

## 1 Channel Ultra-low Capacitance ESD Protection

### Description

PESD30V0201M 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

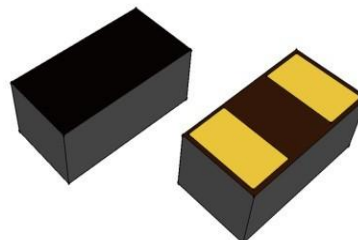
- USB 3.0/3.1
- HDMI 1.3/1.4/2.0
- RF Antenna
- SATA and Esata Interface applications.

**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   |
| Lead temperature                           | $T_L$     | 260        | °C   |
| Operating Temperature Range                | $T_{OP}$  | -40 ~ +90  | °C   |
| Storage Temperature Range                  | $T_{STG}$ | -55 ~ +125 | °C   |

### Dimensions and Pin Configuration



Package Outline:0201



Circuit and Pin Schematic

### Ordering Information

| Part Number  | Shipping          | Reel Size |
|--------------|-------------------|-----------|
| PESD30V0201M | 15000/Tape & Reel | 7 inch    |

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

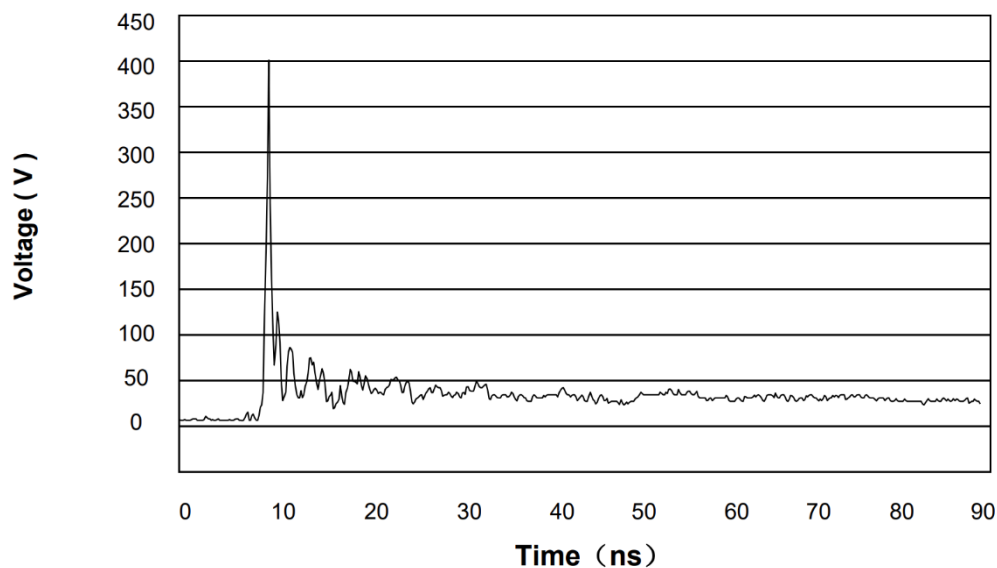
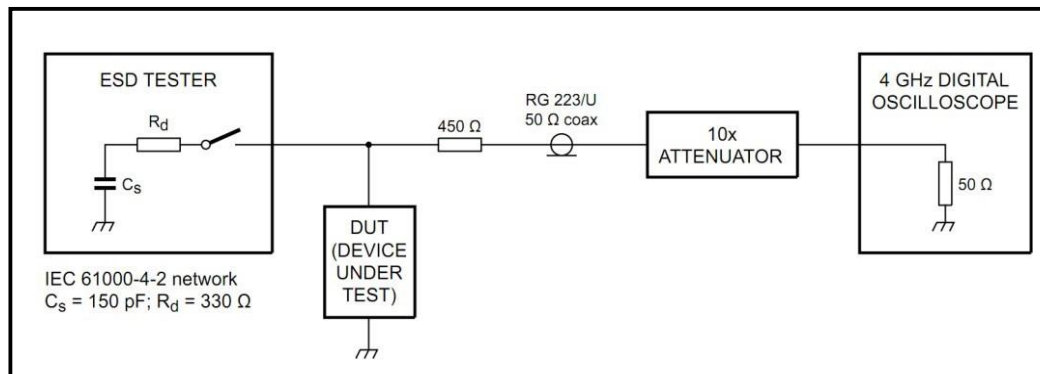
| Parameter                    | Symbol   | Min. | Typ. | Max. | Unit | Test Condition                       |
|------------------------------|----------|------|------|------|------|--------------------------------------|
| Continuous Operating Voltage | $V_{DC}$ |      |      | 30   | V    |                                      |
| 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 30V 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.

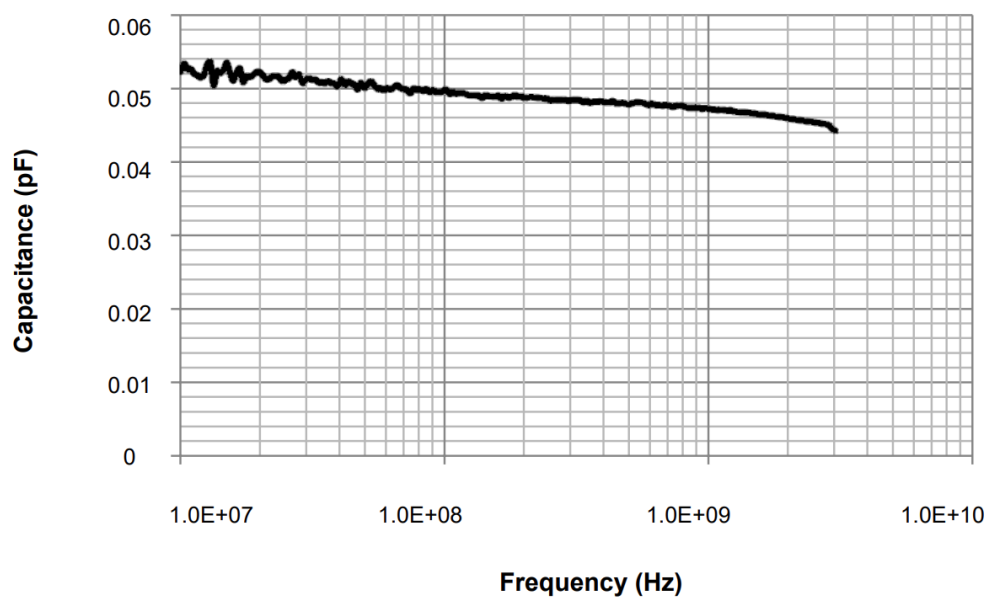
**Environmental Specifications**

|                           | Solder Heat                                                               | Solder ability                     | Preconditioning                                                                                                       | Thermal Shock                                                               | Bias Humidity Test                            |
|---------------------------|---------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------|
| <b>Test Conditions</b>    | 1. $150^{\circ}\text{C}$ , 4H;<br>2. $260^{\circ}\text{C}$ , 10s, 1 Times | $245^{\circ}\text{C}$ , 5s         | 1. $125^{\circ}\text{C}$ , 24H;<br>2. $85^{\circ}\text{C}$ , 85%RH, 162H;<br>3. $260^{\circ}\text{C}$ Reflow, 3 Times | $-55^{\circ}\text{C}$ — $125^{\circ}\text{C}$ ,<br>30min dwell, 1000 cycles | $85^{\circ}\text{C}$ , 85%RH, VDC, 1000H      |
| <b>Pass/Fail Criteria</b> | 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                            |
| <b>Test Conditions</b>    | $125^{\circ}\text{C}$ , VDC, 1000H                                        | $-55^{\circ}\text{C}$ , 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                    |
| <b>Pass/Fail Criteria</b> | $I_L \leq 100\text{nA}$                                                   | $I_L \leq 100\text{nA}$            | No Physical Damage<br>$I_L \leq 100\text{nA}$                                                                         | No Physical Damage<br>$I_L \leq 100\text{nA}$                               | No Physical Damage<br>$I_L \leq 100\text{nA}$ |

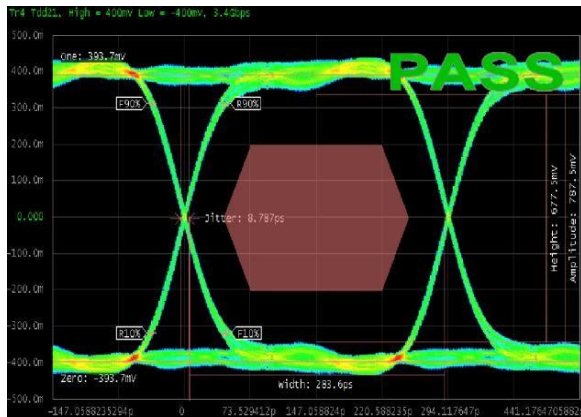
### Typical ESD Response ( IEC 61000-4-2, 8kV contact discharge )



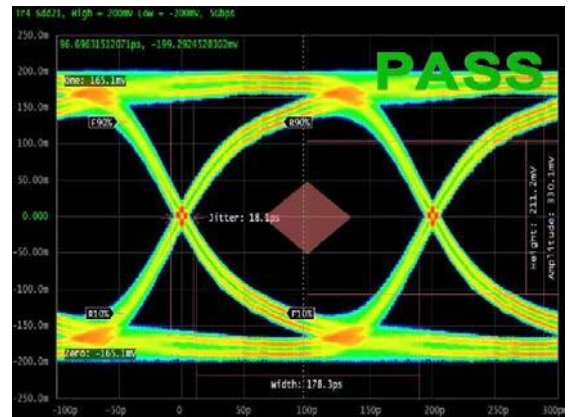
### Typical Device Capacitance VS. Frequency



## Eye Diagram Measurement



HDMI 1.4 Mask at 3.4 Gbps



USB 3.0 Mask at 5.0 Gbps

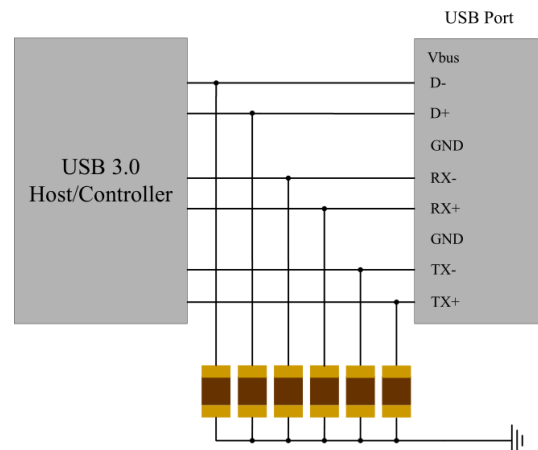
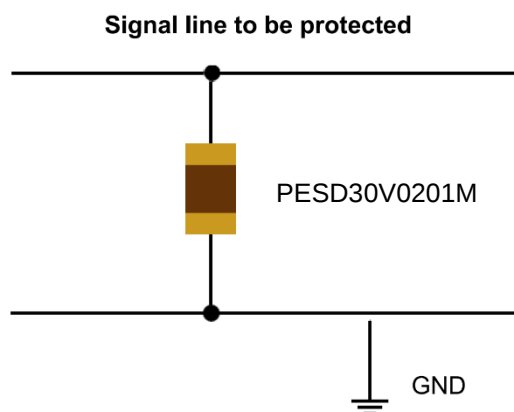


HDMI 2.0 Mask at 6.0 Gbps

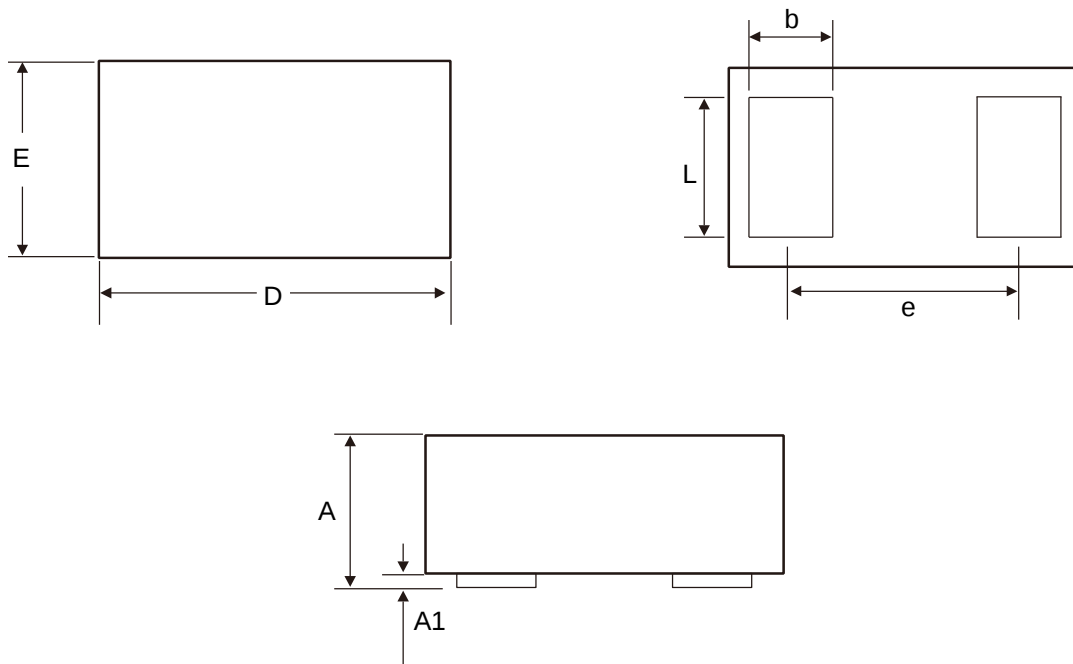
## ESD Protection for Signal Line

The PESD30V0201M is designed for the protection of one bidirectional data line from ESD damage.

- Place the PESD30V0201M as close to the input terminal or connector as possible.
- Minimize the path length between the PESD30V0201M and the protected signal line.
- Use ground planes whenever possible.

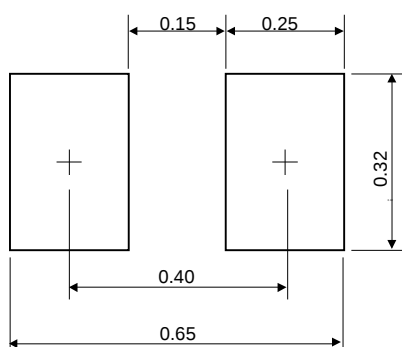


**0201 Package Outline Drawing**



| Symbol | Dimensions in Millimeters |       |       |
|--------|---------------------------|-------|-------|
|        | Min.                      | Typ.  | Max.  |
| A      | 0.250                     | 0.300 | 0.350 |
| A1     | 0.000                     | -     | 0.050 |
| D      | 0.550                     | 0.600 | 0.650 |
| E      | 0.250                     | 0.300 | 0.350 |
| b      | 0.180                     | 0.200 | 0.220 |
| L      | 0.255                     | 0.275 | 0.295 |
| e      | 0.380 BSC                 |       |       |

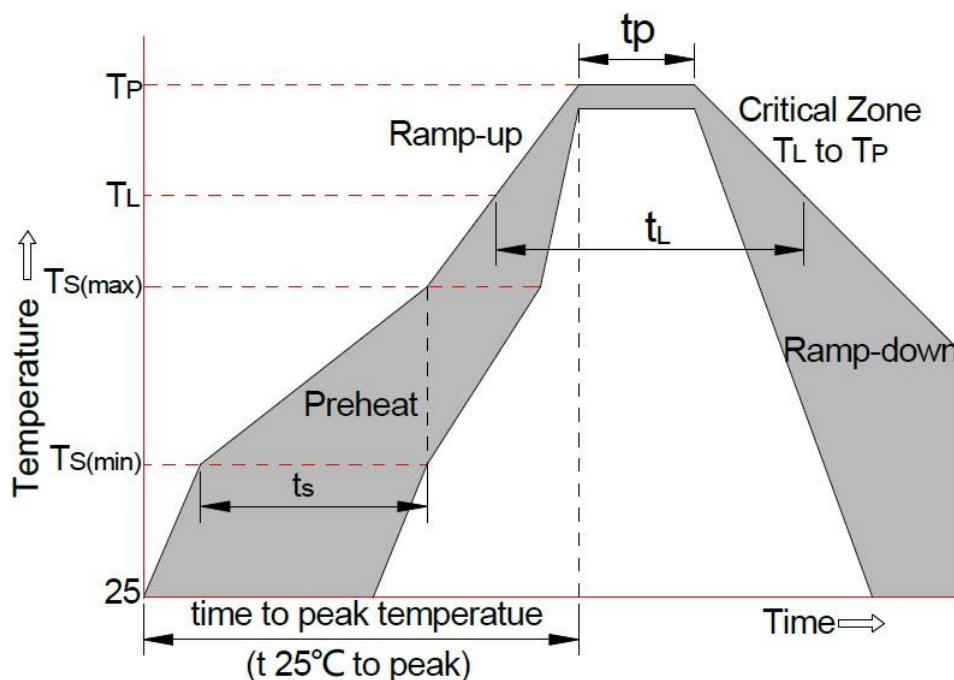
**Recommended PCB Layout (Unit: mm)**



**Notes:**

This recommended land pattern is for reference purposes only. Please consult your manufacturing group to ensure your PCB design guidelines are met.

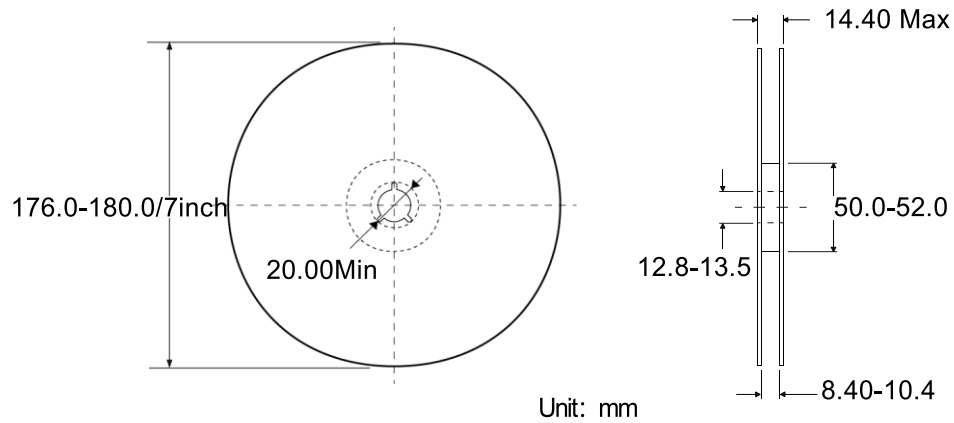
## Soldering Parameters



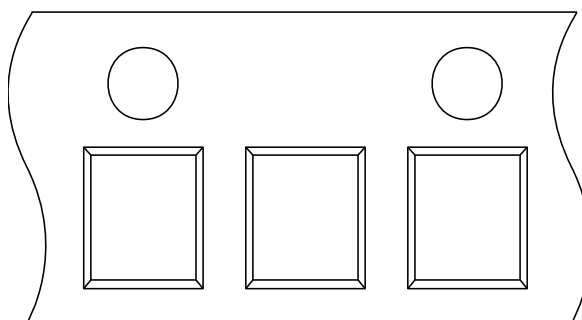
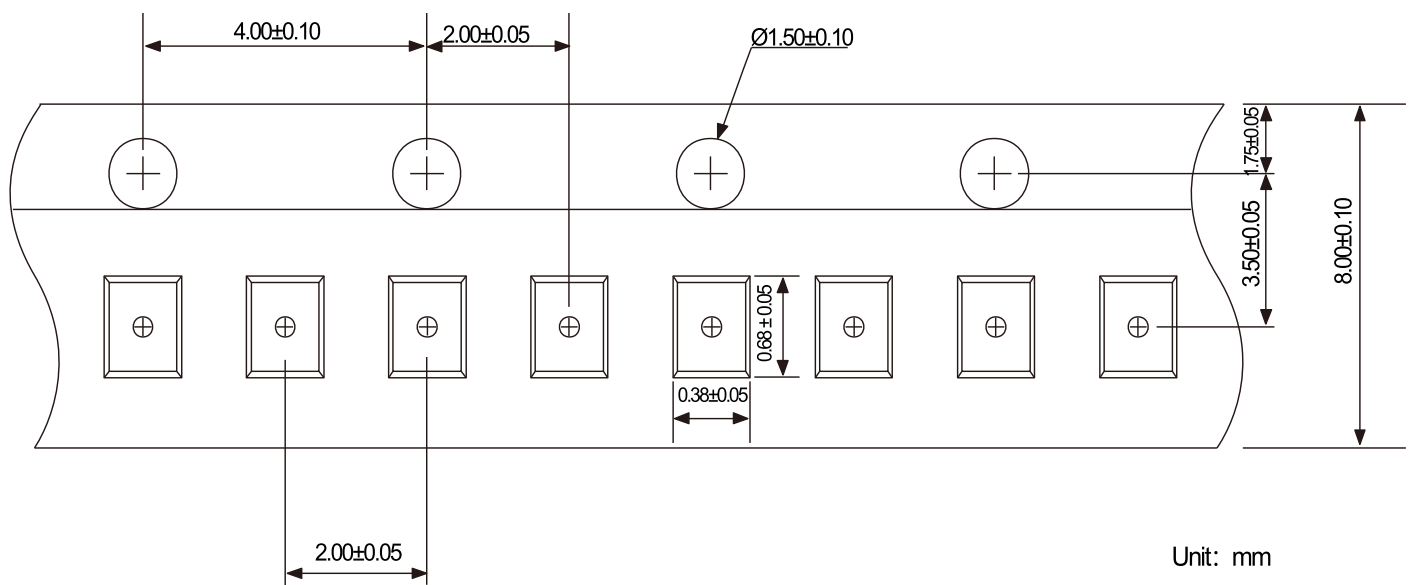
| Reflow Condition                                        |                                   | Pb-Free Assembly |
|---------------------------------------------------------|-----------------------------------|------------------|
| Pre-heat                                                | -Temperature 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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