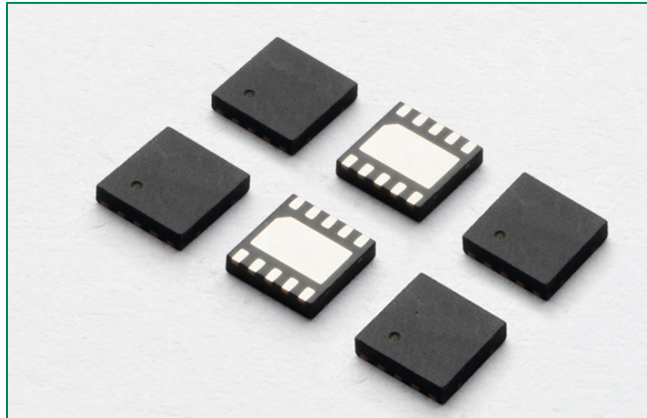
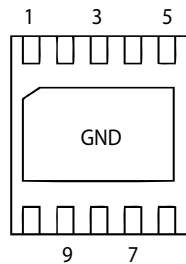


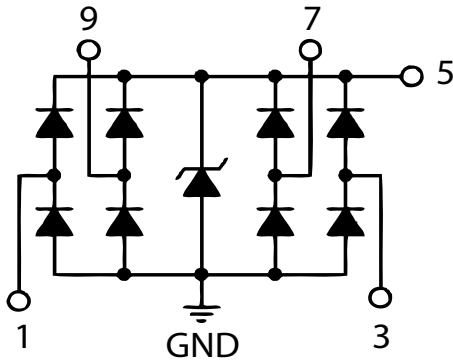
SP3304N Series 3.3V 20A Diode Array



Pinout



Functional Block Diagram



Additional Information



Datasheet



Resources



Samples

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 international standard. The low loading capacitance makes the SP3304N ideal for protecting high-speed signal pins.

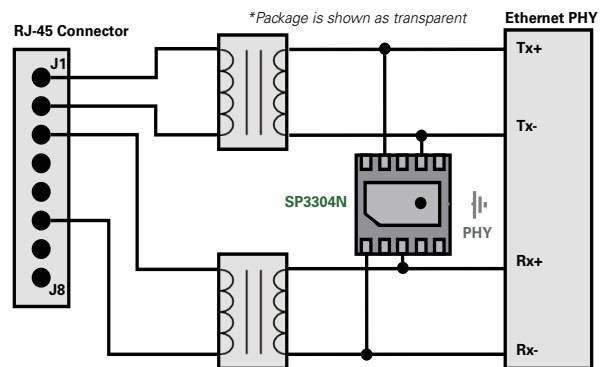
Features

- 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 μA (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.

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.

Thermal Information

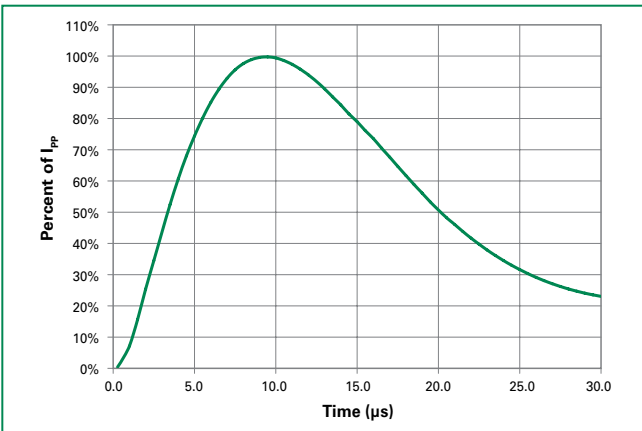
| Parameter | Rating | Units |
|---|------------|-------|
| Storage Temperature Range | -55 to 150 | °C |
| Maximum Junction Temperature | 150 | °C |
| Maximum Lead Temperature (Soldering 20-40s) | 260 | °C |

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

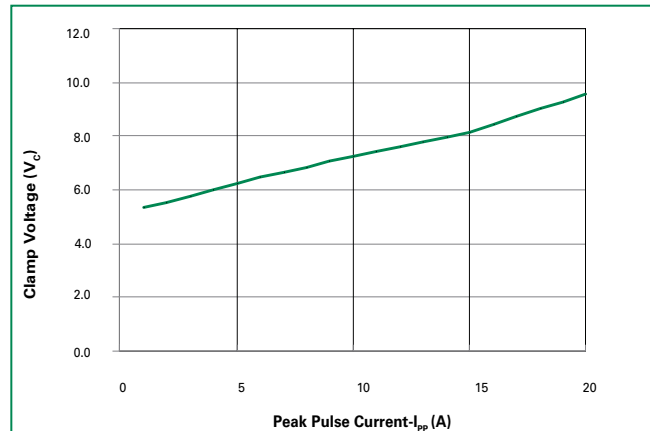
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------------|---------------|--------------------------------------|----------|------|------|----------|
| Reverse Standoff Voltage | V_{RWM} | | | | 3.3 | V |
| Punch Through Voltage | V_{PT} | $I_{PT}=5\mu A$ | 3.5 | | | V |
| Snap Back Voltage | V_{SB} | $I_{SB}=50mA$ | 2.8 | | | V |
| Reverse Leakage Current | I_{LEAK} | $V_R=2.5V$, I/O to GND | | 0.5 | 1.0 | μA |
| Clamp Voltage ¹ | 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 | R_{DYN} | $(V_{C2}-V_{C1})/(I_{PP2}-I_{PP1})$ | | 0.25 | | Ω |
| ESD Withstand Voltage ¹ | V_{ESD} | IEC61000-4-2 (Contact) | ± 30 | | | kV |
| | | IEC61000-4-2 (Air) | ± 30 | | | kV |
| Diode Capacitance ¹ | $C_{I/O-GND}$ | Reverse Bias=0V | | 3.5 | 5.0 | pF |
| Diode Capacitance ¹ | $C_{I/O-I/O}$ | Reverse Bias=0V | | 2.0 | | pF |

Note: ¹ Parameter is guaranteed by design and/or device characterization.

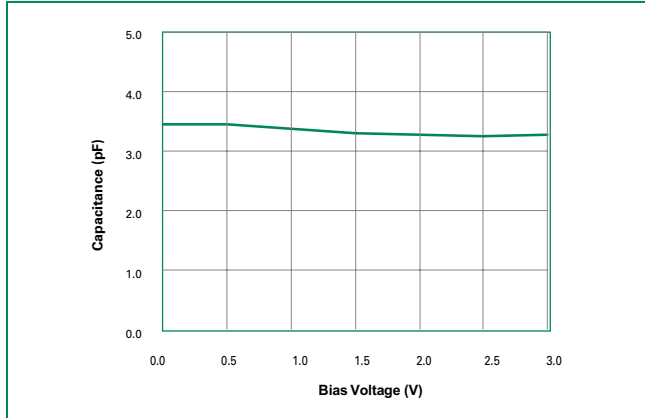
Pulse Waveform



Clamping Voltage vs. I_{PP}



Capacitance vs. Bias

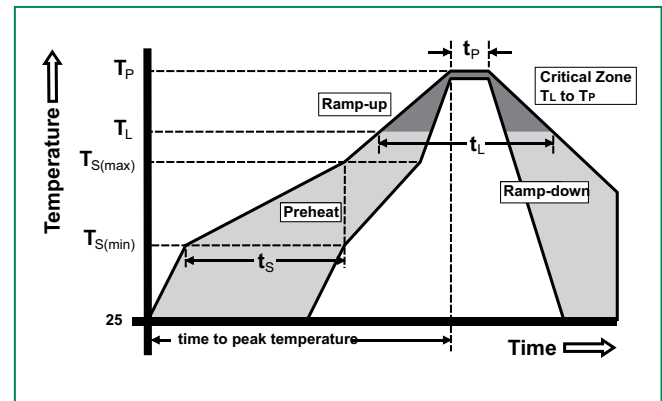


Ordering Information

| Part Number | Package | Marking | Min. Order Qty. |
|-------------|---------|---------|-----------------|
| SP3304NUTG | μDFN-10 | UH4 | 3000 |

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 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) | 20 – 40 seconds | |
| Ramp-down Rate | 6°C/second max | |
| Time 25°C to peak Temperature (T_p) | 8 minutes Max. | |
| Do not exceed | 260°C | |



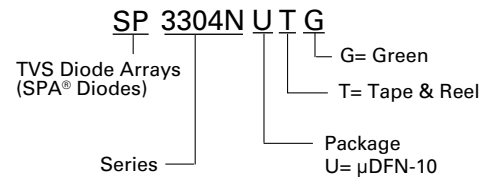
Product Characteristics

| | |
|---------------------|-------------------------|
| Lead Plating | Pre-Plated Frame |
| Lead Material | Copper Alloy |
| Lead Coplanarity | 0.0004 inches (0.102mm) |
| Substitute Material | Silicon |
| Body Material | Molded Epoxy |
| Flammability | UL 94 V-0 |

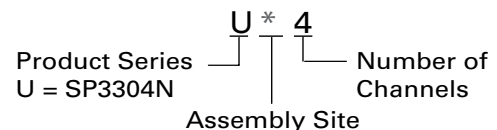
Notes :

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

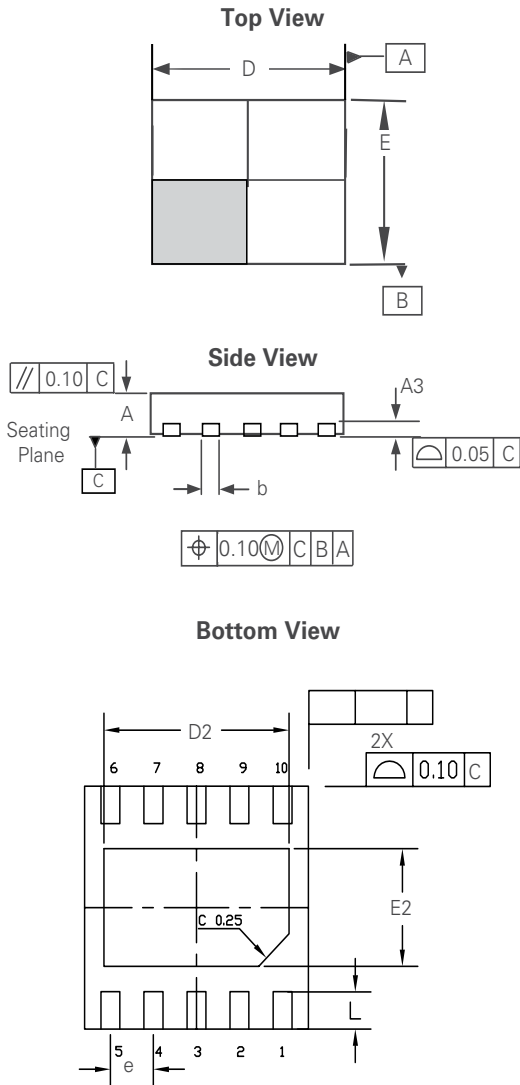
Part Numbering System



Part Marking System

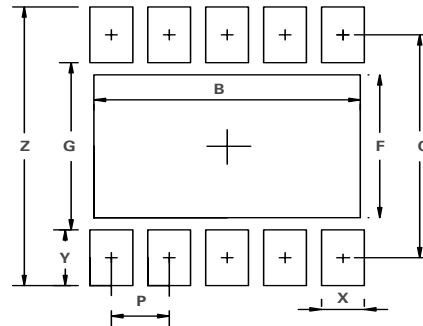


Package Dimensions — μ DFN-10



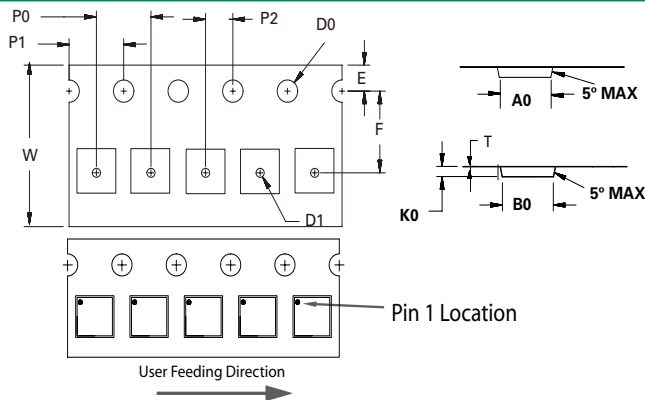
| Package | μ DFN-10 (2.6x2.6mm) | | | | | |
|---------|--------------------------|------|------|-----------|-------|-------|
| JEDEC | MO-229 | | | | | |
| Symbol | Millimeters | | | Inches | | |
| | Min | Nom | Max | Min | Nom | Max |
| A | 0.45 | 0.50 | 0.55 | 0.018 | 0.020 | 0.022 |
| A3 | 0.130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

Recommended Solder Pads μ DFN-10L 2.6x2.6mm



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

Embossed Carrier Tape & Reel Specification — μ DFN-10 (2.6x2.6mm)



| Symbol | Millimeters |
|--------|----------------------|
| A0 | 2.82 ± 0.05 |
| B0 | 2.82 ± 0.05 |
| D0 | ∅1.50 + 0.10 |
| D1 | ∅0.50 + 0.05 |
| E | 1.75 ± 0.10 |
| F | 3.50 ± 0.05 |
| K0 | 0.76 ± 0.05 |
| P0 | 4.00 ± 0.10 |
| P1 | 4.00 ± 0.10 |
| P2 | 2.00 ± 0.05 |
| T | 0.25 ± 0.02 |
| W | 8.00 + 0.30 / - 0.10 |

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