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

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

**PRODUCT: SESD1004Q4UG-0030-088**

DOCUMENT: SCD28659
REV LETTER: B
REV DATE: MARCH 17, 2014


# Specification Status: RELEASED

## BENEFITS
- Low capacitance; provides low 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: +13.00 (typ)
  @ (tp=8x20µs, Ipp=2.2A)
- ESD maximum rating per IEC61000-4-2 standard:
  - ±22kV contact discharge
  - ±22kV air discharge
- Surge: 2.2A (max) @ (tp=8x20µs) per IEC61000-4-5
- Small size and low profile: XDFN array package

## 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

## MATERIALS INFORMATION

| RoHS Compliant | ELV Compliant | Halogen Free * | Lead Free |
|---|---|---|---|
| Directive 2000/53/EC Compliant | Directive 2002/95/EC Compliant | HF | 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 1004 Q4UG - 0030 - 088

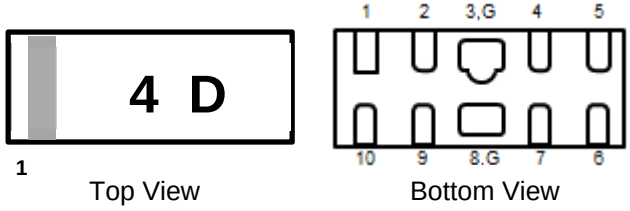
- SESD — Series
- 1004 — EIA Size
- Q4UG — Package Type Q - Array; 4 - Four Channels; G - Common GND Pin; U - Uni-directional
- 0030 — Input Capacitance 0.30 pF (typ)
- 088 — Breakdown Voltage 8.8V (typ)

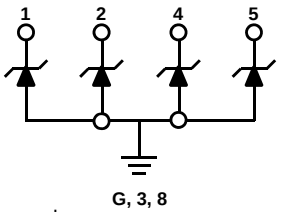
## PART MARKING

4 D

- 4 — Cathode Band - Unidirectional
- D — Product Code Marking Indicator - Single alphanumeric character
- Factory Code Marking - Factory: 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) |
| ± 22 | ± 22 | -55 to +125 | -55 to +150 | 2.2 |

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

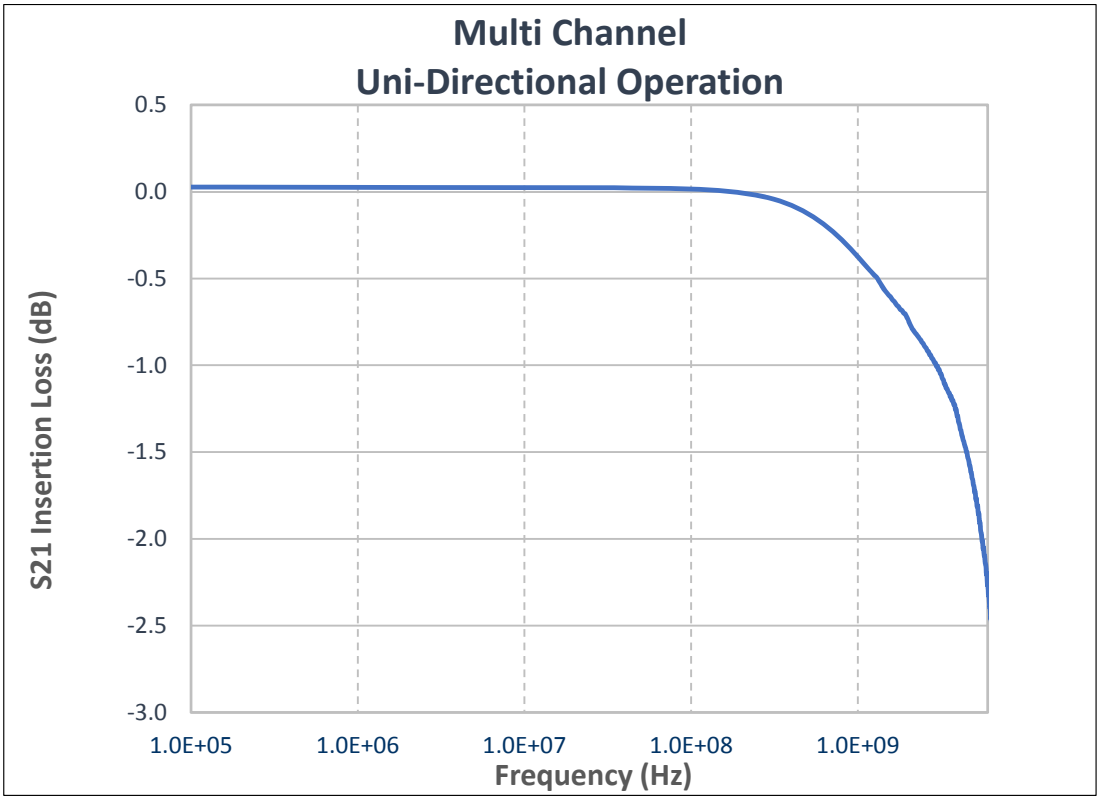
- Device maximum rating @ T = 25ºC, unless otherwise specified
- Caution: Stress exceeding Device Maximum Ratings may damage the device
  Prolonged exposure to stresses above the Recommended Operating Conditions may affect device reliability

## DEVICE ELECTRICAL CHARACTERISTICS

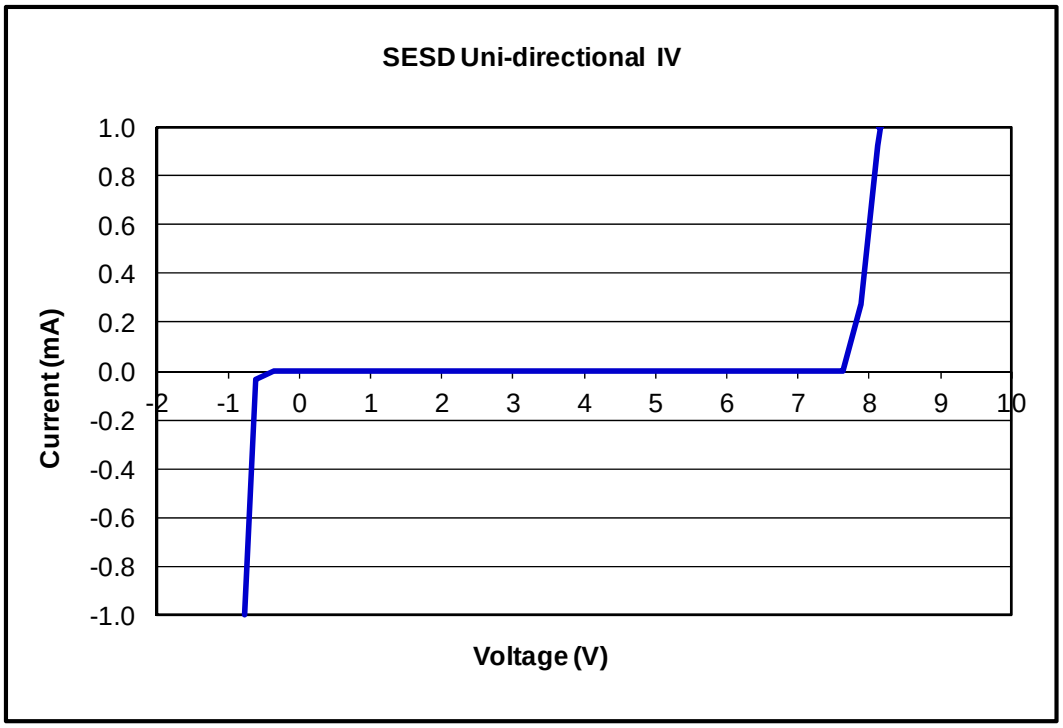
| Input Capacitance @ $V_R$ = 0V, f = 3GHz (pF) | Breakdown Voltage (V) $V_{BR}$ @ $I_T$=1mA (V) | Reverse Working Voltage (V) | Reverse Leakage Current (A) $I_L$ @ $V_{RWM}$=5.0V (nA) | Clamping Voltage $V_{CL}$ @ Ipp=2.2A (V) |
|---|---|---|---|---|
| Typ | Typ | Typ | Typ | Typ |
| 0.30 | +8.80 / -0.80 | 7.00 | 25.0 | +13.0 |

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

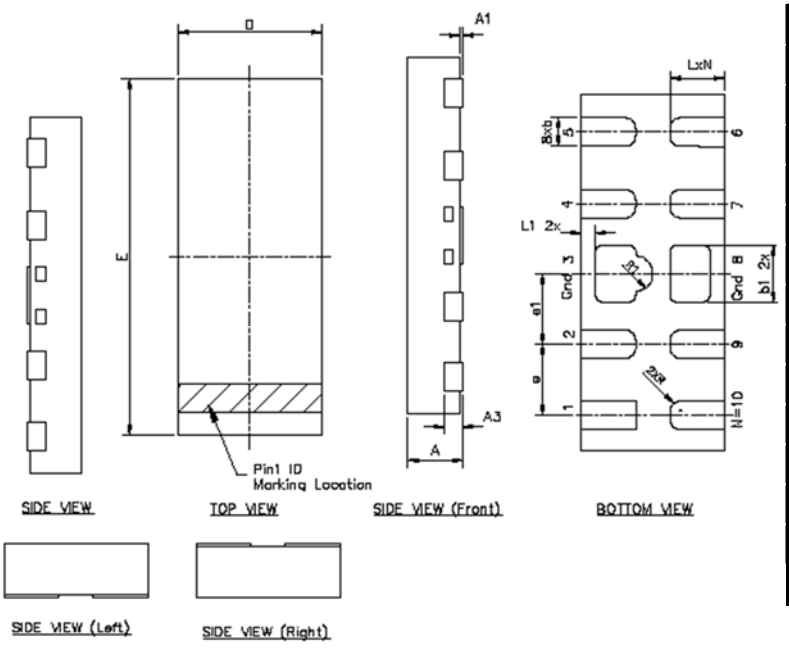
## FIGURE 1. INSERTION LOSS DIAGRAM



## FIGURE 2. DEVICE IV CURVE




## DEVICE DIMENSIONS




| | SESD1004Q4UG | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| **Dim** | Min | Nom | Max | Min | Nom | Max |
| **A** | 0.33 | 0.38 | 0.43 | 0.013 | 0.015 | 0.017 |
| **A1** | 0.00 | 0.02 | 0.05 | 0 | -- | 0.002 |
| **A3** | 0.10 ref. | | | 0.004 ref. | | |
| **D** | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| **E** | 2.40 | 2.50 | 2.60 | 0.094 | 0.098 | 0.102 |
| **b** | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| **b1** | 0.35 | 0.40 | 0.45 | 0.014 | 0.016 | 0.018 |
| **L** | 0.33 | 0.38 | 0.43 | 0.013 | 0.015 | 0.017 |
| **L1** | 0.00 | 0.10 | 0.15 | 0.000 | 0.004 | 0.006 |
| **e** | 0.50 BSC | | | 0.020 BSC | | |
| **e1** | 0.50 BSC | | | 0.020 BSC | | |
| **N** | 10 | | | 10 | | |
| **R** | 0.08 BSC | | | 0.003 BSC | | |
| **R1** | 0.13 BSC | | | 0.005 BSC | | |

BSC – Basic Spacing between Centers

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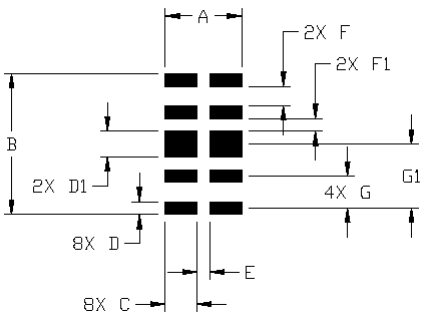
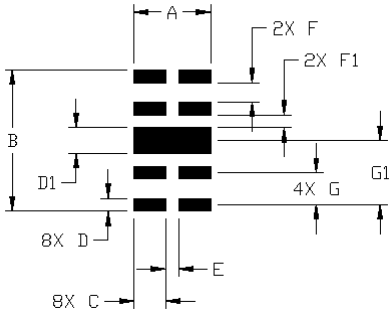
## RECOMMENDED LANDING PATTERN:




Recommended




Alternate

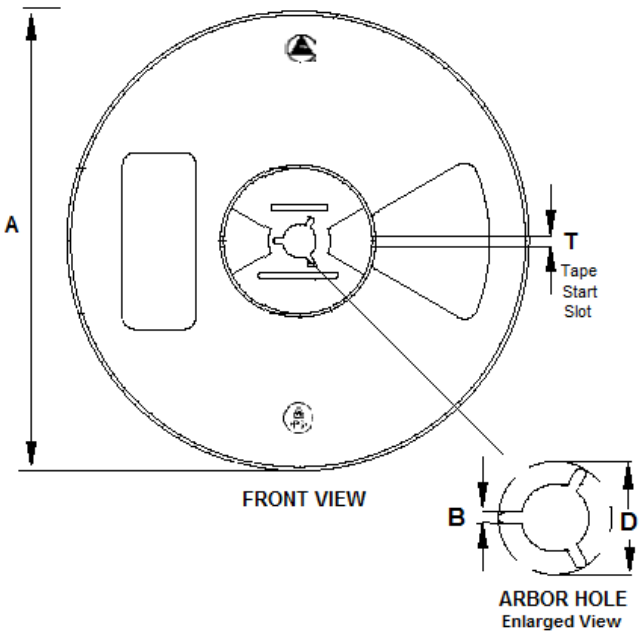
| SESD Landing Pad Layout<br>10 Pin 4-ch Standard FT Array | | |
|---|---|---|
| **Symbol** | **Millimeters** | **Inches** |
| **A** | 1.20 | 0.047 |
| **B** | 2.20 | 0.087 |
| **C** | 0.50 | 0.020 |
| **D** | 0.20 | 0.008 |
| **D1** | 0.40 | 0.016 |
| **E** | 0.20 | 0.008 |
| **F** | 0.30 | 0.012 |
| **F1** | 0.20 | 0.008 |
| **G** | 0.50 BSC | 0.020 BSC |
| **G1** | 1.00 BSC | 0.039 BSC |

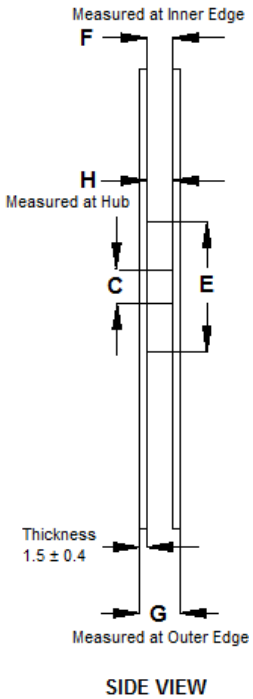
BSC – Basic Spacing between Centers

## PACKAGING

| Packaging | Tape & Reel | Standard Box |
|---|---|---|
| SESD1004Q4UG-0030-088 | 5,000 | 25,000 |

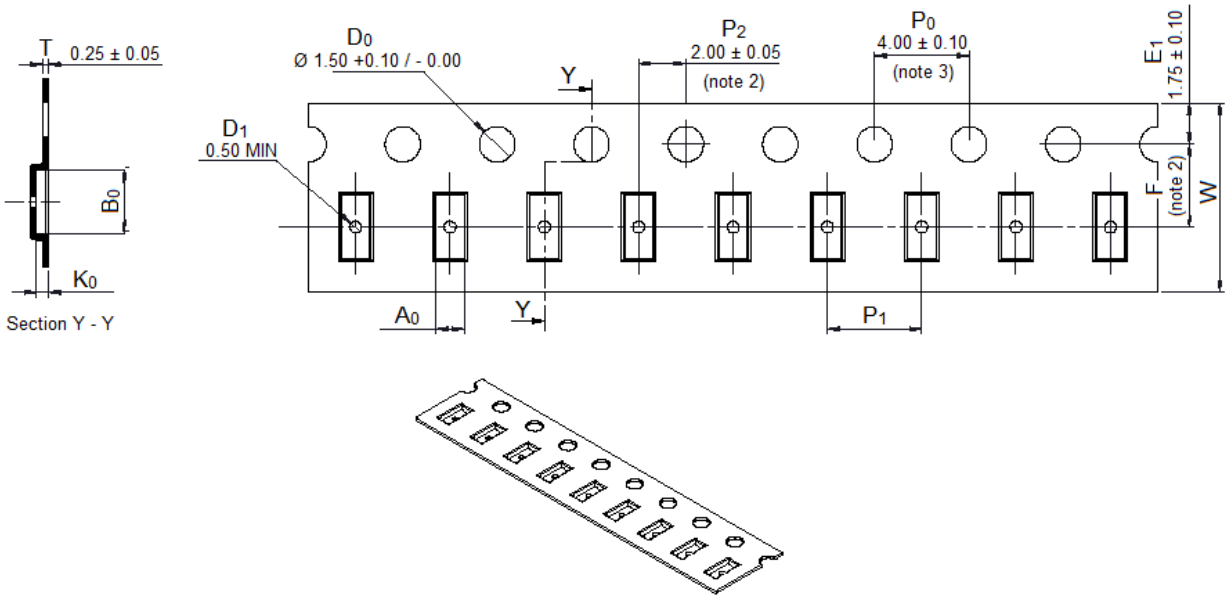
## REEL DIMENSIONS




| 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) |

## CARRIER TAPE DIMENSIONS




| | |
|---|---|
| Ao | 1.20 ± 0.05 |
| Bo | 2.70 ± 0.05 |
| Ko | 0.51 ± 0.05 |
| F | 3.50 ± 0.05 |
| P1 | 4.00 ± 0.10 |
| W | 8.00 + 0.03 / -0.10 |

Note 1. All dimensions in mm
Note 2. 10 sprocket hole pitch cumulative tolerance ± 0.2
Note 3. Measured from centerline of pocket to centerline of sprocket hole
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<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 3. REFLOW PROFILE