

Absolute Maximum Ratings

Rating	Symbol	Value	Units
Peak Pulse Power ($t_p = 8/20\mu s$)	P_{PK}	1200-1600	W
Peak Pulse Current ($t_p = 8/20\mu s$)	I_{PP}	8-80	A
ESD per IEC 61000-4-2 (Contact) ⁽¹⁾ ESD per IEC 61000-4-2 (Air) ⁽¹⁾	V_{ESD}	± 30 ± 30	kV
Operating Temperature	T_J	-40 to +125	°C
Storage Temperature	T_{STG}	-55 to +150	°C

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

μClamp0561P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			5	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{mA}$, Pin 2 to Pin 1	6	7	9	V
Reverse Leakage Current	I_R	$V_{RWM} = 5\text{V}$ $T = 25^\circ\text{C}$		50	300	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu s$			80	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 40\text{A}$, $t_p = 8/20\mu s$, Pin 2 to Pin 1			12	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 80\text{A}$, $t_p = 8/20\mu s$, Pin 2 to Pin 1			15	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ns}$ (TLP), Pin 2 to Pin 1		0.05		Ohms
Junction Capacitance	C_J	$V_R = 0\text{V}$, $f = 1\text{MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			800	pF

Notes:

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

(2): Tested using a constant current source

(3): 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 $t_2 = 90\text{ns}$.

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

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

μClamp1061P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			10	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	12	13.5	15.5	V
Reverse Leakage Current	I_R	$V_{RWM} = 10\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			60	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 10\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			17	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 60\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			25	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.05		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			350	pF

μClamp1261P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			12	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	14	16.5	19	V
Reverse Leakage Current	I_R	$V_{RWM} = 12\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			45	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 10\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			25	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 45\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			33	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.05		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			275	pF

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

μClamp1561P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			15	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	17.5	20	23	V
Reverse Leakage Current	I_R	$V_{RWM} = 15\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			40	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 10\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			28	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 40\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			40	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.05		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			220	pF

μClamp2461P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			24	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	27	32	36	V
Reverse Leakage Current	I_R	$V_{RWM} = 24\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			23	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 10\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			50	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 23\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			65	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.20		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			165	pF

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

μClamp3061P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			30	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	34	40	42	V
Reverse Leakage Current	I_R	$V_{RWM} = 30\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$tp = 8/20\mu\text{s}$			18	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 10\text{ A}$, $tp = 8/20\mu\text{s}$, Pin 2 to Pin 1			55	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 18\text{ A}$, $tp = 8/20\mu\text{s}$, Pin 2 to Pin 1			65	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$tp = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.25		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			155	pF

μClamp3661P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			36	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	37	40	44	V
Reverse Leakage Current	I_R	$V_{RWM} = 36\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$tp = 8/20\mu\text{s}$			18	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 2\text{ A}$, $tp = 8/20\mu\text{s}$, Pin 2 to Pin 1			48	V
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 18\text{ A}$, $tp = 8/20\mu\text{s}$, Pin 2 to Pin 1			70	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$tp = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.25		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			150	pF

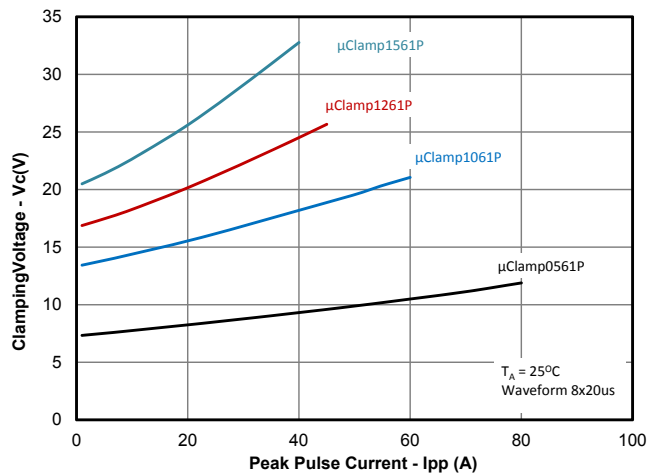
Electrical Characteristics (T=25°C unless otherwise specified)

μClamp4061P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			40	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	45	50	55	V
Reverse Leakage Current	I_R	$V_{RWM} = 40\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			12	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 12\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			80	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP), Pin 2 to Pin 1		0.35		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			125	pF

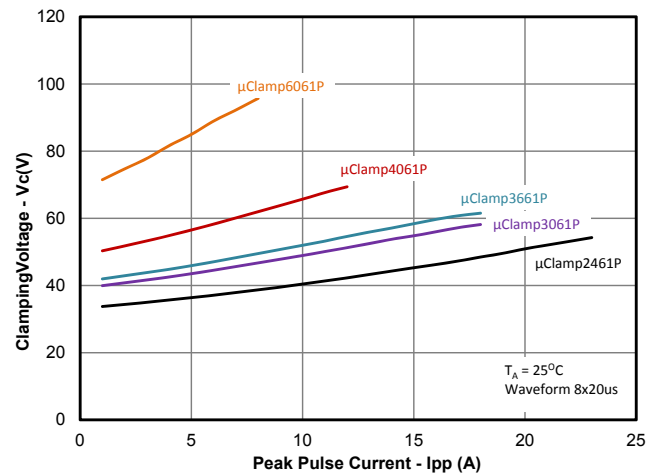
μClamp6061P						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Reverse Stand-Off Voltage	V_{RWM}	-40°C to 125°C, Pin 2 to Pin 1			60	V
Reverse Breakdown Voltage	V_{BR}	$I_t = 1\text{ mA}$, Pin 2 to Pin 1	65	70	85	V
Reverse Leakage Current	I_R	$V_{RWM} = 60\text{ V}$ $T = 25^\circ\text{C}$		<10	100	nA
Peak Pulse Current	I_{PP}	$t_p = 8/20\mu\text{s}$			8	A
Clamping Voltage ⁽²⁾	V_C	$I_{PP} = 8\text{ A}$, $t_p = 8/20\mu\text{s}$, Pin 2 to Pin 1			105	V
Dynamic Resistance ^{(3), (4)}	R_{DYN}	$t_p = 0.2/100\text{ ns}$ (TLP) Pin 2 to Pin 1		0.45		Ohms
Junction Capacitance	C_J	$V_R = 0\text{ V}$, $f = 1\text{ MHz}$ Pin 2 to Pin 1 $T = 25^\circ\text{C}$			110	pF

Typical Characteristics

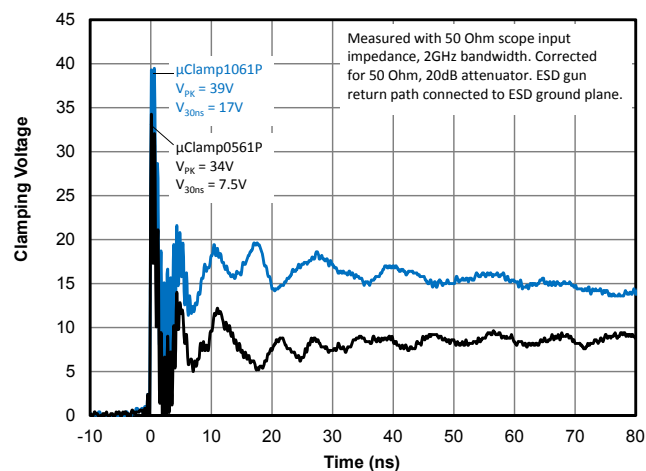
Clamping Voltage vs. Peak Pulse Current ($V_{RWM} = 5V - 15V$)



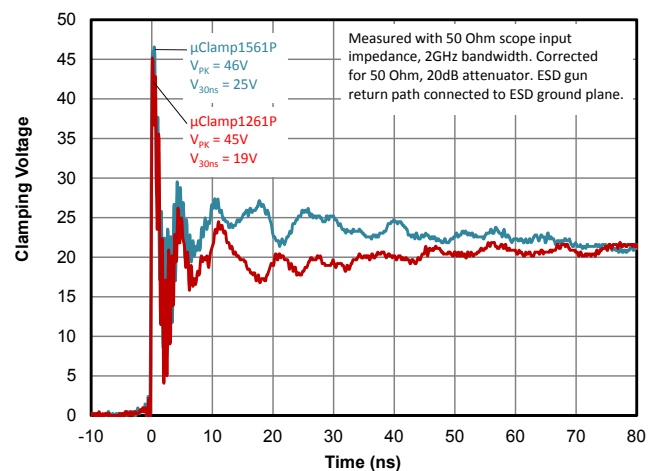
Clamping Voltage vs. Peak Pulse Current ($V_{RWM} = 24V - 60V$)



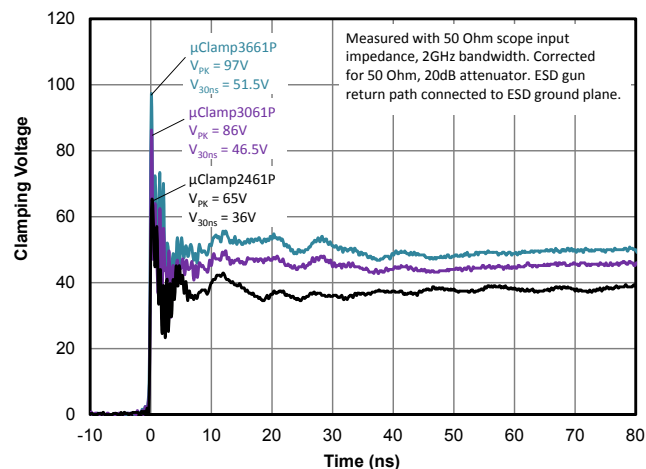
ESD Clamping (8kV Contact per IEC 61000-4-2)



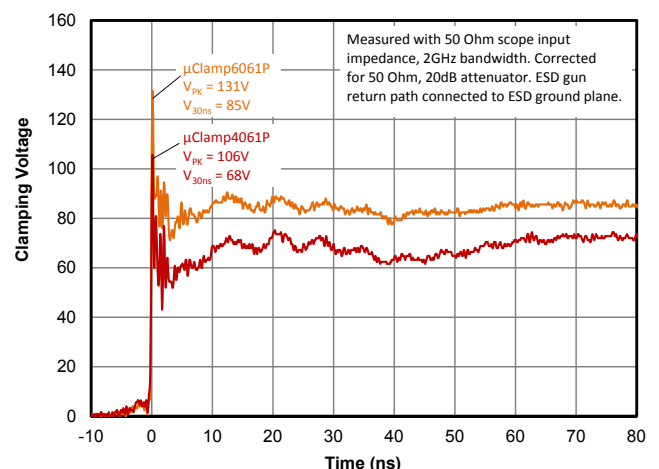
ESD Clamping (8kV Contact per IEC 61000-4-2)



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

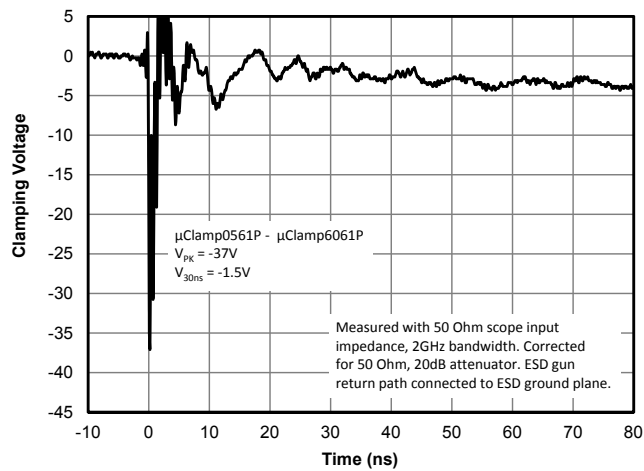


ESD Clamping (8kV Contact per IEC 61000-4-2)

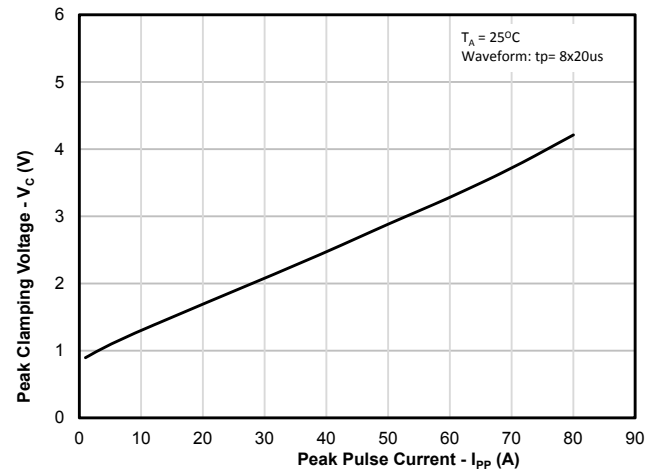


Typical Characteristics

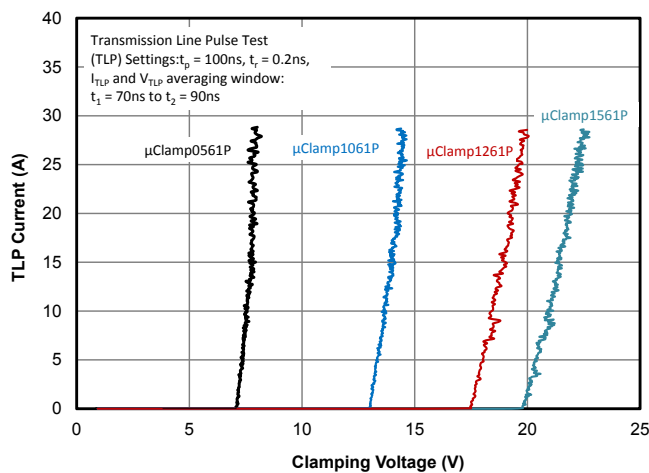
ESD Clamping (-8kV Contact per IEC 61000-4-2)



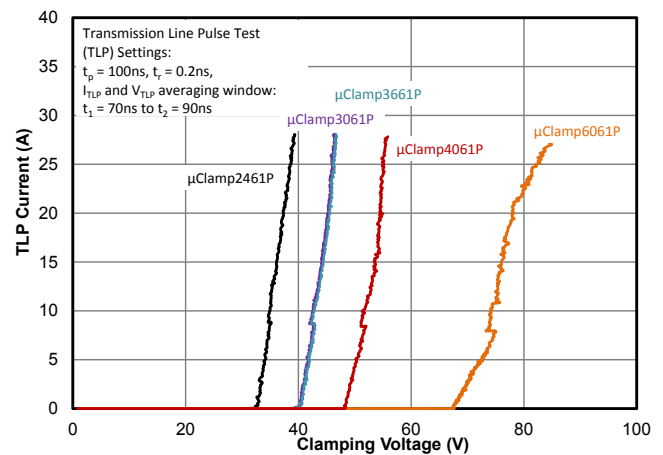
Forward Voltage vs. Peak Pulse Current ($V_{RWM} = 5V - 60V$)



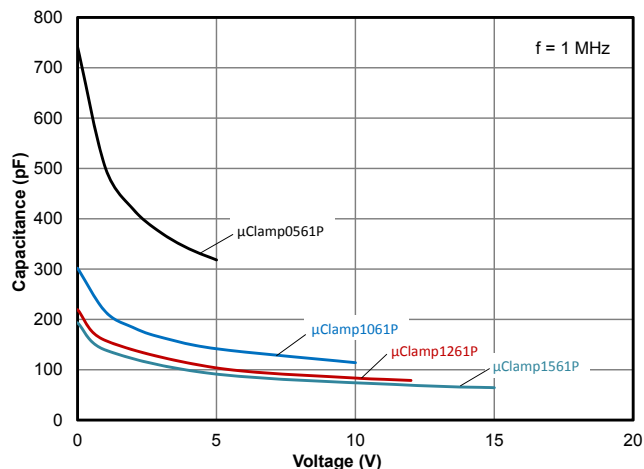
TLP Characteristic (Positive Pulse) - ($V_{RWM} = 5V - 15V$)



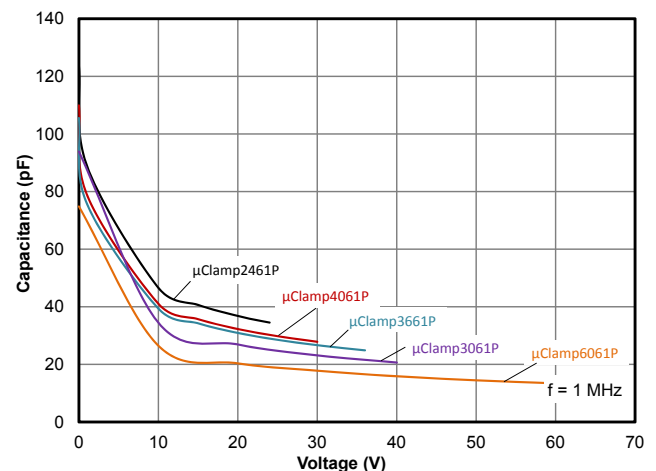
TLP Characteristic (Positive Pulse) - ($V_{RWM} = 24V - 60V$)



Capacitance vs. Reverse Voltage - ($V_{RWM} = 5V - 15V$)



Capacitance vs. Reverse Voltage - ($V_{RWM} = 24V - 60V$)



Application Information

Assembly Guidelines

The figure at the right details Semtech’s recommended mounting pattern. Recommended assembly guidelines are shown in Table 1. 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 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. An area ratio of 0.70 – 0.75 is preferred for the subject package. The area ratio of a rectangular aperture is given as:

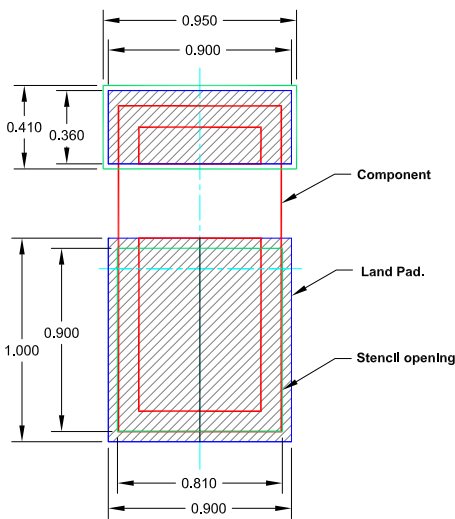
Area Ratio = (L * W) / (2 * (L + W) * T)

Where:

- L = Aperture Length
- W = Aperture Width
- T = Stencil Thickness

Semtech recommends a stencil thickness of 0.125mm 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. Since this device has uneven pad sizes, the recommended stencil opening is 10% smaller than the size of the large pad and 25um larger than the size of the small pad. This is done to control solder height and keep the part planar during reflow. Solder paste with Type 3 or smaller particles are recommended.

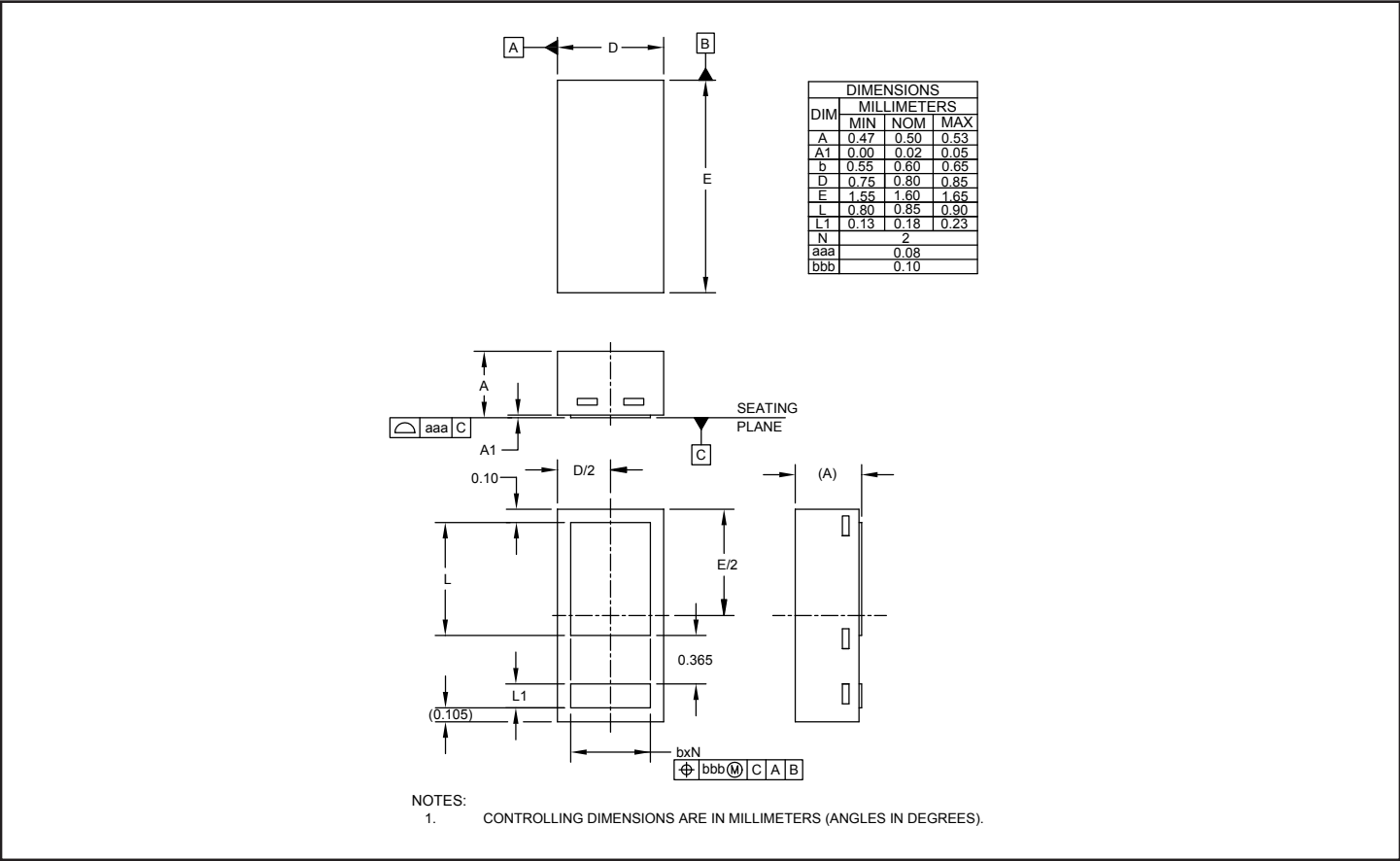
Recommended Mounting Pattern



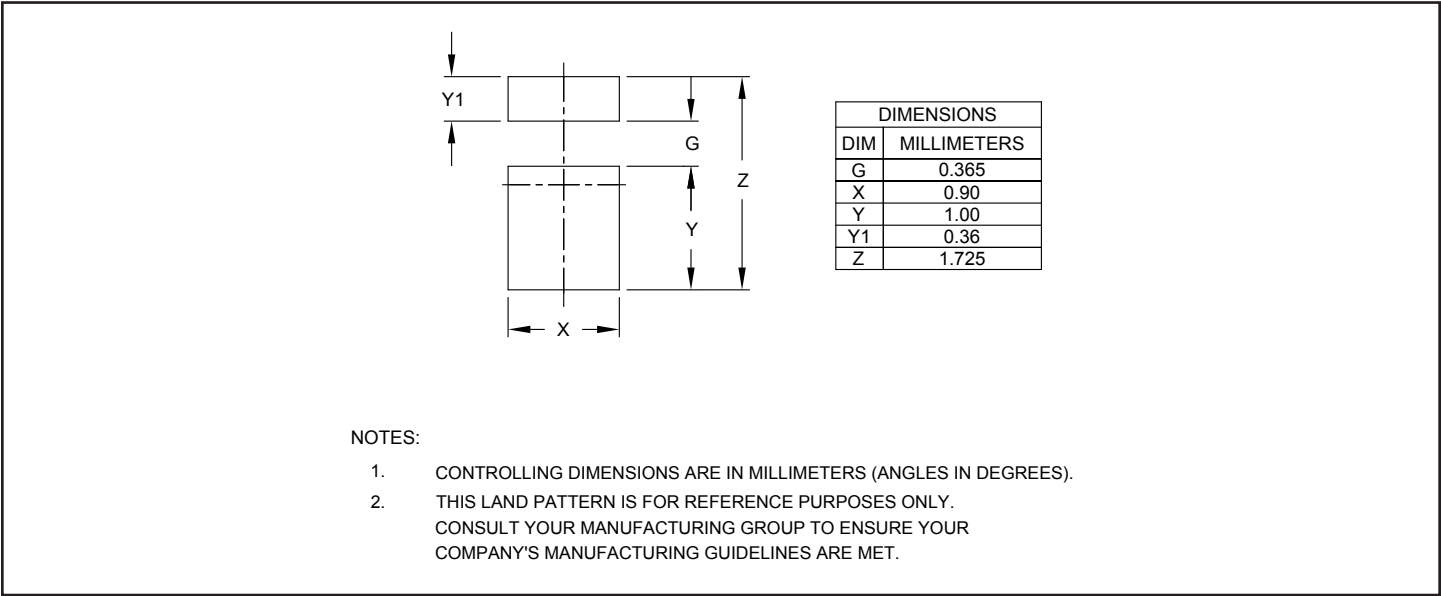
All Dimensions are in mm.
Land Pad. Stencil opening Component

Table 1 - Recommended Assembly Guidelines	
Assembly Parameter	Recommendation
Solder Stencil Design	Laser Cut, Electro-Polished
Aperture Shape	Rectangular
Solder Stencil Thickness	0.125mm (0.005")
Solder Paste Type	Type 3 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

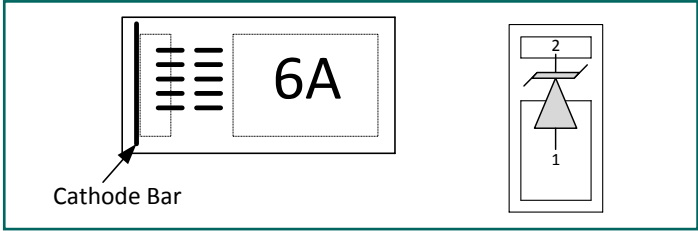
Outline Drawing - SLP1608P2



Land Pattern - SLP1608P2



Marking



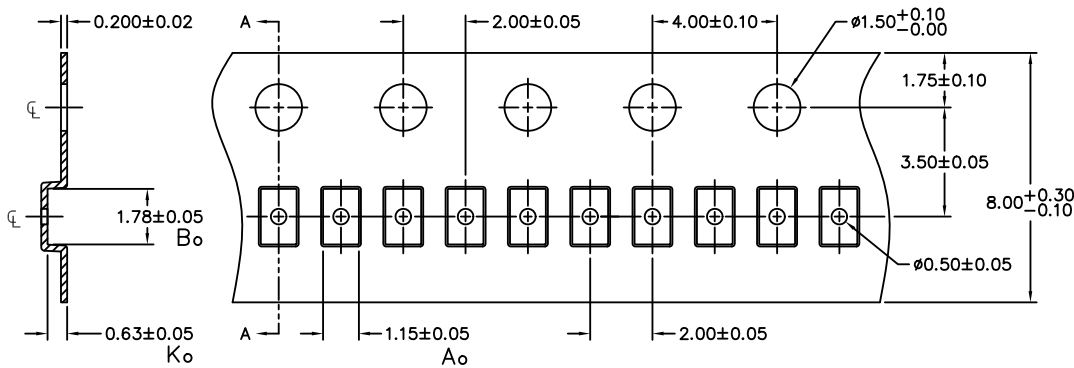
- Notes:
- 1) Dashes represent matrix date code
 - 2) See ordering information for part specific marking codes

Ordering Information

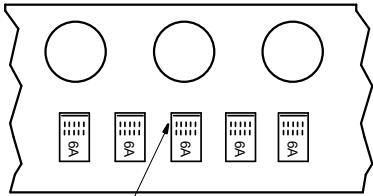
Part Number	Marking Code	Working Voltage	Qty per 7" Reel
μClamp0561P.TNT	6A	5V	10,000
μClamp1061P.TNT	6B	10V	10,000
μClamp1261P.TNT	6C	12V	10,000
μClamp1561P.TNT	6D	15V	10,000
μClamp2461P.TNT	6F	24V	10,000
μClamp3061P.TNT	6G	30V	10,000
μClamp3661P.TNT	6H	36V	10,000
μClamp4061P.TNT	6J	40V	10,000
μClamp6061P.TNT	6K	60V	10,000

- Notes:
- 1) MicroClamp, uClamp and μClamp are trademarks of Semtech Corporation

Tape and Reel Specification



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



Cathode Location
(Towards Sprocket Holes)



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