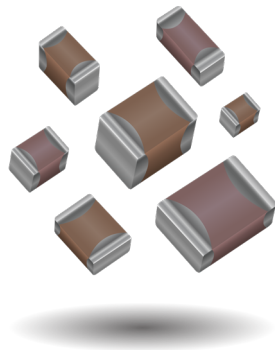


MLCC Tin/Lead Termination "B" (LD Series)

C0G (NP0) – General Specifications



KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a "B" in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX's commitment to providing a full range of products to our customers. KYOCERA AVX has provided in the following pages a full range of values that we are currently offering in this special "B" termination. Please contact the factory if you require additional information on our MLCC Tin/Lead Termination "B" products.

PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

Not RoHS Compliant

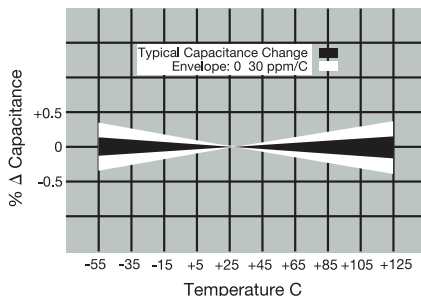
LD05	5	A	101	J	A	B	2	A
Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Terminations	Packaging	Special Code
LD02 - 0402 LD03 - 0603 LD04 - 0504* LD05 - 0805 LD06 - 1206 LD10 - 1210 LD12 - 1812 LD13 - 1825 LD14 - 2225 LD20 - 2220	6.3V = 6 10V = Z 16V = Y 25V = 3 35V = D 50V = 5 100V = 1 200V = 2 500V = 7	C0G (NP0) = A X7R = C X5R = D X8R = F	2 Sig. Digits + Number of Zeros	B = ± 10 pF (<10pF) C = ± 25 pF (<10pF) D = ± 50 pF (<10pF) F = $\pm 1\%$ (≥ 10 pF) G = $\pm 2\%$ (≥ 10 pF) J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	A = Not Applicable 4 = Automotive	B = 5% min lead X = FLEXITERM® with 5% min lead** **X7R only	2 = 7" Reel 4 = 13" Reel Contact Factory For Multiples*	A = Std. Product

*LD04 has the same CV ranges as LD03.

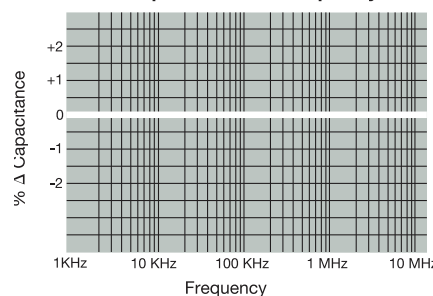
See FLEXITERM® section for CV options

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

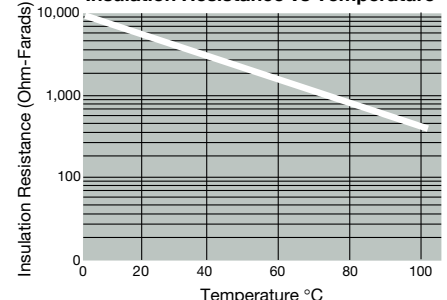
Temperature Coefficient



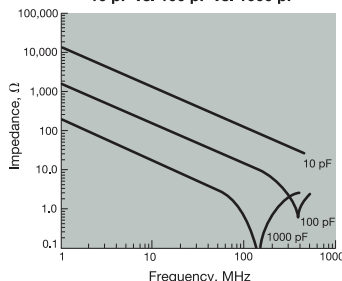
Δ Capacitance vs. Frequency



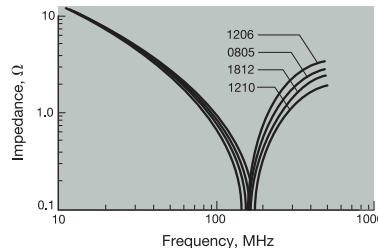
Insulation Resistance vs Temperature



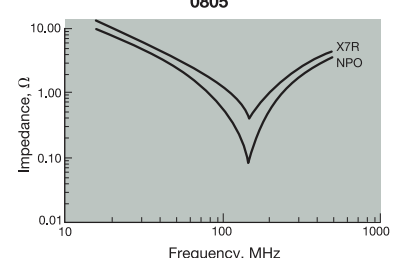
Variation of Impedance with Cap Value
Impedance vs. Frequency
0805 - C0G (NP0)
10 pF vs. 100 pF vs. 1000 pF



Variation of Impedance with Chip Size
Impedance vs. Frequency
1000 pF - C0G (NP0)

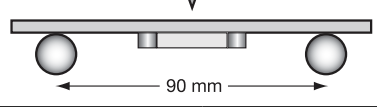


Variation of Impedance with Ceramic Formulation
Impedance vs. Frequency
1000 pF - C0G (NP0) vs X7R 0805



MLCC Tin/Lead Termination “B”

C0G (NP0) – Specifications and Test Methods

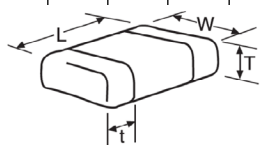
Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz $\pm$ 10% for cap $\leq$ 1000 pF 1.0 kHz $\pm$ 10% for cap $>$ 1000 pF Voltage: 1.0Vrms $\pm$.2V	
Q		<30 pF: Q $\geq$ 400+20 x Cap Value ≥ 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 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 1mm/sec 	
	Capacitance Variation	$\pm 5\%$ or ± 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 ± 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 ± 25 pF, whichever is greater	Step 2: Room Temp	≤ 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	≤ 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 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	≥ 30 pF: Q ≥ 350 ≥ 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)		
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 for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq \pm 5.0\%$ or $\pm .5$ pF, whichever is greater		
	Q	≥ 30 pF: Q ≥ 350 ≥ 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)		

MLCC Tin/Lead Termination "B"

C0G (NP0) – Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		LD02				LD03				LD05					LD06				
Soldering		Reflow/Wave				Reflow/Wave				Reflow/Wave					Reflow/Wave				
Packaging		All Paper				All Paper				Paper/Embossed					Paper/Embossed				
(L) Length	mm	1.00 ± 0.10				1.60 ± 0.15				2.01 ± 0.20					3.20 ± 0.20				
	(in.)	(0.040 ± 0.004)				(0.063 ± 0.006)				(0.079 ± 0.008)					(0.126 ± 0.008)				
(W) Width	mm	0.50 ± 0.10				0.81 ± 0.15				1.25 ± 0.20					1.60 ± 0.20				
	(in.)	(0.020 ± 0.004)				(0.032 ± 0.006)				(0.049 ± 0.008)					(0.063 ± 0.008)				
(t) Terminal	mm	0.25 ± 0.15				0.35 ± 0.15				0.50 ± 0.25					0.50 ± 0.25				
	(in.)	(0.010 ± 0.006)				(0.014 ± 0.006)				(0.020 ± 0.010)					(0.020 ± 0.010)				
WVDC		16	25	50	16	25	50	100	16	25	50	100	200	16	25	50	100	200	500
Cap (pF)	0.5	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.0	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.2	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.5	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.8	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	2.2	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	2.7	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	3.3	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	3.9	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	4.7	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	5.6	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	6.8	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	8.2	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	10	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	12	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	15	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	18	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	22	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	27	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	33	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	39	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	47	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	56	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	68	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	82	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	100	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	120	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	150	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	180	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	220	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	M
	270	C	C	C	G	G	G	G	J	J	J	J	M	J	J	J	J	J	M
	330	C	C	C	G	G	G	G	J	J	J	J	M	J	J	J	J	J	M
	390	C	C	C	G	G	G	G	J	J	J	J	M	J	J	J	J	J	M
	470	C	C	C	G	G	G		J	J	J	J	M	J	J	J	J	J	M
	560				G	G	G		J	J	J	J	M	J	J	J	J	J	M
	680				G	G	G		J	J	J	J		J	J	J	J	J	P
	820				G	G	G		J	J	J	J		J	J	J	J	M	
	1000				G	G	G		J	J	J	J		J	J	J	J	Q	
	1200					G			J	J	J	J		J	J	J	J	Q	
	1500								J	J	J	J		J	J	J	M	Q	
	1800								J	J	J			J	J	M	M		
	2200								J	J	N			J	J	M	P		
	2700								J	J	N			J	J	M	P		
	3300								J	J				J	J	M	P		
	3900								J	J				J	J	M	P		
	4700								J	J				J	J	M	P		
	5600													J	J	M			
	6800													M	M				
	8200													M	M				
	Cap (pF)	0.010													M	M			
	0.012																		
	0.015																		
	0.018																		
	0.022																		
	0.027																		
	0.033																		
	0.039																		
	0.047																		
	0.068																		
	0.082																		
0.1																			
WVDC		16	25	50	16	25	50	100	16	25	50	100	200	16	25	50	100	200	500
SIZE		LD02				LD03				LD05					LD06				



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						EMBOSS							

MLCC Tin/Lead Termination "B"

C0G (NP0) – Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		LD10					LD12					LD13			LD14		
Soldering		Reflow Only					Reflow Only					Reflow Only			Reflow Only		
Packaging		Paper/Embossed					All Embossed					All Embossed			All Embossed		
(L) Length	mm	3.20 ± 0.20					4.50 ± 0.30					4.50 ± 0.30			5.72 ± 0.25		
	(in.)	(0.126 ± 0.008)					(0.177 ± 0.012)					(0.177 ± 0.012)			(0.225 ± 0.010)		
(W) Width	mm	2.50 ± 0.20					3.20 ± 0.20					6.40 ± 0.40			6.35 ± 0.25		
	(in.)	(0.098 ± 0.008)					(0.126 ± 0.008)					(0.252 ± 0.016)			(0.250 ± 0.010)		
(t) Terminal	mm	0.50 ± 0.25					0.61 ± 0.36					0.61 ± 0.36			0.64 ± 0.39		
	(in.)	(0.020 ± 0.010)					(0.024 ± 0.014)					(0.024 ± 0.014)			(0.025 ± 0.015)		
WVDC		25	50	100	200	500	25	50	100	200	500	50	100	200	50	100	200
Cap (pF)	0.5																
	1.0																
	1.2																
	1.5																
	1.8																
	2.2																
	2.7																
	3.3																
	3.9																
	4.7																
	5.6																
	6.8																
	8.2																
	10					J											
	12					J											
	15					J											
	18					J											
	22					J											
	27					J											
	33					J											
	39					J											
	47					J											
	56					J											
	68					J											
	82					J											
	100					J											
	120					J											
	150					J											
	180					J											
	220					J											
	270					J											
	330					J											
	390					M											
	470					M											
	560	J	J	J	J	M											
	680	J	J	J	J	M											
	820	J	J	J	J	M											
	1000	J	J	J	J	M	K	K	K	K	M	M	M	M	M	M	P
	1200	J	J	J	J	M	K	K	K	K	M	M	M	M	M	M	P
	1500	J	J	J	J	M	K	K	K	K	M	M	M	M	M	M	P
	1800	J	J	J	J	M	K	K	K	K	M	M	M	M	M	M	P
	2200	J	J	J	J	Q	K	K	K	K	P	M	M	M	M	M	P
	2700	J	J	J	J	Q	K	K	K	K	Q	M	M	M	M	M	P
	3300	J	J	J	J		P	P	P	P	Q	M	M	M	M	M	P
	3900	J	J	J	M		P	P	P	P	Q	M	M	M	M	M	P
	4700	J	J	J	M		P	P	P	P	Y	M	M	M	M	M	P
	5600	J	J	J			P	P	P	P	Y	M	M	M	M	M	P
	6800	J	J	J			P	P	Q	Q	Y	M	M	M	M	M	P
	8200	J	J	J			P	P	Q	Q	Y	M	M	M	M	M	P
Cap (pF)	0.010	J	J				P	P	Q	Q	Y	M	M		M	M	P
	0.012	J	J				P	P	Q	X	Y	M	M		M	M	P
	0.015						P	P	Q	X	Y	M	M		M	M	Y
	0.018						P	P	X	X	Y	P	M		M	M	Y
	0.022						P	P	X	X		P			M	Y	Y
	0.027						Q	X	X	Z		P			P	Y	Y
	0.033						Q	X	X	Z		P			P		
	0.039						X	X	Z	Z		P			P		
	0.047						X	X	Z	Z		P			P		
	0.068						Z	Z	Z						P		
	0.082						Z	Z	Z						Q		
	0.1						Z	Z	Z						Q		
WVDC		25	50	100	200	500	25	50	100	200	500	50	100	200	50	100	200
SIZE		LD10					LD12					LD13			LD14		

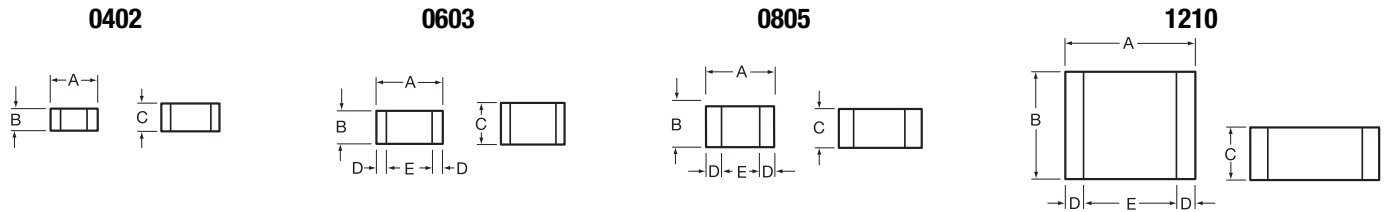
Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
PAPER						EMBOSSD							

MLCC Tin/Lead Termination "B"

C0G (NP0), Sn/Pb – "U" Series Capacitors

GENERAL INFORMATION

"U" Series capacitors are C0G (NP0) chip capacitors specially designed for "Ultra" low ESR for applications in the communications market. Max ESR and effective capacitance are met on each value producing lot to lot uniformity. Sizes available are EIA chip sizes 0603, 0805, and 1210.



Size	A	B	C	D	E
0402	0.039±0.004 (1.00±0.1)	0.020±0.004 (0.50±0.1)	0.024 (0.6) max	0.010 ± 0.006 (0.25 ± 0.15)	0.014 (0.36) min
0603	0.060±0.010 (1.52±0.25)	0.030±0.010 (0.76±0.25)	0.036 (0.91) max	0.010±0.005 (0.25±0.13)	0.030 (0.76) min

HOW TO ORDER

LD05 Case Size LD02 = 0402 LD03 = 0603 LD05 = 0805 LD10 = 1210	1 Voltage Code 3 = 25V 5 = 50V 1 = 100V 2 = 200V	U Dielectric = Ultra Low ESR	100 Capacitance EIA Capacitance Code in pF. First two digits = significant figures or "R" for decimal place. Third digit = number of zeros or after "R" significant figures.	J Capacitance Tolerance Code B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	A Failure Rate Code A = Not Applicable	B Termination B = 5% min lead	2 Packaging Code 2 = 7" Reel 4 = 13" Reel 9 = Bulk	A Special Code A = Standard
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HOW TO ORDER

ELECTRICAL CHARACTERISTICS

Capacitance Values and Tolerances:

Size 0402 - 0.2 pF to 22 pF @ 1 MHz
 Size 0603 - 1.0 pF to 100 pF @ 1 MHz
 Size 0805 - 1.6 pF to 160 pF @ 1 MHz
 Size 1210 - 2.4 pF to 1000 pF @ 1 MHz

Temperature Coefficient of Capacitance (TC):

0±30 ppm/°C (-55° to +125°C)

Insulation Resistance (IR):

10¹² Ω min. @ 25°C and rated WVDC
 10¹¹ Ω min. @ 125°C and rated WVDC

Working Voltage (WVDC):

Size Working Voltage
 0402 - 50, 25 WVDC
 0603 - 200, 100, 50 WVDC

0805 - 200, 100 WVDC

1210 - 200, 100 WVDC

Dielectric Working Voltage (DWV):

250% of rated WVDC

Equivalent Series Resistance Typical (ESR):

040 - See Performance Curve, page 306
 0603 - See Performance Curve, page 306
 0805 - See Performance Curve, page 306
 1210 - See Performance Curve, page 306

Marking:

Laser marking EIA J marking standard (except 0603) (capacitance code and tolerance upon request).

Military Specifications

Meets or exceeds the requirements of MIL-C-55681

MLCC Tin/Lead Termination "B"

C0G (NP0), Sn/Pb – Capacitance Range



SIZE		LD02	LD03			LD05		LD10	
Soldering		All Paper	All Paper			All Embossed		All Embossed	
(L) Length	mm	1.00±0.10	1.60±0.15			2.01±0.20		3.20±0.20	
	(in.)	(0.040±0.004)	(0.063±0.006)			(0.079±0.008)		(0.126±0.008)	
(W) Width	mm	0.50±0.10	0.81±0.15			1.25±0.20		2.50±0.20	
	(in.)	(0.020±0.004)	(0.032±0.006)			(0.049±0.008)		(0.098±0.008)	
(t) Terminal	mm	0.25±0.15	0.35±0.15			0.50±0.25		0.50±0.25	
	(in.)	(0.010±0.006)	(0.014±0.006)			(0.020±0.010)		(0.020±0.010)	
WVDC		50	50	100	200	100	200	100	200
Cap	0.2	F	A	A	A	H	H	D	D
(pF)	0.3	F	A	A	A	H	H	D	D
	0.4	F	A	A	A	H	H	D	D
	0.5	F	A	A	A	H	H	D	D
	0.6	F	A	A	A	H	H	D	D
	0.7	F	A	A	A	H	H	D	D
	0.8	F	A	A	A	H	H	D	D
	0.9	F	A	A	A	H	H	D	D
	1.0	F	A	A	A	H	H	D	D
	1.1	F	A	A	A	H	H	D	D
	1.2	F	A	A	A	H	H	D	D
	1.3	F	A	A	A	H	H	D	D
	1.4	F	A	A	A	H	H	D	D
	1.5	F	A	A	A	H	H	D	D
	1.6	F	A	A	A	H	H	D	D
	1.7	F	A	A	A	H	H	D	D
	1.8	F	A	A	A	H	H	D	D
	1.9	F	A	A	A	H	H	D	D
	2.0	F	A	A	A	H	H	D	D
	2.1	F	A	A	A	H	H	D	D
	2.2	F	A	A	A	H	H	D	D
	2.4	F	A	A	A	H	H	D	D
	2.7	F	A	A	A	H	H	D	D
	3.0	F	A	A	A	H	H	D	D
	3.3	F	A	A	A	H	H	D	D
	3.6	F	A	A	A	H	H	D	D
	3.9	F	A	A	A	H	H	D	D
	4.3	F	A	A	A	H	H	D	D
	4.7	F	A	A	A	H	H	D	D
	5.1	F	A	A	A	H	H	D	D
	5.6	F	A	A	A	H	H	D	D
	6.2	F	A	A	A	H	H	D	D
	6.8	F	A	A	A	H	H	D	D
	7.5	F	A	A	A	H	H	D	D
	8.2	F	A	A	A	H	H	D	D
	9.1	F	A	A	A	H	H	D	D
	10	F	A	A	A	H	H	D	D
	11	F	A	A	A	H	H	D	D
	12	F	A	A	A	H	H	D	D
	18	F	A	A	A	H	H	D	D
	20	F	A	A	A	H	H	D	D
	22	F	A	A	A	H	H	D	D
WVDC		50	50	100	200	100	200	100	200
SIZE		LD02	LD03			LD05		LD10	

SIZE		LD02	LD03			LD05		LD10	
Soldering		All Paper	All Paper			All Embossed		All Embossed	
(L) Length	mm	1.00±0.10	1.60±0.15			2.01±0.20		3.20±0.20	
	(in.)	(0.040±0.004)	(0.063±0.006)			(0.079±0.008)		(0.126±0.008)	
(W) Width	mm	0.50±0.10	0.81±0.15			1.25±0.20		2.50±0.20	
	(in.)	(0.020±0.004)	(0.032±0.006)			(0.049±0.008)		(0.098±0.008)	
(t) Terminal	mm	0.25±0.15	0.35±0.15			0.50±0.25		0.50±0.25	
	(in.)	(0.010±0.006)	(0.014±0.006)			(0.020±0.010)		(0.020±0.010)	
WVDC		50	50	100	200	100	200	100	200
	24	F	A	A	A	H	H	D	D
	27	F	A	A	A	H	H	D	D
Cap	30	F	A	A	A	H	H	D	D
(pF)	33	F	A	A	A	H	H	D	D
	36	F	A	A	A	H	H	D	D
	39	F	A	A	A	H	H	D	D
	43		A	A	A	H	H	D	D
	47		A	A	A	H	H	D	D
	51		A	A	A	H	H	D	D
	56		A	A	A	H	H	D	D
	68		A	A	A	H	H	D	D
	75		A	A		H	H	D	D
	82		A	A		H	H	D	D
	91		A	A		H	H	D	D
	100		A	A		H	H	D	D
	110							D	D
	120							D	D
	130							D	D
	140							D	D
	150							D	D
	160							D	D
	180							D	D
	200							D	D
	220							D	D
	270							D	D
	300							D	D
	330							D	D
	360							D	D
	390							D	D
	430							D	D
	470							D	
	510							D	
	560							D	
	620							D	
	680							D	
	750							D	
	820							D	
	910							D	
	1000							D	
WVDC		50	50	100	200	100	200	100	200
SIZE		LD02	LD03			LD05		LD10	

Case Size	0402 (KGQ05)	0603 (KGQ15)	0805 (KGQ21)	1210 (KGQ32)
Thickness Letter	F	A	H	D
Max Thickness(mm)	0.60	0.90	1.15	1.40
Carrier Tape	PAPER	PAPER	PAPER	PAPER
Packaging Code 7"reel	H	T	T	T
Packaging Code 13"reel	N	M	M	M
PAPER				

TOLERANCE OPTIONS

Capacitance Range	Available Tolerances
0.20-0.50 pF	B, C
0.60-6.2 pF	B, C, D
6.8- 9.1 pF	B, C, J, K, M
10-1000 pF	F, G, J, K, M

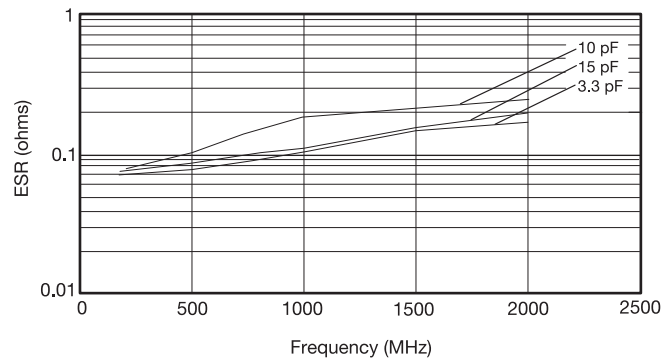
MLCC Tin/Lead Termination “B”

C0G (NP0), Sn/Pb – Capacitance Range

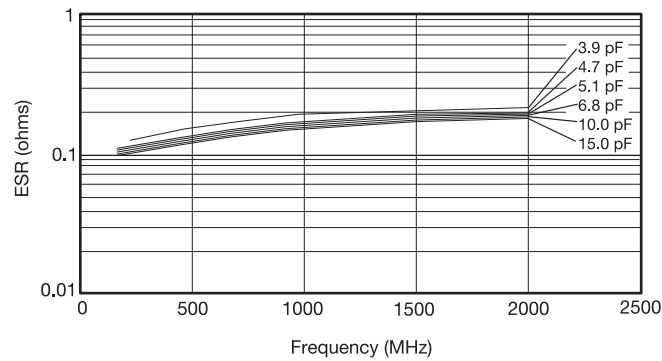


ULTRA LOW ESR, “U” SERIES

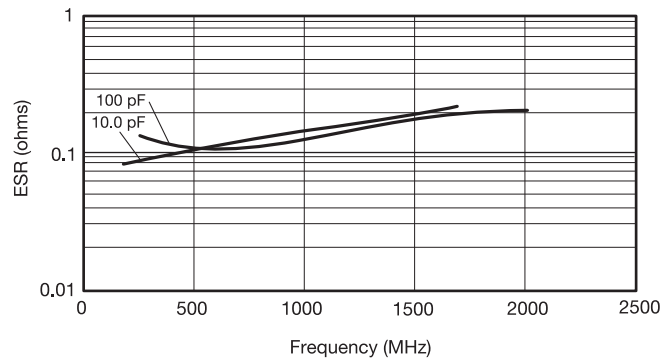
TYPICAL ESR vs. FREQUENCY
0402 “U” SERIES



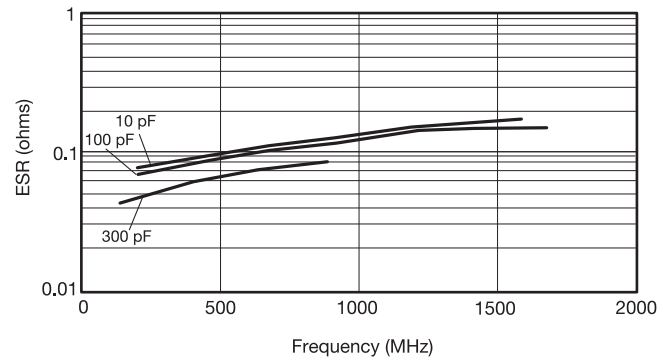
TYPICAL ESR vs. FREQUENCY
0603 “U” SERIES



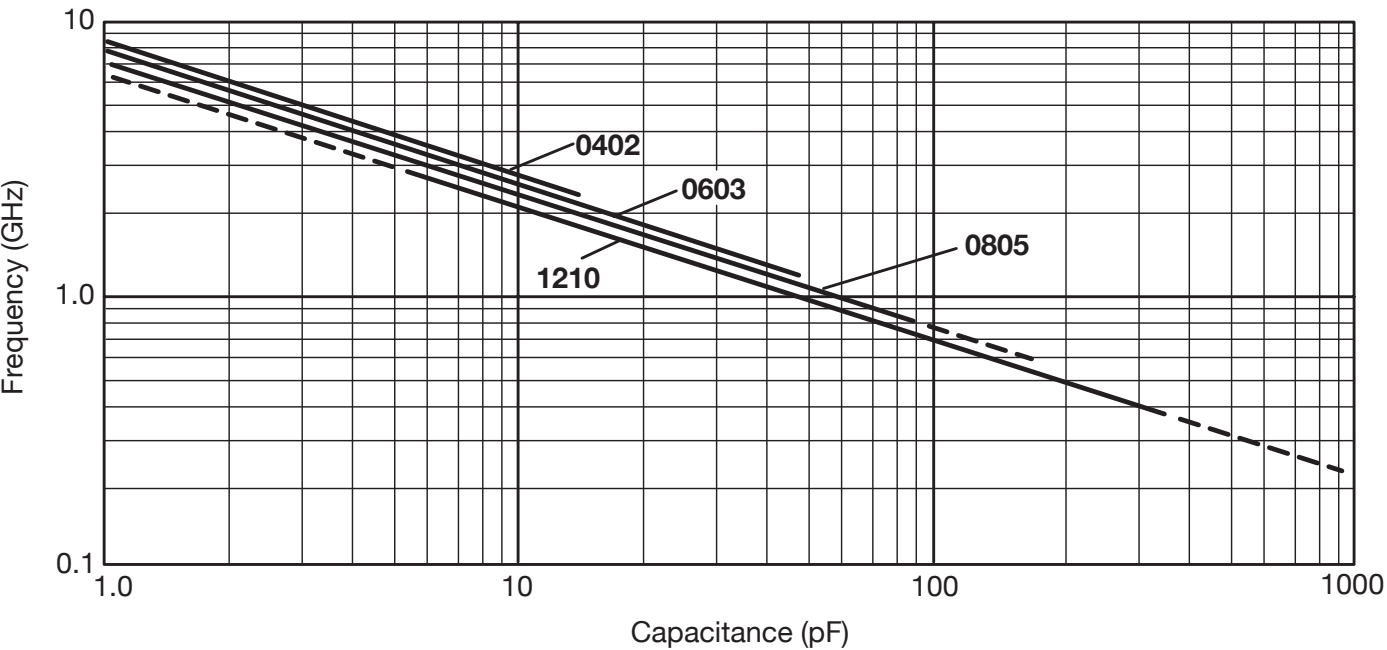
TYPICAL ESR vs. FREQUENCY
0805 “U” SERIES



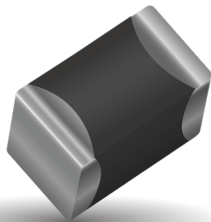
TYPICAL ESR vs. FREQUENCY
1210 “U” SERIES



TYPICAL SERIES RESONANT FREQUENCY “U” SERIES CHIP



MLCC Tin/Lead Termination “B”
X8R – General Specifications



KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a “B” in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX’s commitment to providing a full range of products to our customers. KYOCERA AVX has provided in the following pages a full range of values that we are currently offering in this special “B” termination. Please contact the factory if you require additional information on our MLCC Tin/Lead Termination “B” products.

Not RoHS Compliant

PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

LD05	5	F	101	J	A	B	2	A
Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Terminations	Packaging	Special Code
LD02 - 0402 LD03 - 0603 LD04 - 0504* LD05 - 0805 LD06 - 1206 LD10 - 1210 LD12 - 1812 LD13 - 1825 LD14 - 2225 LD20 - 2220	6.3V = 6 10V = Z 16V = Y 25V = 3 35V = D 50V = 5 100V = 1 200V = 2 500V = 7	X8R = F	2 Sig. Digits + Number of Zeros	B = ±.10 pF (<10pF) C = ±.25 pF (<10pF) D = ±.50 pF (<10pF) F = ±1% (≥ 10 pF) G = ±2% (≥ 10 pF) J = ±5% K = ±10% M = ±20%	A = Not Applicable	B = 5% min lead X = FLEXITERM® with 5% min lead** **X7R only	2 = 7" Reel 4 = 13" Reel Contact Factory For Multiples*	A = Std. Product

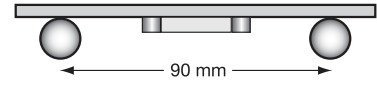
LD04 has the same CV ranges as LD03.

See FLEXITERM® section for CV options

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

MLCC Tin/Lead Termination "B"

X8R – Specifications and Test Methods

Parameter/Test		X8R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +150°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$.2V	
Dissipation Factor		$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 3.5% for 25V DC and 16V 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 1mm/sec 	
	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 150°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)		

MLCC Tin/Lead Termination “B”

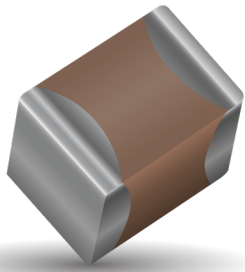
X8R – Capacitance Range

SIZE			LD03		LD05		LD06	
		WVDC	25V	50V	25V	50V	25V	50V
271	Cap	270	G	G				
331	(pF)	330	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	Cap	8200	G	G	J	J	J	J
103	(μF)	0.01	G	G	J	J	J	J
123		0.012	G	G	J	J	J	J
153		0.015	G	G	J	J	J	J
183		0.018	G	G	J	J	J	J
223		0.022	G	G	J	J	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	M	M
683		0.068	G		N	N	M	M
823		0.082			N	N	M	M
104		0.1			N	N	M	M
124		0.12			N	N	M	M
154		0.15			N	N	M	M
184		0.18			N		M	M
224		0.22			N		M	M
274		0.27					M	M
334		0.33					M	M
394		0.39					M	
474		0.47					M	
684		0.68						
824		0.82						
105		1						
		WVDC	25V	50V	25V	50V	25V	50V
SIZE			LD03		LD05		LD06	

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					EMBOSS							

MLCC Tin/Lead Termination "B"

X7R – General Specifications



KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a "B" in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX's commitment to providing a full range of products to our customers. KYOCERA AVX has provided in the following pages a full range of values that we are currently offering in this special "B" termination. Please contact the factory if you require additional information on our MLCC Tin/Lead Termination "B" products.

Not RoHS Compliant

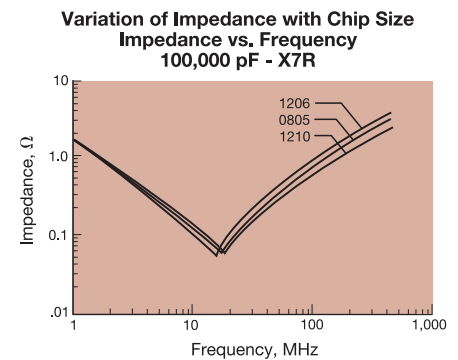
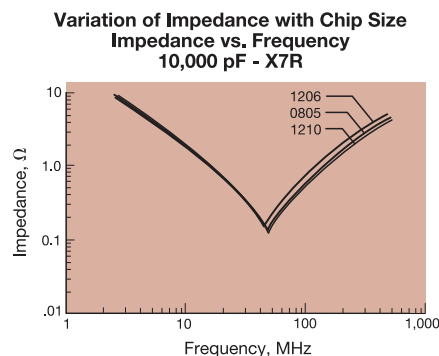
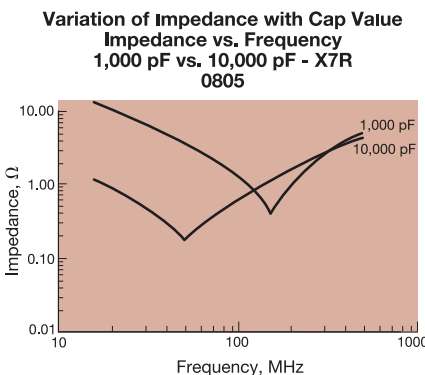
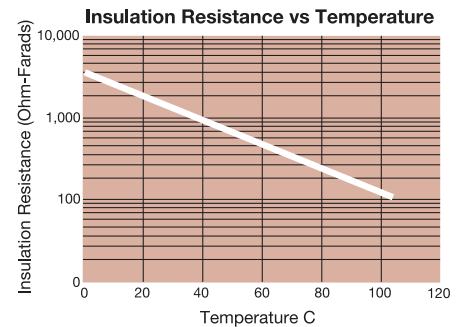
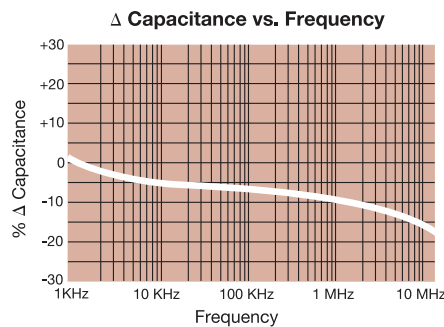
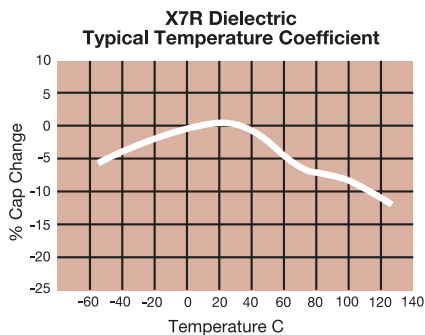
PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

LD05	5	C	101	J	A	B	2	A
Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Terminations	Packaging	Special Code
LD03 - 0603 LD04 - 0504* LD05 - 0805 LD06 - 1206 LD10 - 1210 LD12 - 1812 LD13 - 1825 LD14 - 2225 LD20 - 2220	6.3V = 6 10V = Z 16V = Y 25V = 3 35V = D 50V = 5 100V = 1 200V = 2 500V = 7	X7R = C	2 Sig. Digits + Number of Zeros	B = ± 10 pF (<10pF) C = ± 25 pF (<10pF) D = ± 50 pF (<10pF) F = $\pm 1\%$ (≥ 10 pF) G = $\pm 2\%$ (≥ 10 pF) J = $\pm 5\%$ K = $\pm 10\%$ M = $\pm 20\%$	A = Not Applicable	B = 5% min lead X = FLEXITERM® with 5% min lead** **X7R only	2 = 7" Reel 4 = 13" Reel Contact Factory For Multiples*	A = Std. Product

*LD04 has the same CV ranges as LD03.

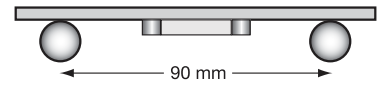
See FLEXITERM® section for CV options

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.



MLCC Tin/Lead Termination “B”

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 1mm/sec 	
	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)		

MLCC Tin/Lead Termination “B”
X7R – Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE		LD02				LD03						LD05						LD06									
Soldering		Reflow/Wave				Reflow/Wave						Reflow/Wave						Reflow/Wave									
Packaging		All Paper				All Paper						Paper/Embossed						Paper/Embossed									
(L) Length	mm (in.)	1.00 ± 0.10 (0.040 ± 0.004)				1.60 ± 0.15 (0.063 ± 0.006)						2.01 ± 0.20 (0.079 ± 0.008)						3.20 ± 0.20 (0.126 ± 0.008)									
(W) Width	mm (in.)	0.50 ± 0.10 (0.020 ± 0.004)				0.81 ± 0.15 (0.032 ± 0.006)						1.25 ± 0.20 (0.049 ± 0.008)						1.60 ± 0.20 (0.063 ± 0.008)									
(t) Terminal	mm (in.)	0.25 ± 0.15 (0.010 ± 0.006)				0.35 ± 0.15 (0.014 ± 0.006)						0.50 ± 0.25 (0.020 ± 0.010)						0.50 ± 0.25 (0.020 ± 0.010)									
WVDC		10	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
Cap (pF)	100																										
	150																										
	220				C																						
	330				C					G	G	G		J	J	J	J	J	J								K
	470				C					G	G	G		J	J	J	J	J	J								K
	680				C					G	G	G		J	J	J	J	J	J								K
	1000				C					G	G	G		J	J	J	J	J	J								K
	1500				C					G	G	G		J	J	J	J	J	J		J	J	J	J	J	J	M
	2200				C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	3300			C	C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	4700			C	C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	6800		C	C						G	G			J	J	J	J	J	J		J	J	J	J	J	J	P
Cap (µF)	0.010		C	C						G	G	G		J	J	J	J	J	J		J	J	J	J	J	J	P
	0.015		C							G	G			J	J	J	J	J	J		J	J	J	J	J	M	
	0.022		C							G	G			J	J	J	J	J	N		J	J	J	J	J	M	
	0.033		C							G	G			J	J	J	J	N			J	J	J	J	J	M	
	0.047									G	G	G		J	J	J	J	N			J	J	J	J	J	M	
	0.068									G	G	G		J	J	J	J	N			J	J	J	J	J	P	
	0.10	C		C*						G	G	G		J	J	J	J	N			J	J	J	J	P	P	
	0.15					G	G							J	J	J	N	N			J	J	J	J	Q		
	0.22					G	G							J	J	N	N	N			J	J	J	J	Q		
	0.33													N	N	N	N	N			J	J	M	P	Q		
	0.47									J*				N	N	N	N	N			M	M	M	P	Q		
	0.68													N	N	N					M	M	Q	Q	Q		
	1.0					J*	J*							N	N	N*					M	M	Q	Q	Q		
	1.5																				P	Q	Q				
	2.2				J*											P*						Q	Q	Q			
	3.3																										
	4.7													P*	P*						Q*	Q*	Q*				
	10																										
	22																				Q*						
	47																										
	100																										
WVDC		10	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
SIZE		LD02				LD03						LD05						LD06									

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							

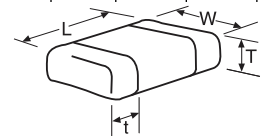
 = Under Development

MLCC Tin/Lead Termination "B"

X7R – Capacitance Range

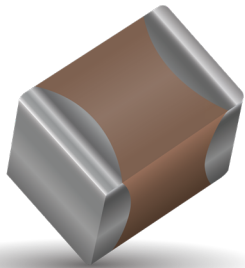
PREFERRED SIZES ARE SHADED

																				
SIZE		LD10							LD12				LD13		LD20				LD14	
Soldering		Reflow Only							Reflow Only				Reflow Only		Reflow Only				Reflow Only	
Packaging		Paper/Embossed							All Embossed				All Embossed		All Embossed				All Embossed	
(L) Length	mm (in.)	3.20 ± 0.20 (0.126 ± 0.008)							4.50 ± 0.30 (0.177 ± 0.012)				4.50 ± 0.30 (0.177 ± 0.012)		5.70 ± 0.50 (0.224 ± 0.020)				5.72 ± 0.25 (0.225 ± 0.010)	
(W) Width	mm (in.)	2.50 ± 0.20 (0.098 ± 0.008)							3.20 ± 0.20 (0.126 ± 0.008)				6.40 ± 0.40 (0.252 ± 0.016)		5.00 ± 0.40 (0.197 ± 0.016)				6.35 ± 0.25 (0.250 ± 0.010)	
(t) Terminal	mm (in.)	0.50 ± 0.25 (0.020 ± 0.010)							0.61 ± 0.36 (0.024 ± 0.014)				0.61 ± 0.36 (0.024 ± 0.014)		0.64 ± 0.39 (0.025 ± 0.015)				0.64 ± 0.39 (0.025 ± 0.015)	
WVDC		10	16	25	50	100	200	500	50	100	200	500	50	100	25	50	100	200	50	100
Cap (pF)	100 150 220																			
	330 470 680																			
	1000 1500 2200	J	J	J	J	J	J	M												
	3300 4700 6800	J	J	J	J	J	J	M												
Cap (μF)	0.010 0.015 0.022	J	J	J	J	J	J	M	K	K	K	K	M	M		X	X	X	M	P
	0.033 0.047 0.068	J	J	J	J	J	J	Q	K	K	K	X	M	M		X	X	X	M	P
	0.10 0.15 0.22	J	J	J	J	J	M		K	K	K	Z	M	M		X	X	X	M	P
	0.33 0.47 0.68	J	J	J	J	Q			K	M	X		M	M		X	X	X	M	P
	1.0 1.5 2.2	N	N	P	X	Z			M	X			M	P		X	X		M	P
	3.3 4.7 10	X	X	Z	Z				Z	Z						X	Z			
	22 47 100	Z	Z												Z					
WVDC		10	16	25	50	100	200	500	50	100	200	500	50	100	25	50	100	200	50	100



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								

MLCC Tin/Lead Termination "B"
X5R – General Specifications



KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a "B" in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX's commitment to providing a full range of products to our customers. KYOCERA AVX has provided in the following pages a full range of values that we are currently offering in this special "B" termination. Please contact the factory if you require additional information on our MLCC Tin/Lead Termination "B" products.

Not RoHS Compliant

PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

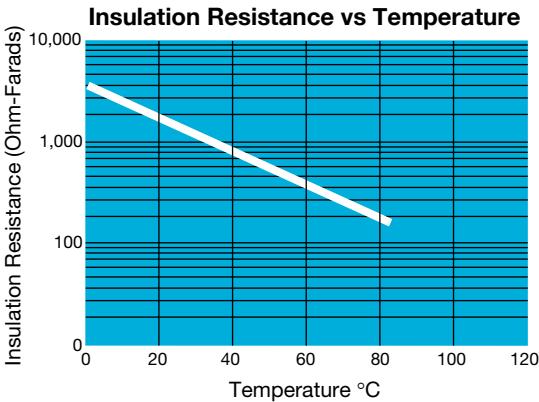
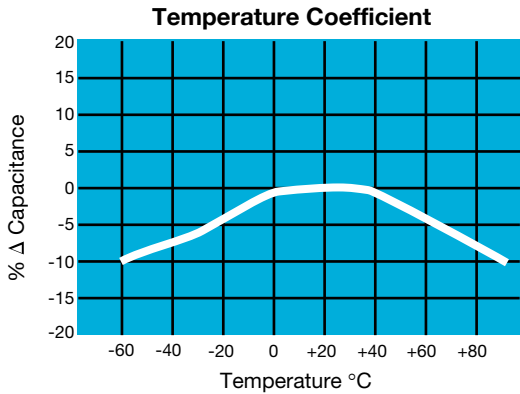
LD05	5	D	101	J		B	2	A
Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	B = 5% min lead X = FLEXITERM® with 5% min lead**	Packaging 2 = 7" Reel 4 = 13" Reel	Special Code A = Std. Product
LD02 - 0402 LD03 - 0603 LD04 - 0504* LD05 - 0805 LD06 - 1206 LD10 - 1210 LD12 - 1812 LD13 - 1825 LD14 - 2225 LD20 - 2220	6.3V = 6 10V = Z 16V = Y 25V = 3 35V = D 50V = 5 100V = 1 200V = 2 500V = 7	X5R = D	2 Sig. Digits + Number of Zeros	B = ±10 pF (<10pF) C = ±25 pF (<10pF) D = ±50 pF (<10pF) F = ±1% (≥ 10 pF) G = ±2% (≥ 10 pF) J = ±5% K = ±10% M = ±20%	A = Not Applicable	**X7R only	Contact Factory For Multiples*	

*LD04 has the same CV ranges as LD03.

See FLEXITERM® section for CV options

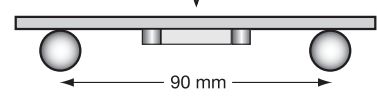
NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

TYPICAL ELECTRICAL CHARACTERISTICS



MLCC Tin/Lead Termination “B”

X5R – Specifications and Test Methods

Parameter/Test		X5R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +85°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$.2V For Cap > 10 μ F, 0.5Vrms @ 120Hz	
Dissipation Factor		$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 3.0% for 25V, 35V DC rating $\leq$ 12.5% Max. for 16V DC rating and lower Contact Factory for DF by PN		
Insulation Resistance		10,000M Ω or 500M 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)	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 1mm/sec 	
	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: +85°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 1.5X rated voltage in test chamber set at 85°C $\pm$ 2°C for 1000 hours (+48, -0). Note: Contact factory for *optional specification part numbers that are tested at < 1.5X rated voltage. 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)		

X5R – Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE	LD02	LD03	LD05	LD06	LD10	LD12
Soldering	Reflow/Wave	Reflow/Wave	Reflow/Wave	Reflow/Wave	Reflow/Wave	
Packaging	All Paper	All Paper	Paper/Embossed	Paper/Embossed	Paper/Embossed	
(L) Length	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	
(W) Width	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	
(t) Terminal	mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	
WVDC	4 6.3 10 16 25 50	4 6.3 10 16 25 35 50	6.3 10 16 25 35 50	6.3 10 16 25 35 50	4 6.3 10 16 25 35 50	6.3 10 25 50
Cap (pF)	100 150 220	C				
	330 470 680	C C C				
	1000 1500 2200	C C C				
	3300 4700 6800	C C C	G G G			
Cap (μF)	0.010 0.015 0.022	C C C	G G G	N		
	0.033 0.047 0.068	C C C	G G G	N N N		
	0.10 0.15 0.22	C C*	G G G	N N N	Q	
	0.33 0.47 0.68	C* C*	G G G	N N N	Q Q	X
	1.0 1.5 2.2	C* C*	G G G	J* N N	P* Q Q	X X X
	3.3 4.7 10	J* J* K*	J* J* J*	J* P P	N N P	Z Z Z
	22 47 100					
WVDC	4 6.3 10 16 25 50	4 6.3 10 16 25 35 50	6.3 10 16 25 35 50	6.3 10 16 25 35 50	4 6.3 10 16 25 35 50	6.3 10 25 50
SIZE	LD02	LD03	LD05	LD06	LD10	LD12

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							

***Optional Specifications – Contact factory**

NOTE: Contact factory for non-specified capacitance values