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

# Multi-Channel
## Silicon ESD Protector
**Overvoltage Protection Device**

**PRODUCT: SESD0402Q2UG-0030-088**

DOCUMENT: SCD28658
REV LETTER: B
REV DATE: MARCH 17, 2014


# Specification Status: RELEASED

## BENEFITS
- Low capacitance; provides lowest insertion loss for high speed data signals
- Small footprint and low profile multi-channel ESD array helps to optimize board space
- Flow-through and single connection design helps routing PCB matched-impedance high speed data lines
- 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: 0.30 pF (typ)
- Low leakage current : 25nA @ 5V (typ)
- Low clamping voltage : +13.0 (typ)
  @ (tp=8x20µs, Ipp=2.5A)
- ESD maximum rating per IEC61000-4-2 standard:
  - ±22kV contact discharge
  - ±22kV air discharge
- Surge: 2.5A (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, V-by-One HS, and LVDS interfaces
- Applications requiring high ESD performance in small DFN packages

## PART NUMBERING

SESD 0402 Q2UG - 0030 - 088

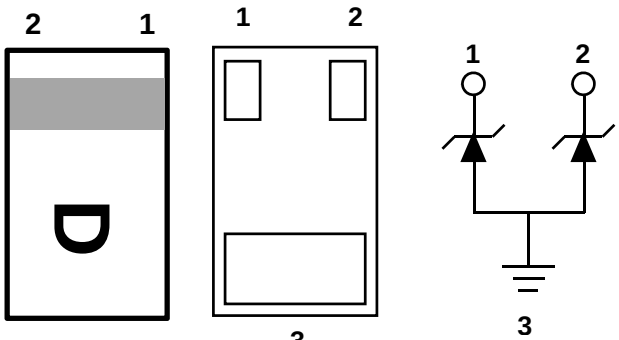
- SESD — Series
- 0402 — EIA Size
- Q2UG — Package Type: Q - Array; 2 - Two Channels; G - Common GND Pin; U - Uni-directional
- 0030 — Input Capacitance: 0.30 pF (typ)
- 088 — Breakdown Voltage: 8.8V (typ)

## PART MARKING

D

- D — Factory Code Marking - Factory: Single alphanumeric character
- Cathode Band - Unidirectional

## PIN CONFIGURATION AND SCHEMATIC




* Drawing not to scale

## 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

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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) |
| ± 22 | ± 22 | -55 to +125 | -55 to +150 | 2.5 |

[1] 22kV @ 10 pulses; 20kV @ 100 pulses; 8kV @ 1,000 pulses (under IEC6100-4-2)

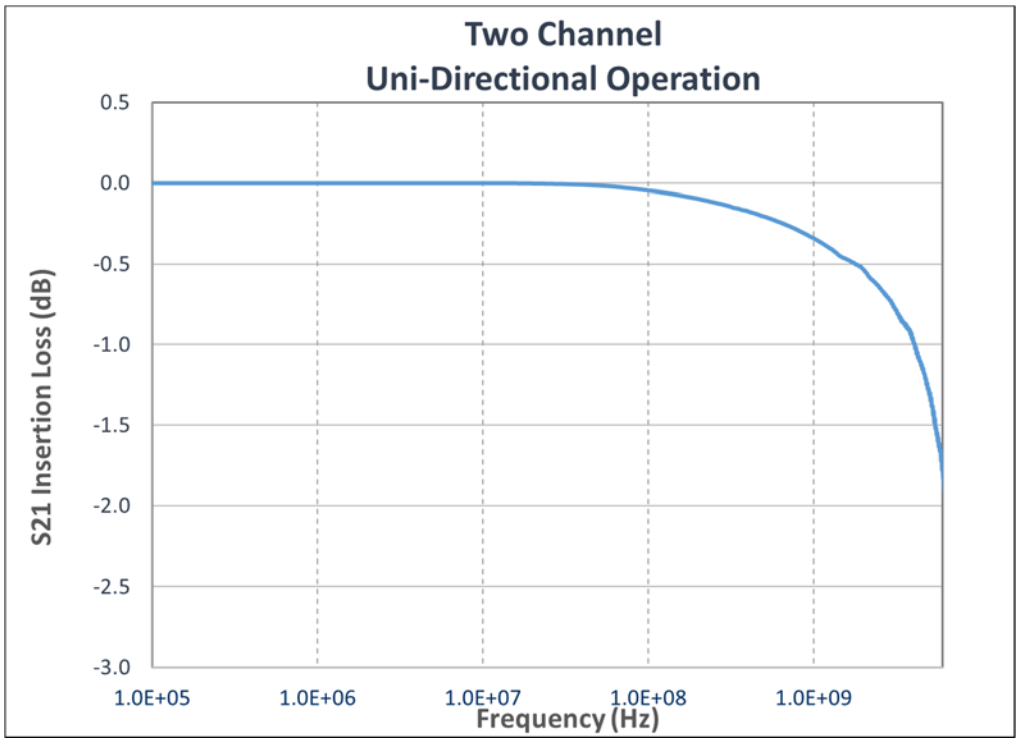
- Device maximum rating @ T = 25ºC, unless otherwise specified.
- Caution: Stress exceeding Device Maximum Ratings may damage the device. Prolonged exposure to stresses above the recommended operating conditions may affect device reliability.

## DEVICE ELECTRICAL CHARACTERISTICS

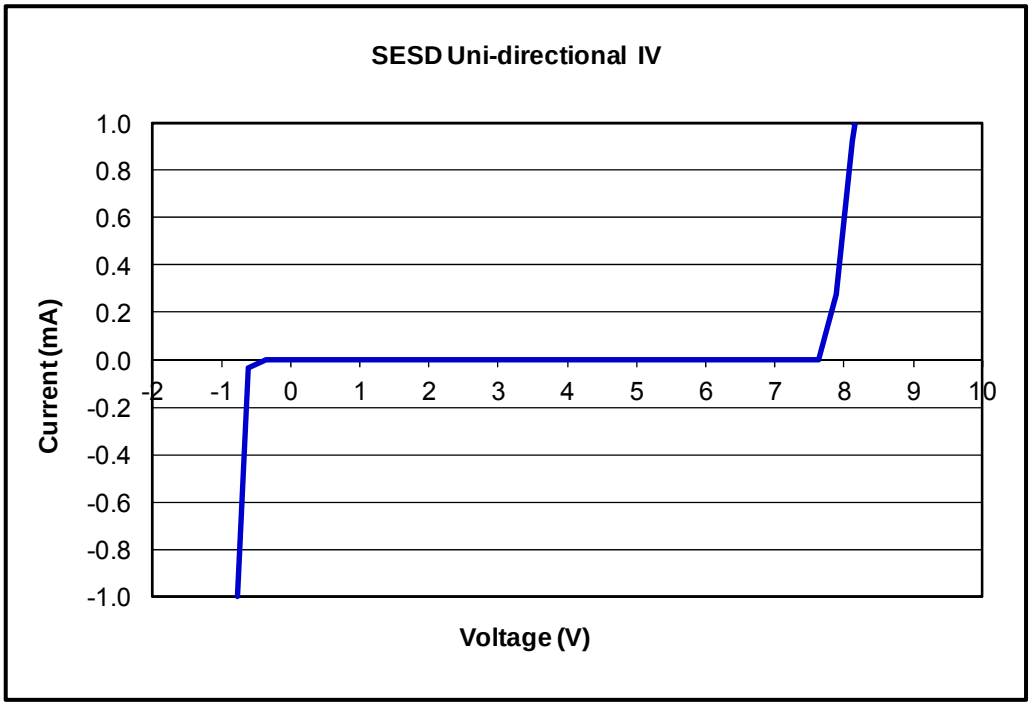
| Input Capacitance @ $V_R$ = 0V, f = 3GHz (pF) | Breakdown Voltage (V) $V_{BR}$ @ $I_T$=1mA (V) | Reverse Working Voltage (V) | Reverse Leakage Current (A) $I_L$ @ $V_{RWM}$=5.0V (nA) | Clamping Voltage $V_{CL}$ @ Ipp=2.5A (V) |
|---|---|---|---|---|
| Typ | Typ | Typ | Typ | Typ |
| 0.30 | +8.80 / -0.80 | 7.00 | 25.0 | +13.0 |

- All device electrical characteristics @ T = 25ºC, unless otherwise specified.

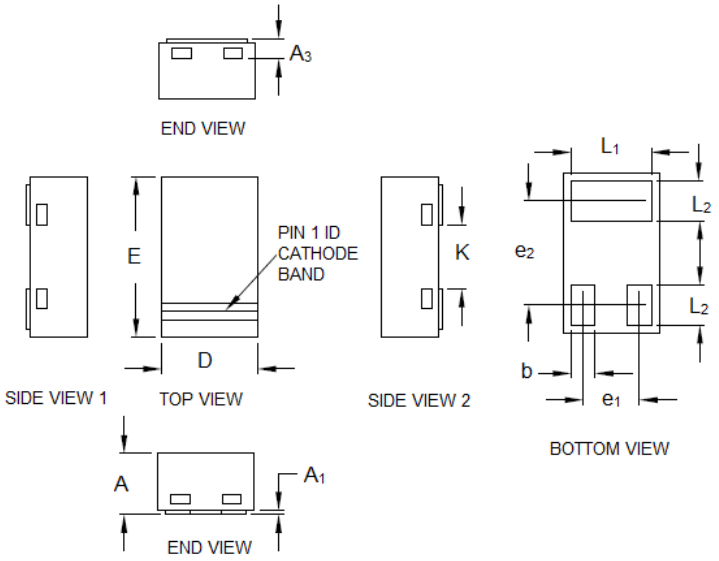
## FIGURE 1. INSERTION LOSS DIAGRAM



## FIGURE 2. DEVICE IV CURVE



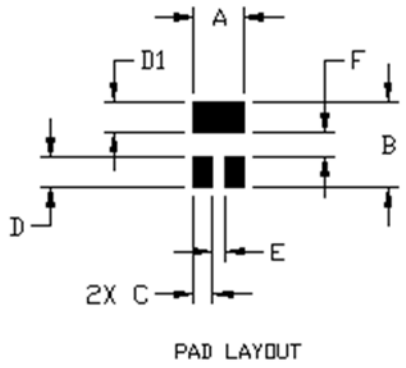

## DEVICE DIMENSIONS




| | SESD0402Q2UG-0020-090 | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters (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 |
| **L1** | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |
| **L2** | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| **b** | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| **e1** | 0.35 BSC | | | 0.014 BSC | | |
| **e2** | 0.65 BSC | | | 0.026 BSC | | |

BSC – Basic Spacing between Centers

## RECOMMENDED LANDING PATTERN:



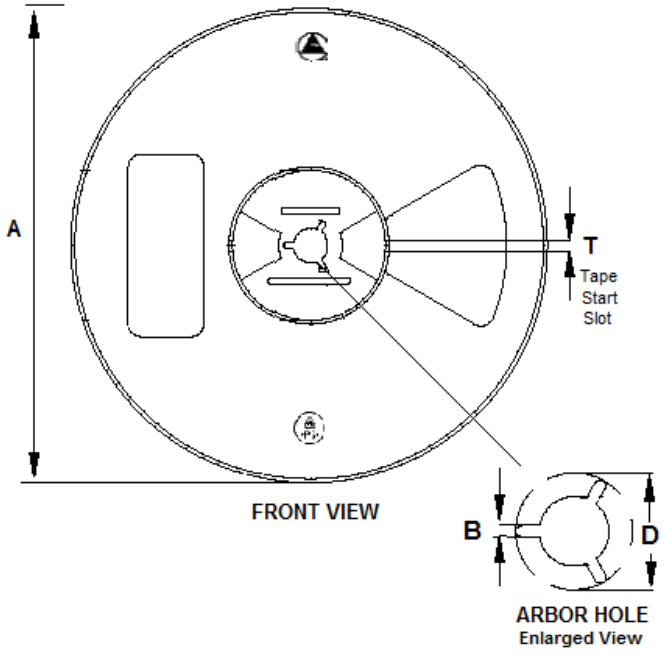
PAD LAYOUT

| SESD Landing Pad Layout 3 Pin 2-ch 0402 Size Array | | |
|---|---|---|
| **Symbol** | **Millimeters (mm)** | **Inches (in)** |
| **A** | 0.60 | 0.024 |
| **B** | 1.00 | 0.039 |
| **C** | 0.225 | 0.009 |
| **D** | 0.35 | 0.014 |
| **D1** | 0.35 | 0.014 |
| **E** | 0.15 | 0.006 |
| **F** | 0.30 | 0.012 |

## PACKAGING

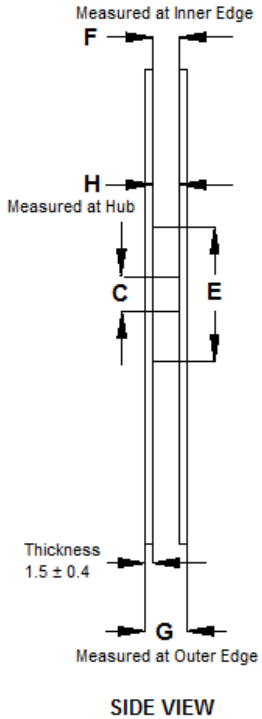
| Packaging | Tape & Reel | Standard Box |
|---|---|---|
| SESD0402Q2UG-0030-088 | 10,000 | 50,000 |

## REEL DIMENSIONS



FRONT VIEW

ARBOR HOLE
Enlarged View



SIDE VIEW

| 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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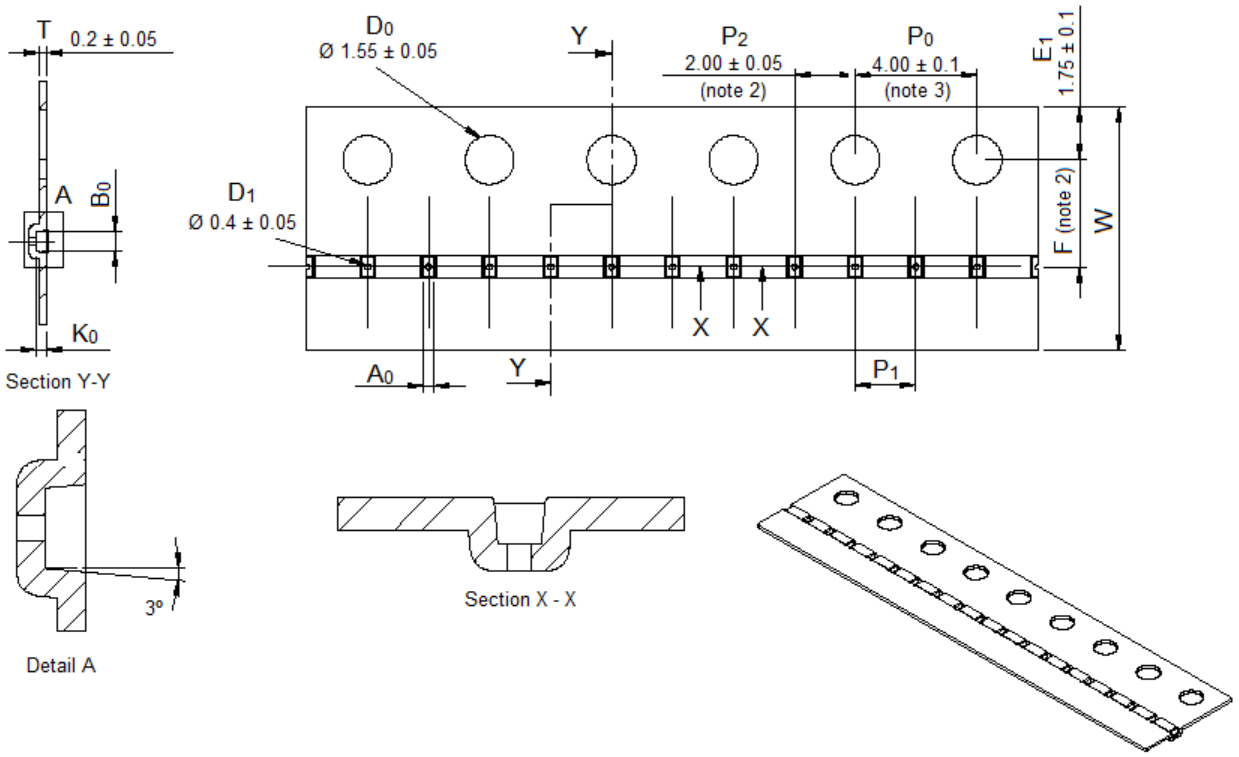
## CARRIER TAPE DIMENSIONS




| | |
|---|---|
| $A_0$ | 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

## 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<br>at 220°C<br>at 240°C<br>at 260°C | 60s ~ 70s<br>50s ~ 60s<br>30s ~ 40s<br>5s ~ 10s |
| E | Cooling | From main heating temperature to 100°C | 4°C/s (max) |

## FIGURE 4. REFLOW PROFILE