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Kind regards,

Team Nexperia



# PNTC114EMB

NPN resistor-equipped transistor;  $R1 = 10\text{ k}\Omega$ ,  $R2 = 10\text{ k}\Omega$

Rev. 1 — 21 June 2012

Product data sheet

## 1. Product profile

### 1.1 General description

NPN Resistor-Equipped Transistor (RET) in a leadless ultra small DFN1006B-3 (SOT883B) Surface-Mounted Device (SMD) plastic package.

PNP complement: PDTA114EMB.

### 1.2 Features and benefits

- 100 mA output current capability
- Reduces component count
- Built-in bias resistors
- Reduces pick and place costs
- Simplifies circuit design
- AEC-Q101 qualified
- Leadless ultra small SMD plastic package
- Low package height of 0.37 mm

### 1.3 Applications

- Low-current peripheral driver
- Control of IC inputs
- Replaces general-purpose transistors in digital applications
- Mobile applications

### 1.4 Quick reference data

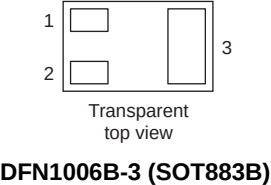
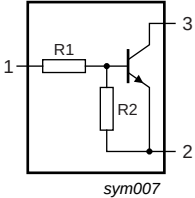
Table 1. Quick reference data

| 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)   | $T_{amb} = 25\text{ }^{\circ}\text{C}$ | 7   | 10  | 13  | $\text{k}\Omega$ |
| R2/R1     | bias resistor ratio       |                                        | 0.8 | 1   | 1.2 |                  |



2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description        | Simplified outline                                                                | Graphic symbol                                                                      |
|-----|--------|--------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | I      | input (base)       |  |  |
| 2   | G      | GND (emitter)      |                                                                                   |                                                                                     |
| 3   | O      | output (collector) |                                                                                   |                                                                                     |

3. Ordering information

Table 3. Ordering information

| Type number | Package    |                                                                                |         |
|-------------|------------|--------------------------------------------------------------------------------|---------|
|             | Name       | Description                                                                    | Version |
| PDTC114EMB  | DFN1006B-3 | Leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.37 mm | SOT883B |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PDTC114EMB  | 0100 1010    |

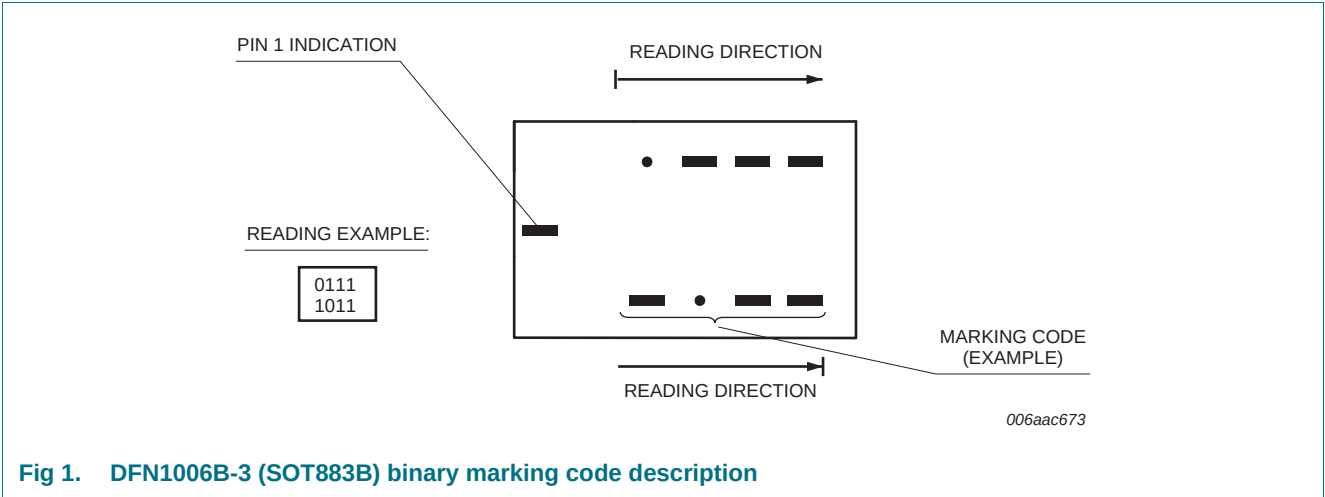


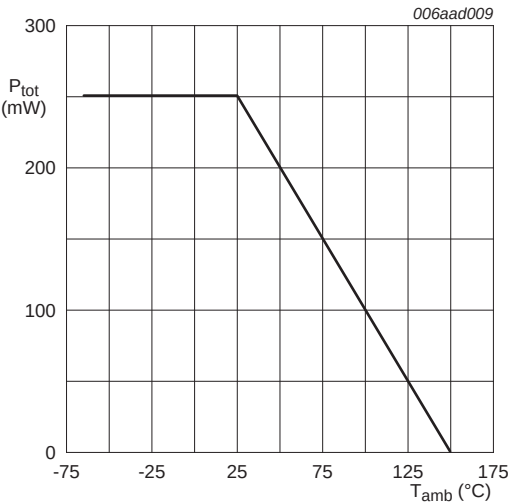
Fig 1. DFN1006B-3 (SOT883B) binary marking code description

5. 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                                 | -   | 50  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                                    | -   | 50  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                               | -   | 10  | V    |
| V <sub>I</sub>   | input voltage             | positive                                     | -   | 40  | V    |
|                  |                           | negative                                     | -   | -10 | V    |
| I <sub>O</sub>   | output current            |                                              | -   | 100 | mA   |
| I <sub>CM</sub>  | peak collector current    | pulsed; t <sub>p</sub> ≤ 1 ms                | -   | 100 | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C <a href="#">[1]</a> | -   | 250 | mW   |
| 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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

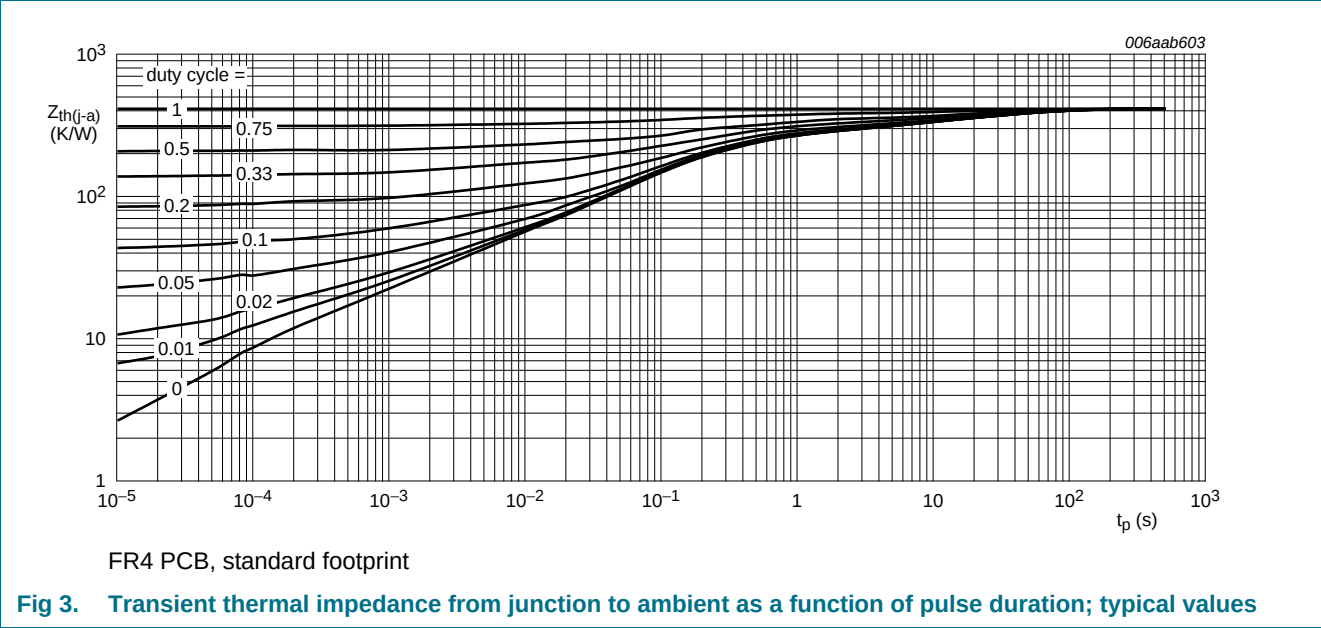
Fig 2. Power derating curve for DFN1006B-3 (SOT883B)

6. 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 | -   | -   | 500 | K/W  |

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

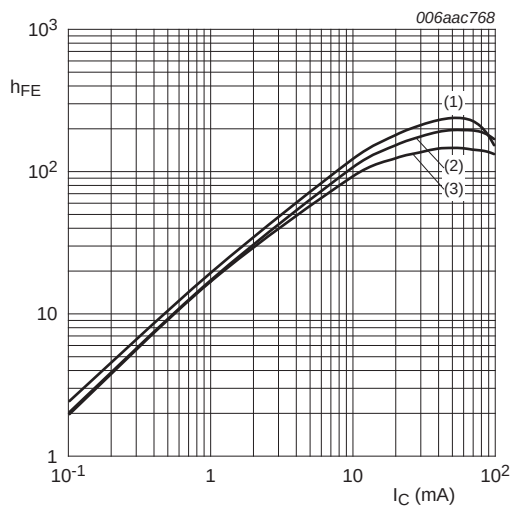


## 7. Characteristics

Table 7. Characteristics

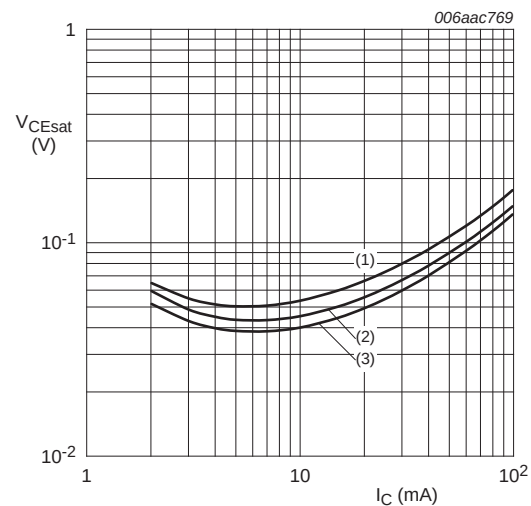
| Symbol       | Parameter                            | Conditions                                                                                                                             | Min | Typ | Max | Unit          |
|--------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $I_{CBO}$    | collector-base cut-off current       | $V_{CB} = 50 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                                | -   | -   | 100 | nA            |
| $I_{CEO}$    | collector-emitter cut-off current    | $V_{CE} = 30 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                                | -   | -   | 1   | $\mu\text{A}$ |
|              |                                      | $V_{CE} = 30 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_j = 150 \text{ }^{\circ}\text{C}$                                                   | -   | -   | 5   | $\mu\text{A}$ |
| $I_{EBO}$    | emitter-base cut-off current         | $V_{EB} = 5 \text{ V}$ ; $I_C = 0 \text{ A}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                                 | -   | -   | 400 | $\mu\text{A}$ |
| $h_{FE}$     | DC current gain                      | $V_{CE} = 5 \text{ V}$ ; $I_C = 5 \text{ mA}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                                | 30  | -   | -   |               |
| $V_{CEsat}$  | collector-emitter saturation voltage | $I_C = 10 \text{ mA}$ ; $I_B = 0.5 \text{ mA}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                               | -   | -   | 150 | mV            |
| $V_{I(off)}$ | off-state input voltage              | $V_{CE} = 5 \text{ V}$ ; $I_C = 100 \mu\text{A}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                             | -   | 1.1 | 0.8 | V             |
| $V_{I(on)}$  | on-state input voltage               | $V_{CE} = 0.3 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                             | 2.5 | 1.8 | -   | V             |
| R1           | bias resistor 1 (input)              | $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                                                                                | 7   | 10  | 13  | kΩ            |
| R2/R1        | bias resistor ratio                  |                                                                                                                                        | 0.8 | 1   | 1.2 |               |
| $C_C$        | collector capacitance                | $V_{CB} = 10 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $i_e = 0 \text{ A}$ ;<br>$f = 1 \text{ MHz}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$ | -   | -   | 2.5 | pF            |
| $f_T$        | transition frequency                 | $V_{CE} = 5 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; $f = 100 \text{ MHz}$ ;<br>$T_{amb} = 25 \text{ }^{\circ}\text{C}$                    | [1] | 230 | -   | MHz           |

[1] Characteristics of built-in transistor.



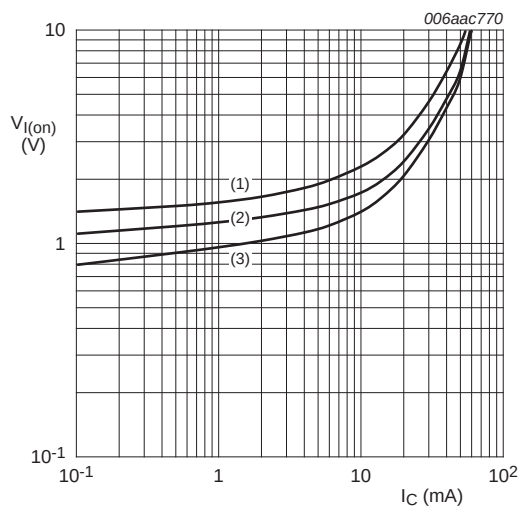
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

Fig 4. DC current gain as a function of collector current; typical values



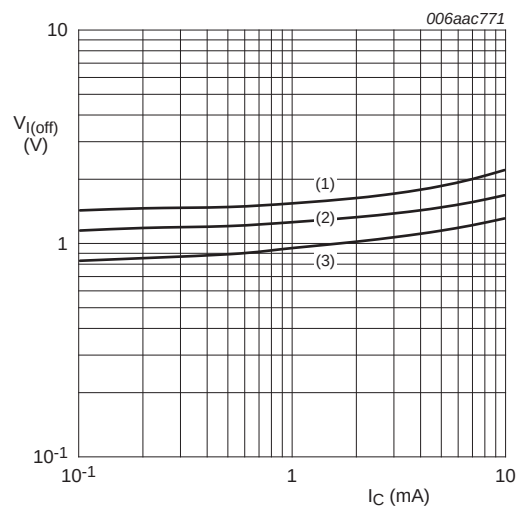
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



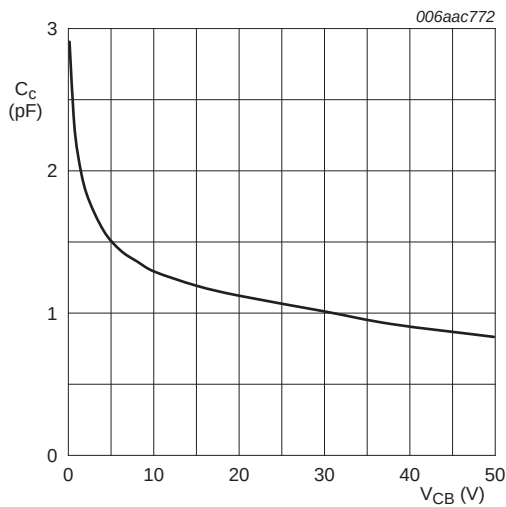
$V_{CE} = 0.3\text{ V}$   
(1)  $T_{amb} = -40\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



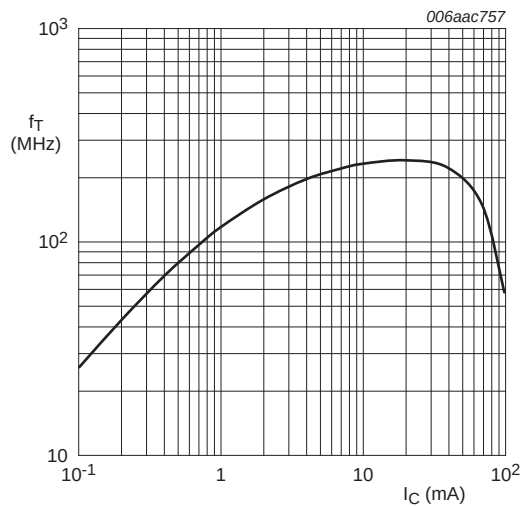
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = -40\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



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

Fig 8. Collector capacitance as a function of collector-base voltage; typical values



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

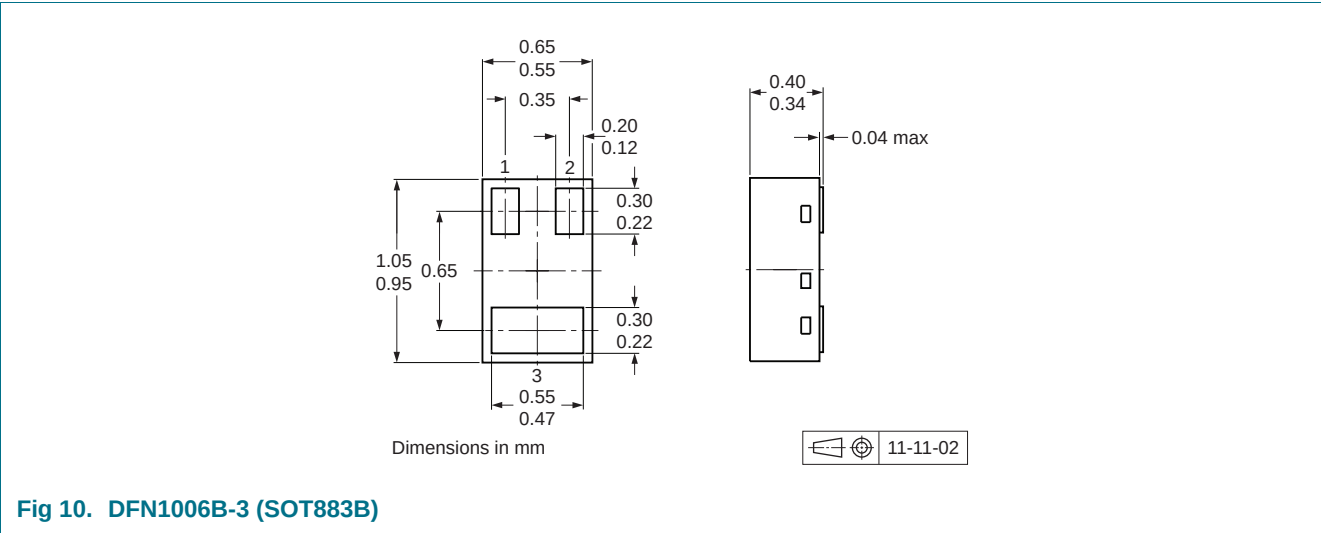
Fig 9. Transition frequency as a function of collector current; typical values of built-in transistor

8. Test information

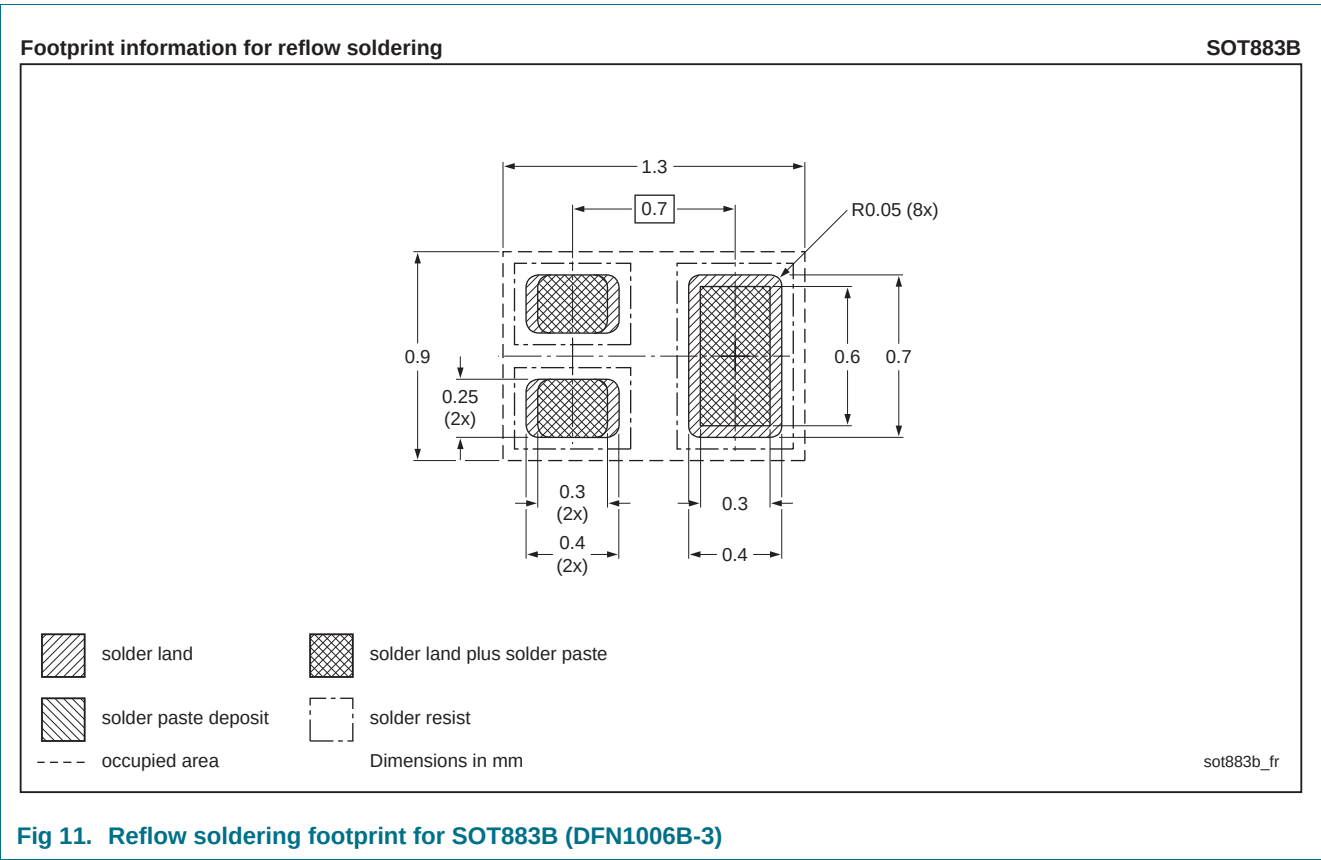
8.1 Quality information

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



10. Soldering





## 11. Revision history

Table 8. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| PDTC114EMB v.1 | 20120621     | Product data sheet | -             | -          |

## 12. Legal information

### 12.1 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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[2] The term 'short data sheet' is explained in section "Definitions".

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Date of release: 21 June 2012

Document identifier: PDT C114EMB