

1 Channel Ultra-low Capacitance ESD Protection

Description

PESD12V0402M polymeric ESD suppressor help protect sensitive electronic equipment against electrostatic discharge (ESD) without distorting data signals. This protection is a result of its ultra-low capacitance of only 0.05pF (I/O to GND), and it can be used to help equipment to pass IEC61000-4-2 level 4 test (15kV air, 15kV contact discharge).

Features

- Ultra-Low capacitance:0.05pF(typ.)
- Low leakage current(<100nA)
- Fast reponse time (<1ns)
- Bi-directional,singe line protectio
- IEC 61000-4-2 (ESD Air):15kv
- IEC 61000-4-2 (ESD Contact):15kv

Applications

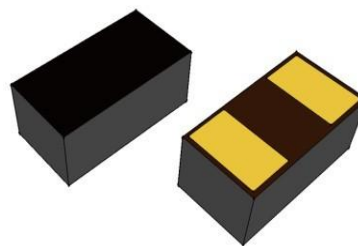
- USB 3.0/3.1
- HDMI 1.3/1.4/2.0
- RF Antenna
- SATA and Esata Interface

Caution: This component is designed for signal line protection only, not intended to be used on power lines or for power bus applications.

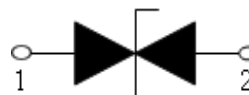
General Characteristics

Parameter	Symbol	Value	Unit
Contact Discharge Voltage Per IEC61000-4-2	V_{ESD}	15	kV
Air Discharge Voltage Per IEC61000-4-2	V_{ESD}	15	kV
Operating Temperature Range	T_A	-40 ~ +90	℃
Storage Temperature Range	T_{STG}	-55 ~ +125	℃

Dimensions and Pin Configuration



Package Outline:0402



Circuit and Pin Schematic

Ordering Information

Part Number	Shipping	Reel Size
PESD12V0402M	10000/Tape & Reel	7 inch

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

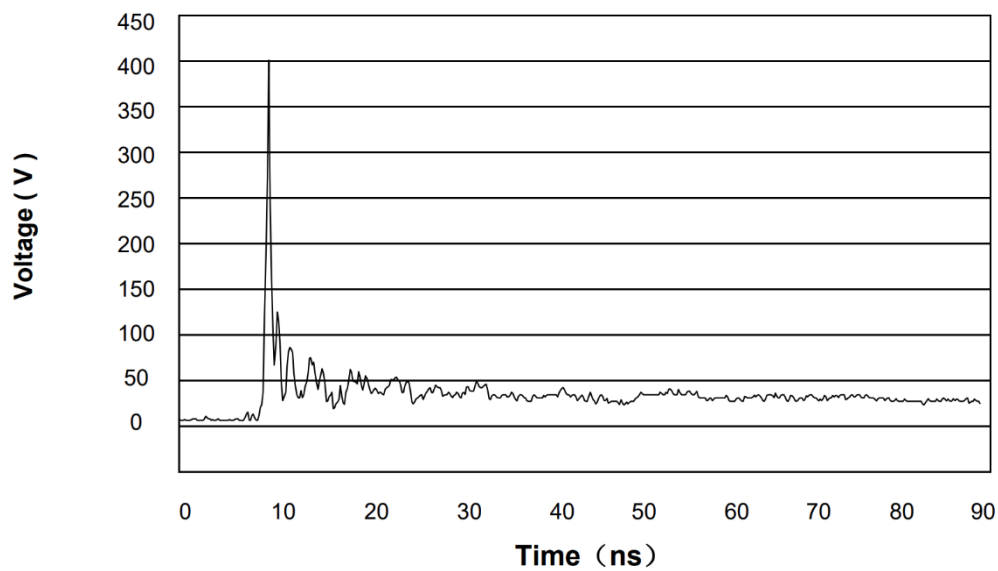
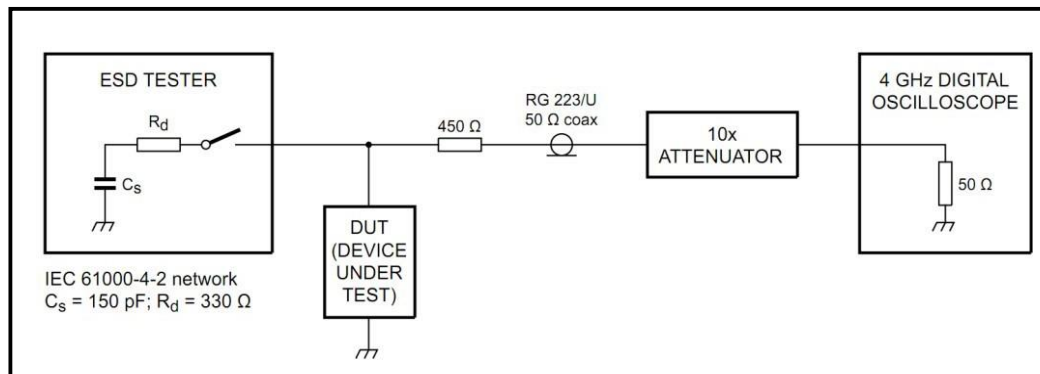
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Continuous Operating Voltage	V_{DC}			12	V	
Trigger Voltage	V_T		450		V	IEC61000-4-2 8KV contact discharge
Clamping Voltage	V_C		40		V	IEC61000-4-2 8KV contact discharge
Leakage Current	I_L			100	nA	DC 12V shall be applied on component
Junction Capacitance	C_P		0.05		pF	$V_R=0V$, $f=1\text{MHz}$

Notes: Trigger and clamping voltage are measured per IEC 61000-4-2, 8KV contact discharge method.

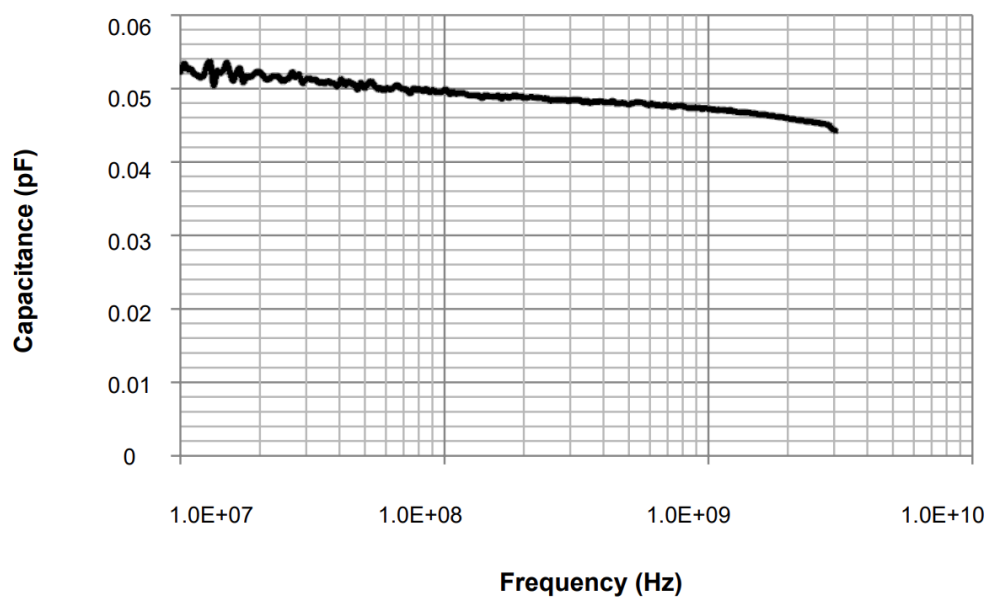
Environmental Specifications

	Solder Heat	Solder ability	Preconditioning	Thermal Shock	Bias Humidity Test
Test Conditions	1. 150°C , 4H; 2. 260°C , 10s, 1 Times	245°C , 5s	1. 125°C , 24H; 2. 85°C , 85%RH, 162H; 3. 260°C Reflow, 3 Times	-55°C — 125°C , 30min dwell, 1000 cycles	85°C , 85%RH, VDC, 1000H
Pass/Fail Criteria	90% Coverage	95% Coverage	$I_L \leq 100\text{nA}$	$I_L \leq 100\text{nA}$	$I_L \leq 100\text{nA}$
	Bias Heat Test	Bias Low Temp Test	Vibration	Mechanical Shock	Solvent Resistance
Test Conditions	125°C , VDC, 1000H	-55°C , VDC, 1000H	10Hz-50Hz-10HZ, 2hrs each in X-Y-Z axis	1500G, 0.5ms, X-Y-Z axis 3 times	I_{PA} , ultrasonic 300s
Pass/Fail Criteria	$I_L \leq 100\text{nA}$	$I_L \leq 100\text{nA}$	No Physical Damage $I_L \leq 100\text{nA}$	No Physical Damage $I_L \leq 100\text{nA}$	No Physical Damage $I_L \leq 100\text{nA}$

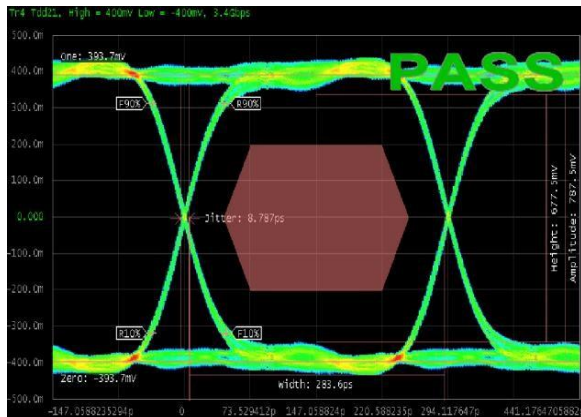
Typical ESD Response (IEC 61000-4-2, 8kV contact discharge)



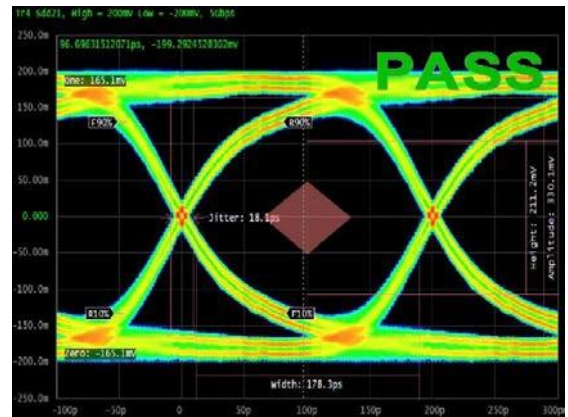
Typical Device Capacitance VS. Frequency



Eye Diagram Measurement



HDMI 1.4 Mask at 3.4 Gbps



USB 3.0 Mask at 5.0 Gbps

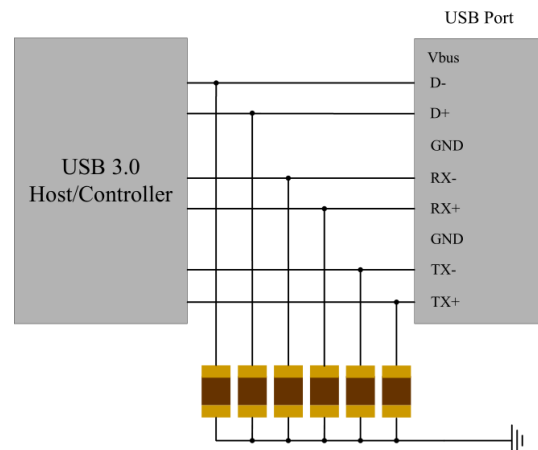
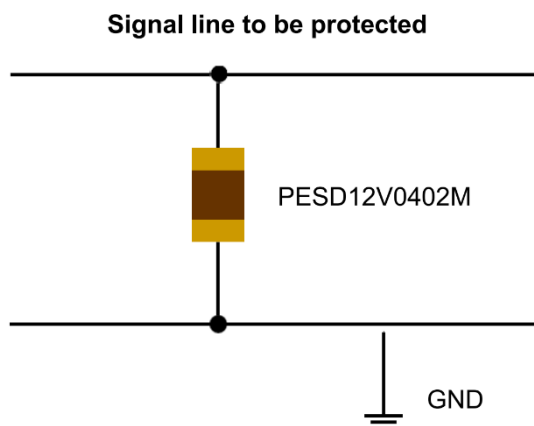


HDMI 2.0 Mask at 6.0 Gbps

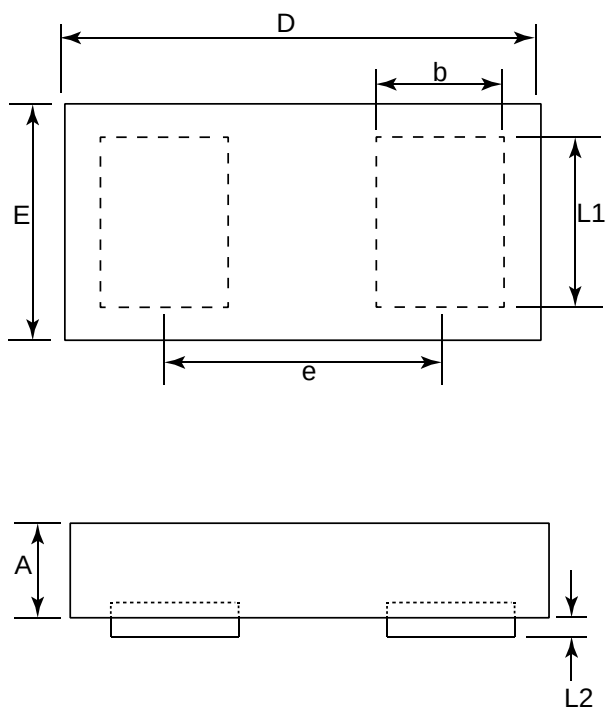
ESD Protection for Signal Line

The PESD12V0402M is designed for the protection of one bidirectional data line from ESD damage.

- Place the PESD12V0402M as close to the input terminal or connector as possible.
- Minimize the path length between the PESD12V0402M and the protected signal line.
- Use ground planes whenever possible.

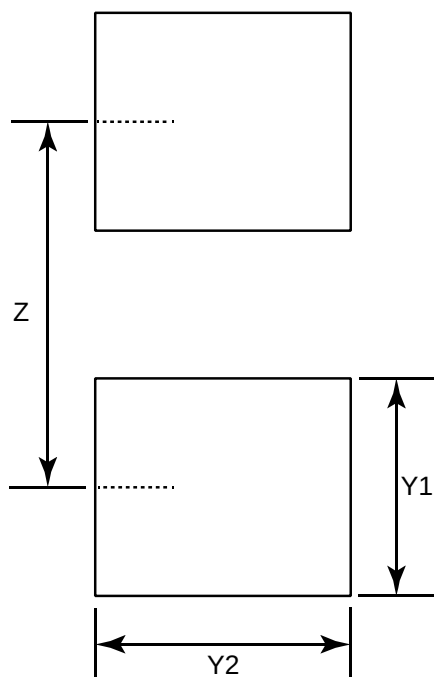


0402 Package Outline Drawing



SYM	DIMENSIONS			
	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.25	0.45	0.010	0.018
b	0.20	0.40	0.008	0.016
D	0.90	1.10	0.035	0.043
e	0.65 BSC		0.026 BSC	
E	0.40	0.60	0.016	0.024
L1	0.30	0.50	0.012	0.020
L2	0.00	0.05	0.00	0.002

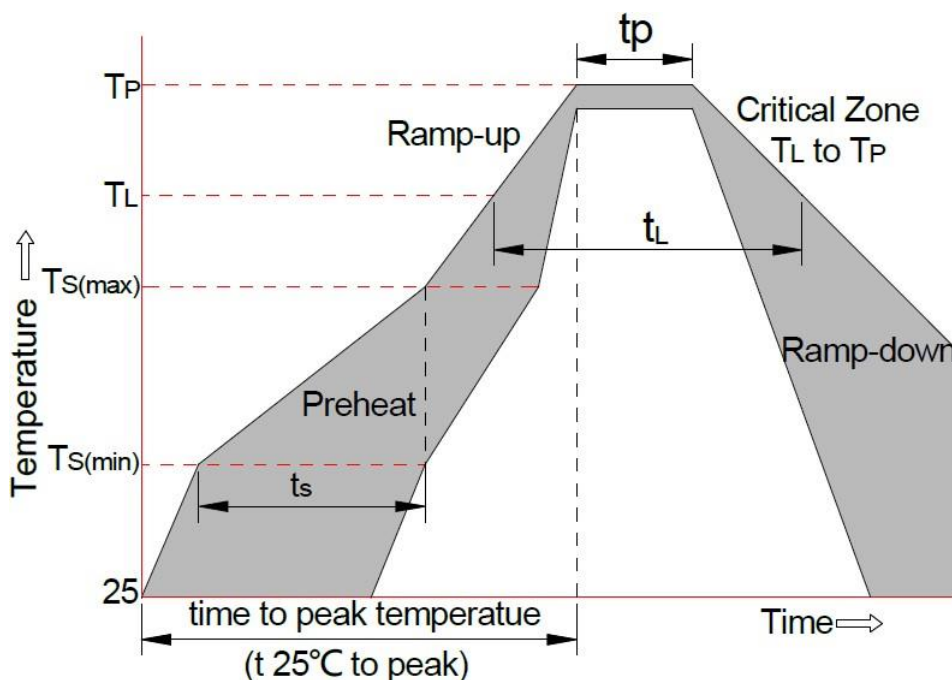
Suggested Land Pattern



SYM	DIMENSIONS	
	MILLIMETERS	INCHES
Y1	0.50	0.020
Y2	0.60	0.024
Z	0.70	0.028

Notes: This solder pad layout is for reference purposes only.

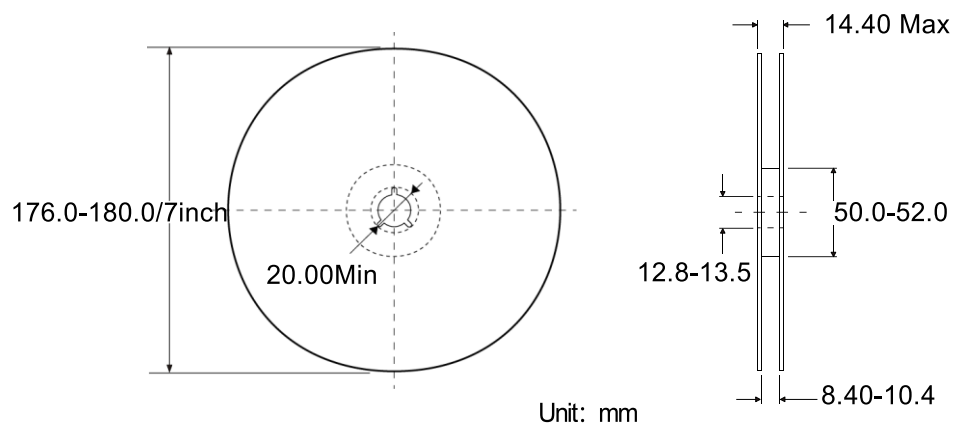
Soldering Parameters



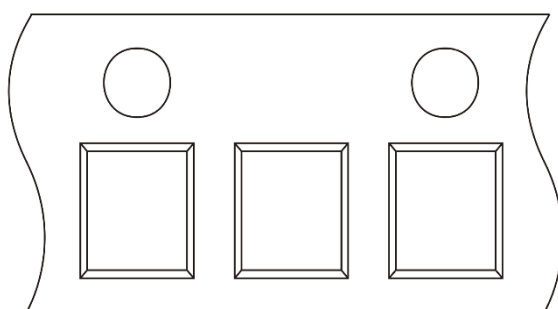
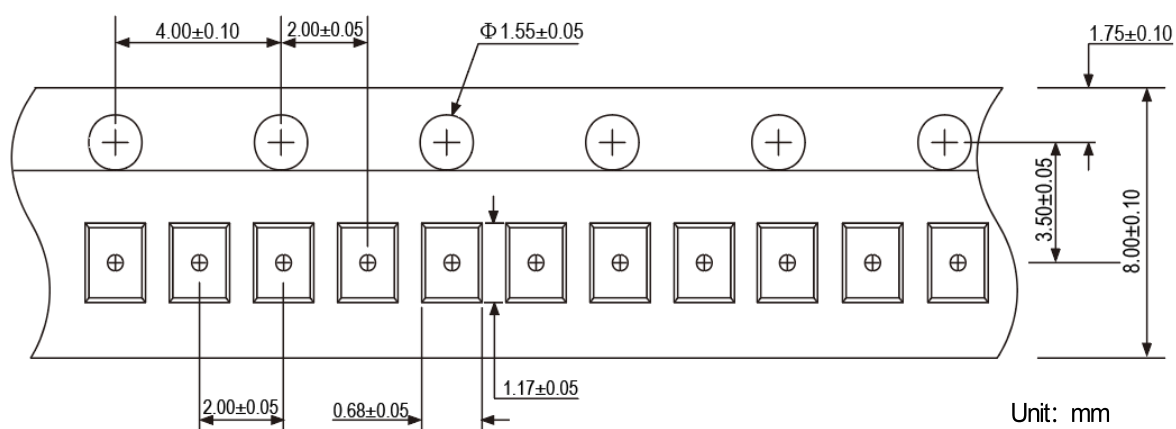
Reflow Condition		Pb-Free Assembly
Pre-heat	-Temperature Min ($T_{S(min)}$)	+150°C
	-Temperature Max($T_{S(max)}$)	+200°C
	-Time (Min to Max) (t_s)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{S(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid 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
xTime 25°C to Peak Temp (T_P)		8 min. Max
Do not exceed		+260°C

TAPE AND REEL INFORMATION

Reel Dimensions



Tape Dimensions



User Direction of Feed

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