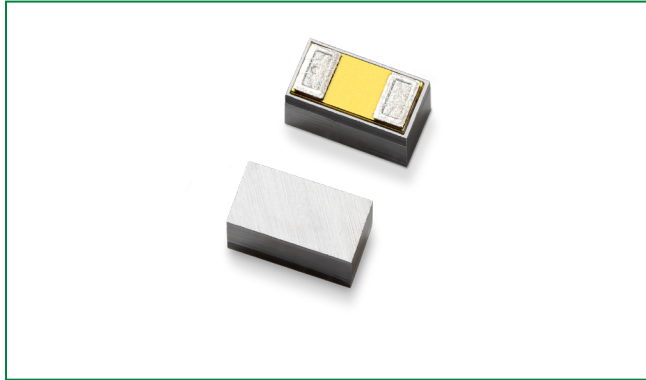


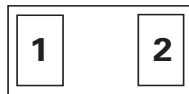
SP4315-01WTG

1.0 V, 0.17 pF, 15 kV, Low Clamping Voltage, Bidirectional TVS, Ultra Low Capacitance ESD protection

HF RoHS Pb



Pinout



Functional Block Diagram



Description

The SP4315-01WTG provides ultra-low capacitance, bidirectional and a high level of protection for electronic equipment that may experience destructive electrostatic discharges (ESD). The typical capacitance of 0.17 pF helps ensure excellent signal integrity on the most challenging consumer electronics interfaces, such as DisplayPort interfaces, Thunderbolt, USB 3x and USB 4.0.

It can safely absorb repetitive ESD strikes at ± 15 kV (contact discharge, IEC 61000-4-2) without performance degradation and safely dissipate 7 A of 8/20 μ s surge current (IEC 61000-4-5 2nd edition).

Features

- ESD, IEC 61000-4-2, ± 15 kV contact, ± 20 kV air
- EFT, IEC 61000-4-4, 40 A (5/50 ns)
- Maximum surge tolerance, IEC 61000-4-5, 2nd edition, 7 A (8/20 μ s)
- Low leakage current of 50 nA (Max) at 1.0 V
- Ultra low capacitance of 0.17 pF (Typ @ $V_R = 0$ V)
- Space efficient 0201
- Halogen-free, lead-free and RoHS compliant
- Moisture Sensitivity Level (MSL-1)

Applications

- 2.5/5G/10G Ethernet
- Thunderbolt 5.0
- USB 3x and USB 4.0
- DisplayPort
- LVDS

Life Support Note:

Not Intended for Use in Life Support or Life Saving Applications

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

SP4315-01WTG

1.0 V, 0.17 pF, 15 kV, Low Clamping Voltage, Bidirectional TVS, Ultra Low Capacitance ESD protection

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current ($t_p = 8/20 \mu s$)	7.0	A
T_{OP}	Operating Temperature	-40 to 125	°C
T_{STOR}	Storage Temperature	-55 to 150	°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

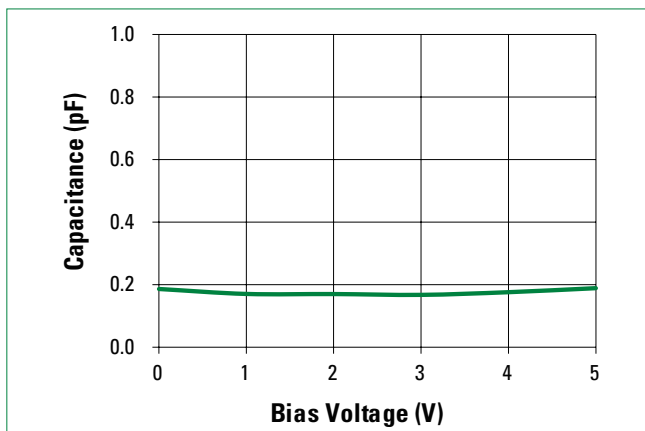
Electrical Characteristics ($T_{OP} = 25^\circ C$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}				1.0	V
Breakdown Voltage	V_{BR}	$I_R = 1 \text{ mA}$	1.5			V
Reverse Leakage Current	I_{LEAK}	$V_R = 1 \text{ V}$		1	50	nA
Holding Voltage	V_{HOLD}	I/O to GND		2.3		V
Clamp Voltage ¹	V_C	$I_{PP} = 16 \text{ A}$, $t_p = 0.2/100 \text{ ns(TLP)}$, I/O to GND		7.0		V
		$I_{PP} = 1 \text{ A}$, $t_p = 8/20 \mu s$, I/O to GND		4.0		V
		$I_{PP} = 7 \text{ A}$, $t_p = 8/20 \mu s$, I/O to GND		6.5		V
Dynamic Resistance ²	R_{DYN}	TLP, $t_p = 100 \text{ ns}$, I/O to GND		0.25		Ω
ESD Withstand Voltage ^{1,3}	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	± 15			kV
		IEC 61000-4-2 (Air Discharge)	± 20			kV
Diode Capacitance ¹	C_{IO-GND}	Reverse Bias = 0 V, $f = 1 \text{ MHz}$, I/O to GND		0.17		pF

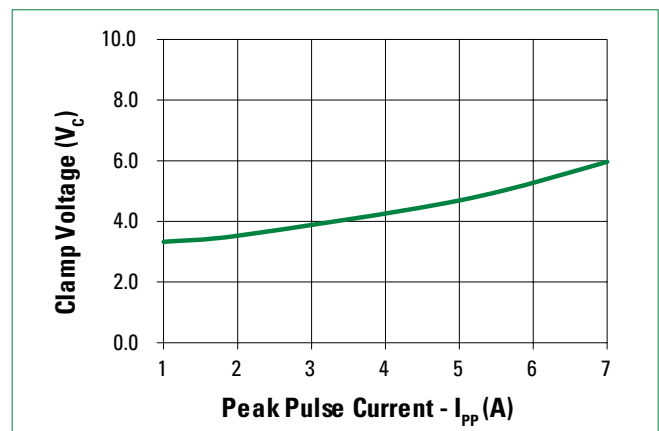
Note:

- Parameter is guaranteed by design and/or component characterization.
- Transmission Line Pulse (TLP) with 100 ns width, 0.2 ns rise time, and average window $t_1 = 70 \text{ ns}$ to $t_2 = 90 \text{ ns}$
- Device stressed with ten non-repetitive ESD pulses according to IEC61000-4-2 ($R = 300 \Omega$, $C = 150 \text{ pF}$).

Capacitance vs. Reverse Bias



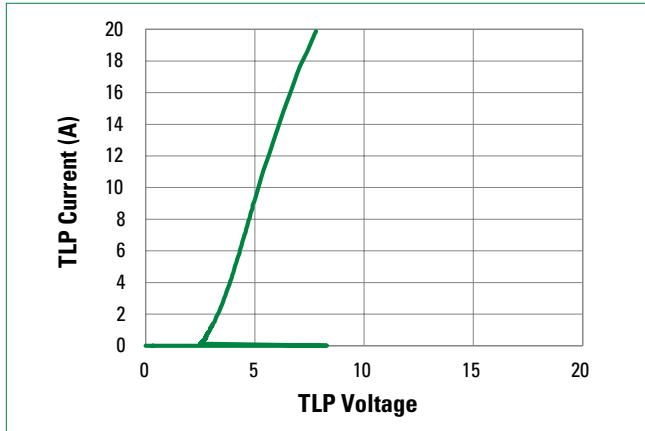
Clamping Voltage vs I_{PP}



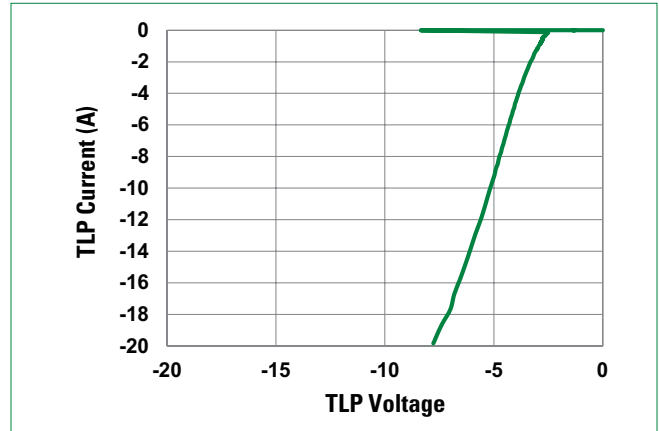
SP4315-01WTG

1.0 V, 0.17 pF, 15 kV, Low Clamping Voltage, Bidirectional TVS, Ultra Low Capacitance ESD protection

Positive Transmission Line Pulsing (TLP) Plot



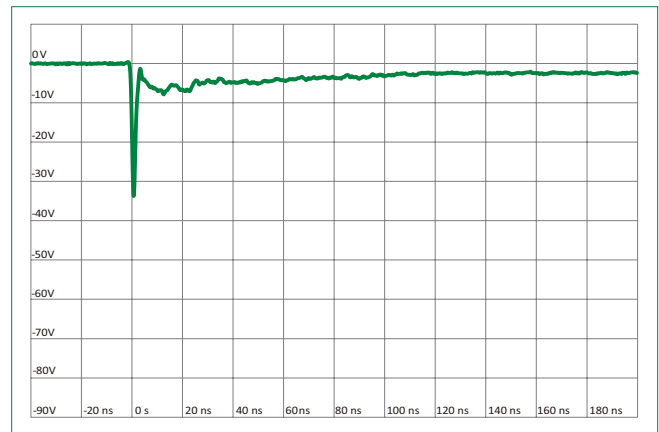
Negative Transmission Line Pulsing (TLP) Plot



IEC 61000-4-2 +8 kV Contact ESD Clamping Voltage



IEC 61000-4-2 -8 kV Contact ESD Clamping Voltage

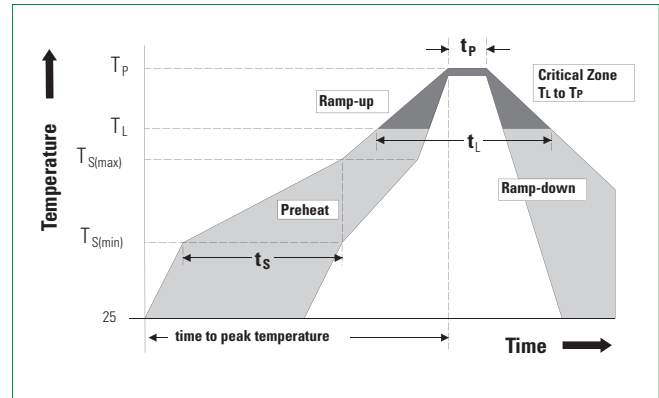


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Soldering Parameters

Reflow Condition		Pb – free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150 °C
	- Temperature Max ($T_{s(max)}$)	200 °C
	- Time (min to max) (t_s)	60 – 180 seconds
Average Ramp Up Rate (Liquidus) Temp (T_L) to Peak		3 °C/second max
$T_{s(max)}$ to T_L - Ramp-up Rate		3 °C/second max
Reflow	- Temperature (T_L) (Liquidus)	217 °C
	- Temperature (t_L)	60 – 150 seconds
Peak Temperature (T_p)		260 ^{+0/-5} °C
Time Within 5 °C of Actual Peak Temperature (t_p)		30 seconds
Ramp-down Rate		6 °C/second max
Time 25 °C to Peak Temperature (T_p)		8 minutes max
Do Not Exceed		260 °C



Product Characteristics

Lead Plating	Tin plating
Lead Material	Copper bump
Flammability	UL recognized compound meeting flammability rating V-0

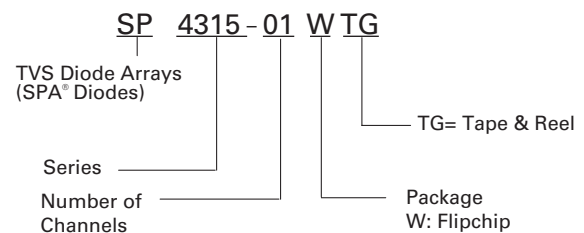
Ordering Information

Part Number	Package	Min. Order Qty.
SP4315-01WTG	Flipchip	10000

Part Marking System



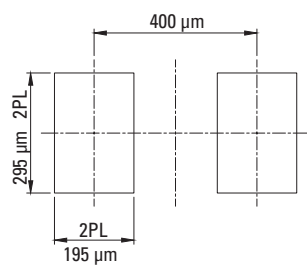
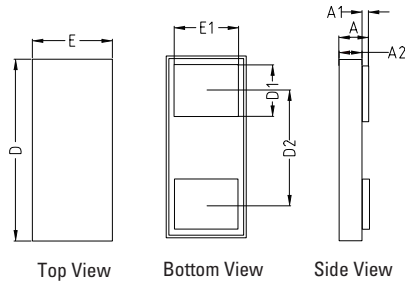
Part Numbering System



SP4315-01WTG

1.0 V, 0.17 pF, 15 kV, Low Clamping Voltage, Bidirectional TVS, Ultra Low Capacitance ESD protection

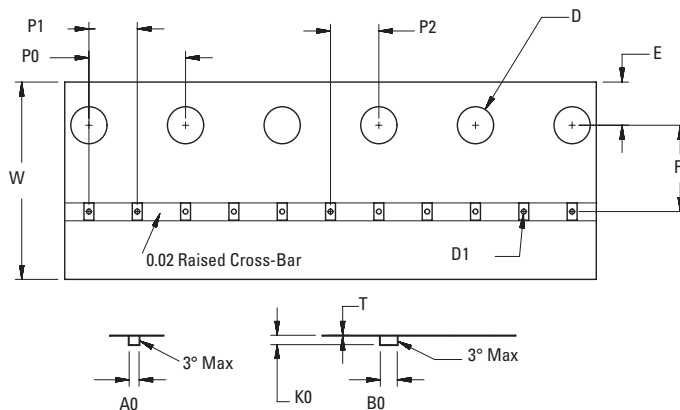
Package Dimensions — Flipchip



Recommended Land Pattern

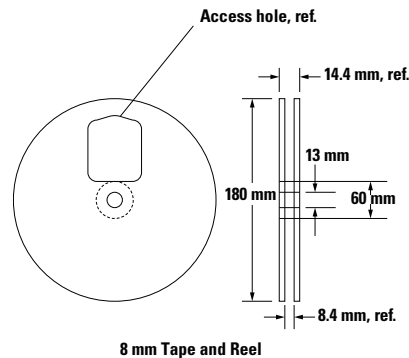
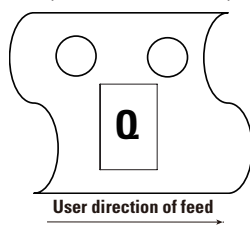
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
D	0.605	0.655	0.0238	0.0258
E	0.305	0.355	0.012	0.014
D1	0.145	0.155	0.0057	0.0061
E1	0.245	0.255	0.0096	0.01
D2	0.400 BSC		0.0157 BSC	
A	0.273	0.329	0.0107	0.013
A2	0.265	0.315	0.0104	0.0124
A1	0.008	0.014	0.0003	0.0006

Embossed Carrier Tape & Reel Specification — Flipchip



Symbol	Millimeters
A0	0.39 +/-0.03
B0	0.69 +/-0.03
D	ø 1.50 +/-0.10
D1	ø 0.20 +/-0.05
E	1.75 +/-0.10
F	3.50 +/-0.05
K0	0.35 +/-0.03
P0	4.00 +/-0.10
P1	2.00 +/-0.05
P2	2.00 +/-0.05
W	8.00 +/-0.30/-0.10
T	0.20 +/-0.02

Component Orientation in Tape



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