

# Single Channel Silicon ESD Protector Overvoltage Protection Device

308 Constitution Drive  
Menlo Park, CA USA  
www.circuitprotection.com

DOCUMENT: SCD28184  
REV LETTER: G  
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## Specification Status: RELEASED

### BENEFITS

- Industry-leading lowest capacitance; provides lowest insertion loss for high speed data signals
- Small size ESD protection diodes for high speed data signals (0201 size devices)
- Helps protect electronic circuits against damage from Electrostatic Discharge (ESD), surge and cable discharge events
- Assists equipment to pass IEC61000-4-2, level 4 testing

### FEATURES

- Low capacitance: 0.20 pF (200fF) (typ)
- Low leakage current: 25nA @ 5V (typ)
- Low clamping voltage: +9.20 / -0.80V (typ) @ (tp=8x20µs, Ipp=2A)
- ESD maximum rating per IEC61000-4-2 standard:
  - 20kV contact discharge
  - 20kV air discharge
- Surge : 2A (max) @ (tp=8x20µs) per IEC61000-4-5
- Small size and low profile: XDFN packages

### APPLICATIONS

- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Ultra-high speed data lines
- USB 3.0/2.0, HDMI 1.3/1.4, DisplayPort, Thunderbolt (Light Peak), V-by-One HS, and LVDS interfaces
- Applications requiring high ESD performance in small packages

### AEC-Q101 QUALIFIED

### MATERIALS INFORMATION

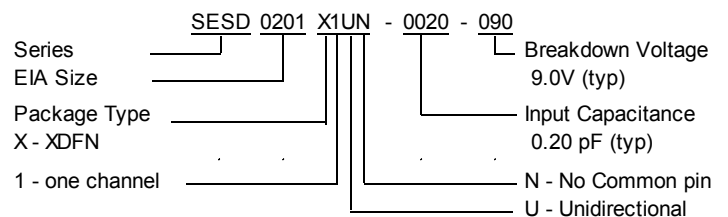
RoHS Compliant    ELV Compliant    Halogen Free \*    Lead Free



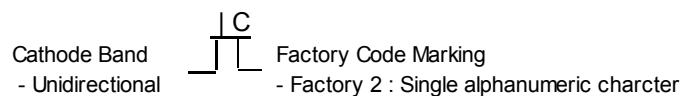
\* Halogen Free refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm  
SESD devices meet MSL-1 Requirements  
DFN case epoxy meets UL 94 V-0



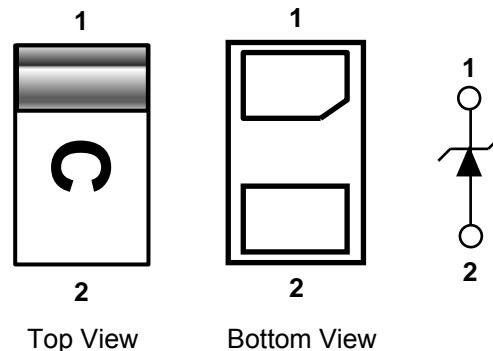
### PART NUMBERING



### PART MARKING



### PIN CONFIGURATION AND SCHEMATIC



\* Drawing not to scale

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## DEVICE MAXIMUM RATING

ESD Withstand <sup>(1)</sup> (IEC 61000-4-2, level 4)		Temperature		Peak Current (tp=8x20µs)
Contact (kV)	Air (kV)	Operating (°C)	Storage (°C)	Ipp (A)
20	20	-55 to +125	-55 to +150	2.0

<sup>(1)</sup> 20kV @ 1 pulse; 10kV @ 100 pulses; 8kV @ 1,000 pulses (under IEC6100-4-2)

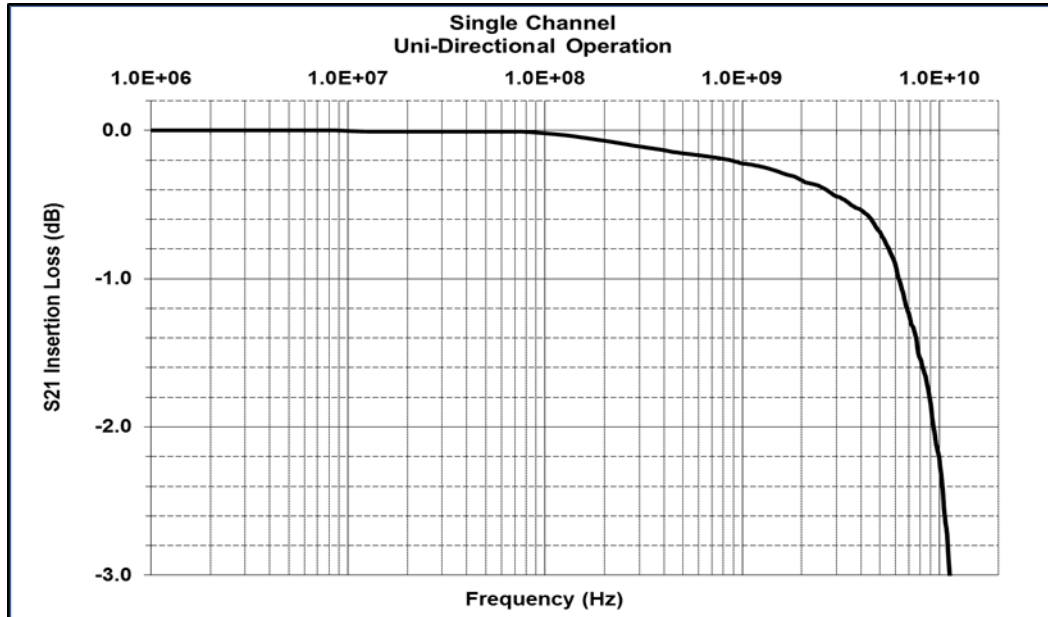
- Maximum leakage current post 15kV & 20kV pulses is less than 1µA
- Device maximum rating @ T = 25°C, unless otherwise specified
- Caution: Stress exceeding Device Maximum Ratings may damage the device  
Prolonged exposure to stresses above the recommended operating conditions may affect device reliability

## DEVICE ELECTRICAL CHARACTERISTICS

Input Capacitance @ V <sub>R</sub> = 0V, f = 3GHz, I/O to GND (pF)		Breakdown Voltage V <sub>BR</sub> @ I <sub>T</sub> =1mA (V)	Reverse Working Voltage (V)		Reverse Leakage Current I <sub>L</sub> @ V <sub>RWM</sub> =5.0V (nA)		Clamping Voltage V <sub>CL</sub> @ Ipp=2.0A (V)
Typ	Maximum	Typ	Min	Max	Typ	Max	Typ
0.20	0.25	+9.00 / -0.80	0	+7.00	25.0	50.0	+9.20 / -0.80

- All device electrical characteristics @ T = 25°C, unless otherwise specified

## FIGURE 1. INSERTION LOSS DIAGRAM

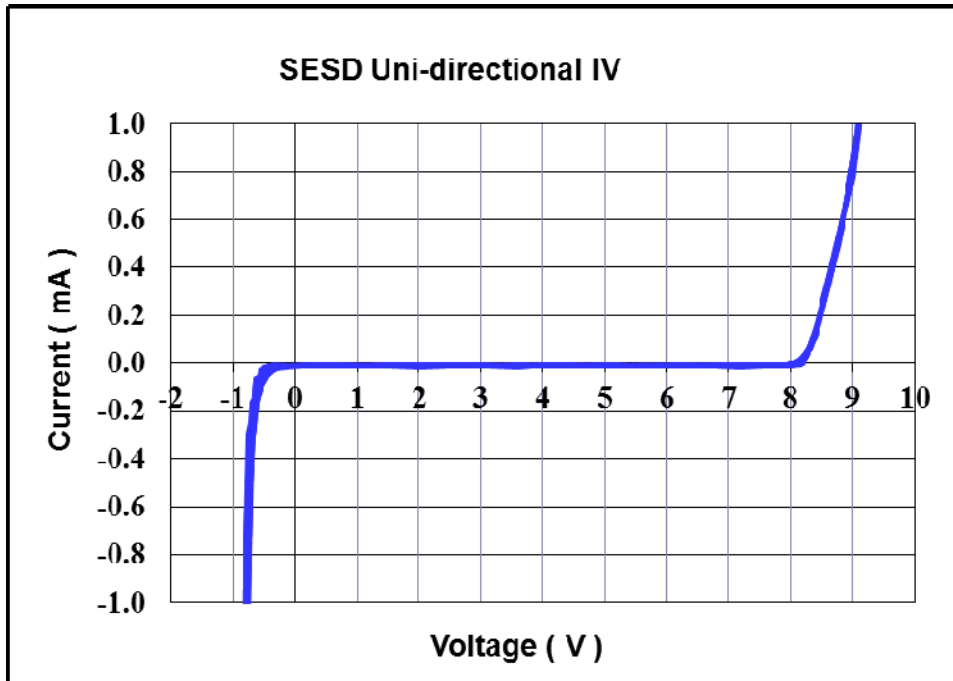


Application	Bit Rate (Gbps)	@ Freq (GHz)	Ins. Loss (dB)
HDMI 1.4 (1080P)	2.25	1.13	-0.23
DisplayPort	2.70	1.35	-0.26
HDMI 1.4 (4K / QuadHD)*	3.40	1.70	-0.30
USB3.0	5.00	2.50	-0.38
eSATA	6.00	3.00	-0.44
Thunderbolt	10.0	5.00	-0.69

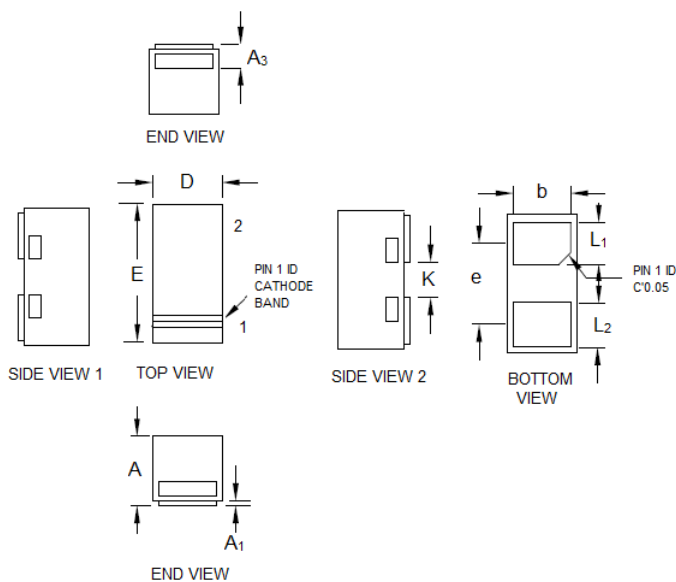
\*HDMI 4K / QuadHD resolutions (4096 x 2160) ready

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**FIGURE 2. DEVICE IV CURVE**



## DEVICE DIMENSIONS



SESD0201X1UN-0020-090						
Millimeters (mm)			Inches (in)			
Dim	Min	Nom	Max	Min	Nom	Max
A	0.28	0.30	0.32	0.011	0.012	0.013
A <sub>1</sub>	0	-	0.05	0	-	0.002
A <sub>3</sub>	0.102 ref.			0.004 ref.		
D	0.25	0.30	0.35	0.010	0.012	0.014
E	0.55	0.60	0.65	0.022	0.024	0.026
K	0.11	0.17	0.22	0.004	0.007	0.009
b	0.20	0.25	0.30	0.008	0.010	0.012
L <sub>1</sub>	0.13	0.18	0.23	0.005	0.008	0.009
L <sub>2</sub>	0.14	0.19	0.24	0.006	0.007	0.009
e	0.356 BSC			0.014 BSC		

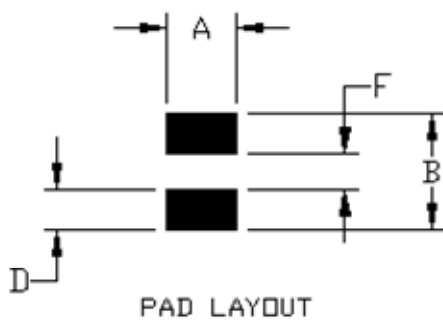
BSC – Basic Spacing between Centers

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## RECOMMENDED LANDING PATTERN:

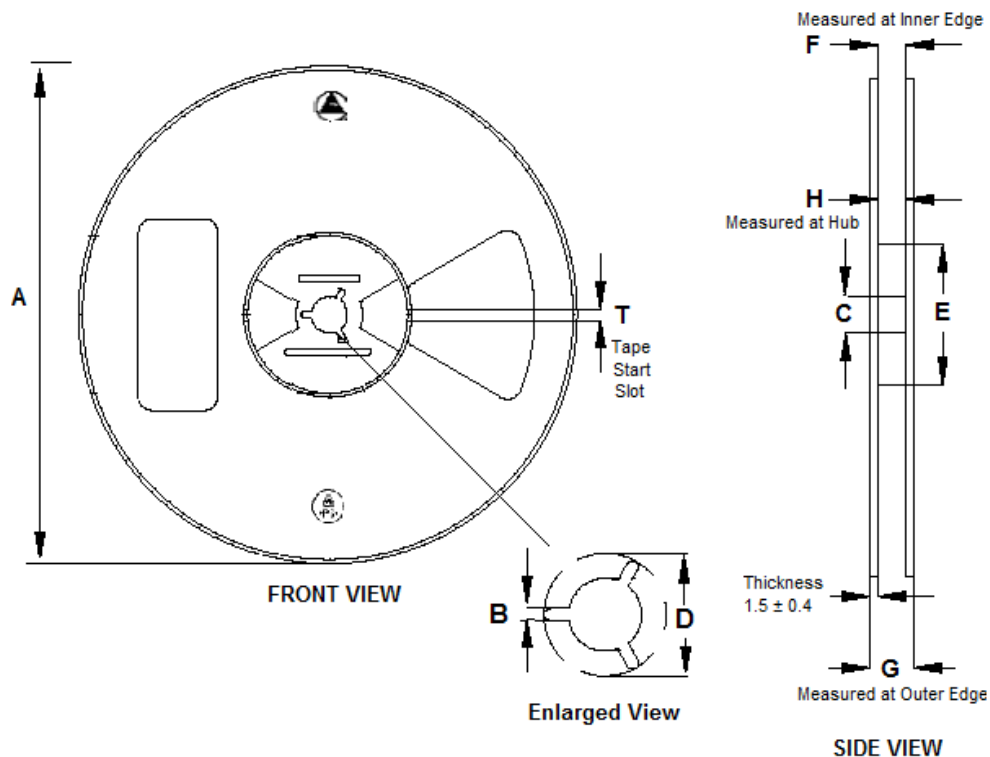


SESD Landing Pad Layout 0201 Package		
Symbol	Milimeters (mm)	Inches (in)
A	0.32	0.013
B	0.62	0.024
D	0.24	0.009
F	0.14	0.006

## PACKAGING

Packaging	Tape & Reel	Standard Box
SESD0201X1UN-0020-090	15,000	75,000

## REEL DIMENSIONS



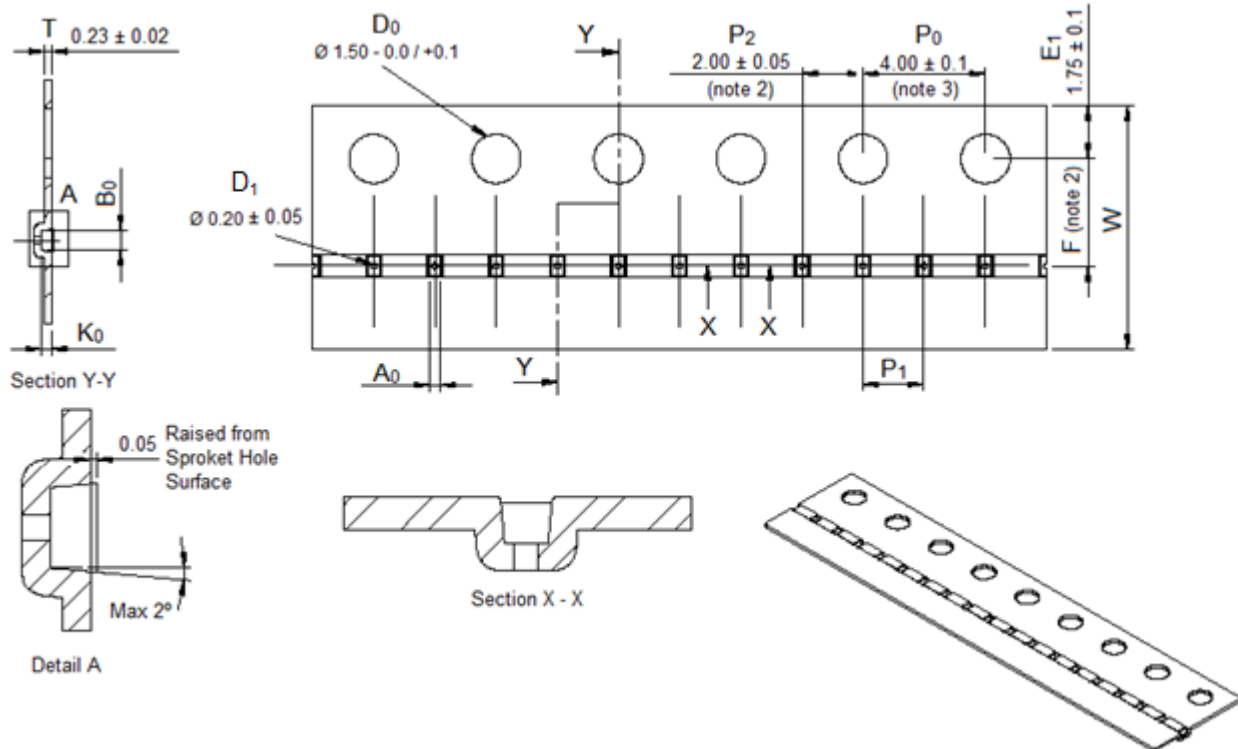
Dimensions	A	B	C	D	E	F	G	H
(mm)	180 ± 2.00	1.50 (min)	13.10 ± 0.20	20.20 (min)	60 ± 1.00	8.75 ± 1.00	11.6 ± 1.00	9.4 (max)

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**CARRIER TAPE DIMENSIONS**



A <sub>0</sub>	0.36 ± 0.03
B <sub>0</sub>	0.66 ± 0.03
K <sub>0</sub>	0.33 ± 0.03
F	3.50 ± 0.05
P <sub>1</sub>	2.00 ± 0.10
W	8.00 ± 0.10

Note 1. All dimensions in mm

Note 2. Measured from centerline of pocket to centerline of sprocket hole

Note 3. Cumulative tolerance of 10 sprocket holes is ± 0.20

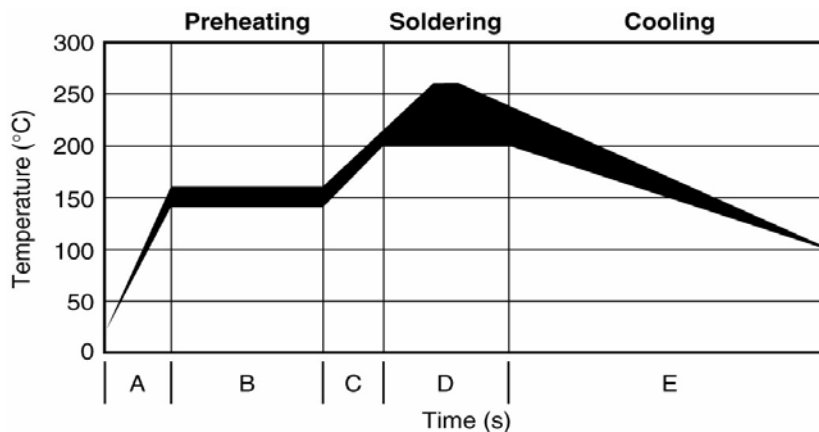
Note 4. Tolerances unless noted ± 0.20

## Single Channel Silicon ESD Protector Overvoltage Protection Device

### SOLDER REFLOW RECOMMENDATION

A	Temperature ramp up 1	From ambient to Preheating temperature	30s to 60s
B	Preheating	140°C - 160°C	60s to 120s
C	Temperature ramp up 2	From Preheating to Main heating temperature	20s to 40s
D	Main heating	at 200°C at 220°C at 240°C at 260°C	60s ~ 70s 50s ~ 60s 30s ~ 40s 5s ~ 10s
E	Cooling	From main heating temperature to 100°C	4°C/s (max)

**FIGURE 3. REFLOW PROFILE**



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