

# Ultra-Low Capacitance ESD Protection Diodes

## Micro-Packaged Diodes for ESD Protection

### ESDL3552B

The ESDL3552B is designed to protect voltage sensitive components that require ultra-low capacitance from ESD and transient voltage events. Excellent clamping capability, low capacitance, high breakdown voltage, high linearity, low leakage, and fast response time make these parts ideal for ESD protection on designs where board space is at a premium. It has industry leading capacitance linearity over voltage making it ideal for high-speed data line protection applications.

#### Features

- Industry Leading Capacitance Linearity Over Voltage
- Ultra-Low Capacitance: 0.25 pF
- Insertion Loss: 0.26 dB @ 5 GHz
- 0201 Isolated DSN Package: 0.62 mm x 0.32 mm
- Stand-off Voltage: 5.0 V
- Low Leakage: < 50 nA
- Low Dynamic Resistance: < 1.0 Ω
- These Devices are Pb-Free, Halogen-Free/BFR-Free and are RoHS Compliant

#### Typical Applications

- High Speed Data Line Protection
- USB 2.0, USB 3.0, USB 3.1

#### MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
IEC 61000-4-2 Level 4 (Contact) (Note 1) IEC 61000-4-2 Level 4 (Air) (Note 1)	ESD	±20 ±20	kV
Maximum Peak Pulse Current IEC 61000-4-5 8/20 μs (Lightning) (Note 2)	I <sub>PP</sub>	2.0	A
Total Power Dissipation (Note 3) @ T <sub>A</sub> = 25°C Thermal Resistance, Junction-to-Ambient	P <sub>D</sub> R <sub>θJA</sub>	300 400	mW °C/W
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55 to +150	°C
Lead Solder Temperature – Maximum (10 Second Duration)	T <sub>L</sub>	260	°C

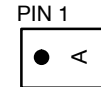
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Non-repetitive current pulse at T<sub>A</sub> = 25°C, per IEC61000-4-2 waveform.
2. Non-repetitive current pulse at T<sub>A</sub> = 25°C, per IEC61000-4-5 waveform.
3. Mounted with recommended minimum pad size, DC board FR-4

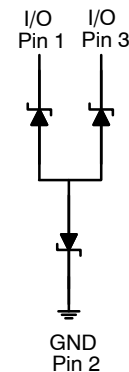


X4DFN3  
CASE 718AB

#### MARKING DIAGRAM



A = Specific Device Code



#### ORDERING INFORMATION

Device	Package	Shipping†
ESDL3552BPFCT5G	X4DFN3 (Pb-Free/ Halide Free)	10000 / 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](#).

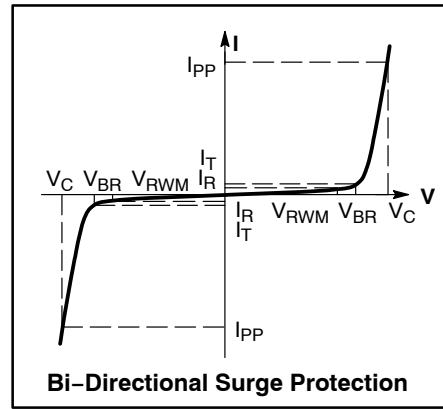
# ESDL3552B

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter
I <sub>PP</sub>	Maximum Reverse Peak Pulse Current
V <sub>C</sub>	Clamping Voltage @ I <sub>PP</sub>
V <sub>RWM</sub>	Working Peak Reverse Voltage
I <sub>R</sub>	Maximum Reverse Leakage Current @ V <sub>RWM</sub>
V <sub>BR</sub>	Breakdown Voltage @ I <sub>T</sub>
I <sub>T</sub>	Test Current

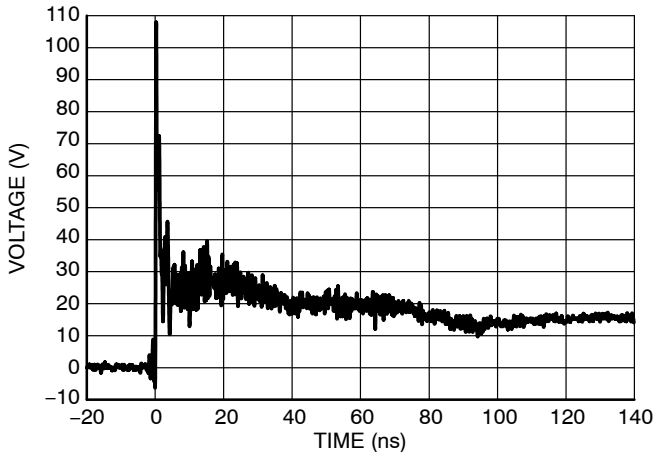
\*See Application Note [AND8308/D](#) for detailed explanations of datasheet parameters.



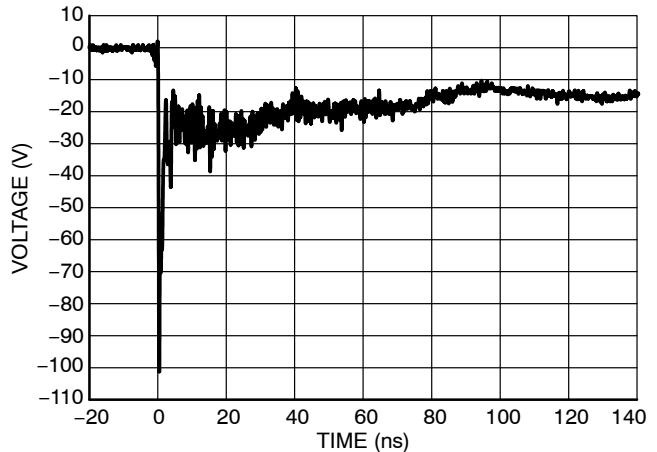
## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Reverse Working Voltage	V <sub>RWM</sub>	Between any two pins (-40°C to +85°C)			5.0	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>T</sub> = 10 mA, Between any two pins (-40°C to +85°C)	6.5	10.2	11.5	V
		I <sub>T</sub> = 1 mA, Between any two pins	7.0	9.3	11	
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5.0 V, T <sub>A</sub> = 25°C		0.001	0.05	μA
		V <sub>RWM</sub> = 5.0 V, T <sub>A</sub> = 85°C		0.001	0.25	μA
Clamping Voltage TLP	V <sub>C</sub>	I <sub>PP</sub> = 4 A } IEC 61000-4-2 Level 1 equivalent (±2 kV Contact, ±4 kV Air) Pin 1 to Pin 2, Pin 3 to Pin 2		14.5		V
		I <sub>PP</sub> = 16 A } IEC 61000-4-2 Level 4 equivalent (±8 kV Contact, ±16 kV Air) Pin 1 to Pin 2, Pin 3 to Pin 2		21.5		V
Reverse Peak Pulse Current	I <sub>PP</sub>	IEC61000-4-5 (8x20 μs), Between any two pins	2.0	3.0		A
Clamping Voltage (8x20 μs)	V <sub>C</sub>	I <sub>PP</sub> = 2 A		14	18	V
Dynamic Resistance	R <sub>DYN</sub>	100 ns TLP, Pin 1 to Pin 2, Pin 3 to Pin 2		0.58		Ω
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 0 V, f = 1 MHz, Between any two pins		0.25	0.30	pF
Capacitance Linearity	C <sub>Δ</sub>	V <sub>R</sub> = 0 V to 5 V, f = 1 MHz		0.03		pF
Insertion Loss	I <sub>L</sub>	f = 2.5 GHz		0.16		dB
		f = 5.0 GHz		0.26		
		f = 10.0 GHz		0.41		

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.



**Figure 1. ESD Clamping Voltage Screenshot Positive 8 kV Contact per IEC61000-4-2**



**Figure 2. ESD Clamping Voltage Screenshot Negative 8 kV Contact per IEC61000-4-2**

TYPICAL CHARACTERISTICS

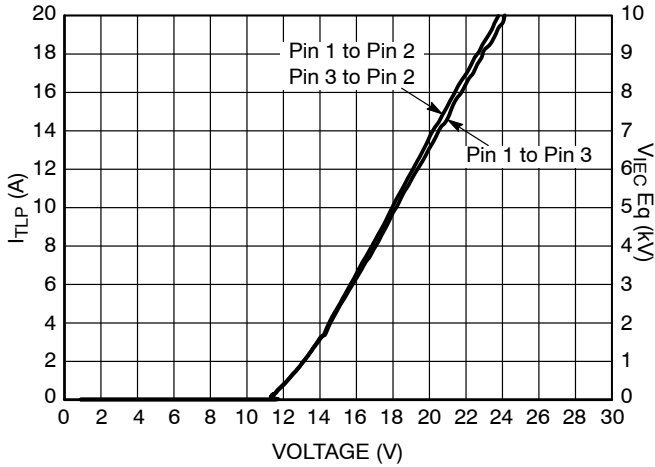


Figure 3. Positive TLP I-V Curve

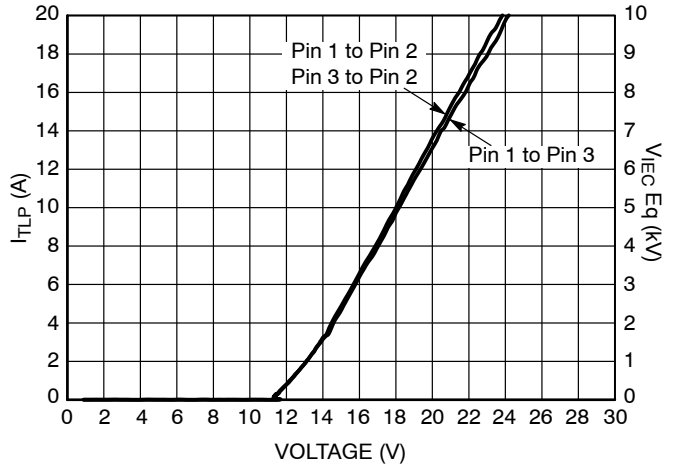


Figure 4. Negative TLP I-V Curve

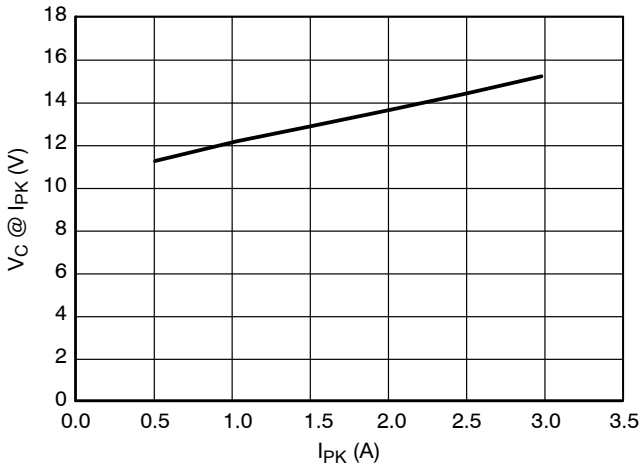


Figure 5. Positive Clamping Voltage vs. Peak Pulse Current ( $t_p = 8/20 \mu s$ )

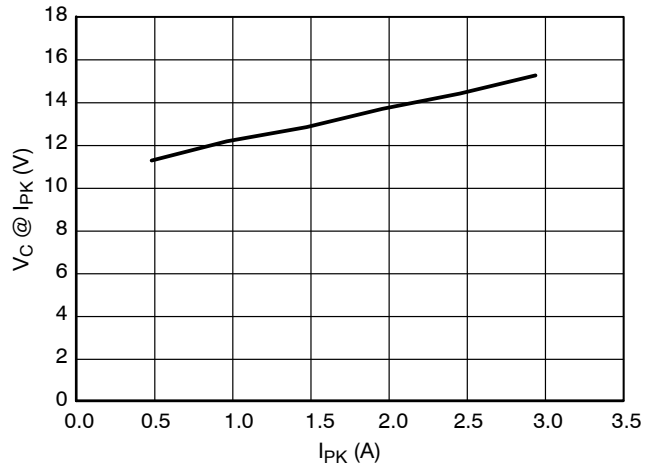


Figure 6. Negative Clamping Voltage vs. Peak Pulse Current ( $t_p = 8/20 \mu s$ )

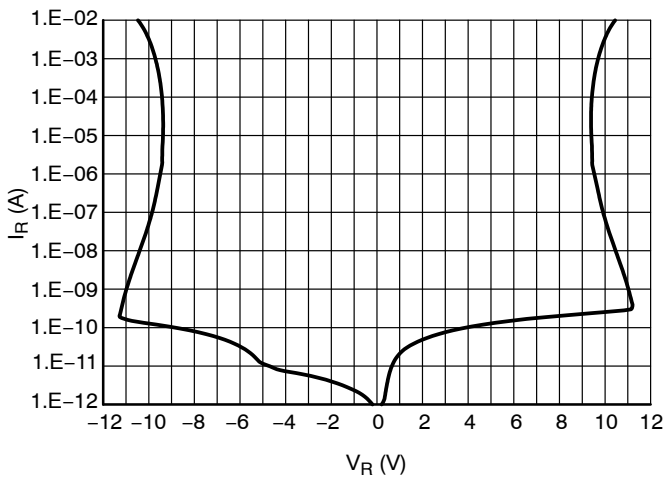


Figure 7. Breakdown Voltage

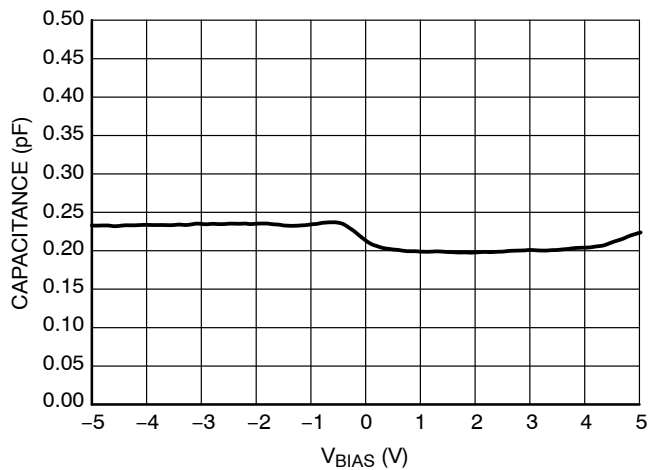
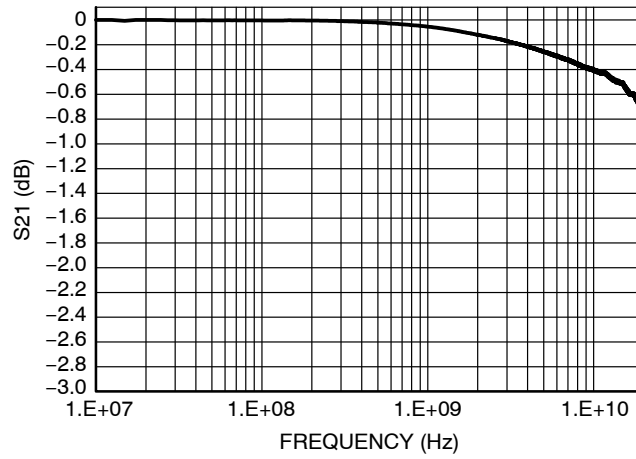


Figure 8. Line Capacitance,  $f = 1 \text{ MHz}$

# ESDL3552B

## TYPICAL CHARACTERISTICS



**Figure 9. Insertion Loss**

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

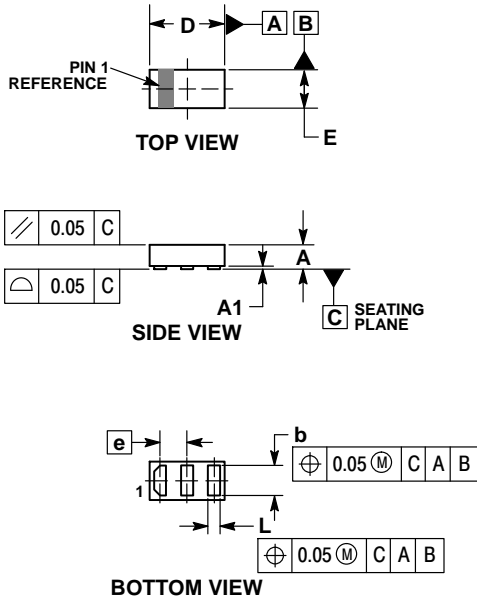
ON Semiconductor®



SCALE 8:1

**X4DFN3 0.62x0.32, 0.225P**  
CASE 718AB  
ISSUE A

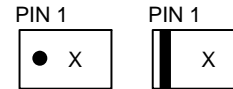
DATE 13 MAR 2018



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.

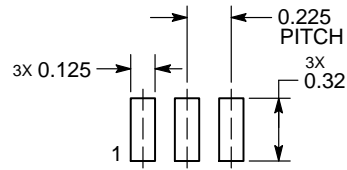
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.175	0.20	0.225
A1	0.000	0.015	0.030
b	0.23	0.25	0.27
D	0.595	0.620	0.645
E	0.295	0.320	0.345
e	0.225 BSC		
L	0.08	0.10	0.12

### GENERIC MARKING DIAGRAMS\*



X = Specific Device Code

### RECOMMENDED MOUNTING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

See Application Note AND8398/D for more mounting details  
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

<b>DOCUMENT NUMBER:</b>	<b>98AON64083G</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>X4DFN3 0.62x0.32, 0.225P</b>	<b>PAGE 1 OF 1</b>

ON Semiconductor and are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

**North American Technical Support:**

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative