



PDTTC143ZU

50 V, 100 mA NPN resistor-equipped transistor;

R1 = 4.7 k Ω , R2 = 47 k Ω

14 July 2023

Product data sheet

1. General description

NPN Resistor-Equipped Transistor (RET) in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

PNP complement: PDTA143ZU

2. Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs

3. Applications

- Digital application in industrial segments
- Cost-saving alternative for BC847 series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

Table 1. Quick reference data

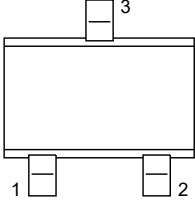
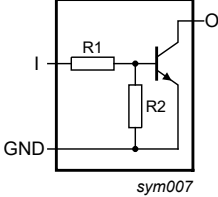
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------------|---------------------------|------------|-----|-----|-----|------|------------|
| V _{CEO} | collector-emitter voltage | open base | - | - | 50 | V | |
| I _O | output current | | - | - | 100 | mA | |
| R1 | bias resistor 1 (input) | | [1] | 3.3 | 4.7 | 6.1 | k Ω |
| R2/R1 | bias resistor ratio | | [1] | 8 | 10 | 12 | |

[1] See "Section 11: Test information" for resistor calculation and test conditions.

50 V, 100 mA NPN resistor-equipped transistor; R1 = 4.7 k Ω , R2 = 47 k Ω

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|--------------------|---|---|
| 1 | I | input (base) |  SC-70 (SOT323) |  sym007 |
| 2 | GND | ground (emitter) | | |
| 3 | O | output (collector) | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------------------|---------|--|------------------------|
| | Name | Description | Version |
| PDTC143ZU | SC-70 | plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body | SOT323 |

7. Marking

Table 4. Marking codes

| Type number | Marking code[1] |
|-------------|-----------------|
| PDTC143ZU | %54 |

[1] % = placeholder for manufacturing site code

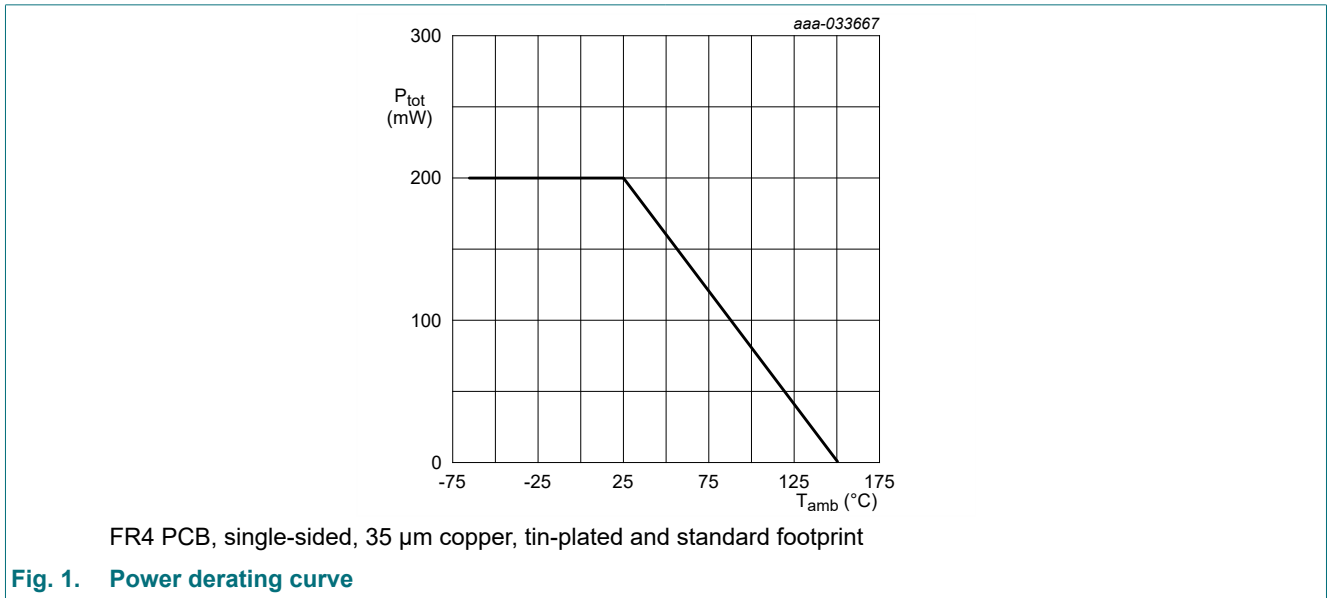
8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---------------------------|-----------------------------|-----|-----|------|
| V_{CBO} | collector-base voltage | open emitter | - | 50 | V |
| V_{CEO} | collector-emitter voltage | open base | - | 50 | V |
| V_{EBO} | emitter-base voltage | open collector | - | 5 | V |
| V_I | input voltage | | -5 | 30 | V |
| I_O | output current | | - | 100 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] | 200 | mW |
| T_j | junction temperature | | - | 150 | °C |
| T_{amb} | ambient temperature | | -65 | 150 | °C |
| T_{stg} | storage temperature | | -65 | 150 | °C |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided, 35 μm copper, tin-plated and standard footprint.

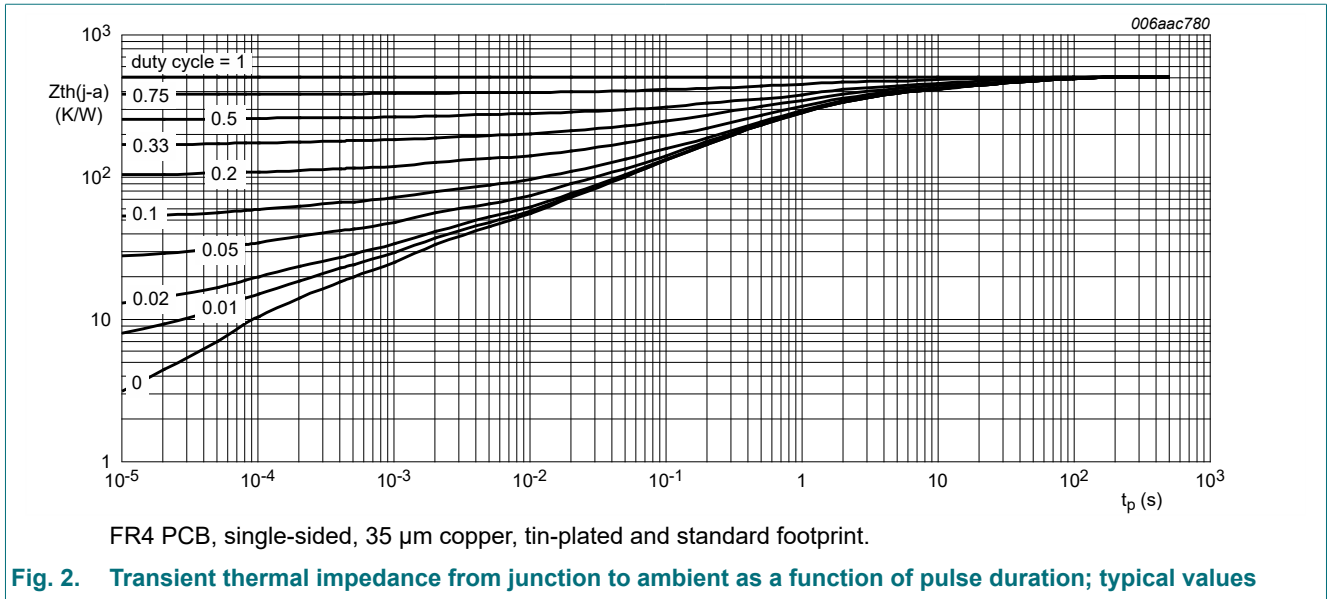


9. Thermal characteristics

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] | - | - | 625 | K/W |

[1] Device mounted on an FR4 PCB, single-sided, 35 μm copper, tin-plated and standard footprint.

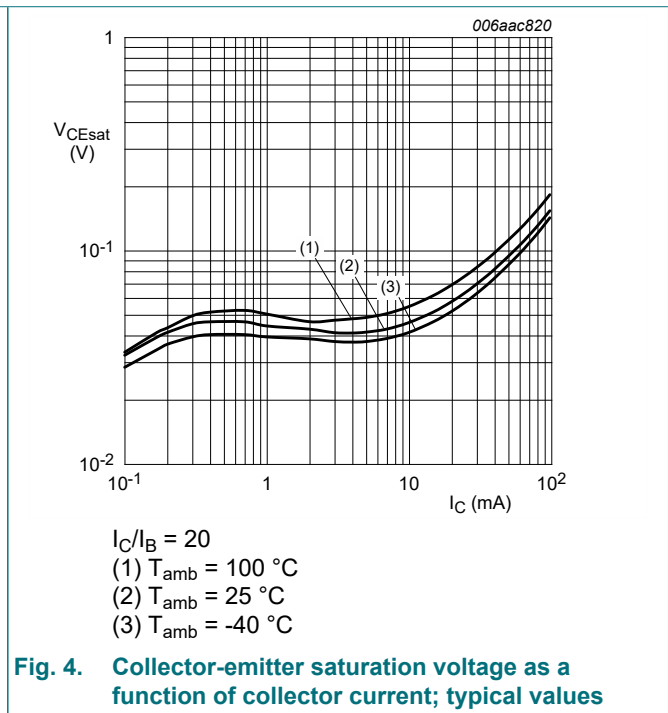
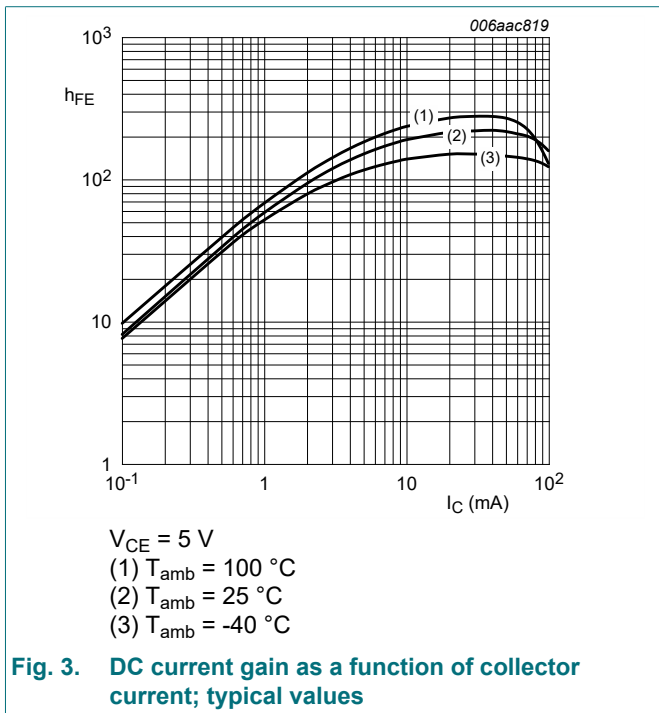


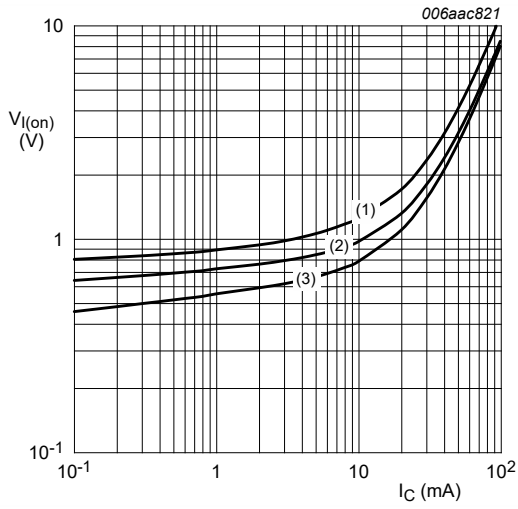
10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|--------------------------------------|---|-----|-----|-----|---------|----|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 100 \mu A; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$ | 50 | - | - | V | |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 2 \text{ mA}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$ | 50 | - | - | V | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 50 \text{ V}; I_E = 0 A; T_{amb} = 25 \text{ }^\circ C$ | - | - | 100 | nA | |
| I_{CEO} | collector-emitter cut-off current | $V_{CE} = 30 \text{ V}; I_B = 0 A; T_{amb} = 25 \text{ }^\circ C$ | - | - | 100 | nA | |
| | | $V_{CE} = 30 \text{ V}; I_B = 0 A; T_j = 150 \text{ }^\circ C$ | - | - | 5 | μA | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5 \text{ V}; I_C = 0 A; T_{amb} = 25 \text{ }^\circ C$ | - | - | 170 | μA | |
| h_{FE} | DC current gain | $V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$ | 100 | - | - | | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 5 \text{ mA}; I_B = 0.25 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$ | - | - | 100 | mV | |
| $V_{I(off)}$ | off-state input voltage | $V_{CE} = 5 \text{ V}; I_C = 100 \mu A; T_{amb} = 25 \text{ }^\circ C$ | - | 0.6 | 0.5 | V | |
| $V_{I(on)}$ | on-state input voltage | $V_{CE} = 0.3 \text{ V}; I_C = 5 \text{ mA}; T_{amb} = 25 \text{ }^\circ C$ | 1.3 | 0.9 | - | V | |
| R1 | bias resistor 1 (input) | | [1] | 3.3 | 4.7 | 6.1 | kΩ |
| R2/R1 | bias resistor ratio | | [1] | 8 | 10 | 12 | |
| C_c | collector capacitance | $V_{CB} = 10 \text{ V}; I_E = 0 A; i_e = 0 A; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$ | - | - | 2.5 | pF | |
| f_T | transition frequency | $V_{CE} = 5 \text{ V}; I_C = 10 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ C$ | [2] | 230 | - | MHz | |

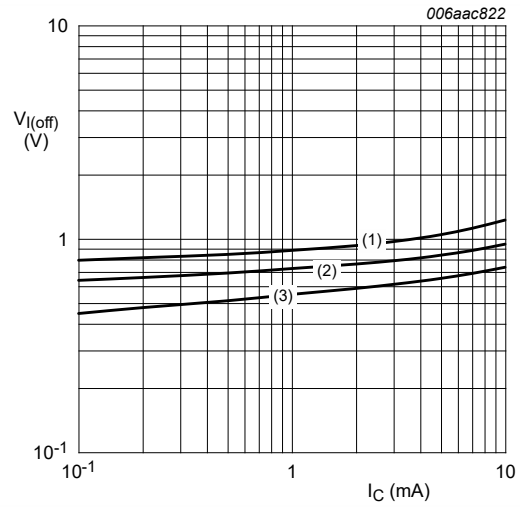
- [1] See "Section 11: Test information" for resistor calculation and test conditions.
- [2] Characteristics of built-in transistor.





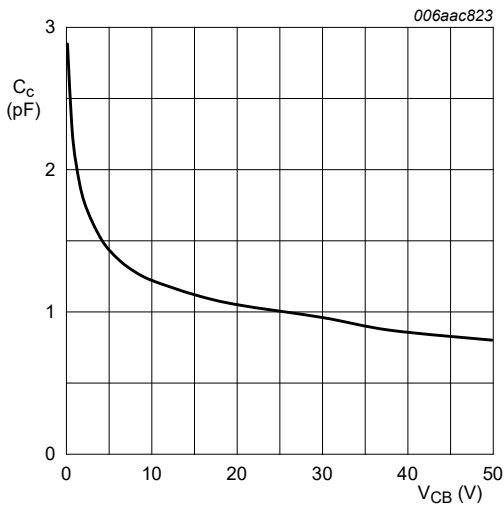
$V_{CE} = 0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig. 5. On-state input voltage as a function of collector current; typical values



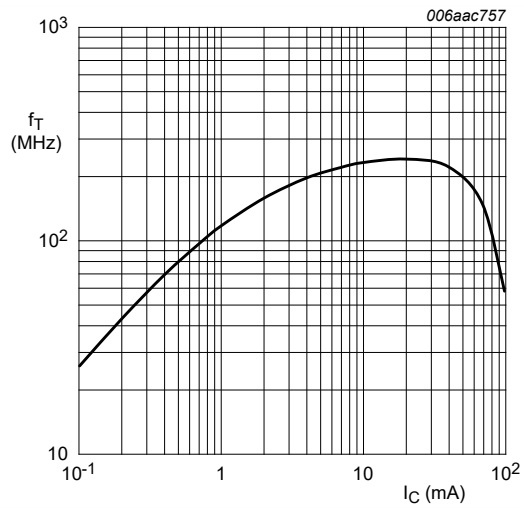
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

Fig. 6. Off-state input voltage as a function of collector current; typical values



$f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 7. Collector capacitance as a function of collector-base voltage; typical values



$V_{CE} = 5 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$

Fig. 8. Transition frequency as a function of collector current; typical values of built-in transistor

11. Test information

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R_1 = \frac{V(I_2) - V(I_1)}{I_2 - I_1}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R_2}{R_1} = \frac{V(I_4) - V(I_3)}{R_1 \cdot (I_4 - I_3)} - 1$$

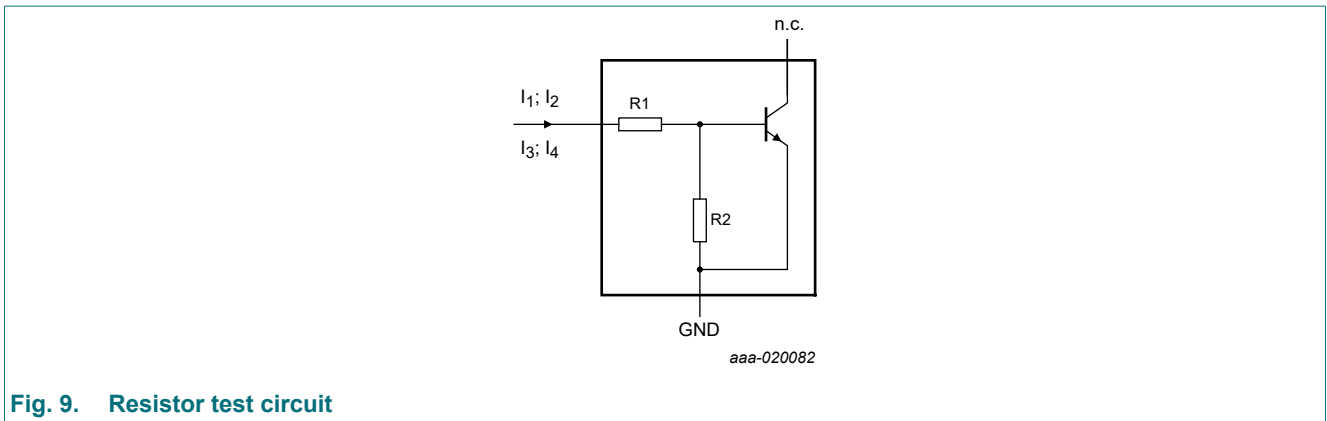


Fig. 9. Resistor test circuit

Resistor test conditions

Table 8. Resistor test conditions

| Type number | R1 (kΩ) | R2 (kΩ) | Test conditions | | | |
|-------------|---------|---------|-----------------|----------------|----------------|----------------|
| | | | I ₁ | I ₂ | I ₃ | I ₄ |
| PDTC143ZU | 4.7 | 47 | 90 μA | 140 μA | -55 μA | -105 μA |

12. Package outline

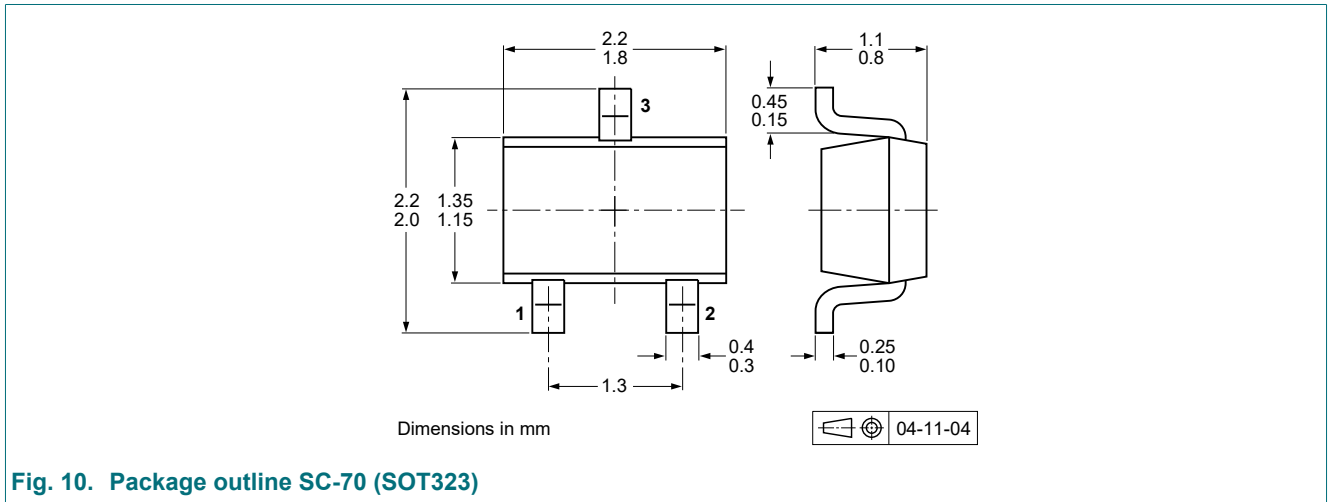


Fig. 10. Package outline SC-70 (SOT323)

13. Soldering

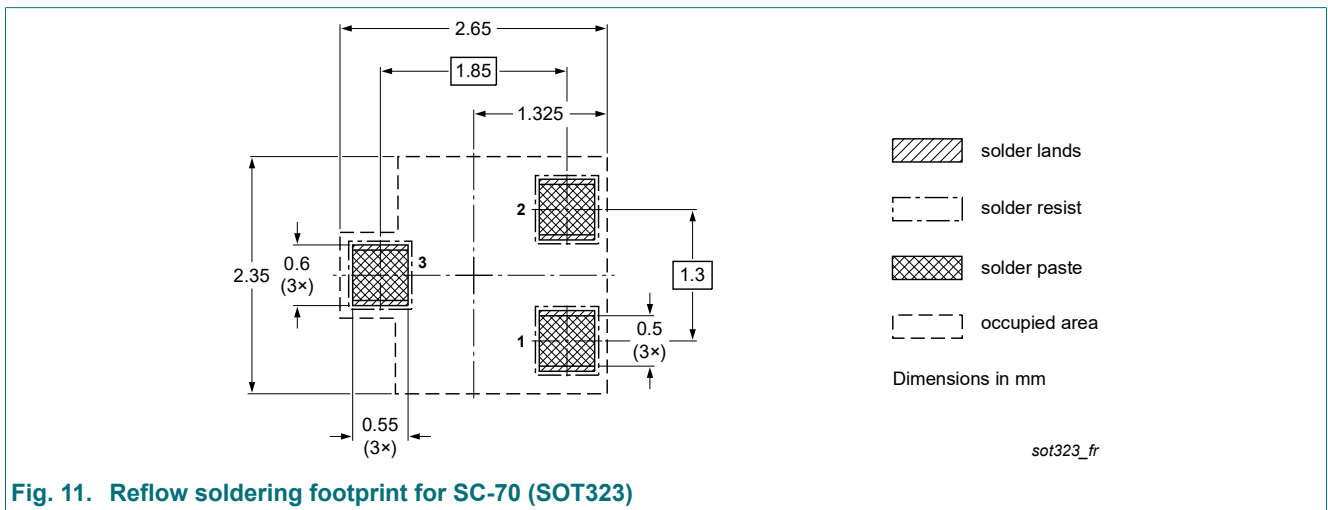


Fig. 11. Reflow soldering footprint for SC-70 (SOT323)

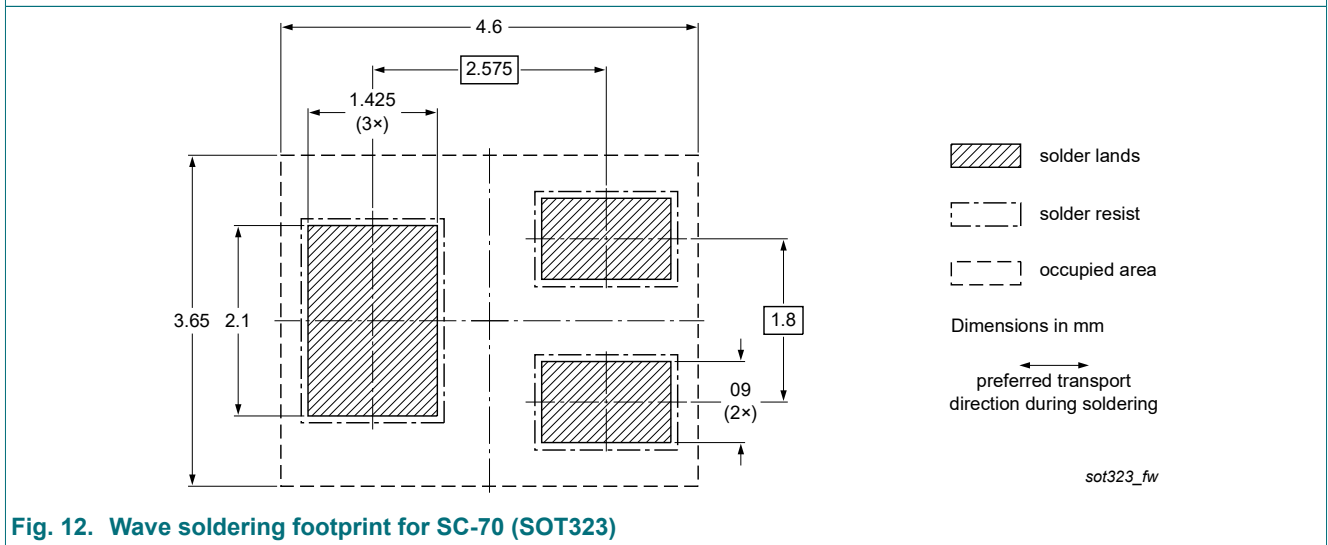


Fig. 12. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 9. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------|--|-----------------------|---------------|---------------------|
| PDTC143ZU v.09 | 20230714 | Product data sheet | - | PDTC143Z_SER v.8 |
| Modification: | <ul style="list-style-type: none"> Family data sheet reduced to single type data sheet. The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Product changed to non automotive. Please refer to the automotive product(s) with -Q. Packing information removed. | | | |
| PDTC143Z_SER v.8 | 20111205 | Product data sheet | - | PDTC143Z_SERIES v.7 |
| PDTC143Z_SERIES v.7 | 20040816 | Product data sheet | - | PDTC143Z_SERIES v.6 |
| PDTC143Z_SERIES v.6 | 20040406 | Product specification | - | PDTC143Z_SERIES v.5 |
| PDTC143Z_SERIES v.5 | 20030910 | Product specification | - | PDTC143Z_SERIES v.4 |
| PDTC143Z_SERIES v.4 | 20030414 | Product specification | - | - |

15. Legal information

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| Document status [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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- [2] The term 'short data sheet' is explained in section "Definitions".
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