

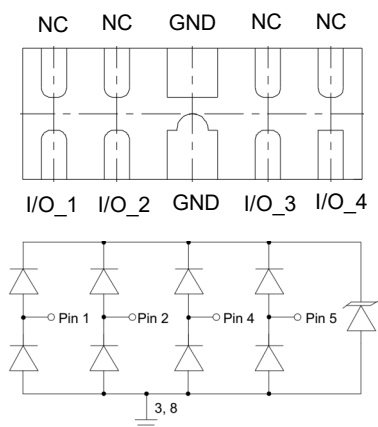
## Description

The Rclam0524P5 is an ultra low capacitance TVS array, utilizing leading monolithic silicon technology to provide fast response time and low ESD clamping voltage, making this device an ideal solution for protecting voltage sensitive high-speed data lines. The Rclam0524P5 has an ultra-low capacitance with a typical value at 0.3pF, and complies with the IEC 61000-4-2 (ESD) with  $\pm 25\text{kV}$  air and  $\pm 20\text{kV}$  contact discharge. It is assembled into a 10-pin 2.5x1.0x0.5mm lead-free DFN package. The flow through style package allows for easy PCB layout and matched trace lengths necessary to maintain consistent impedance between high speed differential lines such as USB 3.0 and HDMI. The small size, ultra-low capacitance and high ESD surge protection make Rclam0524P5 an ideal choice to protect HDMI, MDDI, USB 3.0 and other high speed ports.

## Features

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

## Dimensions and Pin Configuration



Circuit and Pin Schematic

## Mechanical Characteristics

- Package: DFN2510-10 (2.5x1.0x0.5mm)
- Lead Finish: Matte Tin
- Case Material: "Green" Molding Compound.
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram Below
- Marking Information: See Below

## Applications

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

## Marking Information



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

## Ordering Information

| Part Number | Packaging        | Reel Size |
|-------------|------------------|-----------|
| Rclam0524P5 | 3000/Tape & Reel | 7 inch    |

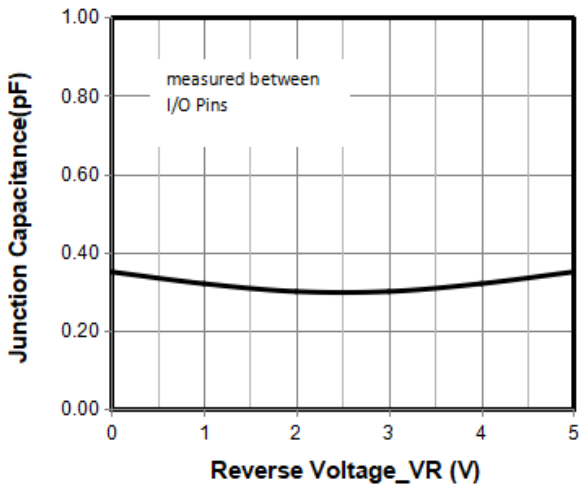
**Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$  unless otherwise specified)**

| Parameter  | Symbol           | Value                | Unit             |
|--|------------------|----------------------|------------------|
| Peak Pulse Power (8/20 $\mu\text{s}$ )                         | Ppk              | 80                   | W                |
| Peak Pulse Current (8/20 $\mu\text{s}$ )                       | I <sub>PP</sub>  | 5                    | A                |
| ESD per IEC 61000-4-2 (Air)<br>ESD per IEC 61000-4-2 (Contact) | V <sub>ESD</sub> | $\pm 25$<br>$\pm 20$ | kV               |
| Operating Temperature Range                                    | T <sub>J</sub>   | -55 to +125          | $^\circ\text{C}$ |
| Storage Temperature Range                                      | T <sub>stg</sub> | -55 to +150          | $^\circ\text{C}$ |

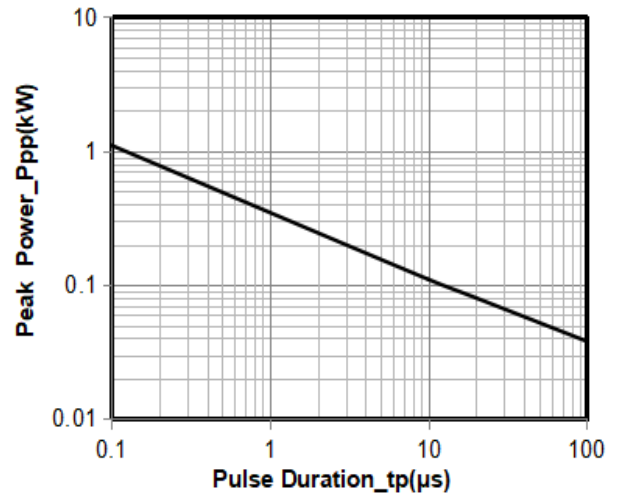
**Electrical Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise specified)**

| 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>   |     | 0.01 | 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                     |

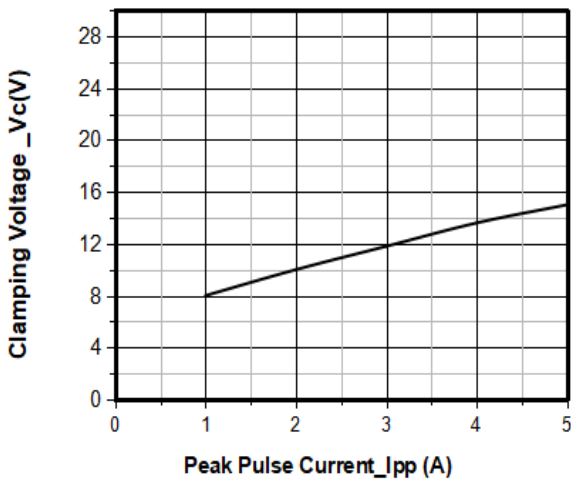
**Typical Performance Characteristics ( $T_A=25^\circ\text{C}$  unless otherwise Specified)**



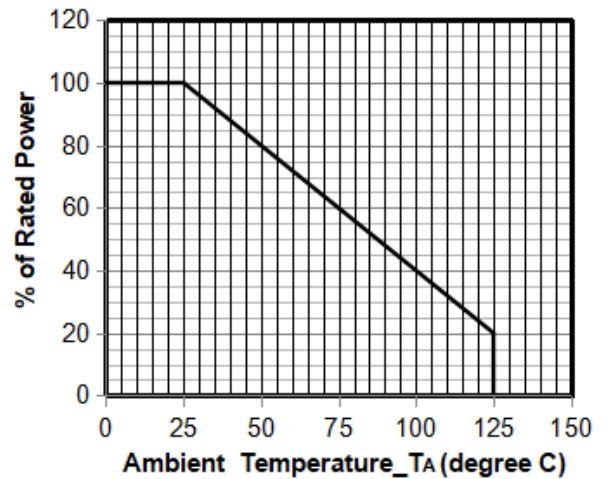
**Junction Capacitance vs. Reverse Voltage**



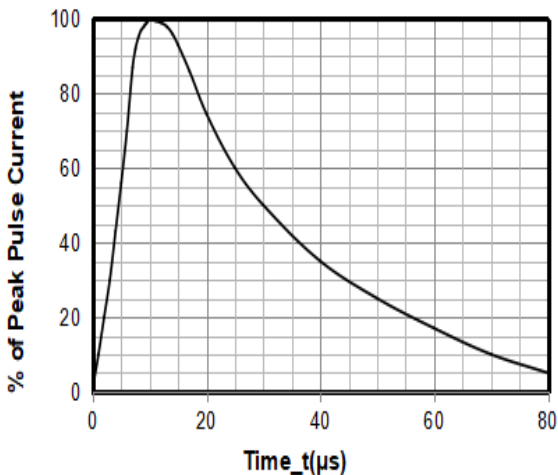
**Peak Pulse Power vs. Pulse Time**



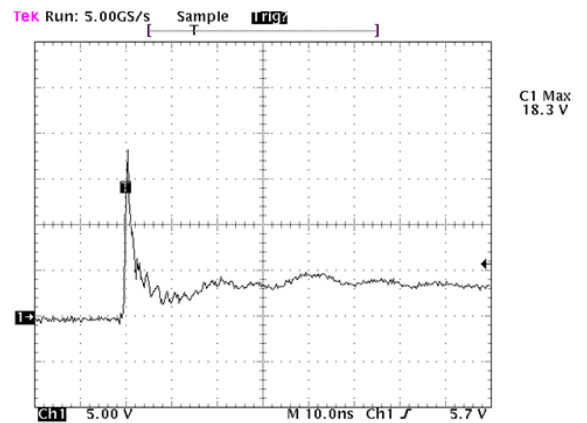
**Clamping Voltage vs. Peak Pulse Current**



**Power Derating Curve**

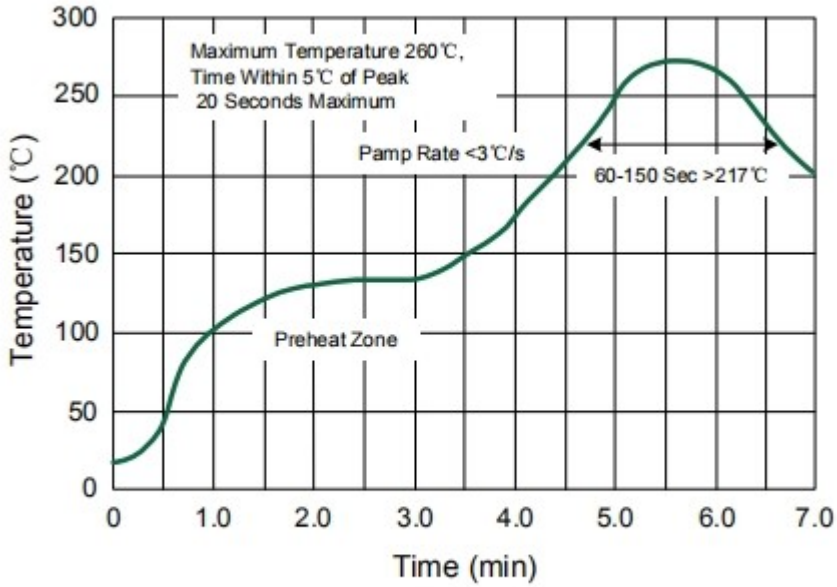


**8 X 20μs Pulse Waveform**



**Note: Data is taken with a 10x attenuator**  
**ESD Clamping Voltage**  
**8 kV Contact per IEC61000-4-2**

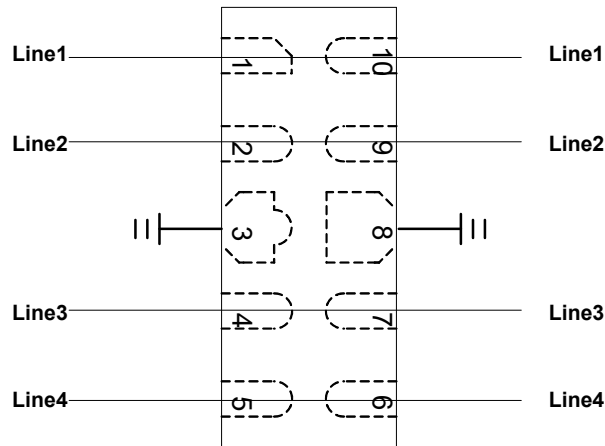
## Re-flow Solder Profile



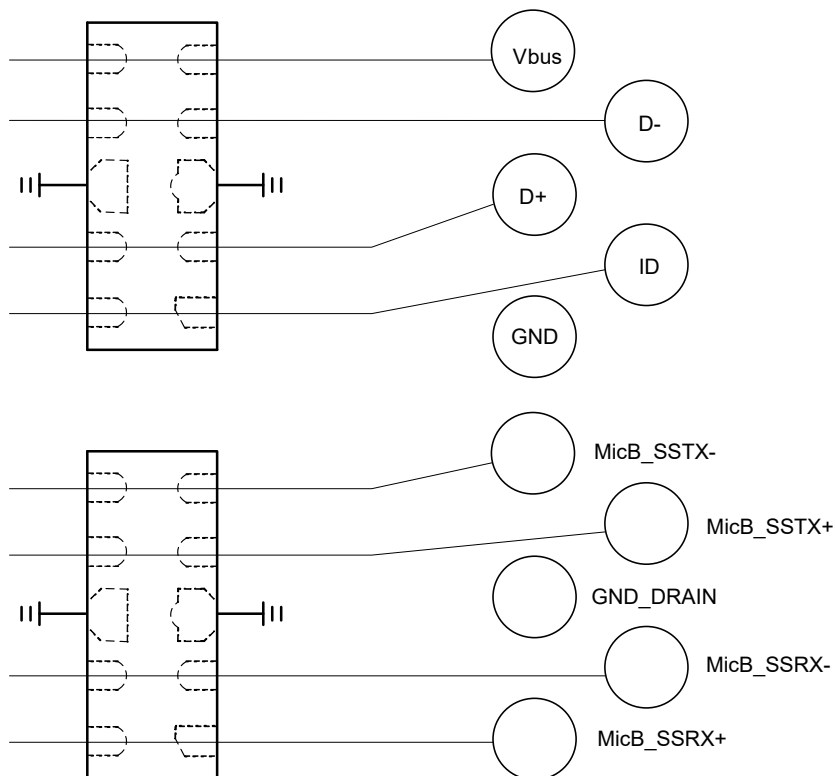
**Lead-free Re-flow Solder Profile**

**Typical Application**

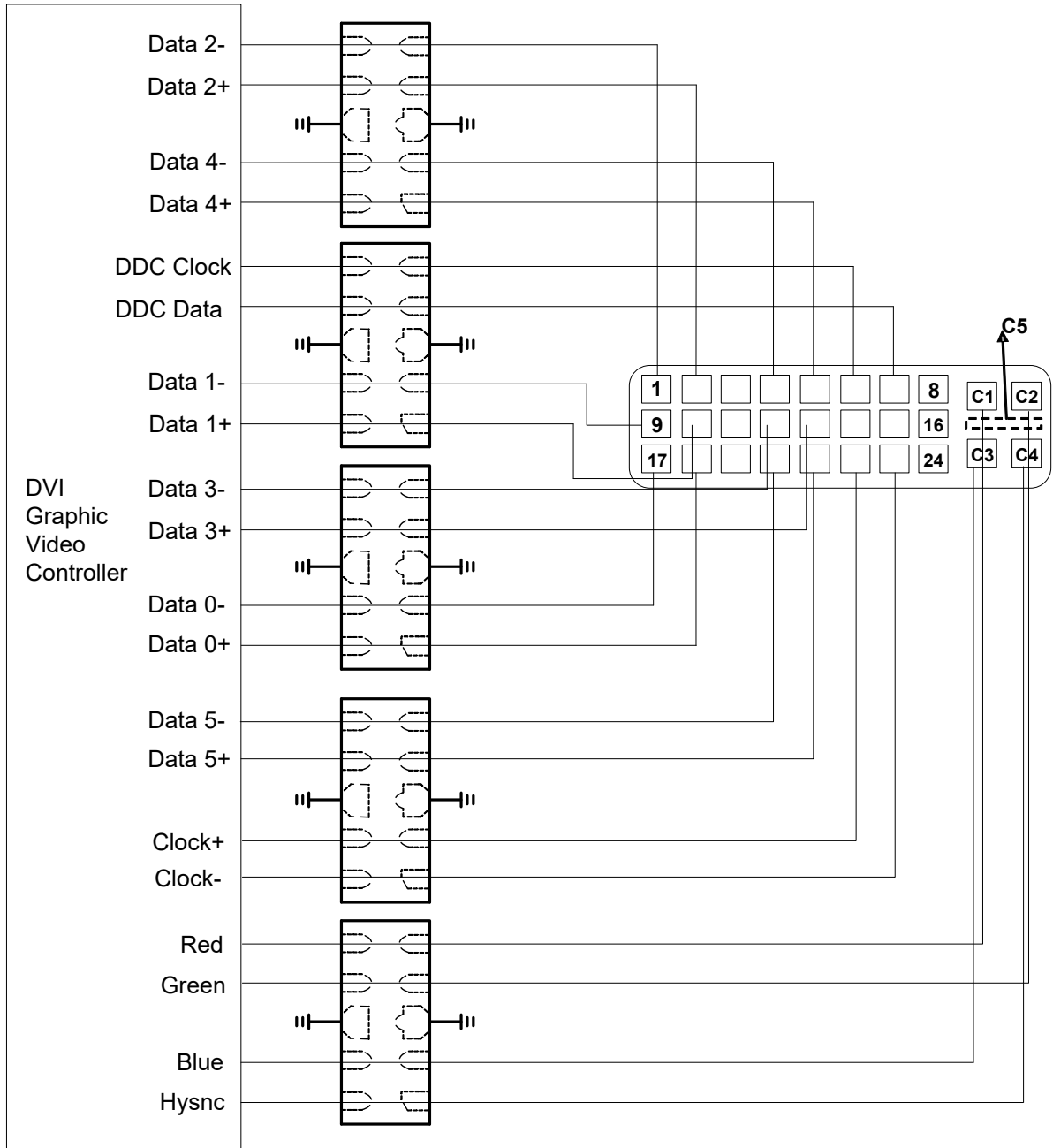
The Rclam0524P5 is designed for easy PCB layout by allowing the traces to run straight through the device. The PCB traces could be used to connect the pin pairs for each line. For example, line 1 enters at pin 1 and exits at pin 10 and the PCB trace connects Pin 1 and Pin 10 together. Ground is connected at Pin 3 and Pin 8.



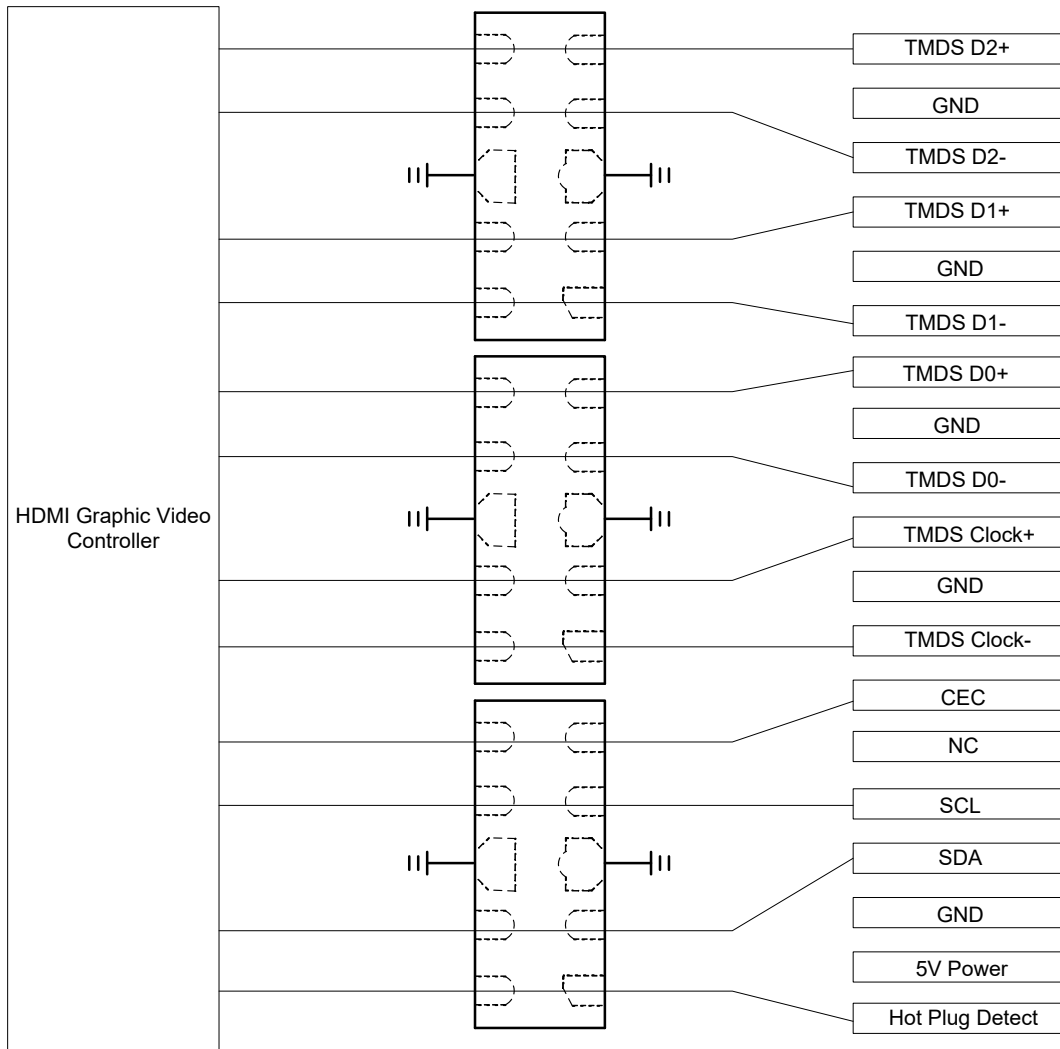
**Rclam0524P5 on USB 3.0 Port Application**



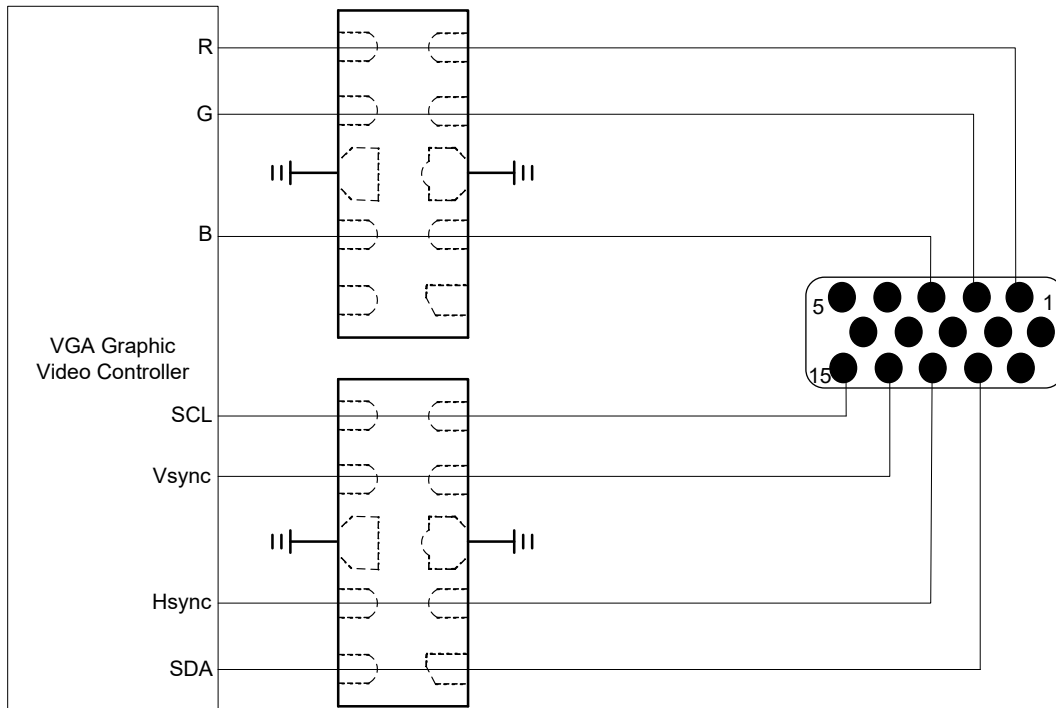
**Rclam0524P5 on DVI Port Application**



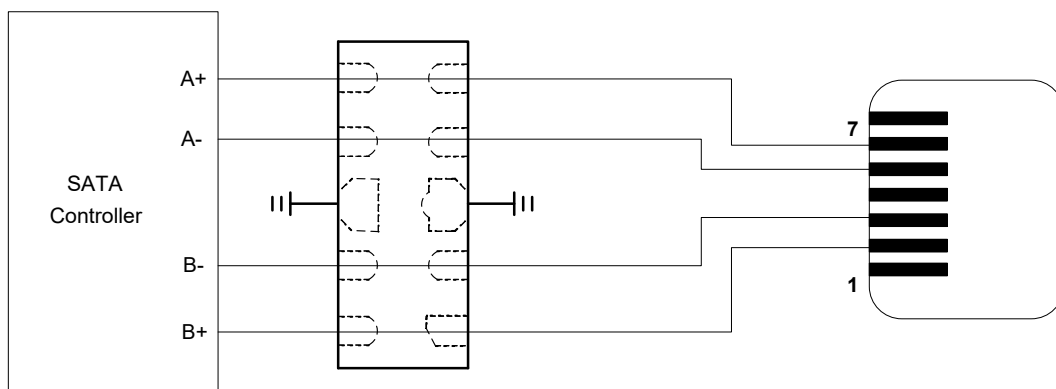
**Rclam0524P5 on HDMI Port Application**



**Rclam0524P5 on VGA Port Application**

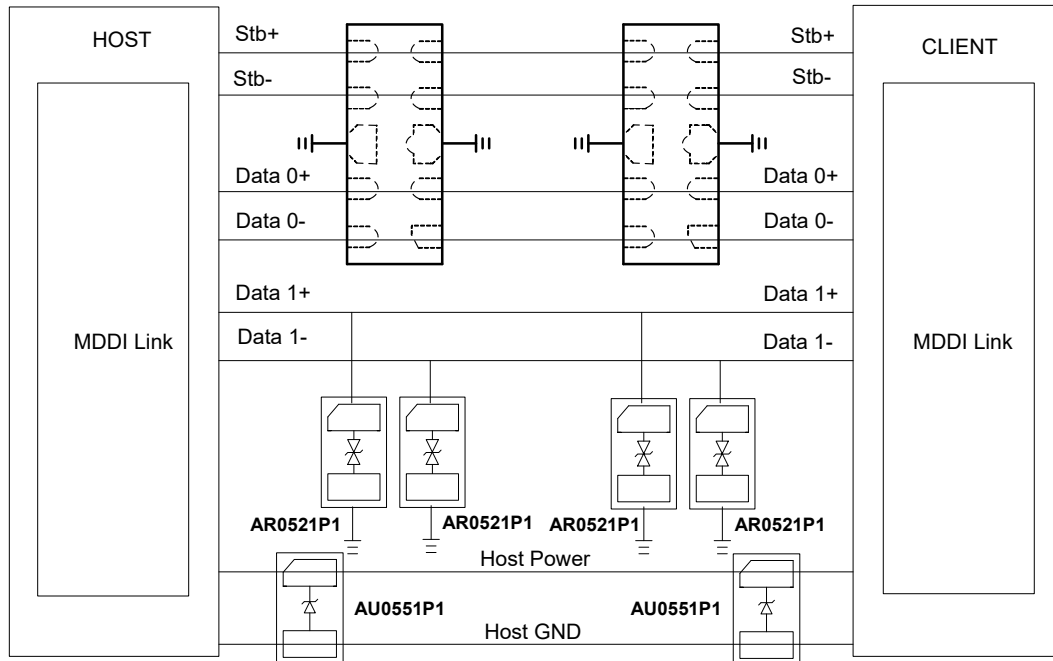


**Rclam0524P5 on eSATA Port Application**

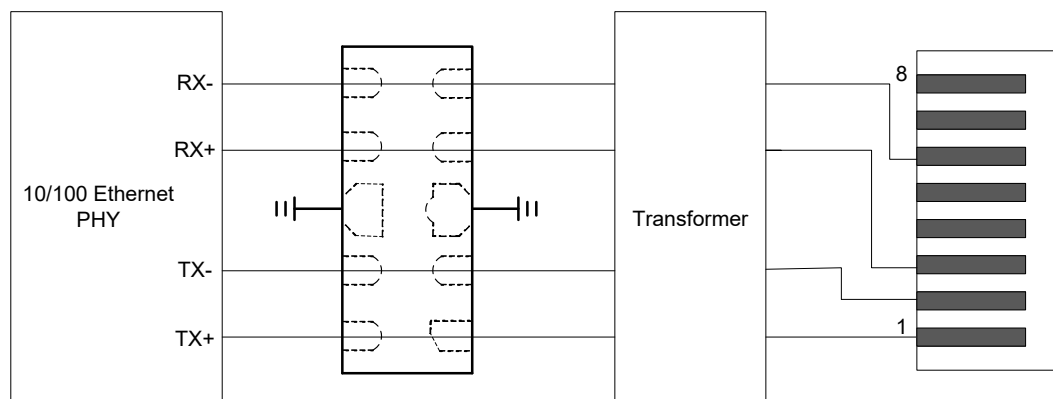


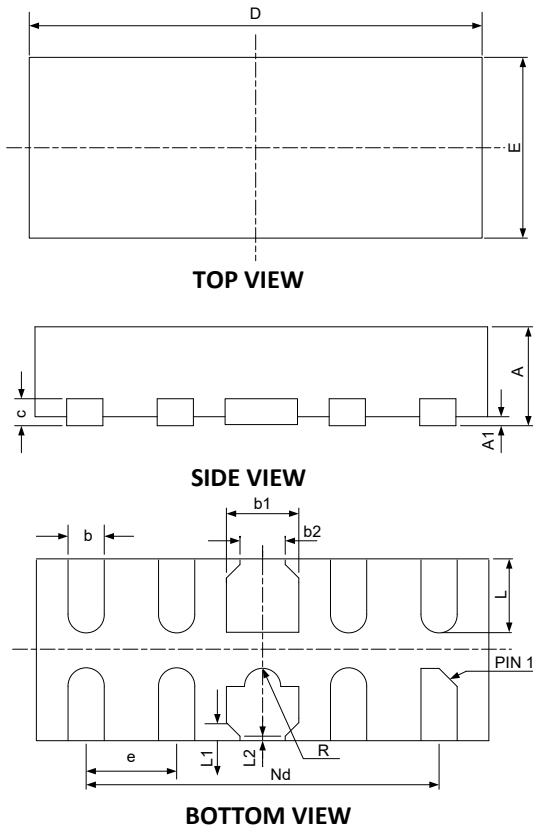


**Rclam0524P5 on MDDI Port Application**

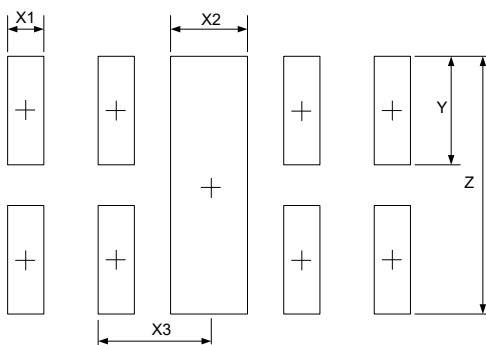


**Rclam0524P5 on 10/100 Base Ethernet Port Application**



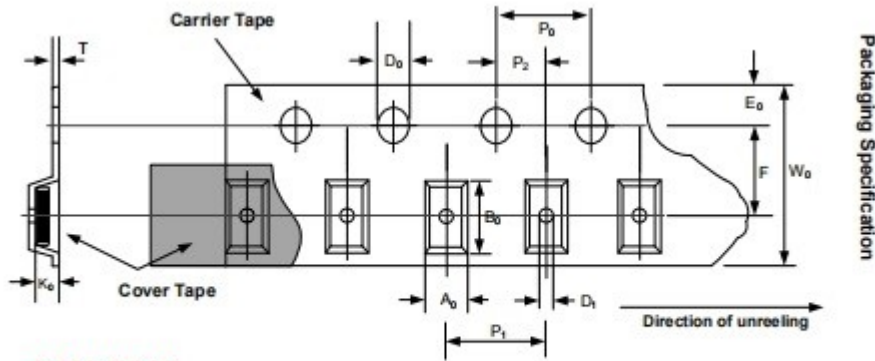
**DFN2510-10 Package Outline Drawing**


| 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 |

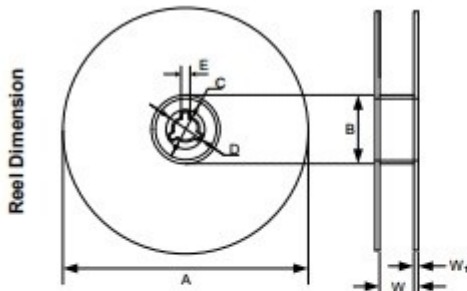
**Suggested Land Pattern**


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

## DFN2510-10 Tape and Reel Specification



DFN-2510



| Symbol         | Inch                | Millimeter       |
|----------------|---------------------|------------------|
| A <sub>0</sub> | 0.047 ±0.002        | 1.20 ±0.05       |
| B <sub>0</sub> | 0.105 ±0.002        | 2.70 ±0.05       |
| K <sub>0</sub> | 0.028 ±0.002        | 0.70 ±0.05       |
| T              | 0.008 ±0.001        | 0.20 ±0.03       |
| D <sub>0</sub> | 0.060 +0.004/-0.000 | 1.50 +0.10/-0.00 |
| D <sub>1</sub> | 0.020 ±0.002        | 0.50 ±0.05       |
| P <sub>1</sub> | 0.157 ±0.004        | 4.00 ±0.10       |
| P <sub>2</sub> | 0.079 ±0.002        | 2.00 ±0.05       |
| P <sub>0</sub> | 0.157 ±0.004        | 4.00 ±0.10       |
| W <sub>0</sub> | 0.315 ±0.008        | 8.00 ±0.20       |
| E <sub>0</sub> | 0.069 ±0.004        | 1.75 ±0.10       |
| F              | 0.138 ±0.002        | 3.50 ±0.05       |
| A              | 7.000 ±0.040        | 178.00 ±1.00     |
| B              | 2.150 ±0.020        | 54.50 ±0.50      |
| C              | 0.512 ±0.008        | 13.00 ±0.20      |
| D              | 0.969 ±0.008        | 24.50 ±0.20      |
| E              | 0.079 ±0.020        | 2.00 ±0.50       |
| W              | 0.354 ±0.020        | 9.00 ±0.50       |
| W <sub>1</sub> | 0.061 ±0.008        | 1.55 ±0.20       |

## Contact Information

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