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Kind regards,

Team Nexperia

DATA SHEET

BSP250

P-channel enhancement mode
vertical D-MOS transistor

Product specification
Supersedes data of November 1994
File under Discrete Semiconductors, SC13b

1997 Jun 20

P-channel enhancement mode
vertical D-MOS transistor

BSP250

FEATURES

- High-speed switching
- No secondary breakdown
- Very low on-resistance.

APPLICATIONS

- Low-loss motor and actuator drivers
- Power switching.

DESCRIPTION

P-channel enhancement mode vertical D-MOS transistor in a SOT223 plastic SMD package.

CAUTION

The device is supplied in an antistatic package.
The gate-source input must be protected against static discharge during transport or handling.

PINNING - SOT223

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

The figure shows two diagrams. On the left is a 'Top view' of the SOT223 package, a rectangular component with four pins labeled 1, 2, 3, and 4. Pin 4 is at the top, 1 is at the bottom left, 2 is at the bottom middle, and 3 is at the bottom right. On the right is the circuit symbol for a P-channel MOSFET. It features a circle with a diagonal line through it. The gate is labeled 'g', the drain is labeled 'd' at the top, and the source is labeled 's' at the bottom. The symbol also includes a triangle pointing towards the drain and a line with an arrow pointing towards the gate.

Top view

MAM121

Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage (DC)		–	–30	V
V_{SD}	source-drain diode forward voltage	$I_S = -1.25\text{ A}$	–	–1.6	V
V_{GSO}	gate-source voltage (DC)	open drain	–	± 20	V
V_{GSth}	gate-source threshold voltage	$I_D = -1\text{ mA}$; $V_{DS} = V_{GS}$	–1	–2.8	V
I_D	drain current (DC)		–	–3	A
R_{DSon}	drain-source on-state resistance	$I_D = -1\text{ A}$; $V_{GS} = -10\text{ V}$	–	0.25	Ω
P_{tot}	total power dissipation	$T_s = 100\text{ }^\circ\text{C}$	–	5	W

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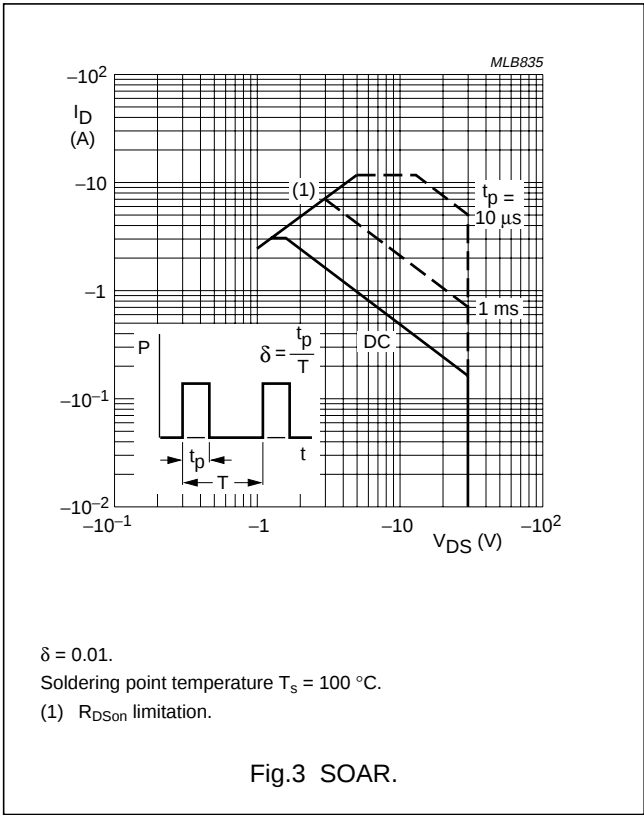
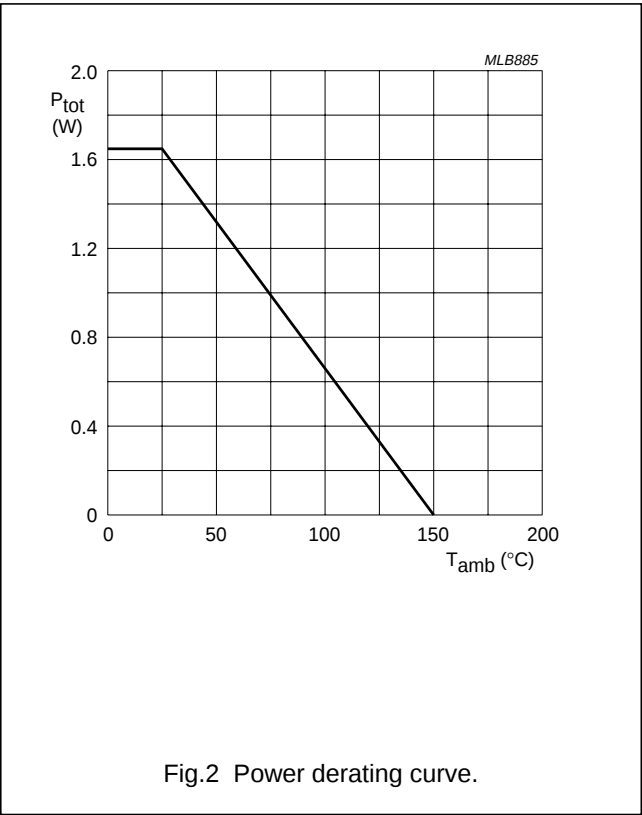
LIMITING VALUES

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_{GSO}	gate-source voltage (DC)	open drain	–	±20	V
I_D	drain current (DC)	$T_s \leq 100\text{ °C}$	–	–3	A
I_{DM}	peak drain current	note 1	–	–12	A
P_{tot}	total power dissipation	$T_s = 100\text{ °C}$	–	5	W
		$T_{amb} = 25\text{ °C}$; note 2	–	1.65	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C
Source-drain diode					
I_S	source current (DC)	$T_s \leq 100\text{ °C}$	–	–1.5	A
I_{SM}	peak pulsed source current	note 1	–	–6	A

Notes

- 1. Pulse width and duty cycle limited by maximum junction temperature.
- 2. Device mounted on an epoxy printed-circuit board, 40 × 40 × 1.5 mm; mounting pad for drain lead minimum 6 cm².



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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	75	K/W
$R_{th\ j-s}$	thermal resistance from junction to soldering point		10	K/W

Note

- Device mounted on an epoxy printed-circuit board, $40 \times 40 \times 1.5$ mm; mounting pad for drain lead minimum 6 cm^2 .

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	$V_{GS} = V_{DS}$; $I_D = -1\text{ mA}$	-1	—	-2.8	V
I_{DSS}	drain-source leakage current	$V_{GS} = 0$; $V_{DS} = -24\text{ V}$	—	—	-100	nA
I_{GSS}	gate leakage current	$V_{GS} = \pm 20\text{ V}$; $V_{DS} = 0$	—	—	± 100	nA
I_{Don}	on-state drain current	$V_{GS} = -10\text{ V}$; $V_{DS} = -1\text{ V}$	-3	—	—	A
		$V_{GS} = -4.5\text{ V}$; $V_{DS} = -5\text{ V}$	-1	—	—	A
R_{DSon}	drain-source on-state resistance	$V_{GS} = -4.5\text{ V}$; $I_D = -0.5\text{ A}$	—	0.33	0.4	Ω
		$V_{GS} = -10\text{ V}$; $I_D = -1\text{ A}$	—	0.22	0.25	Ω
$ y_{fs} $	forward transfer admittance	$V_{DS} = -20\text{ V}$; $I_D = -1\text{ A}$	1	2	—	S
C_{iss}	input capacitance	$V_{GS} = 0$; $V_{DS} = -20\text{ V}$; $f = 1\text{ MHz}$	—	250	—	pF
C_{oss}	output capacitance	$V_{GS} = 0$; $V_{DS} = -20\text{ V}$; $f = 1\text{ MHz}$	—	140	—	pF
C_{rss}	reverse transfer capacitance	$V_{GS} = 0$; $V_{DS} = -20\text{ V}$; $f = 1\text{ MHz}$	—	50	—	pF
Q_G	total gate charge	$V_{GS} = -10\text{ V}$; $V_{DS} = -15\text{ V}$; $I_D = -2.3\text{ A}$	—	10	25	nC
Q_{GS}	gate-source charge	$V_{GS} = -10\text{ V}$; $V_{DS} = -15\text{ V}$; $I_D = -2.3\text{ A}$	—	1	—	nC
Q_{GD}	gate-drain charge	$V_{GS} = -10\text{ V}$; $V_{DS} = -15\text{ V}$; $I_D = -2.3\text{ A}$	—	3	—	nC

Switching times

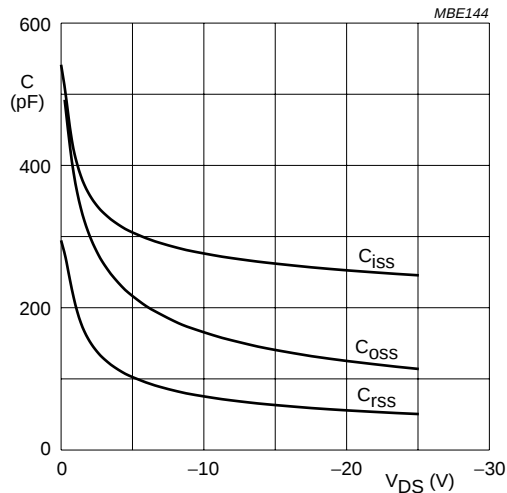
t_{on}	turn-on time	$V_{GS} = 0$ to -10 V ; $V_{DD} = -20\text{ V}$; $I_D = -1\text{ A}$; $R_L = 20\text{ }\Omega$	—	20	80	ns
t_{off}	turn-off time	$V_{GS} = -10$ to 0 V ; $V_{DD} = -20\text{ V}$; $I_D = -1\text{ A}$; $R_L = 20\text{ }\Omega$	—	50	140	ns

Source-drain diode

V_{SD}	source-drain diode forward voltage	$V_{GD} = 0$; $I_S = -1.25\text{ A}$	—	—	-1.6	V
t_{rr}	reverse recovery time	$I_S = -1.25\text{ A}$; $di/dt = 100\text{ A}/\mu\text{s}$	—	150	200	ns

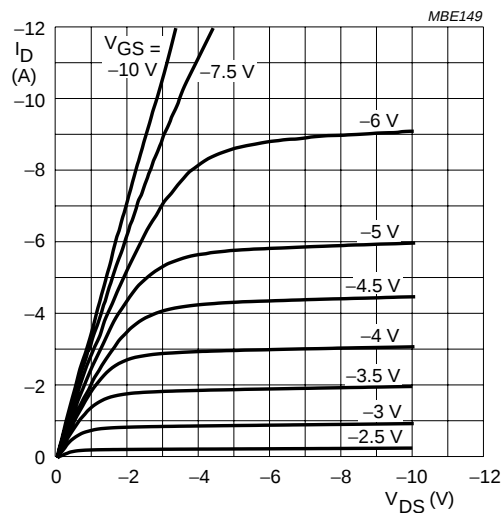
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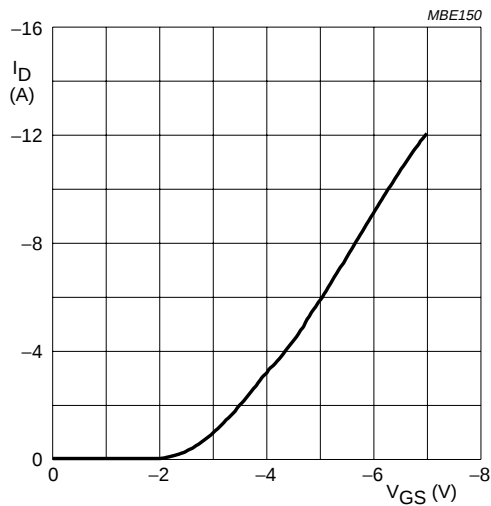
$V_{GS} = 0$.
 $T_j = 25\text{ }^{\circ}\text{C}$.

Fig.4 Capacitance as a function of drain source voltage; typical values.



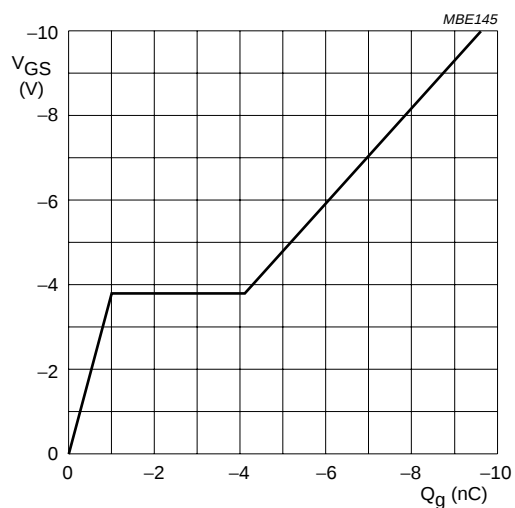
$T_j = 25\text{ }^{\circ}\text{C}$.

Fig.5 Output characteristics; typical values.



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

Fig.6 Transfer characteristic, typical values.

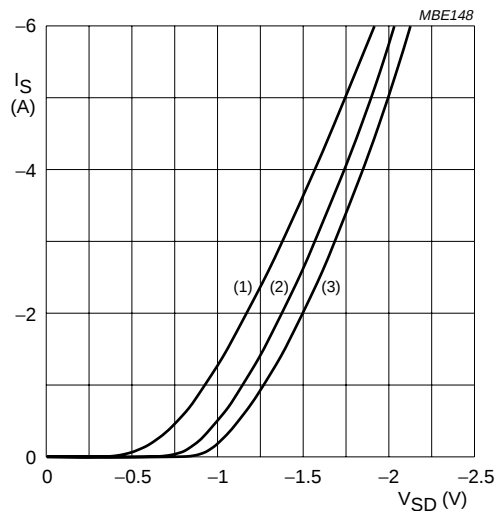


$V_{DD} = -15\text{ V}$.
 $I_D = -3\text{ A}$.

Fig.7 Gate-source voltage as a function of total gate charge.

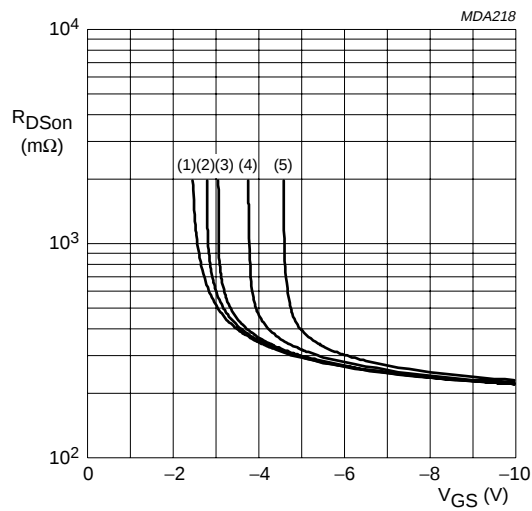
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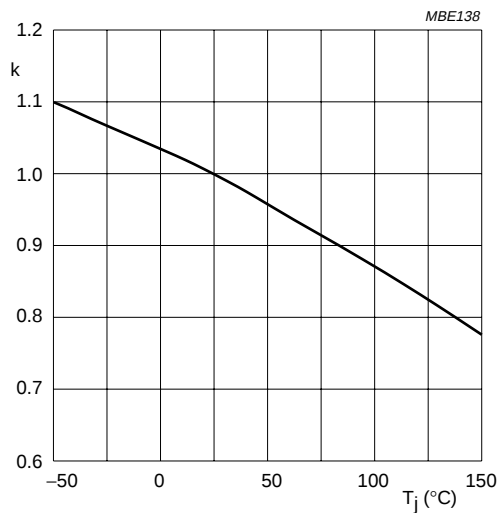
$V_{GD} = 0$.
(1) $T_j = 150\text{ }^{\circ}\text{C}$.
(2) $T_j = 25\text{ }^{\circ}\text{C}$.
(3) $T_j = -55\text{ }^{\circ}\text{C}$.

Fig.8 Source current as a function of source-drain diode forward voltage.



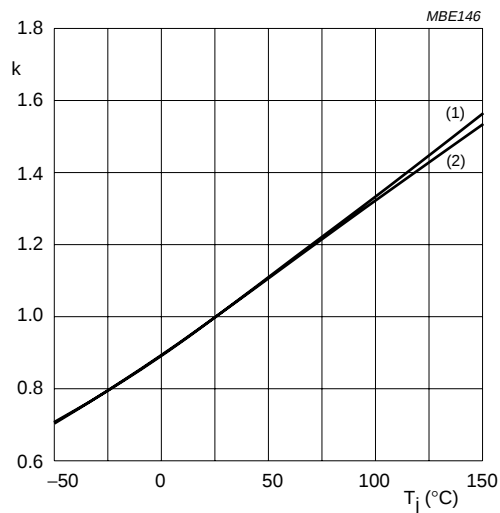
$-V_{DS} \geq -I_D \times R_{DS(on)}$; $T_j = 25\text{ }^{\circ}\text{C}$.
(1) $I_D = -0.1\text{ A}$.
(2) $I_D = -0.5\text{ A}$.
(3) $I_D = -1\text{ A}$.
(4) $I_D = -3\text{ A}$.
(5) $I_D = -6\text{ A}$.

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



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

Fig.10 Temperature coefficient of gate-source threshold voltage.

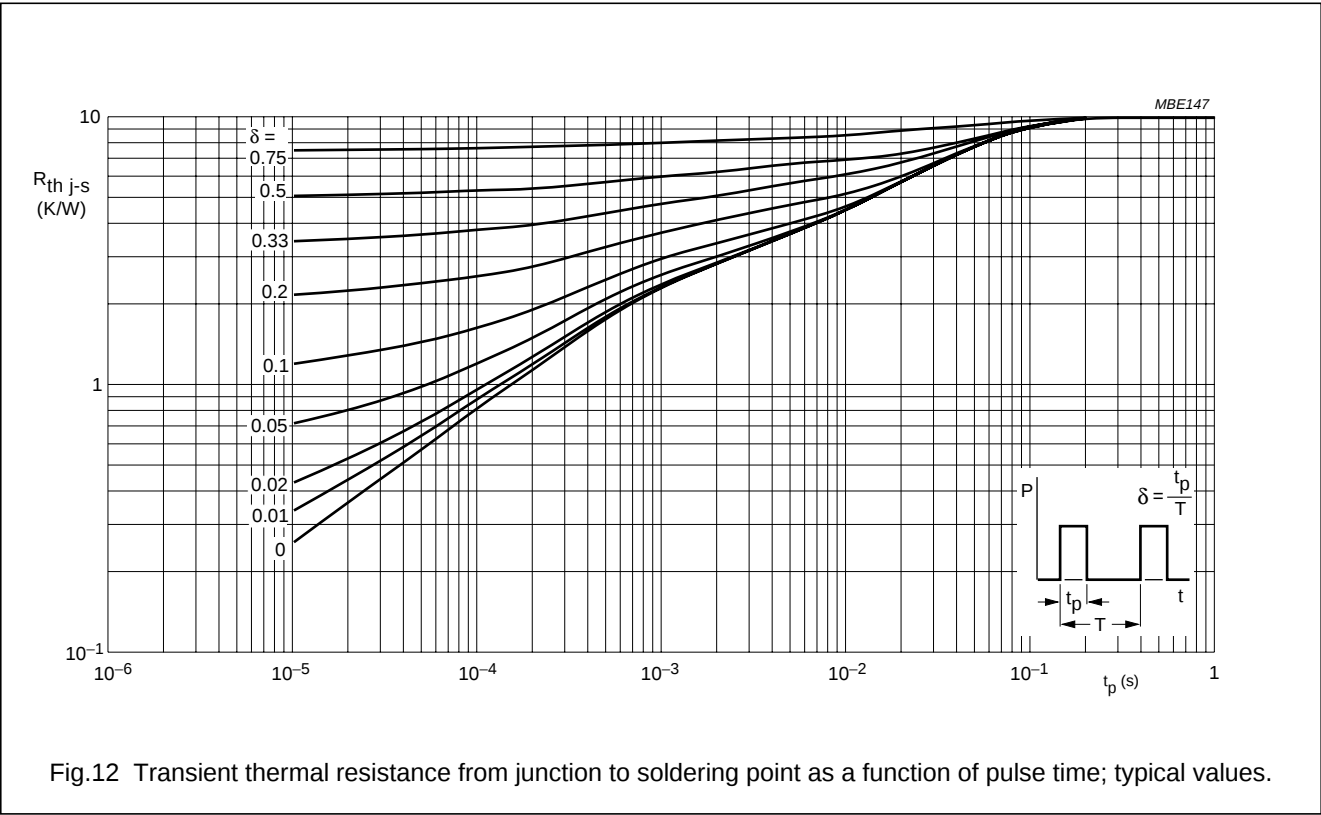


$k = \frac{R_{DS(on)}\text{ at } T_j}{R_{DS(on)}\text{ at } 25\text{ }^{\circ}\text{C}}$
Typical $R_{DS(on)}$ at:
(1) $I_D = -1\text{ A}$; $V_{GS} = -10\text{ V}$.
(2) $I_D = -0.5\text{ A}$; $V_{GS} = -4.5\text{ V}$.

Fig.11 Temperature coefficient of drain-source on-resistance.

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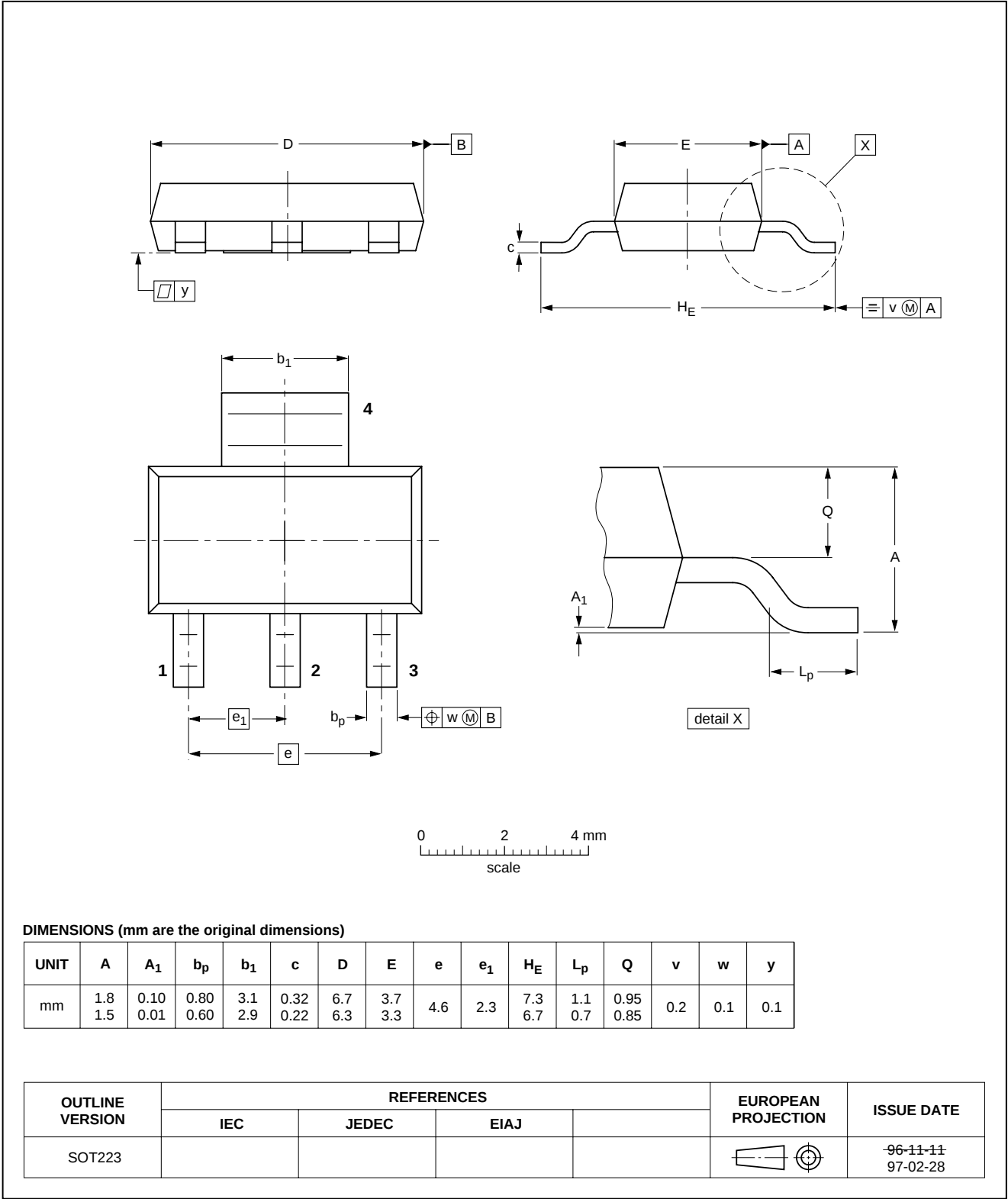
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PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 4 leads

SOT223



**P-channel enhancement mode
vertical D-MOS transistor**

BSP250

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	
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NOTES

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