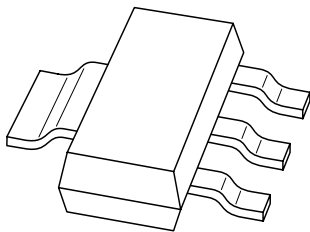


# DATA SHEET



## **BSP60; BSP61; BSP62** PNP Darlington transistors

Product data sheet  
Supersedes data of 1999 Apr 29

2001 May 31

## PNP Darlington transistors

## BSP60; BSP61; BSP62

## FEATURES

- High current (max. 0.5 A)
- Low voltage (max. 80 V)
- Integrated diode and resistor.

## APPLICATIONS

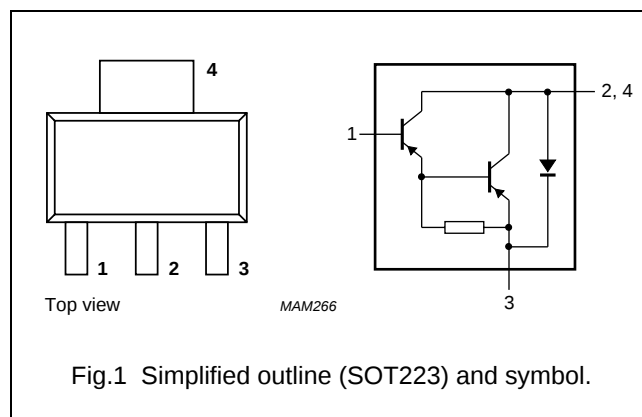
- Industrial switching applications such as:
  - Print hammer
  - Solenoid
  - Relay and lamp drivers.

## DESCRIPTION

PNP Darlington transistor in a SOT223 plastic package.  
NPN complements: BSP50, BSP51 and BSP52.

## PINNING

| PIN  | DESCRIPTION |
|------|-------------|
| 1    | base        |
| 2, 4 | collector   |
| 3    | emitter     |



## LIMITING VALUES

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

| SYMBOL    | PARAMETER                     | CONDITIONS                           | MIN. | MAX. | UNIT |
|-----------|-------------------------------|--------------------------------------|------|------|------|
| $V_{CBO}$ | collector-base voltage        | open emitter                         |      |      |      |
|           | BSP60                         |                                      | –    | –60  | V    |
|           | BSP61                         |                                      | –    | –80  | V    |
|           | BSP62                         |                                      | –    | –90  | V    |
| $V_{CES}$ | collector-emitter voltage     | $V_{BE} = 0$                         |      |      |      |
|           | BSP60                         |                                      | –    | –45  | V    |
|           | BSP61                         |                                      | –    | –60  | V    |
|           | BSP62                         |                                      | –    | –80  | V    |
| $V_{EBO}$ | emitter-base voltage          | open collector                       | –    | –5   | V    |
| $I_C$     | collector current (DC)        |                                      | –    | –1   | A    |
| $I_{CM}$  | peak collector current        |                                      | –    | –2   | A    |
| $I_B$     | base current (DC)             |                                      | –    | –100 | mA   |
| $P_{tot}$ | total power dissipation       | $T_{amb} \leq 25\text{ °C}$ ; note 1 | –    | 1.25 | W    |
| $T_{stg}$ | storage temperature           |                                      | –65  | +150 | °C   |
| $T_j$     | junction temperature          |                                      | –    | 150  | °C   |
| $T_{amb}$ | operating ambient temperature |                                      | –65  | +150 | °C   |

## Note

1. Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>.  
For other mounting conditions, see “Thermal considerations for the SOT223 in the General Part of associated Handbook”.

## PNP Darlington transistors

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## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                        | CONDITIONS | VALUE | UNIT |
|---------------|--------------------------------------------------|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient      | note 1     | 98    | K/W  |
| $R_{th\ j-s}$ | thermal resistance from junction to solder point |            | 17    | K/W  |

## Note

- Device mounted on a printed-circuit board, single sided copper, tinplated, mounting pad for collector 1 cm<sup>2</sup>.  
For other mounting conditions, see "Thermal considerations for the SOT223 in the General Part of associated Handbook".

## CHARACTERISTICS

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

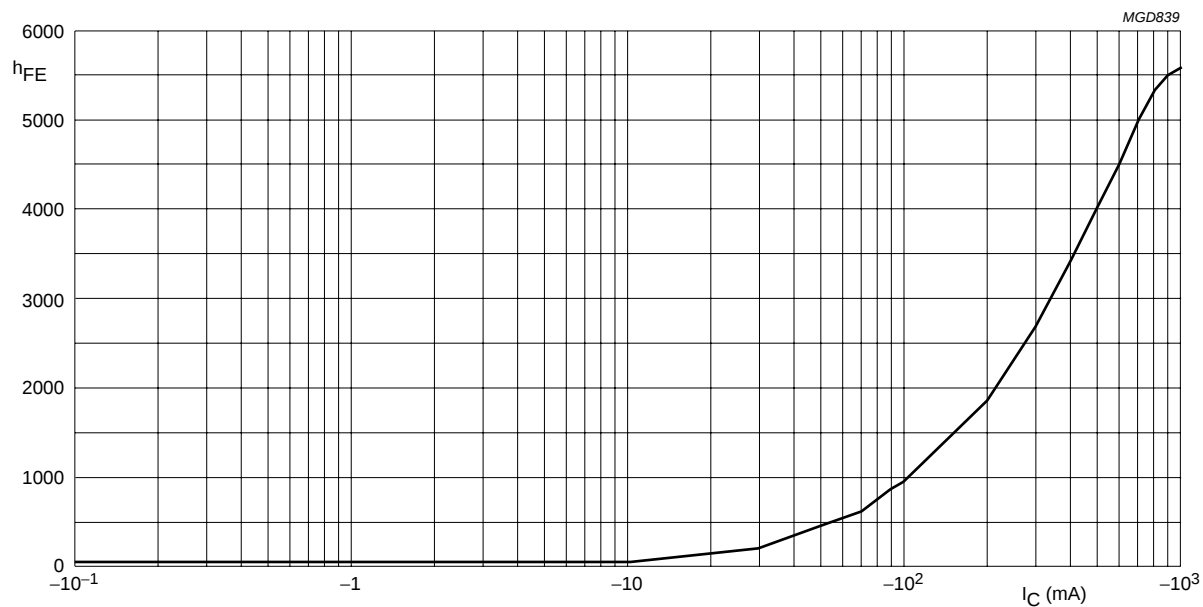
| SYMBOL                                                         | PARAMETER                            | CONDITIONS                                                                                      | MIN.         | TYP.   | MAX.   | UNIT |
|----------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------|--------------|--------|--------|------|
| $I_{CES}$                                                      | collector cut-off current            |                                                                                                 |              |        |        |      |
|                                                                | BSP60                                | $V_{BE} = 0; V_{CE} = -45\text{ V}$                                                             | –            | –      | –50    | nA   |
|                                                                | BSP61                                | $V_{BE} = 0; V_{CE} = -60\text{ V}$                                                             | –            | –      | –50    | nA   |
|                                                                | BSP62                                | $V_{BE} = 0; V_{CE} = -80\text{ V}$                                                             | –            | –      | –50    | nA   |
| $I_{EBO}$                                                      | emitter cut-off current              | $I_C = 0; V_{EB} = -4\text{ V}$                                                                 | –            | –      | –50    | nA   |
| $h_{FE}$                                                       | DC current gain                      | $V_{CE} = -10\text{ V}$ ; note 1; see Fig.2<br>$I_C = -150\text{ mA}$<br>$I_C = -500\text{ mA}$ | 1000<br>2000 | –<br>– | –<br>– |      |
| $V_{CEsat}$                                                    | collector-emitter saturation voltage | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA}$                                                    | –            | –      | –1.3   | V    |
|                                                                |                                      | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA};$<br>$T_j = 150\text{ °C}$                          | –            | –      | –1.3   | V    |
| $V_{BEsat}$                                                    | base-emitter saturation voltage      | $I_C = -500\text{ mA}; I_B = -0.5\text{ mA}$                                                    | –            | –      | –1.9   | V    |
| $f_T$                                                          | transition frequency                 | $I_C = -500\text{ mA}; V_{CE} = -5\text{ V};$<br>$f = 100\text{ MHz}$                           | –            | 200    | –      | MHz  |
| <b>Switching times (between 10% and 90% levels); see Fig.3</b> |                                      |                                                                                                 |              |        |        |      |
| $t_{on}$                                                       | turn-on time                         | $I_{Con} = -500\text{ mA}; I_{Bon} = -0.5\text{ mA};$                                           | –            | 400    | –      | ns   |
| $t_{off}$                                                      | turn-off time                        | $I_{Boff} = 0.5\text{ mA}$                                                                      | –            | 1500   | –      | ns   |

## Note

- Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

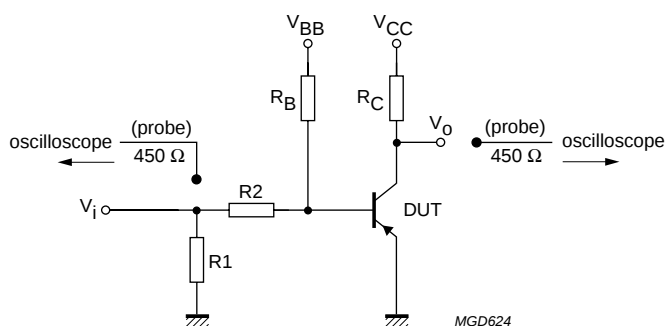
## PNP Darlington transistors

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$V_{CE} = -10$  V.

Fig.2 DC current gain; typical values.



$V_i = -10$  V;  $T = 200$   $\mu$ s;  $t_p = 6$   $\mu$ s;  $t_r = t_f \leq 3$  ns.  
 $R_1 = 56$   $\Omega$ ;  $R_2 = 10$  k $\Omega$ ;  $R_B = 10$  k $\Omega$ ;  $R_C = 18$   $\Omega$ .  
 $V_{BB} = 1.8$  V;  $V_{CC} = -10.7$  V.  
 Oscilloscope: input impedance  $Z_i = 50$   $\Omega$ .

Fig.3 Test circuit for switching times.

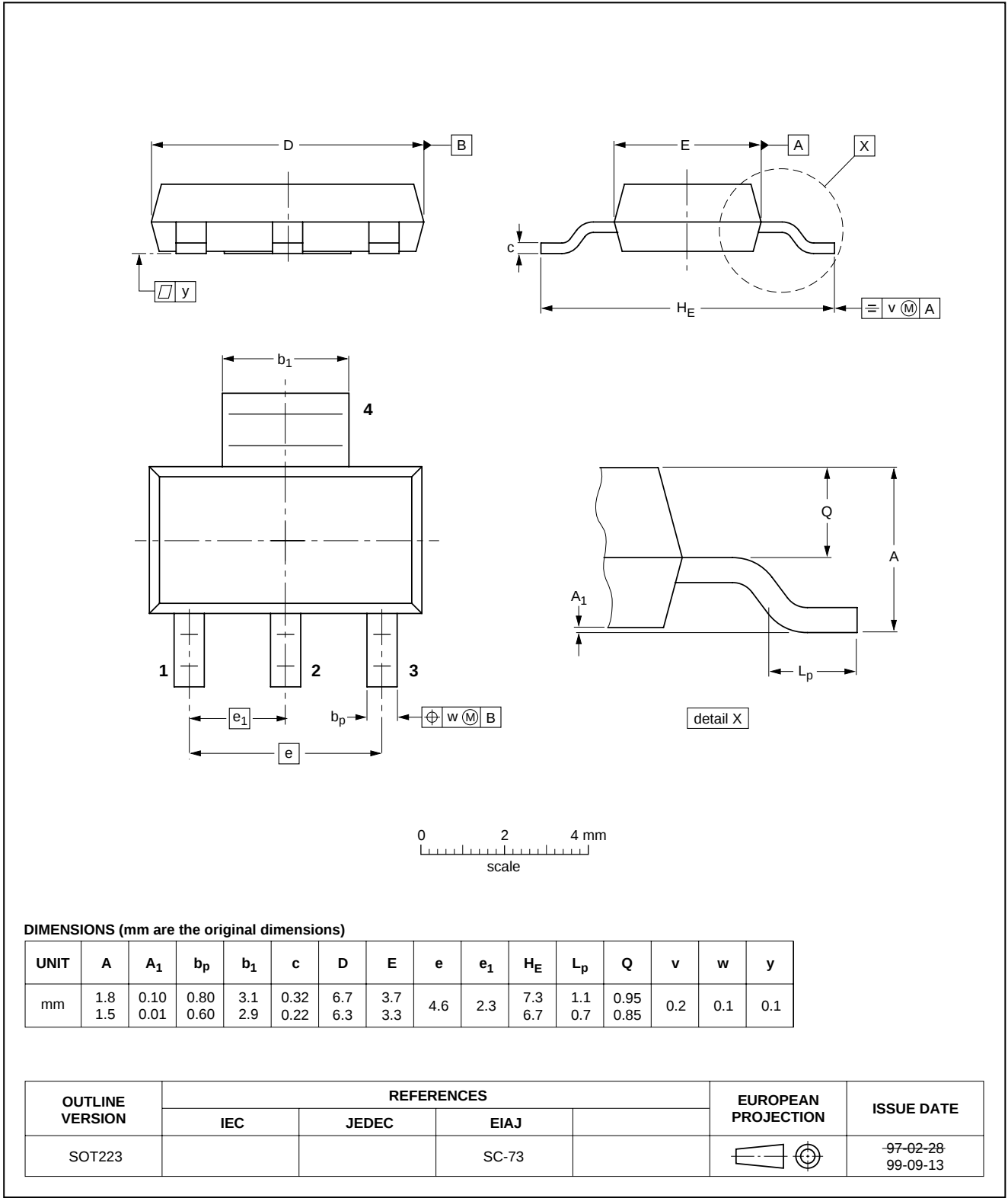
PNP Darlington transistors

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PACKAGE OUTLINE

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

SOT223



## PNP Darlington transistors

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## DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION                                                                            |
|--------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

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Printed in The Netherlands

613514/05/pp7

Date of release: 2001 May 31

Document order number: 9397 750 07906

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