**ESD Protector** **Overvoltage Protection Device**

# Specification Status: Released

## BENEFITS

- ESD protection for high frequency applications (HDMI 1.3)
- Smaller form factor for board space savings
- Helps protect electronic circuits against damage from electrostatic discharge (ESD) events
- Assists equipment to pass IEC 61000-4-2, level 4 testing

## FEATURES

- 0.15 pF (typ) Capacitance
- Low leakage current
- Low clamping voltage
- Fast response time (<1ns)
- Capable of withstanding numerous ESD strikes
- Compatible with standard reflow installation procedures
- Thick film technology
- Bi-directional protection
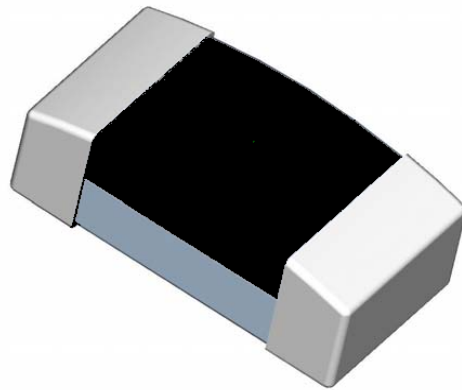
## APPLICATIONS

- HDMI 1.3 interface
- LCD, HDTV
- Cellular phones
- Antennas (cell phones, GPS…)
- Portable video devices (PDA, DSC, Bluetooth…)
- Printer ports
- High speed Ethernet
- USB 2.0 and IEEE 1394 interfaces
- DVI interface

**CAUTION:** This device should not be used in Power Bus applications

## TYPICAL DEVICE RATINGS AND CHARACTERISTICS

| Symbol | Continuous Max Operating Voltage | Typical TLP Trigger Voltage[1] | Typical TLP Clamping Voltage[1] after 30ns | Typical Capacitance[2] @ 1 MHz, $1V_{rms}$ | Typical Leakage Current @$14V_{DC}$ | Max Leakage Current @$14V_{DC}$ |
|---|---|---|---|---|---|---|
| | $V_{DC}$ | $V_{T(TLP)}$ | $V_{C(TLP\,30)}$ | Cp | $I_{L(Typ)}$ | $I_{L(MAX)}$ |
| Unit | V | V | V | pF | µA | µA |
| Value | 42 | 250 | 40 | 0.15 | <0.01 | 10.0 |

Note 1: TLP test method at 1000V (refer to FIG. 5 on page 5)
Note 2: Typical capacitance @ 0V and 14V bias

## GENERAL CHARACTERISTICS

Operating temperature:  -55°C to +125°C
Storage temperature:     -40°C to +85°C

ESD voltage capability (tested per IEC 61000-4-2)

  o   Contact discharge mode:  8kV (typ), 15kV (max)
  o   Air discharge mode:  15kV (typ), 25kV (max)  [1 pulse: per customer request]

ESD pulse withstand:  Typically 100 pulses (tested per IEC 61000-4-2, level 4, and contact method)

## Environmental Specifications

| Test Conditions | Bias Humidity Test | Thermal Shock | Bias Heat Test | Bias Low Temp Test | Solderability | Solder Heat | Vibration | Mechanical Shock | Solvent Resistance |
|---|---|---|---|---|---|---|---|---|---|
| | @ 85°C @ 85% RH $V_{DC}$ (max) 1000 hours | -55°C to 125°C 30min dwell 1000 cycles | @ 125°C $V_{DC}$ (max) 1000 hours | @ -55°C $V_{DC}$ (max) 1000 hours | 250 °C +/- 5 °C 3s +/- 1s | 260 °C,10s | 10 to 50Hz, 60s cycle, 2hrs each in X-Y-Z axis | 1500G, 0.5ms, X-Y-Z axis 3 times | IPA ultrasonic 300s |
| Pass/Fail Criteria | $I_L$≤10µA | $I_L$≤10µA | $I_L$≤10µA | $I_L$≤10µA | 95% coverage | 90% coverage | No Physical Damage $I_L$ ≤ 10 µA | No Physical Damage $I_L$ ≤ 10 µA | No Physical Damage $I_L$ ≤ 10 µA |

## FIG 1: <u>CAPACITANCE VS. FREQUENCY (TYPICAL SAMPLE)</u>

( Flat Response of Capacitance over Frequency Range)
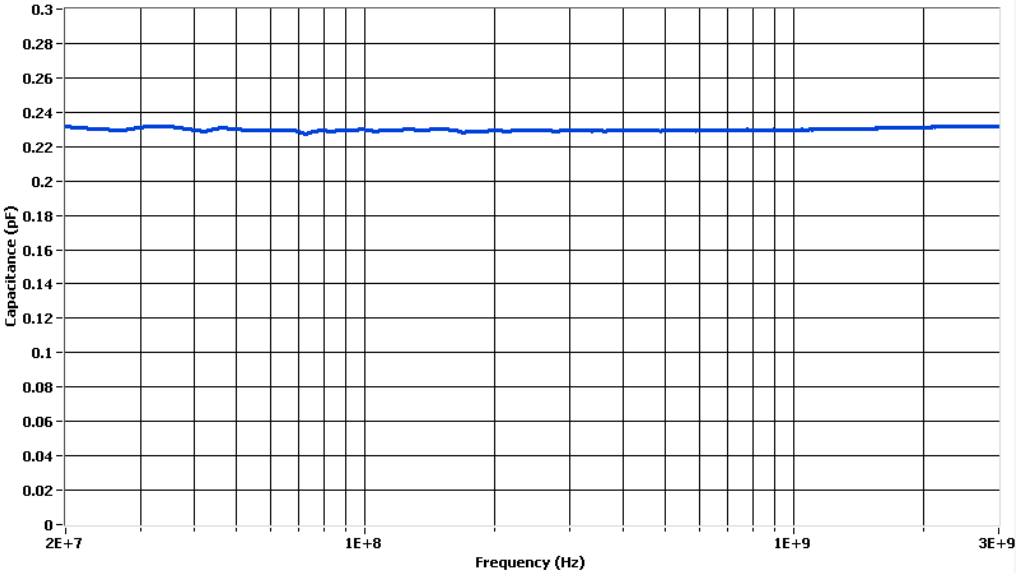


## FIG 2: <u>EYE DIAGRAM (TYPICAL SAMPLE)</u>

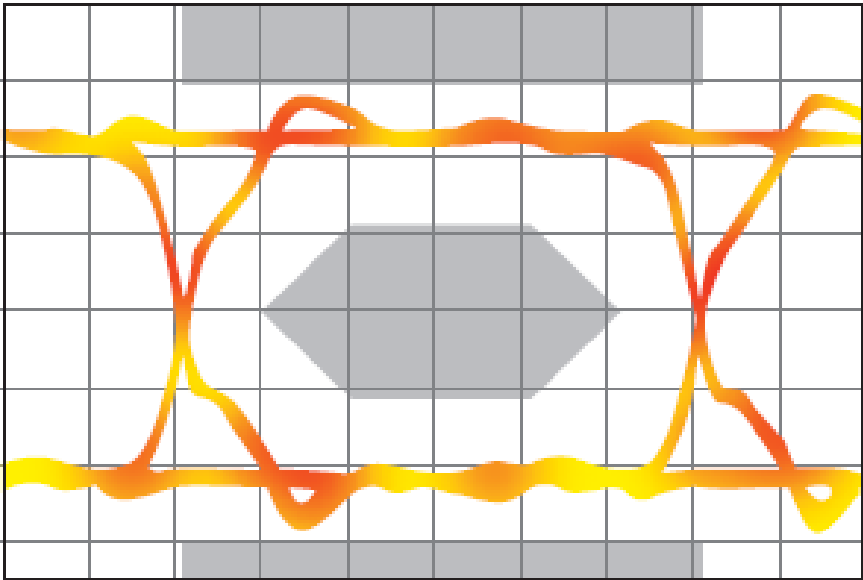( Eye Diagram Performance at 3.4 GHz— meets criteria for HDMI 1.3)

## FIG 3: INSERTION LOSS DIAGRAM (TYPICAL SAMPLE)
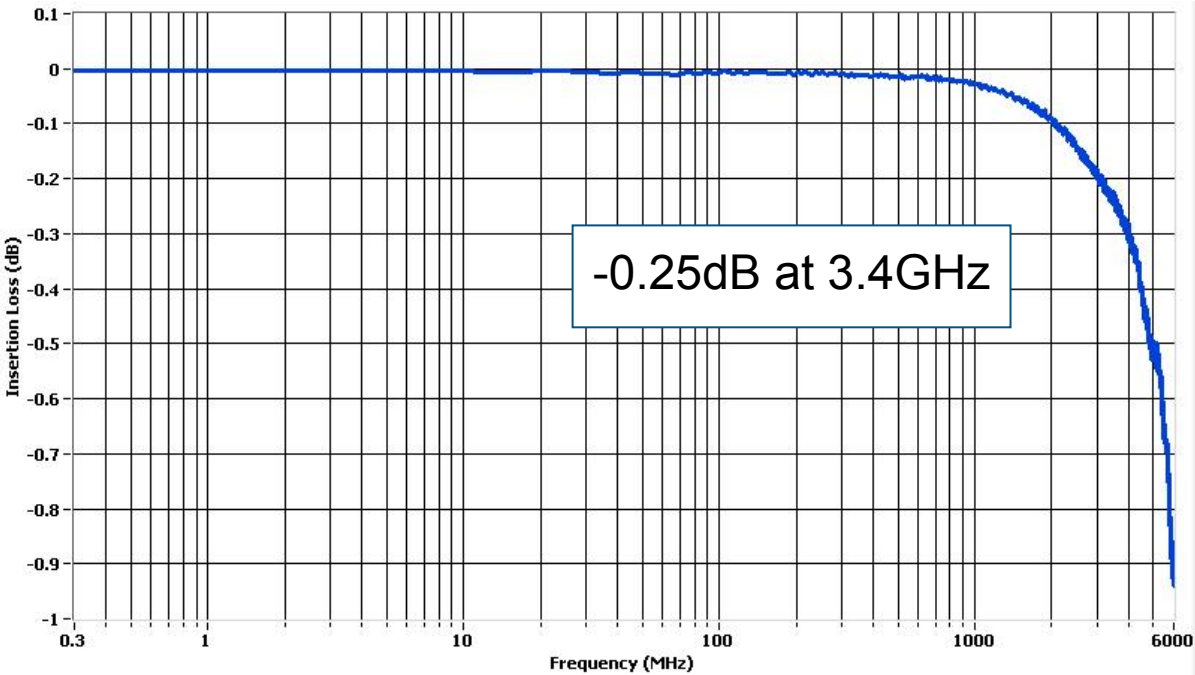(Minimal Insertion Loss at 3.4 GHz)



-0.25dB at 3.4GHz
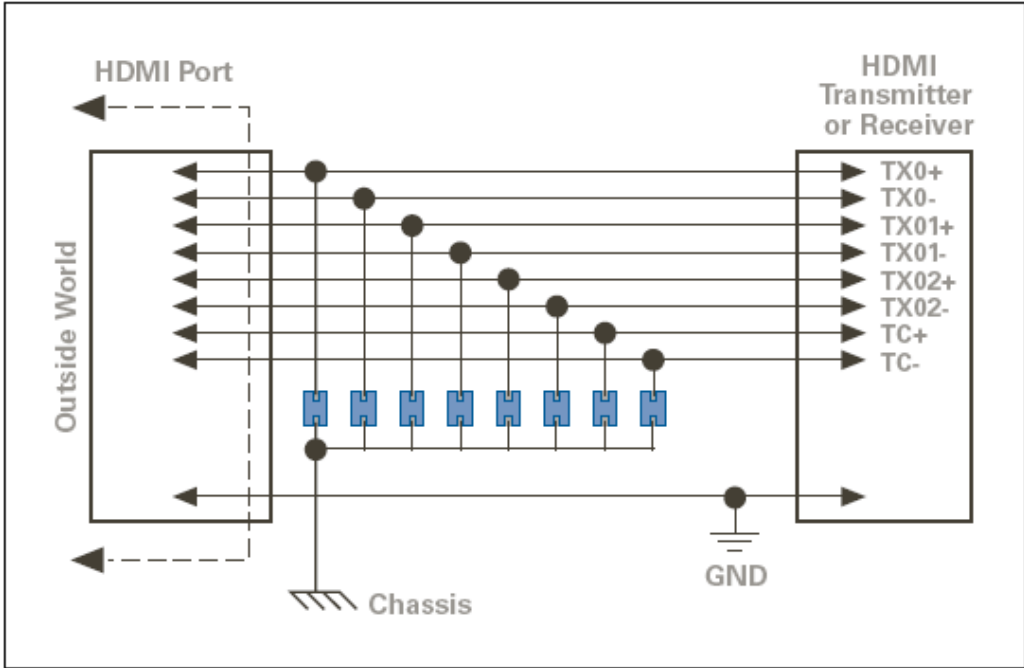
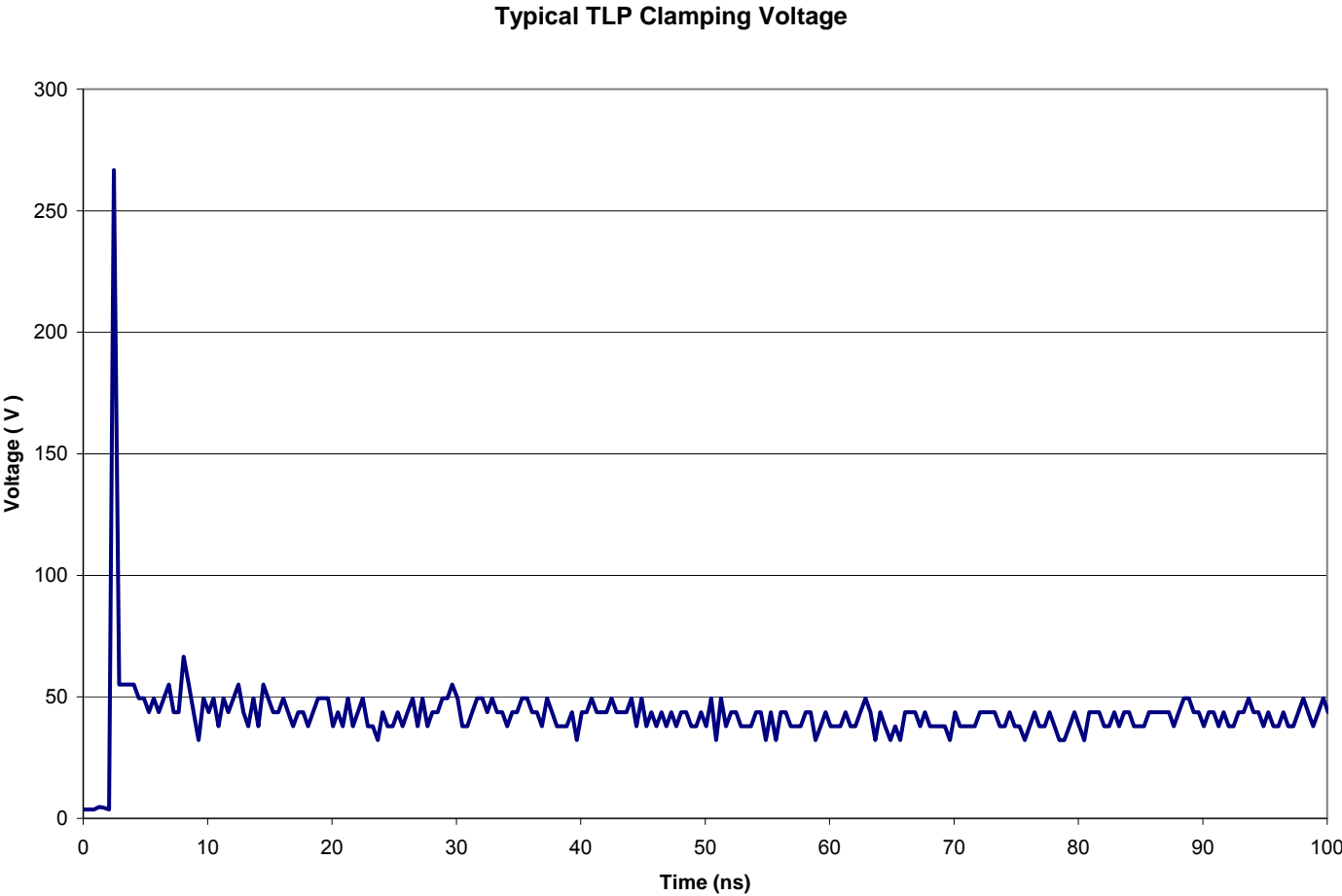## FIG 4: ESD PROTECTION FOR HDMI
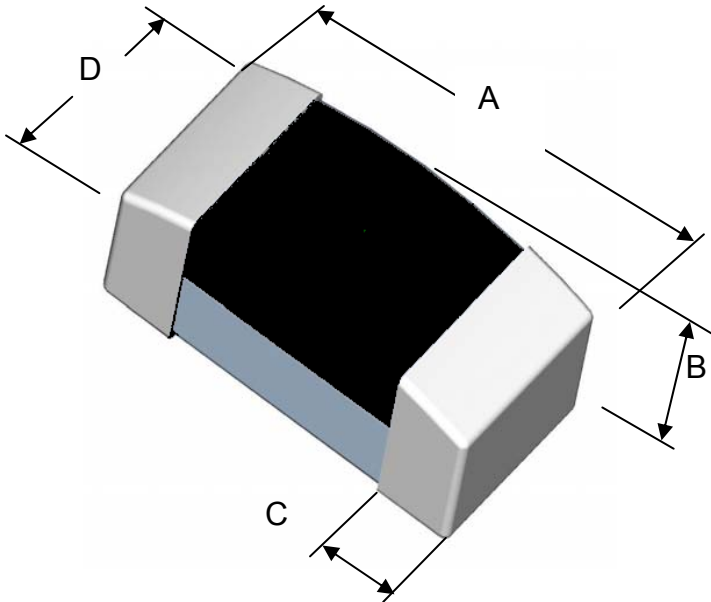Reference Layout and Test Results available)
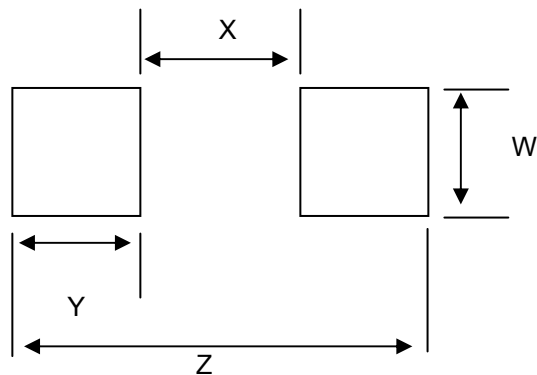
**FIG 5:  TYPICAL TRANSMISSION LINE PULSE RESPONSE GRAPH**

**Typical TLP Clamping Voltage**

## DIMENSIONS



Drawing Not To Scale

| | Length A | | Height B | | Terminal Width C | | Width D | |
|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max |
| mm | 1.50 | 1.70 | 0.40 | 0.60 | 0.20 | 0.40 | 0.70 | 0.90 |
| in* | (0.059) | (0.067) | (0.016) | (0.024) | (0.008) | (0.016) | (0.027) | (0.035) |

\* Round off approximation

## RECOMMENDED LAND PATTERN:



| | W | | X | | Y | | Z | |
|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max |
| mm | 0.90 | 1.00 | 0.50 | 0.60 | 1.00 | 1.10 | 2.70 | 2.80 |
| in* | (0.035) | (0.039) | (0.020) | (0.024) | (0.039) | (0.043) | (0.106) | (0.110) |

\* Round off approximation

## SOLDER REFLOW RECOMMENDATIONS:

| | | | |
|---|---|---|---|
| A | Temperature ramp up 1 | From ambient to Preheating temperature | 30s to 60s |
| B | Preheating | 140°C - 160°C | 60s to 120s |
| C | Temperature ramp up 2 | From Preheating to Main heating temperature | 20s to 40s |
| D | Main heating | at 200°C<br>at 220°C<br>at 240°C<br>at 260°C | 60s ~ 70s<br>50s ~ 60s<br>30s ~ 40s<br>5s ~ 10s |
| E | Cooling | From main heating temperature to 100°C | 4°C/s (max) |