

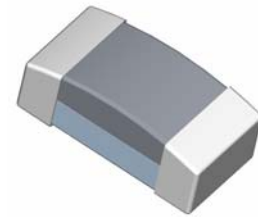
## Specification Status: Released

### BENEFITS

- ESD protection for high frequency application (Example: HDMI 1.3 interface)
- Low leakage current
- Board space savings
- Help to protect sensitive electronic circuits against damage from electrostatic discharge (ESD) events
- Assist equipment to pass IEC 61000-4-2, level 4 testing

### FEATURES

- Capacitance 0.20 pF typical
- 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 devices (PDA, DSC, BlueTooth..., Video Player)
- 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.

### MATERIALS INFORMATION

ROHS Compliant

ELV Compliant

Directive 2002/95/EC  
Compliant

Directive 2000/53/EC  
Compliant

### PART NUMBERING

Series **PESD0603- 240**  
EIA Size **240**  
Operating Voltage Designator  
 $24 \times 10^0 = 24V_{DC}$

## ESD Protector Overvoltage Protection Device

**Circuit Protection Products**

**PRODUCT: PESD0603-240**

DOCUMENT: SCD 27256  
REV LETTER: A  
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### TYPICAL DEVICE RATINGS AND CHARACTERISTICS

|        | Max Operating Voltage | Typical TLP Trigger Voltage <sup>1</sup> | Typical TLP Clamping Voltage <sup>1</sup> after 30ns | Typical Capacitance <sup>2</sup> @ 1 MHz, 1V <sub>rms</sub> | Typical Leakage Current <sup>3</sup> @24V <sub>DC</sub> | Typical Leakage Current <sup>3</sup> @24V <sub>DC</sub> |
|--------|-----------------------|--|--|---|---|---|
| Symbol | V <sub>DC</sub>       | V <sub>T(TLP)</sub>                      | V <sub>C(TLP 30)</sub>                               | C <sub>p</sub>  | I <sub>L(Typ)</sub>                                     | I <sub>L(MAX)</sub>                                     |
| Unit   | V                     | V  | V  | pF  | μA  | μA  |
| Value  | 24                    | 215                                      | 45   | 0.20  | <0.001  | 0.01  |

Note 1: TLP test method at 1000V (refer to graph on next page)  
Note 2: Typical capacitance @ 0V and 24V  
Note 3: Measured with 1s, 24VDC pulse

### GENERAL CHARACTERISTICS

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

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

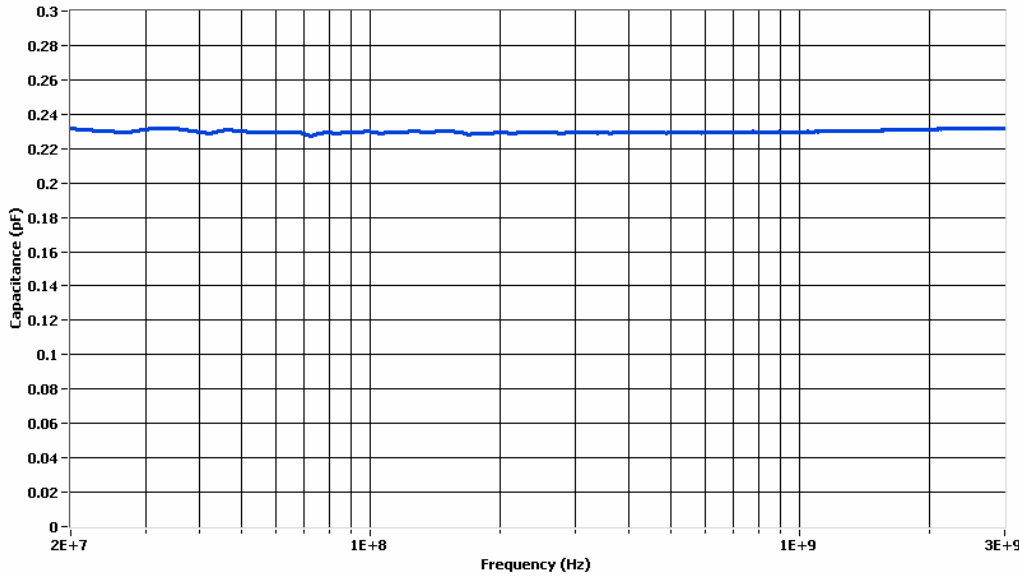
- Contact discharge mode: typical 8kV, max 15kV
- Air discharge mode: typical 15kV, max 25kV

ESD pulse withstand: Typically 500 pulses (tested per IEC 61000-4-2, level 4, and contact method)

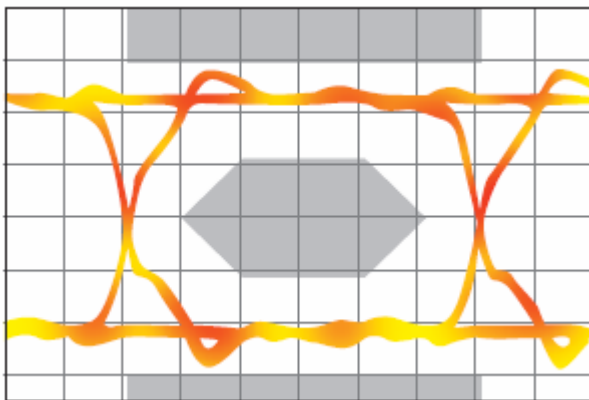
### Environmental Specifications

|                    | Bias Humidity Test                     | Thermal Shock                                | Bias Heat Test                 | Bias Low Temp Test             | Solderability      | Solder Heat          | Vibration                                     | Mechanical Shock                  | Solvent Resistance   |
|--------------------|--|--|--------------------------------|--------------------------------|--------------------|----------------------|---|-----------------------------------|----------------------|
| Test Conditions    | 85°C<br>85%RH<br>Max Vdc<br>1000 hours | -55°C to 125°C<br>30min dwell<br>1000 cycles | 125°C<br>Max Vdc<br>1000 hours | -55°C<br>Max Vdc<br>1000 hours | 230°C±5°C<br>3±1s, | 260°C,<br>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 <sub>L</sub> ≤10μA                   | I <sub>L</sub> ≤10μA                         | I <sub>L</sub> ≤10μA           | I <sub>L</sub> ≤10μA           | 95% coverage       | I <sub>L</sub> ≤10μA | I <sub>L</sub> ≤10μA                          | I <sub>L</sub> ≤10μA              | I <sub>L</sub> ≤10μA |

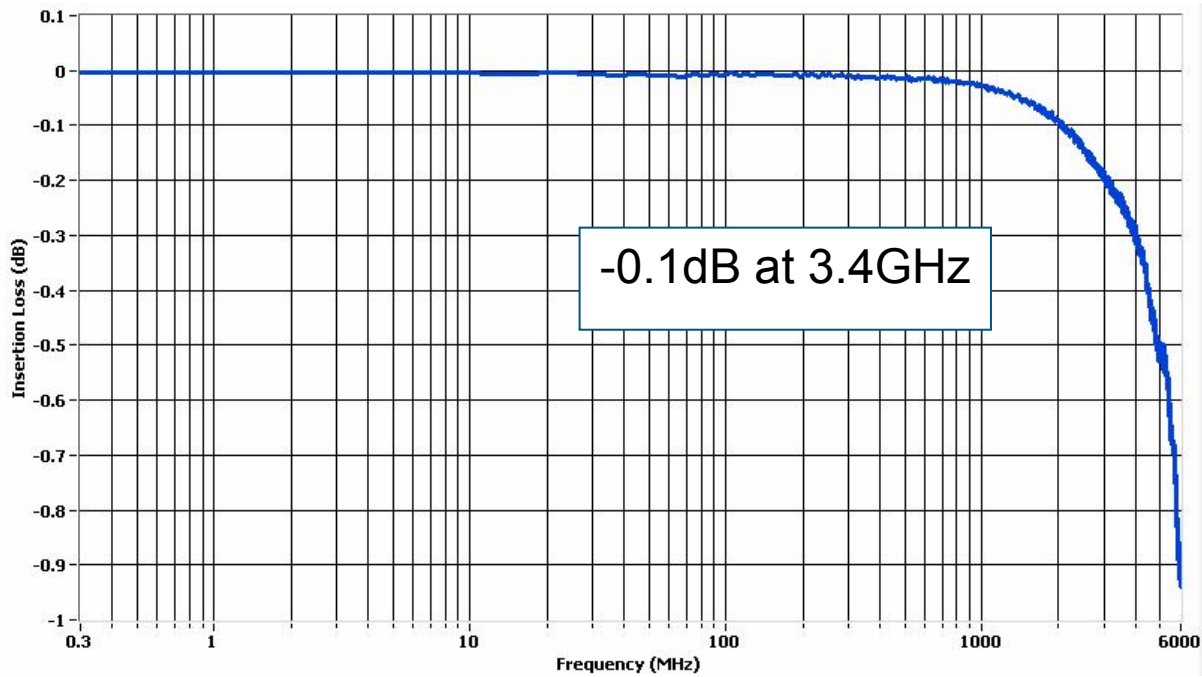
**FIG 1: CAPACITANCE VS. FREQUENCY (TYPICAL SAMPLE)** (PESD0603 Flat Response of Capacitance over Frequency Range)



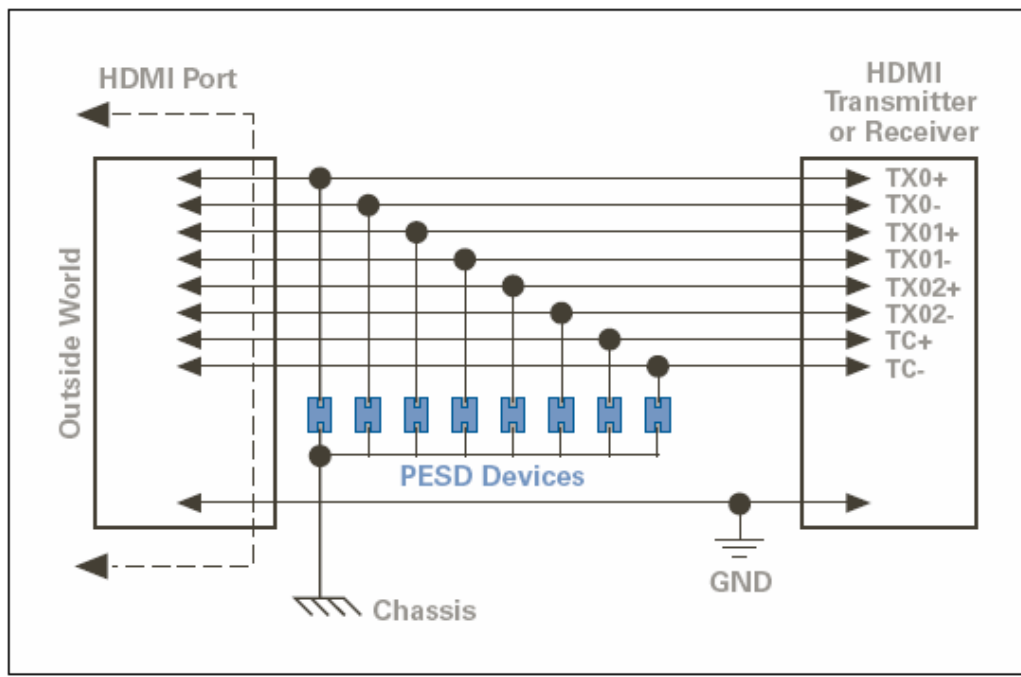
**FIG 2: EYE DIAGRAM (TYPICAL SAMPLE)** (PESD0603 Eye Diagram Performance at 3.4 GHz— meets criteria for HDMI 1.3)



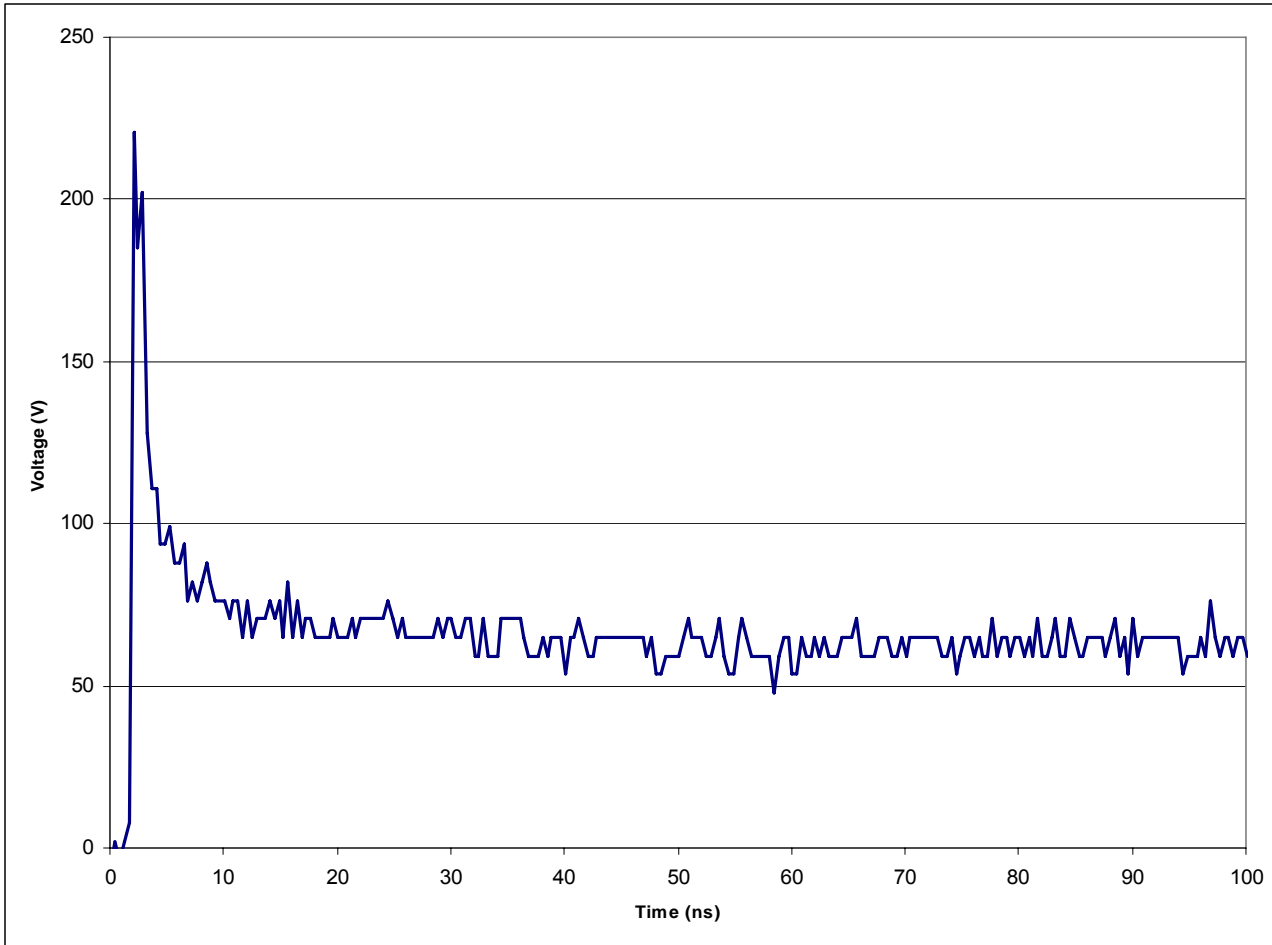
**FIG 3: INSERTION LOSS DIAGRAM (TYPICAL SAMPLE)** (PESD0603 Minimal Insertion Loss at 3.4 GHz)



**FIG 4: ESD PROTECTION FOR HDMI** (PESD0603 Reference Layout and Test Results available)



**FIG 5: TYPICAL TRANSMISSION LINE PULSE RESPONSE GRAPH**



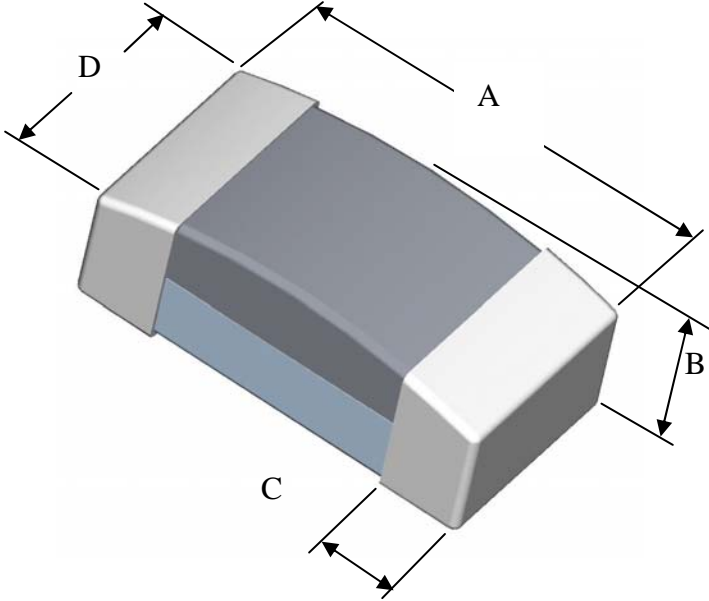
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### DIMENSIONS



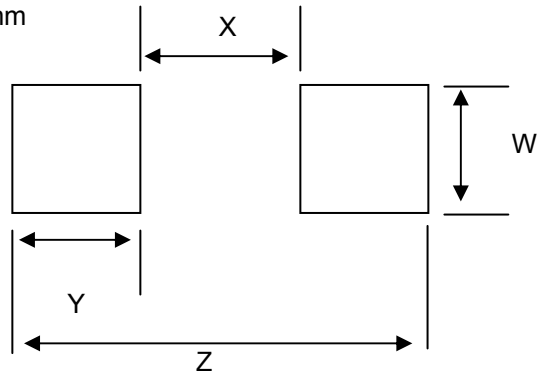
Drawing Not To Scale

|      | Length A |         | Height B |         | Terminal Width C |        | Width D |         |
|------|----------|---------|----------|---------|------------------|--------|---------|---------|
|      | MIN      | MAX     | MIN      | MAX     | MIN              | MAX    | MIN     | MAX     |
| mm:  | 1.4      | 1.8     | 0.4      | 0.6     | 0.1              | 0.5    | 0.6     | 0.9     |
| in*: | (0.055)  | (0.071) | (0.016)  | (0.024) | (0.004)          | (0.02) | (0.024) | (0.035) |

\*Rounded off approximation

### RECOMMENDED LAND PATTERN:

Solder thickness 0.15 to 0.2mm



|       | W       |         | X       |         | Y (Ref) |         | Z       |         |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|
|       | Min     | Max     | Min     | Max     | Min     | Max     | Min     | Max     |
| mm:   | 0.9     | 1.0     | 0.5     | 0.6     | 1.0     | 1.1     | 2.7     | 2.8     |
| in: * | (0.035) | (0.039) | (0.020) | (0.024) | (0.039) | (0.043) | (0.106) | (0.110) |

\*Rounded off approximation.

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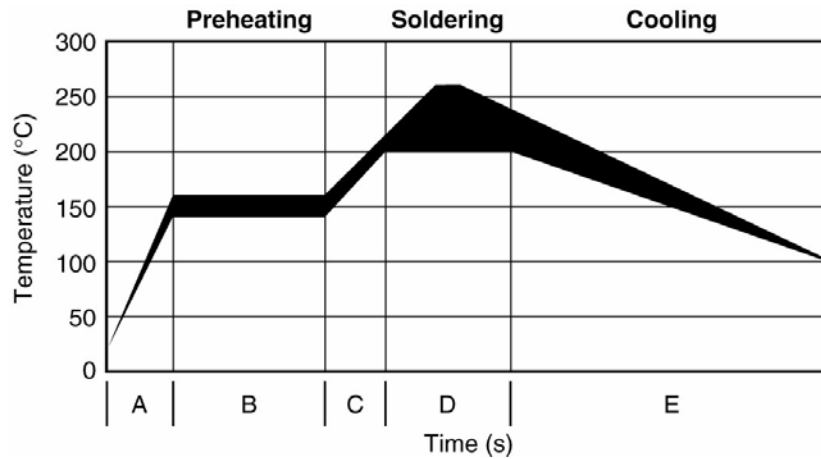
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### SOLDER REFLOW RECOMMENDATIONS:

|   |                       |  |   |
|---|-----------------------|--|---|
| 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       | max 4°C/s                                       |



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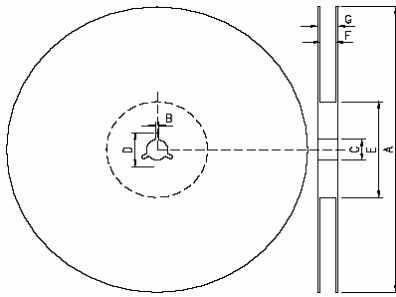
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### PACKAGING

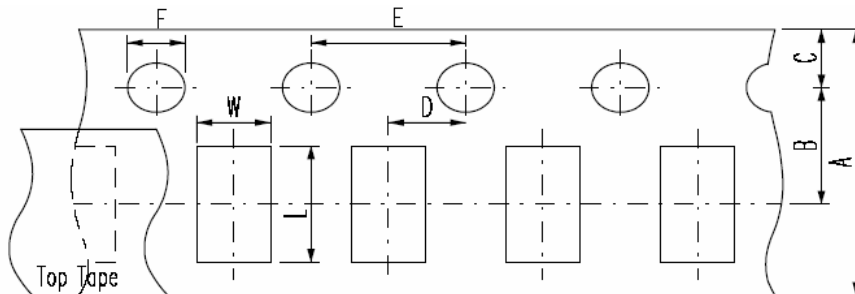
| Packaging    | Tape & Reel | Standard Box |
|--------------|-------------|--------------|
| PESD0603-240 | 5,000       | 25,000       |

#### EIA referenced Reel Dimensions for PESD Devices



#### Reel Dimensions (mm):

|                     | A          | B        | C         | D         | E         | F        | G         |
|---------------------|------------|----------|-----------|-----------|-----------|----------|-----------|
| <b>0603 Devices</b> | 178.0 ±2.0 | 2.0 ±0.5 | 13.0 ±0.5 | 21.0 ±0.8 | 62.0 ±1.5 | 9.0 ±0.5 | 13.0 ±1.0 |



#### Carrier Dimensions (mm):

|                     | A        | B         | C         | D         | E        | F        | L        | W         | T          |
|---------------------|----------|-----------|-----------|-----------|----------|----------|----------|-----------|------------|
| <b>0603 Devices</b> | 8.0 ±0.3 | 3.5 ±0.05 | 1.75 ±0.1 | 2.0 ±0.05 | 4.0 ±0.1 | 1.5 ±0.1 | 1.9 ±0.2 | 1.1 ±0.20 | 0.60 ±0.05 |

**Product Orientation** – always face up (meaning the substrate is at the bottom), but parts do not have polarity mark.

**Leader & Trailer:** The leader is 180mm in length & consists of empty cavities with sealed cover tape. The trailer is 350mm in length & consists of empty cavities with sealed cover tape.



## POST REFLOW, CLEANING CONDITIONS

A 5% saponifier combined with water during wash.

For Ultrasonic process water temperature should be at 50°C and board should be submerged for a minimum of one minute in the solutions, then rinse and dry.

For in-line washing, the temperature of the water sprayed should be at 110°C, rinse and drying is done in-line.



### **WARNING**

**Warning: Application Limitations for PESD0603-240. This part is 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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