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

Single Channel
Silicon ESD Protector
Overvoltage Protection Device

PRODUCT: SESD0402X1UN-0020-090

DOCUMENT: SCD28186
REV LETTER: G
REV DATE: MAY 15, 2013

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 (0402 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 — Directive 2000/53/EC Compliant
ELV Compliant — Directive 2002/95/EC Compliant
Halogen Free * — HF
Lead Free — Pb

* 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

SESD 0402 X1UN - 0020 - 090

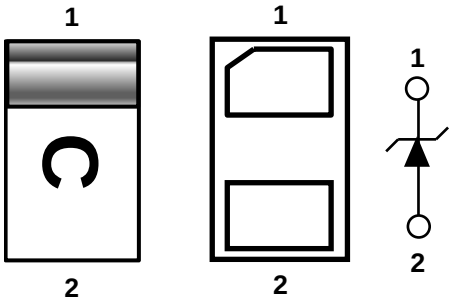
- SESD — Series
- 0402 — EIA Size
- X1UN — Package Type: X - XDFN; 1 - one channel; N - No Common pin; U - Unidirectional
- 0020 — Input Capacitance: 0.20 pF (typ)
- 090 — Breakdown Voltage: 9.0V (typ)

PART MARKING

Cathode Band - Unidirectional

Factory Code Marking - Factory 2 : Single alphanumeric charcter

PIN CONFIGURATION AND SCHEMATIC



* Drawing not to scale

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DEVICE MAXIMUM RATING

ESD Withstand[1] (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

[1] 20kV @ 1 pulse; 10kV @ 100 pulses; 8kV @ 1,000 pulses (under IEC6100-4-2)

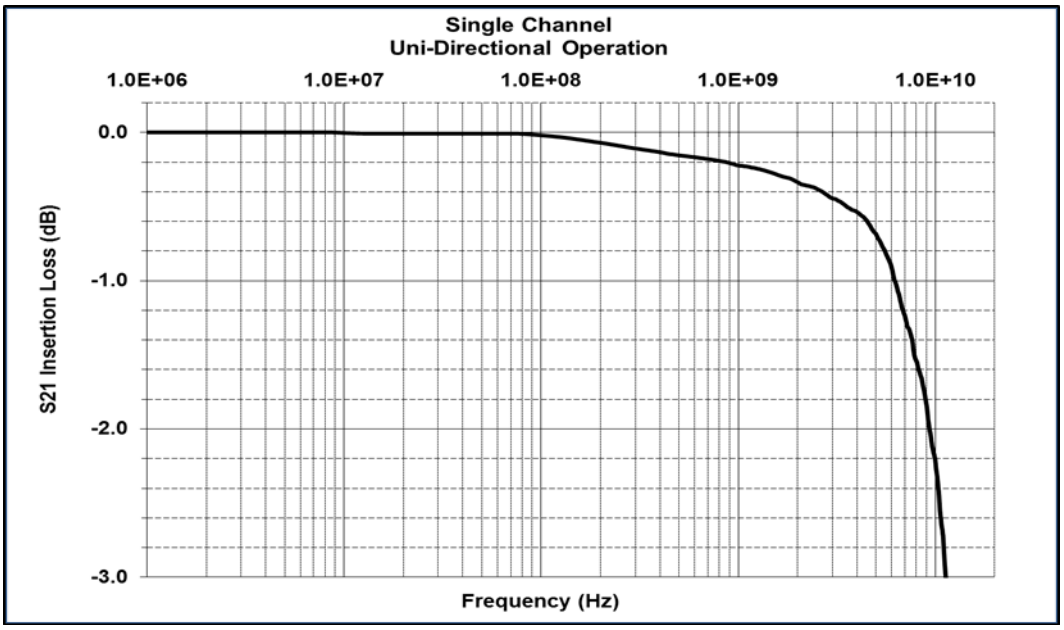
- Maximum leakage current post 15kV & 20kV pulses is less than 1 µA
- Device maximum rating @ T = 25ºC, unless otherwise specified
- Caution: Stress exceeding Device Maximum Ratings may damage the device
  Prolonged exposure to stresses above the recommended operating conditions may affect device reliability

DEVICE ELECTRICAL CHARACTERISTICS

Input Capacitance @ V_R = 0V, f = 3GHz, I/O to GND (pF)		Breakdown Voltage V_{BR} @ I_T=1mA (V)	Reverse Working Voltage (V)		Reverse Leakage Current I_L @ V_{RWM}=5.0V (nA)		Clamping Voltage V_{CL} @ 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 = 25ºC, 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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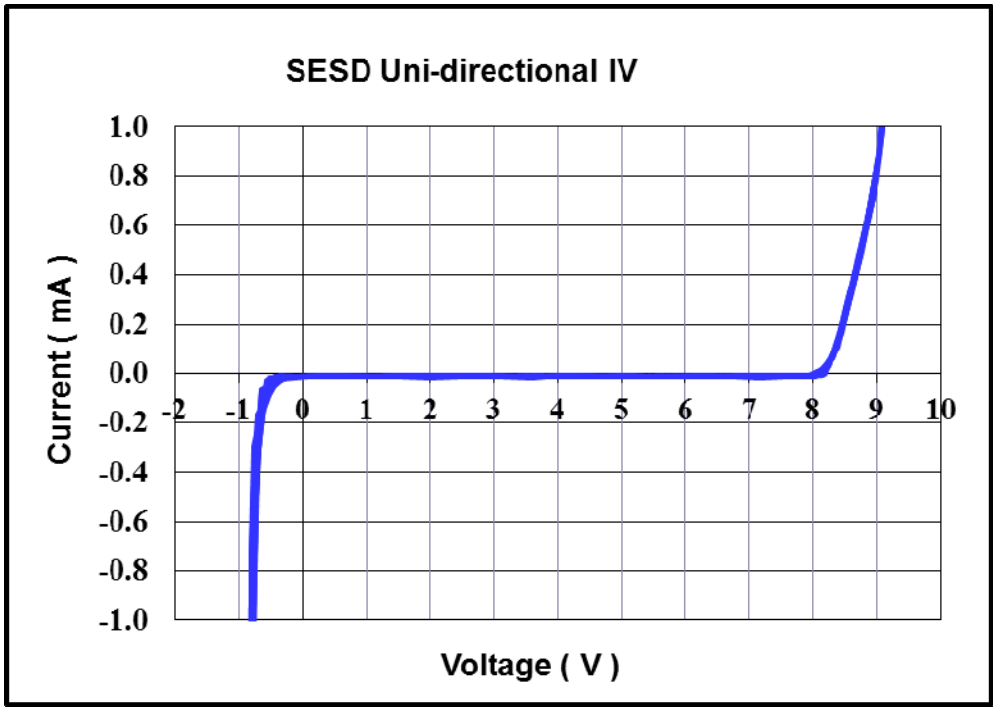
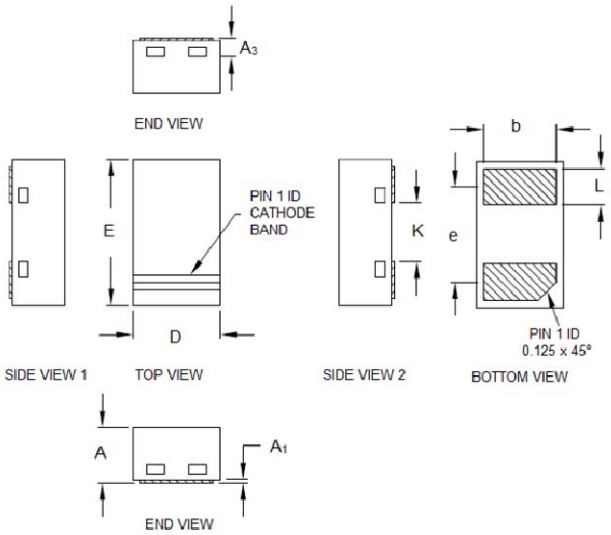
FIGURE 2. DEVICE IV CURVE



DEVICE DIMENSIONS



	SESD0402X1UN-0020-090					
	Milmeters (mm)			Inches (in)		
Dim	Min	Nom	Max	Min	Nom	Max
A	0.33	0.38	0.43	0.013	0.015	0.017
A1	0	-	0.05	0	-	0.002
A3	0.13 ref.			0.005 ref.		
D	0.55	0.60	0.65	0.022	0.024	0.026
E	0.95	1.00	1.05	0.037	0.039	0.041
K	0.35	0.40	0.45	0.014	0.016	0.018
b	0.45	0.50	0.55	0.018	0.020	0.022
L	0.20	0.25	0.30	0.008	0.010	0.012
e	0.65 BSC			0.026 BSC		

BSC – Basic Spacing between Centers

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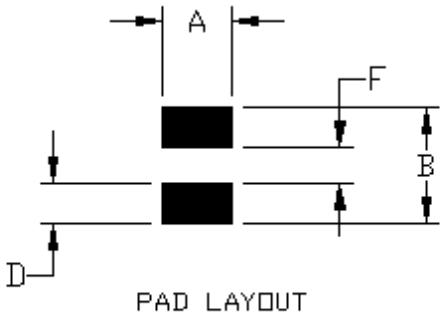
RECOMMENDED LANDING PATTERN:

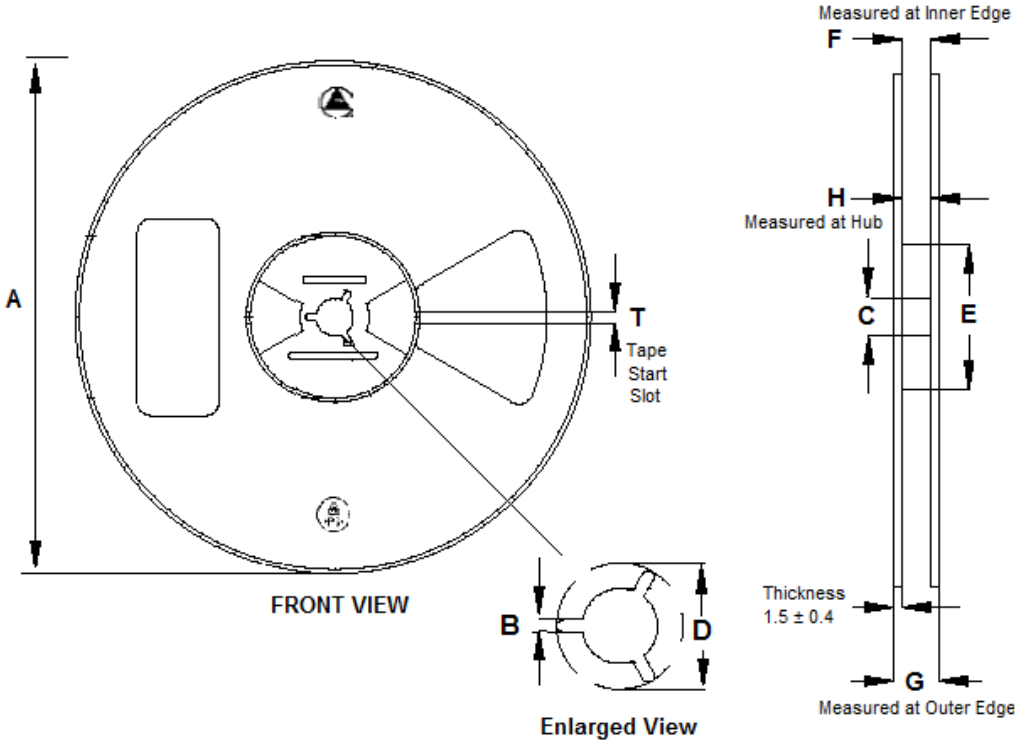


SESD Landing Pad Layout 0402 Package		
Symbol	**Milimeters (mm)**	**Inches (in)**
A	0.60	0.024
B	1.00	0.039
D	0.35	0.014
F	0.30	0.012

PACKAGING

Packaging	Tape & Reel	Standard Box
SESD0402X1UN-0020-090	10,000	50,000

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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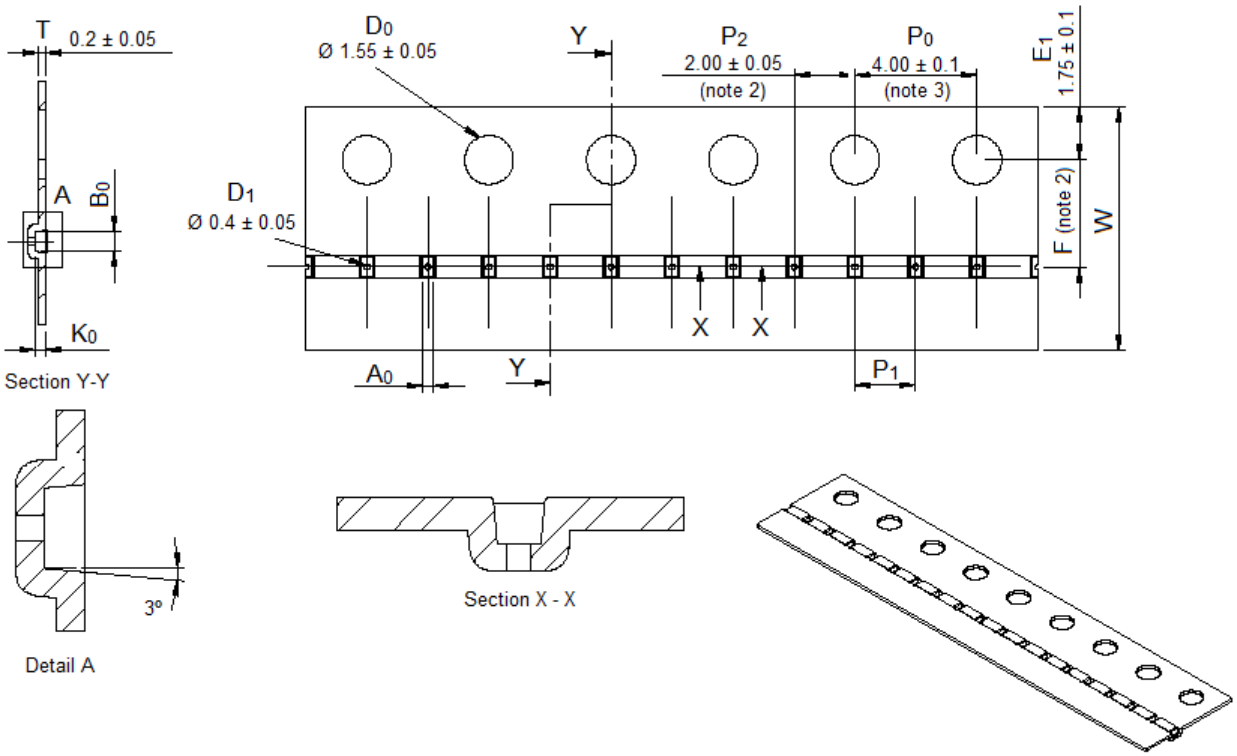
CARRIER TAPE DIMENSIONS



A_0	0.70 ± 0.05
B_0	1.15 ± 0.05
K_0	0.47 ± 0.05
F	3.50 ± 0.05
P_1	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 20 sprocket holes is ± 0.20
Note 4. Tolerances unless noted ± 0.20

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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