

# PEMD24; PUMD24

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NPN/PNP resistor-equipped transistors;  
R1 = 100 k $\Omega$ , R2 = 100 k $\Omega$

Rev. 01 — 2 May 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		
PEMD24	SOT666	-	PEMB24	PEMH24
PUMD24	SOT363	SC-88	PUMB24	PUMH24

### 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

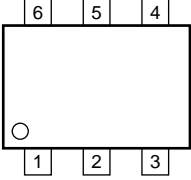
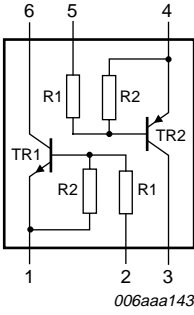
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current (DC)		-	-	20	mA
R1	bias resistor 1 (input)		70	100	130	k $\Omega$
R2/R1	bias resistor ratio		0.8	1	1.2	

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## 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	
PEMD24	-	plastic surface mounted package; 6 leads	SOT666
PUMD24	SC-88	plastic surface mounted package; 6 leads	SOT363

## 4. Marking

**Table 5: Marking codes**

Type number	Marking code <sup>[1]</sup>
PEMD24	6N
PUMD24	T8*

- [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>						
$V_{CBO}$	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		-	+40	V	
	negative		-	-10	V	
	input voltage TR2					
	positive		-	+10	V	
	negative		-	-40	V	
$I_O$	output current (DC)		-	20	mA	
$I_{CM}$	peak collector current		-	100	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$				
	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	
<b>Per device</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$				
	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.

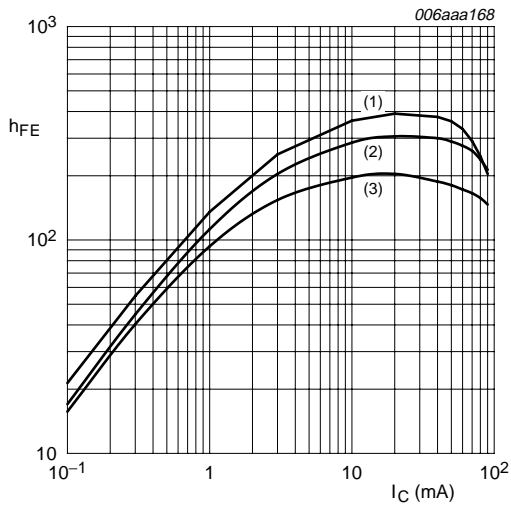
[2] Reflow soldering is the only recommended soldering method.

## 7. Characteristics

**Table 8: Characteristics**

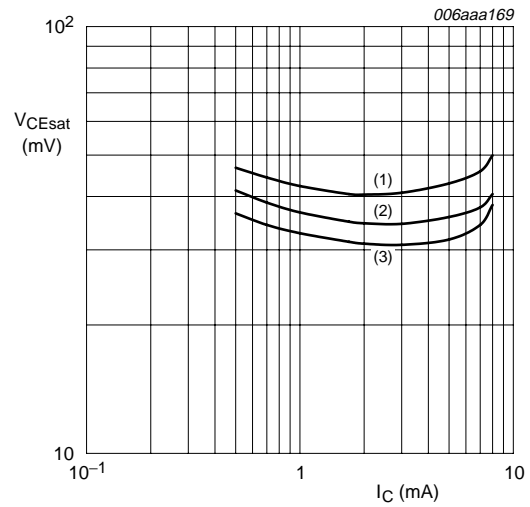
$T_{amb} = 25^\circ\text{C}$  unless otherwise specified.

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	$\mu\text{A}$	
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	50	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	50	$\mu\text{A}$	
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	80	-	-		
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 5\text{ mA}; I_B = 0.25\text{ mA}$	-	-	150	mV	
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	-	1.1	0.5	V	
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 1\text{ mA}$	3	1.5	-	V	
R1	bias resistor 1 (input)		70	100	130	k $\Omega$	
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



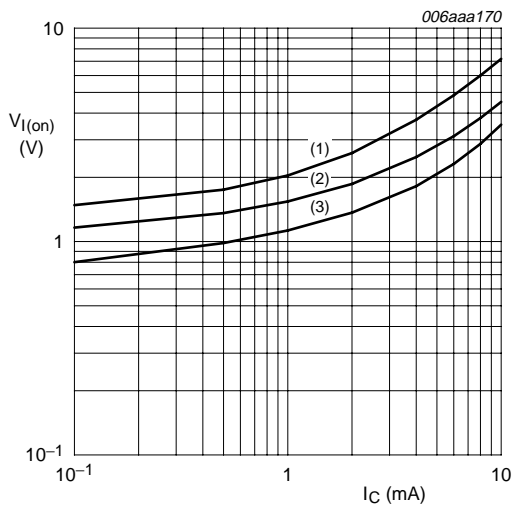
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



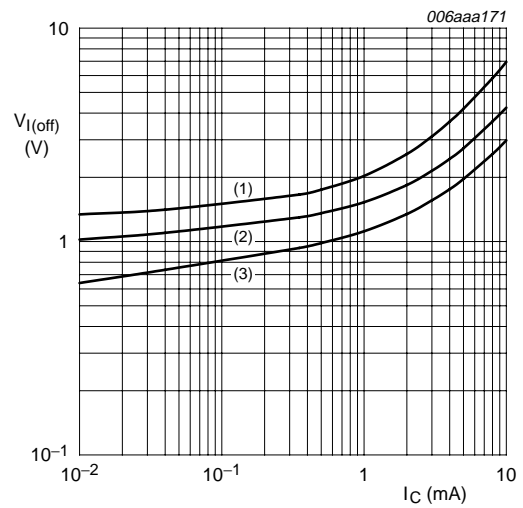
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -40\text{ °C}$

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



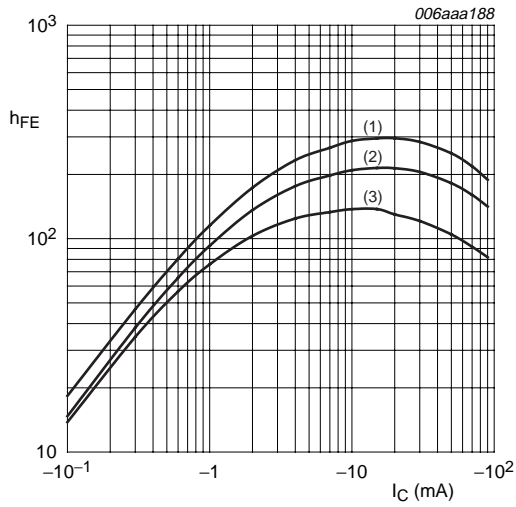
$V_{CE} = 0.3\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

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



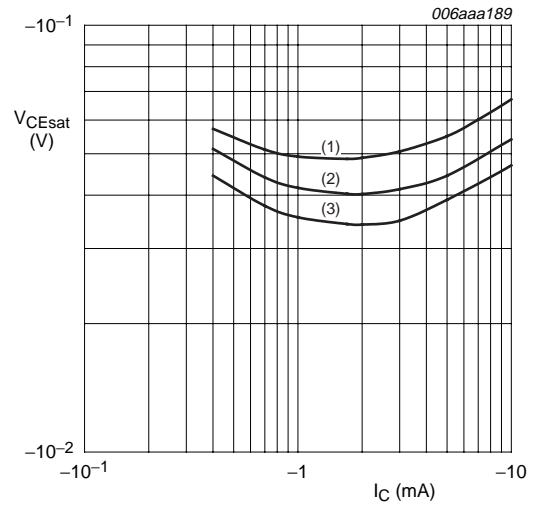
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -40\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

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



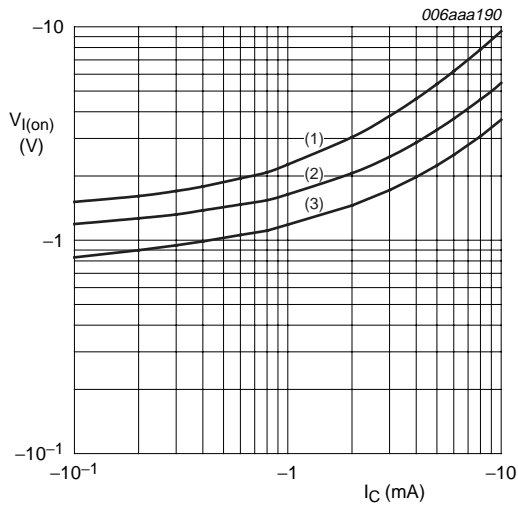
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

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



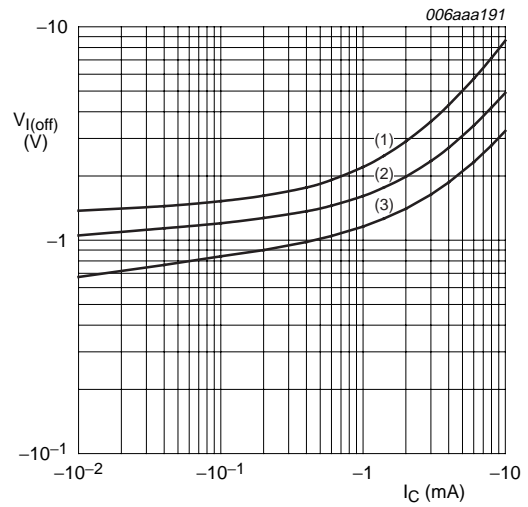
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^\circ\text{C}$

**Fig 6. TR2 (PNP): Collector-emitter 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 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

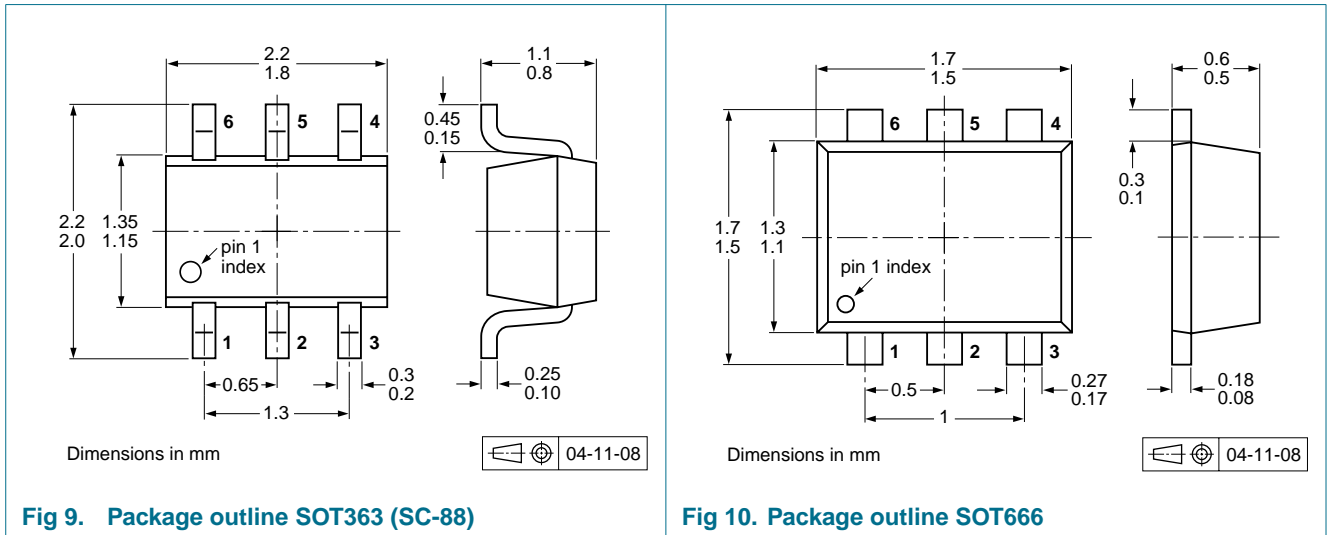


Fig 9. Package outline SOT363 (SC-88)

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
PEMD24	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMD24	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
PEMD24_PUMD24_1	20050502	Product data sheet	-	9397 750 14457	-



## 11. Data sheet status

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