



ESD Protection Devices

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

ESD 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 transient voltage suppression (TVS) diodes and miniature gas discharge tubes (GDTs), ESD 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 ESD 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 applications (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
- Halogen free (refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm)
- 0.25 pF (typical) 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 TV
- 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

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Table E1 Electrical Characteristics for ESD Devices

	Continuous Max Operating Voltage	Typical Trigger Voltage*	Typical Clamping Voltage†	Typical Capacitance @1 MHz, 1V _{RMS}	Typical 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
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 for ESD Devices

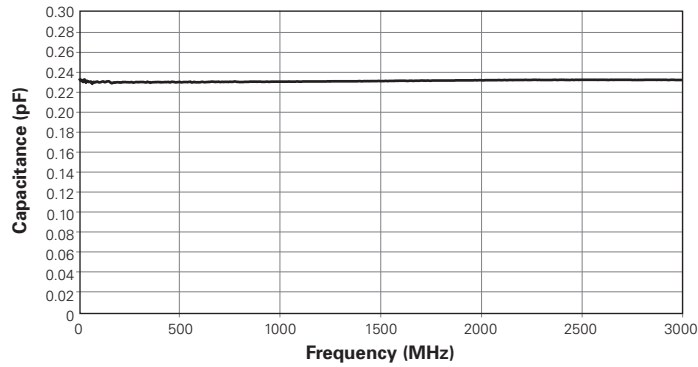


Figure E2 Eye Diagram Performance at 3.4 GHz for ESD Devices

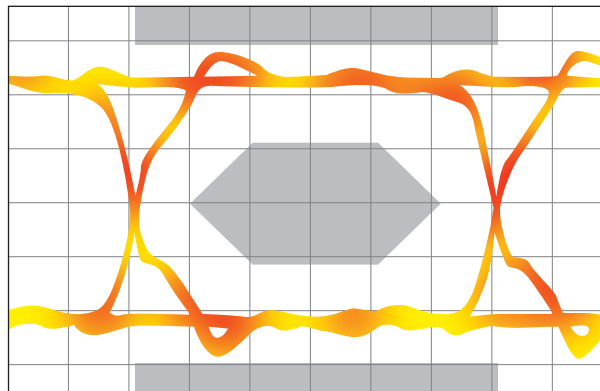


Figure E3 Insertion Loss Diagram for ESD Devices

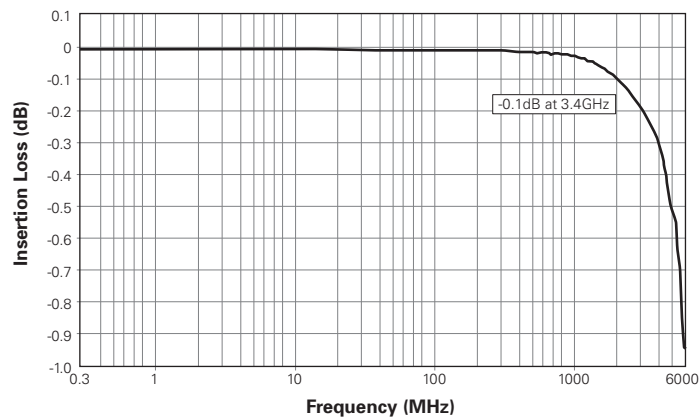
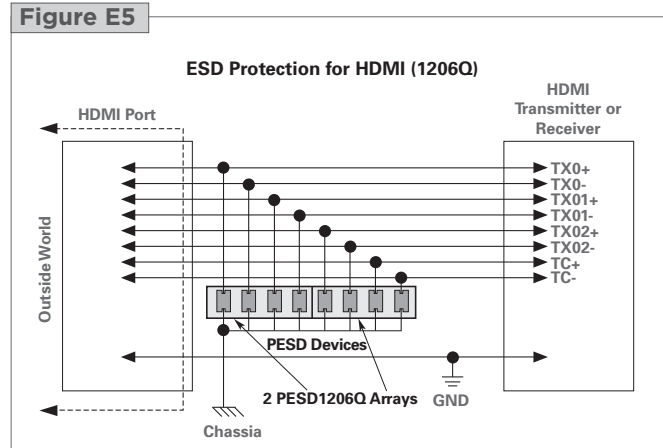
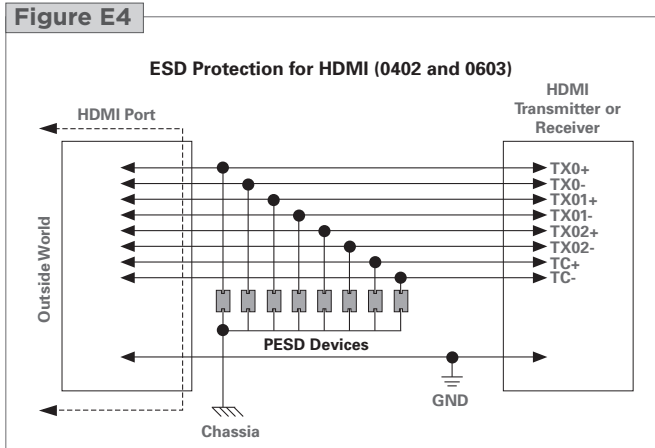
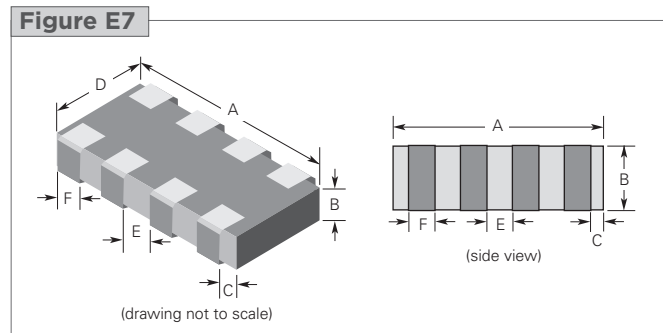
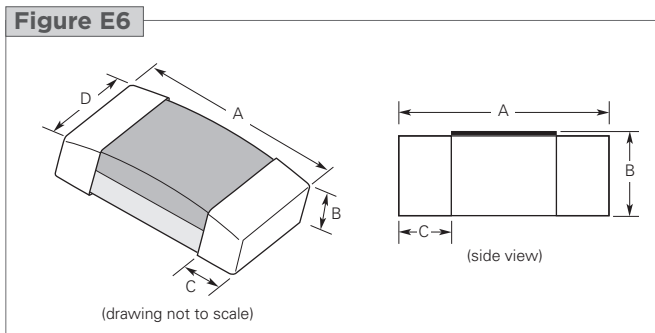


Figure E4-E5 ESD Protection for HDMI

Table E2 Dimensions for ESD Devices 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 (0.035)	1.10 (0.043)	0.23 (0.009)	0.43 (0.017)	0.10 (0.004)	0.30 (0.012)	0.40 (0.016)	0.60 (0.024)	—	—	—	—	E6
PESD0603-240	1.50 (0.059)	1.70 (0.067)	0.45 (0.018)	0.55 (0.022)	0.10 (0.004)	0.50 (0.020)	0.70 (0.028)	1.00 (0.039)	—	—	—	—	E6
PESD1206Q-240	3.10 (0.122)	3.30 (0.130)	0.40 (0.016)	0.60 (0.024)	0.10 (0.004)	0.30 (0.012)	1.50 (0.059)	1.70 (0.067)	0.20 (0.008)	0.60 (0.024)	0.20 (0.008)	0.60 (0.024)	E7

*The dimensions in inches are rounded approximations.

Figure E6-E7 Dimension Figures for ESD Devices

Table E3 Environmental Specifications for ESD Devices

	Test Conditions	Pass / Fail Criteria
Bias humidity test	85°C, 85% RH, $V_{DC(max)}$, 1000 hrs	$I_L \leq 10 \mu A$
Thermal shock	-55°C to 125°C, 30 min dwell, 1000 cycles	$I_L \leq 10 \mu A$
Bias heat test	125°C, $V_{DC(max)}$, 1000 hrs	$I_L \leq 10 \mu A$
Bias low temp test	-55°C, $V_{DC(max)}$, 1000 hrs	$I_L \leq 10 \mu A$
Solderability	250°C ± 5°C, 3 ± 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

Table E4 General Characteristics for ESD Devices

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 (typical), 15kV (max) Air discharge mode : 15kV (typical), 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 for ESD Devices

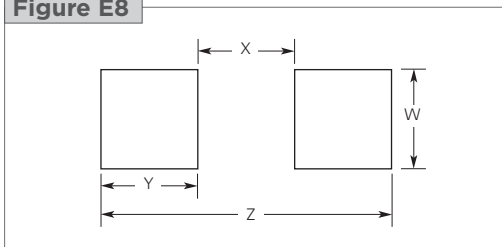
RoHS compliant	Directive 2002/95/EC compliant
ELV compliant	Directive 2000/53/EC compliant
Halogen free	Halogen free refers to: Br≤900ppm, Cl≤900ppm, Br+Cl≤1500ppm

Table E6 Recommended Pad Layout for ESD Devices in Millimeters (Inches)*

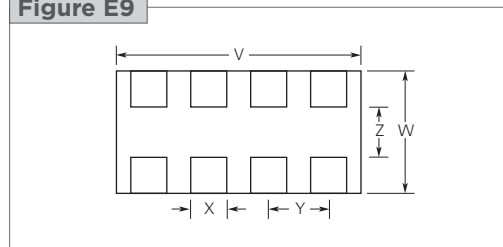
Part Number	V		W		X		Y		Z		Figure
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
PESD0402-140	—	—	0.60 (0.024)	0.70 (0.028)	0.30 (0.012)	0.40 (0.016)	0.80 (0.031)	0.90 (0.035)	2.10 (0.083)	2.20 (0.087)	E8
PESD0603-240	—	—	0.90 (0.035)	1.00 (0.039)	0.50 (0.020)	0.60 (0.024)	1.00 (0.039)	1.10 (0.043)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

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

*The dimensions in inches are rounded approximations.

Figure E8


Note: Solder thickness 0.15 to 0.2 mm

Figure E9

Table E7 Solder Reflow Recommendations for ESD Devices

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 at 220°C at 240°C at 260°C	60s to 70s 50s to 60s 30s to 40s 5s to 10s
E	Cooling	From main heating temperature to 100°C	4°C/s max

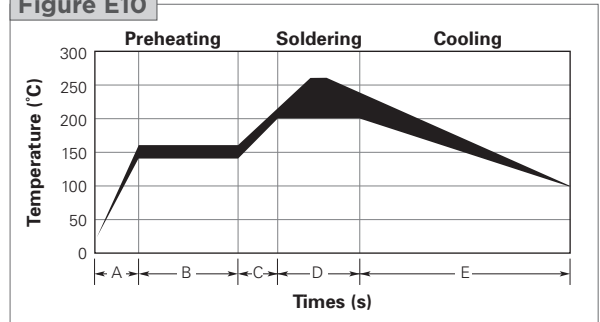
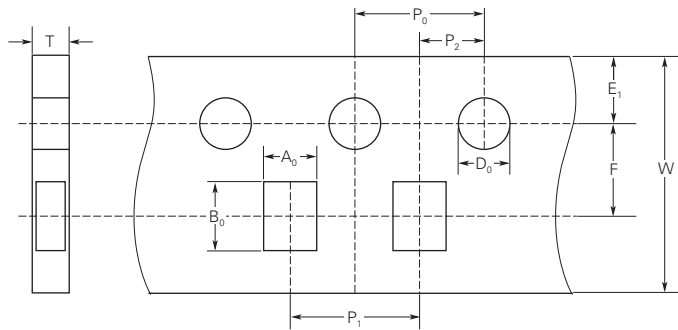
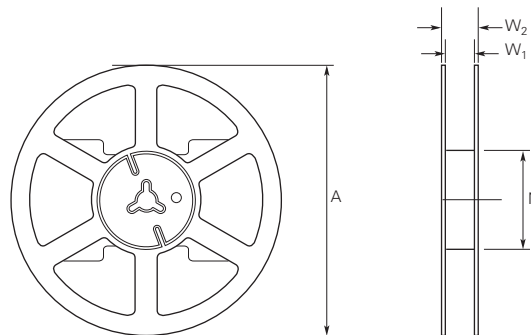
Figure E10


Table E8 Tape and Reel Specifications for ESD Devices

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	0.69	±0.05	1.27	±0.15	2.02	±0.20
B ₀	1.19	±0.05	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	±0.03

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

Figure E11 EIA Referenced Taped Component Dimensions for ESD Devices

Figure E12 EIA Referenced Reel Dimensions for ESD Devices


Parameter Definitions for ESD Devices

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.

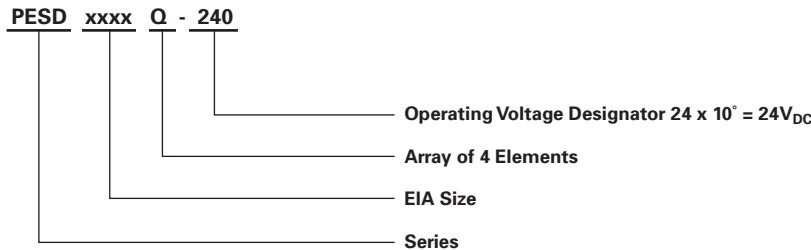
Clamping Voltage (V_C)

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

Capacitance (C_P)

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

Part Numbering System for ESD Devices



Warning :

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

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