

PESDxV4UF; PESDxV4UG; PESDxV4UW

Very low capacitance unidirectional quadruple ESD
protection diode arrays

Rev. 03 — 28 January 2008

Product data sheet

1. Product profile

1.1 General description

Very low capacitance unidirectional quadruple ElectroStatic Discharge (ESD) protection diode arrays in small Surface-Mounted Device (SMD) plastic packages designed to protect up to four signal lines from the damage caused by ESD and other transients.

Table 1. Product overview

Type number	Package			Package configuration
	NXP	JEITA	JEDEC	
PESD3V3V4UF	SOT886	-	MO-252	leadless ultra small
PESD5V0V4UF	SOT886	-	MO-252	leadless ultra small
PESD3V3V4UG	SOT353	SC-88A	-	very small
PESD5V0V4UG	SOT353	SC-88A	-	very small
PESD3V3V4UW	SOT665	-	-	ultra small and flat lead
PESD5V0V4UW	SOT665	-	-	ultra small and flat lead

1.2 Features

- ESD protection of up to four lines
- Very low diode capacitance
- Max. peak pulse power: $P_{PP} = 16\text{ W}$
- Low clamping voltage: $V_{CL} = 11\text{ V}$
- Ultra low leakage current: $I_{RM} = 25\text{ nA}$
- ESD protection up to 12 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PP} = 1.5\text{ A}$

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

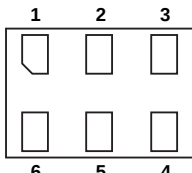
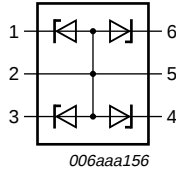
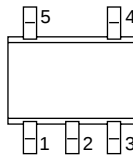
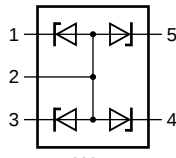
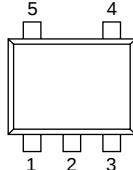
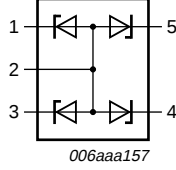
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW		-	-	3.3	V
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW		-	-	5.0	V
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$				
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW		-	15	18	pF
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW		-	12	15	pF

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
PESD3V3V4UF; PESD5V0V4UF			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	common anode		
6	cathode (diode 4)		
bottom view			
PESD3V3V4UG; PESD5V0V4UG			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		
PESD3V3V4UW; PESD5V0V4UW			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PESD3V3V4UF	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
PESD5V0V4UF			
PESD3V3V4UG	SC-88A	plastic surface-mounted package; 5 leads	SOT353
PESD5V0V4UG			
PESD3V3V4UW	-	plastic surface-mounted package; 5 leads	SOT665
PESD5V0V4UW			

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PESD3V3V4UF	A7
PESD5V0V4UF	A8
PESD3V3V4UG	V1*
PESD5V0V4UG	V2*
PESD3V3V4UW	W1
PESD5V0V4UW	W2

[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 diode					
P _{pp}	peak pulse power	t _p = 8/20 μs	^{[1][2][3]} -	16	W
I _{pp}	peak pulse current	t _p = 8/20 μs	^{[1][2][3]} -	1.5	A
Per device					
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.

[2] For PESDxV4UF measured from pin 1, 3, 4 or 6 to pin 2 or 5.

[3] For PESDxV4UG and PESDxV4UW measured from pin 1, 3, 4 or 5 to pin 2.

Table 7. ESD maximum ratings
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
Per diode					
V _{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1][2][3]	12	kV
		MIL-STD-883 (human body model)	-	10	kV

- [1] Device stressed with ten non-repetitive ESD pulses.
[2] For PESDxV4UF measured from pin 1, 3, 4 or 6 to pin 2 or 5.
[3] For PESDxV4UG and PESDxV4UW measured from pin 1, 3, 4 or 5 to pin 2.

Table 8. ESD standards compliance

Standard	Conditions
Per diode	
IEC 61000-4-2; level 4 (ESD)	> 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 4 kV

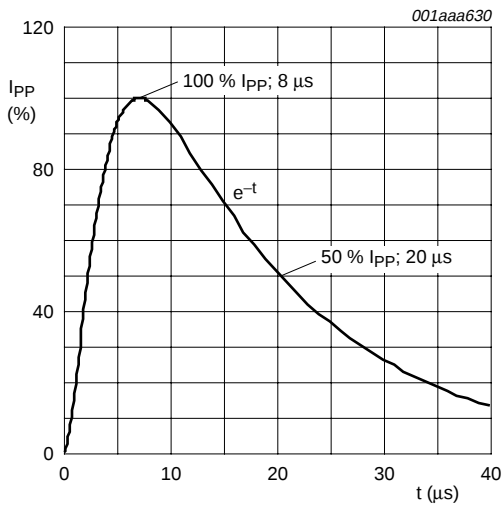


Fig 1. 8/20 μs pulse waveform according to IEC 61000-4-5

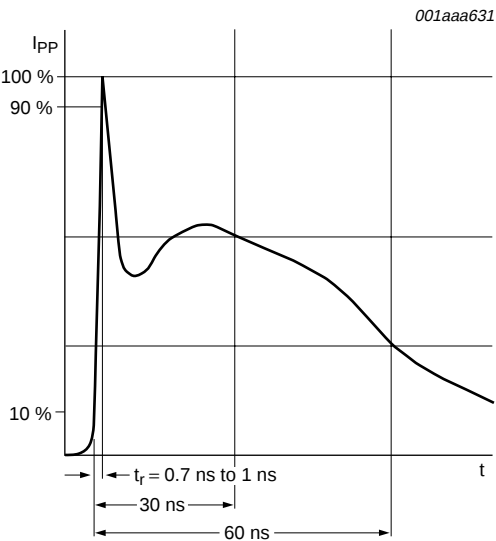


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

Table 9. Characteristics

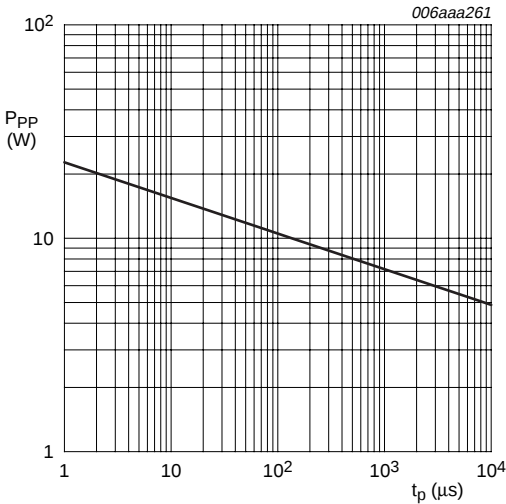
$T_{amb} = 25^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW		-	-	3.3	V
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW		-	-	5.0	V
I_{RM}	reverse leakage current					
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW	$V_{RWM} = 3.3\text{ V}$	-	40	300	nA
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW	$V_{RWM} = 5.0\text{ V}$	-	3	25	nA
V_{BR}	breakdown voltage	$I_R = 1\text{ mA}$				
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW		5.3	5.6	5.9	V
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW		6.4	6.8	7.2	V
C_d	diode capacitance	$f = 1\text{ MHz}$				
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW	$V_R = 0\text{ V}$	-	15	18	pF
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW	$V_R = 3.3\text{ V}$	-	9	12	pF
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW	$V_R = 0\text{ V}$	-	12	15	pF
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW	$V_R = 5\text{ V}$	-	6	9	pF

Table 9. Characteristics ...continued
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CL}	clamping voltage		[1][2][3]			
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW	I _{PP} = 1 A	-	-	9	V
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW	I _{PP} = 2 A	-	-	11	V
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW	I _{PP} = 1 A	-	-	11	V
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW	I _{PP} = 1.7 A	-	-	13	V
r _{dif}	differential resistance	I _R = 1 mA				
	PESD3V3V4UF PESD3V3V4UG PESD3V3V4UW		-	-	200	Ω
	PESD5V0V4UF PESD5V0V4UG PESD5V0V4UW		-	-	100	Ω

- [1] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC 61000-4-5.
[2] For PESDxV4UF measured from pin 1, 3, 4 or 6 to pin 2 or 5.
[3] For PESDxV4UG and PESDxV4UW measured from pin 1, 3, 4 or 5 to pin 2.



T_{amb} = 25 °C

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

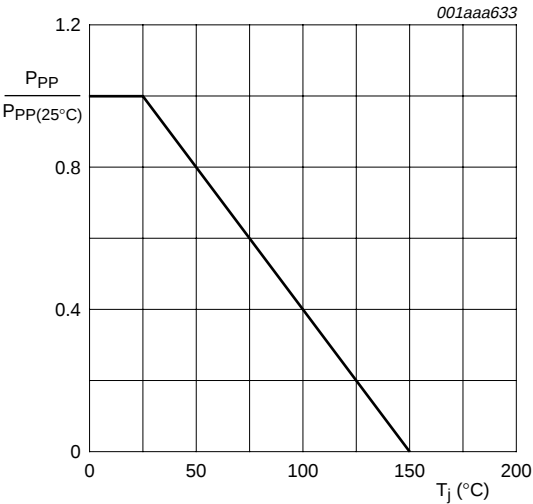
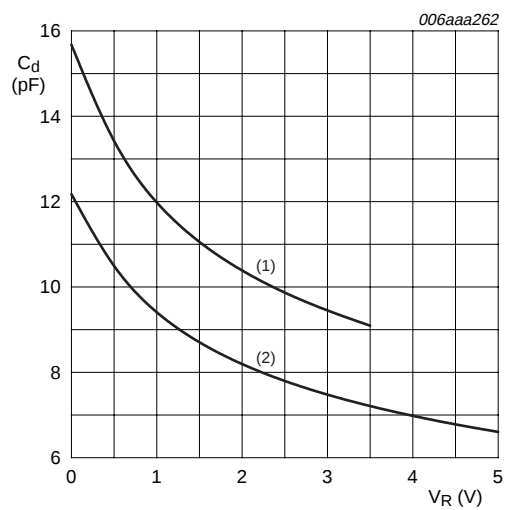


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



$f = 1 \text{ MHz}$; $T_{\text{amb}} = 25^\circ\text{C}$
(1) PESD3V3V4UF; PESD3V3V4UG; PESD3V3V4UW
(2) PESD5V0V4UF; PESD5V0V4UG; PESD5V0V4UW

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

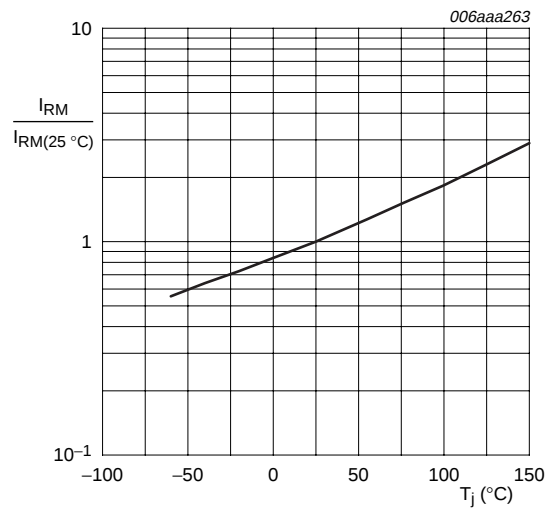


Fig 6. Relative variation of reverse leakage current as a function of junction temperature; typical values

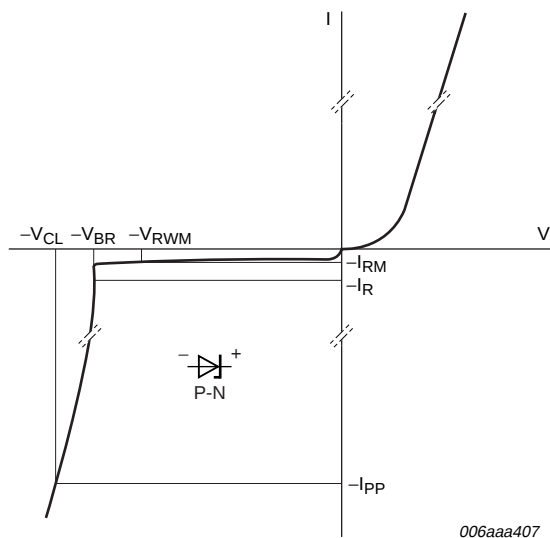
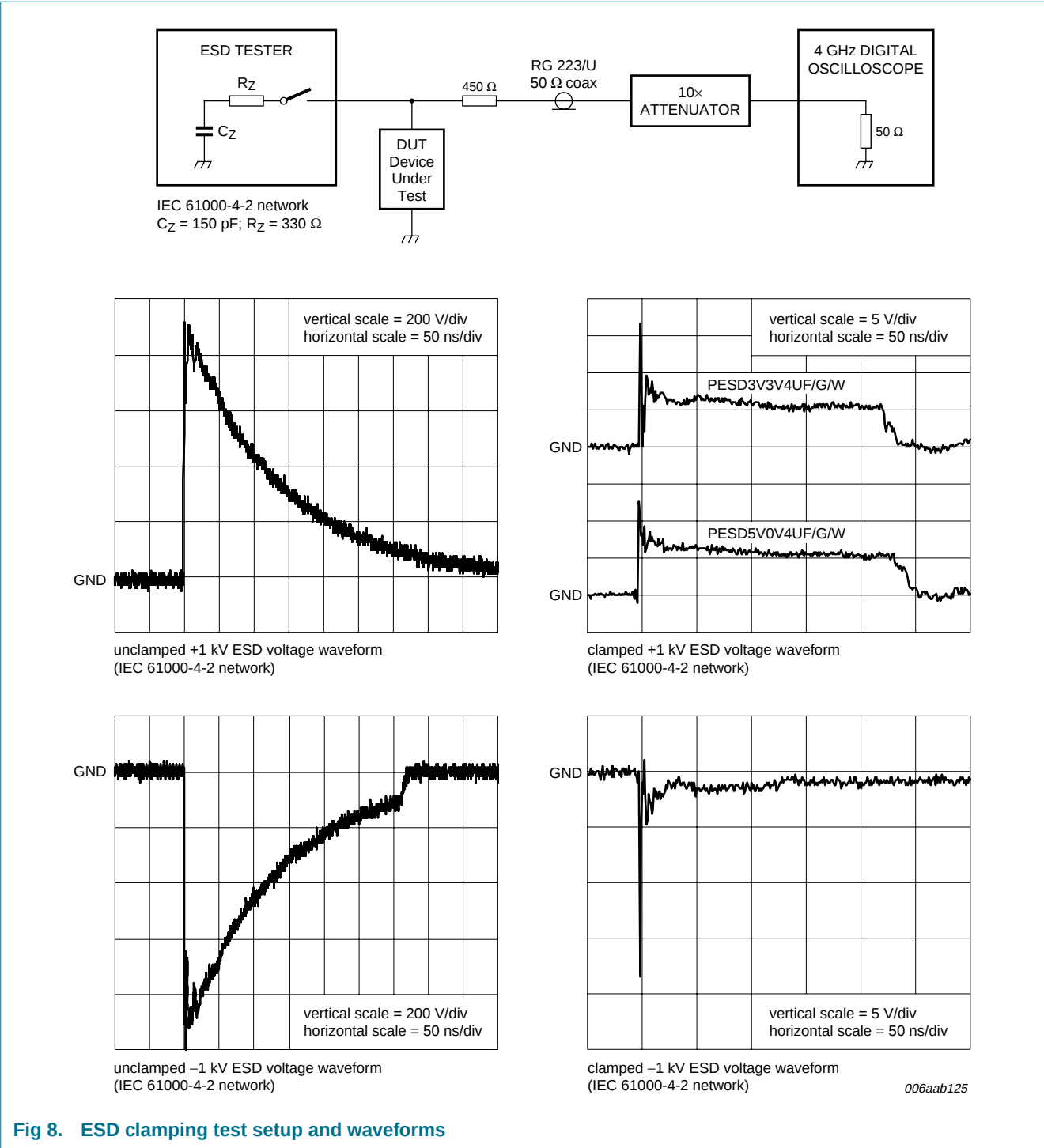
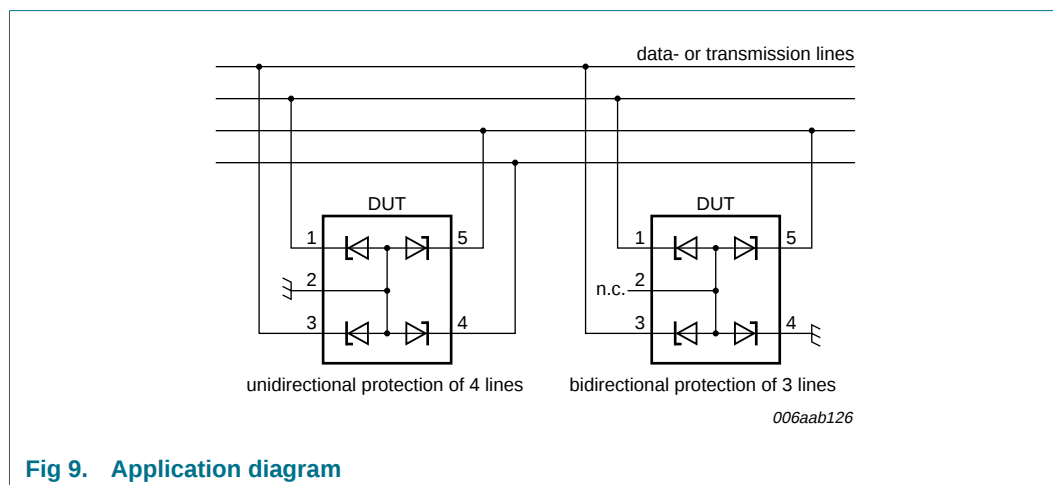


Fig 7. V-I characteristics for a unidirectional ESD protection diode



7. Application information

The devices are designed for the protection of up to four unidirectional data or signal lines from the damage caused by ESD and surge pulses. The devices may be used on lines where the signal polarities are both, positive and negative with respect to ground. The devices provide a surge capability of 16 W per line for an 8/20 μ s waveform each.

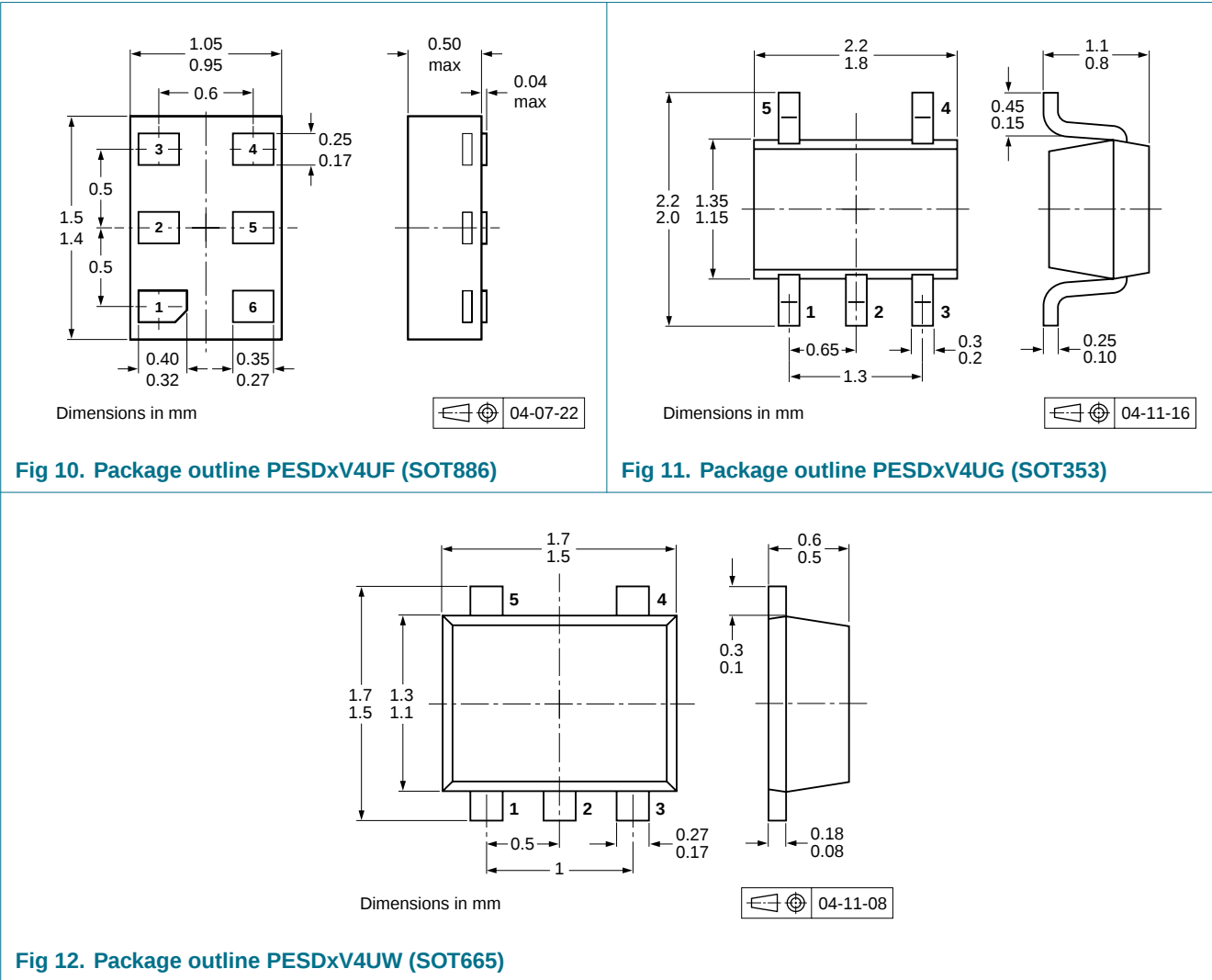


Circuit board layout and protection device placement

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 device as close to the input terminal or connector as possible.
2. The path length between the device 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 (PCB) 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 PCBs, use ground vias.

8. Package outline



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	4000	5000	8000	10000
PESD3V3V4UF	SOT886	4 mm pitch, 8 mm tape and reel; T1	^[2] -	-	-115	-	-
		4 mm pitch, 8 mm tape and reel; T4	^[3] -	-	-132	-	-
PESD5V0V4UF	SOT886	4 mm pitch, 8 mm tape and reel; T1	^[2] -	-	-115	-	-
		4 mm pitch, 8 mm tape and reel; T4	^[3] -	-	-132	-	-
PESD3V3V4UG	SOT353	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	^[4] -125	-	-	-	-165
PESD5V0V4UG	SOT353	4 mm pitch, 8 mm tape and reel; T1	^[2] -115	-	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	^[4] -125	-	-	-	-165
PESD3V3V4UW	SOT665	2 mm pitch, 8 mm tape and reel	-	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-	-
PESD5V0V4UW	SOT665	2 mm pitch, 8 mm tape and reel	-	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-	-

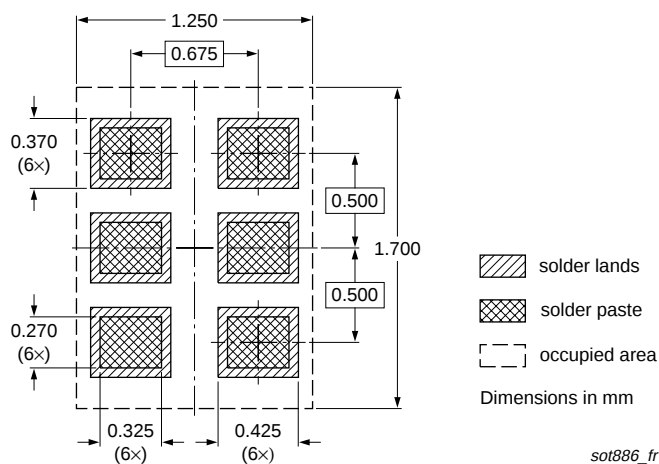
[1] For further information and the availability of packing methods, see [Section 13](#).

[2] T1: normal taping

[3] T4: 90° rotated reverse taping

[4] T2: reverse taping

10. Soldering



Reflow soldering is the only recommended soldering method.

Fig 13. Reflow soldering footprint PESDxV4UF (SOT886)

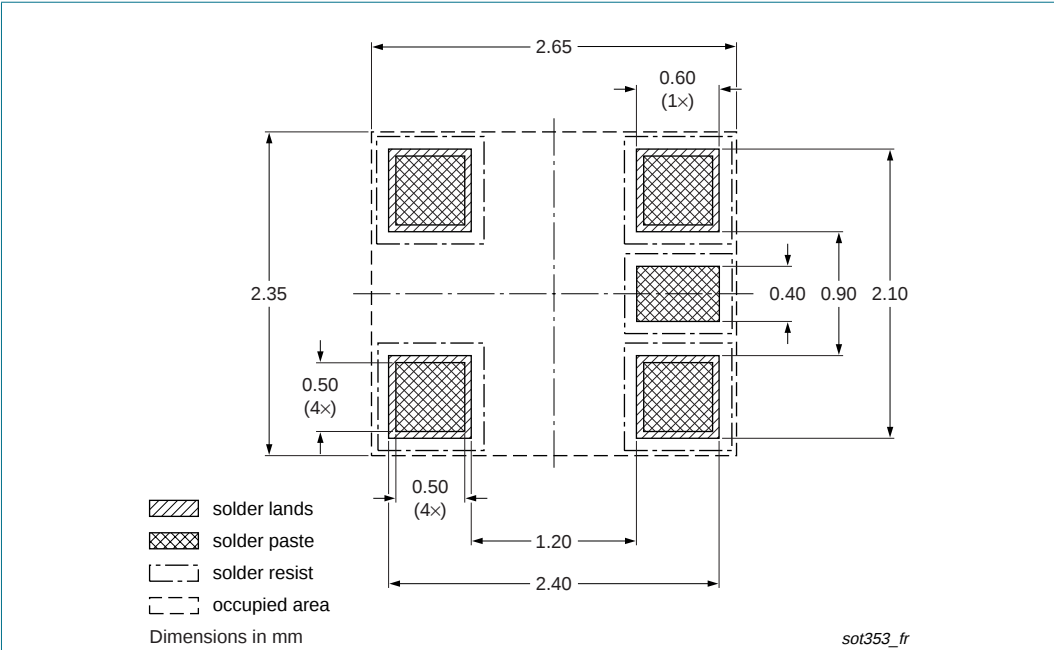


Fig 14. Reflow soldering footprint PESDxV4UG (SOT353/SC-88A)

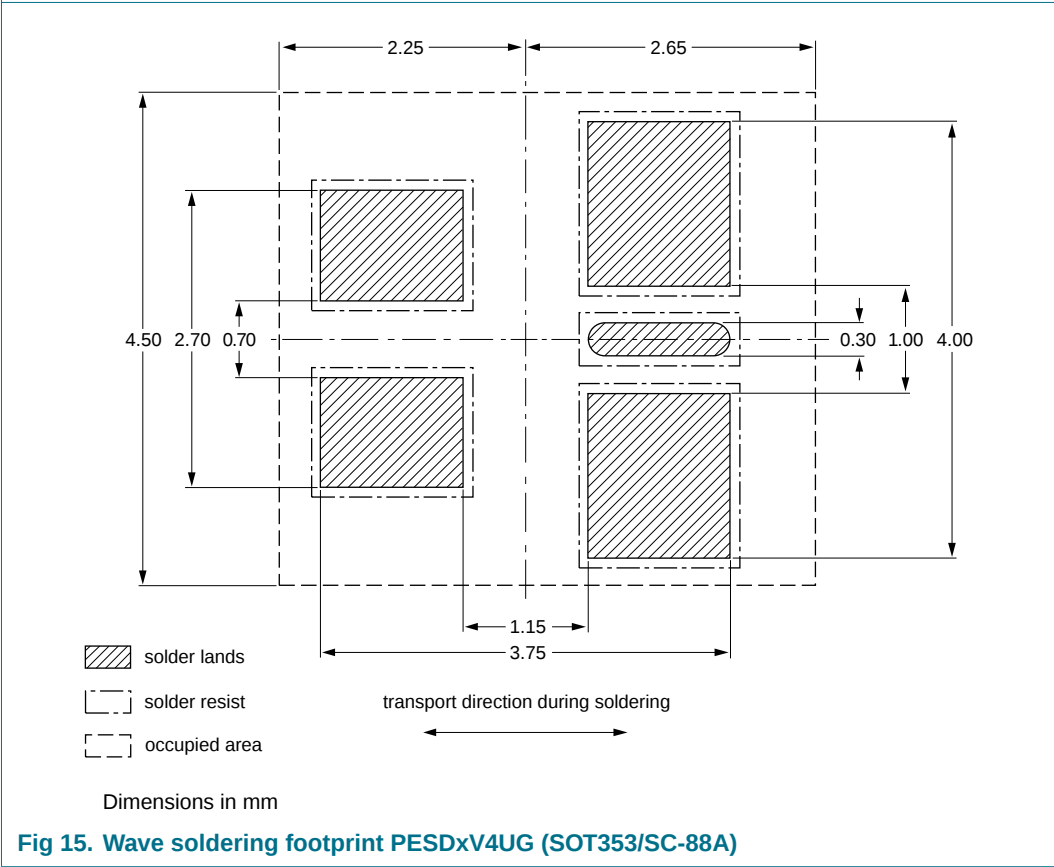
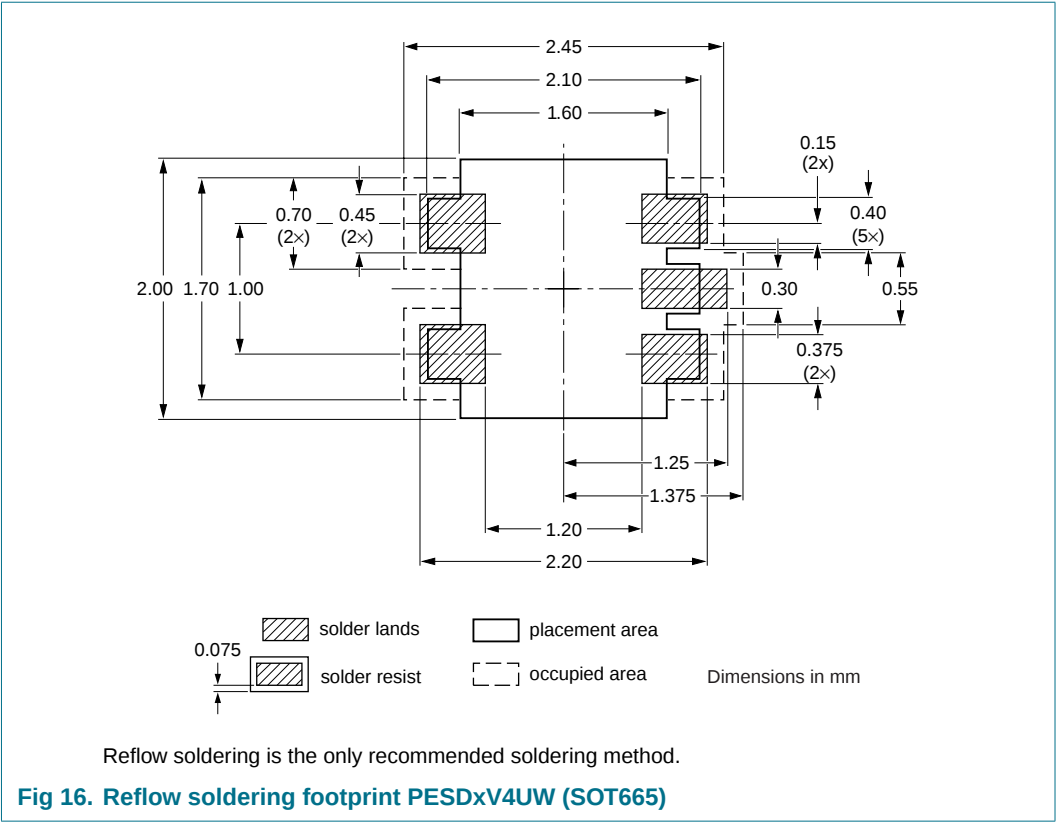


Fig 15. Wave soldering footprint PESDxV4UG (SOT353/SC-88A)



11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESDXV4UF_G_W_3	20080128	Product data sheet	-	PESDXV4UG_SER_2 PESDXV4UW_SER_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type numbers PESD3V3V4UF and PESD5V0V4UF added • Table 1 “Product overview”: added • Figure 7: added • Section 9 “Packing information”: added • Section 10 “Soldering”: added • Section 12 “Legal information”: updated			
PESDXV4UG_SER_2	20050407	Product data sheet	-	PESDXV4UG_SER_1
PESDXV4UW_SER_1	20050422	Product data sheet	-	-

12. Legal information

12.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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