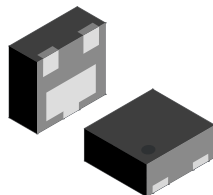
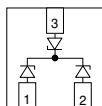


2-Line Low Capacitance, Bidirectional and Symmetrical (BiSy) ESD Protection Diode



DFN1110-3A

MARKING (example only)



Dot = pin marking

X = date code

Y = type code (see table below)

FEATURES

- Small DFN1110-3A
- 2-line ESD protection
- Working range ± 5.5 V
- Low leakage current $I_R < 0.05$ μ A
- Low load capacitance $C_D < 0.45$ pF
- ESD immunity acc. IEC 61000-4-2
 ± 20 kV contact discharge
 ± 20 kV air discharge
- ESD capability according to AEC-Q101:
human body model: class H3B: > 8 kV
- e3 - pins side wall plated with tin (Sn)
- AOI capable
- AEC-Q101 qualified available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



LINKS TO ADDITIONAL RESOURCES



3D Models



Models



Application Notes

ORDERING INFORMATION					
PART NUMBER (EXAMPLE)	ENVIRONMENTAL AND QUALITY CODE			PACKAGING CODE	ORDERING CODE (EXAMPLE)
	AEC-Q101 QUALIFIED	RoHS-COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	TIN PLATED	10K PER 7" REEL (8 mm TAPE) 10K/BOX = MOQ	
		GREEN			
VBUS05M2-HT5	-	G	3	-08	VBUS05M2-HT5-G3-08
VBUS05M2-HT5	H	G	3	-08	VBUS05M2-HT5HG3-08

PACKAGE DATA						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VBUS05M2-HT5	DFN1110-3A	M	1.43 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5; $t_p = 8/20$ μ s; single shot	I_{PPM}	3.4	A
Peak pulse power	Acc. IEC 61000-4-5; $t_p = 8/20$ μ s; single shot	P_{PP}	60	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V_{ESD}	± 20	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		± 20	
Operating temperature	Junction temperature	T_J	-55 to +150	°C
Storage temperature		T_{STG}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS (pin 1 or pin 2 to pin 3; in both directions)
($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	TEST CONDITIONS/REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	2	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	-	< 0.001	0.1	μA
Reverse breakdown voltage	At $I_R = 1\text{ mA}$	V_{BR}	7.5	8.5	9.5	V
Reverse clamping voltage	At $I_{PP} = 1\text{ A}$	V_C	-	11	13	V
	At $I_{PP} = I_{PPM} = 3.4\text{ A}$	V_C	-	15	18	V
Clamping voltage	Transmission line pulse (TLP), $t_p = 100\text{ ns}$ $I_{TLP} = 8\text{ A}$	V_{C-TLP}	-	20	-	V
	Transmission line pulse (TLP), $t_p = 100\text{ ns}$ $I_{TLP} = 16\text{ A}$	V_{C-TLP}	-	27	-	V
Dynamic resistance	Transmission line pulse (TLP), $t_p = 100\text{ ns}$	R_{DYN}	-	1	-	Ω
Capacitance	At $V_R = 0\text{ V}$; $f = 1\text{ MHz}$	C_D	-	0.37	0.45	pF
	At $V_R = 3.3\text{ V}$; $f = 1\text{ MHz}$		-	0.37	0.45	pF

APPLICATION NOTE

The VBUS05M2-HT5 is a two-line ESD protection device with a bidirectional and symmetrical (BiSy) breakdown and clamping performance made for application with a voltage working range up to $\pm 5.5\text{ V}$. The high ESD immunity and a very low capacitance makes it usable for high frequency applications like USB2.0, USB3.0, or HDMI.

With the VBUS05M2-HT5 two high speed data lines can be protected against transient voltage signals like ESD (electro static discharge). Connected to the data line (pin 1 and pin 2) and to ground (pin 3) negative transients will be clamped close above the 5.5 V working range.

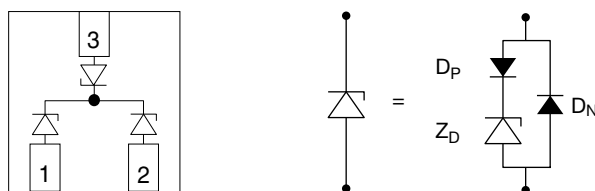
SCHEMATIC DIAGRAM


Fig. A

The simplified schematic diagram in Fig. A shows three identical Z-diodes with the cathode on pin 1, 2, or 3 and common anodes. In reality each Z-diode consist of one Z-diode for the adjustment of the breakdown voltage, and two low capacitance switching diodes which provide the low capacitance. Positive transients will be clamped through the switching diode D_P and the Z-diode Z_D while negative transients will be clamped through the switching diode D_N .

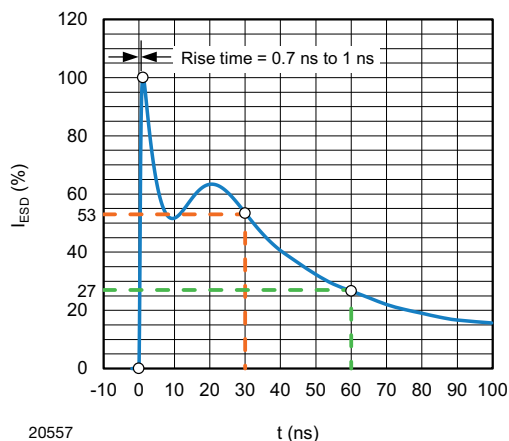
TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


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

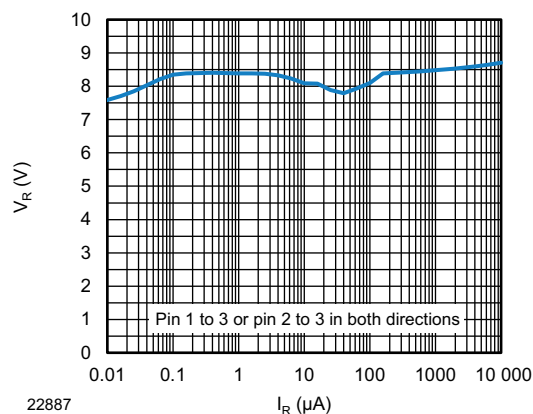


Fig. 4 - Typical Reverse Voltage vs. Reverse Current

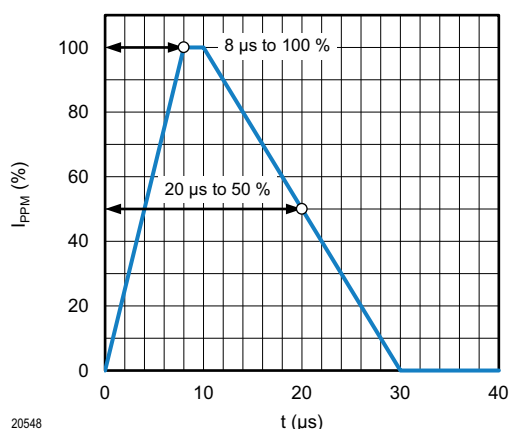


Fig. 2 - 8/20 μ s Peak Pulse Current Wave Form
acc. IEC 61000-4-5

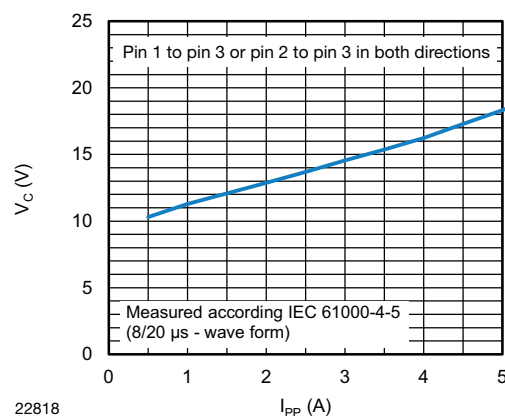


Fig. 5 - Typical Peak Clamping Voltage vs. Peak Pulse Current

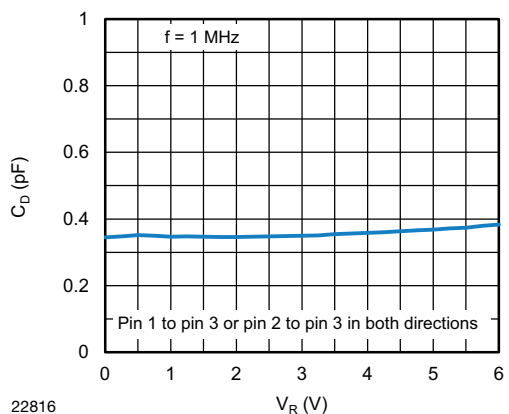


Fig. 3 - Typical Capacitance vs. Reverse Voltage

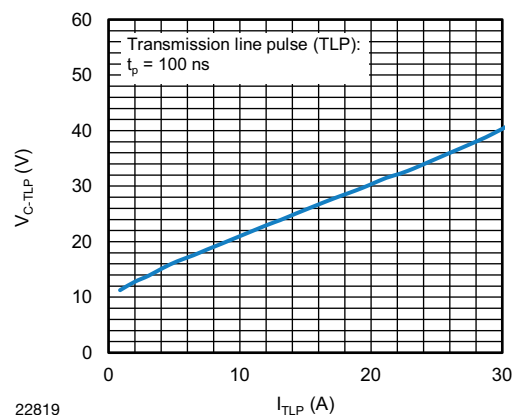
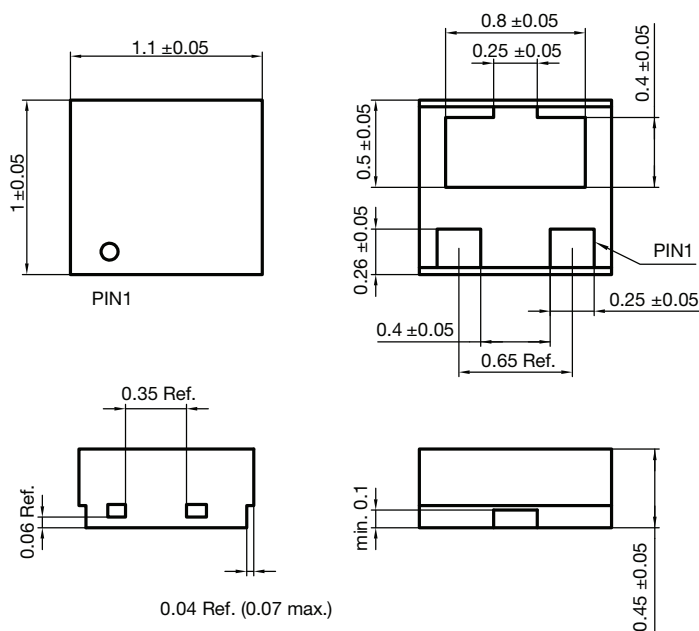


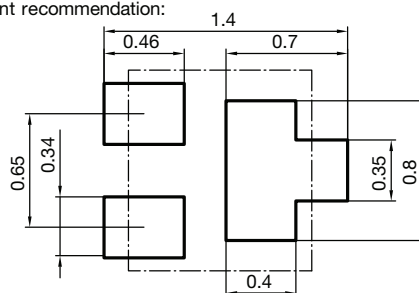
Fig. 6 - Typical Peak Forward Voltage vs. Forward Current



PACKAGE DIMENSIONS in millimeters (inches)



foot print recommendation:



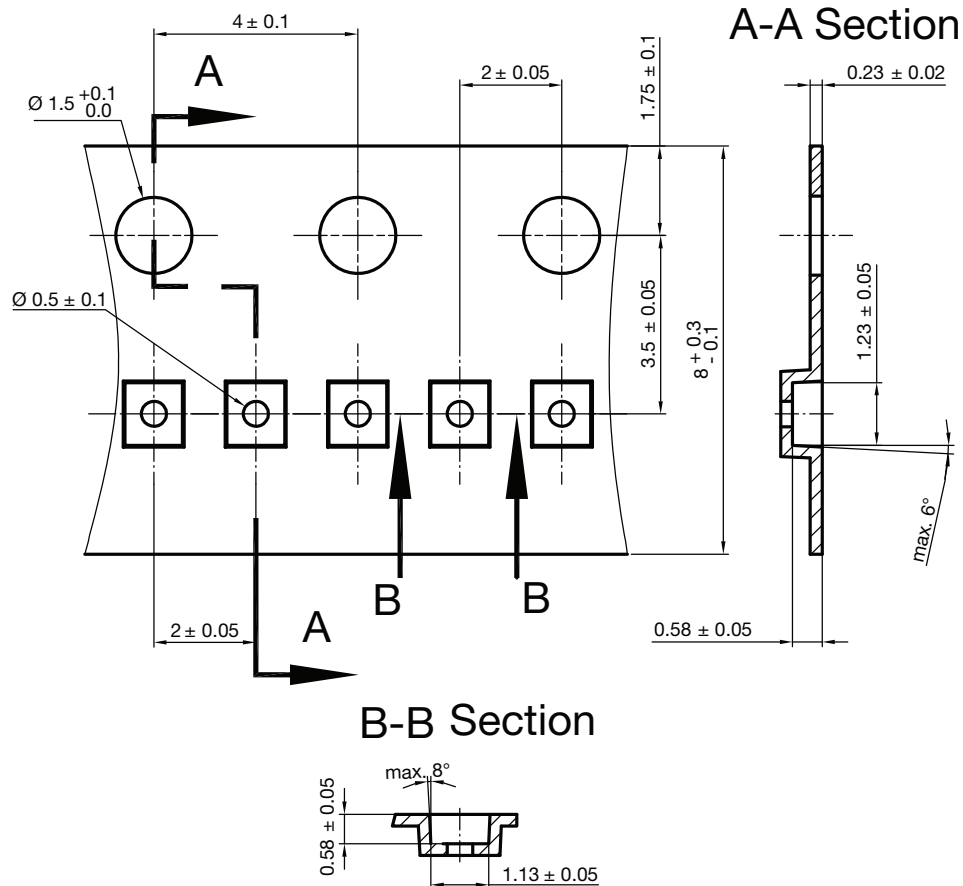
Document no.: S8-V-3906.04-062 (4)

Package name: DFN1110-3A

Created - Date: 04-Apr-2019



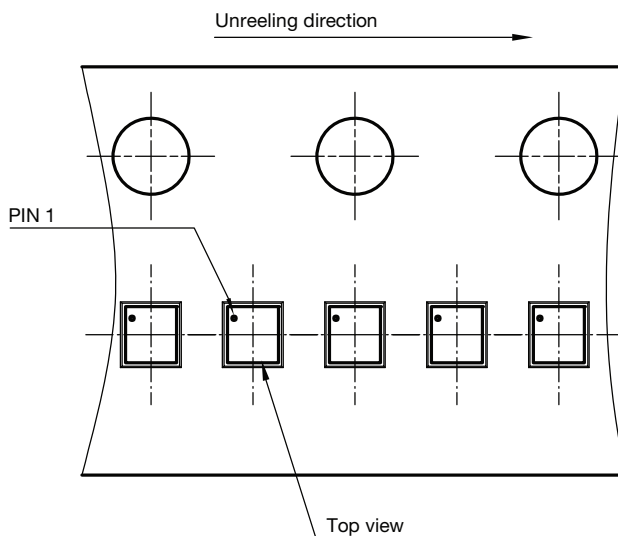
CARRIER TAPE DFN1110-3A



Document no: S8-V-3906.04-065 (4)
Package name: DFN1110-3A
Created date: 28.10.2019

surface resistance: $10^5 - 10^{11} \frac{\text{OHMS}}{\text{SQ}}$
Cumulative tolerances of 10 sprocket holes is ± 0.2 mm

ORIENTATION IN CARRIER TAPE DFN1110-3A



Document no: S8-V-3906.04-066 (4)
Package name: DFN1110-3A
Created date: 28.10.2019



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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. 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.