

PMD3001D

MOSFET driver

Rev. 02 — 28 August 2009

Product data sheet

1. Product profile

1.1 General description

NPN/PNP transistor pair connected as push-pull driver in a SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

1.2 Features

- Low V_{CEsat} Breakthrough In Small Signal (BISS) transistors in push-pull configuration
- Application-optimized pinout
- Space-saving solution
- Internal connections to minimize layout effort
- Reduces component count

1.3 Applications

- MOSFET driver
- Power bipolar transistor driver
- Output current booster for operational amplifier

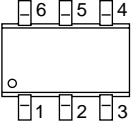
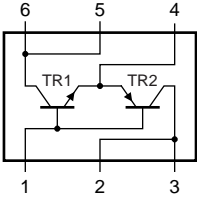
1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------------------------------------------------------------|---------------------------|----------------------------------|-----|-----|-----|------|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| V_{CEO} | collector-emitter voltage | open base | - | - | 40 | V |
| I_C | collector current | | - | - | 1 | A |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | 2 | A |

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1 | base TR1, TR2 |  |  |
| 2 | collector TR2 | | |
| 3 | collector TR2 | | |
| 4 | emitter TR1, TR2 | | |
| 5 | collector TR1 | | |
| 6 | collector TR1 | | |

006aaa659

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--------------------------------------------------|---------|
| | Name | Description | Version |
| PMD3001D | SC-74 | plastic surface-mounted package (TSOP6); 6 leads | SOT457 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMD3001D | 9F |

5. Limiting values

Table 5. Limiting values

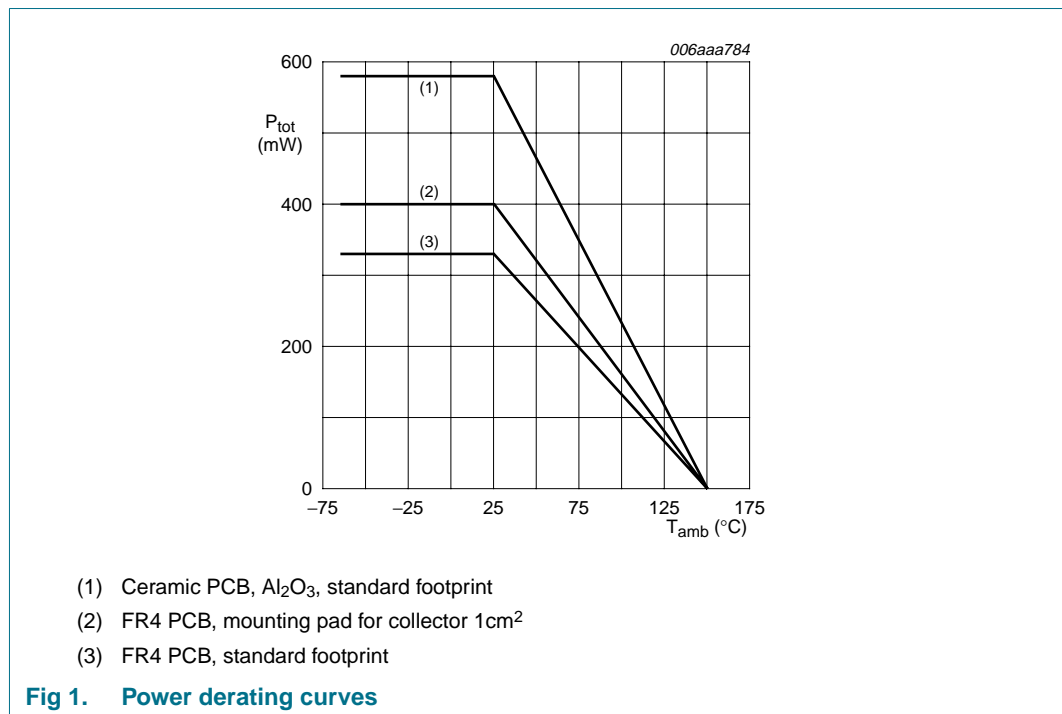
In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol | Parameter | Conditions | Min | Max | Unit | |
|----------------------------------------------------------------------|---------------------------|----------------------------------|-----|------|------|----|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| V_{CBO} | collector-base voltage | open emitter | - | 40 | V | |
| V_{CEO} | collector-emitter voltage | open base | - | 40 | V | |
| I_C | collector current | | - | 1 | A | |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | 2 | A | |
| I_{BM} | peak base current | | - | 0.3 | A | |
| | | single pulse; $t_p \leq 1$ ms | - | 1 | A | |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 330 | mW |
| | | | [2] | - | 400 | mW |
| | | | [3] | - | 580 | 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 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

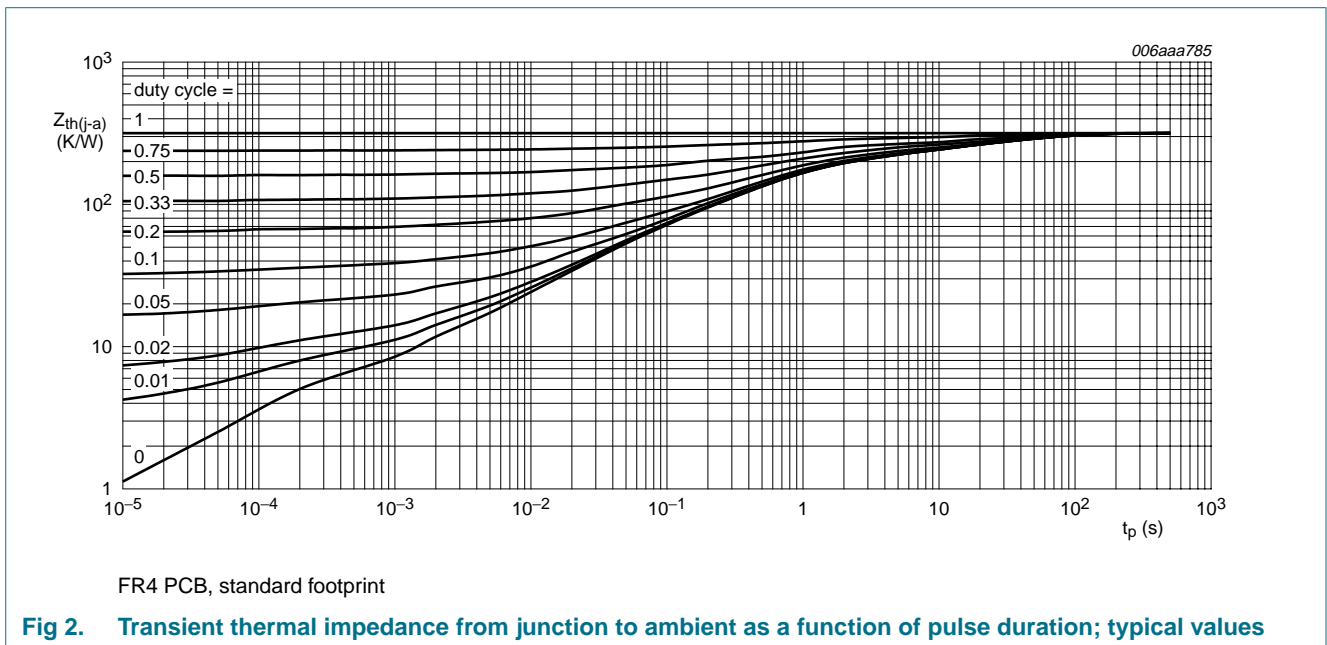
Table 6. Thermal characteristics

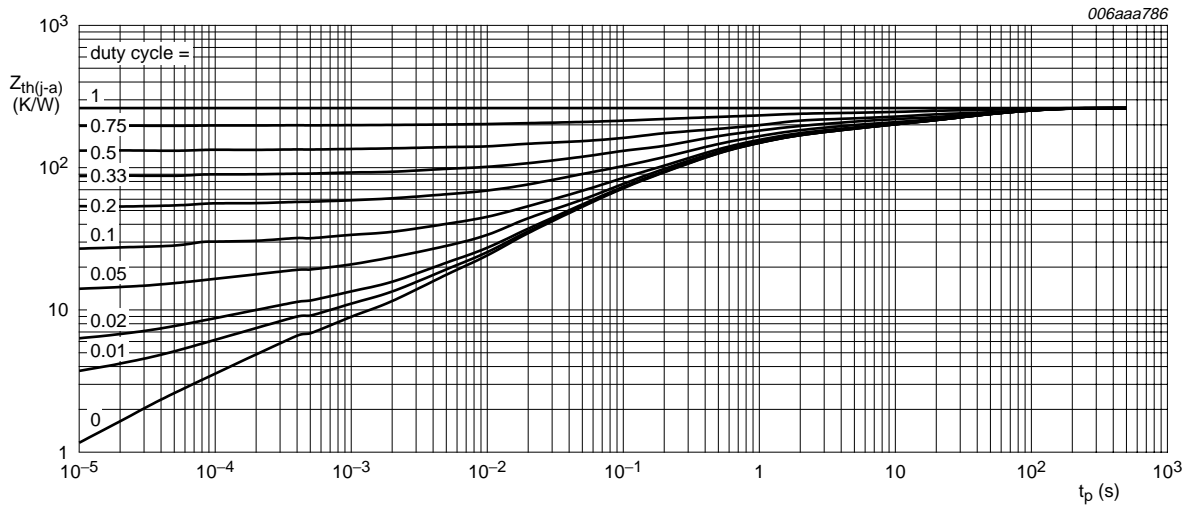
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|---------------------------------------------|-------------|-----|-----|-----|------|-----|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 380 | K/W |
| | | | [2] | - | - | 315 | K/W |
| | | | [3] | - | - | 215 | 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 1cm².

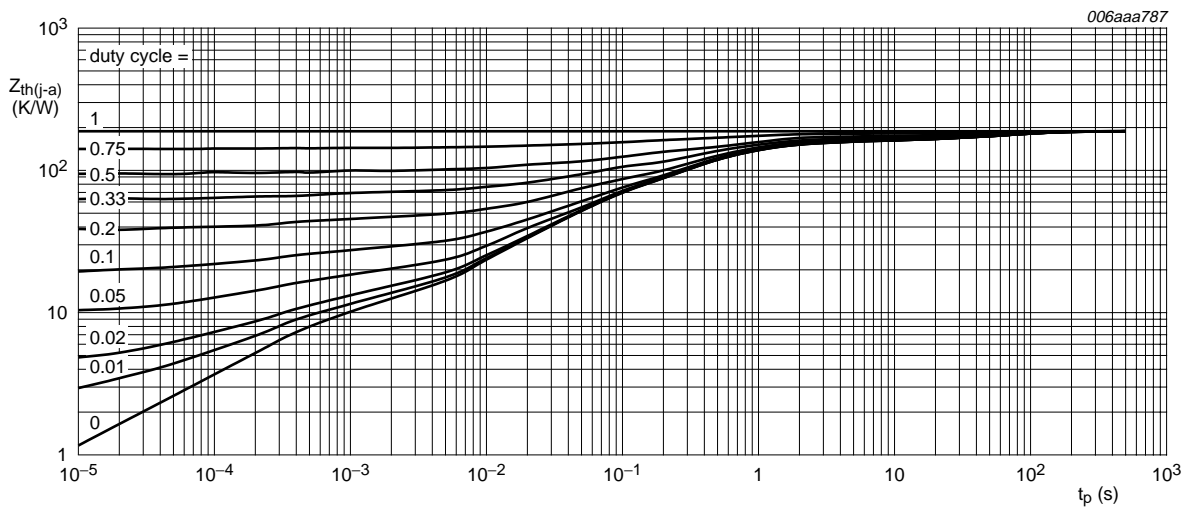
[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.





FR4 PCB, mounting pad for collector 1cm²

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



Ceramic PCB, Al₂O₃, standard footprint

Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

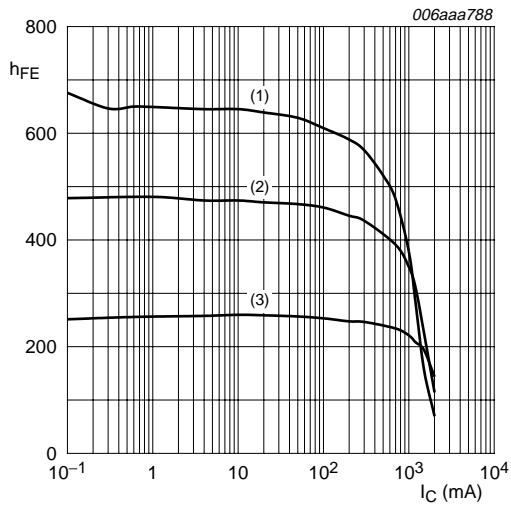
Table 7. Characteristics
T_{amb} = 25 °C unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------------------|--------------------------------------|---------------------------------------------------------------------------|------|-------|-------|------|----|
| Per NPN transistor | | | | | | | |
| I _{CBO} | collector-base cut-off current | V _{CB} = 40 V; I _E = 0 A | - | - | 100 | nA | |
| | | V _{CB} = 40 V; I _E = 0 A; T _j = 150 °C | - | - | 50 | μA | |
| h _{FE} | DC current gain | V _{CE} = 5 V; I _C = 1 mA | 300 | 450 | - | | |
| | | V _{CE} = 5 V; I _C = 200 mA | 300 | 450 | 830 | | |
| | | V _{CE} = 5 V; I _C = 500 mA | [1] | 300 | 400 | - | |
| | | V _{CE} = 5 V; I _C = 1 A | [1] | 200 | 340 | - | |
| | | V _{CE} = 5 V; I _C = 2 A | [1] | 75 | 120 | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = 100 mA; I _B = 5 mA | - | 30 | 80 | mV | |
| | | I _C = 500 mA; I _B = 50 mA | [1] | - | 100 | 120 | mV |
| | | I _C = 1 A; I _B = 100 mA | [1] | - | 180 | 230 | mV |
| | | I _C = 2 A; I _B = 200 mA | [1] | - | 360 | 440 | mV |
| V _{BEsat} | base-emitter saturation voltage | I _C = 100 mA; I _B = 5 mA | - | 0.75 | 0.9 | V | |
| | | I _C = 500 mA; I _B = 50 mA | [1] | - | 0.9 | 1.1 | V |
| | | I _C = 1 A; I _B = 100 mA | [1] | - | 1 | 1.2 | V |
| | | I _C = 2 A; I _B = 200 mA | [1] | - | 1.1 | 1.3 | V |
| V _{BE} | base-emitter voltage | V _{CE} = 5 V; I _C = 1 A | 700 | 800 | 1100 | mV | |
| Per PNP transistor | | | | | | | |
| I _{CBO} | collector-base cut-off current | V _{CB} = -40 V; I _E = 0 A | - | - | -100 | nA | |
| | | V _{CB} = -40 V; I _E = 0 A; T _j = 150 °C | - | - | -50 | μA | |
| h _{FE} | DC current gain | V _{CE} = -5 V; I _C = -1 mA | 300 | 450 | - | | |
| | | V _{CE} = -5 V; I _C = -200 mA | 250 | 390 | 640 | | |
| | | V _{CE} = -5 V; I _C = -500 mA | [1] | 215 | 290 | - | |
| | | V _{CE} = -5 V; I _C = -1 A | [1] | 150 | 200 | - | |
| | | V _{CE} = -5 V; I _C = -2 A | [1] | 50 | 85 | - | |
| V _{CEsat} | collector-emitter saturation voltage | I _C = -100 mA; I _B = -5 mA | - | -40 | -140 | mV | |
| | | I _C = -500 mA; I _B = -50 mA | [1] | - | -110 | -170 | mV |
| | | I _C = -1 A; I _B = -100 mA | [1] | - | -200 | -310 | mV |
| | | I _C = -2 A; I _B = -200 mA | [1] | - | -400 | -500 | mV |
| V _{BEsat} | base-emitter saturation voltage | I _C = -100 mA; I _B = -5 mA | - | -0.75 | -0.9 | V | |
| | | I _C = -500 mA; I _B = -50 mA | [1] | - | -0.88 | -1.1 | V |
| | | I _C = -1 A; I _B = -100 mA | [1] | - | -0.95 | -1.2 | V |
| | | I _C = -2 A; I _B = -200 mA | [1] | - | -1.1 | -1.3 | V |
| V _{BE} | base-emitter voltage | V _{CE} = -5 V; I _C = -1 A | -700 | -800 | -1100 | mV | |

Table 7. Characteristics ...continued
T_{amb} = 25 °C unless otherwise specified

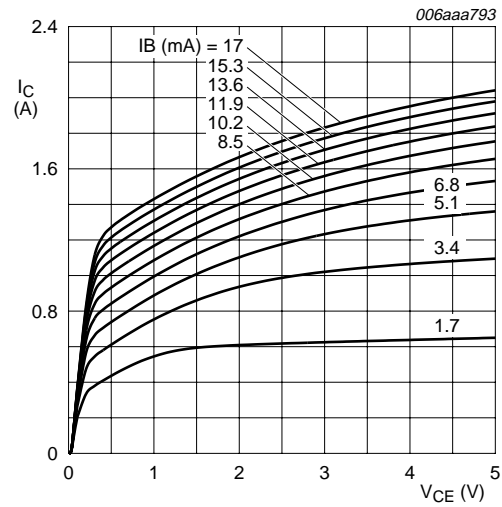
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------|---------------|----------------------------------------------|-----|-----|-----|------|
| Per device | | | | | | |
| t _d | delay time | I _C = 0.5 A; V _I = 8 V | - | 3 | - | ns |
| t _r | rise time | | - | 17 | - | ns |
| t _{on} | turn-on time | | - | 20 | - | ns |
| t _s | storage time | | - | 3 | - | ns |
| t _f | fall time | | - | 6 | - | ns |
| t _{off} | turn-off time | | - | 9 | - | ns |

[1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02



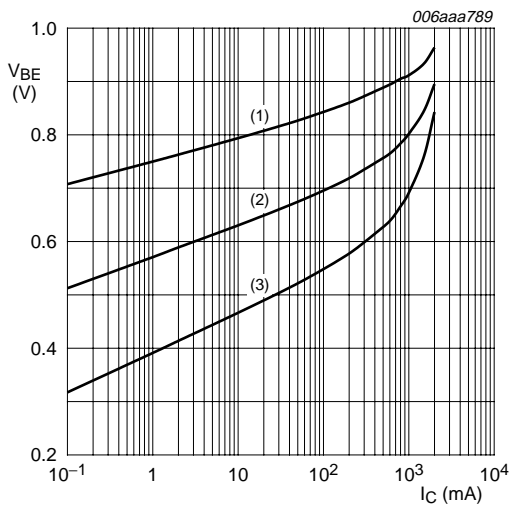
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 5. TR1 (NPN): DC current gain as a function of collector current; typical values



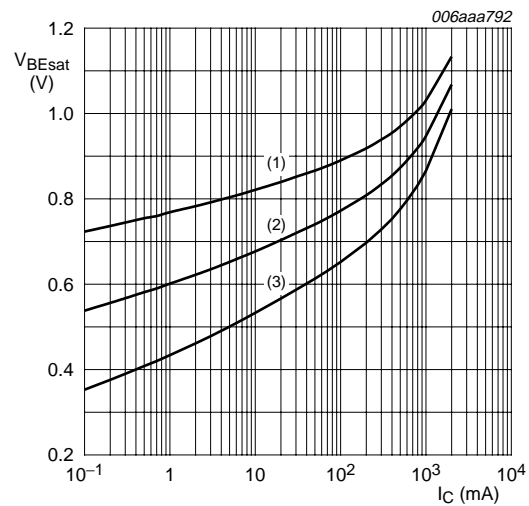
$T_{amb} = 25\text{ }^{\circ}\text{C}$

Fig 6. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values



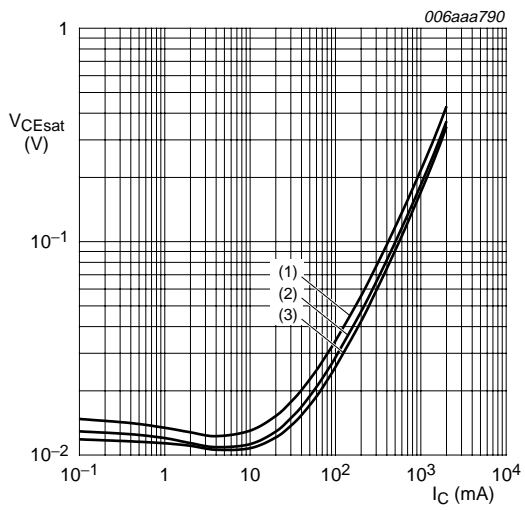
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 7. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values



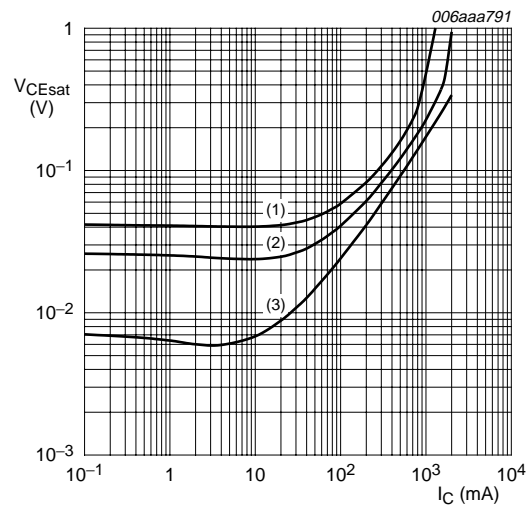
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 8. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values



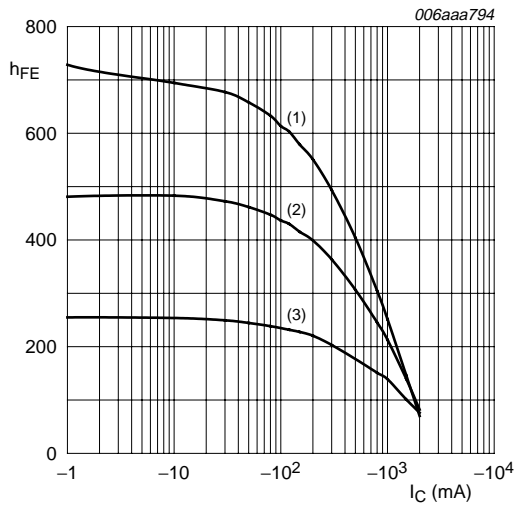
- $I_C/I_B = 20$
- (1) $T_{amb} = 100\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = -55\text{ °C}$

Fig 9. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



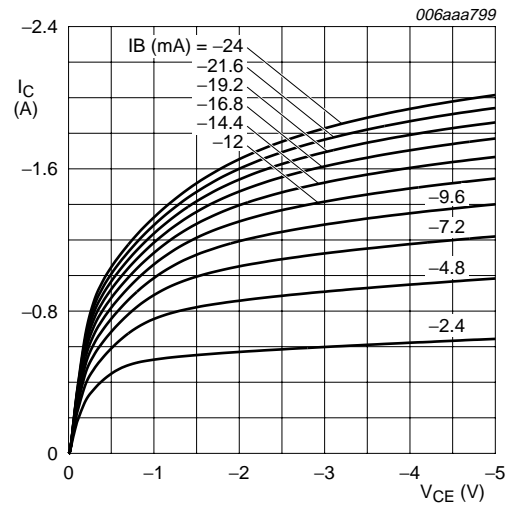
- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 10$

Fig 10. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values



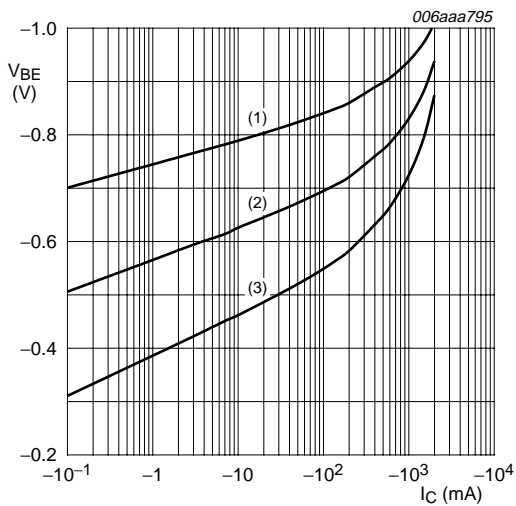
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 11. TR2 (PNP): DC current gain as a function of collector current; typical values



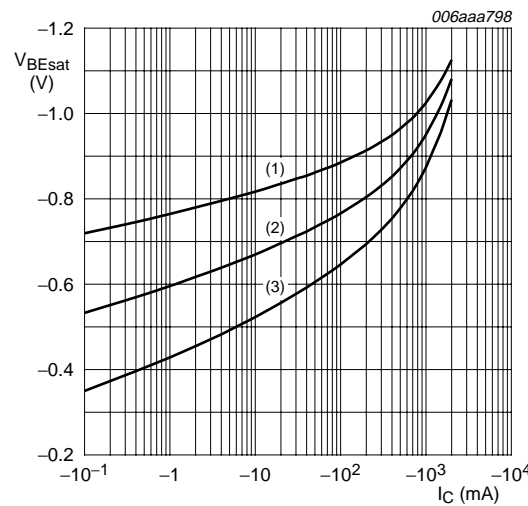
$T_{amb} = 25\text{ }^{\circ}\text{C}$

Fig 12. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values



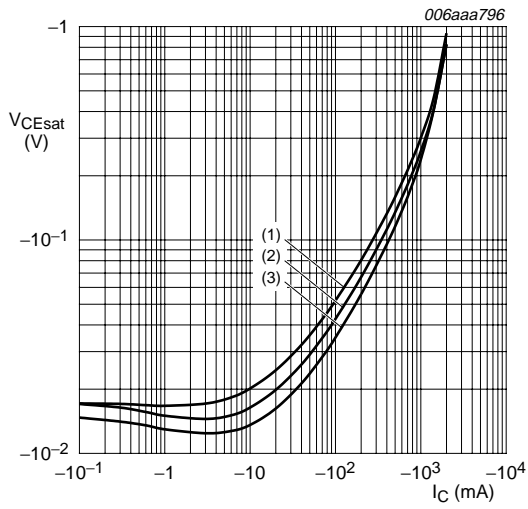
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 13. TR2 (PNP): Base-emitter voltage as a function of collector current; typical values



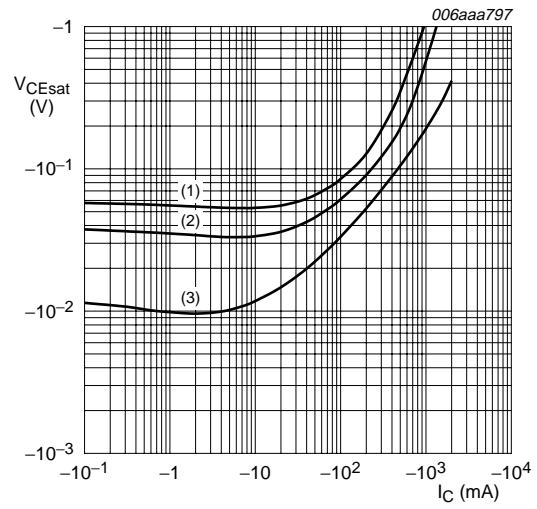
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 14. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values



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

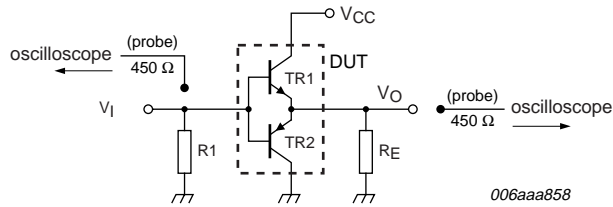
Fig 15. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values



- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 10$

Fig 16. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values

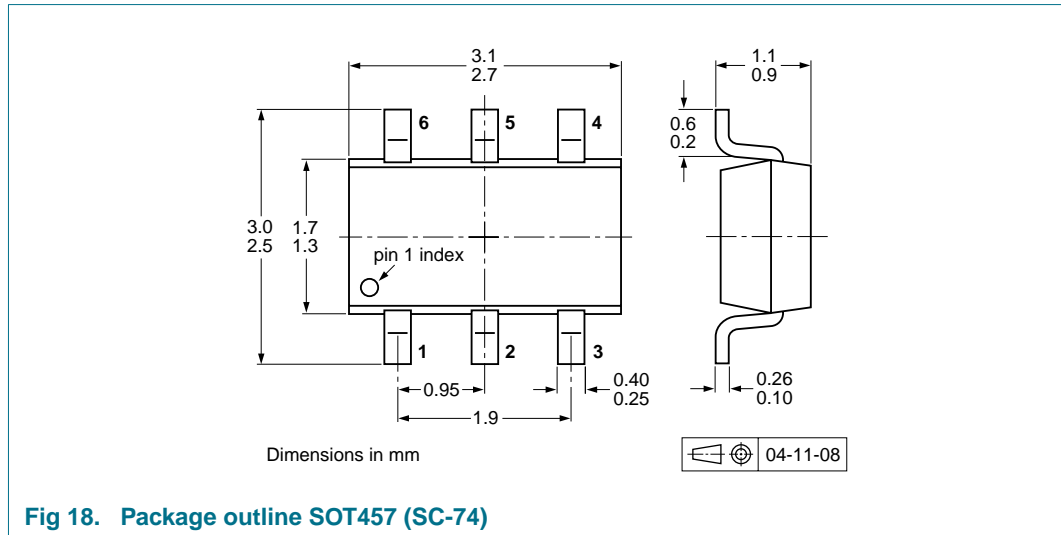
8. Test information



$I_C = 0.5\text{ A}; V_I = 8\text{ V}; R_1 = 56\text{ }\Omega; R_E = 15\text{ }\Omega$

Fig 17. Test circuit for switching times

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 |
| PMD3001D | SOT457 | 4 mm pitch, 8 mm tape and reel; T1 ^[2] | -115 | -135 |
| | | 4 mm pitch, 8 mm tape and reel; T2 ^[3] | -125 | -165 |

[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering

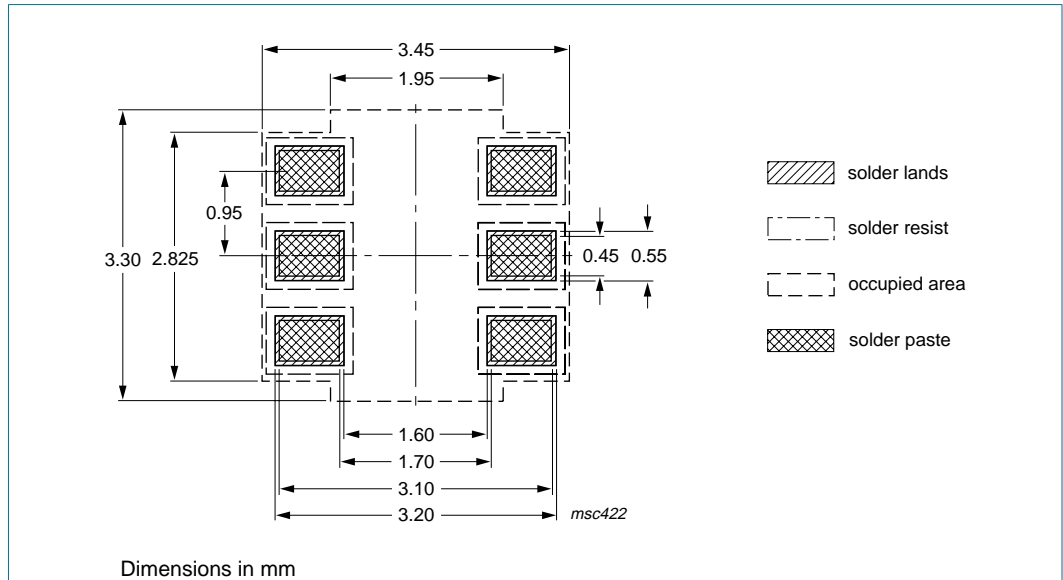


Fig 19. Reflow soldering footprint SOT457 (SC-74)

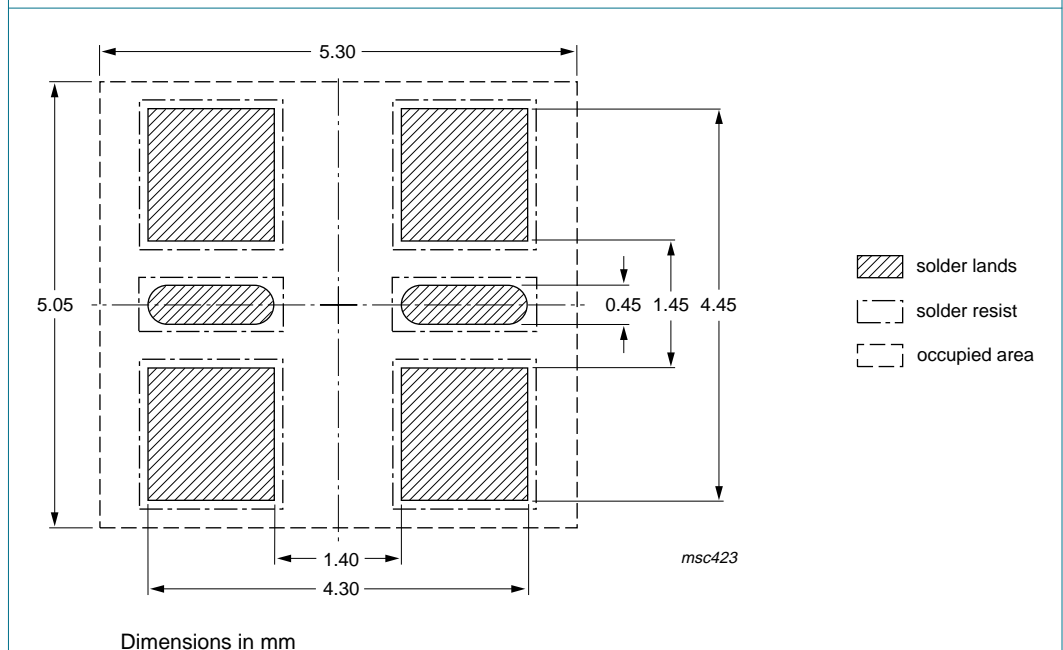


Fig 20. Wave soldering footprint SOT457 (SC-74)

12. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| PMD3001D_2 | 20090828 | Product data sheet | - | PMD3001D_1 |
| Modifications: | | <ul style="list-style-type: none">This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.Figure 20 "Wave soldering footprint SOT457 (SC-74)": updated | | |
| PMD3001D_1 | 20060926 | Product data sheet | - | - |

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13.1 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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