

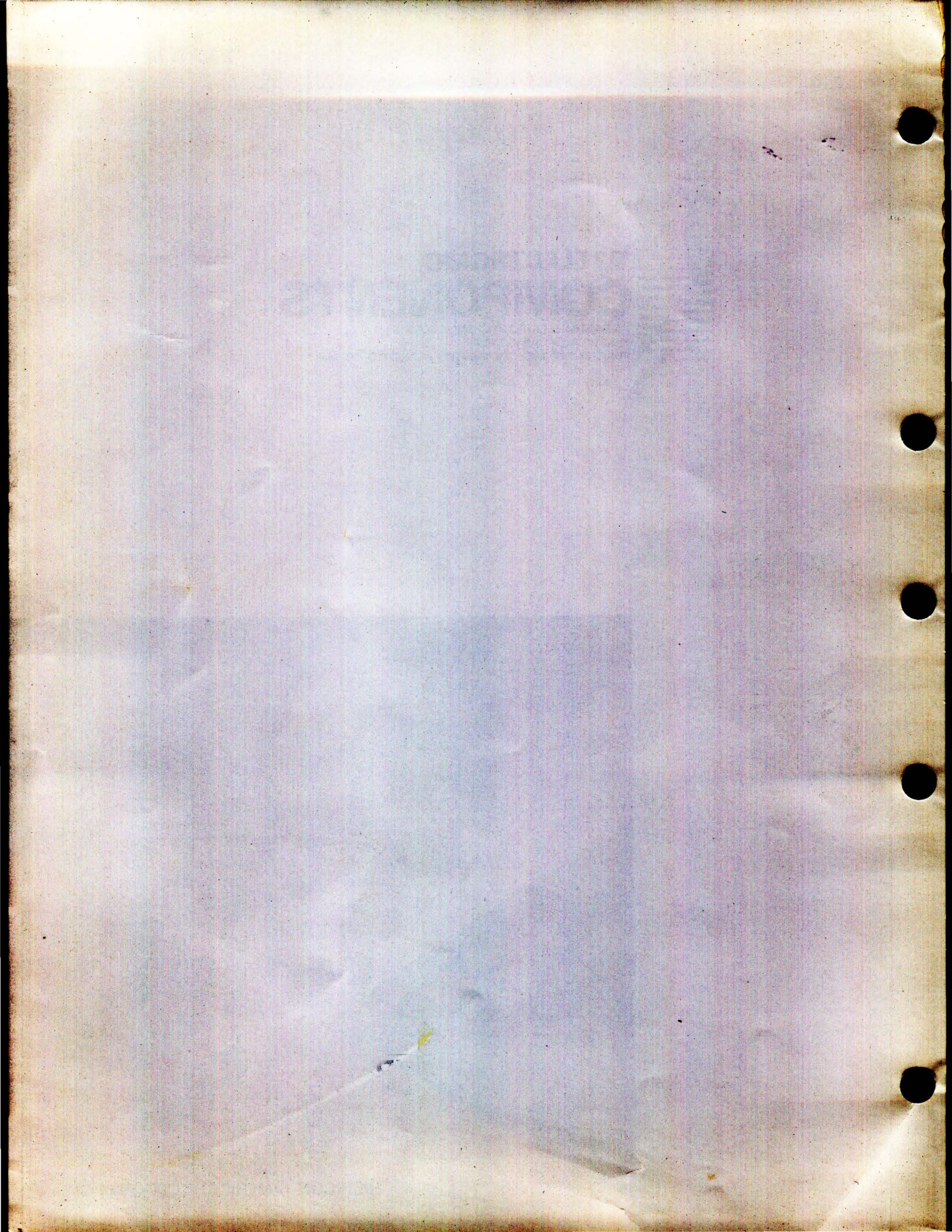


# '92 ELECTRONIC COMPONENTS

ALUMINUM ELECTROLYTIC CAPACITORS  
PLASTIC FILM CAPACITORS  
POSITIVE THERMISTORS "Posi-R" HYBRID I.C.s "Hi-Net"



NICHICON (AMERICA) CORPORATION



## Miniature Aluminum Electrolytic Capacitors

### Chip Type

<b>WX</b> 5.5mmL Chip Type.	<b>WP</b> 5.5mmL Chip Type. Non Polarized	<b>WT</b> 5.5mmL Chip Type. Wide Temperature Range	<b>WF</b> Chip Type, Low Impedance	<b>UP</b> 6mmL Chip Type, Non-Polarized
<b>UT</b> 6mmL Chip Type, Wide Temperature Range	<b>UZ</b> 6mmL Chip Type, Long Life Assurance	<b>UR</b> Chip Type, High C/V	<b>UX</b> Chip Type, Higher Capacitance Range	<b>UK</b> 6mmL Chip Type, For Audio Equipment

### Ultra-Miniature Type

<b>MA</b> 5mmL, Standard, For General Purposes	<b>ML</b> 5mmL, Low Leakage Current
<b>MP</b> 5mmL, Non-Polarized	<b>MT</b> 5mmL, Wide Temperature Range
<b>MQ</b> 5mmL, Long Life Assurance	<b>MF</b> 5mmL, Low Impedance
<b>MJ</b> 5.2mmL, MAX.	<b>SA</b> 7mmL, For General Purposes
<b>SR</b> 7mmL, High C/V	<b>SL</b> 7mmL, Low Leakage Current
<b>SP</b> 7mmL, Non-Polarized	<b>ST</b> 7mmL, Wide Temperature Range
<b>SQ</b> 7mmL, Long Life Assurance	<b>SF</b> 7mmL, Low Impedance

### Standard Type

<b>VX</b> Standard, For General Purposes (Radial Lead Type)	<b>VX</b> Standard, For General Purposes (Axial Lead Type)
<b>VR</b> Miniature Sized	<b>VZ</b> Wide Temperature Range

### Standard Type

<b>VS</b> Low-Profile Sized	<b>RS</b> Compact & Low-Profile Sized
<b>RZ</b> Compact & Low-Profile Sized, Wide Temperature Range	<b>RT</b> Low-Profile Sized, Wide Temperature Range
<b>VP</b> Non-Polarized	<b>ET</b> Non-Polarized, Wide Temperature Range

### High Reliability Type

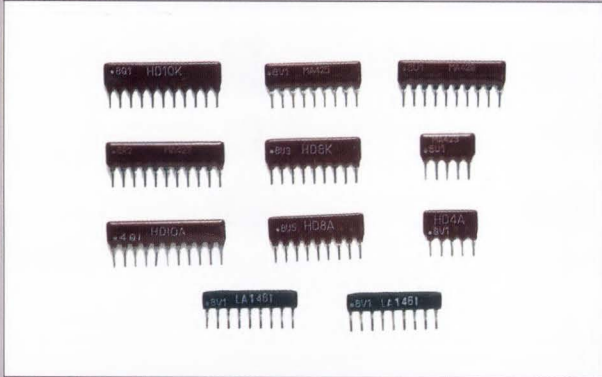
<b>PR</b> Standard, For Switching Power Supplies	<b>PY</b> Low Impedance, High Reliability
<b>PF</b> Low Impedance, High Reliability	<b>PL</b> Extremely Low Impedance, High Reliability
<b>PQ</b> Miniature Sized, Low Impedance, High Reliability	<b>PG</b> Long Life, High Reliability
<b>PH</b> Extremely Long Life, High Reliability	<b>BE</b> High Temperature Range, For +125°C Use

### Special Type

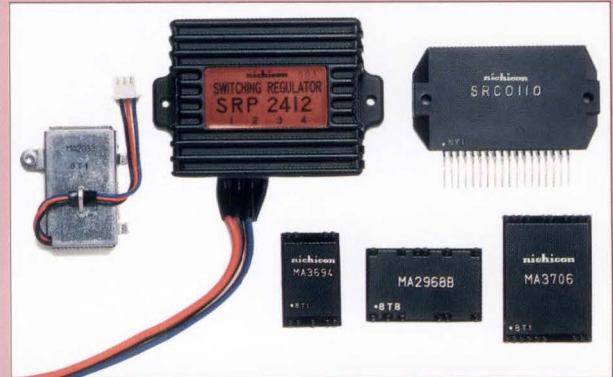
<b>KL</b> Low Leakage Current	<b>ZA</b> Low Noise Purposes
<b>TM</b> Timer Circuit Use	<b>SH</b> Vertical Time Constant Circuit Use
<b>HA</b> Horizontal Deflection Current Correction Use	<b>JB</b> Memory Back-Up Use

## Hybrid ICs "Hi-Net"

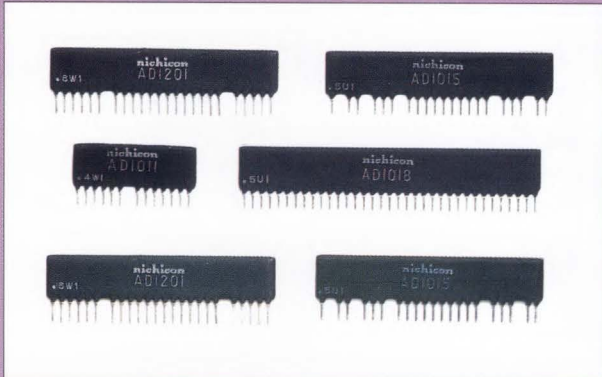
### Diode Array Series



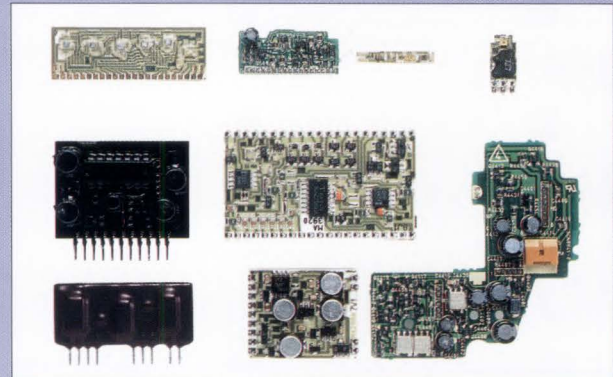
### Switching Regulator Power Hybrid ICs



### Graphic Equalizer Series

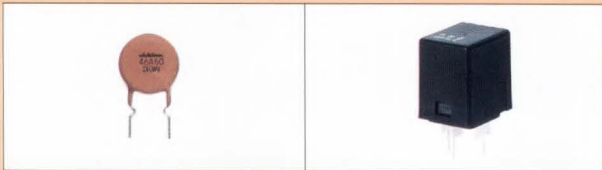


### Custom-made Hybrid ICs

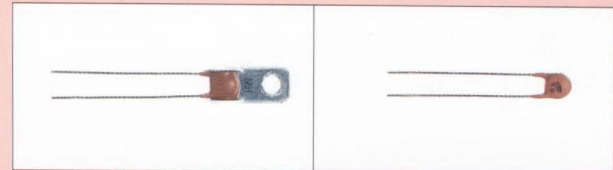


## Positive Thermistors "Posi-R"

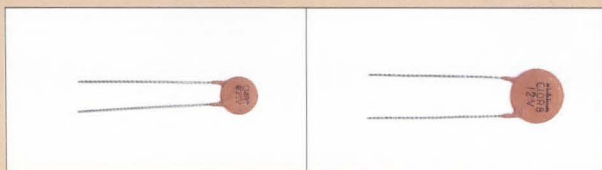
### For Color TV Automatic Degaussing Circuit



### For Thermal Protection



### For Overcurrent Protection



## For Audio Equipment




<p><b>KZ</b> High Grade Type, For Audio Equipment</p> 	<p><b>FS</b> Standard, For Audio Equipment</p> 
<p><b>FX</b> Miniature Sized, For Audio Equipment</p> 	<p><b>FM</b> Miniature Sized, For General Audio Products</p> 
<p><b>SK</b> 7mmL, For Audio Equipment</p> 	<p><b>MC</b> 5mmL, For Audio Equipment</p> 
<p><b>UK</b> 6mmL Chip Type, For Audio Equipment</p> 	<p><b>ES</b> Non-Polarized, For Audio Equipment</p> 
<p><b>DB-GB</b> Bi-Polarized, For Speaker Network</p> 	

## High Reliability Type

<p><b>GQ</b> Snap-in Terminal Type, Long Life, Wide Temperature Range</p> 	<p><b>GE</b> Snap-in Terminal Type, Low-Profile Sized, Wide Temperature Range</p> 
<p><b>GX</b> Snap-in Terminal Type, Long Life, Wide Temperature Range</p> 	<p><b>GR</b> Snap-in Terminal Type, Long Life, Wide Temperature Range</p> 
<p><b>GZ</b> Snap-in Terminal Type, Long Life, Wide Temperature Range</p> 	<p><b>DP</b> Oval-Shaped Type Wide Temperature Range</p> 
<p><b>DK</b> Horizontal Mounting Type, Wide Temperature Range</p> 	

## Large Can Aluminum Electrolytic Capacitors



### Standard Type

<p><b>LK</b> Snap-in Terminal Type, Standard</p> 	<p><b>LQ</b> Snap-in Terminal Type, Low-Profile Sized</p> 
<p><b>DL</b> Horizontal Mounting Type</p> 	


### Special Type

<p><b>AB</b> Snap-in Terminal Type, Withstanding Overvoltage</p> 	<p><b>NR</b> Screw Terminal Type</p> 
<p><b>NQ</b> Screw Terminal Type, Smaller Sized</p> 	<p><b>NT</b> Screw Terminal Type, Wide Temperature Range</p> 
<p><b>NZ</b> Screw Terminal Type, Low Impedance</p> 	<p><b>MK</b> Lug Terminal Type, For Motor Starting</p> 

### High Reliability Type

<p><b>GK</b> Snap-in Terminal Type, Wide Temperature Range</p> 	<p><b>GK-HH</b> PC Board Mounting Type</p> 
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### For Audio Equipment

<p><b>GS</b> Lug/Snap-in Terminal Type, For Audio Equipment</p> 	
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## Tantalum Electrolytic Capacitors

### Chip Type


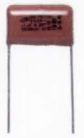



<p><b>F92</b> Resin-molded Chip, Compact Series</p> 	<p><b>F93</b> Resin-molded Chip, Standard Series</p> 
<p><b>F94</b> Resin-molded Chip, Built-in Fuse Series</p> 	<p><b>F97</b> Resin-molded Chip, High Reliability Series</p> 
<p><b>F95</b> Conformal-coated Chip, Series</p> 	

### Resin-Coated Type







<p><b>S87</b> Resin-coated, Compact Series</p> 	<p><b>S89</b> Resin-coated, Standard Series</p> 
<p><b>S99</b> Resin-coated, High Reliability Series</p> 	

## Plastic Film Capacitors




### Safety Standards Recognition Type

<p><b>XW</b> UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI, Approved (Compact Size)</p> 	<p><b>XC</b> UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI, Approved</p> 
<p><b>EW</b> UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI, Approved</p> 	<p><b>XE</b> VDE, DEMKO, SEMKO, UL, Approved</p> 
<p><b>XB</b> UL, CSA, VDE, B S, Approved</p> 	

### Metallized Film Type

<p><b>XJ</b> Standard Type</p> 	<p><b>XN</b> Compact Type</p> 
<p><b>XF</b> Standard Type for High Frequency Applications</p> 	<p><b>XR</b> Electrical Appliance and Material Control Law Approved</p> 
<p><b>AS</b> Tape-Wrapped Axial lead Type</p> 	<p><b>AF</b> Tape-Wrapped Axial lead Type for High Frequency Applications</p> 

### Foil Type

<p><b>YX</b> Miniaturized Standard Type</p> 	<p><b>YS</b> Ultra-Miniaturized Low-Profile Type</p> 
<p><b>YP</b> Ultra-Miniaturized 5mm Lead Pitch Type</p> 	

## Contents

<b>1</b>	ALUMINUM ELECTROLYTIC CAPACITORS	3
<b>2</b>	TANTALUM ELECTROLYTIC CAPACITORS	121
<b>3</b>	PLASTIC FILM CAPACITORS	136
<b>4</b>	POSITIVE THERMISTORS "Posi-R"	156
<b>5</b>	HYBRID I.C.s "Hi-Net"	163

ALUMINUM ELECTROLYTIC CAPACITORS

TANTALUM ELECTROLYTIC CAPACITORS

PLASTIC FILM CAPACITORS

POSITIVE THERMISTORS "Posi-R"

HYBRID I.C.s "Hi-Net"

Nichicon has developed many new series of capacitors and extended the existing ratings in order to meet various needs from our customers. To select our line of products for right application, we have put the following pictographs to individual series for your easy reference.



For SMD



Smaller



High Ripple Current



Low Impedance



Low Leakage Current



Long Life



Non-polarized



RCJ Approved



For Audio Use



Anti-Solvent Feature



For High Frequency



Safety Standards Recognized



# 1

## ALUMINUM ELECTROLYTIC CAPACITORS

### Contents

1-1. Type of capacitors	4
2. Systematic diagram of capacitors based on application	6
3. Precautions in using capacitors	8
4. Type numbering system	9
5. Cut, formed and taped leads	10
6. Individual specifications by series	13

# ALUMINUM ELECTROLYTIC CAPACITORS

## Miniature Aluminum Electrolytic Capacitors

Classification	Series	JIS Configuration	Applications	Operating Temperature Range (°C)	Features					Voltage Range (V.D.C)	Capacitance Range (μF)	Capacitance Tolerance (%)	Page
					Standard type	Smaller-sized & low profile	Low impedance	Long life	Anti-cleaning solvent				
Surface Mounting type	WX	Chip	5.5mmL Chip Type	-40~+85	●				●	4~50	0.1~220	±20	13
	WP	Chip	5.5mmL Chip Type, Non-Polarized	-40~+85		●			●	6.3~50	0.1~47	±20	14
	WT	Chip	5.5mmL Chip Type, Wide Temperature Rang	-55~+105		●			●	4~50	0.1~100	±20	15
	WF	Chip	5.5mmL Chip Type, Low Impedance	-55~+105			●		●	6.3~35	1~220	±20	16
	UP	Chip	6mmL Chip Type, Non-Polarized	-40~+105	●				●	6.3~50	0.1~47	±20	17
	UT	Chip	6mmL Chip Type, Wide Temperature Range	-55~+105	●				●	4~50	0.1~100	±20	18
	UZ	Chip	6mmL Chip Type, Long Life Assurance	-55~+105				●	●	4~50	0.1~100	±20	19
	UR	Chip	6mmL Chip Type, High C/V	-40~+85		●			●	6.3~50	22~1000	±20	20
	UX	Chip	Chip Type, Higher Capacitance Range	-55~+105			●		●	6.3~50	22~470	±20	21
	UK	Chip	6mmL Chip Type, For Audio Equipment	-40~+85					●	4~50	0.1~220	±20	83
Ultra-Miniature type	MA	04	5mmL, Standard, For General Purposes	-40~+85	●				●	4~50	0.1~470	±20	22
	ML	04	5mmL, Low Leakage Current	-40~+85	●				●	4~50	0.1~100	±20	23
	MP	04	5mmL, Non-Polarized	-40~+85	●				●	6.3~50	0.1~47	±20	24
	MT	04	5mmL, Wide Temperature Range	-55~+105	●				●	4~50	0.1~100	±20	25
	MQ	04	5mmL, Long Life Assurance	-55~+105				●	●	4~50	0.1~100	±20	26
	MF	04	5mmL, Low Impedance	-55~+105			●		●	6.3~35	1~100	±20	27
	MJ	04	5.2mmL MAX.	-40~+85		●			●	4~50	0.1~220	±20	28
	SA	04	7mmL, For General Purposes	-40~+85	●				●	6.3~50	0.1~220	±20	29
	SR	04	7mmL, High C/V	-40~+85		●			●	4~50	4.7~470	±20	29
	SL	04	7mmL, Low Leakage Current	-40~+85	●				●	6.3~50	0.1~220	±20	30
	SP	04	7mmL, Non-Polarized	-40~+85	●				●	6.3~50	0.1~47	±20	31
	ST	04	7mmL, Wide Temperature Range	-55~+105	●				●	6.3~50	0.1~220	±20	32
	SQ	04	7mmL, Long Life Assurance	-55~+105				●	●	6.3~50	0.1~220	±20	33
SF	04	7mmL, Low Impedance	-55~+105			●		●	6.3~35	6.8~220	±20	34	
Standard type	VX	04	Standard, For General Purposes	-40 (-25) ~ +85	●				■	6.3~450	0.1~33000	±20	36
		02	Standard, For General Purposes	-40 (-25) ~ +85	●				▲	6.3~450	0.47~22000	±20	38
	VR	04	Miniature Sized	-40 (-25) ~ +85		●			■	6.3~450	0.1~22000	±20	40
	VZ	04	Wide Temperature Range	-55 (-40, -25) ~ +105		●			■	6.3~450	0.1~22000	±20	42
	VS	04	Low-Profile Sized	-40~+85	●				■	6.3~400	0.1~10000	±20	35
	RS	04	Compact & Low-Profile Sized	-40~+85		●			●	6.3~50	0.1~10000	±20	44
	RZ	04	Compact & Low-Profile Sized, Wide Temperature Range	-55~+105	●				●	6.3~50	0.1~10000	±20	45
	RT	04	Low-Profile Sized, Wide Temperature Range	-55 (-40) ~ +105		●			■	6.3~400	0.1~10000	±20	46
	VP	04	Non-Polarized	-40~+85	●				●	6.3~100	0.47~6800	±20	47
ET	04	Non-Polarized, Wide Temperature Range	-55~+105	●				●	6.3~100	0.47~1000	±20	48	
High Reliability type	PR	04	Standard, For Switching Power Supplies	-55 (-40, -25) ~ +105		●	●		■	6.3~450	0.47~22000	±20	56
	PY	04	Low Impedance, High Reliability	-55~+105		●	●		●	6.3~50	0.47~15000	±20	58
	PF	04	Low Impedance, High Reliability	-55~+105	●		●	●	●	6.3~100	0.47~15000	±20	49
	PL	04	Extremely Low Impedance, High Reliability	-55~+105			●	●	●	6.3~63	0.47~15000	±20	60
	PQ	04	Miniature Sized, Low Impedance, High Reliability	-55~+105			●	●	●	6.3~50	0.47~390	±20	66
	PG	04	Long Life, High Reliability	-55~+105			●	●	●	10~63	4.7~4700	±20	68
	PH	04	Extremely Long Life, High Reliability	-55~+105				●	●	10~63	47~3300	±20	69
	BE	04	High Temperature Range, For +125°C Use	-40~+125					●	●	10~50	0.47~470	±20
02		High Temperature Range, For +125°C Use	-40~+125					●		10~50	0.47~470	±20	70

■ : Applicable up to 250 V ratings.  
 (For VX 04 type(Radial lead type with case sizes larger than φ22mm), applicable only to 100V ratings or lower.)  
 ▲ : Applicable up to 100V ratings or lower.

## Miniature Aluminum Electrolytic Capacitors

Classification	Series	JIS Configuration	Applications	Operating Temperature Range (°C)	Features					Voltage Range (V.D.C)	Capacitance Range (μF)	Capacitance Tolerance (%)	Page
					Standard type	Smaller-sized & low profile	Low impedance	Long life	Anti-cleaning solvent				
Special type	KL	04	Low Leakage Current	-40~+105	●				●	10~50	0.1~330	±20, ±10	71
	ZA	04	Low Noise Purposes	-40~+85	●				●	6.3~100	0.47~47	±20	72
	TM	04	Timer Circuit Use	-40~+85	●				●	10~50	1~470	±20, ±10	73
	SH	04	Vertical Time Constant Circuit Use	-40~+85	●				●	16~50	0.47~470	±20, ±10	74
	HA	04	Horizontal Deflection Current Correction Use	-25~+85	●				●	25, 50	2.2~10	±10	75
	JB	04	Memory Back-Up Use	-25~+85	●				●	5.5	2.2~47mF	-10~+50	76
For audio equipment	KZ	04	High Grade Type, For Audio Equipment	-40~+85					●	25~100	10~1000	±20	77
	FS	04	Standard, For Audio Equipment	-40~+85	●				●	6.3~100	0.1~10000	±20	78
	FX	04	Miniature Sized, For Audio Equipment	-40~+85		●			●	6.3~100	0.1~22000	±20	79
	FM	04	Miniature Sized, For General Audio Products	-40~+85		●			●	6.3~100	0.1~22000	±20	80
	SK	04	7mmL, For Audio Equipment	-40~+85	●				●	6.3~50	0.1~220	±20	81
	MC	04	5mmL, For Audio Equipment	-40~+85	●				●	4~50	0.1~220	±20	82
	UK	Chip	6mmL, Chip Type, For Audio Equipment	-40~+85					●	4~50	0.1~220	±20	83
	ES	04	Non-Polarized, For Audio Equipment	-40~+85	●				●	6.3~50	0.47~1000	±20	84
	DB,GB	04	Bi-Polarized, For Speaker Network	-40~+85	●				●	50	1~68	±20, ±10	85

## Large Can Aluminum Electrolytic Capacitors

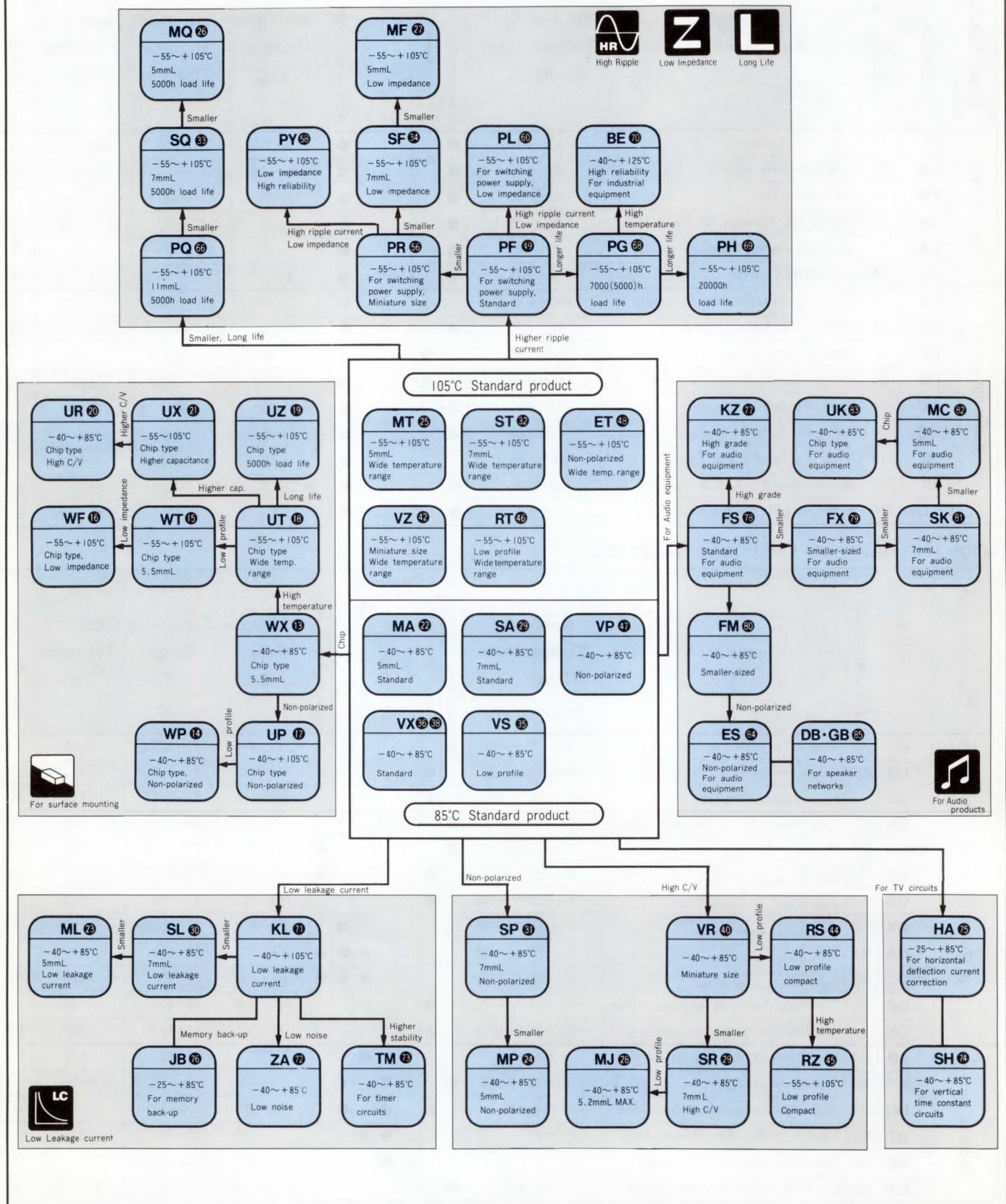
Classification	Series	JIS Configuration	Applications	Operating Temperature Range (°C)	Features					Voltage Range (V.D.C)	Capacitance Range (μF)	Capacitance Tolerance (%)	Page	
					Standard type	Smaller-sized & low profile	Low impedance	High ripple	High temperature range					Long life
Standard type	LK	692	Snap-in Terminal Type, Standard	-40 (-25) ~ +85	●					▲	16~450	47~33000	±20	86
	LQ	692	Snap-in Terminal Type, Low-Profile Sized	-40 (-25) ~ +85	●					▲	16~450	56~56000	±20	89
	DL	—	Horizontal Mounting Type	-40 (-25) ~ +85	●						160~450	82~1500	±20	92
High Reliability type	GK	692	Snap-in Terminal Type, Wide Temperature Range	-40 (-25) ~ +105	●					▲	16~400	56~33000	±20	93
	GK-HH	694 695	PC Board Mounting Type	-40 (-25) ~ +105	●					▲	16~400	560~68000	±20	96
	GQ	692	Snap-in Terminal Type, Low-Profile Sized Wide Temperature Range	-40 (-25) ~ +105	●					▲	16~450	56~47000	±20	98
	GE	692	Snap-in Terminal Type, Low-Profile Sized, Wide Temperature Range	-40 (-25) ~ +105	●						160~400	47~560	±20	101
	GX	692	Snap-in Terminal Type, Long Life, Wide Temperature Range	-40 (-25) ~ +105					●		200~400	82~1500	±20	102
	GR	692	Snap-in Terminal Type, Long Life, Wide Temperature Range	-40 (-25) ~ +105				●	●	●	200~400	39~680	±20	104
	GZ	692	Snap-in Terminal Type, Long Life, Wide Temperature Range	-40 (-25) ~ +105				●	●	●	200~400	33~390	±20	106
	DP	—	Oval-Shaped Type, Wide Temperature Range	-40 (-25) ~ +105	●						200, 400	33~1000	±20	108
	DK	—	Horizontal Mounting Type, Wide Temperature Range	-40 (-25) ~ +105	●						160~400	82~1200	±20	109
Special type	AB	692	Snap-in Terminal Type, Withstanding Overvoltage	-25~+105					●		250	82~820	±20	110
	NR	331	Screw Terminal Type	-40 (-25) ~ +85	●		●		●		16~450	470~470000	±20	112
	NQ	331	Screw Terminal Type, Smaller-Sized	-25~+85	●		●		●		350~450	1000~10000	±20	114
	NT	331	Screw Terminal Type, Wide Temperature Range	-40 (-25) ~ +105			●	●			16~400	220~330000	±20	116
	NZ	331	Screw Terminal Type, Low Impedance	-40~+105			●	●			10~100	1000~100000	±20	111
	MK	622	Lug Terminal Type, For Motor Starting	-20~+65	●						125~250 (VAC)	50~250	0~+20	120
For audio equipment	GS	621	Lug/Snap-in Terminal Type, For Audio Equipment	-40~+85	●						16~100	680~33000	±20	118

▲ : Applicable up to 100V ratings or lower.

# ALUMINUM ELECTROLYTIC CAPACITORS

Systematic Diagram by Series Based on Application

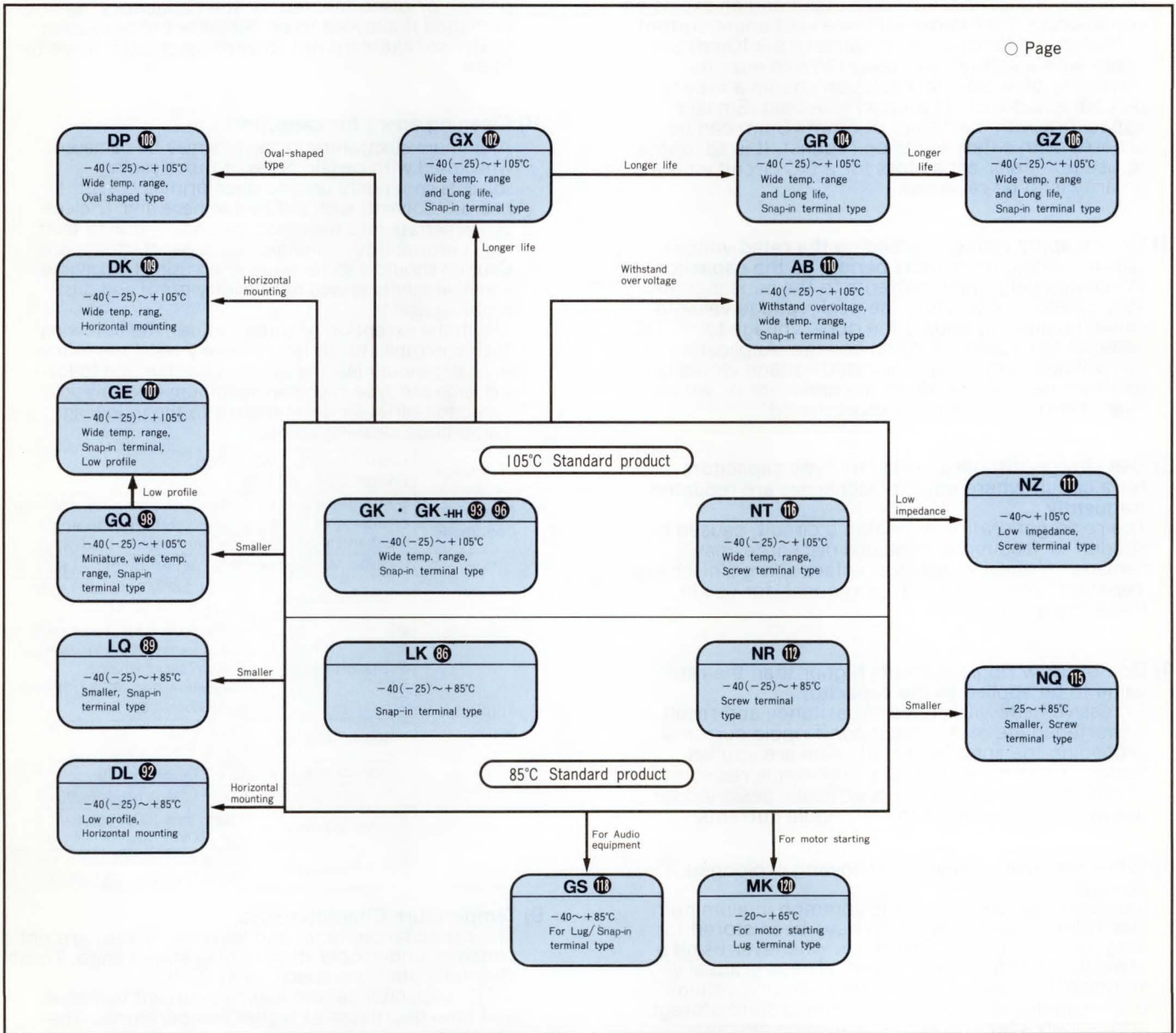
○ Page number



## Miniature Aluminum Electrolytic Capacitors

• Matrix for major series

Configuration	Feature	Standard	Non-polarized	High C/V	Low leakage current	Wide temperature range	For Audio equipment	Low impedance	Long life(5000h)
Standard type		VX	VP	VR	KL	VZ	FS	PL	PQ
Smaller type		VS	—	RS	—	RT(RZ)	—	—	—
7mmL type		SA	SP	SR	SL	ST	SK	SF	SQ
5mmL type		MA	MP	—	ML	MT	MC	MF	MQ
Chip type		WX	UP(WP)	—	—	UT(WT)	UK	WF	UZ



### STANDARDIZATION

Some of the series listed right have been obsoleted from this catalog. On designing, please select from the new series for your applications.

Obsoleted Series	New Series
MX (Chip Type)	→ WX
PZ (Long Life, High Reliability)	→ PG, PL
KS (Standard, For Audio Equipment)	→ FS
KV, KX (Miniature Sized, For Audio Equipment)	→ FX
HK (Snap-in Terminal Type, High C/V, Wide Temperature Range)	→ GK-HH
GP (Snap-in Terminal Type, Low Profile Sized, Wide Temperature Range)	→ GE
PK (Snap-in Terminal Type, Long Life, Wide Temperature Range)	→ GX

# ALUMINUM ELECTROLYTIC CAPACITORS

## IMPORTANT INFORMATION ON THE APPLICATION OF ALUMINUM ELECTROLYTIC CAPACITORS

When you use aluminum electrolytic capacitors, remember the following:

### 1) DC electrolytic capacitors are polarized.

DC electrolytic capacitors have polarity. The polarity is marked on the body of the capacitor. If polarity is reversed, a short-circuit would occur and an explosion would occur if the capacitor were kept under current.

Nichicon capacitors with diameters  $\geq 10\text{mm}$  are made with a safety-vent design to minimize the possibility of accidental explosion should a capacitor be connected with its polarity reversed. Smaller capacitors with diameters of  $5\text{mm} \sim 8\text{mm}$  can be ordered with safety-vents on request. It is advisable to use non-polar capacitors for a DC circuit where polarity is to be reversed.

### 2) Do not apply voltage exceeding the rated voltage (surge voltage for a short period) to the capacitor.

When applying ripple currents to the capacitor, be very careful not to allow the peak voltage value (a value obtained by adding the ripple voltage to the DC voltage) to exceed the rated voltage. Application of any voltage higher than the rated voltage would lead to shortened service life of the capacitor or would even destroy the unit in a short period.

### 3) Use charge/discharge-resistant type capacitors for a circuit where abrupt discharges are repeated frequently.

The rapid generation of heat in a circuit, caused by sudden or frequently repeated discharge, may damage capacitors. Nichicon offers charge/discharge-resistant type capacitors on request, for use in these applications.

### 4) Do not allow ripple currents higher than the rated value to be applied to the capacitor.

Excessive heat will reduce capacitance and result in a shortened life of the capacitor if ripple currents exceeding the specified rated value are applied. Nichicon offers, on request, high-ripple resistant capacitors that have been specifically designed for use in circuits exposed to high ripple currents.

### 5) When you use a capacitor following prolonged storage.

Increased leakage current is common in aluminum electrolytic capacitors which have been stored for long periods of time. Therefore, whenever using a capacitor that has been stored, always gradually increase the voltage to the rated working voltage before application. Since high temperature storage atmospheres tend to increase leakage current, capacitors should be stored at temperatures of  $-40^\circ\text{C} \sim +40^\circ\text{C}$  and kept out of direct sunlight.

### 6) Cautions in soldering capacitors.

The characteristics of capacitors will be adversely affected if they are dipped in solder too long or if the solder temperature is too high. Capacitors should be dipped in solder of  $260^\circ\text{C}$  or below for 10 sec. or less. Soldering irons must never come in contact with the vinyl insulating sleeve of the capacitor.

### 7) Be careful not to subject the terminals or lead wires of capacitors to excessive force.

The terminals or lead wires of capacitors may be broken or disconnected, or the capacitors may be damaged if allowed to be subjected to excessive force, so take care not to apply excessive force to them.

### 8) Cleaning agent for capacitors.

Aluminum electrolytic capacitors may be damaged when used with certain types of flux cleaning solvents commonly used to clean printed circuit boards. Solvents such as Chloroethene and Triclene can penetrate into the capacitor body — due to their high permeability — and destroy capacitor functions. Caution should also be taken when using halogenous adhesive agents as well as humidity-proof and dust-proofing agents.

With the exception of certain values, the following Nichicon capacitor series effectively resist the following halogenous cleaning agents. Likewise, the following large can type Nichicon aluminum electrolytic capacitor series are also resistant to the following halogenous cleaning agents:

Cleaning Agents	Freon TS, TES, TMS, T-P35, Daiflon S3-E, S3-P35		
Cleaning Conditions	5 minutes either by immersion, steaming, spraying or ultrasonic cleaning. Be careful not to apply mechanical stress to the terminals or lead wires.		
Applicable Series	Miniature type	Surface Mounting type	WX, WP, WT, WF, UP, UT, UZ, UR, UX, UK
		Ultra-Miniature type	MA, ML, MP, MT, MQ, MF, MJ, SA, SR, SL, SP, ST, SF, SQ
		Standard type	VX(O4)(Less than $\phi 20$ )(Less than 250V), VX(O2)(Less than 100V), VR(Less than 250V), VZ(Less than 250V), VS(Less than 250V), RS, RZ, RT(Less than 250V), VP, ET
		High Reliability type	PR(Less than 250V), PY, PF, PL, PQ, PG, PH, BE(O4)
		Special type	KL, ZA, TM, SH, HA, JB
	For audio equipment	KZ, FS, FX, FM, SK, MC, UK, ES, DB, GB	
	Large Can type	Standard type	LK(Less than 100V), LQ(Less than 100V)
High Reliability type		GK(Less than 100V), GK, HH(Less than 100V), GQ(Less than 100V), GR, GZ	

### 9) Temperature Characteristics.

The capacitance,  $\tan\delta$ , and leakage current are not constant under operating temperature range. These characteristics are specified at  $20^\circ\text{C}$ .

The capacitance and leakage current increase, and  $\tan\delta$  decreases at higher temperatures. The capacitance and leakage current decrease, and  $\tan\delta$  increases at lower temperatures.

### 10) Ripple Current Coefficients.

The maximum ripple current (r.m.s.) is normally specified at  $85^\circ\text{C}$  and 120 Hz. When the capacitors are used at a condition other than specified, the maximum ripple current varies with temperature and frequency. The maximum ripple current can be calculated using ripple coefficients which are listed in this catalog.

## 11) Estimated Life

Environmental conditions affecting the life of aluminum electrolytic capacitors are temperature, humidity, atmospheric pressure and vibration.

Temperature has the greatest effect on life. The relationship between ambient temperatures and capacitor life has been confirmed to follow ARRHENIUS' equation (a chemical reaction formula due to dielectric molecules activated by thermal energy) in the rated operating temperature range of the capacitor. Our test results show the life of the capacitor is reduced approximately by one-half for each temperature increase of 10°C.

The thermal deterioration due to ripple current stress can be seen in a capacitor in service. The relationship between these two factors and the life of the capacitor may be expressed by following formula:

$$L_N = L \cdot 2^{\frac{T-T_N}{10}} \cdot \frac{1}{B_N}$$

$L_N$  : Lifetime under temperature " $T_N$ " (°C), applied voltage " $V_N$ " (V) and applied ripple current " $i_N$ " (Arms).

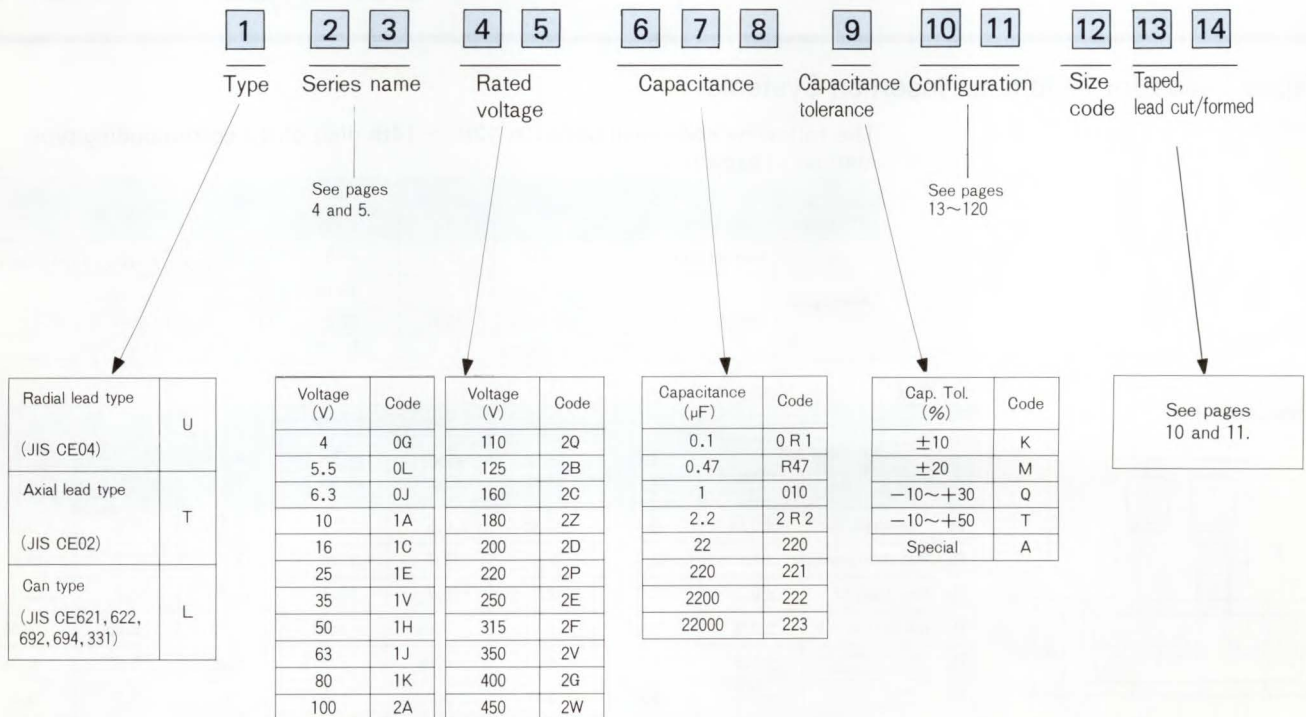
$L$  : Lifetime under maximum rated operating temperature " $T$ " (°C) and applied voltage " $V$ " (V) equal to rated voltage

$B_N$  : Acceleration coefficient of ripple current at temperature " $T_N$ " (°C) and applied ripple current " $i_N$ "

## 12) Blank terminals must be mounted to an electrically isolated place.

Blank terminals are not perfectly isolated from the element. It is important when planning the printed circuit board to electrically isolate the blank terminals. The blank terminals are for added stability only, and should never be electrically connected to either the positive or negative terminal.

## Type numbering system



# ALUMINUM ELECTROLYTIC CAPACITORS

## ※Trimmed (Cut) or Formed Leads

### • Radial lead type

The following code shall be put at 12th~14th digit of the corresponding type number of capacitors.

(mm)

Configurations	Cut/Formed lead code		Dimensions (mm)				Lead configurations
	Code	Applicable series	$\phi D$	F	L	$\ell$	
Forming and cutting	1BA	5mmL, 7mmL series	4	5	5.0	—	<p>(Code 1BA, 1BB) 1.5<sup>MAX</sup> (Code 1FA, 1FV) 2.5<sup>MAX</sup></p>
			5	5	5.0	—	
	1FA	Other series	6.3	5	5.0	—	
			8	5	5.0	—	
Cutting	1CA	All series	10	5	5.0	—	
			12.5	5	5.0	—	
			16	7.5	5.0	—	
			18	7.5	5.0	—	
Snap-in	1AE	5mmL, 7mmL series	4	5	4.5	1.1	<p>(<math>\phi 4, 5, 6, 3, 8</math>) (Code 1AE) 1.5<sup>MAX</sup> (Code 1AA) 2.5<sup>MAX</sup></p>
			5	5	4.5	1.1	
	1AA	Other series	6.3	5	4.5	1.1	
			8	5	4.5	1.3	
	1AA	All series	10	5	4.5	1.3	
			12.5	5	4.5	1.3	
16			7.5	4.5	1.3		
18			7.5	4.5	1.3		
			20	10	5.0	1.8	

\* Lead diameter ( $\phi d$ ) and lead pitch (P) are subject to capacitor specifications.

## ※Taped Leads for Automatic Insertion Systems

### • Radial lead type

The following code shall be put at 12th ~ 14th digit of the corresponding type number of capacitors.

(mm)

Packaging	Lead style	Specifications			Capacitor diameter ( $\phi$ )	Taping code
		$\oplus$ Leader	F	P <sub>o</sub>		
Ammo-pack	Formed lead	—	5.0	12.7	4~8	1TE (5mmL, 7mmL) 1TA ( $\phi 8 \times 7, \phi 5 \times 9 \sim \phi 8 \times 9, \phi 5 \times 11 \sim \phi 8 \times 20$ )
		—	See Table 2	12.7	3~10	1TP (5mmL, 7mmL) 1TD ( $\phi 8 \times 7, \phi 5 \times 9 \sim \phi 10 \times 20$ )
	Straight lead	—	See Table 2	15.0	12.5	1TO ( $\phi 12.5 \times 12.5 \sim \phi 12.5 \times 25$ )
		—	See Table 2	15.0	16, 18	1TN ( $\phi 16, \phi 18 \times 15 \sim 25$ )

(Formed lead type)

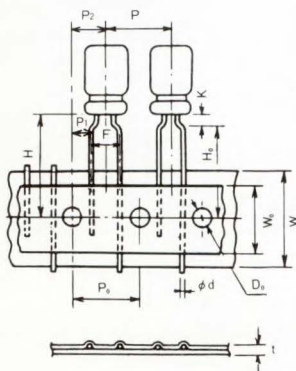


Table 1

(mm)

Item	Case Size	Tolerance	Formed Lead Type						
			$\phi 4 \times 5$ $\phi 4 \times 7$	$\phi 5 \times 5$ $\phi 5 \times 7$	$\phi 5 \times 9$ $\phi 5 \times 11$	$\phi 6.3 \times 5$ $\phi 6.3 \times 7$	$\phi 8 \times 5$ $\phi 8 \times 7$	$\phi 6.3 \times 9$ $\phi 6.3 \times 11$ $\phi 6.3 \times 15$	$\phi 8 \times 9$ $\phi 8 \times 11.5$ $\phi 8 \times 15$ $\phi 8 \times 20$
$\phi d$	Lead-wire diameter	$\pm 0.05$	0.45	0.45	0.5	0.45	0.45 0.5	0.5	0.6
P	Pitch of component	$\pm 1.0$	12.7	12.7	12.7	12.7	12.7	12.7	12.7
P <sub>o</sub>	Feed hole pitch	$\pm 0.3$	12.7	12.7	12.7	12.7	12.7	12.7	12.7
P <sub>1</sub>	Hole center to lead	$\pm 0.7$	3.85	3.85	3.85	3.85	3.85	3.85	3.85
P <sub>2</sub>	Feed hole center to component center	$\pm 1.3$	6.35	6.35	6.35	6.35	6.35	6.35	6.35
F	Lead-to-lead distance	$\pm 0.8$ $\pm 0.2$	5.0	5.0	5.0	5.0	5.0	5.0	5.0
K	Clinch height	MAX.	1.5	1.5	2.5	1.5	1.5(4)*	2.5	4.0
H	Height of component from tape center	$\pm 0.75$	17.5	17.5	18.5	17.5	17.5(20)*	18.5	20.0
H <sub>o</sub>	Lead-wire clinch height	$\pm 0.5$	16.0	16.0	16.0	16.0	16.0	16.0	16.0
W	Tape width	$\pm 0.5$	18.0	18.0	18.0	18.0	18.0	18.0	18.0
W <sub>o</sub>	Hold down tape width	MIN.	7.0	7.0	7.0	7.0	7.0	7.0	7.0
$\phi D_0$	Feed hole diameter	$\pm 0.2$	4.0	4.0	4.0	4.0	4.0	4.0	4.0
t	Total tape thickness	$\pm 0.2$	0.7	0.7	0.7	0.7	0.7	0.7	0.7

\* ( ) Shows for  $\phi 8 \times 7$ , applicable to taping code 1TA.



(Straight lead type)

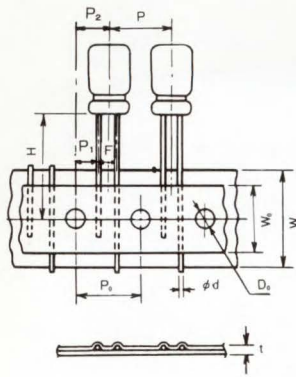


Table 2

(mm)

Item	Case Size	Tolerance	Straight Lead Type								
			$\phi 3$ $\phi 3.5$ $\phi 4$	$\phi 5$	$\phi 6.3$	$\phi 8 \times 5$	$\phi 8 \times 7$	$\phi 8$	$\phi 10$	$\phi 12.5$	$\phi 16$ $\phi 18$
$\phi d$	Lead-wire diameter	$\pm 0.05$	0.4 0.45	0.45 0.5	0.45 0.5	0.45	0.5	0.6	0.6	0.6	0.8
P	Pitch of component	$\pm 1.0$	12.7	12.7	12.7	12.7	12.7	12.7	12.7	15.0	30.0
$P_0$	Feed hole pitch	$\pm 0.3$	12.7	12.7	12.7	12.7	12.7	12.7	12.7	15.0	15.0
$P_1$	Hole center to lead	$\pm 0.7$	5.1 ( $\#1$ 5.35)	5.1 ( $\#1$ 5.35)	5.1 ( $\#1$ 5.35)	5.1	4.6	4.6	3.85	5.0	3.75
$P_2$	Feed hole center to component center	$\pm 1.3$	6.35	6.35	6.35	6.35	6.35	6.35	6.35	7.5	7.5
F	Lead-to-lead distance	$+0.8$ $-0.2$	2.5 $\#1$	2.5 $\#1$	2.5 $\#1$	2.5	3.5	3.5	5.0	5.0	7.5 $\#2$
H	Height of component from tape center	$\pm 0.75$	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5	18.5
W	Tape width	$+1.0$ $-0.5$	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0
$W_0$	Hold down tape width	MIN.	7.0	7.0	7.0	7.0	7.0	7.0	7.0	12.5	12.5
$\phi D_0$	Feed hole diameter	$\pm 0.2$	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
t	Total tape thickness	$\pm 0.2$	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Notes:

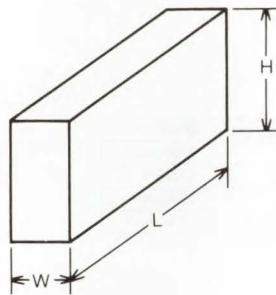
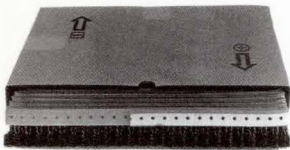
$\#1$  F=2.0mm is also available, provided that capacitor body height is not more than 9mm.

$\#2$  Tolerance on F for  $\phi 16$  and  $\phi 18$  units shall be  $\pm 0.8$ mm.

Special taping specifications on H, F, and K, dimensions other than the above figures are available upon request.

### Packaging

- Ammo-pack (Flat box type)



(mm)

	L	H	W	Case Size	Q'ty/Box
A	340	250	50	4x5, 4x7	2000pcs.
B	340	290	50	5x5, 5x7	2000pcs.
C	340	260	54	4x11, 5x9, 5x11	2000pcs.
				8x5, 8x7, 8x9, 8x11.5, 8x15	1000pcs.
				10x9, 10x12.5, 10x15, 10x16	500pcs.
D	340	260	62	8x20	1000pcs.
				10x20	500pcs.
E	340	300	54	6.3x9, 6.3x11, 6.3x15	2000pcs.
F	340	350	50	3x5, 3.5x5	3000pcs.
				6.3x5, 6.3x7	2000pcs.
G	340	320	62	12.5x12.5, 12.5x15, 12.5x20	500pcs.
				16x15, 16x20, 18x15, 18x20	250pcs.
H	340	320	66	12.5x25	500pcs.
				16x25, 18x25	250pcs.

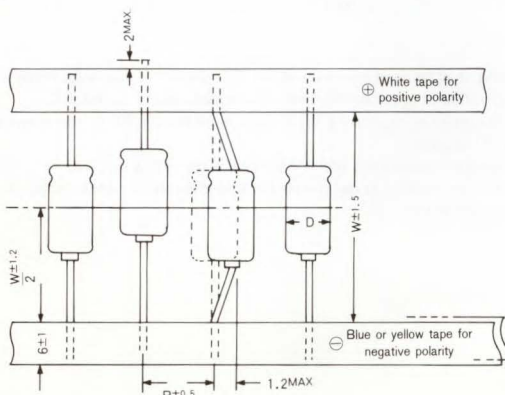
- Axial lead type

The following code shall be put at 12th ~ 14th digit of the corresponding type number of capacitors.

(mm)

Taping Specifications		Dia. of component ( $\phi$ )	Taping code	Q'ty/Reel(pcs.)	
W	P				
52.4	10	5, 6, 6.3, 8	1LS	1500( $\phi 5$ )	1400( $\phi 6$ )
63.5	10	5, 6, 6.3, 8	1LV	1300( $\phi 6.3$ )	1000( $\phi 8$ )
73.0	10	5, 6, 6.3, 8	1LY	1500( $\phi 5$ )	1400( $\phi 6$ ) 1300( $\phi 6.3$ ) 1000( $\phi 8$ )
52.4	15	10, 13 (except $\phi 13 \times 31.5$ )	1LT	500( $\phi 10$ ) 350( $\phi 13$ )	
63.5	15	10, 13	1LW		
73.0	15	10, 13	1LZ		

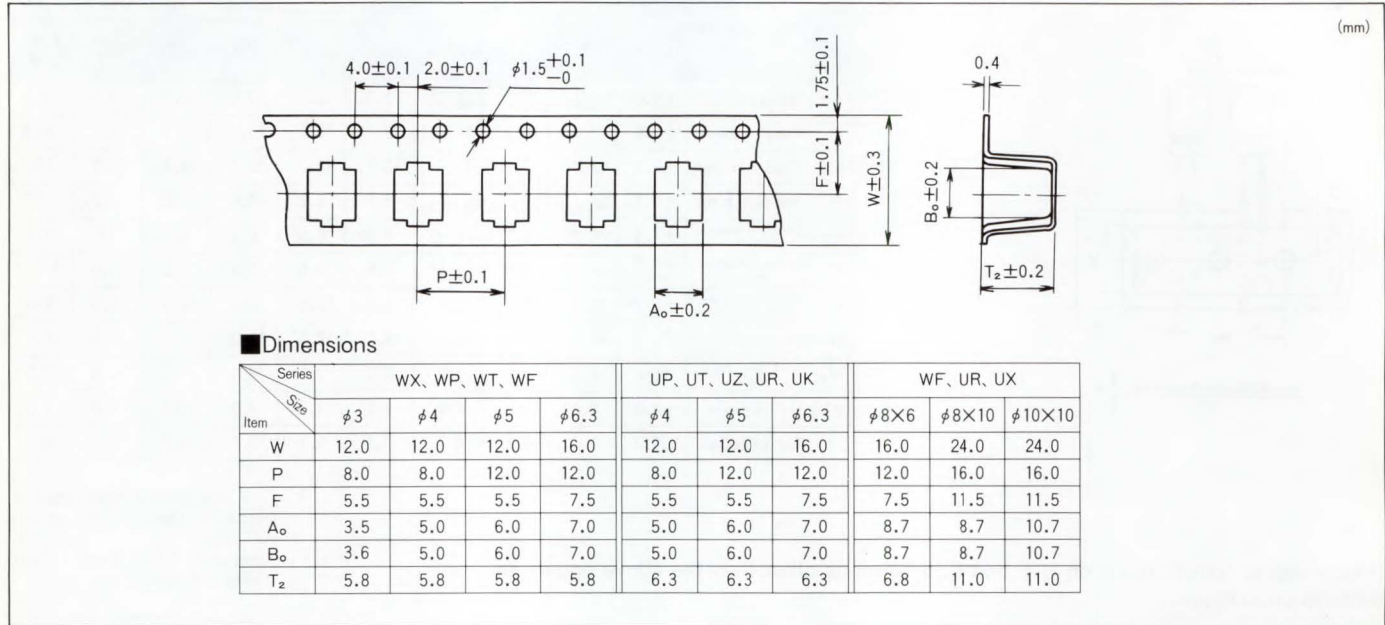
Please contact us for complete information on the package dimensions for taped axial lead capacitors.



# ALUMINUM ELECTROLYTIC CAPACITORS

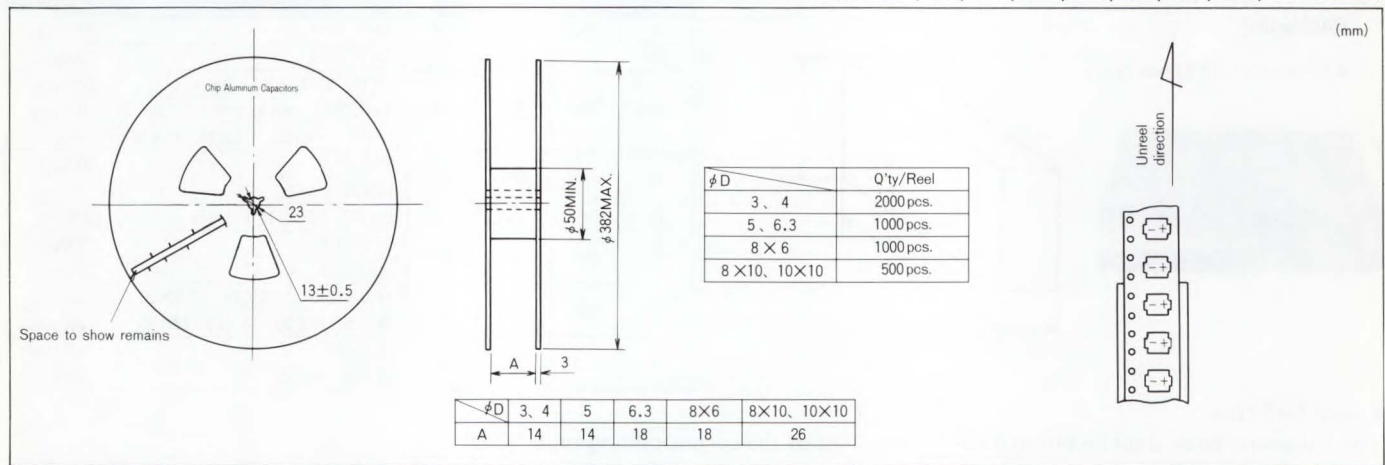
■ Taping Specifications for Chip Type Capacitors (WX, WP, WT, WF, UP, UT, UZ, UR, UX, UK Series)

## ● Carrier tape



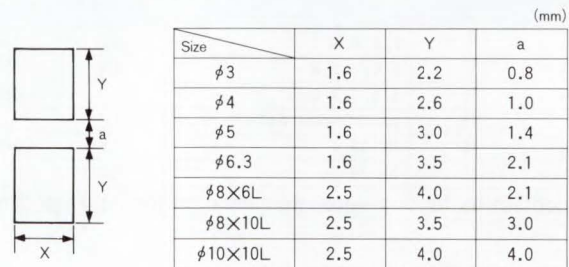
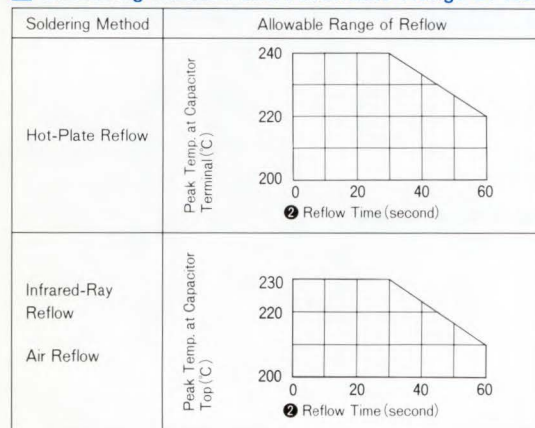
## ● Reel

## ● Polarized (WX, WT, WF, UT, UZ, UR, UX, UK Series)

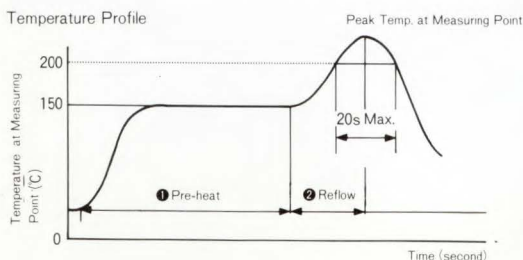


## ■ Soldering Method and Allowable Range of Reflow

## ■ Recommended Land Size



- Pre-heating shall be done less than at +150°C and for 90 seconds, respectively.
- The temperature at capacitor top shall not exceed more than +230°C.
- If the temperature at capacitor top becomes more than +200°C, the reflow time shall be within 20 seconds.
- The standard of temperature profile differs by every reflow method.
- If capacitors are subject to the conditions other than the allowable range of reflow, please contact to us.



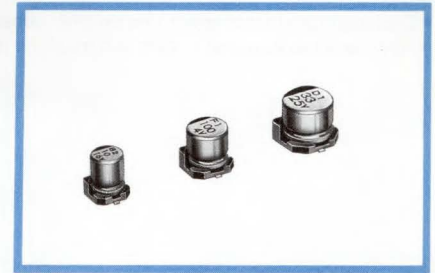
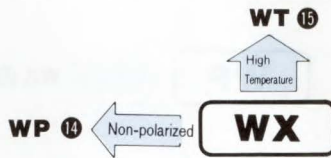
# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**WX** series 5.5mmL Chip Type



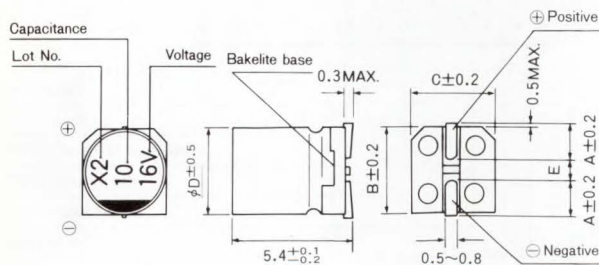
- Chip type with 5.5mm height.
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.
- Load life of 2000 hours at 85°C.



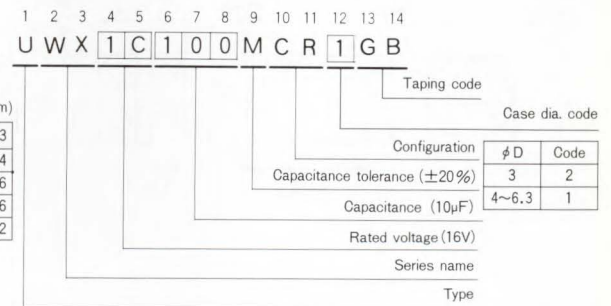
## Specifications

Item	Performance Characteristics																
Operating Temperature Range	-40~+85°C																
Voltage Range	4~50V																
Capacitance Range	0.1~220μF																
Capacitance Tolerance	±20% at 120 Hz, 20°C																
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (μA), whichever is greater.																
tan δ	Measurement frequency : 120Hz, Temperature : 20°C																
	Rated voltage (V)	4	6.3	10	16	25	35	50	Values in ( ) applicable to φ3 case size.								
tan δ (MAX.)	0.35(0.40)	0.26(0.30)	0.20(0.24)	0.16(0.19)	0.14(0.16)	0.12(0.14)	0.12(0.14)										
Stability at Low Temperature	Measurement frequency : 120Hz																
	Rated voltage (V)	4	6.3	10	16	25	35	50									
	Impedance ratio Z-25°C/Z+20°C	7	4	3	2	2	2	2									
ZT/Z20 (MAX.)	Z-40°C/Z+20°C	15	8	8	4	4	3	3									
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.	Leakage Current	Initial specified value or less														
		Capacitance change	Within ±20% of initial value (Within ±25% for 4V and φ3 units)														
		tan δ	200% or less of initial specified value														
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.																
										Leakage current	Initial specified value or less						
										Capacitance change	Within ±10% of initial value						
Marking	Black print on the case top.																
	tan δ	Initial specified value or less															
Applicable Standards	JIS C-5141 and JIS C-5102.																

## Chip Type



## Type numbering system (Example: 16V 10μF)



※ In case of marking for 3φ units, "V" for rated voltage is omitted and Lot No. is expressed only by a digit (month code).

## Dimensions

Cap. (μF)	Code	V		4		6.3		10		16		25		35		50	
		Code	0 G	0 J	1 A	1 C	1 E	1 V	1 H								
0.1	0R1																4(3) 1.0
0.22	R22																4(3) 2.0
0.33	R33																4(3) 2.8
0.47	R47																4(3) 4.0
1	010																4(3) 8.4(8.0)
2.2	2R2												3	8.4	4(3)	13(10)	
3.3	3R3												3	10	4	17	
4.7	4R7											4(3)	16(12)	4	18	5	20
10	100								4(3)	23(18)	5	27	5	29	6.3	33	
22	220	3	19	4(3)	28(21)	5	33	5	37	6.3	42	6.3	46				
33	330	4	28	5	37	5	41	6.3	49	6.3	52						
47	470	4	33	5	45	6.3	52	6.3	58								
100	101	5	56	6.3	70												
220	221	6.3	96														Case size Allowable ripple

( ) is also available with φ3mm upon request.

Taping Specifications are given in page 12.

Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**WP** series 5.5mL Chip Type, Non-Polarized



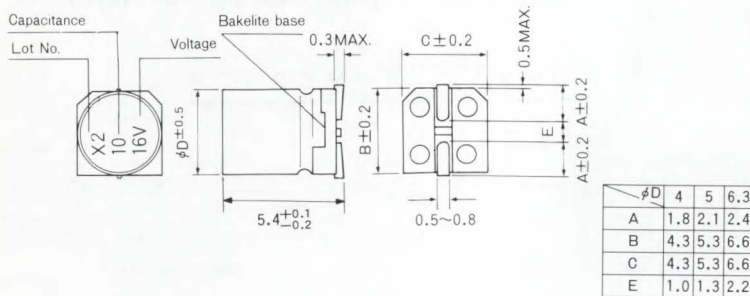
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



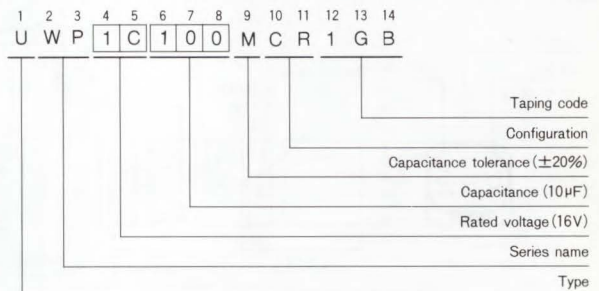
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	6.3~50V							
Capacitance Range	0.1~47μF							
Capacitance Tolerance	±20% at 120 Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.05CV or 10(μA), whichever is greater.							
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C							
	Rated voltage (V)	6.3	10	16	25	35	50	
	tan δ (MAX.)	0.24	0.20	0.17	0.17	0.15	0.15	
Stability at Low Temperature	Measurement frequency : 120Hz							
	Rated voltage (V)	6.3	10	16	25	35	50	
	Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	2
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	8	6	4	4	3	3
Load Life	After 1000 hours' application of rated voltage at 85°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right.							
	Leakage Current	Initial specified value or less						
	Capacitance change	Within ±20% of initial value						
	tan δ	200% or less of initial specified value						
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.							
	Leakage current	Initial specified value or less						
	Capacitance change	Within ±10% of initial value						
	tan δ	Initial specified value or less						
Marking	Black print on the case top.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Chip Type



## Type numbering system (Example: 16V 10μF)



## Dimensions

Cap. (μF)	Code	V		10		16		25		35		50	
		6.3	0 J	1 A	1 C	1 E	1 V	1 H					
0.1	0R1											4	1.0
0.22	R22											4	2.0
0.33	R33											4	2.8
0.47	R47											4	4.0
1	010											4	8.4
2.2	2R2									4	8.4	5	13
3.3	3R3							5	12	5	16	5	17
4.7	4R7					4	12	5	16	5	18	6.3	20
10	100			4	17	5	23	6.3	27	6.3	29		
22	220	5	28	6.3	33	6.3	37						
33	330	6.3	37	6.3	41	6.3	49						
47	470	6.3	45										Allowable ripple

Allowable Ripple (mA) at 85°C 120Hz

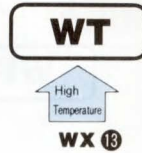
# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**WT** 5.5mmL Chip Type, Wide Temperature Range series



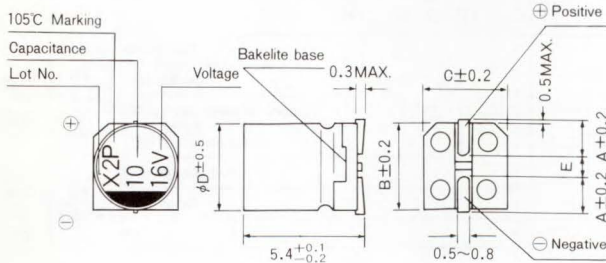
- Chip type with 5.5mm height, operating over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ .
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



## Specifications

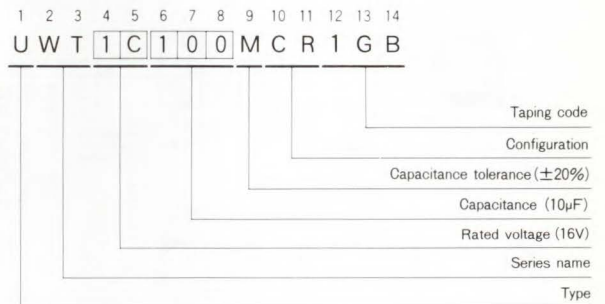
Item	Performance Characteristics																										
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$																										
Voltage Range	4~50V																										
Capacitance Range	0.1~100 $\mu\text{F}$																										
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20 $^{\circ}\text{C}$																										
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 ( $\mu\text{A}$ ), whichever is greater.																										
tan $\delta$	Measurement frequency : 120Hz, Temperature : 20 $^{\circ}\text{C}$																										
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan <math>\delta</math> (MAX.)</td> <td>0.40</td> <td>0.30</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.14</td> </tr> </table>	Rated voltage (V)	4	6.3	10	16	25	35	50	tan $\delta$ (MAX.)	0.40	0.30	0.24	0.20	0.16	0.14	0.14										
Rated voltage (V)	4	6.3	10	16	25	35	50																				
tan $\delta$ (MAX.)	0.40	0.30	0.24	0.20	0.16	0.14	0.14																				
Stability at Low Temperature	Measurement frequency : 120Hz																										
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>Impedance ratio</td> <td>Z<math>-25^{\circ}\text{C}</math> / Z<math>+20^{\circ}\text{C}</math></td> <td>7</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z<math>-40^{\circ}\text{C}</math> / Z<math>+20^{\circ}\text{C}</math></td> <td>15</td> <td>8</td> <td>8</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		4	6.3	10	16	25	35	50	Impedance ratio	Z $-25^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$	7	4	3	2	2	2	2	ZT/Z20 (MAX.)	Z $-40^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$	15	8	8	4	4	3
Rated voltage (V)		4	6.3	10	16	25	35	50																			
Impedance ratio	Z $-25^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$	7	4	3	2	2	2	2																			
ZT/Z20 (MAX.)	Z $-40^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$	15	8	8	4	4	3	3																			
Load Life	After 1000 hours' application of rated voltage at 105 $^{\circ}\text{C}$ , capacitors meet the characteristics requirements listed at right.																										
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm 25\%</math> of initial value for capacitors of 16V or less. Within <math>\pm 20\%</math> of initial value for capacitors of 25V or more.</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm 25\%$ of initial value for capacitors of 16V or less. Within $\pm 20\%$ of initial value for capacitors of 25V or more.	tan $\delta$	200% or less of initial specified value																				
Leakage current	Initial specified value or less																										
Capacitance change	Within $\pm 25\%$ of initial value for capacitors of 16V or less. Within $\pm 20\%$ of initial value for capacitors of 25V or more.																										
tan $\delta$	200% or less of initial specified value																										
Shelf Life	After leaving capacitors under no load at 105 $^{\circ}\text{C}$ for 1000hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																										
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250 $^{\circ}\text{C}$ for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.																										
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm 10\%</math> of initial value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>Initial specified value or less</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm 10\%$ of initial value	tan $\delta$	Initial specified value or less																				
Leakage current	Initial specified value or less																										
Capacitance change	Within $\pm 10\%$ of initial value																										
tan $\delta$	Initial specified value or less																										
Marking	Black print on the case top.																										
Applicable Standards	JIS C-5141 and JIS C-5102.																										

## Chip Type



	4	5	6.3
A	1.8	2.1	2.4
B	4.3	5.3	6.6
C	4.3	5.3	6.6
E	1.0	1.3	2.2

## Type numbering system (Example: 16V 10 $\mu\text{F}$ )



## Dimensions

Cap. ( $\mu\text{F}$ )	V	4		6.3		10		16		25		35		50	
		Code	0 G	0 J	1 A	1 C	1 E	1 V	1 H						
0.1	OR1													4	1.0
0.22	R22													4	2.6
0.33	R33													4	3.2
0.47	R47													4	3.8
1	010													4	6.2
2.2	2R2													4	11
3.3	3R3													4	14
4.7	4R7													4	19
10	100							4	18	5	23	5	25	6.3	30
22	220	4	22	4	22	5	27	5	30	6.3	38	6.3	42		
33	330	5	30	5	30	5	35	6.3	40	6.3	48				
47	470	5	36	5	36	6.3	46	6.3	50						
100	101	6.3	60	6.3	60										

Case size  
Allowable ripple

Allowable Ripple (mA) at 105 $^{\circ}\text{C}$  120Hz

• Taping Specifications are given in page 12.

# ALUMINUM ELECTROLYTIC CAPACITORS

**WF** Chip Type. Low Impedance series



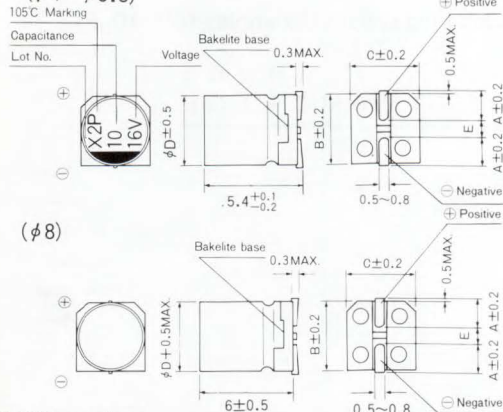
- Chip type, low impedance temperature range up to +105°C.
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



## Specifications

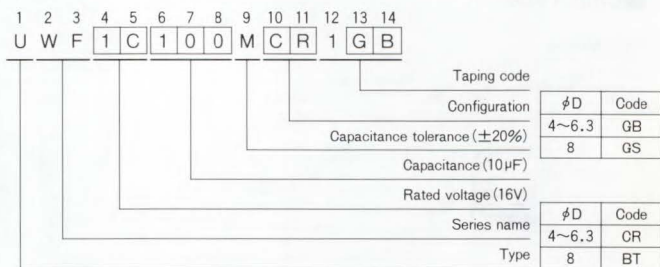
Item	Performance Characteristics						
Operating Temperature Range	-55~+105°C						
Voltage Range	6.3~35V						
Capacitance Range	1~220µF						
Capacitance Tolerance	±20% at 120Hz, 20°C						
Leakage Current	After 2 minute's application of rated voltage, leakage current is not more than 0.01CV or 3(µA), whichever is greater.						
tan δ	Measurement: frequency: 120Hz, Temperature: 20°C						
	Rated voltage (V)	6.3	10	16	25	35	
	tan δ (MAX.)	0.22	0.19	0.16	0.14	0.12	
Stability at Low Temperature	Measurement frequency: 120Hz						
	Rated voltage (V)	6.3	10	16	25	35	
	Impedance ratio Z-25°C/Z+20°C	2	2	2	2	2	
	ZT/Z20 (MAX.)	Z-55°C/Z+20°C	4	4	3	3	3
Load Life	After 1000hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.	Leakage current	Initial specified value or less				
		Capacitance change	Within ±20% of initial value				
		tan δ	200% or less of initial specified value				
Shelf Life	After leaving capacitors under no load at 105°C for 1000hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.						
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.	Leakage current	Initial specified value or less				
		Capacitance change	Within ±10% of initial value				
		tan δ	Initial specified value or less				
Marking	φ4~φ6.3: Blackprint on the case top, φ8: Printed with black color letter on clear yellow sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Chip Type (φ4~φ6.3)



φD	4	5	6.3	8
A	1.8	2.1	2.4	3.3
B	4.3	5.3	6.6	8.3
C	4.3	5.3	6.6	8.3
E	1.0	1.3	2.2	2.3

## Type numbering system (Example: 16V 10µF)



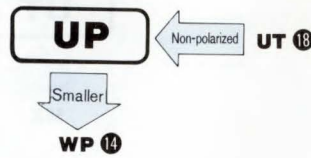
## Dimensions

Cap. (µF)	Code	6.3			10			16			25			35		
		0 J			1 A			1 C			1 E			1 V		
1	010													4	5.0	50
1.5	1R5													4	5.0	50
2.2	2R2													4	5.0	50
3.3	3R3													4	5.0	50
4.7	4R7										4	5.0	50	4	5.0	50
6.8	6R8										4	5.0	50	5	2.6	80
10	100							4	5.0	50	5	2.6	80	5	2.6	80
15	150							5	2.6	80	6.3	1.3	115	6.3	1.3	115
22	220	4	5.0	50	5	2.6	80	5	2.6	80	6.3	1.3	115	6.3	1.3	115
33	330	5	2.6	80	5	2.6	80	6.3	1.3	115	6.3	1.3	115	8	0.8	150
47	470	5	2.6	80	6.3	1.3	115	6.3	1.3	115	8	0.8	150	8	0.8	150
68	680	6.3	1.3	115	6.3	1.3	115	8	0.8	150	8	0.8	150			
100	101	6.3	1.3	115	8	0.8	150	8	0.8	150						
150	151	8	0.8	150	8	0.8	150									
220	221	8	0.8	150										Case size	Impedance	Allowable ripple

**UP** 6mmL Chip Type, Non-Polarized series



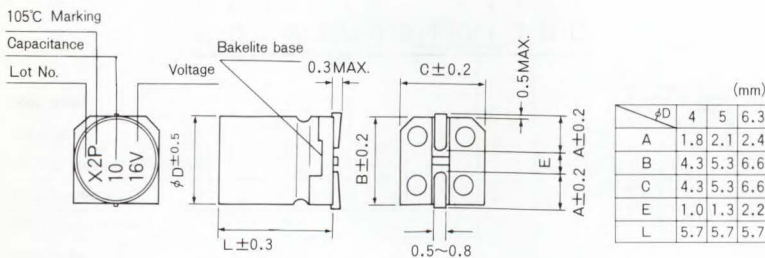
- Chip type, non-polarized withstanding high temperature range up to +105°C
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



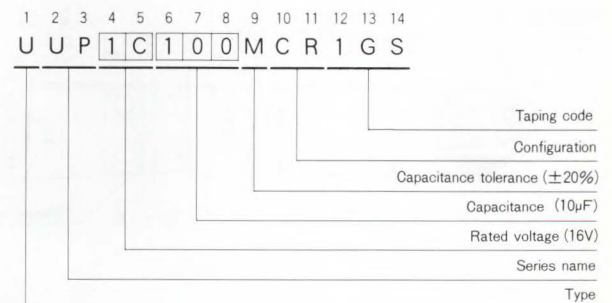
## Specifications

Item	Performance Characteristics																				
Operating Temperature Range	-40~+105°C																				
Voltage Range	6.3~50V																				
Capacitance Range	0.1~47μF																				
Capacitance Tolerance	±20% at 120 Hz, 20°C																				
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.05CV or 10 (μA), whichever is greater.																				
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C																				
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.24</td> <td>0.20</td> <td>0.17</td> <td>0.17</td> <td>0.15</td> <td>0.15</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	tan δ (MAX.)	0.24	0.20	0.17	0.17	0.15	0.15						
Rated voltage (V)	6.3	10	16	25	35	50															
tan δ (MAX.)	0.24	0.20	0.17	0.17	0.15	0.15															
Stability at Low Temperature	Measurement frequency: 120 Hz																				
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>Impedance ratio Z-25°C/Z+20°C</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	Impedance ratio Z-25°C/Z+20°C	4	3	2	2	2	2	ZT/Z20 (MAX.)	8	6	4	4	3
Rated voltage (V)	6.3	10	16	25	35	50															
Impedance ratio Z-25°C/Z+20°C	4	3	2	2	2	2															
ZT/Z20 (MAX.)	8	6	4	4	3	3															
Load Life	After 1000 hours' application of rated voltage at 105°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right.																				
	<table border="1"> <tr> <td>Leakage Current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage Current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value														
Leakage Current	Initial specified value or less																				
Capacitance change	Within ±20% of initial value																				
tan δ	200% or less of initial specified value																				
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																				
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.																				
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±10% of initial value</td> </tr> <tr> <td>tan δ</td> <td>Initial specified value or less</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±10% of initial value	tan δ	Initial specified value or less														
Leakage current	Initial specified value or less																				
Capacitance change	Within ±10% of initial value																				
tan δ	Initial specified value or less																				
Marking	Black print on the case top.																				
Applicable Standards	JIS C-5141 and JIS C-5102.																				

## Chip Type



## Type numbering system (Example: 16V 10μF)



## Dimensions

Cap. (μF)	Code	V		6.3		10		16		25		35		50	
				0 J		1 A		1 C		1 E		1 V		1 H	
0.1	0R1													4	1.0
0.22	R22													4	2.0
0.33	R33													4	2.8
0.47	R47													4	4.0
1	010													4	8.4
2.2	2R2											4	8.4	5	13
3.3	3R3								5	12	5	16	5	17	
4.7	4R7							4	12	5	16	5	18	6.3	20
10	100			4	17	5	23	6.3	27	6.3	29				
22	220	5	28	6.3	33	6.3	37								
33	330	6.3	37	6.3	41	6.3	49								
47	470	6.3	45												

Case size Allowable ripple

Allowable Ripple (mA) at 105°C 120Hz

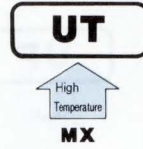
• Taping Specifications are given in page 12.

# ALUMINUM ELECTROLYTIC CAPACITORS

**UT** series 6mmL Chip Type, Wide Temperature Range



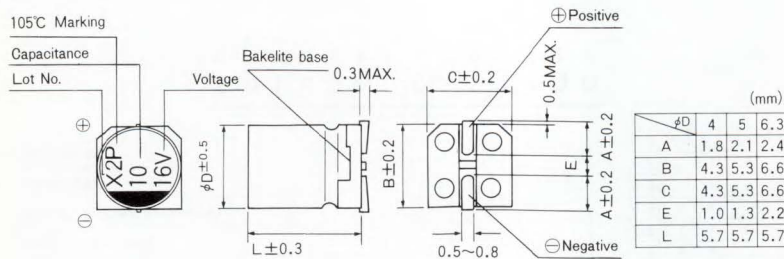
- Chip type with load life 2000 hours at +105°C.
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



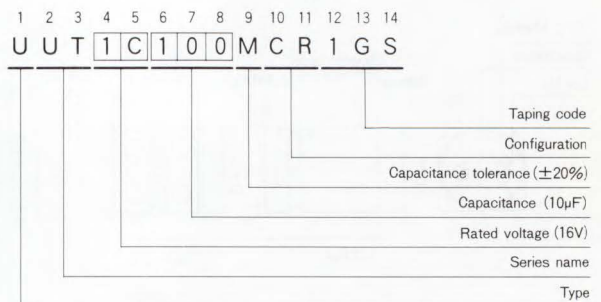
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55~+105°C							
Voltage Range	4~50V							
Capacitance Range	0.1~100μF							
Capacitance Tolerance	±20% at 120Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (μA), whichever is greater.							
tan δ	Measurement frequency : 120Hz, Temperature : 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	tan δ (MAX.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12
Stability at Low Temperature	Measurement frequency : 120Hz							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	6	3	3	2	2	2	2
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	12	8	5	4	3	3
Load Life	After 2000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less				
			Capacitance change	Within ±25% of initial value for capacitors of 16V or less. Within ±20% of initial value for capacitors of 25V or more.				
			tan δ	200% or less of initial specified value				
Shelf Life	After leaving capacitors under no load at 105°C for 1000hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less				
			Capacitance change	Within ±10% of initial value				
			tan δ	Initial specified value or less				
Marking	Black print on the case top.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Chip Type



## Type numbering system (Example: 16V 10μF)



## Dimensions

Cap. (μF)	Code	4		6.3		10		16		25		35		50	
		0 G		0 J		1 A		1 C		1 E		1 V		1 H	
0.1	0R1													4	1.0
0.22	R22													4	2.6
0.33	R33													4	3.2
0.47	R47													4	3.8
1	010													4	6.2
2.2	2R2													4	11
3.3	3R3													4	14
4.7	4R7									4	13	4	15	5	19
10	100							4	18	5	23	5	25	6.3	30
22	220	4	22	4	22	5	27	5	30	6.3	38	6.3	42		
33	330	5	30	5	30	5	35	6.3	40	6.3	48				
47	470	5	36	5	36	6.3	46	6.3	50						
100	101	6.3	60	6.3	60										Allowable ripple

Allowable Ripple (mA) at 105°C 120Hz

• Taping Specifications are given in page.12



# ALUMINUM ELECTROLYTIC CAPACITORS



**UZ** 6mmL Chip Type, Long Life Assurance  
series



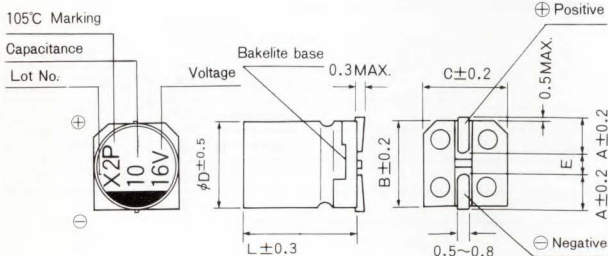
- Chip type with load life of 5000 hours at +105°C.
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



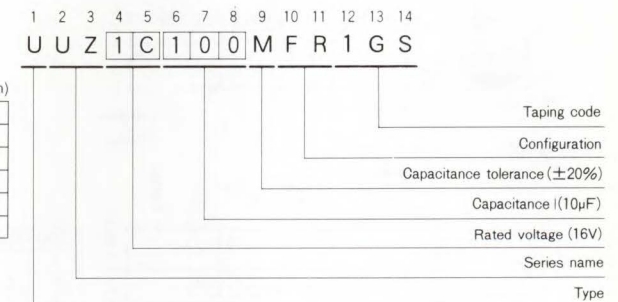
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55~+105°C							
Voltage Range	4~50V							
Capacitance Range	0.1~100μF							
Capacitance Tolerance	±20% at 120Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (μA), whichever is greater.							
tan δ	Measurement frequency: 120Hz, Temperature: 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
Stability at Low Temperature	Measurement frequency: 120Hz							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	6	3	3	2	2	2	2
	ZT/Z20 (MAX.)	12	8	5	4	3	3	3
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within ±30% of initial value			
			tan δ		300% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 105°C for 1000hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within ±10% of initial value			
			tan δ		Initial specified value or less			
Marking	Black print on the case top.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Chip Type



## Type numbering system (Example: 16V 10μF)



## Dimensions

Cap. (μF)	Code	V		4		6.3		10		16		25		35		50	
		Code	0 G	0 J	1 A	1 C	1 E	1 V	1 H								
0.1	0R1															4	1.0
0.22	R22															4	2.6
0.33	R33															4	3.2
0.47	R47															4	3.8
1	010															4	6.2
2.2	2R2															4	11
3.3	3R3															4	14
4.7	4R7									4	13	4	15	5	19		
10	100							4	18	5	23	5	25	6.3	30		
22	220	4	22	4	22	5	27	5	30	6.3	38	6.3	42				
33	330	5	30	5	30	5	35	6.3	40	6.3	48						
47	470	5	36	5	36	6.3	46	6.3	50								
100	101	6.3	60	6.3	60												Allowable ripple

Allowable Ripple (mA) at 105°C 120°C 120Hz

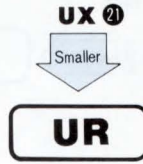
• Taping Specifications are given in page 12.

# ALUMINUM ELECTROLYTIC CAPACITORS

**UR** series Chip Type, High C/V



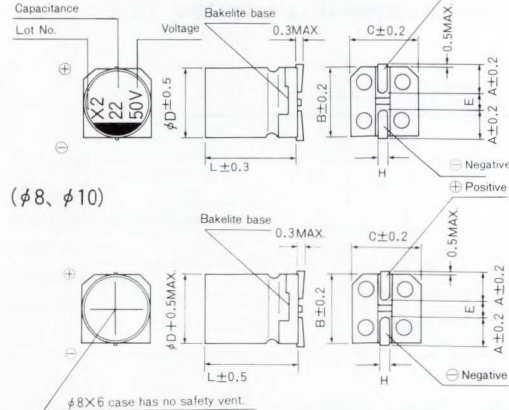
- Chip type, higher capacitance in larger case sizes
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



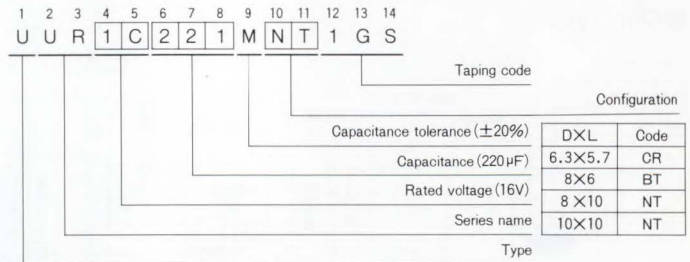
## Specifications

Item	Performance Characteristics					
Operating Temperature Range	-40~+85°C					
Voltage Range	6.3~50V					
Capacitance Range	22~1000μF					
Capacitance Tolerance	±20% at 120Hz, 20°C					
Leakage Current	After 1 minutes' application of rated voltage, leakage current is not more than 0.03CV (μA).					
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C					
	Rated voltage (V)	6.3	10	16	25	35
Stability at Low Temperature	Measurement frequency : 120 Hz					
	Rated voltage (V)	6.3	10	16	25	35
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage Current		Initial specified value or less	
			Capacitance change		Within ±20% of initial value	
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.		tan δ		200% or less of initial specified value	
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.		Leakage Current		Initial specified value or less	
			Capacitance change		Within ±10% of initial value	
Marking	φ6.3: Black print on the case top. φ8~φ10: Printed with black color letter on clear yellow sleeve according to JIS C-5141.					
Applicable Standards	JIS C-5141 and JIS C-5102.					

## Chip Type (φ6.3)



## Type numbering system (Example: 16V 220μF)



DXL	6.3×5.7	8×6	8×10	10×10
A	2.4	3.3	2.9	3.2
B	6.6	8.3	8.3	10.3
C	6.6	8.3	8.3	10.3
E	2.2	2.3	3.1	4.5
H	0.5~0.8	0.5~0.8	0.8~1.1	0.8~1.1

## Dimensions

Cap. (μF)	Code	V		DXL (mm)			
		6.3	10	16	25	35	50
22	220	0 J	1 A	1 C	1 E	1 V	1 H
33	330						6.3×5.7 45
47	470						8×6 95
100	101		6.3×5.7 70	8×6 125	8×6 145	8×10 175	10×10 195
220	221	8×6 160	8×6 175	8×10 215	10×10 250	10×10 265	
330	331	8×6 190	8×10 240	8×10 270	10×10 305		
470	471	8×10 265	8×10 290	10×10 330			
1000	102	10×10 400					

• Taping Specifications are given in page 12.

Allowable Ripple (ma) at 85°C 120Hz

## Frequency coefficient of allowable ripple current

Cap. (μF)	Frequency	50Hz	120Hz	300Hz	1 kHz	10 kHz~
~47		0.80	1	1.15	1.40	1.67
100~1000		0.85	1	1.08	1.20	1.30

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85
Coefficient	1.27	1.0

## UX series

Chip Type, Higher Capacitance Range



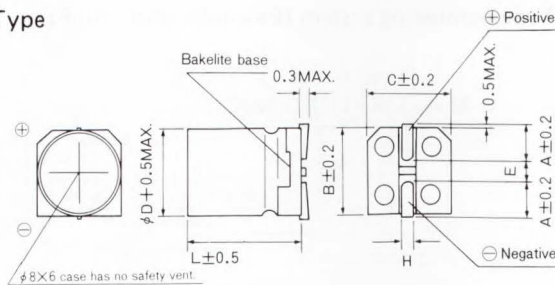
- Chip type, higher capacitance in larger case sizes ( $\phi 8, \phi 10\text{mm}$ ).
- Designed for surface mounting on high density PC board.
- Applicable to automatic insertion machine using carrier tape.



### Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55~+105°C							
Voltage Range	6.3~50V							
Capacitance Range	22~470 $\mu\text{F}$							
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20°C							
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV( $\mu\text{A}$ )							
tan $\delta$	Measurement frequency: 120Hz, Temperature: 20°C							
	Rated voltage (V)	6.3	10	16	25	35	50	
	tan $\delta$ (MAX.)	0.22	0.19	0.16	0.14	0.12	0.10	
Stability at Low Temperature	Measurement frequency: 120Hz							
	Rated voltage (V)	6.3	10	16	25	35	50	
	Impedance ratio ZT/Z20 (MAX.)	Z-55°C/Z+20°C	4	4	3	3	2	
Load Life	After 2000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less				
			Capacitance change	Within $\pm 20\%$ of initial value				
			tan $\delta$	200% or less of initial specified value				
Shelf Life	After leaving capacitors under no load at 105°C for 1000hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.						Leakage current	Initial specified value or less
							Capacitance change	Within $\pm 10\%$ of initial value
							tan $\delta$	Initial specified value or less
Marking	Print: $\cdot$ with black color letter on clear yellow sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

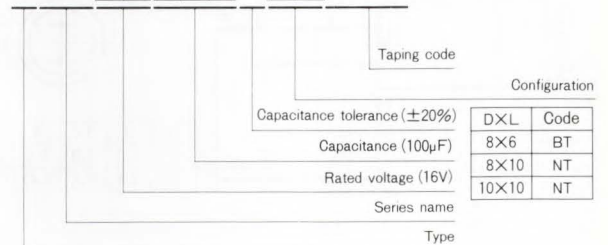
### Chip Type



	(mm)		
DXL	8×6	8×10	10×10
A	3.3	2.9	3.2
B	8.3	8.3	10.3
C	8.3	8.3	10.3
E	2.3	3.1	4.5
H	0.5~0.8	0.8~1.1	0.8~1.1

### Type numbering system (Example: 16V 100 $\mu\text{F}$ )

1 2 3 4 5 6 7 8 9 10 11 12 13 14  
 U U X 1 C 1 0 1 M N T 1 G S



### Dimensions

Cap( $\mu\text{F}$ )	Code	V		DXL (mm)			
		6.3	10	16	25	35	50
22	220	0 J	1 A	1 C	1 E	1 V	1 H
33	330						
47	470						
100	101		8×6 90	8×10 148	8×6 79	8×10 124	10×10 180
220	221	8×10 161	8×10 173	10×10 330			
330	331	8×10 288	10×10 318	10×10 441			
470	471	10×10 340	10×10 351				

Allowable Ripple (mA) at 105°C 120Hz

### Frequency coefficient of allowable ripple current

Cap( $\mu\text{F}$ )	Frequency(Hz)	50Hz	120Hz	300Hz	1kHz	10kHz~
~47		0.80	1.00	1.15	1.40	1.67
		0.85	1.00	1.08	1.20	1.30

### Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+70	+85	+105
Coefficient	1.62	1.40	1.00

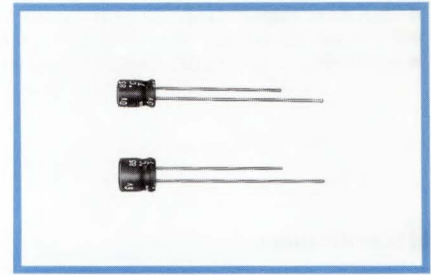
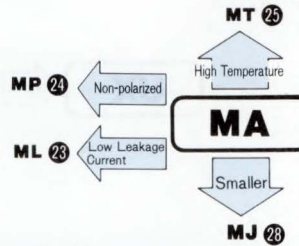
• Taping Specifications are given in page 12.

# ALUMINUM ELECTROLYTIC CAPACITORS

**MA** series 5mmL, Standard, For General Purposes



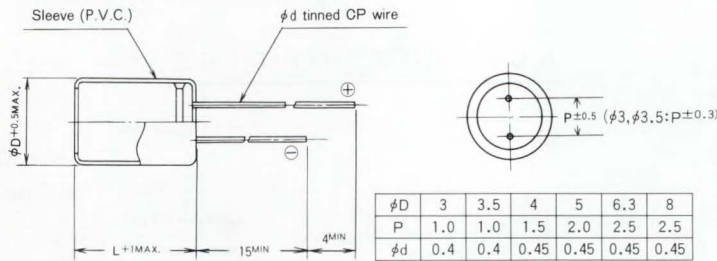
- Standard ultra-miniature series with 5mm height.



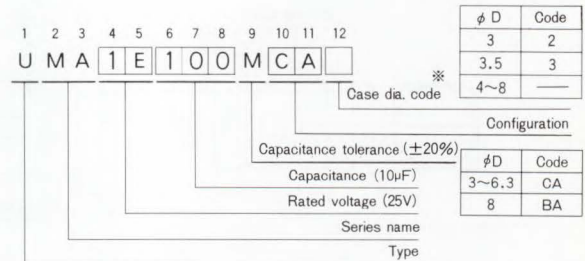
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	4~50V							
Capacitance Range	0.1~470μF							
Capacitance Tolerance	±20% at 120 Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(μA), whichever is greater.							
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	tan δ (MAX.)	0.35	0.24	0.20	0.16	0.14	0.12	0.10
Stability at Low Temperature	Measurement frequency: 120 Hz							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	7	4	3	2	2	2	2
	ZT/Z20 (MAX.) Z-40°C/Z+20°C	15	8	6	4	4	3	3
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.							
	Leakage current	Initial specified value or less						
	Capacitance change	Within ±20% of initial value (φ3: Within ±25%)						
	tan δ	200% or less of initial specified value						
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Marking	Printed with white color letter on black sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Radial Lead Type



## Type numbering system (Example: 25V 10μF)



※ In case at φ3, φ3.5 units, put [2] (φ3) or [3] (φ3.5) as case dia. code.

## Dimensions

Cap.(μF)	V	D X L (mm)							
		4	6.3	10	16	25	35	50	
	Code	0 G	0 J	1 A	1 C	1 E	1 V	1 H	
0.1	0R1							4×5(3×5) : 1.0(1.0)	
0.22	R22							4×5(3×5) : 2.0(2.0)	
0.33	R33							4×5(3×5) : 2.8(2.8)	
0.47	R47							4×5(3×5) : 4.0(4.0)	
1	010							4×5(3×5) : 8.4(8.0)	
2.2	2R2						3×5	8.4 ● 4×5 : 13	
3.3	3R3					3×5	10 ● 3.5×5	14 4×5 : 17	
4.7	4R7				3×5	10 ● 4×5	16 4×5	18 5×5 : 20	
10	100		3×5	15	● 4×5	23	5×5	27 5×5 : 29	
22	220	3×5	19 ● 4×5	28	5×5	33	5×5	37 6.3×5	
33	330	4×5	28 5×5	37	5×5	41	6.3×5	49 6.3×5	
47	470	4×5	33 5×5	45	○ 6.3×5	52	6.3×5	58 □ 8×5	
100	101	5×5	56 ○ 6.3×5	70	□ 8×5	80	8×5	92 8×5	
220	221	6.3×5	96	8×5	110	8×5	135		
330	331	8×5	145	8×5	170				
470	471	8×5	185						

Size 3×5 is available for capacitors marked "●"  
 Size 5×5 is available for capacitors marked "○"  
 Size 6.3×5 is available for capacitors marked "□"  
 In such a case, [M][R] will be put at 2nd and 3rd digit of type numbering system.

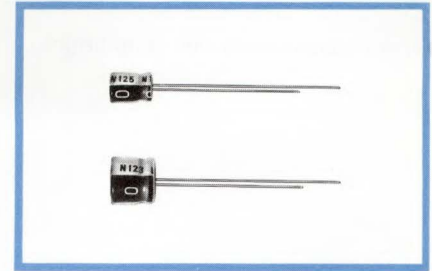
Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**ML** series 5mmL, Low Leakage Current



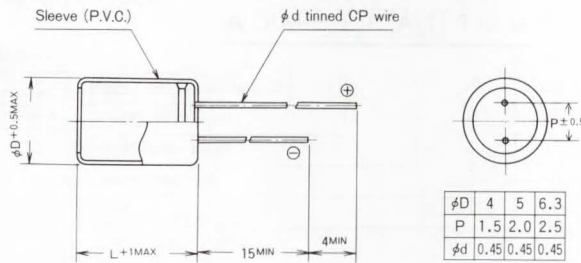
- Low leakage current series with 5mm height.



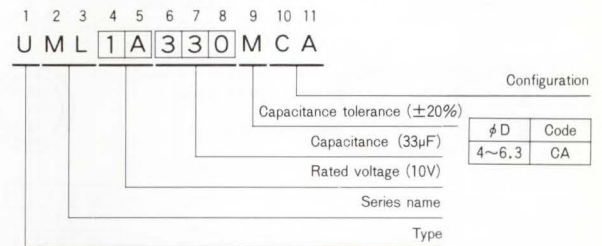
## Specifications

Item	Performance Characteristics																										
Operating Temperature Range	-40~+85°C																										
Voltage Range	4~50V																										
Capacitance Range	0.1~100 μF																										
Capacitance Tolerance	±20% at 120 Hz, 20°C																										
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.002CV or 0.4 (μA), whichever is greater.																										
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C																										
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.35</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> </tr> </table>	Rated voltage (V)	4	6.3	10	16	25	35	50	tan δ (MAX.)	0.35	0.24	0.20	0.16	0.14	0.12	0.10										
Rated voltage (V)	4	6.3	10	16	25	35	50																				
tan δ (MAX.)	0.35	0.24	0.20	0.16	0.14	0.12	0.10																				
Stability at Low Temperature	Measurement frequency : 120 Hz																										
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>Impedance ratio</td> <td>Z-25°C / Z+20°C</td> <td>7</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z-40°C / Z+20°C</td> <td>15</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		4	6.3	10	16	25	35	50	Impedance ratio	Z-25°C / Z+20°C	7	4	3	2	2	2	2	ZT/Z20 (MAX.)	Z-40°C / Z+20°C	15	10	8	6	4	3
Rated voltage (V)		4	6.3	10	16	25	35	50																			
Impedance ratio	Z-25°C / Z+20°C	7	4	3	2	2	2	2																			
ZT/Z20 (MAX.)	Z-40°C / Z+20°C	15	10	8	6	4	3	3																			
Load Life	<p>After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.</p> <table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																				
Leakage current	Initial specified value or less																										
Capacitance change	Within ±20% of initial value																										
tan δ	200% or less of initial specified value																										
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																										
Marking	Printed with black color letter on yellow sleeve according to JIS C-5141.																										
Applicable Standards	JIS C-5141 and JIS C-5102.																										

## Radial Lead Type



## Type numbering system (Example: 10V 33μF)



## Dimensions

Cap. (μF)	Code	V		4		6.3		10		16		25		35		50	
		0 G	0 J	1 A	1 C	1 E	1 V	1 H									
0.1	OR1															4X5	1.0
0.22	R22															4X5	2.0
0.33	R33															4X5	2.8
0.47	R47															4X5	4.0
1	O10															4X5	8.4
2.2	2R2															4X5	13
3.3	3R3															5X5	17
4.7	4R7															5X5	20
10	100															6.3X5	33
22	220					4X5	28	5X5	33	5X5	37	6.3X5	42	6.3X5	46		
33	330	5X5	28	5X5	37	5X5	41	6.3X5	49	6.3X5	52						
47	470	5X5	33	5X5	45	6.3X5	52	6.3X5	58								
100	101	6.3X5	56	6.3X5	70												Allowable ripple

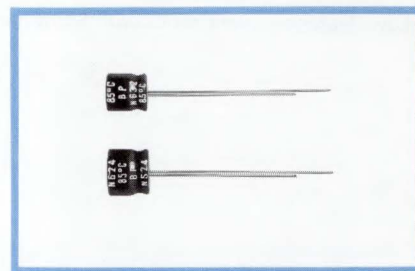
Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**MP** 5mmL, Non-Polarized series



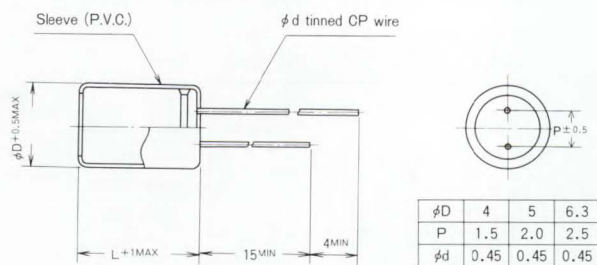
- Non-polarized series with 5mm height.



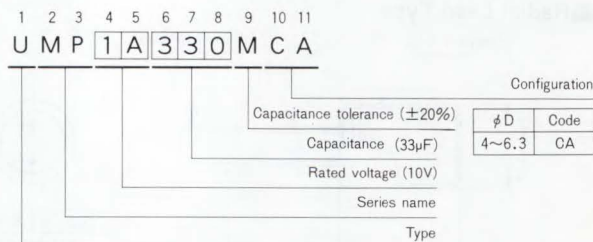
## Specifications

Item	Performance Characteristics																							
Operating Temperature Range	-40~+85°C																							
Voltage Range	6.3~50V																							
Capacitance Range	0.1~47μF																							
Capacitance Tolerance	±20% at 120 Hz, 20°C																							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.05CV or 10(μA), whichever is greater.																							
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C																							
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.24</td> <td>0.20</td> <td>0.17</td> <td>0.17</td> <td>0.15</td> <td>0.15</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	tan δ (MAX.)	0.24	0.20	0.17	0.17	0.15	0.15									
Rated voltage (V)	6.3	10	16	25	35	50																		
tan δ (MAX.)	0.24	0.20	0.17	0.17	0.15	0.15																		
Stability at Low Temperature	Measurement frequency : 120 Hz																							
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>Impedance ratio</td> <td>Z-25°C / Z+20°C</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z-40°C / Z+20°C</td> <td>8</td> <td>6</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		6.3	10	16	25	35	50	Impedance ratio	Z-25°C / Z+20°C	4	3	2	2	2	2	ZT/Z20 (MAX.)	Z-40°C / Z+20°C	8	6	4	4	3
Rated voltage (V)		6.3	10	16	25	35	50																	
Impedance ratio	Z-25°C / Z+20°C	4	3	2	2	2	2																	
ZT/Z20 (MAX.)	Z-40°C / Z+20°C	8	6	4	4	3	3																	
Load Life	After 1000 hours' application of rated voltage at 85°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right.																							
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																	
Leakage current	Initial specified value or less																							
Capacitance change	Within ±20% of initial value																							
tan δ	200% or less of initial specified value																							
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																							
Marking	Printed with white color letter on black sleeve according to JIS C-5141.																							
Applicable Standards	JIS C-5141 and JIS C-5102.																							

## Radial Lead Type



## Type numbering system (Example: 10V 33μF)



## Dimensions

Cap. (μF)	Code	V		DXL(mm)			
		6.3	10	16	25	35	50
0.1	0R1	0 J	1 A	1 C	1 E	1 V	1 H
0.22	R22						4×5 2.0
0.33	R33						4×5 2.8
0.47	R47						4×5 4.0
1	010						4×5 8.4
2.2	2R2					4×5 8.4	5×5 13
3.3	3R3				5×5 12	5×5 16	5×5 17
4.7	4R7			4×5 12	5×5 16	5×5 18	6.3×5 20
10	100		4×5 17	5×5 23	6.3×5 27	6.3×5 29	
22	220	5×5 28	6.3×5 33	6.3×5 37			
33	330	6.3×5 37	6.3×5 41	6.3×5 49			
47	470	6.3×5 45					Allowable ripple

Allowable Ripple (mA) at 85°C 120Hz

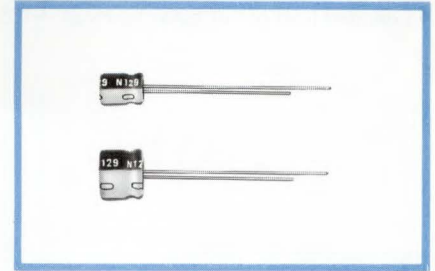
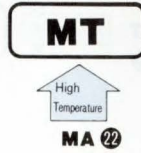
# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**MT** 5mmL, Wide Temperature Range series



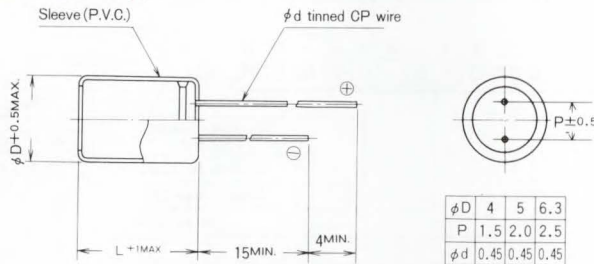
- Wide temperature range of  $-55\sim+105^{\circ}\text{C}$ , with 5mm height.



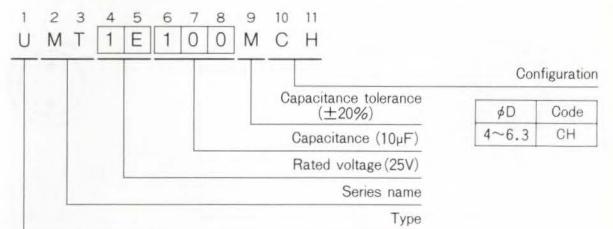
## Specifications

Item	Performance Characteristics																										
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$																										
Voltage Range	4~50V																										
Capacitance Range	0.1~100 $\mu\text{F}$																										
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20 $^{\circ}\text{C}$																										
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3( $\mu\text{A}$ ), whichever is greater.																										
tan $\delta$	Measurement frequency : 120Hz, Temperature : 20 $^{\circ}\text{C}$																										
	<table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> </tr> </thead> <tbody> <tr> <td>tan <math>\delta</math> (MAX.)</td> <td>0.37</td> <td>0.28</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.13</td> <td>0.12</td> </tr> </tbody> </table>	Rated voltage (V)	4	6.3	10	16	25	35	50	tan $\delta$ (MAX.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12										
Rated voltage (V)	4	6.3	10	16	25	35	50																				
tan $\delta$ (MAX.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12																				
Stability at Low Temperature	Measurement frequency : 120Hz																										
	<table border="1"> <thead> <tr> <th colspan="2">Rated voltage (V)</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio</td> <td>Z<math>-25^{\circ}\text{C}</math>/Z<math>+20^{\circ}\text{C}</math></td> <td>6</td> <td>3</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z<math>-40^{\circ}\text{C}</math>/Z<math>+20^{\circ}\text{C}</math></td> <td>12</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> </tr> </tbody> </table>	Rated voltage (V)		4	6.3	10	16	25	35	50	Impedance ratio	Z $-25^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	6	3	3	2	2	2	2	ZT/Z20 (MAX.)	Z $-40^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	12	8	5	4	3	3
Rated voltage (V)		4	6.3	10	16	25	35	50																			
Impedance ratio	Z $-25^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	6	3	3	2	2	2	2																			
ZT/Z20 (MAX.)	Z $-40^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	12	8	5	4	3	3	3																			
Load Life	After 1000 hours' application of rated voltage at 105 $^{\circ}\text{C}$ , capacitors meet the characteristics requirements listed at right.																										
	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm 25\%</math> of initial value (<math>\leq 16\text{V}</math>) Within <math>\pm 20\%</math> of initial value (<math>\geq 25\text{V}</math>)</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>200% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm 25\%$ of initial value ( $\leq 16\text{V}$ ) Within $\pm 20\%$ of initial value ( $\geq 25\text{V}$ )	tan $\delta$	200% or less of initial specified value																				
	Leakage current	Initial specified value or less																									
Capacitance change	Within $\pm 25\%$ of initial value ( $\leq 16\text{V}$ ) Within $\pm 20\%$ of initial value ( $\geq 25\text{V}$ )																										
tan $\delta$	200% or less of initial specified value																										
Shelf Life	After leaving capacitors under no load at 105 $^{\circ}\text{C}$ for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																										
Marking	Printed with white color letter on black sleeve according to JIS C-5141.																										
Applicable Standards	JIS C-5141 and JIS C-5102.																										

## Radial Lead Type



## Type numbering system (Example: 25V 10 $\mu\text{F}$ )



## Dimensions

DXL(mm)

V	4	6.3	10	16	25	35	50	DXL(mm)					
Cap. ( $\mu\text{F}$ )	Code	0 G	0 J	1 A	1 C	1 E	1 V	1 H					
0.1	0R1								4×5	1.0			
0.22	R22								4×5	2.6			
0.33	R33								4×5	3.2			
0.47	R47								4×5	3.8			
1	010								4×5	6.2			
2.2	2R2								4×5	11			
3.3	3R3								4×5	14			
4.7	4R7								5×5	19			
10	100								6.3×5	30			
22	220	4×5	22	4×5	22	5×5	27	5×5	30	6.3×5	38	6.3×5	42
33	330	5×5	30	5×5	30	5×5	35	6.3×5	40	6.3×5	48		
47	470	5×5	36	5×5	36	6.3×5	46	6.3×5	50				
100	101	6.3×5	60	6.3×5	60								Allowable ripple

Allowable Ripple (mA) at 105 $^{\circ}\text{C}$  120Hz

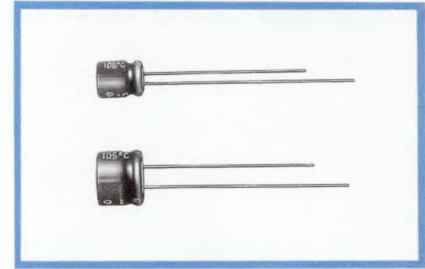
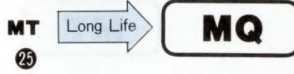
# ALUMINUM ELECTROLYTIC CAPACITORS



5mmL, Long Life Assurance series



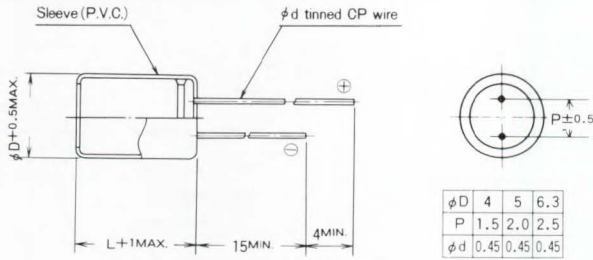
- Extended load life of 5000 hours at +105°C, with 5mm height.



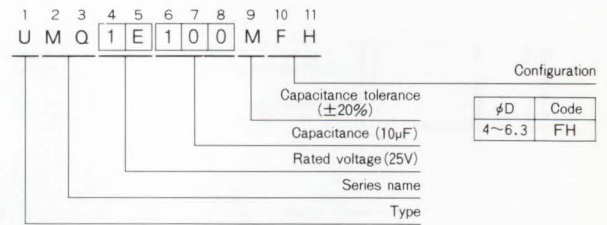
## Specifications

Item	Performance Characteristics																									
Operating Temperature Range	-55~+105°C																									
Voltage Range	4~50V																									
Capacitance Range	0.1~100μF																									
Capacitance Tolerance	±20% at 120Hz, 20°C																									
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(μA), whichever is greater.																									
tan δ	Measurement frequency : 120Hz, Temperature : 20°C																									
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.37</td> <td>0.28</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.13</td> <td>0.12</td> </tr> </table>	Rated voltage (V)	4	6.3	10	16	25	35	50	tan δ (MAX.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12									
Rated voltage (V)	4	6.3	10	16	25	35	50																			
tan δ (MAX.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12																			
Stability at Low Temperature	Measurement frequency : 120Hz																									
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>4</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td rowspan="2">Impedance ratio ZT/Z20 (MAX.)</td> <td>Z-25°C/Z+20°C</td> <td>6</td> <td>3</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z-40°C/Z+20°C</td> <td>12</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		4	6.3	10	16	25	35	50	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	6	3	3	2	2	2	2	Z-40°C/Z+20°C	12	8	5	4	3	3
Rated voltage (V)		4	6.3	10	16	25	35	50																		
Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	6	3	3	2	2	2	2																		
	Z-40°C/Z+20°C	12	8	5	4	3	3	3																		
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.																									
	Leakage current	Initial specified value or less																								
	Capacitance change	Within ±30% of initial value																								
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																									
	tan δ	300% or less of initial specified value																								
Marking	Printed with silver color letter on dark brown sleeve according to JIS C-5141.																									
Applicable Standards	JIS C-5141 and JIS C-5102.																									

## Radial Lead Type



## Type numbering system (Example: 25V 10μF)



## Dimensions

		DXL(mm)													
V		4		6.3		10		16		25		35		50	
Cap. (μF)	Code	0G		0J		1A		1C		1E		1V		1H	
0.1	0R1													4×5	1.0
0.22	R22													4×5	2.6
0.33	R33													4×5	3.2
0.47	R47													4×5	3.8
1	010													4×5	6.2
2.2	2R2													4×5	11
3.3	3R3													4×5	14
4.7	4R7									4×5	13	4×5	15	5×5	19
10	100							4×5	18	5×5	23	5×5	25	6.3×5	30
22	220	4×5	22	4×5	22	5×5	27	5×5	30	6.3×5	38	6.3×5	42		
33	330	5×5	30	5×5	30	5×5	35	6.3×5	40	6.3×5	48				
47	470	5×5	36	5×5	36	6.3×5	46	6.3×5	50						
100	101	6.3×5	60	6.3×5	60									Case size	Allowable ripple

Allowable Ripple (mA) at 105°C 120Hz



**MF** 5mmL, Low Impedance series



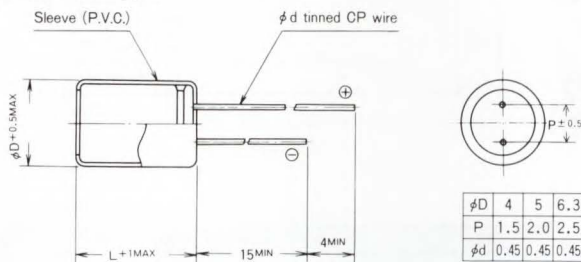
- Low impedance over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ , with 5mm height.
- Suited for DC-DC converters where smaller case size and lower impedance are required.



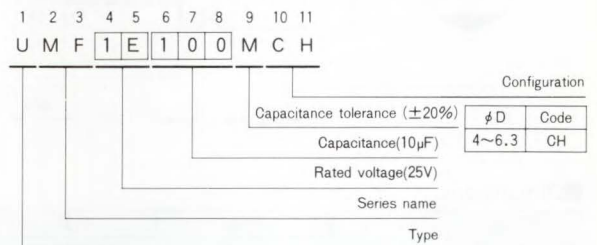
## Specifications

Item	Performance Characteristics																			
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$																			
Voltage Range	6.3~35V																			
Capacitance Range	1~100 $\mu\text{F}$																			
Capacitance Tolerance	$\pm 20\%$ at 120 Hz, $20^{\circ}\text{C}$																			
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3( $\mu\text{A}$ ), whichever is greater.																			
$\tan \delta$	Measurement frequency : 120 Hz, Temperature : $20^{\circ}\text{C}$																			
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> </tr> <tr> <td><math>\tan \delta</math> (MAX.)</td> <td>0.22</td> <td>0.20</td> <td>0.18</td> <td>0.14</td> <td>0.12</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	$\tan \delta$ (MAX.)	0.22	0.20	0.18	0.14	0.12							
Rated voltage (V)	6.3	10	16	25	35															
$\tan \delta$ (MAX.)	0.22	0.20	0.18	0.14	0.12															
Stability at Low Temperature	Measurement frequency : 120 Hz																			
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> </tr> <tr> <td rowspan="2">Impedance ratio</td> <td>Z<math>-25^{\circ}\text{C}</math>/Z<math>+20^{\circ}\text{C}</math></td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z<math>-55^{\circ}\text{C}</math>/Z<math>+20^{\circ}\text{C}</math></td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		6.3	10	16	25	35	Impedance ratio	Z $-25^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	2	2	2	2	2	Z $-55^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	4	4	3	3
Rated voltage (V)		6.3	10	16	25	35														
Impedance ratio	Z $-25^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	2	2	2	2	2														
	Z $-55^{\circ}\text{C}$ /Z $+20^{\circ}\text{C}$	4	4	3	3	3														
Load Life	After 1000 hours' application of rated voltage at $105^{\circ}\text{C}$ , capacitors meet the characteristics requirements listed at right. <table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm 20\%</math> of initial value</td> </tr> <tr> <td><math>\tan \delta</math></td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm 20\%$ of initial value	$\tan \delta$	200% or less of initial specified value													
Leakage current	Initial specified value or less																			
Capacitance change	Within $\pm 20\%$ of initial value																			
$\tan \delta$	200% or less of initial specified value																			
Shelf Life	After leaving capacitors under no load at $105^{\circ}\text{C}$ for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																			
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.																			
Applicable Standards	JIS C-5141 and JIS C-5102.																			

## Radial Lead Type



## Type numbering system (Example: 25V 10 $\mu\text{F}$ )



## Dimensions

Cap. ( $\mu\text{F}$ )	Code	6.3		10			16			25			35			
		0J		1A			1C			1E			1V			
1	010													4X5	3.6	60
1.5	1R5													4X5	3.6	60
2.2	2R2													4X5	3.6	60
3.3	3R3													4X5	3.6	60
4.7	4R7										4X5	3.6	60	4X5	3.6	60
6.8	6R8										4X5	3.6	60	5X5	1.8	95
10	100							4X5	3.6	60	5X5	1.8	95	5X5	1.8	95
15	150							5X5	1.8	95	6.3X5	0.9	140	6.3X5	0.9	140
22	220	4X5	3.6	60	5X5	1.8	95	5X5	1.8	95	6.3X5	0.9	140	6.3X5	0.9	140
33	330	5X5	1.8	95	5X5	1.8	95	6.3X5	0.9	140	6.3X5	0.9	140			
47	470	5X5	1.8	95	6.3X5	0.9	140	6.3X5	0.9	140						
68	680	6.3X5	0.9	140												
100	101	6.3X5	0.9	140										Case size	Impedance	Allowable ripple

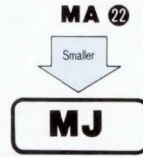
Max. Impedance ( $\Omega$ ) at  $20^{\circ}\text{C}$  100kHz  
Allowable Ripple (mA) at  $105^{\circ}\text{C}$  100kHz

# ALUMINUM ELECTROLYTIC CAPACITORS

**MJ** 5.2mmL MAX. series



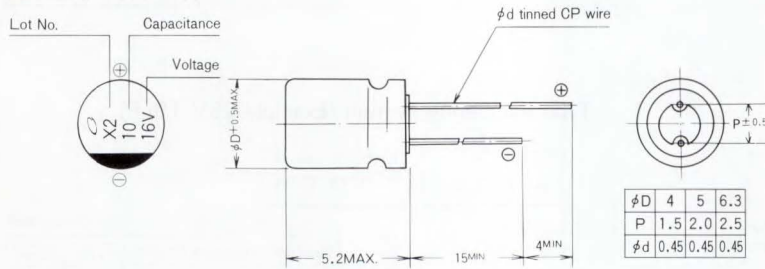
• 5.2mmL MAX. height.



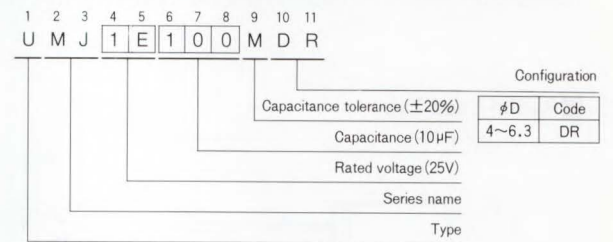
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	4~50V							
Capacitance Range	0.1~220 μF							
Capacitance Tolerance	±20% at 120 Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01 CV or 3 (μA), whichever is greater.							
tan δ	Measurement frequency: 120Hz, Temperature: 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
Stability at Low Temperature	Measurement frequency: 120Hz							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	7	4	3	2	2	2
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within ±20% of initial value			
			tan δ		200% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Marking	Black print on the case top.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Radial Lead Type



## Type numbering system (Example: 25V 10μF)



## Dimensions

Cap. (μF)	Code	4		6.3		10		16		25		35		50	
		0 G		0 J		1 A		1 C		1 E		1 V		1 H	
0.1	0R1													4	1.0
0.22	R22													4	2.0
0.33	R33													4	2.8
0.47	R47													4	4.0
1	010													4	8.4
2.2	2R2													4	13
3.3	3R3													4	17
4.7	4R7									4	16	4	18	5	20
10	100							4	23	5	27	5	29	6.3	33
22	220			4	28	5	33	5	37	6.3	42	6.3	46		
33	330	4	28	5	37	5	41	6.3	49	6.3	52				
47	470	4	33	5	45	6.3	52	6.3	58						
100	101	5	56	6.3	70										
220	221	6.3	96												

Case size: Allowable ripple

Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

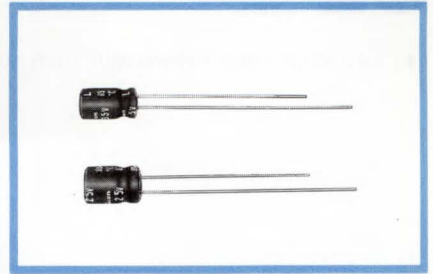
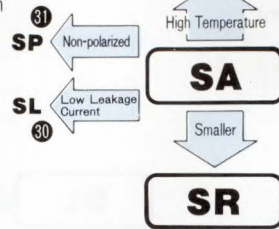
**SA** 7mmL, For General Purposes series

**.SR** 7mmL, High C/V series



ST 32

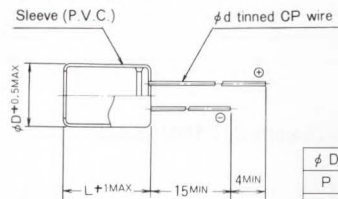
- Standard miniature series with 7mm height.
- Higher C/V series with 7mm height.



## Specifications

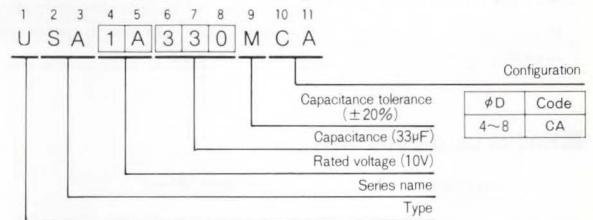
Item	SA series	SR series						
Operating Temperature Range	-40~+85°C	-40~+85°C						
Voltage Range	6.3~50V	4~50V						
Capacitance Range	0.1~220 μF	4.7~470 μF						
Capacitance Tolerance	±20% at 120Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01 CV or 3 (μA), whichever is greater.							
tan δ	Measurement frequency: 120Hz, Temperature: 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
Stability at Low Temperature	Measurement frequency: 120Hz							
	Rated Voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	6	4	3	2	2	2	2
Load Life	ZT/Z20 (MAX.)		12	8	6	4	4	3
	Z-40°C/Z+20°C		12	8	6	4	4	3
	ZT/Z20 (MAX.)		12	8	6	4	4	3
Shelf Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within ±20% of initial value			
			tan δ		200% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Marking	Printed with white color letter on black sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Radial Lead Type



φ D	4	5	6.3	8
P	1.5	2.0	2.5	3.5
φ d	0.45	0.45	0.45	0.5

## Type numbering system (Example: SA series: 10V 33μF)



## Dimensions

Cap. (μF)	V (Code)	4 (0G)		6.3 (0J)		10 (1A)		16 (1C)		25 (1E)		35 (1V)		50 (1H)	
		SR	SA	SR	SA	SR	SA	SR	SA	SR	SA	SR	SA	SR	
0.1	0R1													4×7	
0.22	R22													1.0	
0.33	R33													4×7	
0.47	R47													3.5	
1	010													4×7	
2.2	2R2													10	
3.3	3R3													4×7	
4.7	4R7													4×7	
10	100													24	
22	220													5×7	4×7
33	330													29	23
47	470													24	
100	101													5×7	4×7
220	221													24	
330	331													5×7	4×7
470	471													29	23

Allowable Ripple (mA) at 85°C 120Hz

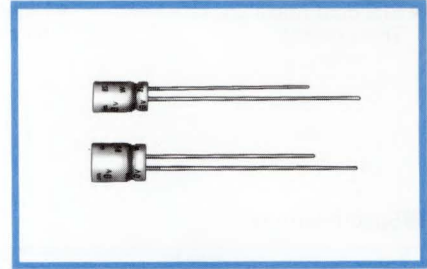
# ALUMINUM ELECTROLYTIC CAPACITORS

**SL** series

7mmL, Low Leakage Current



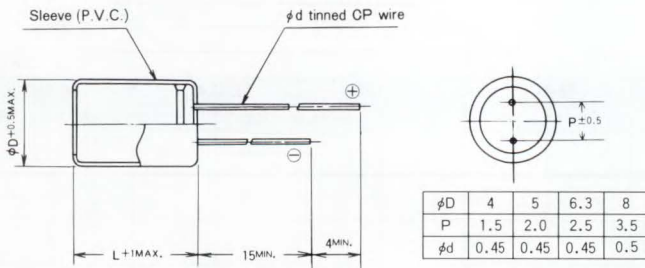
- Low leakage current series with 7mm height.



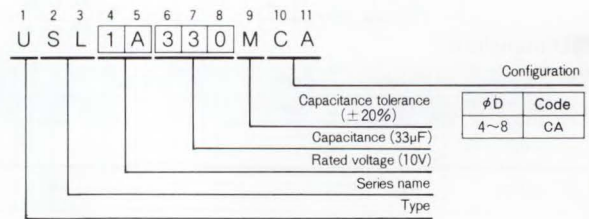
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	6.3~50V							
Capacitance Range	0.1~220 $\mu$ F							
Capacitance Tolerance	$\pm$ 20% at 120 Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.002CV or 0.4( $\mu$ A), whichever is greater.							
tan $\delta$	Measurement frequency : 120 Hz, Temperature : 20°C							
	Rated voltage (V)	6.3	10	16	25	35	50	
Stability at Low Temperature	Measurement frequency : 120 Hz							
	Rated voltage (V)		6.3	10	16	25	35	50
	Impedance ratio	Z-25°C / Z+20°C	4	3	2	2	2	2
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within $\pm$ 20% of initial value			
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.		tan $\delta$		200% or less of initial specified value			
Marking	Printed with black color letter on yellow sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Radial Lead Type



## Type numbering system (Example: 10V 33 $\mu$ F)



## Dimensions

Cap. ( $\mu$ F)	Code	DXL (mm)											
		6.3		10		16		25		35		50	
		0J		1A		1C		1E		1V		1H	
0.1	0R1											4×7	1.0
0.22	R22											4×7	2.3
0.33	R33											4×7	3.5
0.47	R47											4×7	5.0
1	010											4×7	10
2.2	2R2											4×7	19
3.3	3R3											4×7	24
4.7	4R7									4×7	24	5×7	29
10	100					4×7	29	5×7	33	5×7	36	6.3×7	44
22	220	4×7	34	5×7	38	5×7	44	6.3×7	51	6.3×7	57	8×7	65
33	330	5×7	42	5×7	47	6.3×7	57	6.3×7	63	8×7	72		
47	470	5×7	50	6.3×7	59	6.3×7	68	8×7	78				
100	101	6.3×7	77	8×7	96	8×7	107						
220	221	8×7	130										

Allowable Ripple (mA) at 85°C 120Hz

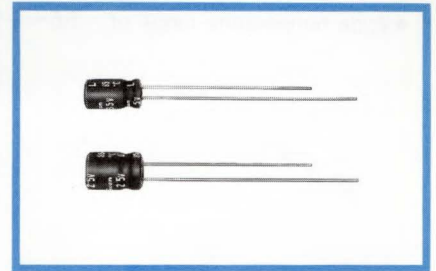
# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**SP** 7mmL, Non-Polarized series



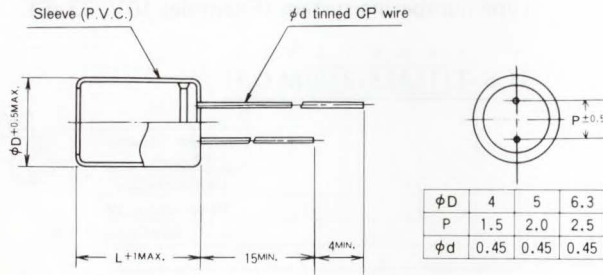
- Non-polarized series with 7mm height.



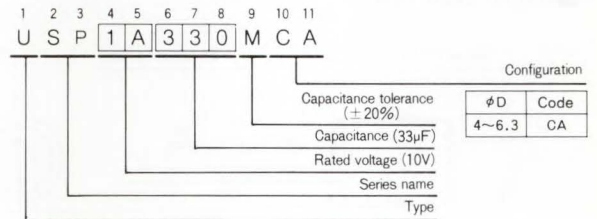
## Specifications

Item	Performance Characteristics						
Operating Temperature Range	-40~+85°C						
Voltage Range	6.3~50V						
Capacitance Range	0.1~47μF						
Capacitance Tolerance	±20% at 120 Hz, 20°C						
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.05CV or 10(μA), whichever is greater.						
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C						
	Rated voltage (V)	6.3	10	16	25	35	50
	tan δ (MAX.)	0.24	0.20	0.16	0.16	0.14	0.12
Stability at Low Temperature	Measurement frequency : 120 Hz						
	Rated voltage (V)	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	4	3	2	2	2	2
	ZT/Z20 (MAX.) Z-40°C/Z+20°C	8	6	4	4	3	3
Load Life	After 1000 hours' application of rated voltage at 85°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less		
			Capacitance change		Within ±20% of initial value		
			tan δ		200% or less of initial specified value		
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.						
Marking	Printed with white color letter on black sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Radial Lead Type



## Type numbering system (Example: 10V 33μF)



## Dimensions

Cap. (μF)	Code	D × L (mm)												
		V	6.3	10	16	25	35	50						
0.1	0R1		0 J	1 A	1 C	1 E	1 V	1 H	4×7	1.0				
0.22	R22								4×7	2.3				
0.33	R33								4×7	3.5				
0.47	R47								4×7	5.0				
1	010								4×7	10				
2.2	2R2								4×7	14				
3.3	3R3								4×7	16				
4.7	4R7				4×7	18	5×7	21	5×7	22	6.3×7	27		
10	100			4×7	24	5×7	30	6.3×7	35	6.3×7	37			
22	220			5×7	40	6.3×7	51	6.3×7	53					
33	330	5×7	42	6.3×7	56	6.3×7	63							
47	470			6.3×7	67	6.3×7	75							

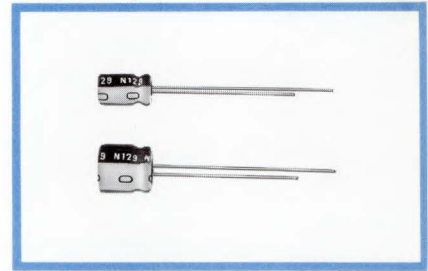
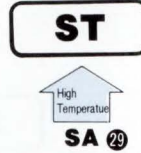
Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**ST** 7mmL, Wide Temperature Range series



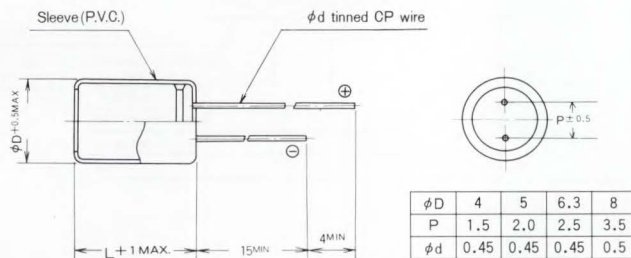
- Wide temperature range of  $-55\sim+105^{\circ}\text{C}$ , with 7mm height.



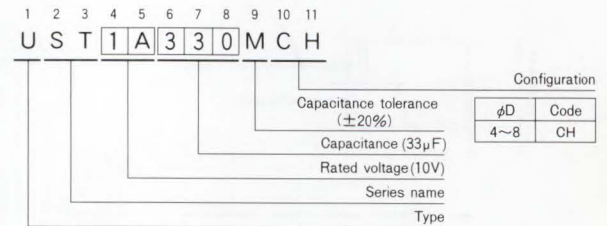
## Specifications

Item	Performance Characteristics		
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$		
Voltage Range	6.3~50V		
Capacitance Range	0.1~220 $\mu\text{F}$		
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20 $^{\circ}\text{C}$		
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3( $\mu\text{A}$ ), whichever is greater.		
tan $\delta$	Measurement frequency : 120 Hz, Temperature : 20 $^{\circ}\text{C}$		
	Rated voltage (V)	6.3    10    16    25    35    50	
	tan $\delta$ (MAX.)	0.24    0.21    0.18    0.15    0.13    0.12	
Stability at Low Temperature	Measurement frequency : 120 Hz		
	Rated voltage (V)	6.3    10    16    25    35    50	
	Impedance ratio Z $-25^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$	3    2    2    2    2    2	
	ZT / Z20(MAX.)	Z $-40^{\circ}\text{C}$ / Z $+20^{\circ}\text{C}$ 6    5    4    3    3    3	
Load Life	After 1000 hours' application of rated voltage at 105 $^{\circ}\text{C}$ , capacitors meet the characteristics requirements listed at right.	Leakage current	Initial specified value or less
		Capacitance change	Within $\pm 25\%$ of initial value ( $\leq 16\text{V}$ ) Within $\pm 20\%$ of initial value ( $\geq 25\text{V}$ )
		tan $\delta$	200% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 105 $^{\circ}\text{C}$ for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.		
Marking	Printed with white color letter on black sleeve according to JIS C-5141.		
Applicable Standards	JIS C-5141 and JIS C-5102.		

## Radial Lead Type



## Type numbering system (Example: 10V 33 $\mu\text{F}$ )



## Dimensions

Cap. ( $\mu\text{F}$ )	Code	V		D $\times$ L (mm)									
		6.3	10	16	25	35	50						
0.1	0R1							4 $\times$ 7	1.0				
0.22	R22							4 $\times$ 7	2.3				
0.33	R33							4 $\times$ 7	3.5				
0.47	R47							4 $\times$ 7	5.0				
1	010							4 $\times$ 7	10				
2.2	2R2							4 $\times$ 7	19				
3.3	3R3							4 $\times$ 7	24				
4.7	4R7							4 $\times$ 7	24				
10	100			4 $\times$ 7	29	5 $\times$ 7	33	5 $\times$ 7	36	6.3 $\times$ 7	44		
22	220	4 $\times$ 7	34	5 $\times$ 7	38	5 $\times$ 7	44	6.3 $\times$ 7	51	6.3 $\times$ 7	57	8 $\times$ 7	65
33	330	5 $\times$ 7	42	5 $\times$ 7	47	6.3 $\times$ 7	57	6.3 $\times$ 7	63	8 $\times$ 7	72		
47	470	5 $\times$ 7	50	6.3 $\times$ 7	59	6.3 $\times$ 7	68	8 $\times$ 7	78				
100	101	6.3 $\times$ 7	77	8 $\times$ 7	96	8 $\times$ 7	107						
220	221	8 $\times$ 7	130										

Allowable Ripple (mA) at 105 $^{\circ}\text{C}$  120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**SQ** series

7mmL, Long Life Assurance

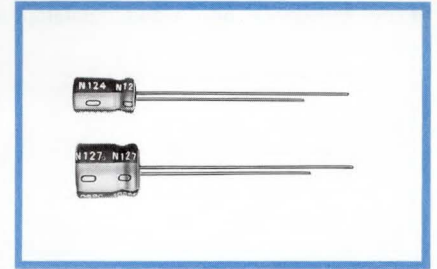
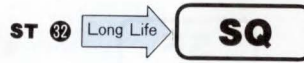


Long Life



Anti-Solvent Feature

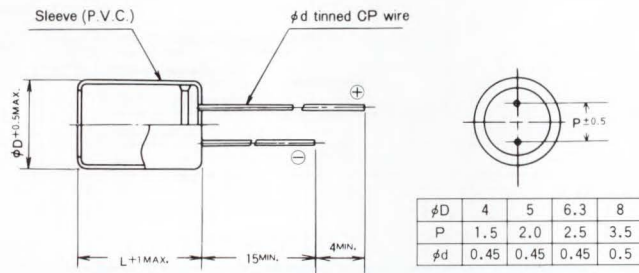
- Extended load life of 5000 hours at +105°C, with 7mm height.



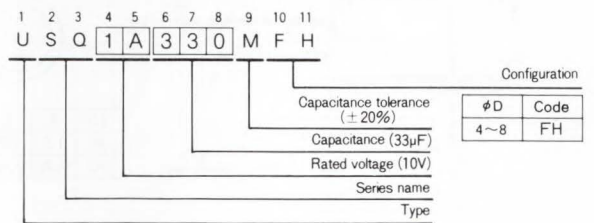
## Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~+105°C						
Voltage Range	6.3~50V						
Capacitance Range	0.1~220μF						
Capacitance Tolerance	±20% at 120 Hz, 20°C						
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 <sub>1</sub> (μA), whichever is greater.						
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C						
	Rated voltage (V)	6.3	10	16	25	35	50
	tan δ (MAX.)	0.24	0.21	0.18	0.15	0.13	0.12
Stability at Low Temperature	Measurement frequency: 120 Hz						
	Rated voltage (V)	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	3	2	2	2	2	2
	ZT/Z20 (MAX.) Z-40°C/Z+20°C	6	5	4	3	3	3
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less		
			Capacitance change		Within ±30% of initial value		
			tan δ		300% or less of initial specified value		
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.						
Marking	Printed with silver color letter on dark brown sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Radial Lead Type



## Type numbering system (Example: 10V 33μF)



## Dimensions

D×L (mm)

Cap. (μF)	Code	V		6.3		10		16		25		35		50	
		Code	0J	1A	1C	1E	1V	1H							
0.1	0R1													4×7	1.0
0.22	R22													4×7	2.3
0.33	R33													4×7	3.5
0.47	R47													4×7	5.0
1	010													4×7	10
2.2	2R2													4×7	19
3.3	3R3													4×7	24
4.7	4R7											4×7	24	5×7	29
10	100							4×7	29	5×7	33	5×7	36	6.3×7	44
22	220	4×7	34	5×7	38	5×7	44	6.3×7	51	6.3×7	57	6.3×7	57	8×7	65
33	330	5×7	42	5×7	47	6.3×7	57	6.3×7	63	8×7	72				
47	470	5×7	50	6.3×7	59	6.3×7	68	8×7	78						
100	101	6.3×7	77	8×7	96	8×7	107								
220	221	8×7	130												

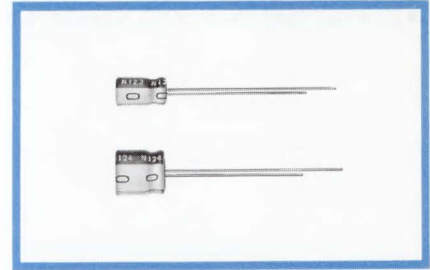
Allowable Ripple (mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**SF** 7mmL, Low Impedance series



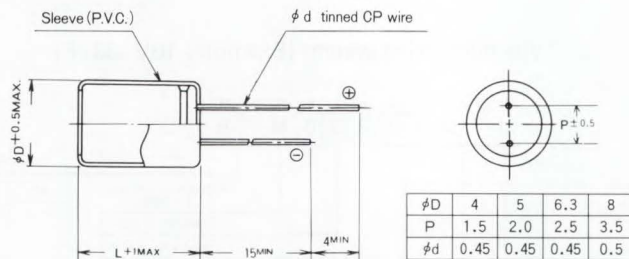
- Low impedance over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ , with 7mm height.



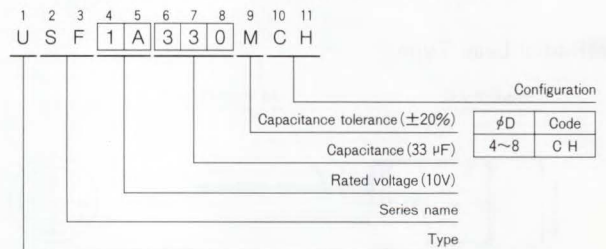
## Specifications

Item	Performance Characteristics					
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$					
Voltage Range	6.3~35V					
Capacitance Range	6.8~220 $\mu\text{F}$					
Capacitance Tolerance	$\pm 20\%$ (120Hz, 20 $^{\circ}\text{C}$ )					
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3( $\mu\text{A}$ ), whichever is greater.					
tan $\delta$	Measurement frequency:120Hz, Temperature:20 $^{\circ}\text{C}$					
	Rated voltage (V)	6.3	10	16	25	35
Stability at Low Temperature	Measurement frequency: 120Hz					
	Rated voltage (V)	6.3	10	16	25	35
Load Life	After 1000 hours' application of rated voltage at 105 $^{\circ}\text{C}$ , capacitors meet the characteristics requirements listed at right.					
	Leakage current	Initial specified value or less				
Shelf Life	After leaving capacitors under no load at 105 $^{\circ}\text{C}$ for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.					
	Capacitance change	Within $\pm 20\%$ of initial value				
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.					
Applicable Standards	JIS C-5141 and JIS C-5102.					

## Radial Lead Type



## Type numbering system (Example: 10V 33 $\mu\text{F}$ )



## Dimensions

DXL (mm)

Cap. ( $\mu\text{F}$ )	Code	6.3		10			16			25			35			
		0J		1A			1C			1E			1V			
6.8	6R8															
10	100															
15	150															
22	220															
33	330	5 $\times$ 7	1.4	120	5 $\times$ 7	1.4	120	6.3 $\times$ 7	0.7	180	6.3 $\times$ 7	0.7	180	6.3 $\times$ 7	0.7	180
47	470	5 $\times$ 7	1.4	120	6.3 $\times$ 7	0.7	180	6.3 $\times$ 7	0.7	180	8 $\times$ 7	0.4	225			
68	680	6.3 $\times$ 7	0.7	180	6.3 $\times$ 7	0.7	180	8 $\times$ 7	0.4	225	8 $\times$ 7	0.4	225			
100	101	6.3 $\times$ 7	0.7	180	8 $\times$ 7	0.4	225	8 $\times$ 7	0.4	225						
150	151	8 $\times$ 7	0.4	225	8 $\times$ 7	0.4	225									
220	221	8 $\times$ 7	0.4	225												

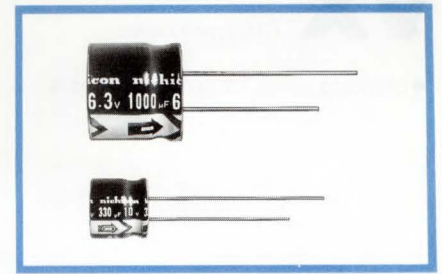
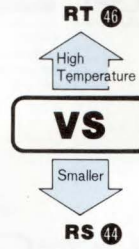
Case size DXL (mm)  
 MAX. Impedance ( $\Omega$ ) at 20 $^{\circ}\text{C}$  100kHz  
 Allowable Ripple (mA) at 105 $^{\circ}\text{C}$  100kHz



**VS** Low-Profile Sized series



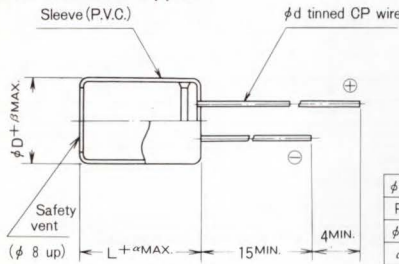
- Low-profile series durable against vibrations and shocks.



## Specifications

Item	Performance Characteristics										
Operating Temperature Range	-40~+85°C										
Voltage Range	6.3~400V										
Capacitance Range	0.1~10000µF										
Capacitance Tolerance	±20% at 120Hz, 20°C										
Leakage Current	After 2 minutes' application of rated voltage, not more than 0.01 CV or 3 (µA), whichever is greater. (6.3~50V)					After 1 minutes' application of rated voltage, not more than 0.04 CV + 100 (µA). (160~400V)					
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120Hz, Temperature: 20°C										
	Rated voltage (V)	6.3	10	16	25	35	50	160	200	250	400
	tan δ (MAX.)	0.24	0.20	0.16	0.14	0.12	0.10	0.20	0.20	0.20	0.25
Stability at Low Temperature	Measurement frequency: 120Hz										
	Rated voltage (V)	6.3	10	16	25	35	50	160	200	250	400
	Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	3	3	3	6
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	10	8	6	4	3	4	4	6	10
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.										
	Leakage current	Initial specified value or less									
	Capacitance change	Within ±20% of initial value for capacitors of 16V or less, and φ5 and φ6.3 Within ±15% of initial value for capacitors of 25V or more, and above φ6.3									
	tan δ	150% or less of initial specified value									
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.										
Marking	Printed with white color letter on dark blue sleeve according to JIS C-5141.										
Applicable Standards	JIS C-5141 and JIS C-5102.										

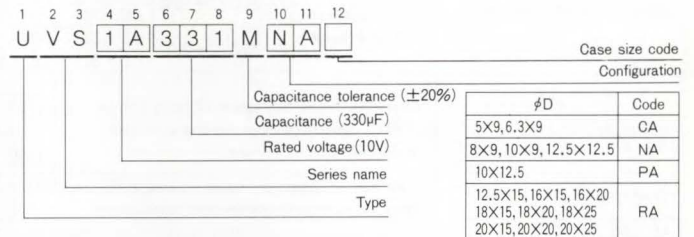
## Radial Lead Type



φD	5	6.3	8	10	12.5	16	18	20
P	2	2.5	3.5	5.0	5.0	7.5	7.5	10.0
φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0
α	1	1	1	1	1	1.5	1.5	2
β	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1

Remarks: Dimensions in ( ) are applied to the capacitors rated at 160~400V.

## Type numbering system (Example: 10V 330µF)



## Dimensions

Cap. (µF)	V Code	6.3		10		16		25		35		50		160		200		250		400		
		0 J	1 A	1 C	1 E	1 V	1 H	2 C	2 D	2 E	2 G	2 H	2 J	2 K	2 L	2 M	2 N	2 O	2 P	2 Q	2 R	
0.1	OR1											5×9	1.3									
0.22	R22											5×9	2.9									
0.33	R33											5×9	4.3									
0.47	R47											5×9	6.0									
1	010											5×9	9.0									
2.2	2R2											5×9	17									
3.3	3R3											5×9	24									
4.7	4R7											5×9	29									
10	100					5×9	33	5×9	36	5×9	38	5×9	42								16×15	115
22	220			5×9	45	5×9	50	5×9	55	6.3×9	60	6.3×9	65					16×15	250	△18×20	180	
33	330	5×9	50	5×9	55	5×9	60	6.3×9	65	6.3×9	70	8×9	85			16×15	300	•18×15	320	★18×25	220	
47	470	5×9	60	5×9	65	6.3×9	85	6.3×9	90	8×9	95	8×9	105		16×15	360	•18×15	370	△18×20	390		
68	680														•18×15	440	△18×20	460	★18×25	470		
100	101	6.3×9	100	6.3×9	105	8×9	120	8×9	125	10×9	155	10×12.5	190		△18×20	560	★18×25	570				
150	151														20×25	710						
220	221	8×9	145	8×9	160	10×9	200	10×12.5	240	12.5×12.5	280	12.5×15	340									
330	331	8×9	190	10×9	220	10×12.5	270	12.5×12.5	320	12.5×15	390	16×15	480									
470	471	10×9	240	10×12.5	290	12.5×12.5	360	12.5×15	410	16×15	510	•18×15	630									
1000	102	12.5×12.5	440	12.5×15	520	16×15	660	•18×15	750	•18×15	790	△18×20	950									
2200	222	16×15	750	16×15	810	•18×15	980	△18×20	1150	★18×25	1250											
3300	332	•18×15	910	•18×15	1050	△18×20	1150	★18×25	1350													
4700	472	△18×20	1100	△18×20	1250	★18×25	1400															
6800	682	★18×25	1350	★18×25	1450	20×25	1700															
10000	103	20×25	1700	20×25	1800																	

Size 16×20 is available for capacitors marked "•". Size 20×15 is available for capacitors marked "△". Size 20×20 is available for capacitors marked "★". Allowable Ripple (mA) at 85°C 120Hz. In this case, [6] will be put at 12th digit of type numbering system.

## Frequency coefficient of allowable ripple current

V	Cap. (µF)	Frequency (Hz)				
		~47	50	120	300	1k
6.3~50	~47	0.75	1.00	1.35	1.57	2.00
	100~470	0.80	1.00	1.23	1.34	1.50
	1000~10000	0.85	1.00	1.10	1.13	1.15
160~400	10~150	0.80	1.00	1.25	1.40	1.60

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85
Coefficient	1.27	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

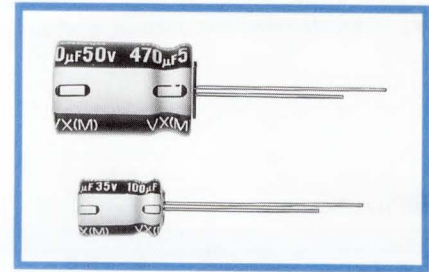
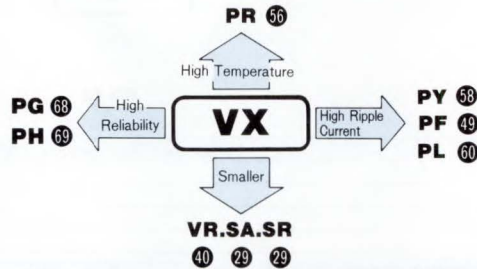
**VX** Standard, For General Purposes  
(04 type) series



Approved by Reliability Center for Electronic Component, Japan-Certification No. RCJ-03-22C

- Standard series for general purposes.

- For capacitors up to 250V.
- For case sizes of  $\phi 22$  or larger, only up to 100V.

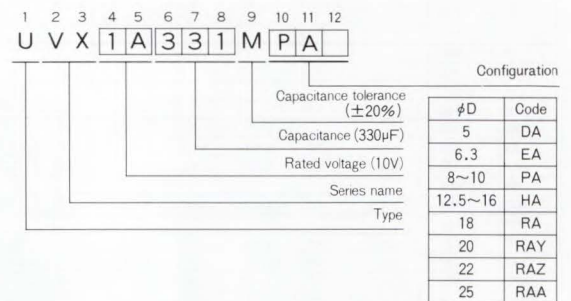
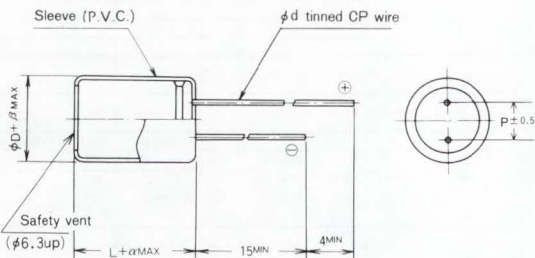


## Specifications

Item	Performance Characteristics												
Operating Temperature Range	$\phi D \leq 20$	-40~+85°C (6.3~400V), -25~+85°C (450V)											
	$\phi D > 20$	-40~+85°C (6.3~250V), -25~+85°C (315~450V)											
Voltage Range	6.3~450V												
Capacitance Range	0.1~33000µF												
Capacitance Tolerance	±20% at 120Hz, 20°C												
Leakage Current	$\phi D \leq 18$	Rated voltage (V)	6.3~100					160~450					
			After 1 minute's application of rated voltage, not more than 0.03 CV or 4µA, whichever is greater.					In case of CV ≤ 1000 After 1 minute's application of rated voltage, not more than 0.1CV+40(µA).					
	$\phi D > 18$	After 2 minutes' application of rated voltage, not more than 0.01CV or 3µA, whichever is greater.					In case of CV > 1000 After 1 minute's application of rated voltage, not more than 0.04CV+100(µA).						
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120Hz, Temperature: 20°C												
	Rated voltage (V)	6.3	10	16	25	35	50	63~100	160~315	350~450			
Stability at Low Temperature	Impedance ratio ZT/Z20 (MAX.)	Z-25°C / Z+20°C	$\phi D \leq 20$	4	3	2	2	2	3	3	6	6	15
			$\phi D > 20$	6	4	3	3	2	4	4	6	15	15
		Z-40°C / Z+20°C	$\phi D \leq 20$	10	8	6	4	3	4	6	8	10	—
			$\phi D > 20$	20	18	15	10	8	12	12	—	—	—
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less									
			Capacitance change	Within ±20% of initial value									
			tan δ	200% or less of initial specified value									
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.												
Marking	Printed with white color letter on purple blue sleeve according to JIS C-5141.												
Applicable Standards	JIS C-5141 and JIS C-5102.												

## Radial Lead Type

Type numbering system (Example: 10V 330 µF)



φD	5	6.3	8	10	12.5	16	18	20	22	25
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	10.0	12.5
φd	0.5	0.5	0.6	0.6	0.6	0.6	0.8	0.8	1.0	1.0
α	~100V	1.0	1.0	1.0	1.5	1.5	1.5	1.5	2.0	2.0
	160V~	—	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0
β	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0

• Dimension table in next page.

# ALUMINUM ELECTROLYTIC CAPACITORS



**VX** (04 type) series

## ■ Dimensions

D×L (mm)

Cap. (μF)	Code	V 6.3		10		16		25		35		50		63		100	
		0 J		1 A		1 C		1 E		1 V		1 H		1 J		2 A	
0.1	0R1											5×11	1.1			5×11	2.1
0.22	R22											5×11	2.3			5×11	4.7
0.33	R33											5×11	3.5			5×11	7
0.47	R47											5×11	5			5×11	10
1	010											5×11	10			5×11	21
2.2	2R2											5×11	23			5×11	30
3.3	3R3											5×11	35			5×11	40
4.7	4R7							5×11	30	5×11	35	5×11	40	5×11	45	5×11	45
10	100					5×11	40	5×11	50	5×11	55	5×11	65	5×11	70	6.3×11	75
22	220	5×11	35	5×11	55	5×11	75	5×11	80	5×11	85	5×11	95	6.3×11	115	8×11.5	130
33	330	5×11	55	5×11	80	5×11	90	5×11	95	5×11	105	6.3×11	125	6.3×11	140	10×12.5	170
47	470	5×11	75	5×11	95	5×11	110	5×11	115	6.3×11	140	6.3×11	150	8×11.5	190	10×16	230
100	101	5×11	130	5×11	145	6.3×11	175	6.3×11	185	8×11.5	230	8×11.5	250	10×12.5	300	12.5×20	400
220	221	6.3×11	215	6.3×11	230	8×11.5	300	8×11.5	320	10×12.5	370	10×16	440	10×20	490	16×25	710
330	331	6.3×11	265	8×11.5	330	8×11.5	360	10×12.5	420	10×16	490	10×20	580	12.5×20	680	16×25	860
470	471	8×11.5	360	8×11.5	390	10×12.5	470	10×16	540	10×20	640	12.5×20	760	12.5×25	880	16×31.5	1100
1000	102	10×12.5	570	10×16	630	10×20	790	12.5×20	950	12.5×25	1100	16×25	1350	16×31.5	1550	18×40 20×35	1690 1720
2200	222	12.5×20	1050	12.5×20	1100	12.5×25	1350	16×25	1550	16×31.5	1800	18×35.5 20×31	2090 2060	18×40 20×35	2200 2250	22×50 25×40	2070 2010
3300	332	12.5×20	1250	12.5×25	1400	16×25	1700	16×31.5	1950	18×35.5 20×31	2220 2190	20×40 22×35	2360 2280	22×40 25×35	2300 2300	25×60	2950
4700	472	16×25	1700	16×25	1800	16×31.5	2100	18×35.5 20×31	2360 2330	20×40 22×35	2490 2460	22×40 25×35	2740 2730	25×40 25×40	2670 2940		
6800	682	16×25	1900	16×31.5	2150	18×35.5 20×31	2500 2470	20×40 22×35	2590 2540	22×40 25×35	3080 3070	25×45	3920	25×60	5220		
10000	103	16×31.5	2250	18×35.5 20×31	2500 2470	18×40 20×35	2640 2610	22×40 25×35	3080 3070	25×45	3920	25×60	5220				
12000	123	16×35.5	2450	18×35.5 20×31	2600 2560	20×40 22×35	2730 2700	22×50 25×40	3770 3590	—	—	—	—				
15000	153	18×35.5 20×31	2680 2650	18×40 20×35	2720 2680	22×40 25×35	3310 3300	25×45	4260	25×60	5550						
18000	183	18×40 20×35	2750 2720	20×40 22×35	2850 2790	22×50 25×40	4050 3860	25×50	4920								
22000	223	20×40 22×35	2850 2790	22×40 25×35	3300 3290	22×40 25×45	3300 4270	25×60	5960								
27000	273	22×45 25×35	3330 3130	22×50 25×40	4090 3900	22×50 25×50	4090 5290										
33000	333	22×50 25×40	3890 3710	22×50 25×50	4090 4820	22×50 25×60	4090 6410										

Cap. (μF)	Code	V 160		200		250		315		350		400		450			
		2 C		2 D		2 E		2 F		2 V		2 G		2 W			
0.47	R47	6.3×11	12	6.3×11	12	6.3×11	12										
1	010	6.3×11	17	6.3×11	17	6.3×11	17	6.3×11	17	8×11.5	18	8×11.5	18	10×12.5	19		
2.2	2R2	6.3×11	26	6.3×11	26	8×11.5	30	8×11.5	30	10×12.5	28	10×12.5	28	10×16	29		
3.3	3R3	8×11.5	35	8×11.5	35	10×12.5	35	10×12.5	35	10×16	35	10×16	35	10×20	35		
4.7	4R7	8×11.5	40	10×12.5	45	10×12.5	45	10×16	45	10×16	40	10×20	45	12.5×20	50		
10	100	10×12.5	65	10×16	70	10×20	70	10×20	70	12.5×20	70	12.5×20	70	12.5×25	75		
22	220	10×20	110	10×20	110	12.5×25	130	12.5×25	120	12.5×25	110	16×25	110	16×31.5	110		
33	330	12.5×20	150	12.5×25	160	12.5×25	160	16×25	150	16×31.5	140	16×31.5	140	18×35.5 20×31	150 140		
47	470	12.5×25	180	12.5×25	180	16×25	210	16×31.5	190	18×35.5 20×31	220 210	18×35.5 20×31	220 210	20×40 22×35	230 220		
100	101	16×25	300	16×31.5	330	18×35.5 20×31	340 330	18×40 20×35	340 330	20×40 22×35	360 350	22×40 25×35	370 360	25×40	390		
150	151	16×35.5	420	18×35.5 20×31	450 440	18×40 20×35	460 460	20×40 22×35	450 450	22×40 25×35	460 450	25×45	520	25×60	600		
220	221	18×35.5 20×31	510 500	18×40 20×35	520 510	20×40 22×35	530 520	22×45 25×35	590 550	—	—	25×45	630	25×60	720		
270	271	18×40 20×35	540 540	20×40 22×35	570 560	22×40 25×30	610 560	—	—	25×45	810	25×60	830				
330	331	20×40 22×35	600 590	22×40 25×30	670 620	22×45 25×35	720 680	—	—	25×60	890						
390	391	22×40 25×30	580 530	22×45 25×35	770 720	22×50 25×40	820 790										
470	471	22×45 25×35	800 750	22×50 25×40	890 850	—	—	—	—	—	—						
560	561	22×50 25×40	920 870	—	—	—	—	—	—	—	—						
680	681	—	—	—	—	—	—	—	—	—	—						
820	821	25×45 25×60	1020 1300	25×45 25×60	1250											Case size	Allowable ripple

Allowable Ripple(mA) at 85°C 120Hz

### ● Frequency coefficient of allowable ripple current

V	Cap. (μF)	Frequency (Hz)				
		50	120	300	1 k	10k~
6.3~100	~ 47	0.75	1.00	1.35	1.57	2.00
	100~ 470	0.80	1.00	1.23	1.34	1.50
	1000~33000	0.85	1.00	1.10	1.13	1.15
160~450	0.47~ 220	0.80	1.00	1.25	1.40	1.60
	270~ 820	0.90	1.00	1.10	1.13	1.15

### ● Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+70	+85
Coefficient	1.27	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS



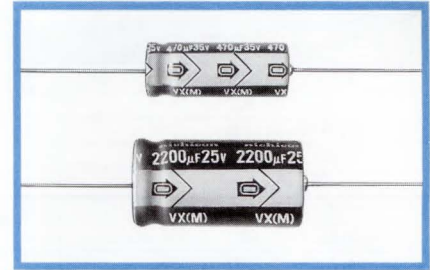
Standard, For General Purposes - Axial Lead Type

(02 type) series



Anti-Solvent Feature  
(Through 100V only)

- Axial lead type of standard series for general purposes.

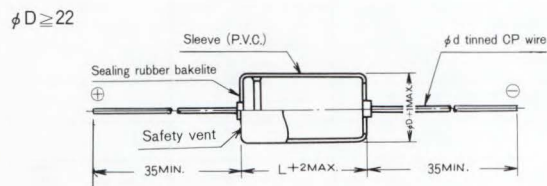
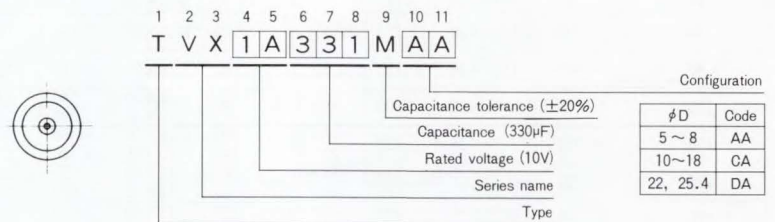
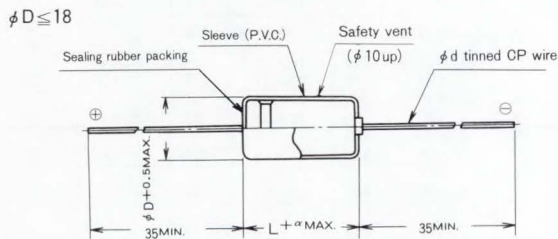


## Specifications

Item	Performance Characteristics																																		
Operating Temperature Range	-40~+85°C (6.3~250V), -25~+85°C (315~450V)																																		
Voltage Range	6.3~450V																																		
Capacitance Range	0.47~22000 µF																																		
Capacitance Tolerance	±20% at 120 Hz, 20°C																																		
Leakage Current	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3~100</td> <td>160~450</td> </tr> <tr> <td>φD ≤ 18</td> <td>After 1 minute's application of rated voltage, not more than 0.03 CV or 4µA, whichever is greater. After 2 minutes' application of rated voltage, not more than 0.01CV or 3µA, whichever is greater.</td> <td>In case of CV ≤ 1000 After 1 minute's application of rated voltage, not more than 0.1 CV + 40 (µA). In case of CV &gt; 1000 After 1 minute's application of rated voltage, not more than 0.04 CV + 100 (µA).</td> </tr> <tr> <td>φD &gt; 18</td> <td>After 5 minutes' application of rated voltage, not more than 3√CV.</td> <td>After 5 minutes' application of rated voltage, not more than 3√CV.</td> </tr> </table>	Rated voltage (V)	6.3~100	160~450	φD ≤ 18	After 1 minute's application of rated voltage, not more than 0.03 CV or 4µA, whichever is greater. After 2 minutes' application of rated voltage, not more than 0.01CV or 3µA, whichever is greater.	In case of CV ≤ 1000 After 1 minute's application of rated voltage, not more than 0.1 CV + 40 (µA). In case of CV > 1000 After 1 minute's application of rated voltage, not more than 0.04 CV + 100 (µA).	φD > 18	After 5 minutes' application of rated voltage, not more than 3√CV.	After 5 minutes' application of rated voltage, not more than 3√CV.																									
	Rated voltage (V)	6.3~100	160~450																																
	φD ≤ 18	After 1 minute's application of rated voltage, not more than 0.03 CV or 4µA, whichever is greater. After 2 minutes' application of rated voltage, not more than 0.01CV or 3µA, whichever is greater.	In case of CV ≤ 1000 After 1 minute's application of rated voltage, not more than 0.1 CV + 40 (µA). In case of CV > 1000 After 1 minute's application of rated voltage, not more than 0.04 CV + 100 (µA).																																
φD > 18	After 5 minutes' application of rated voltage, not more than 3√CV.	After 5 minutes' application of rated voltage, not more than 3√CV.																																	
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120Hz, Temperature: 20°C																																		
Stability at Low Temperature	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63~100</td> <td>160~315</td> <td>350~450</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.08</td> <td>0.20</td> <td>0.25</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	63~100	160~315	350~450	tan δ (MAX.)	0.24	0.20	0.16	0.14	0.12	0.10	0.08	0.20	0.25														
	Rated voltage (V)	6.3	10	16	25	35	50	63~100	160~315	350~450																									
	tan δ (MAX.)	0.24	0.20	0.16	0.14	0.12	0.10	0.08	0.20	0.25																									
<table border="1"> <tr> <td rowspan="4">Impedance ratio ZT/Z20 (MAX.)</td> <td rowspan="2">Z-25°C/Z+20°C</td> <td>φD ≤ 18</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>4</td> <td>6</td> <td>15</td> </tr> <tr> <td>φD &gt; 18</td> <td>6</td> <td>4</td> <td>3</td> <td>2</td> <td>4</td> <td>6</td> <td>15</td> </tr> <tr> <td rowspan="2">Z-40°C/Z+20°C</td> <td>φD ≤ 18</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>12</td> <td>—</td> </tr> <tr> <td>φD &gt; 18</td> <td>20</td> <td>18</td> <td>15</td> <td>10</td> <td>8</td> <td>12</td> <td>—</td> </tr> </table>	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	φD ≤ 18	4	3	2	2	4	6	15	φD > 18	6	4	3	2	4	6	15	Z-40°C/Z+20°C	φD ≤ 18	10	8	6	4	3	12	—	φD > 18	20	18	15	10	8	12	—
Impedance ratio ZT/Z20 (MAX.)			Z-25°C/Z+20°C	φD ≤ 18	4	3	2	2	4	6	15																								
		φD > 18		6	4	3	2	4	6	15																									
		Z-40°C/Z+20°C	φD ≤ 18	10	8	6	4	3	12	—																									
	φD > 18		20	18	15	10	8	12	—																										
Load Life	<p>After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.</p> <table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																												
Leakage current	Initial specified value or less																																		
Capacitance change	Within ±20% of initial value																																		
tan δ	200% or less of initial specified value																																		
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																																		
Marking	Printed with white color letter on purple blue sleeve according to JIS C-5141.																																		
Applicable Standards	JIS C-5141 and JIS C-5102.																																		

## Axial Lead Type

Type numbering system (Example: 10V 330µF)



φD	5~13	16~25.4
φd	0.6	0.8

V	6.3~100	160~450
α	1	2

- Dimension table in next page.

## VX (02 type)

### ■ Dimensions

DXL(mm)

V	6.3		10		16		25		35		50		63		100		
	Cap. (μF)	Code	0 J		1 A		1 C		1 E		1 V		1 H		2 A		
0.47	R47											5×12	5			5×12	10
1	010											5×12	10			5×12	18
2.2	2R2											5×12	23			5×12	28
3.3	3R3											5×12	28	5×12	31	5×12	34
4.7	4R7											5×12	34	5×12	37	5×12	40
10	100							5×12	40	5×12	45	5×12	50	5×12	55	6.3×12	60
22	220					5×12	60	5×12	65	5×12	70	6.3×12	85	6.3×12	90	8×16	120
33	330			5×12	65	5×12	70	5×12	80	6.3×12	90	6.3×16	110	6.3×16	120	8×16	150
47	470			5×12	80	5×12	85	6.3×12	100	6.3×16	120	6.3×16	130	8×16	160	8×20	190
100	101	5×12	110	6.3×12	130	6.3×16	160	6.3×16	170	8×16	210	8×16	220	8×20	260	10×26	340
220	221	6.3×16	200	6.3×16	210	8×16	260	8×16	280	8×20	340	10×21	410	10×26	480	13×26	560
330	331	6.3×16	250	8×16	300	8×16	320	8×20	380	10×21	460	10×26	560	13×26	650	13×31.5	750
470	471	8×16	330	8×16	350	8×20	430	10×26	510	10×26	610	13×26	730	13×31.5	840	16×31.5	970
1000	102	10×21	600	10×21	640	10×26	770	13×26	900	13×31.5	1060	16×31.5	1260	16×31.5	1330	22×40	1540
2200	222	13×26	1020	13×26	1090	13×31.5	1180	16×31.5	1480	16×31.5	1580	18×41	1920	22×40	2160	25.4×52	2430
3300	332	13×26	1200	13×31.5	1390	16×31.5	1620	16×41.5	1710	16×41.5	2050	22×40	2340	22×52	2470		
4700	472	16×31.5	1500	16×31.5	1730	16×41.5	1840	18×41	2170	22×40	2470	22×52	2650	25.4×61	2710		
6800	682	16×31.5	1840	16×41.5	1930	18×41	2310	22×40	2580	22×52	2720	25.4×61	2910				
10000	103	16×41.5	2260	18×41	2350	22×40	2620	22×52	2940	25.4×61	3600						
15000	153	22×40	2450	22×40	2730	22×52	2860	25.4×61	3880								
22000	223	22×52	2550	22×52	2940	25.4×61	3630										

V	160		200		250		315		350		400		450		
	Cap. (μF)	Code	2 C		2 D		2 E		2 F		2 V		2 W		
1	010	6.3×12	13	6.3×12	13	6.3×16	14	6.3×16	14	6.3×16	12	8×16	14	8×16	14
2.2	2R2	6.3×16	23	6.3×16	23	8×16	27	8×16	27	8×16	24	8×20	28	10×21	31
3.3	3R3	8×16	33	8×16	33	8×16	33	8×20	36	8×20	32	10×21	38	10×21	38
4.7	4R7	8×16	39	8×16	39	8×20	45	8×20	45	10×21	46	10×21	46	10×26	50
10	100	8×20	60	10×21	70	10×21	70	10×26	80	13×26	85	13×26	85	13×26	85
22	220	10×26	120	13×26	140	13×26	140	13×31.5	150	13×31.5	140	16×31.5	150	16×31.5	150
33	330	13×26	170	13×26	170	13×31.5	190	16×31.5	210	16×31.5	190	16×41.5	210	18×41	230
47	470	13×31.5	230	13×31.5	230	16×31.5	260	16×31.5	260	16×41.5	260	18×41	290	22×40	310
100	101	16×41.5	430	16×41.5	430	16×41.5	430	22×40	460	22×40	420	22×52	460	25.4×52	540
220	221	22×40	680	22×40	680	22×40	680								
330	331	22×52	940	25.4×52	1010										
470	471	25.4×52	1200												

Allowable Ripple (mA) at 85°C 120Hz

### ● Frequency coefficient of allowable ripple current

V	Cap. (μF)	Frequency (Hz)			
		120	300	1 k	10k~
6.3~100	~ 47	1.00	1.35	1.57	2.00
	100~ 470	1.00	1.23	1.34	1.50
	1000~ 22000	1.00	1.10	1.13	1.15
160~450	1~ 220	1.00	1.25	1.40	1.60
	330~ 470	1.00	1.10	1.13	1.15

### ● Allowable ripple current vs. Ambient temperature

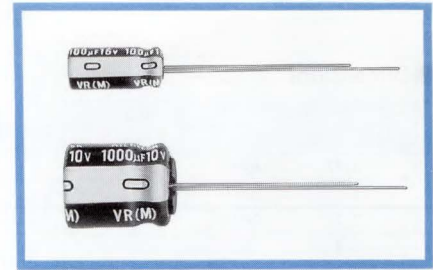
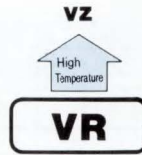
Ambient temp. (°C)	~+70	+85
Coefficient	1.27	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**VR** Miniature Sized series



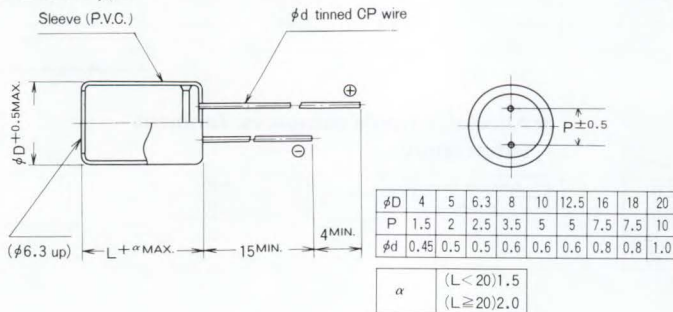
- One rank smaller case sizes than VX series



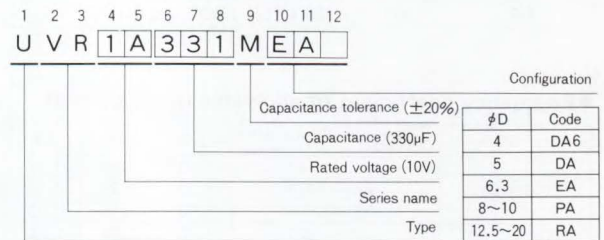
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40~+85°C (6.3~400V), -25~+85°C (450V)	
Voltage Range	6.3~450V	
Capacitance Range	0.1~22000μF	
Capacitance Tolerance	±20% at 120Hz, 20°C	
Leakage Current	Rated voltage (V)	6.3~100
		160~450
tan δ	For capacitance of more than 1000μF, add 0.02 for every increase of 1000μF. Measurement frequency:120Hz, Temperature:20°C	
	Rated voltage (V)	6.3 10 16 25 35 50 63 100 160~315 350~450
Stability at Low Temperature	Measurement frequency:120Hz	
	Impedance ratio	Z-25°C / Z+20°C
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.	
	Capacitance change	Within ±20% of initial value
Marking	Printed with white color letter on black sleeves according to JIS C-5141.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Radial Lead Type



## Type numbering system (Example: 10V 330μF)



• Dimension table in next page.

### Dimensions

DXL(mm)

Cap. (μF)	Code	6.3		10		16		25		35		50	
		0 J		1 A		1 C		1 E		1 V		1 H	
0.1	0R1											• 5×11	1.1
0.22	R22											• 5×11	2.3
0.33	R33											• 5×11	3.5
0.47	R47											• 5×11	5
1	010											• 5×11	10
2.2	2R2											• 5×11	23
3.3	3R3											• 5×11	35
4.7	4R7							• 5×11	30	• 5×11	35	• 5×11	40
10	100					• 5×11	40	• 5×11	50	• 5×11	55	• 5×11	60
22	220	• 5×11	35	• 5×11	55	• 5×11	75	• 5×11	80	• 5×11	85	5×11	95
33	330	• 5×11	55	• 5×11	80	• 5×11	90	• 5×11	95	5×11	105	5×11	120
47	470	• 5×11	75	• 5×11	95	• 5×11	110	• 5×11	115	5×11	130	6.3×11	155
100	101	• 5×11	130	• 5×11	145	5×11	160	6.3×11	190	6.3×11	210	8×11.5	260
220	221	5×11	200	6.3×11	240	6.3×11	260	8×11.5	330	10×12.5	385	10×12.5	410
330	331	6.3×11	270	6.3×11	290	8×11.5	370	10×12.5	440	10×12.5	470	10×16	520
470	471	6.3×11	320	6.3×11	350	8×11.5	440	10×12.5	520	10×16	580	12.5×20	740
1000	102	8×11.5	540	10×12.5	620	10×16	710	10×20	830	12.5×20	1000	12.5×25	1100
2200	222	10×20	900	10×20	970	12.5×20	1150	12.5×25	1300	16×25	1550	16×35.5	1700
3300	332	10×20	1050	12.5×20	1250	12.5×25	1400	16×25	1650	16×35.5	1950	18×35.5	2200
4700	472	12.5×20	1350	12.5×25	1500	16×25	1700	16×31.5	2050	18×35.5	2400		
6800	682	12.5×25	1600	16×25	1850	16×35.5	2150	18×35.5	2550	20×40	3000		
10000	103	16×25	2000	16×35.5	2350	18×35.5	2700						
15000	153	16×35.5	2550	18×35.5	2950	20×40	3400						
22000	223	18×40	3200	20×40	3700							Case size	Allowable ripple

Cap. (μF)	Code	63		100		160		200		250		315		350		400		450		
		1 J		2 A		2 C		2 D		2 E		2 F		2 V		2 G		2 W		
0.1	0R1			5×11	2.1															
0.22	R22			5×11	4.7															
0.33	R33			5×11	7															
0.47	R47			5×11	10	6.3×11	12	6.3×11	12	6.3×11	12									
1	010			5×11	21	6.3×11	17	6.3×11	17	6.3×11	17	6.3×11	17	6.3×11	18	8×11.5	18	8×11.5	18	
2.2	2R2			5×11	30	6.3×11	26	6.3×11	26	6.3×11	26	8×11.5	30	8×11.5	25	10×12.5	28	10×12.5	28	
3.3	3R3			5×11	40	6.3×11	29	6.3×11	29	8×11.5	33	10×12.5	35	10×12.5	32	10×12.5	32	10×16	35	
4.7	4R7			5×11	45	6.3×11	34	8×11.5	39	8×11.5	39	10×12.5	42	10×12.5	39	10×16	41	10×20	43	
10	100	5×11	65	6.3×11	75	8×11.5	58	10×12.5	61	10×16	64	10×20	70	10×20	65	12.5×20	70	12.5×20	70	
22	220	5×11	100	6.3×11	130	10×16	95	10×20	99	12.5×20	110	12.5×20	110	12.5×25	110	16×25	120	16×25	120	
33	330	6.3×11	140	8×11.5	180	10×20	120	12.5×20	140	12.5×20	140	16×25	150	16×25	130	16×31.5	140	16×35.5	150	
47	470	6.3×11	170	10×12.5	230	12.5×20	160	12.5×20	160	12.5×25	170	16×25	180	16×35.5	160	16×35.5	160	18×40	170	
100	101	10×12.5	300	10×20	370	12.5×25	240	16×31.5	250	16×31.5	250	18×35.5	270	18×40	250					
220	221	10×16	470	12.5×25	620	16×35.5	380	18×35.5	390	20×40	430									
330	331	10×20	710	12.5×25	760	18×40	490													
470	471	12.5×20	900	16×25	1000															
1000	102	16×25	1300	18×40	1380															
																			Case size	Allowable ripple

 Allowable Ripple (mA) at 85°C 120Hz  
 Size 4×11 is available for capacitors marked "•"

### ● Frequency coefficient of allowable ripple current

V	Cap. (μF)	Frequency				
		50Hz	120Hz	300Hz	1kHz	10kHz~
6.3~100	~47	0.75	1.00	1.35	1.57	2.00
	100~470	0.80	1.00	1.23	1.34	1.50
	1000~22000	0.85	1.00	1.10	1.13	1.15
160~450	0.47~220	0.80	1.00	1.25	1.40	1.60
	330	0.90	1.00	1.10	1.13	1.15

### ● Allowable ripple current vs. Ambient temperature

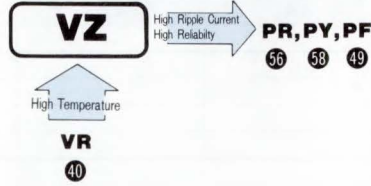
Ambient temp.(°C)	~+70	+85
Coefficient	1.27	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**VZ** Wide Temperature Range series



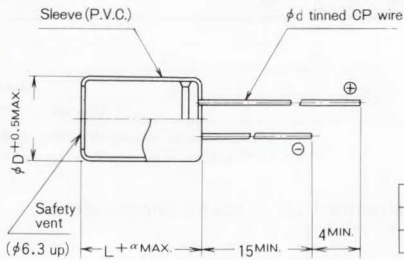
- Small case sizes as same as VR series, but operating over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ .



## Specifications

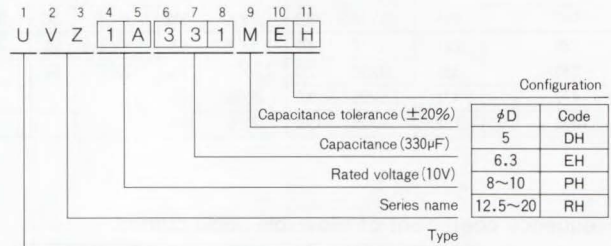
Item	Performance Characteristics	
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$ (6.3~100V), $-40\sim+105^{\circ}\text{C}$ (160~400V), $-25\sim+105^{\circ}\text{C}$ (450V)	
Voltage Range	6.3~450V	
Capacitance Range	0.1~22000µF	
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20°C	
Leakage Current	Rated voltage (V)	6.3~100
		160~450
tan $\delta$	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF.	
	Rated voltage (V)	6.3 10 16 25 35 50 63 100 160~315 350~450
Stability at Low Temperature	Measurement frequency: 120Hz	
	Impedance ratio	Z-25°C / Z+20°C
Load Life	After 1000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.	
	Capacitance change	Within $\pm 20\%$ of initial value
Marking	Printed with white color letter on black sleeve according to JIS C-5141.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Radial Lead Type



φD	5	6.3	8	10	12.5	16	18	20
P	2	2.5	3.5	5	5	7.5	7.5	10
φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0
α	(L < 20) 1.5		(L ≥ 20) 2.0					

## Type numbering system (Example: 10V 330µF)



• Dimension table in next page.



## Dimensions

DXL (mm)

Cap.( $\mu$ F)	V Code	6.3		10		16		25		35		50	
		0 J		1 A		1 C		1 E		1 V		1 H	
0.1	0R1											5×11	1.1
0.22	R22											5×11	2.3
0.33	R33											5×11	3.5
0.47	R47											5×11	7
1	010											5×11	12
2.2	2R2											5×11	18
3.3	3R3											5×11	25
4.7	4R7							5×11	22	5×11	25	5×11	29
10	100					5×11	30	5×11	36	5×11	39	5×11	46
22	220	5×11	28	5×11	41	5×11	54	5×11	58	5×11	61	5×11	68
33	330	5×11	43	5×11	58	5×11	65	5×11	68	5×11	75	5×11	86
47	470	5×11	56	5×11	68	5×11	79	5×11	83	5×11	93	6.3×11	115
100	101	5×11	93	5×11	105	5×11	115	6.3×11	140	6.3×11	150	8×11.5	190
220	221	5×11	145	6.3×11	175	6.3×11	190	8×11.5	240	10×12.5	275	10×12.5	295
330	331	6.3×11	195	6.3×11	210	8×11.5	265	10×12.5	315	10×12.5	340	10×16	375
470	471	6.3×11	230	6.3×11	250	8×11.5	315	10×12.5	375	10×16	415	12.5×20	530
1000	102	8×11.5	390	10×12.5	445	10×16	510	10×20	595	12.5×20	715	12.5×25	790
2200	222	10×20	645	10×20	695	12.5×20	825	12.5×25	930	16×25	1110	16×35.5	1220
3300	332	10×20	750	12.5×20	895	12.5×25	1000	16×25	1180	16×35.5	1400	18×35.5	1580
4700	472	12.5×20	965	12.5×25	1080	16×25	1220	16×31.5	1470	18×35.5	1720		
6800	682	12.5×25	1150	16×25	1330	16×35.5	1540	18×35.5	1830	20×40	2150		
10000	103	16×25	1430	16×35.5	1680	18×35.5	1930						
15000	153	16×35.5	1830	18×35.5	2110	20×40	2430						
22000	223	18×40	2290	20×40	2650								

Cap.( $\mu$ F)	V Code	63		100		160		200		250		315		350		400		450	
		1 J		2 A		2 C		2 D		2 E		2 F		2 V		2 G		2 W	
0.1	0R1			5×11	1.5														
0.22	R22			5×11	3.4														
0.33	R33			5×11	5.0														
0.47	R47			5×11	7.1	6.3×11	8.6	6.3×11	8.6	6.3×11	8.6								
1	010			5×11	15	6.3×11	12	6.3×11	12	6.3×11	12	6.3×11	12	6.3×11	13	8×11.5	13	8×11.5	13
2.2	2R2			5×11	21	6.3×11	18	6.3×11	18	6.3×11	18	8×11.5	22	8×11.5	18	10×12.5	20	10×12.5	20
3.3	3R3			5×11	29	6.3×11	21	6.3×11	21	8×11.5	24	10×12.5	25	10×12.5	23	10×12.5	23	10×16	25
4.7	4R7			5×11	32	6.3×11	24	8×11.5	28	8×11.5	28	10×12.5	30	10×12.5	28	10×16	30	10×20	32
10	100	5×11	46	6.3×11	54	8×11.5	41	10×12.5	44	10×16	46	10×20	50	10×20	47	12.5×20	50	12.5×20	50
22	220	5×11	71	6.3×11	93	10×16	68	10×20	71	12.5×20	79	12.5×20	79	12.5×25	79	16×25	86	16×25	86
33	330	6.3×11	100	8×11.5	130	10×20	86	12.5×20	100	12.5×20	100	16×25	110	16×25	100	16×31.5	110	16×35.5	120
47	470	6.3×11	120	10×12.5	165	12.5×20	115	12.5×20	115	12.5×25	120	16×25	130	16×35.5	120	16×35.5	120	18×40	130
100	101	10×12.5	215	10×20	265	12.5×25	170	16×31.5	180	16×31.5	180	18×35.5	200	18×40	180				
220	221	10×16	335	12.5×25	440	16×35.5	270	18×35.5	280	20×40	310								
330	331	10×20	510	12.5×25	540	18×40	350												
470	471	12.5×20	640	16×25	715														
1000	102	16×25	930	18×40	965														

Allowable Ripple (mA) at 105°C 120Hz

### ● Frequency coefficient of allowable ripple current

V	Cap.( $\mu$ F)	Frequency					
		~47	50Hz	120Hz	300Hz	1kHz	10kHz~
6.3~100	~47		0.75	1.00	1.35	1.57	2.00
	100~470		0.80	1.00	1.23	1.34	1.50
	1000~22000		0.85	1.00	1.10	1.13	1.15
160~450	0.47~220		0.80	1.00	1.25	1.40	1.60
	330		0.90	1.00	1.10	1.13	1.15

### ● Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+70	+85	+105
Coefficient	1.78	1.40	1.00

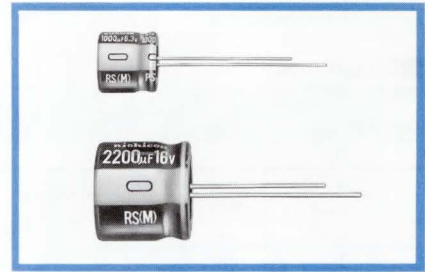
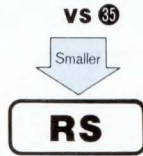
# ALUMINUM ELECTROLYTIC CAPACITORS



Compact & Low-profile Sized  
series



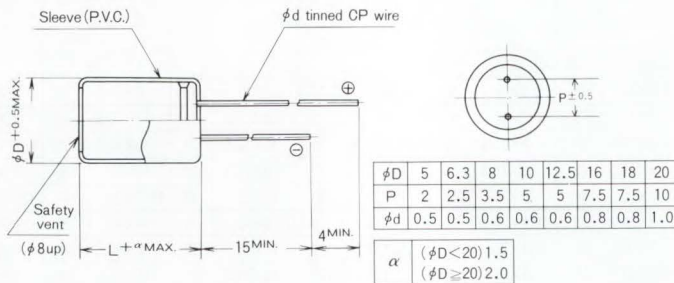
- More compact & low profile case sizes than VS series.



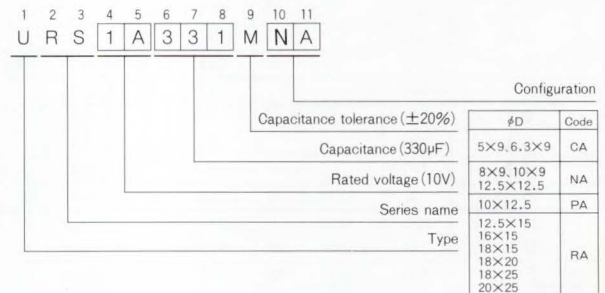
## Specification

Item	Performance Characteristics																						
Operating Temperature Range	-40~+85°C																						
Voltage Range	6.3~50V																						
Capacitance Range	0.1~10000µF																						
Capacitance Tolerance	±20% at 120Hz, 20°C																						
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 (µA), whichever is greater. After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (µA), whichever is greater.																						
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120Hz, Temperature: 20°C																						
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.28</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	tan δ (MAX.)	0.28	0.24	0.20	0.16	0.14	0.12								
Rated voltage (V)	6.3	10	16	25	35	50																	
tan δ (MAX.)	0.28	0.24	0.20	0.16	0.14	0.12																	
Stability at Low Temperature	Measurement frequency: 120Hz																						
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td rowspan="2">Impedance ratio ZT/Z20 (MAX.)</td> <td>Z-25°C/Z+20°C</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z-40°C/Z+20°C</td> <td>12</td> <td>10</td> <td>8</td> <td>5</td> <td>4</td> <td>3</td> </tr> </table>	Rated voltage (V)		6.3	10	16	25	35	50	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	5	4	3	2	2	2	Z-40°C/Z+20°C	12	10	8	5	4
Rated voltage (V)		6.3	10	16	25	35	50																
Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	5	4	3	2	2	2																
	Z-40°C/Z+20°C	12	10	8	5	4	3																
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.																						
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																
	Leakage current	Initial specified value or less																					
Capacitance change	Within ±20% of initial value																						
tan δ	200% or less of initial specified value																						
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																						
Marking	Printed with white color letter on black sleeve according to JIS C-5141.																						
Applicable Standards	JIS C-5141 and JIS C-5102.																						

## Radial Lead Type



## Type numbering system (Example: 10V 330µF)



## Dimensions

Cap. (µF)	Code	DXL (mm)							
		V	6.3	10	16	25	35	50	
		Code	0J	1A	1C	1E	1V	1H	
0.1	OR1							5×9	1.1
0.22	R22							5×9	2.3
0.33	R33							5×9	3.5
0.47	R47							5×9	5
1	010							5×9	10
2.2	2R2							5×9	23
3.3	3R3							5×9	35
4.7	4R7							5×9	40
10	100							5×9	60
22	220	5×9	35	5×9	55	5×9	70	5×9	80
33	330	5×9	55	5×9	75	5×9	85	5×9	95
47	470	5×9	75	5×9	90	5×9	100	5×9	110
100	101	5×9	125	5×9	135	6.3×9	160	6.3×9	180
220	221	6.3×9	200	6.3×9	220	8×9	270	10×9	310
330	331	6.3×9	240	8×9	300	10×9	340	10×9	380
470	471	8×9	330	8×9	360	10×9	410	10×12.5	520
1000	102	10×9	500	10×12.5	620	12.5×12.5	710	12.5×15	820
2200	222	12.5×15	890	12.5×15	960	16×15	1150	18×15	1350
3300	332	16×15	1200	16×15	1300	18×15	1450	18×20	1700
4700	472	16×15	1400	18×15	1550	18×20	1750	18×25	2050
6800	682	18×15	1650	18×20	1850	18×25	2150		
10000	103	18×20	2000	18×25	2350				

## Frequency coefficient of allowable ripple current

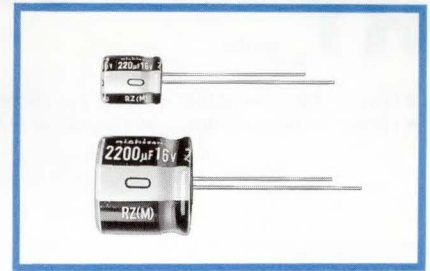
Cap. (µF)	Frequency (Hz)				
	50	120	300	1k	10k~
~47	0.75	1.00	1.35	1.57	2.00
100~470	0.80	1.00	1.23	1.34	1.50
1000~	0.85	1.00	1.10	1.13	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85
Coefficient	1.27	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**RZ** series Compact & Low-Profile Sized, Wide Temperature Range



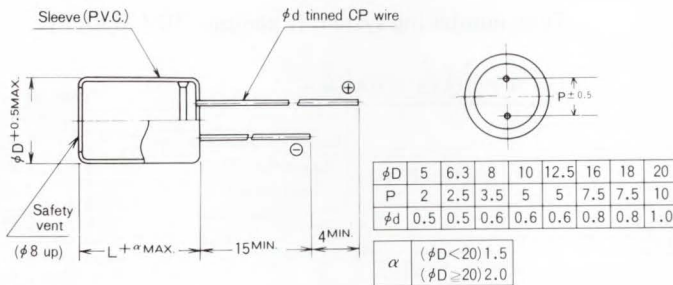
- Very small case sizes as same as RS series, but operating over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ .



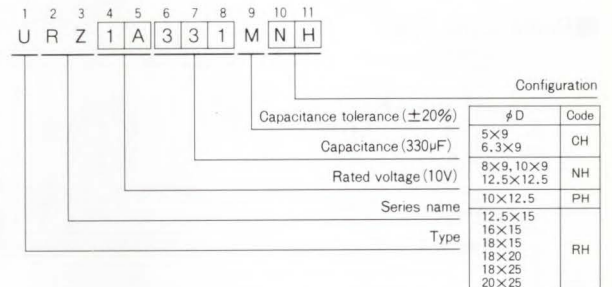
## Specification

Item	Performance Characteristics																						
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$																						
Voltage Range	6.3~50V																						
Capacitance Range	0.1~10000 $\mu\text{F}$																						
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20°C																						
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 ( $\mu\text{A}$ ), whichever is greater. After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 ( $\mu\text{A}$ ), whichever is greater.																						
tan $\delta$	For capacitance of more than 1000 $\mu\text{F}$ , add 0.02 for every increase of 1000 $\mu\text{F}$ . Measurement frequency: 120Hz, Temperature: 20°C																						
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td>tan <math>\delta</math> (MAX.)</td> <td>0.28</td> <td>0.24</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	tan $\delta$ (MAX.)	0.28	0.24	0.20	0.16	0.14	0.12								
Rated voltage (V)	6.3	10	16	25	35	50																	
tan $\delta$ (MAX.)	0.28	0.24	0.20	0.16	0.14	0.12																	
Stability at Low Temperature	Measurement frequency: 120Hz																						
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> </tr> <tr> <td rowspan="2">Impedance ratio ZT/Z20 (MAX.)</td> <td>Z-25°C/Z+20°C</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Z-40°C/Z+20°C</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		6.3	10	16	25	35	50	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	5	4	3	2	2	2	Z-40°C/Z+20°C	10	8	6	4	3
Rated voltage (V)		6.3	10	16	25	35	50																
Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C	5	4	3	2	2	2																
	Z-40°C/Z+20°C	10	8	6	4	3	3																
Load Life	After 1000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. <table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm 20\%</math> of initial value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm 20\%$ of initial value	tan $\delta$	200% or less of initial specified value																
Leakage current	Initial specified value or less																						
Capacitance change	Within $\pm 20\%$ of initial value																						
tan $\delta$	200% or less of initial specified value																						
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																						
Marking	Printed with white color letter on black sleeve according to JIS C-5141.																						
Applicable Standards	JIS C-5141 and JIS C-5102.																						

## Radial Lead Type



## Type numbering system (Example: 10V 330 $\mu\text{F}$ )



## Dimensions

Cap. ( $\mu\text{F}$ )	Code	V						D		L		D x L (mm)
		6.3	10	16	25	35	50					
0.1	0R1	0 J	1 A	1 C	1 E	1 V	1 H					
0.22	R22											
0.33	R33											
0.47	R47											
1	010											
2.2	2R2											
3.3	3R3											
4.7	4R7											
10	100			5 $\times$ 9	30	5 $\times$ 9	20	5 $\times$ 9	25	5 $\times$ 9	30	
22	220	5 $\times$ 9	25	5 $\times$ 9	40	5 $\times$ 9	50	5 $\times$ 9	55	5 $\times$ 9	60	5 $\times$ 9
33	330	5 $\times$ 9	40	5 $\times$ 9	55	5 $\times$ 9	60	5 $\times$ 9	70	5 $\times$ 9	75	6.3 $\times$ 9
47	470	5 $\times$ 9	55	5 $\times$ 9	65	5 $\times$ 9	70	5 $\times$ 9	80	6.3 $\times$ 9	95	6.3 $\times$ 9
100	101	5 $\times$ 9	90	5 $\times$ 9	95	6.3 $\times$ 9	115	6.3 $\times$ 9	130	8 $\times$ 9	155	10 $\times$ 9
220	221	6.3 $\times$ 9	145	6.3 $\times$ 9	155	8 $\times$ 9	190	10 $\times$ 9	220	10 $\times$ 9	235	10 $\times$ 12.5
330	331	6.3 $\times$ 9	170	8 $\times$ 9	210	10 $\times$ 9	240	10 $\times$ 9	270	10 $\times$ 12.5	335	12.5 $\times$ 12.5
470	471	8 $\times$ 9	235	8 $\times$ 9	255	10 $\times$ 9	290	10 $\times$ 12.5	370	12.5 $\times$ 12.5	410	16 $\times$ 15
1000	102	10 $\times$ 9	360	10 $\times$ 12.5	440	12.5 $\times$ 12.5	510	12.5 $\times$ 15	585	16 $\times$ 15	710	18 $\times$ 20
2200	222	12.5 $\times$ 15	635	12.5 $\times$ 15	685	16 $\times$ 15	820	18 $\times$ 15	960	18 $\times$ 20	1110	20 $\times$ 25
3300	332	16 $\times$ 15	860	16 $\times$ 15	930	18 $\times$ 15	1040	18 $\times$ 20	1210	20 $\times$ 25	1430	
4700	472	16 $\times$ 15	1000	18 $\times$ 15	1110	18 $\times$ 20	1250	18 $\times$ 25	1460			
6800	682	18 $\times$ 15	1180	18 $\times$ 20	1320	18 $\times$ 25	1540					
10000	103	18 $\times$ 20	1430	18 $\times$ 25	1680							

## Frequency coefficient of allowable ripple current

Cap. ( $\mu\text{F}$ )	Frequency (Hz)				
	50	120	300	1k	10k~
~47	0.75	1.00	1.35	1.57	2.00
100~470	0.80	1.00	1.23	1.34	1.50
1000~	0.85	1.00	1.10	1.13	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85	+105
Coefficient	1.78	1.40	1.00

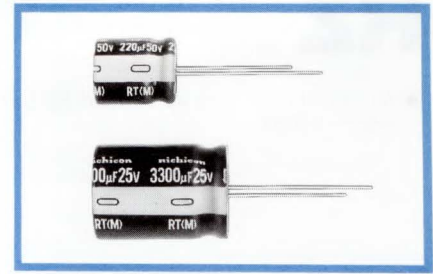
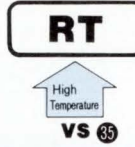
Allowable Ripple (mA) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**RT** series Low-Profile Sized, Wide Temperature Range



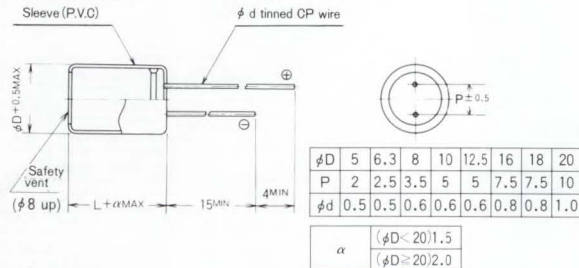
- Low-profile case sizes as same as VS series, but operating over wide temperature range.
- Higher voltage ratings available up to 400V.



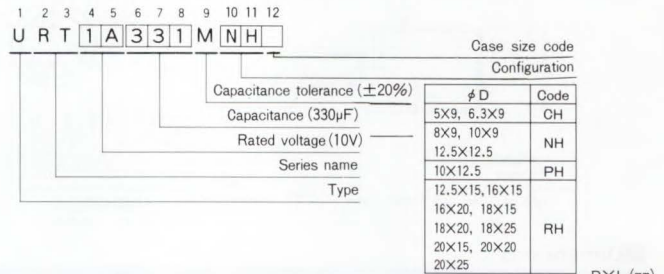
## Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~+105°C (6.3~50V), -40~+105°C (160~400V)
Voltage Range	6.3~400V
Capacitance Range	0.1~10000 µF
Capacitance Tolerance	±20% at 120Hz, 20°C
Leakage Current	Rated voltage (V) 6.3~50V
	Leakage current After 2 minutes' application of rated voltage, leakage current is not more than 0.01 CV or 3 (µA), whichever is greater.
tan δ	160~400V
	0.04 CV+100 (µA), after 1 minute's application of rated voltage.
Stability at Low Temperature	For capacitance of more than 1000 µF, add 0.02 for every increase of 1000 µF. Measurement frequency: 120 Hz, Temperature: 20°C
	Rated voltage (V) 6.3 10 16 25 35 50 160~250 400 tan δ (MAX.) 0.26 0.22 0.18 0.16 0.14 0.12 0.15 0.20
Load Life	After 1000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.
	Leakage current Initial specified value or less Capacitance change Within ±20% of initial value tan δ 200% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours' and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.
Marking	Printed with white color letter on black sleeve according to JIS C-5141.
Applicable Standards	JIS C-5141 and JIS C-5102.

## Radial Lead Type



## Type numbering system (Example: 10V 330µF)



## Dimensions

Cap. (µF)	Code	6.3		10		16		25		35		50		160		200		250		400	
		0	J	1	A	1	C	1	E	1	V	1	H	2	C	2	D	2	E	2	G
0.1	OR1											5×9	1.1								
0.22	R22											5×9	2.3								
0.33	R33											5×9	3.5								
0.47	R47											5×9	5								
1	O10											5×9	10								
2.2	2R2											5×9	16								
3.3	3R3											5×9	25								
4.7	4R7											5×9	30								
10	100					5×9	30	5×9	35	5×9	40	5×9	45								16×15 85
22	220			5×9	40	5×9	50	5×9	55	6.3×9	65	6.3×9	70					16×15	180	△18×20	130
33	330	5×9	40	5×9	55	5×9	60	6.3×9	70	6.3×9	80	8×9	90			16×15	220	• 18×15	230	★18×25	160
47	470	5×9	55	5×9	70	6.3×9	80	6.3×9	90	8×9	100	8×9	110		16×15	260	• 18×15	270	△18×20	280	
68	680														• 18×15	320	△18×20	330	★18×25	340	
100	101	6.3×9	100	6.3×9	110	8×9	130	8×9	140	10×9	160	10×12.5	200	△18×20	400	★18×25	410				
150	151														20×25	510					
220	221	8×9	170	8×9	180	10×9	210	10×12.5	250	12.5×12.5	280	12.5×15	320								
330	331	8×9	200	10×9	230	10×12.5	290	12.5×12.5	320	12.5×15	360	16×15	440								
470	471	10×9	250	10×12.5	320	12.5×12.5	360	12.5×15	400	16×15	490	• 18×15	550								
1000	102	12.5×12.5	440	12.5×15	500	16×15	630	• 18×15	700	• 18×15	750	△18×20	820								
2200	222	16×15	750	16×15	810	• 18×15	930	△18×20	1050	★18×25	1150										
3300	332	• 18×15	930	• 18×15	1000	△18×20	1150	★18×25	1300												
4700	472	△18×20	1100	△18×20	1200	★18×25	1400														
6800	682	★18×25	1350	★18×25	1450	20×25	1700														
10000	103	20×25	1700	20×25	1800																

Size 16×20 is available for capacitors marked. "•" Size 20×15 is available for capacitors marked. "△" Size 20×20 is available for capacitors marked. "★". Allowable Ripple (mA) at 105°C 120Hz. In this case, [6] will be put at 12th digit of type numbering system.

## Frequency coefficient of allowable ripple current

V	Cap. (µF)	Frequency (Hz)	50	120	300	1 k	10k~
6.3~50		~47	0.75	1.00	1.35	1.57	2.00
		100~470	0.80	1.00	1.23	1.34	1.50
		1000~10000	0.85	1.00	1.10	1.13	1.15
160~400	10~150		0.80	1.00	1.25	1.40	1.60

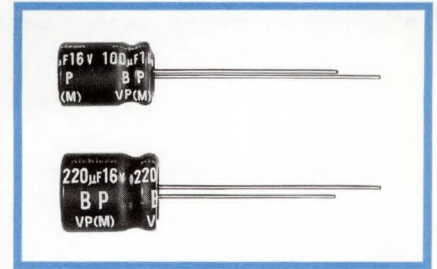
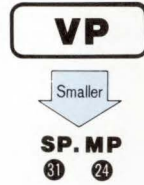
## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85	+105
Coefficient	1.62	1.40	1.00

**VP** Non-Polarized series



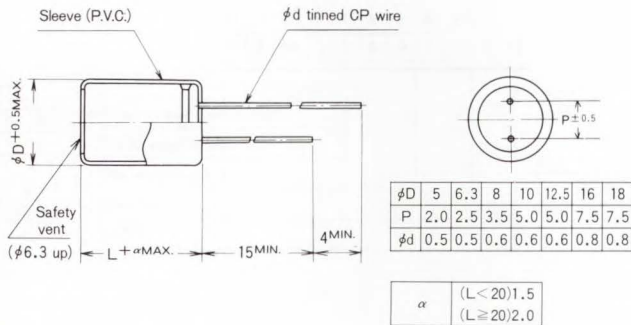
- Standard non-polarized series for entertainment electronics.



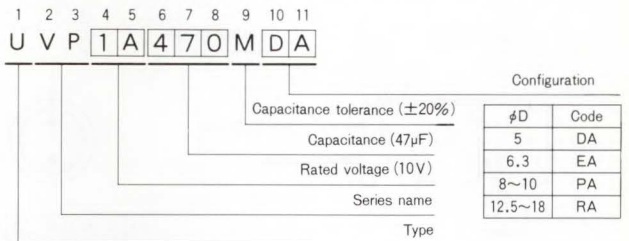
## Specifications

Item	Performance Characteristics																													
Operating Temperature Range	-40~+85°C																													
Voltage Range	6.3~100V																													
Capacitance Range	0.47~6800 µF																													
Capacitance Tolerance	±20% at 120Hz, 20°C																													
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than 0.03CV or 3(µA), whichever is greater.																													
tan δ	For capacitance of more than 1000 µF, add 0.02 for every increase of 1000 µF. Measurement frequency: 120Hz, Temperature: 20°C																													
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.26</td> <td>0.24</td> <td>0.22</td> <td>0.20</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	63	100	tan δ (MAX.)	0.26	0.24	0.22	0.20	0.16	0.14	0.12	0.10											
Rated voltage (V)	6.3	10	16	25	35	50	63	100																						
tan δ (MAX.)	0.26	0.24	0.22	0.20	0.16	0.14	0.12	0.10																						
Stability at Low Temperature	Measurement frequency: 120Hz																													
	<table border="1"> <tr> <td colspan="2">Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>100</td> </tr> <tr> <td rowspan="2">Impedance ratio</td> <td>Z-25°C/Z+20°C</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z-40°C/Z+20°C</td> <td>10</td> <td>8</td> <td>6</td> <td>5</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> </tr> </table>	Rated voltage (V)		6.3	10	16	25	35	50	63	100	Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	2	2	2	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	10	8	6	5	4	4	3
Rated voltage (V)		6.3	10	16	25	35	50	63	100																					
Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	2	2	2																					
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	10	8	6	5	4	4	3	3																				
Load Life	After 1000 hours' application of rated voltage at 85°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right. <table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																							
Leakage current	Initial specified value or less																													
Capacitance change	Within ±20% of initial value																													
tan δ	200% or less of initial specified value																													
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																													
Marking	Printed with white color letter on black sleeve according to JIS C-5141.																													
Applicable Standards	JIS C-5141 and JIS C-5102.																													

## Radial Lead Type



## Type numbering system (Example: 10V 47µF)



## Dimensions

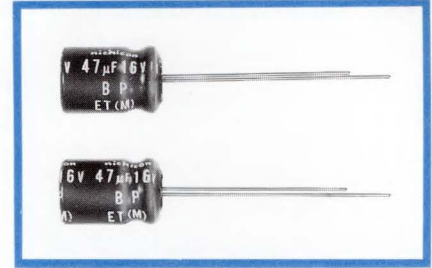
Cap. (µF)	Code	6.3		10		16		25		35		50		63		100	
		0 J	1 A	1 C	1 E	1 V	1 H	1 J	2 A								
0.47	R47											5×11	11			5×11	14
1	010											5×11	17			5×11	21
2.2	2R2											5×11	25			6.3×11	34
3.3	3R3											5×11	27			6.3×11	39
4.7	4R7									5×11	34	5×11	34	6.3×11	34	6.3×11	47
10	100					5×11	42	5×11	42	5×11	43	6.3×11	52	6.3×11	57	8×11.5	71
22	220			5×11	57	5×11	57	6.3×11	65	6.3×11	73	8×11.5	89	8×11.5	95	10×16	135
33	330	5×11	64	5×11	64	5×11	70	6.3×11	80	8×11.5	100	8×11.5	105	10×12.5	135	12.5×20	220
47	470	5×11	76	5×11	76	6.3×11	95	6.3×11	95	8×11.5	120	10×12.5	150	10×16	180	12.5×20	240
100	101	6.3×11	125	6.3×11	125	8×11.5	160	8×11.5	160	10×16	230	10×20	265	12.5×20	320	16×25	425
220	221	8×11.5	215	8×11.5	215	10×12.5	275	10×16	305	12.5×20	410	12.5×25	480	16×25	575	18×35.5	720
330	331	8×11.5	265	10×16	345	10×16	375	12.5×20	450	12.5×20	505	16×25	650	16×31.5	655		
470	471	10×12.5	370	10×16	410	10×20	485	12.5×20	540	12.5×25	655	16×31.5	835	18×35.5	965		
1000	102	10×20	650	12.5×20	720	12.5×25	855	16×25	950	16×31.5	1140						
2200	222	12.5×25	1160	16×25	1280	16×31.5	1510	18×35.5	1620								
3300	332	16×25	1570	16×31.5	1690	18×35.5	1980										
4700	472	16×31.5	2020	18×35.5	2160												
6800	682	18×35.5	2600														

# ALUMINUM ELECTROLYTIC CAPACITORS

**ET** Non-Polarized, Wide Temperature Range series



- Non-polarized series for operations over wide temperature range of  $-55\sim+105^{\circ}\text{C}$ .

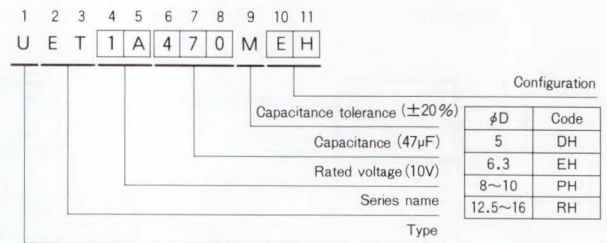
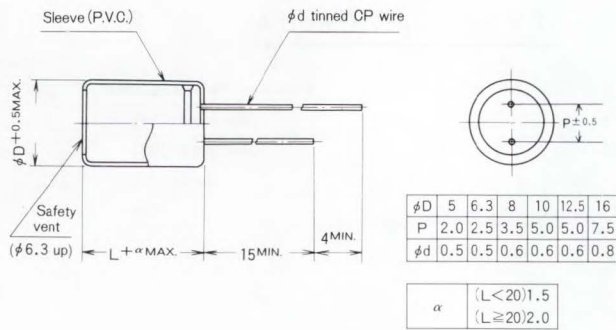


## Specifications

Item	Performance Characteristics	
Operating Temperature Range	$-55\sim+105^{\circ}\text{C}$	
Voltage Range	6.3~100V	
Capacitance Range	0.47~1000 $\mu\text{F}$	
Capacitance Tolerance	$\pm 20\%$ at 120 Hz, $20^{\circ}\text{C}$	
Leakage Current	After 5 minute's application of rated voltage, leakage current is not more than $0.03\text{CV}$ or $3(\mu\text{A})$ , whichever is greater.	
tan $\delta$	Measurement frequency: 120 Hz, Temperature: $20^{\circ}\text{C}$	
	Rated voltage (V)	6.3 10 16 25 35 50 63 100
Stability at Low Temperature	Measurement frequency: 120 Hz	
	Impedance ratio	Z- $25^{\circ}\text{C}$ /Z+ $20^{\circ}\text{C}$
	ZT/Z20 (MAX.)	Z- $40^{\circ}\text{C}$ /Z+ $20^{\circ}\text{C}$
Load Life	After 1000 hours' application of rated voltage at $105^{\circ}\text{C}$ with the polarity inverted every 250 hours, capacitors meet the characteristics requirements listed at right.	Leakage current: Initial specified value or less
		Capacitance change: Within $\pm 20\%$ of initial value
Shelf Life	After leaving capacitors under no load at $105^{\circ}\text{C}$ for 1000 hours' and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.	tan $\delta$ : 200% or less of initial specified value
Marking	Printed with white color letter on black sleeve.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Radial Lead Type

Type numbering system (Example: 10V 47 $\mu\text{F}$ )



## Dimensions

Cap. ( $\mu\text{F}$ )	Code	DXL (mm)												
		V	6.3	10	16	25	35	50	63	100				
0.47	R47													
1	010													
2.2	2R2													
3.3	3R3													
4.7	4R7													
10	100													
22	220													
33	330													
47	470													
100	101													
220	221													
330	331													
470	471													
1000	102													

Allowable Ripple (mA) at  $105^{\circ}\text{C}$  120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

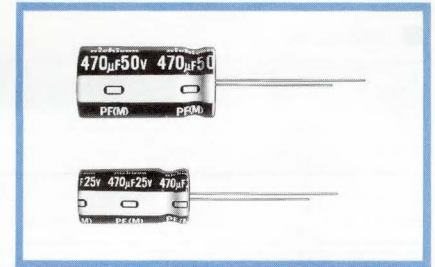
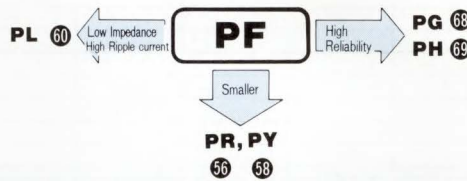
nichicon

**PF** series Low Impedance, High Reliability



Approved by Reliability Center for Electronic Component, Japan-Certification No. RCJ-03-23C

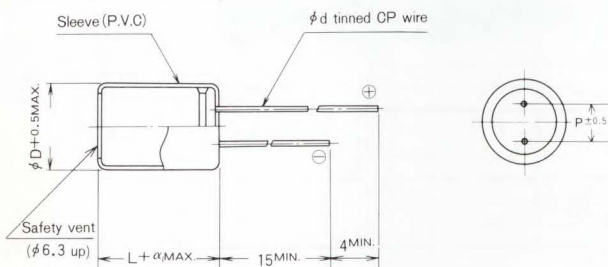
- Low impedance and high reliability withstanding 5000 hour load life at +105°C(3000/2000 hours for smaller case sizes as specified below).
- Capacitance ranges available based on the numerical values in E12 series under JIS.
- Ideally suited for use of switching power supplies.



## Specifications

Item	Performance Characteristics									
Operating Temperature Range	-55~+105°C									
Voltage Range	6.3~100V									
Capacitance Range	0.47~15000µF									
Capacitance Tolerance	±20% at 120Hz, 20°C									
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4µA, whichever is greater.									
tan δ	For capacitance of more than 1000 µF, add 0.02 for every increase of 1000 µF. Measurement frequency: 120Hz, Temperature: 20°C									
	Rated voltage (V)	6.3	10	16	25	35	50	63	80	100
	tan δ (MAX.)	0.24	0.20	0.16	0.14	0.12	0.10	0.08	0.08	0.08
Stability at Low Temperature	Measurement frequency: 120Hz									
	Rated voltage (V)	6.3	10	16	25	35	50	63	80	100
	Impedance ratio ZT/Z20(MAX.)	Z-55°C/Z+20°C	4	4	3	3	3	2	2	2
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. (In case of φD=5, 6.3: 2000hours', φD=8: 3000hours' application)									
	Leakage current	Initial specified value or less								
	Capacitance change	Within ±20% of initial value								
	tan δ	200% or less of initial specified value								
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.									
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.									
Applicable Standards	JIS C-5141 and JIS C-5102.									

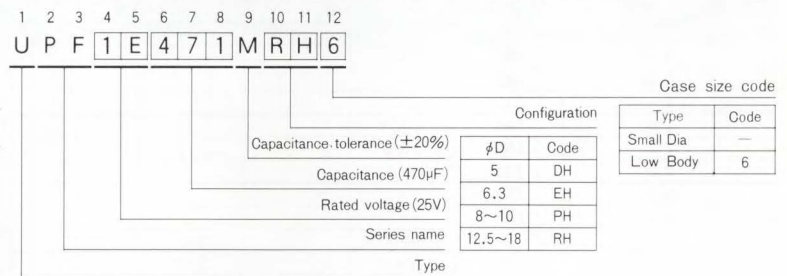
## Radial Lead Type



α	(φ D < 10) 1.0	φ D	5	6.3	8	10	12.5	16	18
	(φ D ≥ 10) 1.5	P	2	2.5	3.5	5	5	7.5	7.5
		φ d	0.5	0.5	0.6	0.6	0.6*	0.8	0.8

\* In case L > 25 for the φ 12.5 dia. unit, lead dia. φ d = 0.8mm.

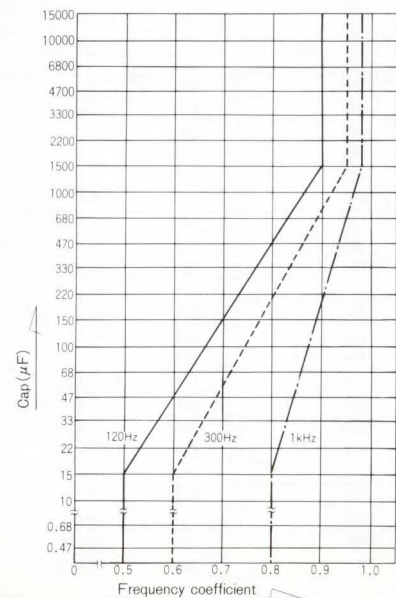
## Type numbering system (Example: 25V 470µF φ12.5 x 15)



## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+65	+85	+105
Coefficient	2.4	2.2	1.7	1.0

## Frequency coefficient of allowable ripple current (10kHz~200kHz=1)



• Dimension table in next page.

# ALUMINUM ELECTROLYTIC CAPACITORS



## Dimensions

DXL (mm)

Cap.( $\mu$ F)	V (Code) Code	Size code	6.3(0J)		10(1A)		16(1C)		25(1E)		35(1V)	
			—	6	—	6	—	6	—	6	—	6
22	220										5×11	
27	270										5×11	
33	330								5×11		6.3×11	
39	390								5×11		6.3×11	
47	470						5×11		6.3×11		6.3×11	
56	560						5×11		6.3×11		6.3×11	
68	680				5×11		6.3×11		6.3×11		6.3×15	
82	820				5×11		6.3×11		6.3×11		6.3×15	
100	101	5×11		6.3×11			6.3×11		6.3×15		8×11.5	
120	121	5×11		6.3×11			6.3×11		6.3×15		8×15	10×12.5
150	151	6.3×11		6.3×11			6.3×15		8×11.5		8×15	10×12.5
180	181	6.3×11		6.3×11			6.3×15		8×15	10×12.5	8×20	10×15
220	221	6.3×11		6.3×15			8×11.5		8×15	10×12.5	8×20	10×15
270	271	6.3×15		6.3×15			8×15	10×12.5	8×20	10×15	10×20	12.5×15
330	331	6.3×15		8×11.5			8×15	10×12.5	8×20	10×15	10×20	12.5×15
390	391	8×11.5		8×15	10×12.5		8×20	10×15	10×20	12.5×15	10×25	12.5×15
470	471	8×15	10×12.5	8×15	10×12.5		8×20	10×15	10×20	12.5×15	10×31.5	16×15
560	561	8×15	10×12.5	8×20	10×15	10×20	12.5×15	10×25	12.5×15	12.5×20	12.5×25	16×15
680	681	8×20	10×15	8×20	10×15	10×20	12.5×15	10×31.5	16×15	12.5×25	18×15	18×15
820	821	8×20	10×15	10×20	12.5×15	10×25	12.5×15	12.5×20	16×15	12.5×25	18×15	18×15
1000	102	10×20	12.5×15	10×20	12.5×15	10×31.5	16×15	12.5×25	18×15	12.5×31.5	16×20	16×20
1200	122	10×20	12.5×15	10×25	12.5×15	12.5×20	16×15	12.5×25	18×15	12.5×35.5	16×25	16×25
1500	152	10×25	12.5×15	10×31.5	16×15	12.5×25	18×15	12.5×31.5	16×20	12.5×40	18×20	18×20
1800	182	10×31.5	16×15	12.5×20	16×15	12.5×31.5	16×20	12.5×35.5	16×25	16×31.5	18×25	18×25
2200	222	10×31.5	16×15	12.5×25	18×15	12.5×31.5	16×20	12.5×40	18×20	16×35.5	18×31.5	18×31.5
2700	272	12.5×25	18×15	12.5×31.5	16×20	12.5×35.5	16×25	16×31.5	18×25	16×40	18×35.5	18×35.5
3300	332	12.5×25	18×15	12.5×35.5	16×20	12.5×40	18×20	16×35.5	18×31.5	18×40		
3900	392	12.5×31.5	16×20	12.5×40	18×20	16×31.5	18×25	16×40	18×35.5			
4700	472	12.5×35.5	18×20	16×31.5	18×25	16×35.5	18×31.5	18×40				
5600	562	12.5×40	18×20	16×35.5	18×25	16×40	18×35.5					
6800	682	16×31.5	18×25	16×35.5	18×31.5	18×35.5						
8200	822	16×35.5	18×31.5	16×40	18×35.5	18×40						
10000	103	16×40	18×31.5	18×40								
12000	123	18×35.5										
15000	153	18×40										

Cap.( $\mu$ F)	V (Code) Code	Size code	50(1H)		63(1J)		80(1K)		100(2A)	
			—	6	—	6	—	6	—	6
0.47	R47		5×11						5×11	
0.68	R68		5×11						5×11	
1	010		5×11						5×11	
1.5	1R5		5×11						5×11	
2.2	2R2		5×11						5×11	
3.3	3R3		5×11						5×11	
4.7	4R7		5×11				5×11		6.3×11	
6.8	6R8		5×11				5×11		6.3×11	
10	100	5×11			5×11		6.3×11		6.3×11	
12	120	5×11			5×11		6.3×11		6.3×11	
15	150	5×11			6.3×11		6.3×11		6.3×15	
18	180	5×11			6.3×11		6.3×11		6.3×15	
22	220	6.3×11			6.3×11		6.3×15		8×11.5	
27	270	6.3×11			6.3×11		6.3×15		8×15	10×12.5
33	330	6.3×11			6.3×15		8×11.5		8×15	10×12.5
39	390	6.3×11			6.3×15		8×15	10×12.5	8×20	10×15
47	470	6.3×15			8×11.5		8×15	10×12.5	10×20	12.5×15
56	560	6.3×15			8×15	10×12.5	8×20	10×15	10×20	12.5×15
68	680	8×11.5			8×15	10×12.5	10×20	12.5×15	10×25	12.5×15
82	820	8×15	10×12.5	8×20	10×15	10×20	12.5×15	10×31.5	16×15	16×15
100	101	8×20	10×15	10×20	12.5×15	10×25	12.5×15	10×31.5	16×15	16×15
120	121	8×20	10×15	10×20	12.5×15	10×31.5	16×15	12.5×25	16×15	16×15
150	151	10×20	12.5×15	10×25	12.5×15	10×31.5	16×15	12.5×25	18×15	18×15
180	181	10×20	12.5×15	10×31.5	16×15	12.5×25	16×15	12.5×31.5	16×20	16×20
220	221	10×25	12.5×15	12.5×20	16×15	12.5×31.5	18×15	12.5×35.5	16×25	16×25
270	271	10×31.5	16×15	12.5×25	18×15	12.5×31.5	16×20	12.5×40	18×20	18×20
330	331	10×31.5	16×15	12.5×25	18×15	12.5×35.5	16×25	16×31.5	18×25	18×25
390	391	12.5×25	16×15	12.5×31.5	16×20	12.5×40	18×20	16×35.5	18×31.5	18×31.5
470	471	12.5×25	18×15	12.5×35.5	16×25	16×31.5	18×25	16×40	18×35.5	18×35.5
560	561	12.5×31.5	16×20	12.5×40	18×20	16×35.5	18×31.5	18×35.5		
680	681	12.5×35.5	16×20	16×31.5	18×25	16×40	18×31.5	18×40		
820	821	12.5×40	18×20	16×35.5	18×31.5	18×35.5				
1000	102	16×31.5	18×25	16×40	18×35.5	18×40				
1200	122	16×35.5	18×31.5	18×40						
1500	152	16×40	18×31.5							
1800	182	18×35.5								
2200	222	18×40								

※ In case of low body type, [6] will be put at 12th digit of type numbering system.



### Standard ratings

Cap. (μF) Code		V Size code Item		6.3(0J)									
				Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
					20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
100	101	5×11	1.70	4.30	97	64							
120	121	5×11	1.30	3.30	110	74							
150	151	6.3×11	0.98	2.50	131	91							
180	181	6.3×11	0.78	2.00	147	105							
220	221	6.3×11	0.61	1.50	166	120							
270	271	6.3×15	0.49	1.20	191	140							
330	331	6.3×15	0.40	1.00	212	160							
390	391	8×11.5	0.34	0.85	292	225							
470	471	8×15	0.28	0.70	348	275	10×12.5	0.29	0.73	352	280		
560	561	8×15	0.24	0.60	376	305	10×12.5	0.26	0.65	372	300		
680	681	8×20	0.20	0.50	452	375	10×15	0.22	0.55	431	355		
820	821	8×20	0.17	0.43	491	415	10×15	0.19	0.48	464	390		
1000	102	10×20	0.15	0.38	577	495	12.5×15	0.17	0.43	542	465		
1200	122	10×20	0.13	0.33	620	545	12.5×15	0.15	0.38	577	505		
1500	152	10×25	0.11	0.28	726	650	12.5×15	0.13	0.33	620	555		
1800	182	10×31.5	0.10	0.25	812	730	16×15	0.11	0.28	894	800		
2200	222	10×31.5	0.087	0.22	871	780	16×15	0.099	0.25	942	845		
2700	272	12.5×25	0.076	0.19	959	860	18×15	0.089	0.22	1060	950		
3300	332	12.5×25	0.068	0.17	1020	915	18×15	0.079	0.20	1130	1010		
3900	392	12.5×31.5	0.062	0.16	1130	1010	16×20	0.072	0.18	1230	1100		
4700	472	12.5×35.5	0.056	0.14	1250	1120	18×20	0.065	0.16	1370	1230		
5600	562	12.5×40	0.052	0.13	1330	1190	18×20	0.060	0.15	1420	1270		
6800	682	16×31.5	0.048	0.12	1730	1550	18×25	0.055	0.14	1600	1440		
8200	822	16×35.5	0.044	0.11	1900	1710	18×31.5	0.051	0.13	1760	1580		
10000	103	16×40	0.041	0.10	2050	1840	18×31.5	0.047	0.12	1830	1640		
12000	123	18×35.5	0.038	0.095	2140	1920							
15000	153	18×40	0.036	0.090	2290	2060							

Cap. (μF) Code		V Size code Item		10(1A)									
				Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
					20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
68	680	5×11	1.60	4.00	100	63							
82	820	5×11	1.30	3.30	110	71							
100	101	6.3×11	1.10	2.80	124	82							
120	121	6.3×11	0.89	2.20	138	93							
150	151	6.3×11	0.70	1.80	155	105							
180	181	6.3×11	0.59	1.50	169	120							
220	221	6.3×15	0.48	1.20	193	140							
270	271	6.3×15	0.40	1.00	212	155							
330	331	8×11.5	0.33	0.83	296	225							
390	391	8×15	0.28	0.70	348	270	10×12.5	0.30	0.75	346	265		
470	471	8×15	0.24	0.60	376	300	10×12.5	0.26	0.65	372	295		
560	561	8×20	0.20	0.50	452	365	10×15	0.22	0.55	431	350		
680	681	8×20	0.17	0.43	491	405	10×15	0.18	0.45	477	395		
820	821	10×20	0.14	0.35	597	505	12.5×15	0.16	0.40	559	475		
1000	102	10×20	0.12	0.30	645	555	12.5×15	0.13	0.33	620	535		
1200	122	10×25	0.10	0.25	836	735	12.5×15	0.12	0.30	645	565		
1500	152	10×31.5	0.090	0.23	856	770	16×15	0.10	0.25	938	840		
1800	182	12.5×20	0.078	0.20	877	785	16×15	0.089	0.22	994	890		
2200	222	12.5×25	0.068	0.17	1010	905	18×15	0.078	0.20	1130	1010		
2700	272	12.5×31.5	0.060	0.15	1150	1030	16×20	0.070	0.18	1240	1110		
3300	332	12.5×35.5	0.053	0.13	1280	1150	16×20	0.062	0.16	1320	1180		
3900	392	12.5×40	0.049	0.12	1370	1230	18×20	0.057	0.14	1460	1310		
4700	472	16×31.5	0.046	0.12	1760	1580	18×25	0.052	0.13	1650	1480		
5600	562	16×35.5	0.042	0.11	1940	1740	18×25	0.049	0.12	1700	1530		
6800	682	16×35.5	0.040	0.10	1990	1790	18×31.5	0.045	0.11	1870	1680		
8200	822	16×40	0.038	0.095	2130	1910	18×35.5	0.042	0.11	2040	1830		
10000	103	18×40	0.035	0.088	2320	2080							

# ALUMINUM ELECTROLYTIC CAPACITORS

**PF** series

## Standard ratings

Cap. (μF)		V Size code Code		Item		16(1C)											
						Case size φDXL (mm)		Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)		Impedance(Ω MAX.)		Allowable ripple(mA rms)	
						20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz				
47	470	5×11	1.60	4.00	100	60											
56	560	5×11	1.30	3.30	110	67											
68	680	6.3×11	1.00	2.50	130	81											
82	820	6.3×11	0.85	2.10	141	91											
100	101	6.3×11	0.70	1.80	155	100											
120	121	6.3×11	0.58	1.50	171	115											
150	151	6.3×15	0.47	1.20	195	135											
180	181	6.3×15	0.40	1.00	212	150											
220	221	8×11.5	0.33	0.83	296	215											
270	271	8×15	0.28	0.70	348	260	10×12.5	0.28	0.70	358	265						
330	331	8×15	0.23	0.58	384	295	10×12.5	0.23	0.58	395	300						
390	391	8×20	0.20	0.50	452	350	10×15	0.20	0.50	452	350						
470	471	8×20	0.18	0.45	477	380	10×15	0.18	0.45	477	380						
560	561	10×20	0.15	0.38	577	470	12.5×15	0.16	0.40	559	455						
680	681	10×20	0.13	0.33	620	515	12.5×15	0.14	0.35	597	495						
820	821	10×25	0.11	0.28	726	615	12.5×15	0.12	0.30	645	545						
1000	102	10×31.5	0.095	0.24	833	720	16×15	0.11	0.28	894	770						
1200	122	12.5×20	0.083	0.21	850	745	16×15	0.093	0.23	972	855						
1500	152	12.5×25	0.072	0.18	986	885	18×15	0.083	0.21	1100	990						
1800	182	12.5×31.5	0.064	0.16	1110	995	16×20	0.074	0.19	1210	1080						
2200	222	12.5×31.5	0.057	0.14	1180	1060	16×20	0.067	0.17	1270	1140						
2700	272	12.5×35.5	0.051	0.13	1310	1170	16×25	0.060	0.15	1460	1310						
3300	332	12.5×40	0.047	0.12	1390	1250	18×20	0.055	0.14	1480	1330						
3900	392	16×31.5	0.044	0.11	1800	1620	18×25	0.051	0.13	1660	1490						
4700	472	16×35.5	0.041	0.10	1960	1760	18×31.5	0.047	0.12	1830	1640						
5600	562	16×40	0.039	0.098	2100	1890	18×35.5	0.045	0.11	1970	1770						
6800	682	18×35.5	0.037	0.093	2170	1950											
8200	822	18×40	0.036	0.090	2290	2060											

Cap. (μF)		V Size code Code		Item		25(1E)											
						Case size φDXL (mm)		Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)		Impedance(Ω MAX.)		Allowable ripple(mA rms)	
						20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz				
33	330	5×11	1.60	4.00	86	49											
39	390	5×11	1.30	3.30	96	55											
47	470	6.3×11	1.10	2.80	108	64											
56	560	6.3×11	0.89	2.20	120	73											
68	680	6.3×11	0.72	1.80	134	84											
82	820	6.3×11	0.60	1.50	147	95											
100	101	6.3×15	0.49	1.20	169	110											
120	121	6.3×15	0.41	1.00	184	125											
150	151	8×11.5	0.33	0.83	296	205											
180	181	8×15	0.28	0.70	348	245	10×12.5	0.30	0.75	346	245						
220	221	8×15	0.23	0.58	384	280	10×12.5	0.26	0.65	372	270						
270	271	8×20	0.19	0.48	464	345	10×15	0.22	0.55	431	320						
330	331	8×20	0.17	0.43	491	375	10×15	0.19	0.48	464	355						
390	391	10×20	0.14	0.35	597	465	12.5×15	0.16	0.40	559	435						
470	471	10×20	0.13	0.33	620	495	12.5×15	0.14	0.35	597	475						
560	561	10×25	0.11	0.28	726	590	12.5×15	0.12	0.30	645	525						
680	681	10×31.5	0.093	0.23	842	700	16×15	0.11	0.28	894	745						
820	821	12.5×20	0.082	0.21	855	725	16×15	0.098	0.25	947	800						
1000	102	12.5×25	0.072	0.18	986	850	18×15	0.086	0.22	1080	930						
1200	122	12.5×25	0.065	0.16	1030	905	18×15	0.078	0.20	1130	990						
1500	152	12.5×31.5	0.058	0.15	1170	1050	16×20	0.068	0.17	1260	1130						
1800	182	12.5×35.5	0.053	0.13	1280	1150	16×25	0.062	0.16	1430	1280						
2200	222	12.5×40	0.048	0.12	1380	1240	18×20	0.056	0.14	1470	1320						
2700	272	16×31.5	0.044	0.11	1800	1620	18×25	0.051	0.13	1660	1490						
3300	332	16×35.5	0.041	0.10	1960	1760	18×31.5	0.047	0.12	1830	1640						
3900	392	16×40	0.038	0.095	2130	1910	18×35.5	0.043	0.11	2010	1800						
4700	472	18×40	0.036	0.090	2290	2060											

Standard ratings

Cap. (μF)	Item	Code	35 (1V)											
			Case size φDXL (mm)	Impedance(Ω MAX.)				Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
				20°C/100kHz		-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		
22	220	5×11	1.50	3.80	89	47								
27	270	5×11	1.20	3.00	100	55								
33	330	6.3×11	0.99	2.50	114	64								
39	390	6.3×11	0.83	2.10	125	72								
47	470	6.3×11	0.69	1.70	137	82								
56	560	6.3×11	0.57	1.40	151	92								
68	680	6.3×15	0.48	1.20	170	105								
82	820	6.3×15	0.39	0.98	189	120								
100	101	8×11.5	0.32	0.80	301	200								
120	121	8×15	0.28	0.70	348	235	10×12.5	0.31	0.78	340	230			
150	151	8×15	0.23	0.58	384	265	10×12.5	0.25	0.63	379	265			
180	181	8×20	0.20	0.50	452	320	10×15	0.22	0.55	431	305			
220	221	8×20	0.17	0.43	491	360	10×15	0.18	0.45	477	350			
270	271	10×20	0.14	0.35	597	445	12.5×15	0.16	0.40	559	415			
330	331	10×20	0.12	0.30	645	495	12.5×15	0.13	0.33	620	475			
390	391	10×25	0.11	0.28	726	565	12.5×15	0.12	0.30	645	500			
470	471	10×31.5	0.093	0.23	842	670	16×15	0.11	0.28	894	715			
560	561	12.5×20	0.082	0.21	855	695	16×15	0.096	0.24	957	775			
680	681	12.5×25	0.072	0.18	986	820	18×15	0.085	0.21	1090	910			
820	821	12.5×25	0.064	0.16	1040	880	18×15	0.076	0.19	1150	975			
1000	102	12.5×31.5	0.058	0.15	1170	1010	16×20	0.068	0.17	1260	1080			
1200	122	12.5×35.5	0.052	0.13	1300	1140	16×25	0.062	0.16	1430	1250			
1500	152	12.5×40	0.048	0.12	1380	1240	18×20	0.056	0.14	1470	1320			
1800	182	16×31.5	0.044	0.11	1800	1620	18×25	0.051	0.13	1660	1490			
2200	222	16×35.5	0.040	0.10	1990	1790	18×31.5	0.047	0.12	1840	1650			
2700	272	16×40	0.037	0.093	2150	1930	18×35.5	0.043	0.11	2010	1800			
3300	332	18×40	0.035	0.088	2320	2080								

Cap. (μF)	Item	Code	50 (1H)											
			Case size φDXL (mm)	Impedance(Ω MAX.)				Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
				20°C/100kHz		-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		
0.47	R47	5×11	47.0	118.0	15	7								
0.68	R68	5×11	32.0	80.0	19	9								
1	010	5×11	22.0	55.0	24	12								
1.5	1R5	5×11	15.0	38.0	30	15								
2.2	2R2	5×11	10.0	25.0	36	18								
3.3	3R3	5×11	6.70	17.0	44	22								
4.7	4R7	5×11	4.70	12.0	54	27								
6.8	6R8	5×11	3.20	8.00	61	33								
10	100	5×11	2.20	5.50	78	39								
12	120	5×11	1.80	4.50	84	42								
15	150	5×11	1.40	3.50	92	46								
18	180	5×11	1.20	3.00	100	51								
22	220	6.3×11	0.98	2.50	122	65								
27	270	6.3×11	0.80	2.00	127	69								
33	330	6.3×11	0.65	1.60	141	80								
39	390	6.3×11	0.55	1.40	153	88								
47	470	6.3×15	0.45	1.10	176	105								
56	560	6.3×15	0.38	0.95	191	115								
68	680	8×11.5	0.31	0.78	306	190								
82	820	8×15	0.26	0.65	361	230	10×12.5	0.28	0.70	358	230			
100	101	8×20	0.22	0.55	431	285	10×15	0.24	0.60	376	250			
120	121	8×20	0.18	0.45	477	320	10×15	0.20	0.50	452	305			
150	151	10×20	0.15	0.38	577	400	12.5×15	0.16	0.40	559	390			
180	181	10×20	0.13	0.33	620	440	12.5×15	0.14	0.35	597	425			
220	221	10×25	0.11	0.28	726	530	12.5×15	0.12	0.30	645	470			
270	271	10×31.5	0.094	0.24	837	625	16×15	0.10	0.25	938	700			
330	331	10×31.5	0.084	0.21	886	680	16×15	0.090	0.23	988	760			
390	391	12.5×25	0.073	0.18	979	760	16×15	0.081	0.20	1040	810			
470	471	12.5×25	0.066	0.17	1020	815	18×15	0.070	0.18	1200	960			
560	561	12.5×31.5	0.060	0.15	1150	935	16×20	0.066	0.17	1280	1040			
680	681	12.5×35.5	0.054	0.14	1270	1060	16×20	0.060	0.15	1340	1110			
820	821	12.5×40	0.050	0.13	1350	1140	18×20	0.054	0.14	1500	1270			
1000	102	16×31.5	0.046	0.12	1760	1520	18×25	0.050	0.13	1680	1450			
1200	122	16×35.5	0.043	0.11	1920	1680	18×31.5	0.047	0.12	1830	1610			
1500	152	16×40	0.040	0.10	2070	1860	18×31.5	0.044	0.11	1900	1710			
1800	182	18×35.5	0.038	0.095	2140	1920								
2200	222	18×40	0.035	0.088	2320	2080								

# ALUMINUM ELECTROLYTIC CAPACITORS



## Standard ratings

Cap.		V		63 (1J)									
		Size code		63						6			
		Item	Code	Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
20°C/100kHz	-10°C/100kHz				105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		
10	100	5×11	1.60	4.00	86	43							
12	120	5×11	1.40	3.50	92	46							
15	150	6.3×11	1.10	2.80	108	54							
18	180	6.3×11	0.95	2.40	116	59							
22	220	6.3×11	0.78	2.00	129	69							
27	270	6.3×11	0.64	1.60	142	78							
33	330	6.3×15	0.52	1.30	164	93							
39	390	6.3×15	0.45	1.10	176	100							
47	470	8×11.5	0.37	0.93	279	165							
56	560	8×15	0.31	0.78	331	200	10×12.5	0.34	0.85	325	195		
68	680	8×15	0.26	0.65	361	225	10×12.5	0.28	0.70	358	225		
82	820	8×20	0.22	0.55	431	280	10×15	0.24	0.60	413	265		
100	101	10×20	0.18	0.45	527	350	12.5×15	0.20	0.50	500	330		
120	121	10×20	0.15	0.38	577	390	12.5×15	0.18	0.45	527	355		
150	151	10×25	0.13	0.33	667	465	12.5×15	0.14	0.35	597	415		
180	181	10×31.5	0.11	0.28	774	550	16×15	0.12	0.30	856	610		
220	221	12.5×20	0.094	0.24	798	585	16×15	0.10	0.25	938	685		
270	271	12.5×25	0.082	0.21	923	690	18×15	0.088	0.22	1070	800		
330	331	12.5×25	0.073	0.18	979	750	18×15	0.078	0.20	1130	870		
390	391	12.5×31.5	0.065	0.16	1100	855	16×20	0.070	0.18	1240	965		
470	471	12.5×35.5	0.058	0.15	1230	980	16×25	0.063	0.16	1420	1130		
560	561	12.5×40	0.052	0.13	1330	1080	18×20	0.058	0.15	1450	1180		
680	681	16×31.5	0.048	0.12	1730	1440	18×25	0.052	0.13	1650	1370		
820	821	16×35.5	0.044	0.11	1900	1610	18×31.5	0.048	0.12	1820	1540		
1000	102	16×40	0.041	0.10	2050	1770	18×35.5	0.044	0.10	1990	1720		
1200	122	18×40	0.038	0.095	2230	1960							

Cap. (μF)		V		80 (1K)									
		Size code		80						6			
		Item	Code	Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)		Case size φDXL (mm)	Impedance(Ω MAX.)		Allowable ripple(mA rms)	
20°C/100kHz	-10°C/100kHz				105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		
4.7	4R7	5×11	4.20	11.0	53	26							
6.8	6R8	5×11	2.60	7.00	68	34							
10	100	6.3×11	1.70	4.60	87	43							
12	120	6.3×11	1.40	3.80	96	48							
15	150	6.3×11	1.20	3.20	104	52							
18	180	6.3×11	1.00	2.70	114	58							
22	220	6.3×15	0.77	2.10	135	71							
27	270	6.3×15	0.63	1.70	149	80							
33	330	8×11.5	0.53	1.40	234	132							
39	390	8×15	0.46	1.20	272	156	10×12.5	0.49	1.30	271	155		
47	470	8×15	0.39	1.10	295	175	10×12.5	0.42	1.10	293	174		
56	560	8×20	0.34	0.92	347	208	10×15	0.36	0.97	337	202		
68	680	10×20	0.28	0.76	426	264	12.5×15	0.31	0.84	402	249		
82	820	10×20	0.25	0.68	447	284	12.5×15	0.27	0.73	430	273		
100	101	10×25	0.21	0.57	526	347	12.5×15	0.23	0.62	466	308		
120	121	10×31.5	0.18	0.49	606	406	16×15	0.20	0.54	663	444		
150	151	10×31.5	0.15	0.41	663	459	16×15	0.18	0.47	699	484		
180	181	12.5×25	0.13	0.35	734	520	16×15	0.15	0.41	766	543		
220	221	12.5×31.5	0.12	0.32	816	595	18×15	0.13	0.35	881	643		
270	271	12.5×31.5	0.10	0.27	894	667	16×20	0.11	0.30	995	742		
330	331	12.5×35.5	0.088	0.24	1000	767	16×25	0.099	0.27	1140	874		
390	391	12.5×40	0.078	0.21	1060	822	18×20	0.089	0.24	1170	908		
470	471	16×31.5	0.069	0.19	1450	1150	18×25	0.080	0.22	1330	1060		
560	561	16×35.5	0.062	0.17	1600	1300	18×31.5	0.072	0.19	1490	1210		
680	681	16×40	0.055	0.15	1770	1470	18×31.5	0.065	0.18	1560	1300		
820	821	18×35.5	0.049	0.13	1890	1590							
1000	102	18×40	0.044	0.12	2080	1790							

## PF series

### Standard ratings

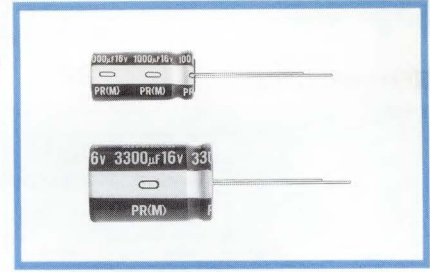
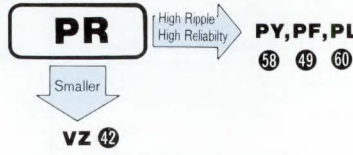
Cap. (μF)	Code	Item	100(2A)											
			Case size φD×L (mm)	Impedance(Ω MAX.)				Allowable ripple(mA rms)		Case size φD×L (mm)	6			
				20°C/100kHz		-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		Impedance(Ω MAX.)		Allowable ripple(mA rms)	
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	20°C/100kHz	-10°C/100kHz		105°C/10kHz~ 200kHz	105°C/120Hz		
0.47	R47	5×11	43.0	116.0	17	8								
0.68	R68	5×11	23.0	62.0	23	11								
1	010	5×11	17.0	46.0	27	13								
1.5	1R5	5×11	10.0	27.0	35	17								
2.2	2R2	5×11	6.60	18.0	43	21								
3.3	3R3	5×11	4.10	11.0	54	27								
4.7	4R7	6.3×11	2.80	7.60	68	34								
6.8	6R8	6.3×11	1.90	5.10	83	41								
10	100	6.3×11	1.20	3.20	104	52								
12	120	6.3×11	1.00	2.70	114	57								
15	150	6.3×15	0.81	2.20	131	65								
18	180	6.3×15	0.67	1.80	145	73								
22	220	8×11.5	0.55	1.50	230	122								
27	270	8×15	0.47	1.30	269	146	10×12.5	0.50	1.40	268	145			
33	330	8×15	0.38	1.00	299	169	10×12.5	0.42	1.10	293	166			
39	390	8×20	0.33	0.89	352	202	10×15	0.36	0.97	337	193			
47	470	10×20	0.28	0.76	423	252	12.5×15	0.31	0.84	402	239			
56	560	10×20	0.24	0.65	456	274	12.5×15	0.27	0.73	430	258			
68	680	10×25	0.21	0.57	526	326	12.5×15	0.23	0.62	466	289			
82	820	10×31.5	0.18	0.49	606	386	16×15	0.19	0.51	681	433			
100	101	10×31.5	0.15	0.41	663	438	16×15	0.17	0.46	719	475			
120	121	12.5×25	0.13	0.35	774	519	16×15	0.14	0.38	793	531			
150	151	12.5×25	0.11	0.30	798	553	18×15	0.12	0.32	917	635			
180	181	12.5×31.5	0.098	0.26	904	641	16×20	0.11	0.30	995	706			
220	221	12.5×35.5	0.087	0.23	1000	730	16×25	0.093	0.25	1170	854			
270	271	12.5×40	0.072	0.19	1130	843	18×20	0.080	0.22	1230	918			
330	331	16×31.5	0.062	0.17	1520	1160	18×25	0.070	0.19	1420	1080			
390	391	16×35.5	0.053	0.14	1730	1340	18×31.5	0.062	0.17	1600	1240			
470	471	16×40	0.047	0.13	1920	1530	18×35.5	0.056	0.15	1770	1410			
560	561	18×35.5	0.041	0.11	2070	1680								
680	681	18×40	0.036	0.097	2300	1910								

# ALUMINUM ELECTROLYTIC CAPACITORS

**PR** series Standard, For Switching Power Supplies



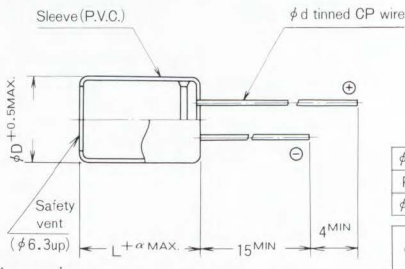
- Same case sizes as VX series, but operating at higher temperature range up to +105°C.
- Designed specifically for use in switching power supplies.



## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-55~+105°C (6.3~100V), -40~+105°C (160~400V), -25~+105°C (450V)							
Voltage Range	6.3~450V							
Capacitance Range	0.47~22000µF							
Capacitance Tolerance	±20% at 120Hz, 20°C							
Leakage Current	Rated voltage(V)	6.3~100 160~450						
	Leakage current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4(µA), whichever is greater. After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(µA), whichever is greater.						
tan δ	Rated voltage (V)	6.3 10 16 25 35 50 63 100 160~250 315~350 400~450						
	tan δ (MAX.)	0.26 0.22 0.18 0.16 0.13 0.10 0.09 0.08 0.15 0.20 0.25						
Stability at Low Temperature	Rated voltage (V)	6.3 10 16 25~100 160~200 250 315~350 400 450						
	Impedance ratio Z <sub>-25°C</sub> /Z <sub>+20°C</sub> Z <sub>T</sub> /Z <sub>20</sub> (MAX.)	4 3 2 2 3 3 4 6 15						
Load Life	After 2000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. (In case of φD≤8, after 1000 hours' application)	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value
	Leakage current	Initial specified value or less						
Capacitance change	Within ±20% of initial value							
tan δ	200% or less of initial specified value							
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours' and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

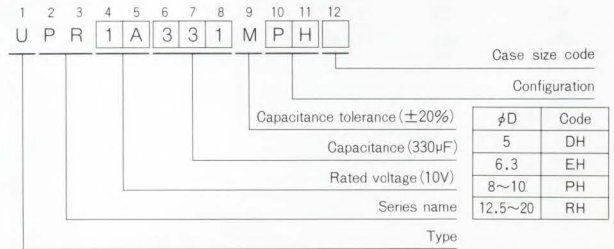
## Radial Lead Type



φD	5	6.3	8	10	12.5	16	18	20
P	2	2.5	3.5	5	5	7.5	7.5	10
φ d	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0

α (L<20) 1.5  
α (L≥20) 2.0

## Type numbering system (Example: 10V 330µF)



## Dimensions

Cap.(µF)	Code	6.3 (0J)			10 (1A)			16 (1C)			25 (1E)		
		Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
4.7	4R7												
10	100							5×11	2.80	35	5×11	2.80	39
22	220	5×11	2.40	34	5×11	2.40	45	5×11	2.40	55	5×11	2.40	60
33	330	5×11	2.30	50	5×11	2.30	60	5×11	2.30	70	5×11	2.20	75
47	470	5×11	2.10	65	5×11	2.10	75	5×11	1.80	85	5×11	1.60	90
100	101	5×11	1.90	100	5×11	1.80	110	6.3×11	0.80	135	6.3×11	0.62	145
220	221	6.3×11	0.67	165	6.3×11	0.58	180	8×11.5	0.36	235	8×11.5	0.35	250
330	331	6.3×11	0.48	200	8×11.5	0.36	255	8×11.5	0.32	285	10×12.5	0.22	355
470	471	8×11.5	0.31	280	8×11.5	0.26	305	10×12.5	0.20	395	10×16	0.16	470
1000	102	10×12.5	0.22	470	10×16	0.14	570	10×20	0.12	700	12.5×20	0.10	855
2200	222	12.5×20	0.096	930	12.5×20	0.090	1010	12.5×25	0.067	1150	16×25	0.053	1230
3300	332	12.5×20	0.090	1100	12.5×25	0.074	1220	16×25	0.052	1350	16×31.5	0.045	1450
4700	472	16×25	0.061	1320	16×25	0.054	1410	16×31.5	0.045	1560	●18×35.5	0.040	1660
6800	682	16×25	0.056	1490	16×31.5	0.046	1610	●18×35.5	0.040	1750	20×40	0.030	2070
10000	103	16×31.5	0.051	1830	●18×35.5	0.038	1980	△18×40	0.035	2170			
15000	153	●18×35.5	0.039	2280	△18×40	0.033	2470						
22000	223	20×40	0.030	2860									

Case size : DXL(mm)    MAX. Impedance : (Ω) at 20°C 100kHz    Allowable ripple : (mA) at 105°C 120Hz  
Size 20×31 is available for capacitors marked "•"    Size 20×35 is available for capacitors marked "△"    In this case, [6] will be put at 12th digit of type numbering system.

## PR series

### Dimensions

Cap.(μF)	Code	Item	35 (1V)			50 (1H)			63 (1J)			100 (2A)		
			Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
0.47	R47					5×11	47.0	7				5×11	43.0	10
1	010					5×11	22.0	12				5×11	20.0	15
2.2	2R2					5×11	10.0	18				5×11	9.80	22
3.3	3R3					5×11	6.70	25				5×11	6.60	29
4.7	4R7	5×11	5.00	27	5×11	4.70	30	5×11	4.70	34	5×11	4.60	37	
10	100	5×11	2.80	44	5×11	2.20	50	5×11	2.10	55	6.3×11	1.80	65	
22	220	5×11	2.30	65	5×11	1.90	75	6.3×11	0.98	90	8×11.5	0.68	115	
33	330	5×11	1.90	85	6.3×11	0.84	105	6.3×11	0.71	110	10×12.5	0.46	160	
47	470	6.3×11	1.00	115	6.3×11	0.80	125	8×11.5	0.65	155	10×16	0.37	210	
100	101	8×11.5	0.50	190	8×11.5	0.45	210	10×12.5	0.31	260	12.5×20	0.180	385	
220	221	10×12.5	0.24	325	10×16	0.21	400	10×20	0.20	465	16×25	0.100	590	
330	331	10×16	0.20	440	10×20	0.19	535	12.5×20	0.12	650	16×25	0.090	720	
470	471	10×20	0.12	580	12.5×20	0.10	730	12.5×25	0.081	800	16×31.5	0.076	875	
1000	102	12.5×25	0.067	995	16×25	0.053	1110	16×31.5	0.049	1200	△18×40	0.047	1320	
2200	222	16×31.5	0.044	1450	●18×35.5	0.037	1530	△18×40	0.032	1840				
3300	332	●18×35.5	0.038	1660	20×40	0.028	1950							
4700	472	△18×40	0.033	2030										

Case size : D×L(mm)  
 MAX. Impedance : (Ω) at 20°C 100kHz  
 Allowable ripple : (mA) at 105°C 120Hz

Cap.(μF)	Code	160		200		250		315		350		400		450	
		2 C	2 D	2 E	2 F	2 V	2 G	2 W							
0.47	R47	6.3×11	12	6.3×11	12	6.3×11	12	8×11.5	11	8×11.5	11				
1	010	6.3×11	17	6.3×11	17	6.3×11	17	8×11.5	16	10×12.5	17	10×12.5	16	10×12.5	18
2.2	2R2	6.3×11	25	6.3×11	25	8×11.5	29	10×12.5	28	10×16	31	10×16	27	10×20	29
3.3	3R3	8×11.5	36	8×11.5	36	10×12.5	42	10×12.5	34	10×16	38	10×20	36	12.5×20	41
4.7	4R7	8×11.5	43	10×12.5	50	10×12.5	50	10×16	45	10×20	49	10×20	43	12.5×20	49
10	100	10×12.5	70	10×16	80	10×20	88	10×20	72	12.5×20	82	12.5×25	72	16×25	75
22	220	10×20	130	10×20	140	12.5×25	155	12.5×25	120	16×25	130	16×25	110	16×31.5	115
33	330	12.5×20	180	12.5×25	190	12.5×25	190	16×25	155	16×31.5	160	16×31.5	140	●18×35.5	145
47	470	12.5×25	220	12.5×25	220	16×25	230	16×35.5	190	●18×35.5	200	●18×35.5	170	20×40	175
100	101	16×25	330	16×31.5	335	●18×35.5	340	△18×40	285	20×40	290				
220	221	●18×35.5	500	△18×40	515	20×40	525							Case size	Allowable ripple

Allowable Ripple (mA) at 105°C 120Hz

Size 20×31 is available for capacitors marked "●"  
 Size 20×35 is available for capacitors marked "△"  
 In this case, [6] will be put at 12th digit of type numbering system.

### ● Frequency coefficient of allowable ripple current

V	CAP(μF)	Frequency				
		50Hz	120Hz	300Hz	1kHz	10kHz~
6.3~100	~47	0.75	1.00	1.35	1.57	2.00
	100~470	0.80	1.00	1.23	1.34	1.50
	1000~22000	0.85	1.00	1.10	1.13	1.15
160~450	0.47~220	0.80	1.00	1.25	1.40	1.60

### ● Allowable ripple current vs. Ambient temperature

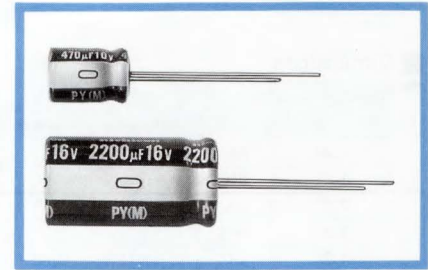
Ambient temp.(°C)	~+70	+85	+105
Coefficient	1.78	1.40	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**PY** series Low Impedance, High Reliability



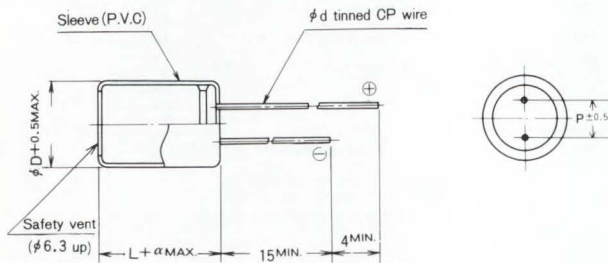
- Smaller case size than PF series
- Lower impedance at high frequency range.



## Specifications

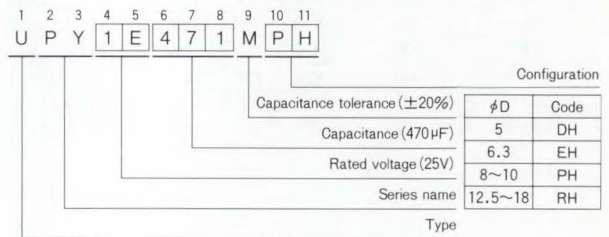
Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Voltage Range	6.3~50V	
Capacitance Range	0.47~15000µF	
Capacitance Tolerance	±20% at 120Hz, 20°C	
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4µA., whichever is greater.	
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency:120Hz, Temperature:20°C	
	Rated voltage (V)	6.3 10 16 25 35 50
	tan δ (MAX.)	0.24 0.20 0.16 0.14 0.12 0.10
Stability at Low Temperature	Measurement frequency:120Hz	
	Rated voltage (V)	6.3 10 16 25 35 50
	Impedance ratio ZT/Z20 (MAX.)	Z-55°C / Z+20°C 5 5 4 4 3 3
Load Life	After 2000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. (In case of ϕD=8: 1000hours' application)	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±20% of initial value
	tan δ	200% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.	
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Radial Lead Type



α	(L<20)	1.5
	(L≥20)	2.0
ϕD	5	6.3 8 10 12.5 16 18
	P	2 2.5 3.5 5 5 7.5 7.5
ϕd	0.5	0.5 0.6 0.6 0.6 0.8 0.8

## Type numbering system (Example: 25V 470µF)



## Frequency coefficient of allowable ripple current

Cap (µF)	Frequency	50Hz	120Hz	300Hz	1 kHz	10 kHz~
~47		—	0.17	0.40	0.65	1
100~220		0.30	0.50	0.65	0.80	1
330~680		0.57	0.71	0.82	0.90	1
1000~15000		0.75	0.87	0.96	0.98	1

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+70	+85	+105
Coefficient	1.78	1.4	1.0

• Dimension table in next page.



# ALUMINUM ELECTROLYTIC CAPACITORS

**PY** series

■ Standard ratings

V		6.3 (0J)			10 (1A)			16 (1C)		
Cap. (μF)	Item Code	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz
10	100							5×11	0.60	180
22	220	5×11	0.60	180	5×11	0.60	180	5×11	0.60	180
33	330	5×11	0.60	180	5×11	0.60	180	5×11	0.60	180
47	470	5×11	0.60	180	5×11	0.60	180	5×11	0.60	180
100	101	5×11	0.60	180	5×11	0.60	180	6.3×11	0.25	280
150	151	6.3×11	0.25	280	6.3×11	0.25	280	6.3×11	0.25	280
220	221	6.3×11	0.25	280	6.3×11	0.25	280	8×11.5	0.14	450
330	331	6.3×11	0.25	280	8×11.5	0.14	450	8×11.5	0.14	450
470	471	8×11.5	0.14	450	8×11.5	0.14	450	10×12.5	0.095	660
680	681	10×12.5	0.095	660	10×12.5	0.095	660	10×16	0.070	850
1000	102	10×12.5	0.095	660	10×16	0.070	850	10×20	0.053	1100
1500	152	10×20	0.053	1100	10×20	0.053	1100	12.5×20	0.050	1400
2200	222	12.5×20	0.050	1400	12.5×20	0.050	1400	12.5×25	0.038	1700
3300	332	12.5×20	0.050	1400	12.5×25	0.038	1700	16×25	0.025	2100
4700	472	16×25	0.025	2100	16×25	0.025	2100	16×31.5	0.022	2600
6800	682	16×25	0.025	2100	16×31.5	0.022	2600	18×35.5	0.020	3000
10000	103	16×31.5	0.022	2600	18×35.5	0.020	3000	18×40	0.018	3600
15000	153	18×35.5	0.020	3000	18×40	0.018	3600			

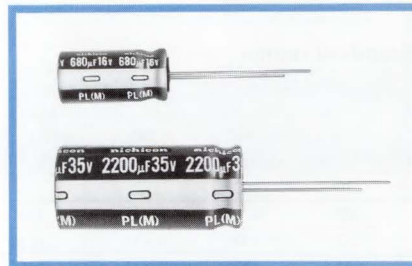
V		25 (1E)			35 (1V)			50 (1H)		
Cap. (μF)	Item Code	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω) MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz
0.47	R47							5×11	5.0	25
1	010							5×11	3.5	40
2.2	2R2							5×11	3.0	55
3.3	3R3							5×11	2.6	65
4.7	4R7	5×11	0.60	180	5×11	0.60	180	5×11	2.3	90
10	100	5×11	0.60	180	5×11	0.60	180	5×11	1.4	120
22	220	5×11	0.60	180	5×11	0.60	180	5×11	1.2	150
33	330	5×11	0.60	180	5×11	0.60	180	6.3×11	0.43	250
47	470	5×11	0.60	180	6.3×11	0.25	280	6.3×11	0.43	250
100	101	6.3×11	0.25	280	8×11.5	0.14	450	8×11.5	0.24	340
150	151	8×11.5	0.14	450	8×11.5	0.14	450	10×12.5	0.17	490
220	221	8×11.5	0.14	450	10×12.5	0.095	660	10×16	0.12	650
330	331	10×12.5	0.095	660	10×16	0.070	850	10×20	0.10	810
470	471	10×16	0.070	850	10×20	0.053	1100	12.5×20	0.085	1100
680	681	10×20	0.053	1100	12.5×20	0.050	1400	12.5×25	0.065	1200
1000	102	12.5×20	0.050	1400	12.5×25	0.038	1700	16×25	0.043	1600
1500	152	16×25	0.025	2100	16×25	0.025	2100	16×31.5	0.038	2000
2200	222	16×25	0.025	2100	16×31.5	0.022	2600	18×35.5	0.034	2300
3300	332	16×31.5	0.022	2600	18×35.5	0.020	3000			
4700	472	18×35.5	0.020	3000	18×40	0.018	3600			
6800	682	18×40	0.018	3600						

# ALUMINUM ELECTROLYTIC CAPACITORS

**PL** series Extremely Low Impedance, High Reliability



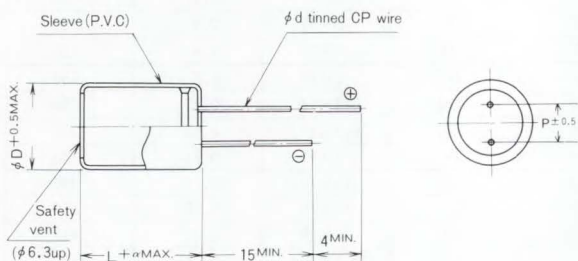
- Same case sizes as PF series, but extremely low impedance as little as 1/2 of PF series.
- High reliability withstanding 5000hour load life at +105°C (3000/2000hours for smaller case sizes as specified below).
- Capacitance ranges available based on the numerical values in E12 series under JIS.
- Ideally suited for use in switching power supplies.



## Specifications

Item	Performance Characteristics															
Operating Temperature Range	-55~+105°C															
Voltage Range	6.3~63V															
Capacitance Range	0.47~15000µF															
Capacitance Tolerance	±20% at 120Hz, 20°C															
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4µA, whichever is greater.															
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120 Hz, Temperature: 20°C															
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> </tr> <tr> <td>tan δ (MAX.)</td> <td>0.22</td> <td>0.19</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> <td>0.10</td> <td>0.08</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	63	tan δ (MAX.)	0.22	0.19	0.16	0.14	0.12	0.10
Rated voltage (V)	6.3	10	16	25	35	50	63									
tan δ (MAX.)	0.22	0.19	0.16	0.14	0.12	0.10	0.08									
Stability at Low Temperature	Measurement frequency: 120 Hz															
	<table border="1"> <tr> <td>Rated voltage (V)</td> <td>6.3</td> <td>10</td> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> </tr> <tr> <td>Impedance ratio ZT/Z20 (MAX.)</td> <td>Z-55°C/Z+20°C</td> <td>4</td> <td>4</td> <td>3</td> <td>3</td> <td>3</td> <td>2</td> </tr> </table>	Rated voltage (V)	6.3	10	16	25	35	50	63	Impedance ratio ZT/Z20 (MAX.)	Z-55°C/Z+20°C	4	4	3	3	3
Rated voltage (V)	6.3	10	16	25	35	50	63									
Impedance ratio ZT/Z20 (MAX.)	Z-55°C/Z+20°C	4	4	3	3	3	2									
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. (In case of φD=5, 6.3: 2000 hours, φD=8: 3000 hours application)															
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value									
Leakage current	Initial specified value or less															
Capacitance change	Within ±20% of initial value															
tan δ	200% or less of initial specified value															
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above. The value of tan δ is, however, 150% or less of initial specified value.															
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.															
Applicable Standards	JIS C-5141 and JIS C-5102.															

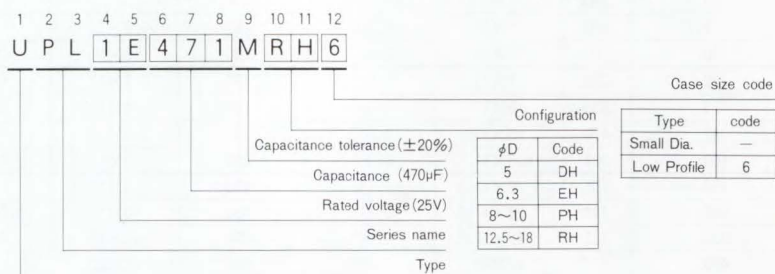
## Radial Lead Type



α	(L < 20)	1.5						
	(L ≥ 20)	2.0						
	φD	5	6.3	8	10	12.5	16	18
	P	2	2.5	3.5	5	5	7.5	7.5
	φd	0.5	0.5	0.6	0.6	0.6*	0.8	0.8

\* In case L > 25 for φ12.5(D) case sizes, lead diameter φ0.8(d) will be applied.

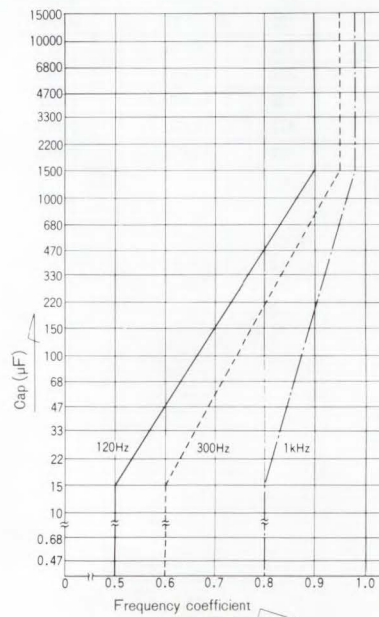
## Type numbering system (Example: 25V 470µF φ12.5 x 15)



## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+65	+85	+105
Coefficient	2.4	2.2	1.7	1.0

## Frequency coefficient of allowable ripple current (10kHz~200kHz=1)



• Dimension table in next page.

■Dimensions

DXL(mm)

Cap. (μF)	Code	V (Code) Size code	6.3(0J)		10(1A)		16(1C)		25(1E)		35(1V)		50(1H)		63(1J)	
			—	6	—	6	—	6	—	6	—	6	—	6	—	6
0.47	R47													5X11		
0.68	R68													5X11		
1	010													5X11		
1.5	1R5													5X11		
2.2	2R2													5X11		
3.3	3R3													5X11		
4.7	4R7													5X11		
6.8	6R8													5X11		
10	100													5X11	5X11	
12	120													5X11	5X11	
15	150													5X11	6.3X11	
18	180													5X11	6.3X11	
22	220										5X11			6.3X11	6.3X11	
27	270										5X11			6.3X11	6.3X11	
33	330								5X11		6.3X11			6.3X11	6.3X15	
39	390								5X11		6.3X11			6.3X11	6.3X15	
47	470						5X11		6.3X11		6.3X11			6.3X15	8X11.5	
56	560						5X11		6.3X11		6.3X11			6.3X15	8X15	10X12.5
68	680				5X11		6.3X11		6.3X11		6.3X15			8X11.5	8X15	10X12.5
82	820				5X11		6.3X11		6.3X11		6.3X15			8X15	10X12.5	8X20
100	101	5X11		6.3X11		6.3X11		6.3X15		8X11.5				8X20	10X15	10X20
120	121	5X11		6.3X11		6.3X11		6.3X15		8X15	10X12.5			8X20	10X15	10X20
150	151	6.3X11		6.3X11		6.3X15		8X11.5		8X15	10X12.5			10X20	12.5X15	10X25
180	181	6.3X11		6.3X11		6.3X15		8X15	10X12.5	8X20	10X15			10X20	12.5X15	10X31.5
220	221	6.3X11		6.3X15		8X11.5		8X15	10X12.5	8X20	10X15			10X25	12.5X15	12.5X20
270	271	6.3X15		6.3X15		8X15	10X12.5	8X20	10X15	10X20	12.5X15			10X31.5	16X15	12.5X25
330	331	6.3X15		8X11.5		8X15	10X12.5	8X20	10X15	10X20	12.5X15			10X31.5	16X15	12.5X25
390	391	8X11.5		8X15	10X12.5	8X20	10X15	10X20	12.5X15	10X25	12.5X15			12.5X25	16X15	12.5X31.5
470	471	8X15	10X12.5	8X15	10X12.5	8X20	10X15	10X20	12.5X15	10X31.5	16X15			12.5X25	18X15	12.5X35.5
560	561	8X15	10X12.5	8X20	10X15	10X20	12.5X15	10X25	12.5X15	12.5X20	16X15			12.5X31.5	16X20	12.5X40
680	681	8X20	10X15	8X20	10X15	10X20	12.5X15	10X31.5	16X15	12.5X25	18X15			12.5X35.5	16X20	16X31.5
820	821	8X20	10X15	10X20	12.5X15	10X25	12.5X15	12.5X20	16X15	12.5X25	18X15			12.5X40	18X20	16X35.5
1000	102	10X20	12.5X15	10X20	12.5X15	10X31.5	16X15	12.5X25	18X15	12.5X31.5	16X20			16X31.5	18X25	16X40
1200	122	10X20	12.5X15	10X25	12.5X15	12.5X20	16X15	12.5X25	18X15	12.5X35.5	16X25			16X35.5	18X31.5	18X40
1500	152	10X25	12.5X15	10X31.5	16X15	12.5X25	18X15	12.5X31.5	16X20	12.5X40	18X20			16X40	18X31.5	
1800	182	10X31.5	16X15	12.5X20	16X15	12.5X31.5	16X20	12.5X35.5	16X25	16X31.5	18X25			18X35.5		
2200	222	10X31.5	16X15	12.5X25	18X15	12.5X31.5	16X20	12.5X40	18X20	16X35.5	18X31.5			18X40		
2700	272	12.5X25	18X15	12.5X31.5	16X20	12.5X35.5	16X25	16X31.5	18X25	16X40	18X35.5					
3300	332	12.5X25	18X15	12.5X35.5	16X20	12.5X40	18X20	16X35.5	18X31.5	18X40						
3900	392	12.5X31.5	16X20	12.5X40	18X20	16X31.5	18X25	16X40	18X35.5							
4700	472	12.5X35.5	18X20	16X31.5	18X25	16X35.5	18X31.5	18X40								
5600	562	12.5X40	18X20	16X35.5	18X25	16X40	18X35.5									
6800	682	16X31.5	18X25	16X35.5	18X31.5	18X35.5										
8200	822	16X35.5	18X31.5	16X40	18X35.5	18X40										
10000	103	16X40	18X31.5	18X40												
12000	123	18X35.5														
15000	153	18X40														

※ In case of low profile type, [6] will be put at 12th digit of type numbering system.

# ALUMINUM ELECTROLYTIC CAPACITORS

**PL** series

## Standard ratings

Cap. (μF)		V Size code Item		6.3 (0.5)									
				Case size φ D×L (mm)		Impedance (Ω MAX.)		Allowable ripple (mA rms)		6		Allowable ripple (mA rms)	
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	Case size φ D×L (mm)	20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	
100	101	5×11		0.85	1.70	150	99						
120	121	5×11		0.65	1.30	175	115						
150	151	6.3×11		0.49	0.98	225	155						
180	181	6.3×11		0.39	0.78	250	175						
220	221	6.3×11		0.30	0.60	285	205						
270	271	6.3×15		0.24	0.48	370	275						
330	331	6.3×15		0.20	0.40	405	310						
390	391	8×11.5		0.17	0.34	445	345						
470	471	8×15		0.14	0.28	550	435	10×12.5	0.14	0.28	575	455	
560	561	8×15		0.12	0.24	595	480	10×12.5	0.13	0.26	600	485	
680	681	8×20		0.10	0.20	730	605	10×15	0.11	0.22	700	580	
820	821	8×20		0.085	0.17	795	670	10×15	0.095	0.19	750	635	
1000	102	10×20		0.075	0.15	950	820	12.5×15	0.085	0.17	890	765	
1200	122	10×20		0.065	0.13	1020	895	12.5×15	0.075	0.15	950	835	
1500	152	10×25		0.055	0.11	1220	1090	12.5×15	0.065	0.13	1020	915	
1800	182	10×31.5		0.050	0.10	1370	1230	16×15	0.055	0.11	1270	1140	
2200	222	10×31.5		0.043	0.086	1470	1320	16×15	0.049	0.098	1340	1200	
2700	272	12.5×25		0.038	0.076	1590	1430	18×15	0.044	0.088	1500	1350	
3300	332	12.5×25		0.034	0.068	1710	1530	18×15	0.039	0.078	1600	1440	
3900	392	12.5×31.5		0.031	0.062	1910	1710	16×20	0.036	0.072	1720	1540	
4700	472	12.5×35.5		0.028	0.056	2100	1890	18×20	0.032	0.064	1920	1720	
5600	562	12.5×40		0.026	0.052	2270	2040	18×20	0.030	0.060	1980	1780	
6800	682	16×31.5		0.024	0.048	2370	2130	18×25	0.027	0.054	2210	1980	
8200	822	16×35.5		0.022	0.044	2550	2290	18×31.5	0.025	0.050	2390	2150	
10000	103	16×40		0.020	0.040	2750	2470	18×31.5	0.023	0.046	2490	2240	
12000	123	18×35.5		0.019	0.038	2820	2530						
15000	153	18×40		0.018	0.036	2960	2660						

Cap. (μF)		V Size code Item		10 (1 A)									
				Case size φ D×L (mm)		Impedance (Ω MAX.)		Allowable ripple (mA rms)		6		Allowable ripple (mA rms)	
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	Case size φ D×L (mm)	20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz	
68	680	5×11		0.80	1.60	155	97						
82	820	5×11		0.65	1.30	175	110						
100	101	6.3×11		0.55	1.10	210	135						
120	121	6.3×11		0.44	0.88	235	160						
150	151	6.3×11		0.35	0.70	265	185						
180	181	6.3×11		0.29	0.58	290	205						
220	221	6.3×15		0.24	0.48	370	270						
270	271	6.3×15		0.20	0.40	405	300						
330	331	8×11.5		0.16	0.32	460	350						
390	391	8×15		0.14	0.28	550	430	10×12.5	0.15	0.30	555	430	
470	471	8×15		0.12	0.24	595	475	10×12.5	0.13	0.26	600	475	
560	561	8×20		0.10	0.20	730	590	10×15	0.11	0.22	700	565	
680	681	8×20		0.085	0.17	795	660	10×15	0.090	0.18	770	635	
820	821	10×20		0.070	0.14	985	835	12.5×15	0.080	0.16	920	780	
1000	102	10×20		0.060	0.12	1060	915	12.5×15	0.065	0.13	1040	895	
1200	122	10×25		0.050	0.10	1280	1120	12.5×15	0.060	0.12	1060	930	
1500	152	10×31.5		0.045	0.090	1440	1290	16×15	0.050	0.10	1330	1190	
1800	182	12.5×20		0.039	0.078	1470	1320	16×15	0.044	0.088	1420	1270	
2200	222	12.5×25		0.034	0.068	1710	1530	18×15	0.039	0.078	1600	1440	
2700	272	12.5×31.5		0.030	0.060	1940	1740	16×20	0.035	0.070	1740	1560	
3300	332	12.5×35.5		0.026	0.052	2180	1960	16×20	0.031	0.062	1850	1660	
3900	392	12.5×40		0.024	0.048	2360	2120	18×20	0.028	0.056	2050	1840	
4700	472	16×31.5		0.023	0.046	2420	2170	18×25	0.026	0.052	2250	2020	
5600	562	16×35.5		0.021	0.042	2610	2340	18×25	0.024	0.048	2340	2100	
6800	682	16×35.5		0.020	0.040	2680	2410	18×31.5	0.022	0.044	2540	2280	
8200	822	16×40		0.019	0.038	2820	2530	18×35.5	0.021	0.042	2690	2420	
10000	103	18×40		0.017	0.034	3040	2730						

Standard ratings

V		16 (1C)										
Cap. (μF)	Code	Item	Case size φDXL (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)		Case size φDXL (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)	
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
47	470	5×11		0.80	1.60	155	92					
56	560	5×11		0.65	1.30	175	105					
68	680	6.3×11		0.50	1.00	220	135					
82	820	6.3×11		0.42	0.84	240	155					
100	101	6.3×11		0.35	0.70	265	175					
120	121	6.3×11		0.29	0.58	290	195					
150	151	6.3×15		0.23	0.46	375	260					
180	181	6.3×15		0.20	0.40	405	285					
220	221	8×11.5		0.16	0.32	460	335					
270	271	8×15		0.14	0.28	550	410	10×12.5	0.14	0.28	575	430
330	331	8×15		0.12	0.24	595	455	10×12.5	0.12	0.24	625	480
390	391	8×20		0.10	0.20	730	570	10×15	0.10	0.20	730	570
470	471	8×20		0.090	0.18	770	615	10×15	0.090	0.18	770	615
560	561	10×20		0.075	0.15	950	770	12.5×15	0.080	0.16	920	745
680	681	10×20		0.065	0.13	1020	845	12.5×15	0.070	0.14	985	815
820	821	10×25		0.055	0.11	1220	1030	12.5×15	0.060	0.12	1060	895
1000	102	10×31.5		0.047	0.094	1410	1210	16×15	0.055	0.11	1270	1090
1200	122	12.5×20		0.041	0.082	1430	1250	16×15	0.046	0.092	1390	1220
1500	152	12.5×25		0.036	0.072	1660	1490	18×15	0.041	0.082	1560	1400
1800	182	12.5×31.5		0.032	0.064	1880	1690	16×20	0.037	0.074	1700	1530
2200	222	12.5×31.5		0.028	0.056	2010	1800	16×20	0.033	0.066	1800	1620
2700	272	12.5×35.5		0.025	0.050	2220	1990	16×25	0.030	0.060	2010	1800
3300	332	12.5×40		0.023	0.046	2410	2160	18×20	0.027	0.054	2090	1880
3900	392	16×31.5		0.022	0.044	2470	2220	18×25	0.025	0.050	2290	2060
4700	472	16×35.5		0.020	0.040	2680	2410	18×31.5	0.023	0.046	2490	2240
5600	562	16×40		0.019	0.038	2820	2530	18×35.5	0.022	0.044	2620	2350
6800	682	18×35.5		0.018	0.036	2900	2610					
8200	822	18×40		0.017	0.034	3040	2730					

V		25 (1E)										
Cap. (μF)	Code	Item	Case size φDXL (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)		Case size φDXL (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)	
				20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/10kHz~ 200kHz	105°C/120Hz
33	330	5×11		0.80	1.60	155	88					
39	390	5×11		0.65	1.30	175	100					
47	470	6.3×11		0.55	1.10	210	125					
56	560	6.3×11		0.44	0.88	235	140					
68	680	6.3×11		0.36	0.72	260	160					
82	820	6.3×11		0.30	0.60	285	180					
100	101	6.3×15		0.24	0.48	370	245					
120	121	6.3×15		0.20	0.40	405	275					
150	151	8×11.5		0.16	0.32	460	320					
180	181	8×15		0.14	0.28	550	390	10×12.5	0.15	0.30	555	395
220	221	8×15		0.11	0.22	625	455	10×12.5	0.13	0.26	600	435
270	271	8×20		0.095	0.19	750	560	10×15	0.11	0.22	700	525
330	331	8×20		0.085	0.17	795	610	10×15	0.095	0.19	750	575
390	391	10×20		0.070	0.14	985	770	12.5×15	0.080	0.16	920	720
470	471	10×20		0.065	0.13	1020	810	12.5×15	0.070	0.14	985	785
560	561	10×25		0.055	0.11	1220	990	12.5×15	0.060	0.12	1060	860
680	681	10×31.5		0.046	0.092	1420	1180	16×15	0.055	0.11	1270	1050
820	821	12.5×20		0.041	0.082	1430	1210	16×15	0.049	0.098	1340	1130
1000	102	12.5×25		0.036	0.072	1660	1430	18×15	0.043	0.086	1520	1310
1200	122	12.5×25		0.032	0.064	1760	1550	18×15	0.039	0.078	1600	1400
1500	152	12.5×31.5		0.029	0.058	1980	1780	16×20	0.034	0.068	1770	1590
1800	182	12.5×35.5		0.026	0.052	2180	1960	16×25	0.031	0.062	1980	1780
2200	222	12.5×40		0.024	0.048	2360	2120	18×20	0.028	0.056	2050	1840
2700	272	16×31.5		0.022	0.044	2470	2220	18×25	0.025	0.050	2290	2060
3300	332	16×35.5		0.020	0.040	2680	2410	18×31.5	0.023	0.046	2490	2240
3900	392	16×40		0.019	0.038	2820	2530	18×35.5	0.021	0.042	2690	2420
4700	472	18×40		0.018	0.036	2960	2660					

# ALUMINUM ELECTROLYTIC CAPACITORS

**PL** series

■ Standard ratings

Cap. (μF)		V		35 (1 V)							
		Size code		6				6			
		Item	Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)		Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)
Code			20°C/100kHz	-10°C/100kHz	105°C/ <sup>10kHz~</sup> / <sub>200kHz</sub>	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/ <sup>10kHz~</sup> / <sub>200kHz</sub>	105°C/120Hz
22	220	5×11	0.75	1.50	160	85					
27	270	5×11	0.60	1.20	180	99					
33	330	6.3×11	0.49	0.98	225	125					
39	390	6.3×11	0.41	0.82	245	140					
47	470	6.3×11	0.34	0.68	270	160					
56	560	6.3×11	0.28	0.56	295	180					
68	680	6.3×15	0.24	0.48	370	230					
82	820	6.3×15	0.19	0.38	415	265					
100	101	8×11.5	0.16	0.32	460	305					
120	121	8×15	0.14	0.28	550	370	10×12.5	0.15	0.30	555	375
150	151	8×15	0.12	0.24	595	415	10×12.5	0.12	0.24	625	435
180	181	8×20	0.10	0.20	730	520	10×15	0.11	0.22	700	500
220	221	8×20	0.085	0.17	795	580	10×15	0.090	0.18	770	560
270	271	10×20	0.070	0.14	985	735	12.5×15	0.080	0.16	920	690
330	331	10×20	0.060	0.12	1060	810	12.5×15	0.065	0.13	1020	780
390	391	10×25	0.055	0.11	1220	955	12.5×15	0.060	0.12	1060	825
470	471	10×31.5	0.046	0.092	1420	1130	16×15	0.055	0.11	1270	1010
560	561	12.5×20	0.041	0.082	1430	1160	16×15	0.048	0.096	1360	1100
680	681	12.5×25	0.036	0.072	1660	1370	18×15	0.042	0.084	1540	1270
820	821	12.5×25	0.032	0.064	1760	1490	18×15	0.038	0.076	1620	1370
1000	102	12.5×31.5	0.029	0.058	1980	1710	16×20	0.034	0.068	1770	1530
1200	122	12.5×35.5	0.026	0.052	2180	1920	16×25	0.031	0.062	1980	1740
1500	152	12.5×40	0.024	0.048	2360	2120	18×20	0.028	0.056	2050	1840
1800	182	16×31.5	0.022	0.044	2470	2220	18×25	0.025	0.050	2290	2060
2200	222	16×35.5	0.020	0.040	2680	2410	18×31.5	0.023	0.046	2490	2240
2700	272	16×40	0.018	0.036	2900	2610	18×35.5	0.021	0.042	2690	2420
3300	332	18×40	0.017	0.034	3040	2730					

Cap. (μF)		V		50 (1 H)							
		Size code		6				6			
		Item	Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)		Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)
Code			20°C/100kHz	-10°C/100kHz	105°C/ <sup>10kHz~</sup> / <sub>200kHz</sub>	105°C/120Hz		20°C/100kHz	-10°C/100kHz	105°C/ <sup>10kHz~</sup> / <sub>200kHz</sub>	105°C/120Hz
0.47	R47	5×11	3.90	7.80	22	11					
0.68	R68	5×11	3.70	7.40	28	14					
1	010	5×11	3.50	7.00	36	18					
1.5	1R5	5×11	3.30	6.60	45	22					
2.2	2R2	5×11	3.00	6.00	54	27					
3.3	3R3	5×11	2.60	5.20	66	33					
4.7	4R7	5×11	2.20	4.40	81	40					
6.8	6R8	5×11	1.80	3.60	91	45					
10	100	5×11	1.40	2.80	115	57					
12	120	5×11	1.20	2.40	125	62					
15	150	5×11	0.93	1.86	145	72					
18	180	5×11	0.80	1.60	155	79					
22	220	6.3×11	0.65	1.30	195	100					
27	270	6.3×11	0.53	1.06	215	115					
33	330	6.3×11	0.43	0.86	240	135					
39	390	6.3×11	0.36	0.72	260	150					
47	470	6.3×15	0.30	0.60	330	195					
56	560	6.3×15	0.25	0.50	360	220					
68	680	8×11.5	0.20	0.40	410	255					
82	820	8×15	0.17	0.34	500	320	10×12.5	0.18	0.36	510	330
100	101	8×20	0.14	0.28	620	410	10×15	0.16	0.32	580	385
120	121	8×20	0.12	0.24	670	455	10×15	0.13	0.26	640	435
150	151	10×20	0.10	0.20	820	570	12.5×15	0.11	0.22	785	545
180	181	10×20	0.085	0.17	890	635	12.5×15	0.095	0.19	845	605
220	221	10×25	0.075	0.15	1040	760	12.5×15	0.080	0.16	920	670
270	271	10×31.5	0.065	0.13	1200	900	16×15	0.070	0.14	1120	840
330	331	10×31.5	0.055	0.11	1300	995	16×15	0.060	0.12	1210	925
390	391	12.5×25	0.048	0.096	1440	1120	16×15	0.055	0.11	1270	990
470	471	12.5×25	0.044	0.088	1500	1190	18×15	0.046	0.092	1470	1170
560	561	12.5×31.5	0.040	0.080	1680	1360	16×20	0.044	0.088	1550	1260
680	681	12.5×35.5	0.036	0.072	1850	1530	16×20	0.040	0.080	1630	1350
820	821	12.5×40	0.033	0.066	2010	1700	18×20	0.036	0.072	1810	1530
1000	102	16×31.5	0.030	0.060	2120	1830	18×25	0.033	0.066	2000	1730
1200	122	16×35.5	0.028	0.056	2260	1990	18×31.5	0.031	0.062	2140	1880
1500	152	16×40	0.026	0.052	2410	2170	18×31.5	0.029	0.058	2220	1990
1800	182	18×35.5	0.025	0.050	2460	2210					
2200	222	18×40	0.024	0.048	2560	2300					

Standard ratings

Cap. (μF)	Code	Item	63 (1J)									
			Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)		Case size φ D×L (mm)	Impedance (Ω MAX.)		Allowable ripple (mA rms)	
				20°C / 100kHz		105°C / 10kHz~ 200kHz			20°C / 100kHz		105°C / 10kHz~ 200kHz	
				20°C / 100kHz	-10°C / 100kHz	105°C / 10kHz~ 200kHz	105°C / 120Hz		20°C / 100kHz	-10°C / 100kHz	105°C / 10kHz~ 200kHz	105°C / 120Hz
10	100	5×11	1.06	2.12	135	67						
12	120	5×11	0.93	1.86	145	72						
15	150	6.3×11	0.73	1.46	185	92						
18	180	6.3×11	0.63	1.26	195	100						
22	220	6.3×11	0.52	1.04	215	110						
27	270	6.3×11	0.43	0.86	240	130						
33	330	6.3×15	0.35	0.70	305	170						
39	390	6.3×15	0.30	0.60	330	190						
47	470	8×11.5	0.25	0.50	365	215						
56	560	8×15	0.21	0.42	450	275	10×12.5	0.23	0.46	450	275	
68	680	8×15	0.17	0.34	500	315	10×12.5	0.19	0.38	495	310	
82	820	8×20	0.15	0.30	600	385	10×15	0.16	0.32	580	375	
100	101	10×20	0.12	0.24	750	495	12.5×15	0.14	0.28	695	460	
120	121	10×20	0.10	0.20	820	555	12.5×15	0.12	0.24	750	510	
150	151	10×25	0.090	0.18	950	665	12.5×15	0.095	0.19	845	590	
180	181	10×31.5	0.075	0.15	1110	790	16×15	0.080	0.16	1050	750	
220	221	12.5×20	0.065	0.13	1140	835	16×15	0.070	0.14	1120	820	
270	271	12.5×25	0.055	0.11	1340	1000	18×15	0.060	0.12	1290	965	
330	331	12.5×25	0.049	0.098	1420	1090	18×15	0.050	0.10	1410	1080	
390	391	12.5×31.5	0.043	0.086	1620	1260	16×20	0.047	0.094	1500	1170	
470	471	12.5×35.5	0.039	0.078	1780	1420	16×25	0.042	0.084	1700	1350	
560	561	12.5×40	0.035	0.070	1950	1580	18×20	0.039	0.078	1730	1400	
680	681	16×31.5	0.032	0.064	2050	1700	18×25	0.035	0.070	1940	1610	
820	821	16×35.5	0.029	0.058	2220	1880	18×31.5	0.032	0.064	2110	1780	
1000	102	16×40	0.027	0.054	2370	2050	18×35.5	0.029	0.058	2280	1970	
1200	122	18×40	0.025	0.050	2510	2210						

# ALUMINUM ELECTROLYTIC CAPACITORS



Miniature Sized, Low Impedance, High Reliability

series



Low Impedance

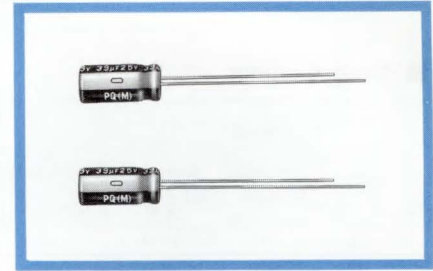
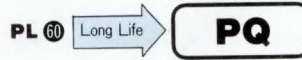


Long Life



Anti-Solvent Feature

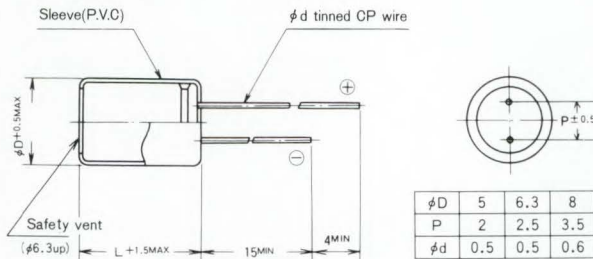
- Miniature sized low impedance series withstanding 5000hour load life at +105°C.
- Developed for space-saving installation on switching power supplies.



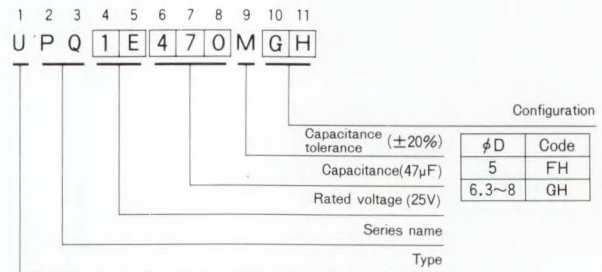
## Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~+105°C						
Voltage Range	6.3~50V						
Capacitance Range	0.47~390 $\mu$ F						
Capacitance Tolerance	$\pm$ 20% at 120Hz, 20°C						
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4( $\mu$ A), whichever is greater.						
tan $\delta$	Frequency:120Hz, Temperature:20°C						
	Rated voltage (V)	6.3	10	16	25	35	50
	tan $\delta$ (MAX.)	0.22	0.19	0.16	0.14	0.12	0.10
Stability at Low Temperature	Measurement frequency:120Hz						
	Rated voltage (V)	6.3	10	16	25	35	50
	Impedance ratio ZT/Z20(MAX.)	Z-55°C/Z+20°C	4	4	3	3	2
Load Life	After 5000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less			
			Capacitance change	Within $\pm$ 30% of initial value			
			tan $\delta$	300% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed at right.		Leakage current	Initial specified value or less			
			Except as Capacitance change	Within $\pm$ 20% of initial value			
			tan $\delta$	150% or less of initial specified value			
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Radial Lead Type



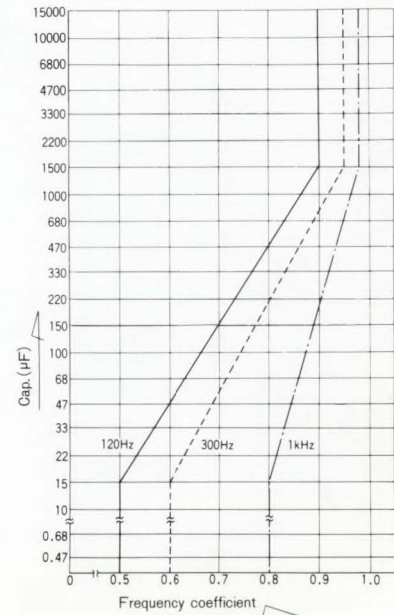
## Type numbering system (Example: 25V 47 $\mu$ F $\phi$ 6.3 $\times$ 11)



## Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+65	+85	+105
Coefficient	2.4	2.2	1.7	1.0

## Frequency coefficient of allowable ripple current (10kHz~200kHz=1)



• Dimension table in next page.



## ■Dimensions

V		6.3 (0J)			10 (1A)			16 (1C)			25 (1E)				
		Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz		
Cap.(μF)	Code	Item													
33		330									5×11	0.80	155		
39		390									5×11	0.65	175		
47		470								5×11	0.80	155	6.3×11	0.55	210
56		560								5×11	0.65	175	6.3×11	0.44	235
68		680				5×11	0.80	155	6.3×11	0.50	220	6.3×11	0.36	260	
82		820				5×11	0.65	175	6.3×11	0.42	240	6.3×11	0.30	285	
100		101	5×11	0.85	150	6.3×11	0.55	210	6.3×11	0.35	265	8×11.5	0.24	370	
120		121	5×11	0.65	175	6.3×11	0.44	235	6.3×11	0.29	290	8×11.5	0.20	405	
150		151	6.3×11	0.49	225	6.3×11	0.35	265	8×11.5	0.23	375	8×11.5	0.16	460	
180		181	6.3×11	0.39	250	6.3×11	0.29	290	8×11.5	0.20	405				
220		221	6.3×11	0.30	285	8×11.5	0.24	370	8×11.5	0.16	460				
270		271	8×11.5	0.24	370	8×11.5	0.20	405							
330		331	8×11.5	0.20	405	8×11.5	0.16	460							
390		391	8×11.5	0.17	445										

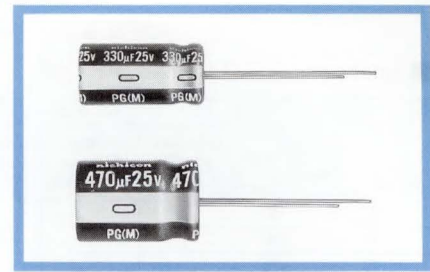
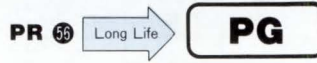
V		35 (1V)			50 (1H)			
		Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	Case size φD×L (mm)	Impedance (Ω)MAX. 20°C 100kHz	Allowable ripple (mA rms) 105°C 100kHz	
Cap.(μF)	Code	Item						
0.47		R47				5×11	3.90	22
0.68		R68				5×11	3.70	28
1		010				5×11	3.50	36
1.5		1R5				5×11	3.30	45
2.2		2R2				5×11	3.00	54
3.3		3R3				5×11	2.60	66
4.7		4R7				5×11	2.20	81
6.8		6R8				5×11	1.80	91
10		100				5×11	1.40	115
12		120				5×11	1.20	125
15		150				5×11	0.93	145
18		180				5×11	0.80	155
22		220	5×11	0.75	160	6.3×11	0.65	195
27		270	5×11	0.60	180	6.3×11	0.53	215
33		330	6.3×11	0.49	225	6.3×11	0.43	240
39		390	6.3×11	0.41	245	6.3×11	0.36	260
47		470	6.3×11	0.34	270	8×11.5	0.30	330
56		560	6.3×11	0.28	295	8×11.5	0.25	360
68		680	8×11.5	0.24	370	8×11.5	0.20	410
82		820	8×11.5	0.19	415			
100		101	8×11.5	0.16	460			

# ALUMINUM ELECTROLYTIC CAPACITORS

**PG** Long Life, High Reliability  
series



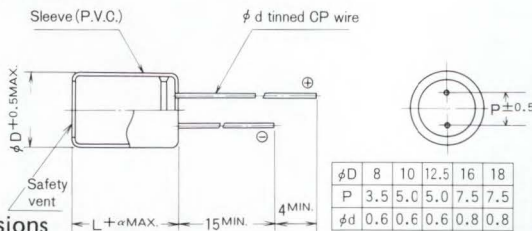
- Extended load life up to 7000hours at +105°C.
- Suited for switching power supplies in which dependable performance is essential.



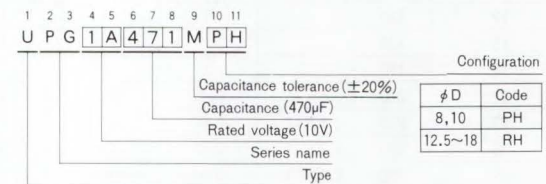
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-55~+105°C	
Voltage Range	10~63V	
Capacitance Range	4.7~4700µF	
Capacitance Tolerance	±20% at 120 Hz, 20°C	
Leakage Current	After 2 minute's application of rated voltage, leakage current is not more than 0.01CV or 3 (µA), whichever is greater.	
tan δ	For capacitance of more than 1000 µF, add 0.02 for every increase of 1000 µF. Measurement frequency: 120 Hz, Temperature: 20°C	
	Rated voltage (V)	10      16      25      35      50      63
	tan δ (MAX.)	0.30    0.25    0.22    0.18    0.15    0.12
Stability at Low Temperature	Measurement frequency: 120 Hz	
	Rated Voltage (V)	10    16    25    35    50    63
	Impedance ratio Z-25°C/Z+20°C	2    2    2    2    2    2
	ZT/Z20 (MAX.) Z-55°C/Z+20°C	5    4    3    3    3    3
Load Life	After 7000 hours' application of rated voltage at 105°C, capacitors meet the characteristics requirements listed at right. (In case of φD ≤ 10, after 5000 hours' application)	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±30% of initial value
	tan δ	300% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed at right.	
	Leakage current	Initial specified value or less
	Except as Capacitance change	Within ±15% of initial value
	tan δ	150% or less of initial specified value
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Radial Lead Type



## Type numbering system (Example: 10V 470µF)



## Dimensions

Cap. (µF)	Code	10 (1A)			16 (1C)			25 (1E)			
		V (Code) Item	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
47	470							8×11.5	1.00	170	
100	101		8×11.5	1.00	170	8×11.5	1.00	170	10×12.5	0.60	250
220	221		10×12.5	0.60	250	10×12.5	0.60	250	10×16	0.40	370
330	331		10×16	0.40	370	10×16	0.40	370	10×20	0.28	500
470	471		10×16	0.40	370	10×20	0.28	500	12.5×20	0.16	750
1000	102		12.5×20	0.16	750	12.5×25	0.14	800	16×25	0.08	1250
2200	222		16×25	0.08	1250	16×25	0.08	1250	16×35.5	0.06	1550
3300	332		16×31.5	0.07	1400	16×35.5	0.06	1550	18×40	0.04	1800
4700	472		16×35.5	0.06	1550	18×35.5	0.05	1700			

Cap. (µF)	Code	35 (1V)			50 (1H)			63 (1J)			
		V (Code) Item	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
4.7	4R7							8×11.5	1.00	170	
10	100							8×11.5	1.00	170	
22	220							8×11.5	1.00	170	
33	330		8×11.5	1.00	170	10×12.5	0.60	250	10×12.5	0.60	250
47	470		8×11.5	1.00	170	10×12.5	0.60	250	10×12.5	0.60	250
100	101		10×12.5	0.60	250	10×16	0.40	370	10×20	0.28	500
220	221		10×20	0.28	500	12.5×20	0.16	750	12.5×20	0.16	750
330	331		12.5×20	0.16	750	12.5×20	0.16	750	12.5×20	0.16	750
470	471		12.5×20	0.16	750	16×25	0.08	1250	16×25	0.08	1250
1000	102		16×25	0.08	1250	16×31.5	0.07	1400	18×35.5	0.05	1700
2200	222		18×35.5	0.05	1700						

## Frequency coefficient of allowable ripple current

Cap. (µF)	Frequency (Hz)	50	120	300	1 k	10k~
~4.7		—	0.15	0.33	0.55	1.00
10~22		0.17	0.30	0.45	0.64	1.00
33~47		0.28	0.42	0.55	0.70	1.00
100~330		0.43	0.55	0.66	0.80	1.00
470~4700		0.59	0.70	0.80	0.90	1.00

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	+65	+85	+105
Coefficient	2.2	1.7	1.0

Ratings of 0.47~3.3µF at 50v/63v are available upon request.

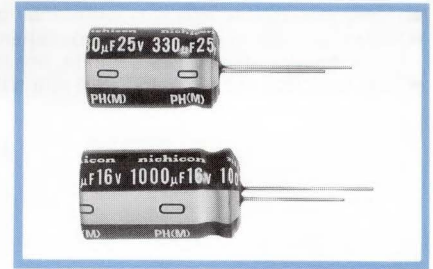
Case size: DXL (mm)  
Impedance: (Ω) MAX. at 20°C 100kHz  
Allowable ripple: (mA) at 105°C 100kHz

# ALUMINUM ELECTROLYTIC CAPACITORS

**PH** series Extremely Long Life, High Reliability



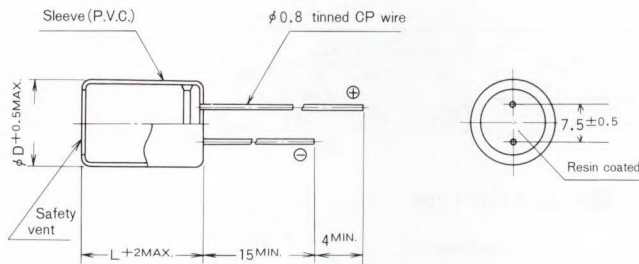
- Extremely long load life of 20,000 hours at +105°C.
- Ideally suited for industrial applications where reliability and quality are the most important.



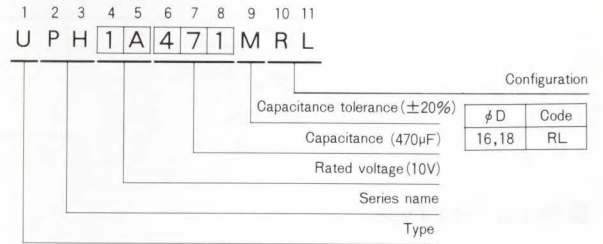
## Specifications

Item	Performance Characteristics						
Operating Temperature Range	-55~+105°C						
Voltage Range	10~63V						
Capacitance Range	47~3300µF						
Capacitance Tolerance	±20% at 120Hz, 20°C						
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV (µA).						
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency: 120 Hz, Temperature: 20°C						
	Rated voltage (V)	10	16	25	35	50	63
	tan δ (MAX.)	0.19	0.16	0.14	0.12	0.10	0.10
Stability at Low Temperature	Measurement frequency: 120 Hz						
	Rated voltage (V)	10	16	25	35	50	63
	Impedance ratio Z-55°C / Z+20°C (MAX.)	2	2	2	2	2	2
Load Life	Capacitors meet the requirements shown at right after 20000 hours' application of rated ripple current overlapped with DC voltage, the max. sum of these being equal to the rated voltage, at 105°C.						
	Leakage current	Initial specified value or less					
	Capacitance change	Within ±30% of initial value					
	tan δ	300% or less of initial specified value					
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the characteristics requirements listed at right.						
	Leakage current	Initial specified value or less					
	Capacitance change	Within ±15% of initial value					
	tan δ	150% or less of initial specified value					
Marking	Printed with white color letter on dark brown sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Radial Lead Type



## Type numbering system (Example: 10V 470µF)



## Dimensions

Cap. (µF)	V (Code)		10 (1A)			16 (1C)			25 (1E)		
	Code	Item	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
330	331					16×26	0.13	0.6	16×26	0.13	0.6
470	471		16×26	0.13	0.6	18×26	0.10	0.9	18×26	0.10	0.9
1000	102		18×26	0.10	0.9	18×31	0.08	1.2	18×41	0.05	1.6
2200	222		18×41	0.05	1.6	18×41	0.05	1.6			
3300	332		18×41	0.05	1.6						

Cap. (µF)	V (Code)		35 (1V)			50 (1H)			63 (1J)		
	Code	Item	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
47	470								16×26	0.13	0.6
100	101					16×26	0.13	0.6	18×26	0.10	0.9
220	221		16×26	0.13	0.6	18×26	0.10	0.9	18×31	0.08	1.2
330	331		18×26	0.10	0.9	18×31	0.08	1.2	18×41	0.05	1.6
470	471		18×31	0.08	1.2	18×41	0.05	1.6			

## Frequency coefficient of allowable ripple current

Cap. (µF)	Frequency (Hz)	50	120	300	1k	10k~
~1000		0.57	0.71	0.82	0.92	1.00
2200~3300		0.84	0.92	0.95	0.97	1.00

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+65	+85	+105
Coefficient	2.2	1.7	1.0

Case size: DXL (mm)  
 Impedance: (Ω) MAX. at 20°C 100kHz  
 Allowable ripple: (A) at 105°C 100kHz

# ALUMINUM ELECTROLYTIC CAPACITORS



High Temperature Range, For +125°C Use

series



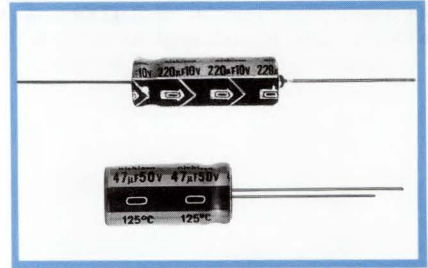
Long Life



Anti-Solvent Feature

(Radial Lead Type only)

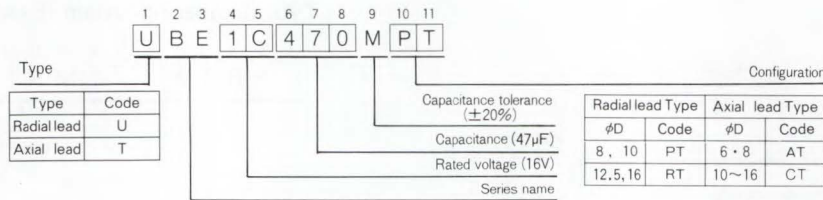
- Highly dependable reliability withstanding load life of 2,000hours at +125°C.
- Suited for telecommunications equipment, space equipment and automobile electronics where heavy duty services are indispensable.
- Axial lead type available, too. (Not anti-solvent yet)



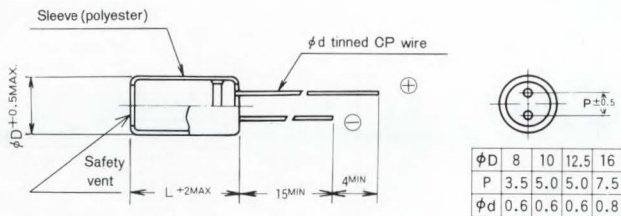
## Specifications

Item	Performance Characteristics					
Operating Temperature Range	-40~+125°C					
Voltage Range	10~50V					
Capacitance Range	0.47~470µF					
Capacitance Tolerance	±20% at 120 Hz, 20°C					
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than 0.002CV or 2 (µA) whichever is greater.					
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C					
	Rated voltage (V)	10	16	25	35	50
Stability at Low Temperature	Measurement frequency : 120 Hz					
	Rated voltage (V)	10	16	25	35	50
	Impedance ratio Z <sub>-25°C</sub> /Z <sub>+20°C</sub>	3	2	2	2	2
Load Life	After 2000 hours' application of rated voltage at 125°C, capacitors meet the characteristics requirements listed at right.					
	Leakage current	Initial specified value or less				
	Capacitance change	Within ±20% of initial value				
Shelf Life	After leaving capacitors under no load at 125°C for 1000 hours and applying voltage according to JIS C-5141 4-3, they meet the requirements for load life characteristics listed above.					
	Dissipation Factor 200% or less of initial specified value					
Marking	Printed with black color letter on clear blue sleeve according to JIS C-5141.					
Applicable Standards	JIS C-5141 and JIS C-5102.					

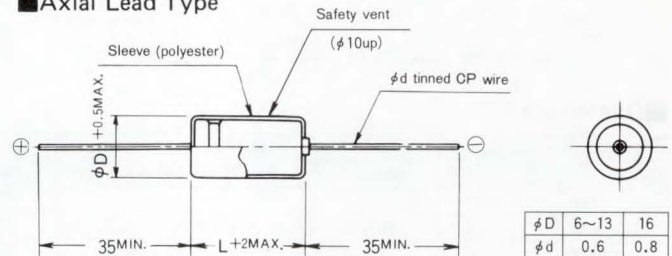
## Type numbering system (Example: Radial Lead Type 16V 47µF)



## Radial Lead Type



## Axial Lead Type



## Dimensions

Cap. (µF)	Code	D × L (mm)					
		V	10	16	25	35	50
0.47	R47	1 A	1 C	1 E	1 V		8×11.5
1	010						8×11.5
2.2	2R2						8×11.5
3.3	3R3						8×11.5
4.7	4R7						8×11.5
10	100						8×11.5
22	220				8×11.5	10×12.5	
33	330			8×11.5	10×12.5	10×16	
47	470		8×11.5	10×12.5	10×16	10×20	
100	101	10×12.5	10×16	10×20	12.5×20	12.5×25	
220	221	10×20	12.5×20	12.5×25	16×25		
330	331	12.5×20	12.5×25	16×25			
470	471	12.5×25	16×25				

## Dimensions

Cap. (µF)	Code	D × L (mm)					
		V	10	16	25	35	50
0.47	R47	1 A	1 C	1 E	1 V	1 H	
1	010						6×16
2.2	2R2						6×16
3.3	3R3						6×16
4.7	4R7						6×16
10	100						6×16
22	220				6×16	8×16	8×20
33	330	6×16	8×16	8×20	8×20	10×21	
47	470	6×16	8×16	8×20	10×21	10×26	
100	101	8×20	10×21	10×21	10×26	13×26	
220	221	10×21	10×26	13×26	13×31.5	16×31.5	
330	331	13×26	13×26	13×31.5	16×31.5		
470	471	13×31.5	13×31.5	16×31.5			

# ALUMINUM ELECTROLYTIC CAPACITORS

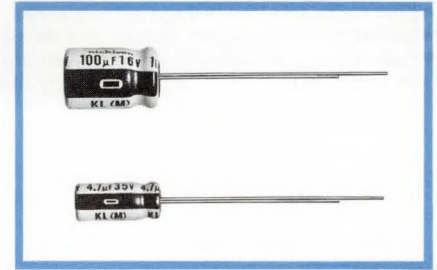
nichicon

**KL** Low Leakage Current series



- Standard low leakage current series.

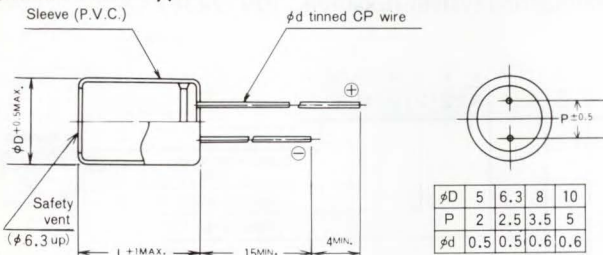
**KL** ← Low Leakage Current **VX 86**



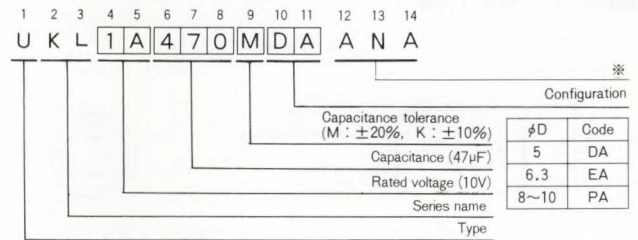
## Specifications

Item	Performance Characteristics				
Operating Temperature Range	-40~+105°C				
Voltage Range	10~50V				
Capacitance Range	0.1~330 µF				
Capacitance Tolerance	±20% (M), ±10% (K) at 120Hz 20°C				
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.002CV or 0.2(µA) whichever is greater.				
tan δ	Rated voltage (V)	10	16	25, 35, 50	Measurement frequency : 120Hz Temperature : 20°C
	tan δ (MAX.)	0.15	0.12	0.08	
Stability at Low Temperature	Rated voltage (V)	10	16	25, 35, 50	Measurement frequency : 120Hz
	Impedance ratio	Z-25°C/Z+20°C	2	2	
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	4	3	2
Load Life	After 2000 hours' application of rated voltage at 85°C, or 1000 hours' at 105°C, capacitors meet the characteristics requirements listed at right.				
	Leakage current	Initial specified value or less			
	Capacitance change	Within ±15% of initial value			
	tan δ	150% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.				
Marking	Printed with black color letter on orange sleeve according to JIS C-5141.				
Applicable Standards	JIS C-5141 and JIS C-5102.				

## Radial Lead Type



## Type numbering system (Example: 10V 47µF)



※ In case 105°C unit is required.

## Dimensions

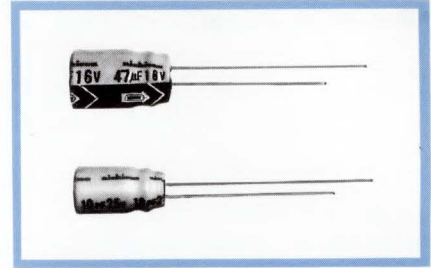
Cap. (µF)	V	D×L(mm)										
		Code	10		16		25		35		50	
		1A	1C		1E		1V		1H			
0.1	0R1										5×11	1.1
0.15	R15										5×11	1.6
0.22	R22										5×11	2.3
0.33	R33										5×11	3.5
0.47	R47										5×11	5.0
0.68	R68										5×11	7.3
1	O10										5×11	10.7
1.5	1R5										5×11	16
2.2	2R2										5×11	23
3.3	3R3										5×11	40
4.7	4R7						5×11	45			5×11	45
6.8	6R8						5×11	55			5×11	55
10	100			5×11	55		5×11	70			5×11	70
15	150			5×11	70		5×11	85	5×11	85	6.3×11	95
22	220			5×11	85		5×11	100	6.3×11	110	6.3×11	110
33	330			5×11	100		6.3×11	140	6.3×11	140	8×11.5	165
47	470			5×11	110		6.3×11	170	8×11.5	190	8×11.5	190
68	680			6.3×11	150		6.3×11	160	8×11.5	230	8×11.5	230
100	101			6.3×11	180		8×11.5	230	8×11.5	280	10×12.5	300
150	151			8×11.5	250		8×11.5	280	10×12.5	370		
220	221			8×11.5	310		10×12.5	370				
330	331			10×12.5	400							

# ALUMINUM ELECTROLYTIC CAPACITORS

**ZA** Low Noise Purposes series



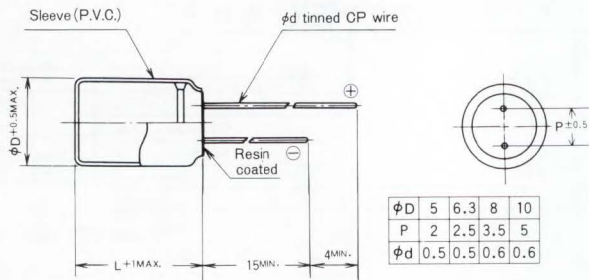
- Low noise and low leakage current series.
- Suited for use in audio devices and measuring instruments.
- Few change on leakage currents, even after severe high temperature shelf testing or shelf life test for a long period at normal temperature.



## Specifications

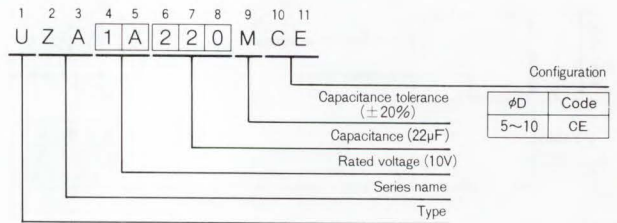
Item	Performance Characteristics								
Operating Temperature Range	-40~+85°C								
Voltage Range	6.3~100V								
Capacitance Range	0.47~47μF								
Capacitance Tolerance	±20% at 120Hz, 20°C								
Leakage Current	After 30 seconds' application of rated voltage, leakage current is not more than 0.004CV or 0.2(μA) whichever is greater.								
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C								
	Rated voltage (V)	6.3	10	16	25	35	50	63	100
	tan δ (MAX.)	0.22	0.20	0.17	0.15	0.12	0.10	0.10	0.10
Stability at Low Temperature	Measurement frequency : 120 Hz								
	Rated voltage (V)	6.3	10	16	25	35	50	63	100
	Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	2	2
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	8	6	4	4	4	4	4
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less				
			Capacitance change		Within ±15% of initial value				
			tan δ		150% or less of initial specified value				
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.								
Marking	Printed with black color letter on orange sleeve according to JIS C-5141.								
Applicable Standards	JIS C-5141 and JIS C-5102.								

## Radial Lead Type



φD	5	6.3	8	10
P	2	2.5	3.5	5
φd	0.5	0.5	0.6	0.6

## Type numbering system (Example: 10V 22μF)



## Dimensions

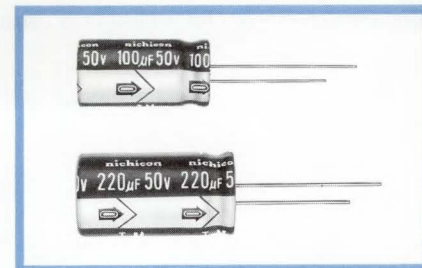
Cap. (μF)	Code	D×L (mm)							
		6.3	10	16	25	35	50	63	100
0.47	R47						5×11.5		5×11.5
1	010						5×11.5	5×11.5	6.3×11.5
2.2	2R2						5×11.5	5×11.5	6.3×11.5
3.3	3R3				5×11.5		6.3×11.5	6.3×11.5	8×13.5
4.7	4R7				5×11.5		6.3×11.5	8×13.5	10×13.5
10	100			5×11.5	6.3×11.5		8×13.5	8×13.5	
22	220	6.3×11.5	6.3×11.5	6.3×11.5	8×13.5	10×13.5	10×13.5		
33	330	6.3×11.5	6.3×11.5	8×13.5	8×13.5	10×13.5			
47	470	6.3×11.5	8×13.5	8×13.5	10×13.5				

**TM** Timer Circuit Use series



- Ideally suited for timer circuits.
- Excellent leakage current stability, even subjected to load or no load at high temperature for a long time.

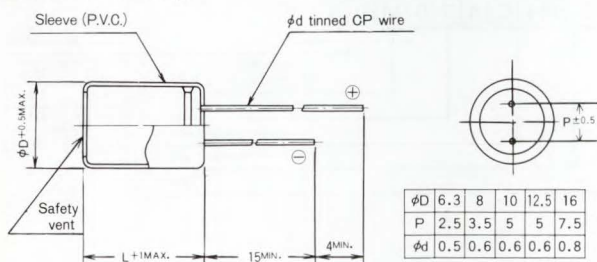
**TM** High Stability **KL 7**



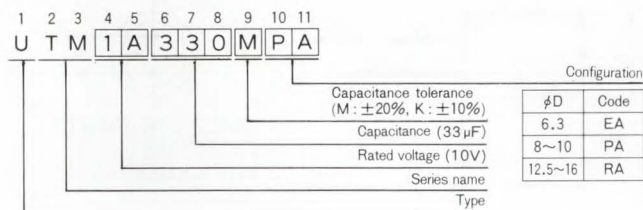
## Specifications

Item	Performance Characteristics					
Operating Temperature Range	-40~+85°C					
Voltage Range	10~50V					
Capacitance Range	1~470 µF					
Capacitance Tolerance	±20% (M) (±10% (K) semi-standard) at 120 Hz, 20°C					
Leakage Current	After 2 minutes' application of rated voltage, leakage current is 0.001CV+1 (µA) or less.					
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C					
	Rated voltage (V)	10	16	25	50	
	tan δ (MAX.)	0.17	0.13	0.10	0.08	
Stability at Low Temperature	Measurement frequency: 120 Hz					
	Rated voltage (V)	10	16	25	50	
	Impedance ratio Z-25°C/Z+20°C	2	2	1.5	1.5	
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	4	3	2	2
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less	
			Capacitance change		Within ±10% of initial value	
			tan δ		150% or less of initial specified value	
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the requirements for load life characteristics listed above.					
Marking	Printed with white color letter on dark blue sleeve according to JIS C-5141.					
Applicable Standards	JIS C-5141 and JIS C-5102.					

## Radial Lead Type



## Type numbering system (Example: 10V 33µF)



## Dimensions

Cap. (µF)	V	D × L (mm)			
		10	16	25	50
	Code	1 A	1 C	1 E	1 H
1	010				6.3×11
2.2	2R2				6.3×11
3.3	3R3			6.3×11	6.3×11
4.7	4R7			6.3×11	8×11.5
10	100		6.3×11	8×11.5	10×12.5
22	220	6.3×11	8×11.5	10×12.5	10×16
33	330	8×11.5	10×12.5	10×16	10×20
47	470	8×11.5	10×12.5	10×16	12.5×20
100	101	10×16	10×20	12.5×20	12.5×25
220	221	10×20	12.5×25	16×25	16×31.5
330	331	12.5×25	16×25	16×25	
470	471	12.5×25	16×25	16×31.5	

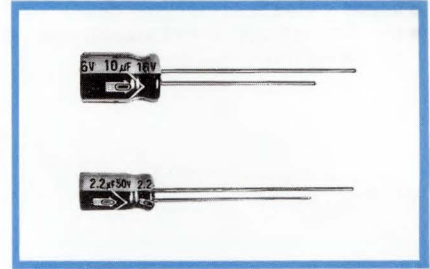
# ALUMINUM ELECTROLYTIC CAPACITORS

# SH

Vertical Time Constant Circuit Use  
series



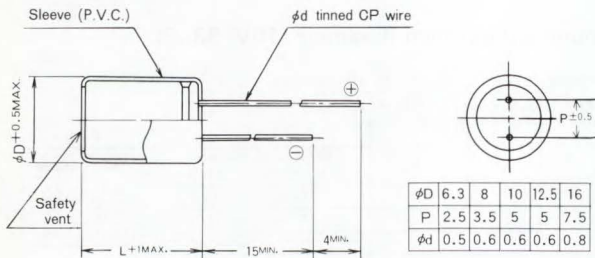
- Designed specifically for vertical time constant circuits of TVs.



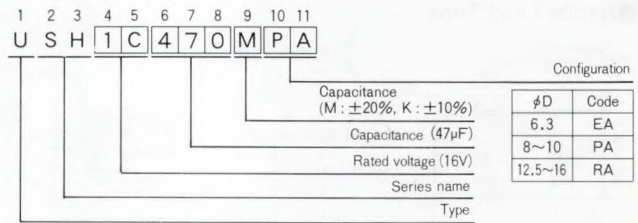
## Specifications

Item	Performance Characteristics				
Operating Temperature Range	-40~+85°C				
Voltage Range	16~50V				
Capacitance Range	0.47~470 µF				
Capacitance Tolerance	±20% (M) (±10% (K) semi-standard) at 120 Hz, 20°C				
Leakage Current	After 2 minutes' application of rated voltage, leakage current is 0.01CV+3 (µA) or less.				
tan δ	0.07 or less at 120 Hz, 20°C				
Stability at Low and High Temperature	Temperature	Capacitance change/20°C	tan δ (MAX.)	Impedance ratio/20°C (MAX.)	Measurement frequency : 120 Hz
	-40°C	within -20%	0.21	2	
	+85°C	within +20%	0.07	—	
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current	Initial specified value or less	
			Capacitance change	Within ±10% of initial value	
			tan δ	150% or less of initial specified value	
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.				
Marking	Printed with black color letter on red sleeve according to JIS C-5141.				
Applicable Standards	JIS C-5141 and JIS C-5102.				

## Radial Lead Type



## Type numbering system (Example: 16V 47µF)



## Dimensions

D × L (mm)

Cap. (µF)	V	D × L (mm)		
		16	25	50
	Code	1 C	1 E	1 H
0.47	R47			6.3×11
1	010			6.3×11
2.2	2R2			6.3×11
3.3	3R3		6.3×11	6.3×11
4.7	4R7		6.3×11	8×11.5
10	100	8×11.5	10×12.5	10×16
22	220	10×16	10×16	10×20
33	330	10×16	10×20	12.5×20
47	470	10×20	12.5×20	12.5×25
100	101	12.5×20	12.5×25	16×25
220	221	12.5×25	16×25	16×35.5
330	331	16×25	16×31.5	
470	471	16×35.5		

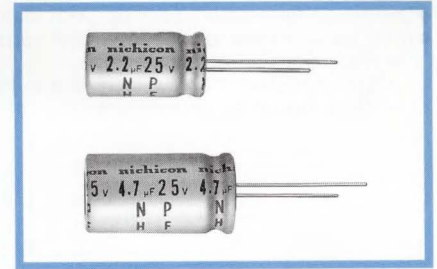


## HA series

Horizontal Deflection Current Correction Use



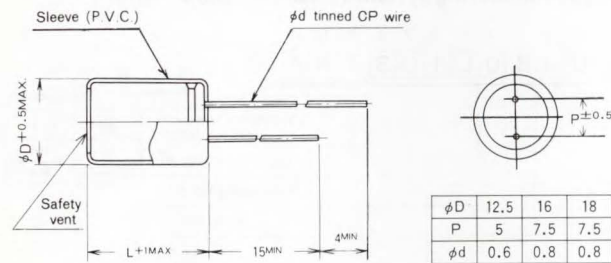
- Designed specifically for horizontal deflection current correction of TVs where high frequencies and high ripple currents are applied.



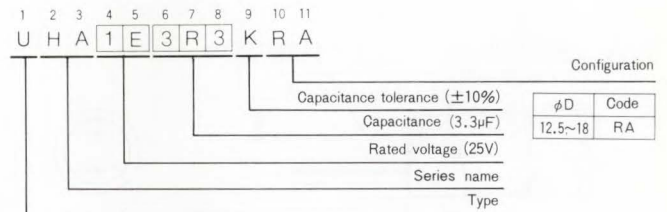
### Specifications

Item	Performance Characteristics	
Operating Temperature Range	-25~+85°C	
Voltage Range	25V, 50V	
Capacitance Range	2.2~10µF	
Capacitance Tolerance	±10% at 120 Hz, 20°C	
Leakage Current	After 5 minutes' application of rated voltage, leakage current is 100 (µA) or less.	
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C	
	Rated voltage (V)	25, 50
	tan δ (MAX.)	0.05
Load Life	After 1000 hours' application of DC 12V on which the specified allowable ripple current is superimposed at 70°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±15% of initial value
	tan δ	200% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 85°C for 500 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.	
Marking	Printed with blue color letter on light blue sleeve according to JIS C-5141.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

### Radial Lead Type



### Type numbering system (Example: 25V 3.3µF)



### Dimensions

Cap. (µF)	Code	V	
		25, 50	1 E, 1 H
2.2	2R2	12.5X25	5
3.3	3R3	16X25	6
4.7	4R7	16X31.5	7
5.6	5R6	16X31.5	7.5
6.8	6R8	16X35.5	8
10	100	18X35.5	10

Case size(mm) Allowable ripple(A)  
Ripple (Ap-p) at 70°C 15.75 kHz.

# ALUMINUM ELECTROLYTIC CAPACITORS



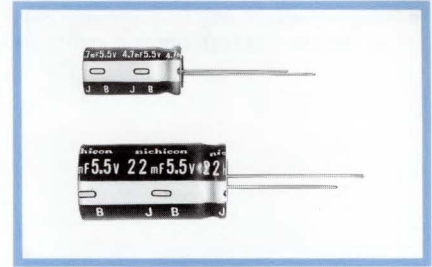
Memory Back-Up Use

series



Anti-Solvent Feature

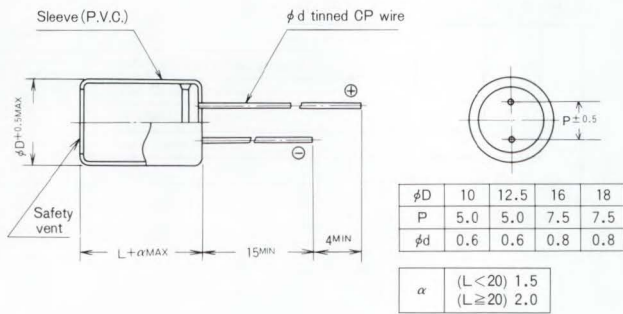
- Developed for memory back-up, with load life of 1000 hours at +85°C.
- Superior to electric double layer type capacitors in the following characteristics:
  - Better voltage maintenance.
  - Speedier charge-up available due to low impedance feature.
  - Wider operating temperature range of -25~+85°C.



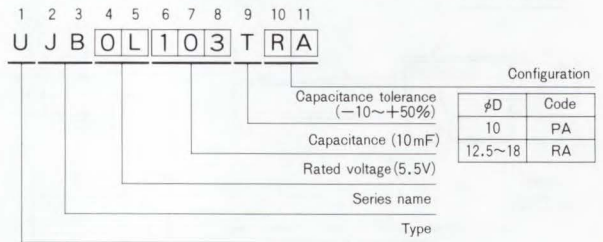
## Specifications

Item	Performance Characteristics																							
Operating Temperature Range	-25~+85°C																							
Voltage Range	5.5V																							
Capacitance Range	2.2~47mF See Note 1																							
Capacitance Tolerance	-10~+50%																							
Leakage Current	C(μA) (C=Rated capacitance value in mF) See Note 2																							
Voltage Maintenance	More than 3.5V See Note 3																							
Stability at Low Temperature	Capacitance(-25°C)/Capacitance(20°C)×100≥70%																							
Impedance See Note 4	Capacitance (mF)	2.2	3.3	4.7	8.2	10	18	22	27	33	39	47												
	Impedance (Ω)	1.5	1.0	0.6	0.3	0.4	0.2	0.2	0.2	0.2	0.1	0.1												
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.																							
													Leakage current	Initial specified value or less										
													Capacitance change	Within ±30% of initial value										
													Impedance	Within 4 times of initial specified value										
Shelf Life	After leaving capacitors under no load at 85°C for 500 hours and applying voltage according to JIS C-5102 4-3, they meet the requirements for load life characteristics listed above.																							
	Marking Printed with white color letter on black sleeve according to JIS C-5141.																							
Applicable Standards	JIS C-5141 and JIS C-5102.																							

## Radial Lead Type



## Type numbering system (Example: 5.5V 10mF)



Ratings (V—mF)	Case Size φD×L (mm)
5.5—2.2	10×12.5
5.5—3.3	10×16
5.5—4.7	10×20
5.5—8.2	12.5×20
5.5—10	12.5×25
5.5—18	16×25
5.5—22	16×31.5
5.5—27	16×35.5
5.5—33	18×31.5
5.5—39	18×35.5
5.5—47	18×40

### Note:

1. After charging a capacitor at the rated voltage of 5.5V for an hour, the capacitance is calculated by the following formula, measuring the time of duration, ΔT(Sec.) from 4V down to 3V when constant current discharge at i(mA)=0.02X nominal capacitance is carried out.  
 Capacitance (mF)=i×ΔT
2. Current value (20°C) after applying the rated voltage of 5.5V for an hour.
3. Voltage value maintained after the capacitor is subjected to 1 hour voltage application at 5V and then left at room temperature (lower than 25°C) for 24 hours.
4. Measuring Frequency: 1kHz (20°C)

# ALUMINUM ELECTROLYTIC CAPACITORS



High Grade Type, For Audio Equipment  
series



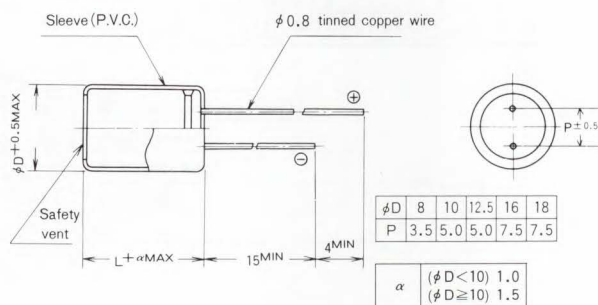
- High grade "nichicon MUSE" acoustic series.
- Ideally suited for first class audio equipment where qualitative and quantitative comfortableness is required.



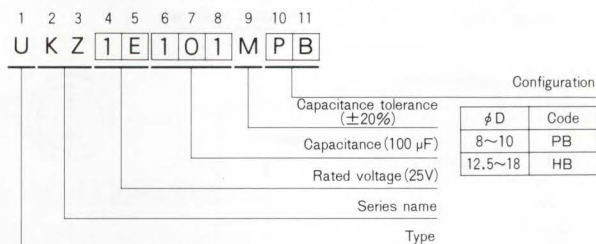
## Specifications

Item	Performance Characteristics			
Operating Temperature Range	-40~+85°C			
Voltage Range	25~100V			
Capacitance Range	10~1000 μF			
Capacitance Tolerance	±20% at 120 Hz, 20°C			
Leakage Current	After 1 minute's application of rated voltage, leakage current is 0.01CV or less.			
tan δ	Measurement frequency : 120 Hz, Temperature : 20°C			
	Rated voltage (V)	25	50	100
Stability at Low Temperature	Measurement frequency : 120 Hz			
	Rated voltage (V)	25	50	100
Load Life	Z-25°C / Z+20°C		Z-40°C / Z+20°C	
	Impedance ratio	2	2	2
Shelf Life	Z-25°C / Z+20°C		Z-40°C / Z+20°C	
	ZT/Z20 (MAX.)	4	3	3
Marking	Leakage current		Initial specified value or less	
	Capacitance change		Within ±20% of initial value	
	tan δ		150% or less of initial specified value	
Applicable Standards	JIS C-5141 and JIS C-5102.			

## Radial Lead Type



## Type numbering system (Example: 25V 100μF)



## Dimensions

DXL (mm)

Cap. (μF)	Code	V		
		25	50	100
10	100	1 E	1 H	2 A
22	220		8×11.5	10×16
33	330	8×11.5	10×12.5	10×20
47	470	10×12.5	10×16	12.5×20
100	101	10×16	12.5×20	16×25
220	221	12.5×20	16×25	16×35.5
330	331	12.5×25	16×31.5	18×35.5
470	471	16×25	16×35.5	
1000	102	16×35.5	18×40	



# ALUMINUM ELECTROLYTIC CAPACITORS



Miniature Sized, For Audio Equipment



Smaller

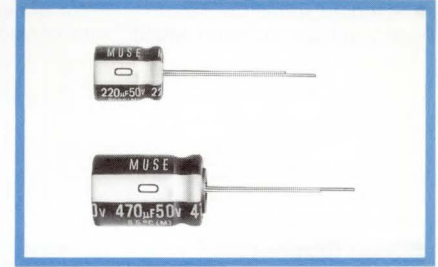
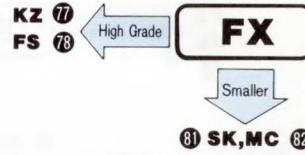


For Audio Use



Anti-Solvent Feature

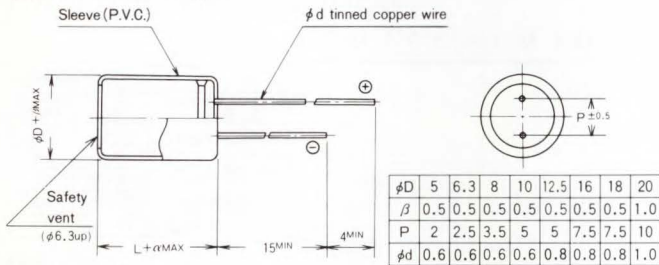
- Miniature sized "nichicon MUSE" acoustic series.
- Suited for use in audio devices where lighter, thinner, shorter and smaller capacitors are required.



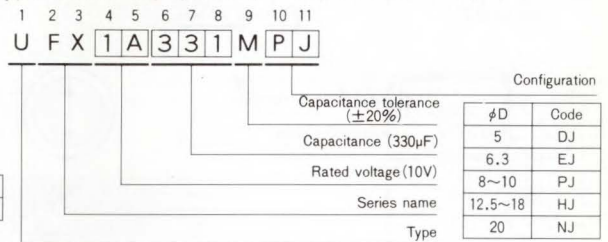
## Specifications

Item	Performance Characteristics									
Operating Temperature Range	-40~+85°C									
Voltage Range	6.3~100V									
Capacitance Range	0.1~22000 µF									
Capacitance Tolerance	±20% at 120 Hz, 20°C									
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3 (µA), whichever is greater. After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4 (µA), whichever is greater.									
tan δ	For capacitance of more than 1000 µF, add 0.02 for every increase of 1000 µF. Measurement frequency : 120 Hz, Temperature : 20°C									
	Rated voltage (V)	6.3	10	16	25	35	50	63	100	
tan δ (MAX.)										
		0.26	0.22	0.18	0.16	0.14	0.12	0.10	0.10	
Stability at Low Temperature	Measurement frequency : 120 Hz									
	Rated voltage (V)		6.3	10	16	25	35	50	63	100
	Impedance ratio	Z-25°C / Z+20°C	4	3	2	2	2	2	2	2
ZT/Z20 (MAX.)		Z-40°C / Z+20°C	10	8	6	4	3	3	3	
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less					
			Capacitance change		Within ±20% of initial value					
			tan δ		200% or less of initial specified value					
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.									
Marking	Printed with silver color letter on emerald green sleeve according to JIS C-5141.									
Applicable Standards	JIS C-5141 and JIS C-5102.									

## Radial Lead Type



## Type numbering system (Example: 10V 330µF)



## Dimensions

D×L (mm)

V	6.3	10	16	25	35	50	63	100
Cap. (µF)	0 J	1 A	1 C	1 E	1 V	1 H	1 J	2 A
Code								
0.1	0R1					5×11	1.1	5×11
0.22	R22					5×11	2.3	5×11
0.33	R33					5×11	3.5	5×11
0.47	R47					5×11	5	5×11
1	010					5×11	10	5×11
2.2	2R2			5×11	40	5×11	23	5×11
3.3	3R3					5×11	35	5×11
4.7	4R7				5×11	30	5×11	40
10	100			5×11	50	5×11	50	5×11
22	220	5×11	35	5×11	55	5×11	70	5×11
33	330	5×11	55	5×11	75	5×11	85	5×11
47	470	5×11	75	5×11	90	5×11	95	5×11
100	101	5×11	120	5×11	130	6.3×11	160	6.3×11
220	221	6.3×11	200	6.3×11	220	8×11.5	280	8×11.5
330	331	6.3×11	250	8×11.5	310	8×11.5	340	10×12.5
470	471	8×11.5	340	8×11.5	370	10×12.5	440	10×16
1000	102	10×12.5	530	10×16	600	10×20	700	12.5×20
2200	222	12.5×20	930	12.5×20	1000	12.5×25	1100	16×25
3300	332	12.5×20	1050	12.5×25	1200	16×25	1350	16×31.5
4700	472	16×25	1300	16×25	1400	16×31.5	1550	18×35.5
6800	682	16×25	1500	16×31.5	1650	18×35.5	1850	20×40
10000	103	16×31.5	1700	18×35.5	1850	18×40	2000	
15000	153	18×35.5	1950	18×40	2050			
22000	223	20×40	2200					
								Allowable ripple

Allowable Ripple (mA) at 85°C 120Hz



# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

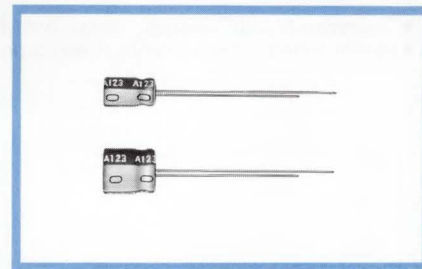


7mmL, For Audio Equipment

series



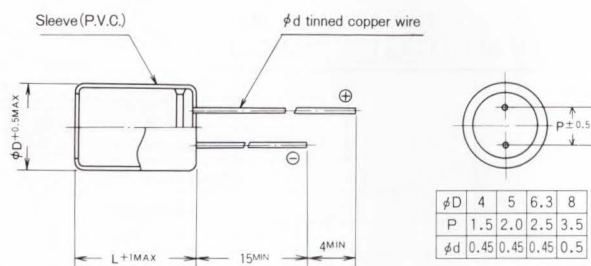
- "nichicon MUSE" acoustic series, with 7mm height.
- Ideally suited for Hi-Fi VTR, car stereos, car CD players, etc.



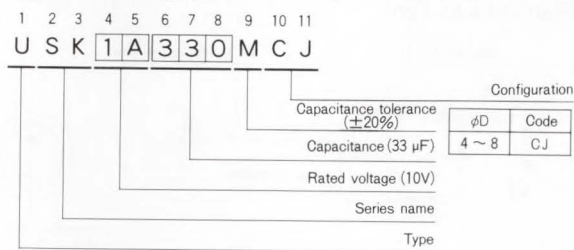
## Specifications

Item	Performance Characteristics						
Operating Temperature Range	-40~+85°C						
Voltage Range	6.3~50V						
Capacitance Range	0.1~220μF						
Capacitance Tolerance	±20% at 120 Hz, 20°C						
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01 CV or 3 (μA), whichever is greater.						
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C						
	Rated voltage (V)	6.3	10	16	25	35	50
Stability at Low Temperature	Measurement frequency: 120 Hz						
	Impedance ratio	Z-25°C / Z+20°C	4	3	2	2	2
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirement listed at right.		Leakage current		Initial specified value or less		
			Capacitance change		Within ±20% of initial value		
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.		tan δ		200% or less of initial specified value		
Marking	Printed with white color letter on black sleeve according to JIS C-5141.						
Applicable Standards	JIS C-5141 and JIS C-5102.						

## Radial Lead Type



## Type numbering system (Example: 10V 33μF)



## Dimensions

Cap. (μF)	Code	D×L(mm)													
		V		6.3		10		16		25		35		50	
0.1	0R1	0 J		1 A		1 C		1 E		1 V		1 H		4×7	1.0
0.22	R22													4×7	2.3
0.33	R33													4×7	3.5
0.47	R47													4×7	5.0
1	010													4×7	10
2.2	2R2													4×7	19
3.3	3R3													4×7	24
4.7	4R7									4×7		24	5×7	29	
10	100					4×7		29	5×7	33	5×7	36	6.3×7	44	
22	220	4×7	34	5×7	38	5×7	44	6.3×7	51	6.3×7	57	8×7	65		
33	330	5×7	42	5×7	47	6.3×7	57	6.3×7	63	8×7	72				
47	470	5×7	50	6.3×7	59	6.3×7	68	8×7	78						
100	101	6.3×7	77	8×7	96	8×7	107								
220	221	8×7	130											Case size	

Allowable Ripple(mA) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

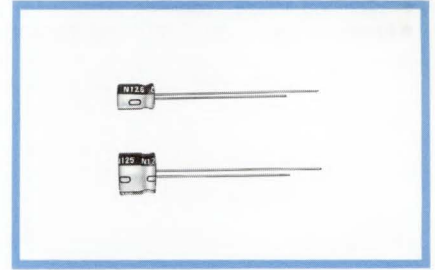
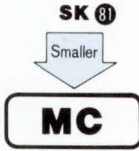


5mmL, For Audio Equipment

series



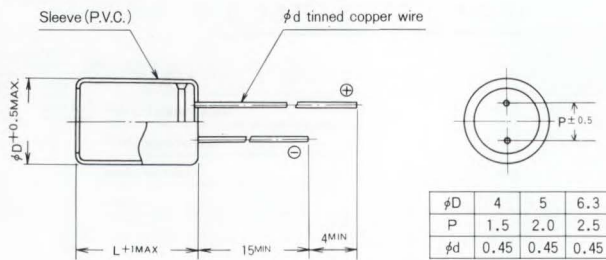
- "nichicon MUSE" acoustic series, with 5mm height.
- Ideally suited for very compact audio products in very thin and small dimensions.



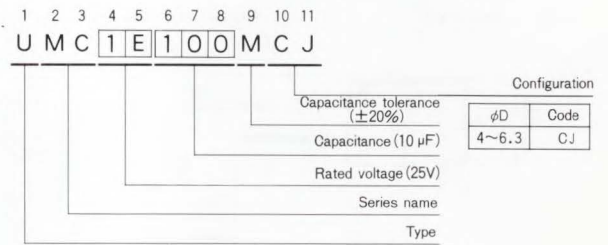
## Specifications

Item	Performance Characteristics								
Operating Temperature Range	-40~+85°C								
Voltage Range	4~50V								
Capacitance Range	0.1~220μF								
Capacitance Tolerance	±20% at 120Hz, 20°C								
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(μA), whichever is greater.								
tan δ	Measurement frequency: 120Hz, Temperature: 20°C								
	Rated voltage (V)	4	6.3	10	16	25	35	50	
	tan δ (MAX.)	0.35	0.24	0.20	0.16	0.14	0.12	0.10	
Stability at Low Temperature	Measurement frequency: 120Hz								
	Rated voltage (V)	4	6.3	10	16	25	35	50	
	Impedance ratio	Z-25°C/Z+20°C	7	4	3	2	2	2	2
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	15	8	6	4	4	3	3
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirement listed at right.	Leakage current	Initial specified value or less						
		Capacitance change	Within ±20% of initial value						
		tan δ	200% or less of initial specified value						
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.								
Marking	Printed with white color letter on black sleeve according to JIS C-5141.								
Applicable Standards	JIS C-5141 and JIS C-5102.								

## Radial Lead Type



## Type numbering system (Example: 25V 10μF)



## Dimensions

Cap. (μF)	Code	4		6.3		10		16		25		35		50		D×L(mm)	Allowable ripple
		V	0 G	0 J	1 A	1 C	1 E	1 V	1 H								
0.1	0R1														4×5	1.0	
0.22	R22														4×5	2.0	
0.33	R33														4×5	2.8	
0.47	R47														4×5	4.0	
1	010														4×5	8.4	
2.2	2R2														4×5	13	
3.3	3R3														4×5	17	
4.7	4R7														4×5	20	
10	100							4×5	23	5×5	16	4×5	18	5×5	29	6.3×5	33
22	220			4×5	28	5×5	33	5×5	37	6.3×5	27	6.3×5	29	6.3×5	46		
33	330	4×5	28	5×5	37	5×5	41	6.3×5	49	6.3×5	52						
47	470	4×5	33	5×5	45	6.3×5	52	6.3×5	58								
100	101	5×5	56	6.3×5	70												
220	221	6.3×5	96														

Allowable Ripple(mA) at 85°C 120Hz



# ALUMINUM ELECTROLYTIC CAPACITORS

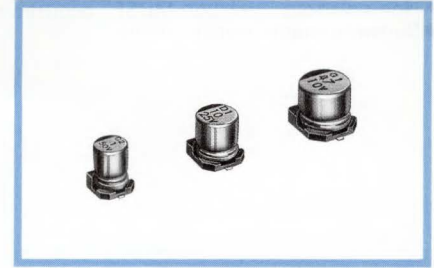
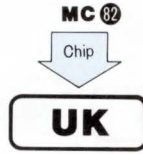
nichicon



6mmL Chip Type. For Audio Equipment series



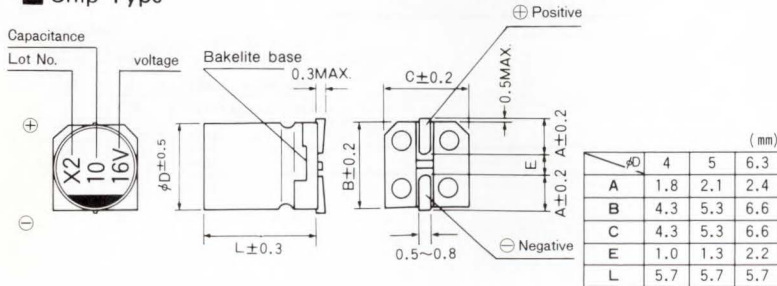
- Chip type "nichicon MUSE" acoustic series.
- Applicable to automatic insertion machine using carrier tape.



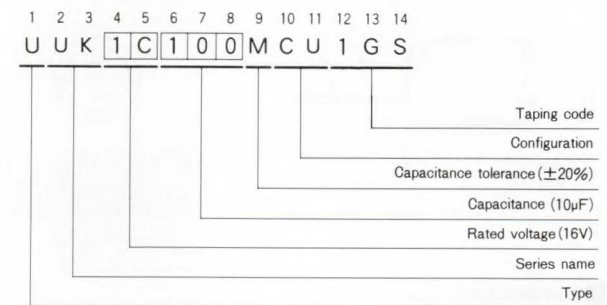
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	4~50V							
Capacitance Range	0.1~220μF							
Capacitance Tolerance	±20% at 120Hz, 20°C							
Leakage Current	After 2 minutes' application of rated voltage, leakage current is not more than 0.01 CV or 3 (μA), whichever is greater.							
tan δ	Measurement frequency: 120Hz, Temperature: 20°C							
	Rated voltage (V)	4	6.3	10	16	25	35	50
Stability at Low Temperature	Measurement frequency: 120Hz							
	Rated voltage (V)	4	6.3	10	16	25	35	50
	Impedance ratio Z-25°C/Z+20°C	7	4	3	2	2	2	2
Load Life	After 2000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed at right.		Leakage Current		Initial specified value or less			
			Capacitance change		Within ±20% of initial value			
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102, 4-3, they meet the specified value for load life characteristics listed above.		tan δ		200% or less of initial specified value			
Resistance to soldering heat	The capacitors shall be kept on the hot plate maintained at 250°C for 30 seconds. After removing from the hot plate and restored at room temperature, they meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less			
			Capacitance change		Within ±10% of initial value			
Marking	Black print on the case top.		tan δ		Initial specified value or less			
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Chip Type



## Type numbering system (Example: 16V 10μF)



## Dimensions

Cap. (μF)	Code	V		4		6.3		10		16		25		35		50		
		0G	0J	1A	1C	1E	1V	1H										
0.1	0R1																4	1.0
0.22	R22																4	2.0
0.33	R33																4	2.8
0.47	R47																4	4.0
1	010																4	8.4
2.2	2R2																4	13
3.3	3R3																4	17
4.7	4R7																4	20
10	100																5	33
22	220																6.3	33
33	330	4	28	5	37	5	41	6.3	49	6.3	52						6.3	46
47	470	4	33	5	45	6.3	52	6.3	58								6.3	58
100	101	5	56	6.3	70												6.3	70
220	221	6.3	96														6.3	96

• Taping Specifications are given in page. 12

Allowable Ripple (mA) at 85°C 120Hz

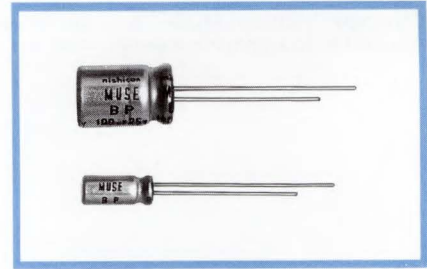
# ALUMINUM ELECTROLYTIC CAPACITORS



Non-Polarized, For Audio Equipment  
series



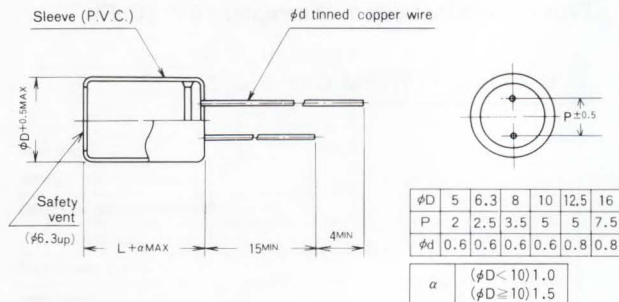
- Non-polarized "nichicon MUSE" acoustic series.
- Suited for audio signal circuits.



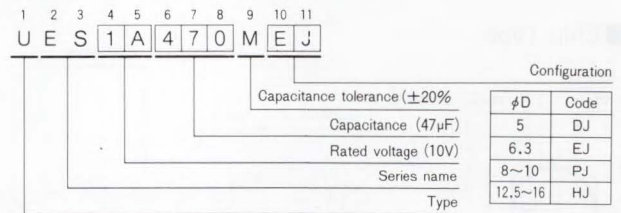
## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+85°C							
Voltage Range	6.3~50V							
Capacitance Range	0.47~1000 $\mu$ F							
Capacitance Tolerance	$\pm$ 20% at 120Hz, 20°C							
Leakage Current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 3( $\mu$ A), whichever is greater.							
tan $\delta$	Measurement frequency : 120Hz, Temperature : 20°C							
	Rated voltage (V)	6.3	10	16	25	35	50	
	tan $\delta$ (MAX.)	0.24	0.20	0.16	0.16	0.14	0.12	
Stability at Low Temperature	Measurement frequency : 120Hz							
	Rated voltage (V)		6.3	10	16	25	35	50
	Impedance ratio	Z-25°C/Z+20°C	4	3	2	2	2	2
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	8	6	4	4	4	4
Load Life	After 1000 hours' application of rated voltage at 85°C with the polarity inverted every 250 hours, capacitors meet the characteristics requirement listed at right.							
	Leakage current	Initial specified value or less						
	Capacitance change	Within $\pm$ 20% of initial value						
	tan $\delta$	150% or less of initial specified value						
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.							
Marking	Printed with black color letter on clear green sleeve according to JIS C-5141.							
Applicable Standards	JIS C-5141 and JIS C-5102.							

## Radial Lead Type



## Type numbering system (Example: 10V 47 $\mu$ F)



## Dimensions

Cap. ( $\mu$ F)	Code	D X L (mm)					
		6.3	10	16	25	35	50
0.47	R47	0 J	1 A	1 C	1 E	1 V	1 H
1	010						5X11
2.2	2R2						5X11
3.3	3R3						5X11
4.7	4R7						5X11
10	100			5X11	5X11	6.3X11	8X11.5
22	220		5X11	6.3X11	6.3X11	8X11.5	10X12.5
33	330	5X11	6.3X11	6.3X11	8X11.5	10X12.5	10X16
47	470	6.3X11	6.3X11	8X11.5	10X12.5	10X12.5	10X20
100	101	8X11.5	10X12.5	10X12.5	10X16	10X20	12.5X25
220	221	10X12.5	10X16	10X20	12.5X25	12.5X25	16X25
330	331	10X16	10X20	12.5X20	12.5X25	16X25	16X31.5
470	471	10X20	12.5X20	12.5X25	16X25	16X25	
1000	102	12.5X25	16X25	16X25	16X31.5		

## DB.GB

Bi-Polarized, For Speaker Network

series

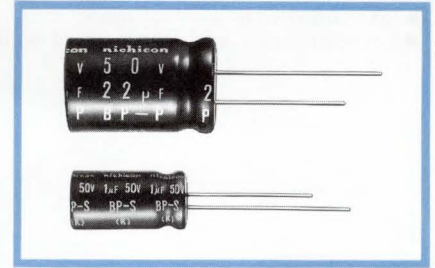


For Audio Use



Anti-Solvent Feature

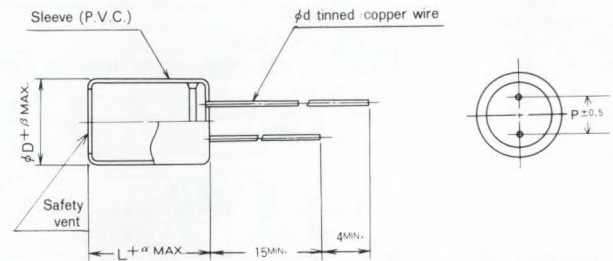
- Bi-polarized series.
- Designed specifically for crossover networks in Hi-Fi sound systems.



### Specifications

Performance Characteristics	DB series	GB series
Operating Temperature Range	-40~+85°C	-40~+85°C
Voltage Range	50V	50V
Capacitance Tolerance	±20% at 1kHz	±10% at 1kHz
Leakage Current (After 5 minutes' application of rated voltage)	0.03CV or 3(µA)	0.03CV or 3(µA)
tan δ (MAX.) (1 kHz) (5 kHz)	0.10 or less 0.15 or less	0.05 or less 0.05 or less
Allowable Continuous Current (8 Ω-fo)	Value in table or less	Value in table or less
Marking	Printed with white color letter on dark green sleeve.	
Applicable Standards	EIAJ RC 3803	EIAJ RC 3803

### Radial Lead Type



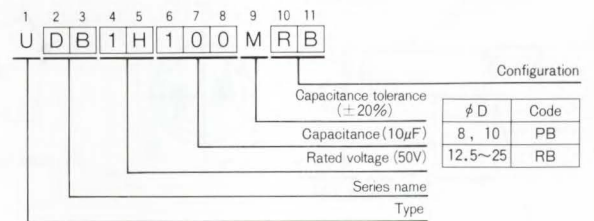
φD	8	10	12.5	16	18	22	25
P	3.5	5	5	7.5	7.5	10	12.5
φd	0.8	0.8	0.8	0.8	0.8	1.0	1.0
α	1	1	1	1	1	2	2
β	0.5	0.5	0.5	0.5	0.5	1	1

### Dimensions

D × L (mm)

Cap. (µF)	Series Code	DB		GB		Allowable ripple (mA rms)		
		1H (50V)	50V	Frequency (Hz)	DB	GB		
1	010	8×11.5	10×20	20k	205	760		
1.5	1R5	8×11.5	12.5×20	13k	245	800		
2.2	2R2	10×12.5	12.5×20	9k	320	820		
3.3	3R3	10×16	16×25	6k	400	850		
4.7	4R7	10×20	16×25	4.2k	480	890		
6.8	6R8	12.5×20	16×31.5	2.9k	540	920		
10	100	12.5×25	18×35.5	2k	600	970		
15	150	12.5×25	22×40	1.3k	660	1040		
22	220	16×25	22×40	900	740	1060		
33	330	16×31.5	25×40	600	800	1120		
47	470	18×35.5	—	420	1020	—		
68	680	22×40	—	290	1200	—		

### Type numbering system (Example: DB series 50V 10µF)



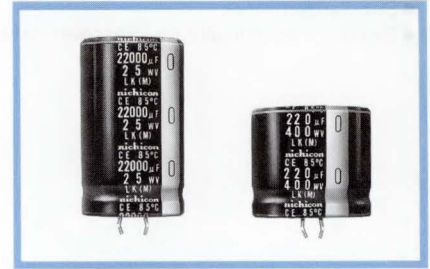
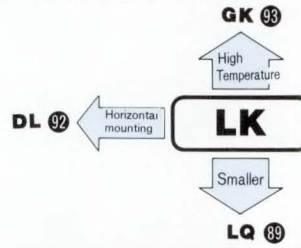
# ALUMINUM ELECTROLYTIC CAPACITORS

**LK** Snap-in Terminal Type, Standard series



Approved by Reliability Center for Electronic Component, Japan-Certification No. RCJ-03-25C

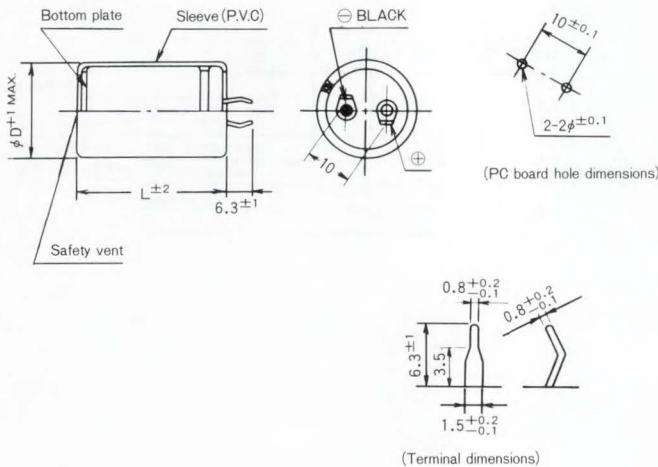
- Standard snap-in terminal series.
- Extended capacitance ranges based on the numerical values in E12 series under JIS.



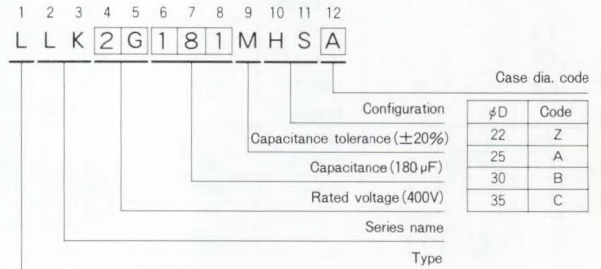
## Specifications

Item	Performance Characteristics													
Operating Temperature Range	-40~+85°C (16~250V) ,	-25~+85°C (400・450V)												
Voltage Range	16~450V													
Capacitance Range	47~33000µF													
Capacitance Tolerance	±20% at 120Hz, 20°C													
Leakage Current	I ≤ 3 / CV (µA) (After 5 minutes' application of rated voltage) [C: Capacitance (µF), V: Voltage (V)]													
tan δ	Measurement frequency: 120Hz, Temperature: 20°C													
	Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	400	450	
	tan δ (MAX.)	0.5	0.4	0.35	0.3	0.25	0.2	0.2	0.15	0.10	0.10	0.20	0.20	
Stability at Low Temperature	Measurement frequency: 120Hz													
	Rated voltage (V)		16~100			160~250			400~450					
	Impedance ratio	Z-25°C / Z+20°C	4			3			8					
	ZT / Z20 (MAX.)	Z-40°C / Z+20°C	15			12								
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 85°C, capacitors meet the characteristics requirements listed at right.													
	Leakage current		Initial specified value or less											
	Capacitance change		Within ±20% of initial value											
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours, they meet the requirements listed at right.													
	Leakage current		Initial specified value or less											
	Capacitance change		Within ±15% of initial value											
	tan δ		150% or less of initial specified value											
Marking	Printed with white color letter on black sleeve.													
Applicable Standards	JIS C-5141 and JIS C-5102.													

## Drawing



## Type numbering system (Example: 400V 180µF)



• Dimension table in next page.

# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

LK series

## ■ Dimensions

D×L (mm)

Cap. (μF)	V (Code) Code	φD	16 (1C)				25 (1E)				35 (1V)				50 (1H)					
			22	25	30	35	22	25	30	35	22	25	30	35	22	25	30	35		
2200	222																22×25			
																	1.85			
2700	272																22×30			
																	2.10			
3300	332										22×25						22×35	25×25		
											2.20						2.35	2.35		
3900	392										22×30						22×35	25×30		
											2.25						2.50	2.50		
4700	472									22×25	22×30	25×25					22×40	25×35	30×25	
										1.90	2.40	2.40					2.80	2.80	2.80	
5600	562									22×30	22×35	25×30					22×45	25×40	30×30	
										2.25	2.75	2.75					3.30	3.30	3.30	
6800	682	22×25								22×35	25×25						22×50	25×40	30×35	
		2.50								2.55	2.55						3.80	3.80	3.80	
8200	822	22×30								22×40	25×30	30×25					25×50	30×40	35×30	
		2.65								3.10	3.10	3.20					4.30	4.35	4.25	
10000	103	22×30	25×25							22×45	25×35	30×30						30×45	35×35	
		2.85	2.85							3.40	3.40	3.40						4.75	4.70	
12000	123	22×35	25×30							22×50	25×40	30×30					25×50	30×40	35×30	
		3.25	3.25							4.00	3.90	3.85					4.45	4.50	4.40	
15000	153	22×40	25×35	30×25						25×45	30×35	35×30					30×45	35×35		
		3.70	3.75	3.65						3.75	4.45	4.45					5.00	5.00		
18000	183	22×50	25×40	30×30						30×40	35×35						30×50	35×40		
		4.35	4.25	4.20						5.00	5.10						5.55	5.50		
22000	223		25×45	30×35	35×30					30×50	35×40						35×50			
			4.80	4.80	4.80					5.80	5.75						6.25			
27000	273			30×40	35×30						35×50									
				5.20	5.15						6.60									
33000	333			30×45	35×40															
				5.80	5.90															

Cap. (μF)	V (Code) Code	φD	63 (1J)				80 (1K)				100 (2A)			
			22	25	30	35	22	25	30	35	22	25	30	35
820	821										22×25			
											1.20			
1000	102										22×30	25×25		
											1.50	1.50		
1200	122									22×25	22×35	25×30		
										1.30	1.75	1.75		
1500	152									22×30	25×25			
										1.80	1.80			
1800	182	22×25								22×35	25×30			
		1.70								2.05	2.05			
2200	222	22×30	25×25							22×40	25×30	30×25		
		2.30	2.30							2.30	2.30	2.30		
2700	272	22×35	25×30							22×45	25×35	30×30		
		2.40	2.45							2.50	2.45	2.50		
3300	332	22×40	25×35	30×25						22×50	25×40	30×30		
		2.75	2.80	2.75						2.95	2.85	2.80		
3900	392	22×45	25×35	30×30						25×45	30×35			
		3.00	2.90	3.00						3.20	3.20			
4700	472	22×50	25×40	30×30						25×50	30×40	35×30		
		3.30	3.25	3.20						3.75	3.80	3.70		
5600	562		25×45	30×35							30×45	35×35		
			3.75	3.75							4.40	4.35		
6800	682			30×40	35×30						30×50	35×40		
				4.20	4.15						4.80	4.80		
8200	822			30×45	35×35						35×45			
				4.70	4.65						5.35			
10000	103				35×40									
					5.20									
12000	123				35×50									
					6.10									

Allowable Ripple (A) at 85°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS



## ■ Dimensions

D×L(mm)

Cap. (μF)	Code	V (Code)		160(2C)				200(2D)				250(2E)							
		Code	φD	22	25	30	35	22	25	30	35	22	25	30	35				
180	181														22×25 0.95				
220	221							22×25 1.10							22×30 1.15	25×25 1.15			
270	271							22×30 1.25							22×35 1.25	25×30 1.25			
330	331	22×25 1.30						22×30 1.40	25×25 1.40						22×40 1.45	25×30 1.45	30×25 1.45		
390	391	22×30 1.50	25×25 1.55					22×35 1.60	25×30 1.60						22×45 1.70	25×35 1.70	30×30 1.70		
470	471	22×35 1.75	25×30 1.75					22×40 1.80	25×35 1.80	30×25 1.75					22×50 1.90	25×40 1.90	30×35 1.90	35×25 1.90	
560	561	22×35 1.90	25×30 1.90	30×25 1.95				22×45 2.00	25×35 2.00	30×30 2.05					25×45 2.15	30×35 2.15	35×30 2.15		
680	681	22×40 2.15	25×35 2.20	30×30 2.20				25×40 2.25	30×35 2.25	35×25 2.30							30×40 2.40	35×30 2.35	
820	821	22×50 2.45	25×40 2.45	30×30 2.45	35×25 2.50			25×50 2.55	30×40 2.60	35×30 2.50							30×45 2.75	35×35 2.75	
1000	102		25×45 2.80	30×35 2.80	35×30 2.85					30×45 2.95	35×35 2.90								35×40 3.00
1200	122		25×50 3.10	30×40 3.20	35×35 3.25					30×50 3.40	35×40 3.40								35×50 3.50
1500	152			30×45 3.70	35×40 3.75						35×45 3.80								
1800	182				35×40 4.00						35×50 4.15								
2200	222				35×50 4.50														

Cap. (μF)	Code	V (Code)		400(2G)				450(2W)											
		Code	φD	22	25	30	35	22	25	30	35								
47	470							22×25 0.49											
56	560							22×30 0.57											
68	680	22×25 0.58						22×30 0.63	25×25 0.63										
82	820	22×30 0.60						22×35 0.74	25×30 0.75										
100	101	22×30 0.77	25×25 0.77					22×40 0.88	25×35 0.89	30×25 0.86									
120	121	22×35 0.86	25×30 0.86					22×45 0.96	25×40 0.98	30×30 0.96	35×25 0.99								
150	151	22×40 0.97	25×30 0.92	30×25 0.96					25×45 1.10	30×35 1.10	35×30 1.13								
180	181	22×45 1.10	25×35 1.06	30×30 1.11	35×25 1.13				25×50 1.24	30×40 1.18	35×30 1.22								
220	221	22×50 1.25	25×40 1.22	30×35 1.28	35×30 1.32					30×45 1.42	35×35 1.40								
270	271		25×45 1.39	30×40 1.47	35×30 1.46					30×50 1.62	35×40 1.61								
330	331			30×45 1.68	35×35 1.70						35×45 1.83								
390	391			30×50 1.95	35×40 1.93						35×50 2.10								
470	471				35×45 2.23														
560	561				35×50 2.54														

Allowable Ripple (A) at 85°C 120Hz

### ● Frequency coefficient of allowable ripple current

Coef.	Frequency (Hz)	50	60	120	1 k	10k~
		16~100V	0.88	0.90	1.00	1.15
160~250V	0.85	0.88	1.00	1.15	1.20	
400·450V	0.88	0.90	1.00	1.10	1.15	

### ● Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85
Coefficient	1.48	1.42	1.30	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS



Snap-in Terminal Type, Small-Sized  
series

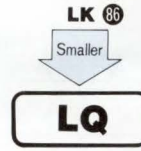


Smaller



Anti-Solvent  
Feature  
(Through 100V only)

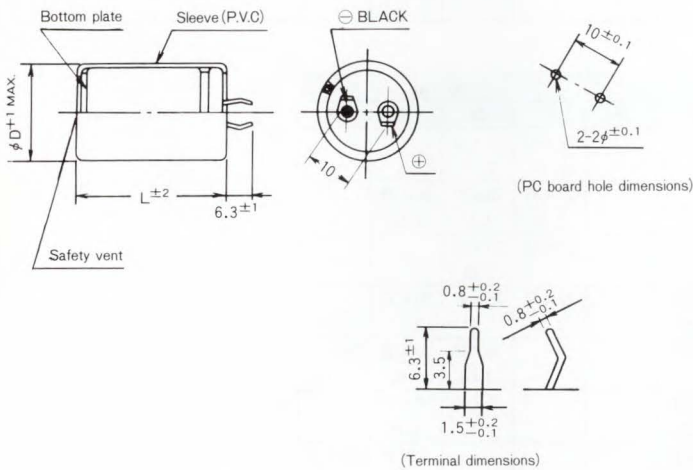
- Much smaller case sizes than standard LK series.
- Working voltage ranges extended from 16V to 450V.



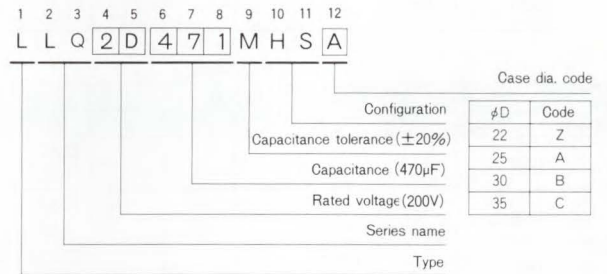
## Specifications

Item	Performance Characteristics																									
Operating Temperature Range	-40~+85°C (16~250V), -25~+85°C (400·450V)																									
Voltage Range	16~450V																									
Capacitance Range	56~56000μF																									
Capacitance Tolerance	±20% at 120Hz, 20°C																									
Leakage Current	$I \leq 3 \sqrt{CV}$ (μA) (After 5 minutes' application of rated voltage) [C: Capacitance (μF), V: Voltage (V)]																									
tan δ	Measurement frequency: 120Hz, Temperature: 20°C																									
	<table border="1"> <tr> <th>Rated voltage (V)</th> <td>16</td> <td>25</td> <td>35</td> <td>50</td> <td>63</td> <td>80</td> <td>100</td> <td>160</td> <td>200</td> <td>250</td> <td>400</td> <td>450</td> </tr> <tr> <th>tan δ (MAX.)</th> <td>0.50</td> <td>0.40</td> <td>0.35</td> <td>0.30</td> <td>0.25</td> <td>0.20</td> <td>0.20</td> <td>0.15</td> <td>0.15</td> <td>0.15</td> <td>0.20</td> <td>0.20</td> </tr> </table>	Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	400	450	tan δ (MAX.)	0.50	0.40	0.35	0.30	0.25	0.20	0.20	0.15	0.15	0.15	0.20
Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	400	450														
tan δ (MAX.)	0.50	0.40	0.35	0.30	0.25	0.20	0.20	0.15	0.15	0.15	0.20	0.20														
Stability at Low Temperature	Measurement frequency: 120Hz																									
	<table border="1"> <tr> <th colspan="2">Rated voltage (V)</th> <th>16~100</th> <th>160~250</th> <th>400·450</th> </tr> <tr> <th rowspan="2">Impedance ratio</th> <th>Z-25°C/Z+20°C</th> <td>4</td> <td>3</td> <td>8</td> </tr> <tr> <th>ZT/Z20(MAX.)</th> <td>15</td> <td>12</td> <td>—</td> </tr> </table>	Rated voltage (V)		16~100	160~250	400·450	Impedance ratio	Z-25°C/Z+20°C	4	3	8	ZT/Z20(MAX.)	15	12	—											
Rated voltage (V)		16~100	160~250	400·450																						
Impedance ratio	Z-25°C/Z+20°C	4	3	8																						
	ZT/Z20(MAX.)	15	12	—																						
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 85°C, capacitors meet the characteristics requirements listed at right.																									
	<table border="1"> <tr> <th>Leakage current</th> <td>Initial specified value or less</td> </tr> <tr> <th>Capacitance change</th> <td>Within ±20% of initial value</td> </tr> <tr> <th>tan δ</th> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																			
Leakage current	Initial specified value or less																									
Capacitance change	Within ±20% of initial value																									
tan δ	200% or less of initial specified value																									
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours, they meet the requirements listed at right.																									
	<table border="1"> <tr> <th>Leakage current</th> <td>Initial specified value or less</td> </tr> <tr> <th>Capacitance change</th> <td>Within ±15% of initial value</td> </tr> <tr> <th>tan δ</th> <td>150% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±15% of initial value	tan δ	150% or less of initial specified value																			
Leakage current	Initial specified value or less																									
Capacitance change	Within ±15% of initial value																									
tan δ	150% or less of initial specified value																									
Marking	Printed with white color letter on black sleeve.																									
Applicable Standards	JIS C-5141 and JIS C-5102.																									

## Drawing



## Type numbering system (Example: 200V 470μF)



## Frequency coefficient of allowable current

Frequency (Hz)	50	60	120	1 k	10k~
16~100V	0.88	0.90	1.00	1.15	1.15
160~250V	0.85	0.88	1.00	1.15	1.20
400·450V	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+60	+70	+85
Coefficient	1.48	1.42	1.30	1.00





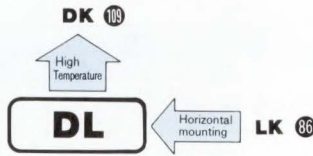


# ALUMINUM ELECTROLYTIC CAPACITORS

**DL** Horizontal Mounting Type series



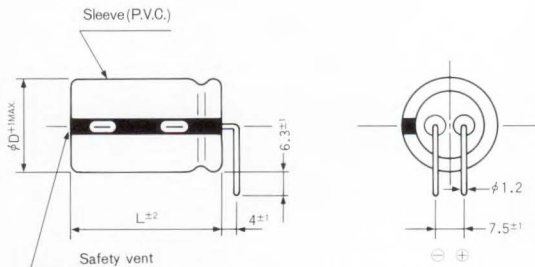
- Same case sizes as LK series, but suited for horizontal mounting to assure flat and low-profile design.



## Specifications

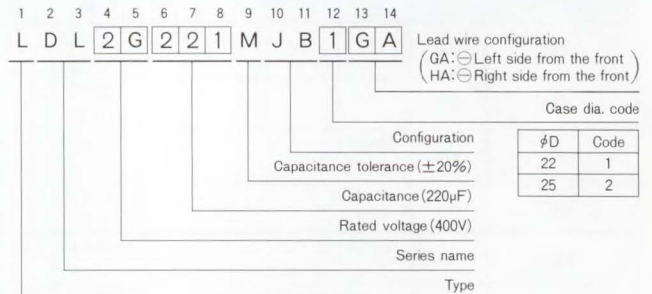
Item	Performance Characteristics					
Operating Temperature Range	-40~+85°C (160~250V), -25~+85°C (400~450V)					
Voltage Range	160~450V					
Capacitance Range	82~1500µF					
Capacitance Tolerance	±20% at 120Hz, 20°C					
Leakage Current	$I \leq 3\sqrt{CV}$ (µA) (After 5 minutes' application of rated voltage) (C: Capacitance (µF), V: Voltage (V))					
tan δ	Measurement frequency: 120Hz, Temperature: 20°C					
	Rated voltage (V)	160	200	250	400	450
	tan δ (MAX.)	0.15	0.10	0.10	0.20	0.25
Stability at Low Temperature	Measurement frequency: 120Hz					
	Rated voltage (V)		160~250	400~450		
	Impedance ratio	Z-25°C/Z+20°C	3	8		
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	12	—		
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 85°C, capacitors meet the characteristics requirements listed at right.					
	Leakage current	Initial specified value or less				
	Capacitance change	Within ±20% of initial value				
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours, they meet the requirements listed at right.					
	Leakage current	Initial specified value or less				
	Capacitance change	Within ±15% of initial value				
Marking	Printed with white color letter on black sleeve.					
Applicable Standards	JIS C-5141 and JIS C-5102.					

## Drawing



The case structure with an auxiliary terminal is also available upon request. Please contact to us for detailed information.

## Type numbering system (Example: 400V 220µF)



## Dimensions

Cap. (µF)	V (Code)	Code	160 (2C)		200 (2D)		250 (2E)		400 (2G)		450 (2W)	
			φD									
82	820											
100	101											
120	121											
150	151											
180	181											
220	221											
270	271											
330	331											
390	391											
470	471											
560	561	22×35	1.90									
680	681	22×40	2.15	25×35	2.20							
820	821	22×50	2.45	25×40	2.45							
1000	102	22×60	2.80	25×45	2.80							
1200	122			25×50	3.10							
1500	152			25×60	3.70							

Allowable Ripple (A) at 85°C 120Hz

## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1k	10k~
160~250V	0.85	0.88	1.00	1.15	1.20
400~450V	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	+45	+60	+70	+85
Coefficient	1.48	1.42	1.30	1.00

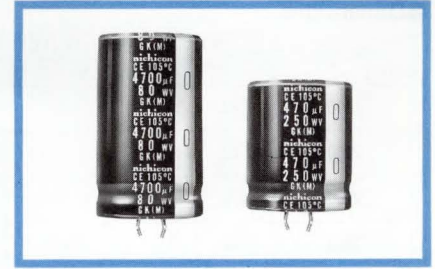
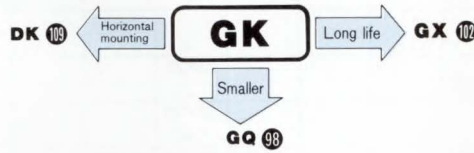
# ALUMINUM ELECTROLYTIC CAPACITORS

**GK** series Snap-in Terminal Type, Wide Temperature Range



Approved by Reliability Center for Electronic Component, Japan-Certification No. RCJ-03-24C

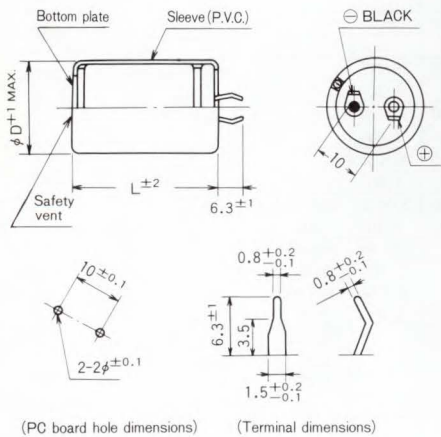
- Higher operating temperature range up to +105°C.
- Extended capacitance ranges based on the numerical values in E12 series under JIS.



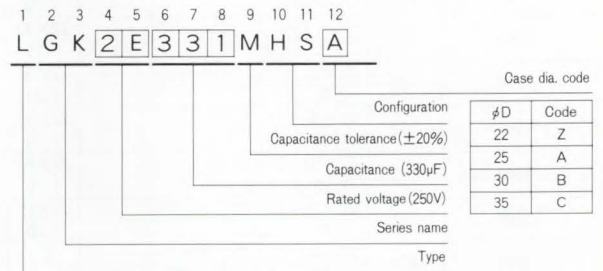
## Specifications

Item	Performance Characteristics											
Operating Temperature Range	-40~+105°C (16~250V), -25~+105°C (400V)											
Voltage Range	16~400V											
Capacitance Range	56~33000μF											
Capacitance Tolerance	±20% at 120 Hz, 20°C											
Leakage Current	I ≤ 3√CV (μA) (After 5 minutes' application of rated voltage) [C: Capacitance (μF), V: Voltage (V)]											
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C											
	Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	400
	tan δ (MAX.)	0.5	0.4	0.35	0.3	0.25	0.2	0.2	0.15	0.10	0.10	0.20
Stability at Low Temperature	Measurement frequency: 120 Hz											
	Rated voltage (V)		16~100			160~250			400			
	Impedance ratio	Z-25°C/Z+20°C	4			3			8			
	ZT/Z20 (MAX.)	Z-40°C/Z+20°C	15			12			—			
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.											
	Leakage current	Initial specified value or less										
	Capacitance change	Within ±20% of initial value										
	tan δ	200% or less of initial specified value										
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the requirements listed at right.											
	Leakage current	Initial specified value or less										
	Capacitance change	Within ±15% of initial value										
	tan δ	150% or less of initial specified value										
Marking	Printed with white color letter on dark brown sleeve.											
Applicable Standards	JIS C-5141 and JIS C-5102.											

## Drawing



## Type numbering system (Example: 250V 330μF)



# ALUMINUM ELECTROLYTIC CAPACITORS



## ■Dimensions

DXL (mm)

Cap. (μF)	V (Code) Code	φD	16 (1C)				25 (1E)				35 (1V)				50 (1H)			
			22	25	30	35	22	25	30	35	22	25	30	35	22	25	30	35
1800	182																	22×25 1.15
2200	222																	22×30 1.35
2700	272																	22×25 1.25 22×30 1.45
3300	332																	22×30 1.45 22×35 1.85
3900	392																	22×25 1.25 22×30 1.60
4700	472																	22×30 1.55 22×35 1.80
5600	562																	22×25 1.45 22×30 1.65
6800	682																	22×30 1.65 22×35 2.05
8200	822																	22×25 1.85 22×30 1.85
10000	103																	22×35 2.15 25×30 2.15
12000	123																	22×30 2.45 25×35 2.50
15000	153																	22×30 2.85 25×40 2.85
18000	183																	25×45 3.20 30×35 3.20
22000	223																	25×45 3.75 30×40 3.70
27000	273																	30×45 3.95 35×40 4.00
33000	333																	35×45 4.50

Cap. (μF)	V (Code) Code	φD	63 (1J)				80 (1K)				100 (2A)							
			22	25	30	35	22	25	30	35	22	25	30	35				
560	561																	22×25 0.75
680	681																	22×30 0.95
820	821																	22×25 1.00 22×30 1.10
1000	102																	22×30 1.15 22×35 1.20
1200	122																	22×25 0.95 22×30 1.25
1500	152																	22×30 1.20 22×35 1.30
1800	182																	22×30 1.30 25×25 1.25
2200	222																	22×30 1.60 25×30 1.55
2700	272																	22×40 1.80 25×35 1.80
3300	332																	22×30 2.15 25×40 2.15
3900	392																	25×45 2.55 30×35 2.55
4700	472																	25×45 2.75 30×40 2.70
5600	562																	30×45 3.15 35×35 3.10
6800	682																	30×50 3.60 35×40 3.55
8200	822																	35×45 3.90
10000	103																	35×50 4.40

Allowable Ripple (A) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**GK** series

■ Dimensions

D×L(mm)

Cap. (µF)	V (Code)	Code	φD	160 (2C)				200 (2D)				250 (2E)				400 (2G)						
				22	25	30	35	22	25	30	35	22	25	30	35	22	25	30	35			
56	560																	22×25 0.29				
68	680																	22×30 0.36	25×25 0.36			
82	820																	22×35 0.44	25×30 0.46			
100	101																	22×40 0.55	25×35 0.55	30×25 0.53		
120	121											22×25 0.55						22×45 0.59	25×35 0.57	30×30 0.60		
150	151											22×30 0.65						22×50 0.67	25×40 0.64	30×30 0.63	35×25 0.60	
180	181						22×25 0.70					22×30 0.75	25×25 0.75						25×50 0.82	30×35 0.78	35×30 0.80	
220	221	22×25 0.75					22×25 0.80					22×35 0.85	25×30 0.85	30×25 0.85					25×50 0.85	30×40 0.88	35×35 0.90	
270	271	22×30 0.90					22×30 0.90	25×25 0.90				22×40 0.95	25×35 1.00	30×30 1.00							30×45 0.98	35×35 0.96
330	331	22×30 1.00					22×35 1.05	25×30 1.05				22×45 1.10	25×35 1.10	30×30 1.10							30×50 1.21	35×40 1.21
390	391	22×35 1.15	25×25 1.10				22×40 1.20	25×35 1.25	30×25 1.20			22×50 1.25	25×40 1.25	30×35 1.25	35×25 1.25							35×45 1.32
470	471	22×40 1.30	25×30 1.25				22×45 1.30	25×35 1.30	30×30 1.35				25×45 1.30	30×35 1.30	35×30 1.30							35×50 1.45
560	561	22×45 1.45	25×35 1.40	30×25 1.40			22×50 1.50	25×40 1.45	30×30 1.50	35×25 1.50				30×40 1.55	35×35 1.55							
680	681	22×50 1.65	25×40 1.60	30×30 1.60	35×25 1.60		25×50 1.70	30×35 1.70	35×30 1.70					30×50 1.80	35×40 1.80							
820	821		25×45 1.80	30×35 1.75	35×30 1.75				30×40 1.90	35×35 1.90				30×50 1.95	35×40 1.95							
1000	102			30×40 2.00	35×35 2.00				30×50 2.15	35×40 2.10					35×50 2.30							
1200	122				30×45 2.30	35×35 2.30				35×40 2.30												
1500	152					35×40 2.65				35×50 2.75												
1800	182					35×50 3.05																Case size Allowable ripple

Allowable Ripple (A) at 105°C 120Hz

● Frequency coefficient of allowable ripple current

Coeff.	Frequency (Hz)	50	60	120	1 k	10k~
		16~100V	0.88	0.90	1.00	1.15
	160~250V	0.85	0.88	1.00	1.15	1.20
	400V	0.88	0.90	1.00	1.10	1.15

● Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

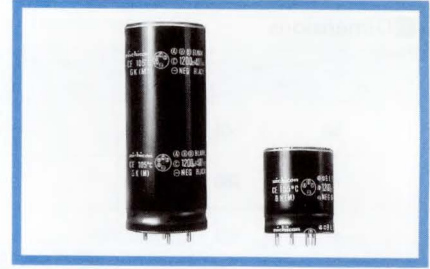
**GK<sub>HH</sub>** series

PC Board Mounting Type



Anti-Solvent Feature  
(Through 100V only)

- Higher C/V products of GK series.
- Plentiful line-up from  $\phi 35 \times 63$  to  $\phi 40 \times 100$ mm.
- Auxiliary terminals provided to assure anti-vibration performance.

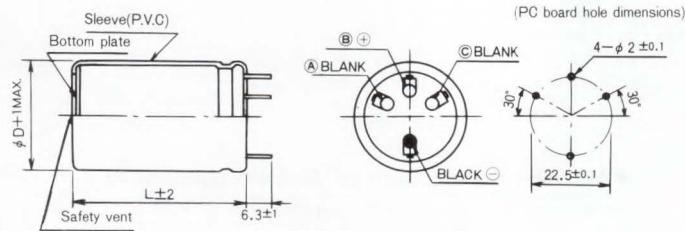


## Specifications

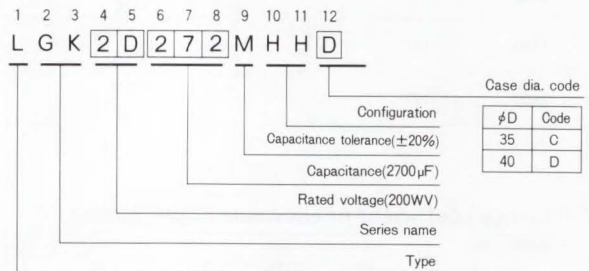
Item	Performance Characteristics											
Operating Temperature Range	-40~+105°C (16~250V), -25~+105°C (400V)											
Voltage Range	16~400V											
Capacitance Range	560~68000 $\mu$ F											
Capacitance Tolerance	$\pm 20\%$ (120Hz, 20°C)											
Leakage Current	$I \leq 3\sqrt{CV}$ ( $\mu$ A) (After 5 minutes' application of rated voltage) (C:Capacitance( $\mu$ F), V:Voltage(V))											
tan $\delta$	Measurement frequency:120Hz, Temperature:20°C											
	Rated voltage(V)	16	25	35	50	63	80	100	160	200	250	400
	tan $\delta$ (MAX.)	0.60	0.50	0.40	0.35	0.30	0.30	0.25	0.20	0.15	0.15	0.30
Stability at Low Temperature	Measurement frequency:120Hz											
	Rated voltage(V)		16~250				400					
	Impedance ratio	Z-25°C/Z+20°C	4				8					
	ZT/Z20(MAX.)	Z-40°C/Z+20°C	15				—					
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.											
	Leakage current	Initial specified value or less										
	Capacitance change	Within $\pm 20\%$ of initial value										
	tan $\delta$	200% or less of initial specified value										
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the requirements listed at right.											
	Leakage current	Initial specified value or less										
	Capacitance change	Within $\pm 15\%$ of initial value										
	tan $\delta$	150% or less of initial specified value										
Marking	Printed with white color letter on dark brown sleeve.											
Applicable Standards	JIS C-5141 and JIS C-5102.											

## Drawing

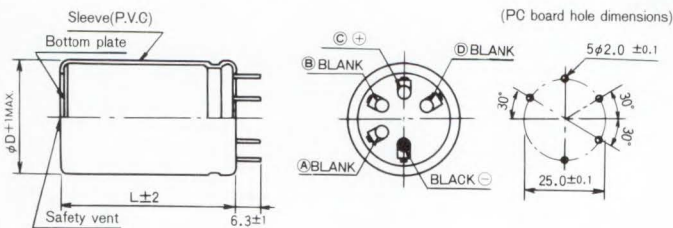
- For 63mmL or shorter with  $\phi 35$  and  $\phi 40$ mm.



## Type numbering system (Example: 200V 2700 $\mu$ F)



- For 63mmL or longer with  $\phi 40$ mm.



Notes:  
As blank terminals are not insulated from capacitor element, they shall be mounted on independent lands.

- Frequency coefficient of allowable ripple current

Coef.	Frequency (Hz)	50	60	120	1 k	10k~
	16~100V	0.88	0.90	1.00	1.15	1.15
160~250V	0.85	0.88	1.00	1.15	1.20	
400V	0.88	0.90	1.00	1.10	1.15	

- Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

• Dimension table in next page.

■ Dimensions

D×L (mm)

Cap.(μF)	V(Code) Code	φ D	16 (1C)		25 (1E)		35 (1V)		50 (1H)	
			φ35	φ40	φ35	φ40	φ35	φ40	φ35	φ40
18000	183								35×68	40×63
									5.55	5.80
22000	223						35×63	40×50	35×80	40×63
							5.1	5.0	6.35	6.15
27000	273						35×68	40×63		
							5.5	5.8		
33000	333				35×63	40×50	35×80	40×63		
					5.6	5.5	6.25	6.05		
39000	393				35×68	40×63				
					6.0	6.3				
47000	473		35×63	40×50	35×80	40×63				
			5.9	5.75	6.8	6.6				
56000	563		35×68	40×63						
			6.20	6.45						
68000	683		35×80	40×63						
			6.90	6.70						

Cap.(μF)	V(Code) Code	φ D	63 (1J)		80 (1K)		100 (2A)	
			φ35	φ40	φ35	φ40	φ35	φ40
5600	562						35×68	40×63
							4.40	4.55
6800	682						35×80	40×63
							4.80	4.65
8200	822				35×63	40×50		
					4.75	4.65		
10000	103				35×80	40×63		
					5.45	5.00		
12000	123		35×63	40×50				
			5.35	5.25				
15000	153		35×80	40×63				
			5.85	6.10				

Cap.(μF)	V(Code) Code	φ D	160 (2C)		200 (2D)		250 (2E)		400 (2G)	
			φ35	φ40	φ35	φ40	φ35	φ40	φ35	φ40
560	561								35×63	40×50
									1.75	1.70
680	681								35×80	40×63
									2.05	2.00
820	821								35×80	
									2.20	
1000	102								35×100	40×80
									2.65	2.60
1200	122						35×63	40×50		40×100
							2.75	2.70		3.00
1500	152						35×68	40×63		
							3.20	3.35		
1800	182				35×63	40×50	35×100	40×80		
					3.30	3.20	4.05	3.95		
2200	222		35×63	40×50	35×80	40×63	35×100	40×80		
			3.50	3.45	3.90	3.80	4.35	4.20		
2700	272		35×68	40×63	35×100	40×80		40×100		
			3.90	4.10	4.65	4.50		5.00		
3300	332		35×80	40×63		40×80				
			4.55	4.40		4.90				
3900	392		35×100	40×80		40×100				
			5.30	5.20		5.70				
4700	472			40×100						
				6.15						

Case size  
Allowable ripple  
Allowable Ripple(A) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS



Snap-in Terminal Type, Smaller-Sized, Wide Temperature Range series



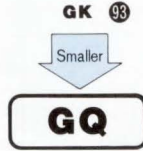
Smaller



Anti-Solvent Feature

(Through 100V only)

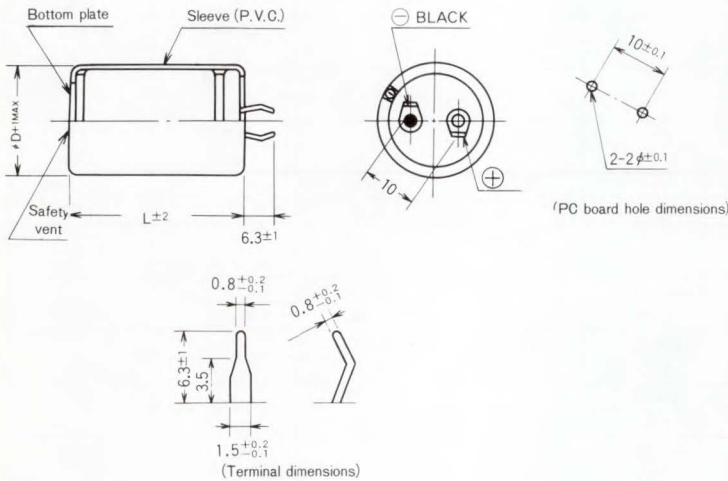
- One rank smaller case sizes than GK series.
- Extended working voltage ranges from 16V to 450V.



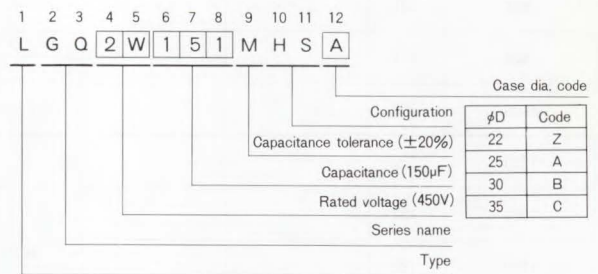
## Specifications

Item	Performance Characteristics																											
Operating Temperature Range	-40~+105°C (16~250V), -25~+105°C (315·400·450V)																											
Voltage Range	16~450V																											
Capacitance Range	56~47000μF																											
Capacitance Tolerance	±20% (120Hz, 20°C)																											
Leakage Current	$I \leq 3\sqrt{CV}$ (μA) (After 5 minutes' application of rated voltage) [C: Capacitance (μF), V: Voltage (V)]																											
tan δ	Measurement frequency: 120Hz, Temperature: 20°C																											
	<table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> <th>160</th> <th>200</th> <th>250</th> <th>315</th> <th>400</th> <th>450</th> </tr> </thead> <tbody> <tr> <td>tan δ (MAX.)</td> <td>0.50</td> <td>0.40</td> <td>0.35</td> <td>0.30</td> <td>0.25</td> <td>0.20</td> <td>0.20</td> <td>0.15</td> <td>0.15</td> <td>0.15</td> <td>0.25</td> <td>0.25</td> <td>0.25</td> </tr> </tbody> </table>	Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	315	400	450	tan δ (MAX.)	0.50	0.40	0.35	0.30	0.25	0.20	0.20	0.15	0.15	0.15	0.25	0.25
Rated voltage (V)	16	25	35	50	63	80	100	160	200	250	315	400	450															
tan δ (MAX.)	0.50	0.40	0.35	0.30	0.25	0.20	0.20	0.15	0.15	0.15	0.25	0.25	0.25															
Stability at Low Temperature	Measurement frequency: 120Hz																											
	<table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>16~100</th> <th>160~250</th> <th>315·400·450</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio Z-25°C / Z+20°C</td> <td>4</td> <td>3</td> <td>8</td> </tr> <tr> <td>ZT/Z20 (MAX.) Z-40°C / Z+20°C</td> <td>15</td> <td>12</td> <td>—</td> </tr> </tbody> </table>	Rated voltage (V)	16~100	160~250	315·400·450	Impedance ratio Z-25°C / Z+20°C	4	3	8	ZT/Z20 (MAX.) Z-40°C / Z+20°C	15	12	—															
Rated voltage (V)	16~100	160~250	315·400·450																									
Impedance ratio Z-25°C / Z+20°C	4	3	8																									
ZT/Z20 (MAX.) Z-40°C / Z+20°C	15	12	—																									
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.																											
	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																					
Leakage current	Initial specified value or less																											
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Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours they meet the requirements listed at right.																											
	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±15% of initial value</td> </tr> <tr> <td>tan δ</td> <td>150% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±15% of initial value	tan δ	150% or less of initial specified value																					
Leakage current	Initial specified value or less																											
Capacitance change	Within ±15% of initial value																											
tan δ	150% or less of initial specified value																											
Marking	Printed with white color letter on dark brown sleeve																											
Applicable Standards	JIS C-5141 and JIS C-5102.																											

## Drawing



## Type numbering system (Example: 450V 150μF)



## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1 k	10k~
16~100V	0.88	0.90	1.00	1.15	1.15
160~250V	0.85	0.88	1.00	1.15	1.20
315·400·450V	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

• Dimension table in next page.



# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon



## Dimensions

DxL (mm)

Cap.(µF)	V (Code)		16 (1C)				25 (1E)				35 (1V)				50 (1H)			
	Code	φ D	22	25	30	35	22	25	30	35	22	25	30	35	22	25	30	35
1800	182														22×25			
															1.31			
2700	272														22×30	25×25		
															1.70	1.70		
3300	332										22×25				22×35	25×30		
											1.43				1.98	2.00		
3900	392										22×30				22×40	25×35	30×25	
											1.65				2.25	2.28	2.22	
4700	472						22×25				22×35	25×25			22×45	25×40	30×30	
							1.55				1.89	1.78			2.56	2.61	2.58	
5600	562						22×30				22×35	25×30	30×25		22×50	25×40	30×35	
							1.76				2.02	2.04	2.12		2.89	2.81	2.95	
6800	682		22×25				22×30	25×25			22×40	25×35			25×50	30×40	35×30	
			1.60				1.91	1.91			2.28	2.31			3.37	3.39	3.31	
8200	822		22×30				22×35	25×30	30×25		22×50	25×40	30×30				30×45	35×35
			1.85				2.14	2.16	2.24		2.67	2.60	2.56				3.71	3.66
10000	103		22×30	25×25			22×40	25×35			25×45	30×35					30×50	35×40
			1.99	1.99			2.40	2.44			2.92	2.92					4.09	4.07
12000	123		22×35	25×30	30×25		22×45	25×40	30×30		25×50	30×40	35×30					35×45
			2.28	2.30	2.38		2.69	2.74	2.70		3.26	3.28	3.20					4.50
15000	153		22×40	25×35				25×45	30×35	35×30			30×45	35×35				
			2.64	2.68				3.15	3.13	3.22			3.74	3.69				
18000	183		22×45	25×40	30×30			25×50	30×40									35×40
			2.98	3.04	3.00			3.54	3.54									4.16
22000	223			25×45	30×35				30×45	35×35								35×50
				3.40	3.39				4.24	3.96								4.92
27000	273			25×50	30×40	35×30				35×45								
				3.81	3.83	3.74				4.75								
33000	333				30×45	35×35				35×50								
					4.30	4.24				5.39								
39000	393				30×50	35×40												
					4.74	4.72												
47000	473					35×45												
						5.27												

Cap.(µF)	V (Code)		63 (1J)				80 (1K)				100 (2A)			
	Code	φ D	22	25	30	35	22	25	30	35	22	25	30	35
560	561										22×25			
											1.07			
820	821						22×25				22×30	25×25		
							1.11				1.35	1.35		
1000	102						22×30	25×25			22×35	25×30		
							1.29	1.29			1.54	1.56		
1200	122		22×25				22×30	25×25			22×40	25×35	30×25	
			1.25				1.39	1.39			1.74	1.76	1.71	
1500	152		22×30	25×25			22×35	25×30			22×45	25×40	30×30	
			1.44	1.44			1.61	1.62			1.99	2.03	2.00	
1800	182		22×30	25×25			22×40	25×35	30×25		25×45	30×35		
			1.52	1.52			1.83	1.86	1.81		2.28	2.27		
2200	222		22×35	25×30			22×45	25×35	30×30		25×50	30×40	35×30	
			1.73	1.75			2.09	2.01	2.10		2.57	2.59	2.52	
2700	272		22×40	25×35	30×25			25×45	30×35				30×45	35×35
			1.97	1.99	1.93			2.43	2.43				2.94	2.90
3300	332		22×50	25×40	30×30			25×50	30×40	35×30			30×50	35×40
			2.32	2.27	2.24			2.76	2.78	2.71			3.32	3.31
3900	392			25×45	30×35				30×45	35×35				35×45
				2.54	2.55				3.12	3.07				3.69
4700	472			25×50	30×40	35×30			30×50	35×40				35×50
				2.88	2.90	2.83			3.52	3.50				4.14
5600	562				30×45	35×35				35×45				
					3.28	3.24				3.87				
6800	682				30×50	35×40				35×50				
					3.73	3.71				4.19				
8200	822					35×45								
						4.16								
10000	103					35×50								
						4.69								

Case size  
Allowable ripple

Allowable Ripple(A) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS



## ■ Dimensions

DXL (mm)

Cap. (μF) Code		V (Code) φ D	160 (2C)				180 (2Z)				200 (2D)				250 (2E)			
			22	25	30	35	22	25	30	35	22	25	30	35	22	25	30	35
150	151													22×25				
														0.65				
180	181													22×25				
														0.75				
220	221													22×30	25×25			
														0.85	0.85			
270	271	22×25				22×25				22×25				22×35	25×30	30×25		
		0.90				0.90				0.90				1.00	1.00	1.00		
330	331	22×25				22×30				22×30	25×25			22×40	25×30	30×25		
		1.00				1.05				1.05	1.05			1.10	1.10	1.10		
390	391	22×30				22×30	25×25			22×35	25×30			22×45	25×40	30×30		
		1.15				1.20	1.20			1.25	1.25			1.25	1.25	1.25		
470	471	22×35	25×25			22×35	25×30			22×40	25×30	30×25		22×50	25×40	30×35	35×25	
		1.30	1.30			1.30	1.30			1.35	1.35	1.35		1.30	1.30	1.30	1.30	
560	561	22×40	25×30			22×40	25×35	30×25		22×45	25×35	30×30		25×50	30×35	35×30		
		1.45	1.45			1.40	1.40	1.40		1.50	1.50	1.50		1.55	1.55	1.55		
680	681	22×45	25×35	30×25		22×45	25×40	30×30		22×50	25×45	30×30	35×25			30×45	35×35	
		1.65	1.65	1.65		1.65	1.65	1.65		1.70	1.70	1.70	1.70			1.80	1.80	
820	821	22×50	25×40	30×30	35×25	22×50	25×45	30×35	35×25		25×50	30×35	35×30				35×40	
		1.80	1.80	1.80	1.80	1.85	1.85	1.85	1.85		1.90	1.90	1.90				1.95	
1000	102		25×45	30×35	35×30		25×50	30×40	35×30			30×45	35×35				35×45	
			2.00	2.00	2.00		2.05	2.05	2.05			2.15	2.15				2.30	
1200	122		25×50	30×40	35×30			30×45	35×35			30×50	35×35				35×50	
			2.30	2.30	2.30			2.30	2.30			2.30	2.30				2.65	
1500	152			30×45	35×35			30×50	35×40				35×45					
				2.65	2.65			2.70	2.70				2.75					
1800	182			30×50	35×45				35×45				35×50					
				3.05	3.05				3.15				3.25					
2200	222				35×50				35×50									
					3.50				3.60									

Cap. (μF) Code		V (Code) φ D	315 (2F)				400 (2G)				450 (2W)			
			22	25	30	35	22	25	30	35	22	25	30	35
56	560									22×25				
										0.41				
68	680					22×25				22×30	25×25			
						0.40				0.48	0.48			
82	820	22×25				22×30	25×25			22×35				
		0.46				0.50	0.50			0.56				
100	101	22×30				22×35	25×30			22×40	25×30	30×25		
		0.55				0.55	0.55			0.64	0.61	0.63		
120	121	22×30	25×25			22×40	25×30	30×25		22×45	25×35			
		0.60	0.60			0.60	0.60	0.60		0.72	0.71			
150	151	22×35	25×30	30×25		22×45	25×35	30×30		22×50	25×40	30×30	35×25	
		0.70	0.70	0.70		0.70	0.70	0.70		0.83	0.81	0.80	0.82	
180	181	22×40	25×30	30×25		22×50	25×40	30×30	35×25		25×45	30×35		
		0.83	0.78	0.82		0.85	0.85	0.85	0.85		0.92	0.91		
220	221	22×45	25×35	30×30			25×45	30×35	35×30		25×50	30×40	35×30	
		0.90	0.90	0.90			0.90	0.90	0.90		1.05	1.05	1.03	
270	271	22×50	25×40	30×35	35×25		25×50	30×40	35×30			30×45	35×35	
		1.00	1.00	1.00	1.00		1.00	1.00	1.00			1.21	1.19	
330	331		25×50	30×35	35×30			30×45	35×35			30×50	35×40	
			1.25	1.25	1.25			1.25	1.25			1.38	1.38	
390	391			30×40	35×35			30×50	35×40				35×45	
				1.35	1.35			1.35	1.35				1.55	
470	471			30×50	35×40				35×45				35×50	
				1.45	1.45				1.45				1.74	
560	561				35×45				35×50					
					1.65				1.65					
680	681				35×50									
					1.90									

Allowable Ripple (A) at 105°C 120Hz

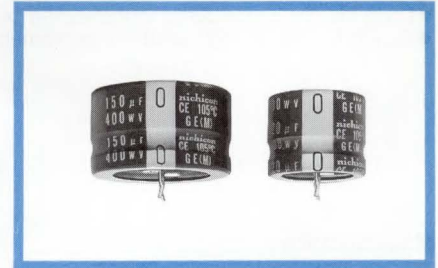
# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**GE** Snap-in Terminal Type, Low-Profile Sized, Wide Temperature Range series



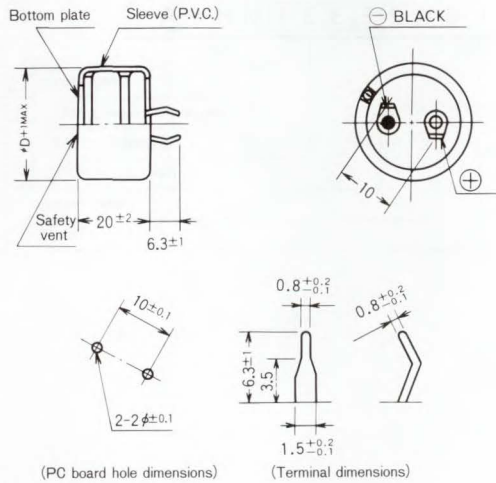
- Low-profile version of GQ series.
- Ideally suited for flat and low-profile design.



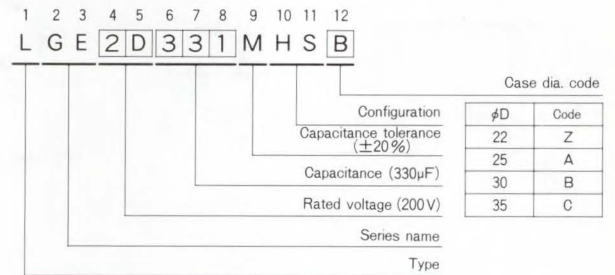
## Specifications

Item	Performance Characteristics					
Operating Temperature Range	-40~+105°C (160~250V), -25~+105°C (400V)					
Voltage Range	160~400V					
Capacitance Range	47~560μF					
Capacitance Tolerance	±20% at 120 Hz, 20°C					
Leakage Current	$I \leq 3\sqrt{CV}$ (μA) (After 5 minutes' application of rated voltage); [C: Capacitance (μF), V: Voltage (V)]					
tan δ	Measurement frequency: 120 Hz, Temperature: 20°C					
	Rated voltage (V)	160	180	200	250	400
Stability at Low Temperature	Measurement frequency: 120 Hz					
	Rated voltage (V)		160~250		400	
	Impedance ratio Z-25°C/Z+20°C	3		8		
Load Life	ZT/Z20 (MAX.)		12		-	
	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.		Leakage current		Initial specified value or less	
			Capacitance change		Within ±20% of initial value	
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours they meet the requirements listed at right.		tan δ		200% or less of initial specified value	
			Leakage current		Initial specified value or less	
			Capacitance change		Within ±15% of initial value	
Marking	Printed with white color letter on dark brown sleeve					
Applicable Standards	JIS C-5141 and JIS C-5102.					

## Drawing



## Type numbering system (Example: 200V 330μF)



## Dimensions

Cap.(μF)	Code	DXL(mm)											
		160 (2C)		180 (2Z)		200 (2D)		250 (2E)		400 (2G)			
47	470									22×20	0.23		
68	680									25×20	0.31		
100	101								22×20	0.46	30×20	0.41	
120	121								22×20	0.51	35×20	0.49	
150	151			22×20	0.55	22×20	0.55	25×20	0.62	35×20	0.55		
180	181	22×20	0.65	22×20	0.65	25×20	0.67	30×20	0.75				
220	221	22×20	0.69	25×20	0.76	25×20	0.76	30×20	0.86				
270	271	25×20	0.85	30×20	0.95	30×20	1.05	35×20	1.04				
330	331	30×20	1.05	30×20	1.04	30×20	1.10	35×20	1.15				
390	391	30×20	1.13	35×20	1.25	35×20	1.25						
470	471	35×20	1.35	35×20	1.37	35×20	1.37						
560	561	35×20	1.48										

## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1 k	10k~
Coeff. 160~250V	0.85	0.88	1.00	1.15	1.20
400V	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

Allowable Ripple (A) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

**GX** Snap-in Terminal Type, Long Life, Wide Temperature Range  
series



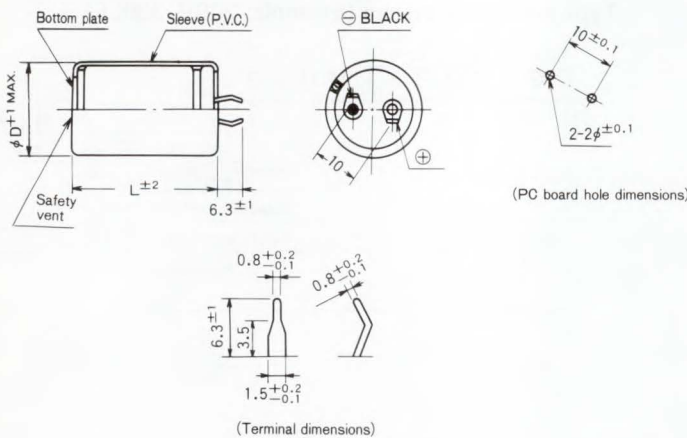
- Long life assurance series withstanding 5000 hour application of ripple current.
- Suited for use in high reliability equipment.



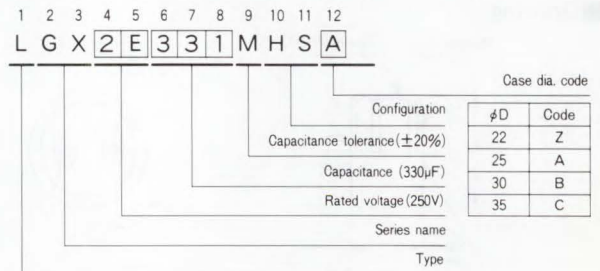
## Specifications

Item	Performance Characteristics		
Operating Temperature Range	-40~+105°C (200 · 250V), -25~+105°C (400V)		
Voltage Range	200~400V		
Capacitance Range	82~1500μF		
Capacitance Tolerance	±20% (120Hz, 20°C)		
Leakage Current	$I \leq 3\sqrt{CV}$ (μA) (After 5 minutes' application of rated voltage) [C:Capacitance(μF), V:Voltage(V)]		
tan δ	Measurement frequency:120Hz, Temperature:20°C		
	Rated voltage (V)	200 · 250      400	
	tan δ (MAX.)      0.15      0.25		
Stability at Low Temperature	Measurement frequency:120Hz,		
	Rated voltage (V)	200 · 250      400	
	Impedance ratio	Z-25°C / Z+20°C      4      8	
	ZT/Z20 (MAX.)	Z-40°C / Z+20°C      12      —	
Load Life	After an application of rated voltage(maximum value of DC voltage overlapped by an allowable ripple current) for 5000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	Leakage current	Initial specified value or less
		Capacitance change	Within ±20% of initial value
		tan δ	200% or less of initial specified value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the requirements listed at right.	Leakage current	Initial specified value or less
		Capacitance change	Within ±15% of initial value
		tan δ	150% or less of initial specified value
Marking	Printed with white color letter on dark brown sleeve.		
Applicable Standards	JIS C-5141 and JIS C-5102.		

## Drawing



## Type numbering system (Example: 250V 330μF)



## Dimensions

DXL(mm)

Cap.(μF)	V(Code)	Code	φ D	200 (2D)				250 (2E)				400 (2G)					
				22	25	30	35	22	25	30	35	22	25	30	35		
82	820												22×30 0.45				
100	101												22×35 0.52	25×30 0.52	30×25 0.54		
120	121												22×40 0.59	25×35 0.60	30×30 0.62		
150	151												22×50 0.70	25×40 0.68	30×30 0.67		
180	181							22×30 0.66	25×25 0.66					25×45 0.76	30×35 0.76		
220	221							22×35 0.78	25×30 0.79					25×50 0.85	30×40 0.86	35×30 0.84	
270	271			22×30 0.82	25×25 0.82			22×40 0.92	25×30 0.88	30×25 0.91						30×45 0.95	35×35 0.94
330	331			22×35 0.94	25×30 0.95			22×45 1.05	25×35 1.01	30×30 1.06						30×50 1.10	35×40 1.09
390	391			22×40 1.07	25×35 1.08	30×25 1.05		22×50 1.19	25×40 1.15	30×35 1.20							35×45 1.22
470	471			22×45 1.21	25×35 1.17	30×30 1.22			25×45 1.30	30×35 1.30	35×30 1.34						35×50 1.35
560	561			22×50 1.36	25×40 1.32	30×30 1.31				30×40 1.47	35×35 1.52						
680	681				25×50 1.58	30×35 1.51	35×30 1.55			30×50 1.72	35×40 1.71						
820	821					30×40 1.72	35×35 1.78				35×45 1.91						
1000	102					30×50 2.02	35×40 2.01				35×50 2.14						
1200	122						35×45 2.25										
1500	152						35×50 2.55										Case size Allowable ripple

Allowable Ripple(A) at 105°C 120Hz

### ● Frequency coefficient of allowable ripple current

Coeff.	Frequency(Hz)	50	60	120	1 k	10k~
	200・250V		0.85	0.88	1.00	1.15
400V		0.88	0.90	1.00	1.10	1.15

### ● Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**GR** series

Snap-in Terminal Type, Long Life, Wide Temperature Range

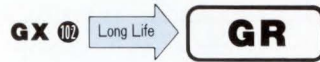
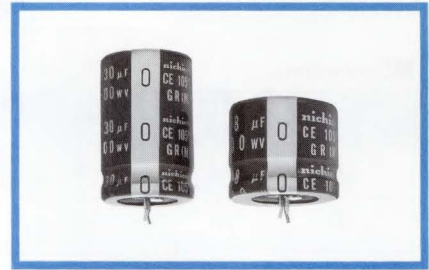


Long Life



Anti-Solvent Feature

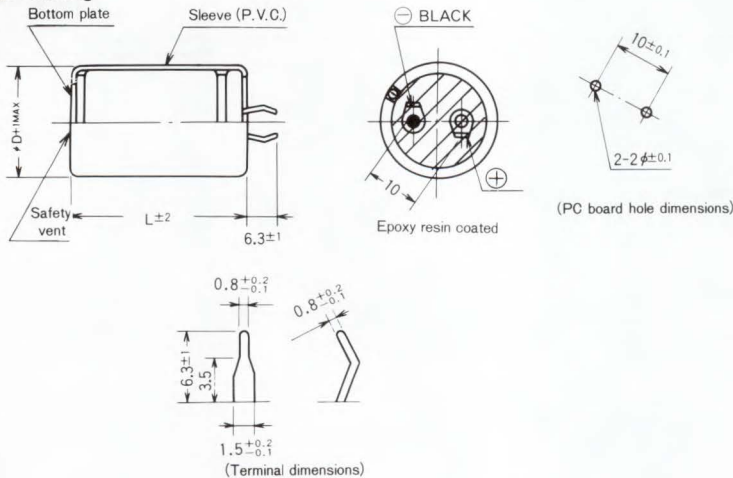
- Long life assurance series withstanding 10000 hour application of ripple current.
- Resistant to cleaning solvents as sealing parts are coated with epoxy resin.
- Suited for use in high reliability equipment.



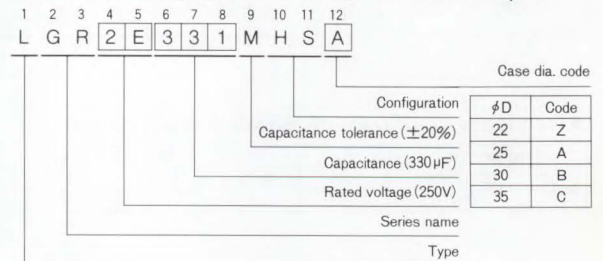
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40~+105°C (200 • 250V), -25~+105°C (400V)	
Voltage Range	200~400V	
Capacitance Range	39~680µF	
Capacitance Tolerance	±20% (120Hz, 20°C)	
Leakage Current	$I \leq 3\sqrt{CV}$ (µA) (After 5 minutes' application of rated voltage) [C:Capacitance (µF), V:Voltage (V)]	
tan δ	Measurement frequency: 120Hz, Temperature: 20°C	
	Rated voltage (V)	200 • 250      400
Stability at Low Temperature	Measurement frequency: 120Hz	
	Rated voltage (V)	200 • 250      400
	Impedance ratio	Z-25°C / Z+20°C      4      8
	ZT/Z20 (MAX.)	Z-40°C / Z+20°C      12      —
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 10000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±20% of initial value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±15% of initial value
Marking	Printed with white color letter on dark brown sleeve.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Drawing



## Type numbering system (Example: 250V 330µF)



■ Dimensions

D×L(mm)

Cap.(μF)	Code	V (Code)	φD	200 (2D)				250 (2E)				400 (2G)						
				22	25	30	35	22	25	30	35	22	25	30	35			
39	390												22×30	25×25				
													0.26	0.26				
47	470												22×35	25×30				
													0.33	0.33				
56	560												22×40	25×30	30×25			
													0.37	0.35	0.37			
68	680												22×45	25×35	30×25			
													0.43	0.42	0.40			
82	820												22×50	25×40	30×30			
													0.49	0.47	0.47			
100	101													25×45	30×35	35×30		
														0.55	0.55	0.57		
120	121							22×30	25×25					25×50	30×40	35×30		
								0.51	0.51					0.62	0.63	0.61		
150	151			22×30	25×25			22×35	25×30							30×45	35×35	
				0.56	0.56			0.61	0.62							0.74	0.73	
180	181			22×35	25×30			22×40	25×35	30×25							35×40	
				0.65	0.66			0.71	0.72	0.70							0.82	
220	221			22×40	25×30	30×25		22×50	25×40	30×30								
				0.77	0.73	0.76		0.87	0.84	0.83								
270	271			22×45	25×35	30×30			25×45	30×35	35×30							
				0.89	0.86	0.90			0.96	0.96	0.99							
330	331			22×50	25×40	30×30			25×50	30×40	35×35							
				1.02	0.99	0.98			1.09	1.10	1.14							
390	391				25×45	30×35	35×30				30×45	35×35						
					1.11	1.11	1.14				1.23	1.21						
470	471				25×50	30×40	35×30					35×40						
					1.25	1.26	1.23					1.38						
560	561					30×45	35×35											
						1.42	1.40											
680	681						35×40											Case size
							1.60											Allowable ripple

Allowable Ripple(A) at 105°C 120Hz

● Frequency coefficient of allowable ripple current

Coeff.	Frequency(Hz)					
	200・250V	50	60	120	1 k	10k~
	400V	0.85	0.88	1.00	1.15	1.20
		0.88	0.90	1.00	1.10	1.15

● Allowable ripple current vs. Ambient temperature

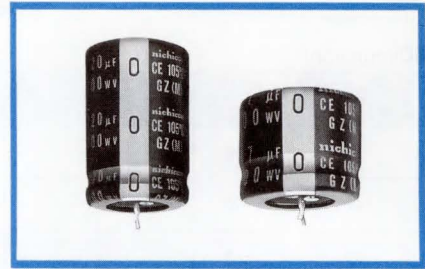
Ambient temp.(°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**GZ** series Snap-in Terminal Type, Long Life, Wide Temperature Range



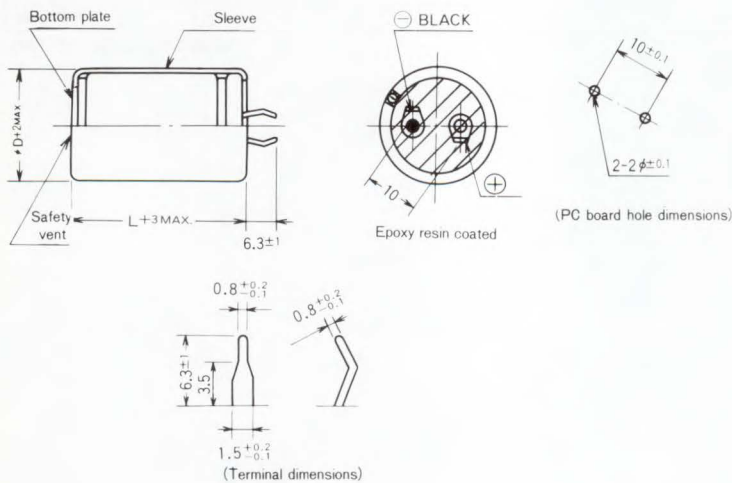
- Long life assurance series withstanding 20000 hour application of ripple current.
- Resistant to cleaning solvents as sealing parts are coated with epoxy resin.
- Suited for use in high reliability equipment.



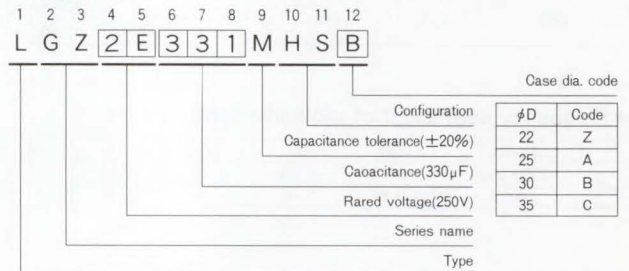
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40~+105°C (200 · 250V) , -25~+105°C (400V)	
Voltage Range	200~400V	
Capacitance Range	33~390μF	
Capacitance Tolerance	±20% (120Hz, 20°C)	
Leakage Current	I ≤ 3√CV (μA) (After 5 minutes' application of rated voltage) (C:Capacitance (μF), V:Voltage V)	
tan δ	Measurement frequency:120Hz, Temperature:20°C	
	Rated voltage(V)	200 · 250      400
Stability at Low Temperature	Measurement frequency:120Hz	
	Rated voltage(V)	200 · 250      400
	Impedance ratio Z-25°C / Z+20°C	4      8
Load Life	After an application of rated voltage(maximum value of DC voltage overlapped by an allowable ripple current) for 20000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±25% of initial value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±15% of initial value
Marking	Printed with white color letter on black sleeve.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Drawing



## Type numbering system (Example: 250V 330μF)





## Dimensions

DXL(mm)

Cap.( $\mu$ F)	Code	V(Code)	200 (2D)				200 (2E)				400 (2G)						
			22	25	30	35	22	25	30	35	22	25	30	35			
33	330											22×30	25×25				
												0.29	0.29				
39	390											22×35	25×30				
												0.33	0.34				
47	470											22×40	25×35	30×25			
												0.38	0.38	0.37			
56	560											22×45	25×40	30×30			
												0.44	0.44	0.44			
68	680												25×45	30×35	35×30		
													0.50	0.50	0.52		
82	820					22×30	25×25						25×50	30×40	35×30		
						0.46	0.46						0.58	0.58	0.57		
100	101					22×35	25×30							30×45	35×35		
						0.55	0.55							0.66	0.65		
120	121	22×30	25×25			22×40	25×35	30×25						30×50	35×40		
		0.55	0.55			0.64	0.65	0.63						0.76	0.76		
150	151	22×40	25×30			22×50	25×40	30×30									
		0.69	0.66			0.79	0.76	0.75									
180	181	22×45	25×35	30×30			25×45	30×35	35×30								
		0.80	0.77	0.81			0.88	0.88	0.91								
220	221	22×50	25×40	30×30			25×50	30×40	35×30								
		0.93	0.90	0.89			1.00	1.00	0.98								
270	271		25×45	30×35	35×30			30×45	35×35								
			1.03	1.03	1.06			1.14	1.12								
330	331			30×40	35×35			30×50	35×40								
				1.17	1.21			1.29	1.28								
390	391			30×50	35×40												Case size
				1.37	1.36												Allowable ripple

Allowable Ripple A) at 105°C 120Hz

### ● Frequency coefficient of allowable ripple current

Coeff.	Frequency(Hz)					
	200 · 250V	50	60	120	1 k	10k ~
	0.85	0.88	1.00	1.15	1.20	
	0.88	0.90	1.00	1.10	1.15	

### ● Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

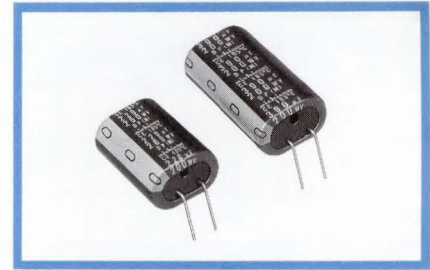


Oval-Shaped Type, Wide Temperature Range

series



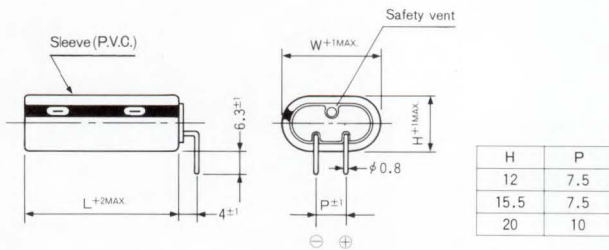
- Oval-shaped series for horizontal mounting.
- High operating temperature ranges up to +105°C.
- Designed for use in very thin and flat equipment like switching power supplies, automobile electronics and etc.



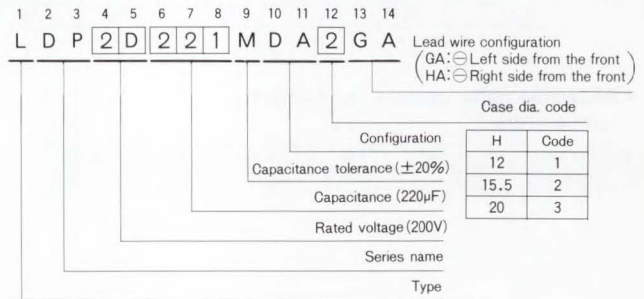
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-40~+105°C (200V), -25~+105°C (400V)	
Voltage Range	200 · 400V	
Capacitance Range	33~1000μF	
Capacitance Tolerance	±20% at 120 Hz, 20°C	
Leakage Current	$I \leq 3 \sqrt{CV}$ (μA) (After 5 minutes' application of rated voltage) (C:Capacitance (μF), V:Voltage (V))	
tan δ	Measurement frequency: 120Hz, Temperature: 20°C	
	Rated voltage (V)	200      400
Stability at Low Temperature	Measurement frequency: 120Hz	
	Rated voltage (V)	200      400
	Impedance ratio	Z-25°C/Z+20°C      3      8
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±20% of initial value
Shelf Life	After leaving capacitors under no load of 105°C for 1000 hours they meet the requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within ±15% of initial value
Marking	Printed with white color letter on dark brown sleeve.	
Applicable Standards	JIS C-5141 and JIS C-5102.	

## Drawing



## Type numbering system (Example: 200V 220μF)



## Dimensions

Size H×W×L (mm)	200 (2D)		400 (2G)	
	Capacitance (μF)	Allowable ripple (A)	Capacitance (μF)	Allowable ripple (A)
12×25×25	100	0.37	33	0.21
12×25×30	120	0.44	47	0.27
12×25×35	150	0.52	68	0.35
12×25×40	180	0.60	82	0.40
15.5×25×25	120	0.44	47	0.27
15.5×25×30	180	0.58	68	0.35
15.5×25×35	220	0.68	82	0.41
15.5×25×40	270	0.80	100	0.48
15.5×25×50	390	1.06	120	0.59
20×35×30	270	0.84	82	0.36
20×35×35	330	0.99	120	0.46
20×35×40	470	1.24	150	0.54
20×35×50	560	1.49	180	0.66
20×35×60	1000	2.16	270	0.87

Allowable Ripple at 105°C 120Hz

## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1 k	10k~
Coeff.	200V	0.85	0.88	1.00	1.15
	400V	0.88	0.90	1.00	1.10

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

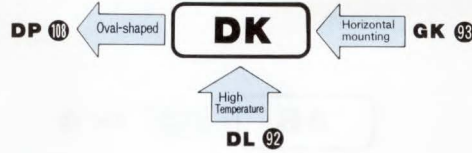
nichicon

**DK** series

Horizontal Mounting Type, Wide Temperature Range



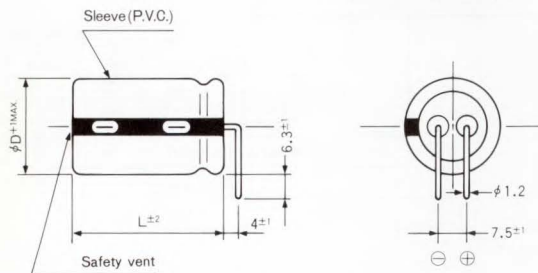
- Horizontal mounting version of GK series.
- Suited for use in flat electronic devices where height space is limited.



## Specifications

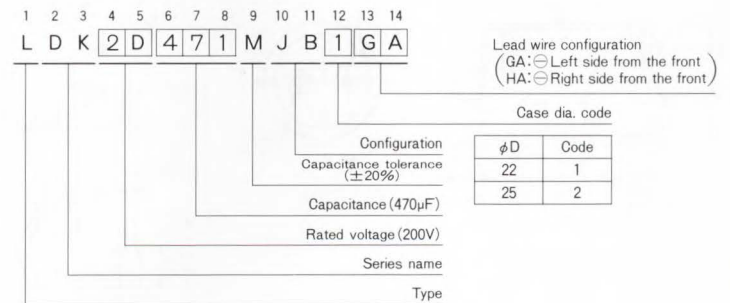
Item	Performance Characteristics				
Operating Temperature Range	-40~+105°C (160~250V), -25~+105°C (400V)				
Voltage Range	160~400V				
Capacitance Range	82~1200 $\mu$ F				
Capacitance Tolerance	$\pm$ 20% at 120Hz, 20°C				
Leakage Current	$I \leq 3\sqrt{CV}$ ( $\mu$ A) (After 5 minutes' application of rated voltage) [C: Capacitance ( $\mu$ F), V: Voltage (V)]				
tan $\delta$	Measurement frequency: 120Hz, Temperature: 20°C				
	Rated voltage (V)	160	200	250	400
	tan $\delta$ (MAX.)	0.15	0.10	0.10	0.20
Stability at Low Temperature	Measurement frequency: 120Hz				
	Rated voltage (V)	160~250		400	
	Impedance ratio Z-25°C / Z+20°C	3		8	
	ZT/Z20 (MAX.)	Z-40°C / Z+20°C		12	
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.				
	Leakage current	Initial specified value or less			
	Capacitance change	Within $\pm$ 20% of initial value			
	tan $\delta$	200% or less of initial specified value			
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours they meet the requirements listed at right.				
	Leakage current	Initial specified value or less			
	Capacitance change	Within $\pm$ 15% of initial value			
	tan $\delta$	150% or less of initial specified value			
Marking	Printed with white color letter on dark brown sleeve.				
Applicable Standards	JIS C-5141 and JIS C-5102.				

## Drawing



The case structure with an auxiliary terminal is also available upon request. Please contact to us for detailed information.

## Type numbering system (Example: 200V 470 $\mu$ F)



## Dimensions

D×L (mm)

Cap. ( $\mu$ F)	Code	V (Code)		160 (2C)		200 (2D)		250 (2E)		400 (2G)	
		Code	$\phi$ D	22	25	22	25	22	25	22	25
82	820									22×35	0.44
100	101									22×40	0.55
120	121									22×45	0.59
150	151									22×50	0.67
180	181									22×60	0.82
220	221							22×35	0.85		
270	271							22×40	0.95		
330	331					22×35	1.05	22×45	1.10	25×35	1.10
390	391	22×35	1.15			22×40	1.20	22×50	1.12	25×40	1.25
470	471	22×40	1.30			22×45	1.30	25×35	1.30	25×45	1.30
560	561	22×45	1.45	25×35	1.40	22×50	1.50	25×40	1.45	25×60	1.55
680	681	22×50	1.65	25×40	1.60	22×60	1.70	25×50	1.70		
820	821	22×60	1.80	25×45	1.75			25×60	1.90		
1000	102			25×50	2.00						
1200	122			25×60	2.20						

Allowable Ripple (A) at 105°C 120Hz

## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1 k	10k~
160~250V	0.85	0.88	1.00	1.15	1.20
400V	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**AB** Snap-in Terminal Type, Withstanding Overvoltage series

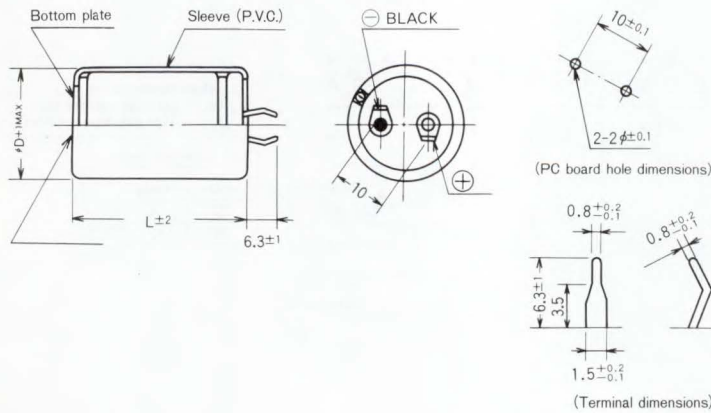
- Suited for 100V/200V switch-over use in switching power supplies.
- Applicable to "Abnormal Test" under the safety standard, VDE 0806.
- Withstand overvoltage and high surge voltages.



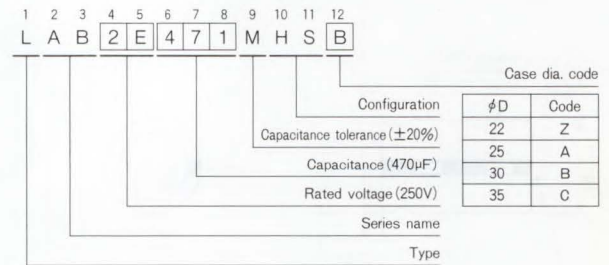
## Specifications

Item	Performance Characteristics	
Operating Temperature Range	-25~+105°C	
Voltage Range	250V	
Capacitance Range	82~820 $\mu$ F	
Capacitance Tolerance	$\pm 20\%$ at 120Hz, 20°C	
Leakage Current	$I \leq 3\sqrt{CV}$ ( $\mu$ A) (After 5 minutes' application of rated voltage) [C: Capacitance ( $\mu$ F), V: Voltage (V)]	
tan $\delta$	Rated voltage (V)	250
	tan $\delta$ (MAX.)	0.20
Measurement frequency: 120Hz, Temperature: 20°C		
Stability at Low Temperature	Rated voltage (V)	250
	Impedance ratio ZT/Z20 (MAX.)	Z-25°C/Z+20°C 8
Measurement frequency: 120Hz		
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within $\pm 20\%$ of initial value
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours they meet the requirements listed at right.	
	Leakage current	Initial specified value or less
	Capacitance change	Within $\pm 15\%$ of initial value
Withstand excess voltage	Not defective after 7 hours continuous charges of 360VDC at 70°C atmosphere.	
	Marking	
Printed with white color letter on dark blue sleeve		
Applicable Standards		JIS C-5141 and JIS C-5102.

## Drawing



## Type numbering system (Example: 250V 470 $\mu$ F)



## Dimensions

Cap. ( $\mu$ F)	V (Code)		250 (2E)				DXL (mm)
	Code	#D	22	25	30	35	
82	820	22	22×20	0.40			
100	101	22	22×25	0.50	25×20	0.50	
150	151	22	22×30	0.65	25×25	0.65	30×20
180	181	22	22×35	0.75	25×30	0.75	30×25
220	221	22	22×40	0.85	25×30	0.85	30×25
270	271	22	22×45	0.95	25×35	1.00	30×30
330	331	22	22×50	1.10	25×40	1.10	30×30
390	391				25×45	1.25	30×35
470	471					1.30	30×40
560	561					1.55	30×45
680	681						35×25
820	821						35×30
							35×35
							35×40
							35×45
							1.00
							1.10
							1.25
							1.30
							1.55
							1.80
							1.95
							Allowable ripple
							Case size

## Frequency coefficient of allowable ripple current

Frequency (Hz)	50	60	120	1k	10k~
Coefficient	0.88	0.90	1.00	1.10	1.15

## Allowable ripple current vs. Ambient temperature

Ambient temp. (°C)	~+45	+60	+70	+85	+105
Coefficient	2.47	2.37	2.17	1.67	1.00

Allowable Ripple (A) at 105°C 120Hz

# ALUMINUM ELECTROLYTIC CAPACITORS

nichicon

**NZ** Screw Terminal Type, Low Impedance series



- Screw terminal series, withstanding 2000 hour application of ripple current at +105°C.
- Extremely low impedance at high frequency ranges.
- Suited for use in filtering circuits of power sources for computers, telecommunications equipment and etc.



## Specifications

Item	Performance Characteristics							
Operating Temperature Range	-40~+105°C							
Voltage Range	10~100V							
Capacitance Range	1000~100000 $\mu$ F							
Capacitance Tolerance	$\pm$ 20% (120Hz, 20°C)							
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than $3\sqrt{CV}$ ( $\mu$ A) or 5 mA, whichever is smaller (at 20°C) [C:Capacitance ( $\mu$ F), V:Voltage (V)]							
Impedance at High Frequency	Impedance at 20°C 20kHz, as per Table below							
Load Life	After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm</math>20% of initial value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm$ 20% of initial value	tan $\delta$	200% or less of initial specified value
	Leakage current	Initial specified value or less						
	Capacitance change	Within $\pm$ 20% of initial value						
tan $\delta$	200% or less of initial specified value							
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours they meet the requirements listed at right.	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within <math>\pm</math>20% of initial value</td> </tr> <tr> <td>tan <math>\delta</math></td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within $\pm$ 20% of initial value	tan $\delta$	200% or less of initial specified value
	Leakage current	Initial specified value or less						
	Capacitance change	Within $\pm$ 20% of initial value						
tan $\delta$	200% or less of initial specified value							
Marking	Printed with white color letter on black sleeve.							
Applicable Standard	JIS C-5141 and JIS C5102							

■ Drawing Please refer to Drawing for NR series in page 112.

## Dimensions

V(Code) Cap.( $\mu$ F)	Code	Item	10 (1A)			16 (1C)			25 (1E)			35 (1V)		
			Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
4700	472											35×50	0.016	8.9
10000	103		35×50	0.012	10.4	35×50	0.012	10.4	35×80	0.010	14.0	35×80	0.010	14.0
22000	223		35×80	0.008	15.6	35×80	0.008	15.6	35×100	0.008	17.2	51×80	0.007	20.4
33000	333		35×80	0.007	17.6	35×100	0.008	18.6	51×80	0.006	22.0			
47000	473		35×100	0.006	20.0	51×80	0.006	23.6						
100000	104		51×120	0.005	29.0									

V(Code) Cap.( $\mu$ F)	Code	Item	50 (1H)			63 (1J)			80 (1K)			100 (2A)		
			Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple	Case size	Impedance	Allowable ripple
1000	102											35×50	0.022	7.6
2200	222					35×50	0.018	8.4	35×80	0.014	11.0	35×80	0.014	11.3
3300	332		35×50	0.015	9.2	35×80	0.012	12.4	35×80	0.012	12.7	35×100	0.011	14.2
4700	472		35×80	0.010	13.9	35×80	0.010	13.9	35×100	0.008	16.1			
10000	103		35×100	0.008	17.2	51×80	0.007	20.3						

Case size D×L (mm)  
Impedance ( $\Omega$ ) at 20°C, 20kHz  
Allowable ripple (A) at 85°C, 20Hz

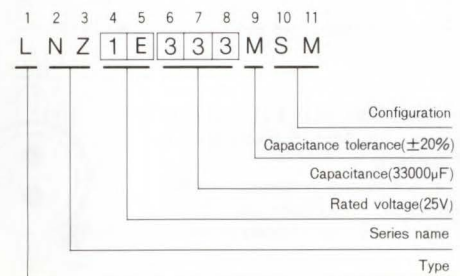
## ● Frequency coefficient of allowable ripple current

Frequency (Hz)	120	360	1 k	20k~
Coefficient	0.86	0.89	0.94	1.00

## ● Allowable ripple current vs. Ambient temperature

Ambient temp.(°C)	~+40	+60	+70	+85	+105
Coefficient	1.50	1.42	1.30	1.00	0.50

Type numbering system (Example: 25V 33000 $\mu$ F)

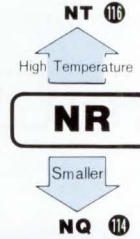


# ALUMINUM ELECTROLYTIC CAPACITORS

**NR** Screw Terminal Type  
series



- Screw terminal series in more compact case sizes.
- Designed for high reliability and high ripple current capability.
- Ideally suited for use in industrial robots, tooling machines, inverters, telecommunications equipment, measuring instruments and etc.

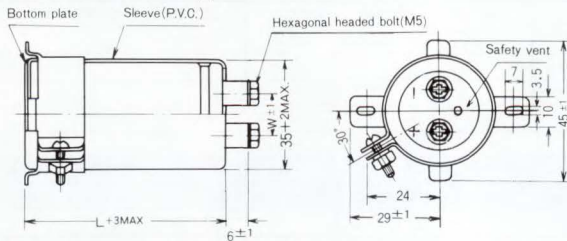


## Specifications

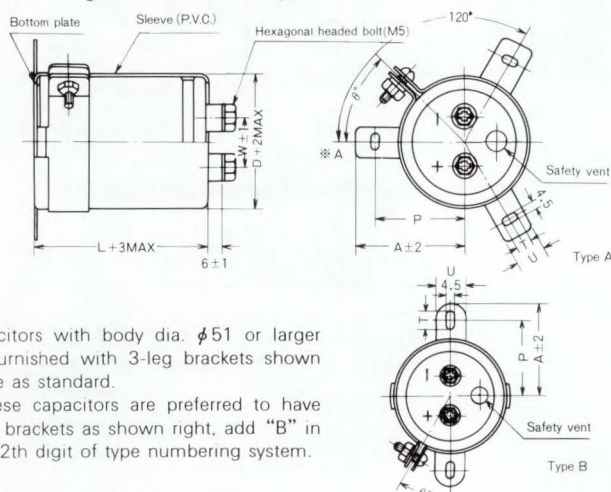
Item	Performance Characteristics																																																													
Operating Temperature Range	-40~+85°C (16~100V), -25~+85°C (160~450V)																																																													
Voltage Range	16~450V																																																													
Capacitance Range	470~470000 μF																																																													
Capacitance Tolerance	±20% (120Hz, 20°C)																																																													
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than $3\sqrt{C/V}$ (μA) or 5 mA, whichever is smaller (at 20°C) [C: Capacitance (μF), V: Voltage (V)]																																																													
tan δ	<table border="1"> <thead> <tr> <th>Case dia. \ V</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> <th>160~250</th> <th>350~450</th> <th rowspan="5">Measurement frequency : 120Hz, 20°C</th> </tr> </thead> <tbody> <tr> <td>φ 35</td> <td>0.7</td> <td>0.45</td> <td>0.45</td> <td>0.3</td> <td>0.25</td> <td>0.25</td> <td>0.2</td> <td>0.15</td> <td>0.25</td> </tr> <tr> <td>φ 51</td> <td>1.0</td> <td>0.6</td> <td>0.6</td> <td>0.45</td> <td>0.35</td> <td>0.3</td> <td>0.2</td> <td>0.15</td> <td>0.25</td> </tr> <tr> <td>φ 63.5</td> <td>1.3</td> <td>0.8</td> <td>0.7</td> <td>0.5</td> <td>0.4</td> <td>0.35</td> <td>0.25</td> <td>0.2</td> <td>0.25</td> </tr> <tr> <td>φ 76.2</td> <td>2.0</td> <td>1.2</td> <td>0.9</td> <td>0.7</td> <td>0.5</td> <td>0.4</td> <td>0.35</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>φ 90</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>0.25</td> <td>0.25</td> </tr> </tbody> </table>	Case dia. \ V	16	25	35	50	63	80	100	160~250	350~450	Measurement frequency : 120Hz, 20°C	φ 35	0.7	0.45	0.45	0.3	0.25	0.25	0.2	0.15	0.25	φ 51	1.0	0.6	0.6	0.45	0.35	0.3	0.2	0.15	0.25	φ 63.5	1.3	0.8	0.7	0.5	0.4	0.35	0.25	0.2	0.25	φ 76.2	2.0	1.2	0.9	0.7	0.5	0.4	0.35	0.25	0.25	φ 90	—	—	—	—	—	—	—	0.25	0.25
	Case dia. \ V	16	25	35	50	63	80	100	160~250	350~450	Measurement frequency : 120Hz, 20°C																																																			
	φ 35	0.7	0.45	0.45	0.3	0.25	0.25	0.2	0.15	0.25																																																				
	φ 51	1.0	0.6	0.6	0.45	0.35	0.3	0.2	0.15	0.25																																																				
	φ 63.5	1.3	0.8	0.7	0.5	0.4	0.35	0.25	0.2	0.25																																																				
φ 76.2	2.0	1.2	0.9	0.7	0.5	0.4	0.35	0.25	0.25																																																					
φ 90	—	—	—	—	—	—	—	0.25	0.25																																																					
Stability at Low Temperature	<table border="1"> <thead> <tr> <th rowspan="2">Rated voltage (V)</th> <th colspan="2">Measurement frequency : 120 Hz</th> </tr> <tr> <th>16~100</th> <th>160~450</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio ZT/Z20 (MAX.)</td> <td>Z-40°C/Z+20°C 12</td> <td>Z-25°C/Z+20°C 8</td> </tr> </tbody> </table>	Rated voltage (V)	Measurement frequency : 120 Hz		16~100	160~450	Impedance ratio ZT/Z20 (MAX.)	Z-40°C/Z+20°C 12	Z-25°C/Z+20°C 8																																																					
	Rated voltage (V)		Measurement frequency : 120 Hz																																																											
16~100		160~450																																																												
Impedance ratio ZT/Z20 (MAX.)	Z-40°C/Z+20°C 12	Z-25°C/Z+20°C 8																																																												
Load Life	Capacitors meet the requirements shown at right after subjected to 5000 hours' application of allowable ripple current overlapped with DC voltage, the max. sum of these being equal to rated voltage at 85°C. <table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±15% of initial value</td> </tr> <tr> <td>tan δ</td> <td>175% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±15% of initial value	tan δ	175% or less of initial specified value																																																							
Leakage current	Initial specified value or less																																																													
Capacitance change	Within ±15% of initial value																																																													
tan δ	175% or less of initial specified value																																																													
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																																																													
Marking	Printed with black color letter on light blue sleeve.																																																													
Applicable Standard	JIS C-5141 and JIS C-5102.																																																													

## Drawing

### φ35 Screw terminal type



### φ51 or larger Screw terminal type



### Note

Capacitors with body dia. φ51 or larger are furnished with 3-leg brackets shown above as standard. If these capacitors are preferred to have 2-leg brackets as shown right, add "B" in the 12th digit of type numbering system.

\* Screws conform to ISO.

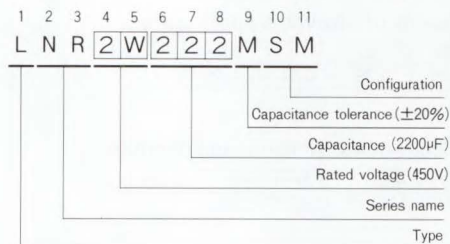
## Dimension of terminal pitch (W)

Case dia. (mm)	W (mm)
35	12.7
51	22.0
63.5	28.6
76.2	31.8
90	31.8

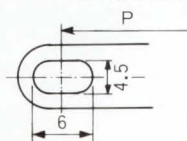
## Dimensions of mounting bracket (mm)

Symbol	φD	3-Leg				2-Leg			
		φ51	φ63.5	φ76.2	φ90	φ51	φ63.5	φ76.2	φ90
P	32.5	38.1	44.5	50.8	33.2	40.5	46.5	53	
A	38.5	43	49.2	55.5	39.5	46.5	53	59	
T	7	8	7	7	6	6	6	6	
U	12	14	16	16	14	14	14	14	
θ°	60	60	60	60	30	30	30	30	

## Type numbering system (Example 450V 2200μF)



3-leg brackets for φ90 capacitors have different hole shapes from the ordinary ones as illustrated below.



• Dimension table in next page.

## NR series

### Dimensions

DXL(mm)

V (Code)		16 (1C)		25 (1E)		35 (1V)		50 (1H)		63 (1J)	
Cap. (μF)	Code	20		32		44		63		79	
	S.V.										
10000	103									35×80	4.1
15000	153							35×80	5.4	35×100	5.5
22000	223							35×100	6.1	35×120	7.1
33000	333			35×80	6.0	35×80	6.2	51×70	7.0	51×80	8.8
47000	473	35×80	6.4	35×100	8.2	35×120	8.2	51×90	8.6	51×120	11.7
68000	683	35×100	7.9	35×120	9.4	51×80	9.3	51×100	11.0	63.5×100	15.0
100000	104	35×120	10.6	51×100	12.0	51×120	13.6	63.5×100	14.2	63.5×140	20.8
150000	154	51×100	11.5	51×120	15.3	63.5×100	14.5	76.2×120	18.6	76.2×140	26.0
220000	224	51×120	15.6	63.5×120	18.9	76.2×100	16.8				
330000	334	63.5×120	25.1	76.2×120	23.2	76.2×140	24.8				
470000	474	76.2×120	30.5								

V (Code)		80 (1K)		100 (2A)		160 (2C)		200 (2D)		250 (2E)	
Cap. (μF)	Code	100		125		200		250		300	
	S.V.										
1000	102									35×80	2.4
1500	152							35×80	2.9	35×100	3.0
2200	222					35×80	3.2	35×100	3.5	51×80	4.0
3300	332					35×120	4.7	51×80	4.8	51×100	5.4
4700	472			35×80	3.8	51×80	5.0	51×100	6.3	63.5×100	7.3
6800	682			35×100	4.5	51×100	6.4	51×140	7.3	63.5×120	8.9
10000	103	35×80	4.2	35×120	5.3	63.5×100	9.1	63.5×120	9.8	76.2×120	11.8
15000	153	35×120	6.0	51×80	6.0	76.2×100	12.0	76.2×120	13.0	90×140	16.4
22000	223	51×80	6.5	51×100	6.8	76.2×140	16.9	90×140	15.9		
33000	333	51×120	9.2	51×140	10.0	90×140	19.2				
47000	473	63.5×100	12.7	63.5×140	14.4						
68000	683	63.5×140	15.5	76.2×140	18.2						
100000	104	76.2×140	21.3								

V (Code)		350 (2V)		400 (2G)		450 (2W)	
Cap. (μF)	Code	400		450		500	
	S.V.						
470	471			35×80	2.0	35×80	2.1
680	681	35×80	2.5	35×100	2.6	35×120	2.9
1000	102	51×60	3.3	51×70	3.3	51×80	3.6
1200	122	51×70	3.6	51×80	4.2	51×100	4.2
1500	152	51×80	4.5	51×100	4.8	51×110	5.1
1800	182	51×90	5.1	51×110	5.4	63.5×90	5.4
2200	222	51×110	6.0	51×130	6.3	63.5×110	6.6
2700	272	51×130	6.9	63.5×110	7.2	63.5×130	7.5
3300	332	63.5×100	8.1	63.5×130	8.4	76.2×110	8.4
3900	392	63.5×110	9.0	76.2×100	8.7	76.2×130	9.6
4700	472	76.2×100	9.6	76.2×130	10.5	76.2×150	11.4
5600	562	76.2×110	11.4	76.2×150	12.3	76.2×150	13.2
6800	682	76.2×130	13.5	76.2×150	13.5	90×150	14.4
8200	822	76.2×150	15.0	90×150	15.9	90×150	15.9
10000	103	90×150	16.8	90×150	17.7	90×190	17.5
12000	123	90×150	18.4	90×190	20.7		
15000	153	90×190	22.8				

Case size φD×L  
Allowable ripple(A) at 85°C 120Hz

### Frequency coefficient of allowable ripple current

Frequency (Hz)	60	120	360	1 k	10k~
16~100V	0.90	1.00	1.08	1.15	1.15
160~250V	0.88	1.00	1.08	1.15	1.20
350~450V	0.82	1.00	1.20	1.35	1.40

### Allowable ripple current vs. Ambient temperature

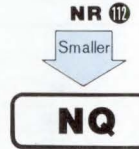
Ambient temp. (°C)	~+40	+60	+70	+85
16~250V	1.50	1.42	1.30	1.00
350~450V	2.70	2.00	1.70	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**NQ** Screw Terminal Type, Smaller-Sized series



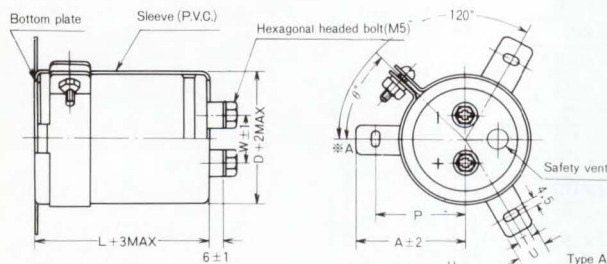
- Smaller case sizes than NR series.
- High reliability, long life guaranteed for 10,000 hour application of ripple current at +85°C.
- Suited for use in industrial power supplies like inverter circuits, etc.



## Specifications

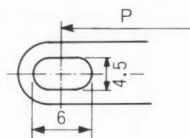
Item	Performance Characteristics															
Operating Temperature Range	-25~+85°C															
Voltage Range	350~450V															
Capacitance Range	1000~10000μF															
Capacitance Tolerance	±20% (120Hz, 20°C)															
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than $3\sqrt{CV}$ (μA) or 5 mA, whichever is smaller (at 20°C). (C: Capacitance (μF), V: Voltage (V))															
tan δ	<table border="1"> <thead> <tr> <th>Case dia.</th> <th>W.V.</th> <th>350~450</th> </tr> </thead> <tbody> <tr> <td>φ 51</td> <td></td> <td>0.25</td> </tr> <tr> <td>φ 63.5</td> <td></td> <td>0.25</td> </tr> <tr> <td>φ 76.2</td> <td></td> <td>0.25</td> </tr> <tr> <td>φ 90</td> <td></td> <td>0.25</td> </tr> </tbody> </table>	Case dia.	W.V.	350~450	φ 51		0.25	φ 63.5		0.25	φ 76.2		0.25	φ 90		0.25
	Case dia.	W.V.	350~450													
	φ 51		0.25													
	φ 63.5		0.25													
φ 76.2		0.25														
φ 90		0.25														
Stability at Low Temperature	Measurement frequency: 120Hz															
	<table border="1"> <thead> <tr> <th>Rated voltage (V)</th> <th>350~450</th> </tr> </thead> <tbody> <tr> <td>Impedance ratio ZT/Z20 (MAX.)</td> <td><math>Z_{-25°C}/Z_{+20°C}</math> 8</td> </tr> </tbody> </table>	Rated voltage (V)	350~450	Impedance ratio ZT/Z20 (MAX.)	$Z_{-25°C}/Z_{+20°C}$ 8											
Rated voltage (V)	350~450															
Impedance ratio ZT/Z20 (MAX.)	$Z_{-25°C}/Z_{+20°C}$ 8															
Load Life	Capacitors meet the requirements shown at right after subjected to 10000 hours' application of allowable ripple current overlapped with DC voltage, the max. sum of these being equal to rated voltage at 85°C.															
	<table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value									
	Leakage current	Initial specified value or less														
Capacitance change	Within ±20% of initial value															
tan δ	200% or less of initial specified value															
Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.															
Marking	Printed with white color letter on black sleeve.															
Applicable Standard	JIS C-5141 and JIS C-5102.															

## Drawing



**Note:**  
Capacitors with body dia. φ51 or larger are furnished with 3-leg brackets shown above as standard.  
If these capacitors are preferred to have 2-leg brackets as shown right, add "B" in the 12th digit of type numbering system.

3-leg brackets for φ90 capacitors have different hole shapes from the ordinary ones as illustrated below.



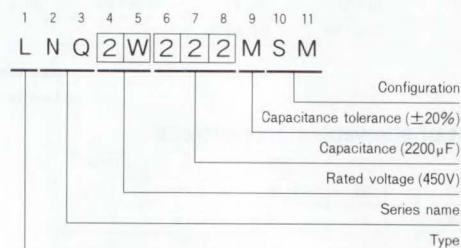
### Dimension of terminal pitch (W)

Case dia. (mm)	W (mm)
51	22.0
63.5	28.6
76.2	31.8
90	31.8

### Dimensions of mounting bracket (mm)

Symbol	Leg Shape φD	3-Leg				2-Leg			
		φ 51	φ 63.5	φ 76.2	φ 90	φ 51	φ 63.5	φ 76.2	φ 90
P		32.5	38.1	44.5	50.8	33.2	40.5	46.5	53
A		38.5	43	49.2	55.5	39.5	46.5	53	59
T		7	8	7	7	6	6	6	6
U		12	14	16	16	14	14	14	14
θ°		60	60	60	60	30	30	30	30

### Type numbering system (Example 450V 2200μF)



• Dimension table in next page.



## NQ series

### ■ Dimensions

DXL(mm)

Cap.( $\mu$ F)	Code	V(Code)	350 (2V)		400 (2G)		450 (2W)	
		S.V.	400		450		500	
1000	102						51× 75	4.3
1200	122				51× 75	4.6	51× 95	5.4
1500	152		51× 75	5.3	51× 95	5.9	51×105	6.4
1800	182		51× 85	6.2	51×105	6.8	63.5× 85	7.0
2200	222		51×105	7.7	51×125	8.3	63.5×105	8.6
2700	272		51×115	9.0	63.5×105	9.3	63.5×115	10.1
3300	332		63.5× 95	9.4	63.5×125	11.1	76.2×105	11.6
3900	392		63.5×105	12.1	76.2×105	12.3	76.2×115	13.2
4700	472		76.2× 95	14.0	76.2×125	14.8	76.2×135	15.1
5600	562		76.2×105	16.1	76.2×135	16.7	76.2×145	18.0
6800	682		76.2×125	18.6	90×125	19.3	90×145	21.5
8200	822		76.2×145	22.2	90×145	22.8		
10000	103		90×145	26.0			Case size	Allowable ripple

Allowable ripple(A) at 85°C 120Hz

### ● Frequency coefficient of allowable ripple current

Frequency(Hz)	60	120	360	1 k	10k~
Coefficient	0.80	1.00	1.10	1.30	1.40

### ● Allowable ripple Current vs. Ambient temperature

Ambient temp(°C)	~+40	+60	+70	+85
Coefficient	2.50	2.00	1.70	1.00

# ALUMINUM ELECTROLYTIC CAPACITORS

**NT** Screw Terminal Type, Wide Temperature Range series



- Screw terminal series for high temperature up to +105°C.
- High reliability, long life guaranteed for 2000 hour application of ripple current at +105°C.
- Suited for use in industrial applications where high reliability and dependable performance are the most important.

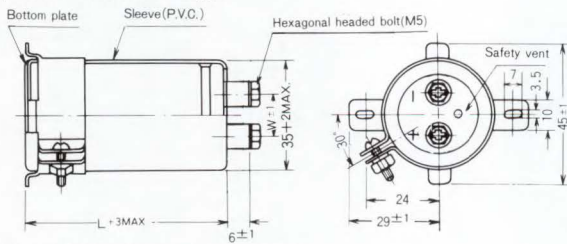


## Specifications

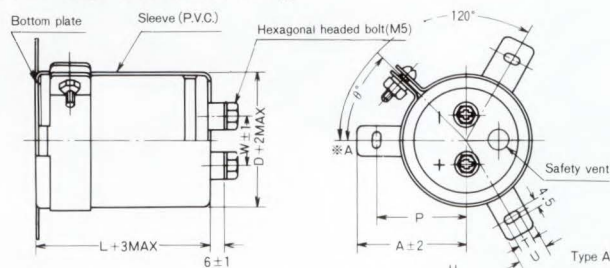
Item	Performance Characteristics																																																																														
Operating Temperature Range	-40~+105°C (16~100V), -25~+105°C (160~400V)																																																																														
Voltage Range	16~400V																																																																														
Capacitance Range	220~330000μF																																																																														
Capacitance Tolerance	±20% at 120Hz, 20°C																																																																														
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than $I \leq 3/\sqrt{CV}$ (μA) or 5mA, whichever is smaller. (C: Capacitance (μF), V: Voltage (V))																																																																														
tan δ	Measurement frequency: 120Hz, Temperature: 20°C																																																																														
	<table border="1"> <thead> <tr> <th>φD \ V</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> <th>63</th> <th>80</th> <th>100</th> <th>160</th> <th>200</th> <th>250</th> <th>350</th> <th>400</th> </tr> </thead> <tbody> <tr> <td>35</td> <td>0.45</td> <td>0.45</td> <td>0.40</td> <td>0.30</td> <td>0.25</td> <td>0.25</td> <td>0.20</td> <td>0.15</td> <td>0.15</td> <td>0.15</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>51</td> <td>0.60</td> <td>0.60</td> <td>0.45</td> <td>0.45</td> <td>0.35</td> <td>0.30</td> <td>0.20</td> <td>0.15</td> <td>0.15</td> <td>0.15</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>63.5</td> <td>0.80</td> <td>0.70</td> <td>0.50</td> <td>0.50</td> <td>0.40</td> <td>0.35</td> <td>0.25</td> <td>0.20</td> <td>0.20</td> <td>0.20</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>76.2</td> <td>1.20</td> <td>0.90</td> <td>0.70</td> <td>0.70</td> <td>0.70</td> <td>0.50</td> <td>0.40</td> <td>0.35</td> <td>0.25</td> <td>0.25</td> <td>0.25</td> <td>0.25</td> </tr> <tr> <td>90</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>0.35</td> <td>0.25</td> <td>0.25</td> <td>0.25</td> <td>0.25</td> </tr> </tbody> </table>	φD \ V	16	25	35	50	63	80	100	160	200	250	350	400	35	0.45	0.45	0.40	0.30	0.25	0.25	0.20	0.15	0.15	0.15	0.25	0.25	51	0.60	0.60	0.45	0.45	0.35	0.30	0.20	0.15	0.15	0.15	0.25	0.25	63.5	0.80	0.70	0.50	0.50	0.40	0.35	0.25	0.20	0.20	0.20	0.25	0.25	76.2	1.20	0.90	0.70	0.70	0.70	0.50	0.40	0.35	0.25	0.25	0.25	0.25	90	—	—	—	—	—	—	—	0.35	0.25	0.25	0.25	0.25
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76.2	1.20	0.90	0.70	0.70	0.70	0.50	0.40	0.35	0.25	0.25	0.25	0.25																																																																			
90	—	—	—	—	—	—	—	0.35	0.25	0.25	0.25	0.25																																																																			
Stability at Low Temperature	Measurement frequency: 120Hz																																																																														
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Load Life	<p>After an application of rated voltage (maximum value of DC voltage overlapped by an allowable ripple current) for 2000 hours at 105°C, capacitors meet the characteristics requirements listed at right.</p> <table border="1"> <tbody> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Not less than 20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </tbody> </table>	Leakage current	Initial specified value or less	Capacitance change	Not less than 20% of initial value	tan δ	200% or less of initial specified value																																																																								
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Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																																																																														
Marking	Printed with white color letter on black sleeve.																																																																														
Applicable Standard	JIS C-5141 and JIS C-5102.																																																																														

## Drawing

### φ35 Screw terminal type



### φ51 or larger Screw terminal type



**Note :**  
Capacitors with body dia. φ51 or larger are furnished with 3-leg brackets shown above as standard.  
If these capacitors are preferred to have 2-leg brackets as shown right, add "B" in the 12th digit of type numbering system.

## Dimension of terminal pitch (W)

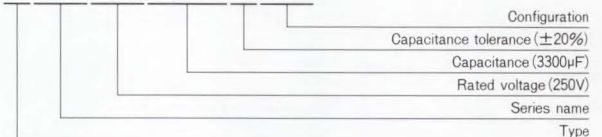
Case dia. (mm)	W (mm)
35	12.7
51	22.0
63.5	28.6
76.2	31.8
90	31.8

## Dimensions of mounting bracket (mm)

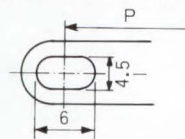
Symbol	φD	3-Legs				2-Legs			
		φ51	φ63.5	φ76.2	φ90	φ51	φ63.5	φ76.2	φ90
P	32.5	38.1	44.5	50.8	33.2	40.5	46.5	53	
A	38.5	43	49.2	55.5	39.5	46.5	53	59	
T	7	8	7	7	6	6	6	6	
U	12	14	16	16	14	14	14	14	
θ°	60	60	60	60	30	30	30	30	

## Type numbering system (Example: 250V 3300μF)

1 2 3 4 5 6 7 8 9 10 11  
L N T 2 E 3 3 2 M S M



3-leg brackets for φ90 capacitors have different hole shapes from the ordinary ones as illustrated below.



• Dimension table in next page.

\* Screws conform to ISO.

### ■ Dimensions

DXL (mm)

Cap. (μF)	V (Code)		16 (1C)		25 (1E)		35 (1V)		50 (1H)	
	Surge Volt.	Code	20		32		44		63	
10000	103						35×80	9.4	35×80	9.7
15000	153						35×80	10.2	35×100	11.0
22000	223				35×80	7.5	35×100	11.1	51×80	12.6
33000	333		35×80	8.9	35×100	10.8	51×80	14.8	51×120	15.5
47000	473		35×100	11.5	51×80	14.8	51×100	16.7	63.5×100	19.8
68000	683		51×80	14.2	51×120	16.9	51×120	24.5	63.5×120	25.6
100000	104		51×100	19.1	63.5×100	21.6	63.5×120	26.1	76.2×120	33.5
150000	154		51×120	20.7	63.5×120	27.5	76.2×120	30.2		
220000	224		63.5×120	28.1	76.2×120	34.0				
330000	334		76.2×120	41.2						

Cap. (μF)	V (Code)		63 (1J)		80 (1K)		100 (2A)		160 (2C)	
	Surge Volt.	Code	79		100		125		200	
1000	102								35×80	3.0
1500	152								35×80	4.2
2200	222						35×80	4.5	35×100	5.1
3300	332						35×80	6.5	51×80	7.5
4700	472				35×80	5.8	35×100	7.6	51×100	8.0
6800	682				35×100	6.9	51×80	9.0	63.5×100	10.2
10000	103		35×100	7.4	51×80	8.8	51×100	10.6	63.5×120	14.6
15000	153		51×80	9.9	51×100	12.6	63.5×100	13.8	76.2×120	19.2
22000	223		51×100	12.8	63.5×100	13.6	76.2×100	15.6	76.2×140	23.5
33000	333		63.5×100	15.8	76.2×100	19.3	76.2×140	20.0	90×140	26.7
47000	473		63.5×120	21.1	76.2×120	26.7				
68000	683		76.2×120	27.0						

Cap. (μF)	V (Code)		200 (2D)		250 (2E)		350 (2V)		400 (2G)	
	Surge Volt.	Code	250		300		400		450	
220	221								35×80	1.3
330	331						35×80	1.5	35×80	1.7
470	471						35×80	2.1	35×100	2.4
680	681				35×80	2.7	51×80	3.5	51×100	3.8
1000	102		35×80	3.3	35×100	3.8	51×100	4.6	51×120	5.0
1500	152		35×100	4.6	51×80	4.8	51×120	6.3	63.5×100	6.8
2200	222		51×80	5.6	51×100	6.4	63.5×120	8.4	76.2×100	8.6
3300	332		51×100	7.7	63.5×100	8.6	76.2×120	11.3	76.2×140	12.2
4700	472		63.5×100	10.1	63.5×120	11.7	76.2×140	13.4	90×140	14.9
6800	682		63.5×120	11.7	76.2×120	14.2	90×140	18.9		
10000	103		76.2×120	15.7	90×140	18.9				
15000	153		76.2×140	20.8						
22000	223		90×140	30.2					Case size	Allowable ripple

Allowable Ripple (A) at 85°C 120Hz

### ● Frequency coefficient of allowable ripple current

Frequency (Hz)		60	120	360	1 k	10k~
Coeff.	16~100V	0.90	1.00	1.08	1.15	1.15
	160~250V	0.88	1.00	1.08	1.15	1.20
	400 - 450V	0.90	1.00	1.08	1.10	1.15

### ● Allowable ripple current vs. Ambient temperature

Ambient temp.	~+40	+60	+70	+85	+105
Coefficient	1.50	1.42	1.30	1.00	0.50

# ALUMINUM ELECTROLYTIC CAPACITORS

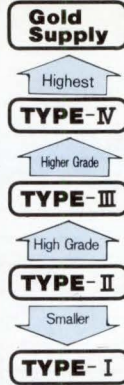


Lug/Snap-in Terminal Type, For Audio Equipment

series



For Audio Use

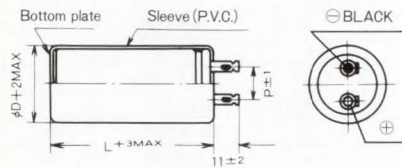


- Designed for high grade audio equipment, giving priority to high fidelity sound quality.
- Snap-in terminal type developed to suit for use in mini-compos, CD, DAT players, cassette decks and etc.
- Selectable from the following 5 grades :
  - Great Supply Type I Compact size
  - Great Supply Type II Standard
  - Great Supply Type III High grade
  - Great Supply Type IV Higher grade
  - Gold Supply Highest grade with gold-plated terminals

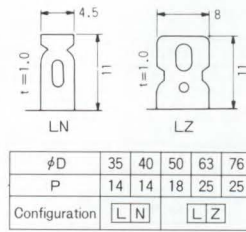
## Specifications

Item	Performance Characteristics																												
Operating Temperature Range	-40~+85°C																												
Voltage Range	16~100V																												
Capacitance Range	680~33000µF																												
Capacitance Tolerance	±20% at 120Hz, 20°C																												
Leakage Current	After 5 minutes' application of rated voltage, leakage current is not more than $3\sqrt{CV}$ (µA). [C: Capacitance (µF), V: Voltage (V)]																												
tan δ	Measurement frequency: 120Hz, Temperature: 20°C																												
	<table border="1"> <thead> <tr> <th rowspan="2">Grade</th> <th colspan="3">16</th> <th colspan="3">25~63</th> <th colspan="3">71~100</th> </tr> <tr> <th>TYPE-I</th> <th>TYPE-II</th> <th>TYPE-III, IV Gold Supply</th> <th>TYPE-I</th> <th>TYPE-II</th> <th>TYPE-III, IV Gold Supply</th> <th>TYPE-I</th> <th>TYPE-II</th> <th>TYPE-III, IV Gold Supply</th> </tr> </thead> <tbody> <tr> <td>tan δ</td> <td>0.35</td> <td>0.30</td> <td>0.25</td> <td>0.30</td> <td>0.25</td> <td>0.22</td> <td>0.25</td> <td>0.22</td> <td>0.20</td> </tr> </tbody> </table>	Grade	16			25~63			71~100			TYPE-I	TYPE-II	TYPE-III, IV Gold Supply	TYPE-I	TYPE-II	TYPE-III, IV Gold Supply	TYPE-I	TYPE-II	TYPE-III, IV Gold Supply	tan δ	0.35	0.30	0.25	0.30	0.25	0.22	0.25	0.22
Grade	16			25~63			71~100																						
	TYPE-I	TYPE-II	TYPE-III, IV Gold Supply	TYPE-I	TYPE-II	TYPE-III, IV Gold Supply	TYPE-I	TYPE-II	TYPE-III, IV Gold Supply																				
tan δ	0.35	0.30	0.25	0.30	0.25	0.22	0.25	0.22	0.20																				
Stability at Low Temperature	Measurement frequency: 120Hz																												
	<table border="1"> <thead> <tr> <th rowspan="2">Impedance ratio</th> <th colspan="2">16~100</th> </tr> <tr> <th>Z-25°C / Z+20°C</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>ZT/Z20 (MAX.)</td> <td>Z-40°C / Z+20°C</td> <td>12</td> </tr> </tbody> </table>	Impedance ratio	16~100		Z-25°C / Z+20°C	4	ZT/Z20 (MAX.)	Z-40°C / Z+20°C	12																				
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	Z-25°C / Z+20°C	4																											
ZT/Z20 (MAX.)	Z-40°C / Z+20°C	12																											
Load Life	Capacitors meet the requirements shown at right after 1000 hours' application of rated ripple current overlapped with DC voltage, the max. sum of these being equal to rated voltage, at 85°C.																												
	<table border="1"> <tr> <td>Leakage current</td> <td>Initial specified value or less</td> </tr> <tr> <td>Capacitance change</td> <td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td> <td>200% or less of initial specified value</td> </tr> </table>	Leakage current	Initial specified value or less	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value																						
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Shelf Life	After leaving capacitors under no load at 85°C for 1000 hours and applying voltage according to JIS C-5102 4-3, they meet the specified value for load life characteristics listed above.																												
Marking	Printed with gold color letter on black sleeve.																												
Applicable Standards	JIS C-5141 and JIS C-5102.																												

## Drawing (Lug terminal type)

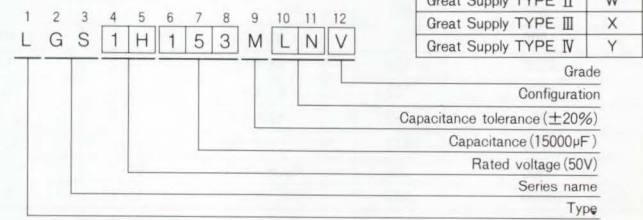


## Configuration φ35 ~ φ40 φ50 ~ φ76



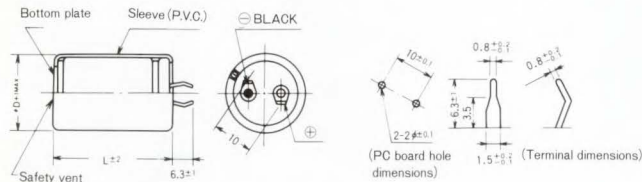
φD	35	40	50	63	76
P	14	14	18	25	25
Configuration	LN		LZ		

## Type numbering system (Example: Great Supply Type I 50V 15000µF)

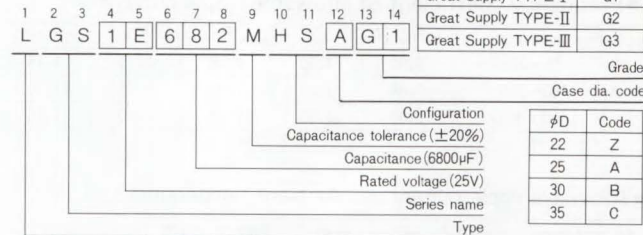


Grade	Code
Gold Supply	—
Great Supply TYPE I	V
Great Supply TYPE II	W
Great Supply TYPE III	X
Great Supply TYPE IV	Y

## (Snap-in terminal type)



## Type numbering system (Example: Great Supply Type I 25V 6800µF)



Grade	Code
Great Supply TYPE-I	G1
Great Supply TYPE-II	G2
Great Supply TYPE-III	G3

## Dimensions(Lug terminal type)

Cap. (µF)	Code	Grade	V (Code)	50 (1H)	63 (1J)	71 (H2)	80 (1K)	100 (2A)	D×L (mm)	
6800	682	TYPE-I					35×68	4.4	40×80	5.1
		TYPE-II			35×68	4.3	40×80	5.5	50×80	6.2
		TYPE-III	35×80	5.2	40×80	5.5	40×100	6.5	50×100	7.3
		TYPE-IV	40×80	5.5	40×100	6.1	50×80	6.7	50×100	7.3
10000	103	TYPE-I					35×68	3.9	35×80	4.7
		TYPE-II	35×80	4.6	40×80	4.9	40×100	6.1	50×80	6.2
		TYPE-III	40×100	6.1	40×100	6.1	50×100	7.3	50×100	6.9
		TYPE-IV	40×100	6.1	50×80	6.2	50×100	7.3	63×80	7.6
15000	153	TYPE-I					35×68	4.8	40×80	5.5
		TYPE-II	40×80	6.1	40×100	6.7	50×80	7.6	50×100	7.7
		TYPE-III	50×80	7.6	50×100	8.4	63×80	9.3	63×100	11.3
		TYPE-IV	50×100	8.4	63×80	8.7	63×100	10.1	76×100	11.3
22000	223	TYPE-I					40×80	6.7	40×100	7.4
		TYPE-II	50×80	8.3	50×100	9.1	63×80	10.5	63×100	12.9
		TYPE-III	63×80	10.5	63×100	11.6	63×100	12.3	76×100	13.7
		TYPE-IV	63×80	10.5	63×100	11.6	63×100	12.3	76×100	13.7
33000	333	TYPE-I					63×80	9.5	63×100	10.4

Allowable Ripple (A) at 85°C 120Hz



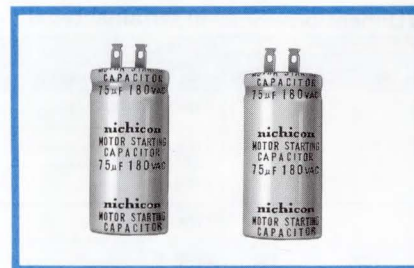
# ALUMINUM ELECTROLYTIC CAPACITORS



Lug Terminal Type. For Motor Starting

series

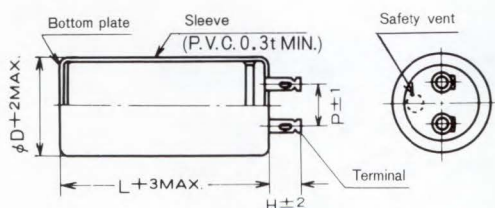
- Two or three ranks smaller case sizes than the previous MS series.
- Three different terminal dimensions selectable for particular usages as shown below.



## Specifications

Item	Performance Characteristics											
Operating Temperature Range	-20~+65°C											
Voltage Range	125~250V.AC											
Capacitance Range	50~250μF											
Capacitance Tolerance	0~+20% at 60 Hz, 20°C											
tan δ	0.08 or less at 60 Hz, 20°C											
Overvoltage	① Withstanding 1.4 times of AC rated voltage for 30 seconds. ② Withstanding 1.2 times of AC rated voltage for 2 minutes. Note: The tests ① and ② are conducted by using different specimens.											
Safety Vent Performance	Internal element shall not burst out of capacitor body or break the case when abnormal heat is generated by continuous application of AC voltage equivalent to 1.4 times or less of rated voltage.											
Insulation Resistance	Between all terminals and mounting fixture: 100 MΩ or more											
Withstand Voltage	Between all terminals and mounting fixture: 1500 VAC for 1 min.											
Life Test	Apply rated voltage to a capacitor at 65°C in accordance with the table at right.	<table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Voltage application cycle</th> <th>Number of applications</th> </tr> </thead> <tbody> <tr> <td>125 · 140V</td> <td>2 times/min. 1 sec. on and 29 sec. off</td> <td>75000 times</td> </tr> <tr> <td>160~250V</td> <td>Once/min. 1 sec. on and 59 sec. off</td> <td>30000 times</td> </tr> </tbody> </table>	Rated voltage	Voltage application cycle	Number of applications	125 · 140V	2 times/min. 1 sec. on and 29 sec. off	75000 times	160~250V	Once/min. 1 sec. on and 59 sec. off	30000 times	
	Rated voltage	Voltage application cycle	Number of applications									
125 · 140V	2 times/min. 1 sec. on and 29 sec. off	75000 times										
160~250V	Once/min. 1 sec. on and 59 sec. off	30000 times										
Capacitors meet the requirements shown at right when it is restored at normal temperature after completion of the test.	<table border="1"> <thead> <tr> <th>Capacitance change</th> <th>Within ±25% of measurement before test</th> </tr> </thead> <tbody> <tr> <td>Dissipation factor (tan δ)</td> <td>0.2 or less</td> </tr> </tbody> </table>	Capacitance change	Within ±25% of measurement before test	Dissipation factor (tan δ)	0.2 or less							
Capacitance change	Within ±25% of measurement before test											
Dissipation factor (tan δ)	0.2 or less											
Applicable Standard	JIS C-4905											

## Drawing

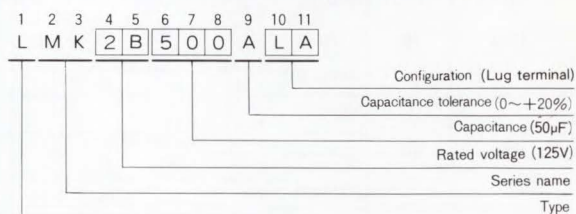


φD	25	30	35	40	45	50
P	10	10	14	14	18	18

## Dimensions of terminal

Terminal dimensions (H)			
Configuration	L A	L C	L D
Applicable size	φ25~φ35	φ40~φ45	φ50

## Type numbering system (Example: 125V 50μF)



## Dimensions

V (VAC)		125	140	160	180	200	220	250
Cap. (μF)	Code	2 B	C 5	2 C	2 Z	2 D	2 P	2 E
50	500	25×40	25×40	25×50	25×60	35×60	35×63	35×80
75	750	25×50	25×60	25×68	30×60	35×80	35×100	35×100
80	800	25×50	25×60	30×60	30×60	35×80	35×100	40×80
100	101	25×63	25×63	30×60	30×68	35×80	35×100	40×100
120	121	25×68	30×60	35×60	35×63	40×100	40×100	40×120
150	151	30×63	30×63	35×63	35×68	40×120	40×120	45×125
170	171	30×68	35×50	35×80	35×80	40×120	45×105	50×105
200	201	35×60	35×63	35×100	35×100	45×125	45×125	50×125
250	251	35×68	35×80	35×100	40×100			

# 2 TANTALUM ELECTROLYTIC CAPACITORS

Contents
----------

2-1. Type of capacitors	122
2. Systematic diagram of capacitors based on applications	122
3. Precautions in using capacitors	123
4. Individual specifications by series	126

# TANTALUM ELECTROLYTIC CAPACITORS

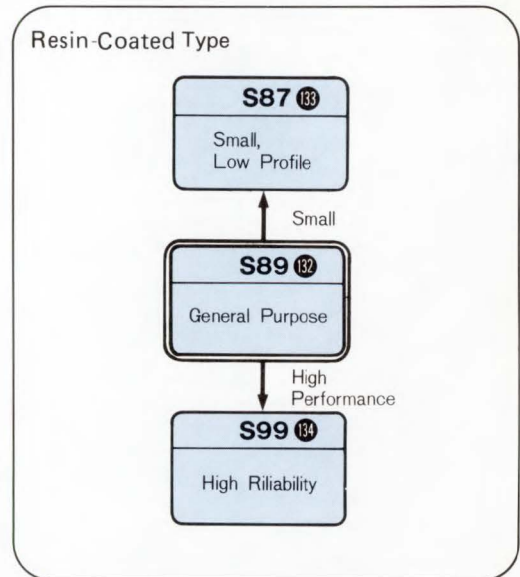
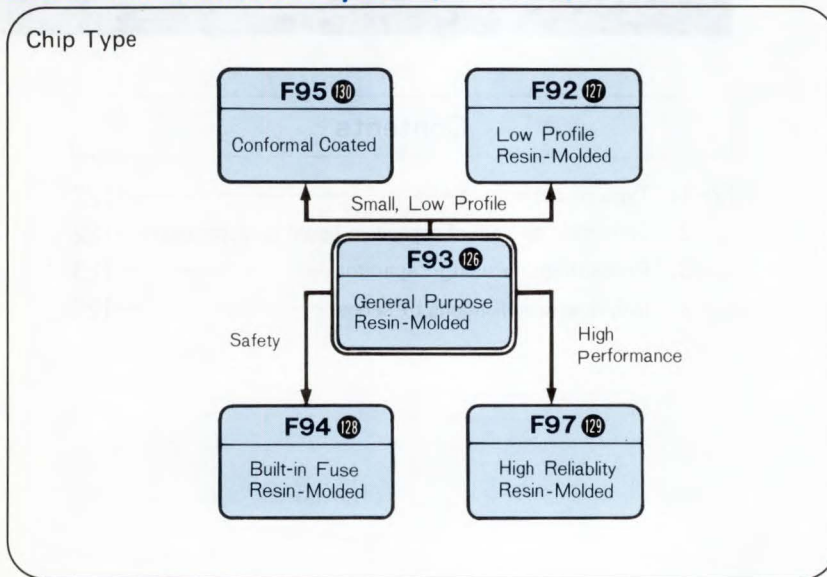


Anti-Solvent Feature

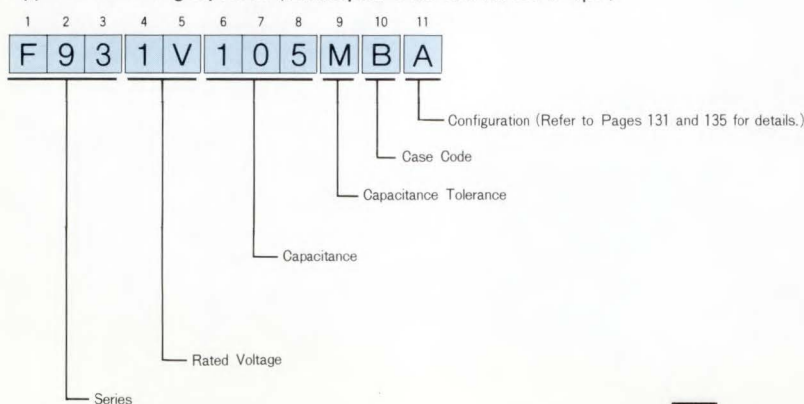
## Solid Tantalum Electrolytic Capacitors

Kind	Solid Tantalum Electrolytic Capacitors							
Series	F92	F93	F94	F97	F95	S87	S89	S99
Photograph								
Type	Resin-Molded Chip	Resin-Molded Chip	Built-in Fuse Resin-Molded Chip	Resin-Molded Chip	Conformal Coated Chip	Resin-Coated	Resin-Coated	Resin-Coated
Features	<ul style="list-style-type: none"> <li>Low Profile, Rectangular Molded</li> <li>Excellent High Frequency Characteristics</li> <li>Excellent Humidity Resistance</li> </ul>	<ul style="list-style-type: none"> <li>General Purpose Rectangular Molded</li> <li>Low ESR/Impedance, Excellent High Frequency Characteristics</li> <li>Excellent Humidity Resistance</li> </ul>	<ul style="list-style-type: none"> <li>Built-in Fuse</li> <li>Rectangular Molded</li> <li>Prevent Burn-Out</li> <li>Low ESR, Excellent High Frequency Characteristics</li> </ul>	<ul style="list-style-type: none"> <li>Rectangular Molded</li> <li>Soldering Heat Resistance</li> <li>Superior Humidity &amp; Environment Resistance</li> <li>High Reliability</li> </ul>	<ul style="list-style-type: none"> <li>Small Rectangular</li> <li>Low ESR/Impedance, Excellent High Frequency Characteristics</li> <li>Soldering Heat Resistance</li> </ul>	<ul style="list-style-type: none"> <li>Miniature Size For Commercial Use</li> <li>Low Profile</li> </ul>	<ul style="list-style-type: none"> <li>General Purpose For Commercial Use</li> <li>Excellent Temperature Characteristics</li> </ul>	<ul style="list-style-type: none"> <li>High Reliability</li> <li>Excellent Frequency Characteristics</li> <li>Excellent Temperature Characteristics</li> </ul>
Applicable Standard	EIAJ RC-3813	EIAJ RC-3813	EIAJ RC-3813	EIAJ RC-3813	EIAJ RC-3813	JIS C 5142E	JIS C 5142E	JIS C 5142E
Operating Temperature Range (°C)	-55~+125	-55~+125	-55~+125	-55~+125	-55~+125	-55~+85	-55~+85	-55~+125
Rated Voltage (V)	4~20	4~50	6.3~50	4~35	4~50	4~35	4~35	4~35
Capacitance (μF)	0.1~6.8	0.1~150	1~47	0.1~68	0.1~150	0.1~100	0.1~150	0.1~100
Capacitance Tolerance (%)	±20	±20, ±10	±20, ±10	±20, ±10	±20, ±10	±20	±20, ±10	±20, ±10
Leakage Current (μA)	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.01CV or 0.5 Max.	0.008CV or 0.3 Max.
Dissipation Factor (%)	4~6 Max.	4~8 Max.	4~6 Max.	4~6 Max.	4~8 Max.	4~10 Max.	4~10 Max.	4~8 Max.
Failure Rate	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 1% / 1000hours	at 85°C Rated Voltage Applied 0.5% / 1000hours

## Solid Tantalum Electrolytic Capacitors System Chart



### Type Numbering System (Example: F93 Series 35V 1μF)

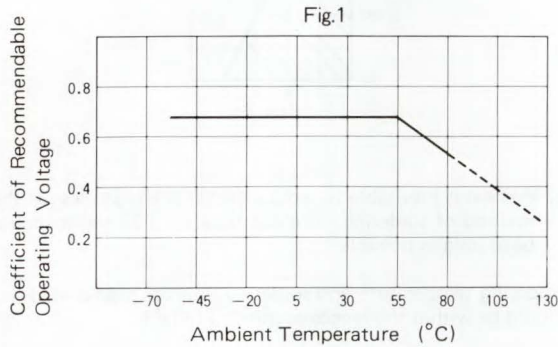




## Application Note for Solid Tantalum Electrolytic Capacitors

### 1. Operating Voltage

To get better operating reliability, it is recommendable to use at properly derated voltage. Refer to the reliability in page 125. The NASA APPLICATION NOTE shown in Fig. 1, is commonly used.



The correlations among rated voltage, surge voltage at 85°C and derated voltage at 125°C are as shown in Table-1.

Table-1

Rated voltage(V)	4	6.3	7	10	16	20	25	35	50
80°C Surge voltage(V)	5.2	8	9	13	20	26	32	46	65
125°C Derated voltage(V)	2.5	4	4.5	6.3	10	13	16	22	32

### 2. Ripple Capability

The ripple capability of solid tantalum electrolytic capacitors is defined by both equivalent series resistance (ESR) and power dissipation due to the ripple current.

#### 2.1 Maximum allowable power dissipation

When applying ripple current to the capacitor, do not allow power dissipation exceeding the specified value shown in Table 2.

Table-2

Maximum allowable power dissipation Pmax.(W) at 25°C

Series	Pmax.					
	0.015	0.03	0.05	0.075	0.09	0.10
F 92	A	B				
F 93		A · B · C	D · N			
F 94		B · C	D · N			
F 97		B · C	D			
F 95	Q	R · S · T · V · W	Y · F · G			
S 87	P · Q	R · S · T · V · W · Y	Z			
S 89		A · B	C	D	E	
S 99			A · B	C · D · E	F · G	H

#### 2.2 Maximum allowable ripple current

Maximum allowable ripple current is given by the following formula:

$$I_{RMS} = \sqrt{\frac{P}{ESRD}}$$

where, P : Max. allowable power dissipation(W) (Table-2)  
ESRD: ESR at operating frequency (Ω)

The equivalent series resistance (ESRD) at operating frequency is given by the formula in reference to Fig. 2:

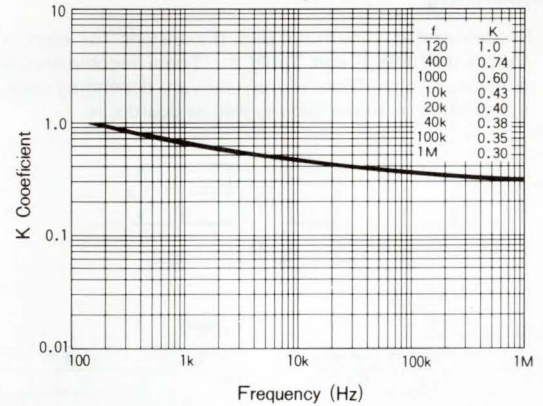
$$ESRD = K \cdot ESR_{120}$$

ESR<sub>120</sub> is equivalent series resistance measured at 120Hz, and given by the formula:

$$ESR_{120} = DF \cdot Xc = \frac{13.26 \times DF}{C}$$

where, DF: Specified dissipation factor at 120Hz(%)  
Xc: Reactance at 120Hz (Ω)  
C: Capacitance at 120Hz (μF)

Fig.2



#### 2-3 Maximum allowable ripple voltage

The sum of D.C. voltage and the peak of ripple voltage shall not exceed the rated voltage for positive peak and the negative voltage shown in Table 4 for negative peak.

The maximum allowable ripple voltage is given by the formula:

$$E_{RMS} = I \cdot Z_D = Z_D \sqrt{\frac{P}{ESRD}}$$

where, P : Max. allowable power dissipation (W)  
ESRD: ESR at operating frequency (Ω)  
Z<sub>D</sub> : Impedance at operating frequency (Ω)

#### 2-3 Derating by temperature

In a higher temperature use, the ripple current or voltage shall be reduced according to Table 3.

Table-3  
Derating coefficient

Temperature	25°C	55°C	85°C	105°C	125°C
Derating coefficient	1.0	0.8	0.6	0.5	0.4

### 3. Reverse Voltage

The solid tantalum electrolytic capacitors are polarized. Therefore, no reverse voltage shall be allowed.

However, the reverse voltage specified in Table-4 will not cause catastrophic failure such as short circuit for up to 240 hours when source impedance is 33 ohms or more.

Table-4

Series	Reverse Voltage		
	Percentage to rated voltage (%)		
	+25°C	+55°C	+85°C
F92	10	6	3
F93	10	6	3
F94	10	6	3
F97	10	6	3
F95	10	6	3
S87	6	4	2
S89	6	4	2
S99	10	6	3

### 4. Low Impedance Circuit

In low impedance circuit applications such as power supply circuits, the failure rate may increase due to inrush current. Therefore, voltage derating of less than 1/2 ~ 1/3 to rated voltage is recommended. If you need assistance, please contact to your local Nichicon sales office.

# TANTALUM ELECTROLYTIC CAPACITORS

## 5. Mounting

5-1. Recommended mounting pad dimensions for chip type are shown in Table 5 and Table 6. These recommendations are guidelines only. Dimensions may vary depending upon soldering conditions, solder type as well as board size.

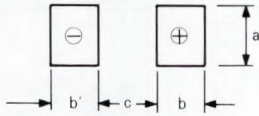


Table-5

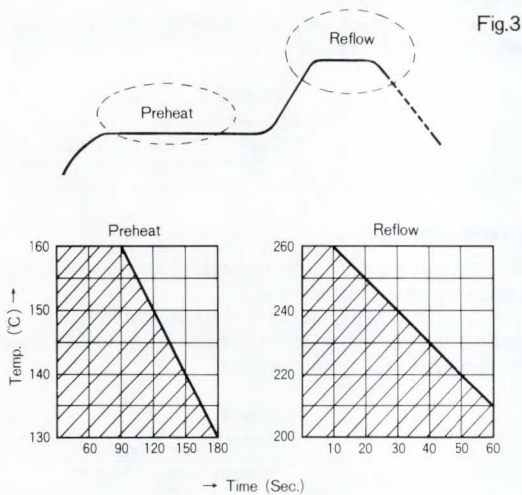
Type	F 92 · F 93 · F 94 · F 97			
Case	a	b	b'	c
A	1.4	2.0	2.0	1.2
B	2.7	2.1	2.1	1.4
C	2.6	2.5	2.5	2.8
D	3.5	2.6	2.6	2.3
N	2.8	2.8	2.8	4.3

Table-6

Type	F 95			
Case	a	b	b'	c
Q · R · S	1.7	0.7	0.8	1.1
T	3.1	1.0	1.0	0.9
V · W	3.2	1.0	1.1	1.5
Y	5.0	1.6	1.6	1.6
F	5.0	1.7	1.6	1.6
G	5.0	1.7	1.7	1.6

5-2. Soldering temperature and soldering time for chip type should be within limits as shown below when measured at terminal surface.

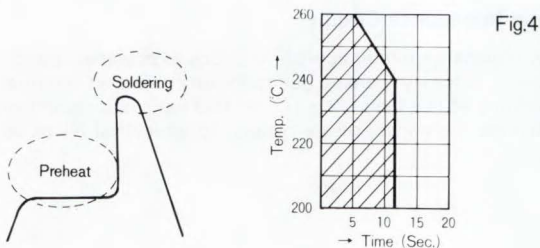
• Reflow (Infrared Ray, Hot Plate, Hot Air, etc.)



• Vapor Phase Soldering

30 sec. max. at 215°C (Preheat is subject to "Reflow".)

• Flow (Dipping, Wave Soldering, etc.)



(Preheat is subject to "Reflow".)

• Soldering-iron (30 watts or less)

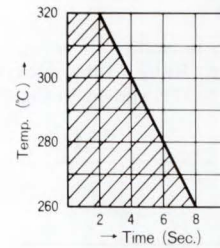


Fig.5

NOTE: Preheat is inevitable to reduce heat shock regardless of the method of soldering. Preheat time for F95 series should be as long as possible.

5-3. Soldering temperature and soldering time for resin-coated type should be within the ranges as shown in Fig. 6.

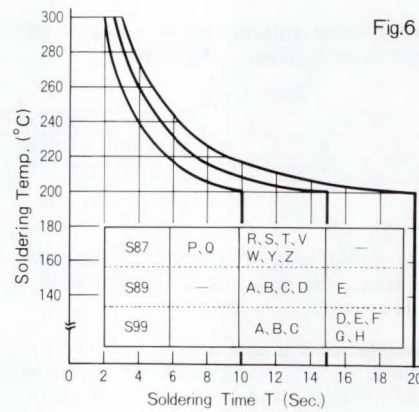


Fig.6

Table-5  
Coefficient of Circuit Board

Type of Circuit Board	Soldering Time (Sec.)
Double-sided through-hole and flexible	0.5 T approx.
Glass-epoxy, 0.3mm thick (single-sided)	0.75 T approx.
Glass-epoxy, 0.5mm thick (single-sided)	T
Glass-epoxy, 0.8mm thick (single-sided)	1.5 T approx.

5-4 Cleaning

To clean the board after soldering, refer to the conditions specified below.

(1) Cleaning Agent

- Halogenous Organic Solvent (CFC112, GFC113, Trichloroethane, Methyl-chloride, etc.)
- Alcoholic Solvent (Iso-propyl alcohol, Methyl alcohol, etc.)
- Others (Petroleum Solvent, etc.)

(2) Cleaning Method

Either cleaning method shown below can be used. But in case of ultrasonic cleaning, the cleaning time shall not exceed 3 minutes.

- Ultrasonic (f = 25 ~ 40 kHz, W = 10 ~ 20 w/l, Temp. = 35 ~ 40°C)
- Vaporizing
- Spraying
- Dipping

Note: The following attention shall be paid not to cause mechanical stresses onto F92, F93, F94 and F97 capacitors, in case that ultrasonic cleaning is applied.

- Do not allow a circuit board to touch the agitator.
- Do not stack circuit boards in the cleaning bath.

## Estimate of Failure Rate

The failur rate varies by the operating conditions such as charging current, operating temperature and applied voltage. These factors should be taken into consideration when selecting the capacitor. Specified failure rates for each series are as shown in page 122.

Fig. 1 Coefficient of Voltage Derating

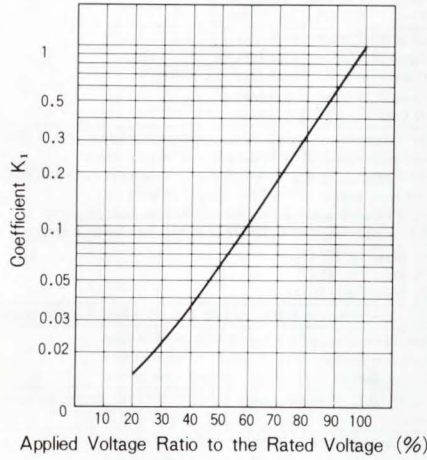
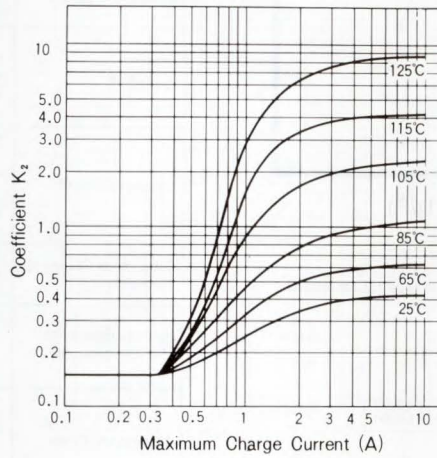


Fig. 2 Charge Current vs. Temp. Coefficient



Formura

$$\begin{aligned} &\text{Estimated failure rate (\%/1000 hours)} \\ &= \text{Specified failure rate (85°C, Rated Voltage, } 3 \Omega) \times K_1 \times K_2 \end{aligned}$$

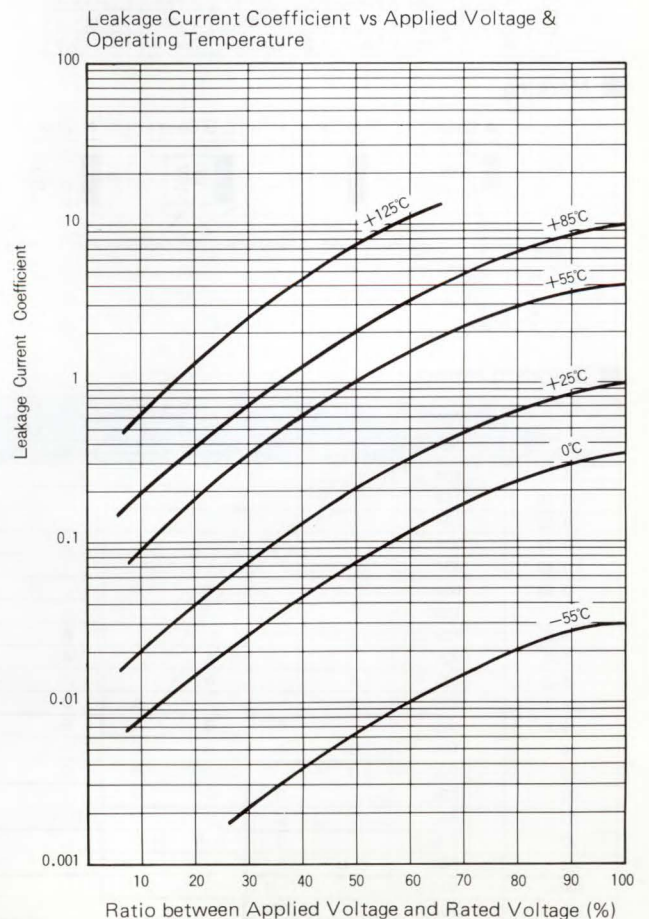
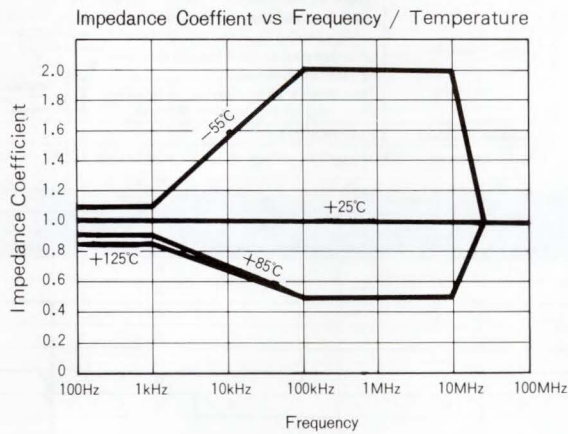
Example

- (1) Series: F97 (Specified failure rate 0.5%/1000 hours)
- (2) Operating temperature: 65°C
- (3) Ratio between Applied Voltage and Rated Voltage: 50%
- (4) Max. charging current: 0.8 Amps

$$\text{Estimated failure rate} = (1) 0.5 \times (3) 0.061 \times (2) \cdot (4) 0.27 = 0.0082\%/1000 \text{ hours} = 82 \text{ Fit.}$$

## Typical Characteristics

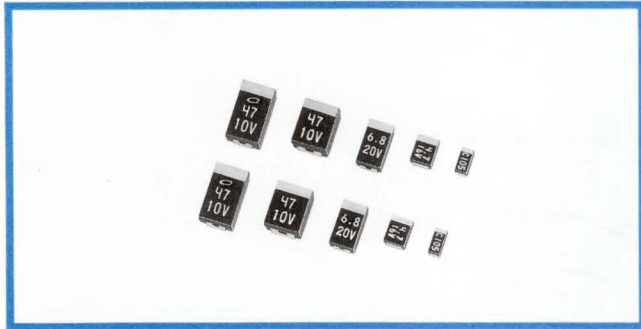
Typical characteristic coefficients of impedance and leakage current at operating frequencies, temperatures and voltages are as shown in the following graphs.



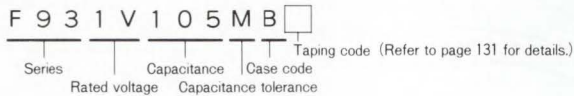
# TANTALUM ELECTROLYTIC CAPACITORS

# F93

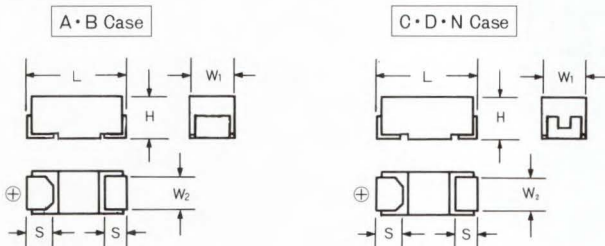
Resin-Molded Chip,  
Standard Series



## Type numbering system (Example: 35V 1μF)



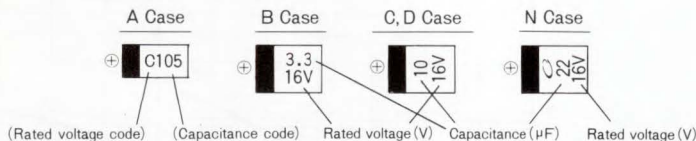
## Drawing



## Dimensions

Case code	L	W <sub>1</sub>	W <sub>2</sub>	H	S
A	3.2±0.2	1.6±0.2	1.2±0.1	1.6±0.2	0.8±0.3
B	3.4±0.2	2.8±0.2	2.3±0.1	1.9±0.2	0.8±0.3
C	5.8±0.2	3.2±0.2	2.2±0.1	2.3±0.2	1.3±0.3
D	5.8±0.2	4.5±0.2	3.1±0.1	3.1±0.2	1.3±0.3
N	7.3±0.2	4.3±0.2	2.4±0.1	2.8±0.2	1.3±0.3

## Marking



4V	G	20V	D
6.3V	J	25V	E
10V	A	35V	V
16V	C	50V	H

## Standard ratings

Cap. (μF)	Code	4		6.3		10		16		20		25		35		50	
		0G		0J		1A		1C		1D		1E		1V		1H	
		Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended	Standard	Extended
0.1	104																A
0.15	154																A
0.22	224																B
0.33	334																B
0.47	474																B
0.68	684																C
1	105							A									C
1.5	155							A									C
2.2	225				A			A									D·N
3.3	335		A		A			B	A								D·N
4.7	475		A			A		B	A								D·N
6.8	685			A		B	A	B									D·N
10	106		B	A		B		B									D·N
15	156		B			B		C	B								D·N
22	226			B		C	B		C	D·N							D
33	336		C	B				C	D·N								D
47	476			C		D·N	C		D·N								D
68	686		D·N	C			D·N		D·N								D
100	107			D·N			D·N										D
150	157			D·N													D

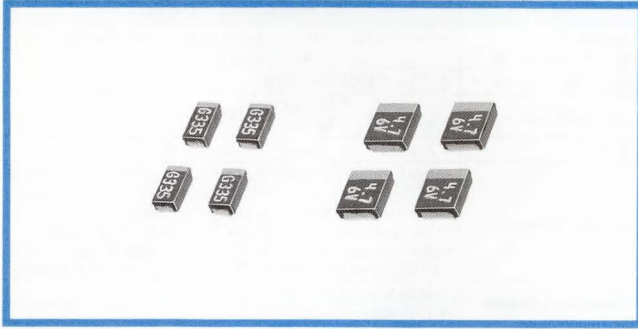
Note: Capacitors having rated voltage of 2.5V are available upon request. Please contact to our sales office for details.

## Specifications

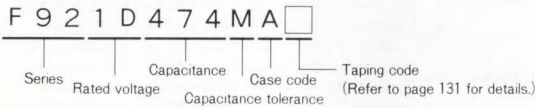
Item	Performance Characteristics	
	Standard Ratings	Extended Ratings
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C)*	
Capacitance Tolerance	±20%, ±10% (at 120Hz)	
Dissipation Factor	0.1~1 μF 4% Max. 1.5~68 μF 6% Max. (at 120Hz) 100 μF~ 8% Max.	
Impedance	<ul style="list-style-type: none"> <li>A Case (~0.33 μF) 50 Ω Max.</li> <li>A Case (0.47 μF~) 20 Ω Max.</li> <li>B Case 15 Ω Max. (at 100kHz)</li> <li>C Case 7.5 Ω Max.</li> <li>D, N Case 2.5 Ω Max.</li> </ul>	
Leakage Current *	<ul style="list-style-type: none"> <li>After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5 μA, whichever is greater.</li> <li>After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5 μA, whichever is greater.</li> <li>After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3 μA, whichever is greater.</li> </ul>	
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)	
Humidity Resistance (No voltage applied)	At 60°C 90~95% R.H. 500 hours   At 40°C 90~95% R.H. 500 hours Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less	
Temperature Cycles	-55°C/+125°C 30 minutes each 50 cycles   -55°C/+125°C 30 minutes each 5 cycles Capacitance Change ..... Within ±5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less	
Resistance to Soldering Heat	260°C For 10 seconds   260°C For 5 seconds Immersing capacitors completely   Immersing capacitors completely Capacitance Change ..... Within ±3% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less	
Surge Voltage *	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less	
Load Life *	After 2000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less	
Shear Test	After applying the pressure load of 5N for 10 ±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate, neither exfoliation nor its sign shall be found at the terminal electrode.                      5N (0.51 kg·f) For 10±1 seconds	
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure load is applied with a specified jig at the center of the substrate so that the substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.                      R340 20 45 45	
Applicable Standard	EIAJ-RC-3813	

\* As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

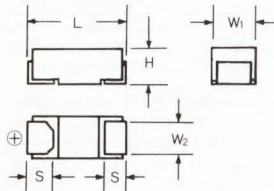
## F92 Resin-Molded Chip, Compact Series



### Type numbering system (Example: 20V 0.47μF)



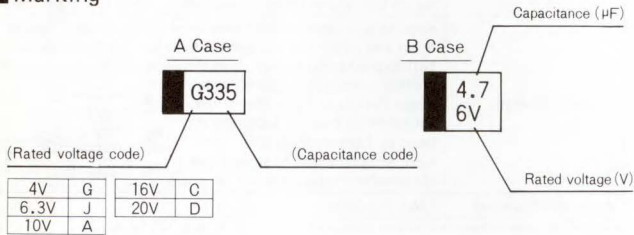
### Drawing



### Dimensions

Case code	L	W <sub>1</sub>	W <sub>2</sub>	H	S
A	3.2±0.2	1.6±0.2	1.2±0.1	1.2MAX	0.8±0.3
B	3.4±0.2	2.8±0.2	2.3±0.1	1.2MAX	0.8±0.3

### Marking



### Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C)*
Capacitance Tolerance	±20% (at 120Hz)
Dissipation Factor	0.1~1 μF 4% Max. (at 120Hz) 1.5~68μF 6% Max.
Leakage Current *	<ul style="list-style-type: none"> <li>After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5μA, whichever is greater.</li> <li>After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5μA, whichever is greater.</li> <li>After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3μA, whichever is greater.</li> </ul>
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H., For 500 hours (No voltage applied) Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Temperature Cycles	At -55°C/+125°C, For 30 minutes each, 5 cycles Capacitance Change ..... Within ±5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	At 260°C, For 5 seconds, Immersing capacitors completely, Capacitance Change ..... Within ±3% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Surge Voltage*	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Load Life*	After 2000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Shear Test	After applying the pressure load of 5N for 10±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate, there shall be found neither exfoliation nor its sign at the terminal electrode. 5N (0.51kg·f) For 10±1 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that the substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.
Applicable Standard	EIAJ-RC-3813

\* As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

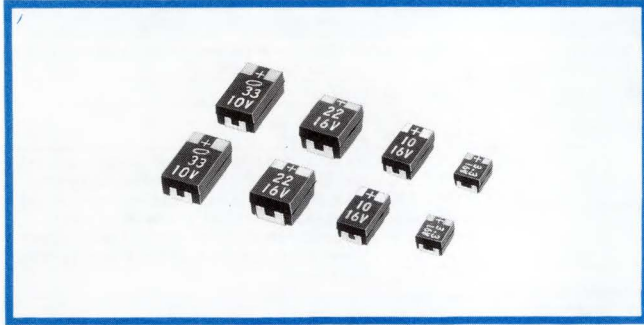
### Standard ratings

Cap.(μF)	V					
	Code	4	6.3	10	16	20
0.1	104					A
0.15	154					A
0.22	224					A
0.33	334					A
0.47	474					A
0.68	684				A	B
1	105			A		B
1.5	155		A			B
2.2	225	A			B	
3.3	335	A		B		
4.7	475		B			
6.8	685	B				

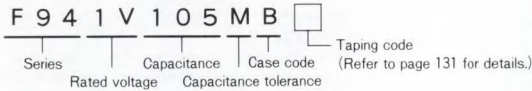
# TANTALUM ELECTROLYTIC CAPACITORS

## F94

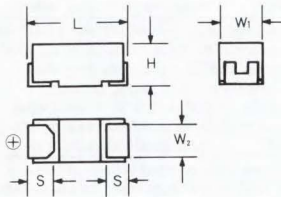
Resin-molded Chip,  
Built-in Fuse Series



### Type numbering system (Example: 35V 1 $\mu$ F)



### Drawing

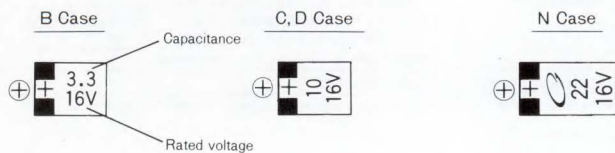


### Dimensions

(mm)

Case code	L	W <sub>1</sub>	W <sub>2</sub>	H	S
B	3.4±0.2	2.8±0.2	2.3±0.1	1.9±0.2	0.8±0.3
C	5.8±0.2	3.2±0.2	2.2±0.1	2.3±0.2	1.3±0.3
D	5.8±0.2	4.5±0.2	3.1±0.1	3.1±0.2	1.3±0.3
N	7.3±0.2	4.3±0.2	2.4±0.1	2.8±0.2	1.3±0.3

### Marking



### Specifications

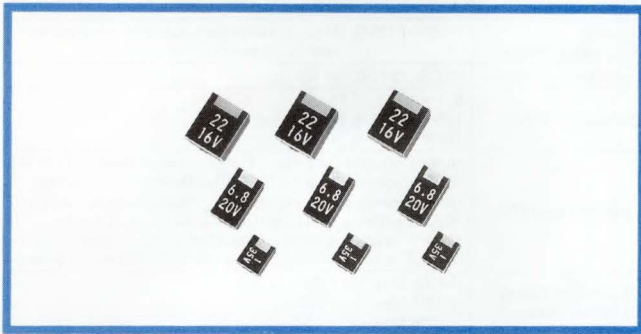
Item	Performance Characteristics
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C.)
Capacitance Tolerance	±20%, ±10% (at 120Hz)
Dissipation Factor	1 $\mu$ F 4% Max. (at 120Hz) 1.5~47 $\mu$ F 6% Max.
E. S. R.	1.2 $\Omega$ Max. (at 10MHz) (Except for B Case)
Leakage Current *	<ul style="list-style-type: none"> <li>•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5<math>\mu</math>A, whichever is greater.</li> <li>•After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5<math>\mu</math>A, whichever is greater.</li> <li>•After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3<math>\mu</math>A, whichever is greater.</li> </ul>
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H., For 500hours (No voltage applied) Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Temperature Cycles	At -55°C/+125°C, For 30 minutes each, 5 cycles Capacitance Change ..... Within ± 5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Resistance to Soldering Heat	At 260°C, For 10 seconds, Immersing capacitors completely, Capacitance Change ..... Within ± 3% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Surge Voltage *	After application of surge voltage in series with a 33 $\Omega$ resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ± 5% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Load Life *	After 2000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Fuse Blow-out Time	Within 5 seconds at 5A applied
Shear Test	After applying the pressure load of 5N for 10±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate, there shall be found neither exfoliation nor its sign at the terminal electrode. 5N (0.51kg·f) For 10±1 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that the substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.
Applicable Standard	EIAJ RC-3813

\*As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

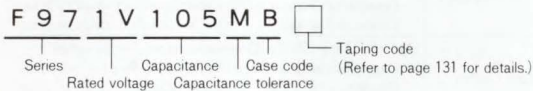
### Standard ratings

Cap. ( $\mu$ F)	Code	V							
		6.3	10	16	20	25	35	50	
1	105	0J	1A	1C	1D	1E	1V	1H	
1.5	155					B	C		
2.2	225				B		C		
3.3	335			B		C	C	D	
4.7	475		B		C	C	D·N		
6.8	685	B			C	D·N	D		
10	106			C	D·N	D			
15	156		C		D				
22	226	C		D·N					
33	336		D·N						
47	476	D·N							

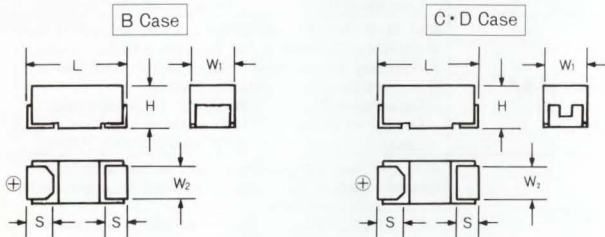
## F97 Resin-molded Chip, High Reliability (High temperature/moisture resistance) Series



### Type numbering system (Example: 35V 1 $\mu$ F)



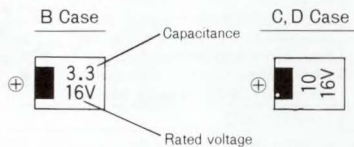
### Drawing



### Dimensions

Case code	L	W <sub>1</sub>	W <sub>2</sub>	H	S
B	3.4±0.2	2.8±0.2	2.3±0.1	1.9±0.2	0.8±0.3
C	5.8±0.2	3.2±0.2	2.2±0.1	2.3±0.2	1.3±0.3
D	5.8±0.2	4.5±0.2	3.1±0.1	3.1±0.2	1.3±0.3

### Marking



### Standard ratings

Cap.( $\mu$ F)	V	Code							
		4	6.3	10	16	20	25	35	
		0G	0J	1A	1C	1D	1E	1V	
0.1	104							B	
0.15	154							B	
0.22	224							B	
0.33	334							B	
0.47	474							B	
0.68	684							B	
1	105							B	
1.5	155						B	C	
2.2	225					B		C	
3.3	335				B			C	
4.7	475			B			C	D	
6.8	685		B			C		D	
10	106	B			C		D		
15	156			C		D			
22	226		C		D				
33	336	C		D					
47	476		D						
68	686	D							

### Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C.)*
Capacitance Tolerance	±20%, ±10% (at 120Hz)
Dissipation Factor	0.1~1 $\mu$ F 4% Max. (at 120Hz) 1.5~68 $\mu$ F 6% Max.
Leakage Current*	<ul style="list-style-type: none"> <li>•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5<math>\mu</math>A, whichever is greater.</li> <li>•After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5<math>\mu</math>A, whichever is greater.</li> <li>•After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3<math>\mu</math>A, whichever is greater.</li> </ul>
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)
Humidity Resistance	At 85°C, 85% R.H., For 1000 hours (No voltage applied) Capacitance Change ... Within ±10% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... 125% or less of initial specified value
Load Humidity	At 60°C, 90~95% R.H., For 500 hours with rated voltage applied Capacitance Change ... Within ±10% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... 125% or less of initial specified value
Temperature Cycles	At -55°C/+125°C, For 30 minutes each, 1000 cycles Capacitance Change ... Within ±5% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Resistance to Soldering Heat	At 300°C, Reflowing capacitors for 15 seconds Max. Capacitance Change ... Within ±3% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Solderability	After immersing capacitors completely into a solder pot at 230°C for 2 seconds, more than 3/4 of their electrode area shall remain covered with new solder.
Surge Voltage*	After application of surge voltage in series with a 33 $\Omega$ resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ... Within ±5% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Load Life*	After 2000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change ... Within ±10% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Shear Test	After applying the pressure load of 5N for 10±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate, there shall be found neither exfoliation nor its sign at the terminal electrode. 5N (0.51kg·f) For 10±1 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that the substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.
Applicable Standard	EIAJ RC-3813

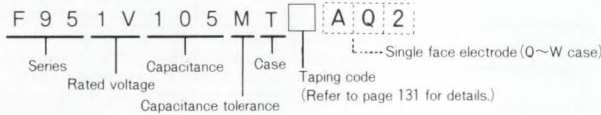
\* As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

# TANTALUM ELECTROLYTIC CAPACITORS

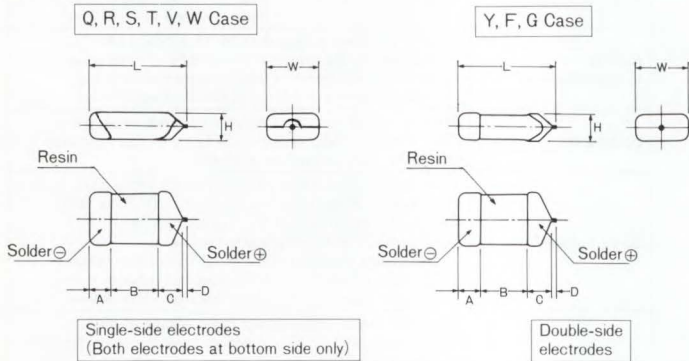
**F95** Conformal coated Chip



## Type numbering system (Example: 35V 1μF)



## Drawing



## Dimensions

Case code	L	W	H	A	B	C	D
Q	3.2±0.3	1.6±0.3	1.0 MAX	0.8±0.3	1.2±0.3	0.5 MIN	0.4
R	3.2±0.3	1.6±0.3	1.1 MAX	0.8±0.3	1.2±0.3	0.5 MIN	0.4
S	3.2±0.3	1.6±0.3	1.2 MAX	0.8±0.3	1.2±0.3	0.5 MIN	0.4
T	3.4±0.3	2.7±0.3	1.2 MAX	0.8±0.3	1.2±0.3	0.5 MIN	0.4
V	4.5±0.4	2.7±0.3	1.3 MAX	1.0±0.4	1.7±0.4	0.8 MIN	0.5
W	4.5±0.4	2.7±0.3	1.6 MAX	1.0±0.4	1.7±0.4	0.8 MIN	0.5
Y	5.6±0.4	4.4±0.4	1.6 MAX	1.2±0.5	2.2±0.5	1.0 MIN	0.6
F	5.6±0.4	4.5±0.4	2.1 MAX	1.2±0.5	2.2±0.5	1.0 MIN	0.6
G	5.6±0.4	4.6±0.4	2.6 MAX	1.2±0.5	2.2±0.5	1.0 MIN	0.6

## Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C.)*
Capacitance Tolerance	±20%, ±10% (at 120Hz)
Dissipation Factor	0.1~1 μF 4% Max. 1.5~68 μF 6% Max. (at 120Hz) 100 μF~ 8% Max.
Leakage Current *	•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5 μA, whichever is greater. •After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5 μA, whichever is greater. •After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.125CV or 6.3 μA, whichever is greater.
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H., For 500 hours (No voltage applied) Capacitance Change..... Within ±10% of initial value Dissipation Factor..... Initial specified value or less Leakage Current..... Initial specified value or less
Temperature Cycles	At -55°C/+125°C, 30 minutes each, For 5 cycles, Capacitance Change..... Within ±5% of initial value Dissipation Factor..... Initial specified value or less Leakage Current..... Initial specified value or less
Resistance to Soldering Heat	At 260°C, For 10 seconds, Immersing capacitors completely, Capacitance Change .... Within ±3% of initial value Dissipation Factor..... Initial specified value or less Leakage Current..... Initial specified value or less
Surge Voltage *	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change .... Within ±5% of initial value Dissipation Factor..... Initial specified value or less Leakage Current..... Initial specified value or less
Load Life *	After 2000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change .... Within ±10% of initial value Dissipation Factor..... Initial specified value or less Leakage Current..... Initial specified value or less
Shear Test	After applying the pressure load of 5N for 10±1 seconds horizontally to the center of capacitor side body which has no electrode and has been soldered beforehand on an aluminum substrate, there shall be found neither exfoliation nor its sign at the terminal electrode.  5N (0.51kg·f) For 10±1 seconds
Terminal Strength	Keeping a capacitor surface-mounted on a substrate upside down and supporting the substrate at both of the opposite bottom points 45mm apart from the center of the capacitor, the pressure strength is applied with a specified jig at the center of the substrate so that the substrate may bend by 1mm as illustrated. Then, there shall be found no remarkable abnormality on the capacitor terminals.  R340 -20
Applicable Standard	EIAJ-RC-3813

\* As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

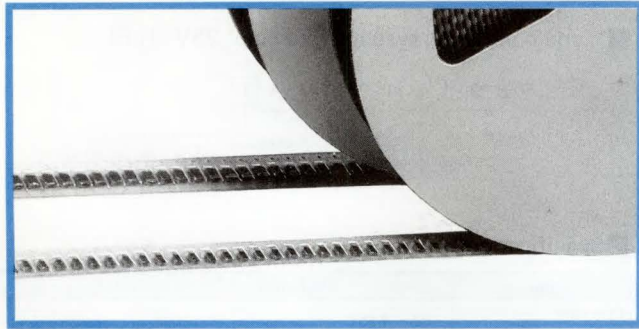
## Standard ratings

Cap. (μF)	V	Code									
		4	6.3	10	16	20	25	35	50		
		OG	OJ	1A	1C	1D	1E	1V	1H		
0.1	104							Q	R		
0.15	154							Q	R		
0.22	224							Q	R		
0.33	334							Q	S		
0.47	474						Q	Q	T		
0.68	684					Q	Q	S	V		
1	105				Q	Q	S	T	W		
1.5	155			Q	Q	S	T	V	Y		
2.2	225		Q	Q	Q	T	V	W	F		
3.3	335	Q	Q	Q	S	V	W	Y			
4.7	475	Q	Q	R	T	W	Y	F			
6.8	685	Q	R	S	V	Y	F	G			
10	106	R	S	T	W	F	G				
15	156	S	T	V	Y	G	G				
22	226	T	V	Y	F	G					
33	336	V	W	F	G						
47	476	W	Y	G							
68	686	Y	F								
100	107	F	G								
150	157	G									

Note: Capacitors having rated voltage of 2.5V are available upon request. Please contact to our sales office for details.



## Taping Specifications for Automatic Insertion (Chip Type Capacitors)



## Type numbering system

F 9 3 1 V 1 0 5 M B B  
 F 9 5 1 V 1 0 5 M T B A Q 2

Series                      Capacitance                      Case code  
 Rated voltage                      Capacitance tolerance

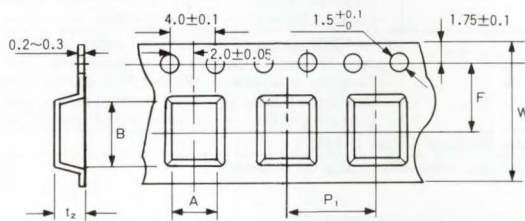
Since Q,R,S,T,V and W case sizes of F95 series have single-side electrode structures as illustrated below, code "AQ2" is added at the end of each type number to distinguish from other case sizes.

Their electrode area at the cover tape side becomes lessened, accordingly.

Tape Width (mm)	Polarity	Taping Code		Applicable Case Size	
		Reel Dia. $\phi$ 178 mm	Reel Dia. $\phi$ 330 mm	F92-F93 F94-F97	F95
8	R (Anode is at opposite side of feeding holes.)	A	E	A·B	Q·R S·T
	L (Anode is at feeding hole side.)	B	F		
12	R (Anode is at opposite side of feeding holes.)	C	G	C·D·N	V·W·Y F·G
	L (Anode is at feeding hole side.)	D	H		

## Carrier Tape Dimensions (mm)

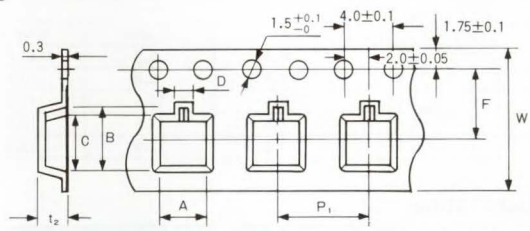
F92 · F93 · F94 · F97



Case code	W	A	B	F	P <sub>1</sub>	t <sub>2</sub>
A	8.0±0.3	1.9±0.1	3.5±0.1	3.5±0.05	4.0±0.1	2.1 <sup>MAX</sup> <sub>(1.7)</sub>
B		3.3±0.1	3.8±0.1			2.4 <sup>MAX</sup> <sub>(1.7)</sub>
C	12.0±0.3	3.6±0.1	6.0±0.1	5.5±0.05	8.0±0.1	2.9 <sup>MAX</sup>
D		5.0±0.1				3.7 <sup>MAX</sup>
Y		4.8±0.1	3.5 <sup>MAX</sup>			
N		4.8±0.1	7.7±0.1			3.5 <sup>MAX</sup>

Figures in ( ) at t<sub>2</sub> are applicable to F92 series.

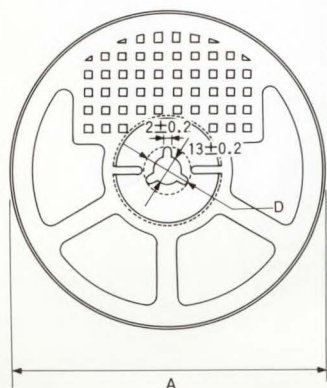
F95



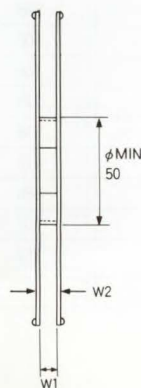
Note: The above illustrates the emboss shape for "Polarity L".  
 In case of "Polarity R", the shape becomes .

Case code	W	A	B	C	D	F	P <sub>1</sub>	t <sub>2</sub>
Q · R · S	8.0±0.3	2.0±0.2	3.6±0.2	3.0±0.2	1.0±0.2	3.5±0.05	4.0±0.1	1.5 <sup>MAX</sup>
T								1.2±0.2
V	12.0±0.3	3.0±0.2	4.8±0.2	4.0±0.2	1.1±0.2	5.5±0.05	8.0±0.1	2.1 <sup>MAX</sup>
W			4.9±0.2	4.1±0.2	1.2±0.2			
Y			5.9±0.2	5.1±0.2	1.3±0.2			
F			6.0±0.2	5.2±0.2	1.4±0.2			
G	4.9±0.2							3.2 <sup>MAX</sup>

## Reel Dimensions (mm)



Note: The above shows the dimensions of  $\phi$ 178 reel.  
 In case of  $\phi$ 330 reel, the appearance shape is slightly different.



Item	Reel Diameter	
	$\phi$ 178	$\phi$ 330
A	$\phi$ 178±2.0	$\phi$ 330±2.0
D	$\phi$ 21±0.8	$\phi$ 21±0.8

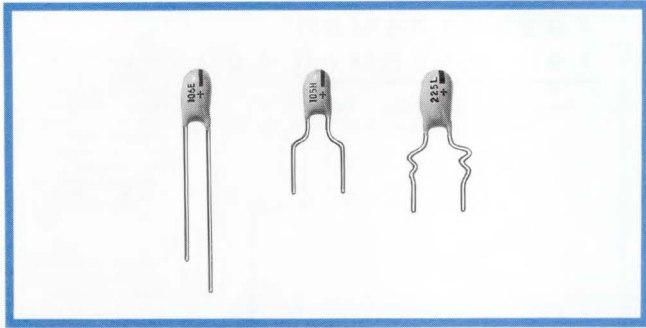
Item	Tape width	
	8	12
W1	8.4± $\frac{3}{8}$	12.4± $\frac{3}{8}$
W2	14.4MAX	18.4MAX

## Standard Packaging Quantity

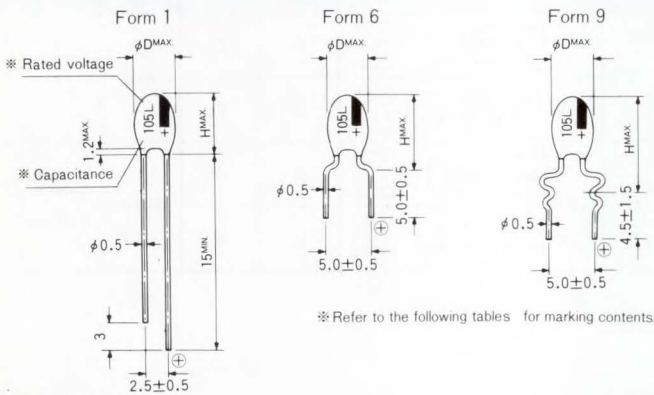
Series	Case code	Q'ty (pcs./reel)	
		Reel Dia. $\phi$ 178	Reel Dia. $\phi$ 330
F92	A	2500	10000
	B	2500	10000
F93	A	2000	9000
	B	2000	8000
F94	C	500	3000
F97	D	500	2500
	N	500	2500
	Q, R, S	2500	10000
F95	T	2500	10000
	V, W	2000	8500
	Y	1000	4000
	F	1000	3000
	G	500	2500

# TANTALUM ELECTROLYTIC CAPACITORS

## S89 Resin-coated, Standard Series



### ■ Drawing



### ■ Dimensions

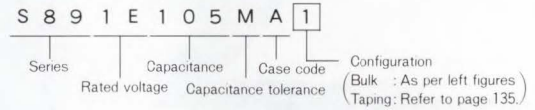
Case code	D	H (mm)		
		Form 1	Form 6	Form 9
A	3.5	6.0	9.3	10.0
B	3.8	6.5	9.8	10.5
C	4.4	7.5	10.5	11.5
D	4.8	8.5	11.5	12.5
E	5.2	9.5	12.5	13.5

### ■ Standard ratings

Cap. (μF)	Code	V						Capacitance code
		4	6.3	10	16	25	35	
0.1	104	0G	0J	1A	1C	1E	1V	104
0.15	154						A	154
0.22	224						A	224
0.33	334						A	334
0.47	474						A	474
0.68	684					A	B	684
1	105					A	B	105
1.5	155				A	B	C	155
2.2	225				A	B	C	225
3.3	335			A	B	C	D	335
4.7	475		A	A	B	C	D	475
6.8	685		A	B	C	D	E	685
10	106	A	B	B	C	D	E	106
15	156	B	B	C	D	E		156
22	226	B	C	C	D			226
33	336	C	C	D	E			336
47	476	C	D	D				476
68	686	D	D	E				686
100	107	D	E					107
150	157	E						157
Rated voltage code		C	D	E	F	H	L	

Note: Capacitors having rated voltage of 6.3V can be applied up to 7V.

### ■ Type numbering system (Example: 25V 1μF)

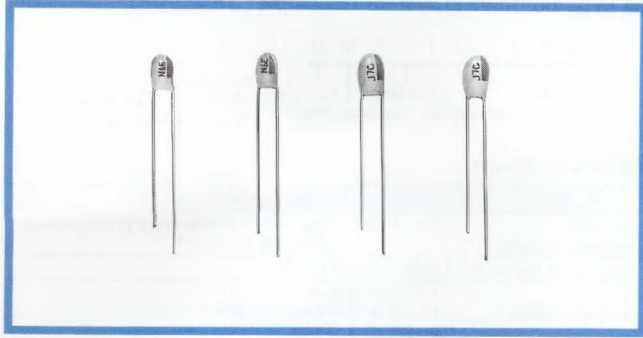


### ■ Specifications

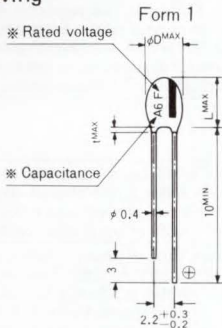
Item	Performance Characteristics
Operating Temperature Range	-55~+85°C
Capacitance Tolerance	±20%, ±10% (at 120Hz)
Dissipation Factor	0.1~1 μF 4% Max. 1.5~6.8 μF 6% Max. 10~68 μF 8% Max. 100 μF~ 10% Max. (at 120Hz)
Leakage Current	•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5μA, whichever is greater. •After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5μA, whichever is greater.
Capacitance Change by Temperature	+12% Max. (at 85°C) -12% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H., For 500 hours (No voltage applied) Capacitance Change ··· Within ±12% of initial value Dissipation Factor ····· Initial specified value or less Leakage Current ······· Initial specified value or less
Resistance to Soldering Heat	After immersing the bottom parts of capacitor bodies by 2~2.5mm in a solder pot at 270±5°C for 3±0.5 seconds, Capacitance Change ··· Within ±3% of initial value Dissipation Factor ····· Initial specified value or less Leakage Current ······· Initial specified value or less
Surge Voltage*	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ··· Within ±5% of initial value Dissipation Factor ····· Initial specified value or less Leakage Current ······· Initial specified value or less
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ··· Within ±10% of initial value Dissipation Factor ····· Initial specified value or less Leakage Current ······· Initial specified value or less
Applicable Standard	JIS C-5142 E

\*As for the surge voltage, refer to page 123 for details.

## S87 Resin-coated, Compact Series



### ■ Drawing

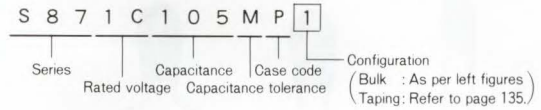


※ Refer to the following table for marking contents.

### ■ Dimensions

Case code	D	L	t
P	3.1	4.9	0.8
Q	3.2	4.9	0.8
R	3.2	5.0	0.8
S	3.4	5.2	0.8
T	3.8	5.4	0.8
V	4.0	5.6	1.0
W	4.2	6.2	1.0
Y	4.4	6.4	1.0
Z	4.6	7.0	1.0

### ■ Type numbering system (Example: 16V 1 $\mu$ F)



### ■ Specifications

Item	Performance Characteristics
Operating Temperature Range	-55~+85°C
Capacitance Tolerance	±20% (at 120Hz)
Dissipation Factor	0.1~1 $\mu$ F 4% Max. 1.5~6.8 $\mu$ F 6% Max. (at 120Hz) 10~68 $\mu$ F 8% Max. 100 $\mu$ F~ 10% Max.
Leakage Current	•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.01CV or 0.5 $\mu$ A, whichever is greater. •After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5 $\mu$ A, whichever is greater.
Capacitance Change by Temperature	+12% Max. (at 85°C) -12% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H., For 500 hours (No voltage applied) Capacitance Change ... Within ±12% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Resistance to Soldering Heat	After immersing the bottom parts of capacitor bodies by 2~2.5mm in a solder pot at 270±5°C for 3±0.5 seconds. Capacitance Change ... Within ±3% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Surge Voltage*	After application of surge voltage in series with a 33 $\Omega$ resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ... Within ±5% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Load Life	After 1000 hours' application of rated voltage at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ... Within ±10% of initial value Dissipation Factor ... Initial specified value or less Leakage Current ... Initial specified value or less
Applicable Standard	JIS C 5142 E

\*As for the surge voltage, refer to page 123 for details.

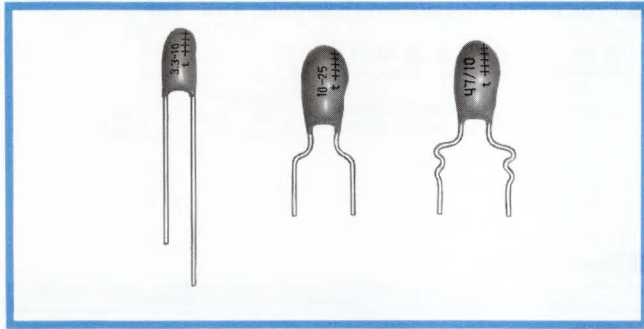
### ■ Standard ratings

Cap. ( $\mu$ F)	Code	V						Capacitance code
		4	6.3	10	16	25	35	
0.1	104	0G	0J	1A	1C	1E	1V	A5
0.15	154							E5
0.22	224							J5
0.33	334							N5
0.47	474					P	R	S5
0.68	684					Q	S	W5
1	105				P	R	T	A6
1.5	155				Q	S	V	E6
2.2	225			P	R	T	W	J6
3.3	335		P	Q	S	V	Y	N6
4.7	475	P	Q	R	T	W	Z	S6
6.8	685	Q	R	S	V	Y		W6
10	106	R	S	T	W	Z		A7
15	156	S	T	V	Y			E7
22	226	T	V	W	Z			J7
33	336	V	W	Y				N7
47	476	W	Y	Z				S7
68	686	Y	Z					W7
100	107	Z						A8
Rated voltage code		C	D	E	F	H	L	

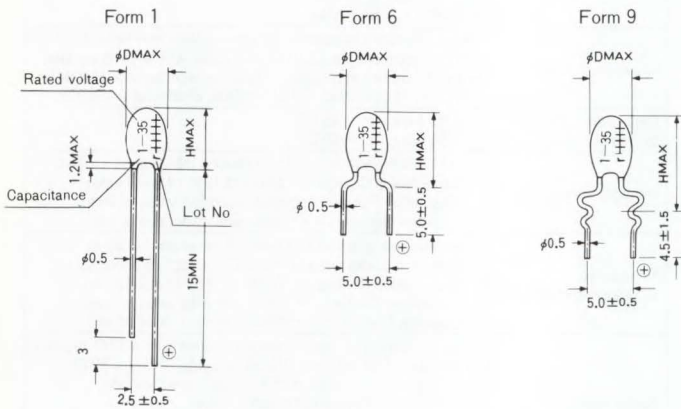
Note: Capacitors having rated voltage of 6.3V can be applied up to 7V.

# TANTALUM ELECTROLYTIC CAPACITORS

**S99** Resin-coated,  
High Reliability Series



## ■ Drawing



## ■ Dimensions

(mm)

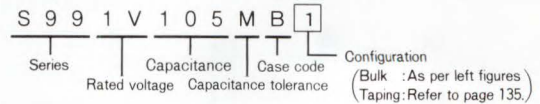
Case code	D	H		
		Form 1	Form 6	Form 9
A	3.6	6.2	9.5	10.2
B	3.6	6.4	9.7	10.4
C	3.8	7.0	10.3	11.0
D	4.0	7.4	10.7	11.4
E	4.4	8.0	11.3	12.0
F	4.8	8.6	11.9	12.5
G	5.4	9.2	12.5	13.0
H	5.4	10.2	13.5	14.2

## ■ Standard ratings

Cap. (μF)	V	Code							
		4	6.3	10	16	20	25	35	
0.1	104	OG	0J	1A	1C	1D	1E	1V	
0.15	154							A	
0.22	224							A	
0.33	334							A	
0.47	474							A	
0.68	684							A	
1	105				A		A	B	
1.5	155				A	A	B	C	
2.2	225				A	B	C	D	
3.3	335			A	B	C	D	E	
4.7	475		A	B	C	D	E	F	
6.8	685	A	B	C	D	E	F	G	
10	106	B	C	D	E	F	G	H	
15	156	C	D	E	F	G	H		
22	226	D	E	F	G	H			
33	336	E	F	G	H				
47	476	F	G	H					
68	686	G	H						
100	107	H							

Note : Capacitors having rated voltage of 6.3V can be applied up to 7V.

## ■ Type numbering system (Example: 35V 1μF)

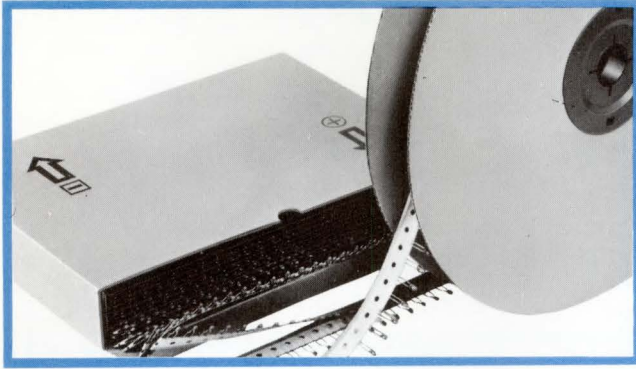


## ■ Specifications

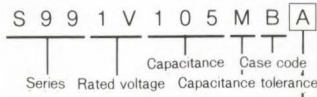
Item	Performance Characteristics
Operating Temperature Range	-55~+125°C (Max. operating temperature at rated voltage shall be up to 85°C.)*
Capacitance Tolerance	±20%, ±10% (at 120Hz)
Dissipation Factor	0.1~ 1μF 4 % Max. 1.5~ 68μF 6 % Max. (at 120Hz) 100~220μF 8 % Max.
Impedance	To be specified by each rating, at 25°C, 10kHz.
Leakage Current*	•After 1 minute's application of rated voltage, leakage current at 25°C is not more than 0.008CV or 0.3μA, whichever is greater. •After 1 minute's application of rated voltage, leakage current at 85°C is not more than 0.1CV or 5μA, whichever is greater. •After 1 minute's application of derated voltage, leakage current at 125°C is not more than 0.15CV or 7.5μA, whichever is greater.
Capacitance Change by Temperature	+15% Max. (at 125°C) +10% Max. (at 85°C) -10% Max. (at -55°C)
Humidity Resistance	At 40°C, 90~95% R.H. For 500 hours (No voltage applied) Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less of initial specified value
Resistance to Soldering Heat	After immersing the bottom parts of capacitor bodies by 2~2.5mm in a solder pot at 270±5°C for 3±0.5 seconds, Capacitance Change ..... Within ±3 % of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Surge Voltage*	After application of surge voltage in series with a 33Ω resistor at the rate of 30 seconds ON, 30 seconds OFF, for 1000 successive test cycles at 85°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±5 % of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... Initial specified value or less
Load Life*	After 1000 hours' application of rated voltage at 85°C, or derated voltage at 125°C, capacitors meet the characteristics requirements listed below. Capacitance Change ..... Within ±10% of initial value Dissipation Factor ..... Initial specified value or less Leakage Current ..... 125% or less of initial specified value
Applicable Standard	JIS C 5142 E

\*As for the surge voltage and derated voltage at 125°C, refer to page 123 for details.

## Taping Specifications for Automatic Insertion (Resin-coated Type)



### Type numbering system

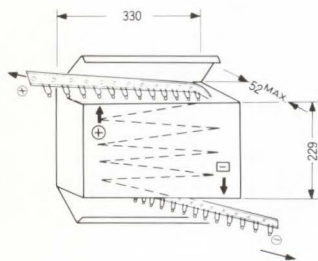


Lead Configuration	Packaging	Configuration code	Applicable series		
			S87	S89	S99
5.0mm pitch Formed leads	Ammo-pack	A	—	○	○
	Reel-pack ⊕	B	—	○	○
	Reel-pack ⊖	C	—	○	○
2.5mm pitch Straight leads	Ammo-pack	G	—	○	○
	Reel-pack ⊕	H	—	○	○
	Reel-pack ⊖	J	—	○	○
2.0mm pitch Straight leads	Ammo-pack	K	○	—	—

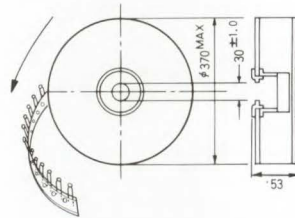
Note: Except for V.W.Y.Z cases of S87 series.

### Packaging (mm)

Ammo-pack, (Flat box type)



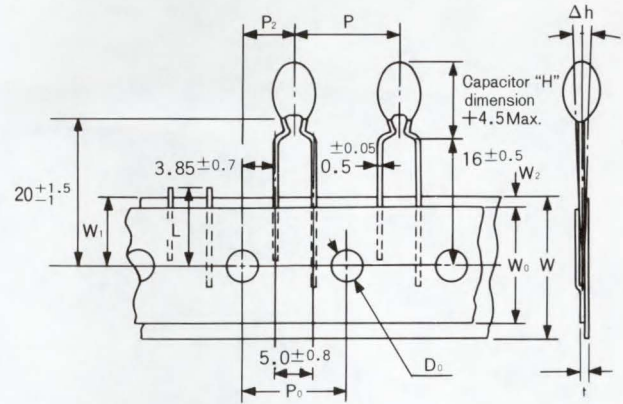
Reel-pack



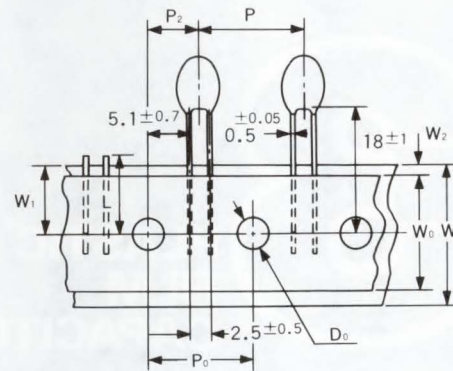
In case of reel-pack, please designate either ⊕ lead or ⊖ lead should be pulled out first, when placing an order with us.

Series	Ammo-pack (Flat box type)				Reel-pack			
	2500	2000	1500	1000	3000	2500	2000	1500
S87	P·Q·R S·T	—	—	—				
S89	A·B	C·D	E	—	A·B	C	D·E	—
S99	A·B	C·D·E	F·G	H	A·B	C·D	E·F	G·H

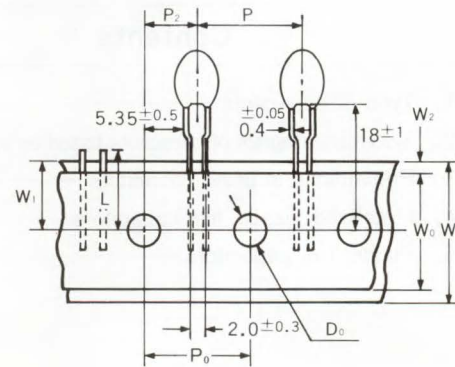
5mm pitch Formed lead type



2.5mm pitch Formed lead type



2.0mm pitch Straight lead type



(mm)

	P	P <sub>0</sub>	P <sub>2</sub>	Δh	W	W <sub>0</sub>	W <sub>1</sub>	W <sub>2</sub>	D <sub>0</sub>	t	L
Dimensions	12.7	12.7	6.35	0	18	5	9	0~3	4	0.6	11
Tolerance	±1	±0.3	±1.3	±2	+1 -0.5	MIN.	+0.5 -0.5		±0.2	±0.3	MAX.

# 3 PLASTIC FILM CAPACITORS

Contents
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3-1. Type of capacitors	137
2. Systematic diagram of capacitors based on applications	138
3. Precautions in using capacitors	139
4. Metallized plastic film capacitors	144
5. Plastic film capacitors	153

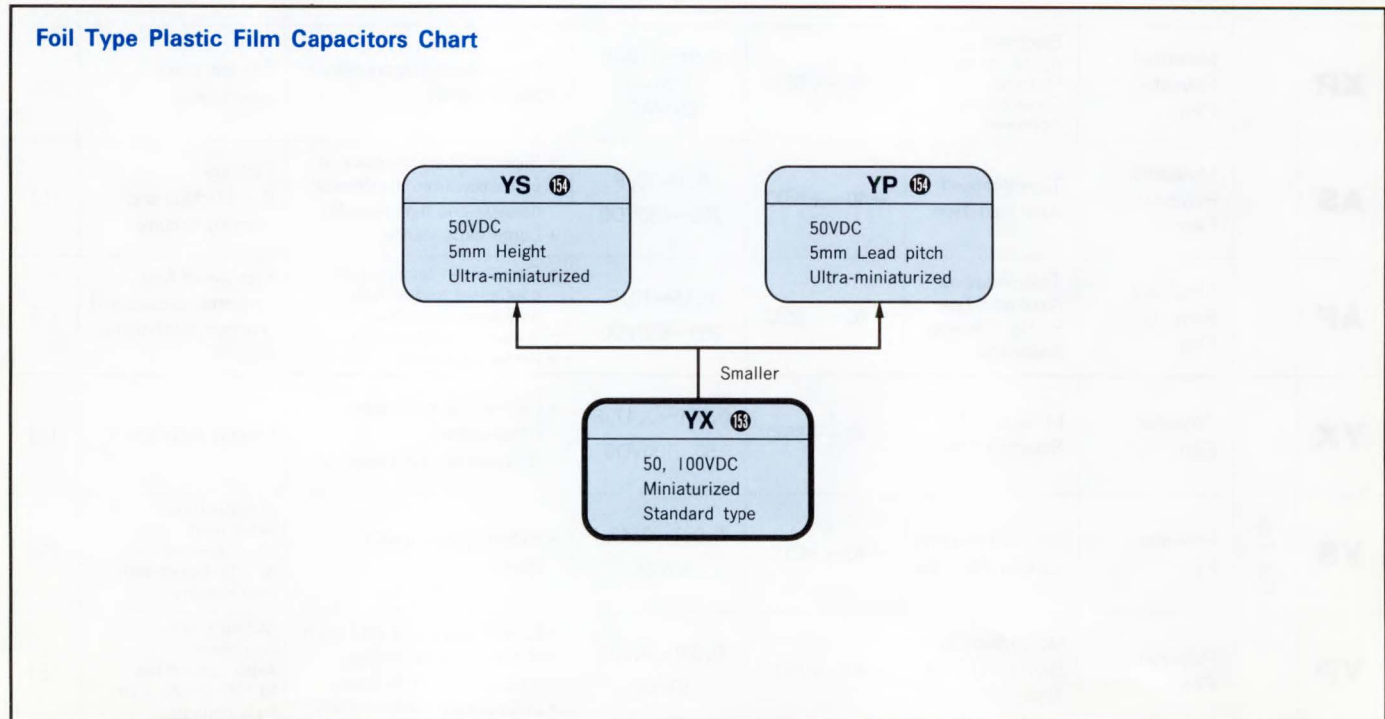
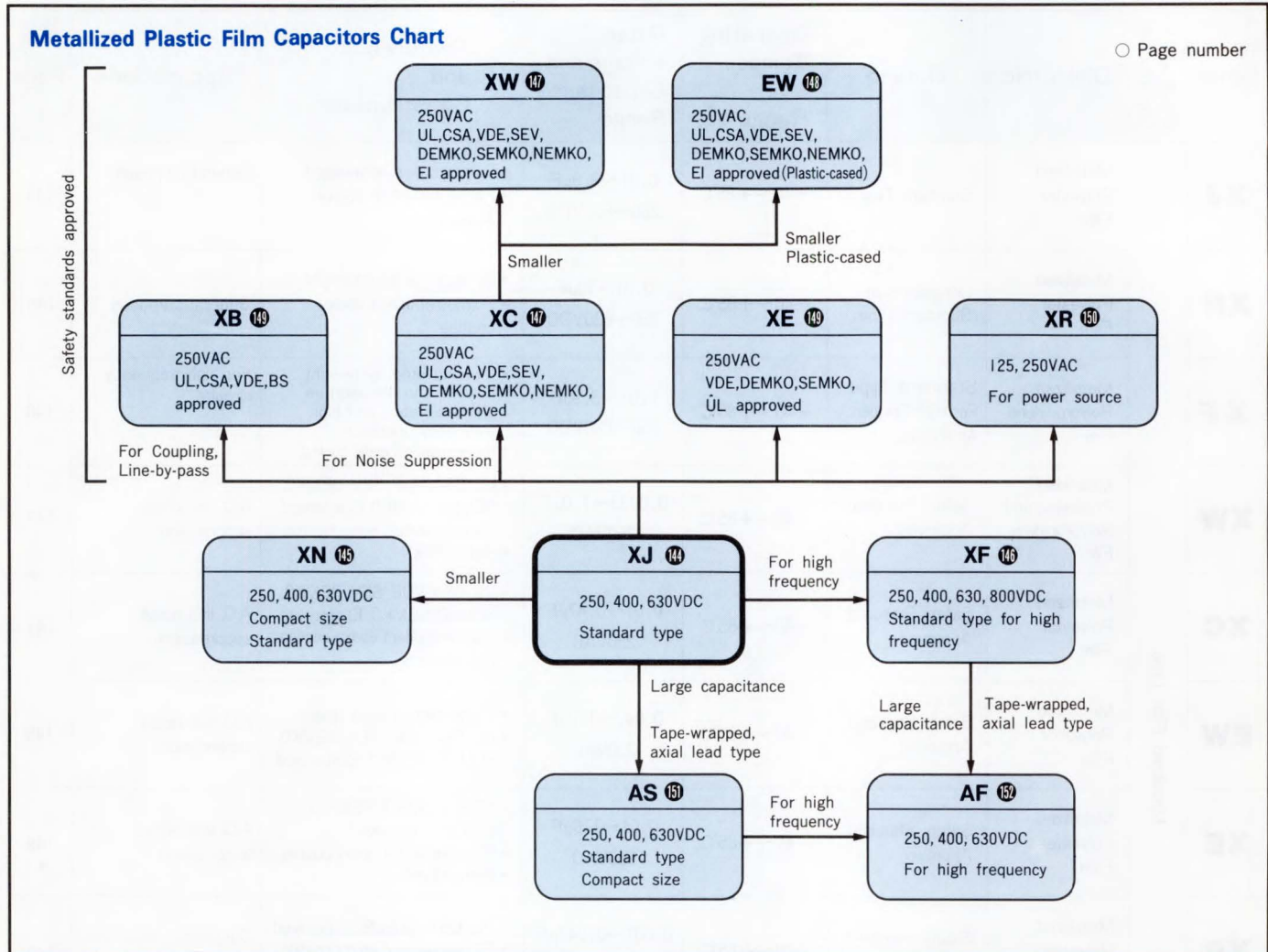
Type of Plastic Film Capacitors

Series	Electrode Construction	Dielectric	Outline	Operating Temperature Range	Rated Voltage and Capacitance Range	Features and Constructions	Applications	Page
<b>XJ</b>	Metalized Film Type	Metalized Polyester Film	Standard Type	-40~+85°C	0.01~3.9μF 250~630VDC	<ul style="list-style-type: none"> <li>• Compact and lightweight</li> <li>• Flame-retardant epoxy coating</li> </ul>	General purposes	144
<b>XN</b>		Metalized Polyester Film	Compact Size Standard Type	-40~+85°C	0.01~10μF 250~630VDC	<ul style="list-style-type: none"> <li>• Compact and lightweight</li> <li>• Flame-retardant epoxy coating</li> </ul>	General purposes	145
<b>XF</b>		Metalized Polypropylene Film	Standard Type For High Frequency Applications	-40~+85°C	0.01~3.9μF 250~800VDC	<ul style="list-style-type: none"> <li>• Compact and lightweight</li> <li>• Excellent in temperature characteristics and high frequency operation</li> <li>• Flame-retardant epoxy coating.</li> </ul>	For high frequency circuits	146
<b>XW</b>		Metalized Polyester, and Polypropylene Film	Safety Standard Approved	-40~+85°C	0.0033~1.0μF 250VAC	<ul style="list-style-type: none"> <li>• UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI approved</li> <li>• Flame-retardant epoxy coating</li> <li>• High reliability</li> </ul>	A.C. line noise suppression	147
<b>XC</b>		Metalized Polyester Film	Safety Standard Approved	-40~+85°C	0.01~0.47μF 250VAC	<ul style="list-style-type: none"> <li>• UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI approved</li> <li>• Flame-retardant epoxy coating</li> <li>• High reliability</li> </ul>	A.C. line noise suppression	147
<b>EW</b>		Metalized Polyester Film	Safety Standard Approved	-40~+85°C	0.047~1.0μF 250VAC	<ul style="list-style-type: none"> <li>• Flame-retardant epoxy cased</li> <li>• UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO, EI approved</li> </ul>	A.C. line noise suppression	148
<b>XE</b>		Metalized Polyester Film	Safety Standard Approved	-40~+85°C	0.01~1.0μF 250VAC	<ul style="list-style-type: none"> <li>• VDE, DEMKO, SEMKO, UL1283 approved</li> <li>• Flame-retardant epoxy coating</li> <li>• High reliability</li> </ul>	A.C. line noise suppression	149
<b>XB</b>		Metalized Polyester Film	Safety Standard Approved	-40~+85°C	0.001~0.047μF 250 VAC	<ul style="list-style-type: none"> <li>• UL, CSA, VDE, BS approved</li> <li>• Flame-retardant epoxy coating</li> <li>• High reliability</li> </ul>	Coupling, line-by-pass circuits	149
<b>XR</b>		Metalized Polyester Film	Electrical Appliance and Material Control Law Approved	-40~+85°C	0.01~1.0μF 125VAC 250VAC	<ul style="list-style-type: none"> <li>• Flame-retardant epoxy coating</li> <li>• High reliability</li> </ul>	A.C. line noise suppression	150
<b>AS</b>		Metalized Polyester Film	Tape-Wrapped Axial lead Type	-40~+85°C	0.1~10μF 250~630VDC	<ul style="list-style-type: none"> <li>• Superior characteristics in protection from mechanical damage and high humidity</li> <li>• Large capacitance</li> </ul>	Filtering, D.C. blocking and coupling circuits	151
<b>AF</b>	Metalized Polypropylene Film	Tape-Wrapped Axial lead Type For High Frequency Applications	-40~+85°C	0.15~10μF 250~630VDC	<ul style="list-style-type: none"> <li>• Excellent in temperature coefficient and at high frequency operation</li> <li>• Humidity resistance</li> <li>• Large capacitance</li> </ul>	Filtering of high frequency circuits and charging/discharging circuits	152	
<b>YX</b>	Foil Type	Polyester Film	Miniaturized Standard Type	-40~+85°C	0.001~0.47μF 50, 100VDC	<ul style="list-style-type: none"> <li>• Uniform epoxy coating (clear-yellow)</li> <li>• Optimum for auto-insertion</li> </ul>	General purposes	153
<b>YS</b>		Polyester Film	Ultra-Miniaturized Low-Profile Type	-40~+85°C	0.001~0.47μF 50VDC	<ul style="list-style-type: none"> <li>• Extremely low height (5mm)</li> </ul>	Miniaturized equipment. Auto assemblies to P.C. board with high density	154
<b>YP</b>		Polyester Film	Ultra-Miniaturized 5mm Lead Pitch Type	-40~+85°C	0.001~0.1μF 50VDC	<ul style="list-style-type: none"> <li>• Lower height and lead pitch of 5mm provide space advantage on P.C. board.</li> <li>• Optimum for auto insertion</li> </ul>	Miniaturized equipment. Auto assemblies to P.C. board with high density	154

When DC rated capacitors are operated in AC circuit, there may happen troubles because of inherent temperature rise, discharge, etc. So in such a case, please contact us in advance for the right application.

# PLASTIC FILM CAPACITORS

## Systematic Diagram by Series Based on Applications





**PRECAUTIONS IN USING PLASTIC FILM CAPACITORS**

When you use plastic film capacitors, pay attention to the following.

**1 Rated Voltage**

**(1) Operating Temperature Range**

Rated voltage of film capacitors are marked with either "AC" or "DC", depending upon their major applications.

In case of "DC" marked capacitors, the applied voltage shall be within the range which the peak value of ripple voltage (DC voltage + peak value of AC voltage) does not exceed DC rated voltage.

Though rated voltage of XJ, XN and XF series capacitors are marked with "DC" rating, these capacitors are applicable to AC circuits (except for insertion between power sources) and their AC rated values are specified conform to safety performance A1 and C1 under JIS C 5151 as shown below.

**Table 1 DC Rated Voltage vs. AC Rated Voltage**

DC Rated Voltage XJ (XN) Series	AC Rated Voltage XJ (XN) Series
250VDC	125VAC(100VAC)
400VDC	200VAC(160VAC)
630VDC	250VAC(250VAC)

DC Rated Voltage XF Series	AC Rated Voltage XF Series
250VDC	125VAC
400VDC	160VAC
630VDC	200VAC
800VDC	250VAC

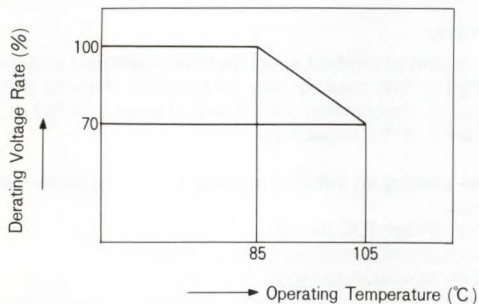
When excess AC voltage is applied, capacitor generates heat which causes oxidizing deterioration of metallized film and leads to failure due to an increase of  $\tan \delta$  by damage at the connecting points of electrodes.

**(2) Derating of DC Rated Voltage to High Temperature Use**

When operating metallized polyester film capacitors (XJ series) at high temperature range (Max. 105°C), the rated voltage shall be derated to operating temperature as specified below.

However, in case of metallized polypropylene film capacitors (XF series), they shall be operated within the specified temperature range since their heat shrinkage is much greater than metallized polyester film.

**Derating of Voltage and Operating Temperature XJ Series**



**(3) Derating of Rated Voltage to High Frequency**

When operating capacitors at 50/60Hz AC current, the maximum permissible value (VAC) can be calculated from Table 2, provided that the effective current and the effective VA shall not exceed the values specified in Tables 3 and 4.

When operating capacitors at sinuous wave other than sine wave, consult our sales office. (In case of sinuous wave, the effective current and the effective VA values shall be calculated from peak voltage and current of applied current wave, pulse and frequency.)

**Table 2 Derating of Voltage at High Frequency**

XJ Series		XF Series	
Frequency	Derating Rate to 50/60Hz AC Rated voltage	Frequency	Derating Rate to 50/60Hz AC Rated voltage
50/60(Hz)	100 (%)	50/60(Hz)	100 (%)
1k	54	1k	76
5k	39	5k	55
10k	34	10k	49
20k	30	20k	41
30k	27	30k	38
40k	26	40k	36
50k	25	50k	35
60k	24	60k	33
70k	23	70k	32
80k	22	80k	31
90k	21	90k	30
100k	21	100k	30
		200k	26
		300k	24
		400k	22
		500k	21

**2 Operating Temperature Range**

Operating temperature range (T) is specified as a sum of ambient temperature (Ta), inherent temperature ( $\Delta T$ ) and temperature rise by radiant heat from other heat sources (Tr). When capacitors are operated in AC circuit or high frequency/high ripple current circuit, temperature of capacitors rises inherently as explained above and causes damage and deterioration on dielectric film. Therefore, operating temperature shall be within the range specified for each series of capacitors.

The inherent temperature rise at no air circulation (ambient temperature at 40°C) shall be within the value listed in Table 3.

**Table 3 Inherent Temperature Rise**

Type of Capacitor	Inherent Temperature Rise
Metallized Polypropylene Film Capacitors (XF Series)	Within 5°C
Metallized Polyester Film Capacitors (XJ, XN Series)	Within 15°C

**3 Permissible Current**

Since electrodes of metallized film capacitors are of vacuum-evaporated metal, they are drawn out through a metalicon metal sprayed over the sections of capacitor element. By this reason, if excess current is applied to the capacitors, the connecting point between vacuum-evaporated metal and metalicon metal melts down and capacitor life may be deteriorated because  $\tan \delta$  increases and inherent temperature rises. Therefore, capacitors shall be operated within the permissible current values specified individually.

# PLASTIC FILM CAPACITORS

## 4 Use for Across-the-Line as Noise Suppressor

For across-the-line capacitors as noise suppressor, very strict safety performance is required in the U.S.A., Canada and European countries as well as in Japan. For this application, the most suitable type shall be selected from XW, XC, EW series (UL, CSA, VDE, NEMKO, SEMKO, DEMKO, SEV and EI standards recognized) and XE series (VDE, DEMKO SEMKO and UL1283 standards recognized). Besides, for antenna coupling and line-by-pass capacitors, highly reliable XB series (UL, CSA, VDE and BS standards recognized) is recommended.

## 5 Safety Standards

For capacitors used as noise suppressor in OA appliances and VA equipment like TVs and VTRs, voltage is, in general, applied continuously for 24 hours, and moreover abnormal surge voltage (thunder surge) may be also applied unexpectedly. Such factors give very cruel influences to the capacitor life. If capacitors get abnormal once, there will be possibility of smoking and flaming. To avoid such a dangerous trouble, many countries prohibit capacitors to be used in power source line unless otherwise recognized under the strict safety standards authorized in the world as listed below.

Table 4 Overseas Safety Standards

Name of Institution	Applicable Standards
UL (U. S. A.)	UL 1414, UL 1283
CSA (Canada)	CSA C 22.2 No. 0, No. 1
VDE (Germany)	VDE 0565-1
EI (Finland)	E384/14 (IEC 384-14)
SEMKO (Sweden)	SS 443 04 14
NEMKO (Norway)	NEMKO 132
DEMKO (Denmark)	Afsnit 21
SEV (Switzerland)	SEV 1055
BSI (U. K.)	BS 415

## 6 Class of Capacitors

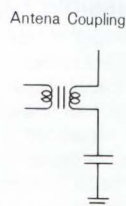
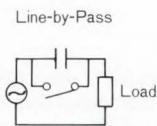
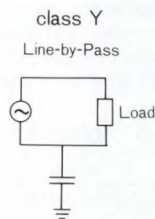
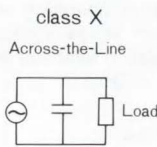
Safety regulations on capacitors are classified by IEC, depending upon the usage of circuitry. (European countries are also conforming to IEC standard.)

Class X : A capacitor of a type suitable for use in situations where failure of the capacitor would not lead to danger of electrical shock.

Class Y : A capacitor of a type suitable for use in situations where failure of the capacitor could lead to danger of electrical shock.

According to UL (U.S.A.) and CSA (Canada), the class of safety regulations is expressed and classified in the following ways.

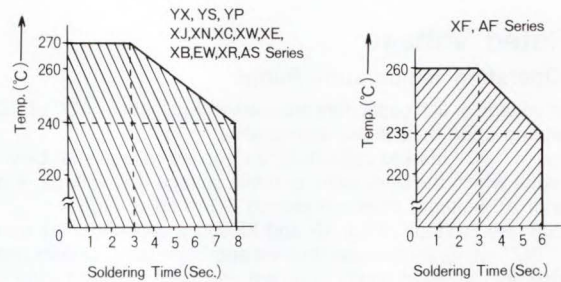
- Across-the-line..... X
- Line-by-pass..... X, Y
- Antenna coupling..... Y



## 7 General Precautions

### (1) Soldering Conditions

When soldering capacitors, a soldering process for a long time and at high temperature may result in deterioration of characteristics or short-circuit defects. Please ensure that soldering is carried out within the range shown in the diagram below.



### (2) Load to Lead Wires

Attention must be paid to avoid mechanical shock or damage to capacitors so that lead wires may not be loaded more than necessary, because excess load may result in disconnection of lead wires or short-circuit defects.

### (3) Shock to Capacitors

Attention must be paid so that any sharp objects like air-driver, soldering iron, pincette, chassis edge and etc. may not stick strongly to the surface of capacitors.

### (4) Cleaning Solvent

For cleaning PC boards, a solvent which has little effect to capacitors such as isopropyl alcohol, Daiflon S3-MC, Daiflon S3-E and etc. should be used.

Solvents containing chlorine types such as dichloroethane, trichloroethylene and etc. should be avoided.

### (5) Charging/Discharging

When capacitors are used in a rapid and frequent charge/discharge circuit, the deterioration of capacitor performance is accelerated. So, film capacitors are not suited for such an application. If used so, charge/discharge should be done through a resistor of 2 kΩ or higher.

## 8 Hum (Buzz)

Hum produced by capacitors is due to mechanical vibration of dielectric (film) caused by the coulomb force which exists between electrodes which opposite polarity. A more louder hum is produced especially when applied voltage has distortion, and/or higher frequency component, although hum does not spoil characteristics of capacitors.

## 9 Others

(1) With regard to product specifications, materials and other points mentioned in this catalog may be changed without notification. Data shown in this catalog are of typical figures and do not guarantee performance of the capacitors.

(2) When placing an order or making an inquiry, please specify the followings;

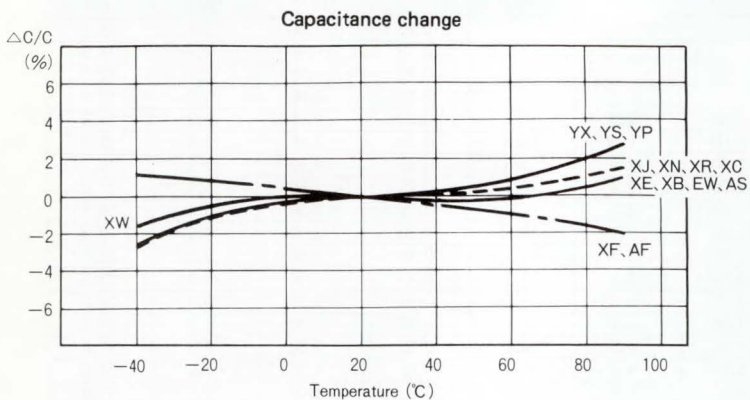
- Working voltage (DC or AC)
- Capacitance value and capacitance tolerance
- Operating temperature range
- Operating conditions (Waveform, frequency, pulse, current, etc)
- Safety level
- \* Influence to other components when a capacitor gets short-circuited or open.
- \* Influence to the capacitor when other components or the circuit work irregularly.



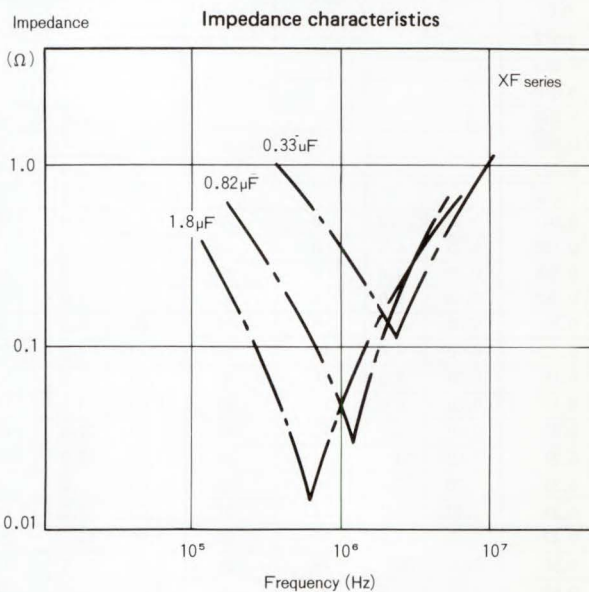
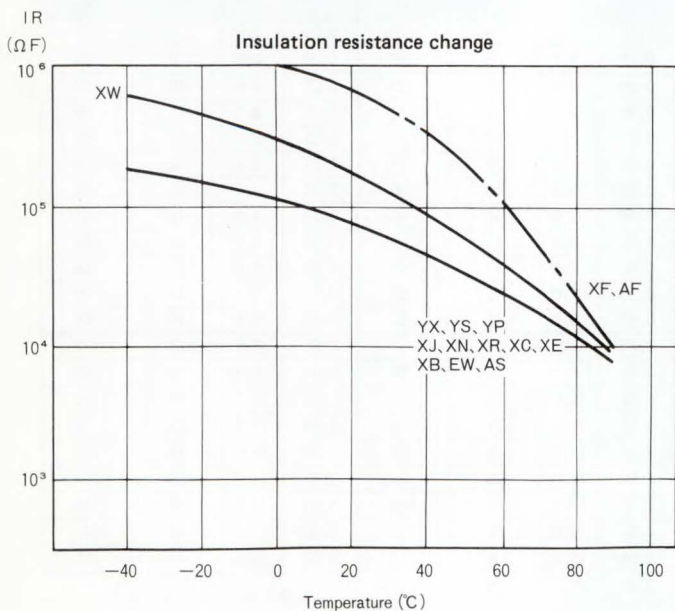
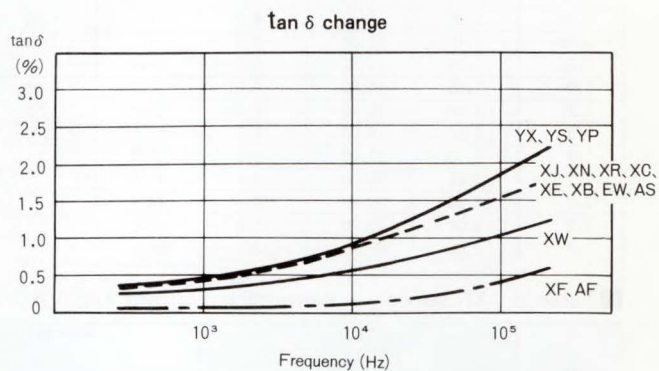
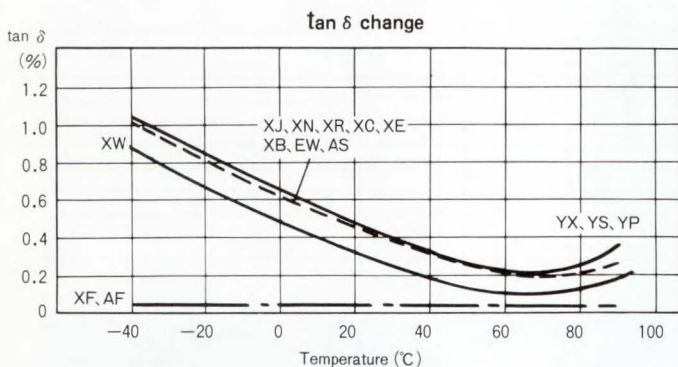
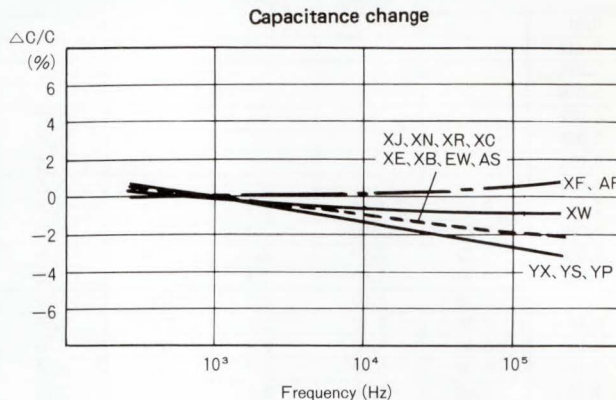
# PLASTIC FILM CAPACITORS

## Typical Characteristic Curves

### Temperature Characteristics



### Frequency Characteristics















# PLASTIC FILM CAPACITORS



Metallized Polyester Film Capacitor

series (Safety Standards recognized)



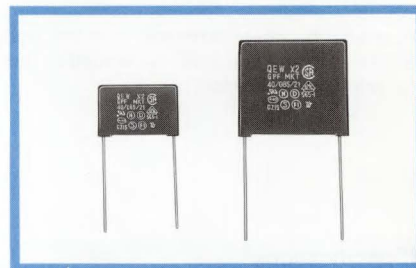
Safety Standards

- Recognized by the most authorized safety standards in the world, such as UL, CSA, VDE, SEV, DEMKO, SEMKO, NEMKO and EI, designing for applications where safety and reliability are required.
- Highly reliable series in a compact and light flame-retardant epoxy case for superior installation capability and non-inflammability.
- Self-healing and non-inductive construction, using a dielectric of metallized polyester film, suited for use as a noise suppressor (across-the-line).



Smaller, Case type

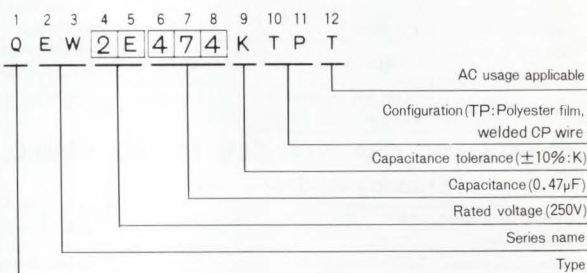
XC, XW



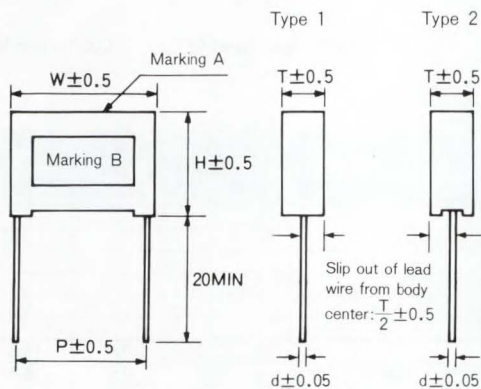
## Specifications

Applicable Standard	CSA(C22.2), UL(1414), VDE(0565-1), Other 5 European countries
Operating Temperature Range	-40~+85°C
Rated Voltage	250VAC
Capacitance Range	0.047~1.0μF
Capacitance Tolerance	±10%(K)
Dielectric Loss Tangent	1.0%(at 1kHz) or less
Withstand Voltage	1250VAC(Between Terminals) for 1 minute
	2000VAC(Between Terminals and Coverage) for 1 minute
Insulation Resistance	15000MΩ (0.33μF or less)
	5000Ω F(0.39μF or more)
Humidity Resistance	40°C 95% for 21 days
Encapsulation	Flame-retardant resin case filled with epoxy resin

Type numbering system (Example : 250V 0.47μF)



## Drawing



## Dimensions

Cap. (μF)	V (Code)		250VAC (2E)					Type
	Code	Size	T	W	H	d	P	
0.047	473		8.5	18.0	15.5	0.6	15.0	1
0.068	683		8.5	18.0	15.5	0.6	15.0	1
0.1	104		7.0	26.0	17.0	0.8	22.5	1
0.22	224		11.0	26.0	19.0	0.8	22.5	2
0.33	334		12.5	31.0	20.5	0.8	27.5	2
0.47	474		14.0	31.0	23.5	0.8	27.5	2
1.0	105		20.0	34.0	30.5	0.8	30.0	2

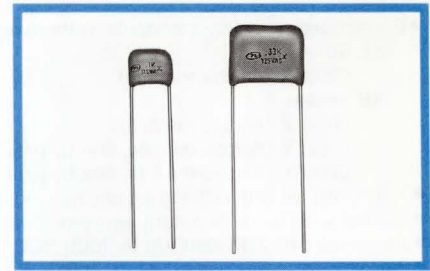


# PLASTIC FILM CAPACITORS

## XR

Metallized Polyester Film Capacitor  
 Electrical Appliance and Material Control Law (Japan) approved  
 For AC powey source series

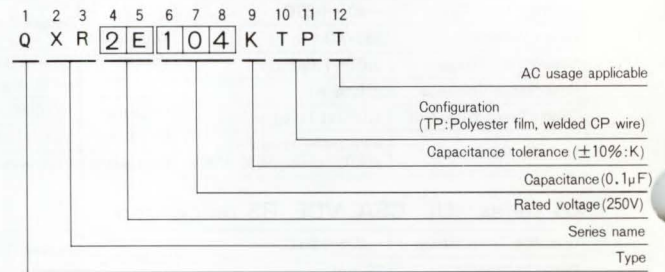
- Highly reliable and superior in high frequency applications, self-healing and non-inductive construction, using a dielectric of metallized polyester film.
- Finished by inner dipping, with liquid epoxy resin and outer coating with flame-retardant epoxy resin, those double coatings provide excellent humidity resistance.
- Designed in a small and compact size, but yet with higher capacitance, for high density mounting.
- Ideally suited for noise suppression in power source circuitry.



### Specifications

Item	Performance Characteristics
Operating Temperature Range	-40~+85°C
Rated Voltage	125、250VAC
Capacitance Range	Safety performance A1 0.01~0.47 $\mu$ F Safety performance C1 0.1 ~1.0 $\mu$ F
Capacitance Tolerance	$\pm 10\%$ (K)
Dielectric Loss Tangent	1.0% or less (at 1kHz 20°C)
Insulation Resistance	$C \leq 0.47\mu F$ 2000M $\Omega$ or more $C > 0.47\mu F$ 1000 $\Omega F$ or more
Withstand Voltage	Between Terminals : Rated Voltage Between Terminals and Coverage : Rated Voltage
Encapsulation	Flame-retardant epoxy resin
Applicable Standard	JIS C 5151 A1、C1

Type numbering system (Example: 250V 0.1 $\mu$ F)

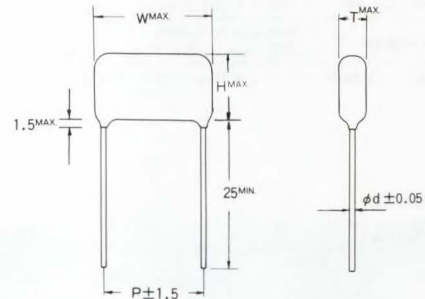


### Safety Performance

Symbol	A1	C1
Connecting Condition	Connected with load in parallel	Connected with load in series
Capacitance	0.01~0.47 $\mu$ F	0.1~1.0 $\mu$ F

Remarks : In applications, at least either one of the conditions shown below has to be fulfilled:  
 ① A resistor of 100 $\Omega$  or more shall be connected with a capacitor in series.  
 ② Pulse of higher than rated voltage $\times 1.4 \times \sqrt{2}$  Vo-p shall not be applied to both terminals of capacitor.

### Drawing



### Dimensions

Unit:mm

Cap. ( $\mu$ F)	Code	v	125 VAC (2B)					250VAC (2E)				
			T	W	H	d	p	T	W	H	d	p
0.01	103						4.8	15.0	9.4	0.6	12.5	
0.015	153						5.5	15.0	10.0	0.6	12.5	
0.022	223	4.3	10.5	8.4	0.6	7.5	6.3	15.0	10.8	0.6	12.5	
0.033	333	4.9	10.5	9.1	0.6	7.5	7.1	15.0	12.3	0.6	12.5	
0.047	473	4.7	13.0	9.8	0.6	10.0	6.2	20.0	11.5	0.6	17.5	
0.068	683	5.4	13.0	10.5	0.6	10.0	6.7	20.0	13.5	0.6	17.5	
0.1	104	6.1	13.0	11.7	0.6	10.0	7.8	20.0	14.6	0.6	17.5	
0.15	154	5.1	18.0	12.4	0.6	15.0	8.0	25.5	15.3	0.8	22.5	
0.22	224	5.9	18.0	13.2	0.6	15.0	8.9	25.5	17.6	0.8	22.5	
0.33	334	7.6	18.0	13.3	0.6	15.0	10.9	25.5	19.8	0.8	22.5	
0.47	474	8.3	18.0	15.6	0.6	15.0	11.3	30.5	20.2	0.8	27.5	
0.68	684	7.2	25.0	16.1	0.8	22.5						
1.0	105	8.7	25.0	17.6	0.8	22.5						

# AS

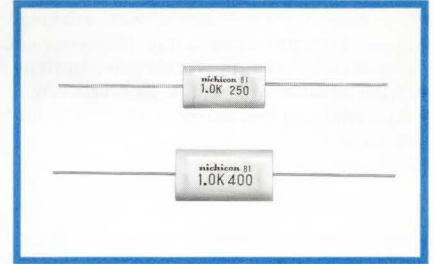
Metallized Polyester Film Capacitor

series (Tape-wrapped Axial Compact Type)

- Non-inductive construction, compact size, metallized film capacitor with axial lead wires.
- Highly reliable with self-healing property.
- Minimum loss at high frequency.
- Tape-wrapped and epoxy endfilled at both leads for superior mechanical strength and humidity resistance.
- High capacitance value, offering a wide variety of applications.

### Applications

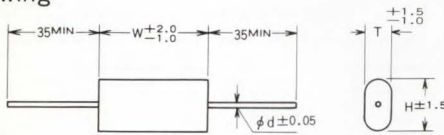
- Filtering DC-blocking, coupling and so on of general communications equipment and use in AC circuits for motor starting, charging/discharging, lighting, noise suppression, etc. Contact us for details for use in AC circuits.



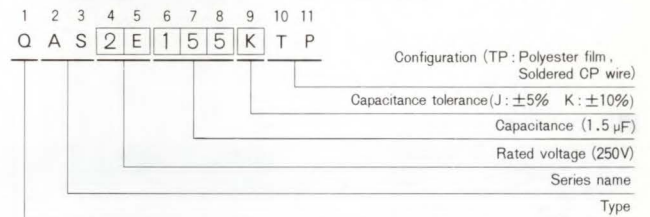
### Specifications

Item	Performance Characteristics
Operating Temperature Range	-40~+85°C
Rated Voltage	250, 400, 630 V.D.C.
Capacitance Range	0.1~10 $\mu$ F
Capacitance Tolerance	$\pm 5\%$ (J), $\pm 10\%$ (K)
Dielectric Loss Tangent	1.0% or less (at 1 kHz 20°C)
Insulation Resistance	$C \leq 0.33\mu\text{F}$ : 9000M $\Omega$ or more $C > 0.33\mu\text{F}$ : 3000 $\Omega$ F or more
Withstand Voltage	Between Terminals: Rated Voltage $\times$ 175%, 1~5 secs. Between Terminals and Coverage: Rated Voltage $\times$ 200%, 1~5 secs.
Encapsulation	Adhesive polyester film, epoxy resin
Applicable Standard	JIS C 5115

### Drawing



### Type numbering system (Example: 250V 1.5 $\mu$ F)



### Dimensions

Cap. ( $\mu$ F)	V(Code) Code	250VDC (2E)				400VDC (2G)				630VDC (2J)			
		T	W	H	d	T	W	H	d	T	W	H	d
0.1	104									4.5	28.0	11.0	0.8
0.12	124									5.0	28.0	11.5	0.8
0.15	154									6.0	28.0	12.5	0.8
0.18	184									6.0	28.0	14.0	0.8
0.22	224									7.0	28.0	15.0	0.8
0.27	274									8.0	28.0	16.0	0.8
0.33	334					6.0	23.0	14.0	0.8	9.0	28.0	17.0	0.8
0.39	394					6.5	23.0	14.5	0.8	10.0	28.0	18.0	0.8
0.47	474	4.0	23.0	10.5	0.8	7.5	23.0	15.5	0.8	9.5	33.0	17.5	0.8
0.56	564	4.5	23.0	11.0	0.8	8.0	23.0	16.0	0.8	10.5	33.0	18.5	0.8
0.68	684	5.5	23.0	11.5	0.8	7.5	28.0	15.5	0.8	10.0	38.0	19.5	1.0
0.82	824	6.0	23.0	12.5	0.8	8.5	28.0	16.0	0.8	11.0	38.0	20.5	1.0
1.0	105	6.0	23.0	14.0	0.8	9.5	28.0	17.5	0.8	11.0	44.0	20.5	1.0
1.2	125	7.0	23.0	15.0	0.8	10.5	28.0	18.5	0.8	12.5	44.0	22.5	1.0
1.5	155	6.5	28.0	14.5	0.8	11.5	28.0	21.0	0.8	14.5	44.0	23.5	1.0
1.8	185	7.0	28.0	15.0	0.8	13.0	28.0	22.0	0.8	16.0	44.0	25.5	1.0
2.2	225	8.0	28.0	16.0	0.8	12.0	33.0	21.5	0.8	16.5	50.0	26.0	1.0
2.7	275	9.0	28.0	17.0	0.8	14.0	33.0	23.5	0.8	18.5	50.0	28.0	1.0
3.3	335	8.0	33.0	18.0	0.8	15.5	33.0	25.0	0.8	21.0	50.0	30.0	1.0
3.9	395	9.0	33.0	19.0	0.8	17.0	33.0	26.5	0.8				
4.7	475	10.5	33.0	20.0	0.8	17.0	39.0	26.5	1.0				
5.6	565	12.0	33.0	21.0	0.8	19.0	39.0	28.0	1.0				
6.8	685	12.0	38.0	21.0	1.0								
8.2	825	13.0	38.0	22.5	1.0								
10.0	106	15.0	38.0	24.0	1.0								

Unit:mm

# PLASTIC FILM CAPACITORS

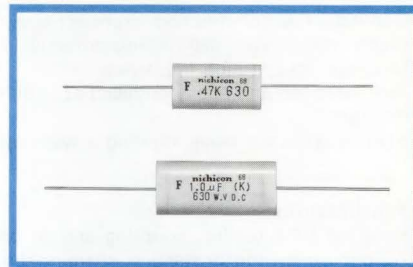
# AF

Metallized Polypropylene Film Capacitor

series (Tape-wrapped Axial Type for High Frequency Applications)



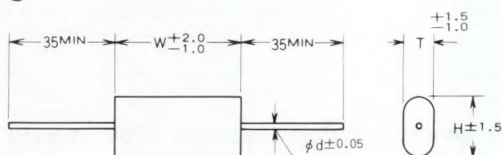
- Non-inductive construction, with axial lead wires.
- Superior performance in high frequency circuit and charging/discharging circuit due to excellent characteristics of metallized polypropylene film dielectric.
- Highly reliable with self-healing property.
- Tape-wrapped and epoxy endfilled at both leads for superior mechanical strength and humidity resistance.



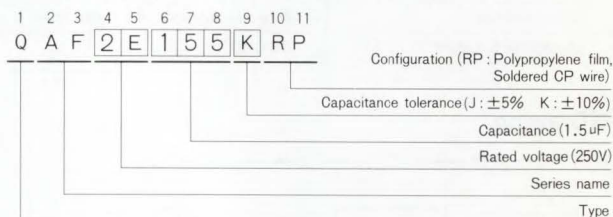
## Specifications

Item	Performance Characteristics
Operating Temperature Range	-40~+85°C
Rated Voltage	250, 400, 630 V.D.C.
Capacitance Range	0.15~10 μF
Capacitance Tolerance	±5% (J), ±10% (K)
Dielectric Loss Tangent	0.1% or less (at 1kHz 20°C)
Insulation Resistance	C ≤ 0.33 μF 30000 MΩ or more C > 0.33 μF 10000 Ω F or more
Withstand Voltage	Between Terminals : Rated Voltage × 175%, 1~5 secs. Between Terminals and Coverage : Rated Voltage × 200%, 1~5 secs.
Encapsulation	Adhesive polyester film, resin

## Drawing



## Type numbering system (Example: 250V 1.5 μF)



## Dimensions

Cap. (μF)	V (Code)	Code	Size	250VDC (2E)				400VDC (2G)				630VDC (2J)				Unit:mm	
				T	W	H	d	T	W	H	d	T	W	H	d		
0.15	154													4.8	28.0	11.4	0.8
0.18	184													5.4	28.0	12.0	0.8
0.22	224													5.6	28.0	13.8	0.8
0.27	274													6.5	28.0	14.6	0.8
0.33	334							6.1	28.0	12.7	0.8	7.4	28.0	15.6	0.8		
0.39	394							6.8	28.0	13.4	0.8	8.3	28.0	16.4	0.8		
0.47	474			4.3	28.0	10.9	0.8	7.7	28.0	14.2	0.8	7.8	33.0	15.9	0.8		
0.56	564			4.8	28.0	11.4	0.8	7.9	28.0	16.2	0.8	8.7	33.0	16.9	0.8		
0.68	684			5.0	28.0	13.2	0.8	9.0	28.0	17.2	0.8	9.9	33.0	18.1	0.8		
0.82	824			5.7	28.0	13.9	0.8	8.5	33.0	16.7	0.8	10.5	33.0	20.2	0.8		
1.0	105			6.5	28.0	14.7	0.8	9.7	33.0	17.9	0.8	10.4	38.0	20.1	1.0		
1.2	125			7.4	28.0	15.5	0.8	10.3	33.0	20.0	0.8	11.7	38.0	21.4	1.0		
1.5	155			8.6	28.0	16.7	0.8	11.9	33.0	21.6	0.8	12.0	44.0	21.7	1.0		
1.8	185			9.6	28.0	17.8	0.8	11.7	38.0	21.4	1.0	13.5	44.0	23.2	1.0		
2.2	225			9.3	33.0	17.5	0.8	13.3	38.0	22.7	1.0	15.3	44.0	25.0	1.0		
2.7	275			10.0	33.0	19.7	0.8	13.6	44.0	23.3	1.0	15.8	50.0	25.6	1.0		
3.3	335			11.4	33.0	21.1	0.8	15.4	44.0	25.1	1.0	17.9	50.0	27.6	1.0		
3.9	395			12.7	33.0	22.4	0.8	17.1	44.0	26.8	1.0						
4.7	475			12.6	38.0	22.3	1.0	17.5	50.0	27.2	1.0						
5.6	565			12.6	44.0	22.3	1.0	19.5	50.0	29.2	1.0						
6.8	685			14.3	44.0	24.0	1.0										
8.2	825			16.1	44.0	25.8	1.0										
10.0	106			16.6	50.0	26.3	1.0										

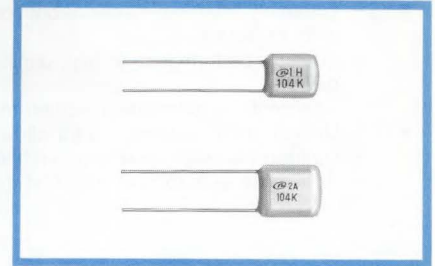
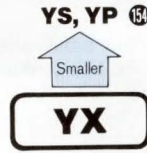
# PLASTIC FILM CAPACITORS



Foil Type Polyester Film Capacitor

series (Standard type, Coating with Clear -yellow Resin)

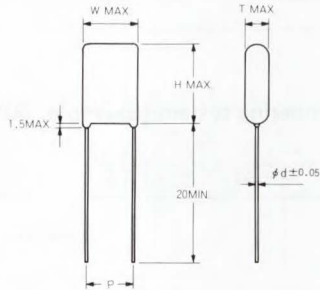
- Inductive construction, using a dielectric of polyester film together with aluminum foil.
- Coated with epoxy resin for superior heat resistance, humidity resistance and solvent resistance.
- Suited for use in commercial and industrial applications.
- Available for automatic insertion systems.



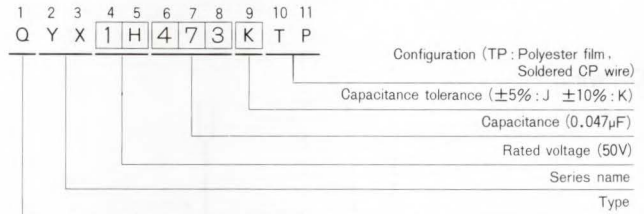
### Specifications

Item	Performance Characteristics
Operating Temperature Range	-40~+85°C
Rated Voltage	50, 100V.D.C.
Capacitance Range	0.001~0.47 μF
Capacitance Tolerance	± 5 % (J), ±10% (K)
Dielectric Loss Tangent	0.8% or less (at 1 kHz 20°C)
Insulation Resistance	30,000MΩ or more
Withstand Voltage	Between Terminals : Rated Voltage X 250%. 1~5 secs. Between Terminals and Coverage : Rated Voltage X 200%. 1~5 secs.
Encapsulation	Epoxy resin
Applicable Standard	JIS C5113

### Drawing



### Type numbering system (Example: 50V 0.047 μF)



### Dimensions

Unit:mm

Cap. (μF)	V (Code)		50 VDC (1H)					100 VDC (2A)				
	Code	Size	T	W	H	d	P	T	W	H	d	P
0.001	102		2.5	5.0	7.0	0.5	3.5±0.75	2.8	5.5	10.0	0.5	3.5 <sup>+1.0</sup> <sub>-0.8</sub>
0.0012	122		2.5	5.0	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0015	152		2.5	5.0	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0018	182		2.5	5.5	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0022	222		3.0	5.5	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0027	272		3.0	5.5	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0033	332		3.0	5.5	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0039	392		3.0	5.5	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0047	472		3.0	6.0	7.0	0.5	3.5	2.8	5.5	10.5	0.5	3.5
0.0056	562		3.0	6.0	7.0	0.5	3.5	2.8	6.0	10.5	0.5	5.0±1.0
0.0068	682		3.0	6.0	7.0	0.5	3.5	2.8	6.0	10.5	0.5	5.0
0.0082	822		3.0	6.0	7.0	0.5	3.5	3.0	6.5	10.5	0.5	5.0
0.01	103		3.0	6.0	7.0	0.5	3.5	3.0	6.5	10.5	0.5	5.0
0.012	123		3.5	6.0	7.0	0.5	3.5	3.0	6.5	11.5	0.5	5.0
0.015	153		3.5	6.0	8.5	0.5	3.5	3.0	6.5	11.5	0.5	5.0
0.018	183		3.5	6.5	8.5	0.5	3.5	3.5	6.5	11.5	0.5	5.0
0.022	223		3.5	6.5	9.0	0.5	3.5	3.5	6.5	11.5	0.5	5.0
0.027	273		3.5	6.5	9.0	0.5	3.5	3.5	7.5	11.5	0.5	5.0
0.033	333		4.0	7.0	9.0	0.5	3.5	3.5	7.5	11.5	0.5	5.0
0.039	393		4.0	7.0	9.0	0.5	3.5	4.5	8.5	12.5	0.5	5.0
0.047	473		4.5	7.5	9.5	0.5	5.0±1.0	4.5	8.5	12.5	0.5	5.0
0.056	563		4.5	7.5	9.5	0.5	5.0	4.5	9.5	12.5	0.5	7.5 <sup>+1.0</sup> <sub>-1.2</sub>
0.068	683		4.5	8.0	9.5	0.5	5.0	4.5	9.5	12.5	0.5	7.5
0.082	823		4.5	8.0	9.5	0.5	5.0	5.5	11.0	12.5	0.5	7.5
0.1	104		5.5	9.0	10.5	0.5	5.0	5.5	11.0	12.5	0.5	7.5
0.12	124		5.5	9.0	10.5	0.5	5.0	6.0	12.5	14.0	0.5	10.0 <sup>+1.0</sup> <sub>-1.2</sub>
0.15	154		6.0	10.0	12.0	0.5	5.0	6.0	12.5	14.0	0.5	10.0
0.18	184		6.0	10.5	12.0	0.5	5.0	7.0	14.0	14.0	0.5	10.0
0.22	224		6.0	11.0	12.0	0.5	7.5 <sup>+1.0</sup> <sub>-1.2</sub>	7.0	14.0	14.0	0.5	10.0
0.27	274		7.5	12.5	14.5	0.6	7.5	8.0	14.5	17.0	0.6	10.0
0.33	334		7.5	12.5	14.5	0.6	7.5	8.0	14.5	17.0	0.6	10.0
0.39	394		9.5	14.0	15.0	0.6	7.5	9.5	16.5	17.0	0.6	10.0
0.47	474		9.5	14.0	15.0	0.6	7.5	9.5	16.5	17.0	0.6	10.0

# PLASTIC FILM CAPACITORS

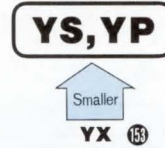
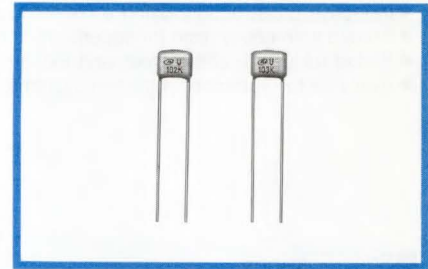
# YS.YP

Foil Type Polyester Film Capacitor

series (Low Profile Super Miniature Type, Coating with Clear-yellow Resin)



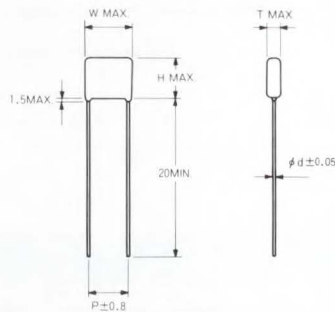
- YS – Extremely small in dimensions both of height and body width, and light in weight compared with YX series.
  - Superior performance in high density assemblies, reducing total thickness of electronic devices.
  - Applicable to automatic insertion machine.
- YP – Unified 5mm lead spacing for all ratings, low-profile size.
  - Optimum for high density assemblies on PC board, due to 5mm straight lead spacing.
  - Applicable to automatic insertion machine.



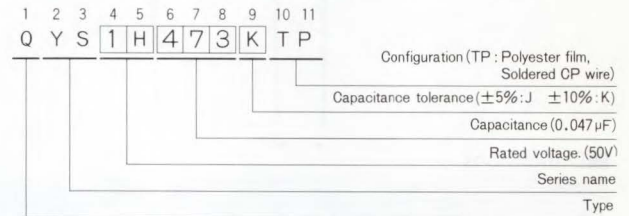
## Specifications

Item	Performance Characteristics
Operating Temperature Range	-40~+85°C
Rated Voltage	50V.D.C.
Capacitance Range	0.001~0.47 μF
Capacitance Tolerance	± 5% (J)、±10% (K)
Dielectric Loss Tangent	0.8% or less (at 1 kHz 20°C)
Insulation Resistance	30,000 MΩ or more
Withstand Voltage	Between Terminals : Rated Voltage X 250%. 1~5 secs. Between Terminals and Coverage : Rated Voltage X 200%. 1~5 secs.
Encapsulation	Epoxy resin
Applicable Standard	JIS C5113

## Drawing



## Type numbering system (Example: 50V 0.047μF)



## Dimensions

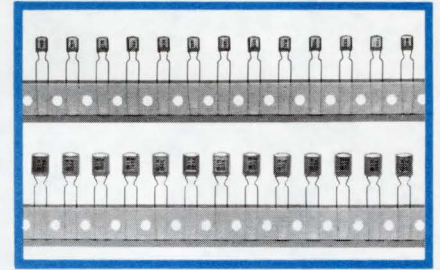
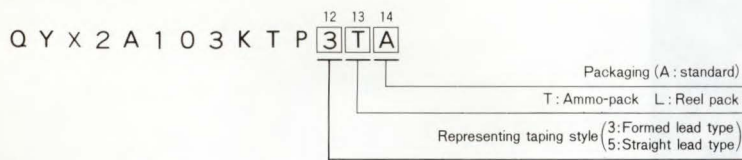
Unit:mm

Series	V(Code)	YS Series						YP Series				
		50 VDC (1H)						50 VDC (1H)				
		T	W	H	d	P	T	W	H	d	P	
0.001	102	3.0	5.0	5.0	0.5	3.5	3.0	6.5	5.0	0.5	5.0	
0.0015	152	3.0	5.0	5.0	0.5	3.5	3.0	6.5	5.0	0.5	5.0	
0.0022	222	3.0	5.5	5.0	0.5	3.5	3.0	6.5	5.0	0.5	5.0	
0.0033	332	3.0	5.5	5.0	0.5	3.5	3.0	6.5	5.0	0.5	5.0	
0.0047	472	3.0	6.0	5.0	0.5	3.5	3.0	6.5	5.0	0.5	5.0	
0.0068	682	3.0	6.0	5.0	0.5	3.5	3.5	6.5	5.0	0.5	5.0	
0.01	103	3.5	6.5	5.0	0.5	3.5	3.5	6.5	5.0	0.5	5.0	
0.015	153	3.5	6.5	5.0	0.5	3.5	3.5	7.0	5.0	0.5	5.0	
0.022	223	4.0	7.0	5.5	0.5	3.5	4.0	7.5	5.5	0.5	5.0	
0.033	333	5.0	7.5	6.0	0.5	3.5	5.0	8.0	6.0	0.5	5.0	
0.047	473	5.5	8.5	6.0	0.5	5.0	5.5	8.5	6.5	0.5	5.0	
0.068	683	5.5	8.5	7.0	0.5	5.0	5.5	8.5	7.5	0.5	5.0	
0.1	104	6.5	9.5	7.5	0.5	5.0	6.5	9.5	7.5	0.5	5.0	
0.15	154	6.0	9.5	10.0	0.5	5.0						
0.22	224	6.5	10.5	11.0	0.5	7.5						
0.33	334	7.0	11.0	13.0	0.6	7.5						
0.47	474	8.5	12.5	13.0	0.6	7.5						

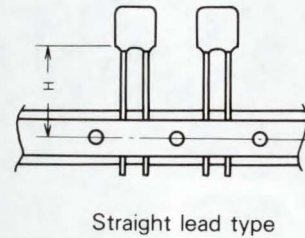
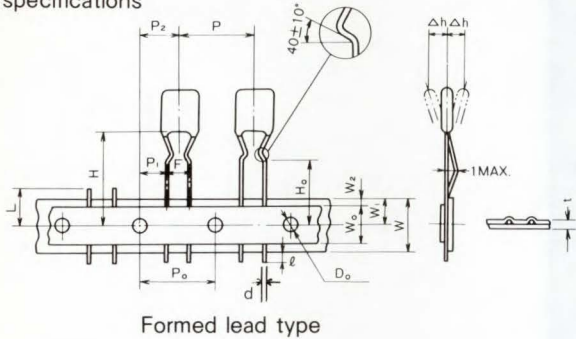


## Taped Capacitors for Automatic Insertion Systems (YX, YS, YP series)

### Type numbering system



### Taping specifications



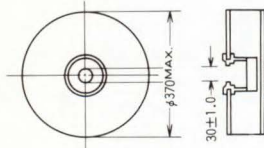
### Dimensions

Item	Symbol	Dimensions (mm)		Item	Symbol	Dimensions (mm)	
		Dimensions	Tolerance			Dimensions	Tolerance
Pitch of component	P	12.7	±1.0	Slip out of hold down tape	W <sub>2</sub>	2.5	MAX.
Feed hole pitch	P <sub>o</sub>	12.7	±0.3	Height of component from tape center	H*	20.0 (16.0)	±0.75
Distance between hole and lead wire	P <sub>1</sub>	3.85	±0.7	Lead-wire clinch height	H <sub>o</sub>	16.0	±0.5
Distance between hole and component	P <sub>2</sub>	6.35	±1.3	Length of cut lead	ℓ	2.0	MAX.
Lead-to-lead distance	F	5.0	$\begin{matrix} +0.8 \\ -0.2 \end{matrix}$	Feed hole diameter	D <sub>o</sub>	4.0	±0.2
Tilt of component	Δh	0	±2.0	Total tape thickness	t	0.7	±0.2
Tape width	W	18.0	$\begin{matrix} +1.0 \\ -0.5 \end{matrix}$	Cut length of rejected component	L	11.0	MAX.
Hold down tape width	W <sub>o</sub>	15.0	$\begin{matrix} +0.5 \\ -2.5 \end{matrix}$	Lead wire diameter	φd	0.5	±0.05
Slip out of hole	W <sub>1</sub>	9.0	$\begin{matrix} +0.75 \\ -0.5 \end{matrix}$				

\*Straight lead type is available only for 5mm lead pitch capacitors, and H will be 16mm.

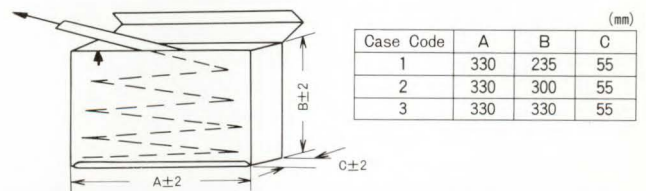
### Packaging

#### Reel pack



Series	Cap. range (μF)	Q'ty/Reel (pcs.)
YX (50V)	0.001 ~0.01	2,000
	0.012 ~0.039	1,500
	0.047 ~0.1	1,000
	0.12 ~0.22	800
YX (100V)	0.001 ~0.01	2,000
	0.012 ~0.039	1,500
	0.047 ~0.1	1,000

#### Ammo-pack



Series	Cap. range (μF)	Q'ty/Case (pcs.)	Case code
YX (50V)	0.001 ~0.0018	2,000	1
	0.0022~0.0039	2,000	2
	0.0047~0.027	2,000	3
	0.033 ~0.22	1,000	2
YX (100V)	0.001 ~0.0018	2,000	1
	0.0022~0.0039	2,000	2
	0.0047~0.027	2,000	3
	0.033 ~0.1	1,000	2
YS	0.001 ~0.0015	2,000	1
	0.0022~0.0033	2,000	2
	0.0047~0.022	2,000	3
YP	0.033 ~0.22	1,000	2
	0.001 ~0.0015	2,000	1
	0.0022~0.0033	2,000	2
	0.0047~0.022	2,000	3
	0.033 ~0.1	1,000	2

# 4

**POSITIVE  
THERMISTORS  
"Posi-R"**

Contents

4-1. Positive Thermistors, "Posi-R" ————— 159

Characteristics of Positive Thermistors "Posi-R"

● Switching Temperature (Resistance Anomaly Point)

At the resistance/temperature characteristics of positive thermistors "Posi-R", the temperature which the resistance value becomes twice as high as that of at 25°C, is called as "switching temperature" (Curie point).

Thermistors "Posi-R" show anomalous temperature characteristic of resistivity, and typical characteristics are represented in Fig. 1. Optimum characteristics can be selected for each application.

● Temperature Coefficient

The temperature coefficient is calculated from the linear range at the steepest portion of resistance (T<sub>1</sub>~T<sub>2</sub>) as illustrated in Fig. 2.

$$\text{Temperature coefficient} = \frac{2.303 (\log_{10} R_2/R_1)}{t_2 - t_1} \times 100 (\%/^{\circ}\text{C})$$

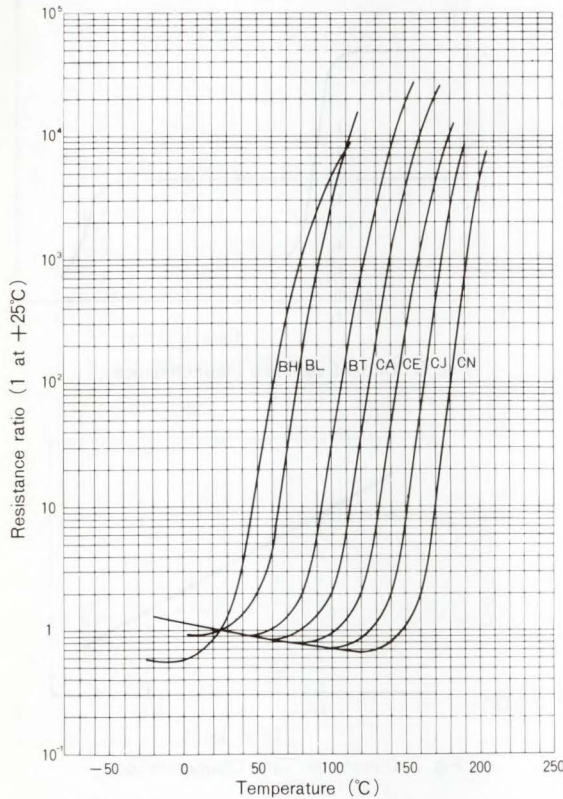


Fig. 1 Resistance vs. Temperature Characteristics

● Maximum Inrush Current

The maximum inrush current is the maximum allowable current (effective value) flowed into a Posi-R. No current higher than this shall be flowed as it causes breakdown of a Posi-R.

● Returning Time

The returning time is the time constant necessary for a Posi-R to quickly return to the switching temperature (resistance of twice as high as the initial value) after the power source is cut off.

● Dissipation Factor

When a power source is applied to Posi-R and thermal equilibrium will have been reached, the following equation is established.

$$V \cdot I = C (T_1 - T_0)$$

- Where, V : Applied voltage (V)
- I : Equilibrium current (A)
- C : Dissipation factor (W/°C)
- T<sub>1</sub> : Equilibrium temperature of Posi-R (°C)
- T<sub>0</sub> : Ambient temperature (°C)

In case that the dissipation factor is known by putting arbitrary values of voltage and current into the above equation, the equilibrium temperature at the then voltage can be attained.

The temperature rise (T<sub>1</sub>-T<sub>0</sub>) of Posi-R due to voltage application can be also computed easily.

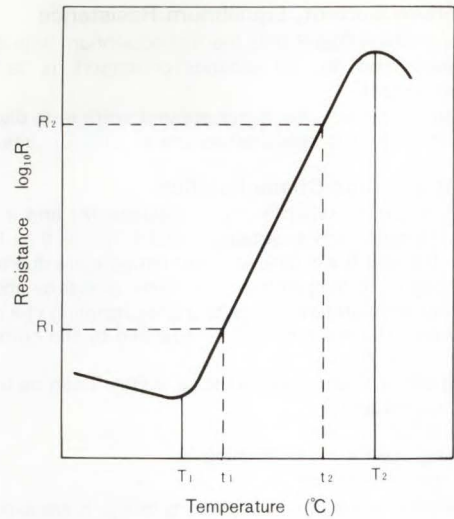


Fig. 2 Temperature Characteristics of Posi-R

● Voltage/Current Characteristics

In the Fig. 3 circuit, the relationship between voltage and current is called as the voltage/current characteristics when the voltage is applied to Posi-R and it gets the thermal equilibrium.

As seen in Fig. 4, the characteristic follows Ohm's law up to E<sub>1</sub> point. The current increases when the voltage is raised, provided that the temperature characteristic is within the range of switching temperature or lower. The range between E<sub>1</sub> and E<sub>2</sub> is over the switching temperature but within the constant range of power dissipation. However, beyond E<sub>2</sub> point, an excess power will run and Posi-R will result in breakdown, accordingly.

Therefore, the operating voltage of Posi-R shall be lower than E<sub>2</sub>, and its rated voltage shall be defined to half of E<sub>2</sub> value or lower, taking the safety into account.

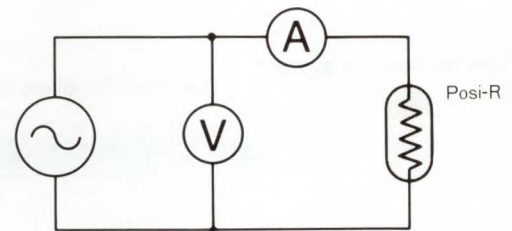


Fig. 3 Measuring Circuit

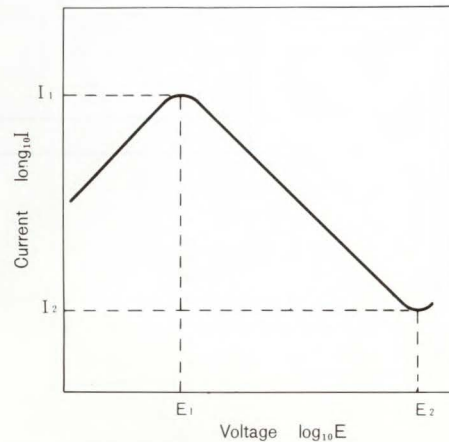


Fig. 4 Voltage/Current Characteristics

# POSITIVE THERMISTORS "Posi-R"

## ● Equilibrium Current, Equilibrium Resistance

The current, which Posi-R gets thermal equilibrium with an arbitrary voltage application (for 30 seconds or longer), is called as the equilibrium current.

Besides, the quotient which the applied voltage is divided by the equilibrium current is specified as the equilibrium resistance.

## ● Current vs. Time Characteristics

In the Fig. 5 circuit, when a load resistance (R) and a Posi-R are connected in series and an arbitrary voltage higher than  $E_1$  in Fig. 4 is applied, the Posi-R will have inherent temperature due to a current flowing through it. Its temperature rises as time passes by, and it exceeds the switching temperature in a certain time, resulting in a rapid damp of the current. The trip time can be adjusted by the current volume as shown in Fig. 6.

By making use of these characteristics, a Posi-R can be used for the following applications;

1. Timing circuit
2. Switching use for motor running
3. Overcurrent protection

When the parameters of  $I_1$ ,  $t_1$ ,  $I_2$  and  $t_2$  in Fig. 6 are expressed in a logarithmic graph in the manner of Fig. 7, an almost linear graph is formed and the relationship between the circuit current and the trip time can be obtained.

But, when a Posi-R is used for a timing application such as a timer, the voltage shall be appropriately applied for 30 seconds or less as the changes of conditions may affect much more as time passes by.

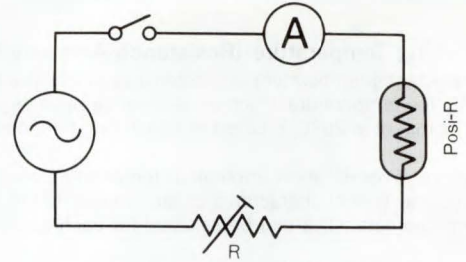


Fig. 5 Measuring Circuit

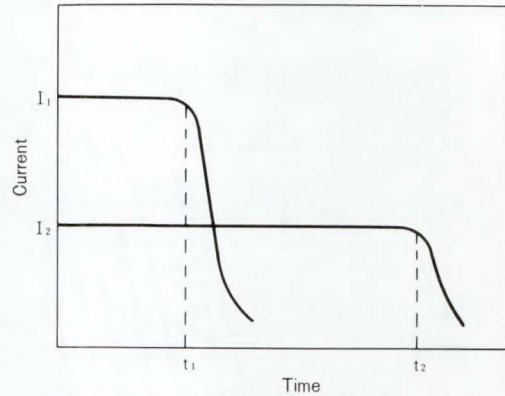


Fig. 6 Current vs. Time Characteristics

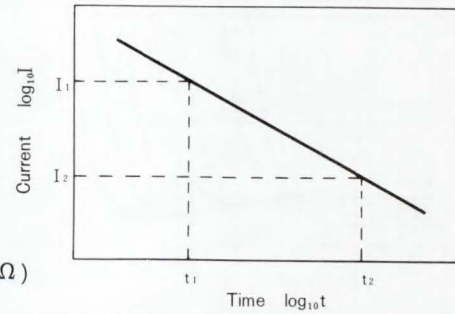


Fig. 7 Current vs. Time Characteristics

## ■ Type numbering system

(Example for overcurrent protection 12V, 2.2Ω)

1 2 3 4 5 6 7 8 9 10 11  
Z P C 1 9 C E 2 R 2 A

Revision Code

Configuration

Type (Posi-R)

Nominal resistance

Switching Temperature (Example)		Nominal resistance	Code
Temperature	Code		
50°C	BL	0.5Ω	0R5
120°C	CE	1.0Ω	1R0
135°C	CH	10Ω	100
		100Ω	101
		1kΩ	102

Usage

Application	Code
For degaussing, Solder-mounting type	B
For degaussing, Encased type	K
For overcurrent protection	C
Disc type	D
For constant temperature heater	H
For temperature detection	P
For motor starting	M
For general purpose, Solder-mounting type	A
Others	Z

**For Overcurrent Protection**

When something abnormal occurs at the load such as a transistor circuit or a small-type motor, an abnormal current rushes into the power source circuit. Then, a power transistor at the transformer or the switching power supply generates heat in an abnormal level and causes breakdown.

If a Posi-R for overcurrent protection is used in such a circuit, it can make the temperature compensation and protection for the power source and the load. An example is as shown in Fig. 8.

As to the temperature protection, it can be perfectly made in use of this Posi-R owing to the excellent characteristic of resistance anomaly, that is, a current is reduced by the increased resistance due to the self-heating of Posi-R.

At the voltage/current characteristics in Fig. 9, there is a peak current. If a current larger than this peak current flows, a Posi-R acts. But if a current less than the peak current flows, a Posi-R does not act. The peak current varies depending upon the size of Posi-R, resistance and ambient temperature. Fig. 10 shows an example of current characteristics.

At the current higher than the upper limit of fluctuation range, a Posi-R acts. Contrary, at the current less than the lower limit, it does not act. But the fluctuation range varies owing to ambient temperature.

For instance, if the operating temperature range is supposed to be at  $-10 \sim +60^{\circ}\text{C}$ , the lower limit at  $+60^{\circ}\text{C}$  becomes the maximum value for a normal current (non-acting) and the upper limit at  $-10^{\circ}\text{C}$  becomes the minimum value for a limiting current (acting), respectively.

Judging from the above explained relations, a Posi-R can be suited for the circuit where the ratio of a limiting current to a normal current is more than 2.5 ~ 3 times.

Characteristic of ZPC4MCE100A

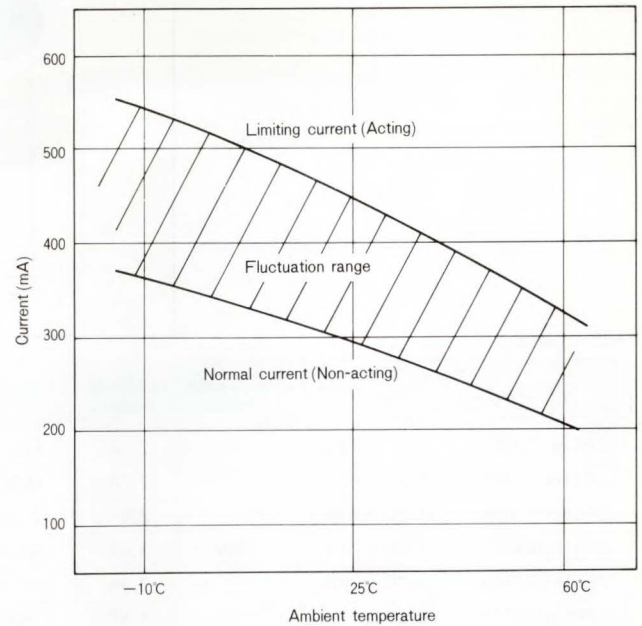


Fig. 10 Current Characteristic

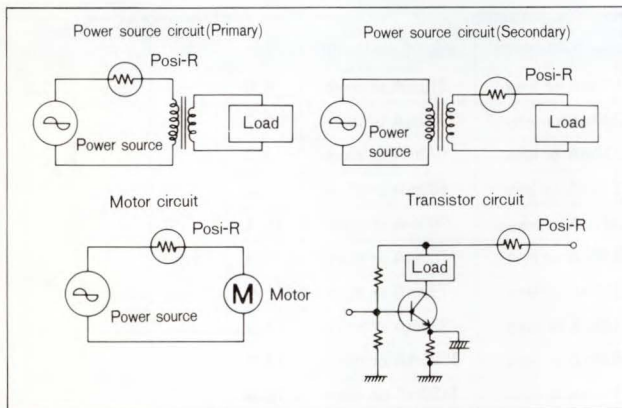


Fig. 8 Examples of applications

Characteristic of ZPC4MCE100A

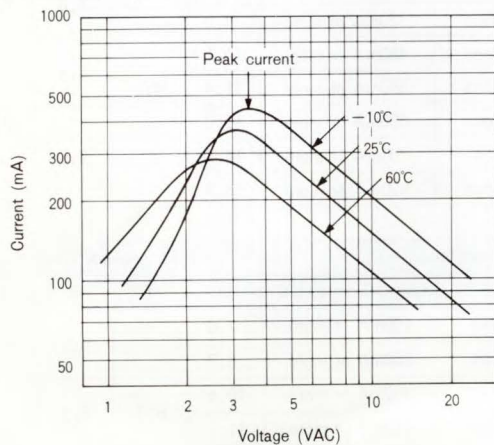


Fig. 9 Voltage/Current Characteristics

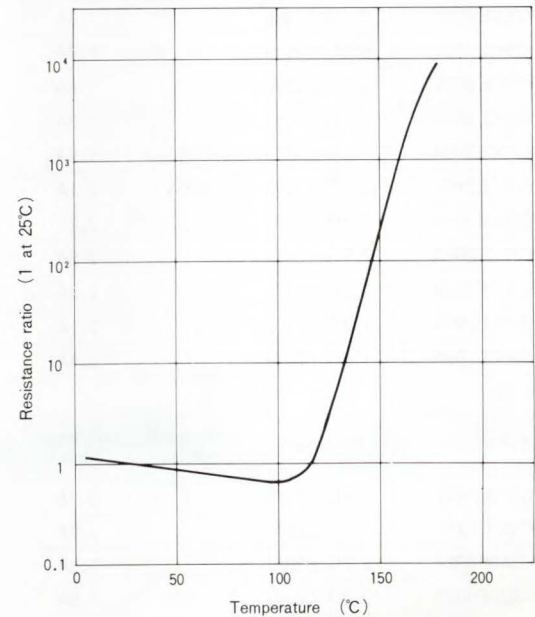
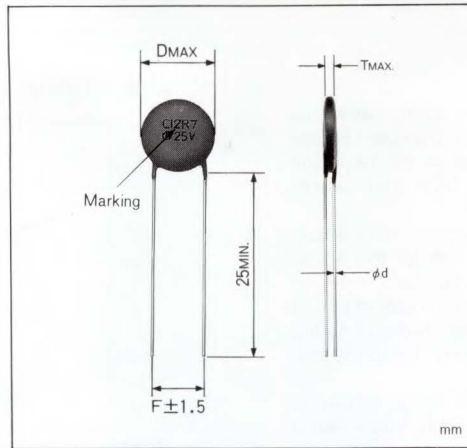


Fig. 11 Resistance vs. Temperature Characteristics

# POSITIVE THERMISTORS "Posi-R"

■ For Overcurrent Protection



• 12V Class

Type No.	Resistance	Max. Operating Voltage	Max. Inrush Current	Current Characteristic			Dimensions (mm)			
				25°C	Normal Current (60°C)	Limiting Current (-10°C)	D	T	F	d
ZPC19CE2R2A	2.2Ω ±20%	16V	2.4A	610mA ±20%	350mA or less	890mA or more	9.7	3.0	6.3	0.6
ZPC1BCE1R8A	1.8Ω ±20%		2.7A	680mA ±20%	400mA or less	1000mA or more	10.5			
ZPC1DCE1R5A	1.5Ω ±20%		3.0A	750mA ±20%	440mA or less	1100mA or more	11.4			
ZPC1HCE1R2A	1.2Ω ±20%		3.6A	900mA ±20%	520mA or less	1320mA or more	13.0	9.5		
ZPC1KCE1R0A	1.0Ω ±20%		3.9A	980mA ±20%	570mA or less	1450mA or more	13.8			
ZPC1NCE0R8A	0.8Ω ±20%		4.5A	1130mA ±20%	660mA or less	1700mA or more	15.1			
ZPC1TCE0R5A	0.5Ω ±20%		5.0A	1600mA ±20%	940mA or less	2340mA or more	17.5			

• 25V Class

Type No.	Resistance	Max. Operating Voltage	Max. Inrush Current	Current Characteristic			Dimensions (mm)			
				25°C	Normal Current (60°C)	Limiting Current (-10°C)	D	T	F	d
ZPC25CE8R2A	8.2Ω ±20%	35V	1.3A	210mA ±20%	120mA or less	310mA or more	8.0	3.5	6.3	0.6
ZPC29CE6R8A	6.8Ω ±20%		1.4A	350mA ±20%	200mA or less	510mA or more	9.7			
ZPC29CE4R7A	4.7Ω ±20%		1.6A	390mA ±20%	230mA or less	570mA or more	9.7			
ZPC2DCE4R7A	4.7Ω ±20%		1.8A	460mA ±20%	270mA or less	680mA or more	11.4			
ZPC2DCE3R9A	3.9Ω ±20%		1.9A	480mA ±20%	280mA or less	700mA or more	11.4			
ZPC2ECE3R9A	3.9Ω ±20%		2.1A	520mA ±20%	300mA or less	760mA or more	11.9			
ZPC2ECE3R3A	3.3Ω ±20%		2.2A	540mA ±20%	310mA or less	790mA or more	11.9	9.5		
ZPC2LCE2R7A	2.7Ω ±20%		2.5A	630mA ±20%	370mA or less	930mA or more	14.3			
ZPC2LCE2R2A	2.2Ω ±20%		2.8A	690mA ±20%	400mA or less	1020mA or more	14.3			
ZPC2RCE2R2A	2.2Ω ±20%		3.1A	780mA ±20%	450mA or less	1150mA or more	15.9	15.9		
ZPC2RCE1R8A	1.8Ω ±20%		3.4A	850mA ±20%	500mA or less	1250mA or more	15.9			

• 50V Class

Type No.	Resistance	Max. Operating Voltage	Max. Inrush Current	Current Characteristic			Dimensions (mm)			
				25°C	Normal Current (60°C)	Limiting Current (-10°C)	D	T	F	d
ZPC32CE240A	24Ω ±20%	60V	0.7A	170mA ±20%	100mA or less	250mA or more	6.5	4.5	5.0	0.6
ZPC35CE150A	15Ω ±20%		0.9A	220mA ±20%	130mA or less	320mA or more	8.0			
ZPC3ACE8R2A	8.2Ω ±20%		1.3A	330mA ±20%	190mA or less	480mA or more	10.1			
ZPC3DCE6R2A	6.2Ω ±20%		1.5A	380mA ±20%	220mA or less	560mA or more	11.4			
ZPC3HCE4R7A	4.7Ω ±20%		1.9A	470mA ±20%	270mA or less	690mA or more	13.0	9.5		
ZPC3MCE3R6A	3.6Ω ±20%		2.2A	540mA ±20%	310mA or less	790mA or more	14.7			
ZPC3RCE3R0A	3.0Ω ±20%		2.5A	630mA ±20%	370mA or less	920mA or more	15.9			

• 100V, 120V Class

Type No.	Resistance	Max. Operating Voltage	Max. Inrush Current	Current Characteristic			Dimensions (mm)			
				25°C	Normal Current (60°C)	Limiting Current (-10°C)	D	T	F	d
ZPC42CE560A	56Ω ±20%	140V	0.5A	110mA ±20%	65mA or less	160mA or more	7.0	6.0	5.0	0.6
ZPC45CE300A	30Ω ±20%		0.7A	170mA ±20%	100mA or less	250mA or more	8.7			
ZPC49CE220A	22Ω ±20%		1.0A	230mA ±20%	130mA or less	340mA or more	10.4			
ZPC40CE150A	15Ω ±20%		1.1A	280mA ±20%	160mA or less	410mA or more	11.7			
ZPC4MCE100A	10Ω ±20%		1.5A	370mA ±20%	210mA or less	540mA or more	15.3	9.5		
ZPC4PCE6R8A	6.8Ω ±20%		1.8A	450mA ±20%	260mA or less	660mA or more	16.2			

• Other current values are also available upon request.

**For Degaussing Circuit in Color TV**

A Posi-R for a degaussing circuit in color TV, using commercial frequency as a power source, is applicable to either single-element circuit or double-element circuit with high attenuation, as illustrated in Figs. 12 and 13, respectively.

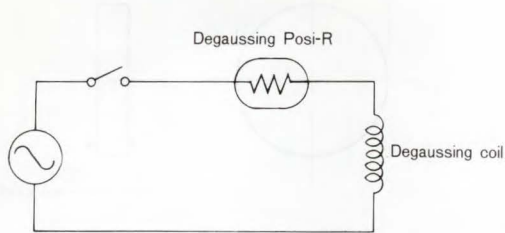


Fig. 12 Automatic Degaussing Circuit (Single-element)

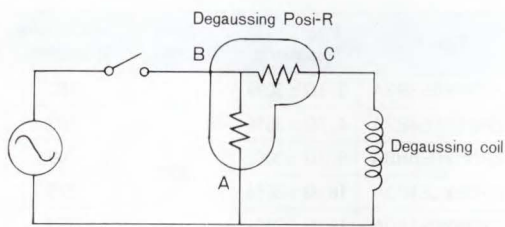
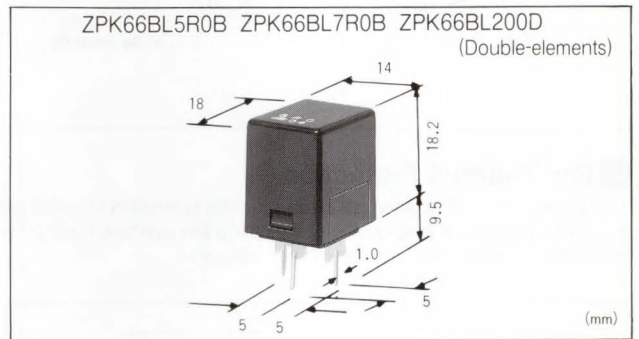
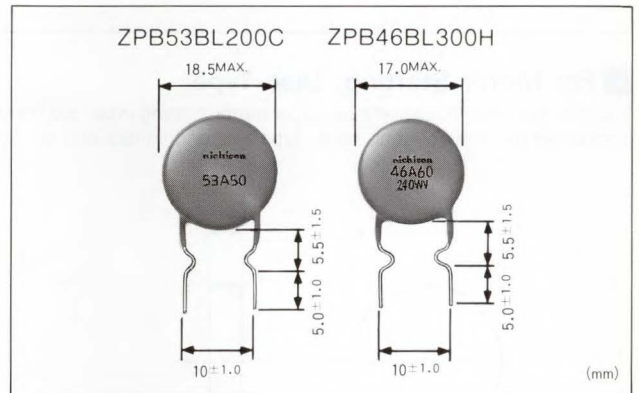
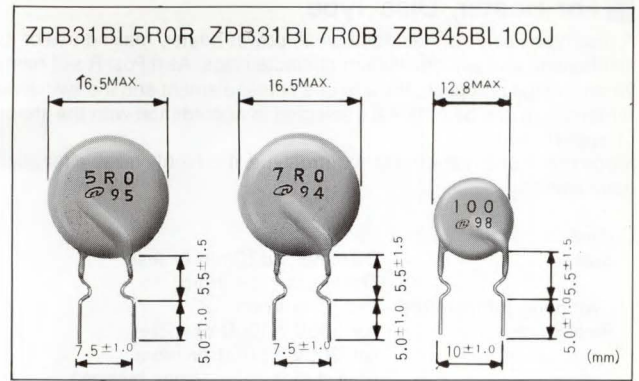


Fig. 13 Automatic Degaussing Circuit (Double-elements)



Type No.	Rated Voltage	Initial Resistance	Switching Temperature	Current Characteristics			Remarks
				Inrush	3 seconds	60 seconds	
ZPB31BL5R0R	100V	5Ω±20%	50°C	35Ap-p or more	300mA-p-p or less	60mA-p-p or less	Solder-mounting type
ZPB31BL7R0B	120V	7Ω±20%		25Ap-p or more	300mA-p-p or less	60mA-p-p or less	∕
ZPB45BL100J	120V	10Ω±30%		20Ap-p or more	240mA-p-p or less	40mA-p-p or less	∕
ZPB53BL200C	220V	20Ω±30%		7.5A0-p or more	150mA0-p or less	20mA0-p or less	∕
ZPB46BL300H	220V	30Ω±30%		8A0-p or more	110mA0-p or less	20mA0-p or less	∕
ZPK66BL5R0B	100V	5Ω±20%		35A0-p or more	300mA0-p or less	20A0-p or less	Encased type
ZPK66BL7R0B	120V	7Ω±20%		25A0-p or more	300mA0-p or less	10A0-p or less	∕
ZPK66BL200D	220V	20Ω±30%		15A0-p or more	300mA0-p or less	10mA0-p or less	∕

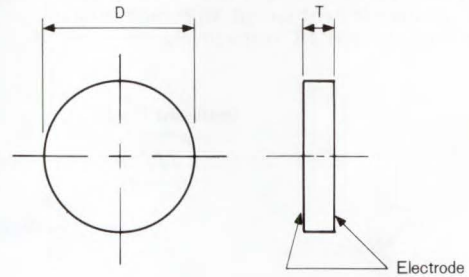
# POSITIVE THERMISTORS "Posi-R"

## For Heater, Disc Type

A disc type Posi-R is ideal for a small-power heater, making use of its self-heating and self-equilibrium characteristics. As a Posi-R self-heats when voltage is applied, the size of a heater element and the switching temperature can be optionally selected in accordance with the shape of appliances. Since this is of a non-contact control type, it is highly reliable for such applications.

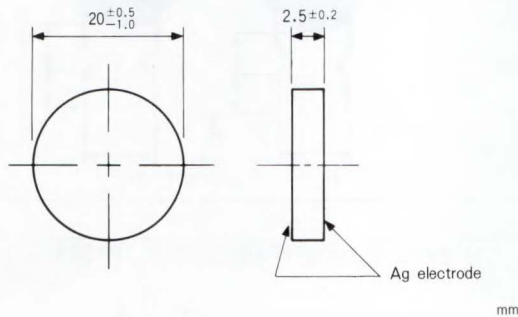
### Outline

Size	Diameter : $\phi 20\text{mm}$ or less Thickness : 2 ~ 3mm
Switching temperature	170°C or lower
Resistance	For 100V : $100\Omega$ or more For 200V : $500\Omega$ or more (Resistance value varies by size.)



## For Motor Starting, Disc Type

This disc type Posi-R is ideally suited for motor starting in various home appliances like refrigerators, home-type air conditioners and etc.



Type No.	Initial Resistance	Switching Temperature	Max. Operating Voltage(Vrms)	Max. Inrush Current(Arms)
ZPD5YCE3R3A	$3.3\Omega \pm 30\%$	120°C	160	12
ZPD5YCE4R7A	$4.7\Omega \pm 30\%$		180	12
ZPD5YCE6R8A	$6.8\Omega \pm 30\%$		200	10
ZPD5YCE100A	$10\Omega \pm 30\%$		225	9
ZPD5YCE150A	$15\Omega \pm 30\%$		250	8
ZPD5YCE220A	$22\Omega \pm 30\%$		270	7
ZPD5YCH3R3A	$3.3\Omega \pm 30\%$	135°C	140	12
ZPD5YCH4R7A	$4.7\Omega \pm 30\%$		160	12
ZPD5YCH6R8A	$6.8\Omega \pm 30\%$		180	10
ZPD5YCH100A	$10\Omega \pm 30\%$		200	9

## For Thermal Protection

This series of Posi-R as a temperature indicator is small in size and little in calorific capacity. It is so useful for indicating any overheating of power transistors and thyristors in the power sources.

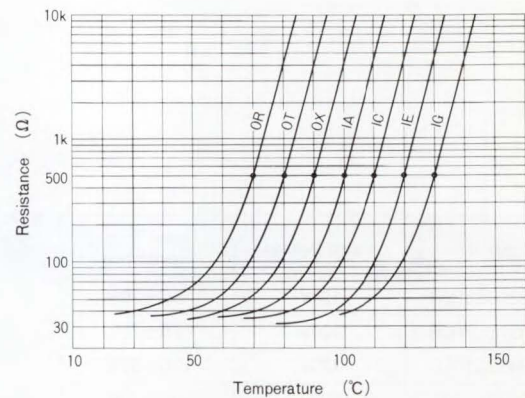
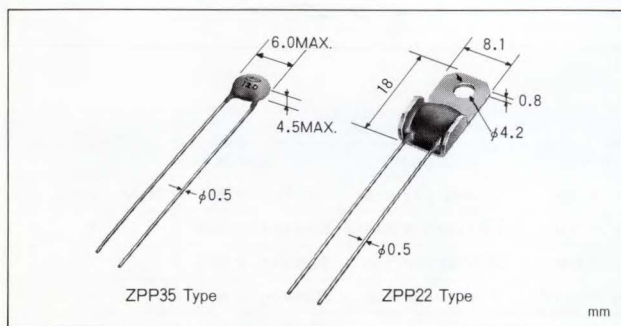


Fig. 14 Resistance vs. Temperature Characteristic

Type No.		Temperature Indication			Max. Operating Voltage	Max. Inrush Current	
ZPP35 Type	ZPP22 Type	25°C	Tr (°C)	Tr-5°C			Tr+5°C
ZPP350R500A	ZPP220R501A	100Ω or less	70	500Ω or less	500Ω or more	16VDC	100mA
ZPP350T500A	ZPP220T501A		80				
ZPP350X500A	ZPP220X501A		90				
ZPP351A500A	ZPP221A501A		100				
ZPP351C500A	ZPP221C501A		110				
ZPP351E500A	ZPP221E501A		120				
ZPP351G500A	ZPP221G501A		130				

\*The current flowed in a Posi-R shall be within the range lest it should generate heat.  
\*Resistance at trip temperature (Tr) is available up to 3kΩ, upon request.



# 5

## HYBRID I.C.s "Hi-Net"

### Contents

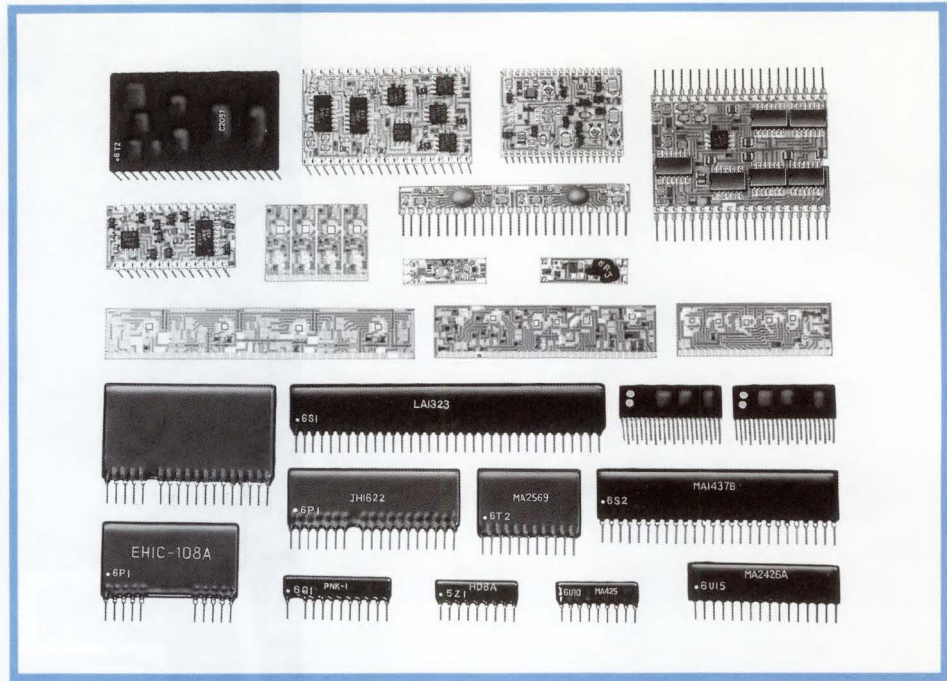
5-1. Custom-made Hybrid ICs	164
2. Diode Arrays	166
3. RD Arrays	166
4. Diode Mini-Arrays	167
5. Diode Arrays for Specific Layout	167
6. Graphic Equalizers	168
7. Power Hybrid ICs for Switching Regulators	169

# HYBRID I.C.s "Hi-Net"

NICHICON Hybrid ICs employ precious metal thick films featuring stable characteristics. Because of their high reliability, they are extensively used in various fields ranging from OA and FA associated equipment to VTR, audio appliances, automobile devices and electronic toys.

NICHICON offers you a complete line from Hybrid IC's including "Hybrid LSI" where a C.P.U. chip is directly bonded to simple C arrays and R arrays.

The low-cost and yet high-quality NICHICON Hybrid ICs are sure to help greatly in achieving smaller circuits, higher package density, higher reliability, labor saving, and improved productivity.

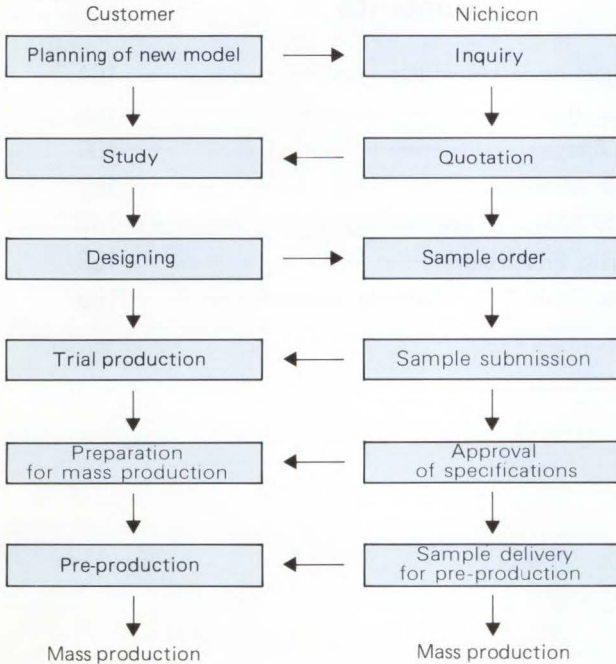


## Custom-made Hybrid ICs

NICHICON offers to design and manufacture custom-made Hybrid ICs/"Hi-Net" with a required function and shape, based on the specific circuitry from the customer.

"Hi-Net" is available of either type with miniature molded semiconductor or chip-bonded semiconductor for high density mounting, and is rich in variety on coatings.

Custom-made "Hi-Net" is to be designed and manufactured in the following stages:



Inquiring with circuit drawing, specific parts required, quantity basis, delivery schedule.

Pricing, structure, shape, dimension, etc.

Start of designing, Information on test method/regulations, function of circuit requested.

Generally 10 pcs. of samples are to be submitted.

In case samples found good, final specifications for approval are to be submitted.

Final approval on samples and specifications

Notice:  
Confidential information given by the customer will be strictly kept secret without permission in writing.

## • Advantages by Hybrid ICs

Adoption of Hybrid ICs will give:

1. Miniaturization . . . . . High mounting density of Hybrid IC helps to make the equipment smaller in size and lighter in weight, that leads to total cost reduction, yet increases value of the equipment.
2. Cost reduction . . . . . Hybrid IC makes it possible to decrease the number of printed circuit boards, or eliminate the use of them, connectors, etc, resulting in cost savings.
3. Retrenchment of trimming . . . . . Hybrid IC is highly reliable for a long period of application, by retrenching trimming process for pre-set resistors, that has to be done before Hybrid IC' has not been adopted.
4. Secrecy of circuit . . . . . Secrecy of circuit can be kept by custom-made Hybrid IC
5. Best function . . . . . Hybrid IC tested 100% by NICHICON provides reliable function and high yield ratio when assembled in the circuit as an integrated block.

## ■ Applications of Hybrid ICs "Hi-Net"

	Applications		Circuits
Consumer Equipment	Video equipment	VTR, VTR camera, CATV, 8mm VTR	Video amplifier, Signal control, Chroma, Synchronous signal, power supply circuits.
	Audio equipment	Stereo, Car stereo, Portable compo.	Graphic equalizer, Noise Canceller, Multi-plexer circuits
	Optronics	Camera	Motor control, Exposure circuits
	Automobile	Panel instrument, Turbo controller Power steering, Wiper	Signal control, Signal amplifier, Interface circuits
	Home appliance	Air conditioner, Electronic musical instrument, Cooking system	Controller, Computer control, AD/DA converter, Detector circuits
	Medical instrument	Low frequency curing instrument, Hearing aid, Various medical appliance	Oscillator, Amplifier, Filter, Interface circuits
	Micro-computer	Computer, Peripheral	Power supply, Interface, Signal control circuits
	Electronic toy	Radio-control car, TV game	Control, Motor driver, RF/IF, Power supply circuits
	Others	Watch, Telephone, Interphone	Oscillator, Frequency divider, Driver, Amplifier circuits
Industrial Equipment	Office automation	Copying machine, Word processor, Facsimile, Printer	Driver, Filter, Memory, Signal control circuits
	Computer system	Computer, Disc memory	Calculator, Memory, Power supply, Matrix, Signal control, Interface circuits
	Traffic system	Signal, Display system, Controller	Signal control, Driver, Display, Logic, Interface circuits
	Control system	N-C machine, Sequencer, Control panel	Interface, Power supply, Control, Servo, Logic circuits
	Cable telecom system	Telephone, Crossbar exchanger, Security system	Signal amplifier, Logic circuits
	Radio system	Wireless telephone, Pocket bell, Cellularphone	High frequency, Mixer, IF, Detector, Audio circuits
	Detector	Sensor, Proximity switch	Oscillator, Switching, Amplifier, Sensing amplifier circuits
	Power supply	Power supply	Power, Sensor, Amplifier, Signal control circuits
Others	Broadcasting	Various electronic circuits	

## ■ Standard Hybrid ICs "Hi-Net"

NICHICON has various standard units as shown below. Semi-custom made units are also available on request.

Series	Features	Applications
Diode array	High speed series, High voltage series	Diode matrix, Interface, Gate circuits, Surge killer circuits, Controller for OA peripheral
RD array	Compact product of resistors and diodes	Interface, Gate circuits, Controller for OA peripheral
Graphic equalizer	Stereo and monaural (4~9 channels)	Car-stereo, Tape recorder, Indicator
Audio circuit	Equalizer amplifier, Noise canceller	Car stereo, Tape recorder
Switching power supply	Single/multiple power supply	Power supply for automotive appliance, controller, radio apparatus
Automotive CD power supply	Ultra-miniature power supply	Automotive CD, On-board power supply for OA equipment

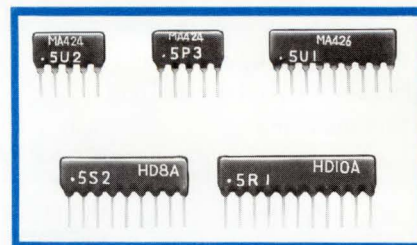
# HYBRID I.C.s "Hi-Net"

## Diode Arrays

High-speed switching diode arrays and high voltage-withstand diode arrays are of NICHICON's standard series. They are combined to be conveniently used for both binary and decimal systems. High-speed series is ideal for computer peripherals, control boards and general electronic appliances. Besides, high voltage-withstand series is ideal for plasma displays, relay surge-preventive circuits.

Both of these series are in stock for prompt delivery. Any special requirements with customer's particular circuits will be also welcome. Please consult us for the details.

(Samples for the items listed below are not always available on stock, please contact our sales office for details together with your specific requirements.)



### High-speed switching diode array series

#### Absolute maximum ratings ※

Items	Symbol	Ratings
Peak reverse voltage	$V_{RM}$	40V
DC reverse voltage	$V_R$	40V
Surge current(1 $\mu$ s)	$I_{FSM}$	4.0A
Peak forward current	$I_{FM}$	300mA
Average rectified current	$I_O$	150mA※
Storage temperature	$T_{stg}$	-25~+85°C

※ 100mA for simultaneous energizing.

※ Maximum Current value applicable to each diode.

#### Electrical characteristics

$T_a$  : +25°C

Items	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Reverse current	$I_R$	$V_R=40V$	—	—	0.5	$\mu A$
Forward voltage	$V_{F1}$	$I_F=10mA$	—	0.7	1.0	V
Forward voltage	$V_{F2}$	$I_F=50mA$	—	0.79	1.0	V
Forward voltage	$V_{F3}$	$I_F=100mA$	—	0.85	1.2	V
Reverse recovery time	$t_{rr}$	$I_F=10mA, V_R=6V$	—	—	4.0	nS

#### Series List

Code	Type	Number of diodes	Common electrode	Dimensions (%Max.)			No. of Pins n	Circuit diagram
				W	H	T		
ZHMA0423	MA423	4	Cathode	14	9	3.5	5	
ZHMA0424	MA424		Anode					
ZHMA0425	MA425	8	Cathode	24	9	3.5	9	
ZHMA0426	MA426		Anode					
ZHMA0427	MA427	10	Cathode	29	9	3.5	11	
ZHMA0428	MA428		Anode					
ZHMA0429	MA429	5	Isolated	27	9	3.5	10	
ZHMA0430	MA430	4	Isolated	21.5	9	3.5	8	
ZHMA0431	MA431	6	Cathode	19	9	3.5	7	
ZHMA0432	MA432		Anode					

### High voltage-withstand series

#### Absolute maximum ratings ※

Items	Symbol	Ratings
Peak reverse voltage	$V_{RM}$	220V
Reverse DC voltage	$V_R$	200V
Surge current (1 sec.)	$I_S$	1A
Peak forward current	$I_{FM}$	600mA
Average rectified current	$I_O$	200mA
Storage temperature	$T_{stg}$	-25~+85°C

※ Maximum Current value applicable to each diode.

#### Electrical characteristics

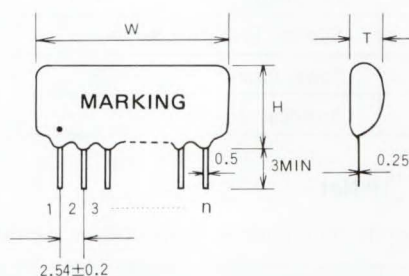
$T_a$  : +25°C

Items	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Reverse current	$I_R$	$V_R=110V$	—	—	1.0	$\mu A$
Forward voltage	$V_F$	$I_F=50mA$	—	—	1.3	V
Reverse voltage	$V_R$	$I_R=100\mu A$	220	—	—	V
Time required for recovery from reverse voltage or current	$t_{rr}$	$I_F=I_R=30mA$ $R_L=100\Omega$	—	—	100	nS

#### Series List

Code	Type	Number of diodes	Common electrode	Dimensions (%Max.)			No. of Pins n	Circuit diagram
				W	H	T		
ZHLA0650	HD-4K	4	Cathode	14	9	3	5	
ZHLA0651	HD-4A		Anode					
ZHLA0652	HD-8K	8	Cathode	24	9	3	9	
ZHLA0653	HD-8A		Anode					
ZHLA0654	HD-10K	10	Cathode	29	9	3	11	
ZHLA0655	HD-10A		Anode					
ZHLA0656	HD-4S	4	Isolated	21.5	9	3	8	
ZHLA0657	HD-5S	5	Isolated	27	9	3	10	

#### Drawing



- Epoxy-resin coating
- Iron lead frame, tin-plated over copper

## RD Arrays

#### Series List

Code	Type	Common electrode	No. of elements		Specifications			Dimensions (%Max.)			No. of pins n	Circuit diagram
			Resistor	Diode	Resistance	Tol.	Loss (R)	W	H	T		
ZHMA2401	MA2401	Anode	8	8	330 $\Omega$	$\pm 5\%$	60mW	24.5	7	4	9	
ZHMA2402	MA2402	Anode	8	8	1 k $\Omega$	$\pm 5\%$	60mW	24.5	7	4	9	

## Diode Mini-Arrays

- Height.....5mm Max.

The mounting height of electronic device can be made substantially low-profile and compact.

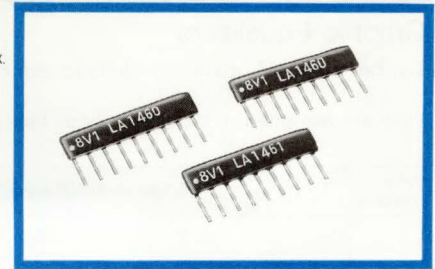
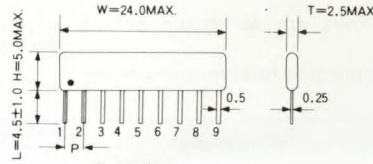
- Thickness.....2.5mm Max.

Diode arrays can be placed in a row with 2.54mm pitch, and high density mounting is available at a rate of one diode per 0.1 sq. inch.

- Electrical characteristics

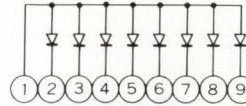
Items	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Reverse current	$I_R$	$V_R=35V$	—	—	0.5	$\mu A$
Forward voltage	$V_{F1}$	$I_F=10mA$	—	0.75	1.0	V
Forward voltage	$V_{F2}$	$I_F=50mA$	—	0.90	1.1	V
Forward voltage	$V_{F3}$	$I_F=100mA$	—	0.95	1.2	V
Reverse recovery time	$t_{rr}$	$I_F=10mA$ $V_R=6V$	—	—	4.0	ns

### ● Drawing

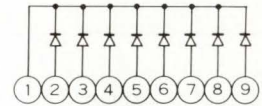


### ● Circuit diagram

ZHLA1460



ZHLA1461



Any particular specifications are also available upon request.

- Electrical characteristics

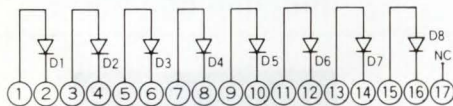
Items	Symbol	Conditions	Ratings			Unit
			Min.	Typ.	Max.	
Reverse current	$I_R$	$V_R=40V$	—	—	0.5	$\mu A$
Forward voltage	$V_{F1}$	$I_F=10mA$	—	0.7	1.0	V
Forward voltage	$V_{F2}$	$I_F=50mA$	—	0.79	1.0	V
Forward voltage	$V_{F3}$	$I_F=100mA$	—	0.85	1.2	V
Reverse recovery time	$t_{rr}$	$I_F=10mA$ $V_R=6V$	—	—	4.0	nS

## Diode Arrays for Specific Layout

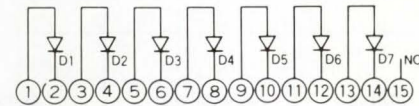
- Absolute maximum ratings

Items	Symbol	Ratings
Peak reverse voltage	$V_{RM}$	40V
DC reverse voltage	$V_R$	40V
Surge current (1 $\mu$ s)	$I_{FSM}$	4.0A
Peak forward current	$I_{FM}$	300mA
Average rectified current	$I_o$	100mA
Storage temperature	$T_{stg}$	-25~+85°C

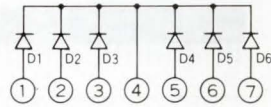
ZHMA2906 23.5<sup>W</sup>×16<sup>H</sup>×6<sup>T</sup>(mm) (Fig. B)



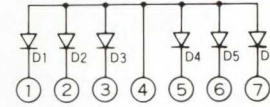
ZHMA2907 21<sup>W</sup>×16<sup>H</sup>×6<sup>T</sup>(mm) (Fig. B)



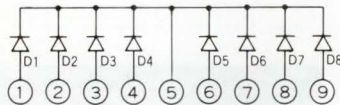
ZHMA2901 19<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



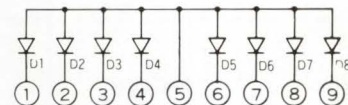
ZHMA2902 19<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



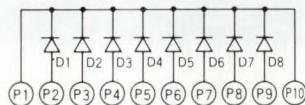
ZHMA2911 24<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



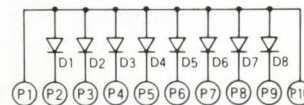
ZHMA2912 24<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



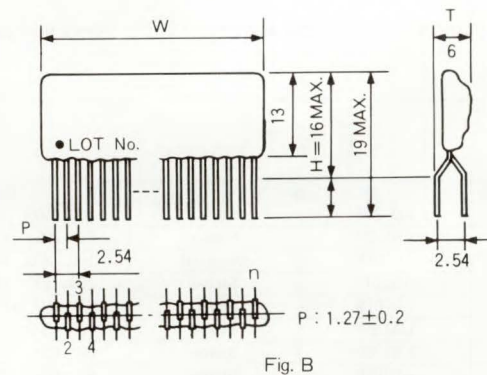
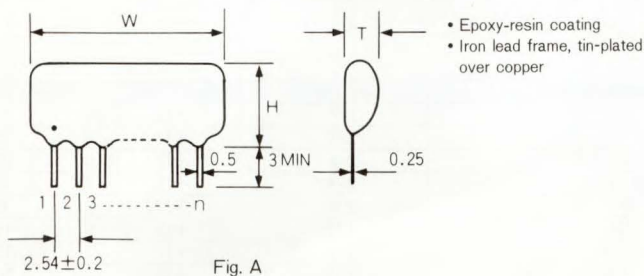
ZHMA2913 26.5<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



ZHMA2914 26.5<sup>W</sup>×9<sup>H</sup>×3.5<sup>T</sup>(mm) (Fig. A)



- Drawing












Cautions : Full care to be taken when solder flow applied to those miniature products.

# HYBRID I.C.s "Hi-Net"

## Graphic Equalizers

Typical standard items of graphic equalizers are as shown below. (Samples for the items listed below are not always available on stock, please contact our sales office for details together with your specific requirements.)

They are designed in blocks so as to be applicable to common circuits.

No. of elements	Type	Type numbering system	Dimensions (mm)	Appearance
4	AD1203	ZHLA0243	68W×16H×4T	
5	AD1020	ZHMA1728	68W×16H×5T	
	AD1011	ZHLA0224	37W×16H×4T	
	AD1201	ZHLA0241	68W×16H×4T	
	AD1015	ZHMA1663	68W×16H×5T	
	LA1351	ZHLA1351	68W×9.5H×6T	
	LA1360	ZHLA1360	68W×9.5H×6T	
7	AD1018	ZHLA0244	90W×16H×4T	
	AD1010	ZHMA1551	90W×17.5H×9T	
9	AD1009	ZHLA0212B	57W×16H×4T	

### • Features

No. of elements	Type	Center frequency (Hz)	Gain (dB)	Applied Voltage(V)	Circuit current (mA)
4	AD1203	Stereo 100, 500, 2k, 10k	±7	+12	30
5	AD1020	Stereo 60, 250, 1k, 3.5k, 10k	±10	+12	35
	AD1011	Monaural 100, 330, 1k, 3.3k, 10k	±9	+12	20
	AD1201	Stereo 100, 330, 1k, 3.3k, 10k	±9	+12	35
	AD1015	Stereo 63, 250, 1k, 4k, 16k	±8	+12	35
	LA1351	Stereo 100, 300, 1k, 3k, 12k	±12	+12	15
	LA1360	Stereo 60, 250, 1k, 3.5k, 10k	±12	+12	15
7	AD1018	Stereo 60, 150, 400, 1k, 2.4k, 6k, 15k	±12	+12	50
	AD1010	Stereo 60, 140, 250, 500, 1k, 3.5k, 9.1k	±12	+12	50
9	AD1009	Monaural 60, 125, 250, 500, 1k, 2k, 4k, 8k, 16k	±12	+12	30

## Power Hybrid ICs for Switching Regulators

NICHICON's total engineering technology of thick film and assembling has successfully achieved in development of power hybrid ICs, which have a few watt power loss level. Hereunder are shown for standard switching regulators of DC-DC down converter type. (Samples for the items listed below are not always available on stock, please contact our sales office for details together with your specific requirements.)

### SRP Series

This compact module, packed in an aluminum die-casting case and sealed tightly with resin, is assembled with miniature thick film Hybrid IC and other components like electrolytic capacitors, choke coils and etc.

This is ideally suited for control circuits of switching regulators in battery apparatus, automobile appliances, and navigation devices, as it has vibration and salt resistance property.

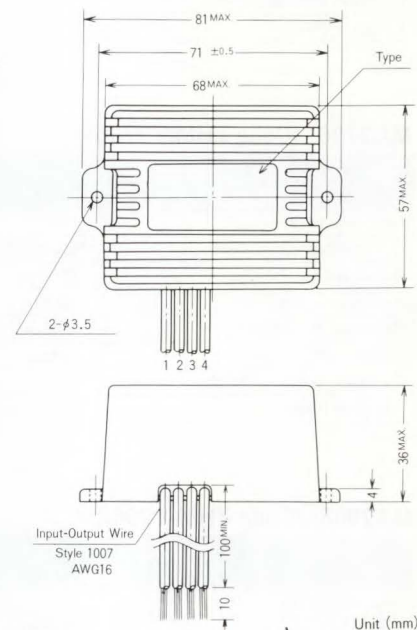


#### Electrical characteristics

Ta : +25°C

Items	Type	SRP2405	SRP2409	SRP2412	SRP2412B	SRP2415
	Code	ZHSP2405	ZHSP2409	ZHSP2412	ZHSP2412B	ZHSP2415
Input voltage (V)		19.2~31.2(24Typ.)				
Output current (A)		0.25~2.0 (3A for intermittent use)				
Oscillation frequency (kHz)		50				
Output voltage (V)		5	9	12	13.8	15
Regulation to line (mV)		30	100	150	150	180
Regulation to load (mV)		20	30	30	30	40
Output ripple (mVp-p)		50	60	60	60	80
Limited output current (A)		3.6	3.6	3.6	3.6	3.6
Efficiency (%)		70	75	81	83	84

#### Dimensions



### SRC Series

This compact module consists of thick film Hybrid IC and power electric parts mounted on an aluminum base, and has less heat resistance so as to be suitable for control circuits of switching regulators.

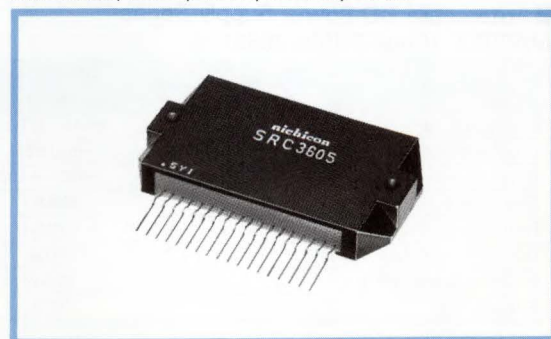
This is ideal for on-board power supplies of control panels and various kind of power supplies.

#### Composite Power Supply (1 output)

Ta : +25°C

Items	Type	SRC3605	SRC3609	SRC3612	SRC3612B	SRC3615
	Code	ZHSC3605	ZHSC3609	ZHSC3612	ZHSC3612B	ZHSC3615
Input voltage (V)		50Max(36Typ.)				
Output current (A)		3.0Max.				
Oscillation frequency (kHz)		50				
Output voltage (V)		5	9	12	13.8	15
Regulation to line (mV)		100	200	250	300	300
Regulation to load (mV)		30	30	30	40	40
Output ripple (mVp-p)		20	30	40	50	50
Limited output current (A)		3.6	3.6	3.5	3.6	3.6
Efficiency (%)		65	75	80	82	83

#### SRC3605, 3609, 3612, 3612B, 3615

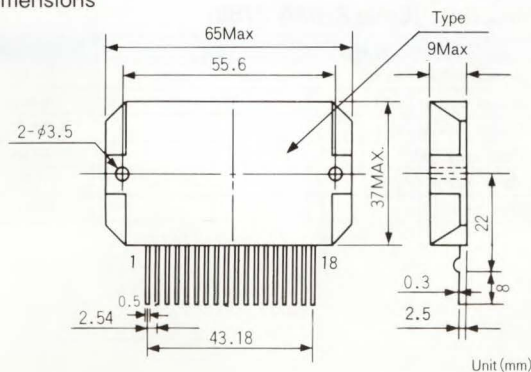


#### Composite Power Supply (2 outputs)

Ta : +25°C

Item	Type	SRC 0110 (Code ZHSC0110)	
	Ratings	Output 1	Output 2
Input voltage (V)		5 50Max.(35Typ.)	
Output voltage (V)		5.0±0.1	24.0±0.3
Output current AV (A)		3	3
Output current PK (A)		3.6	6
Regulation to line (mV)		150Max.	300Max
Regulation to load (mV)		180Max.	250Max
Oscillation frequency (kHz)		35Typ.	
Efficiency (%)		80Typ.	

#### Dimensions

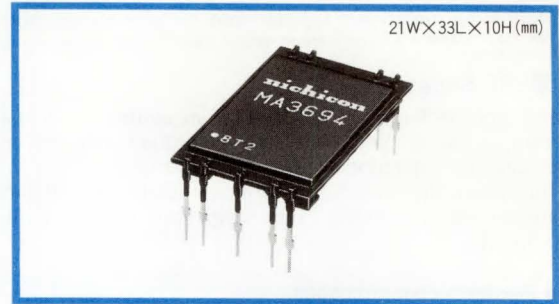


# HYBRID I.C.s "Hi-Net"

## ■ On-board Power Supply Series

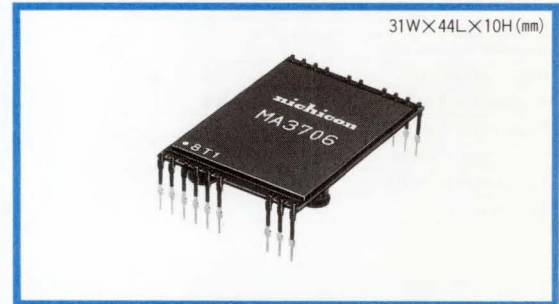
### MA3694 (Code ZHMA 3694)

Items	Specifications	
	Output	
Input voltage (V)	20~30 (24Typ.)	
Output voltage (V)	5.0±0.25	
Output current (mA)	10~200	
Regulation to line (mV)	25Max.	
Regulation to load (mV)	50Max.	
Output ripple (mVpp)	100Max.	
Oscillation frequency (kHz)	50Typ.	
Efficiency (%)	65Typ.	



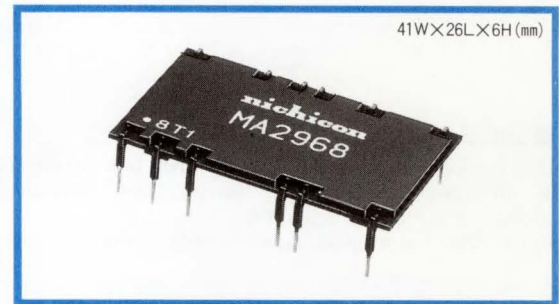
### MA3706 (Code ZHMA 3706)

Items	Specifications	
	Output 1	Output 2
Input voltage (V)	8~16 (13.5Typ.)	
Output voltage (V)	15.0±0.2	-15.0±0.2
Output current (mA)	80~150	-50~-100
Regulation to line (mV)	50Max.	50Max.
Regulation to load (mV)	30Max.	30Max.
Output ripple (mVpp)	50Max.	50Max.
Oscillation frequency (kHz)	150Typ.	
Efficiency (%)	72Typ.	



### MA2968 (Code ZHMA 2968)

Items	Specifications	
	Output 1	Output 2
Input voltage (V)	10.2~13.8 (12Typ.)	
Output voltage (V)	-5.0±0.1	12.0±0.24
Output current (mA)	-35~-65	90~200
Regulation to line (mV)	50Max.	50Max.
Regulation to load (mV)	10Max.	10Max.
Output ripple (mVpp)	50Max.	50Max.
Oscillation frequency (kHz)	150Typ.	
Efficiency (%)	78Typ.	



## ■ Automobile CD Power Supply Series

### MA2033 (Code ZHMA 2033)

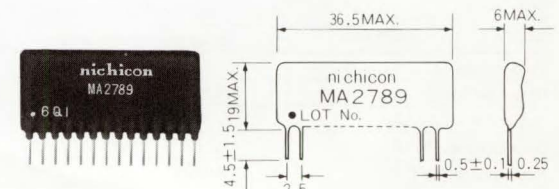
Items	Specifications	
	Output	
Input voltage (V)	8~16 (12Typ.)	
Output voltage (V)	-8.0±0.2	
Output current AV (A)	-100~-200	
Regulation to line (mV)	300Max.	
Regulation to load (mV)	100Max.	
Output ripple (mVpp)	20Typ.	
Oscillation frequency (kHz)	200Typ.	
Efficiency (%)	58Typ.	



## ■ Power Supply Control Circuit Series

### MA2789 (Code ZHMA 2789)

Items	Specifications
Source voltage (V)	7~40
Output current (mA)	200Max.
Output voltage (V)	5.0±0.1
Frequency (kHz)	50Typ.
Base voltage (V)	5.0Typ.
Bias current (mA)	10Typ.









## MILLIMETER TO INCH CONVERSION TABLE

mm	inch	mm	inch	mm	inch	mm	inch
1	.039	18	.709	37	1.457	61	2.402
1.5	.059	19	.748	38	1.496	62	2.441
2	.079	20	.787	39	1.535	63	2.480
2.5	.098	21	.827	40	1.575	64	2.520
3	.118	22	.866	41	1.614	65	2.559
3.5	.138	23	.906	41.5	1.634	66	2.598
4	.157	24	.945	42	1.654	67	2.638
5	.197	25	.984	43	1.693	68	2.677
5.3	.209	25.4	1.000	44	1.732	69	2.717
6	.236	26	1.024	45	1.772	70	2.756
6.3	.248	27	1.063	46	1.811	71	2.795
7	.275	28	1.102	47	1.850	72	2.835
8	.314	28.6	1.126	48	1.890	73	2.874
9	.354	29	1.142	49	1.929	74	2.913
10	.394	30	1.181	50	1.969	75	2.953
11	.433	30.5	1.201	51	2.008	76	2.992
11.5	.453	31	1.220	52	2.047	76.2	3.000
12	.472	31.5	1.240	53	2.087	80	3.150
12.5	.492	31.8	1.252	54	2.126	90	3.543
12.7	.500	32	1.260	55	2.165	100	3.937
13	.512	33	1.299	56	2.205	120	4.724
14	.551	34	1.339	57	2.244	140	5.512
15	.591	34.5	1.358	58	2.283	160	6.299
16	.629	36	1.417	59	2.323		
17	.669	36.5	1.437	60	2.362		

NOTE : To convert other millimeter values to inches multiply by 0.03937

## CENTIGRADE TO FAHRENHEIT CONVERSION TABLE

$$C^{\circ} = (F^{\circ} - 32) \times \frac{5}{9}$$

$$F^{\circ} = (C^{\circ} \times 1.8) + 32$$

°C	-55	-40	-30	-25	-20	-17.8	0	20	25	40	45	60	70	85	105	125	260
°F	-67	-40	-22	-13	-4	0	32	68	77	104	113	140	158	185	221	257	500

**nichicon**

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