

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 ($t_p=8/20\mu s$). ESD characteristics are highlighted by high ESD withstand voltage ($\pm 30kV$ 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: $\pm 30kV$ (Air and Contact) per IEC 61000-4-2
- Ultra-small package
- Protects one line
- Low ESD clamping voltage
- Working voltage: $\pm 3.3V$
- 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

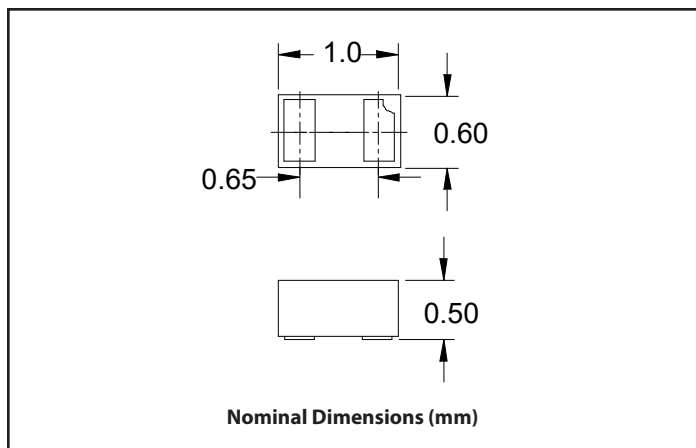
Mechanical Characteristics

- 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

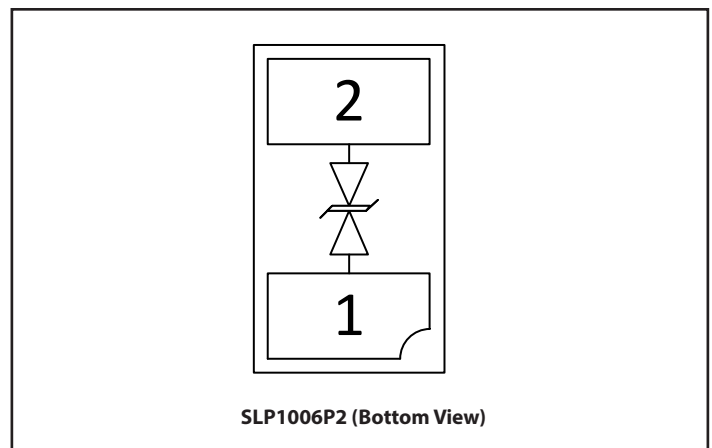
Applications

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

Package Dimension



Schematic & Pin Configuration



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	°C
Storage Temperature	T _{STG}	-55 to +150	°C

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

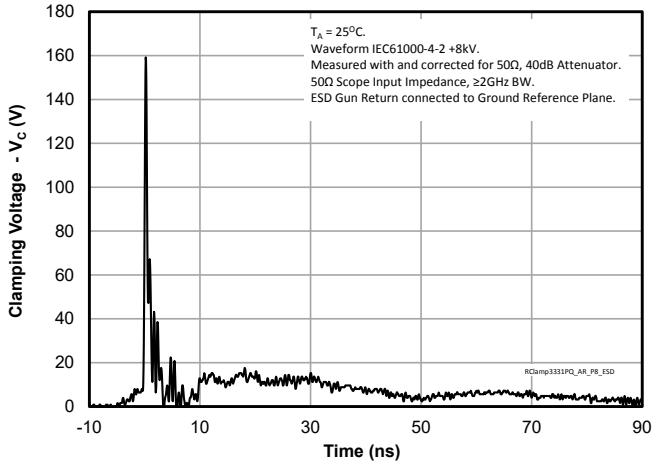
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V _{RWM}	T = -40 °C to +125 °C, Pin 1 to 2 or 2 to 1			3.3	V
Reverse Breakdown Voltage	V _{BR}	I _t = 1mA, Pin 1 to 2 or 2 to 1	6	7.6	11	V
Reverse Leakage Current	I _R	V _{RWM} = 3.3V, Pin 1 to 2 or 2 to 1			50	nA
Clamping Voltage 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:

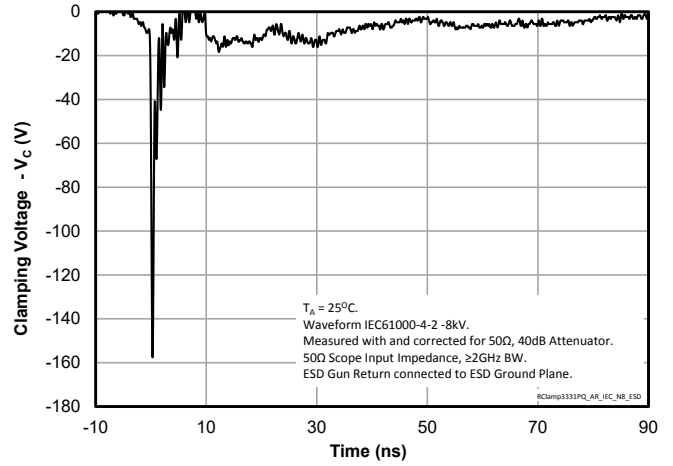
- ESD gun return path connected to ESD ground plane
- ESD gun return path to Horizontal Coupling Plane (HCP); Test conditions: a) 150pF/330pF, 330Ω; b) 150pF/330pF, 2kΩ
- Measured using a 1.2/50μs voltage, 8/20μs current combination waveform, R_s = 2 Ohms. Clamping is defined as the peak voltage across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

Typical Characteristics

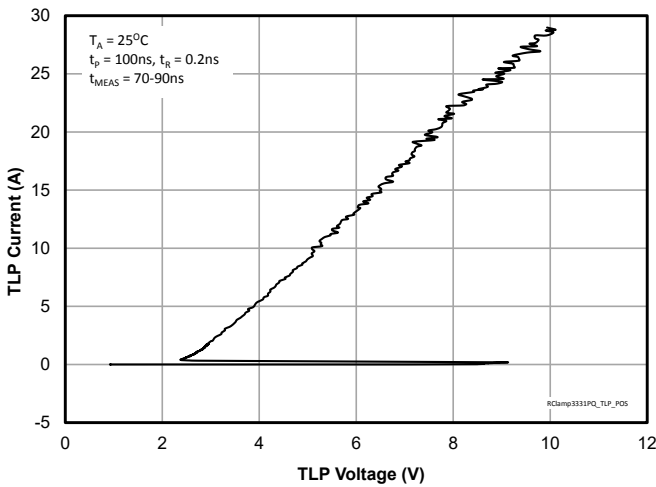
ESD Clamping (8kV Contact per IEC 61000-4-2)



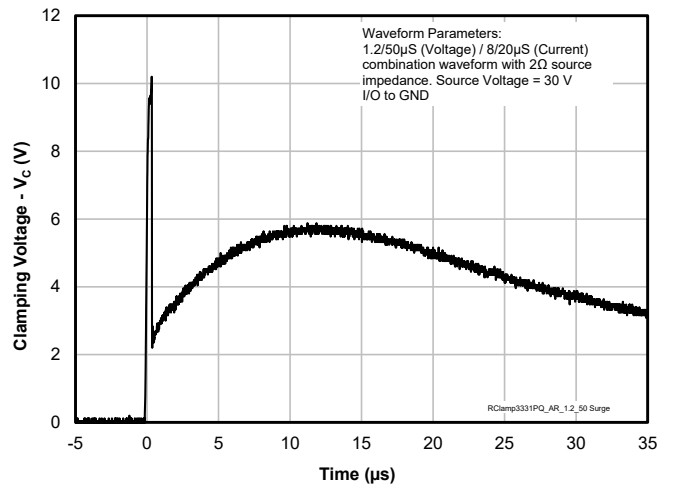
ESD Clamping (-8kV Contact per IEC 61000-4-2)



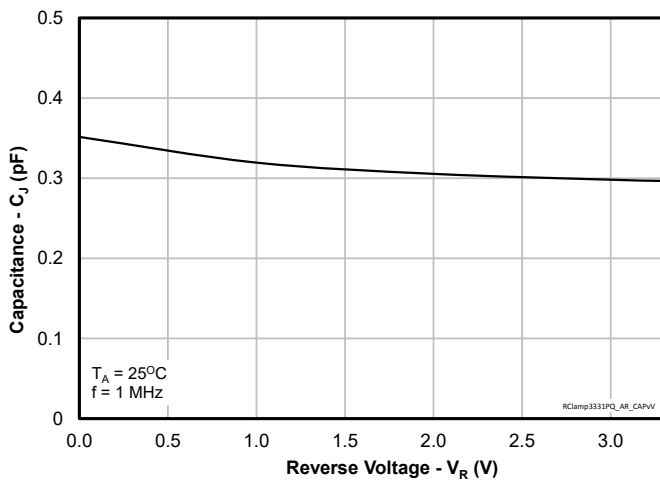
TLP Characteristic (Positive Pulse)



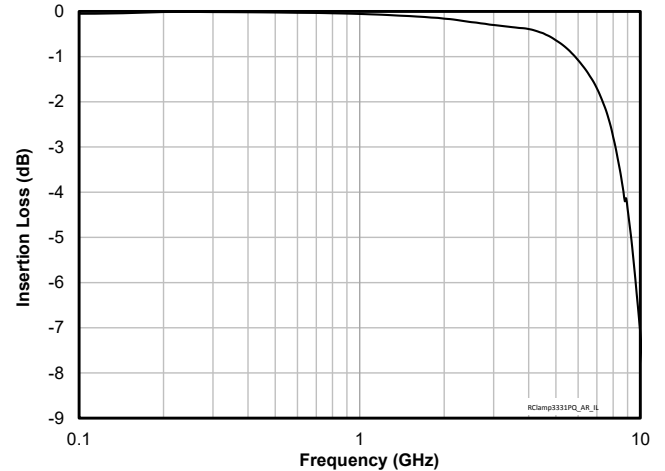
Clamping Characteristic (10A, Combination Waveform)



Capacitance vs. Reverse Voltage

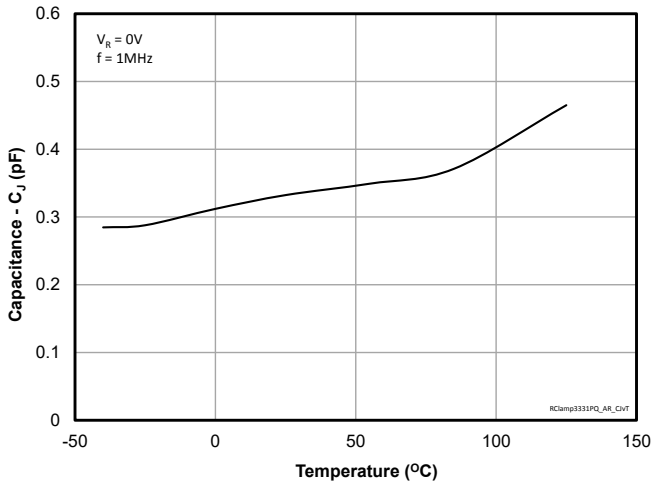


Insertion Loss - S21

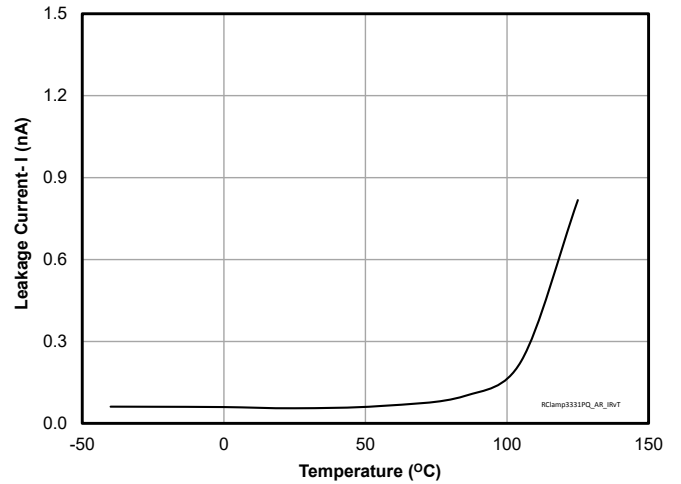


Typical Characteristics (Continued)

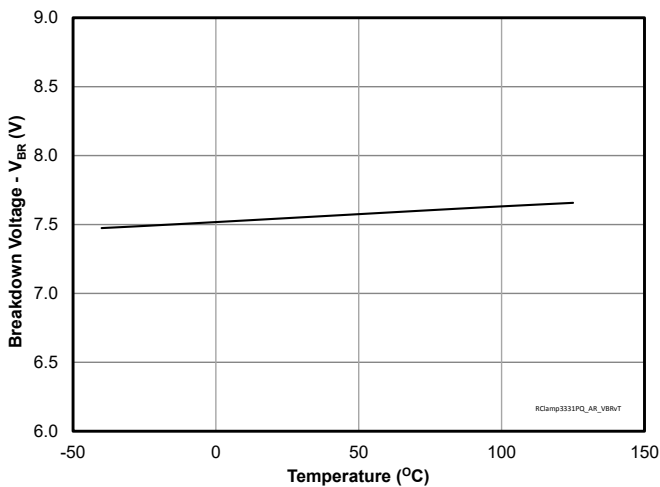
Capacitance vs. Temperature



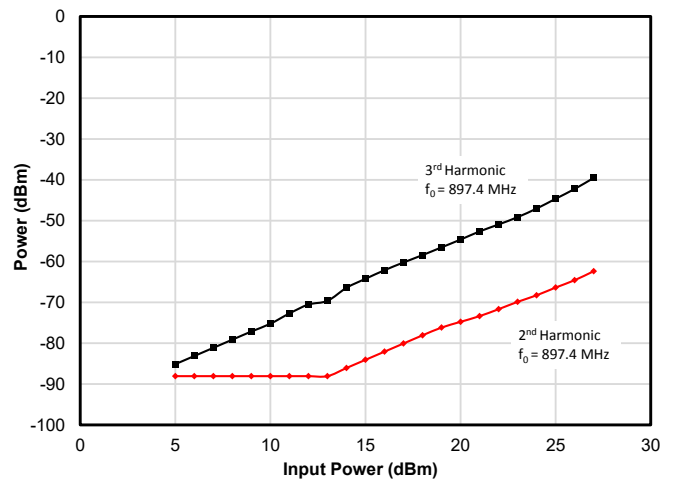
Leakage vs. Temperature



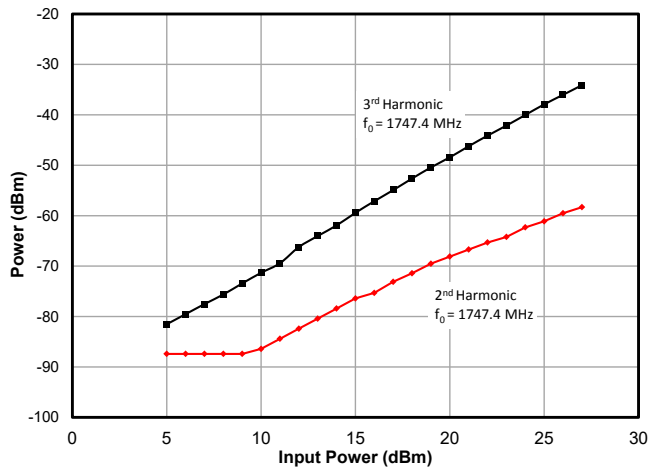
Breakdown Voltage vs. Temperature



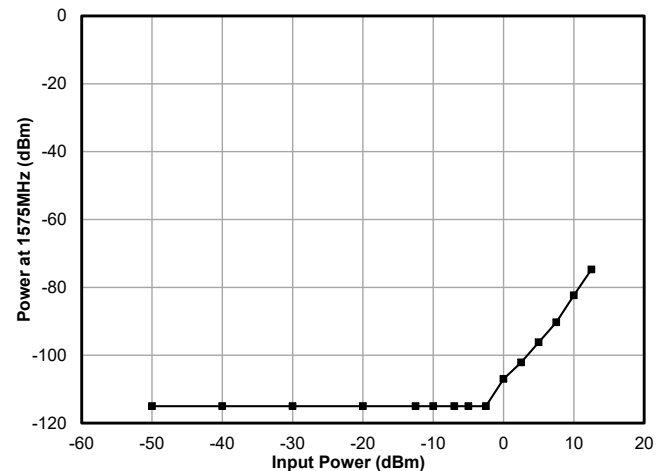
Harmonic Generation - GSM Low Band



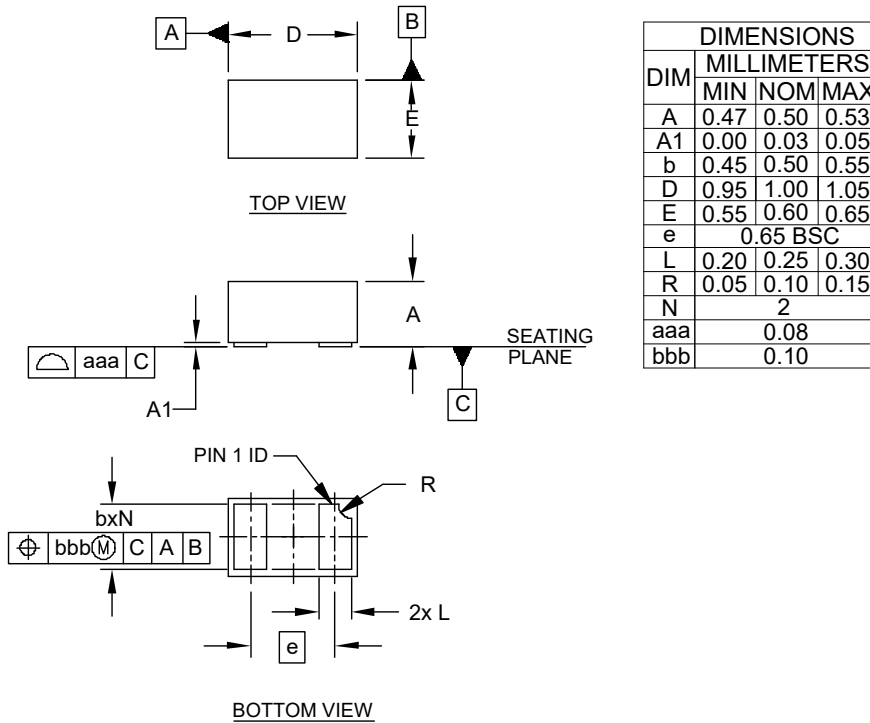
Harmonic Generation - GSM High Band



Intermodulation Distortion (Input: 760MHz + 815 MHz)



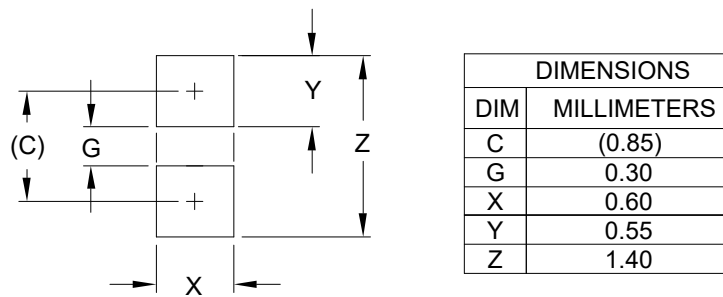
Outline Drawing - SLP1006P2



NOTES:

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

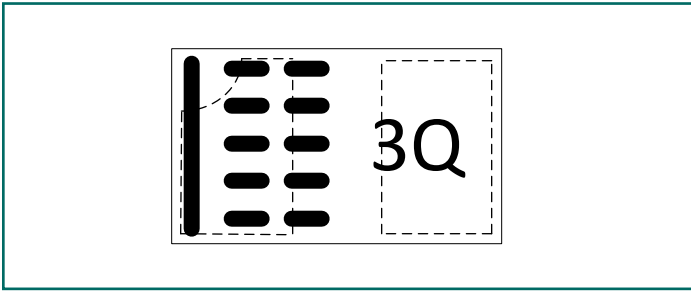
Land Pattern - SLP1006P2



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.

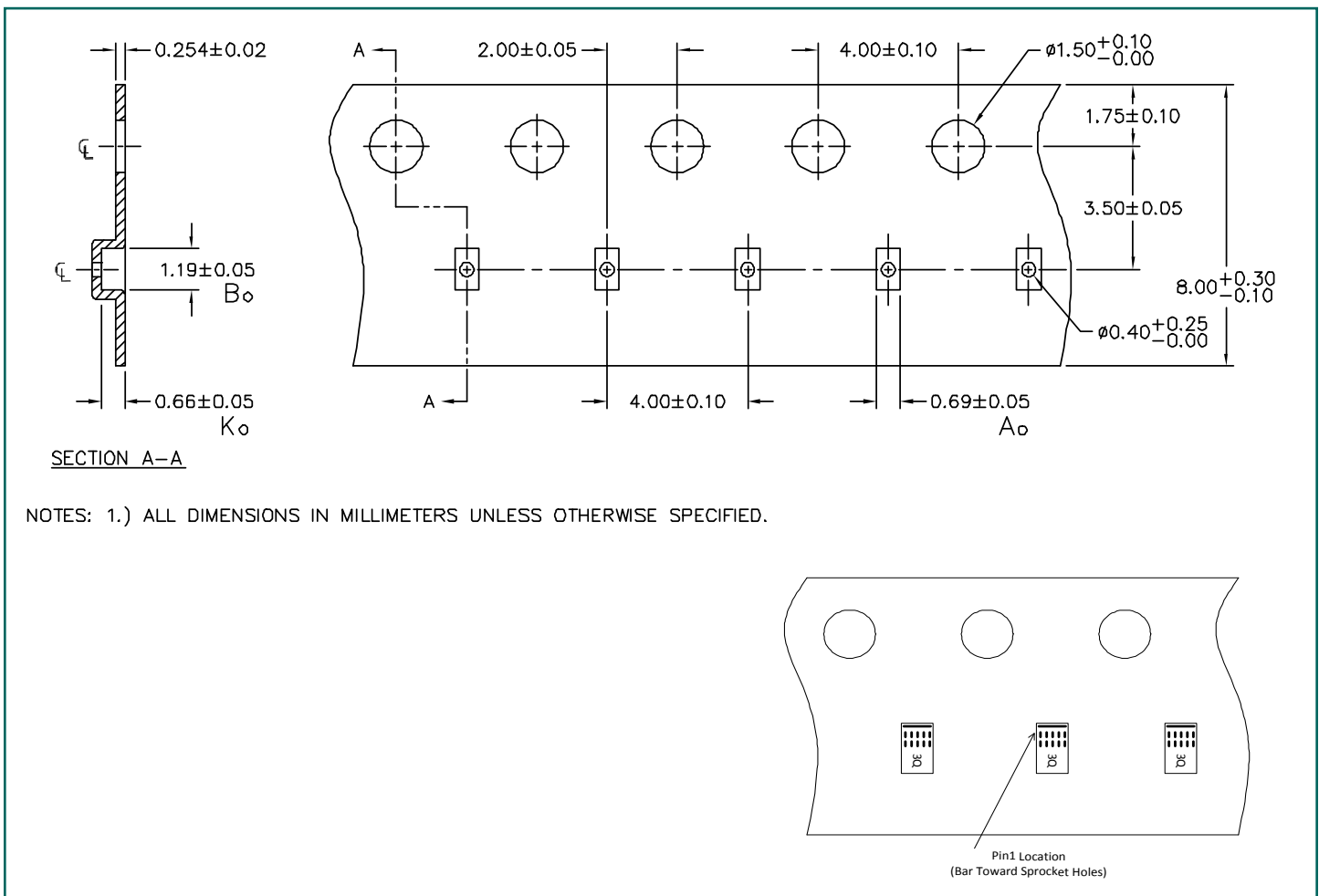
Marking



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



Ordering Information

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



IMPORTANT NOTICE

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Semtech assumes no liability for any errors in this document, or for the application or design described herein. Semtech reserves the right to make changes to the product or this document at any time without notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Semtech warrants performance of its products to the specifications applicable at the time of sale, and all sales are made in accordance with Semtech's standard terms and conditions of sale.

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR IN NUCLEAR APPLICATIONS IN WHICH THE FAILURE COULD BE REASONABLY EXPECTED TO RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Semtech products for any such unauthorized application, the customer shall indemnify and hold Semtech and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

The Semtech name and logo are registered trademarks of the Semtech Corporation. All other trademarks and trade names mentioned may be marks and names of Semtech or their respective companies. Semtech reserves the right to make changes to, or discontinue any products described in this document without further notice. Semtech makes no warranty, representation or guarantee, express or implied, regarding the suitability of its products for any particular purpose. All rights reserved.

© Semtech 2021

Contact Information

Semtech Corporation
200 Flynn Road, Camarillo, CA 93012
Phone: (805) 498-2111, Fax: (805) 498-3804
www.semtech.com