



SEMTECH®

Description

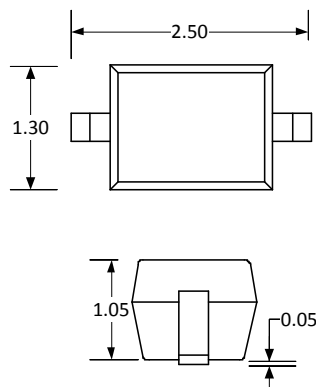
RClamp1221H-RClamp3621H series is a low capacitance ESD protection device specifically designed to protect high-speed Ethernet lines. They offer desirable characteristics for board-level protection, including fast response time, low operating and clamping voltage, and no device degradation. These devices feature a large cross-sectional area for conducting high surge capability of 15A-35A ($t_p = 8/20 \mu s$). RClamp1221H-RClamp3621H has a typical capacitance of only 1.7pF and 1.8pF, which is ideal for high-speed lines. Each device will protect one high-speed data line.

RClamp1221H-RClamp3621H series 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.

Applications

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

Package Dimension



Nominal Dimensions (mm)

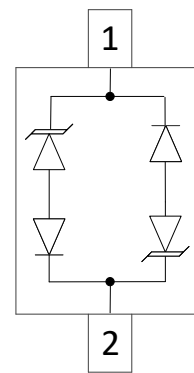
Features

- High ESD withstand Voltage
 - IEC 61000-4-2 (ESD): $\pm 30kV$ (Contact), $\pm 30kV$ (Air)
 - IEC 61000-4-5 (Lightning): 15A-35A ($t_p = 8/20 \mu s$)
- Protects one high-speed data line
- Working voltage options: 12V, 15V, 24V, and 36V
- Low capacitance: 1.7pF and 1.8pF typical
- Solid-state silicon-avalanche technology

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

Functional Schematic



SOD-323 (Top View)

Absolute Maximum Rating

RATING	SYMBOL	VALUE	UNITS
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	700-1200	W
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾	V_{ESD}	±30	kV
ESD per IEC 61000-4-2 (Air) ⁽¹⁾		±30	
Operating Temperature	T_{OP}	-40 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

Electrical Characteristics

T=25°C unless otherwise specified

RCLAMP1221H

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	16.4	18	V
Reverse Leakage Current	I_R	$V_{RWM} = 12V$			1	μA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu s$			35	A
Clamping Voltage	V_C	$I_{PP} = 1A, t_p = 8/20\mu s$		17	20	V
		$I_{PP} = 35A, t_p = 8/20\mu s$		28	34	
Dynamic Resistance ^{(2),(3)}	R_{DYN}	$t_p = 0.2/100ns$ (TLP)		0.25		Ω
Junction Capacitance	C_J	$V_R = 0V, f = 1MHz$		1.7	2.5	pF

Notes:

(1): ESD Gun return path 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 $I_{TLP} = 16A$

Electrical Characteristics

T=25°C unless otherwise specified

RCLAMP1521H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				15	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{mA}$	17	18	21.5	V
Reverse Leakage Current	I_R	$V_{RWM} = 15\text{V}$			1	μA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			34	A
Clamping Voltage	V_C	$I_{PP} = 1\text{A}, t_p = 8/20\mu\text{s}$		18.5	22	V
		$I_{PP} = 34\text{A}, t_p = 8/20\mu\text{s}$		30	35	
Dynamic Resistance ^{(2),(3)}	R_{DYN}	$t_p = 0.2/100\text{ns}$ (TLP)		0.24		Ω
Junction Capacitance	C_J	$V_R = 0\text{V}, f = 1\text{MHz}$		1.8	2.5	pF

RCLAMP2421H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				24	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{mA}$	27	29.7	34	V
Reverse Leakage Current	I_R	$V_{RWM} = 24\text{V}$			1	μA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			24	A
Clamping Voltage	V_C	$I_{PP} = 1\text{A}, t_p = 8/20\mu\text{s}$		30.5	35	V
		$I_{PP} = 24\text{A}, t_p = 8/20\mu\text{s}$		44	50.5	
Dynamic Resistance ^{(2),(3)}	R_{DYN}	$t_p = 0.2/100\text{ns}$ (TLP)		0.27		Ω
Junction Capacitance	C_J	$V_R = 0\text{V}, f = 1\text{MHz}$		1.8	2.5	pF

Notes:

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

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

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

Electrical Characteristics

T=25°C unless otherwise specified

RCLAMP3621H

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse Stand-Off Voltage	V_{RWM}				36	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{mA}$	38	40.7	43	V
Reverse Leakage Current	I_R	$V_{RWM} = 24\text{V}$			1	μA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			15	A
Clamping Voltage	V_C	$I_{PP} = 1\text{A}, t_p = 8/20\mu\text{s}$		42.1	48	V
		$I_{PP} = 15\text{A}, t_p = 8/20\mu\text{s}$		55.3	65	
Dynamic Resistance ^{(2),(3)}	R_{DYN}	$t_p = 0.2/100\text{ns}$ (TLP)		0.38		Ω
Junction Capacitance	C_J	$V_R = 0\text{V}, f = 1\text{MHz}$		1.8	2.5	pF

Notes:

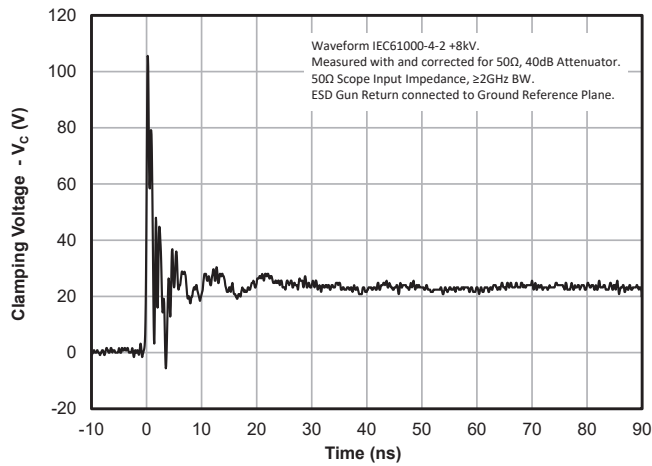
(1): ESD Gun return path to Ground Reference Plane (GRP)

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

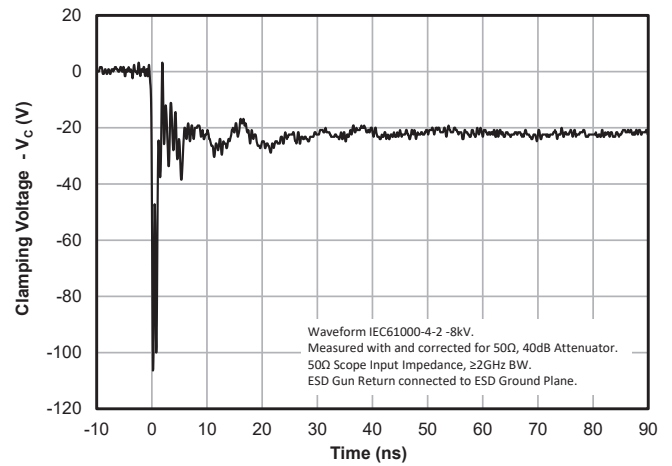
(3): Dynamic resistance calculated from $I_{TLP} = 4\text{A}$ to $I_{TLP} = 16\text{A}$

Typical Characteristics-RClamp1221H

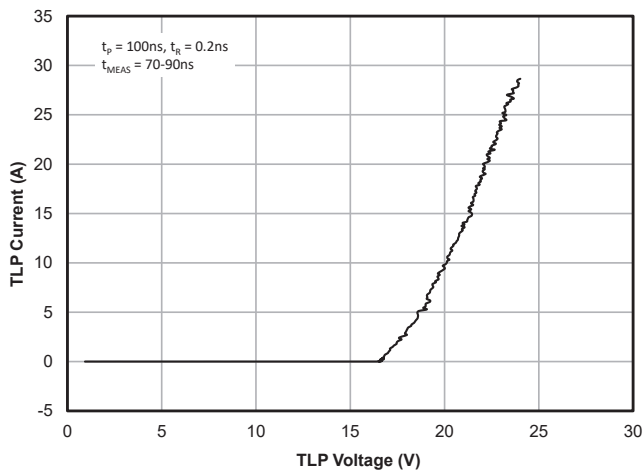
ESD Clamping (+8kV Contact per IEC 61000-4-2)



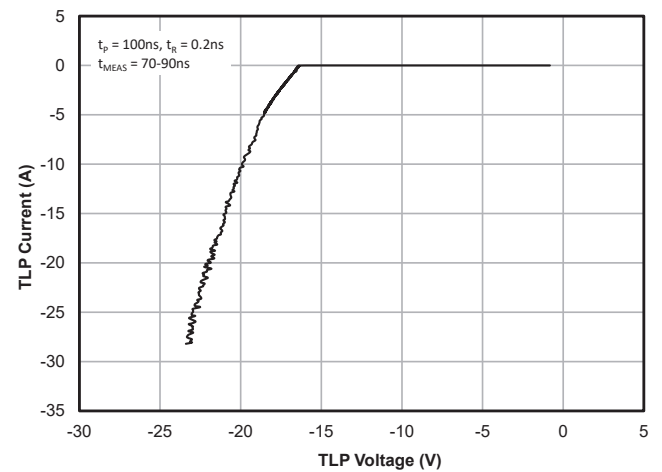
ESD Clamping (-8kV Contact per IEC 61000-4-2)



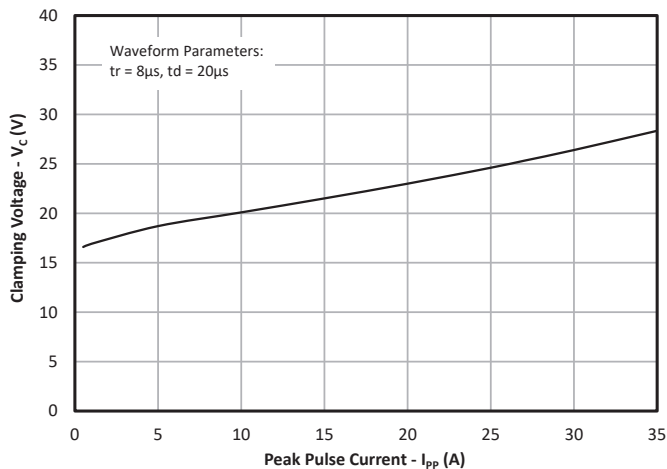
TLP Characteristics (Positive Pulse)



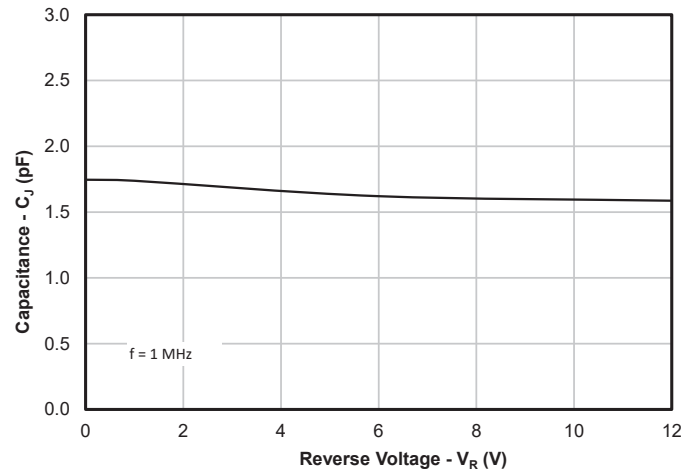
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20\mu\text{s}$)

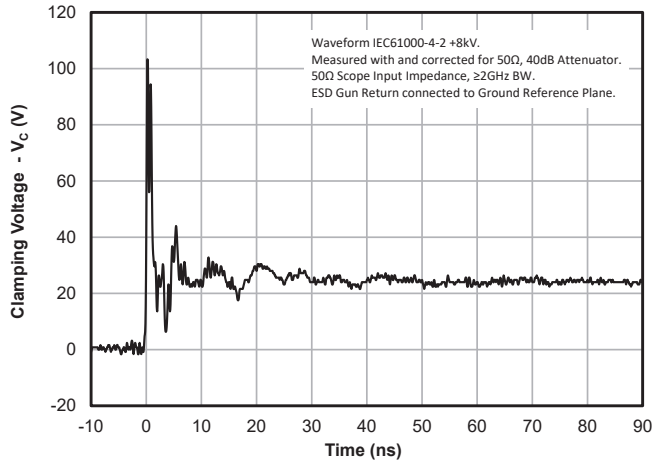


Capacitance vs. Reverse Voltage

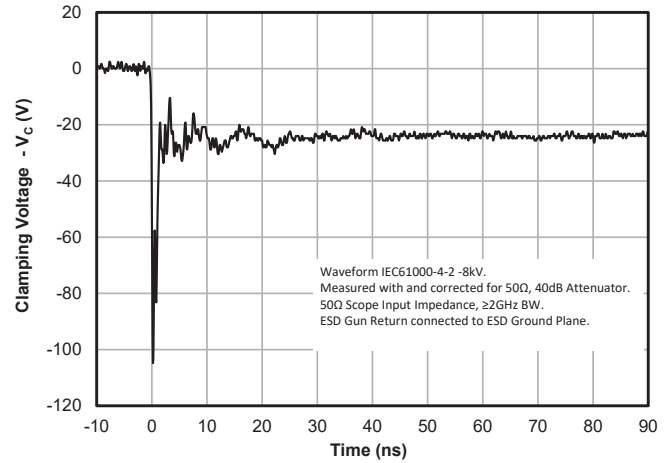


Typical Characteristics-RClamp1521H

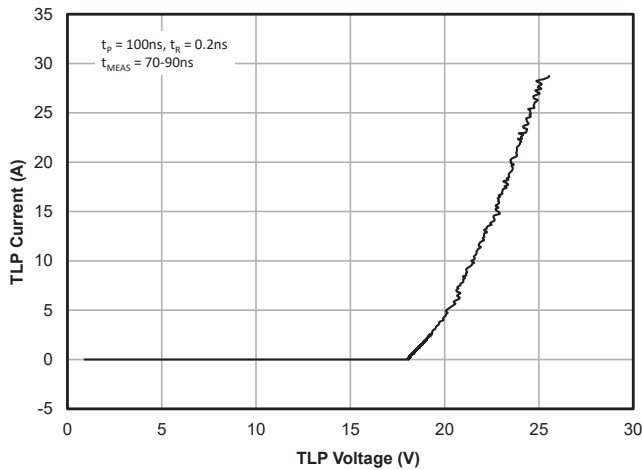
ESD Clamping (+8kV Contact per IEC 61000-4-2)



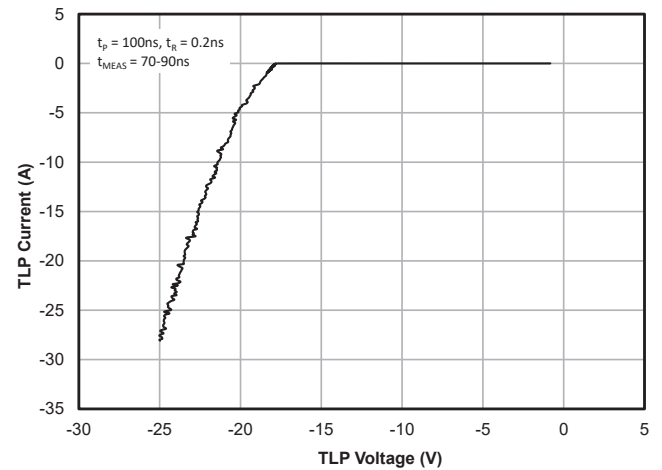
ESD Clamping (-8kV Contact per IEC 61000-4-2)



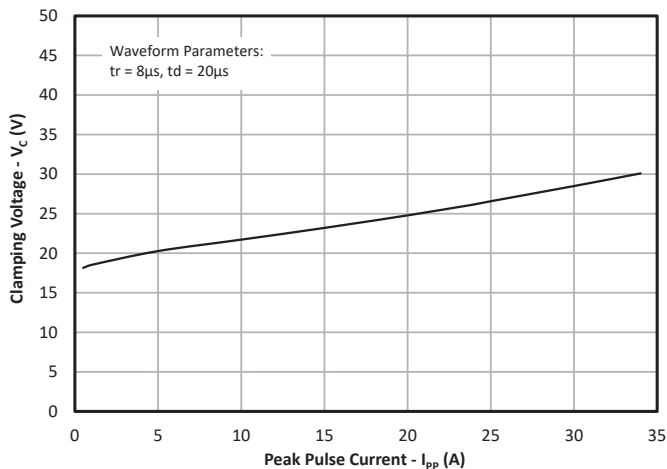
TLP Characteristics (Positive Pulse)



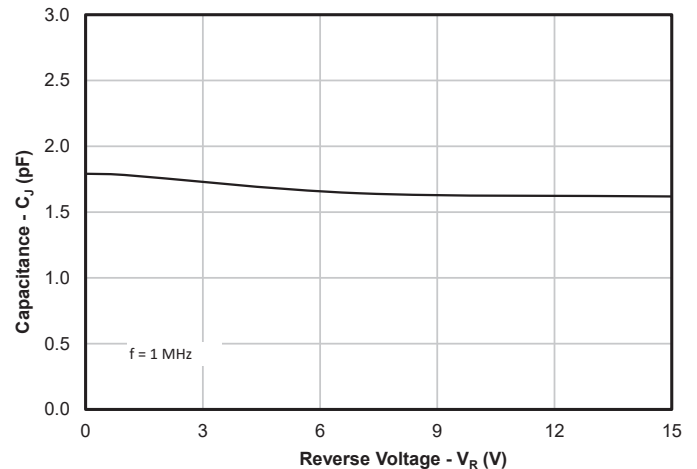
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20\mu\text{s}$)

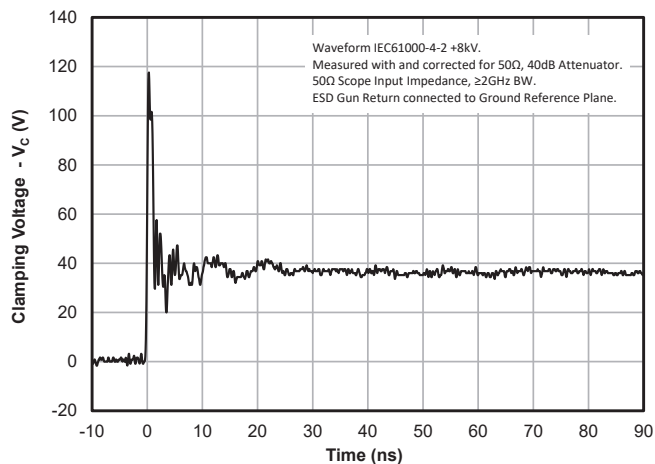


Capacitance vs. Reverse Voltage

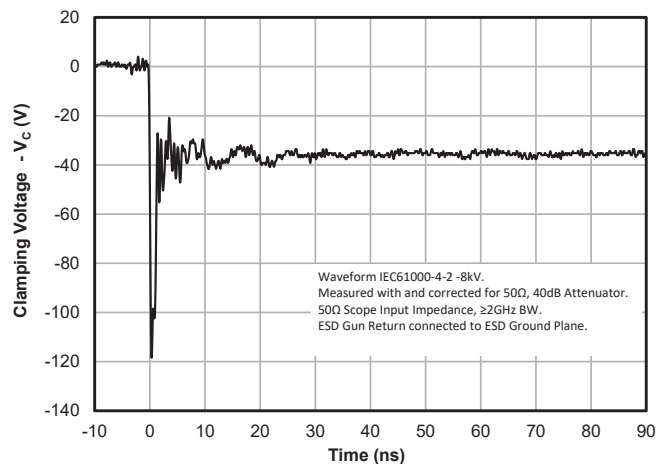


Typical Characteristics-RClamp2421H

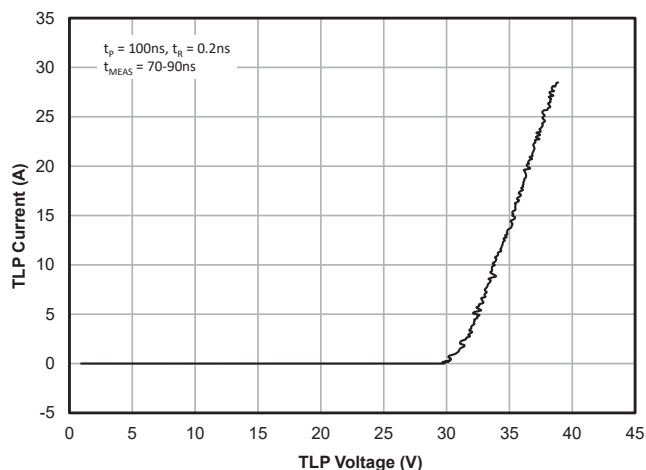
ESD Clamping (+8kV Contact per IEC 61000-4-2)



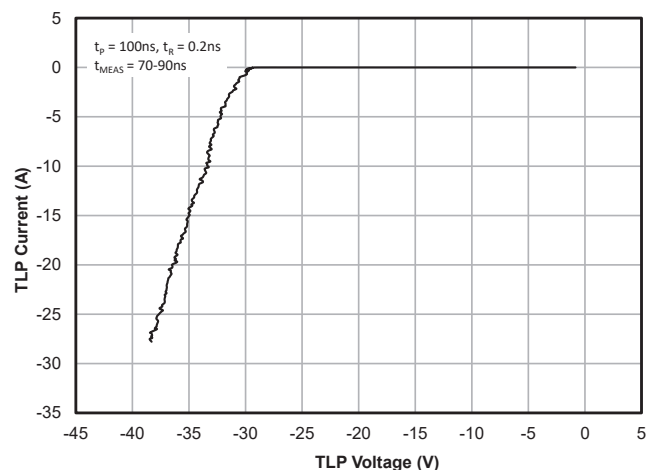
ESD Clamping (-8kV Contact per IEC 61000-4-2)



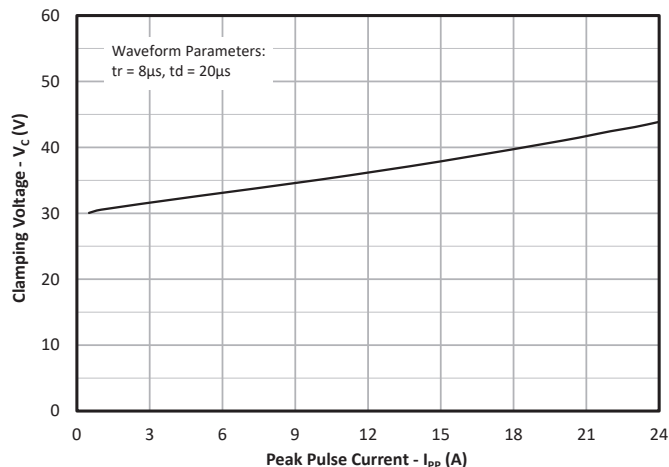
TLP Characteristics (Positive Pulse)



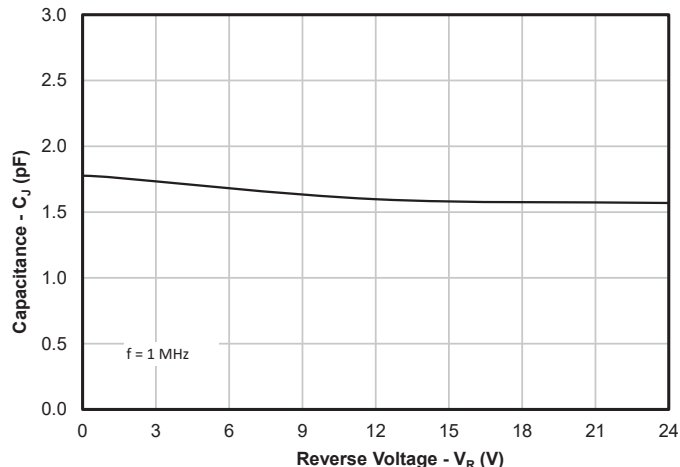
TLP Characteristics (Negative Pulse)



Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20\mu\text{s}$)

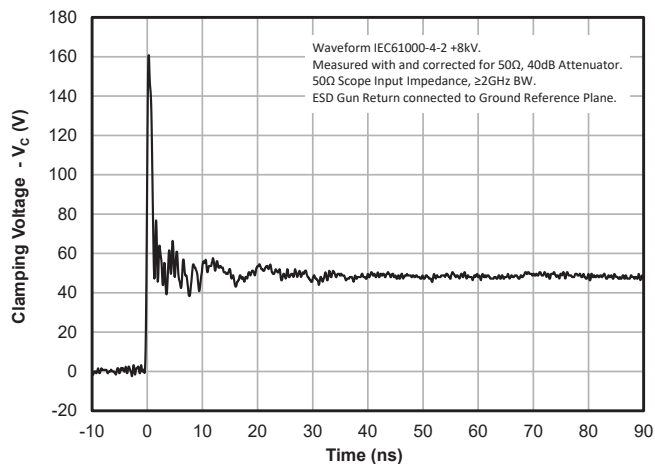


Capacitance vs. Reverse Voltage

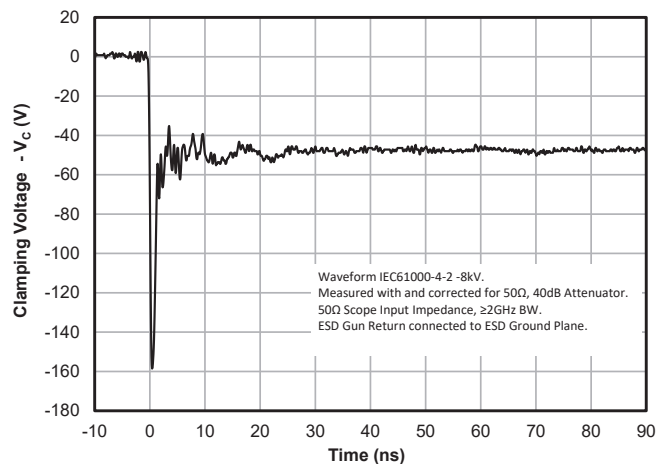


Typical Characteristics-RClamp3621H

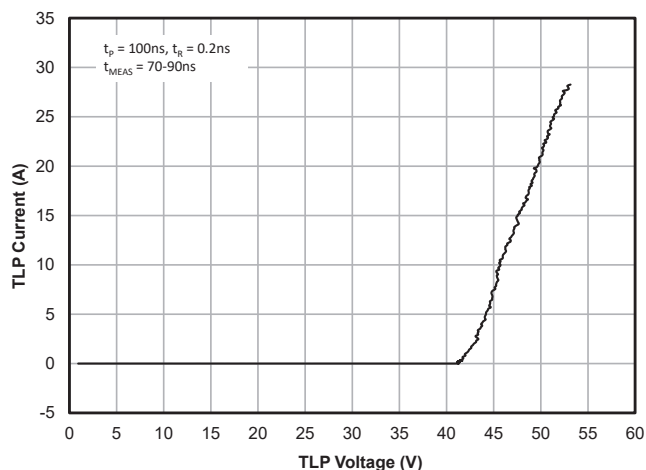
ESD Clamping (+8kV Contact per IEC 61000-4-2)



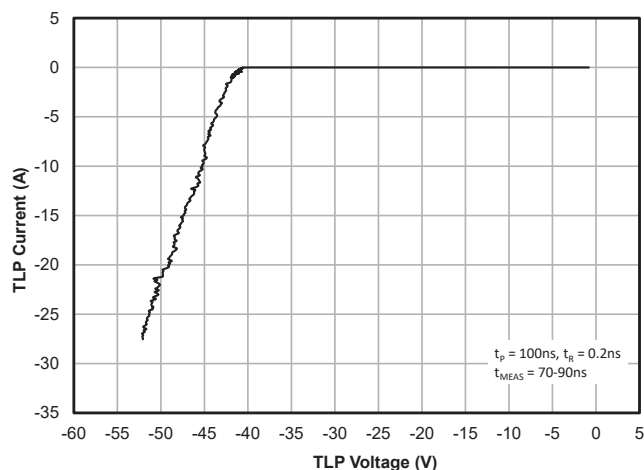
ESD Clamping (-8kV Contact per IEC 61000-4-2)



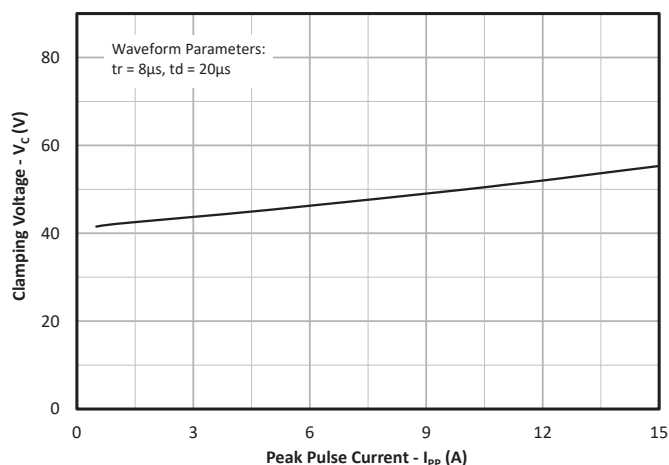
TLP Characteristics (Positive Pulse)



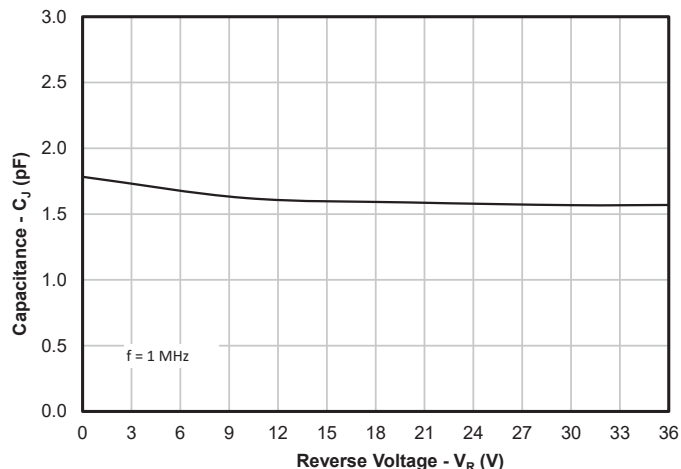
TLP Characteristics (Negative Pulse)



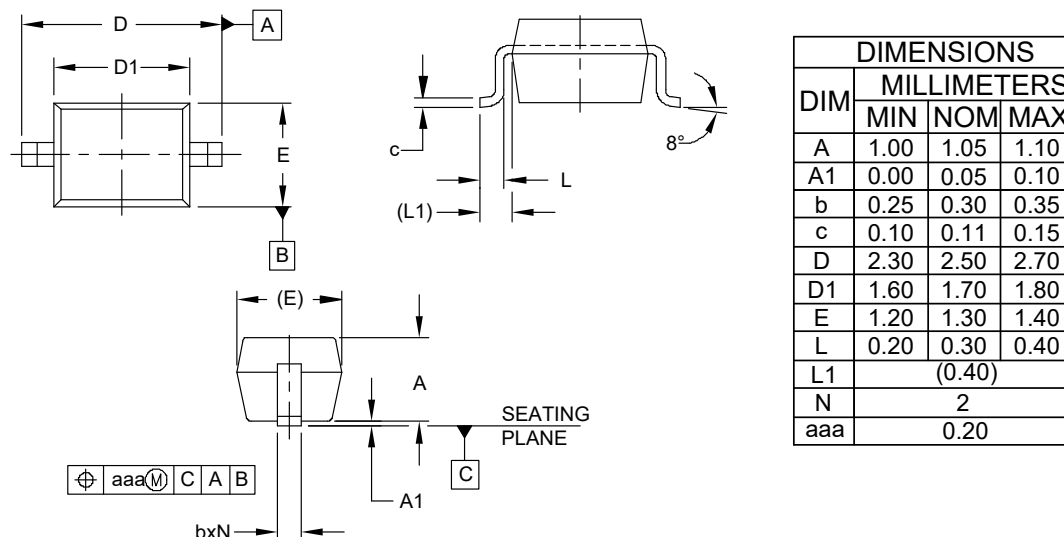
Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20\mu\text{s}$)



Capacitance vs. Reverse Voltage



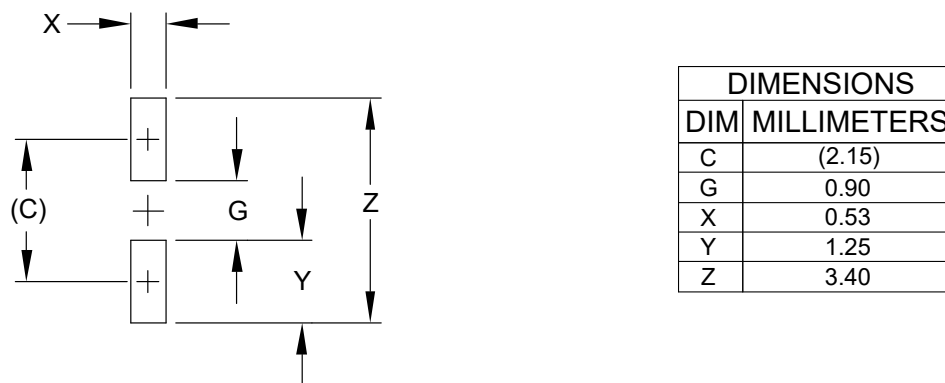
Outline Drawing - SOD-323



NOTES:

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

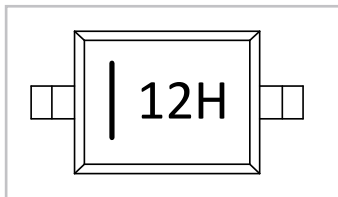
Landing Pattern - SOD-323



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.

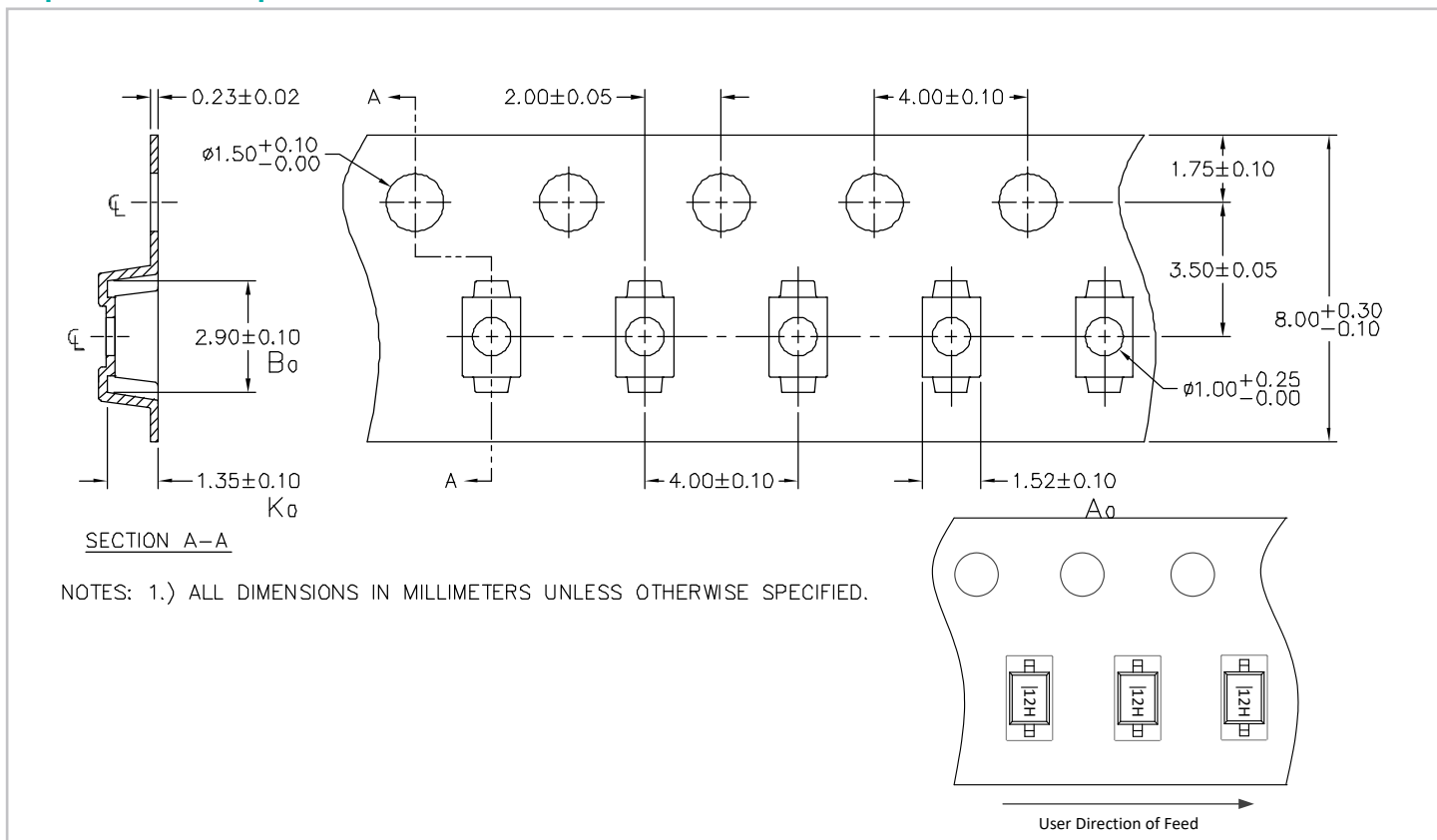
Marking Code



Notes:

- (1) Device is electrically symmetrical.
- (2) Bar indicates Pin 1 location.

Tape and Reel Specification



Order Information

PART NUMBER	MARKING CODE	WORKING VOLTAGE	QTY PER REEL	REEL SIZE
RClamp1221H.C	12H	12V	3,000	7"
RClamp1521H.C	15H	15V	3,000	7"
RClamp2421H.C	24H	24V	3,000	7"
RClamp3621H.C	36H	36V	3,000	7"

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