PowerMOS transistor

BUZ54A

T-39-13

July 1987

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a metal envelope.

This device is intended for use in Switched Mode Power Supplies (SMPS), motor control, welding, DC/DC and DC/AC converters, and in general purpose switching applications.

QUICK REFERENCE DATA

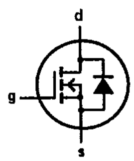
SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	1000	V
I_D	Drain current (d.c.)	4,5	A
P_{tot}	Total power dissipation	125	W
$R_{DS(ON)}$	Drain-source on-state resistance	2,6	Ω

MECHANICAL DATA

Dimensions in mm

Net mass: 12 g

Pinning:
1 = Gate
2 = Drain
3 = Source



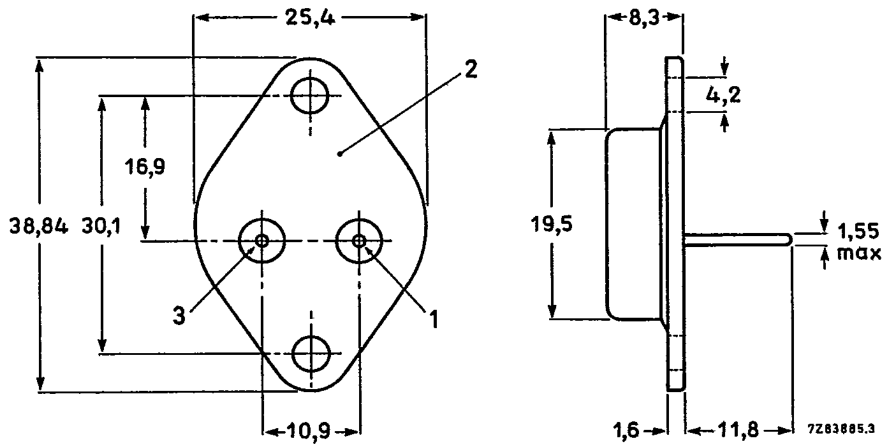


Fig.1 TO3; drain connected to mounting base.

Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Accessories supplied on request: refer to Mounting instructions for TO3 envelopes.

T-39-13

RATINGS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	–	–	1000	V
V_{DGR}	Drain-gate voltage	R_{GS} = 20 kΩ	–	1000	V
$\pm V_{GS}$	Gate-source voltage	–	–	20	V
I_D	Drain current (d.c.)	T_{mb} = 25 °C	–	4,5	A
I_D	Drain current (d.c.)	T_{mb} = 100 °C	–	2,8	A
I_{DM}	Drain current (pulse peak value)	T_{mb} = 25 °C	–	18	A
P_{tot}	Total power dissipation	T_{mb} = 25 °C	–	125	W
T_{stg}	Storage temperature	–	–55	150	°C
T_j	Junction temperature	–	–	150	°C

THERMAL RESISTANCES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0,25 mA	1000	–	–	V
$V_{GS(TO)}$	Gate threshold voltage	V_{DS} = V_{GS}; I_D = 1 mA	2,1	3,0	4,0	V
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 25 °C	–	20	250	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 1000 V; V_{GS} = 0 V; T_j = 125 °C	–	0,1	1,0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±20 V; V_{DS} = 0 V	–	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2,6 A	–	2,3	2,6	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2,6 A	1,4	3,5	–	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	–	3900	5000	pF
C_{oss}	Output capacitance		–	180	300	pF
C_{rss}	Feedback capacitance		–	60	90	pF
$t_{d\,on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2,4 A; V_{GS} = 10 V; R_{GS} = 50 Ω; R_{gen} = 50 Ω	–	60	90	ns
t_r	Turn-on rise time		–	90	140	ns
$t_{d\,off}$	Turn-off delay time		–	330	430	ns
t_f	Turn-off fall time		–	110	140	ns
L_d	Internal drain inductance	Measured from contact screw on header closer to source pin and centre of die	–	5,0	–	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	–	12,5	–	nH

REVERSE DIODE RATINGS AND CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	T_{mb} = 25 °C	–	–	4,5	A
I_{DRM}	Pulsed reverse drain current	T_{mb} = 25 °C	–	–	18	A
V_{SD}	Diode forward on-voltage	I_F = 9 A; V_{GS} = 0 V; T_j = 25 °C	–	1,5	1,4	V
t_{rr}	Reverse recovery time	I_F = 4,5 A; T_j = 25 °C	–	2000	–	ns
Q_{rr}	Reverse recovery charge	$-dI_F/dt$ = 100 A/µs; T_j = 25 °C; V_{GS} = 0 V; V_R = 100 V	–	30	–	µC

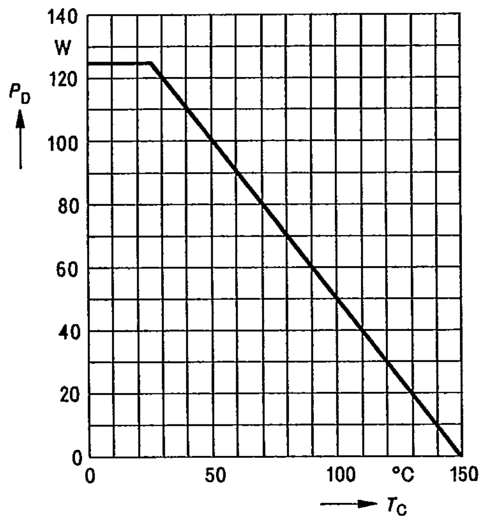


Fig.2 *Power dissipation $P_D = f(T_{mb})$.*

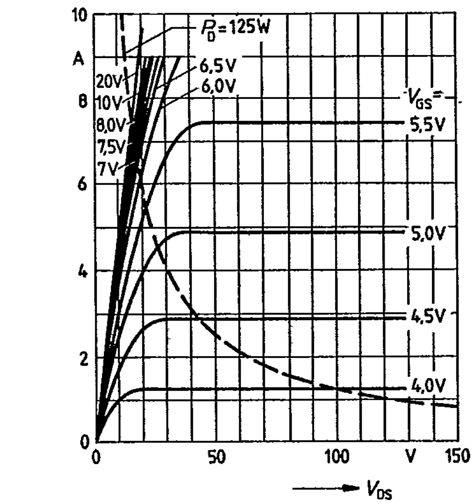


Fig.3 *Typical output characteristics $I_D = f(V_{DS})$ Parameter: V_{GS}; 80 µs pulse test; T_{mb} = 25°C.*

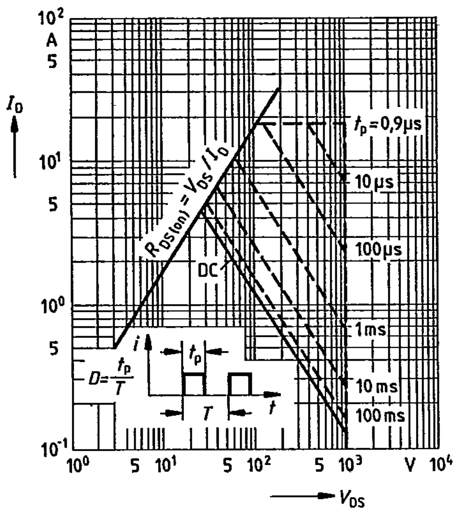


Fig.4 *Safe operating area I_D(DC) and $I_{DM} = f(V_{DS})$ Parameter: t_p; D = 0,01; T_{mb} = 25°C.*

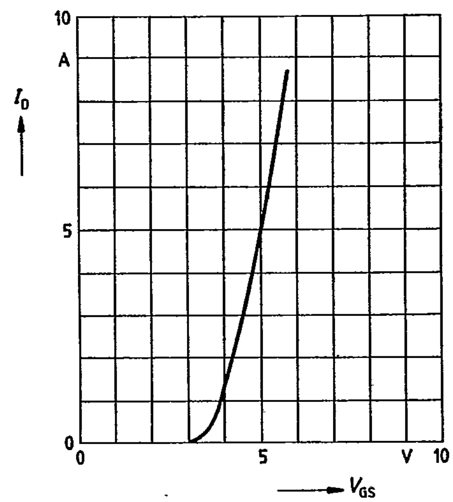


Fig.5 *Typical transfer characteristic $I_D = f(V_{GS})$ Conditions: 80 µs pulse test; V_{DS} = 25 V, T_{mb} = 25°C.*

T-39-13

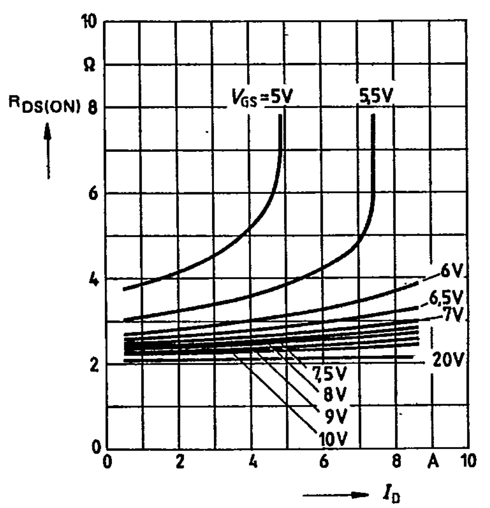


Fig.6 *Typical drain-source on-state resistance $R_{DS(ON)} = f(I_D)$*
Parameter: V_{GS}; T_j = 25 °C.

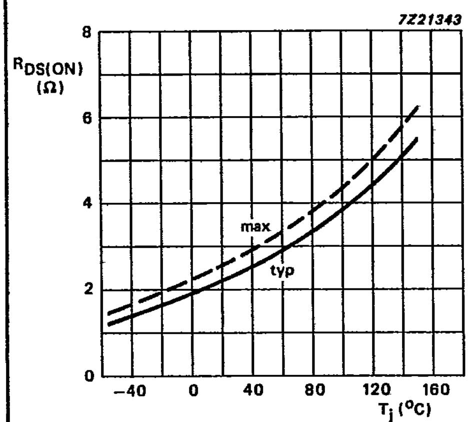


Fig.7 *Drain-source on-state resistance $R_{DS(ON)} = f(T_j)$*
Conditions: I_D = 2,6 A; V_{GS} = 10 V.

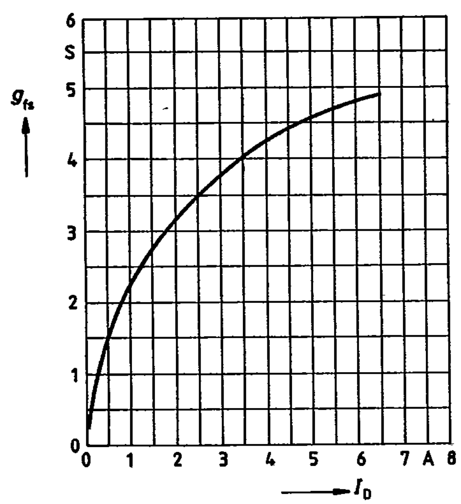


Fig.8 *Typical transconductance $g_{fs} = f(I_D)$*
Conditions: 80 µs pulse test;
V_{DS} = 25 V; T_j = 25 °C.

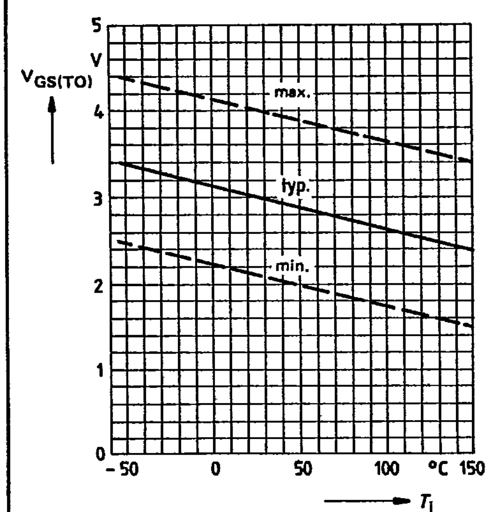


Fig.9 *Gate threshold voltage $V_{GS(TO)} = f(T_j)$*
Conditions: $V_{DS} = V_{GS}$; I_D = 1 mA.

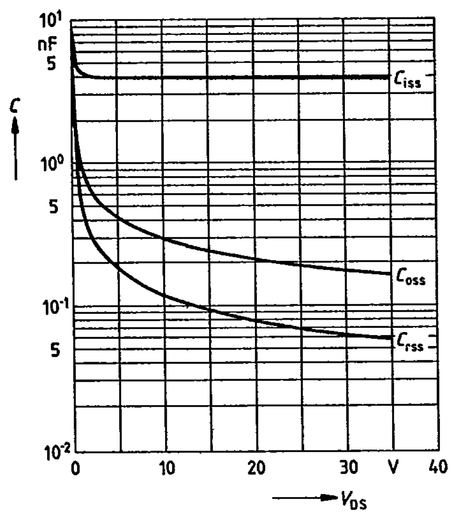


Fig.10 Typical capacitances $C = f(V_{DS})$
Conditions: $V_{GS} = 0$; $f = 1$ MHz.

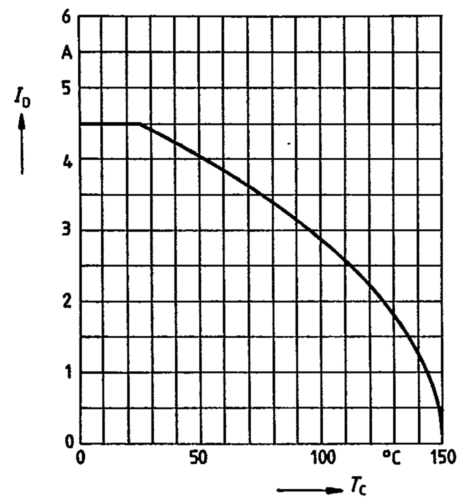


Fig.11 Continuous drain current $I_D = f(T_{mb})$
Conditions: $V_{GS} \geq 10$ V.

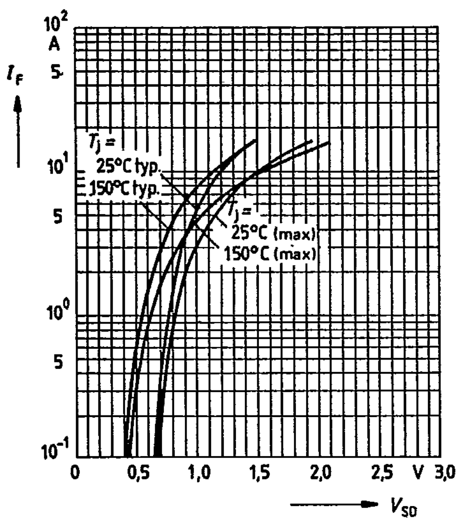


Fig.12 Forward characteristics of reverse diode
$I_F = f(V_{SD})$
Parameter: T_j; $t_p = 80$ µs.

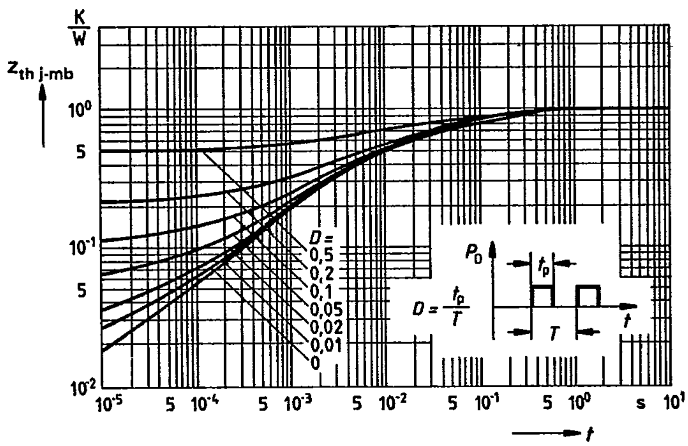


Fig.13 Transient thermal impedance $Z_{th\ j\text{-}mb} = f(t)$
Parameter: $D = t_p/T$.

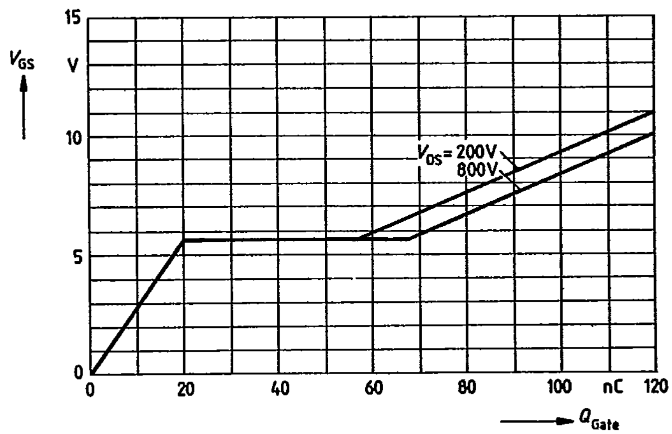


Fig.14 Typical gate-charge $V_{GS} = f(Q_{Gate})$
Parameter: V_{DS}; $I_{DM} = 8{,}0$ A.