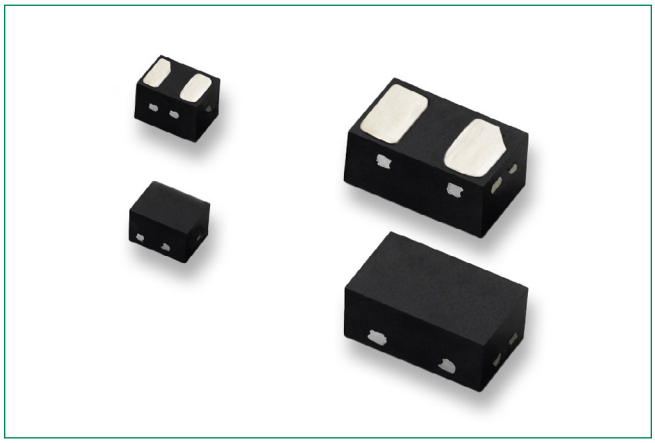
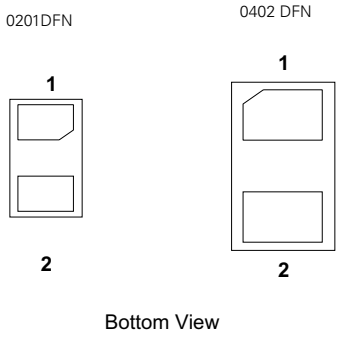
SESD Series

Ultra Low Capacitance Discrete TVS

AUTOMOTIVE GRADE | RoHS | Pb | ELV

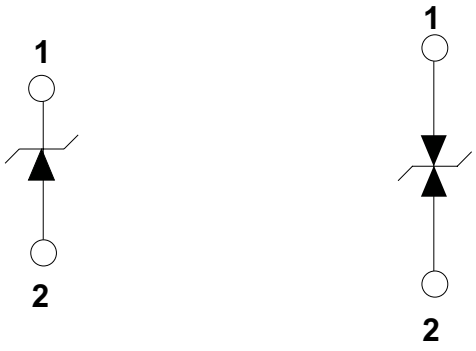


Pinout



Bottom View

Functional Block Diagram



Unidirectional **Bidirectional**

Description

The SESD Series Ultra Low Capacitance Discrete TVS provides unidirectional and bidirectional ESD protection for the most challenging high speed serial interfaces. Its low off-state capacitance, extremely low leakage (< 50 nA) and low dynamic resistance make it compatible with high speed signaling such as USB 3.1, HDMI 2.0, DisplayPort, and V-by-One®.

The SESD series has an ESD (IEC 61000-4-2) rating of ±20 kV packaged in the industry's popular 0402 and 0201 footprints.

Features

- 0.13pF MAX bidirectional off-state capacitance
- 0.25pF MAX unidirectional off-state capacitance
- IEC 61000-4-2 ESD rating of ±20 kV air and contact discharge
- Low clamping voltage of 10V @ I_{PP}=2A (Bidirectional) (t_P=8/20µs)
- PPAP capable
- Low profile 0201 and 0402 DFN packages
- Facilitates excellent signal integrity
- ELV-Compliant
- RoHS-Compliant and Lead-Free
- AEC-Q101 qualified

Applications

- Ultra-high speed data lines
- USB 3.1, 3.0, 2.0
- HDMI 2.0, 1.4a, 1.3
- DisplayPort(TM)
- Thunderbolt (Light Peak)
- 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

Revised: GD. 08/04/22

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	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.

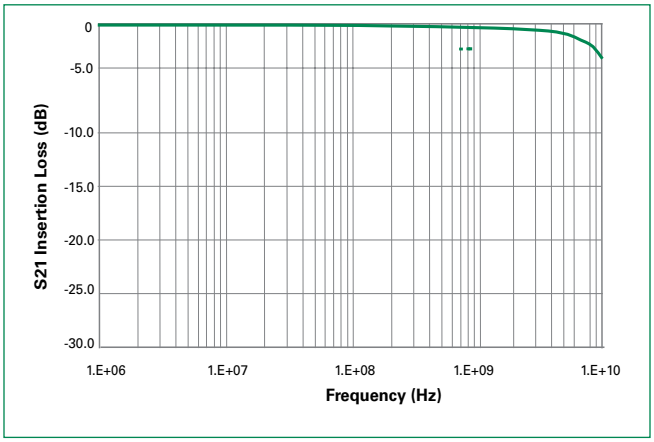
Unidirectional Electrical Characteristics - (T_{OP}=25°C)

Parameter	Test Conditions	Min	Typ	Max	Units
Input Capacitance	Reverse Bias=0V, f = 3GHz	-	0.20	0.25	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
ESD Withstand Voltage	IEC 61000-4-2 (Contact)	±20	-	-	kV
	IEC 61000-4-2 (Air)	±20	-	-	

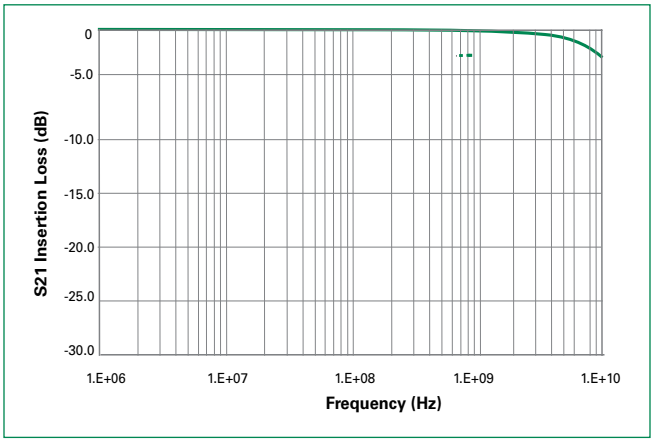
Bidirectional Electrical Characteristics - (T_{OP}=25°C)

Parameter	Test Conditions	Min	Typ	Max	Units
Input Capacitance	Reverse Bias=0V, f = 3GHz	-	0.10	0.13	pF
Breakdown Voltage	V_{BR} @ I_T=1mA	-	9.80	-	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	-	10.0	-	V
ESD Withstand Voltage	IEC 61000-4-2 (Contact)	±20	-	-	kV
	IEC 61000-4-2 (Air)	±20	-	-	

Insertion Loss Diagram - Unidirectional



Insertion Loss Diagram - Bidirectional



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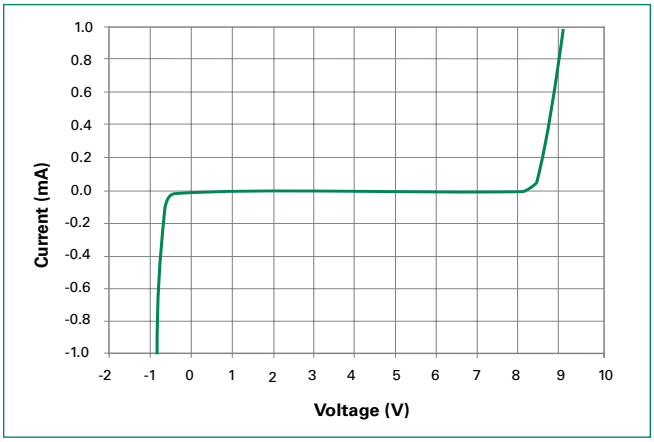
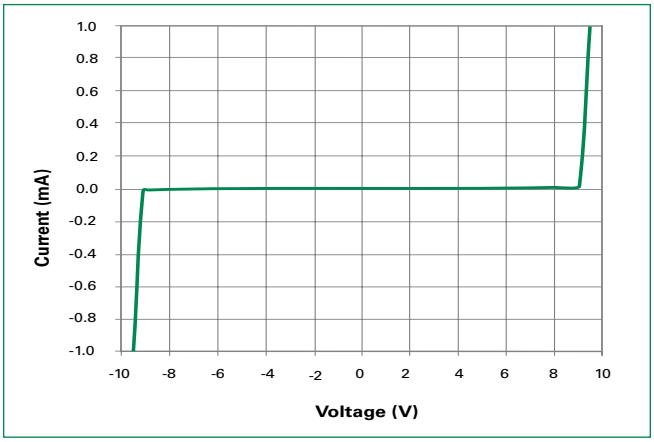
Component IV Curve - Unidirectional

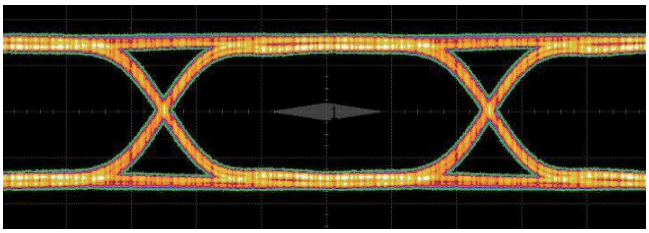


Component IV Curve - Bidirectional

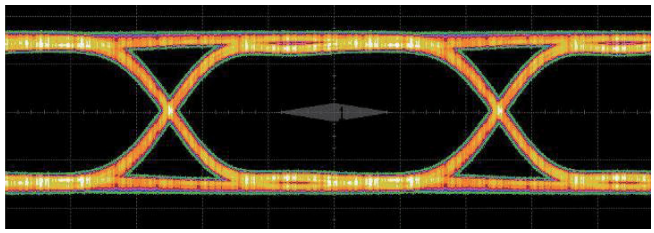


USB3.0 Eye Diagram

5.0 Gb/s, 1000mV differential, CPO Compliant Test Pattern



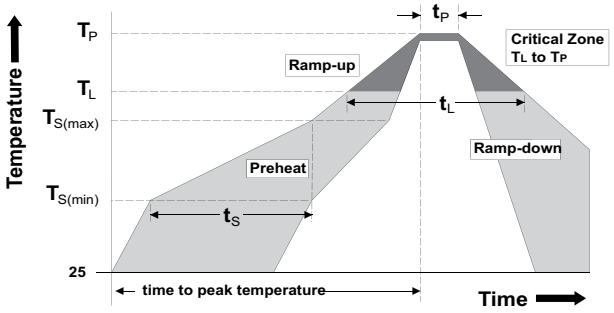
Without SESD Device



With SESD Device

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 – 120 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)		30 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

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

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SESD Series
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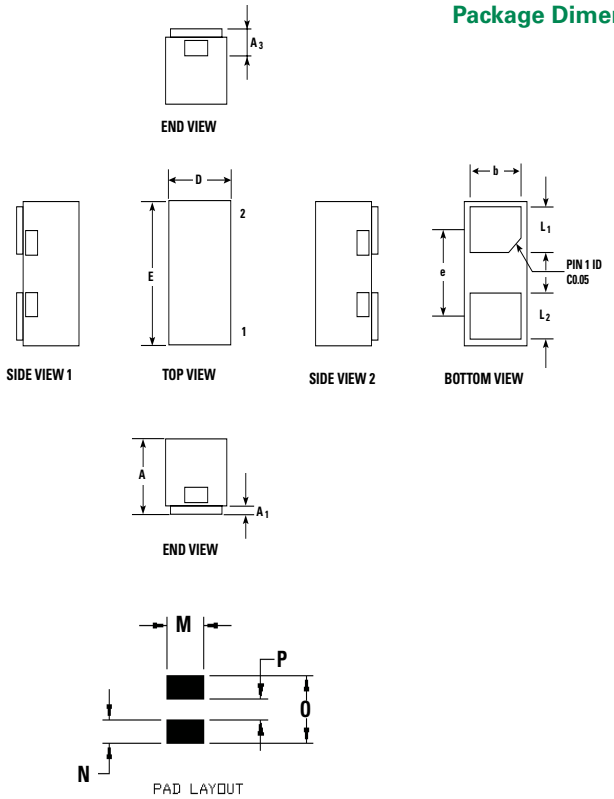
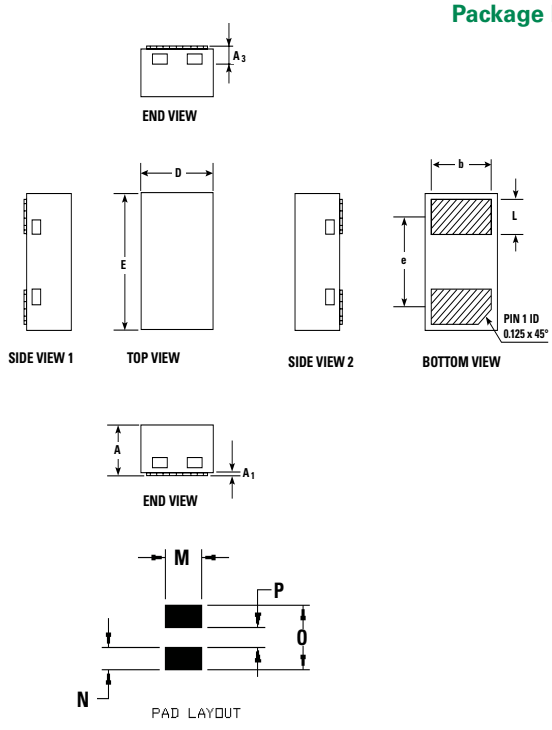
Package Dimensions — 0201 DFN



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
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	0.31	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
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	

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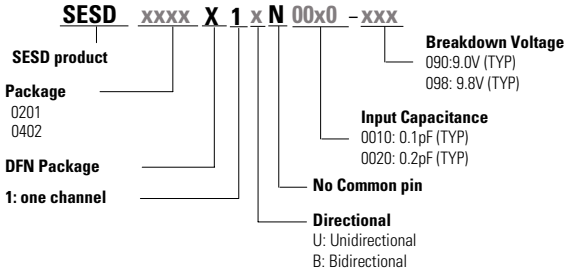
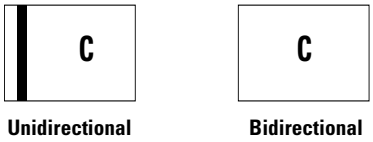
Part Numbering System



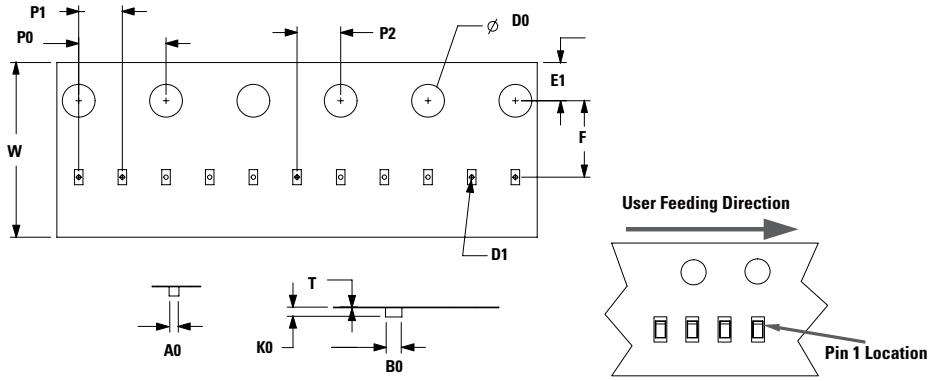
Part Marking System



Ordering Information

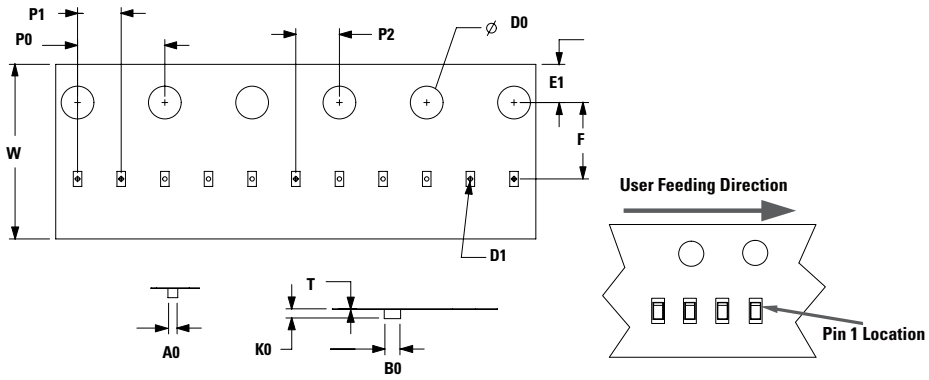
Part Number	Package	Ordering Part Number	Min. Order Qty.
SESD0201X1UN-0020-090	0201 DFN	RF2192-000	75000
SESD0201X1BN-0010-098	0201 DFN	RF2193-000	75000
SESD0402X1UN-0020-090	0402 DFN	RF2943-000	50000
SESD0402X1BN-0010-098	0402 DFN	RF2945-000	50000

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