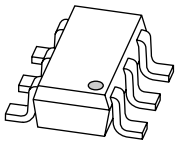


PMD9003D

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

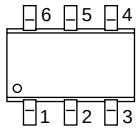
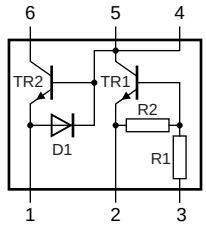
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
I_C	collector current			-	-	0.1	A
Transistor 2 (TR2)							
V_{CEO}	collector-emitter voltage	open base		-	-	45	V
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	0.2	A
Diode (D1)							
I_F	forward current			-	-	–0.2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

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

founded by Philips

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		

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
Transistor 1 (TR1)					
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
Transistor 2 (TR2)					
V_{CBO}	collector-base voltage	open emitter	-	50	V
V_{CEO}	collector-emitter voltage	open base	-	45	V

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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
Diode (D1)						
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				
		$t_p = 1$ µs		-	–9	A
		$t_p = 100$ µs		-	–3	A
		$t_p = 10$ 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 cm^2.

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

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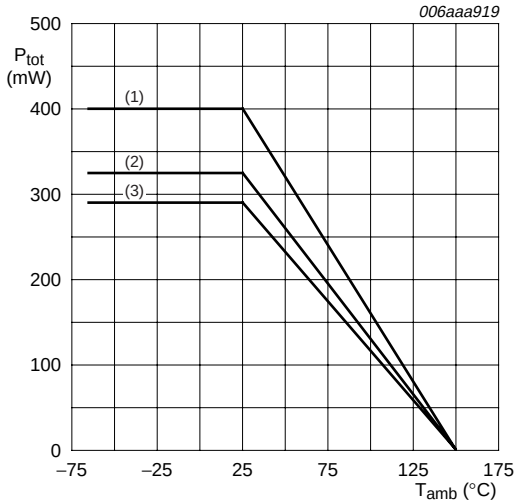

(1) Ceramic PCB, Al_2O_3, standard footprint

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

(3) FR4 PCB, standard footprint

Fig 1. TR2: Power derating curves

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Transistor 2 (TR2)							
$R_{th(j-a)}$	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^2.

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

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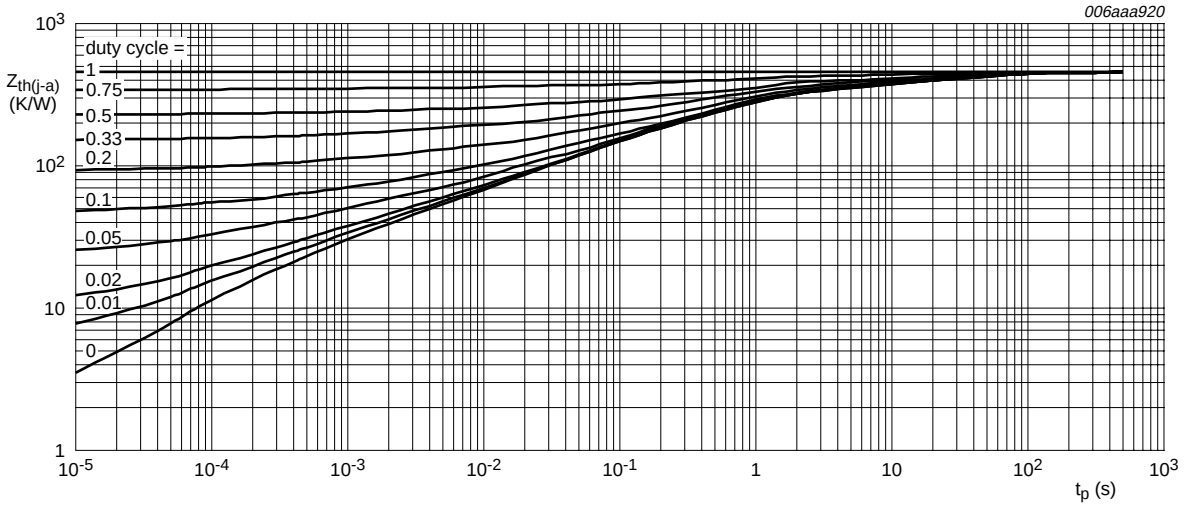
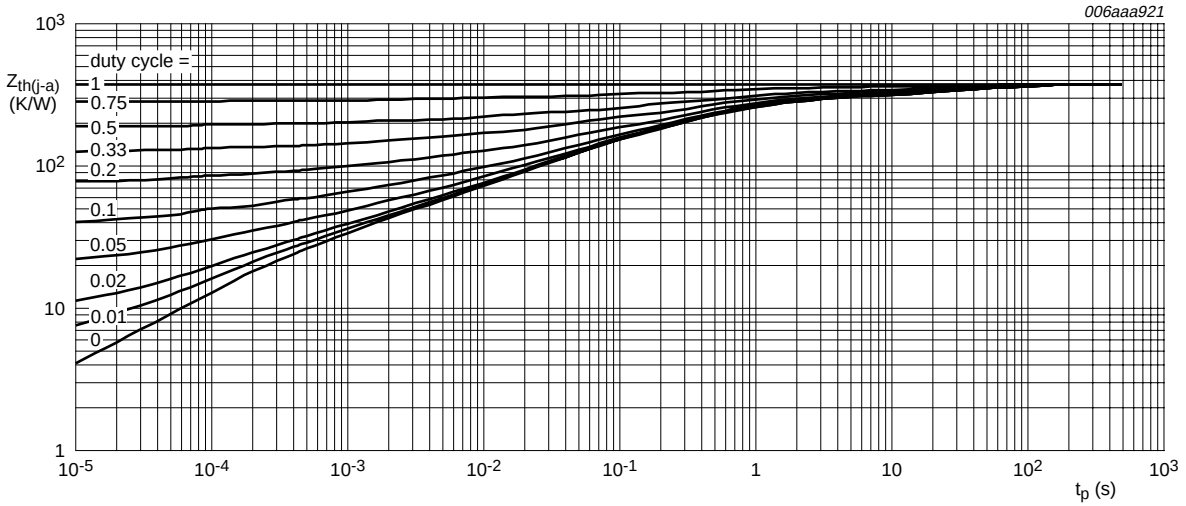


FR4 PCB, standard footprint

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^2

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

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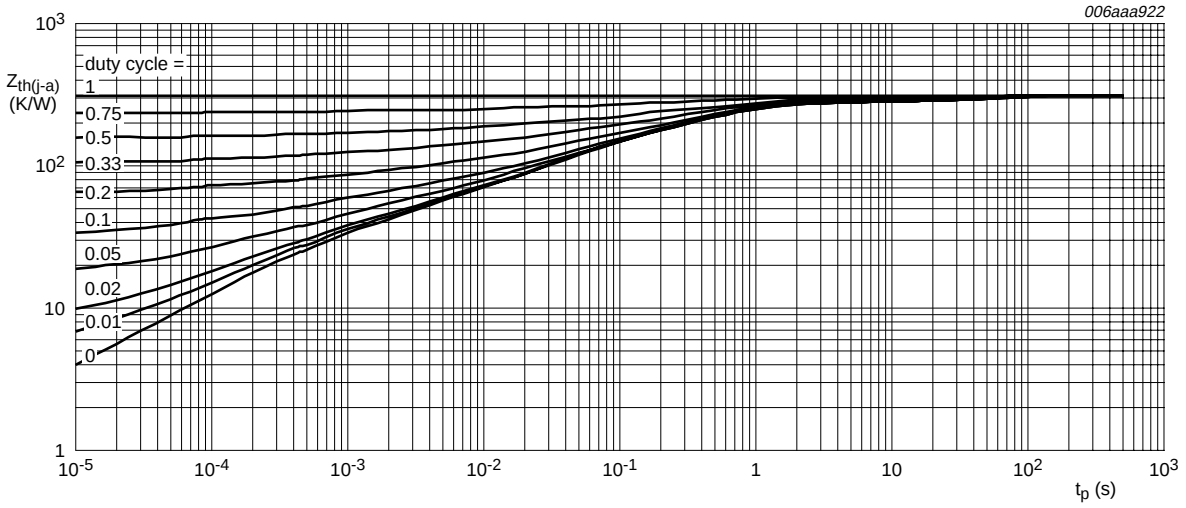

Ceramic PCB, Al_2O_3, standard footprint

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 °C unless otherwise specified.

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

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Table 7. Characteristics *...continued*

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA		-	0.7	-	V
		I_C = 100 mA; I_B = 5 mA		-	0.9	-	V
V_{BE}	base-emitter voltage	V_{CE} = 5 V; I_C = 2 mA		610	660	710	mV
		V_{CE} = 5 V; I_C = 10 mA		-	-	770	mV
Diode (D1)							
V_F	forward voltage	I_F = –200 mA	[1]	-	-	–1.1	V
TR2 and D1							
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA		200	290	450	
		V_{CE} = 5 V; I_C = 100 mA		95	140	-	
		V_{CE} = 5 V; I_C = 200 mA		24	35	-	
Device							
t_d	delay time	I_C = 0.05 A; I_B = 1 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: $t_p \leq 300$ µs; $\delta \leq 0.02$.

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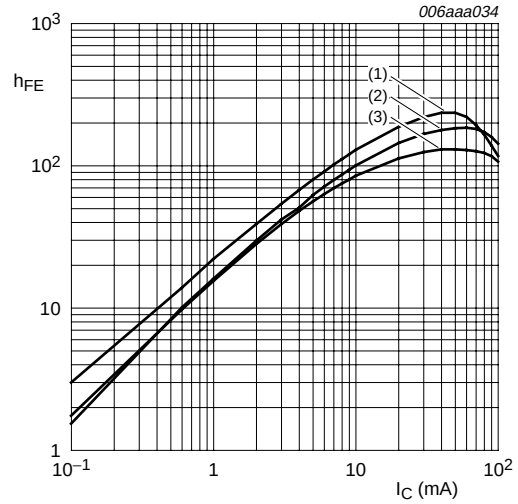


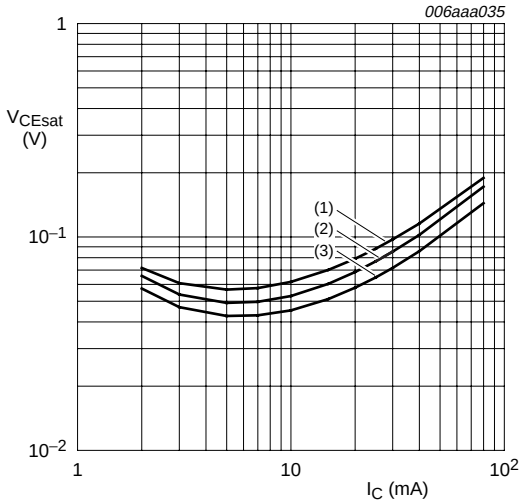
V_{CE} = 5 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

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



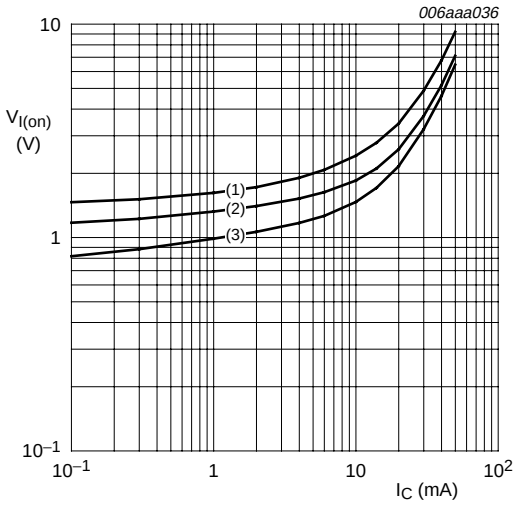
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –40 °C

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



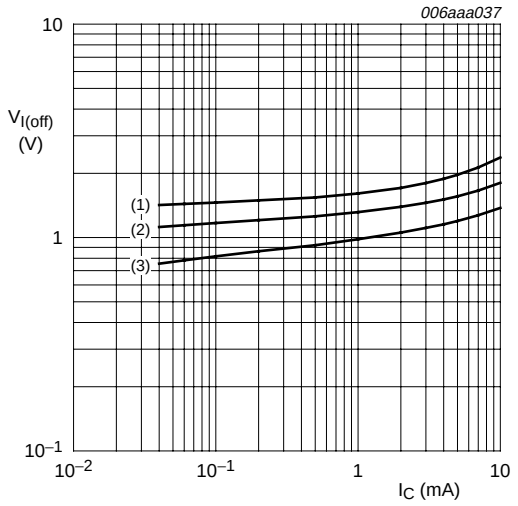
V_{CE} = 0.3 V

(1) T_{amb} = –40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



V_{CE} = 5 V

(1) T_{amb} = –40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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

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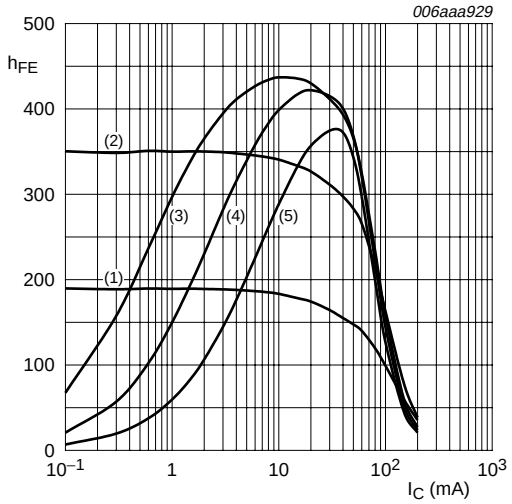


V_{CE} = 5 V

(1) T_{amb} = –55 °C

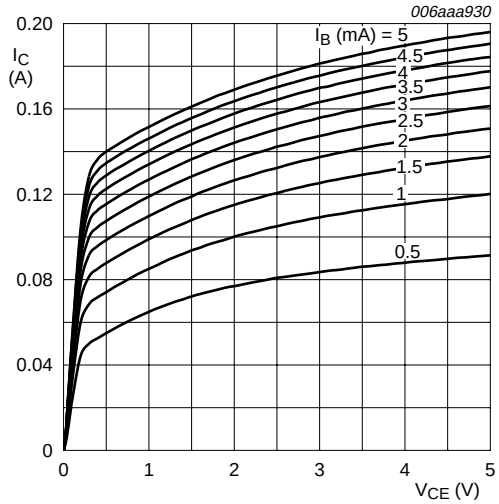
(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

(4) T_{amb} = 125 °C

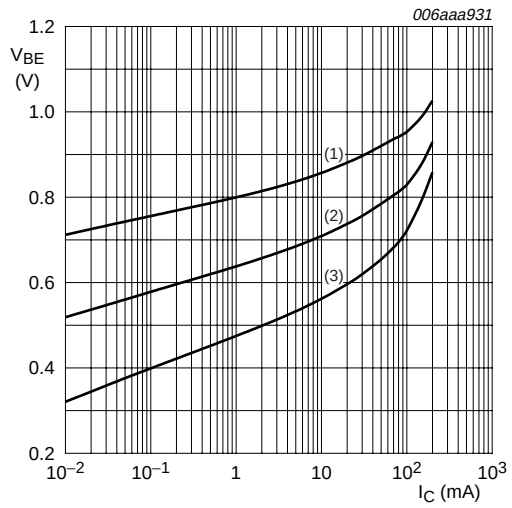
(5) T_{amb} = 150 °C

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



T_{amb} = 25 °C

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



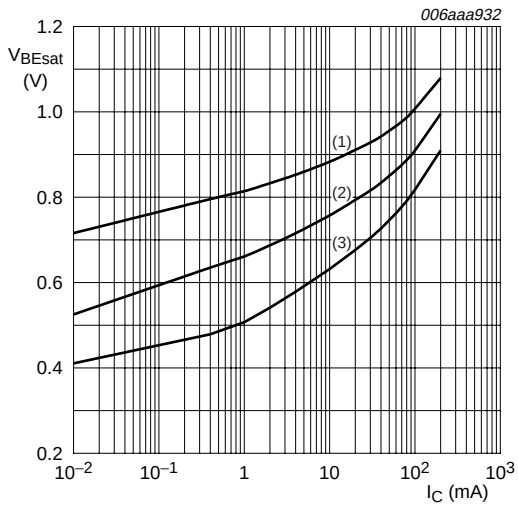
V_{CE} = 5 V

(1) T_{amb} = –55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 11. TR2: 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 12. TR2: Base-emitter saturation voltage as a function of collector current; typical values

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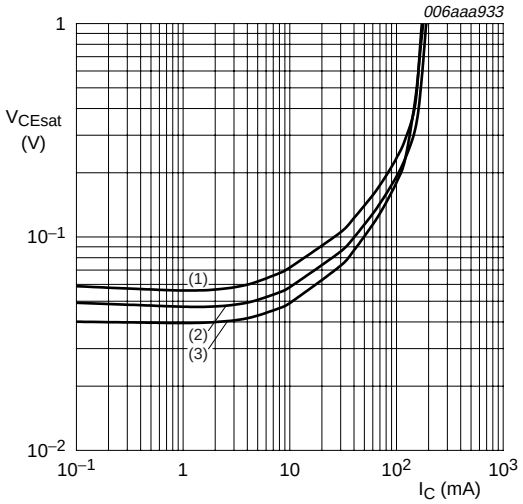


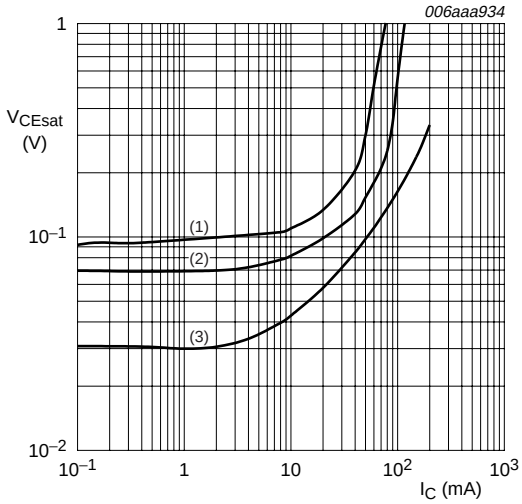
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

Fig 13. TR2: Collector-emitter saturation voltage as a function of collector current; typical values



$T_{amb} = 25$ °C

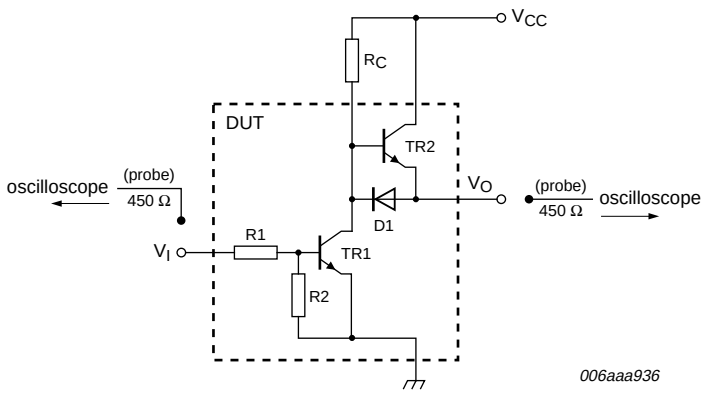
(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 10$

Fig 14. TR2: Collector-emitter saturation voltage as a function of collector current; typical values

8. Test information



$I_C = 0.05$ A; $I_B = 1$ mA; $R_C = 180$ Ω

Fig 15. Test circuit for switching times

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9. Package outline

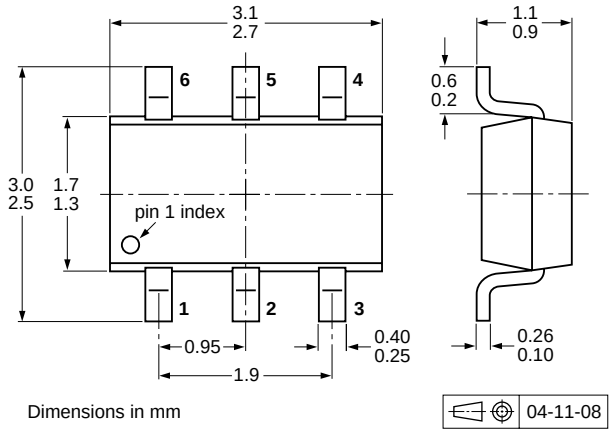

Fig 16. Package outline SOT457 (SC-74)

10. Packing information

Table 8. Packing methods

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

Type number	Package	Description		Packing quantity	
				3000	10000
PMD9003D	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

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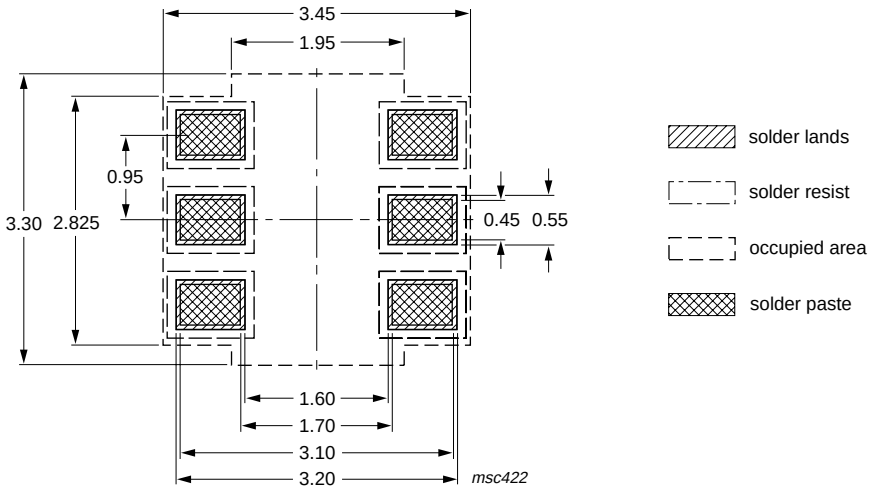
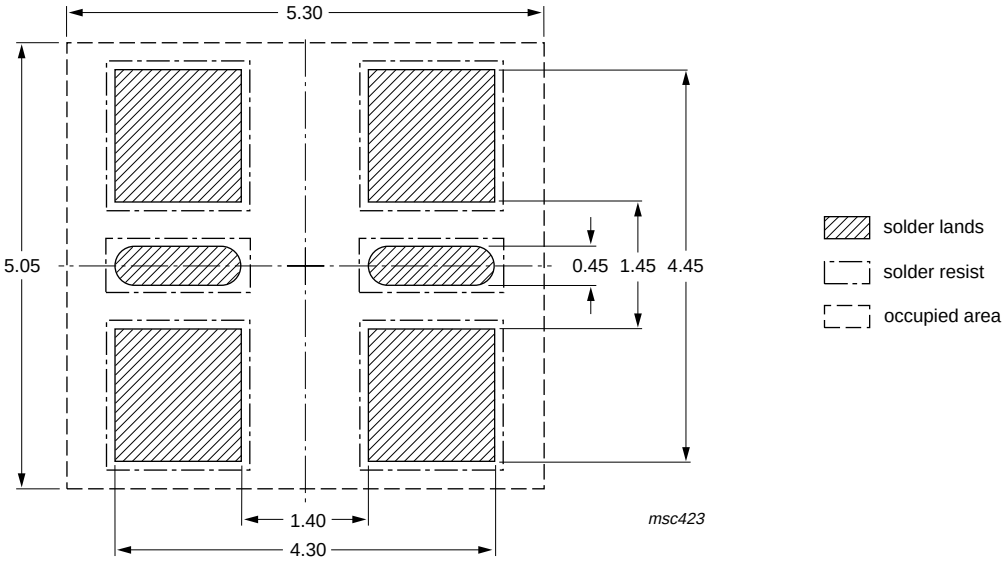
11. Soldering



Dimensions in mm

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



Dimensions in mm

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

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12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMD9003D_1	20061124	Product data sheet	-	-

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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.nxp.com.

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