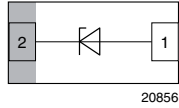




## Single-Line ESD-Protection Diode in DFN1006-2A



### MARKING (example only)



Bar = cathode marking  
X = date code  
YY = type code (see table below)

### FEATURES

- Compact DFN1006-2A package
- Low package height < 0.5 mm
- 1-line unidirectional ESD-protection
- AEC-Q101 qualified available
- Working range 1 V to 33 V
- ESD immunity acc. IEC 61000-4-2  
±15 kV to ±30 kV contact discharge  
±15 kV to ±30 kV air discharge
- Lead plating: Sn (e3)  
- soldering can be checked by standard vision inspection  
- AOI = Automated Optical Inspection
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### LINKS TO ADDITIONAL RESOURCES



ORDERING INFORMATION					
PART NUMBER (EXAMPLE)	AEC-Q101 QUALIFIED	ENVIRONMENTAL AND QUALITY CODE			ORDERING CODE (EXAMPLE)
		RoHS COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	TIN PLATED	10K PER 7" REEL (8 mm TAPE)	
		GREEN		MOQ = 10K/BOX	
VESD05C1-HD1	-	G	3	-08	VESD05C1-HD1-G3-08
VESD05C1-HD1	H	G	3	-08	VESD05C1-HD1HG3-08

PACKAGE DATA						
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
VESD01C1-HD1	DFN1006-2A	2A	0.83 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C
VESD03C1-HD1		2B				
VESD05C1-HD1		2G				
VESD08C1-HD1		2D				
VESD12C1-HD1		2E				
VESD16C1-HD1		2H				
VESD26C1-HD1		2J				
VESD33C1-HD1		2K				



<b>ABSOLUTE MAXIMUM RATINGS VESD01C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	11	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD03C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	11.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD05C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	8.7	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD08C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	6.60	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C



<b>ABSOLUTE MAXIMUM RATINGS VESD12C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	4.4	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD16C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	3.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	30	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		30	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD26C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	2.1	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	20	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		20	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C

<b>ABSOLUTE MAXIMUM RATINGS VESD33C1-HD1</b> (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITIONS	SYMBOL	VALUE	UNIT
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	1.6	A
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot	P <sub>PP</sub>	100	W
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses	V <sub>ESD</sub>	15	kV
	Air discharge acc. IEC 61000-4-2; 10 pulses		15	kV
Operating temperature	Junction temperature	T <sub>J</sub>	-55 to +150	°C
Storage temperature		T <sub>stg</sub>	-65 to +150	°C



<b>ELECTRICAL CHARACTERISTICS VESD01C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	1	V
Reverse voltage	at $I_R = 100\text{ }\mu\text{A}$	$V_R$	1	1.2	-	V
Reverse current	at $V_R = 1\text{ V}$	$I_R$	-	20	100	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 5\text{ mA}$	$V_{BR}$	2.55	2.7	2.85	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 11\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	6.4	6.9	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 11\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	3.2	3.92	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.13	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	153	192	230	pF

<b>ELECTRICAL CHARACTERISTICS VESD03C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	3	V
Reverse voltage	at $I_R = 20\text{ }\mu\text{A}$	$V_R$	3	-	-	V
Reverse current	at $V_R = 3\text{ V}$	$I_R$	-	8	20	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 5\text{ mA}$	$V_{BR}$	4.45	4.7	4.95	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 11.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	7.8	8.70	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 11.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	2.6	3.32	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.19	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	89	112	135	pF

<b>ELECTRICAL CHARACTERISTICS VESD05C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	5	V
Reverse voltage	at $I_R = 1\text{ }\mu\text{A}$	$V_R$	5	-	-	V
Reverse current	at $V_R = 5\text{ V}$	$I_R$	-	0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	7.1	7.5	7.9	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 8.7\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	10.3	11.5	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 8.7\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	2.2	2.74	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.2	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	53	67	81	pF



<b>ELECTRICAL CHARACTERISTICS VESD08C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	8	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	8	-	-	V
Reverse current	at $V_R = 8\text{ V}$	$I_R$	-	0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	9.4	9.85	10.3	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 6.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	13.7	15.3	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 6.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	1.9	2.32	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.23	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	37	47	57	pF

<b>ELECTRICAL CHARACTERISTICS VESD12C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	12	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	12	-	-	V
Reverse current	at $V_R = 12\text{ V}$	$I_R$	-	0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	14.3	15	15.8	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 4.4\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	20.5	22.7	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 4.4\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	1.6	1.88	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.4	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	26	33	40	pF

<b>ELECTRICAL CHARACTERISTICS VESD16C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	16	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	16	-	-	V
Reverse current	at $V_R = 16\text{ V}$	$I_R$	-	0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	17.1	18	18.9	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 3.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	25.3	28	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 3.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	1.5	1.72	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	0.53	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	21	27	33	pF



<b>ELECTRICAL CHARACTERISTICS VESD26C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	26	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	26	-	-	V
Reverse current	at $V_R = 26\text{ V}$	$I_R$	-	< 0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	28.5	30	31.5	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 2.1\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	43	48	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 2.1\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	1.3	1.42	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	1.9	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	14	17.5	21	pF

<b>ELECTRICAL CHARACTERISTICS VESD33C1-HD1</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Protection paths	Number of lines which can be protected	$N_{channel}$	-	-	1	lines
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	33	V
Reverse voltage	at $I_R = 0.1\text{ }\mu\text{A}$	$V_R$	33	-	-	V
Reverse current	at $V_R = 33\text{ V}$	$I_R$	-	< 0.01	0.1	$\mu\text{A}$
Reverse breakdown voltage	at $I_R = 1\text{ mA}$	$V_{BR}$	37	39	41	V
Reverse clamping voltage	at $I_{PP} = I_{PPM} = 1.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_C$	-	56	62.5	V
Forward clamping voltage	at $I_{PP} = 1\text{ A}$ , $t_p = 300\text{ }\mu\text{s}$	$V_F$	0.9	1.1	1.2	V
	at $I_{PP} = I_{PPM} = 1.6\text{ A}$ , $t_p = 8/20\text{ }\mu\text{s}$	$V_F$	-	1.22	1.32	V
Dynamic resistance	$t_p = 100\text{ ns}$ (TLP; pin 2-1)	$r_{dyn}$	-	3.6	-	$\Omega$
Capacitance	at $V_R = 0\text{ V}$ ; $f = 1\text{ MHz}$	$C_D$	12	15	18	pF

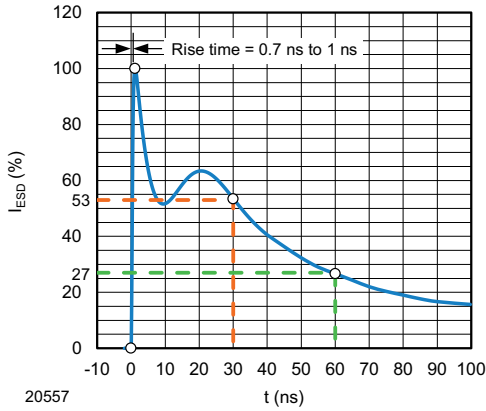


Fig. 1 - ESD Discharge Current Wave Form acc. IEC 61000-4-2 (330 Ω / 150 pF)

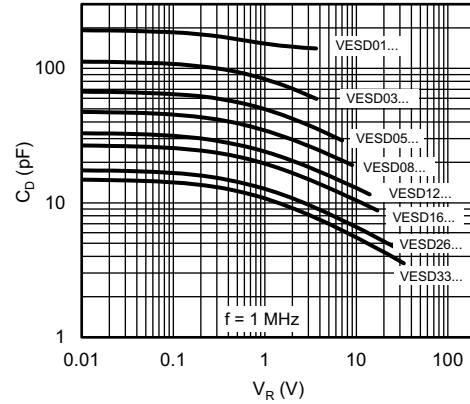


Fig. 4 - Typical Capacitance vs. Reverse Voltage

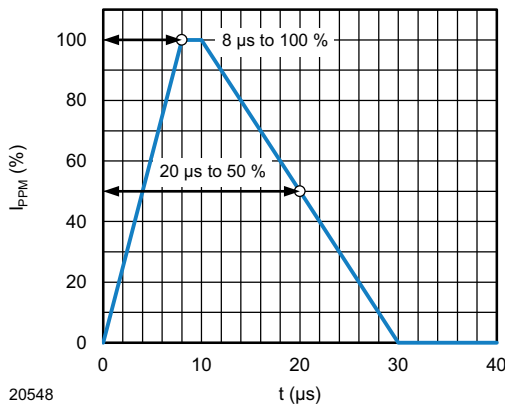


Fig. 2 - 8/20 μs Peak Pulse Current Wave Form acc. IEC 61000-4-5

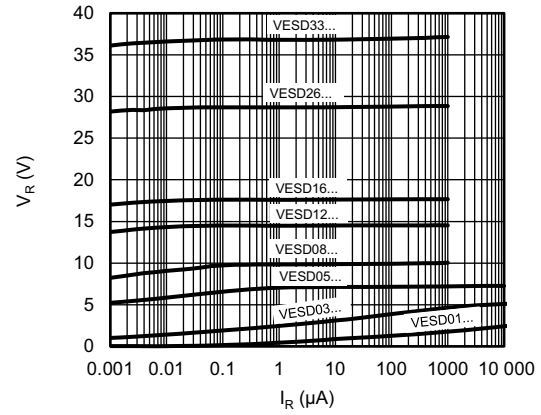


Fig. 5 - Typical Reverse Voltage vs. Reverse Current

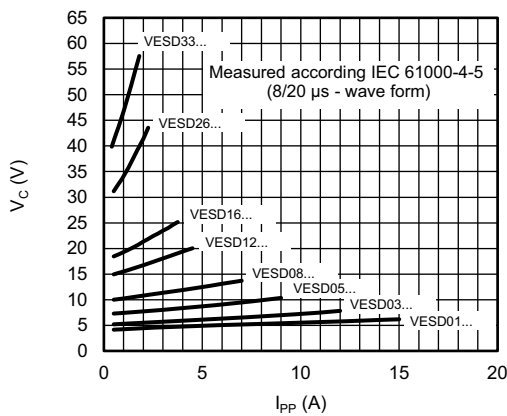


Fig. 3 - Typical Peak Clamping Voltage vs. Peak Pulse Current

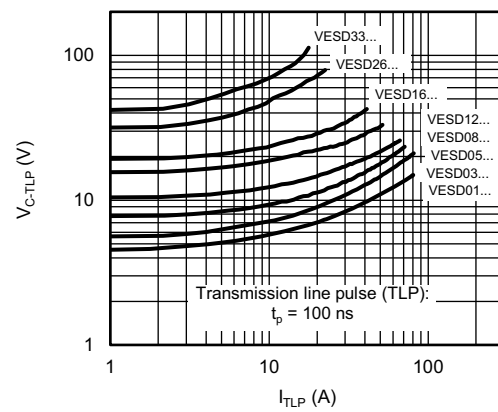


Fig. 6 - Typical Clamping Voltage vs. Peak Pulse Current

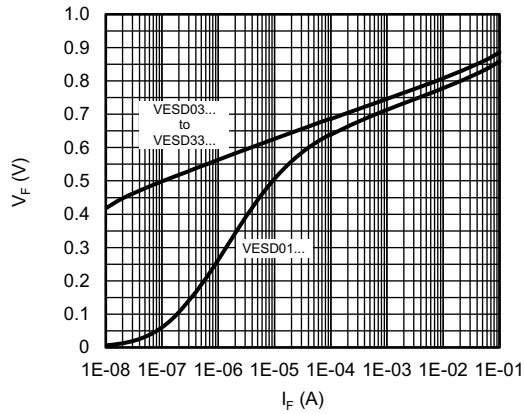


Fig. 7 - Typical Forward Voltage vs. Forward Current

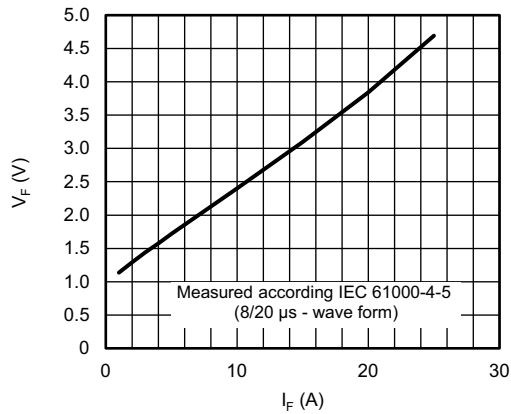


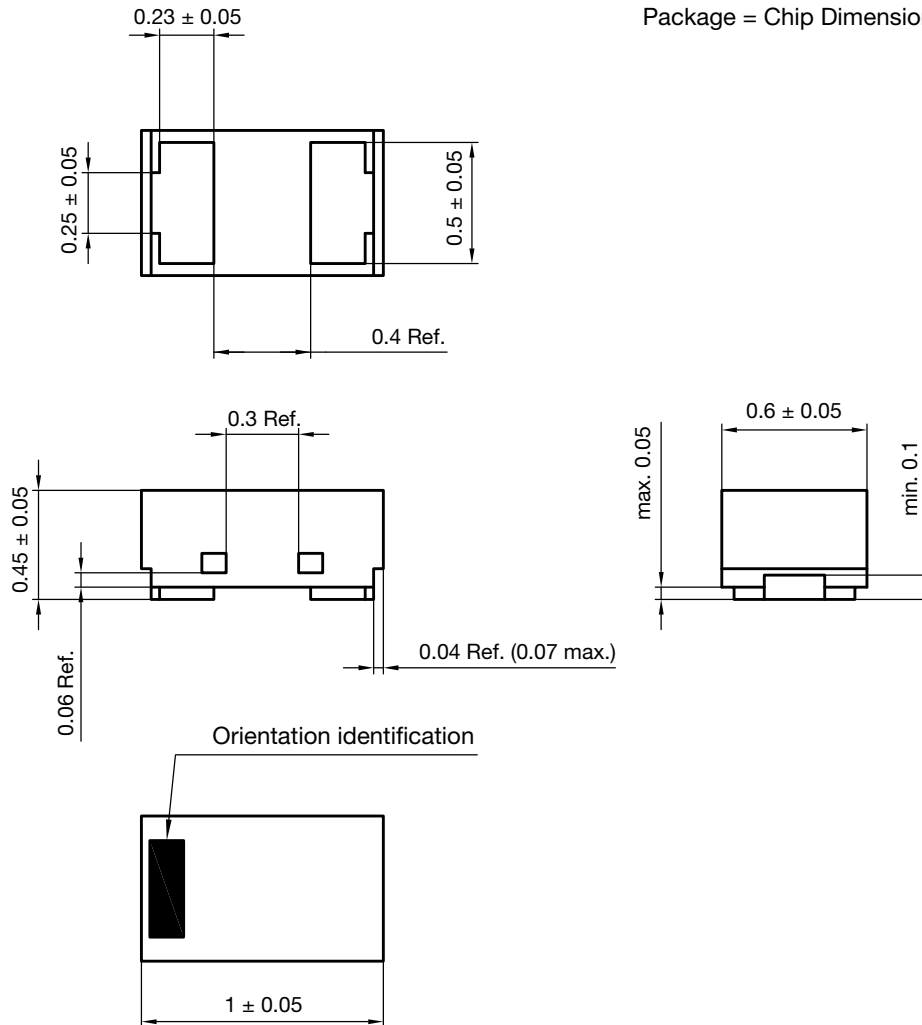
Fig. 8 - Typical Forward Voltage vs. Forward Current



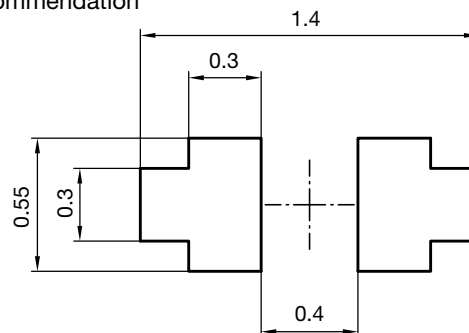


## PACKAGE DIMENSIONS in millimeters (Inches): DFN1006-2A

Package = Chip Dimension in mm



### Footprint recommendation

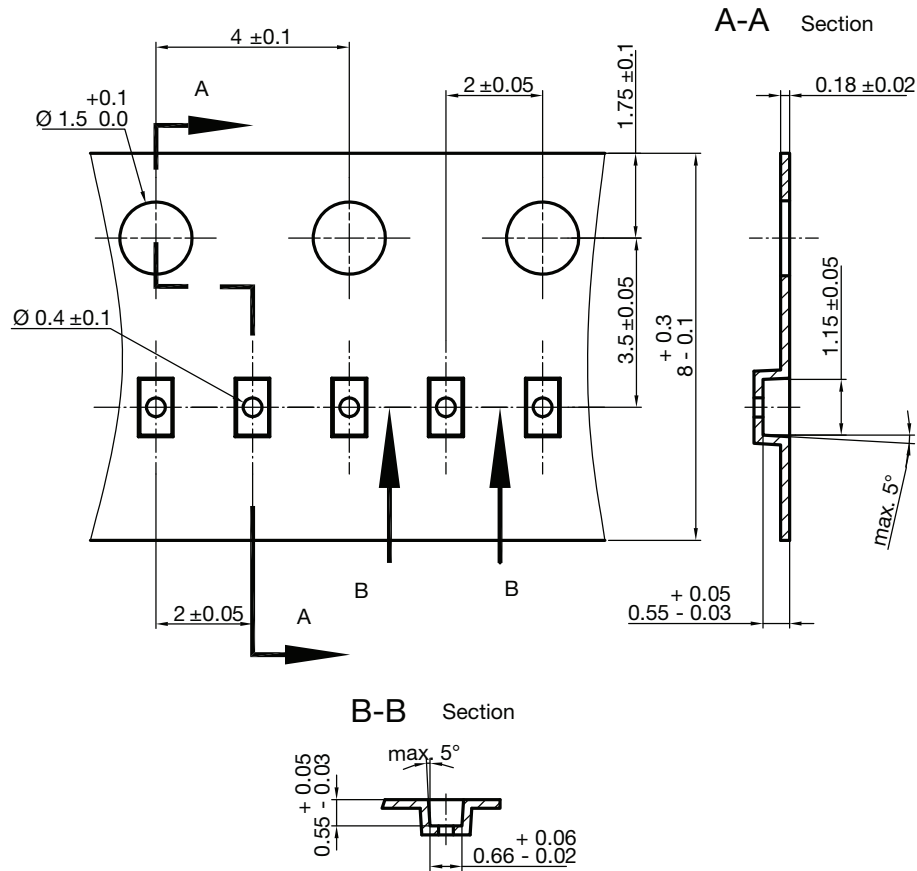


Document no.: S8-V-3906.04-059 (4)  
Created - Date: 11-Jul-2018  
Rev.5 - Date: 17-Sep-2021

23191



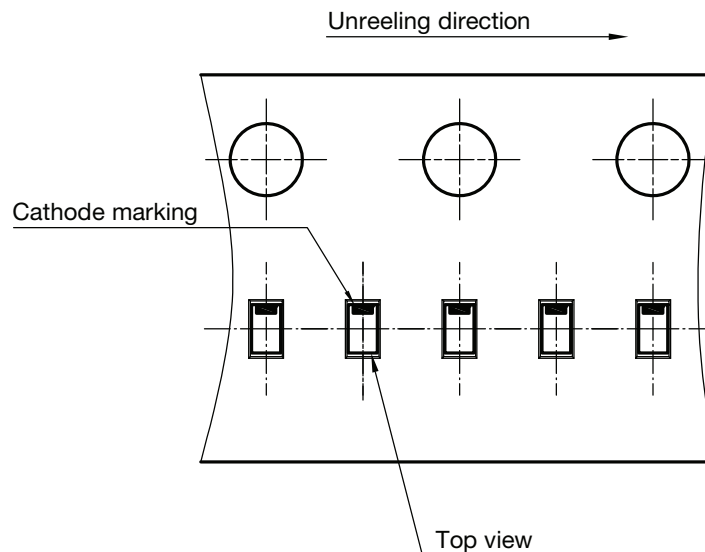
## CARRIER TAPE DFN1006-2A



S8-V-3906.04-063 (4)  
created 28.10.2019

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

## ORIENTATION IN CARRIER TAPE DFN1006-2A



S8-V-3906.04-064 (4)  
created 28.10.2019



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