MM Series – MLCC for Medical Applications

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

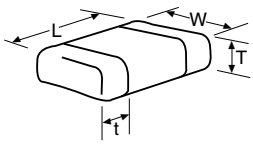
Implantable, Non-Life Supporting Medical Devices
- e.g. implanted temporary cardiac monitor, insulin pumps

External, Life Supporting Medical Devices
- e.g. heart pump external controller

External Devices
- e.g. patient monitoring, diagnostic equipment

HOW TO ORDER

MM02	Z	A	100	J	C	T	2	A
Size MM02 = 0402 MM03 = 0603 MM05 = 0805 MM06 = 1206 MM10 = 1210 MM08 = 1808 MM12 = 1812 MM20 = 2220	**Rated Voltage** Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V 2 = 200V V = 250V 7 = 500V	**Dielectric Code** A = NP0 (C0G) C = X7R	**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** B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% (≥10pF) G = ±2% (≥10pF) J = ±5% K = ±10% M = ±20%	**Failure Rate** C = Standard Range *Contact AVX for others	**Termination Finish** T = Plated Ni & Sn (NP0 only) Z = Flexiterm (X7R only)	**Packaging** 2 = 7" Reel 4 = 13" Reel	**Special Code** A = Standard *Contact AVX for others



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
Design	Minimum ceramic thickness of 0.020" on all X7R product	Minimum ceramic thickness of 0.029" (0.74mm)
Dicing	Side & end margins = 0.003" min	Side & end margins = 0.004" min Cover layers = 0.003" min
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	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

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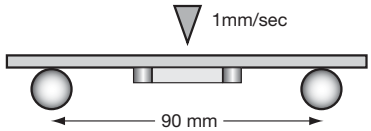
NP0 (C0G) – Specifications & Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF 1.0 kHz ± 10% for cap > 1000 pF Voltage: 1.0Vrms ± .2V	
Q		<30 pF: Q≥ 400+20 x Cap Value ≥30 pF: Q≥ 1000		
Insulation Resistance		100,000MΩ or 1000MΩ - µF, whichever is less	Charge device with rated voltage for 60 ± 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	±5% or ±.5 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
Solderability		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5ºC for 5.0 ± 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260ºC for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	≤ ±2.5% or ±.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: -55ºC ± 2º	30 ± 3 minutes
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater	Step 2: Room Temp	≤ 3 minutes
	Q	Meets Initial Values (As Above)	Step 3: +125ºC ± 2º	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 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with twice rated voltage in test chamber set at 125ºC ± 2ºC for 1000 hours (+48, -0). Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	Capacitance Variation	≤ ±3.0% or ± .3 pF, whichever is greater		
	Q (C=Nominal Cap)	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C		
	Insulation Resistance	≥ 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 85ºC ± 2ºC/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±5.0% or ± .5 pF, whichever is greater		
	Q	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

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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 (pF)	0.5	0R5											
	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			

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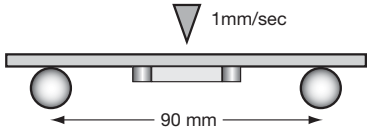
X7R Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V	
Dissipation Factor		≤ 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		
Insulation Resistance		100,000MΩ or 1000MΩ - µF, whichever is less	Charge device with rated voltage for 120 ± 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	≤ ±12%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
Solderability		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5ºC for 5.0 ± 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260ºC 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)		
Thermal Shock	Appearance	No visual defects	Step 1: -55ºC ± 2º	30 ± 3 minutes
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125ºC ± 2º	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	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage (≤ 10V) in test chamber set at 125ºC ± 2ºC 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)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85ºC ± 2ºC/ 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)		

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X7R Capacitance Range

PREFERRED SIZES ARE SHADED

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																																										
0.22	224																																										
0.33	334																																										
0.47	474																																										
0.56	564																																										
0.68	684																																										
0.82	824																																										
1.0	105																																										
1.2	125																																										
1.5	155																																										
	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
SIZE		0402			0603						0805							1206								1210								1808			1812				2220		