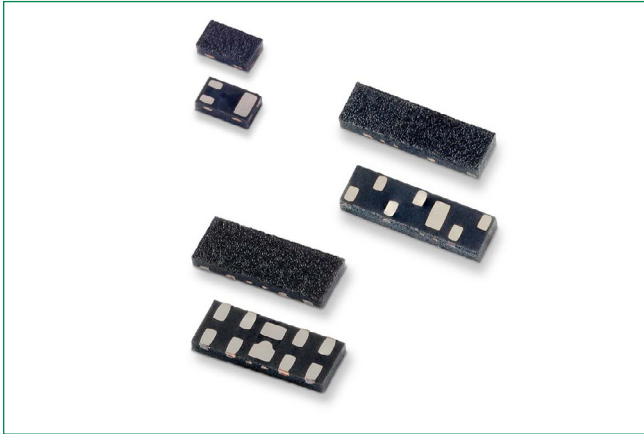


# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes



### Additional Information



Resources

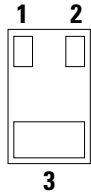


Accessories



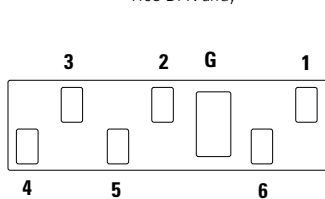
Samples

0402 DFN array

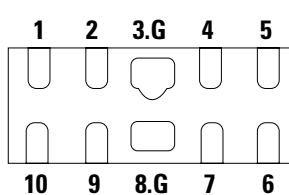


### Pinout

1103 DFN array



1004 DFN array



### Bottom View

### Description

The SEDS series Ultra Low Capacitance Diode Arrays provides signal integrity-preserving unidirectional ESD protection for the world's most challenging high speed serial interfaces. Compelling packaging options including the standard 1004 DFN 2.5 mm x 1.0 mm layout, and the board space-friendly 1103 DFN minimize trace layout complexity, and save significant PCB space. The 0402 DFN provides the most flexibility for PCB layout purposes. This series is rated in excess of 20kV contact ESD protection (IEC 61000-4-2) while maintaining extremely low leakage and dynamic resistance, and is offered in the industry's most progressive and popular footprints. The SEDS series sets higher standards for signal integrity and usability.

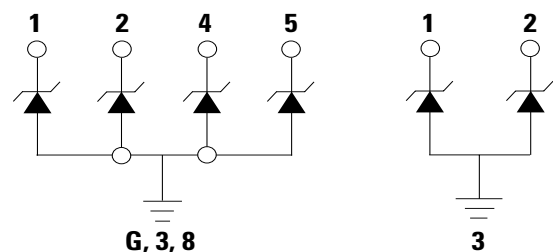
### Features

- 0.20pF TYP capacitance
- ESD, IEC 61000-4-2, ±20kV contact, ±20kV air
- Low clamping voltage of 9.2V @ IPP=2.0A (tP=8/20µs)
- Low profile DFN array packages
- Facilitates excellent signal integrity
- AEC-Q101 qualified
- Moisture Sensitivity Level(MSL-1)
- ELV Compliant
- RoHS Compliant and Lead Free
- PPAP capable

### Applications

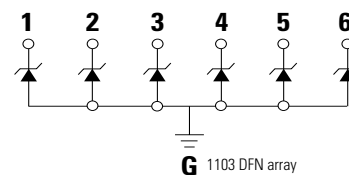
- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort(TM)
- V-by-One®)
- Thunderbolt
- LVDS interfaces
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Applications requiring high ESD performance in small packages
- Automotive applications

### Functional Block Diagram



0802/1004 DFN array

0402 DFN array



1103 DFN array

# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Absolute Maximum Ratings

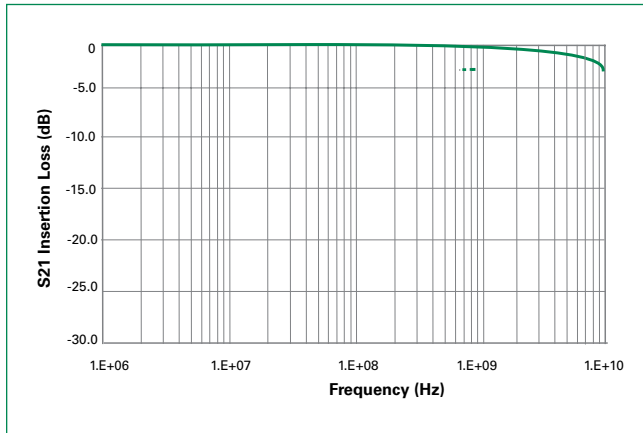
| Symbol     | Parameter                        | Value      | Units |
|------------|----------------------------------|------------|-------|
| $I_{PP}$   | Peak Current ( $t_p=8/20\mu s$ ) | 2.0        | A     |
| $T_{OP}$   | Operating Temperature            | -55 to 125 | °C    |
| $T_{STOR}$ | Storage Temperature              | -55 to 150 | °C    |

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

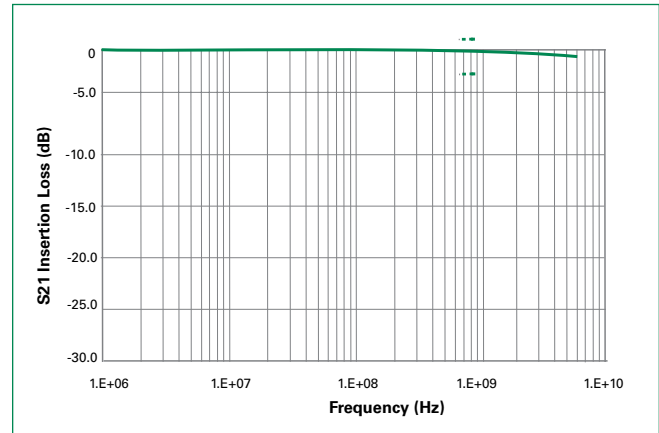
### Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

| Parameter               | Test Conditions           | Min      | Typ  | Max  | Units |
|-------------------------|---------------------------|----------|------|------|-------|
| Input Capacitance       | @ $V_R = 0V$ , $f = 3GHz$ |          | 0.20 | 0.22 | pF    |
| Breakdown Voltage       | $V_{BR}$ @ $I_T=1mA$      |          | 9.00 |      | V     |
| Reverse Working Voltage |                           |          |      | 7.0  | V     |
| Reverse Leakage Current | $I_L$ @ $V_{RWM}=5.0V$    |          | 25   | 50   | nA    |
| Clamping Voltage        | $V_{CL}$ @ $I_{PP}=2.0A$  |          | 9.20 |      | V     |
| Peak Pulse Current      | $t_p=8/20\mu s$           |          |      | 2.0  | A     |
| ESD Withstand Voltage   | IEC61000-4-2 (Contact)    | $\pm 20$ |      |      | kV    |
|                         | IEC 61000-4-2 (Air)       | $\pm 20$ |      |      |       |

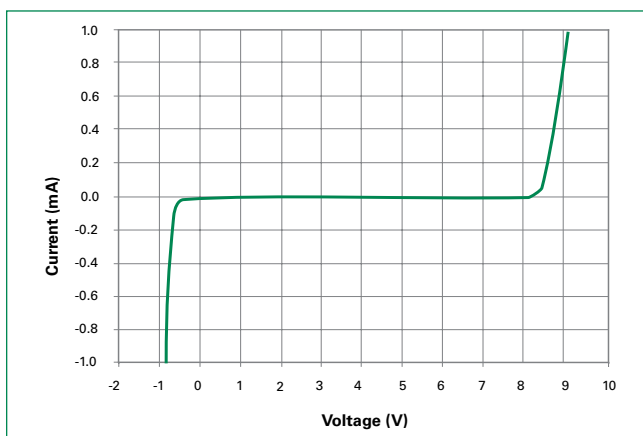
#### Insertion Loss Diagram



#### Insertion Loss Diagram - 1103 DFN Array



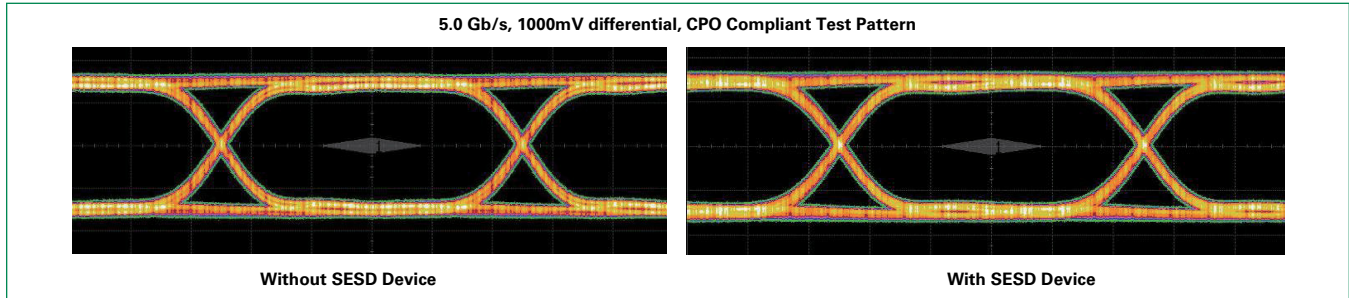
#### Component IV Curve



# SESD Series Ultra Low Capacitance Diode Arrays

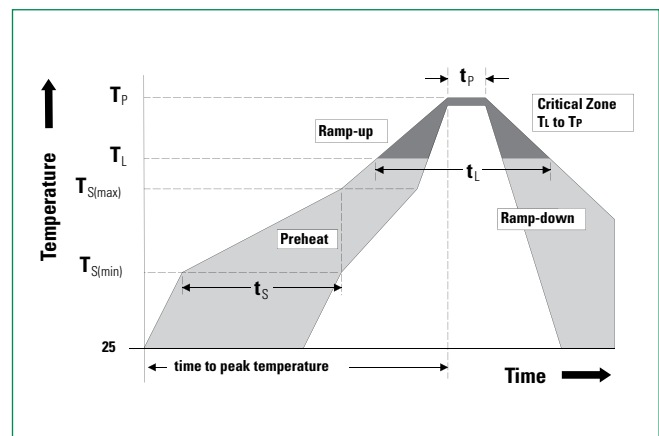
## SPA® Diodes

### USB3.0 Eye Diagram



### Soldering Parameters

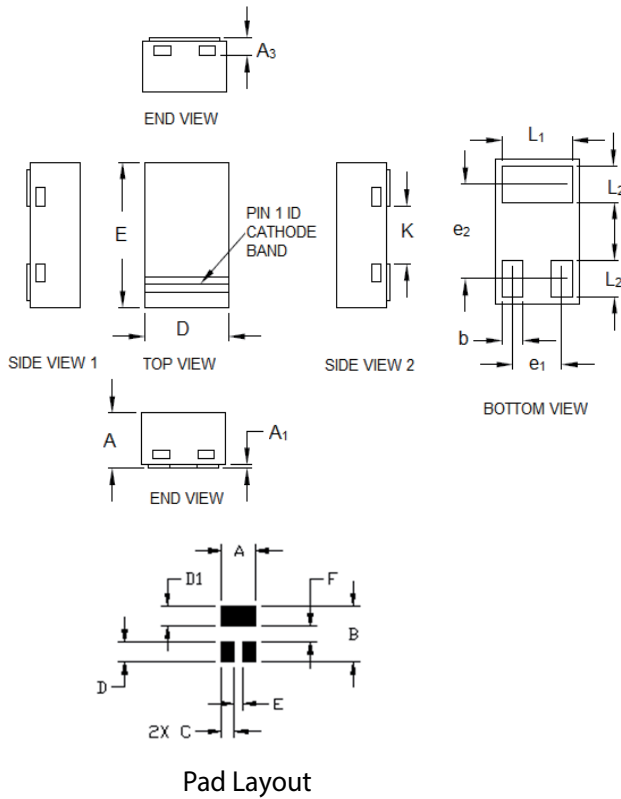
|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <b>Reflow Condition</b>  |                                    | Pb – Free assembly      |
| <b>Pre Heat</b>  | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 120 secs           |
| <b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>  | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|  | - Temperature ( $t_L$ )            | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 30 seconds              |
| <b>Ramp-down Rate</b>  |                                    | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes Max.          |
| <b>Do not exceed</b>   |                                    | 260°C                   |



# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

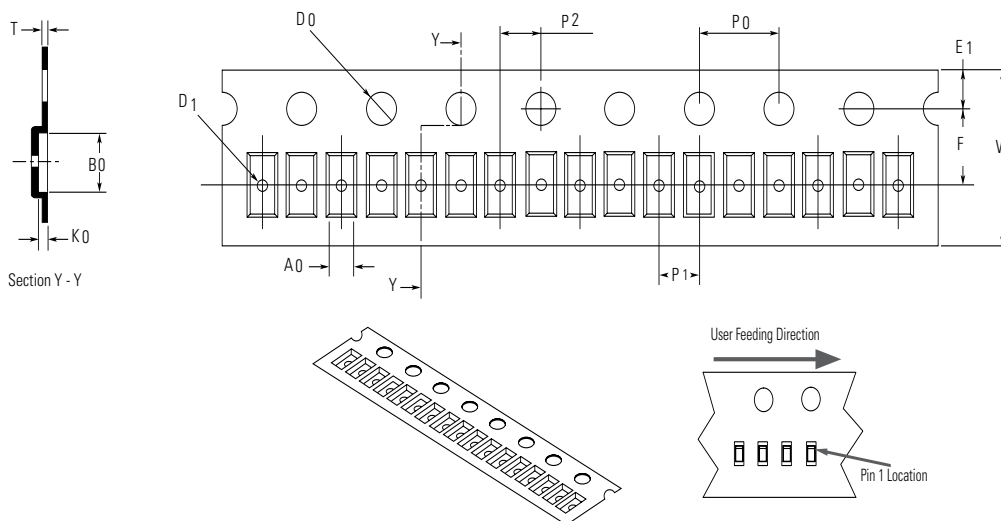
### Package Dimensions — 0402 DFN Array



| 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>  | 0.10        | 0.15 | 0.20 | 0.004      | 0.006 | 0.008 |
| <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  |

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

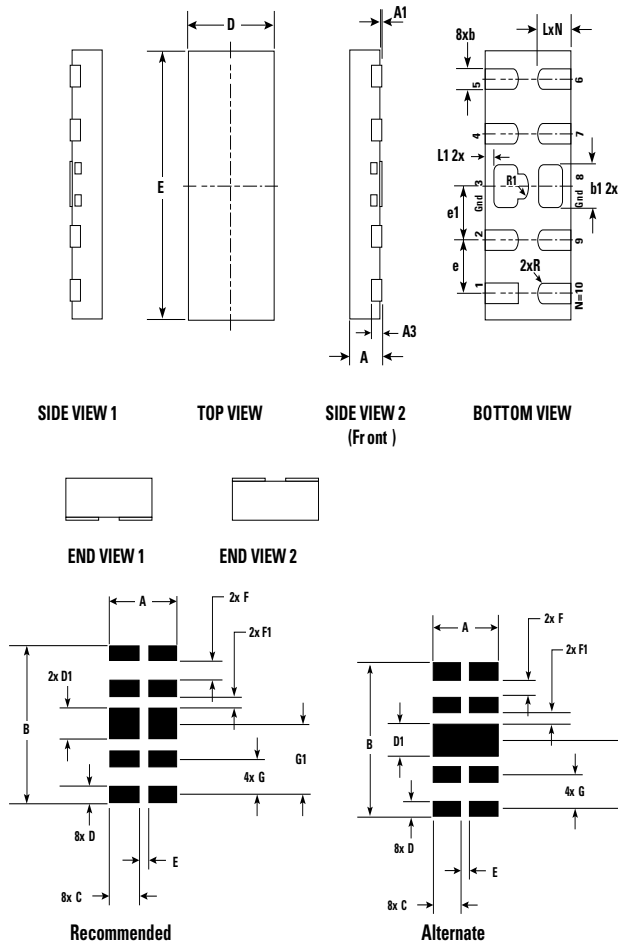


| Symbol    | Millimeters     |
|-----------|-----------------|
| <b>A0</b> | 0.70+/-0.05     |
| <b>B0</b> | 1.15+/-0.05     |
| <b>D0</b> | ∅ 1.55 + 0.05   |
| <b>D1</b> | ∅ 0.40 +/- 0.05 |
| <b>E1</b> | 1.75+/-0.10     |
| <b>F</b>  | 3.50+/-0.05     |
| <b>K0</b> | 0.47+/-0.05     |
| <b>P0</b> |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

# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Package Dimensions — 1004 DFN Array

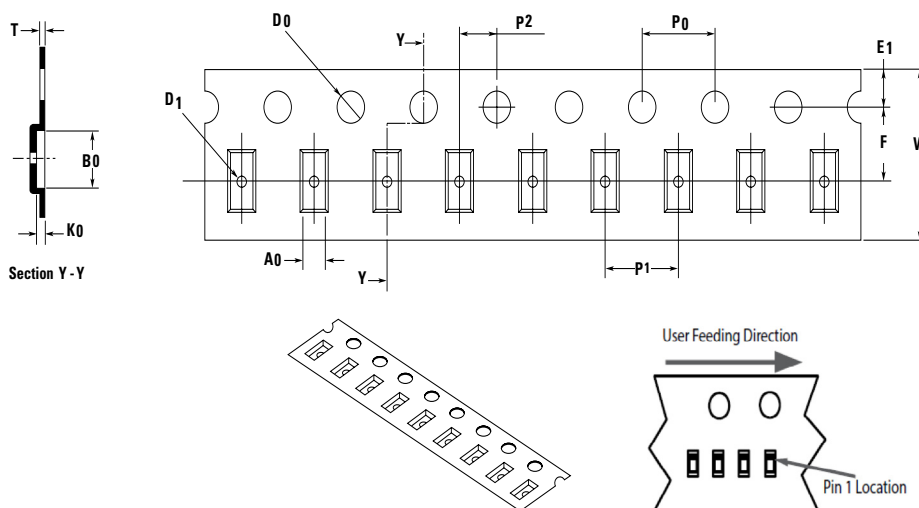


**Pad Layout**

| 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> | 0.00        | 0.02 | 0.05 | 0          | —     | 0.002 |
| <b>A3</b> | 0.127 ref.  |      |      | 0.005 ref. |       |       |
| <b>D</b>  | 0.90        | 1.00 | 1.10 | 0.035      | 0.039 | 0.043 |
| <b>E</b>  | 2.40        | 2.50 | 2.60 | 0.094      | 0.098 | 0.102 |
| <b>b</b>  | 0.15        | 0.20 | 0.25 | 0.006      | 0.008 | 0.010 |
| <b>b1</b> | 0.35        | 0.40 | 0.45 | 0.014      | 0.016 | 0.018 |
| <b>L</b>  | 0.33        | 0.38 | 0.43 | 0.013      | 0.015 | 0.017 |
| <b>L1</b> | 0.00        | 0.10 | 0.15 | 0.000      | 0.004 | 0.006 |
| <b>e</b>  | 0.50 BSC    |      |      | 0.020 BSC  |       |       |
| <b>e1</b> | 0.50 BSC    |      |      | 0.020 BSC  |       |       |
| <b>R</b>  | 0.08 BSC    |      |      | 0.003 BSC  |       |       |
| <b>R1</b> | 0.13 BSC    |      |      | 0.005 BSC  |       |       |
| <b>N</b>  | 10          |      |      | 10         |       |       |

| Symbol    | Millimeters | Inches    |
|-----------|-------------|-----------|
| <b>A</b>  | 1.20        | 0.047     |
| <b>B</b>  | 2.20        | 0.087     |
| <b>C</b>  | 0.50        | 0.020     |
| <b>D</b>  | 0.20        | 0.008     |
| <b>D1</b> | 0.40        | 0.016     |
| <b>E</b>  | 0.20        | 0.008     |
| <b>F</b>  | 0.30        | 0.012     |
| <b>F1</b> | 0.20        | 0.008     |
| <b>G</b>  | 0.50 BSC    | 0.020 BSC |
| <b>G1</b> | 1.00 BSC    | 0.039 BSC |

### Embossed Carrier Tape & Reel Specification — 1004 DFN Array

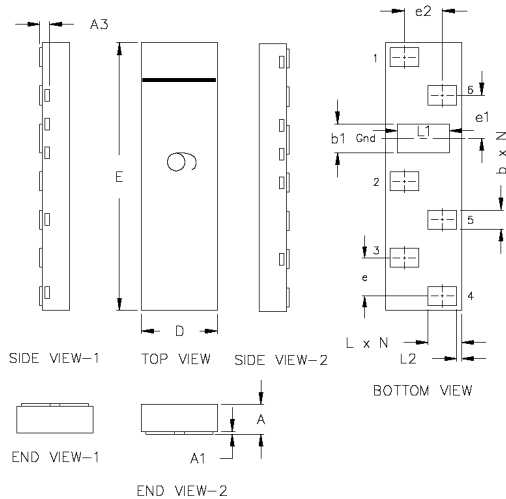


| Symbol    | Millimeters     |
|-----------|-----------------|
| <b>A0</b> | 1.20+/-0.05     |
| <b>B0</b> | 2.70+/-0.05     |
| <b>D0</b> | ∅ 1.50+0.10/-0  |
| <b>D1</b> | ∅ 0.50 min      |
| <b>E1</b> | 1.75+/-0.10     |
| <b>F</b>  | 3.50+/-0.05     |
| <b>K0</b> | 0.51+/-0.10     |
| <b>P0</b> | 4.00+/-0.10     |
| <b>P1</b> | 4.00+/-0.10     |
| <b>P2</b> | 2.00+/-0.05     |
| <b>W</b>  | 8.00+0.30/-0.10 |
| <b>T</b>  | 0.25+/-0.05     |

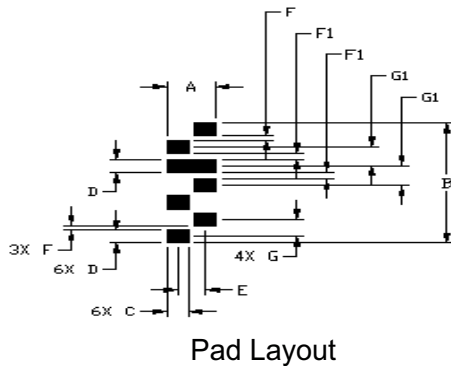
# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Package Dimensions – 1103 DFN Array

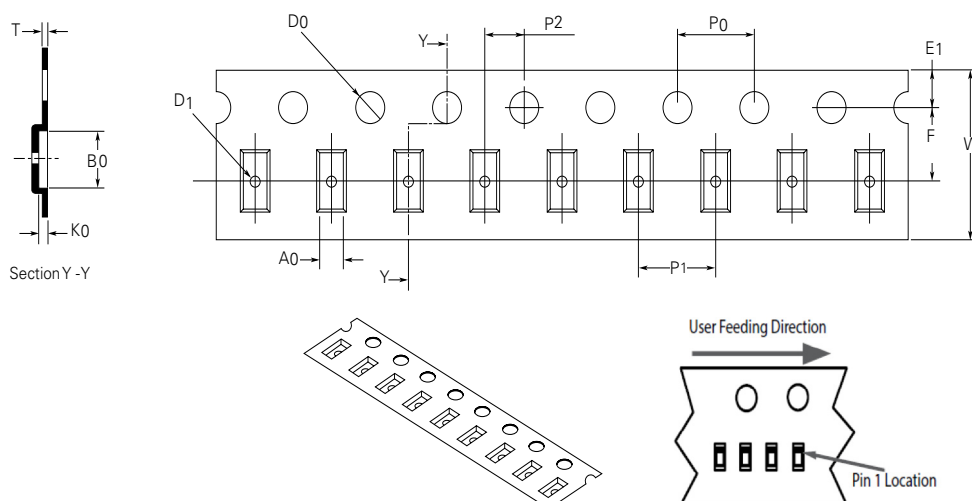


| Symbol    | Millimeters |      |      | Inches     |       |       |
|-----------|-------------|------|------|------------|-------|-------|
|           | Min         | Typ  | Max  | Min        | Typ   | Max   |
| <b>A</b>  | 0.33        | 0.38 | 0.43 | 0.013      | 0.015 | 0.017 |
| <b>A1</b> | 0.00        | 0.02 | 0.05 | 0          | –     | 0.002 |
| <b>A3</b> | 0.127 ref.  |      |      | 0.005 ref. |       |       |
| <b>D</b>  | 0.70        | 0.80 | 0.90 | 0.027      | 0.031 | 0.035 |
| <b>E</b>  | 2.70        | 2.80 | 2.90 | 0.106      | 0.110 | 0.114 |
| <b>b</b>  | 0.15        | 0.20 | 0.25 | 0.006      | 0.008 | 0.010 |
| <b>b1</b> | 0.25        | 0.30 | 0.35 | 0.010      | 0.012 | 0.014 |
| <b>L</b>  | 0.30        | 0.35 | 0.40 | 0.012      | 0.014 | 0.016 |
| <b>L1</b> | 0.50        | 0.55 | 0.60 | 0.019      | 0.021 | 0.024 |
| <b>L2</b> | 0.05 BSC    |      |      | 0.002 BSC  |       |       |
| <b>e</b>  | 0.40 BSC    |      |      | 0.016 BSC  |       |       |
| <b>e1</b> | 0.45 BSC    |      |      | 0.018 BSC  |       |       |
| <b>e2</b> | 0.40 BSC    |      |      | 0.016 BSC  |       |       |
| <b>N</b>  | 6           |      |      | 6          |       |       |



| Symbol    | Millimeters | Inches    |
|-----------|-------------|-----------|
| <b>A</b>  | 0.80        | 0.031     |
| <b>B</b>  | 2.80        | 0.110     |
| <b>C</b>  | 0.35        | 0.014     |
| <b>D</b>  | 0.30        | 0.012     |
| <b>E</b>  | 0.45        | 0.018     |
| <b>F</b>  | 0.10        | 0.004     |
| <b>F1</b> | 0.15        | 0.006     |
| <b>G</b>  | 0.40 BSC    | 0.016 BSC |
| <b>G1</b> | 0.45 BSC    | 0.018 BSC |

### Embossed Carrier Tape & Reel Specification – 1103 DFN Array

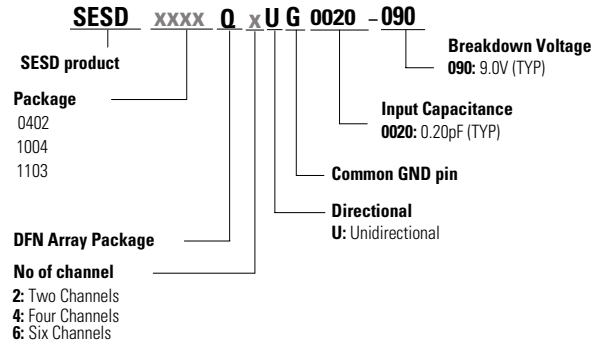


| Symbol    | Millimeters     |
|-----------|-----------------|
| <b>A0</b> | 1.00+/-0.05     |
| <b>B0</b> | 3.00+/-0.05     |
| <b>D0</b> | ∅ 1.50+0.10/-0  |
| <b>D1</b> | ∅ 0.50 min      |
| <b>E1</b> | 1.75+/-0.10     |
| <b>F</b>  | 3.50+/-0.05     |
| <b>K0</b> | 0.51+/-0.05     |
| <b>P0</b> | 4.00+/-0.10     |
| <b>P1</b> | 4.00+/-0.10     |
| <b>P2</b> | 2.00+/-0.05     |
| <b>W</b>  | 8.00+0.30/-0.10 |
| <b>T</b>  | 0.25+/-0.05     |

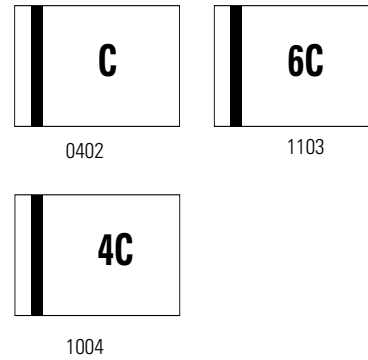
# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Part Numbering System



### Part Marking System



### Ordering Information

| Part Number           | Package        | Ordering Part Number | Minimum Order Quantity |
|-----------------------|----------------|----------------------|------------------------|
| SESD0402Q2UG-0020-090 | 0402 DFN Array | RF2946-000           | 50,000                 |
| SESD1004Q4UG-0020-090 | 1004 DFN Array | RF3077-000           | 25,000                 |
| SESD1103Q6UG-0020-090 | 1103 DFN Array | RF3078-000           | 25,000                 |

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