

RClamp3331PQ RailClamp® Low Capacitance ESD and EOS Protection

PROTECTION PRODUCTS

Description

RClamp®3331PQ is specifically designed to provide secondary surge and ESD protection on antennas and high-speed data ports. RClamp3331PQ utilizes snap-back or "crow-bar" technology to minimize device clamping voltage. It features high surge current capability of 10A (tp=8/20µs). ESD characteristics are highlighted by high ESD withstand voltage (+/-30kV per IEC 61000-4-2) and extremely low dynamic resistance (0.28 Ohms typical). Each device will protect one lines operating at 3.3 volts and are qualified to AEC-Q100 (Grade 1) and AEC-Q101 for automotive applications.

RClamp3331PQ is in a 2-pin SLP1006P2 package. It measures 1.0×0.6 mm with a nominal height of 0.5mm. The leads are finished with lead-free NiPdAu. The combination of small size, low capacitance, and high ESD surge capability makes them ideal for use in industrial, automotive, and consumer applications.

Features

- High ESD withstand Voltage: ±30kV (Air and Contact) per IEC 61000-4-2
- Ultra-small package
- · Protects one line
- · Low ESD clamping voltage
- Working voltage: ±3.3V
- Low capacitance: 0.35 pF Typical
- Low leakage current
- Low dynamic resistance
- Qualified to AEC-Q100 (Grade 1) and AEC-Q101
- Solid-state silicon-avalanche technology

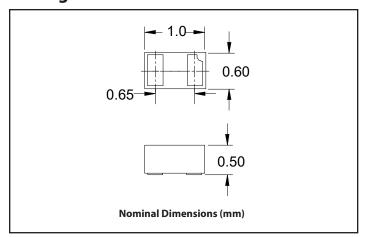
Mechanical Characteristics

- SLP1006P2 package
- Pb-Free, Halogen Free, RoHS/WEEE compliant
- Nominal Dimensions: 1.0 x 0.6 x 0.5 mm
- · Lead Finish: NiPdAu
- · Marking: Marking code
- · Packaging: Tape and Reel

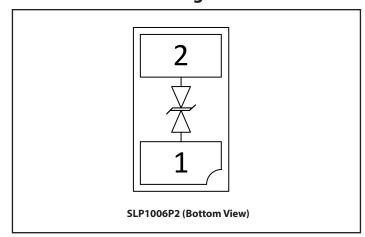
Applications

- Antenna
- USB3.0 / USB 3.1 / USB Type-C
- Automotive Applications
- Industrial Equipment

Package Dimension



Schematic & Pin Configuration



RClamp3331PQ Final Datasheet Revision Date

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Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = $8/20\mu s$)	P _{PK}	30	W
Peak Pulse Current (tp = 8/20μs)	I _{PP}	10	A
ESD per IEC 61000-4-2 (Air) ⁽¹⁾ ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	V _{ESD}	±30 ±30	kV
ESD per ISO-10605 (Air) ⁽²⁾ ESD per ISO-10605 (Contact) ⁽²⁾	V _{ESD}	±30 ±25	kV
Operating Temperature	T,	-40 to +125	∘С
Storage Temperature	T _{STG}	-55 to +150	∘С

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

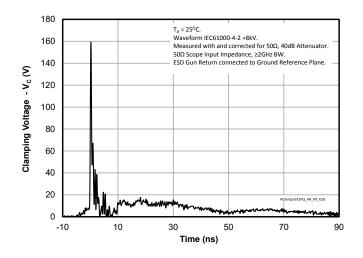
Parameter	Symbol	Conditions	Min.	Тур.	Max.	Units
Reverse Stand-Off Voltage	V _{RWM}	T = -40 °C to +125 °C, Pin 1 to 2 or 2 to 1			3.3	٧
Reverse Breakdown Voltage	V _{BR}	I _t = 1mA, Pin 1 to 2 or 2 to 1	6	7.6	11	٧
Reverse Leakage Current	I _R	V _{RWM} = 3.3V, Pin 1 to 2 or 2 to 1			50	nA
Clamping Voltage ³	V _c	I_{pp} = 10A, tp = 1.2/50 μs (Voltage), 8/20 μs (Current) Combination Waveform		6	8	V
ESD Clamping Voltage⁴	V _C	I _{TLP} = 4A, tp = 0.2/100ns (TLP)		3.6		V
ESD Clamping Voltage ⁴	V _C	I _{TLP} = 16A, tp = 0.2/100ns (TLP)		6.6		V
Dynamic Resistance ^{4,5}	R _{DYN}	tp = 0.2/100ns		0.28		Ω
Junction Capacitance	C	$V_R = 0V, f = 1MHz$		0.35	0.38	pF

Notes:

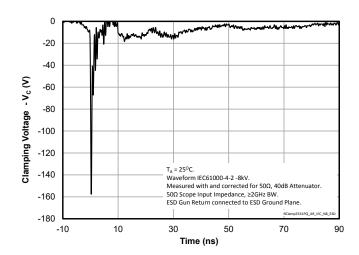
- 1) ESD gun return path connected to ESD ground plane
- 2) ESD gun return path to Horizontal Coupling Plane (HCP); Test conditions: a) 150pF/330pF, 330Ω ; b) 150pF/330pF, $2k\Omega$
- 3) Measured using a 1.2/50 μ s voltage, 8/20 μ s current combination waveform, $R_s = 2$ Ohms. Clamping is defined as the peak voltage across the device after the device snaps back to a conducting state.
- 4) Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 0.2ns, I_{TLP} and V_{TLP} averaging window: t1 = 70ns to t2 = 90ns.
- 5) Dynamic resistance calculated from $I_{TIP} = 4A$ to $I_{TIP} = 16A$

Typical Characteristics

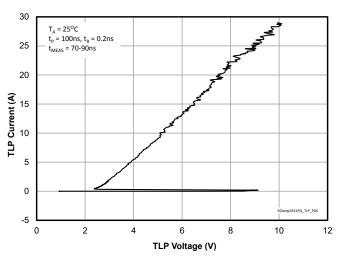
ESD Clamping (8kV Contact per IEC 61000-4-2)



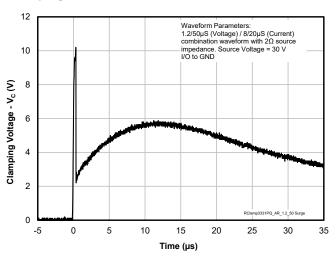
ESD Clamping (-8kV Contact per IEC 61000-4-2)



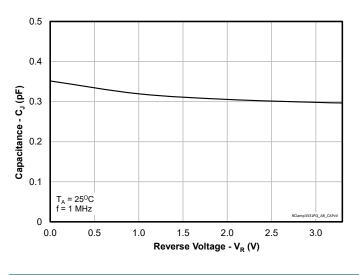
TLP Characteristic (Positive Pulse)



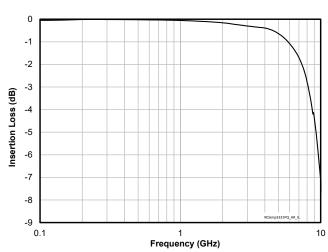
Clamping Characteristic (10A, Combination Waveform)



Capacitance vs. Reverse Voltage



Insertion Loss - S21

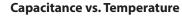


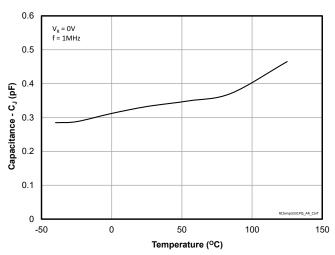
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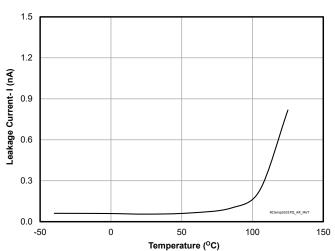
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Typical Characteristics (Continued)

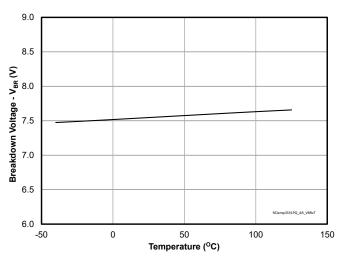




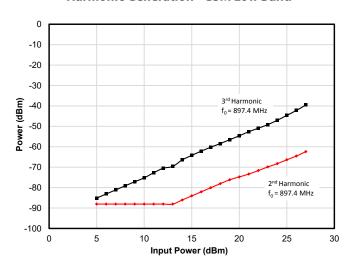
Leakage vs. Temperature



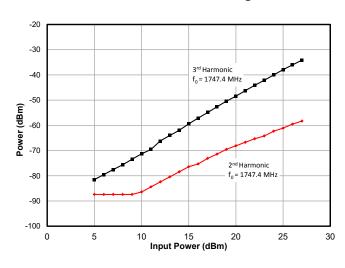
Breakdown Voltage vs. Temperature



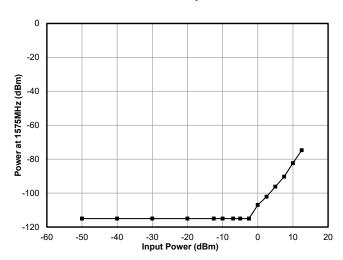
Harmonic Generation - GSM Low Band



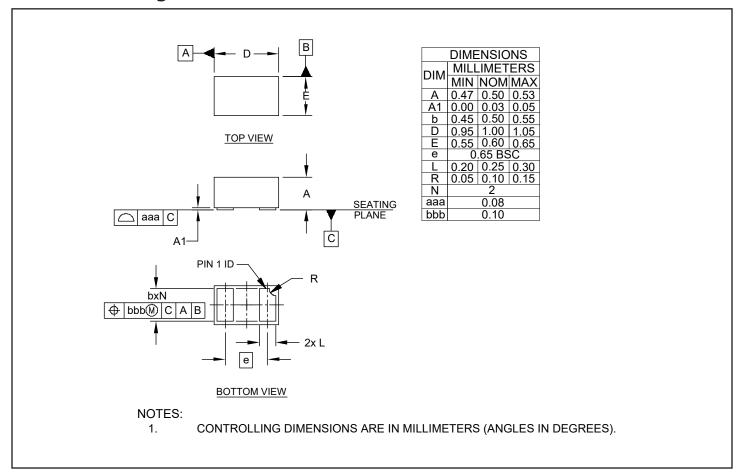
Harmonic Generation - GSM High Band



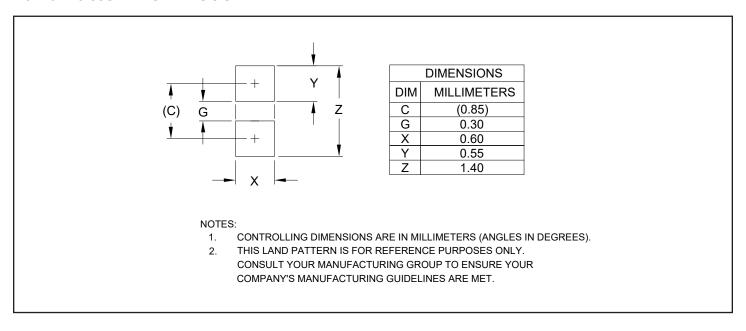
Intermodulation Distortion (Input: 760MHz + 815 MHz)



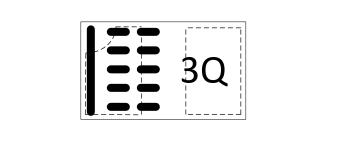
Outline Drawing - SLP1006P2



Land Pattern - SLP1006P2



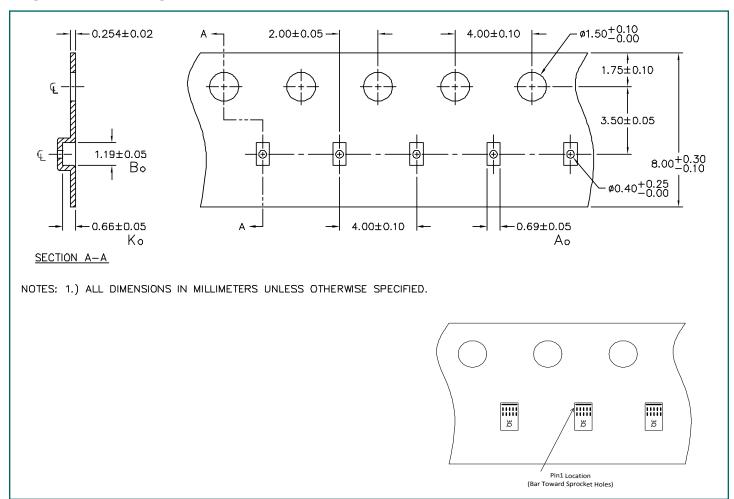
Marking



Notes:

- 1. Device is electrically symmetrical
- 2. Marking will also include line matrix date code
- 3. Bar indicates Pin 1 location

Tape and Reel Specification



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Ordering Information

Part Number	Qty per Reel	Reel Size			
RClamp3331PQTCT	3,000	7"			
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