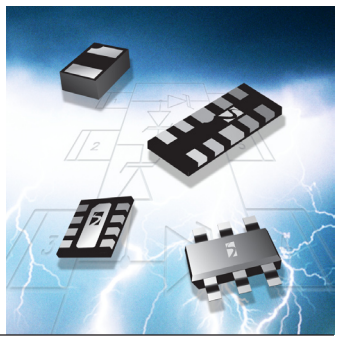
SEMTECH PROTECTION PRODUCTS



Transient Voltage Suppressors (TVS)

Transient voltage protection to meet the industry's toughest requirements

Semtech's protection products are industry-leading, state-of-the-art devices for protecting sensitive circuitry from Electrostatic Discharge (ESD), Electrical Fast Transients (EFT), Lightning, Cable Discharge Events (CDE) and other electricial overstress. They are designed to meet the industry's most rigid immunity standards, including:

- IEC 61000-4-2 (ESD) ±15kV (air)
- IEC 61000-4-2 (ESD) ±8kV (contact)
- IEC 61000-4-4 (EFT) 40A (5/50ns)
- IEC 61000-4-5 (lightning)
- Telcordia GR-1089
- ITU K.20, K.21

Features:

- Sub 5V solutions: 2.5V – 3.3V
- Ultra-low capacitance devices: <1pF
- Extremely low clamping voltage
- ESD protection + EMI/RFI filtering
- Single-line and multi-line protection
- Small package solutions, including Semtech's own leadless package
- High volume manufacturing
- Solid-state silicon-avalanche technology
- RoHS/WEEE Compliant

Typical Applications:

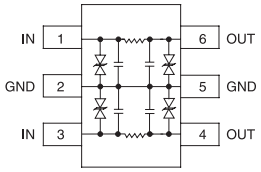
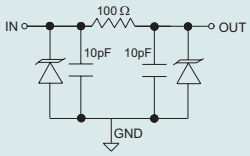
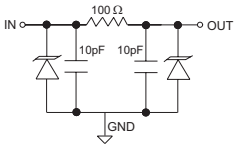
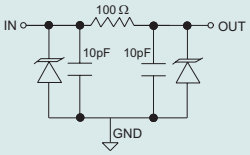
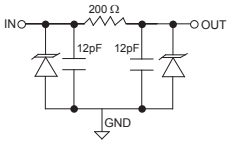
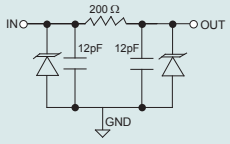
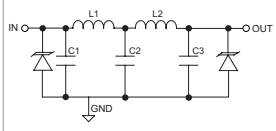
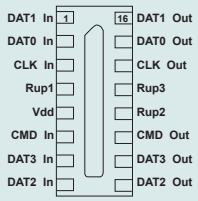
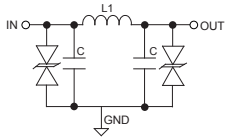
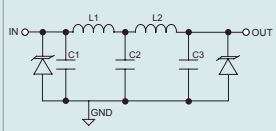
- Portables
- Ethernet
- Set Top Box
- LCDTV/Monitor Interfaces: HDMI / DVI / DisplayPort
- Telecom / Datacom Interfaces
- Servers / Desktop / Notebooks

TVS Application Matrix

PART NUMBER	T1/E1 (Outside Line)	T1/E1 (Inside Line)	T3/E3	xDSL	ISDN S/T/U	SLIC	IEEE 1394 Firewire	10/100/1000 Ethernet	Serial/Parallel Ports	LVDS	USB 1.1/2.0/OTG	Multimedia Memory Port	Audio	Color LCD Display	Battery Contacts	Power Line	Keypad	Accessory Connector Kit	HDMI	DisplayPort	DVI	Analog Video
EMI Clamp® - ESD + EMI Protection Devices																						
EClamp1002A													•					•				
EClamp2357N												•		•								
EClamp2374K														•				•				
EClamp2376K														•				•				
EClamp2378K														•				•				
EClamp2374P														•				•				
EClamp2376P														•				•				
EClamp2378P														•				•				
EClamp2384K														•				•				
EClamp2386K														•				•				
EClamp2388K														•				•				
EClamp2384P														•				•				
EClamp2386P														•				•				
EClamp2388P														•				•				
EClamp2394P														•				•				
EClamp2396P														•				•				
EClamp2398P														•				•				
EClamp2410P												•										
EClamp2422N													•									
EClamp2454P														•				•				
EClamp2456P														•				•				
EClamp2458P														•				•				
EClamp2455K												•										
EClamp2455P												•										
EClamp2522P											•											
EClamp3202A													•					•				
STF203-15											•							•				
STF203-22											•							•				
STF203-33											•							•				
TransClamp® - High-Power Surge TVS																						
TClamp0602N		•	•	•	•			•														
TClamp2502N								•														•
TClamp3302N				•	•			•														•
LC01-6	•																					
LC03-3.3			•		•			•														
LC03-6		•	•	•	•			•														
LC04-6		•	•	•																		
LC05-6		•																				
RailClamp® - Low Capacitance TVS																						
RClamp0502A							•	•		•	•											•
RClamp0502B							•	•		•	•	•		•							•	•
RClamp0502N									•		•	•										•
RClamp0504F							•	•		•	•	•									•	•
RClamp0504N		•	•	•	•		•	•	•	•	•	•									•	•
RClamp0504P							•	•		•	•	•					•				•	•
RClamp0504S							•	•		•	•										•	•
RClamp0524J*										•				•					•	•	•	•
RClamp0524S*								•		•									•	•	•	•
RClamp0821P										•	•	•									•	•

PART NUMBER	T1/E1 (Outside Line)	T1/E1 (Inside Line)	T3/E3	xDSL	ISDN S/T/U	SLIC	IEEE 1394 Firewire	10/100/1000 Ethernet	Serial/Parallel Ports	LVDS	USB 1.1/2.0/OTG	Multimedia Memory Port	Audio	Color LCD Display	Battery Contacts	Power Line	Keypad	Accessory Connector Kit	HDMI	DisplayPort	DVI	Analog Video
RailClamp® - Low Capacitance TVS																						
RClamp0854P*											•											
RClamp1502B							•			•	•											
RClamp1521P										•	•	•									•	•
RClamp1654P*											•											
RClamp2402B							•			•	•											
RClamp2502L*			•		•			•														
RClamp2504N					•			•		•		•										•
RClamp2504P								•		•		•										•
RClamp3304N	•	•	•		•			•		•	•	•									•	•
RClamp3304P								•		•		•										•
RClamp3654P											•											
RClamp7002M				•		•																
SR05				•					•		•										•	•
SR12				•																		
SR2.8							•															•
SR3.3											•											•
SR70	•	•		•	•	•																•
SRDA05-4	•	•									•											•
SRDA12-4				•																		
SRDA3.3-4	•	•			•						•											•
MicroClamp® - TVS Arrays																						
µClamp0501H									•						•	•	•	•				
µClamp0501P									•						•	•	•	•				
µClamp0502P													•		•		•	•				
µClamp0501T									•						•	•	•	•				
µClamp0502T									•						•	•	•	•				
µClamp0504T*															•	•	•	•				
µClamp0505T*															•	•	•	•				
µClamp0506T*															•	•	•	•				
µClamp0508T									•				•				•	•				
µClamp0504A									•								•	•				
µClamp0505A									•				•				•	•				
µClamp0511P															•		•	•				
µClamp0511T*											•			•	•	•	•	•				
µClamp0524P									•								•	•				
µClamp1201H									•						•	•	•	•				
µClamp1201P									•						•	•	•	•				
µClamp1211P															•		•	•				
µClamp2401T									•						•	•	•	•				
µClamp3301P									•						•	•	•	•				
µClamp3304A									•								•	•				
µClamp3305P									•						•		•	•				
µClamp3306P									•						•		•	•				
µClamp3311P															•		•	•				
µClamp3324P									•								•	•				
LCDA12C-1				•					•													
LCDA15C-1				•					•													
LCDA24C-1				•					•													
SLVU2.8-4								•														
SLVU2.8-8								•														

* New products added since last printing.

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C (pF) @ V_R = 0V	C (pF) @ V_R = 2.5V	R (ohm)	L (nH)	C MAX (pF) L-G @ V_R = 0V	I_R MAX (µA) @ V_{RWM}	PACKAGE
EClamp1002A EClamp3202A	2 line ESD/EMI protection for speaker ports (EClamp1002A) and microphone ports (EClamp3202A)		5	6	–	–	10 32	–	160	5	SC-89
EClamp2357N	EMI Filter and ESD protection for Secure Digital Card Interfaces		5	6	10	–	100	–	22	–	QFN
EClamp2374K EClamp2376K EClamp2378K	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces		5	6	10	–	100	–	24		SLP1713P8 SLP2513P12 SLP3313P16
EClamp2374P EClamp2376P EClamp2378P	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces		5	6	10	–	100	–	20	–	SLP2116P8 SLP3016P12 SLP4016P16
EClamp2384K EClamp2386K EClamp2388K	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces, 400µm lead pitch		5	6	–	12	200	–	–	–	SLP1713P8 SLP2513P12 SLP3313P16
EClamp2384P EClamp2386P EClamp2388P	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces		5	6	–	12	200	–	–	–	SLP2116P8 SLP3016P12 SLP4016P16
EClamp2394P EClamp2396P EClamp2398P	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces		5	6	–	12	–	19	–	–	SLP2116P8 SLP3016P12 SLP4016P16
EClamp2410P	ESD protection for T-Flash/MicroSD Interfaces		5	6	–	12	45	–	–	–	SLP4016P16
EClamp2422N	2 line ESD/EMI protection for Audio Interfaces		5	6	100	–	–	2	–	–	SLP1510N6
EClamp2454P EClamp2456P EClamp2458P	4, 6, 8 line ESD/EMI protection for Color LCD Interfaces		5	6	–	12	–	28	–	–	SLP2116P8 SLP3016P12 SLP4016P16

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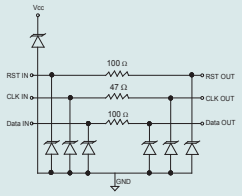
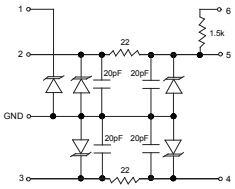
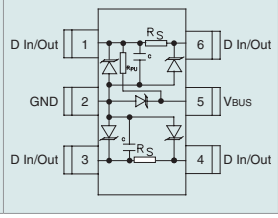
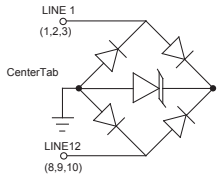
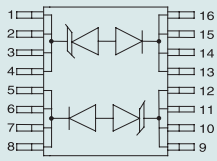
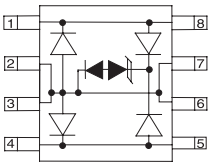
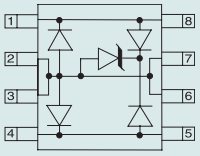
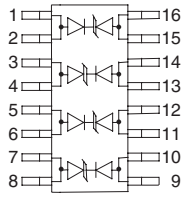
EMIClamp® – ESD + EMI Protection Devices

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C (pF) @ V_R = 0V	C (pF) @ V_R = 2.5V	R (ohm)	L (nH)	C MAX (pF) L-G @ V_R = 0V	I_R MAX (µA) @ V_{RWM}	PACKAGE
EClamp2455K **EClamp2455P**	4 line ESD/EMI protection for SIM Cards, ('K'=400µm lead pitch) ('P'=500µm lead pitch)		5	6	20	–	100, 47	–	24	0.5	SLP1713P8 SLP2116P8
EClamp2522P	USB upstream port filter & TVS for EMI filtering and ESD protection		5.5	6	20	–	22	–	45	1	SLP1616P6
STF203-15 **STF203-22** **STF203-33**	USB upstream port filter & TVS for EMI filtering and ESD protection		5.25	6	47	–	15 22 33	–	–	5	SC-70 6L

TransClamp® – High-Power Surge TVS

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C_J MAX (pF) L-L@ V_R = 0V	PEAK POWER (W) (8/20µs)	PEAK POWER (W) (10/1000µs)	I_{PP} @ (10/1000µs)	I_{PP} (A) @ (8/20µs)	I_R MAX (µA) @ V_{RWM}	PACKAGE
TClamp0602N **TClamp2502N** **TClamp3302N**	2 line, Low Cap TVS for Ethernet and Telecom Interfaces		6 2.5 3.3	6.8 – –	12	2500 – –	–	–	95	5 0.5 1	SLP2626P10
LC01-6	Low Cap TVS for high-speed telecommunication systems		6	8	–	–	1500	100	–	25	SO-16W
LC03-3.3	2 line, Low Cap 3.3V TVS for high-speed interfaces		3.3	–	12	1800	–	–	100	1	SO-8
LC03-6	2 line, Low Cap TVS for high-speed data interfaces		6	6.8	12	2000	–	–	100	25	SO-8
LC04-6 **LC05-6**	Dual Low Cap TVS Array for telecom linecard applications, protects 2 tip & ring line pairs		6	6.8	15	– 2000	1000 –	70 –	200 100	15	SO-16

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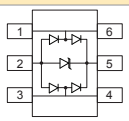
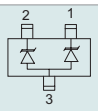
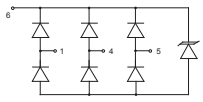
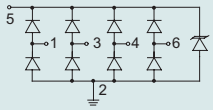
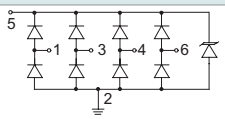
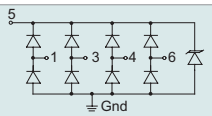
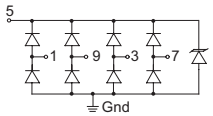
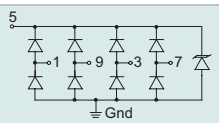
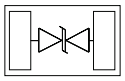
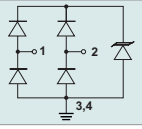
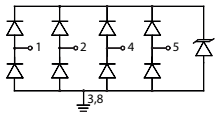
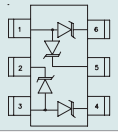
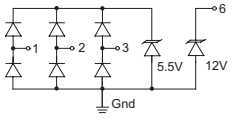
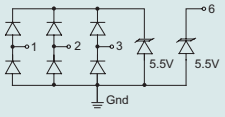
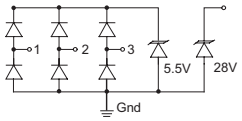
PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C_J MAX (pF) L-L @ V_R = 0V	PEAK POWER (W) (8/20µs)	I_{PP} (A) @ (8/20µs)	I_R MAX (µA) @ V_{RWM}	PACKAGE
RClamp0502A	2 line, Ultra-Low Cap TVS Array		5	6	0.7	50	3	1	SC-89
RClamp0502B RClamp1502B RClamp2402B	2 line protection, Ultra-Low Cap TVS for ESD/CDE protection		5 15 24	6 16.7 26.7	0.9	125 200 200	5 5 4	1	SC-75
RClamp0502N	2 data, 1 power line protection, Ultra-Low Cap TVS Array		6.5	7	0.5	100	3	1	SLP1210N6
RClamp0504F RClamp0504S	4 line protection, Low Cap TVS Array		5	6	1.5	150	6	3	SC-70 6L SOT-23 6L
RClamp0504N	4 line protection, Low Cap TVS Diode Array		5	6	5+	300	12	5	SLP2020P6
RClamp0504P	4 line protection, Low Cap TVS Array		5	6	1	150	6	3	SLP1616P6
RClamp2504N RClamp3304N	4 line protection, Low Cap TVS Array for Ethernet and Telecom Interfaces		2.5 3.3	–	5+	450	25	5	SLP2626P10
RClamp2504P RClamp3304P	4 line Ultra-Low Cap TVS Array		2.5 3.3	–	0.8+	80	5	0.5	SLP1616P6
RClamp0521P RClamp0821P RClamp1521P	Ultra-low Cap, 1 line ESD protection		5 8 15	6 10 16.7	0.5	100 100 120	4	1	SLP1006P2
RClamp0522P	Protect 2 lines for High speed applications		5	6	0.4	150	5	1	SLP1610P4
RClamp0524P RClamp0524J*	Protect 4 lines for High speed applications		5	6	0.4	150	5	1	SLP2510P8 SLP2710P8
RClamp0524S*	4 line protection, low cap TVS for Ethernet Interfaces		5	6	5+	150	6	1	SOT-23 6L
RClamp1654P*	3 data line protection and 1 power line for USB charger and USB OTG		5.5	6.5	0.5	100	3	1	SLP1616P6
RClamp0854P*	3 data line protection and 1 power line for USB charger and USB OTG		5.5	6.5	0.5	100	3	1	SLP1616P6
RClamp3654P	3 data line protection and 1 power line for USB charger and USB OTG		5.5	6.5	0.5	100	3	1	SLP1616P6

+ Line-to-ground capacitance (max) value

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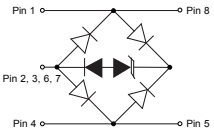
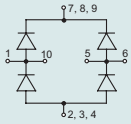
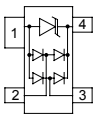
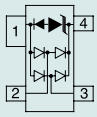
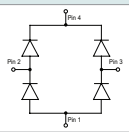
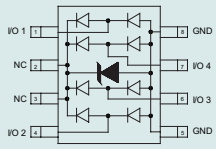
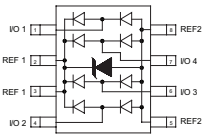
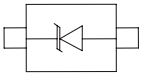
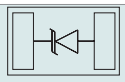
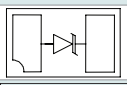
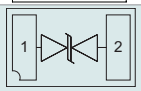
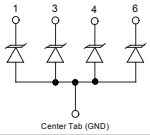
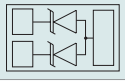
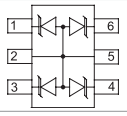
RailClamp® – Low Capacitance TVS

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C_J MAX (pF) L-L @ V_R = 0V	PEAK POWER (W) (8/20µs)	I_{PP} (A) @ (8/20µs)	I_R MAX (µA) @ V_{RWM}	PACKAGE
RClamp2502L*	2,5V, Flow-through TVS for Gigabit and Fast Ethernet Protection		2.5	-	5	800	40	1	SO-8
RClamp7002M	2 high speed line protection, Low Cap TVS Diode Array for ADSL application		70	85	10+	1000	70	5	MSOP-10
SR05 **SR12**	2 line, Low Cap TVS Diode Array		5 12	6 13.3	10+	500 500	25 16	5 1	SOT-143
SR2.8 **SR3.3**	2 line, Low Cap TVS Diode Array		2.8 3.3	–	10+	200 150	14 10	1 1	SOT-143
SR70	2 line, Low Cap TVS Diode Array		70	85	10+	–	24	5	SOT-143
SRDA3.3-4	4 line, Low Capacitance TVS Diode Array		3.3	-	15+	500	25	1	SO-8
SRDA-5-4 **SRDA12-4**	4 line, Low Capacitance TVS Diode Array		5 12	6 13.3	15+	500	25 20	10 1	SO-8

MicroClamp® - TVS Arrays

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C_J MAX (pF) L-G @ V_R = 0V	PEAK POWER (W) (8/20µs)	I_{PP} (A) @ (8/20µs)	I_R MAX (µA) @ V_{RWM}	PACKAGE
µClamp0501H **µClamp1201H**	1 line ESD protection		5 12	6 13.3	160 60	240 200	16 8	5 1	SOD-523
µClamp0501P **µClamp1201P**	1 line ESD protection		5 12	6 13.3	160 60	200	16 8	5 1	SLP1006P2
µClamp0501T **µClamp2401T**	1 line ESD protection		5 24	6 27	10 50	25 150	2 3	0.25	SLP1006P2T
µClamp0511T*	1 line ESD protection		5	6	7	-	2	0.05 (V_R=3.3V)	SLP1006P2T
µClamp0504T* **µClamp0505T*** **µClamp0506T***	4, 5, 6 line ESD protection		5	6	10	25	2	0.25	SLP1313P6T
µClamp0502P **µClamp0502T**	2 line ESD protection		5	6	10	25	2	0.25	SLP1006P3 SLP1006P3T
µClamp0504A **µClamp3304A**	4 line ESD protection array		5 3.3	6 –	75 30	100 40	7 5	1 0.5	SC-89

+ Line-to-ground capacitance (max) value

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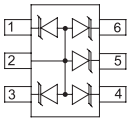
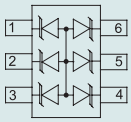
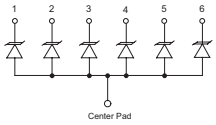
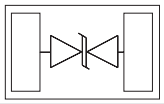
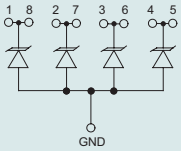
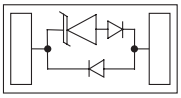
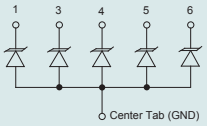
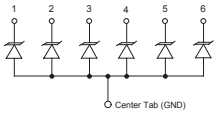
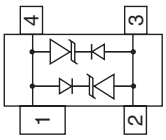
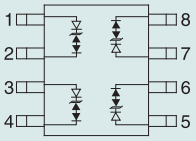
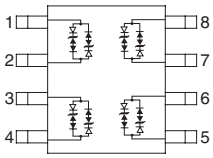
MicroClamp® – TVS Arrays (Continued)

PART NUMBER	DESCRIPTION	DEVICE SCHEMATIC	V_{RWM} MAX (V)	V_{BR} MIN (V)	C_J MAX (pF) L-G @ V_R = 0V	PEAK POWER (W) (8/20µs)	I_{PP} (A) @ (8/20µs)	I_R MAX (µA) @ V_{RWM}	PACKAGE
µClamp0505A	5 line ESD protection array		5	6	75	100	7	1	SC-89
µClamp0506A	5 line ESD protection array		5	6	40	100	7	1	SC-89
µClamp0506P	6 line ESD protection array		5	6	75	100	7	1	SLP1616P6
µClamp0508T*	8 line ESD protection		5	6	10	25	2	0.25	SLP1713P8T
µClamp0511P **µClamp1211P** **µClamp3311P**	1 line ESD protection		5 12 3.3	6 13.3 –	75 25 15	170 200 90	12 7 5	1 1 0.5	SLP1006P2
µClamp0524P **µClamp3324P**	4 line, low voltage TVS for ESD protection		5 3.3	6 –	160 30	240 40	16 5	5 0.5	SLP2116P8
µClamp3301P	1 line, low voltage ESD/CDE protection		3.3	–	30	40	5	0.5	SLP1006P2
µClamp3305P	5 line, 3.3V TVS		3.3	–	25	40	5	0.5	SLP1616P6
µClamp3306P	6 line, 3.3V TVS		3.3	–	25	40	5	0.5	SLP1616P6

LCDA/SLVU Families - TVS Arrays

LCDA12C-1 **LCDA15C-1** **LCDA24C-1**	1 line, Low Cap TVS Diode Array		12 15 24	13.3 16.7 26.7	15 15 10	500	–	5 5 1	SOT-143
SLVU2.8-4	4 line, EPD TVS Diode Array for ESD and latch-up protection		2.8	–	–	400	24	1	SO-8
SLVU2.8-8	8 line EPD TVS Diode Array for ESD and latch-up protection		2.8	–	–	600	30	1	SO-8

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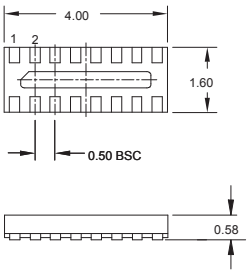
TVS Package Diagrams

SLP4016P16



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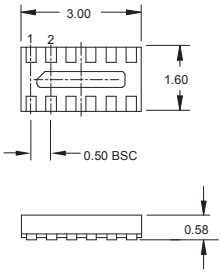

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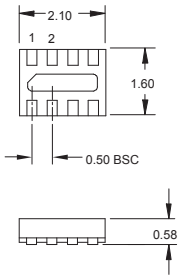

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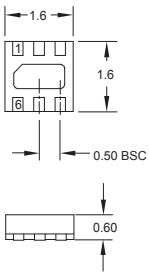

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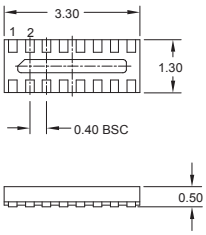

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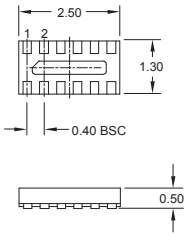

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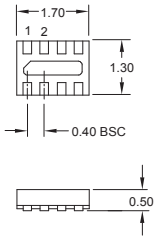

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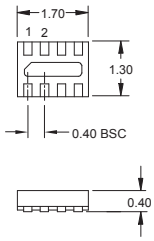

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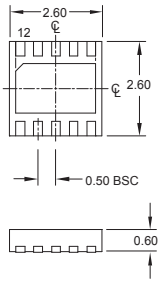

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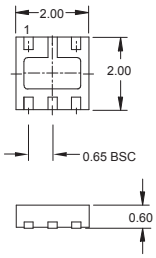

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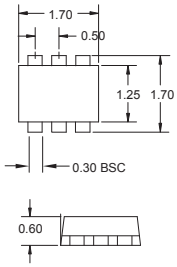

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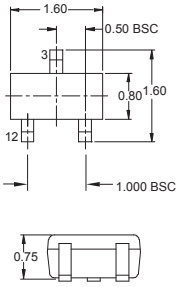

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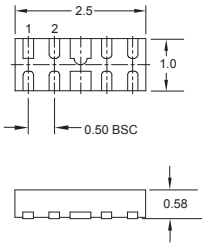

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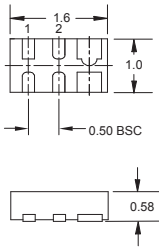

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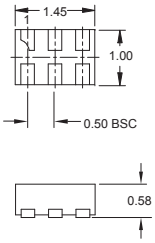

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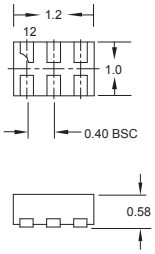

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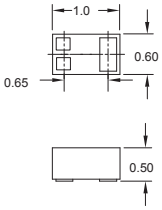

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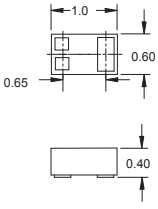

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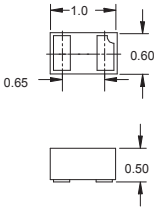

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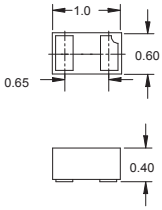

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