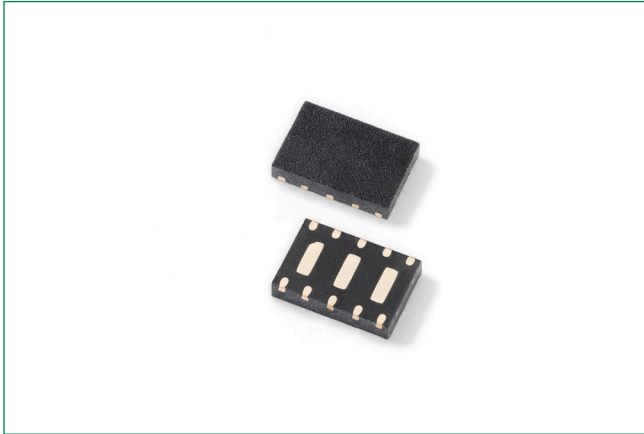
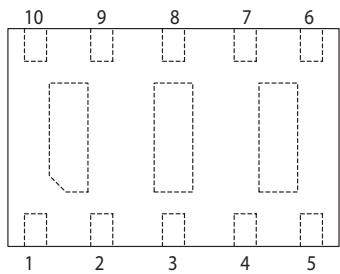
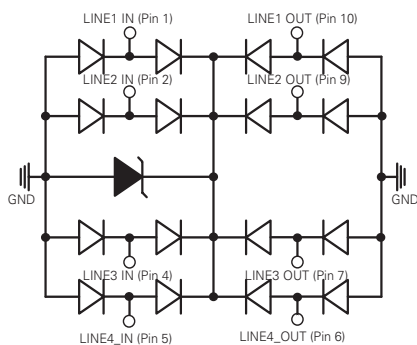


# SP2555NUTG Series

## Lightning Surge Protection

**HF** **RoHS** **Pb**

**Pinout**

**Functional Block Diagram**


## Description

The SP2555NUTG 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 high-speed, differential data lines. It's packaged in a  $\mu$ DFN package (3.0 x 2.0mm) and each component can protect up to 4 channels or 2 differential pairs, up to 45A (IEC 61000-4-5 2nd edition,) and up to 30kV ESD (IEC 61000-4-2). The "flow-through" design minimizes signal distortion, reduces voltage overshoot, and provides a simplified PCB design.

The SP2555NUTG with its low capacitance and low clamping voltage makes it ideal for high-speed data interfaces such as 1GbE applications found in notebooks, switches, etc.

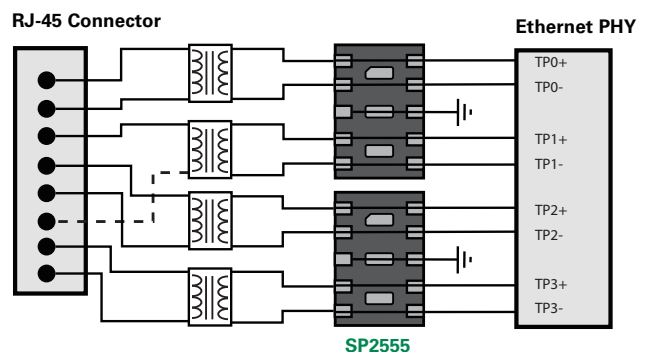
## Features & Benefits

- ESD, IEC 61000-4-2,  $\pm 30$ kV contact,  $\pm 30$ kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd Edition, 45A (8/20 $\mu$ s)
- Low capacitance of 2.5pF@0V (TYP) per I/O
- Low leakage current of 0.1 $\mu$ A (TYP) at 2.5V
- $\mu$ DFN-10 package is optimized for high-speed data line routing
- Provides protection for two differential data pairs (4 channels) up to 45A
- Low operating and clamping voltage
- AEC-Q101 qualified
- Halogen free, Lead free and RoHS compliant

## Applications

- 10/100/1000 Ethernet
- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- LVDS Interfaces
- Integrated Magnetics
- Smart TV

## 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.

# SP2555NUTG Series

## Lightning Surge Protection

### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	45	A
$P_{PK}$	Peak Pulse Power ( $t_p=8/20\mu s$ )	1000	W
$T_{OP}$	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	$V_{RWM}$	$I_R \leq 1\mu A$			2.5	V
Reverse Leakage Current	$I_R$	$V_{RWM} = 2.5V, T = 25^\circ C$		0.1	0.5	$\mu A$
Snap Back Voltage	$V_{SB}$	$I_{SB} = 50mA$	2.0			V
Clamp Voltage	$V_C$	$I_{PP} = 1A, t_p = 8/20\mu s$ , Any I/O to Ground		4.5		V
		$I_{PP} = 10A, t_p = 8/20\mu s$ , Any I/O to Ground		7.5		
		$I_{PP} = 25A, t_p = 8/20\mu s$ , Any I/O to Ground		12		
		$I_{PP} = 45A, t_p = 8/20\mu s$ , Line-to-Line <sup>1</sup> , two I/O Pins connected together on each line		19		
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , Any I/O to Ground		0.1		$\Omega$
ESD Withstand Voltage	$V_{ESD}$	IEC 61000-4-2 (Contact)	$\pm 30$			kV
		IEC 61000-4-2 (Air)	$\pm 30$			kV
Diode Capacitance	$C_{I/O \text{ to GND}}$	Between I/O Pins and Ground $V_R = 0V, f = 1MHz$		2.5		pF
	$C_{I/O \text{ to I/O}}$	Between I/O Pins $V_R = 0V, f = 1MHz$		1.2		pF

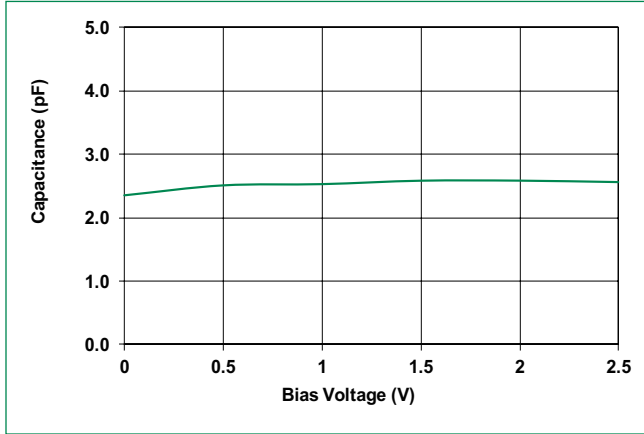
**Notes:**

- Rating with 2 pins connected together per suggested diagram ( For example, pin1 is connected to pin 10, pin 2 is connected to Pin 9, Pin 4 is connected to pin 7 and pin 5 is connected to pin 6)
- Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

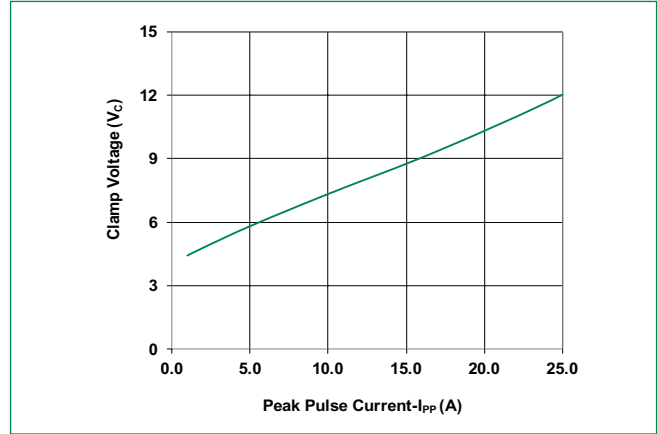
# SP2555NUTG Series

## Lightning Surge Protection

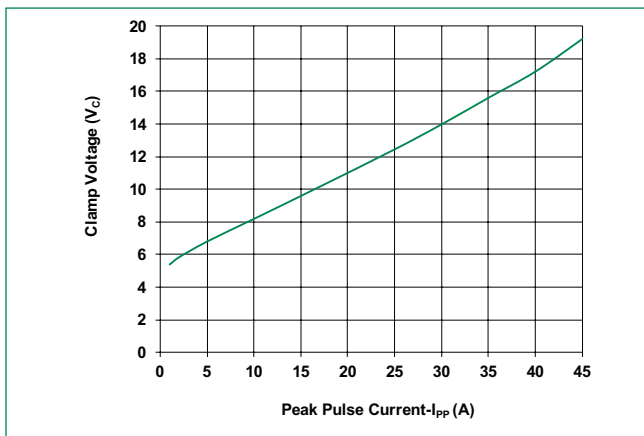
**Capacitance vs. Reverse Bias**



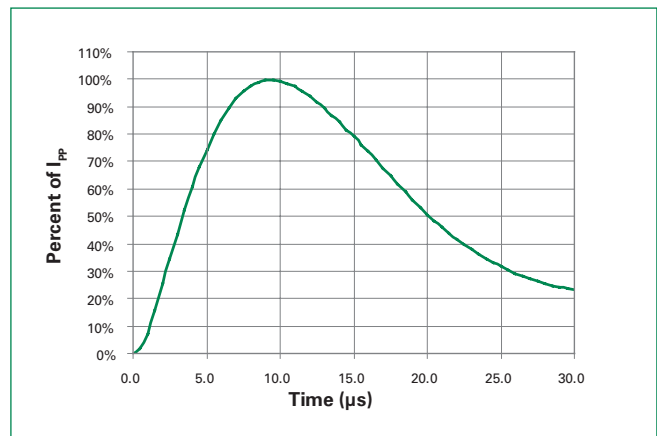
**Clamping Voltage vs.  $I_{pp}$  (I/O to GND)**



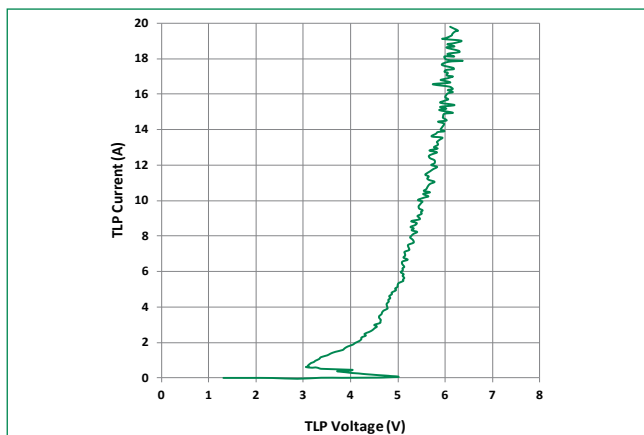
**Clamping Voltage vs.  $I_{pp}$  (Line-to-Line)**



**8/20 $\mu$ S Pulse Waveform**



**Transmission Line Pulsing(TLP) Plot**

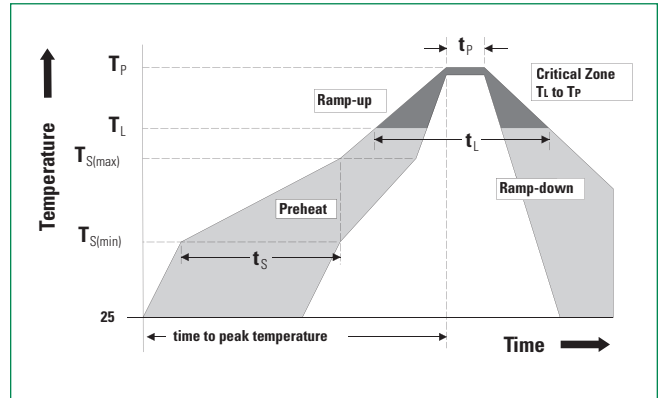


# SP2555NUTG Series

## Lightning Surge Protection

### Soldering Parameters

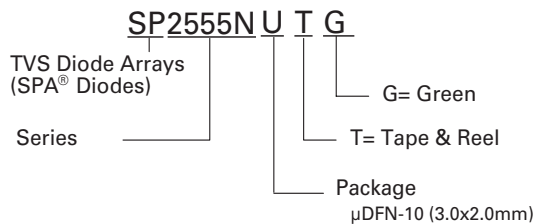
<b>Reflow Condition</b>		Pb – Free assembly
<b>Pre Heat</b>	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 120 secs
<b>Average ramp up rate (Liquidus) Temp (<math>T_L</math>) to peak</b>		3°C/second max
<b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>		3°C/second max
<b>Reflow</b>	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
<b>Peak Temperature (<math>T_p</math>)</b>		260 <sup>+0/-5</sup> °C
<b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>		30 seconds
<b>Ramp-down Rate</b>		6°C/second max
<b>Time 25°C to peak Temperature (<math>T_p</math>)</b>		8 minutes Max.
<b>Do not exceed</b>		260°C



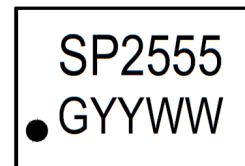
### Ordering Information

Part Number	Package	Marking	Min. Order Qty.
SP2555NUTG	μDFN-10 (3.0x2.0mm)	SP2555	3000

### Part Numbering System



### Part Marking System

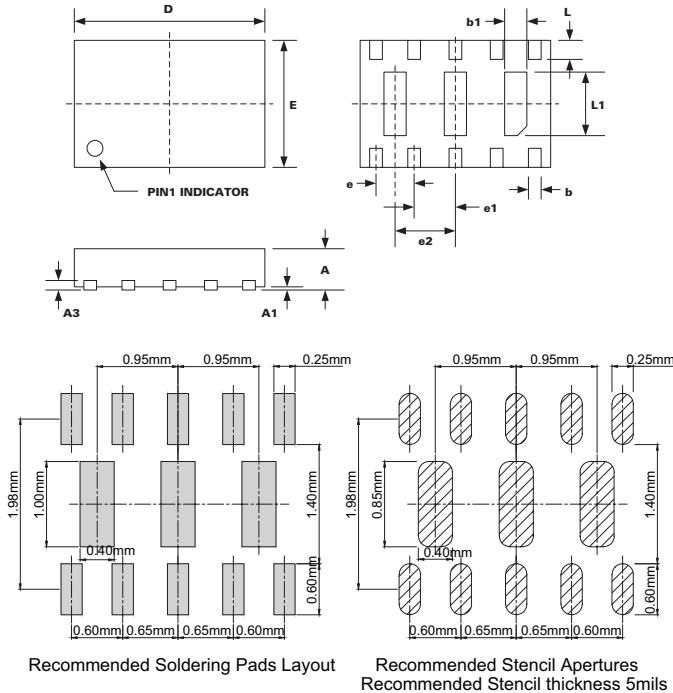


First row= Part Name= SP2555  
Second row= Assembly Code+ Date Code

# SP2555NUTG Series

## Lightning Surge Protection

### Package Dimensions — $\mu$ DFN-10 (3.0x2.0mm)

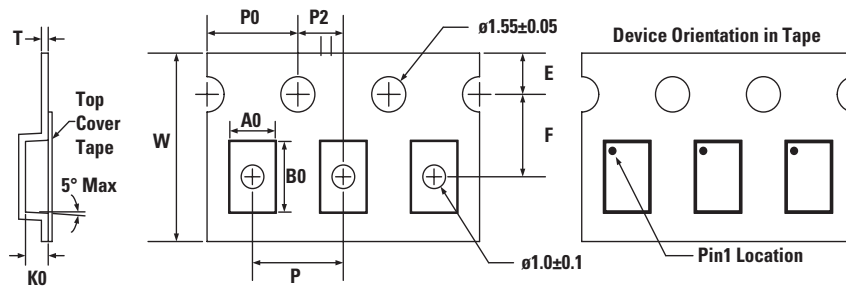


Package	$\mu$ DFN-10 (3.0x2.0mm)					
JEDEC	MO-229					
Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
A	0.50	0.60	0.65	0.020	0.024	0.026
A1	0.00	0.03	0.05	0.000	0.001	0.002
A3	0.15 Ref			0.006 Ref		
b	0.15	0.20	0.25	0.006	0.008	0.010
b1	0.25	0.35	0.45	0.010	0.014	0.018
D	2.90	3.00	3.10	0.114	0.118	0.122
E	1.90	2.00	2.10	0.075	0.079	0.083
e	0.60 BSC			0.024 BSC		
e1	0.65 BSC			0.026 BSC		
e2	0.95 BSC			0.037		
L	0.25	0.30	0.35	0.010	0.012	0.014
L1	0.95	1.00	1.05	0.037	0.039	0.041

#### Notes:

- All dimensions are in millimeters
- Dimensions include solder plating.
- Dimensions are exclusive of mold flash & metal burr.
- Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.
- Package surface matte finish VDI 11-13.

### Tape & Reel Specification — $\mu$ DFN-10 (3.0x2.0mm)



Package	$\mu$ DFN-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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