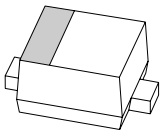


PESD5Zx series

Low capacitance unidirectional ESD protection diodes

Rev. 02 — 4 April 2008 Product data sheet

1. Product profile

1.1 General description

Low capacitance unidirectional ElectroStatic Discharge (ESD) protection diodes in a SOD523 (SC-79) ultra small and flat lead Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients.

Table 1. Product overview

Type number	Package		Configuration
	NXP	JEITA	
PESD5Z2.5	SOD523	SC-79	single
PESD5Z3.3			
PESD5Z5.0			
PESD5Z6.0			
PESD5Z7.0			
PESD5Z12			

1.2 Features

- ESD protection of one line
- Low diode capacitance
- Max. peak pulse power: P_{PP} = 260 W
- Low clamping voltage: V_{CL} = 15 V
- Low leakage current: I_{RM} < 1 nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); I_{PP} = 20 A

1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- 10/100/1000 Mbit/s Ethernet
- Communication systems
- Portable electronics
- Subscriber Identity Module (SIM) card protection
- FireWire
- High-speed data lines

1.4 Quick reference data

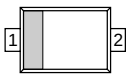
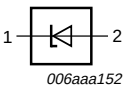
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD5Z2.5		-	-	2.5	V
	PESD5Z3.3		-	-	3.3	V
	PESD5Z5.0		-	-	5.0	V
	PESD5Z6.0		-	-	6.0	V
	PESD5Z7.0		-	-	7.0	V
	PESD5Z12		-	-	12.0	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V				
	PESD5Z2.5		-	229	300	pF
	PESD5Z3.3		-	172	200	pF
	PESD5Z5.0		-	89	150	pF
	PESD5Z6.0		-	78	150	pF
	PESD5Z7.0		-	69	150	pF
	PESD5Z12		-	35	75	pF

2. Pinning information

Table 3. Pinning

Pin	Description		Simplified outline	Symbol
1	cathode	[1]		
2	anode			

006aaa152

[1] The marking bar indicates the cathode.

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PESD5Z2.5	SC-79	plastic surface-mounted package; 2 leads	SOD523
PESD5Z3.3			
PESD5Z5.0			
PESD5Z6.0			
PESD5Z7.0			
PESD5Z12			

4. Marking

Table 5. Marking codes

Type number	Marking code
PESD5Z2.5	N7
PESD5Z3.3	N8
PESD5Z5.0	N9
PESD5Z6.0	NA
PESD5Z7.0	NB
PESD5Z12	NC

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]			
	PESD5Z2.5			-	260	W
	PESD5Z3.3			-	260	W
	PESD5Z5.0			-	180	W
	PESD5Z6.0			-	180	W
	PESD5Z7.0			-	180	W
	PESD5Z12			-	200	W
I_{PP}	peak pulse current	t_p = 8/20 µs	[1][2]			
	PESD5Z2.5			-	20	A
	PESD5Z3.3			-	20	A
	PESD5Z5.0			-	10	A
	PESD5Z6.0			-	10	A
	PESD5Z7.0			-	10	A
	PESD5Z12			-	6	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] Measured from pin 1 to 2.

Table 7. ESD maximum ratings

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
V_{ESD}	electrostatic discharge voltage					
	PESD5Zx series	IEC 61000-4-2 (contact discharge)	[1][2]	-	30	kV
		machine model		-	400	V
		MIL-STD-883 (human body model)		-	10	kV

[1] Device stressed with ten non-repetitive ESD pulses.

[2] Measured from pin 1 to 2.

Table 8. ESD standards compliance

Standard	Conditions
Per diode	
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 4 kV

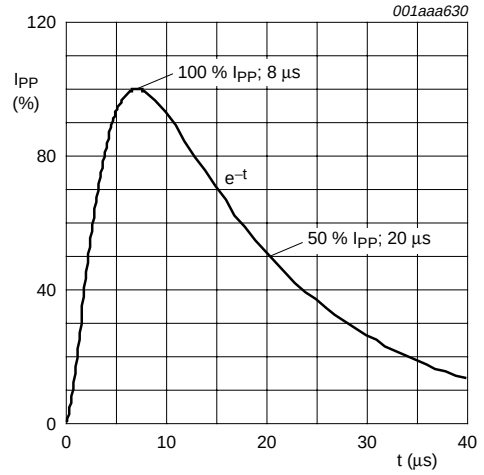


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

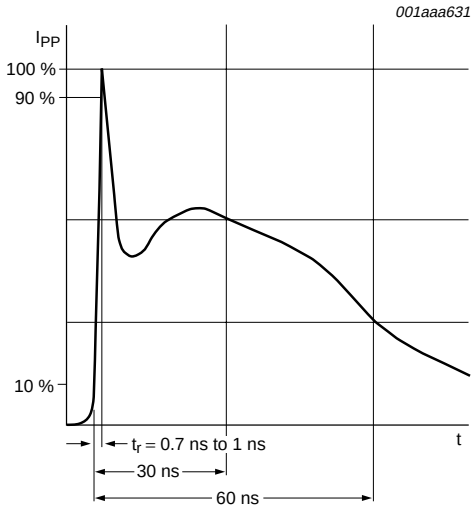


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

Table 9. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_{RWM}	reverse standoff voltage						
	PESD5Z2.5			-	-	2.5	V
	PESD5Z3.3			-	-	3.3	V
	PESD5Z5.0			-	-	5.0	V
	PESD5Z6.0			-	-	6.0	V
	PESD5Z7.0			-	-	7.0	V
	PESD5Z12			-	-	12.0	V
I_{RM}	reverse leakage current						
	PESD5Z2.5	V_{RWM} = 2.5 V		-	0.5	6	µA
	PESD5Z3.3	V_{RWM} = 3.3 V		-	8	50	nA
	PESD5Z5.0	V_{RWM} = 5.0 V		-	5	50	nA
	PESD5Z6.0	V_{RWM} = 6.0 V		-	2	10	nA
	PESD5Z7.0	V_{RWM} = 7.0 V		-	< 1	10	nA
	PESD5Z12	V_{RWM} = 12.0 V		-	< 1	10	nA
V_{BR}	breakdown voltage	I_R = 1 mA					
	PESD5Z2.5			4	-	-	V
	PESD5Z3.3			5	-	-	V
	PESD5Z5.0			6.2	-	-	V
	PESD5Z6.0			6.8	-	-	V
	PESD5Z7.0			7.5	-	-	V
	PESD5Z12			14.1	-	-	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V					
	PESD5Z2.5			-	229	300	pF
	PESD5Z3.3			-	172	200	pF
	PESD5Z5.0			-	89	150	pF
	PESD5Z6.0			-	78	150	pF
	PESD5Z7.0			-	69	150	pF
	PESD5Z12			-	35	75	pF
V_{CL}	clamping voltage	I_{PP} = 5 A	[1][2]				
	PESD5Z2.5			-	8	9	V
	PESD5Z3.3			-	8	10	V
	PESD5Z5.0			-	12	13	V
	PESD5Z6.0			-	12	13	V
	PESD5Z7.0			-	14	15	V
	PESD5Z12			-	27	30	V

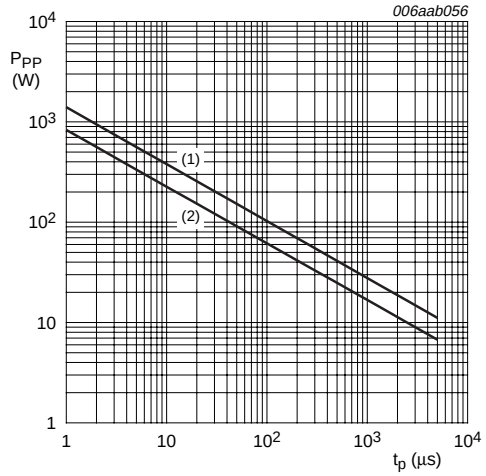
Table 9. Characteristics *...continued*

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CL}	clamping voltage		[1][2]				
	PESD5Z2.5	I_{PP} = 20 A		-	-	15	V
	PESD5Z3.3	I_{PP} = 20 A		-	-	18	V
	PESD5Z5.0	I_{PP} = 10 A		-	-	18	V
	PESD5Z6.0	I_{PP} = 10 A		-	-	18	V
	PESD5Z7.0	I_{PP} = 10 A		-	-	19	V
	PESD5Z12	I_{PP} = 6 A		-	-	35	V
r_{dif}	differential resistance	I_R = 5 mA					
	PESD5Z2.5			-	-	60	Ω
	PESD5Z3.3			-	-	10	Ω
	PESD5Z5.0			-	-	15	Ω
	PESD5Z6.0			-	-	15	Ω
	PESD5Z7.0			-	-	15	Ω
	PESD5Z12			-	-	40	Ω

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

[2] Measured from pin 1 to 2.



T_{amb} = 25 °C

(1) PESD5Z2.5; PESD5Z3.3

(2) PESD5Z5.0; PESD5Z6.0; PESD5Z7.0; PESD5Z12

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

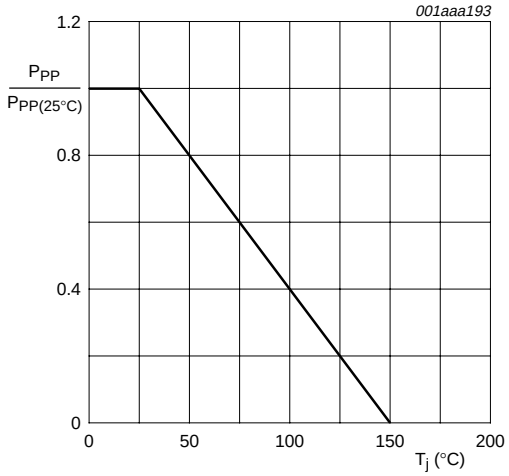
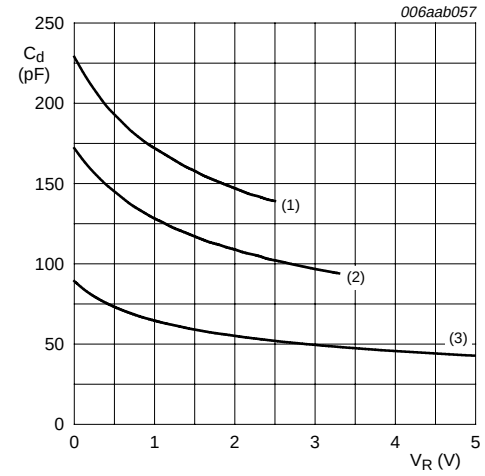


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



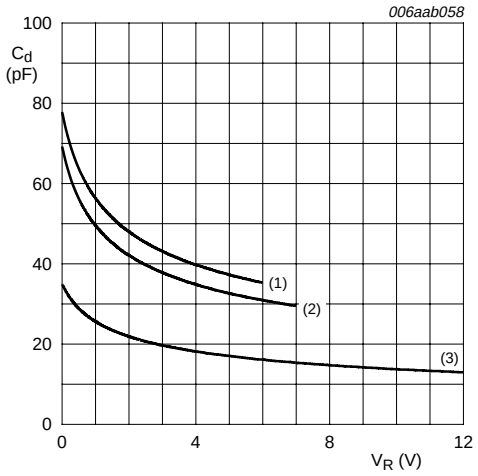
f = 1 MHz; T_{amb} = 25 °C

(1) PESD5Z2.5

(2) PESD5Z3.3

(3) PESD5Z5.0

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



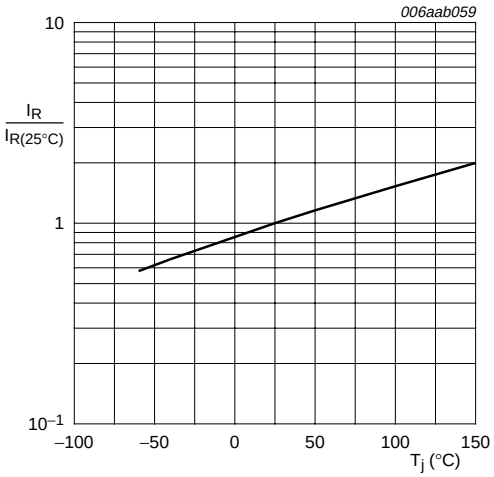
f = 1 MHz; T_{amb} = 25 °C

(1) PESD5Z6.0

(2) PESD5Z7.0

(3) PESD5Z12

Fig 6. Diode capacitance as a function of reverse voltage; typical values



PESD5Z2.5; V_{RWM} = 2.5 V

PESD5Z3.3; V_{RWM} = 3.3 V

I_R is less than 50 nA at 150 °C for:

PESD5Z5.0; V_{RWM} = 5.0 V

PESD5Z6.0; V_{RWM} = 6.0 V

PESD5Z7.0; V_{RWM} = 7.0 V

PESD5Z12; V_{RWM} = 12.0 V

Fig 7. Relative variation of reverse current as a function of junction temperature; typical values

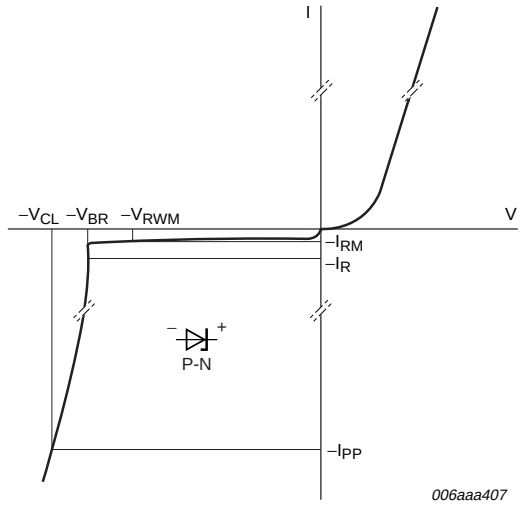


Fig 8. V-I characteristics for a unidirectional ESD protection diode

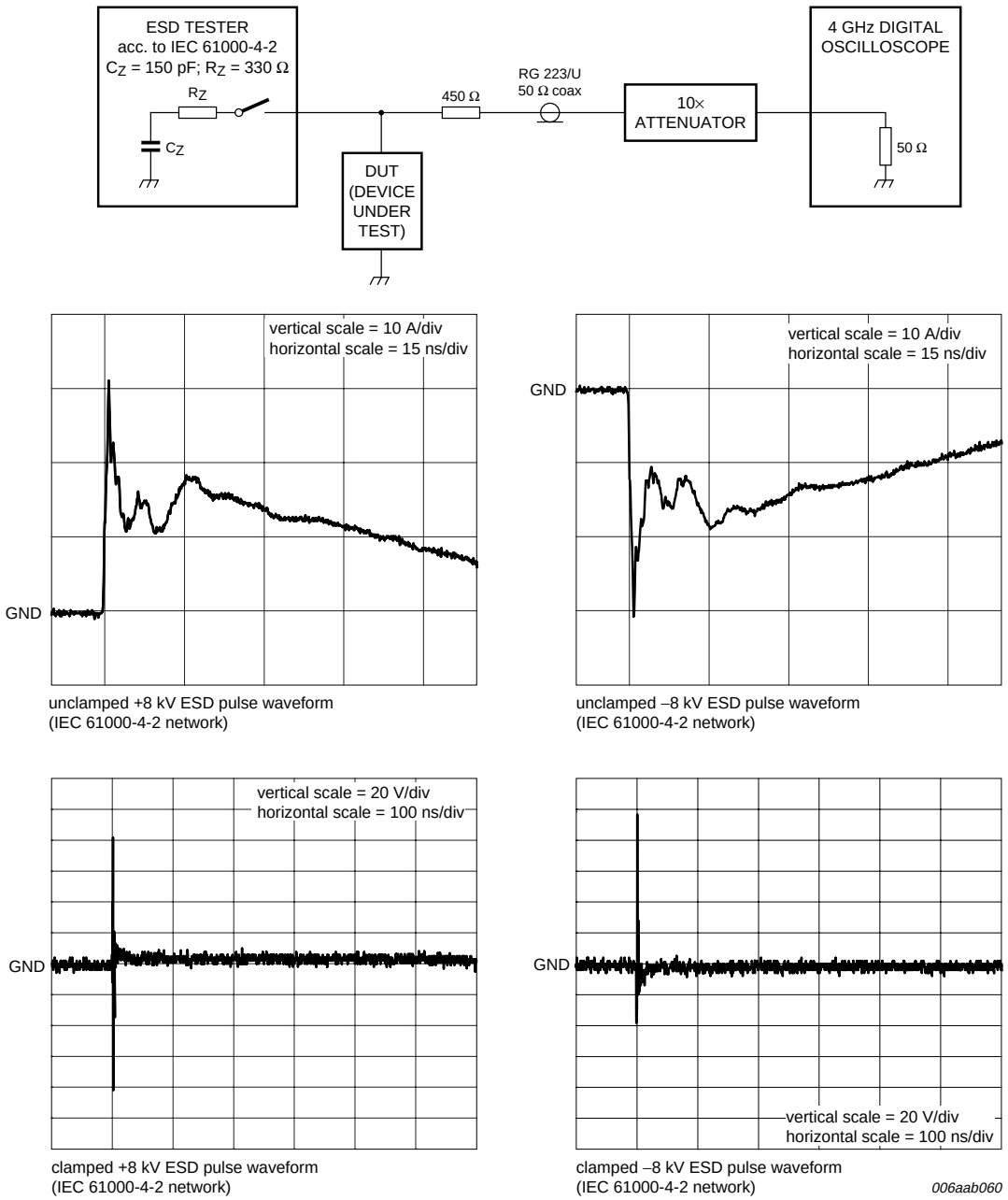


Fig 9. ESD clamping test setup and waveforms for PESD5Z2.5

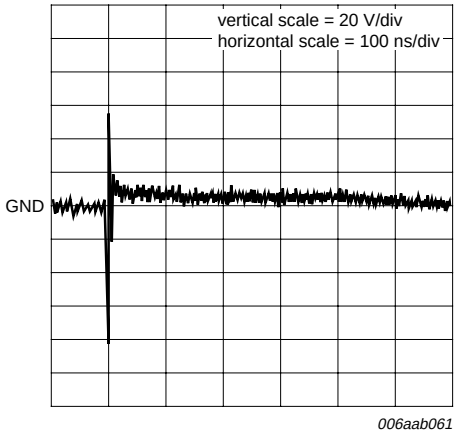


Fig 10. PESD5Z3.3: Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

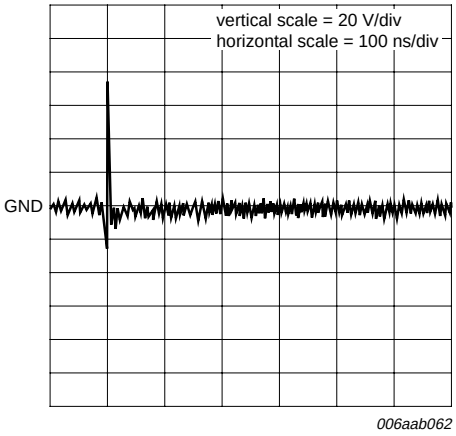


Fig 11. PESD5Z3.3: Clamped −8 kV ESD pulse waveform (IEC 61000-4-2 network)

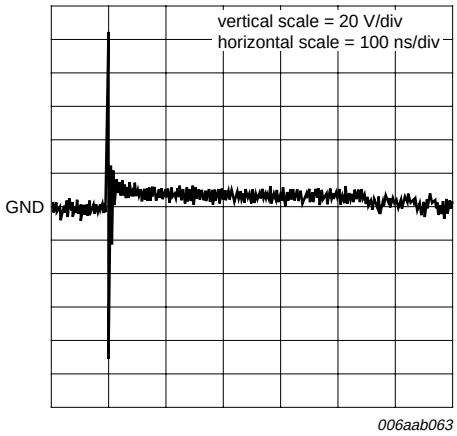


Fig 12. PESD5Z5.0: Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

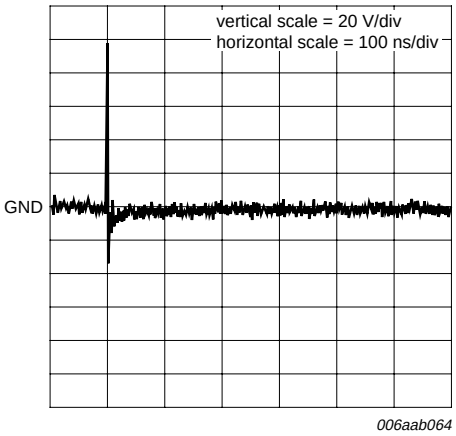


Fig 13. PESD5Z5.0: Clamped −8 kV ESD pulse waveform (IEC 61000-4-2 network)

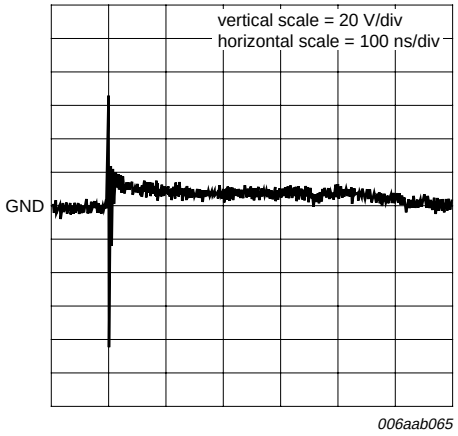


Fig 14. PESD5Z6.0: Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

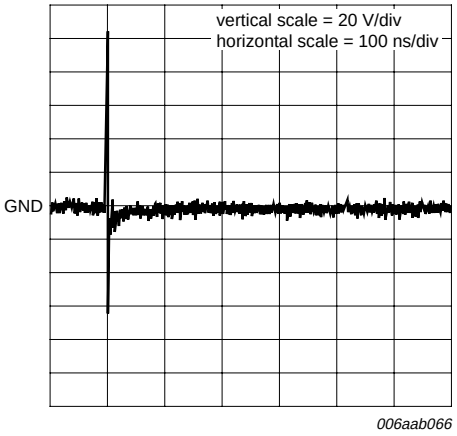


Fig 15. PESD5Z6.0: Clamped −8 kV ESD pulse waveform (IEC 61000-4-2 network)

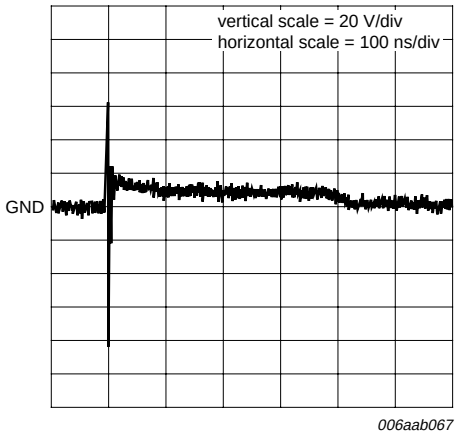


Fig 16. PESD5Z7.0: Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

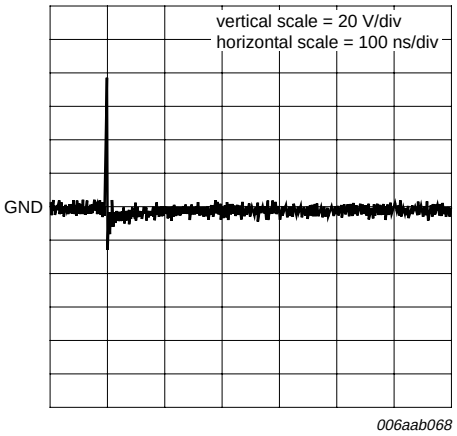


Fig 17. PESD5Z7.0: Clamped −8 kV ESD pulse waveform (IEC 61000-4-2 network)

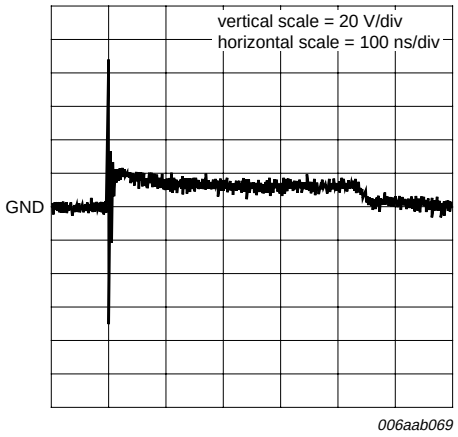


Fig 18. PESD5Z12: Clamped +8 kV ESD pulse waveform (IEC 61000-4-2 network)

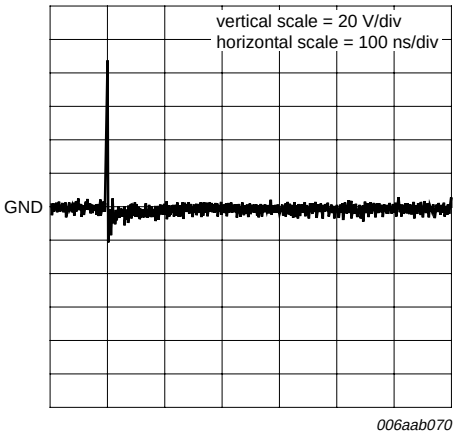


Fig 19. PESD5Z12: Clamped −8 kV ESD pulse waveform (IEC 61000-4-2 network)

7. Application information

The PESD5Zx series is designed for the protection of one unidirectional data or signal line from the damage caused by ESD and surge pulses. The device may be used on lines where the signal polarities are either positive or negative with respect to ground. The PESD5Zx series provides a surge capability of 260 W per line for an 8/20 µs waveform.

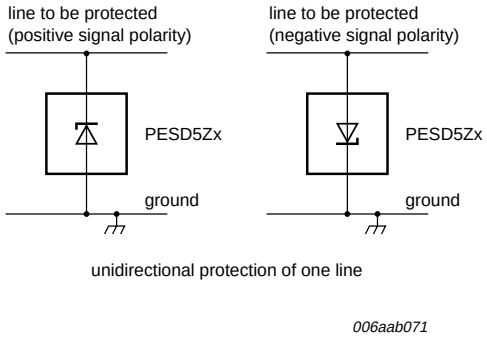


Fig 20. Application diagram

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 PESD5Zx as close to the input terminal or connector as possible.
2. The path length between the PESD5Zx 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

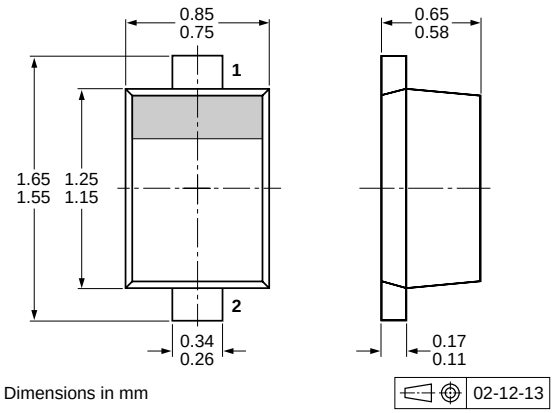


Fig 21. Package outline SOD523 (SC-79)

9. Packing information

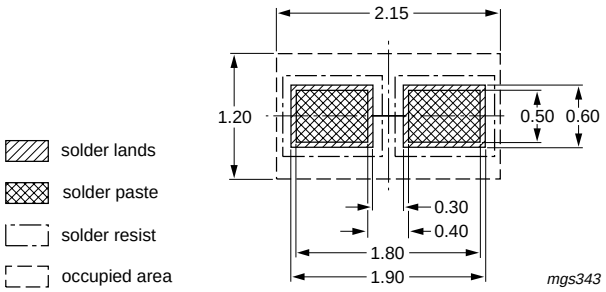
Table 10. Packing methods

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

Type number	Package	Description	Packing quantity		
			3000	8000	10000
PESD5Z2.5	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135
PESD5Z3.3	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135
PESD5Z5.0	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135
PESD5Z6.0	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135
PESD5Z7.0	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135
PESD5Z12	SOD523	2 mm pitch, 8 mm tape and reel	-	-315	-
		4 mm pitch, 8 mm tape and reel	-115	-	-135

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

10. Soldering



Reflow soldering is the only recommended soldering method.

Dimensions in mm

Fig 22. Reflow soldering footprint SOD523 (SC-79)

11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5ZX_SER_2	20080404	Product data sheet	-	PESD5ZX_SER_1
Modifications:	• Table 10: Type number updated to PESD5Z12			
PESD5ZX_SER_1	20070813	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.

12.2 Definitions

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