

**PKCSP0402 Single Line TVS Diode for ESD Protection**

**Description**

TVS diodes are designed to replace multilayer varistors (MLVs) in portable applications such as cell phones, notebook computers, and PDA's. They offer superior electrical characteristics such as lower clamping voltage and no device degradation when compared to MLVs.

The UMD08-0402 is a Uni-Directional TVS that is designed to provide high overvoltage protection by clamping action and have instantaneous response to transient overvoltages. The PKCSP0402 is a very small package which allows space saving on high density printed circuit board and also gives the designer the flexibility to protect one line in applications where arrays are not practical.

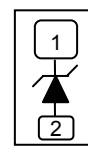
**Features**

- \* Solid-state silicon avalanche technology
- \* PKCSP0402 package
- \* Uni-Directional protection
- \* Protects one I/O or Power line
- \* 150 Watts peak pulse power ( $t_p = 8/20\mu s$ )
- \* Working voltage: 8V
- \* Low clamping factor  $V_{cl}/V_{br}$
- \* Low leakage current
- \* Full RoHS compliance
- \* Complies with the following standards:
  - IEC 61000-4-2 (ESD) Air-15kv, Contact-8kv
  - IEC 61000-4-4 (EFT) (5/50ns)
  - IEC 61000-4-5 (Surge) (8/20 $\mu s$ )

**Small Surface Mount Device TVS**



**PKCSP0402 Pin Configuration**



| <u>Pin</u> | <u>Description</u> |
|------------|--------------------|
| 1          | Cathode            |
| 2          | Anode              |

**Mechanical Characteristics**

- \* Molded PKCSP0402 package
- \* Weight 1.369 milligrams (Approximate)
- \* Available in Lead-Free Gold Plating
- \* Solder Reflow Temp: Pure-Tin (Sn), 260-270°C
- \* Consult Factory for Leaded Device Availability
- \* Flammability Rating UL 94V-0
- \* 8mm Tape and Reel per EIA Standard 481
- \* Device Marking: Marking Code,  
Pin one defined by DOT

**Applications**

- \* Cellular Handset
- \* PDA
- \* Notebook
- \* Digital Camera
- \* Wifi Phone



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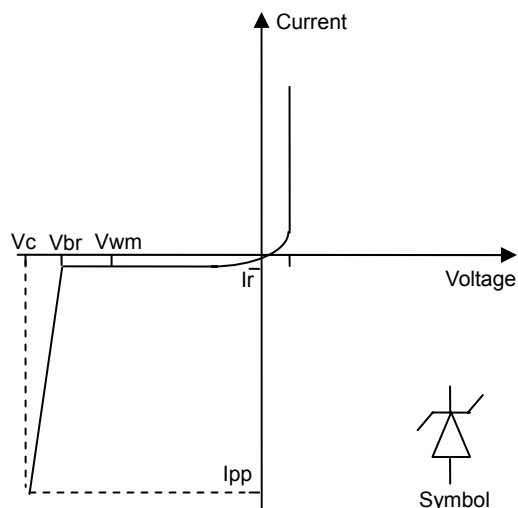
**Absolute Maximum Ratings @ 25°C unless otherwise specified**

| Parameter                                   | Symbol | Value      | Units |
|---|--------|------------|-------|
| Peak Pulse Power; pulse waveform = 8/20µs   | Ppp    | 150        | W     |
| Peak Pulse Current; pulse waveform = 8/20µs | Ipp    | 9          | A     |
| ESD per IEC 61000-4-2 (Air)                 | Vpp    | ±15        | kV    |
| ESD per IEC 61000-4-2 (Contact)             |        | ±8         |       |
| Operating Temperature                       | Tj     | -55 to 125 | °C    |
| Storage Temperature                         | Tstg   | -55 to 150 | °C    |

**Electrical Characteristics @ 25°C unless otherwise specified**

| Parameter            | Symbol | Conditions       | Minimum | Typical | Maximum | Units |
|----------------------|--------|------------------|---------|---------|---------|-------|
| Stand-off Voltage    | Vwm    |                  |         |         | 8.0     | V     |
| Breakdown Voltage    | Vbr    | It=1mA           | 8.4     | 9.2     | 9.9     | V     |
| Leakage Current      | Ir     | Vwm=8V, T=25°C   |         |         | 1.0     | µA    |
| Clamping Voltage     | Vc     | Ipp=1A Tp=8/20µs |         | 12.5    |         | V     |
| Clamping Voltage     | Vc     | Ipp=9A Tp=8/20µs |         | 16.0    | 18.0    | V     |
| Peak Pulse Current   | Ipp    | Tp=8/20µs        |         |         | 9       | A     |
| Junction Capacitance | Cj     | Vr=0V, f=1MHz    |         | 40      |         | pF    |

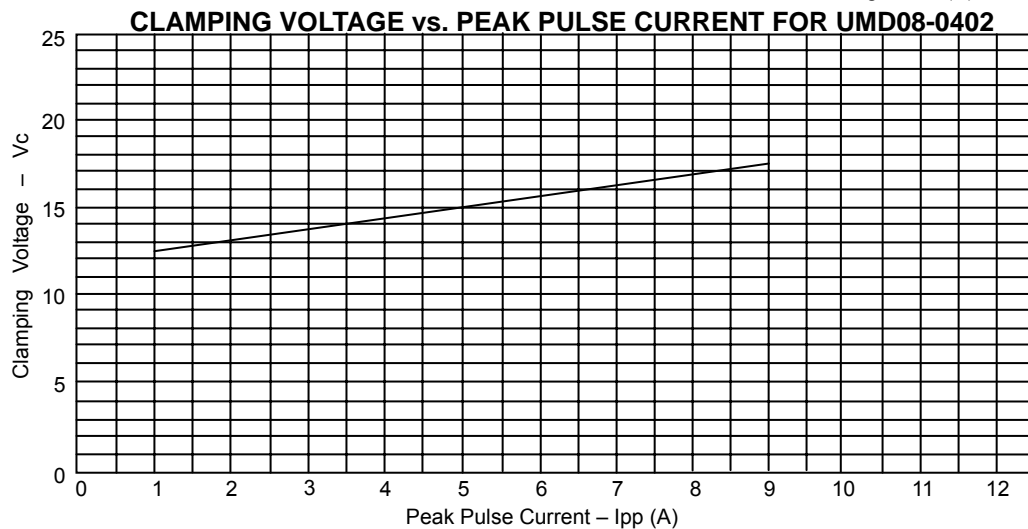
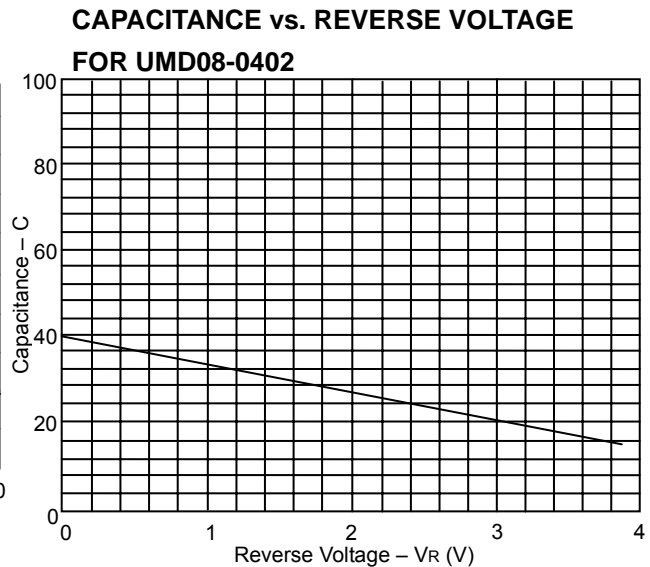
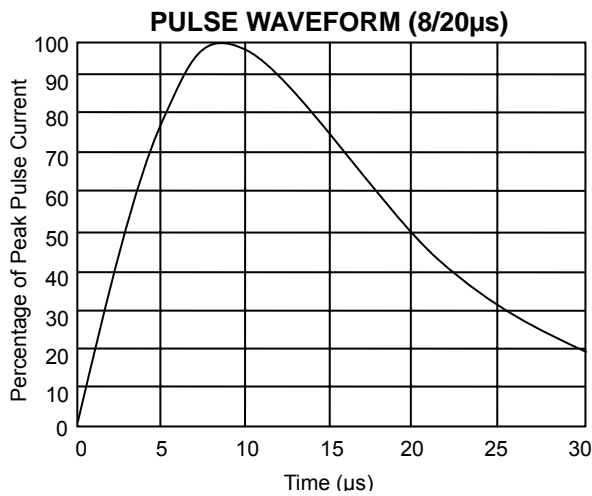
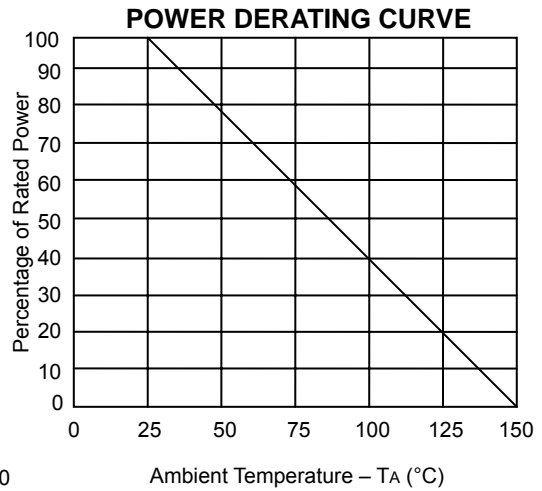
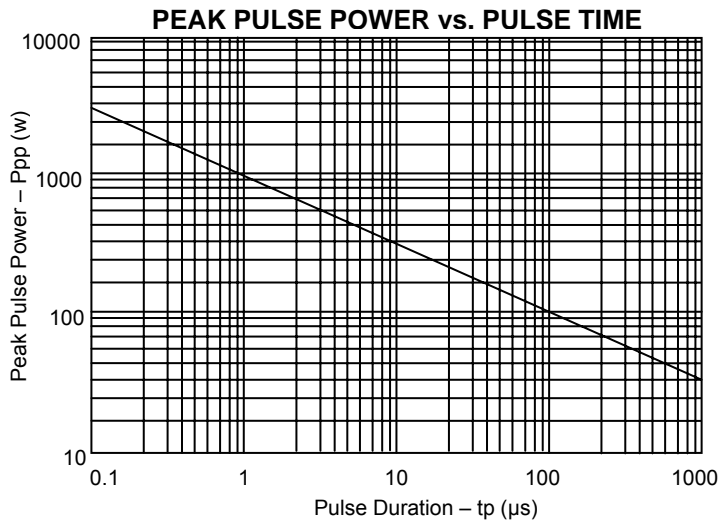
**Uni-Directional Protection**





**PKCSP0402 Single Line TVS Diode for ESD Protection**

**Electrical Characteristics Graphs**



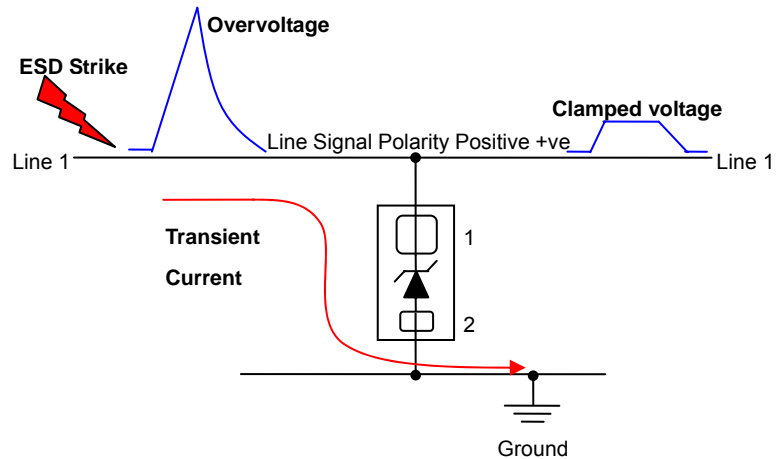
**PKCSP0402 Single Line TVS Diode for ESD Protection**

**Applications Information**

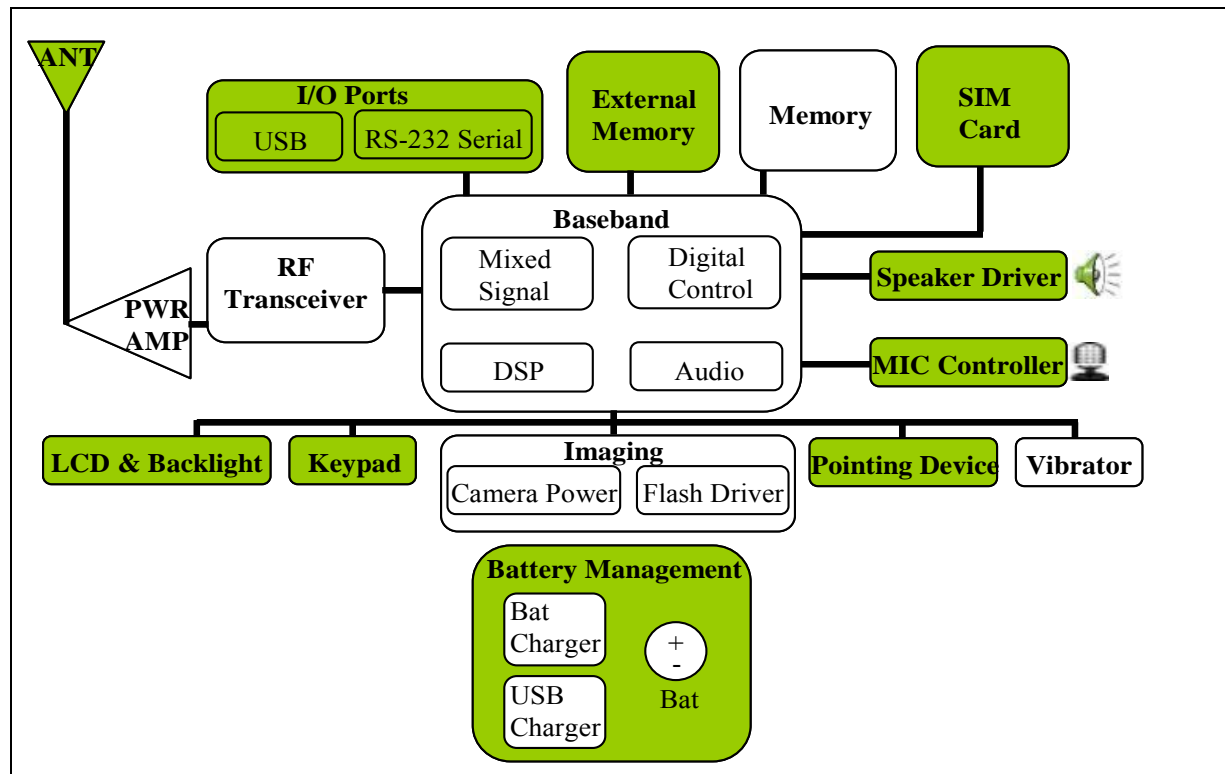
The UMD08-0402 is designed to protect one data, I/O, or power supply line. The device is Uni-directional and may be used on lines where the signal polarity is above ground. The cathode pin should be placed towards the line that is to be protected.

Circuit connectivity is as follows:

- Line 1 is connected to Pin 1
- Pin 2 is connected to Ground



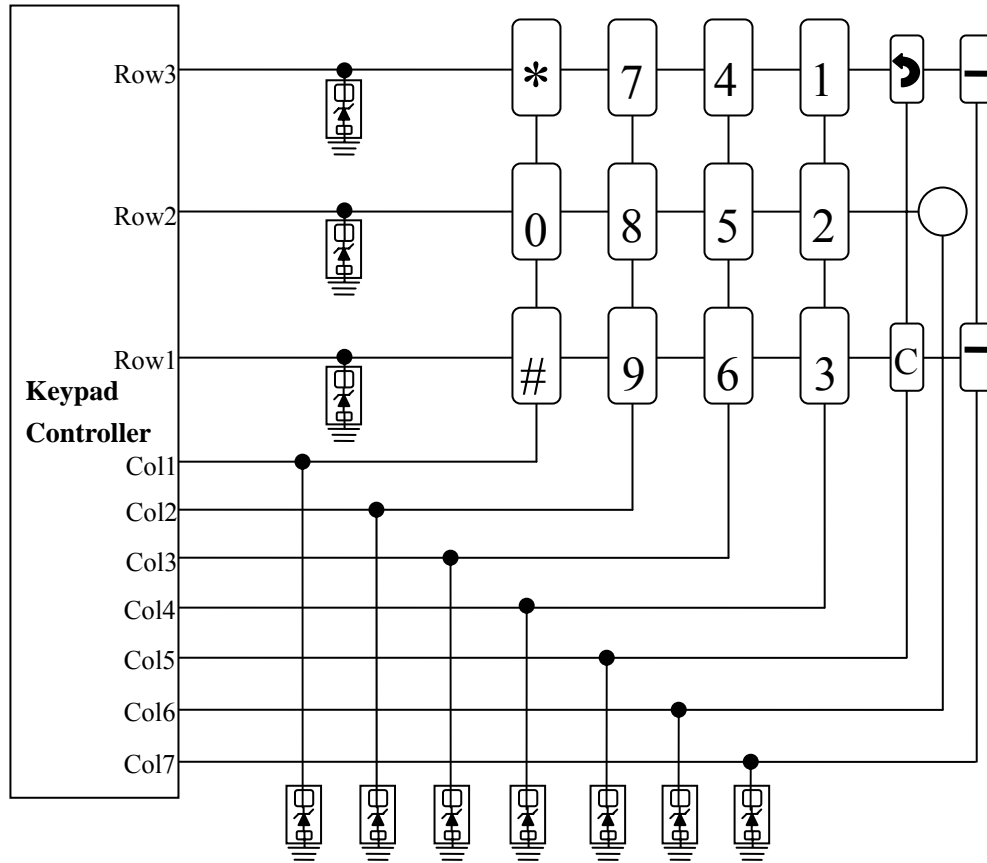
**Mobile Handset Block Diagram**



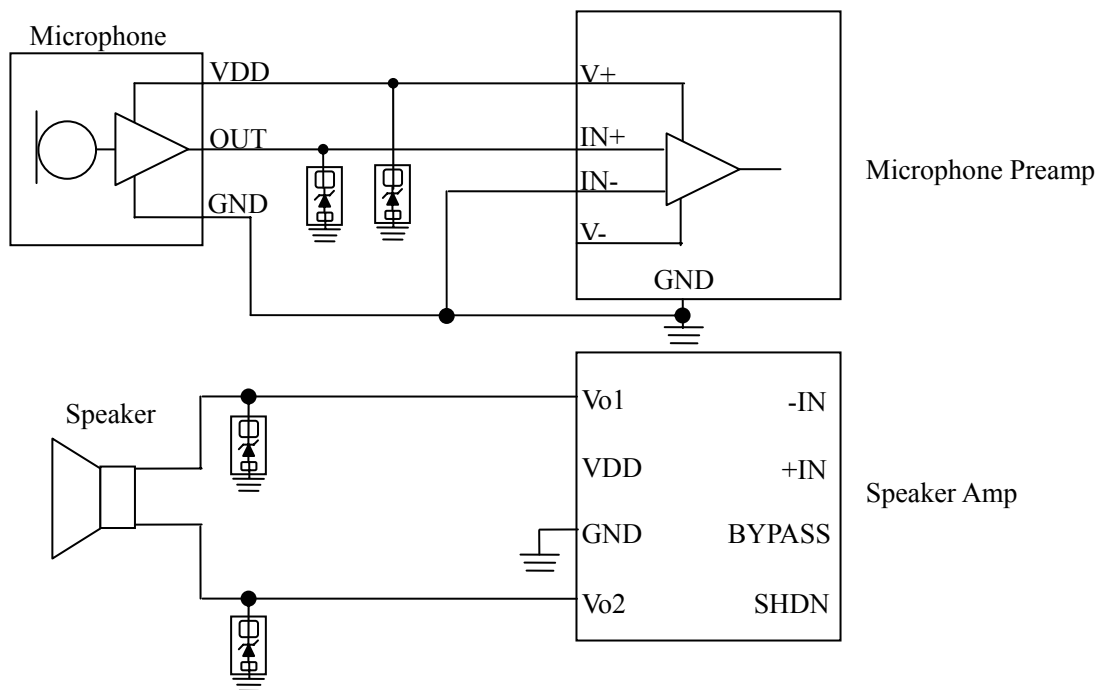
Areas that require ESD protection are highlight in green.

**PKCSP0402 Single Line TVS Diode for ESD Protection**

**UMD08-0402 on Keypad Application**



**UMD08-0402 on Microphone and Speaker Application**



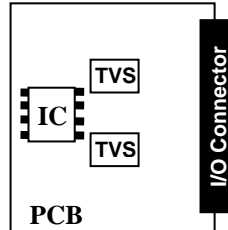
**PKCSP0402 Single Line TVS Diode for ESD Protection**

**Circuit Board Layout Recommendations**

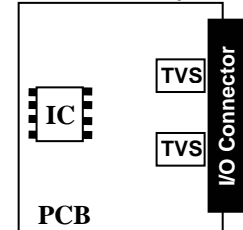
Good circuit board layout is critical for creating an effective surge suppression circuit. The following PCB guidelines are recommended to enhance the performance of a TVS device:

- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- The ESD transient return path to ground should be kept as short as possible.
- Place a TVS and decoupling capacitor between power and ground of components that may be vulnerable to electrostatic discharges to the ground plane.
- Minimize all conductive loops including power and ground loops.
- Use multilayer boards when possible.
- Minimize interconnecting line lengths.
- Never run critical signals near board edges.
- Fill unused portions of the PCB with ground plane.

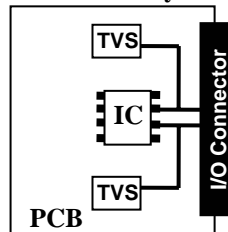
**Poor PCB Layout**



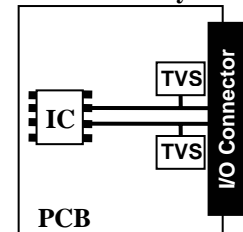
**Good PCB Layout**



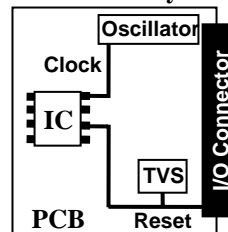
**Poor PCB Layout**



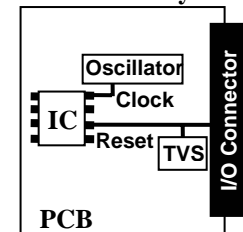
**Good PCB Layout**



**Poor PCB Layout**



**Good PCB Layout**



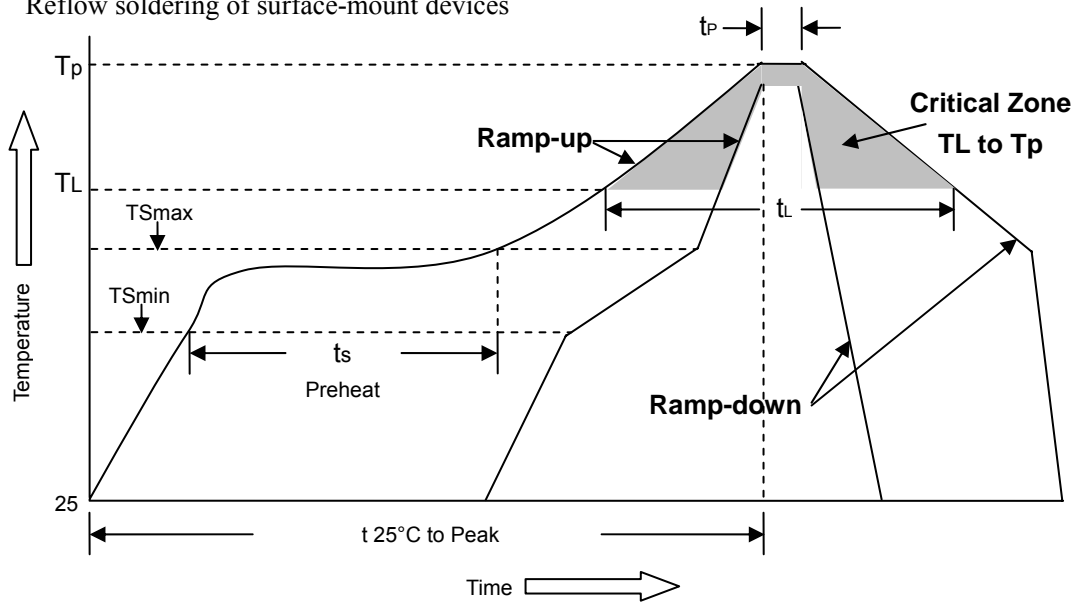
**Gold Plating Finish**

Gold Plating has become one of the industry standards for lead-free finishes. Gold plating is highly valued for its physical properties in many applications and the ability to resist corrosion and oxides forming on the surface, which could prevent conductivity in applications. Gold plating provides good wear resistance and contact resistance in low-pressure applications. Excellent conductivity and the ability to withstand the elevated temperatures and long dwell times required for lead-free reflow are two more benefits of gold plating.

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**Soldering Method for UMD's Products**

1. Storage environment: Temperature = 10°C~35°C Humidity = 65%±15%
2. Reflow soldering of surface-mount devices



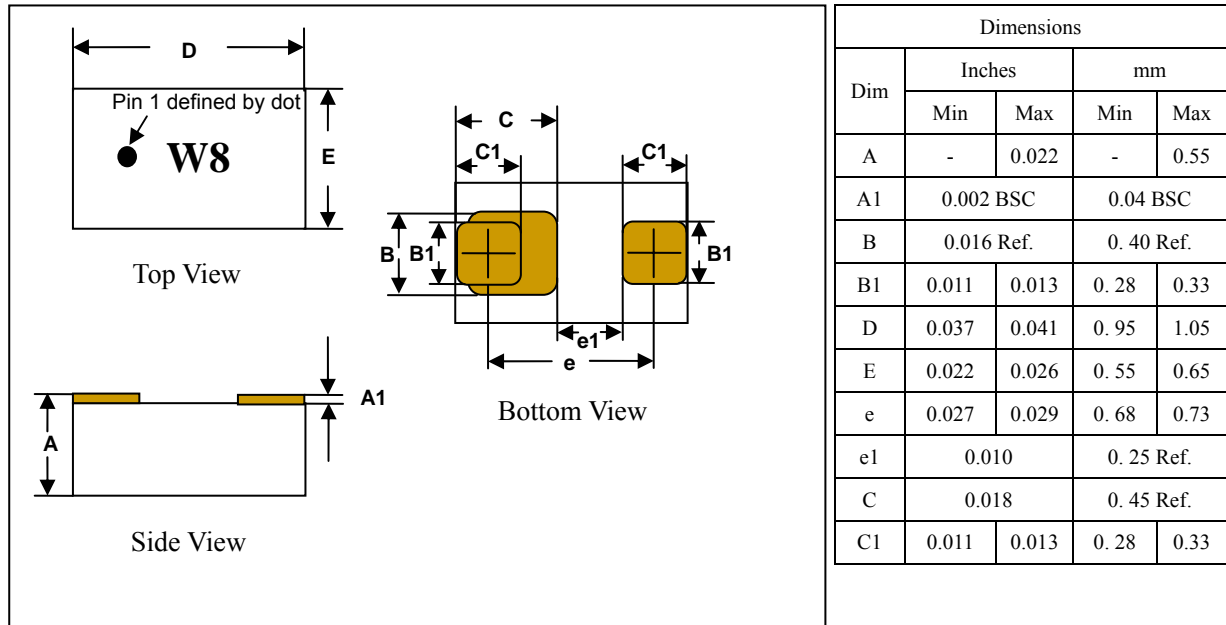
| Profile Feature  | Pb-Free Assembly |
|--|------------------|
| Average ramp-up rate (TL to TP)                              | <3°C/sec         |
| Preheat  |                  |
| - Temperature Min (T <sub>Smin</sub> )                       | 150°C            |
| - Temperature Max (T <sub>Smax</sub> )                       | 200°C            |
| - Time (min to max) (t <sub>s</sub> )                        | 60~180sec        |
| T <sub>Smax</sub> to TL                                      |                  |
| - Ramp-up Rate   | <3°C/sec         |
| Time maintained above:                                       |                  |
| - Temperature (TL)   | 220°C            |
| - Time (t <sub>L</sub> )                                     | 50~145sec        |
| Peak Temperature (T <sub>P</sub> )                           | 260°C +0/-5°C    |
| Time within 5°C of actual Peak Temperature (t <sub>p</sub> ) | 20~40sec         |
| Ramp-down Rate   | <6°C/sec         |
| Time 25°C to peak Temperature                                | <8 minutes       |

Flow (wave) soldering (solder dipping)

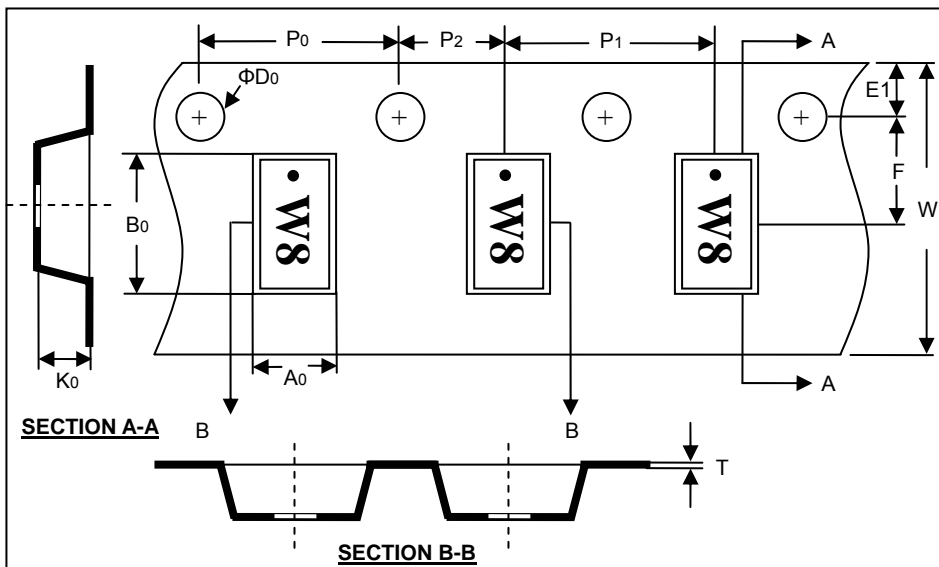
| Products        | Dipping time |
|-----------------|--------------|
| Pb devices      | 5sec±1sec    |
| Pb-Free devices | 5sec±1sec    |

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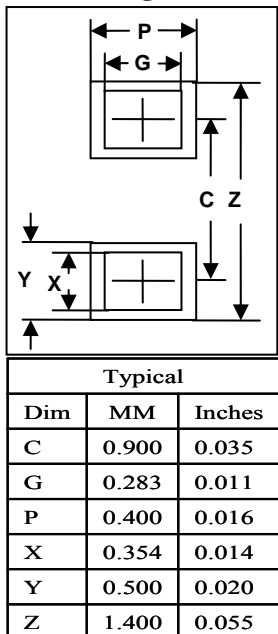
**PKCSP0402 Dimension Drawing**



**PKCSP0402 Carrier Dimension**



**Mounting Pattern**



Dimensions in mm.

|            |            |           |           |           |           |           |
|------------|------------|-----------|-----------|-----------|-----------|-----------|
| Reel Dia.  | Tape Width | A0        | B0        | K0        | ΦD0       | E1        |
| 178mm (7") | 8mm        | 0.80±0.10 | 1.20±0.10 | 0.70±0.10 | 1.50±0.10 | 1.75±0.10 |
| F          | W          | P0        | P2        | P1        | T         |           |
| 3.50±0.05  | 8.00±0.30  | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 0.25      |           |





**PKCSP0402 Single Line TVS Diode for ESD Protection**

**Marking Code**

| Part Number | Device Marking |
|-------------|----------------|
| UMD08-0402  | W8             |

**Ordering Information**

| Part Number | Lead Finish | Qty Per Reel | Reel Size |
|-------------|-------------|--------------|-----------|
| UMD08-0402  | Pb-Free     | 5,000        | 7 inch    |

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