

# BUJ100LR

NPN power transistor

Rev. 02 — 29 July 2010

Product data sheet

## 1. Product profile

### 1.1 General description

High voltage, high speed, planar passivated NPN power switching transistor in a SOT54 (TO-92) 3 leads plastic package.

### 1.2 Features and benefits

- Fast switching
- High voltage capability of 700 V

### 1.3 Applications

- Compact fluorescent lamps (CFL)
- Inverters
- Electronic lighting ballasts
- Off-line self-oscillating power supplies

### 1.4 Quick reference data

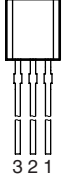
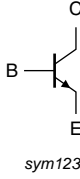
Table 1. Quick reference data

| Symbol                        | Parameter                      | Conditions   | Min | Typ | Max | Unit |
|-------------------------------|--------------------------------|--|-----|-----|-----|------|
| $I_C$                         | collector current              | DC; see <a href="#">Figure 2</a>   | -   | -   | 1   | A    |
| $P_{tot}$                     | total power dissipation        | $T_{lead} \leq 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 1</a>  | -   | -   | 2.1 | W    |
| $V_{CESM}$                    | collector-emitter peak voltage | $V_{BE} = 0\text{ V}$  | -   | -   | 700 | V    |
| <b>Static characteristics</b> |                                |  |     |     |     |      |
| $h_{FE}$                      | DC current gain                | $V_{CE} = 5\text{ V}$ ; $I_C = 0.8\text{ A}$ ;<br>$T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 8</a> ;<br>see <a href="#">Figure 9</a> | 5   | 7.5 | 20  |      |



## 2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline  | Graphic symbol  |
|-----|--------|-------------|---|---|
| 1   | B      | base        |  |  |
| 2   | C      | collector   |   |   |
| 3   | E      | emitter     |   |   |

**SOT54 (TO-92)**

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |   |         |
|-------------|---------|---|---------|
|             | Name    | Description   | Version |
| BUJ100LR    | TO-92   | plastic single-ended leaded (through hole) package; 3 leads | SOT54   |

## 4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol     | Parameter                      | Conditions  | Min | Max | Unit |
|------------|--------------------------------|---|-----|-----|------|
| $V_{CESM}$ | collector-emitter peak voltage | $V_{BE} = 0\text{ V}$                                       | -   | 700 | V    |
| $V_{CBO}$  | collector-base voltage         | $I_E = 0\text{ A}$  | -   | 700 | V    |
| $V_{CEO}$  | collector-emitter voltage      | $I_B = 0\text{ A}$  | -   | 400 | V    |
| $I_C$      | collector current              | DC; see <a href="#">Figure 2</a>                            | -   | 1   | A    |
| $I_{CM}$   | peak collector current         |   | -   | 2   | A    |
| $I_B$      | base current                   | DC  | -   | 0.5 | A    |
| $I_{BM}$   | peak base current              |   | -   | 1   | A    |
| $P_{tot}$  | total power dissipation        | $T_{lead} \leq 25\text{ °C}$ ; see <a href="#">Figure 1</a> | -   | 2.1 | W    |
| $T_{stg}$  | storage temperature            |   | -65 | 150 | °C   |
| $T_j$      | junction temperature           |   | -   | 150 | °C   |
| $V_{EBO}$  | emitter-base voltage           | $I_C = 0\text{ A}$ ; $I(\text{Emitter}) = 10\text{ mA}$     | -   | 9   | V    |

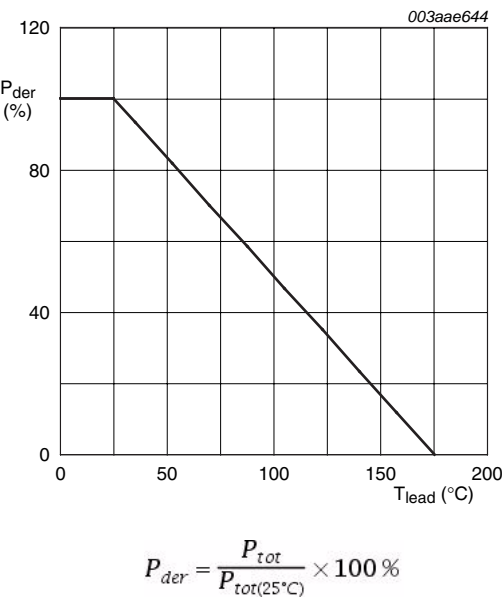


Fig 1. Normalized total power dissipation as a function of lead temperature

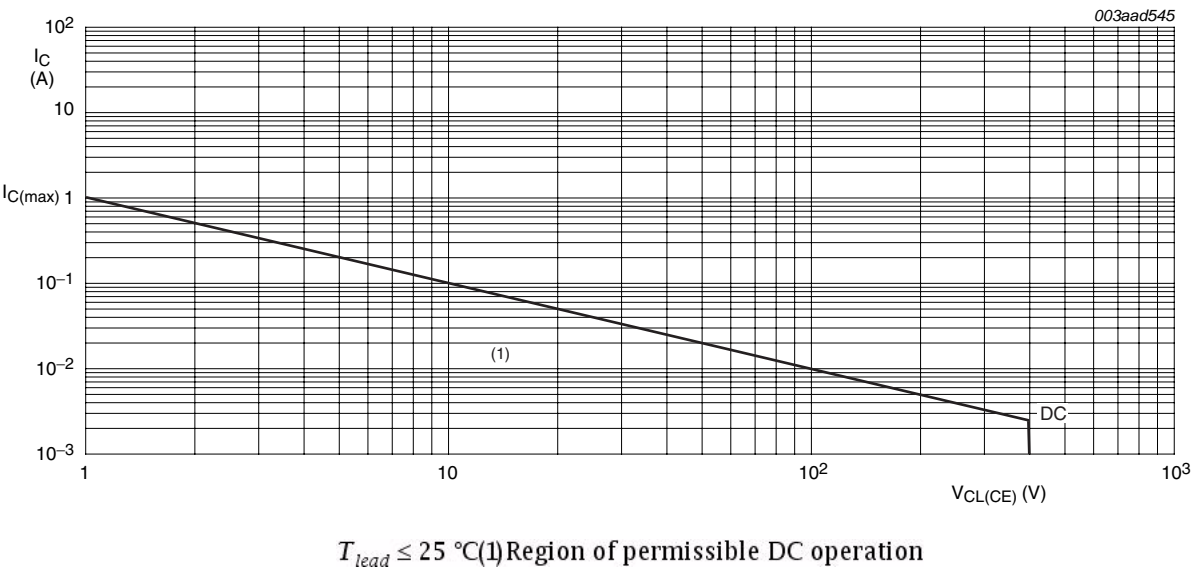


Fig 2. Forward bias safe operating area

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol           | Parameter                                   | Conditions                                      | Min | Typ | Max | Unit |
|------------------|---|---|-----|-----|-----|------|
| $R_{th(j-lead)}$ | thermal resistance from junction to lead    | see <a href="#">Figure 3</a>                    | -   | -   | 60  | K/W  |
| $R_{th(j-a)}$    | thermal resistance from junction to ambient | printed-circuit board mounted; lead length 4 mm | -   | 150 | -   | K/W  |

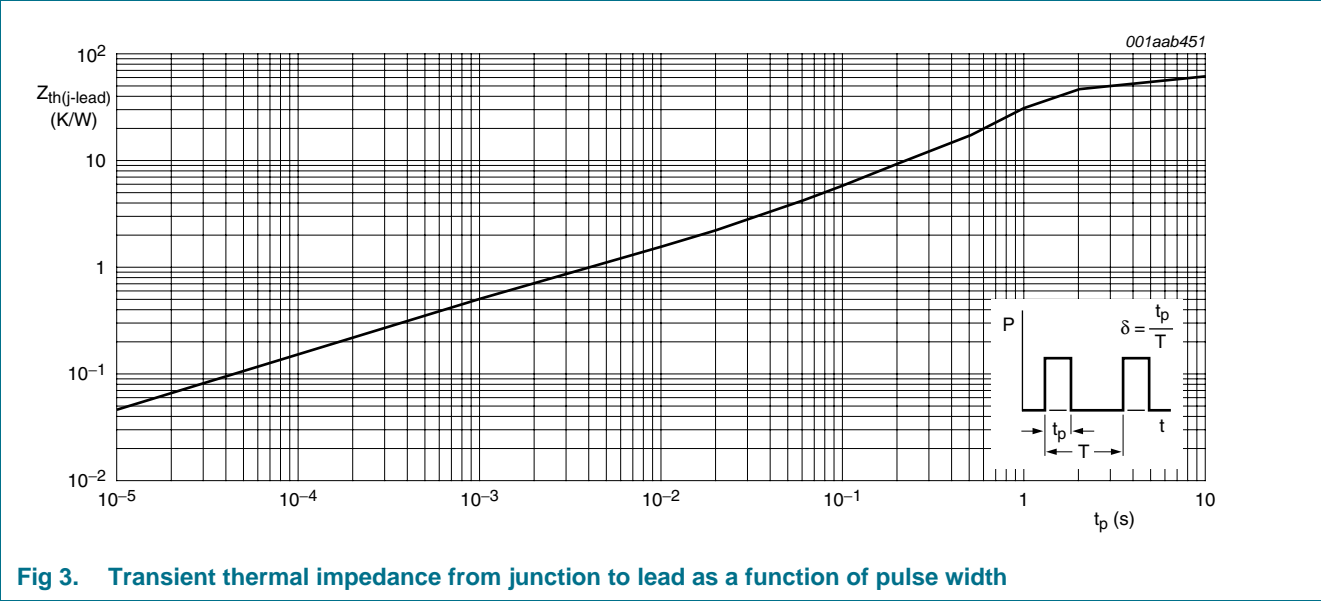


Fig 3. Transient thermal impedance from junction to lead as a function of pulse width

## 6. Characteristics

Table 6. Characteristics

| Symbol                  | Parameter                            | Conditions   | Min | Typ | Max | Unit |
|-------------------------|--------------------------------------|--|-----|-----|-----|------|
| Static characteristics  |                                      |  |     |     |     |      |
| $I_{CES}$               | collector-emitter cut-off current    | $V_{BE} = 0\text{ V}$ ; $V_{CE} = 700\text{ V}$ ; $T_j = 125\text{ }^{\circ}\text{C}$  | -   | -   | 5   | mA   |
| $I_{EBO}$               | emitter-base cut-off current         | $V_{EB} = 9\text{ V}$ ; $I_C = 0\text{ A}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$   | -   | -   | 1   | mA   |
| $V_{CEOsus}$            | collector-emitter sustaining voltage | $I_B = 0\text{ A}$ ; $I_C = 1\text{ mA}$ ; $L_C = 25\text{ mH}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>  | 400 | -   | -   | V    |
| $V_{CEsat}$             | collector-emitter saturation voltage | $I_C = 0.25\text{ A}$ ; $I_B = 50\text{ mA}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 6</a>  | -   | 0.2 | 0.5 | V    |
|                         |                                      | $I_C = 0.5\text{ A}$ ; $I_B = 125\text{ mA}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 6</a>  | -   | 0.3 | 1   | V    |
|                         |                                      | $I_C = 0.75\text{ A}$ ; $I_B = 250\text{ mA}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 6</a>   | -   | 0.4 | 1.5 | V    |
| $V_{BEsat}$             | base-emitter saturation voltage      | $I_C = 0.25\text{ A}$ ; $I_B = 50\text{ mA}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 7</a>  | -   | -   | 1   | V    |
|                         |                                      | $I_C = 0.5\text{ A}$ ; $I_B = 125\text{ mA}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 7</a>  | -   | -   | 1.2 | V    |
| $h_{FE}$                | DC current gain                      | $I_C = 0.5\text{ mA}$ ; $V_{CE} = 2\text{ V}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$  | 12  | -   | -   |      |
|                         |                                      | $I_C = 0.4\text{ A}$ ; $V_{CE} = 5\text{ V}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 8</a> ; see <a href="#">Figure 9</a>   | 10  | -   | 30  |      |
|                         |                                      | $I_C = 0.8\text{ A}$ ; $V_{CE} = 5\text{ V}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 8</a> ; see <a href="#">Figure 9</a>   | 5   | 7.5 | 20  |      |
| Dynamic characteristics |                                      |  |     |     |     |      |
| $t_f$                   | fall time                            | $I_C = 1\text{ A}$ ; $I_{BON} = 200\text{ mA}$ ; $V_{BB} = -5\text{ V}$ ; $L_B = 1\text{ }\mu\text{H}$ ; $T_{lead} = 25\text{ }^{\circ}\text{C}$ ; inductive load; see <a href="#">Figure 10</a> ; see <a href="#">Figure 11</a> | -   | 80  | -   | ns   |

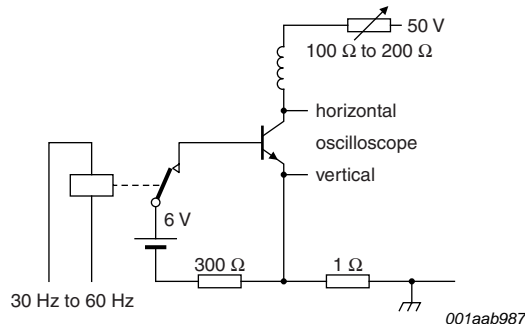


Fig 4. Test circuit for collector-emitter sustaining voltage

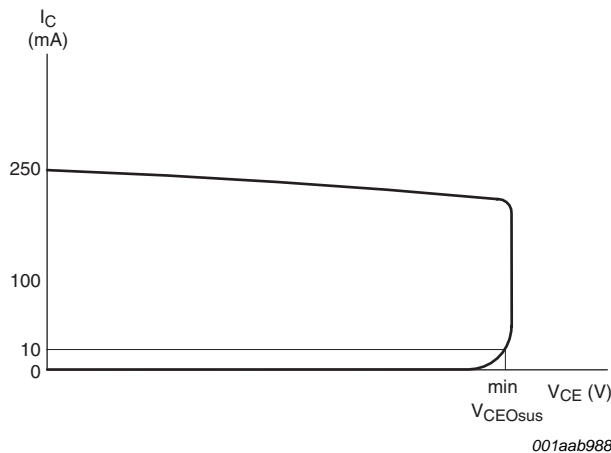


Fig 5. Oscilloscope display for collector-emitter sustaining voltage test waveform

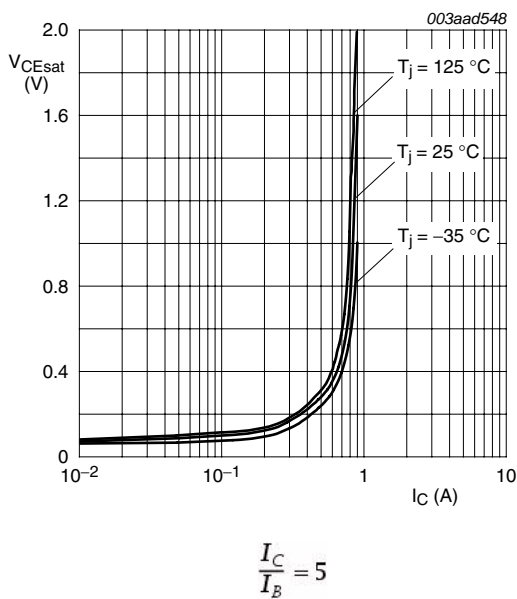


Fig 6. Collector-emitter saturation voltage as a function of collector current; typical values

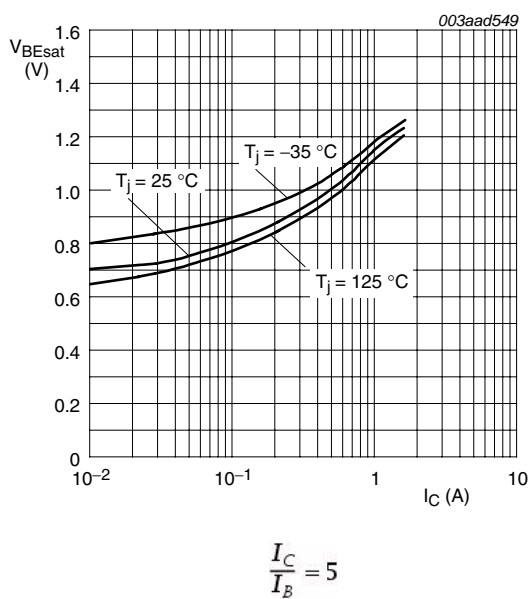
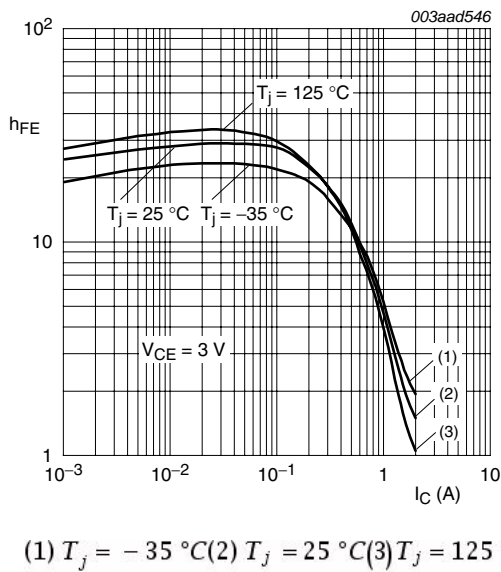
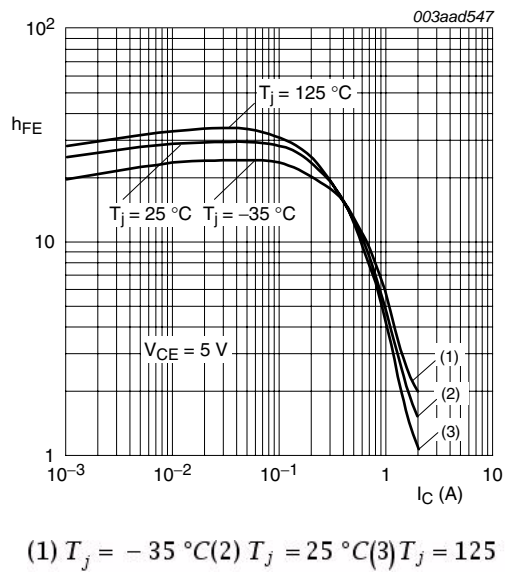


Fig 7. Base-emitter saturation voltage as a function of collector current; typical values



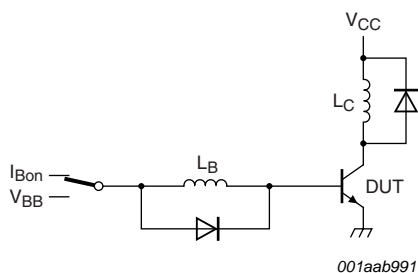
(1)  $T_j = -35^\circ\text{C}$  (2)  $T_j = 25^\circ\text{C}$  (3)  $T_j = 125^\circ\text{C}$

Fig 8. DC current gain as a function of collector current; typical values



(1)  $T_j = -35^\circ\text{C}$  (2)  $T_j = 25^\circ\text{C}$  (3)  $T_j = 125^\circ\text{C}$

Fig 9. DC current gain as a function of collector current; typical values



$V_{CC} = 300\text{ V}; V_{BB} = -5\text{ V}; L_C = 200\text{ }\mu\text{H}; L_B = 1\text{ }\mu\text{H}$

Fig 10. Test circuit for inductive load switching

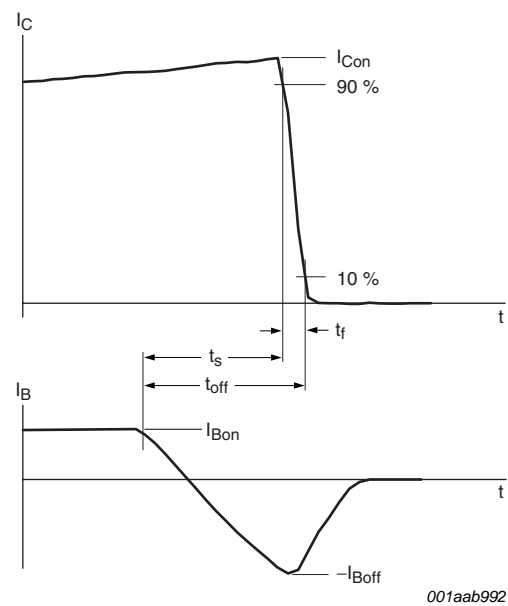


Fig 11. Switching times waveforms for inductive load

7. Package outline

Plastic single-ended leaded (through hole) package; 3 leads

SOT54

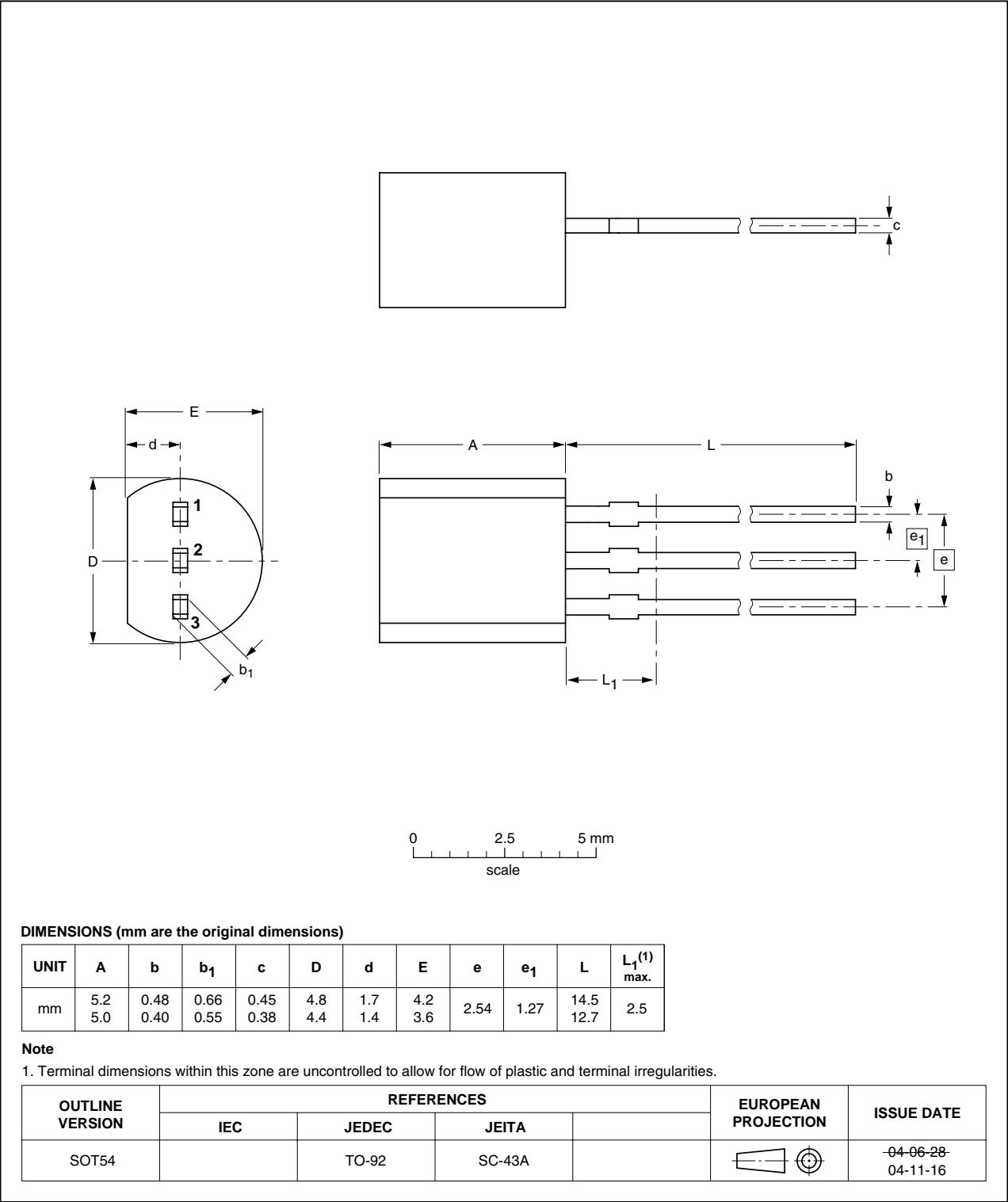


Fig 12. Package outline SOT54 (TO-92)



## 8. Revision history

**Table 7.** Revision history

| Document ID    | Release date  | Data sheet status  | Change notice | Supersedes   |
|----------------|---|--------------------|---------------|--------------|
| BUJ100LR v.2   | 20100729  | Product data sheet | -             | BUJ100LR v.1 |
| Modifications: | <ul style="list-style-type: none"><li>• Various changes to content.</li></ul> |                    |               |              |
| BUJ100LR v.1   | 20090812  | Product data sheet | -             | -            |

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### 9.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

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Date of release: 29 July 2010

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