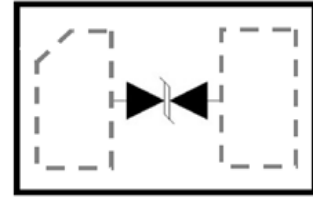


## Description

The RCLAMP3321P provides ESD protection for USB3.0, HDMI1.3/1.4, and other high-speed ports. It may be used to meet the ESD immunity requirements of IEC 61000-4-2. The RCLAMP3321P is designed to minimize both the ESD peak clamping and the TLP clamping. The dynamic resistance is minimized (0.47 Ohms typical) for optimum protection of sensitive circuits. Maximum capacitance is only 0.35pF. This allows the RCLAMP3321P to be used in applications operating in excess of 5GHz without signal attenuation. These devices are manufactured using Semtech's proprietary low voltage technology for superior characteristics at operating voltages up to 3.3 volts.

The RCLAMP3321P is in a 2-pin SLP1006P2 package. It measures 1.0 x 0.6 x 0.5mm. The leads are spaced at a pitch of 0.65mm and are finished with lead-free NiPdAu. Each device will protect one line operating at 3.3 volts. The combination of low peak ESD clamping, low dynamic resistance, and low capacitance makes this device suitable for applications such as USB 3.0, HDMI and V-By-One interfaces in portable devices.



## Applications

- USB 3.0
- HDMI 1.3/1.4
- V-By-One
- Display Port
- MHL / MDDI
- LVDS Interfaces
- eSATA Interfaces

## Features

- Transient protection for data lines to IEC 61000-4-2 (ESD) ±17kV (air), ±12kV (contact)  
IEC 61000-4-4 (EFT) 40A (tp = 5/50ns)  
Cable Discharge Event (CDE)
- Ultra-small package (1.0 x 0.6 x 0.5mm)
- Protects one data or I/O line
- Low capacitance: 0.35pF
- Dynamic Resistance: 0.47 Ohms Typical
- Low ESD clamping voltage
- Operating voltage: 3.3V
- Solid-state silicon-avalanche technology

## Mechanical Characteristics

- SLP1006P2 package
- Molding compound flammability rating: UL 94V-0
- Marking: Marking code
- Packaging: Tape and Reel
- Lead Finish: NiPdAu
- Pb-Free, Halogen Free, RoHS/WEEE Compliant

## Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20µs)	P <sub>PK</sub>	25	W
Maximum Peak Pulse Current (tp = 8/20µs)	I <sub>PP</sub>	3	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	V <sub>ESD</sub>	+/- 17 +/- 12	kV
Operating Temperature	T <sub>J</sub>	-55 to +125	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

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

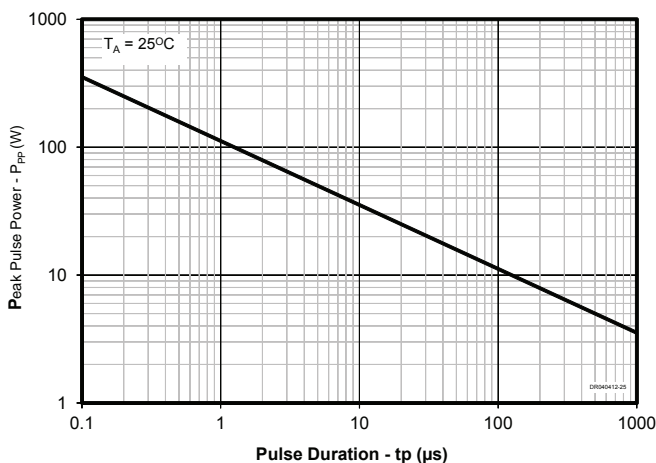
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	$V_{RWM}$				3.3	V
Breakdown Voltage	$V_{BR}$	$I_{BR} = 1mA$	5.5	7	8.5	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 3.3V$		10	50	nA
Clamping Voltage	$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s$		9.5	10	V
Clamping Voltage	$V_C$	$I_{PP} = 4A, t_p = 8/20\mu s$		10.5	13	V
ESD Clamping Voltage <sup>2</sup>	$V_C$	$I_{PP} = 4A,$ $t_{lp} =$		8.8		V
ESD Clamping Voltage	$V_C$	$I_{PP} = 16A,$ $t_{lp} = 0.2/100ns$		14.5		V
Trigger Voltage <sup>2</sup>	$V_{TRIG}$	$t_{lp} = 0.2/100ns$		8		V
Dynamic Resistance <sup>2,3</sup>	$R_{DYN}$	$t_{lp} = 0.2 / 100ns$		0.47		$\Omega$
Junction Capacitance	$C_j$	$V_R = 0V, f = 1MHz$		0.22	0.35	pF

Notes

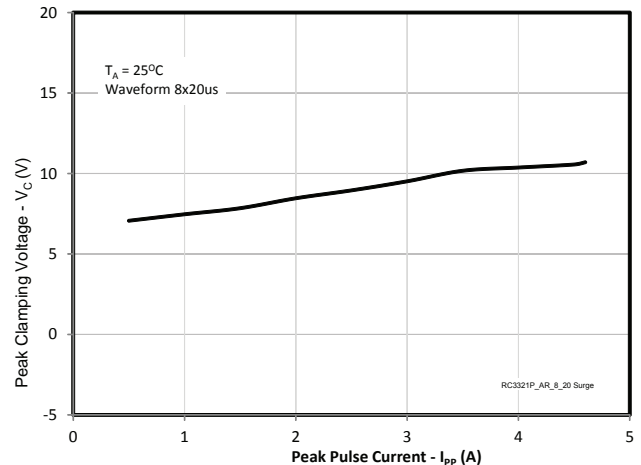
- 1)ESD gun return path connected to ESD ground reference plane.
- 2)TLP Settings:  $t_p = 100ns, t_r = 0.2ns, I_{TLP}$  and  $V_{TLP}$  sample window:  $t_1 = 70ns$  to  $t_2 = 90ns$ .
- 3) Dynamic resistance calculated from  $I_{pp} = 4A$  to  $I_{pp} = 16A$  using "Best Fit"
- 4) Device is electrically symmetrical

**Typical Characteristics**

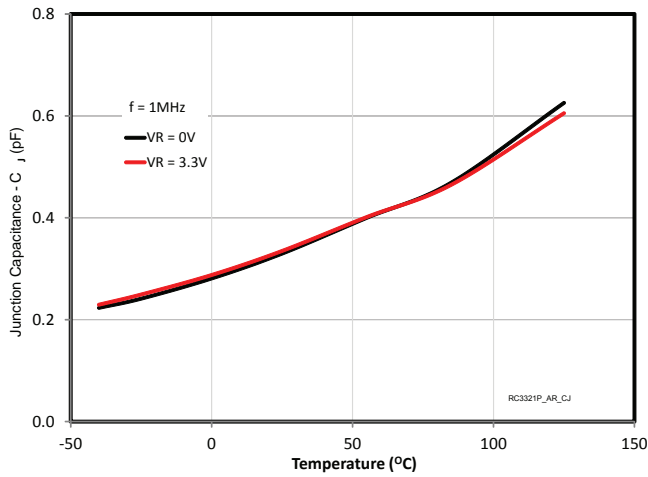
**Non-Repetitive Peak Pulse Power vs. Pulse Time**



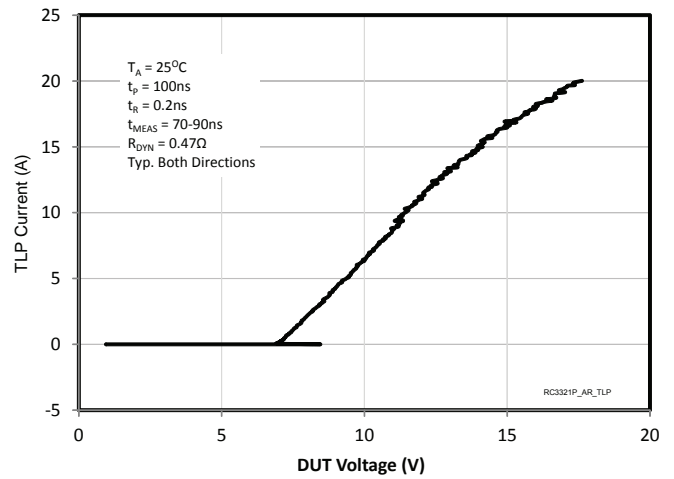
**8x20us Peak Clamping Voltage vs Peak Current**



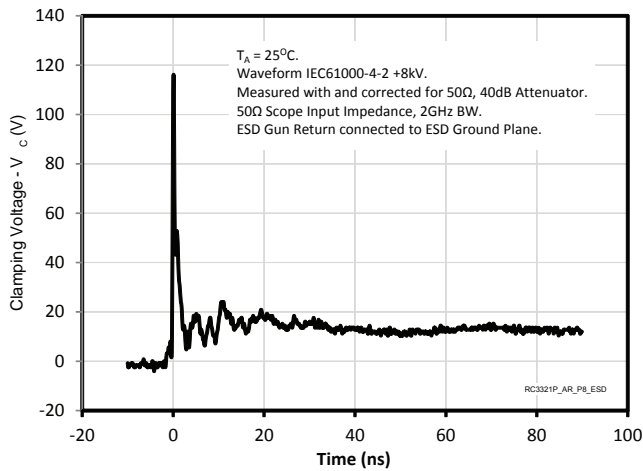
### Capacitance vs. Temperature vs. Bias Voltage



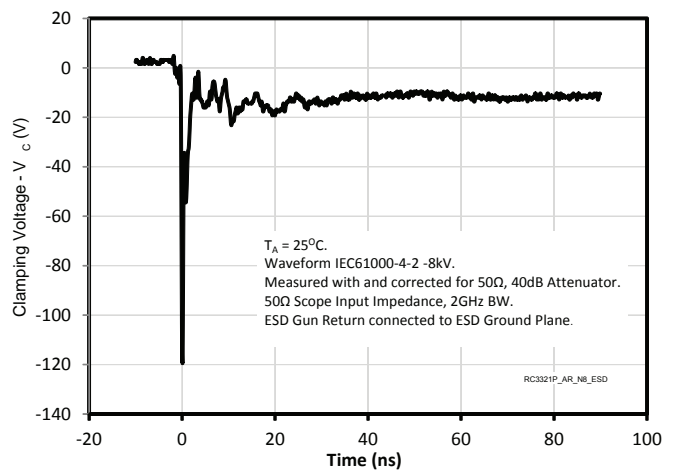
### TLP Characteristic



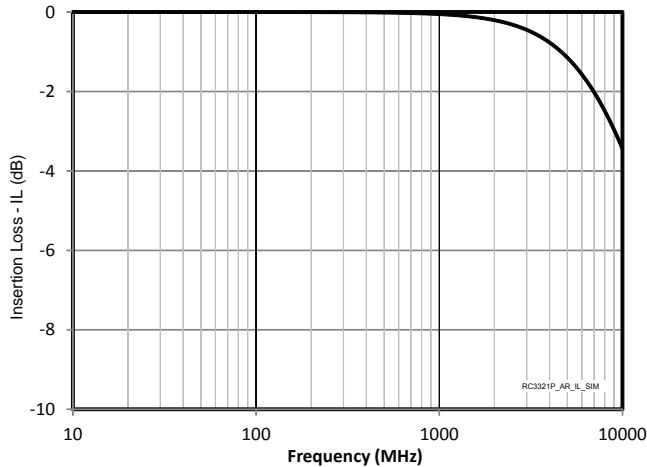
### ESD Clamping (+8kV Contact per IEC 61000-4-2)



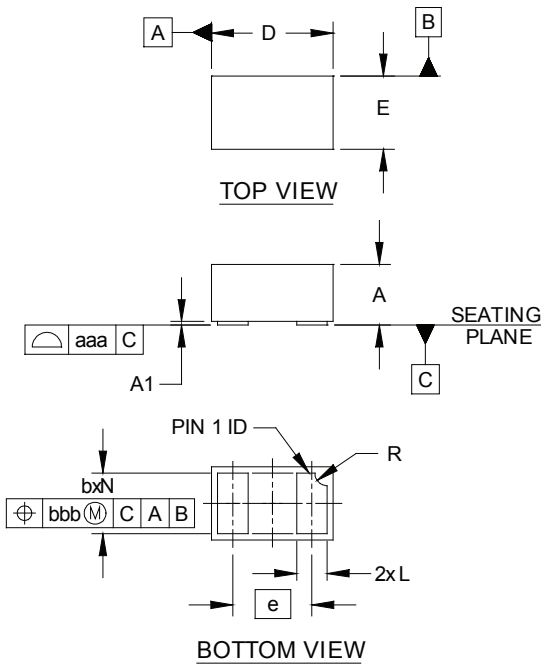
### ESD Clamping (-8kV Contact per IEC 61000-4-2)



### Typical Insertion Loss (S21)



SLP1006P2 PACKAGE OUTLINE DIMENSIONS

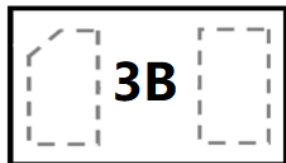


DIM	DIMENSIONS					
	INCHES			MILLIMETERS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	.016	.020	.022	0.40	0.50	0.55
A1	.000	.001	.002	0.00	0.03	0.05
b	.018	.020	.022	0.45	0.50	0.55
D	.035	.039	.043	0.90	1.00	1.10
E	.020	.024	.028	0.50	0.60	0.70
e	.026 BSC			0.65 BSC		
L	.008	.010	.012	0.20	0.25	0.30
R	.002	.004	.006	0.05	0.10	0.15
N	2			2		
aaa	.003			0.08		
bbb	.004			0.10		

NOTES:

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

Marking



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