

# PEMD18; PUMD18

NPN/PNP resistor-equipped transistors;  
R1 = 4.7 k $\Omega$ , R2 = 10 k $\Omega$

Rev. 01 — 13 June 2005

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
	Philips	JEITA		
PEMD18	SOT666	-	PEMB18	PEMH18
PUMD18	SOT363	SC-88	PUMB18	PUMH18

### 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 <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	100	mA
R1	bias resistor 1 (input)		3.3	4.7	6.1	k $\Omega$
R2/R1	bias resistor ratio		1.7	2.1	2.6	

**PHILIPS**

## 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	
PEMD18	-	plastic surface mounted package; 6 leads	SOT666
PUMD18	SC-88	plastic surface mounted package; 6 leads	SOT363

## 4. Marking

Table 5: Marking codes

Type number	Marking code <sup>[1]</sup>
PEMD18	6B
PUMD18	T5*

- [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	
<b>Per transistor; for the PNP transistor with negative polarity</b>						
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	-	7	V	
V <sub>I</sub>	input voltage TR1					
	positive		-	+20	V	
	negative		-	-7	V	
	input voltage TR2					
	positive		-	+7	V	
	negative		-	-20	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	
<b>Per device</b>						
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.

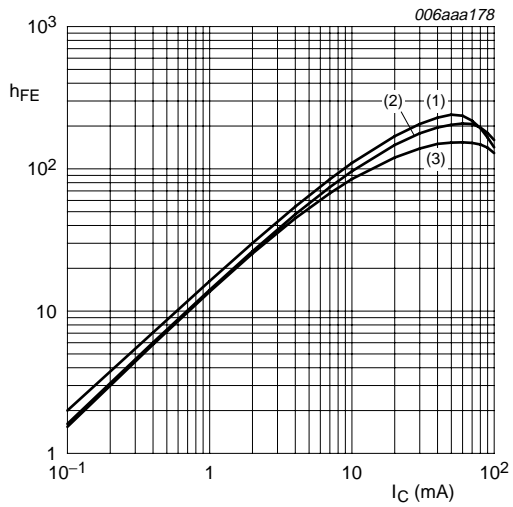
[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8: Characteristics**

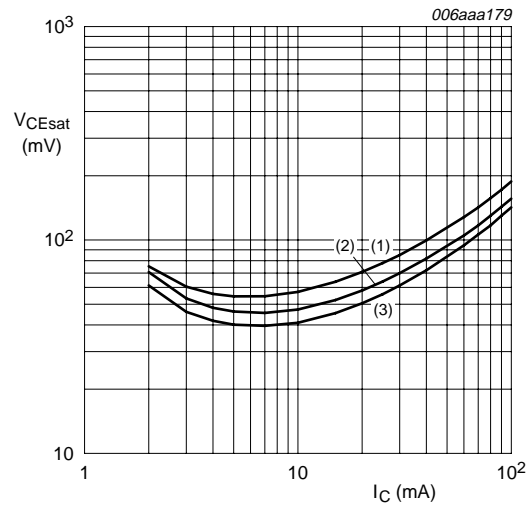
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

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	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	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	600	μA	
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}$	50	-	-		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	-	100	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$	-	-	0.3	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 20\text{ mA}$	2.5	-	-	V	
R1	bias resistor 1 (input)		3.3	4.7	6.1	kΩ	
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



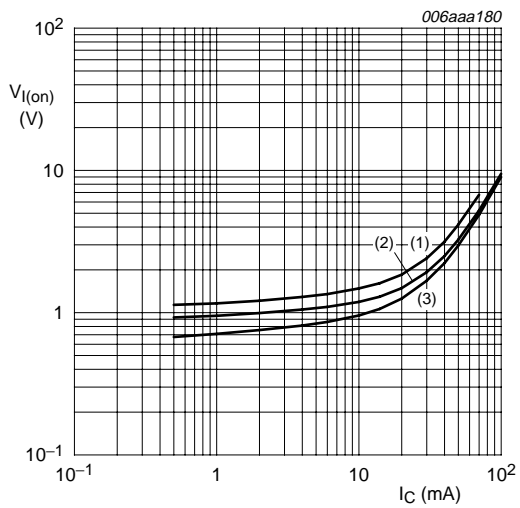
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40\text{ }^\circ\text{C}$

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



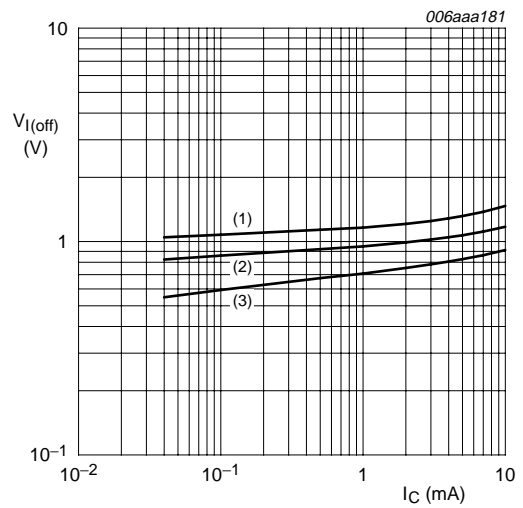
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40\text{ }^\circ\text{C}$

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



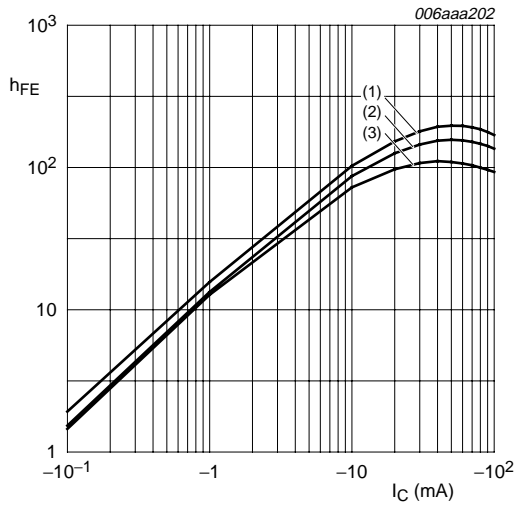
$V_{CE} = 0.3\text{ V}$   
 (1)  $T_{amb} = -40\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



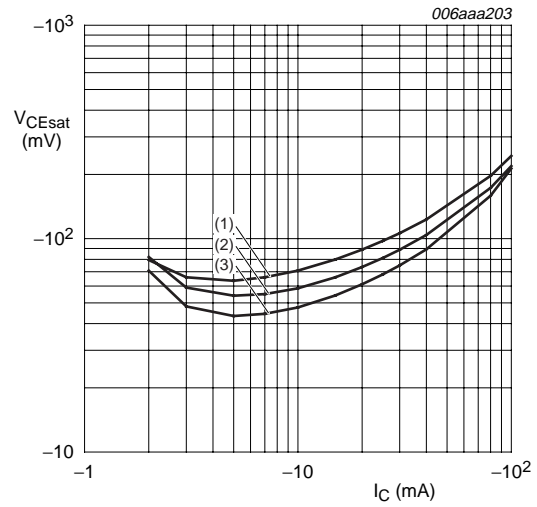
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -40\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



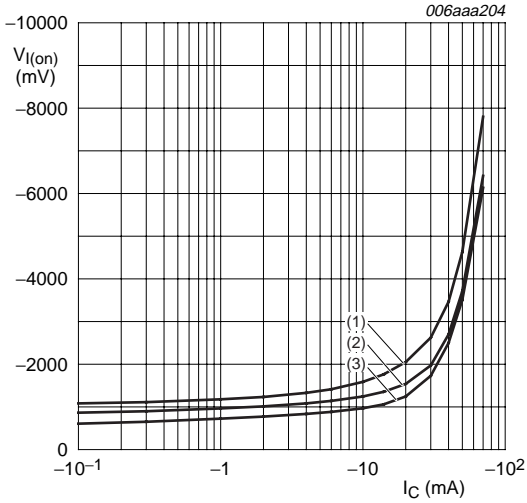
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



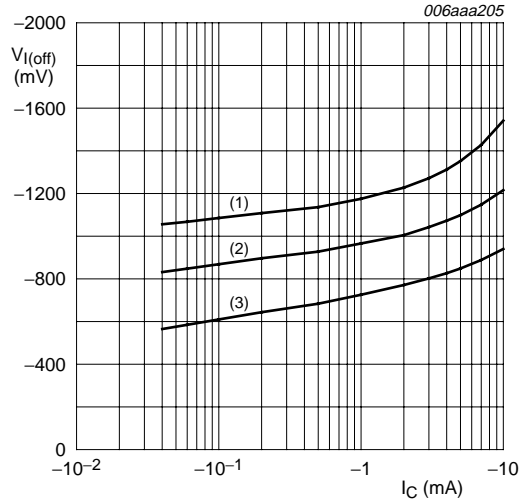
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

**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)  $T_{amb} = 100\text{ °C}$

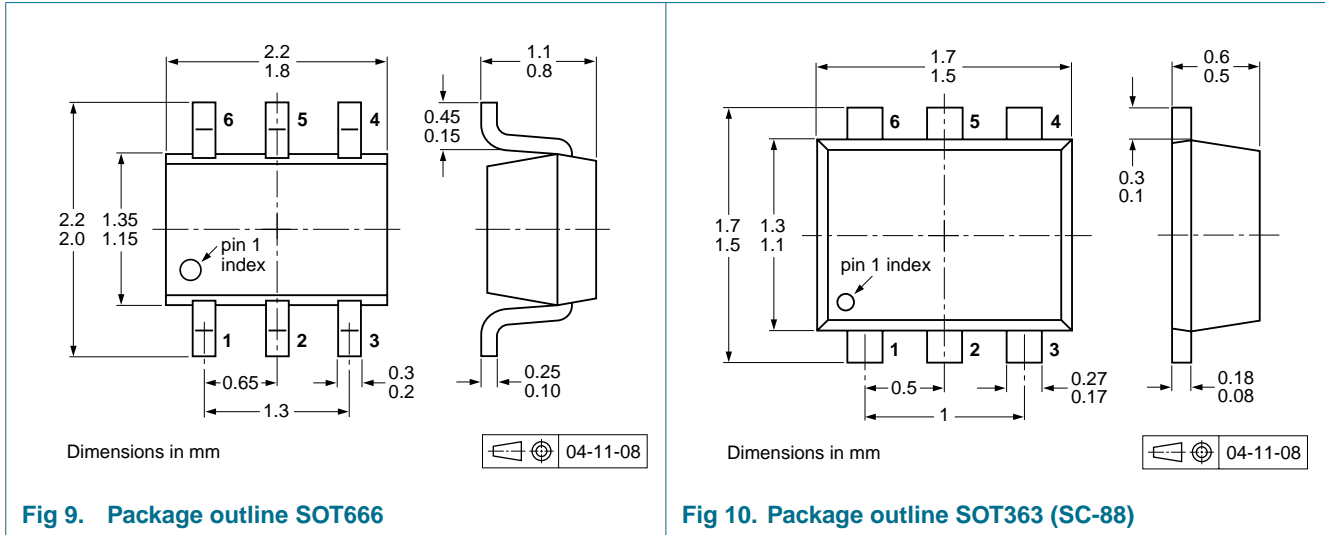
**Fig 7. TR2 (PNP): On-state input voltage as a function of collector current; typical values**



$V_{CE} = -5\text{ V}$   
 (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



### 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
PEMD18	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMD18	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 15](#).

[2] T1: normal taping

[3] T2: reverse taping

## 10. Revision history

**Table 10: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PEMD18_PUMD18_1	20050613	Product data sheet	-	9397 750 14459	-



## 11. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definition
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