

New Silicon ESD Protection Devices

Portfolio Overview

TE Connectivity's Circuit Protection Products

January 18, 2012



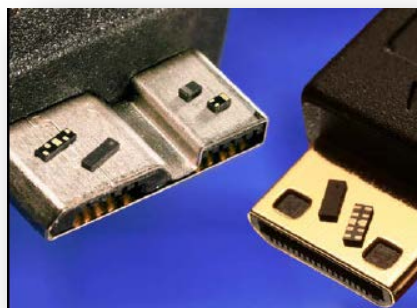
Single-channel Silicon ESD Protection Devices

Multi-channel Silicon ESD Flow-Through Arrays



Single-channel 0201, 0402

Multi-channel 0402, 0802, 1004, 1103



KEY FEATURES

- Low capacitance –
0.10 pF (typ, bi-di)
0.02 pF (typ, uni-di)
- Low leakage current –
50nA @ 5V (max)
- Low clamping voltage –
 $\pm 9.9V$ (typ, bi-di)
 $+ 9.158 / -0.8V$ (typ, uni-di)
- ESD $\pm 20kV$ contact & air discharge
per IEC61000-4-2
- Surge – 2A (max) @ (tp= 8x20 μ s)
per IEC61000-4-2-5
- Small size and low profile XDFN
packages

RoHS Compliant

Directive 2000/53/EC
Compliant

ELV Compliant

Directive 2002/95/EC
Compliant

Halogen Free*



Pb-Free



Single-channel Silicon ESD Protection Devices

Multi-channel Silicon ESD Flow-Through Arrays



Package	0402 1 -ch Bi-Di	0402 1 -ch Uni-	0201 1-ch Bi-Di	0201 1 -ch Uni-	2-ch Flow-Through 0402	4-ch Flow-Through Array	4-ch Flow-Through Mini-Array	6-ch Flow-Through Array
Dimensions (mm)	1.0x0.6x0.38	1.0x0.6x0.38	0.6x0.3x0.31	0.6x0.3x0.31	1.0x0.6x0.38	2.5x1.0x0.31 (0.5mm pitch)	2.0x0.6x0.31 (0.4mm pitch)	2.8x0.8x0.31 (0.4mm pitch)
Technology	SESD (Bi-Di)	SESD (Uni-Di)	SESD (Bi-Di)	SESD (Uni-Di)				
pF / kV contact	0.10pF / 20kV	0.20pF / 20kV	0.10pF / 20kV	0.20pF / 20kV				
IEEE61000-4-5 8x20µs Surge	2A							
Leakage Current	50nA (Max)							
Applications	Ultra-High-Speed Digital (HDMI, USB 3.0, Thunderbolt protocols, DisplayPort protocols, V-by-One HS, LVDS)							

Single-Channel Protection

2-Channel

4-Channel

6-Channel

Applications

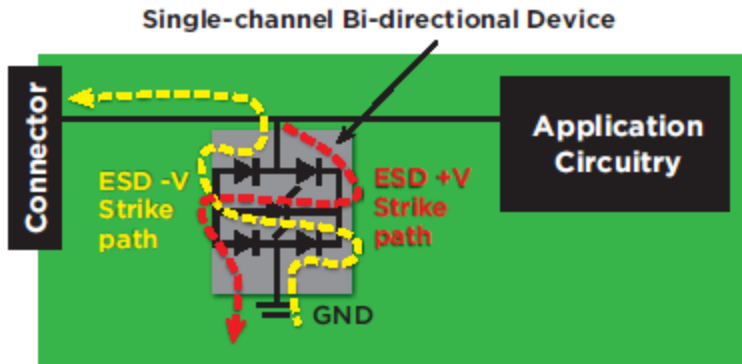
- Consumer, mobile and portable electronics
- Tablet PC and external storage with high speed interfaces
- Ultra-high speed data lines
 - USB 3.0/2.0
 - HDMI 1.3/1.4: including support for 4K (Quad-HiDef Resolution)
 - DisplayPort interface
 - Thunderbolt interface
 - V-by-One HS
 - LVDS interface
- Applications requiring high ESD performance in small DFN packages

Benefits

- Industry-leading lowest capacitance
- Industry-leading lowest insertion loss
- ESD protection up to 20kV contact/air-discharge per IEC61000-4-2
- Industry's smallest footprint and lowest profile multi-channel ESD
 - Bi-Directional and Uni-Directional 0201, 0402
- Flow-through and single connection design helps routing PCB matched impedance high speed data lines
- Surge 2A (max) @ (tp=8x20µs) per IEC61000-4-2-5

**Consumer, mobile and portable
electronics**

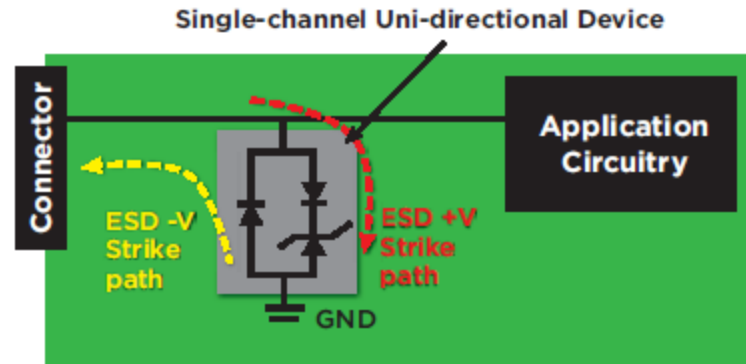
Single-channel Functional Diagram: Bi-Directional and Uni-Directional



- Helps protect against damage from $+ / - V_{ESD}$ strikes to 20kV contact & air discharge.
- If the signal voltage does below $-9.8V$ or above $+9.8V$ the ESD device turns on and shunts to GND.

Application	Bit Rate (Gbps)	@Frequency (GHz)	Insertion Loss (dB)
HDMI 1.4 (1080P)	2.25	1.13	-0.12
DisplayPort	2.70	1.35	-0.16
HDMI 1.4 (max spec)*	3.40	1.70	-0.19
USB3.0	5.00	2.50	-0.23
eSATA	6.00	3.00	-0.27
Thunderbolt	10.00	5.00	-0.30

* Devices are HDMI 4K / QuadHD resolutions (4096 x 2160) ready.



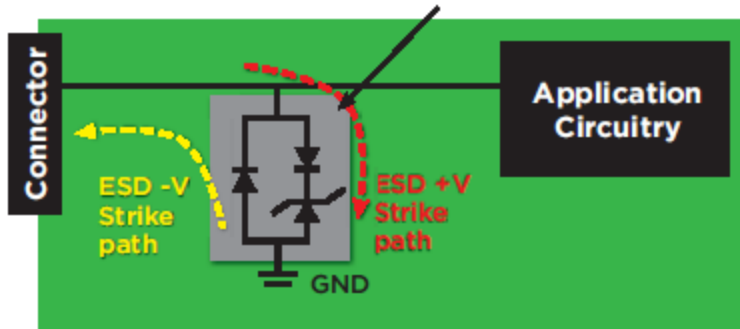
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- If the signal voltage does below $-0.8V$ or above $+9.0V$ the ESD device turns on and shunts to GND.

Application	Bit Rate (Gbps)	@Frequency (GHz)	Insertion Loss (dB)
HDMI 1.4 (1080P)	2.25	1.13	-0.15
DisplayPort	2.70	1.35	-0.20
HDMI 1.4 (max spec)*	3.40	1.70	-0.23
USB3.0	5.00	2.50	-0.29
eSATA	6.00	3.00	-0.35
Thunderbolt	10.00	5.00	-0.50

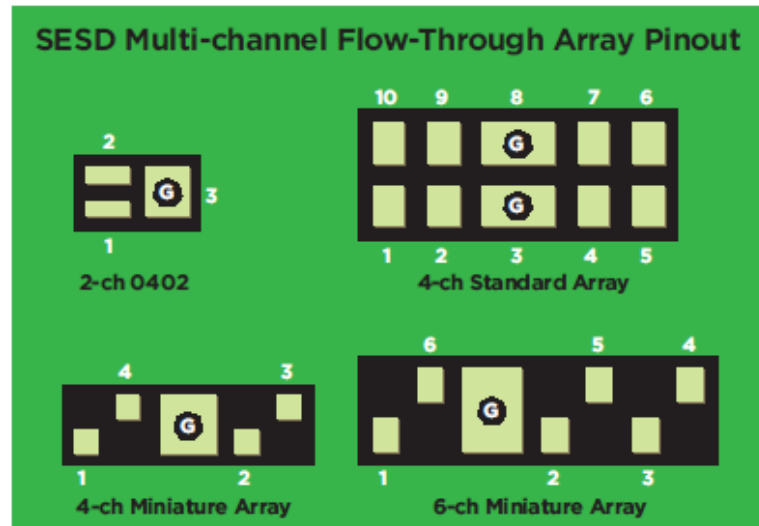
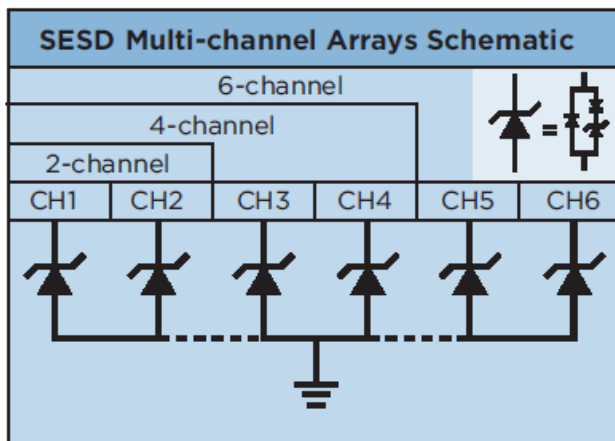
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SESD Multi-Channel Array Operation and PIN Configuration

One-channel in Multi-channel SESD Array



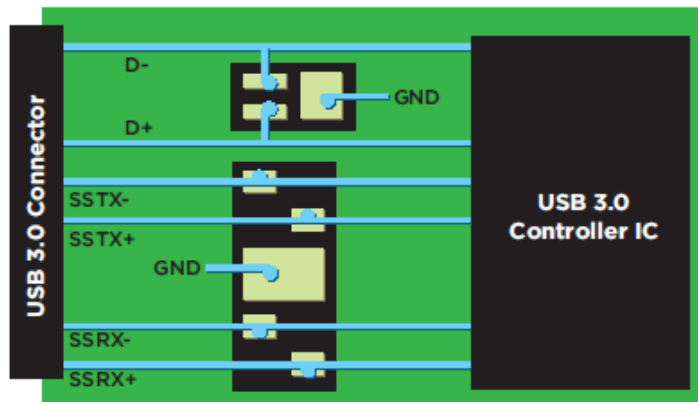
- Helps protect against damage from $+ / - V_{ESD}$ strikes to 20kV contact & air discharge.
- If the signal voltage does below $-0.8V$ or above $+9.0V$ the ESD device turns on and shunts to GND.



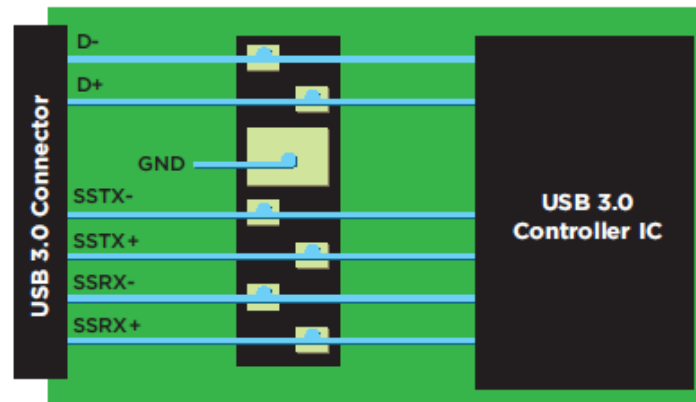
Recommended Application Configurations

USB, HDMI, Thunderbolt Interfaces

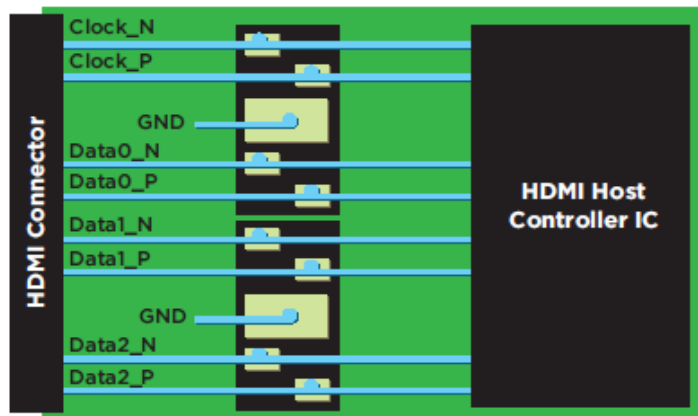
USB 3.0 using a 4-ch Array and 2-ch Array



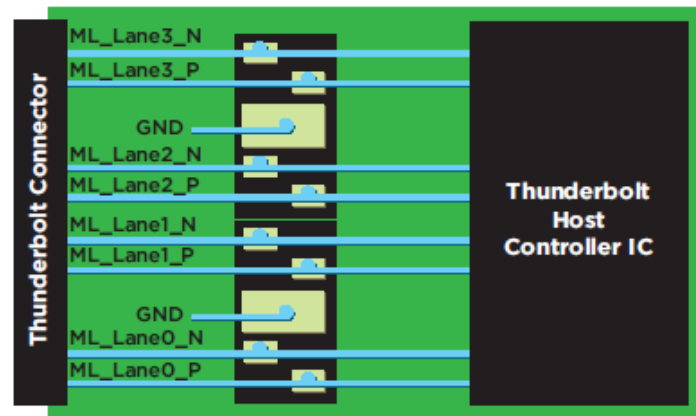
USB 3.0 using a 6-ch Array



HDMI using 4-ch Arrays



Thunderbolt using 4-ch Arrays



Features

- **Price** - TE's SESD family has an attractive price structure that may enhance your competitiveness.
- **Wide Selection** – TE's SESD family, with its single and multiple array options, allows standard product to meet specialized high volume customer requests.
- **Performance** – TE's SESD family provides the performance you need, meeting IEC specifications.

P/N, MOQ, etc.

TE Part #	Part Description	Sample Availability (Y/N)	Standard MOQ	# of Channels	Size	Bi-di or Uni-di?	Capacitance	kV Rating
RF2193-000	SESD0201X1BN-0010-098	Y	15,000	1	201	Bi-di	0.10pF	20kV contact/air
RF2195-000	SESD0402X1BN-0010-098	Y	10,000	1	402	Bi-di	0.10pF	
RF2192-000	SESD0201X1UN-0020-090	Y	15,000	1	201	Uni-di	0.20pF	
RF2194-000	SESD0402X1UN-0020-090	Y	10,000	1	402	Uni-di	0.20pF	
RF2196-000	SESD0402Q2UG-0020-090	Y	10,000	2-ch	2-ch 0402	Uni-di	0.20pF	
RF2197-000	SESD0802Q4UG-0020-090	Y	5,000	4-ch	4-ch mini	Uni-di	0.20pF	
RF2524-000	SESD1004Q4UG-0020-090	Y	5,000	4-ch	4-ch STD	Uni-di	0.20pF	
RF2525-000	SESD1103Q6UG-0020-090	Y	5,000	6-ch	6-ch mini	Uni-di	0.20pF	

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