Philips Components

Data sheet	
status	Preliminary specification
date of issue	March 1991

BUK451-60A/B
PowerMOS transistor

PHILIPS INTERNATIONAL   56E D ■ 7110826 0044569 298 ■■PHIN

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 automotive and general purpose switching applications.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	UNIT
	BUK451	**-60A**	**-60B**	
V_{DS}	Drain-source voltage	60	60	V
I_D	Drain current (DC)	5.0	5.0	A
P_{tot}	Total power dissipation	40	40	W
T_j	Junction temperature	175	175	°C
$R_{DS(ON)}$	Drain-source on-state resistance	0.4	0.5	Ω

PINNING - TO220AB

PIN	DESCRIPTION
1	gate
2	drain
3	source
tab	drain

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	-	-	60		V
V_{DGR}	Drain-gate voltage	$R_{GS} = 20\ k\Omega$	-	60		V
$\pm V_{GS}$	Gate-source voltage	-	-	30		V
				-60A	**-60B**	
I_D	Drain current (DC)	$T_{mb} = 25\ °C$	-	5.0	5.0	A
I_D	Drain current (DC)	$T_{mb} = 100\ °C$	-	5.0	4.8	A
I_{DM}	Drain current (pulse peak value)	$T_{mb} = 25\ °C$	-	20	20	A
P_{tot}	Total power dissipation	$T_{mb} = 25\ °C$	-	40		W
T_{stg}	Storage temperature	-	- 55	175		°C
T_j	Junction Temperature	-	-	175		°C

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THERMAL RESISTANCES

From junction to mounting base	$R_{th\ j-mb}$ = 3.75 K/W
From junction to ambient	$R_{th\ j-a}$ = 60 K/W

STATIC CHARACTERISTICS

T_{mb} = 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	60	-	-	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} = 60 V; V_{GS} = 0 V; T_J = 25 °C	-	1	10	μA
I_{DSS}	Zero gate voltage drain current	V_{DS} = 60 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; BUK451-60A	-	0.25	0.4	Ω
		I_D = 4.0 A BUK451-60B	-	0.40	0.5	Ω

DYNAMIC CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	V_{DS} = 25 V; I_D = 4.0 A	1.5	1.9	-	S
C_{iss}	Input capacitance	V_{GS} = 0 V; V_{DS} = 25 V; f = 1 MHz	-	160	240	pF
C_{oss}	Output capacitance		-	75	100	pF
C_{rss}	Feedback capacitance		-	35	50	pF
$t_{d\ on}$	Turn-on delay time	V_{DD} = 30 V; I_D = 3 A;	-	4	6	ns
t_r	Turn-on rise time	V_{GS} = 10 V; R_{GS} = 50 Ω;	-	15	25	ns
$t_{d\ off}$	Turn-off delay time	R_{gen} = 50 Ω	-	10	20	ns
t_f	Turn-off fall time		-	15	25	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 LIMITING VALUES AND CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

| SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	5.0	A
I_{DRM}	Pulsed reverse drain current	-	-	-	20	A
V_{SD}	Diode forward voltage	I_F = 5.0 A ; V_{GS} = 0 V	-	1.1	1.5	V
t_{rr}	Reverse recovery time	I_F = 5.0 A; $-dI_F/dt$ = 100 A/μs;	-	60	-	ns
Q_{rr}	Reverse recovery charge	V_{GS} = 0 V; V_R = 30 V	-	0.15	-	μC

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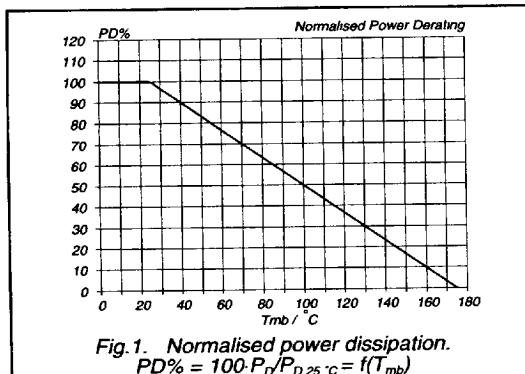
Fig.1. Normalised power dissipation.
$PD\% = 100 \cdot P_D/P_{D\,25\,°C} = f(T_{mb})$
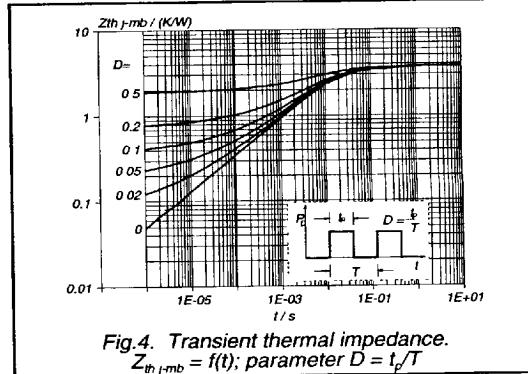
Fig.4. Transient thermal impedance.
$Z_{th\,j-mb} = f(t)$; parameter $D = t_p/T$
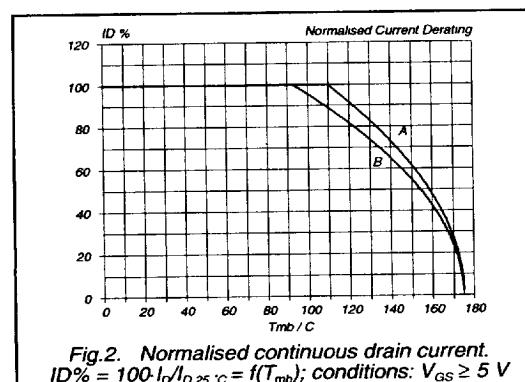
Fig.2. Normalised continuous drain current.
$ID\% = 100 \cdot I_D/I_{D\,25\,°C} = f(T_{mb})$; conditions: $V_{GS} \geq 5$ V
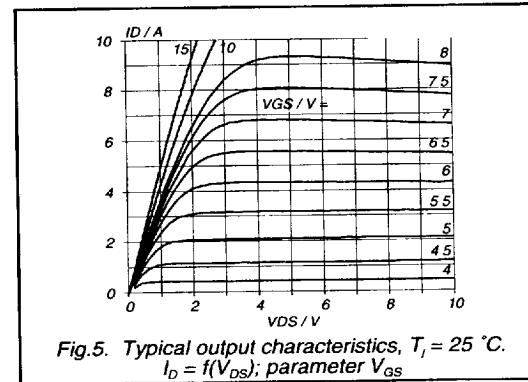
Fig.5. Typical output characteristics, $T_I = 25$ °C.
$I_D = f(V_{DS})$; parameter V_{GS}
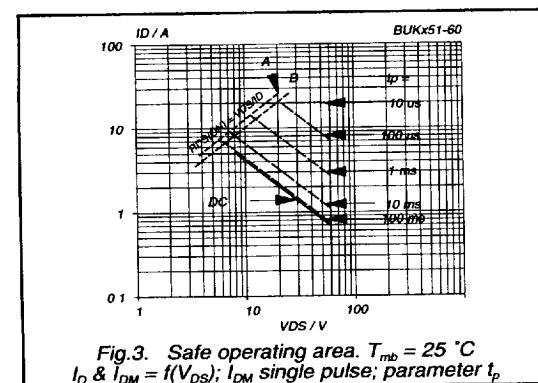
Fig.3. Safe operating area. $T_{mb} = 25$ °C
I_D & $I_{DM} = f(V_{DS})$; I_{DM} single pulse; parameter t_p
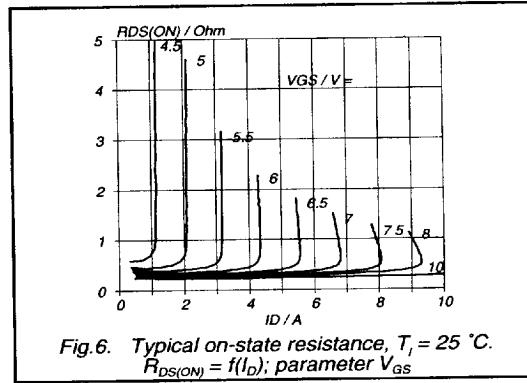
Fig.6. Typical on-state resistance, $T_I = 25$ °C.
$R_{DS(ON)} = f(I_D)$; parameter V_{GS}

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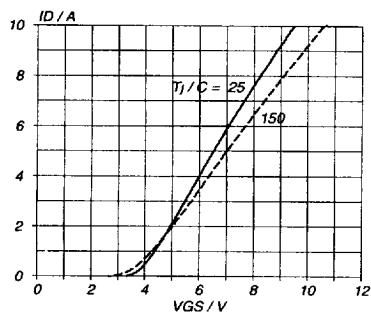

Fig.7.   Typical transfer characteristics.
$I_D = f(V_{GS})$; conditions: V_{DS} = 25 V; parameter T_J
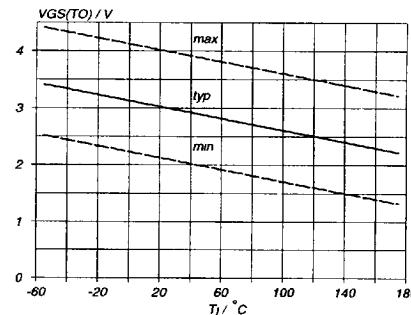
Fig.10.   Gate threshold voltage.
$V_{GS(TO)} = f(T_J)$; conditions: I_D = 1 mA; $V_{DS} = V_{GS}$
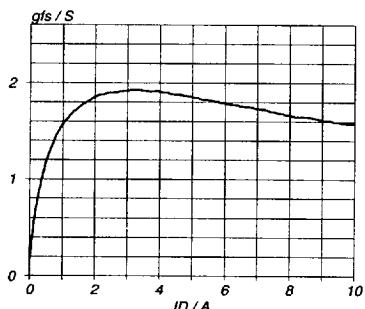
Fig.8.   Typical transconductance, T_J = 25 °C.
$g_{fs} = f(I_D)$; conditions: V_{DS} = 25 V
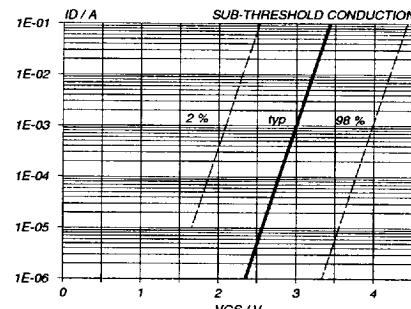
Fig.11.   Sub-threshold drain current.
$I_D = f(V_{GS})$; conditions: T_J = 25 °C; $V_{DS} = V_{GS}$
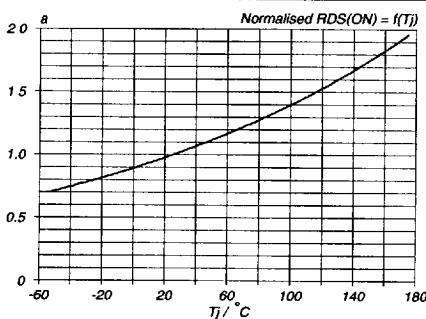
Fig.9.   Normalised drain-source on-state resistance.
$a = R_{DS(ON)}/R_{DS(ON)25\,°C} = f(T_J)$; I_D = 4.0 A; V_{GS} = 5 V
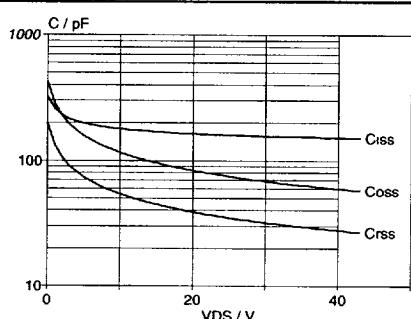
Fig.12.   Typical capacitances, C_{iss}, C_{oss}, C_{rss}.
$C = f(V_{DS})$; conditions: V_{GS} = 0 V; f = 1 MHz

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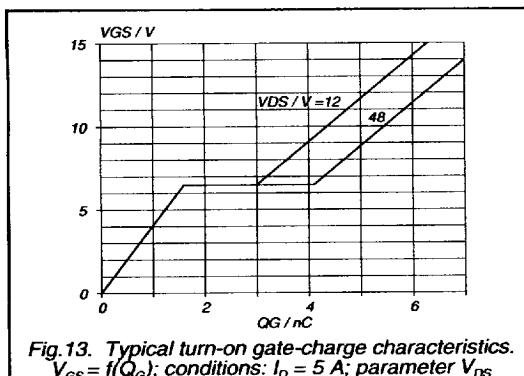
Fig.13.   Typical turn-on gate-charge characteristics.
$V_{GS} = f(Q_G)$; conditions: $I_D = 5$ A; parameter V_{DS}
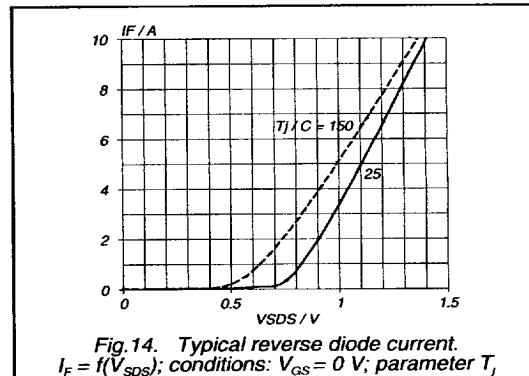
Fig.14.   Typical reverse diode current.
$I_F = f(V_{SDS})$; conditions: $V_{GS} = 0$ V; parameter T_j