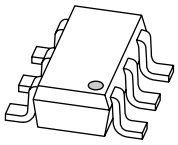


# PMD3001D

## MOSFET driver

Rev. 01 — 26 September 2006 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

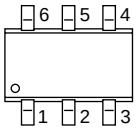
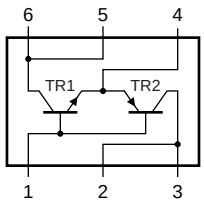
Table 1. Quick reference data

| 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 |

PHILIPS

## 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**

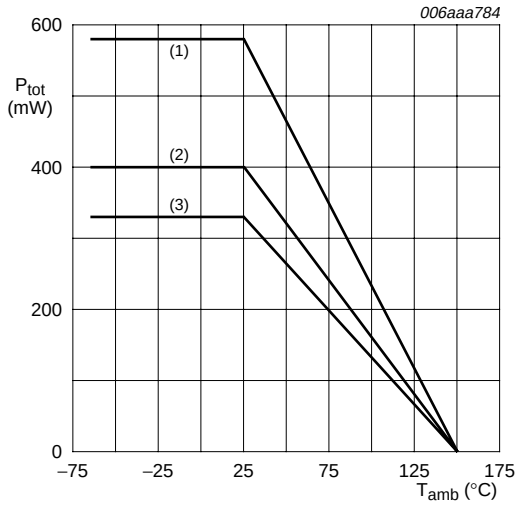
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| 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 $cm^2$.

[3] Device mounted on a ceramic PCB, $Al_2O_3$, standard footprint.




(1) Ceramic PCB, $Al_2O_3$, standard footprint

(2) FR4 PCB, mounting pad for collector 1 $cm^2$

(3) FR4 PCB, standard footprint

**Fig 1. Power derating curves**

## 6. Thermal characteristics

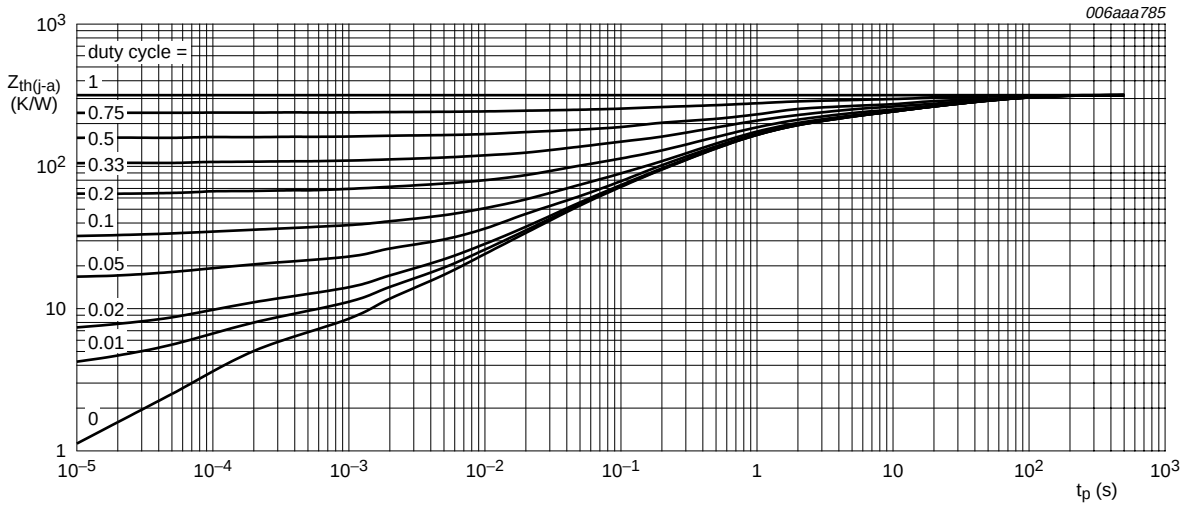
**Table 6. Thermal characteristics**

| 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.

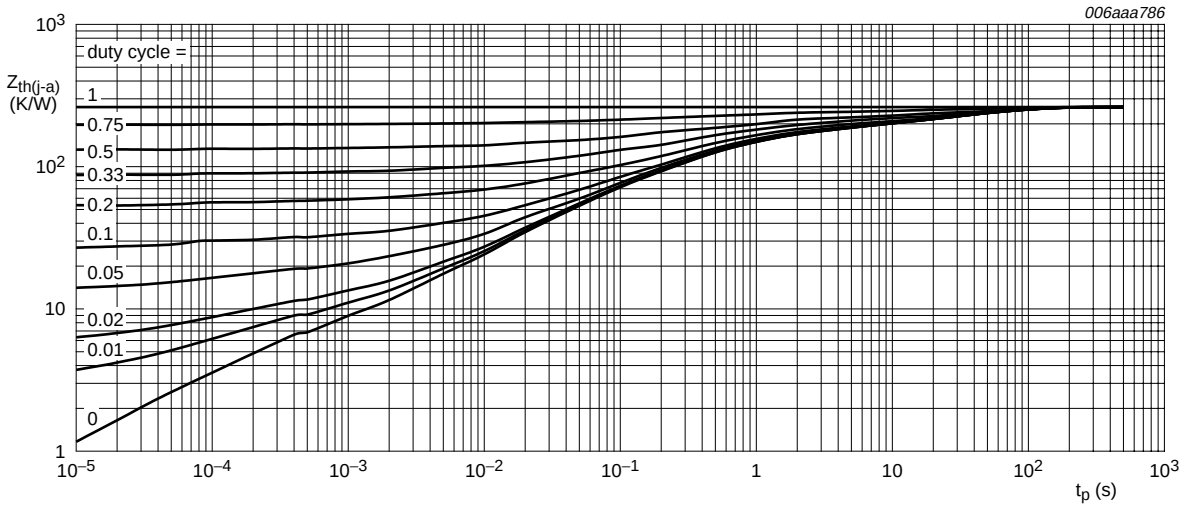
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 $cm^2$.

[3] Device mounted on a ceramic PCB, $Al_2O_3$, standard footprint.



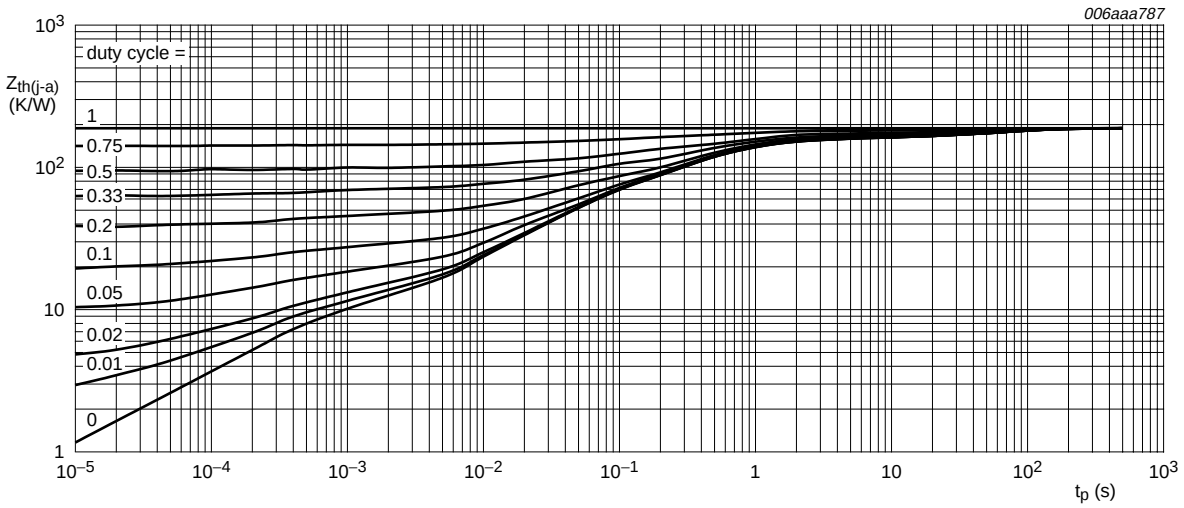

FR4 PCB, standard footprint

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




FR4 PCB, mounting pad for collector 1 cm$^2$

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




Ceramic PCB, $Al_2O_3$, 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.*

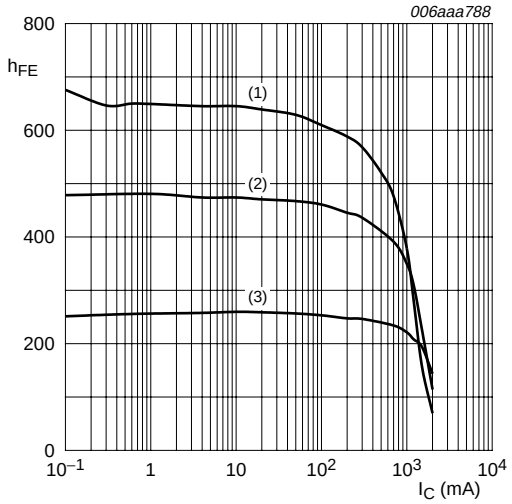
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per NPN transistor** | | | | | | | |
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 40 V; $I_E$ = 0 A | | - | - | 100 | nA |
| | | $V_{CB}$ = 40 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | 50 | 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: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.



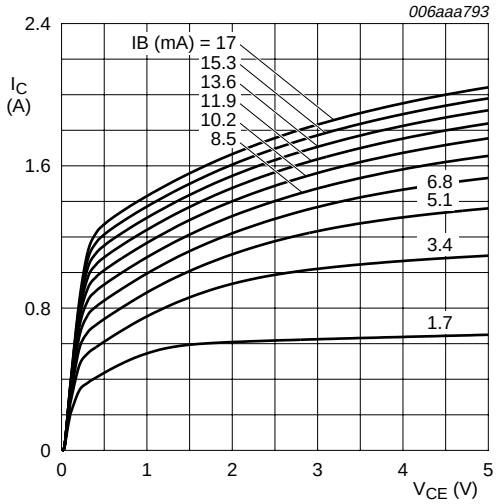

$V_{CE}$ = 5 V

(1) $T_{amb}$ = 100 °C

(2) $T_{amb}$ = 25 °C

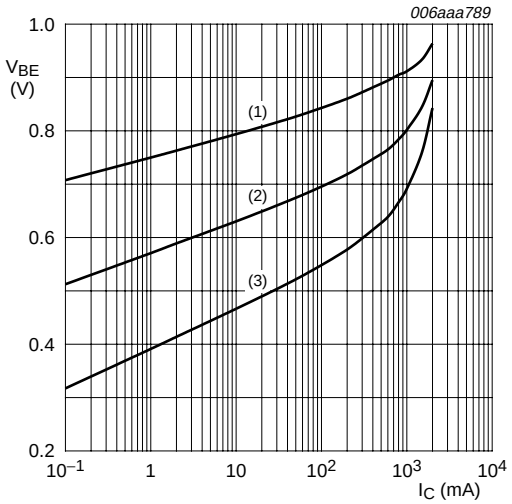
(3) $T_{amb}$ = –55 °C

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




$T_{amb}$ = 25 °C

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



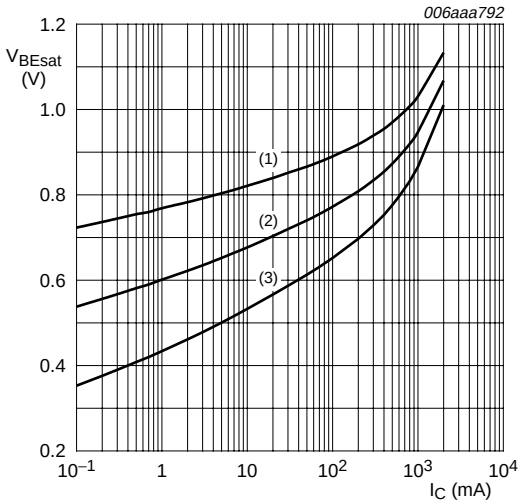

$V_{CE}$ = 5 V

(1) $T_{amb}$ = –55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 100 °C

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



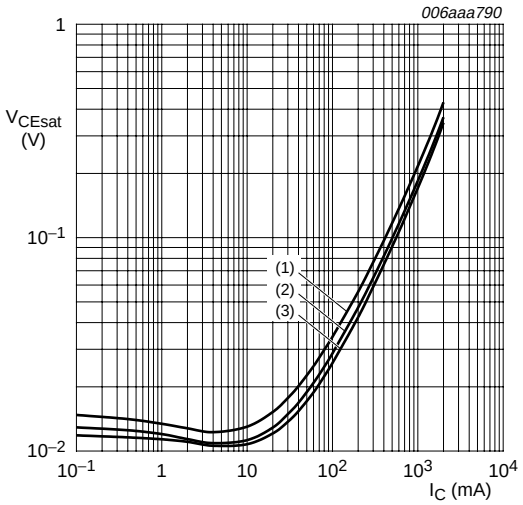

$I_C/I_B$ = 20

(1) $T_{amb}$ = –55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 100 °C

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



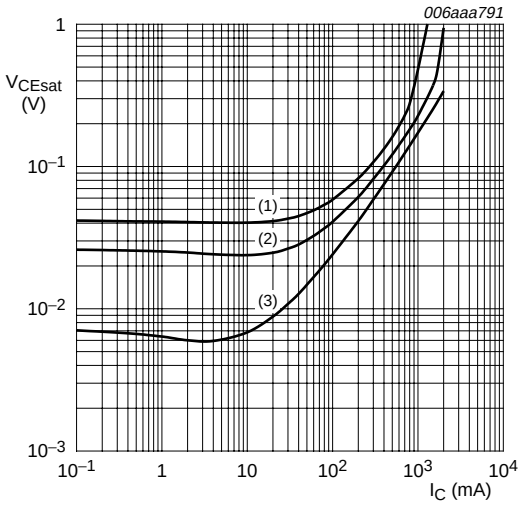

$I_C/I_B$ = 20

(1) $T_{amb}$ = 100 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

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



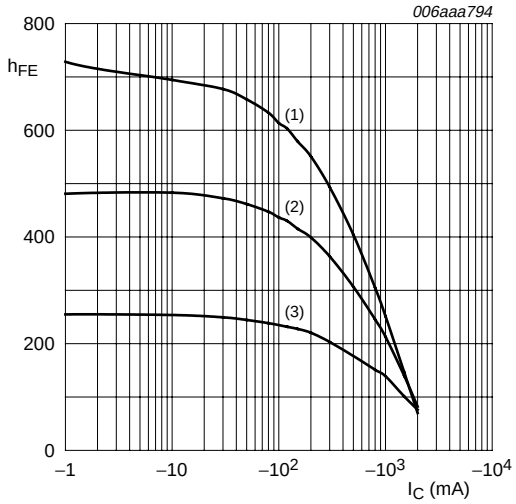

$T_{amb}$ = 25 °C

(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**



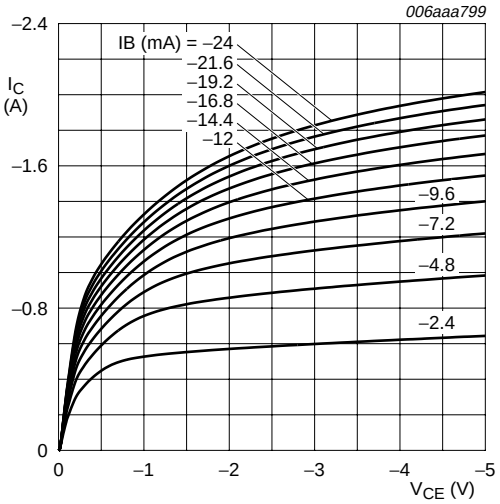

$V_{CE}$ = −5 V

(1) $T_{amb}$ = 100 °C

(2) $T_{amb}$ = 25 °C

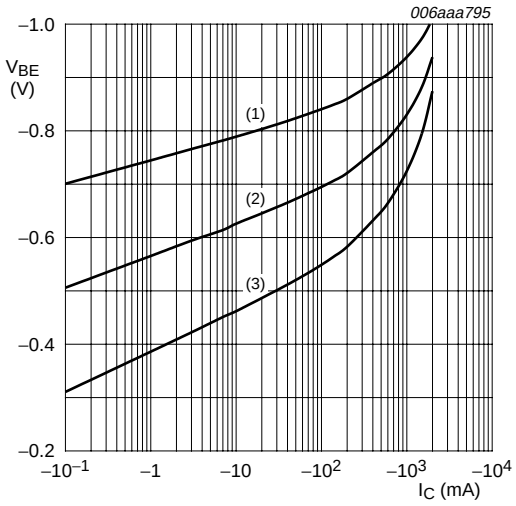
(3) $T_{amb}$ = −55 °C

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




$T_{amb}$ = 25 °C

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



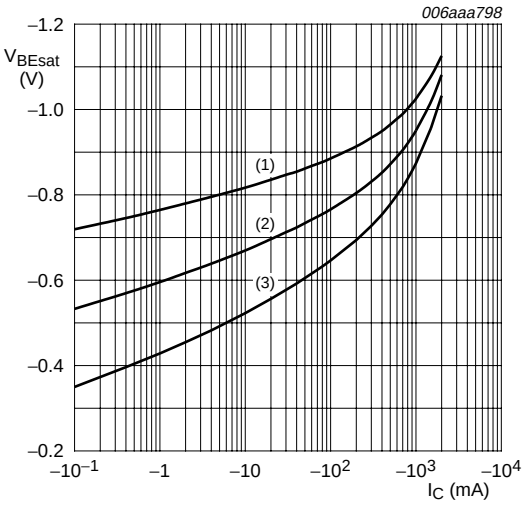

$V_{CE}$ = −5 V

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 100 °C

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



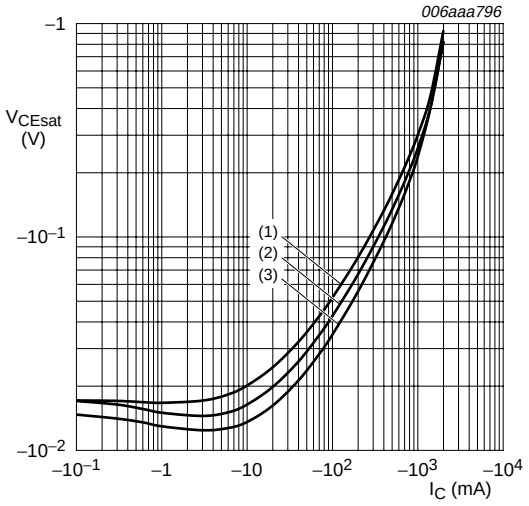

$I_C/I_B$ = 20

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 100 °C

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



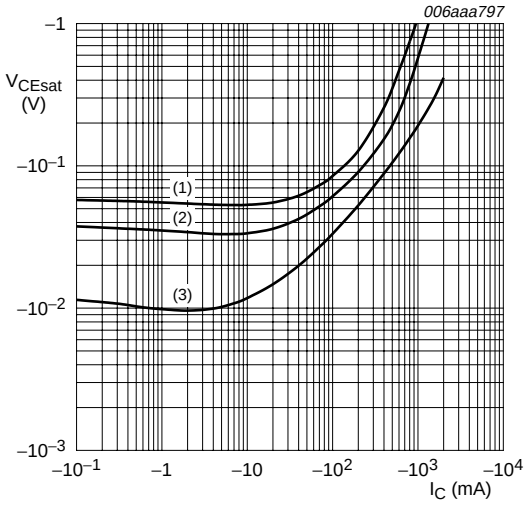

$I_C/I_B$ = 20

(1) $T_{amb}$ = 100 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

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




$T_{amb}$ = 25 °C

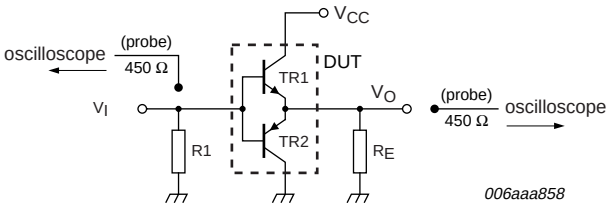
(1) $I_C/I_B$ = 100

(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 A; $V_I$ = 8 V; R1 = 56 Ω; $R_E$ = 15 Ω

**Fig 17. Test circuit for switching times**

## 9. Package outline

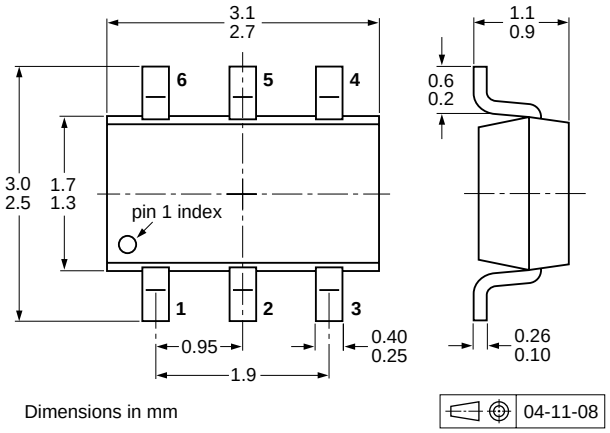



**Fig 18. Package outline SOT457 (SC-74)**

## 10. Packing information

**Table 8. Packing methods**

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

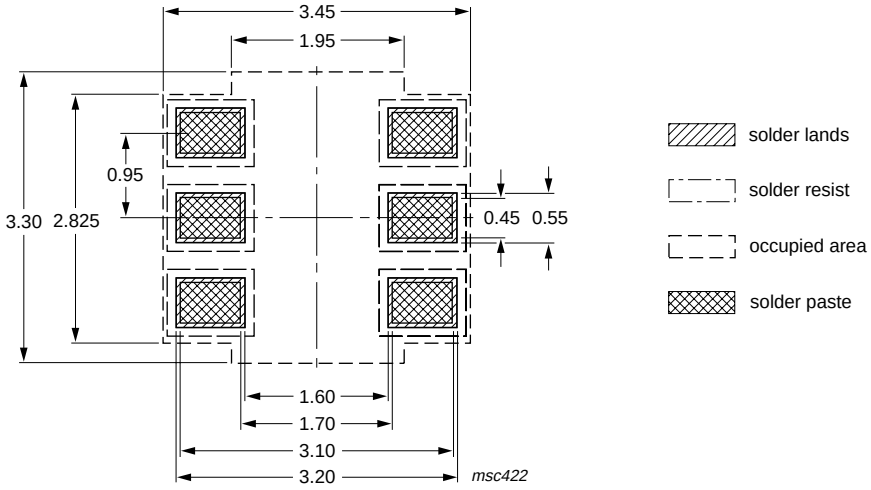
| Type number | Package | Description | | Packing quantity | |
|---|---|---|---|---|---|
| | | | | 3000 | 10000 |
| PMD3001D | SOT457 | 4 mm pitch, 8 mm tape and reel; T1 | [2] | -115 | -135 |
| | | 4 mm pitch, 8 mm tape and reel; T2 | [3] | -125 | -165 |

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

[2] T1: normal taping

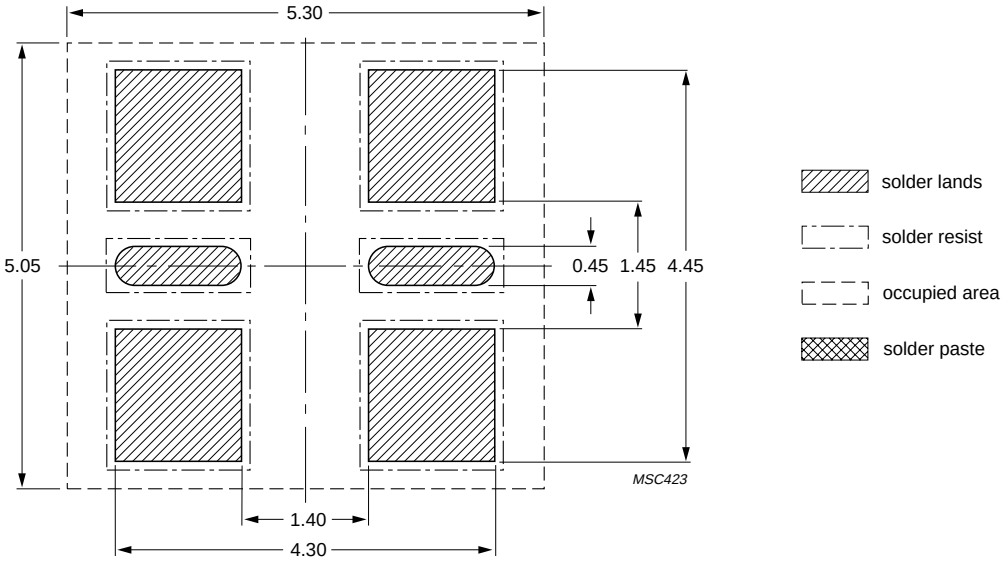
[3] T2: reverse taping

# 11. Soldering




Dimensions in mm

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




Dimensions in mm

**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_1 | 20060926 | Product data sheet | - | - |

# 13. Legal information

## 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.semiconductors.philips.com.

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