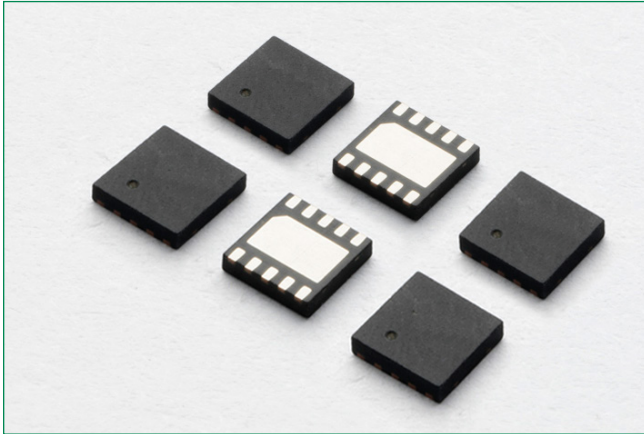


# SP3304N

## Series 3.3V 20A Diode Array

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

### Additional Information



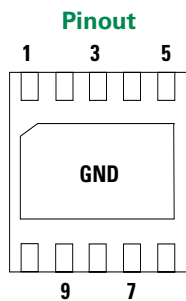
Resources



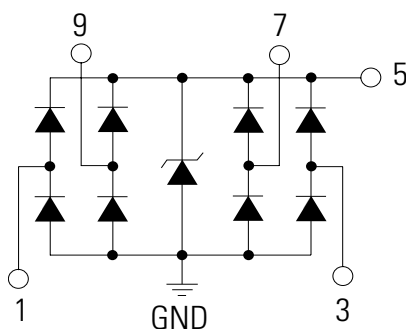
Accessories



Samples



### Functional Block Diagram



### Description

The SP3304N integrates 4 channels of low capacitance diodes with an additional zener diode to protect sensitive I/O pins against lightning induced surge events and ESD. This robust device can safely absorb up to 20A per IEC 61000-4-5 2nd Edition ( $t_P=8/20\mu s$ ) without performance degradation and a minimum  $\pm 30kV$  ESD per IEC 61000-4-2. The low loading capacitance makes the SP3304N ideal for protecting high-speed signal pins.

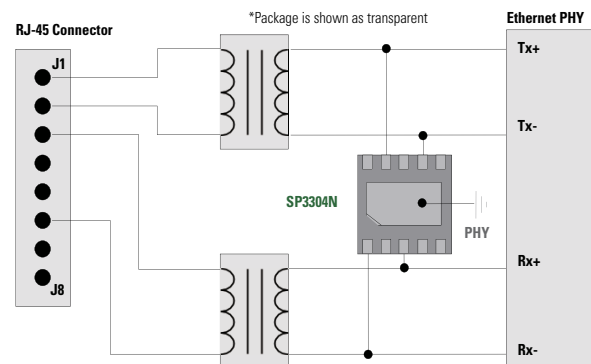
### Features & Benefits

- RoHS compliant, lead-free and halogen-free
- ESD, IEC 61000-4-2,  $\pm 30kV$  contact,  $\pm 30kV$  air
- EFT, IEC 61000-4-4, 40A ( $t_P=5/50ns$ )
- Lightning, IEC 61000-4-5 2nd Edition, 20A ( $t_P=8/20\mu s$ )
- Low capacitance of 3.5pF (TYP) per I/O
- Low leakage current of  $1\mu A$  (MAX) at 3.3V
- Moisture Sensitivity Level (MSL Level-1)

### Applications

- 10/100/1000 Ethernet Interfaces
- Customer Premise Equipment (CPE)
- VoIP Phones
- Set Top Boxes
- PBX Systems
- Small Cells

### 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.

**SP3304N**

## Series 3.3V 20A Diode Array

**Absolute Maximum Ratings**

Symbol	Parameter	Value	Units
$I_{PP}$	Peak Current ( $t_p=8/20\mu s$ )	20.0	A
$P_{PK}$	Peak Pulse Power ( $t_p=8/20\mu s$ )	300	W
$T_{OP}$	Operating Temperature	-40 to 125	°C
$T_{STOR}$	Storage Temperature	-55 to 150	°C

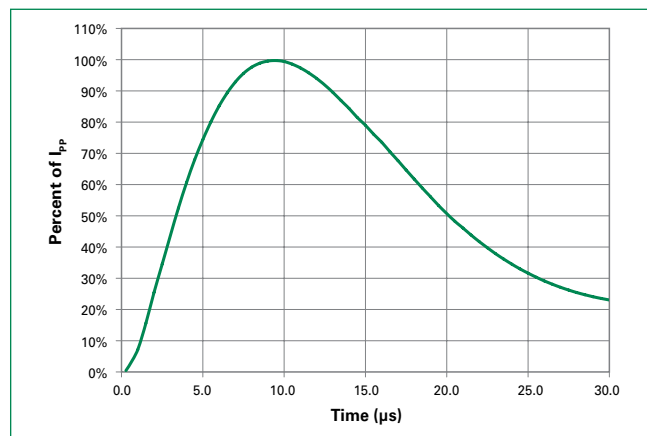
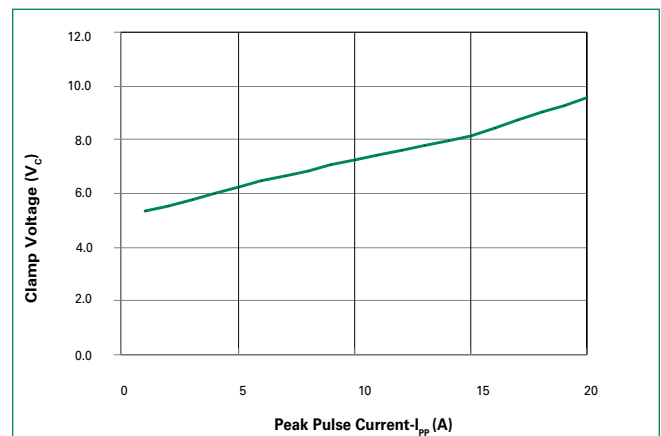
**Caution:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

**Electrical Characteristics (TOP=25°C)**

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Reverse Standoff Voltage	$V_{RWM}$				3.3	V
Punch Through Voltage	$V_{PT}$	$I_{PT}=5\mu A$	3.5			V
Snap Back Voltage	$V_{SB}$	$I_{SB}=50mA$	2.8			V
Reverse Leakage Current	$I_{LEAK}$	$V_R=3.3V$ , I/O to GND		0.5	1.0	$\mu A$
Clamp Voltage <sup>1</sup>	$V_C$	$I_{PP}=1A$ , $t_p=8/20\mu s$ , Fwd			6.0	V
		$I_{PP}=5A$ , $t_p=8/20\mu s$ , Fwd			7.0	V
		$I_{PP}=10A$ , $t_p=8/20\mu s$ , Fwd			8.0	V
		$I_{PP}=20A$ , $t_p=8/20\mu s$ , Fwd			11.5	V
Dynamic Resistance <sup>2</sup>	$R_{DYN}$	TLP, $t_p=100ns$ , I/O to GND		0.25		W
ESD Withstand Voltage <sup>1</sup>	$V_{ESD}$	IEC61000-4-2 (Contact)	$\pm 30$			kV
		IEC61000-4-2 (Air)	$\pm 30$			kV
Diode Capacitance <sup>1</sup>	$C_{I/O-GND}$	Reverse Bias=0V, f=1MHz		3.5	5.0	pF
Diode Capacitance <sup>1</sup>	$C_{I/O-I/O}$	Reverse Bias=0V, f=1MHz		2.0		pF

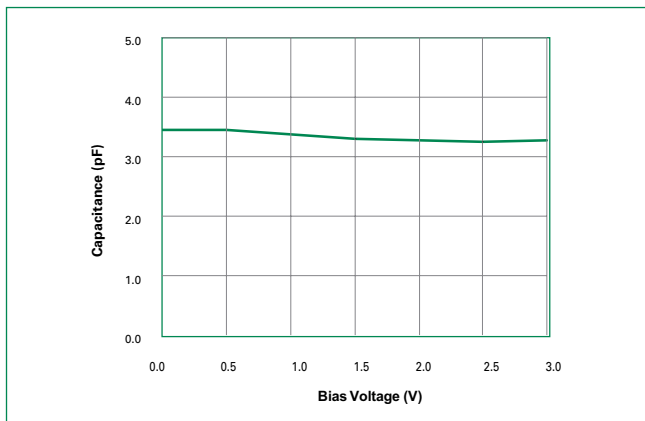
**Note:** <sup>1</sup> Parameter is guaranteed by design and/or device characterization.

<sup>2</sup> Transmission Line Pulse (TLP) with 100ns width, 2ns rise time, and average window  $t_1=70ns$  to  $t_2=90ns$

**Pulse Waveform****Clamping Voltage vs. IPP**

**SP3304N**

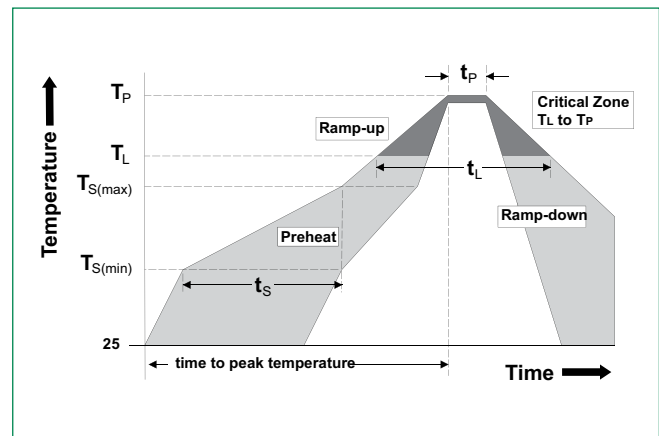
## Series 3.3V 20A Diode Array

**Capacitance vs. Bias****Ordering Information**

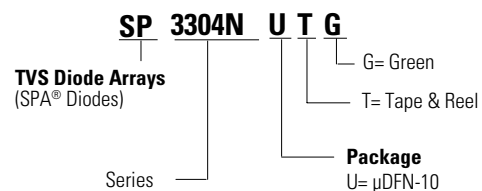
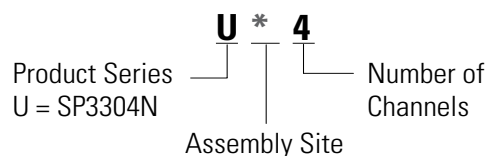
Part Number	Package	Min. Order Qty.
SP3304NUTG	μDFN-10	3000

**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 – 180 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>	20 – 40 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	

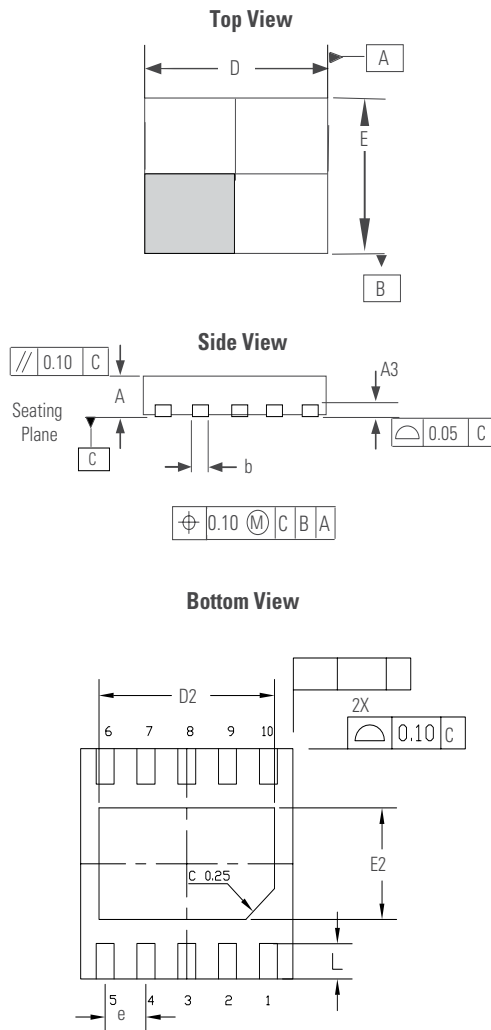
**Product Characteristics**

<b>Lead Plating</b>	Pre-Plated Frame
<b>Lead Material</b>	Copper Alloy
<b>Substrate Material</b>	Silicon
<b>Body Material</b>	Molded Epoxy
<b>Flammability</b>	UL Recognized compound meeting flammability rating V-0

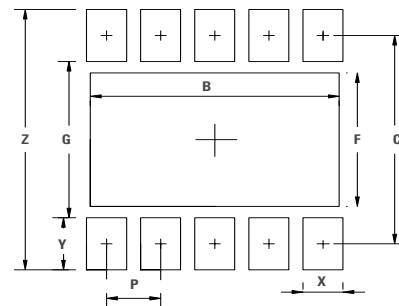
**Part Numbering System****Part Marking System**

**SP3304N**

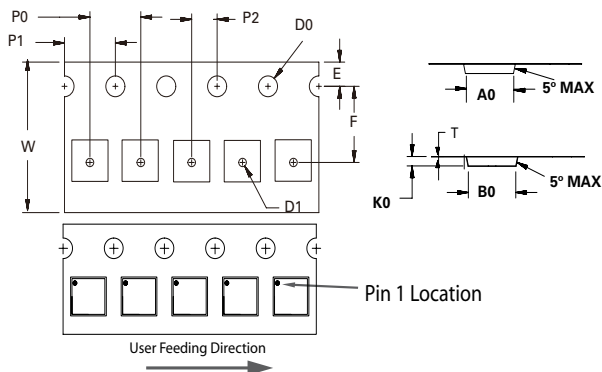
## Series 3.3V 20A Diode Array

**Package Dimensions —  $\mu$ DFN-10**

Package	$\mu$ DFN-10 (2.6x2.6mm)					
JEDEC	MO-229					
Symbol	Millimeters			Inches		
	Min	Nom	Max	Min	Nom	Max
<b>A</b>	0.45	0.50	0.55	0.018	0.020	0.022
<b>A3</b>	0.130 Ref			0.005 Ref		
<b>b</b>	0.17	0.22	0.27	0.006	0.008	0.010
<b>D</b>	2.50	2.60	2.70	0.097	0.101	0.105
<b>D2</b>	2.10	2.15	2.20	0.081	0.083	0.085
<b>E</b>	2.50	2.60	2.70	0.097	0.101	0.105
<b>E2</b>	1.21	1.26	1.31	0.046	0.049	0.051
<b>e</b>	0.50 BSC			0.020 BSC		
<b>L</b>	0.35	0.40	0.45	0.014	0.016	0.018

Recommended Solder Pads  $\mu$ DFN-10L 2.6x2.6mm

Symbol	Dimension	
	Millimeters	Inches
<b>B</b>	2.30	0.091
<b>C</b>	2.20	0.087
<b>F</b>	1.41	0.056
<b>G</b>	1.65	0.065
<b>P</b>	0.50	0.020
<b>X</b>	0.37	0.015
<b>Y</b>	0.55	0.022
<b>Z</b>	2.75	0.108

**Embossed Carrier Tape & Reel Specification —  $\mu$ DFN-10 (2.6x2.6mm)**

Symbol	Millimeters
<b>A0</b>	2.82 ± 0.05
<b>B0</b>	2.82 ± 0.05
<b>D0</b>	Ø1.50 + 0.10
<b>D1</b>	Ø 0.50 + 0.05
<b>E</b>	1.75 ± 0.10
<b>F</b>	3.50 ± 0.05
<b>K0</b>	0.76 ± 0.05
<b>P0</b>	4.00 ± 0.10
<b>P1</b>	4.00 ± 0.10
<b>P2</b>	2.00 ± 0.05
<b>T</b>	0.25 ± 0.02
<b>W</b>	8.00 + 0.30 /- 0.10

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