

### VMMBZ16C1DD1 to VMMBZ33C1DD1

Vishay Semiconductors

AUTOMOTIVE GRADE

RoHS

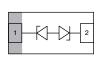
COMPLIANT

HALOGEN FREE

GREEN

(5-2008)

# Single-Line Bidirectional ESD-Protection Diode in DFN1006-2B





### **MARKING** (example only)



Bar = pin 1 marking X = date code YY = type code (see table below)

#### **LINKS TO ADDITIONAL RESOURCES**







#### **FEATURES**

- Compact DFN1006-2B package
- Low package height < 0.5 mm
- 1-line bidirectional ESD-protection
- AEC-Q101 qualified available
- Working range ±14 V; ± 28 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 <a href="https://www.vishav.com/doc?99912">www.vishav.com/doc?99912</a>

#### **Soldering Recommendations for DFN Packages:**

please see Application Note: www.vishav.com/doc?86198



ORDERING INFORMATION						
	AEC-Q101 QUALIFIED	ENVIRONMEN				
PART NUMBER (EXAMPLE)		RoHS COMPLIANT + LEAD (Pb)-FREE TERMINATIONS	TIN PLATED	10K PER 7" REEL (8 mm TAPE)	ORDERING CODE (EXAMPLE)	
		GREEN		MOQ = 10K/BOX		
VMMBZ16C1DD1	-	G	3	-08	VMMBZ16C1DD1-G3-08	
VMMBZ16C1DD1	Н	G	3	-08	VMMBZ16C1DD1HG3-08	

PACKAGE DATA								
DEVICE NAME	PACKAGE NAME	TYPE CODE	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS		
VMMBZ16C1DD1	DFN1006-2B	2Y	0.83 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C		
VMMBZ33C1DD1	DFN1006-2B	2N	0.83 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	Peak temperature max. 260 °C		

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<b>ABSOLUTE MAXIMUM RATINGS</b> VMMBZ16C1DD1 (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	METER TEST CONDITIONS		VALUE	UNIT			
Peak pulse current	Acc. IEC 61000-4-5, 8/20 μs/single shot	I <sub>PPM</sub>	4	Α			
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot <sup>(1)</sup>	P <sub>PP</sub>	108	W			
Peak pulse current	t <sub>p</sub> = 10/1000 μs <sup>(1)</sup>	I <sub>PPM</sub>	0.65	Α			
Peak pulse power	t <sub>p</sub> = 10/1000 μs <sup>(1)</sup>	P <sub>PP</sub>	15	W			
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses (1)	V	30	kV			
	Air discharge acc. IEC 61000-4-2; 10 pulses (1)	$V_{ESD}$	30	kV			
Operating temperature	Junction temperature	T <sub>J</sub> -55 to +150		°C			
Storage temperature		T <sub>stg</sub>	-55 to +150	°C			

ABSOLUTE MAXIMUM RATINGS VMMBZ33C1DD1 (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>	1.7	А		
Peak pulse power	Acc. IEC 61000-4-5, 8/20 μs/single shot <sup>(1)</sup>	$P_{PP}$	100	W		
Peak pulse current	$t_p = 10/1000 \ \mu s^{(1)}$	I <sub>PPM</sub>	0.3	Α		
Peak pulse power	t <sub>p</sub> = 10/1000 μs <sup>(1)</sup>	P <sub>PP</sub>	15	W		
ESD immunity	Contact discharge acc. IEC 61000-4-2; 10 pulses (1)	M	15	kV		
	Air discharge acc. IEC 61000-4-2; 10 pulses (1)	$V_{ESD}$	15	kV		
Operating temperature	Junction temperature	T <sub>J</sub> -55 to +150		°C		
Storage temperature		T <sub>stg</sub>	-55 to +150	°C		

<b>ELECTRICAL CHARACTERISTICS</b> VMMBZ16C1DD1 (T <sub>amb</sub> = 25 °C, unless otherwise specified)								
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT		
Protection paths	Number of lines which can be protected	N <sub>channel</sub>	=	-	1	lines		
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	=	-	14	V		
Reverse voltage	At I <sub>R</sub> = 0.01 μA	$V_R$	14	-	-	V		
D	At V <sub>R</sub> = 14 V	I <sub>R</sub>	=	< 0.001	0.01	μΑ		
Reverse current	At V <sub>R</sub> = 14 V; T <sub>J</sub> = 150 °C <sup>(1)</sup>		-	0.06	10	μΑ		
Reverse breakdown voltage	At I <sub>R</sub> = 1 mA	$V_{BR}$	16.2	16.7	17.3	V		
	At $I_R = 1$ mA; $T_J = -40$ °C to $+150$ °C (1)		15	-	18.7	V		
Reverse clamping voltage	At $I_{PP} = I_{PPM} = 4 \text{ A}$ , $t_p = 8/20 \mu\text{s}$	V <sub>C</sub>	20	23.7	27	V		
	$t_p = 100 \text{ ns (TLP)}; I_{TLP} = 16 \text{ A}^{(1)}$	$V_{C\_TLP}$	=	26	-	V		
Dynamic resistance	t <sub>p</sub> = 100 ns (TLP) <sup>(1)</sup>	r <sub>dyn</sub>	=	0.55	-	Ω		
Capacitance	At $V_R = 0 V$ ; $f = 1 MHz$	C <sub>D</sub>	12	14.5	17	pF		

<b>ELECTRICAL CHARACTERISTICS</b> VMMBZ33C1DD1 (T <sub>amb</sub> = 25 °C, unless otherwise specified)							
PARAMETER	TEST CONDITIONS / REMARKS	SYMBOL	MIN.	TYP.	MAX.	UNIT	
Protection paths	Number of lines which can be protected	N <sub>channel</sub>	ı	-	1	lines	
Reverse stand off voltage	Max. reverse working voltage	$V_{RWM}$	-	-	28	V	
Reverse voltage	At I <sub>R</sub> = 0.01 μA	$V_{R}$	28	-	-	V	
Reverse current	At V <sub>R</sub> = 28 V	I <sub>R</sub>	-	< 0.001	0.01	μA	
neverse current	At $V_R = 28 \text{ V}; T_J = 150 ^{\circ}\text{C}^{(1)}$		-	0.1	10	μA	
Reverse breakdown voltage	At I <sub>R</sub> = 1 mA	$V_{BR}$	32.7	33.7	34.8	V	
heverse breakdown voltage	At $I_R = 1$ mA; $T_J = -40$ °C to $+150$ °C $^{(1)}$		30	-	39.7	V	
Reverse clamping voltage	At $I_{PP} = I_{PPM} = 1.7 \text{ A}$ , $t_p = 8/20 \mu\text{s}$	$V_{C}$	40	49	59	V	
	$t_p = 100 \text{ ns (TLP)}; I_{TLP} = 16 \text{ A}^{(1)}$	$V_{C\_TLP}$	-	88	-	V	
Dynamic resistance	$t_p = 100 \text{ ns (TLP)}^{(1)}$	r <sub>dyn</sub>		3.3	ı	Ω	
Capacitance	At $V_R = 0 V$ ; $f = 1 MHz$	$C_D$	6	8	10	pF	

### Note

<sup>(1)</sup> Guaranteed by design. Tested during device characterization

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f = 1 MHz

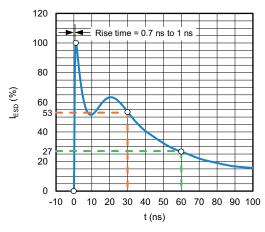


Fig. 1 - ESD Discharge Current Wave Form Acc. IEC 61000-4-2  $(330 \Omega / 150 pF)$ 

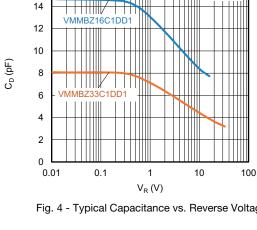


Fig. 4 - Typical Capacitance vs. Reverse Voltage

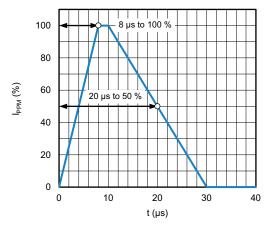


Fig. 2 - 8/20 µs Peak Pulse Current Wave Form Acc. IEC 61000-4-5

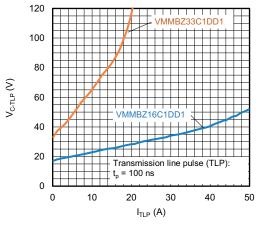


Fig. 5 - Typical Clamping Voltage vs. Peak Pulse Current

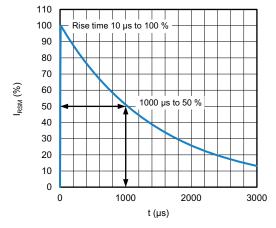


Fig. 3 - 10/1000 µs Peak Pulse Current Wave Form

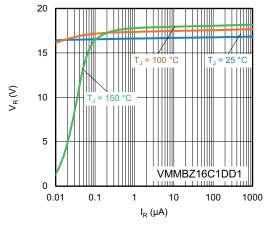


Fig. 6 - Typical Reverse Voltage vs. Reverse Current

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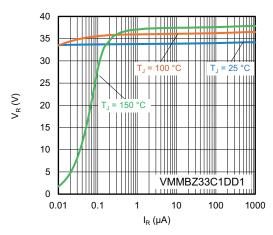


Fig. 7 - Typical Reverse Voltage vs. Reverse Current

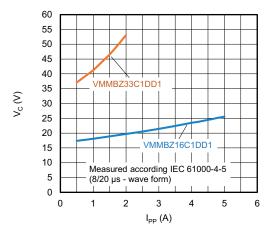


Fig. 8 - Typical Peak Clamping Voltage vs. Peak Pulse Current

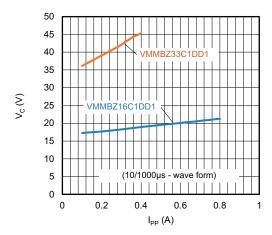


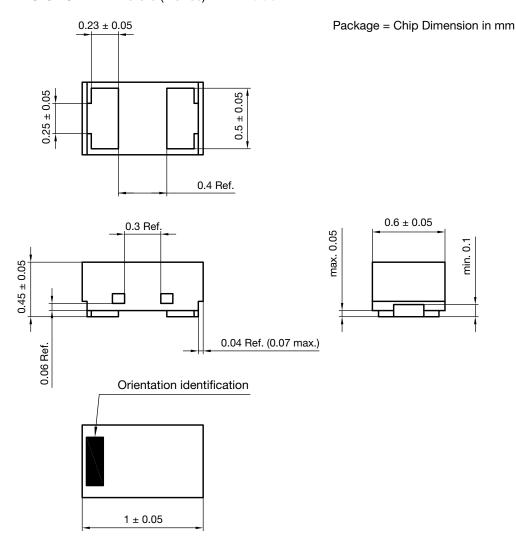
Fig. 9 - Typical Peak Clamping Voltage vs. Peak Pulse Current

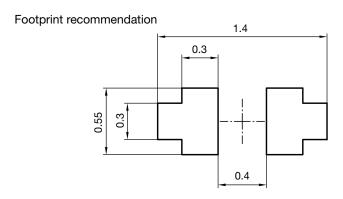




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### PACKAGE DIMENSIONS in millimeters (inches): DFN1006-2B



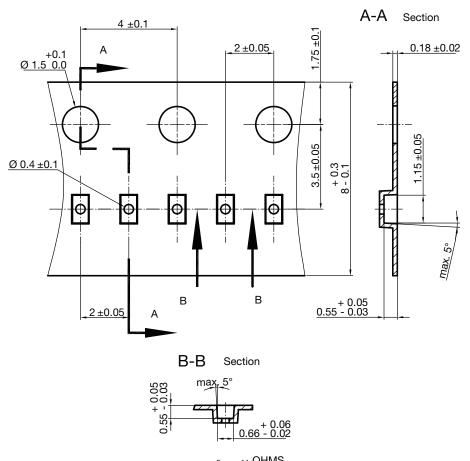


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### **CARRIER TAPE DFN1006-2B**



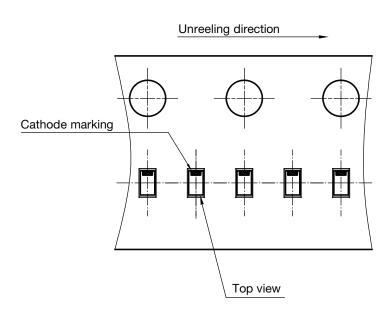
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S8-V-3906.04-064 (4)

created 28.10.2019

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

### **ORIENTATION IN CARRIER TAPE DFN1006-2B**



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