

Description

RClamp03348P provides low-voltage ESD protection for up to eight lines on high-speed ports. RClamp03348P is designed to minimize both ESD peak clamping and TLP clamping voltage. The maximum capacitance of RClamp03348P on each line to ground is only 0.65pF; this allows RClamp03348P to be used in applications operating at more than 5GHz without signal attenuation.

The RClamp03348P is in a 9-pin DFN 3.80 x 1.00 x 0.50 mm 9-Lead package. The intra-pair lead pitch is 0.40mm. Innovative flow-through package design simplifies PCB layout and allows matched trace lengths for consistent impedance between high-speed differential lines.

Applications

- V-By-One
- LVDS
- eDP
- MHL
- eSATA

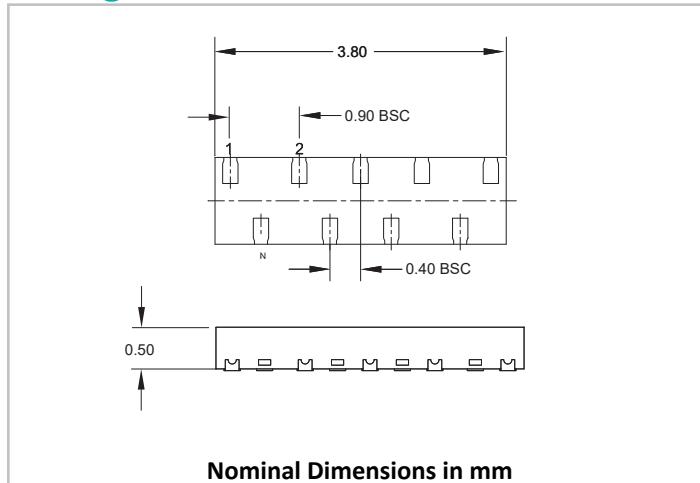
Features

- Transient protection for high-speed data lines to
- IEC 61000-4-2 (ESD): $\pm 14\text{kV}$ (Contact), $\pm 16\text{kV}$ (Air)
- IEC 61000-4-5 (Lightning): 3.8A (8/20 μs)
- Package design optimized for high speed lines
- Protects eight high-speed data lines
- Low ESD clamping voltage
- Working voltage: 3.3V
- Low capacitance: 0.65pF max (I/O to GND)
- Low dynamic resistance: 0.42 Ω typical (I/O to GND)
- Solid-state silicon-avalanche technology

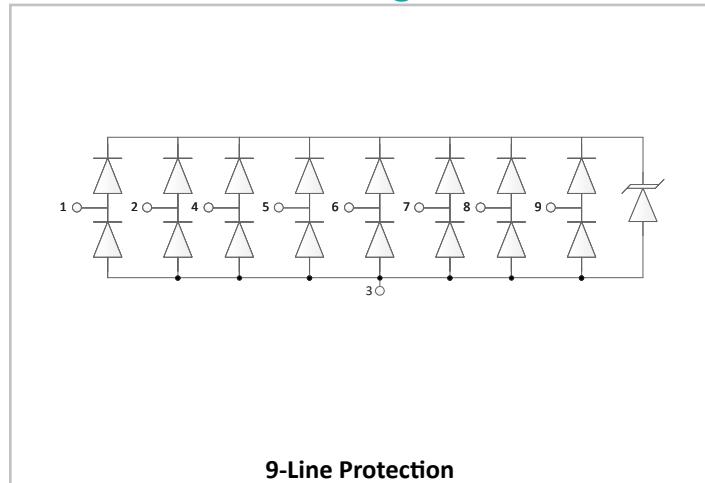
Mechanical Characteristics

- Package: DFN 3.80 x 1.00 x 0.50 mm 9-Lead
- Lead Pitch: 0.40mm (intra-pair)
- Pb-Free, Halogen Free, RoHS/WEEE compliant
- Lead Finish: Pb-free
- Molding Compound Flammability Rating: UL 94V-0
- Marking: Marking Code + Data Code
- Packaging: Tape and Reel

Package Dimension



Schematic and Pin Configuration



Absolute Maximum Rating

RATING	SYMBOL	VALUE	UNITS
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	36	W
Peak Pulse Current ($t_p = 8/20\mu s$)	I_{PP}	3.8	A
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	V_{ESD}	± 14	kV
ESD per IEC 61000-4-2 (Air) ⁽¹⁾		± 16	
Operating Temperature	T_{OP}	-55 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Electrical Characteristics

T=25°C unless otherwise specified

All measurements from any I/O to ground

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				3.3	V
Punch-Through Voltage	V_{PT}	$I_{PT} = 2\mu A$	3.8	4.9	6	V
Reverse Leakage Current	I_R	$V_{RWM} = 3.3V$	5	100	nA	
Clamping Voltage	V_C	$I_{PP} = 1A, t_p = 8/20 \mu s$	5.8	7		V
		$I_{PP} = 3.8A, t_p = 8/20 \mu s$	6.8	9		
ESD Clamping Voltage ⁽²⁾	V_C	$I_{TLP} = 16A, t_p = 0.2/100ns (TLP)$	12.2			V
		$I_{TLP} = -16A, t_p = 0.2/100ns (TLP)$	5.8			
Dynamic Resistance ^{(2),(3)}	R_{DYN}	$t_p = 0.2/100ns (TLP), I/O to GND$	0.42			Ω
		$t_p = 0.2/100ns (TLP), GND to I/O$	0.29			
Junction Capacitance	C_J	$V_R = 0V, f = 1MHz, I/O to GND$	0.49	0.65		pF
		$V_R = 0V, f = 1MHz, \text{between I/O pins}$	0.20	0.40		

Notes:

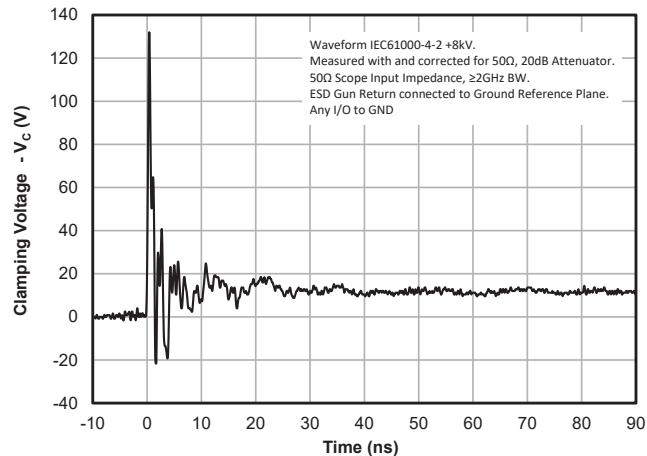
(1): ESD gun return path connected to Ground Reference Plane (GRP).

(2): Transmission Line Pulse Test (TLP) Settings: $t_p = 100ns$, $t_r = 0.2ns$, I_{TLP} and V_{TLP} averaging window: $t_1 = 70ns$ to $t_2 = 90ns$.

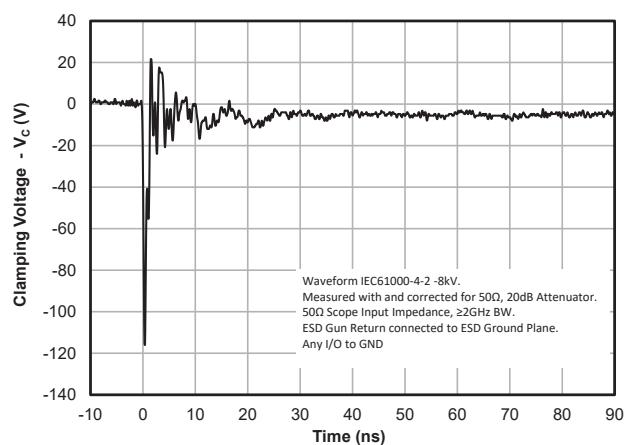
(3): Dynamic resistance calculated from $I_{TLP} = 4A$ to $I_{TLP} = 16A$.

Typical Characteristics

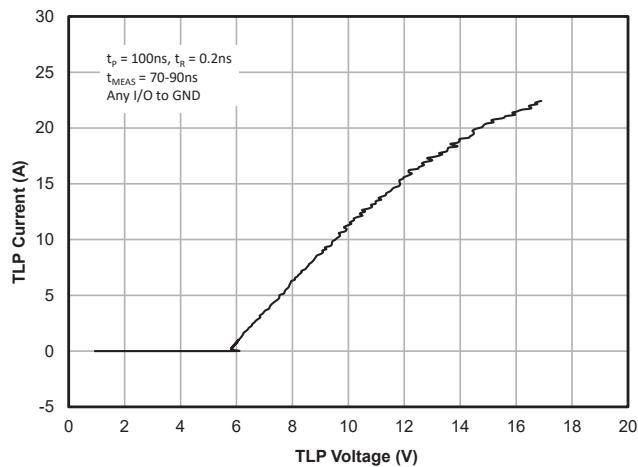
ESD Clamping (8kV Contact per IEC 61000-4-2)



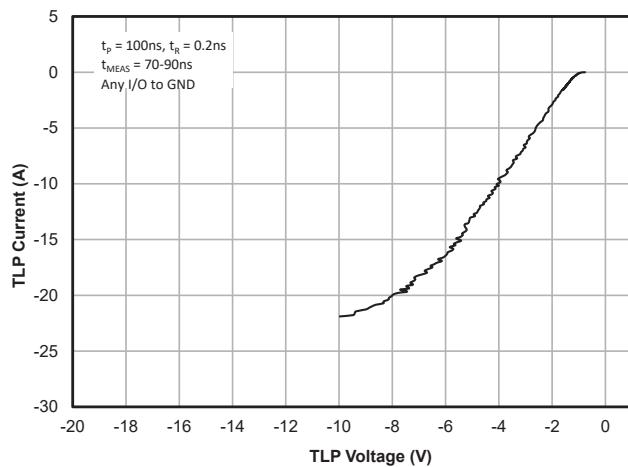
ESD Clamping (-8kV Contact per IEC 61000-4-2)



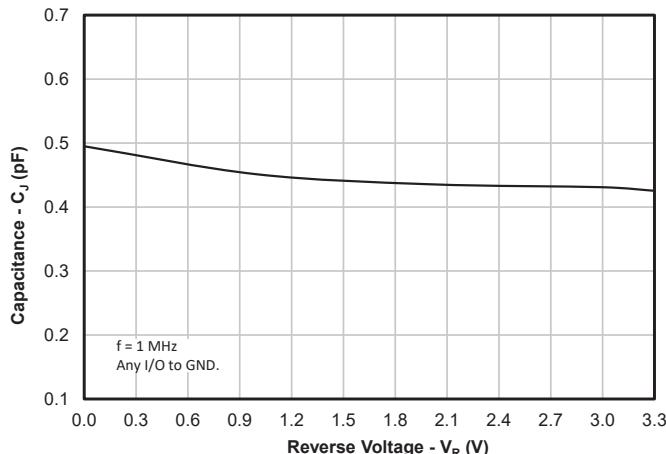
TLP Characteristics (Positive Pulse)



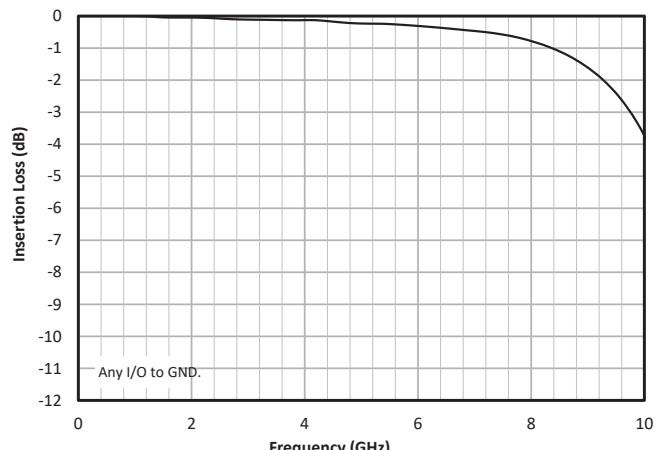
TLP Characteristics (Negative Pulse)



Capacitance vs. Reverse Voltage



Insertion Loss - S21



Applications Information

Assembly Guidelines

The figure at the right details Semtech's recommended mounting pattern. Recommended assembly guidelines are shown in Table 2. Note that these are only recommendations and should serve only as a starting point for design since there are many factors that affect the assembly process. Exact manufacturing parameters will require some experimentation to get the desired solder application. Semtech's recommended mounting pattern is based on the following design guidelines:

Land Pattern

The recommended land pattern follows IPC standards and is designed for maximum solder coverage. Detailed dimensions are shown elsewhere in this document.

Solder Stencil

Stencil design is one of the key factors which will determine the volume of solder paste which is deposited onto the land pad. The area ratio of the stencil aperture will determine how well the stencil will print. The area ratio takes into account the aperture shape, aperture size, and stencil thickness. A minimum area ratio of 0.66 is preferred for the subject package. The area ratio of a rectangular aperture is given as:

$$\text{Area Ratio} = (L * W) / (2 * (L + W) * T)$$

Where:

L = Aperture Length

W = Aperture Width

T = Stencil Thickness

Semtech recommends a stencil thickness of 0.100mm for this device. The stencil should be laser cut with electro-polished finish. The stencil should have a positive taper of approximately 5 degrees. Electro polishing and tapering the walls results in reduced surface friction and better paste release. Due to the small aperture size, a solder paste with Type 4 or smaller particles are recommended. Assuming a 100 μ m thick stencil, the aperture dimensions shown will yield an area ratio of approximately 0.92.

Recommended Stencil Design

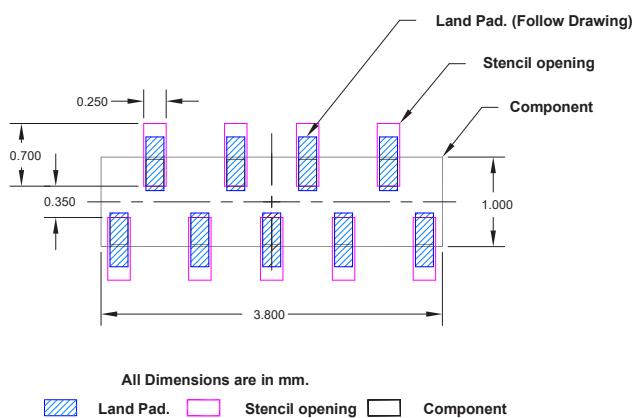
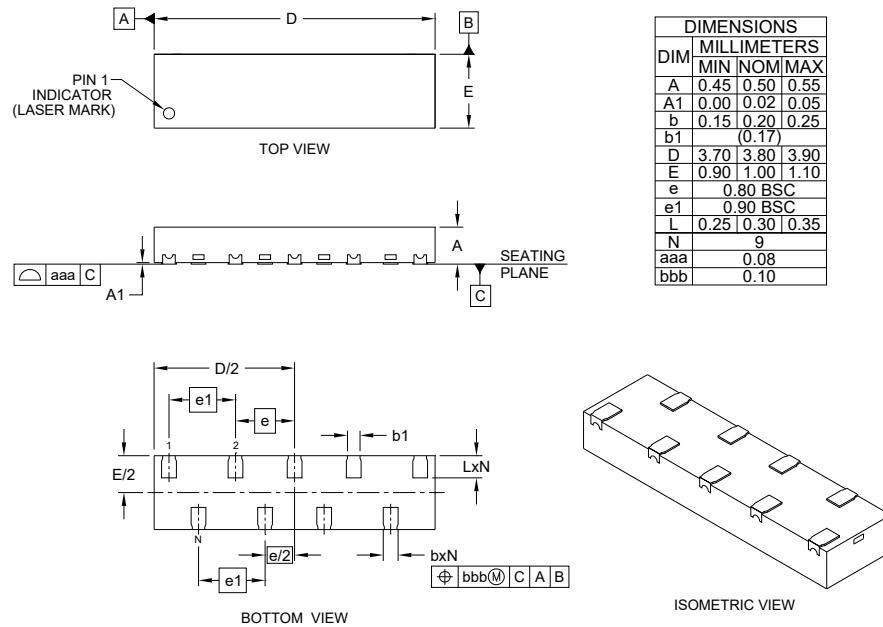


Table 2 - Assembly Guidelines

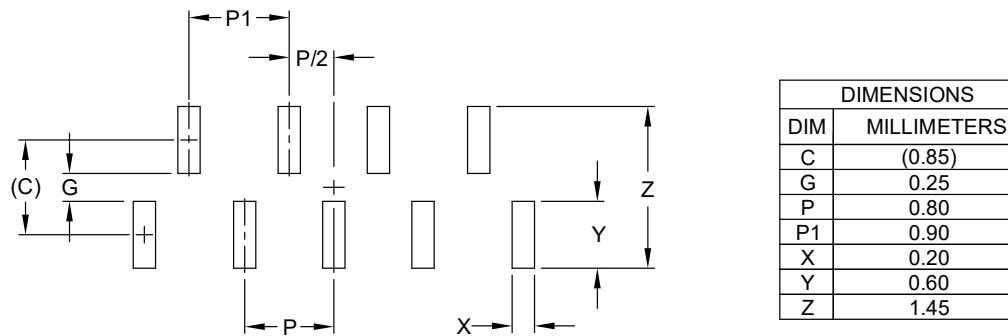
Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular
Solder Stencil Thickness	0.100mm (0.004")
Solder Paste Type	Type 4 Size Sphere or Smaller
Solder Reflow Profile	Per JEDEC J-STD-020
PCB Solder Pad Design	Non Solder Mask Defined
PCB Pad Finish	OSP or NiAu

Outline Drawing - DFN 3.80 x 1.00 x 0.50mm 9-Lead



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

Landing Pattern - DFN 3.80 x 1.00 x 0.50mm 9-Lead



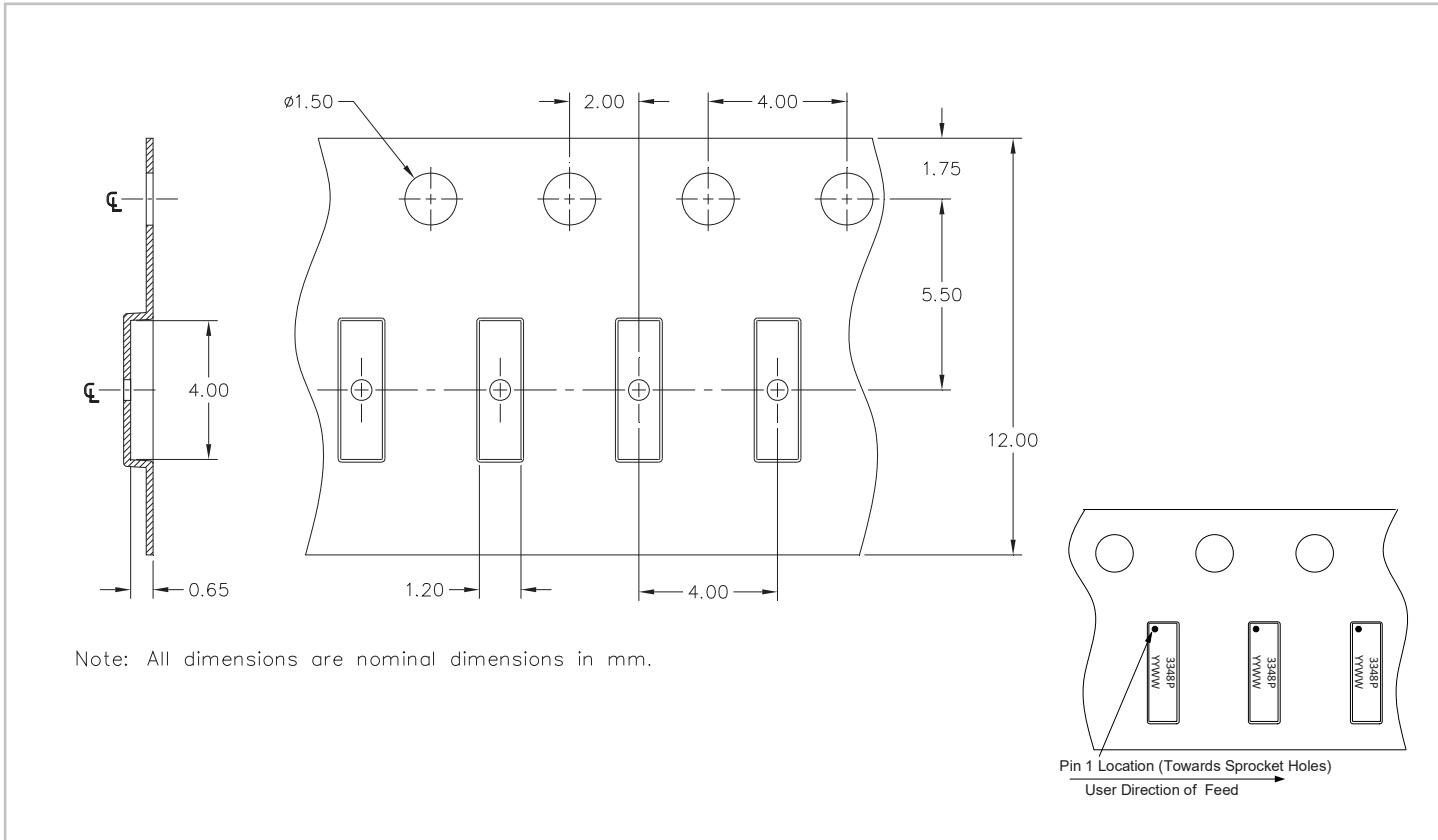
NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY.
CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR
COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code



Note: Dot indicates pin 1 location.

Tape and Reel Specification (4mm Pitch)



Order Information

PART NUMBER	QTY PER REEL	MATERIAL	REEL SIZE
RClamp03348P.C	3,000	Plastic	7"

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Datasheet Identification	Product Status	Definition
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