

PowerMOS transistor

BUK457-400A
BUK457-400B

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

T-39-13

SYMBOL	PARAMETER	BUK457	MAX.	MAX.	UNIT
V_{DS}	Drain-source voltage	-400A	-400B	400	V
I_D	Drain current (DC)	400	400	13	A
P_{tot}	Total power dissipation	150	150	11	W
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	0.5	Ω

MECHANICAL DATA

Dimensions in mm

Net Mass: 2g

Pinning:

1 = Gate

2 = Drain

3 = Source

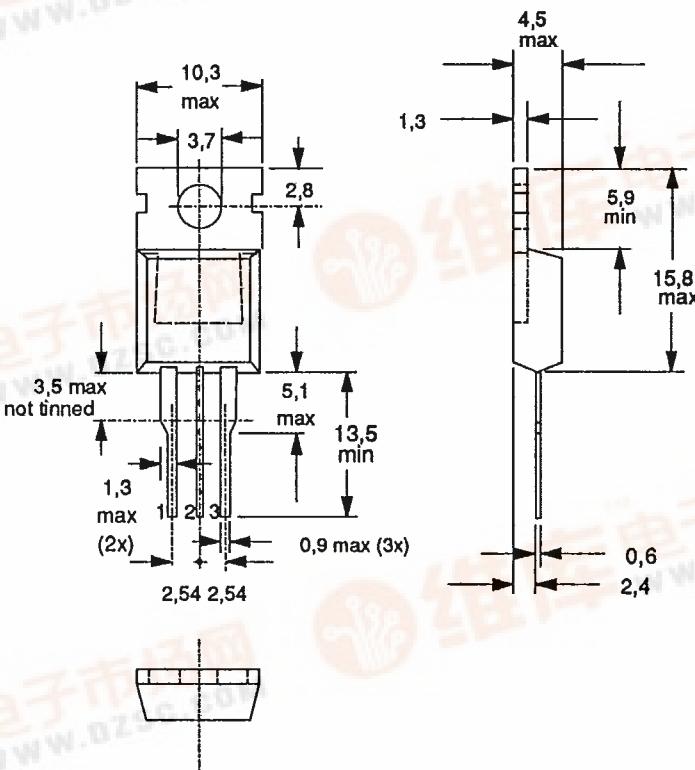
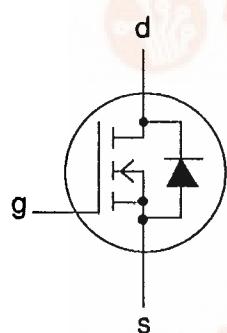


Fig.1 TO220AB; drain connected to mounting base.

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 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} V_{DGR} $\pm V_{GS}$	Drain-source voltage	$R_{GS} = 20 \text{ k}\Omega$	-	400		V
	Drain-gate voltage		-	400		V
	Gate-source voltage		-	30		V
I_D I_D I_{DM}	Drain current (DC)	$T_{mb} = 25^\circ\text{C}$ $T_{mb} = 100^\circ\text{C}$ $T_{mb} = 25^\circ\text{C}$	-	-400A	-400B	A
	Drain current (DC)		-	13	11	A
	Drain current (pulse peak value)		-	8.2	7	A
P_{tot} T_{sig} T_j	Total power dissipation	$T_{mb} = 25^\circ\text{C}$	-	52	44	W
	Storage temperature		-	150		°C
	Junction Temperature		-55	150	150	°C

THERMAL RESISTANCES

From junction to mounting base	$R_{th,j-mb} = 0.83 \text{ K/W}$
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	$V_{GS} = 0 \text{ V}; I_D = 0.25 \text{ mA}$	400	-	-	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	$V_{DS} = 400 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25^\circ\text{C}$	-	2	20	μA
I_{GSS}	Zero gate voltage drain current	$V_{DS} = 400 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125^\circ\text{C}$	-	0.1	1.0	mA
$R_{DS(ON)}$	Gate source leakage current	$V_{GS} = \pm 30 \text{ V}; V_{DS} = 0 \text{ V}$	-	10	100	nA
	Drain-source on-state resistance	$V_{GS} = 10 \text{ V}; I_D = 6.5 \text{ A}$ BUK457-400A BUK457-400B	-	0.35	0.4	Ω
			-	0.45	0.5	Ω

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}; I_D = 6.5 \text{ A}$	5.0	8.0	-	S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Feedback capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}$	-	1500	1800	pF
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Turn-on rise time Turn-off delay time Turn-off fall time	$V_{DD} = 30 \text{ V}; I_D = 2.8 \text{ A};$ $V_{GS} = 10 \text{ V}; R_{GS} = 50 \Omega;$ $R_{gen} = 50 \Omega$	-	20	40	ns
			-	60	90	ns
			-	200	250	ns
			-	75	90	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

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	13	A
I_{DRM}	Pulsed reverse drain current	-	-	-	52	A
V_{SD}	Diode forward voltage	$I_F = 13 \text{ A}; V_{GS} = 0 \text{ V}$	-	1.1	1.4	V
t_{rr}	Reverse recovery time	$I_F = 13 \text{ A}; -dI_F/dt = 100 \text{ A}/\mu\text{s}$	-	500	-	ns
Q_{rr}	Reverse recovery charge	$V_{GS} = 0 \text{ V}; V_R = 100 \text{ V}$	-	6.0	-	μC

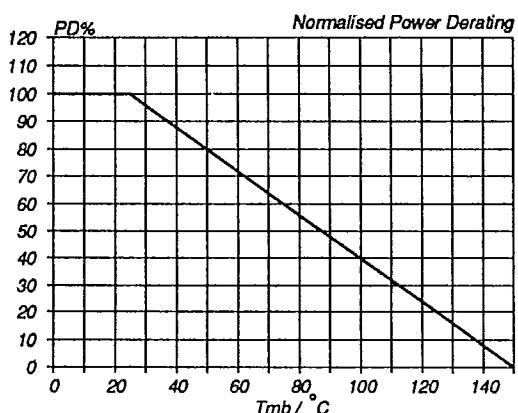


Fig.2. Normalised power dissipation.
 $PD\% = 100 \cdot P_D/P_{D,25^\circ\text{C}} = f(T_{mb})$

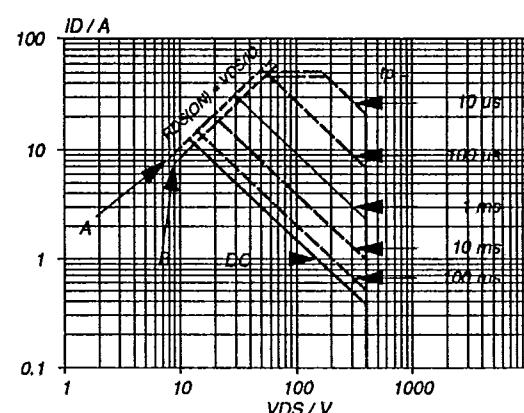


Fig.4. Safe operating area. $T_{mb} = 25^\circ\text{C}$
 I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p

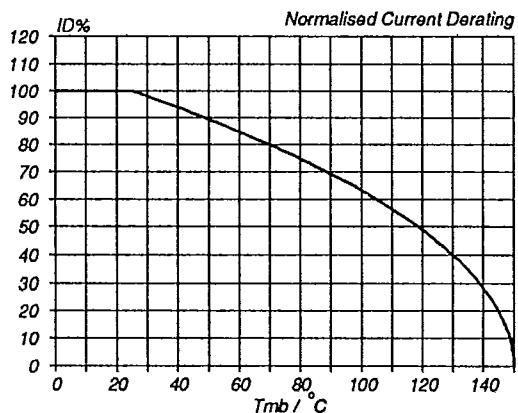


Fig.3. Normalised continuous drain current.
 $ID\% = 100 \cdot I_D/I_{D,25^\circ\text{C}} = f(T_{mb})$; conditions: $V_{GS} \geq 10 \text{ V}$

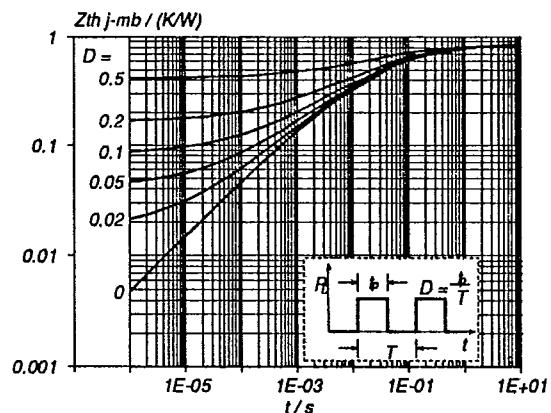
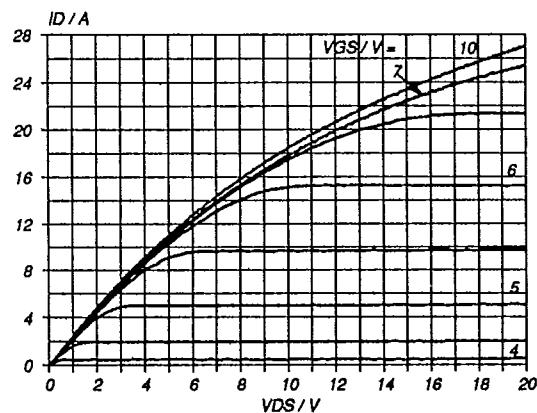
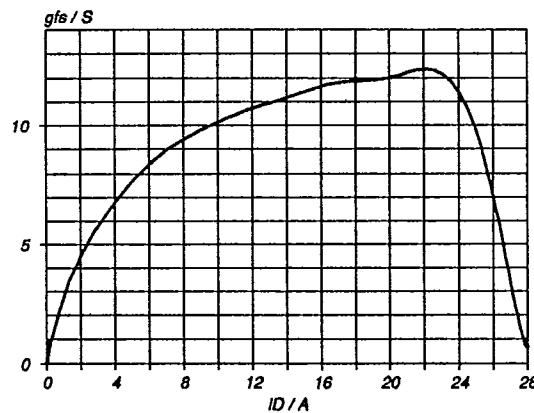
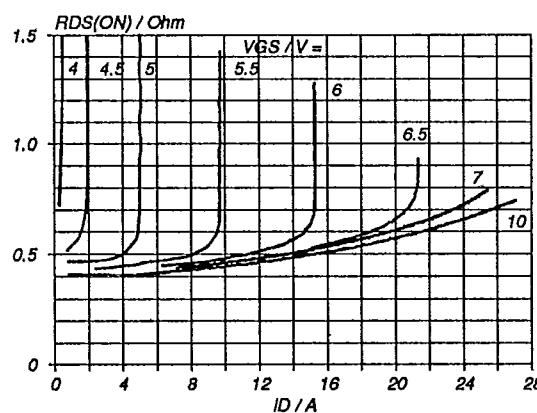
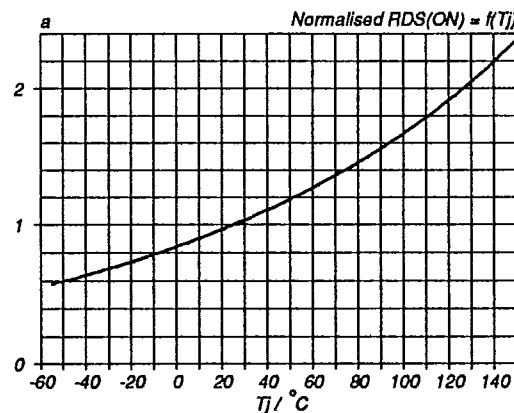
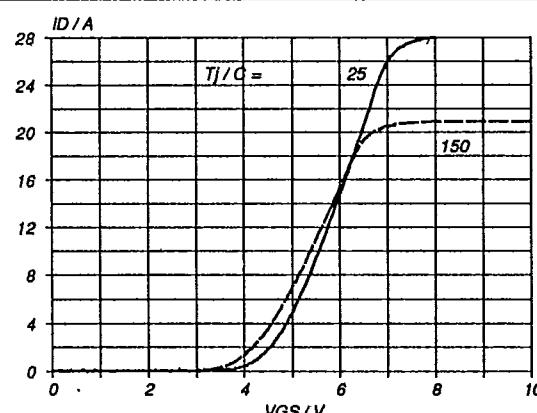
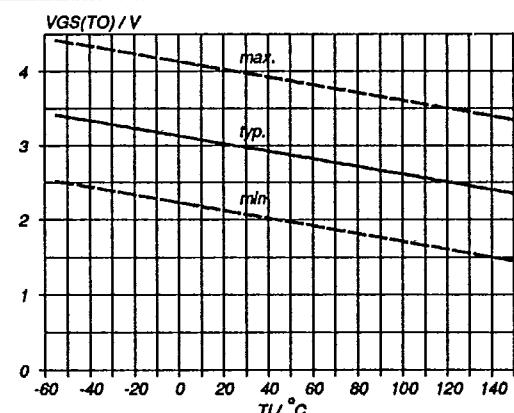


Fig.5. Transient thermal impedance.
 $Z_{th,j-mb} = f(t)$; parameter $D = t_p/T$

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Fig.6. ¹ Typical output characteristics, $T_j = 25^\circ\text{C}$.
 $I_D = f(V_{DS})$; parameter V_{GS} Fig.9. Typical transconductance, $T_j = 25^\circ\text{C}$.
 $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ VFig.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.
 $a = R_{DS(ON)}/R_{DS(ON)25^\circ\text{C}} = f(T_j)$; $I_D = 6.5$ A; $V_{GS} = 10$ VFig.8. Typical transfer characteristics.
 $I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j Fig.11. Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$

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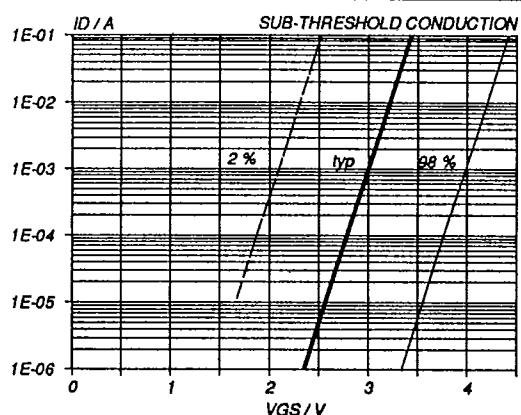


Fig.12. Sub-threshold drain current.
 $I_D = f(V_{GS})$; conditions: $T_j = 25^\circ\text{C}$; $V_{DS} = V_{GS}$

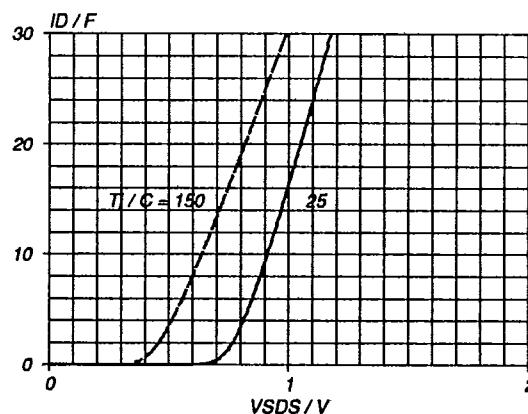


Fig.15. Typical reverse diode current.
 $I_F = f(V_{DS})$; conditions: $V_{GS} = 0\text{ V}$; parameter T_j

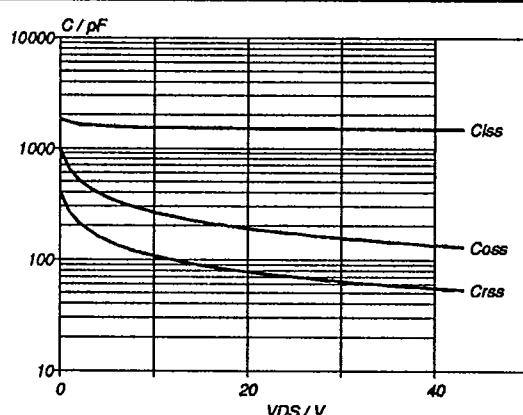


Fig.13. Typical capacitances, C_{iss} , C_{oss} , C_{rss} .
 $C = f(V_{DS})$; conditions: $V_{GS} = 0\text{ V}$; $f = 1\text{ MHz}$

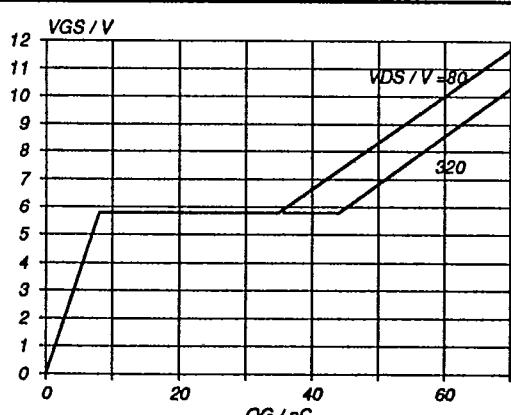


Fig.14. Typical turn-on gate-charge characteristics.
 $V_{GS} = f(Q_G)$; conditions: $I_D = 13\text{ A}$; parameter V_{DS}