

DATA SHEET

BSN304; BSN304A

**N-channel enhancement mode
vertical D-MOS transistors**

Product specification
File under Discrete Semiconductors, SC13b

April 1995

N-channel enhancement mode vertical D-MOS transistors

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FEATURES

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

DESCRIPTION

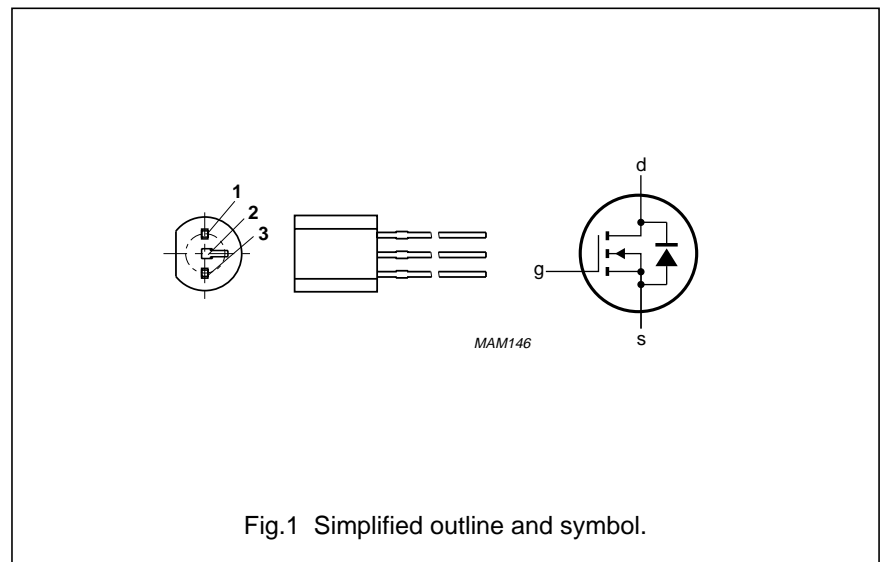
N-channel enhancement mode vertical D-MOS transistor in a TO-92 variant envelope, intended for use as a line current interruptor in telephone sets and for applications in relay, high-speed and line transformer drivers.

PINNING - TO-92 variant

PIN	DESCRIPTION
BSN304	
1	gate
2	drain
3	source
BSN304A	
1	source
2	gate
3	drain

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	
V_{DS}	drain-source voltage		–	300	V
I_D	DC drain current		–	250	mA
P_{tot}	total power dissipation	up to $T_{amb} = 25\text{ }^\circ\text{C}$	–	1	W
$\pm V_{GSO}$	gate-source voltage	open drain	–	20	V
$R_{DS(on)}$	drain-source on-resistance	$I_D = 250\text{ mA};$ $V_{GS} = 10\text{ V}$	–	8	Ω
$V_{GS(off)}$	gate-source cut-off voltage	$I_D = 1\text{ mA};$ $V_{GS} = V_{DS}$	0.8	2	V



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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		–	300	V
$\pm V_{GSO}$	gate-source voltage	open drain	–	20	V
I_D	DC drain current		–	250	mA
I_{DM}	peak drain current		–	1	A
P_{tot}	total power dissipation	up to $T_{amb} = 25\text{ °C}$; note 1	–	1	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j-a}$	from junction to ambient; note 1	125 K/W

Note

1. Device mounted on an epoxy printed-circuit board, maximum lead length 4 mm; mounting pad for the drain lead minimum 10 mm x 10 mm.

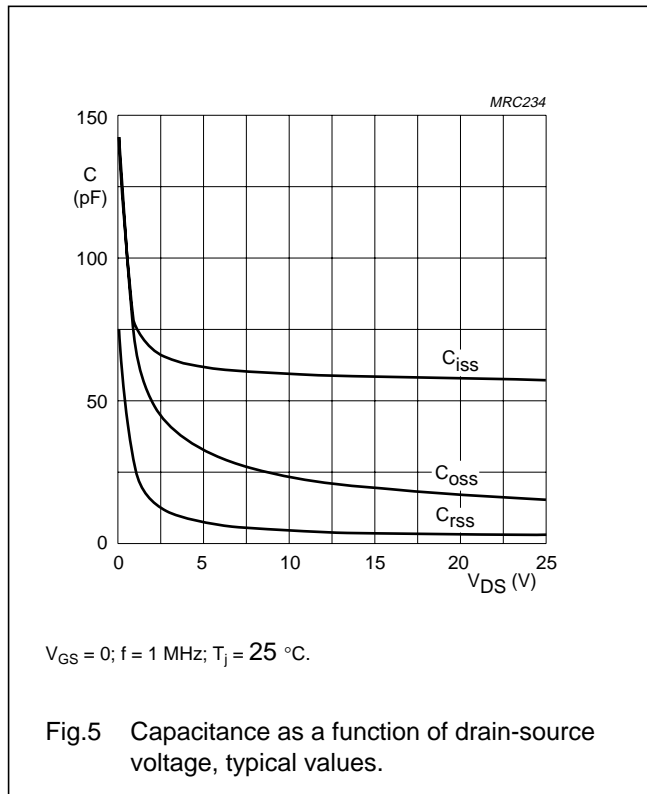
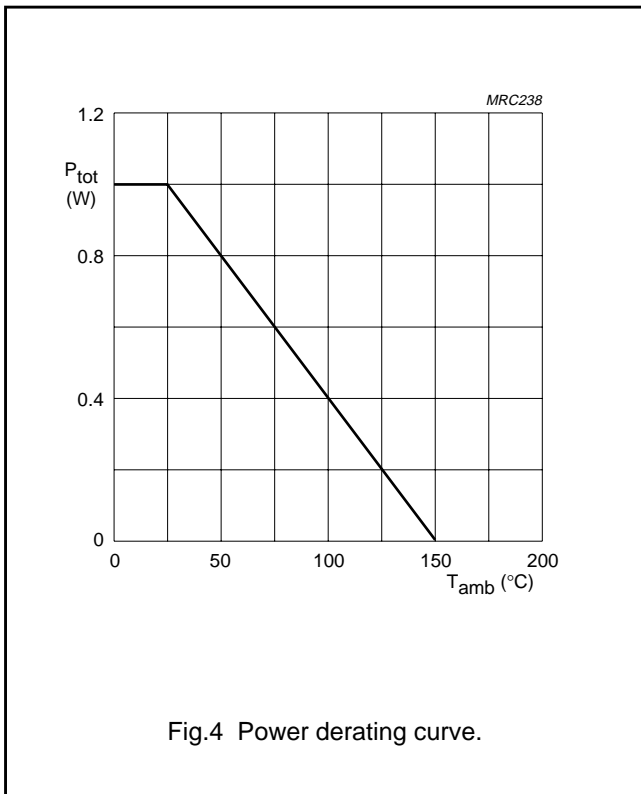
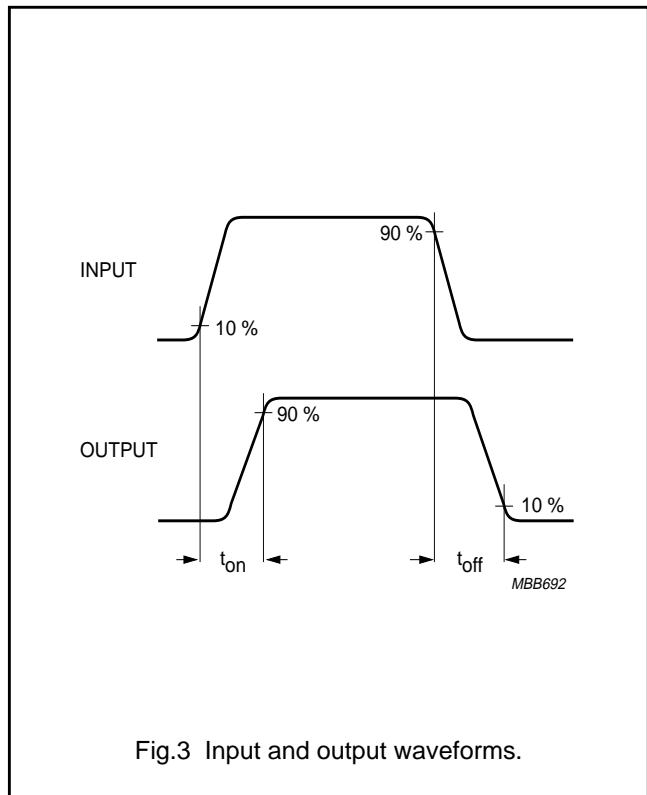
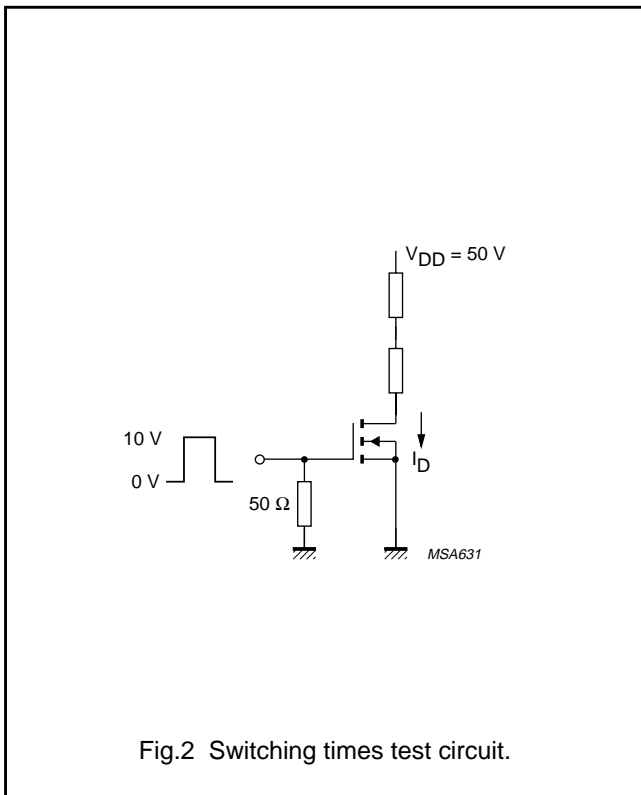
STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10\ \mu\text{A}$; $V_{GS} = 0$	300	–	–	V
$\pm I_{GSS}$	gate-source leakage current	$\pm V_{GS} = 20\text{ V}$; $V_{DS} = 0$	–	–	100	nA
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\text{ mA}$; $V_{DS} = V_{GS}$	0.8	–	2	V
$R_{DS(on)}$	drain-source on-resistance	$I_D = 250\text{ mA}$; $V_{GS} = 10\text{ V}$	–	6.7	8	Ω
		$I_D = 20\text{ mA}$; $V_{GS} = 2.4\text{ V}$	–	7.9	14	Ω
I_{DSS}	drain-source leakage current	$V_{DS} = 240\text{ V}$; $V_{GS} = 0$	–	–	100	nA
$ Y_{fs} $	transfer admittance	$I_D = 250\text{ mA}$; $V_{DS} = 25\text{ V}$	200	380	–	mS
C_{iss}	input capacitance	$V_{DS} = 25\text{ V}$; $V_{GS} = 0$; $f = 1\text{ MHz}$	–	57	90	pF
C_{oss}	output capacitance	$V_{DS} = 25\text{ V}$; $V_{GS} = 0$; $f = 1\text{ MHz}$	–	15	30	pF
C_{rss}	feedback capacitance	$V_{DS} = 25\text{ V}$; $V_{GS} = 0$; $f = 1\text{ MHz}$	–	2.6	15	pF
Switching times (see Figs 2 and 3)						
t_{on}	turn-on time	$I_D = 250\text{ mA}$; $V_{DD} = 50\text{ V}$; $V_{GS} = 0\text{ to }10\text{ V}$	–	2.5	10	ns
t_{off}	turn-off time	$I_D = 250\text{ mA}$; $V_{DD} = 50\text{ V}$; $V_{GS} = 10\text{ to }0\text{ V}$	–	17	30	ns

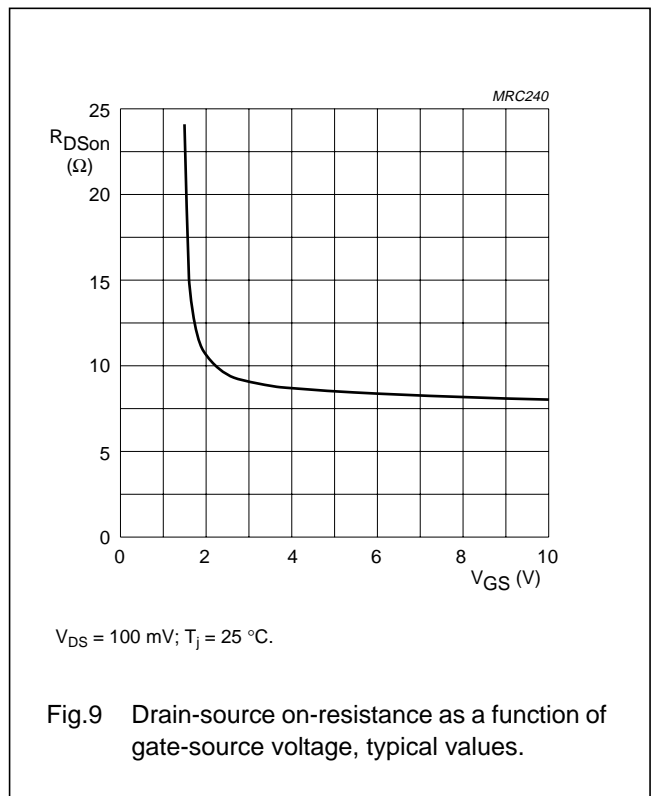
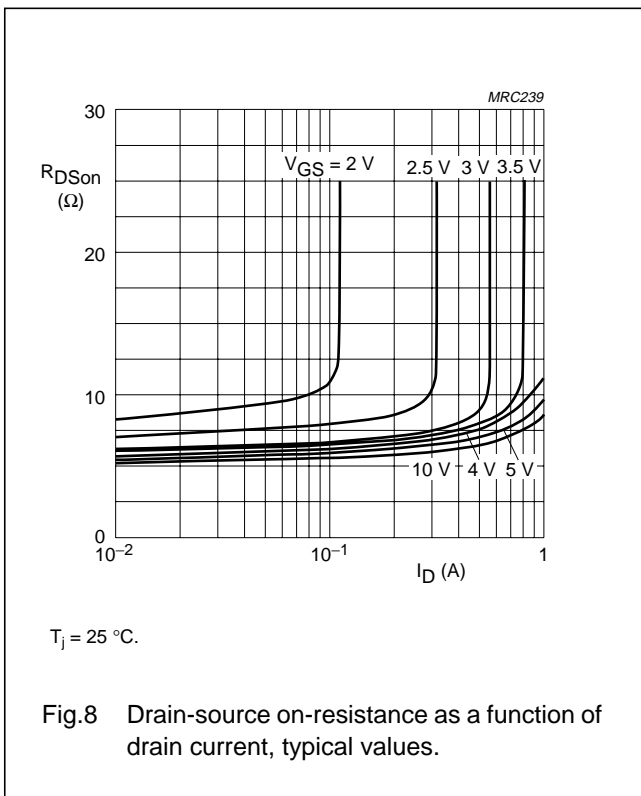
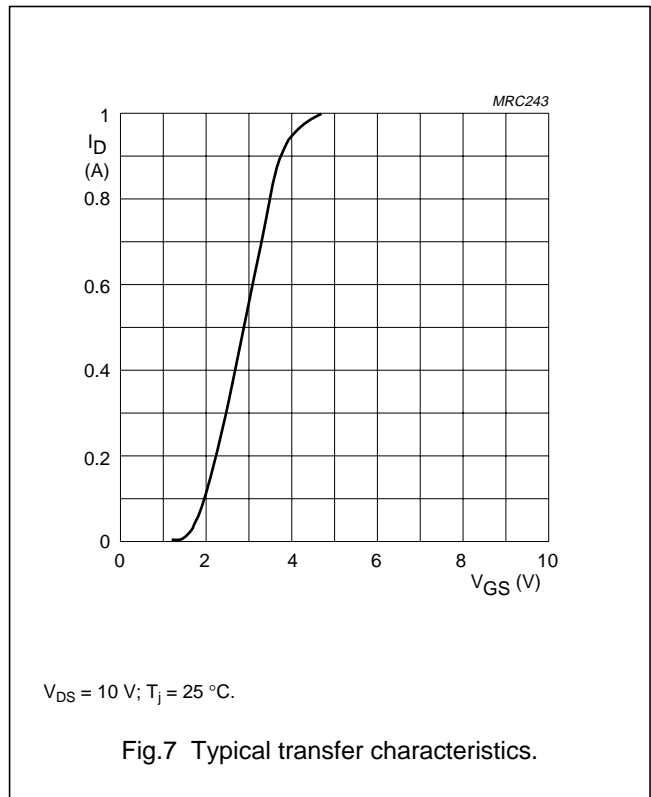
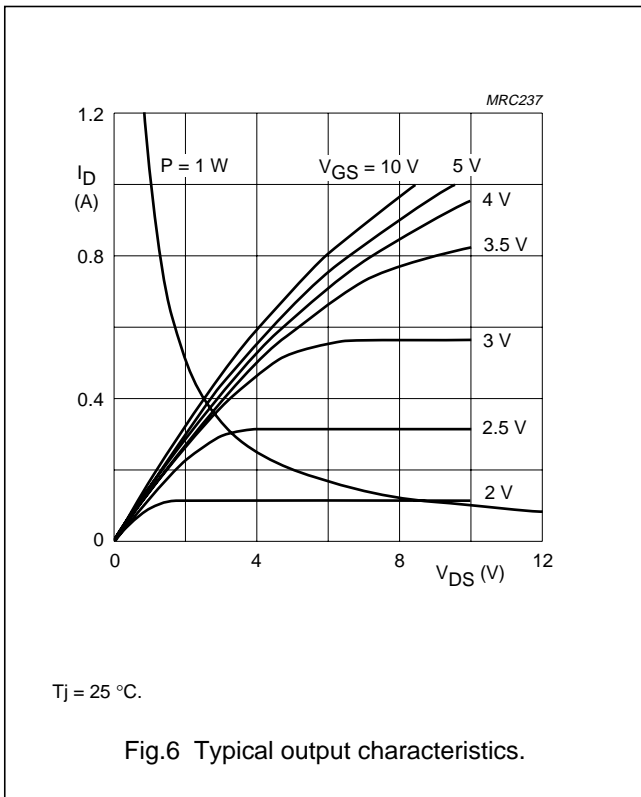
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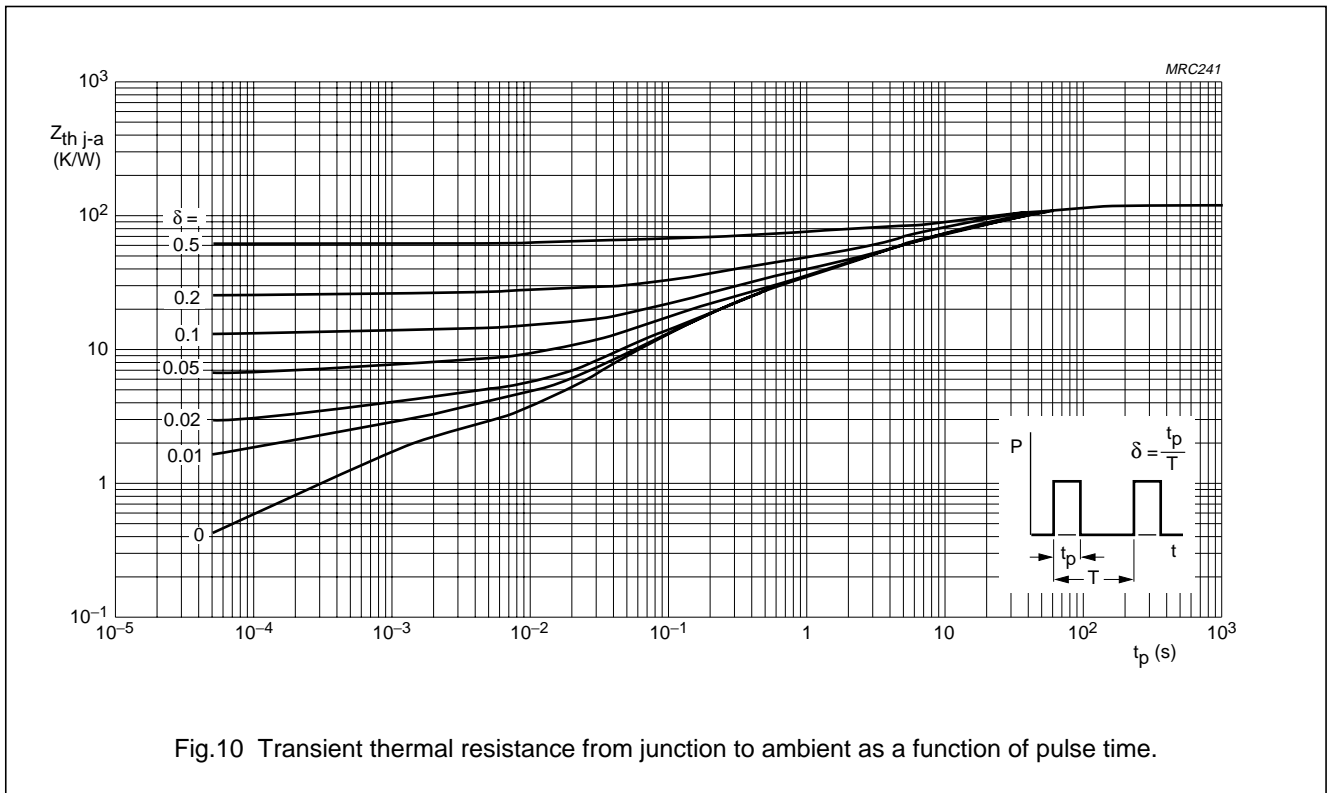


Fig.10 Transient thermal resistance from junction to ambient as a function of pulse time.

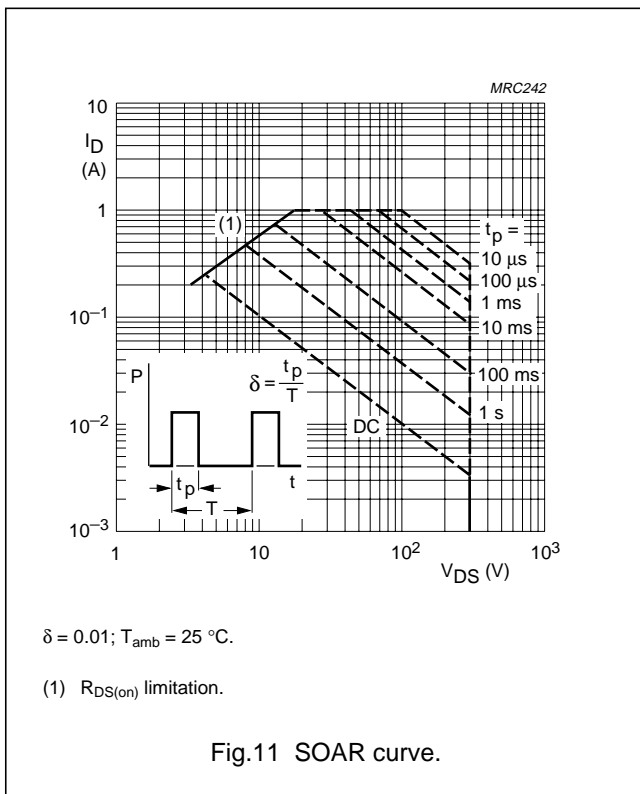
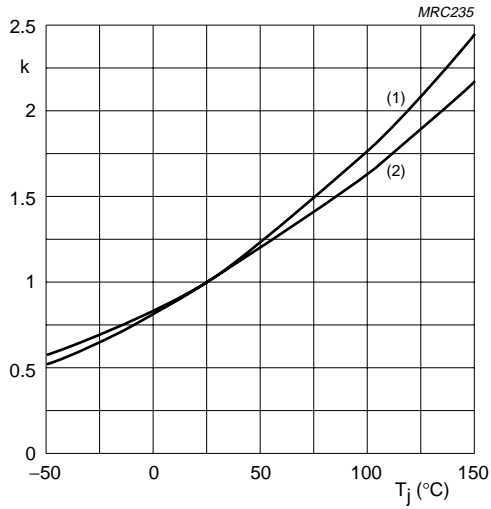


Fig.11 SOAR curve.

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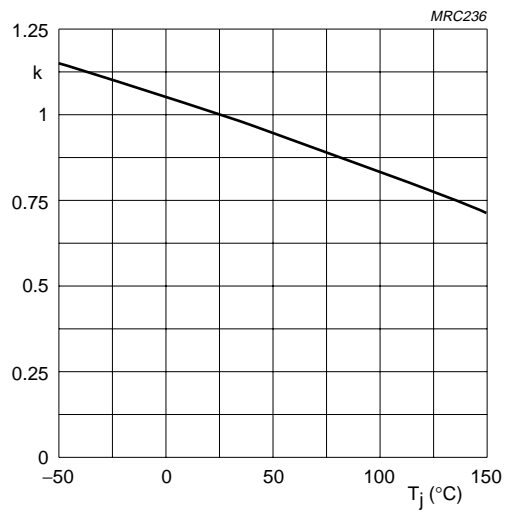


$$k = \frac{R_{DS(on)} \text{ at } T_j}{R_{DS(on)} \text{ at } 25^\circ\text{C}}$$

Typical $R_{DS(on)}$:

- (1) $I_D = 250 \text{ mA}$; $V_{GS} = 10 \text{ V}$.
- (2) $I_D = 20 \text{ mA}$; $V_{GS} = 2.4 \text{ V}$.

Fig.12 Temperature coefficient of drain-source on-resistance.



$$k = \frac{V_{GS(th)} \text{ at } T_j}{V_{GS(th)} \text{ at } 25^\circ\text{C}}$$

Fig.13 Temperature coefficient of gate-source threshold voltage.

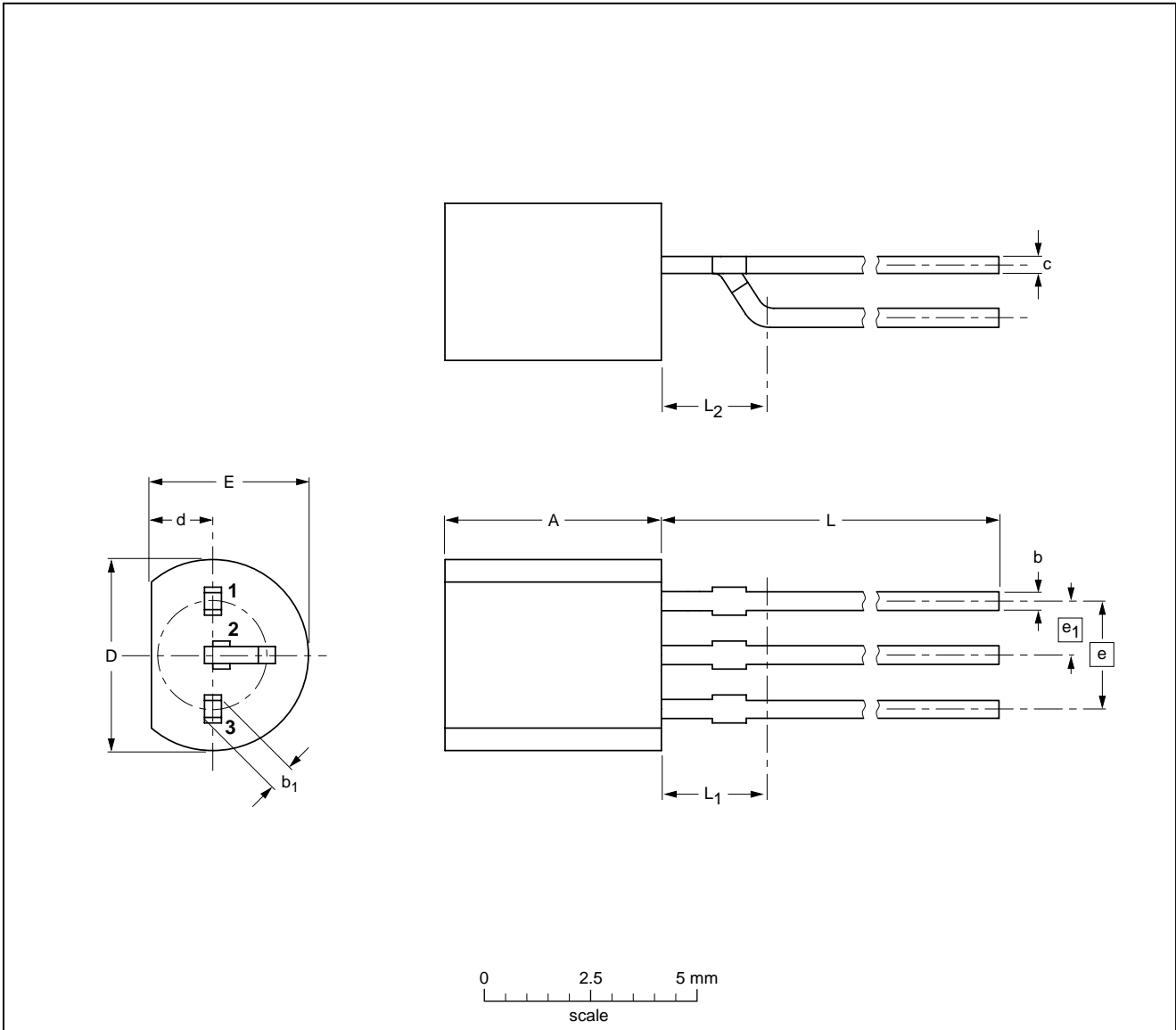
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PACKAGE OUTLINES

Plastic single-ended leaded (through hole) package; 3 leads (on-circle)

SOT54 variant



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b ₁	c	D	d	E	e	e ₁	L	L ₁ ⁽¹⁾ max	L ₂ max
mm	5.2 5.0	0.48 0.40	0.66 0.56	0.45 0.40	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5	2.5

Notes

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT54 variant		TO-92	SC-43		97-04-14

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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.
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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NOTES

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Printed in The Netherlands

137107/00/01/pp12

Date of release: April 1995

Document order number: 9397 750 02464

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