



PEMH16

50 V, 100 mA NPN/NPN resistor-equipped transistor;
R1 = 22 k Ω , R2 = 47 k Ω

29 December 2022

Product data sheet

1. General description

NPN/NPN Resistor-Equipped Transistor (RET) in an ultra small and flat lead SOT666 Surface-Mounted Device (SMD) plastic package.

NPN/PNP complement: PEMD16

PNP/PNP complement: PEMB16

2. Features and benefits

- Built-in bias resistors
- Simplified circuit design
- Reduces component count
- Reduces pick and place costs

3. Applications

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

4. Quick reference data

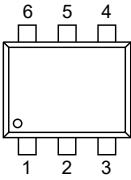
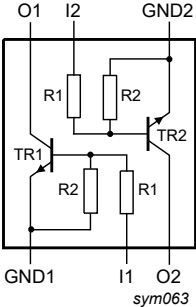
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V _{CEO}	collector-emitter voltage	open base	-	-	50	V
I _O	output current		-	-	100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	k Ω
R2/R1	bias resistor ratio		1.7	2.1	2.6	

50 V, 100 mA NPN/NPN resistor-equipped transistor; R1 = 22 kΩ, R2 = 47 kΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	GND1	GND (emitter) TR1	 SOT666	 sym063
2	I1	input (base) TR1		
3	O2	output (collector) TR2		
4	GND2	GND (emitter) TR2		
5	I2	input (base) TR2		
6	O1	output (collector) TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PEMH16	SOT666	plastic, surface-mounted package; 6 leads; 0.5 mm pitch; 1.6 mm x 1.2 mm x 0.55 mm body	SOT666

7. Marking

Table 4. Marking codes

Type number	Marking code
PEMH16	5K

8. Limiting values

Table 5. 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		-	7	V
V _I	input voltage	positive (input voltage TR1)		-	40	V
		negative (input voltage TR1)		-	-7	V
I _O	output current			-	100	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1] [2]	-	200	mW
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1] [2]	-	300	mW
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-65	150	°C
T _{stg}	storage temperature			-65	150	°C

[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.

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	625	K/W
Per device							
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	416	K/W

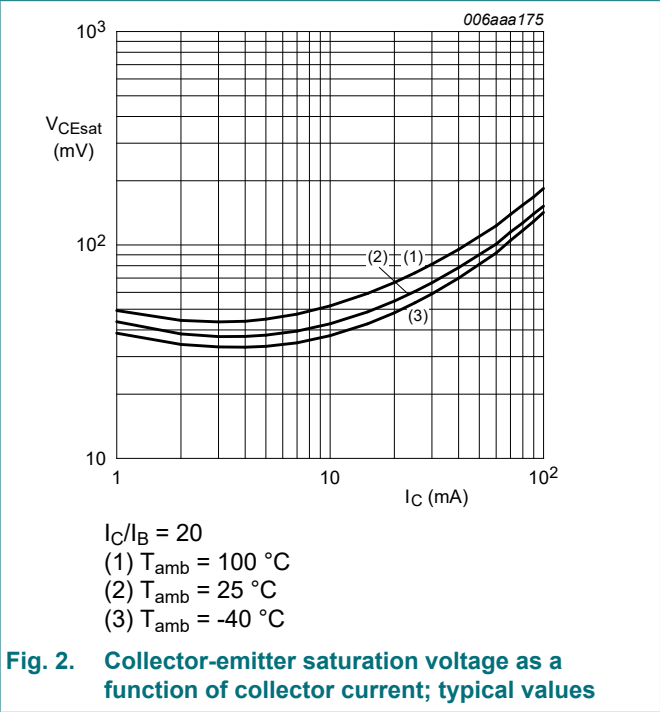
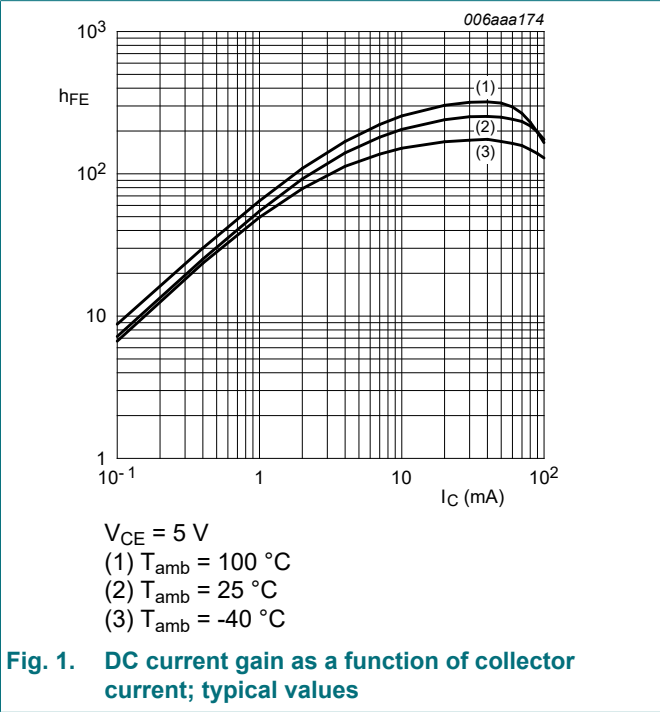
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

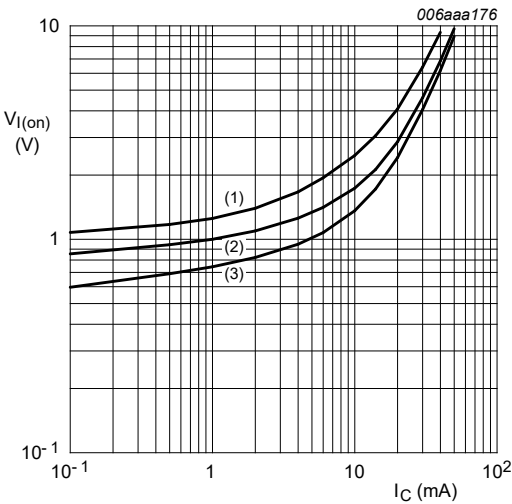
[2] Reflow soldering is the only recommended soldering method.

10. Characteristics

Table 7. Characteristics

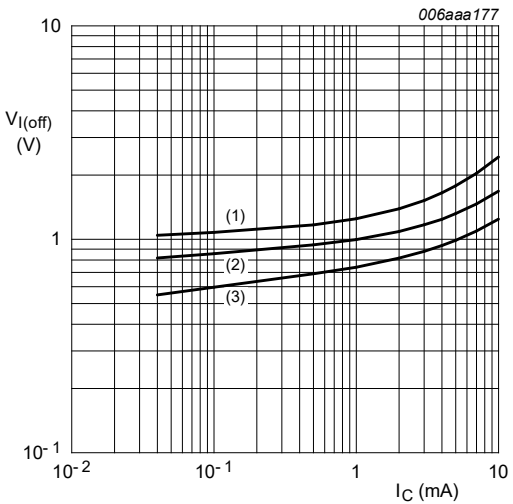
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}$; $I_E = 0\text{ A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\text{ mA}$; $I_B = 0\text{ A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	50	-	-	V
I_{CBO}	collector-base cut-off current	$V_{CB} = 50\text{ V}$; $I_E = 0\text{ A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30\text{ V}$; $I_B = 0\text{ A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	1	μA
		$V_{CE} = 30\text{ V}$; $I_B = 0\text{ A}$; $T_j = 150\text{ }^\circ\text{C}$	-	-	50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}$; $I_C = 0\text{ A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	120	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}$; $I_C = 5\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$	80	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 10\text{ mA}$; $I_B = 0.5\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}$; $I_C = 100\text{ }\mu\text{A}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	0.8	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}$; $I_C = 2\text{ mA}$; $T_{amb} = 25\text{ }^\circ\text{C}$	2	1.1	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		1.7	2.1	2.6	
C_c	collector capacitance	$V_{CB} = 10\text{ V}$; $I_E = 0\text{ A}$; $i_e = 0\text{ A}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	2.5	pF





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

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



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

Fig. 4. Off-state input voltage as a function of collector current; typical values

11. Test information

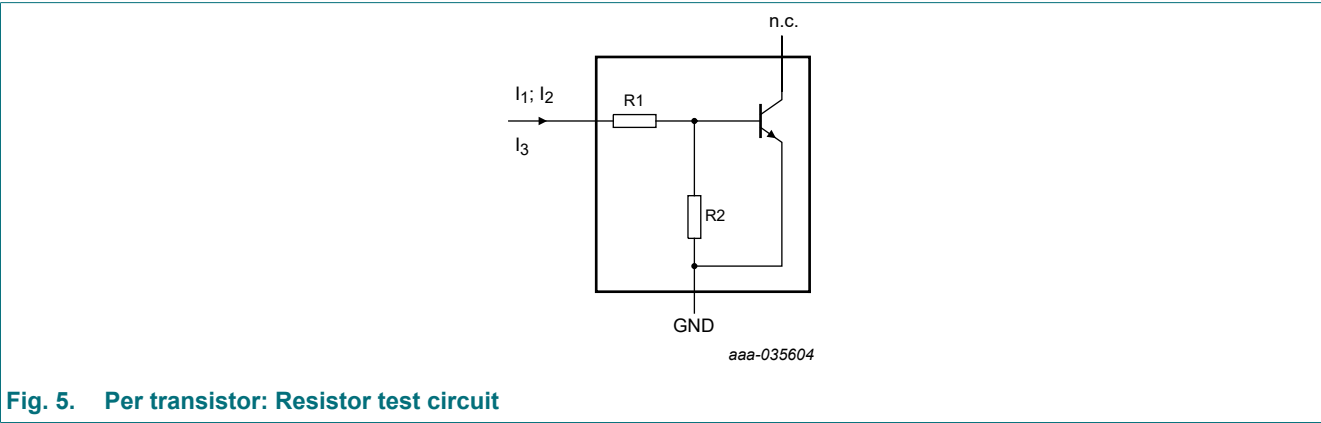
Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R_1 = \frac{V(I_2) - V(I_1)}{I_2 - I_1}$$

- Calculation of bias resistor ratio (R2/R1)

$$\frac{R_2}{R_1} = \frac{V(I_3)}{R_1 \cdot I_3} - 1$$

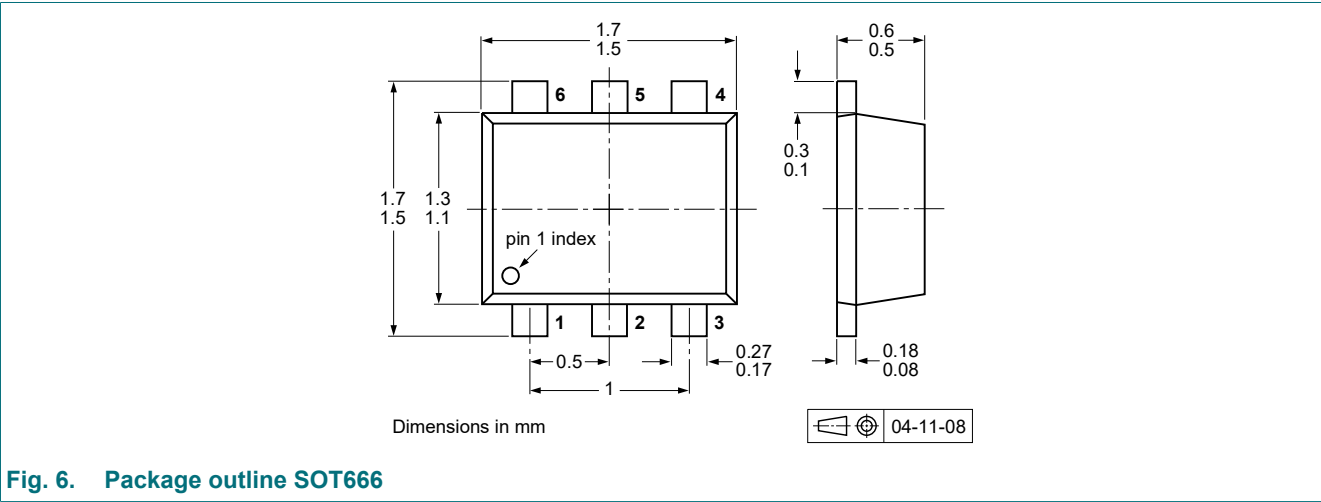


Resistor test conditions

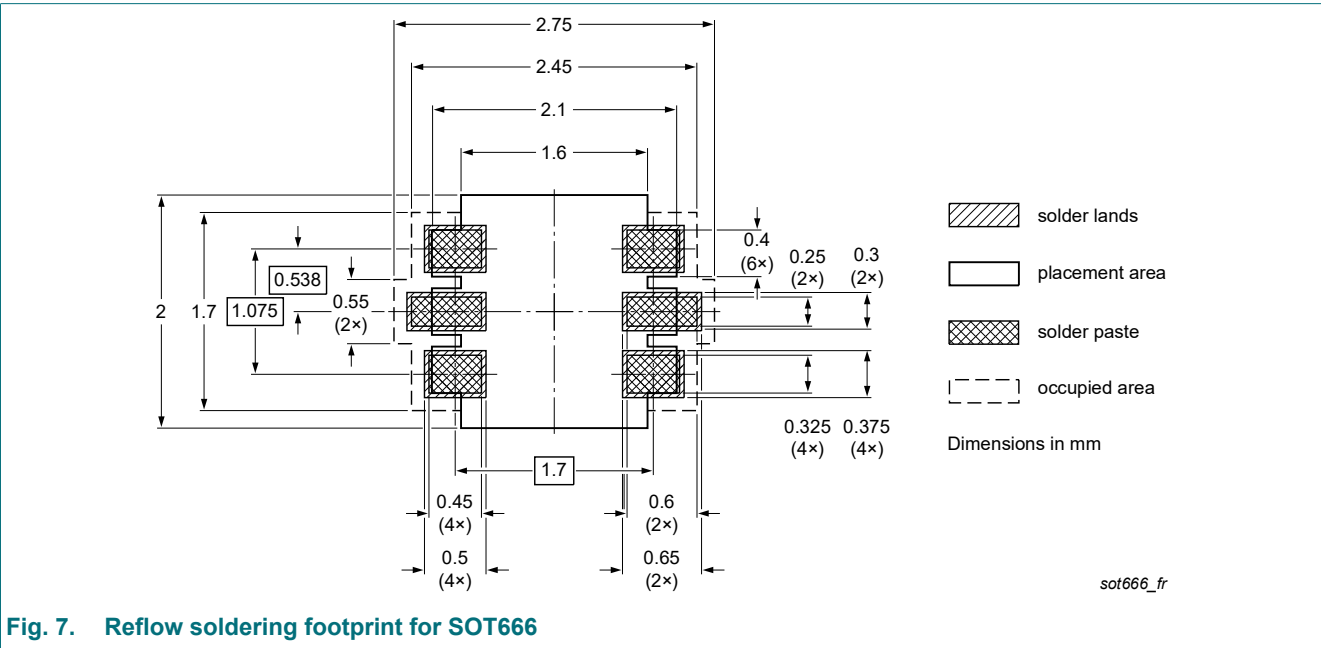
Table 8. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions		
			I ₁	I ₂	I ₃
PEMH16	22	47	160 μA	210 μA	-100 μA

12. Package outline



13. Soldering



14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PEMH16 v.5	20221229	Product data sheet	-	PEMH16_PUMH16_4
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Family data sheet reduced to single type data sheet. • Product(s) changed to non-automotive qualification. • Packing information removed.			
PEMH16_PUMH16_4	20091115	Product data sheet	-	PEMH16_PUMH16_3
PEMH16_PUMH16_3	20050607	Product data sheet	-	PUMH16_2
PUMH16_2	20040414	Product specification	-	PUMH16_1
PUMH16_1	20031009	Product specification	-	-

15. Legal information

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".
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