

# DATA SHEET

**PEMD13; PUMD13**  
NPN/PNP resistor-equipped  
transistors;  $R1 = 4.7 \text{ k}\Omega$ ,  $R2 = 47 \text{ k}\Omega$

Product specification  
Supersedes data of 2001 Feb 27

2003 Oct 08

**NPN/PNP resistor-equipped transistors;**  
**R1 = 4.7 kΩ, R2 = 47 kΩ**

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**FEATURES**

- Built-in bias resistors
- Simplified circuit design
- Reduction of component count
- Reduced pick and place costs.

**APPLICATIONS**

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

**QUICK REFERENCE DATA**

SYMBOL	PARAMETER	TYP.	MAX.	UNIT
V <sub>CEO</sub>	collector-emitter voltage	–	50	V
I <sub>O</sub>	output current (DC)	–	100	mA
TR1	NPN	–	–	–
TR2	PNP	–	–	–
R1	bias resistor	4.7	–	kΩ
R2	bias resistor	47	–	kΩ

**DESCRIPTION**

NPN/PNP resistor-equipped transistors (see “Simplified outline, symbol and pinning” for package details).

**PRODUCT OVERVIEW**

TYPE NUMBER	PACKAGE		MARKING CODE	PNP/PNP COMPLEMENT	NPN/PNP COMPLEMENT
	PHILIPS	EIAJ			
PEMD13	SOT666		Z1	PEMB13	PEMH13
PUMD13	SOT363	SC-88	3*1 <sup>(1)</sup>	PUMB13	PUMH13

**Note**

- \* = p: Made in Hong Kong.  
 \* = t: Made in Malaysia.  
 \* = W: Made in China.

**SIMPLIFIED OUTLINE, SYMBOL AND PINNING**

TYPE NUMBER	SIMPLIFIED OUTLINE AND SYMBOL	PINNING	
		PIN	DESCRIPTION
PEMD13 PUMD13	<p>Top view</p> <p>MAM468</p>	1	emitter TR1
		2	base TR1
		3	collector TR2
		4	emitter TR2
		5	base TR2
		6	collector TR1

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### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PEMD13	–	plastic surface mounted package; 6 leads	SOT666
PUMD13	–	plastic surface mounted package; 6 leads	SOT363

### 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 negative		–	+30	V
			–	–5	V
$V_I$	input voltage TR2 positive negative		–	+5	V
			–	–30	V
$I_O$	output current (DC)		–	100	mA
$I_{CM}$	peak collector current		–	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$			
	SOT363	note 1	–	200	mW
	SOT666	notes 1 and 2	–	200	mW
$T_{stg}$	storage temperature		–65	+150	$^\circ\text{C}$
$T_j$	junction temperature		–	150	$^\circ\text{C}$
$T_{amb}$	operating ambient temperature		–65	+150	$^\circ\text{C}$
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$			
	SOT363	note 1	–	300	mW
	SOT666	notes 1 and 2	–	300	mW

### Notes

1. Device mounted on an FR4 printed-circuit board, single-sided copper, standard footprint.
2. Reflow soldering is the only recommended soldering method.

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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
<b>Per transistor</b>				
$R_{th\ j-a}$	thermal resistance from junction to ambient	$T_{amb} \leq 25 \text{ }^\circ\text{C}$		
	SOT363	note 1	625	K/W
	SOT666	notes 1 and 2	625	K/W
<b>Per device</b>				
$R_{th\ j-a}$	thermal resistance from junction to ambient	$T_{amb} \leq 25 \text{ }^\circ\text{C}$		
	SOT363	note 1	416	K/W
	SOT666	notes 1 and 2	416	K/W

## Notes

1. Device mounted on an FR4 printed-circuit board, single-sided copper, standard footprint.
2. Reflow soldering is the only recommended soldering method.

## 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	$V_{CB} = 50 \text{ V}$ ; $I_E = 0$	–	–	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}$ ; $I_B = 0$	–	–	1	$\mu\text{A}$
		$V_{CE} = 30 \text{ V}$ ; $I_B = 0$ ; $T_j = 150 \text{ }^\circ\text{C}$	–	–	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}$ ; $I_C = 0$	–	–	170	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}$ ; $I_C = 10 \text{ mA}$	100	–	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 5 \text{ mA}$ ; $I_B = 0.25 \text{ mA}$	–	–	100	mV
$V_{i(off)}$	input-off voltage	$I_C = 100 \text{ }\mu\text{A}$ ; $V_{CE} = 5 \text{ V}$	–	0.6	0.5	V
$V_{i(on)}$	input-on voltage	$I_C = 5 \text{ mA}$ ; $V_{CE} = 0.3 \text{ V}$	1.3	0.9	–	V
R1	input resistor		3.3	4.7	6.1	$\text{k}\Omega$
$\frac{R2}{R1}$	resistor ratio		8	10	12	
$C_c$	collector capacitance	$I_E = i_e = 0$ ; $V_{CB} = 10 \text{ V}$ ; $f = 1 \text{ MHz}$				
	TR1 (NPN)		–	–	2.5	pF
	TR2 (PNP)		–	–	3	pF

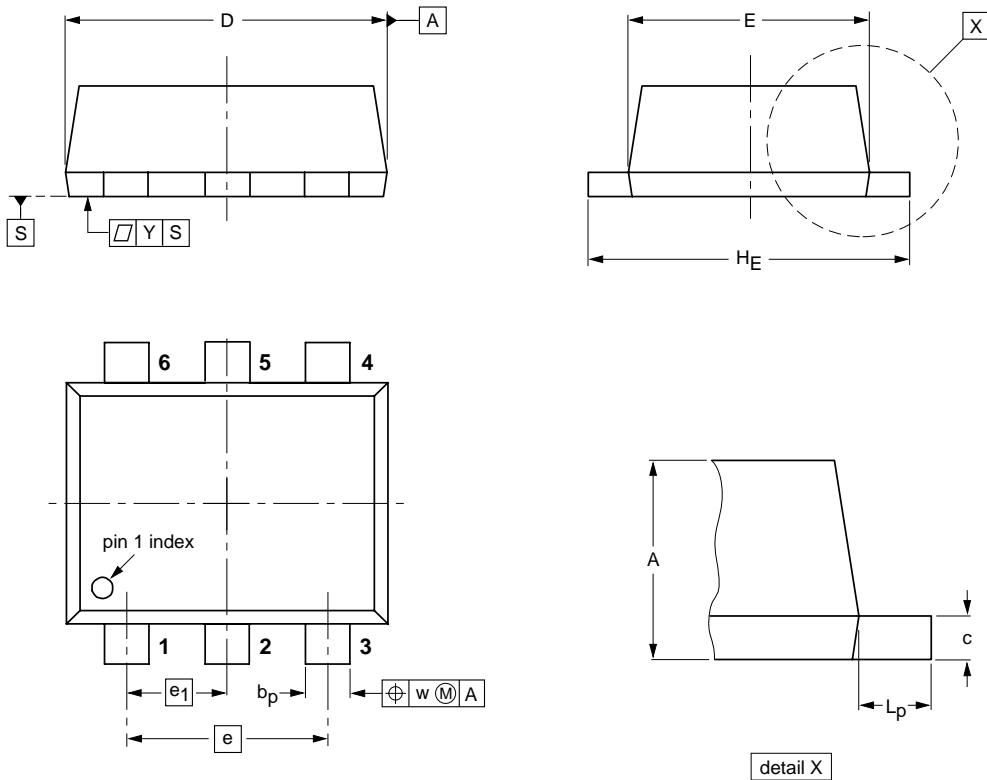
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PACKAGE OUTLINES

Plastic surface mounted package; 6 leads

SOT666



DIMENSIONS (mm are the original dimensions)

UNIT	A	$b_p$	c	D	E	e	$e_1$	$H_E$	$L_p$	w	y
mm	0.6 0.5	0.27 0.17	0.18 0.08	1.7 1.5	1.3 1.1	1.0	0.5	1.7 1.5	0.3 0.1	0.1	0.1

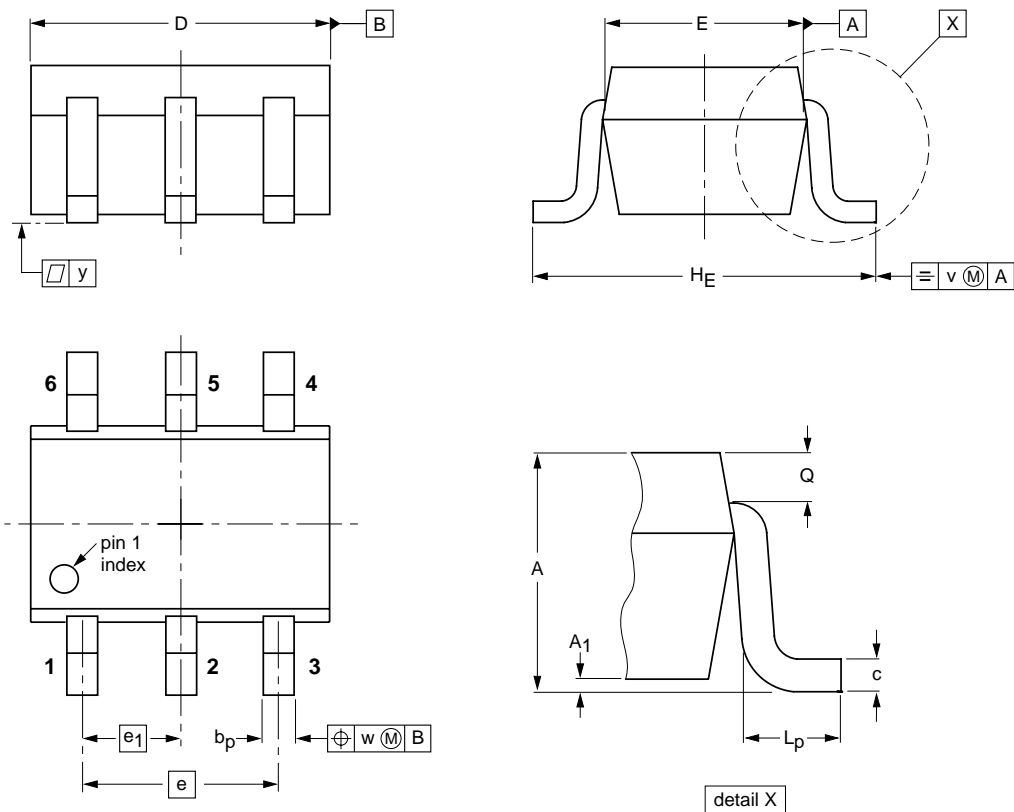
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT666					01-01-04 01-08-27

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SOT363



DIMENSIONS (mm are the original dimensions)

UNIT	A	A1 max	bp	c	D	E	e	e1	HE	Lp	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT363			SC-88			97-02-28

NPN/PNP resistor-equipped transistors;  
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#### DATA SHEET STATUS

LEVEL	DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)(3)</sup>	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.
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#### 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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