

## Features

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

## Applications

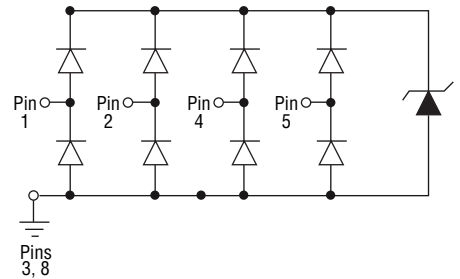
- HDMI 1.3, 1.4 and 2.0
- DisplayPort
- Digital Visual Interface (DVI)
- SATA and eSATA
- USB 3.0
- Memory protection
- SIM card ports

# 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.



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

Parameter	Symbol	CDDFN10-3324P	Unit
Peak Pulse Power (t <sub>p</sub> = 8/20 μS)	P <sub>pp</sub>	30	W
Peak Pulse Current (t <sub>p</sub> = 8/20 μS)	I <sub>pp</sub>	4	A
Operating Temperature	T <sub>J</sub>	-55 to +85	°C
Storage Temperature	T <sub>STG</sub>	-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 <sub>WM</sub>			3.3	V
Breakdown Voltage @ 1 mA	V <sub>BR</sub>	4.5			V
Leakage Current @ V <sub>WM</sub>	I <sub>R</sub>		0.1	0.5	μA
Capacitance @ 1.65 V, f = 1 MHz (I/O to GND) (V <sub>pin-3, -8</sub> = 0 V)	C <sub>IN</sub>		0.45	0.65	pF
Capacitance @ 1.65 V, f = 1 MHz (I/O to I/O) (V <sub>pin-3, -8</sub> = 0 V)	C <sub>CROSS</sub>		0.04	0.08	pF
Clamping Voltage @ 8/20 μs @ I <sub>pp</sub>	V <sub>C</sub>			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.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

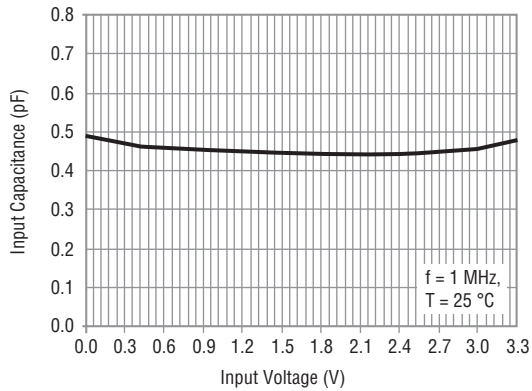
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# CDDFN10-3324P - Surface Mount TVS Diode Array

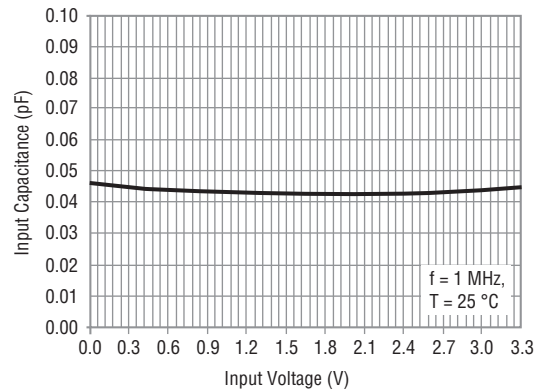
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## Rating & Characteristic Curves

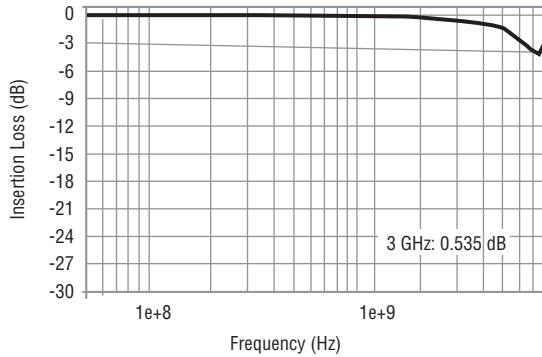
### Typical Voltage vs. Capacitance $C_{IN}$



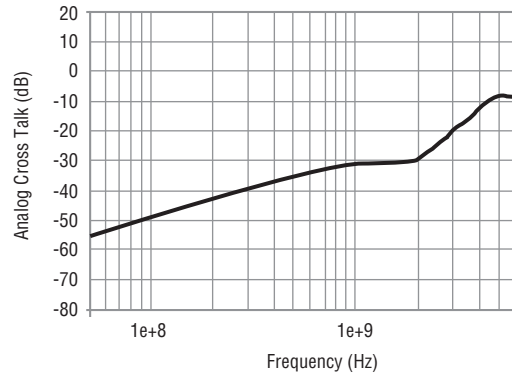
### Typical Voltage vs. Capacitance $C_{CROSS}$



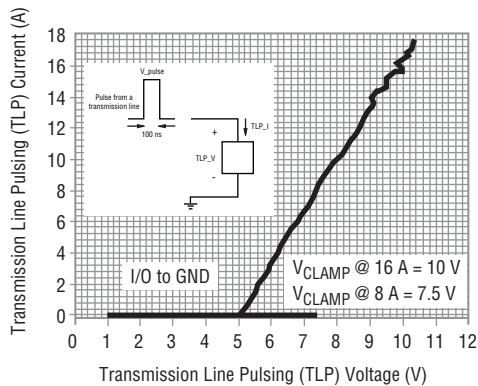
### Typical Insertion Loss $S_{21}$



### Typical Analog Cross Talk



### Typical Transmission Line Pulsing (TLP)



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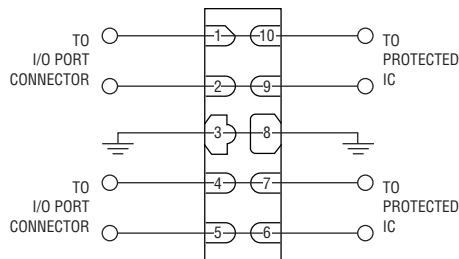
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# CDDFN10-3324P - Surface Mount TVS Diode Array

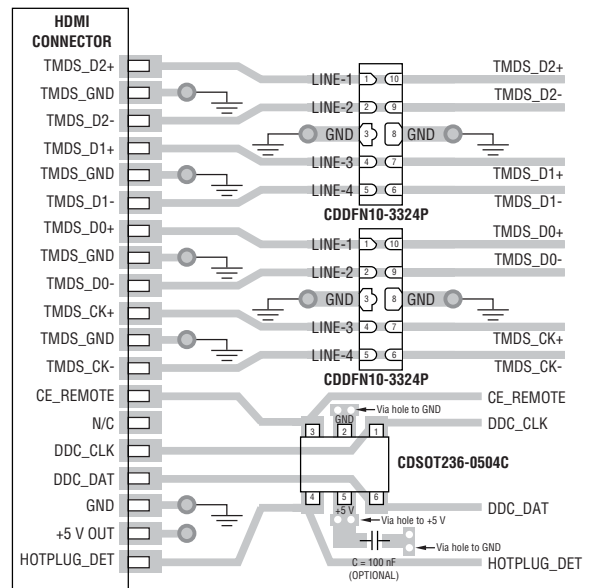


## Reference Application

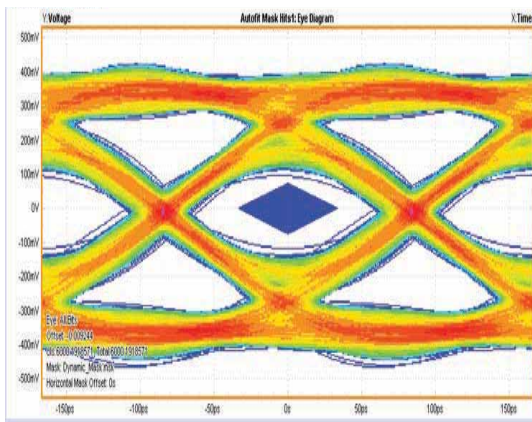
The Bourns® Model CDDFN10-3324P is designed to protect high-speed data ports from ESD transients. For high-speed ports above 5 Gbps such as HDMI 2.0 and USB 3.0, maintaining signal line impedance is a critical requirement. The use of a DFN10 package using a “feed-through” layout provides minimal impedance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



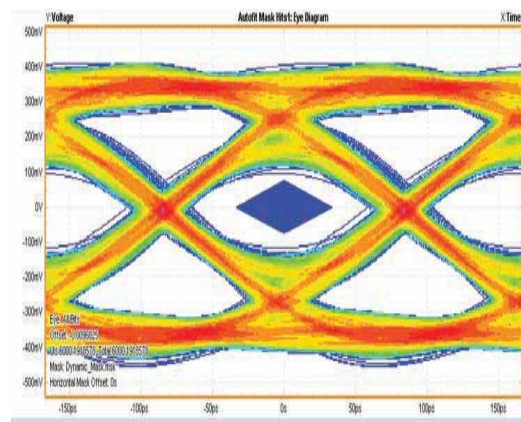
Model CDDFN10-3324P Layout on HDMI Port



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



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

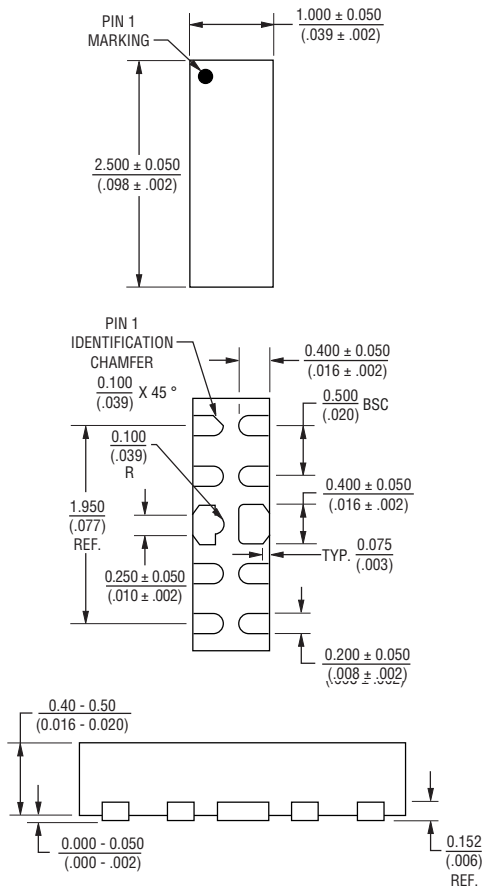


HDMI 2.0 Eye Diagram Test With Model CDDFN10-3324P

# CDDFN10-3324P - Surface Mount TVS Diode Array

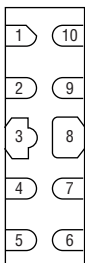


## Product Dimensions



DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$

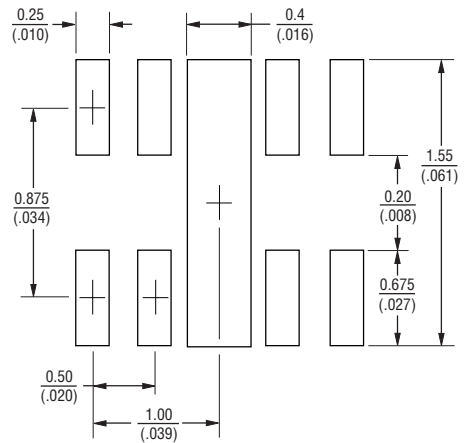
## Device Pinout



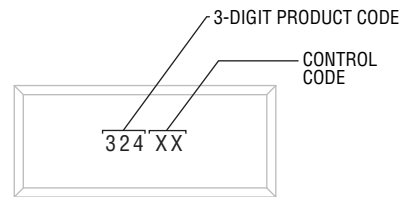
TOP VIEW

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

## Recommended Footprint



## Typical Part Marking



## Environmental Specifications

Moisture Sensitivity Level	3
ESD Classification (HBM)	3B

## How to Order

CD DFN10 - 33 24 P - 13

Common Code	_____
Chip Diode	_____
Package	_____
DFN10 = DFN-10 Package	_____
Working Peak Reverse Voltage	_____
33 = 3.3 $V_{RWM}$ (Volts)	_____
Number of Lines	_____
24 = 2 Ground / 4 Data Lines	_____
Suffix	_____
P = Ultra-low Capacitance	_____
Reel Option	_____
(Blank) = 7-inch Reel	_____
-13 = 13-inch Reel	_____

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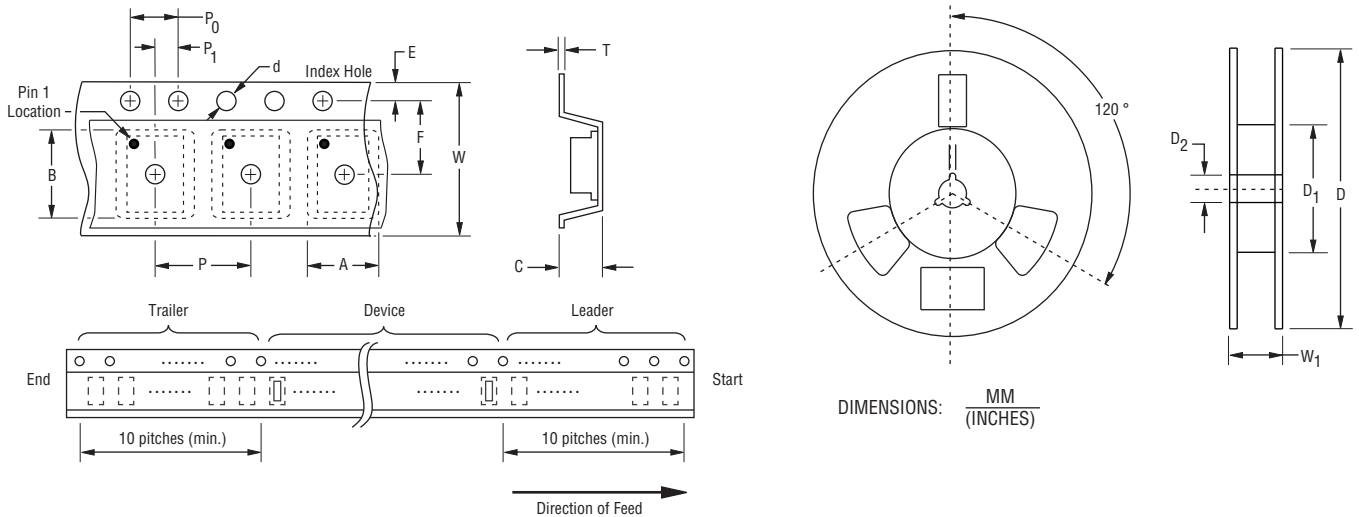
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# CDDFN10-3324P - Surface Mount TVS Diode Array

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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	CDDFN10-3324P	CDDFN10-3324P-13
Carrier Width	A	$\frac{1.70 \pm 0.08}{(0.067 \pm 0.003)}$	$\frac{1.2 \pm 0.05}{(0.047 \pm 0.002)}$
Carrier Length	B	$\frac{2.30 \pm 0.08}{(0.091 \pm 0.003)}$	$\frac{2.7 \pm 0.05}{(0.106 \pm 0.002)}$
Carrier Depth	C	$\frac{0.75 \pm 0.05}{(0.030 \pm 0.002)}$	$\frac{0.7 \pm 0.05}{(0.028 \pm 0.002)}$
Sprocket Hole	d	$\frac{1.15 \pm 0.10}{(0.045 \pm 0.004)}$	$\frac{1.5 +0.10/-0}{(0.059 +0.004/-0)}$
Reel Outside Diameter	D	$\frac{178}{(7.008)}$	$\frac{330 \pm 1.0}{(12.992 \pm 0.039)}$
Reel Inner Diameter	D <sub>1</sub>	$\frac{54.40 \pm 0.40}{(2.142 \pm 0.016)}$	$\frac{100 \pm 0.5}{(3.937 \pm 0.02)}$
Feed Hole Diameter	D <sub>2</sub>	$\frac{13.0 \pm 0.20}{(0.512 \pm 0.008)}$	$\frac{13.0 \pm 0.20}{(0.512 \pm 0.008)}$
Sprocket Hole Position	E	$\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$	$\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$
Punch Hole Position	F	$\frac{3.50 \pm 0.05}{(0.138 \pm 0.002)}$	$\frac{3.50 \pm 0.05}{(0.138 \pm 0.002)}$
Punch Hole Pitch	P	$\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$	$\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$
Sprocket Hole Pitch	P <sub>0</sub>	$\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$	$\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$
Embossment Center	P <sub>1</sub>	$\frac{2.00 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{2.00 \pm 0.05}{(0.079 \pm 0.002)}$
Overall Tape Thickness	T	$\frac{0.20 \pm 0.30}{(0.008 \pm 0.012)}$	$\frac{0.20 \pm 0.30}{(0.008 \pm 0.012)}$
Tape Width	W	$\frac{8.00 +0.30/-0.10}{(0.315 +0.012/- 0.004)}$	$\frac{8.00 +0.30/-0.10}{(0.315 +0.012/- 0.004)}$
Reel Width	W <sub>1</sub>	$\frac{12.30 \pm 1.00}{(0.484 \pm 0.039)}$	$\frac{9.5 +3/-1}{(0.374 +0.118/-0.039)}$
Quantity per Reel	--	3000	15,000

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