

# ANTREX Electronics

## Electronic Components Sourcing Information

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### Product Reference Information

|                      |                           |
|----------------------|---------------------------|
| <b>Part Number:</b>  | PBSS4160T-QR              |
| <b>Manufacturer:</b> | Nexperia USA Inc.         |
| <b>Package:</b>      | TO-236-3, SC-59, SOT-23-3 |
| <b>Availability:</b> | Please confirm with sales |

#### Product Page:

<https://antrexco.com/product/details/nexperia-usa-inc/pbss4160t-qr.html>

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#### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



# PBSS4160T-Q

60 V, 1 A NPN low V<sub>CEsat</sub> (BISS) transistor

15 December 2021

Product data sheet

## 1. General description

NPN low V<sub>CEsat</sub> transistor in a small SOT23 plastic package. PNP complement: PBSS5160T-Q.

## 2. Features and benefits

- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability I<sub>C</sub> and I<sub>CM</sub>
- High efficiency, reduces heat generation
- Reduces printed-circuit board area required
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- Major application segments:
  - Automotive 42 V power
  - Telecom infrastructure
  - Industrial.
- Power management:
  - DC-to-DC conversion
  - Supply line switching.
- Peripheral driver
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors).

## 4. Quick reference data

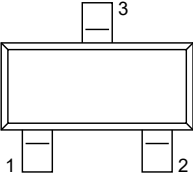
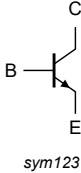
Table 1. Quick reference data

| Symbol             | Parameter                               | Conditions                                                                                                         |     | Min | Typ | Max | Unit |
|--------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|------|
| V <sub>CEO</sub>   | collector-emitter voltage               | open base                                                                                                          |     | -   | -   | 60  | V    |
| I <sub>C</sub>     | collector current                       |                                                                                                                    | [1] | -   | -   | 1   | A    |
| I <sub>CM</sub>    | peak collector current                  | or limited by T <sub>j(max)</sub> ; t <sub>p</sub> = 1 ms                                                          |     | -   | -   | 2   | A    |
| R <sub>CEsat</sub> | collector-emitter saturation resistance | I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C |     | -   | 200 | 250 | mΩ   |

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                         | Graphic symbol                                                                                |
|-----|--------|-------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | B      | base        | <br>SOT23 | <br>sym123 |
| 2   | E      | emitter     |                                                                                            |                                                                                               |
| 3   | C      | collector   |                                                                                            |                                                                                               |

6. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                          |         |
|-------------|---------|------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                              | Version |
| PBSS4160T-Q | SOT23   | plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body | SOT23   |

7. Marking

Table 4. Marking codes

| Type number | Marking code[1] |
|-------------|-----------------|
| PBSS4160T-Q | %U5             |

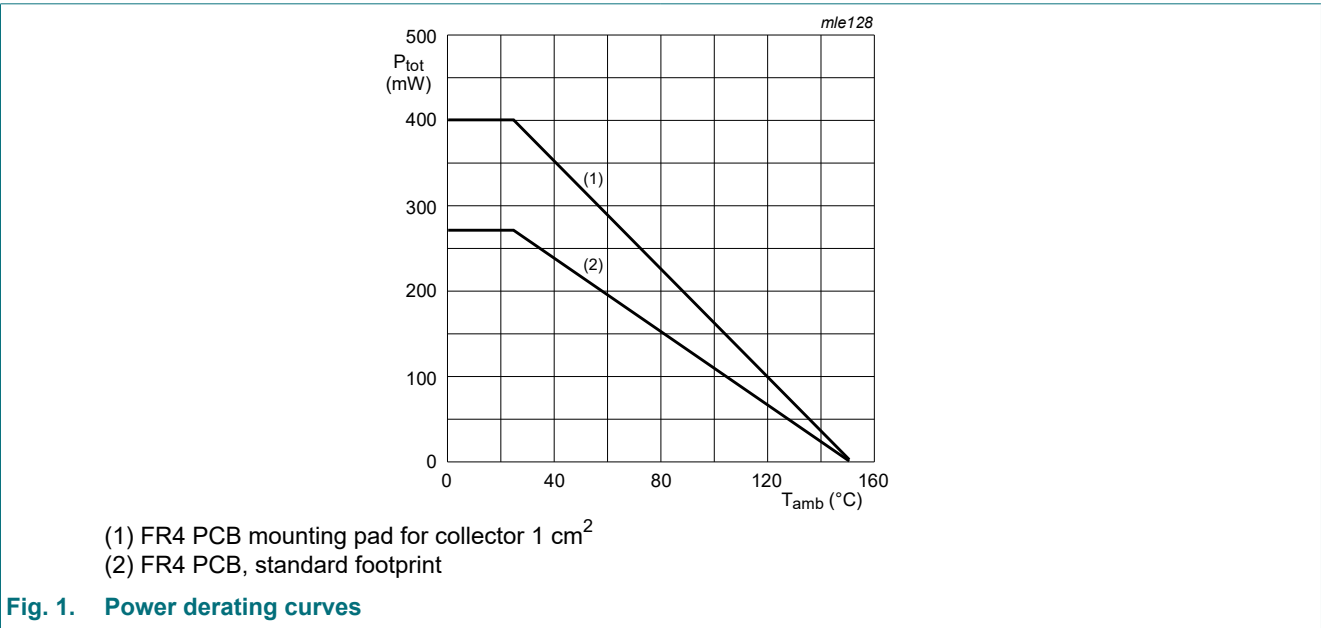
[1] % = placeholder for manufacturing site code

8. Limiting values

Table 5. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol           | Parameter                 | Conditions                                                |         | Min | Max  | Unit |
|------------------|---------------------------|-----------------------------------------------------------|---------|-----|------|------|
| V <sub>CBO</sub> | collector-base voltage    | open emitter                                              |         | -   | 80   | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                                                 |         | -   | 60   | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                                            |         | -   | 5    | V    |
| I <sub>C</sub>   | collector current         |                                                           | [1]     | -   | 0.9  | A    |
|                  |                           |                                                           | [2]     | -   | 1    | A    |
| I <sub>CM</sub>  | peak collector current    | or limited by T <sub>j(max)</sub> ; t <sub>p</sub> = 1 ms |         | -   | 2    | A    |
| I <sub>B</sub>   | base current              |                                                           |         | -   | 300  | mA   |
| I <sub>BM</sub>  | peak base current         | t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02                         |         | -   | 1    | A    |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C                                  | [1]     | -   | 270  | mW   |
|                  |                           |                                                           | [2]     | -   | 400  | mW   |
|                  |                           |                                                           | [1] [3] | -   | 1.25 | W    |
| T <sub>j</sub>   | junction temperature      |                                                           |         | -   | 150  | °C   |
| T <sub>amb</sub> | ambient temperature       |                                                           |         | -65 | 150  | °C   |
| T <sub>stg</sub> | storage temperature       |                                                           |         | -65 | 150  | °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] Pulsed; t<sub>p</sub> ≤ 10 ms; δ ≤ 0.02

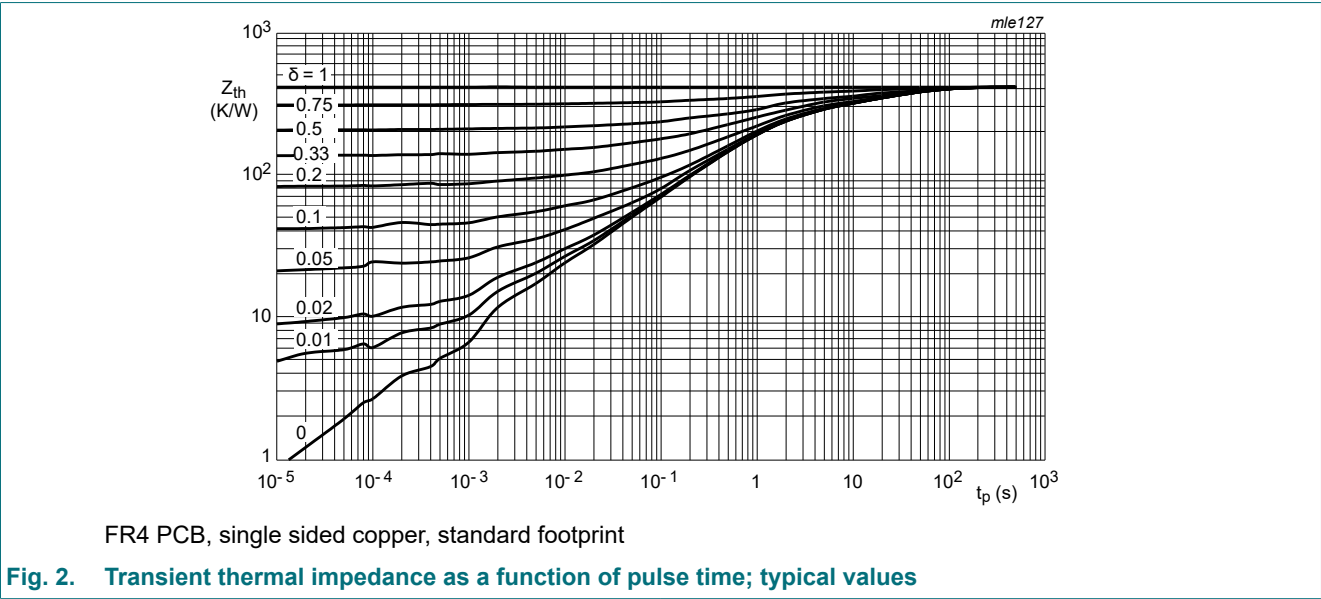


9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                   | Conditions  |         | Min | Typ | Max | Unit |
|---------------|---------------------------------------------|-------------|---------|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1]     | -   | -   | 465 | K/W  |
|               |                                             |             | [2]     | -   | -   | 312 | K/W  |
|               |                                             |             | [1] [3] | -   | -   | 100 | K/W  |

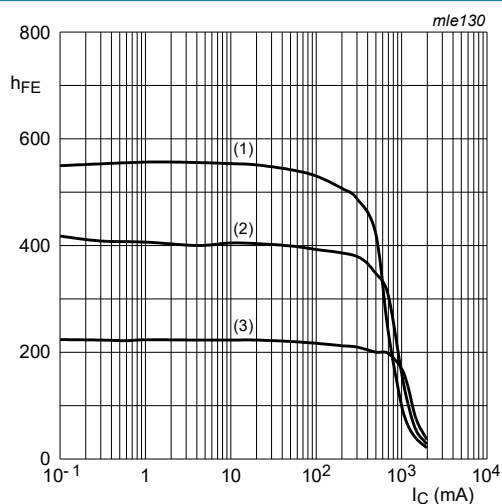
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.  
[3] Pulsed;  $t_p \leq 10$  ms;  $\delta \leq 0.02$ .



## 10. Characteristics

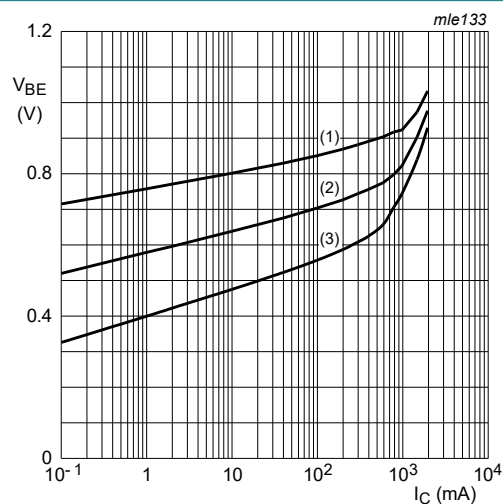
Table 7. Characteristics

| Symbol      | Parameter                               | Conditions                                                                                                                                         | Min | Typ  | Max | Unit          |
|-------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| $I_{CBO}$   | collector-base cut-off current          | $V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                     | -   | -    | 100 | nA            |
|             |                                         | $V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$                                                                        | -   | -    | 50  | $\mu\text{A}$ |
| $I_{CES}$   | collector-emitter cut-off current       | $V_{CE} = 60\text{ V}; V_{BE} = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                  | -   | -    | 100 | nA            |
| $I_{EBO}$   | emitter-base cut-off current            | $V_{EB} = 5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                      | -   | -    | 100 | nA            |
| $h_{FE}$    | DC current gain                         | $V_{CE} = 5\text{ V}; I_C = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                     | 250 | 400  | -   |               |
|             |                                         | $V_{CE} = 5\text{ V}; I_C = 500\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 200 | 350  | -   |               |
|             |                                         | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$    | 100 | 150  | -   |               |
| $V_{CEsat}$ | collector-emitter saturation voltage    | $I_C = 100\text{ mA}; I_B = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                     | -   | 90   | 110 | mV            |
|             |                                         | $I_C = 500\text{ mA}; I_B = 50\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                    | -   | 110  | 140 | mV            |
|             |                                         | $I_C = 1\text{ A}; I_B = 100\text{ mA}; \text{pulsed}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02; T_{amb} = 25\text{ }^{\circ}\text{C}$    | -   | 200  | 250 | mV            |
| $R_{CEsat}$ | collector-emitter saturation resistance |                                                                                                                                                    | -   | 200  | 250 | m $\Omega$    |
| $V_{BEsat}$ | base-emitter saturation voltage         | $I_C = 1\text{ A}; I_B = 50\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                       | -   | 0.95 | 1.1 | V             |
| $V_{BEon}$  | base-emitter turn-on voltage            | $V_{CE} = 5\text{ V}; I_C = 1\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                                                      | -   | 0.82 | 0.9 | V             |
| $f_T$       | transition frequency                    | $V_{CE} = 10\text{ V}; I_C = 50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                               | 150 | 220  | -   | MHz           |
| $C_c$       | collector capacitance                   | $V_{CB} = 10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$                                 | -   | 5.5  | 10  | pF            |



$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 3. DC current gain as a function of collector current; typical values



$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig. 4. Base-emitter voltage as a function of collector current; typical values

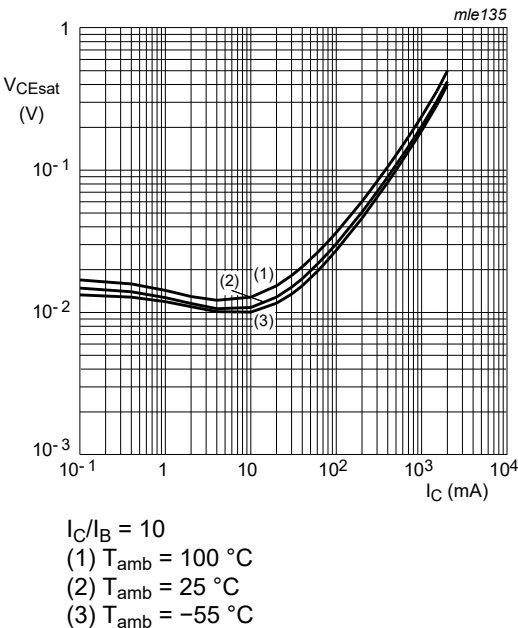


Fig. 5. Collector-emitter saturation voltage as a function of collector current; typical values

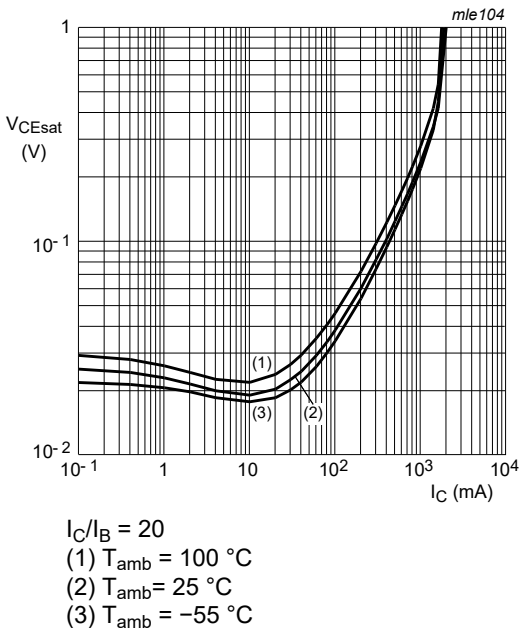


Fig. 6. Collector-emitter saturation voltage as a function of collector current; typical values

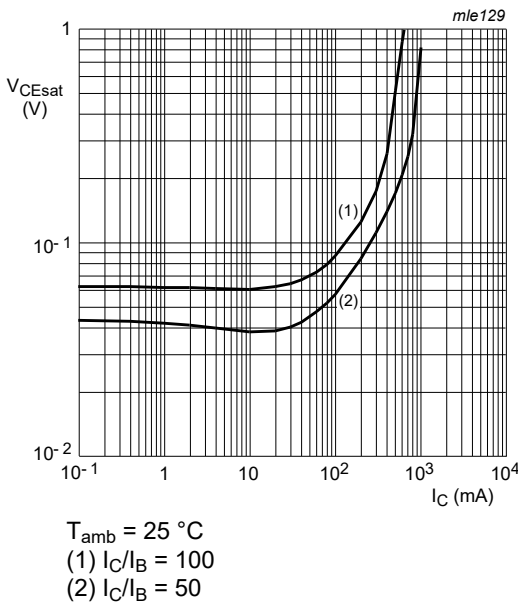


Fig. 7. Collector-emitter saturation voltage as a function of collector current; typical values

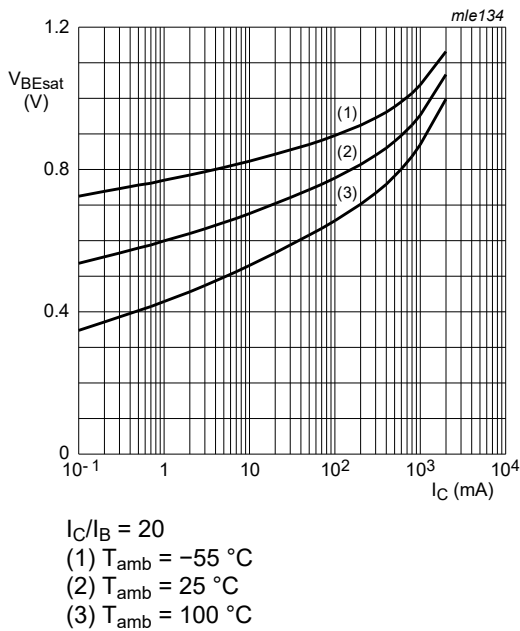
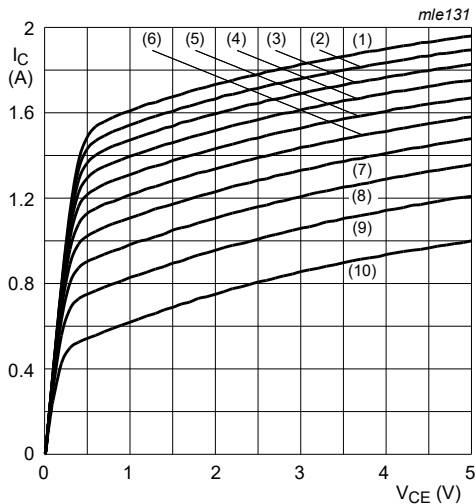
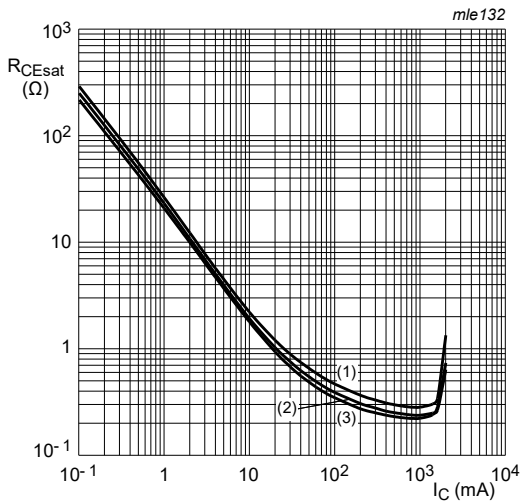


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values



$T_{amb} = 25^\circ\text{C}$   
(1)  $I_B = 60\text{ mA}$   
(2)  $I_B = 54\text{ mA}$   
(3)  $I_B = 48\text{ mA}$   
(4)  $I_B = 42\text{ mA}$   
(5)  $I_B = 36\text{ mA}$   
(6)  $I_B = 30\text{ mA}$   
(7)  $I_B = 24\text{ mA}$   
(8)  $I_B = 18\text{ mA}$   
(9)  $I_B = 12\text{ mA}$   
(10)  $I_B = 6\text{ mA}$

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



$I_C/I_B = 20$   
(1)  $T_{amb} = 100^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -55^\circ\text{C}$

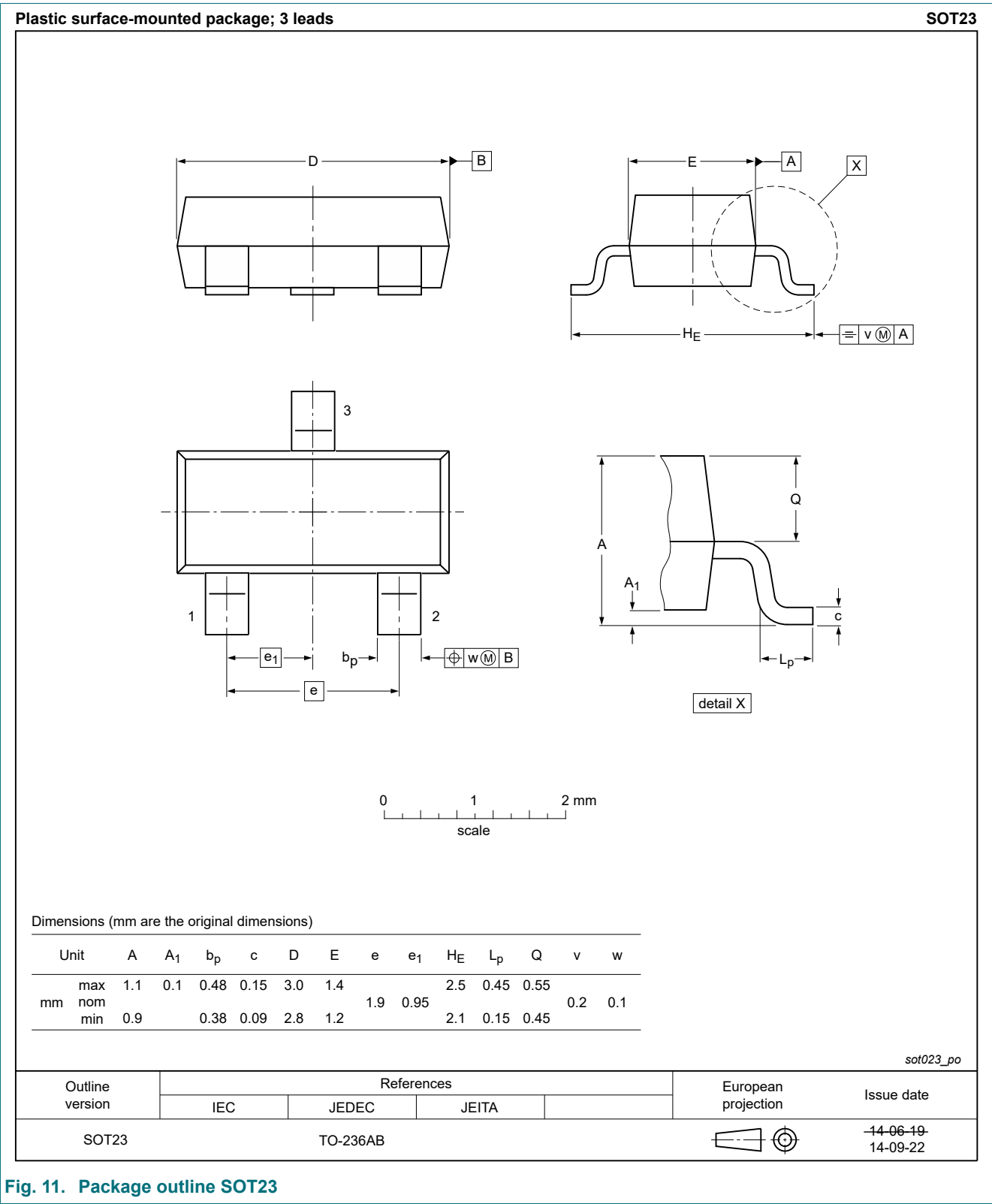
Fig. 10. Equivalent on-resistance as a function of collector current; typical values

11. Test information

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.

12. Package outline



13. Soldering

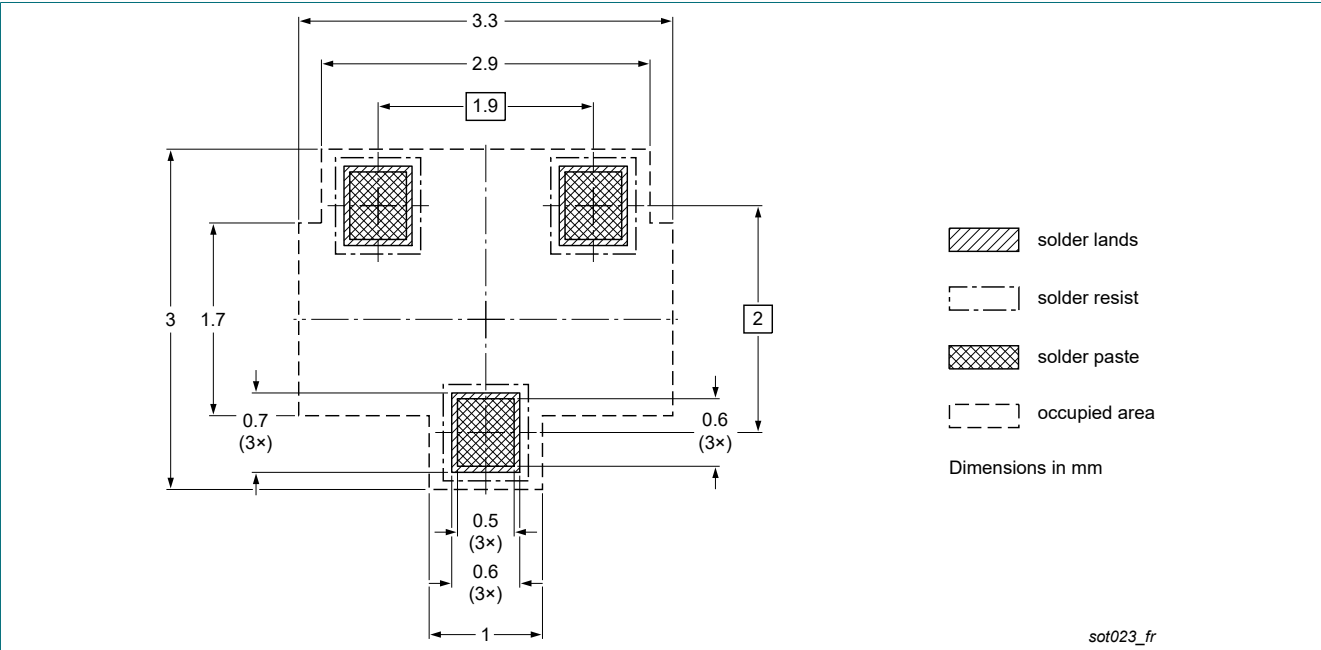


Fig. 12. Reflow soldering footprint for SOT23

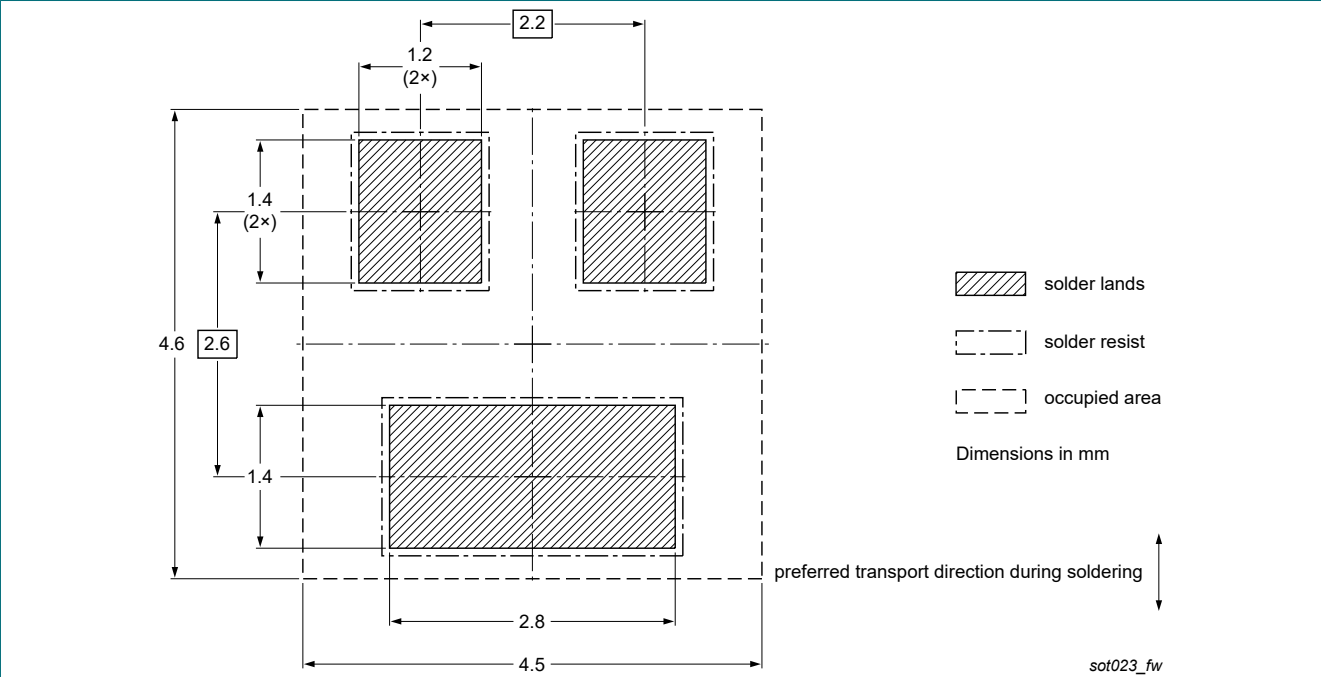


Fig. 13. Wave soldering footprint for SOT23

14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PBSS4160T-Q v.1 | 20211215     | Product data sheet | -             | -          |

## 15. 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.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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