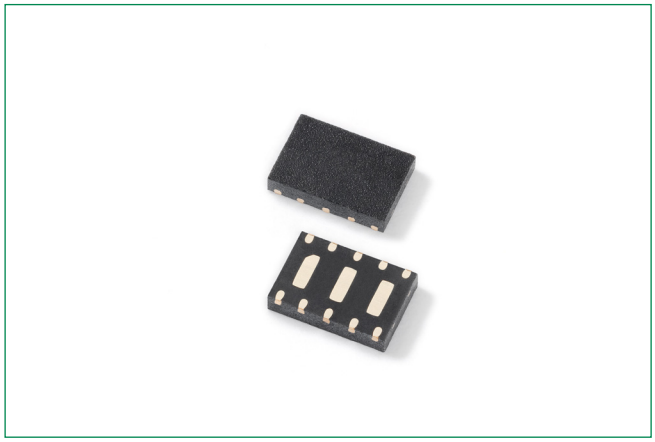
SP3384NUTG Series
Lightning Surge Protection

HF RoHS Pb



Description

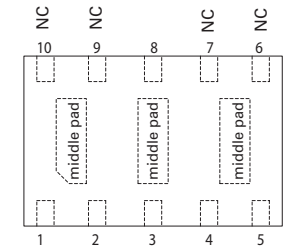
The SP3384NUTG is a low-capacitance, TVS Diode Array designed to provide protection against ESD (electrostatic discharge), CDE (cable discharge events), EFT (electrical fast transients), and lightning induced surges for highspeed, differential data lines. It's packaged in a µDFN package (3.0 x 2.0mm) and each device can protect up 4 channels up to 15A (IEC 61000-4- 5 2nd edition,) and up to ±30kV ESD (IEC 61000-4-2).

The SP3384NUTG with its low capacitance and low clamping voltage makes it ideal for high-speed data interfaces up to 10GbE application found in switches, servers, etc.

Features

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000- 4-5 2nd edition, 15A (tP=8/20µs)
- Low capacitance of 0.5pF@0V (TYP)
- Low leakage current of 3nA(typ) & 40nA(max) at 3.3V
- Low leakage current of 40nA at 3.3V in 100°C"
- Low operating and clamping voltage
- µDFN-10 package is optimized for high-speed data line routing
- Provides protection for two differential data pairs (4 channels) up to 15A
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)

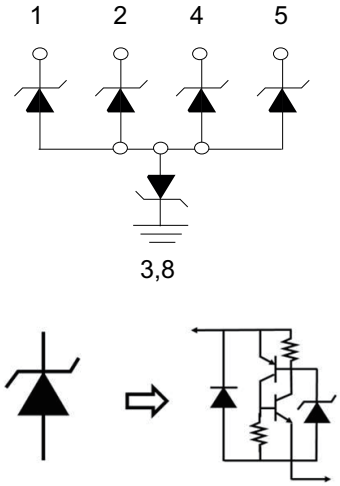
Pinout



Note: PIN3, PIN8 and middle PADs are same potential

Top View

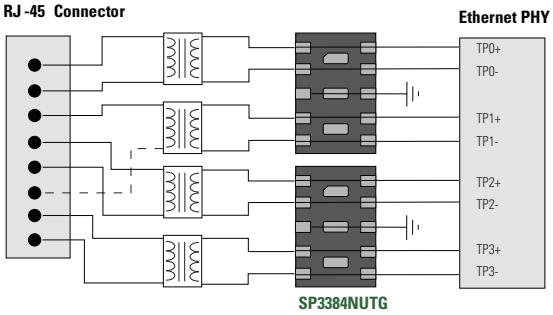
Functional Block Diagram



Applications

- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- LVDS Interfaces
- Integrated Magnetics
- Smart TV
- 2.5G/5G/10G Ethernet

Application Example



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.

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Absolute Maximum Ratings

Symbol	Parameter	Value	Units
I_{PP}	Peak Current (t_p=8/20µs)	15	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.

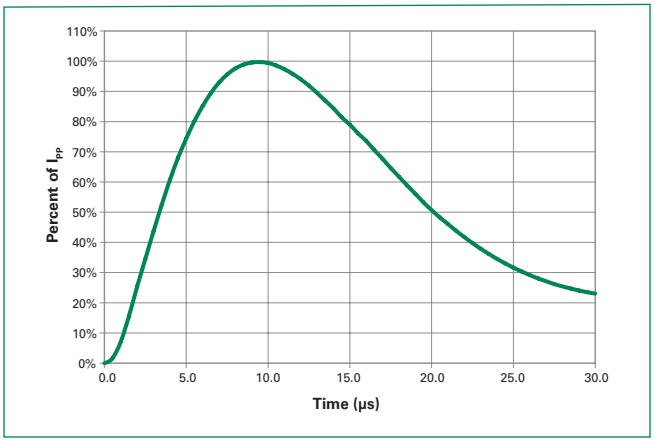
Electrical Characteristics (T_{OP}=25°C)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	V_{RWM}	I_R = 1µA			3.3	V
Breakdown Voltage	V_{BR}	I_R = 1mA	6.5	9		V
Reverse Leakage Current	I_{LEAK}	V_R=3.3V		3	20	nA
		V_R=3.3V at 100°C		40		nA
Holding Voltage	V_{HOLD}	I/O to I/O		2.3		V
Clamp Voltage[1]	V_C	I_{PP}=1A, t_p=8/20µs		4	5.5	V
		I_{PP}=15A, t_p=8/20µs		12	15	V
Dynamic Resistance[2]	R_{DYN}	TLP, t_p=100ns		0.34		Ω
ESD Withstand Voltage[1,3]	V_{ESD}	IEC 61000-4-2 (Contact Discharge)	±30			kV
		IEC 61000-4-2 (Air Discharge)	±30			kV
Diode Capacitance[1]	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		0.5	0.7	pF

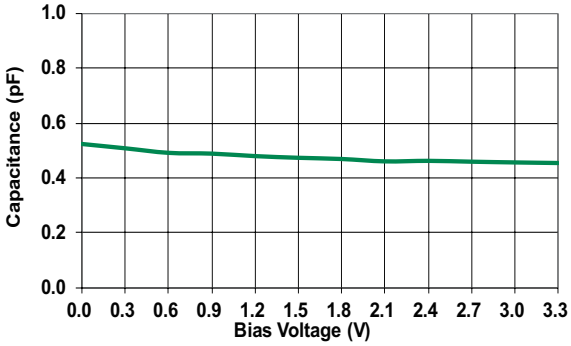
Notes:

1. Parameter is guaranteed by design and/or component characterization.
2. Transmission Line Pulse (TLP) test setting : Std.TDR(50Ω),tp=100ns, tr=0.2ns ITLP and VTLP averaging window: start t1=70ns to end t2=90ns
3. Device stressed with ten non-repetitive ESD pulses.

8/20µs Pulse Waveform



Capacitance vs. Reverse Bias



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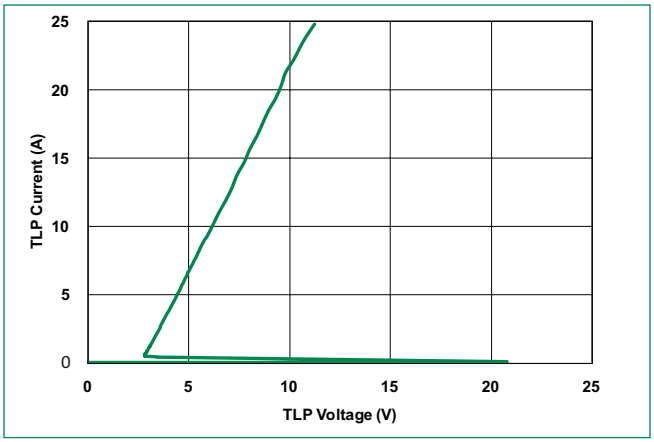
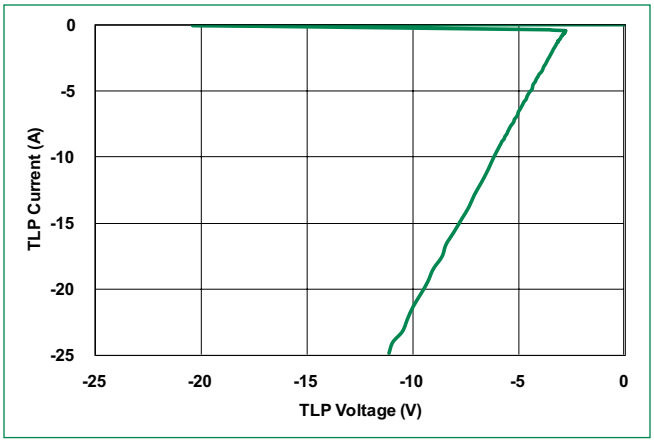
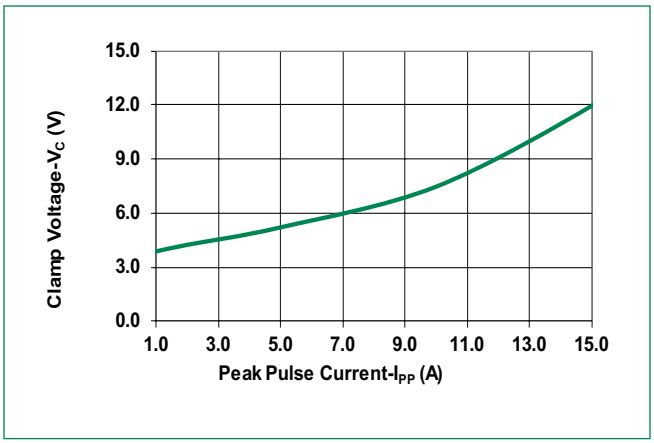
Positive Transmission Line Pulsing (TLP) Plot



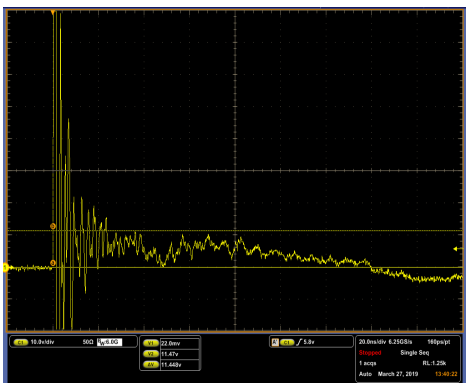
Negative Transmission Line Pulsing (TLP) Plot



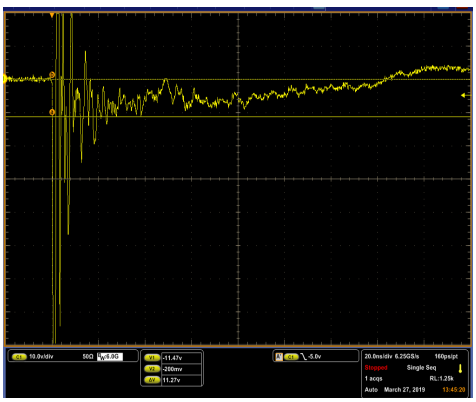
Clamping Voltage vs. Peak Pulse Current



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



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



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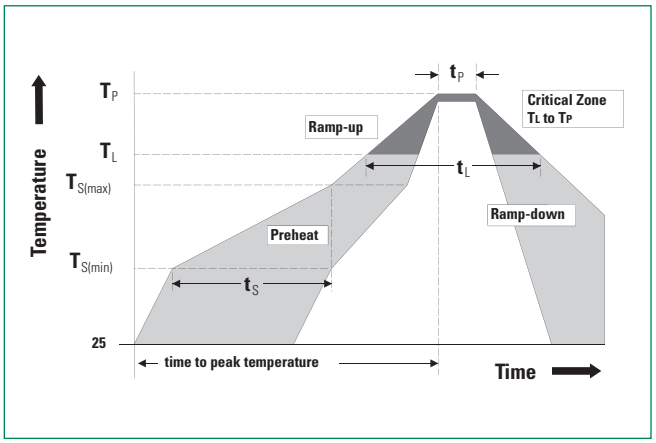
Soldering Parameters

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 – 120 secs
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



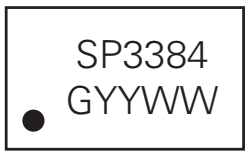
Ordering Information

Part Number	Package	Min. Order Qty.
SP3384NUTG	µDFN-10 (3.0x2.0mm)	3000

Product Characteristics

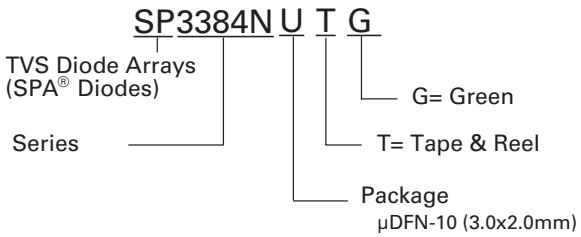
Lead Plating	PPF
Lead Material	Copper Alloy
Substrate Material	Silicon
Body Material	Molded Compound
Flammability	UL Recognized compound meeting flammability rating V-0

Part Marking System



First row = Part name = SP3384
Second row = Assembly code + Date Code

Part Numbering System



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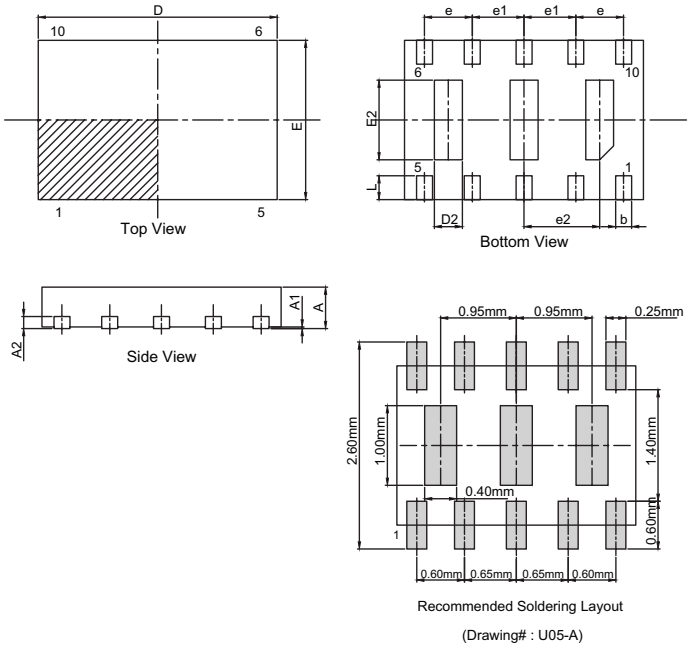
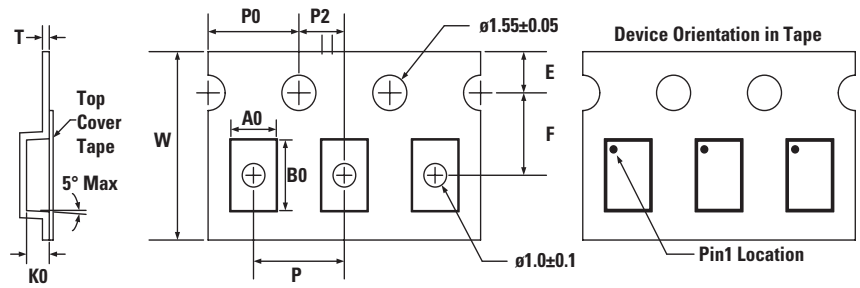
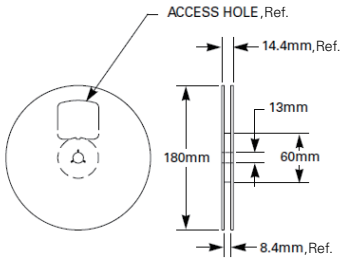
Package Dimensions - µDFN-10 (3.0x2.0mm)



Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.50	0.55	0.60	0.020	0.022	0.024
A1	0.00	0.02	0.05	0.000	0.001	0.002
A2		0.15 Ref			0.006 Ref	
b	0.15	0.20	0.25	0.006	0.008	0.010
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.90	2.00	2.10	0.075	0.079	0.083
D2	0.25	0.35	0.45	0.010	0.014	0.018
E2	0.90	1.00	1.10	0.035	0.039	0.043
L	0.20	0.30	0.40	0.008	0.012	0.016
e		0.60 BSC			0.024 BSC	
e1		0.65 BSC			0.026 BSC	
e2		0.95 BSC			0.037 BSC	

Tape & Reel Specification — µDFN-10 (3.0x2.0mm)





8mm TAPE AND REEL

Package	µDFN-10 (3.0x2.0mm)
Symbol	**Millimeters**
A0	2.30 +/- 0.10
B0	3.20 +/- 0.10
E	1.75 +/- 0.10
F	3.50 +/- 0.05
K0	1.0 +/- 0.10
P	4.00 +/- 0.10
P0	4.00 +/- 0.10
P2	2.00 +/- 0.10
T	0.3 +/- 0.05
W	8.00 +0.30/- 0.10

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