

## Features

- Low capacitance - 0.3 pF
- ESD protection
- Vcc + six I/O data lines
- RoHS compliant\*

## Applications

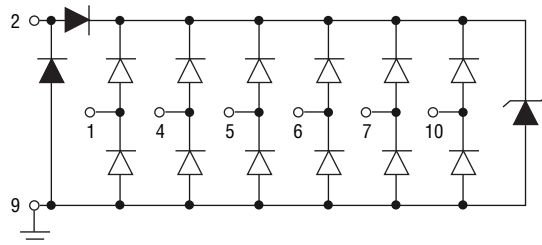
- USB 3.0
- HDMI 1.4
- High speed port protection
- Portable electronics

# CDDFN10-0506N - TVS/Steering Diode Array

## General Information

The Bourns® Model CDDFN10-0506N device provides ESD and EFT protection for high speed data ports meeting IEC 61000-4-2 (ESD) and IEC 61000-4-4 (EFT) requirements. The Transient Voltage Suppressor array, protecting up to six data lines, offers a Working Peak Voltage of 5.0 V.

The DFN-10 package is easy to handle with standard pick and place equipment and their flat configuration minimizes roll away.



## Absolute Maximum Ratings, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

| Parameter  | Symbol    | Rating                           | Unit             |
|--|-----------|----------------------------------|------------------|
| Peak Pulse Current ( $t_p = 8/20\ \mu\text{s}$ )   | $I_{pp}$  | 3.5                              | A                |
| Peak Pulse Power ( $t_p = 8/20\ \mu\text{s}$ )     | $P_{pk}$  | 40                               | W                |
| Operating Supply Voltage ( $V_{dd} - \text{Gnd}$ ) | $V_{DC}$  | 6                                | V                |
| DC Voltage on any I/O Pad                          | $V_{IO}$  | (Gnd -0.5) to ( $V_{dd} + 0.5$ ) | V                |
| Storage Temperature                                | $T_{STG}$ | -55 to +150                      | $^\circ\text{C}$ |
| Operating Temperature                              | $T_{OPR}$ | -40 to +85                       | $^\circ\text{C}$ |
| ESD Protection per IEC 61000-4-2                   |           |                                  |                  |
| Contact Discharge                                  |           | $\pm 8$                          | kV               |
| Air Discharge                                      |           | $\pm 15$                         | kV               |
| EFT Protection per IEC 61000-4-4 @ 5/50 ns         |           | 40                               | A                |

## Electrical Characteristics (@ $T_A = 25\text{ }^\circ\text{C}$ Unless Otherwise Noted)

| Parameter  | Symbol             | Min. | Typ. | Max. | Unit          |
|--|--------------------|------|------|------|---------------|
| Working Peak Voltage <sup>1</sup>                          | $V_{WM}$           |      |      | 5.0  | V             |
| Breakdown Voltage @ 1 mA <sup>1</sup>                      | $V_{BR}$           | 6.0  |      |      | V             |
| Forward Voltage @ 15 mA <sup>2</sup>                       | $V_F$              |      | 0.8  | 1.2  | V             |
| Leakage Current @ $V_{WM}$ <sup>1</sup>                    | $I_L$              |      |      | 2.5  | $\mu\text{A}$ |
| Leakage Current @ $V_{WM}$ <sup>3</sup>                    | $I_{IO}$           |      |      | 1    | $\mu\text{A}$ |
| Channel Capacitance <sup>3</sup> @ 2.5 V, 1 MHz            | $C_{IO}$           |      | 0.25 | 0.35 | pF            |
| Channel to Channel Capacitance <sup>4</sup> @ 2.5 V, 1 MHz | $C_{CROSS}$        |      | 0.05 | 0.07 | pF            |
| ESD Dynamic Turn-on Resistance <sup>5</sup>                | $R_{dynamic\_I/O}$ |      | 0.35 |      | $\Omega$      |
| ESD Dynamic Turn-on Resistance <sup>6</sup>                | $R_{dynamic\_VDD}$ |      | 0.2  |      | $\Omega$      |

Note 1: Pin 2 to Pin 9

Note 2: Pin 9 to Pin 2.

Note 3: Pin 1, 4, 5, 6, 7 or 10 to Ground.

Note 4: Between I/O 1, 4, 5, 6, 7 or 10.

Note 5: Any I/O Pin to Ground.

Note 6:  $V_{DD}$  Pin to Ground.

\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

Specifications are subject to change without notice.

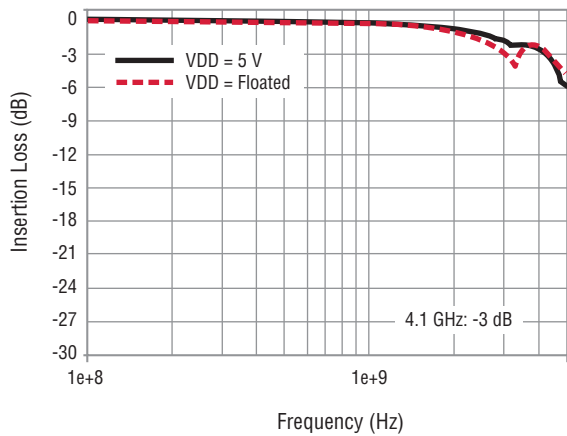
The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time. Users should verify actual device performance in their specific applications.

# CDDFN10-0506N - TVS/Steering Diode Array

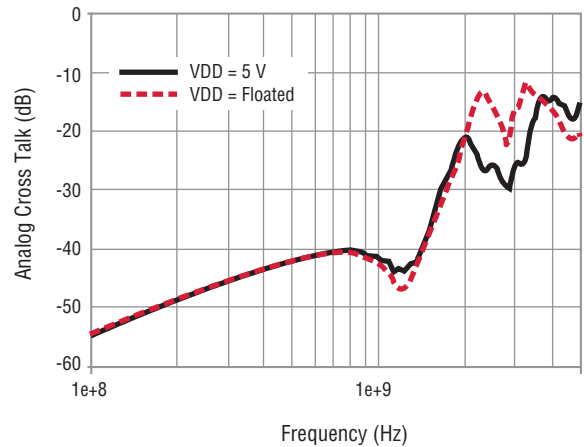
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## Performance Curves

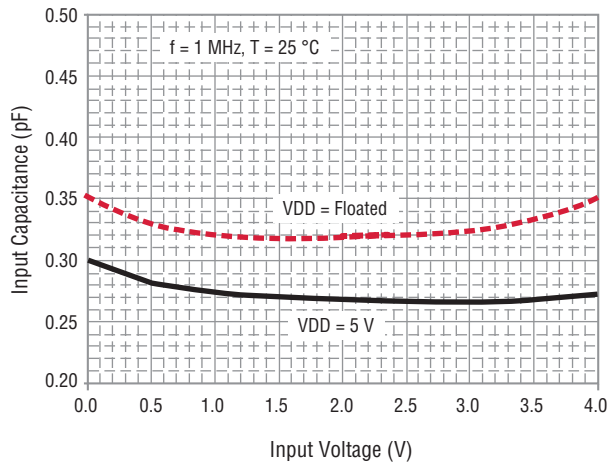
### Insertion Loss S21



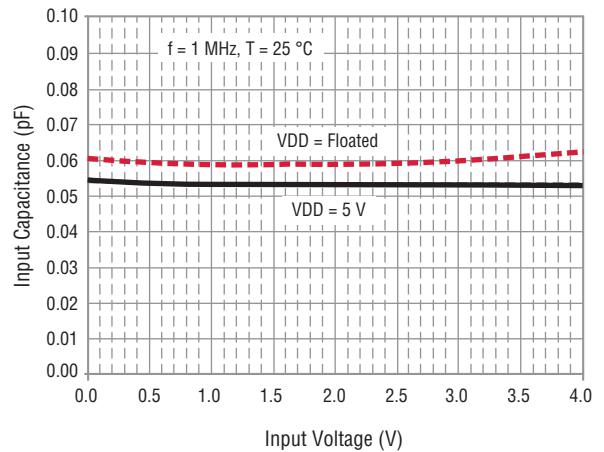
### Crosstalk Between I/Os



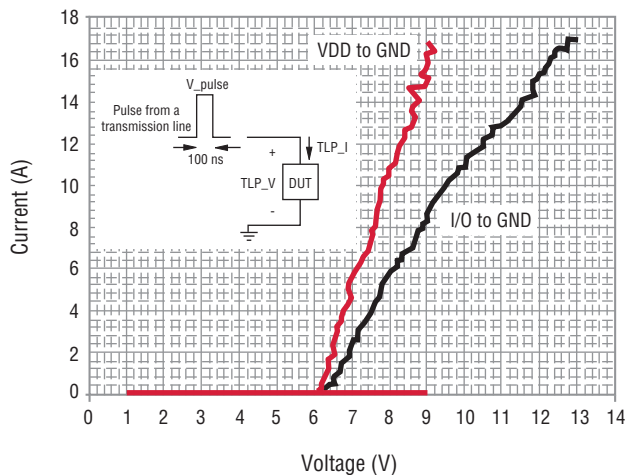
### Channel Capacitance versus Voltage



### Channel to Channel Capacitance versus Voltage



### Typical V/I Characteristic



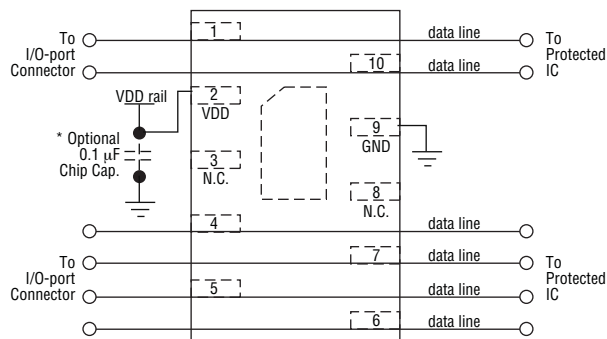
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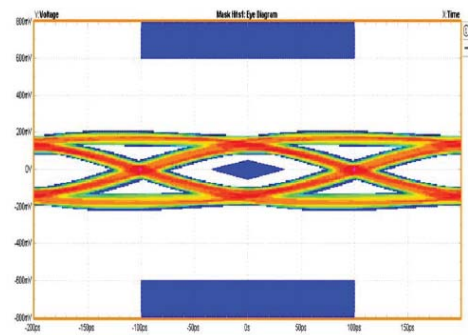
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## Reference Application

Bourns® Model CDDFN10-0506N is designed to protect high speed data ports from ESD transients. For high speed ports above 5 Gb/s such as USB 3.0, differential signalling is used where the need to keep impedance constant is a critical requirement. The use of a DFN-10 package using a “feed through” layout provides a minimum impedance change on the high speed data line while the ultra-low capacitance performance of the device limits the signal loss degradation of each channel.



**CDDFN10-0506N Layout on USB 3.0 Port**



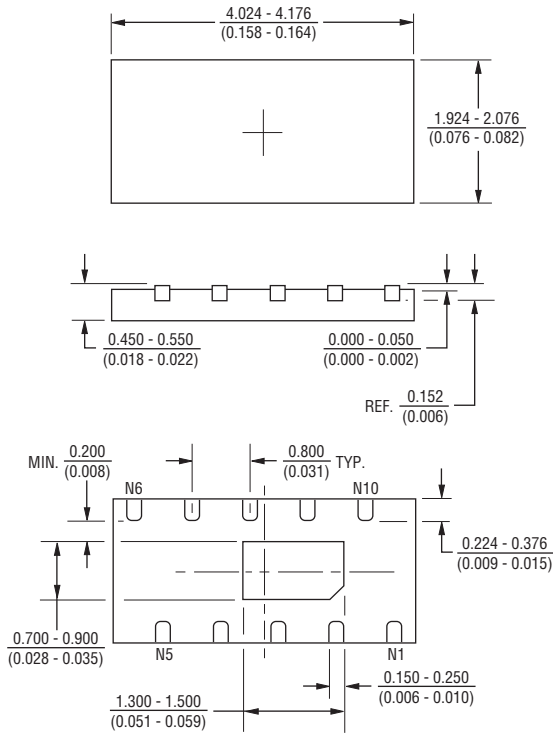
**CDDFN10-0506N Using 5 GHz Eye Diagram**

# CDDFN10-0506N - TVS/Steering Diode Array



## Product Dimensions

This is a molded DFN10 package with lead free 100 % Matte Sn on the lead frame. It has a flammability rating of UL 94V-0.

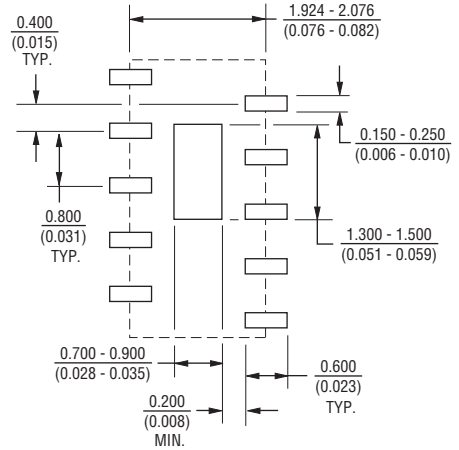


DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$

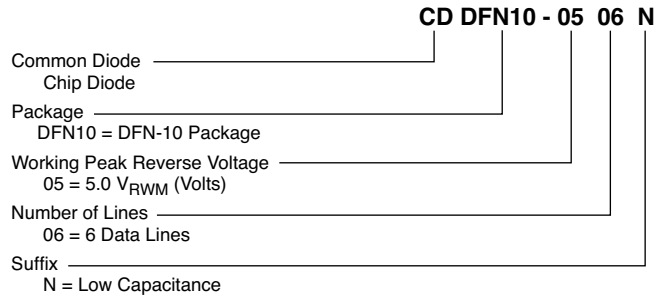
## Typical Part Marking

CDDFN10-0506N .....506

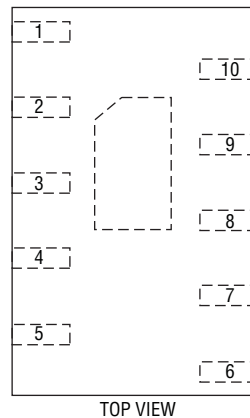
## Recommended Footprint



## How to Order



## Pin Out



| Pin        | Function             |
|------------|----------------------|
| 1          | I/O LINE             |
| 2          | V <sub>CC</sub> LINE |
| 3          | N.C.                 |
| 4          | I/O LINE             |
| 5          | I/O LINE             |
| 6          | I/O LINE             |
| 7          | I/O LINE             |
| 8          | N.C.                 |
| 9          | Ground               |
| 10         | I/O LINE             |
| Center Pad | Ground               |

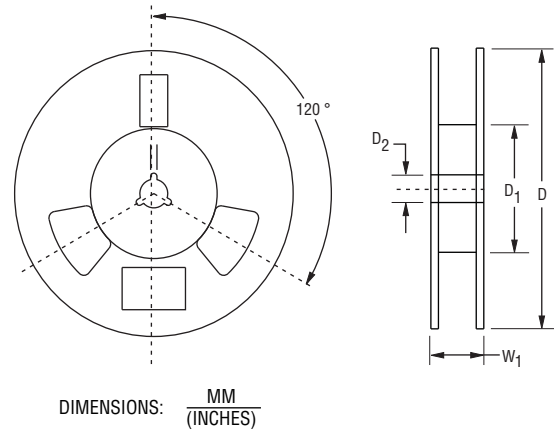
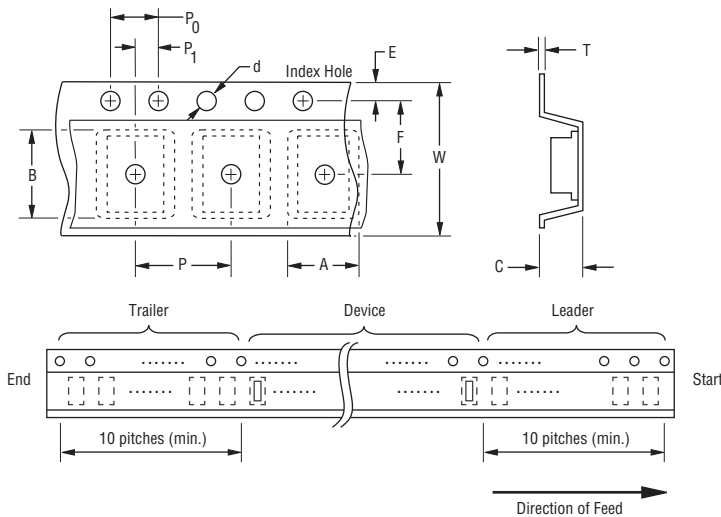
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## Packaging Information

The product will be dispensed in tape and reel format (see diagram below).



Devices are packed in accordance with EIA standard RS-481-A.

| Item                   | Symbol         | DFN-10   |
|------------------------|----------------|--|
| Carrier Width          | A              | $\frac{2.21 \pm 0.05}{(0.087 \pm 0.002)}$        |
| Carrier Length         | B              | $\frac{4.22 +0.05/-0.04}{(0.166 +0.002/-0.002)}$ |
| Carrier Depth          | C              | $\frac{0.81 \pm 0.05}{(0.032 \pm 0.002)}$        |
| Sprocket Hole          | d              | $\frac{1.50 +0.1/-0}{(0.059 +0.004/-0)}$         |
| Reel Outside Diameter  | D              | $\frac{180 \pm 3}{(7.087 \pm .118)}$             |
| Reel Inner Diameter    | D <sub>1</sub> | $\frac{50.0}{(1.969)}$ MIN.                      |
| Feed Hole Diameter     | D <sub>2</sub> | $\frac{13.0 +0.5/-0.2}{(0.512 +0.020/-0.008)}$   |
| Sprocket Hole Position | E              | $\frac{1.75 \pm 0.10}{(0.069 \pm 0.004)}$        |
| Punch Hole Position    | F              | $\frac{5.50 \pm 0.05}{(0.217 \pm 0.002)}$        |
| Punch Hole Pitch       | P              | $\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$        |
| Sprocket Hole Pitch    | P <sub>0</sub> | $\frac{4.00 \pm 0.10}{(0.157 \pm 0.004)}$        |
| Embossment Center      | P <sub>1</sub> | $\frac{2.00 \pm 0.05}{(0.079 \pm 0.002)}$        |
| Overall Tape Thickness | T              | $\frac{0.6}{(0.024)}$ MAX.                       |
| Tape Width             | W              | $\frac{12.3}{(0.484)}$ MAX.                      |
| Reel Width             | W <sub>1</sub> | $\frac{18.4}{(0.724)}$ MAX.                      |
| Quantity per Reel      | --             | 3000   |

REV. 09/15

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