

PowerMOS transistor

**BUK445-50A
BUK445-50B**

T-39-09

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.	MAX.	UNIT
	BUK445			
V_{DS}	Drain-source voltage	-50A 50	-50B 50	V
I_D	Drain current (DC)	21	20	A
P_{tot}	Total power dissipation	30	30	W
T_j	Junction temperature	150	150	°C
$R_{DS(ON)}$	Drain-source on-state resistance	0.038	0.045	Ω

MECHANICAL DATA

Dimensions in mm

Net Mass: 2g

Pinning:

- 1 = Gate
- 2 = Drain
- 3 = Source

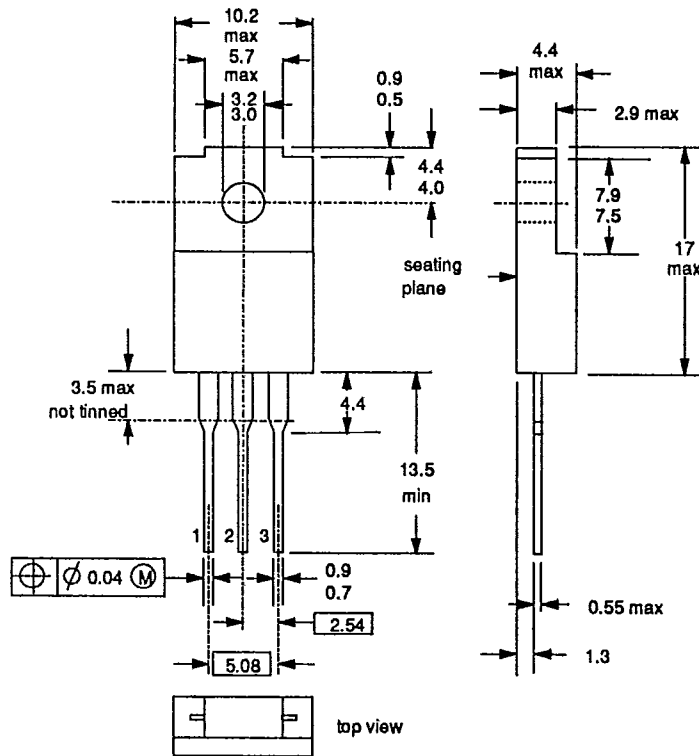
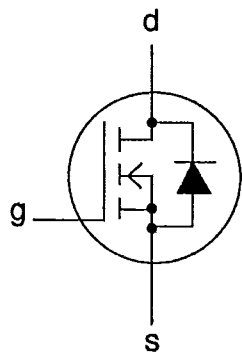


Fig.1 SOT-186; The seating plane is electrically isolated from all terminals.

- 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 F-pack 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)	$T_{hs} = 25 \text{ }^\circ\text{C}$	-	-50A 21	A
I_{D1}	Drain current (DC)	$T_{hs} = 100 \text{ }^\circ\text{C}$	-	13	A
I_{DM}	Drain current (pulse peak value)	$T_{hs} = 25 \text{ }^\circ\text{C}$	-	84	A
P_{tot}	Total power dissipation	$T_{hs} = 25 \text{ }^\circ\text{C}$	-	30	W
T_{stg}	Storage temperature	-	-55	150	$^\circ\text{C}$
T_j	Junction Temperature	-	-	150	$^\circ\text{C}$

THERMAL RESISTANCES

From junction to heatsink From junction to ambient	with heatsink compound	$R_{th\ j-hs} = 4.17 \text{ K/W}$ $R_{th\ j-a} = 55 \text{ K/W}$
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STATIC CHARACTERISTICS

 $T_{hs} = 25 \text{ }^\circ\text{C}$ 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	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	1	10	μA
I_{DSS}	Zero gate voltage drain current	$V_{DS} = 50 \text{ V}; V_{GS} = 0 \text{ V}; T_j = 125 \text{ }^\circ\text{C}$	-	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	$V_{GS} = 10 \text{ V}; I_D = 20 \text{ A}$	-	0.03 0.04	0.038 0.045	Ω
		BUK445-50A				
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DYNAMIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
g_{fs}	Forward transconductance	$V_{DS} = 25 \text{ V}; I_D = 20 \text{ A}$	8	13.5	-	S
C_{iss}	Input capacitance	$V_{GS} = 0 \text{ V}; V_{DS} = 25 \text{ V}; f = 1 \text{ MHz}$	-	1650	2000	pF
C_{oss}	Output capacitance		-	560	750	pF
C_{rss}	Feedback capacitance		-	300	400	pF
$t_{d\ on}$	Turn-on delay time	$V_{DD} = 30 \text{ V}; I_D = 3 \text{ A}; V_{GS} = 10 \text{ V}; R_{GS} = 50 \text{ } \Omega;$	-	25	40	ns
t_r	Turn-on rise time	$R_{gen} = 50 \text{ } \Omega$	-	60	90	ns
$t_{d\ off}$	Turn-off delay time		-	125	160	ns
t_f	Turn-off fall time		-	100	130	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

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

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

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REVERSE DIODE RATINGS AND CHARACTERISTICS

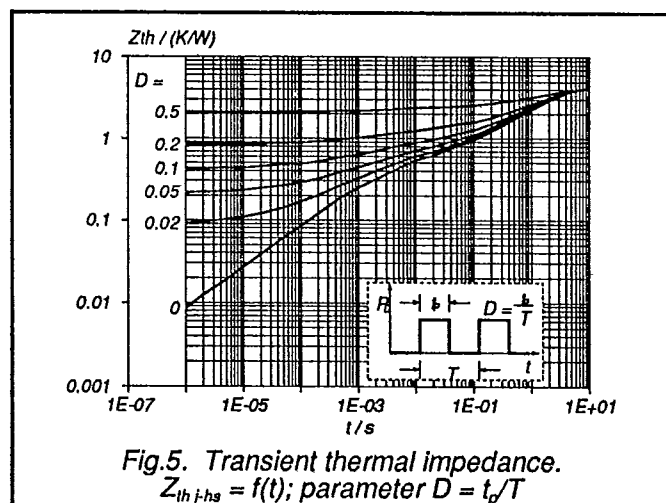
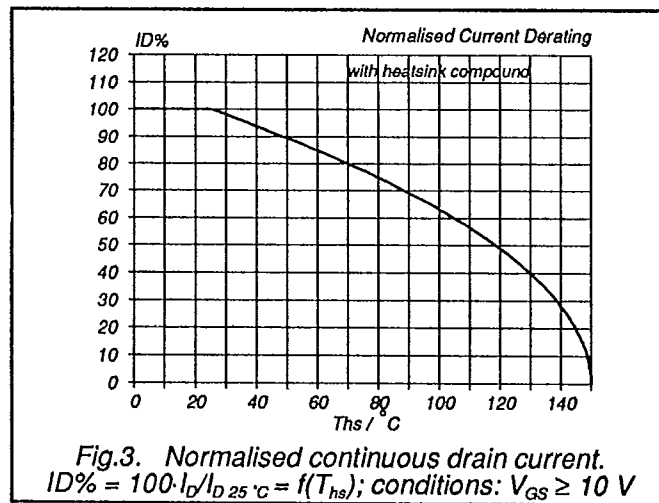
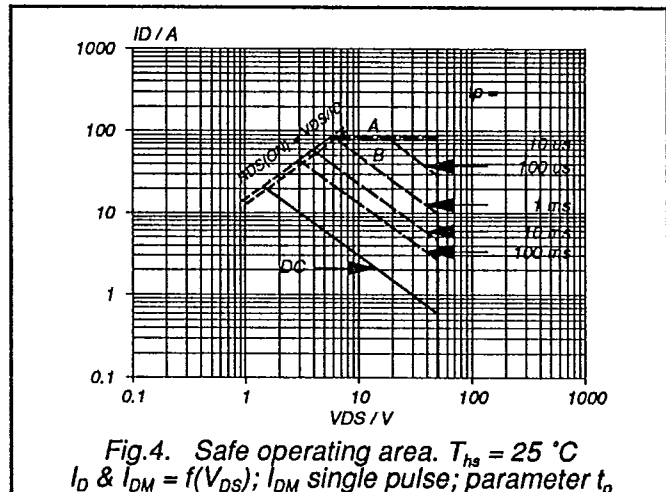
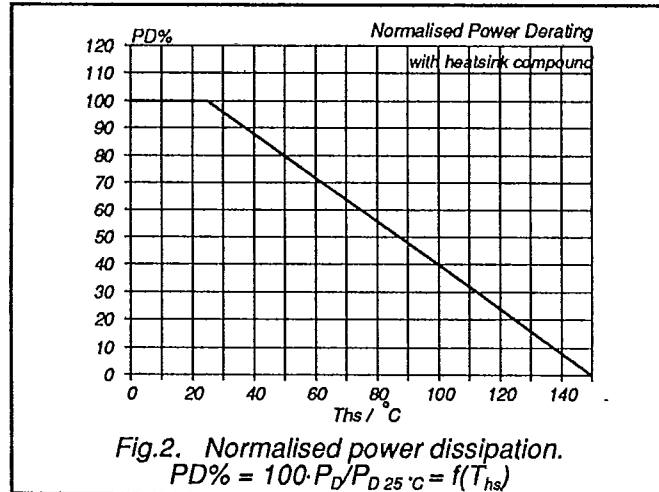
$T_{hs} = 25\text{ }^\circ\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DR}	Continuous reverse drain current	-	-	-	21	A
I_{DRM}	Pulsed reverse drain current	-	-	-	84	A
V_{SD}	Diode forward voltage	$I_F = 21\text{ A}; V_{GS} = 0\text{ V}$	-	1.4	1.8	V
t_{rr}	Reverse recovery time	$I_F = 21\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_R = 30\text{ V}$	-	250	-	ns
Q_{rr}	Reverse recovery charge	$I_F = 21\text{ A}; -di_F/dt = 100\text{ A}/\mu\text{s}; V_{GS} = 0\text{ V}; V_R = 30\text{ V}$	-	0.30	-	μC

AVALANCHE RATING

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
W_{DSS}	Drain-source non-repetitive unclamped inductive turn-off energy	$I_D = 41\text{ A}; V_{DD} \leq 25\text{ V}; V_{GS} = 10\text{ V}; R_{GS} = 50\ \Omega$	-	-	100	mJ



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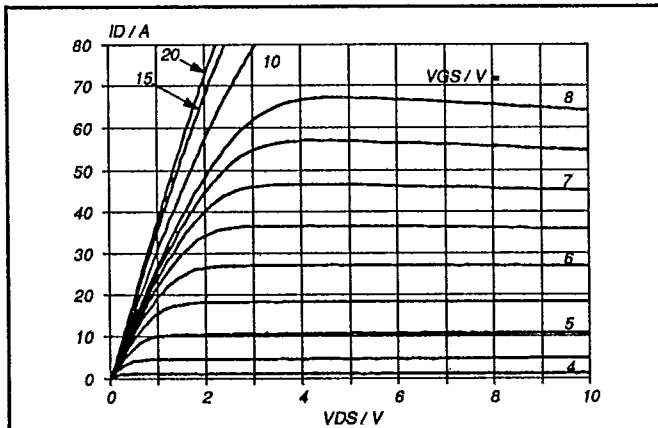


Fig. 6. Typical output characteristics, $T_j = 25^\circ\text{C}$.
 $I_D = f(V_{DS})$; parameter V_{GS}

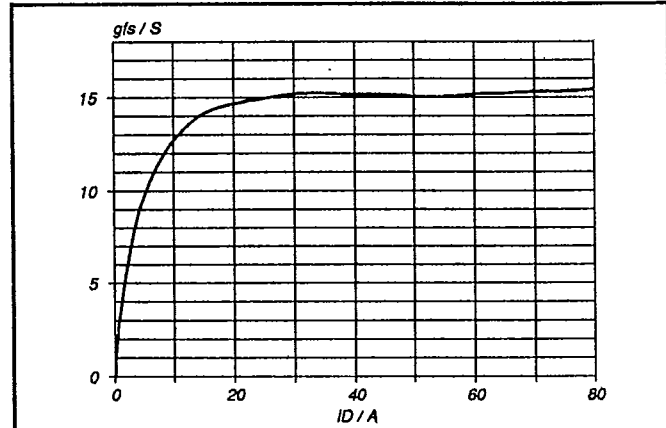


Fig. 9. Typical transconductance, $T_j = 25^\circ\text{C}$.
 $g_{fs} = f(I_D)$; conditions: $V_{DS} = 25\text{ V}$

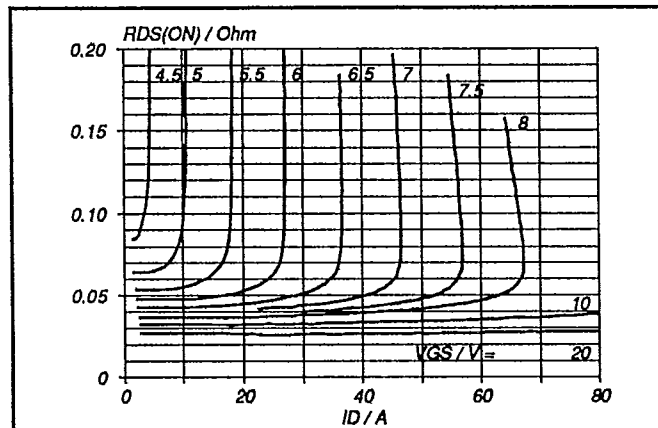


Fig. 7. Typical on-state resistance, $T_j = 25^\circ\text{C}$.
 $R_{DS(ON)} = f(I_D)$; parameter V_{GS}

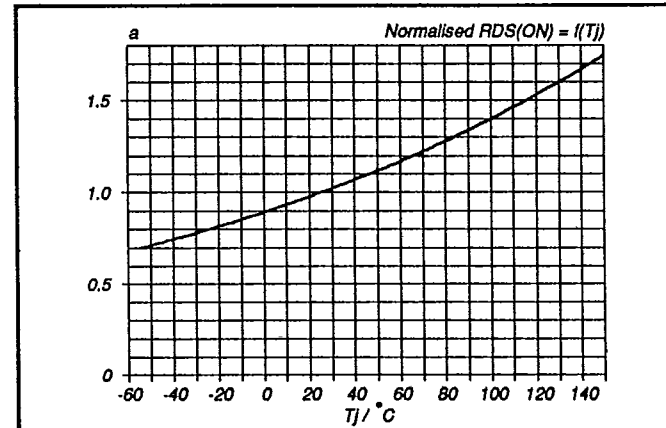


Fig. 10. Normalised drain-source on-state resistance.
 $a = R_{DS(ON)}/R_{DS(ON)25^\circ\text{C}} = f(T_j)$; $I_D = 20\text{ A}$; $V_{GS} = 10\text{ V}$

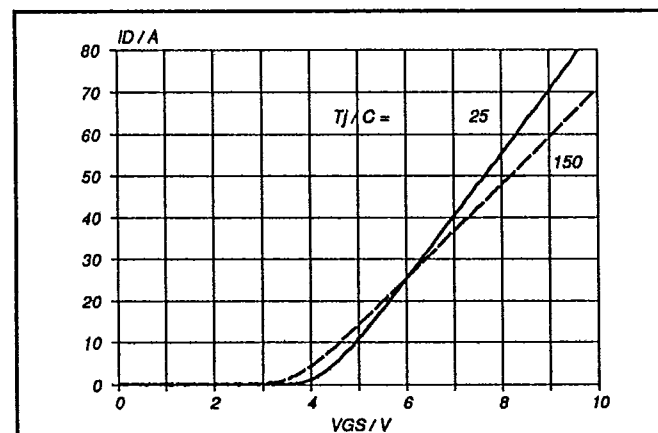


Fig. 8. Typical transfer characteristics.
 $I_D = f(V_{GS})$; conditions: $V_{DS} = 25\text{ V}$; parameter T_j

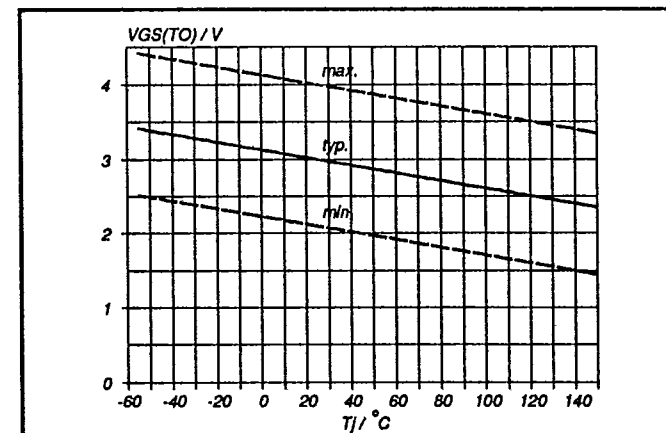
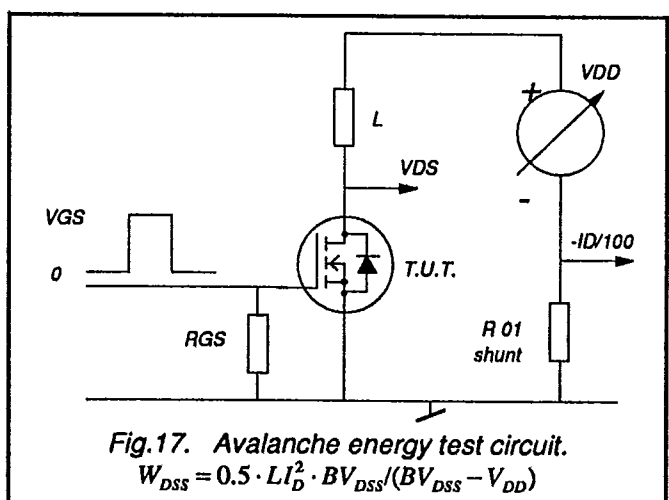
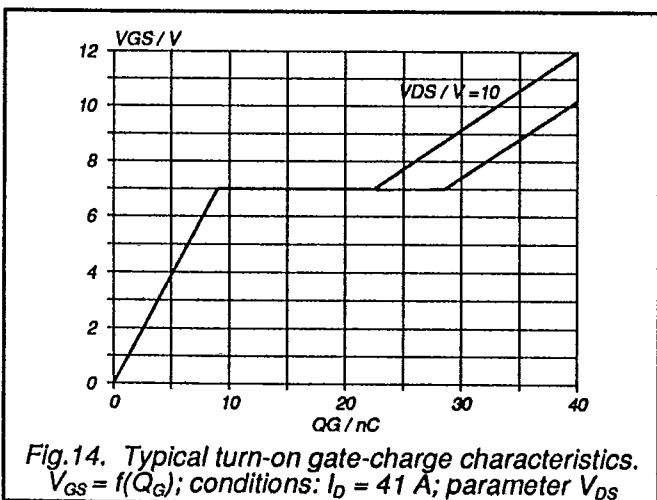
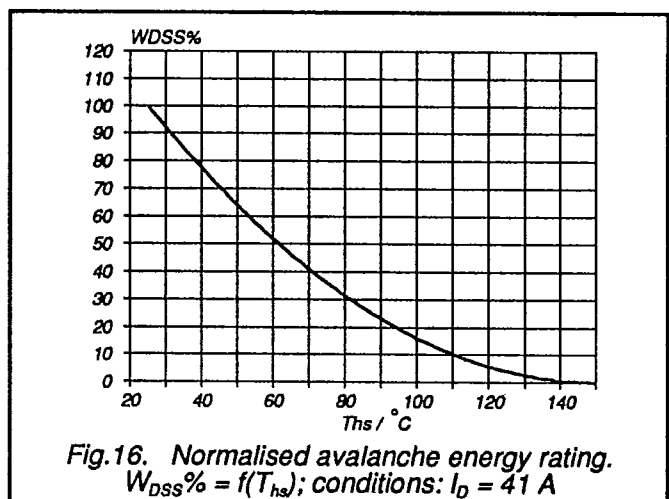
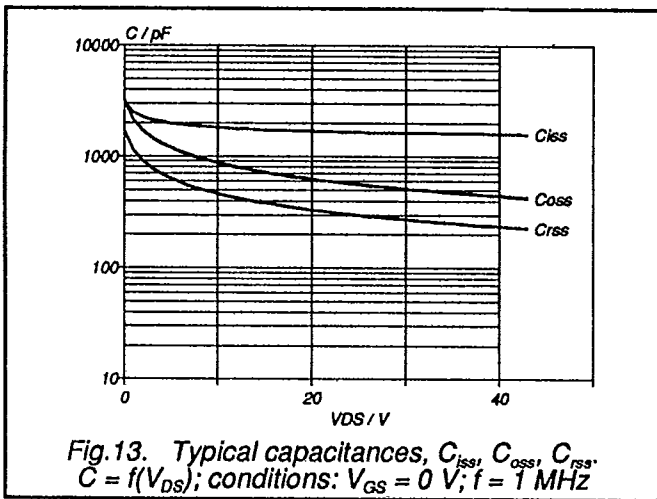
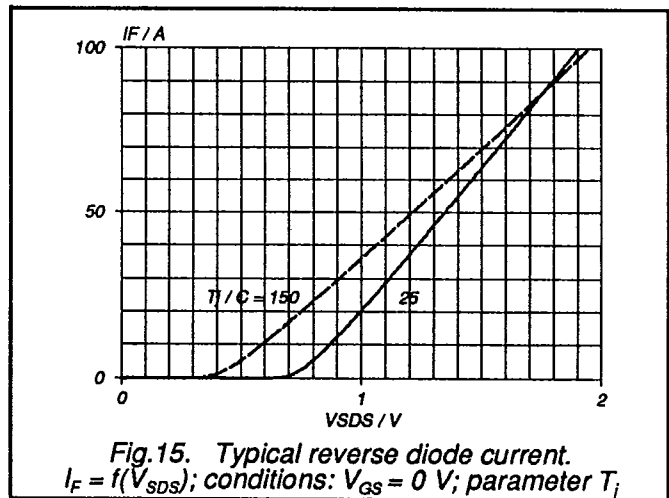
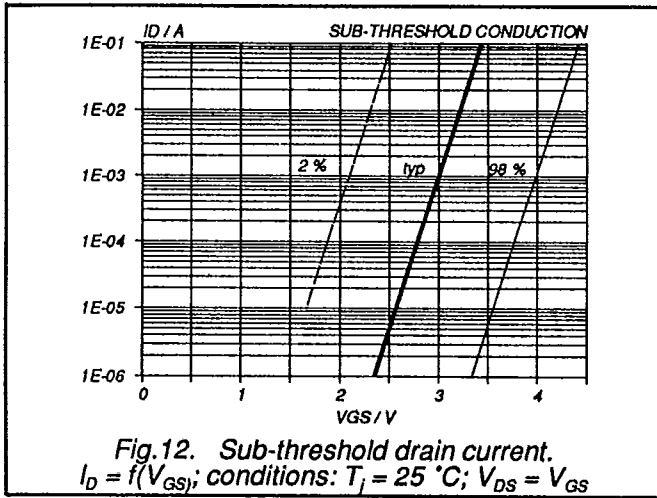


Fig. 11. Gate threshold voltage.
 $V_{GS(TO)} = f(T_j)$; conditions: $I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$

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