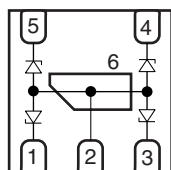
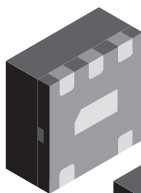


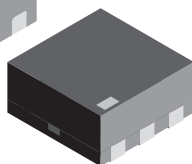
## 4-Line BUS-Port ESD Protection



20897



20896



### 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/doc299912](http://www.vishay.com/doc299912)



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

### MARKING (example only)



Dot = pin 1 marking

X = date code

Y = type code (see table below)

### DESIGN SUPPORT TOOLS

[click logo to get started](#)

**3D**  
Models  
Available

### ORDERING INFORMATION

DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (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 FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VBUS54DD-HS4	LLP1010-6M	D	1.07 mg	UL 94 V-0	MSL level 1 (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 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 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

**ELECTRICAL CHARACTERISTICS VBUS54DD-HS4** (Pin 1, 3, 4, or 5 to pin 2 or 6)

( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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.

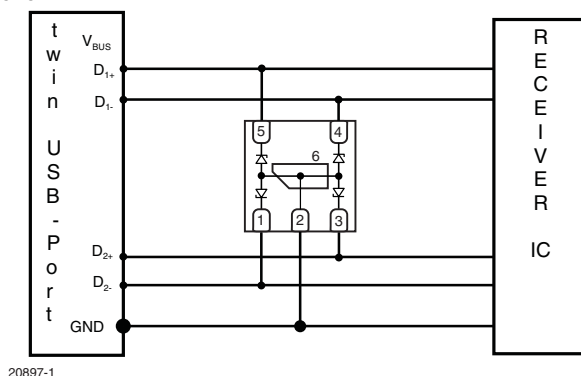
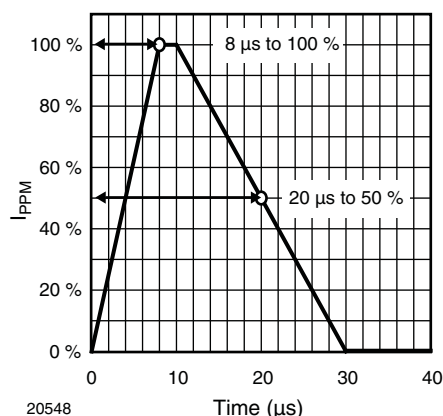

**TYPICAL CHARACTERISTICS**  $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified


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

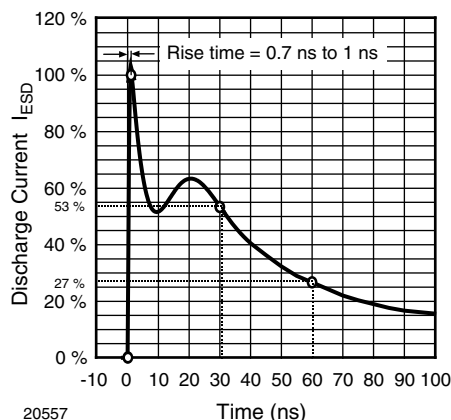


Fig. 2 - ESD Discharge Current Wave Form  
acc. IEC 61000-4-2 (330  $\Omega$ /150 pF)

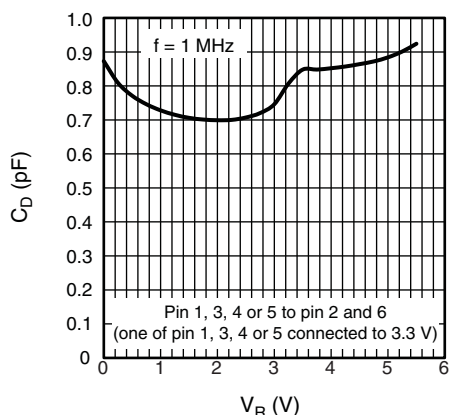
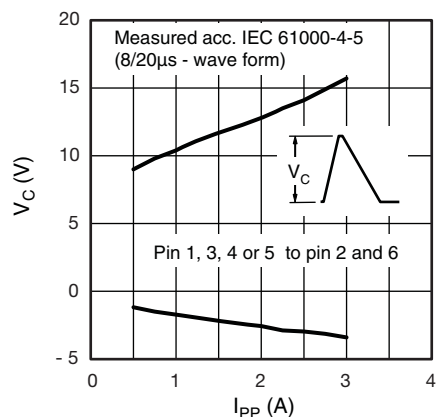
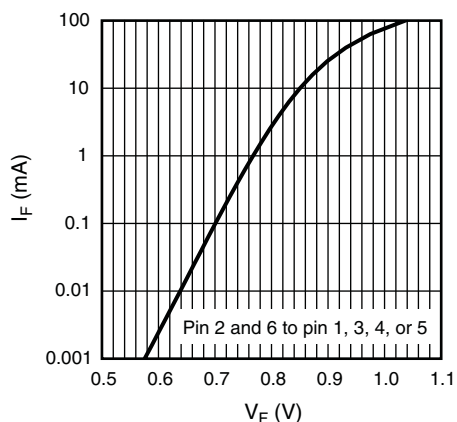
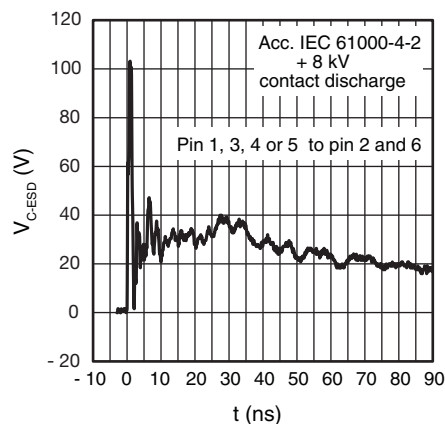

Fig. 3 - Typical Capacitance  $C_D$  vs. Reverse Voltage  $V_R$ 

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)

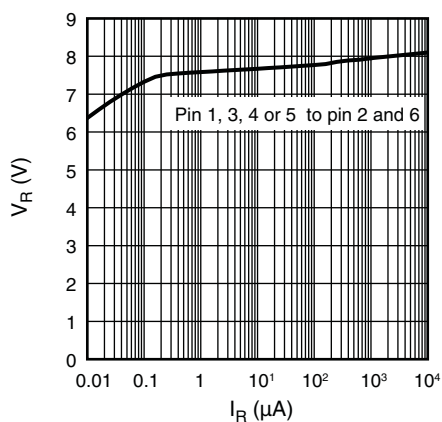
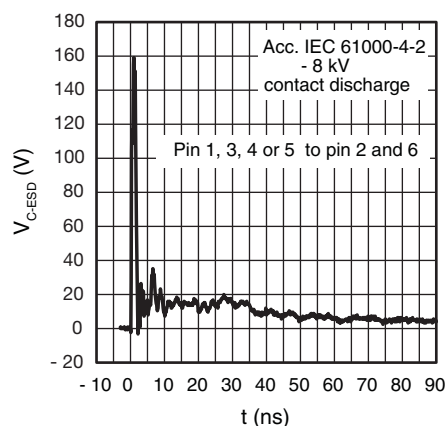
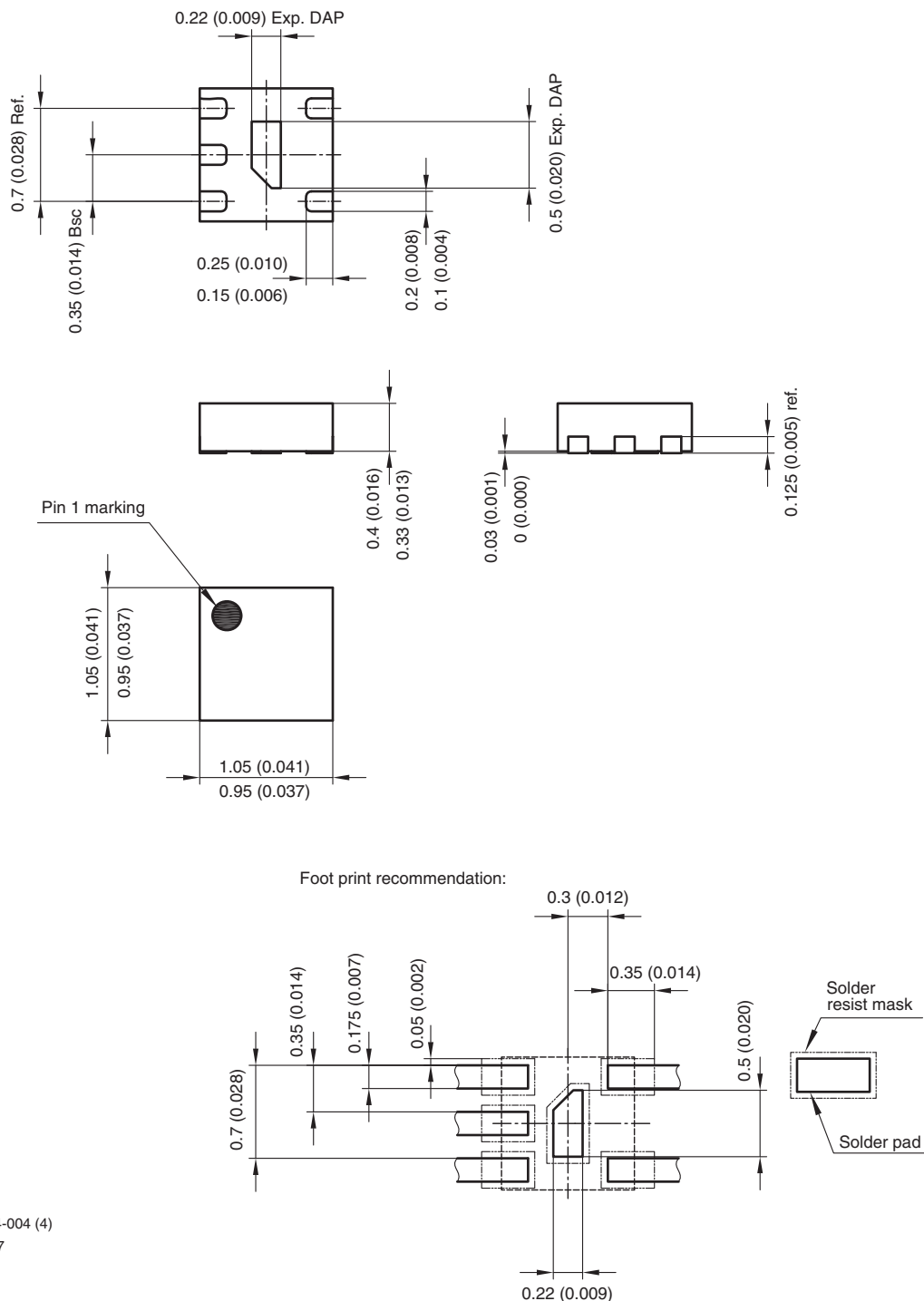

Fig. 5 - Typical Reverse Voltage  $V_R$  vs. Reverse Current  $I_R$ 


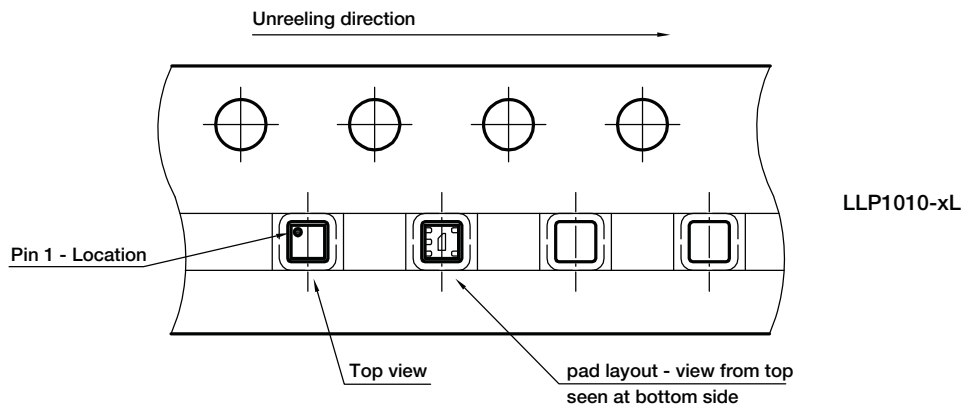
Fig. 8 - Typical Clamping Performance at -8 kV Contact Discharge (acc. IEC 61000-4-2)



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



Document no.: S8-V-3906.04-004 (4)  
Created - Date: 17.July.2007  
Rev. 5 - Date: 11.May.2016  
20899

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


Document no.: S8-V-3906.04-015 (4)

Created - Date: 11.Jun. 2008

Rev. 4 - Date: 28. Jan. 2010

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