

Description

RClamp®1591P is a low capacitance ESD protection device specifically designed to protect high-speed lines for magnetic environments. It uses non-magnetic components which is critical in certain health diagnostic applications.

RClamp1591P offers desirable characteristics for board level protection including fast response time, low operating and low clamping voltage. The device features high surge capability of 20A ($t_p = 8/20 \mu s$) and a low capacitance of only 3pF (Maximum). Each device will protect one bidirectional data line operating up to 15 volts.

RClamp1591P is in a QFN 2.9 x 2.5 x 0.55mm 4-Lead package. Its package uses the same pin out and land pattern as SOT-143 for effortless drop-in replacement. The non-magnetic packaging makes this device ideal for use in MRI and diagnostic imaging applications.

Features

- ESD withstand voltage: $\pm 30kV$ (air), $\pm 30kV$ (contact) per IEC 61000-4-2
- High Surge Capability: 20A ($t_p = 8/20 \mu s$, $R_s = 2 \Omega$) per IEC 61000-4-5
- Low capacitance: 3pF (Maximum)
- Protects one high-speed data line
- Working voltage: $\pm 15V$
- Non-magnetic for MRI Applications
- Solid-state silicon-avalanche technology

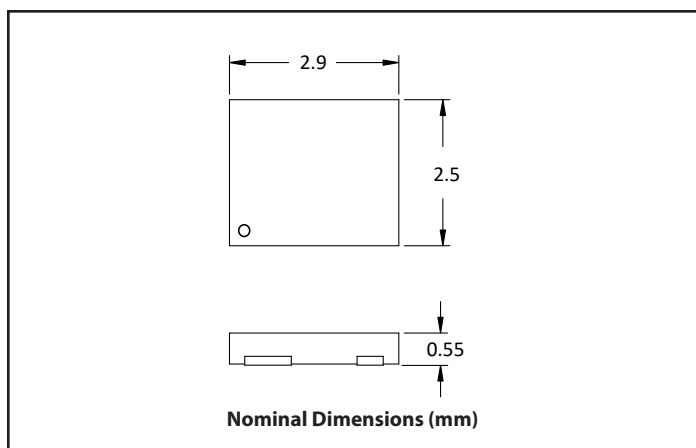
Mechanical Characteristics

- Package: QFN 2.9 x 2.5 x 0.55mm 4-Lead
- Interchangeable with SOT-143
- Pb-free, Halogen Free, RoHS/WEEE compliant
- Lead Finish: Pb-free
- Marking: Marking code
- Packaging: Tape and Reel

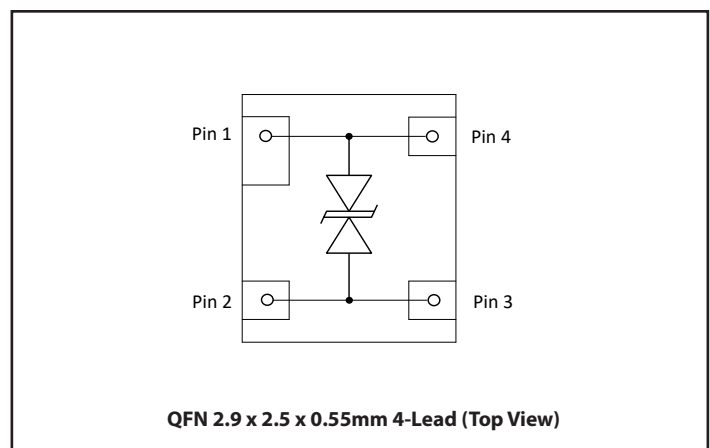
Applications

- MRI Applications
- Ethernet
- RS 485
- RS 232
- USB 2.0

Package Dimension



Schematic & Pin Configuration



Absolute Maximum Rating

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	660	W
Peak Pulse Current ($t_p = 8/20\mu s$)	I_{PP}	20	A
ESD per IEC 61000-4-2 (Air) ⁽¹⁾ ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	V_{ESD}	± 30 ± 30	kV
Operating Temperature	T_{OP}	-40 to +125	°C
Junction Temperature and Storage Temperature	T_J & T_{STG}	-55 to +150	°C

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

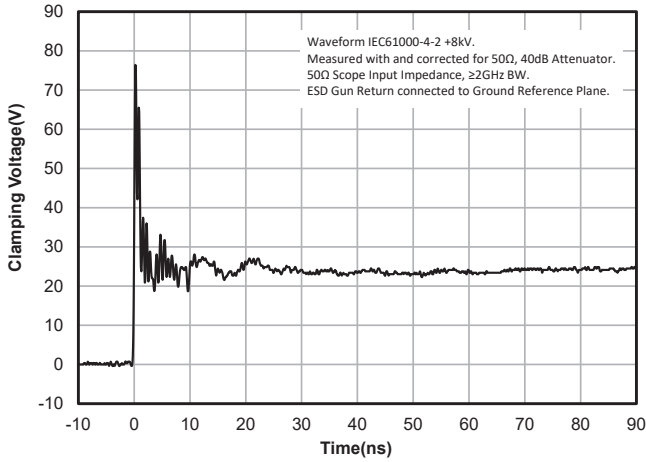
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	Pin 1 to 2 or Pin 2 to 1			15	V
Reverse Breakdown Voltage	V_{BR}	$I_T = 1mA$	16.7	18.3		V
Reverse Leakage Current	I_R	$V_{RWM} = 15V$			1	μA
Clamping Voltage ⁽²⁾	V_C	$t_p = 1.2/50\mu s$ (Voltage), $8/20\mu s$ (Current) Combination Waveform	$I_{PP} = 1A$	18.9	24	V
			$I_{PP} = 20A$	27	33	V
ESD Clamping Voltage ⁽³⁾	V_C	$t_p = 0.2/100ns$ (TLP)	$I_{TLP} = 4A$	20.5		V
			$I_{TLP} = 16A$	22.9		
Dynamic Resistance ^{(3),(4)}	R_{DYN}	$t_p = 0.2/100ns$		0.20		Ω
Junction Capacitance	C_J	$V_R = 0V, f = 1MHz$		1.3	3	pF

Notes:

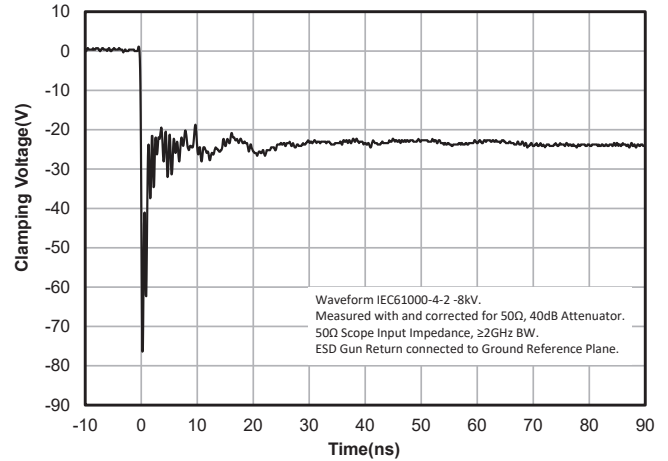
- ESD gun return path connected to ESD ground plane
- Measured using a $1.2/50\mu s$ voltage, $8/20\mu s$ current combination waveform, $R_s = 2\Omega$. Clamping is defined as the peak voltage across the device after the device snaps back to a conducting state.
- Transmission Line Pulse Test (TLP) Settings: $t_p = 100ns$, $t_r = 0.2ns$, I_{TLP} and V_{TLP} averaging window: $t_1 = 70ns$ to $t_2 = 90ns$.
- Dynamic resistance calculated from $I_{TLP} = 4A$ to $I_{TLP} = 16A$

Typical Characteristics

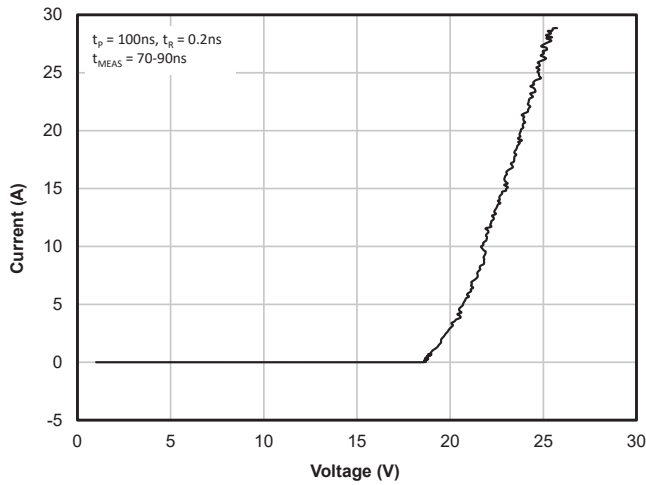
ESD Clamping (+8kV Contact per IEC 61000-4-2)



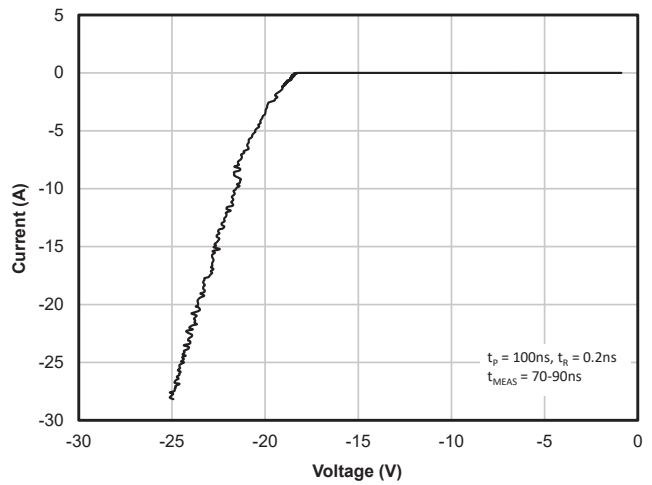
ESD Clamping (-8kV Contact per IEC 61000-4-2)



TLP Characteristic (Positive Pulse)

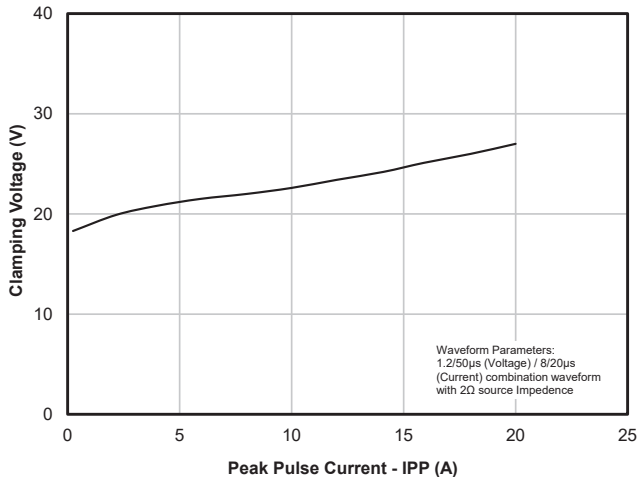


TLP Characteristic (Negative Pulse)

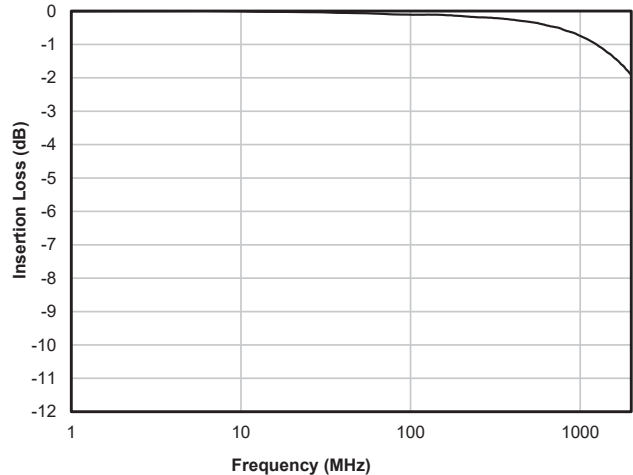


Clamping Characteristic

$I_{PP} = 20\text{A}$, $t_p = 1.2/50\mu\text{s}$, 8/20μs Combination Waveform

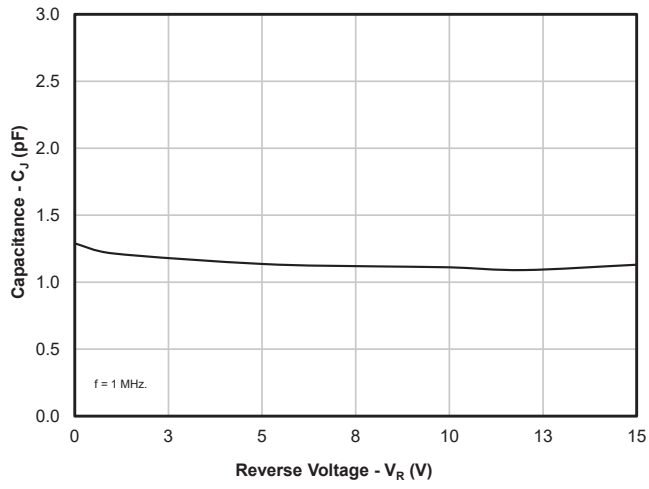


Insertion Loss - S21

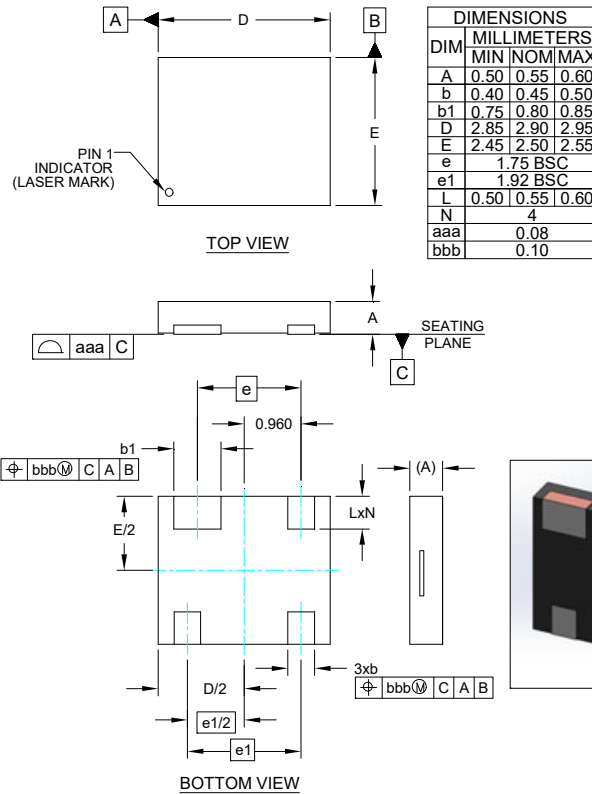


Typical Characteristics

Capacitance vs. Reverse Voltage

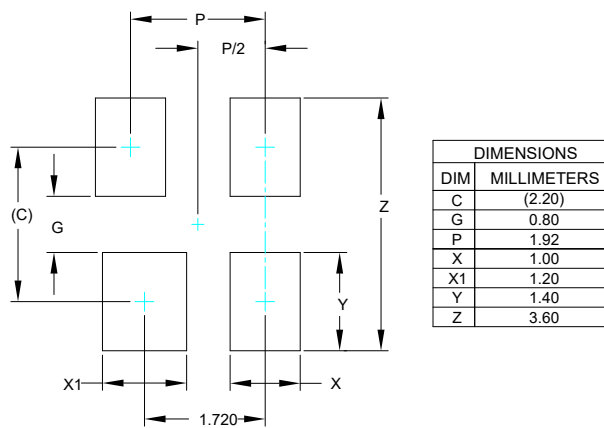


Outline Drawing - QFN 2.9 x 2.5 x 0.55mm 4-Lead



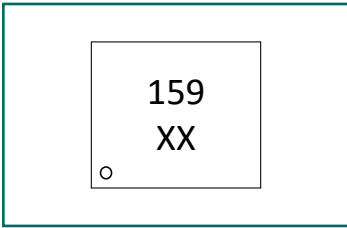
NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

Land Pattern - QFN 2.9 x 2.5 x 0.55mm 4-Lead



NOTES:
1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.
2. COMPONENT MEETS JEDEC REFLOW PROFILE FOR PB FREE.

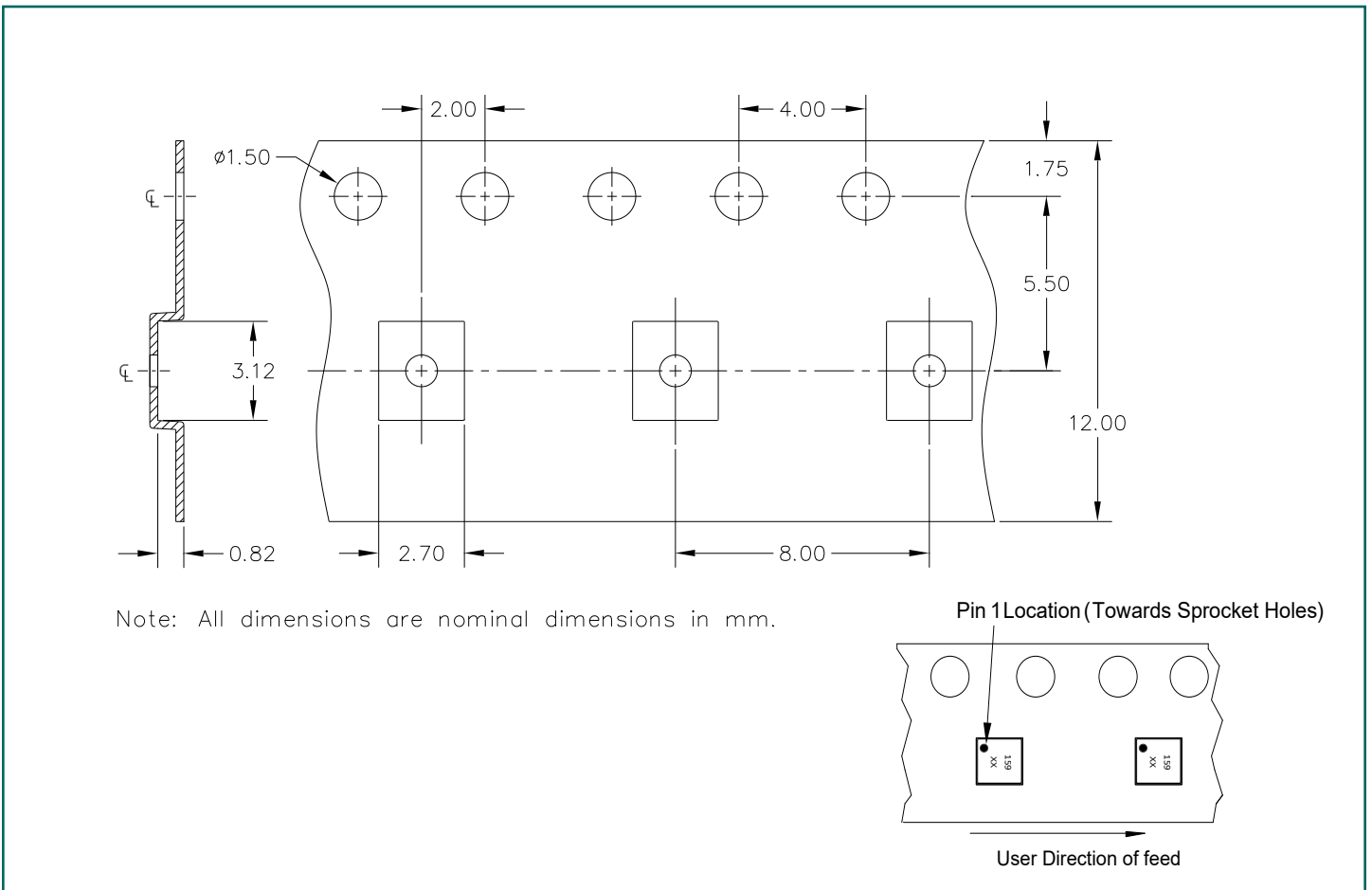
Marking



Notes:

- 1. Dot indicates Pin 1 location.
- 2. XX = Date Code.

Tape and Reel Specification



Ordering Information

Part Number	Qty per Reel	Reel Size
RClamp1591P.L	3,000	13"
RClamp is trademark of Semtech Corporation.		



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