PowerMOS transistor   BUK445-600B

GENERAL DESCRIPTION

N-channel enhancement mode field-effect power transistor in a plastic full-pack 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.	UNIT
V_{DS}	Drain-source voltage	600	V
I_D	Drain current (DC)	2.2	A
P_{tot}	Total power dissipation	30	W
$R_{DS(ON)}$	Drain-source on-state resistance	2.5	Ω

PINNING - SOT186

PIN	DESCRIPTION
1	gate
2	drain
3	source
case	isolated

PIN CONFIGURATION
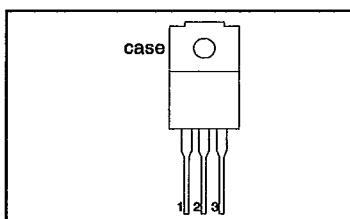
SYMBOL
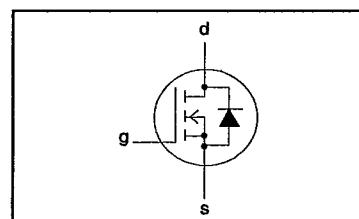
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	Drain-source voltage	-	-	600	V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20\ k\Omega$	-	600	V
$\pm V_{GS}$	Gate-source voltage	-	-	30	V
I_D	Drain current (DC)	$T_{hs} = 25\ °C$	-	2.2	A
I_D	Drain current (DC)	$T_{hs} = 100\ °C$	-	1.4	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25\ °C$	-	8.8	A
P_{tot}	Total power dissipation	$T_{hs} = 25\ °C$	-	30	W
T_{stg}	Storage temperature	-	- 55	150	°C
T_j	Junction Temperature	-	-	150	°C

THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th\ j\text{-}hs}$	Thermal resistance junction to heatsink	with heatsink compound	-	-	4.1	K/W
$R_{th\ j\text{-}a}$	Thermal resistance junction to ambient		-	55	-	K/W

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STATIC CHARACTERISTICS

T_{hs} = 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	600	-	-	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} = 600 V; V_{GS} = 0 V; T_j = 25 °C	-	2	20	µA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 600 V; V_{GS} = 0 V; T_j =125 °C	-	0.1	1.0	mA
I_{GSS}	Gate source leakage current	V_{GS} = ±30 V; V_{DS} = 0 V	-	10	100	nA
$R_{DS(ON)}$	Drain-source on-state resistance	V_{GS} = 10 V; I_D = 2.5 A	-	2.1	2.5	Ω

DYNAMIC CHARACTERISTICS

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 2.5 A	2.5	4.5	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	750	1000	pF
C_{oss}	Output capacitance		-	90	140	pF
C_{rss}	Feedback capacitance		-	40	70	pF
$t_{d on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 2.6 A;	-	10	45	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	45	60	ns
$t_{d off}$	Turn-off delay time	R_{gen} = 50 Ω	-	100	140	ns
t_f	Turn-off fall time		-	40	65	ns
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

ISOLATION

T_{hs} = 25 °C unless otherwise specified

| SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{isol}	Repetitive peak voltage from all three terminals to external heatsink	R.H. ≤ 65% ; clean and dustfree	-	-	1500	V
C_{isol}	Capacitance from T2 to external heatsink	f = 1 MHz	-	12	-	pF

REVERSE DIODE LIMITING VALUES AND CHARACTERISTICS

T_{hs} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	2.5	A
I_{DRM}	Pulsed reverse drain current	-	-	-	10	A
V_{SD}	Diode forward voltage	I_F = 2.5 A ; V_{GS} = 0 V	-	1.1	1.4	V
t_{rr}	Reverse recovery time	I_F = 2.5 A; -dI_F/dt = 100 A/µs;	-	1200	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 100 V	-	6.0	-	µC

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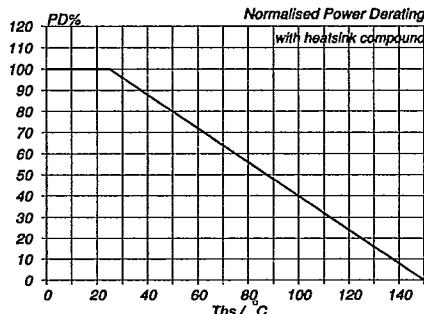
Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{hs})$
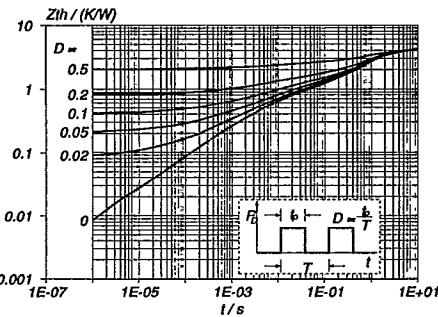
Fig.4. Transient thermal impedance.
$Z_{th\,j\text{-}hs} = f(t)$; parameter $D = t_p/T$
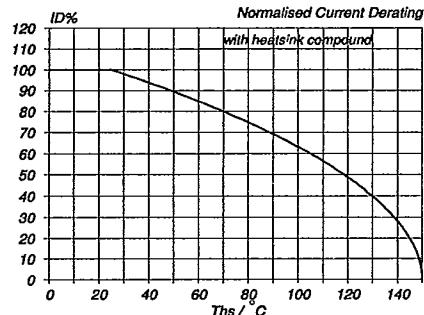
Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{hs})$; conditions: $V_{GS} \geq 10$ V
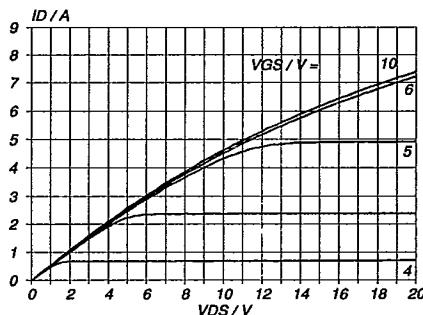
Fig.5. Typical output characteristics, $T_j = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}
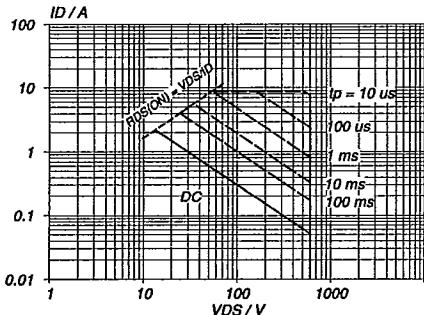
Fig.3. Safe operating area. $T_{hs} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p
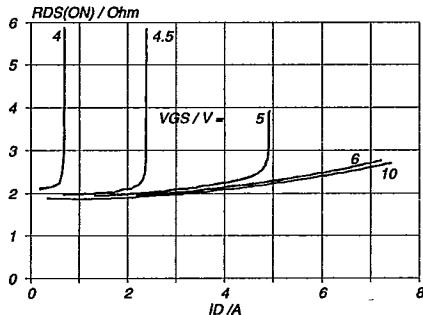
Fig.6. Typical on-state resistance, $T_j = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

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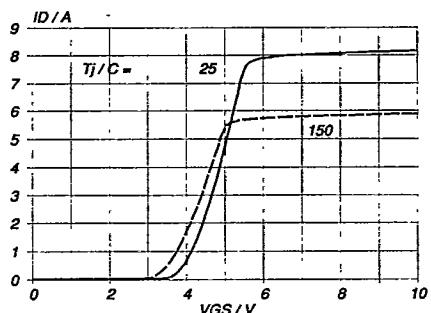
Fig.7.   Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: $V_{DS} = 25$ V; parameter T_j
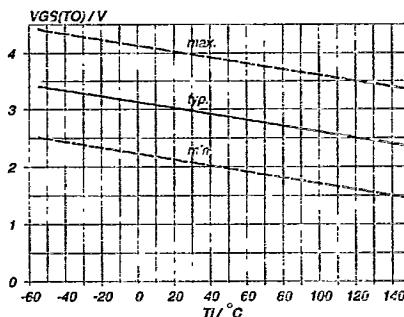
Fig.10.   Gate threshold voltage.
$V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1$ mA; $V_{DS} = V_{GS}$
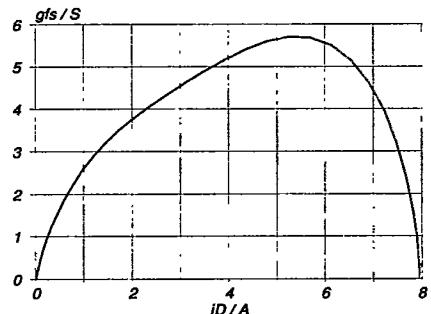
Fig.8.   Typical transconductance, $T_j = 25$ °C.
$g_{fs} = f(I_D)$; conditions: $V_{DS} = 25$ V
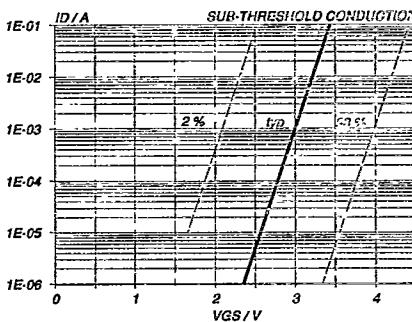
Fig.11.   Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: $T_j = 25$ °C; $V_{DS} = V_{GS}$
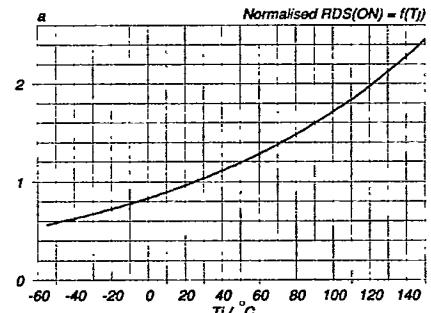
Fig.9.   Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25°C} = f(T_j)$; $I_D = 2.5$ A; $V_{GS} = 10$ V
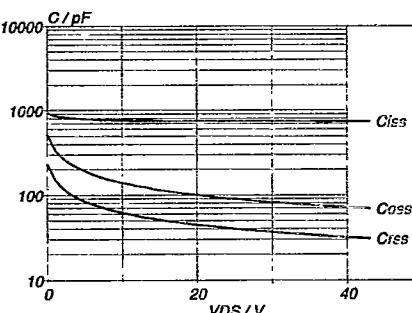
Fig.12.   Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: $V_{GS} = 0$ V; $f = 1$ MHz

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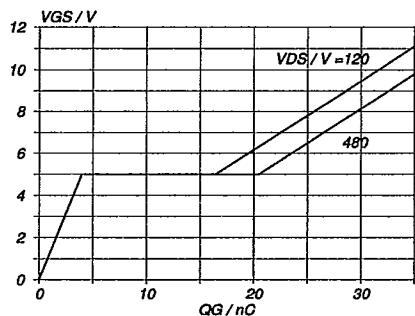
Fig.13. *Typical turn-on gate-charge characteristics.*
$V_{GS} = f(Q_G)$; conditions: $I_D = 4.5$ A; parameter V_{DS}
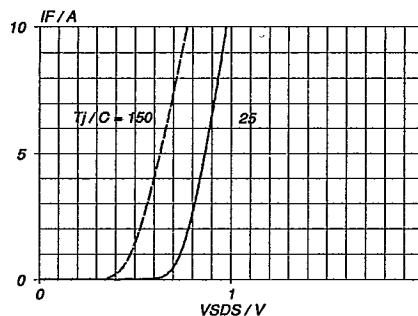
Fig.14. *Typical reverse diode current.*
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j

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