



# 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

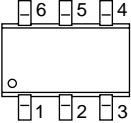
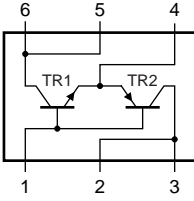
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</b>						
$V_{CEO}$	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

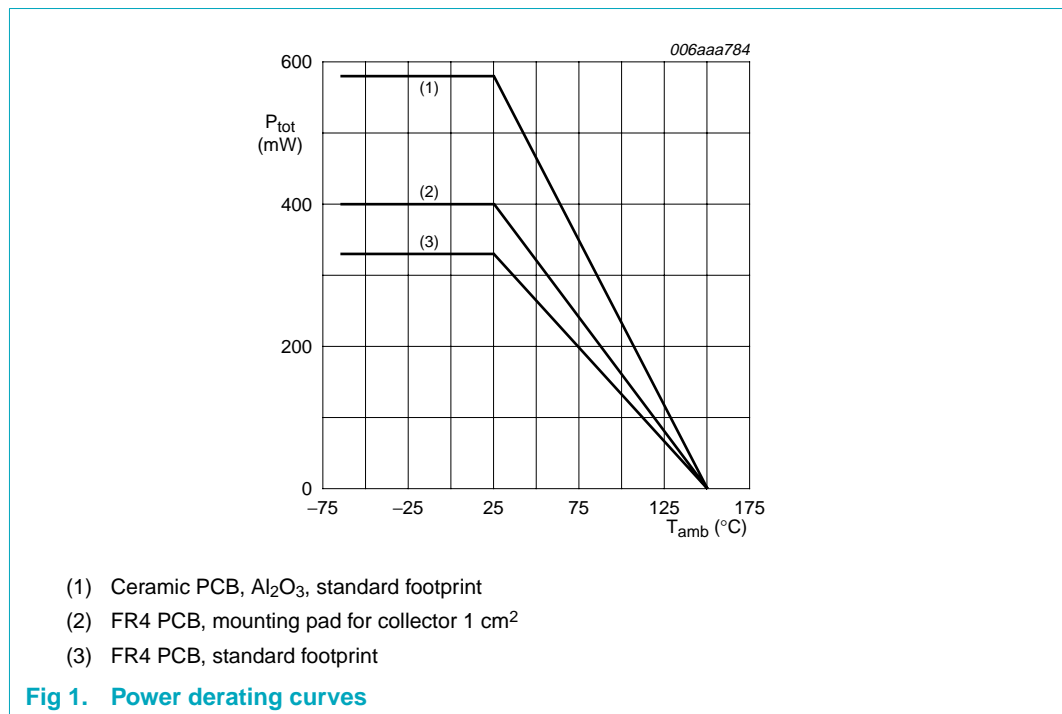
## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
<b>Per transistor; for the PNP transistor with negative polarity</b>						
$V_{CBO}$	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	
<b>Per device</b>						
$P_{tot}$	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<sup>2</sup>.
- [3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

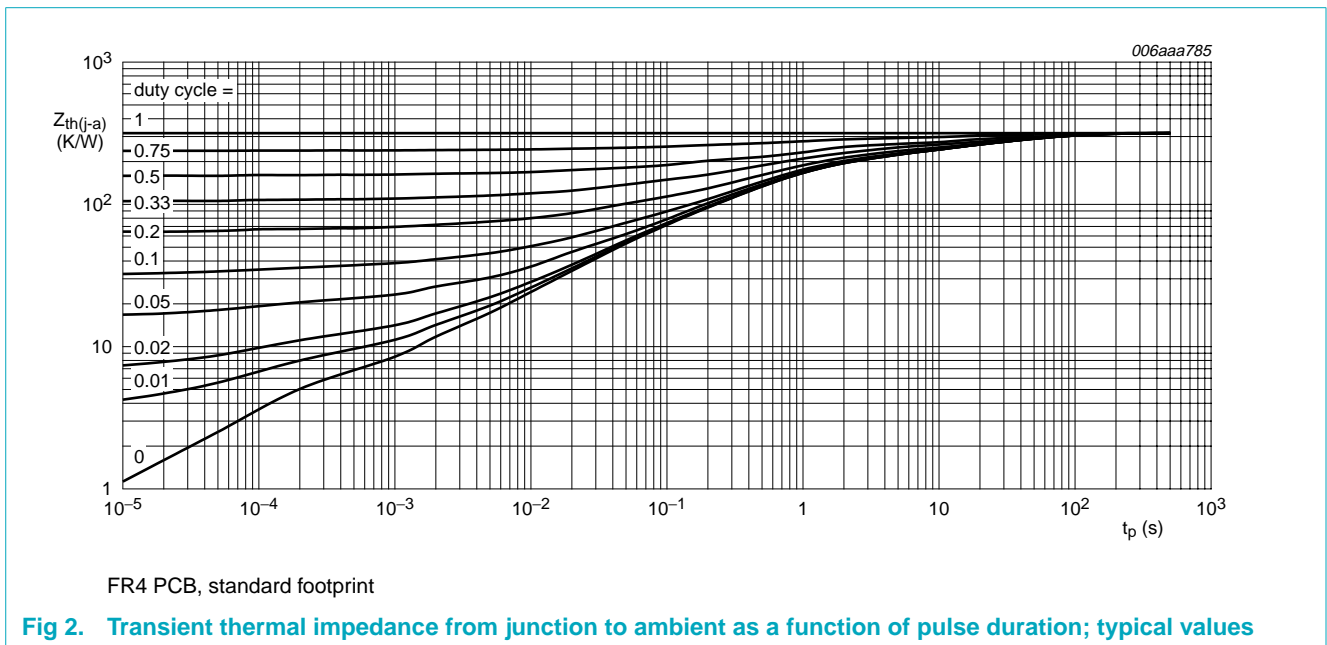


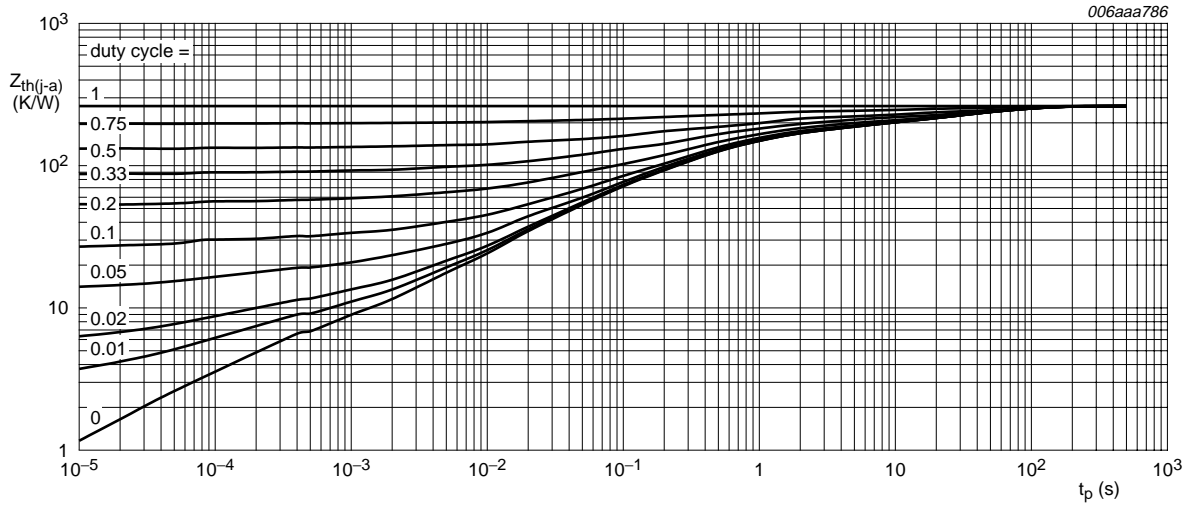
## 6. Thermal characteristics

**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

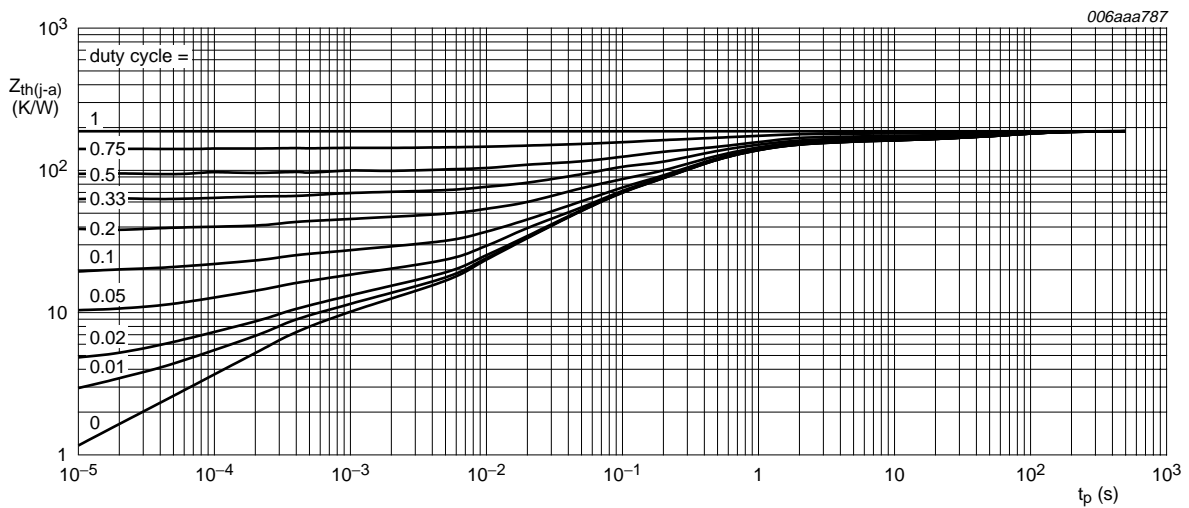
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.





FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

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

## 7. Characteristics

**Table 7. Characteristics**

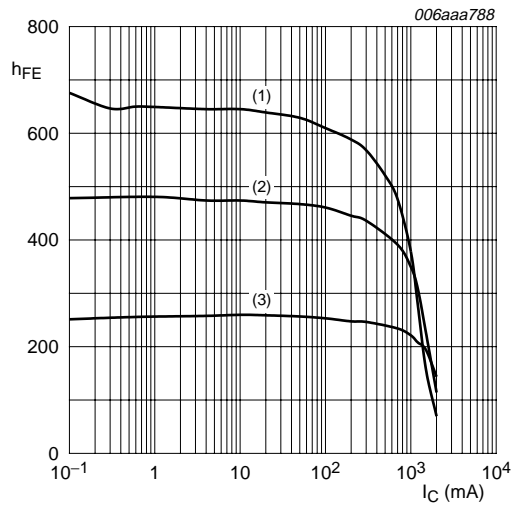
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per NPN transistor</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 40\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 40\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$	300	450	-	
		$V_{CE} = 5\text{ V}; I_C = 200\text{ mA}$	300	450	830	
		$V_{CE} = 5\text{ V}; I_C = 500\text{ mA}$	[1] 300	400	-	
		$V_{CE} = 5\text{ V}; I_C = 1\text{ A}$	[1] 200	340	-	
		$V_{CE} = 5\text{ V}; I_C = 2\text{ A}$	[1] 75	120	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	-	30	80	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	100	120	mV
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	180	230	mV
		$I_C = 2\text{ A}; I_B = 200\text{ mA}$	[1] -	360	440	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	-	0.75	0.9	V
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	0.9	1.1	V
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	1	1.2	V
		$I_C = 2\text{ A}; I_B = 200\text{ mA}$	[1] -	1.1	1.3	V
$V_{BE}$	base-emitter voltage	$V_{CE} = 5\text{ V}; I_C = 1\text{ A}$	700	800	1100	mV
<b>Per PNP transistor</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -40\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$	300	450	-	
		$V_{CE} = -5\text{ V}; I_C = -200\text{ mA}$	250	390	640	
		$V_{CE} = -5\text{ V}; I_C = -500\text{ mA}$	[1] 215	290	-	
		$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	[1] 150	200	-	
		$V_{CE} = -5\text{ V}; I_C = -2\text{ A}$	[1] 50	85	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -100\text{ mA}; I_B = -5\text{ mA}$	-	-40	-140	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-110	-170	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-200	-310	mV
		$I_C = -2\text{ A}; I_B = -200\text{ mA}$	[1] -	-400	-500	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -100\text{ mA}; I_B = -5\text{ mA}$	-	-0.75	-0.9	V
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-0.88	-1.1	V
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-0.95	-1.2	V
		$I_C = -2\text{ A}; I_B = -200\text{ mA}$	[1] -	-1.1	-1.3	V
$V_{BE}$	base-emitter voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	-700	-800	-1100	mV

**Table 7. Characteristics ...continued**  
 $T_{amb} = 25^{\circ}\text{C}$  unless otherwise specified.

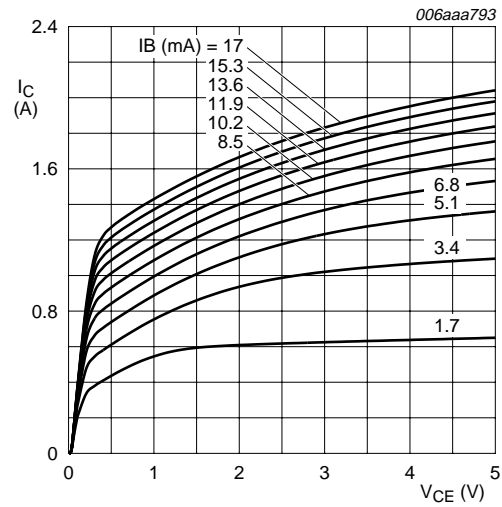
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$t_d$	delay time	$I_C = 0.5\text{ A}; V_1 = 8\text{ V}$	-	3	-	ns
$t_r$	rise time		-	17	-	ns
$t_{on}$	turn-on time		-	20	-	ns
$t_s$	storage time		-	3	-	ns
$t_f$	fall time		-	6	-	ns
$t_{off}$	turn-off time		-	9	-	ns

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



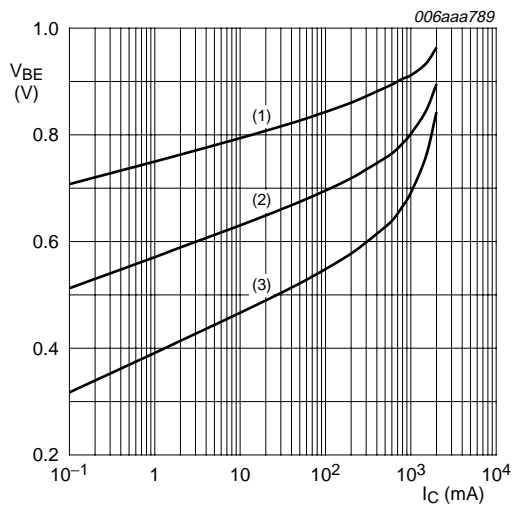
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



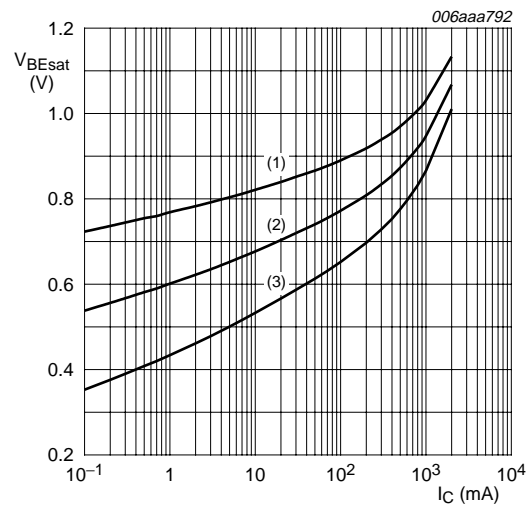
$T_{amb} = 25\text{ }^{\circ}\text{C}$

**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)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

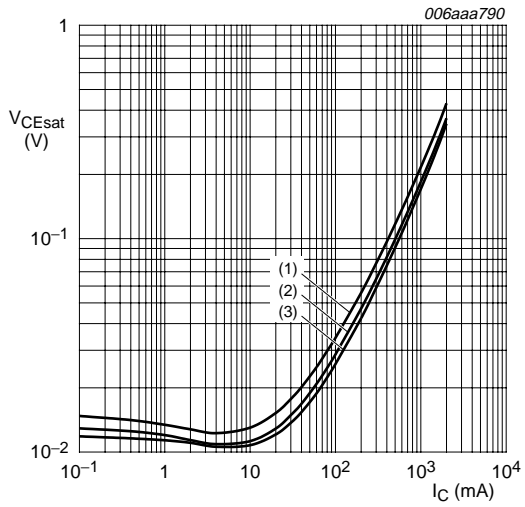
**Fig 7. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values**



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

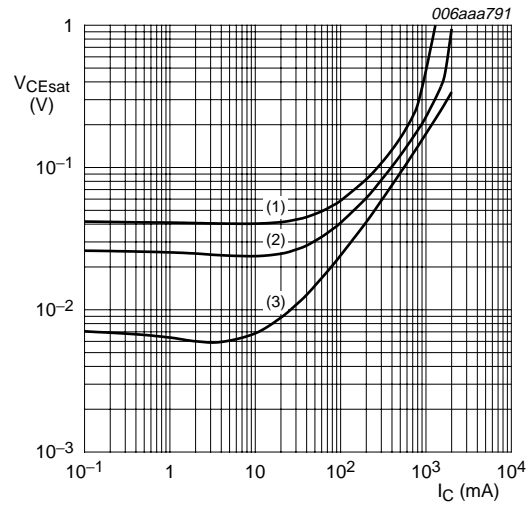
**Fig 8. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values**





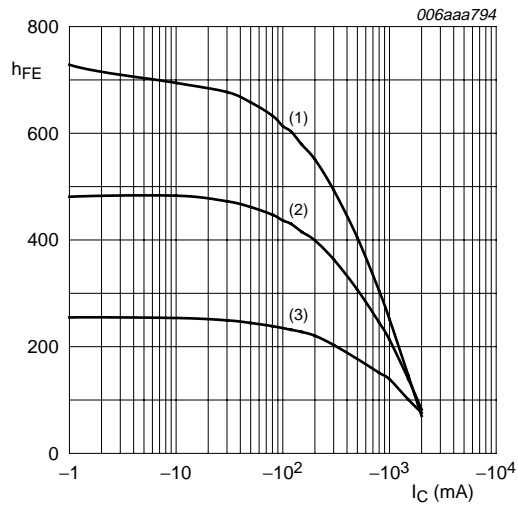
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



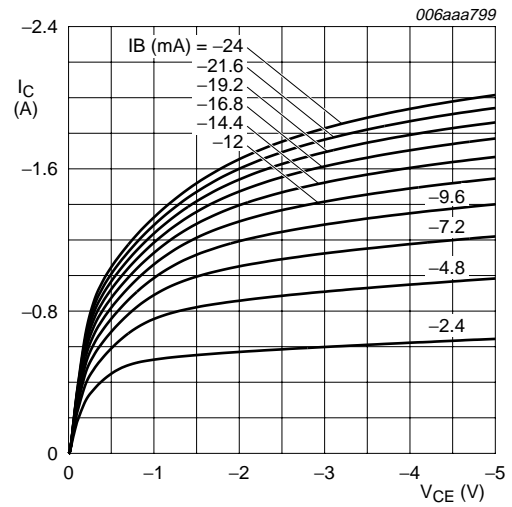
- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

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



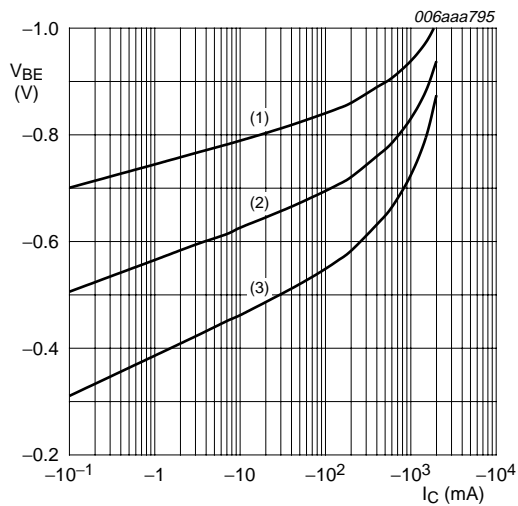
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



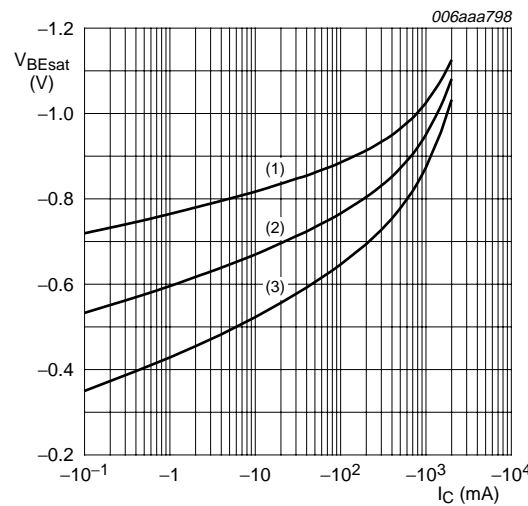
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



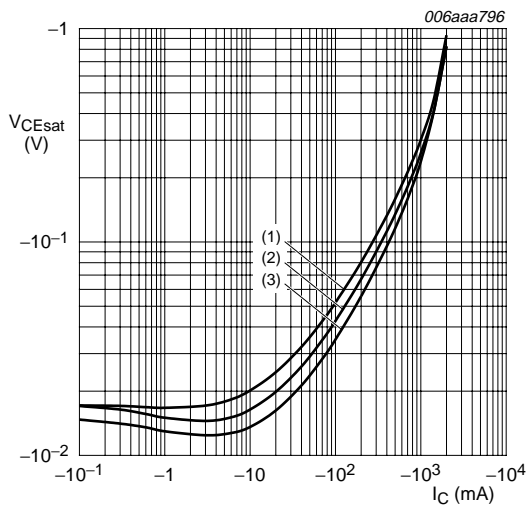
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



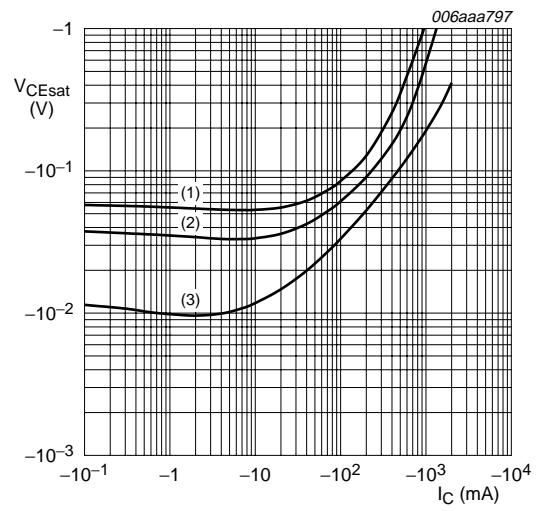
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



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

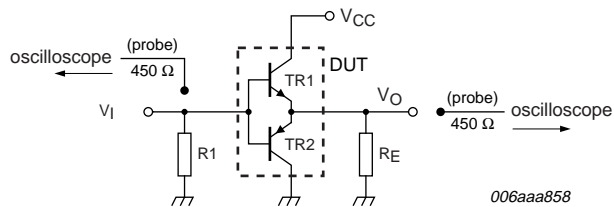
**Fig 15. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values**



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

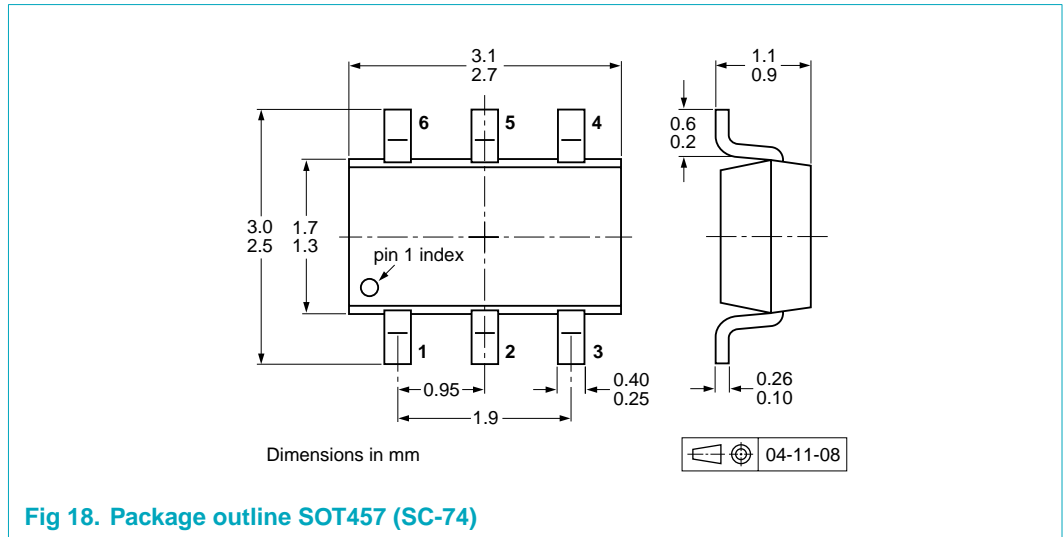
## 8. Test information



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

**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.<sup>[1]</sup>

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

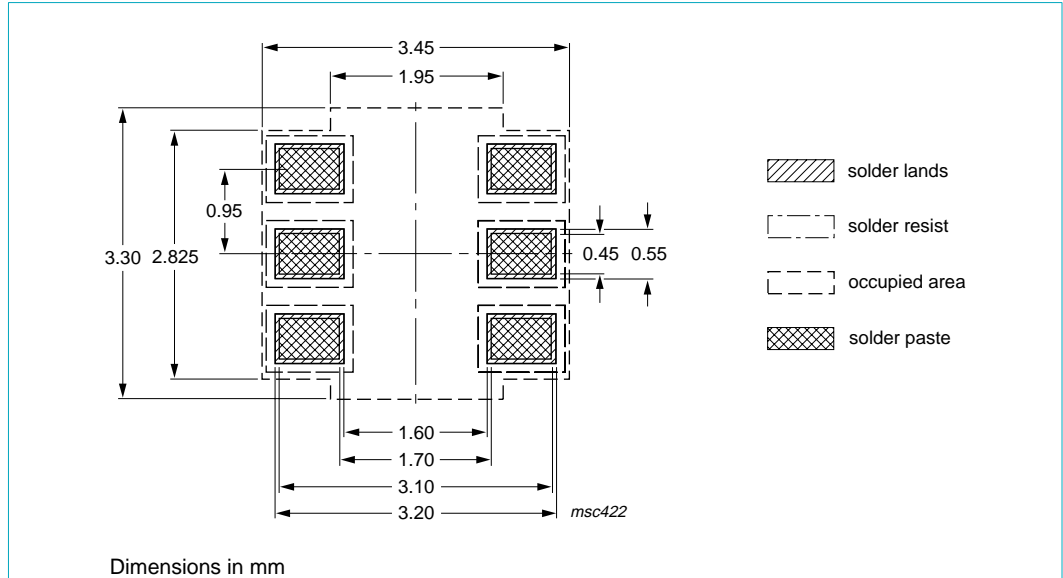


Fig 19. Reflow soldering footprint SOT457 (SC-74)

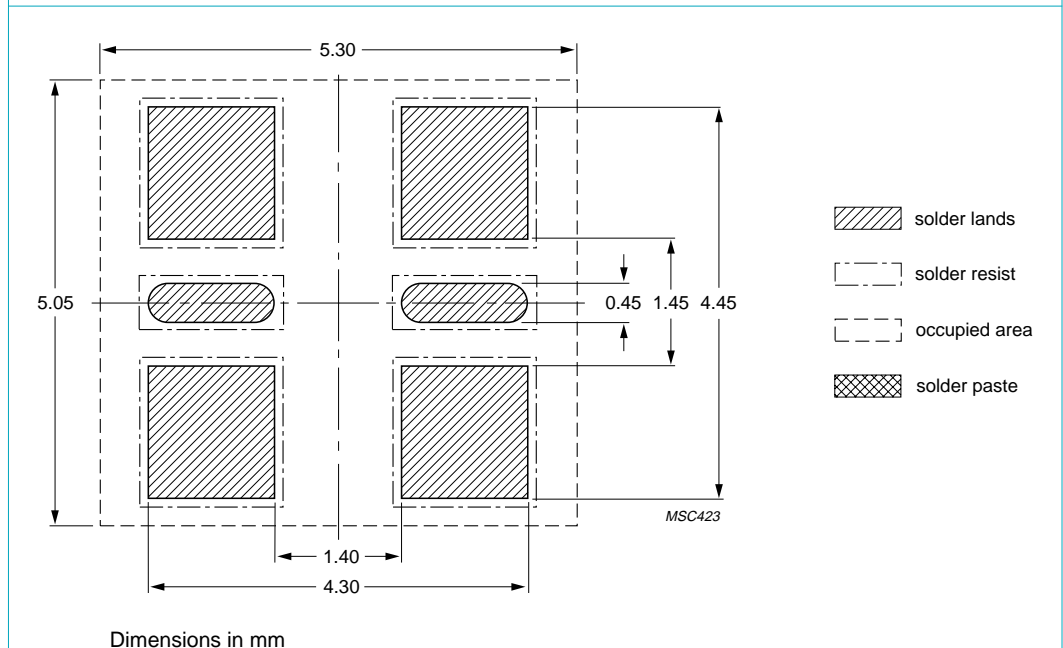


Fig 20. Wave soldering footprint SOT457 (SC-74)

## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMD3001D_1	20060926	Product data sheet	-	-

## 13. Legal information

### 13.1 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.

[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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Date of release: 26 September 2006

Document identifier: PMD3001D\_1