UNITED MICRO DEVICE INC. UMD05-0402

PKCSP0402 Single Line TVS Diode for ESD Protection

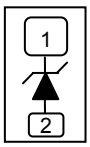
Description

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.

Small Surface Mount Device TVS

PKCSP0402 Pin Configuration



Pin	Description
1	Cathode
2	Anode

Features

* Solid-state silicon avalanche technology
* PKCSP0402 package
* Uni-Directional protection
* Protects one I/O or Power line
* 150 Watts peak pulse power (tp = 8/20µs)
* Working voltage: 5V
* Low clamping factor Vcl/Vbr
* 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) (8/20µs)

Mechanical Characteristics

* Molded PKCSP0402 package
* Weight 1.369 milligrams (Approximate)
* Available in Lead-Free Gold Plating
* Solder Reflow Temp: Pure-Tin (Sn), 260-270ºC
* 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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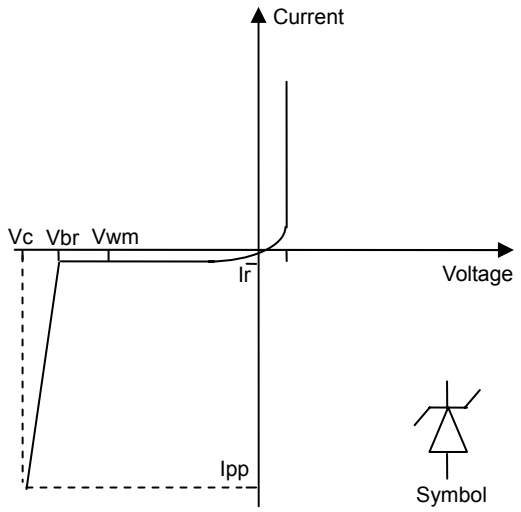
PKCSP0402 Single Line TVS Diode for ESD Protection

Absolute Maximum Ratings @ 25ºC 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	12	A
ESD per IEC 61000-4-2 (Air) ESD per IEC 61000-4-2 (Contact)	Vpp	±15 ±8	kV
Operating Temperature	Tj	-55 to 125	ºC
Storage Temperature	Tstg	-55 to 150	ºC

Electrical Characteristics @ 25ºC unless otherwise specified						
Parameter	**Symbol**	**Conditions**	**Minimum**	**Typical**	**Maximum**	**Units**
Stand-off Voltage	Vwm				5.0	V
Breakdown Voltage	Vbr	It=1mA	6.0			V
Leakage Current	Ir	Vwm=5V, T=25°C			1	µA
Clamping Voltage	Vc	Ipp=1A Tp=8/20µs			7.2	V
Clamping Voltage	Vc	Ipp=12A Tp=8/20µs			12.1	V
Peak Pulse Current	Ipp	Tp=8/20µs			12	A
Junction Capacitance	Cj	Vr=0V, f=1MHz		60		pF

Uni-Directional Protection



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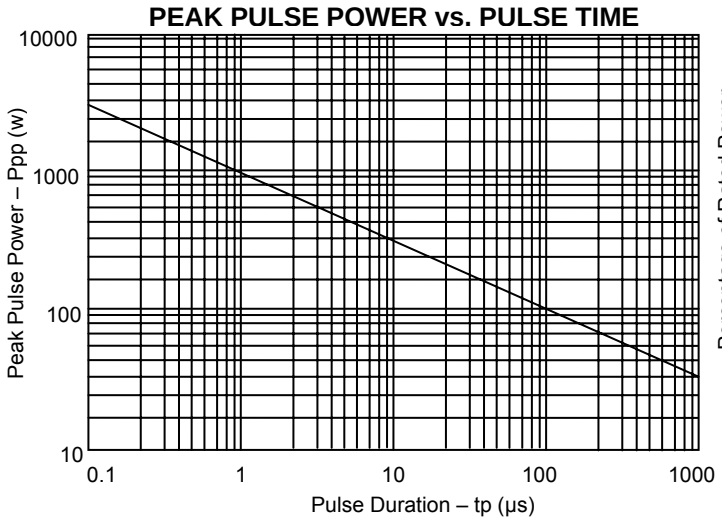
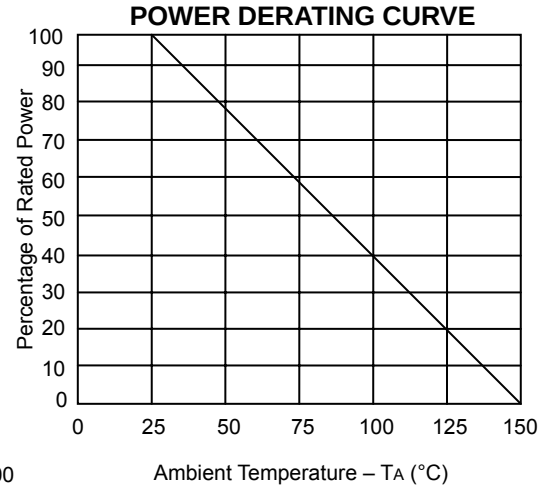
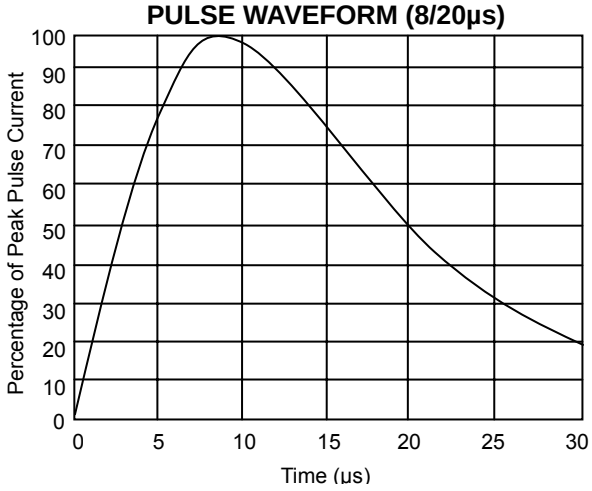
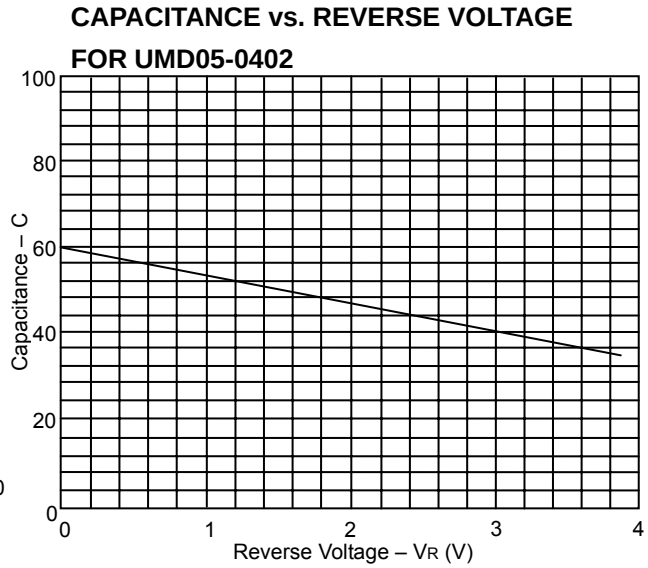
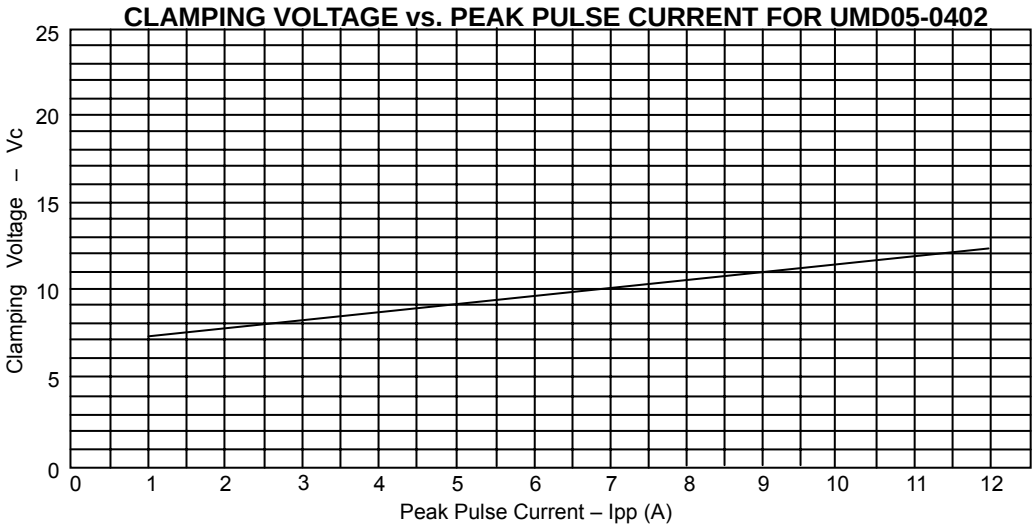
Electrical Characteristics Graphs











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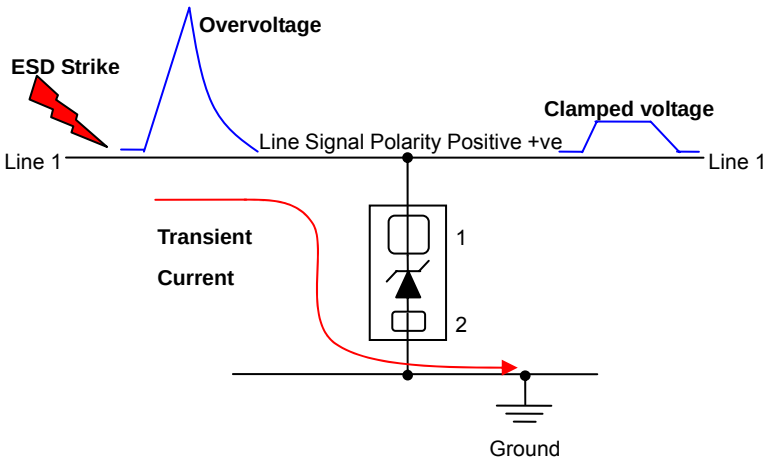
PKCSP0402 Single Line TVS Diode for ESD Protection

Applications Information

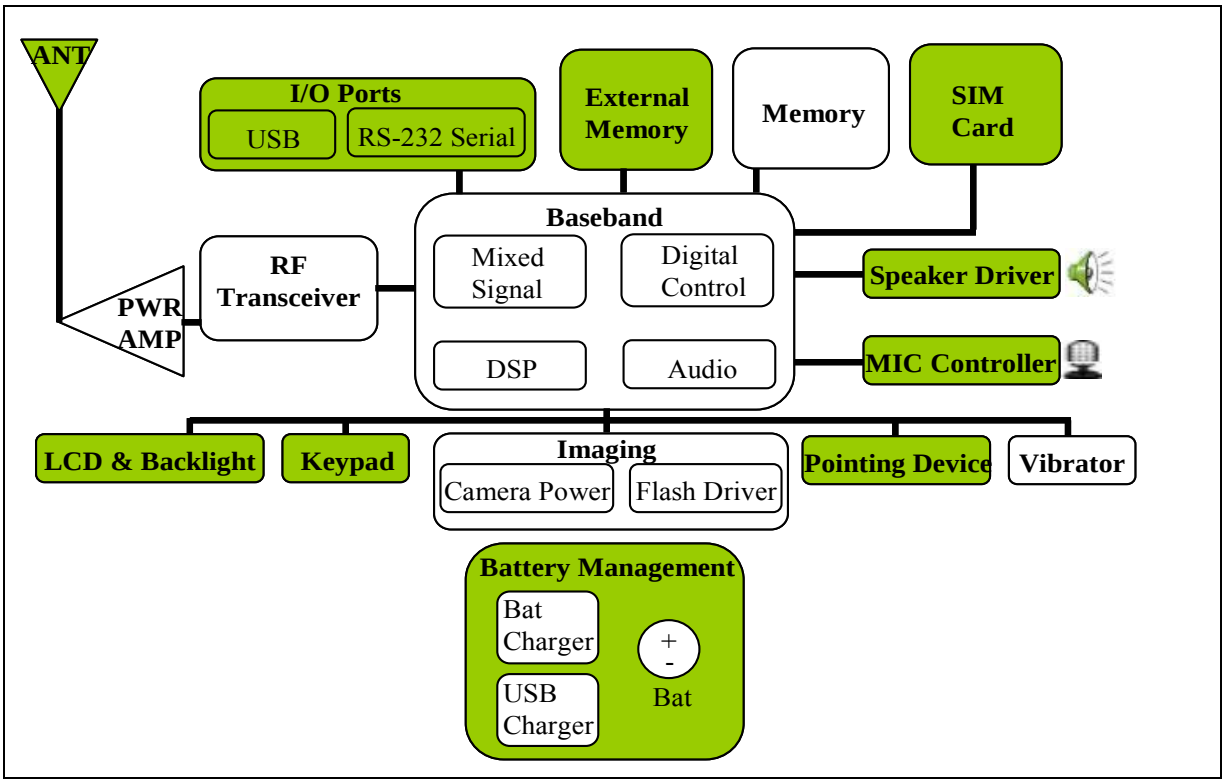
The UMD05-0402 is designed to protect one data, I/O, or power supply line. The device is Uni-directional and may be used on lines where the signal polarity is above ground. The cathode pin should be placed towards the line that is to be protected.

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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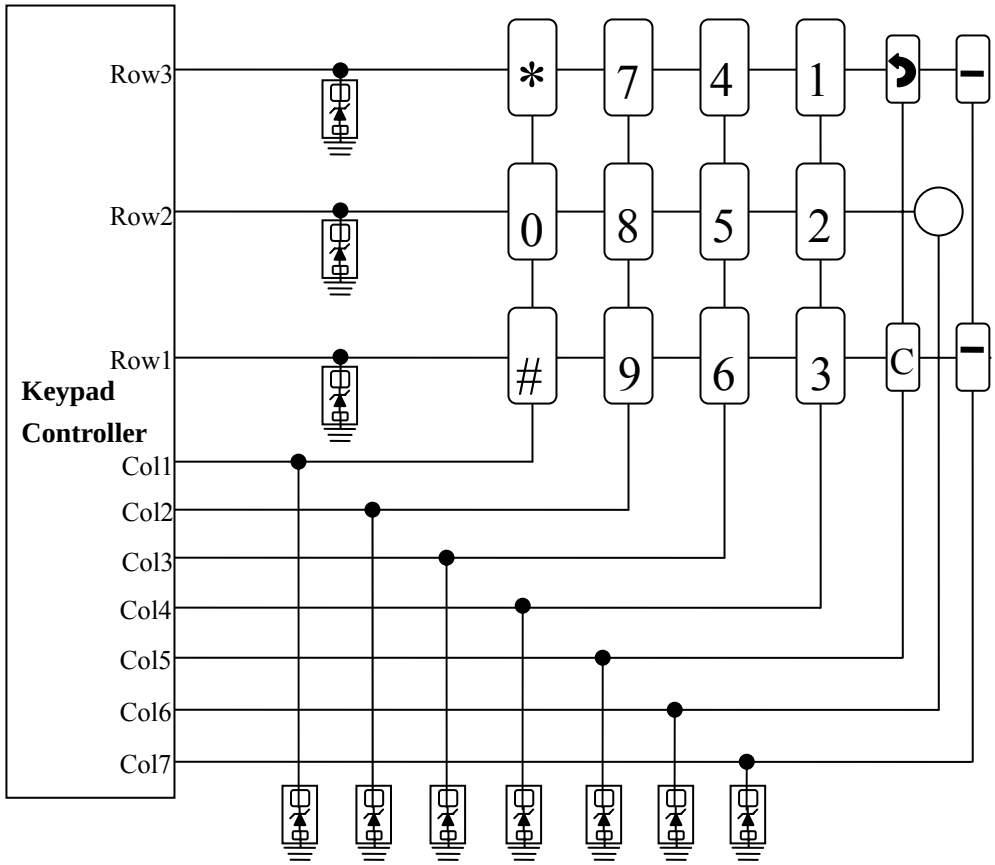
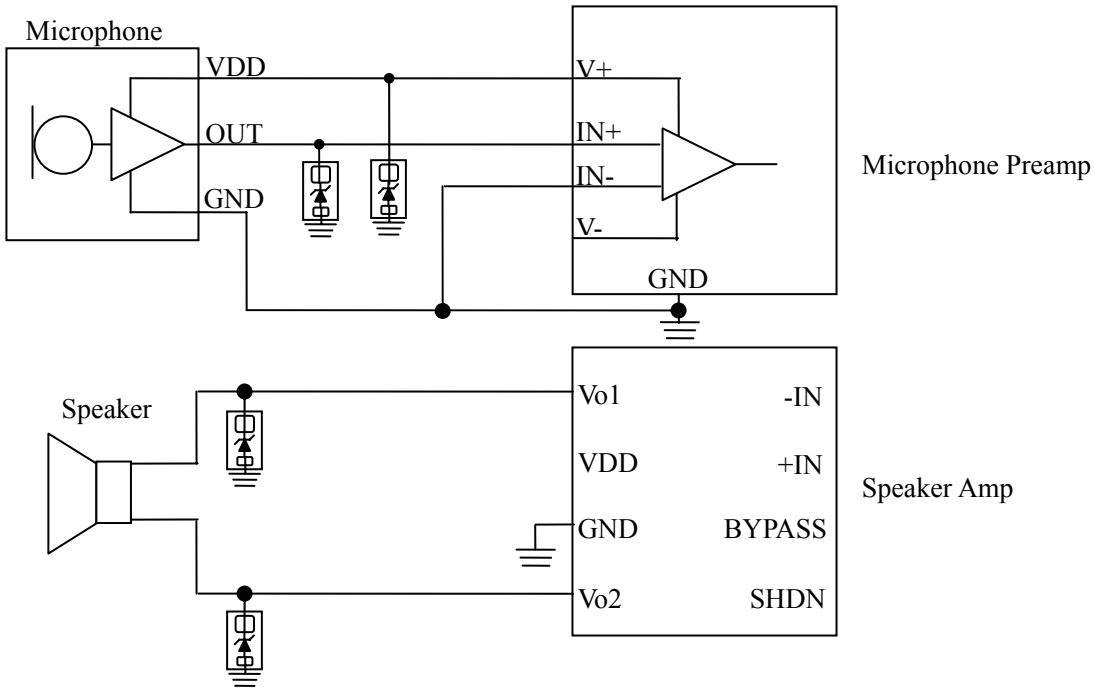
UMD05-0402 on Keypad Application



UMD05-0402 on Microphone and Speaker Application



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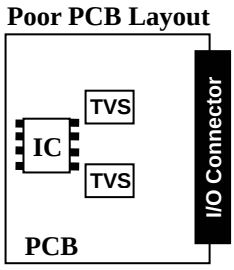
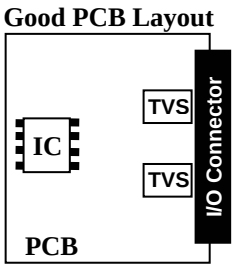
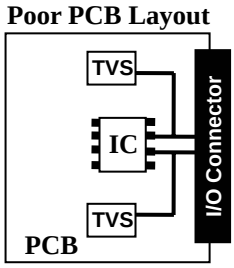
Circuit Board Layout Recommendations

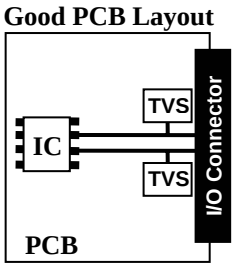
Good circuit board layout is critical for creating an effective surge suppression circuit. The following PCB guidelines are recommended to enhance the performance of a TVS device:

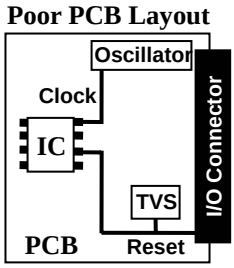
- Place the TVS near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the TVS and the protected line.
- The ESD transient return path to ground should be kept as short as possible.
- Place a TVS and decoupling capacitor between power and ground of components 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.

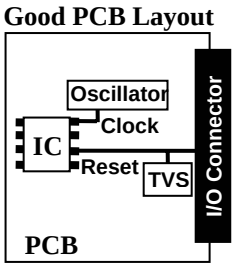












Gold Plating Finish

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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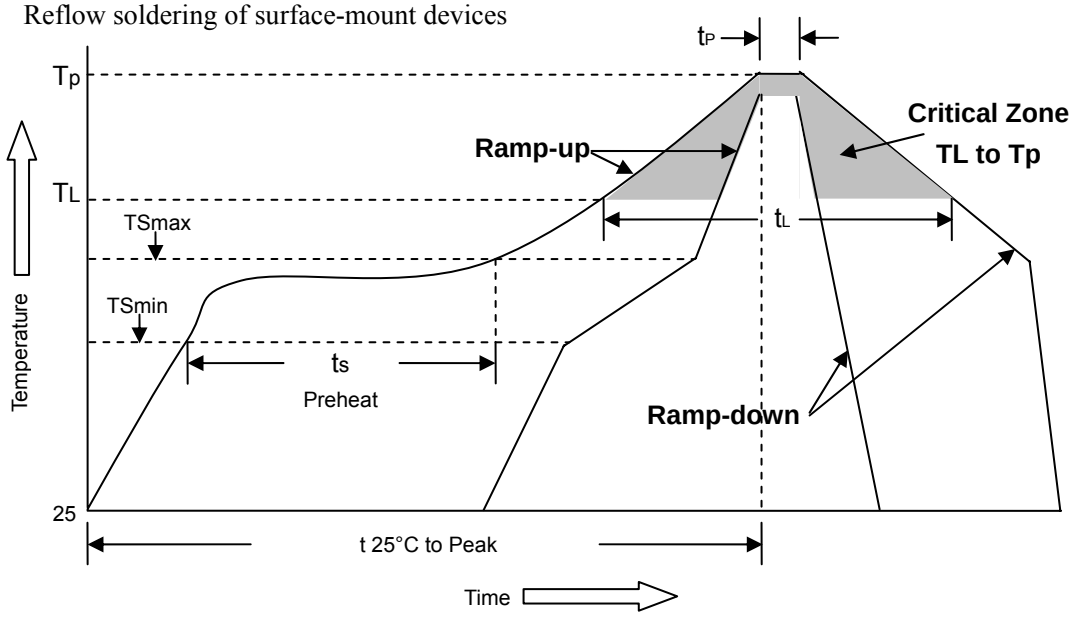
Soldering Method for UMD's Products

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



Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3ºC/sec
Preheat - Temperature Min (T_{Smin}) - Temperature Max (T_{Smax}) - Time (min to max) (t_s)	 150ºC 200ºC 60~180sec
T_{Smax} to T_L - Ramp-up Rate	 <3ºC/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 220ºC 50~145sec
Peak Temperature (T_P)	260ºC +0/-5ºC
Time within 5ºC of actual Peak Temperature (t_P)	20~40sec
Ramp-down Rate	<6ºC/sec
Time 25ºC 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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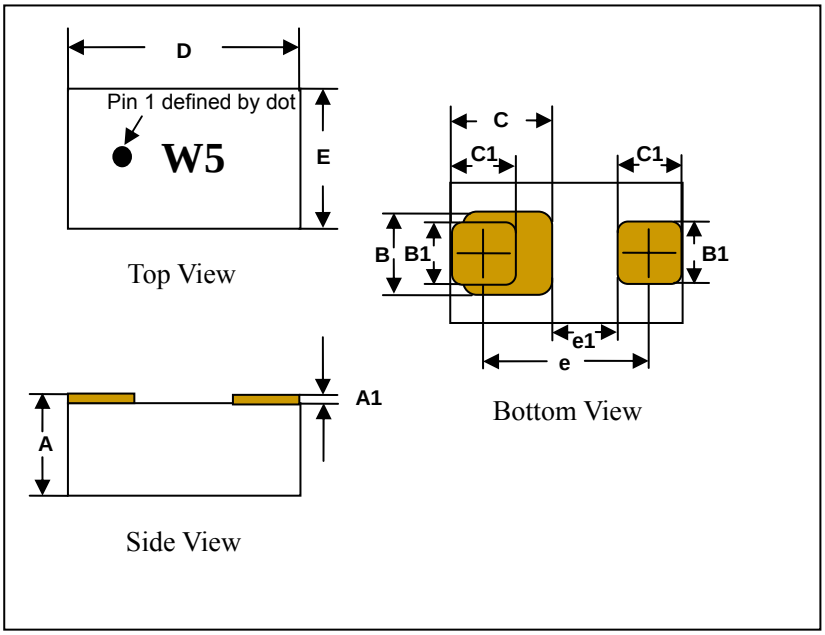
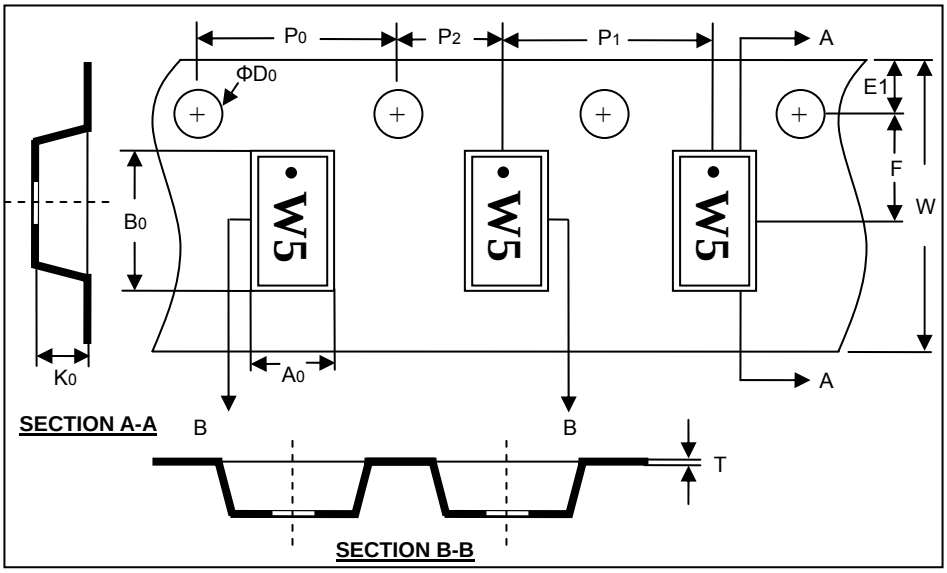
PKCSP0402 Dimension Drawing

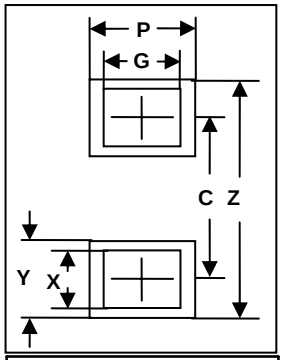


Dimensions				
Dim	Inches		mm	
	Min	Max	Min	Max
A	-	0.022	-	0.55
A1	0.002 BSC		0.04 BSC	
B	0.016 Ref.		0. 40 Ref.	
B1	0.011	0.013	0. 28	0.33
D	0.037	0.041	0. 95	1.05
E	0.022	0.026	0. 55	0.65
e	0.027	0.029	0. 68	0.73
e1	0.010		0. 25 Ref.	
C	0.018		0. 45 Ref.	
C1	0.011	0.013	0. 28	0.33

PKCSP0402 Carrier Dimension



Mounting Pattern



Typical		
Dim	MM	Inches
C	0.900	0.035
G	0.283	0.011
P	0.400	0.016
X	0.354	0.014
Y	0.500	0.020
Z	1.400	0.055

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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PKCSP0402 Single Line TVS Diode for ESD Protection

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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