

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 UMD05-0402 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.

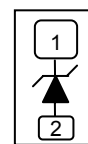
Features

- * 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: 5V
- * 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 μs)

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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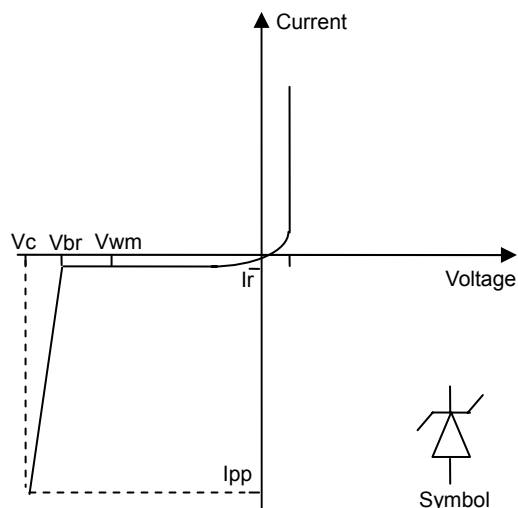
Absolute Maximum Ratings @ 25°C unless otherwise specified

Parameter	Symbol	Value	Units
Peak Pulse Power; pulse waveform = 8/20µs	P _{pp}	150	W
Peak Pulse Current; pulse waveform = 8/20µs	I _{pp}	12	A
ESD per IEC 61000-4-2 (Air)	V _{pp}	±15	kV
ESD per IEC 61000-4-2 (Contact)		±8	
Operating Temperature	T _j	-55 to 125	°C
Storage Temperature	T _{stg}	-55 to 150	°C

Electrical Characteristics @ 25°C unless otherwise specified

Parameter	Symbol	Conditions	Minimum	Typical	Maximum	Units
Stand-off Voltage	V _{wm}				5.0	V
Breakdown Voltage	V _{br}	I _t =1mA	6.0			V
Leakage Current	I _r	V _{wm} =5V, T=25°C			1	µA
Clamping Voltage	V _c	I _{pp} =1A T _p =8/20µs			7.2	V
Clamping Voltage	V _c	I _{pp} =12A T _p =8/20µs			12.1	V
Peak Pulse Current	I _{pp}	T _p =8/20µs			12	A
Junction Capacitance	C _j	V _r =0V, f=1MHz		60		pF

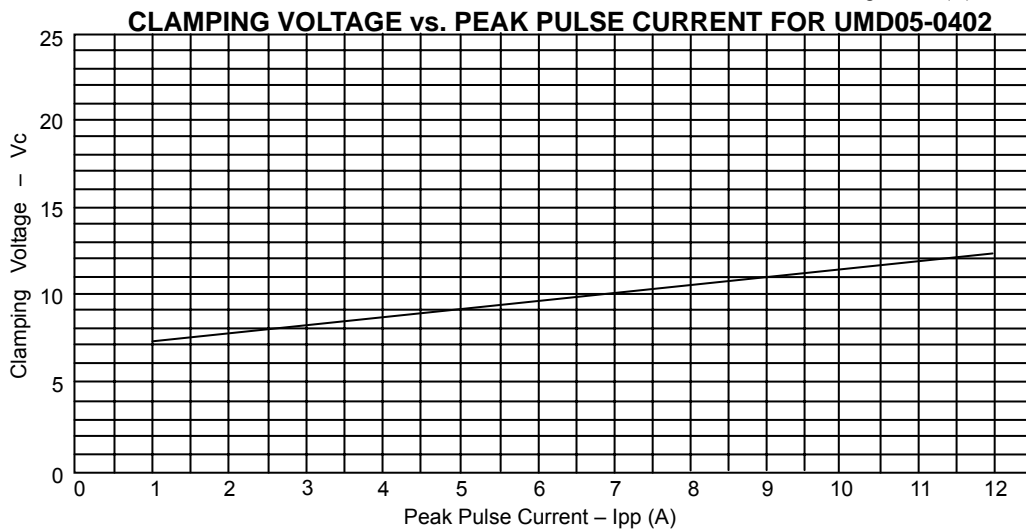
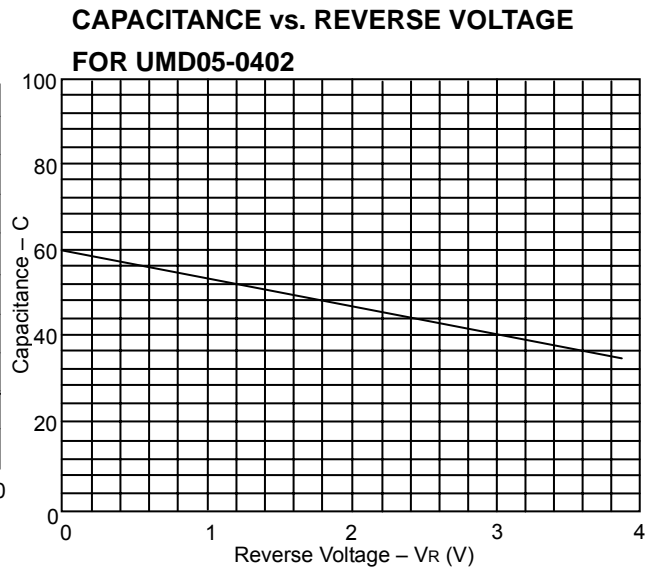
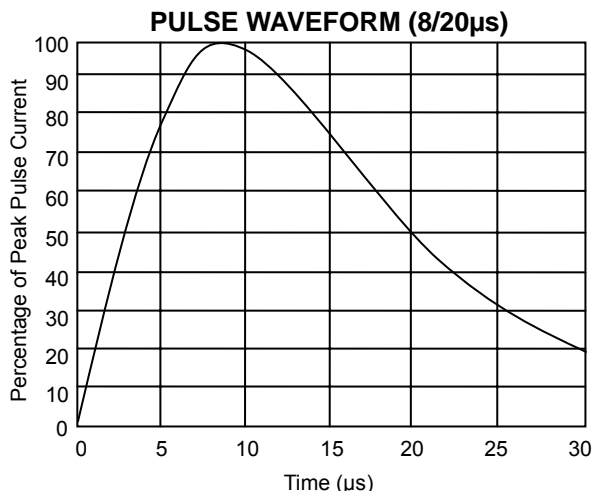
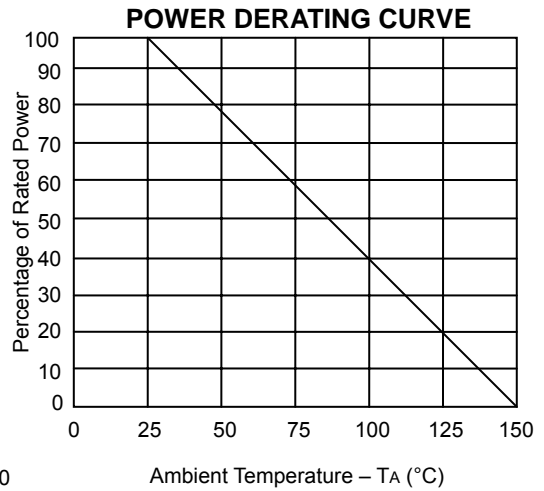
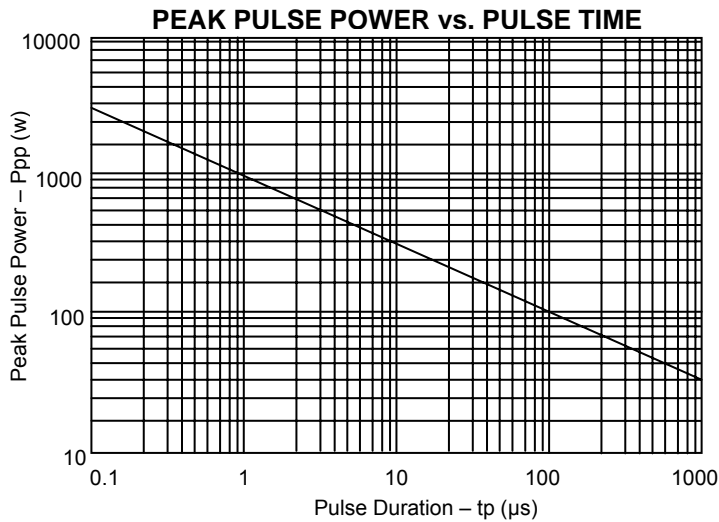
Uni-Directional Protection





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Electrical Characteristics Graphs



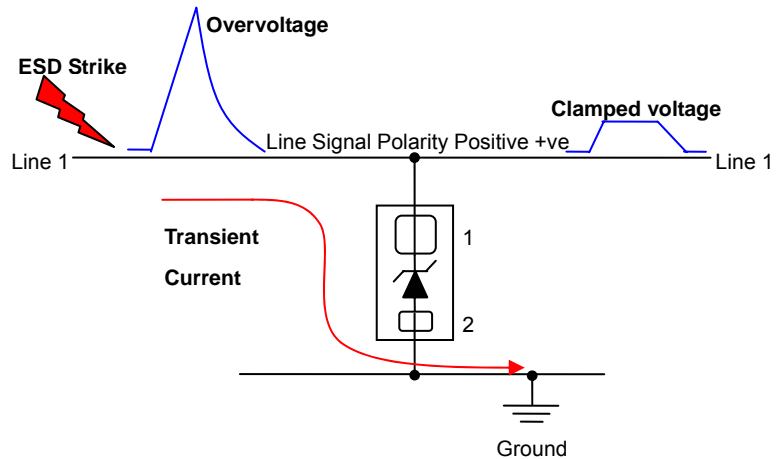
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Applications Information

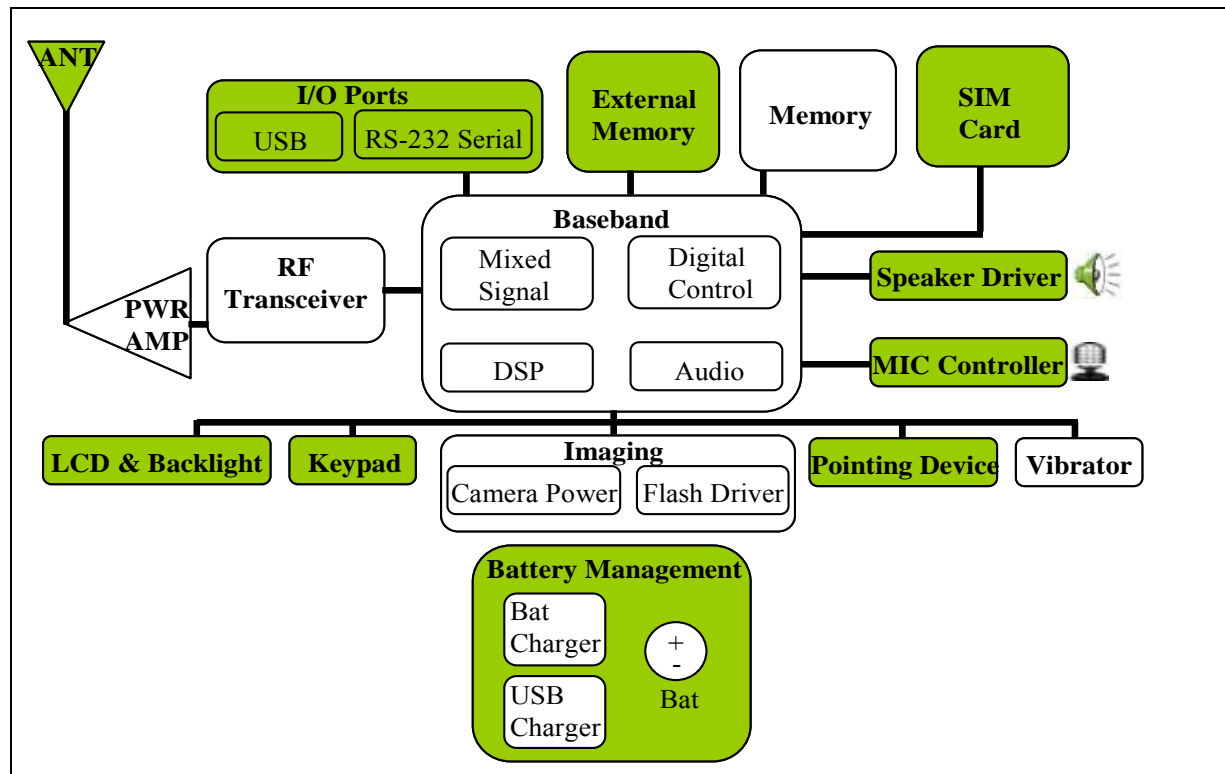
The UMD05-0402 is designed to protect one data, I/O, or power supply line. The device is Uni-directional and may be used on lines where the signal polarity is above ground. The cathode pin should be placed towards the line that is to be protected.

Circuit connectivity is as follows:

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



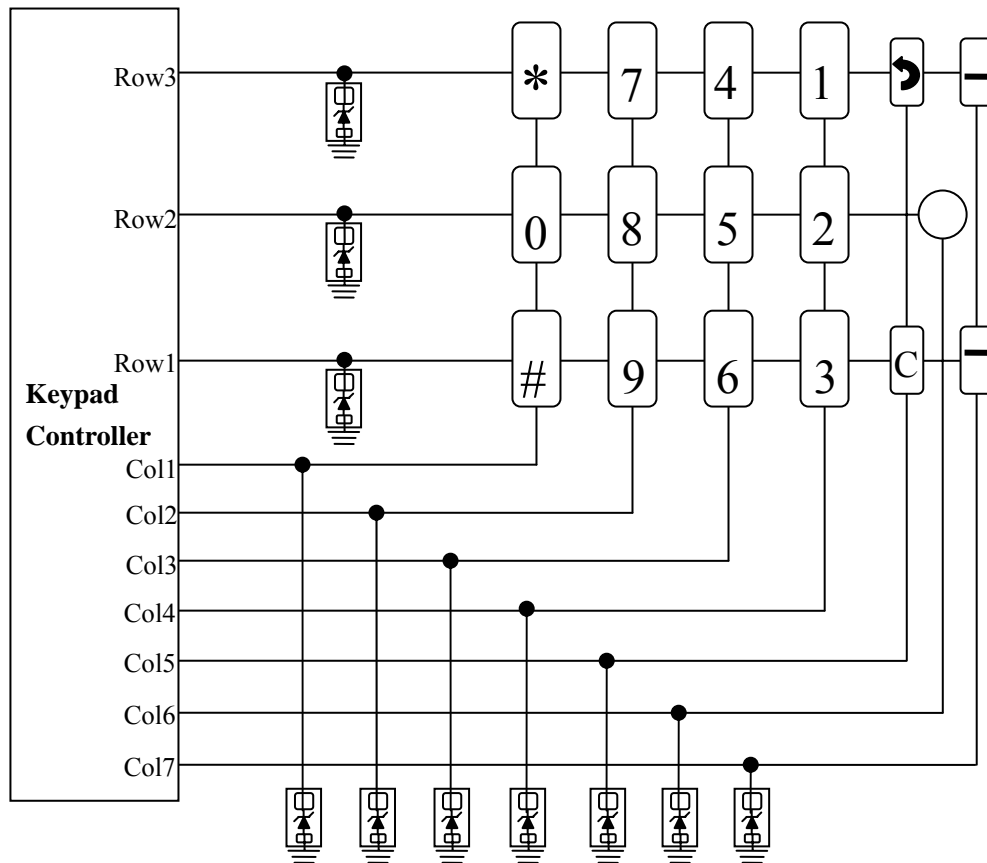
Mobile Handset Block Diagram



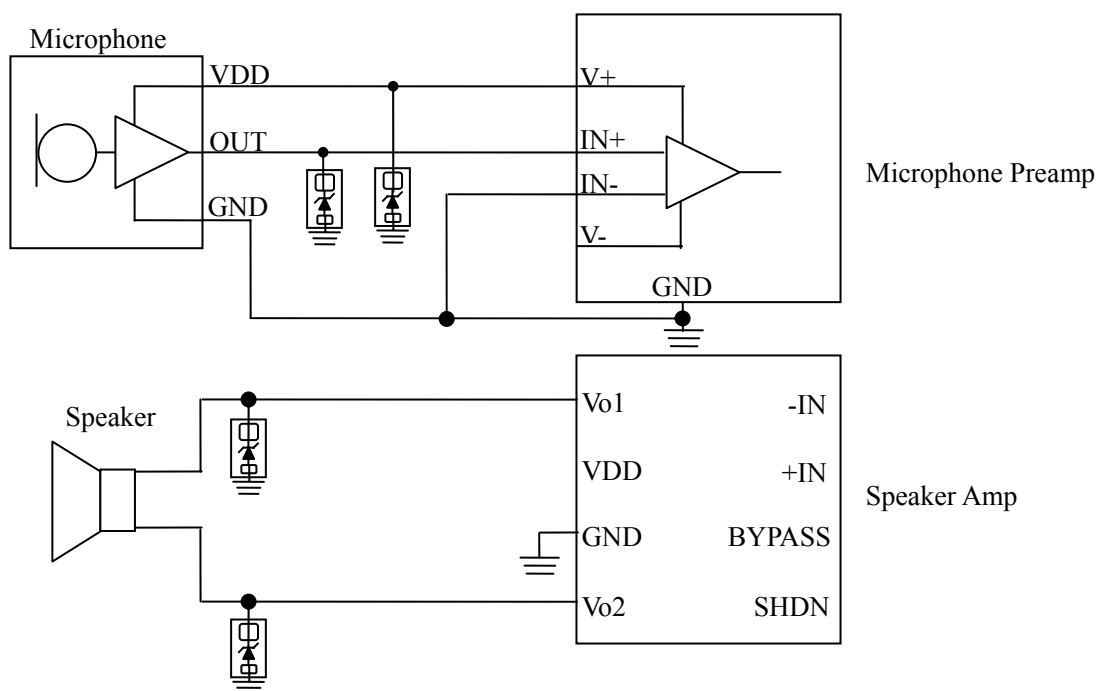
Areas that require ESD protection are highlight in green.

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UMD05-0402 on Keypad Application



UMD05-0402 on Microphone and Speaker Application



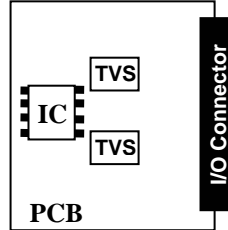
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Circuit Board Layout Recommendations

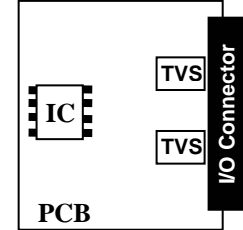
Good circuit board layout is critical for creating an effective surge suppression circuit. The following PCB guidelines are recommended to enhance the performance of a TVS device:

- 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.

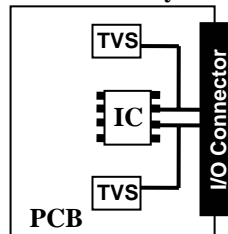
Poor PCB Layout



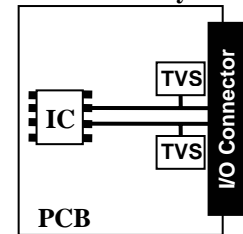
Good PCB Layout



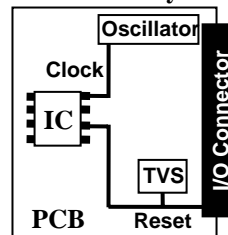
Poor PCB Layout



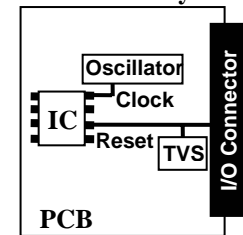
Good PCB Layout



Poor PCB Layout



Good PCB Layout



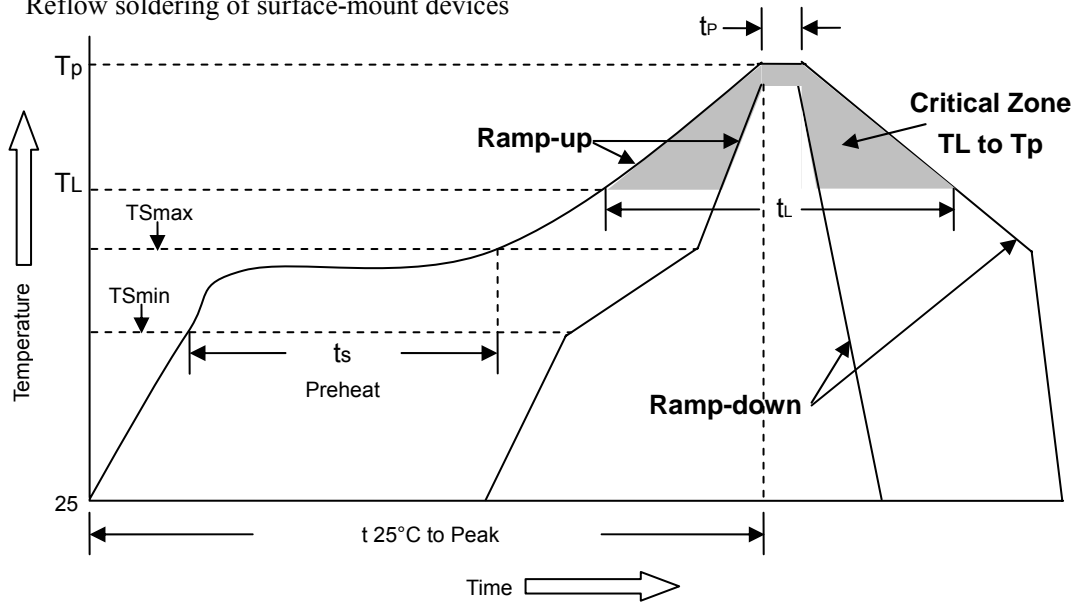
Gold Plating Finish

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



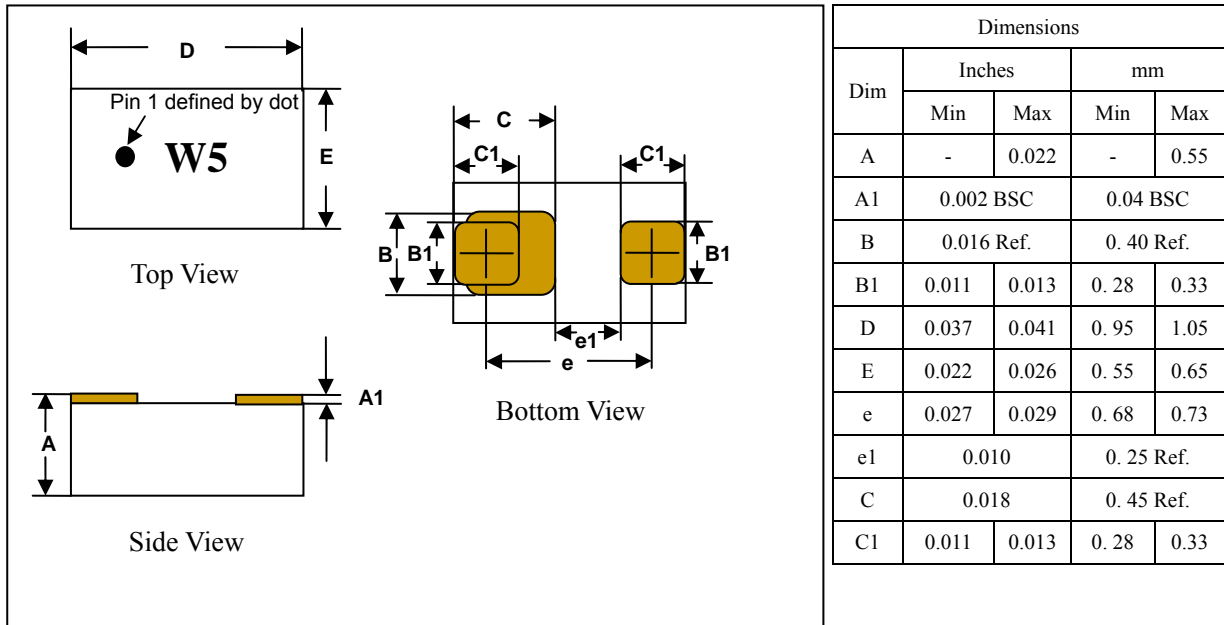
Profile Feature	Pb-Free Assembly
Average ramp-up rate (TL to TP)	<3°C/sec
Preheat	
- Temperature Min (TSmin)	150°C
- Temperature Max (TSmax)	200°C
- Time (min to max) (ts)	60~180sec
TSmax to TL	
- Ramp-up Rate	<3°C/sec
Time maintained above:	
- Temperature (TL)	220°C
- Time (tL)	50~145sec
Peak Temperature (Tp)	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	20~40sec
Ramp-down Rate	<6°C/sec
Time 25°C to peak Temperature	<8 minutes

Flow (wave) soldering (solder dipping)

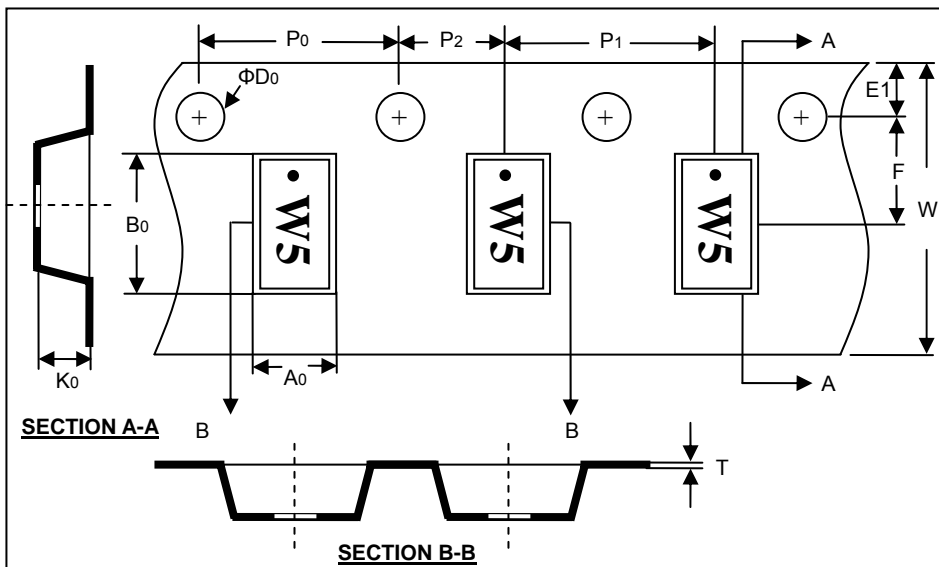
Products	Dipping time
Pb devices	5sec±1sec
Pb-Free devices	5sec±1sec

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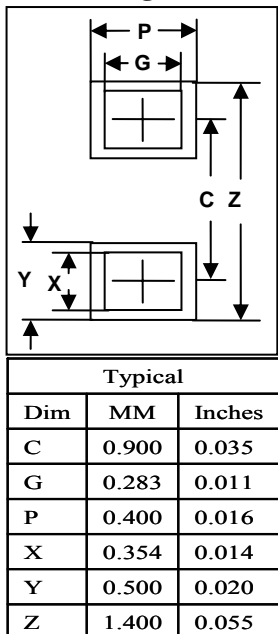
PKCSP0402 Dimension Drawing



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	



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Marking Code

Part Number	Device Marking
UMD05-0402	W5

Ordering Information

Part Number	Lead Finish	Qty Per Reel	Reel Size
UMD05-0402	Pb-Free	5,000	7 inch

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