

# DATA SHEET

## **BSP230**

P-channel enhancement mode  
vertical D-MOS transistor

Product specification  
Supersedes data of 1997 Jun 17  
File under Discrete Semiconductors, SC13b

1997 Oct 21

P-channel enhancement mode  
vertical D-MOS transistor

BSP230

FEATURES

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

APPLICATIONS

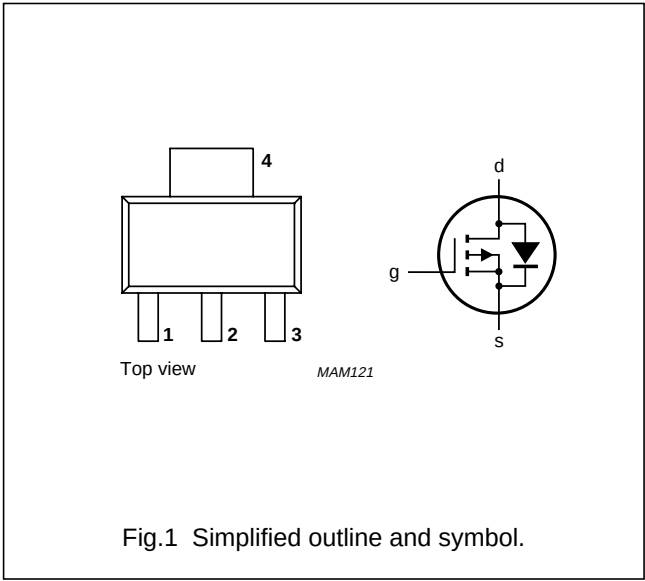
- Line current interruptor in telephone sets
- Relay, high speed and line transformer drivers.

DESCRIPTION

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

PINNING - SOT223

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



CAUTION

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

QUICK REFERENCE DATA

| 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        |
| $V_{GSth}$ | gate-source threshold voltage    | $I_D = -1 \text{ mA}$ ; $V_{DS} = V_{GS}$          | –1.95 | –2.8     | V        |
| $I_D$      | drain current (DC)               |                                                    | –     | –210     | mA       |
| $R_{DSon}$ | drain-source on-state resistance | $I_D = -170 \text{ mA}$ ; $V_{GS} = -10 \text{ V}$ | –     | 17       | $\Omega$ |
| $P_{tot}$  | total power dissipation          | $T_{amb} \leq 25 \text{ }^\circ\text{C}$           | –     | 1.5      | 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)      |                                      | –    | –300  | V    |
| $V_{GSO}$ | gate-source voltage (DC)       | open drain                           | –    | ±20   | V    |
| $I_D$     | drain current (DC)             |                                      | –    | –210  | mA   |
| $I_{DM}$  | peak drain current             |                                      | –    | –0.75 | A    |
| $P_{tot}$ | total power dissipation        | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 1.5   | W    |
| $T_{stg}$ | storage temperature            |                                      | –65  | +150  | °C   |
| $T_j$     | operating junction temperature |                                      | –    | 150   | °C   |

## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | CONDITIONS | VALUE | UNIT |
|---------------|---------------------------------------------|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1     | 83.3  | K/W  |

### Note to the Limiting values and Thermal characteristics

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

## CHARACTERISTICS

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

| SYMBOL                                    | PARAMETER                        | CONDITIONS                                                                             | MIN.  | TYP. | MAX. | UNIT     |
|-------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------|-------|------|------|----------|
| $V_{(BR)DSS}$                             | drain-source breakdown voltage   | $V_{GS} = 0$ ; $I_D = -10\text{ }\mu\text{A}$                                          | –300  | –    | –    | V        |
| $V_{GSth}$                                | gate-source threshold voltage    | $V_{DS} = V_{GS}$ ; $I_D = -1\text{ mA}$                                               | –1.95 | –    | –2.8 | V        |
| $I_{DSS}$                                 | drain-source leakage current     | $V_{GS} = 0$ ; $V_{DS} = -240\text{ V}$                                                | –     | –    | –100 | nA       |
| $I_{GSS}$                                 | gate leakage current             | $V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0$                                              | –     | –    | ±100 | nA       |
| $R_{DSon}$                                | drain-source on-state resistance | $V_{GS} = -10\text{ V}$ ; $I_D = -170\text{ mA}$                                       | –     | –    | 17   | $\Omega$ |
| $ y_{fs} $                                | forward transfer admittance      | $V_{DS} = -25\text{ V}$ ; $I_D = -170\text{ mA}$                                       | 100   | –    | –    | mS       |
| $C_{iss}$                                 | input capacitance                | $V_{GS} = 0$ ; $V_{DS} = -25\text{ V}$ ; $f = 1\text{ MHz}$                            | –     | 60   | 90   | pF       |
| $C_{oss}$                                 | output capacitance               | $V_{GS} = 0$ ; $V_{DS} = -25\text{ V}$ ; $f = 1\text{ MHz}$                            | –     | 15   | 30   | pF       |
| $C_{rss}$                                 | reverse transfer capacitance     | $V_{GS} = 0$ ; $V_{DS} = -25\text{ V}$ ; $f = 1\text{ MHz}$                            | –     | 5    | 15   | pF       |
| <b>Switching times</b> (see Figs 2 and 3) |                                  |                                                                                        |       |      |      |          |
| $t_{on}$                                  | turn-on time                     | $V_{GS} = 0\text{ to }-10\text{ V}$ ; $V_{DD} = -50\text{ V}$ ; $I_D = -250\text{ mA}$ | –     | 5    | 10   | ns       |
| $t_{off}$                                 | turn-off time                    | $V_{GS} = -10\text{ to }0\text{ V}$ ; $V_{DD} = -50\text{ V}$ ; $I_D = -250\text{ mA}$ | –     | 15   | 30   | ns       |

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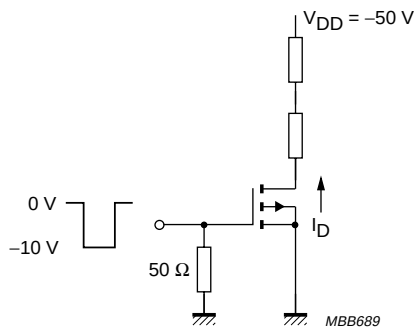


Fig.2 Switching time test circuit.

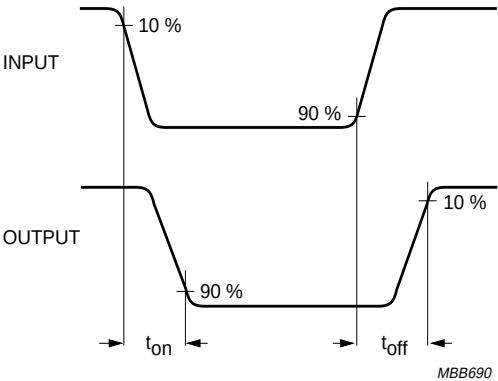


Fig.3 Input and output waveforms.

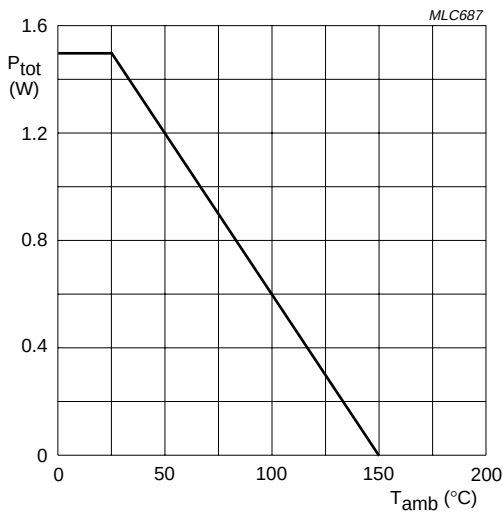
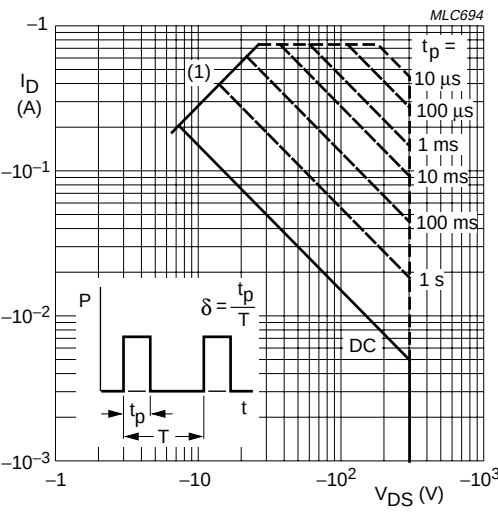


Fig.4 Power derating curve.

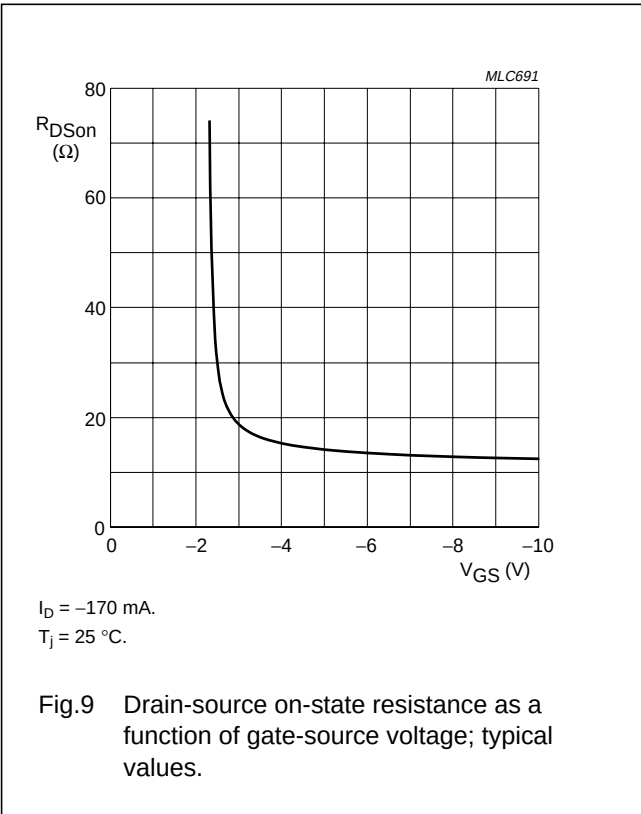
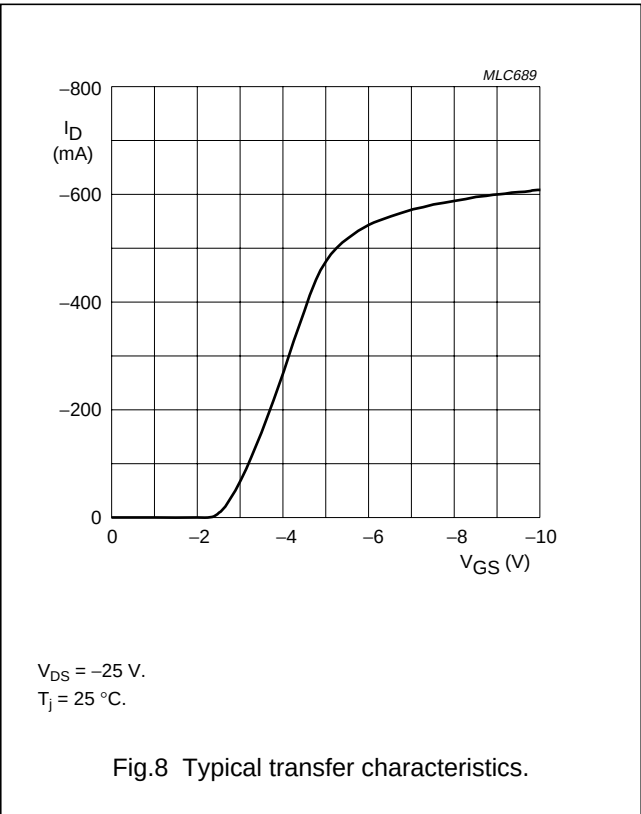
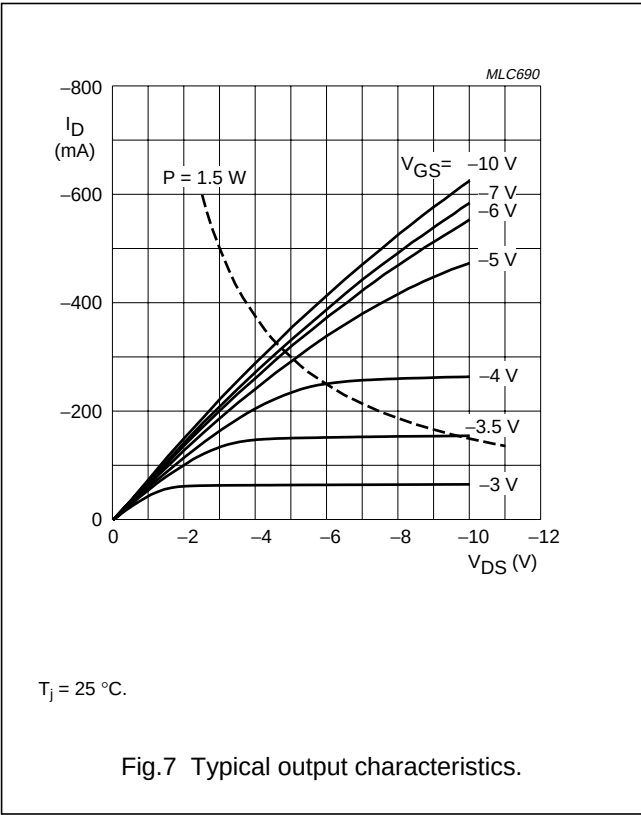
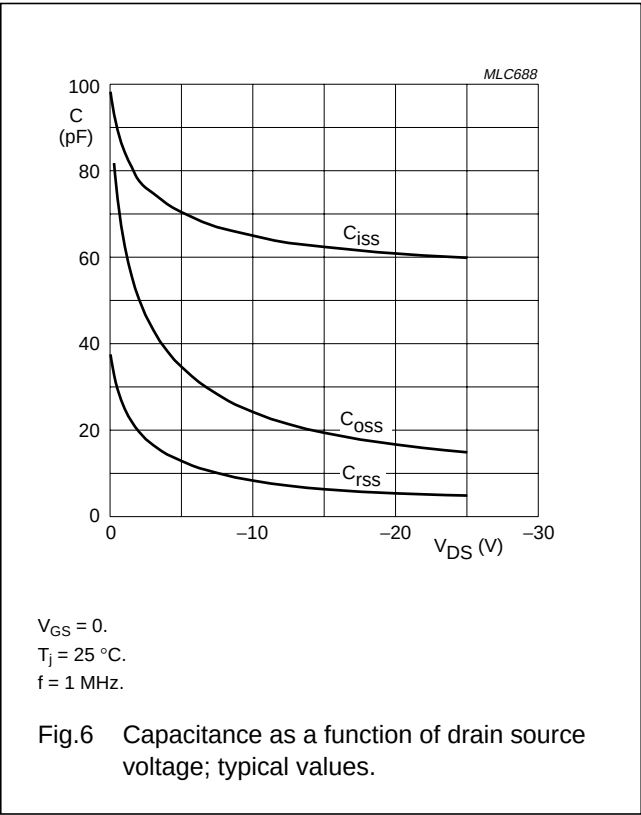


$\delta = 0.01$ .  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ .  
(1)  $R_{DSon}$  limitation.

Fig.5 DC SOAR.

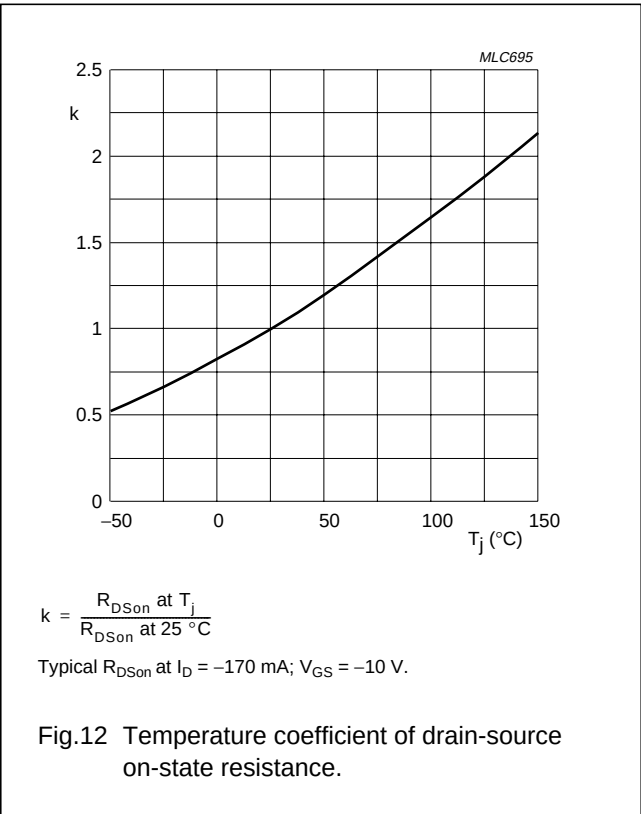
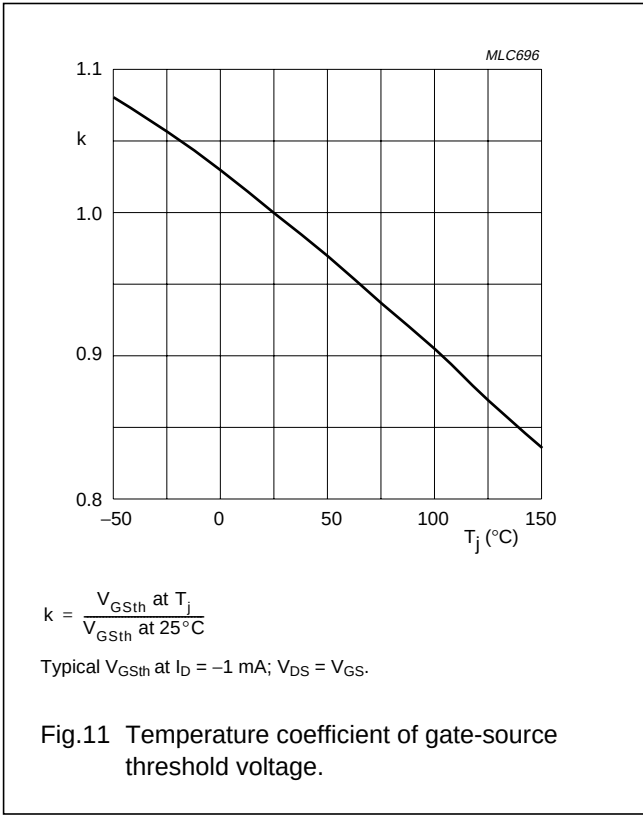
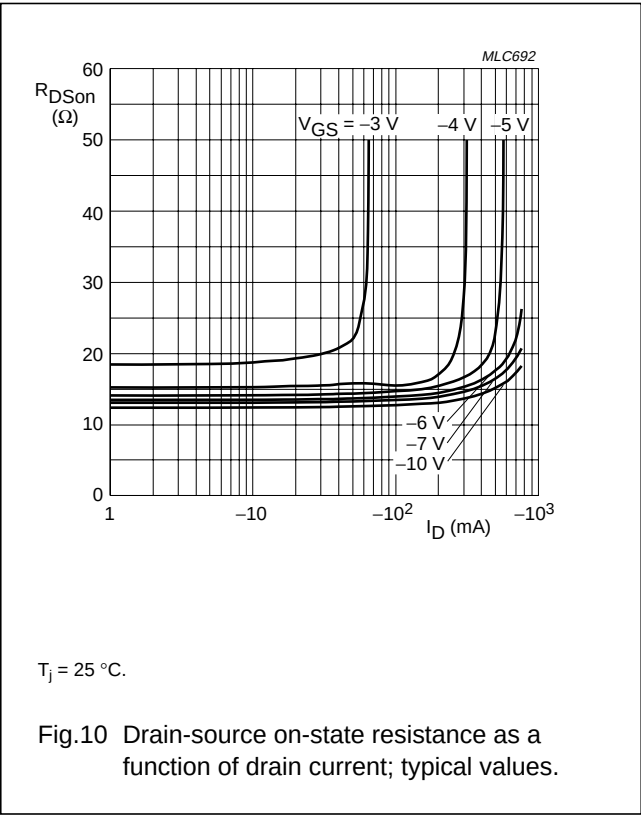
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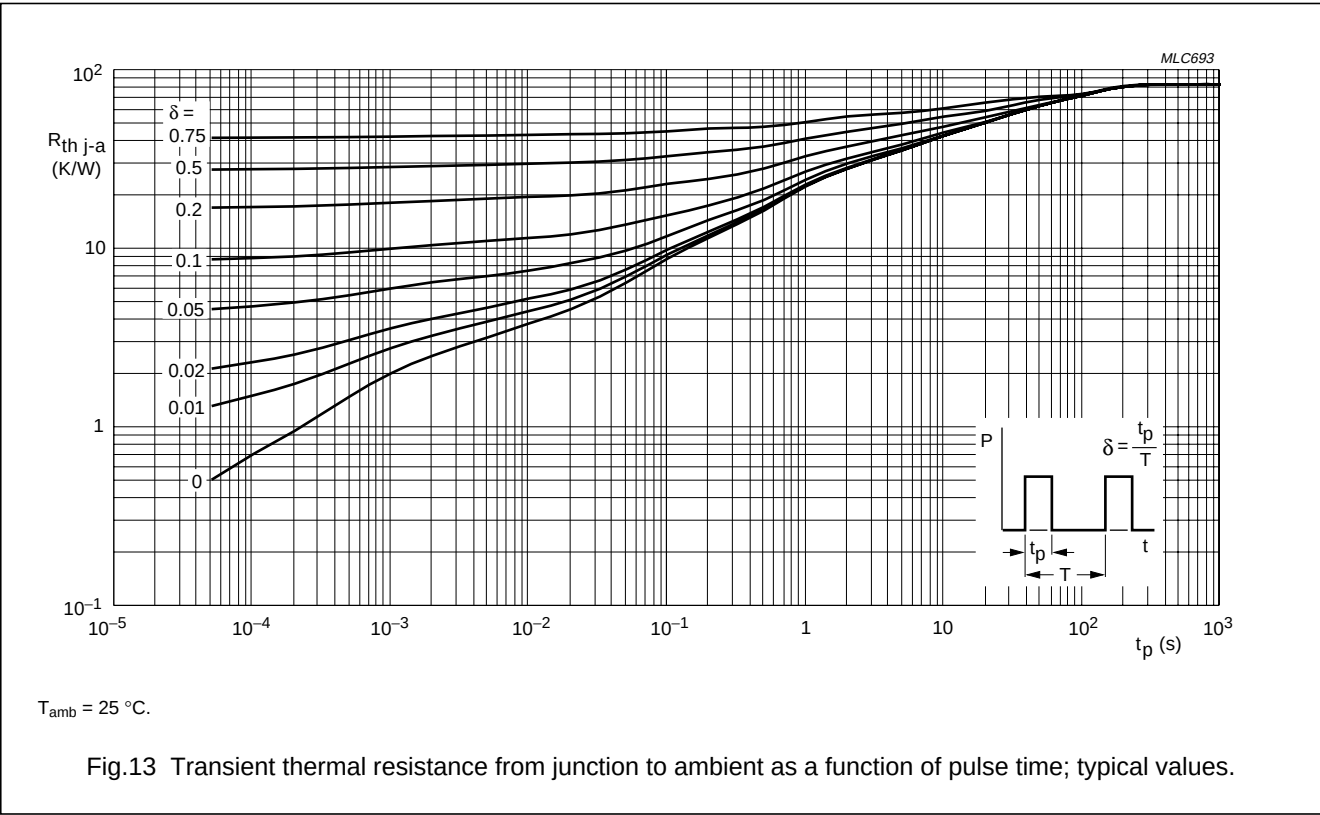
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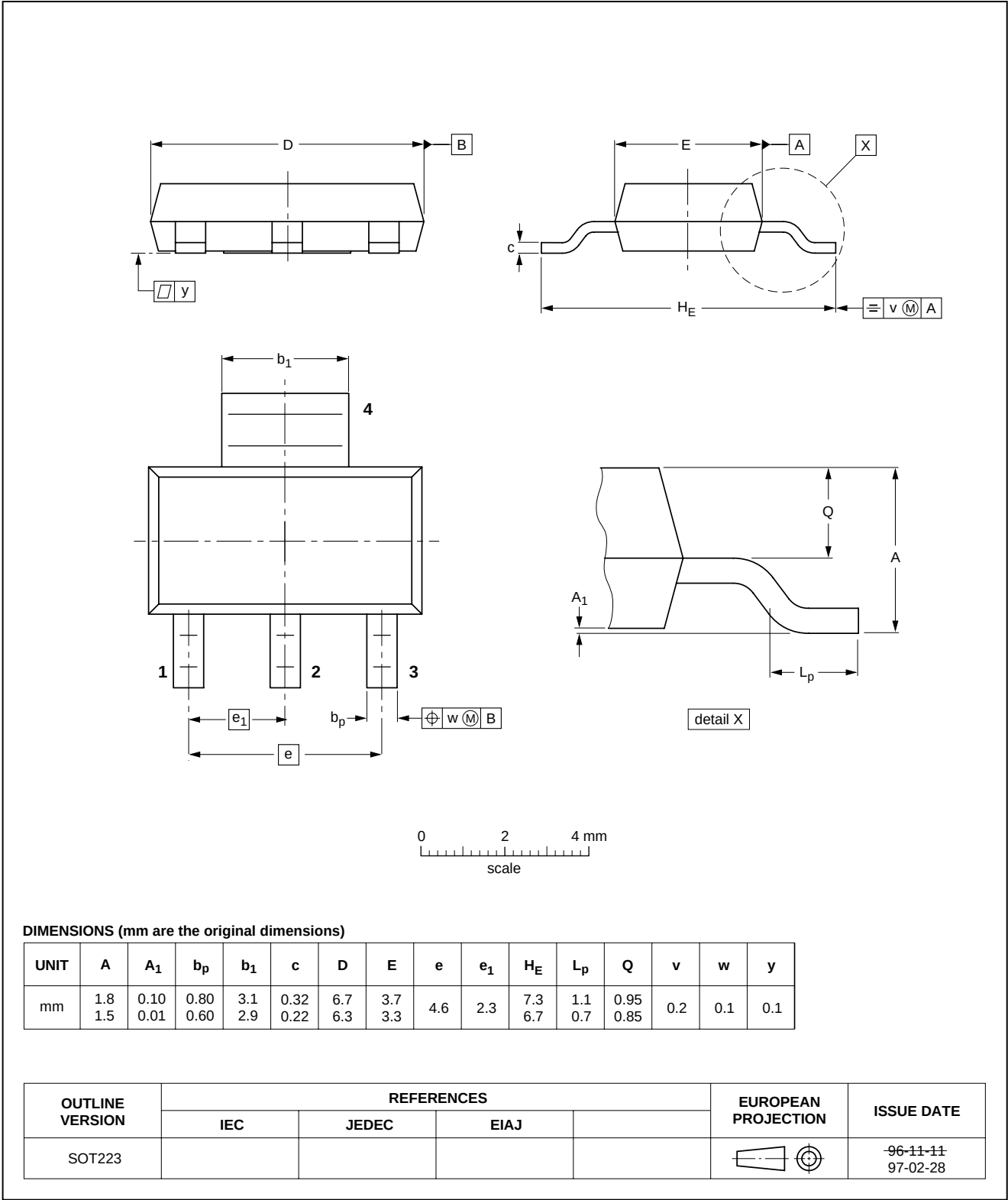
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PACKAGE OUTLINE

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

SOT223





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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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