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 W
- Low clamping voltage: $V_{(CL)R}$ = 14 V
- Ultra low leakage current: I_{RM} = 5 nA
- ESD protection > 30 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge); I_{PP} = 12 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 V; f = 1 MHz	-	35	45	pF

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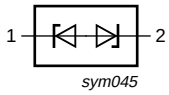
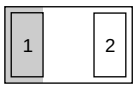
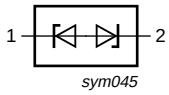
2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
SOD323, SOD523			
1	cathode 1	 001aab540	 sym045
2	cathode 2		
SOD882			
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

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5. Limiting values

Table 6: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
P_{PP}	peak pulse power	8/20 µs	[1] [2]	-	130	W
I_{PP}	peak pulse current	8/20 µs	[1] [2]	-	12	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+150	°C
T_{stg}	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); Figure 2	> 15 kV (air); > 8 kV (contact)
HBM MIL-STD 883; class 3	> 4 kV

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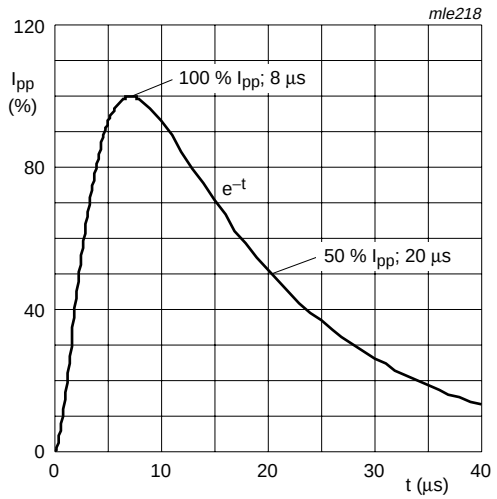

Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

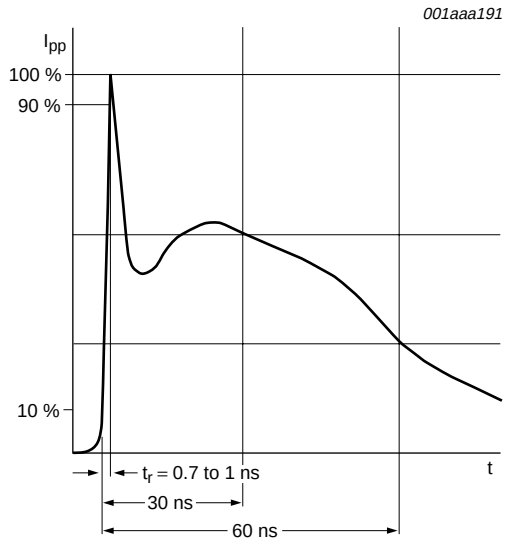

Fig 2. ElectroStatic Discharge (ESD) pulse waveform according to IEC 61000-4-2

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6. Characteristics

Table 9: Characteristics

T_{amb} = 25 °C unless otherwise specified.

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

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

[2] Measures from pin 1 to pin 2.

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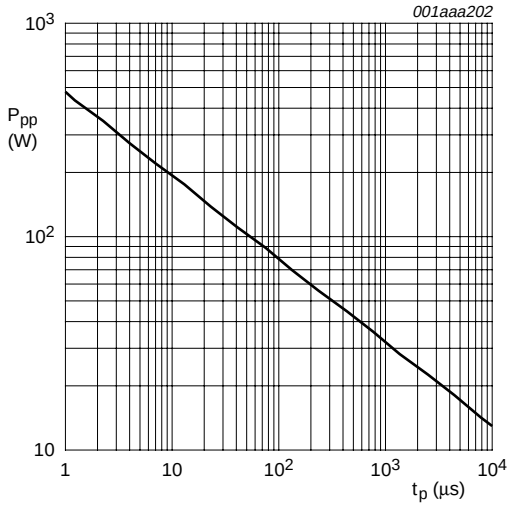


T_{amb} = 25 °C

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

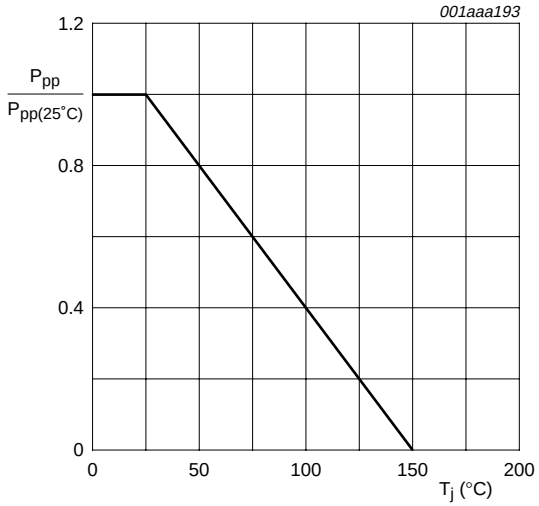
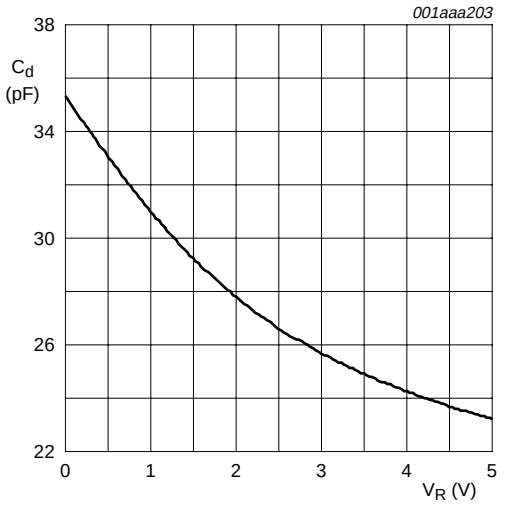


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



T_{amb} = 25 °C; f = 1 MHz

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

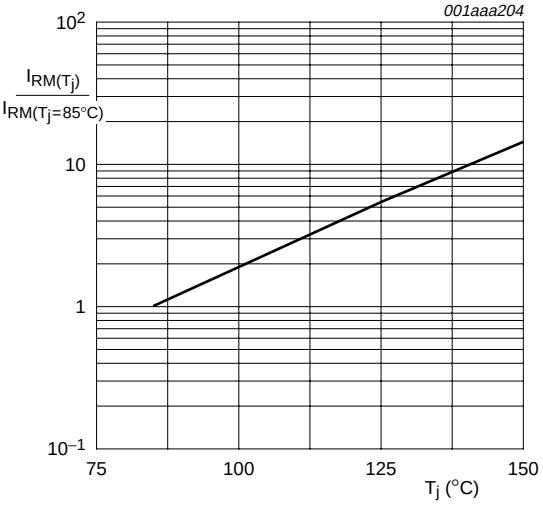


Fig 6. Relative variation of reverse leakage current as a function of junction temperature; typical values

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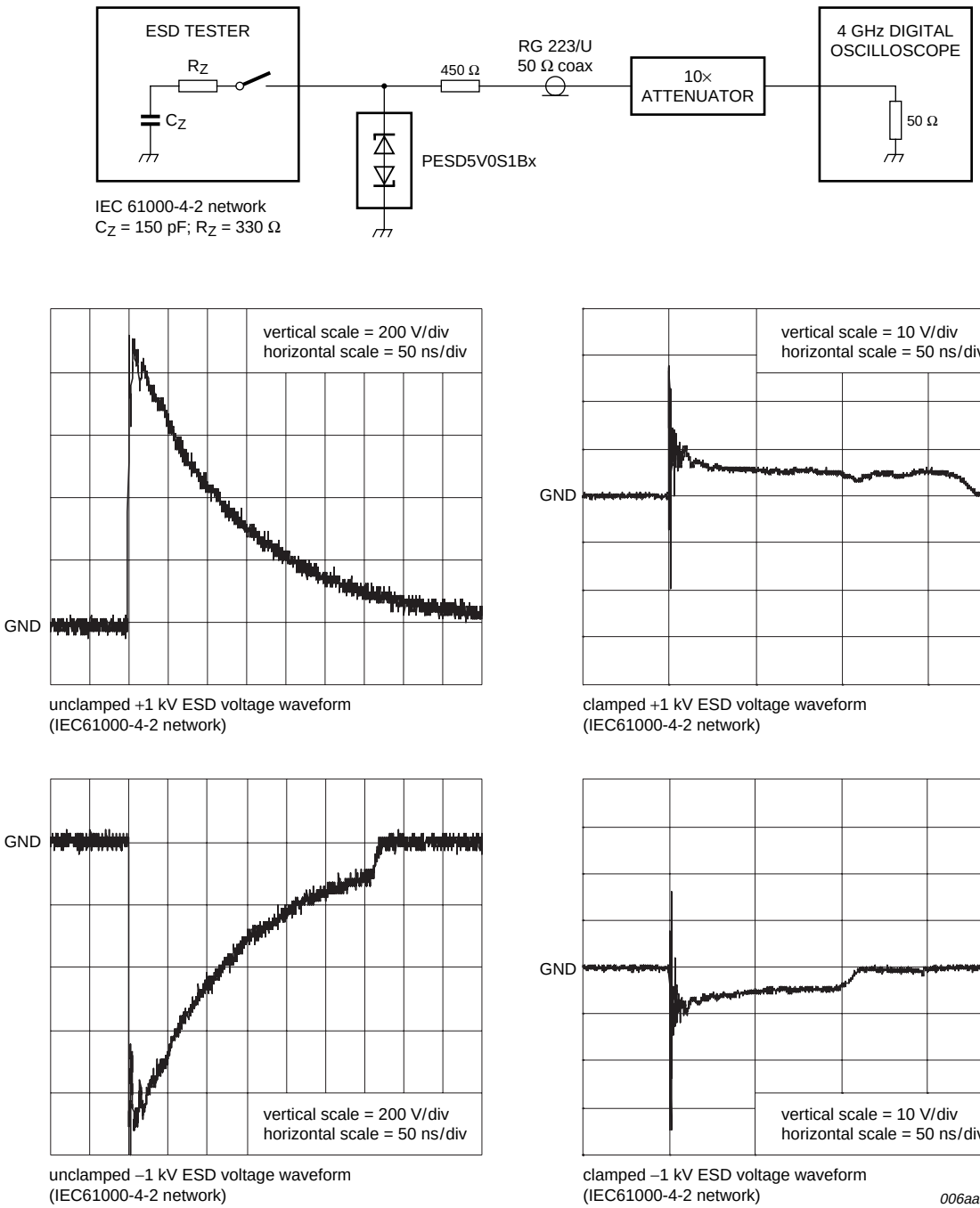

Fig 7. ESD clamping test set-up and waveforms

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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 μs waveform.

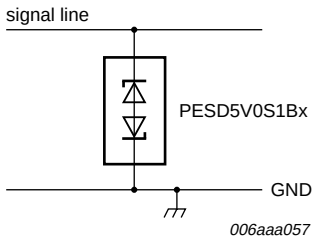

Fig 8. Bidirectional protection of one signal line.

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.

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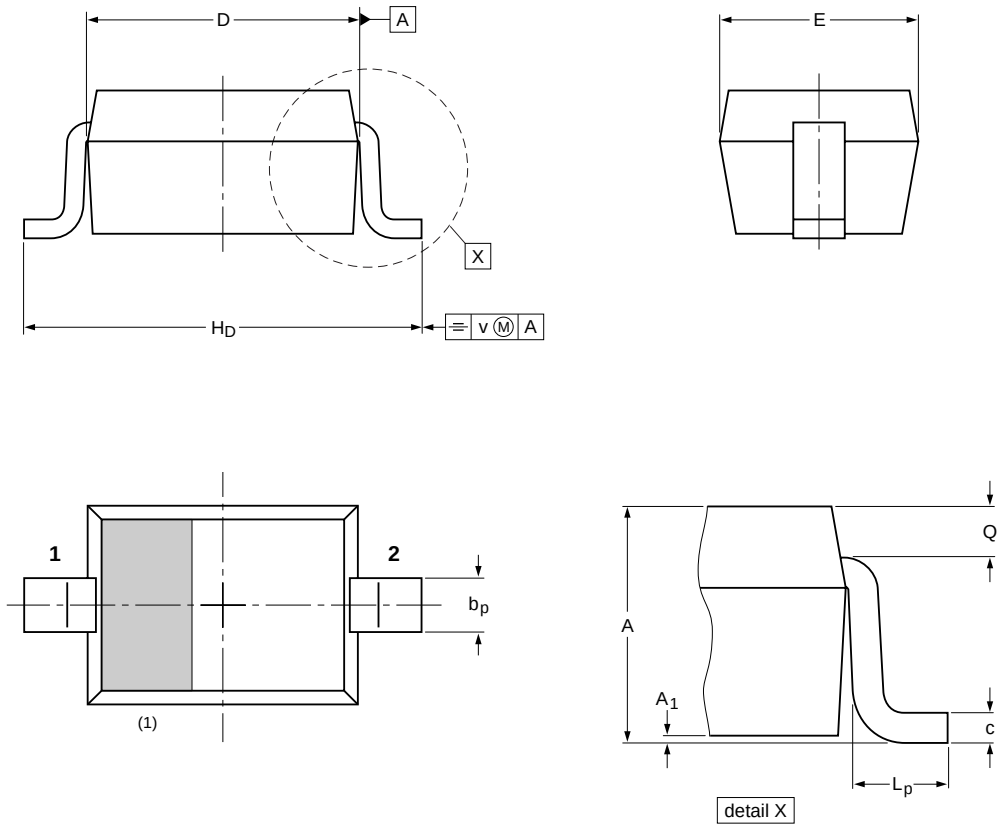
8. Package outline

Plastic surface mounted package; 2 leads **SOD323**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	H_D	L_p	Q	v
mm	1.1 0.8	0.05	0.40 0.25	0.25 0.10	1.8 1.6	1.35 1.15	2.7 2.3	0.45 0.15	0.25 0.15	0.2

Note

1. The marking bar indicates the cathode

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD323			SC-76			~~99-09-13~~ 03-12-17

Fig 9. Package outline SOD323 (SC-76)

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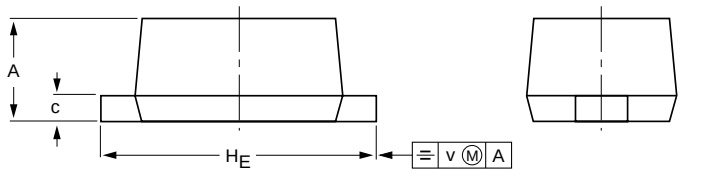
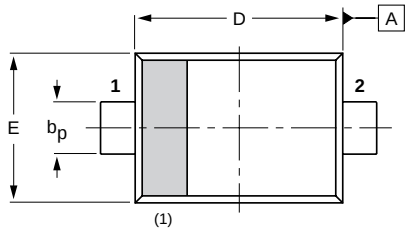
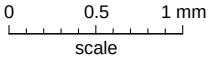
Plastic surface mounted package; 2 leads **SOD523**







DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	H_E	v
mm	0.65 0.58	0.34 0.26	0.17 0.11	1.25 1.15	0.85 0.75	1.65 1.55	0.1

Note

1. The marking bar indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD523			SC-79			~~98-11-25~~ 02-12-13

Fig 10. Package outline SOD523 (SC-79)

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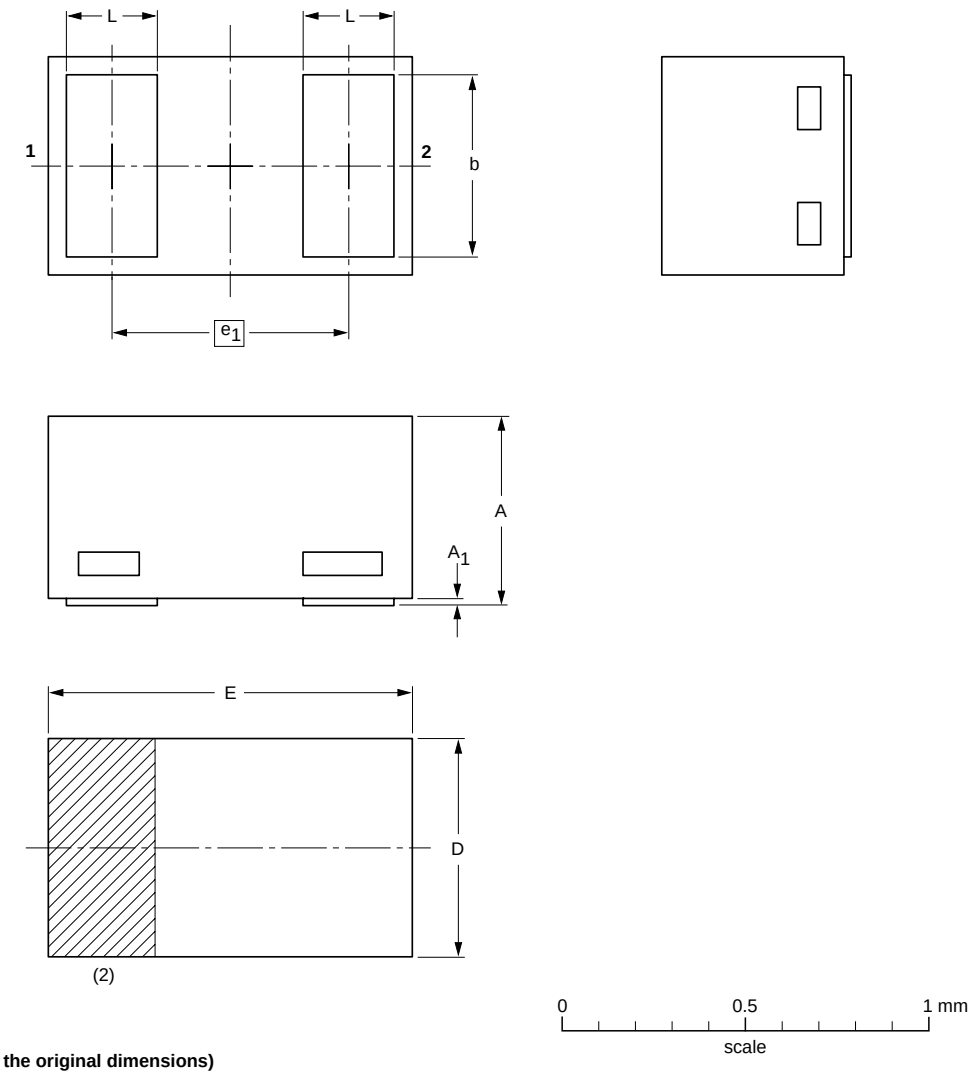
Leadless ultra small plastic package; 2 terminals; body 1.0 x 0.6 x 0.5 mm **SOD882**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1)	A1 max.	b	D	E	e1	L
mm	0.50 0.46	0.03	0.55 0.47	0.62 0.55	1.02 0.95	0.65	0.30 0.22

Notes

1. Including plating thickness
2. The marking bar indicates the cathode

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD882						~~03-04-16~~ 03-04-17

Fig 11. Package outline SOD882

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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.

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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:	• Table 1 Product overview added • Figure 1 Figure title amended • Table 9 Symbol for differential resistance amended to r_{dif} • Figure 5 Axis description changed from V_{BR} to V_R and figure title amended				
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	-

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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.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[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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15. Contents

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