



**THE DATASHEET OF  
PMD9003D,115**



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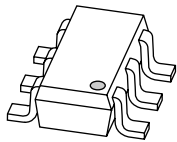
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Kind regards,

Team Nexperia



# PMD9003D

## MOSFET driver

Rev. 01 — 24 November 2006

Product data sheet

## 1. Product profile

### 1.1 General description

NPN Resistor-Equipped Transistor (RET), NPN general-purpose transistor and high-speed switching diode connected in totem pole configuration in a small SOT457 (SC-74) Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Two transistors and one high-speed switching diode as driver
- Totem pole configuration
- Application-optimized pinout
- Internal connections to minimize layout effort
- Space-saving solution
- Reduces component count

### 1.3 Applications

- MOSFET driver

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$I_C$	collector current		-	-	0.1	A
<b>Transistor 2 (TR2)</b>						
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	0.2	A
<b>Diode (D1)</b>						
$I_F$	forward current		-	-	-0.2	A
$V_F$	forward voltage	$I_F = -200$ mA	[1]	-	-1.1	V

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

## 2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Symbol
1	OUT	output		
2	GND	ground		
3	IN	input		
4	RC	collector resistor		
5	RC	collector resistor		
6	VCC	supply voltage		

006aaa658

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMD9003D	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMD9003D	9D

## 5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Transistor 1 (TR1)</b>					
$V_{CBO}$	collector-base voltage	open emitter	-	50	V
$V_{CEO}$	collector-emitter voltage	open base	-	50	V
$V_{EBO}$	emitter-base voltage	open collector	-	10	V
$I_C$	collector current		-	0.1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	0.1	A
$V_I$	input voltage				
	positive		-	+40	V
	negative		-	-10	V
<b>Transistor 2 (TR2)</b>					
$V_{CBO}$	collector-base voltage	open emitter	-	50	V
$V_{CEO}$	collector-emitter voltage	open base	-	45	V

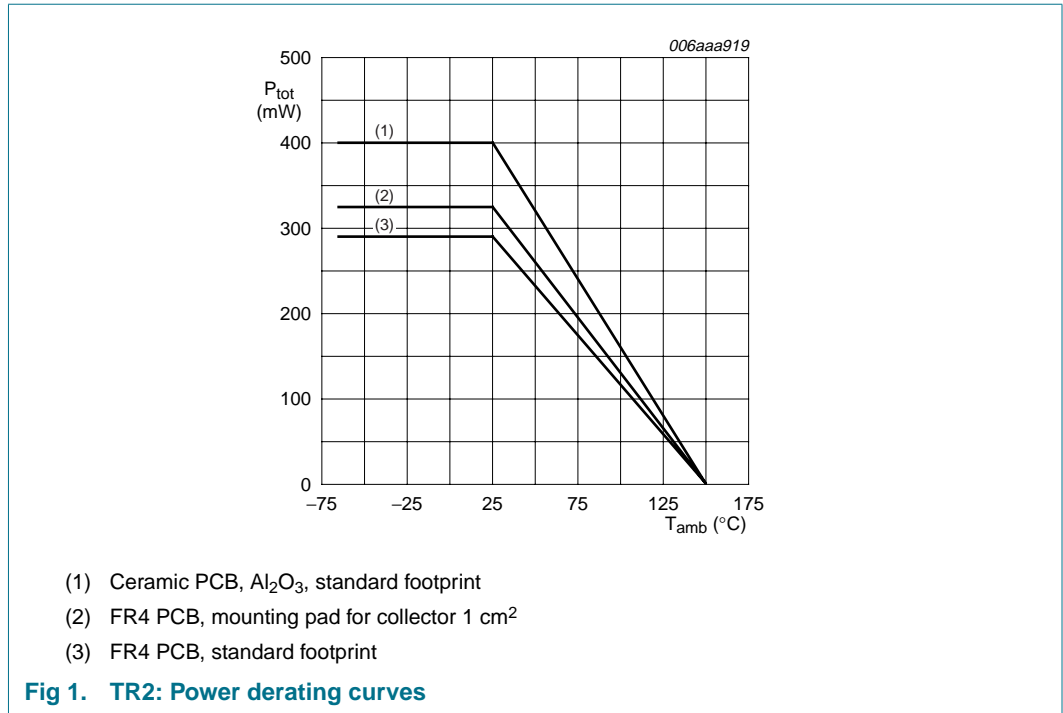
**Table 5. Limiting values ...continued***In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit	
$I_C$	collector current		-	0.1	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	0.2	A	
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	0.2	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	290	mW
			[2]	-	325	mW
			[3]	-	400	mW
<b>Diode (D1)</b>						
$I_F$	forward current		-	-0.2	A	
$I_{FRM}$	repetitive peak forward current	$t_p \leq 1$ ms; $\delta \leq 0.25$	-	-0.6	A	
$I_{FSM}$	non-repetitive peak forward current	square wave				
		$t_p = 1$ $\mu$ s	-	-9	A	
		$t_p = 100$ $\mu$ s	-	-3	A	
		$t_p = 10$ ms	-	-1.7	A	
<b>Device</b>						
$T_j$	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

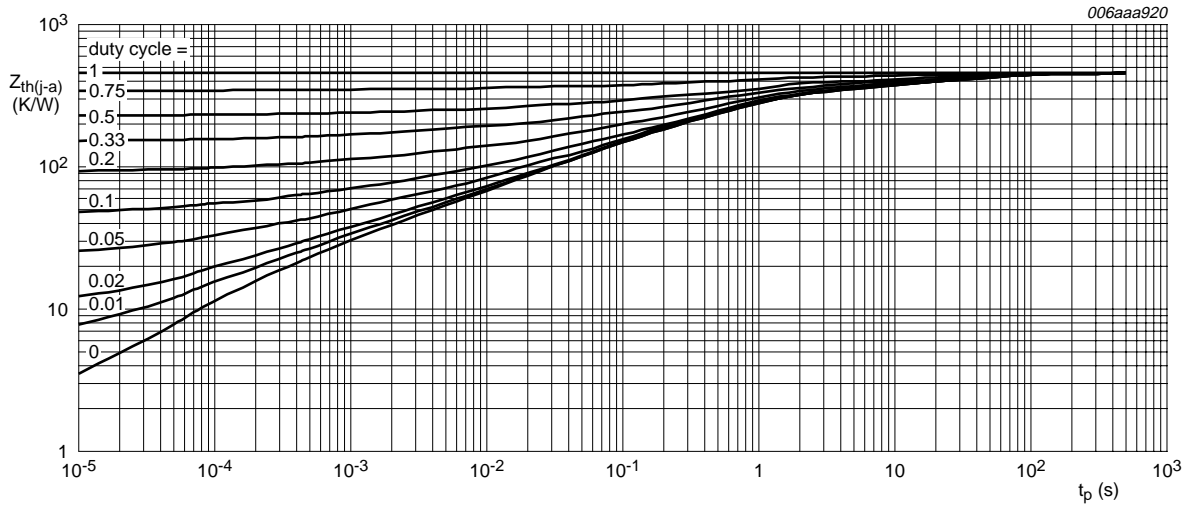
**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Transistor 2 (TR2)</b>							
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	430	K/W
			[2]	-	-	385	K/W
			[3]	-	-	312	K/W

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

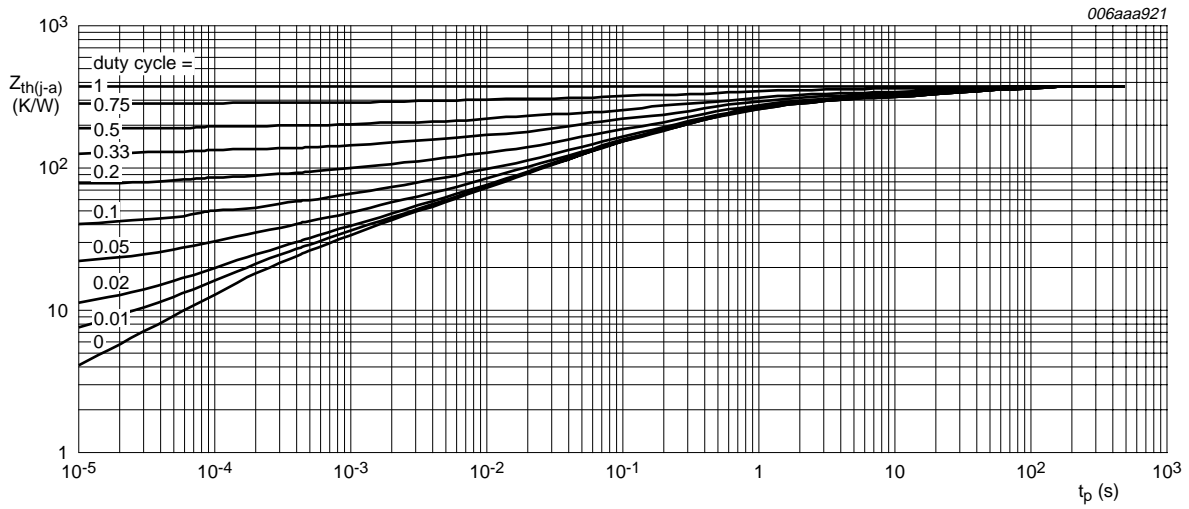
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



FR4 PCB, standard footprint

Fig 2. TR2: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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

Fig 3. TR2: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

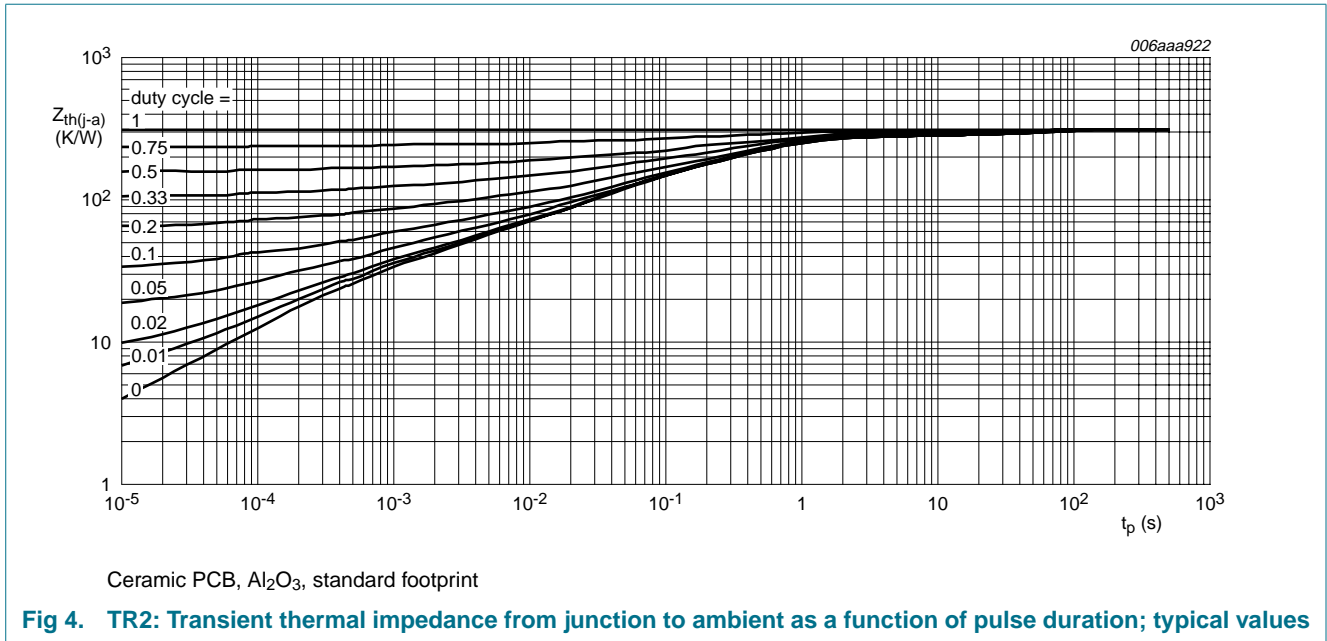


Fig 4. TR2: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

Table 7. Characteristics

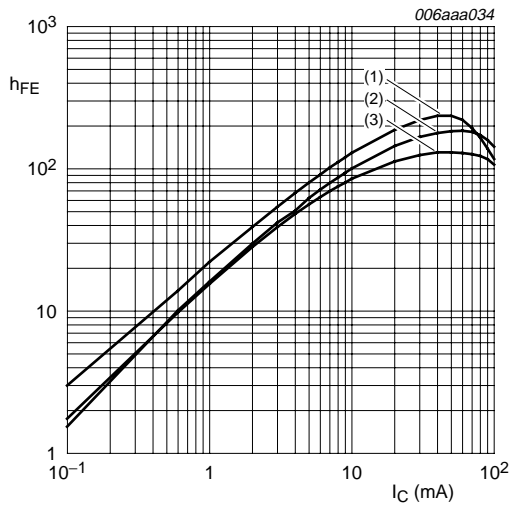
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Transistor 1 (TR1)</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; I_E = 0\text{ A}$	-	-	1	$\mu\text{A}$
		$V_{CE} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_E = 0\text{ A}$	-	-	0.4	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 20\text{ mA}$	30	150	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	50	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 0.1\text{ mA}$	-	1.1	0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	2.9	2.3	-	V
R1	bias resistor 1 (input)		7	10	13	k $\Omega$
R2/R1	bias resistor ratio		0.8	1	1.2	
<b>Transistor 2 (TR2)</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	15	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	5	$\mu\text{A}$
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	60	200	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	-	200	400	mV
		$I_C = 200\text{ mA}; I_B = 20\text{ mA}$	-	340	500	mV

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

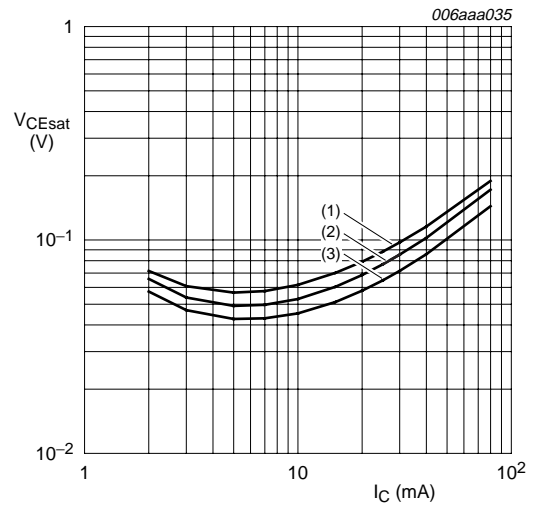
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	0.7	-	V
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	-	0.9	-	V
$V_{BE}$	base-emitter voltage	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$	610	660	710	mV
		$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}$	-	-	770	mV
<b>Diode (D1)</b>						
$V_F$	forward voltage	$I_F = -200\text{ mA}$	[1]	-	-1.1	V
<b>TR2 and D1</b>						
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 1\text{ mA}$	200	290	450	
		$V_{CE} = 5\text{ V}; I_C = 100\text{ mA}$	95	140	-	
		$V_{CE} = 5\text{ V}; I_C = 200\text{ mA}$	24	35	-	
<b>Device</b>						
$t_d$	delay time	$I_C = 0.05\text{ A}; I_B = 1\text{ mA}$	-	20	-	ns
$t_r$	rise time		-	94	-	ns
$t_{on}$	turn-on time		-	114	-	ns
$t_s$	storage time		-	904	-	ns
$t_f$	fall time		-	253	-	ns
$t_{off}$	turn-off time		-	1157	-	ns

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



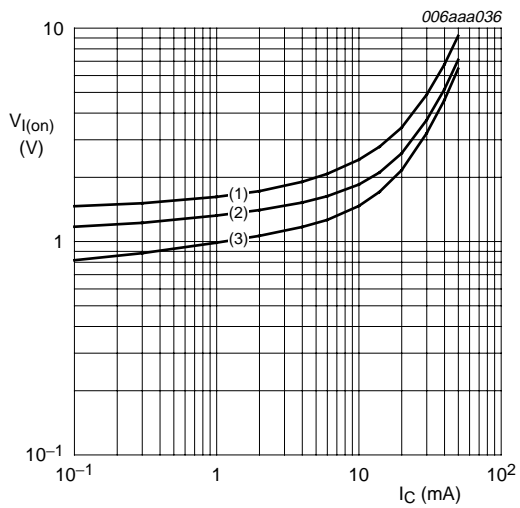
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



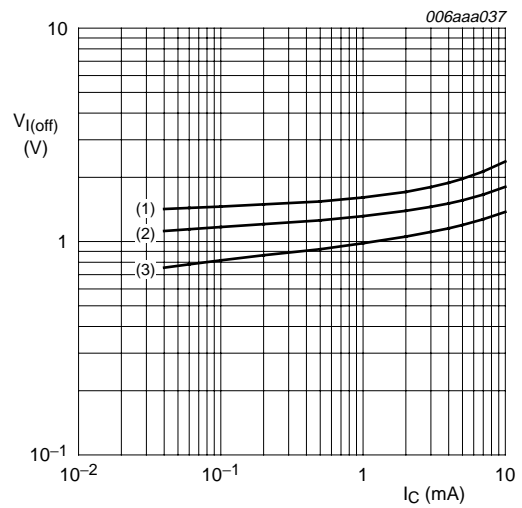
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



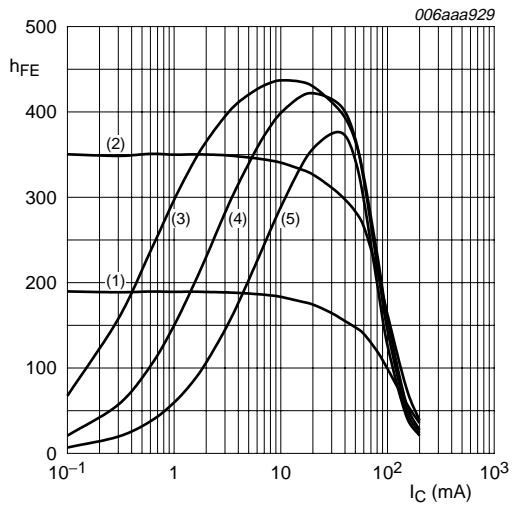
$V_{CE} = 0.3\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig 7. TR1: On-state input voltage as a function of collector current; typical values**



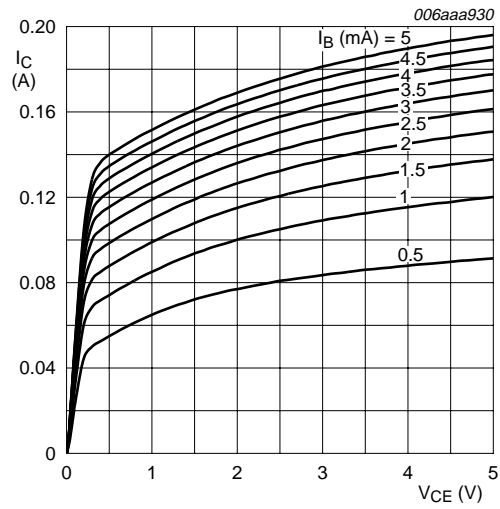
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig 8. TR1: Off-state input voltage as a function of collector current; typical values**



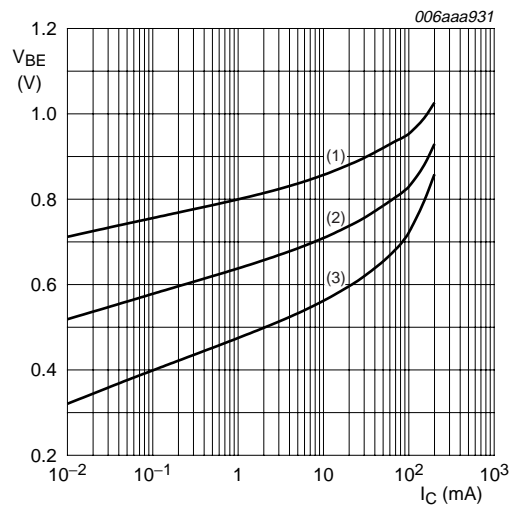
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (4)  $T_{amb} = 125\text{ }^{\circ}\text{C}$   
 (5)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig 9. TR2 and D1: DC current gain as a function of collector current; typical values**



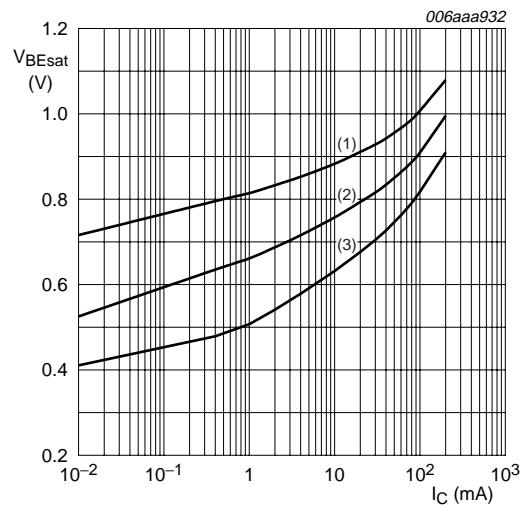
$T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 10. TR2: Collector current as a function of collector-emitter voltage; typical values**



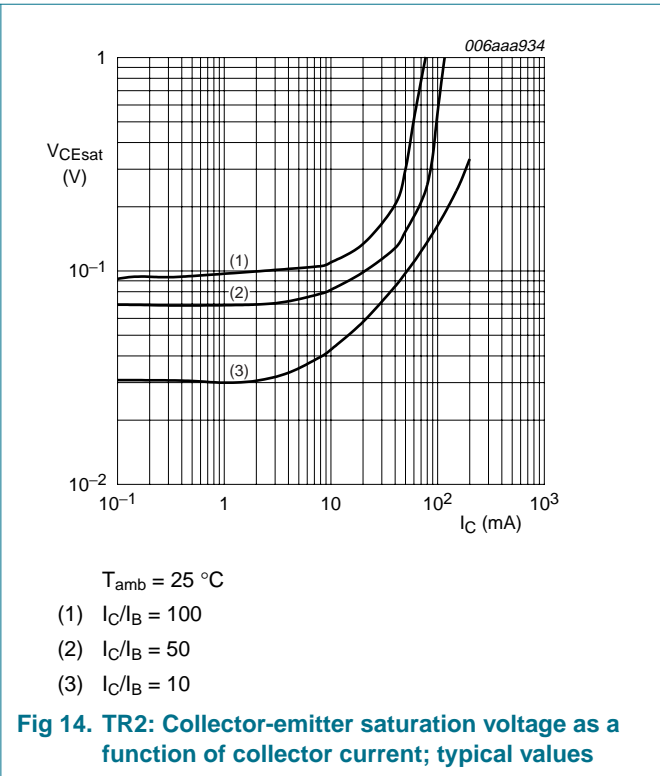
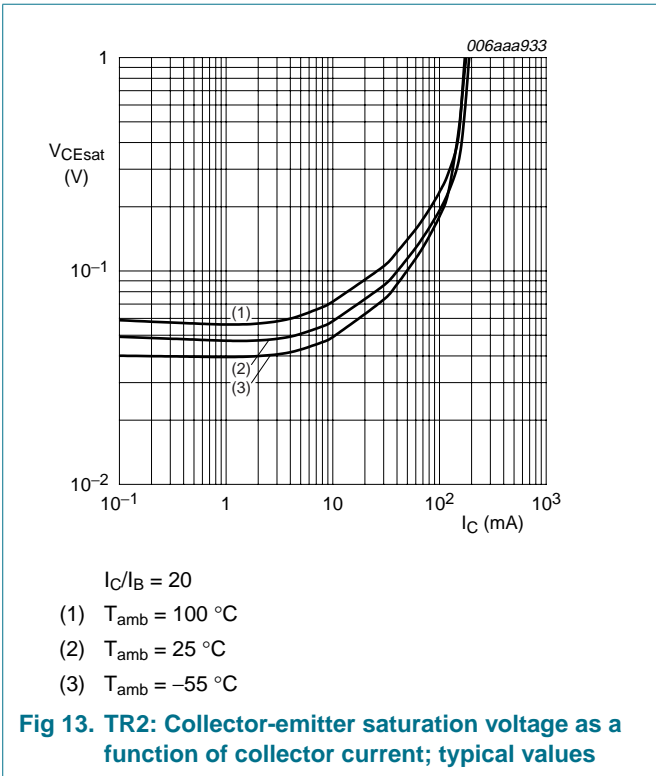
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

**Fig 11. TR2: Base-emitter voltage as a function of collector current; typical values**

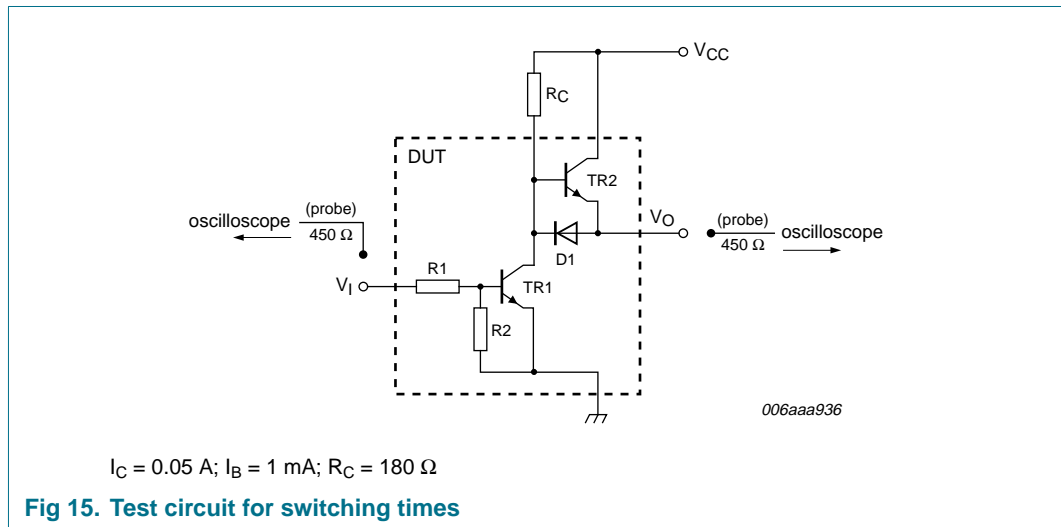


$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

**Fig 12. TR2: Base-emitter saturation voltage as a function of collector current; typical values**



8. Test information



## 9. Package outline

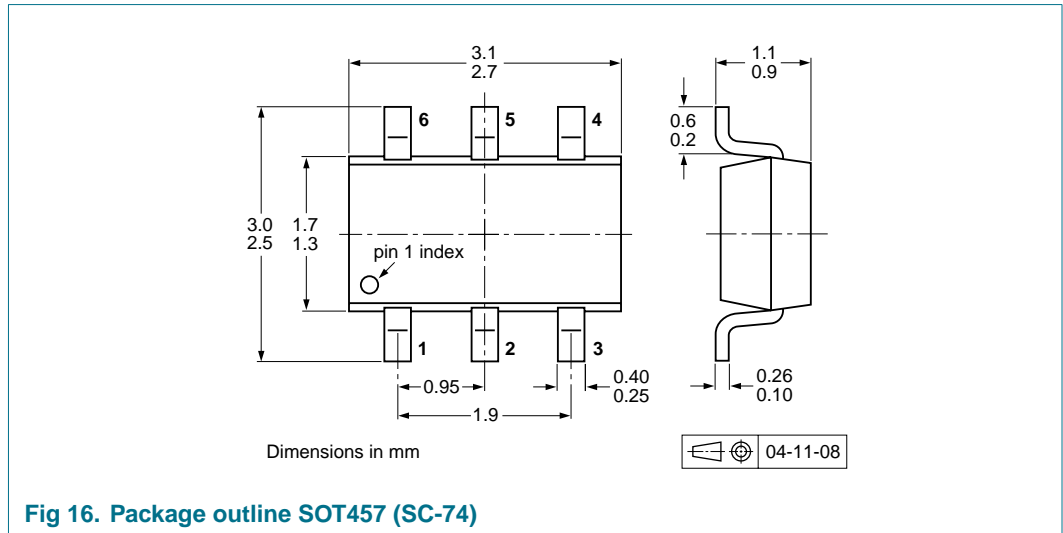


Fig 16. Package outline SOT457 (SC-74)

## 10. Packing information

**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity	
			3000	10000
PMD9003D	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

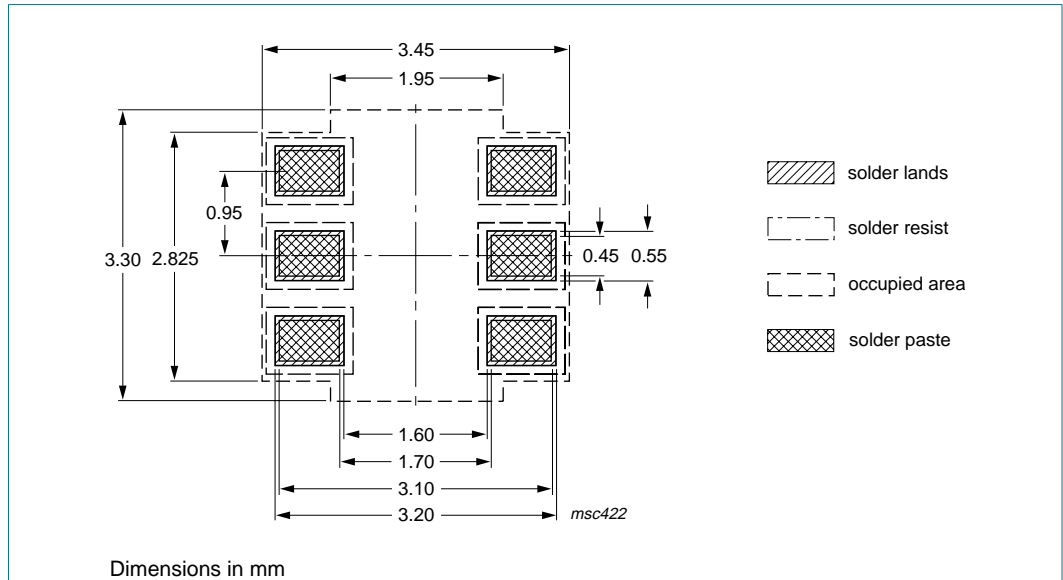


Fig 17. Reflow soldering footprint SOT457 (SC-74)

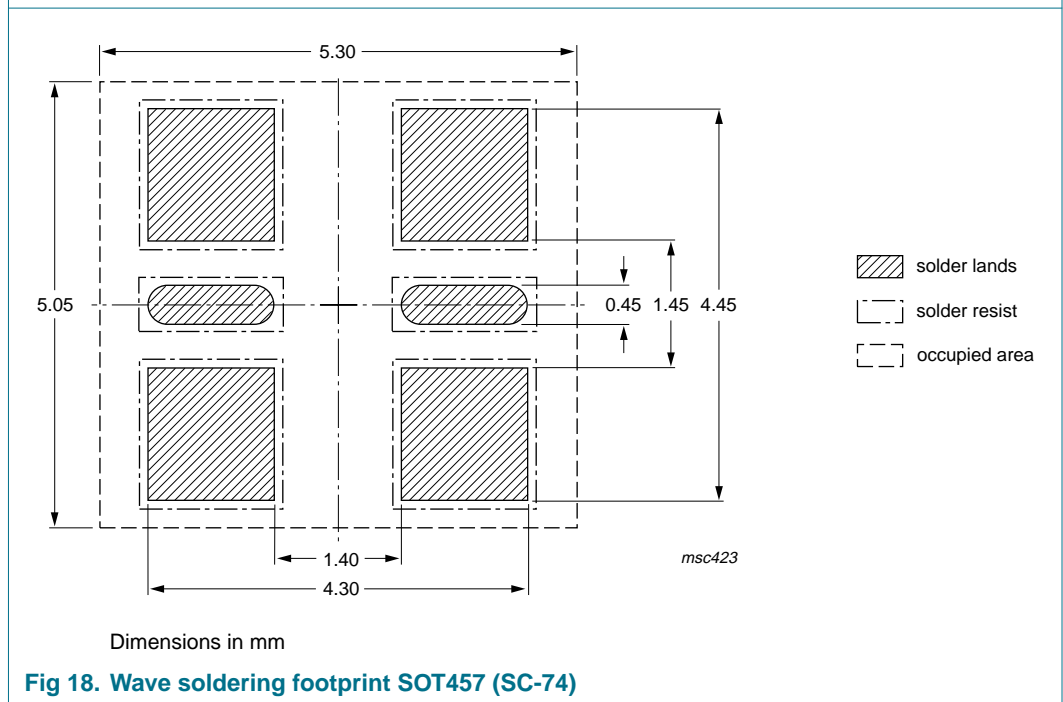


Fig 18. Wave soldering footprint SOT457 (SC-74)

## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMD9003D_1	20061124	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.
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Date of release: 24 November 2006

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