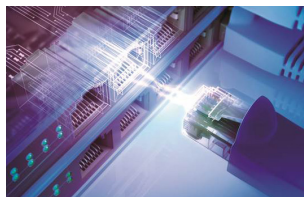




protection



Transient Voltage Suppressor Solutions

# TVS Protection Selector Guide

Industry leading circuit protection solutions to safeguard data interfaces from ESD and surge transients


# TVS Application Matrix

Semtech's protection products are industry-leading, advanced solutions for protecting sensitive circuitry from Electrostatic Discharge (ESD), Electrical Fast Transients (EFT), Lightning, Cable Discharge Events (CDE) and other electrical overstress. These solutions meet the industry's most rigid immunity standards, including:

- IEC 61000-4-2 (ESD)
- IEC 61000-4-4 (EFT)
- 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: <0.5pF
- Extremely low clamping voltage


 = AEC-Q100 qualified

- 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

### APPLICATIONS

- Portable electronics
- Ethernet
- Set Top Box
- HDTV/Monitor interfaces
- Telecom/Datacom interfaces
- Servers/Desktop
- Notebooks/Tablets
- Automotive interfaces (AEC-Q100 qualified)
- Wearables





Part Number	T-Carrier	xDSL	Antenna	Automotive (AEC-Q100)	10/100/1000 Ethernet	Proximity Sensor	Serial/Parallel Ports	LVDS	USB1.1/2.0/3.0/OTG	Multimedia Memory Port	Audio	Color LCD Display	Battery Contacts	Power Line	Keypad	Accessory Connector Kit	HDMI/DisplayPort	Analog Video
<b>EMI Clamp® - ESD + EMI Protection Devices</b>																		
 EClamp2357NQ				■						■								
EClamp2374K																		
EClamp2376K													■					
EClamp2378K																■		
EClamp2384K																		
EClamp2386K													■					
EClamp2388K																		
EClamp2394P																		
EClamp2396P																		
EClamp2398P																		
EClamp2410P																		
EClamp2422N																		
EClamp2454P																		
EClamp2456P																		
EClamp2458P																		
EClamp2455K																		
EClamp2455P																		
EClamp2465T																		

Part Number	T-Carrier	xDSL	Antenna	Automotive (AEC-Q100)	10/100/1000 Ethernet	Proximity Sensor	Serial/Parallel Ports	LVDS	USB1.1/2.0/3.0/OTG	Multimedia Memory Port	Audio	Color LCD Display	Battery Contacts	Power Line	Keypad	Accessory Connector Kit	HDMI/DisplayPort	Analog Video
EClamp2515K																		
EClamp2522P																		
 EClamp2374KQ				■														
STF203-15																		
STF203-22																		
STF203-33																		


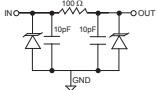
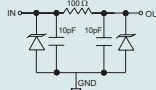
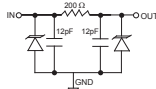
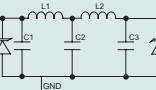

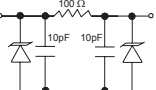
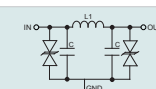
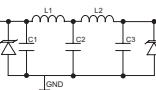

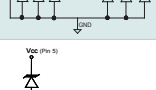
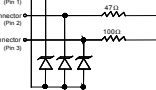
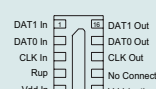

### TransClamp® - High-Power Surge TVS

TClamp0602N	■	■																
TClamp1202P																		
TClamp1272S			■															
TClamp2472S			■															
TClamp2482S			■															
TClamp2502N																		■
TClamp2512N																		
TClamp3302N																		■
TClamp3312N																		
LC01-6	■																	
LC03-3.3	■																	
LC03-6	■	■																
LC04-6	■	■																
LC05-6	■																	
LC04-12	■	■																

### RailClamp® - Low capacitance TVS

RClamp0502A																		
 RClamp0582BQ																		
RClamp0582N																		
RClamp0504FA																		
RClamp0504N	■	■																
RClamp0504PA																		
RClamp0506T																		
 RClamp0512TQ																		
RClamp0521PA																		
RClamp0521Z																		
RClamp0524PA																		
 RClamp0524PQ																		
 RClamp0531TQ																		
RClamp0531Z																		
RClamp0532T																		
RClamp0534N																		
RClamp0542T																		
RClamp0544T																		
RClamp0551P																		
RClamp0552T																		
RClamp0554S	■																	






EMIClamp® – ESD + EMI Protection Devices											
Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C (pF) @ V <sub>R</sub> = 0V	C (pF) @ V <sub>R</sub> = 2.5V	R (ohm)	L (nH)	C Max (pF) L-G @ V <sub>R</sub> = 0V	I <sub>R</sub> Max (μA) @ V <sub>RWM</sub>	Package
 EClamp2357NQ	6-line ESD/EMI protection for secure digital card interfaces		5	6	10	-	100	-	22	0.5	16 Pin QFN
EClamp2374K EClamp2376K EClamp2378K	4, 6, 8-line ESD/EMI protection for color LCD interfaces		5	6	10	-	100	-	24	-	SLP1713P8 SLP2513P12 SLP3313P16
EClamp2384K EClamp2386K EClamp2388K	4, 6, 8-line ESD/EMI protection for color LCD interfaces, 400μm lead pitch		5	6	-	12	200	-	-	-	SLP1713P8 SLP2513P12 SLP3313P16
EClamp2394P EClamp2396P EClamp2398P	4, 6, 8-line ESD/EMI protection for Color LCD Interfaces		5	6	-	12	-	19	-	-	SLP2116P8 SLP3016P12 SLP4016P16
 EClamp2374KQ	4-line ESD/EMI TVS for color LCD display		5V	6V	20pF	-	100Ω	n/a	24pF	0.50μA	SLP1713P
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
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
EClamp2465T	4-line ESD/EMI protection for SIM card		5	6	10	-	100, 47	-	12	0.5	SLP1713P8T
EClamp2515K	ESD protection for T-Flash/MicroSD interfaces		5	6	22	-	45	-	-	-	SLP3313P16
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 <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>J</sub> Max (pF) L-L@ V <sub>R</sub> = 0V	Peak Power (W) (8/20µs)	Peak Power (W) (10/1000µs)	I <sub>PP</sub> (A) @ (10/1000µs)	I <sub>PP</sub> (A) @ (8/20µs)	I <sub>R</sub> Max (µA) @ V <sub>RWM</sub>	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
TClamp1202P	Low cap TVS for RS-485 interfaces		12	13.3	12	–	300	12	100	0.1	SLP2020P5
TClamp1272S	Low cap TVS for xDSL interfaces		12	13.5	5	600	–	–	20	0.1	SOT-23 6L
TClamp2512N TClamp3312N	2-line, low cap TVS for Ethernet & telecom interfaces		2.5V 3.3V	2.7V 3.5V	8	–	–	–	120	0.1	SLP2626P10
TClamp2472S	Low cap TVS for xDSL interfaces		24	27	2	–	–	–	–	0.1	SOT-23 6L
TClamp2482S	Low cap TVS for xDSL interfaces		24	27	2	150	–	–	20	0.1	SOT-23 6L
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
LC04-12	Dual, low cap TVS array for telecom linecard applications, protects 2 tip & ring line pairs		12	13.3	15	600	600	25	100	2	SO-16

RailClamp® – Low Capacitance TVS									
Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>i</sub> Max (pF) L-L @ V <sub>r</sub> = 0V	Peak Power (W) (8/20µs)	I <sub>pp</sub> (A) @ (8/20µs)	I <sub>r</sub> Max (µA) @ V <sub>RWM</sub>	Package
RClamp0502A	2-line, ultra-low cap TVS Array		5	6	0.7	50	3	1	SC-89
RClamp0502BA 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
RClamp2451ZA	24V, 1-Line ESD protection		24	25.5	0.45	60	3	0.05	SLP0603P2X3
RClamp0504FA RClamp0504S RClamp0504N	4-line protection, low cap TVS Array		5	6	1.5 1.5 5*	150 150 300	6 6 12	3 3 5	SC-70 6L SOT-23 6L SLP2020P6
RClamp0504PA	4-line protection, low cap TVS array		5	6	1	150	6	3	SLP1616P6
RClamp0506T	6-line protection, ultra-low cap TVS for high speed applications		5	6.5	0.4	75	5	0.1	SLP3313P6T
RClamp0512TQ	5V, 2-line surge and ESD protection for high speed applications		5	6.5	2	-	-	0.1	SLP1006N3T
RClamp0521PA RClamp0821P RClamp1521P	Ultra-low cap, 1-line ESD protection		5 8 15	6 10 16.7	0.5	100 100 120	4	1	SLP1006P2
RClamp0521Z	Ultra small, 1-line ESD protection		5	6	0.5	100	4	0.1	SLP0603P2X3A
RClamp3552T	2-line, low voltage, ESD protection		3.5	-	0.4	60	4	0.3	SLP0603P2X3
RClamp0522P	Protect 2 lines for high speed applications		5	6	0.4	150	5	1	SLP1610P4
RClamp0524PA RClamp0524PQ	Protect 4 lines for high speed applications		5	6 6.5	0.4	150 75	5	1 0.1	SLP2510P8
RClamp0531TQ	1-line protection, ultra-low cap TVS for automotive applications		5	6	0.8	80	4	0.1	SLP1006P2T
RClamp0531Z	Ultra small, 1-Line ESD protection		5	7	0.4	60	3	0.02	SLP0603P2X3

**RailClamp® – Low Capacitance TVS (Continued)**

Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>i</sub> Max (pF) L-L @ V <sub>r</sub> = 0V	Peak Power (W) (8/20μs)	I <sub>PP</sub> (A) @ (8/20μs)	I <sub>r</sub> Max (μA) @ V <sub>RWM</sub>	Package
RClamp0534N	4-line protection, low cap TVS for high speed applications		5	6	3	500	25	0.5	SLP3020N10
RClamp0542T	Protect 2 lines for high speed applications		5	6.5	0.4	75	5	0.05	SLP1610P4T
RClamp0544T	Protect 4 lines for high speed applications		5	6.5	0.4	75	5	0.1	SLP2010P8T
RClamp0551P	Ultra-low cap, 1-line ESD protection		5	6	0.5	60	3	0.1	SLP1006P2
RClamp0552T	Ultra-low cap, 2-line ESD protection		5	6.5	0.4	60	3	0.02	SLP1006N3T
RClamp0561Z	Ultra-low capacitance, 1-Line ESD protection		5	6.5	0.15	–	–	50	SGP0603P2X3
RClamp0564P	4-line, low-capacitance protection for high-speed interfaces		5	6.5	0.20	–	3	50	SGP2010N5
RClamp7534P	4-line, low-capacitance protection for high-speed interfaces		5	6.5	0.22	–	4	100	SGP2010N5
 RClamp0554S	4 line protection, low cap TVS for high surge applications		5	6	5*	375	25	0.5	SOT-23 6L
RClamp0582B	2-line protection, ultra-low cap TVS for High Speed Applications		5	6	0.8	300	15	0.1	SC-75
 RClamp0582BQ	2 line protection, ultra-low cap TVS for automotive applications		5	6	0.8	300	15	0.1	SC-75
RClamp0582N	2 data, 1 power line protection, ultra-low cap TVS for automotive applications		6.5	7	0.5	125	5	0.1	SLP1210N6
 RClamp0584J	4-line protection, ultra-low cap for high speed applications		5	6.5	0.4	75	5	0.1	SLP2710P8

**RailClamp® – Low Capacitance TVS (Continued)**

Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>i</sub> Max (pF) L-L @ V <sub>r</sub> = 0V	Peak Power (W) (8/20µs)	I <sub>PP</sub> (A) @ (8/20µs)	I <sub>r</sub> Max (µA) @ V <sub>RWM</sub>	Package
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
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
RClamp2502L	2.5V, flow-through TVS for gigabit and fast Ethernet protection		2.5	-	5	800	40	1	SO-8
RClamp2504N RClamp3304NA	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
 RClamp2574NQ RClamp3374N	4-line protection, high power TVS for Ethernet interfaces		2.5 3.3	-	5*	1000	40	0.5	SLP3020N10
RClamp3321P	3.3V, 1-line ESD protection		3.3	5.5	0.35	25	3	0.05	SLP1006P2
RClamp3324P	3.3V, 4-line surge and ESD protection		3.3	-	0.4	-	4.5	0.05	SGP2510P8
RClamp3328P	3.3V, 8-line surge and ESD protection		3.3	-	0.4	75	5	0.1	SGP3810N9
RClamp3331ZA	3.3V, 1-line ESD protection		3.3	5.5	0.45	30	4	0.05	SLP0603P2X3
RClamp3346P	3.3V, 6-line ESD protection for high speed applications		3.3	-	0.4	-	4.5	0.05	SGP2708N7




**RailClamp® – Low Capacitance TVS (Continued)**

Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>J</sub> Max (pF) L-L @ V <sub>R</sub> = 0V	Peak Power (W) (8/20μs)	I <sub>PP</sub> (A) @ (8/20μs)	I <sub>R</sub> Max (μA) @ V <sub>RWM</sub>	Package
RClamp3324T	3.3V, flow-through TVS for USB 3.0 interfaces		3.3	–	0.4	75	5	0.1	SLP1710P4T
RClamp3354S	4-line, 3.3V TVS for GbE interfaces		3.3	–	5*	400	25	0.5	SOT-23
RClamp3654PA	3 data line protection and 1 power line for USB charger and USB OTG		5.5	6.5	0.5	100	3	1	SLP1616P6
RClamp7522T	2-line protection, ultra-low cap TVS for high speed applications		5	6.5	0.4	100	4	0.1	SLP1007N5T
RClamp7524T	4-line protection, ultra-low cap TVS for high speed applications		5	6.5	0.4	75	5	0.1	SLP1308N5T
RClamp7528T RClamp7538P	8-line protection, ultra-low cap TVS for high speed applications		5	6.5	0.4	75	5	0.1	SLP2611N9T SLP3810N9
SR05 SR12	2-line, low cap TVS diode array		5 12	6 13.3	10*	500 550	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

**RailClamp® – Low Capacitance TVS (Continued)**

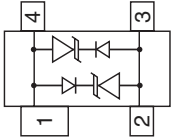
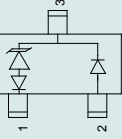
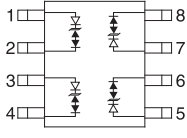
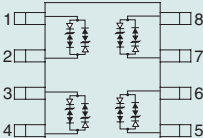
Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>J</sub> Max (pF) L-L @ V <sub>R</sub> = 0V	Peak Power (W) (8/20μs)	I <sub>PP</sub> (A) @ (8/20μs)	I <sub>R</sub> Max (μA) @ V <sub>RWM</sub>	Package
SRDA5-4 SRDA12-4	4-line, low capacitance TVS diode array		5 12	6 13.3	15*	500	25 20	10 1	SO-8
SRV05-4	4-line, low capacitance TVS diode array		5	6	5*	300	12	5	SOT-23 6L

**MicroClamp® - TVS Arrays**

Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>J</sub> Max (pF) L-G @ V <sub>R</sub> = 0V	Peak Power (W) (8/20μs)	I <sub>PP</sub> (A) @ (8/20μs)	I <sub>R</sub> Max (μA) @ V <sub>RWM</sub>	Package
μClampxx61P	High power, 1-line ESD & surge protection		5-40	–	220 to 125	1200 to 1500	80-5	0.2	SLP1608P2
μClamp0501H μClamp1201H	1-line ESD protection		5 12	6 13.3	160 60	240 200	16 8	5 1	SOD-523
 μClamp0301PQ 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
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
μClamp0504T μClamp0505T μClamp0506T	4, 5, 6-line ESD protection		5	6	10	25	2	0.25	SLP1313P6T
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

MicroClamp® - TVS Arrays (Continued)									
Part Number	Description	Device Schematic	V <sub>RWM</sub> Max (V)	V <sub>BR</sub> Min (V)	C <sub>J</sub> Max (pF) L-G @ V <sub>R</sub> = 0V	Peak Power (W) (8/20μs)	I <sub>PP</sub> (A) @ (8/20μs)	I <sub>R</sub> Max (μA) @ V <sub>RWM</sub>	Package
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
μClamp0511T	1-line ESD protection		5	6	7	-	2	0.05 (V <sub>R</sub> =3.3V)	SLP1006P2T
μClamp0511Z μClamp0541Z μClamp3311Z μClamp1211Z	Ultra small, 1 line ESD protection		5 5 3.3 12	6 6 - 13.3	7 9 9 25	- 25 30 125	- 2 4 5	0.05	SLP0603P2X3
μClamp0524P μClamp3324P	4-line, low voltage TVS for ESD protection		5 3.3	6 -	160 30	240 40	16 5	5 0.5	SLP2116P8
μClamp2501T	1-line, 2.5V TVS for ESD protection		2.5	-	30	40	5	0.05	SLP1006P2T
μClamp2511T μClamp3311T μClamp1211T	1-line ESD protection		2.5 3.3	- -	10 10	40 40	5 5	0.05	SLP1006P2T
μClamp3321ZA	1-Line ESD protection		3.3 5	5.5 6.5	0.45 5	30	4 2.5	0.05 0.02	SLP0603P2X3
μClamp2804L	4-line, 2.8V TVS array for Ethernet applications		2.8	-	-	100	10	0.05	SO-8
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
μClamp3311PQ	1-line, low voltage TVS for automotive applications		3.3	-	15	90	5	0.5	SLP1006P2
μClamp3381P	3.3V, 1-line ESD and surge protection		3.3	4.5	35	275	25	0.1	SGP1006N2
μClamp5011ZA	1-line ESD protection		5	6.5	5	30	2.5	0.02	SLP0603P2X3
μClamp3612P	1-line, 36V TVS for proximity switch input protection		33	36	25	170	-	1	SLP1006P2
μClamp3603T	3-line, 36V TVS for proximity switch protection		36	-	50	-	-	1	SLP1710N6T

## LCDA/SLVU Families - 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) (8/20 $\mu$ s)	$I_{PP}$ (A) @ (8/20 $\mu$ s)	$I_R$ Max ( $\mu$ A) @ $V_{RWM}$	Package
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
SLVU2.8Q	1-line, 2.8V TVS for automotive applications		2.8	-	100	400	24	0.25	SOT-23
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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