

PowerMOS transistor

GENERAL DESCRIPTION

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

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

QUICK REFERENCE DATA

SYMBOL	PARAMETER	BUK455	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-200A	-200B		V
I_D	Drain current (DC)	200	200		A
P_{tot}	Total power dissipation	14	13		W
T_J	Junction temperature	125	125		°C
$R_{DS(ON)}$	Drain-source on-state resistance	175	175	0.28	Ω

MECHANICAL DATA

blue binder, tab 4

Dimensions in mm

Net Mass: 2g

Pinning:

1 = Gate

2 = Drain

3 = Source

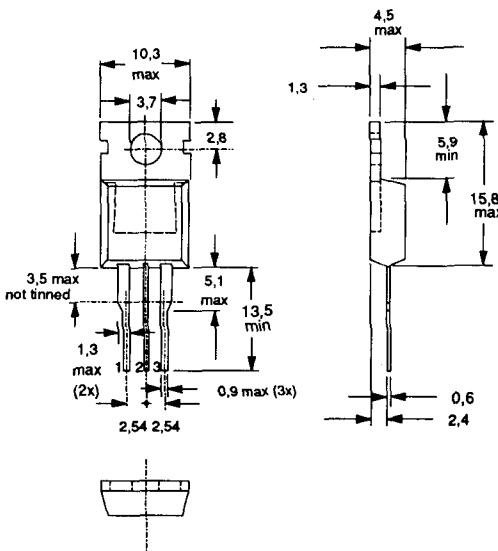
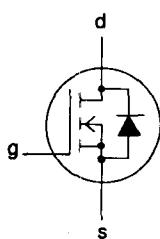


Fig.1 TO220AB; drain connected to mounting base.

Notes

- Observe the general handling precautions for electrostatic-discharge sensitive devices (ESDs) to prevent damage to MOS gate oxide.
- Accessories supplied on request: refer to Mounting instructions for TO220 envelopes.

RATINGS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.		MAX.		UNIT
			-	-	-200A	-200B	
V_{DS}	Drain-source voltage	$R_{GS} = 20 \text{ k}\Omega$	-	-	200	200	V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$	-	-	200	200	V
$\pm V_{GS}$	Gate-source voltage	-	-	-	30	30	V
I_D	Drain current (DC)	$T_{mb} = 25^\circ\text{C}$	-	-	14	13	A
I_o	Drain current (DC)	$T_{mb} = 100^\circ\text{C}$	-	-	10	9	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25^\circ\text{C}$	-	-	56	52	A
P_{DQ}	Total power dissipation	$T_{mb} = 25^\circ\text{C}$	-	-	125	125	W
T_{stg}	Storage temperature	-	-	-55	175	175	°C
T_j	Junction Temperature	-	-	-	175	175	°C

THERMAL RESISTANCES

From junction to mounting base	$R_{th(j\rightarrow mb)} = 1.2 \text{ K/W}$
From junction to ambient	$R_{th(j\rightarrow a)} = 60 \text{ K/W}$

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0 \text{ V}; I_D = 0.25 \text{ mA}$	200	-	-	V
$V_{GS(TO)}$	Gate threshold voltage	$V_{DS} = V_{GS}; I_D = 1 \text{ mA}$	2.1	3.0	4.0	V
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 200 \text{ V}; V_{GS} = 0 \text{ V}; T_{j} = 25^\circ\text{C}$	-	1	10	μA
I_{oss}	Zero gate voltage drain current	$V_{DS} = 200 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125^\circ\text{C}$	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	$V_{GS} = \pm 30 \text{ V}; V_{DS} = 0 \text{ V}$	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	$V_{GS} = 10 \text{ V}; BUK455-200A$ $I_D = 7 \text{ A} \quad BUK455-200B$	-	0.2	0.23	Ω

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}; I_D = 7 \text{ A}$	6	8.4	-	S
C_{iss}	Input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}$	-	1400	1750	pF
C_{oss}	Output capacitance	-	-	190	250	pF
C_{rss}	Feedback capacitance	-	-	55	80	pF
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 30 \text{ V}; I_D = 3 \text{ A}$	-	18	30	ns
t_r	Turn-on rise time	$V_{GS} = 10 \text{ V}; R_{GS} = 50 \Omega$	-	35	60	ns
$t_{d(off)}$	Turn-off delay time	$R_{gen} = 50 \Omega$	-	85	120	ns
t_f	Turn-off fall time	-	-	35	50	ns
L_d	Internal drain inductance	Measured from contact screw on tab to centre of die	-	3.5	-	nH
L_d	Internal drain inductance	Measured from drain lead 6 mm from package to centre of die	-	4.5	-	nH
L_s	Internal source inductance	Measured from source lead 6 mm from package to source bond pad	-	7.5	-	nH

REVERSE DIODE RATINGS AND CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	14	A
I_{DRM}	Pulsed reverse drain current	$I_F = 14 \text{ A}; V_{GS} = 0 \text{ V}$	-	1.0	56	A
t_r	Reverse recovery time	$I_F = 14 \text{ A}; -dI_F/dt = 100 \text{ A}/\mu\text{s}$	-	200	-	ns
Q_r	Reverse recovery charge	$V_{GS} = 0 \text{ V}; V_R = 30 \text{ V}$	-	0.25	-	μC

AVALANCHE RATING

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	$I_D = 14 \text{ A}; V_{DD} \leq 100 \text{ V}; V_{GS} = 10 \text{ V}; R_{DS} = 50 \Omega$	-	-	100	mJ

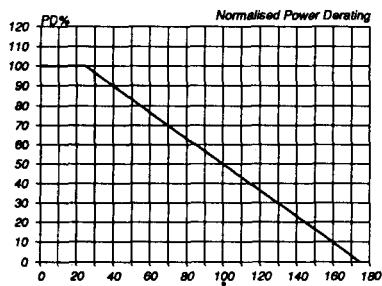


Fig.2. Normalised power dissipation.
 $PD\% = 100 \cdot P_D / P_{D, 25^\circ\text{C}} = f(T_{mb})$

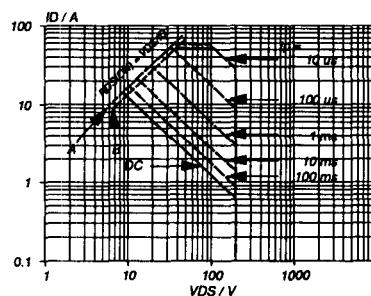


Fig.4. Safe operating area. $T_{mb} = 25^\circ\text{C}$
 I_D & $I_{DM} = f(V_{DS}); I_{DM}$ single pulse; parameter t_p

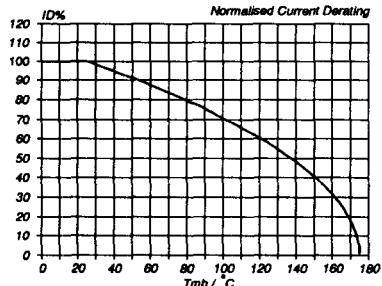


Fig.3. Normalised continuous drain current.
 $ID\% = 100 \cdot I_D / I_{D, 25^\circ\text{C}} = f(T_{mb})$; conditions: $V_{GS} \geq 10 \text{ V}$

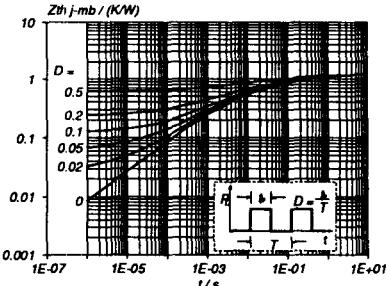


Fig.5. Transient thermal impedance.
 $Z_{th(j-mb)} = f(t);$ parameter $D = t_p/T$

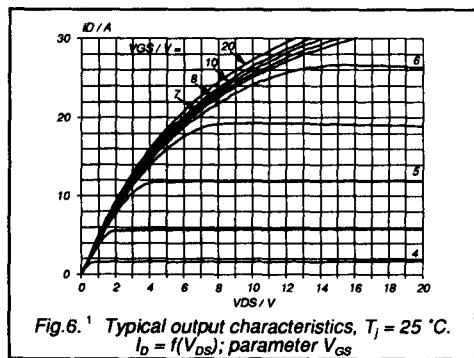


Fig.6. ¹ Typical output characteristics, $T_j = 25^\circ\text{C}$.
 $I_D = f(V_{DS})$; parameter V_{GS}

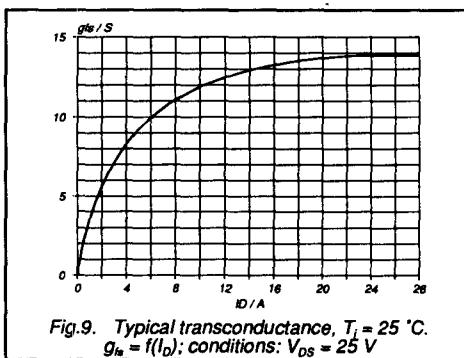


Fig.9. Typical transconductance, $T_j = 25^\circ\text{C}$.
 $g_{ds} = f(I_D)$; conditions: $V_{DS} = 25\text{ V}$

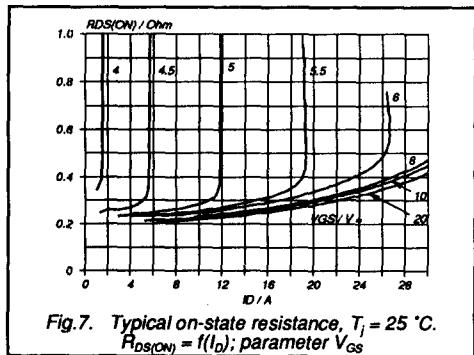


Fig.7. Typical on-state resistance, $T_j = 25^\circ\text{C}$.
 $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

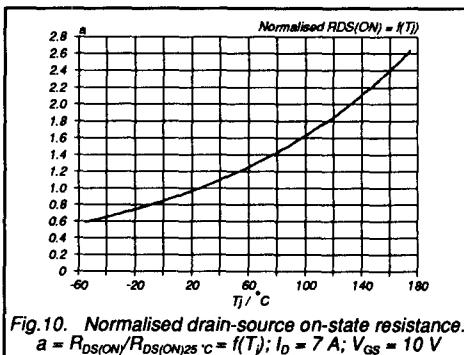


Fig.10. Normalised drain-source on-state resistance.
 $a = R_{DS(ON)}/R_{DS(ON)25^\circ\text{C}} = f(T_j)$; $I_D = 7\text{ A}$; $V_{GS} = 10\text{ V}$

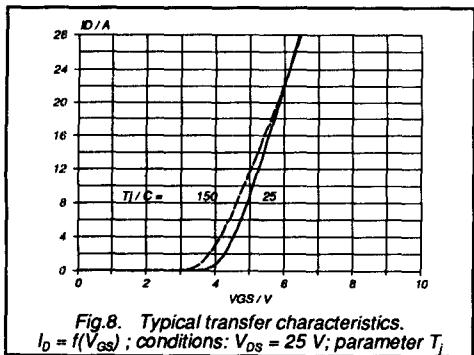


Fig.8. Typical transfer characteristics.
 $I_D = f(V_{GS})$; conditions: $V_{DS} = 25\text{ V}$; parameter T_j

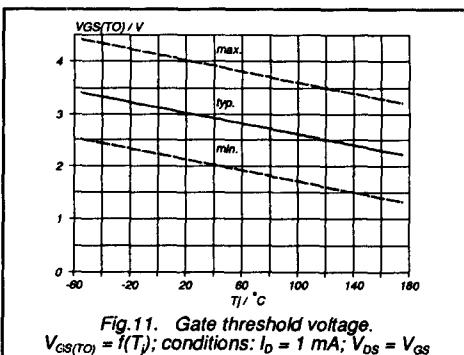


Fig.11. Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$

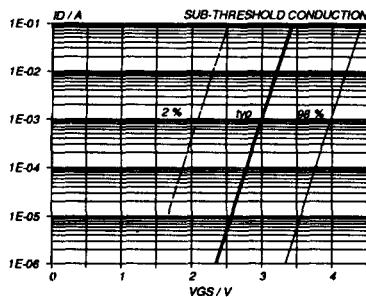


Fig.12. Sub-threshold drain current.
 $I_D = f(V_{GS})$; conditions: $T_j = 25^\circ\text{C}$; $V_{DS} = V_{GS}$

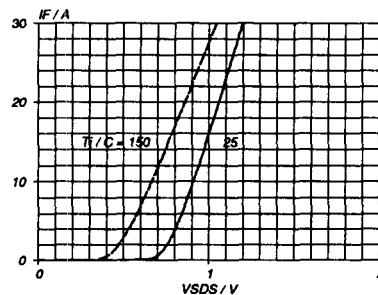


Fig.15. Typical reverse diode current.
 $I_F = f(V_{DS})$; conditions: $V_{GS} = 0\text{ V}$; parameter T_j

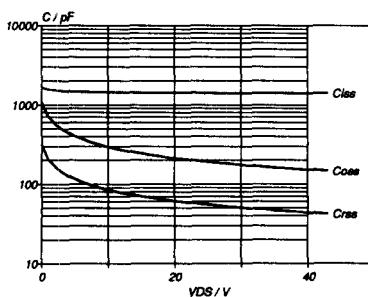


Fig.13. Typical capacitances, C_{iss} , C_{oss} , C_{rss} .
 $C = f(V_{DS})$; conditions: $V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$

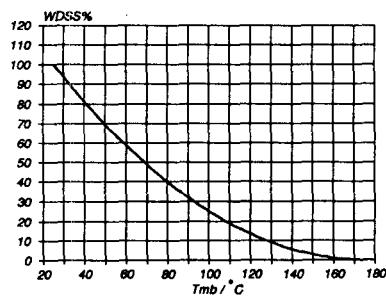


Fig.16. Normalised avalanche energy rating.
 $W_{DSS}\% = f(T_{mb})$; conditions: $I_D = 14\text{ A}$

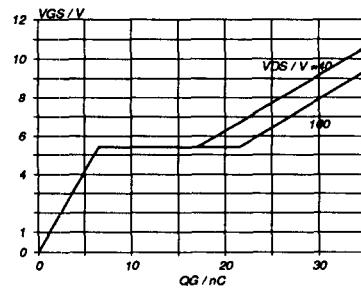


Fig.14. Typical turn-on gate-charge characteristics.
 $V_{GS} = f(Q_G)$; conditions: $I_D = 14\text{ A}$; parameter V_{DS}

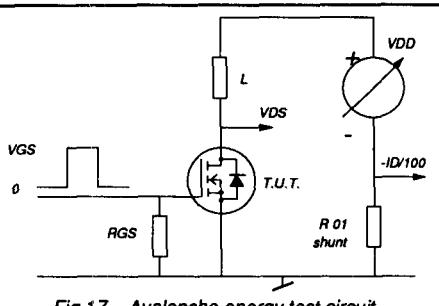


Fig.17. Avalanche energy test circuit.
 $W_{DSS} = 0.5 \cdot L I_D^2 \cdot BV_{DSS} / (BV_{DSS} - V_{DD})$