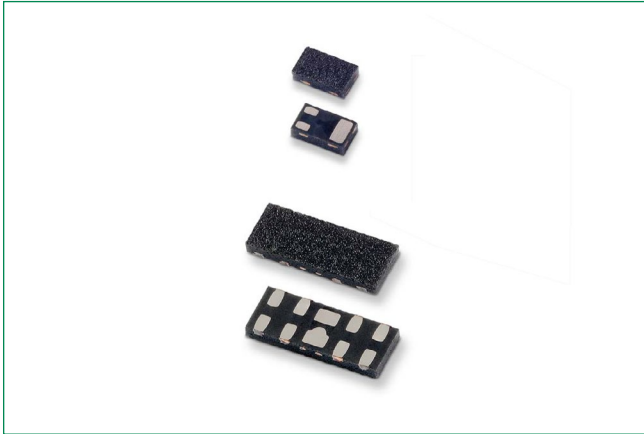


# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes



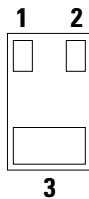
### Web Resources



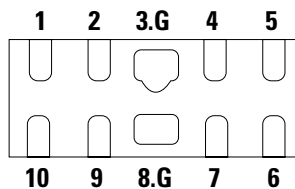
Download ECAD models, order samples, and find technical resources at [www.littelfuse.com](http://www.littelfuse.com)

### Pinout

0402 DFN array



1004 DFN array



Bottom View

### Description

The SESD 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 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 SESD series sets higher standards for signal integrity and usability.

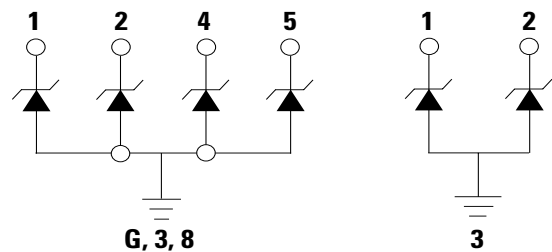
### Features

- 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

# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Absolute Maximum Ratings

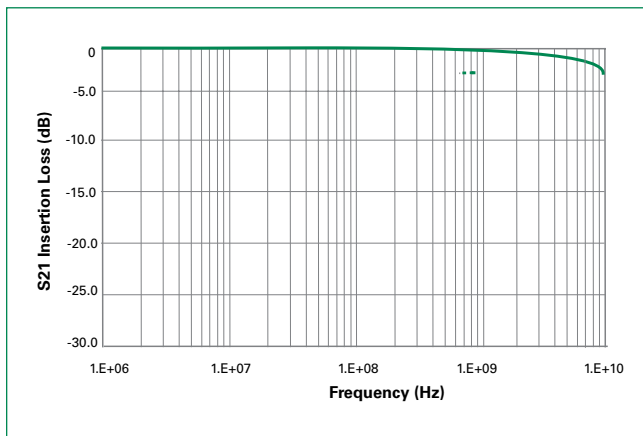
Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	2.0	A
$T_{OP}$	Operating Temperature	-55 to 125	°C
$T_{STOR}$	Storage Temperature	-55 to 150	°C

**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.

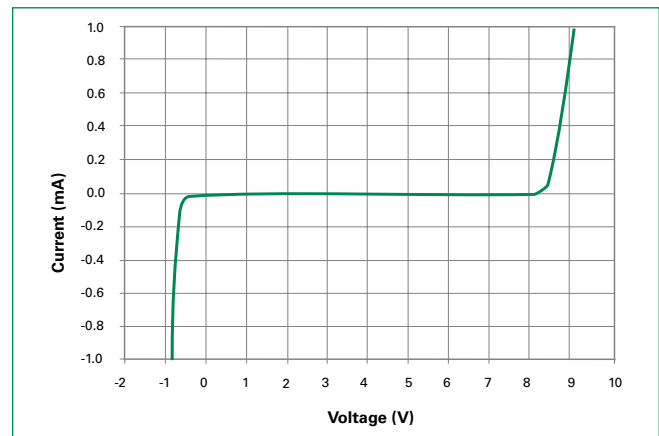
### Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

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



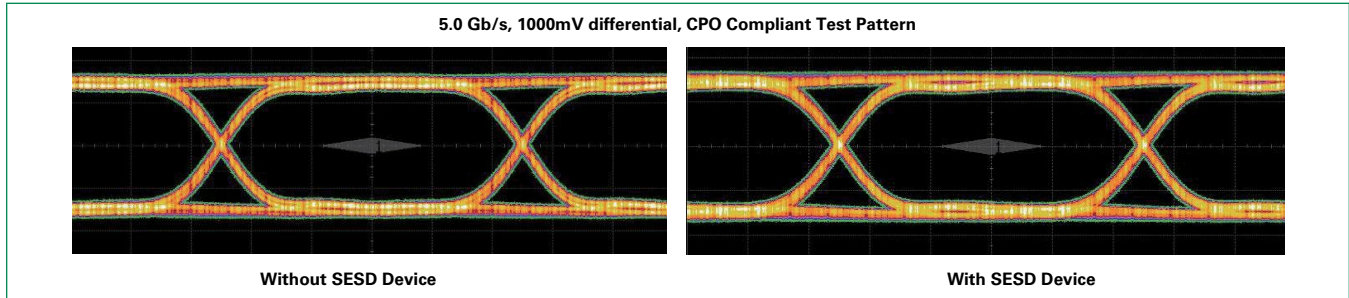
### Component IV Curve



# SESD Series Ultra Low Capacitance Diode Arrays

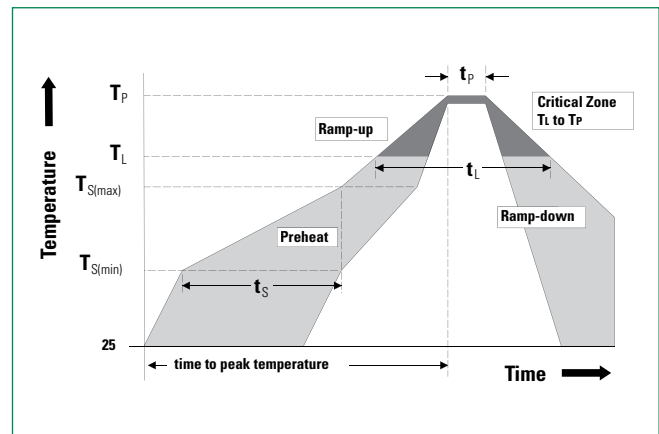
## SPA® Diodes

### USB3.0 Eye Diagram



### Soldering Parameters

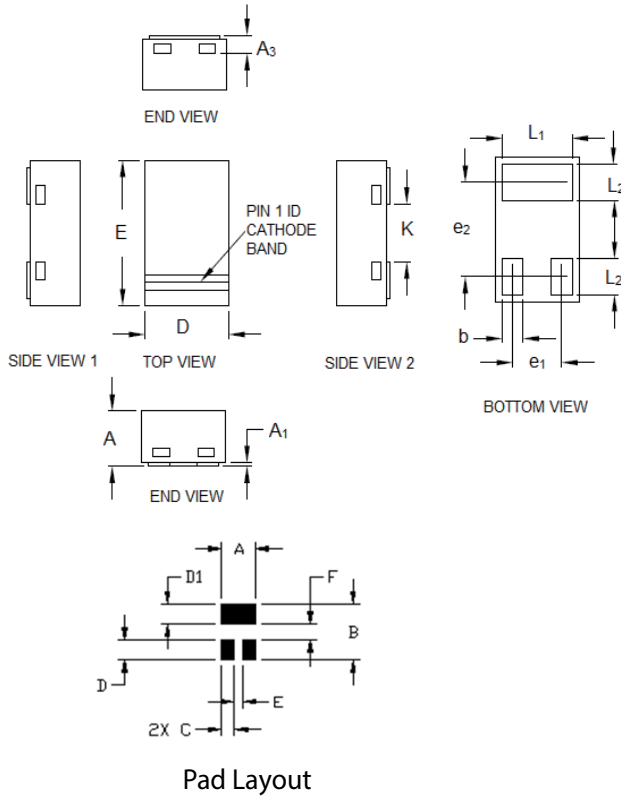
<b>Reflow Condition</b>	Pb – Free assembly	
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b>	3°C/second max	
<b><math>T_{s(max)}</math> 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

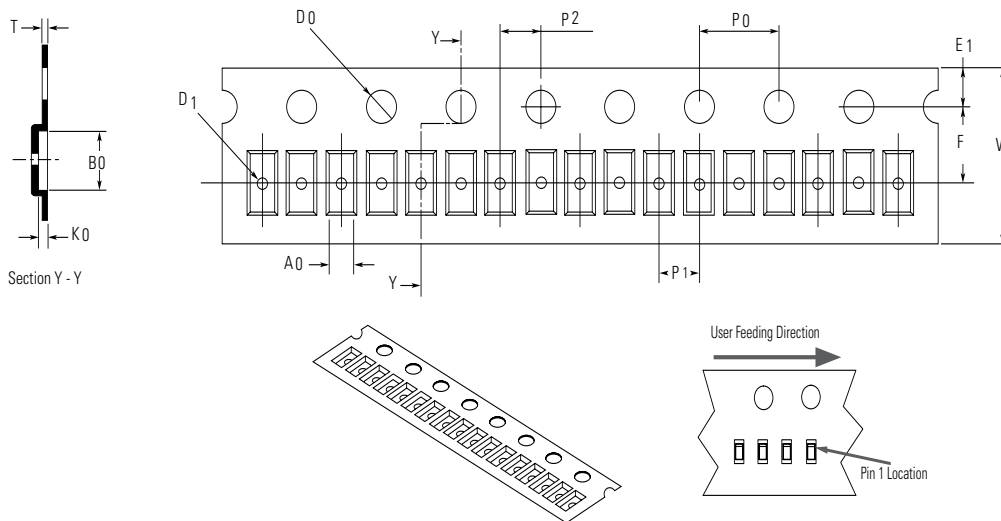
### Package Dimensions — 0402 DFN Array



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

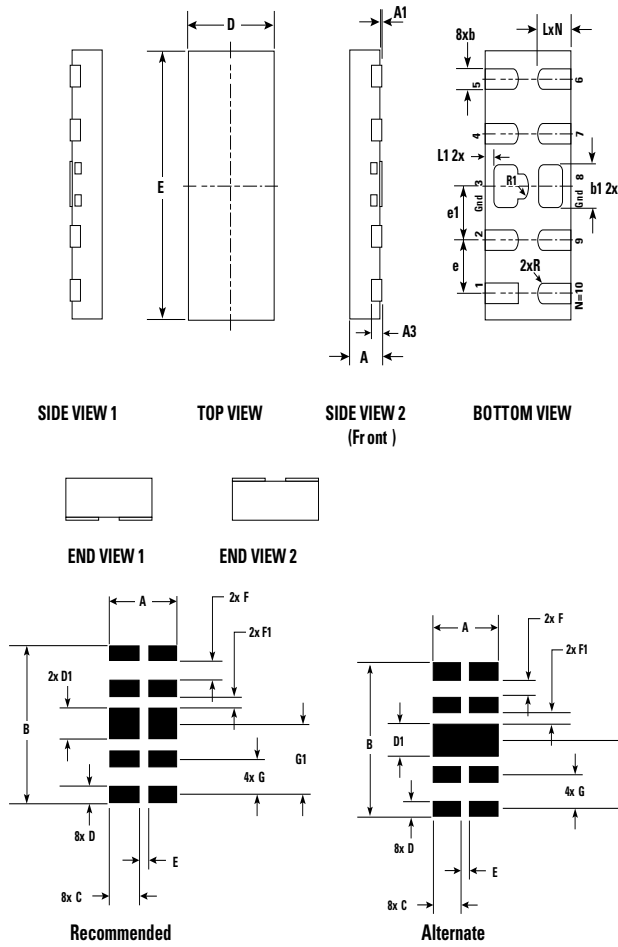


Symbol	Millimeters
<b>A0</b>	0.70+/-0.05
<b>B0</b>	1.15+/-0.05
<b>D0</b>	ø 1.55 + 0.05
<b>D1</b>	ø 0.40 +/- 0.05
<b>E1</b>	1.75+/-0.10
<b>F</b>	3.50+/-0.05
<b>K0</b>	0.47+/-0.05
<b>P0</b>	4.00+/-0.10
<b>P1</b>	2.00+/-0.05
<b>P2</b>	2.00+/-0.05
<b>W</b>	8.00 +/-0.10
<b>T</b>	0.20+/-0.05

# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

### Package Dimensions — 1004 DFN Array

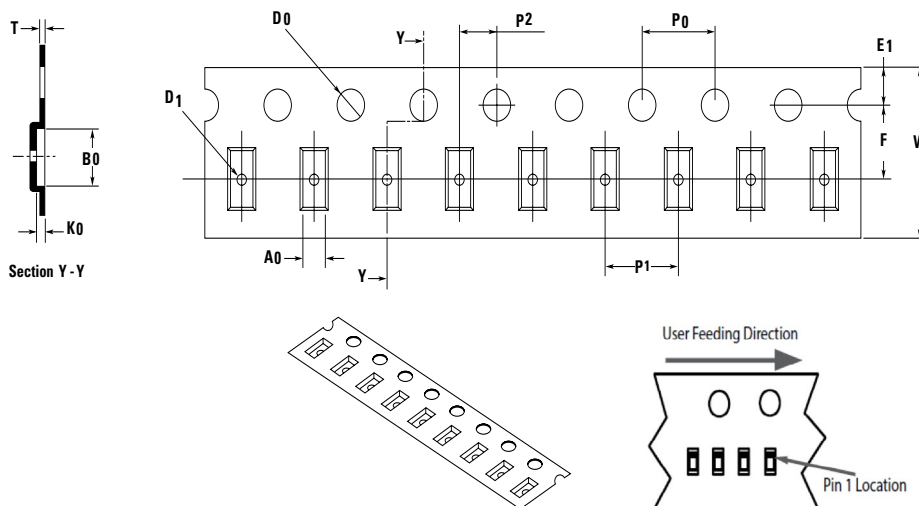


**Pad Layout**

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

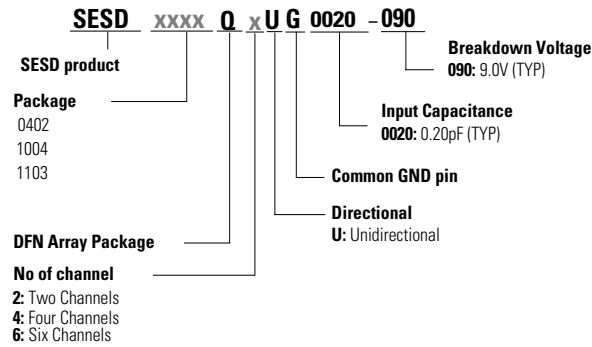


Symbol	Millimeters
<b>A0</b>	1.20+/-0.05
<b>B0</b>	2.70+/-0.05
<b>D0</b>	∅ 1.50+0.10/-0
<b>D1</b>	∅ 0.50 min
<b>E1</b>	1.75+/-0.10
<b>F</b>	3.50+/-0.05
<b>K0</b>	0.51+/-0.10
<b>P0</b>	4.00+/-0.10
<b>P1</b>	4.00+/-0.10
<b>P2</b>	2.00+/-0.05
<b>W</b>	8.00+0.30/-0.10
<b>T</b>	0.25+/-0.05

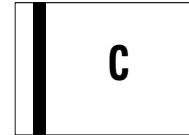
# SESD Series Ultra Low Capacitance Diode Arrays

## SPA® Diodes

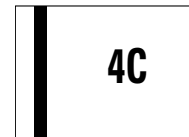
### Part Numbering System



### Part Marking System



0402



1004

### 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

**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <http://www.littelfuse.com/disclaimer-electronics>.