New Jersey Semi-Conductor Products, Inc.

20 STERN AVE.
SPRINGFIELD, NEW JERSEY 07081
U.S.A.

TELEPHONE: (973) 376-2922
(212) 227-6005
FAX: (973) 376-8960

# 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 |

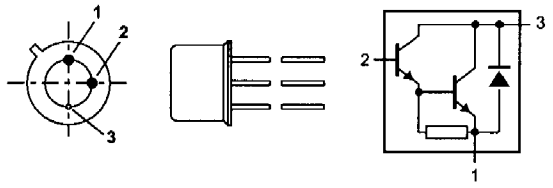



Fig.1 Simplified outline (TO-39) and symbol.

## 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 | $T_{amb} \leq 25$ °C | – | – | 0.8 | W |
| | | $T_{case} \leq 25$ °C | – | – | 5 | W |
| $h_{FE}$ | DC current gain | $I_C$ = 500 mA; $V_{CE}$ = 10 V | 2000 | – | – | |
| $f_T$ | transition frequency | $I_C$ = 500 mA; $V_{CE}$ = 5 V; f = 100 MHz | – | 200 | – | MHz |

## LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | 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 |
| $V_{EBO}$ | 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 | $T_{amb} \leq 25$ °C | – | 0.8 | W |
| | | $T_{case} \leq 25$ °C | – | 5 | W |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | | – | 200 | °C |
| $T_{amb}$ | operating ambient temperature | | –65 | +150 | °C |

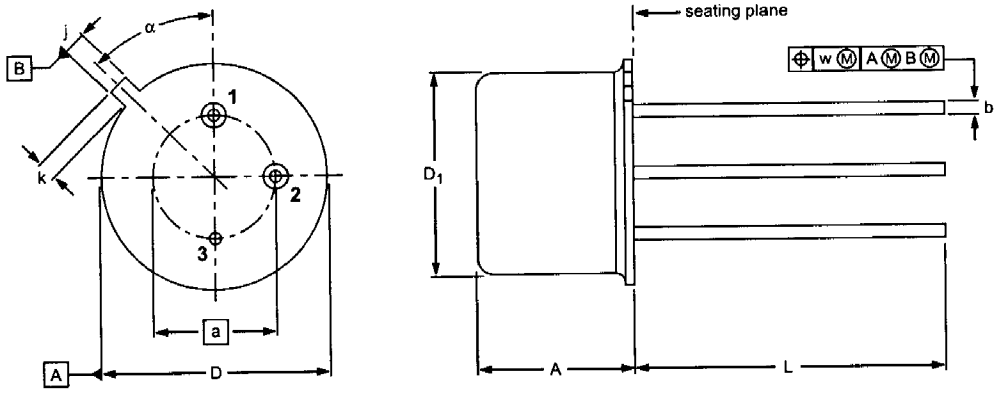
## THERMAL CHARACTERISTICS

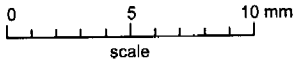
| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---|---|---|---|---|
| $R_{th\ j\text{-}a}$ | thermal resistance from junction to ambient | in free air | 220 | K/W |
| $R_{th\ j\text{-}c}$ | thermal resistance from junction to case | | 35 | K/W |

## CHARACTERISTICS

$T_j$ = 25 °C unless otherwise specified.

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




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | a | b | D | $D_1$ | 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 | | | |
|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | |
| SOT5/11 | | TO-39 | | |