

PEMH24; PUMH24

NPN/NPN resistor-equipped transistors;
R1 = 100 k Ω , R2 = 100 k Ω

Rev. 04 — 18 May 2005

Product data sheet

1. Product profile

1.1 General description

NPN/NPN Resistor-Equipped Transistors (RET).

Table 1: Product overview

Type number	Package		NPN/PNP complement	PNP/PNP complement
	Philips	JEITA		
PEMH24	SOT666	-	PEMD24	PEMB24
PUMH24	SOT363	SC-88	PUMD24	PUMB24

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

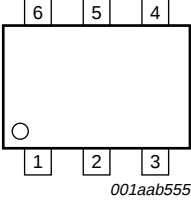
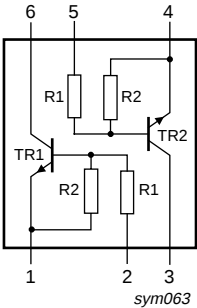
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current (DC)		-	-	20	mA
R1	bias resistor 1 (input)		70	100	130	k Ω
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		
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
PEMH24	-	plastic surface mounted package; 6 leads	SOT666
PUMH24	SC-88	plastic surface mounted package; 6 leads	SOT363

4. Marking

Table 5: Marking codes

Type number	Marking code [1]
PEMH24	6T
PUMH24	H8*

[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					
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				
	positive		-	+40	V
	negative		-	-10	V
I _O	output current (DC)		-	20	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 an FR4 PCB, single-sided copper, tin-plated and standard footprint.

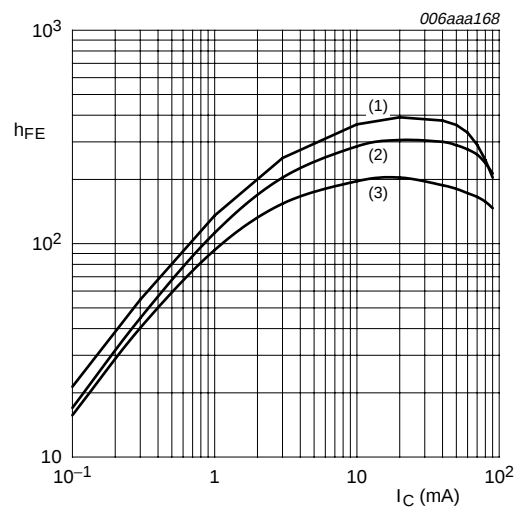
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8: Characteristics

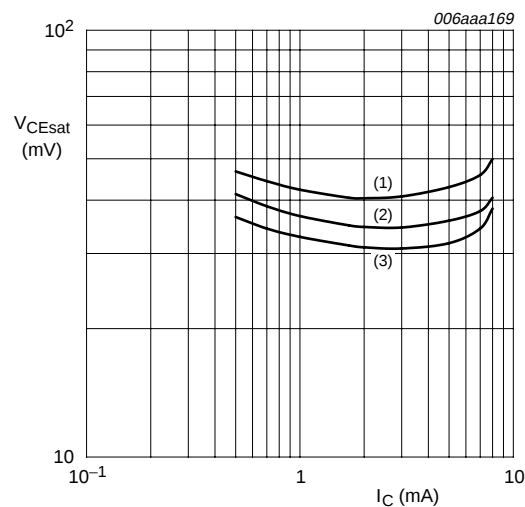
 $T_{amb} = 25^\circ\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
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
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	50	μA
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	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	2.5	pF



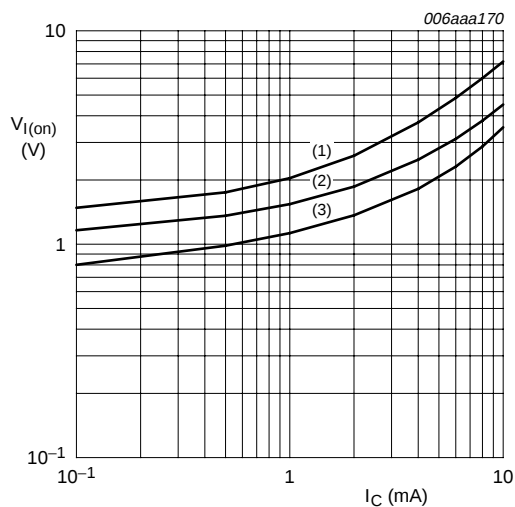
- $V_{CE} = 5\text{ V}$
(1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 1. DC current gain as a function of collector current; typical values



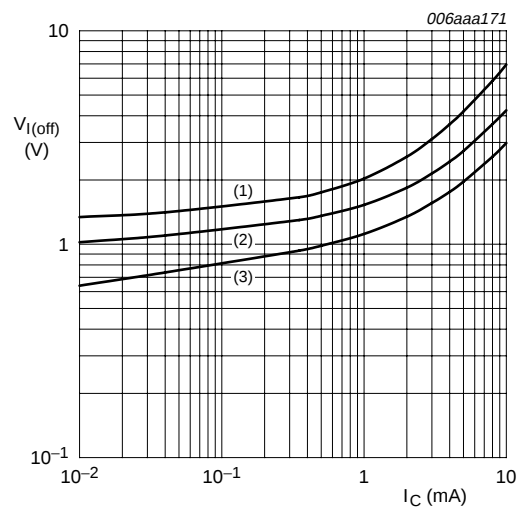
- $I_C/I_B = 20$
(1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -40\text{ }^{\circ}\text{C}$

Fig 2. 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) $T_{amb} = 100\text{ }^{\circ}\text{C}$

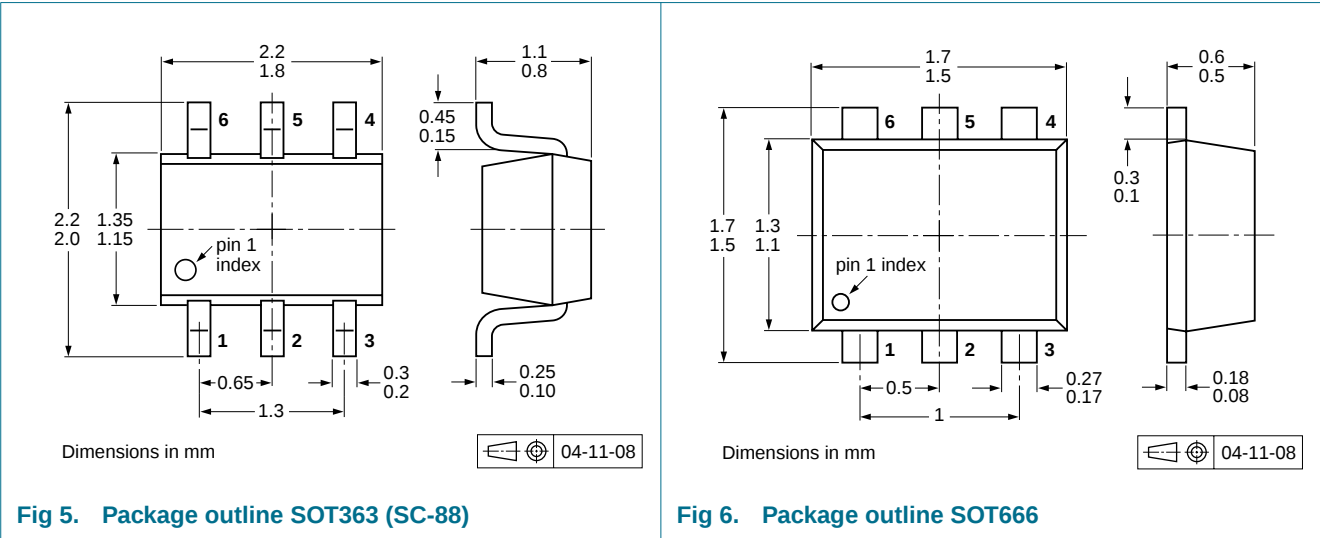
Fig 3. On-state input voltage as a function of collector current; typical values



- $V_{CE} = 5\text{ V}$
(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. 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
PEMH24	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMH24	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
PEMH24_PUMH24_4	20050518	Product data sheet	-	9397 750 14456	PUMH24_3
Modifications:					
• Type PEMH24 added • Table 1 “Product overview”: added • Figure 1, 2, 3 and 4: electrical graphs added • Table 9 “Packing methods”: added • Section 14 “Trademarks”: added					
PUMH24_3	20041015	Product data sheet	-	9397 750 13628	PUMH24_2
PUMH24_2	20040414	Product specification	-	9397 750 13087	PUMH24_1
PUMH24_1	20031016	Product specification	-	9397 750 11895	-

11. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2] [3]}	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

12. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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