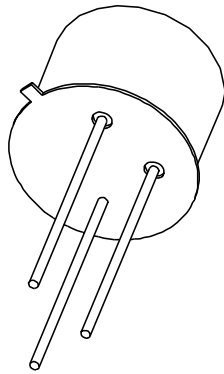


# DATA SHEET



## **BSS50; BSS51; BSS52** NPN Darlington transistors

Product specification  
Supersedes data of 1997 May 13  
File under Discrete Semiconductors, SC04

1997 Sep 03

# NPN Darlington transistors

# BSS50; BSS51; BSS52

### FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V)
- Integrated diode and resistor.

### APPLICATIONS

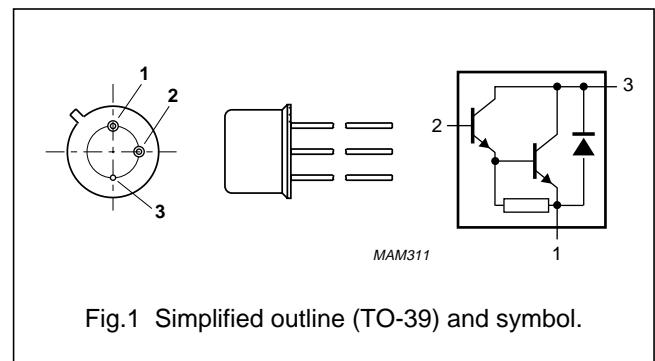
- Industrial high gain amplification.

### DESCRIPTION

NPN Darlington transistor in a TO-39 metal package.  
 PNP complements: BSS61 and BSS62.

### PINNING

| PIN | DESCRIPTION                  |
|-----|------------------------------|
| 1   | emitter                      |
| 2   | base                         |
| 3   | collector, connected to case |



### QUICK REFERENCE DATA

| SYMBOL    | PARAMETER                 | CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|-----------|---------------------------|--|------|------|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter   |      |      |      |      |
|           | BSS50                     |  | –    | –    | 60   | V    |
|           | BSS51                     |  | –    | –    | 80   | V    |
|           | BSS52                     |  | –    | –    | 90   | V    |
| $V_{CES}$ | collector-emitter voltage | $V_{BE} = 0$   |      |      |      |      |
|           | BSS50                     |  | –    | –    | 45   | V    |
|           | BSS51                     |  | –    | –    | 60   | V    |
|           | BSS52                     |  | –    | –    | 80   | V    |
| $I_C$     | collector current         |  | –    | –    | 1    | A    |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^\circ\text{C}$                        | –    | –    | 0.8  | W    |
|           |                           | $T_{case} \leq 25\text{ }^\circ\text{C}$                       | –    | –    | 5    | W    |
| $h_{FE}$  | DC current gain           | $I_C = 500\text{ mA}; V_{CE} = 10\text{ V}$                    | 2000 | –    | –    |      |
| $f_T$     | transition frequency      | $I_C = 500\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$ | –    | 200  | –    | MHz  |

## NPN Darlington transistors

## BSS50; BSS51; BSS52

**LIMITING VALUES**

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

| SYMBOL           | PARAMETER                     | CONDITIONS                | MIN. | MAX. | UNIT |
|------------------|-------------------------------|---------------------------|------|------|------|
| V <sub>CBO</sub> | collector-base voltage        | open emitter              |      |      |      |
|                  | BSS50                         |                           | –    | 60   | V    |
|                  | BSS51                         |                           | –    | 80   | V    |
|                  | BSS52                         | –                         | 90   | V    |      |
| V <sub>CES</sub> | collector-emitter voltage     | V <sub>BE</sub> = 0       |      |      |      |
|                  | BSS50                         |                           | –    | 45   | V    |
|                  | BSS51                         |                           | –    | 60   | V    |
|                  | BSS52                         | –                         | 80   | V    |      |
| V <sub>EBO</sub> | emitter-base voltage          | open collector            | –    | 5    | V    |
| I <sub>C</sub>   | collector current (DC)        |                           | –    | 1    | A    |
| I <sub>CM</sub>  | peak collector current        |                           | –    | 2    | A    |
| I <sub>B</sub>   | base current (DC)             |                           | –    | 100  | mA   |
| P <sub>tot</sub> | total power dissipation       | T <sub>amb</sub> ≤ 25 °C  | –    | 0.8  | W    |
|                  |                               | T <sub>case</sub> ≤ 25 °C | –    | 5    | W    |
| T <sub>stg</sub> | storage temperature           |                           | –65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature          |                           | –    | 200  | °C   |
| T <sub>amb</sub> | operating ambient temperature |                           | –65  | +150 | °C   |

**THERMAL CHARACTERISTICS**

| SYMBOL              | PARAMETER                                   | CONDITIONS  | VALUE | UNIT |
|---------------------|---|-------------|-------|------|
| R <sub>th j-a</sub> | thermal resistance from junction to ambient | in free air | 220   | K/W  |
| R <sub>th j-c</sub> | thermal resistance from junction to case    |             | 35    | K/W  |

## NPN Darlington transistors

## BSS50; BSS51; BSS52

## CHARACTERISTICS

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

| SYMBOL  | PARAMETER  | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|---|--|--|------|------|------|---------------|
| $I_{CES}$   | collector cut-off current<br>BSS50<br>BSS51<br>BSS52     | $V_{BE} = 0; V_{CE} = 45\text{ V}$   | –    | –    | 50   | nA            |
|   |  | $V_{BE} = 0; V_{CE} = 60\text{ V}$   | –    | –    | 50   | nA            |
|   |  | $V_{BE} = 0; V_{CE} = 80\text{ V}$   | –    | –    | 50   | nA            |
| $I_{EBO}$   | emitter cut-off current                                  | $I_C = 0; V_{EB} = 4\text{ V}$   | –    | –    | 50   | nA            |
| $h_{FE}$  | DC current gain  | $V_{CE} = 10\text{ V}$<br>$I_C = 150\text{ mA}$                                    | 1000 | –    | –    |               |
|   |  | $I_C = 500\text{ mA}$  | 2000 | –    | –    |               |
|   |  |  |      |      |      |               |
| $V_{CEsat}$   | collector-emitter saturation voltage                     | $I_C = 500\text{ mA}; I_B = 0.5\text{ mA}$   | –    | –    | 1.3  | V             |
|   |  | $I_C = 500\text{ mA}; I_B = 0.5\text{ mA}; T_j = 200\text{ }^\circ\text{C}$        | –    | –    | 1.3  | V             |
| $V_{CEsat}$   | collector-emitter saturation voltage<br>BSS51            | $I_C = 1\text{ A}; I_B = 1\text{ mA}$  | –    | –    | 1.6  | V             |
|   |  | $I_C = 1\text{ A}; I_B = 1\text{ mA}; T_j = 200\text{ }^\circ\text{C}$             | –    | –    | 2.3  | V             |
| $V_{CEsat}$   | collector-emitter saturation voltage<br>BSS50; BSS52     | $I_C = 1\text{ A}; I_B = 4\text{ mA}$  | –    | –    | 1.6  | V             |
|   |  | $I_C = 1\text{ A}; I_B = 4\text{ mA}; T_j = 200\text{ }^\circ\text{C}$             | –    | –    | 1.6  | V             |
| $V_{BEsat}$   | base-emitter saturation voltage                          | $I_C = 500\text{ mA}; I_B = 0.5\text{ mA}$   | –    | –    | 1.9  | V             |
| $V_{BEsat}$   | base-emitter saturation voltage<br>BSS51<br>BSS50; BSS52 | $I_C = 1\text{ A}; I_B = 1\text{ mA}$  | –    | –    | 2.2  | V             |
|   |  | $I_C = 1\text{ A}; I_B = 4\text{ mA}$  | –    | –    | 2.2  | V             |
| $V_{BEon}$  | base-emitter on-state voltage                            | $I_C = 150\text{ mA}; V_{CE} = 10\text{ V}$  | 1.3  | –    | 1.65 | V             |
|   |  | $I_C = 500\text{ mA}; V_{CE} = 10\text{ V}$  | 1.4  | –    | 1.75 | V             |
| $f_T$   | transition frequency                                     | $I_C = 500\text{ mA}; V_{CE} = 5\text{ V}; f = 100\text{ MHz}$                     | –    | 200  | –    | MHz           |
| <b>Switching times (between 10% and 90% levels)</b> |  |  |      |      |      |               |
| $t_{on}$  | turn-on time   | $I_{Con} = 500\text{ mA}; I_{Bon} = 0.5\text{ mA};$<br>$I_{Boff} = -0.5\text{ mA}$ | –    | 0.5  | –    | $\mu\text{s}$ |
|   |  | $I_{Con} = 1\text{ A}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$             | –    | 0.4  | –    | $\mu\text{s}$ |
| $t_{off}$   | turn-off time  | $I_{Con} = 500\text{ mA}; I_{Bon} = 0.5\text{ mA};$<br>$I_{Boff} = -0.5\text{ mA}$ | –    | 1.3  | –    | $\mu\text{s}$ |
|   |  | $I_{Con} = 1\text{ A}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$             | –    | 1.5  | –    | $\mu\text{s}$ |

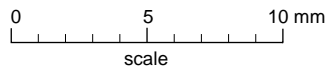
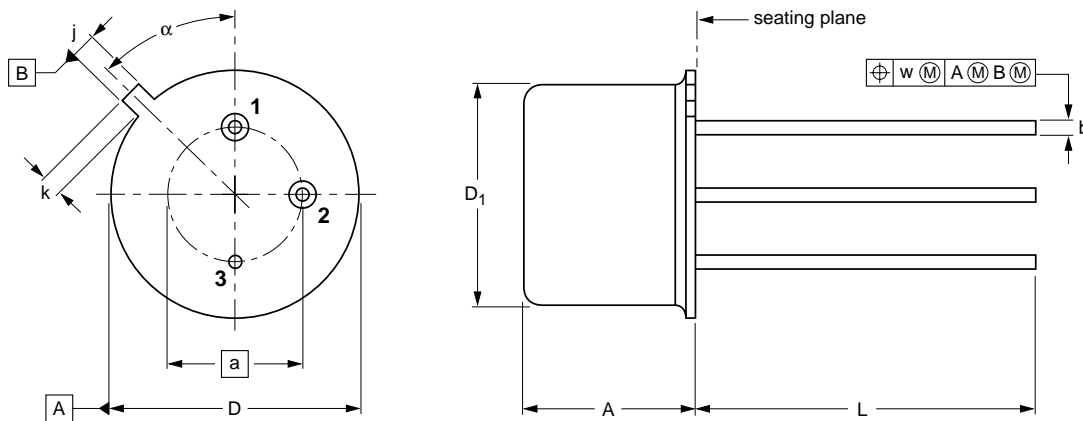
NPN Darlington transistors

BSS50; BSS51; BSS52

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT5/11



DIMENSIONS (mm are the original dimensions)

| UNIT | A            | a    | b            | D            | D <sub>1</sub> | j            | k            | L            | w   | α   |
|------|--------------|------|--------------|--------------|----------------|--------------|--------------|--------------|-----|-----|
| mm   | 6.60<br>6.35 | 5.08 | 0.48<br>0.41 | 9.39<br>9.08 | 8.33<br>8.18   | 0.85<br>0.75 | 0.95<br>0.75 | 14.2<br>12.7 | 0.2 | 45° |

| OUTLINE VERSION | REFERENCES |       |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |  |                     |            |
| SOT5/11         |            | TO-39 |      |  |                     | 97-04-11   |

## NPN Darlington transistors

## BSS50; BSS51; BSS52

**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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NPN Darlington transistors

BSS50; BSS51; BSS52

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