

# PEMD16; PUMD16

NPN/PNP resistor-equipped transistors;  
R1 = 22 k $\Omega$ , R2 = 47 k $\Omega$

Rev. 3 — 28 June 2011

Product data sheet

## 1. Product profile

### 1.1 General description

NPN/PNP resistor-equipped transistors.

Table 1. Product overview

Type number	Package		PNP/PNP complement	NPN/PNP complement
	NXP	JEITA		
PEMD16	SOT666	-	PEMB16	PEMH16
PUMD16	SOT363	SC-88	PUMB16	PUMH16

### 1.2 Features and benefits

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

### 1.3 Applications

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

### 1.4 Quick reference data

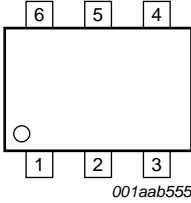
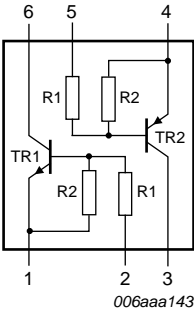
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	k $\Omega$
R2/R1	bias resistor ratio		1.7	2.1	2.6	



2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic 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		
	Name	Description	Version
PEMD16	-	plastic surface-mounted package; 6 leads	SOT666
PUMD16	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PEMD16	5H
PUMD16	D1*

[1] \* = placeholder for manufacturing site code

## 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 <sub>CBO</sub>	collector-base voltage	open emitter	-	50	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	50	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	5	V
V <sub>I</sub>	input voltage TR1				
	positive		-	+40	V
	negative		-	−7	V
	input voltage TR2				
	positive		-	+7	V
	negative		-	−40	V
I <sub>o</sub>	output current		-	100	mA
I <sub>CM</sub>	peak collector current		-	100	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C			
	SOT363		[1] -	200	mW
	SOT666		[1][2] -	200	mW
T <sub>stg</sub>	storage temperature		−65	+150	°C
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		−65	+150	°C
Per device					
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 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
<b>Per transistor</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1] -	-	625	K/W
	SOT666		[1][2] -	-	625	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT363		[1] -	-	416	K/W
	SOT666		[1][2] -	-	416	K/W

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

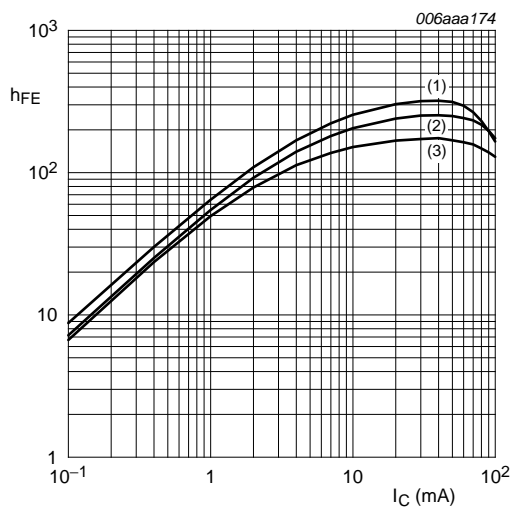
[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8. Characteristics**

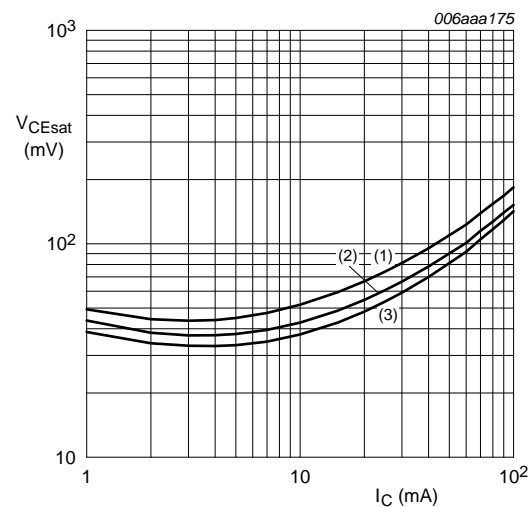
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor; for the PNP transistor with negative polarity</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	$V_{CE} = 30\text{ V}$ ; $I_B = 0\text{ A}$	-	-	1	$\mu\text{A}$
		$V_{CE} = 30\text{ V}$ ; $I_B = 0\text{ A}$ ; $T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}$ ; $I_C = 0\text{ A}$	-	-	120	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 5\text{ mA}$	80	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}$ ; $I_B = 0.5\text{ mA}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}$ ; $I_C = 100\text{ }\mu\text{A}$	-	0.8	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}$ ; $I_C = 2\text{ mA}$	2	1.1	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	k $\Omega$
R2/R1	bias resistor ratio		1.7	2.1	2.6	
$C_c$	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



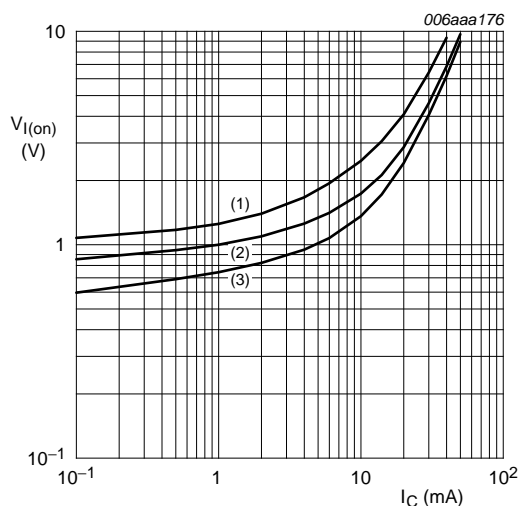
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -40^\circ\text{C}$

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



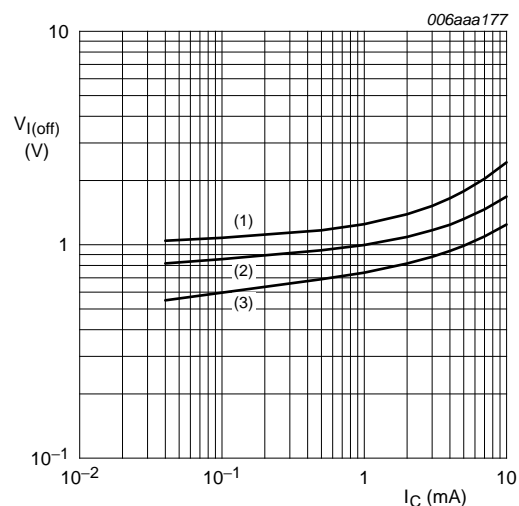
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -40^\circ\text{C}$

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



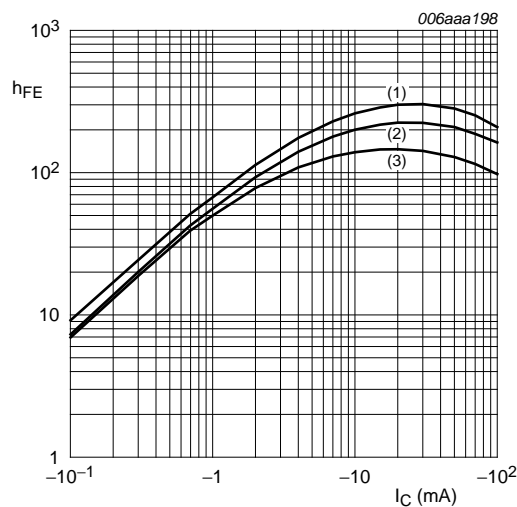
- $V_{CE} = 0.3\text{ V}$
- (1)  $T_{amb} = -40^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = 100^\circ\text{C}$

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



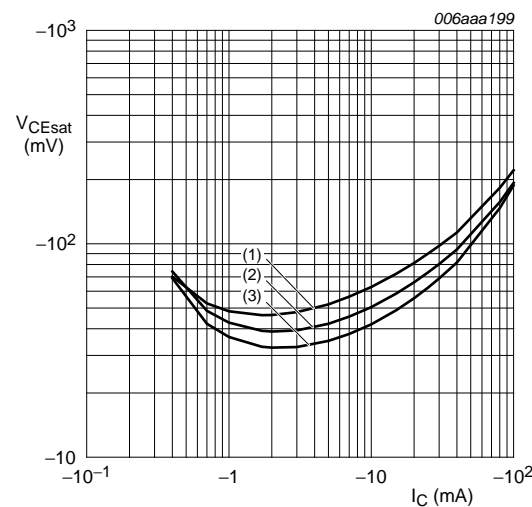
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = -40^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = 100^\circ\text{C}$

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



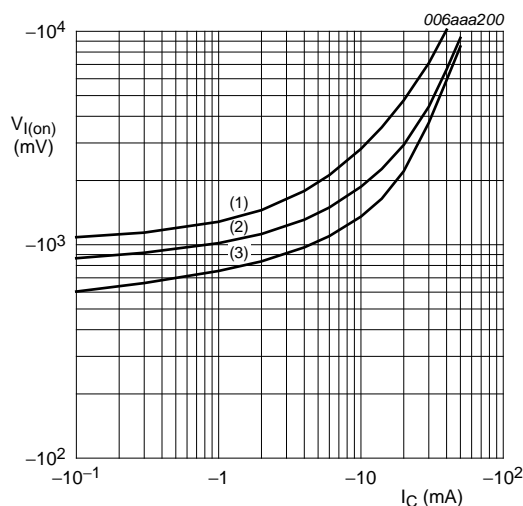
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -40^\circ\text{C}$

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



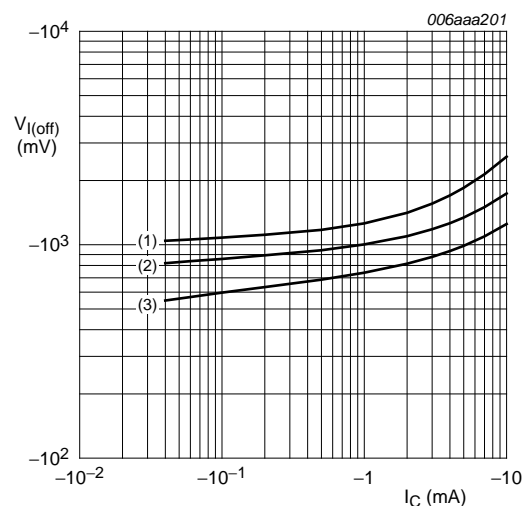
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100^\circ\text{C}$
  - (2)  $T_{amb} = 25^\circ\text{C}$
  - (3)  $T_{amb} = -40^\circ\text{C}$

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



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

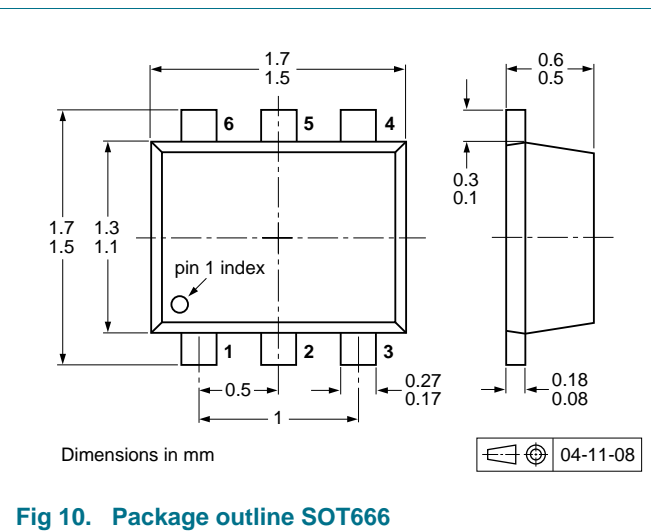
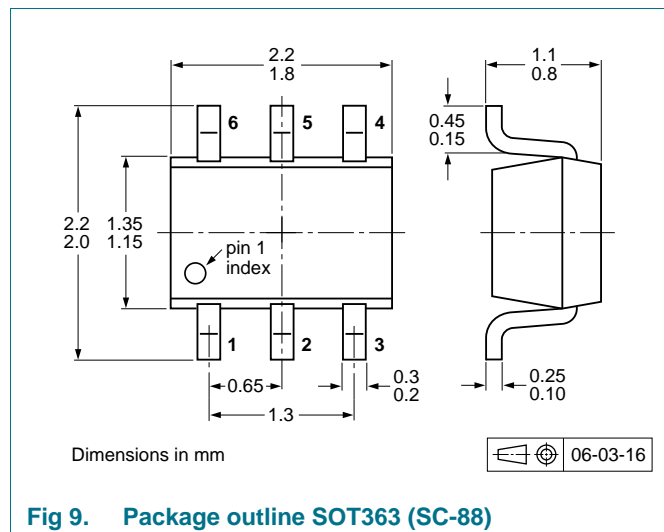
Fig 7. TR2 (PNP): On-state input voltage as a function of collector current; typical values



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

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	10000
PEMD16	SOT666	4 mm pitch, 8 mm tape and reel	-	-115	-
PUMD16	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
PEMD16_PUMD16 v.3	20110628	Product data sheet	-	PEMD16_PUMD16 v.2
Modifications:	<ul style="list-style-type: none"><li>• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductor.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Figure 9 “Package outline SOT363 (SC-88)”</a> is updated.</li><li>• <a href="#">Section 11 “Legal information”</a> is updated.</li></ul>			
PEMD16_PUMD16 v.2	20050607	Product data sheet	-	PUMD16 v.1
PUMD16 v.1	20031022	Product specification	-	-



## 11. Legal information

### 11.1 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".

[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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