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 x 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

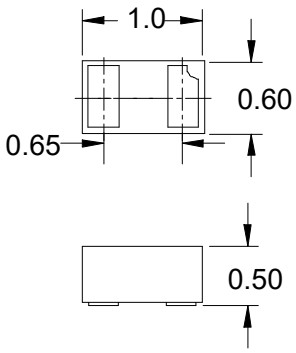
Mechanical Characteristics

- 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

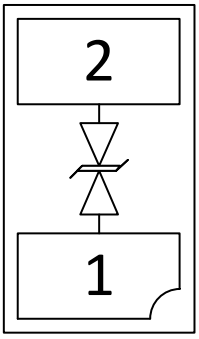
- Antenna
- USB3.0 / USB 3.1/ USB Type-C
- Automotive Applications
- Industrial Equipment

Package Dimension



Nominal Dimensions (mm)

Schematic & Pin Configuration



SLP1006P2 (Bottom View)

Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power (tp = 8/20µs)	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_J	-40 to +125	^oC
Storage Temperature	T_{STG}	-55 to +150	^oC

Electrical Characteristics (T=25^{o}C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	T = -40 ^{o}C to +125 ^{o}C, Pin 1 to 2 or 2 to 1			3.3	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA, Pin 1 to 2 or 2 to 1	6	7.6	11	V
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 Voltage[4]	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		
Dynamic Resistance[4,5]	R_{DYN}	tp = 0.2/100ns		0.28		Ω
Junction Capacitance	C_J	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, 2kΩ

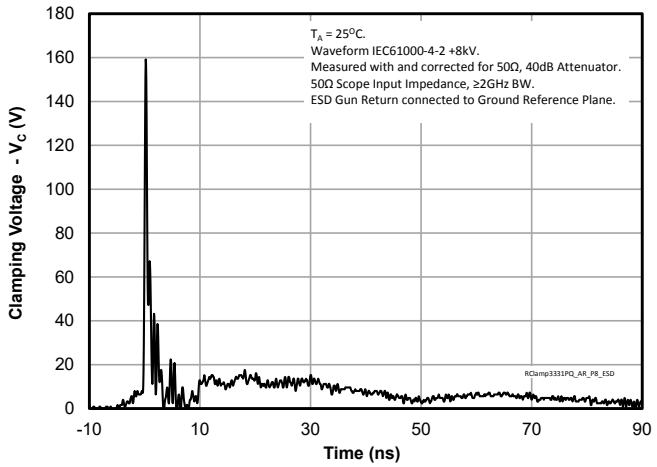
3) Measured using a 1.2/50µs voltage, 8/20µs current combination waveform, R_S = 2 Ohms. Clamping is defined as the peak voltage across the device after the device snaps back to a conducting state.

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

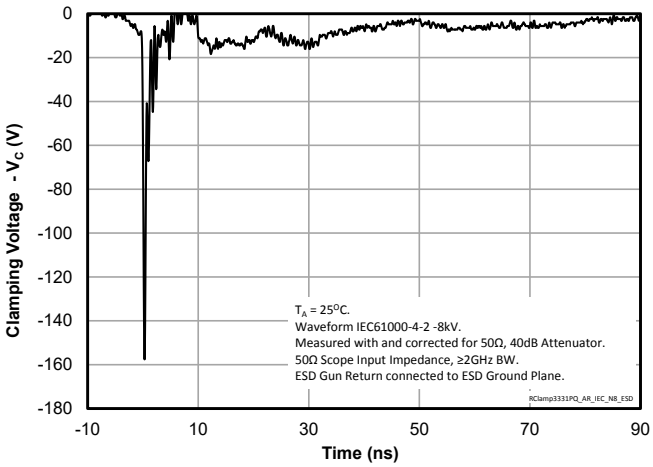
5) Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics

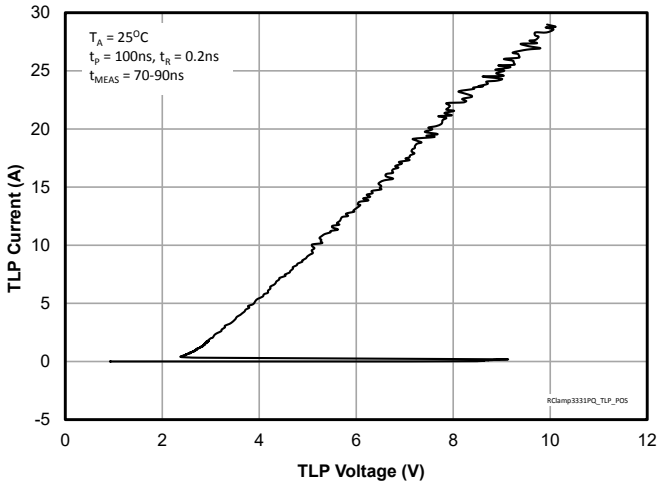
ESD Clamping (8kV Contact per IEC 61000-4-2)



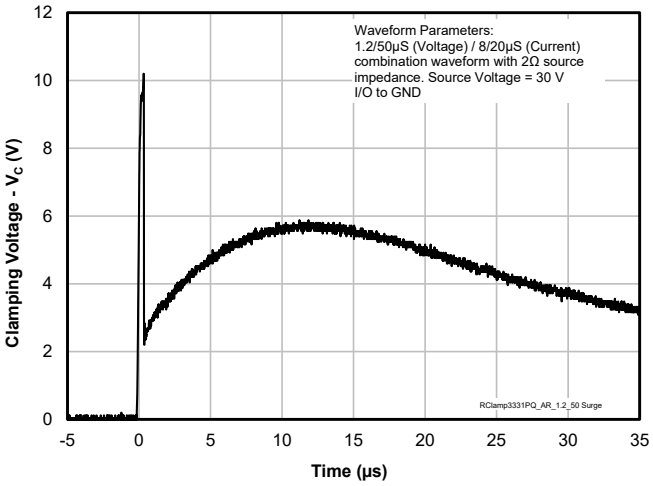
ESD Clamping (-8kV Contact per IEC 61000-4-2)



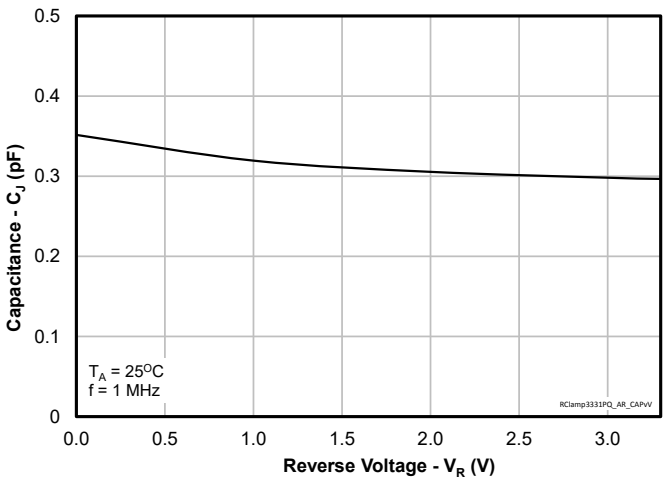
TLP Characteristic (Positive Pulse)



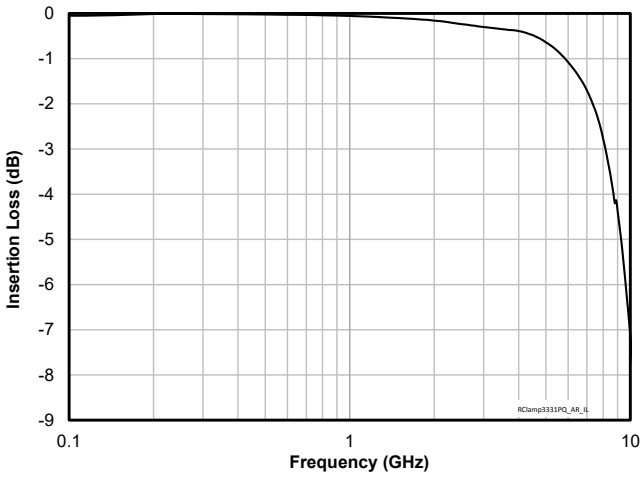
Clamping Characteristic (10A, Combination Waveform)



Capacitance vs. Reverse Voltage

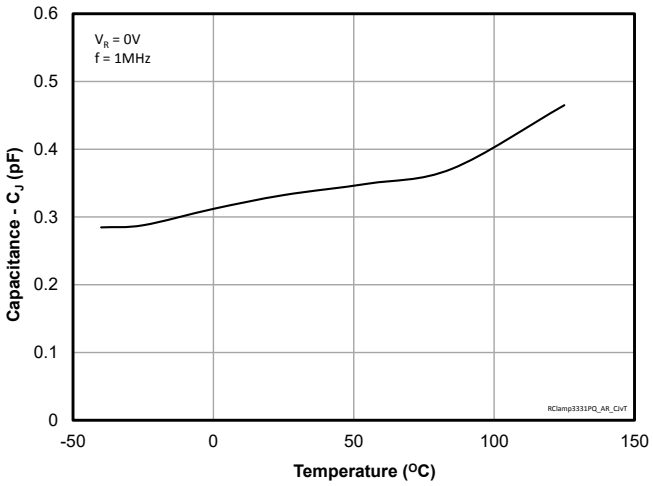


Insertion Loss - S21

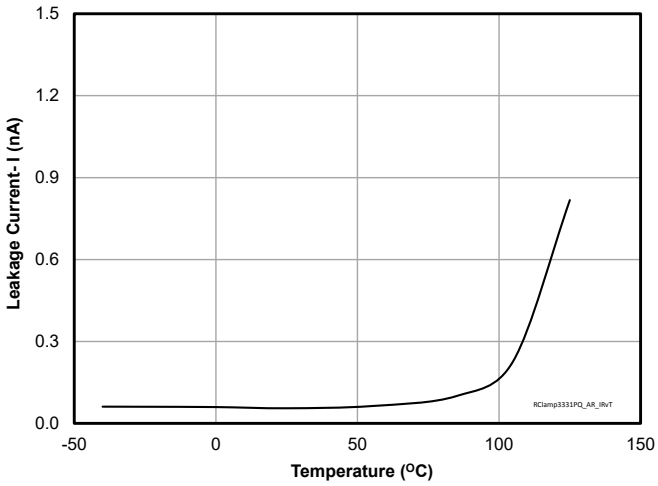


Typical Characteristics (Continued)

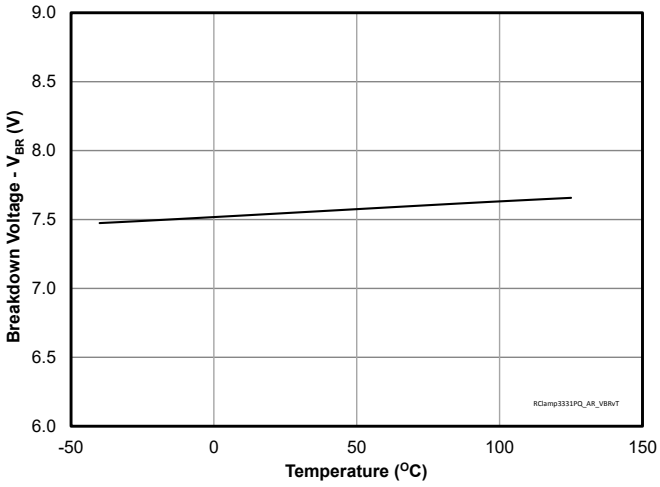
Capacitance vs. Temperature



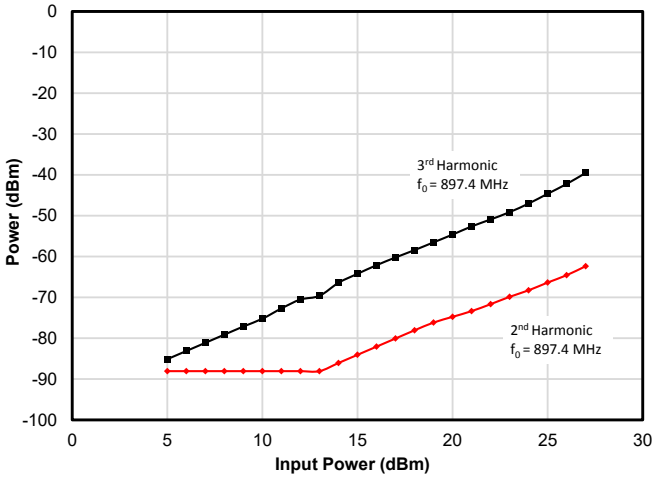
Leakage vs. Temperature



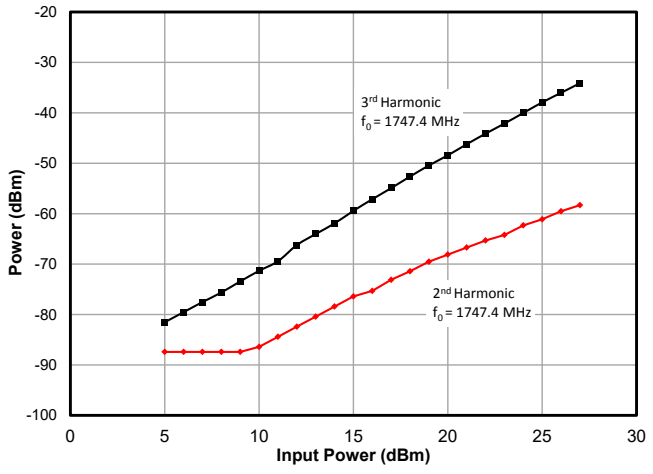
Breakdown Voltage vs. Temperature



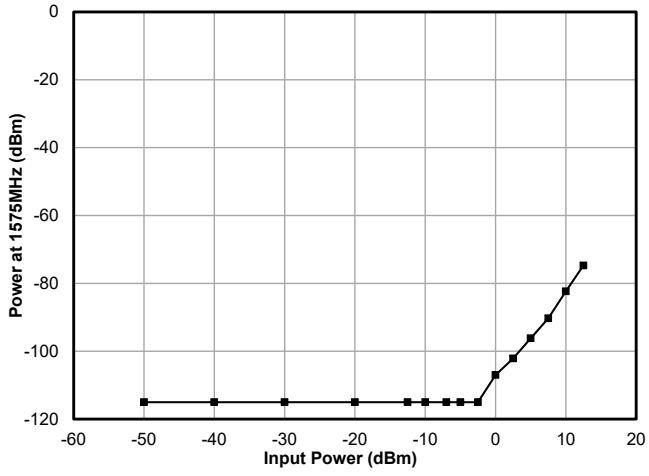
Harmonic Generation - GSM Low Band



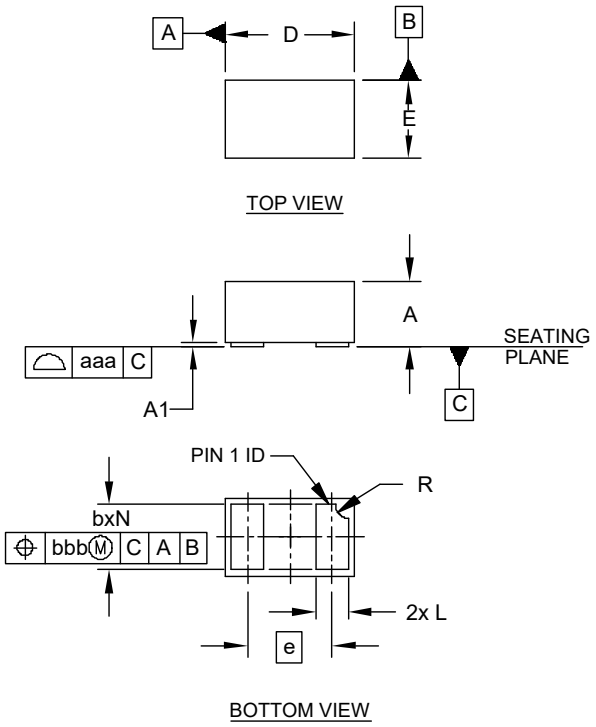
Harmonic Generation - GSM High Band



Intermodulation Distortion (Input: 760MHz + 815 MHz)



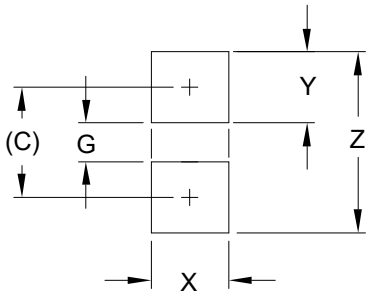
Outline Drawing - SLP1006P2



DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.47	0.50	0.53
A1	0.00	0.03	0.05
b	0.45	0.50	0.55
D	0.95	1.00	1.05
E	0.55	0.60	0.65
e	0.65 BSC		
L	0.20	0.25	0.30
R	0.05	0.10	0.15
N	2		
aaa	0.08		
bbb	0.10		

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

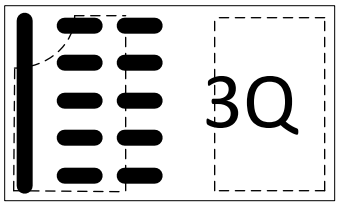
Land Pattern - SLP1006P2



DIMENSIONS	
DIM	MILLIMETERS
C	(0.85)
G	0.30
X	0.60
Y	0.55
Z	1.40

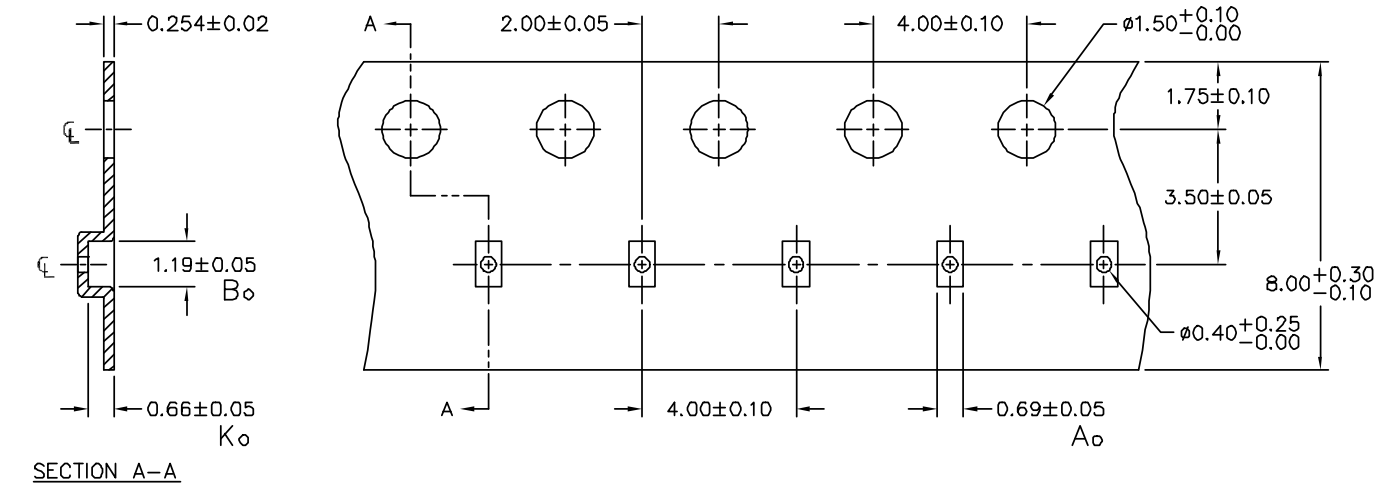
NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking

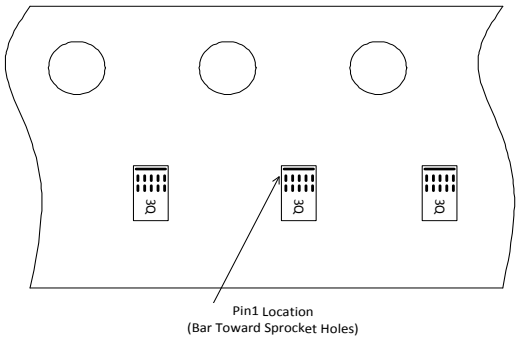


Notes:
1. Device is electrically symmetrical
2. Marking will also include line matrix date code
3. Bar indicates Pin 1 location

Tape and Reel Specification



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



Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp3331PQTCT	3,000	7″
RClamp is trademark of Semtech Corporation		

Contact Information

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