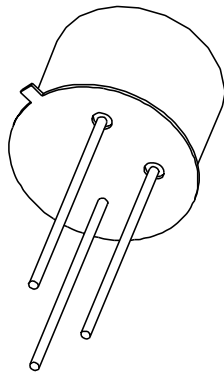


DATA SHEET



BSX59; BSX61 NPN switching transistors

Product specification
Supersedes data of September 1994
File under Discrete Semiconductors, SC04

1997 May 22

NPN switching transistors

BSX59; BSX61

FEATURES

- High current (max. 1 A)
- Low voltage (max. 45 V).

APPLICATIONS

- High-speed switching in industrial applications.

DESCRIPTION

NPN switching transistor in a TO-39 metal package.

PINNING

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

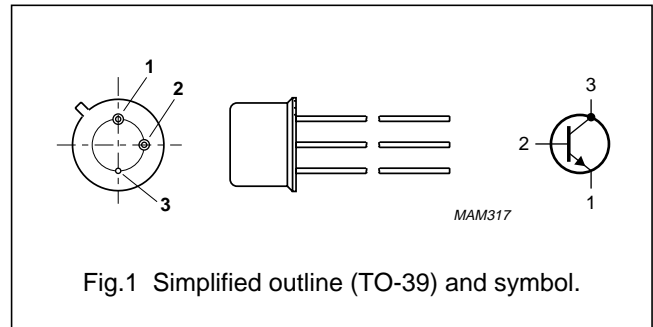


Fig.1 Simplified outline (TO-39) and symbol.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---------------------------|---|------|------|------|
| V_{CBO} | collector-base voltage | open emitter | – | 70 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 45 | V |
| I_C | collector current (DC) | | – | 1 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ }^\circ\text{C}$ | – | 800 | mW |
| h_{FE} | DC current gain | $I_C = 50\text{ mA}; V_{CE} = 1\text{ V}$ | 30 | – | |
| f_T | transition frequency | $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$ | 250 | – | MHz |
| t_{off} | turn-off time | $I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA}; I_{Boff} = -50\text{ mA}$ | – | 60 | ns |
| | BSX59 | | | 100 | ns |
| | BSX61 | | | | |

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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 | – | 70 | V |
| V_{CEO} | collector-emitter voltage | open base | – | 45 | V |
| V_{EBO} | emitter-base voltage | open collector | – | 5 | V |
| I_C | collector current (DC) | | – | 1 | A |
| I_{CM} | peak collector current | | – | 1 | A |
| I_{BM} | peak base current | | – | 200 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | – | 800 | mW |
| 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 |
|---------------|---|-------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | in free air | 220 | K/W |
| $R_{th\ j-c}$ | thermal resistance from junction to case | | 43 | K/W |

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CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|--|------|------|------|---------------|
| I_{CBO} | collector cut-off current | $I_E = 0; V_{CB} = 40\text{ V}$ | – | – | 500 | nA |
| | | $I_E = 0; V_{CB} = 40\text{ V}; T_j = 150\text{ °C}$ | – | – | 300 | μA |
| I_{EBO} | emitter cut-off current BSX59 BSX61 | $I_C = 0; V_{EB} = 4\text{ V}$ | – | – | 300 | nA |
| | | | – | – | 500 | nA |
| I_{EBO} | emitter cut-off current | $I_C = 0; V_{EB} = 4\text{ V}; T_j = 150\text{ °C}$ | – | – | 50 | μA |
| h_{FE} | DC current gain | $I_C = 150\text{ mA}; V_{CE} = 1\text{ V}$ | 30 | – | – | |
| | | $I_C = 500\text{ mA}; V_{CE} = 1\text{ V}$ | 30 | – | 90 | |
| | | $I_C = 1\text{ A}; V_{CE} = 5\text{ V}$ | 20 | – | – | |
| V_{CEsat} | collector-emitter saturation voltage BSX59 | $I_C = 150\text{ mA}; I_B = 15\text{ mA}$ | – | – | 300 | mV |
| | | $I_C = 500\text{ mA}; I_B = 50\text{ mA}$ | – | – | 500 | mV |
| | | $I_C = 1\text{ A}; I_B = 100\text{ mA}$ | – | – | 1 | V |
| V_{CEsat} | collector-emitter saturation voltage BSX61 | $I_C = 150\text{ mA}; I_B = 15\text{ mA}$ | – | – | 500 | mV |
| | | $I_C = 500\text{ mA}; I_B = 50\text{ mA}$ | – | – | 700 | mV |
| | | $I_C = 1\text{ A}; I_B = 100\text{ mA}$ | – | – | 1.3 | V |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 150\text{ mA}; I_B = 15\text{ mA}$ | – | – | 1 | V |
| V_{BEsat} | base-emitter saturation voltage BSX59 BSX61 | $I_C = 500\text{ mA}; I_B = 50\text{ mA}$ | 0.85 | – | 1.2 | V |
| | | | 0.7 | – | 1.3 | V |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 1\text{ A}; I_B = 100\text{ mA}$ | – | – | 1.8 | V |
| C_c | collector capacitance | $I_E = i_e = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz}$ | – | 6 | 10 | pF |
| C_e | emitter capacitance | $I_C = i_c = 0; V_{EB} = 500\text{ mV}; f = 1\text{ MHz}$ | – | 36 | 50 | pF |
| f_T | transition frequency | $I_C = 50\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$ | 250 | – | – | MHz |
| Switching times (between 10% and 90% levels) | | | | | | |
| t_{on} | turn-on time BSX59 BSX61 | $I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA};$ $I_{Boff} = -50\text{ mA}$ | – | 17 | 35 | ns |
| | | | – | 18 | 50 | ns |
| t_{off} | turn-off time BSX59 BSX61 | $I_{Con} = 500\text{ mA}; I_{Bon} = 50\text{ mA};$ $I_{Boff} = -50\text{ mA}$ | – | 45 | 60 | ns |
| | | | – | 70 | 100 | ns |

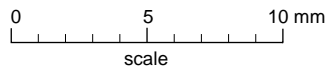
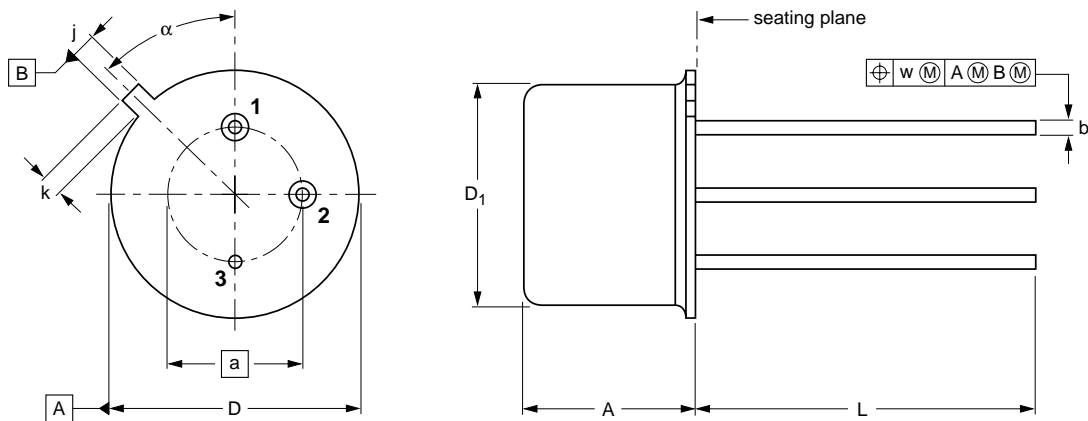
NPN switching transistors

BSX59; BSX61

PACKAGE OUTLINE

Metal-can cylindrical single-ended package; 3 leads

SOT5/11



DIMENSIONS (mm are the original dimensions)

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

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

NPN switching transistors

BSX59; BSX61

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 | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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