

# SESD Series

## Enhanced ESD Diode Arrays

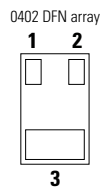


### Web Resources



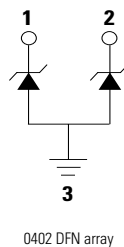
Download ECAD models, order samples, and find technical resources at [www.littelfuse.com](http://www.littelfuse.com)

### Pinout



Bottom View

### Functional Block Diagram



### Description

The SEDS Series Enhanced ESD Diode Arrays provides higher order ESD protection in signal-integrity-preserving unidirectional arrays for the world's most challenging high speed serial interfaces. Compelling packaging options include the standard 2.5mmx1.0mm and the SOD-883. Standard packages minimize trace layout complexity, save significant PCB space, and improve reusability of the footprints. The nominal capacitance makes the devices applicable to the worlds' fastest consumer serial interfaces.

### Features & Benefits

- 0.30pFTYP capacitance
- ESD, IEC61000-4-2,  $\pm 22\text{kV}$  contact,  $\pm 22\text{kV}$  air
- Low clamping voltage of 13V @ IPP=2.2A (tP=8/20 $\mu\text{s}$ )
- Low profile 0402 DFN array packages
- Facilitates the preservation of signal integrity
- ELV Compliant
- RoHS Compliant and Lead Free
- Moisture Sensitivity Level (MSL Level-1)
- AEC-Q101 qualified
- PPAP capable

### Applications

- Ultra-high speed data lines
- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort(TM)
- V-by-One®
- Thunderbolt
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Applications requiring high ESD performance in small packages

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### Absolute Maximum Ratings

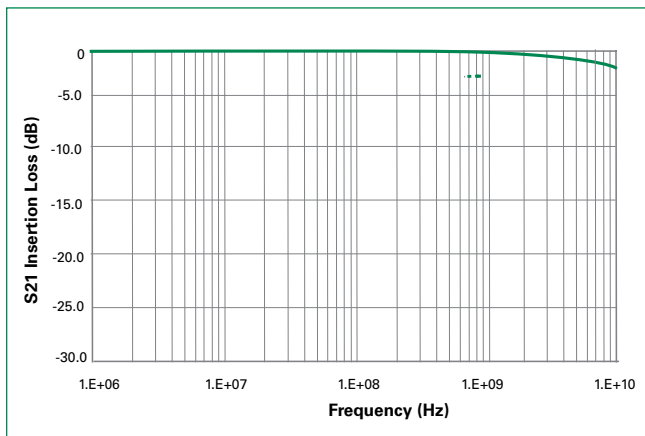
| Symbol     | Parameter                        | Value      | Units |
|------------|----------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) | 2.2        | A     |
| $T_{OP}$   | Operating Temperature            | -55 to 125 | °C    |
| $T_{STOR}$ | Storage Temperature              | -55 to 150 | °C    |

**Caution:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### 0402 DFN Array Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

| Parameter               | Symbol        | Test Conditions                               | Min      | Typ  | Max | Units |
|-------------------------|---------------|-----------------------------------------------|----------|------|-----|-------|
| Input Capacitance       | $C_{I/O-GND}$ | Reverse Bias=0V, $f=3\text{ GHz}$             |          | 0.30 |     | pF    |
| Breakdown Voltage       | $V_{BR}$      | $I_R=1\text{ mA}$                             |          | 8.80 |     | V     |
| Reverse Working Voltage | $V_{RWM}$     |                                               |          |      | 7.0 | V     |
| Reverse Leakage Current | $I_{LEAK}$    | $V_R=5\text{ V}$ , Any I/O to GND             |          | 25   |     | nA    |
| Clamping Voltage        | $V_C$         | $I_{PP}=2.2\text{ A}$ , $t_p=8/20\mu s$ , Fwd |          | 13.0 |     | V     |
| ESD Withstand Voltage   | $V_{ESD}$     | IEC61000-4-2 (Contact)                        | $\pm 22$ |      |     | kV    |
|                         |               | IEC61000-4-2 (Air)                            | $\pm 22$ |      |     |       |

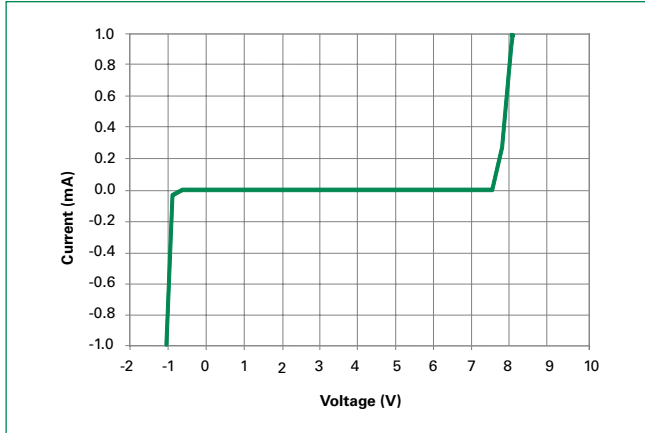
### Insertion Loss Diagram - SESD0402Q2UG-0030-088



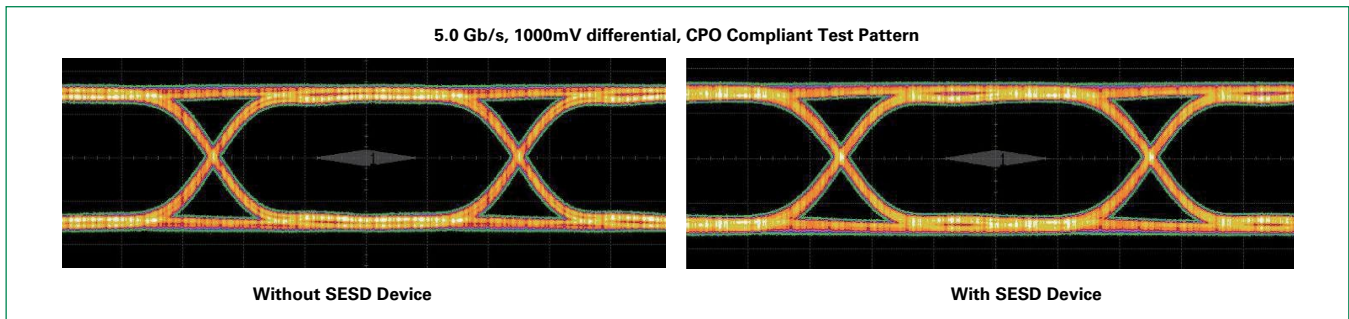
# SESD Series

## Enhanced ESD Diode Arrays

Device IV Curve

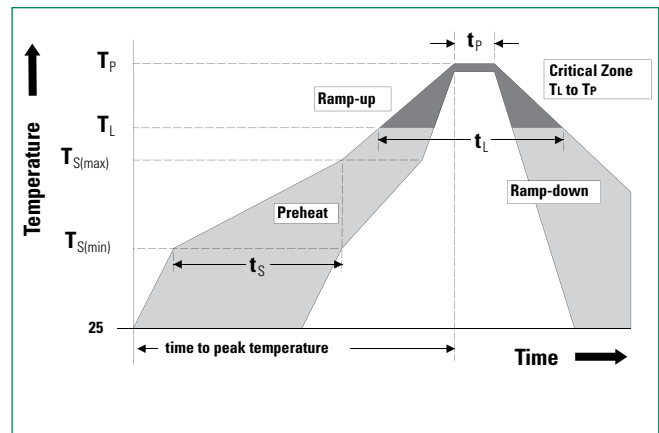


USB3.0 Eye Diagram



Soldering Parameters

|                                                        |                                    |                    |
|--------------------------------------------------------|------------------------------------|--------------------|
| Reflow Condition                                       |                                    | Pb – Free assembly |
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C              |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C              |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs      |
| Average ramp up rate (Liquidus) Temp ( $T_L$ ) to peak |                                    | 3°C/second max     |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 3°C/second max     |
| Reflow                                                 | - Temperature ( $T_L$ ) (Liquidus) | 217°C              |
|                                                        | - Temperature ( $t_L$ )            | 60 – 150 seconds   |
| Peak Temperature ( $T_p$ )                             |                                    | 260 $^{+0/-5}$ °C  |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds    |
| Ramp-down Rate                                         |                                    | 6°C/second max     |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.     |
| Do not exceed                                          |                                    | 260°C              |



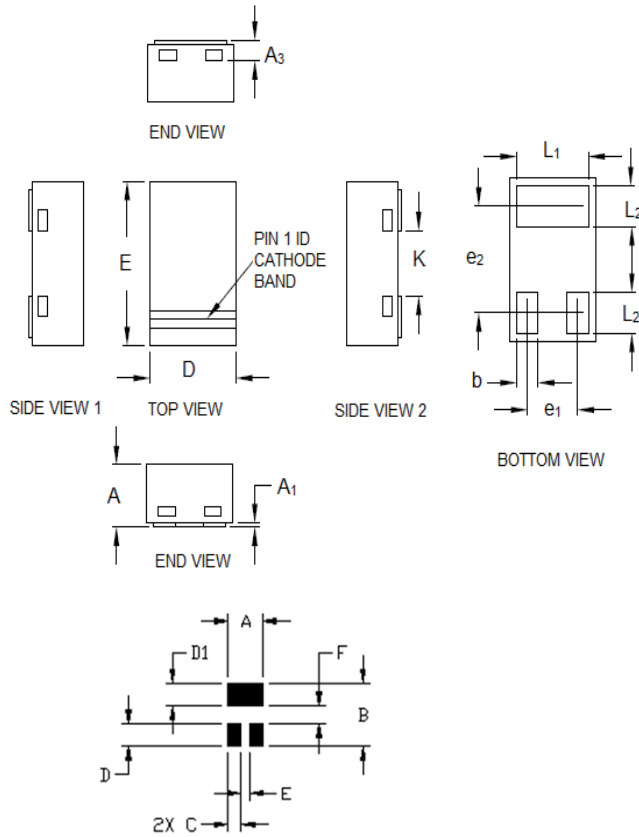
Product Characteristics of 0402 DFN Package

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| Lead Plating       | Pre-Plated Frame                                        |
| Lead Material      | Copper Alloy                                            |
| Substrate material | Silicon                                                 |
| Body Material      | UL Recognized compound meeting flammability rating V-0. |

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## Enhanced ESD Diode Arrays

### Package Dimensions — 0402 DFN Array

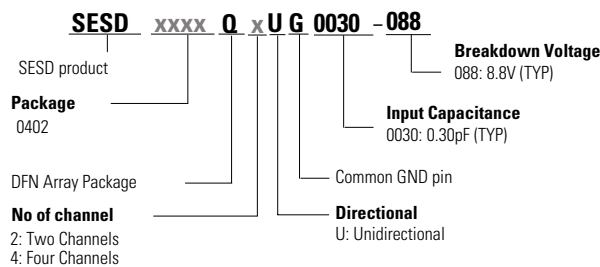


Pad Layout

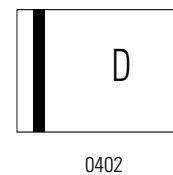
| Symbol    | Millimeters |      |      | Inches     |       |       |
|-----------|-------------|------|------|------------|-------|-------|
|           | Min         | Typ  | Max  | Min        | Typ   | Max   |
| <b>A</b>  | 0.33        | 0.38 | 0.43 | 0.013      | 0.015 | 0.017 |
| <b>A1</b> | 0           | -    | 0.05 | 0          | -     | 0.002 |
| <b>A3</b> | 0.13 ref.   |      |      | 0.005 ref. |       |       |
| <b>D</b>  | 0.55        | 0.60 | 0.65 | 0.022      | 0.024 | 0.026 |
| <b>E</b>  | 0.95        | 1.00 | 1.05 | 0.037      | 0.039 | 0.041 |
| <b>K</b>  | 0.35        | 0.40 | 0.45 | 0.014      | 0.016 | 0.018 |
| <b>L1</b> | 0.45        | 0.50 | 0.55 | 0.018      | 0.020 | 0.022 |
| <b>L2</b> | 0.20        | 0.25 | 0.30 | 0.008      | 0.010 | 0.012 |
| <b>b</b>  | 0.14        | 0.19 | 0.24 | 0.006      | 0.007 | 0.009 |
| <b>e1</b> | 0.35 BSC    |      |      | 0.014 BSC  |       |       |
| <b>e2</b> | 0.65 BSC    |      |      | 0.026 BSC  |       |       |

| Symbol    | Millimeters | Inches |
|-----------|-------------|--------|
| <b>A</b>  | 0.60        | 0.024  |
| <b>B</b>  | 1.00        | 0.039  |
| <b>C</b>  | 0.23        | 0.009  |
| <b>D</b>  | 0.35        | 0.014  |
| <b>D1</b> | 0.35        | 0.014  |
| <b>E</b>  | 0.15        | 0.006  |
| <b>F</b>  | 0.30        | 0.012  |

### Part Numbering System



### Part Marking System



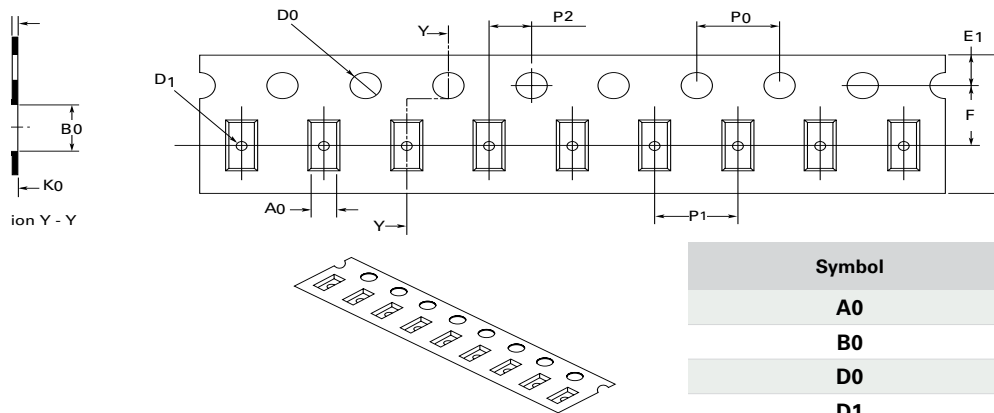
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## Enhanced ESD Diode Arrays

### Ordering Information

| Part Number           | Package        | Ordering Part Number | Minimum Order Quantity |
|-----------------------|----------------|----------------------|------------------------|
| SESD0402Q2UG-0030-088 | 0402 DFN Array | RF3925-000           | 50,000                 |

### Embossed Carrier Tape & Reel Specification — 0402 DFN Array



| Symbol    | Millimeters    |
|-----------|----------------|
| <b>A0</b> | 0.70+/-0.05    |
| <b>B0</b> | 1.15+/-0.05    |
| <b>D0</b> | ø 1.55+ 0.05   |
| <b>D1</b> | ø 0.40+/- 0.05 |
| <b>E1</b> | 1.75+/-0.10    |
| <b>F</b>  | 3.50+/-0.05    |
| <b>K0</b> | 0.47+/-0.05    |
| <b>P0</b> | 4.00+/-0.10    |
| <b>P1</b> | 2.00+/-0.10    |
| <b>P2</b> | 2.00+/-0.05    |
| <b>W</b>  | 8.00+/-0.10    |
| <b>T</b>  | 0.20+/-0.05    |

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