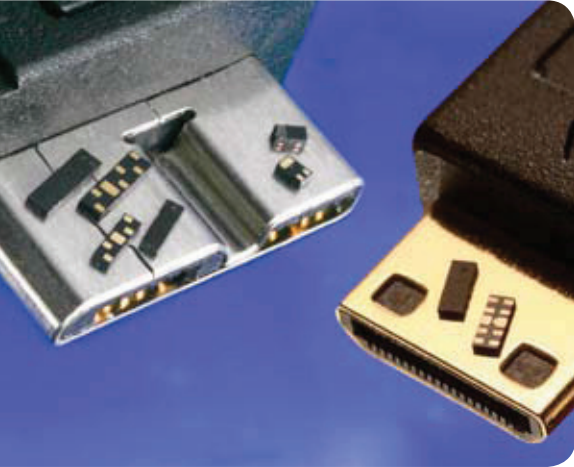


## Product Overview

### Multi-channel Silicon ESD Flow-Through Arrays

TE Connectivity's Silicon ESD arrays help to protect electronic circuits against damage from Electrostatic Discharge (ESD), surge and cable discharge events.





## KEY FEATURES

- Low Capacitance 0.20pF (typ, 200fF)
- Low leakage current - 50nA @ 5V (typ)
- Low clamping voltage - +9.20/-0.80V (typ) @ (tp=8x20µs, Ipp=2A)
- ESD - 20kV contact and air discharge per IEC61000-4-2
- Surge - 2A (tp=8x20µs) per IEC61000-4-5
- Small size and low profile XDFN Array packages - 0.31mm height

RoHS Complaint, Pb and Halogen Free (refers to: Br ≤ 900ppm, Cl ≤ 900ppm, Br+Cl ≤ 1500ppm)

The Silicon ESD (SESD) arrays help provide protection and improve reliability of electronics in applications including but not limited to consumer, portable and mobile electronics. The multi-channel SESD flow-through arrays have industry leading ultra-low capacitance of 0.20pF with low insertion loss which help protect high-speed data signals. The SESD arrays provide robust ESD protection with an industry-leading 20kV contact and air discharge rating per the IEC61000-4-2 standard. The ultra-low capacitance SESD arrays enable signal integrity for today's highest-speed interfaces including USB 3.0/2.0, HDMI, eSATA, DisplayPort, and Thunderbolt.

TE offers four- and six- channel miniature arrays which are up to 85% smaller than common multi-channel arrays to fit into space constrained applications. TE's ultra-small packages have lower parasitic impedance which reduces insertion loss at high frequencies compared to larger size packaged devices. The four- and six-channel arrays, with 0.31mm package height, have a 50% lower profile than other package options in the market. All of TE's SESD arrays are in flow-through design packages which allow for matched impedance PCB trace routing essential for high speed signal integrity.

## 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, DisplayPort interface, Thunderbolt interface (Light Peak), V-by-One HS, and LVDS interface
- Applications requiring high ESD performance in small DFN packages

## BENEFITS

- Industry-leading lowest capacitance; provides lowest insertion loss for high speed data signals
- Provides ESD protection up to 20kV contact and air discharge per IEC61000-4-2
- Industry's smallest footprint and lowest profile multi-channel ESD arrays helps to optimize board space
- Flow-through and single connection design helps routing PCB matched impedance high speed data lines
- Helps protect electronic circuits against damage from Electrostatic Discharge (ESD), lightning and cable discharge events
- Assist equipment to pass IEC61000-4-2, level 4 testing

DEVICE ELECTRICAL CHARACTERISTICS

Device Maximum Ratings

Multi-Channel Arrays	IEC 61000-4-2, level 4 (ESD withstand)		Temperature		Peak Current (tp=8x20µs)
	Contact (kV)	Air (kV)	Operating (°C)	Storage (°C)	Ipp (A)
SESD0402Q2UG-0020-090 (2-ch)	20	20	-55 to +125	-55 to +150	2.0
SESD0802Q4UG-0020-090 (4-ch)					
SESD1004Q4UG-0020-090 (4-ch)					
SESD1103Q6UG-0020-090 (6-ch)					

Caution: Stress exceeding Device Maximum Ratings may damage the device. Prolong exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Device Electrical Characteristics @ T = 25°C

Multi-Channel Arrays	Input Capacitance <sup>(1)</sup>		Breakdown Voltage (typ)	Reverse Leakage Current (typ)	Clamping Voltage (typ)
	Typical (pF)	Maximun (pF)	V <sub>br</sub> @ I <sub>t</sub> = 1mA (V)	I <sub>L</sub> @ V <sub>RWM</sub> = 5.0V (nA)	V <sub>CL</sub> @ Ipp = 2.0A (V)
SESD0402Q2UG-0020-090 (2-ch)	0.20	0.22	+9.00 / -0.80	50.0	+9.20 / -0.80
SESD0802Q4UG-0020-090 (4-ch)					
SESD1004Q4UG-0020-090 (4-ch)					
SESD1103Q6UG-0020-090 (6-ch)					

<sup>(1)</sup> @ Vr = 0V, f = 3GHz, I/O to GND

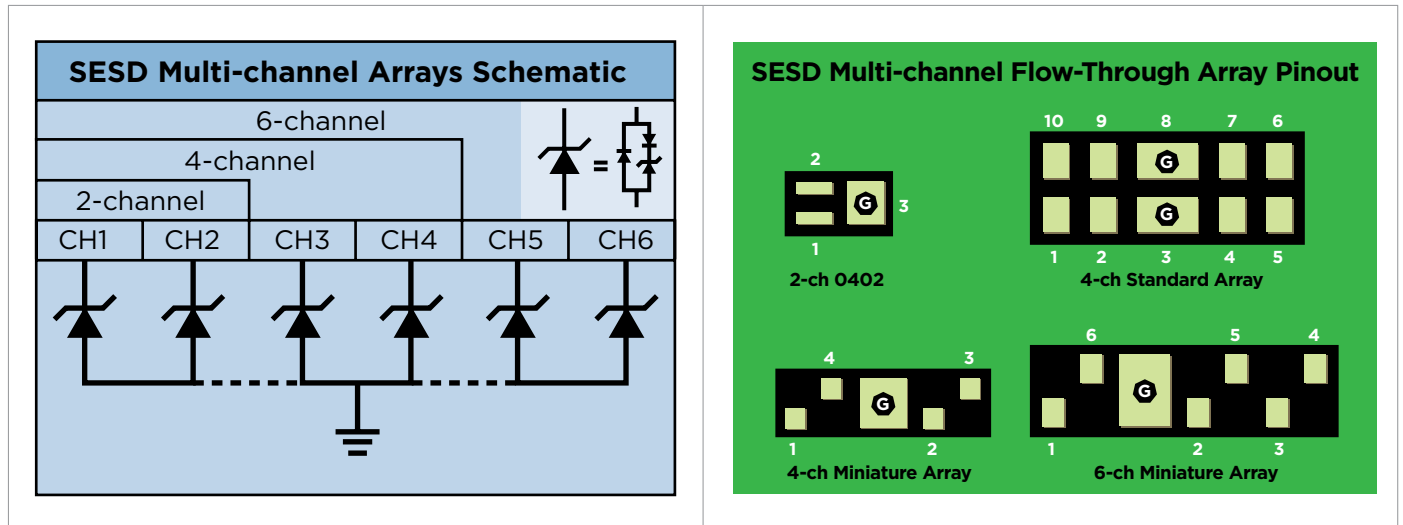
DEVICE IV CHARACTERISTICS AND OPERATION

**SESD Multi-channel Array IV**

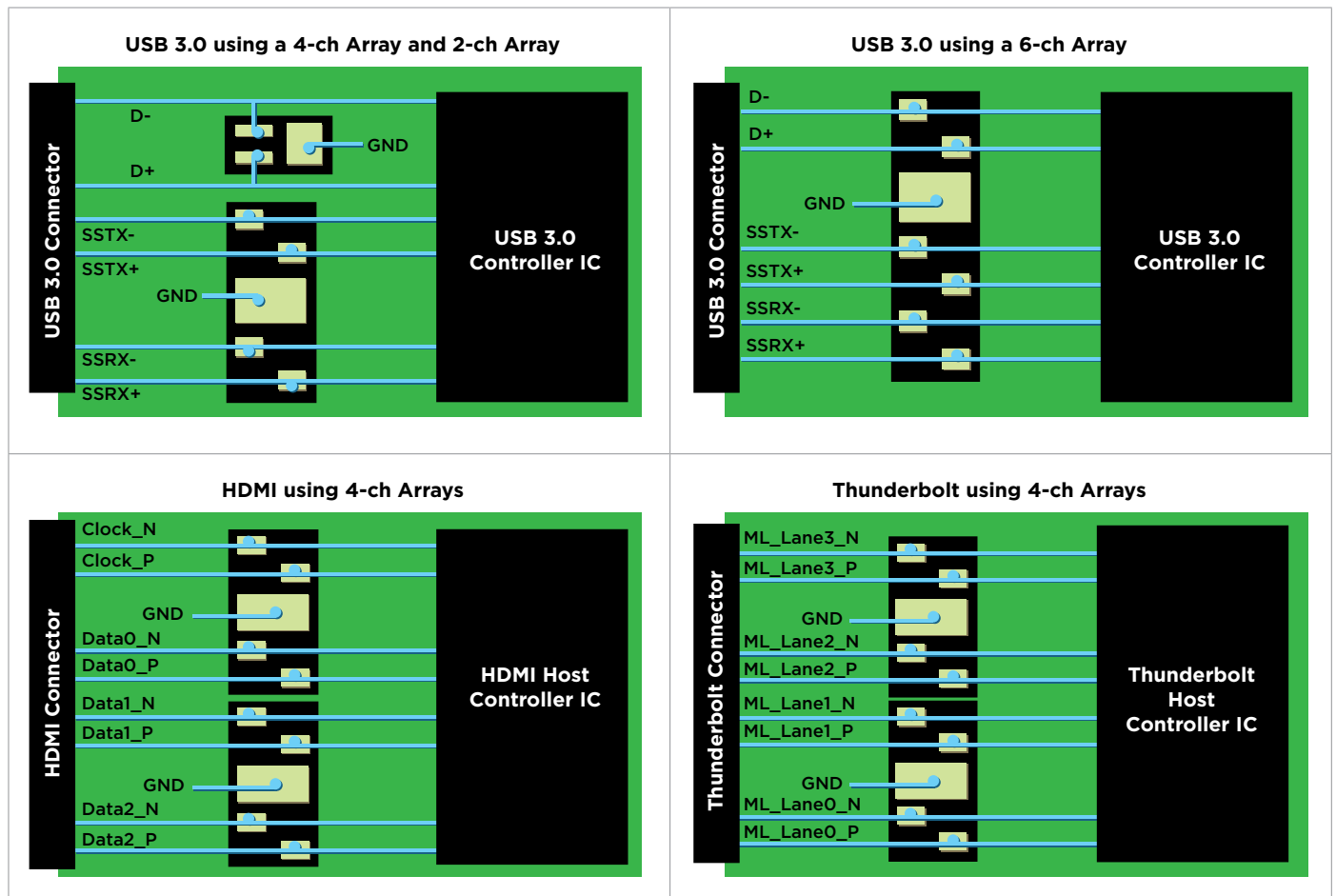
**One-channel in Multi-channel SESD Array**

- Helps protect against damage from V<sub>ESD</sub> strikes to 20kV contact & air discharge.
- If the signal voltage goes below -0.8V or above +9.0V the ESD device turns on and shunts to GND.

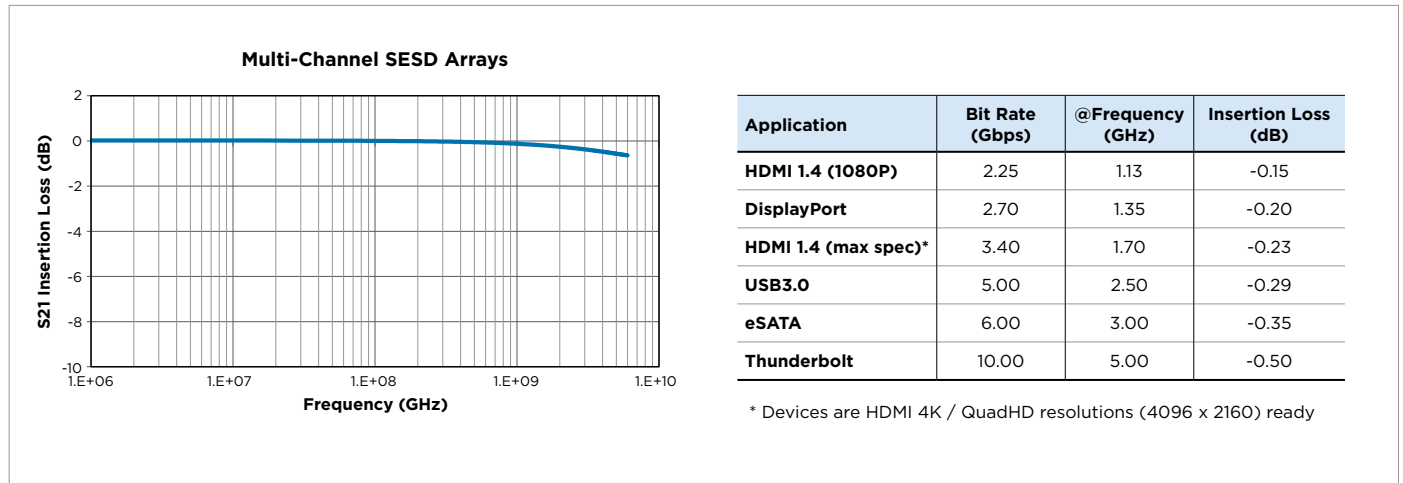
SESD MULTI-CHANNEL ARRAY SCHEMATIC AND PIN CONFIGURATION



RECOMMENDED APPLICATION CONFIGURATIONS



INSERTION LOSS DIAGRAMS



MATERIAL INFORMATION

RoHS Compliant

Directive 2000/53/EC  
Compliant

ELV Compliant

Directive 2002/95/EC  
Compliant

Halogen Free\*



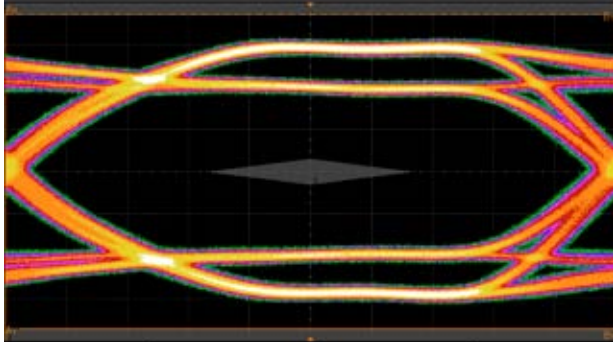
Pb-Free



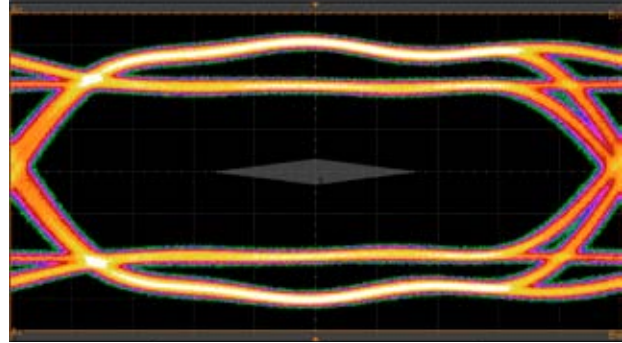
\* Halogen Free refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm.  
 SESD devices meet MSL-1 Requirements  
 DFN case epoxy meets UL 94 V-0

EYE DIAGRAMS

**USB3.0 Eye Diagrams**  
5.0Gb/s, 1000mV differential, CPO Compliant Test Pattern

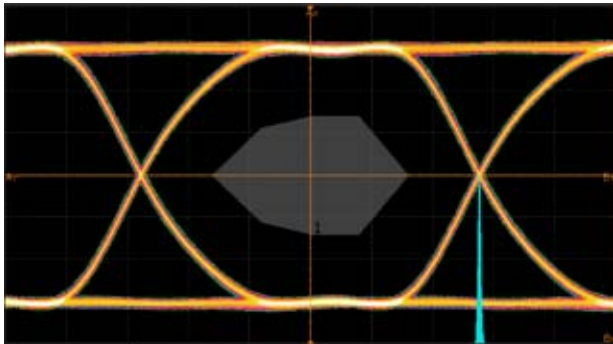


Without SESD Device

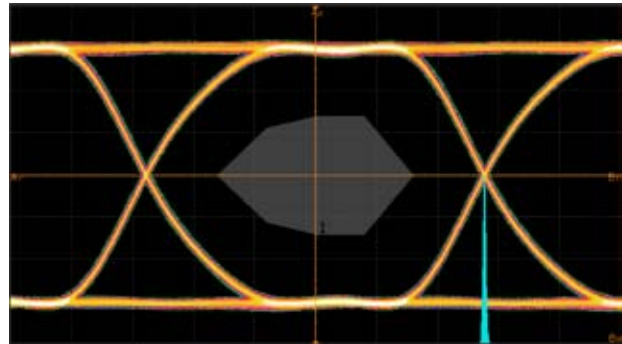


With SESD Device

**DisplayPort Eye Diagrams**  
2.7Gb/s, 800mV differential, PRBS7 Compliant Test Pattern, SSC enabled

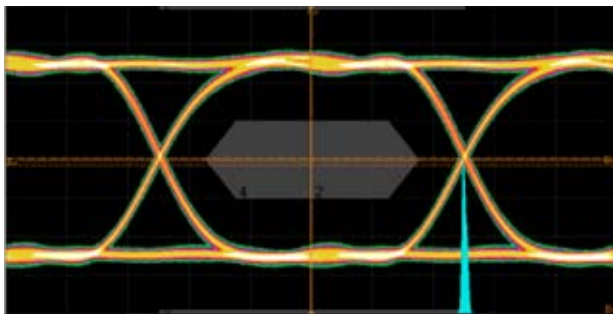


Without SESD Device

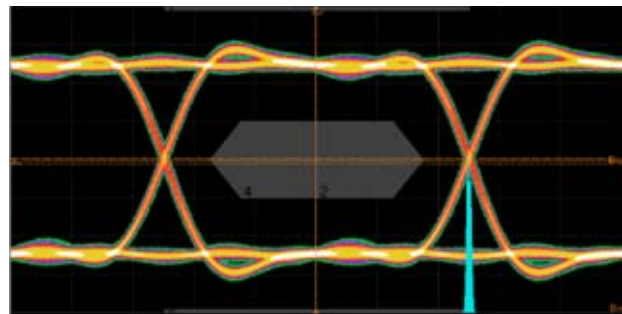


With SESD Device

**HDMI Eye Diagrams**  
3.4Gb/s, 990mV differential, TMDS Data



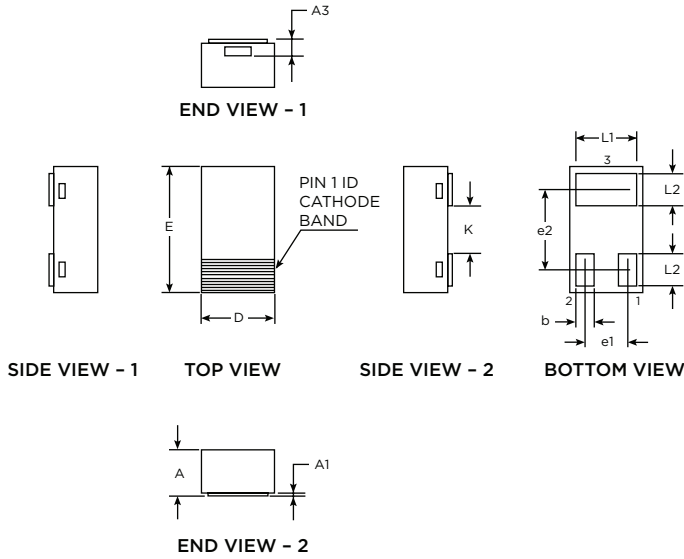
Without SESD Device



With SESD Device

DEVICE DIMENSION

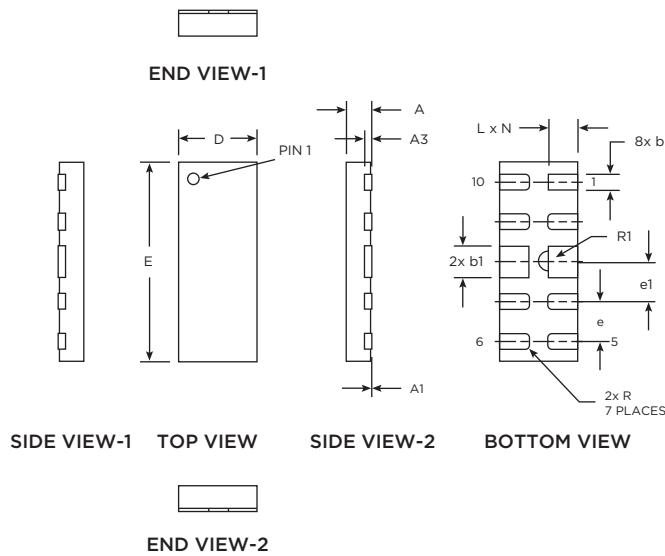
SESD0402Q2UG-0020-090: 2-ch 0402 Size Array



Dim	SESD0402Q2UG-0020-090					
	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.33	0.38	0.43	0.013	0.015	0.0169
A1	0	-	0.05	0	-	0.0020
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
L1	0.45	0.50	0.55	0.018	0.020	0.022
L2	0.20	0.25	0.30	0.008	0.010	0.012
b	0.10	0.15	0.20	0.004	0.006	0.008
e1	0.35 BSC			0.014 BSC		
e2	0.65 BSC			0.026 BSC		

BSC - Basic Spacing between Centers

SESD1004Q4UG-0020-090: 4-ch Flow-Through Standard Array



Dim	SESD1004Q4UG-0020-090					
	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.30	0.31	0.32	0.0118	0.0122	0.0126
A1	0	-	0.05	0	-	0.0020
A3	0.10 ref.			0.004 ref.		
D	0.90	1.00	1.10	0.035	0.039	0.043
E	2.40	2.50	2.60	0.094	0.098	0.102
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.35	0.40	0.45	0.014	0.016	0.018
L	0.30	0.38	0.425	0.012	0.015	0.017
e	0.50 BSC			0.020 BSC		
e1	0.60 BSC			0.024 BSC		
N	10			10		
R	0.075 BSC			0.003 BSC		
R1	0.125 BSC			0.005 BSC		

BSC - Basic Spacing between Centers

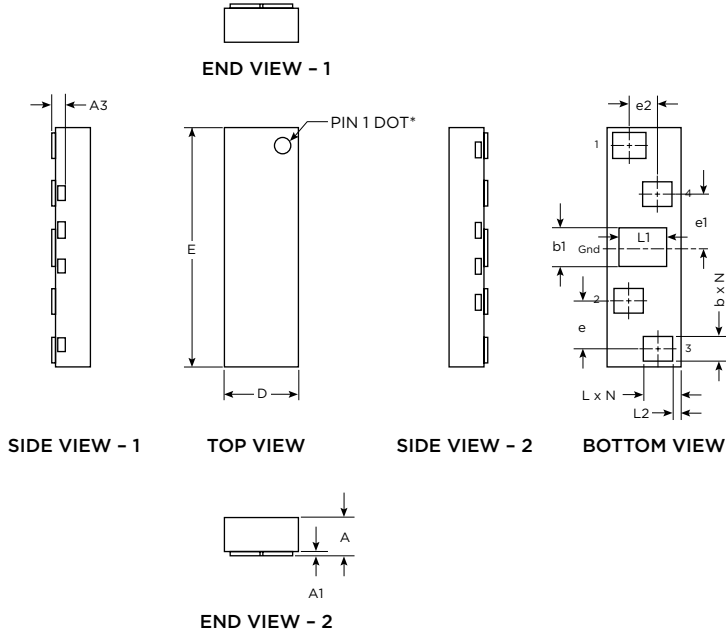
\* Pin 1 dot is laser marked. Radius and location within the pin 1 terminal.



DEVICE DIMENSION

CONT'D

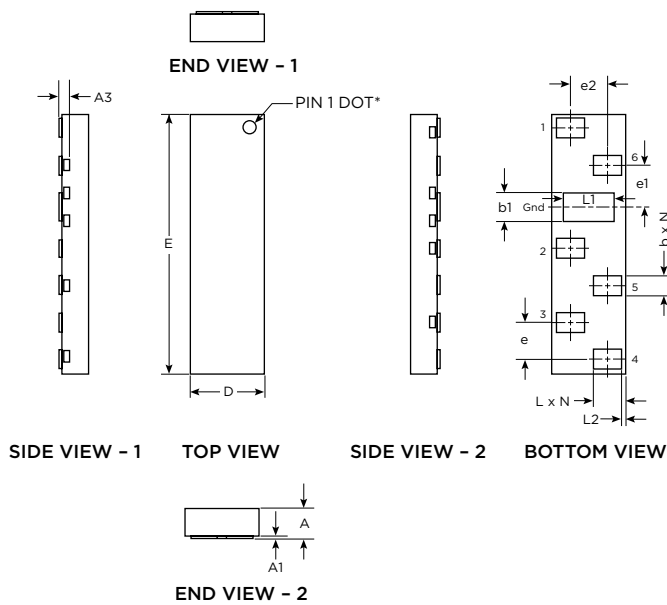
**SESD0802Q4UG-0020-090: 4-ch Flow-Through Miniature Array**



Dim	SESD0802Q4UG-0020-090					
	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.30	0.31	0.32	0.0118	0.0122	0.0126
A1	0	-	0.05	0	-	0.0020
A3	0.10 ref.			0.004 ref.		
D	0.50	0.60	0.70	0.020	0.024	0.028
E	1.90	2.00	2.10	0.075	0.079	0.083
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.25	0.30	0.36	0.010	0.012	0.014
L	0.25	0.30	0.35	0.010	0.012	0.014
L1	0.35	0.40	0.45	0.014	0.016	0.018
L2	0.05 BSC			0.002 BSC		
e	0.40 BSC			0.016 BSC		
e1	0.45 BSC			0.018 BSC		
e2	0.25 BSC			0.010 BSC		
N	4			4		

BSC - Basic Spacing between Centers

**SESD1103Q6UG-0020-090: 6-ch Flow-Through Miniature Array**



Dim	SESD1103Q6UG-0020-090					
	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.30	0.31	0.32	0.0118	0.0122	0.0126
A1	0	-	0.05	0	-	0.0020
A3	0.10 ref.			0.004 ref.		
D	0.70	0.80	0.90	0.027	0.031	0.035
E	2.70	2.80	2.90	0.106	0.110	0.114
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.25	0.30	0.35	0.010	0.012	0.014
L	0.30	0.35	0.40	0.012	0.014	0.016
L1	0.50	0.55	0.60	0.019	0.021	0.023
L2	0.05 BSC			0.002 BSC		
e	0.40 BSC			0.016 BSC		
e1	0.45 BSC			0.018 BSC		
e2	0.40 BSC			0.016 BSC		
N	6			6		

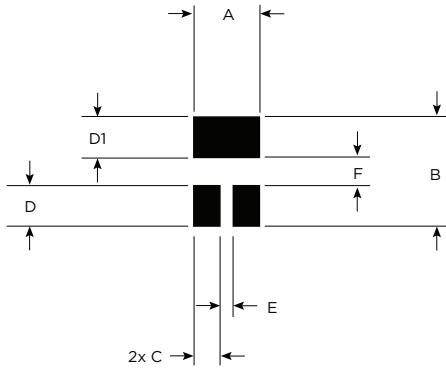
BSC - Basic Spacing between Centers

\* Pin 1 dot is laser marked. Radius and location within the pin 1 terminal.



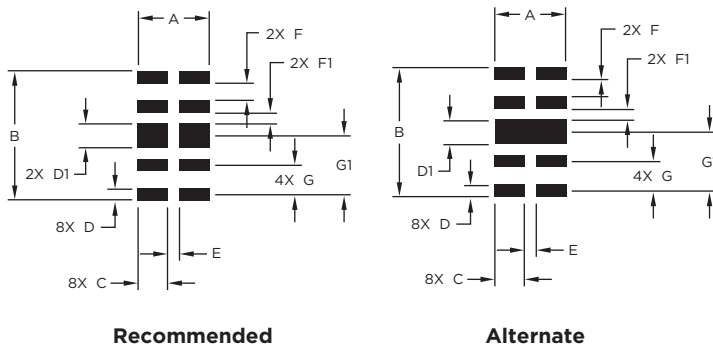
RECOMMENDED LANDING PAD LAYOUT

SESD0402Q2UG-0020-090: 2-ch 0402 Size Array



SESD Landing Pad Layout 3 Pin 2-ch 0402 Size Array		
Symbol	Millimeters	Inches
A	0.60	0.024
B	1.00	0.039
C	0.225	0.009
D	0.35	0.014
D1	0.35	0.014
E	0.15	0.006
F	0.30	0.012

SESD1004Q4UG-0020-090: 4-ch Flow-Through Standard Array



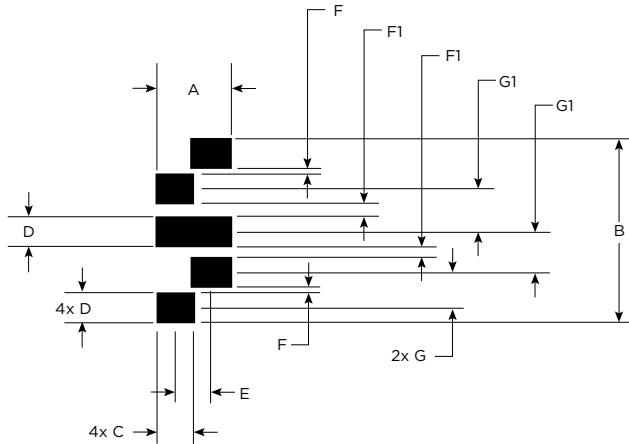
SESD Landing Pad Layout 10 Pin 4-ch Standard FT Array		
Symbol	Millimeters	Inches
A	1.20	0.047
B	2.20	0.087
C	0.50	0.020
D	0.20	0.008
D1	0.40	0.016
E	0.20	0.008
F	0.30	0.012
F1	0.20	0.008
G	0.50 BSC	0.020 BSC
G1	1.00 BSC	0.039 BSC

BSC - Basic Spacing between Centers

RECOMMENDED LANDING PAD LAYOUT

CONT'D

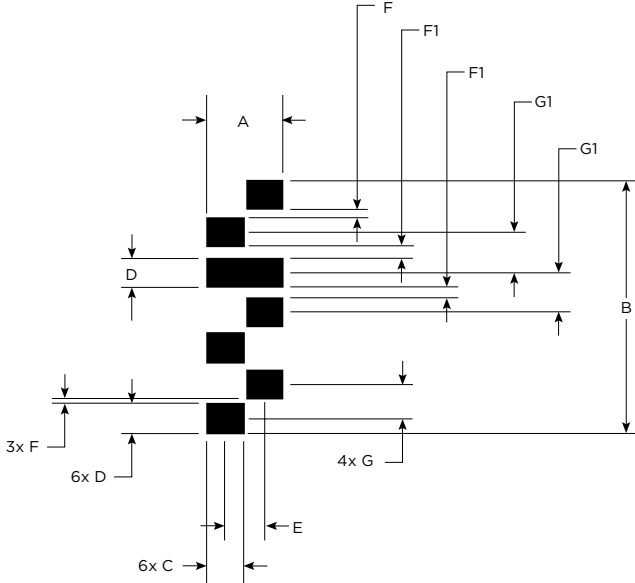
SESD0802Q4UG-0020-090: 4-ch Flow-Through Miniature Array



SESD Landing Pad Layout 5 Pin 4-ch Miniature FT Array		
Symbol	Millimeters	Inches
A	0.60	0.024
B	2.00	0.079
C	0.30	0.012
D	0.30	0.012
E	0.30	0.012
F	0.10	0.004
F1	0.15	0.006
G	0.40 BSC	0.016 BSC
G1	0.45 BSC	0.018 BSC

BSC - Basic Spacing between Centers

SESD1103Q6UG-0020-090: 6-ch Flow-Through Miniature Array



SESD Landing Pad Layout 7 Pin 6-ch Miniature FT Array		
Symbol	Millimeters	Inches
A	0.80	0.031
B	2.80	0.110
C	0.35	0.014
D	0.30	0.012
E	0.45	0.018
F	0.10	0.004
F1	0.15	0.006
G	0.40 BSC	0.016 BSC
G1	0.40 BSC	0.016 BSC

BSC - Basic Spacing between Centers

## FOR MORE INFORMATION

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Menlo Park, CA USA 94025-1164  
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Fax : (650) 361-4600

[www.circuitprotection.com](http://www.circuitprotection.com)  
[www.circuitprotection.com.hk](http://www.circuitprotection.com.hk) (Chinese)  
[www.te.com/japan/bu/circuitprotection/](http://www.te.com/japan/bu/circuitprotection/) (Japanese)

#### Brazil

Tel : 55-11-2103-6090  
Fax: 55-11-2103-6216

#### UK / Eire / Benelux / Israel

**South Africa / Nordic / Baltic / Others**  
Tel : 49-89-6089485  
Fax: 49-89-6089394

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Tel : 81-44-900-5110  
Fax: 81-44-900-5140

#### Korea

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Fax: 82-2-3486-1786

#### Taiwan

Tel : 886-2-8768-2788 x 211  
Fax: 886-2-8768-1277

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Tel : 86-10-6569-3488 x 16526  
Fax: 86-10-6569-3206

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Fax: 86-21-6485-3255

#### China, Shenzhen / Guangzhou

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Fax: 86-755-2598-0419

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Tel : 65-6590-5089  
Fax: 65-6481-9377

#### Thailand / Malaysia / Vietnam

Tel : 6-04-217-8112  
Fax: 6-04-229-8177

#### Australia / Philippines

Tel : 63-2-988-9465  
Fax: 63-2-848-0205

#### India

Tel : 91-80-4161-3745  
Mobile : 91-99-0248-8886

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\*as defined [www.te.com/leadfree](http://www.te.com/leadfree)

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