

TrenchMOS™ transistor Logic level FET

BUK9880-55

GENERAL DESCRIPTION

N-channel enhancement mode logic level field-effect power transistor in a plastic envelope suitable for surface mounting. The device features very low on-state resistance and has integral zener diodes giving ESD protection. It is intended for use in automotive and general purpose switching applications.

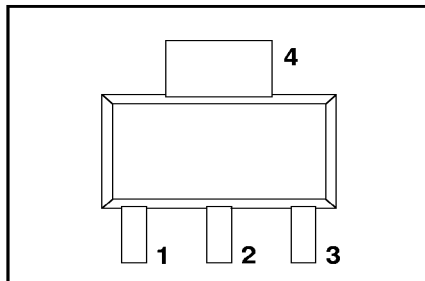
QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{DS}	Drain-source voltage	55	V
I_D	Drain current	7.5	A
P_{tot}	Total power dissipation	1.8	W
T_j	Junction temperature	150	°C
$R_{DS(ON)}$	Drain-source on-state resistance $V_{GS} = 5\text{ V}$	80	mΩ

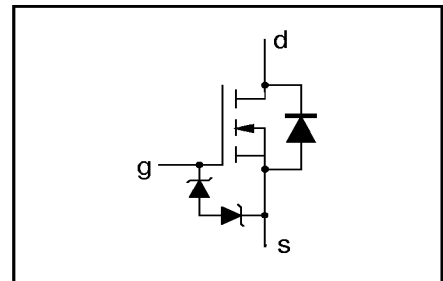
PINNING - SOT223

PIN	DESCRIPTION
1	gate
2	drain
3	source
4	drain (tab)

PIN CONFIGURATION



SYMBOL



LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	55	V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20\text{ k}\Omega$	-	55	V
$\pm V_{GS}$	Gate-source voltage	-	-	10	V
I_D	Drain current (DC)	$T_{sp} = 25\text{ °C}$	-	7.5	A
I_D	Drain current (DC)	On PCB in Fig.2 $T_{amb} = 25\text{ °C}$	-	3.5	A
I_D	Drain current (DC)	On PCB in Fig.2 $T_{amb} = 100\text{ °C}$	-	2.2	A
I_{DM}	Drain current (pulse peak value)	$T_{sp} = 25\text{ °C}$	-	40	A
P_{tot}	Total power dissipation	$T_{sp} = 25\text{ °C}$	-	8.3	W
P_{tot}	Total power dissipation	On PCB in Fig.2 $T_{amb} = 25\text{ °C}$	-	1.8	W
T_{stg}, T_j	Storage & operating temperature	-	- 55	150	°C

ESD LIMITING VALUE

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_C	Electrostatic discharge capacitor voltage	Human body model (100 pF, 1.5 kΩ)	-	2	kV

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THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
$R_{th\ j-sp}$	From junction to solder point	Mounted on any PCB	12	15	K/W
$R_{th\ j-amb}$	From junction to ambient	Mounted on PCB of Fig.18	-	70	K/W

STATIC CHARACTERISTICS

 $T_j = 25^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.25\text{ mA}$ $T_j = -55^\circ\text{C}$	55	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}; I_D = 1\text{ mA}$ $T_j = 150^\circ\text{C}$	1.0	1.5	2.0	V
		$T_j = -55^\circ\text{C}$	0.6	-	-	V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 55\text{ V}; V_{GS} = 0\text{ V};$ $T_j = 150^\circ\text{C}$	-	0.05	10	μA
I_{GSS}	Gate source leakage current	$V_{GS} = \pm 5\text{ V}$ $T_j = 150^\circ\text{C}$	-	0.02	1	μA
$\pm V_{(BR)GSS}$	Gate source breakdown voltage	$I_G = \pm 1\text{ mA}$ $T_j = 150^\circ\text{C}$	10	-	-	V
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 5\text{ V}; I_D = 5\text{ A}$ $T_j = 150^\circ\text{C}$	-	65	80	$\text{m}\Omega$
			-	-	148	$\text{m}\Omega$

DYNAMIC CHARACTERISTICS

 $T_{mb} = 25^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25\text{ V}; I_D = 5\text{ A}; T_j = 25^\circ\text{C}$	4	8	-	S
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 25\text{ V}; f = 1\text{ MHz}$	-	500	650	pF
C_{oss}	Output capacitance		-	110	135	pF
C_{rss}	Feedback capacitance		-	60	85	pF
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 30\text{ V}; I_D = 7\text{ A};$ $V_{GS} = 5\text{ V}; R_G = 10\ \Omega;$	-	10	15	ns
t_r	Turn-on rise time		-	30	50	ns
$t_{d\ off}$	Turn-off delay time		-	30	45	ns
t_f	Turn-off fall time	$T_j = 25^\circ\text{C}$	-	30	40	ns

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

 $T_j = -55$ to 175°C unless otherwise specified

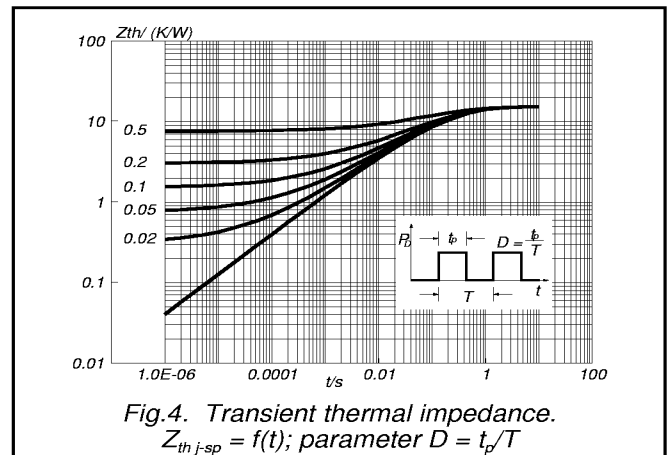
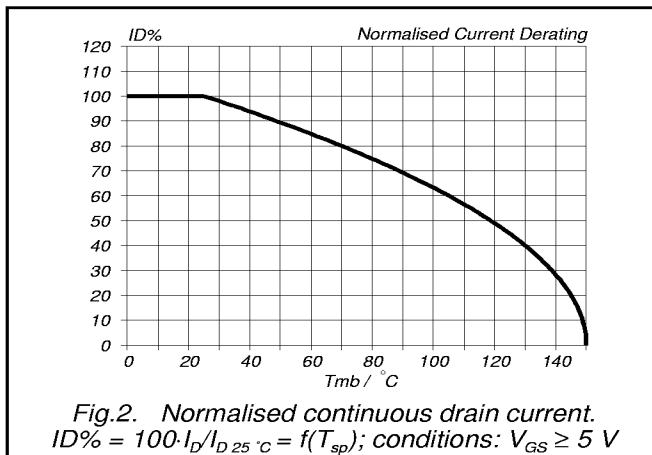
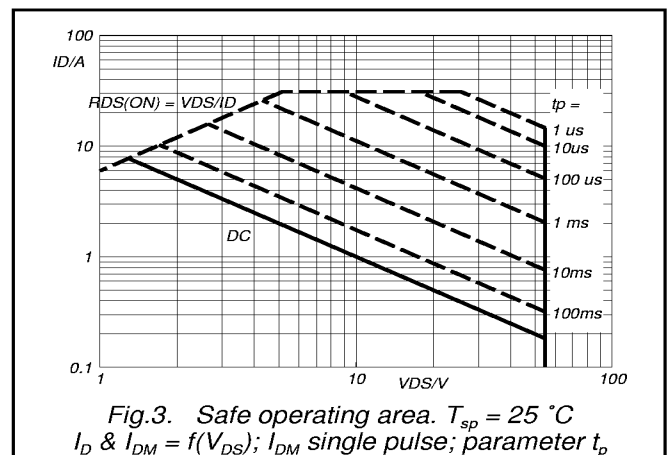
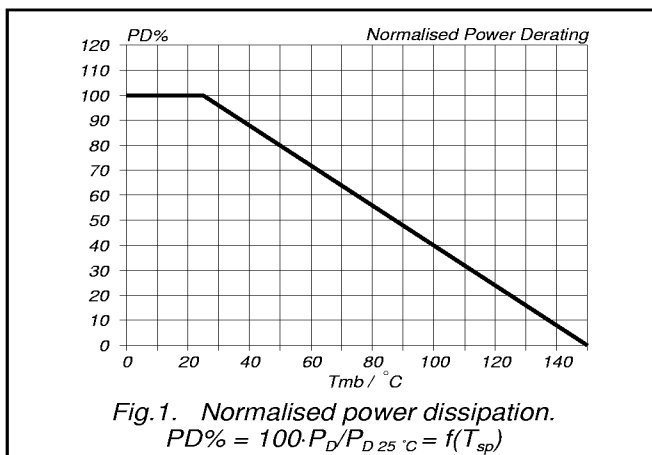
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	$T_{sp} = 25^\circ\text{C}$	-	-	7.5	A
I_{DRM}	Pulsed reverse drain current	$T_{sp} = 25^\circ\text{C}$	-	-	40	A
V_{SD}	Diode forward voltage	$I_F = 5\text{ A}; V_{GS} = 0\text{ V}$	-	0.85	1.1	V
t_{rr}	Reverse recovery time	$I_F = 5\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s};$ $V_{GS} = -10\text{ V}; V_R = 30\text{ V}$	-	38	-	ns
Q_{rr}	Reverse recovery charge		-	0.2	-	μC

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AVALANCHE LIMITING VALUE

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	$I_D = 2.5 \text{ A}; V_{DD} \leq 25 \text{ V}; V_{GS} = 5 \text{ V}; R_{GS} = 50 \Omega; T_{sp} = 25 \text{ }^\circ\text{C}$	-	-	30	mJ



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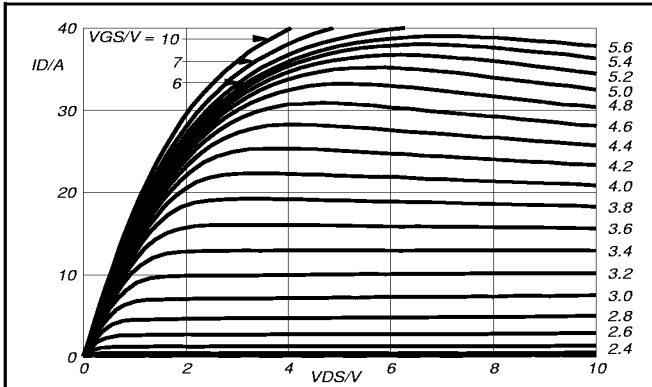


Fig. 5. Typical output characteristics, $T_j = 25\text{ }^\circ\text{C}$.
 $I_D = f(V_{DS})$; parameter V_{GS}

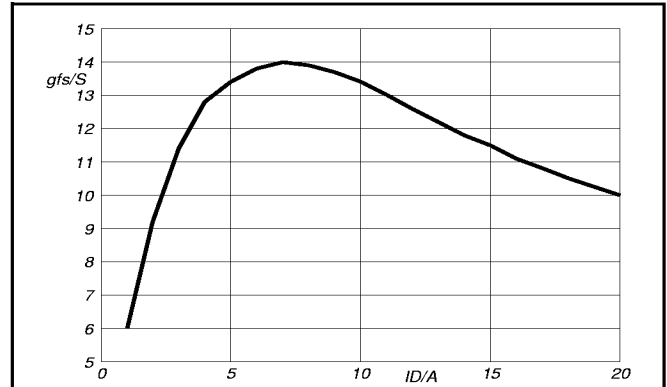


Fig. 8. Typical transconductance, $T_j = 25\text{ }^\circ\text{C}$.
 $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25\text{ V}$

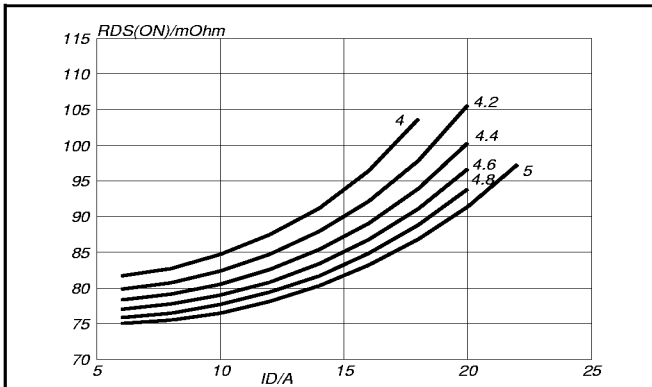


Fig. 6. Typical on-state resistance, $T_j = 25\text{ }^\circ\text{C}$.
 $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

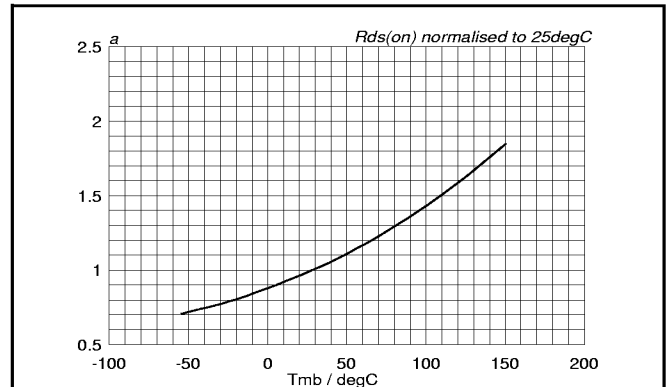


Fig. 9. Normalised drain-source on-state resistance.
 $a = R_{DS(ON)}/R_{DS(ON)25\text{ }^\circ\text{C}} = f(T_j)$; $I_D = 5\text{ A}$; $V_{GS} = 5\text{ V}$

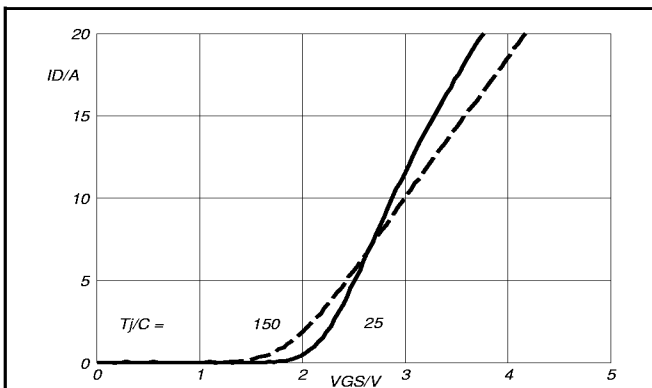


Fig. 7. Typical transfer characteristics.
 $I_D = f(V_{GS})$; conditions: $V_{DS} = 25\text{ V}$; parameter T_j

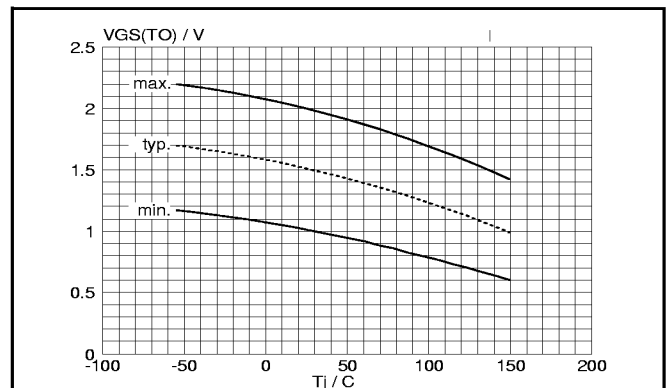
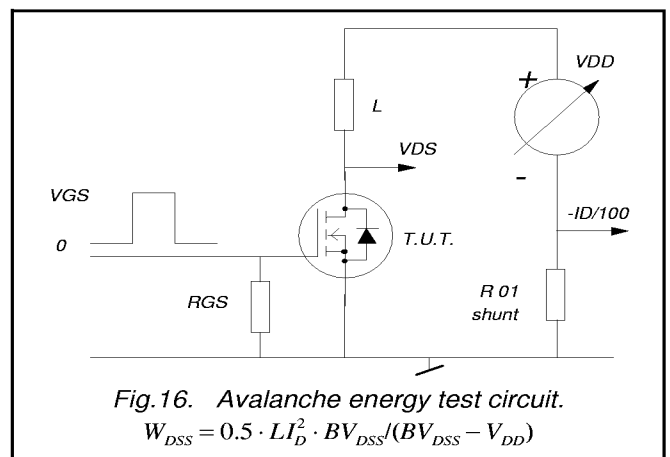
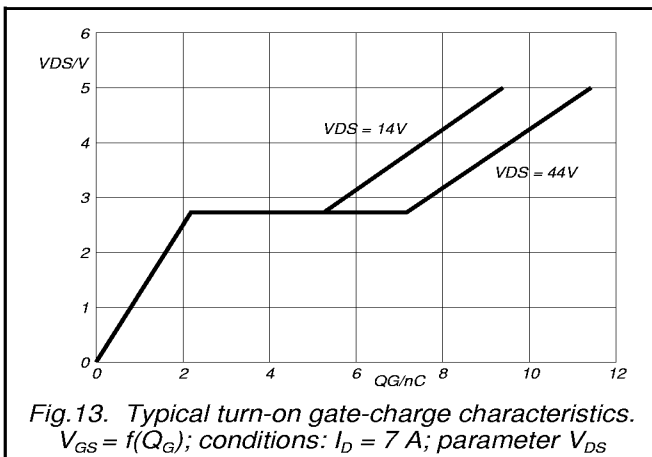
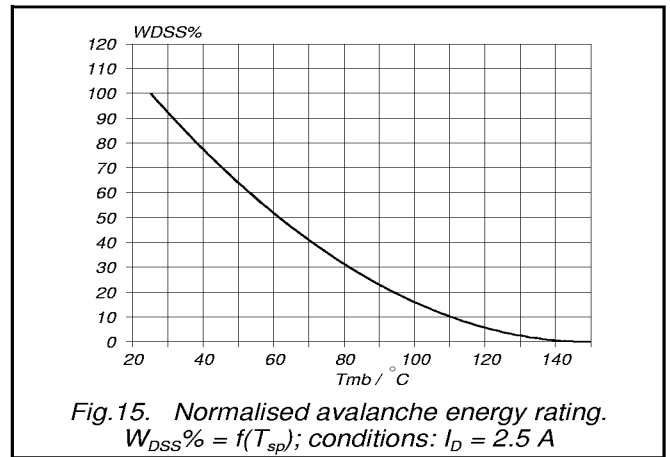
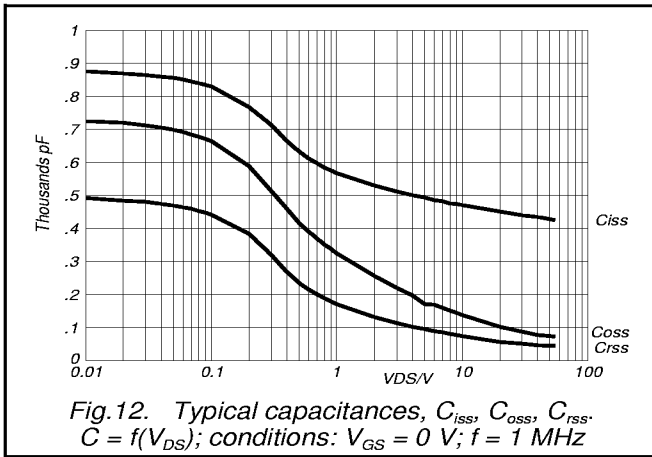
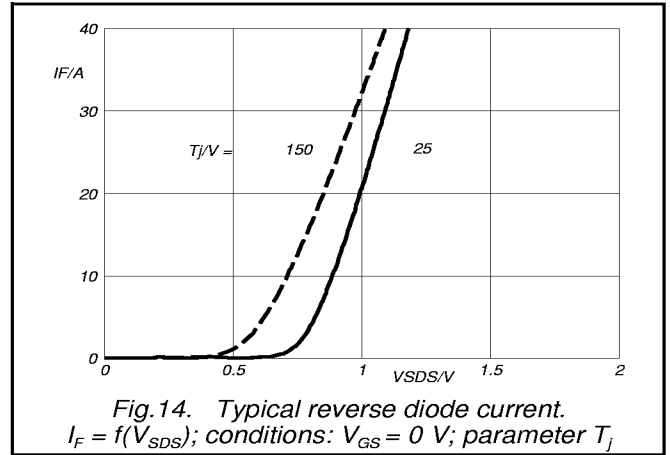
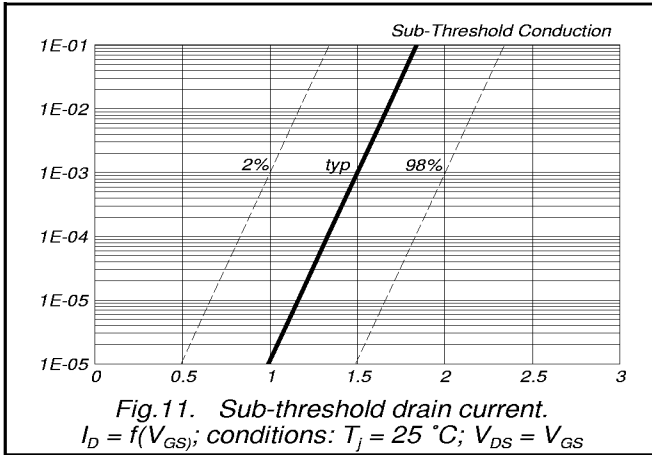


Fig. 10. Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$

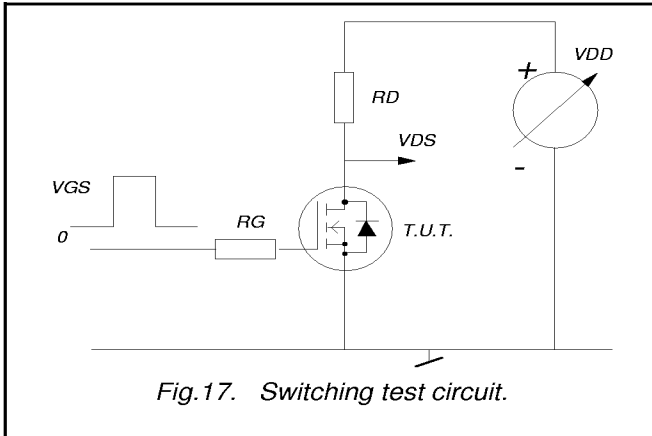
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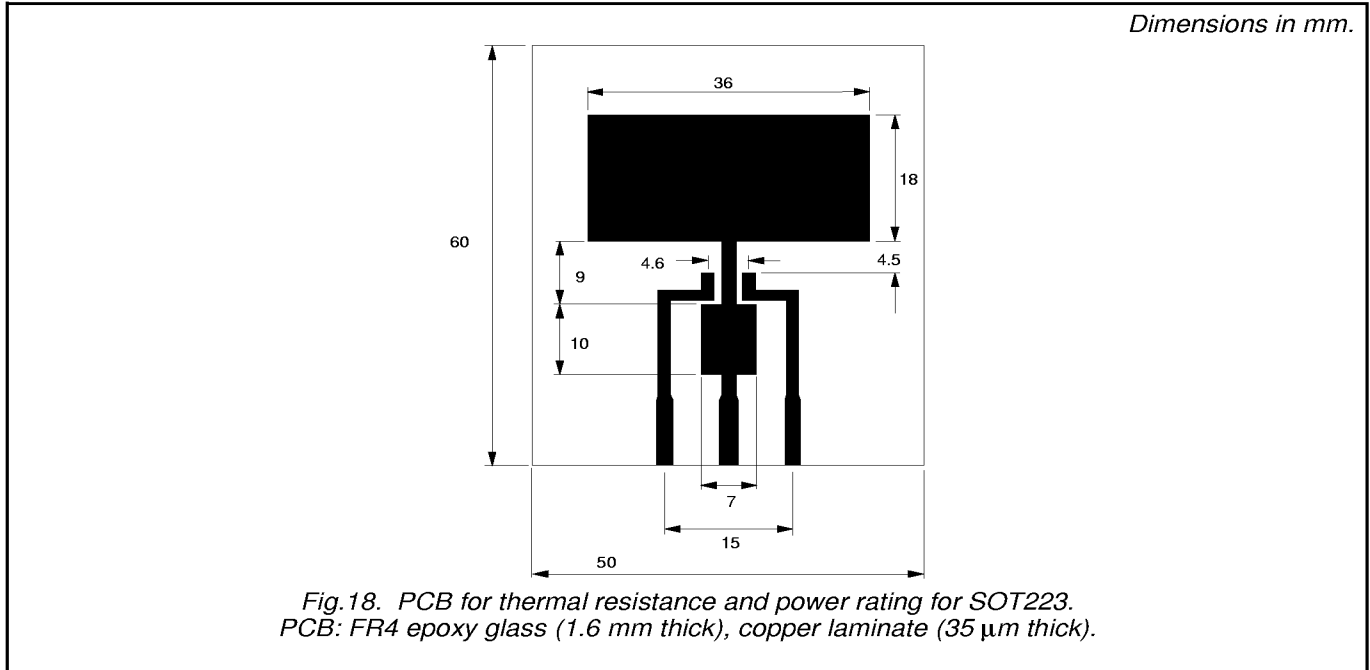
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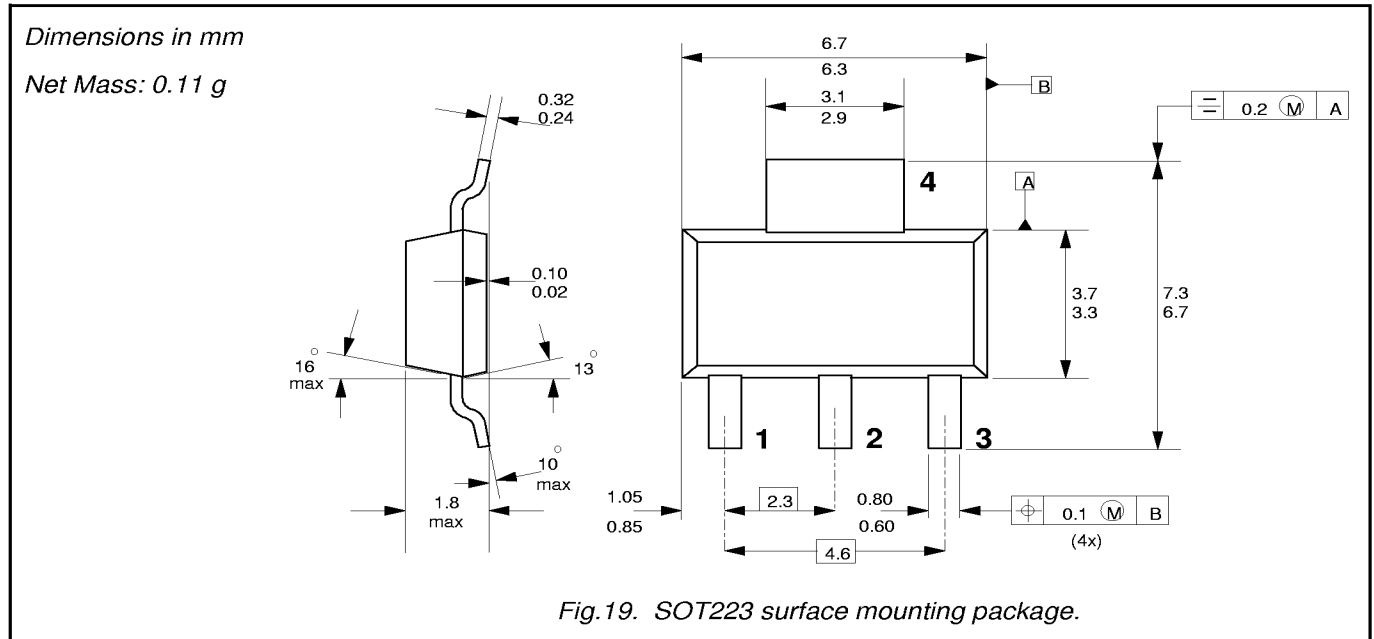
PRINTED CIRCUIT BOARD



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MECHANICAL DATA



Notes

1. Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
2. Refer to surface mounting instructions for SOT223 envelope.
3. Epoxy meets UL94 V0 at 1/8".