

# DATA SHEET

**2N7002**

**N-channel vertical D-MOS  
transistor**

Product specification  
File under Discrete Semiconductors, SC13b

April 1995

# N-channel vertical D-MOS transistor

2N7002

## 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 SOT23 envelope. It is designed for use as a Surface Mounted Device (SMD) in thin and thick-film circuits, with applications in relay, high-speed and line transformer drivers.

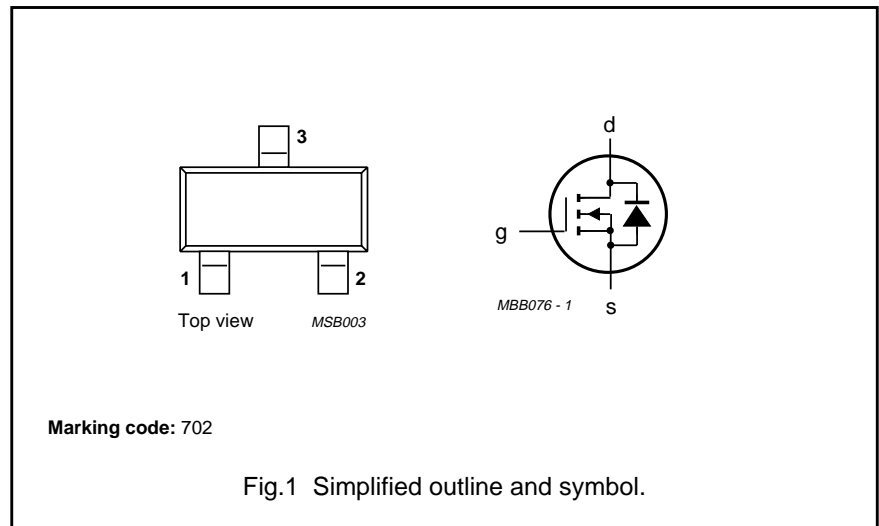
## PINNING - SOT23

PIN	DESCRIPTION
1	gate
2	source
3	drain

## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$V_{DS}$	drain-source voltage		60	V
$I_D$	drain current	DC value	180	mA
$R_{DS(on)}$	drain-source on-resistance	$I_D = 500\text{ mA}$ $V_{GS} = 10\text{ V}$	5	$\Omega$
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\text{ mA}$ $V_{GS} = V_{DS}$	3	V

## PIN CONFIGURATION



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**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DS}$	drain-source voltage		–	60	V
$\pm V_{GSO}$	gate-source voltage	open drain	–	40	V
$I_D$	drain current	DC value	–	180	mA
$I_{DM}$	drain current	peak value	–	800	mA
$P_{tot}$	total power dissipation	$T_{amb} = 25\text{ °C}$ (note 1) (note 2)	– –	300 250	mW mW
$T_{stg}$	storage temperature range		–65	150	°C
$T_j$	junction temperature		–	150	°C

**Notes**

1. Mounted on a ceramic substrate measuring  $10 \times 8 \times 0.7$  mm.
2. Mounted on a printed circuit board.

**THERMAL RESISTANCE**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	from junction to ambient	note 1 note 2	430 500	K/W K/W

**Notes**

1. Mounted on a ceramic substrate measuring  $10 \times 8 \times 0.7$  mm.
2. Mounted on a printed circuit board.

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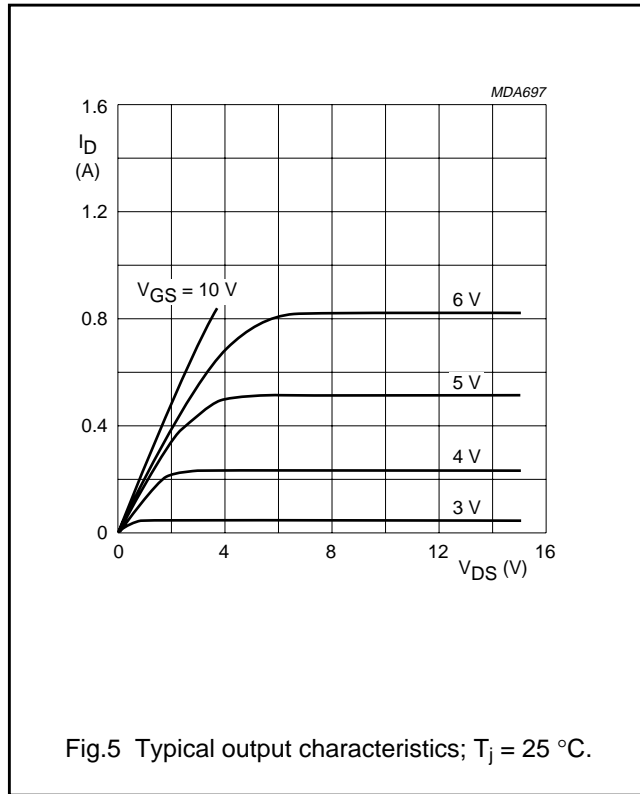
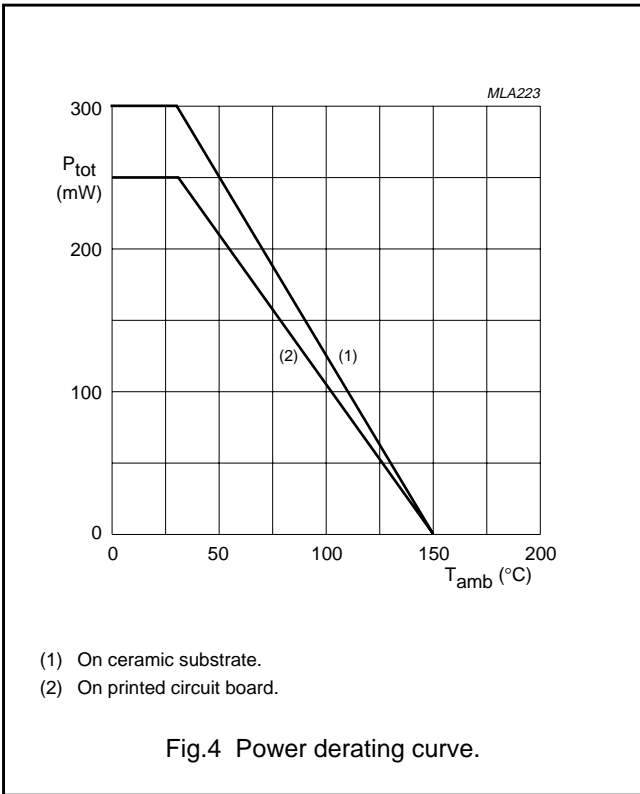
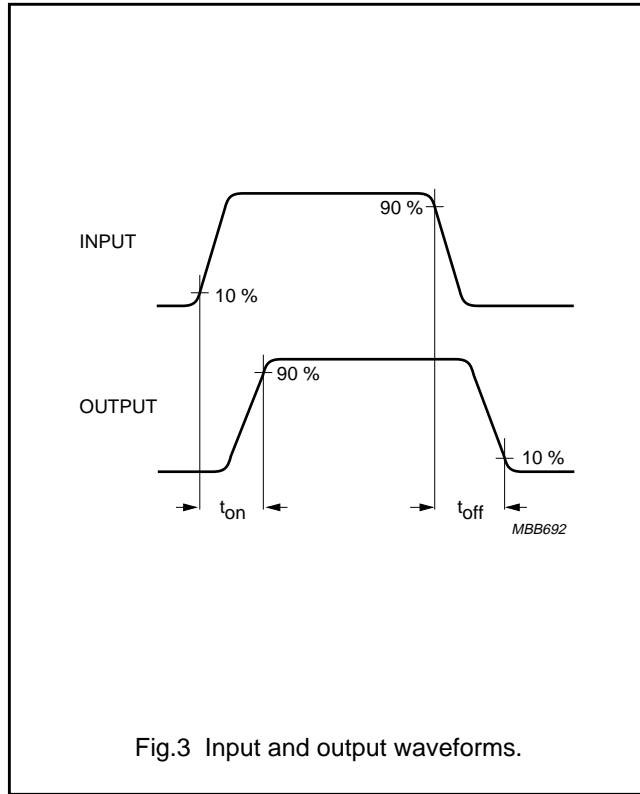
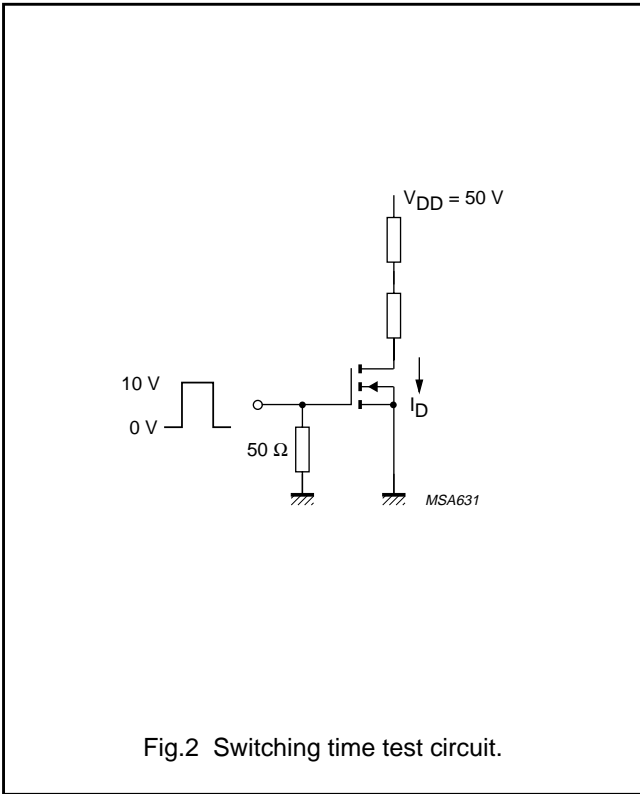
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**CHARACTERISTICS** $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$I_D = 10\ \mu\text{A}$ $V_{GS} = 0$	60	90	–	V
$I_{DSS}$	drain-source leakage current	$V_{DS} = 48\ \text{V}$ $V_{GS} = 0$	–	–	1	$\mu\text{A}$
$\pm I_{GSS}$	gate-source leakage current	$V_{DS} = 0$ $\pm V_{GS} = 15\ \text{V}$	–	–	10	nA
$V_{GS(th)}$	gate-source threshold voltage	$I_D = 1\ \text{mA}$ $V_{GS} = V_{DS}$	0.8	–	3	V
$R_{DS(on)}$	drain-source on-resistance	$I_D = 500\ \text{mA}$ $V_{GS} = 10\ \text{V}$	–	3.5	5	$\Omega$
		$I_D = 75\ \text{mA}$ $V_{GS} = 4.5\ \text{V}$	–	–	5.3	$\Omega$
$ Y_{fs} $	transfer admittance	$I_D = 200\ \text{mA}$ $V_{DS} = 10\ \text{V}$	100	200	–	mS
$C_{iss}$	input capacitance	$V_{DS} = 10\ \text{V}$ $V_{GS} = 0$ $f = 1\ \text{MHz}$	–	25	40	pF
$C_{oss}$	output capacitance	$V_{DS} = 10\ \text{V}$ $V_{GS} = 0$ $f = 1\ \text{MHz}$	–	22	30	pF
$C_{rss}$	feedback capacitance	$V_{DS} = 10\ \text{V}$ $V_{GS} = 0$ $f = 1\ \text{MHz}$	–	6	10	pF
<b>Switching times (see Figs 2 and 3)</b>						
$t_{on}$	turn-on time	$I_D = 200\ \text{mA}$ $V_{DD} = 50\ \text{V}$ $V_{GS} = 0\ \text{to}\ 10\ \text{V}$	–	–	10	ns
$t_{off}$	turn-off time	$I_D = 200\ \text{mA}$ $V_{DD} = 50\ \text{V}$ $V_{GS} = 0\ \text{to}\ 10\ \text{V}$	–	–	15	ns

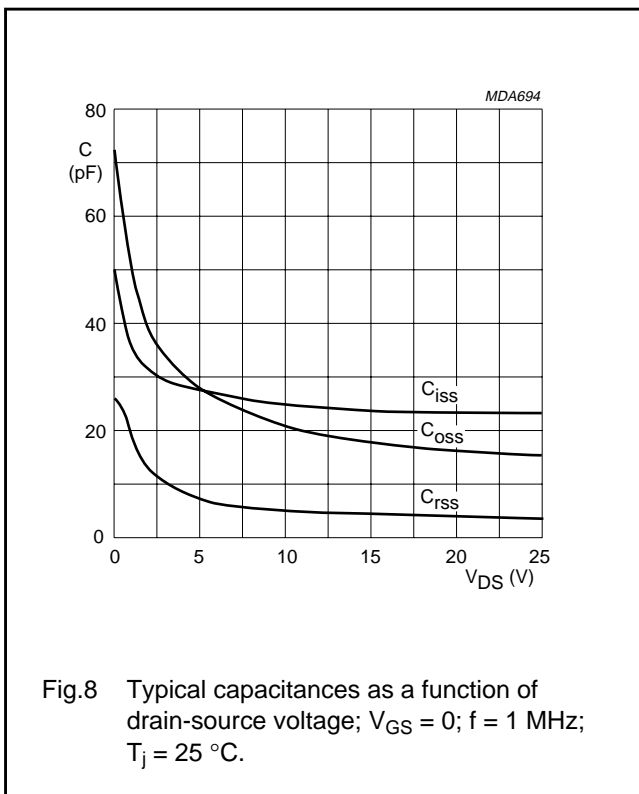
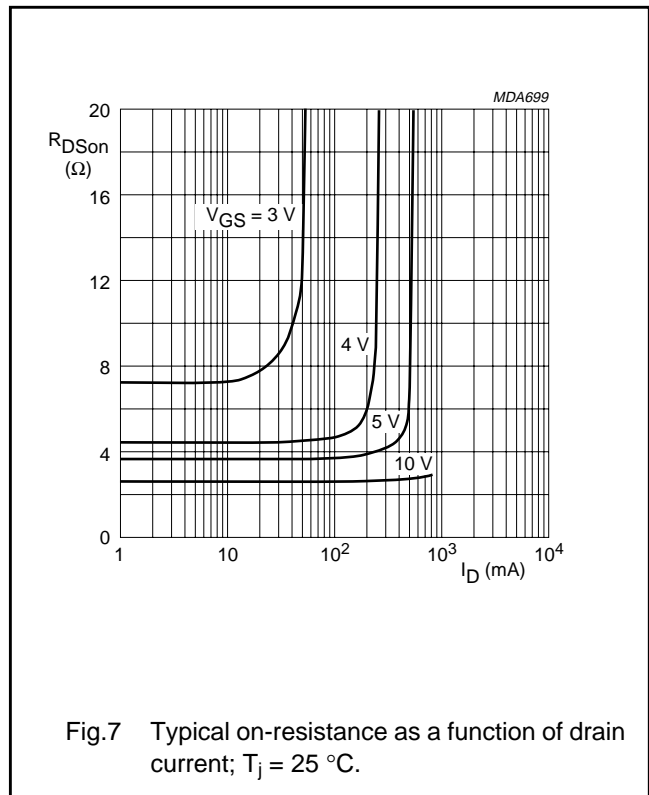
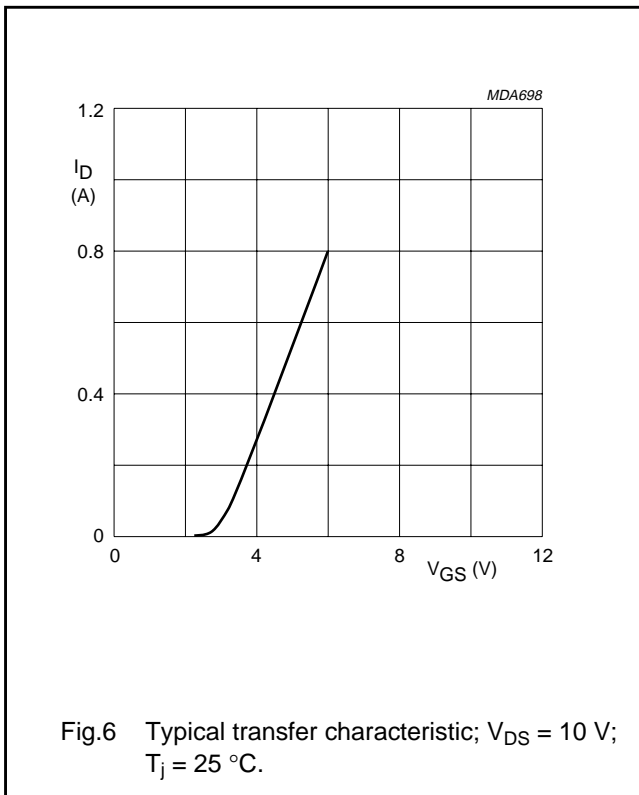
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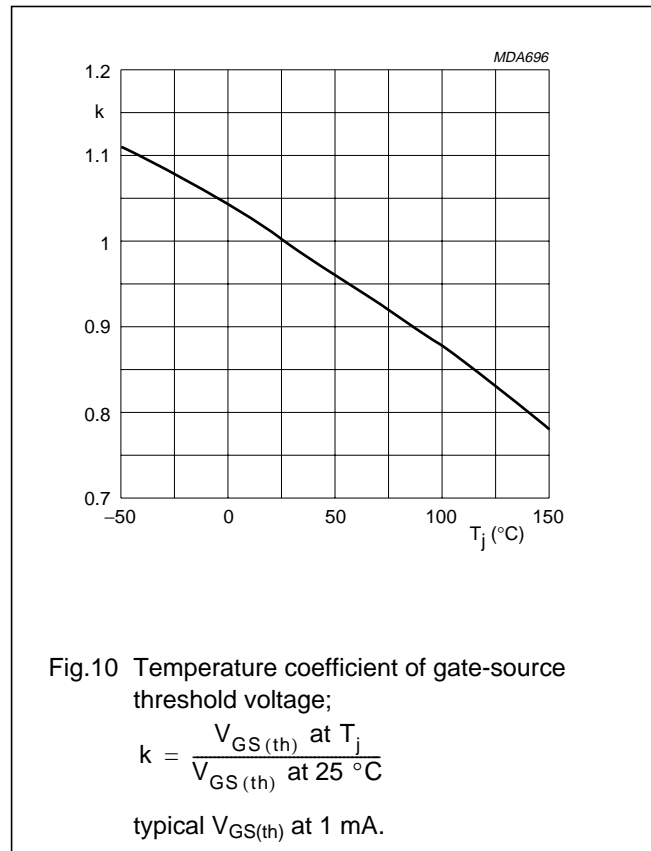
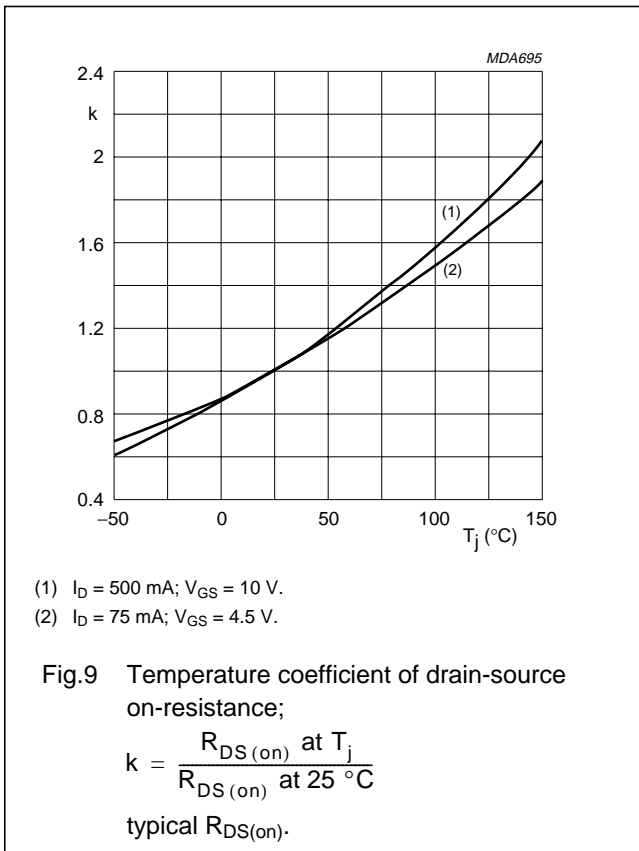
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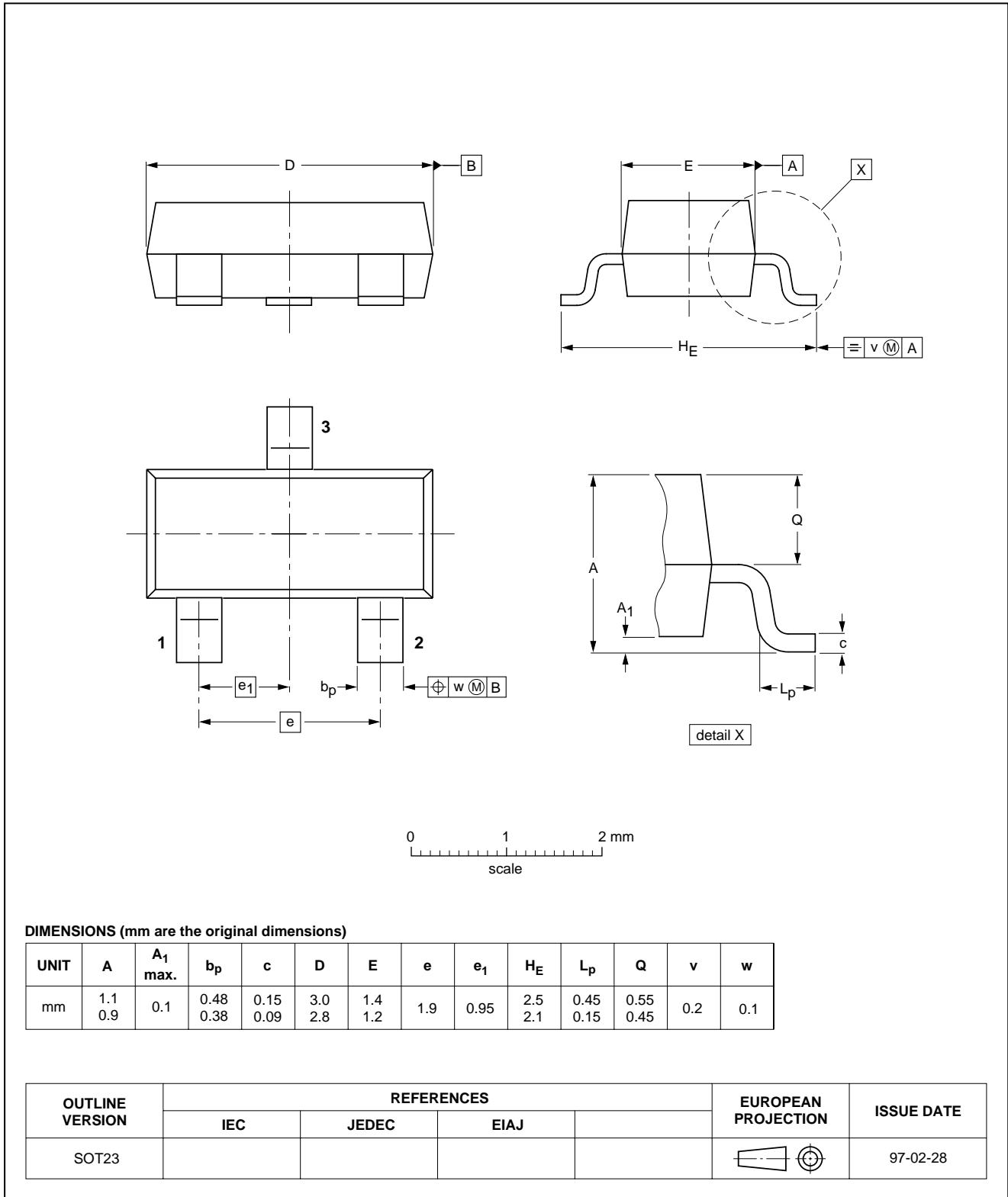
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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23





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**DEFINITIONS**

<b>Data sheet status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
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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