

ESD and Surge Protection Device, Bidirectional

Micro-Packaged Diodes for ESD Protection

ESDL3141

The ESDL3141 is designed to protect voltage sensitive components that require low capacitance from ESD and transient voltage events. Excellent clamping capability, low capacitance, low leakage, and fast response time, make these parts ideal for ESD protection on designs where board space is at a premium. Because of its low capacitance, the part is well suited for use in high frequency designs such as USB 2.0/3.0 high speed applications.

Features

- Low Capacitance 1.4 pF (Typ)
- Low Clamping Voltage
- Small Body Outline Dimensions: 1.00 mm x 0.60 mm
- Low Body Height: 0.23 mm
- Stand-off Voltage: 14 V
- Protection for the following IEC Standards:
 - IEC61000-4-2 Level 4: ±30 kV Contact Discharge
 - IEC61000-4-5 (Lightning): I_{pp} 10 A (8/20 μs)
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- USB 2.0
- USB Type C Alternate Audio Mode

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IEC 61000-4-2 (ESD) Contact Air		±30 ±30	kV
Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +150	°C
Lead Solder Temperature - Maximum (10 Second Duration)	T _L	260	°C

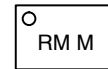
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

See Application Note AND8308/D for further description of survivability specs.



X2DFN2
1.0 X 0.6
CASE 714AB

MARKING DIAGRAM



RM = Specific Device Code
M = Date Code

ORDERING INFORMATION

Device	Package	Shipping [†]
ESDL3141MXT5G	X2DFN2 (Pb-Free)	8000 / Tape & Reel

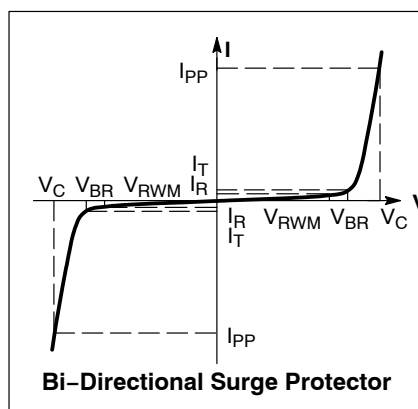
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise noted)

Symbol	Parameter
I _{PP}	Maximum Reverse Peak Pulse Current
V _C	Clamping Voltage @ I _{PP}
V _{RWM}	Working Peak Reverse Voltage
I _R	Maximum Reverse Leakage Current @ V _{RWM}
V _{BR}	Breakdown Voltage @ I _T
I _T	Test Current

*See Application Note AND8308/D for detailed explanations of datasheet parameters.



ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V _{RWM}	Pin 2 to Pin 1 Pin 1 to Pin 2			14 5	V
Breakdown Voltage	V _{BR}	I _T = 10 mA, Pin 2 to Pin 1 I _T = 1 mA, Pin 2 to Pin 1 I _T = 1 mA, Pin 1 to Pin 2	14.1 13.75 5.5	15.3 14.5 7.0	17.5 16.5 8.2	V
Reverse Leakage Current	I _R	@ 3.3 V, Pin 2 to Pin 1 @ 14 V, Pin 2 to Pin 1 @ 5.0 V, Pin 1 to Pin 2			0.1 2.0 0.1	μA
Clamping Voltage	V _C	Per IEC61000-4-2, ±8 kV Contact	See Figures 1 & 2			V
Clamping Voltage TLP (Note 1)	V _C	I _{PP} = 8 A IEC61000-4-2 Level 2 Equivalent (±4 kV Contact, ±8 kV Air) (Pin 2 to Pin 1) (Pin 1 to Pin 2)		17.9 8.85		V
		I _{PP} = 16 A IEC61000-4-2 Level 4 Equivalent (±8 kV Contact, ±16 kV Air) (Pin 2 to Pin 1) (Pin 1 to Pin 2)		19.3 10.9		V
Reverse Peak Pulse Current	I _{PP}	IEC61000-4-5 (8x20 μs) Pin 2 to Pin 1 IEC61000-4-5 (8x20 μs) Pin 1 to Pin 2	10 13.5	12 16.5		A
Clamping Voltage 8x20 μs Waveform per Figure A (Note 2)	V _C	I _{PP} = 10 A (Pin 2 to Pin 1) I _{PP} = 13.5 A (Pin 1 to Pin 2)		19.5 12.3	21.5 14	V
Dynamic Resistance	R _{DYN}	I/O Pin to GND (8x20 μs) (Pin 2 to Pin 1) (Pin 1 to Pin 2)		0.35 0.52		Ω
Junction Capacitance	C _J	V _R = 0 V, f = 1 MHz		1.4	1.75	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

- ANSI/ESD STM5.5.1 – Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model.
TLP conditions: Z₀ = 50, t_p = 100 ns, t_r = 1 ns, averaging window; t₁ = 70 ns to t₂ = 90 ns.
- Non-repetitive current pulse at T_A = 25°C, per IEC61000-4-5 waveform.

TYPICAL CHARACTERISTICS

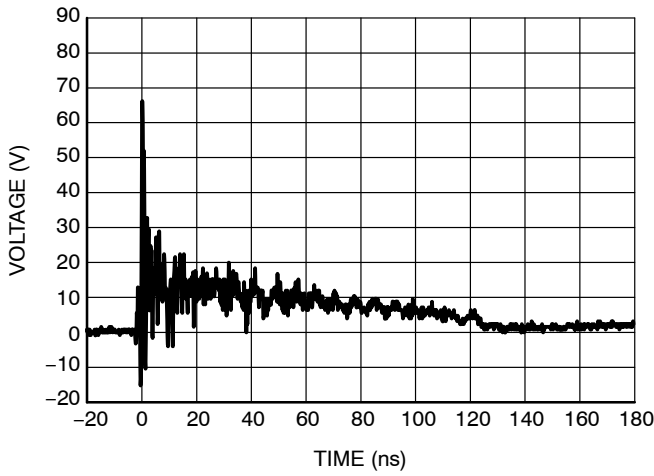


Figure 1. ESD Clamping Voltage Pin 1 to Pin 2
8 kV Contact per IEC61000-4-2

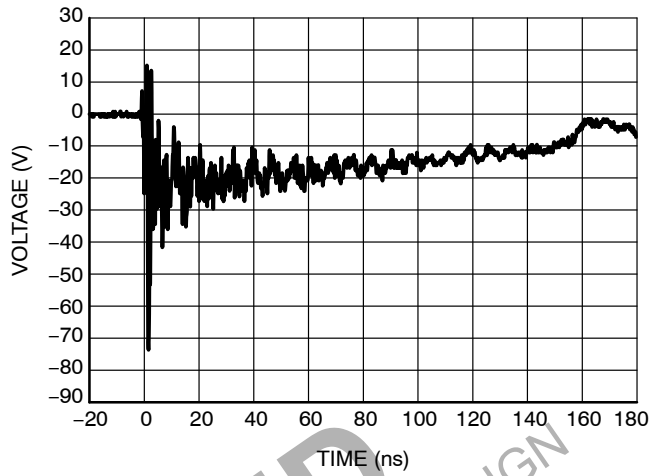


Figure 2. ESD Clamping Voltage Pin 2 to Pin 1
8 kV Contact per IEC61000-4-2

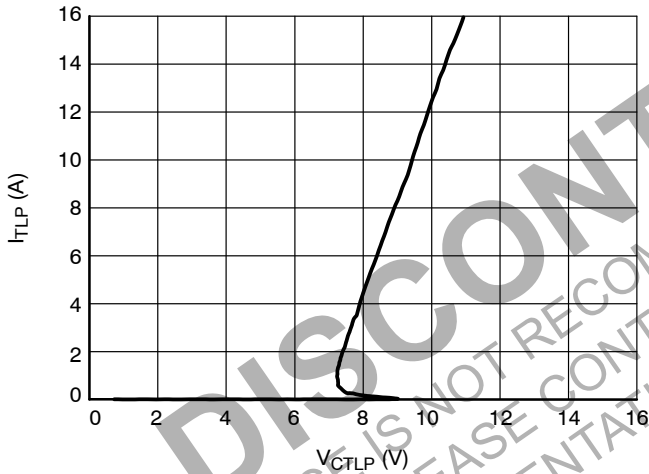


Figure 3. Pin 1 to Pin 2 100 ns TLP I-V Curve

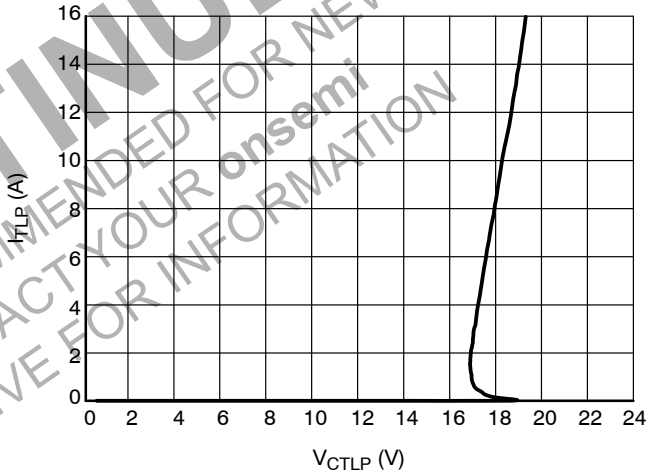


Figure 4. Pin 2 to Pin 1 TLP I-V Curve

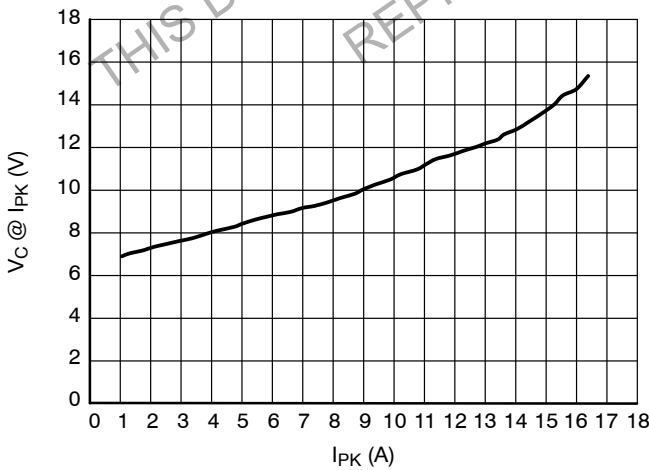


Figure 5. Pin 1 to Pin 2 Clamping Voltage vs.
Peak Pulse Current ($t_p = 8/20 \mu s$)

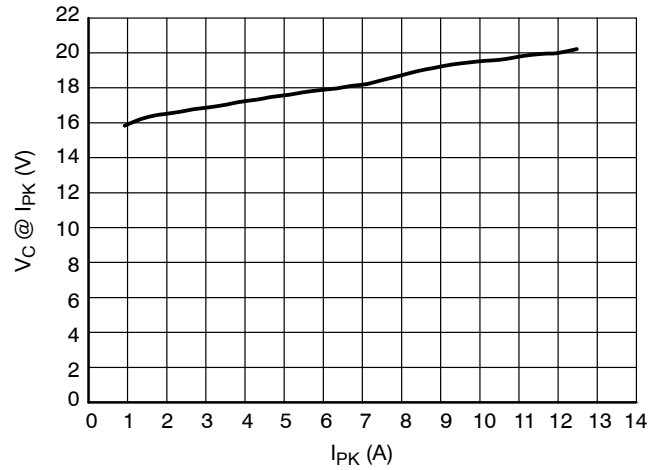


Figure 6. Pin 2 to Pin 1 Clamping Voltage vs.
Peak Pulse Current ($t_p = 8/20 \mu s$)

TYPICAL CHARACTERISTICS

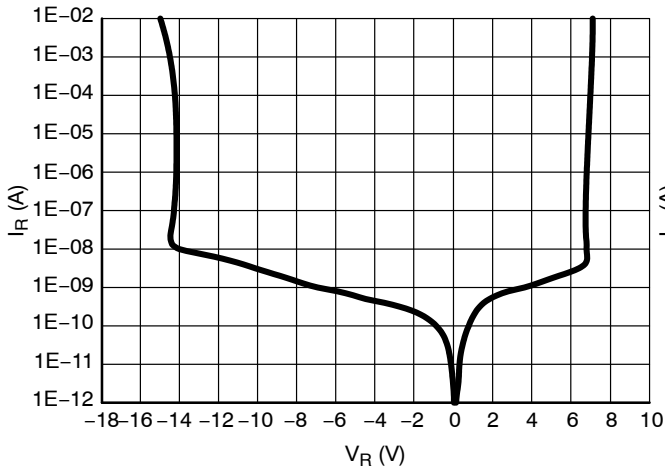


Figure 7. Breakdown Voltage

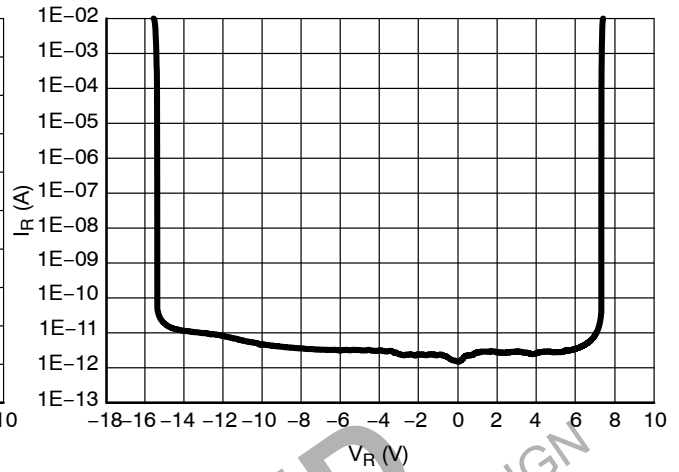


Figure 8. Reverse Leakage Current

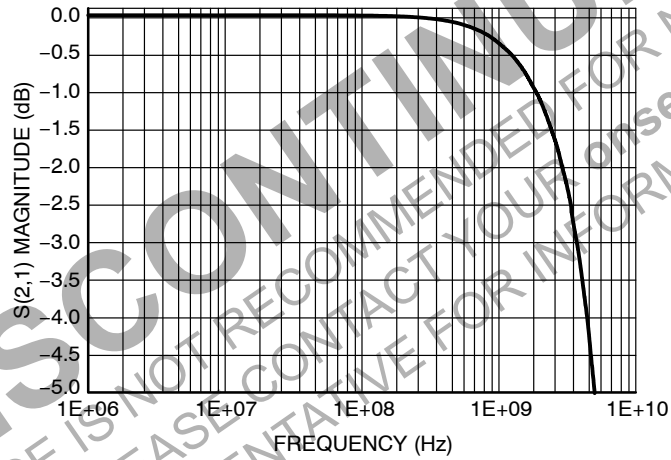


Figure 9. Insertion Loss

IEC 61000-4-2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

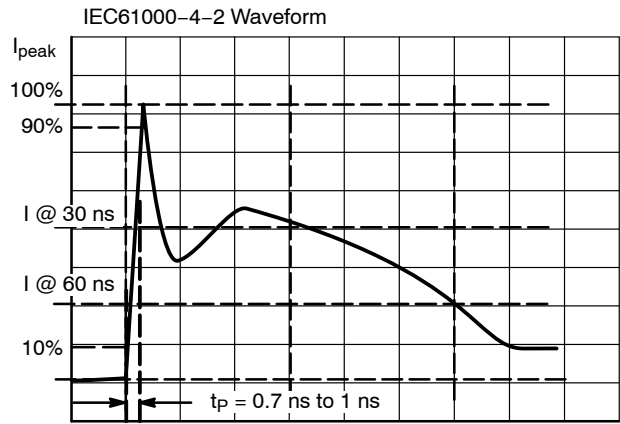


Figure 10. IEC61000-4-2 Spec

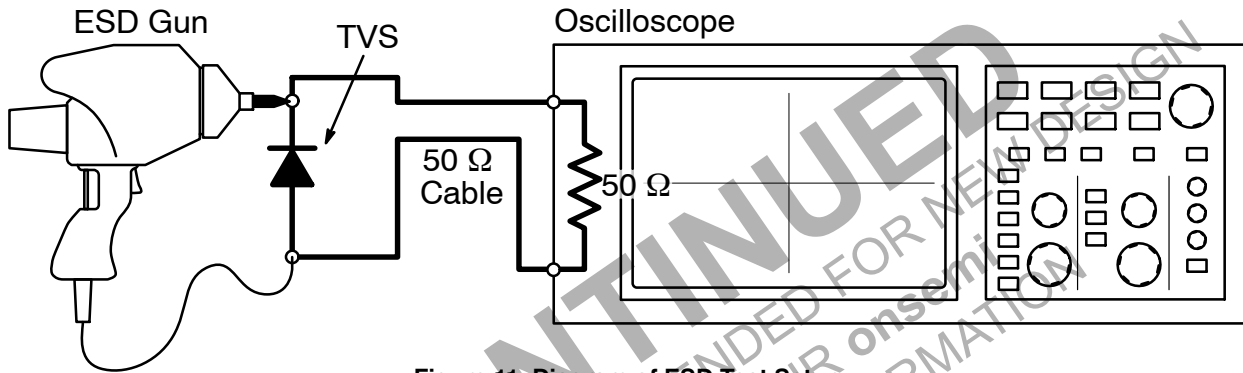


Figure 11. Diagram of ESD Test Setup

ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage

at the device level. ON Semiconductor has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the datasheets for all ESD protection diodes. For more information on how ON Semiconductor creates these screenshots and how to interpret them please refer to AND8307/D.

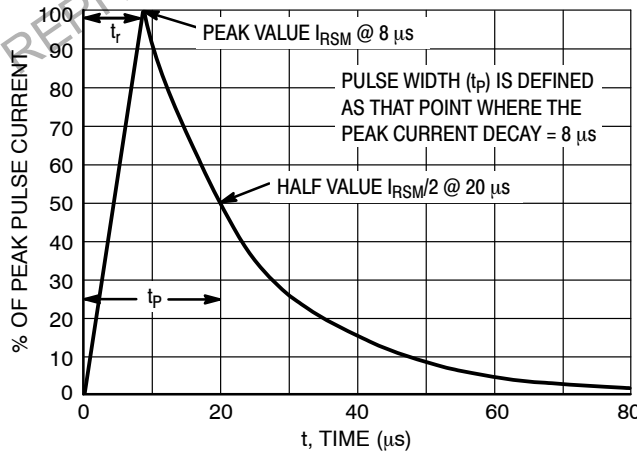
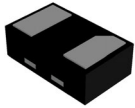


Figure 12. 8 X 20 μs Pulse Waveform

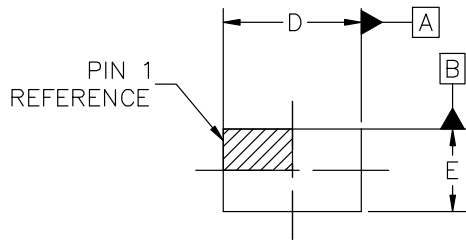
MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

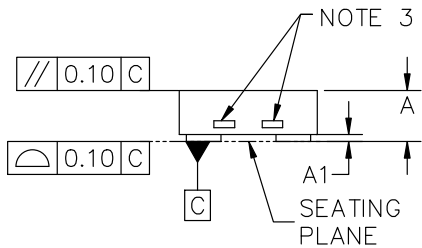


X2DFN2 1.00x0.60x0.37, 0.65P
CASE 714AB
ISSUE C

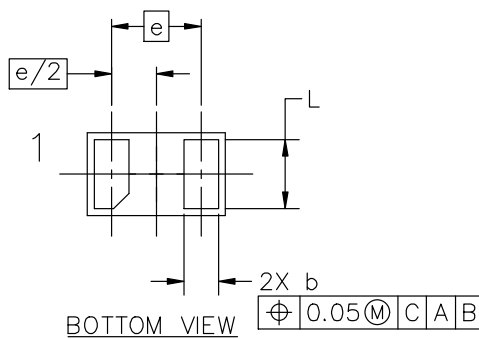
DATE 21 FEB 2024



TOP VIEW



SIDE VIEW

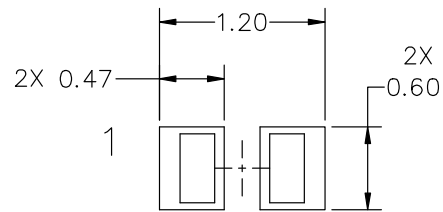


BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5–2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. EXPOSED COPPER ALLOWED AS SHOW.

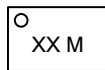
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.34	0.37	0.40
A1	---	0.03	0.050
b	0.20	0.25	0.30
D	0.95	1.00	1.05
E	0.55	0.60	0.65
e	0.65 BSC		
L	0.45	0.50	0.55



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XX = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	X2DFN2 1.00x0.60x0.37, 0.65P	PAGE 1 OF 1

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