

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 | <p>Transparent top view</p> | <p>018aaa140</p> |
| 2 | low capacitance ESD protection | | |
| 3 | low capacitance ESD protection | | |
| 4 | not connected | | |
| 5 | not connected | | |
| 6 | V_{BUS} ESD protection | | |
| 7 | ground (GND) | | |



3. Ordering information

Table 2. Ordering information

| Type number | Package | | Version |
|---------------|-----------|--|-----------|
| | Name | Description | |
| 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; [1] | - | ±8 | kV |
| P_{PP} | peak pulse power | $t_p = 8/20 \mu s$ 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 | $t_p = 8/20 \mu s$ 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 ≤ 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 |
| ΔC _(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}.

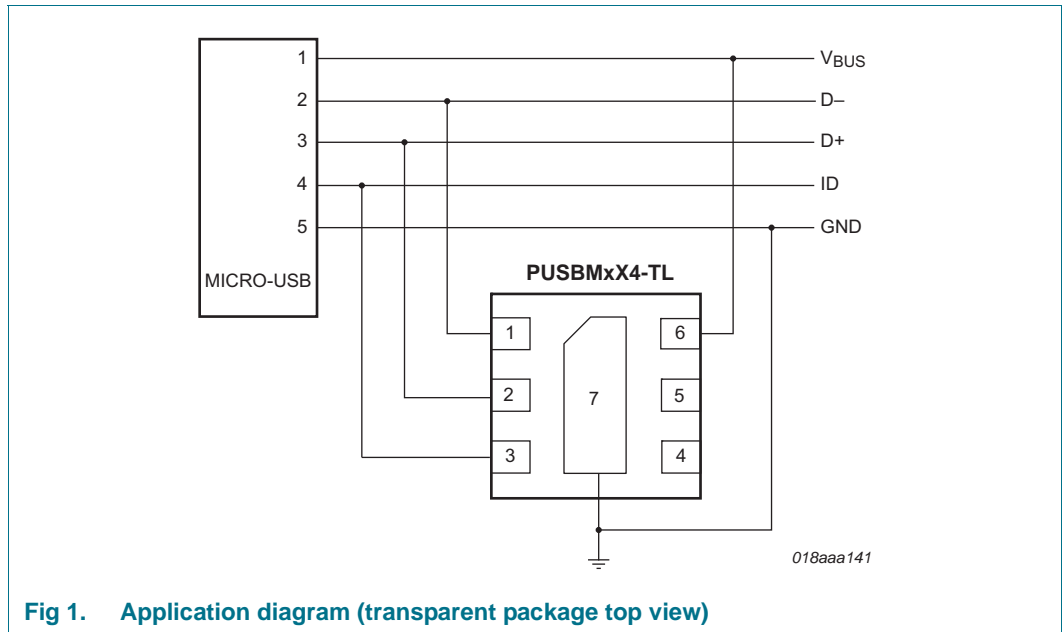
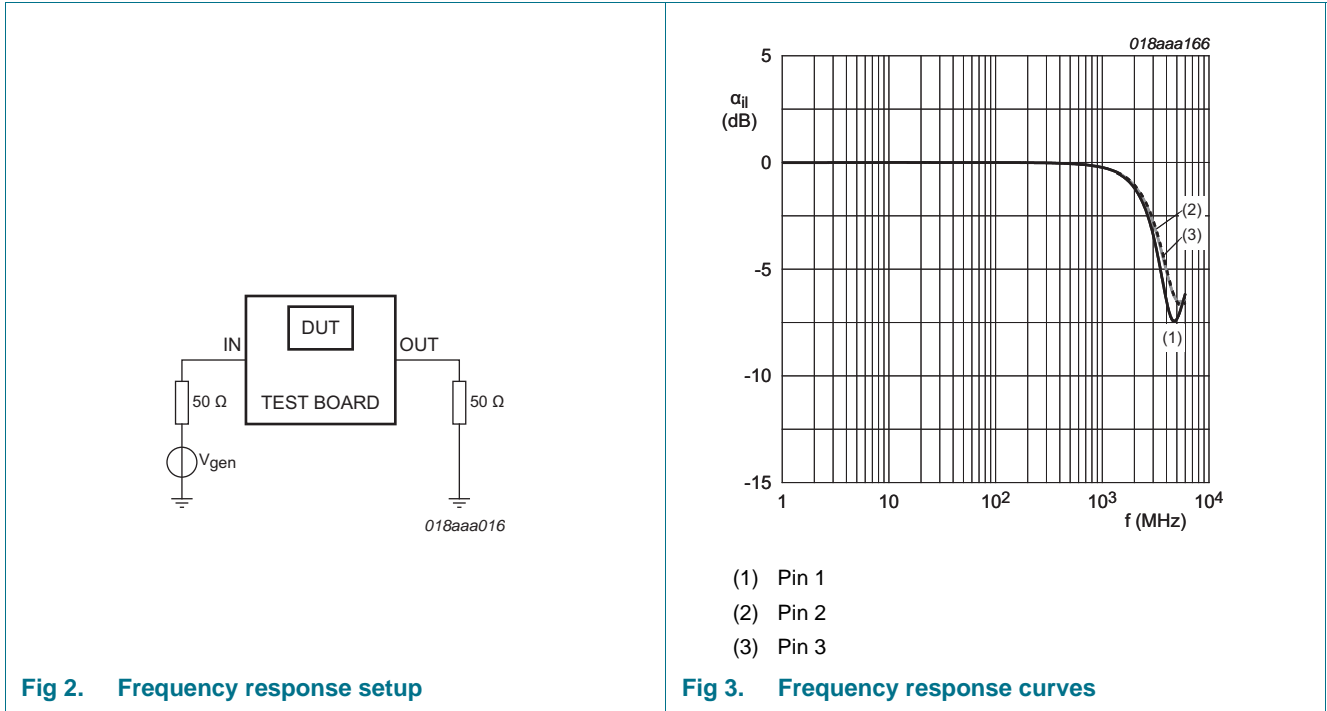


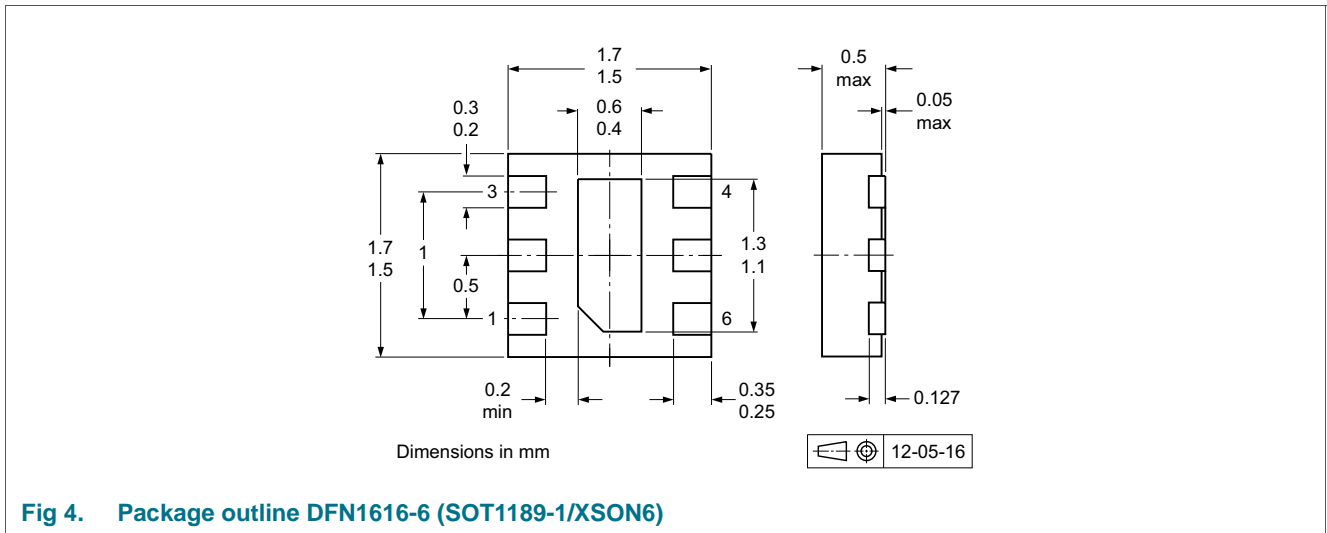
Fig 1. Application diagram (transparent package top view)

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](#).



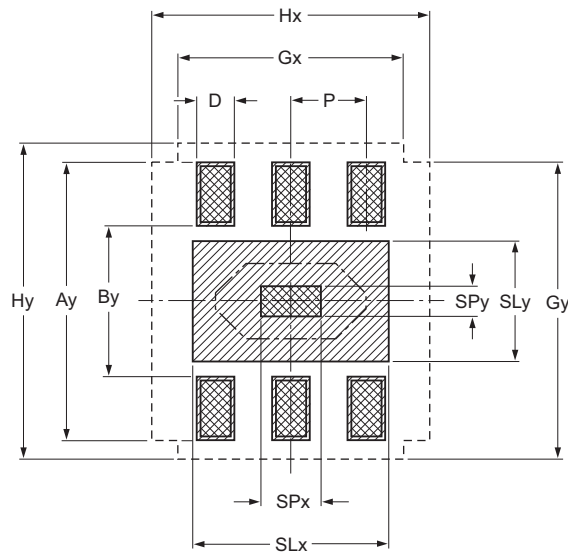
8. Package outline





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: | | | | |
| | | | <ul style="list-style-type: none">• 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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