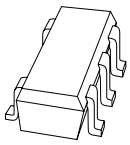

PESDxV4UG series

Very low capacitance quadruple ESD protection diode arrays in SOT353 package

Rev. 02 — 7 April 2005 Product data sheet

1. Product profile

1.1 General description

Very low capacitance quadruple ElectroStatic Discharge (ESD) protection diode arrays in very small SOT353 (SC-88A) plastic package designed to protect up to four signal lines from the damage caused by ESD and other transients.

1.2 Features

- ESD protection of up to four lines
- Very low diode capacitance
- Low clamping voltage
- Ultra low leakage current: I_{RM} = 3 nA
- ESD protection up to 12 kV
- IEC 61000-4-2; level 4 (ESD)

1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Communication systems
- Portable electronics
- Subscriber Identity Module (SIM) card protection

1.4 Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse stand-off voltage					
	PESD3V3V4UG		-	-	3.3	V
	PESD5V0V4UG		-	-	5.0	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; see Figure 5				
	PESD3V3V4UG		-	15	18	pF
	PESD5V0V4UG		-	12	15	pF

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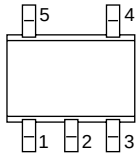
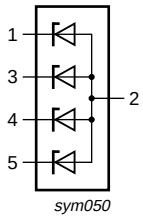
2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	cathode 1		
2	common anode		
3	cathode 2		
4	cathode 3		
5	cathode 4		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PESD3V3V4UG	SC-88A	plastic surface mounted package; 5 leads	SOT353
PESD5V0V4UG			

4. Marking

Table 4: Marking codes

Type number	Marking code [1]
PESD3V3V4UG	V1*
PESD5V0V4UG	V2*

[1] * = p: Made in Hong Kong
* = t: Made in Malaysia
* = W: Made in China

5. Limiting values

Table 5: Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PP}	peak pulse power	8/20 µs	[1] [2]			
	PESD3V3V4UG			-	16	W
	PESD5V0V4UG			-	16	W
I_{PP}	peak pulse current	8/20 µs	[1] [2]			
	PESD3V3V4UG			-	1.5	A
	PESD5V0V4UG			-	1.5	A

Table 5: Limiting values *...continued*

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

Symbol	Parameter	Conditions	Min	Max	Unit
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 exponential decay waveform according to IEC 61000-4-5; see Figure 1.

[2] Measured from pin 1, 3, 4 or 5 to 2.

Table 6: ESD maximum ratings

Symbol	Parameter	Conditions		Min	Max	Unit
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1] [2]			
	PESD3V3V4UG			-	12	kV
	PESD5V0V4UG			-	12	kV
	PESDxV4UG series	HBM MIL-STD-883		-	10	kV

[1] Device stressed with ten non-repetitive ESD pulses; see Figure 2.

[2] Measured from pin 1, 3, 4 or 5 to 2.

Table 7: ESD standards compliance

Standard	Conditions
IEC 61000-4-2; level 4 (ESD); see Figure 2	> 8 kV (contact)
HBM MIL-STD-883; class 3	> 4 kV

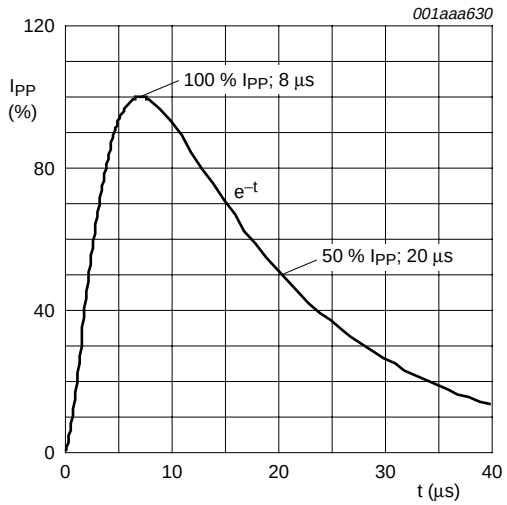


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

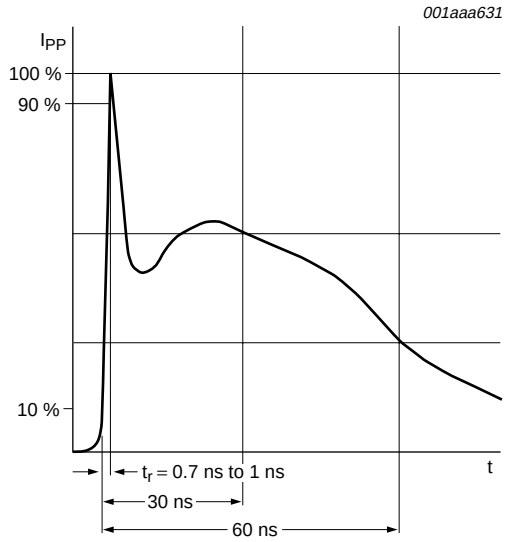


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

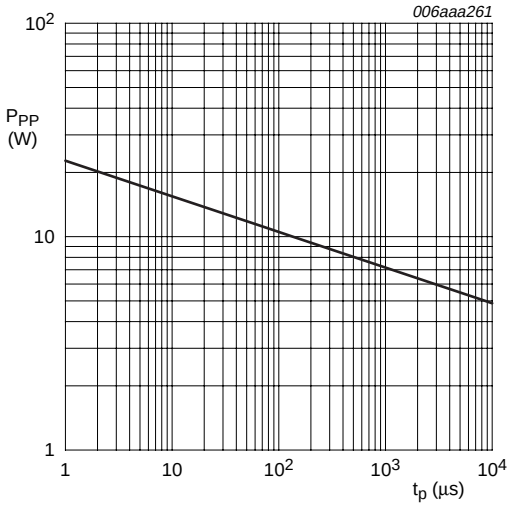
Table 8: Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse stand-off voltage					
	PESD3V3V4UG		-	-	3.3	V
	PESD5V0V4UG		-	-	5.0	V
I_{RM}	reverse leakage current	see Figure 6;				
	PESD3V3V4UG	V_{RWM} = 3.3 V	-	40	300	nA
	PESD5V0V4UG	V_{RWM} = 5.0 V	-	3	25	nA
V_{BR}	breakdown voltage	I_R = 1 mA				
	PESD3V3V4UG		5.3	5.6	5.9	V
	PESD5V0V4UG		6.4	6.8	7.2	V
C_d	diode capacitance	f = 1 MHz; see Figure 5;				
	PESD3V3V4UG	V_R = 0 V	-	15	18	pF
		V_R = 3.3 V	-	9	12	pF
	PESD5V0V4UG	V_R = 0 V	-	12	15	pF
		V_R = 5 V	-	6	9	pF
V_{CL}	clamping voltage	[1] [2]				
	PESD3V3V4UG	I_{PP} = 1 A	-	-	9	V
		I_{PP} = 2 A	-	-	11	V
	PESD5V0V4UG	I_{PP} = 1 A	-	-	11	V
		I_{PP} = 1.7 A	-	-	13	V
r_{dif}	differential resistance	I_R = 1 mA				
	PESD3V3V4UG		-	-	200	Ω
	PESD5V0V4UG		-	-	100	Ω

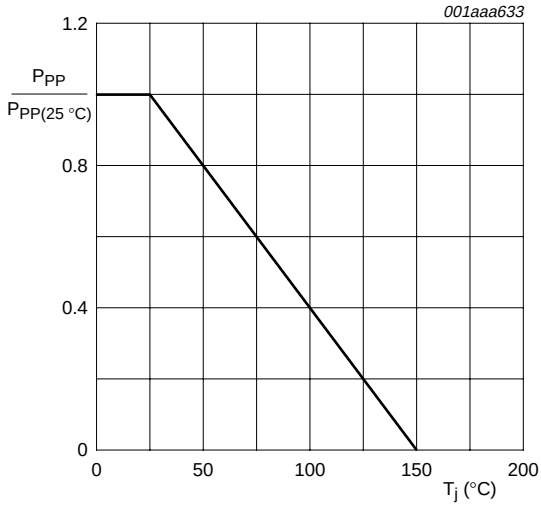
[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5; see Figure 1.

[2] Measured from pin 1, 3, 4 or 5 to 2.



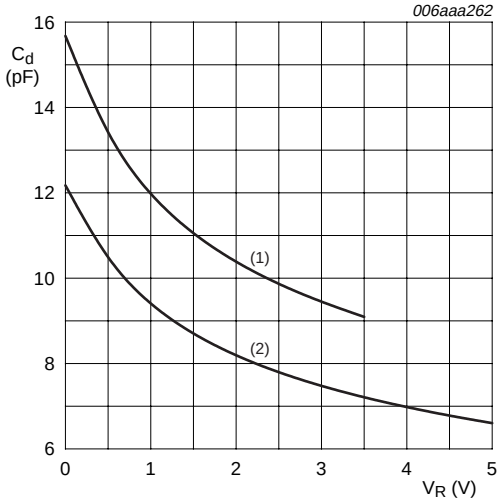
T_{amb} = 25 °C

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



T_{amb} = 25 °C

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

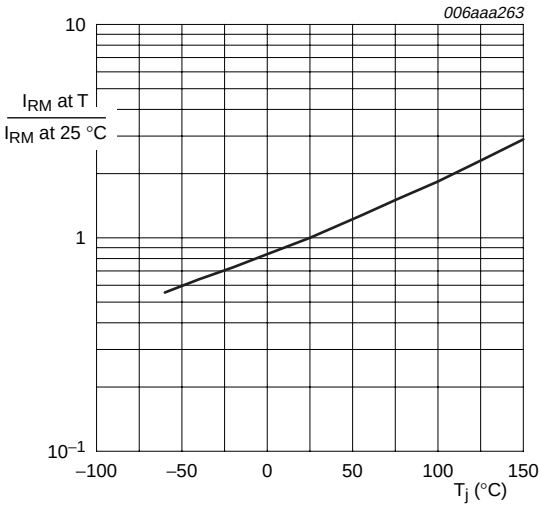


f = 1 MHz; T_{amb} = 25 °C

(1) PESD3V3V4UG

(2) PESD5V0V4UG

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



PESD3V3V4UG

PESD5V0V4UG

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

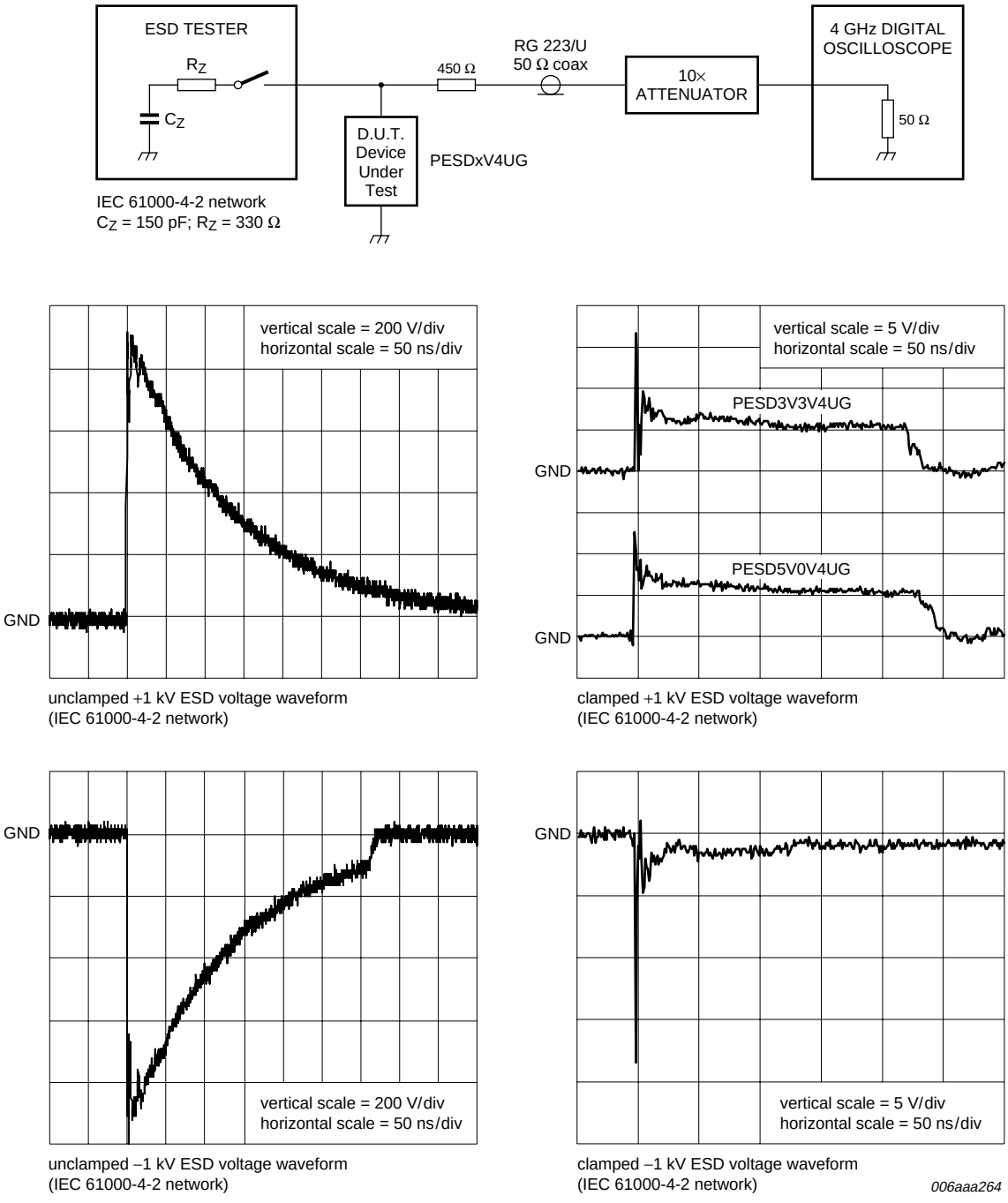


Fig 7. ESD clamping test set-up and waveforms

7. Application information

The PESDxV4UG series is designed for protection of up to four unidirectional data lines from the damage caused by ESD and surge pulses. The PESDxV4UG series may be used on lines where the signal polarities are above or below ground. The PESDxV4UG series provides a surge capability of 16 W per line for an 8/20 μs waveform.

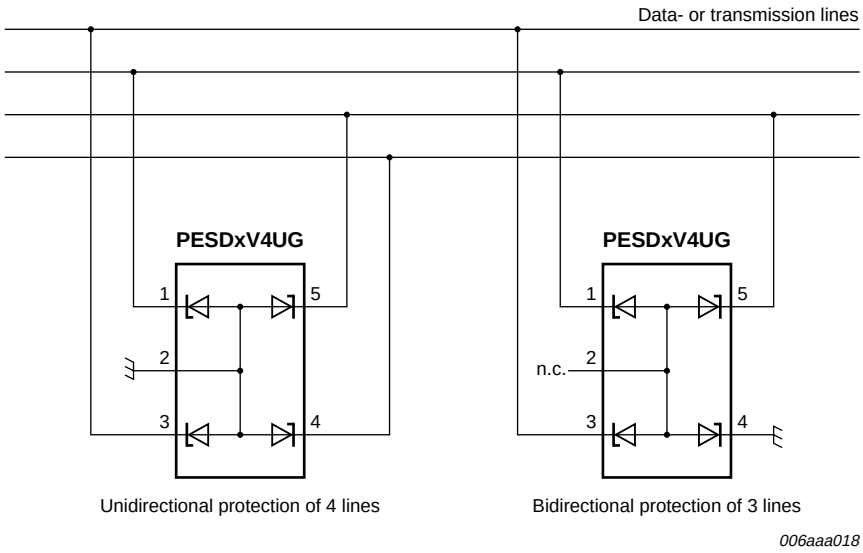


Fig 8. Application diagram

Circuit board layout and protection device placement

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

1. Place the PESDxV4UG as close to the input terminal or connector as possible.
2. The path length between the PESDxV4UG and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
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

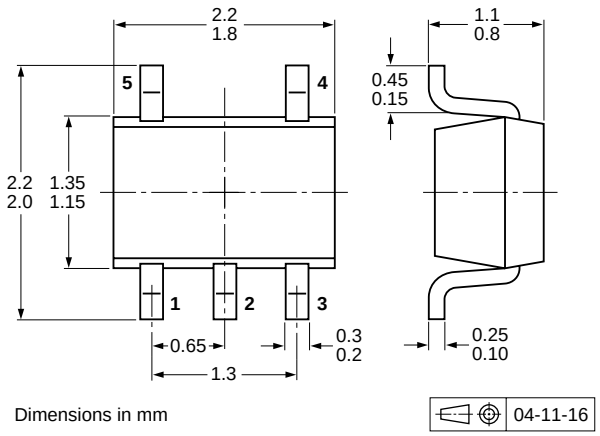


Fig 9. Package outline SOT353 (SC-88A)

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
PESD3V3V4UG	SOT353	4 mm pitch, 8 mm tape and reel	-115
PESD5V0V4UG			

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

10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PESDXV4UG_SER_2	20050407	Product data sheet	-	9397 750 14479	PESDXV4UG_SER_1
Modifications:	• Table 5 P_{PP} and I_{PP} value added • Table 8 I_{RM}, V_{BR}, C_d, V_{CL} and r_{dif} adjusted • Section 7 P_{PP} value adjusted				
PESDXV4UG_SER_1	20040906	Objective data sheet	-	9397 750 13598	-

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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