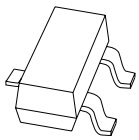


PRTR5V0U1T

Ultra low capacitance single rail-to-rail ESD protection

Rev. 01 — 25 September 2008 Product data sheet

1. Product profile

1.1 General description

Ultra low capacitance single rail-to-rail ElectroStatic Discharge (ESD) protection device in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package designed to protect one Hi-Speed data line or high-frequency signal line from the damage caused by ESD and other transients.

PRTR5V0U1T incorporates one ultra low capacitance rail-to-rail protection channel as well as an additional ESD protection diode to ensure signal line protection even if no supply voltage is available.

1.2 Features

- ESD protection of one Hi-Speed data line or high-frequency signal line
- Ultra low input/output to ground capacitance: $C_{(I/O\text{-}GND)}$ = 1 pF
- ESD protection up to 8 kV
- IEC 61000-4-2, level 4 (ESD)
- Very low clamping voltage due to an integrated additional ESD protection diode
- Very low reverse current
- Small SMD plastic package

1.3 Applications

- USB interfaces (2.0)
- Digital Video Interface (DVI) / High Definition Multimedia Interface (HDMI) interfaces
- Mobile and cordless phones
- Personal Digital Assistants (PDA)
- Digital cameras
- Wide Area Network (WAN) / Local Area Network (LAN) systems
- PCs, notebooks, printers and other PC peripherals

1.4 Quick reference data

Table 1. Quick reference data

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

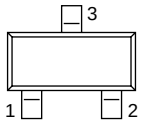
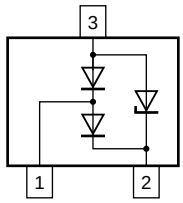
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per channel							
$C_{(I/O-GND)}$	input/output to ground capacitance	f = 1 MHz; $V_{(I/O-GND)}$ = 0 V	[1]	-	1	1.5	pF
Zener diode							
V_{RWM}	reverse standoff voltage			-	-	5.5	V
C_{sup}	supply pin to ground capacitance	f = 1 MHz; V_{CC} = 0 V	[2]	-	16	-	pF

[1] Measured from pin 1 to ground.

[2] Measured from pin 2 to ground.

2. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I/O	input/output		
2	V_{CC}	supply voltage		
3	GND	ground		

006aab111

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PRTR5V0U1T	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PRTR5V0U1T	ZN*

[1] * = -: made in Hong Kong
* = 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
Per device					
T_{amb}	ambient temperature		–40	+85	°C
T_{stg}	storage temperature		–55	+125	°C

Table 6. ESD maximum ratings

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

Symbol	Parameter	Conditions		Min	Max	Unit
Per channel						
V_{ESD}	electrostatic discharge voltage		[1][2]			
		IEC 61000-4-2; level 4 (contact discharge)		-	8	kV
		MIL-STD-883 (human body model)		-	10	kV

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

[2] Measured from pin 1 to 2 or 3.

Table 7. ESD standards compliance

Standard	Conditions
Per diode	
IEC 61000-4-2; level 4 (ESD)	> 8 kV (contact)

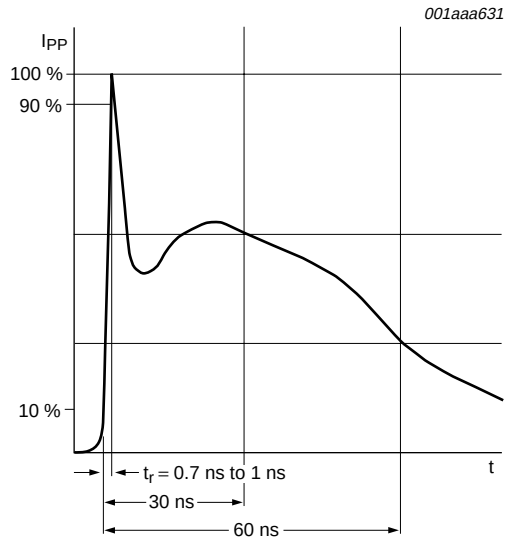


Fig 1. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

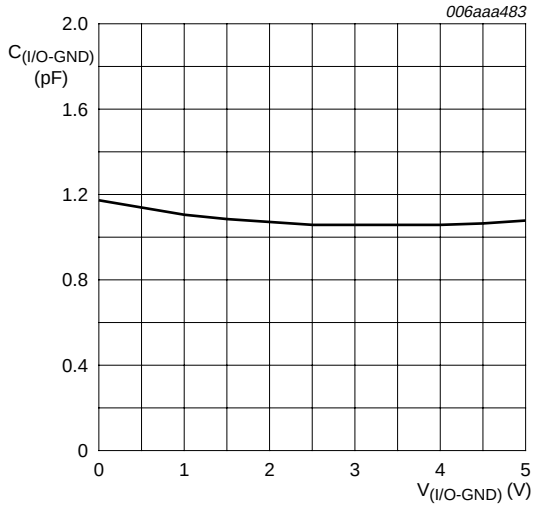
Table 8. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per channel							
I_R	reverse current	V_R = 3 V	[1]	-	< 1	100	nA
$C_{(I/O-GND)}$	input/output to ground capacitance	f = 1 MHz; $V_{(I/O-GND)}$ = 0 V	[1]	-	1	1.5	pF
V_F	forward voltage			-	0.7	-	V
Zener diode							
V_{RWM}	reverse standoff voltage			-	-	5.5	V
V_{BR}	breakdown voltage		[2]	6	-	9	V
C_{sup}	supply pin to ground capacitance	f = 1 MHz; V_{CC} = 0 V	[2]	-	16	-	pF

[1] Measured from pin 1 to ground.

[2] Measured from pin 2 to ground.



f = 1 MHz; T_{amb} = 25 °C

Fig 2. Input/output to ground capacitance as a function of input/output to ground voltage; typical values

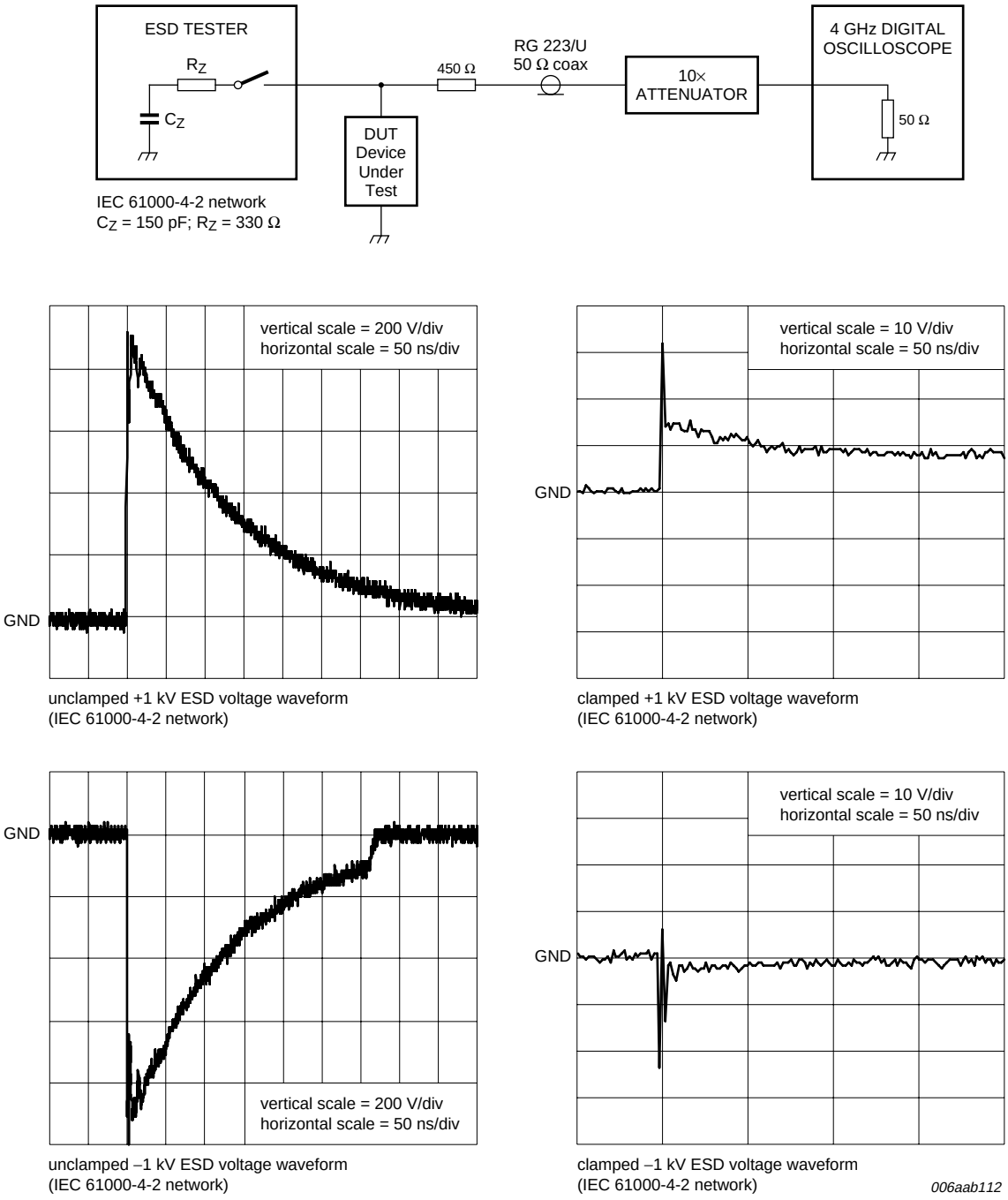


Fig 3. ESD clamping test setup and waveforms

7. Application information

With a capacitance of only 1 pF, the PRTR5V0U1T offers IEC 61000-4-2, level 4 compliant ESD protection.

The PRTR5V0U1T integrates one ultra low capacitance rail-to-rail ESD protection channel and an additional ESD protection diode.

The additional ESD protection diode connected between ground and V_{CC} prevents charging of the supply.

To achieve the maximum ESD protection level, no additional external capacitors are required.

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 PRTR5V0U1T as close to the input terminal or connector as possible.
2. The path length between the PRTR5V0U1T 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

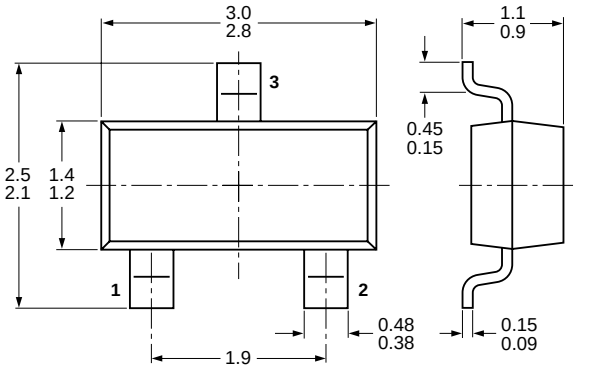


Fig 4. Package outline SOT23 (TO-236AB)

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	10000
PRTR5V0U1T	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

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

10. Soldering

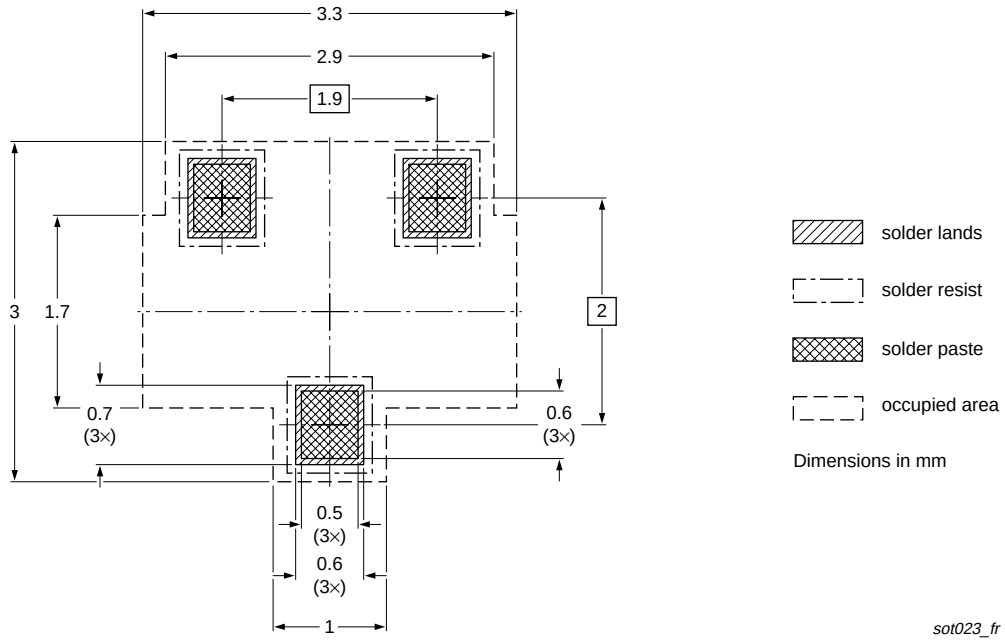


Fig 5. Reflow soldering footprint SOT23 (TO-236AB)

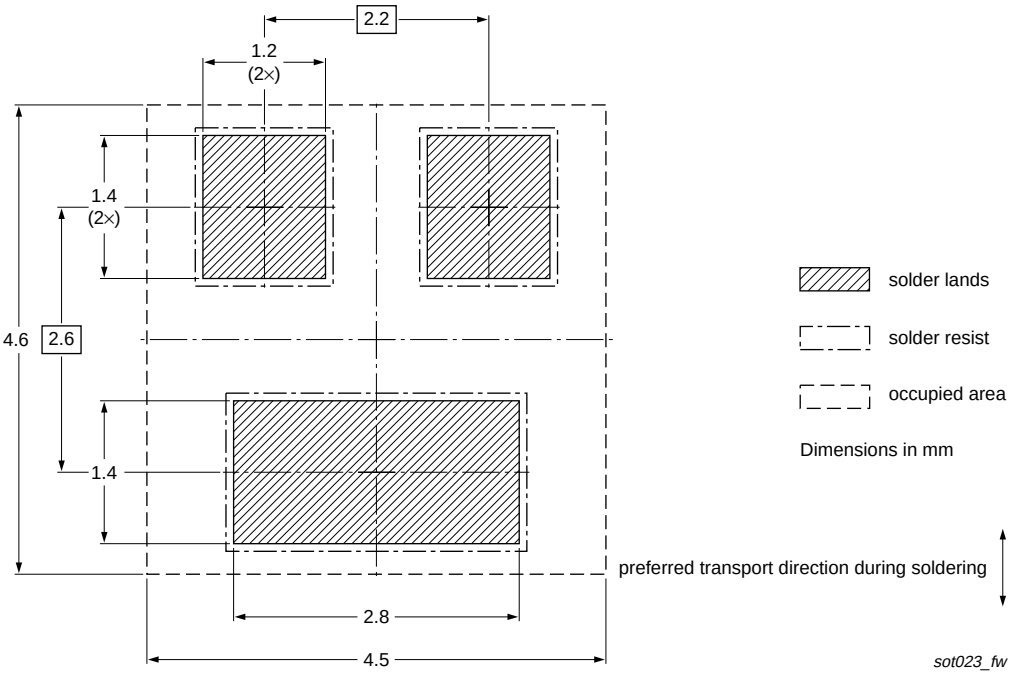


Fig 6. Wave soldering footprint SOT23 (TO-236AB)

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PRTR5V0U1T_1	20080925	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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14. Contents

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