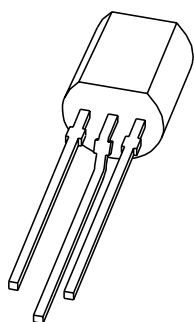


# DATA SHEET



## **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

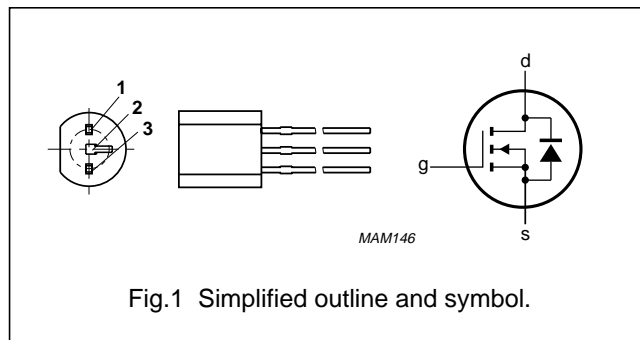
- Line current interruptor in telephone sets
- Relay, high-speed and line transformer drivers.

### 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	–	$\pm 20$	V
$R_{DSon}$	drain-source on-state resistance	$I_D = 250\text{ mA}$ ; $V_{GS} = 10\text{ V}$	–	6	$\Omega$
$V_{GSoff}$	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	–	$\pm 20$	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.

# N-channel enhancement mode vertical D-MOS transistor

BSN304

## 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	$V_{GS} = \pm 20\ \text{V}; V_{DS} = 0$	–	–	$\pm 100$	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	$\Omega$
		$I_D = 20\ \text{mA}; V_{GS} = 2.4\ \text{V}$	–	4.8	10	$\Omega$
$I_{DSS}$	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

N-channel enhancement mode  
vertical D-MOS transistor

BSN304

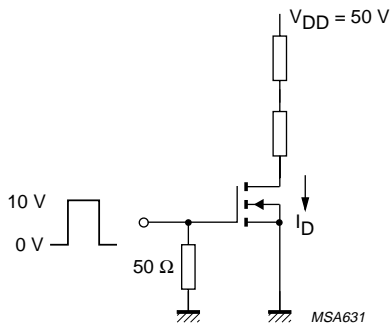


Fig.2 Switching times test circuit.

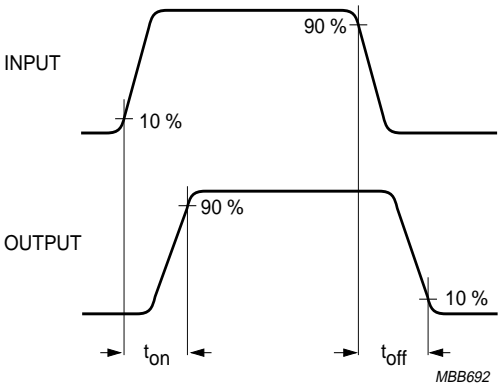


Fig.3 Input and output waveforms.

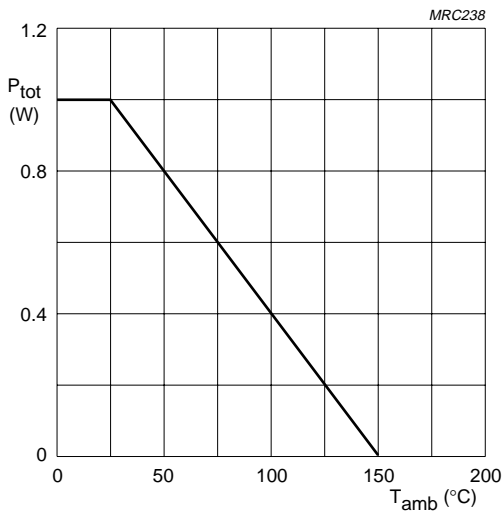
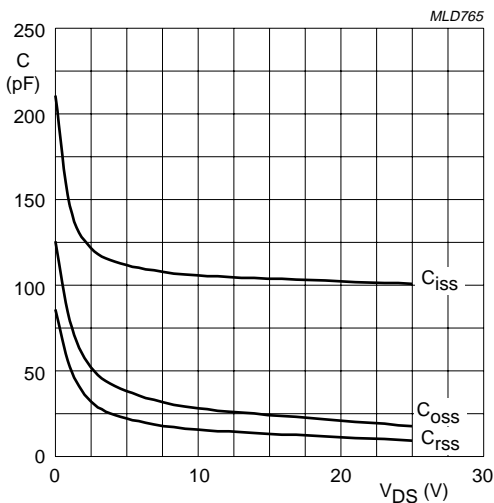


Fig.4 Power derating curve.



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

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

N-channel enhancement mode  
vertical D-MOS transistor

BSN304

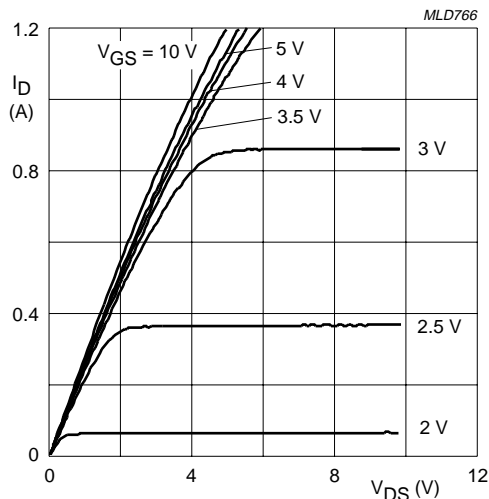


Fig.6 Typical output characteristics.

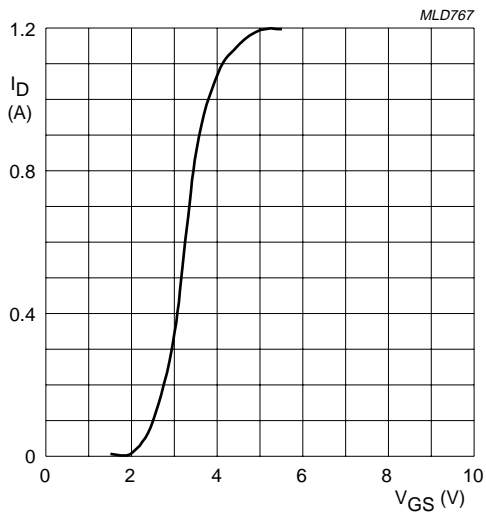


Fig.7 Typical transfer characteristics.

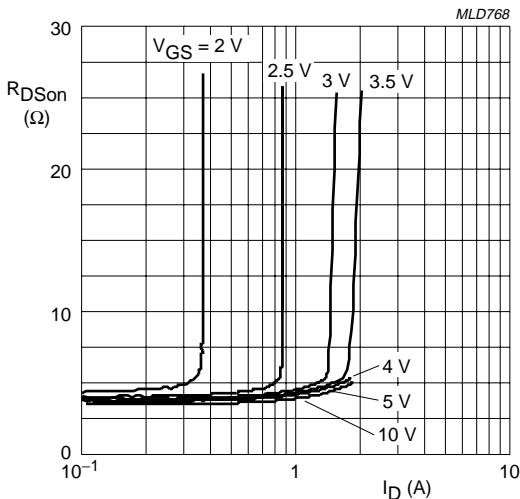


Fig.8 Drain-source on-state resistance as a function of drain current; typical values.

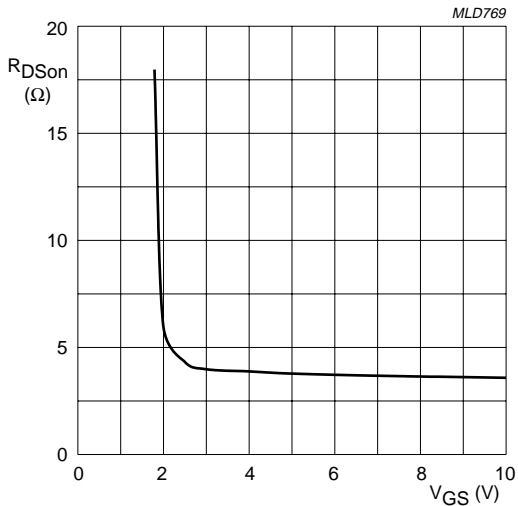


Fig.9 Drain-source on-state resistance as a function of gate-source voltage; typical values.

N-channel enhancement mode  
vertical D-MOS transistor

BSN304

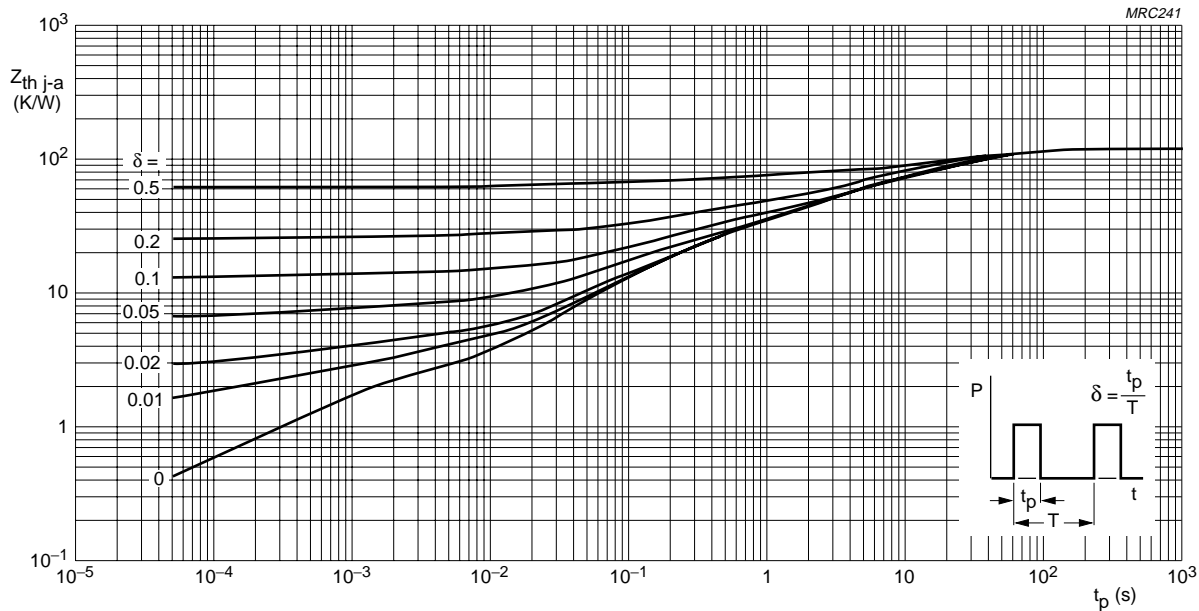
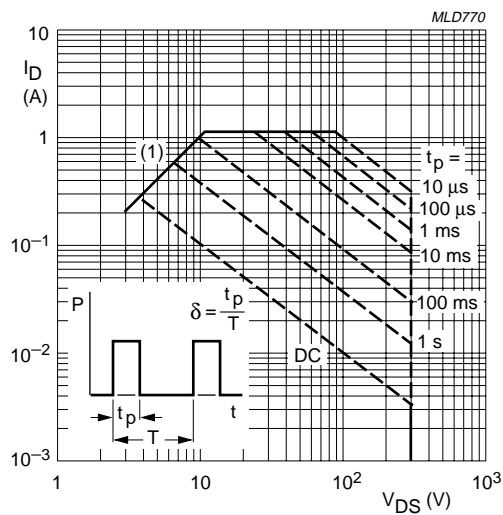


Fig.10 Transient thermal resistance from junction to ambient as a function of pulse time.

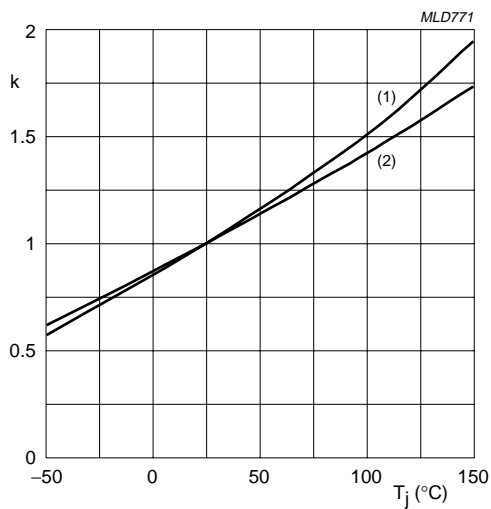


$\delta = 0.01$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .  
(1)  $R_{DSon}$  limitation.

Fig.11 SOAR curve.

N-channel enhancement mode  
vertical D-MOS transistor

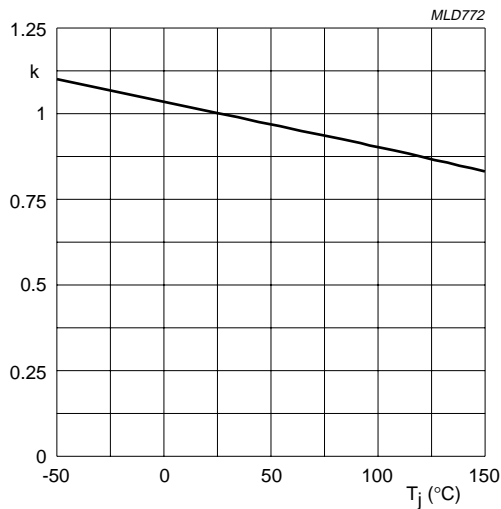
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$$k = \frac{R_{DS(on)} \text{ at } T_j}{R_{DS(on)} \text{ at } 25^\circ\text{C}}$$

Typical  $R_{DS(on)}$ :  
(1)  $I_D = 250$  mA;  $V_{GS} = 10$  V.  
(2)  $I_D = 20$  mA;  $V_{GS} = 2.4$  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.

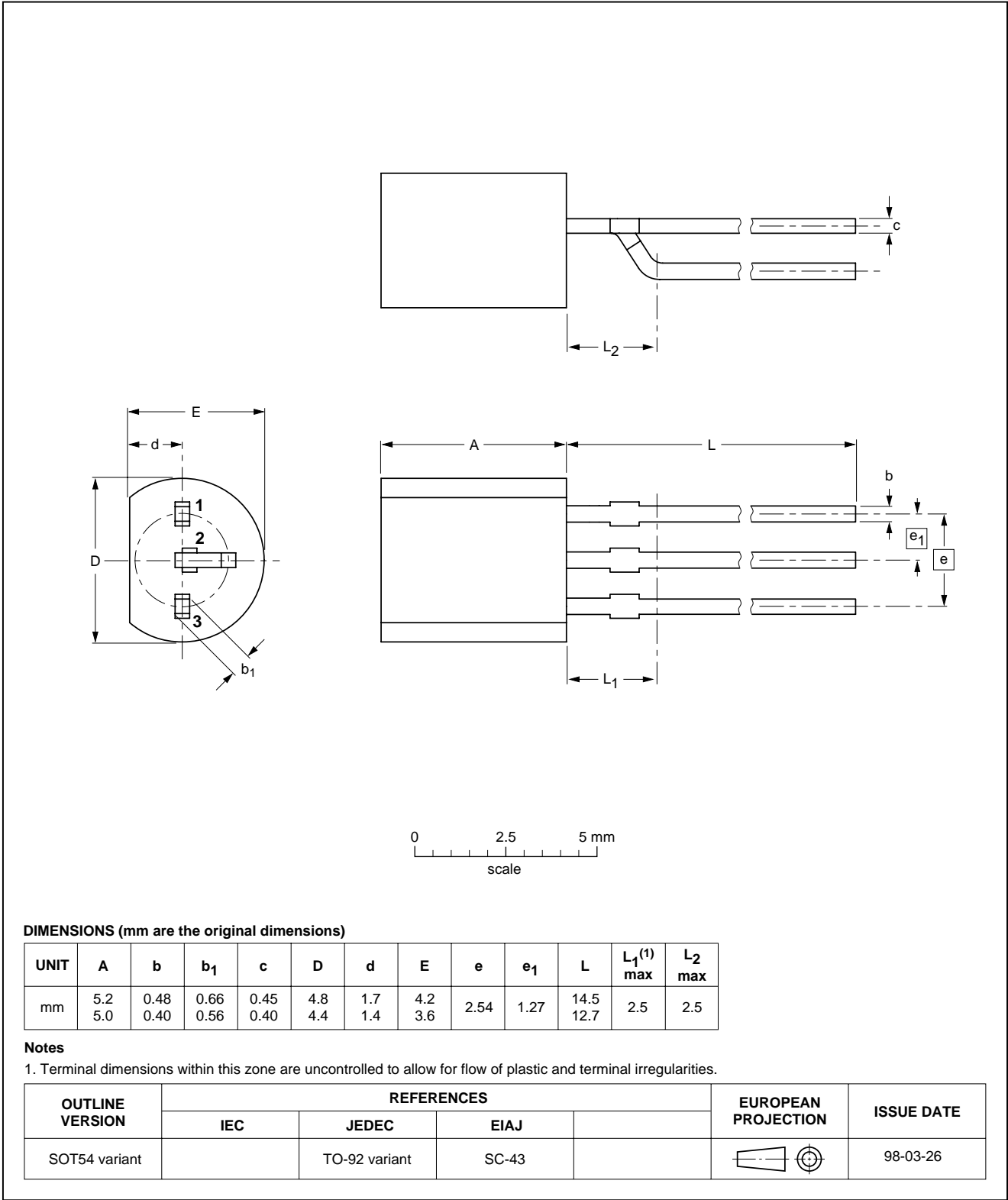
N-channel enhancement mode  
vertical D-MOS transistor

BSN304

PACKAGE OUTLINES

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

SOT54 variant





# N-channel enhancement mode vertical D-MOS transistor

BSN304

## DATA SHEET STATUS

DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	DEFINITIONS
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N-channel enhancement mode  
vertical D-MOS transistor

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BSN304

**NOTES**

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N-channel enhancement mode  
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**NOTES**

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