

## ULTRA LOW CAPACITANCE TVS DIODE ARRAY

### Features

- Ultra low capacitance: 0.3pF typical (I/O to I/O)
- Ultra low leakage: nA level
- Low operating voltage: 5V
- Low clamping voltage
- Up to 4 lines protects
- Leadless flow-through package
- Complies with following standards:
  - IEC 61000-4-2 (ESD) immunity test  
Air discharge:  $\pm 30\text{kV}$   
Contact discharge:  $\pm 25\text{kV}$
  - IEC61000-4-4 (EFT) 40A (5/50ns)
  - IEC61000-4-5 (Lightning) 5A (8/20 $\mu\text{s}$ )
- RoHS Compliant

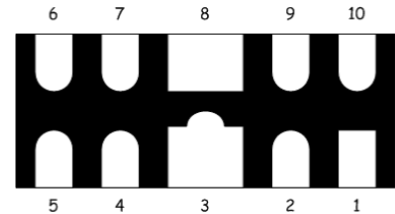
### Applications

- HDMI 1.3 & 1.4 & 2.0, USB 2.0 & 3.0 and MDDI ports
- 10/100/1000 Ethernet
- Monitors and flat panel displays
- Set-top box and Digital TV
- Video graphics cards
- Digital Video Interface (DVI)
- Notebook Computers
- PCI Express and Serial SATA Ports

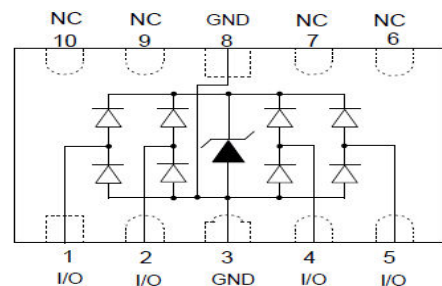
### Mechanical Characteristics

- Package: DFN2510-10 (2.5 $\times$ 1.0 $\times$ 0.5mm)
- Lead Finish: Matte Tin
- Case Material: "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram Below
- Marking Information: See Below

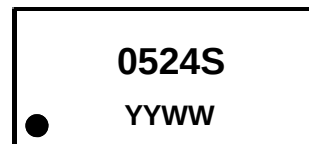
### Dimensions DFN2510P10



### Pin Configuration



### Marking Information



0524S = Device Marking Code  
YYWW = Date Code  
Dot denotes Pin1

### Ordering Information

| Part Number | Packaging        | Reel Size |
|-------------|------------------|-----------|
| ULC0441P    | 3000/Tape & Reel | 7 inch    |

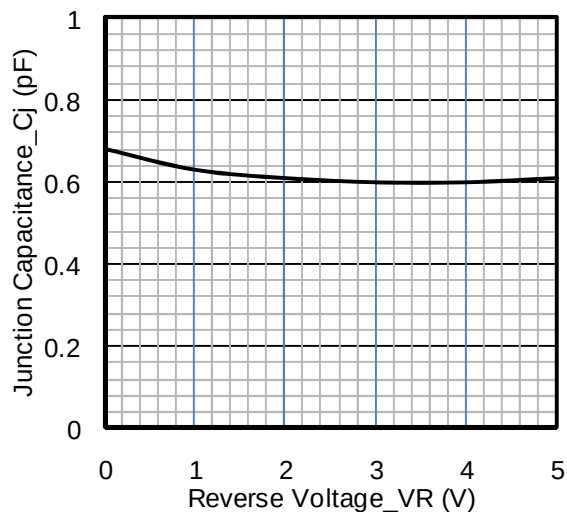
## Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter                                | Symbol           | Value       | Unit               |
|------------------------------------------|------------------|-------------|--------------------|
| Peak Pulse Power (8/20 $\mu\text{s}$ )   | Ppk              | 100         | W                  |
| Peak Pulse Current (8/20 $\mu\text{s}$ ) | I <sub>PP</sub>  | 5           | A                  |
| ESD per IEC 61000-4-2 (Air)              | V <sub>ESD</sub> | $\pm 30$    | kV                 |
| ESD per IEC 61000-4-2 (Contact)          |                  | $\pm 25$    |                    |
| Operating Temperature Range              | T <sub>J</sub>   | -55 to +125 | $^{\circ}\text{C}$ |
| Storage Temperature Range                | T <sub>stg</sub> | -55 to +150 | $^{\circ}\text{C}$ |

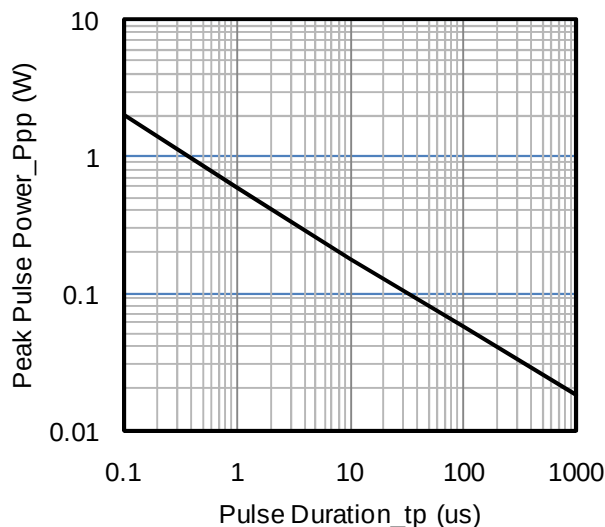
## Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter               | Symbol           | Min | Typ | Max | Unit          | Test Condition                                                           |
|-------------------------|------------------|-----|-----|-----|---------------|--------------------------------------------------------------------------|
| Reverse Working Voltage | V <sub>RWM</sub> |     |     | 5   | V             | Any I/O pin to ground                                                    |
| Breakdown Voltage       | V <sub>BR</sub>  | 6   |     |     | V             | I <sub>T</sub> = 1mA, any I/O pin to ground                              |
| Reverse Leakage Current | I <sub>R</sub>   |     |     | 0.5 | $\mu\text{A}$ | V <sub>RWM</sub> = 5V, any I/O pin to ground                             |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 9   | V             | I <sub>PP</sub> = 1A (8 x 20 $\mu\text{s}$ pulse), any I/O pin to ground |
| Clamping Voltage        | V <sub>C</sub>   |     |     | 16  | V             | I <sub>PP</sub> = 5A (8 x 20 $\mu\text{s}$ pulse), any I/O pin to ground |
| Junction Capacitance    | C <sub>J</sub>   |     | 0.3 | 0.4 | pF            | V <sub>R</sub> = 0V, f = 1MHz, between I/O pins                          |
| Junction Capacitance    | C <sub>J</sub>   |     |     | 0.8 | pF            | V <sub>R</sub> = 0V, f = 1MHz, any I/O pin to ground                     |

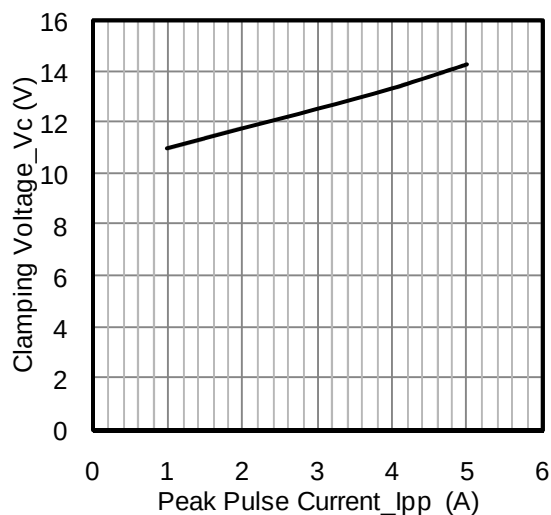
## Typical Performance Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise Specified)



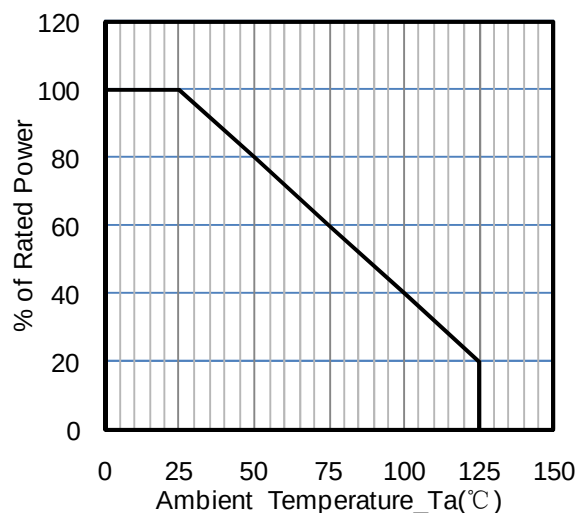
**Junction Capacitance vs. Reverse Voltage**



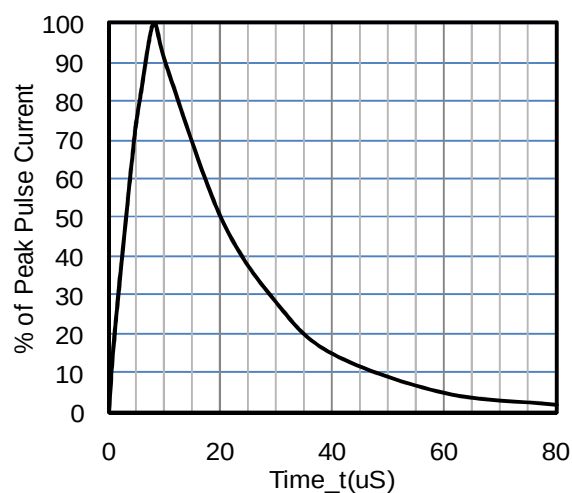
**Peak Pulse Power vs. Pulse Time**



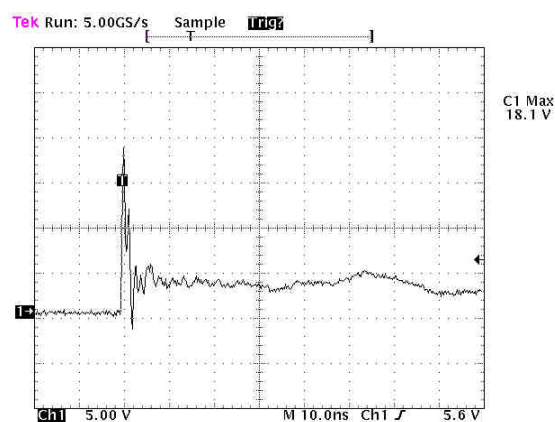
**Clamping Voltage vs. Peak Pulse Current**



**Power Derating Curve**



**8 X 20 $\mu\text{s}$  Pulse Waveform**

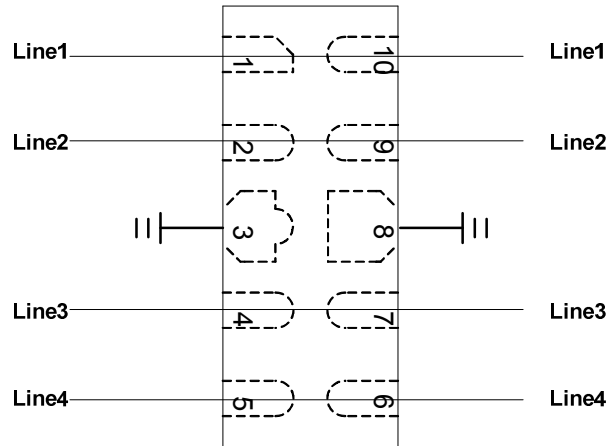


**ESD Clamping Voltage**

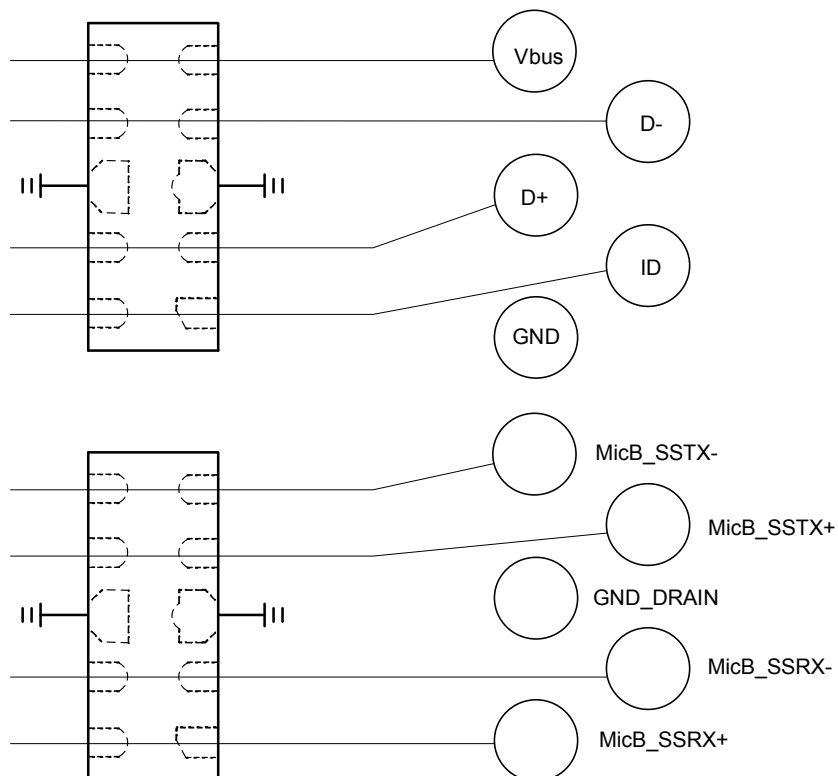
8 kV Contact per IEC61000-4-2

## Typical Application

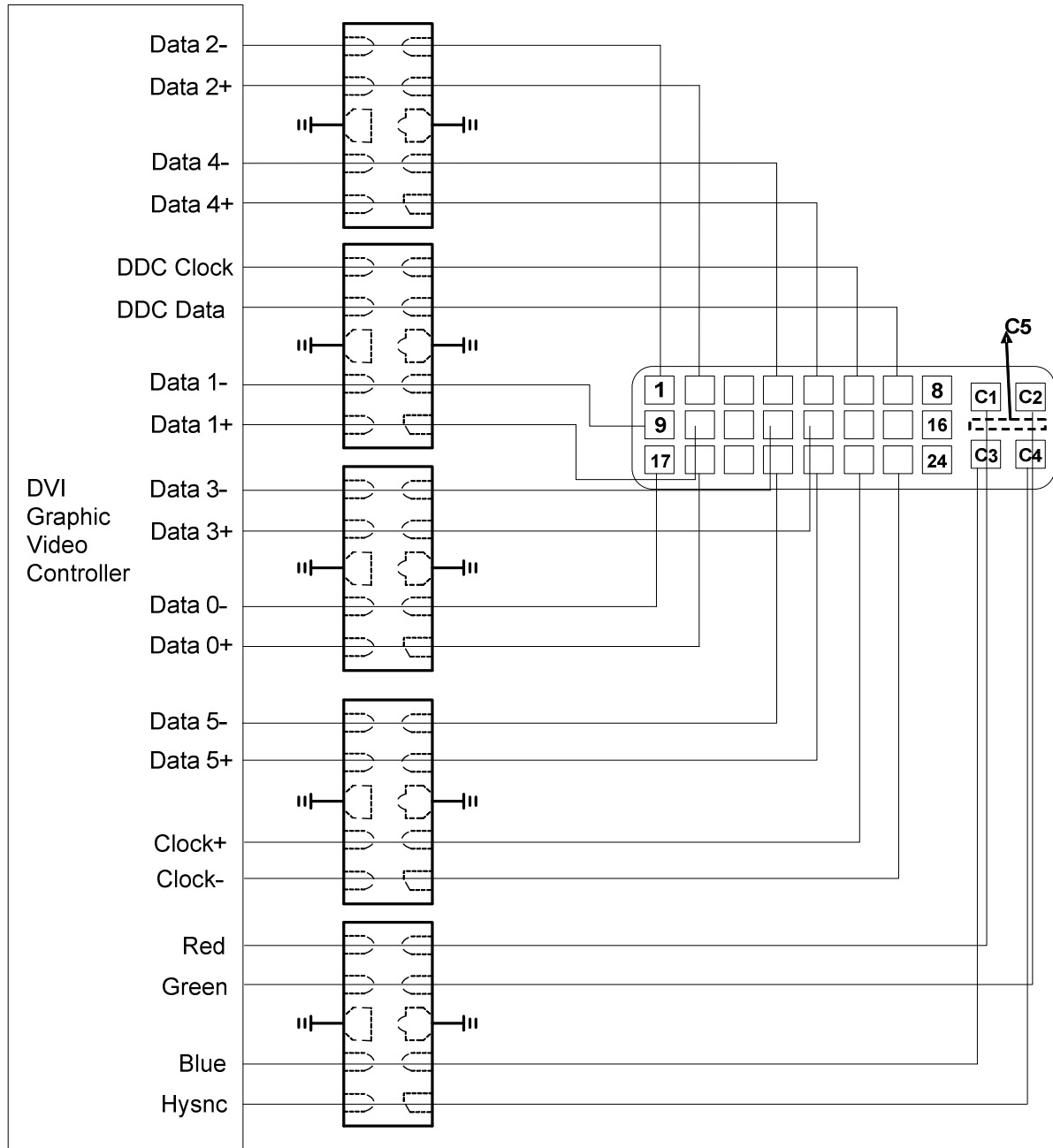
The ULC0441P is designed for easy PCB layout by allowing the traces to run straight through the device. The PCB traces could be used to connect the pin pairs for each line. For example, line 1 enters at pin 1 and exits at pin 10 and the PCB trace connects Pin 1 and Pin 10 together. Ground is connected at Pin 3 and Pin 8.



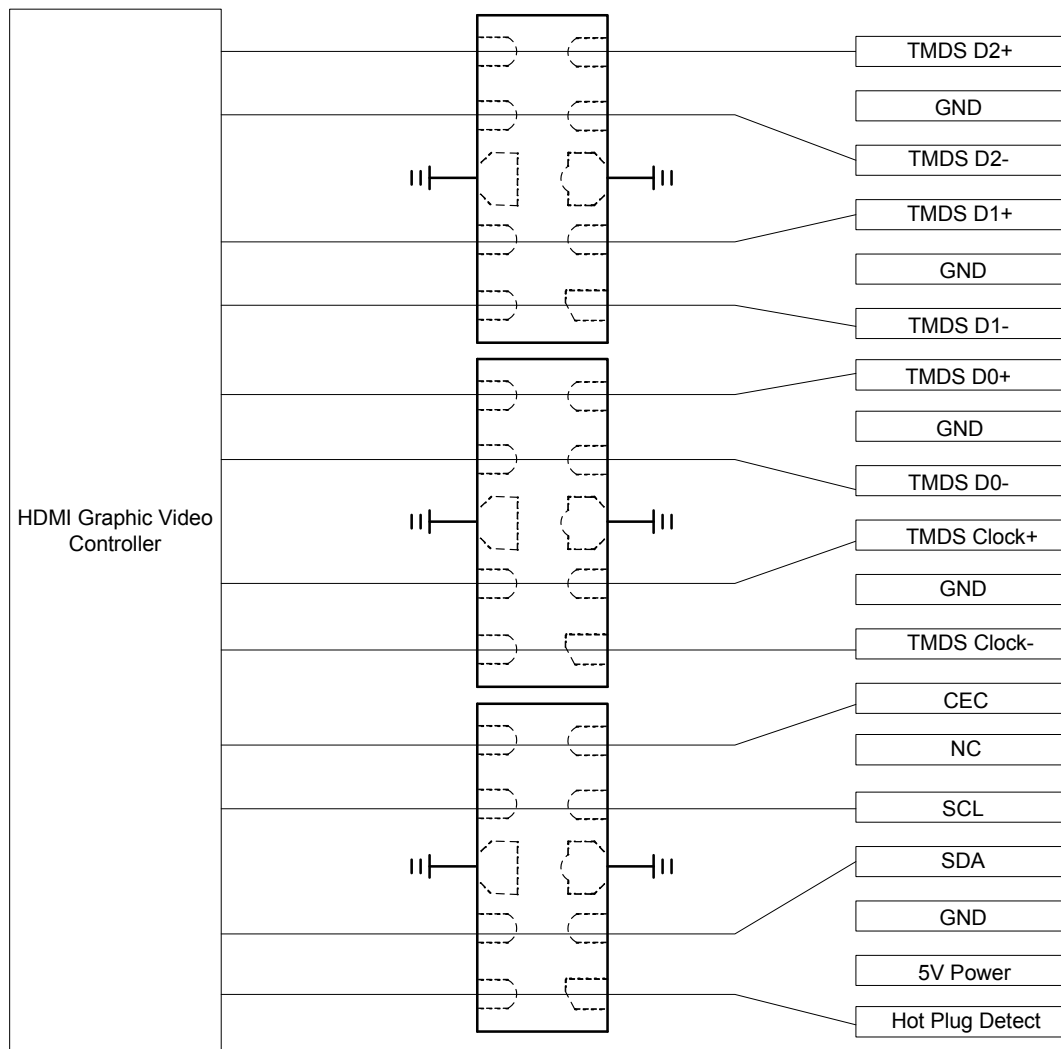
## ULC0441P on USB 3.0 Port Application



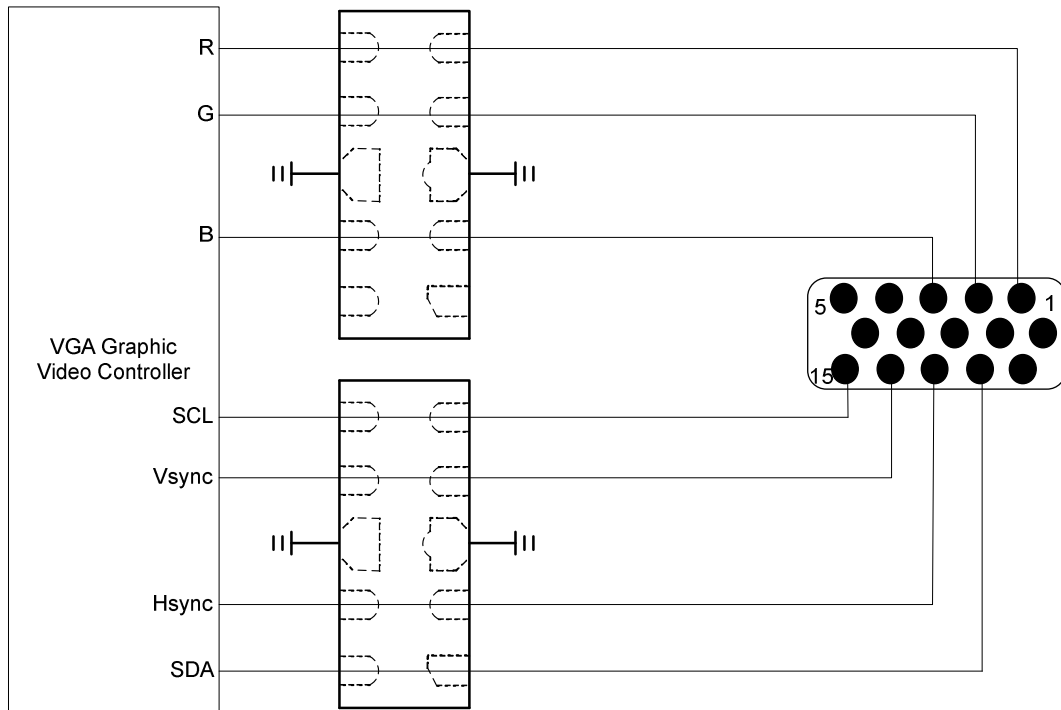
## ULC0441P on DVI Port Application



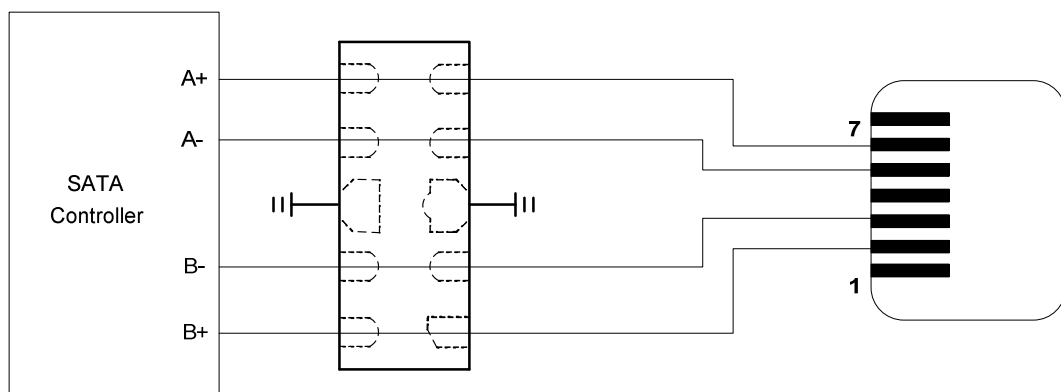
## ULC0441P on HDMI Port Application



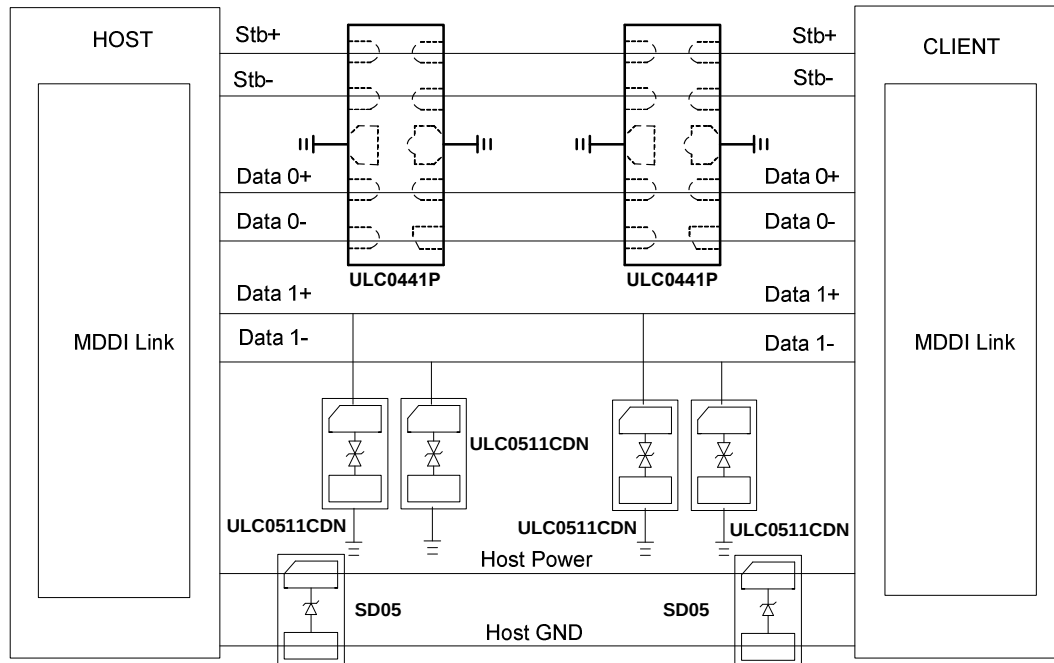
## ULC0441P on VGA Port Application



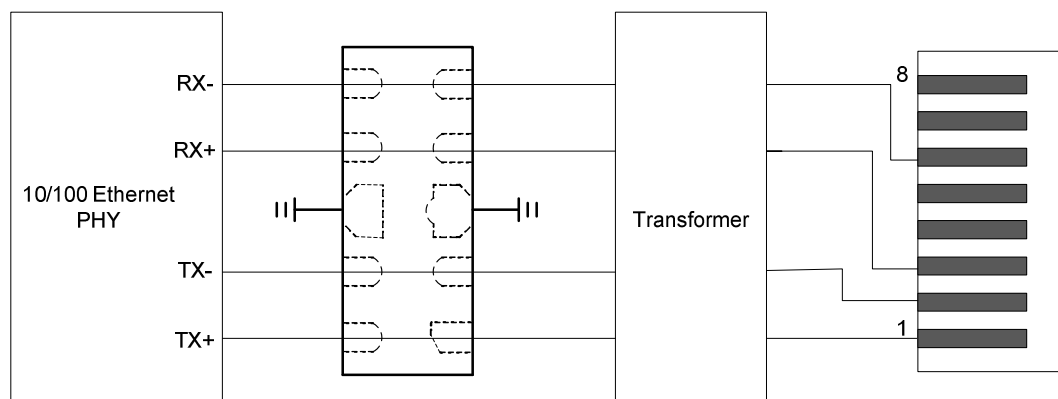
## ULC0441P on eSATA Port Application



## ULC0441P on MDDI Port Application

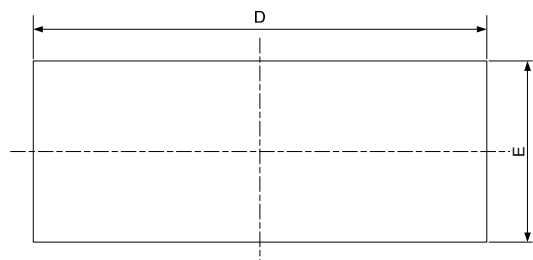


## ULC0441P on 10/100 Base Ethernet Port Application

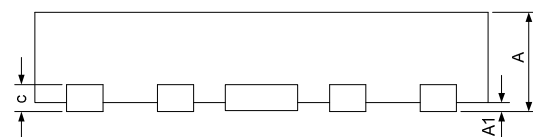




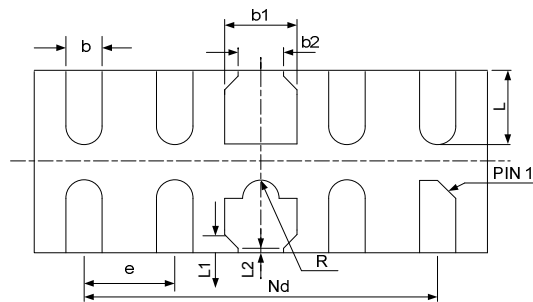
## DFN2510-10 Package Outline Drawing



TOP VIEW



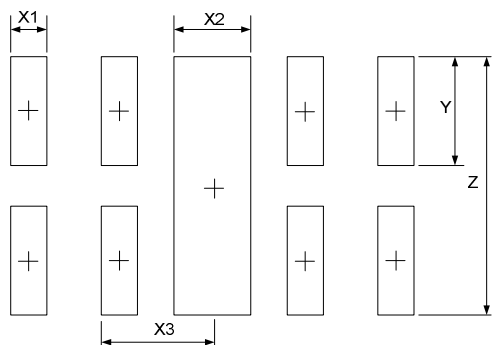
SIDE VIEW



BOTTOM VIEW

| SYM | DIMENSIONS  |      |      |          |       |       |
|-----|-------------|------|------|----------|-------|-------|
|     | MILLIMETERS |      |      | INCHES   |       |       |
|     | MIN         | NOM  | MAX  | MIN      | NOM   | MAX   |
| A   | 0.45        | 0.50 | 0.55 | 0.018    | 0.020 | 0.022 |
| A1  | 0.00        | 0.02 | 0.05 | 0.000    | 0.001 | 0.002 |
| b   | 0.15        | 0.20 | 0.25 | 0.006    | 0.008 | 0.010 |
| b1  | 0.35        | 0.40 | 0.45 | 0.014    | 0.016 | 0.018 |
| b2  | 0.20        | 0.25 | 0.30 | 0.008    | 0.010 | 0.012 |
| c   | 0.10        | 0.15 | 0.20 | 0.004    | 0.006 | 0.008 |
| D   | 2.45        | 2.50 | 2.55 | 0.098    | 0.100 | 0.102 |
| e   | 0.50BSC     |      |      | 0.020BSC |       |       |
| Nd  | 2.00BSC     |      |      | 0.080BSC |       |       |
| E   | 0.95        | 1.00 | 1.05 | 0.038    | 0.040 | 0.042 |
| L   | 0.35        | 0.40 | 0.45 | 0.014    | 0.016 | 0.018 |
| L1  | 0.075REF    |      |      | 0.003REF |       |       |
| L2  | 0.050REF    |      |      | 0.002REF |       |       |
| h   | 0.08        | 0.12 | 0.15 | 0.003    | 0.005 | 0.006 |
| R   | 0.05        | 0.10 | 0.15 | 0.002    | 0.004 | 0.006 |

## Suggested Land Pattern



| SYM | DIMENSIONS  |        |
|-----|-------------|--------|
|     | MILLIMETERS | INCHES |
| X1  | 0.200       | 0.008  |
| X2  | 0.400       | 0.016  |
| X3  | 0.500       | 0.020  |
| Y   | 0.600       | 0.024  |
| Z   | 1.400       | 0.056  |