PHILIPS

Power MOS transistors

S9

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PHILIPS

Data handbook

Electronic components and materials

Semiconductors

Part 9 January 1984

Power MOS transistors

SEMICONDUCTORS

PART 9 - JANUARY 1984

POWER MOS TRANSISTORS

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DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, sub-assemblies and materials; it is made up of four series of handbooks each comprising several parts.

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks is comprised of the following parts:

T1 **Tubes for r.f. heating**

T2a **Transmitting tubes for communications, glass types**

T2b **Transmitting tubes for communications, ceramic types**

T3 **Klystrons, travelling-wave tubes, microwave diodes**

ET3 **Special Quality tubes, miscellaneous devices** (will not be reprinted)

T4 **Magnetrons**

T5 **Cathode-ray tubes**
Instrument tubes, monitor and display tubes, C.R. tubes for special applications

T6 **Geiger-Müller tubes**

T7 **Gas-filled tubes**
Segment indicator tubes, indicator tubes, dry reed contact units, thyratrons, industrial rectifying tubes, ignitrons, high-voltage rectifying tubes, associated accessories

T8 **Picture tubes and components**
Colour TV picture tubes, black and white TV picture tubes, colour monitor tubes for data graphic display, monochrome monitor tubes for data graphic display, components for colour television, components for black and white television and monochrome data graphic display

T9 **Photo and electron multipliers**
Photomultiplier tubes, phototubes, single channel electron multipliers, channel electron multiplier plates

T10 **Camera tubes and accessories, image intensifiers**

T11 **Microwave semiconductors and components**

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks is comprised of the following parts:

S1 Diodes
Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes(< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2 Power diodes, thyristors, triacs
Rectifier diodes, voltage regulator diodes (> 1,5 W), rectifier stacks, thyristors, triacs

S3 Small-signal transistors

S4a Low-frequency power transistors and hybrid modules

S4b High-voltage and switching power transistors

S5 Field-effect transistors

S6 R.F. power transistors and modules

S7 Microminiature semiconductors for hybrid circuits

S8 Devices for optoelectronics
Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices.

S9 Power MOS transistors

S10 Wideband transistors and wideband hybrid IC modules

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks is comprised of the following parts:

IC1 **Bipolar ICs for radio and audio equipment**

IC2 **Bipolar ICs for video equipment**

IC3 **ICs for digital systems in radio, audio and video equipment**

IC4 **Digital integrated circuits**
CMOS HE4000B family

IC5 **Digital integrated circuits — ECL**
ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs

IC6 **Professional analogue integrated circuits**

IC7 **Signetics bipolar memories**

IC8 **Signetics analogue circuits**

IC9 **Signetics TTL logic**

IC10 **Signetics Integrated Fuse Logic (IFL)**

IC11 **Microprocessors, microcomputers and peripheral circuitry**

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks is comprised of the following parts:

C1 **Assemblies for industrial use**
PLC modules, PC20 modules, HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices, hybrid ICs

C2 **Television tuners, video modulators, surface acoustic wave filters**

C3 **Loudspeakers**

C4 **Ferroxcube potcores, square cores and cross cores**

C5 **Ferroxcube for power, audio/video and accelerators**

C6 **Electric motors and accessories**
Permanent magnet synchronous motors, stepping motors, direct current motors

C7 **Variable capacitors**

C8 **Variable mains transformers**

C9 **Piezoelectric quartz devices**
Quartz crystal units, temperature compensated crystal oscillators, compact integrated oscillators, quartz crystal cuts for temperature measurements

C10 **Connectors**

C11 **Non-linear resistors**
Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)

C12 **Variable resistors and test switches**

C13 **Fixed resistors**

C14 **Electrolytic and solid capacitors**

C15 **Film capacitors, ceramic capacitors**

C16 **Piezoelectric ceramics, permanent magnet materials**

INDEX OF TYPE NUMBERS

Data Handbooks S1 to S10

The inclusion of a type number in this publication does not necessarily imply its availability.

FET = Field-effect transistors
GD = Germanium diodes
Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sm = Small-signal transistors
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BDT20	S4a	P
BD332	S4a	P	BD828	S4a	P	BDT21	S4a	P
BD333	S4a	P	BD829	S4a	P	BDT29	S4a	P
BD334	S4a	P	BD830	S4a	P	BDT29A	S4a	P
BD335	S4a	P	BD839	S4a	P	BDT29B	S4a	P
BD336	S4a	P	BD840	S4a	P	BDT29C	S4a	P
BD337	S4a	P	BD841	S4a	P	BDT30	S4a	P
BD338	S4a	P	BD842	S4a	P	BDT30A	S4a	P
BD433	S4a	P	BD843	S4a	P	BDT30B	S4a	P
BD434	S4a	P	BD844	S4a	P	BDT30C	S4a	P
BD435	S4a	P	BD845	S4a	P	BDT31	S4a	P
BD436	S4a	P	BD846	S4a	P	BDT31A	S4a	P
BD437	S4a	P	BD847	S4a	P	BDT31B	S4a	P
BD438	S4a	P	BD848	S4a	P	BDT31C	S4a	P
BD645	S4a	P	BD849	S4a	P	BDT32	S4a	P
BD646	S4a	P	BD850	S4a	P	BDT32A	S4a	P
BD647	S4a	P	BD933	S4a	P	BDT32B	S4a	P
BD648	S4a	P	BD934	S4a	P	BDT32C	S4a	P
BD649	S4a	P	BD935	S4a	P	BDT41	S4a	P
BD650	S4a	P	BD936	S4a	P	BDT41A	S4a	P
BD651	S4a	P	BD937	S4a	P	BDT41B	S4a	P
BD652	S4a	P	BD938	S4a	P	BDT41C	S4a	P
BD675	S4a	P	BD939	S4a	P	BDT42	S4a	P

P = Low-frequency power transistors

P = Low-frequency power transistors
Sm = Small-signal transistors

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
Sm = Small-signal transistors
WBT = Wideband hybrid IC transistors

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor Modules
WBM = Wideband hybrid IC modules
WBT = Wideband hybrid IC transistors

Mm = Microminiature semiconductors for hybrid circuits
PDT = Photodiodes or transistors
RFP = R.F. power transistors and modules
Sm = Small-signal transistors
Th = Thyristors

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
PM = Power MOS transistors
Sm = Small-signal transistors
SP = Low-frequency switching power transistors
Th = Thyristors
Tri = Triacs

type no.	book	section	type no.	book	section	type no.	book	section
BUZ50B	S9	PM	BY478	S1	R	BYX25*	S2	R
BUZ53A	S9	PM	BY505	S1	R	BYX30*	S2	R
BUZ54	S9	PM	BY509	S1	R	BYX32*	S2	R
BUZ54A	S9	PM	BY527	S1	R	BYX38*	S2	R
BUZ60	S9	PM	BY584	S1	R	BYX39*	S2	R
BUZ60B	S9	PM	BY609	S1	R	BYX42*	S2	R
BUZ63	S9	PM	BY610	S1	R	BYX45*	S2	R
BUZ63B	S9	PM	BYV20	S2	R	BYX46*	S2	R
BUZ64	S9	PM	BYV21*	S2	R	BYX49*	S2	R
BUZ71	S9	PM	BYV22	S2	R	BYX50*	S2	R
BUZ71A	S9	PM	BYV23	S2	R	BYX52*	S2	R
BUZ72	S9	PM	BYV24	S2	R	BYX56*	S2	R
BUZ72A	S9	PM	BYV27	S1	R	BYX71*	S2	R
BUZ73A	S9	PM	BYV28	S1	R	BYX90	S1	R
BUZ74	S9	PM	BYV30*	S2	R	BYX91*	S1	R
BUZ74A	S9	PM	BYV32*	S2	R	BYX94	S1	R
BUZ76	S9	PM	BYV92*	S2	R	BYX96*	S2	R
BUZ76A	S9	PM	BYV95A	S1	R	BYX97*	S2	R
BUZ80	S9	PM	BYV95B	S1	R	BYX98*	S2	R
BUZ80A	S9	PM	BYV95C	S1	R	BYX99*	S2	R
BUZ83	S9	PM	BYV96D	S1	R	BZT03	S1	Vrg
BUZ83A	S9	PM	BYV96E	S1	R	BZV10	S1	Vrf
BUZ84	S9	PM	BYW19*	S2	R	BZV11	S1	Vrf
BUZ84A	S9	PM	BYW25	S2	R	BZV12	S1	Vrf
BY184	S1	R	BYW29*	S2	R	BZV13	S1	Vrf
BY188G	S1	R	BYW30*	S2	R	BZV14	S1	Vrf
BY223	S2	R	BYW31*	S2	R	BZV15*	S2	Vrf
BY224*	S2	R	BYW54	S1	R	BZV37	S1	Vrf
BY225*	S2	R	BYW55	S1	R	BZV46	S1	Vrg
BY228	S1	R	BYW56	S1	R	BZV49*	S1/S7	Vrg
BY229*	S2	R	BYW92*	S2	R	BZV85	S1	Vrg
BY249	S2	R	BYW93*	S2	R	BZW70*	S2	TS
BY260*	S2	R	BYW94*	S2	R	BZW86*	S2	TS
BY261*	S2	R	BYW95A	S1	R	BZW91*	S2	TS
BY277*	S2	R	BYW95B	S1	R	BZX55	S1	Vrg
BY438	S1	R	BYW95C	S1	R	BZX70*	S2	Vrg
BY448	S1	R	BYW96D	S1	R	BZX75	S1	Vrg
BY458	S1	R	BYW96E	S1	R	BZX79*	S1	Vrg
BY476	S1	R	BYX10	S1	R	BZX84*	S7/S1	Mm/Vrg
BY477	S1	R	BYX22*	S2	R	BZX87*	S1	Vrg

* = series
Mm = Microminiature semiconductors for hybrid circuits
PM = Power MOS transistors
R = Rectifier diodes
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes

* = series
D = Displays
GD = Germanium diodes
LED = Light emitting diodes
P = Low-frequency power transistors
Ph = Photoconductive devices
PhC = Photocouplers
St = Rectifier stacks
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes
WBM = Wideband hybrid IC modules

FET = Field-effect transistors
I = Infrared devices
LED = Light emitting diodes
P = Low-frequency power transistors
Ph = Photoconductive devices
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
St = Rectifier stacks
Vrf = Voltage reference diodes
WBT = Wideband hybrid IC transistors

A = Accessories
DH = Diecast heatsinks
FET = Field-effect transistors
HE = Heatsink extrusions
I = Infrared devices
Ph = Photoconductive devices
RFP = R.F. power transistors and modules
Sm = Small-signal transistors

SELECTION GUIDE

SELECTION GUIDE

V_{DS} max. V	case	I_D max. A	P_{tot} max. W	$R_{DS\ ON}$ < Ω	V_F typ. V	g_{fs} typ. A/V	t_f typ. ns	C_{rs} typ. pF	type number
50	TO-220	12	75	0,1	1,4	4,8	60	120	BUZ10
		12	75	0,12	1,4	4,8	60	120	BUZ10A
		30	75	0,04	1,7	8,0	450	360	BUZ11
		25	75	0,06	1,6	8,0	450	360	BUZ11A
		12	40	0,1	1,6	4,8	150	160	BUZ71
		12	40	0,12	1,6	4,8	–	160	BUZ71A
50	TO-3	39	125	0,04	1,7	12,0	200	500	BUZ14
		45	125	0,03	1,8	12,0	200	500	BUZ15
100	TO-220	12	75	0,2	1,4	4,0	60	80	BUZ20
		18	75	0,1	1,6	3,5	60	200	BUZ21
		10	40	0,2	1,55	3,8	150	80	BUZ72
		9	40	0,25	1,55	3,8	150	80	BUZ72A
100	TO-3	10	78	0,2	1,3	4,0	60	80	BUZ23
		32	125	0,06	1,5	10,0	200	500	BUZ24
		19	78	0,1	1,5	8,0	450	360	BUZ25
200	TO-220	7	75	0,75	1,15	3,5	60	100	BUZ30
		12,5	75	0,2	1,4	5,0	60	140	BUZ31
		9,5	75	0,4	1,3	3,5	60	100	BUZ32
		5,8	40	0,6	1,4	3,5	130	60	BUZ73A
200	TO-3	7,2	78	0,75	1,15	3,5	60	100	BUZ33
		17	125	0,2	1,15	7,5	200	500	BUZ34
		9,9	78	0,4	1,3	3,5	60	100	BUZ35
		22	125	0,12	1,2	7,5	200	500	BUZ36
400	TO-220	5,5	75	1,0	1,15	2,5	100	30	BUZ60
		4,5	75	1,5	1,15	2,5	100	30	BUZ60B
		3,0	40	1,8	1,1	2,5	100	25	BUZ76
		2,6	40	2,5	1,1	2,5	100	25	BUZ76A
400	TO-3	5,9	78	1,0	1,2	2,5	100	30	BUZ63
		4,5	78	1,5	1,15	2,5	100	30	BUZ63B
		10,5	125	0,4	1,3	4,5	100	100	BUZ64
450	TO-3	10	125	0,5	1,3	4,0	100	100	BUZ45C

V_{DS} max. V	case	I_D max. A	P_{tot} max. W	$R_{DS\ ON}$ < Ω	V_F typ. V	g_{fs} typ. A/V	t_f typ. ns	C_{rs} typ. pF	type number
500	TO-220	2,5	75	4,5	1,0	2,5	100	30	BUZ40
		4,5	75	1,5	1,1	2,5	100	30	BUZ41A
		4,0	75	2,0	1,1	2,5	100	30	BUZ42
		2,4	40	3,0	1,0	2,5	100	20	BUZ74
		2,0	40	3,0	1,0	2,5	100	20	BUZ74A
500	TO-3	2,8	78	4,5	1,05	2,5	100	30	BUZ43
		4,8	78	1,5	1,15	2,5	100	30	BUZ44A
		9,6	125	0,6	1,3	4,0	100	100	BUZ45
		8,3	125	0,8	1,3	4,0	100	100	BUZ45A
		10	125	0,5	1,3	4,0	100	100	BUZ45B
		4,2	78	2,0	1,1	2,5	100	30	BUZ46
800	TO-220	2,6	75	4,0	1,05	1,8	100	30	BUZ80
		3,0	75	3,0	1,05	1,8	100	30	BUZ80A
800	TO-3	2,9	78	4,0	1,05	1,8	100	30	BUZ83
		3,4	78	3,0	1,1	1,8	100	30	BUZ83A
		5,3	125	2,0	1,0	3,0	100	100	BUZ84
		6,0	125	1,5	1,1	3,0	100	100	BUZ84A
1000	TO-220	2,5	75	5,0	1,05	1,5	100	30	BUZ50A
		2,0	75	8,0	1,05	1,5	100	30	BUZ50B
1000	TO-3	2,6	78	5,0	1,05	1,5	100	30	BUZ53A
		5,3	125	2,0	1,15	2,0	100	100	BUZ54
		4,6	125	2,6	1,15	2,0	100	100	BUZ54A

SELECTION GUIDE

CLIP MOUNTING

envelope	direct mounting		insulated mounting			
	clip		mica	alumina	clip	
TO-220 (SOT-78)	56363		56369 or	56367	56364	

SCREW MOUNTING

envelope	direct mounting		insulated mounting			
	metal washer	mounting material	mica washer	insul. bush	metal washer	mounting material
TO-220 (SOT-78)	56360a	M3				
up to 800 V			56359b	56359c	56360a	M3
up to 1000 V			56359b	56359d	56360a	M3
TO-3 (SOT-3)	–	M4				
up to 500 V			56201d	56201j or 56261a		M3
up to 2000 V			56339	56352		M3

The accessories mentioned can be supplied on request.

See also chapter Mounting Instructions.

GENERAL

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices – as opposed to integrated circuits –, multiples of such devices and semiconductor chips.

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
B. SILICON or other material with band gap of 1,0 to 1,3 eV.
C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

A. DIODE; signal, low power
B. DIODE; variable capacitance
C. TRANSISTOR; low power, audio frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
N. PHOTO-COUPLER
P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15\ ^{o}C/W$)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leqslant 15\ ^{o}C/W$)
X. DIODE: multiplier, e.g. varactor, step recovery
Y. DIODE; rectifying, booster
Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.*
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.*
This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*
   The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage
   A. 1% (according to IEC 63: series E96)
   B. 2% (according to IEC 63: series E48)
   C. 5% (according to IEC 63: series E24)
   D. 10% (according to IEC 63: series E12)
   E. 20% (according to IEC 63: series E6)
   The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.
   The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*
   The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*
   The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER,* preceded by a hyphen (–)
   The NUMBER indicates the depletion layer in μm. The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER,* preceded by a stroke (/).
   The NUMBER indicates how many basic devices are assembled into the array.

* When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

TRANSISTOR RATINGS

The ratings are presented as voltage, current, power and temperature ratings. The list of these ratings and their definitions is given as follows:

Transistor voltage ratings

Collector to base voltage ratings

V_{CBmax} — The maximum permissible instantaneous voltage between collector and base terminals. The collector voltage is negative with respect to base in PNP transistors and positive with respect to base in NPN types.

V_{CBmax} ($I_E = 0$) — The maximum permissible instantaneous voltage between collector and base terminals, when the emitter terminal is open circuited.

Emitter to base voltage ratings

V_{EBmax} — The maximum permissible instantaneous reverse voltage between emitter and base terminal. The emitter voltage is negative with respect to base for PNP transistor and positive with respect to base for NPN types.

V_{EBmax} ($I_C = 0$) — The maximum permissible instantaneous reverse voltage between emitter and base terminals when the collector terminal is open circuited.

Collector to emitter voltage ratings

V_{CEmax} — The maximum permissible instantaneous voltage between collector and emitter terminals. The collector voltage is negative with respect to emitter in PNP transistors and positive with respect to emitter in NPN types. This rating is very dependent on circuit conditions and collector current and it is necessary to refer to the curve of V_{CE} versus I_C for the appropriate circuit condition in order to obtain the correct rating.

V_{CEmax} (Cut-off) — The maximum permissible instantaneous voltage between collector and emitter terminals when the emitter current is reduced to zero by means of a reverse emitter base voltage, i.e. the base voltage is normally positive with respect to emitter for PNP transistor and negative with respect to emitter for NPN types.

NOTE: The term "cut-off" is sometimes replaced by $V_{BE} > x$ volts, or $\frac{R_B}{R_E}, \leqslant y$ which are equivalent conditions under which the device may be cut-off.

V_{CEmax} ($I_C = x$ mA) — The maximum permissible instantaneous voltage between collector and emitter terminals when the collector current is at a high value, often the max. rated value.

V_{CEmax} ($I_B = 0$) — The maximum permissible instantaneous voltage between collector and emitter terminals when the base terminal is open circuited or when a very high resistance is in series with the base terminal. Special care must be taken to ensure that thermal runaway due to excessive collector leakage current does not occur in this condition.

Due to the current dependency of V_{CE} it is usual to present this information as a voltage rating chart which is a curve of collector current versus collector to emitter voltage (see Fig. 1).

This curve is divided into two areas:

A permissible area of operation under all conditions of base drive provided the dissipation rating is not exceeded (area 1) and an area where operation is allowable under certain specified conditions (area 2). To assist in determining the rating in this second area, further curves are provided relating the voltage rating to external circuit conditions, for example:

$$\frac{R_B}{R_E},\ R_B,\ Z_{Bg},\ V_{BE},\ I_B \text{ or } \frac{V_{BB}}{R_B}.$$

An example of this type of curve is given in Fig. 2 as V_{CE} versus $\frac{R_B}{R_E}$ for two different values of collector current.

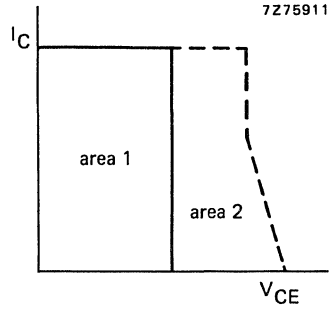


Fig. 1.

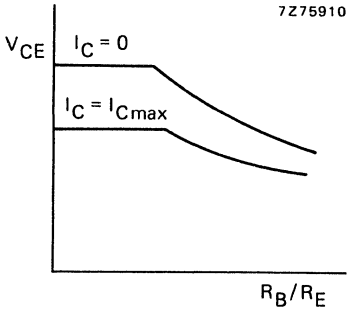


Fig. 2.

It should be noted that when R_E is shunted by a capacitor, the collector voltage V_{CE} during switching must be restricted to a value which does not rely on the effect of R_E.
In the case of an inductive load and when an energy rating is given, it may be permissible to operate outside the rated area provided the spcified energy rating is not exceeded.

Transistor current ratings

Collector current ratings

I_{Cmax}	The maximum permissible collector current. Without further qualification, the d.c. value is implied.
$I_{C(AV)max}$	The maximum permissible average value of the total collector current
I_{CM}	The maximum permissible instantaneous value of the total collector current.

Emitter current ratings

I_{Emax}	The maximum permissible emitter current. Without further qualification, the d.c. value is implied.
$I_{E(AV)max}$	The maximum permissible average value of the total emitter current.
$I_{ER(AV)max}$	The maximum permissible average value of the total emitter current when operating in the reverse emitter-base breakdown region.
I_{EM}	The maximum permissible instantaneous value of the total emitter current.
I_{ERM}	The maximum permissible instantaneous value of the total reverse emitter current allowable in the reverse breakdown region.

Base current ratings

I_{Bmax}	The maximum permissible base current. Without further qualification, the d.c. value is implied.
$I_{B(AV)max}$	The maximum permissible average value of the total base current.
$I_{BR(AV)max}$	The maximum permissible average value of the total reverse base current allowable in the reverse breakdown region.
I_{BM}	The maximum permissible instantaneous value of the total base current. The rating also includes the switch off current.
I_{BRM}	The maximum permissible instantaneous value of the total reverse current allowable in the reverse breakdown region.

Transistor power ratings

P_{tot} max: The total maximum permissible continuous power dissipation in the transistor and includes both the collector-base dissipation and the emitter-base dissipation. Under steady state conditions the total power is given by the expression:

$$P_{tot} = V_{CE} \times I_C + V_{BE} \times I_B.$$

In order to distinguish between "steady state" and "pulse" conditions the terms "steady state power (P_S)" and "pulse power (P_P)" are often used. The permissible total power dissipation is dependent upon temperature and its relationship is shown by means of a chart as shown in Fig. 3.

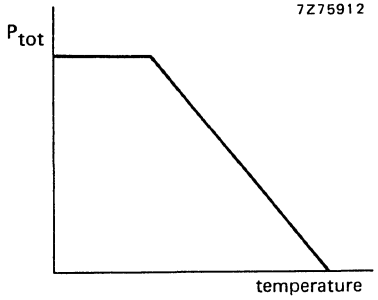


Fig. 3.

The temperature may be ambient, case or mounting base temperatures. Where a cooling clip or a heatsink is attached to the device, the allowable power dissipation is also dependent on the efficiency of the heatsink.

The efficiency of this clip or heatsink is measured in terms of its thermal resistance ($R_{th\,h}$) normally expressed in degrees kelvin per watt (K/W). For a mounting base rated device, the added effect of the contact resistance ($R_{th\,i}$) must be taken into account.

The effect of heatsinks of various thermal resistance and contact resistance is often included in the above chart.

Thus for any heatsink of known thermal resistance and any given ambient temperature, the maximum permissible power dissipation can be established. Alternatively, knowing the power dissipation which will occur and the ambient temperature, the necessary heatsink thermal resistance can be calculated.

A general expression from which the total permissible steady state power dissipation can be calculated is:

$$P_{tot} = \frac{T_j - T_{amb}}{R_{th\ j\text{-}a}}$$

where $R_{th\ j\text{-}a}$ is the thermal resistance from the transistor junction to the ambient. For case rated or mounting base rated devices, the thermal resistance $R_{th\ j\text{-}a}$ is made up of the thermal resistance junction to case or mounting base ($R_{th\ j\text{-}mb}$), the contact thermal resistance ($R_{th\ i}$) and the heatsink thermal resistance $R_{th\ h}$.

For the calculation of pulse power operation P_p, the maximum pulse power is obtained by the aid of a chart as shown in Fig. 4.

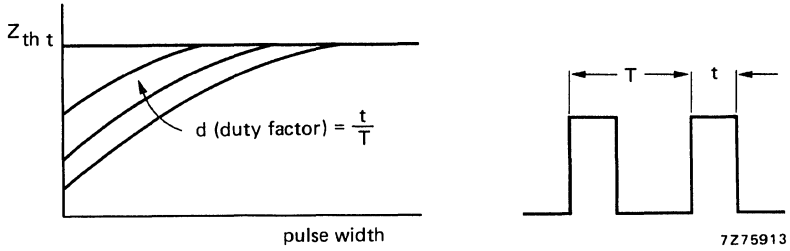


Fig. 4.

The general expression from which the maximum pulse power dissipation can be calculated is:

$$P_p = \frac{T_j - T_{amb} - P_s \times R_{th\ j\text{-}a}}{Z_{th\ t} + d\ (R_{th\ c\text{-}a})}$$

where $Z_{th\ t}$ and d are given in the above chart and $R_{th\ c\text{-}a}$ is the thermal resistance between case and ambient for case rated device. For mounting base rated device, it is equal to $R_{th\ h} + R_{th\ i}$ and is zero for free air rated device because the effect of the temperature rise of the case over the ambient for a pulse train is already included in $Z_{th\ t}$.

Temperature ratings

T_{jmax}	The maximum permissible junction temperature which is used as the basis for the calculation of power ratings. Unless otherwise stated, the continuous value is implied.
T_{jmax} (continous operation)	The maximum permissible continuous value.
T_{jmax} (intermittent operation)	The maximum permissible instantaneous junction temperature usually allowed for a total duration of 200 hours.
T_{mb}	The temperature of the surface making contact with a heatsink. This is confined to devices where a flange or stud for fixing onto a heatsink forms an integral part of the envelope.
T_{case}	The temperature of the envelope. This is confined to devices to which may be attached a clip-on cooling fin.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

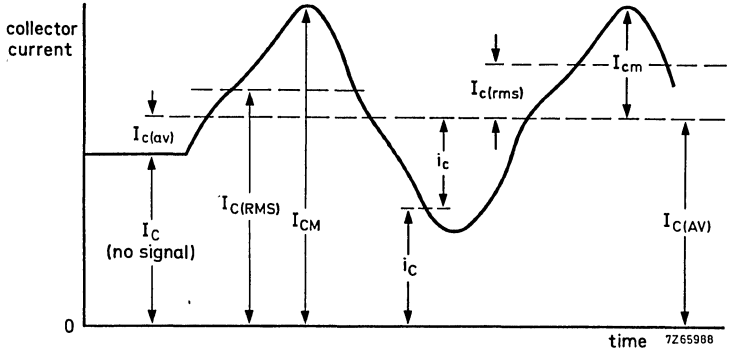
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f = forward; forward transfer
I, i (or 1) = input
L, l = load
O, o (or 2) = output
R, r = reverse; reverse transfer
S, s = source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)
R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

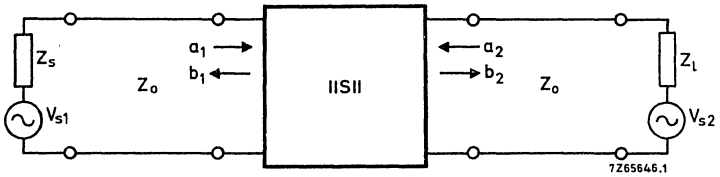
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1, b_1, a_2 and b_2.



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}} \qquad 1)$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}}$$

Z_o = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$
$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \frac{b_1}{a_1}\bigg|_{a_2 = 0}$$

$$s_r = s_{12} = \frac{b_1}{a_2}\bigg|_{a_1 = 0}$$

$$s_f = s_{21} = \frac{b_2}{a_1}\bigg|_{a_2 = 0}$$

$$s_o = s_{22} = \frac{b_2}{a_2}\bigg|_{a_1 = 0}$$

1) The squares of these quantities have the dimension of power.

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

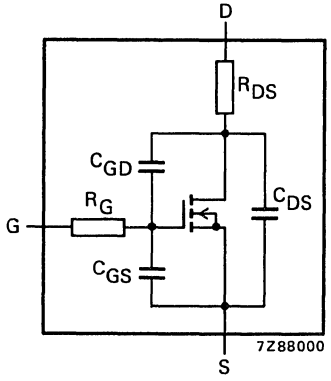
$s_f = s_{21}$ = Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$

$s_o = s_{22}$ = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

N-CHANNEL ENHANCEMENT POWER MOS TRANSISTORS

This new range of power MOS transistors offers:

- very low on-state resistance (< 0,1 Ω, 50 V type)
- drain-source voltages up to 1000 V
- drain currents up to 14 A (continuous)
- microcomputer and TTL compatibility.



C_{DS} is the drain-source capacitance
C_{GS} is the gate-source capacitance
C_{GD} is the gate-drain capacitance
R_{DS} is the drain-source resistance
R_G is the gate resistance.

Fig. 1 Equivalent circuit of a power MOS transistor.

C_{GD} and C_{DS} depend on the drain-source voltage, C_{GS} does not.

If R_G and R_{DS} are neglected, the values stated in the data sheets for C_{is} (input capacitance) C_{os} (output capacitance) and C_{rs} (feedback capacitance) are related to the equivalent circuit capacitances by:

$C_{is} = C_{GS} + C_{GD}$
$C_{os} = C_{DS} + C_{GD}$
$C_{rs} = C_{GD}$

PRECAUTIONS

The gate input of a power MOS transistor can easily be electrostatically charged to a high voltage. Ensure that the gate-source voltage never exceeds the maximum value stated in the data sheet, otherwise the transistor will be destroyed. When soldering by hand, use earthed soldering irons.

MAXIMUM RATINGS

The ratings in the data sheets are absolute maximum ratings according to IEC 134. If any one of these ratings is exceeded the component may be destroyed.

LETTER SYMBOLS

Basic letters

I, i = current

V, v = voltage

P, p = power

Lower-case letters indicate instantaneous values that vary with time. Otherwise, upper case letters are used.

Subscripts for voltages

In general, two subscripts are used indicating the points between which a voltage is measured. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node.

Subscripts for supply voltages

Supply voltages are indicated by repeating the appropriate terminal subscript, e.g. V_{DD}.

Subscripts for currents

At least one subscript is used indicating the terminal carrying the current. Positive current is defined as conventional current flow into a terminal. Negative current is defined as conventional current flow out of a terminal.

CHARACTERISTICS

The data given under Characteristics are mean values. In many cases, data are supplemented by a range statement.

Drain-source voltage V_{DS}

Maximum permissible value of the voltage between drain and source.

Drain-gate voltage V_{DGR}

Maximum permissible value of the voltage between drain and gate, when bridging gate-source with a predefined resistance.

Continuous drain current I_D

Maximum permissible value of the direct current at the drain connection.

Pulsed drain current $I_{D\,puls}$

Maximum permissible peak value of the drain current during pulse operation as specified in the diagram "safe operating area" for a respective pulse width and duty cycle.

Gate-source voltage V_{GS}

Maximum permissible value of the voltage between gate and source.

Maximum power dissipation P_D

Maximum permissible power dissipation of the transistor.

Operating temperature range T_j

The range of the permissible chip temperature, with which the transistor may be operated continuously.

Storage temperature range T_{stg}

The temperature range within which the transistor may be stored or transported without electrical load.

Soldering temperature T_{sld}

The maximum permissible temperature during soldering at the terminals of the component, at a specified distance to the case and for a specified time.

Thermal resistance $R_{th\ j\text{-}c}$

Thermal resistance between chip and case at thermal equilibrium.

Thermal resistance $R_{th\ j\text{-}a}$

Thermal resistance between chip and ambient air at thermal equilibrium.

Thermal resistance $R_{th\ j\text{-}sr}$

Thermal resistance between chip and substrate metallization rear side at thermal equilibrium.

Drain-source breakdown voltage $V_{(BR)DSS}$

The voltage between the drain and source measured at a specified drain current and with the gate and source short-circuited.

Gate threshold voltage V_{GST}

The gate source voltage measured at a specified drain current and drain-source voltage.

Zero gate voltage drain current I_{DSS}

The drain current at a specified drain-source voltage and with the gate and source short-circuited.

Gate-source leakage current I_{GSS}

The gate leakage current at a specified gate-source voltage and with the drain and source short-circuited.

Drain-source on-state resistance $R_{DS\ ON}$

The resistance between the drain and source at specified values of gate-source voltage and drain current.

Forward transfer conductance g_{fs}.

Ratio of the change of the drain current to the change in gate-source voltage producing it for a specified drain-source voltage.

Input capacitance C_{is}

The capacitance between gate and source with the drain and source short-circuited for alternating voltages.

Output capacitance C_{os}

The capacitance between drain and source with the gate and source short-circuited for alternating voltages.

Feedback capacitance C_{rs}

The capacitance between drain and gate with the source connected to the protective screen of the measuring bridge. Stated at particular gate-source and drain-source voltages and measuring frequency.

Turn-on time t_{on}

$t_{on} = t_{d\ on} + t_r$
where:
$t_{d\ on}$ is the turn-on delay time measured between the 10% value of the gate-source voltage and the 90% value of the drain-source voltage, and t_r is the rise time measured between the 90% and 10% value of the drain-source voltage.

Turn-off time t_{off}

$t_{off} = t_{d\ off} + t_f$
where:
$t_{d\ off}$ is the turn-off delay time measured between the 90% value of the gate-source voltage and the 10% value of the drain-source voltage, and t_f is the fall time measured between 10% and 90% values of the drain-source voltage.

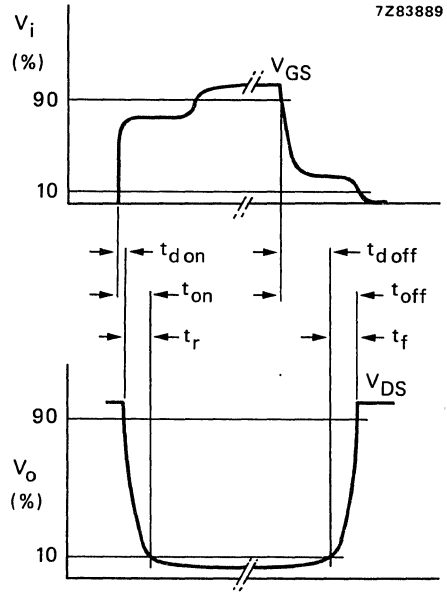


Fig. 2 Definition of switching times.

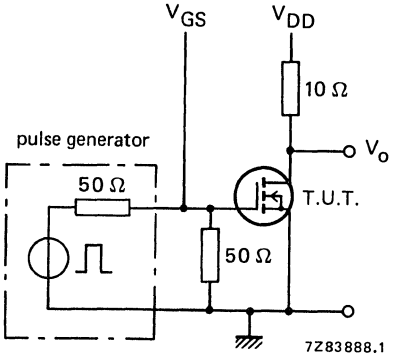


Fig. 3 Measuring circuit.

MEASURING CIRCUITS

Parameters should be measured at the temperatures stated in the data sheets.

Drain current I_D

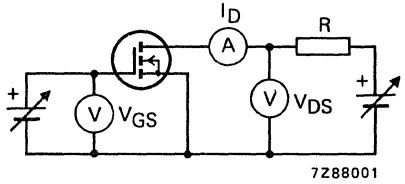


Fig. 4 Circuit for measuring the drain current I_D.

R limits the drain current. The specified gate-source voltage V_{GS} is set.
If V_{GS} = 0 has been specified, the gate and source must be short-circuited.

Drain-source on-resistance $R_{DS\,ON}$

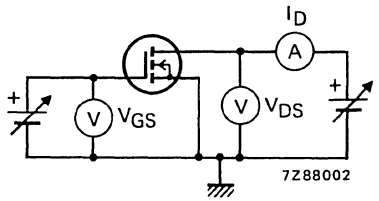


Fig. 5 Circuit for measuring the on-resistance $R_{DS\,ON}$.

In general, $R_{DS\,ON}$ is measured in the saturation region. The internal resistance of the voltmeter V_{DS} must be much larger than the turn-on resistance to be measured.

Gate threshold voltage V_{GST}

(Use the circuit for measuring I_D). The gate-source voltage is slowly increased from zero until the specified drain current is reached.

Gate-source leakage current I_{GSS}

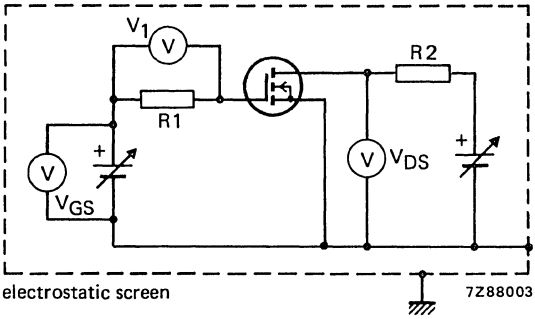


Fig. 6 Circuit for measuring the gate-source leakage current I_{GSS}.

R1 and R2 are protection resistors. R1 should be smaller than $V_{GS}/100I_{GSS}$. V1 should have an internal resistance > 100 R1. The leakage current is given by $I_{GSS} = V1/R1$.

The circuit must be electrostatically screened. Take care in the circuit arrangement to prevent leakage currents that would give false results.

Input capacitance C_{is}

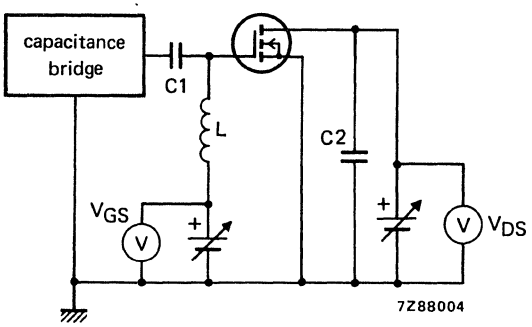


Fig. 7 Circuit for measuring the input capacitance C_{is}.

The impedances of C1 and C2 should be negligible at the measuring frequency. Inductance L should decouple the d.c. supply.

Output capacitance C_{os}

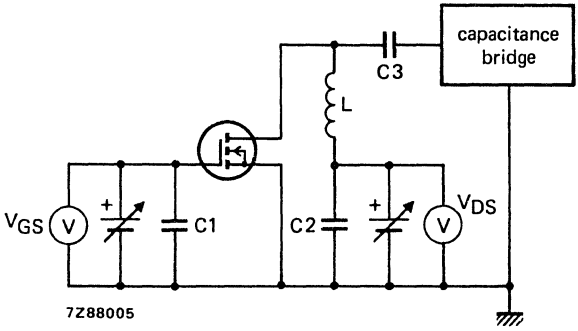


Fig. 8 Circuit for measuring the output capacitance C_{os}.

The impedances of C1, C2 and C3 should be negligible at the measuring frequency. Inductance L should decouple the d.c. supply.

Feedback capacitance C_{rs}

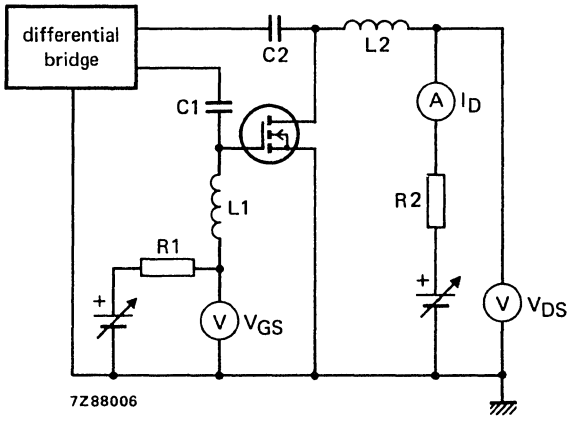


Fig. 9 Circuit for measuring the feedback capacitance C_{rs}.

The impedances of C1 and C2 should be negligible at the measuring frequency. Inductances L1 and L2 should decouple the d.c. supply.

THERMAL RESISTANCE

The thermal resistance between the junction and ambient of a transistor on a heatsink is:

$R_{th\ j\text{-}a} = R_{th\ j\text{-}mb} + R_{th\ mb\text{-}a}$,
where $R_{th\ j\text{-}mb}$ is the thermal resistance between junction and mounting base and $R_{th\ mb\text{-}a}$ is the thermal resistance between mounting base and ambient.

SOLDERING INSTRUCTIONS

Take care that the transistors are not overheated during soldering. Do not move connections whilst soldering.

Recommended soldering times (seconds):

		Distance from soldering point to envelope (mm)	
		1,6	5
Soldering time	(T_{sld} = 260 °C)	15	15
Soldering time	(T_{sld} = 300 °C)	10	15

These times apply to hand soldering only. Where automatic soldering techniques are used, ensure that the maximum junction temperature is not exceeded.

DEFINITION OF SYMBOLS USED IN THE DATA SHEETS

Voltages

$V_{(BR)DSS}$	Drain-source breakdown voltage
V_{DD}	Supply voltage
V_{DGR}	Drain-gate voltage with a specified gate-source resistance
V_{DS}	Drain-source voltage
V_F	Forward diode voltage
V_{GS}	Gate-source voltage
V_{GST}	Gate threshold voltage

Currents

I_D	Drain current (d.c. or average)
I_{DM}	Drain current (pulse peak value)
I_{DSS}	Zero gate voltage drain current
I_F	Forward diode current
I_{FRM}	Forward diode current (peak)
I_{GSS}	Gate-source leakage current

Switching times

$t_{d\,off}$	Turn-off delay
$t_{d\,on}$	Turn-on delay
t_f	Turn-off fall time
t_r	Turn-on rise time

Capacitances

C_{is}	Input capacitance
C_{os}	Output capacitance
C_{rs}	Feedback capacitance

Miscellaneous

g_{fs}	Forward transfer conductance
P_{tot}	Total power dissipation
$R_{DS\,ON}$	Drain-source on-state resistance
$R_{th\,j\text{-}mb}$	Thermal resistance from junction to mounting base
T_j	Junction temperature
T_{stg}	Storage temperature

TRANSISTOR DATA

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

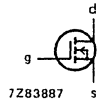
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.); T_{mb} = 100 °C	I_D	max.	12 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	60 ns

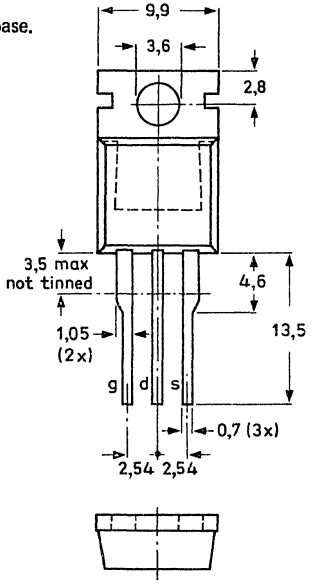
MECHANICAL DATA

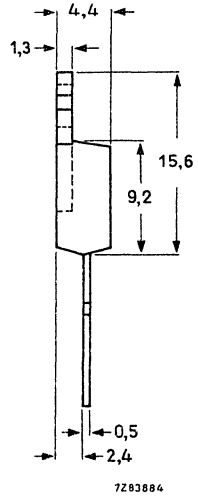
Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.







Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 100 °C	I_D	max.	12 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	36 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	typ. <	0,085 Ω 0,1 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12 A
Forward current (peak value)	I_{FRM}	<	36 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,4 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs; T_j = 25 °C			
recovery time	t_{rr}	typ.	150 ns
recovery charge	Q_s	typ.	1 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance				
V_{DS} = 25 V; I_D = 6 A	g_{fs}	>	3	A/V
		typ.	4,8	A/V
Input capacitance at f = 1 MHz				
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500	pF
Output capacitance at f = 1 MHz				
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	400	pF
Feedback capacitance at f = 1 MHz				
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	120	pF
Switching times (see Figs 3 and 4)				
(between 10% and 90% levels)				
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V				
turn-on times: delay time	$t_{d\,on}$	typ.	20	ns
rise time	t_r	typ.	60	ns
turn-off times: delay time	$t_{d\,off}$	typ.	120	ns
fall time	t_f	typ.	60	ns

DEVELOPMENT SAMPLE DATA

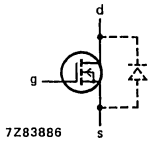


Fig. 2 Diode characteristics.

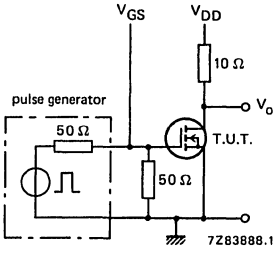


Fig. 3 Switching time test circuit.

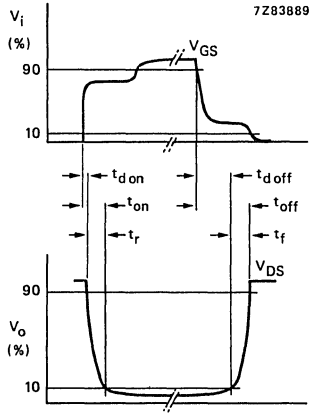


Fig. 4 Switching time waveforms.

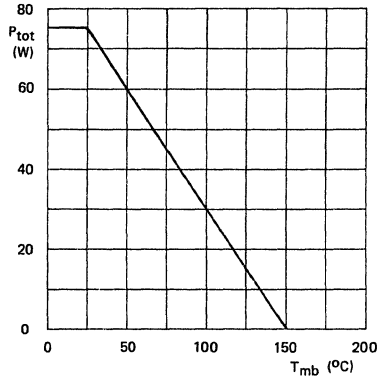


Fig. 5 Power derating curve.

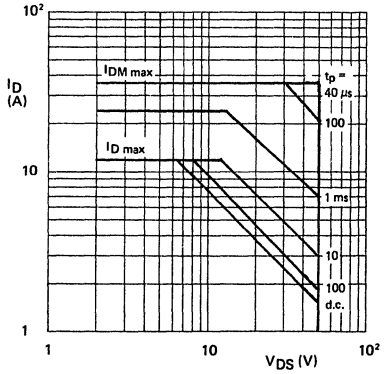


Fig. 6 Safe Operating ARea
T_{mb} = 25 °C; δ = 0,01.

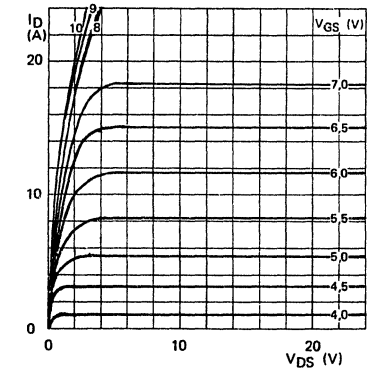


Fig. 7 Output characteristic.
80 μs pulse test; T_{mb} = 25 °C.

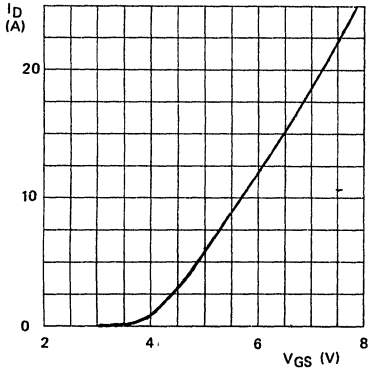


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

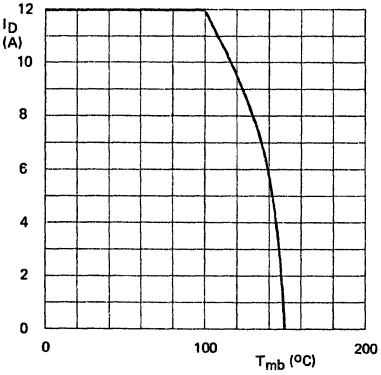


Fig. 9 Drain current as a function
of mounting base temperature.

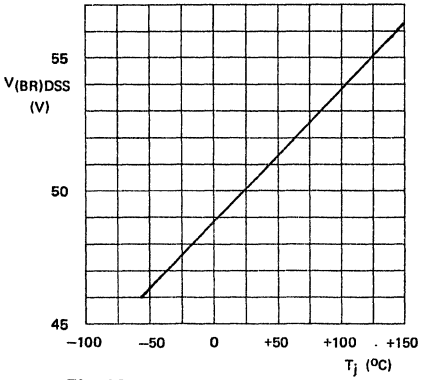


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

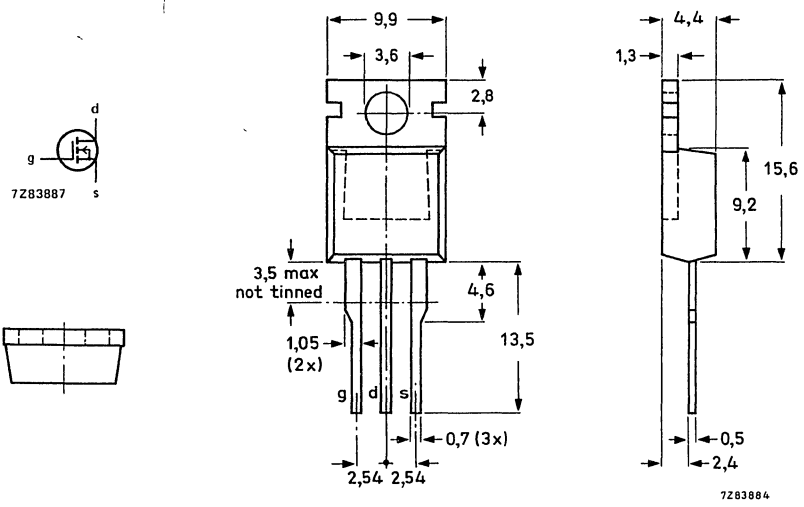
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.); T_{mb} = 90 °C	I_D	max.	12 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,12 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 90 °C	I_D	max.	12	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	36	A
Total power dissipation	P_{tot}	max.	75	W
Storage temperature	T_{stg}		−55 to + 150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage				
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50	V
Gate threshold voltage				
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current				
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current				
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance				
V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	typ.	0,11	Ω
		<	0,12	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12	A
Forward current (peak value)	I_{FRM}	<	36	A
On-state voltage				
I_F = 2 I_D; V_{GS} = 0 V; T_j = 25 °C	V_F	typ.	1,4	V
		<	1,8	V
Reverse recovery				
I_F = 2 I_D; dI_F/dt = 100 A/μs; T_j = 25 °C				
recovery time	t_{rr}	typ.	150	ns
recovery charge	Q_s	typ.	1	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 6 A	g_{fs}	> 3,0 typ. 4,8	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1500	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 400	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 120	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 20	ns
rise time	t_r	typ. 60	ns
turn-off times: delay time	$t_{d\,off}$	typ. 120	ns
fall time	t_f	typ. 60	ns

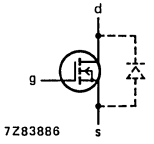


Fig. 2 Diode characteristics.

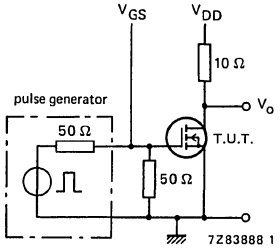


Fig. 3 Switching time test circuit.

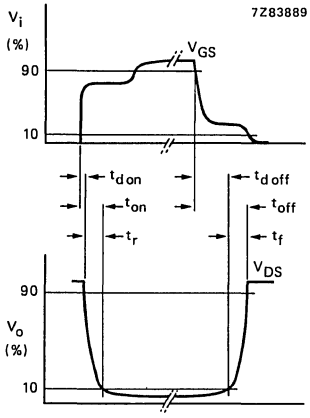


Fig. 4 Switching time waveforms.

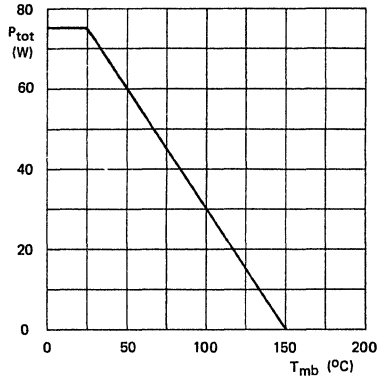


Fig. 5 Power derating curve.

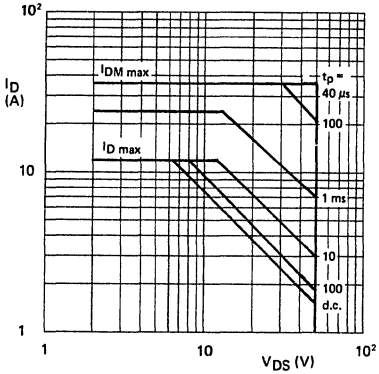


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

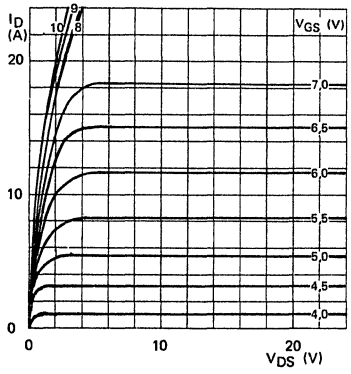


Fig. 7 Output characteristic.
80 µs pulse test; T_{mb} = 25 °C.

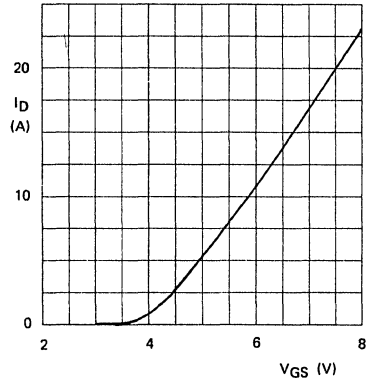


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

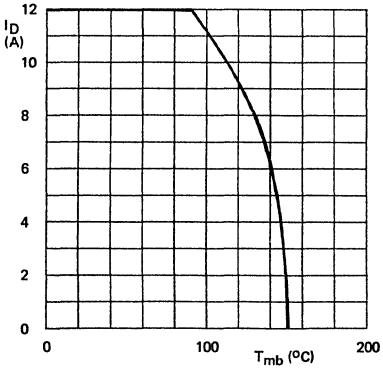


Fig. 9 Drain current as a function of mounting base temperature.

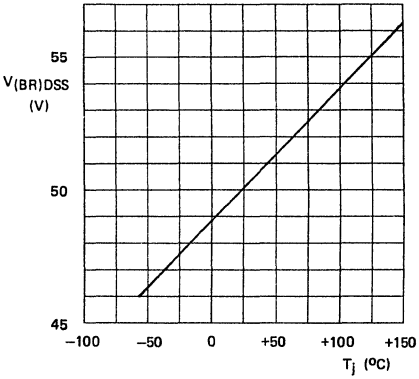


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

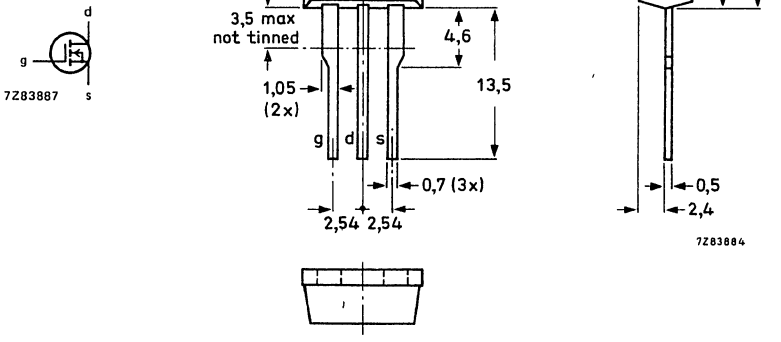
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	30 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,04 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	450 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	30 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	90 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage			
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage			
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current			
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance			
V_{GS} = 10 V; I_D = 14 A	$R_{DS\ ON}$	<	0,04 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	30 A
Forward current (peak value)	I_{FRM}	<	90 A
On-state voltage			
T_j = 25 °C; V_{GS} = 0 V; I_D = 2 x I_F	V_F	typ.	1,7 V
Reverse recovery			
I_D = 2 I_F; dI_F/dt = 100 A/μs; T_j = 25 °C			
recovery time	t_{rr}	typ.	200 ns
recovery charge	Q_s	typ.	0,25 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 14 A	g_{fs}	>	4 A/V
		typ.	8 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	900 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	800 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	360 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	220 ns
turn-off times: delay time	$t_{d\,off}$	typ.	600 ns
fall time	t_f	typ.	450 ns

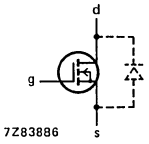


Fig. 2 Diode characteristics.

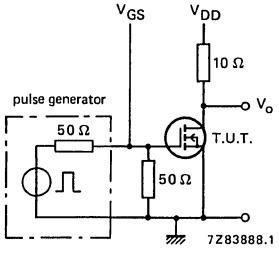


Fig. 3 Switching time test circuit.

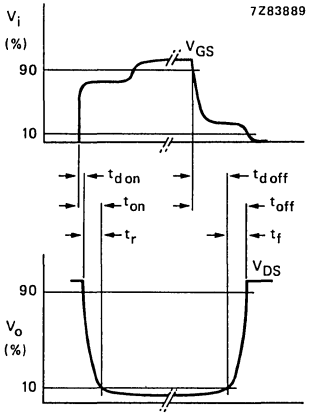


Fig. 4 Switching time waveforms.

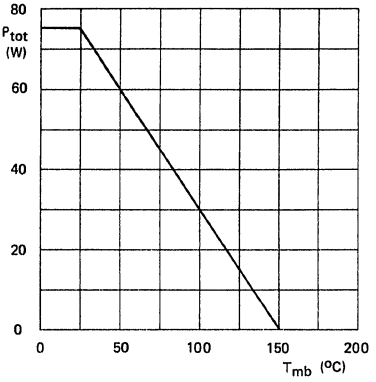


Fig. 5 Power derating curve.

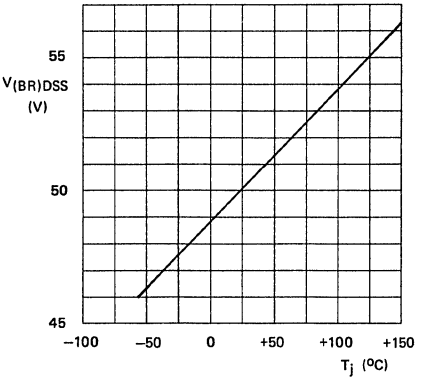


Fig. 6 Drain-source breakdown voltage as a function of junction temperature.

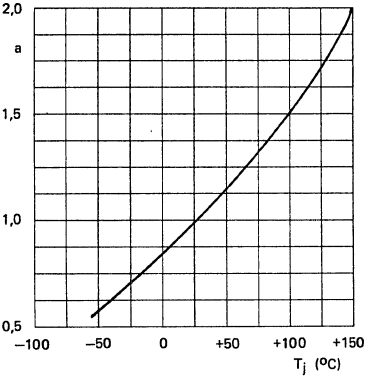


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

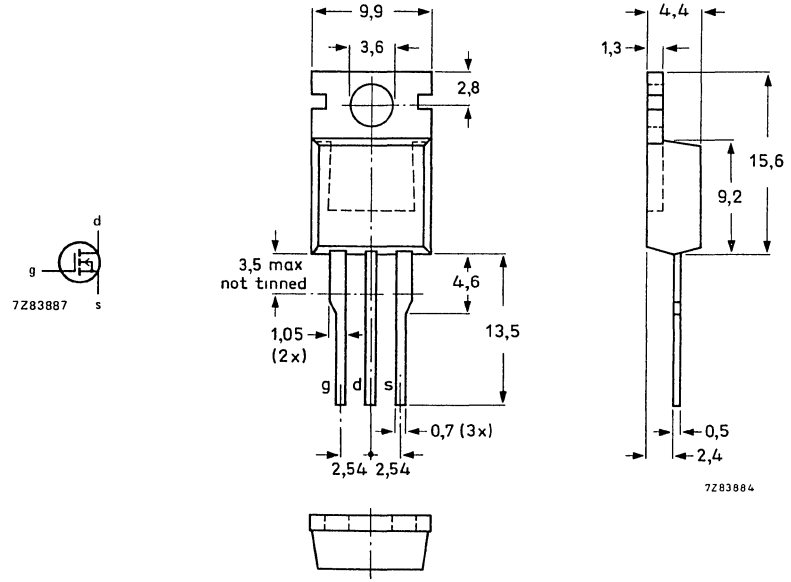
Drain-source voltage	V_{DS}	max.	50	V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	25	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75	W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,06	Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	450	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	25 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	75 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 14 A	$R_{DS\ ON}$	<	0,06 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	25 A
Forward current (peak value)	I_{FRM}	<	75 A
On-state voltage T_j = 25 °C; V_{GS} = 0 V; I_D = 2 x I_F	V_F	 typ. <	1,6 V 2,4 V
Reverse recovery I_D = 2 I_F; dI_F/dt = 100 A/μs; T_j = 25 °C			
recovery time	t_{rr}	typ.	200 ns
recovery charge	Q_s	typ.	0,25 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 14 A	g_{fs}	>	4 A/V
		typ.	8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	900 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	800 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	360 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	220 ns
turn-off times: delay time	$t_{d\,off}$	typ.	600 ns
fall time	t_f	typ.	450 ns

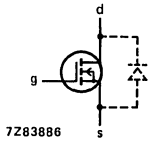


Fig. 2 Diode characteristics.

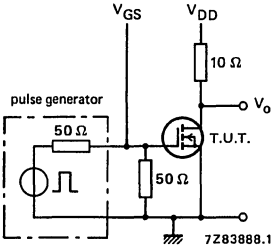


Fig. 3 Switching time test circuit.

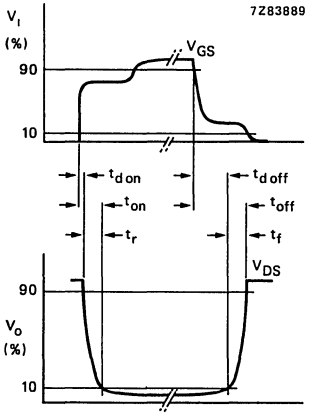


Fig. 4 Switching time waveforms.

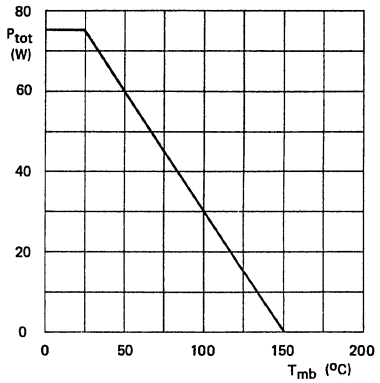


Fig. 5 Power derating curve.

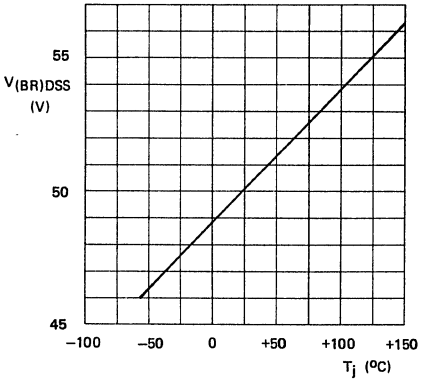


Fig. 6 Drain-source breakdown voltage as a function of junction temperature.

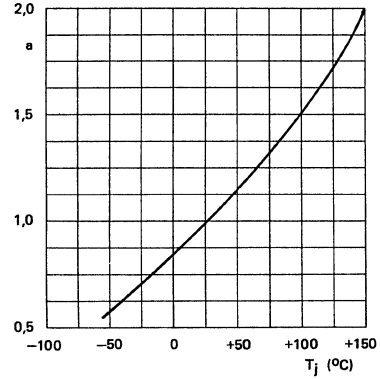


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

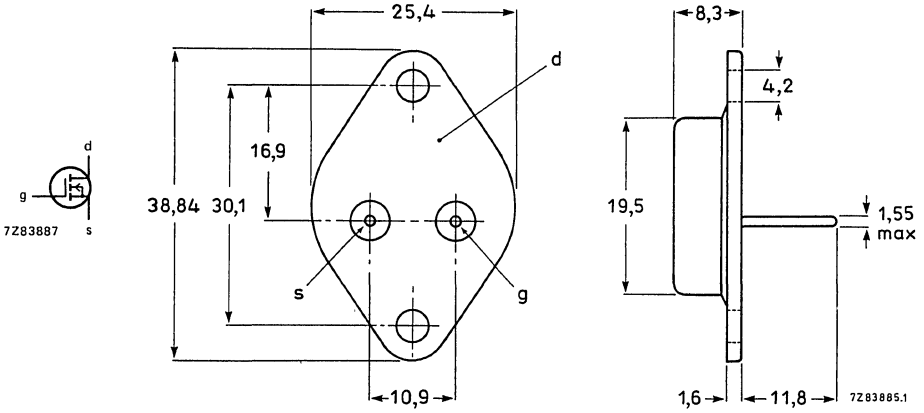
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.)	I_D	max.	39 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,04 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	200 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	39 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	115 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3,0 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 22 A	$R_{DS\ ON}$	typ.	0,035 Ω
		<	0,04 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	39 A
Forward current (peak value)	I_{FRM}	<	115 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	<	2,2 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	150 ns
recovery charge	Q_s	typ.	1 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 6 A	g_{fs}	>	7 A/V
		typ.	12 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	1200 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	500 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	200 ns
turn-off times: delay time	$t_{d\,off}$	typ.	300 ns
fall time	t_f	typ.	200 ns

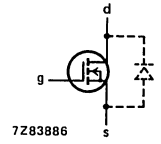


Fig. 2 Diode characteristics.

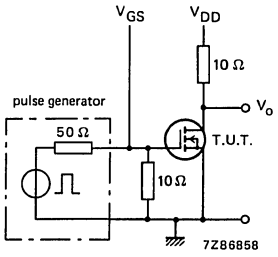


Fig. 3 Switching time test circuit.

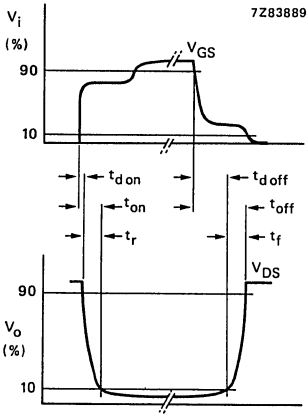


Fig. 4 Switching time waveforms.

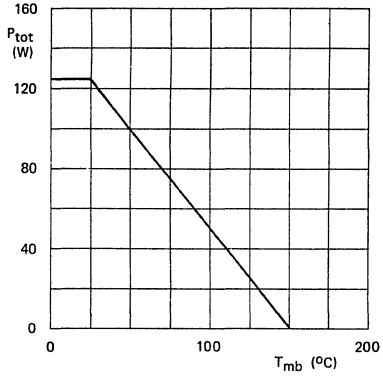


Fig. 5 Power derating curve.

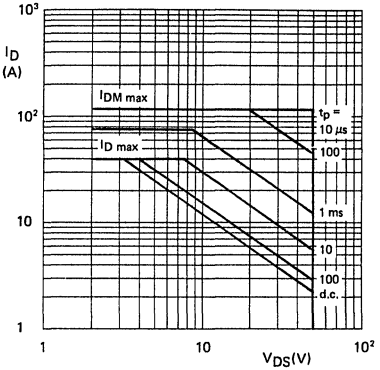


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

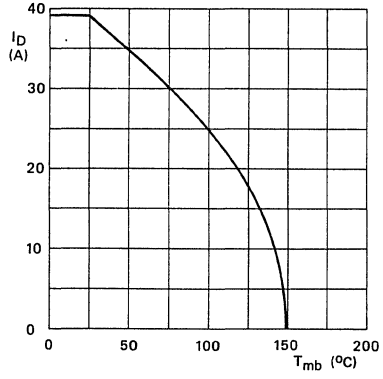


Fig. 7 Drain current as a function of mounting base temperature.

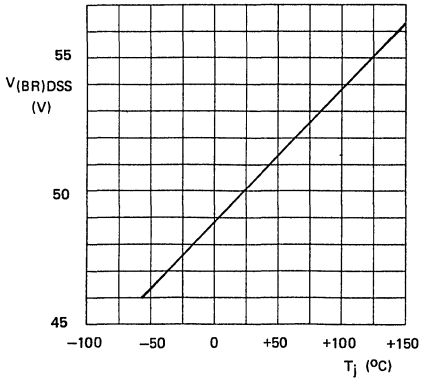


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

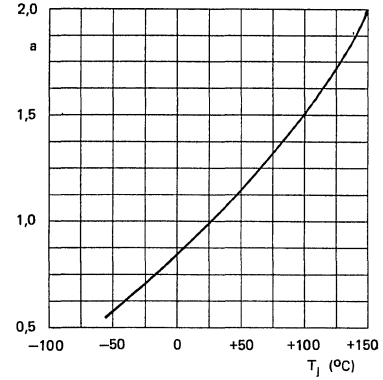


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

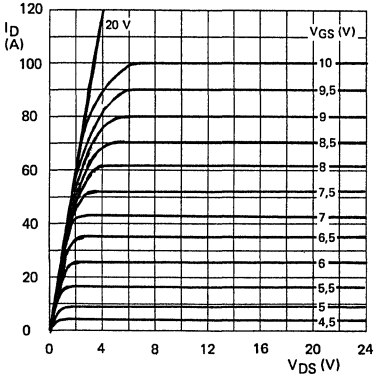


Fig. 10 Typical output characteristic.
T_{mb} = 25 °C; t_p = 80 μs.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

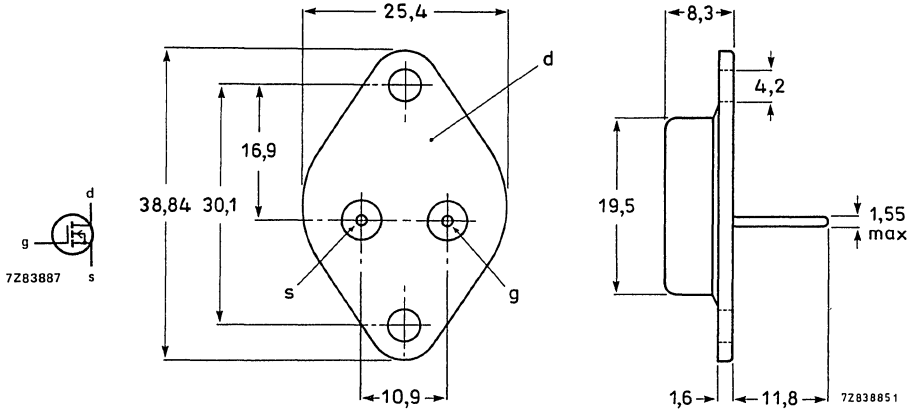
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.)	I_D	max.	45 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,03 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	200 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	45 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	135 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4,0 V
		typ.	3,0 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 22 A	$R_{DS\ ON}$	typ.	0,025 Ω
		<	0,03 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	45 A
Forward current (peak value)	I_{FRM}	<	135 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	<	2,4 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	150 ns
recovery charge	Q_s	typ.	1 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 22 A	g_{fs}	> typ.	7 A/V 12 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	1200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	500 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	200 ns
turn-off times: delay time	$t_{d\,off}$	typ.	300 ns
fall time	t_f	typ.	200 ns

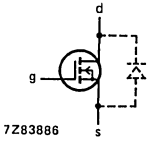


Fig. 2 Diode characteristics.

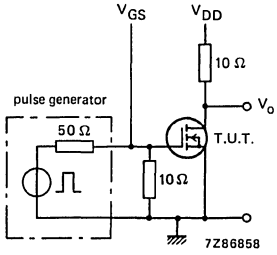


Fig. 3 Switching time test circuit.

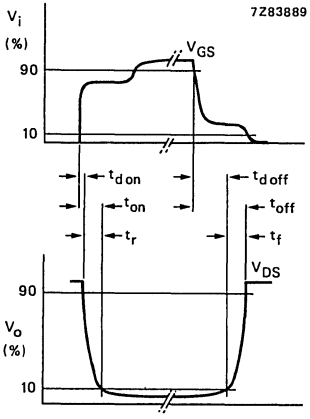


Fig. 4 Switching time waveforms.

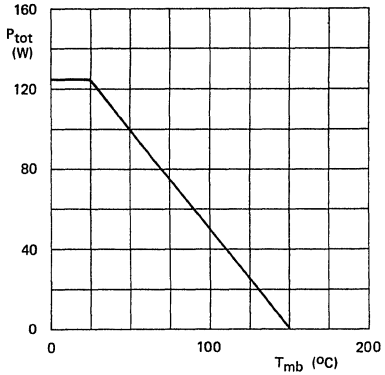


Fig. 5 Power derating curve.

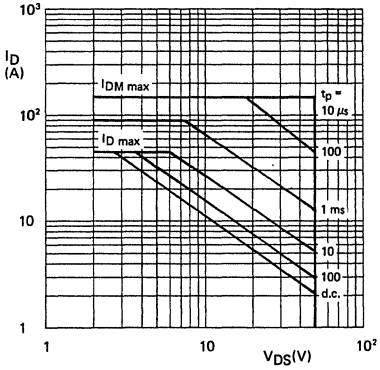


Fig. 6 Safe Operating ARea. T_{mb} = 25 °C; δ = 0,01.

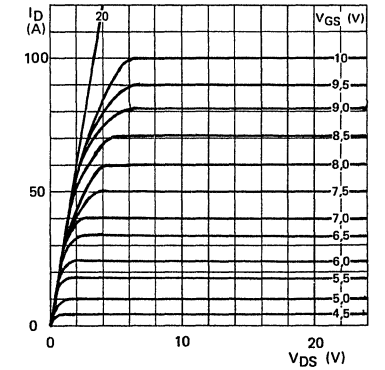


Fig. 7 Output characteristic. 80 μs pulse test; T_{mb} = 25 °C.

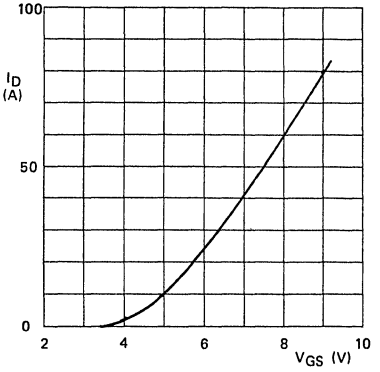


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

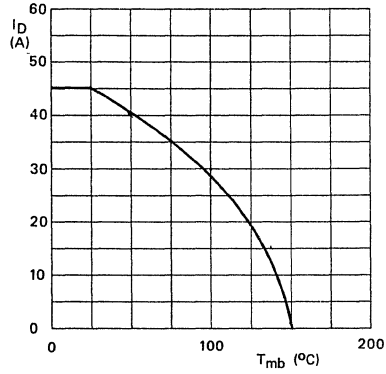


Fig. 9 Drain current as a function of mounting base temperature.

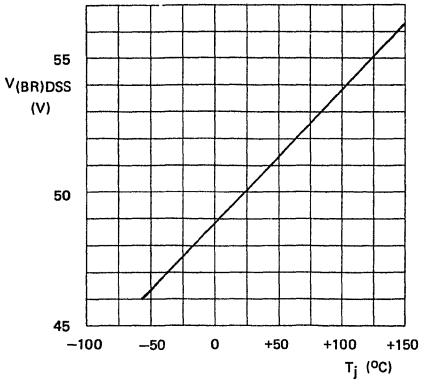


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

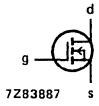
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.)	I_D	max.	12 A
Total power dissipation; T_{mb} = 50 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	60 ns

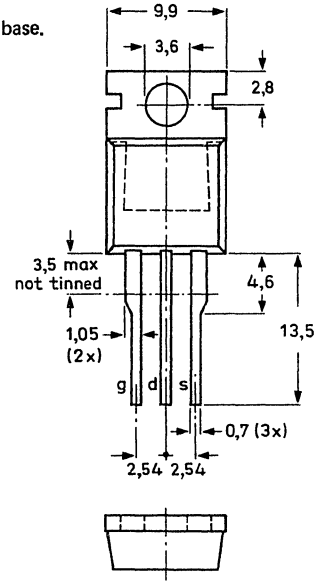
MECHANICAL DATA

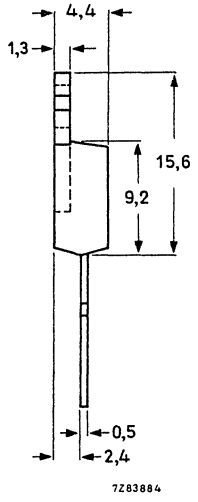
Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.







Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 50 °C	I_D	max.	12 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	36 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}	−55 to + 150	°C
Junction temperature	T_j	max. + 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	2,1 to 4,0 typ. 3,0	V V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	typ. <	0,15 Ω 0,2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12 A
Forward current (peak value)	I_{FRM}	<	36 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ. <	1,4 V 1,8 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	200 ns
recovery charge	Q_s	typ.	1,6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance		>	2,7 A/V
V_{DS} = 25 V; I_D = 6 A	g_{fs}	typ.	4,0 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	300 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	80 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	20 ns
rise time	t_r	typ.	60 ns
turn-off times: delay time	$t_{d\,off}$	typ.	120 ns
fall time	t_f	typ.	60 ns

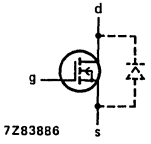


Fig. 2 Diode characteristics.

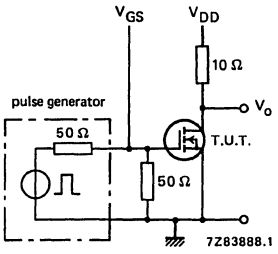


Fig. 3 Switching time test circuit.

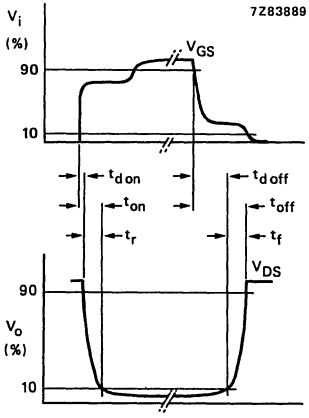


Fig. 4 Switching time waveforms.

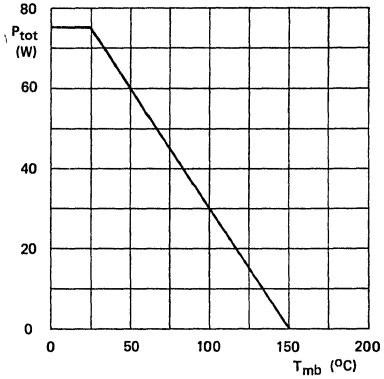


Fig. 5 Power derating curve.

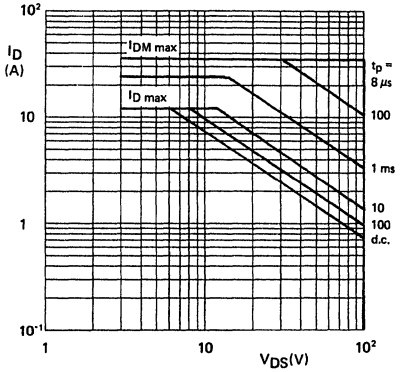


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

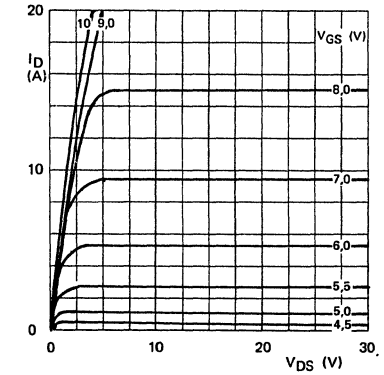


Fig. 7 Output characteristic.
80 μs pulse test; T_{mb} = 25 °C.

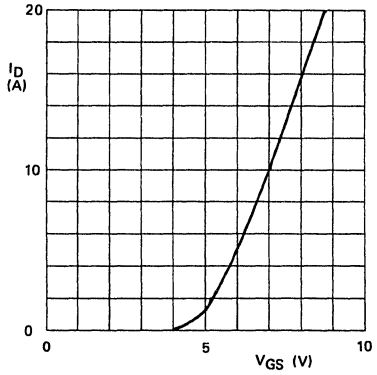


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

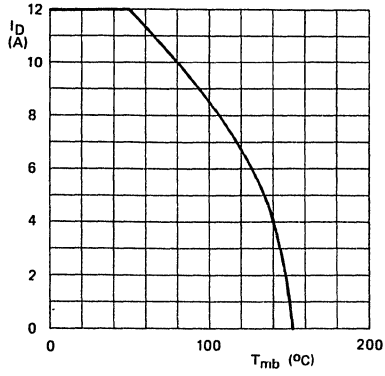


Fig. 9 Drain current as a function of mounting base temperature.

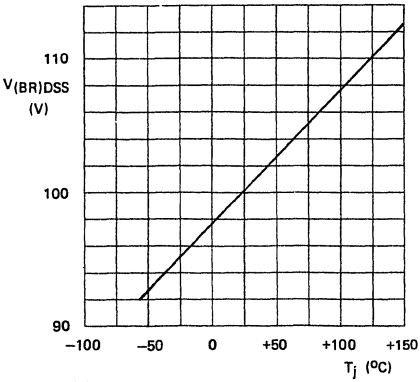


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

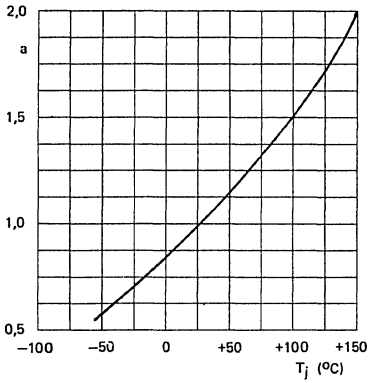


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

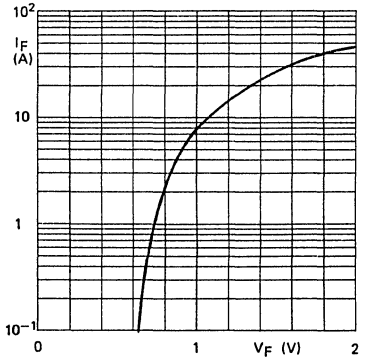


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

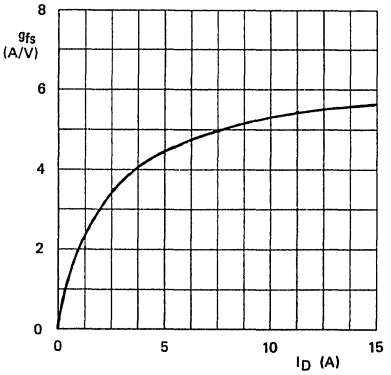


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

DEVELOPMENT SAMPLE DATA

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

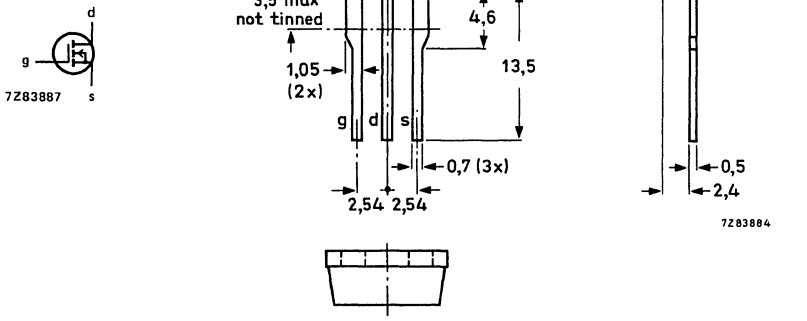
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.)	I_D	max.	18 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 40 °C	I_D	max.	18 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	54 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4,0 V
		typ.	3,0 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 9 A	$R_{DS\ ON}$	typ.	0,09 Ω
		<	0,1 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	18 A
Forward current (peak value)	I_{FRM}	<	54 A
On-state voltage I_F = 2 x I_D; V_{GS} = 0 V; T_j = 25 °C	V_F	typ.	1,6 V
		<	2,2 V
Reverse recovery I_F = 2 x I_D; dI_F/dt = 100 A/μs; T_j = 25 °C			
recovery time	t_{rr}	typ.	200 ns
recovery charge	Q_s	typ.	1,6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 9 A	g_{fs}	> 3,5 typ. 6	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1000	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 450	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 200	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 20	ns
rise time	t_r	typ. 60	ns
turn-off times: delay time	$t_{d\,off}$	typ. 120	ns
fall time	t_f	typ. 60	ns

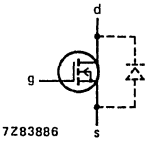


Fig. 2 Diode characteristics.

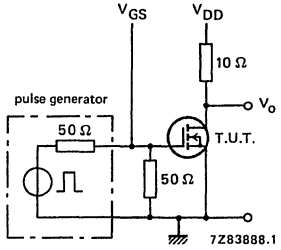


Fig. 3 Switching time test circuit.

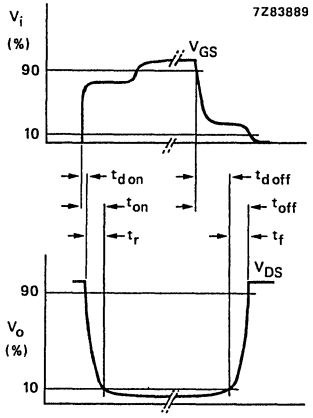


Fig. 4 Switching time waveforms.

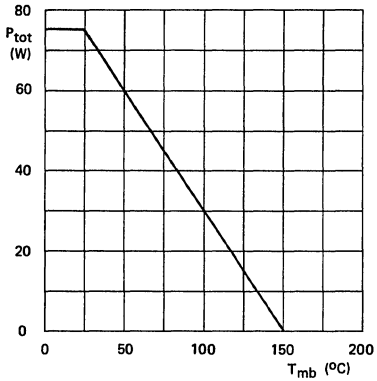


Fig. 5 Power derating curve.

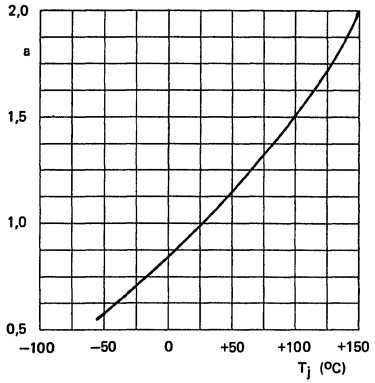


Fig. 6 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

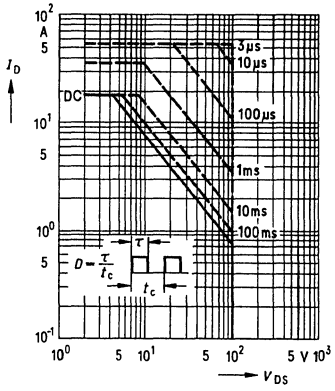


Fig. 7 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

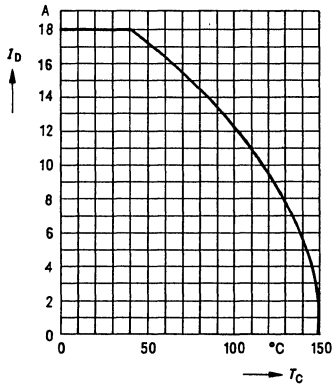


Fig. 8 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

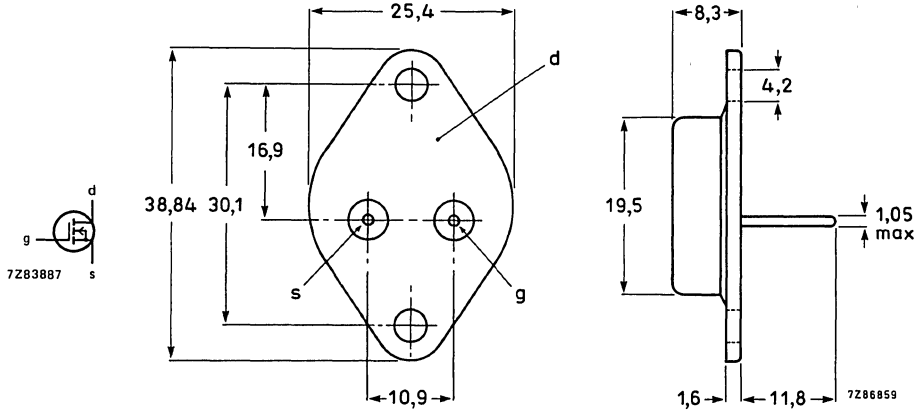
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.)	I_D	max.	10 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 85 °C	I_D	max.	10	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	30	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78	W
Storage temperature	T_{stg}		−55 to + 150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	typ.	0,15	Ω
		<	0,2	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	10	A
Forward current (peak value)	I_{FRM}	<	30	A
On-state voltage I_F = 2 x I_D; V_{GS} = 0 V	V_F	typ.	1,3	V
		<	1,6	V
Reverse recovery I_F = 2 x I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	200	ns
recovery charge	Q_s	typ.	1,6	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 6 A	g_{fs}	> 2,7 A/V typ. 4 A/V	
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1400 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	300 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	80 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	20 ns
rise time	t_r	typ.	60 ns
turn-off times: delay time	$t_{d\,off}$	typ.	120 ns
fall time	t_f	typ.	60 ns

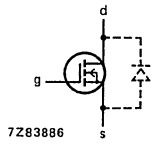


Fig. 2 Diode characteristics.

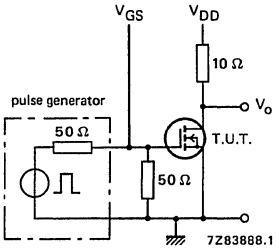


Fig. 3 Switching time test circuit.

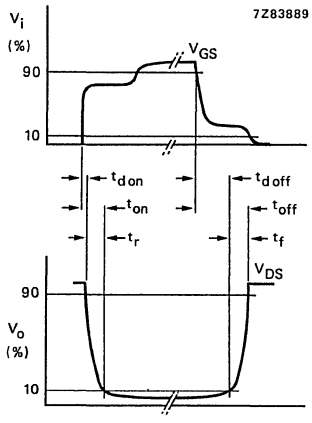


Fig. 4 Switching time waveforms.

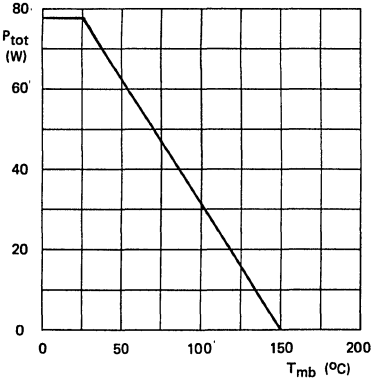


Fig. 5 Power derating curve.

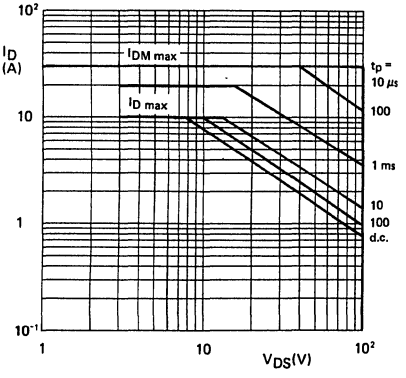


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

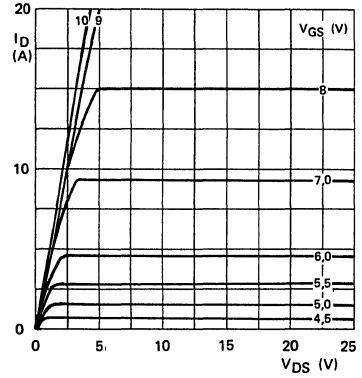


Fig. 7 Output characteristics.
80 µs pulse test; T_{mb} = 25 °C.

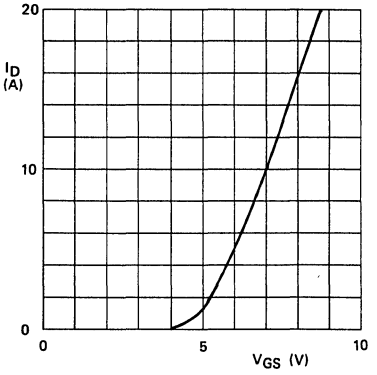


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

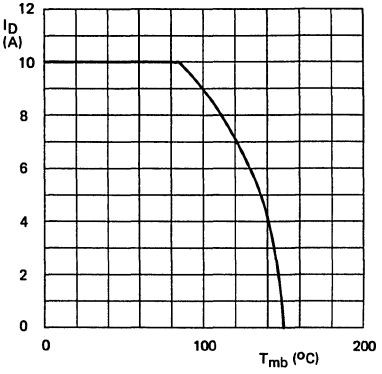


Fig. 9 Drain current as a function of mounting base temperature.

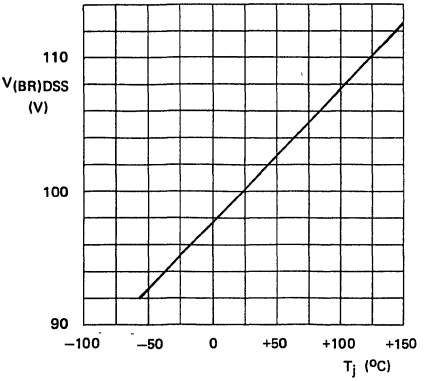


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

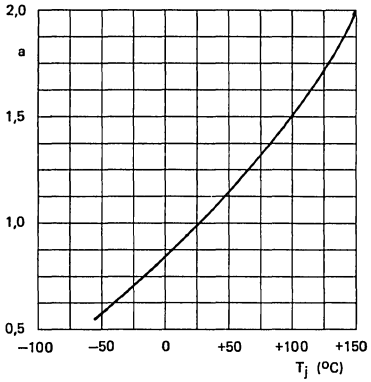


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

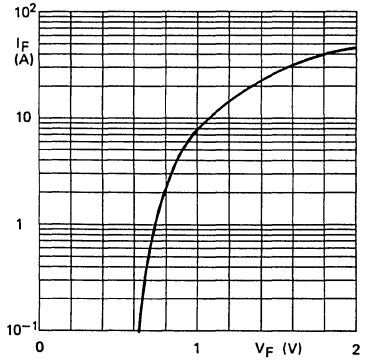


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

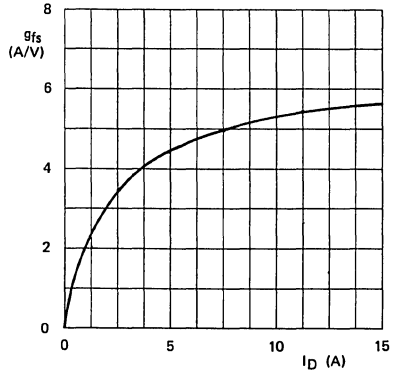


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

DEVELOPMENT SAMPLE DATA

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

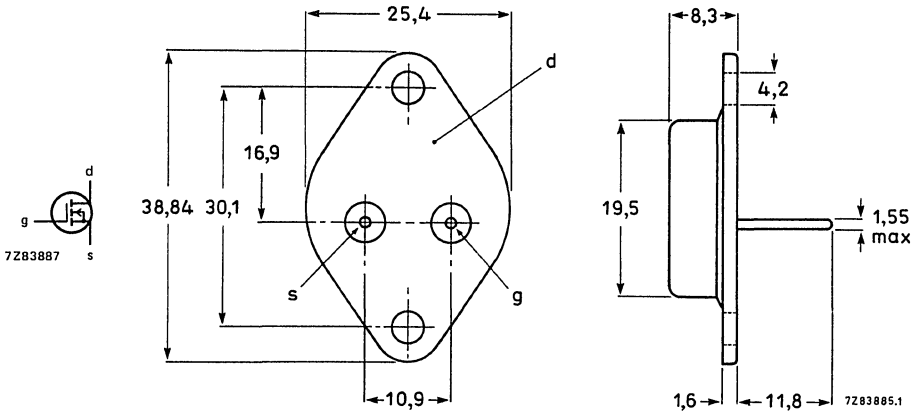
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.)	I_D	max.	32 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,06 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	200 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	32	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	95	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100	V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 16 A	$R_{DS\ ON}$	typ.	0,055	Ω
		<	0,06	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	32	A
Forward current (peak value)	I_{FRM}	<	95	A
On-state voltage $I_F = 2 \times I_D$; V_{GS} = 0 V	V_F	typ.	1,5	V
		<	2,0	V
Reverse recovery $I_F = 2 \times I_D$; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	200	ns
recovery charge	Q_s	typ.	1,6	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance		>	6 A/V
V_{DS} = 25 V; I_D = 16 A	g_{fs}	typ.	10 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	900 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	500 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	200 ns
turn-off times: delay time	$t_{d\,off}$	typ.	300 ns
fall time	t_f	typ.	200 ns

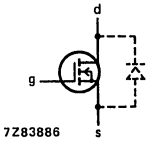


Fig. 2 Diode characteristics.

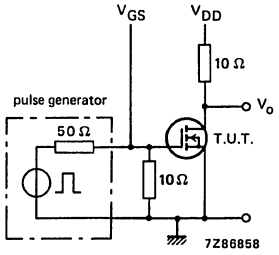


Fig. 3 Switching time test circuit.

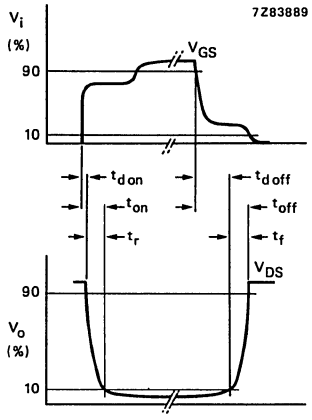


Fig. 4 Switching time waveforms.

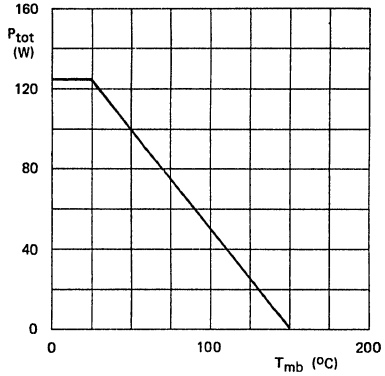


Fig. 5 Power derating curve.

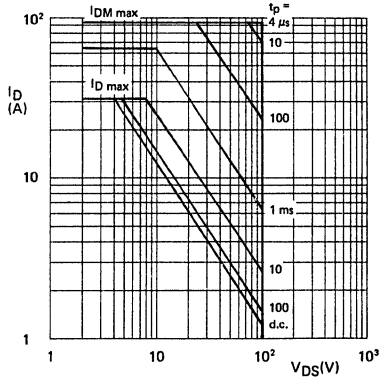


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

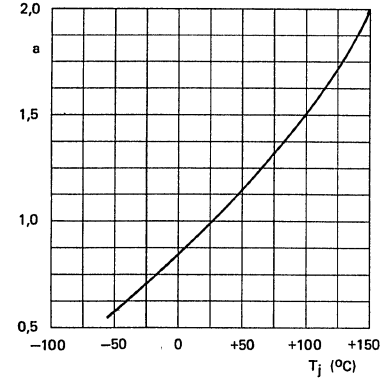


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

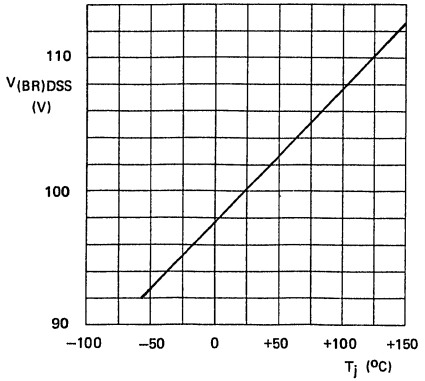


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

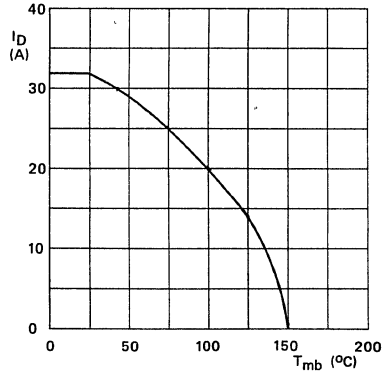


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

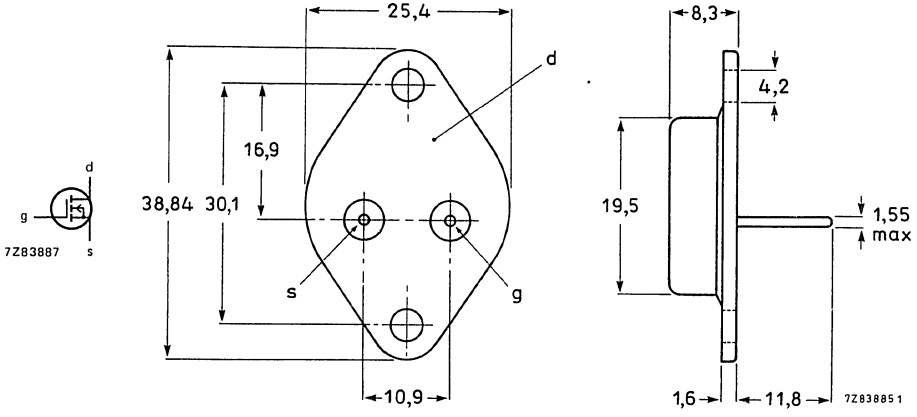
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.)	I_D	max.	19 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	320 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	19	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	57	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage				
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100	V
Gate threshold voltage				
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current				
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current				
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance				
V_{GS} = 10 V; I_D = 9 A	$R_{DS\ ON}$	typ.	0,09	Ω
		<	0,1	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	19	A
Forward current (peak value)	I_{FRM}	<	57	A
On-state voltage				
I_F = 2 x I_D; V_{GS} = 0 V	V_F	typ.	1,5	V
		<	2,1	V
Reverse recovery				
I_F = 2 x I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	200	ns
recovery charge	Q_s	typ.	0,25	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 9 A	g_{fs}	>	4 A/V
		typ.	8 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	900 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	450 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	200 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	35 ns
rise time	t_r	typ.	120 ns
turn-off times: delay time	$t_{d\,off}$	typ.	600 ns
fall time	t_f	typ.	320 ns

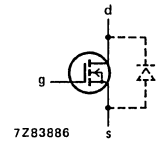


Fig. 2 Diode characteristics.

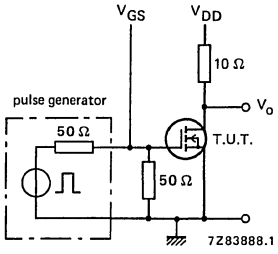


Fig. 3 Switching time test circuit.

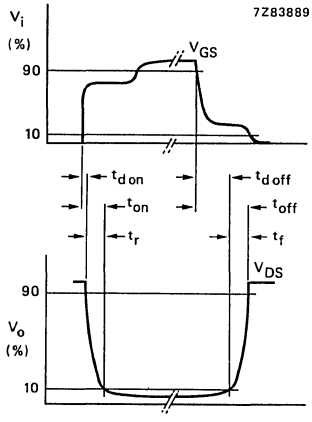


Fig. 4 Switching time waveforms.

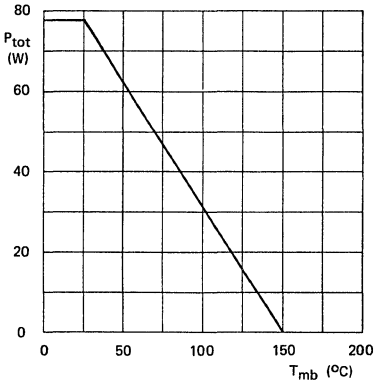


Fig. 5 Power derating curve.

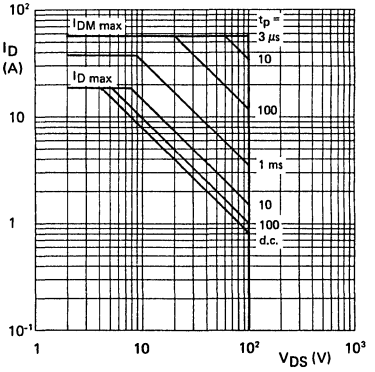


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

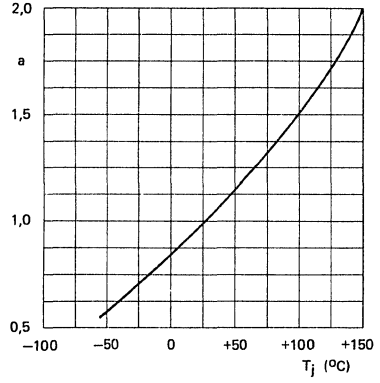


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

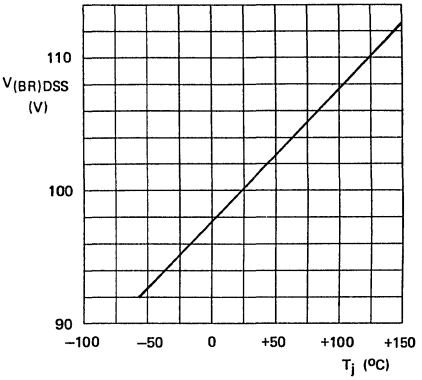


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

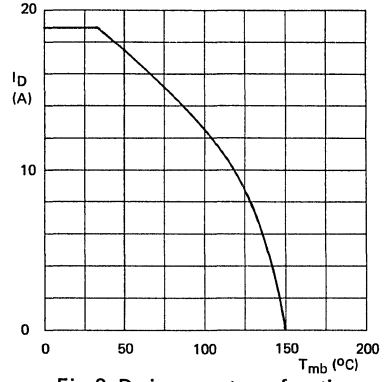


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

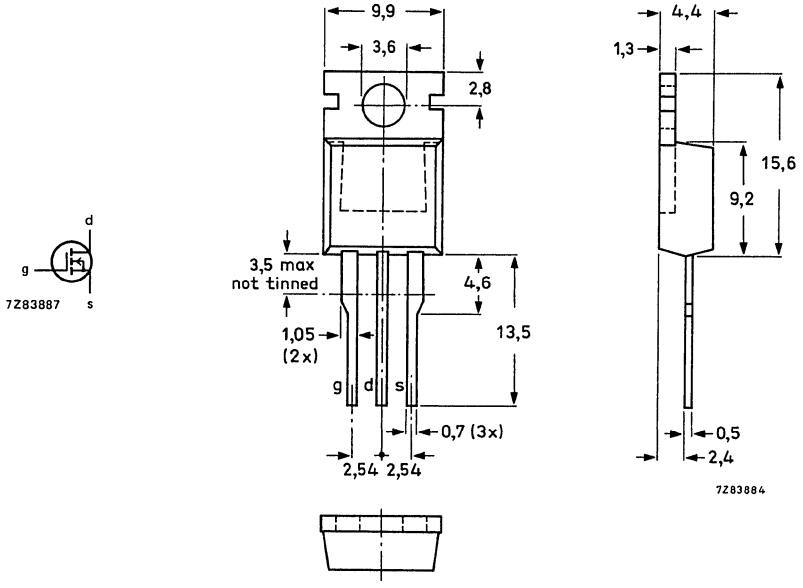
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	7 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,75 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	7 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	21 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V typ. 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <<	1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 4,5 A	$R_{DS\ ON}$	typ. <	0,45 Ω 0,75 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	7 A
Forward current (peak value)	I_{FRM}	<	21 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,15 V 1,50 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 4,5 A	g_{fs}	> 2,2	A/V
		typ. 5	A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1500	pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 300	pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 100	pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 20	ns
rise time	t_r	typ. 60	ns
turn-off times: delay time	$t_{d\,off}$	typ. 120	ns
fall time	t_f	typ. 60	ns

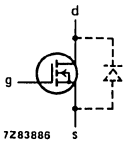


Fig. 2 Diode characteristics.

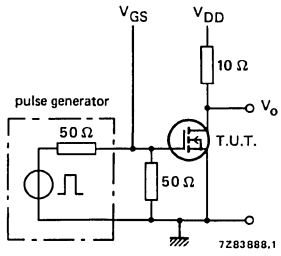


Fig. 3 Switching time test circuit.

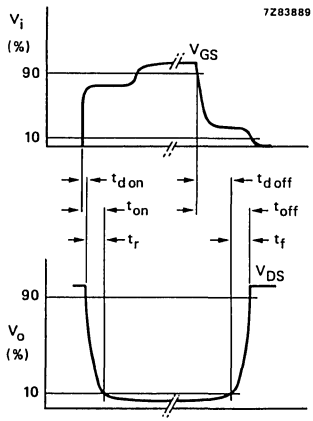


Fig. 4 Switching time waveforms.

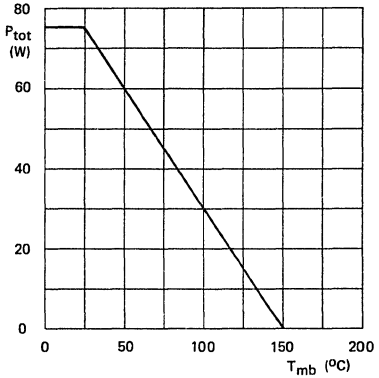


Fig. 5 Power derating curve.

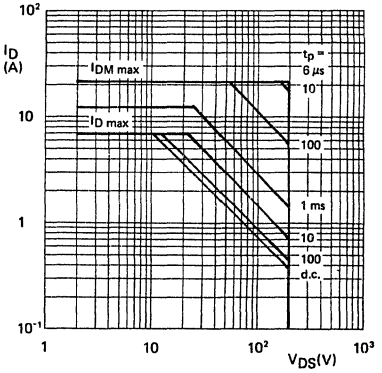


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

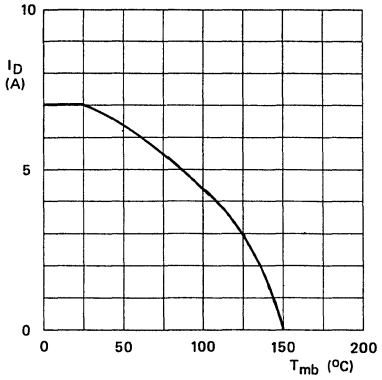


Fig. 7 Drain current as a function of mounting base temperature.

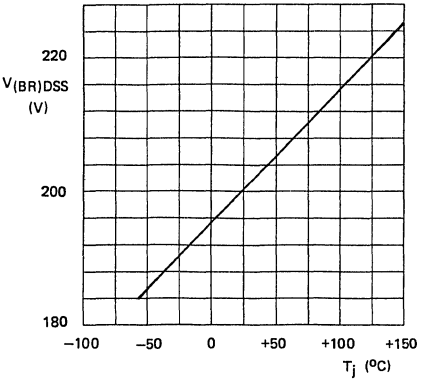


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

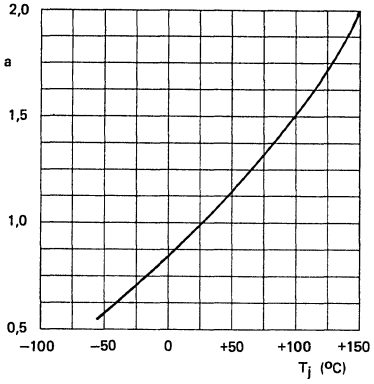


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

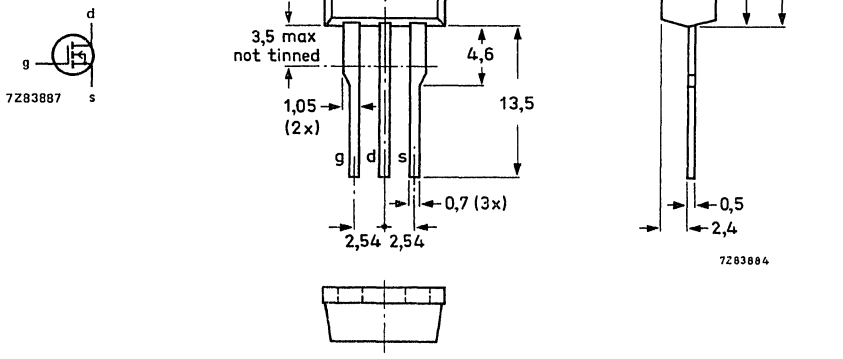
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	12,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	12,5 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	37 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	typ.	0,17 Ω
		<	0,2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12,5 A
Forward current (peak value)	I_{FRM}	<	37 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,4 V
		<	1,8 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 6 A	g_{fs}	> 3	A/V
		typ. 5	A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1000	pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 300	pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 140	pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 20	ns
rise time	t_r	typ. 60	ns
turn-off times: delay time	$t_{d\,off}$	typ. 120	ns
fall time	t_f	typ. 60	ns

DEVELOPMENT SAMPLE DATA

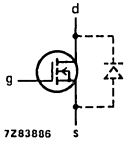


Fig. 2 Diode characteristics.

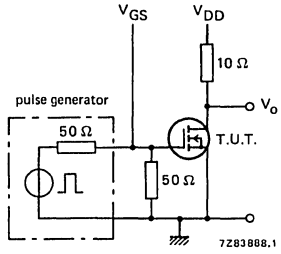


Fig. 3 Switching time test circuit.

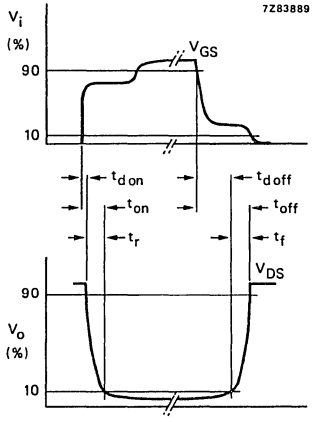


Fig. 4 Switching time waveforms.

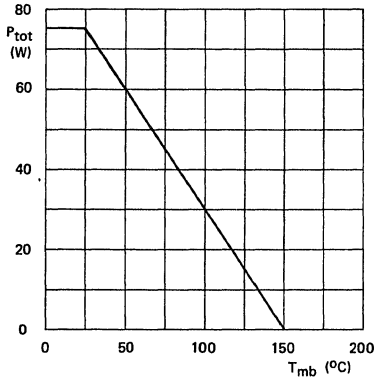


Fig. 5 Power derating curve.

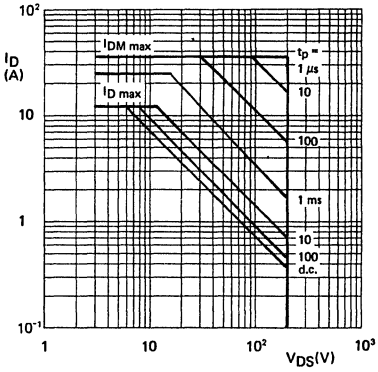


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

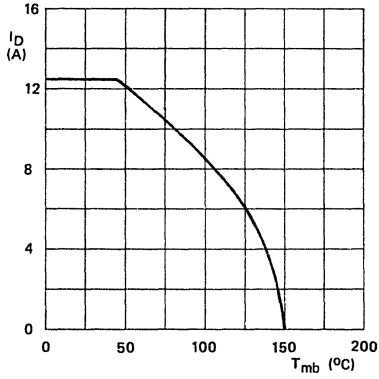


Fig. 7 Drain current as a function of mounting base temperature.

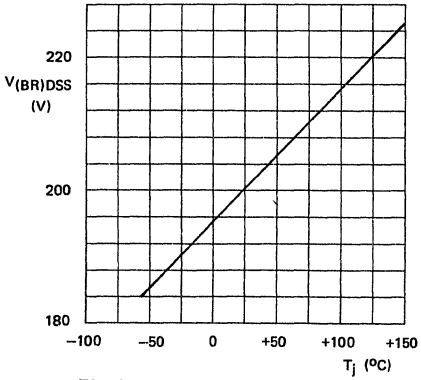


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

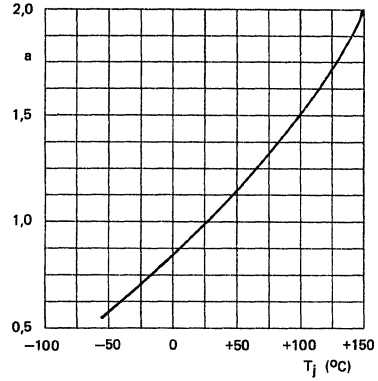


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

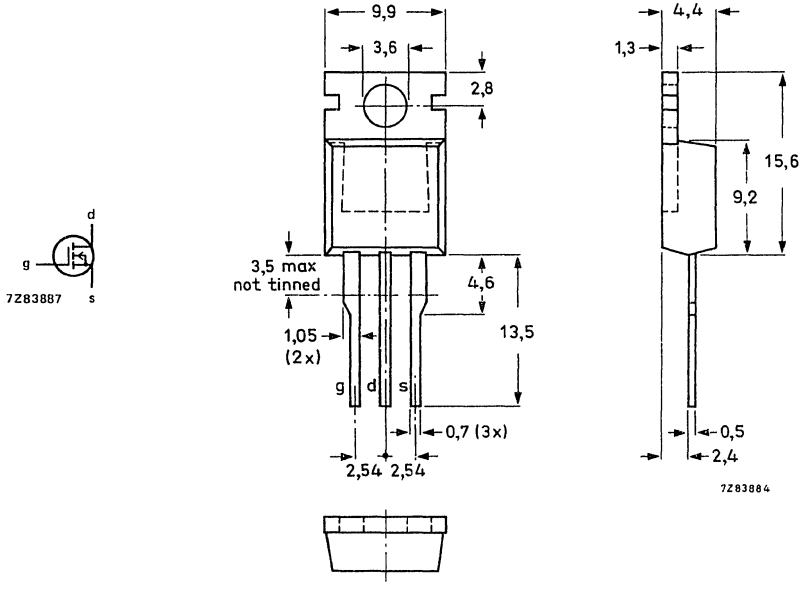
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	9,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	± V_{GS}	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	9,5 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	28 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage			
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage			
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current			
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance			
V_{GS} = 10 V; I_D = 4,5 A	$R_{DS\ ON}$	typ.	0,35 Ω
		<	0,4 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	9,5 A
Forward current (peak value)	I_{FRM}	<	28 A
On-state voltage			
I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,3 V
		<	1,7 V
Reverse recovery			
I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 4,5 A	g_{fs}	>	2,2 A/V
		typ.	5 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	300 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	20 ns
rise time	t_r	typ.	60 ns
turn-off times: delay time	$t_{d\,off}$	typ.	120 ns
fall time	t_f	typ.	60 ns

DEVELOPMENT SAMPLE DATA

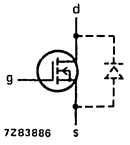


Fig. 2 Diode characteristics.

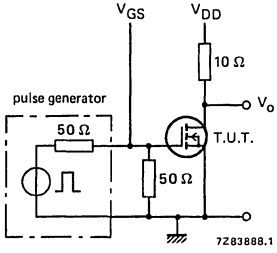


Fig. 3 Switching time test circuit.

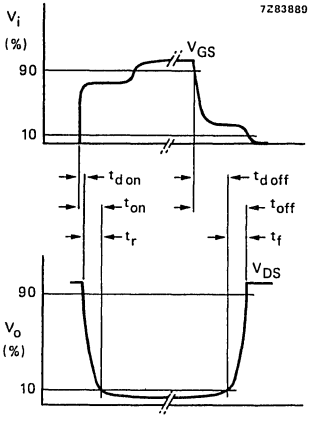


Fig. 4 Switching time waveforms.

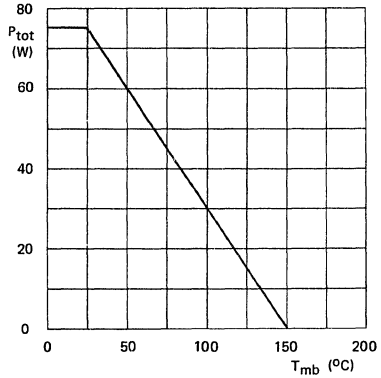


Fig. 5 Power derating curve.

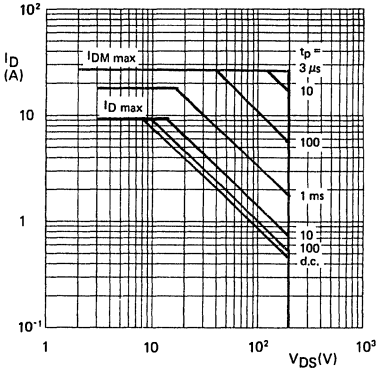


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

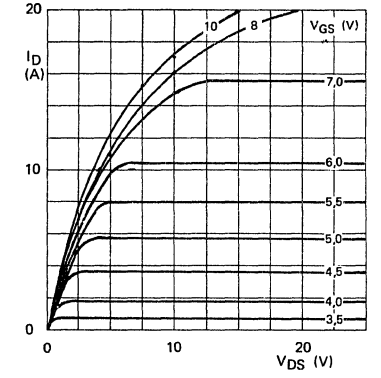


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

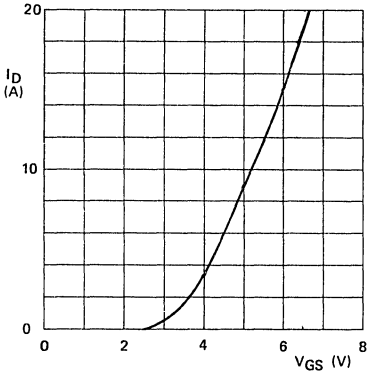


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

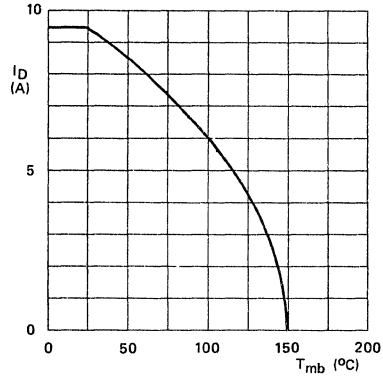


Fig. 9 Drain current as a function
of mounting base temperature.

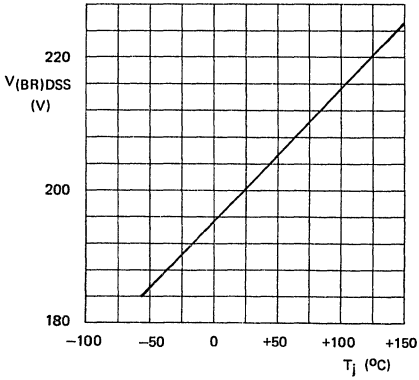


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

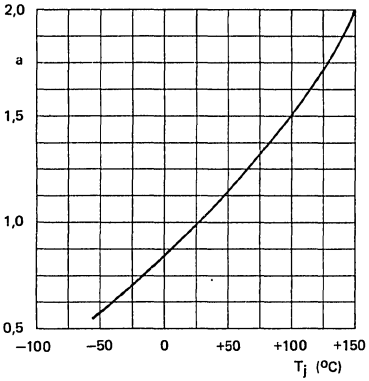


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

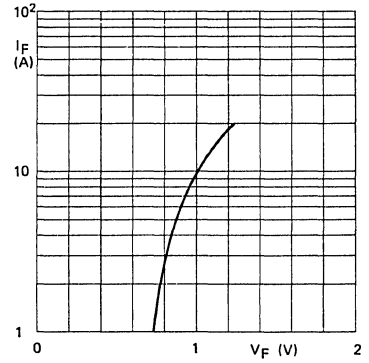


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

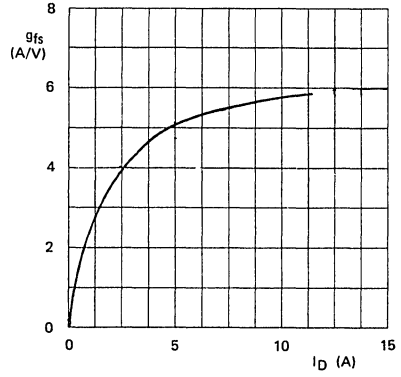


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

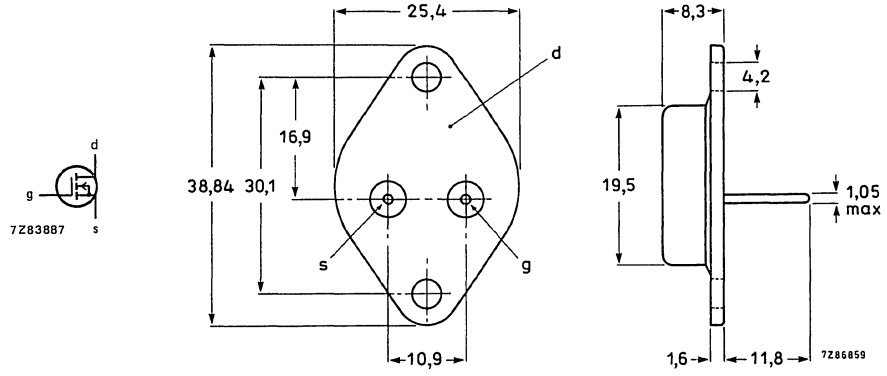
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	7,2 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,75 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	7,2 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	21 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Storage temperature	T_{stg}	−55 to + 150	°C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	 I_{DSS} I_{DSS}	 < <	 1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 4,5 A	$R_{DS\ ON}$	typ. <	0,5 Ω 0,75 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	7,2 A
Forward current (peak value)	I_{FRM}	<	21 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,15 V 1,5 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 4,5 A	g_{fs}	> 2,2 typ. 5	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1500	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 300	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 100	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 20	ns
rise time	t_r	typ. 60	ns
turn-off times: delay time	$t_{d\,off}$	typ. 120	ns
fall time	t_f	typ. 60	ns

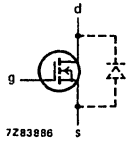


Fig. 2 Diode characteristics.

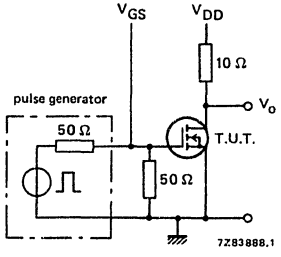


Fig. 3 Switching time test circuit.

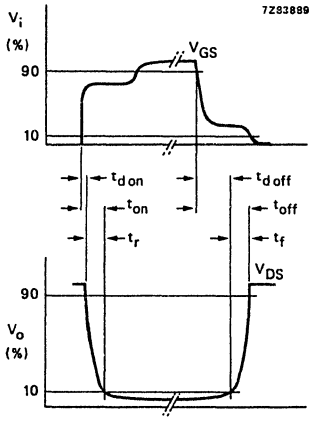


Fig. 4 Switching time waveforms.

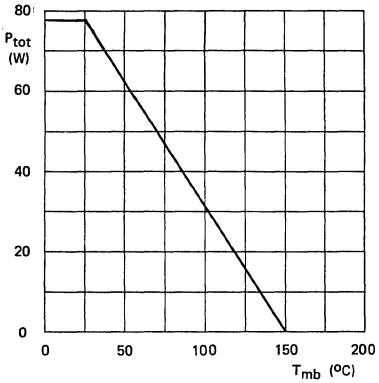


Fig. 5 Power derating curve.

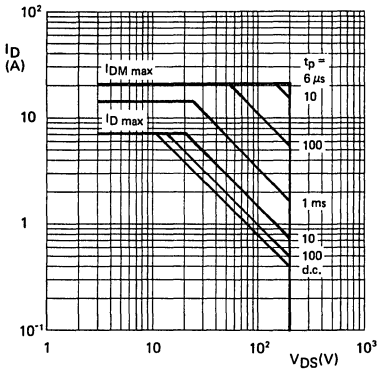


Fig. 6 Safe Operating ARea. T_{mb} = 25 °C; δ = 0,01.

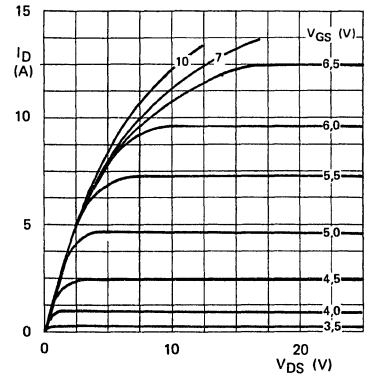


Fig. 7 Output characteristic, 80 μs pulse test; T_{mb} = 25 °C.

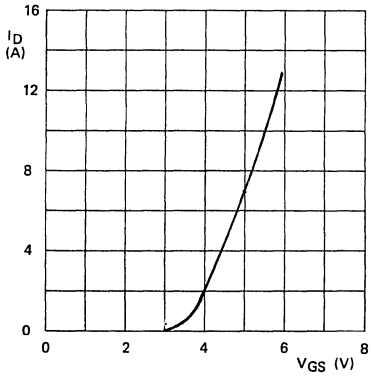


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

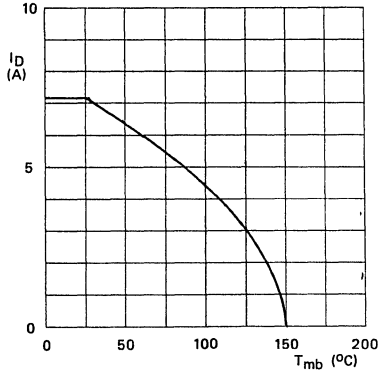


Fig. 9 Drain current as a function of mounting base temperature.

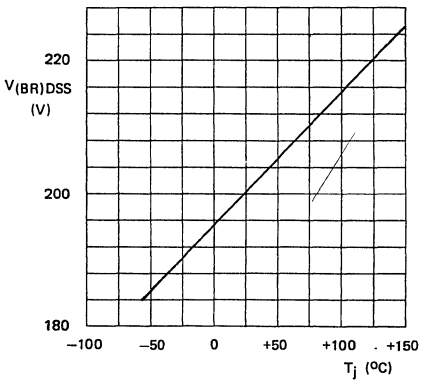


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

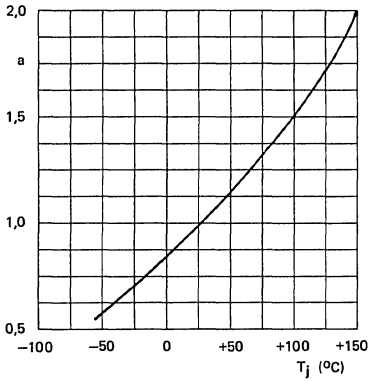


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

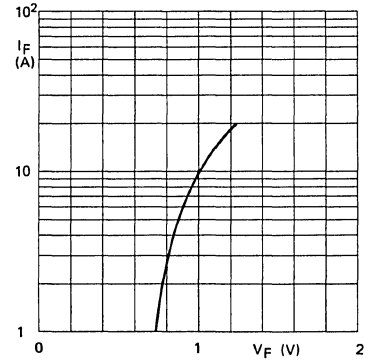


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

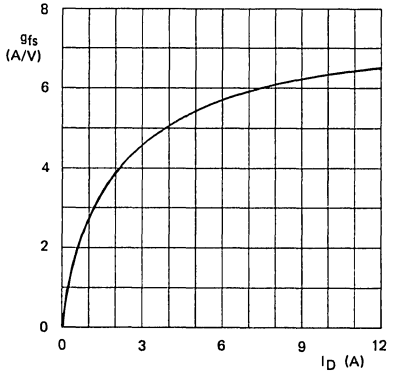


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

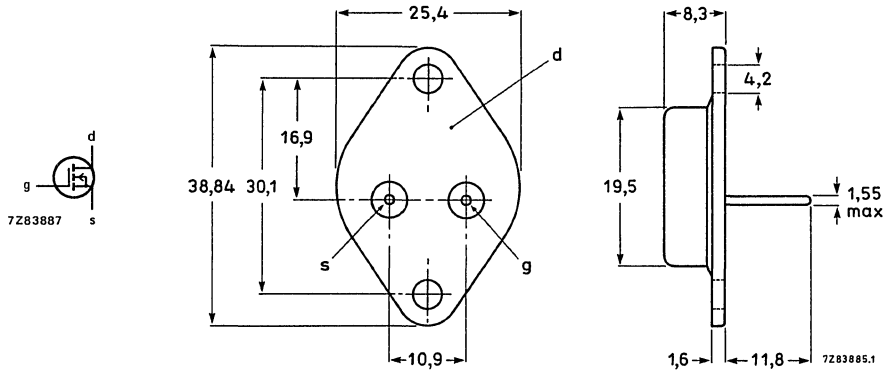
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	17 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	200 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	17 A
Drain current (pulse peak value); T_{mb} = 30 °C	I_{DM}	max.	50 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3,0 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 44 A	$R_{DS\ ON}$	typ.	0,17 Ω
		<	0,2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	17 A
Forward current (peak value)	I_{FRM}	<	50 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,15 V
		<	1,55 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 44 A	g_{fs}	>	3 A/V
		typ.	5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	900 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	500 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	200 ns
turn-off times: delay time	$t_{d\,off}$	typ.	300 ns
fall time	t_f	typ.	200 ns

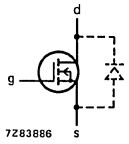


Fig. 2 Diode characteristics.

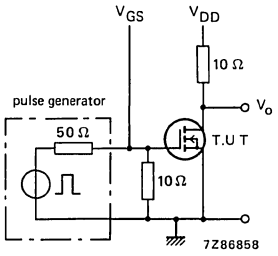


Fig. 3 Switching time test circuit.

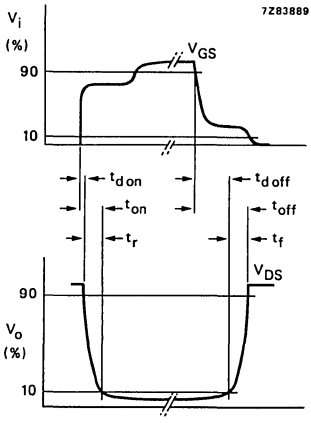


Fig. 4 Switching time waveforms.

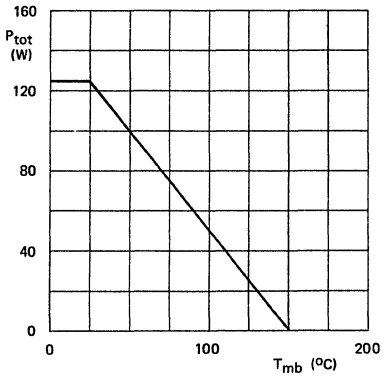


Fig. 5 Power derating curve.

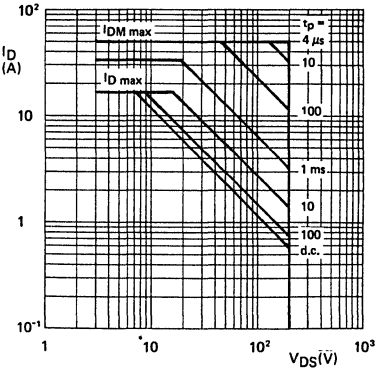


Fig. 6 Safe Operating AREa.
T_{mb} = 25 °C; δ = 0,01.

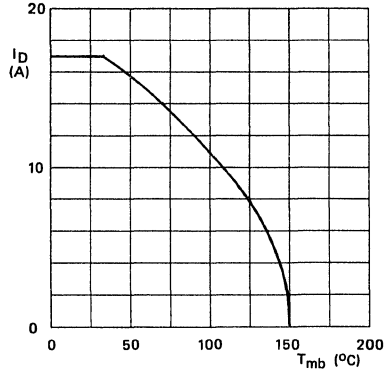


Fig. 7 Drain current as a function of mounting base temperature.

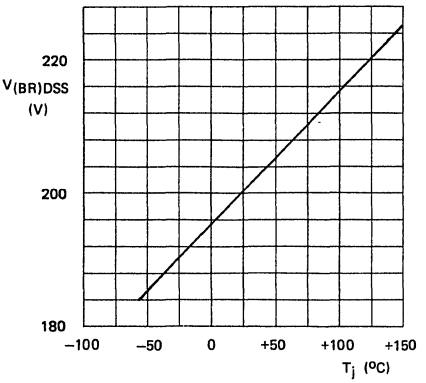


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

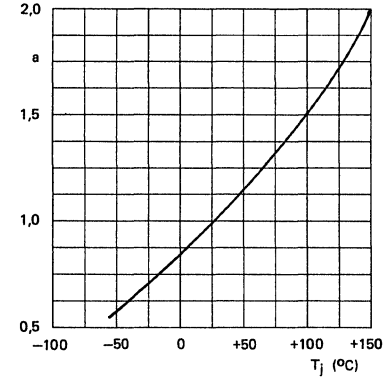


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

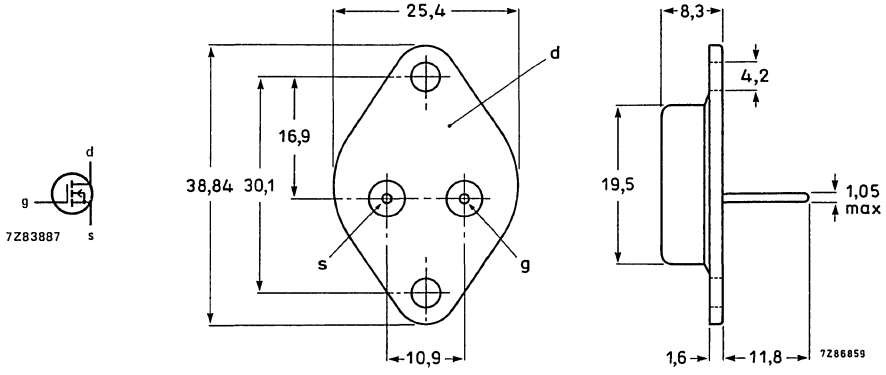
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	9,9 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	60 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	9,9 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	29 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 4,5 A	$R_{DS\ ON}$	typ.	0,35 Ω
		<	0,4 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	9,9 A
Forward current (peak value)	I_{FRM}	<	29 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,3 V
		<	1,7 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	400 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 4,5 A	g_{fs}	> typ.	2,2 A/V 5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	300 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	20 ns
rise time	t_r	typ.	60 ns
turn-off times: delay time	$t_{d\,off}$	typ.	120 ns
fall time	t_f	typ.	60 ns

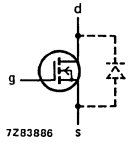


Fig. 2 Diode characteristics.

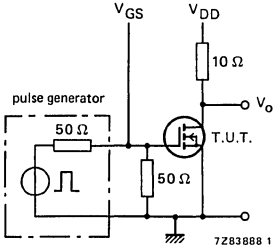


Fig. 3 Switching time test circuit.

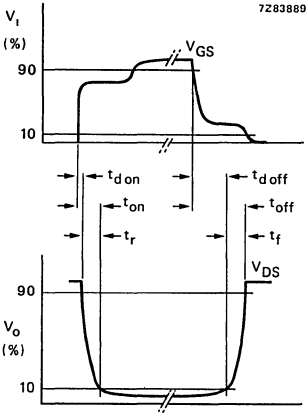


Fig. 4 Switching time waveforms.

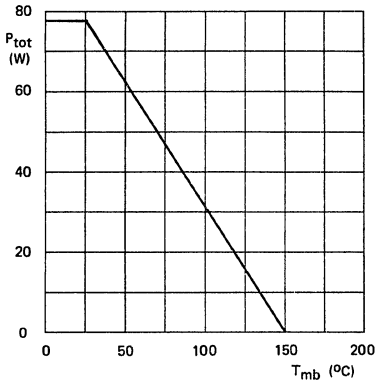


Fig. 5 Power derating curve.

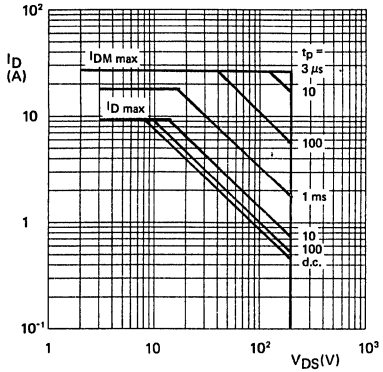


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

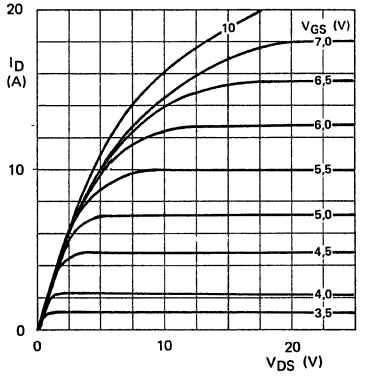


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

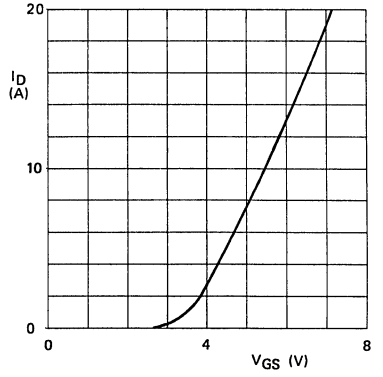


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

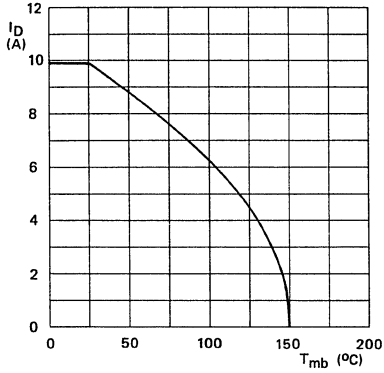


Fig. 9 Drain current as a function
of mounting base temperature.

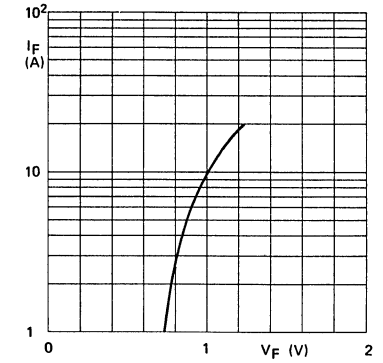


Fig. 10 Diode forward current as a function
of forward voltage. t_p = 80 μs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

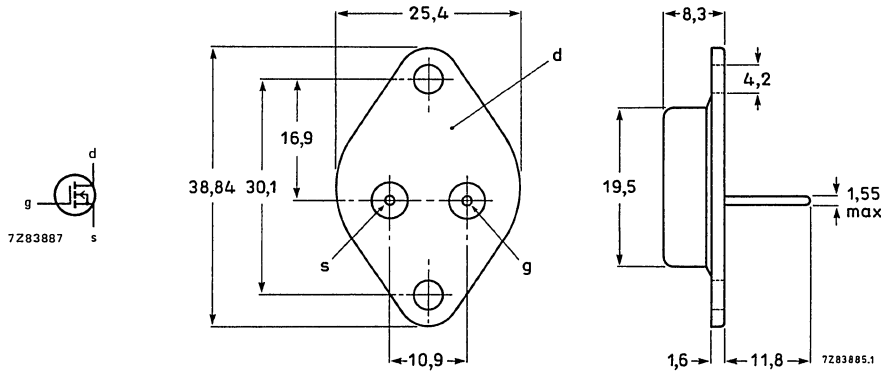
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.)	I_D	max.	22 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\,ON}$	<	0,12 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = A; V_{GS} = 10 V	t_f	typ.	200 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	22	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	65	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 11 A	$R_{DS\ ON}$	<	0,12	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	22	A
Forward current (peak value)	I_{FRM}	<	65	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,2	V
		<	1,7	V
Reverse recovery I_F = 2 I_D; DI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	400	ns
recovery charge	Q_s	typ.	6	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 11 A	g_{fs}	>	9 A/V
		typ.	13 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	900 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	500 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	200 ns
turn-off times: delay time	$t_{d\,off}$	typ.	300 ns
fall time	t_f	typ.	200 ns

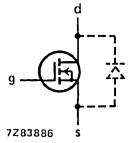


Fig. 2 Diode characteristics.

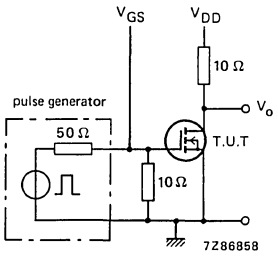


Fig. 3 Switching time test circuit.

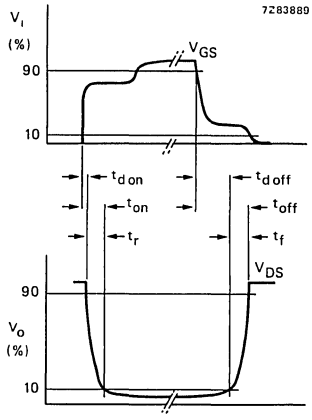


Fig. 4 Switching time waveforms.

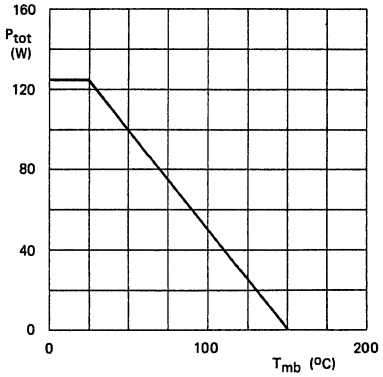


Fig. 5 Power derating curve.

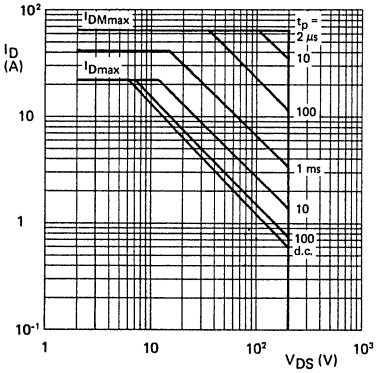


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

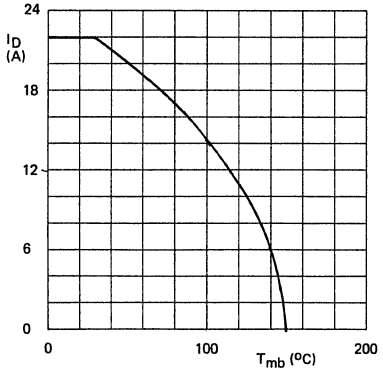


Fig. 7 Drain current as a function of mounting base temperature.

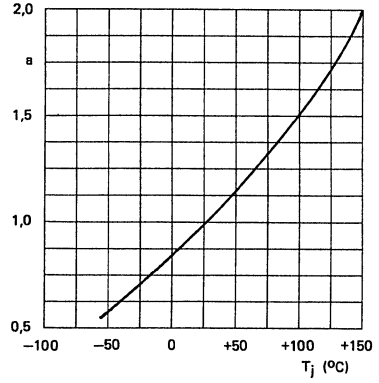


Fig. 8 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

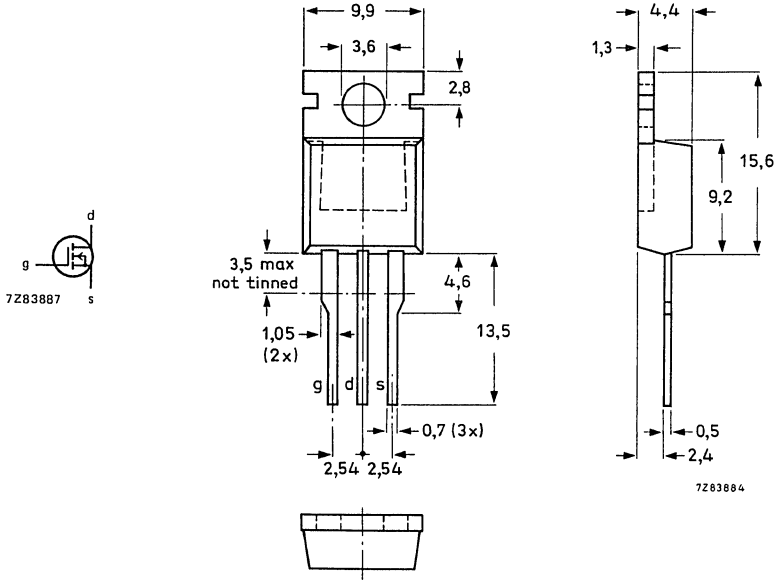
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	2,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	4,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 45 °C	I_D	max.	2,5	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7,5	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	typ.	3,0	Ω
		<	4,5	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,5	A
Forward current (peak value)	I_{FRM}	<	7,5	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,0	V
		<	1,3	V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs; T_j = 25 °C				
recovery time	t_{rr}	typ.	1200	ns
recovery charge	Q_s	typ.	6	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,5 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

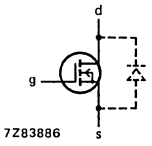


Fig. 2 Diode characteristics.

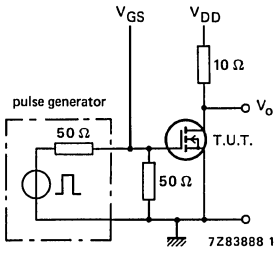


Fig. 3 Switching time test circuit.

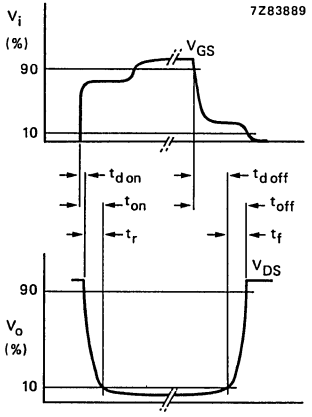


Fig. 4 Switching time waveforms.

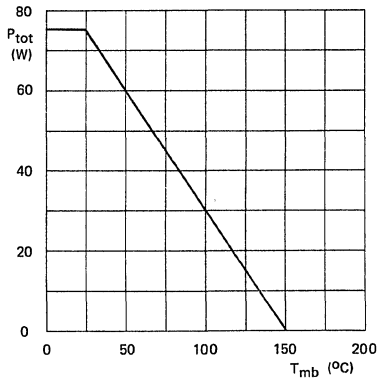


Fig. 5 Power derating curve.

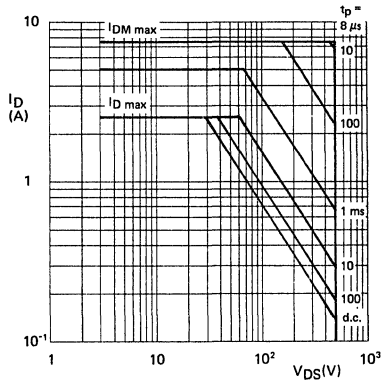


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

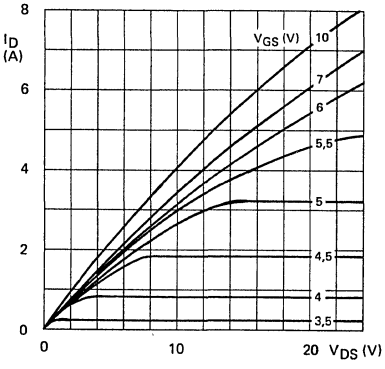


Fig. 7 Output characteristics,
80 µs pulse test; T_{mb} = 25 °C.

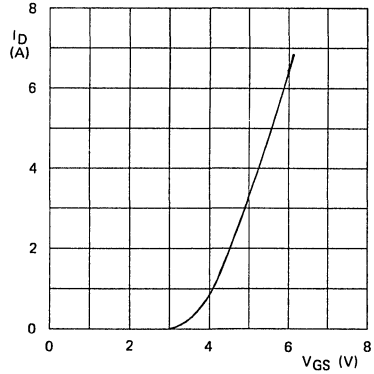


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

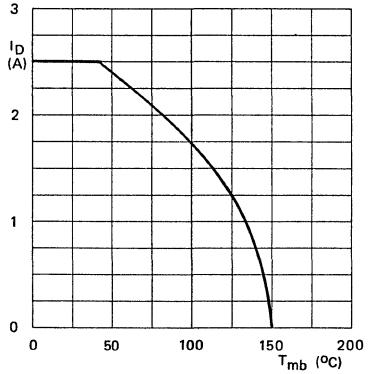


Fig. 9 Drain current as a function
of mounting base temperature.

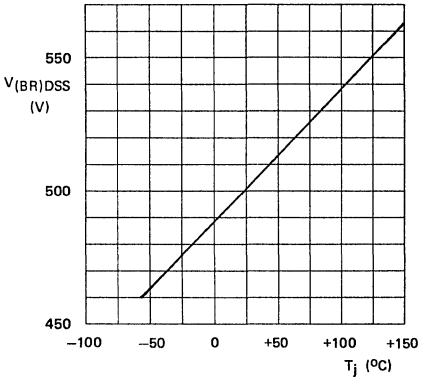


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

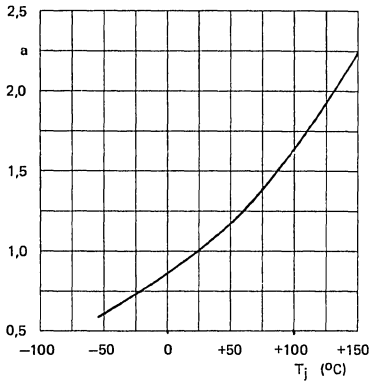


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

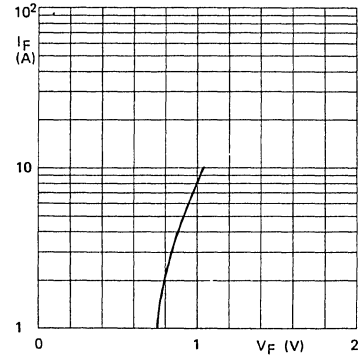


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

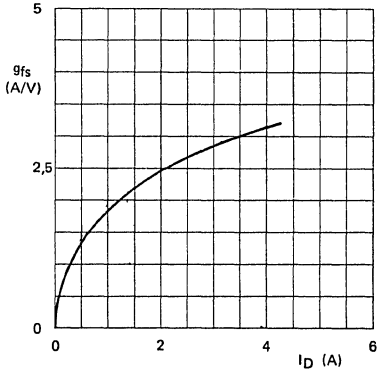


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

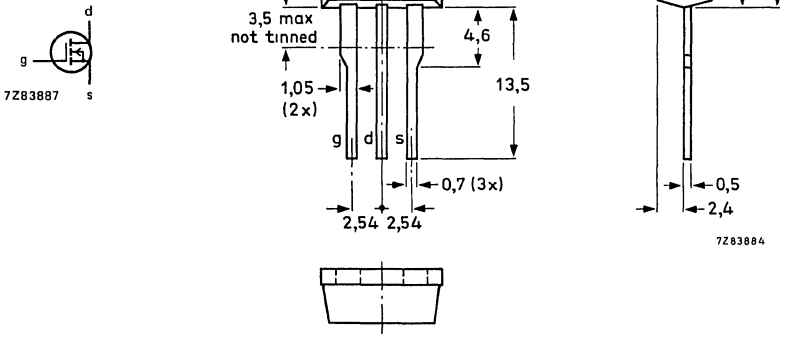
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	4,5 A
Total power dissipation	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	± V_{GS}	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	4,5 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	13 A
Total power dissipation	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	typ.	1,4 Ω
		<	1,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,5 A
Forward current (peak value)	I_{FRM}	<	13 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,1 V
		<	1,5 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs; T_j = 25 °C			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,5 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

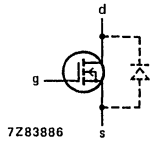


Fig. 2 Diode characteristics.

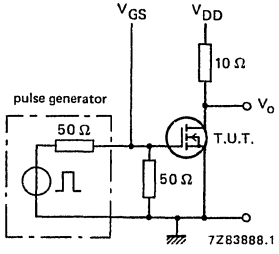


Fig. 3 Switching time test circuit.

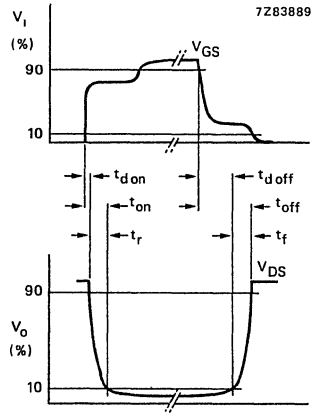


Fig. 4 Switching time waveforms.

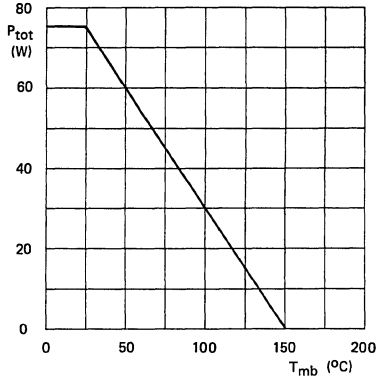


Fig. 5 Power derating curve.

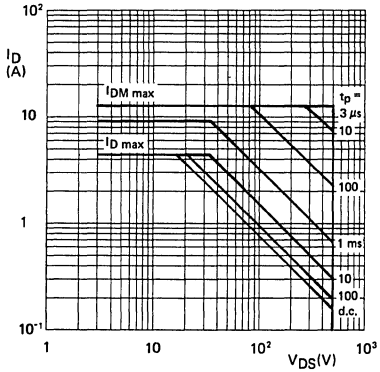


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

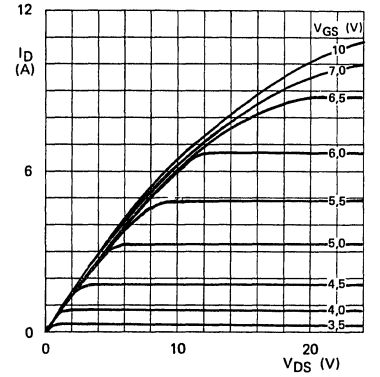


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

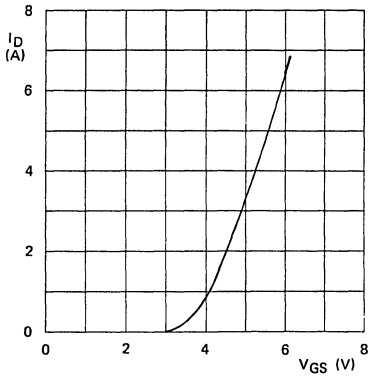


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

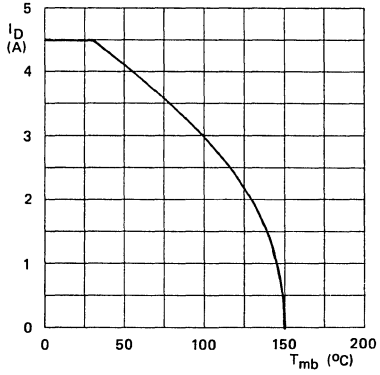


Fig. 9 Drain current as a function
of mounting base temperature.

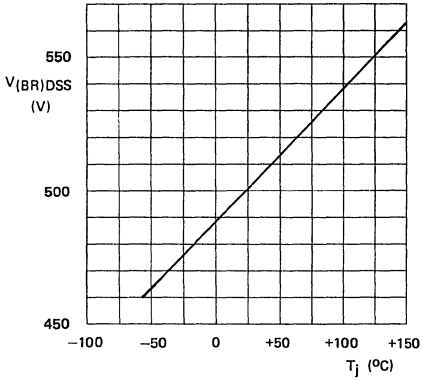


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

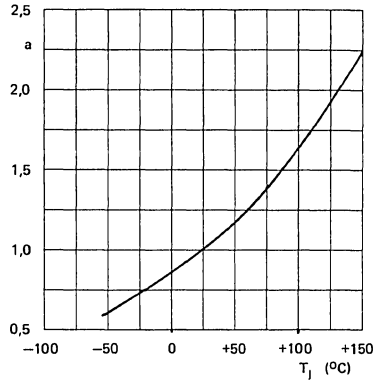


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

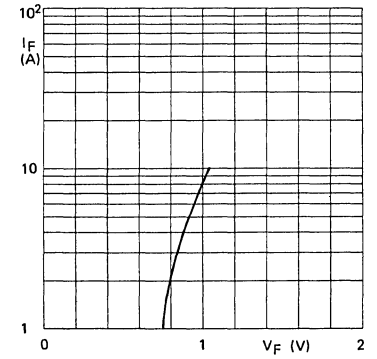


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

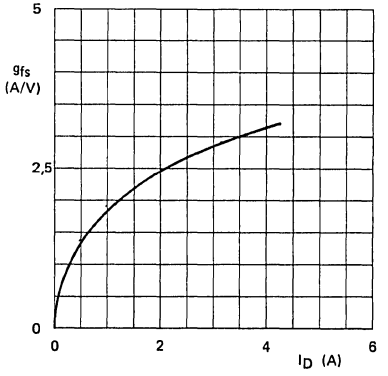


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

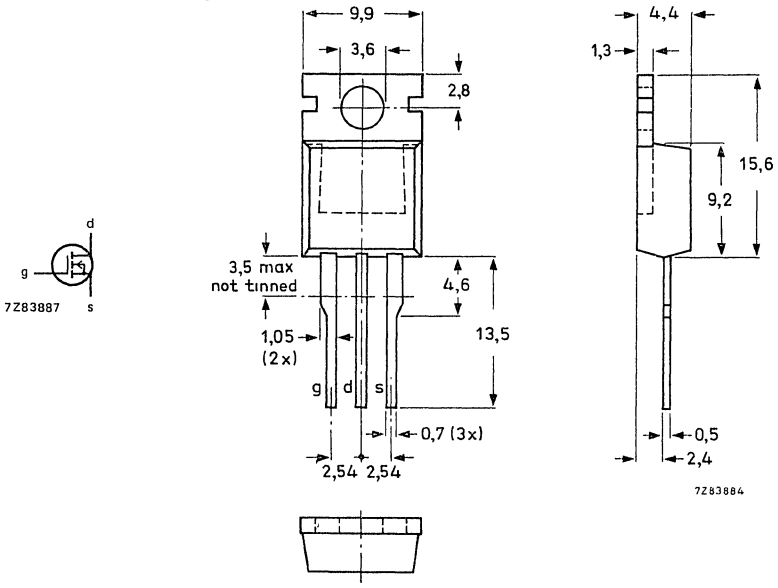
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	4 A
Total power dissipation	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2,0 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	± V_{GS}	max.	20 V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	4 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	12 A
Total power dissipation	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3,0 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	typ.	1,8 Ω
		<	2,0 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4 A
Forward current (peak value)	I_{FRM}	<	12 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,1 V
		<	1,5 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,5 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

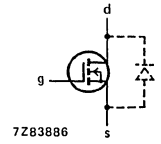


Fig. 2 Diode characteristics.

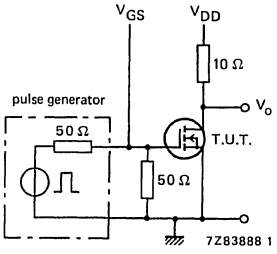


Fig. 3 Switching time test circuit.

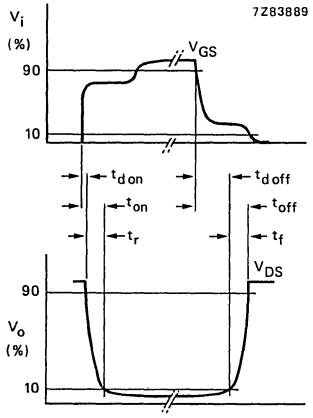


Fig. 4 Switching time waveforms.

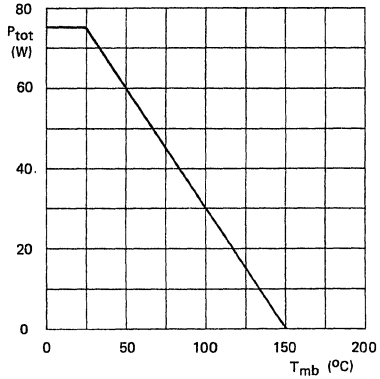


Fig. 5 Power derating curve.

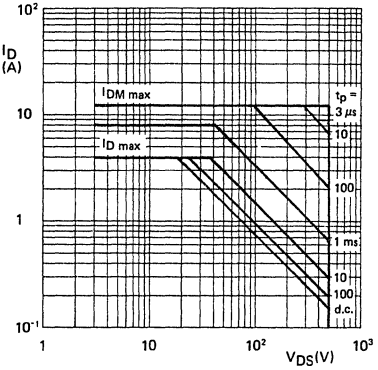


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

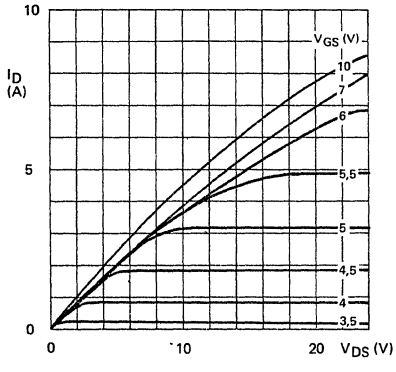


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

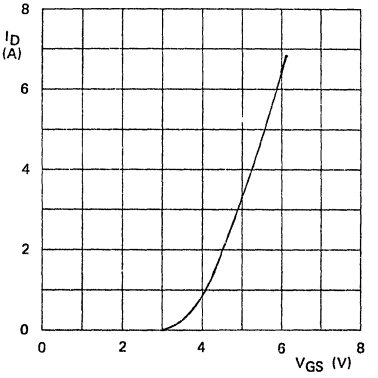


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

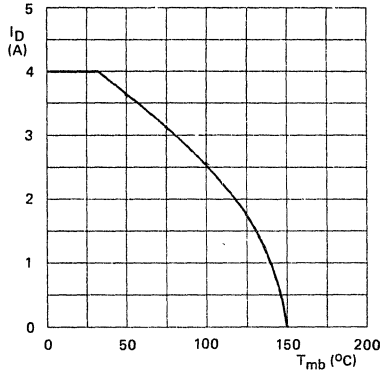


Fig. 9 Drain current as a function
of mounting base temperature.

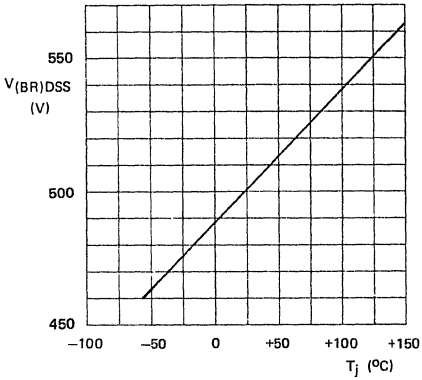


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

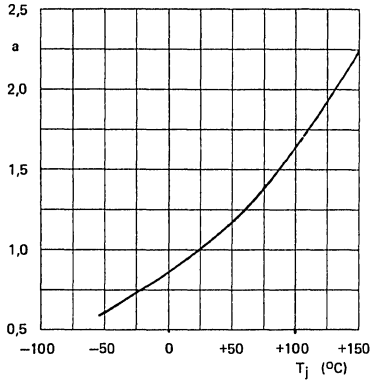


Fig. 11 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

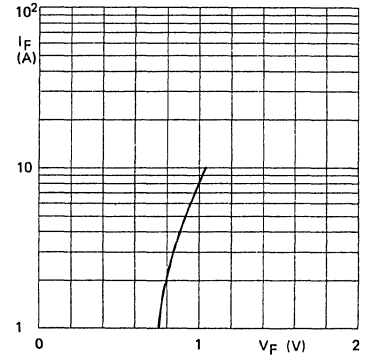


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

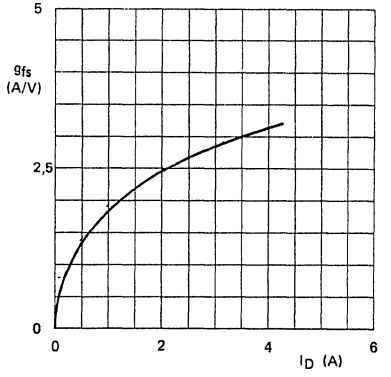


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

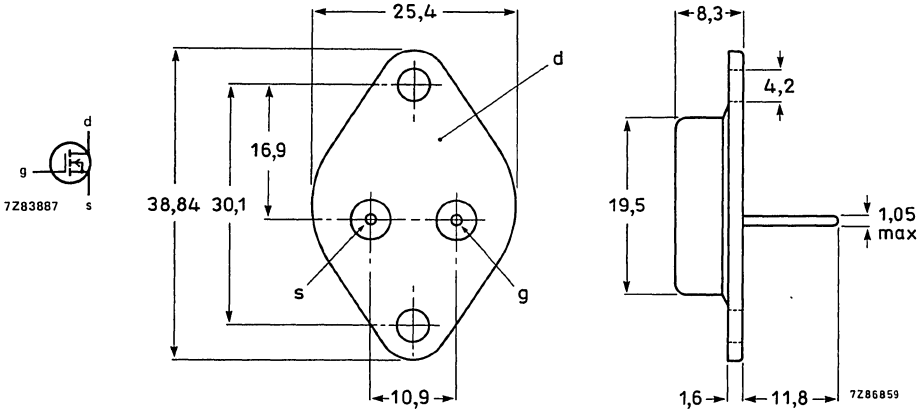
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	2,8 A
Total power dissipation	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	4,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	2,8 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	8,0 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	typ.	3 Ω
		<	4,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,8 A
Forward current (peak value)	I_{FRM}	<	8,0 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	6,0 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> 1,5 typ. 2,5	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1600	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 90	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 30	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 30	ns
rise time	t_r	typ. 70	ns
turn-off times: delay time	$t_{d\,off}$	typ. 160	ns
fall time	t_f	typ. 100	ns

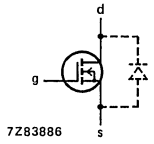


Fig. 2 Diode characteristics.

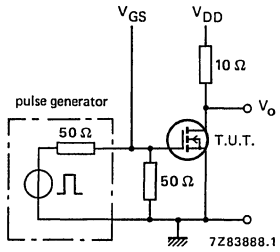


Fig. 3 Switching time test circuit.

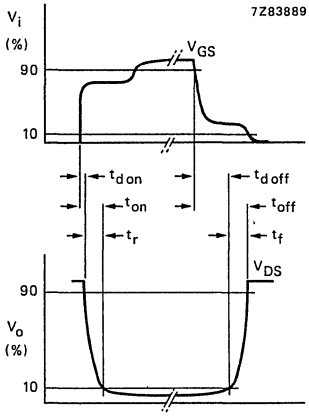


Fig. 4 Switching time waveforms.

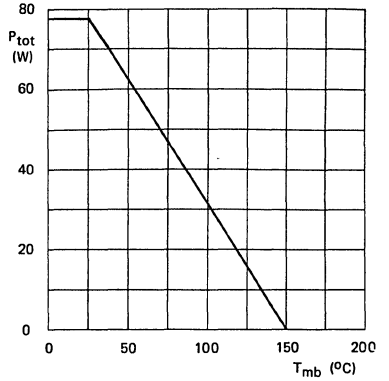


Fig. 5 Power derating curve.

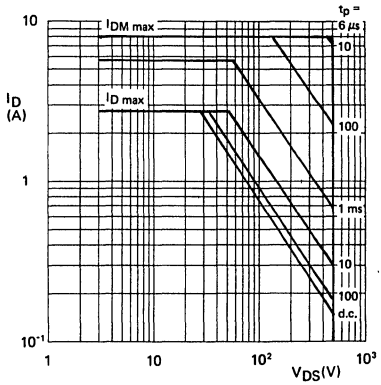


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

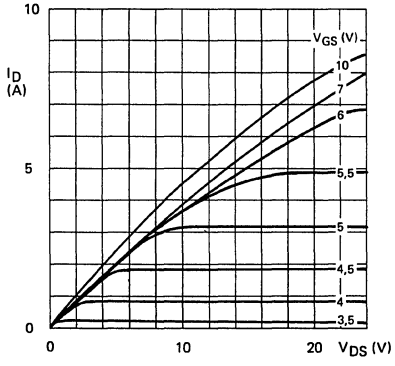


Fig. 7 Output characteristic,
80 µs pulse test; T_{mb} = 25 °C.

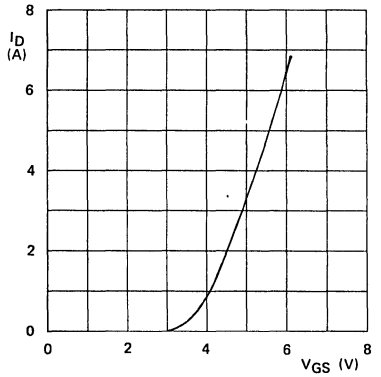


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

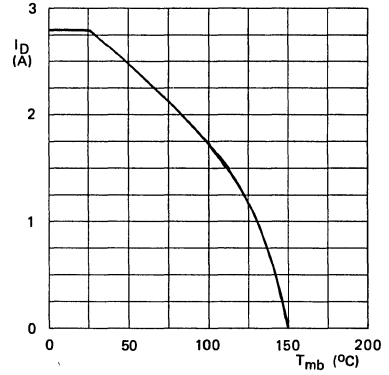


Fig. 9 Drain current as a function
of mounting base temperature.

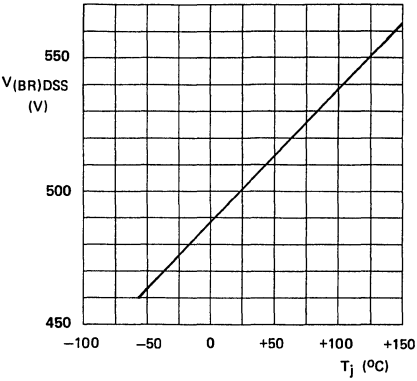


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

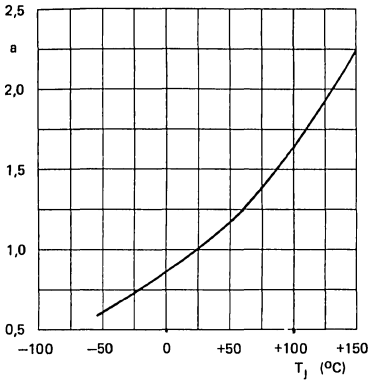


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

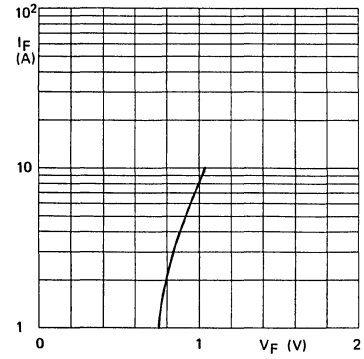


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

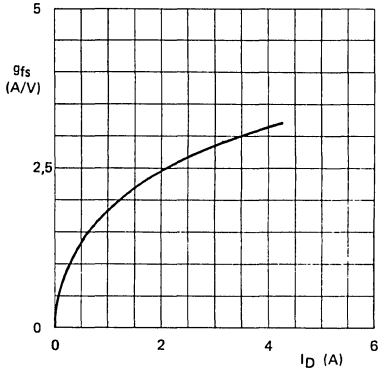


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

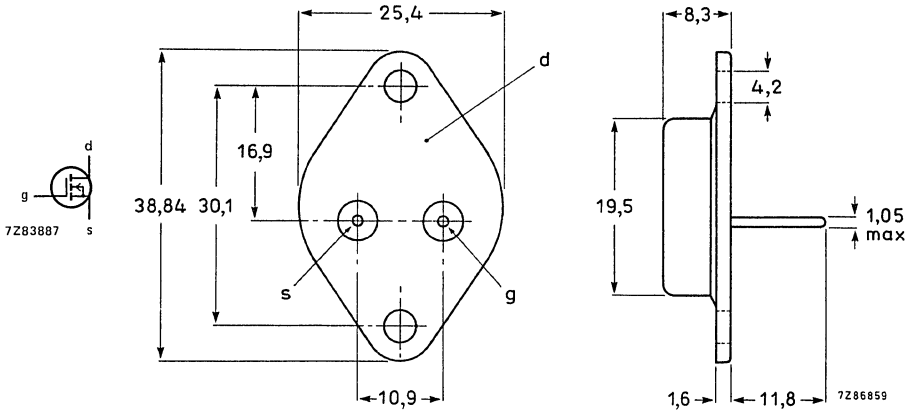
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	4,8 A
Total power dissipation	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	4,8 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	14 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}	−55 to +	150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	1,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,8 A
Forward current (peak value)	I_{FRM}	<	14 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,15 V
		<	1,5 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,5 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

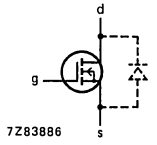


Fig. 2 Diode characteristics.

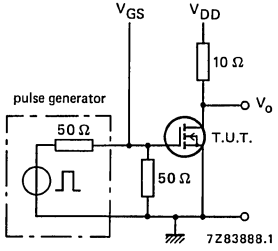


Fig. 3 Switching time test circuit.

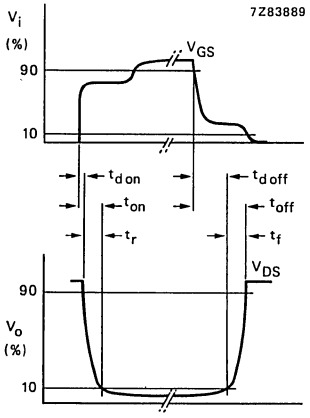


Fig. 4 Switching time waveforms.

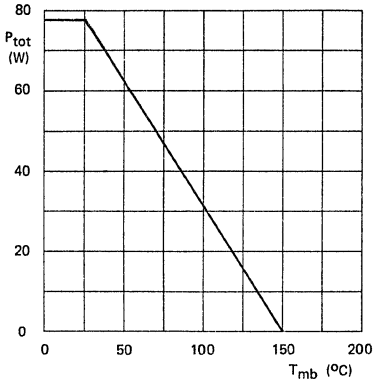


Fig. 5 Power derating curve.

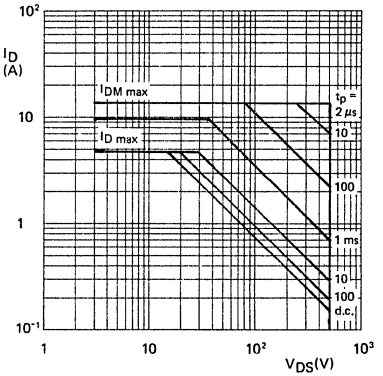


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

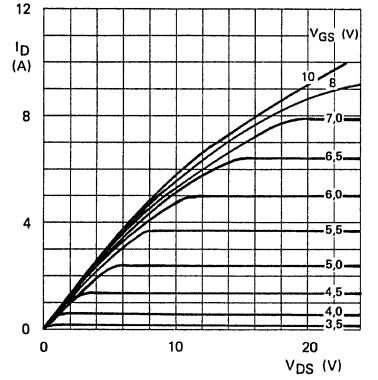


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

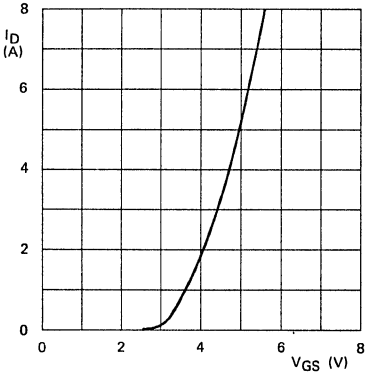


Fig. 8 Typical transfer characteristic
V_{DS} = 25 V; 80 μs pulse test; T_j = 25 °C.

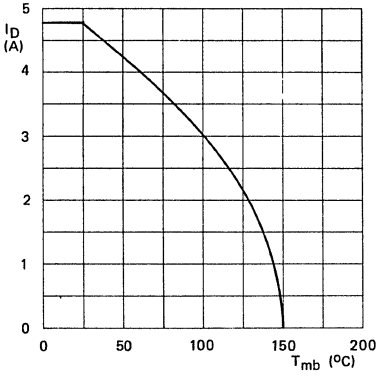


Fig. 9 Drain current as a function
of mounting base temperature.

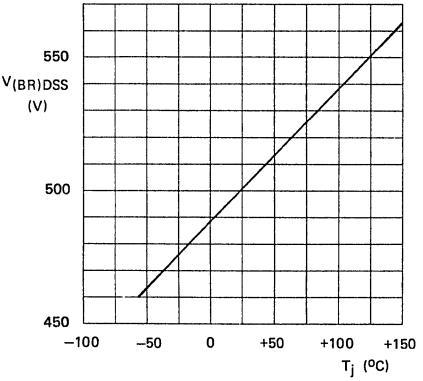


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

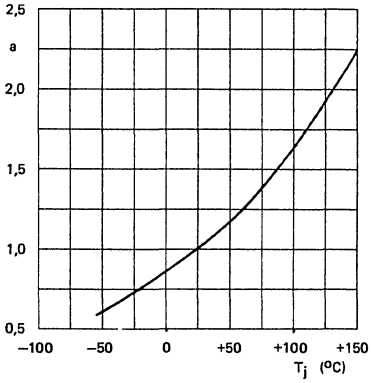


Fig. 11 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

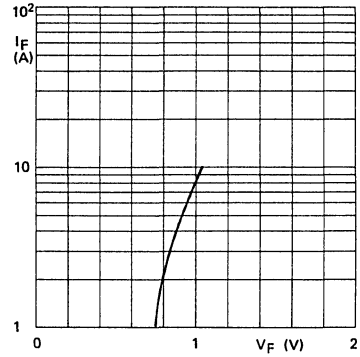


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

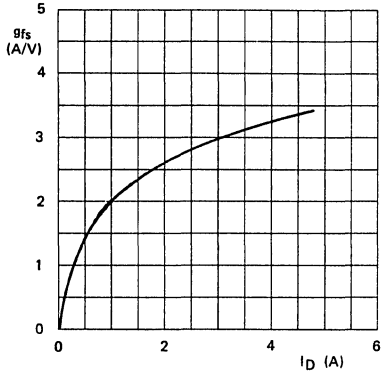


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

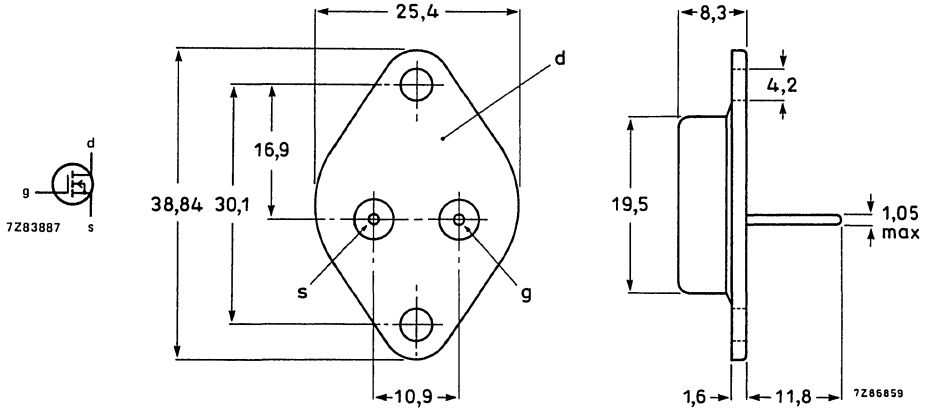
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	9,6 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,6 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	± V_{GS}	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	9,6 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	28 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	typ.	0,55 Ω
		<	0,6 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	9,6 A
Forward current (peak value)	I_{FRM}	<	28 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,3 V
		<	1,7 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> typ.	2,7 A/V 5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	450 ns
fall time	t_f	typ.	100 ns

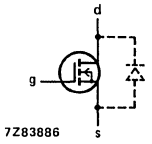


Fig. 2 Diode characteristics.

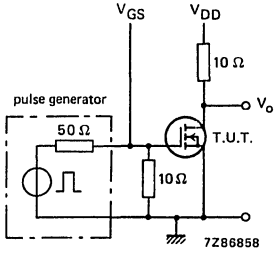


Fig. 3 Switching time test circuit.

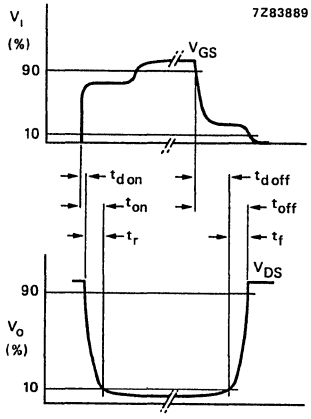


Fig. 4 Switching time waveforms.

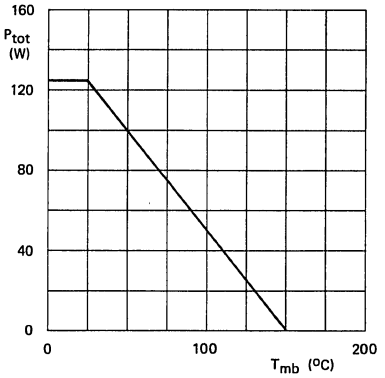


Fig. 5 Power derating curve.

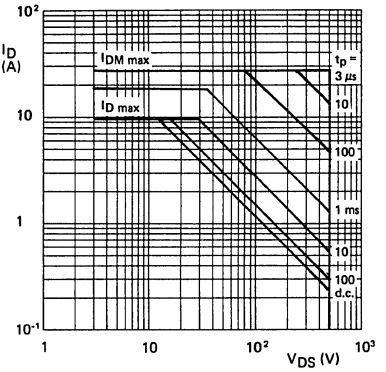


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

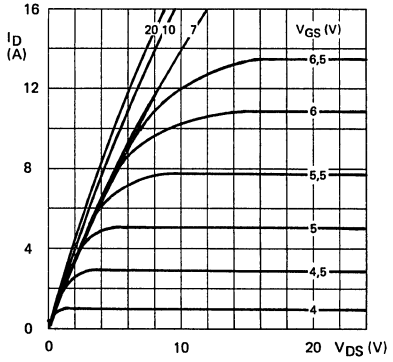


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

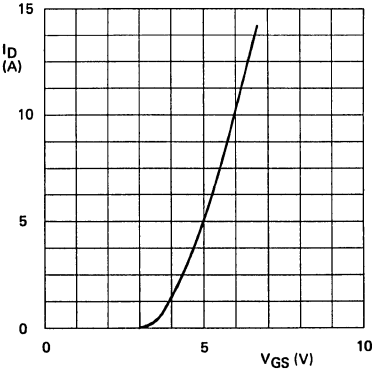


Fig. 8 Typical transfer characteristic
V_{DS} = 25 V; 80 μs pulse test; T_j = 25 °C.

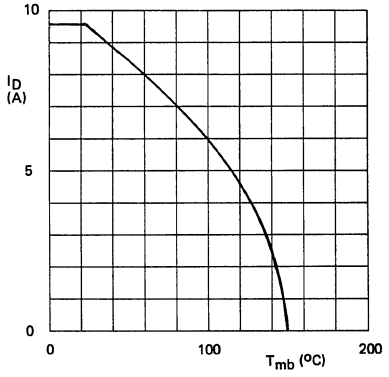


Fig. 9 Drain current as a function
of mounting base temperature.

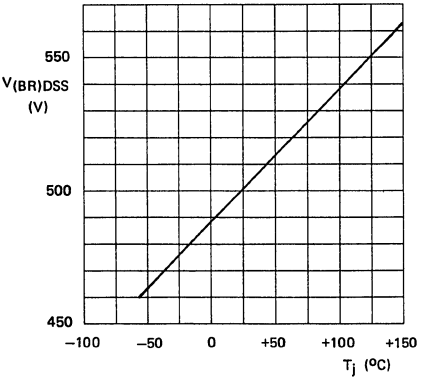


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

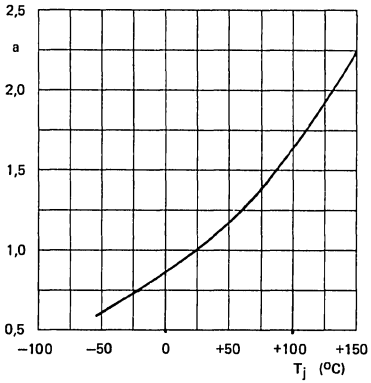


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

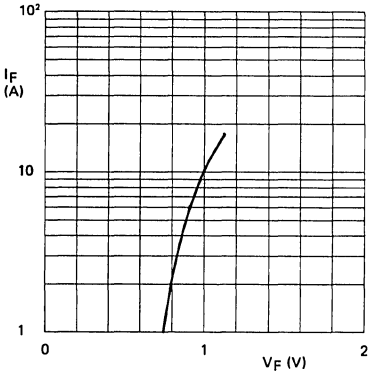


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

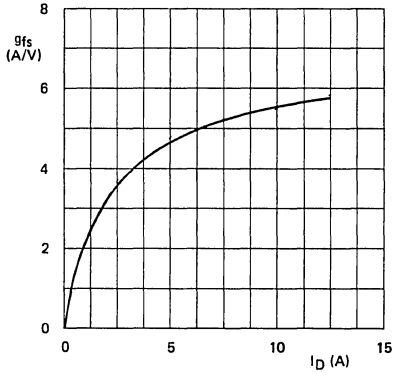


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

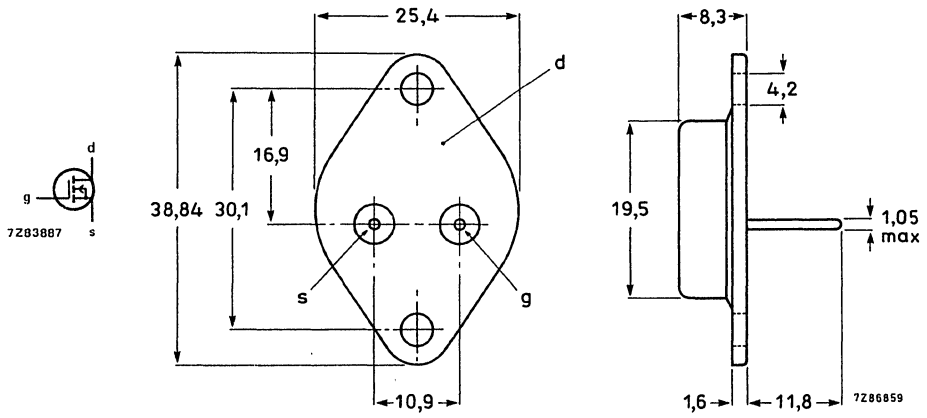
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	8,3 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,8 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	8,3 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	24 A
Total power dissipation	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	 I_{DSS} I_{DSS}	 < <	 1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	typ. <	0,7 Ω 0,8 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	8,3 A
Forward current (peak value)	I_{FRM}	<	24 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ. <	1,3 V 1,6 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> typ.	2,7 A/V 5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	450 ns
fall time	t_f	typ.	100 ns

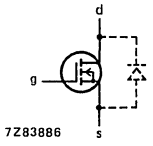


Fig. 2 Diode characteristics.

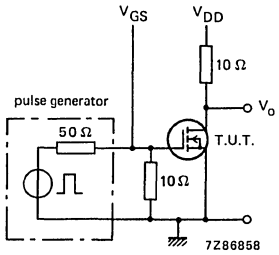


Fig. 3 Switching time test circuit.

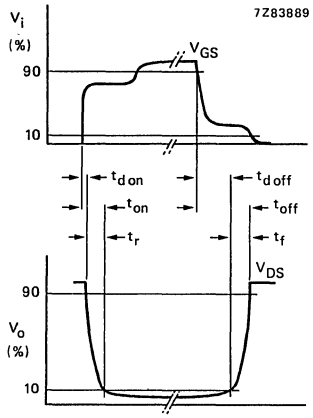


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

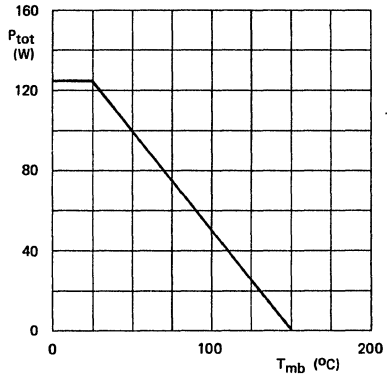


Fig. 5 Power derating curve.

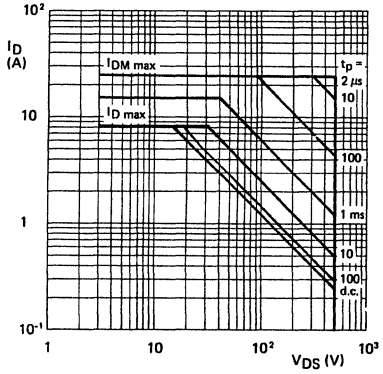


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

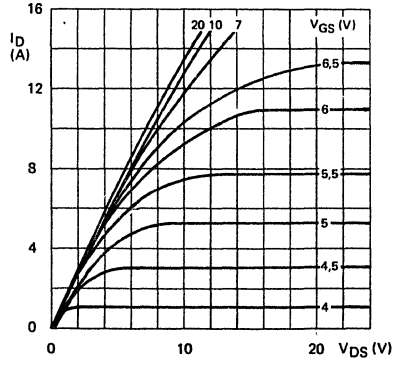


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

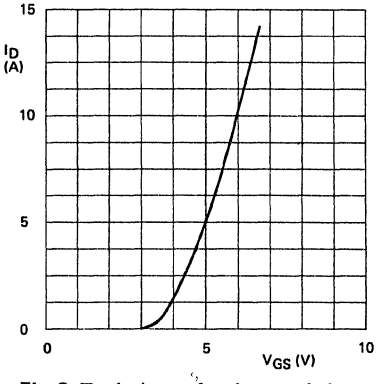


Fig. 8 Typical transfer characteristic
V_{DS} = 25 V; 80 μs pulse test; T_j = 25 °C.

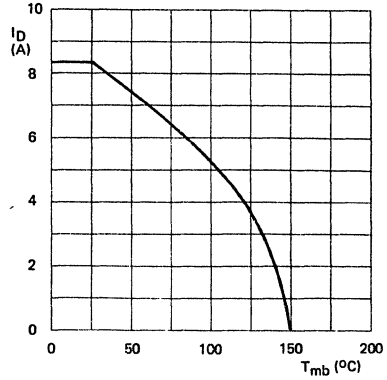


Fig. 9 Drain current as a function
of mounting base temperature.

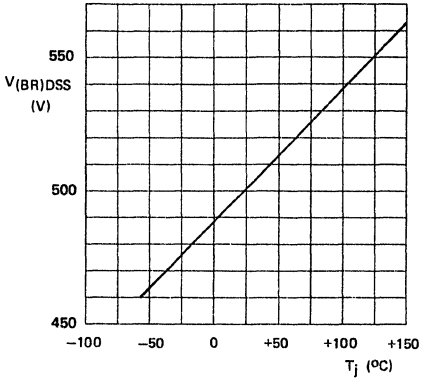


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

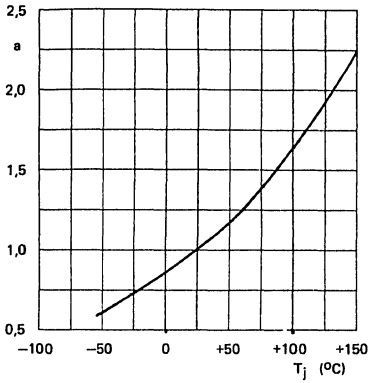


Fig. 11 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

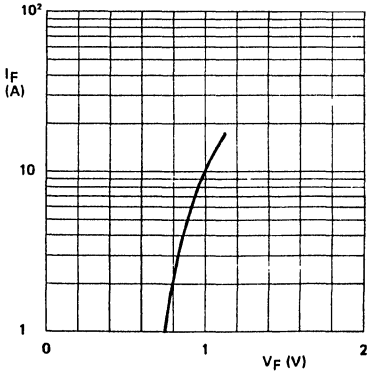


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

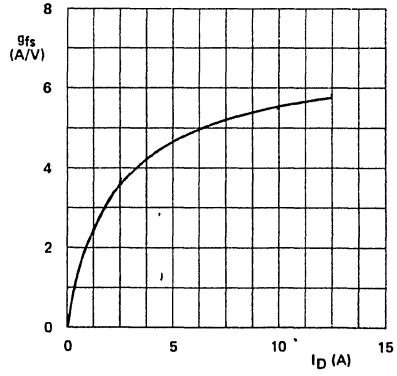


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

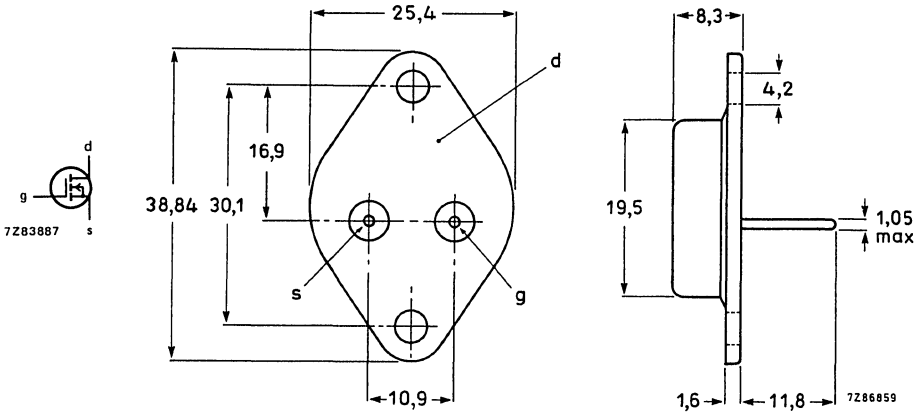
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	10 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	10 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	30 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}	−55 to + 150	°C
Junction temperature	T_j	max. + 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	 I_{DSS} I_{DSS}	 < <	 1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	<	0,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	10 A
Forward current (peak value)	I_{FRM}	<	30 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,3 V 1,7 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> 2,7 typ. 5	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 3500	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 200	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 100	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 50	ns
rise time	t_r	typ. 100	ns
turn-off times: delay time	$t_{d\,off}$	typ. 450	ns
fall time	t_f	typ. 100	ns

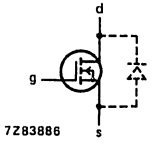


Fig. 2 Diode characteristics.

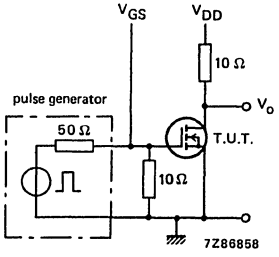


Fig. 3 Switching time test circuit.

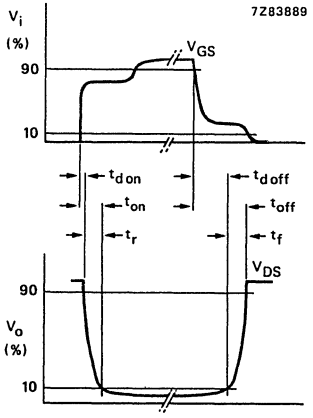


Fig. 4 Switching time waveforms.

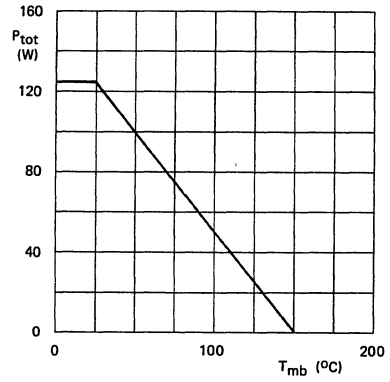


Fig. 5 Power derating curve.

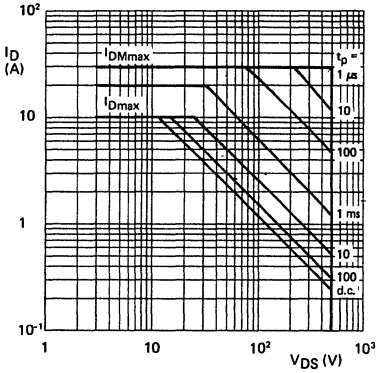


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

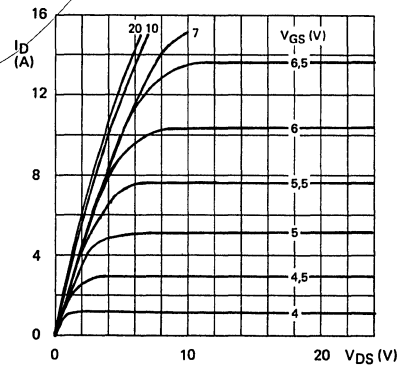


Fig. 7 Output characteristic,
80 μs pulse test; T_{mb} = 25 °C.

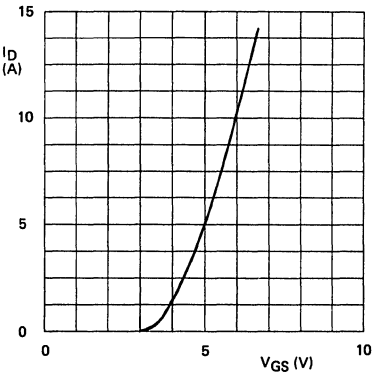


Fig. 8 Typical transfer characteristic
V_{DS} = 25 V; 80 μs pulse test; T_j = 25 °C.

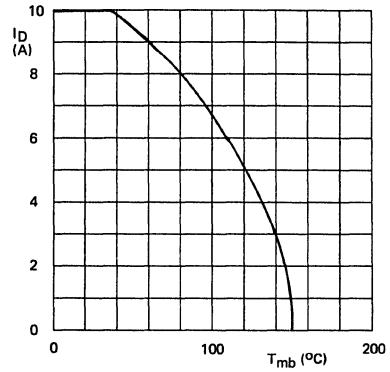


Fig. 9 Drain current as a function
of mounting base temperature.

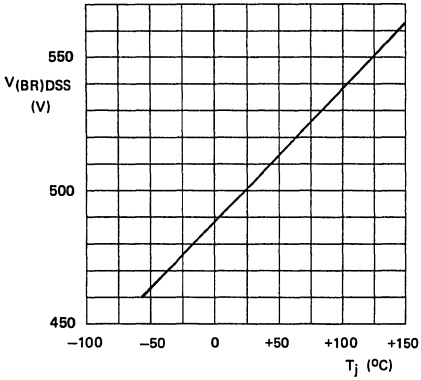


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

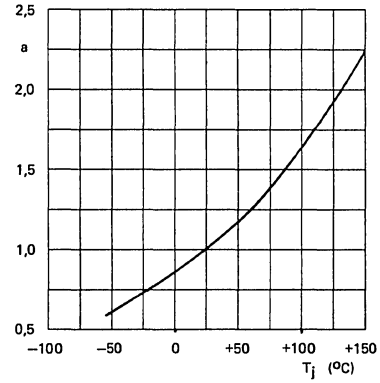


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

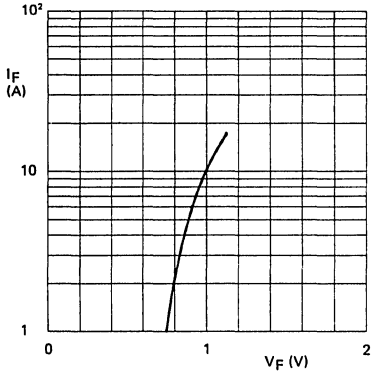


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

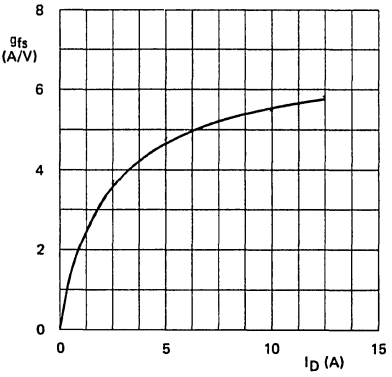


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

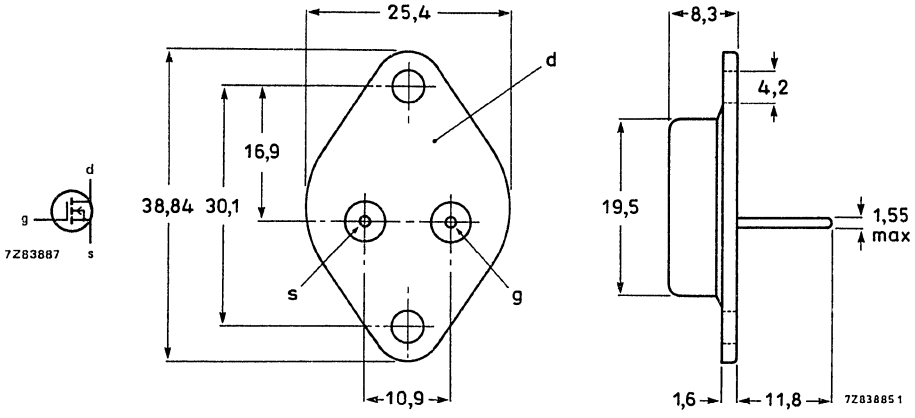
Drain-source voltage	V_{DS}	max.	450	V
Drain current (d.c.)	I_D	max.	10	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125	W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,5	Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	100	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	450 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	450 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	10 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	30 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	450 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	<	0,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	10 A
Forward current (peak value)	I_{FRM}	<	30 A
On-state voltage $I_F = 2 \times I_D$; V_{GS} = 0 V	V_F	typ.	1,3 V
		<	1,7 V
Reverse recovery $I_F = 2 \times I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 16 A	g_{fs}	>	2,7 A/V
		typ.	4,0 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	450 ns
fall time	t_f	typ.	100 ns

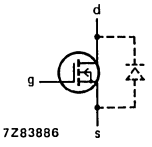


Fig. 2 Diode characteristics.

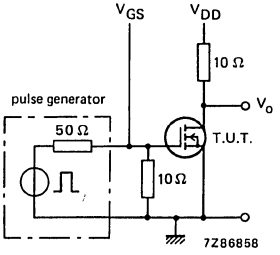


Fig. 3 Switching time test circuit.

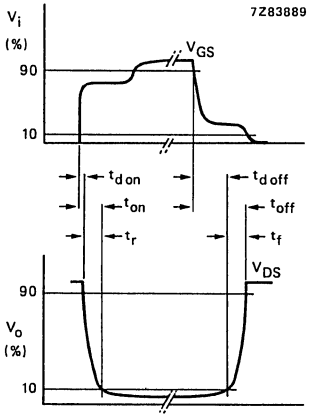


Fig. 4 Switching time waveforms.

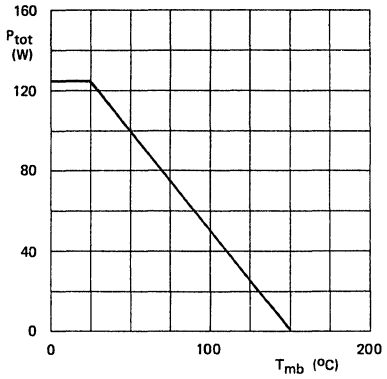


Fig. 5 Power derating curve.

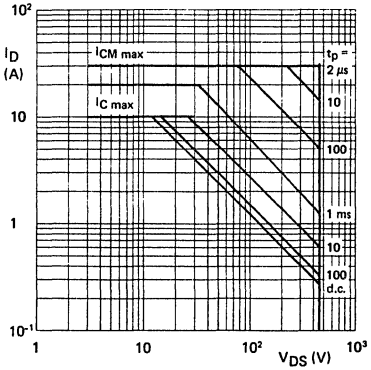


Fig. 6 Safe Operating AReа.
T_{mb} = 25 °C; δ = 0,01.

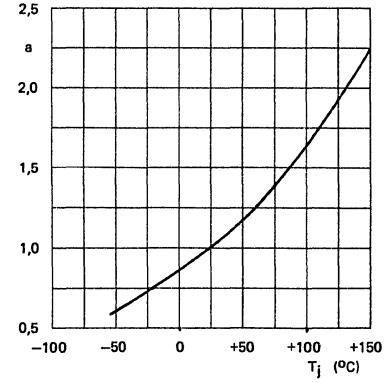


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

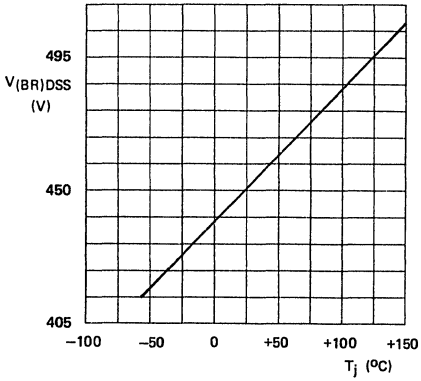


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

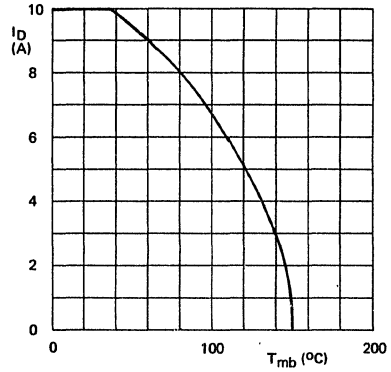


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

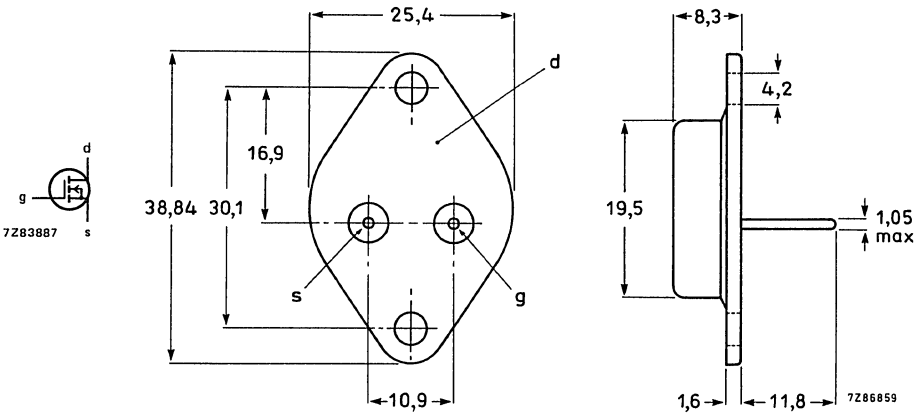
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.)	I_D	max.	4,2 A
Total power dissipation	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2,0 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	4,2 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	12 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}	−55 to +	150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	 I_{DSS} I_{DSS}	 < <	 1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	typ. <	1,8 Ω 2,0 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,2 A
Forward current (peak value)	I_{FRM}	<	12 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,1 V 1,4 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1200 ns
recovery charge	Q_s	typ.	6,0 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,5 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

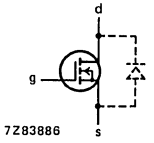


Fig. 2 Diode characteristics.

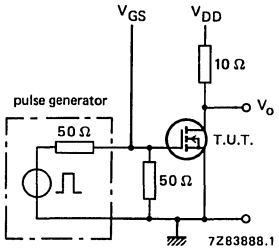


Fig. 3 Switching time test circuit.

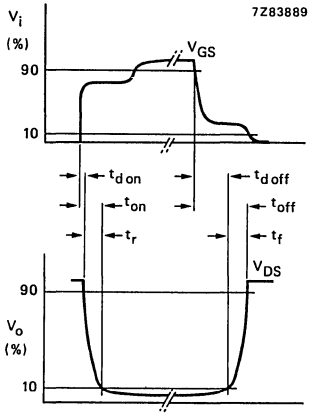


Fig. 4 Switching time waveforms.

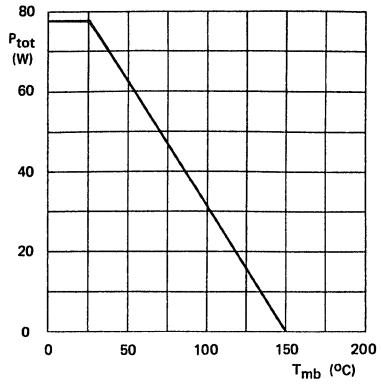


Fig. 5 Power derating curve.

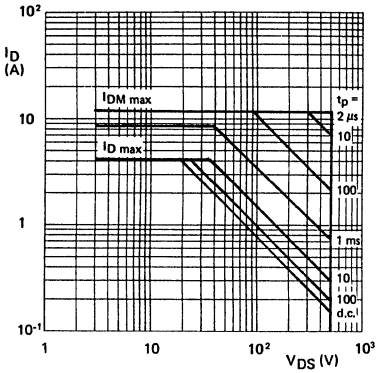


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

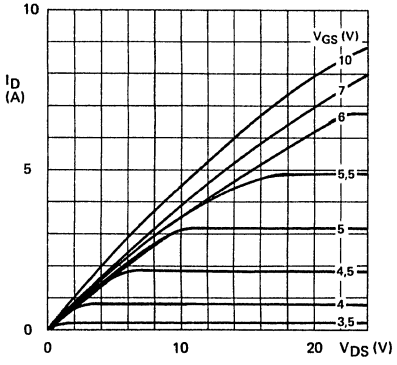


Fig. 7 Output characteristic,
80 µs pulse test; T_{mb} = 25 °C.

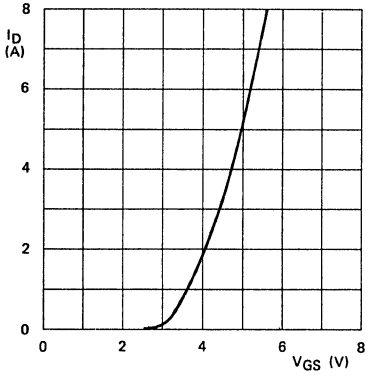


Fig. 8 Typical transfer characteristic
at V_{DS} = 25 V.

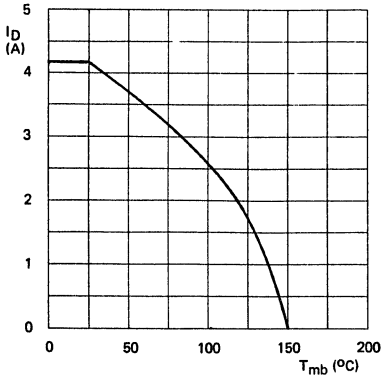


Fig. 9 Drain current as a function
of mounting base temperature.

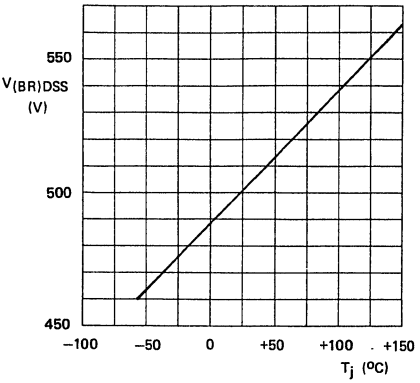


Fig. 10 Drain-source breakdown voltage
as a function of junction temperature.

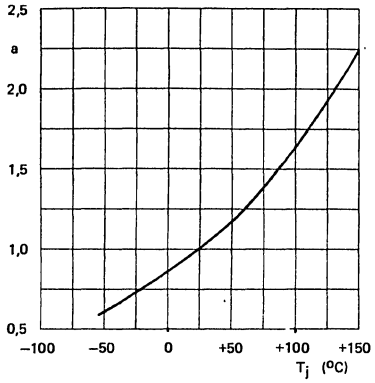


Fig. 11 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

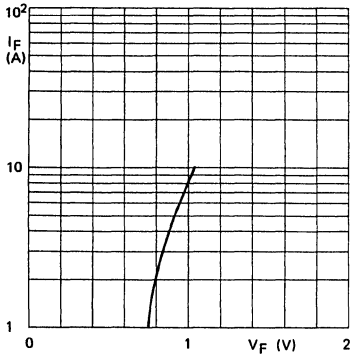


Fig. 12 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

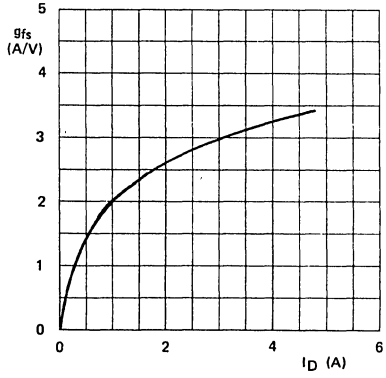


Fig. 13 Forward transfer conductance as a function of drain current. V_{DS} = 25 V; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

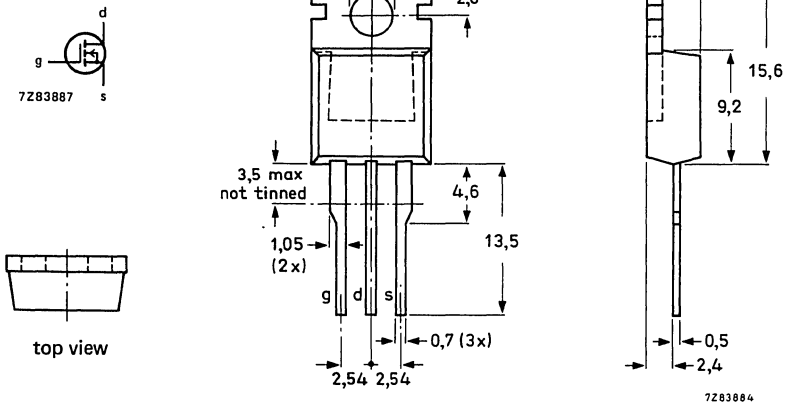
Drain-source voltage	V_{DS}	max.	1000 V
Drain current (d.c.)	I_D	max.	2,5 A
Total power dissipation	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	5,0 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,0 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	1000 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	1000 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	2,5 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7,5 A
Total power dissipation	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	1000 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,5 A
Forward current (peak value)	I_{FRM}	<	7,5 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	2500 ns
recovery charge	Q_s	typ.	250 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> typ.	0,7 A/V 1,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,0 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

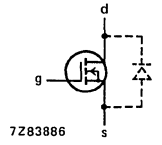


Fig. 2 Diode characteristics.

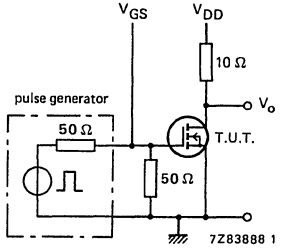


Fig. 3 Switching time test circuit.

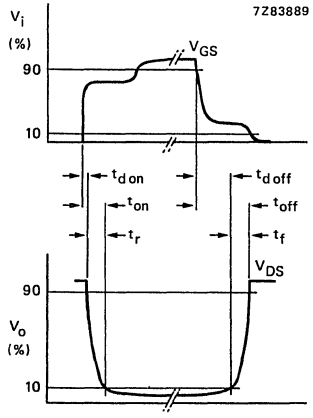


Fig. 4 Switching time waveforms.

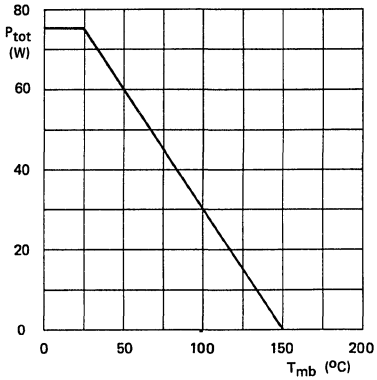


Fig. 5 Power derating curve.

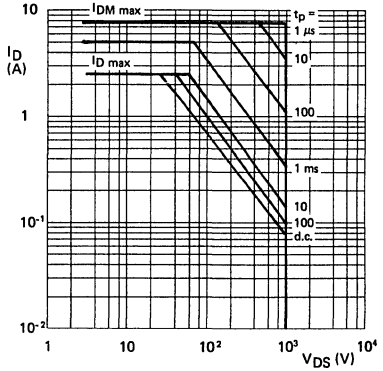


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

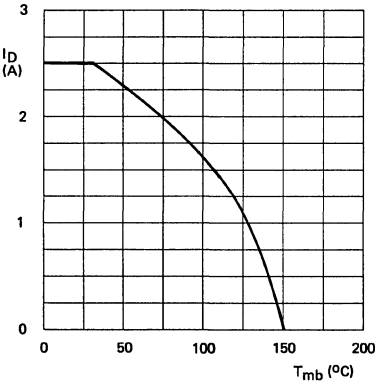


Fig. 7 Drain current as a function of mounting base temperature.

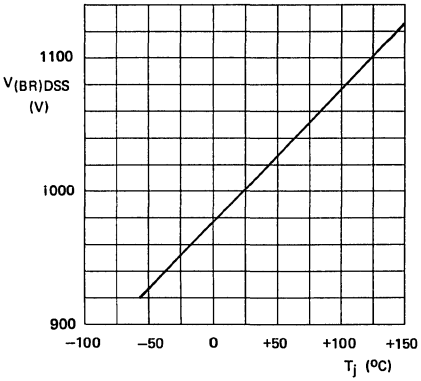


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

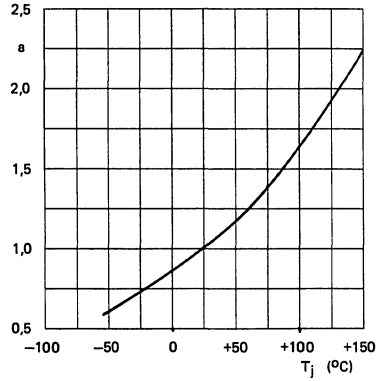


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

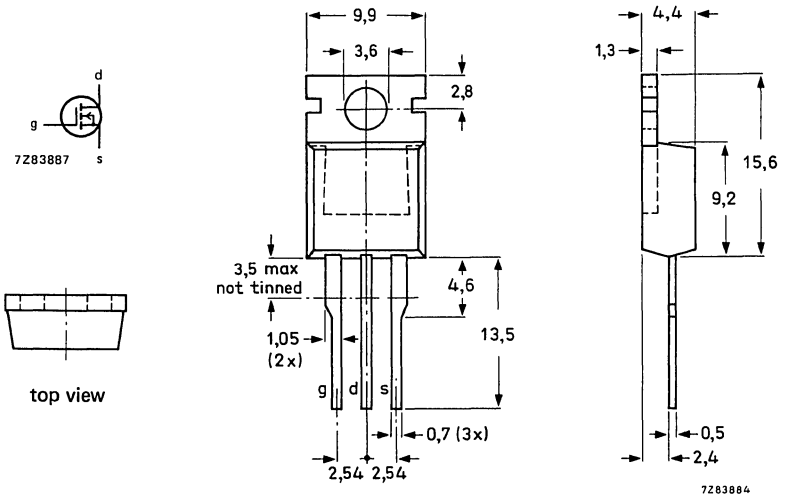
Drain-source voltage	V_{DS}	max.	1000 V
Drain current (d.c.)	I_D	max.	2,0 A
Total power dissipation	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\,ON}$	<	8 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 1,7 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	1000 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	1000 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	2,0 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	6,0 A
Total power dissipation	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	1000 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	8 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2 A
Forward current (peak value)	I_{FRM}	<	6 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	2000 ns
recovery charge	Q_s	typ.	15 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> typ.	0,7 A/V 1,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 1,7 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

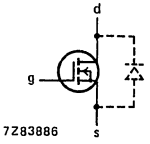


Fig. 2 Diode characteristics.

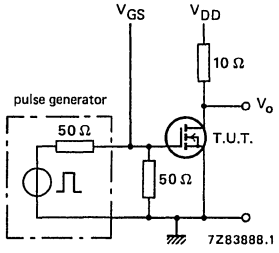


Fig. 3 Switching time test circuit.

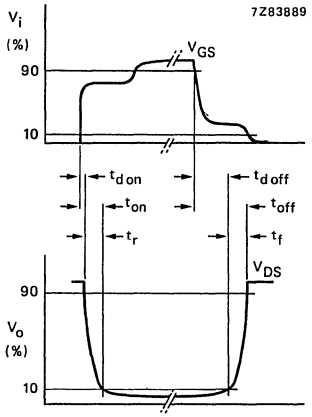


Fig. 4 Switching time waveforms.

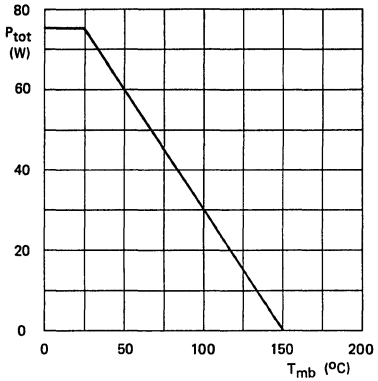


Fig. 5 Power derating curve.

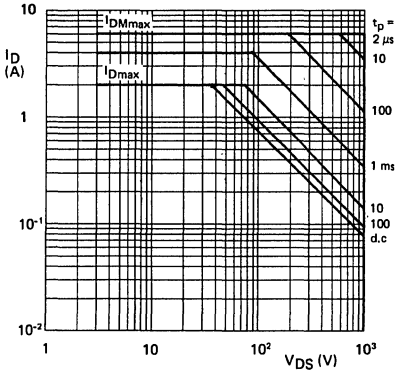


Fig. 6 Safe Operating AREa.
T_{mb} = 25 °C; δ = 0,01.

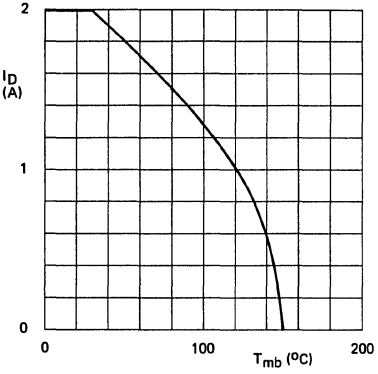


Fig. 7 Drain current as a function of mounting base temperature.

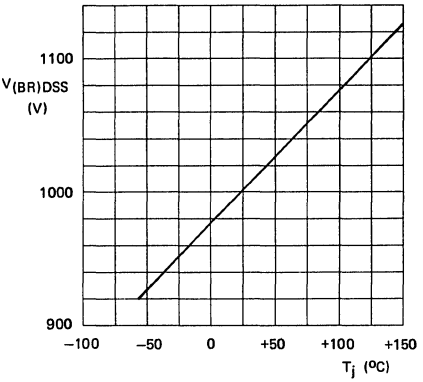


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

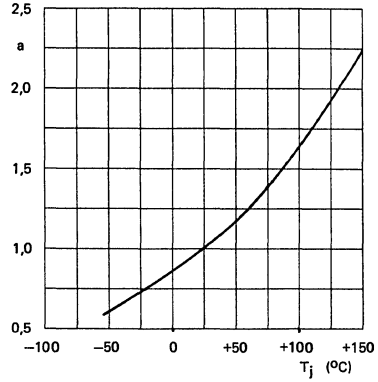


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

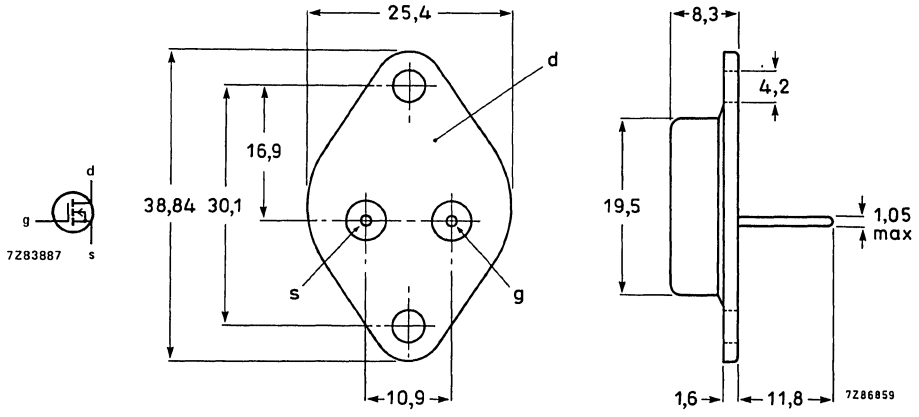
Drain-source voltage	V_{DS}	max.	1000 V
Drain current (d.c.)	I_D	max.	2,6 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	5,0 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,0 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	1000 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	1000 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	2,6 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7,5 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	1000 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,6 A
Forward current (peak value)	I_{FRM}	<	7,5 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	2000 ns
recovery charge	Q_s	typ.	15 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> typ.	0,7 A/V 1,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,0 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

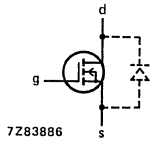


Fig. 2 Diode characteristics.

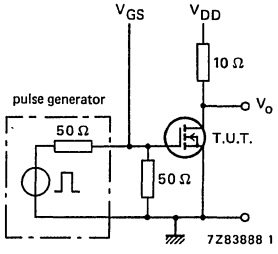


Fig. 3 Switching time test circuit.

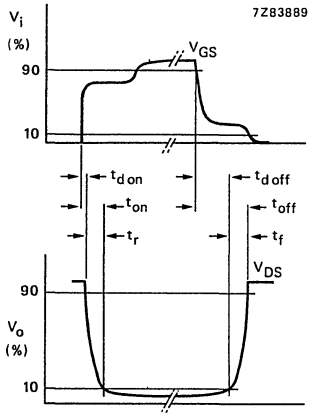


Fig. 4 Switching time waveforms.

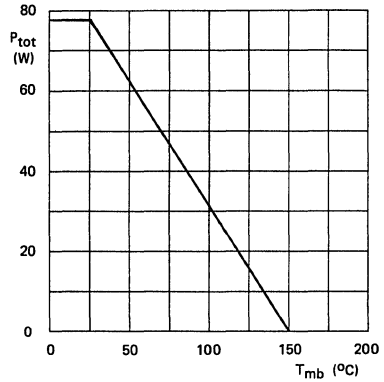


Fig. 5 Power derating curve.

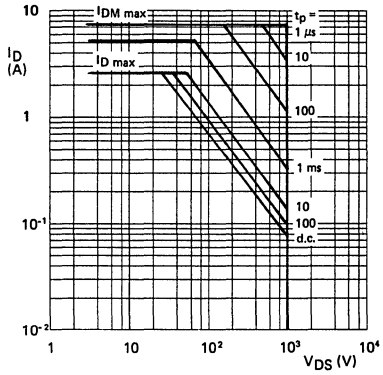


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

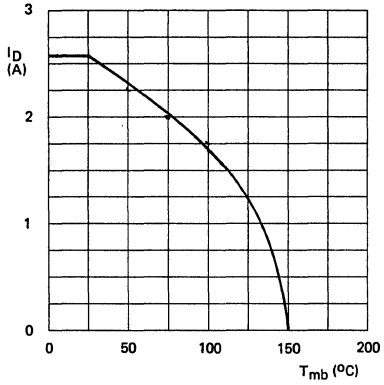


Fig. 7 Drain current as a function of mounting base temperature.

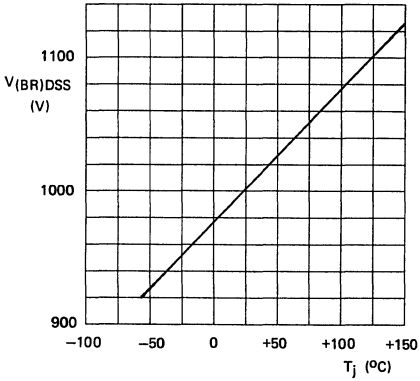


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

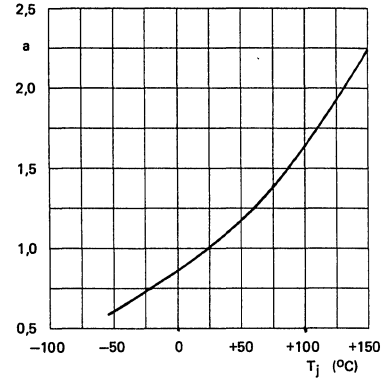


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

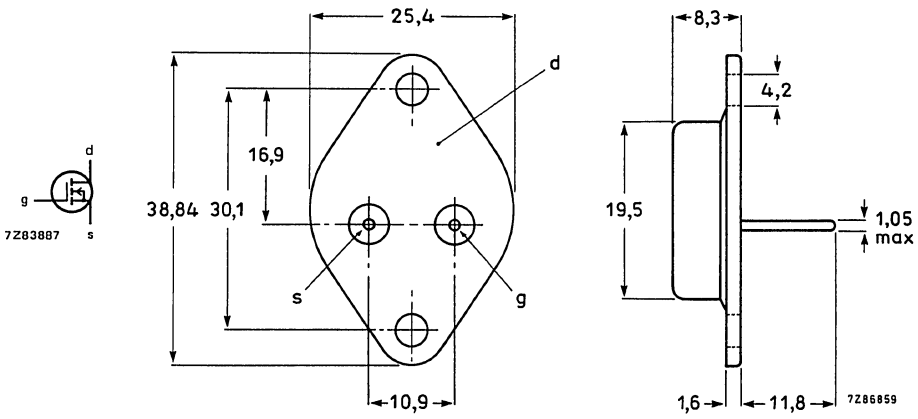
Drain-source voltage	V_{DS}	max.	1000 V
Drain current (d.c.)	I_D	max.	5,3 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2,0 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	1000 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	1000 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	5,3 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	15 A
Total power dissipation	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	1000 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V typ. 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	5,3 A
Forward current (peak value)	I_{FRM}	<	15 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,15 V 1,4 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	2000 ns
recovery charge	Q_s	typ.	30 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> 1,4 typ. 2,0	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 3500	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 200	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 100	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 60	ns
rise time	t_r	typ. 140	ns
turn-off times: delay time	$t_{d\,off}$	typ. 500	ns
fall time	t_f	typ. 100	ns

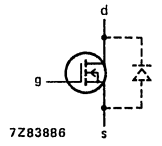


Fig. 2 Diode characteristics.

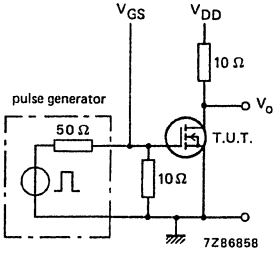


Fig. 3 Switching time test circuit.

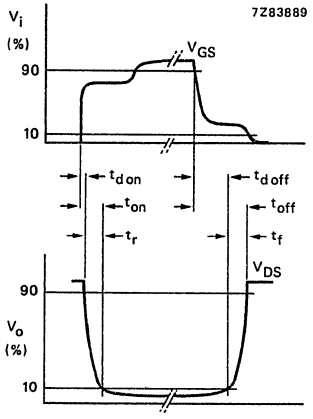


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

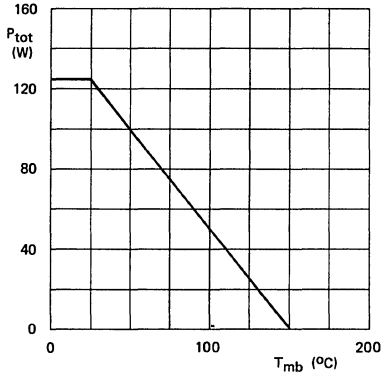


Fig. 5 Power derating curve.

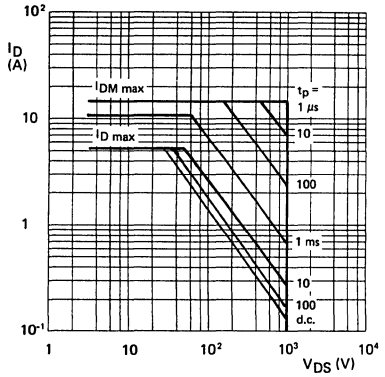


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

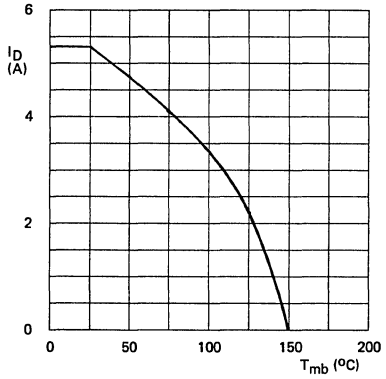


Fig. 7 Drain current as a function of mounting base temperature.

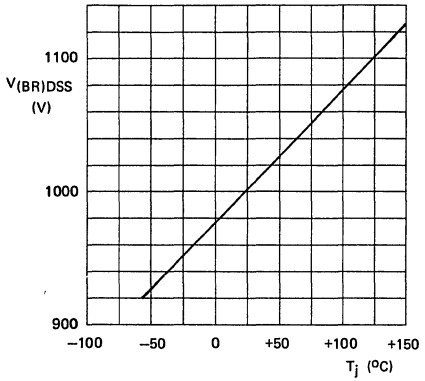


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

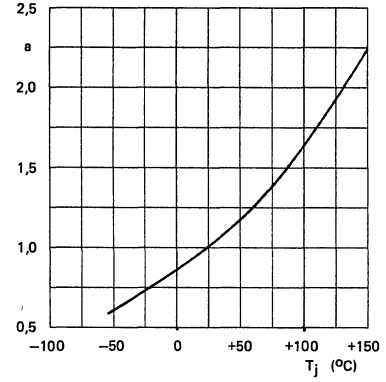


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

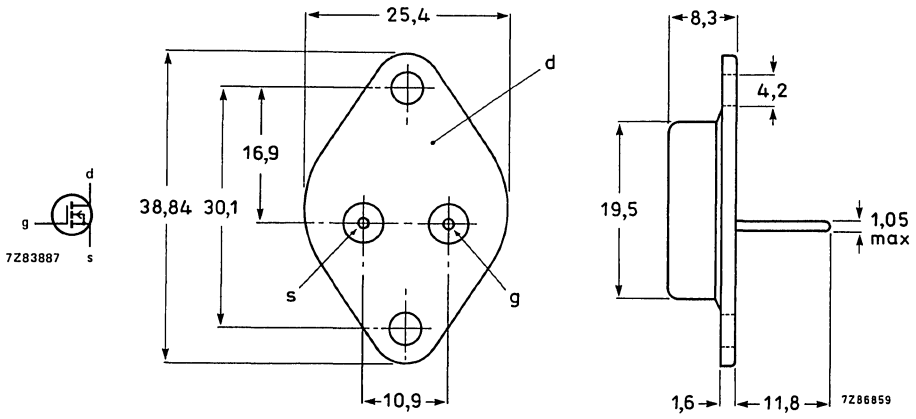
Drain-source voltage	V_{DS}	max.	1000 V
Drain current (d.c.)	I_D	max.	4,6 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2,6 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,4 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	1000 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	1000 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	4,6 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	13 A
Total power dissipation	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	1000 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	2,6 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,6 A
Forward current (peak value)	I_{FRM}	<	13 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,15 V
		<	1,4 V
Reverse recoverh I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	2000 ns
recovery charge	Q_s	typ.	30 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> 1,4 typ. 2,0	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 3500	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 200	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 100	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,4 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 60	ns
rise time	t_r	typ. 140	ns
turn-off times: delay time	$t_{d\,off}$	typ. 500	ns
fall time	t_f	typ. 100	ns

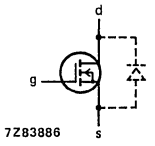


Fig. 2 Diode characteristics.

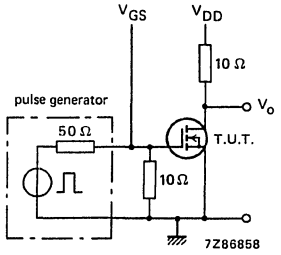


Fig. 3 Switching time test circuit.

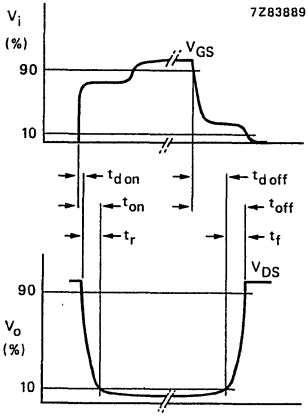


Fig. 4 Switching time waveforms.

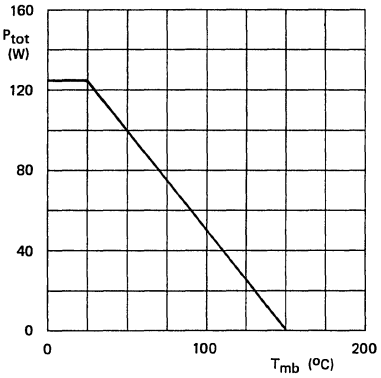


Fig. 5 Power derating curve.

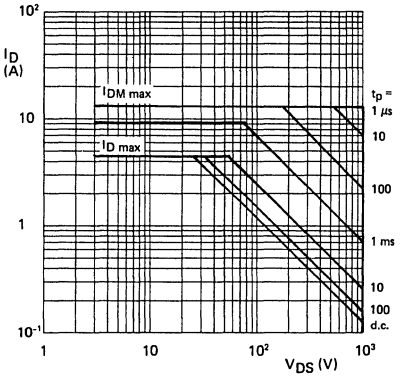


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

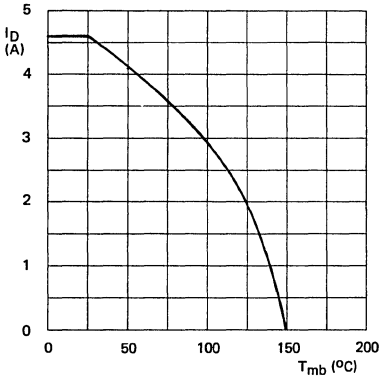


Fig. 7 Drain current as a function of mounting base temperature.

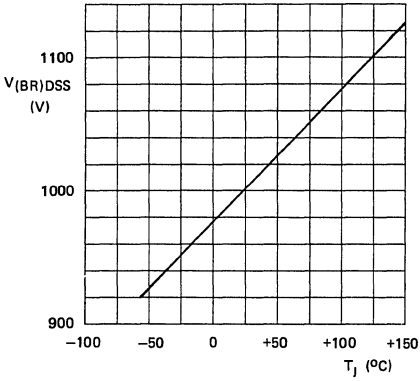


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

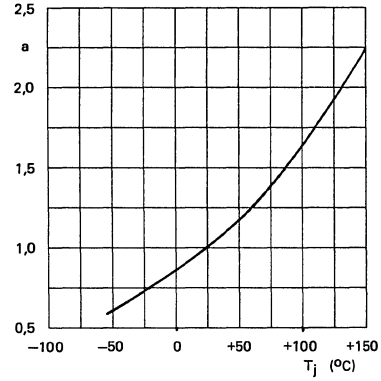


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

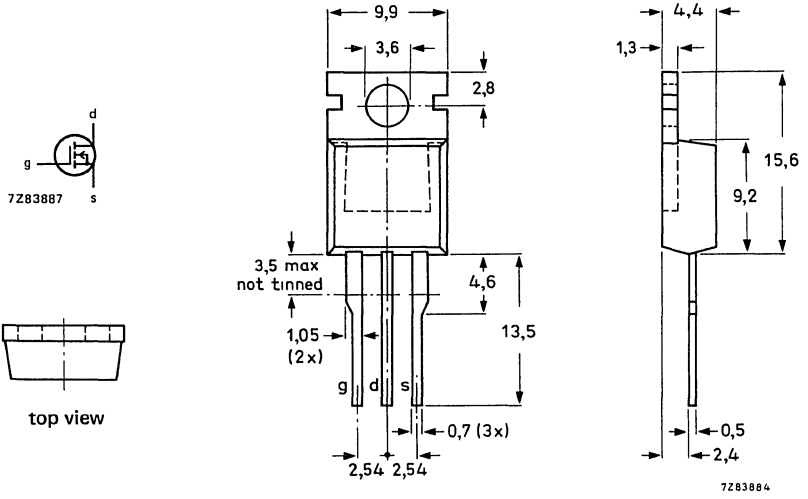
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	5,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	5,5	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	16	A
Total power dissipation	P_{tot}	max.	75	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max. +	150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	1,0	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	5,5	A
Forward current (peak value)	I_{FRM}	<	16	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,15	V
		<	1,6	V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	1000	ns
recovery charge	Q_s	typ.	5	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,7 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

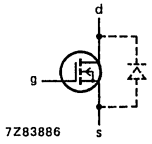


Fig. 2 Diode characteristics.

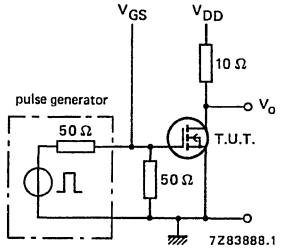


Fig. 3 Switching time test circuit.

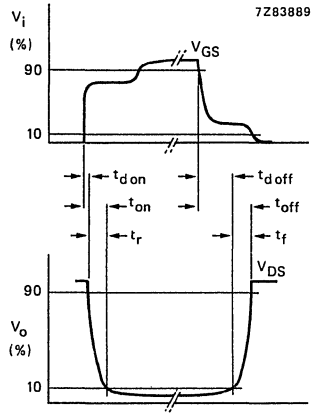


Fig. 4 Switching time waveforms.

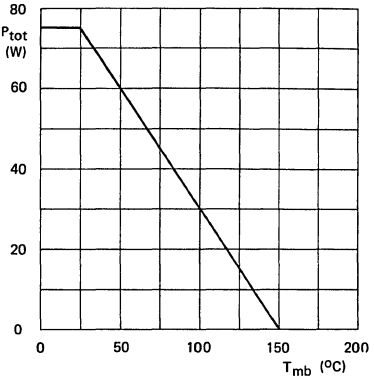


Fig. 5 Power derating curve.

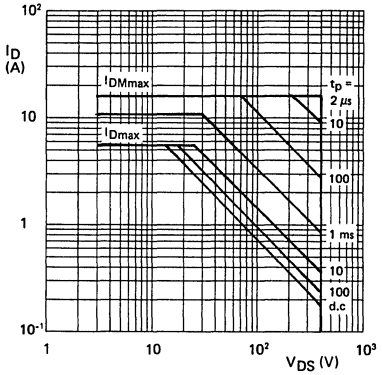


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

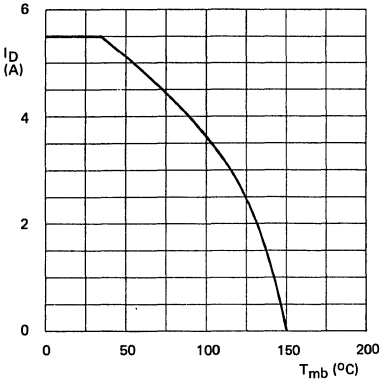


Fig. 7 Drain current as a function of mounting base temperature.

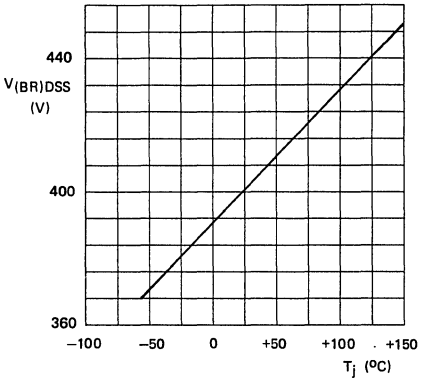


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

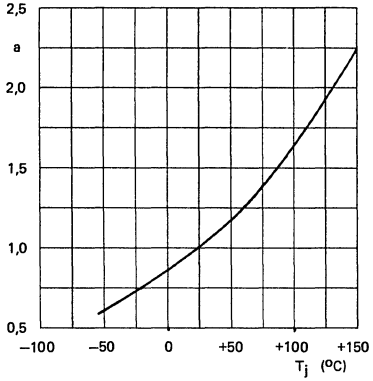


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

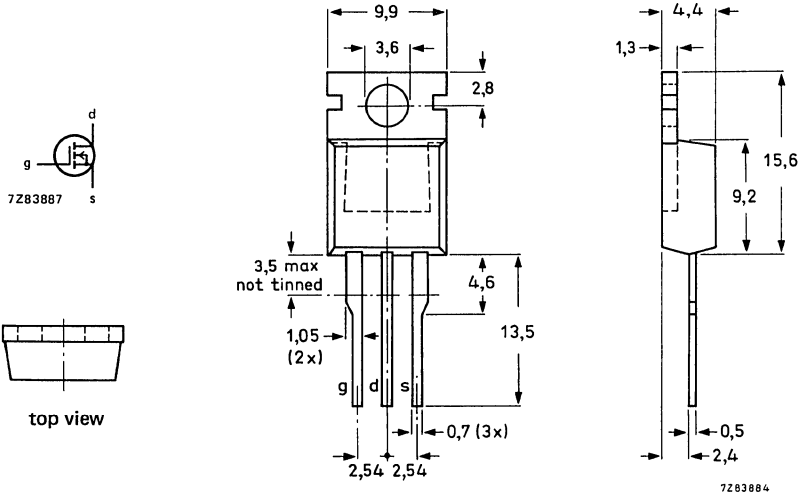
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	4,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\,ON}$	<	1,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	4,5	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	13	A
Total power dissipation	P_{tot}	max.	75	W
Storage temperature	T_{stg}		−55 to + 150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	1,5	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,5	A
Forward current (peak value)	I_{FRM}	<	13	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,15	V
		<	1,5	V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	1000	ns
recovery charge	Q_s	typ.	5	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,7 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

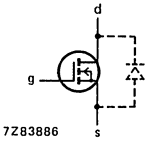


Fig. 2 Diode characteristics.

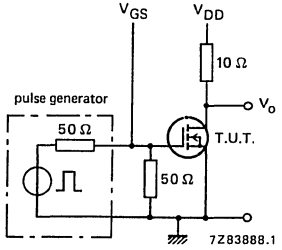


Fig. 3 Switching time test circuit.

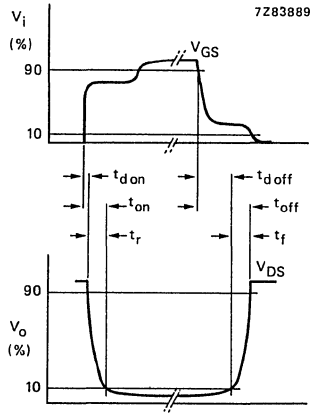


Fig. 4 Switching time waveforms.

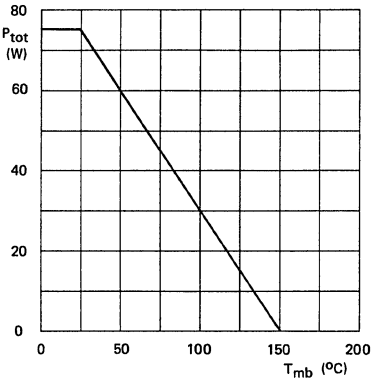


Fig. 5 Power derating curve.

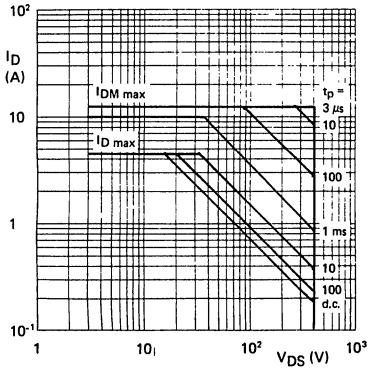


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

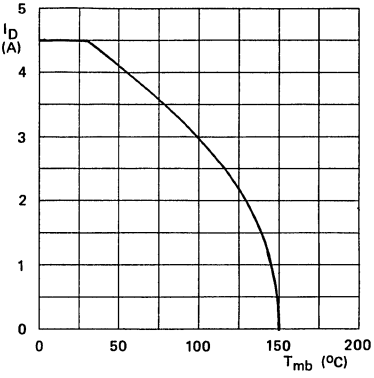


Fig. 7 Drain current as a function of mounting base temperature.

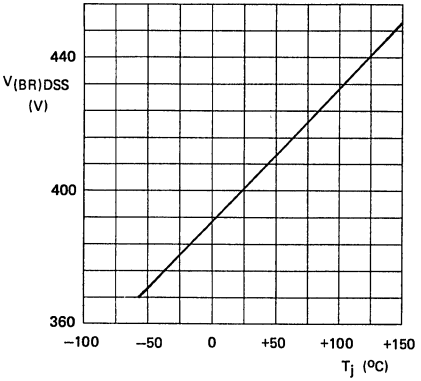


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

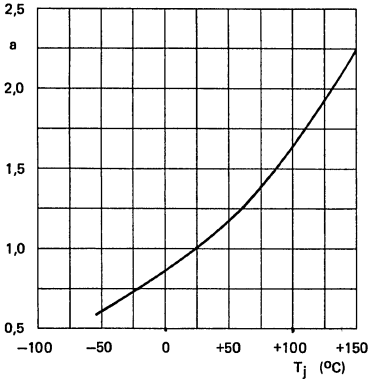


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

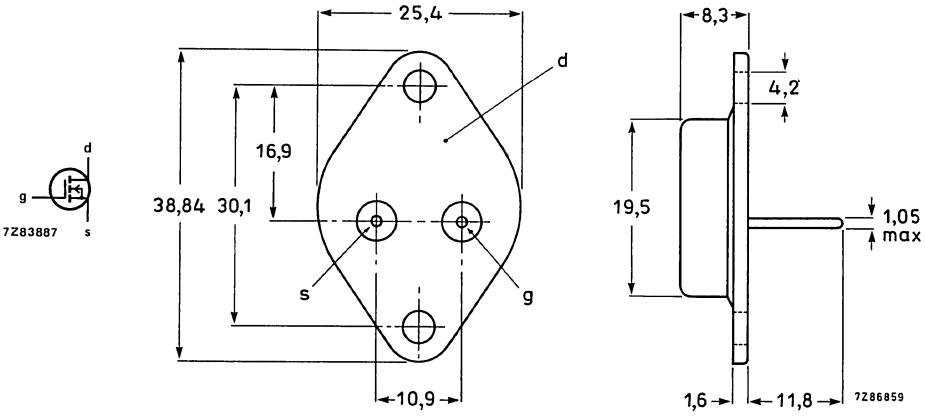
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.)	I_D	max.	5,9 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	5,9	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	17	A
Total power dissipation	P_{tot}	max.	78	W
Storage temperature	T_{stg}		−55 to + 150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400	V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current				
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	1	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	5,9	A
Forward current (peak value)	I_{FRM}	<	17	A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,2	V
		<	1,65	V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	1000	ns
recovery charge	Q_s	typ.	5	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,7 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

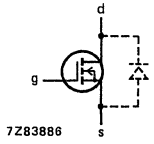


Fig. 2 Diode characteristics.

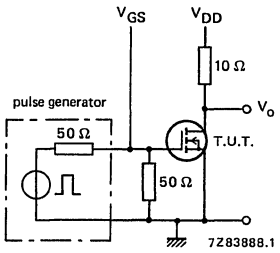


Fig. 3 Switching time test circuit.

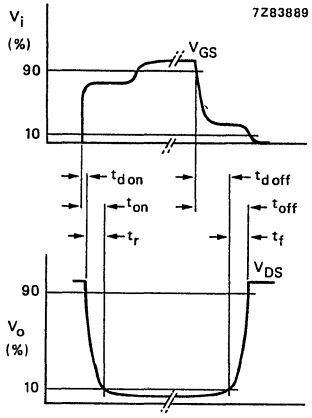


Fig. 4 Switching time waveforms.

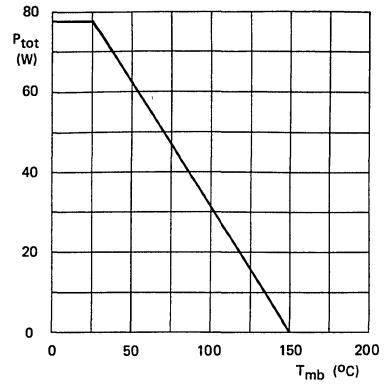


Fig. 5 Power derating curve.

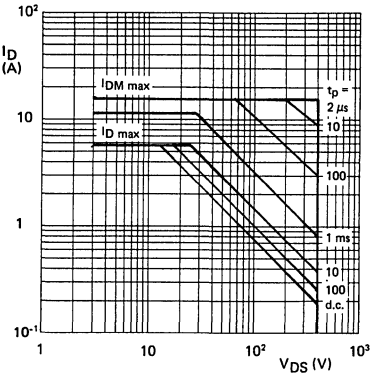


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

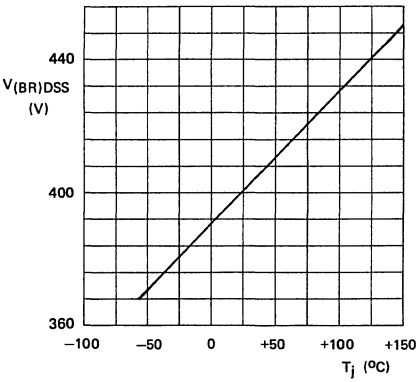


Fig. 7 Drain-source breakdown voltage as a function of junction temperature.

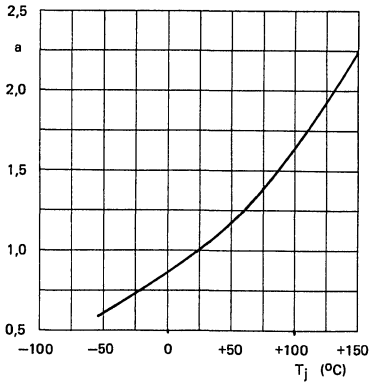


Fig. 8 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

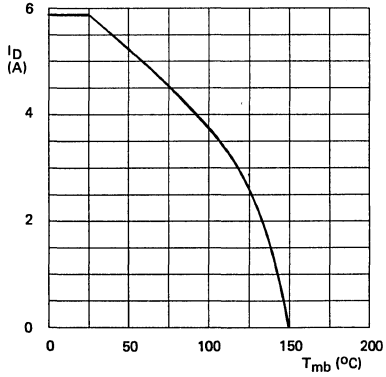


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

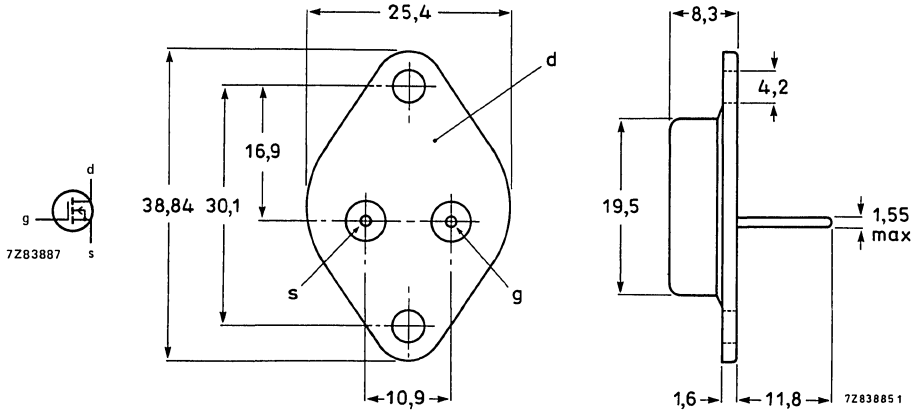
Drain-source voltage	V_{DS}	max.	400	V
Drain current (d.c.); T_{mb} = 40 °C	I_D	max.	4,5	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78	W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1,5	Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V	t_f	typ.	100	ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 40 °C	I_D	max.	4,5	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	13	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	78	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max. +	150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage				
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400	V
Gate threshold voltage				
$V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current				
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current				
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance				
V_{GS} = 10 V; I_D = 2,5 A	$R_{DS\ ON}$	<	1,5	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	4,5	A
Forward current (peak value)	I_{FRM}	<	13	A
On-state voltage				
$I_F = 2 \times I_D$; V_{GS} = 0 V	V_F	typ.	1,15	V
		<	1,5	V
Reverse recovery				
$I_F = 2 \times I_D$; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	1000	ns
recovery charge	Q_s	typ.	5	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 2,5 A	g_{fs}	> typ.	1,7 A/V 2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	160 ns
fall time	t_f	typ.	100 ns

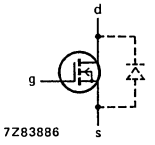


Fig. 2 Diode characteristics.

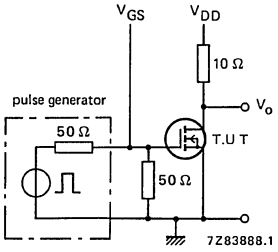


Fig. 3 Switching time test circuit.

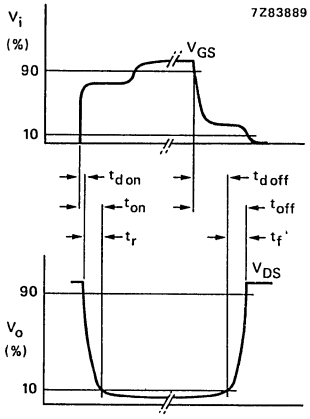


Fig. 4 Switching time waveforms.

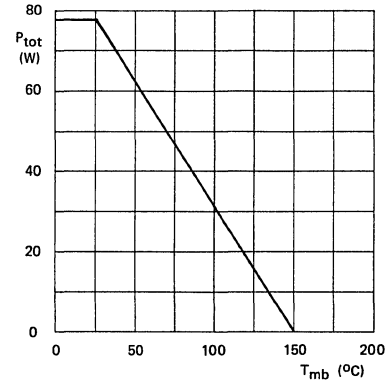


Fig. 5 Power derating curve.

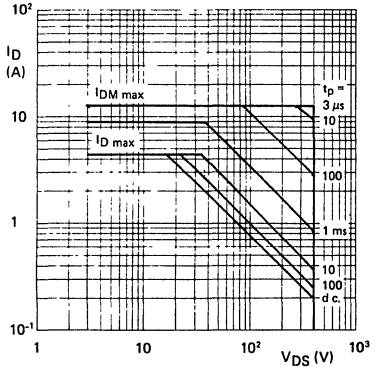


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

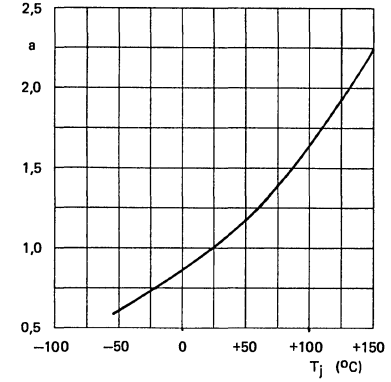


Fig. 7 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

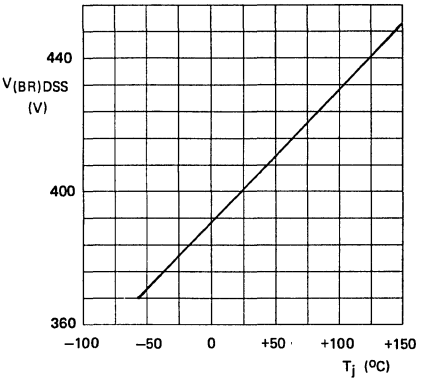


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

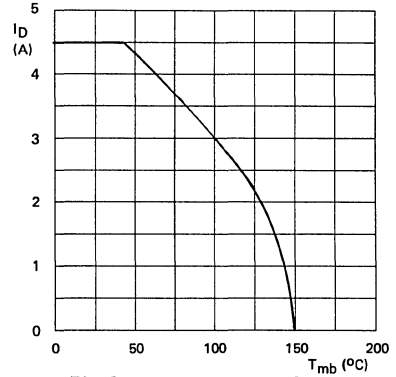


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

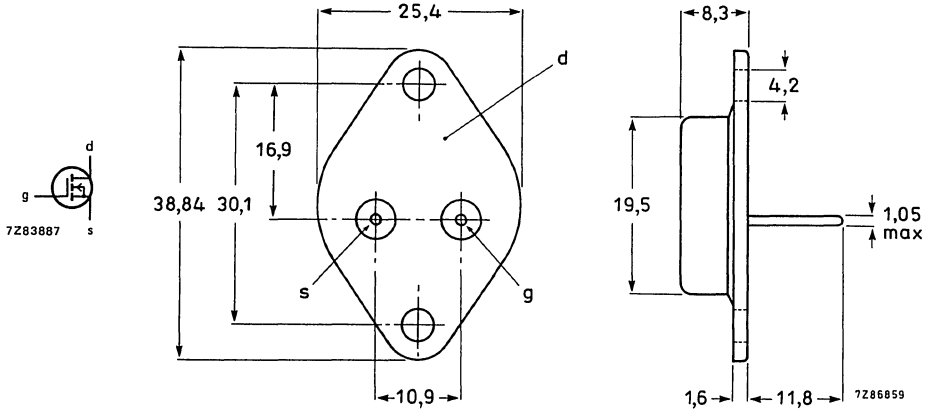
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.)	I_D	max.	10,5 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

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See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 50 °C	I_D	max.	10,5 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	31 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,0 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	<	0,4 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	10,5 A
Forward current (peak value)	I_{FRM}	<	31 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,3 V
		<	1,7 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1000 ns
recovery charge	Q_s	typ.	10 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> typ.	3,3 A/V 4,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	50 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	450 ns
fall time	t_f	typ.	100 ns

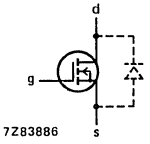


Fig. 2 Diode characteristics.

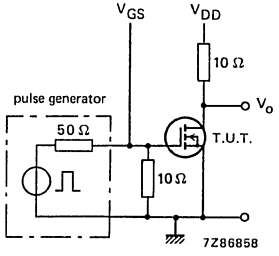


Fig. 3 Switching time test circuit.

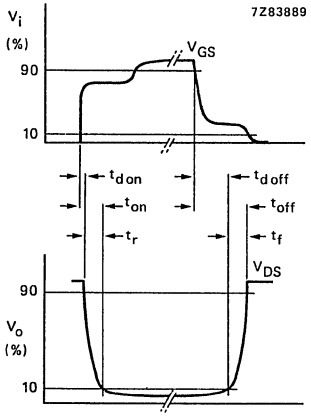


Fig. 4 Switching time waveforms.

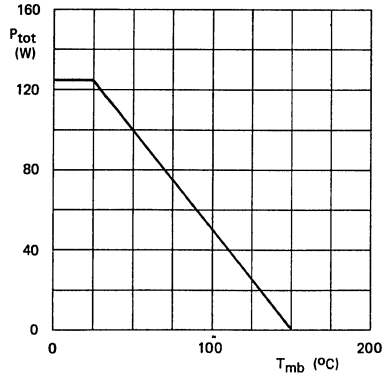


Fig. 5 Power derating curve.

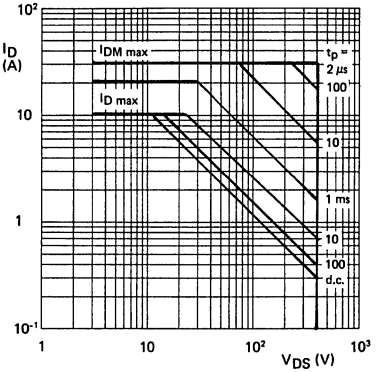


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

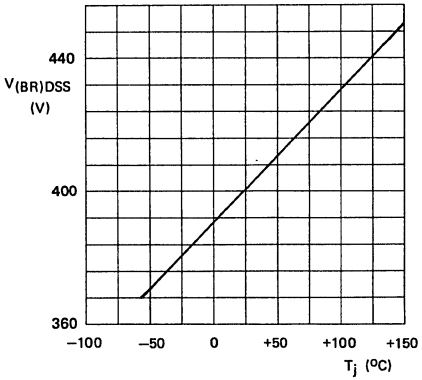


Fig. 7 Drain-source breakdown voltage as a function of junction temperature.

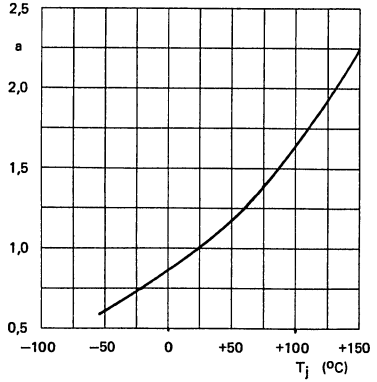


Fig. 8 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

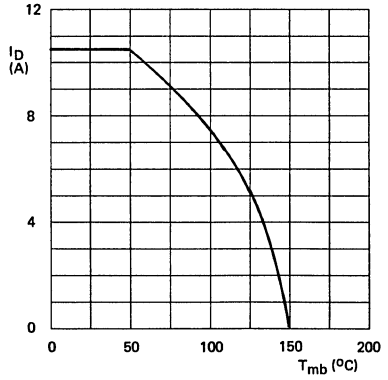


Fig. 9 Drain current as a function of mounting base temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

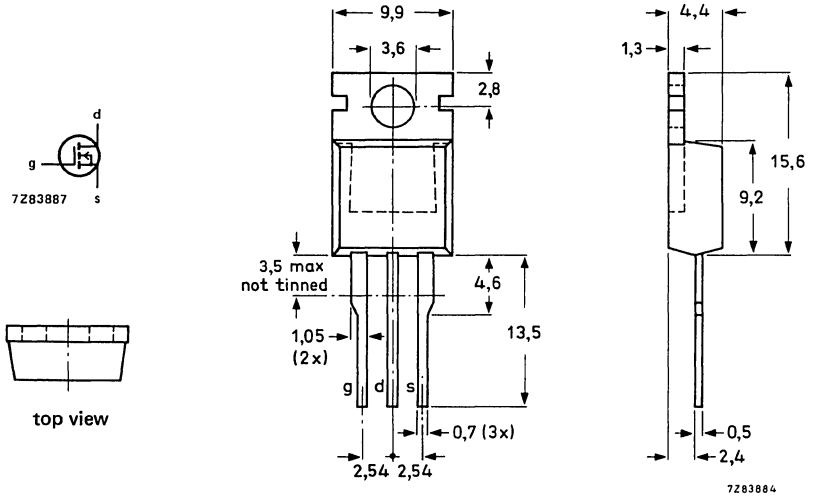
Drain-source voltage	V_{DS}	max.	50 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	12 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,1 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V	t_f	typ.	150 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 60 °C	I_D	max.	12 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	36 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}	−55 to +	150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1,0 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	<	0,1 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12 A
Forward current (peak value)	I_{FRM}	<	36 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,6 V
		<	2,2 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	120 ns
recovery charge	Q_s	typ.	0,15 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 6 A	g_{fs}	> typ.	3 A/V 4,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	480 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	280 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	160 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	150 ns

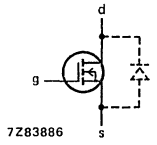


Fig. 2 Diode characteristics.

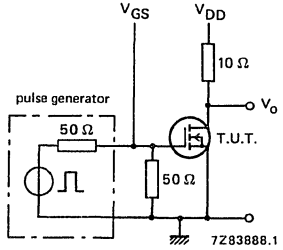


Fig. 3 Switching time test circuit.

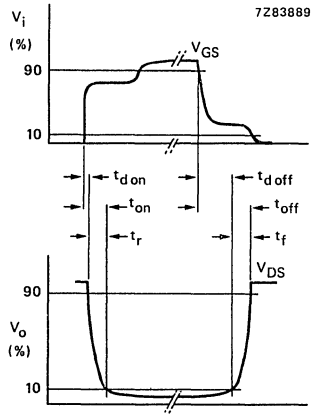


Fig. 4 Switching time waveforms.

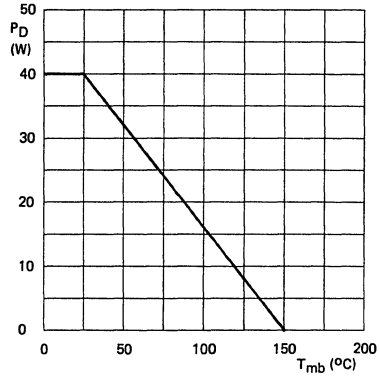


Fig. 5 Power derating curve.

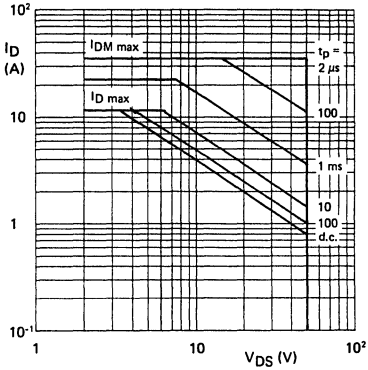


Fig. 6 Safe Operating ARea. T_{mb} = 25 °C; δ = 0,01.

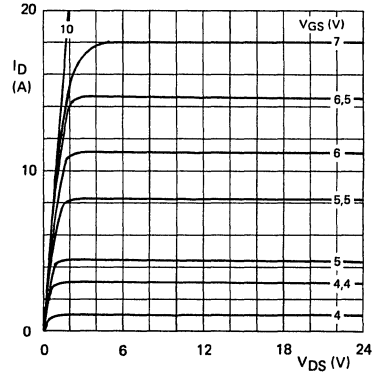


Fig. 7 Output characteristic, 80 μs pulse test; T_{mb} = 25 °C.

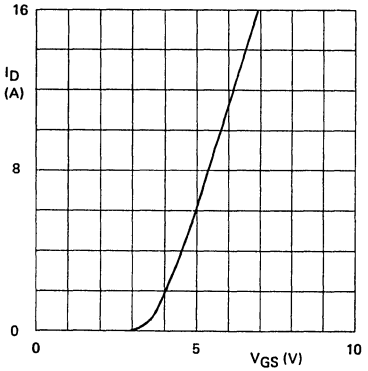


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

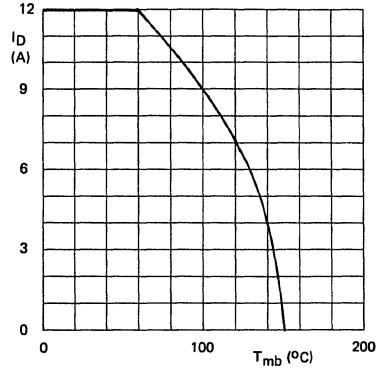


Fig. 9 Drain current as a function of mounting base temperature.

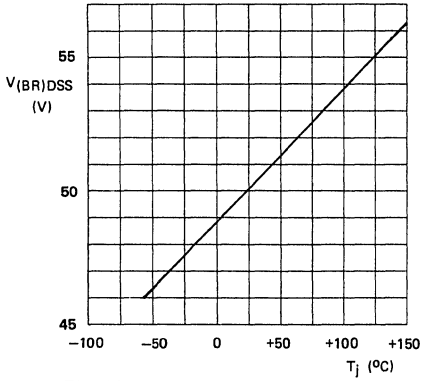


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

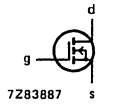
Drain-source voltage	V_{DS}	max.	50	V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	12	A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40	W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,12	Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V	t_f	typ.	150	ns

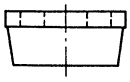
MECHANICAL DATA

Dimensions in mm

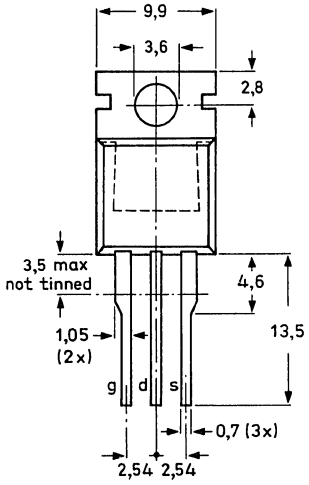
Fig. 1 TO-220AB.

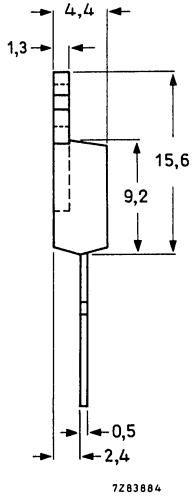
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	50	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	50	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 40 °C	I_D	max.	12	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	36	A
Total power dissipation	P_{tot}	max.	40	W
Storage temperature	T_{stg}		−55 to + 150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage				
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	50	V
Gate threshold voltage				
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current				
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1	mA
Gate-source leakage current				
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance				
V_{GS} = 10 V; I_D = 6 A	$R_{DS\ ON}$	<	0,12	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	12	A
Forward current (peak value)	I_{FRM}	<	36	A
On-state voltage				
I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,6	V
		<	2,2	V
Reverse recovery				
I_F = 2 I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	120	ns
recovery charge	Q_s	typ.	0,15	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 6 A	g_{fs}	> typ.	3,0 A/V 4,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	480 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	280 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	160 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	150 ns

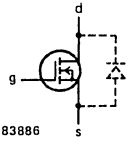


Fig. 2 Diode characteristics.

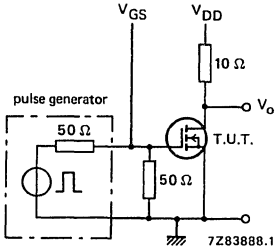


Fig. 3 Switching time test circuit.

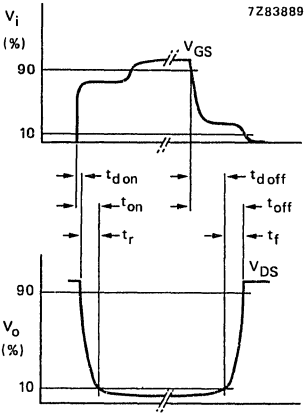


Fig. 4 Switching time waveforms.

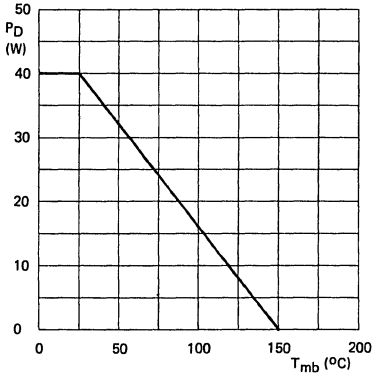


Fig. 5 Power derating curve.

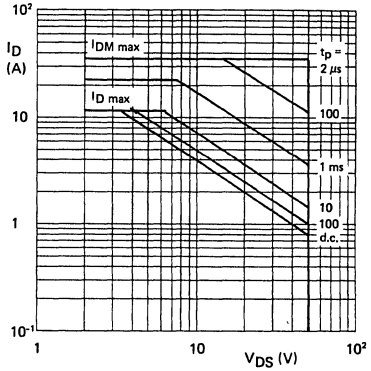


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

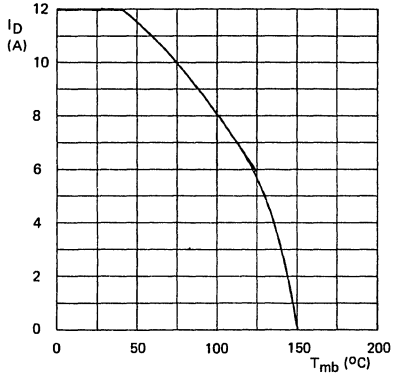


Fig. 7 Drain current as a function of mounting base temperature.

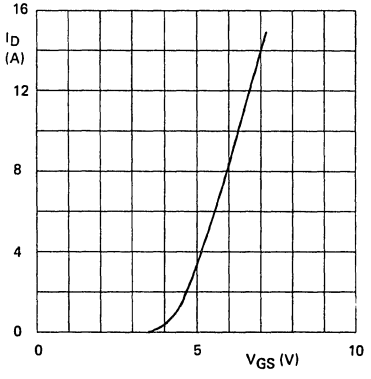


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

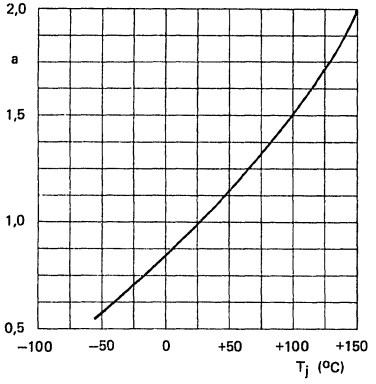


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

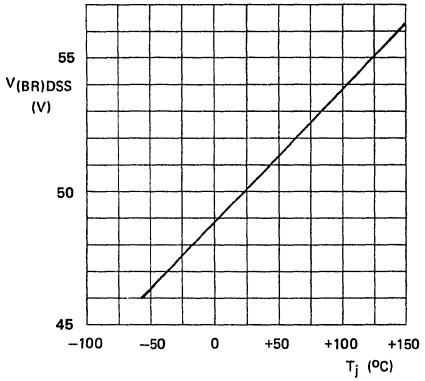


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

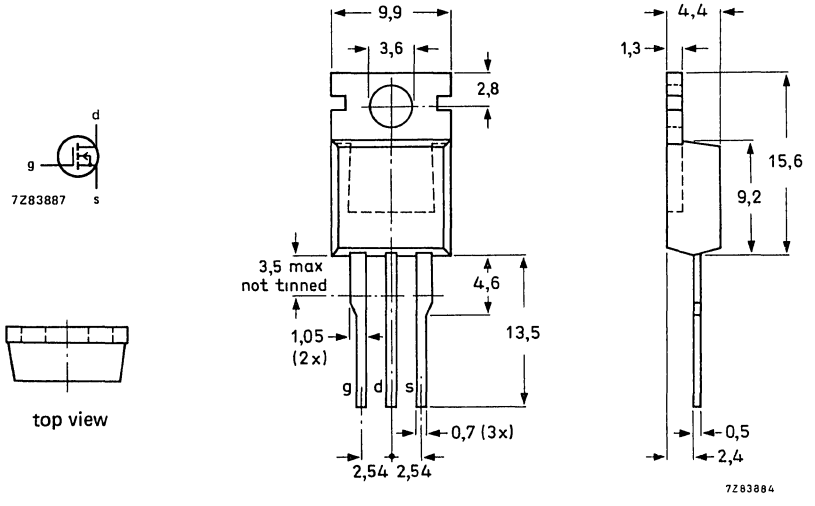
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	10 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,7 A; V_{GS} = 10 V	t_f	typ.	150 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100 V
Gate-source voltage	± V_{GS}	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	10 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	30 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}	−55 to + 150	°C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	0,25 mA 1 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	<	0,2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	10 A
Forward current (peak value)	I_{FRM}	<	30 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ. <	1,55 V 2,1 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	170 ns
recovery charge	Q_s	typ.	0,30 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> typ.	2,7 A/V 3,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	440 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	150 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	80 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	150 ns

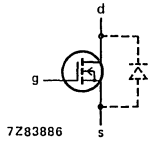


Fig. 2 Diode characteristics.

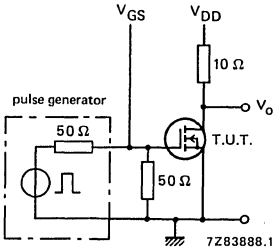


Fig. 3 Switching time test circuit.

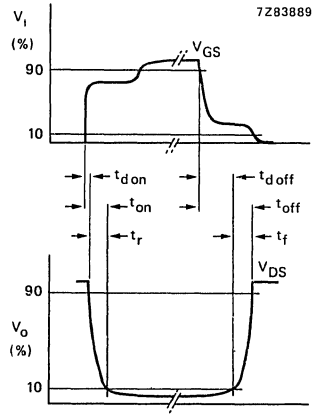


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

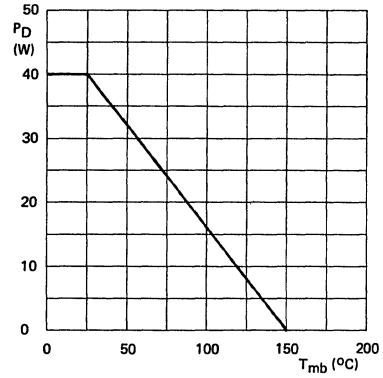


Fig. 5 Power derating curve.

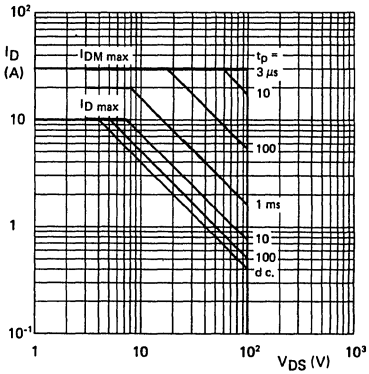


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

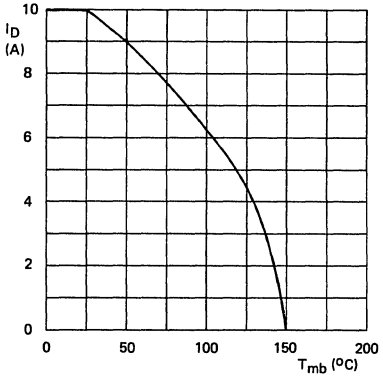


Fig. 7 Drain current as a function of mounting base temperature.

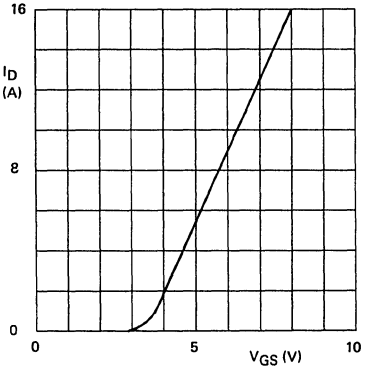


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

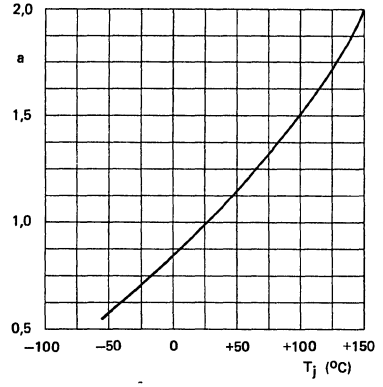


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

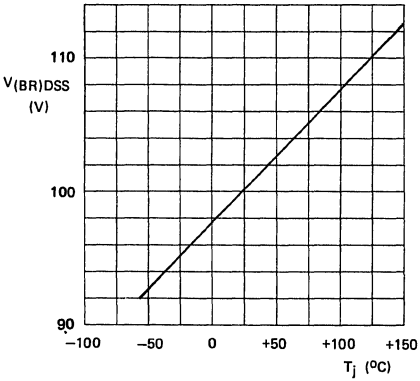


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

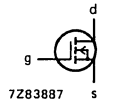
Drain-source voltage	V_{DS}	max.	100 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	9 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,25 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V	t_f	typ.	150 ns

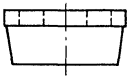
MECHANICAL DATA

Dimensions in mm

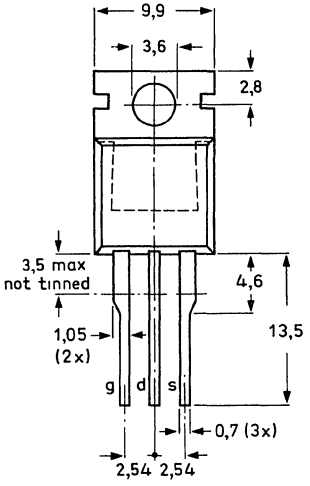
Fig. 1 TO-220AB.

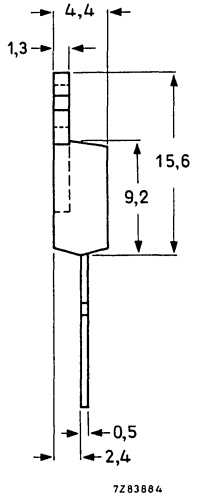
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	100 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	100 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	9 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	27 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}	−55 to +	150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	100 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 5 A	$R_{DS\ ON}$	<	0,25 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	9 A
Forward current (peak value)	I_{FRM}	<	27 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,5 V
		<	2 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	170 ns
recovery charge	Q_s	typ.	0,30 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 5 A	g_{fs}	> typ.	2,7 A/V 3,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	440 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	150 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	80 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,9 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	150 ns

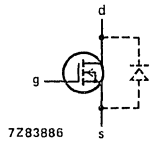


Fig. 2 Diode characteristics.

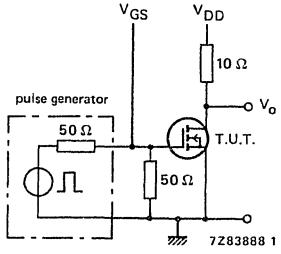


Fig. 3 Switching time test circuit.

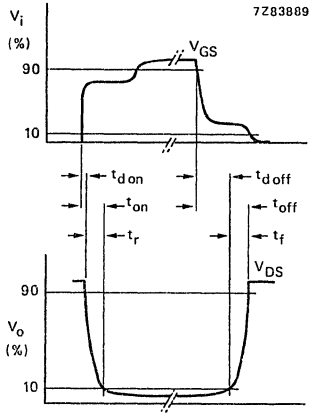


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

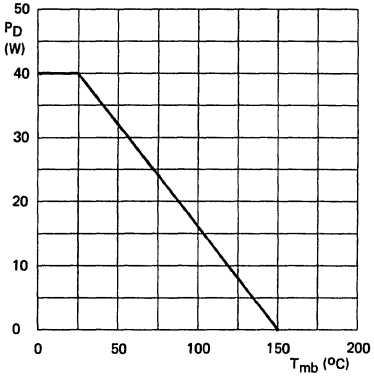


Fig. 5 Power derating curve.

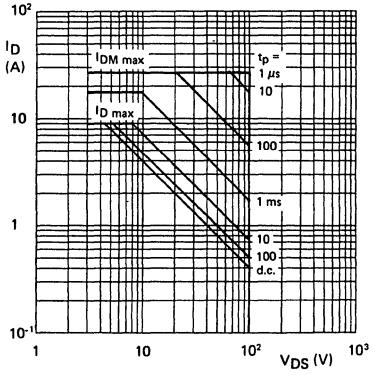


Fig. 6 Safe Operating ARea. T_{mb} = 25 °C; δ = 0,01.

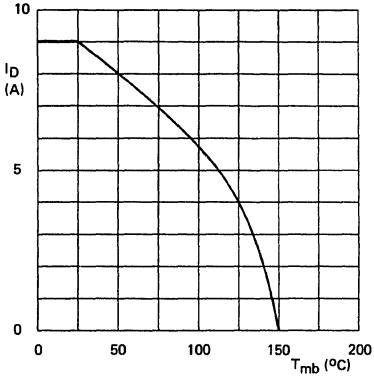


Fig. 7 Drain current as a function of mounting base temperature.

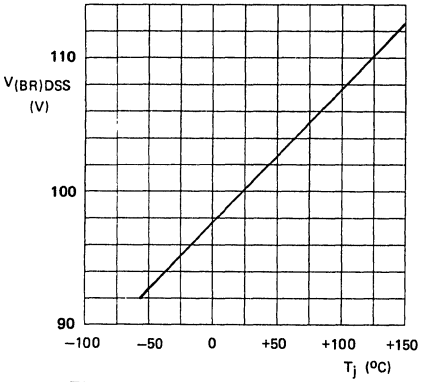


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

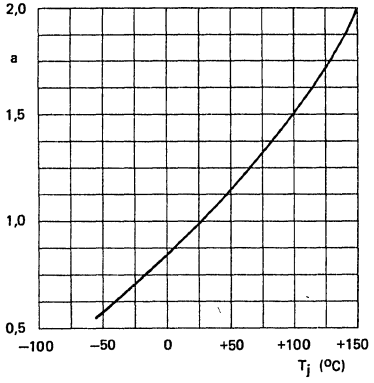


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

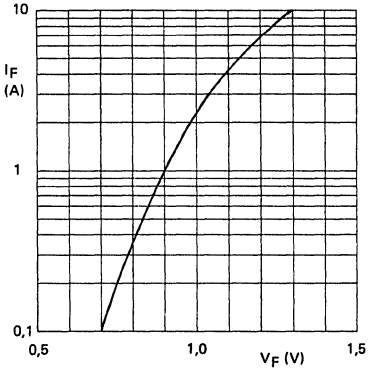


Fig. 10 Typical diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

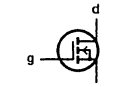
Drain-source voltage	V_{DS}	max.	200 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	5,8 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	0,6 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V	t_f	typ.	130 ns

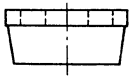
MECHANICAL DATA

Dimensions in mm

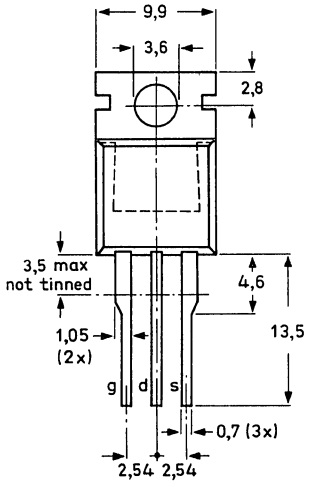
Fig. 1 TO-220AB.

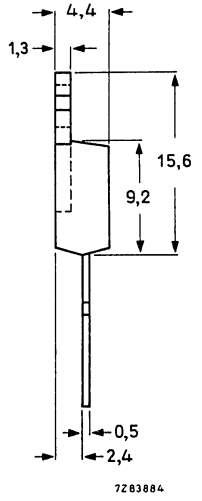
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	200 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	200 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	5,8 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	17 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	200 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 3,5 A	$R_{DS\ ON}$	<	0,6 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	5,8 A
Forward current (peak value)	I_{FRM}	<	17 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,4 V
		<	1,7 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	200 ns
recovery charge	Q_s	typ.	0,6 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 3,5 A	g_{fs}	> typ.	2,2 A/V 3,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	450 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	120 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	60 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,8 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	190 ns
fall time	t_f	typ.	130 ns

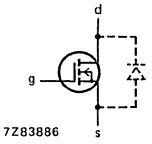


Fig. 2 Diode characteristics.

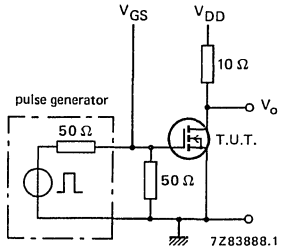


Fig. 3 Switching time test circuit.

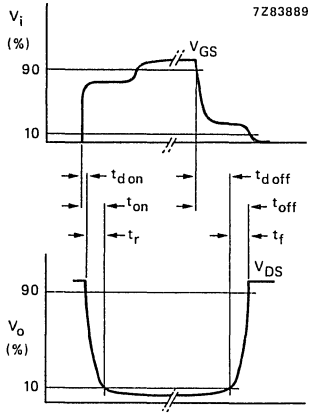


Fig. 4 Switching time waveforms.

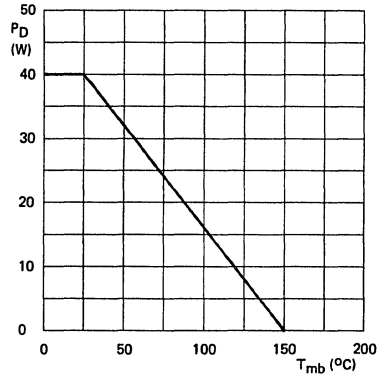


Fig. 5 Power derating curve.

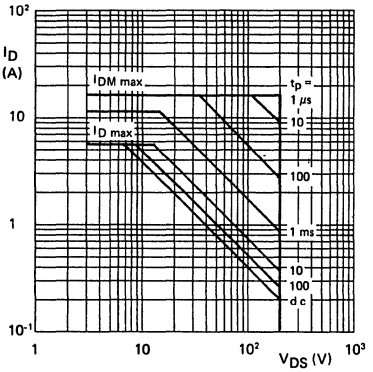


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

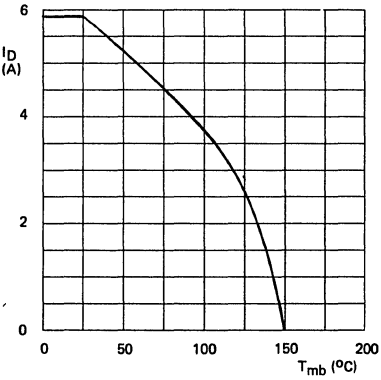


Fig. 7 Drain current as a function of mounting base temperature.

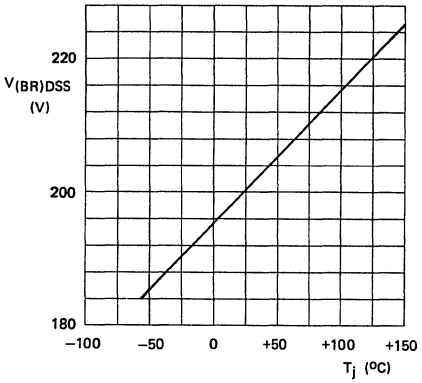


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

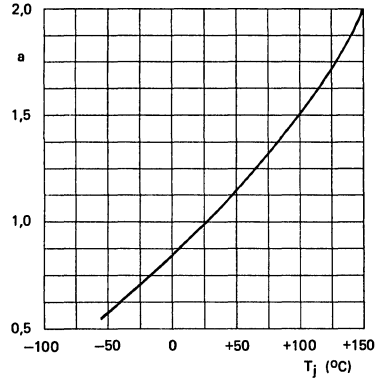


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

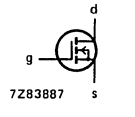
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2,4 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	3 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V	t_f	typ.	100 ns

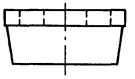
MECHANICAL DATA

Dimensions in mm

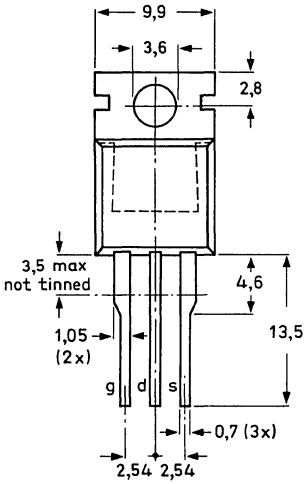
Fig. 1 TO-220AB.

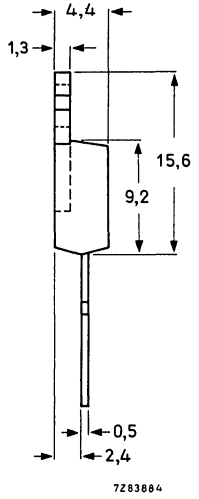
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2,4	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7	A
Total power dissipation	P_{tot}	max.	40	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,2 A	$R_{DS\ ON}$	typ.	2,6	Ω
		<	3,0	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,4	A
Forward current (peak value)	I_{FRM}	<	7	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1	V
		<	1,3	V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs				
recovery time	t_{rr}	typ.	350	ns
recovery charge	Q_s	typ.	3,5	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,2 A	g_{fs}	typ.	2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	350 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	50 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	20 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	150 ns
fall time	t_f	typ.	100 ns

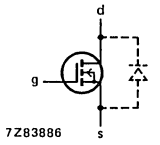


Fig. 2 Diode characteristics.

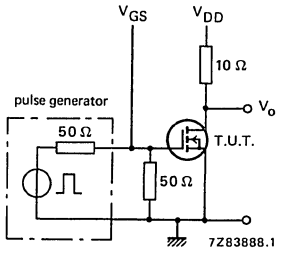


Fig. 3 Switching time test circuit.

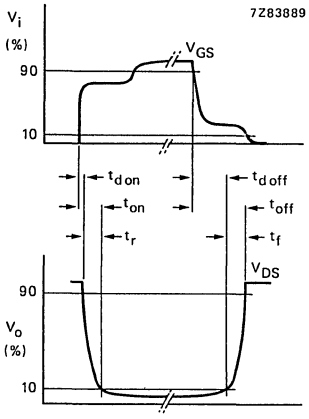


Fig. 4 Switching time waveforms.

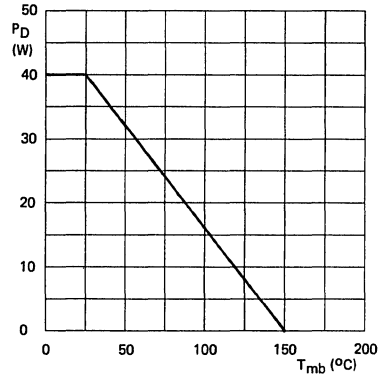


Fig. 5 Power derating curve.

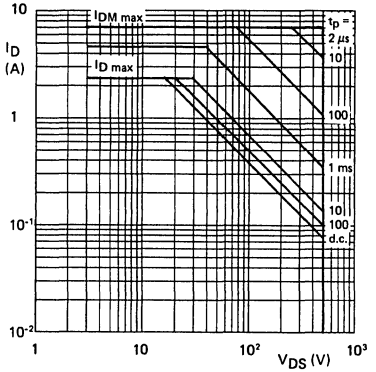


Fig. 6 Safe Operating AREa.
T_{mb} = 25 °C; δ = 0,01.

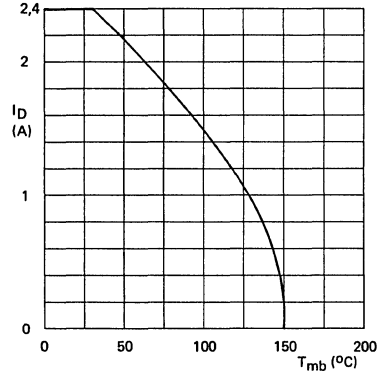


Fig. 7 Drain current as a function of mounting base temperature.

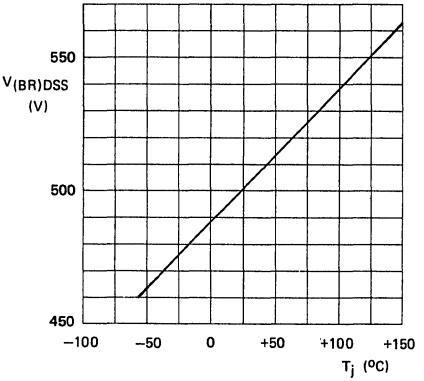


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

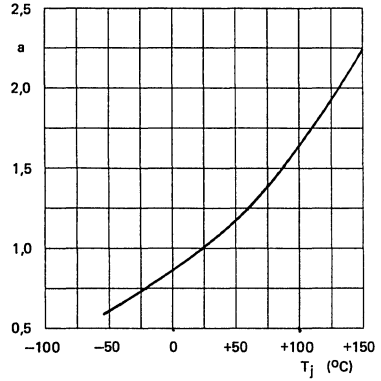


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

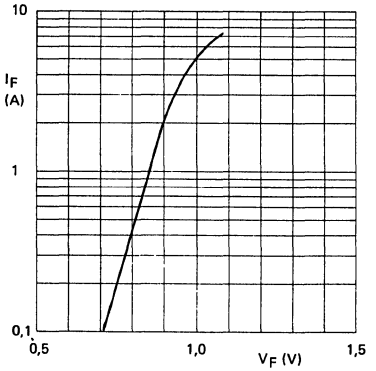


Fig. 10 Diode forward current as a function of forward voltage. t_p = 80 µs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

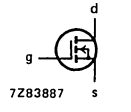
Drain-source voltage	V_{DS}	max.	500 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V	t_f	typ.	100 ns

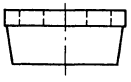
MECHANICAL DATA

Dimensions in mm

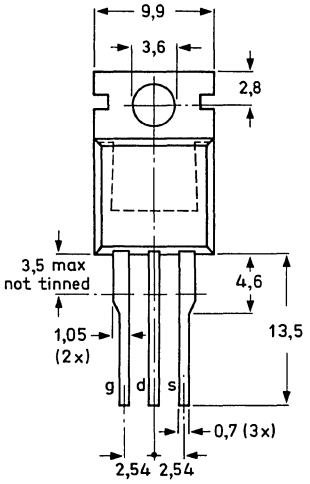
Fig. 1 TO-220AB.

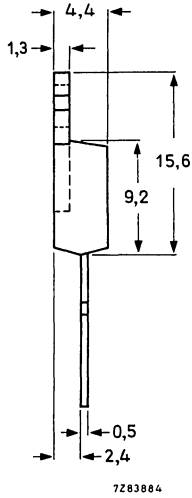
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	500 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	500 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	6 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}	−55 to +	150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	500 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	0,25 mA 1 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,2 A	$R_{DS\ ON}$	typ. <	3,6 Ω 4,0 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2 A
Forward current (peak value)	I_{FRM}	<	6 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ. <	1 V 1,3 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	350 ns
recovery charge	Q_s	typ.	3,5 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,2 A	g_{fs}	typ.	2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	350 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	50 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	20 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	150 ns
fall time	t_f	typ.	100 ns

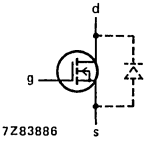


Fig. 2 Diode characteristics.

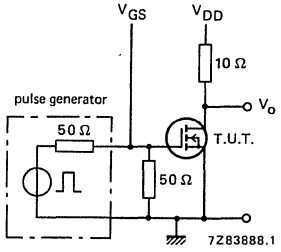


Fig. 3 Switching time test circuit.

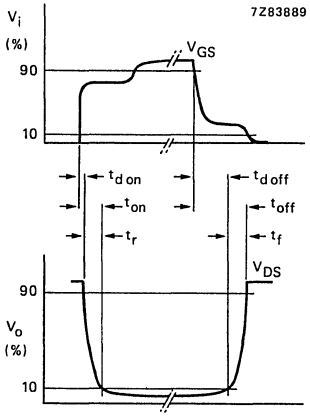


Fig. 4 Switching time waveforms.

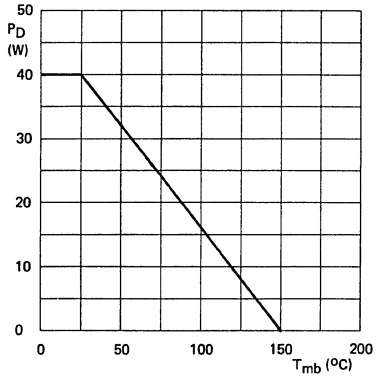


Fig. 5 Power derating curve.

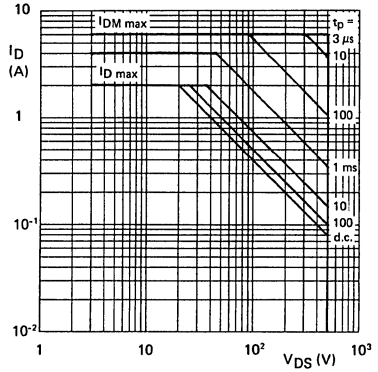


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

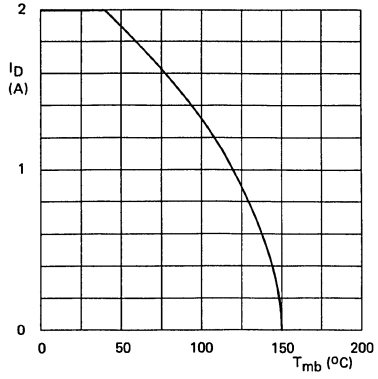


Fig. 7 Drain current as a function of mounting base temperature.

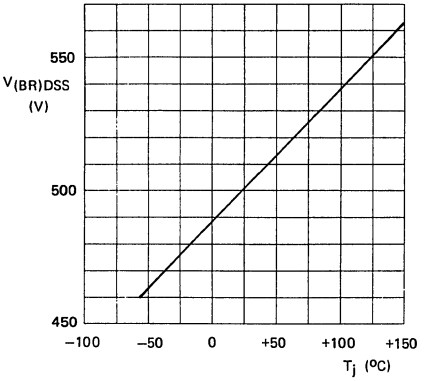


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

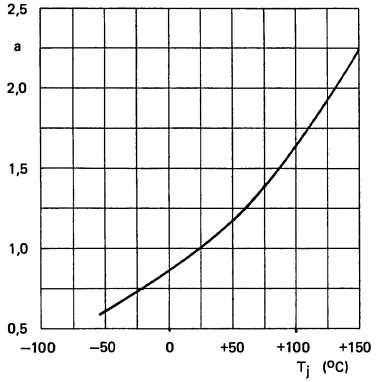


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

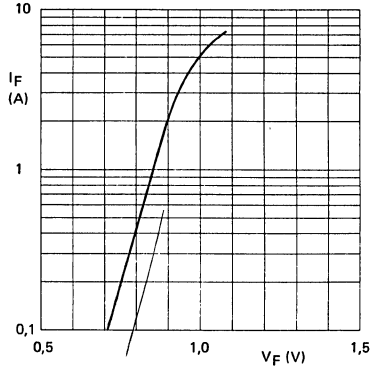


Fig. 10 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

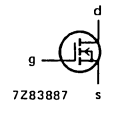
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	3 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1,8 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V	t_f	typ.	100 ns

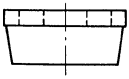
MECHANICAL DATA

Dimensions in mm

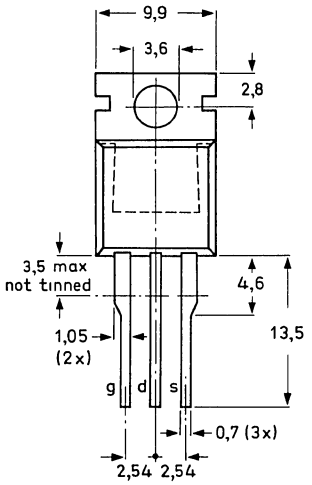
Fig. 1 TO-220AB.

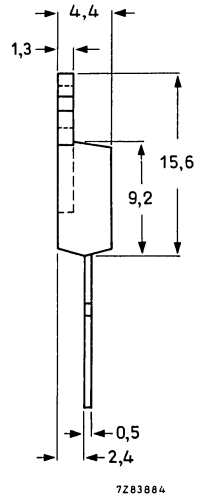
Drain connected to mounting base.





top view





Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	3 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	9 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage			
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400 V
Gate threshold voltage			
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	0,25 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	1 mA
Gate-source leakage current			
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance			
V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	1,8 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	3 A
Forward current (peak value)	I_{FRM}	<	9 A
On-state voltage			
I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,1 V
		<	1,4 V
Reverse recovery			
I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	300 ns
recovery charge	Q_s	typ.	2,5 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	typ.	2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	420 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	60 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	25 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	150 ns
fall time	t_f	typ.	100 ns

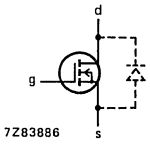


Fig. 2 Diode characteristics.

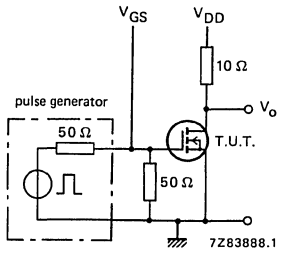


Fig. 3 Switching time test circuit.

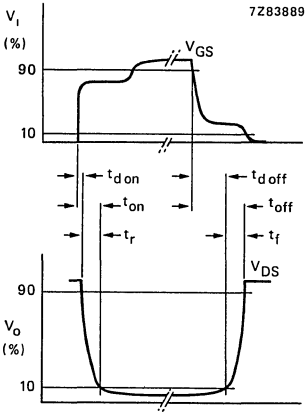


Fig. 4 Switching time waveforms.

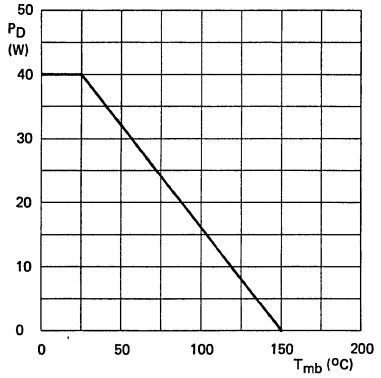


Fig. 5 Power derating curve.

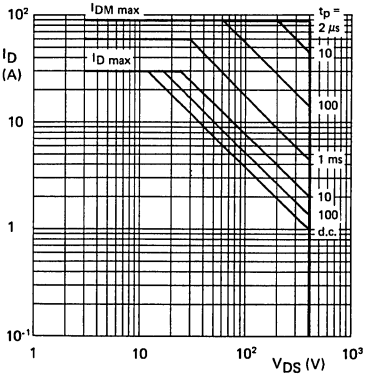


Fig. 6 Safe Operating ARea. T_{mb} = 25 °C; δ = 0,01.

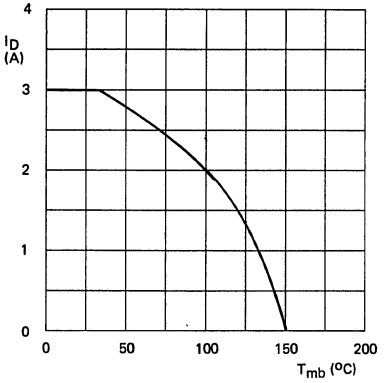


Fig. 7 Drain current as a function of mounting base temperature.

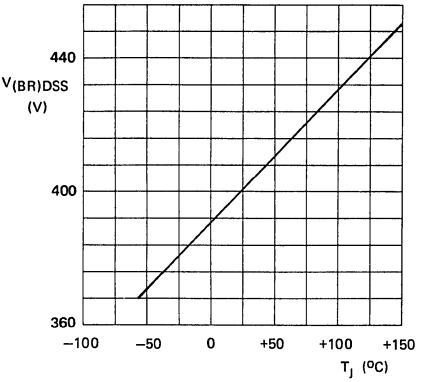


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

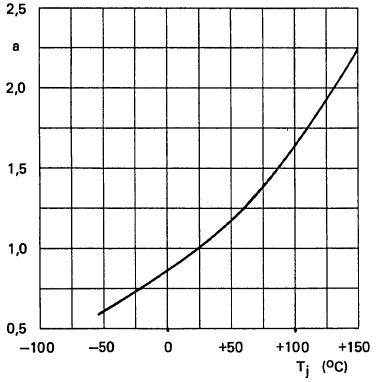


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

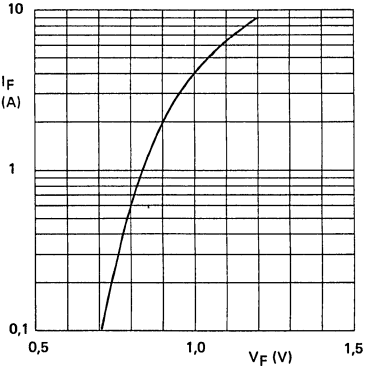


Fig. 10 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

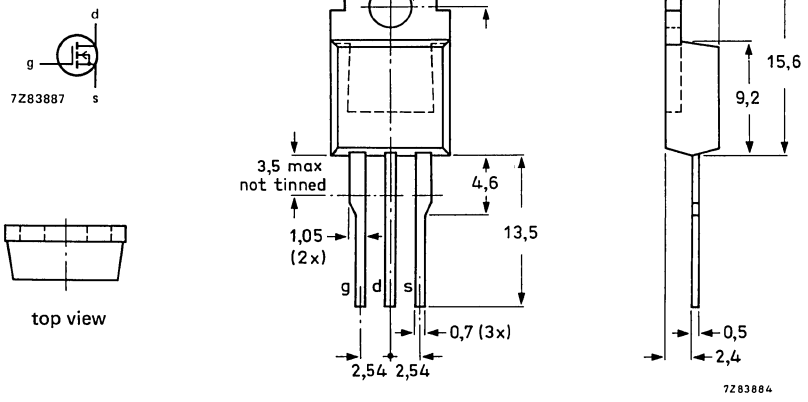
Drain-source voltage	V_{DS}	max.	400 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2,6 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	40 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,4 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	400 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	400 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 35 °C	I_D	max.	2,6 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7,5 A
Total power dissipation	P_{tot}	max.	40 W
Storage temperature	T_{stg}	−55 to + 150	°C
Junction temperature	T_j	max. + 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	3,1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	400 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS} I_{DSS}	< <	 0,25 mA 1 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	typ. <	2,2 Ω 2,5 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,6 A
Forward current (peak value)	I_{FRM}	<	7,5 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ. <	1,1 V 1,4 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	300 ns
recovery charge	Q_s	typ.	2,5 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	typ.	2,5 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	420 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	60 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	25 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,4 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	30 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	150 ns
fall time	t_f	typ.	100 ns

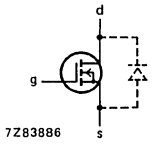


Fig. 2 Diode characteristics.

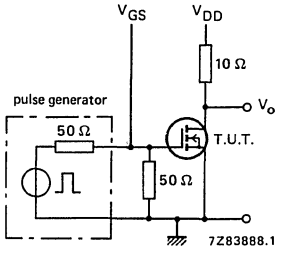


Fig. 3 Switching time test circuit.

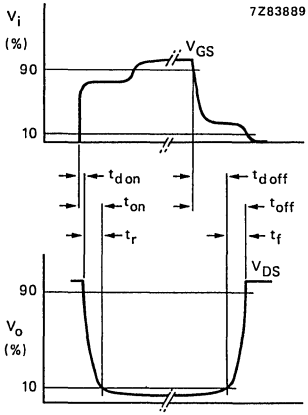


Fig. 4 Switching time waveforms.

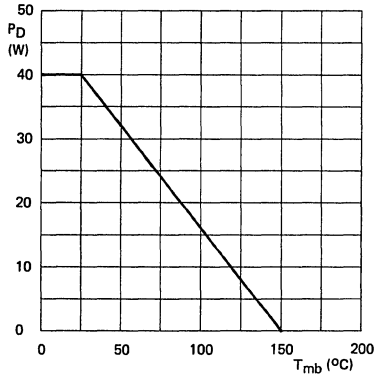


Fig. 5 Power derating curve.

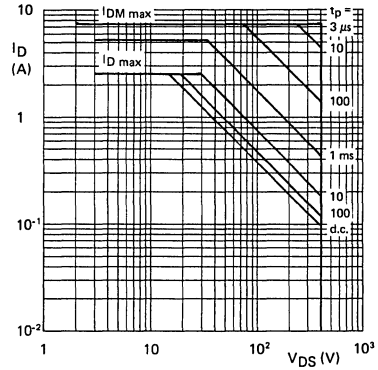


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

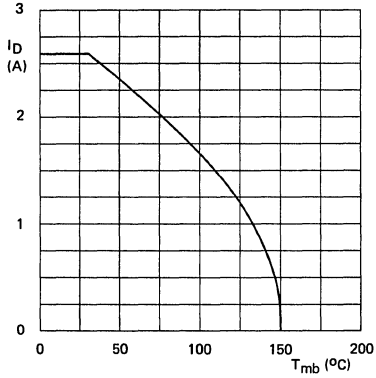


Fig. 7 Drain current as a function of mounting base temperature.

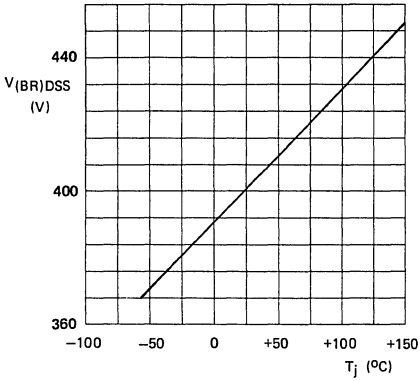


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

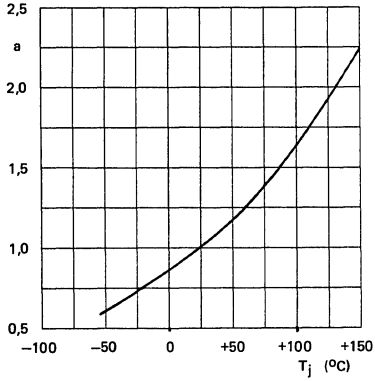


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

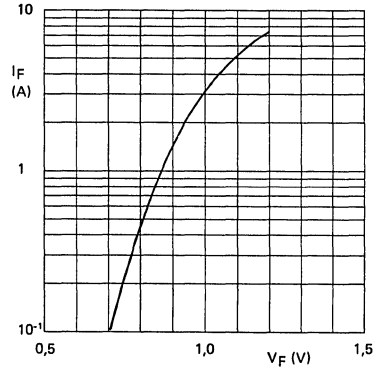


Fig. 10 Diode forward current as a function of forward voltage. t_p = 80 μs; T_j = 25 °C.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

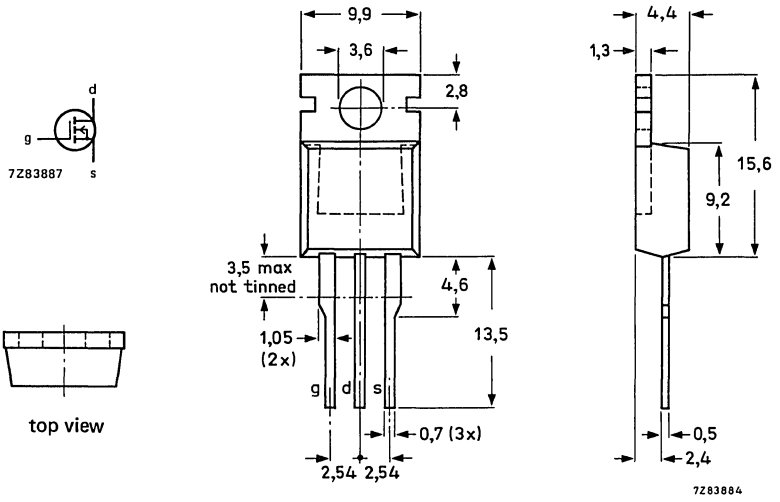
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	2,6 A
Total power dissipation	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 45 °C	I_D	max.	2,6 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	7,5 A
Total power dissipation	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800 V
Gate threshold voltage $V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}	 typ.	2,1 to 4 V 3 V
Zero gate voltage drain current $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C $V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	 I_{DSS} I_{DSS}	 <	 1 mA 4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	4 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,6 A
Forward current (peak value)	I_{FRM}	<	7,5 A
On-state voltage $I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ. <	1,05 V 1,3 V
Reverse recovery $I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1800 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> typ.	1,0 A/V 1,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

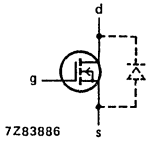


Fig. 2 Diode characteristics.

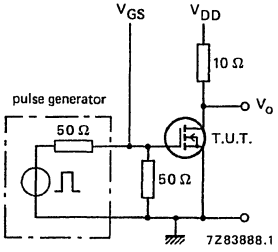


Fig. 3 Switching time test circuit.

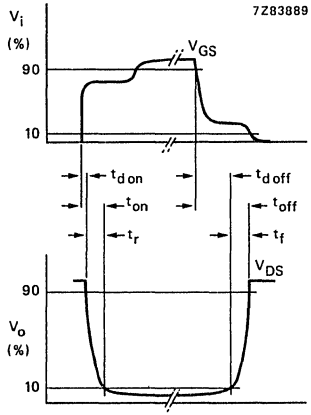


Fig. 4 Switching time waveforms.

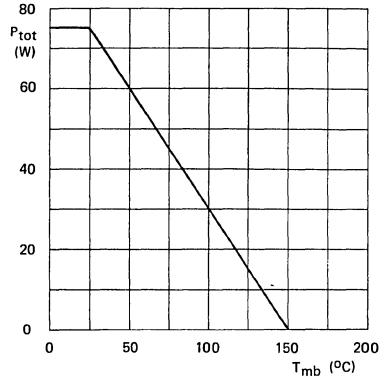


Fig. 5 Power derating curve.

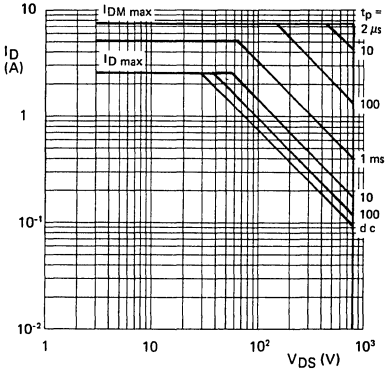


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

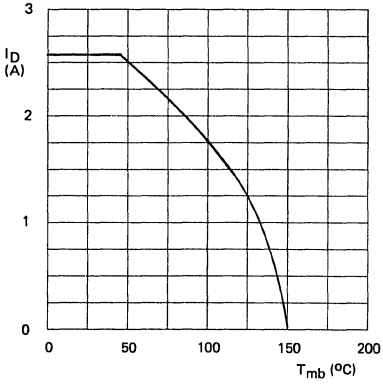


Fig. 7 Drain current as a function of mounting base temperature.

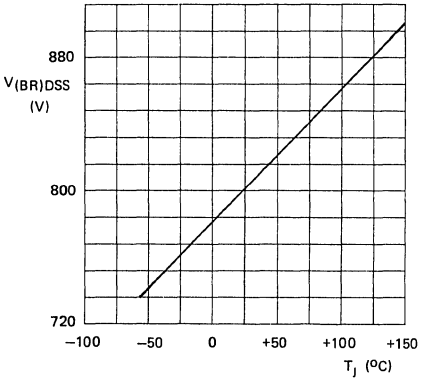


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

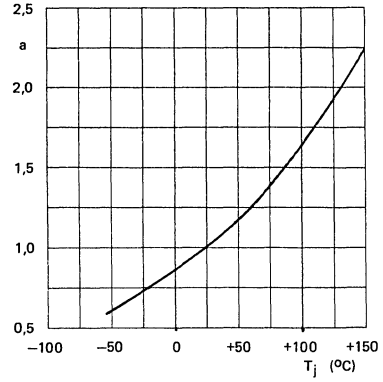


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a plastic envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

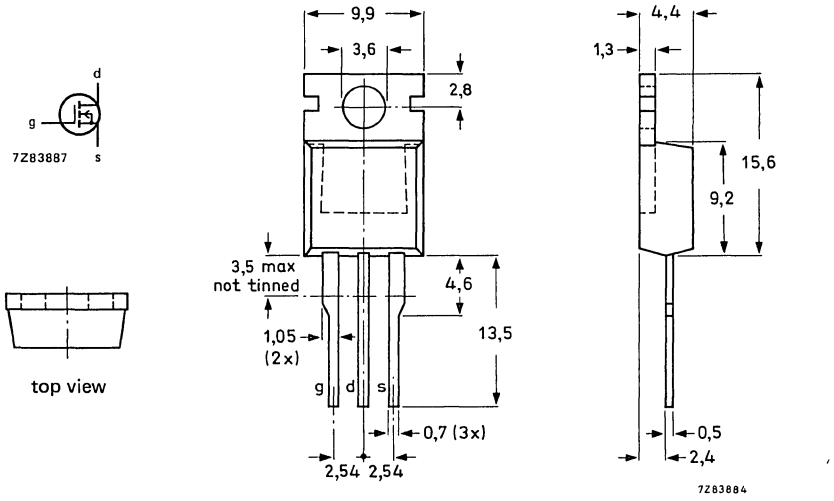
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	3 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	3 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 45 °C	I_D	max.	3 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	9 A
Total power dissipation; T_{mb} = 25 °C	P_{tot}	max.	75 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,67 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	75 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage			
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800 V
Gate threshold voltage			
V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current			
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance			
V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	3 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	3 A
Forward current (peak value)	I_{FRM}	<	9 A
On-state voltage			
I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery			
I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1800 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> 1,0 typ. 1,8	A/V A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ. 1600	pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ. 90	pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ. 30	pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ. 40	ns
rise time	t_r	typ. 70	ns
turn-off times: delay time	$t_{d\,off}$	typ. 200	ns
fall time	t_f	typ. 100	ns

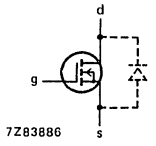


Fig. 2 Diode characteristics.

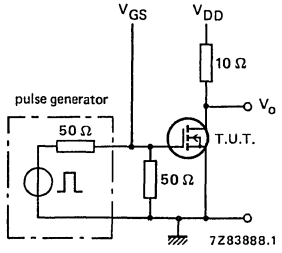


Fig. 3 Switching time test circuit.

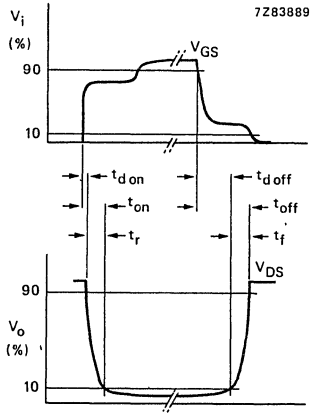


Fig. 4 Switching time waveforms.

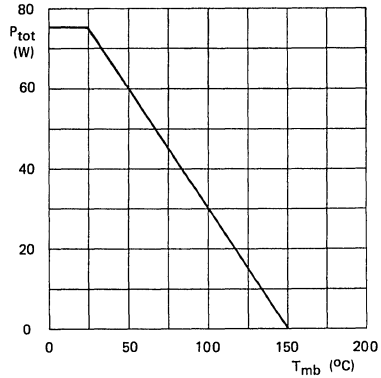


Fig. 5 Power derating curve.

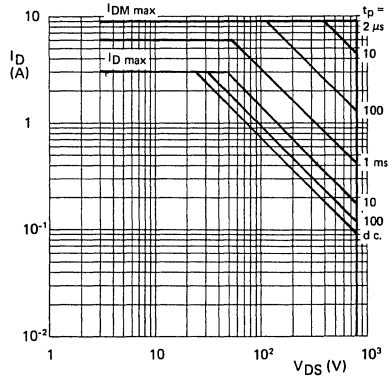


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

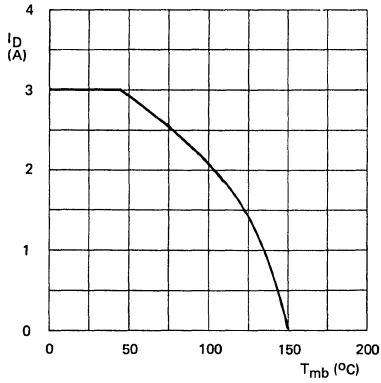


Fig. 7 Drain current as a function of mounting base temperature.

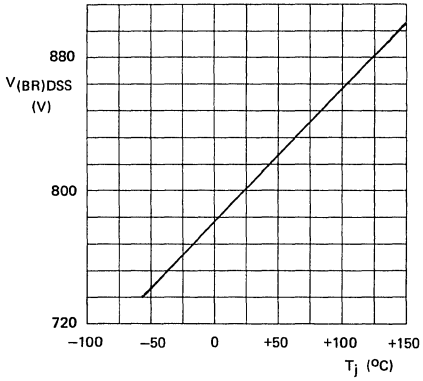


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

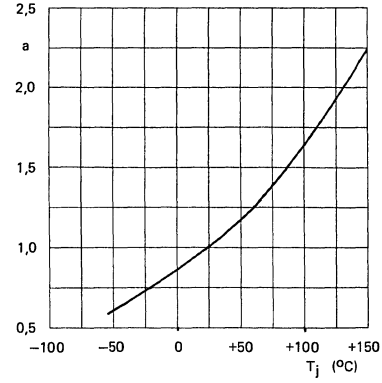


Fig. 9 $R_{DS\,ON}$ (T_j) = a x $R_{DS\,ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

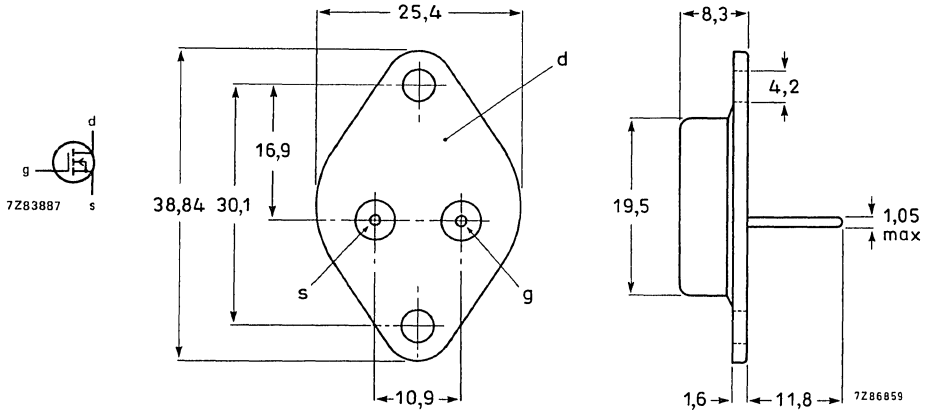
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	2,9 A
Total power dissipation	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	4 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 30 °C	I_D	max.	2,9 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	8,5 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage			
V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800 V
Gate threshold voltage			
$V_{DS} = V_{GS}$; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current			
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
$V_{DS} = V_{DSmax}$; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current			
V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance			
V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	4 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	2,9 A
Forward current (peak value)	I_{FRM}	<	8,5 A
On-state voltage			
$I_F = 2\ I_D$; V_{GS} = 0 V	V_F	typ.	1,05 V
		<	1,3 V
Reverse recovery			
$I_F = 2\ I_D$; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1800 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance			
V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	>	1,0 A/V
		typ.	1,8 A/V
Input capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz			
V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4)			
(between 10% and 90% levels)			
V_{DD} = 30 V; I_D = 2,1 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

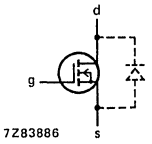


Fig. 2 Diode characteristics.

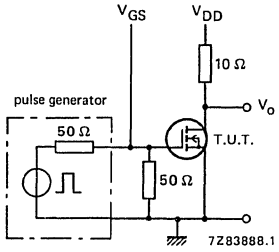


Fig. 3 Switching time test circuit.

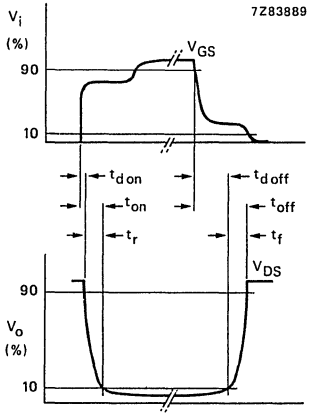


Fig. 4 Switching time waveforms.

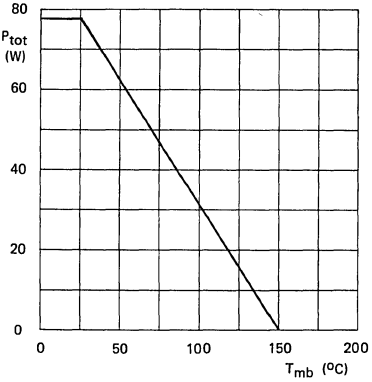


Fig. 5 Power derating curve.

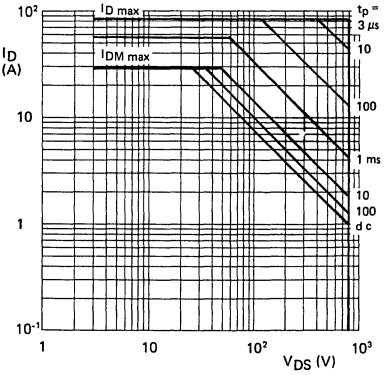


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

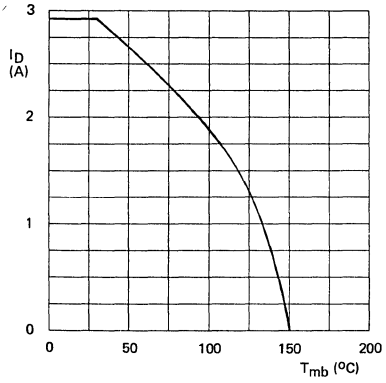


Fig. 7 Drain current as a function of mounting base temperature.

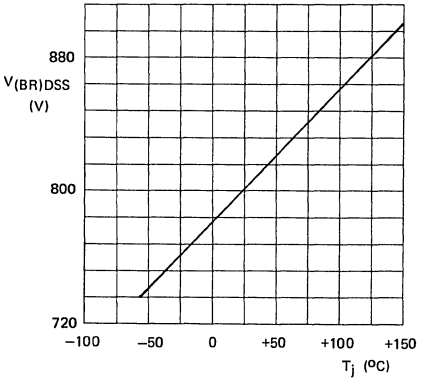


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

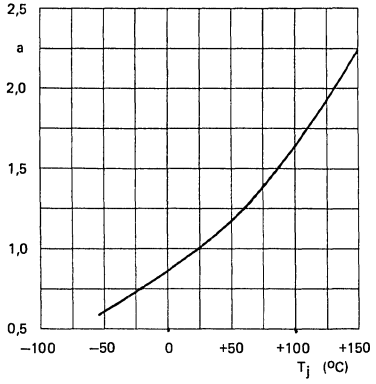


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

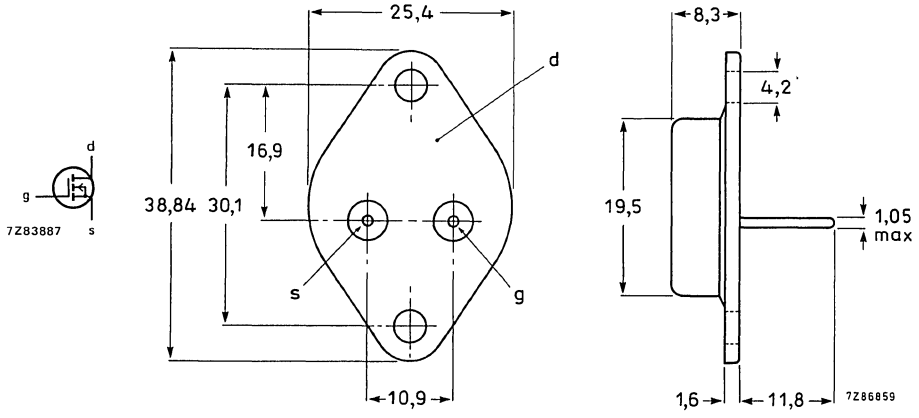
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	3,4 A
Total power dissipation	P_{tot}	max.	78 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	3 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	3,4 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	10 A
Total power dissipation	P_{tot}	max.	78 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,6 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 1,5 A	$R_{DS\ ON}$	<	3 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	3,4 A
Forward current (peak value)	I_{FRM}	<	10 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V	V_F	typ.	1,1 V
		<	1,35 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1800 ns
recovery charge	Q_s	typ.	12 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 1,5 A	g_{fs}	> typ.	1,0 A/V 1,8 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	1600 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	90 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	30 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,3 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	40 ns
rise time	t_r	typ.	70 ns
turn-off times: delay time	$t_{d\,off}$	typ.	200 ns
fall time	t_f	typ.	100 ns

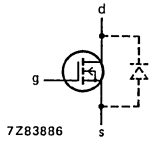


Fig. 2 Diode characteristics.

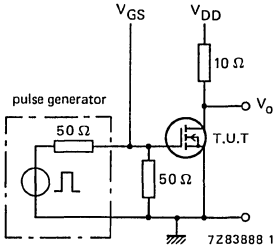


Fig. 3 Switching time test circuit.

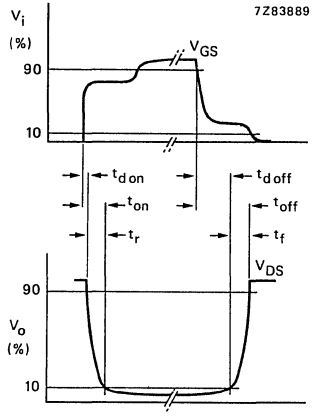


Fig. 4 Switching time waveforms.

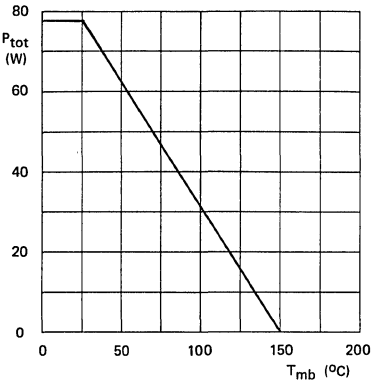


Fig. 5 Power derating curve.

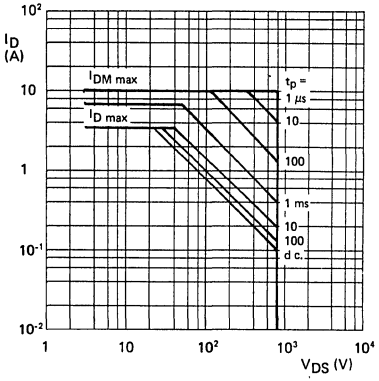


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

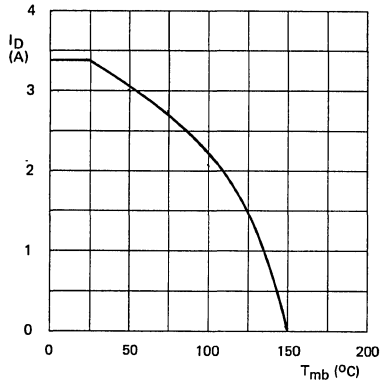


Fig. 7 Drain current as a function of mounting base temperature.

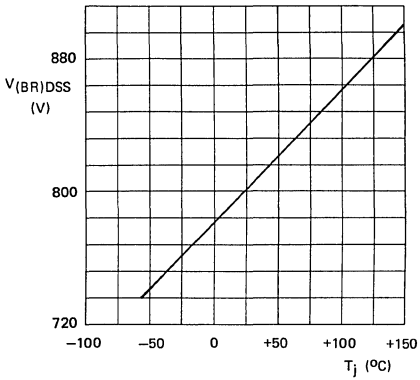


Fig. 8 Drain-source breakdown voltage as a function of junction temperature.

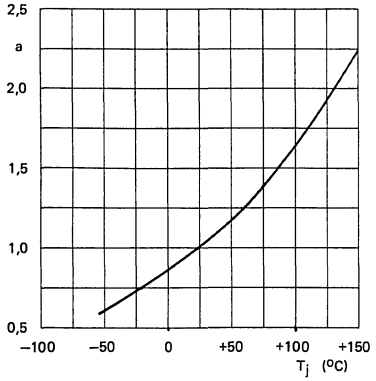


Fig. 9 $R_{DS\ ON}$ (T_j) = a x $R_{DS\ ON}$ (25 °C).

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

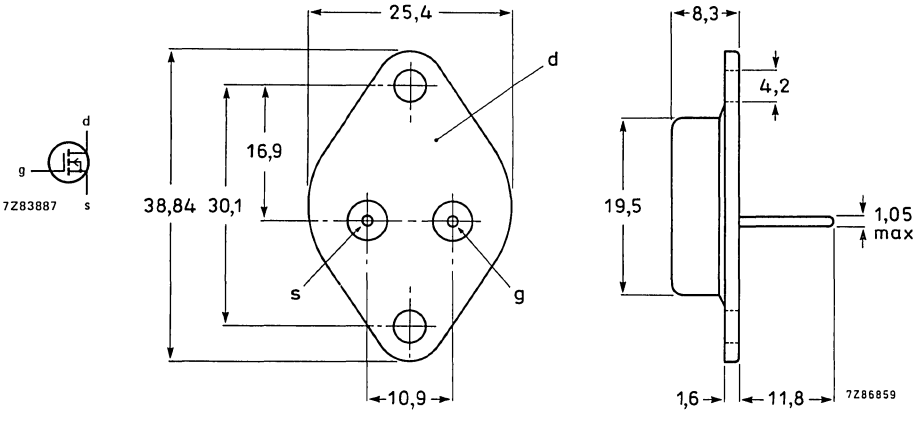
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	5,3 A
Total power dissipation	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	2 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800 V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	5,3 A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	15 A
Total power dissipation	P_{tot}	max.	125 W
Storage temperature	T_{stg}		−55 to + 150 °C
Junction temperature	T_j	max.	+ 150 °C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1 K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35 K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800 V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4 V
		typ.	3 V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1 mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4 mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100 nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 3 A	$R_{DS\ ON}$	<	2 Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	5,3 A
Forward current (peak value)	I_{FRM}	<	15 A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V; T_j = 25 °C	V_F	typ.	1 V
		<	1,45 V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs			
recovery time	t_{rr}	typ.	1800 ns
recovery charge	Q_s	typ.	25 μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 3 A	g_{fs}	>	1,8 A/V
		typ.	3 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,5 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	60 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	500 ns
fall time	t_f	typ.	100 ns

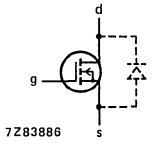


Fig. 2 Diode characteristics.

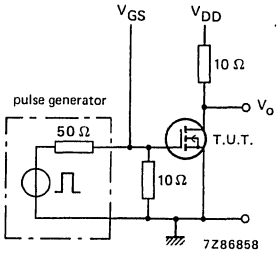


Fig. 3 Switching time test circuit.

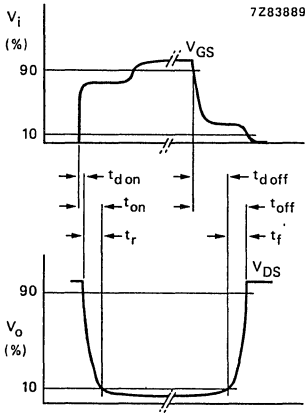


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

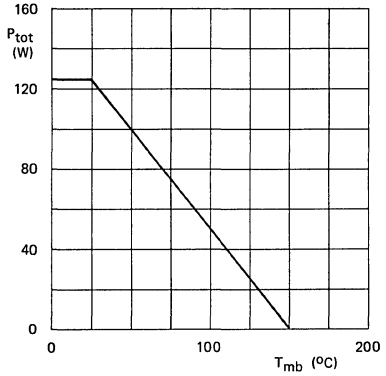


Fig. 5 Power derating curve.

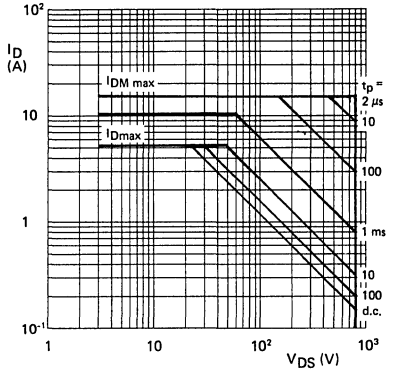


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

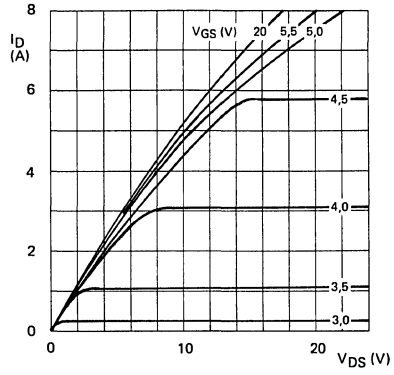


Fig. 7 Output characteristic.
80 μs pulse test; T_{mb} = 25 °C.

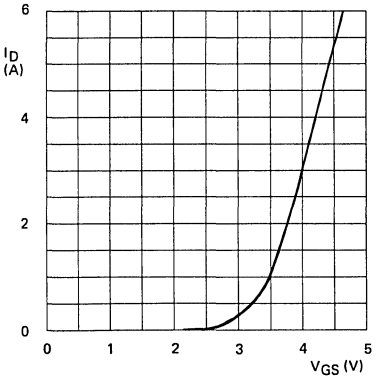


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

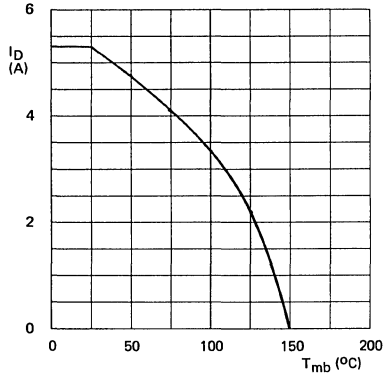


Fig. 9 Drain current as a function of mounting base temperature.

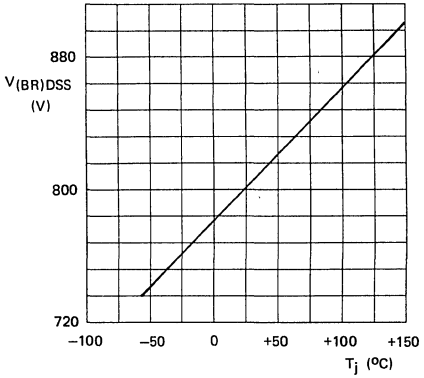


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

POWER MOS TRANSISTOR

N-channel enhancement mode field-effect power transistor in a TO-3 envelope; with the drain connected to the mounting base.
Intended for use in motor control; SMPS; welding, DC/DC and DC/AC converters.

QUICK REFERENCE DATA

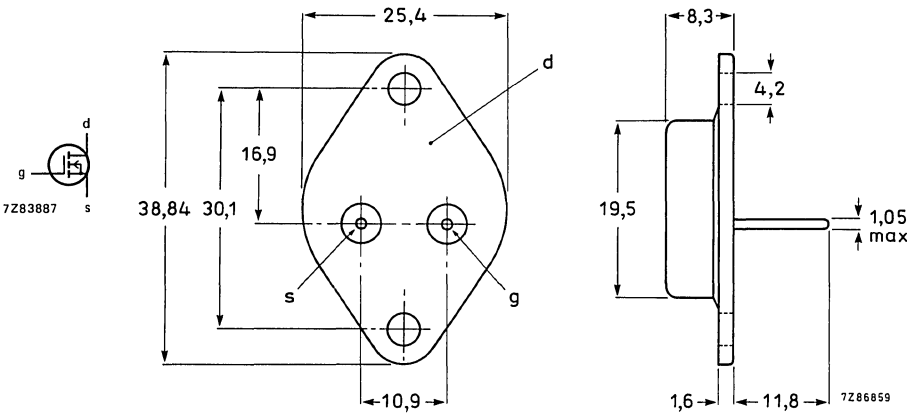
Drain-source voltage	V_{DS}	max.	800 V
Drain current (d.c.)	I_D	max.	6 A
Total power dissipation	P_{tot}	max.	125 W
Drain-source resistance (on)	$R_{DS\ ON}$	<	1,5 Ω
Turn-off fall-time V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V	t_f	typ.	100 ns

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-3.

Drain connected to mounting base.



Protect the gate-source input during transport or handling against static charge.

See relevant chapter for mounting instructions.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	800	V
Drain-gate voltage (R_{GS} = 20 kΩ)	V_{DGR}	max.	800	V
Gate-source voltage	$\pm V_{GS}$	max.	20	V
Drain current (d.c.); T_{mb} = 25 °C	I_D	max.	6	A
Drain current (pulse peak value); T_{mb} = 25 °C	I_{DM}	max.	18	A
Total power dissipation	P_{tot}	max.	125	W
Storage temperature	T_{stg}	−55 to +	150	°C
Junction temperature	T_j	max.	+ 150	°C

THERMAL CHARACTERISTICS

Thermal resistance

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1	K/W
From junction to ambient	$R_{th\ j\text{-}a}$	=	35	K/W

STATIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Drain-source breakdown voltage V_{GS} = 0 V; I_D = 1 mA	$V_{(BR)DSS}$	>	800	V
Gate threshold voltage V_{DS} = V_{GS}; I_D = 10 mA	V_{GST}		2,1 to 4	V
		typ.	3	V
Zero gate voltage drain current V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 25 °C	I_{DSS}	<	1	mA
V_{DS} = V_{DSmax}; V_{GS} = 0; T_j = 125 °C	I_{DSS}	<	4	mA
Gate-source leakage current V_{GS} = 20 V; V_{DS} = 0 V	I_{GSS}	<	100	nA
Drain-source on-state resistance V_{GS} = 10 V; I_D = 3 A	$R_{DS\ ON}$	<	1,5	Ω

Diode characteristics

T_{mb} = 25 °C unless otherwise specified

Forward current	I_F	<	6	A
Forward current (peak value)	I_{FRM}	<	18	A
On-state voltage I_F = 2 I_D; V_{GS} = 0 V; T_j = 25 °C	V_F	typ.	1,1	V
		<	1,5	V
Reverse recovery I_F = 2 I_D; dI_F/dt = 100 A/μs; T_j = 25 °C				
recovery time	t_{rr}	typ.	1800	ns
recovery charge	Q_s	typ.	25	μC

DYNAMIC CHARACTERISTICS

Forward transfer conductance V_{DS} = 25 V; I_D = 3 A	g_{fs}	>	1,8 A/V
		typ.	3 A/V
Input capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{is}	typ.	3500 pF
Output capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{os}	typ.	200 pF
Feedback capacitance at f = 1 MHz V_{GS} = 0 V; V_{DS} = 25 V	C_{rs}	typ.	100 pF
Switching times (see Figs 3 and 4) (between 10% and 90% levels) V_{DD} = 30 V; I_D = 2,6 A; V_{GS} = 10 V			
turn-on times: delay time	$t_{d\,on}$	typ.	60 ns
rise time	t_r	typ.	100 ns
turn-off times: delay time	$t_{d\,off}$	typ.	500 ns
fall time	t_f	typ.	100 ns

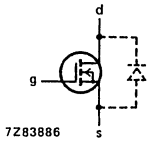


Fig. 2 Diode characteristics.

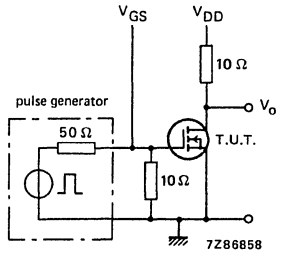


Fig. 3 Switching time test circuit.

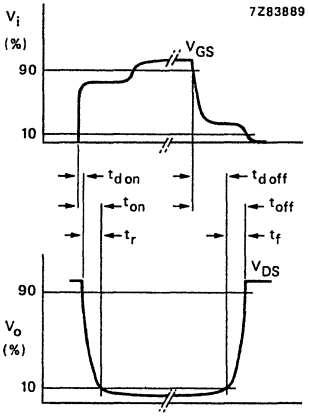


Fig. 4 Switching time waveforms.

DEVELOPMENT SAMPLE DATA

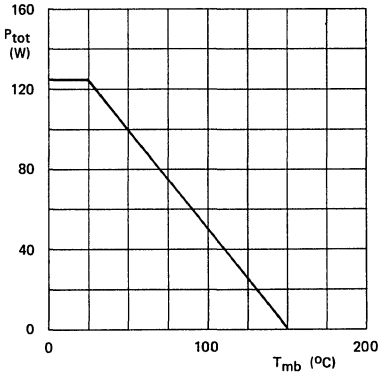


Fig. 5 Power derating curve.

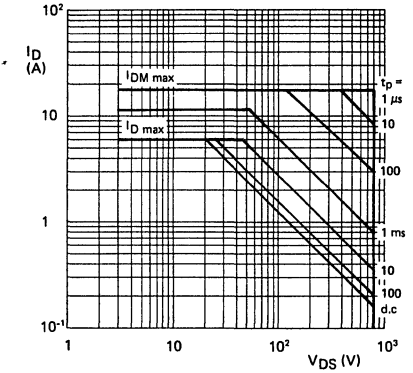


Fig. 6 Safe Operating ARea.
T_{mb} = 25 °C; δ = 0,01.

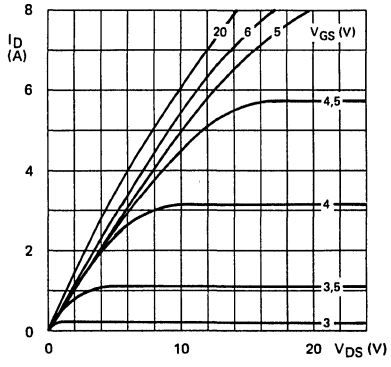


Fig. 7 Output characteristic.
80 μs pulse test; T_{mb} = 25 °C.

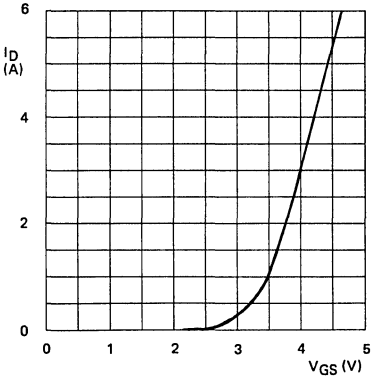


Fig. 8 Typical transfer characteristic at V_{DS} = 25 V.

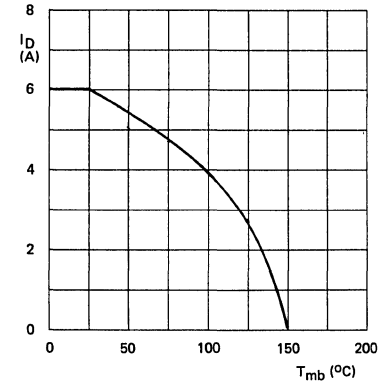


Fig. 9 Drain current as a function of mounting base temperature.

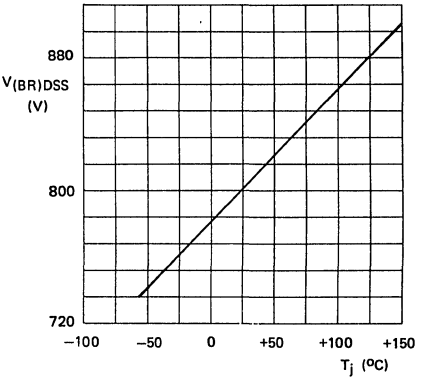


Fig. 10 Drain-source breakdown voltage as a function of junction temperature.

MOUNTING INSTRUCTIONS

MOUNTING INSTRUCTIONS FOR TO-220 ENVELOPES

GENERAL DATA AND INSTRUCTIONS

General rules

1. First fasten the device to the heatsink before soldering the leads.
2. Avoid axial stress to the leads.
3. Keep mounting tool (e.g. screwdriver) clear of the plastic body.
4. The rectangular washer may only touch the plastic part of the body; it should not exert any force on that part (screw mounting).

Heatsink requirements

Flatness in the mounting area: 0,02 mm maximum per 10 mm.
Mounting holes must be deburred, see further mounting instructions.

Heatsink compound

Values of the thermal resistance from mounting base to heatsink ($R_{th\ mb\text{-}h}$) given for mounting with heatsink compound refer to the use of a metallic oxide-loaded compound. Ordinary silicone grease is not recommended.

For insulated mounting, the compound should be applied to the bottom of both device and insulator.

Mounting methods for power transistors

1. Clip mounting

   Mounting with a spring clip gives:

   a. A good thermal contact under the crystal area, and slightly lower $R_{th\ mb\text{-}h}$ values than screw mounting.
   b. Safe insulation for mains operation.

2. M3 screw mounting

   It is recommended that the rectangular spacing washer is inserted between screw head and mounting tab.

   Mounting torque for screw mounting:

   (For thread-forming screws these are final values. Do not use self-tapping screws.)

Minimum torque (for good heat transfer)	0,55 Nm (5,5 kgcm)
Maximum torque (to avoid damaging the device)	0,80 Nm (8,0 kgcm)

   N.B.: When a nut or screw is not driven direct against a curved spring washer or lock washer (not for thread-forming screw), the torques are as follows:

Minimum torque (for good heat transfer)	0,4 Nm (4 kgcm)
Maximum torque (to avoid damaging the device)	0,6 Nm (6 kgcm)

N.B.: Data on accessories are given in separate data sheets.

3. Rivet mounting non-insulated

The device should not be pop-rivetted to the heatsink. However, it is permissible to press-rivet providing that eyelet rivets of soft material are used, and the press forces are slowly and carefully controlled so as to avoid shock and deformation of either heatsink or mounting tab.

Thermal data

			clip mounting	screw mounting	
From mounting base to heatsink					
with heatsink compound, direct mounting	$R_{th\ mb\text{-}h}$	=	0,3	0,5	K/W
without heatsink compound, direct mounting	$R_{th\ mb\text{-}h}$	=	1,4	1,4	K/W
with heatsink compound and 0,1 mm maximum mica washer	$R_{th\ mb\text{-}h}$	=	2,2	–	K/W
with heatsink compound and 0,25 mm maximum alumina insulator	$R_{th\ mb\text{-}h}$	=	0,8	–	K/W
with heatsink compound and 0,05 mm mica washer					
insulated up to 500 V	$R_{th\ mb\text{-}h}$	=	–	1,4	K/W
insulated up to 800 V/1000 V	$R_{th\ mb\text{-}h}$	=	–	1,6	K/W
without heatsink compound and 0,05 mm mica washer					
insulated up to 500 V	$R_{th\ mb\text{-}h}$	=	–	3,0	K/W
insulated up to 800 V/1000 V	$R_{th\ mb\text{-}h}$	=	–	4,5	K/W

Lead bending

Maximum permissible tensile force on the body, for 5 seconds is 20 N (2 kgf).

The leads can be bent through 90° maximum, twisted or straightened. To keep forces within the above-mentioned limits, the leads are generally clamped near the body, using pliers. The leads should neither be bent nor twisted less than 2,4 mm from the body.

Soldering

Lead soldering temperature at > 3 mm from the body; $t_{sld} < 5$ s:

Devices with $T_{j\ max} \leqslant 175$ °C, soldering temperature $T_{sld\ max} = 275$ °C.
Devices with $T_{j\ max} \leqslant 110$ °C, soldering temperature $T_{sld\ max} = 240$ °C.

Avoid any force on body and leads during or after soldering: do not correct the position of the device or of its leads after soldering.

It is not permitted to solder the metal tab of the device to a heatsink, otherwise its junction temperature rating will be exceeded.

Mounting base soldering

Recommended metal-alloy of solder paste (85% metal weight)
62 Sm/36 Pb/2 Ag or 60 Sn/40 Pb.
Maximum soldering temperature $\leqslant 200$ °C (tab-temperature).
Soldering cycle duration including pre-heating $\leqslant 30$ sec.

For good soldering and avoiding damage to the encapsulation pre-heating is recommended to a temperature $\leqslant 165$ °C at a duration $\leqslant 10$ s.

INSTRUCTIONS FOR CLIP MOUNTING

Direct mounting with clip 56363

1. Apply heatsink compound to the mounting base, then place the transistor on the heatsink.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical (see Figs 1 and 2).
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab (see Fig. 2a).

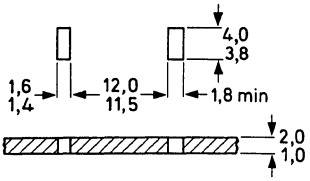


Fig. 1 Heatsink requirements.

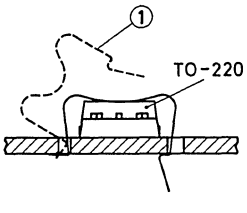


Fig. 2 Mounting.
(1) spring clip 56363.

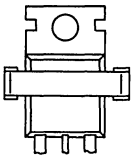


Fig. 2a Position of transistor (top view).

Insulated mounting with clip 56364

With the insulators 56367 or 56369 insulation up to 2 kV is obtained.

1. Apply heatsink compound to the bottom of both transistor and insulator, then place the transistor with the insulator on the heatsink.
2. Push the short end of the clip into the narrow slot in the heatsink with the clip at an angle of 10° to 30° to the vertical (see Figs 3 and 4).
3. Push down the clip over the device until the long end of the clip snaps into the wide slot in the heatsink. The clip should bear on the plastic body, not on the tab. Ensure that the device is centred on the mica insulator to prevent creepage.

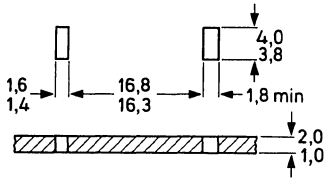


Fig. 3 Heatsink requirements.

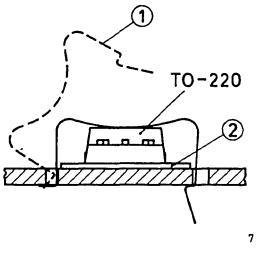


Fig. 4 Mounting.
(1) spring clip 56364.
(2) insulator 56369 or 56367.

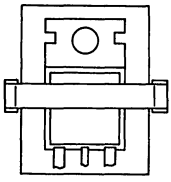


Fig. 4a Position of transistor (top view).

INSTRUCTIONS FOR SCREW MOUNTING

Dimensions in mm

Direct mounting with screw and spacing washer

- *through heatsink with nut*

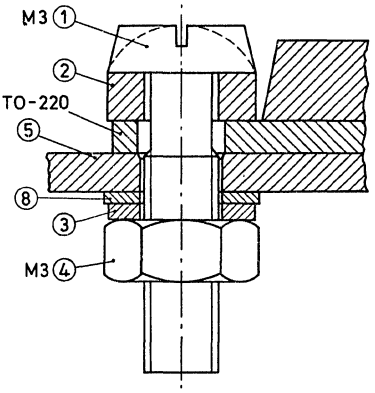


Fig. 5 Assembly.

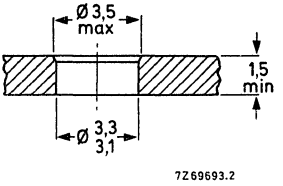


Fig. 6 Heatsink requirements.

(1) M3 screw.
(2) rectangular washer (56360a).
(3) lock washer.
(4) M3 nut.
(5) heatsink.
(8) plain washer.

- *into tapped heatsink*

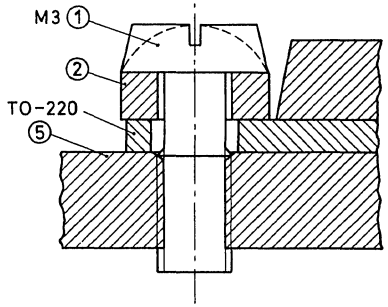


Fig. 7 Assembly.

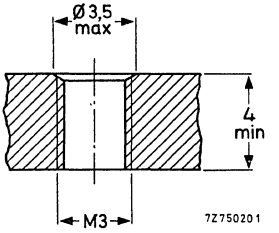


Fig. 8 Heatsink requirements.

(1) M3 screw.
(2) rectangular washer 56360a.
(5) heatsink.

Insulated mounting with screw and spacing washer
(not recommended where mounting tab is on mains voltage)

Dimensions in mm

- *through heatsink with nut*

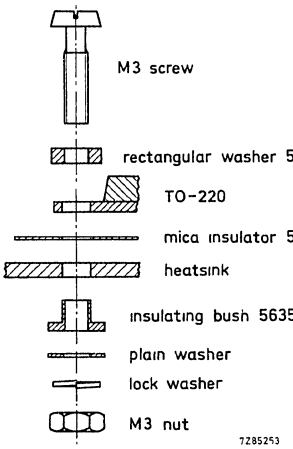


Fig. 9 Insulated screw mounting with rectangular washer. Known as a "bottom mounting".

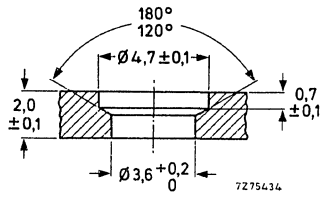


Fig. 10 Heatsink requirements for 500 V insulation.

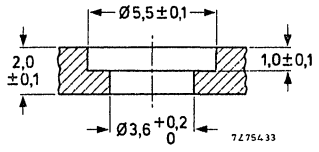


Fig. 11 Heatsink requirements for 800 V insulation.

- *into tapped heatsink*

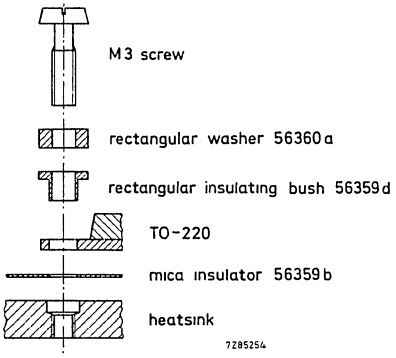


Fig. 12 Insulated screw mounting with rectangular washer into tapped heatsink. Known as a "top mounting".

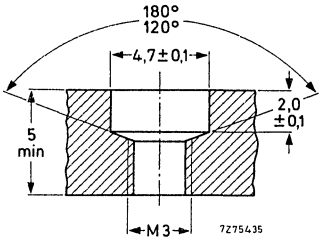


Fig. 13 Heatsink requirements for 500 V insulation.

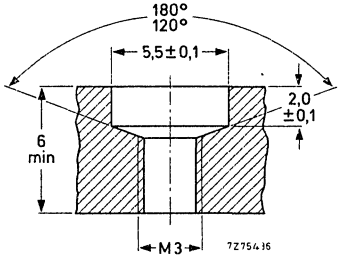


Fig. 14 Heatsink requirements for 1000 V insulation.

MOUNTING INSTRUCTIONS FOR TO-3 ENVELOPES

GENERAL DATA AND INSTRUCTIONS

Instructions for direct mounting.

Mounting instructions for up to 500 V insulation.
Using insulating bushes 56201j or 56261a and mica washer 56201d.

Mounting instructions for 500 to 2000 V insulation.
Using mounting support 56352 and mica washer 56339.

Heatsink requirements

Flatness in the mounting area: 0,05 mm per 40 mm

Mounting holes must be deburred.

Mounting torques

Minimum torque (for good heat transfer)	0,4 Nm (4 kgcm)
Maximum torque (to avoid damaging the transistor)	0,6 Nm (6 kgcm)

N.B.: When the driven nut or screw is in direct contact with a toothed lock washer (e.g. Fig. 10), the torques are as follows:

Minimum torque	0,55 Nm (5,5 kgcm)
Maximum torque	0,8 Nm (8 kgcm)

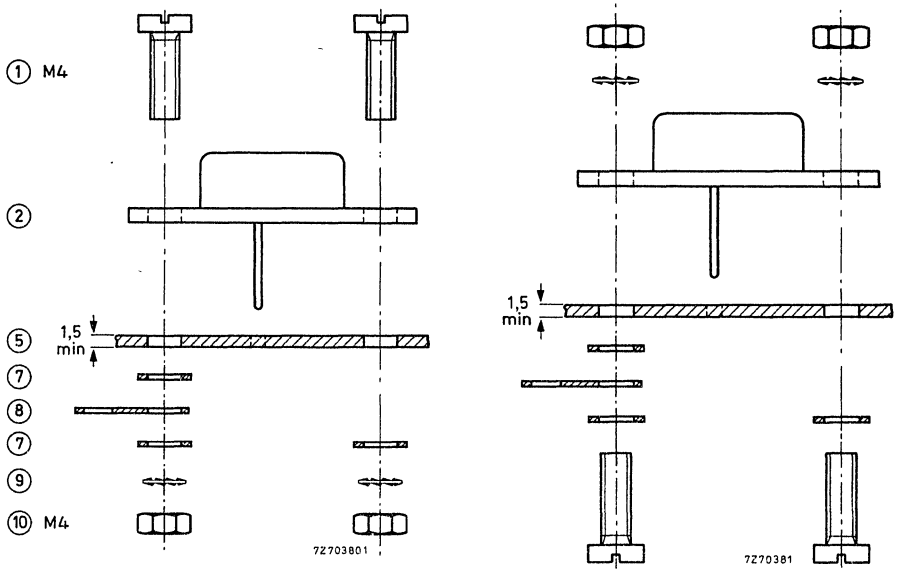
Thermal data

The thermal resistance from mounting base to heatsink ($R_{th\ mb\text{-}h}$) can be reduced by applying a heat conducting compound between transistor and heatsink. For insulated mounting the compound should be applied to the bottom of both device and insulator.

		Direct mounting	Insulated mounting		
			500 V mica	2000 V mica	
From mounting base to heatsink					
without heatsink compound	$R_{th\ mb\text{-}h}$	0,6	1,0	1,25	K/W
with heatsink compound	$R_{th\ mb\text{-}h}$	0,1	0,3	0,5	K/W

INSTRUCTIONS FOR DIRECT MOUNTING

The transistors should be mounted with M4 screws, see Figs 1 and 2. Minimum heatsink thickness (for good heat transfer) 1,5 mm. Hole pattern: Fig. 3.
A heatsink with tapped holes or insert nuts can also be used, but a torque washer is necessary between metal washer and transistor. See Fig. 4.



Figs 1 and 2. Direct mounting with nuts.

Legend
(1) = screw
(2) = TO-3
(4) = mica
(5) = heatsink
(6) = insulating bush
(7) = metal washer
(8) = soldering tag
(9) = lock washer
(10) = nut
(11) = tapped hole
(12) = insert nut
Dimensions in mm

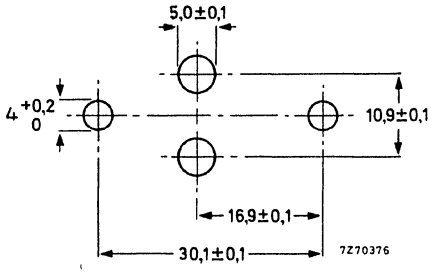


Fig. 3 Hole pattern for direct mounting with nuts.

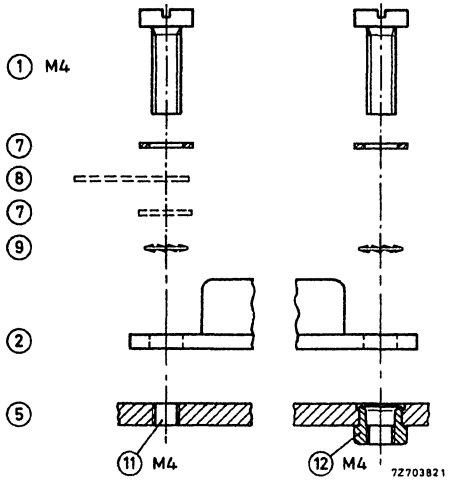


Fig. 4 Direct mounting with tapped holes or insert nuts.

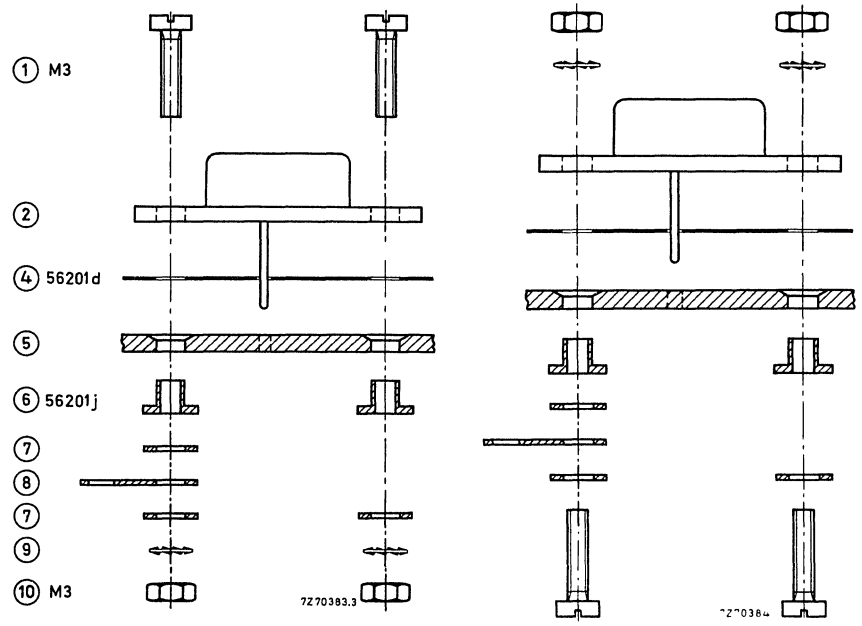
MOUNTING INSTRUCTIONS FOR UP TO 500 V INSULATION

Using insulating bushes 56201j and mica washer 56201d

For the component arrangement with minimum heatsink thickness see Figs 5 and 6. For hole pattern and shape of holes see Figs 7 and 8.

Using insulating bush 56261a and mica washer 56201d

For an arrangement with M3 screws and nuts see Fig. 9, mounting holes are given in Figs 7 and 8. The accessories can also be used in combination with M3 screws and heatsinks provided with tapped holes or insert nuts. Lock washers are necessary between screw-head and metal washer, see Fig. 10. For an assembly drawing with tapped holes see Fig. 11, with insert nuts see Fig. 12.



Figs 5 and 6. Insulated mounting (500 V) with 56201j and 56201d. Heatsink thickness: 1,5 to 2,5 mm.

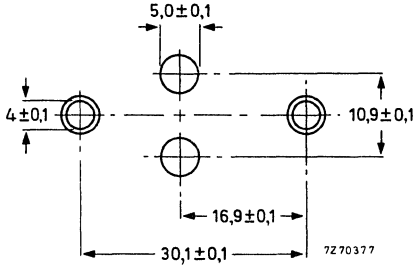


Fig. 7 Hole pattern for 500 V insulation, nut fastening.

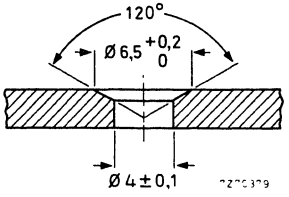


Fig. 8 Shape of hole for 500 V insulation, nut fastening.

For legend see page 276.

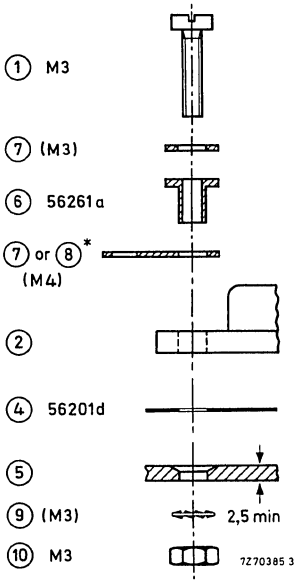


Fig. 9 Insulated mounting (500 V) with nuts.

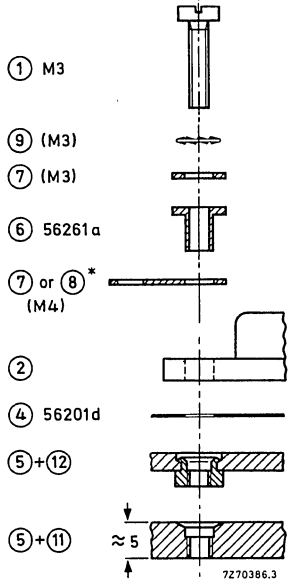


Fig. 10 Insulated mounting (500 V) with tapped holes or insert nuts.

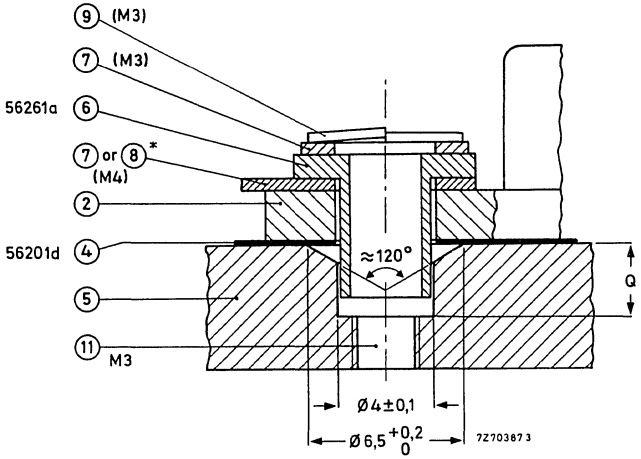


Fig. 11 Assembly (partial) for Fig. 10 - tapped holes.
Q minimum 2,5 mm.

For legend see page 276.

* Thickness approximately 0,6 mm, outer diameter 7,5 mm.

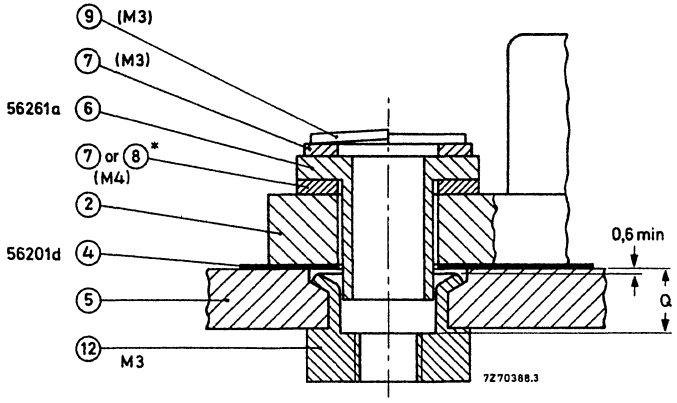


Fig. 12 Assembly (partial) for Fig. 10 - insert nuts Q minimum 2,5 mm.

For legend see page 276.

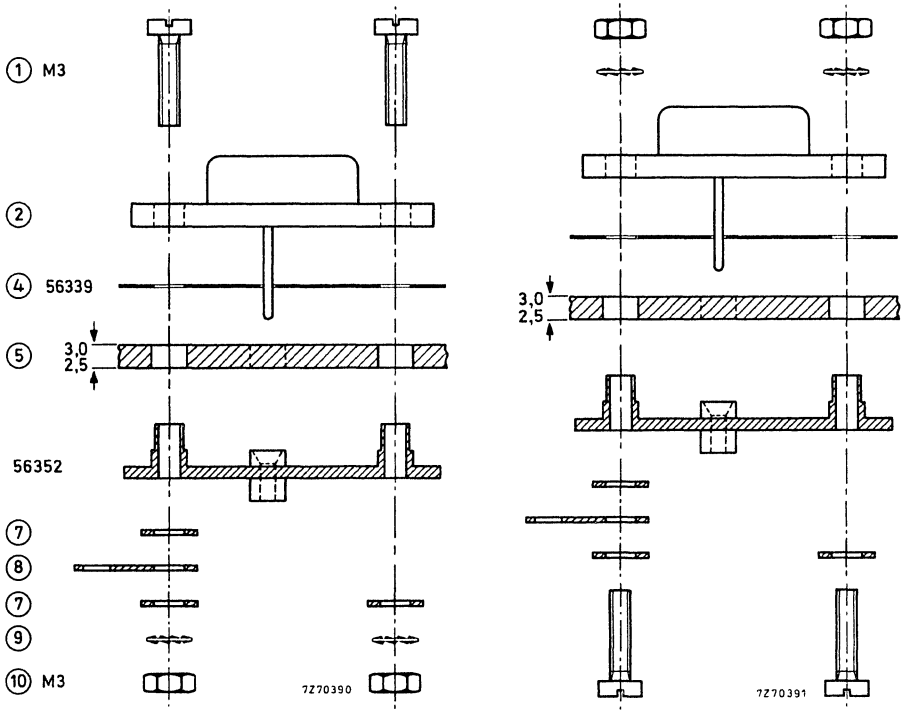
Dimensions in mm

* Thickness approximately 0,6 mm, outer diameter 7,5 mm.

MOUNTING INSTRUCTIONS FOR 500 V TO 2000 V INSULATION

Using mounting support 56352 and mica washer 56339

The transistor should be mounted with M3 screws. For component arrangement see Figs 13 and 14. For hole pattern see Fig. 15. Thickness of heatsink 2,5 mm to 3 mm.



Figs 13 and 14. Insulated mounting (500 V–2000 V).

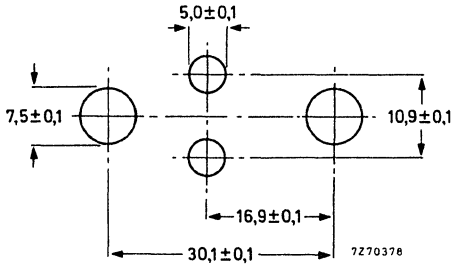


Fig. 15 Hole pattern for Figs 13 and 14.

For legend see preceding page.

ACCESSORIES

TYPE NUMBER SURVEY ACCESSORIES

type number	description	envelope
56201d	mica washer (up to 500 V)	TO-3
56201j	insulating bushes (up to 500 V)	TO-3
56261a	insulating bushes (up to 500 V)	TO-3
56339	mica washer (500 to 2000 V)	TO-3
56352	insulating mounting support	TO-3
56359b	mica washer (up to 1000 V)	TO-220
56359c	insulating bush (up to 800 V)	TO-220
56359d	rectangular insulating bush (up to 1000 V)	TO-220
56360a	rectangular washer (brass)	TO-220
56363	spring clip (direct mounting)	TO-220
56364	spring clip (insulated mounting)	TO-220
56367	alumina insulator (up to 2000 V)	TO-220

Clip mounting TO-220 envelopes

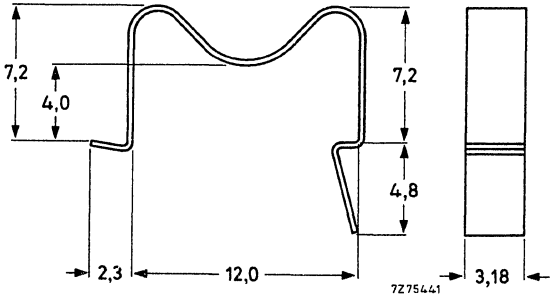
56363 SPRING CLIP

for direct mounting of TO-220 envelopes

MECHANICAL DATA

Dimensions in mm

Material: steel, zinc-chromate passivated.



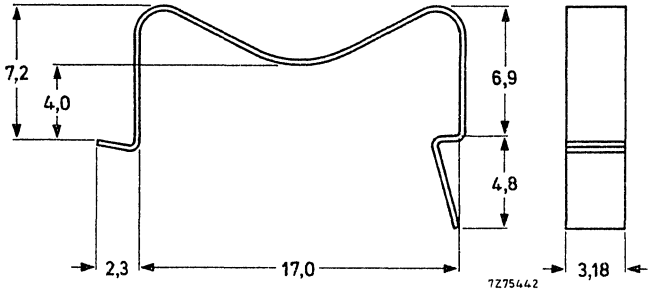
56364 SPRING CLIP

for insulated mounting of TO-220 envelopes

MECHANICAL DATA

Dimensions in mm

Material: steel, zinc-chromate passivated.



to be used in conjunction with **56367** or **56369.**

Clip mounting TO-220 envelopes

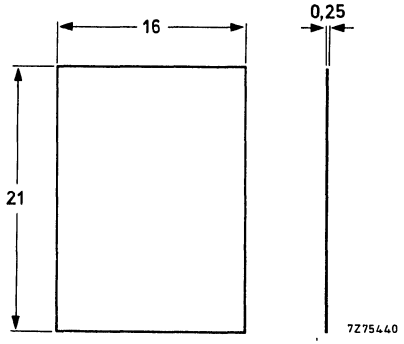
56367 ALUMINA INSULATOR

for insulated clip mounting of TO-220 envelopes (up to 2 kV)

MECHANICAL DATA

Dimensions in mm

Material: 96-alumina.



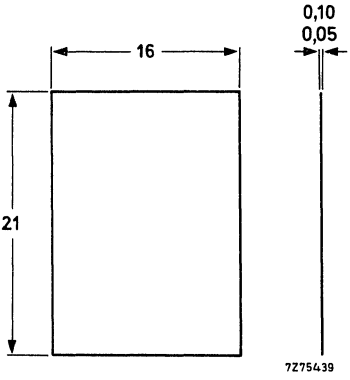
* Because alumina is brittle, extreme care must be taken when mounting devices not to crack the alumina, particularly when used without heatsink compound.

56369 MICA INSULATOR

for insulated clip mounting of TO-220 envelopes (up to 2 kV)

MECHANICAL DATA

Dimensions in mm



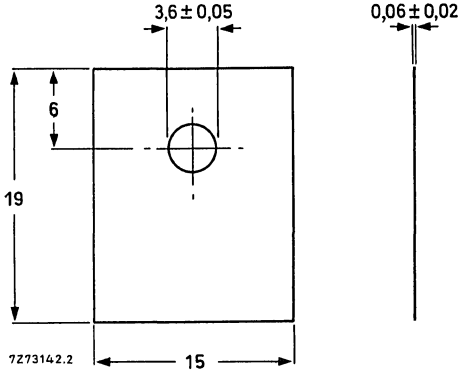
Mounting TO-220 envelopes

56359b MICA WASHER

for TO-220 envelopes (up to 1000 V)

MECHANICAL DATA

Dimensions in mm



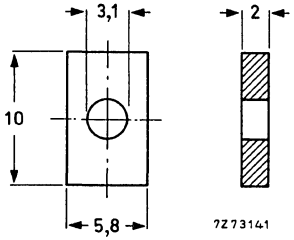
56360a RECTANGULAR WASHER

for direct and insulated mounting of TO-220 envelopes

MECHANICAL DATA

Material: brass; nickel plated

Dimensions in mm



Mounting TO-220 envelopes

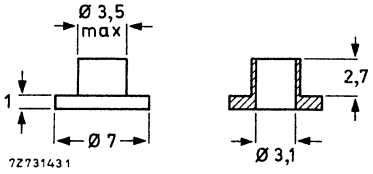
56359c INSULATING BUSH

for TO-220 envelopes (up to 800 V)

MECHANICAL DATA

Material: polyester

Dimensions in mm



TEMPERATURE

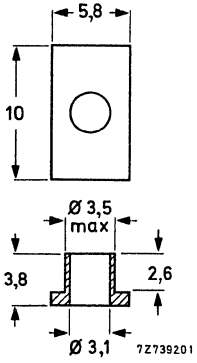
Maximum permissible temperature T_{max} = 150 °C

56359d RECTANGULAR INSULATING BUSH

for TO-220 envelopes (up to 1000 V)

MECHANICAL DATA

Dimensions in mm



TEMPERATURE

Maximum permissible temperature T_{max} = 150 °C

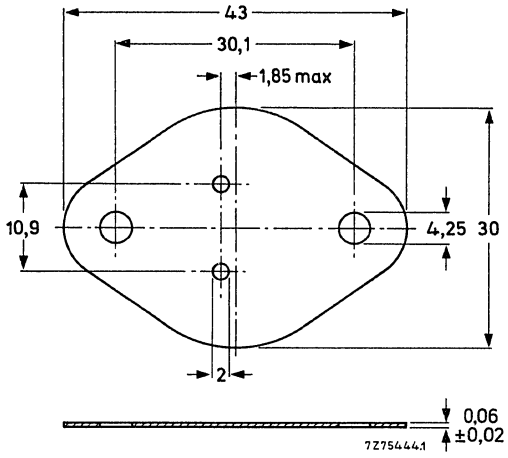
Mounting TO-3 envelopes

56201d MICA WASHER

Mica washer for up to 500 V insulation of **TO-3** envelopes.

MECHANICAL DATA

Dimensions in mm



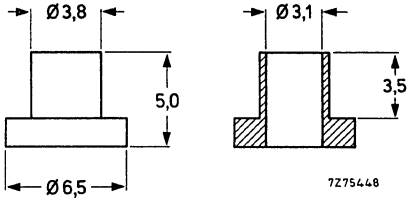
56201j 2 INSULATING BUSHES

Two insulating bushes for up to 500 V insulation of **TO-3** envelopes.

MECHANICAL DATA

Material: polyester

Dimensions in mm



TEMPERATURE

Maximum permissible temperature T_{max} 150 °C

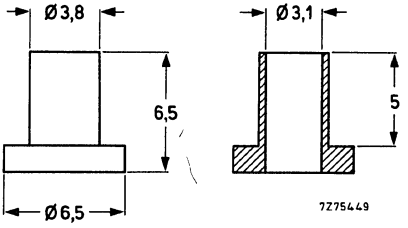
Mounting TO-3 envelopes

56261a 2 INSULATING BUSHES

Two insulating bushes for up to 500 V insulation of **TO-3** envelopes.

MECHANICAL DATA Dimensions in mm

Material: polyester



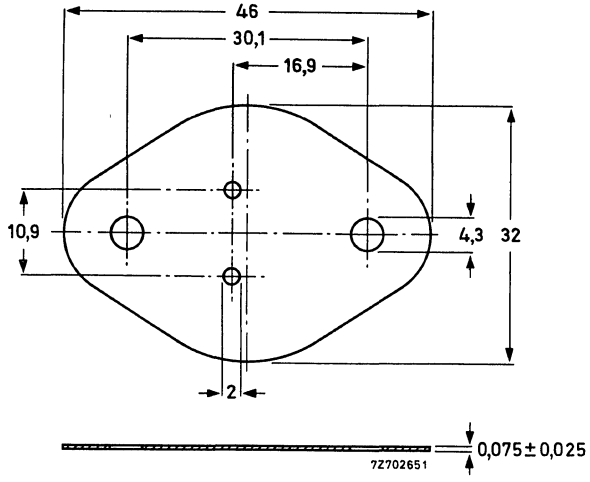
TEMPERATURE

Maximum permissible temperature T_{max} 150 °C

56339 MICA WASHER

Mica washer for 500 to 2000 V insulation of TO-3 envelopes, for which it should be combined with mounting support 56352.

MECHANICAL DATA Dimensions in mm



Mounting TO-3 envelopes

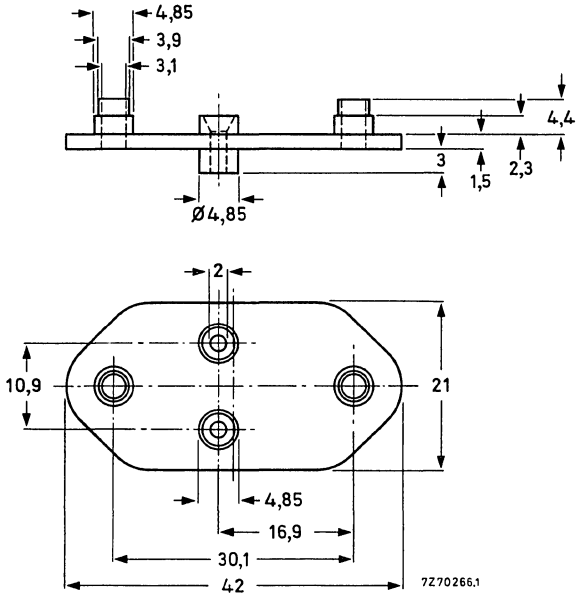
56352 MOUNTING SUPPORT

Mounting support for 500 to 2000 V insulation of TO-3 envelopes, for which it should be combined with mica washer 56339.

MECHANICAL DATA

Dimensions in mm

Material: polyester



TEMPERATURE

Maximum permissible temperature	T_{max}	125 °C

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