

## Automotive

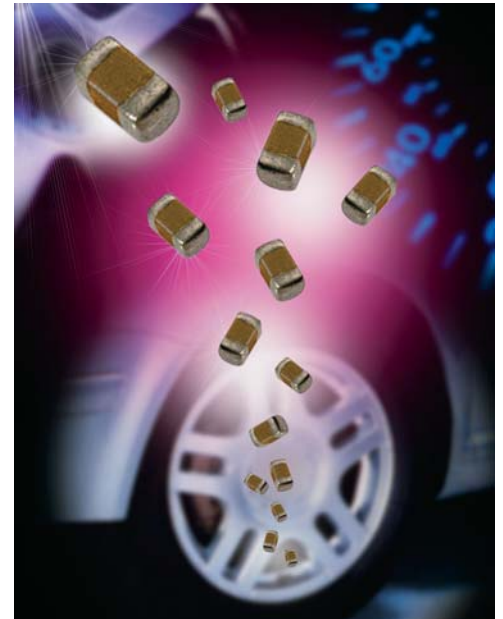
### GENERAL DESCRIPTION

AVX Corporation has supported the Automotive Industry requirements for Multilayer Ceramic Capacitors consistently for more than 10 years. Products have been developed and tested specifically for automotive applications and all manufacturing facilities are QS9000 and VDA 6.4 approved.

As part of our sustained investment in capacity and state of the art technology, we are now transitioning from the established Pd/Ag electrode system to a Base Metal Electrode system (BME).

AVX is using AECQ200 as the qualification vehicle for this transition. A detailed qualification package is available on request and contains results on a range of part numbers including:

- X7R dielectric components containing BME electrode and copper terminations with a Ni/Sn plated overcoat.
- X7R dielectric components, BME electrode with epoxy finish for conductive glue mounting.
- X7R dielectric components BME electrode and soft terminations with a Ni/Sn plated overcoat.
- NP0 dielectric components containing Pd/Ag electrode and silver termination with a Ni/Sn plated overcoat.



### HOW TO ORDER

0805	5	A	104	K	4	T	2	A
Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Terminations	Packaging	Special Code
0402	10V = Z	NP0 = A	2 Significant Digits + Number of Zeros	F = ±1% (≥10pF)* G = ±2% (≥10pF)* J = ±5% (≤1µF) K = ±10% M = ±20%	4 = Automotive	T = Plated Ni and Sn Z = FLEXITERM®*** U = Conductive Epoxy**	2 = 7" Reel 4 = 13" Reel	A = Std. Product
0603	16V = Y	X7R = C	e.g. 10µF = 106					
0805	25V = 3	X8R = F						
1206	50V = 5							
1210	100V = 1							
1812	200V = 2 500V = 7							

\*NP0 only

Contact factory for availability of Tolerance Options for Specific Part Numbers.

NOTE: Contact factory for non-specified capacitance values.  
0402 case size available in T termination only.

### COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

	Commercial	Automotive
<b>Administrative</b>	Standard Part Numbers. No restriction on who purchases these parts.	Specific Automotive Part Number. Used to control supply of product to Automotive customers.
<b>Design</b>	Minimum ceramic thickness of 0.020"	Minimum Ceramic thickness of 0.029" (0.74mm) on all X7R product.
<b>Dicing</b>	Side & End Margins = 0.003" min	Side & End Margins = 0.004" min Cover Layers = 0.005" 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.

All Tests have Accept/Reject Criteria 0/1

# Automotive MLCC

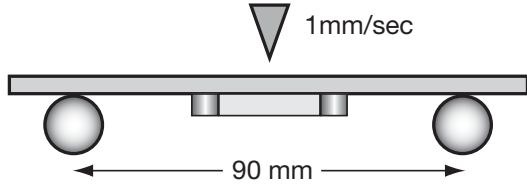


## NP0/X7R Dielectric

### FLEXITERM® FEATURES

a) Bend Test

The capacitor is soldered to the PC Board as shown:



b) Temperature Cycle testing

FLEXITERM® has the ability to withstand at least 1000 cycles between -55°C and +125°C

Typical bend test results are shown below:

Style	Conventional Term	Soft Term
0603	>2mm	>5
0805	>2mm	>5
1206	>2mm	>5

### ELECTRODE AND TERMINATION OPTIONS

#### NP0 DIELECTRIC

**NP0 Ag/Pd Electrode  
Nickel Barrier Termination  
PCB Application**

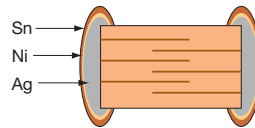


Figure 1 Termination Code T

#### X7R DIELECTRIC

**X7R Dielectric  
PCB Application**

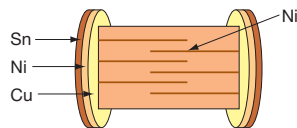


Figure 2 Termination Code T

**X7R Nickel Electrode  
Soft Termination  
PCB Application**

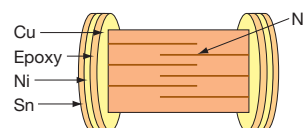


Figure 3 Termination Code Z

**Conductive Epoxy Termination  
Hybrid Application**

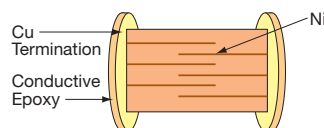


Figure 4 Termination Code U



# Automotive MLCC - NP0



## Capacitance Range

		0603			0805			1206					1210				1812	
		25V	50V	100V	25V	50V	100V	25V	50V	100V	200V	500V	25V	50V	100V	200V	50V	100V
100	10pF	G	G	G	J	J	J	J	J	J	J	J						
120	12	G	G	G	J	J	J	J	J	J	J	J						
150	15	G	G	G	J	J	J	J	J	J	J	J						
180	18	G	G	G	J	J	J	J	J	J	J	J						
220	22	G	G	G	J	J	J	J	J	J	J	J						
270	27	G	G	G	J	J	J	J	J	J	J	J						
330	33	G	G	G	J	J	J	J	J	J	J	J						
390	39	G	G	G	J	J	J	J	J	J	J	J						
470	47	G	G	G	J	J	J	J	J	J	J	J						
510	51	G	G	G	J	J	J	J	J	J	J	J						
560	56	G	G	G	J	J	J	J	J	J	J	J						
680	68	G	G	G	J	J	J	J	J	J	J	J						
820	82	G	G	G	J	J	J	J	J	J	J	J						
101	100	G	G	G	J	J	J	J	J	J	J	J						
121	120	G	G	G	J	J	J	J	J	J	J	J						
151	150	G	G	G	J	J	J	J	J	J	J	J						
181	180	G	G	G	J	J	J	J	J	J	J	J						
221	220	G	G	G	J	J	J	J	J	J	J	J						
271	270	G	G	G	J	J	J	J	J	J	J	J						
331	330	G	G	G	J	J	J	J	J	J	J	J						
391	390	G	G		J	J	J	J	J	J	J	J						
471	470	G	G		J	J	J	J	J	J	J	J						
561	560				J	J	J	J	J	J	J	J						
681	680				J	J	J	J	J	J	J	J						
821	820				J	J	J	J	J	J	J	J						
102	1000				J	J	J	J	J	J	J	J	J	J	J	J		
122	1200							J	J	J	J	J	J	J	M	M		
152	1500							J	M	M	M	M	J	J	M	M		
182	1800							J	M	M	M	M	J	J	M	M		
222	2200							J	M	M	M	M	J	J	M	M		
272	2700							J	M	Q			J	J	M			
332	3300							J	M	Q			J	J	P		K	K
392	3900												J	J	P		K	K
472	4700												J	J	P		K	K
103	10nF																	
		25V	50V	100V	25V	50V	100V	25V	50V	100V	200V	500V	25V	50V	100V	200V	50V	100V
		0603			0805			1206					1210				1812	

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSSED							

 = Under Development

# Automotive MLCC - X7R



## Capacitance Range

		0402			0603				0805				1206					1210				1812		2220				
		16V	25V	50V	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	500V	16V	25V	50V	100V	50V	100V	25V	50V
221	Cap .22																											
271	(nF) .27																											
331	.33																											
391	.39																											
471	.47																											
561	.56																											
681	.68																											
821	.82																											
102	1				G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
182	1.8				G	G	G	G		J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
222	2.2				G	G	G	G		J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
332	3.3				G	G	G	G		J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
472	4.7				G	G	G	G		J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
103	10				G	G	G	G		J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	K	K	
123	12				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
153	15				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
183	18				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
223	22				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
273	27				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
333	33				G	G	G			J	J	J	M		J	J	J	J	J			K	K	K	K	K	K	
473	47				G	G	G			J	J	J	M		J	J	J	M	J			K	K	K	K	K	K	
563	56				G	G	G			J	J	J	M		J	J	J	M	J			K	K	K	M	K	K	
683	68				G	G	G			J	J	J	M		J	J	J	M	J			K	K	K	M	K	K	
823	82				G	G	G			J	J	J	M		J	J	J	M	J			K	K	K	M	K	K	
104	100				G	G	G			J	J	M	M		J	J	J	M	J			K	K	K	M	K	K	
124	120									J	J	M			J	J	M	M				K	K	K	P	K	K	
154	150									M	N	M			J	J	M	M				K	K	K	P	K	K	
224	220									M	N	M			J	M	M	Q				M	M	M	P	M	M	
334	330									N	N	M			J	M	P	Q				P	P	P	Q	X	X	
474	470									N	N	M			M	M	P	Q				P	P	P	Q	X	X	
684	680									N	N				M	Q	Q	Q				P	P	Q	X	X	X	
105	Cap 1									N	N				M	Q	Q	Q				P	Q	Q	X	X	X	
155	(µF) 1.5														Q	Q						P	Q	Z	Z	X	X	
225	2.2														Q	Q						X	Z	Z	Z	Z	Z	
335	3.3																					X	Z	Z		Z		
475	4.7																					X	Z	Z		Z		
106	10																											Z
226	22																											Z
		16V	25V	50V	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	16V	25V	50V	100V	200V	500V	16V	25V	50V	100V	50V	100V	25V	50V
		0402			0603				0805				1206					1210				1812		2220				

= Under Development

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

# Automotive MLCC - X8R



## Capacitance Range

SIZE		0603		0805		1206	
	WVDC	25V	50V	25V	50V	25V	50V
271	Cap	G	G				
331	(pF)	G	G	J	J		
471	470	G	G	J	J		
681	680	G	G	J	J		
102	1000	G	G	J	J	J	J
152	1500	G	G	J	J	J	J
182	1800	G	G	J	J	J	J
222	2200	G	G	J	J	J	J
272	2700	G	G	J	J	J	J
332	3300	G	G	J	J	J	J
392	3900	G	G	J	J	J	J
472	4700	G	G	J	J	J	J
562	5600	G	G	J	J	J	J
682	6800	G	G	J	J	J	J
822	8200	G	G	J	J	J	J
103	Cap	G	G	J	J	J	J
123	(µF)	G	G	J	J	J	J
153	0.012	G	G	J	J	J	J
183	0.015	G	G	J	J	J	J
223	0.018	G	G	J	J	J	J
273	0.022	G	G	J	J	J	J
333	0.027	G	G	J	J	J	J
393	0.033	G	G	J	J	J	J
473	0.039	G	G	J	J	J	J
563	0.047	G	G	J	J	J	J
683	0.056	G		N	N	M	M
823	0.068	G		N	N	M	M
104	0.082			N	N	M	M
124	0.1			N	N	M	M
154	0.12			N	N	M	M
184	0.15			N	N	M	M
224	0.18			N		M	M
274	0.22			N		M	M
334	0.27					M	M
394	0.33					M	M
474	0.39					M	
564	0.47					M	
684	0.68						
824	0.82						
105	1						
	WVDC	25V	50V	25V	50V	25V	50V
SIZE		0603		0805		1206	

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER					EMBOSSED							

= AEC-Q200 Qualified