

Description

The CLAMP0524P_LC 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 CLAMP0524P_LC has an ultra-low capacitance with a typical value at 0.2pF, and complies with the IEC 61000-4-2 (ESD) standard 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 CLAMP0524P_LC an ideal choice to protect HDMI, MDDI, USB3.0 and other high speed ports.

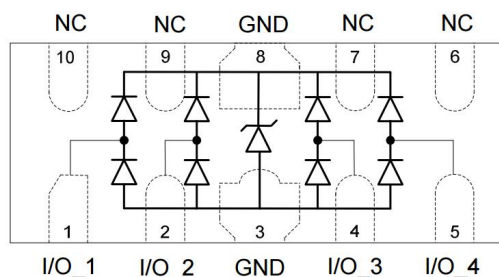
Features

- 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: $\pm 25\text{kV}$
 - Contact discharge: $\pm 20\text{kV}$
- IEC61000-4-5 (Lightning) 4A (8/20 μs)
- RoHS Compliant

Ordering Information

| Part Number | Packaging | Reel Size |
|---------------|------------------|-----------|
| CLAMP0524P_LC | 3000/Tape & Reel | 7 inch |

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
- Digital Video Interface (DVI)
- Notebook Computers
- PCI Express and Serial SATA Ports

Marking information



Dot denotes Pin1

Details marking code reference specification of approval

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

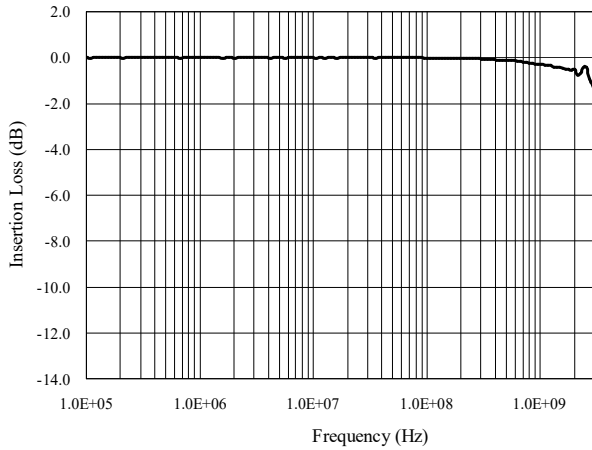
| Parameter | Symbol | Value | Unit |
|---------------------------------|------------------|-------------|------|
| Peak Pulse Power (8/20μs) | P _{pk} | 60 | W |
| Peak Pulse Current (8/20μs) | I _{PP} | 4 | A |
| ESD per IEC 61000-4-2 (Air) | V _{ESD} | ±25 | kV |
| ESD per IEC 61000-4-2 (Contact) | | ±20 | |
| Operating Temperature Range | T _J | -55 to +125 | °C |
| Storage Temperature Range | T _{stg} | -55 to +150 | °C |

Electrical Characteristics (T_A=25°C unless otherwise specified)

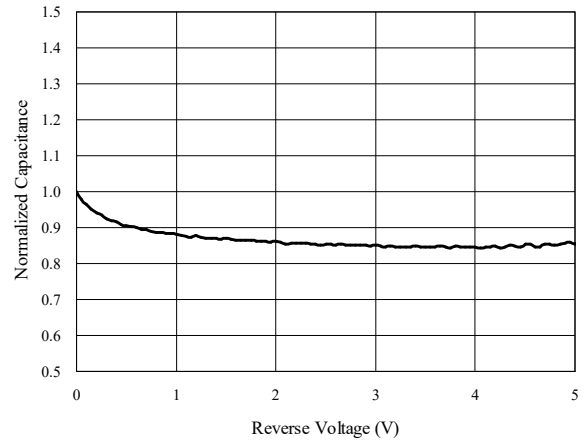
| Parameter | Symbol | Min | Typ | Max | Unit | Test Condition |
|-------------------------|------------------|-----|-----|-----|------|--|
| Reverse Working Voltage | V _{RWM} | | | 5 | V | Any I/O pin to ground |
| Breakdown Voltage | V _{BR} | 6 | | | V | I _T = 1mA, any I/O pin to ground |
| Reverse Leakage Current | I _R | | 0.2 | 0.5 | μA | V _{RWM} = 5V, any I/O pin to ground |
| Clamping Voltage | V _C | | | 10 | V | I _{PP} = 1A (8 x 20μs pulse), any I/O pin to ground |
| Clamping Voltage | V _C | | | 15 | V | I _{PP} = 4A (8 x 20μs pulse), any I/O pin to ground |
| Junction Capacitance | C _J | | 0.2 | 0.3 | pF | V _R = 0V, f = 1MHz, between I/O pins |
| Junction Capacitance | C _J | | 0.4 | 0.5 | pF | V _R = 0V, f = 1MHz, any I/O pin to ground |

Typical Performance Characteristics (T_A=25°C unless otherwise Specified)

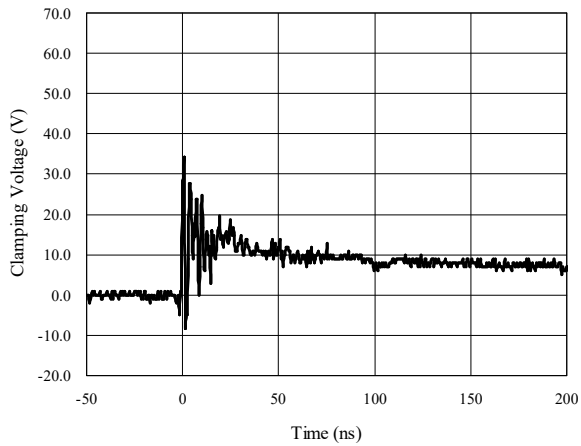
Insertion Loss S21 of I/O to GND



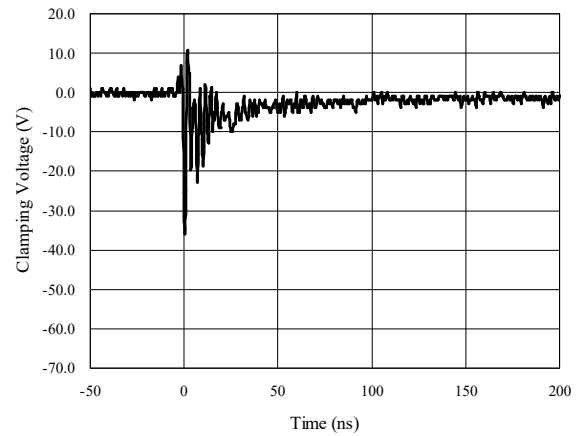
Normalized Capacitance vs. Reverse Voltage



ESD Clamping
(+8kV Contact per IEC 61000-4-2)

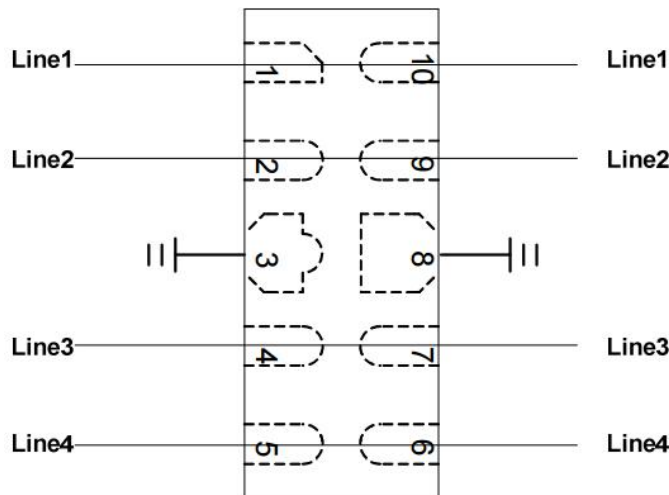


ESD Clamping
(-8kV Contact per IEC 61000-4-2)

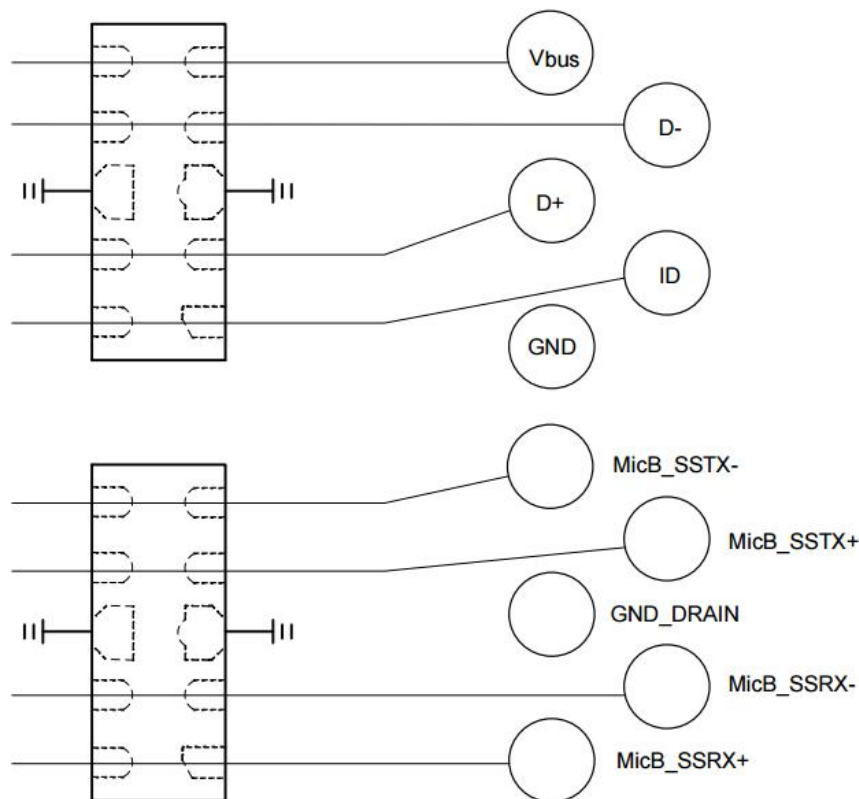


Typical Application

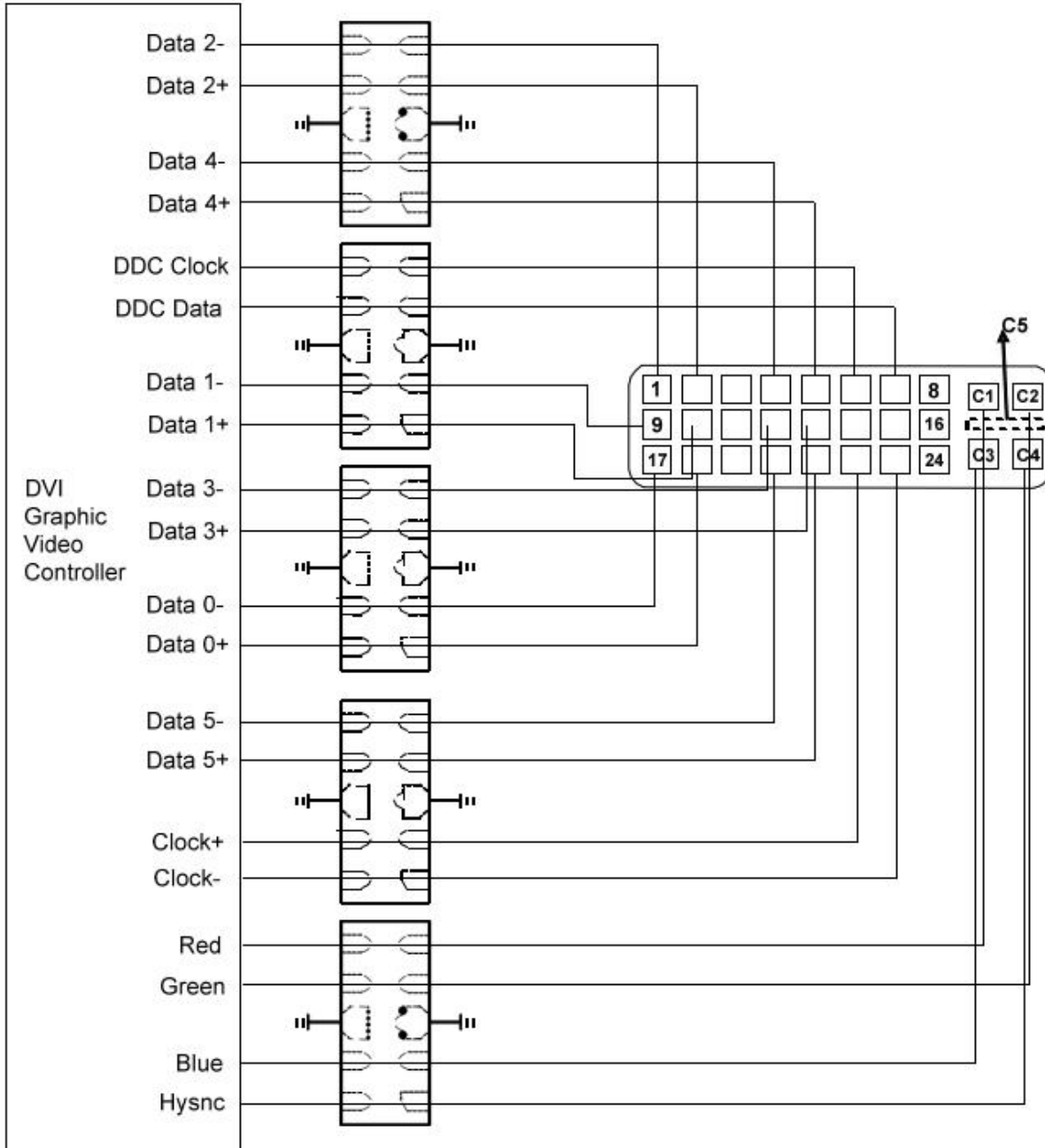
The CLAMP0524P_LC is designed for easy PCB layout by allowing the traces to run straight through the device. The PCB traces could be used to connect the pin pairs for each line. For example, line 1 enters at pin 1 and exits at pin 10 and the PCB trace connects Pin 1 and Pin 10 together. Ground is connected at Pin 3 and Pin 8.



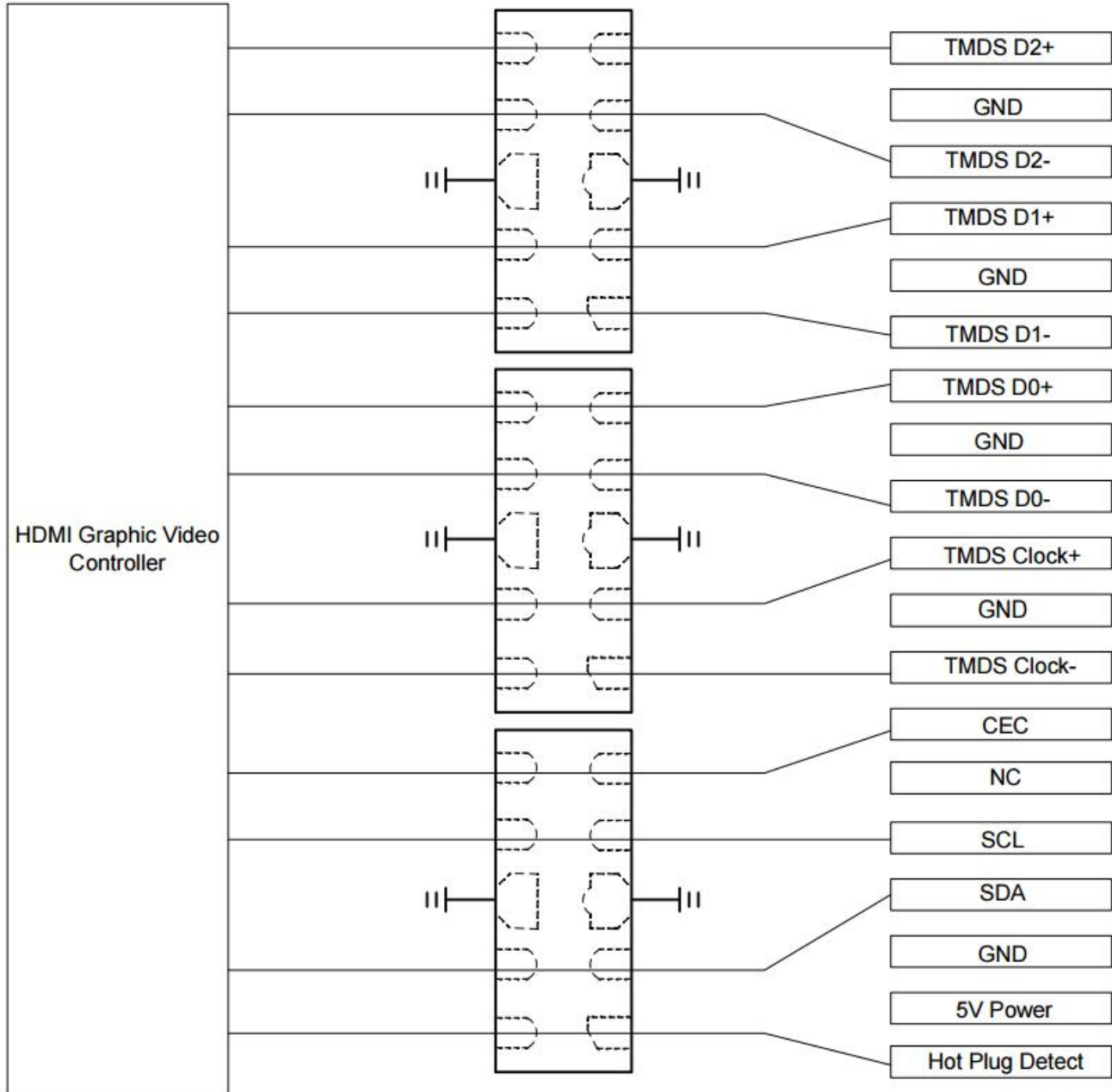
CLAMP0524P_LC on USB 3.0 Port Application



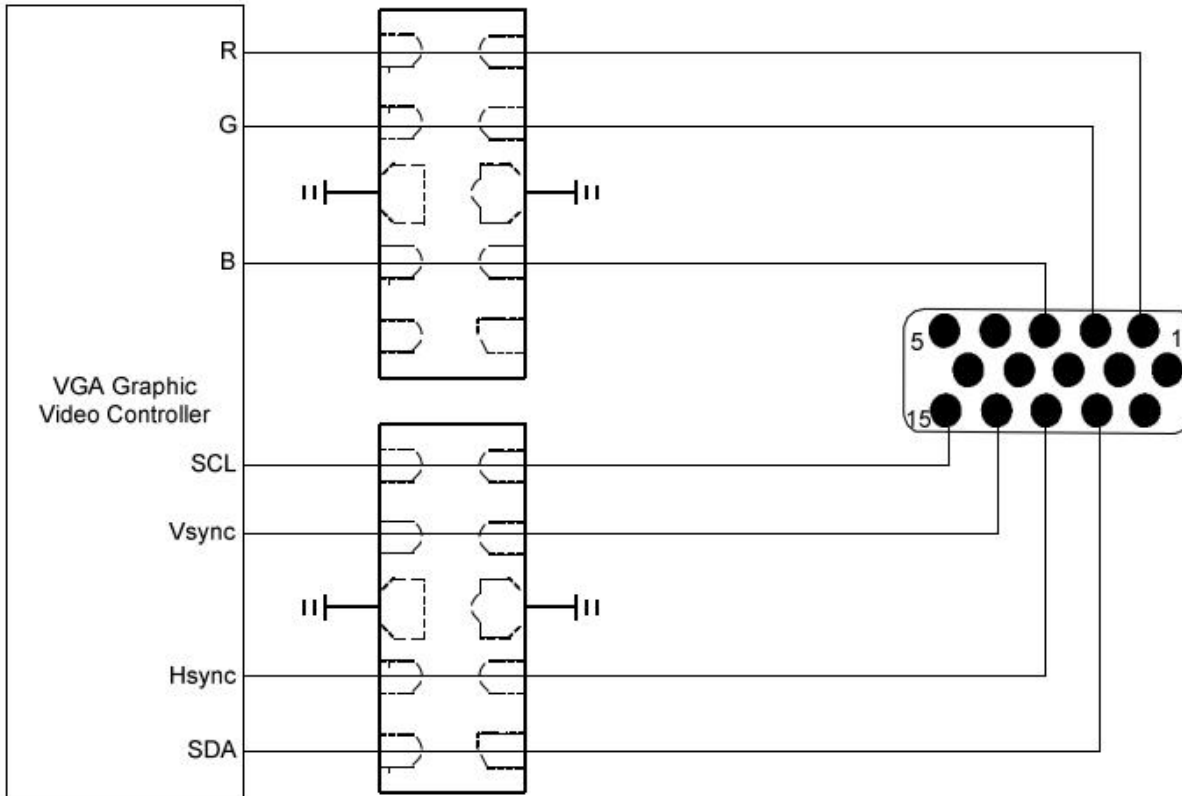
CLAMP0524P LC on DVI Port Application



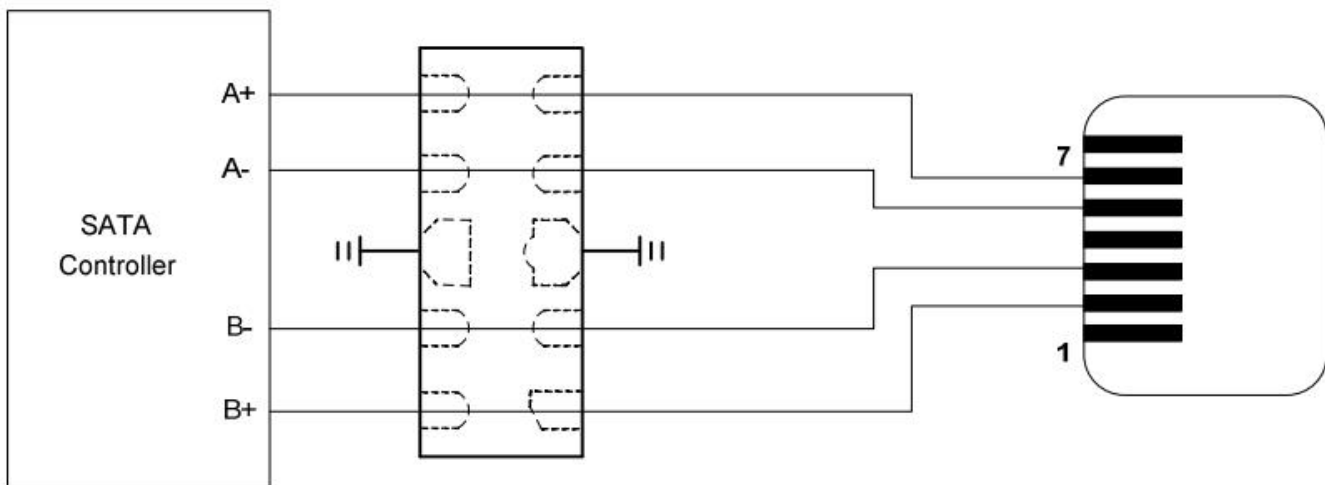
CLAMP0524P LC on HDMI Port Application



CLAMP0524P LC on VGA Port Application

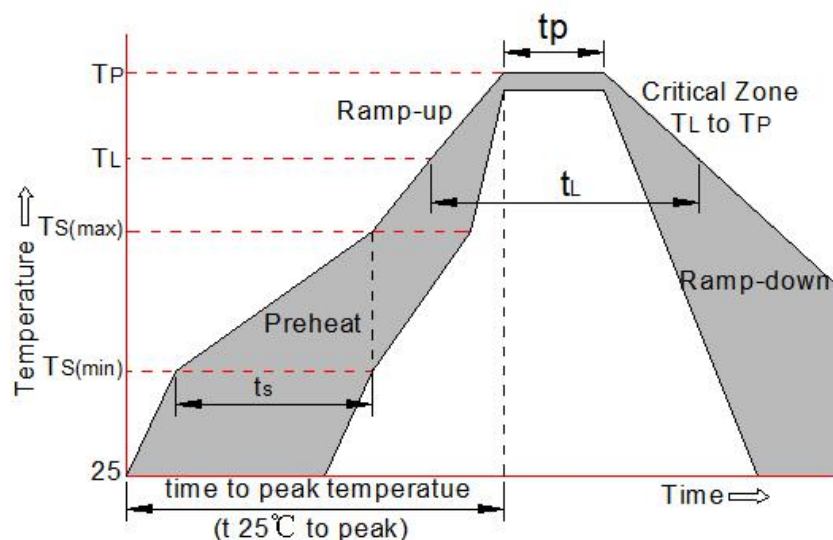


CLAMP0524P LC on eSATA Port Application

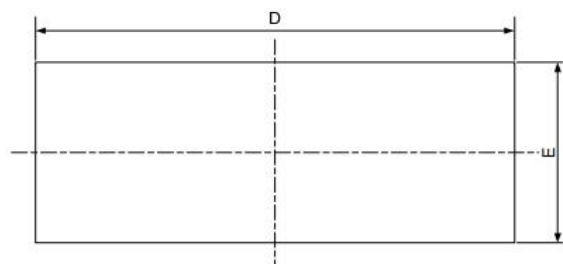


Soldering parameters

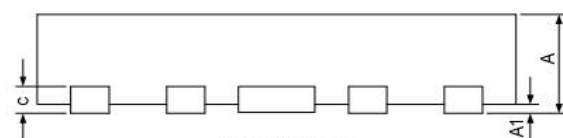
| | | |
|---|-----------------------------------|---------------------------------|
| Reflow Condition | | Pb-Free assembly (see FIG.2) |
| Pre Heat | -Temperature Min ($T_{s(min)}$) | +150°C |
| | -Temperature Max($T_{s(max)}$) | +200°C |
| | -Time (Min to Max) (t_s) | 60-180 secs. |
| Average ramp up rate (Liquid us Temp (T_L) to peak) | | 3°C/sec. Max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/sec. Max |
| Reflow | -Temperature(T_L) (Liquid us) | +217°C |
| | -Temperature(t_L) | 60-150 secs. |
| Peak Temp (T_p) | | +260(+0/-5)°C |
| Time within 5°C of actual Peak Temp (t_p) | | 30 secs. Max |
| Ramp-down Rate | | 6°C/sec. Max |
| Time 25°C to Peak Temp (T_p) | | 8 min. Max |
| Do not exceed | | +260°C |



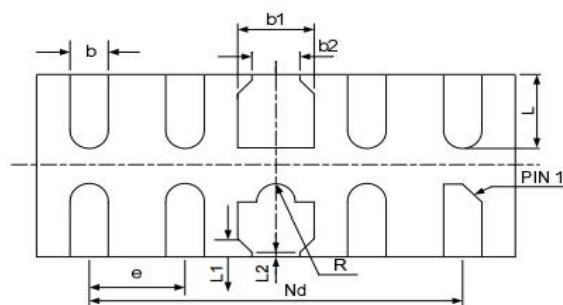
Package mechanical data



TOP VIEW



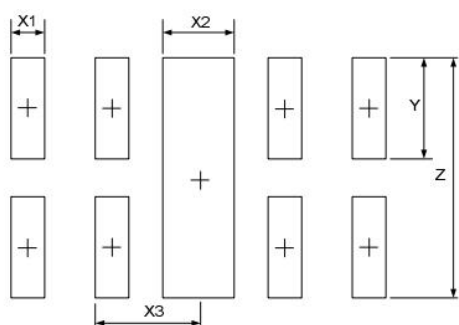
SIDE VIEW



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 |

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