

# PESD5V0S1BA; PESD5V0S1BB; PESD5V0S1BL

Low capacitance bidirectional ESD protection diodes

Rev. 03 — 17 December 2004

Product data sheet

## 1. Product profile

### 1.1 General description

Low capacitance ElectroStatic Discharge (ESD) protection diodes in ultra small SMD plastic packages designed to protect one signal line from the damage caused by ESD and other transients.

Table 1: Product overview

Type number	Package	
	Philips	JEITA
PESD5V0S1BA	SOD323	SC-76
PESD5V0S1BB	SOD523	SC-79
PESD5V0S1BL	SOD882	-

### 1.2 Features

- Bidirectional ESD protection of one line
- Max. peak pulse power:  $P_{PP} = 130 \text{ W}$
- Low clamping voltage:  $V_{(CL)R} = 14 \text{ V}$
- Ultra low leakage current:  $I_{RM} = 5 \text{ nA}$
- ESD protection  $> 30 \text{ kV}$
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PP} = 12 \text{ A}$
- Ultra small SMD plastic packages

### 1.3 Applications

- Cellular handsets and accessories
- Portable electronics
- Computers and peripherals
- Communication systems
- Audio and video equipment

### 1.4 Quick reference data


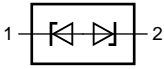
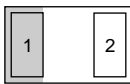
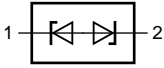
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RWM}$	reverse stand-off voltage		-	-	5	V
$C_d$	diode capacitance	$V_R = 0 \text{ V};$ $f = 1 \text{ MHz}$	-	35	45	pF

# PHILIPS

## 2. Pinning information

**Table 3: Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOD323, SOD523</b>			
1	cathode 1	 001aab540	 sym045
2	cathode 2		
<b>SOD882</b>			
1	cathode 1	 Transparent top view	 sym045
2	cathode 2		

## 3. Ordering information

**Table 4: Ordering information**

Type number	Package		
	Name	Description	Version
PESD5V0S1BA	SC-76	plastic surface mounted package; 2 leads	SOD323
PESD5V0S1BB	SC-79	plastic surface mounted package; 2 leads	SOD523
PESD5V0S1BL	-	leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm	SOD882

## 4. Marking

**Table 5: Marking codes**

Type number	Marking code
PESD5V0S1BA	E6
PESD5V0S1BB	L7
PESD5V0S1BL	F1

## 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 diode</b>					
P <sub>PP</sub>	peak pulse power	8/20 μs	[1][2] -	130	W
I <sub>PP</sub>	peak pulse current	8/20 μs	[1][2] -	12	A
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	storage temperature		-65	+150	°C

[1] Non-repetitive current pulse 8/20 μs exponentially decaying waveform according to IEC61000-4-5; see [Figure 1](#).

[2] Measured from pin 1 to pin 2.

**Table 7: ESD maximum ratings**

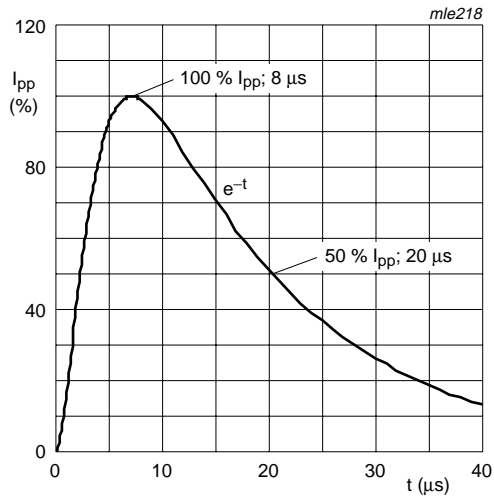
Symbol	Parameter	Conditions	Min	Max	Unit
ESD	electrostatic discharge capability	IEC 61000-4-2 (contact discharge)	[1][2] -	30	kV
		HBM MIL-Std 883	-	10	kV

[1] Measured from pin 1 to pin 2.

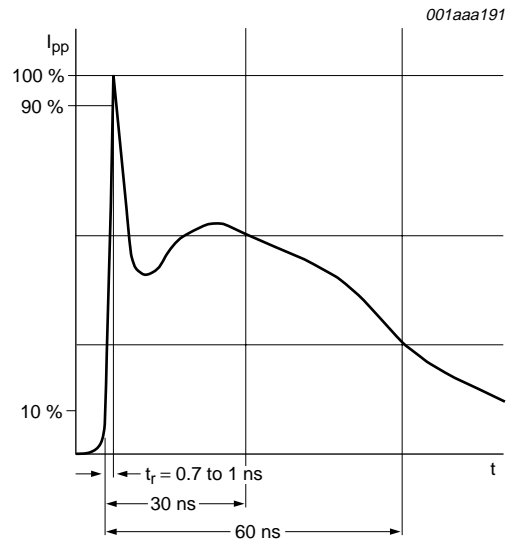
[2] Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses; see [Figure 2](#).

**Table 8: ESD standards compliance**

ESD Standard	Conditions
IEC 61000-4-2, level 4 (ESD); <a href="#">Figure 2</a>	> 15 kV (air); > 8 kV (contact)
HBM MIL-STD 883; class 3	> 4 kV



**Fig 1. 8/20  $\mu s$  pulse waveform according to IEC 61000-4-5**



**Fig 2. ElectroStatic Discharge (ESD) pulse waveform according to IEC 61000-4-2**

## 6. Characteristics

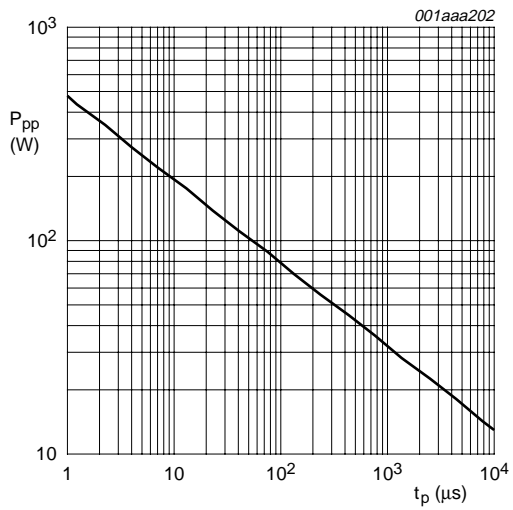
**Table 9: Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{RWM}$	reverse stand-off voltage		-	-	5	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 5\text{ V}$ ; see <a href="#">Figure 6</a>	-	5	100	nA
$V_{(CL)R}$	clamping voltage	$I_{PP} = 1\text{ A}$	[1][2] -	-	10	V
		$I_{PP} = 12\text{ A}$	[1][2] -	-	14	V
$V_{(BR)}$	breakdown voltage	$I_R = 1\text{ mA}$	5.5	-	9.5	V
$r_{dif}$	differential resistance	$I_R = 1\text{ mA}$	-	-	50	$\Omega$
$C_d$	diode capacitance	$V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$ ; see <a href="#">Figure 5</a>	-	35	45	pF

[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponentially decaying waveform according to IEC61000-4-5; see [Figure 1](#).

[2] Measures from pin 1 to pin 2.



$T_{amb} = 25\text{ }^\circ C$

Fig 3. Peak pulse power dissipation as a function of exponential time duration  $t_p$ ; typical values

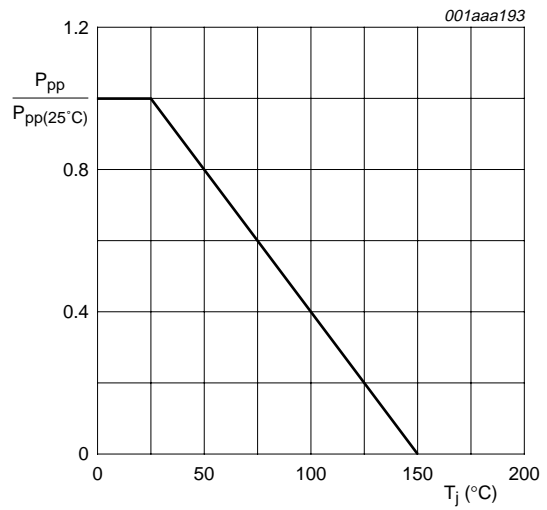
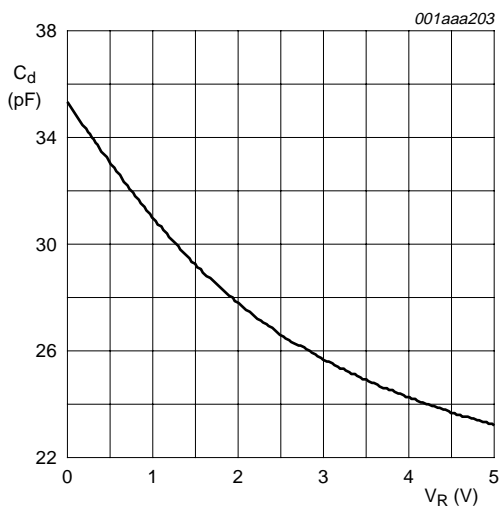


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



$T_{amb} = 25\text{ }^\circ C$ ;  $f = 1\text{ MHz}$

Fig 5. Diode capacitance as a function of reverse voltage; typical values

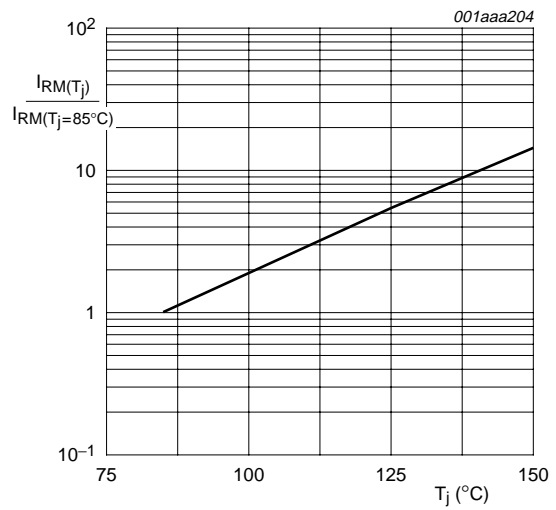
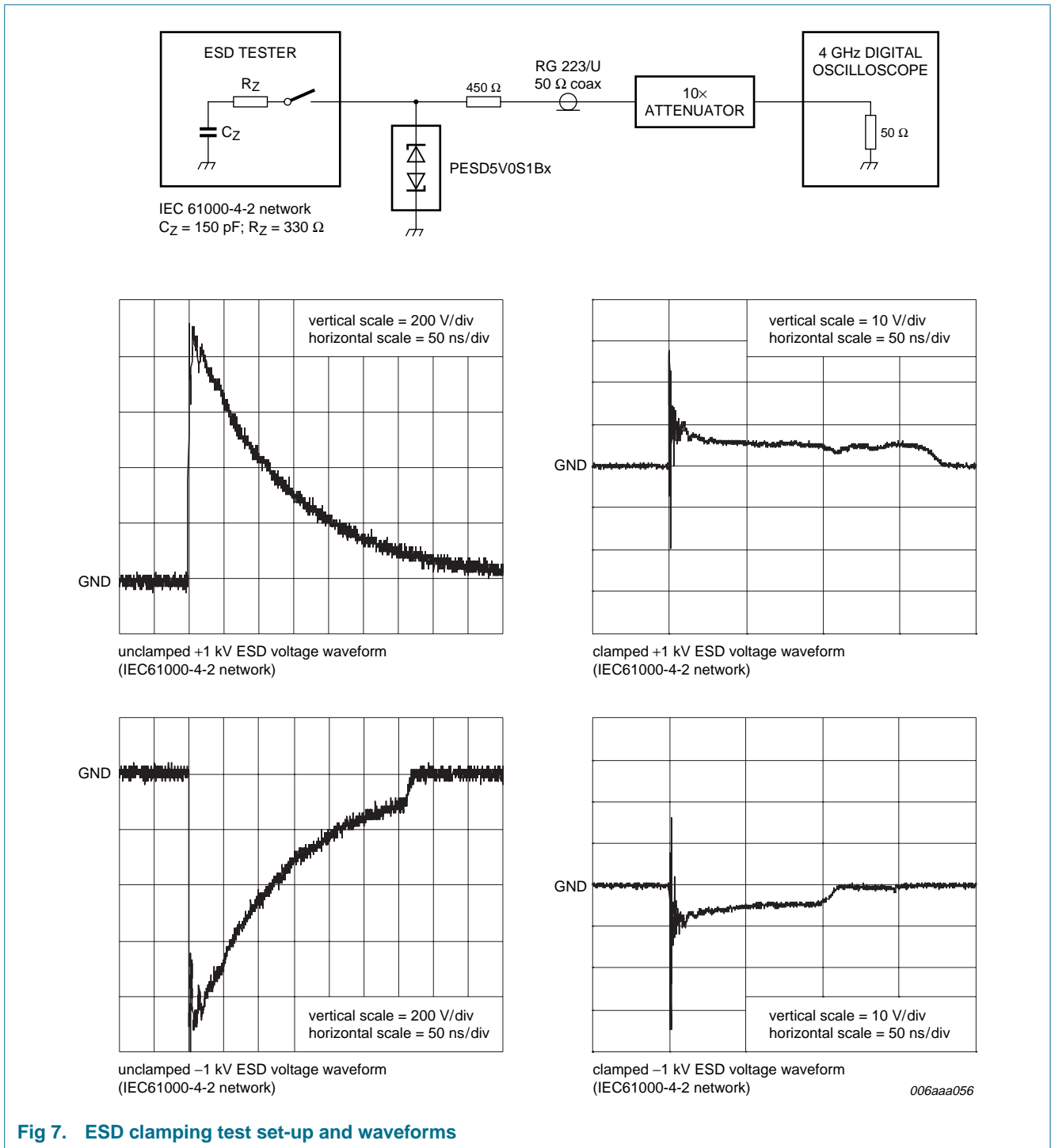


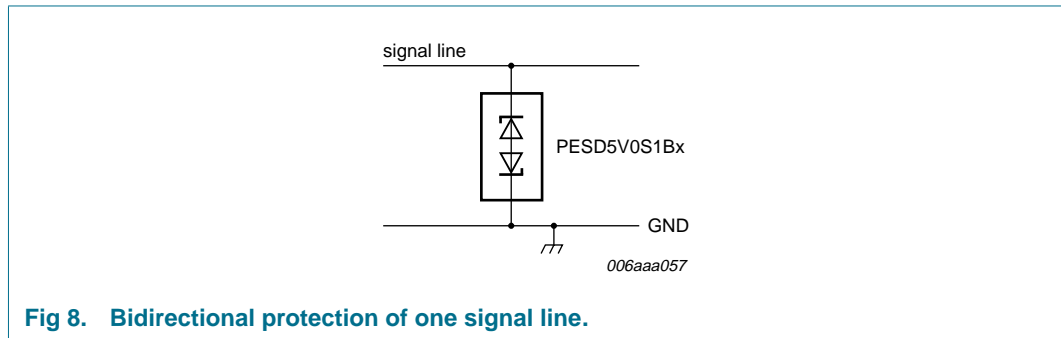
Fig 6. Relative variation of reverse leakage current as a function of junction temperature; typical values



**Fig 7. ESD clamping test set-up and waveforms**

## 7. Application information

PESD5V0S1Bx series is designed for the protection of one bidirectional signal line from the damage caused by ElectroStatic Discharge (ESD) and surge pulses. The devices may be used on lines where the signal polarities are above and below ground. They provide a surge capability of up to 130 W per line for a 8/20  $\mu$ s waveform.



### Circuit board layout and protection device placement:

Circuit board layout is critical for the suppression of ESD, EFT and surge transients. The following guidelines are recommended:

1. Place the protection device as close to the input terminal or connector as possible.
2. The path length between the protection device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protection conductors in parallel with unprotected conductor.
5. Minimize all printed-circuit board conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Ground planes should be used whenever possible. For multilayer printed-circuit boards, use ground vias.



8. Package outline

Plastic surface mounted package; 2 leads

SOD323

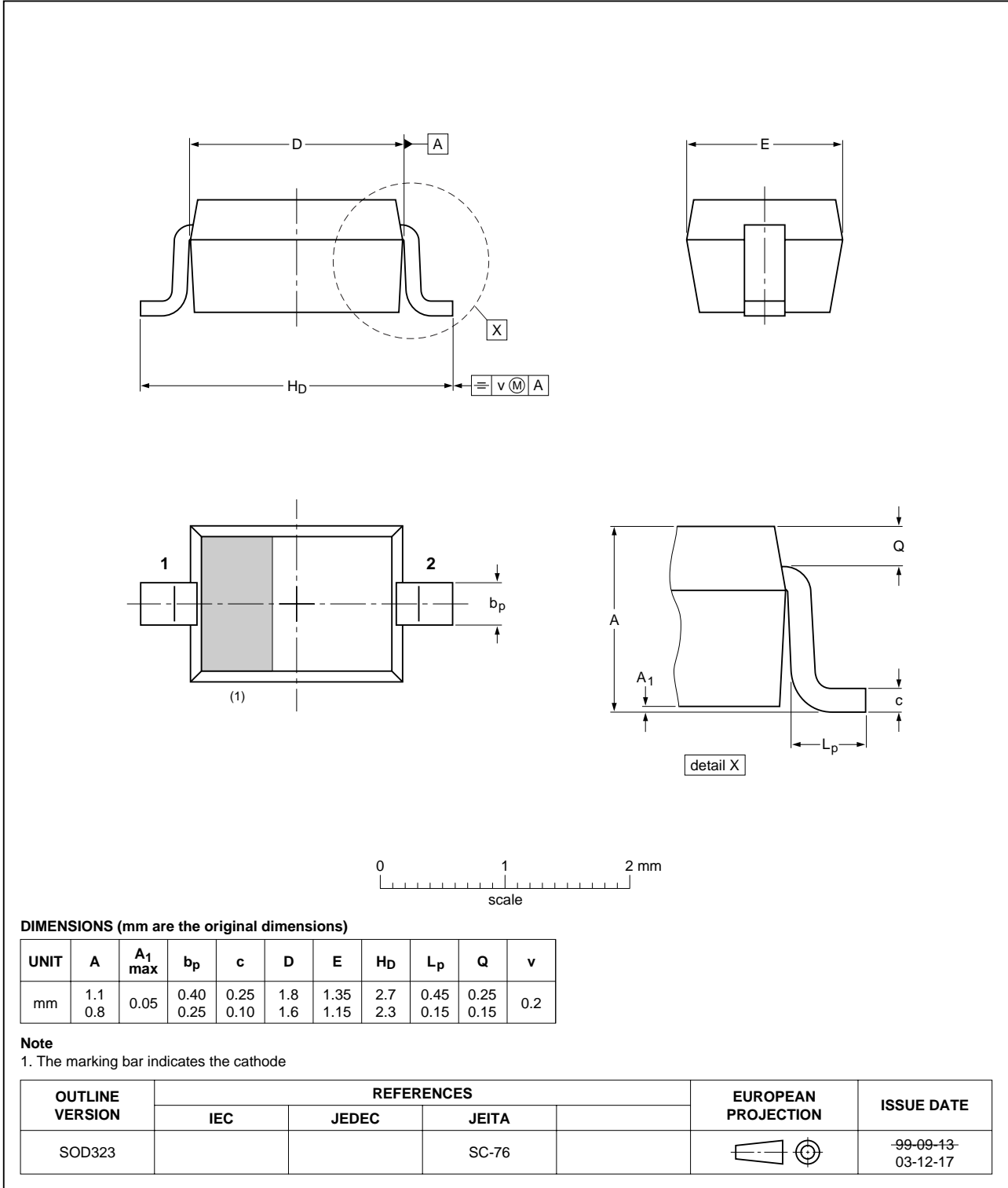


Fig 9. Package outline SOD323 (SC-76)

Plastic surface mounted package; 2 leads

SOD523

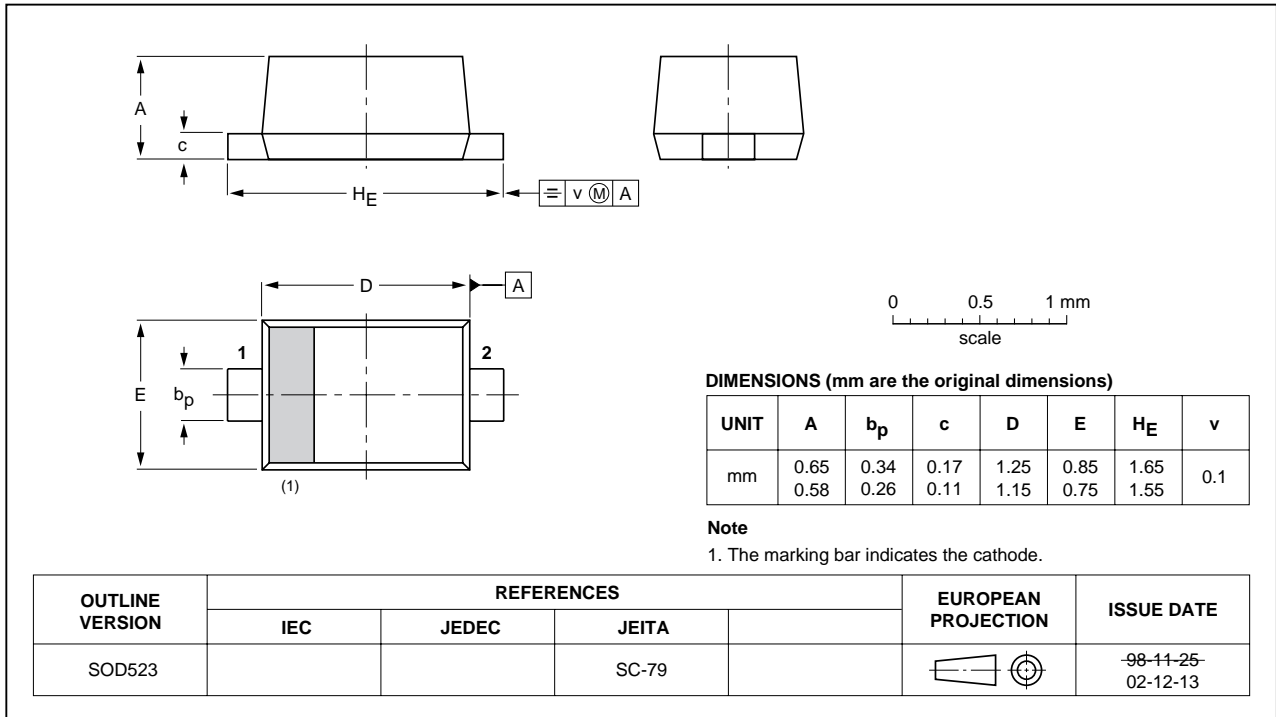


Fig 10. Package outline SOD523 (SC-79)

Leadless ultra small plastic package; 2 terminals; body 1.0 x 0.6 x 0.5 mm

SOD882

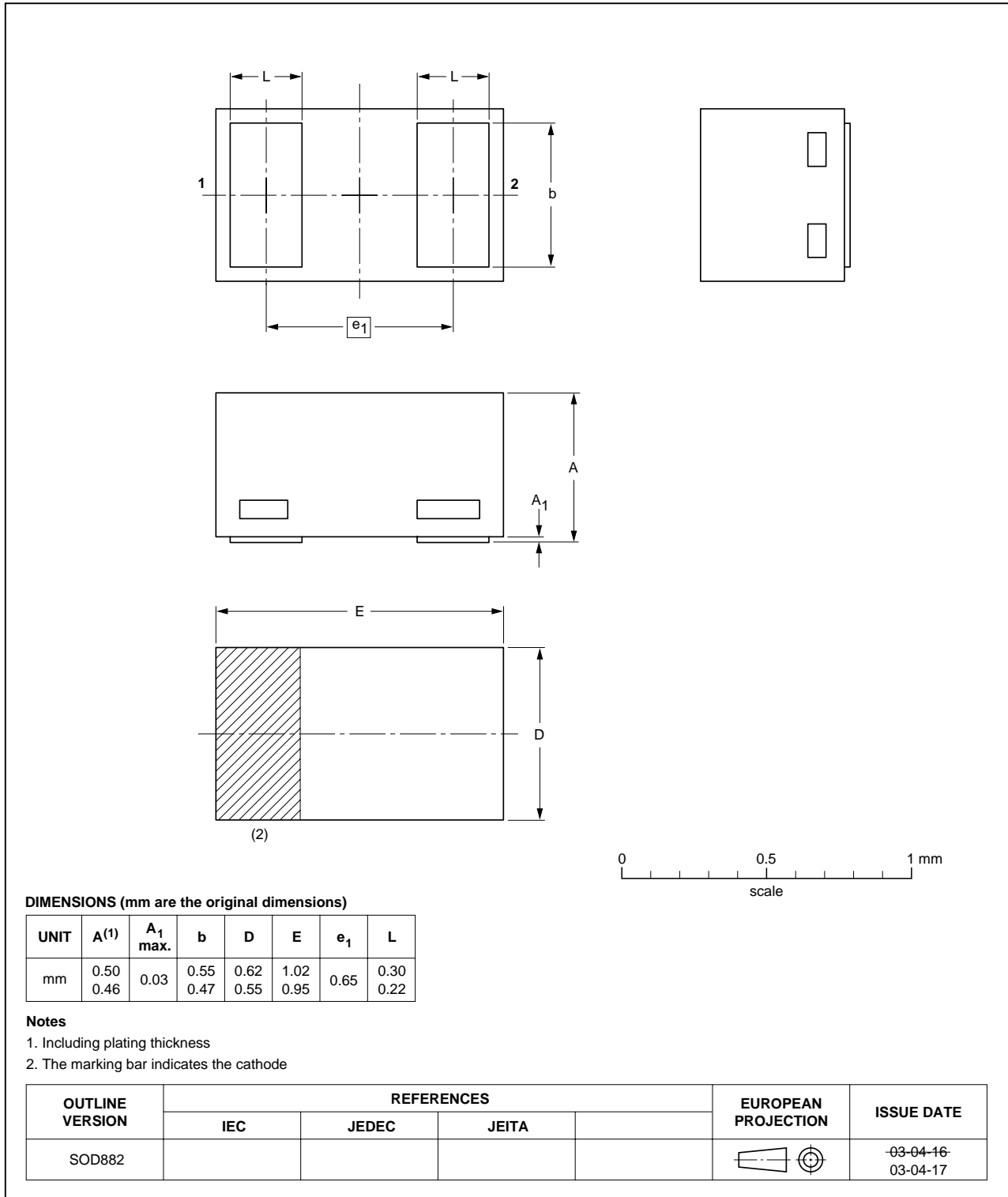


Fig 11. Package outline SOD882

## 9. Packing information

**Table 10: Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code. [\[1\]](#)

Type number	Package	Description	Packing quantity	
			3000	10000
PESD5V0S1BA	SOD323	4 mm pitch, 8 mm tape and reel	-115	-135
PESD5V0S1BB	SOD523	4 mm pitch, 8 mm tape and reel	-115	-135
PESD5V0S1BL	SOD882	4 mm pitch, 8 mm tape and reel	-	-315

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

## 10. Revision history

Table 11: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PESD5V0S1BA_BB_BL_3	20041217	Product data sheet	-	9397 750 14036	PESD5V0S1BA_BB_BL_2
Modifications:					
<ul style="list-style-type: none"> <li>• <a href="#">Table 1</a> Product overview added</li> <li>• <a href="#">Figure 1</a> Figure title amended</li> <li>• <a href="#">Table 9</a> Symbol for differential resistance amended to <math>r_{dif}</math></li> <li>• <a href="#">Figure 5</a> Axis description changed from <math>V_{BR}</math> to <math>V_R</math> and figure title amended</li> </ul>					
PESD5V0S1BA_BB_BL_2	20040802	Product data sheet	-	9397 750 13514	PESD5V0S1BA_1 PESD5V0S1BB_1
PESD5V0S1BA_1	20040322	Product specification	-	9397 750 12256	-
PESD5V0S1BB_1	20040304	Product specification	-	9397 750 12257	-

## 11. Data sheet status

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