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Team Nexperia

PUSBMxX4-TL series

High-speed USB OTG ESD protection diode arrays

Rev. 3 — 14 June 2012 Product data sheet

1. Product profile

1.1 General description

PUSBMxX4-TL is a series of four 4-channel ElectroStatic Discharge (ESD) diode arrays for USB 2.0 (On-The-Go (OTG)) interfaces. The devices provide protection to downstream components from ESD voltages up to ±8 kV contact discharge. They offer three low capacitance ESD protection pins and one V_{BUS} protection diode. They are encapsulated in an ultra thin DFN1616-6 (SOT1189-1/XSON6) plastic package with 0.5 mm pitch. These features make the devices ideal for use in applications requiring component miniaturization, such as mobile phone handsets.

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) and Dark Green compliant
- ESD protection according to IEC 61000-4-2 level 4: ±8 kV contact discharge
- Electrical Fast Transients (EFT) protection according to IEC 61000-4-4 40A (5/50 ns)
- Three pairs of ultra low capacitance (1.1 pF typ.) rail-to-rail ESD protection diodes
- Ultra thin DFN1616-6 (SOT1189-1/XSON6) plastic package; 0.5 mm pitch

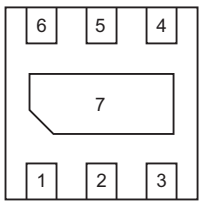
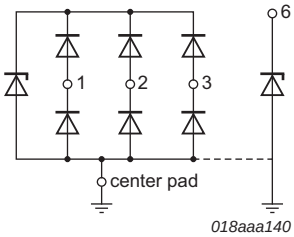
1.3 Applications

High-speed USB 2.0 and USB OTG connector ESD protection in:

- Cellular phone and Personal Communication System (PCS) mobile handsets
- Mobile internet devices
- Digital still cameras
- Portable media players

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	low capacitance ESD protection		
2	low capacitance ESD protection		
3	low capacitance ESD protection		
4	not connected		
5	not connected		
6	V_{BUS} ESD protection		
7	ground (GND)		

Transparent top view

018aaa140

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
PUSBM5V5X4-TL	DFN1616-6	plastic, thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.6 × 1.6 × 0.5 mm	SOT1189-1
PUSBM12VX4-TL			
PUSBM15VX4-TL			
PUSBM30VX4-TL			

4. Marking

Table 3. Marking codes

Type number	Marking code
PUSBM5V5X4-TL	XE
PUSBM12VX4-TL	XL
PUSBM15VX4-TL	XO
PUSBM30VX4-TL	30

5. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{RWM}	reverse standoff voltage	pins 1, 2, 3	–0.5	+5.5	V
	PUSBM5V5X4-TL	pin 6 (V_{BUS})	–0.5	+5.5	V
	PUSBM12VX4-TL	pin 6 (V_{BUS})	–0.5	+12	V
	PUSBM15VX4-TL	pin 6 (V_{BUS})	–0.5	+15	V
	PUSBM30VX4-TL	pin 6 (V_{BUS})	–0.5	+30	V
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2, level 4; pins 1, 2, 3, 6 to GND; contact discharge [1]	-	±8	kV
P_{PP}	peak pulse power	t_p = 8/20 µs			
		pins 1, 2, 3; V_{CL} = 12 V	-	35	W
	PUSBM5V5X4-TL	pin 6 (V_{BUS}); V_{CL} = 9.2 V	-	100	W
	PUSBM12VX4-TL	pin 6 (V_{BUS}); V_{CL} = 16 V	-	100	W
	PUSBM15VX4-TL	pin 6 (V_{BUS}); V_{CL} = 22 V	-	100	W
	PUSBM30VX4-TL	pin 6 (V_{BUS}); V_{CL} = 43 V	-	100	W
I_{PP}	peak pulse current	t_p = 8/20 µs			
		pins 1, 2, 3	-	3	A
	PUSBM5V5X4-TL	pin 6 (V_{BUS})	-	12	A
	PUSBM12VX4-TL	pin 6 (V_{BUS})	-	6	A
	PUSBM15VX4-TL	pin 6 (V_{BUS})	-	3	A
	PUSBM30VX4-TL	pin 6 (V_{BUS})	-	2	A

Table 4. Limiting values *...continued*

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

Symbol	Parameter	Conditions	Min	Max	Unit
$T_{reflow(peak)}$	peak reflow temperature	$t_p \leq 10$ s	-	+260	°C
T_{amb}	ambient temperature		–30	+85	°C
T_{stg}	storage temperature		–55	+150	°C

[1] Device is qualified with 1000 pulses of ±8 kV contact discharges each, according to IEC61000-4-2 far exceeding level 4 (±8 kV contact discharge).

6. Characteristics

Table 5. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage			0.6	-	1.2	V
Low capacitance ESD protection							
V_{BRzd}	Zener diode breakdown voltage	I_{test} = 1 mA		6	-	10	V
$C_{(I/O-GND)}$	input/output to ground capacitance	$V_{bias(DC)}$ = 0.5 V; f = 1 MHz; pins 1, 2, 3 to GND	[1]	-	1.1	1.3	pF
$\Delta C_{(I/O-GND)}$	input/output to ground capacitance variation	$V_{bias(DC)}$ = 0.5 V; f = 1 MHz		-	0.02	-	pF
$C_{(I/O-I/O)}$	input/output to input/output capacitance	$V_{bias(DC)}$ = 0.5 V; f = 1 MHz; pins 1 to 2, 1 to 3, 2 to 3		-	0.5	-	pF
I_{RM}	reverse leakage current	pins 1, 2, 3 to GND; V_{RWM} = 5.5 V		-	100	1000	nA
V_{BUS} ESD protection							
V_{BR}	breakdown voltage	pin 6 (V_{BUS}) to GND; I_{test} = 1 mA					
	PUSBM5V5X4-TL			6.4	6.8	7.2	V
	PUSBM12VX4-TL			12.5	14.5	16	V
	PUSBM15VX4-TL			17	18	19	V
	PUSBM30VX4-TL			32	36	40	V
C_d	diode capacitance	$V_{bias(DC)}$ = 0.5 V; f = 1 MHz; pin 6 (V_{BUS}) to GND					
	PUSBM5V5X4-TL			-	165	220	pF
	PUSBM12VX4-TL			-	73	100	pF
	PUSBM15VX4-TL			-	60	90	pF
	PUSBM30VX4-TL			-	50	70	pF
I_{RM}	reverse leakage current	pin 6 (V_{BUS}) to GND					
	PUSBM5V5X4-TL	V_{RWM} = 5.5 V		-	200	500	nA
	PUSBM12VX4-TL	V_{RWM} = 12 V		-	1	100	nA
	PUSBM15VX4-TL	V_{RWM} = 15 V		-	1	100	nA
	PUSBM30VX4-TL	V_{RWM} = 30 V		-	1	100	nA

[1] Guaranteed by design.

7. Application information

7.1 Typical application

The devices are designed to protect USB interfaces from downstream ESD. They offer three low capacitance ESD protection channels for D–, D+ and ID and a high-voltage ESD protection channel for V_{BUS}.

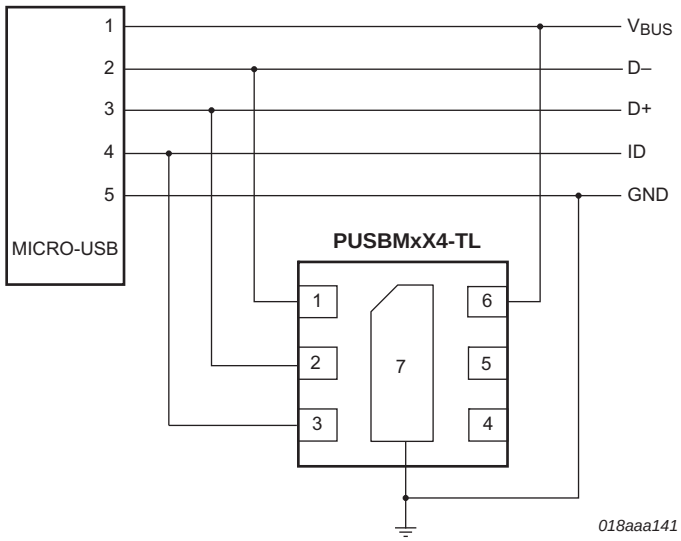


Fig 1. Application diagram (transparent package top view)

7.2 Insertion loss

The setup for measuring frequency response curves in a 50 Ω system is shown in Figure 2. The frequency response curves for the low capacitance ESD protection channels (pins 1 to 3) are depicted in Figure 3.

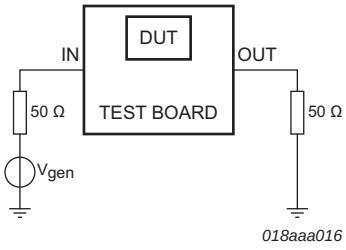
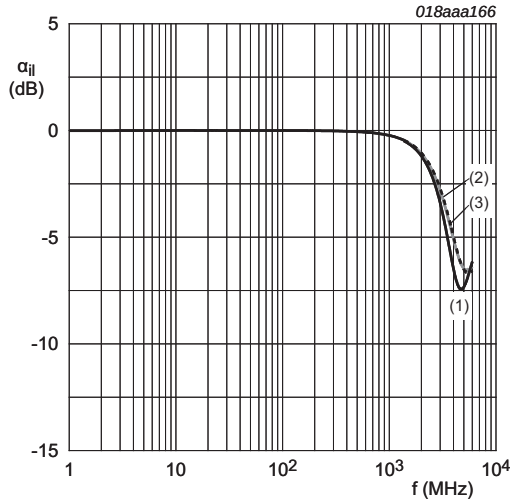


Fig 2. Frequency response setup



(1) Pin 1
(2) Pin 2
(3) Pin 3

Fig 3. Frequency response curves

8. Package outline

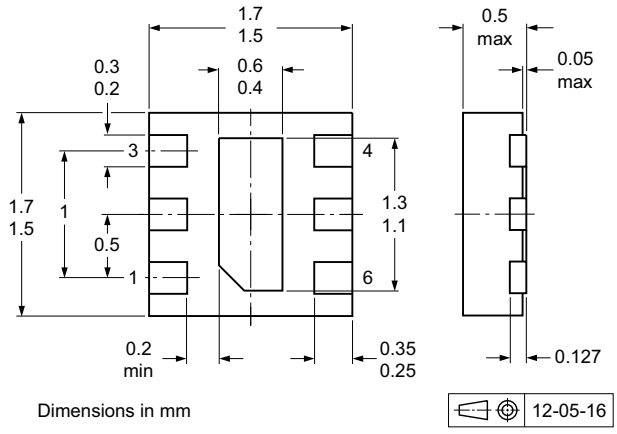
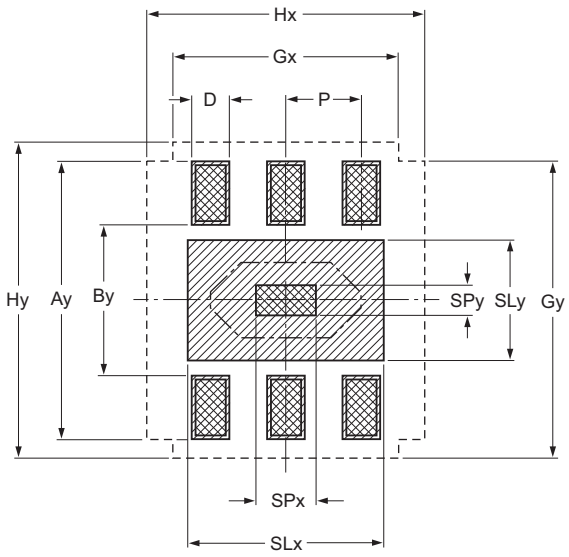


Fig 4. Package outline DFN1616-6 (SOT1189-1/XSON6)

9. Soldering

Footprint information for reflow soldering of HXSON6 package **SOT1189-1**



solder land

solder land plus solder paste

occupied area

solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	SLy	SPx	SPy	Gx	Gy	Hx	Hy
0.50	1.85	1.05	0.25	1.3	0.8	0.4	0.2	1.5	1.85	1.85	2.1

Issue date ~~11-06-27~~ 11-07-06

sot1189-1_fr

Fig 5. Reflow soldering footprint DFN1616-6 (SOT1189-1/XSON6)

10. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PUSBMXX4-TL_SER v.3	20120614	Product data sheet	-	PUSBMXX4-TL_SER v.2
Modifications:	• Section 2 “Pinning information”: simplified outline graph updated • Figure 1 updated • Figure 4 replaced by minimized package outline			
PUSBMXX4-TL_SER v.2	20120416	Preliminary data sheet	-	PUSBMXX4-TL_SER v.1
PUSBMXX4-TL_SER v.1	20111209	Preliminary data sheet	-	-

11. Legal information

11.1 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".

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13. Contents

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Document identifier: PUSBMXX4-TL_SER

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