

## Excellent Integrated System Limited

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

[Littelfuse](#)

[SESD0402X1BN-0015-096](#)

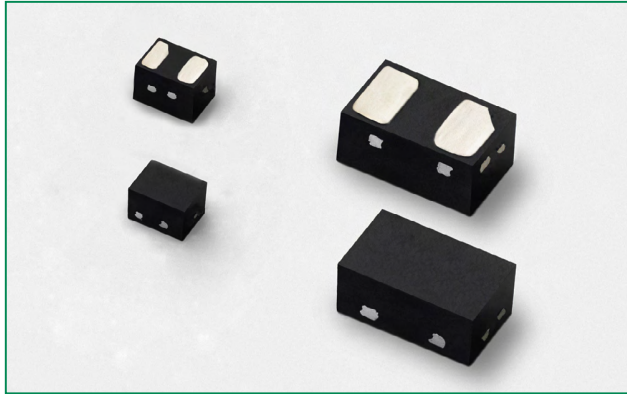
For any questions, you can email us directly:

[sales@integrated-circuit.com](mailto:sales@integrated-circuit.com)

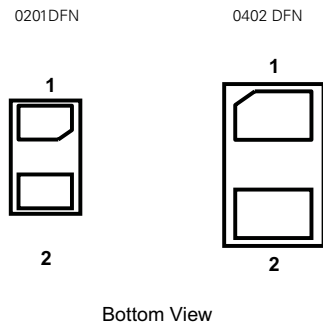
**TVS Diode Arrays (SPA® Diodes)**  
 SESD Series Enhanced ESD Diode Arrays



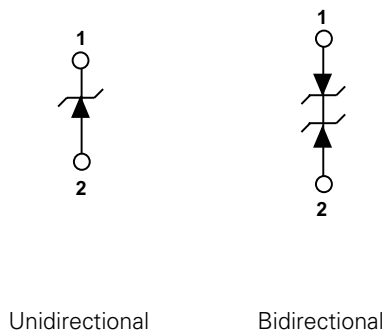
**SESD Series Enhanced ESD Discrete TVS**



**Pinout**



**Functional Block Diagram**



**Description**

The SESD Series Enhanced ESD Discrete TVS provides ultra low capacitance unidirectional and bidirectional ESD protection for the world's most challenging high speed serial interfaces. Ultra low capacitance permits excellent signal integrity on the most challenging consumer electronics interfaces, such as USB 3.1, HDMI 2.0, DisplayPort, and V-by-One®. Providing in excess of 22kV contact ESD protection (IEC61000-4-2) while maintaining extremely low leakage and dynamic resistance, offered in the industry's most popular footprints (0402 and 0201), the SESD series sets higher standards for signal integrity and usability.

**Features**

- 0.15pF TYP bidirectional
- 0.30pF TYP unidirectional
- ESD, IEC61000-4-2, ±22kV contact, ±22kV air
- Low clamping voltage of 14V @  $I_{pp}=2.5A$  (Bidirectional) ( $t_p=8/20\mu s$ )
- Low profile 0201 and 0402 DFN packages
- Facilitates excellent signal integrity
- ELV Compliant

**Applications**

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

## TVS Diode Arrays (SPA®Diodes)

### SESD Series Enhanced ESD Diode Arrays

#### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	2.5	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.

#### Thermal Information

Parameter	Rating	Units
Storage Temperature Range	-55 to 150	°C
Maximum Junction Temperature	150	°C
Maximum Lead Temperature (Soldering 20-40s)	260	°C

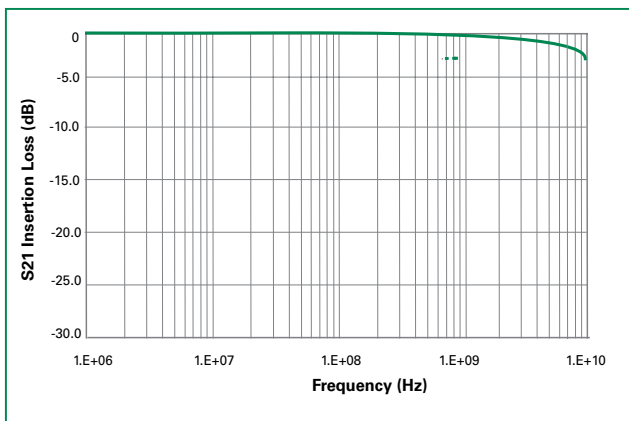
#### Unidirectional Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

Parameter	Test Conditions	Min	Typ	Max	Units
Input Capacitance	@ $V_R = 0V$ , $f = 3GHz$		0.30		pF
Breakdown Voltage	$V_{BR}$ @ $I_T=1mA$		8.80		V
Reverse Working Voltage				7.0	V
Reverse Leakage Current	$I_L$ @ $V_{RWM}=5.0V$		25		nA
Clamping Voltage	$V_{CL}$ @ $I_{PP}=2.5A$		13.0		V
ESD Withstand Voltage	IEC61000-4-2 (Contact)	±22			kV
	IEC61000-4-2 (Air)	±22			

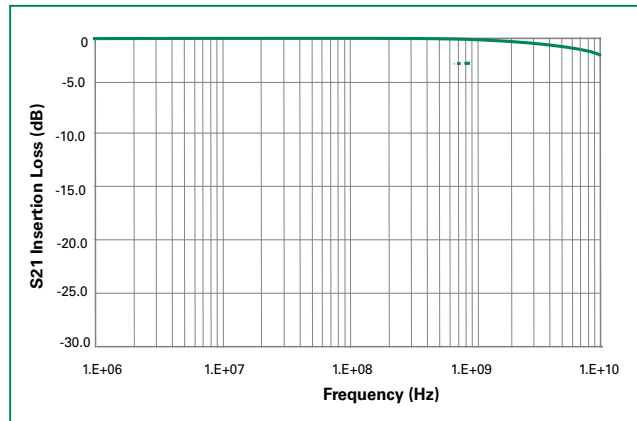
#### Bidirectional Electrical Characteristics - ( $T_{OP}=25^\circ C$ )

Parameter	Test Conditions	Min	Typ	Max	Units
Input Capacitance	@ $V_R = 0V$ , $f = 3GHz$		0.15		pF
Breakdown Voltage	$V_{BR}$ @ $I_T=1mA$		9.6		V
Reverse Working Voltage				7.0	V
Reverse Leakage Current	$I_L$ @ $V_{RWM}=5.0V$		25		nA
Clamping Voltage	$V_{CL}$ @ $I_{PP}=2.5A$		14.0		V
ESD Withstand Voltage	IEC61000-4-2 (Contact)	±22			kV
	IEC61000-4-2 (Air)	±22			

#### Insertion Loss Diagram - Unidirectional



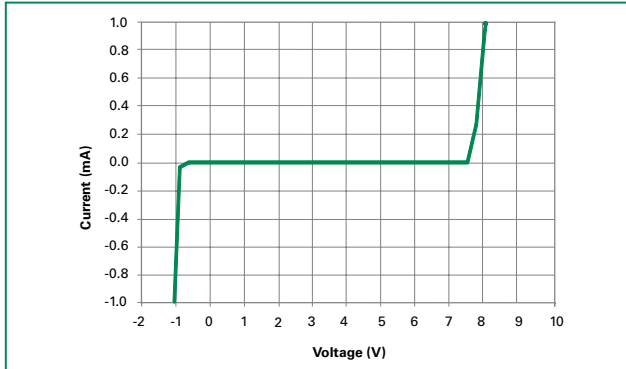
#### Insertion Loss Diagram - Bidirectional



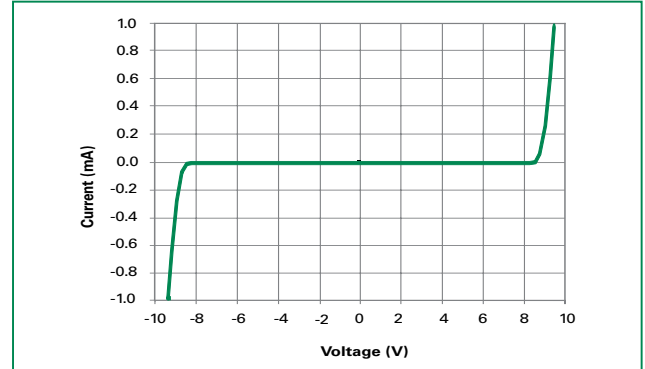
# TVS Diode Arrays (SPA® Diodes)

## SESD Series Enhanced ESD Diode Arrays

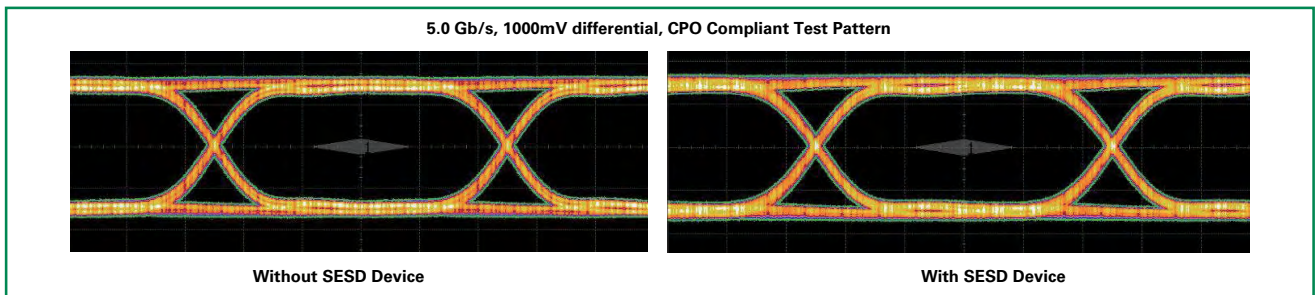
### Device IV Curve - Unidirectional



### Device IV Curve - Bidirectional

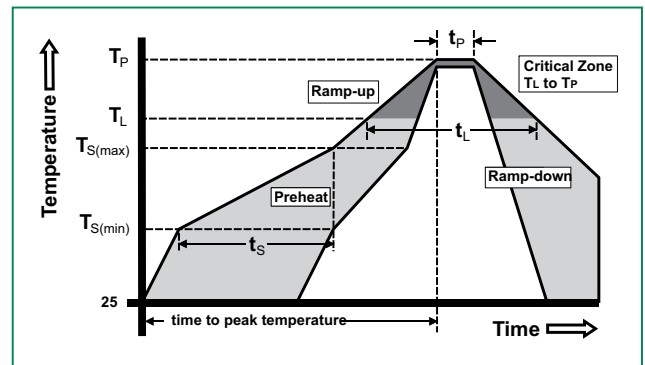


### USB3.0 Eye Diagram



### 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 <sup>+0/-5</sup> °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

<b>Lead Plating</b>	Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Lead Coplanarity</b>	0.0004 inches (0.102mm)
<b>Substrate material</b>	Silicon
<b>Body Material</b>	Molded Epoxy
<b>Flammability</b>	UL 94 V-0

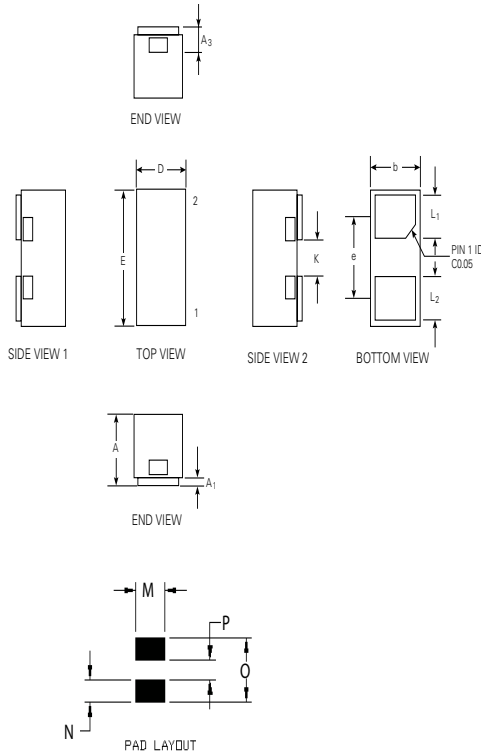
Notes :

1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Bld is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
5. Package surface matte finish VDI 11-13.

## TVS Diode Arrays (SPA®Diodes)

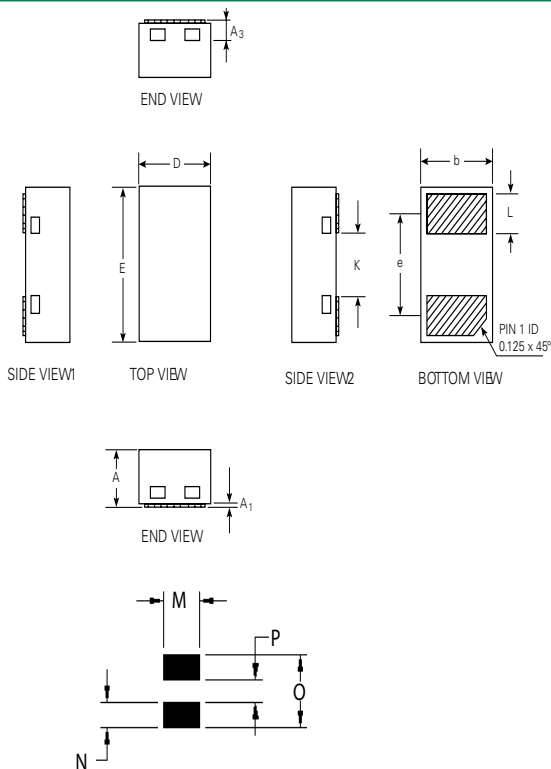
### SESD Series Enhanced ESD Diode Arrays

#### Package Dimensions — 0201 DFN



Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.28	0.30	0.32	0.011	0.012	0.013
A1	0	-	0.05	0	-	0.002
A3	0.102 ref.			0.004 ref.		
D	0.25	0.30	0.35	0.010	0.012	0.014
E	0.55	0.60	0.65	0.022	0.024	0.026
K	0.11	0.17	0.22	0.004	0.007	0.009
b	0.20	0.25	0.30	0.008	0.010	0.012
L1	0.13	0.18	0.23	0.005	0.008	0.009
L2	0.14	0.19	0.24	0.006	0.007	0.009
e	0.356 BSC			0.014 BSC		
M		0.32			0.013	
N		0.24			0.009	
O		0.62			0.024	
P		0.14			0.006	

#### Package Dimensions — 0402 DFN

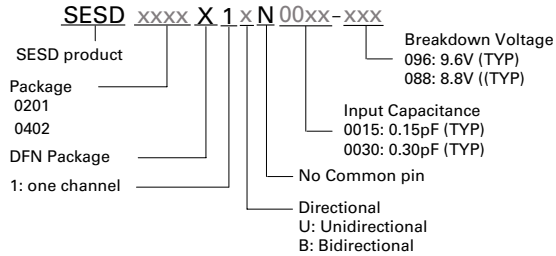


Symbol	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.33	0.38	0.43	0.013	0.015	0.017
A1	0	-	0.05	0	-	0.002
A3	0.13 ref.			0.005 ref.		
D	0.55	0.60	0.65	0.022	0.024	0.026
E	0.95	1.00	1.05	0.037	0.039	0.041
K	0.35	0.40	0.45	0.014	0.016	0.018
b	0.45	0.50	0.55	0.018	0.020	0.022
L	0.20	0.25	0.30	0.008	0.010	0.012
e	0.65 BSC			0.026 BSC		
M		0.60			0.024	
N		0.35			0.014	
O		1.00			0.039	
P		0.30			0.012	

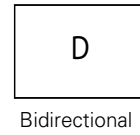
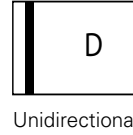
# TVS Diode Arrays (SPA® Diodes)

## SESD Series Enhanced ESD Diode Arrays

### Part Numbering System



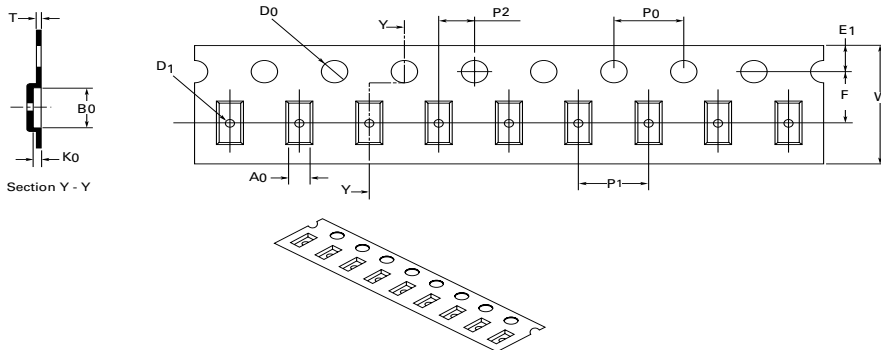
### Part Marking System



### Ordering Information

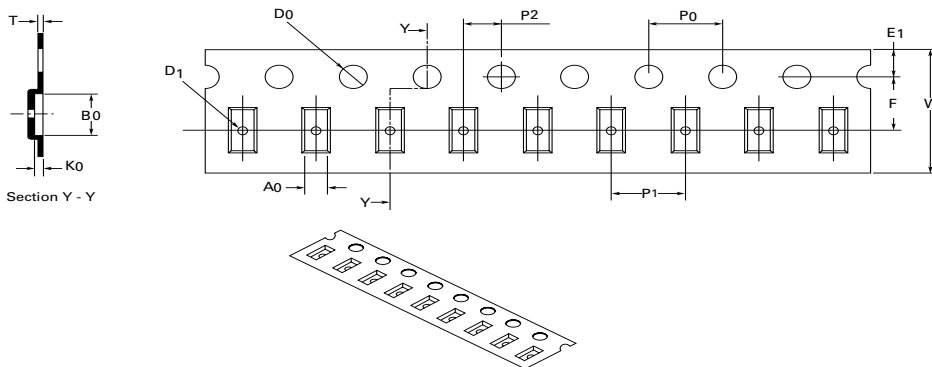
Part Number	Package	Marking	Ordering Part Number	Minimum Order Quantity
SESD0201X1UN-0030-088	0201 DFN	I D	RF3917-000	75000
SESD0201X1BN-0015-096	0201 DFN	D	RF3918-000	75000
SESD0402X1UN-0030-088	0402 DFN	I D	RF3920-000	50000
SESD0402X1BN-0015-096	0402 DFN	D	RF3922-000	50000

### Embossed Carrier Tape & Reel Specification — 0201 DFN



Symbol	Millimeters
A0	0.36+/-0.03
B0	0.66+/-0.03
D0	ø 1.50 + 0.10/-0
D1	ø 0.20 +/- 0.05
E1	1.75+/-0.10
F	3.50+/-0.05
K0	0.33+/-0.03
P0	4.00+/-0.10
P1	2.00+/-0.10
P2	2.00+/-0.05
W	8.00+/-0.10
T	0.23+/-0.02

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



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