

Description

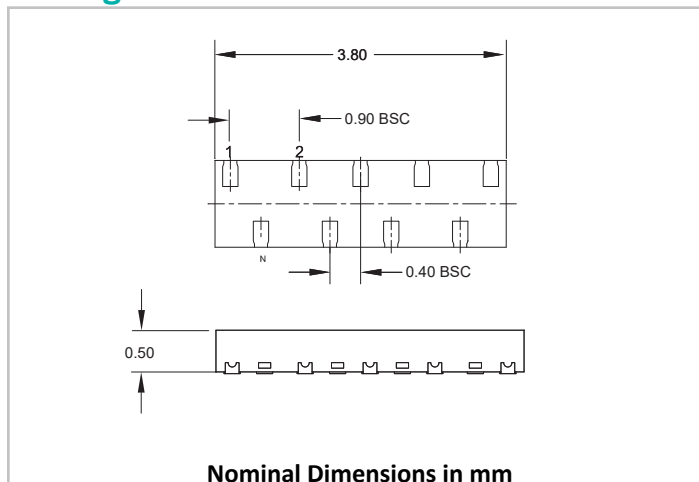
RClamp03348P provides low-voltage ESD protection for up to eight lines on high-speed ports. RClamp03348P is designed to minimize both ESD peak clamping and TLP clamping voltage. The maximum capacitance of RClamp03348P on each line to ground is only 0.65pF; this allows RClamp03348P to be used in applications 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

Package Dimension



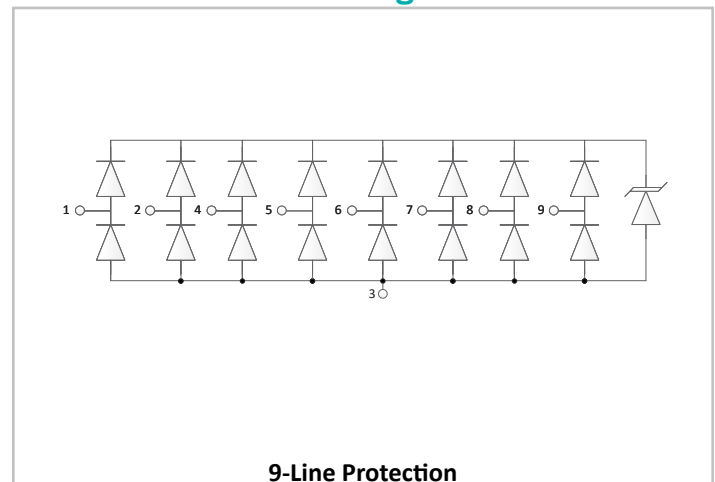
Features

- 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

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 |
| | | $V_R = 0V, f = 1MHz$, between I/O pins | | 0.20 | 0.40 | |

Notes:

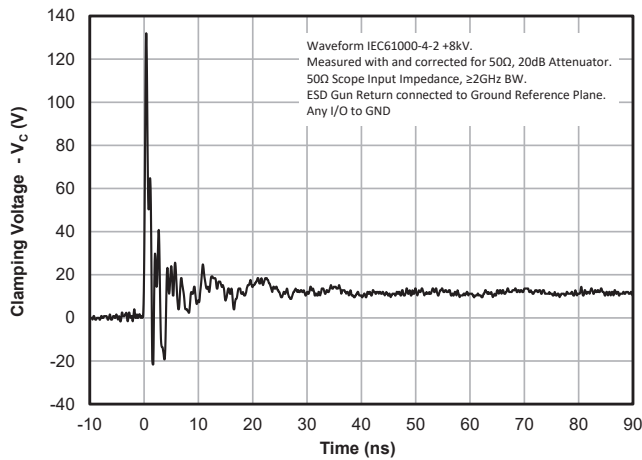
(1): ESD gun return path connected to Ground Reference Plane (GRP).

(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 $t_2 = 90ns$.

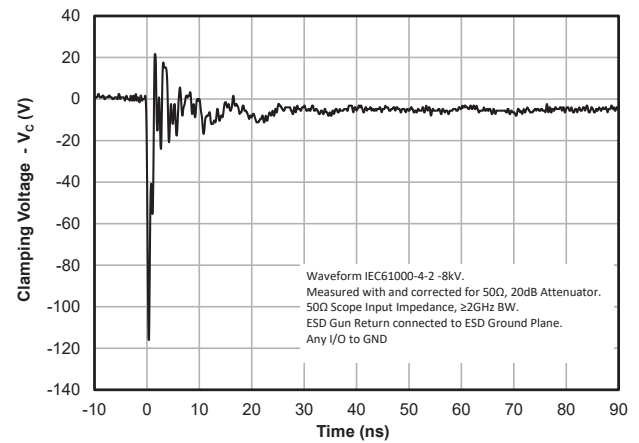
(3): Dynamic resistance calculated from $I_{TLP} = 4A$ to $I_{TLP} = 16A$.

Typical Characteristics

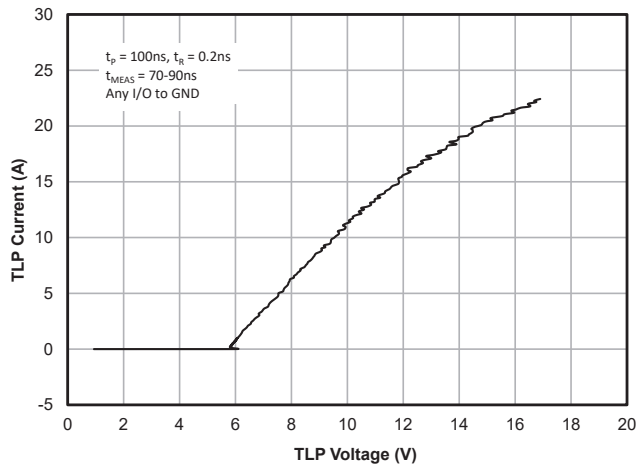
ESD Clamping (8kV Contact per IEC 61000-4-2)



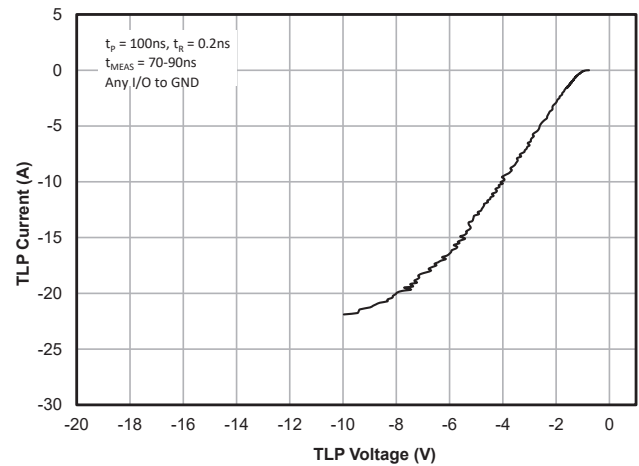
ESD Clamping (-8kV Contact per IEC 61000-4-2)



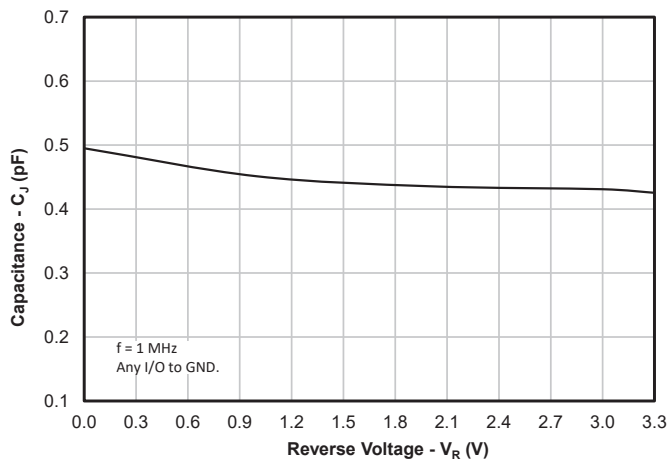
TLP Characteristics (Positive Pulse)



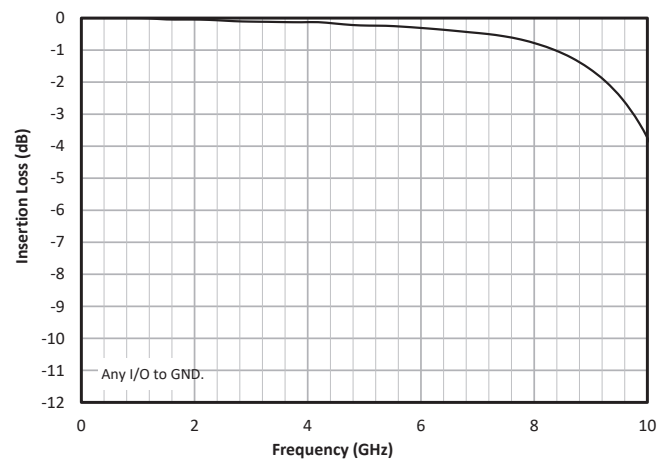
TLP Characteristics (Negative Pulse)



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 100µm thick stencil, the aperture dimensions shown will yield an area ratio of approximately 0.92.

Recommended Stencil Design

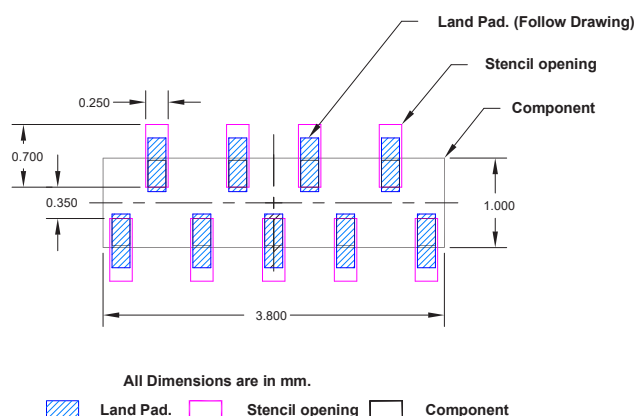
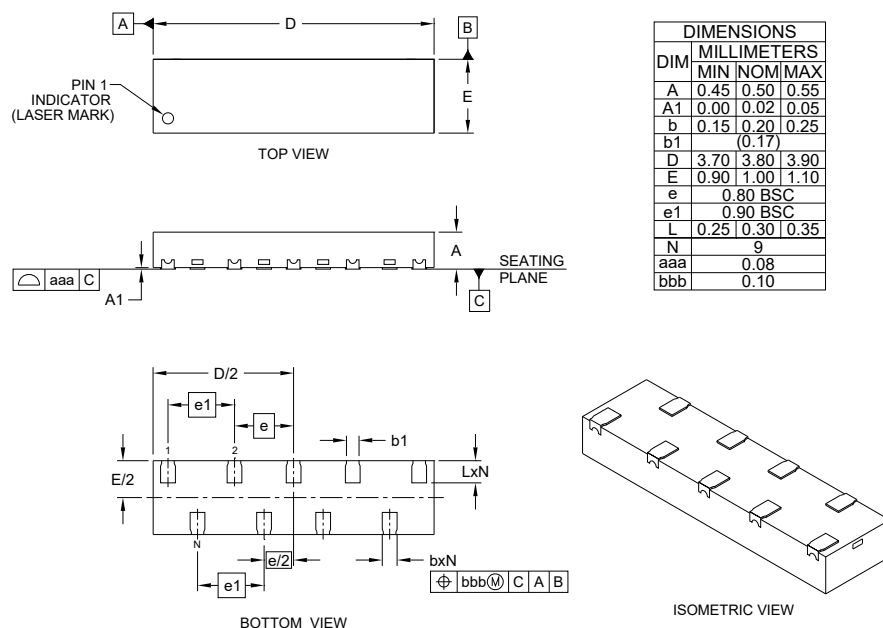


Table 2 - Assembly Guidelines

| 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 |

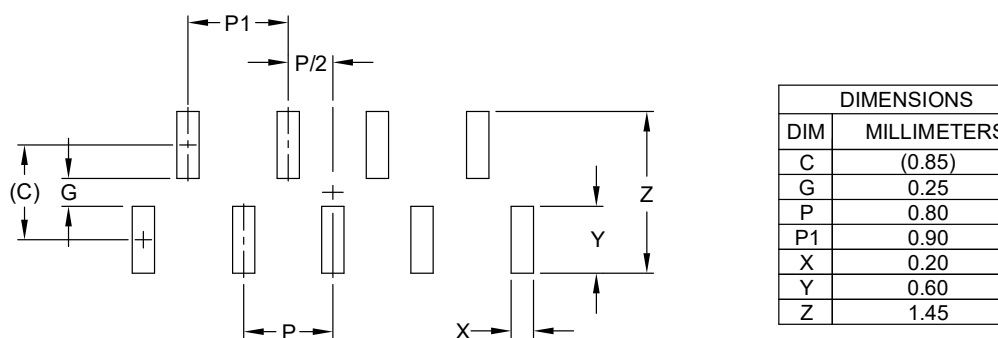
Outline Drawing - DFN 3.80 x 1.00 x 0.50mm 9-Lead



NOTES:

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

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



NOTES:

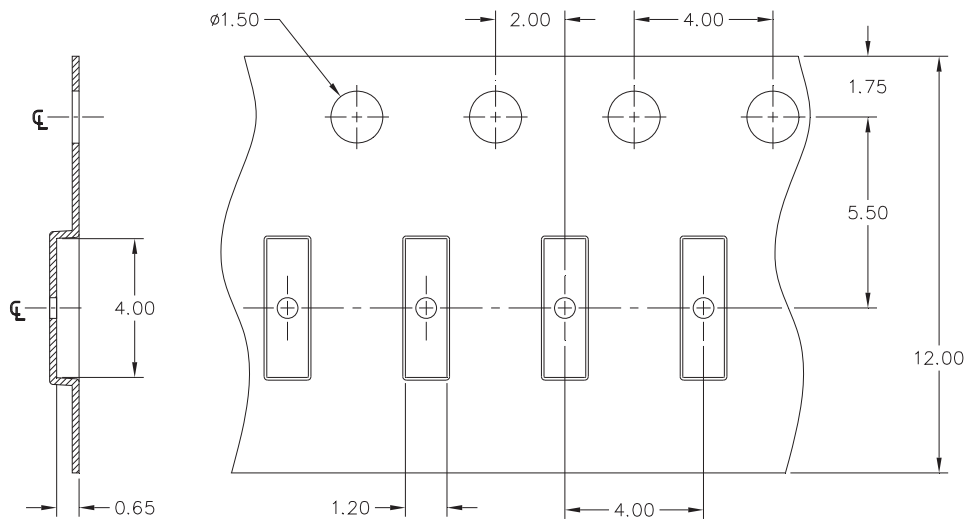
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code

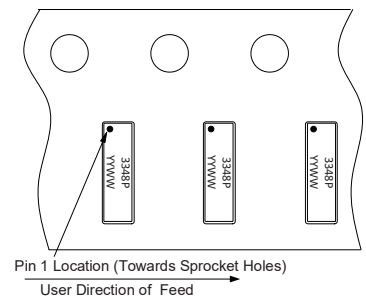
3348P
● YYWW

Note: Dot indicates pin 1 location.

Tape and Reel Specification (4mm Pitch)



Note: All dimensions are nominal dimensions in mm.



Order Information

| PART NUMBER | QTY PER REEL | MATERIAL | REEL SIZE |
|--|--------------|----------|-----------|
| RClamp03348P.C | 3,000 | Plastic | 7" |
| RailClamp and RClamp are registered trademarks of Semtech Corporation. | | | |



Datasheet Identification Definitions

| Datasheet Identification | Product Status | Definition |
|--------------------------|------------------------|---|
| Draft | Formative or In Design | This datasheet contains the design specifications for product development. Semtech reserves the right to change the product or this document without notice. |
| Preliminary | First Production | This datasheet contains initial specifications. The product has passed Semtech's reliability testing. Changes to fit, form, or function are not expected however, Semtech reserves the right to change the product or this document at any time without notice. |
| Final | Full Production | This datasheet contains final specifications. Further product changes are not expected however, Semtech reserves the right to change the product or this document at any time without notice. |

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