

PEMB20; PUMB20

PNP/PNP resistor-equipped transistors;
R1 = 2.2 k Ω , R2 = 2.2 k Ω

Rev. 02 — 21 February 2005

Product data sheet

1. Product profile

1.1 General description

PNP/PNP resistor-equipped transistors.

Table 1: Product overview

Type number	Package		NPN/PNP complement	NPN/PNP complement
	Philips	JEITA		
PEMB20	SOT666	-	PEMD20	PEMH20
PUMB20	SOT363	SC-88	PUMD20	PUMH20

1.2 Features

- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place cost

1.3 Applications

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

1.4 Quick reference data

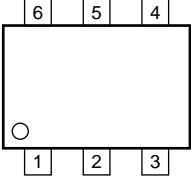
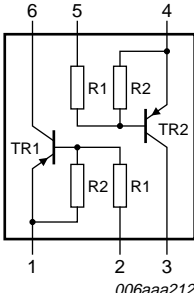
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	-50	V
I _O	output current (DC)		-	-	-100	mA
R1	bias resistor 1 (input)		1.54	2.2	2.86	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	 001aab555	 006aaa212
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
PEMB20	-	plastic surface mounted package; 6 leads	SOT666
PUMB20	SC-88	plastic surface mounted package; 6 leads	SOT363

4. Marking

Table 5: Marking codes

Type number	Marking code ^[1]
PEMB20	6G
PUMB20	B9*

- [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		-	+10	V	
	negative		-	-12	V	
I _O	output current (DC)		-	-100	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, 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	T _{amb} ≤ 25 °C					
	SOT363		[1]	-	-	625	K/W
	SOT666		[1] [2]	-	-	625	K/W
Per device							
R _{th(j-a)}	thermal resistance from junction to ambient	T _{amb} ≤ 25 °C					
	SOT363		[1]	-	-	416	K/W
	SOT666		[1] [2]	-	-	416	K/W

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

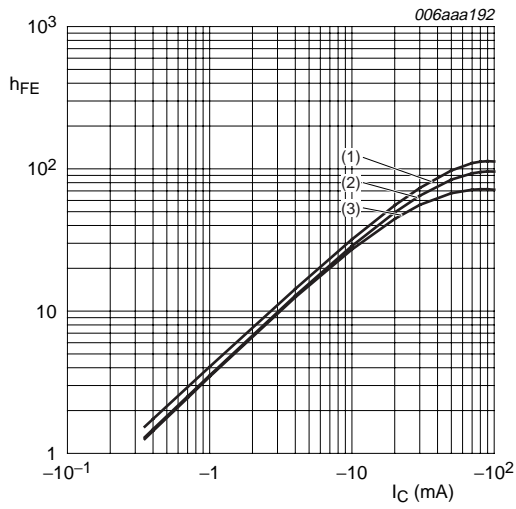
[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8: Characteristics

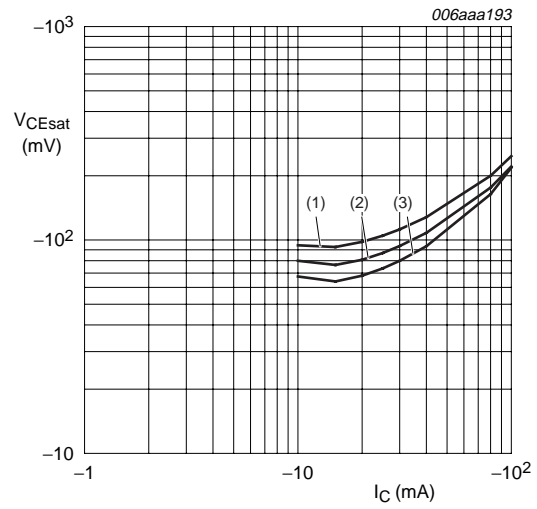
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

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
		$V_{CE} = -30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-2	mA
h_{FE}	DC current gain	$V_{CE} = -5\text{ V}; I_C = -20\text{ mA}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$	-	-	-150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$	-	-1.2	-0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = -0.3\text{ V}; I_C = -20\text{ mA}$	-2	-1.6	-	V
R1	bias resistor 1 (input)		1.54	2.2	2.86	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	3	pF



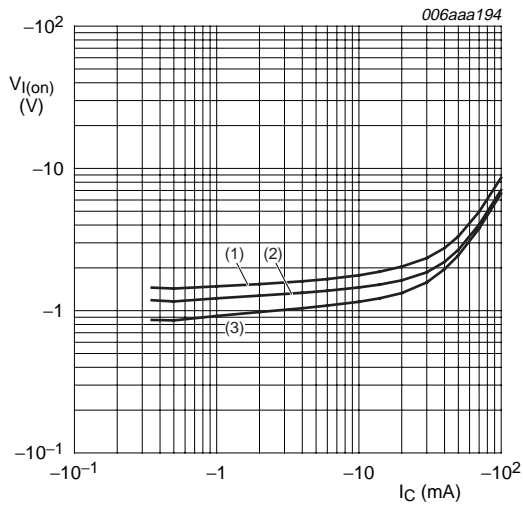
$V_{CE} = -5\text{ V}$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -40\text{ }^\circ\text{C}$

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



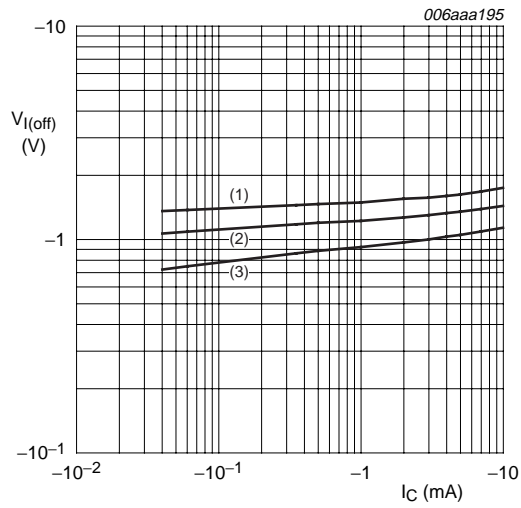
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -40\text{ }^\circ\text{C}$

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

Plastic surface mounted package; 6 leads

SOT363

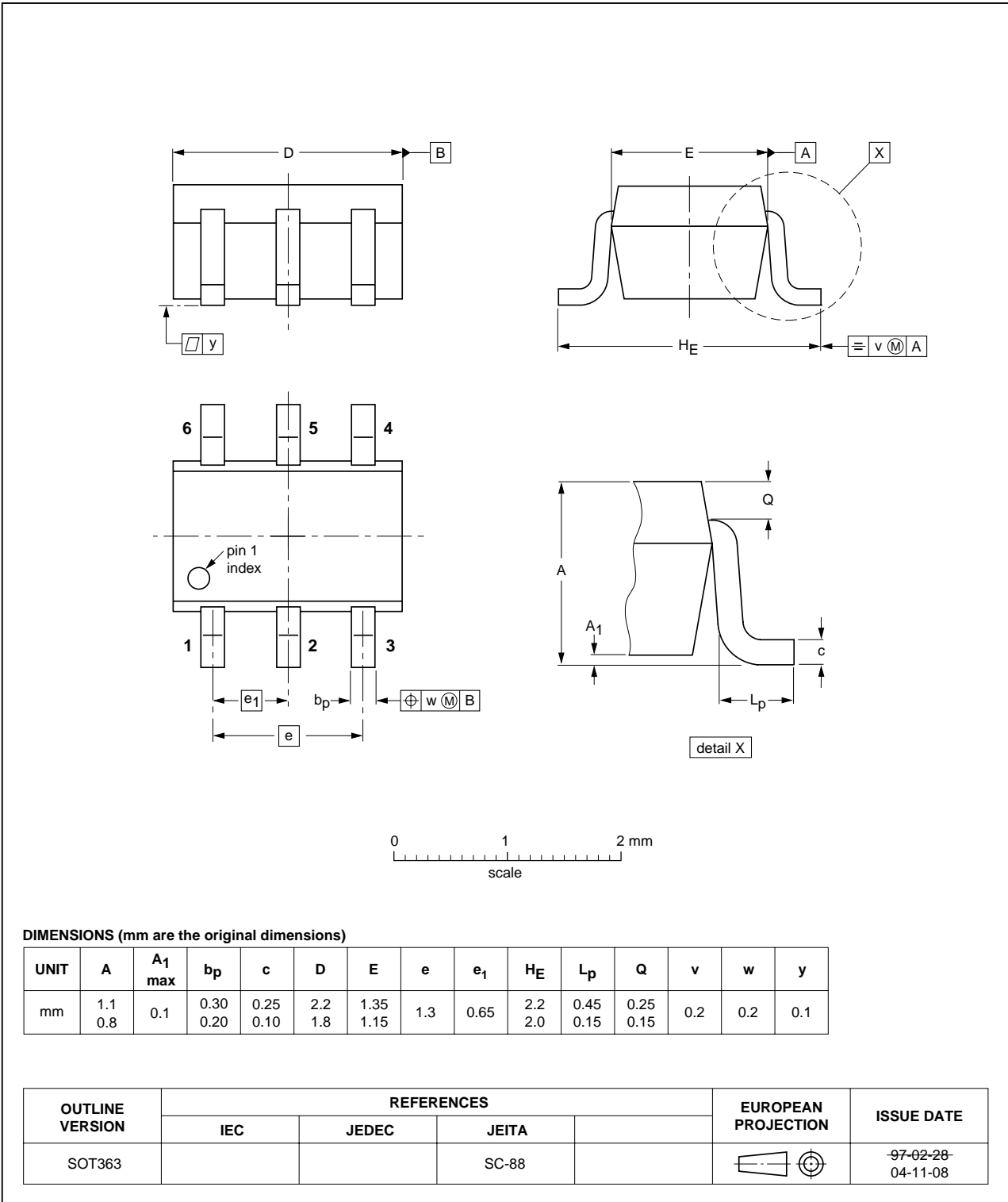


Fig 5. Package outline SOT363 (SC-88)

Plastic surface mounted package; 6 leads

SOT666

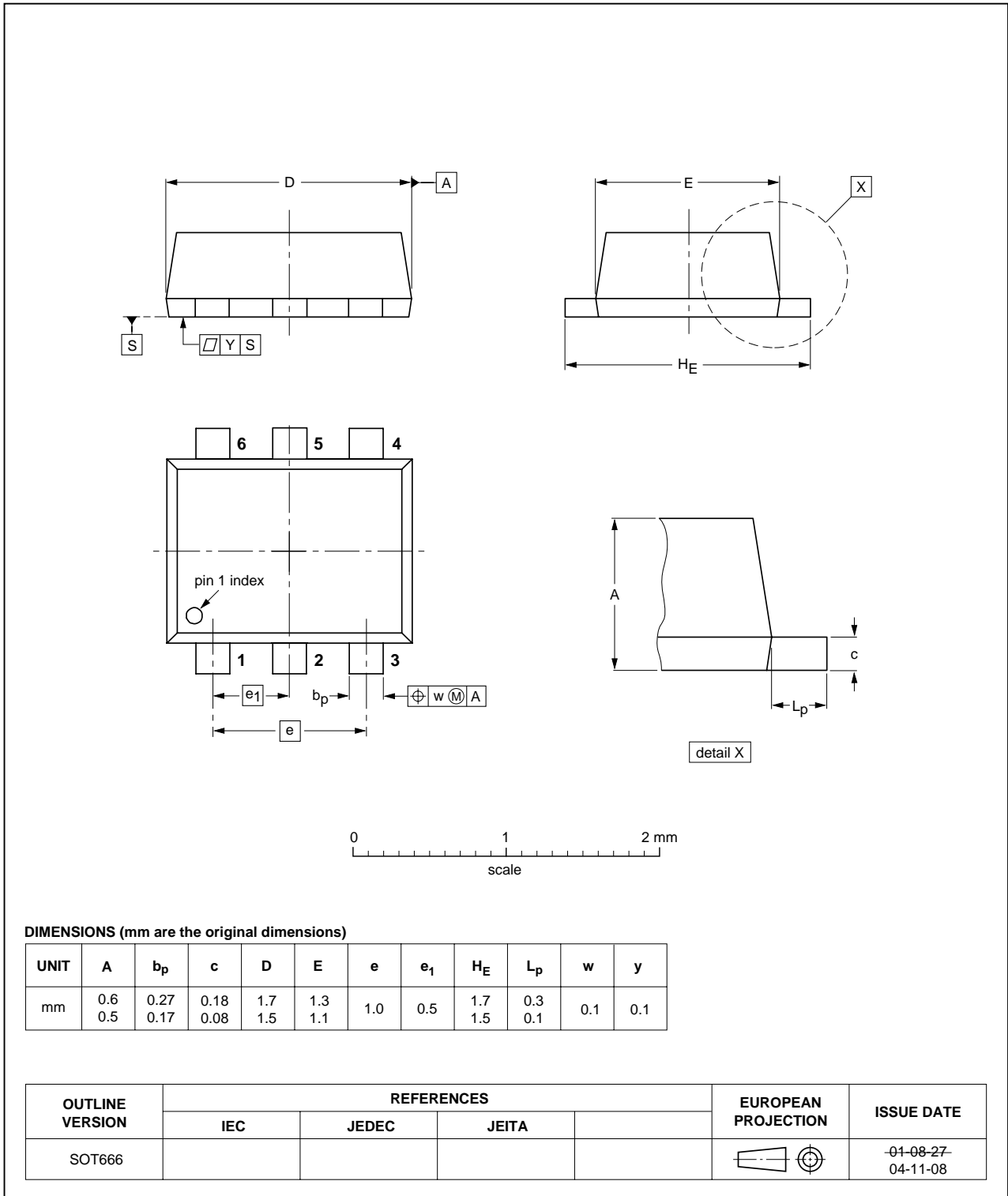


Fig 6. Package outline SOT666

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	10000
PEMB20	SOT666	4 mm pitch, 8 mm tape and reel	-	-115	-
PUMB20	SOT363	4 mm pitch, 8 mm tape and reel; T1 [2]	-115	-	-135
PUMB20	SOT363	4 mm pitch, 8 mm tape and reel; T2 [3]	-125	-	-165

[1] For further information and the availability of packing methods, see [Section 14](#).

[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
PEMB20_PUMB20_2	20050221	Product data sheet	-	9397 750 14369	PUMB20_1
Modifications:					
			<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors Type number PEMB20 added Table 8 "Characteristics" $V_{i(on)}$ input-on voltage renamed to $V_{I(on)}$ on-state input voltage Table 8 "Characteristics" $V_{i(off)}$ input-off voltage renamed to $V_{I(off)}$ off-state input voltage Figure 1, 2, 3 and 4 electrical graphs added Table 9 "Packing methods" added 		
PUMB20_1	20031003	Product specification	-	9397 750 11822	-

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.
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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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