

**NPN medium power transistors**

**BSX45; BSX46; BSX47**

**FEATURES**

- High current (max. 1 A)
- Low voltage (max. 80 V).

**APPLICATIONS**

- General industrial applications.

**DESCRIPTION**

NPN medium power transistor in a TO-39 metal package.

**PINNING**

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

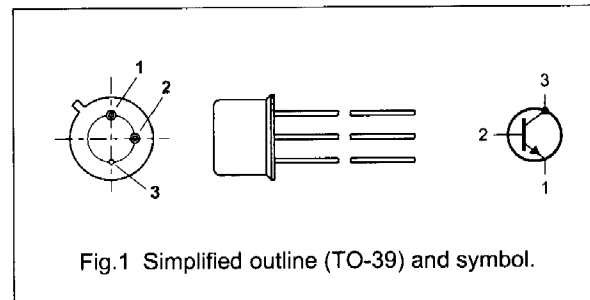
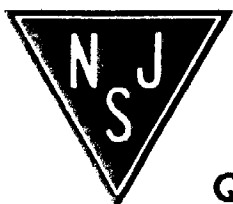


Fig.1 Simplified outline (TO-39) and symbol.

**QUICK REFERENCE DATA**

| SYMBOL           | PARAMETER                    | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|------------------|------------------------------|---|------|------|------|------|
| V <sub>CB0</sub> | collector-base voltage       | open emitter  |      |      |      |      |
|                  | BSX45                        |   | —    | —    | 80   | V    |
|                  | BSX46                        |   | —    | —    | 100  | V    |
| V <sub>CE0</sub> | collector-emitter voltage    | open base   |      |      |      |      |
|                  | BSX45                        |   | —    | —    | 40   | V    |
|                  | BSX46                        |   | —    | —    | 60   | V    |
|                  | BSX47                        |   | —    | —    | 80   | V    |
| I <sub>CM</sub>  | peak collector current       |   | —    | —    | 1.5  | A    |
| P <sub>tot</sub> | total power dissipation      | T <sub>case</sub> ≤ 25 °C                                   | —    | —    | 6.25 | W    |
| h <sub>FE</sub>  | DC current gain              | I <sub>C</sub> = 100 mA; V <sub>CE</sub> = 1 V              |      |      |      |      |
|                  | BSX45-10; BSX46-10; BSX47-10 |   | 63   | 100  | 160  |      |
|                  | BSX45-16; BSX46-16; BSX47-16 |   | 100  | 160  | 250  |      |
| f <sub>T</sub>   | transition frequency         | I <sub>C</sub> = 50 mA; V <sub>CE</sub> = 10 V; f = 100 MHz | 50   | —    | —    | MHz  |



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**Quality Semi-Conductors**

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**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              |      |      |      |
|                  | BSX45                         |                           | –    | 80   | V    |
|                  | BSX46                         |                           | –    | 100  | V    |
|                  | BSX47                         |                           | –    | 120  | V    |
| V <sub>CEO</sub> | collector-emitter voltage     | open base                 |      |      |      |
|                  | BSX45                         |                           | –    | 40   | V    |
|                  | BSX46                         |                           | –    | 60   | V    |
|                  | BSX47                         |                           | –    | 80   | V    |
| V <sub>EBO</sub> | emitter-base voltage          | open collector            | –    | 7    | V    |
| I <sub>C</sub>   | collector current (DC)        |                           | –    | 1    | A    |
| I <sub>CM</sub>  | peak collector current        |                           | –    | 1.5  | A    |
| I <sub>BM</sub>  | peak base current             |                           | –    | 200  | mA   |
| P <sub>tot</sub> | total power dissipation       | T <sub>case</sub> ≤ 25 °C | –    | 6.25 | 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 | 200   | K/W  |
| R <sub>th j-c</sub> | thermal resistance from junction to case    |             | 28    | K/W  |

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**CHARACTERISTICS**

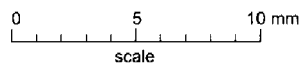
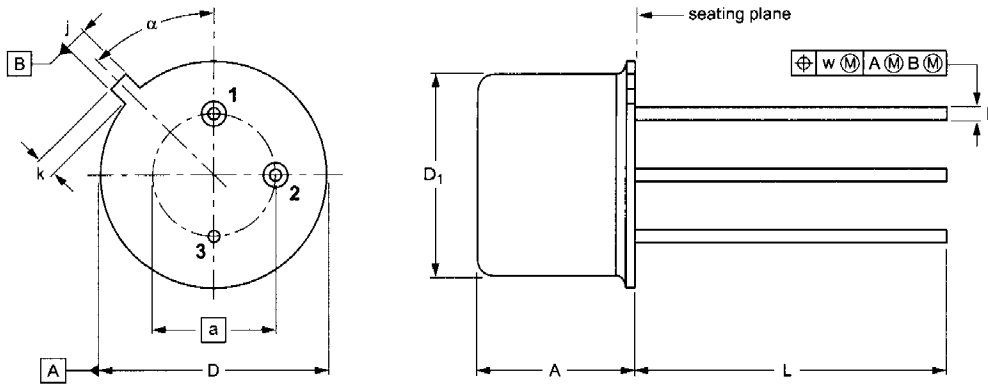
T<sub>amb</sub> = 25 °C unless otherwise specified.

| SYMBOL  | PARAMETER   | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|---|---|---|------|------|------|------|
| I <sub>CBO</sub>                                    | collector cut-off current<br>BSX45; BSX46                                       | I <sub>E</sub> = 0; V <sub>CB</sub> = 60 V  | –    | –    | 30   | nA   |
|   |   | I <sub>E</sub> = 0; V <sub>CB</sub> = 60 V; T <sub>amb</sub> = 150 °C                           | –    | –    | 10   | μA   |
| I <sub>CBO</sub>                                    | collector cut-off current<br>BSX47  | I <sub>E</sub> = 0; V <sub>CB</sub> = 80 V  | –    | –    | 30   | nA   |
|   |   | I <sub>E</sub> = 0; V <sub>CB</sub> = 80 V; T <sub>amb</sub> = 150 °                            | –    | –    | 10   | μA   |
| I <sub>EBO</sub>                                    | emitter cut-off current   | I <sub>C</sub> = 0; V <sub>EB</sub> = 5 V   | –    | –    | 10   | nA   |
| h <sub>FE</sub>                                     | DC current gain<br>BSX45-10; BSX46-10; BSX47-10<br>BSX45-16; BSX46-16           | I <sub>C</sub> = 100 μA; V <sub>CE</sub> = 1 V  | 15   | 40   | –    |      |
|   |   |   | 25   | 90   | –    |      |
| h <sub>FE</sub>                                     | DC current gain<br>BSX45-10; BSX46-10; BSX47-10<br>BSX45-16; BSX46-16; BSX47-16 | I <sub>C</sub> = 100 mA; V <sub>CE</sub> = 1 V  | 63   | 100  | 160  |      |
|   |   |   | 100  | 160  | 250  |      |
| h <sub>FE</sub>                                     | DC current gain<br>BSX45-10; BSX46-10; BSX47-10<br>BSX45-16; BSX46-16           | I <sub>C</sub> = 500 mA; V <sub>CE</sub> = 1 V  | 25   | 40   | –    |      |
|   |   |   | 35   | 60   | –    |      |
| h <sub>FE</sub>                                     | DC current gain<br>BSX45-10; BSX46-10; BSX47-10<br>BSX45-16; BSX46-16           | I <sub>C</sub> = 1 A; V <sub>CE</sub> = 1 V   | –    | 20   | –    |      |
|   |   |   | –    | 30   | –    |      |
| V <sub>CEsat</sub>                                  | collector-emitter saturation voltage<br>BSX45; BSX46                            | I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA   | –    | –    | 1    | V    |
| V <sub>CEsat</sub>                                  | collector-emitter saturation voltage<br>BSX47                                   | I <sub>C</sub> = 500 mA; I <sub>B</sub> = 25 mA   | –    | –    | 900  | mV   |
| V <sub>BE</sub>                                     | base-emitter voltage  | I <sub>C</sub> = 100 mA; V <sub>CE</sub> = 1 V  | –    | –    | 1    | V    |
|   |   | I <sub>C</sub> = 500 mA; V <sub>CE</sub> = 1 V  | 0.75 | –    | 1.5  | V    |
|   |   | I <sub>C</sub> = 1 A; V <sub>CE</sub> = 1 V   | –    | –    | 2    | V    |
| C <sub>c</sub>                                      | collector capacitance<br>BSX45<br>BSX46<br>BSX47                                | I <sub>E</sub> = I <sub>e</sub> = 0; V <sub>CB</sub> = 10 V; f = 1 MHz                          | –    | –    | 25   | pF   |
|   |   |   | –    | –    | 20   | pF   |
|   |   |   | –    | –    | 15   | pF   |
| C <sub>e</sub>                                      | emitter capacitance   | I <sub>C</sub> = I <sub>c</sub> = 0; V <sub>EB</sub> = 0.5 V; f = 1 MHz                         | –    | –    | 80   | pF   |
| f <sub>T</sub>                                      | transition frequency  | I <sub>C</sub> = 50 mA; V <sub>CE</sub> = 10 V; f = 100 MHz                                     | 50   | –    | –    | MHz  |
| F   | noise figure  | I <sub>C</sub> = 100 μA; V <sub>CE</sub> = 5 V; R <sub>S</sub> = 1 kΩ;<br>f = 1 kHz; B = 200 Hz | –    | 3.5  | –    | dB   |
| <b>Switching times (between 10% and 90% levels)</b> |   |   |      |      |      |      |
| t <sub>on</sub>                                     | turn-on time  | I <sub>Con</sub> = 100 mA; I <sub>Bon</sub> = 5 mA;<br>I <sub>Boff</sub> = –5 mA                | –    | –    | 200  | ns   |
| t <sub>off</sub>                                    | turn-off time   |   | –    | –    | 850  | ns   |

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   | $\alpha$ |
|------|--------------|------|--------------|--------------|----------------|--------------|--------------|--------------|-----|----------|
| 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 |      |                     |            |