4-Line BUS-Port ESD-Protection

Features

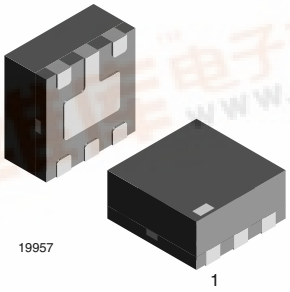
- Ultra compact LLP75-6A package
- 4-line USB ESD-protection
- Low leakage current
- Low load capacitance C_D = 1.2 pF
- ESD-protection acc. IEC 61000-4-2
  ± 30 kV contact discharge
  ± 30 kV air discharge
- High surge current acc. IEC61000-4-5 I_{PP} > 11 A
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

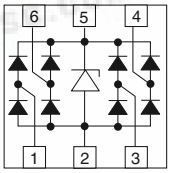
Pb-free

e3

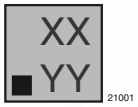
RoHS COMPLIANT

GREEN (5-2008)*





Marking (example only)



Dot = Pin 1 marking
XX = Date code
YY = Type code (see table below)

Ordering Information

Device name	Ordering code	Taped units per reel (8 mm tape on 7" reel)	Minimum order quantity
VBUS054CV-HS3	VBUS054CV-HS3-GS08	3000	15000

Package Data

Device name	Package name	Marking code	Weight	Molding compound flammability rating	Moisture sensitivity level	Soldering conditions
VBUS054CV-HS3	LLP75-6A	U8	5.1 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

Absolute Maximum Ratings

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	I_{PPM}	13	A
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	P_{PP}	246	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 30	kV
Operating temperature	Junction temperature	T_J	- 40 to + 125	°C
Storage temperature		T_{STG}	- 40 to + 150	°C

* Please see document "Vishay Green and Halogen-Free Definitions (5-2008)" http://www.vishay.com/doc?99902

Electrical Characteristics

Ratings at 25 °C, ambient temperature unless otherwise specified

VBUS054CV-HS3

Date line: pin 1 , 3, 4 or 6 to pin 2

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Protection paths	Number of line which can be protected	N_{lines}			4	lines
Reverse working voltage	at I_R = 0.1 µA	V_{RWM}	5			V
Reverse current	at $V_{IN} = V_{RWM}$ = 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; acc. IEC 61000-4-5	V_C		18	22	V
Forward clamping voltage	at I_F = 11 A; acc. IEC 61000-4-5	V_F		6.5	8	V
Data line 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

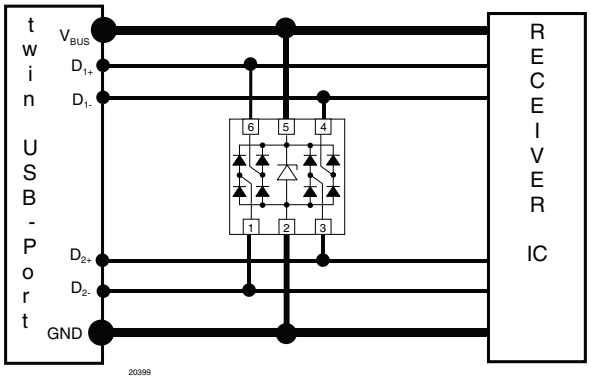
VBUS054CV-HS3

V_{BUS}-line: pin 5 to pin 2

Parameter	Test conditions/remarks	Symbol	Min.	Typ.	Max.	Unit
Reverse working voltage	at I_R = 0.1 µA	V_{RWM}	5	6.6		V
Reverse current	at $V_{IN} = V_{RWM}$ = 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} = 13 A; acc. IEC 61000-4-5	V_C		18	22	V
Forward clamping voltage	at I_F = 13 A; acc. IEC 61000-4-5	V_F			7	V
Line capacitance	V_R (at pin 5) = 0 V; f = 1 MHz	C_D		190		pF

Application Note

With the VBUS054CV-HS3 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 5 V working range. An avalanche diode clamps the supply line (V_{BUS} at pin 5) to ground (pin 2). The high speed data lines, D1+, D2+, D1- and D2- , 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

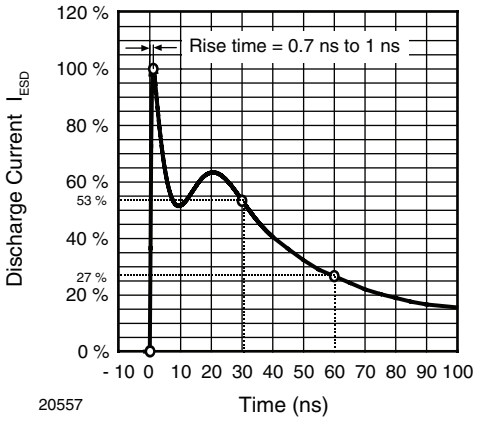


Figure 1. ESD Discharge Current Wave Form
acc. IEC 61000-4-2 (330 Ω/150 pF)

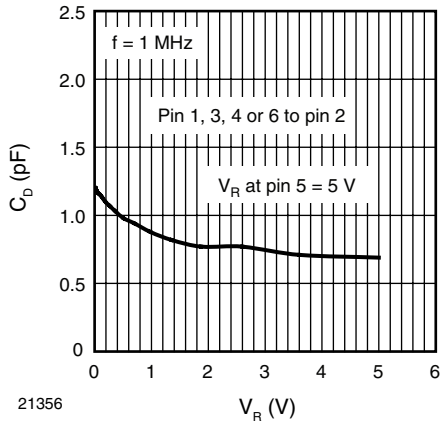


Figure 3. Typical Capacitance C_D vs. Reverse Voltage V_R

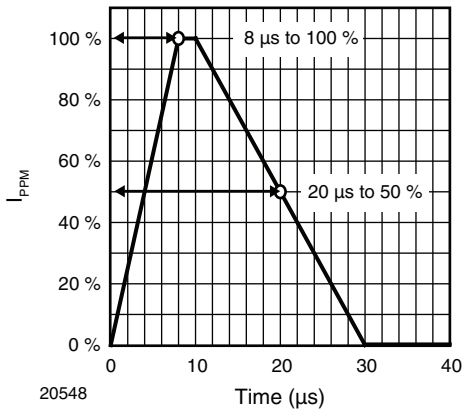


Figure 2. 8/20 µs Peak Pulse Current Wave Form
acc. IEC 61000-4-5

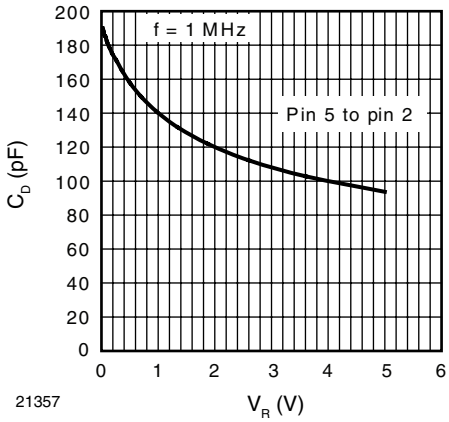


Figure 4. Typical Capacitance C_D vs. Reverse Voltage V_R

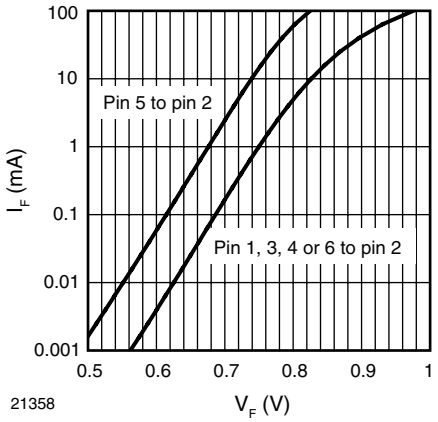


Figure 5. Typical Forward Current I_F vs. Forward Voltage V_F

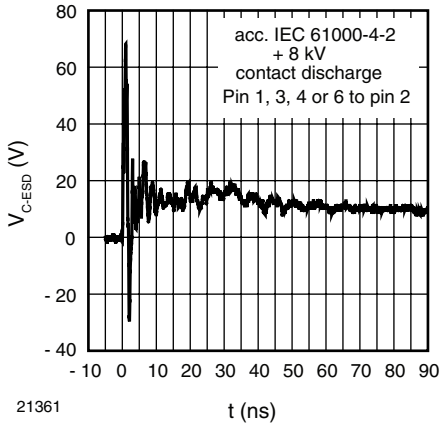


Figure 8. Typical Clamping Performance at + 8 kV Contact Discharge (acc. IEC 61000-4-2)

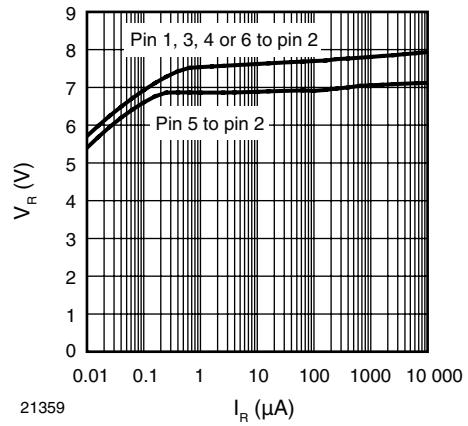


Figure 6. Typical Reverse Voltage V_R vs. Reverse Current I_R

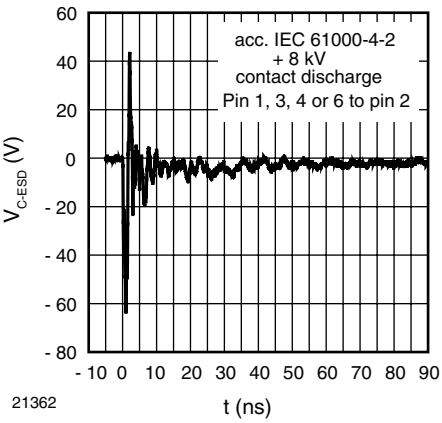


Figure 9. Typical Clamping performance at - 8 kV Contact Discharge (acc. IEC 61000-4-2)

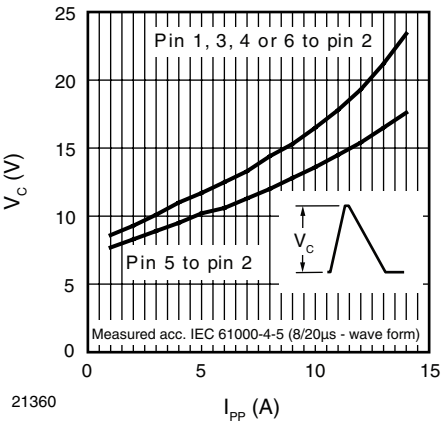


Figure 7. Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

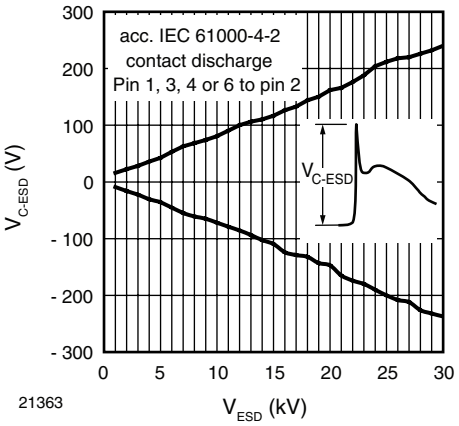
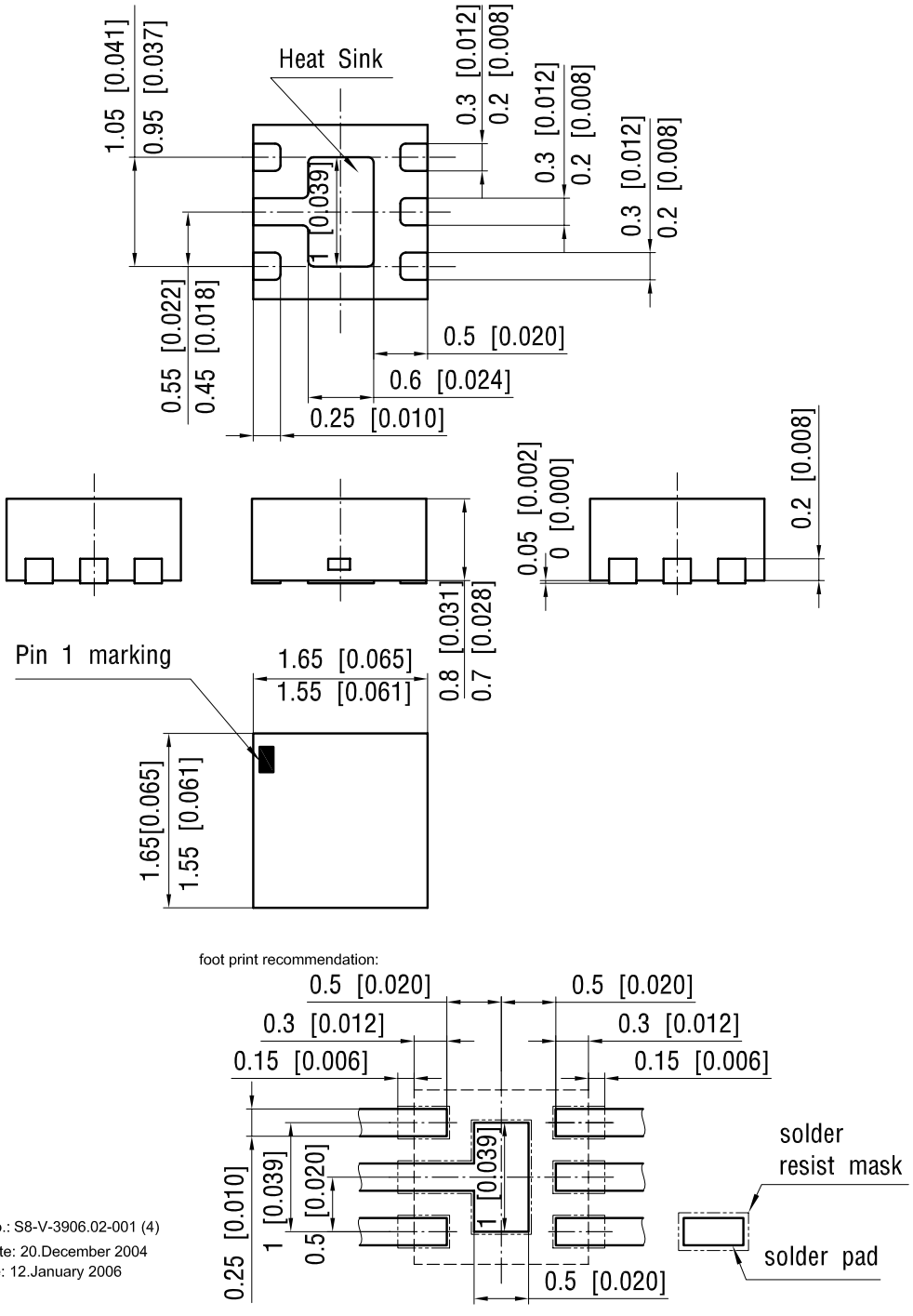


Figure 10. Typical Peak Clamping Voltage at ESD Contact Discharge (acc. IEC 61000-4-2)

Package Dimensions in millimeters (inches): LLP75-6A



foot print recommendation:

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18058

Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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