

PESD PROTECTION DEVICES

Littelfuse's Polymer ESD (PESD) line of devices helps protect I/O ports on HDMI 1.3, portable video players, LCD and plasma TVs, USB 2.0, digital visual interface (DVI) and antenna switches. PESD devices shunt electrostatic discharge away from sensitive circuitry in HDTV equipment, printers, laptops, cellular phones and other portable devices.

PESD devices offer many advantages over traditional protection devices, such as multi layer varistors (MLVs), which may degrade or distort the signal in high data rate circuits. Compared to miniature gas discharge tubes (GDTs), PESD devices provide a more compact form factor and an economical solution for the shrinking profiles of today's compact information appliances.

Available in a range of form factors, our PESD protection devices provide low capacitance and meet transmission line pulse (TLP) testing, as well as IEC61000-4-2 testing.



BENEFITS

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

FEATURES

- RoHS compliant
- Lead free
- Halogen free (refers to: Br \geq 900ppm, Cl \geq 900ppm, Br+Cl \geq 1500ppm)
- 0.25 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 interfaces
- LCD & plasma TVs
- Cellular phones
- Antennas
- Portable video players
- Portable devices (PDA, DSC, Bluetooth)
- Printer ports
- Satellite radios
- USB 2.0 and IEEE 1394 interfaces
- DVI
- GPS systems

Table E1 — Electrical Characteristics

| | Continuous Max Operating Voltage | Typ Trigger Voltage* | Typ Clamping Voltage† | Typ Capacitance @ 1 MHz, 1V _{RMS} | Typ Leakage Current | Max Leakage Current @ Max V _{DC} |
|---------------|----------------------------------|----------------------|-----------------------|--|---------------------|---|
| Symbol | V _{DC} | V _{T(TLP)} | V _{C(TLP)} | C _P | I _{L(TYP)} | I _{L(MAX)} |
| Unit | V | V | V | pF | μA | μA |
| PESD0402-140 | 14 | 250 | 40 | 0.25 | < 0.01 | 10.0 |
| PESD0402-240 | 24 | 250 | 40 | 0.25 | < 0.01 | 10.0 |
| PESD0603-240 | 24 | 215 | 45 | 0.25 | < 0.01 | 10.0 |
| PESD1206Q-240 | 24 | 250 | 45 | 0.25 | < 0.01 | 10.0 |

Notes : * TLP test method at 1kV.
 † Measured 30ns after pulse initiation.
 Typical capacitance value is at 0V and max operating voltage bias.

Figure E1 — Capacitance vs. Frequency

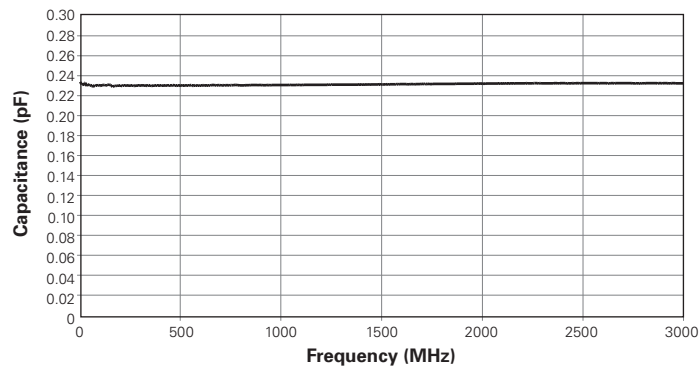


Figure E2 — Eye Diagram Performance at 3.4 GHz

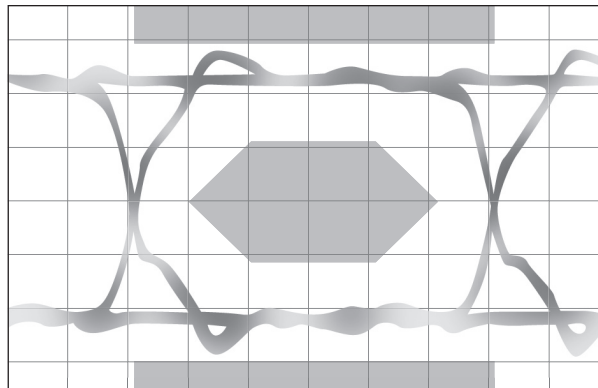
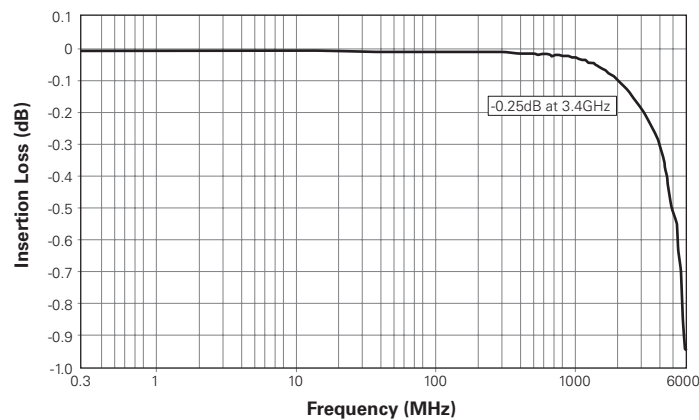


Figure E3 — Insertion Loss Diagram



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Figures E4-E5 – PESD Device Protection for HDMI (PESD devices provide electrostatic discharge protection)

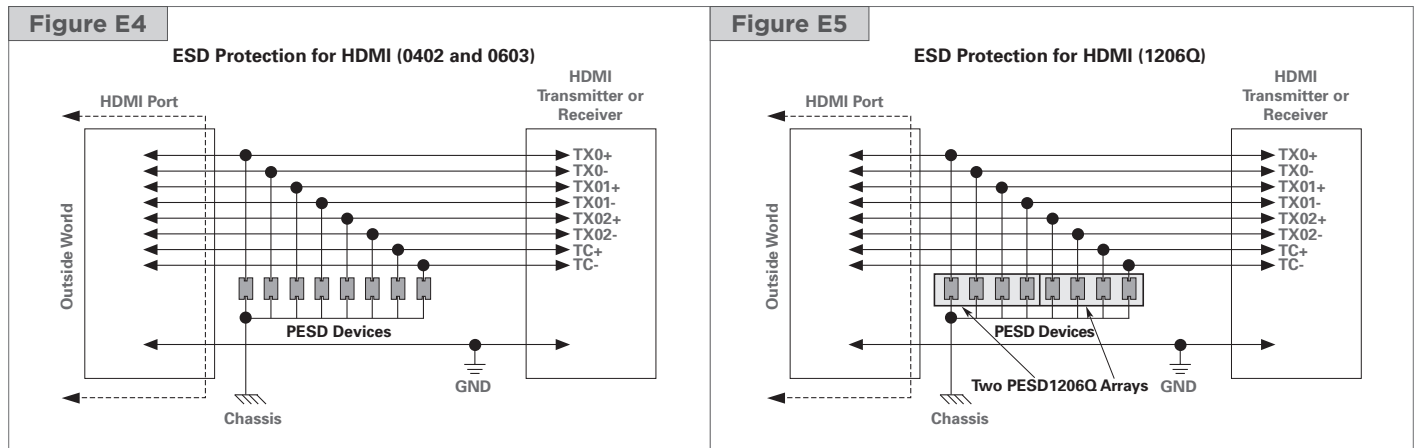


Table E2 – Dimensions in Millimeters (Inches*)

| Part Number | A | | B | | C | | D | | E | | F | | Figure |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| PESD0402-140 | 0.90 | 1.10 | 0.23 | 0.43 | 0.10 | 0.30 | 0.40 | 0.60 | — | — | — | — | E6 |
| PESD0402-240 | (0.035) | (0.043) | (0.009) | (0.017) | (0.004) | (0.012) | (0.016) | (0.024) | | | | | |
| PESD0603-240 | 1.50 | 1.70 | 0.45 | 0.55 | 0.10 | 0.50 | 0.70 | 0.95 | — | — | — | — | E6 |
| | (0.059) | (0.067) | (0.018) | (0.022) | (0.004) | (0.020) | (0.028) | (0.037) | | | | | |
| PESD1206Q-240 | 3.10 | 3.30 | 0.40 | 0.60 | 0.10 | 0.30 | 1.50 | 1.70 | 0.20 | 0.60 | 0.20 | 0.60 | E7 |
| | (0.122) | (0.130) | (0.016) | (0.024) | (0.004) | (0.012) | (0.059) | (0.067) | (0.008) | (0.024) | (0.008) | (0.024) | |

*The dimensions in inches are rounded approximations.

Figures E6-E7 – Dimension Figures

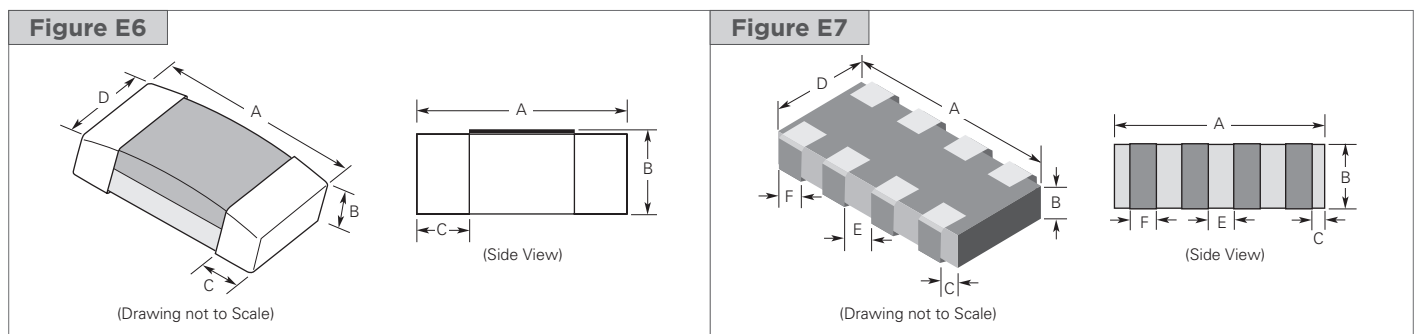


Table E3 – Environmental Specifications

| | Test Conditions | Pass / Fail Criteria |
|--------------------|--|----------------------|
| Bias Humidity Test | 85°C, 85% RH, $V_{DC(max)}$, 1000 hrs | I_L % 10 μ A |
| Thermal Shock | -55°C to 125°C, 30 min Dwell, 1000 Cycles | I_L % 10 μ A |
| Bias Heat Test | 125°C, $V_{DC(max)}$, 1000 hrs | I_L % 10 μ A |
| Bias Low Temp Test | -55°C, $V_{DC(max)}$, 1000 hrs | I_L % 10 μ A |
| Solderability | 250°C \pm 5°C, 3 \pm 1s | 95% Coverage |
| Solder Heat | 260°C, 10s | 90% Coverage |
| Vibration | 10 to 50Hz, 60s Cycle, 2 hrs Each in X-Y-Z-Direction | No Physical Damage |
| Solvent Resistance | IPA Ultrasonic 300s | No Physical Damage |
| Shock | 1500G, 0.5ms Each, X-Y-Z Axis 3 Times Each Axis | No Physical Damage |

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Table E4 – General Characteristics

| | |
|--|---|
| Storage Temperature | -40°C to +85°C |
| Operating Temperature | -55°C to +125°C |
| ESD Voltage Capability (Tested per IEC 61000-4-2) | Contact Discharge Mode: 8kV (Typ), 15kV (max) Air Discharge Mode: 15kV (Typ), 25kV (max) [1 Pulse: per Customer Request] |
| ESD Pulse Withstand | 100 Pulses (Tested per IEC 61000-4-2, Level 4, Contact Method) |

Table E5 – Materials Information

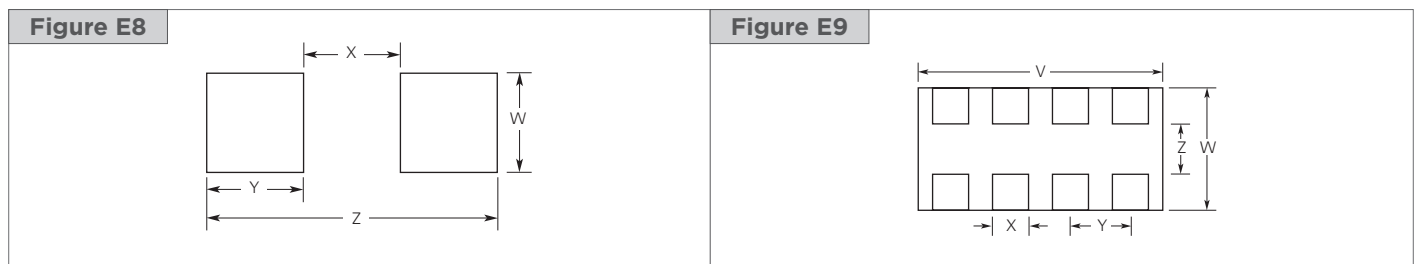
| | |
|----------------|---|
| RoHS Compliant | Directive 2002/95/EC Compliant |
| RoHS 2.0 | Directive 2011/65/EU Compliant |
| ELV Compliant | Directive 2000/53/EC Compliant |
| Halogen Free | Halogen Free Refers to: Br#900ppm, Cl#900ppm, Br+Cl#1500ppm |

Table E6 – Recommended Pad Layout in Millimeters and (Inches*)

| Part Number | V | | W | | X | | Y | | Z | | Figure |
|--------------|-----|-----|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| PESD0402-140 | — | — | 0.60 | 0.70 | 0.30 | 0.40 | 0.80 | 0.90 | 2.10 | 2.20 | E8 |
| PESD0402-240 | | | (0.024) | (0.028) | (0.012) | (0.016) | (0.031) | (0.035) | (0.083) | (0.087) | |
| PESD0603-240 | — | — | 0.90 | 1.00 | 0.50 | 0.60 | 1.00 | 1.10 | 2.70 | 2.80 | E8 |
| | | | (0.035) | (0.039) | (0.020) | (0.024) | (0.039) | (0.043) | (0.106) | (0.110) | |

| Part Number | V | W | X | Y | Z | Figure |
|---------------|---------|---------|---------|---------|---------|--------|
| | Typ | Typ | Typ | Typ | Typ | |
| PESD1206Q-240 | 3.20 | 2.20 | 0.50 | 0.80 | 1.00 | E9 |
| | (0.126) | (0.087) | (0.020) | (0.031) | (0.039) | |

*The dimensions in inches are rounded approximations.



Note: Solder thickness 0.15 to 0.2mm.

Table E7 – 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 | 60s to 70s |
| | | at 220°C | 50s to 60s |
| | | at 240°C | 30s to 40s |
| | | at 260°C | 5s to 10s |
| E | Cooling | From Main Heating Temperature to 100°C | 4°C/s (max) |

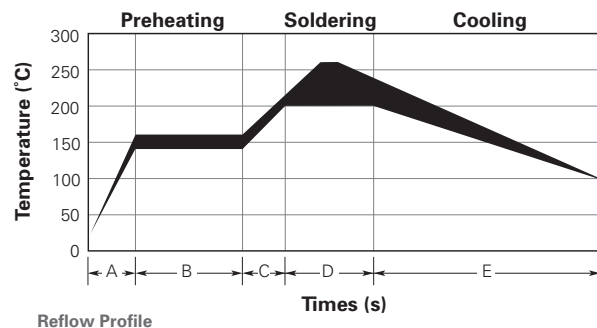


Table E8 – Tape Specifications

| Tape Dimension EIA Mark | 0402 | | 0603 | | 1206Q | |
|----------------------------|----------------|-----------|----------------|-----------|----------------|-----------|
| | Dimension (mm) | Tolerance | Dimension (mm) | Tolerance | Dimension (mm) | Tolerance |
| W | 8.00 | ±0.30 | 8.00 | ±0.30 | 8.00 | ±0.30 |
| P ₀ | 4.00 | ±0.10 | 4.00 | ±0.10 | 4.00 | ±0.10 |
| P ₁ | 2.00 | ±0.05 | 4.00 | ±0.05 | 4.00 | ±0.05 |
| P ₂ | 2.00 | ±0.05 | 2.00 | ±0.05 | 2.00 | ±0.05 |
| A ₀ | 0.63 | ±0.03 | 1.27 | ±0.15 | 2.02 | ±0.20 |
| B ₀ | 1.13 | ±0.03 | 2.02 | ±0.20 | 3.62 | ±0.20 |
| D ₀ | 1.50 | ±0.10 | 1.50 | ±0.10 | 1.50 | ±0.10 |
| F | 3.50 | ±0.05 | 3.50 | ±0.05 | 3.50 | ±0.05 |
| E ₁ | 1.75 | ±0.10 | 1.75 | ±0.10 | 1.75 | ±0.10 |
| T | 0.48 | ±0.03 | 0.60 | ±0.03 | 0.75 | ±0.05 |

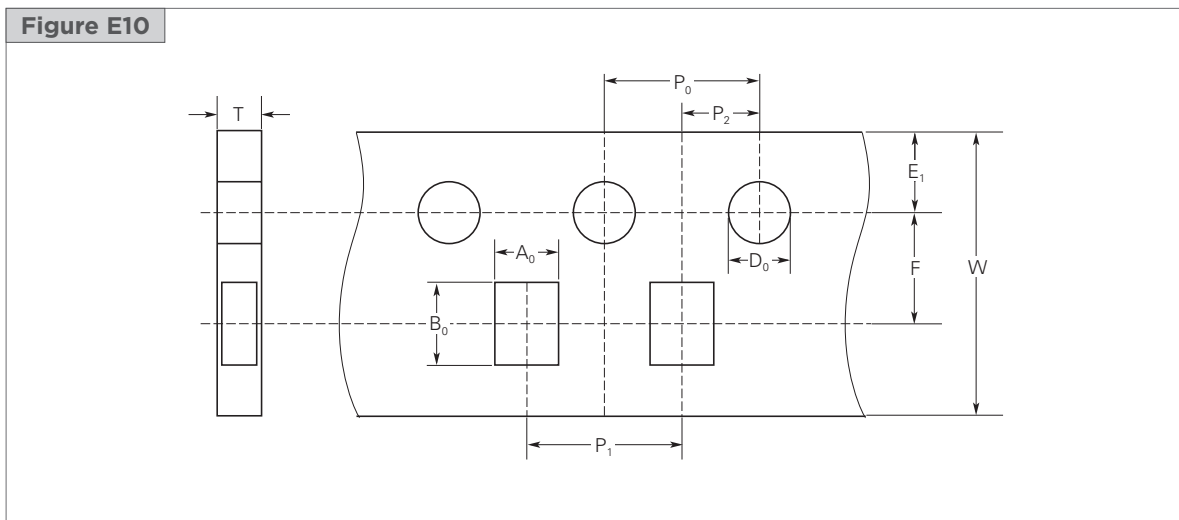
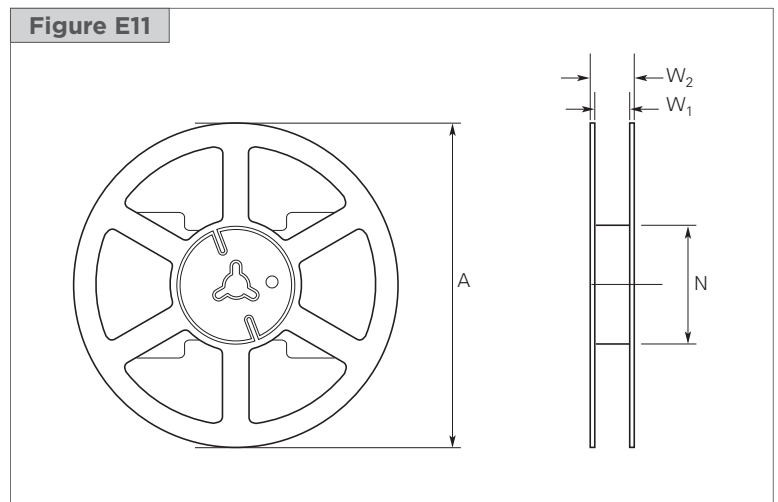


Table E9 – Reel Specifications

| Reel Dimensions (0402, 0603 & 1206Q) | |
|--------------------------------------|----------------|
| EIA Mark | Dimension (mm) |
| A max | 180.0 |
| N min | 60.5 |
| W ₁ max | 9.5 |
| W ₂ max | 14.0 |



PESD Protection Devices

Parameter Definitions

Operation Voltage (V_{DC})

Defined as DC voltage, under which device is in OFF state and leakage current below certain threshold.

Leakage Current (I_L)

Current through device under Operation Voltage V_{DC} .

Trigger Voltage (V_T)

Voltage at which the device switches from the OFF to the ON state, during the IEC waveform or the TLP system.

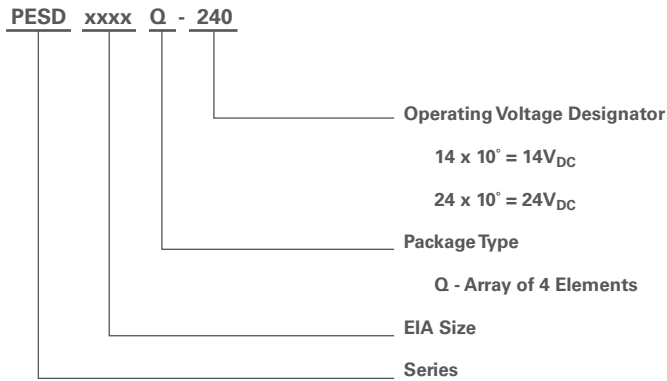
Clamping Voltage (V_C)

Voltage across device under 8kV per IEC or measured by TLP system. Typically measured 30ns after initiation of the ESD pulse (for TLP, both 30ns and 60ns are sometimes used).

Capacitance (C_P)

Capacitance of the device measured at 1MHz with 0V and max operating voltage bias.

Part Numbering System



Warning :

Application Limitations for PESD0402-140, PESD0402-240, PESD0603-240 and PESD1206Q-240: These parts are not intended to be used on power lines or for power bus applications. Users should independently evaluate the suitability of and test each product selected for their own application.

Notice:

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse.