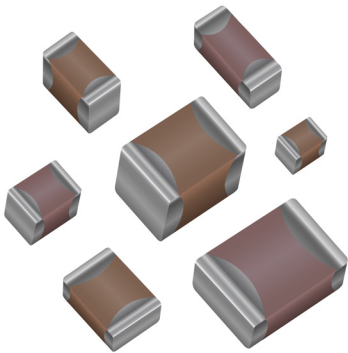


# MLCC Medical Applications – MM Series



## General Specifications



The AVX MM series is a multi-layer ceramic capacitor designed for use in medical applications other than implantable/life support. These components have the design & change control expected for medical devices and also offer enhanced LAT including reliability testing and 100% inspection.

### APPLICATIONS

#### Implantable, Non-Life Supporting Medical Devices

- e.g. implanted temporary cardiac monitor, insulin pumps

#### External, Life Supporting Medical Devices

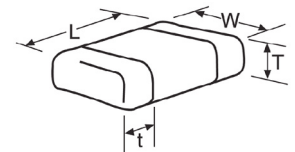
- e.g. heart pump external controller

#### External Devices

- e.g. patient monitoring, diagnostic equipment

### HOW TO ORDER

<b>MM02</b>	<b>Z</b>	<b>A</b>	<b>100</b>	<b>J</b>	<b>G</b>	<b>T</b>	<b>3</b>	<b>A</b>
Size	Rated Voltage	Dielectric Code	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Termination Finish	Packaging	Special Code
MM02 = 0402	Z = 10V	A = NP0 (COG)	(2 significant digits + number of zeros)	B = ±0.1pF	C = Standard Range	T = Plated Ni & Sn (NP0 only)	2 = 7" Reel	A = Standard
MM03 = 0603	Y = 16V	C = X7R	for values <10pF: letter R denotes decimal point.	C = ±0.25pF	Contact AVX for others	Z = Flexiterm (X7R only)	4 = 13" Reel	Contact AVX for others
MM05 = 0805	3 = 25V		Example: 68pF = 680	D = ±0.5pF				
MM06 = 1206	5 = 50V		8.2pF = 8R2	F = ±1% (≥10pF)				
MM10 = 1210	1 = 100V			G = ±2% (≥10pF)				
MM08 = 1808	2 = 200V			J = ±5%				
MM12 = 1812	V = 250V			K = ±10%				
MM20 = 2220	7 = 500V			M = ±20%				



### COMMERCIAL VS MM SERIES PROCESS COMPARISON

	Commercial	MM Series
<b>Administrative</b>	Standard part numbers; no restriction on who purchases these parts	Specific series part number, used to control supply of product
<b>Design</b>	Minimum ceramic thickness of 0.020" on all X7R product	Minimum ceramic thickness of 0.029" (0.74mm)
<b>Dicing</b>	Side & end margins = 0.003" min	Side & end margins = 0.004" min Cover layers = 0.003" min
<b>Lot Qualification Destructive Physical Analysis (DPA)</b>	As per EIA RS469	Increased sample plan – stricter criteria
<b>Visual/Cosmetic Quality</b>	Standard process and inspection	100% inspection
<b>Application Robustness</b>	Standard sampling for accelerated wave solder on X7R dielectrics	Increased sampling for accelerated wave solder on X7R and NP0 followed by lot by lot reliability testing
<b>Design/Change Control</b>	Required to inform customer of changes in: <ul style="list-style-type: none"> <li>• form</li> <li>• fit</li> <li>• function</li> </ul>	AVX will qualify and notify customers before making any change to the following materials or processes: <ul style="list-style-type: none"> <li>• Dielectric formulation, type, or supplier</li> <li>• Metal formulation, type, or supplier</li> <li>• Termination material formulation, type, or supplier</li> <li>• Manufacturing equipment type</li> <li>• Quality testing regime including sample size and accept/ reject criteria</li> </ul>

# MM Series – MLCC for Medical Applications

## NPO (COG) – Specifications & Test Methods



Parameter/Test		NPO Specification Limits	Measuring Conditions	
<b>Operating Temperature Range</b>		-55°C to +125°C	Temperature Cycle Chamber	
<b>Capacitance</b>		Within specified tolerance	Freq.: 1.0 MHz $\pm$ 10% for cap $\leq$ 1000 pF 1.0 kHz $\pm$ 10% for cap > 1000 pF Voltage: 1.0Vrms $\pm$ .2V	
<b>Q</b>		<30 pF: Q $\geq$ 400+20 x Cap Value $\geq$ 30 pF: Q $\geq$ 1000		
<b>Insulation Resistance</b>		100,000M $\Omega$ or 1000M $\Omega$ - $\mu$ F, whichever is less	Charge device with rated voltage for 60 $\pm$ 5 secs @ room temp/humidity	
<b>Dielectric Strength</b>		No breakdown or visual defects	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
<b>Resistance to Flexure Stresses</b>	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	$\pm$ 5% or $\pm$ .5 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3		
<b>Solderability</b>		$\geq$ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 $\pm$ 5°C for 5.0 $\pm$ 0.5 seconds	
<b>Resistance to Solder Heat</b>	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 $\pm$ 2 hours before measuring electrical properties.	
	Capacitance Variation	$\leq$ $\pm$ 2.5% or $\pm$ .25 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Thermal Shock</b>	Appearance	No visual defects	Step 1: -55°C $\pm$ 2°	30 $\pm$ 3 minutes
	Capacitance Variation	$\leq$ $\pm$ 2.5% or $\pm$ .25 pF, whichever is greater	Step 2: Room Temp	$\leq$ 3 minutes
	Q	Meets Initial Values (As Above)	Step 3: +125°C $\pm$ 2°	30 $\pm$ 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	$\leq$ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature	
<b>Load Life</b>	Appearance	No visual defects	Charge device with twice rated voltage in test chamber set at 125°C $\pm$ 2°C for 1000 hours (+48, -0).  Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	Capacitance Variation	$\leq$ $\pm$ 3.0% or $\pm$ .3 pF, whichever is greater		
	Q	$\geq$ 30 pF: Q $\geq$ 350 $\geq$ 10 pF, <30 pF: Q $\geq$ 275 +5C/2 <10 pF: Q $\geq$ 200 +10C		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Load Humidity</b>	Appearance	No visual defects	Store in a test chamber set at 85°C $\pm$ 2°C/ 85% $\pm$ 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.  Remove from chamber and stabilize at room temperature for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq$ $\pm$ 5.0% or $\pm$ .5 pF, whichever is greater		
	Q	$\geq$ 30 pF: Q $\geq$ 350 $\geq$ 10 pF, <30 pF: Q $\geq$ 275 +5C/2 <10 pF: Q $\geq$ 200 +10C		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

# MM Series – MLCC for Medical Applications

## NP0/COG Capacitance Range



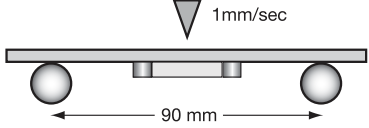
PREFERRED SIZES ARE SHADED

SIZE			0603				0805				1206			
	WVDC		16	25	50	100	16	25	50	100	16	25	50	100
Cap	0.5	0R5												
(pF)	1.0	1R0												
	1.2	1R2												
	1.5	1R5												
	1.8	1R8												
	2.2	2R2												
	2.7	2R7												
	3.3	3R3												
	3.9	3R9												
	4.7	4R7												
	5.6	5R6												
	6.8	6R8												
	8.2	8R2												
	10	100												
	12	120												
	15	150												
	18	180												
	22	220												
	27	270												
	33	330												
	39	390												
	47	470												
	56	560												
	68	680												
	82	820												
	100	101												
	120	121												
	150	151												
	180	181												
	220	221												
	270	271												
	330	331												
	390	391												
	470	471												
	560	561												
	680	681												
	820	821												
	1000	102												
	1200	122												
	1500	152												
	WVDC		16	25	50	100	16	25	50	100	16	25	50	100
	<b>SIZE</b>		<b>0603</b>				<b>0805</b>				<b>1206</b>			

# MM Series – MLCC for Medical Applications



## X7R Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
<b>Operating Temperature Range</b>		-55°C to +125°C	Temperature Cycle Chamber	
<b>Capacitance</b>		Within specified tolerance	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V	
<b>Q</b>	≤ 10% for ≥ 50V DC rating ≤ 12.5% for 25V DC rating ≤ 12.5% for 25V and 16V DC rating ≤ 12.5% for ≤ 10V DC rating			
<b>Insulation Resistance</b>		100,000MΩ or 1000MΩ - μF, whichever is less	Charge device with rated voltage for 120 ± 5 secs @ room temp/humidity	
<b>Dielectric Strength</b>		No breakdown or visual defects	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
<b>Resistance to Flexure Stresses</b>	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	≤ ±12%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
<b>Solderability</b>		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds	
<b>Resistance to Solder Heat</b>	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	≤ ±7.5%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Thermal Shock</b>	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 ± 2 hours at room temperature	
<b>Load Life</b>	Appearance	No visual defects	Charge device with 1.5 rated voltage (≤ 10V) in test chamber set at 125°C ± 2°C for 1000 hours (+48, -0)  Remove from test chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Load Humidity</b>	Appearance	No visual defects	Store in a test chamber set at 85°C ± 2°C/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.  Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

