

PowerMOS transistor

BUK456-50A
BUK456-50B

T-39-13

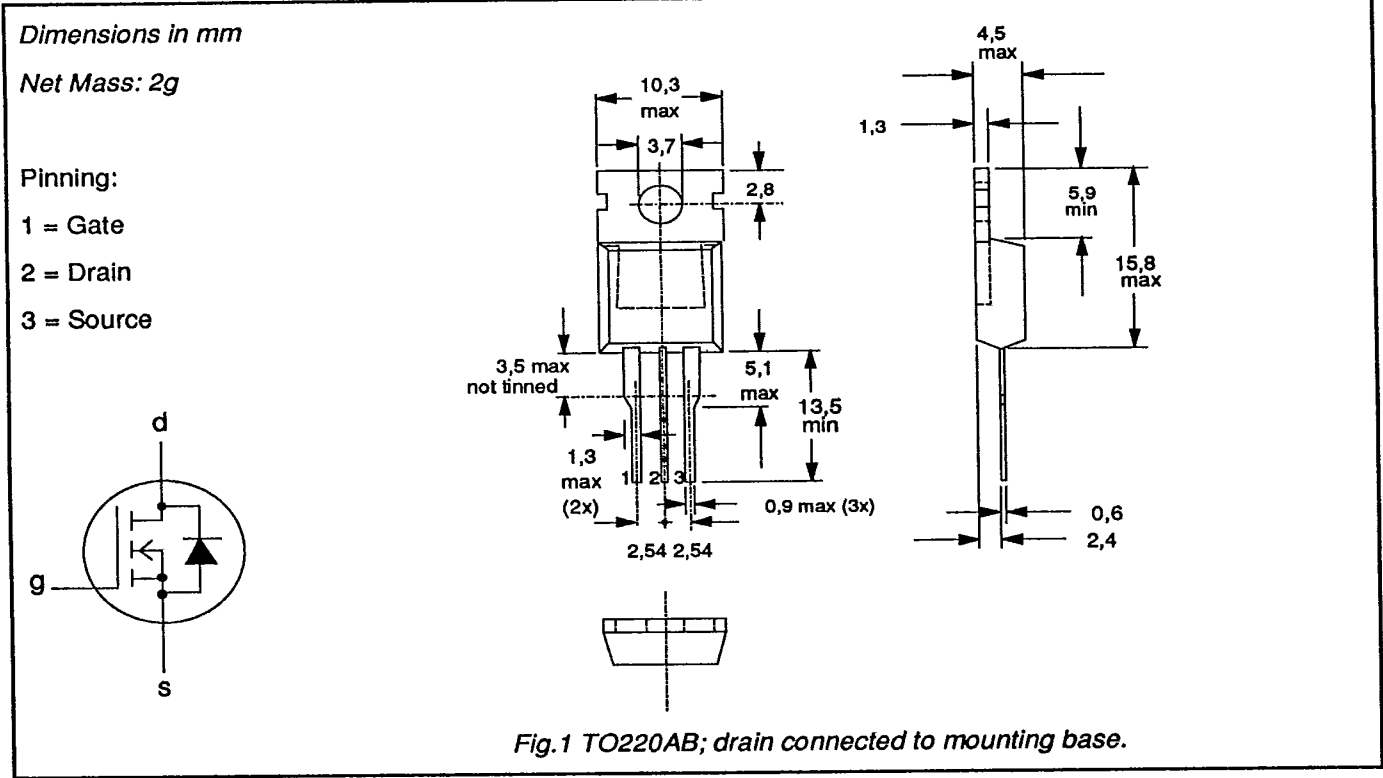
GENERAL DESCRIPTION

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	MAX.	MAX.	UNIT
	BUK456	-50A	-50B	
V_{DS}	Drain-source voltage	50	50	V
I_D	Drain current (DC)	52	51	A
P_{tot}	Total power dissipation	150	150	W
T_j	Junction temperature	175	175	°C
$R_{DS(ON)}$	Drain-source on-state resistance	0.028	0.03	Ω

MECHANICAL DATA



- 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 TO220 envelopes.

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RATINGS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	50	V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20 \text{ k}\Omega$	-	50	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	$T_{mb} = 25^\circ\text{C}$	-	-50A 52	A
I_D	Drain current (DC)	$T_{mb} = 100^\circ\text{C}$	-	36	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25^\circ\text{C}$	-	208	A
P_{tot}	Total power dissipation	$T_{mb} = 25^\circ\text{C}$	-	150	W
T_{stg}	Storage temperature	-	-55	175	$^\circ\text{C}$
T_J	Junction Temperature	-	-	175	$^\circ\text{C}$

THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j-mb} = 1.0 \text{ K/W}$
From junction to ambient	$R_{th\ j-a} = 60 \text{ K/W}$

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	$V_{GS} = 0 \text{ V}; I_D = 0.25 \text{ mA}$	50	-	-	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	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; T_J = 25^\circ\text{C}$	-	1	10	μA
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; T_J = 125^\circ\text{C}$	-	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	$V_{GS} = 10 \text{ V}; I_D = 29 \text{ A}$	-	0.024	0.028	Ω
		BUK456-50A	-	0.027	0.030	Ω
		BUK456-50B	-			

DYNAMIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}; I_D = 29 \text{ A}$	17	22	-	S
C_{iss}	Input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}$	-	1500	2000	pF
C_{oss}	Output capacitance		-	800	1000	pF
C_{rss}	Feedback capacitance		-	270	400	pF
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 30 \text{ V}; I_D = 3 \text{ A}; V_{GS} = 10 \text{ V}; R_{GS} = 50 \Omega; R_{gen} = 50 \Omega$	-	20	30	ns
t_r	Turn-on rise time		-	70	100	ns
$t_{d\ off}$	Turn-off delay time		-	170	220	ns
t_f	Turn-off fall time		-	120	160	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

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REVERSE DIODE RATINGS AND CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	52	A
I_{DRM}	Pulsed reverse drain current	-	-	-	208	A
V_{SD}	Diode forward voltage	$I_F = 52\text{ A}; V_{GS} = 0\text{ V}$	-	1.8	2.5	V
t_{rr}	Reverse recovery time	$I_F = 52\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_R = 30\text{ V}$	-	350	-	ns
Q_{rr}	Reverse recovery charge	$I_F = 52\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_R = 30\text{ V}$	-	2.1	-	μC

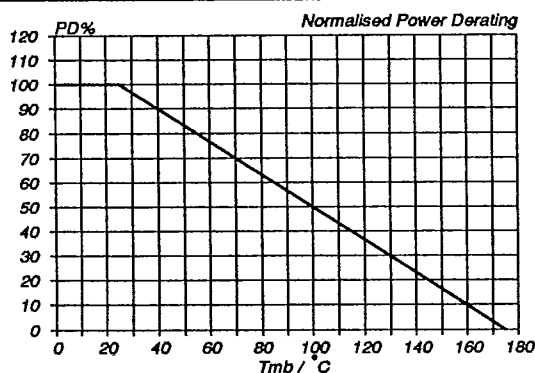


Fig.2. Normalised power dissipation.
 $PD\% = 100 \cdot P_D / P_{D\ 25\text{ }^{\circ}\text{C}} = f(T_{mb})$

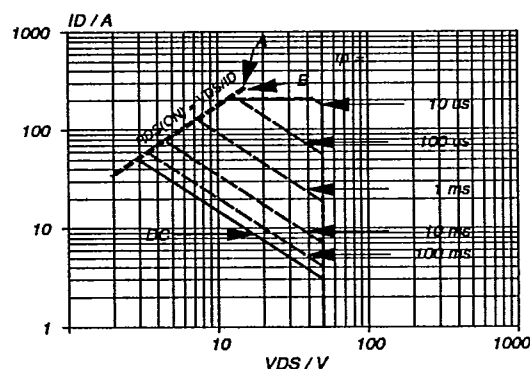


Fig.4. Safe operating area. $T_{mb} = 25\text{ }^{\circ}\text{C}$
 I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

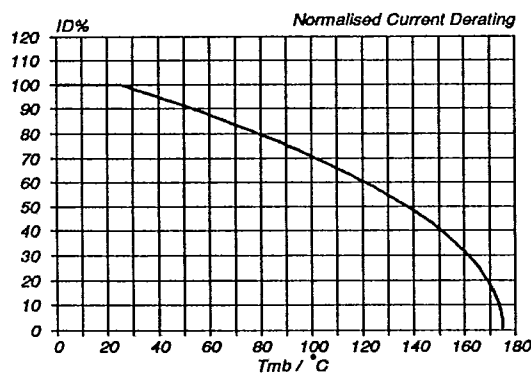


Fig.3. Normalised continuous drain current.
 $ID\% = 100 \cdot I_D / I_{D\ 25\text{ }^{\circ}\text{C}} = f(T_{mb})$; conditions: $V_{GS} \geq 10\text{ V}$

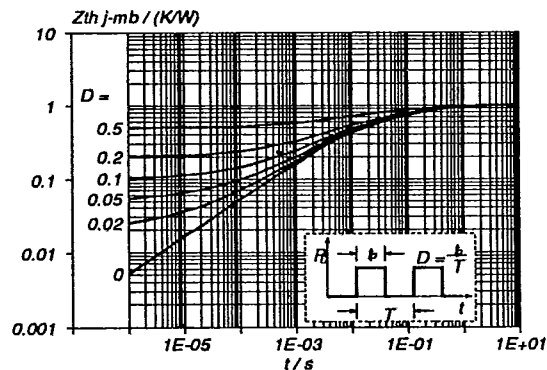


Fig.5. Transient thermal impedance.
 $Z_{th\ j-mb} = f(t)$; parameter $D = t_p / T$

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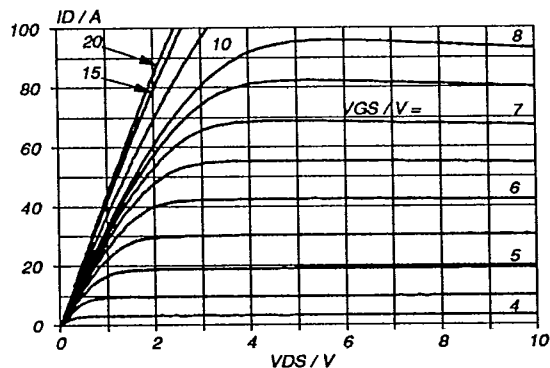


Fig. 6. Typical output characteristics, $T_j = 25^\circ\text{C}$.
 $I_D = f(V_{DS})$; parameter V_{GS}

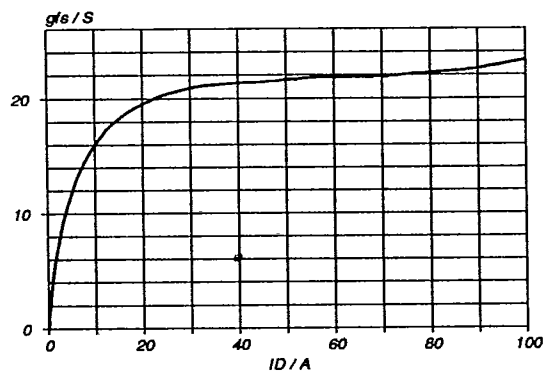


Fig. 9. Typical transconductance, $T_j = 25^\circ\text{C}$.
 $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25\text{ V}$

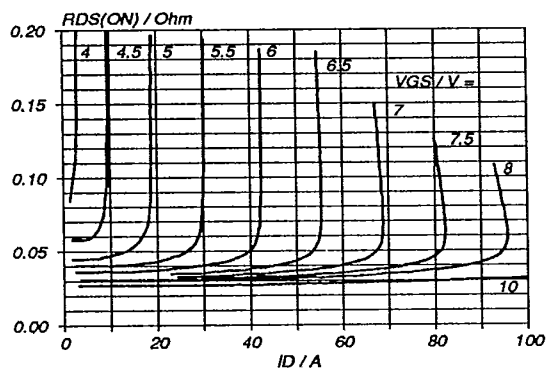


Fig. 7. Typical on-state resistance, $T_j = 25^\circ\text{C}$.
 $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

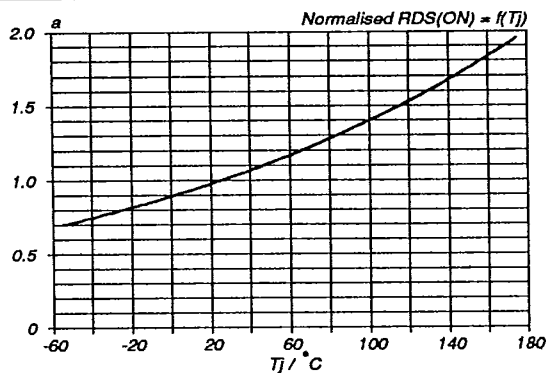


Fig. 10. Normalised drain-source on-state resistance.
 $a = R_{DS(ON)}/R_{DS(ON)25^\circ\text{C}} = f(T_j)$; $I_D = 29\text{ A}$; $V_{GS} = 10\text{ V}$

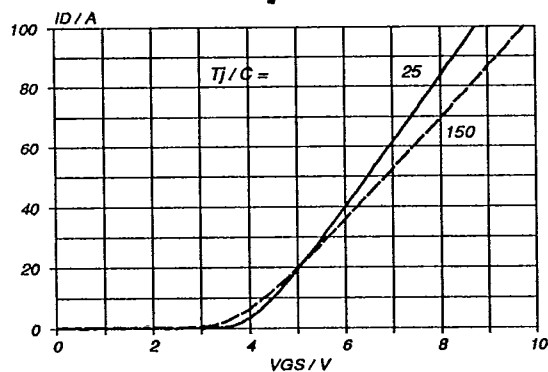


Fig. 8. Typical transfer characteristics.
 $I_D = f(V_{GS})$; conditions: $V_{DS} = 25\text{ V}$; parameter T_j

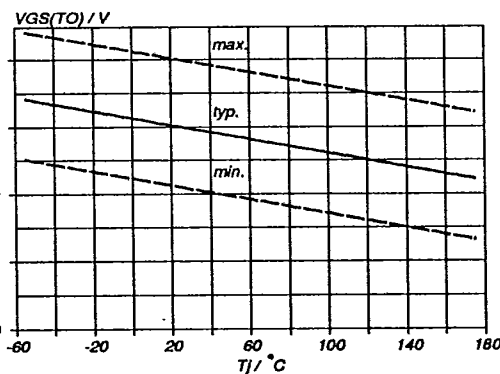


Fig. 11. Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$

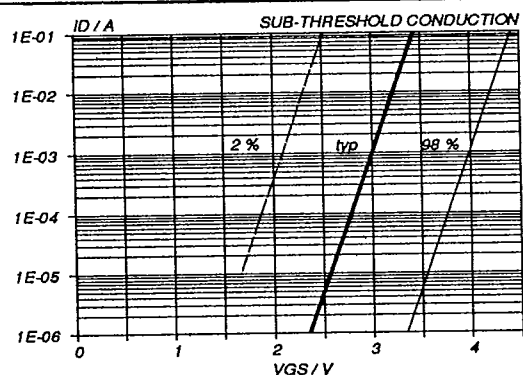


Fig. 12. Sub-threshold drain current.
 $I_D = f(V_{GS})$; conditions: $T_j = 25^\circ\text{C}$; $V_{DS} = V_{GS}$

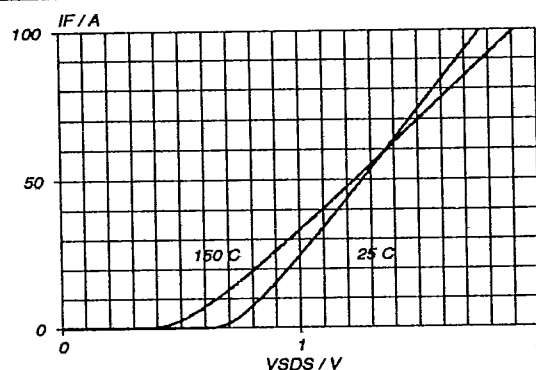


Fig. 15. Typical reverse diode current.
 $I_F = f(V_{SDS})$; conditions: $V_{GS} = 0\text{ V}$; parameter $T_j / ^\circ\text{C}$

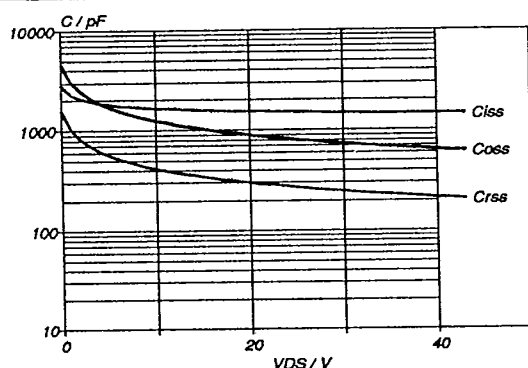


Fig. 13. Typical capacitances, C_{iss} , C_{oss} , C_{rss} .
 $C = f(V_{DS})$; conditions: $V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$

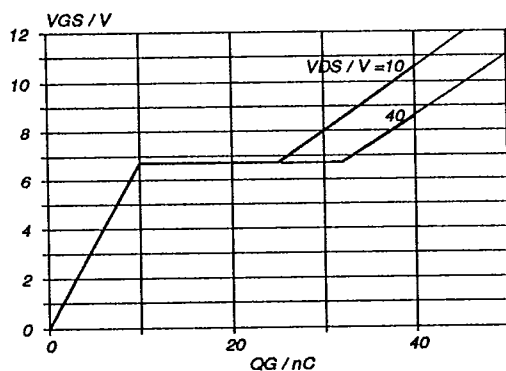


Fig. 14. Typical turn-on gate-charge characteristics.
 $V_{GS} = f(Q_G)$; conditions: $I_D = 52\text{ A}$; parameter V_{DS}