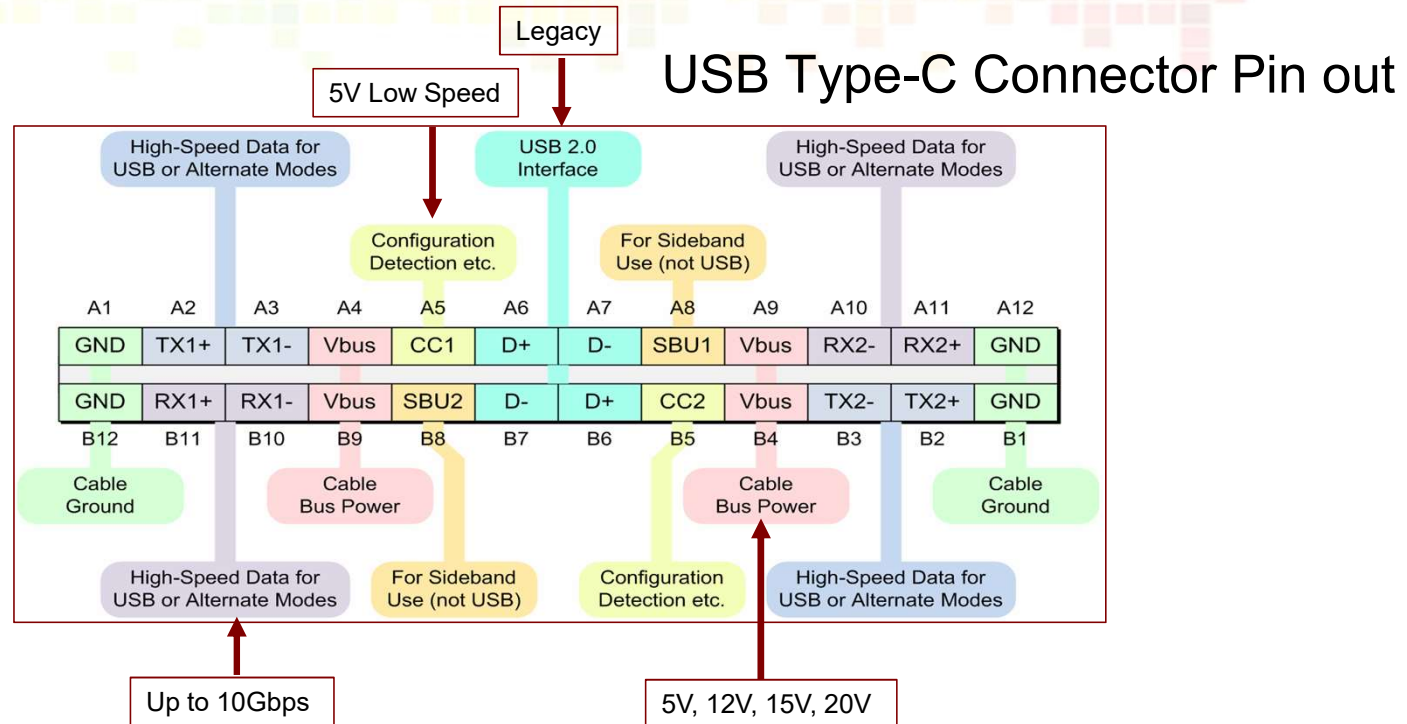


USB Type-C Protection



3 Primary TVS Types Needed for USB-C Protection

- High Speed(TXx+,TXx-,RXx+,RXx-) 4 High Speed Lines(up to 10Gbps)
- Medium Speed(D+,D-,SBUx,CCx) Up to 8 Lines
- Vbus (for Power Delivery(PD) can range from 5V, 12V, 15V, and 20V



USB Type-C Low Speed TVS Focus Solutions



Device	# Chan	V_{rwm} (V)	Cj(pf)	V_{ESD} Air/Contact	I_{pp} (A) 8x20us	Package(mm)	Notes
RClamp4021ZA	1	4	0.55	$\pm 25\text{kV}/\pm 20\text{kV}$	8	0.6x0.3x0.25	D+/D-
RClamp0582B	2	5	0.5	$\pm 30\text{kV}/\pm 25\text{kV}$	15	SC-75(SOT-523)	RClamp0582BQ is Auto Grade
uClamp5031ZA	1	5	13	$\pm 30\text{kV}/\pm 30\text{kV}$	7.5	0.6x0.3x0.25	SBUx/CCx Lines
uClamp2411ZA	1	24	9	$\pm 17\text{kV}/\pm 20\text{kV}$	3	1.0x0.6x0.25	For use with SBUx/CCx lines with PD 15, 20V

Many applications use a USB-C connector but do not implement USB High Speed or Power Delivery(PD) and thus just need protection for the legacy D+/D- and Vbus lines.

Devices indicate for use with Power Delivery where the SBUx and CCx lines can be exposed to the PD voltage via the inductance of the cable.



USB Type-C High Speed TVS Focus Solutions



Device	# Chan	V_{rwm} (V)	Cj(pf)	V_{ESD} Air/Contact	Ipp(A) 8x20us	Package(mm)	Notes
RClamp3371ZC	1	3.3	0.2	$\pm 17\text{kV}/\pm 15\text{kV}$	9	0.6x0.3x0.25	
RClamp3552T	2	3.5	0.3	$\pm 20\text{kV}/\pm 17\text{kV}$	4	1.0x0.6x0.4	Solderable flanks, TQ is Auto Grade
RClamp03354P	4	3.3	0.28	$\pm 15\text{kV}/\pm 12\text{kV}$	10	2.5x1.0x0.55	Vclamp=3V @ 4A



USB Type-C Vbus TVS Focus Solutions



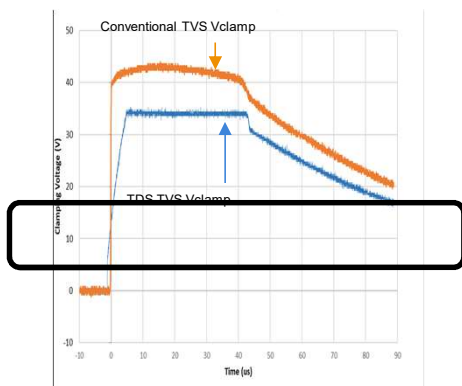
Device	# Chan	V _{rwm} (V)	Cj(pf)	V _{ESD} Air/Contact	Ipp(A) 8x20us	Package(mm)	Notes
pClamp0511ZV	1	5	275	±30kV/±30kV	115	1.6x1.0x0.5	
uClamp5501ZV	1	5.5	445	±30kV/±30kV	60	1.0x0.6x0.25	7.2V Clamp Voltage @ 10A
pClamp1021P	1	10	600	±30kV/±30kV	80	1.0x0.6x0.5	
pClamp1221P	1	12	408	±30kV/±30kV	80	1.6x1.0x0.5	
uClamp1571P	1	15	220	±30kV/±30kV	40	1.6x1.0x0.5	
uClamp2271P	1	22	165	±30kV/±30kV	25	1.6x1.0x0.5	
TDS2211P	1	22	40	±30kV/±30kV	40	1.6x1.6x0.55	

NOTE: For USB applications that are only providing 5V USB Power ONLY the Vbus lines need protection.

TDS Value Proposition

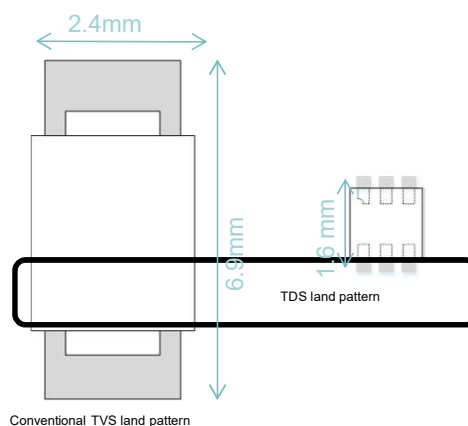


30% Lower VClamp



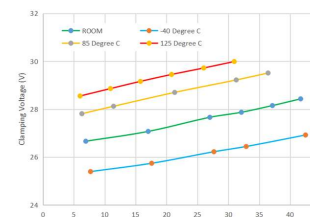
Semtech TDS achieves 30% lower Vclamp over conventional TVS diodes

80% Smaller Footprint

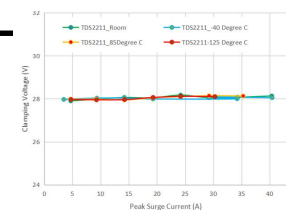


Semtech TDS consumes 80% less board "real estate" than conventional surge rated TVS

Constant clamp over Temp



Conventional TVS Vclamp over temperature



TDS Vclamp over temperature

Unlike conventional TVS, TDS Vclamping will not degrade over temperature