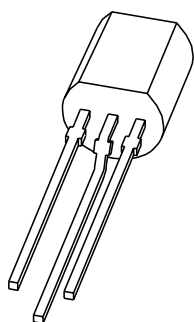


DATA SHEET



BSN304

N-channel enhancement mode
vertical D-MOS transistor

Product specification
Supersedes data of 1997 Jun 17

2001 Dec 11

N-channel enhancement mode vertical D-MOS transistor

BSN304

FEATURES

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

APPLICATIONS

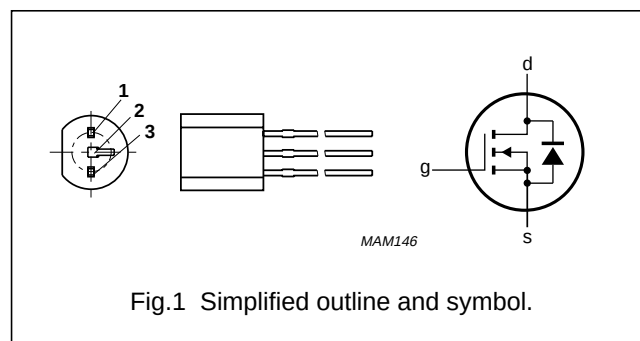
- Line current interruptor in telephone sets
- Relay, high-speed and line transformer drivers.

DESCRIPTION

N-channel enhancement mode vertical D-MOS transistor in a TO-92 variant package.

PINNING - TO-92 variant

PIN	DESCRIPTION
1	gate
2	drain
3	source



QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	300	V
I_D	drain current (DC)		–	300	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	–	1	W
V_{GSO}	gate-source voltage	open drain	–	± 20	V
R_{DSon}	drain-source on-state resistance	$I_D = 250\text{ mA}$; $V_{GS} = 10\text{ V}$	–	6	Ω
V_{GSoff}	gate-source cut-off voltage	$I_D = 1\text{ mA}$; $V_{GS} = V_{DS}$	0.8	2	V

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	300	V
V_{GSO}	gate-source voltage (DC)	open drain	–	± 20	V
I_D	drain current (DC)		–	300	mA
I_{DM}	peak drain current		–	1.2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$; note 1	–	1	W
T_{stg}	storage temperature		–55	+150	°C
T_j	operating junction temperature		–	150	°C

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.

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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance 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

$T_j = 25\ ^\circ\text{C}$ 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
I_{GSS}	gate-source leakage current	$V_{GS} = \pm 20\ \text{V}; V_{DS} = 0$	–	–	± 100	nA
V_{GSth}	gate-source threshold voltage	$I_D = 1\ \text{mA}; V_{DS} = V_{GS}$	0.8	–	2	V
R_{DSon}	drain-source on-state resistance	$I_D = 250\ \text{mA}; V_{GS} = 10\ \text{V}$	–	3.7	6	Ω
		$I_D = 20\ \text{mA}; V_{GS} = 2.4\ \text{V}$	–	4.8	10	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	690	–	mS
C_{iss}	input capacitance	$V_{DS} = 25\ \text{V}; V_{GS} = 0; f = 1\ \text{MHz}$	–	100	120	pF
C_{oss}	output capacitance	$V_{DS} = 25\ \text{V}; V_{GS} = 0; f = 1\ \text{MHz}$	–	21	30	pF
C_{rss}	feedback capacitance	$V_{DS} = 25\ \text{V}; V_{GS} = 0; f = 1\ \text{MHz}$	–	10	15	pF

Switching times (see Figs 2 and 3)

t_{on}	turn-on time	$I_D = 250\ \text{mA}; V_{DD} = 50\ \text{V}; V_{GS} = 0\ \text{to}\ 10\ \text{V}$	–	6	10	ns
t_{off}	turn-off time	$I_D = 250\ \text{mA}; V_{DD} = 50\ \text{V}; V_{GS} = 10\ \text{to}\ 0\ \text{V}$	–	46	60	ns

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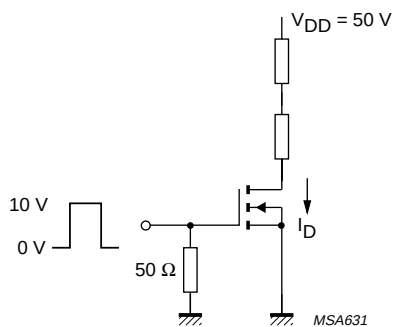


Fig.2 Switching times test circuit.

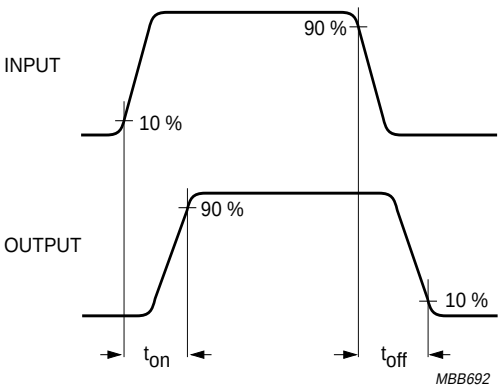


Fig.3 Input and output waveforms.

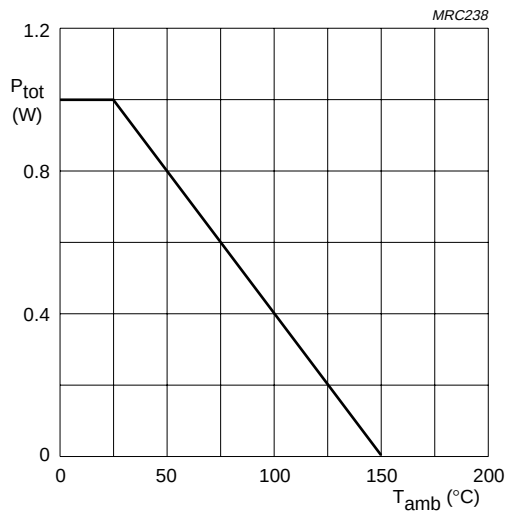
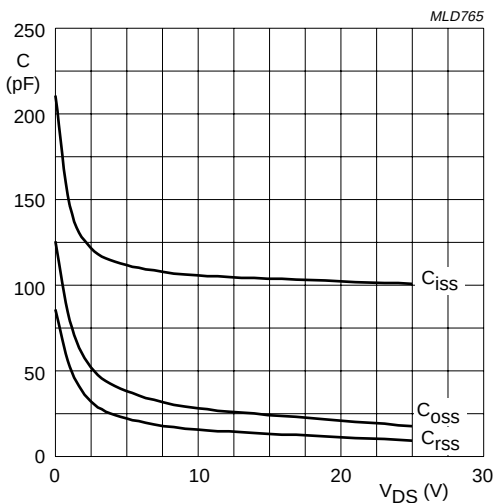


Fig.4 Power derating curve.

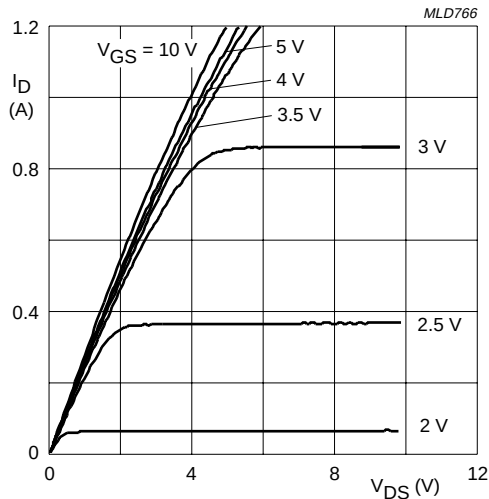


$V_{GS} = 0$; $f = 1$ MHz; $T_j = 25$ °C.

Fig.5 Capacitance as a function of drain-source voltage; typical values.

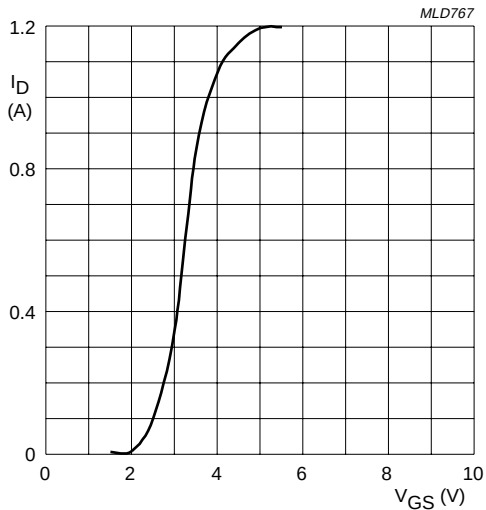
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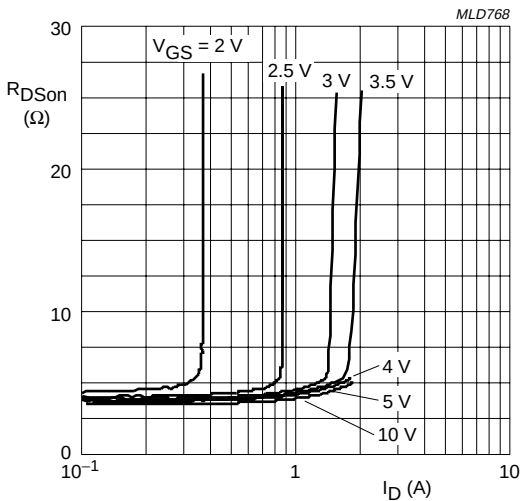
$T_j = 25\text{ }^\circ\text{C}$.

Fig.6 Typical output characteristics.



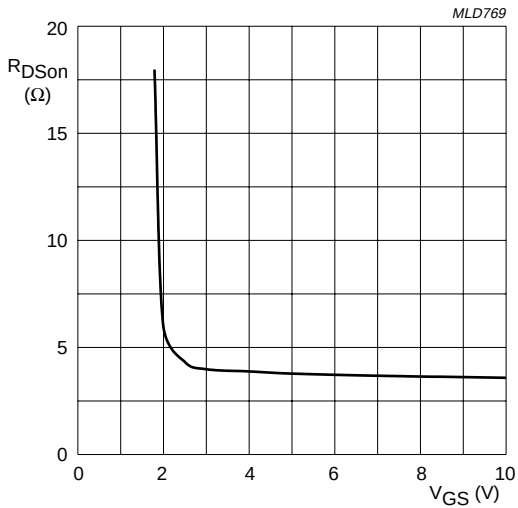
$V_{DS} = 10\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$.

Fig.7 Typical transfer characteristics.



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

Fig.8 Drain-source on-state resistance as a function of drain current; typical values.



$V_{DS} = 100\text{ mV}$; $T_j = 25\text{ }^\circ\text{C}$.

Fig.9 Drain-source on-state resistance as a function of gate-source voltage; typical values.

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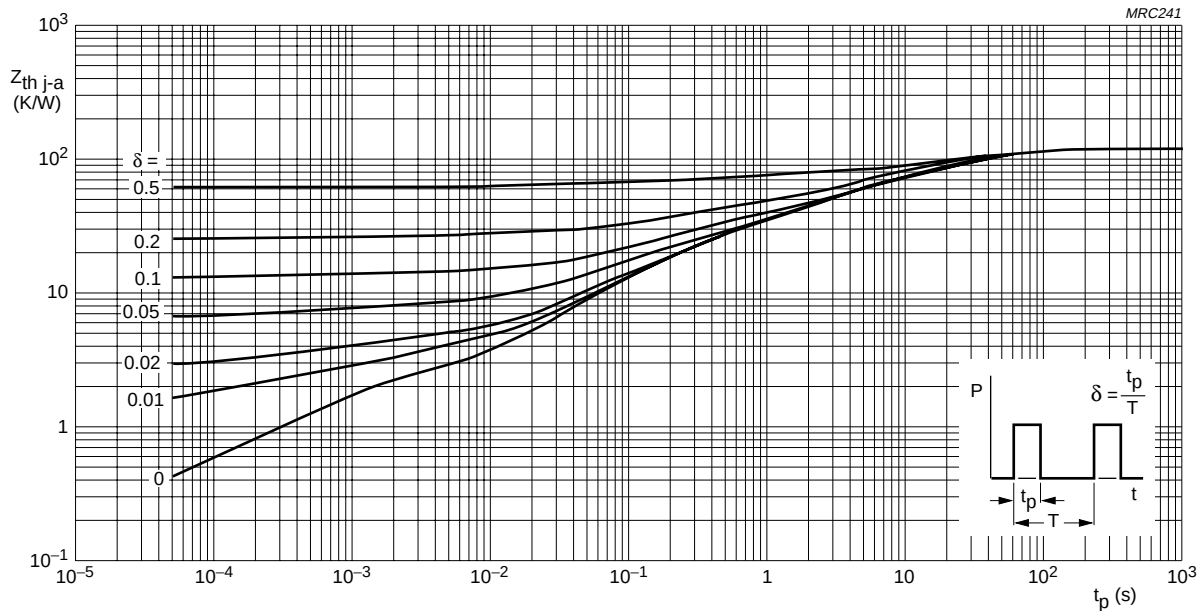
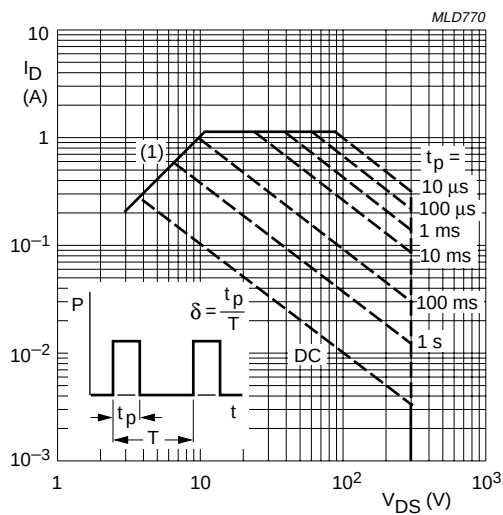


Fig.10 Transient thermal resistance from junction to ambient as a function of pulse time.

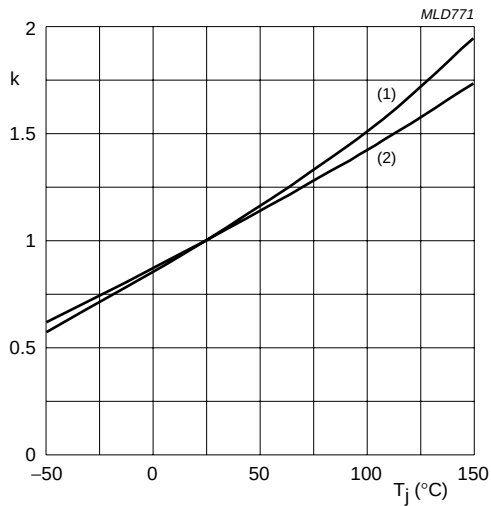


$\delta = 0.01$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.
(1) R_{DSon} limitation.

Fig.11 SOAR curve.

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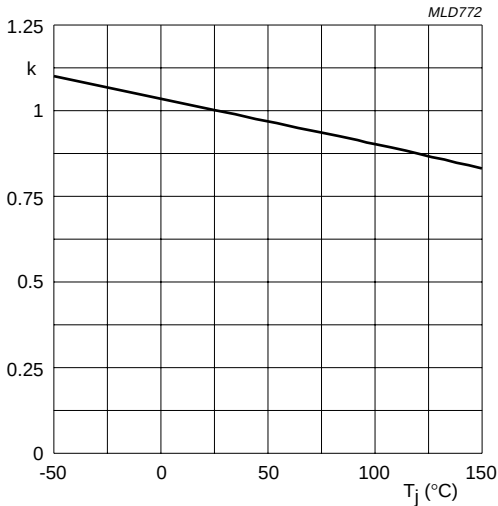
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$$k = \frac{R_{DS(on)} \text{ at } T_j}{R_{DS(on)} \text{ at } 25^\circ\text{C}}.$$

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-state resistance; typical values.



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

Fig.13 Temperature coefficient of gate-source threshold voltage; typical values.

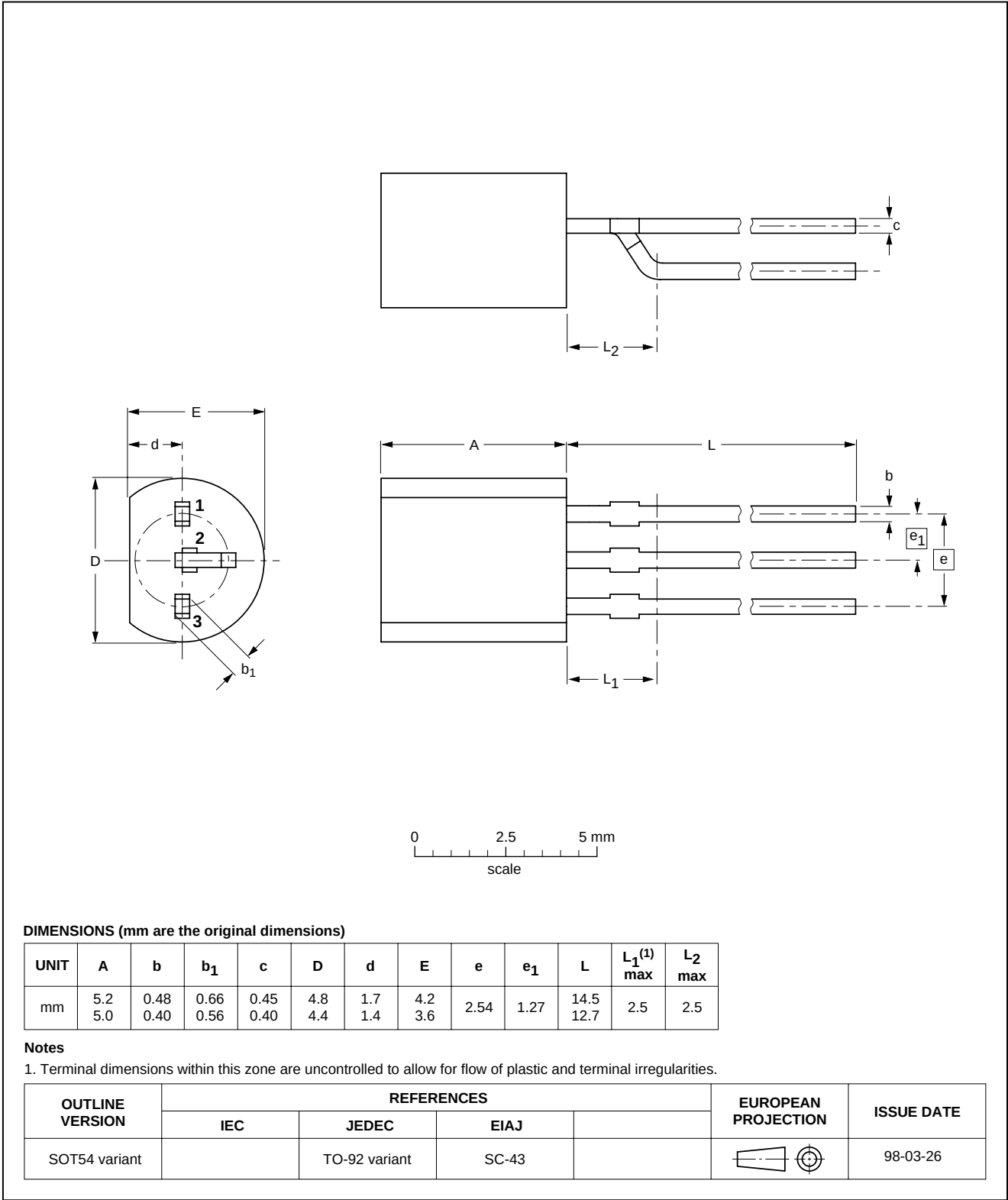
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PACKAGE OUTLINES

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

SOT54 variant



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DATA SHEET STATUS

DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITIONS
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NOTES

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NOTES

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