



PDTB113EU

50 V, 500 mA PNP resistor-equipped transistor

8 April 2024

Product data sheet

1. General description

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

NPN complement: PDTD113EU

2. Features and benefits

- 500 mA output current capability
- Reduces pick and place costs
- Built-in bias resistors
- ± 10 % resistor ratio tolerance
- Simplifies circuit design
- Reduces component count
- High temperature applications up to 175 °C
- AEC-Q101 qualified

3. Applications

- Cost-saving alternative for BC807 series in digital applications
- Control of IC inputs
- Switching loads

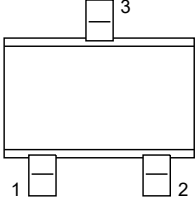
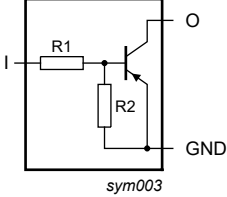
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------------|--------------------------|-----|-----|------|------------|
| V_{CE0} | collector-emitter voltage | open base | - | - | -50 | V |
| I_O | output current | | - | - | -500 | mA |
| R1 | bias resistor 1 (input) | $T_{amb} = 25\text{ °C}$ | 0.7 | 1 | 1.3 | k Ω |
| R2/R1 | bias resistor ratio | | 0.9 | 1 | 1.1 | |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|--------------------|---|---|
| 1 | I | input (base) |  <p>SC-70 (SOT323)</p> |  |
| 2 | G | GND (emitter) | | |
| 3 | O | output (collector) | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------------------|---------|--|------------------------|
| | Name | Description | Version |
| PDTB113EU | 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] |
|-------------|-----------------|
| PDTB113EU | ZG% |

[1] % = placeholder for manufacturing site code

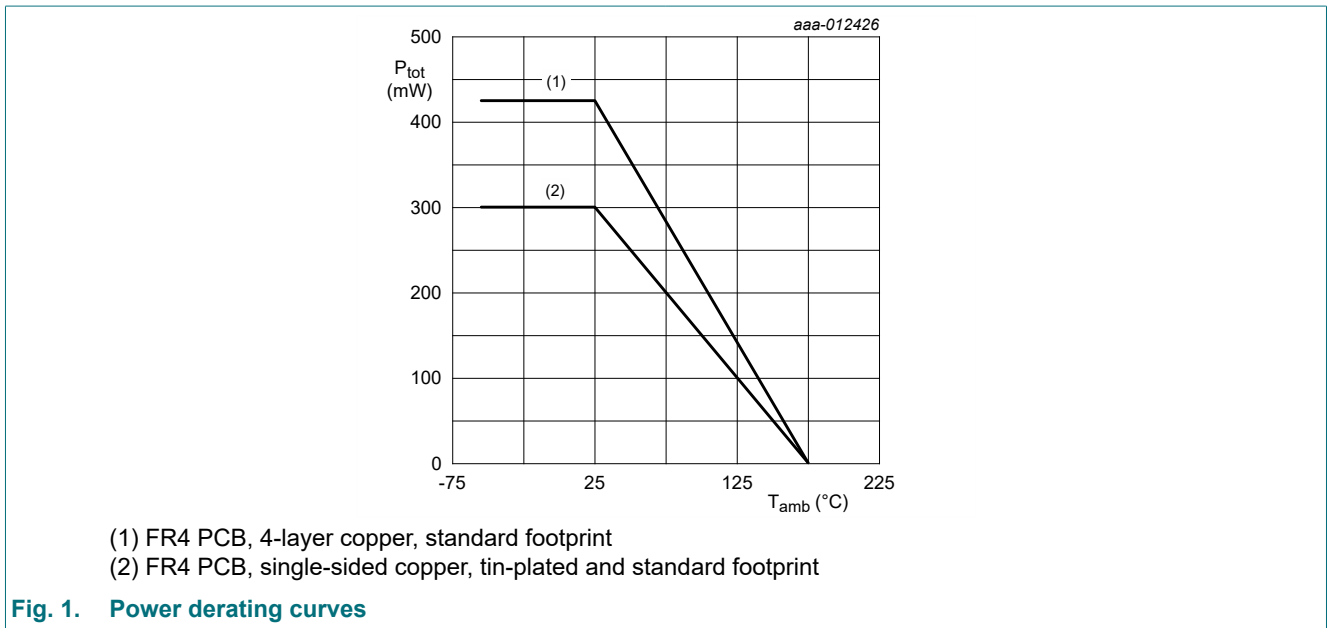
8. Limiting values

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 | - | -10 | V | |
| V_I | input voltage | | -10 | 10 | V | |
| I_O | output current | | - | -500 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] | - | 300 | mW |
| | | $T_{amb} \leq 25\text{ °C}$ | [2] | - | 425 | mW |
| T_j | junction temperature | | - | 175 | °C | |
| T_{amb} | ambient temperature | | -55 | 175 | °C | |
| T_{stg} | storage temperature | | -55 | 175 | °C | |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer 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] | - | - | 500 | K/W |
| | | | [2] | - | - | 353 | K/W |

- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

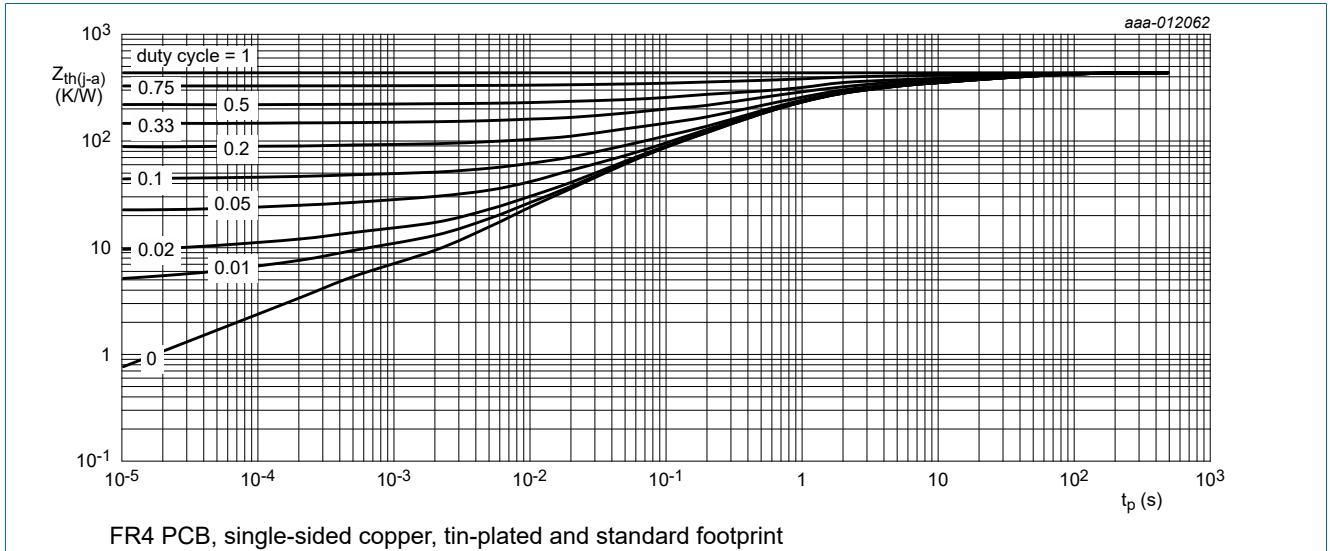


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT323/SC-70; typical values

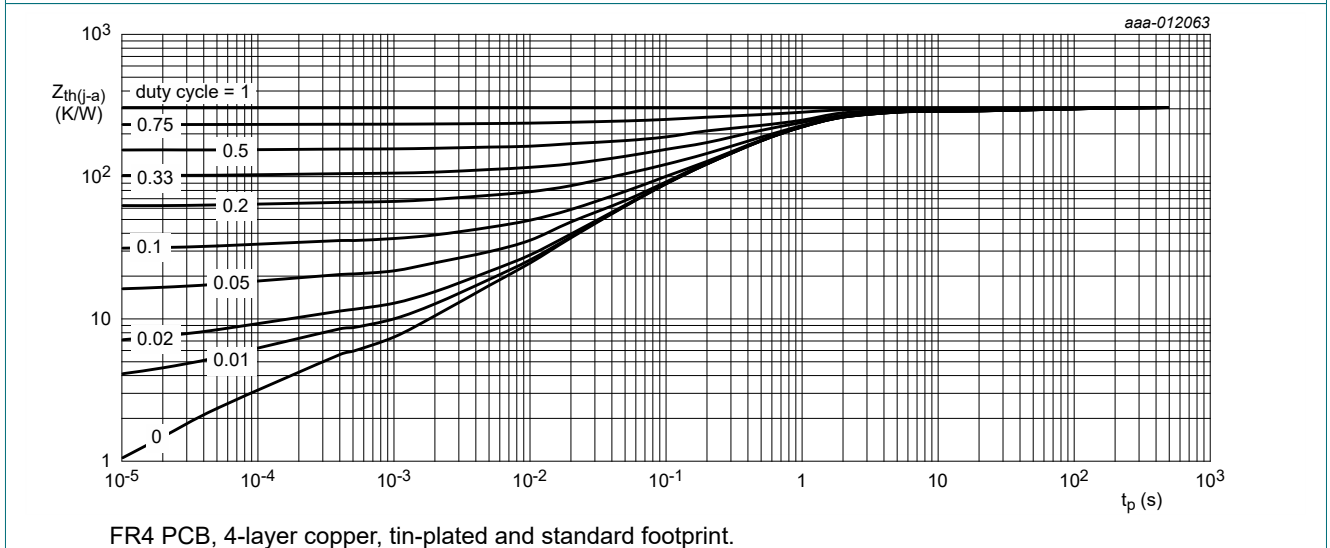


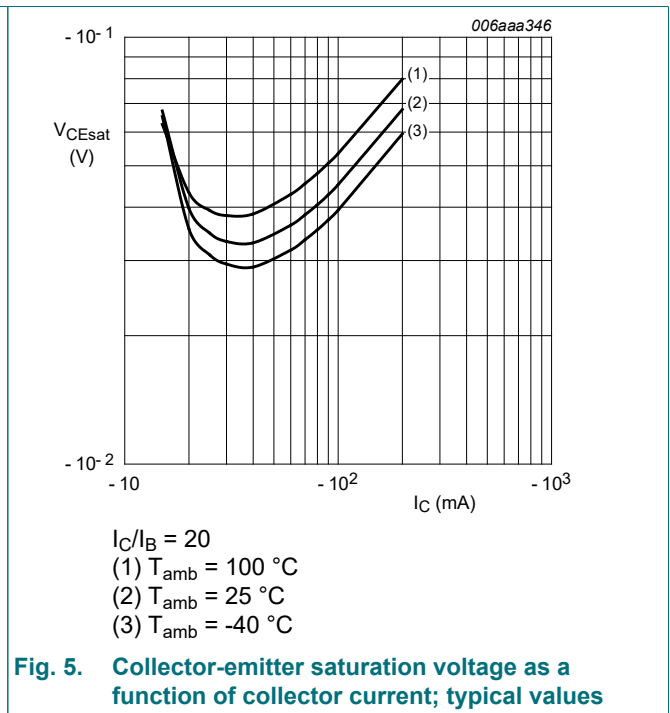
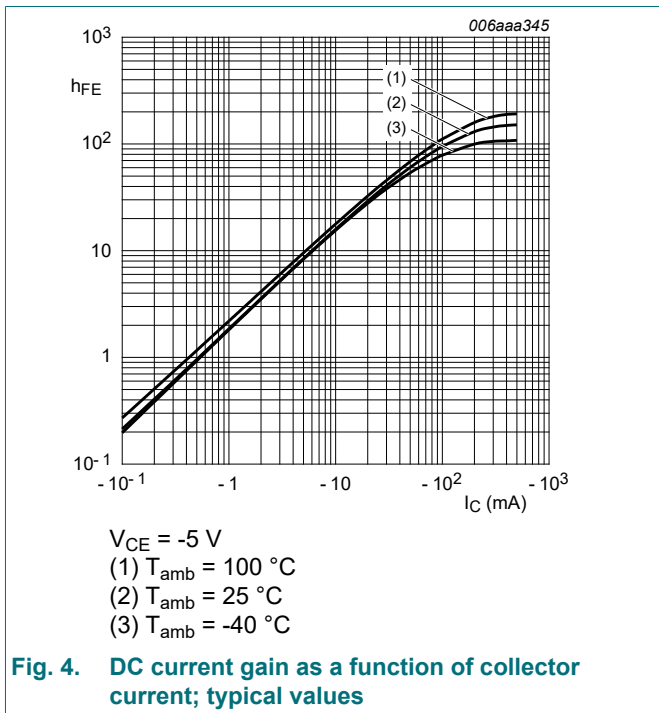
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT323/SC-70; typical values

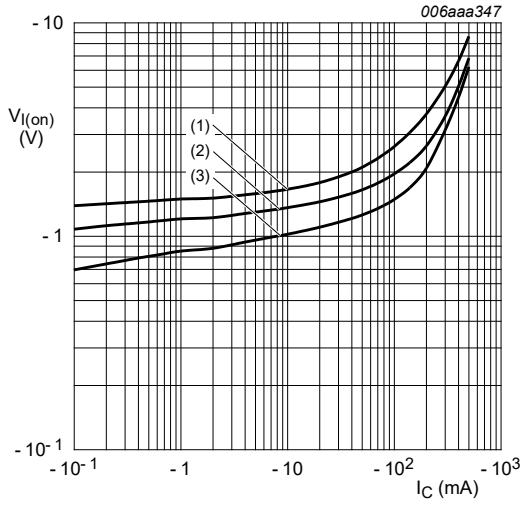
10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------|--------------------------------------|---|------|------|------|---------------|
| I_{CBO} | collector-base cut-off current | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -100 | nA |
| | | $V_{CB} = -50\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -100 | nA |
| I_{CEO} | collector-emitter cut-off current | $V_{CE} = -50\text{ V}; I_B = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -0.5 | μA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -4 | mA |
| h_{FE} | DC current gain | $V_{CE} = -5\text{ V}; I_C = -50\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | 33 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -50\text{ mA}; I_B = -2.5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -100 | mV |
| $V_{I(off)}$ | off-state input voltage | $V_{CE} = -5\text{ V}; I_C = -100\text{ }\mu\text{A}; T_{amb} = 25\text{ }^\circ\text{C}$ | -0.6 | -1 | -1.5 | V |
| $V_{I(on)}$ | on-state input voltage | $V_{CE} = -0.3\text{ V}; I_C = -20\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | -1 | -1.4 | -1.8 | V |
| R1 | bias resistor 1 (input) | $T_{amb} = 25\text{ }^\circ\text{C}$ | 0.7 | 1 | 1.3 | k Ω |
| R2/R1 | bias resistor ratio | | 0.9 | 1 | 1.1 | |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | 11 | - | pF |
| f_T | transition frequency | $V_{CE} = -5\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | [1] | 140 | - | MHz |

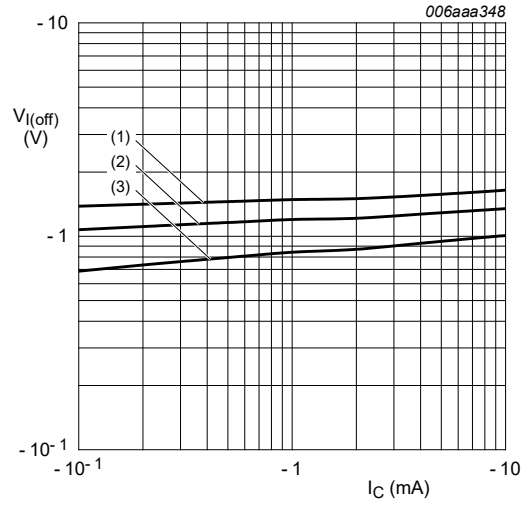
[1] Characteristics of built-in transistor.





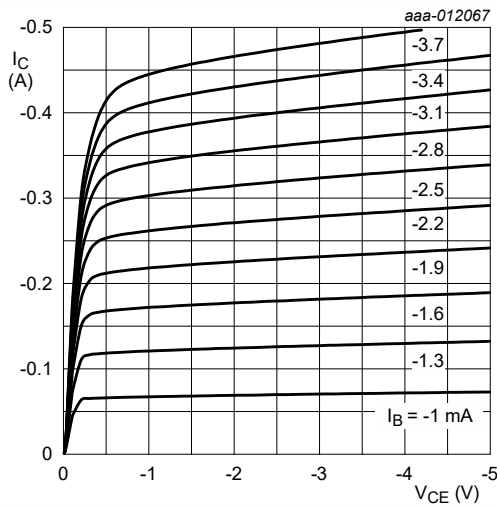
$V_{CE} = -0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



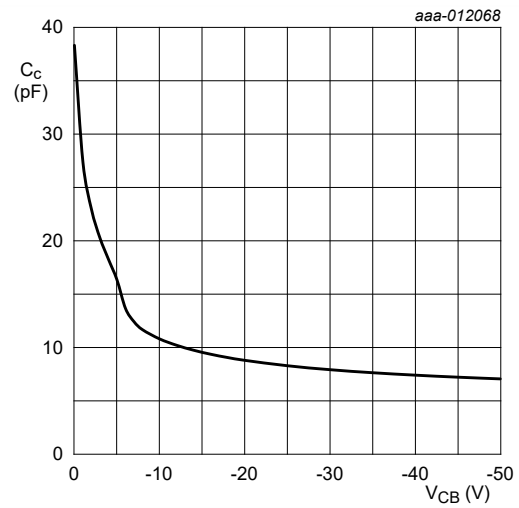
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig. 7. Off-state input voltage as a function of collector current; typical values



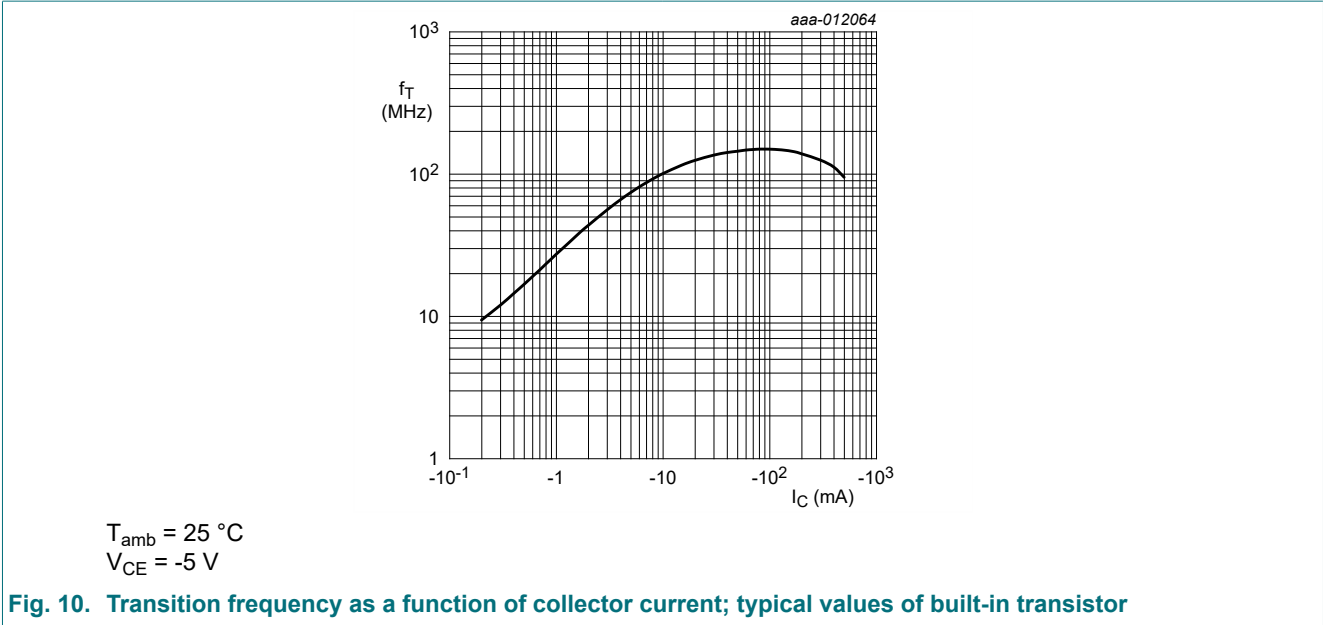
$T_{amb} = 25\text{ °C}$

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



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

Fig. 9. Collector capacitance as a function of collector-base voltage; typical values of built-in transistor

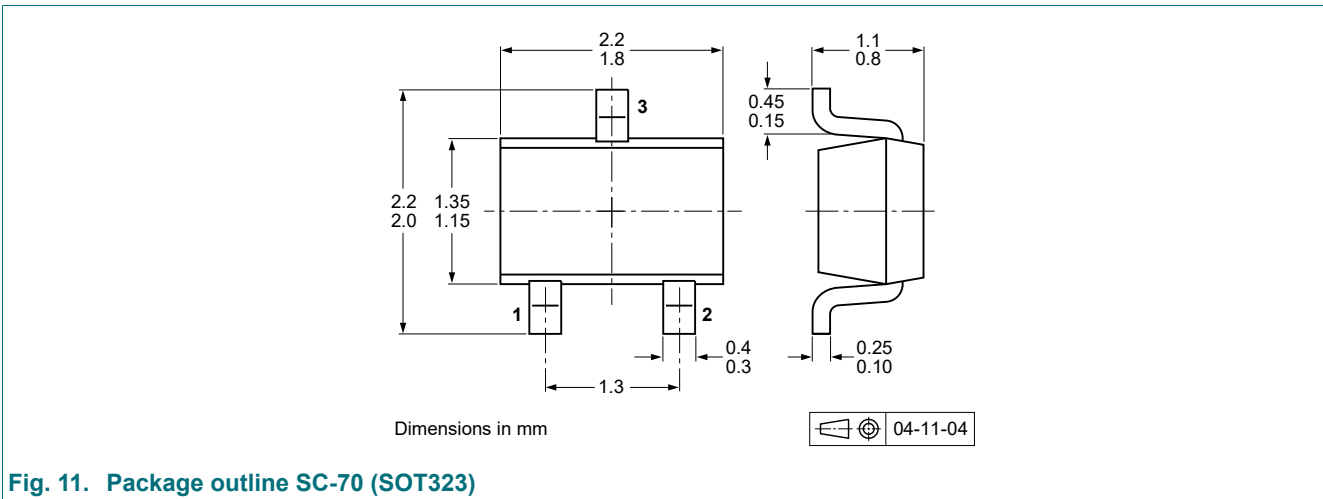


11. Test information

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

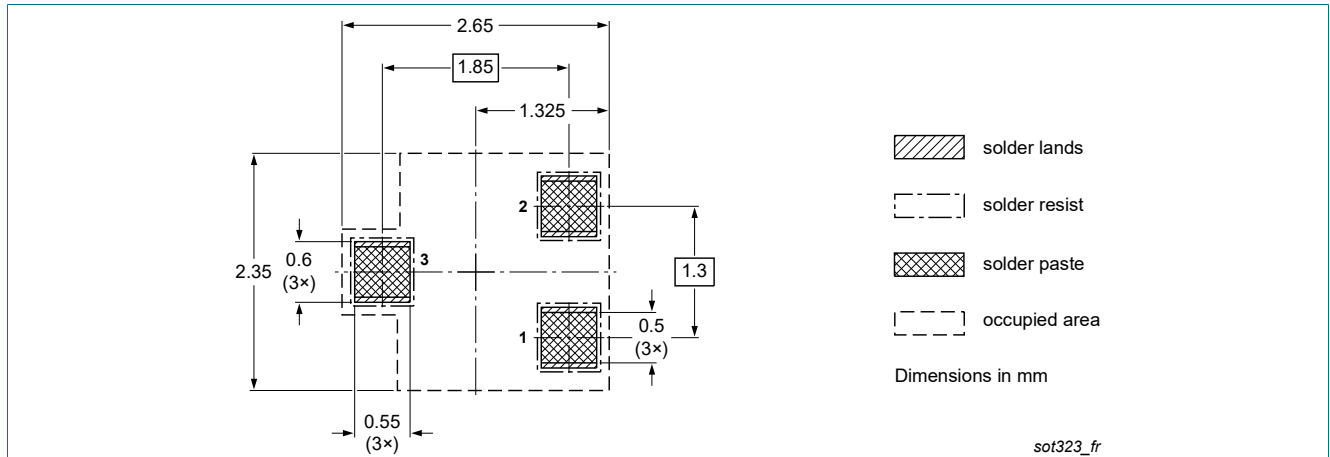


Fig. 12. Reflow soldering footprint for SC-70 (SOT323)

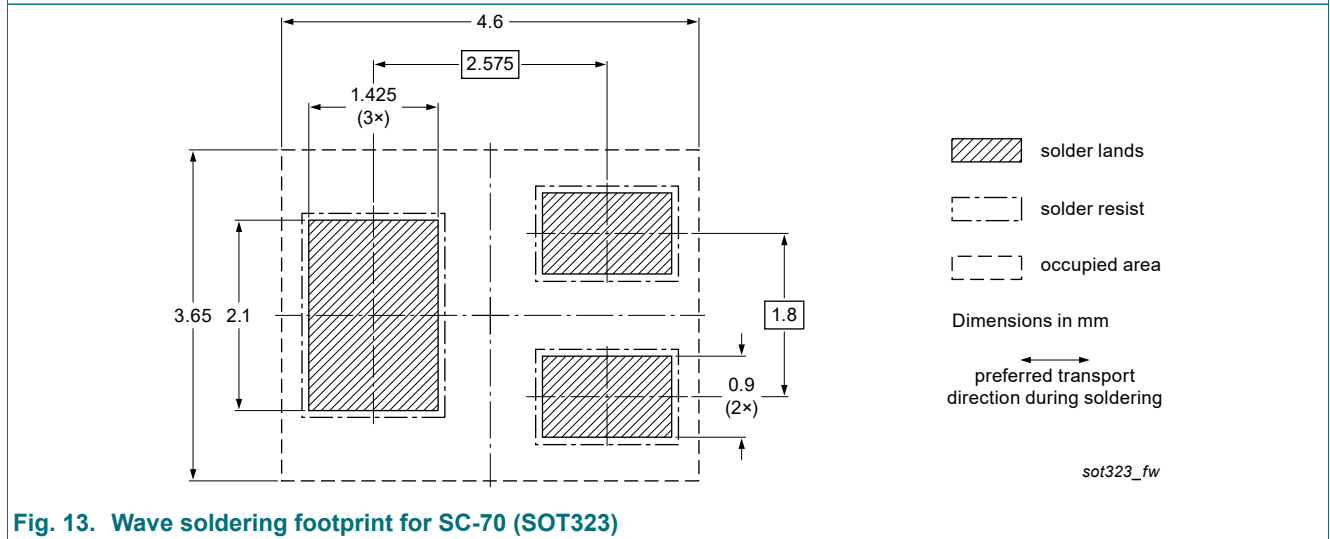


Fig. 13. Wave soldering footprint for SC-70 (SOT323)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|--|--------------------|---------------|-------------------|
| PDTB113EU v.2 | 20240408 | Product data sheet | - | PDTB1XXXU_SER v.1 |
| Modifications: | • Family data sheet reduced to single type data sheet. | | | |
| PDTB1XXXU_SER v.1 | 20140506 | Product data sheet | - | - |

15. Legal information

Data sheet status

| 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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