Si High Voltage Capacitors
1000 V MACOM KV CAPS™

MACOM KV CAPS™

MKVC-1Ax Series
Rev. V1

Features

- High Working Voltage: 1000 V
- Wide Range of Capacitance: 3.6 - 1300 pF
- Excellent Stability
- Available in plastic SMT or ceramic hermetic packages
- RoHS* Compliant

Applications

- MACOM KV CAPS™ are suitable for use in resonant circuits, as DC blocks and as RF bypass capacitors.

Description

The MACOM KV CAPS™ Si high voltage capacitors feature very high working voltage ratings, very low loss and excellent stability by virtue of their novel internal construction and very high quality dielectric layers. These capacitors are available in surface mount (SMT) plastic packages or in hermetic ceramic packages.

The capacitance tolerance is ±5% of nominal value. Contact the factory for other tolerance values.

These capacitors have high insulation resistance, low dissipation factor and low temperature coefficient, as well as excellent long term stability.

These capacitors are capable of meeting the environmental requirements of MIL-STD-750. and MIL-PRF-19500.

Available Packages[1]

1. Packages not to size, dimensions can be found on the MACOM website.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications: Working Voltage = 1000 V @ T_A = 25°C

Part Number	Capacitance (pF)	SMT Package Style (mm)
MKVC-1A03R6	3.6	3.4 X 2.5 X 0.9
MKVC-1A03R9	3.9	3.4 X 2.5 X 0.9
MKVC-1A04R3	4.3	3.4 X 2.5 X 0.9
MKVC-1A04R7	4.7	3.4 X 2.5 X 0.9
MKVC-1A05R1	5.1	3.4 X 2.5 X 0.9
MKVC-1A05R6	5.6	3.4 X 2.5 X 0.9
MKVC-1A06R2	6.2	3.4 X 2.5 X 0.9
MKVC-1A06R8	6.8	3.4 X 2.5 X 0.9
MKVC-1A07R5	7.5	3.4 X 2.5 X 0.9
MKVC-1A08R2	8.2	3.4 X 2.5 X 0.9
MKVC-1A09R1	9.1	3.4 X 2.5 X 0.9
MKVC-1A10R0	10	3.4 X 2.5 X 0.9
MKVC-1A11R0	11	3.4 X 2.5 X 0.9
MKVC-1A12R0	12	3.4 X 2.5 X 0.9
MKVC-1A13R0	13	3.4 X 2.5 X 0.9
MKVC-1A15R0	15	3.4 X 2.5 X 0.9
MKVC-1A18R0	18	3.4 X 2.5 X 0.9
MKVC-1A20R0	20	3.4 X 2.5 X 0.9
MKVC-1A22R0	22	3.4 X 2.5 X 0.9
MKVC-1A24R0	24	3.4 X 2.5 X 0.9
MKVC-1A27R0	27	3.4 X 2.5 X 0.9
MKVC-1A30R0	30	3.4 X 2.5 X 0.9
MKVC-1A33R0	33	3.4 X 2.5 X 0.9
MKVC-1A36R0	36	3.4 X 2.5 X 0.9
MKVC-1A39R0	39	3.4 X 2.5 X 0.9
MKVC-1A43R0	43	3.4 X 2.5 X 0.9
MKVC-1A47R0	47	3.4 X 2.5 X 0.9
MKVC-1A51R0	51	3.4 X 2.5 X 0.9
MKVC-1A56R0	56	3.4 X 2.5 X 0.9
MKVC-1A62R0	62	3.4 X 2.5 X 0.9
MKVC-1A68R0	68	3.4 X 2.5 X 0.9
MKVC-1A75R0	75	3.4 X 2.5 X 0.9
MKVC-1A82R0	82	3.4 X 2.5 X 0.9
MKVC-1A91R0	91	3.4 X 2.5 X 0.9
MKVC-1A0100	100	3.4 X 2.5 X 0.9

Part Number	Capacitance (pF)	SMT Package Style
MKVC-1A0110	110	4.3 x 3 x 0.9
MKVC-1A0120	120	4.3 x 3 x 0.9
MKVC-1A0130	130	4.3 x 3 x 0.9
MKVC-1A0150	150	4.3 x 3 x 0.9
MKVC-1A0160	160	4.3 x 3 x 0.9
MKVC-1A0180	180	4.3 x 3 x 0.9
MKVC-1A0200	200	4.3 x 3 x 0.9
MKVC-1A0220	220	4.3 x 3 x 0.9
MKVC-1A0240	240	4.3 x 3 x 0.9
MKVC-1A0270	270	4.3 x 3 x 0.9
MKVC-1A0300	300	4.3 x 3 x 0.9
MKVC-1A0330	330	4.3 x 3 x 0.9
MKVC-1A0360	360	4.3 x 3 x 0.9
MKVC-1A0390	390	4.3 x 3 x 0.9
MKVC-1A0430	430	4.3 x 3 x 0.9
MKVC-1A0470	470	4.3 x 3 x 0.9
MKVC-1A0510	510	4.3 x 3 x 0.9
MKVC-1A0560	560	4.3 x 3 x 0.9

Part Number	Capacitance (pF)	SMT Package Style
MKVC-1A0620	620	5.3 x 4 x 0.9
MKVC-1A0680	680	5.3 x 4 x 0.9
MKVC-1A0750	750	5.3 x 4 x 0.9
MKVC-1A0820	820	5.3 x 4 x 0.9
MKVC-1A0910	910	5.3 x 4 x 0.9
MKVC-1A1000	1000	5.3 x 4 x 0.9
MKVC-1A1100	1100	5.3 x 4 x 0.9
MKVC-1A1200	1200	5.3 x 4 x 0.9
MKVC-1A1300	1300	5.3 x 4 x 0.9

Consult factory for suggested hermetic package styles.

Electrical Specifications, T_A = 25 °C unless otherwise noted

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Temperature Coefficient of Capacitance	-55 °C ≤ T_A ≤ 125 °C	ppm/°C	—	—	50
Capacitance Tolerance	Wrt nominal value	%	-5	—	+5
Insulation Resistance	T_A = 25 °C, V = 800 V	GΩ	10	—	—
Equivalent Series Resistance	—	mΩ	—	750	—
Equivalent Series Inductance	—	nH	—	1.5	—

Absolute Maximum Ratings[2,3]

Parameter	Absolute Maximum
Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +200°C

2. Exceeding any one or more of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation near these survivability limits.

Handling Procedures

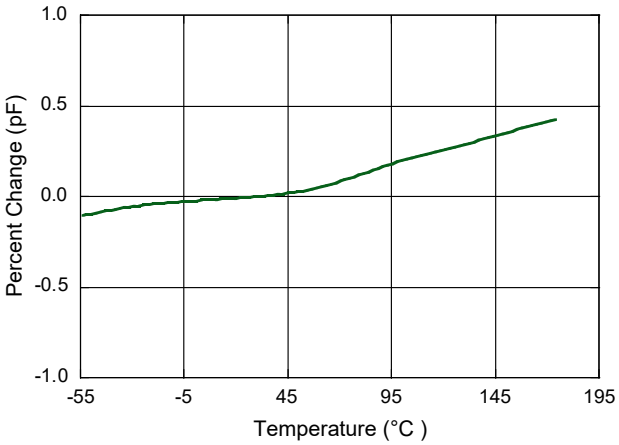
Please observe the following precautions to avoid damage:

Static Sensitivity

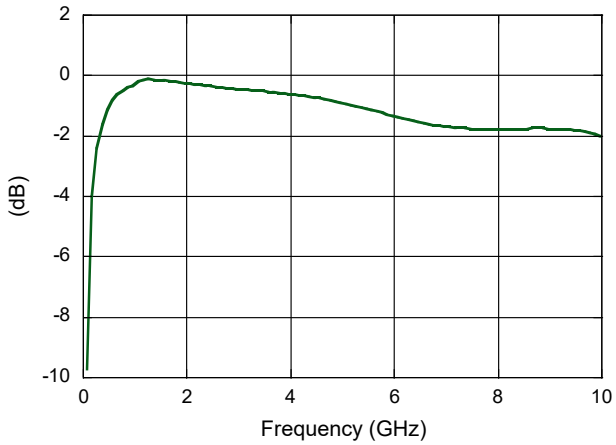
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

Percent Change in Capacitance vs. Temperature



Insertion Loss vs. Frequency



Data for a 10 pF capacitor - series connected

Assembly Instructions

KV CAPS™ may be attached to a circuit substrate using solder or conductive epoxy.

PCB Design for SMT Packaged Capacitors

These devices may be soldered to a PCB using lead (Pb)-bearing or RoHS-compatible solders. The layout of the surface mount board plays a critical role in product design and must be done properly to achieve the intended performance of the device. An accurate PCB pad and solder stencil design provides a proper connection interface between the device package and the board.With the correct pad geometry, the package will self-align when subjected to a solder reflow process and will also allow for just enough excess surface area for adequate solder filleting. The solder mask should be applied over bare copper (SMOBC) to avoid solder reflow under the solder mask. The plating on the PCB could be Electroless Nickel Immersion Gold (ENIG), Electroless Nickel Electroless Palladium Immersion Gold (ENEPIG) or tin plate.

Stencil Design

A stencil thickness of 0.100 to 0.125 mm is recommended. A laser-cut, stainless steel stencil with electro-polished trapezoidal walls is recommended. For consistent release of the solder paste from the stencil a nano coating may be applied to the stencil.

RoHS and Lead(Pb)-Based Reflow Profile Recommendations

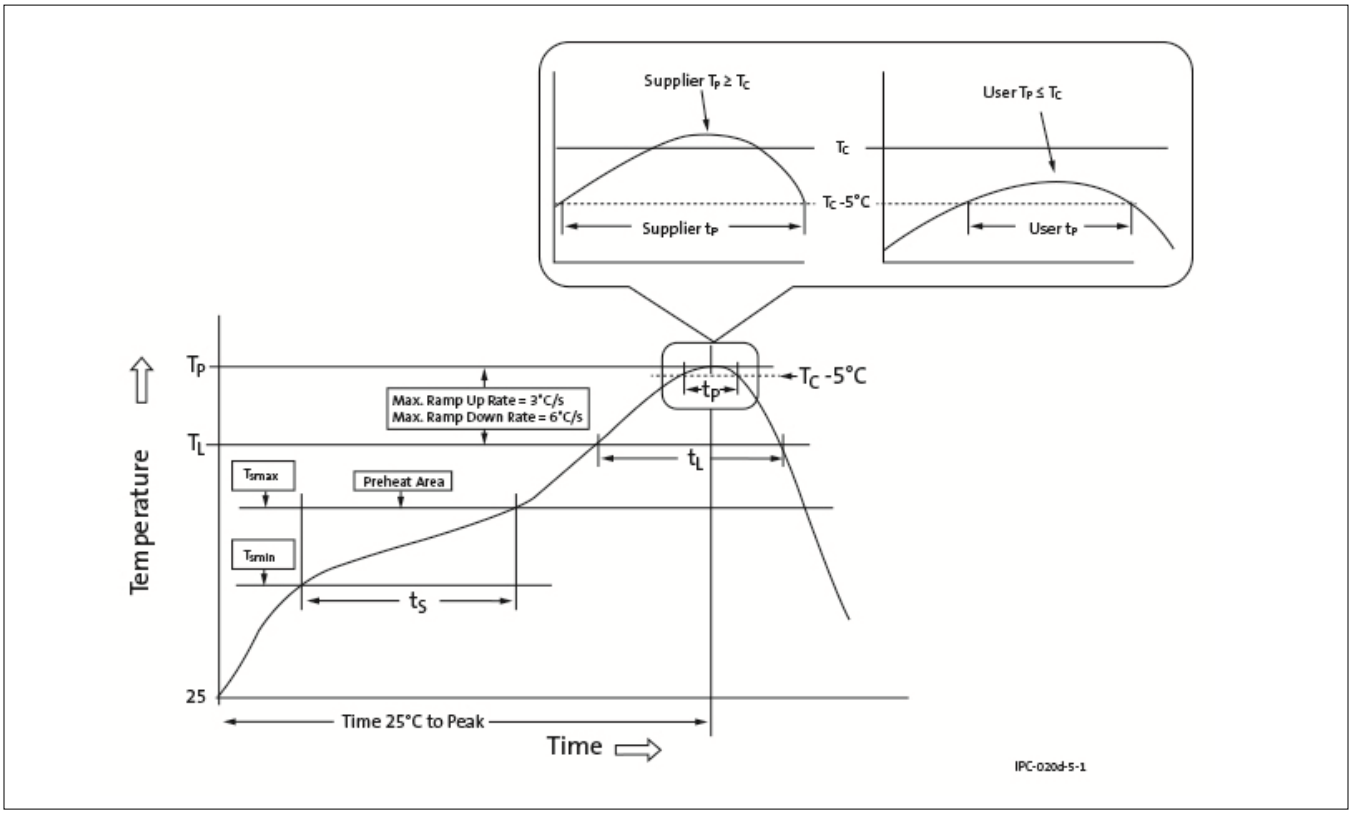
The most common solder reflow method for RoHS and lead based solders is accomplished in a belt furnace using convection heat transfer. Table 1 along with Figure 1 show a typical convection reflow profile of temperature versus time. The profile reflects the three distinct heating stages, or zones (preheat, reflow, and cooling) recommended in automated reflow processes to ensure reliable, finished solder joints. The profile will vary among soldering systems and is intended as an example to use as a starting point. Other factors that can affect the profile include the density and types of components on the board, type of solder used and type of board or substrate material being used. Thermocouples should be securely attached to the top surface of a representative component to ensure the temperature exposure requirements are met. The temperature profile should be recorded by data acquisition for future reference.

In these cases, the solder temperature profile recommended by the solder manufacturer should be utilized and shall not exceed the guidelines in the table below, for proper intermetallic formation.

It is important that the following maximum conditions must not be exceeded during the soldering process:

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat/Soak Temperature Min (TSmin) Temperature Max (TSmax) Time (ts) from (TSmin to TSmax)	100°C 150°C 60 – 120 seconds	150°C 200°C 60 – 120 seconds
Ramp-Up Rate (TL to TP)	3°C/second max.	3°C/second max.
Liquidous Temperature (TL) Time (tL) maintained above TL	183°C 60 – 150 seconds	217° 60 – 150 seconds
Peak package body temperature (TP)	For users TP must not exceed the Classification temperature in Table 4 For suppliers TP must not exceed the Classification temperature in Table 4	For users TP must not exceed the Classification temperature in Table 5 For suppliers TP must not exceed the Classification temperature in Table 5
Time (tP)* within 5°C of the specified Classification temperature (TC), see reflow profile	20* seconds	30* seconds
Ramp-Down Rate (TP) to (TL)	6°C/second max.	6°C/second max
Time 25° to Peak Temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile temperature (TP) is defined as a supplier minimum and a user maximum	—	—

Recommended Temperature Profile



Note 1: All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow (e.g., live-bug). If parts are reflowed in other than the normal live-bug assembly orientation (i.e., dead-bug), TP shall be within ±2°C of the live-bug TP and still meet the TC requirements, otherwise, the profile shall be adjusted to achieve the latter. To accurately measure actual peak package body temperatures refer the JEP140 for recommended thermocouple use.

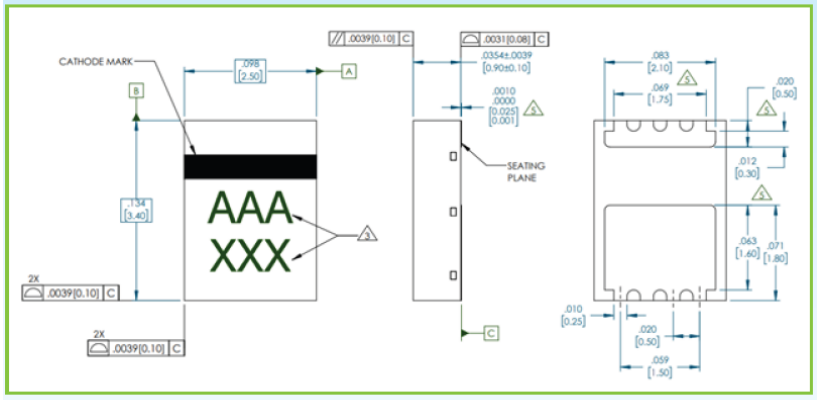
Note 2: Reflow profiles in this document are for classification/preconditioning and are not meant to specify board assembly profiles. Actual board assembly profiles should be developed based on specific process needs and board designs and should not exceed the parameters in Table 3. For example, if TC is 260°C and time tP is 30 seconds, this means the following for the supplier and the user. For a supplier: The peak temperature must be at least 260°. The time above 255°C must be at least 30 seconds. For a user: The peak temperature must not exceed 260°. The time above 255°C must not exceed 30 seconds.

Note 3: All components in the test load shall meet the classification profile requirements.

Note 4: SMD packages classified to a given moisture sensitivity level by using Procedures or Criteria defined within any previous version of J-STD-020, JESD22-A112 (rescinded), IPC-SM-786 (rescinded) do not need to be reclassified to the current revision unless a change in classification level or a higher peak classification temperature is desired.

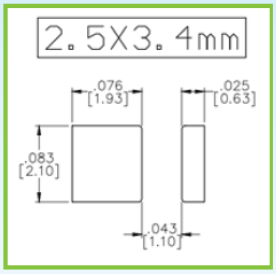
Outline Drawings

3.4 x 2.5 x 0.9 mm Package Outline



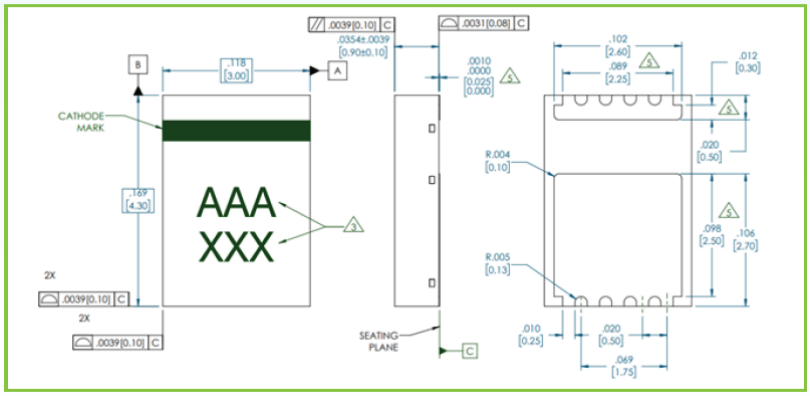
Note: Dimensions in [mm]; Lead Finish: Sn Plate

Recommended Land Pad



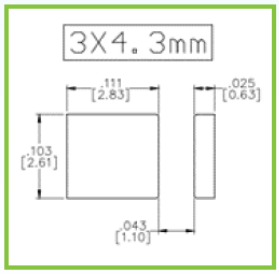
Note: Dimensions in [mm]

4.3 x 3.0 x 0.9 mm Package Outline



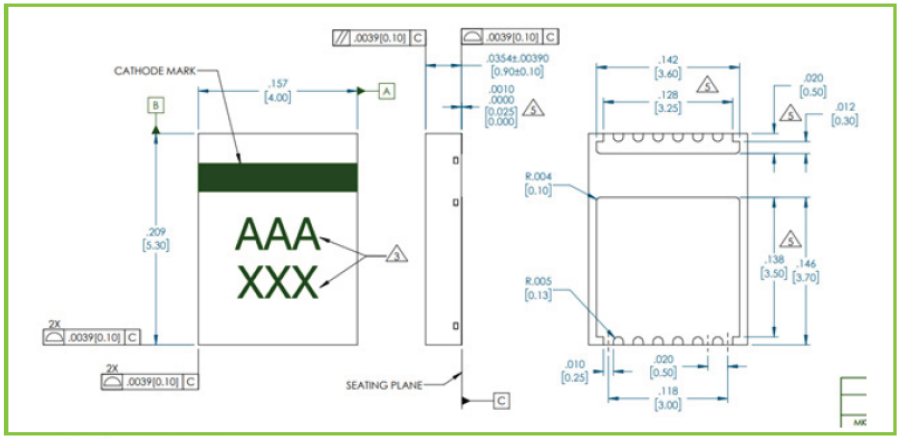
Note: Dimensions in [mm]; Lead Finish: Sn Plate

Recommended Land Pad



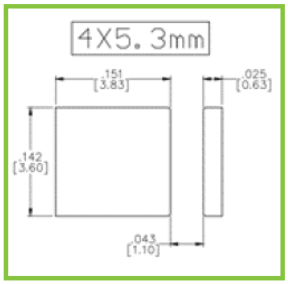
Note: Dimensions in [mm]

5.3 x 4.0 x 0.9 mm Package Outline



Note: Dimensions in [mm]; Lead Finish: Sn Plate

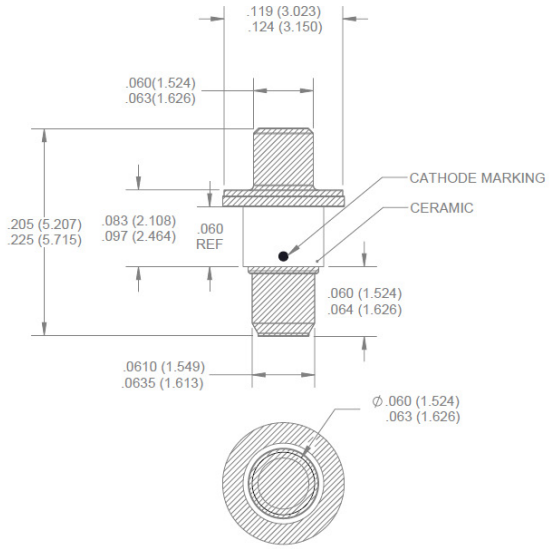
Recommended Land Pad

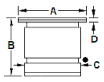


Note: Dimensions in [mm]

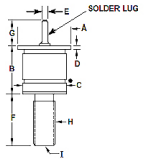
Outline Drawings

ODS-30



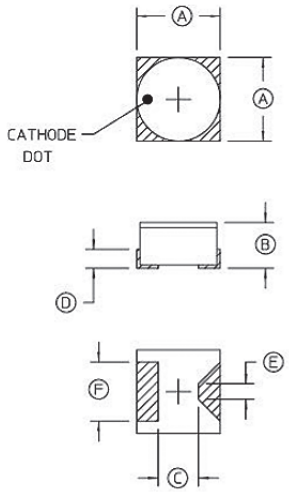


DIM.	Case Style 1027			
	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.304	0.316	7.72	8.02
B	0.254	0.270	6.45	6.86
C	0.245	0.255	6.22	6.48
D	0.023	0.031	0.58	0.79
	C_P = 0.45 pF			



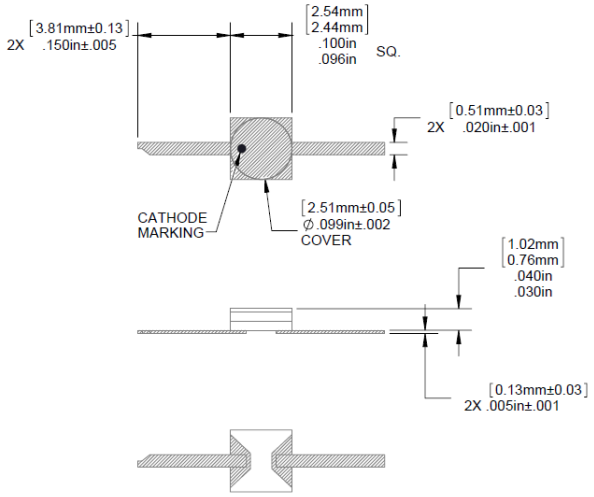
DIM.	Case Style 1082			
	Inches		Millimeters	
	Min.	Max.	Min.	Max.
A	0.304	0.316	7.72	8.02
B	0.286	0.292	7.26	7.42
C	0.245	0.255	6.22	6.48
D	0.023	0.031	0.58	0.79
E	0.060	0.065	1.52	1.65
F	0.281	0.305	7.14	7.75
G	0.190	0.205	4.83	5.21
H	6-40 UNF-3A			
I	0.072 SPLINE X 0.070 DP			
	C_P = 0.45 pF			

ODS-1056

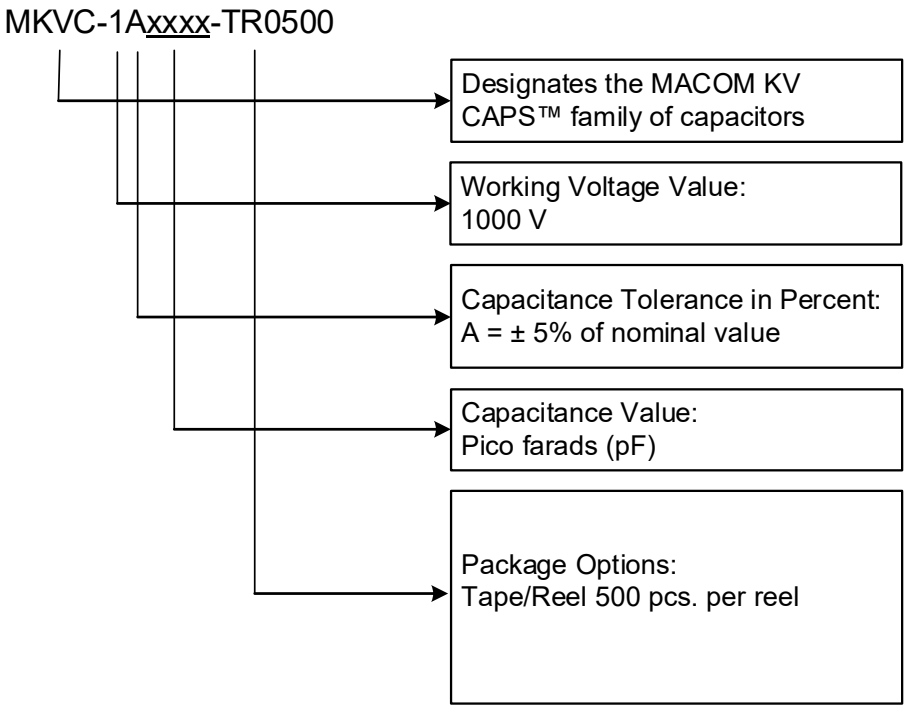


DIM.	INCHES		MM	
	MIN.	MAX.	MIN.	MAX.
A	.065	.075	1.65	1.91
B	.034	.041	0.86	1.04
C	.030	.036	0.76	0.91
D	.009	.021	.229	.533
E	.010	.014	.254	.356
F	.043	.053	1.09	1.35

ODS-186



Ordering Information:



Example: MKVC-1A09R1-TR0500 specifies a particular part from the MACOM KV CAPS™ Series

- whose working voltage is 1000 V
- whose capacitance tolerance is ± 5%,
- whose capacitance is 9.1 pF,
- which is shipped in tape and reel.

Consult factory for the part number and shipping quantities and packaging for ceramic packaged capacitors.