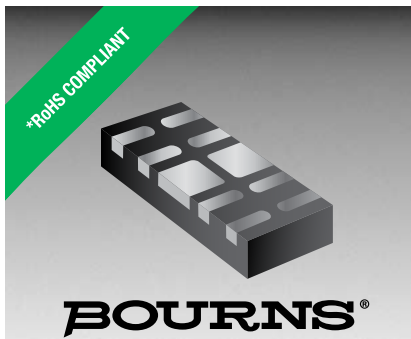




## Features

- RoHS compliant\*
- Low capacitance - 0.04 pF (I/O to I/O)
- ESD protection to IEC 61000-4-2 (Level 4)

## Applications

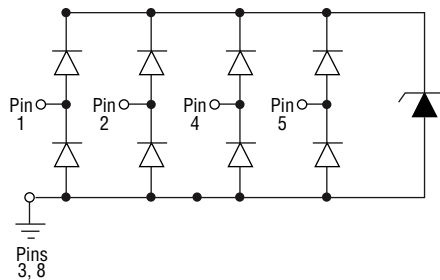
- HDMI 1.3, 1.4 and 2.0
- DisplayPort
- Digital Visual Interface (DVI)
- SATA and eSATA
- USB 3.0
- Memory protection
- SIM card ports

# CDDFN10-3324P - Surface Mount TVS Diode Array

## General Information

The Model CDDFN10-3324P device provides ESD, CDE and EFT protection for high-speed data ports, meeting IEC 61000-4-2 (ESD) requirements. The Transient Voltage Suppressor array, protecting up to four data lines, offers a Working Peak Reverse Voltage of 3.3 V and a Minimum Breakdown Voltage of 4.5 V.

The DFN10 packaged device has an ultra-low typical capacitance of only 0.04 pF between I/O lines. This allows it to be used for protecting sensitive components used on high-speed interfaces. The small footprint of the device allows for flow-through routing on the PCB, helping to maintain matched impedances of the high-speed data lines.



## Additional Information

Click these links for more information:



## Absolute Maximum Ratings (@ T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Parameter                                       | Symbol    | CDDFN10-3324P | Unit |
|-------------------------------------------------|-----------|---------------|------|
| Peak Pulse Power ( $t_p = 8/20 \mu\text{s}$ )   | $P_{pp}$  | 30            | W    |
| Peak Pulse Current ( $t_p = 8/20 \mu\text{s}$ ) | $I_{pp}$  | 4             | A    |
| Operating Temperature                           | $T_J$     | -55 to +85    | °C   |
| Storage Temperature                             | $T_{STG}$ | -55 to +150   | °C   |

## Electrical Characteristics (@ T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Parameter                                              | Symbol      | Min. | Typ. | Max. | Unit          |
|--------------------------------------------------------|-------------|------|------|------|---------------|
| Working Peak Reverse Voltage                           | $V_{WM}$    |      |      | 3.3  | V             |
| Breakdown Voltage @ 1 mA                               | $V_{BR}$    | 4.5  |      |      | V             |
| Leakage Current @ $V_{WM}$                             | $I_R$       |      | 0.1  | 0.5  | $\mu\text{A}$ |
| Capacitance @ 1.65 V, $f = 1 \text{ MHz}$ (I/O to GND) | $C_{IN}$    |      | 0.45 | 0.65 | pF            |
| Capacitance @ 1.65 V, $f = 1 \text{ MHz}$ (I/O to I/O) | $C_{CROSS}$ |      | 0.04 | 0.08 | pF            |
| Clamping Voltage @ $8/20 \mu\text{s}$ @ $I_{pp}$       | $V_C$       |      |      | 7.5  | V             |
| ESD Protection per IEC 6-1000-4-2                      |             |      |      |      |               |
| Contact Discharge                                      |             |      |      | 12   | kV            |
| Air Discharge                                          |             |      |      | 15   | kV            |



**WARNING Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

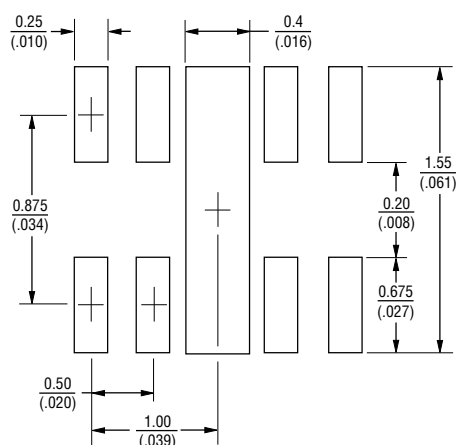
\*RoHS Directive 2015/863, Mar 31, 2015 and Annex.  
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### Recommended Footprint



A diagram showing a rectangular box divided into two sections. The left section contains the text "324" and the right section contains the text "XX". A line points from the text "3-DIGIT PRODUCT CODE" to the "324" section. Another line points from the text "CONTROL CODE" to the "XX" section.

|                                 |    |
|---------------------------------|----|
| Moisture Sensitivity Level..... | 3  |
| ESD Classification (HBM).....   | 3B |

## CD DFN10 - 33 24 P

Common Code \_\_\_\_\_  
 Chip Diode \_\_\_\_\_  
 Package \_\_\_\_\_  
 DFN10 = DFN-10 Package  
 Working Peak Reverse Voltage \_\_\_\_\_  
 33 = 3.3 V<sub>RWM</sub> (Volts)  
 Number of Lines \_\_\_\_\_  
 24 = 2 Ground / 4 Data Lines  
 Suffix \_\_\_\_\_  
 P = Ultra-low Capacitance

|   |    |
|---|----|
| 1 | 10 |
| 2 | 9  |
| 3 | 8  |
| 4 | 7  |
| 5 | 6  |

| Pin      | Function                                                      |
|----------|---------------------------------------------------------------|
| 1,2,4,5  | Input and Output Lines                                        |
| 6,7,9,10 | NC (No Internal Connection)<br>for Feed-Through Layout design |
| 3,8      | GND                                                           |

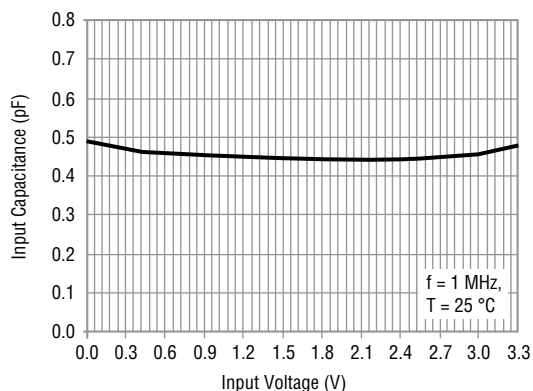
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# CDDFN10-3324P - Surface Mount TVS Diode Array

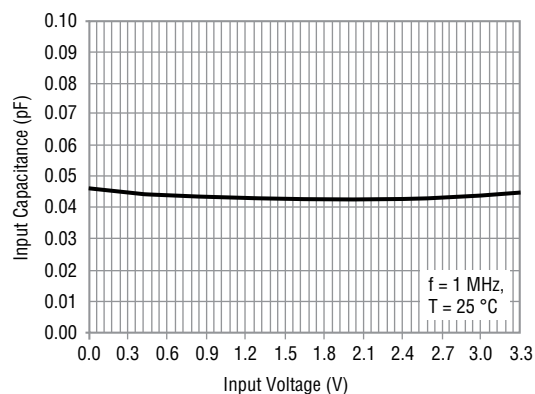
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## Rating & Characteristic Curves

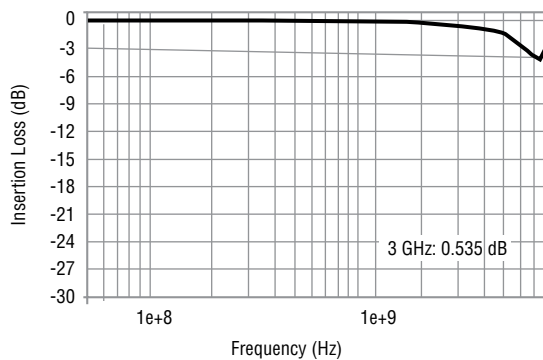
### Typical Voltage vs. Capacitance $C_{IN}$



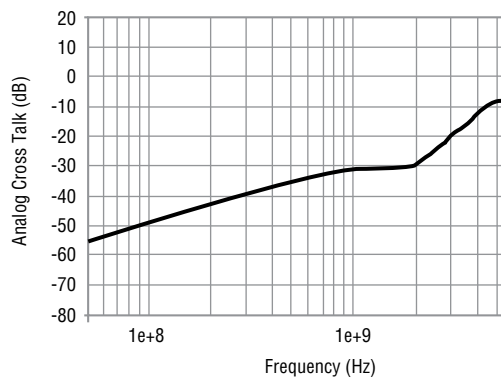
### Typical Voltage vs. Capacitance $C_{CROSS}$



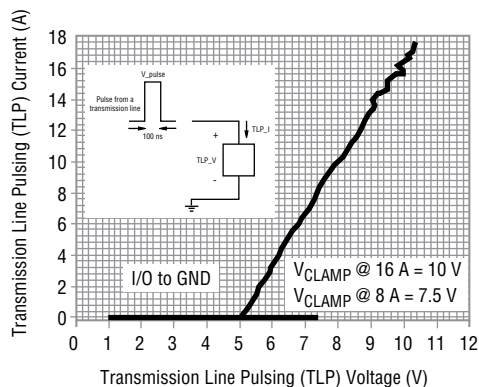
### Typical Insertion Loss S21



### Typical Analog Cross Talk



### Typical Transmission Line Pulsing (TLP)



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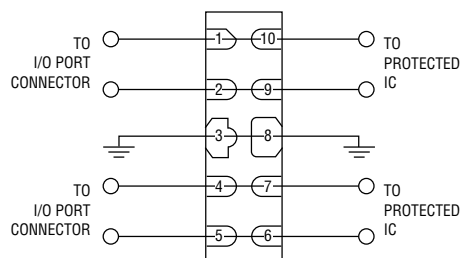
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# CDDFN10-3324P - Surface Mount TVS Diode Array

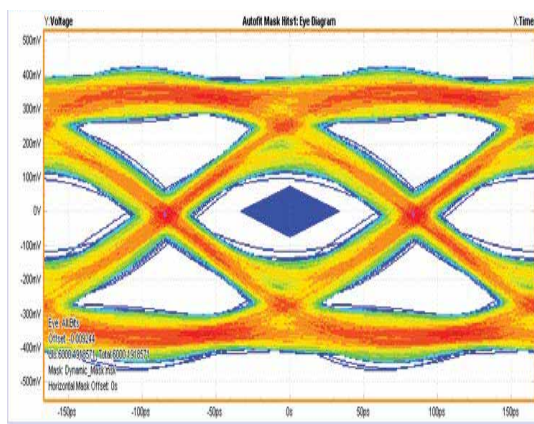
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## Reference Application

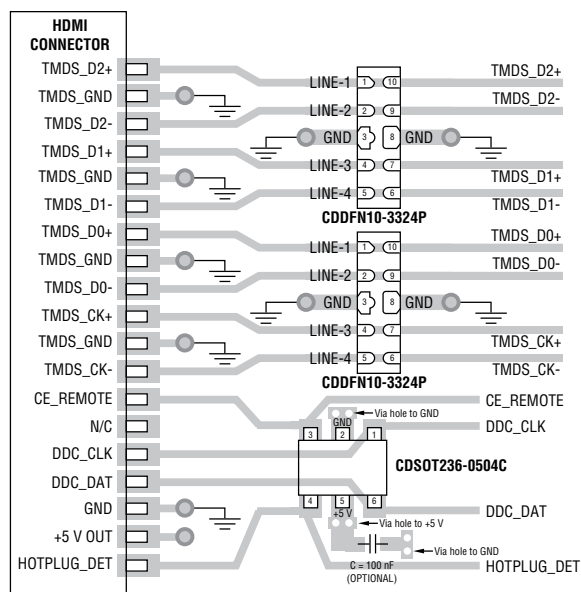
The Bourns® Model CDDFN10-3324P is designed to protect high-speed data ports from ESD transients. For high-speed ports above 5 Gbps such as HDMI 2.0 and USB 3.0, maintaining signal line impedance is a critical requirement. The use of a DFN10 package using a “feed-through” layout provides minimal impedance change on the high-speed data line, while the ultra-low capacitance performance of the device limits signal degradation on each channel.



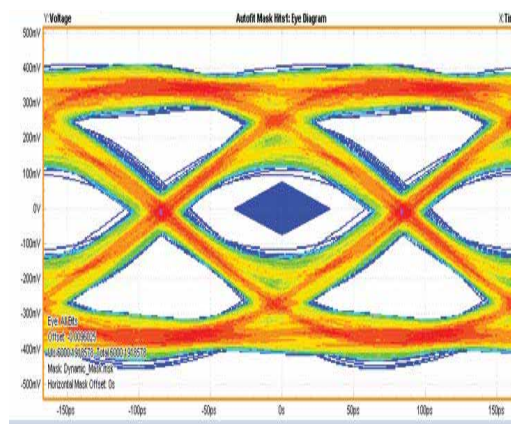
Model CDDFN10-3324P Layout on HDMI Port



HDMI 2.0 Eye Diagram Test  
Without Model CDDFN10-3324P  
(PCB Only)



Feed-Through Layout -  
Model CDDFN10-3324P in HDMI Application



HDMI 2.0 Eye Diagram Test  
With Model CDDFN10-3324P

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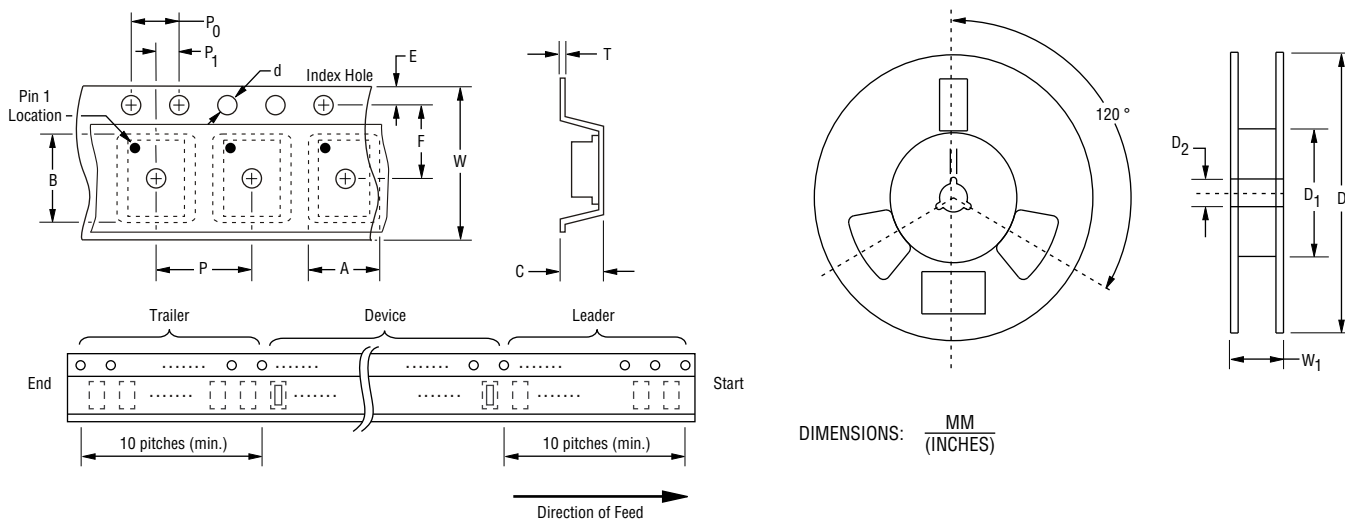
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# CDDFN10-3324P - Surface Mount TVS Diode Array

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## Packaging Information

The product is packaged in an 8 mm x 4 mm tape and reel format per EIA-481-D standard.



| Item                   | Symbol | DFN-10                                             |
|------------------------|--------|----------------------------------------------------|
| Carrier Width          | A      | $\frac{1.70 \pm 0.08}{(0.067 \pm 0.003)}$          |
| Carrier Length         | B      | $\frac{2.30 \pm 0.08}{(0.091 \pm 0.003)}$          |
| Carrier Depth          | C      | $\frac{0.75 \pm 0.05}{(0.030 \pm 0.002)}$          |
| Sprocket Hole          | d      | $\frac{1.15 \pm 0.10}{(0.045 \pm 0.004)}$          |
| Reel Outside Diameter  | D      | $\frac{178}{(7.008)}$                              |
| Reel Inner Diameter    | D1     | $\frac{54.40 \pm 0.40}{(2.142 \pm 0.016)}$         |
| Feed Hole Diameter     | D2     | $\frac{13.0 \pm 0.20}{(0.512 \pm 0.008)}$          |
| Sprocket Hole Position | E      | $\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$          |
| Punch Hole Position    | F      | $\frac{3.50 \pm 0.05}{(0.138 \pm 0.002)}$          |
| Punch Hole Pitch       | P      | $\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$          |
| Sprocket Hole Pitch    | P0     | $\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$          |
| Embossment Center      | P1     | $\frac{2.00 \pm 0.05}{(0.079 \pm 0.002)}$          |
| Overall Tape Thickness | T      | $\frac{0.20 \pm 0.30}{(0.008 \pm 0.012)}$          |
| Tape Width             | W      | $\frac{8.00 + 0.30/-0.10}{(0.315 + 0.012/-0.004)}$ |
| Reel Width             | W1     | $\frac{12.30 \pm 1.00}{(0.484 \pm 0.039)}$         |
| Quantity per Reel      | --     | 3000                                               |

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