

# ESD Protection Diodes

## Micro-packaged Diodes for ESD Protection

### SESDU1052, SESDU1052C

The SESDU1052 and SESDU1052C are designed to protect voltage sensitive components from ESD. Excellent clamping capability, low leakage, and fast response time provide best in class protection on designs that are exposed to ESD. Because of its small size, it is suited for use in smartphone, smart-watch, or many other portable / wearable applications where board space comes at a premium.

#### Features

- Low Capacitance (4 pF Max, I/O to GND)
- Small Body Outline Dimensions: – 01005 Size: 0.435 x 0.230 mm
- Protection for the Following IEC Standards:  
IEC 61000-4-2 (Level 4)
- Low ESD Clamping Voltage
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### Applications

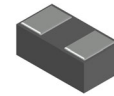
- GPIO, Audio, USB Type-C Port Protection

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

Rating	Symbol	Value	Unit
Operating Junction Temperature Range	T <sub>J</sub>	–55 to +125	°C
Storage Temperature Range	T <sub>stg</sub>	–55 to +150	°C
Lead Solder Temperature – Maximum (10 Seconds)	T <sub>L</sub>	260	°C
SESDU1052: IEC 61000-4-2 Contact IEC 61000-4-2 Air	ESD	±20 ±20	kV kV

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.



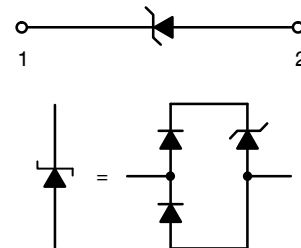
DSN2  
CASE 152BB

#### MARKING DIAGRAM



- 1 = SESDU1052 Device Code  
7 = SESDU1052C Device Code

#### PIN CONFIGURATION AND SCHEMATIC



#### ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

# SESDU1052, SESDU1052C

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V <sub>RWM</sub>	I/O Pin to GND			5.5	V
Breakdown Voltage	V <sub>BR</sub>	I <sub>T</sub> = 1 mA, I/O Pin to GND	5.9	6.8	8.5	V
Reverse Leakage Current	I <sub>R</sub>	V <sub>RWM</sub> = 5.5 V, I/O Pin to GND			0.1	μA
Clamping Voltage TLP (Note 1) I/O Pin to GND	V <sub>C</sub>	I <sub>PP</sub> = 8 A I <sub>PP</sub> = 16 A I <sub>PP</sub> = 30 A		8.3 9.5 11.3		V
Clamping Voltage TLP (Note 1) GND to I/O Pin	V <sub>C</sub>	I <sub>PP</sub> = 8 A I <sub>PP</sub> = 16 A I <sub>PP</sub> = 30 A		1.8 2.4 3.7		V
Dynamic Resistance	R <sub>DYN</sub>	I/O Pin to GND, 100 ns TLP		0.15		Ω
Holding Voltage	V <sub>H</sub>	I/O Pin to GND, 100 ns TLP	6.0	7.5	9.0	V
Trigger Voltage	V <sub>T</sub>	I/O Pin to GND, 100 ns TLP		8.0	10	V
Reverse Peak Pulse Current	I <sub>PP</sub>	IEC61000-4-5 (8x20 μs), I/O Pin to GND	3.0	11		A
Clamping Voltage (8x20 μs)	V <sub>C</sub>	I <sub>PP</sub> = 3 A, I/O Pin to GND		8.0	10	V
Junction Capacitance	C <sub>J</sub>	V <sub>R</sub> = 0 V, f = 1 MHz		2.0	4.0	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.

1. ANSI/ESD STM5.5.1 – Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model.

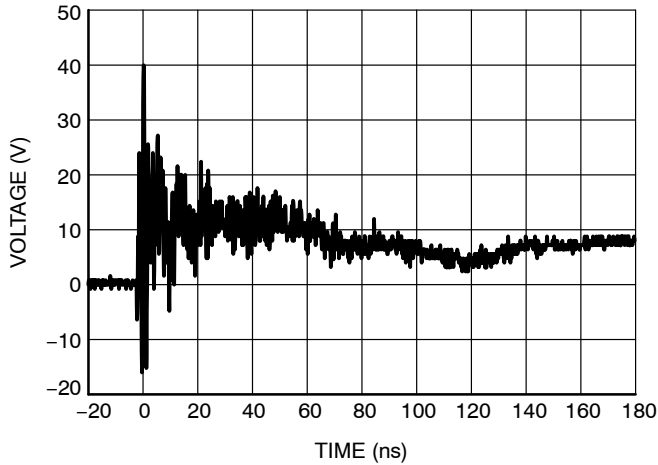
TLP conditions: Z<sub>0</sub> = 50 Ω, t<sub>p</sub> = 100 ns, t<sub>r</sub> = 1 ns, averaging window; t<sub>1</sub> = 70 ns to t<sub>2</sub> = 90 ns.

## ORDERING INFORMATION

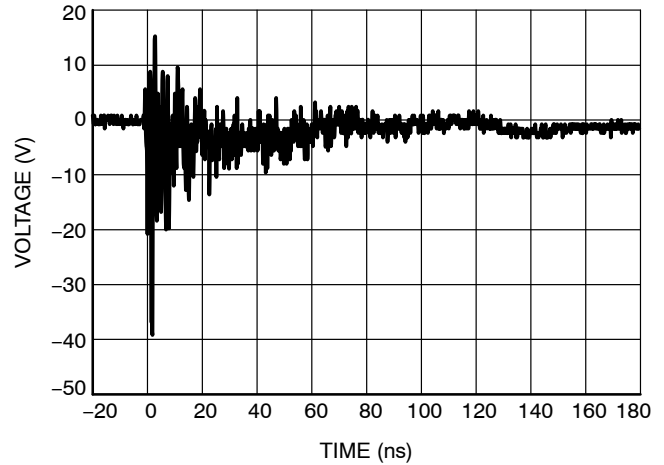
Device	Package	Shipping <sup>†</sup>
SESDU1052FCT5G	DSN2 – 01005 (Pb-Free)	10,000 / Tape & Reel
SESDU1052CFCT5G		

<sup>†</sup>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.

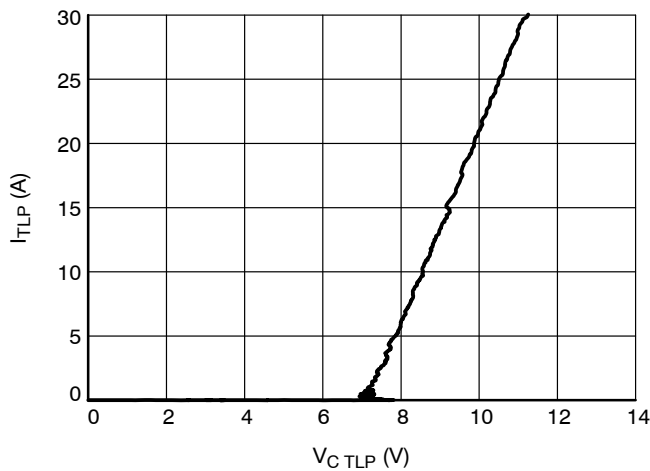
TYPICAL CHARACTERISTICS



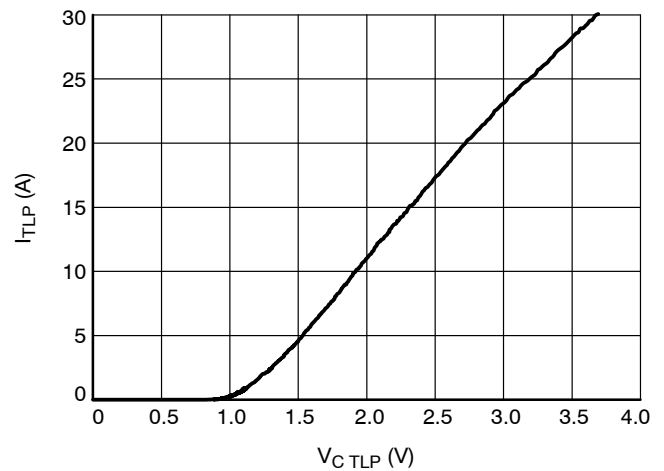
**Figure 1. ESD Clamping Voltage  
Positive 8 kV Contact per IEC61000-4-2**



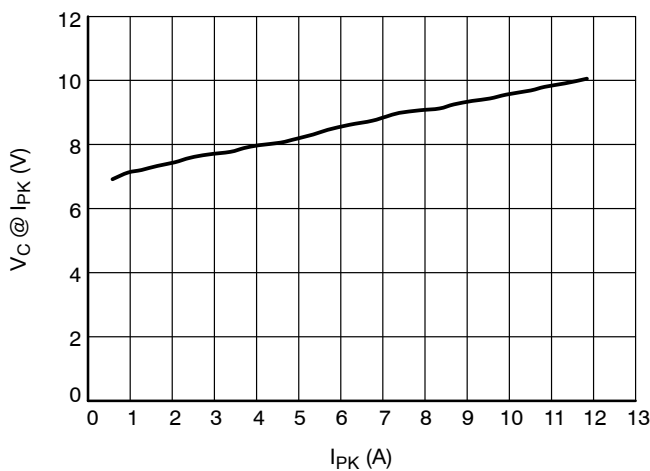
**Figure 2. ESD Clamping Voltage  
Negative 8 kV Contact per IEC61000-4-2**



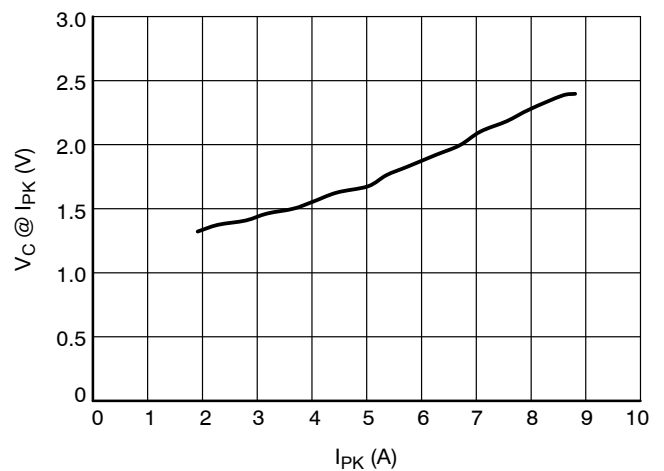
**Figure 3. Positive 100 ns TLP I-V Curve**



**Figure 4. Negative 100 ns 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 ( $t_p = 8/20 \mu s$ )**

TYPICAL CHARACTERISTICS

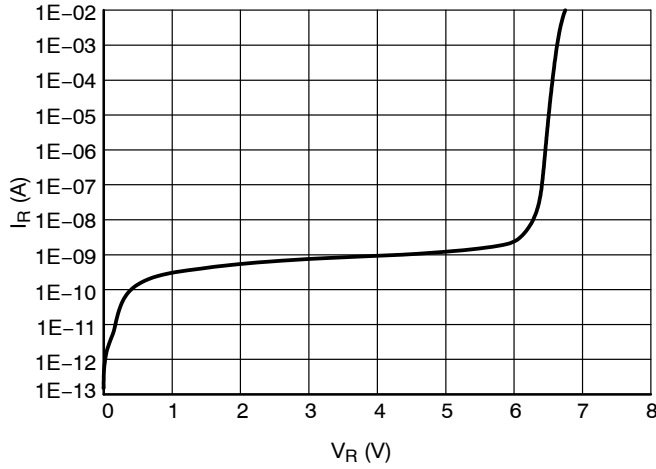


Figure 7. Breakdown Voltage

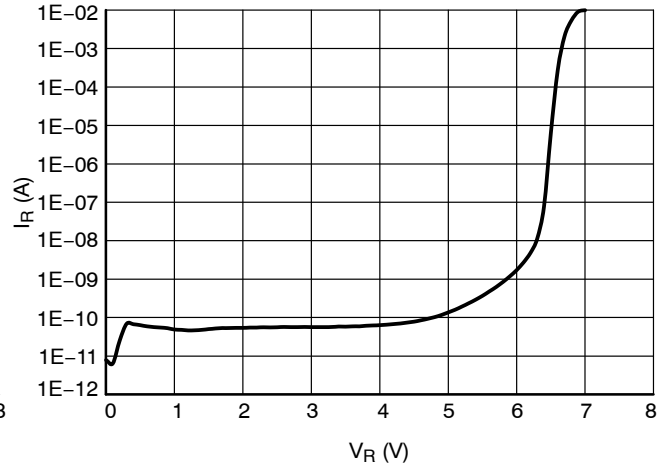


Figure 8. Reverse Leakage Current

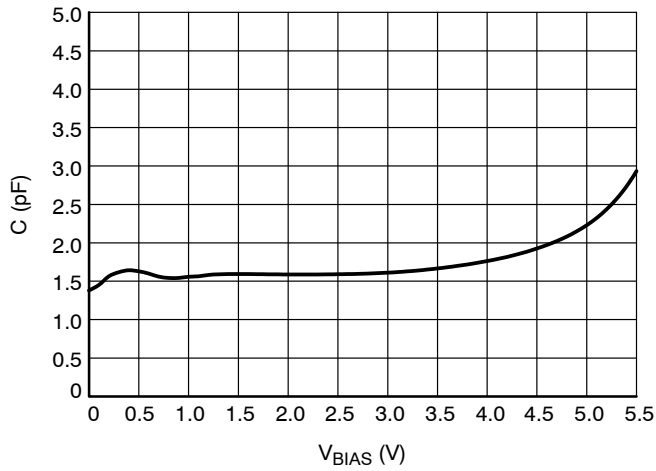


Figure 9. Line Capacitance,  $f = 1$  MHz

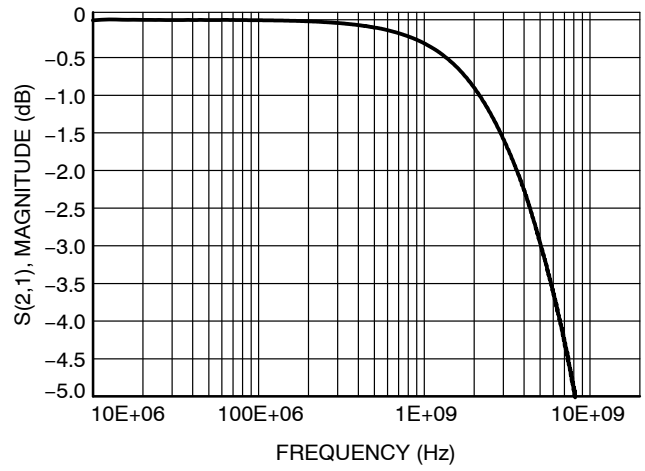


Figure 10. Insertion Loss

## 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 11. IEC61000-4-2 Spec

## Transmission Line Pulse (TLP) Measurement

Transmission Line Pulse (TLP) provides current versus voltage (I-V) curves in which each data point is obtained from a 100 ns long rectangular pulse from a charged transmission line. A simplified schematic of a typical TLP system is shown in Figure 12. TLP I-V curves of ESD protection devices accurately demonstrate the product's ESD capability because the 10s of amps current levels and under 100 ns time scale match those of an ESD event. This is illustrated in Figure 13 where an 8 kV IEC 61000-4-2 current waveform is compared with TLP current pulses at 8 A and 16 A. A TLP I-V curve shows the voltage at which the device turns on as well as how well the device clamps voltage over a range of current levels.

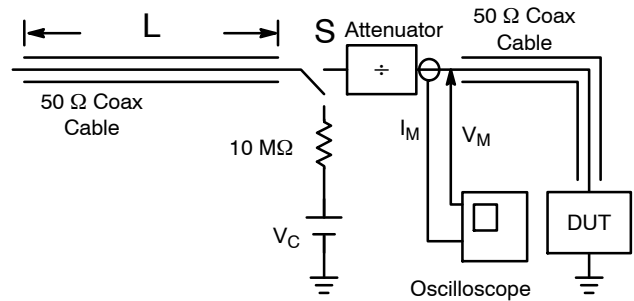


Figure 12. Simplified Schematic of a Typical TLP System

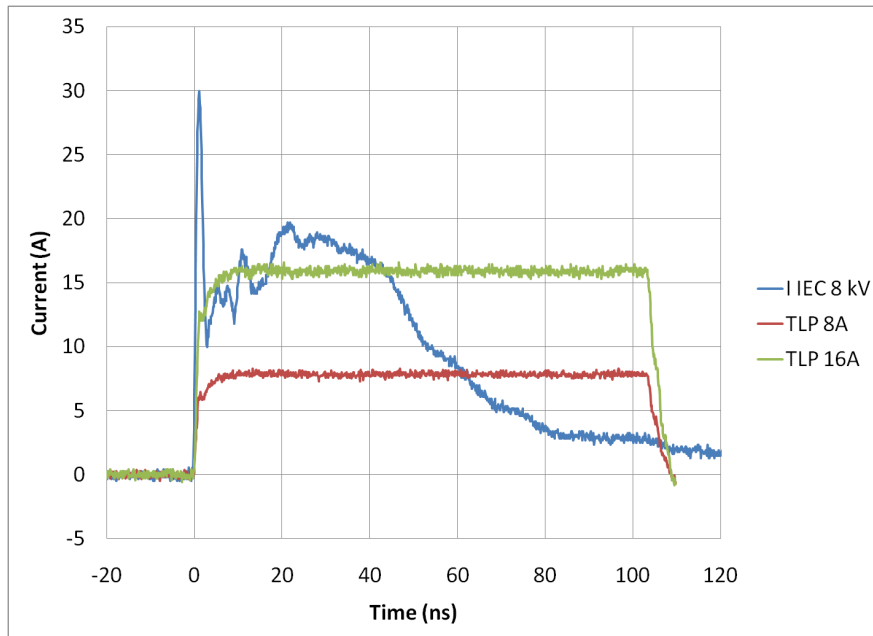
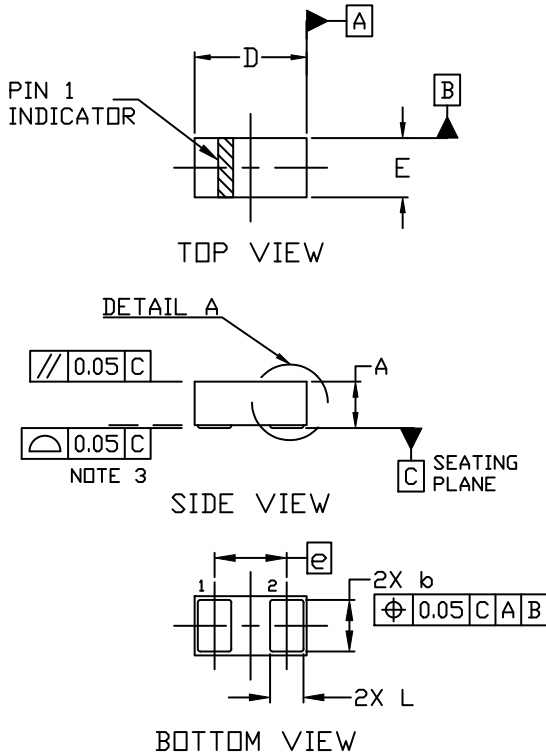


Figure 13. Comparison Between 8 kV IEC 61000-4-2 and 8 A and 16 A TLP Waveforms

# SESDU1052, SESDU1052C

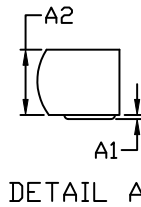
## PACKAGE DIMENSIONS

DSN2, 0.435x0.23, 0.28P  
CASE 152BB  
ISSUE A

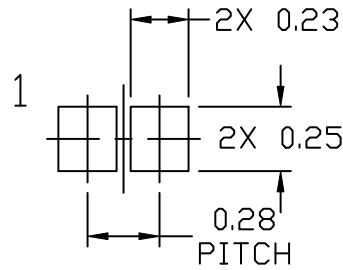


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO ALL PADS



DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.165	0.180	0.195
A1	0.008	0.011	0.014
A2	0.157	0.169	0.181
b	0.192	0.200	0.208
D	0.415	0.435	0.455
E	0.210	0.230	0.250
e	0.28 BSC		
L	0.122	0.130	0.138



### 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.

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