

# ANTREX Electronics

Electronic Components Sourcing Information

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## Product Reference Information

**Part Number:** BCX54-10TF  
**Manufacturer:** Nexperia USA Inc.  
**Package:** TO-243AA  
**Availability:** Please confirm with sales

**Product Page:**

<https://antrexco.com/product/details/nexperia-usa-inc/bcx54-10tf.html>

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**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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# BCX54T series

45 V, 1 A NPN power bipolar transistors

Rev. 1 — 22 August 2019

Product data sheet

## 1. Product profile

### 1.1. General description

NPN power transistors in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package  |       | PNP complement |
|-------------|----------|-------|----------------|
|             | Nexperia | JEDEC |                |
| BCX54T      | SOT89    | SC-62 | BCX51T         |
| BCX54-10T   |          |       | BCX51-10T      |
| BCX54-16T   |          |       | BCX51-16T      |

### 1.2. Features and benefits

- High collector current capability  $I_C$  and  $I_{CM}$
- Three current gain selections
- High power dissipation capability
- AEC-Q101 qualified

### 1.3. Applications

- Linear voltage regulators
- MOSFET drivers
- Low-side switches
- Power management
- Amplifiers

### 1.4. Quick reference data

Table 2. Quick reference data

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

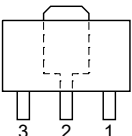
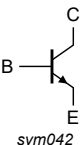
| Symbol    | Parameter                 | Conditions                           | Min | Typ | Max | Unit |
|-----------|---------------------------|--------------------------------------|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                            | -   | -   | 45  | V    |
| $I_C$     | collector current         |                                      | -   | -   | 1   | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$ | -   | -   | 2   | A    |

| Symbol   | Parameter       | Conditions                                   |     | Min | Typ | Max | Unit |
|----------|-----------------|----------------------------------------------|-----|-----|-----|-----|------|
| $h_{FE}$ | DC current gain |                                              |     |     |     |     |      |
|          | BCX54T          | $V_{CE} = 2 \text{ V}; I_C = 150 \text{ mA}$ | [1] | 63  | -   | 250 |      |
|          | BCX54-10T       |                                              | [1] | 63  | -   | 160 |      |
|          | BCX54-16T       |                                              | [1] | 100 | -   | 250 |      |

[1] pulsed;  $t_p \leq 300 \text{ } \mu\text{s}$ ;  $\delta \leq 0.02$

## 2. Pinning information

Table 3. Pinning

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

## 3. Ordering information

Table 4. Ordering information

| Type number | Package |                                                                                           |         |
|-------------|---------|-------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                               | Version |
| BCX54T      | SC-62   | plastic, surface-mounted package; 3 leads; 1.5 mm pitch;<br>4.5 mm x 2.5 mm x 1.5 mm body | SOT89   |
| BCX54-10T   |         |                                                                                           |         |
| BCX54-16T   |         |                                                                                           |         |

## 4. Marking

Table 5. Marking

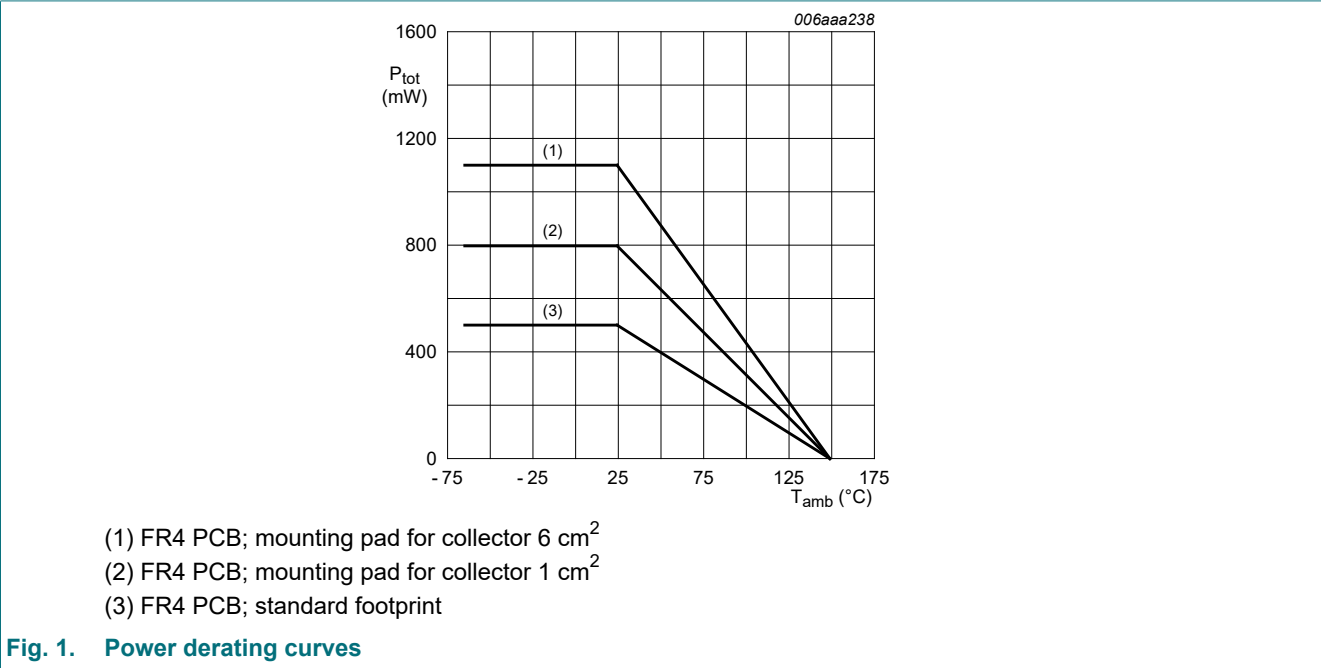
| Type number | Marking code |
|-------------|--------------|
| BCX54T      | B5           |
| BCX54-10T   | B6           |
| BCX54-16T   | B7           |

5. Limiting values

Table 6. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol    | Parameter                 | Conditions                                    | Min | Max  | Unit               |
|-----------|---------------------------|-----------------------------------------------|-----|------|--------------------|
| $V_{CBO}$ | collector-base voltage    | open emitter                                  | -   | 45   | V                  |
| $V_{CEO}$ | collector-emitter voltage | open base                                     | -   | 45   | V                  |
| $V_{EBO}$ | emitter-base voltage      | open collector                                | -   | 5    | V                  |
| $I_C$     | collector current         |                                               | -   | 1    | A                  |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$          | -   | 2    | A                  |
| $I_B$     | base current              |                                               | -   | 200  | mA                 |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$          | -   | 300  | mA                 |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [1] | -   | 500  | mW                 |
|           |                           | [2]                                           | -   | 800  | mW                 |
|           |                           | [3]                                           | -   | 1100 | mW                 |
| $T_j$     | junction temperature      |                                               | -   | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature       |                                               | -55 | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage temperature       |                                               | -65 | 150  | $^{\circ}\text{C}$ |

- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.



6. Thermal characteristics

Table 7. Thermal characteristics

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

| Symbol        | Parameter                                   | Conditions  |     | Min | Typ | Max | Unit |
|---------------|---------------------------------------------|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | -   | -   | 250 | K/W  |
|               |                                             |             | [2] | -   | -   | 157 | K/W  |
|               |                                             |             | [3] | -   | -   | 114 | K/W  |

- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.

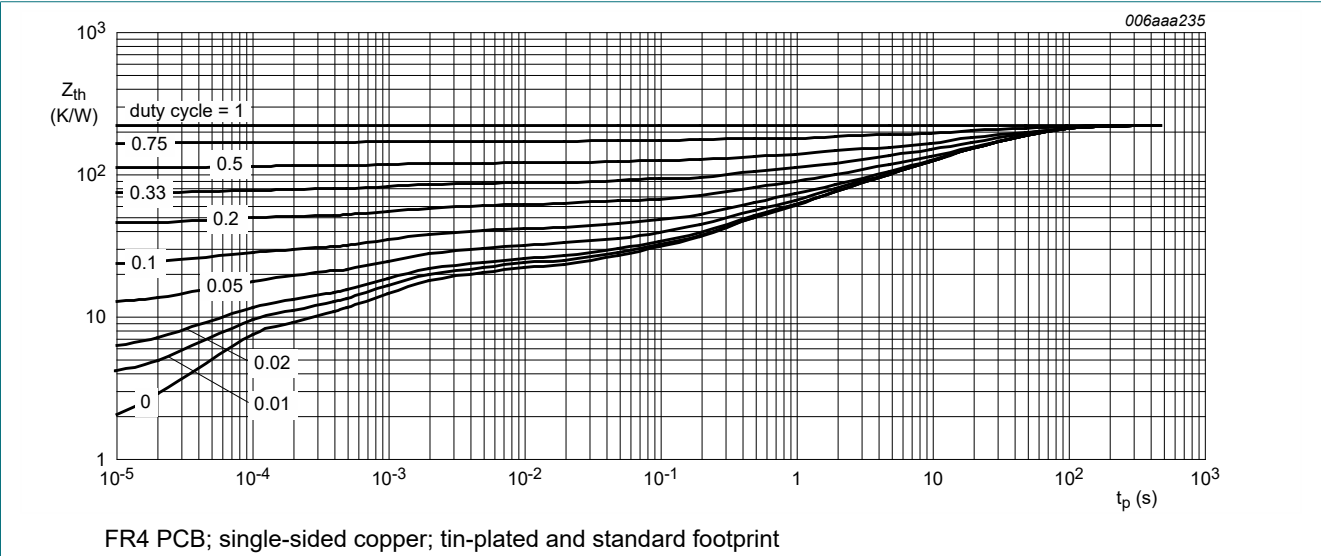


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

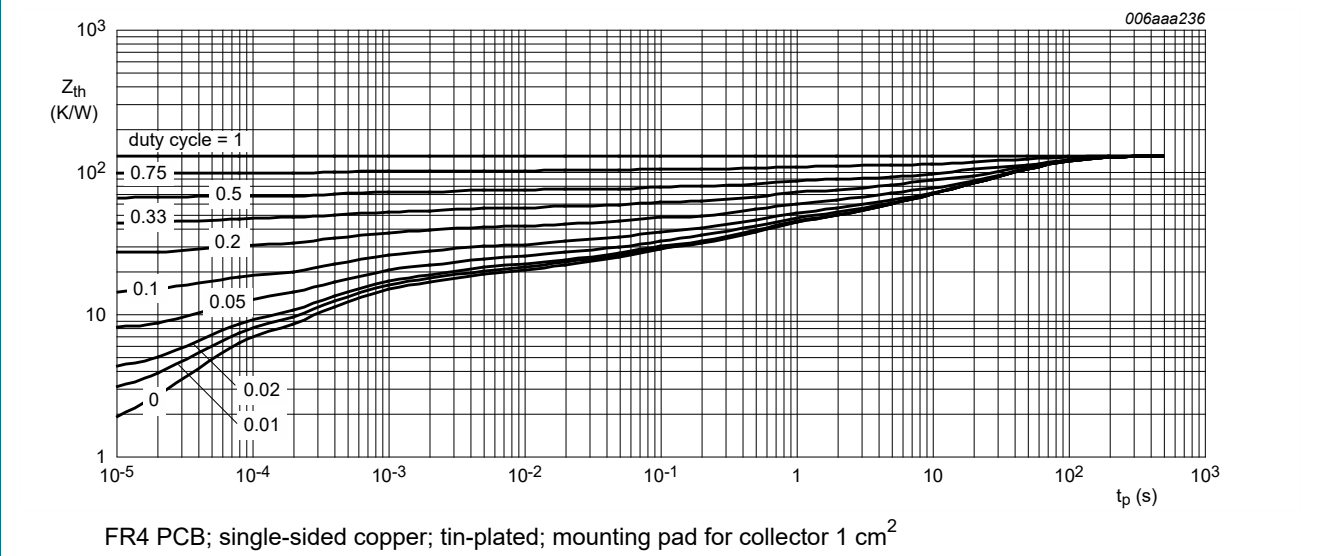
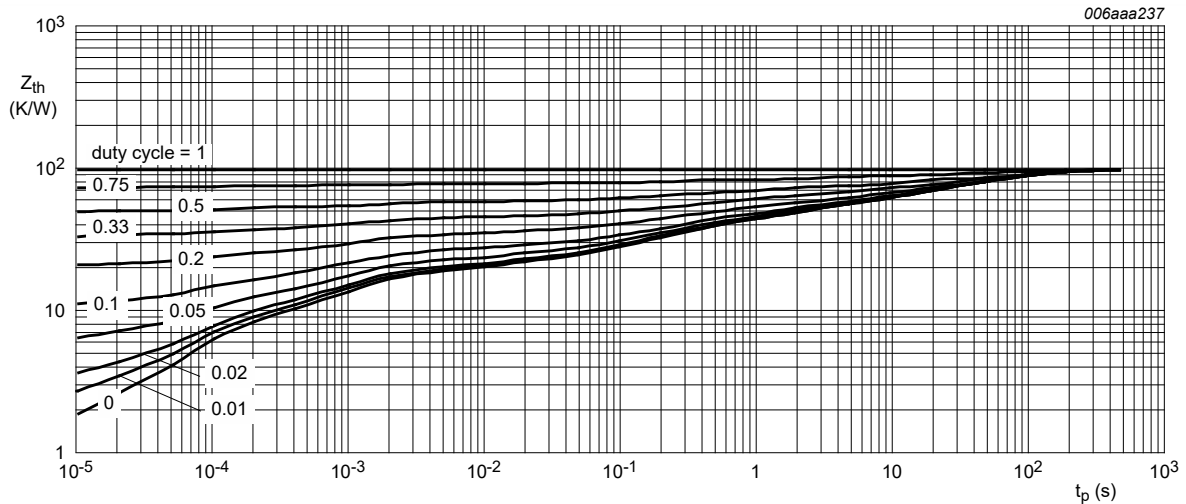


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



**Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 7. Characteristics

**Table 8. Characteristics**

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

| Symbol        | Parameter                            | Conditions                                                             | Min     | Typ | Max | Unit          |
|---------------|--------------------------------------|------------------------------------------------------------------------|---------|-----|-----|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage     | $I_C = 100\text{ }\mu\text{A}$ ; $I_E = 0\text{ A}$                    | 45      | -   | -   | V             |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage  | $I_C = 2\text{ mA}$ ; $I_E = 0\text{ A}$                               | 45      | -   | -   | V             |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage       | $I_E = 100\text{ }\mu\text{A}$ ; $I_C = 0\text{ A}$                    | 5       | -   | -   | V             |
| $I_{CBO}$     | collector-base cut-off current       | $V_{CB} = 30\text{ V}$ ; $I_E = 0\text{ A}$                            | -       | -   | 100 | nA            |
|               |                                      | $V_{CB} = 30\text{ V}$ ; $I_E = 0\text{ A}$ ; $T_J = 150\text{ °C}$    | -       | -   | 10  | $\mu\text{A}$ |
| $I_{EBO}$     | emitter-base cut-off current         | $V_{EB} = 5\text{ V}$ ; $I_C = 0\text{ A}$                             | -       | -   | 100 | nA            |
| $h_{FE}$      | DC current gain                      |                                                                        |         |     |     |               |
|               | BCX54T, -10T, -16T                   | $V_{CE} = 2\text{ V}$ ; $I_C = 5\text{ mA}$                            | 63      | -   | -   |               |
|               |                                      | $V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$                          | [1] 40  | -   | -   |               |
|               | BCX54T                               | $V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$                          | [1] 63  | -   | 250 |               |
|               | BCX54-10T                            | $V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$                          | [1] 63  | -   | 160 |               |
|               | BCX54-16T                            | $V_{CE} = 2\text{ V}$ ; $I_C = 150\text{ mA}$                          | [1] 100 | -   | 250 |               |
| $V_{CEsat}$   | collector-emitter saturation voltage | $I_C = 500\text{ mA}$ ; $I_B = 50\text{ mA}$                           | [1] -   | -   | 500 | mV            |
| $V_{BE}$      | base-emitter voltage                 | $V_{CE} = 2\text{ V}$ ; $I_C = 500\text{ mA}$                          | [1] -   | -   | 1   | V             |
| $f_T$         | transition frequency                 | $V_{CE} = 5\text{ V}$ ; $I_C = 50\text{ mA}$ ; $f = 100\text{ MHz}$    | -       | 155 | -   | MHz           |
| $C_c$         | collector capacitance                | $V_{CB} = 10\text{ V}$ ; $I_E = i_e = 0\text{ A}$ ; $f = 1\text{ MHz}$ | -       | 4.5 | -   | pF            |

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

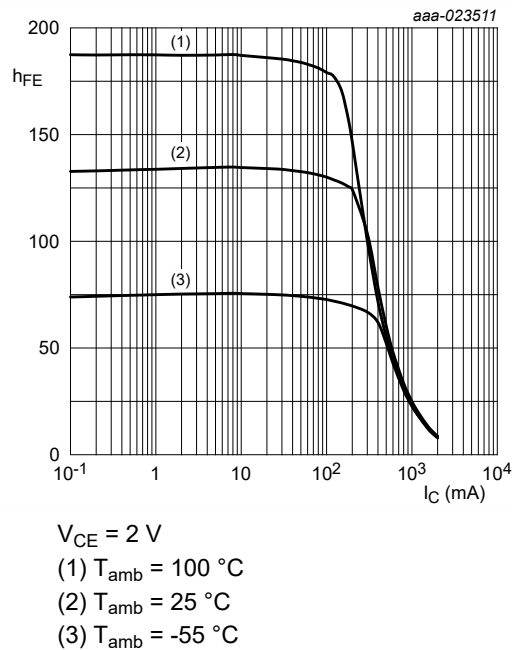


Fig. 5. DC current gain as a function of collector current; typical values

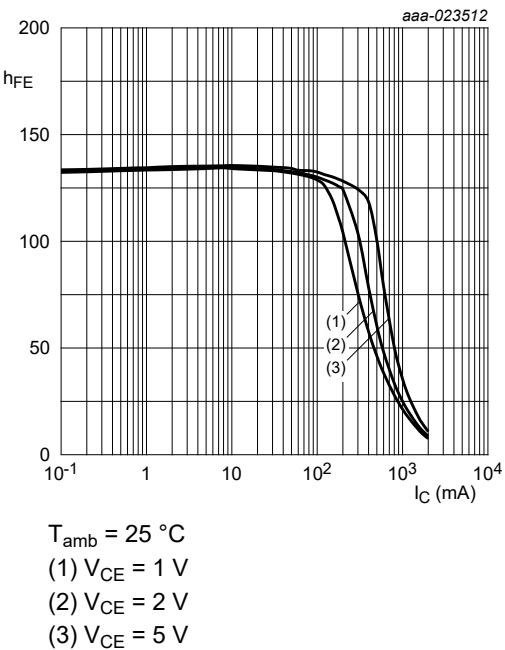


Fig. 6. DC current gain as a function of collector current; typical values

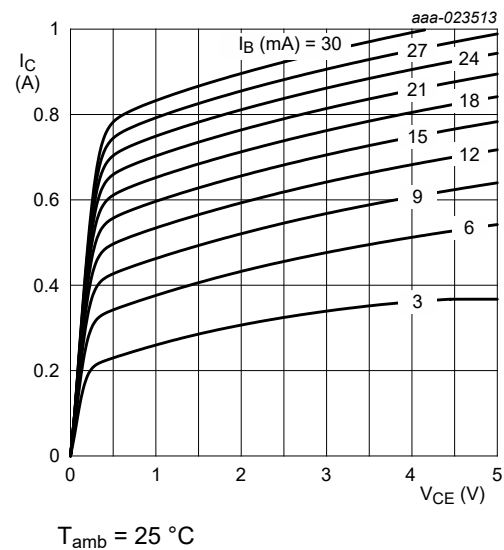


Fig. 7. Collector current as a function of collector-emitter voltage; typical values

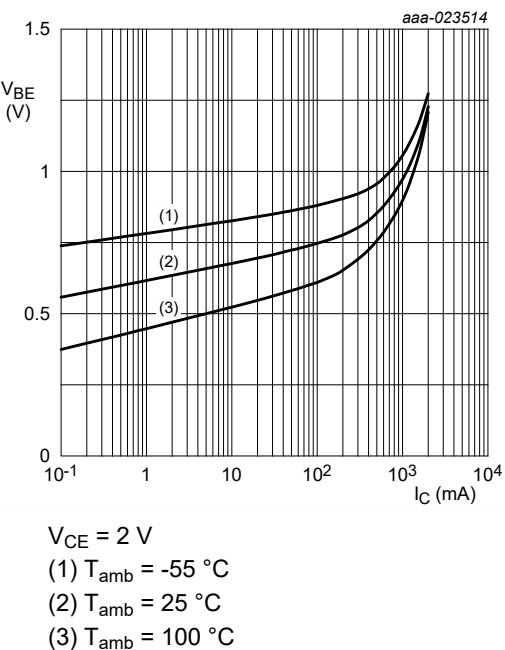


Fig. 8. Base-emitter voltage as a function of collector current; typical values

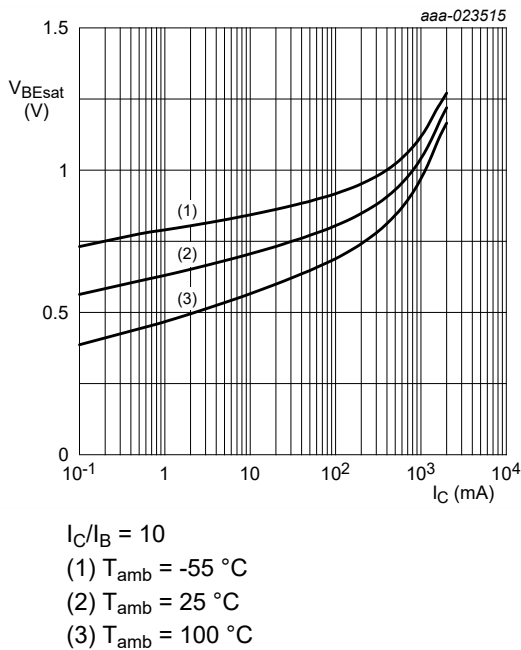


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values

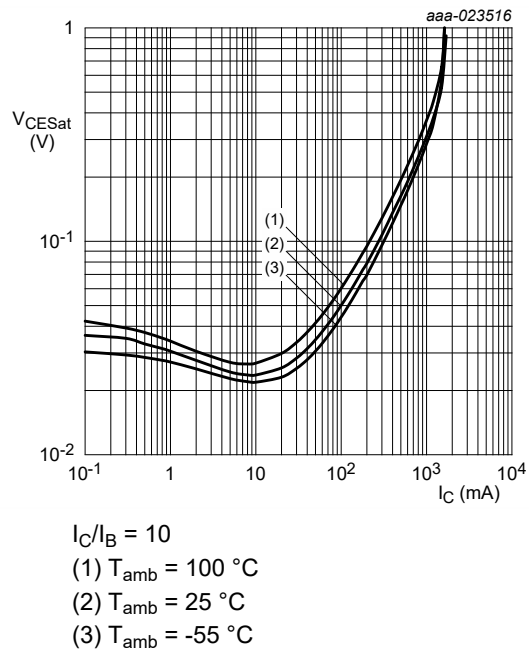


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

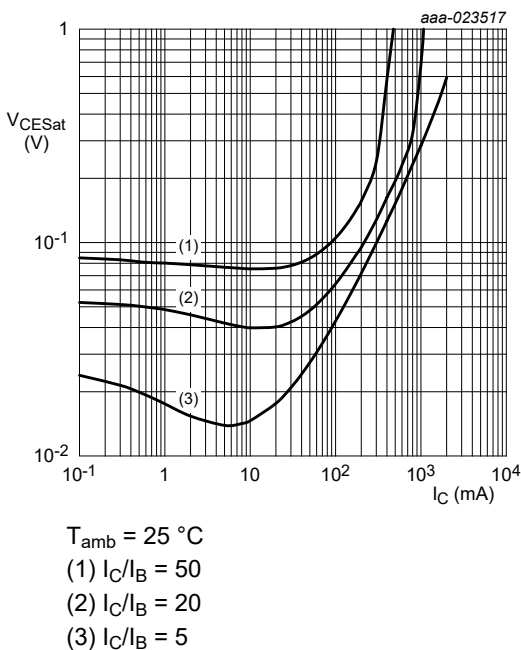


Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values

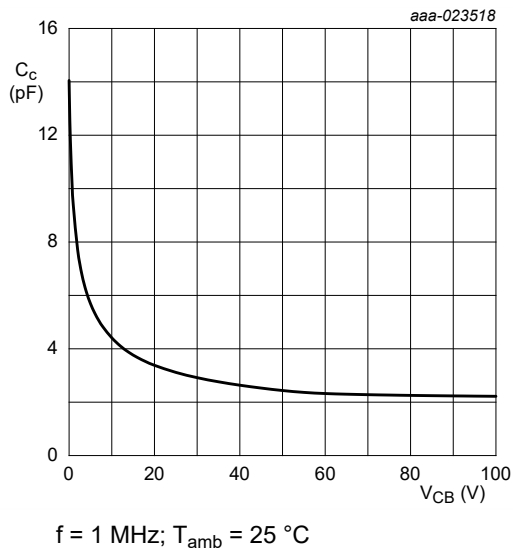


Fig. 12. Collector capacitance as a function of collector-base voltage; typical values

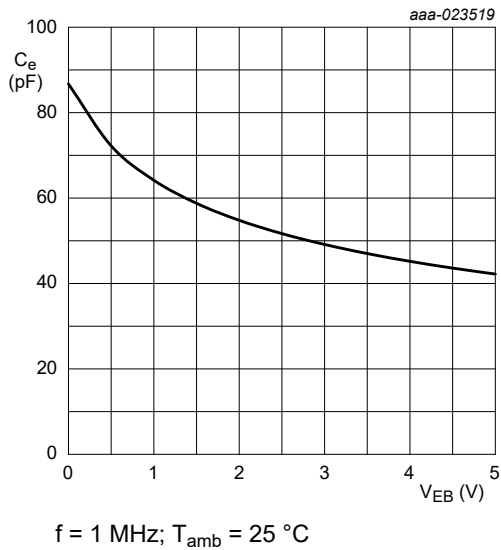


Fig. 13. Emitter capacitance as a function of emitter-base voltage; typical values

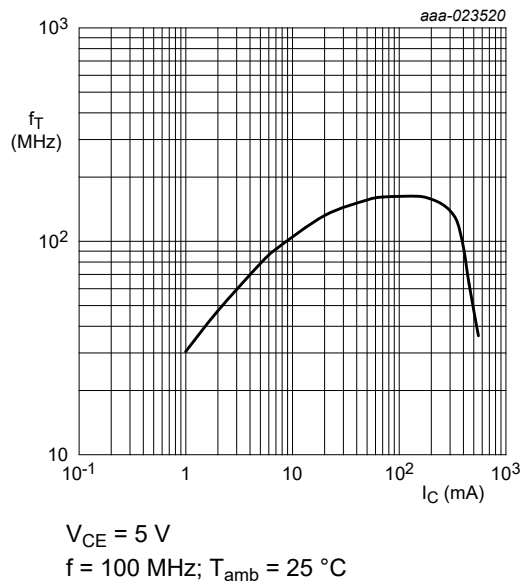


Fig. 14. Transition frequency as a function of collector current; typical values

8. Test information

8.1. Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

9. Package outline

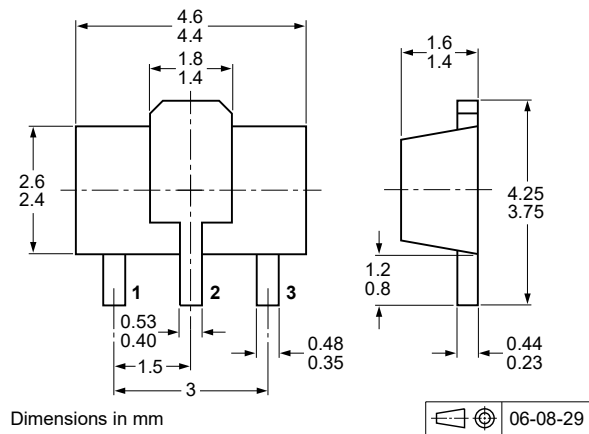


Fig. 15. Package outline SOT89 (SC-62)

10. Soldering

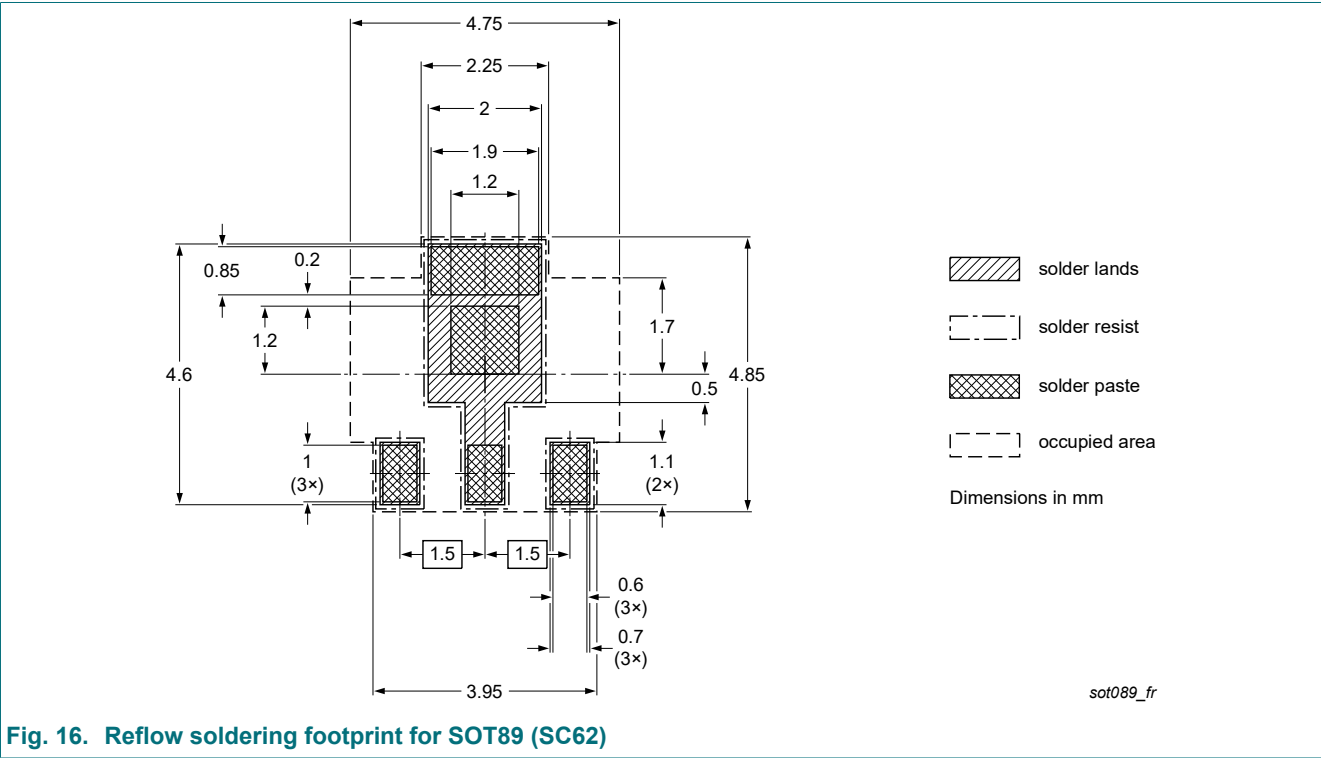


Fig. 16. Reflow soldering footprint for SOT89 (SC62)

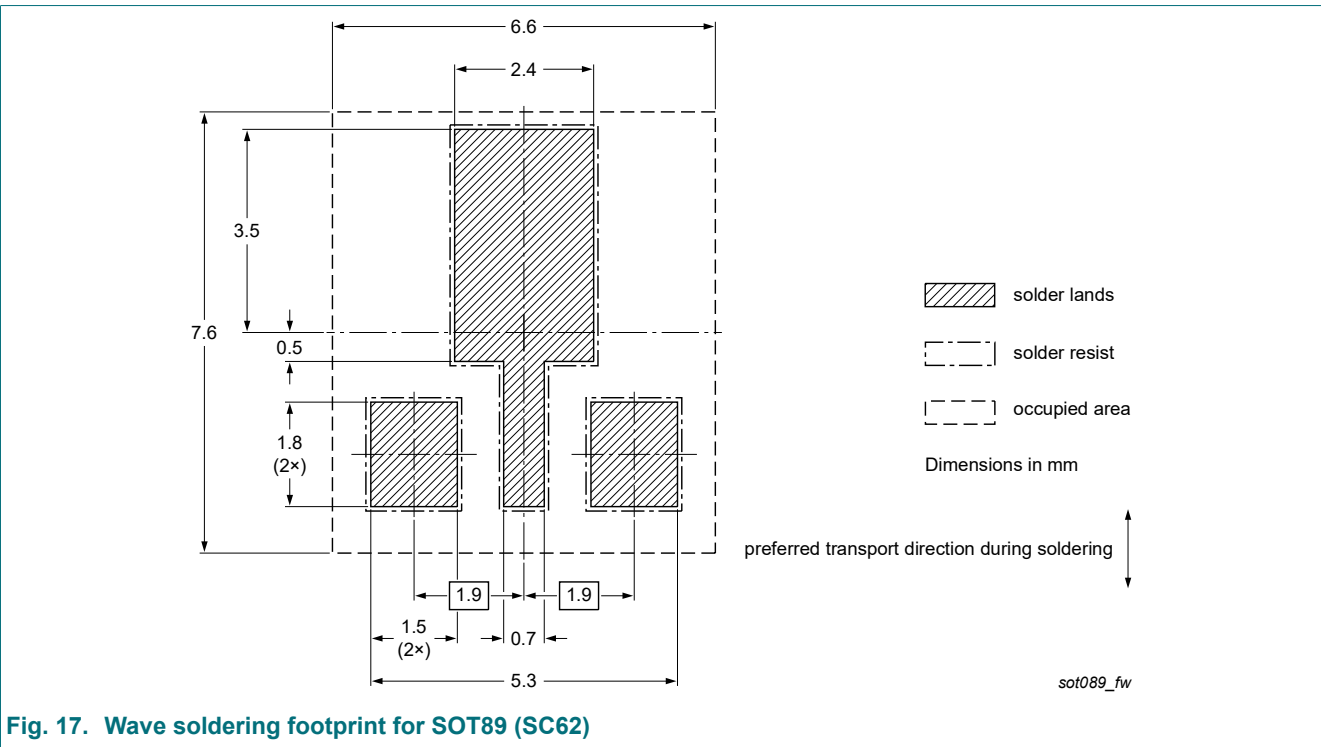


Fig. 17. Wave soldering footprint for SOT89 (SC62)

11. Revision history

Table 9. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| BCX54T_SER v.1 | 20190822     | Product data sheet | -             | -          |

## 12. Legal information

### Data sheet status

| Document status<br>[1][2]      | Product status [3] | 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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