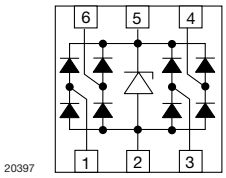
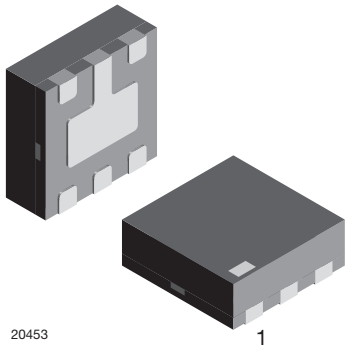
4-Line BUS-Port ESD Protection





FEATURES

- Ultra compact LLP75-6L package
- 4-line USB ESD protection
- Low leakage current
- Low load capacitance C_D = 1.2 pF
- ESD immunity acc. IEC 61000-4-2
  ± 30 kV contact discharge
  ± 30 kV air discharge
- High surge current acc. IEC 61000-4-5 I_{pp} > 11 A
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu), (no Sn)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

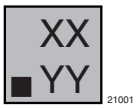
e4

RoHS COMPLIANT

HALOGEN FREE

GREEN (5-2008)

MARKING (example only)



Dot = pin 1 marking
XX = date code
YY = 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
VBUS54CV-HSF	VBUS54CV-HSF-G4-08	3000	15 000

PACKAGE DATA						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VBUS54CV-HSF	LLP75-6L	UC	4.2 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS VBUS54CV-HSF				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Pin 1, 3, 4 or 6 to pin 2 acc. IEC 61000-4-5, t_p = 8/20 µs/single shot	I_{PPM}	11	A
	Pin 5 to pin 2 acc. IEC 61000-4-5; t_p = 8/20 µs; single shot		13	
Peak pulse power	Pin 1, 3, 4 or 6 to pin 2 acc. IEC 61000-4-5, t_p = 8/20 µs/single shot	P_{PP}	242	W
	Pin 5 to pin 2 acc. IEC 61000-4-5; t_p = 8/20 µs; single shot		246	
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		± 30	
Operating temperature	Junction temperature	T_J	-40 to +125	°C
Storage temperature		T_{STG}	-40 to +150	°C

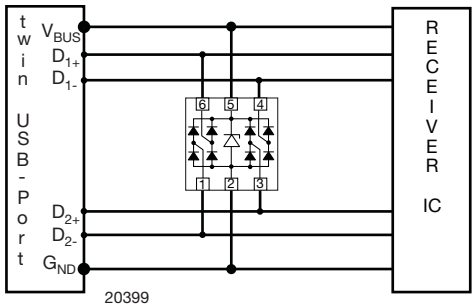
For technical questions, contact: ESDprotection@vishay.com

ELECTRICAL CHARACTERISTICS VBUS54CV-HSF (pin 1, 3, 4, or 6 to pin 2) (T_{amb} = 25 °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	Max. reverse working voltage	V_{RWM}	-	-	5.5	V
Reverse voltage	at I_R = 0.1 µA	V_R	5.5	-	-	V
Reverse current	at V_{RWM} = 5.5 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	7	7.9	8.6	V
Reverse clamping voltage	at I_{PP} = 11 A	V_C	-	18	22	V
Forward clamping voltage	at I_{PP} =11 A	V_F	-	6.5	8	V
Capacitance	V_R (at I/O pin) = 0 V V_R (at pin 5) = 5 V; f = 1 MHz	C_D	-	1.2	2.5	pF
Line symmetry	Difference of the line capacitances	dC_D	-	-	0.2	pF

ELECTRICAL CHARACTERISTICS (pin 5 to pin 2) (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITIONS/REMARKS**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Reverse stand-off voltage	Max. reverse working voltage	V_{RWM}	-	-	5.5	V
Reverse voltage	at I_R = 0.1 µA; pin 2 to pin 1	V_R	5.5	-	-	V
Reverse current	at V_{RWM} = 5.5 V	I_R	-	0.01	0.1	µA
Reverse breakdown voltage	at I_R = 1 mA	V_{BR}	6.3	7.1	8	V
Reverse clamping voltage	at I_{PP} = 13 A	V_C	-	18	22	V
Forward clamping voltage	at I_{PP} =13 A	V_F	-	-	7	V
Capacitance	V_R (at pin 5) = 0 V; f = 1 MHz	C_D	-	190	-	pF

APPLICATION NOTE

With the VBUS54CV-HSF a double, high speed USB-port 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. An avalanche diode clamps the supply line (V_{BUS} at pin 5) to ground (pin 2). The high speed data lines, D_{1+}, D_{2+}, D_{1-} and D_{2-}, are connected to pin 1, 3, 4 and 6. As long as the signal voltage on the data lines is between the ground- and the V_{BUS} -level, the low capacitance PN-diodes offer a very high isolation to V_{BUS}, ground and to the other data lines. But as soon as any transient signal exceeds this working range, one of the PN-diodes gets in the forward mode and clamps the transient to ground or the avalanche break through voltage level.



TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

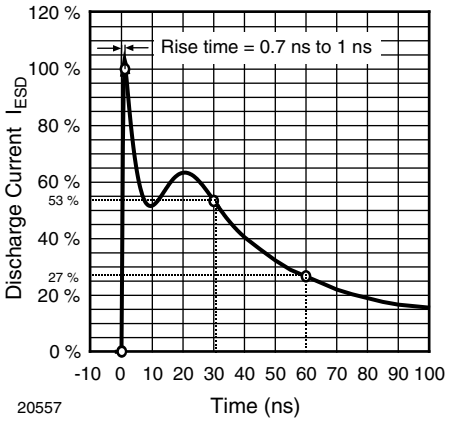


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

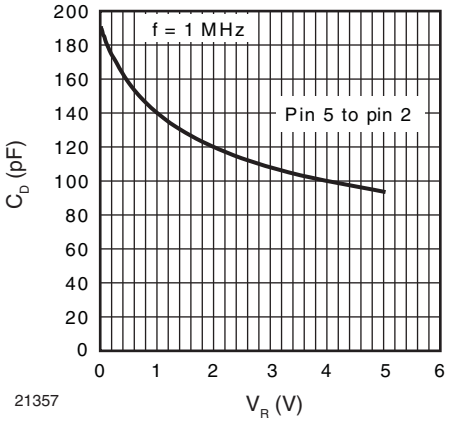


Fig. 4 - Typical Capacitance C_D vs. Reverse Voltage V_R

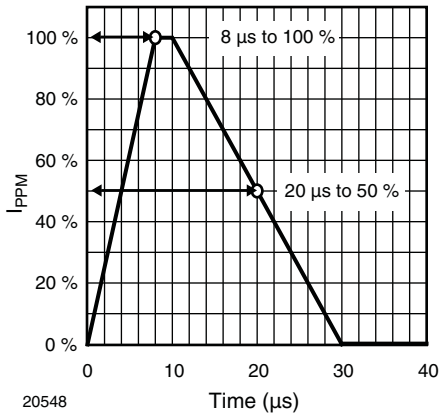


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form acc. IEC 61000-4-5

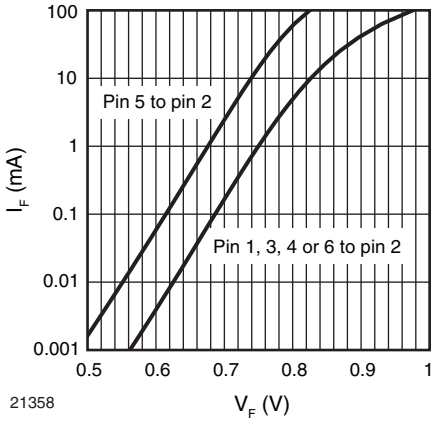


Fig. 5 - Typical Forward Current I_F vs. Forward current I_R

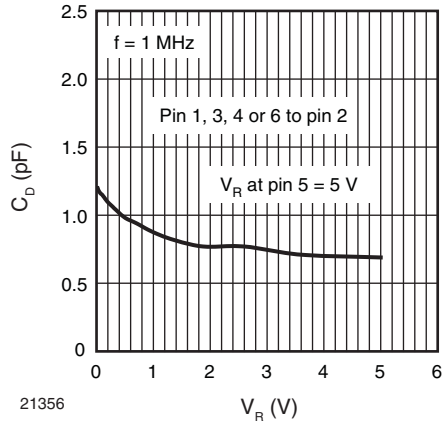


Fig. 3 - Typical Capacitance C_D vs. Reverse Voltage V_R

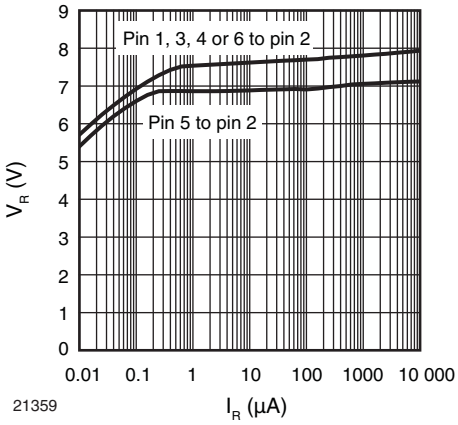


Fig. 6 - Typical Reverse Voltage V_R vs. Reverse Current I_R

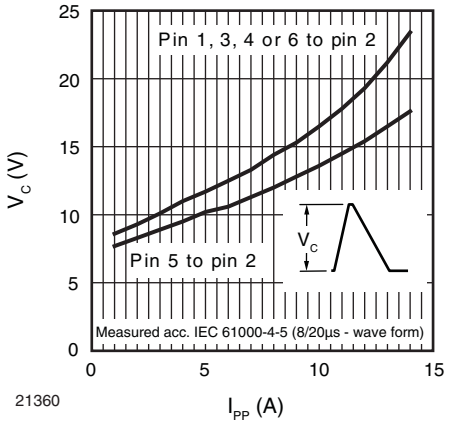


Fig. 7 - Typical Peak Clamping Voltage vs. Peak Pulse Current I_{PP}

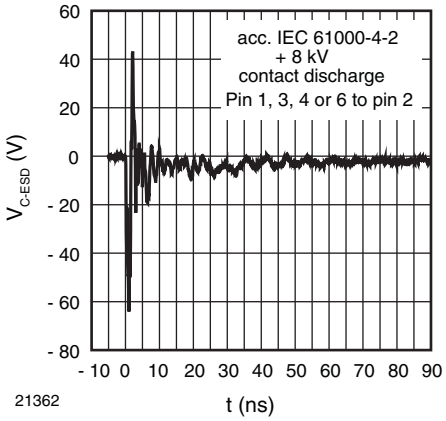


Fig. 9 - Typical Clamping Performance at 8 kV Contact Discharge (acc. IEC 61000-4-2)

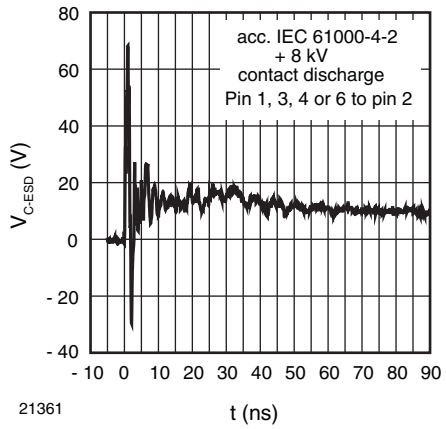


Fig. 8 - Typical Clamping Performance at 8 kV Contact Discharge (acc. IEC 61000-4-2)

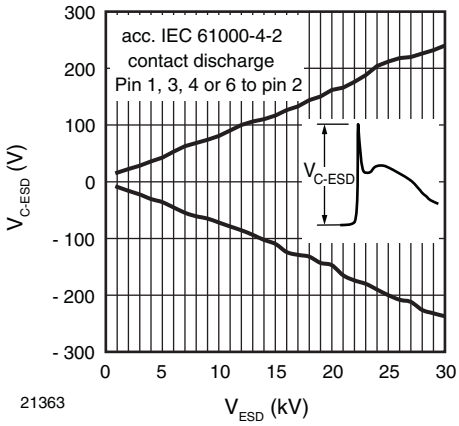
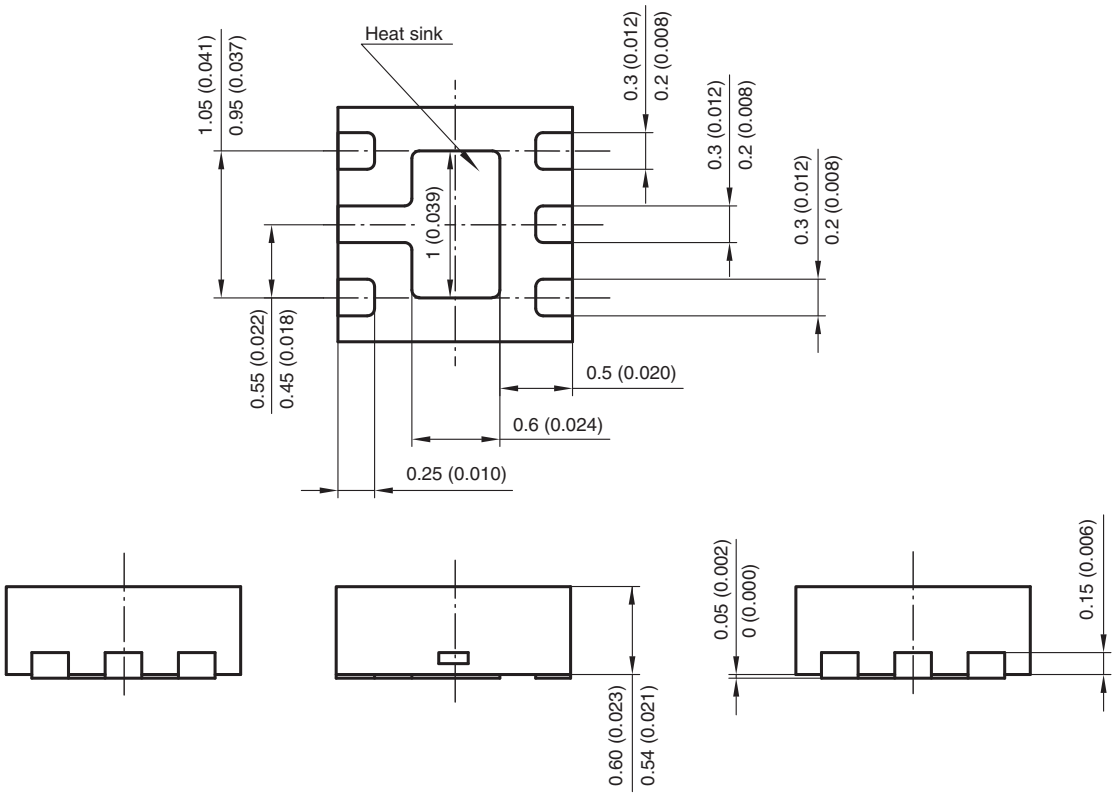
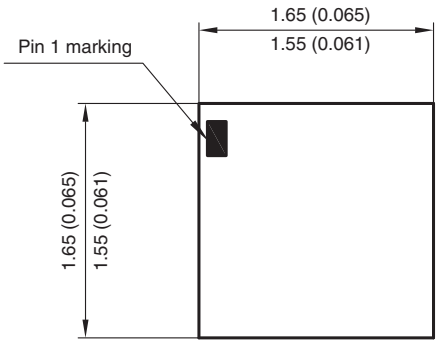


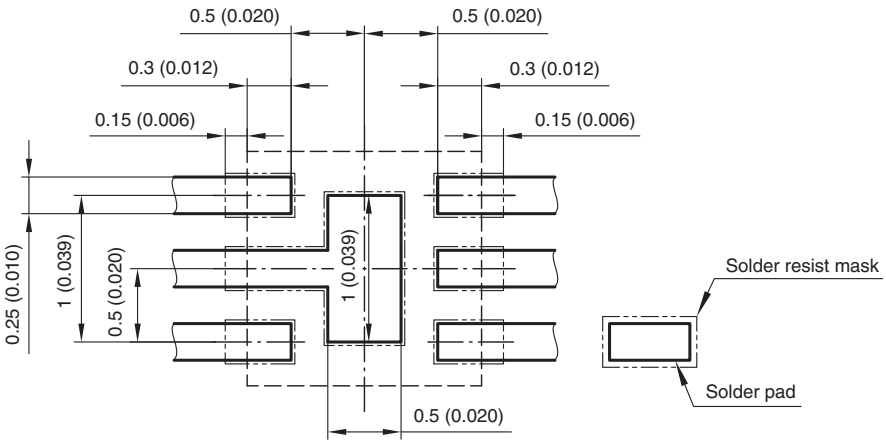
Fig. 10 - Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

PACKAGE DIMENSIONS in millimeters (inches): **LLP75-6L**





Foot print recommendation:



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Rev. 4 - Date: 21. March 2006
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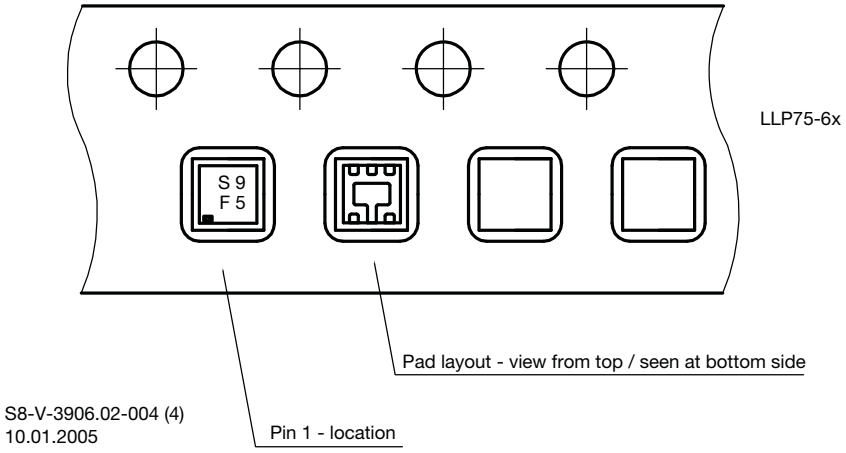

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