

PEMD15; PUMD15

NPN/PNP resistor-equipped transistors;
R1 = 4.7 k Ω , R2 = 4.7 k Ω

Rev. 03 — 2 September 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		
PEMD15	SOT666	-	PEMB15	PEMH15
PUMD15	SOT363	SC-88	PUMB15	PUMH15

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

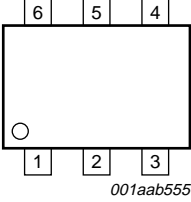
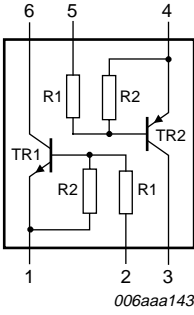
1.4 Quick reference data

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)		3.3	4.7	6.1	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	 <p>001aab555</p>	 <p>006aaa143</p>
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	
PEMD15	-	plastic surface mounted package; 6 leads	SOT666
PUMD15	SC-88	plastic surface mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PEMD15	5E
PUMD15	D0*

[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 _{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	
V _I	input voltage TR1					
	positive		-	+30	V	
	negative		-	-10	V	
	input voltage TR2					
	positive		-	+10	V	
	negative		-	-30	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
	SOT666		[1][2]	-	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
	SOT666		[1][2]	-	300	mW

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

[2] 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
	SOT666		[1][2]	-	625	K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1]	-	416	K/W
	SOT666		[1][2]	-	416	K/W

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

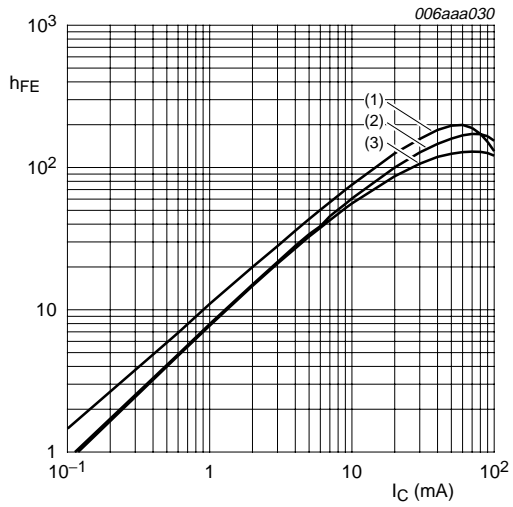
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

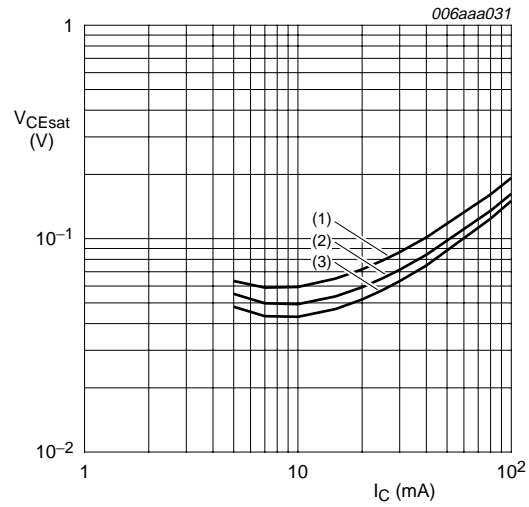
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	0.9	mA	
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}$	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	0.5	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	2.5	1.9	-	V	
R1	bias resistor 1 (input)		3.3	4.7	6.1	kΩ	
R2/R1	bias resistor ratio		0.8	1	1.2		
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$					
			TR1 (NPN)	-	-	2.5	pF
			TR2 (PNP)	-	-	3	pF



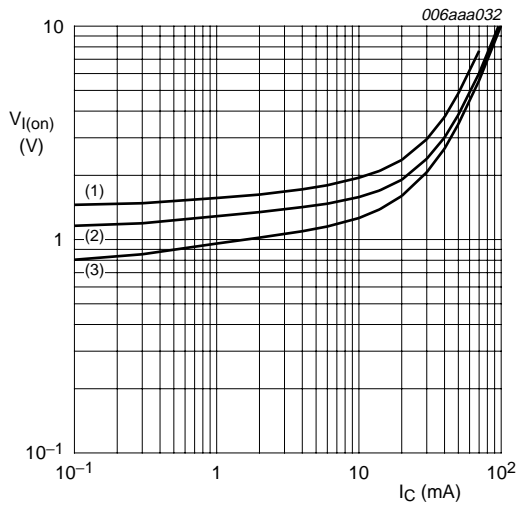
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



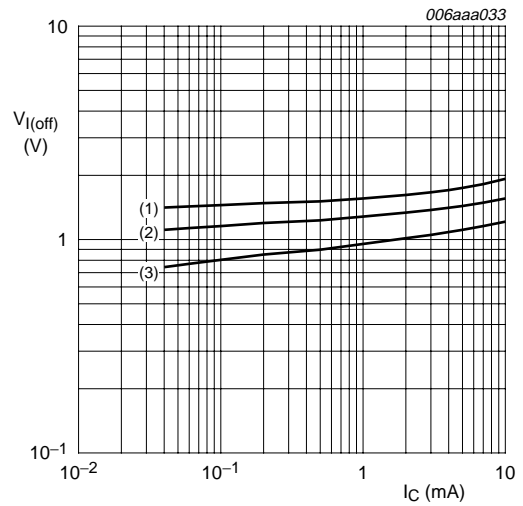
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



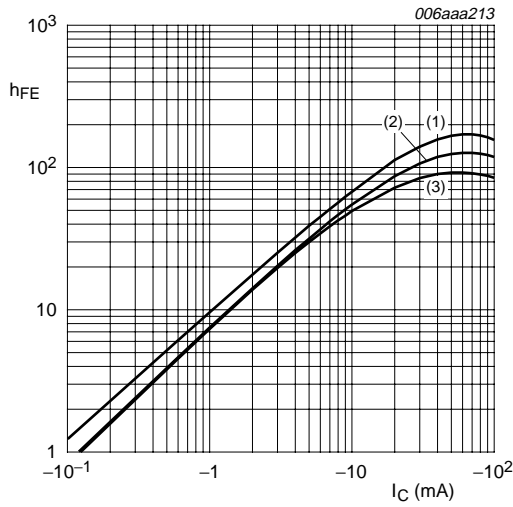
$V_{CE} = 0.3\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



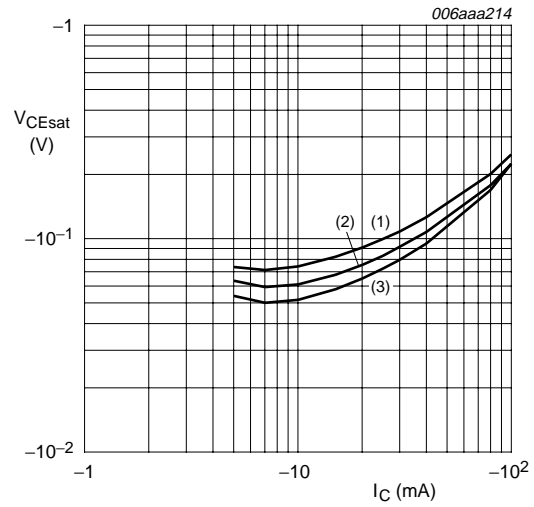
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -40\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



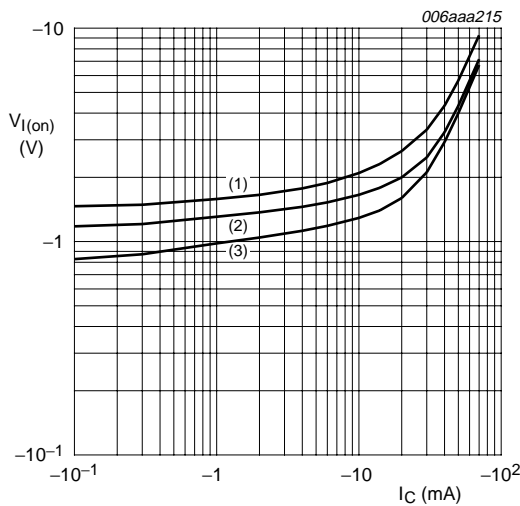
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

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



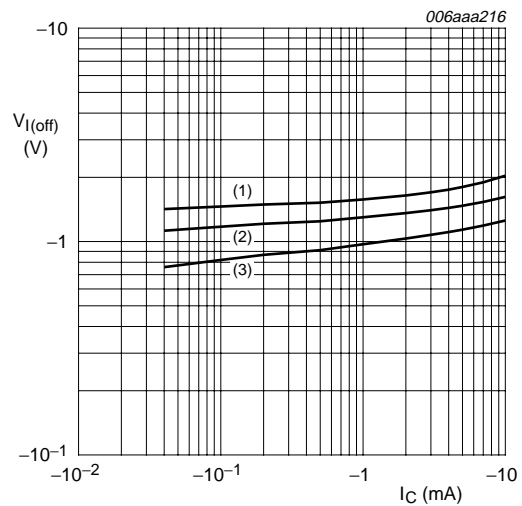
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -40\text{ °C}$

Fig 6. TR2 (PNP): 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. TR2 (PNP): 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. TR2 (PNP): Off-state input voltage as a function of collector current; typical values

8. Package outline

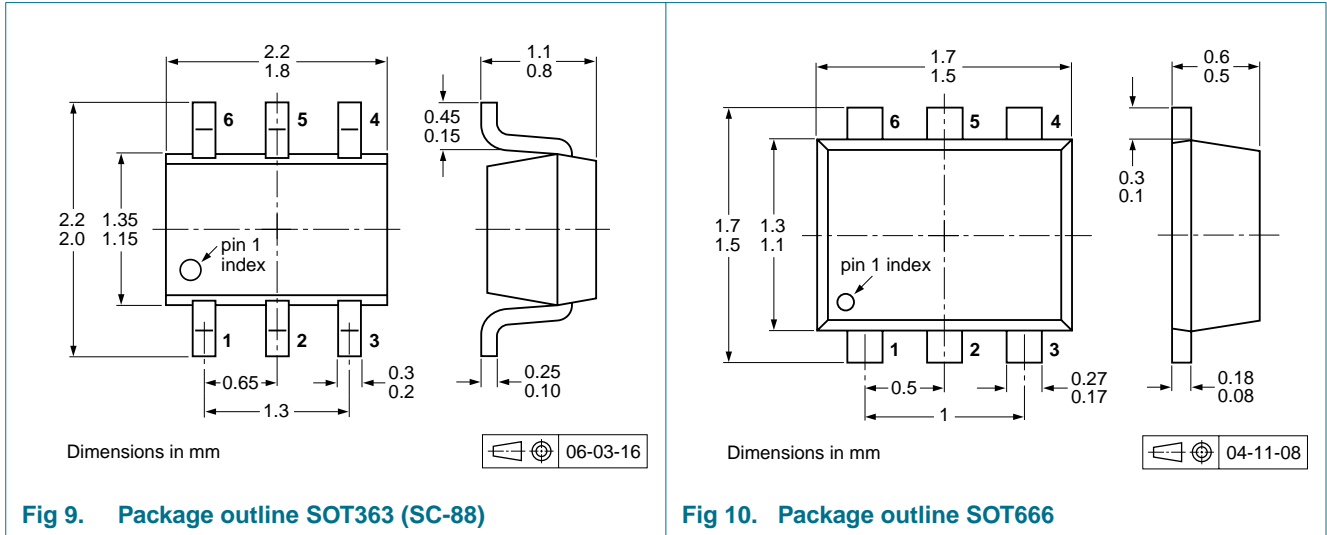


Fig 9. Package outline SOT363 (SC-88)

Fig 10. Package outline SOT666

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
PEMD15	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMD15	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
PEMD15_PUMD15_3	20090902	Product data sheet	-	PEMD15_PUMD15_2
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			
PEMD15_PUMD15_2	20050425	Product data sheet	-	PUMD15_1
PUMD15_1	20040204	Product specification	-	-

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".

[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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13. Contents

1	Product profile	1
1.1	General description	1
1.2	Features	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	2
3	Ordering information	2
4	Marking	2
5	Limiting values	3
6	Thermal characteristics	4
7	Characteristics	4
8	Package outline	7
9	Packing information	7
10	Revision history	8
11	Legal information	9
11.1	Data sheet status	9
11.2	Definitions	9
11.3	Disclaimers	9
11.4	Trademarks	9
12	Contact information	9
13	Contents	10



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