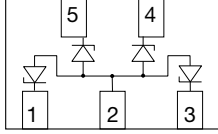
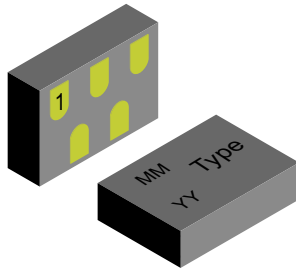


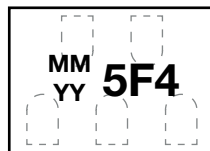
4-Line BUS-Port ESD Protection Array - Flow Through Design



22736



MARKING



Pin 1

22738

5F4 = type code
 MM = date code month
 YY = date code year

DESIGN SUPPORT TOOLS click logo to get started



FEATURES

- Compact chip level page CLP1007-5L
- Length = 1 mm; width = 0.7 mm; height = 0.27 mm
- 4-lines, unidirectional ESD protection array
- Low leakage current $I_R < 0.1 \mu A$
- Low capacitance at $V_R = 0 V = 0.9 pF$ (typ.)
- Ideal for high speed data line like
 - HDMI, DisplayPort, eSATA
 - USB, 1394/firewire
 - Thunderbolt
- ESD immunity acc. IEC 61000-4-2
 - $\pm 15 kV$ contact discharge
 - $\pm 15 kV$ air discharge
- e4 - precious metal (e.g. Ag, Au, NiPd, NiPdAu) (no Sn)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



ORDERING INFORMATION			
DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL (8 mm TAPE ON 7" REEL)	MINIMUM ORDER QUANTITY
VBUS54FD-SD1	VBUS54FD-SD1-G4-08	10 000	10 000

PACKAGE DATA					
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VBUS54FD-SD1	CLP1007-5L	5F4	0.1 mg	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot	I_{PPM}	3	A
Peak pulse power	Acc. IEC 61000-4-5; $t_p = 8/20 \mu s$; single shot	P_{PP}	45	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	
Operating temperature	Junction temperature	T_J	-40 to +125	$^\circ\text{C}$
Storage temperature		T_{STG}	-55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS (pin 1, 3, 4 or 5 to pin 2) ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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	Max. reverse working voltage	V_{RWM}	-	-	5.5	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	V_R	5.5	-	-	V
Reverse current	at $V_{RWM} = 5.5\text{ V}$	I_R	-	< 1 nA	0.1	μA
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	V_{BR}	6.9	7.5	8.7	V
Reverse clamping voltage	at $I_{PP} = 1\text{ A}$	V_C	-	9.5	11	V
	at $I_{PP} = I_{PPM} = 3\text{ A}$	V_C	-	12.9	15	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$	V_F	-	1.8	2.2	V
	at $I_{PP} = 3\text{ A}$	V_F	-	3	4	V
Capacitance	at $V_R = 0\text{ V}$; $f = 1\text{ MHz}$	C_D	-	0.9	1	pF
	at $V_R = 3.3\text{ V}$; $f = 1\text{ MHz}$		-	0.9	1	pF
Clamping voltage	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$, $I_{TLP} = 8\text{ A}$	V_{C-TLP}	-	18	-	V
Clamping voltage	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$, $I_{TLP} = 16\text{ A}$	V_{C-TLP}	-	24	-	V
Dynamic resistance	Transmission Line Pulse (TLP); $t_p = 100\text{ ns}$	V_{C-TLP}	-	0.93	-	Ω

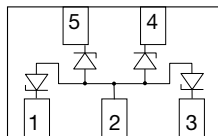
APPLICATION NOTE

The **VBUS54FD-SD1** is a four-line ESD protection device with the characteristic of a Z-diode with a high ESD immunity and a very low capacitance which makes it usable for high frequency applications like USB 2.0, USB 3.0 or HDMI.

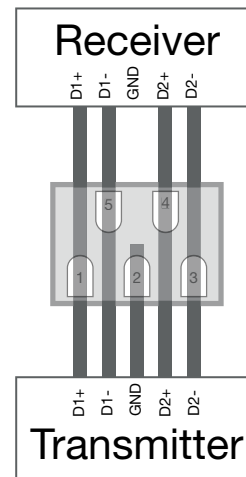
With the **VBUS54FD-SD1** four high speed data lines can be protected against transient voltage signals like ESD (electro static discharge). Connected to the data line (pin 1, 3 and pin 4, 5) and to ground (pin 2) negative transients will be clamped close below the ground level while positive transients will be clamped close above the 5.5 V working range. The clamping behavior of the **VBUS54FD-SD1** is bidirectional but asymmetrical (**BiAs**) and so it offers the best protection for applications running up to 5.5 V.

Pin configuration:

- Pin 2 is the central ground pin and has to be connected to ground
- Pin 1, 3 and 4, 5 are the inputs for the data lines D_{1+} and D_{1-} and D_{2+} and D_{2-} .



22736



22737

FLOW THROUGH DESIGN

Modern digital transmission lines can be clocked up to 480 Mbit/s (USB 2.0) or 1.65 Gbit/s (HDMI).

At such high data rates the transmission lines like cables or the line traces on the PCBs have to be very homogeneous regarding their surge impedance. This requires well defined trace dimensions as trace width and distance which have to be calculated depending on the requested surge impedance (e.g. 50 Ω) and the PCB material and layer dimensions. Any device connected to the data lines - like ESD protection devices - have to be connected with minimal changes in these trace dimensions and distances.

With the package in the so called "Flow Through Design" this is possible. The lines are running straight along the PCB while the **VBUS54FD-SD1** is placed on top without any vias or loops.



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

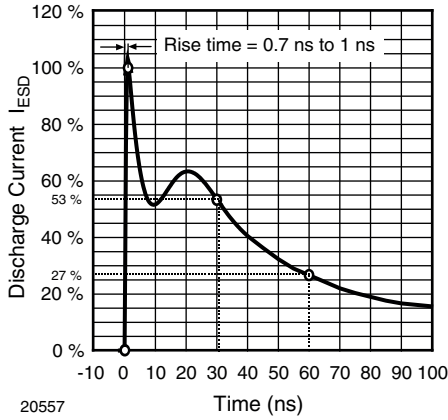


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω/150 pF)

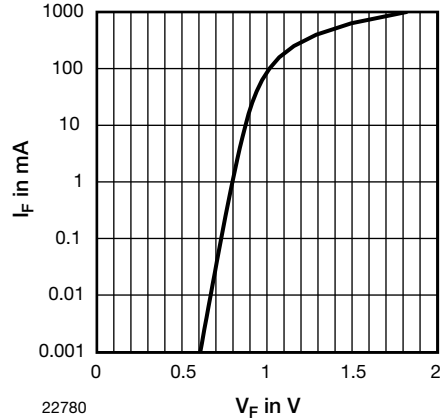


Fig. 4 - Typical Forward Current I_F vs. Forward Voltage V_F

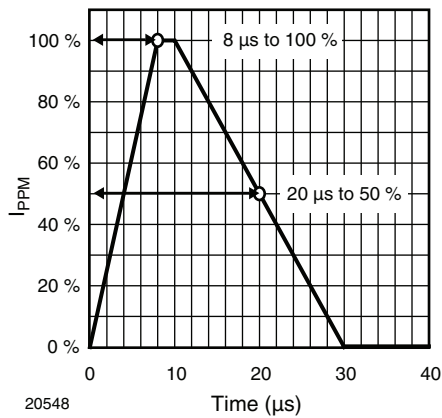


Fig. 2 - 8/20 μs Peak Pulse Current Wave Form acc. IEC 61000-4-5

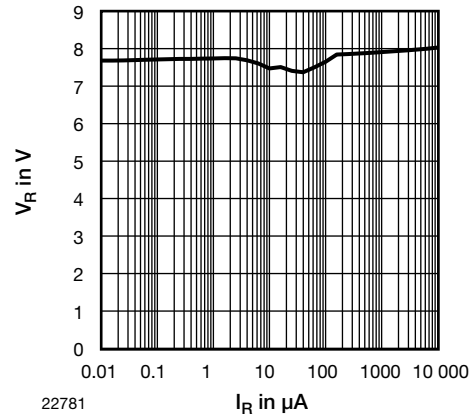


Fig. 5 - Typical Reverse Voltage V_R vs. Reverse Current I_R

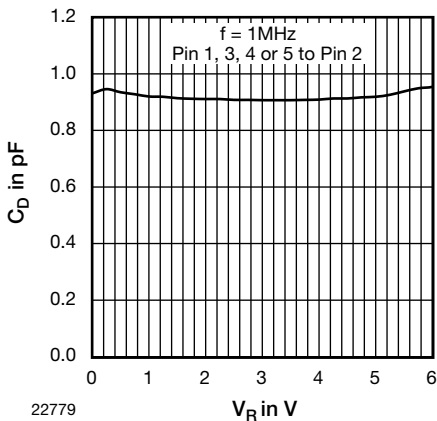


Fig. 3 - Typical Capacitance C_D vs. Reverse Voltage V_R

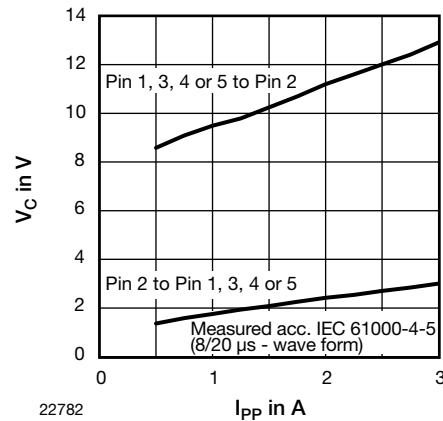


Fig. 6 - Typical Peak Clamping Voltage V_C vs. Peak Pulse Current I_{PP}

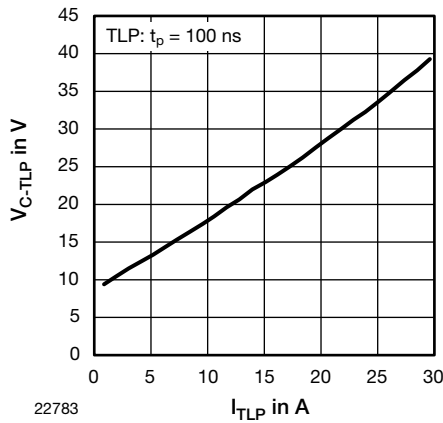
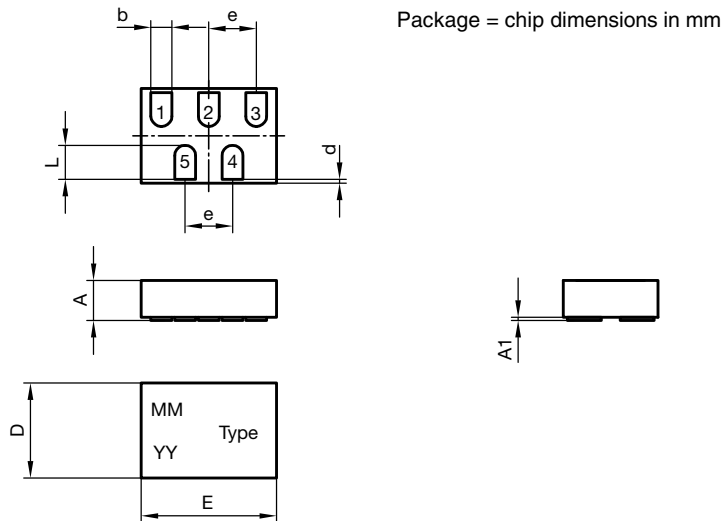


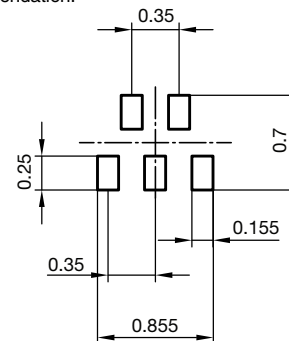
Fig. 7 - Typical Clamping Performance at 100 ns Transmission Line Pulse (TLP)

PACKAGE DIMENSIONS in millimeters: **CLP1007-5L**



	Millimeters	
	min.	max.
A	0.25	0.29
A1	-	0.02
b	0.13	0.15
D	0.68	0.73
E	0.98	1.03
e	0.35	
L	0.23	0.27
Radius	0.075	
e	0.03	

foot print recommendation:

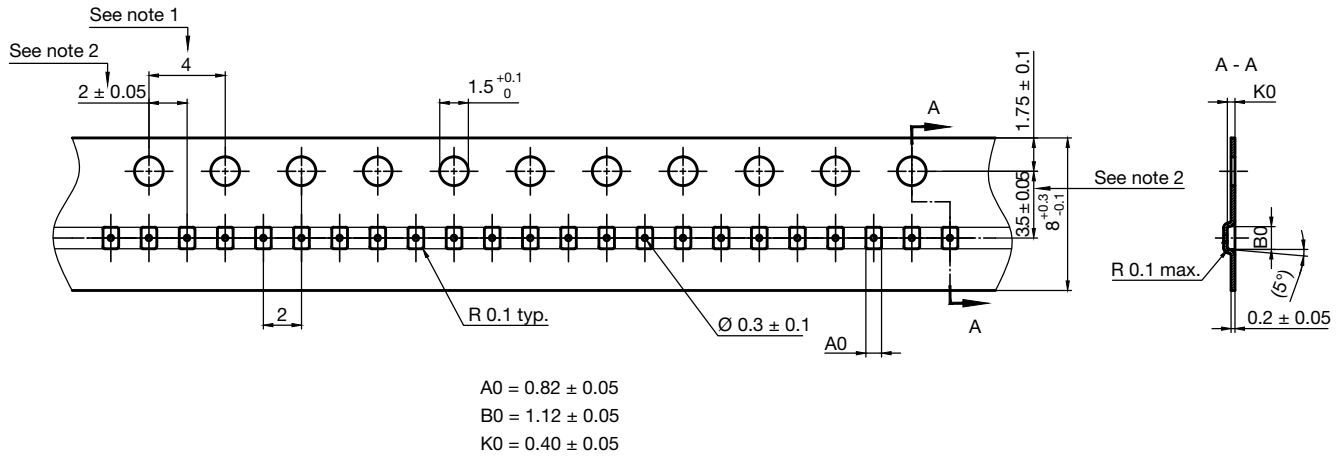


Document no.:S8-V-3906.04-041 (4)
Created - Date: 11. August 2015
22857

Footprint and soldering recommendation:
please see Application Note: www.vishay.com/doc?85917



CARRIER TAPE in millimeters: **CLP1007-5L**



Notes:

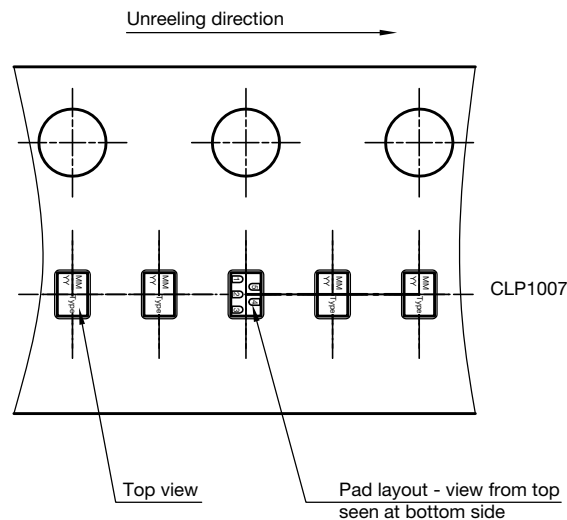
1. 10 Sprocket hole pitch cumulative tolerance ± 0.2
2. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole
3. A0 and B0 are calculated on a plane at a distance "R" above the bottom of the pocket

Document no.: S8-V-3906.04-042 (3)

Created - Date: 23. November 2015

22858

ORIENTATION IN CARRIER TAPE: CLP1007-5L



Document no.: S8-V-3906.04-043 (4)

Created - Date: 17. August 2015

22859



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.