RClamp1201H-RClamp3601H

RailClamp®

ESD and EOS Protection for High-speed Interfaces

Description

RClamp1201H-RClamp3601H series is a low capacitance ESD protection device specifically designed to protect high-speed Ethernet lines. They offer desirable characteristics for board-level protection, including fast response time, low operating and clamping voltage, and no device degradation. These devices feature a large cross-sectional area for conducting high surge capability of 14A-35A (t_p = 8/20 µs). RClamp1201H-RClamp3601H series has a typical capacitance of only 3.1pF-3.3pF which is ideal for high speed lines. Each device will protect one high-speed data line.

RClamp1201H-RClamp3601H is in a 2-pin SOD-323 package; leads are finished with lead-free Matte tin. They may be used to protect 12V, 15V, 24V and 36V systems. The combination of small size, low capacitance, and high ESD, surge capability makes them ideal for use in industrial and telecom applications.

Features

- High ESD withstand Voltage
  - IEC 61000-4-2 (ESD): ±30kV (Contact), ±30kV (Air)
  - IEC 61000-4-5 (Lightning): 14A-35A (t_p = 8/20µs)
- Protects one high-speed data line
- Working voltage options: 12V, 15V, 24V, and 36V
- Low capacitance: 3.1pF-3.3pF typical
- Solid-state silicon-avalanche technology

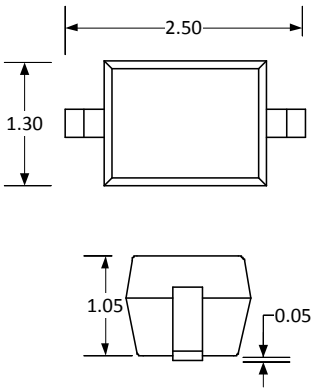
Applications

- Telecom
- Industrial
- 10/100/1000 Ethernet
- DOCSIS modems
- USB 2.0

Mechanical Characteristics

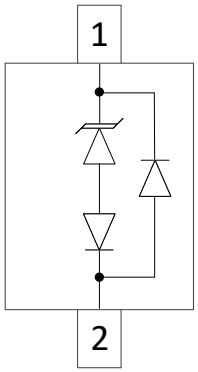
- Package: SOD-323
- Pb-free, Halogen Free, RoHS/WEEE compliant
- Molding compound flammability rating: UL 94V-0
- Lead Finish: Pb-Free
- Marking: Marking Code
- Packaging: Tape and Reel

Package Dimension



Nominal Dimensions (mm)

Functional Schematic



SOD-323 (Top View)

Absolute Maximum Rating

RATING	SYMBOL	VALUE	UNITS
Peak Pulse Power (t_p = 8/20µs)	P_{PK}	800 - 1100	W
ESD per IEC 61000-4-2 (Contact)(1) ESD per IEC 61000-4-2 (Air)(1)	V_{ESD}	±30 ±30	kV
Operating Temperature	T_{OP}	-40 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Electrical Characteristics

T=25°C unless otherwise specified

All data taken from Pin 1 to 2 unless otherwise specified.

RCLAMP1201H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				12	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA	14.5	15.5	18.2	V
Reverse Leakage Current	I_R	V_{RWM} = 12V			1	µA
Peak Pulse Current	I_{PP}	t_p = 8/20µs			35	A
Clamping Voltage	V_C	I_{PP} = 1A, t_p = 8/20µs I_{PP} = 35 A, t_p = 8/20µs		15.8 22.3	18.5 25.7	V
Dynamic Resistance(2),(3)	R_{DYN}	t_p = 0.2/100ns (TLP)		0.14		Ω
Junction Capacitance	C_J	V_R = 0V, f = 1MHz		3.3	5	pF

Notes:

(1): ESD Gun return path to Ground Reference Plane (GRP)

(2): Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 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

Electrical Characteristics

T=25°C unless otherwise specified

All data taken from Pin 1 to 2 unless otherwise specified.

RCLAMP1501H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				15	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA	16	17.2	20	V
Reverse Leakage Current	I_R	V_{RWM} = 15V			1	µA
Peak Pulse Current	I_{PP}	t_p = 8/20µs			34	A
Clamping Voltage	V_C	I_{PP} = 1A, t_p = 8/20µs		17.5	21	V
		I_{PP} = 34A, t_p = 8/20µs		24.5	28	
Dynamic Resistance(2),(3)	R_{DYN}	t_p = 0.2/100ns (TLP)		0.14		Ω
Junction Capacitance	C_J	V_R = 0V, f = 1MHz		3.1	5	pF

RCLAMP2401H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				24	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA	26	28.8	32	V
Reverse Leakage Current	I_R	V_{RWM} = 24V			1	µA
Peak Pulse Current	I_{PP}	t_p = 8/20µs			24	A
Clamping Voltage	V_C	I_{PP} = 1A, t_p = 8/20µs		29.5	34	V
		I_{PP} = 24A, t_p = 8/20µs		40	46	
Dynamic Resistance(2),(3)	R_{DYN}	t_p = 0.2/100ns (TLP)		0.17		Ω
Junction Capacitance	C_J	V_R = 0V, f = 1MHz		3.2	5	pF

Notes:

(1): ESD Gun return path to Ground Reference Plane (GRP)

(2): Transmission Line Pulse Test (TLP) Settings: tp = 100ns, tr = 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

Electrical Characteristics

T=25°C unless otherwise specified

All data taken from Pin 1 to 2 unless otherwise specified.

RCLAMP3601H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				36	V
Reverse Breakdown Voltage	V_{BR}	I_t = 1mA	37	40	43	V
Reverse Leakage Current	I_R	V_{RWM} = 36V			1	µA
Peak Pulse Current	I_{PP}	t_p = 8/20µs			14	A
Clamping Voltage	V_C	I_{PP} = 1A, t_p = 8/20µs		41	47	V
		I_{PP} = 14A, t_p = 8/20µs		52	59	
Dynamic Resistance(2),(3)	R_{DYN}	t_p = 0.2/100ns (TLP)		0.24		Ω
Junction Capacitance	C_J	V_R = 0V, f = 1MHz		3.3	5	pF

Notes:

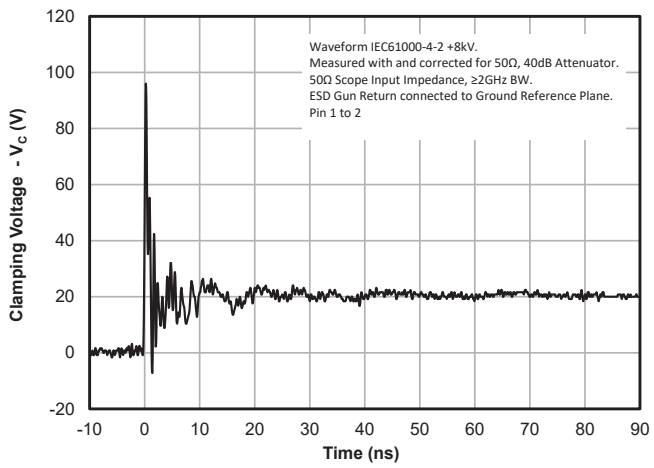
(1): ESD Gun return path to Ground Reference Plane (GRP)

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

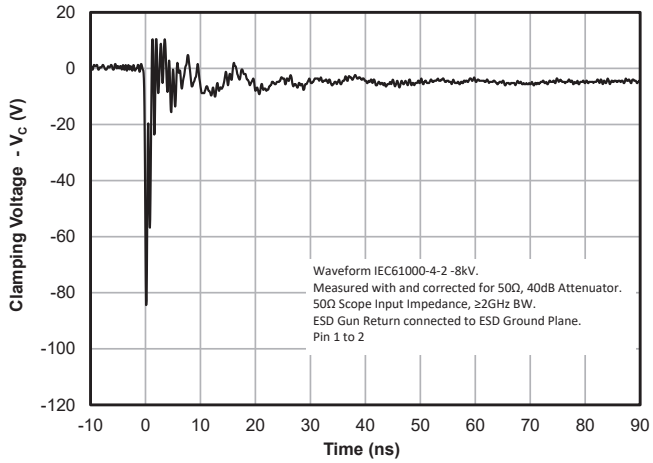
(3): Dynamic resistance calculated from I_{TLP} = 4A to I_{TLP} = 16A

Typical Characteristics-RClamp1201H

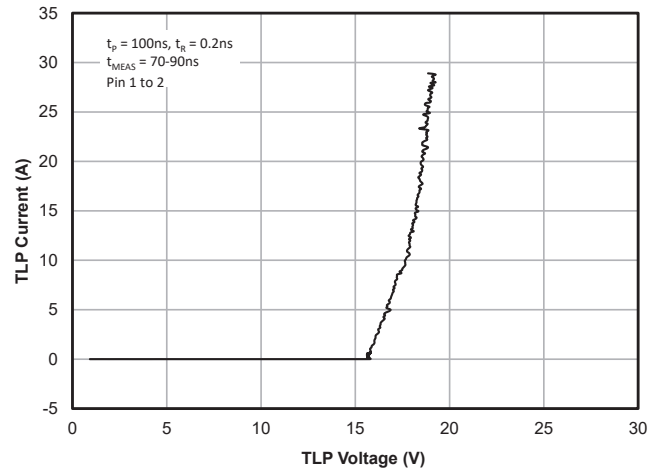
ESD Clamping (+8kV Contact per IEC 61000-4-2)



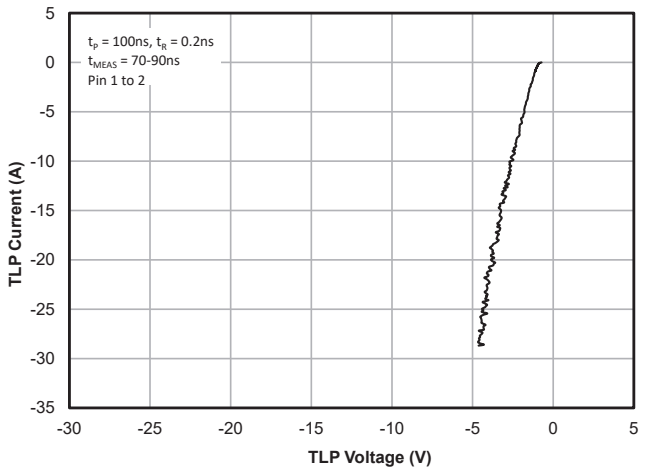
ESD Clamping (-8kV Contact per IEC 61000-4-2)



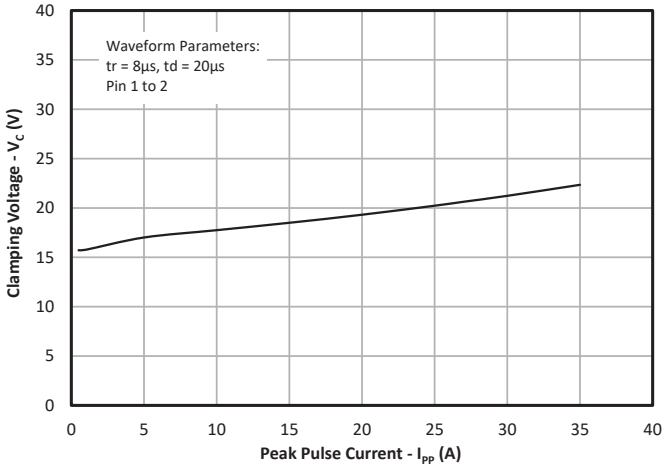
TLP Characteristics (Positive Pulse)



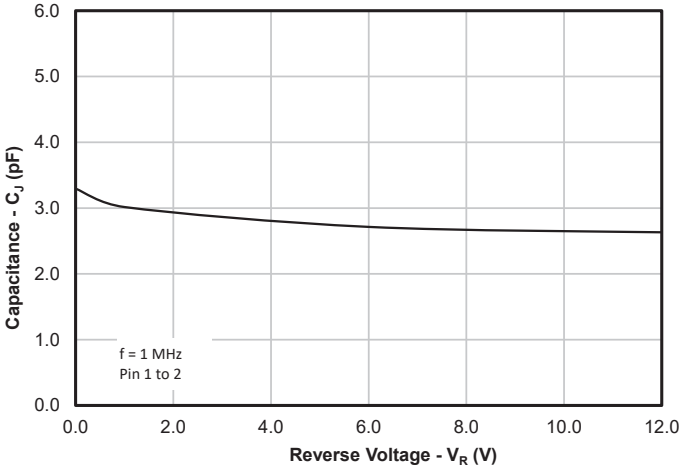
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current (t_p = 8/20µs)

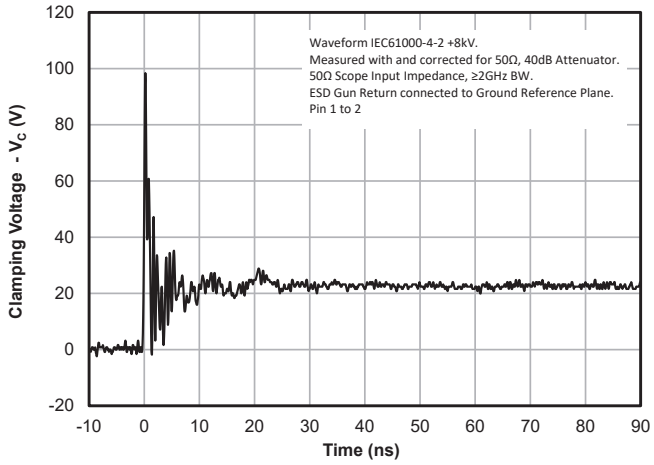


Capacitance vs. Reverse Voltage

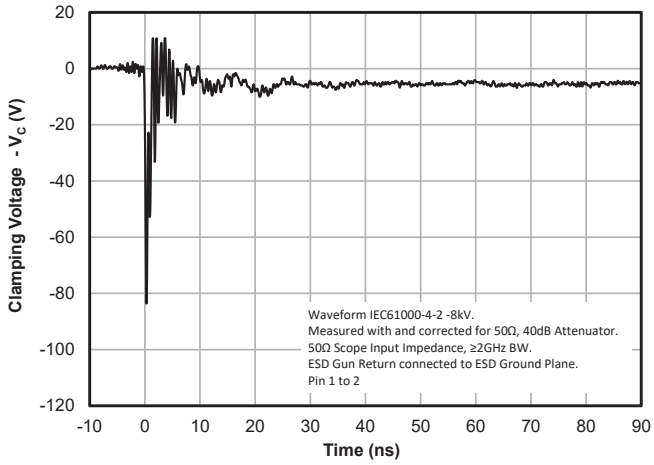


Typical Characteristics-RClamp1501H

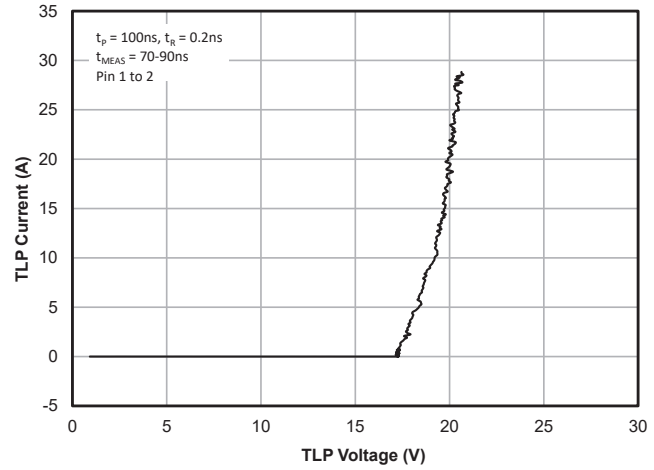
ESD Clamping (+8kV Contact per IEC 61000-4-2)



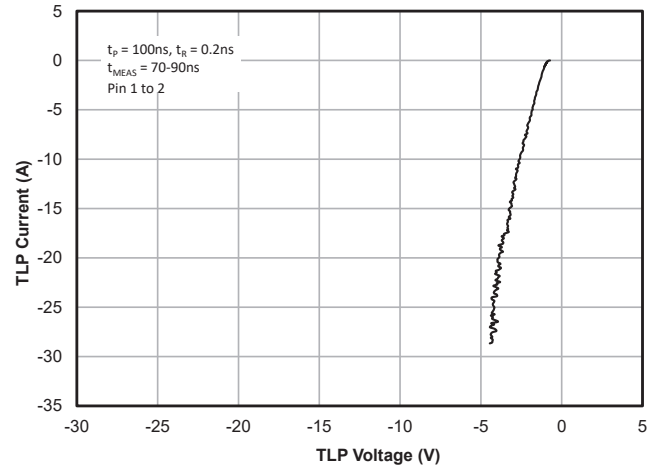
ESD Clamping (-8kV Contact per IEC 61000-4-2)



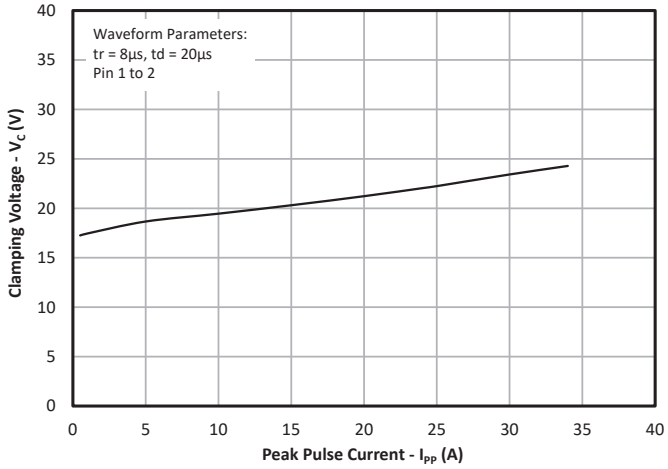
TLP Characteristics (Positive Pulse)



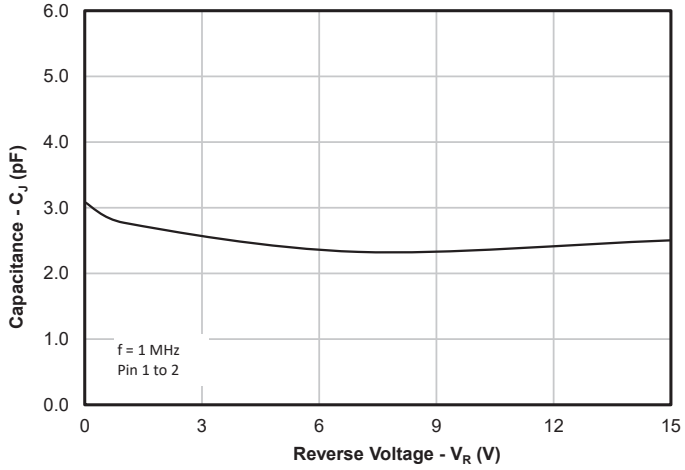
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current (t_p = 8/20µs)

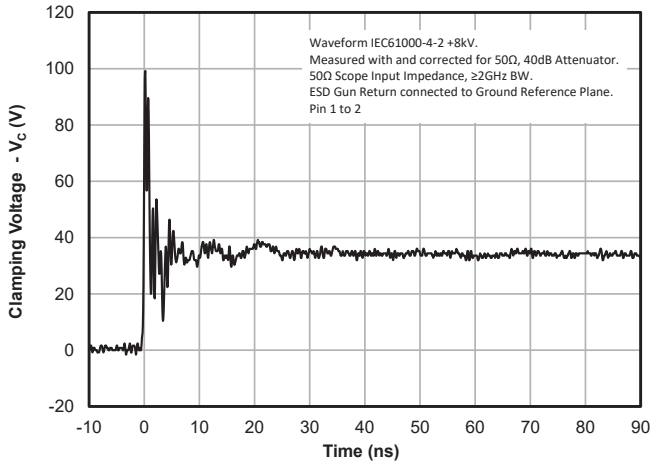


Capacitance vs. Reverse Voltage

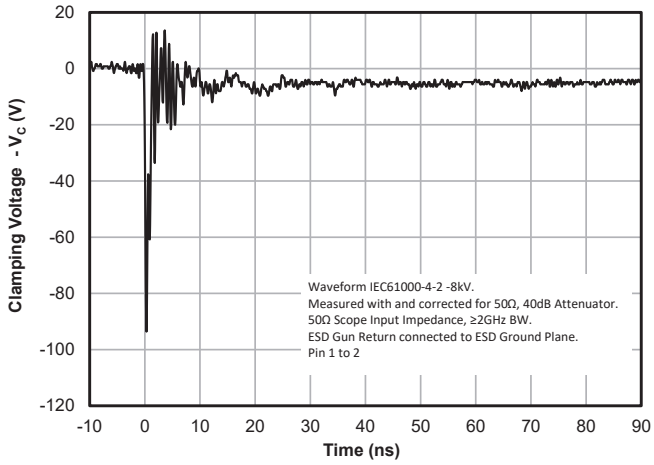


Typical Characteristics-RClamp2401H

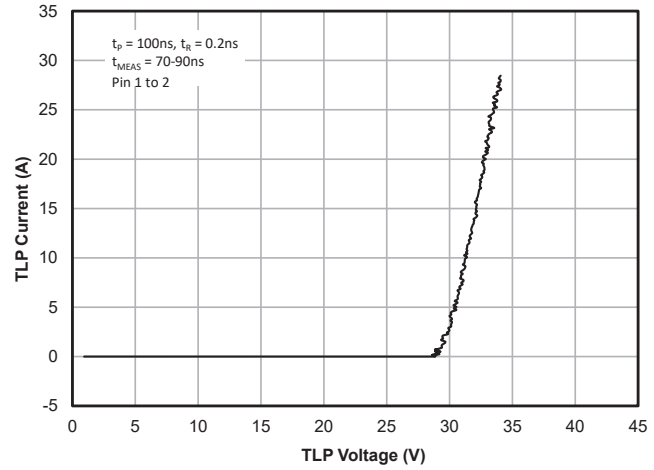
ESD Clamping (+8kV Contact per IEC 61000-4-2)



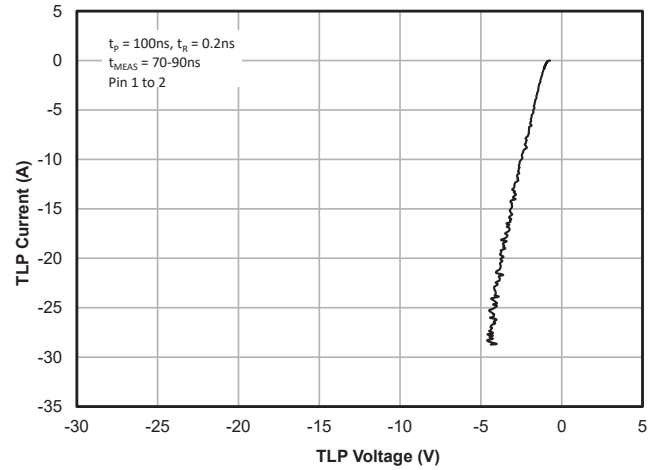
ESD Clamping (-8kV Contact per IEC 61000-4-2)



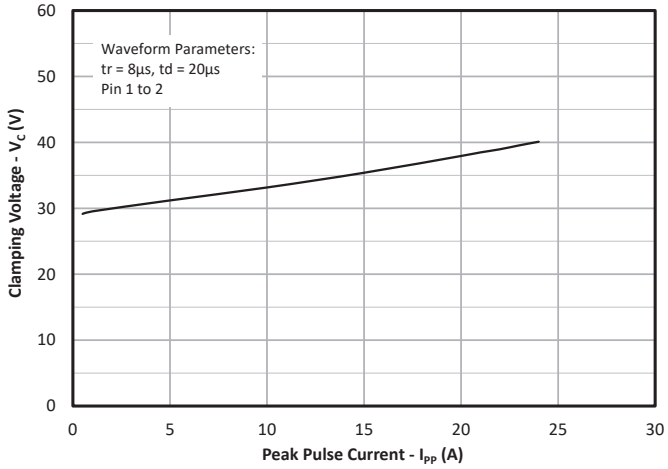
TLP Characteristics (Positive Pulse)



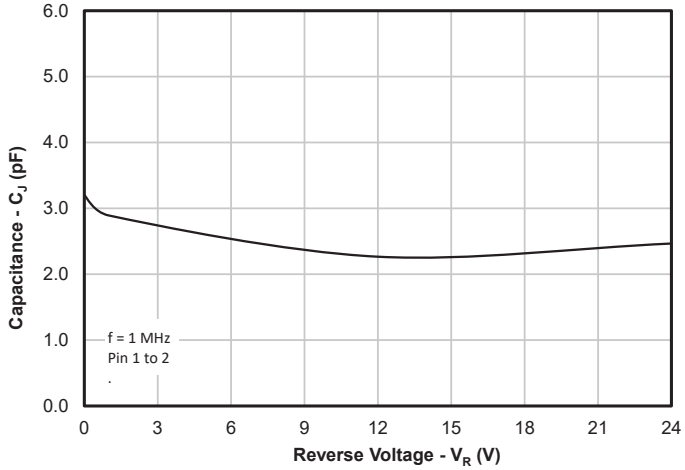
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current (t_p = 8/20µs)

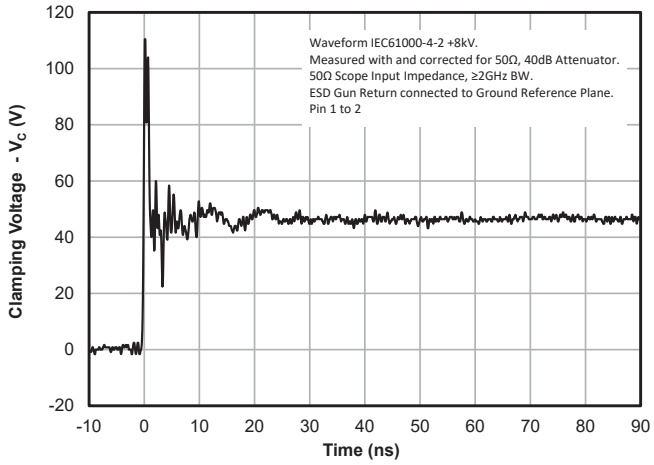


Capacitance vs. Reverse Voltage

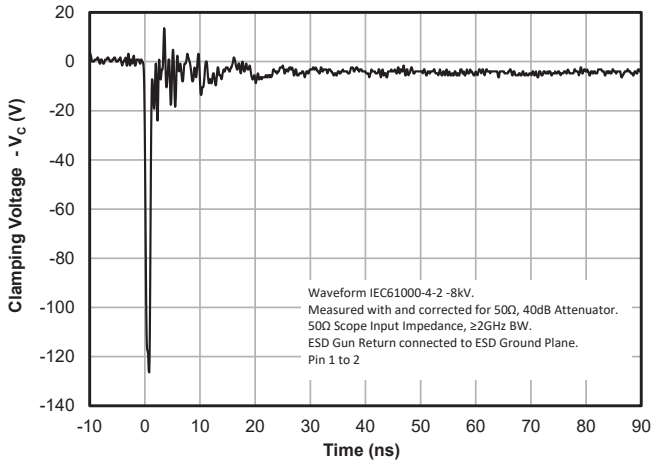


Typical Characteristics-RClamp3601H

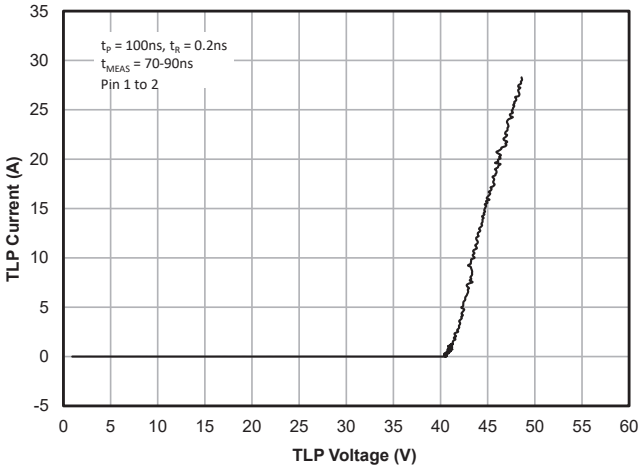
ESD Clamping (+8kV Contact per IEC 61000-4-2)



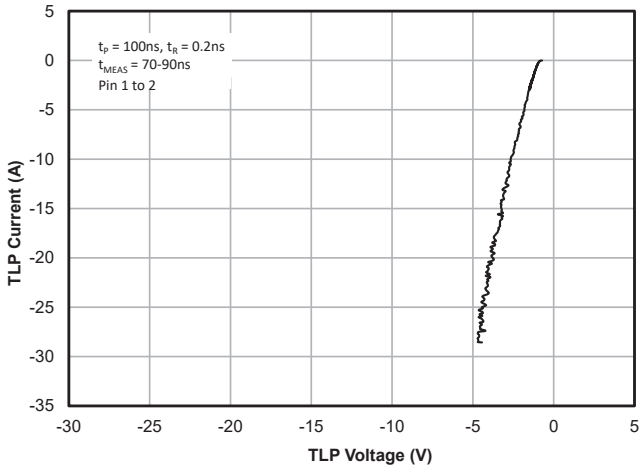
ESD Clamping (-8kV Contact per IEC 61000-4-2)



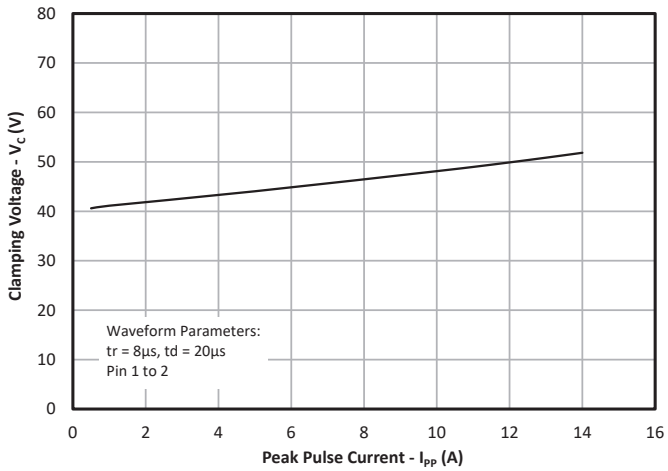
TLP Characteristics (Positive Pulse)



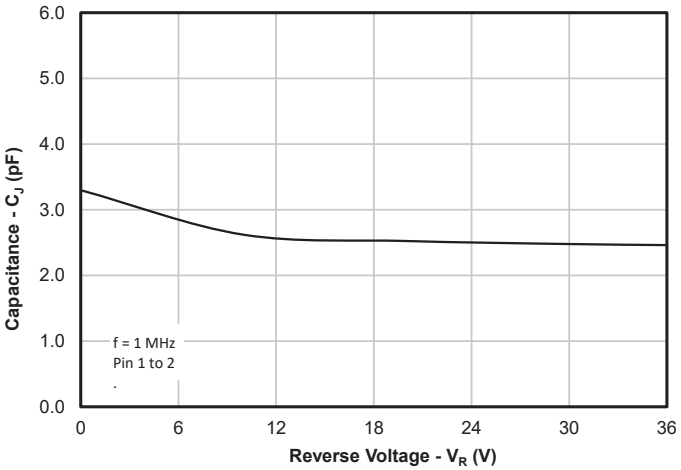
TLP Characteristics (Negative Pulse)



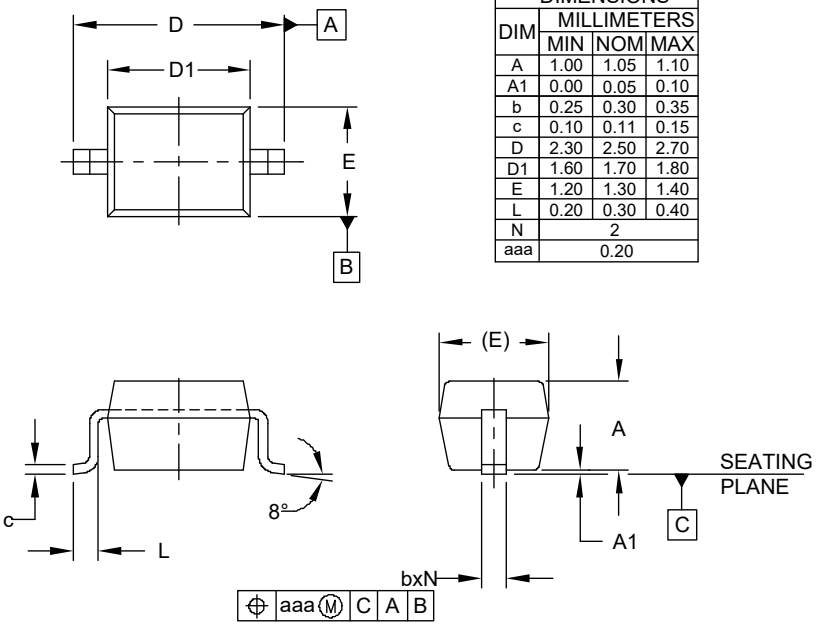
Clamping Voltage vs. Peak Pulse Current (t_p = 8/20µs)



Capacitance vs. Reverse Voltage



Outline Drawing - SOD-323

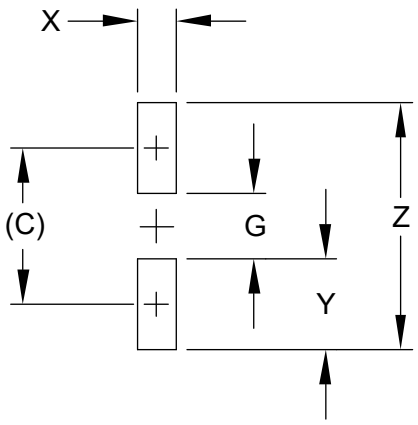


DIMENSIONS			
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	1.00	1.05	1.10
A1	0.00	0.05	0.10
b	0.25	0.30	0.35
c	0.10	0.11	0.15
D	2.30	2.50	2.70
D1	1.60	1.70	1.80
E	1.20	1.30	1.40
L	0.20	0.30	0.40
N	2		
aaa	0.20		

NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONS "D1" AND "E" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

Landing Pattern - SOD-323

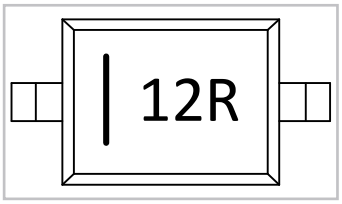


DIMENSIONS	
DIM	MILLIMETERS
C	(2.15)
G	0.90
X	0.53
Y	1.25
Z	3.40

NOTES:

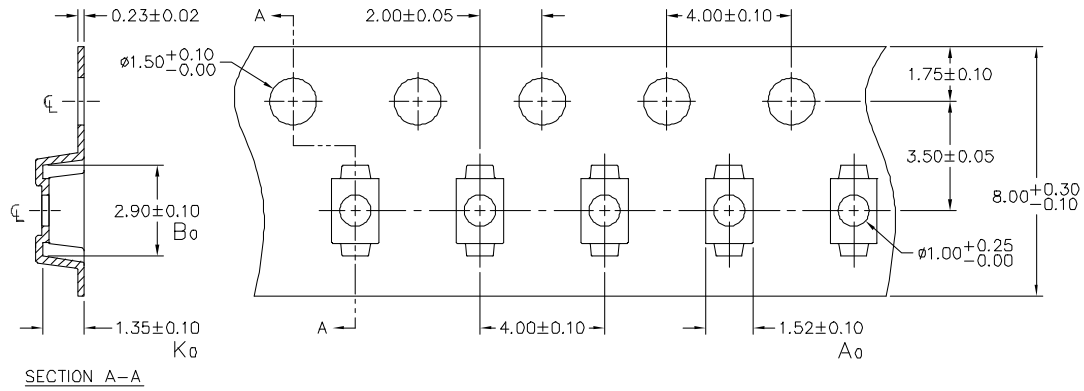
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.

Marking Code

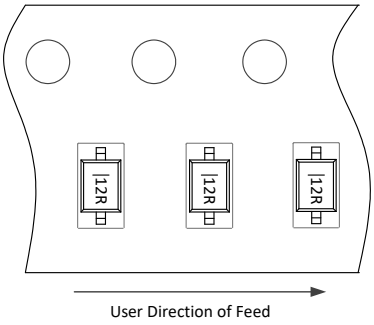


Note: Bar indicates Pin 1 location.

Tape and Reel Specification



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



Order Information

PART NUMBER	MARKING CODE	WORKING VOLTAGE	QTY PER REEL	REEL SIZE
RClamp1201H.C	12R	12V	3,000	7"
RClamp1501H.C	15R	15V	3,000	7"
RClamp2401H.C	24R	24V	3,000	7"
RClamp3601H.C	36R	36V	3,000	7"

Datasheet Identification Definitions

Datasheet Identification	Product Status	Definition
Preliminary	Formative or In Design	This data sheet contains the design specifications for product development. Semtech reserves the right to change the product or this document without notice.
Engineering	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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