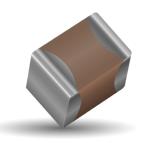
### **Automotive MLCC**

### **General Specifications**



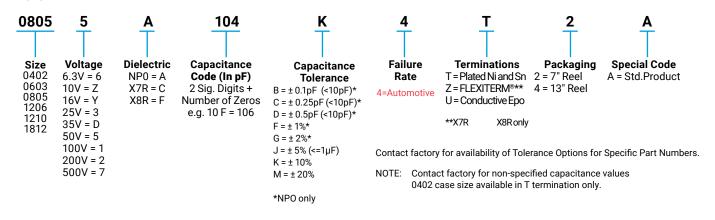


#### **GENERAL DESCRIPTION**

KYOCERA AVX has supported the Automotive Industry requirements for Multilayer Ceramic Capacitors consistently for more than 25 years. Products have been developed and tested specifically for automotive applications and all manufacturing facilities are QS9000 and VDA 6.4 approved.

KYOCERA 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.

#### **HOW TO ORDER**



#### COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

	Commercial	Automotive
Administrative	Standard Part Numbers. No restriction on who purchases these parts.	Specific Automotive Part Number. sed to control supply of product to Automotive customers.
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.

All Tests have Accept/Reject Criteria 0/1

## **Automotive MLCC**

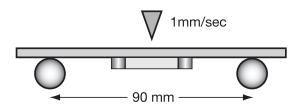
### **NP0/X7R Dielectric**



#### **FLEXITERM FEATURES**

a) Bend Test

The capacitor is soldered to the PC Board as shown:



Typical bend test results are shown below:

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

a) Temperature Cycle testing FLEXITERM® has the ability to withstand at least 1000 cycles between -55°C and +125°C

# **Automotive MLCC-NP0**



## **Capacitance Range**

Case	Size		0402				0603						0805							12	206							1210			
Length (L)	mm (in.)	(0	1.00 ± 0.1 040 ± 0.0	0		(0	1.60 ± 0.1 .063 ± 0.0	5					2.01 ± 0.20 079 ± 0.00								± 0.20 ± 0.008)							3.20 ± 0.20 .126 ± 0.00			
Width (W)	mm (in.)	1	0.50 ± 0.0 020 ± 0.0	0			0.81 ± 0.1 .032 ± 0.0	5				1	0.79 ± 0.00 0.25 ± 0.20 0.49 ± 0.00							1.60	± 0.20 ± 0.008)							2.50 ± 0.0 0.098 ± 0.0	0		
Terminal (t)	mm (in.)	1	0.25 ± 0.1 010 ± 0.0	5			0.35 ± 0.1 .014 ± 0.0	 5					0.50 ± 0.25 020 ± 0.0	 5						0.50								0.50 ± 0.2 .020 ± 0.0	5		
CAP	CAP Code	25	50	100	25	50	100	200	250	25	50	100	200	250	500	630	25	50	100	200	250	500	630	1000	50	100	200	250	500	630	1000
0.5	0R5	С	С	С	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
5	1R0 5R0	C	C	C	G G	G	G	G G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	Q Q	Q	J	J	J	J	J	J	J
10	100	С	С	С	G	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
12	120	С	С	С	G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
15	150	С	С	С	G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
18	180	С	С	С	G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
22	220	С	С	С	G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
27 33	270 330	С	C	С	G G	G	G	G G	G G	J	J J	J	J	J J			J	J	J	J	J	J	Q Q	Q	J	J	J	J	J	J	J
39	390	С	С	С	G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
47	470	С	С		G	G	G	G	G	J	J	J	J	J			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
56	560	С	С		G	G	G	G		J	J	J	J	N			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
68	680	С	С		G	G	G	G		J	J	J	J	N			J	J	J	J	J	J	Q	Q	J	J	J	J	J	J	J
82	820	С	С		G	G	G	G		J	J	J	J	N			J	J	J	J	J	J	Q	Q	N	N	N	N	N	N	N
100 120	101	С	С		G G	G	G	G		J	J	J	J	N N			J	J	J	J	J	J	Q	Q	N N	N N	N	N P	N P	N P	N
150	121 151				G	G	G			J	J	J	J	N N			J	J	J	J	J	J	Q	Q	N N	N	N N	P	P	P	X
180	181				G	G	G			J	J	J	J	N			J	J	J	J	J	J	Q	Q	N	N	N	P	P	P	X
220	221				G	G	G			J	J	J	J	N			J	J	J	J	J	J	Q	Q	N	N	N	P	P	P	X
270	271				G	G	G			J	J	J	J	N			J	J	J	J	J	J	Q		N	N	N	Р	Р	Р	Х
330	331				G	G	G			J	J	J	J	N			J	J	J	J	J	J	Q		N	N	N	Р	Р	Р	Х
390	391				G	G	G			J	J	J	J				J	J	J	J	J	J	Q		N	N	N	Р	P	P	Х
430 470	431 471				G	G	-			J	J	J	J				J	J	J	J	J	J	Q		N	N	N	P P	P	P P	X
560	561				G G	G				J	J	J	J				J	J	J	J	M	J Q	Q Q		N N	N N	N N	P	P	P	Х
680	681				G	G				J	J	J					J	J	J	J	M	0	Q		N	N	N	P	P	P	$\vdash$
1,000	102				G	G				J	J	J					J	J	J	J	М	Q	Q		N	N	N	Р	Р	Х	
1,200	122				G	G				J	J						N	N	N	N					N	N	N	Р	Р		
1,500	152				G	G				J	J						N	N	N	N					N	N	N	P	Р		
2,200	222				G	<u> </u>				J	J						J	J	J	J	J	J	J		N	N	N	Р	K	K	$\vdash$
2,700 3,300	272 332				G G												J M	J	J	J M	J M	J	J M						K	K	$\vdash$
3,900	392				G	-	-										M	M	M	M	M	M	M			-			M	M	$\vdash$
4,700	472				G												P	P	P	P	P	P	P						M	M	
5,600	562				G																								М	М	
6,800	682				G																								N	N	
8,200	822				G																								Р	Р	
10,000	103				G	<u> </u>				<u> </u>	_							<u> </u>	-	<u> </u>	<u> </u>			-	<u> </u>	<u> </u>	<u> </u>	X	Х	Х	$\vdash$
12,000	123 153					-	-			-								-	-	-	<u> </u>			-	-	<u> </u>	<u> </u>	X	-	<del></del>	$\vdash\vdash\vdash$
15,000 18,000	183													-					1					1	-			X		-	$\vdash\vdash$
22,000	223										$\vdash$				$\vdash$									<u> </u>				X			$\vdash$
27,000	273																											Х			$\Box$
33,000	333																											Х			
39,000	393																														
47,000	473																	ļ		<u> </u>				_		<u> </u>			ļ	<u> </u>	$\sqcup$
56,000 68,000	563 683					-				-	$\vdash$			_	$\vdash$			-	-	-	-			-	-		-	-	-	_	$\vdash\vdash$
82,000	823		<b>-</b>				<del>                                     </del>		<b>-</b>					_	$\vdash$		<b>-</b>	<del>                                     </del>					<del>                                     </del>		<u> </u>	<u> </u>	<del>                                     </del>		<u> </u>	_	$\vdash\vdash$
100,000	104																														$\vdash$
CAP	CAP	25	50	100	25	50	100	200	250	25	50	100	200	250	500	630	25	50	100	200	250	500	630	1000	50	100	200	250	500	630	1000
Case	Code		0402				0603						0805								206				1210						
Case	0.26		0402				0003						0003							. 12								1210			

Letter	А	С	Е	G	J	K	М	N	Р	Q	Х	Υ	Z
Max.	0.33	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79
Thickness	(0.013)	(0.022)	(0.028)	(0.035)	(0.037)	(0.040)	(0.050)	(0.055)	(0.060)	(0.070)	(0.090)	(0.100)	(0.110)
			PAPER						EMBC	SSED			

# **Automotive MLCC - X7R**



## **Capacitance Range**

	Size			102					0603								305							1206							10				312			22			
S	oldering		Reflov	v/Wave				F	Reflow/W	ave						Reflow	v/Wave						Re	flow/Wa	ive					Reflo	w Only			_	w Only			Reflov	/ Only		
(L) Length	mm (in.)		1 ± (0.04 ±	0.1 0.004)				(0	1.6 ± 0.1 .063 ± 0.	15 006)						2.01 (0.079	± 0.2 ± 0.008)							3.2 ± 0.2 26 ± 0.0						3.2 (0.126	± 0.2 ± 0.008)			0.0	77 ± 112)			5.7 ± (0.224	: 0.5 ± 0.02)		
(W) Width	mm (in.)		0.5 (0.02 ±	± 0.1 ± 0.004)					0.81 ± 0. .032 ± 0.							1.25 (0.049	± 0.2 ± 0.008)						(0.0	1.6 ± 0.2 163 ± 0.0	: (08)					2.5 (0.098	± 0.2 ± 0.008)			(0.1 0.0	,			5± (0.197±	0.4 : 0.016)		
(t) Termina	mm I (in.)		0.25 (0.01 ±	± 0.15 ± 0.006)					0.35 ± 0. .014 ± 0.							0.5 ± (0.02 :								0.5 ± 0.2 02 ± 0.0							: 0.25 ± 0.01)			0.61 : (0.0 0.0	124 ±			0.64 5			
	WVDC	6.3V	16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	6.3V	10V	16V	25V	50V	100V	200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	200V	250V	50V	100V	25V	50V	100V	200V	250V	500V
101	100												-				-															М	Q						$\vdash$	$\dashv$	
221	220 270		С	С	С	G	G	G	G	G	G	-		$\vdash$					_	$\vdash$							$\vdash$	_	-	$\vdash$	-	M	Q				-		$\overline{}$	$\dashv$	-
331	330		С	С	С	G	G	G	G	G	G			$\vdash$																		м	Q						-	$\dashv$	-
391	390		С	С	С	G	G	G	G	G	G																					М	Q						-	$\dashv$	$\neg$
471	470		С	С	С	G	G	G	G	G	G			H																		М	Q							$\neg$	
561	560		С	С	С	G	G	G	G	G	G																					М	Q								
681	680		С	С	С	G	G	G	G	G	G																					М	Q						$\perp$		
821	820		С	С	С	G	G	G	G	G	G	_	_																			М	Q						$\vdash$		
102	1000		С	С	С	G	G	G	G	G	G	G	├	$\vdash \vdash \mid$	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	M	Q	K	K				$\vdash$	$\dashv$	
122	1220 1500	-	С	С	С	G	G	G	G	G	G	G	$\vdash$	$\vdash \vdash \vdash$	J	J	J	J	J	J J	J	J	J	J	J	J	J	K	K	K	K	M	Q	K	K	<del>                                     </del>			$\overline{}$	$\dashv$	$\dashv$
182	1800		С	С	С	G	G	G	G	G	G	G		H	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	м	Q	K	K				$\overline{}$	$\dashv$	-
222	2200		С	С	С	G	G	G	G	G	G	G		H	J	J	J	J	J	J	J	J	J	J	J	J	J	К	К	К	К	M	Q	К	К				$\dashv$	$\dashv$	$\dashv$
272	2700		С	С	С	G	G	G	G	G	G	G			J	J	J	J	J	J	J	J	J	J	J	J	J	К	К	К	К	М	Q	К	К				$\Box$	$\neg$	$\neg$
332	3300		С	С	С	G	G	G	G	G	G	G			J	J	J	J	J	J	J	J	J	J	J	J	J	K	К	К	К	М	Q	К	К						
392	3900		С	С	С	G	G	G	G	G	G	G			J	J	J	J	J	J	J	J	J	J	J	J	٦	K	К	К	K	М	Q	К	K						
472	4700		С	С	С	G	G	G	G	G	G	G		$\sqcup$	J	J	J	J	J	J	J	J	J	J	J	J	J	К	К	К	K	М	Q	К	K				$\longrightarrow$		
562	5600		С	С	С	G	G	G	G	G	G	G	_	$\vdash$	J	J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	М	Q	K	K		-		$\vdash$	$\dashv$	
682 822	6800 8200	-	С	С	С	G	G	G	G	G	G	G		$\vdash$	J	J J	J	J	J	J	J	J	J	J	J	J	J	K	K	K	K	M	Q	K	K		-		$\rightarrow$	$\dashv$	
103	Cap 0.01		С	C	С	G	G	G	G	G	G	G	-	$\vdash$	J	J	J	J	J	J	J	J	J	J J	J	J	J	K	K	K	K	M	Q	K	K				$\vdash$	$\dashv$	
123	(uF) 0.012		С	"		G	G	G	G	G	"	G		Н	J	J	J	N	N	N	J	J	J	J	J	J	J	K	K	K	K	м	Q	K	K		-		$\neg$	$\dashv$	$\dashv$
153	0.015		С			G	G	G	G	G				Н	J	J	J	N	N	N	J	J	J	J	J	J		К	К	К	К	М	Q	К	К				-	$\neg$	$\neg$
183	0.018		С			G	G	G	G	G				М	J	J	J	N	N	N	J	J	J	J	J	J		К	К	К	К	М	Q	К	К				$\neg$	$\neg$	$\neg$
223	0.022		С			G	G	G	G	G		Ī	İ		J	J	J	N	N	N	J	J	J	J	Q	Q		К	К	К	К	М	Q	К	К				П		$\neg$
273	0.027		С			G	G	G	G	J					J	J	J	N	N	N	J	J	J	J	Q	Q		K	К	К	K	М	Q	К	К						
333	0.033		С			G	G	G	G	J	_			Ш	J	J	J	N	N	N	J	J	J	J	Q	Q		К	К	К	К	М	Q	К	K				$\sqcup$		
393	0.039	_				G	G	G	G	J	_	_		$\vdash$	J	J	J	N	N	N	J	J	J	J	Q	Q		K	K	K	K	М	Q	K	K				$\vdash$	$\dashv$	
473 563	0.047 0.056	-				G	G	G	G	J	-	$\vdash$		$\vdash$	J	J	J	N N	N	N	J	J	J	M	Q Q	Q Q		K	K	K	K M	M	Q	K	K		-		-	$\rightarrow$	
683	0.056					G	G	G	G	J		$\vdash$		$\vdash$	J	J	J	N		$\vdash$	J	J	J	M	Q	Q	$\vdash$	K	K	K	M	M	Q	K	K		-	_	$\overline{}$	$\dashv$	$\dashv$
823	0.082					G	G	G	G	J				$\vdash$	J	J	J	N			J	J	J	м	Q	Q		K	K	К	м	Q	Q	К	K				-	$\dashv$	-
104	0.1					G	G	G	G	J		<u> </u>		$\vdash \vdash$	J	J	J	N			J	J	J	М	Q	Q		К	К	К	М	Q	Q	К	К					$\neg$	Х
124	0.12					G	J	J			1				J	J	N	N			J	J	М	М	Q	Q		К	К	К	Р	Q	Q	К	К				$\neg$	$\neg$	
154	0.15					G	J	J							М	N	N	N			J	J	М	М	Q	Q		К	К	К	Р	Q	Q	К	К						
224	0.22					G	J	J						Щ	М	N	N	N			J	М	М	Q	Q	Q		М	М	М	Р	Q	Q	М	М				Щ		
334	0.33	_	$\vdash$	<u> </u>	<u> </u>	<u> </u>	1	╄	1	╄	1	_	<u> </u>	$\sqcup$	N	N	N	N		Ш	J	М	Р	Q		<u> </u>		Р	Р	Р	Q	Z	Z	Х	Х				$\vdash$		
474	0.47	-	<u> </u>	-	<u> </u>	-	+	-	+	-	-	-	-	$\vdash \vdash \vdash$	N	N	N	N		$\square$	М	М	P	Q	$\vdash$	<u> </u>	$\vdash$	P	P	P	Q	<u> </u>	-	X	X	_	$\square$			$\longrightarrow$	
684	0.68	0	$\vdash$	1	$\vdash$	$\vdash$	+	+	+	+	+	+-	1	$\vdash\vdash\vdash$	N	N	N	N		$\vdash$	М	Q	Q	Q		_	$\vdash$	P P	P	Q	Z	$\vdash$	$\vdash$	X	X	-	Z	7	_		-
105	1.5	U	$\vdash$	1		$\vdash$	+	+	+	+	+	+	1	$\vdash\vdash\vdash$	N N	N N	N N	N		$\vdash$	M Q	Q	Q Q	Q		-	$\vdash$	P	Q	Q Z	Z		$\vdash$	X	X		Z	Z	Z	X Z	$\dashv$
225	2.2	_	$\vdash$	$\vdash$		$\vdash$	+	+	+	+	+	<u> </u>	$\vdash$	$\vdash \vdash$	N	N	N			$\vdash$	Q	Q	Q	Q			$\vdash$	Z	Z	Z	Z		$\vdash$	Z	Z		Z	Z			$\dashv$
335	3.3	_				t	T	T	T	T	T			$\vdash \vdash$						$\Box$	Q	Q	Q					х	Z	Z	Z			Z			Z	Z		$\dashv$	$\dashv$
475	4.7																				Q	Q	Q					х	Z	Z	Z			Z			Z	Z		$\Box$	$\Box$
106	10	_											Р	Р							Q							Z	Z	Z				Z		Z	Z	Z			
226	22													Щ																						Z			$\Box$		
	WVDC	6.3V	16V	25V	50V	10V	16V	25V		100V	200V	250V	6.3V	10V	16V	25V			200V	250V	16V	25V	50V	100V	200V	250V	500V	16V	25V	50V	100V	200V	250V	50V	100V	25V	50V		-	250V	500V
	Size			0402					0603								0	805						1206						12	10			18	512			22	20		

Letter	Α	С	E	G	J	K	М	N	Р	Q	Х	Υ	Z
Max.	0.33	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79
Thickness	(0.013)	(0.022)	(0.028)	(0.035)	(0.037)	(0.04)	(0.05)	(0.055)	(0.060)	(0.07)	(0.09)	(0.1)	(0.11)
			PAPER						FMR	OSSED			

# **Automotive MLCC - X8R**



## **Capacitance Range**

	SIZE			0603			0805		1206 Reflow/Wave			
	Soldering	]		Reflow/Wave			Reflow/Wave		Reflow	//Wave		
WVDC	W	VDC	25V	50V	100V	25V	50V	100V	25V	50V		
472	pF	4700	G	G	G	J	J	J	J	J		
562		5600	G	G	G	J	J	J	J	J		
682		6800	G	G	G	J	J	J	J	J		
822		8200	G	G	G	J	J	J	J	J		
103	uF	0.01	G	G	G	J	J	J	J	J		
123		0.012	G	G		J	J	N	J	J		
153		0.015	G	G		J	J	N	J	J		
183		0.018	G	G		J	J	N	J	J		
223		0.022	G	G		J	J	N	J	J		
273		0.027	G	G		J	J		J	J		
333		0.033	G	G		J	J		J	J		
393		0.039	G	G		J	J		J	J		
473		0.047	G	G		J	J		J	J		
563		0.056	G			N	N		М	М		
683		0.068	G			N	N		М	М		
823		0.082				N	N		М	М		
104		0.1				N	N		М	М		
124		0.12				N	N		М	М		
154		0.15				N	N		М	М		
184		0.18				N			М	М		
224		0.22				N			М	М		
274		0.27							М	М		
334		0.33							М	М		
394		0.39							М	М		
474		0.47							М	Q		
684		0.68							Q	Q		
824		0.82							Q	Q		
105		1							Q	Q		
WVDC	W	/DC	25V	50V	100V	25V	50V	100V	25V	50V		
	SIZE			0603			0805		12	206		

Letter	Α	С	Е	G	J	K	М	N	Р	Q	Χ	Υ	Z
Max.	0.33	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79
Thickness	(0.013)	(0.022)	(0.028)	(0.035)	(0.037)	(0.040)	(0.050)	(0.055)	(0.060)	(0.070)	(0.090)	(0.100)	(0.110)
			PAPER						EMBC	SSED			