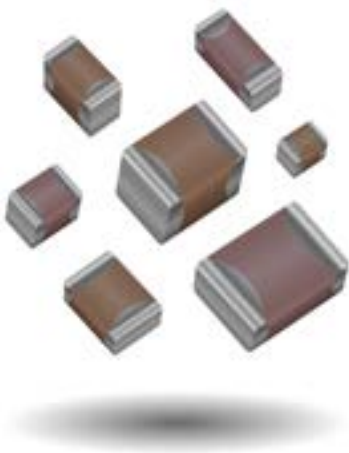


MLCC Medical Applications – MM Series

General Specifications



The 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

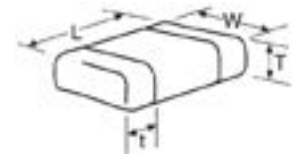
- e.g. heart pump external controller

External Devices

- e.g. patient monitoring, diagnostic equipment

HOW TO ORDER

MM02	Z	A	100	J	G	T	3	A
Size	Rated Voltage	Dielectric Code	Capacitance Code (In pF) (2 significant digits + number of zeros) for values <10pF: letter R denotes decimal point. Example: 68pF = 680 8.2pF = 8R2	Capacitance Tolerance	Failure Rate C = Standard Range Contact KYOCERA AVX for others	Termination Finish T = Plated Ni & Sn (NP0 only) Z = Flexitem (X7R only)	Packaging 2 = 7" Reel 4 = 13" Reel	Special Code A = Standard Contact KYOCERA AVX for others
MM02 = 0402 MM03 = 0603 MM05 = 0805 MM06 = 1206 MM10 = 1210 MM08 = 1808 MM12 = 1812 MM20 = 2220	Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V 2 = 200V V = 250V 7 = 500V	A = NP0 (C0G) C = X7R		B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% (≥10pF) G = ±2% (≥10pF) J = ±5% K = ±10% M = ±20%				

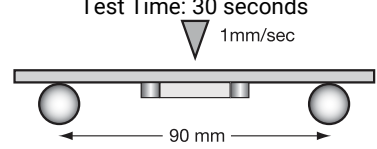


COMMERCIAL VS MM SERIES PROCESS COMPARISON

	Commercial	MM Series
Administrative	Standard part numbers; no restriction on who purchases these parts	Specific series part number, used to control supply of product
Lot Qualification Destructive Physical Analysis (DPA)	As per EIA RS469	Increased sample plan – stricter criteria
Visual/Cosmetic Quality	Standard process and inspection	100% inspection
Application Robustness	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
Design/Change Control	Required to inform customer of changes in: form fit function	KYOCERA AVX will qualify and notify customers before making any change to the following materials or processes: Dielectric formulation, type, or supplier Metal formulation, type, or supplier Termination material formulation, type, or supplier Manufacturing equipment type Quality testing regime including sample size and accept/ reject criteria

MM Series – MLCC for Medical Applications

NP0 (C0G) – Specifications & Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		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	
Q		<30 pF: Q $\geq$ 400+20 x Cap Value $\geq$ 30 pF: Q $\geq$ 1000		
Insulation Resistance		100,000M Ω or 1000M Ω - μ F, whichever is less	Charge device with rated voltage for 60 $\pm$ 5 secs @ room temp/humidity	
Dielectric Strength		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.	
Resistance to Flexure Stresses	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		
Solderability		$\geq$ 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	
Resistance to Solder Heat	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)		
Thermal Shock	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	
	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.	
Load Life	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)		
	Appearance	No visual defects		
Load Humidity	Capacitance Variation	$\leq \pm$ 5.0% or $\pm$.5 pF, whichever is greater	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.	
	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)		
	Appearance	No visual defects		

MM Series – MLCC for Medical Applications

NP0/C0G Capacitance Range

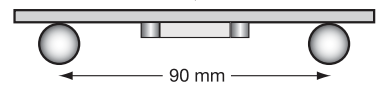


PREFERRED SIZES ARE SHADED

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
SIZE			0603				0805				1206			

MM Series – MLCC for Medical Applications

X7R Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$.2V	
Dissipation Factor		$\leq$ 10% for $\geq$ 50V DC rating $\leq$ 12.5% for 25V DC rating $\leq$ 12.5% for 25V and 16V DC rating $\leq$ 12.5% for $\leq$ 10V DC rating		
Insulation Resistance		100,000M Ω or 1000M Ω - μ F, whichever is less	Charge device with rated voltage for 120 $\pm$ 5 secs @ room temp/humidity	
Dielectric Strength		No breakdown or visual defects	Charge device with 250% 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.	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	$\leq \pm 12\%$		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3		
Solderability		$\geq$ 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	
Resistance to Solder Heat	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	$\leq \pm 7.5\%$		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: -55°C $\pm$ 2°	30 $\pm$ 3 minutes
	Capacitance Variation	$\leq \pm 7.5\%$	Step 2: Room Temp	$\leq$ 3 minutes
	Dissipation Factor	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 $\pm$ 2 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage ($\leq$ 10V) 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 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Load Humidity	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 and humidity for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

SIZE		0402			0603						0805						1206							1210							1808			1812					2220						
WVDC		16	25	50	10	16	25	50	100	200	10	16	25	50	100	200	250	10	16	25	50	100	200	250	500	10	16	25	50	100	200	250	500	50	100	200	50	100	200	250	25	50	100		
Cap	220	221																																											
(pF)	270	271																																											
	330	331																																											
	390	391																																											
	470	471																																											
	560	561																																											
	680	681																																											
	820	821																																											
	1000	102																																											
	1200	122																																											
	1500	152																																											
	1800	182																																											
	2200	222																																											
	2700	272																																											
	3300	332																																											
	3900	392																																											
	4700	472																																											
	5600	562																																											
	6800	682																																											
	8200	822																																											
cap	0.010	103																																											
uF	0.012	123																																											
	0.015	153																																											
	0.018	183																																											
	0.022	223																																											
	0.027	273																																											
	0.033	333																																											
	0.039	393																																											
	0.047	473																																											
	0.056	563																																											
	0.068	683																																											
	0.082	823																																											
	0.10	104																																											
	0.12	124																																											
	0.15	154																																											
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