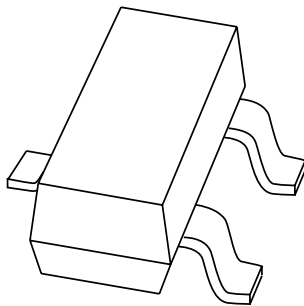


DATA SHEET

**BSH103**

N-channel enhancement mode
MOS transistor

Product specification
Supersedes data of 1998 Jan 30
File under Discrete Semiconductors, SC13b

1998 Feb 11

N-channel enhancement mode MOS transistor

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FEATURES

- Very low threshold
- High-speed switching
- No secondary breakdown
- Direct interface to C-MOS, TTL etc.

APPLICATIONS

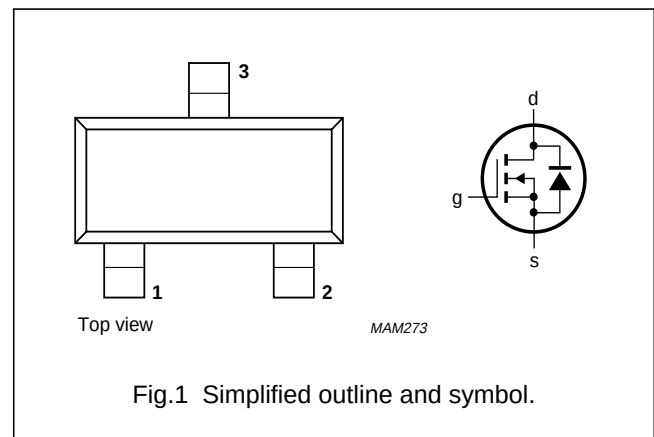
- Power management
- DC to DC converters
- Battery powered applications
- 'Glue-logic'; interface between logic blocks and/or periphery
- General purpose switch.

DESCRIPTION

N-channel enhancement mode MOS transistor in a SOT23 SMD package.

PINNING - SOT23

PIN	SYMBOL	DESCRIPTION
1	g	gate
2	s	source
3	d	drain



QUICK REFERENCE DATA

SYMBOL	PARAMETERS	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	30	V
V_{SD}	source-drain diode forward voltage	$V_{GD} = 0$; $I_S = 0.5$ A	–	1	V
V_{GS}	gate-source voltage (DC)		–	± 8	V
V_{GSth}	gate-source threshold voltage	$V_{DS} = V_{GS}$; $I_D = 1$ mA	0.4	–	V
I_D	drain current (DC)	$T_s = 80$ °C	–	0.85	A
R_{DSon}	drain-source on-state resistance	$V_{GS} = 2.5$ V; $I_D = 0.5$ A	–	0.5	Ω
P_{tot}	total power dissipation	$T_s = 80$ °C	–	0.5	W

CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

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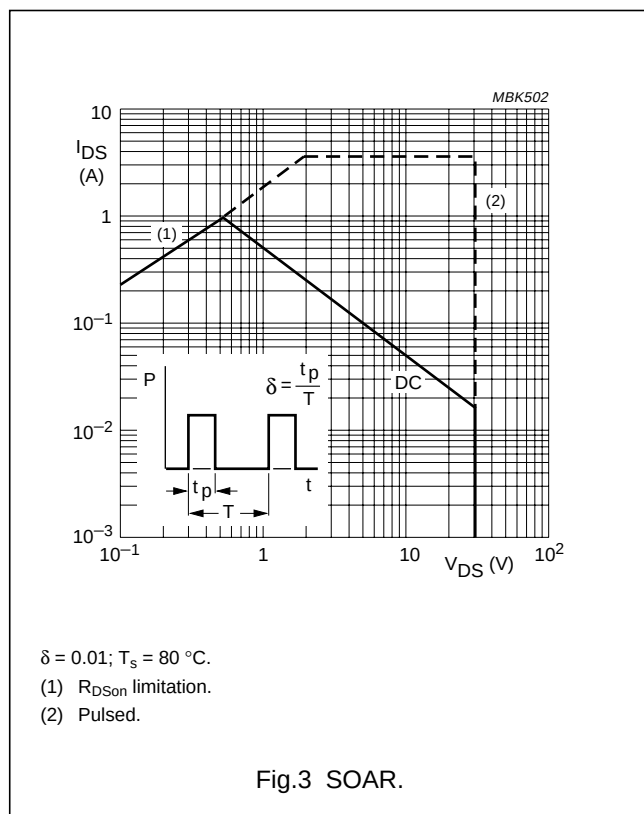
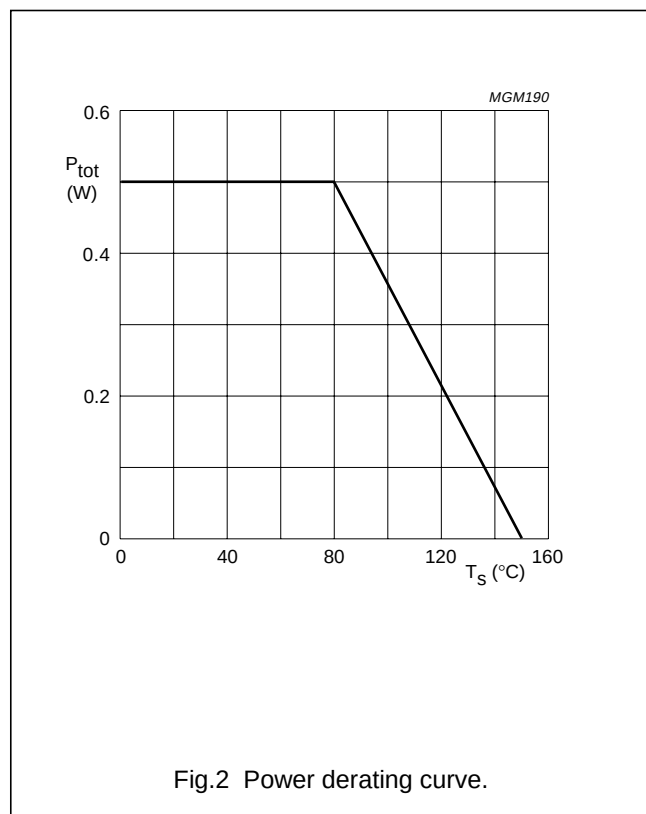
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	30	V
V_{GS}	gate-source voltage (DC)		–	± 8	V
I_D	drain current (DC)	$T_S = 80\text{ }^{\circ}\text{C}$; note 1	–	0.85	A
I_{DM}	peak drain current	note 2	–	3.4	A
P_{tot}	total power dissipation	$T_S = 80\text{ }^{\circ}\text{C}$	–	0.5	W
		$T_{amb} = 25\text{ }^{\circ}\text{C}$; note 3	–	0.75	W
		$T_{amb} = 25\text{ }^{\circ}\text{C}$; note 4	–	0.54	W
T_{stg}	storage temperature		–55	+150	$^{\circ}\text{C}$
T_j	operating junction temperature		–55	+150	$^{\circ}\text{C}$
Source-drain diode					
I_S	source current (DC)	$T_S = 80\text{ }^{\circ}\text{C}$	–	0.5	A
I_{SM}	peak pulsed source current	note 2	–	2	A

Notes

- T_S is the temperature at the soldering point of the drain lead.
- Pulse width and duty cycle limited by maximum junction temperature.
- Device mounted on printed-circuit board with an $R_{th\ a-tp}$ (ambient to tie-point) of 27.5 K/W.
- Device mounted on printed-circuit board with an $R_{th\ a-tp}$ (ambient to tie-point) of 90 K/W.



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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	140	K/W

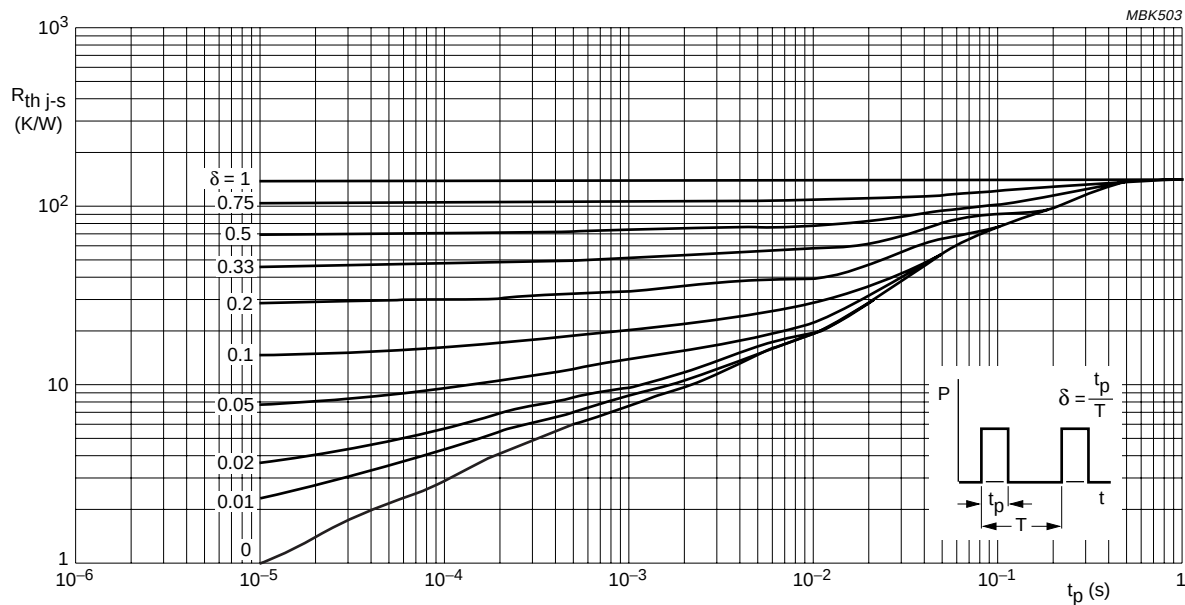


Fig.4 Transient thermal resistance from junction to soldering point as a function of pulse time; typical values.

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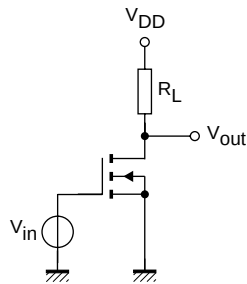
CHARACTERISTICS

$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$; $I_D = 10\text{ }\mu\text{A}$	30	–	–	V
V_{GSth}	gate-source threshold voltage	$V_{GS} = V_{DS}$; $I_D = 1\text{ mA}$	0.4	–	–	V
I_{DSS}	drain-source leakage current	$V_{GS} = 0$; $V_{DS} = 24\text{ V}$	–	–	100	nA
I_{GSS}	gate leakage current	$V_{GS} = \pm 8\text{ V}$; $V_{DS} = 0$	–	–	± 100	nA
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}$; $I_D = 0.5\text{ A}$	–	–	0.4	Ω
		$V_{GS} = 2.5\text{ V}$; $I_D = 0.5\text{ A}$	–	–	0.5	Ω
		$V_{GS} = 1.8\text{ V}$; $I_D = 0.25\text{ A}$	–	–	0.6	Ω
C_{iss}	input capacitance	$V_{GS} = 0$; $V_{DS} = 24\text{ V}$; $f = 1\text{ MHz}$	–	83	–	pF
C_{oss}	output capacitance	$V_{GS} = 0$; $V_{DS} = 24\text{ V}$; $f = 1\text{ MHz}$	–	27	–	pF
C_{rss}	reverse transfer capacitance	$V_{GS} = 0$; $V_{DS} = 24\text{ V}$; $f = 1\text{ MHz}$	–	14	–	pF
Q_G	total gate charge	$V_{GS} = 4.5\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	2100	–	pC
Q_{GS}	gate-source charge	$V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	95	–	pC
Q_{GD}	gate-drain charge	$V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$	–	670	–	pC
Switching times						
$t_{d(on)}$	turn-on delay time	$V_{GS} = 0\text{ to }8\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	2.5	–	ns
t_f	fall time	$V_{GS} = 0\text{ to }8\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	3.5	–	ns
t_{on}	turn-on switching time	$V_{GS} = 0\text{ to }8\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	6	–	ns
$t_{d(off)}$	turn-off delay time	$V_{GS} = 8\text{ to }0\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	20	–	ns
t_r	rise time	$V_{GS} = 8\text{ to }0\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	7	–	ns
t_{off}	turn-off switching time	$V_{GS} = 8\text{ to }0\text{ V}$; $V_{DD} = 15\text{ V}$; $I_D = 0.5\text{ A}$; $R_{gen} = 6\text{ }\Omega$	–	27	–	ns
Source-drain diode						
V_{SD}	source-drain diode forward voltage	$V_{GD} = 0$; $I_S = 0.5\text{ A}$	–	–	1	V
t_{rr}	reverse recovery time	$I_S = 0.5\text{ A}$; $di/dt = -100\text{ A}/\mu\text{s}$	–	25	–	ns

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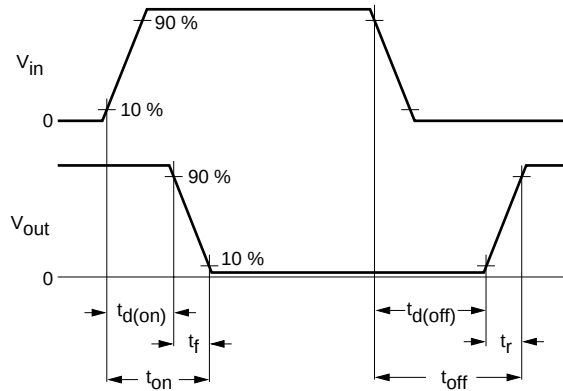
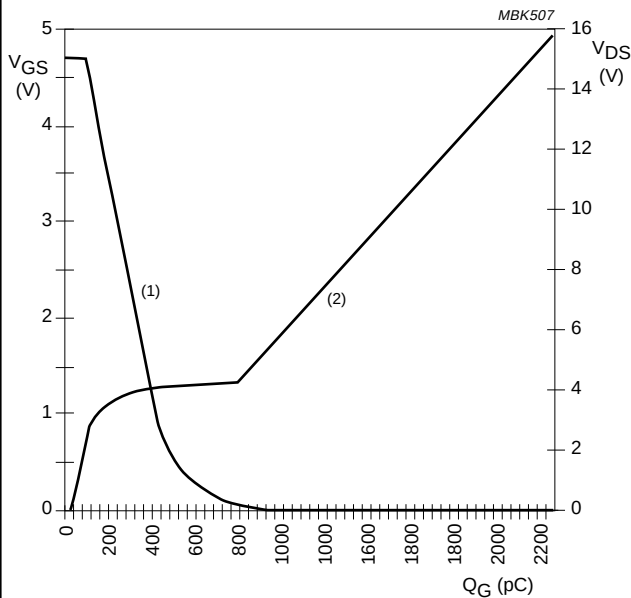


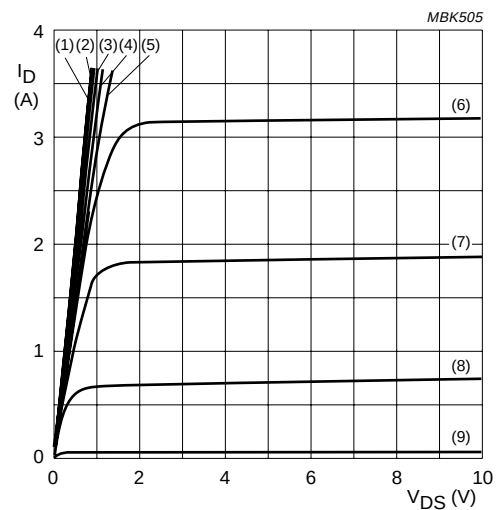
Fig.5 Switching times test circuit with input and output waveforms.



$V_{DD} = 15 \text{ V}$; $I_D = 0.5 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$.

- (1) V_{DS} .
(2) V_{GS} .

Fig.6 Gate-source and drain-source voltages as functions of total gate charge; typical values.



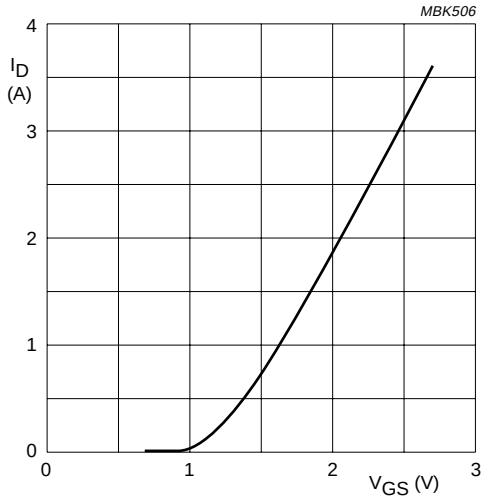
$T_{amb} = 25 \text{ }^{\circ}\text{C}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 0$.

- (1) $V_{GS} = 7.5 \text{ V}$.
(2) $V_{GS} = 5.5 \text{ V}$.
(3) $V_{GS} = 4.5 \text{ V}$.
(4) $V_{GS} = 3.5 \text{ V}$.
(5) $V_{GS} = 3 \text{ V}$.
(6) $V_{GS} = 2.5 \text{ V}$.
(7) $V_{GS} = 2 \text{ V}$.
(8) $V_{GS} = 1.5 \text{ V}$.
(9) $V_{GS} = 1 \text{ V}$.

Fig.7 Output characteristics; typical values.

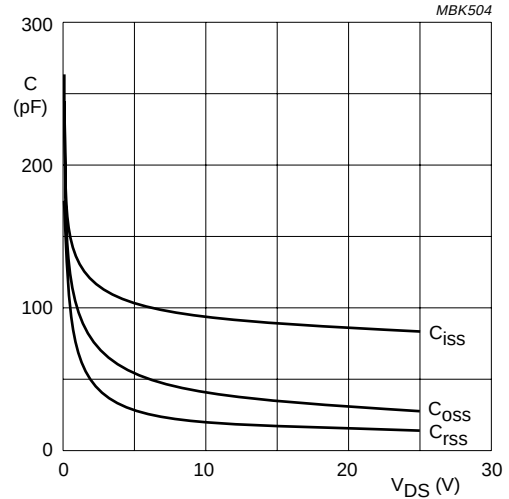
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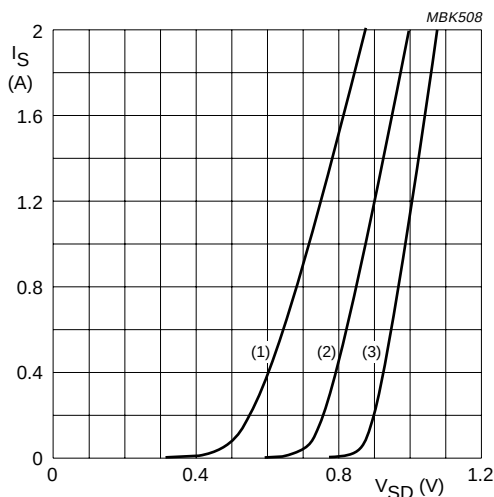
$V_{DS} = 10 \text{ V}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 0$.

Fig.8 Transfer characteristic; typical values.



$V_{GS} = 0$; $f = 1 \text{ MHz}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$.

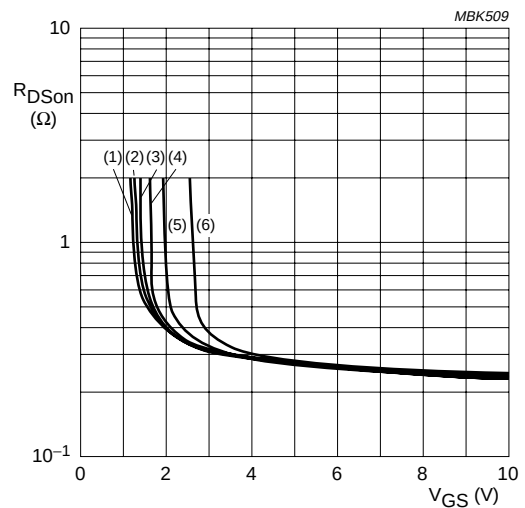
Fig.9 Capacitance as a function of drain-source voltage; typical values.



$V_{GD} = 0$.

- (1) $T_{amb} = 150 \text{ }^{\circ}\text{C}$.
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$.
- (3) $T_{amb} = -65 \text{ }^{\circ}\text{C}$.

Fig.10 Source current as a function of source-drain diode forward voltage; typical values.



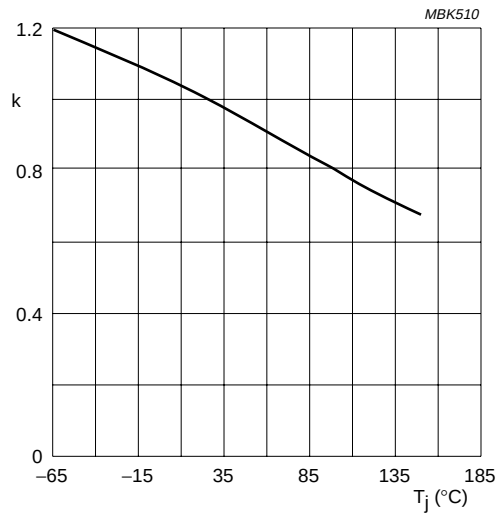
$T_{amb} = 25 \text{ }^{\circ}\text{C}$; $t_p = 300 \text{ } \mu\text{s}$; $\delta = 0$.

- (1) $I_D = 0.1 \text{ A}$.
- (2) $I_D = 0.22 \text{ A}$.
- (3) $I_D = 0.45 \text{ A}$.
- (4) $I_D = 0.9 \text{ A}$.
- (5) $I_D = 1.8 \text{ A}$.
- (6) $I_D = 3.6 \text{ A}$.

Fig.11 Drain-source on-state resistance as a function of gate-source voltage; typical values.

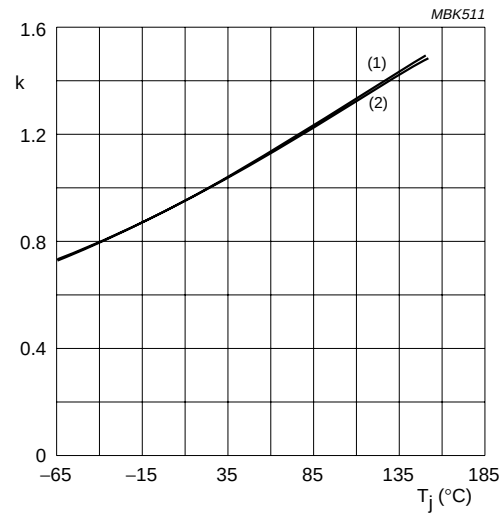
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$$k = \frac{V_{GSth} \text{ at } T_J}{V_{GSth} \text{ at } 25^\circ\text{C}} \cdot V_{GSth} \text{ at } V_{DS} = V_{GS}; I_D = 1 \text{ mA.}$$

Fig.12 Temperature coefficient of gate-source threshold voltage as a function of junction temperature; typical values.



$$k = \frac{R_{DSon} \text{ at } T_J}{R_{DSon} \text{ at } 25^\circ\text{C}} \cdot \begin{matrix} (1) R_{DSon} \text{ at } V_{GS} = 4.5 \text{ V}; I_D = 0.5 \text{ mA.} \\ (2) R_{DSon} \text{ at } V_{GS} = 2.5 \text{ V}; I_D = 0.5 \text{ mA.} \end{matrix}$$

Fig.13 Temperature coefficient of drain-source on-resistance as a function of junction temperature; typical values.

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DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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Printed in The Netherlands

135108/00/04/pp12

Date of release: 1998 Feb 11

Document order number: 9397 750 03303

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