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The RClamp[®]3321P 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.

RClamp3321P Ultra-Low Capacitance 1-Line, 3.3V ESD protection

- ◆ 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

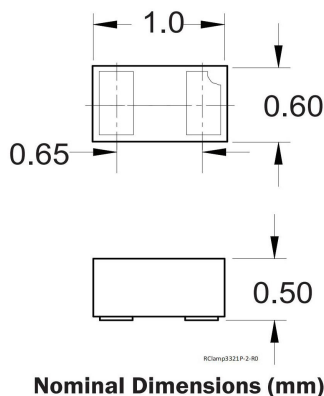
Mechanical Characteristics

- ◆ 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

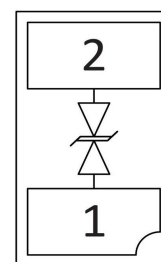
Applications

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

Package Dimensions



Schematic & Pin Configuration



SLP1006P2 (Bottom View)

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Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	25	Watts
Maximum Peak Pulse Current ($t_p = 8/20\mu s$)	I_{PP}	3	Amps
ESD per IEC 61000-4-2 (Air) ¹ ESD per IEC 61000-4-2 (Contact) ¹	V_{ESD}	+/- 17 +/- 12	kV
Operating Temperature	T_J	-55 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}				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 ²	V_C	$I_{PP} = 4A,$ $t_{lp} = 0.2/100ns$		8.8		V
ESD Clamping Voltage ²	V_C	$I_{PP} = 16A,$ $t_{lp} = 0.2/100ns$		14.5		V
Trigger Voltage ²	V_{TRIG}	$t_{lp} = 0.2/100ns$		8		V
Dynamic Resistance ^{2, 3}	R_{DYN}	$t_{lp} = 0.2 / 100ns$		0.47		Ω
Junction Capacitance	C_J	$V_R = 0V, f = 1MHz$		0.22	0.35	pF

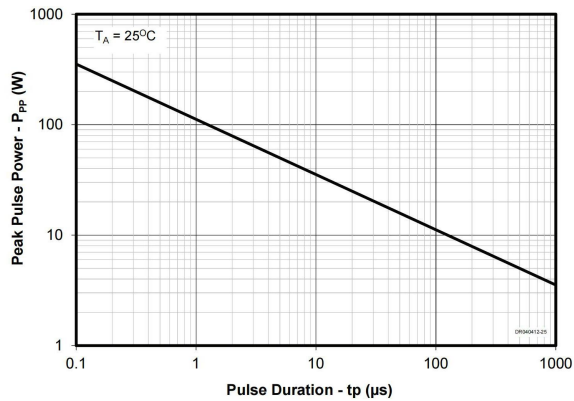
Notes

- 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

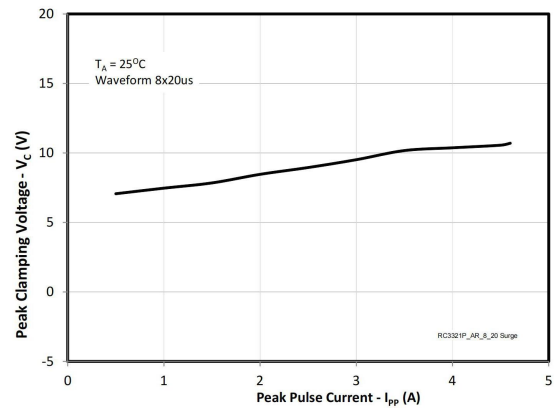
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Typical Characteristics

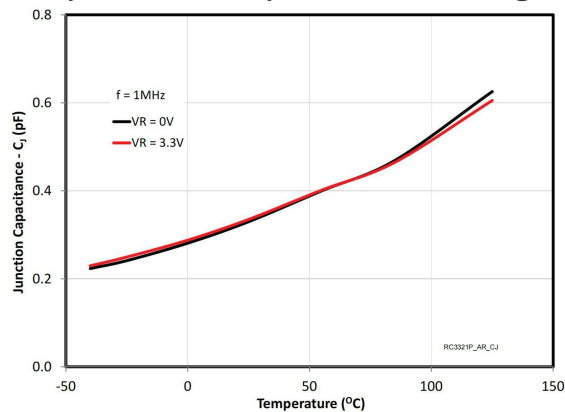
Non-Repetitive Peak Pulse Power vs. Pulse Time



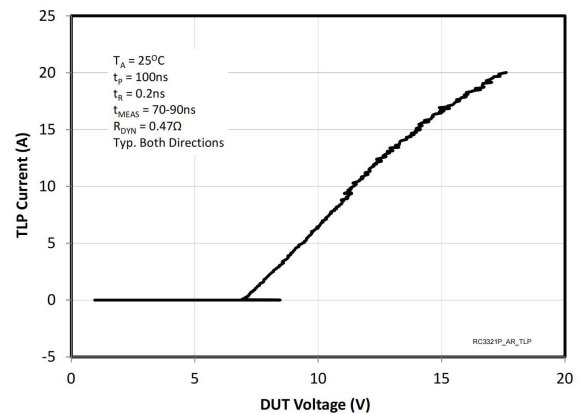
8x20us Peak Clamping Voltage vs Peak Current



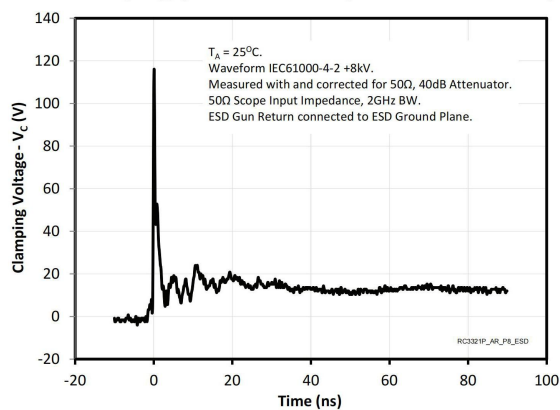
Capacitance vs. Temperature vs. Bias Voltage



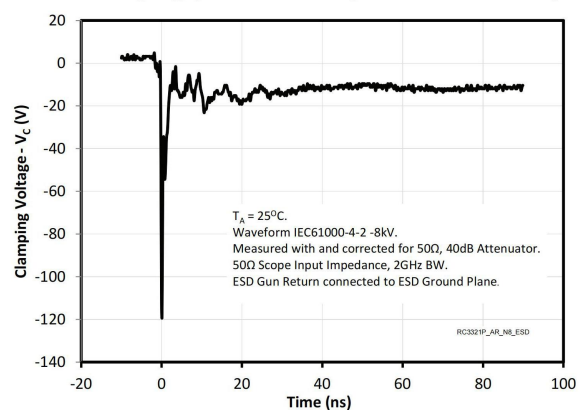
TLP Characteristic



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

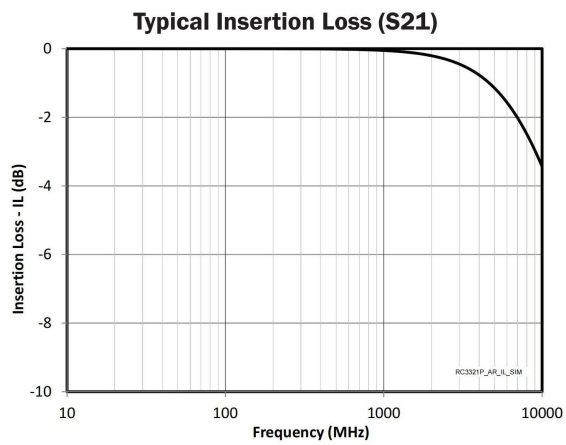


ESD Clamping (-8kV Contact per IEC 61000-4-2)



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Typical Characteristics (Continued)

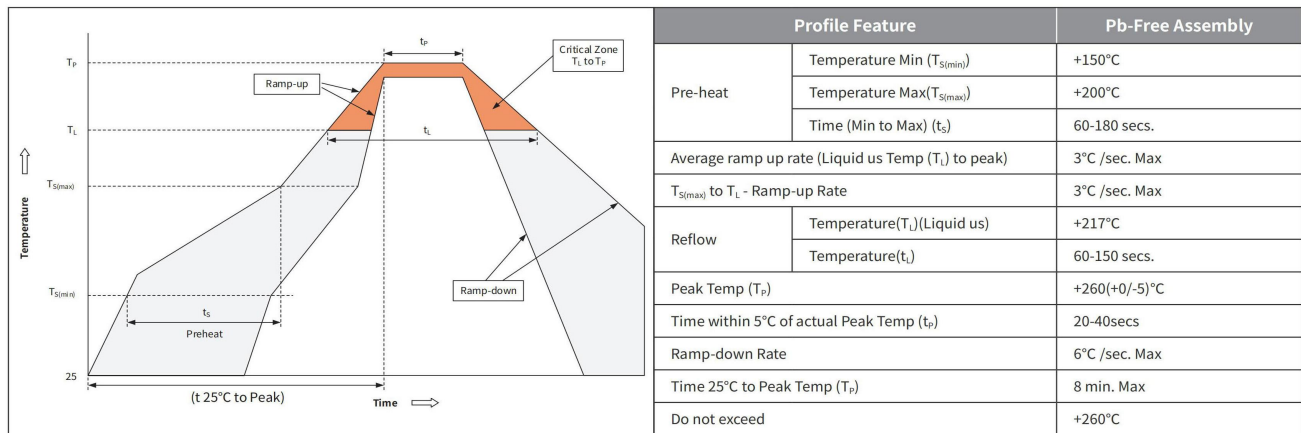


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Ordering Information

PREFERRED P/N	PACKAGE	SIZE(mm)	DELIVERY MODE	MPQ(PCS)
	DFN1006-2L	1.00×0.60×0.37	7" REEL	10,000

Recommended Soldering Conditions



Package Outline Dimensions (DFN1006-2L)

Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
A	0.950	1.050	0.037	0.041
B	0.550	0.650	0.022	0.026
C	0.350	0.450	0.014	0.018
D	0.550	0.650	0.022	0.026
D ₁	0.280	0.380	0.011	0.015
E	0.450	0.550	0.018	0.022
L	0.000	0.100	0.000	0.004

Suggested Pad Layout

Symbol	Dimensions			
	Millimeters		Inches	
	Min	Max	Min	Max
J	0.50	0.60	0.020	0.024
K	0.25	0.35	0.010	0.014
M	0.55	0.65	0.022	0.026