

PMD5002K

MOSFET driver

Rev. 01 — 6 November 2006

Product data sheet

1. Product profile

1.1 General description

PNP switching transistor and high-speed switching diode to protect the base-emitter junction in reverse direction in a SOT346 (SC-59A/TO-236) small Surface-Mounted Device (SMD) plastic package.

1.2 Features

- Switching transistor and high-speed switching diode as driver
- High-speed switching diode to protect the base-emitter junction
- Application-optimized pinout
- Internal connections to minimize layout effort
- Space-saving solution
- Reduces component count

1.3 Applications

- Power MOSFET driver

1.4 Quick reference data

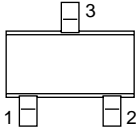
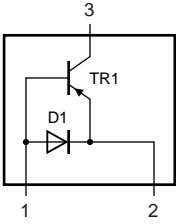
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---------------------------|----------------------------------|-----|-----|------|------|
| PNP transistor | | | | | | |
| V_{CE0} | collector-emitter voltage | open base | - | - | -40 | V |
| I_C | collector current | | - | - | -0.6 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | -1 | A |
| Diode | | | | | | |
| I_F | forward current | | - | - | 0.2 | A |
| V_F | forward voltage | $I_F = 200$ mA | [1] | - | 1.1 | V |

[1] Pulse test: $t_p \leq 300$ μ s; $\delta \leq 0.02$.

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------------------|---|---|
| 1 | base TR1, anode D1 |  |  |
| 2 | emitter TR1, cathode D1 | | |
| 3 | collector TR1 | | |

006aaa656

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PMD5002K | SC-59A | plastic surface-mounted package; 3 leads | SOT346 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMD5002K | D5 |

5. Limiting values

Table 5. Limiting values

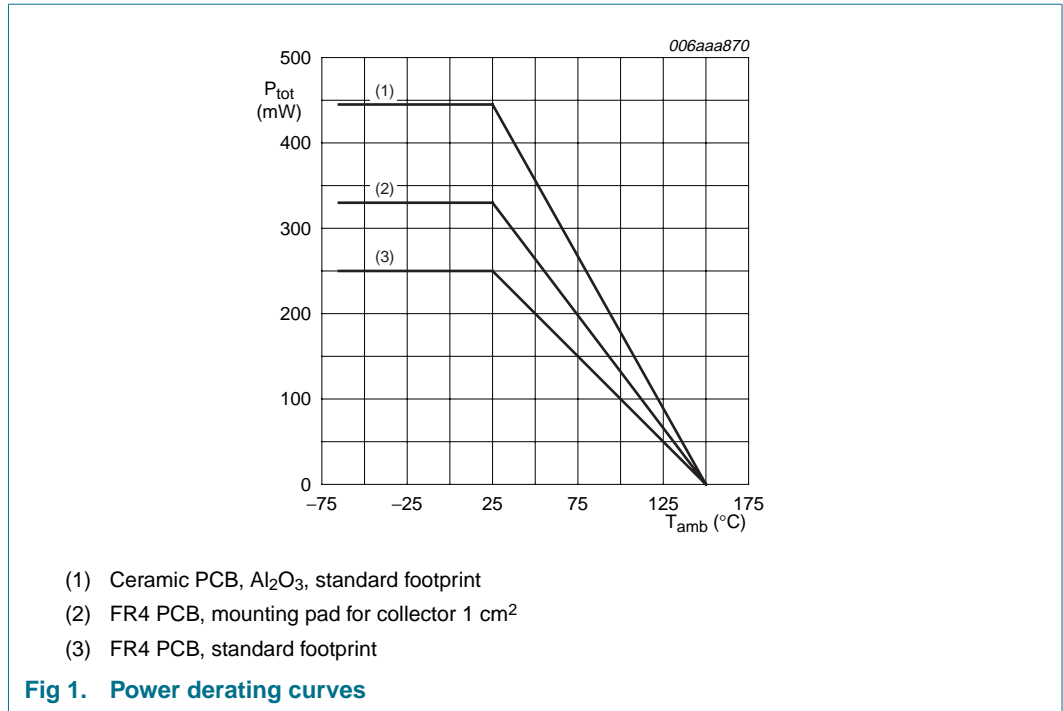
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|-----------------------|-------------------------------------|----------------------------------|-----|------|------|----|
| PNP transistor | | | | | | |
| V_{CBO} | collector-base voltage | open emitter | - | -40 | V | |
| V_{CEO} | collector-emitter voltage | open base | - | -40 | V | |
| I_C | collector current | | - | -0.6 | A | |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | -1 | A | |
| I_B | base current | | - | -0.2 | A | |
| I_{BM} | peak base current | single pulse; $t_p \leq 1$ ms | - | -0.3 | A | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 250 | mW |
| | | | [2] | - | 330 | mW |
| | | | [3] | - | 445 | mW |
| Diode | | | | | | |
| I_F | forward current | | - | 0.2 | A | |
| I_{FRM} | repetitive peak forward current | $t_p \leq 1$ ms; $\delta = 0.25$ | - | 0.6 | A | |
| I_{FSM} | non-repetitive peak forward current | square wave | | | | |
| | | $t_p \leq 1$ μ s | - | 9 | A | |
| | | $t_p \leq 100$ μ s | - | 3 | A | |
| | | $t_p \leq 10$ ms | - | 1.7 | A | |
| Device | | | | | | |
| 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 copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

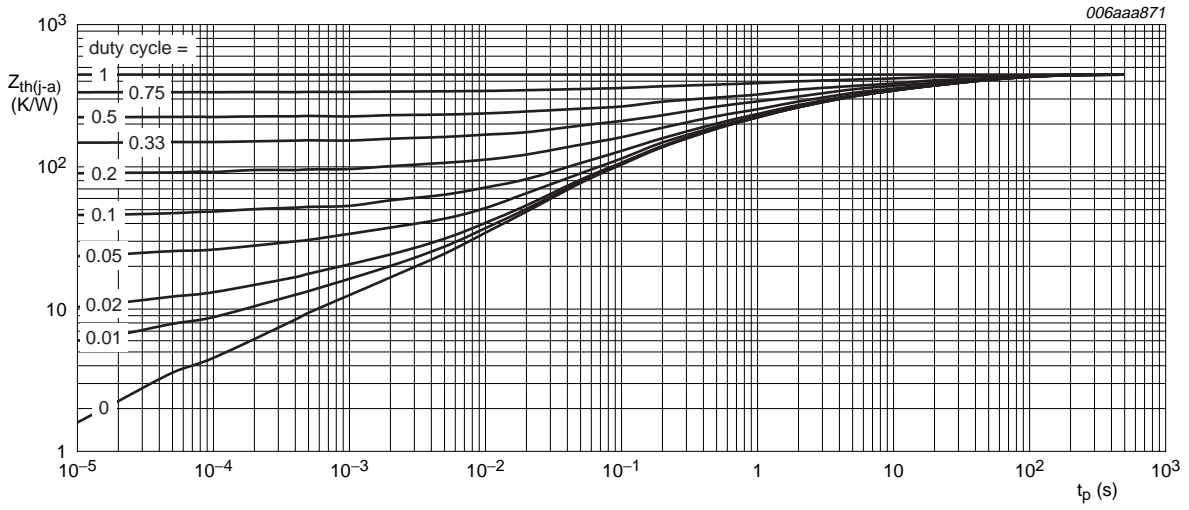


6. Thermal characteristics

Table 6. Thermal characteristics

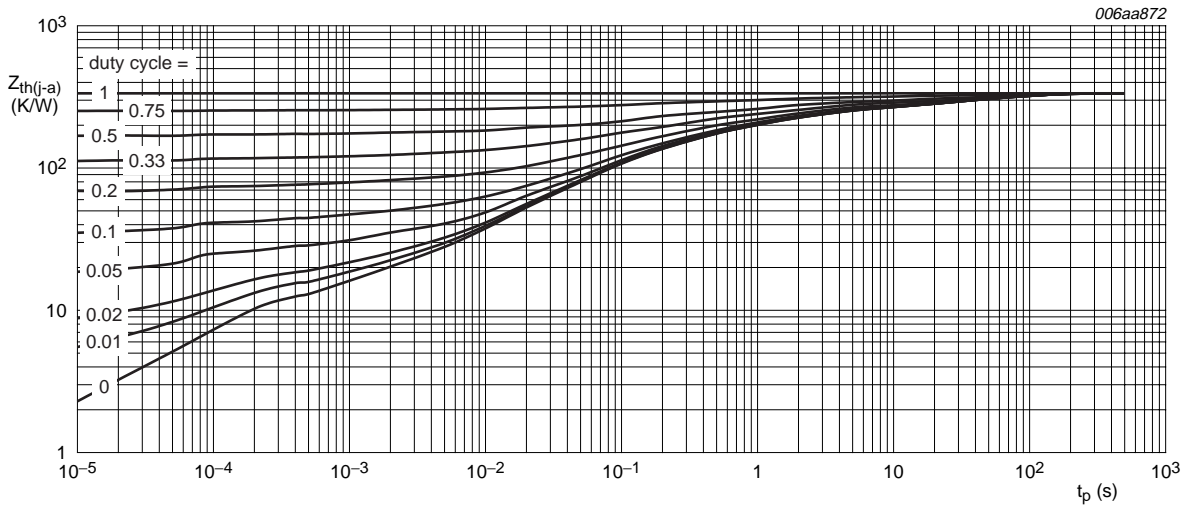
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|-----------------------|---|-------------|-----|-----|-----|------|-----|
| PNP transistor | | | | | | | |
| R _{th(j-a)} | thermal resistance from junction to ambient | in free air | [1] | - | - | 500 | K/W |
| | | | [2] | - | - | 375 | K/W |
| | | | [3] | - | - | 280 | 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 cm².
- [3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.



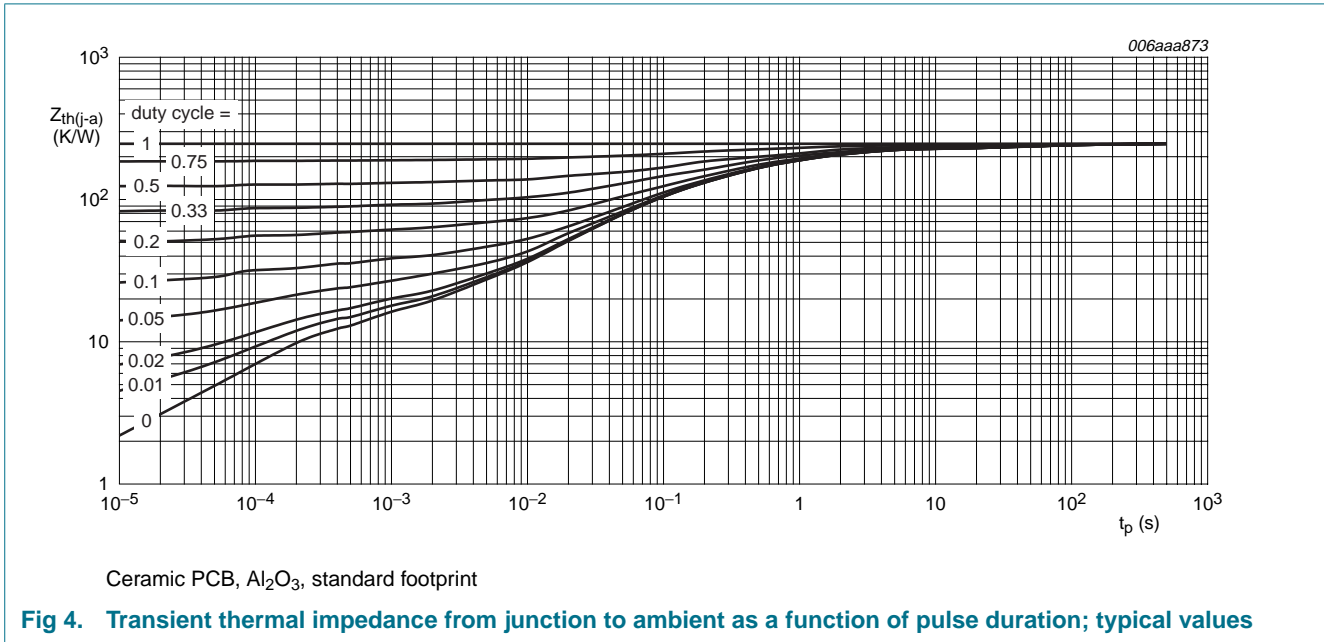
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm²

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

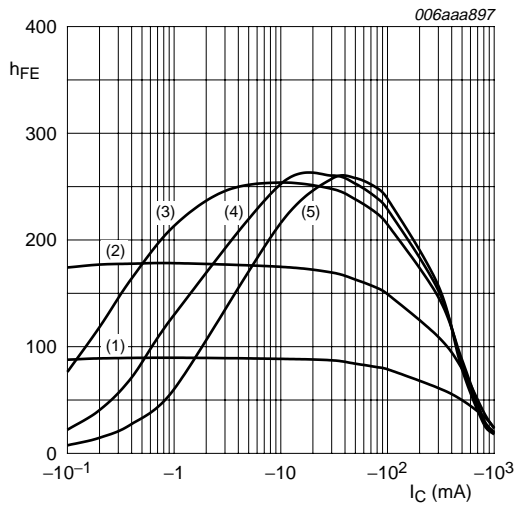


7. Characteristics

Table 7. Characteristics

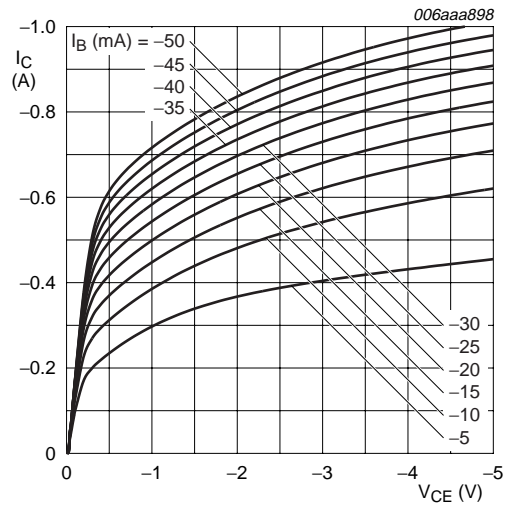
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|--------------------------------------|--|-----|-------|------|---------------|
| PNP transistor | | | | | | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$ | - | - | -10 | nA |
| | | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$ | - | - | -10 | μA |
| h_{FE} | DC current gain | $V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$ | 100 | 180 | - | |
| | | $V_{CE} = -5\text{ V}; I_C = -200\text{ mA}$ | 100 | 125 | - | |
| | | $V_{CE} = -5\text{ V}; I_C = -500\text{ mA}$ [1] | 50 | 80 | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -200\text{ mA}; I_B = -20\text{ mA}$ | - | -130 | -250 | mV |
| | | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1] | - | -280 | -500 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -200\text{ mA}; I_B = -20\text{ mA}$ | - | -0.86 | -1 | V |
| | | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$ [1] | - | -0.97 | -1.1 | V |
| V_{BE} | base-emitter voltage | $V_{CE} = -5\text{ V}; I_C = -300\text{ mA}$ | - | -830 | - | mV |
| Diode | | | | | | |
| V_F | forward voltage | $I_F = 200\text{ mA}$ [1] | - | - | 1.1 | V |
| Device | | | | | | |
| t_d | delay time | $I_C = -0.15\text{ A}; I_B = -5\text{ mA}$ | - | 7 | - | ns |
| t_r | rise time | | - | 34 | - | ns |
| t_{on} | turn-on time | | - | 41 | - | ns |
| t_s | storage time | | - | 610 | - | ns |
| t_f | fall time | | - | 172 | - | ns |
| t_{off} | turn-off time | | - | 782 | - | ns |
| Device with optional capacitor C1 | | | | | | |
| t_d | delay time | $I_C = -0.15\text{ A}; I_B = -5\text{ mA}; C1 = 1\text{ nF}$ | - | 4 | - | ns |
| t_r | rise time | | - | 3 | - | ns |
| t_{on} | turn-on time | | - | 7 | - | ns |
| t_s | storage time | | - | 40 | - | ns |
| t_f | fall time | | - | 43 | - | ns |
| t_{off} | turn-off time | | - | 83 | - | ns |

[1] Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.



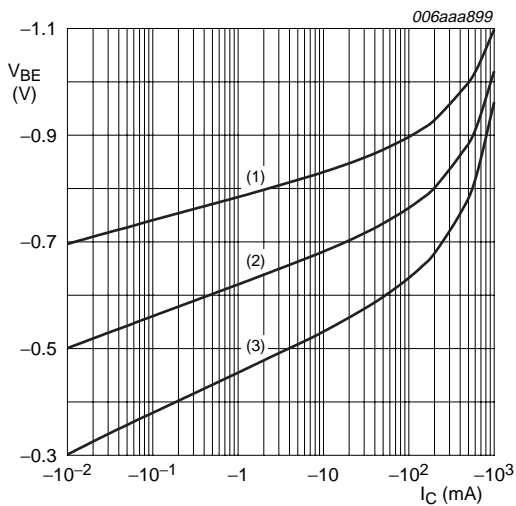
$V_{CE} = -5 V$
 (1) $T_{amb} = -55^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = 100^\circ C$
 (4) $T_{amb} = 125^\circ C$
 (5) $T_{amb} = 150^\circ C$

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



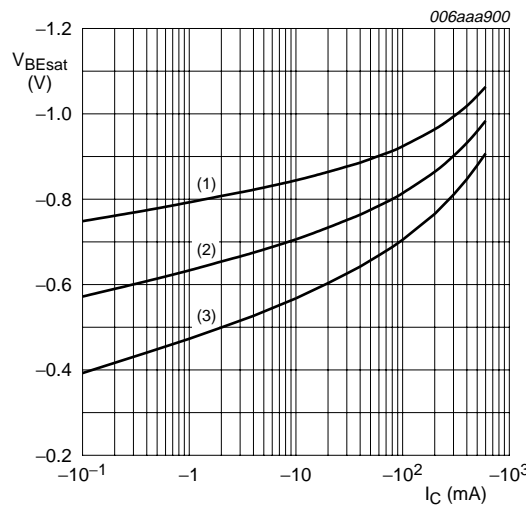
$T_{amb} = 25^\circ C$

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



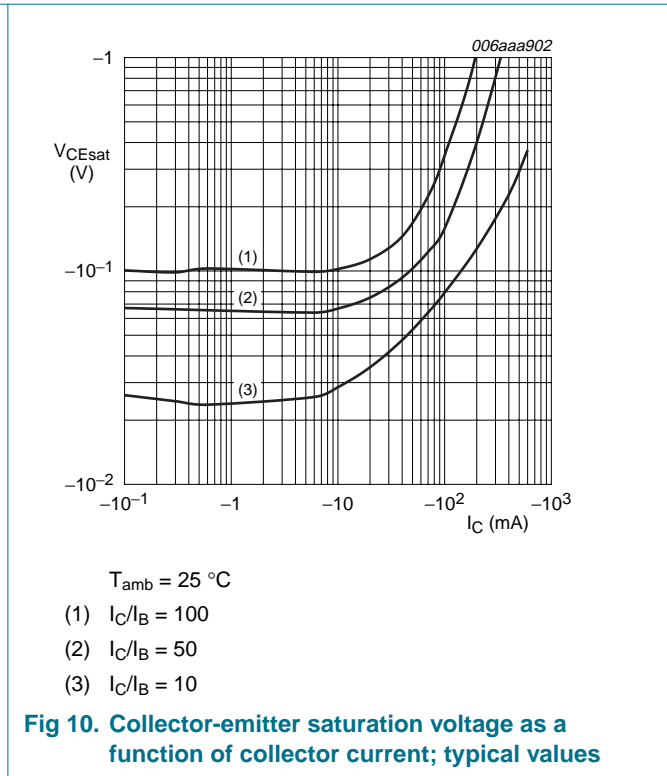
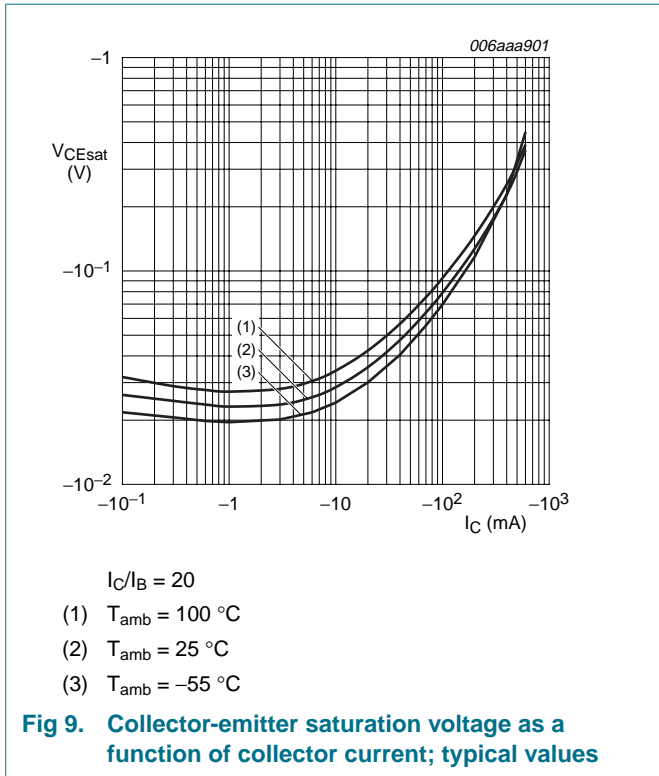
$V_{CE} = -5 V$
 (1) $T_{amb} = -55^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = 100^\circ C$

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

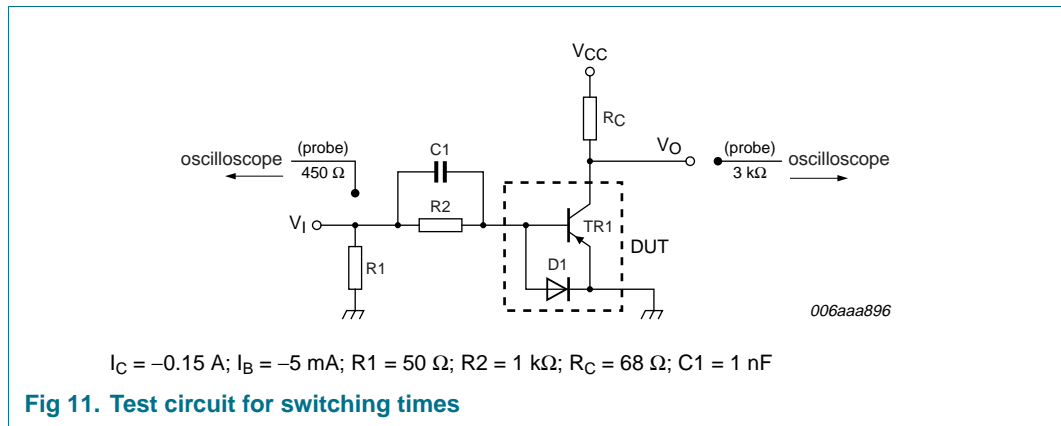


$I_C/I_B = 20$
 (1) $T_{amb} = -55^\circ C$
 (2) $T_{amb} = 25^\circ C$
 (3) $T_{amb} = 100^\circ C$

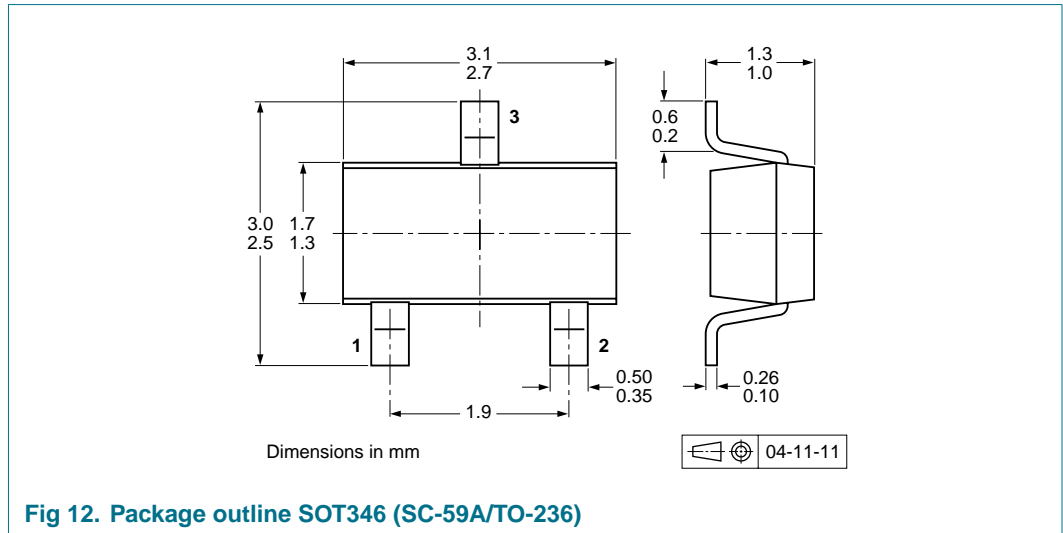
Fig 8. Base-emitter saturation voltage as a function of collector current; typical values



8. Test information



9. Package outline



10. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

| Type number | Package | Description | Packing quantity | |
|-------------|---------|--------------------------------|------------------|-------|
| | | | 3000 | 10000 |
| PMD5002K | SOT346 | 4 mm pitch, 8 mm tape and reel | -115 | -135 |

[1] For further information and the availability of packing methods, see [Section 15](#).

11. Soldering

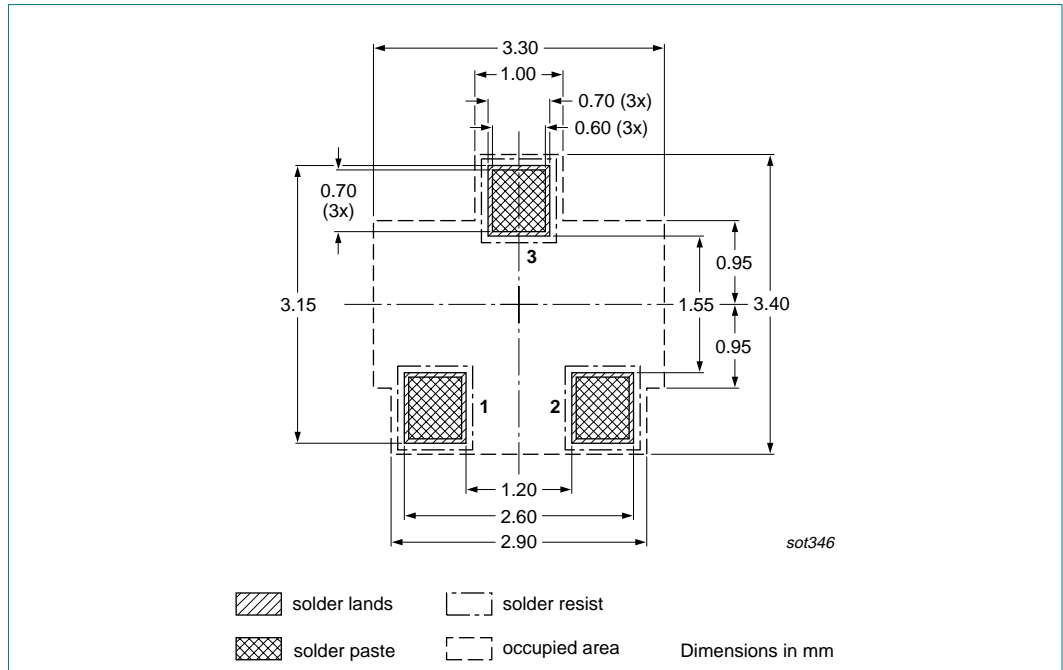


Fig 13. Reflow soldering footprint

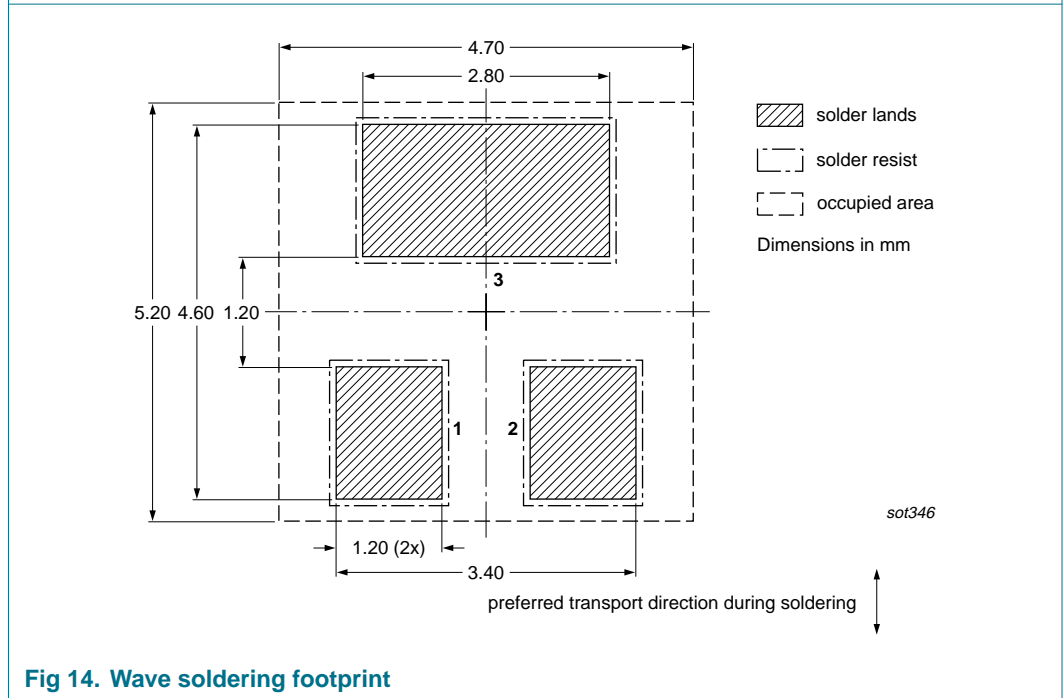
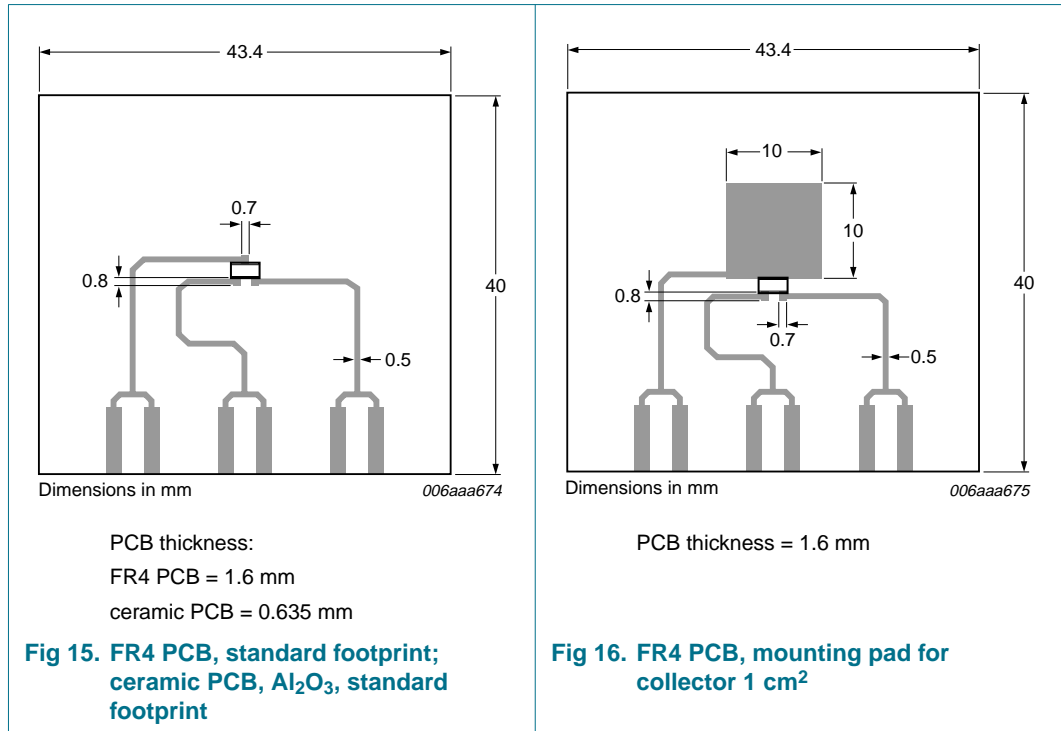


Fig 14. Wave soldering footprint

12. Mounting



13. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| PMD5002K_1 | 20061106 | Product data sheet | - | - |

14. Legal information

14.1 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. |

[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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16. Contents

1 Product profile 1

1.1 General description 1

1.2 Features 1

1.3 Applications 1

1.4 Quick reference data 1

2 Pinning information 2

3 Ordering information 2

4 Marking 2

5 Limiting values 3

6 Thermal characteristics 4

7 Characteristics 7

8 Test information 9

9 Package outline 10

10 Packing information 10

11 Soldering 11

12 Mounting 12

13 Revision history 13

14 Legal information 14

14.1 Data sheet status 14

14.2 Definitions 14

14.3 Disclaimers 14

14.4 Trademarks 14

15 Contact information 14

16 Contents 15

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