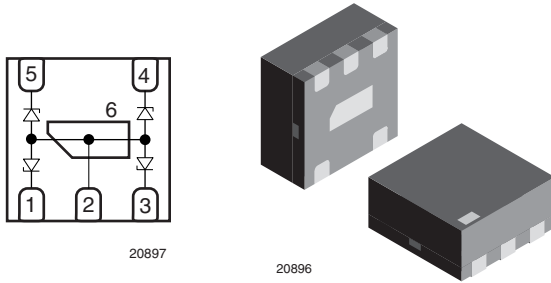
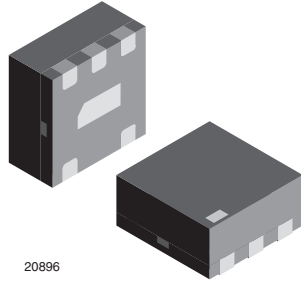


## 4-Line BUS-Port ESD Protection

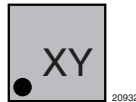


20897



20896

### MARKING (example only)



20932

Dot = pin 1 marking

X = date code

Y = type code (see table below)

### DESIGN SUPPORT TOOLS

[click logo to get started](#)

### FEATURES

- Ultra compact LLP1010-6M package
- Low package height < 0.4 mm
- 4-line USB ESD protection
- Low leakage current
- Low load capacitance  $C_D = 0.8$  pF
- ESD immunity acc. IEC 61000-4-2  
± 15 kV contact discharge  
± 15 kV air discharge
- Pin plating NiPdAu (e4) no whisker growth
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### ORDERING INFORMATION

| DEVICE NAME  | ORDERING CODE      | TAPED UNITS PER REEL<br>(8 mm TAPE ON 7" REEL) | MINIMUM ORDER QUANTITY |
|--------------|--------------------|--|------------------------|
| VBUS54DD-HS4 | VBUS54DD-HS4-G4-08 | 5000   | 5000                   |

### PACKAGE DATA

| DEVICE NAME  | PACKAGE NAME | TYPE CODE | WEIGHT  | MOLDING COMPOUND<br>FLAMMABILITY RATING | MOISTURE<br>SENSITIVITY LEVEL        | SOLDERING CONDITIONS         |
|--------------|--------------|-----------|---------|---|--------------------------------------|------------------------------|
| VBUS54DD-HS4 | LLP1010-6M   | D         | 1.07 mg | UL 94 V-0                               | MSL level 1<br>(according J-STD-020) | Peak temperature max. 260 °C |

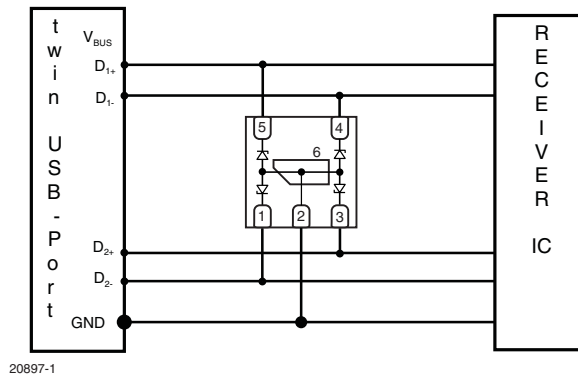
### ABSOLUTE MAXIMUM RATINGS VBUS54DD-HS4

| PARAMETER             | TEST CONDITIONS   | SYMBOL    | VALUE       | UNIT |
|-----------------------|---|-----------|-------------|------|
| Peak pulse current    | Pin 1, 3, 4 or 5 to pin 2 or 6<br>acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot | $I_{PPM}$ | 3           | A    |
| Peak pulse power      | Pin 1, 3, 4 or 5 to pin 2 or 6<br>acc. IEC 61000-4-5; $t_p = 8/20$ $\mu$ s; single shot | $P_{PP}$  | 57          | W    |
| ESD immunity          | Contact discharge acc. IEC 61000-4-2; 10 pulses   | $V_{ESD}$ | ± 15        | kV   |
|                       | Air discharge acc. IEC 61000-4-2; 10 pulses   |           | ± 15        | kV   |
| Operating temperature | Junction temperature  | $T_J$     | -40 to +125 | °C   |
| Storage temperature   |   | $T_{STG}$ | -55 to +150 | °C   |

| <b>ELECTRICAL CHARACTERISTICS VBUS54DD-HS4</b> (Pin 1, 3, 4, or 5 to pin 2 or 6)<br>( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |  |               |      |        |      |               |
|--|--|---------------|------|--------|------|---------------|
| PARAMETER  | TEST CONDITIONS/REMARKS                              | SYMBOL        | MIN. | TYP.   | MAX. | UNIT          |
| Protection paths   | Number of lines which can be protected               | $N_{channel}$ | -    | -      | 4    | lines         |
| Reverse stand-off voltage  |  | $V_{RWM}$     | -    | -      | 5.5  | V             |
| Reverse current  | at $V_{IN} = V_{RWM} = 5.5\text{ V}$                 | $I_R$         | -    | < 0.01 | 0.1  | $\mu\text{A}$ |
| Reverse breakdown voltage  | at $I_R = 1\text{ mA}$                               | $V_{BR}$      | 6.9  | 8      | 8.7  | V             |
| Reverse clamping voltage   | at $I_{PP} = 3\text{ A}$ acc. IEC 61000-4-5          | $V_C$         | -    | 16     | 19   | V             |
| Forward clamping voltage   | at $I_F = 3\text{ A}$ acc. IEC 61000-4-5             | $V_F$         | -    | 3.5    | 4.5  | V             |
| Capacitance  | $V_{IN} = 0\text{ V}$ ; any other I/O pin at 3.3 V   | $C_D$         | -    | 0.8    | 1    | pF            |
|  | $V_{IN} = 2.5\text{ V}$ ; any other I/O pin at 3.3 V |               | -    | 0.5    | 0.8  | pF            |

### APPLICATION NOTE

With the **VBUS54DD-HS4** a double, high speed USB-port or up to 4 other high speed signal or data lines can be protected against transient voltage signals. Negative transients will be clamped close below the ground level while positive transients will be clamped close above the working range. The high speed data lines,  $D_{1+}$ ,  $D_{2+}$ ,  $D_{1-}$  and  $D_{2-}$ , are connected to pin **1, 3, 4, and 5**, pin **2 or 6** are connected to ground. As long as the signal voltage on the data lines is between the ground- and the break down level, the low input capacitance of each channel offers a very high isolation to ground and to the other data lines. But as soon as any transient signal exceeds this working range, the VBUS54DD-HS4 clamps the transient to ground or to the avalanche break down voltage level.



### TYPICAL CHARACTERISTICS $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

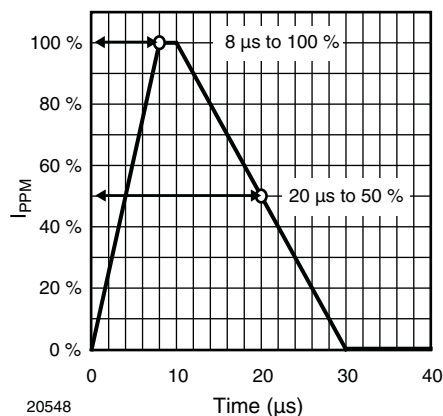


Fig. 1 - 8/20  $\mu\text{s}$  Peak Pulse Current Wave Form acc. IEC 61000-4-5

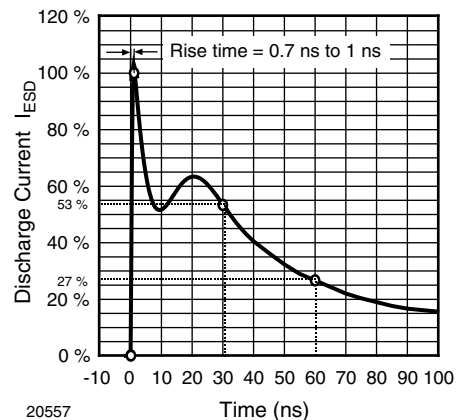


Fig. 2 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

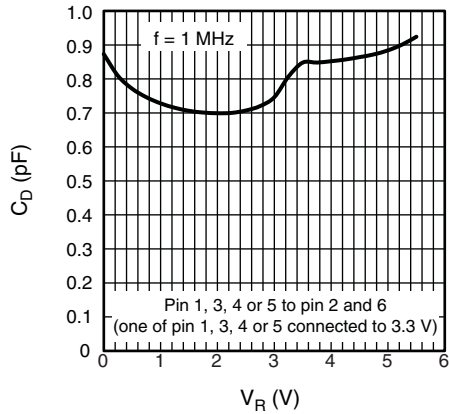


Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$

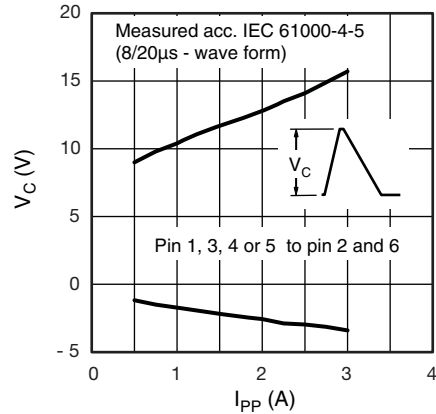


Fig. 6 - Typical Peak Clamping Voltage  $V_C$  vs. Peak Pulse Current  $I_{PP}$

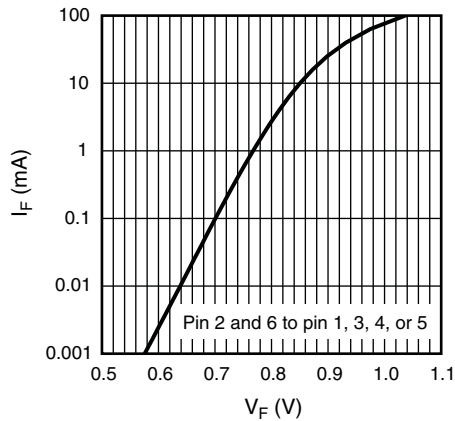


Fig. 4 - Typical Forward Current  $I_F$  vs. Forward Voltage  $V_F$

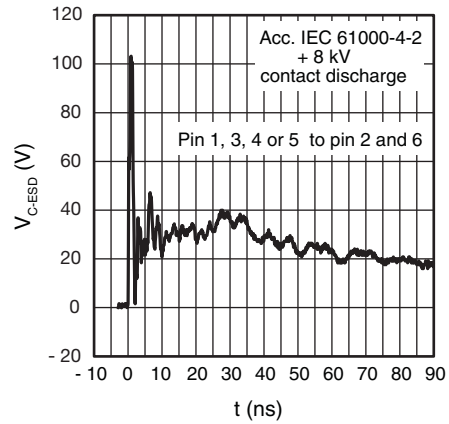


Fig. 7 - Typical Clamping Performance at +8 kV Contact Discharge (acc. IEC 61000-4-2)

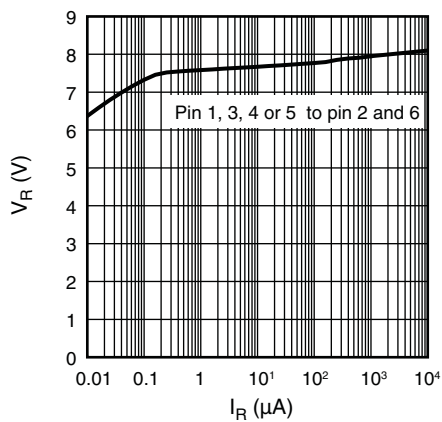


Fig. 5 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$

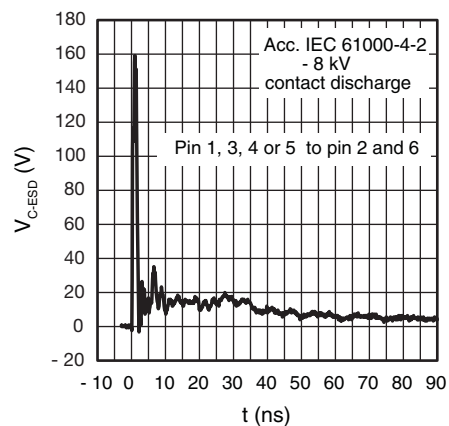
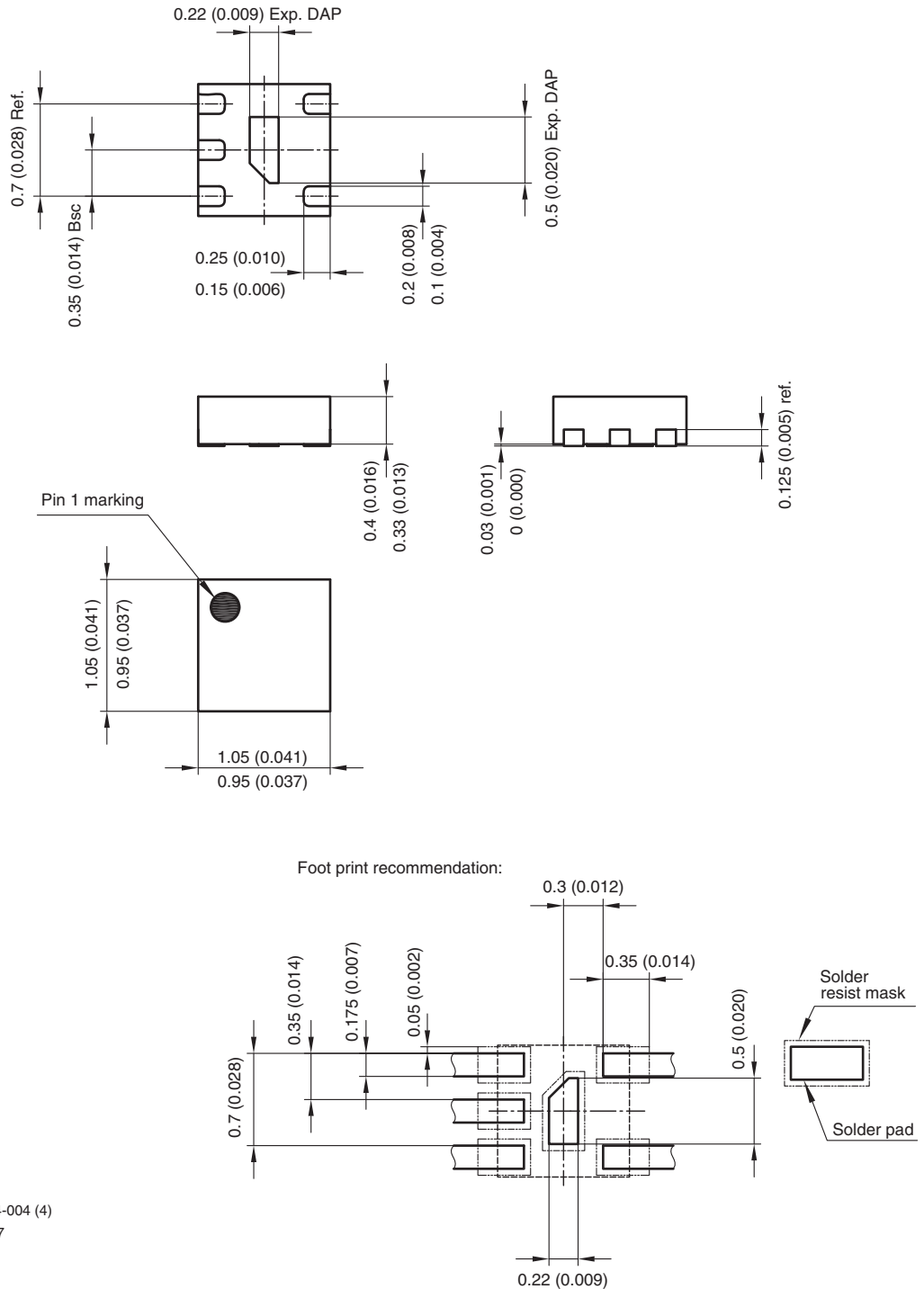


Fig. 8 - Typical Clamping Performance at -8 kV Contact Discharge (acc. IEC 61000-4-2)



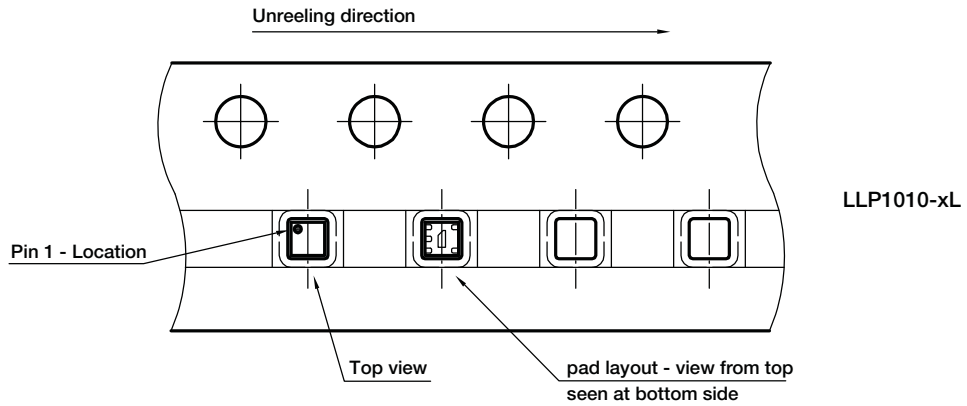
## PACKAGE DIMENSIONS in millimeters (inches): **LLP1010-6M**



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 Rev. 5 - Date: 11.May.2016  
 20899



**ORIENTATION IN CARRIER TAPE - LLP1010-xL**



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22669



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