Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Current (t_p = 8/20µs)	I_{PP}	4.5	A
ESD per IEC 61000-4-2 (Air)(1) ESD per IEC 61000-4-2 (Contact)(1)	V_{ESD}	±20 ±17	kV
Operating Temperature	T_J	-40 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Electrical Characteristics (T=25°C unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	Any I/O to GND				3.3	V
Reverse Breakdown Voltage	V_{BR}	I_{BR} = 10µA		7	8	9	V
Reverse Leakage Current	I_R	V_{RWM} = 3.3V Any I/O to GND	T = 25°C		0.01	0.05	µA
			T = 125°C			0.150	
Clamping Voltage	V_C	tp = 8/20µs Any I/O to GND	I_{PP} = 1A		2.5	3.5	V
			I_{PP} = 4.5A		3.5	4.5	
ESD Clamping Voltage[2]	V_C	tp = 0.2/100ns	I_{PP} = 16A		5.5		V
			I_{PP} = -16A		-3		
Dynamic Resistance (positive)[2,3]	R_{DYN}	tp = 0.2/100ns			0.15		Ω
Dynamic Resistance (negative)[2,3]	R_{DYN}	tp = 0.2/100ns			0.14		
Junction Capacitance	C_J	V_R = 0V, f = 1MHz, Any I/O to GND			0.60	0.65	pF
		V_R = 0V, f = 1MHz, Between I/O pins			0.30	0.40	

Notes

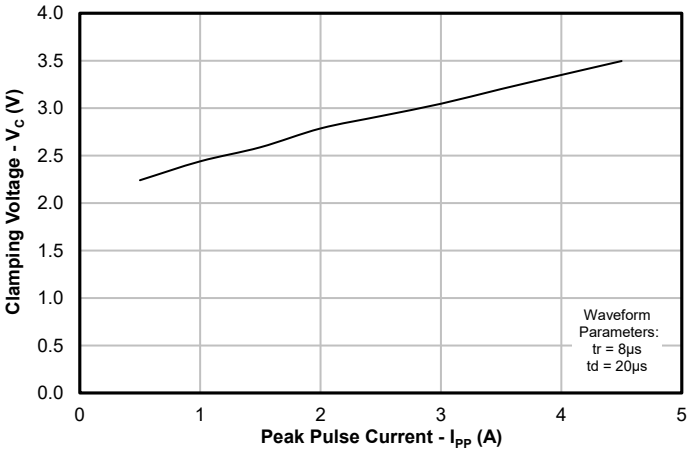
1) Measured with a 20dB attenuator, 50 Ohm scope input impedance, 2GHz bandwidth. ESD gun return path connected to ESD ground plane.

2) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t1 = 70ns to t2 = 90ns.

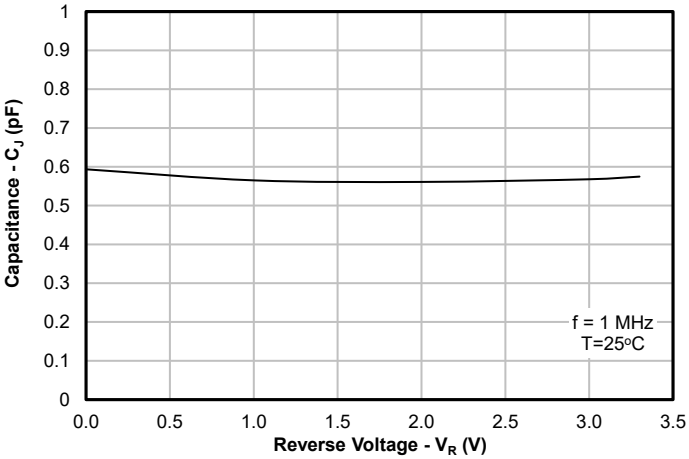
3) Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

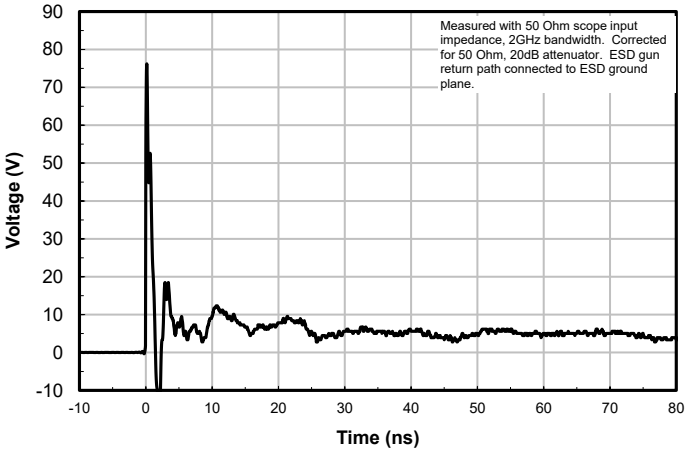
Clamping Voltage vs. Peak Pulse Current (Between any I/O and Ground)



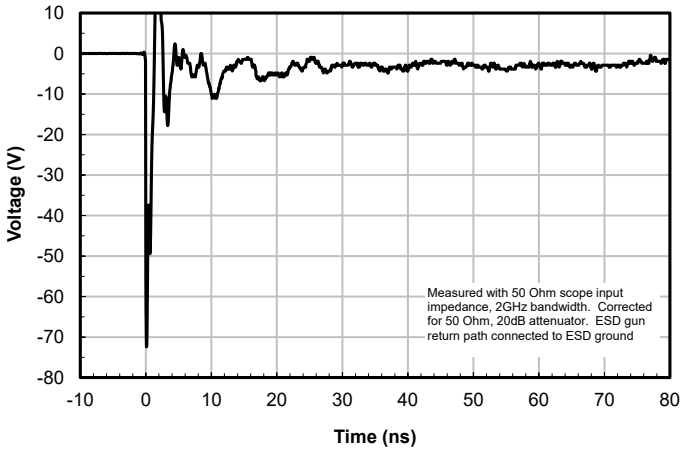
Junction Capacitance vs. Reverse Voltage (Between any I/O and Ground)



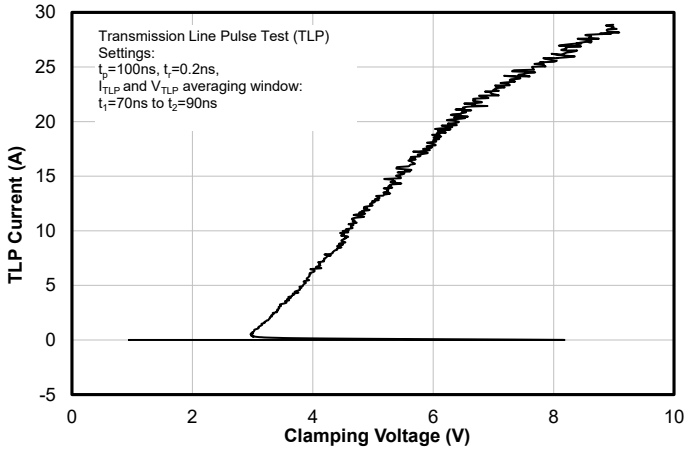
ESD Clamping (+8kV Contact per IEC 61000-4-2) (Between any I/O and Ground)



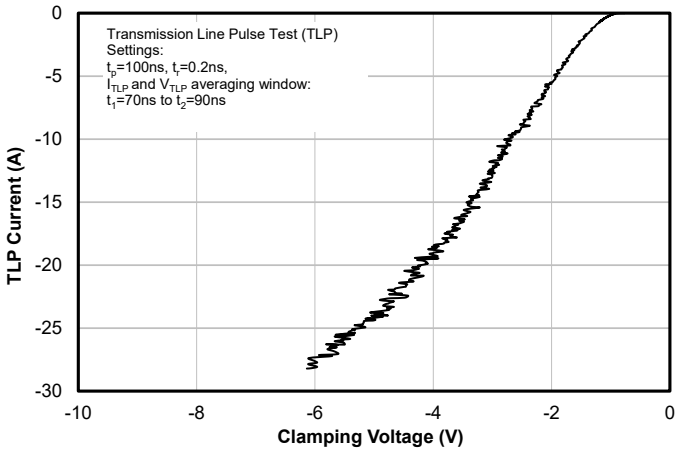
ESD Clamping (-8kV Contact per IEC 61000-4-2) (Between any I/O and Ground)



TLP Characteristic (Positive)

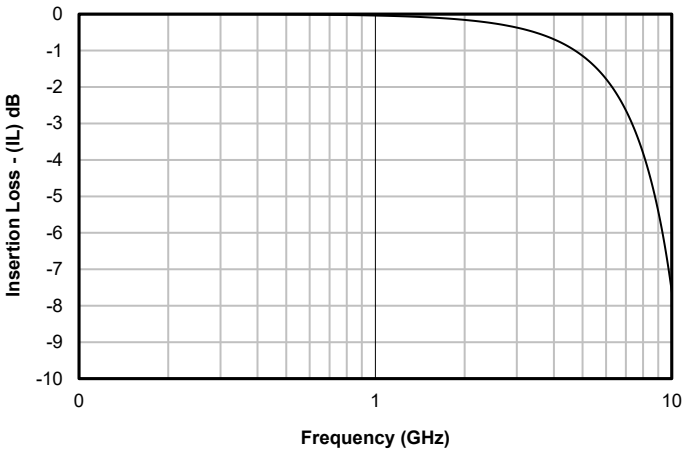


TLP Characteristic (Negative)

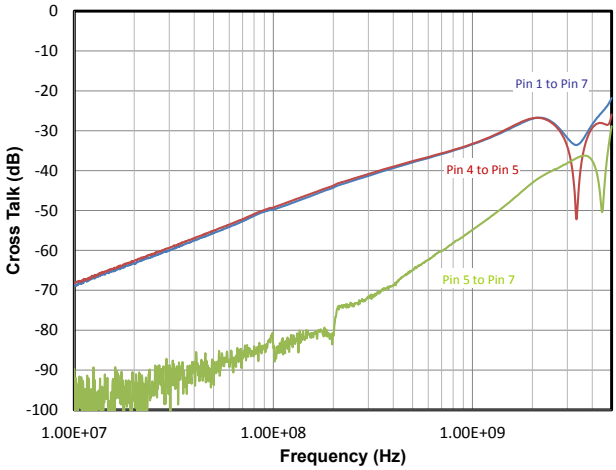


Typical Characteristics (Continued)

Insertion Loss - S21



Analog Crosstalk



Application Information

Protecting USB 3.0 Ports

RClamp3346P is designed to protect all six USB 3.0 SuperSpeed and high speed differential lines. PCB traces enter and exit each I/O pin and ground is connected at pin 2. For best results, it is recommended that the ground connection be made using a filled via-in-pad. The via should be filled with a conductive paste. This technique saves board space and reduces parasitic inductance in the ground path. Figures 2 and 3 are examples of how to route high speed differential traces through the RClamp3346P. Differential impedance of each pair can easily be controlled for USB 3.0 (85 Ohms +/-15%).

The RClamp3346P should be placed as close to the connector as possible for optimum ESD performance. Internal construction of the RClamp3346P has been optimized to minimize series inductance within the package. This helps to reduce the ESD peak clamping voltage. Dynamic resistance is extremely low (typically 0.15 Ohms) further reducing the ESD clamping voltage.

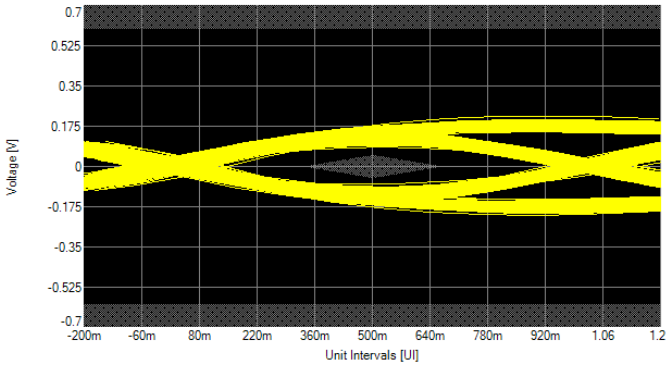


Figure 1 - USB 3.0 Eye Diagram with RClamp3346P

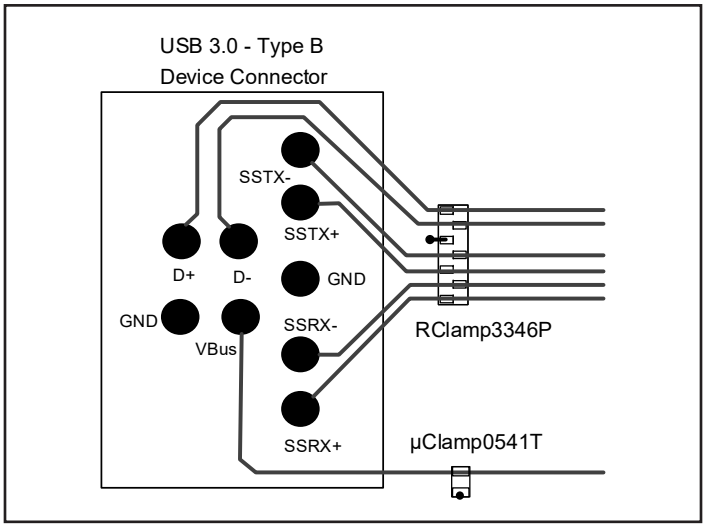


Figure 2 - Example USB 3.0 Layout
(Type B Device Connector)

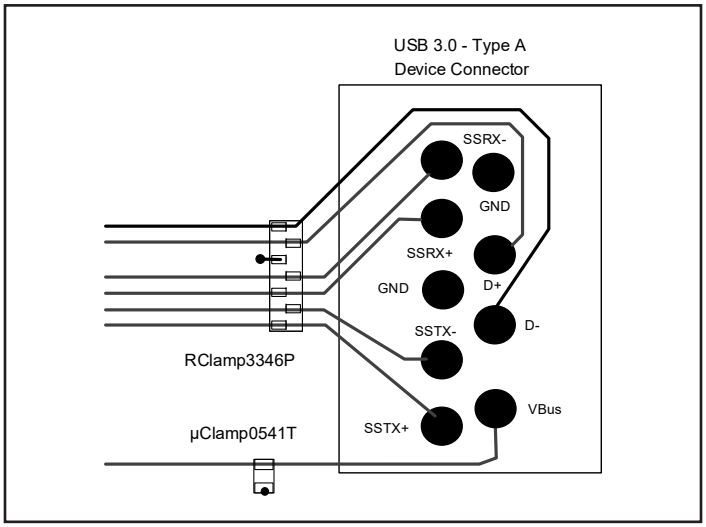


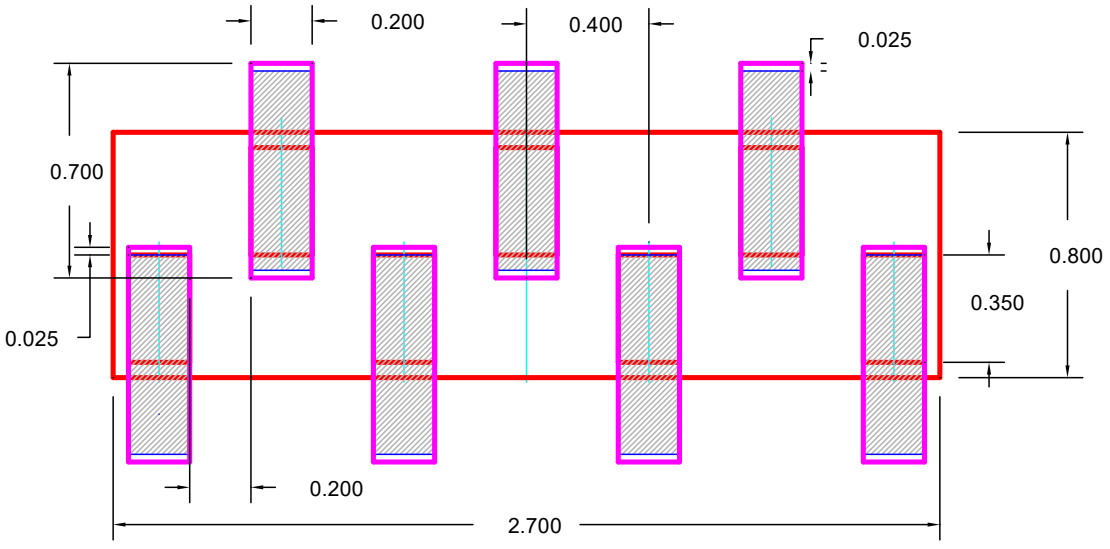
Figure 3 - Example USB 3.0 Layout
(Type A Device Connector)

Application Information

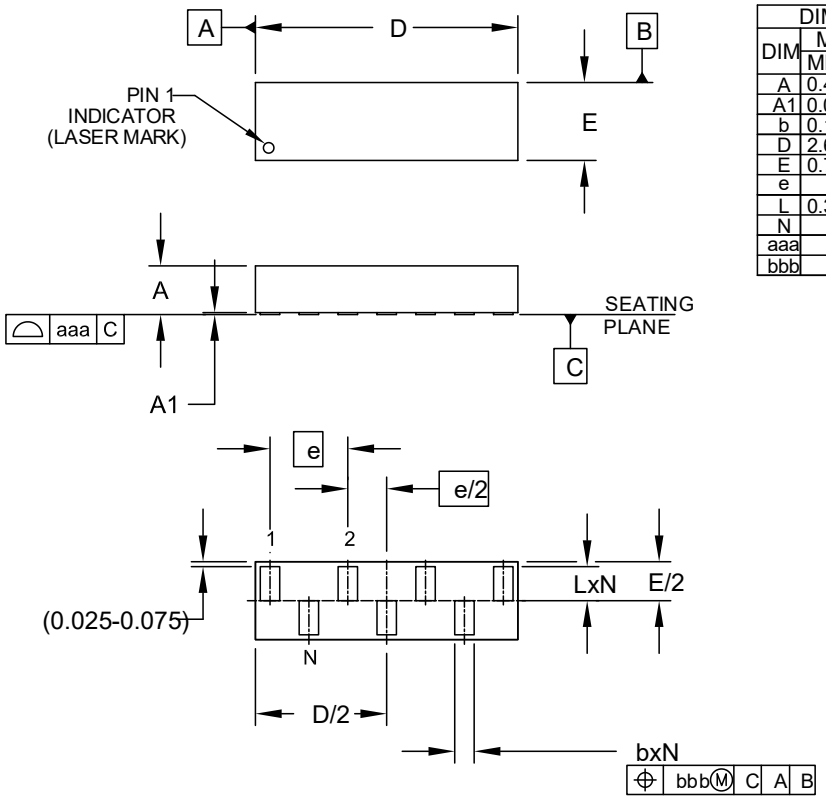
Assembly Guidelines

The small size of this device means that some care must be taken during the mounting process to insure reliable solder joint. Semtech's recommended assembly guidelines for mounting this device are shown in the Table 1. Figure 4 details Semtech's recommended aperture. Note that these are only recommendations and should serve only as a starting point for design since there are many factors that affect the assembly process. Exact manufacturing parameters will require some experimentation to get the desired solder application.

Assembly Parameter	Recommendation
Solder Stencil Design	Laser cut, Electro-Polished
Aperture shape	Rectangular with rounded corners
Solder Stencil Thickness	0.100 mm (0.004")
Solder Paste Type	Type 4 size sphere or smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Non-Solder mask defined
PCB Pad Finish	OSP OR NiAu



Outline Drawing - SGP2708N7

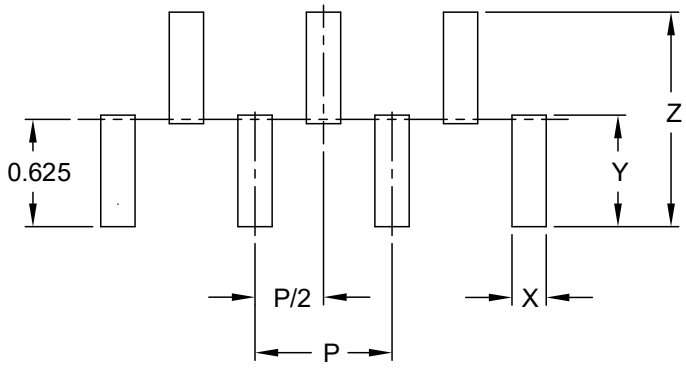


DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.45	0.55	0.65
A1	0.00	0.03	0.05
b	0.15	0.20	0.25
D	2.65	2.70	2.75
E	0.75	0.80	0.85
e	0.80 BSC		
L	0.30	0.35	0.40
N	7		
aaa	0.08		
bbb	0.10		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

Land Pattern - SGP2708N7

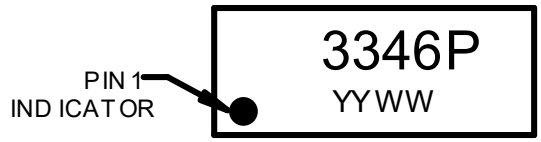


DIMENSIONS	
DIM	MILLIMETERS
P	0.80
X	0.20
Y	0.65
Z	1.25

NOTES:

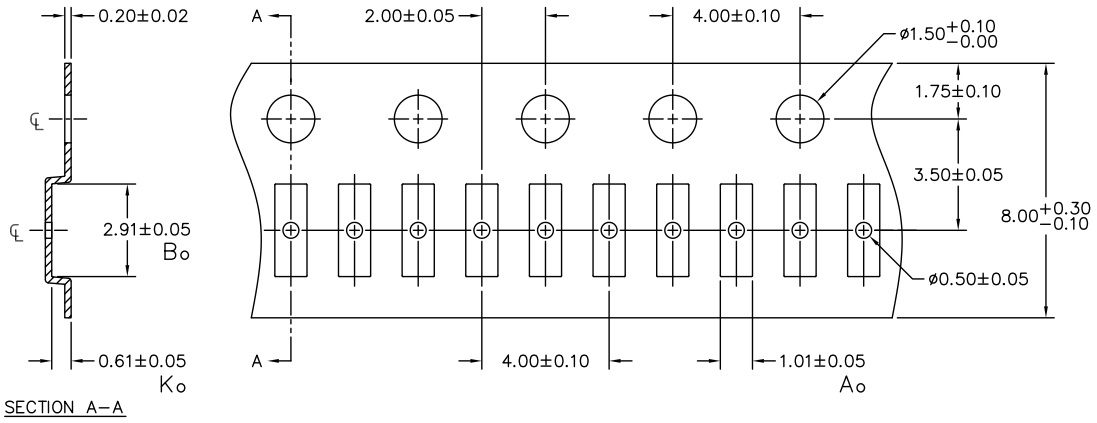
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code

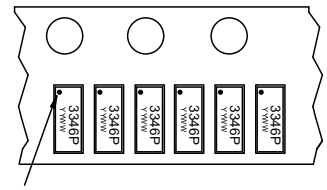


YYWW = Date Code

Tape and Reel Specification



NOTES: 1.) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.



Pin 1 Location (Towards Sprocket Holes)

User Direction of feed

Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp3346P.TNT	10,000	7″

Contact Information

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www.semtech.com