

PEMD3; PIMD3; PUMD3

NPN/PNP resistor-equipped transistors;

R1 = 10 k Ω , R2 = 10 k Ω

Rev. 10 — 15 November 2009

Product data sheet

1. Product profile

1.1 General description

NPN/PNP Resistor-Equipped Transistors (RET).

Table 1. Product overview

Type number	Package		PNP/PNP complement	NPN/PNP complement
	NXP	JEITA		
PEMD3	SOT666	-	PEMB11	PEMH11
PIMD3	SOT457	SC-74	-	-
PUMD3	SOT363	SC-88	PUMB11	PUMH11

1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs

1.3 Applications

- Low current peripheral driver
- Control of IC inputs
- Replaces general-purpose transistors in digital applications

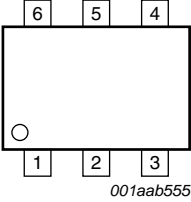
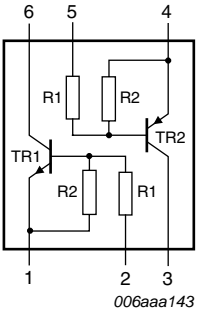
1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current (DC)		-	-	100	mA
R1	bias resistor 1 (input)		7	10	13	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
1	GND (emitter) TR1		
2	input (base) TR1		
3	output (collector) TR2		
4	GND (emitter) TR2		
5	input (base) TR2		
6	output (collector) TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
PEMD3	-	plastic surface mounted package; 6 leads	SOT666
PIMD3	SC-74	plastic surface mounted package; 6 leads	SOT457
PUMD3	SC-88	plastic surface mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PEMD3	D3
PIMD3	M7
PUMD3	D*3

[1] * = -: made in Hong Kong
 * = p: made in Hong Kong
 * = t: made in Malaysia
 * = W: made in China

5. Limiting values

Table 6. 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 _{CB0}	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	
V _I	input voltage TR1					
	positive		-	+40	V	
	negative		-	-10	V	
	input voltage TR2					
	positive		-	+10	V	
	negative		-	-40	V	
I _O	output current (DC)		-	100	mA	
I _{CM}	peak collector current		-	100	mA	
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C				
	SOT363		[1]	-	200	mW
	SOT457		[2]	-	300	mW
	SOT666		[1][3]	-	200	mW
T _{stg}	storage temperature		-65	+150	°C	
T _j	junction temperature		-	150	°C	
T _{amb}	ambient temperature		-65	+150	°C	
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C				
	SOT363		[1]	-	300	mW
	SOT457		[2]	-	600	mW
	SOT666		[1][3]	-	300	mW

[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 with 65 μ m copper strip line, standard footprint.

[3] Reflow soldering is the only recommended soldering method.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1]	-	625	K/W
	SOT457		[2]	-	417	K/W
	SOT666		[1][3]	-	625	K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1]	-	416	K/W
	SOT457		[2]	-	208	K/W
	SOT666		[1][3]	-	416	K/W

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

[2] Device mounted on an FR4 PCB with 65 μm copper strip line, standard footprint.

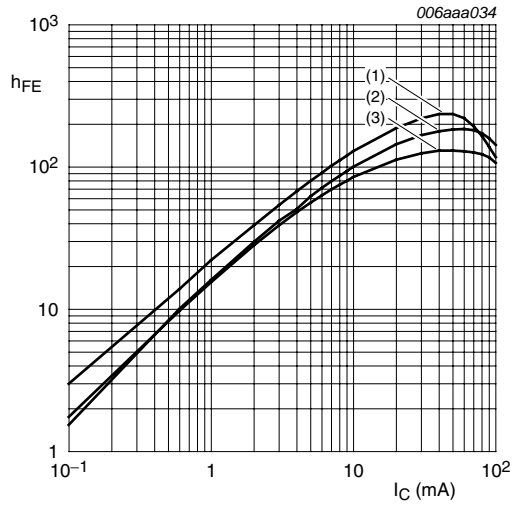
[3] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

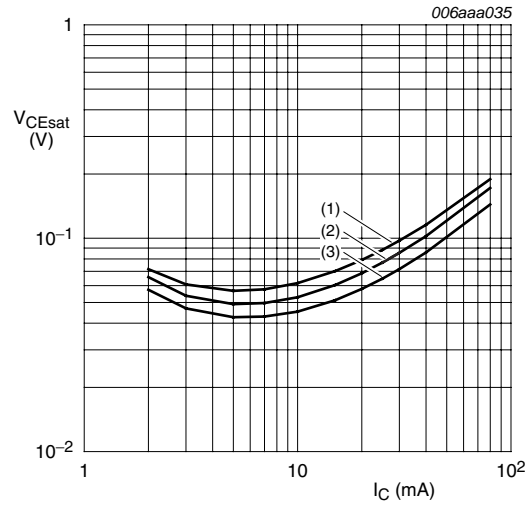
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor; for the PNP transistor with negative polarity						
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	$V_{CE} = 30\text{ V}; I_B = 0\text{ A}$	-	-	1	μA
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ °C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	400	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$	-	1.1	0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 10\text{ mA}$	2.5	1.8	-	V
R1	bias resistor 1 (input)		7	10	13	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$	-	-	-	
		TR1 (NPN)	-	-	2.5	pF
		TR2 (PNP)	-	-	3	pF



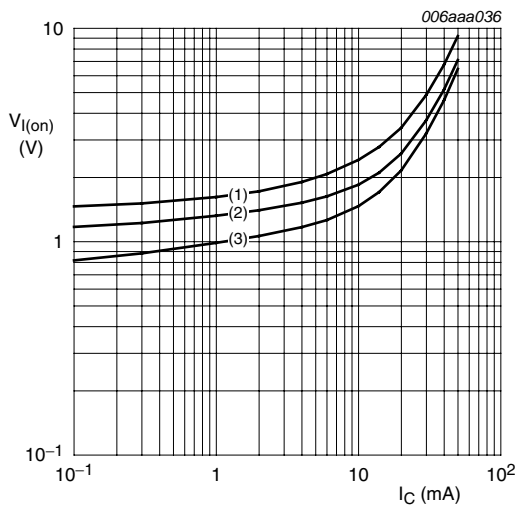
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig 1. TR1 (NPN): DC current gain as a function of collector current; typical values



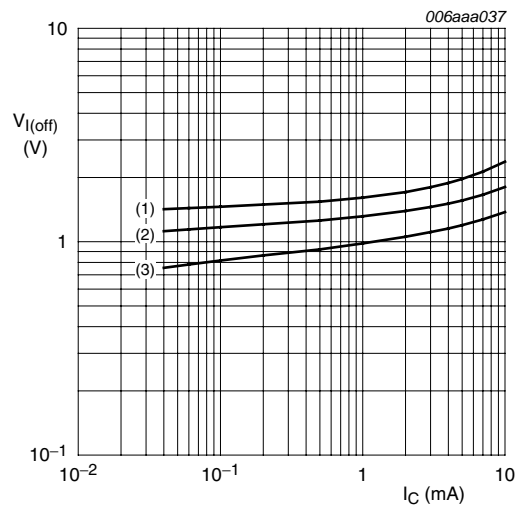
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig 2. TR1 (NPN): Collector-emitter voltage as a function of collector current; typical values



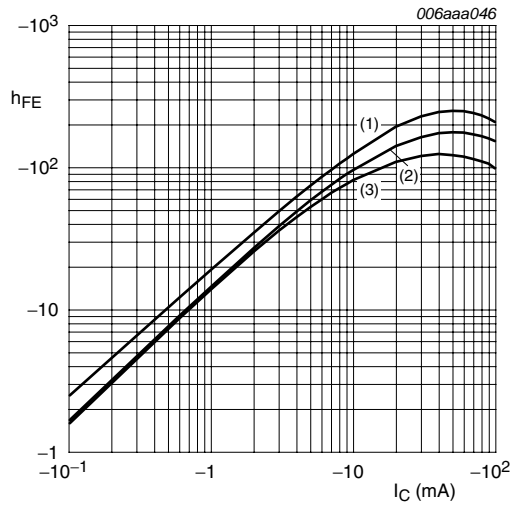
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig 3. TR1 (NPN): On-state input voltage as a function of collector current; typical values



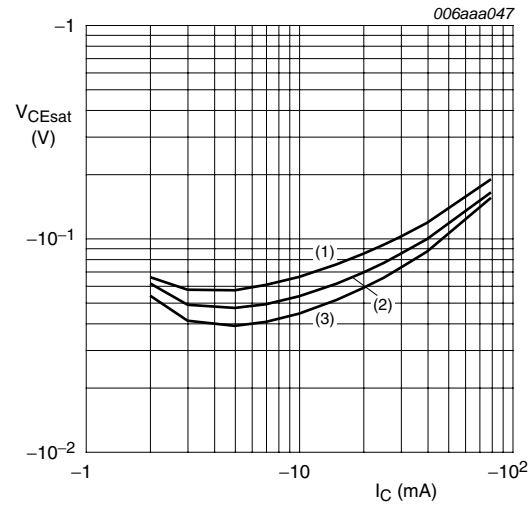
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

Fig 4. TR1 (NPN): Off-state input voltage as a function of collector current; typical values



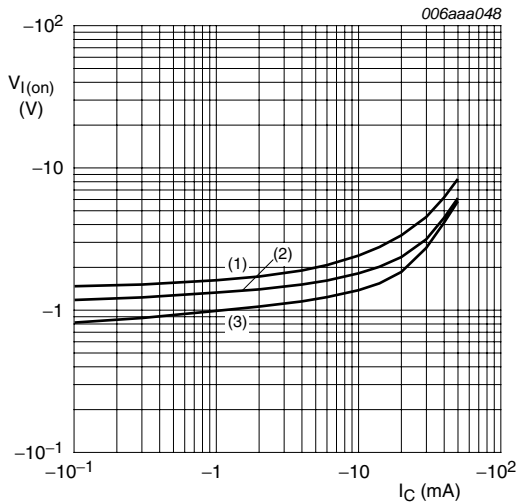
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

Fig 5. TR2 (PNP): DC current gain as a function of collector current; typical values



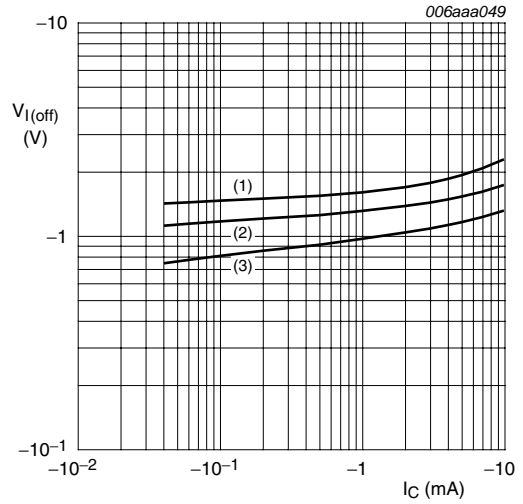
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

Fig 6. TR2 (PNP): Collector-emitter voltage as a function of collector current; typical values



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

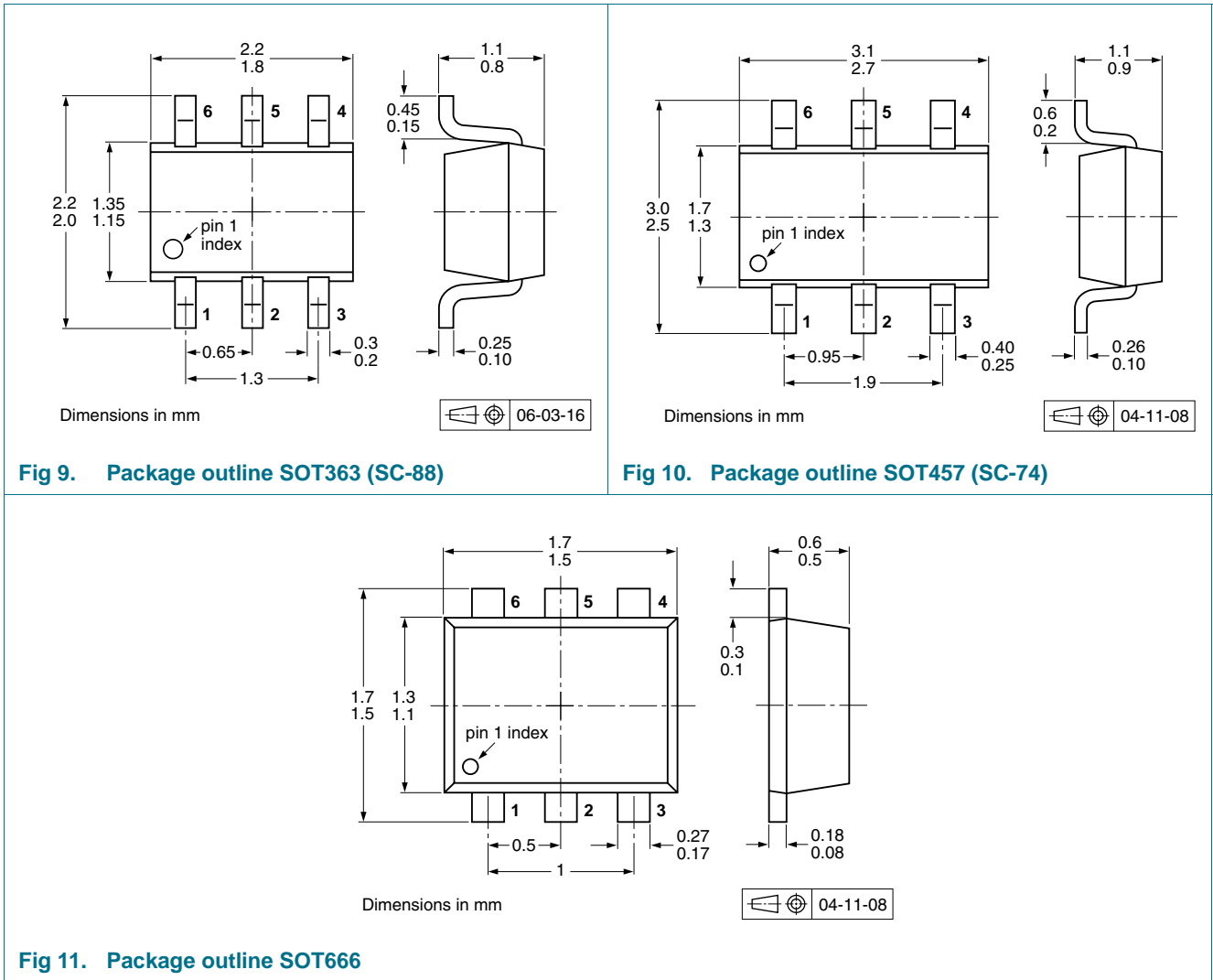
Fig 7. TR2 (PNP): On-state input voltage as a function of collector current; typical values



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

Fig 8. TR2 (PNP): Off-state input voltage as a function of collector current; typical values

8. Package outline



9. Packing information

Table 9. Packing methods

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

Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PEMD3	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PIMD3	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
PUMD3	SOT363	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 12](#).

[2] T1: normal taping

[3] T2: reverse taping

10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMD3_PIMD3_PUMD3_10	20091115	Product data sheet	-	PEMD3_PIMD3_PUMD3_9
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 9 "Package outline SOT363 (SC-88)": updated 			
PEMD3_PIMD3_PUMD3_9	20050518	Product data sheet	-	PEMD3_PIMD3_PUMD3_8
PEMD3_PIMD3_PUMD3_8	20041206	Product data sheet	-	PEMD3_PUMD3_7

11. Legal information

11.1 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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