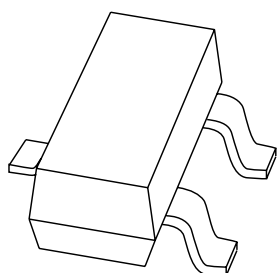


DATA SHEET



PESDxS2UAT series Double ESD protection diodes in SOT23 package

Product specification

2004 Feb 18

Double ESD protection diodes in SOT23 package

PESDxS2UAT series

FEATURES

- Unidirectional ESD protection of up to two lines
- Common-cathode configuration
- Max. peak pulse power: $P_{pp} = 330\text{ W}$ at $t_p = 8/20\text{ }\mu\text{s}$
- Low clamping voltage: $V_{(CL)R} = 20\text{ V}$ at $I_{pp} = 18\text{ A}$
- Ultra-low reverse leakage current: $I_{RM} < 700\text{ nA}$
- ESD protection $> 30\text{ kV}$
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{pp} = 18\text{ A}$ at $t_p = 8/20\text{ }\mu\text{s}$.

APPLICATIONS

- Computers and peripherals
- Communication systems
- Audio and video equipment
- Data lines
- CAN bus protection.

DESCRIPTION

Unidirectional double ESD protection diodes in common cathode configuration in the SOT23 plastic package. Designed to protect up to two transmission or data lines against damage from ElectroStatic Discharge (ESD) and other transients.

MARKING

TYPE NUMBER	MARKING CODE ⁽¹⁾
PESD3V3S2UAT	*7A
PESD5V0S2UAT	*7B
PESD12VS2UAT	*7C
PESD15VS2UAT	*7D
PESD24VS2UAT	*7E

Note

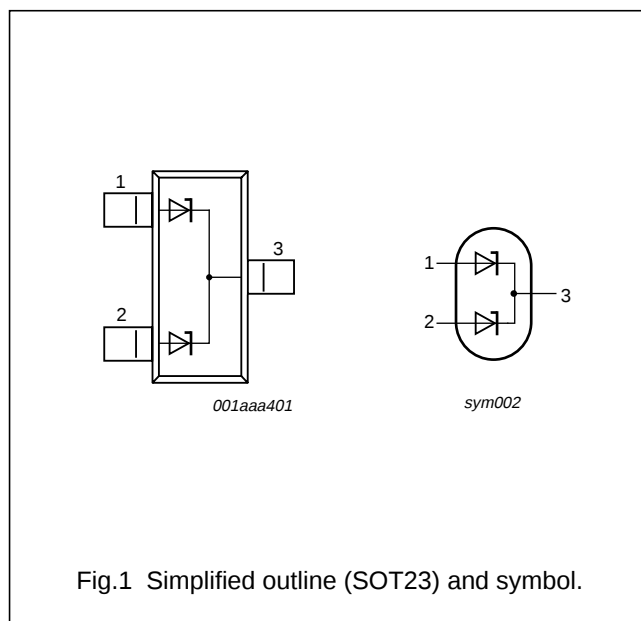
1. * = p : made in Hong Kong.
* = t : made in Malaysia.
* = W : made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	VALUE	UNIT
V_{RWM}	reverse stand-off voltage	3.3, 5, 12, 15 and 24	V
C_d	diode capacitance $V_R = 0\text{ V}$; $f = 1\text{ MHz}$	207, 152, 38, 32 and 23	pF
	number of protected lines	2	

PINNING

PIN	DESCRIPTION
1	anode 1
2	anode 2
3	common cathode



Double ESD protection diodes in SOT23 package

PESDxS2UAT series

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PESD3V3S2UAT	–	plastic surface mounted package; 3 leads	SOT23
PESD5V0S2UAT			
PESD12VS2UAT			
PESD15VS2UAT			
PESD24VS2UAT			

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 μ s pulse; notes 1 and 2			
	PESD3V3S2UAT		–	330	W
	PESD5V0S2UAT		–	260	W
	PESD12VS2UAT		–	180	W
	PESD15VS2UAT		–	160	W
	PESD24VS2UAT		–	160	W
I_{pp}	peak pulse current	8/20 μ s pulse; notes 1 and 2			
	PESD3V3S2UAT		–	18	A
	PESD5V0S2UAT		–	15	A
	PESD12VS2UAT		–	5	A
	PESD15VS2UAT		–	5	A
	PESD24VS2UAT		–	3	A
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C
T_{stg}	storage temperature		–65	+150	°C

Notes

1. Non-repetitive current pulse 8/20 μ s exponential decay waveform; see Fig.2.
2. Measured across either pins 1 and 3 or pins 2 and 3.

Double ESD protection diodes
in SOT23 package

PESDxS2UAT series

ESD maximum ratings

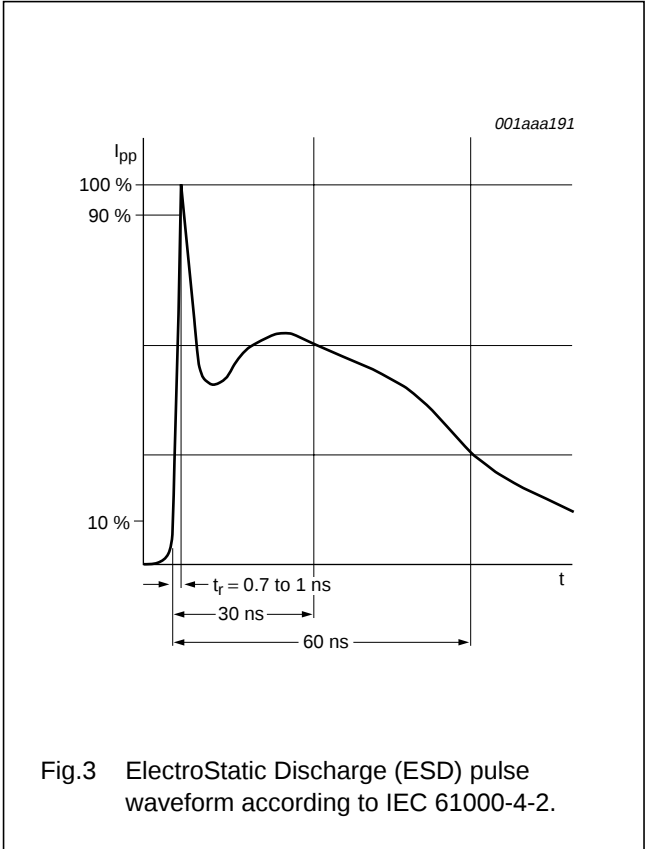
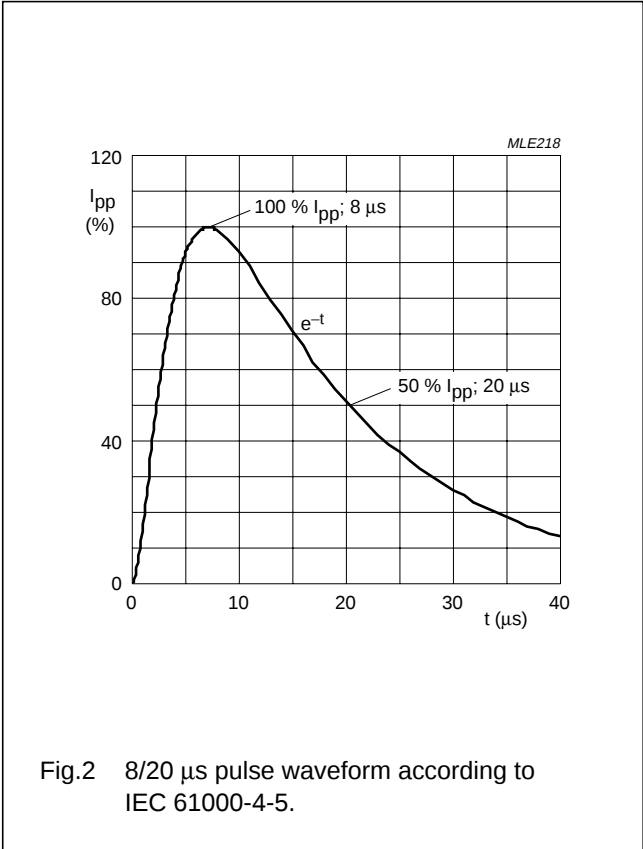
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
ESD	electrostatic discharge	IEC 61000-4-2 (contact discharge); notes 1 and 2		
		PESD3V3S2UAT	30	kV
		PESD5V0S2UAT	30	kV
		PESD12VS2UAT	30	kV
		PESD15VS2UAT	30	kV
		PESD24VS2UAT	23	kV
		HBM MIL-Std 883		
		PESDxS2UAT-series	10	kV

Notes

- 1. Device stressed with ten non-repetitive ESD pulses; see Fig.3.
- 2. Measured from pin 1, 2, 3, 4, 5 or 8 to pin 6 or 7.

ESD standards compliance

ESD STANDARD	CONDITIONS
IEC 61000-4-2; level 4 (ESD); see Fig.3	> 15 kV (air); > 8 kV (contact)
HBM MIL-Std 883; class 3	> 4 kV



Double ESD protection diodes in SOT23 package

PESDxS2UAT series

ELECTRICAL CHARACTERISTICS

$T_j = 25\text{ }^{\circ}\text{C}$; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{RWM}	reverse stand-off voltage					
	PESD3V3S2UAT		–	–	3.3	V
	PESD5V0S2UAT		–	–	5	V
	PESD12VS2UAT		–	–	12	V
	PESD15VS2UAT		–	–	15	V
	PESD24VS2UAT		–	–	24	V
I_{RM}	reverse leakage current					
	PESD3V3S2UAT	$V_{RWM} = 3.3\text{ V}$	–	0.7	2	μA
	PESD5V0S2UAT	$V_{RWM} = 5\text{ V}$	–	0.1	1	μA
	PESD12VS2UAT	$V_{RWM} = 12\text{ V}$	–	<1	50	nA
	PESD15VS2UAT	$V_{RWM} = 15\text{ V}$	–	<1	50	nA
	PESD24VS2UAT	$V_{RWM} = 24\text{ V}$	–	<1	50	nA
V_{BR}	breakdown voltage	$I_Z = 5\text{ mA}$				
	PESD3V3S2UAT		5.2	5.6	6.0	V
	PESD5V0S2UAT		6.4	6.8	7.2	V
	PESD12VS2UAT		14.7	15.0	15.3	V
	PESD15VS2UAT		17.6	18.0	18.4	V
	PESD24VS2UAT		26.5	27.0	27.5	V
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$				
	PESD3V3S2UAT		–	207	300	pF
	PESD5V0S2UAT		–	152	200	pF
	PESD12VS2UAT		–	38	75	pF
	PESD15VS2UAT		–	32	70	pF
	PESD24VS2UAT		–	23	50	pF
$V_{(CL)R}$	clamping voltage	notes 1 and 2				
	PESD3V3S2UAT	$I_{pp} = 1\text{ A}$	–	–	7	V
		$I_{pp} = 18\text{ A}$	–	–	20	V
	PESD5V0S2UAT	$I_{pp} = 1\text{ A}$	–	–	9	V
		$I_{pp} = 15\text{ A}$	–	–	20	V
	PESD12VS2UAT	$I_{pp} = 1\text{ A}$	–	–	19	V
		$I_{pp} = 5\text{ A}$	–	–	35	V
	PESD15VS2UAT	$I_{pp} = 1\text{ A}$	–	–	23	V
		$I_{pp} = 5\text{ A}$	–	–	40	V
	PESD24VS2UAT	$I_{pp} = 1\text{ A}$	–	–	36	V
		$I_{pp} = 3\text{ A}$	–	–	70	V

Double ESD protection diodes
in SOT23 package

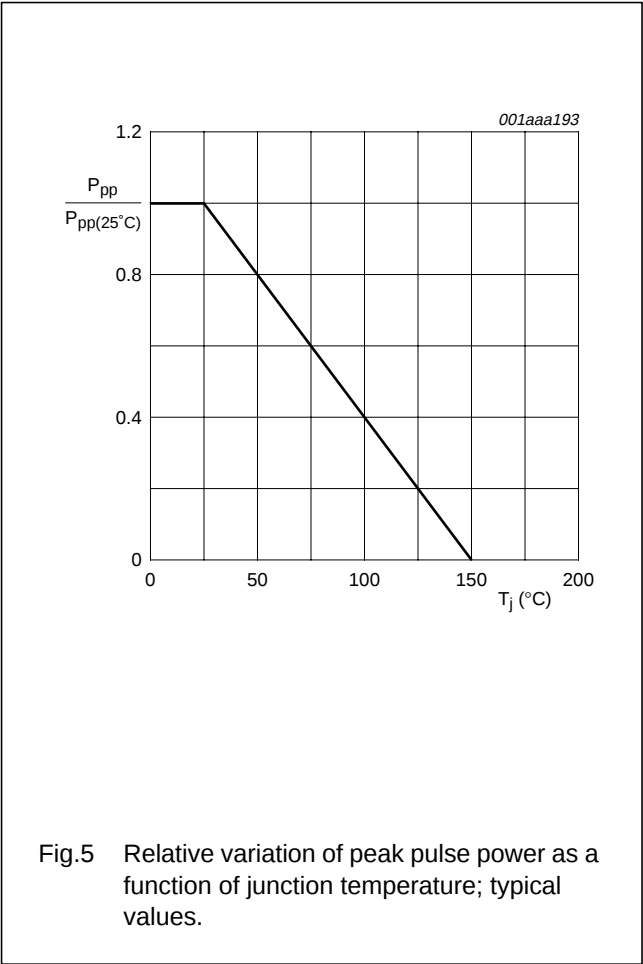
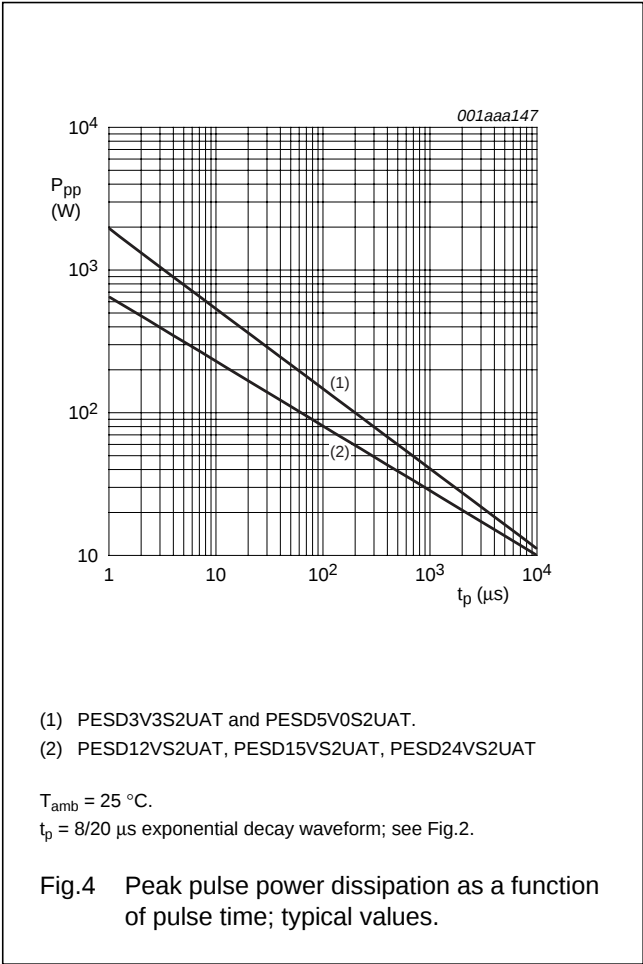
PESDxS2UAT series

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
R _{diff}	differential resistance					
	PESD3V3S2UAT	I _R = 1 mA	–	–	400	Ω
	PESD5V0S2UAT	I _R = 1 mA	–	–	80	Ω
	PESD12VS2UAT	I _R = 1 mA	–	–	200	Ω
	PESD15VS2UAT	I _R = 1 mA	–	–	225	Ω
	PESD24VS2UAT	I _R = 0.5 mA	–	–	300	Ω

Notes

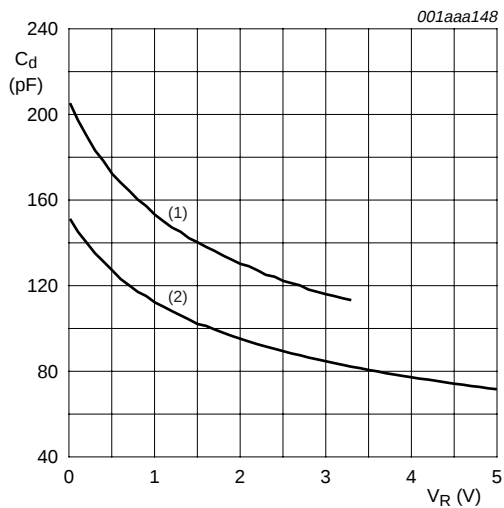
- 1. Non-repetitive current pulse 8/20 μs exponential decay waveform; see Fig.2.
- 2. Measured either across pins 1 and 3 or pins 2 and 3.

GRAPHICAL DATA



Double ESD protection diodes in SOT23 package

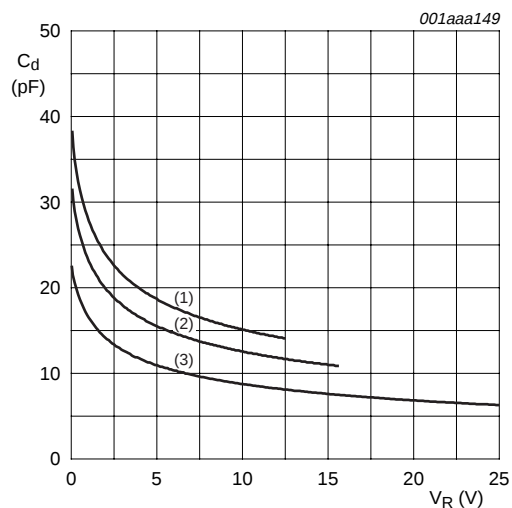
PESDxS2UAT series



- (1) PESD3V3S2UAT; $V_{RWM} = 3.3$ V.
(2) PESD5V0S2UAT; $V_{RWM} = 5$ V.

$T_{amb} = 25$ °C; $f = 1$ MHz.

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



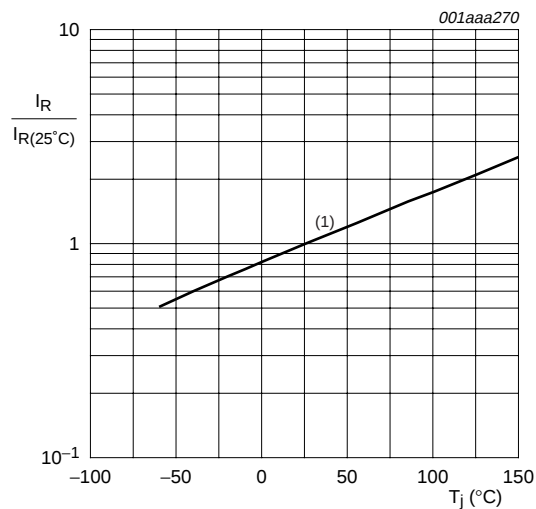
- (1) PESD12VS2UAT; $V_{RWM} = 12$ V.
(2) PESD15VS2UAT; $V_{RWM} = 15$ V.
(3) PESD24VS2UAT; $V_{RWM} = 24$ V.

$T_{amb} = 25$ °C; $f = 1$ MHz.

Fig.7 Diode capacitance as a function of reverse voltage; typical values.

Double ESD protection diodes in SOT23 package

PESDxS2UAT series



(1) PESD3V3S2UAT; $V_{RWM} = 3.3$ V.
 PESD5V0S2UAT; $V_{RWM} = 5$ V.

I_R is less than 10 nA at 150 °C for:

PESD12V52UAT; $V_{RWM} = 12$ V.

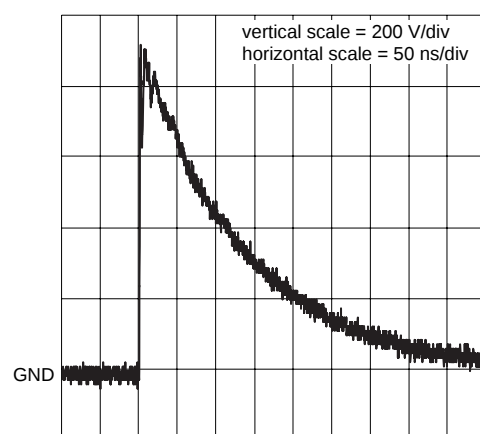
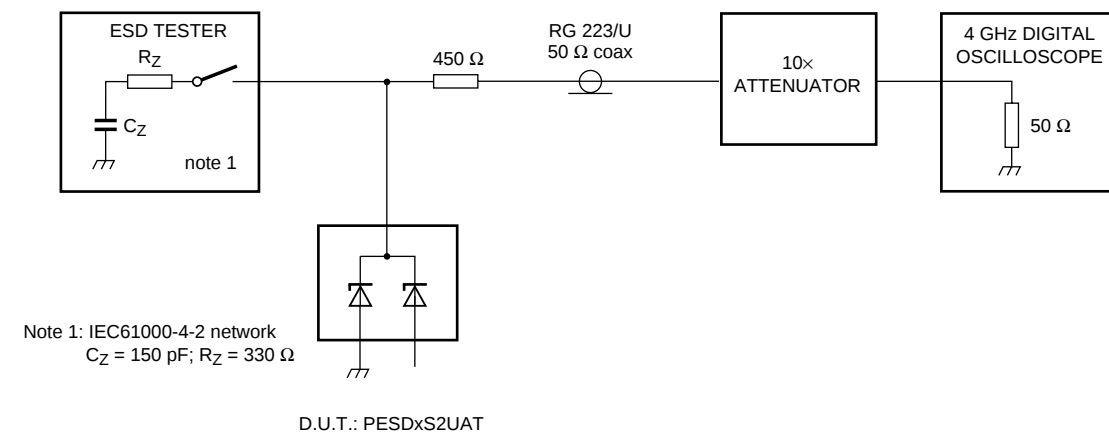
PESD15VS2UAT; $V_{RWM} = 15$ V.

PESD24VS2UAT; $V_{RWM} = 24$ V.

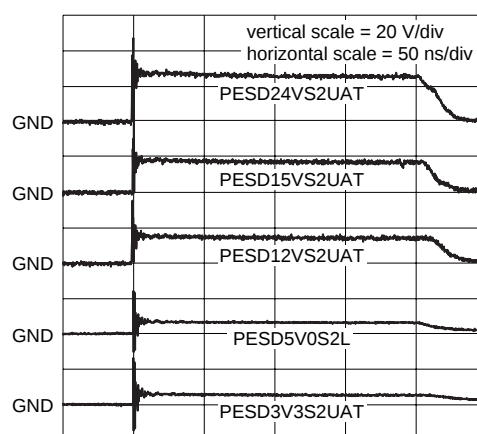
Fig.8 Relative variation of reverse leakage current as a function of junction temperature; typical values.

Double ESD protection diodes in SOT23 package

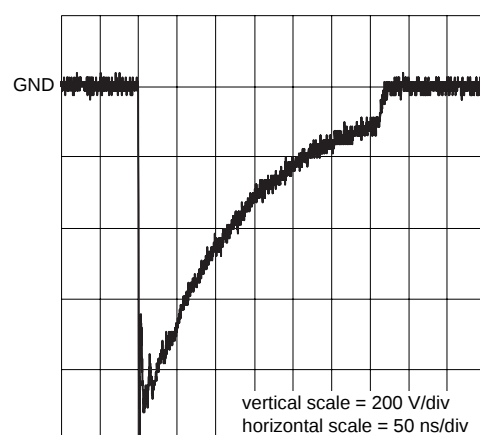
PESDxS2UAT series



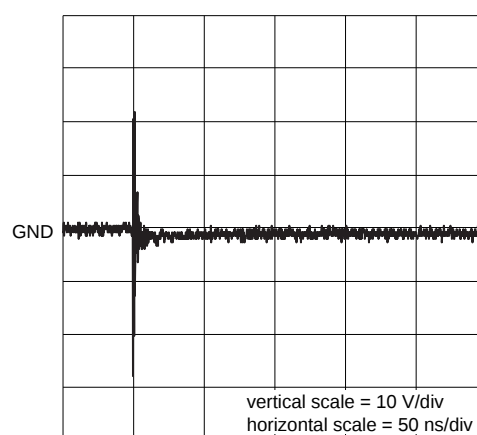
unclamped +1 kV ESD voltage waveform
(IEC61000-4-2 network)



clamped +1 kV ESD voltage waveform
(IEC61000-4-2 network)



unclamped -1 kV ESD voltage waveform
(IEC61000-4-2 network)



clamped -1 kV ESD voltage waveform
(IEC61000-4-2 network)

001aaa151

Fig.9 ESD clamping test set-up and waveforms.

Double ESD protection diodes in SOT23 package

PESDxS2UAT series

APPLICATION INFORMATION

The PESDxS2UAT series can protect up to two lines against damage caused by unidirectional ElectroStatic Discharge (ESD) and surge pulses. The PESDxS2UAT series can protect lines whose signal polarities are below ground. PESDxS2UAT series provide a surge capability of up to 330 Watts peak pulse power per line for a 8/20 μ s waveform.

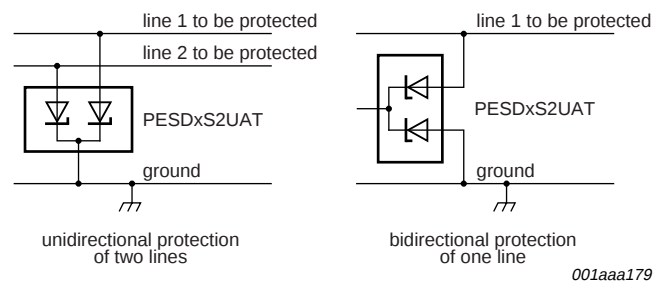


Fig.10 Typical application: ESD protection of data lines.

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 PESDxS2UAT as close as possible to the input terminal or connector.
2. Minimize the path length between the PESDxS2UAT and the protected line.
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 transient return paths to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Ground planes should be used whenever possible.
9. Use vias for multi-layer printed-circuit boards.

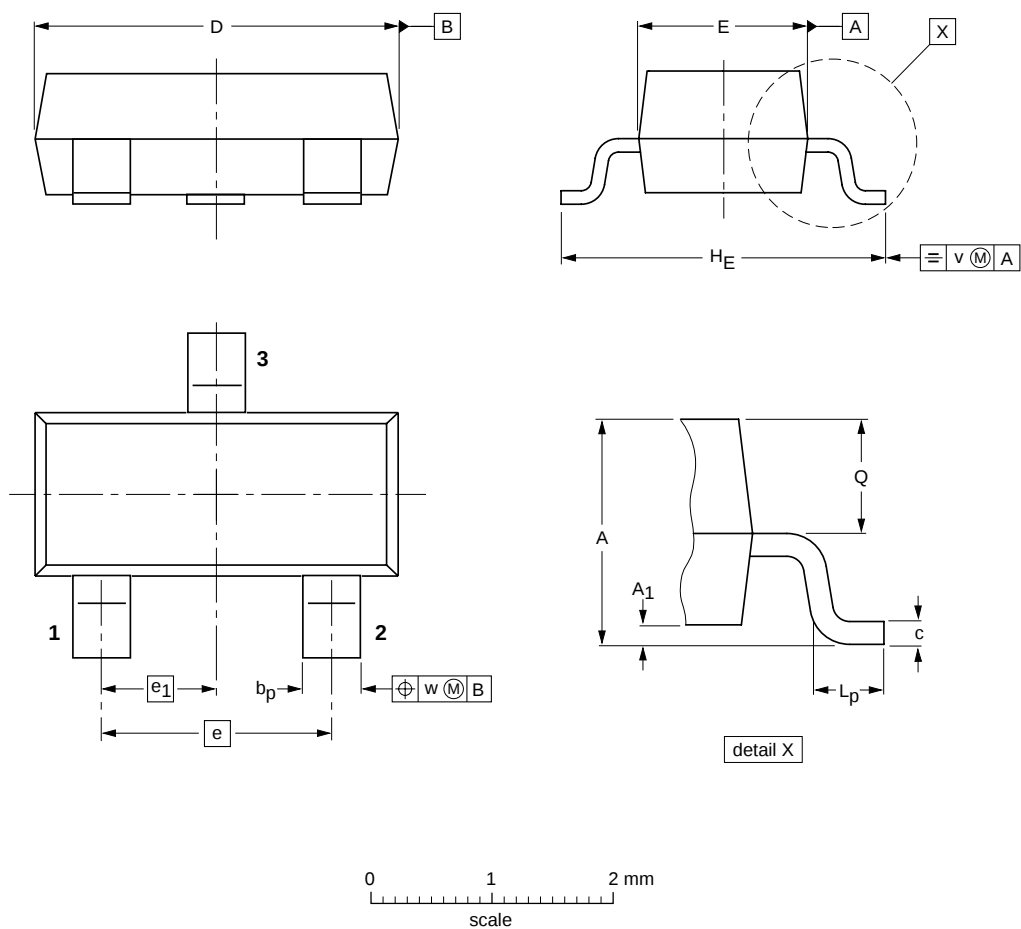
Double ESD protection diodes
in SOT23 package

PESDxS2UAT series

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max.	b _p	c	D	E	e	e ₁	H _E	L _p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23		TO-236AB				97-02-28 99-09-13

Double ESD protection diodes in SOT23 package

PESDxS2UAT series

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.
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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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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