

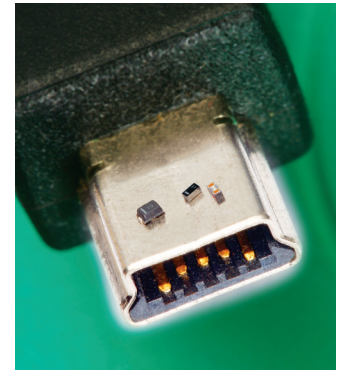
Silicon ESD Protection Devices

The Silicon ESD (SESD) protection devices help protect electronic circuits against damage from electrostatic discharge (ESD) events. The 0201-sized SESD device's miniature footprint - measuring 0.6mm x 0.3mm x 0.3mm - is approximately 70 percent smaller than prior-generation devices, offering designers flexibility in space-constrained applications.

The SESD0201C-006-058 device is a bi-directional and ultra-low capacitance 0.6 picofarad (pF) device that is suitable for protecting very-high-speed data lines, such as USB and HDMI, or low-voltage antenna ports. The device's ultra-low capacitance, low insertion loss (<0.5dB up to 3GHz), and high linearity of capacitance vs. frequency helps minimize signal degradation.

The SESD0201C-120-058 device is a higher-capacitance (12pF) device that can be used for low-speed generic interfaces such as keypads, power buttons, speakers, and microphone ports in portable electronics. Both SESD0201C-006-058 and SESD0201C-012-058 devices offer 8kV contact and 15kV air discharge protection per the IEC61000-4-2, level 4 standard.

Also included in the product line is the SESD0402S-005-054 device, an ultra-low-capacitance SOD-923 (0402-size package) device with 0.5pF typical capacitance. This device offers a 10kV contact discharge rating per IEC61000-4-2, level 4 and can be used with digital applications such as USB and HDMI.



Benefits:

- Small size SESD protection diodes for high speed signals
- ESD protection in space-constrained portable electronics and mobile handsets
- Helps protect electronic circuits against damage from ESD
- Assist equipment to pass IEC61000-4-2, level 4 testing

Features:

- RoHS compliant
- Halogen Free (refers to: Br ≤ 900ppm, Cl ≤ 900ppm, Br+Cl ≤ 1500ppm)
- Low-leakage current - 1.0µA (max)
- Low-breakdown voltage < 5.8V
- Capable of withstanding numerous ESD strikes
- Low capacitance and insertion loss
- SOD-923 case epoxy material meets UL 94 V-0
- SESD0402S devices meet MSL-1 requirements

Applications:

- Mobile phones and portable electronics
- High-speed data lines (low capacitance 0201 and 0402)
- Low-voltage antenna ports (bi-directional 0201)
- USB 2.0 / 3.0, HDMI 1.3 / 1.4, and DisplayPort
- Applications requiring high ESD performance in a small package

Maximum Ratings for SESD Devices

Part Numbers	IEC 61000-4-2, level 4 (ESD Withstand)		Temperature		Total Power Dissipation on FR-4 board ⁽¹⁾ (mW)
	Contact (kV)	Air (kV)	Operating (°C)	Storage (°C)	
SESD0201C-006-058	±8	±15	-40 to +125	-40 to +125	150
SESD0201C-120-058	±8	±15	-40 to +125	-40 to +125	250
SESD0402S-005-054	±10	±15	-55 to +125	-55 to +150	250

(1) FR-4 board = 30mm x 30mm x 2mm

Electrical Characteristics @ T=25°C for SESD Devices

Part Numbers	Input Capacitance ⁽¹⁾		Leakage Current (max)	Breakdown Voltage (min)	Working Reverse Voltage
	Typical (pF)	Maximum (pF)	I _L @ V _{wrv} = 5.0V (uA)	V _{br} @ I _L ⁽⁴⁾ = 1mA (V)	V _{wrv} @ peak (V)
SESD0201C-006-058	0.6 ⁽²⁾	0.9	1.0	±5.8	5.0
SESD0201C-120-058	12.0	13.5	1.0	±5.8	5.0
SESD0402S-005-054	0.5 ⁽³⁾	0.9	1.0	+5.4 / -1.0	5.0

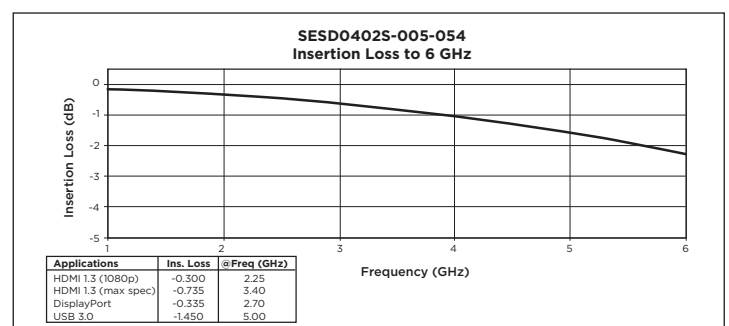
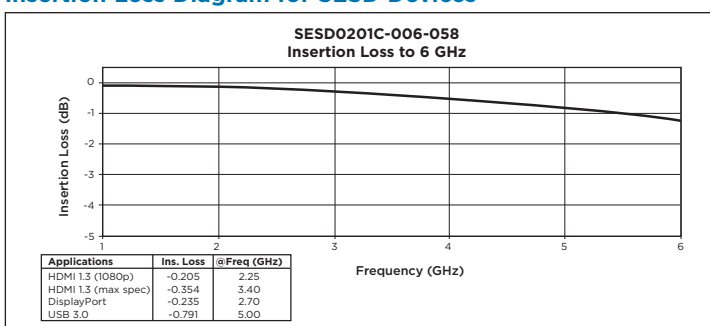
(1) @ Vr=0V, f=1MHz

(2) 0.19pF@f=3GHz

(3) 0.17pF@f=3GHz

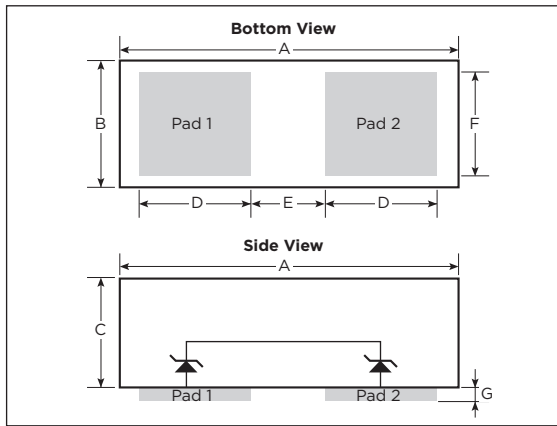
(4) V_{br} is measured at test current I_L

Insertion Loss Diagram for SESD Devices

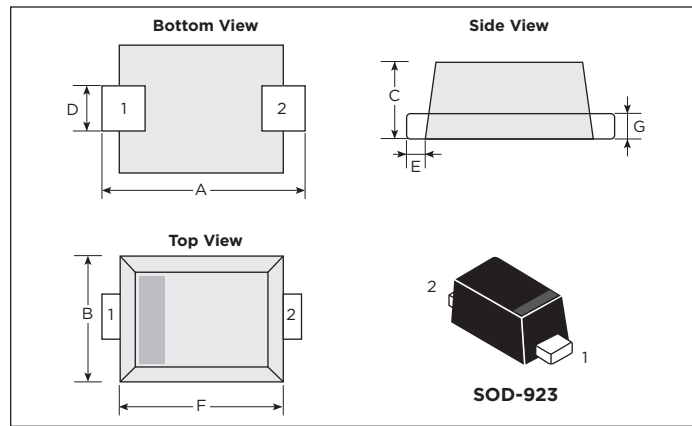


Device Dimensions for SESD Devices

SESD0201C CSP Package



SESD0402S SOD-923 Package



SESD0201C	A	B	C	D	E	F	G
mm	0.60 ± 0.03	0.30 ± 0.03	0.27 ± 0.03	0.15 ± 0.03	0.25 ± 0.03	0.25 ± 0.03	0.005 (max)
mils*	23.62 ± 1.20	11.81 ± 1.20	10.63 ± 1.20	5.91 ± 1.20	9.84 ± 1.20	9.84 ± 1.20	0.197 (max)

SESD0402S	A	B	C	D	E	F	G
mm	1.00 ± 0.01	0.60 ± 0.01	0.37 ± 0.03	0.20 ± 0.05	0.10 ± 0.05	0.80 ± 0.05	0.12 ± 0.05
mils*	39.37 ± 0.40	23.62 ± 0.40	14.57 ± 1.20	7.87 ± 2.00	3.94 ± 2.00	31.50 ± 2.00	4.72 ± 2.00

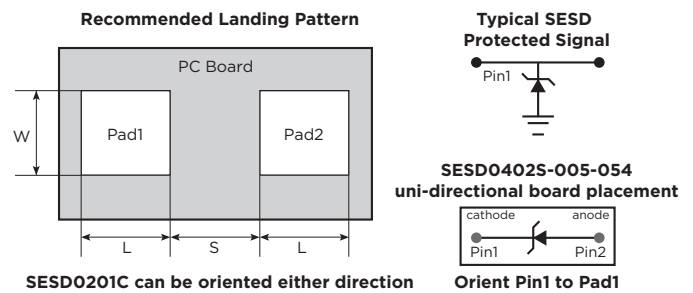
*Round off approximation

PCB Pad Layout for SESD Devices

SESD0201C	L	S	W
mm	0.28 ± 0.01	0.19 ± 0.01	0.30 ± 0.01
mils*	11.0 ± 0.40	7.50 ± 0.40	11.80 ± 0.40

SESD0402S	L	S	W
mm	0.30 ± 0.01	0.60 ± 0.01	0.40 ± 0.01
mils*	11.80 ± 0.40	23.60 ± 0.40	15.70 ± 0.40

*Round off approximation



SESD Application Examples

HDMI 1.3 / 1.4	USB 2.0 / 3.0	DisplayPort	RF / Antenna
Ethernet low voltage control line is unique to HDMI 1.4; all other signals same as HDMI 1.3.	USB 3.0 signals are ten times faster than USB 2.0 signals. USB 3.0 port includes USB 2.0 signals for backward compatibility.	DisplayPort signals run as high as 2.7GHz, requiring low capacitance for minimal insertion loss.	RF / Antenna signals require low clamping voltage, bi-directional operation, and low capacitance for minimal insertion loss.
High speed HDMI / USB / DisplayPort signals: Use SESD0201C-006-058 or SESD0402S-005-054			Use Q201 size Bi-directional SESD0201C-006-058
HDMI / USB / DisplayPort control lines: Use SESD0201C-120-058 or SESD0201C-006-058 or SESD0402S-005-054			

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