

# DATA SHEET

## **BU506; BU506D** Silicon diffused power transistors

Product specification  
Supersedes data of December 1991  
File under Discrete Semiconductors, SC06

1997 Aug 13

# Silicon diffused power transistors

# BU506; BU506D

## DESCRIPTION

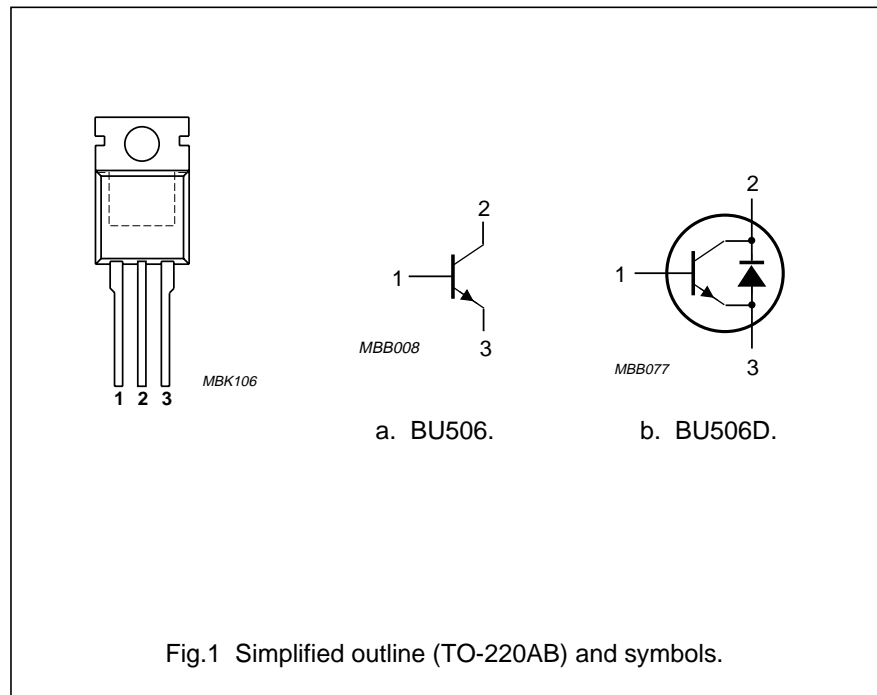
High-voltage, high-speed, switching NPN power transistor in a TO-220AB package. The BU506D has an integrated efficiency diode.

## APPLICATIONS

- Horizontal deflection circuits of colour television receivers
- Line-operated switch-mode applications.

## PINNING

| PIN | DESCRIPTION                           |
|-----|---------------------------------------|
| 1   | base                                  |
| 2   | collector; connected to mounting base |
| 3   | emitter                               |



## QUICK REFERENCE DATA

| SYMBOL      | PARAMETER                            | CONDITIONS   | TYP. | MAX. | UNIT          |
|-------------|--------------------------------------|--|------|------|---------------|
| $V_{CESM}$  | collector-emitter peak voltage       | $V_{BE} = 0$   | –    | 1500 | V             |
| $V_{CEO}$   | collector-emitter voltage            | open base  | –    | 700  | V             |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Fig.6 | –    | 1    | V             |
| $V_F$       | diode forward voltage (BU506D)       | $I_F = 3\text{ A}$ ; see Fig.10                        | 1.5  | –    | V             |
| $I_{Csat}$  | collector saturation current         |  | –    | 3    | A             |
| $I_C$       | collector current (DC)               | see Fig.2  | –    | 5    | A             |
| $I_{CM}$    | collector current (peak value)       | see Fig.2  | –    | 8    | A             |
| $P_{tot}$   | total power dissipation              | $T_{mb} \leq 25\text{ °C}$ ; see Fig.3                 | –    | 100  | W             |
| $t_f$       | fall time                            | inductive load; see Fig.9                              | 0.7  | –    | $\mu\text{s}$ |

## THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER   | VALUE | UNIT |
|----------------|---|-------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting base | 1.25  | K/W  |

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**LIMITING VALUES**

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

| SYMBOL     | PARAMETER                      | CONDITIONS   | MIN. | MAX. | UNIT             |
|------------|--------------------------------|--|------|------|------------------|
| $V_{CESM}$ | collector-emitter peak voltage | $V_{BE} = 0$                                       | –    | 1500 | V                |
| $V_{CEO}$  | collector-emitter voltage      | open base  | –    | 700  | V                |
| $I_{Csat}$ | collector saturation current   |  | –    | 3    | A                |
| $I_C$      | collector current (DC)         | see Fig.2  | –    | 5    | A                |
| $I_{CM}$   | collector current (peak value) | see Fig.2  | –    | 8    | A                |
| $I_B$      | base current (DC)              |  | –    | 3    | A                |
| $I_{BM}$   | base current (peak value)      |  | –    | 5    | A                |
| $P_{tot}$  | total power dissipation        | $T_{mb} \leq 25\text{ }^\circ\text{C}$ ; see Fig.3 | –    | 100  | W                |
| $T_{stg}$  | storage temperature            |  | –65  | +150 | $^\circ\text{C}$ |
| $T_j$      | junction temperature           |  | –    | 150  | $^\circ\text{C}$ |

**CHARACTERISTICS**

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

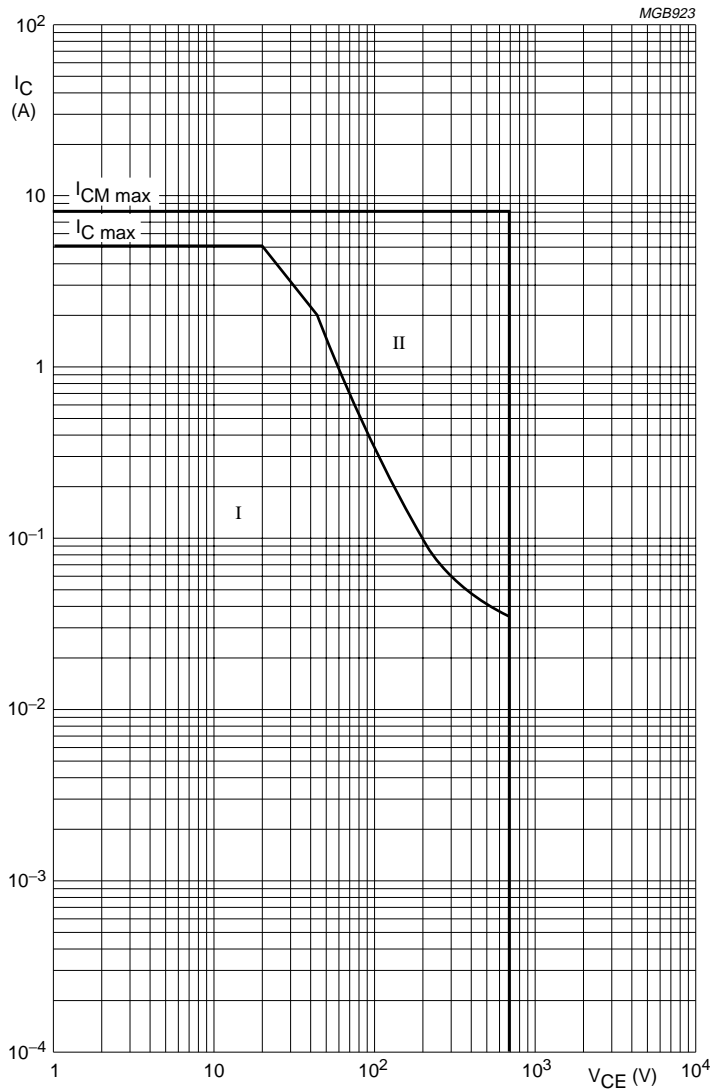
| SYMBOL  | PARAMETER                            | CONDITIONS   | MIN. | TYP. | MAX. | UNIT          |
|---|--------------------------------------|--|------|------|------|---------------|
| $V_{CEOsust}$   | collector-emitter sustaining voltage | see Figs 4 and 5   | 700  | –    | –    | V             |
| $V_{CEsat}$   | collector-emitter saturation voltage | $I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Fig.6                               | –    | –    | 1    | V             |
| $V_{BEsat}$   | base-emitter saturation voltage      | $I_C = 3\text{ A}$ ; $I_B = 1.33\text{ A}$ ; see Fig.7                               | –    | –    | 1.3  | V             |
| $V_F$   | diode forward voltage (BU506D)       | $I_F = 3\text{ A}$ ; see Fig.10  | –    | 1.5  | 2.2  | V             |
| $I_{CES}$   | collector-emitter cut-off current    | $V_{CE} = V_{CESmax}$ ; $V_{BE} = 0$ ; note 1  | –    | –    | 0.5  | mA            |
|   |                                      | $V_{CE} = V_{CESmax}$ ; $V_{BE} = 0$ ;<br>$T_j = 125\text{ }^\circ\text{C}$ ; note 1 | –    | –    | 1    | mA            |
| $I_{EBO}$   | emitter-base cut-off current         | $V_{EB} = 6\text{ V}$ ; $I_C = 0$  | –    | –    | 10   | mA            |
| $h_{FE}$  | DC current gain                      | $V_{CE} = 5\text{ V}$ ; $I_C = 100\text{ mA}$ ;<br>see Fig.8                         | 6    | 13   | 30   |               |
| <b>Switching times in horizontal deflection circuit (see Fig.9)</b> |                                      |  |      |      |      |               |
| $t_s$   | storage time                         | $I_{CM} = 3\text{ A}$ ; $I_{B(end)} = 1\text{ A}$ ;<br>$L_B = 12\text{ }\mu\text{H}$ | –    | 6.5  | –    | $\mu\text{s}$ |
| $t_f$   | fall time                            | $I_{CM} = 3\text{ A}$ ; $I_{B(end)} = 1\text{ A}$ ;<br>$L_B = 12\text{ }\mu\text{H}$ | –    | 0.7  | –    | $\mu\text{s}$ |

**Note**

1. Measured with a half-sinewave voltage (curve tracer).

Silicon diffused power transistors

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$T_{mb} = 25\ ^\circ\text{C}$ .

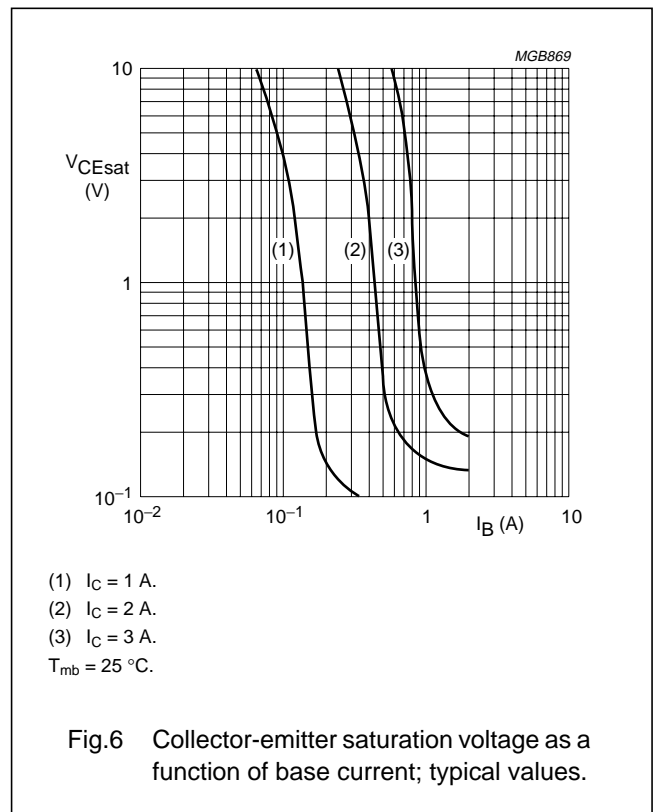
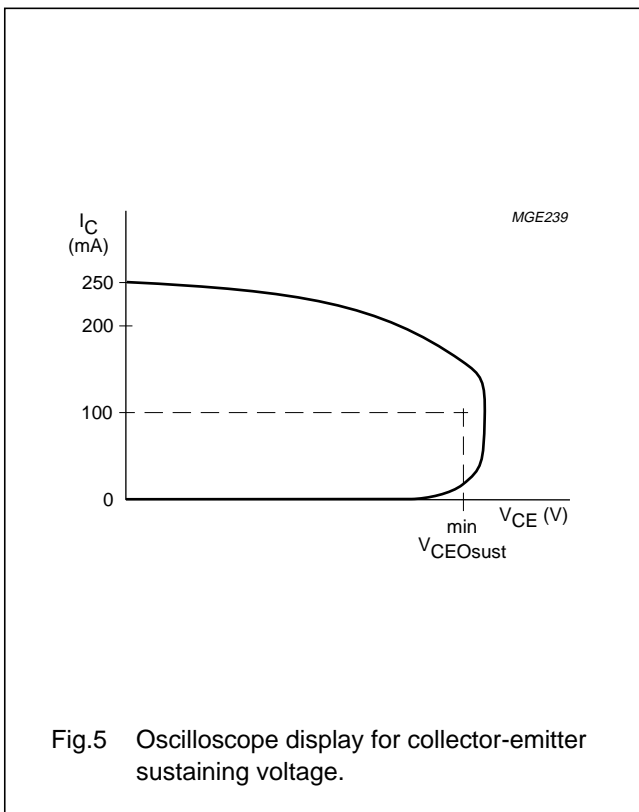
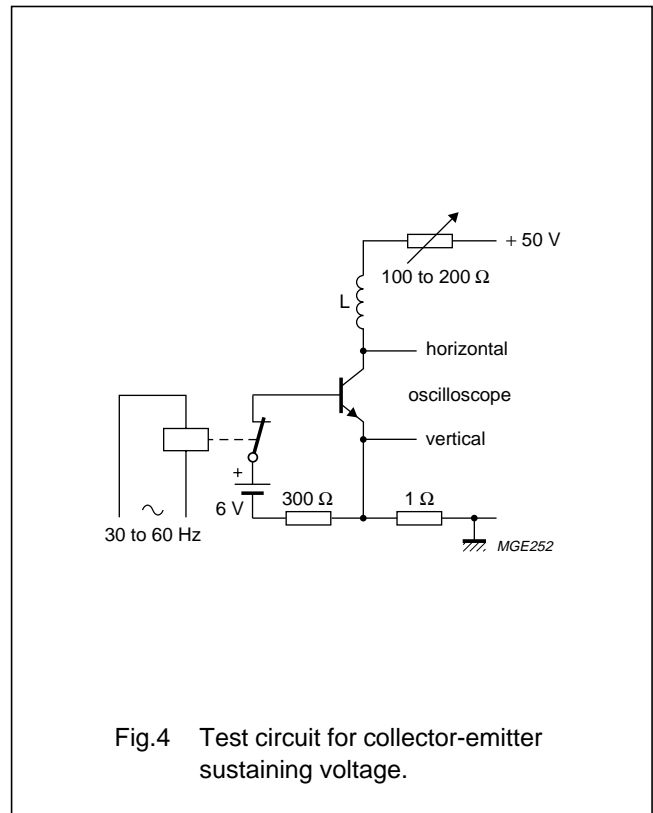
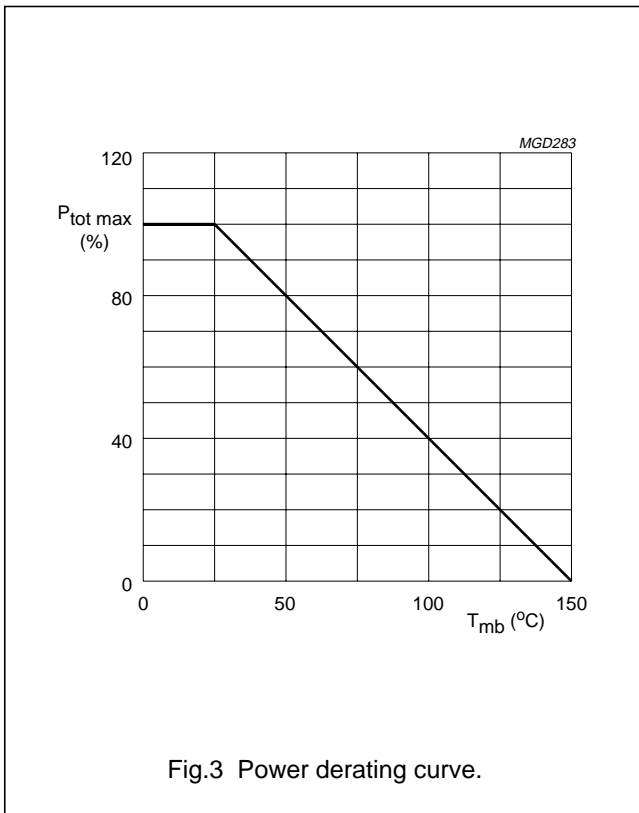
I - Region of permissible DC operation.

II - Permissible extension for repetitive pulse operation.

Fig.2 Forward bias SOAR.

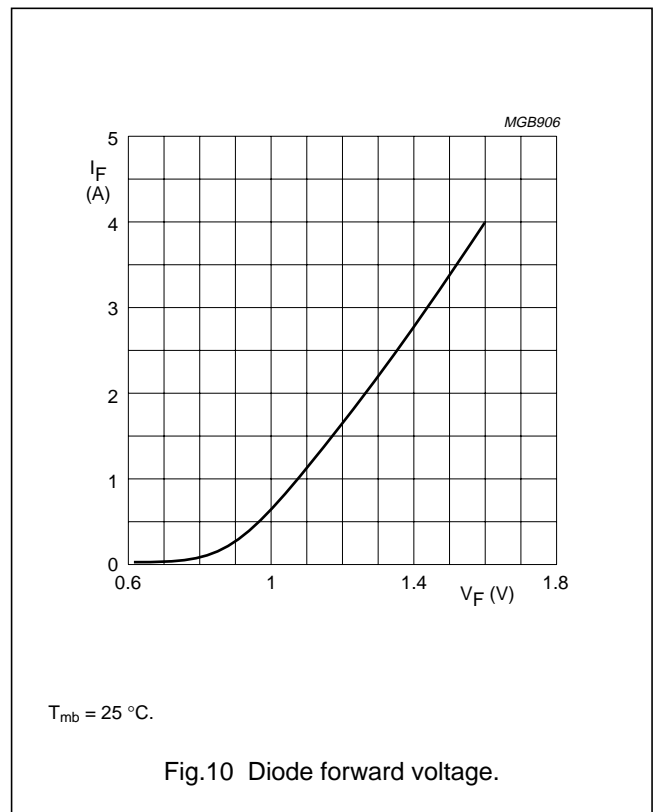
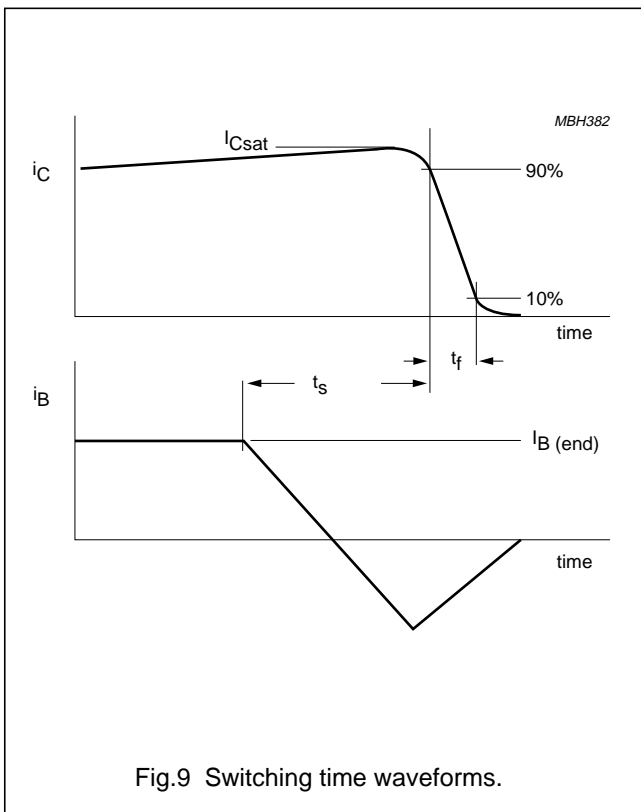
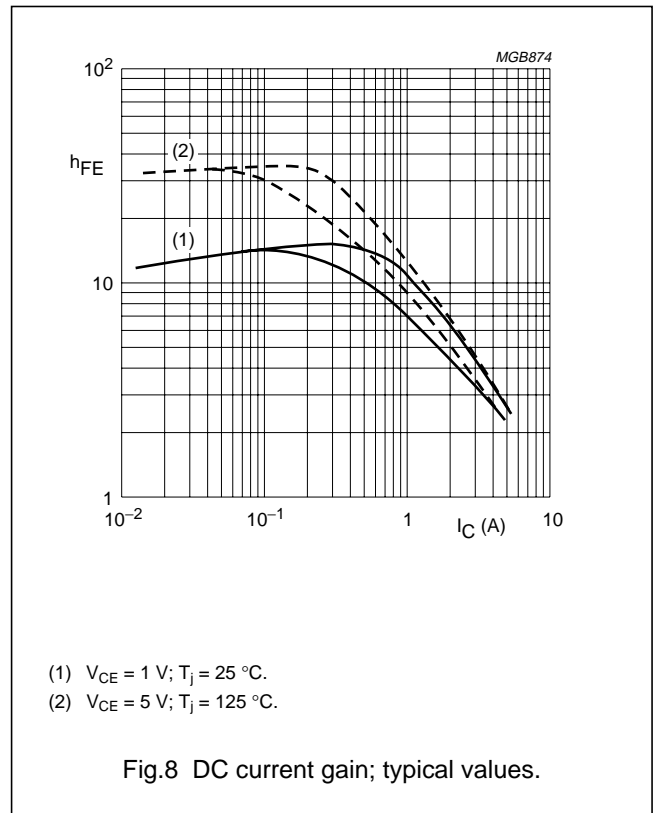
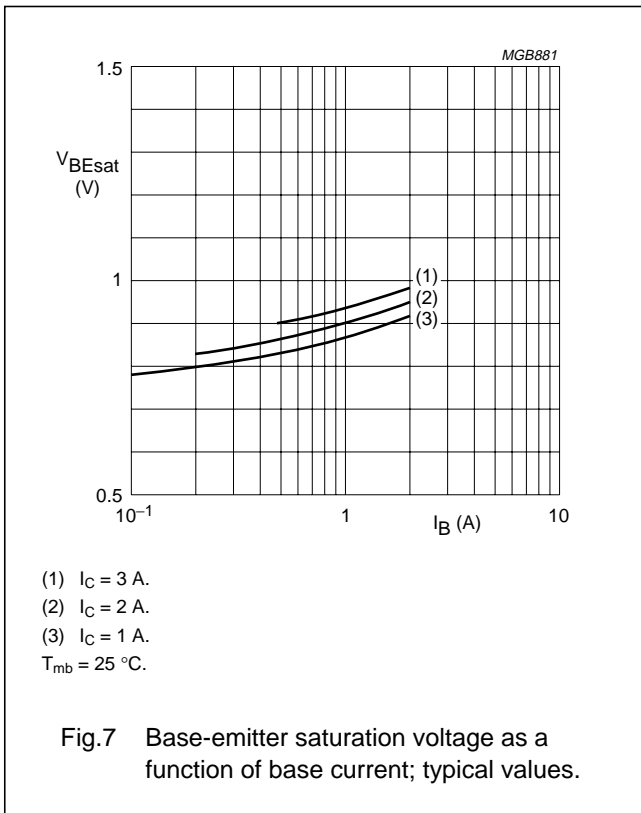
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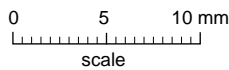
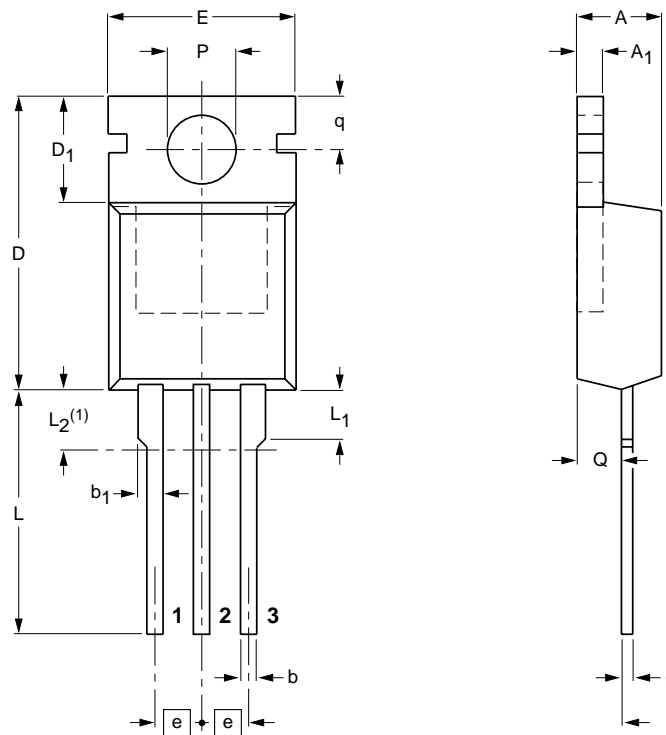
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PACKAGE OUTLINE

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220

SOT78



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub> | b          | b <sub>1</sub> | c          | D            | D <sub>1</sub> | E           | e    | L            | L <sub>1</sub> | L <sub>2</sub> <sup>(1)</sup><br>max. | P          | q          | Q          |
|------|------------|----------------|------------|----------------|------------|--------------|----------------|-------------|------|--------------|----------------|---------------------------------------|------------|------------|------------|
| mm   | 4.5<br>4.1 | 1.39<br>1.27   | 0.9<br>0.7 | 1.3<br>1.0     | 0.7<br>0.4 | 15.8<br>15.2 | 6.4<br>5.9     | 10.3<br>9.7 | 2.54 | 15.0<br>13.5 | 3.30<br>2.79   | 3.0                                   | 3.8<br>3.6 | 3.0<br>2.7 | 2.6<br>2.2 |

Note

1. Terminals in this zone are not tinned.

| OUTLINE VERSION | REFERENCES |        |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|--|---------------------|------------|
|                 | IEC        | JEDEC  | EIAJ |  |                     |            |
| SOT78           |            | TO-220 |      |  |                     | 97-06-11   |

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**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>  |   |
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**NOTES**

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**NOTES**

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