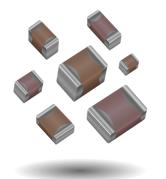
## MLCC Tin/Lead Termination "B" (LD Series)

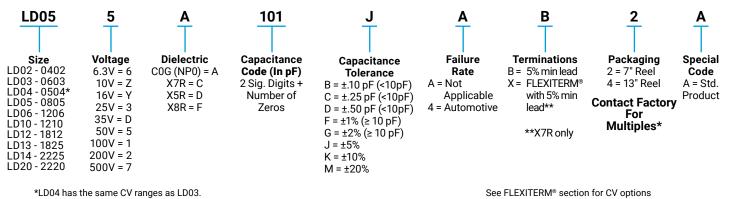
### COG (NP0) - General Specifications





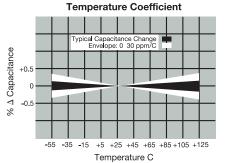
KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a "B" in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX's commitment to 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.

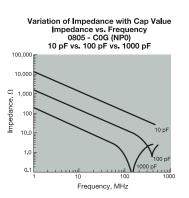
#### PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION) **Not RoHS Compliant**

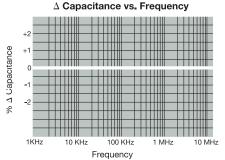


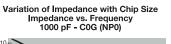
\*LD04 has the same CV ranges as LD03.

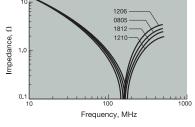
NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers. Contact factory for non-specified capacitance values.



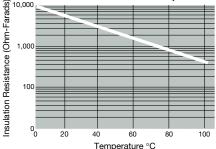




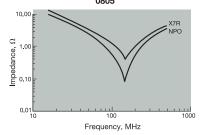




Insulation Resistance vs Temperature 10.000



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



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# MLCC Tin/Lead Termination "B" COG (NP0) – Specifications and Test Methods



Parame	ter/Test	NP0 Specification Limits	Measuring	Conditions				
<b>Operating Tem</b>	perature Range	-55°C to +125°C	Temperature C	Cycle Chamber				
Сарас		Within specified tolerance	Freq.: 1.0 MHz ± 10	% for cap ≤ 1000 pF				
(	2	<30 pF: Q≥ 400+20 x Cap Value ≥30 pF: Q≥ 1000	1.0 kHz ± 10% fc Voltage: 1.0	or cap > 1000 pF				
Insulation	Resistance	100,000MΩ or 1000MΩ - μF, whichever is less	Charge device with 60 ± 5 secs @ roo					
Dielectric	: Strength	No breakdown or visual defects	Charge device with 250 1-5 seconds, w/charge limited to 50 Note: Charge device wit for 500V	and discharge current 0 mA (max) h 150% of rated voltage				
	Appearance	No defects	Deflectio	on: 2mm				
Resistance to	Capacitance Variation	$\pm 5\%$ or $\pm .5$ pF, whichever is greater	Test Time: :	30 seconds 7 1mm/sec				
Flexure Stresses	Q	Meets Initial Values (As Above)						
	Insulation Resistance	≥ Initial Value x 0.3	90	mm — →				
Solder	rability	≥ 95% of each terminal should be covered with fresh solder	Dip device in eutection for 5.0 ± 0.					
	Appearance	No defects, <25% leaching of either end terminal						
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater						
Resistance to Solder Heat	Q	Meets Initial Values (As Above)	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2					
Solder Heat	Insulation Resistance	Meets Initial Values (As Above)	hours before measurin	g electrical properties.				
	Dielectric Strength	Meets Initial Values (As Above)						
	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes				
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater	Step 2: Room Temp ≤ 3 minutes					
Thermal Shock	Q	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	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					
	Appearance	No visual defects	-					
	Capacitance Variation	$\leq \pm 3.0\%$ or $\pm .3$ pF, whichever is greater	Charge device with twi					
Load Life	Q	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C	chamber set a for 1000 hou Remove from test chamb	ırs (+48, -0).				
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	temperature before mo	for 24 hours				
	Dielectric Strength	Meets Initial Values (As Above)		-				
	Appearance	No visual defects						
	Capacitance Variation	$\leq \pm 5.0\%$ or $\pm .5$ pF, whichever is greater	Store in a test chamber s	set at 85°C + 2°C/ 85%				
Load Humidity	Q	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C	5% relative humid (+48, -0) with rate	ity for 1000 hours d voltage applied.				
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from chamber temperature for 24 ± 2 h					
	Dielectric Strength	Meets Initial Values (As Above)						

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# MLCC Tin/Lead Termination "B" COG (NP0) – Capacitance Range



### **PREFERRED SIZES ARE SHADED**

			•									LD06							
SIZE			LD02								LD05								
Solderi			eflow/Wa								flow/Way					Reflow/			
Packagi			All Pape .00 ± 0.1				aper ± 0.15				er/Embos .01 ± 0.20				P	aper/Em 3.20 ± 0			
(L) Length	mm (in.)		.00 ± 0.1 )40 ± 0.0				± 0.15 ± 0.006)				$.01 \pm 0.20$ $.079 \pm 0.00$					3.20 ± ( 0.126 ± (			
14() 14(: -[4]-	mm		.50 ± 0.1				± 0.15				.25 ± 0.20					1.60 ± 0			
W) Width	(in.)		020 ± 0.0				± 0.006)				)49 ± 0.00					(0.063 ± (			
(t) Terminal	mm		.25 ± 0.1				± 0.15				.50 ± 0.2					0.50 ± 0			
	(in.) WVDC	(0.0 16	010 ± 0.0 25	50	16	25	<u>± 0.006)</u> 50	100	16	25	020 ± 0.0 <sup>2</sup> 50	10)	200	16	25	0.020 ± 0 50	100	200	500
Сар	0.5	C	C	C	G	G	G	G	J	J		J	J	J	J	J	J	J	J
(pF)	1.0	Č	c	c	G	G	G	G	J	J	J	Ĵ	J	J	J	Ĵ	Ĵ	J	J
	1.2	С	С	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	1.5	<u>С</u> С	C C	C C	GG	G	G	G G	J	J J	J	J	J J	J	J	J	J	J	J
	1.8 2.2	c	c	c	G	G	G G	G	J	J	J	J	J	J	J	J	J	J	J
	2.7	č	c	č	G	G	G	G	Ĵ	Ĵ	Ĵ	Ĵ	J	J	Ĵ	Ĵ	J	Ĵ	Ĵ
	3.3	С	С	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	3.9	С	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	4.7	<u>С</u> С	C C	C C	G G	G	G	G G	J	J J	J	J	J J	J	J	J	J	J	J
	5.0 6.8	C	C C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	8.2	č	c	č	G	G	G	G	J	J	J	J	J	J	J	J	J	Ĵ	Ĵ
	10	С	С	С	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 18	<u>С</u> С	C C	C C	G G	G	G	G G	J	J J	J	J	J J	J	J	J	J	J	J J
	22	c	C C	c	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	27	С	С	С	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	33	С	С	С	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	39 47	C	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	47	C C	C C	C C	GG	G	G	G G	J	J	J	J	J J	J	J	J	J	J	J
	68	č	c	č	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	82	С	С	С	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	100	С	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	120 150	C C	C C	C C	GG	G G	G G	G G	J	J	J	J	J J	J	JJ	J	J	J	J
	180	<u>с</u>	C	C	G	G	G	G	J	J	J	J	J	J	J	J	J	J	J
	220	Č	c	Ċ	G	G	G	G	J	J	J	Ĵ	Ĵ	J	J	J	Ĵ	J	M
	270	С	С	С	G	G	G	G	J	J	J	J	М	J	J	J	J	J	М
	330	С	C	C	G	G	G	G G	J	J	J	J	M	J	J	J	J	J	M
	390 470	C C	C C	C C	G G	GG	G G	G	J	J	J	J	M M	J	J	J	J	J	M
	560	0		Ŭ	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	Р
	820				G	G	G		J	J	J	J		J	J	J	J	M	
	1000				G	G G	G		J	J	J	J		J	J	J	J	Q	
	1200 1500					9			J	J	J			J	J	J	J	Q	
	1800		l I					İ	J	J	J	1		J	J	M	M		
	2200								J	J	N			J	J	м	P		
	2700 3300								J J	J J	N			J	J	M	P P		
	3300								J	J				J	J	M	P		
	4700								J	Ĵ				J	J	M	P		
	5600													J	J	М			
	6800 8200													M	M				
Сар	0.010													M M	M				
(pF)	0.012																		
	0.015		L	>		× 1/1	•												
	0.018		-				$\mathbf{x}$												
	0.022 0.027			$\sim$			ÎT												
	0.027		Η (	$\sim$											<u> </u>				
	0.039																		
	0.047		Ļ		₹ <b>T</b>										L				
	0.068			I	I	I	I												
	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				03		-		LD05					LDO			
								-											

Letter	А	С	E	G	J	К	М	N	Р	Q	Х	Y	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						EMB	OSSED			

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# MLCC Tin/Lead Termination "B" COG (NP0) – Capacitance Range



### PREFERRED SIZES ARE SHADED

SIZE			LD10					LD12				LD13			LD14	
Soldering		R	Reflow On	ly				Reflow Or	nly			Reflow Only			Reflow Only	
Packaging			er/Embos					II Embos				All Embossed			All Embossed	
(L) Length mm (in.)			3.20 + 0.2 126 ± 0.0					4.50 ± 0.3 .177 ± 0.0				4.50 ± 0.30 (0.177 ± 0.012)	)		5.72 ± 0.25 (0.225 ± 0.010	))
W) Width mm (in.)		2	2.50 ± 0.2 098 ± 0.0	0				3.20 ± 0.2 .126 ± 0.0	20			6.40 ± 0.40 (0.252 ± 0.016)			6.35 ± 0.25 (0.250 ± 0.010	<b>,</b>
(t) Torminal mm		C	0.50 ± 0.2	5				0.61 ± 0.3	36			0.61 ± 0.36			0.64 ± 0.39	, 
(i) (in.) WVDC	25	50	020 ± 0.0 100	200	500	25	50	.024 ± 0.0 100	200	500	50	(0.024 ± 0.014) 100	200	50	(0.025 ± 0.015 100	200
Cap 0.5 (pF) 1.0 1.2 1.5																
1.8 2.2 2.7																W
3.3 3.9 4.7															$\square$	J IT
5.6 6.8 8.2 10					J										<b>€</b>	
10 12 15 18					J J J											
22 27 33					J J J											
39 47 56					J J J											
68 82 100					J J J											
120 150 180 220					J J J											
270 270 330 390					J J M											
470 560 680	J J	J	J	J	M M M											
820 1000 1200	J J J	J J	J J	J J M	M M M	K K	K K	K K	K K	M M	M M	M M	M M	M M	M	P P
1500 1800 2200 2700	J J J	J J J	J J J	M Q Q	M	K K K	K K K	K K K	K K P	M M P Q	M M M M	M M M M	M M M M	M M M M	M M M M	P P P P
3300 3900 4700	J J J	J J	J M M			P P P	P P P	P P P	P P P	Q Q Y	M M M	M M M	M M M	M M M	M M M	P P P
5600 6800 8200	J J	J				P P P	P P P	P Q Q	P Q Q	Y Y Y	M M M	M M M	M M	M M M	M M M	P P P
Cap 0.010 (pF) 0.012 0.015 0.018	J J	J				P P P	P P P	Q Q Q X	Q X X X	Y Y Y	M M M P	M M M		M M M	M M M	P P Y Y
0.013 0.022 0.027 0.033						P Q Q	P X X	X X X	X Z Z		P P P			M P P	Y Y	Y Y
0.039 0.047 0.068						X X Z	X X Z	Z Z Z	ZZ		P P			P P P		
0.082						Z Z	Z Z	Z Z						Q Q		
WVDC SIZE	25	50	100	200	500	25	50	100 LD12	200	500	50	100 LD13	200	50	100 LD14	200
SIZE			LD10					LUIZ				LUIS			LU 14	

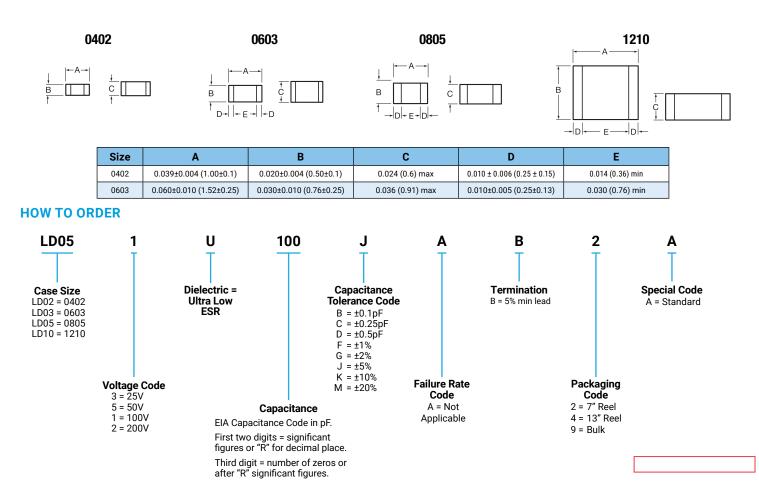
Letter	А	С	E	G	J	К	М	N	Р	Q	Х	Y	Z
Max.	0.33	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79
Thickness	(0.013)	(0.022)	(0.028)	(0.035)	(0.037)	(0.040)	(0.050)	(0.055)	(0.060)	(0.070)	(0.090)	(0.100)	(0.110)
	PAPER							·	FMB	OSSED	·	·	

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### **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.



#### **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):

 $10^{12}\,\Omega$  min. @ 25°C and rated WVDC  $10^{11}\,\Omega$  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

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# MLCC Tin/Lead Termination "B" COG (NP0), Sn/Pb - Capacitance Range

SIZE Soldering n

(i WVDC Сар

WVDC

SIZE

(L) Length

(W) Width

(t) Terminal

(pF)

LOD2       LOD3       LOD5       LD1       SIZE       LD03       LD03       LD03       LD10         mm       1.004 0.01       1.504 0.15       2.01 + 0.2       3.20 + 0.20       0.008		LD02		LD03			05	10	10		SIZE		LD02		LD03		10	05	10	10
nm         1.02e 0.10         1.64 ± 0.15         2.01 ± 0.20         3.02 ± 0.20         0.008         0.		-							-				-							
(n)         (0.0402 0.004)         (0.053+0.0+0)         (0.079+)         (0.12+0.0+0)         (0.02+0.0+0)	ř									5	orderin	ř – – – – – – – – – – – – – – – – – – –								
Image: Control (C)         C)         C)         C										(1)]	nath									
(m)         (0.229 ± 0.004)         (0.032± 0.005)         (0.039± 0.008) <td>(in.)</td> <td>(0.040± 0.004)</td> <td>(0.0</td> <td>63±0.0</td> <td>06)</td> <td></td> <td></td> <td>(0.126:</td> <td>±0.008)</td> <td></td> <td>ngtii</td> <td>(in.)</td> <td>(0.040± 0.004)</td> <td>(0.0</td> <td>63±0.0</td> <td>06)</td> <td></td> <td></td> <td>(0.126±</td> <td>£0.008)</td>	(in.)	(0.040± 0.004)	(0.0	63±0.0	06)			(0.126:	±0.008)		ngtii	(in.)	(0.040± 0.004)	(0.0	63±0.0	06)			(0.126±	£0.008)
(m)         (0.229:00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.099:00-00-0)         (0.029:0-00-0)         (0.029:0-00-0)	mm	0.50 ±0.10	0.	81±0.1	5			2.50:	±0.20	(110.)		mm	0.50 ±0.10	0.	81±0.1	5			2.50	±0.20
(n)         (0.010+0.000)         (0.02+0.000)         (0.02+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)         (0.01+0.001)	(in.)	(0.020 ±0.004)	(0.0	32±0.0	06)	(0.049 :	±0.008)	(0.098:	±0.008)	(W) V	Vidth	(in.)	(0.020 ±0.004)	(0.0	32±0.0	06)	(0.049 :	±0.008)	(0.098±	0.008)
Image:	mm	0.25±0.15	0.	35±0.1	5	0.50 :	±0.25	0.50:	±0.25	(t) T ==	minal	mm	0.25±0.15	0.	35±0.1	5	0.50	±0.25	0.50	£0.25
12       F       A       A       A       H       H       D       D         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         0.6       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         1.1       F       A       A       A       H       H       D       D         1.3       F       A       A       A       H       H       D       D         1.4       F       A       A       H       H <t< td=""><td>(in.)</td><td>(0.010±0.006)</td><td>(0.0</td><td>14±0.0</td><td>06)</td><td>(0.020±</td><td>±0.010)</td><td>(0.020:</td><td>±0.010)</td><td>(t) Ter</td><td>minai</td><td>(in.)</td><td>(0.010±0.006)</td><td>(0.0</td><td>14±0.0</td><td>06)</td><td>(0.020±</td><td>±0.010)</td><td>(0.020±</td><td>±0.010)</td></t<>	(in.)	(0.010±0.006)	(0.0	14±0.0	06)	(0.020±	±0.010)	(0.020:	±0.010)	(t) Ter	minai	(in.)	(0.010±0.006)	(0.0	14±0.0	06)	(0.020±	±0.010)	(0.020±	±0.010)
0.3         F         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         H         H         D	Ĵ.	50	50	100	200	100	200	100	200		WVDC		50	50	100	200	100	200	100	200
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         0.6       F       A       A       A       H       H       D       D         0.7       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       H       H       D       D         1.5       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D <td>0.2</td> <td></td> <td>Α</td> <td>A</td> <td></td> <td></td> <td>Н</td> <td></td> <td>D</td> <td></td> <td></td> <td>24</td> <td></td> <td>А</td> <td>Α</td> <td>Α</td> <td></td> <td>Н</td> <td>D</td> <td>D</td>	0.2		Α	A			Н		D			24		А	Α	Α		Н	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         0.8       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       H       H       D       D         1.5       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D <td></td>																				
06       F       A       A       A       H       H       D       D         07       F       A       A       A       H       H       D       D         08       F       A       A       A       H       H       D       D         09       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         13       F       A       A       H       H       D       D         14       F       A       A       H       H       D       D         15       F       A       A       H       H       D       D         16       F       A       A       H       H       D       D         17       F       A       A       H       H       D       D         19       F	-																			
07     F     A     A     H     H     D     D       08     F     A     A     H     H     D     D       09     F     A     A     H     H     D     D       10     F     A     A     H     H     D     D       11     F     A     A     H     H     D     D       12     F     A     A     H     H     D     D       13     F     A     A     H     H     D     D       14     F     A     A     H     H     D     D       15     F     A     A     H     H     D     D       16     F     A     A     H     H     D     D       17     F     A     A     H     H     D     D       18     F     A     A     H     H     D     D       19     F     A     A     H     H     D     D       100     C     A     A     H     H     D     D       121     F     A     A     H     H     D     D										(p	F)									
0.9       F       A       A       H       H       D       D         0.9       F       A       A       H       H       D       D         1.0       F       A       A       H       H       D       D         1.1       F       A       A       H       H       D       D         1.1       F       A       A       H       H       D       D         1.2       F       A       A       H       H       D       D         1.3       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.0       F       A       A       H       H       D       D         1.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D																				
0.9       F       A       A       H       H       D       D         1.0       F       A       A       H       H       D       D         1.1       F       A       A       H       H       D       D         1.2       F       A       A       H       H       D       D         1.3       F       A       A       H       H       D       D         1.4       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.7       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D	-											-	F							
10       F       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         13       F       A       A       H       H       D       D         14       F       A       A       H       H       D       D         15       F       A       A       H       H       D       D         15       F       A       A       H       H       D       D         16       F       A       A       H       H       D       D         17       F       A       A       H       H       D       D         19       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         21       F       A       A       H       H       D       D         220       F       A       A       H       H       D       D      <																				
11       F       A       A       H       H       D       D         1.2       F       A       A       H       H       D       D         1.3       F       A       A       H       H       D       D         1.4       F       A       A       H       H       D       D         1.4       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D         1.5       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D         2.4       F       A       A       H       H       D       D	-																			
12       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         1.6       F       A       A       A       H       H       D       D         1.7       F       A       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D       100       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D       130       C       C       D       D       D       0       130       C       C       D       D       D       0       0       0       0       0       0       0       0       0       0 <td></td>																				
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         1.5       F       A       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.7       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         3.0       F       A       A       H       H       D       D         3.3       F       A       A																				
14       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         1.6       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       H       H       D       D         2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6																A				
1.5       F       A       A       H       H       D       D         1.6       F       A       A       H       H       D       D         1.7       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         2.4       F       A       A       H       H       D       D         2.7       F       A       A       H       H       D       D         3.0       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D																				
16       F       A       A       H       H       D       D         1.7       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         2.4       F       A       A       H       H       D       D         2.7       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D																				
1.7       F       A       A       H       H       D       D         1.8       F       A       A       H       H       D       D         1.9       F       A       A       H       H       D       D         2.0       F       A       A       H       H       D       D         2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         2.4       F       A       A       H       H       D       D         3.0       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.4       F       A       A       H       H       D       D         3.4       F       A       A       H       H       D       D         3.6       F       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       H       H       D       D       130       Image: Constraint of the symbolic constration of the symbolic constraint of the symbolic constrating symbo																				
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       H       H       D       D       140       Image: Constraint of the symbolic orgen with or																				
2.1       F       A       A       H       H       D       D         2.2       F       A       A       H       H       D       D         2.4       F       A       A       H       H       D       D         2.7       F       A       A       H       H       D       D         3.0       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.7       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         5.1       F       A       A       H       H       D       D									D										D	
2.2       F       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         2.7       F       A       A       A       H       H       D       D         3.0       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       H       H       D       D         3.43       F       A       A       H       H       D       D         3.43       F       A       A       H       H       D       D         4.3       F       A       A       H       H       D       D         5.6       F       A       A       H       H       D       D         5.6       F	2.0	F	Α	A	Α	Н	Н	D	D			140							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         3.3       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         3.43       F       A       A       A       H       H       D       D         4.3       F       A       A       A       H       H       D       D         5.6       F       A       A       A       H       H       D       D         5.6       F       A       A       A       H       H       D       D         5.6       F       A       A       H       H	2.1	F	Α	Α	Α	Н	н	D	D			150							D	D
2.7       F       A       A       H       H       D       D         3.0       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.3       F       A       A       H       H       D       D         3.6       F       A       A       H       H       D       D         3.9       F       A       A       H       H       D       D         4.3       F       A       A       H       H       D       D         4.7       F       A       A       H       H       D       D         5.1       F       A       A       H       H       D       D         5.6       F       A       A       H       H       D       D         6.2       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         6.2       F       A       A       H       H       D       D	2.2	F	Α	Α	Α	Н	Н	D	D			160							D	D
3.0       F       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         3.9       F       A       A       A       H       H       D       D         3.3       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         4.3       F       A       A       H       H       D       D       330       -       -       D       D       D         5.1       F       A       A       H       H       D       D       430       -       -       D       D       -         5.2       F       A       A       A       H       H       <				Α																
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         4.3       F       A       A       H       H       D       D         4.7       F       A       A       H       H       D       D         5.1       F       A       A       H       H       D       D         5.6       F       A       A       H       H       D       D         6.2       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         10       F       A       A																				
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       H       H       D       D         6.2       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A																				
3.9       F       A       A       A       H       H       D       D         4.3       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       H       H       D       D         6.2       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         8.2       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         10       F       A       A       H       H       D       D         11       F       A																				
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       H       H       D       D         6.8       F       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         8.2       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         10       F       A       A       H       H       D       D         11       F																ļ				
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         6.2       F       A       A       A       H       H       D       D         6.8       F       A       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         620       Image: Colored colo																				
5.1       F       A       A       H       H       D       D         5.6       F       A       A       H       H       D       D         6.2       F       A       A       H       H       D       D         6.2       F       A       A       H       H       D       D         6.8       F       A       A       H       H       D       D         7.5       F       A       A       H       H       D       D         8.2       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         9.1       F       A       A       H       H       D       D         10       F       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D <td></td>																				
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         6.8       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       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td><td></td><td></td><td></td><td></td></td<>																				
6.2       F       A       A       H       H       D       D         6.8       F       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         9.1       F       A       A       A       H       H       D       D         10       F       A       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td> </td><td> </td><td></td><td></td><td></td><td>0</td></td<>																				0
6.8       F       A       A       A       H       H       D       D         7.5       F       A       A       A       H       H       D       D       620       Image: Constraint of the state of the stat																				
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       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F       A       A       H       H       D       D         50       50       100       200       100       200       100       200																				
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         10       F       A       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F       A       A       H       H       D       D         50       50       100       200       100       200       100       200         50       50       100       200       100       200       100       200						-														
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         11       F       A       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F       A       A       H       H       D       D         50       50       100       200       100       200       100       200         50       50       100       200       100       200       100       200																				
10       F       A       A       H       H       D       D         11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F       A       A       H       H       D       D         50       50       100       200       100       200       100       200         50       50       100       200       100       200       100       200																				
11       F       A       A       H       H       D       D         12       F       A       A       H       H       D       D         18       F       A       A       H       H       D       D         20       F       A       A       H       H       D       D         22       F       A       A       H       H       D       D         50       50       100       200       100       200       100       200																				
12     F     A     A     A     H     H     D     D       18     F     A     A     A     H     H     D     D       20     F     A     A     H     H     D     D       22     F     A     A     H     H     D     D       50     50     100     200     100     200     100     200	11	F					н	D	D			910							D	
20         F         A         A         A         H         H         D         D           22         F         A         A         H         H         D         D           50         50         100         200         100         200         100         200	12	F						D	D			1000							D	
22         F         A         A         A         H         H         D         D           50         50         100         200         100         200         100         200	18	F	Α	Α	Α	Н	Н	D	D		WVDC		50	50	100	200	100	200	100	200
50 50 100 200 100 200 100 200	20	F		Α			Н	D	D		SIZE		LD02		LD03		LD	05	LD	
	22	F	Α	Α	Α	Н	Н	D	D											
LD02 LD03 LD05 LD10			50		200	100	200	100	200											
		LD02		LD03		LD	05	LD	10											

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

### **TOLERANCE OPTIONS**

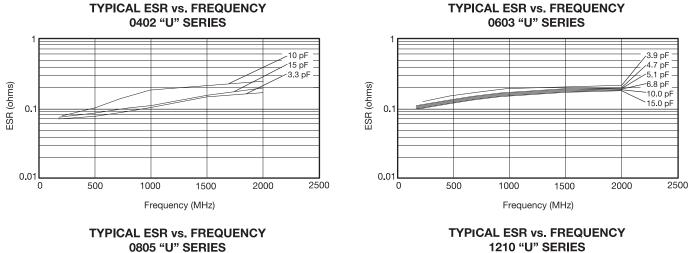
Capacitance Range	Available Tolerances
0.20-0.50 pF	B, C
0.60-6.2 pF	B,C, D
6.8- 9.1 pF	B, C, J, K, M
10-1000 pF	F,G, J, K, M

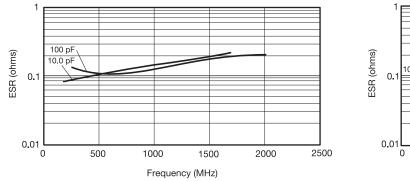
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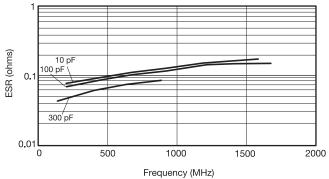
### COG (NP0), Sn/Pb - Capacitance Range

### **ULTRA LOW ESR, "U" SERIES**





1210 "U" SERIES



**TYPICAL** SERIES RESONANT FREQUENCY **"U" SERIES CHIP** 10 0402 0603 Frequency (GHz) 0805 1210 1.0 0.1 1.0 1000 10 100

## Capacitance (pF)

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online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

### X8R – General Specifications

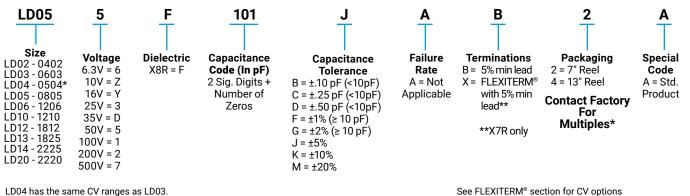




KYOCERA AVX will support those customers for commercial and military Multilayer Ceramic Capacitors with a termination consisting of 5% minimum lead. This termination is indicated by the use of a "B" in the 12th position of the KYOCERA AVX Catalog Part Number. This fulfills KYOCERA AVX's commitment to 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)



LD04 has the same CV ranges as LD03.

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

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## X8R – Specifications and Test Methods

Paramet	ter/Test	X8R Specification Limits	Measuring	Conditions			
Operating Temp	perature Range	-55°C to +150°C	Temperature C	cycle Chamber			
Capac	itance	Within specified tolerance					
Dissipatio	on Factor	$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 3.5% for 25V DC and 16V DC rating	Freq.: 1.0 F Voltage: 1.0				
Insulation I	Resistance	100,000MΩ or 1000MΩ - μF, whichever is less	Charge device with 120 ± 5 secs @ roo	n rated voltage for om temp/humidity			
Dielectric	Strength	No breakdown or visual defects	Charge device with 250 1-5 seconds, w/charge limited to 50 Note: Charge device wit for 500V	and discharge current ) mA (max) h 150% of rated voltage			
	Appearance	No defects	Deflectio	n <sup>.</sup> 2mm			
Resistance to	Capacitance Variation	≤ ±12%	Test Time: 3				
Flexure Stresses	Dissipation Factor	Meets Initial Values (As Above)					
	Insulation Resistance	≥ Initial Value x 0.3	90	mm			
Solder	ability	≥ 95% of each terminal should be covered with fresh solder	Dip device in eutection for 5.0 ± 0.				
	Appearance	No defects, <25% leaching of either end terminal					
	Capacitance Variation	≤ ±7.5%					
Resistance to Solder Heat	Dissipation Factor	Meets Initial Values (As Above)	Dip device in eutectic s seconds. Store at room	temperature for 24 ± 2			
	Insulation Resistance	Meets Initial Values (As Above)	hours before measurin	g electrical properties.			
	Dielectric Strength	Meets Initial Values (As Above)		1			
		No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes			
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes			
Thermal Shock	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	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 24 ± 2 hours at ro				
	Appearance	No visual defects	-				
	Capacitance Variation	≤ ±12.5%	Charge device with 1.5 test chamber set				
Load Life	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	for 1000 hou				
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from test chamb temperature for 24 ± 2 h				
Load Humidity	Dielectric Strength	Meets Initial Values (As Above)					
	Appearance	No visual defects	-				
	Capacitance Variation	≤ ±12.5%	Store in a test chamber s 5% relative humidi	ity for 1000 hours			
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	(+48, -0) with rate				
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from chamber temperature ar 24 ± 2 hours bet	nd humidity for			
	Dielectric Strength	Meets Initial Values (As Above)		ore measuring.			

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- SURFACE MOUNT CERAMIC CAPACITOR PRODUCT



### X8R – Capacitance Range

	SIZE	LD	03	LD	05	LD	06
	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	М	М
683	0.068	G		N	N	M	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	
474	0.47					М	
684	0.68						
824	0.82						
105	1						
	WVDC	25V	50V	25V	50V 25V 50V		
	SIZE	LD	LD03 LD05 LD06				06

Letter	А	С	E	G	J	K	М	N	Р	Q	Х	Y	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	·		

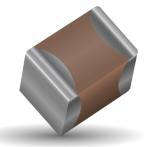
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### X7R – General Specifications

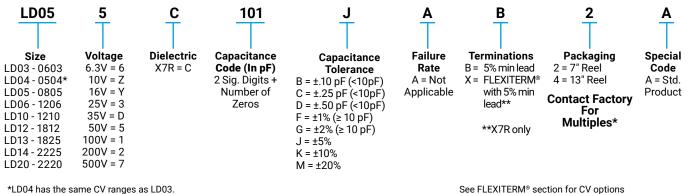




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**Not RoHS Compliant** 

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



\*LD04 has the same CV ranges as LD03.

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

+30

+20

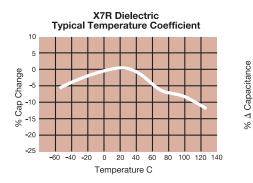
-10

-20

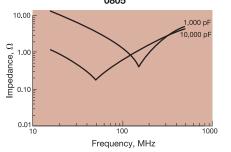
-30

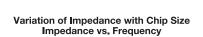
1KHz

10 KHz









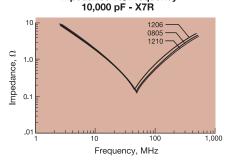
Frequency

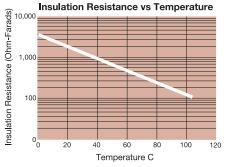
100 KHz

1 MHz

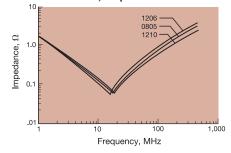
10 MHz

△ Capacitance vs. Frequency





Variation of Impedance with Chip Size Impedance vs. Frequency 100,000 pF - X7R



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X7R – Specifications and Test Methods

Paramet	ter/Test	X7R Specification Limits	Measuring	Conditions			
Operating Temp	perature Range	-55°C to +125°C	Temperature C	ycle Chamber			
Capac	itance	Within specified tolerance	-				
Dissipatio	on 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	Freq.: 1.0 k Voltage: 1.0'				
Insulation I	Resistance	100,000MΩ or 1000MΩ - μF, whichever is less	Charge device with 120 ± 5 secs @ roo				
Dielectric	Strength	No breakdown or visual defects	Charge device with 250 1-5 seconds, w/charge limited to 50 Note: Charge device with for 500V	and discharge current mA (max) 1 150% of rated voltage			
	Appearance	No defects	Deflectio	n: 2mm			
Resistance to	Capacitance Variation	≤ ±12%	Test Time: 3				
Flexure Stresses	Dissipation Factor	Meets Initial Values (As Above)					
	Insulation Resistance	≥ Initial Value x 0.3	90 r	nm			
Solder	ability	≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic for 5.0 ± 0.5				
	Appearance	No defects, <25% leaching of either end terminal	-				
	Capacitance Variation	≤ ±7.5%					
Resistance to Solder Heat	Dissipation Factor	Meets Initial Values (As Above)	Dip device in eutectic s seconds. Store at room	temperature for 24 ± 2			
	Insulation Resistance	Meets Initial Values (As Above)	hours before measuring	j electrical properties.			
	Dielectric Strength	Meets Initial Values (As Above)					
	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes			
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes			
Thermal Shock	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	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 24 ± 2 hours at ro				
	Appearance	No visual defects	-				
	Capacitance Variation	≤ ±12.5%	Charge device with 1.5 r test chamber set	ated voltage (≤ 10V) in			
Load Life	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	for 1000 hou				
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from test chamb temperature for 24 ± 2 h				
	Dielectric Strength	Meets Initial Values (As Above)					
	Appearance	No visual defects	4				
	Capacitance Variation	≤ ±12.5%	Store in a test chamber s 5% relative humidi				
Load Humidity	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	(+48, -0) with rated	voltage applied.			
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from chamber temperature an 24 + 2 bours bef	d humidity for			
Dielect	Dielectric Strength	Meets Initial Values (As Above)	24 ± 2 hours before measuring.				

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### X7R – Capacitance Range

### **PREFERRED SIZES ARE SHADED**

								Œ	D														Ē				
SIZE			LD						LD03							LD05				LD06 Reflow/Wave Paper/Embossed							
Solder			Reflow		e				low/W							low/W											
Packag			All P						II Pap								ossed					Pa					
(L) Length	mm (in.)		1.00 : : 0.040	± 0.10					50 ± 0. 53 ± 0.							01 ± 0 79 ± 0						((	: 3.20 : 3.26	± 0.20			
	(iii.) mm	((	0.50 :						$\frac{55 \pm 0}{31 \pm 0}$							$\frac{79 \pm 0}{25 \pm 0}$						(		± 0.00 ± 0.20			
W) Width	(in.)	((	0.30 : 0.020 :						$31 \pm 0.32 \pm 0.32 \pm 0.331 \pm 0.3311$							23±0 49±0						((	0.063 :				
	mm	(	0.25 :						$35 \pm 0.35 \pm 0.$							$\frac{1}{50 \pm 0}$						(		± 0.00			
(t) Terminal	(in.)	((	0.010 :						14 ± 0.							20 ± 0						((	0.020 :				
WVD	C	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
Сар	100																										
(pF)	150																										
(1-1)	220				С																						
	330				C					G	G	G		J	J	J	J	J	J								К
	470				c					G	G	G		Ĵ	J	J	Ĵ	J	Ĵ								ĸ
	680				c					G	G	G		Ĵ	Ĵ	J	J	Ĵ	J								ĸ
	1000				C					G	G	G		J	J	J	J	J	J								K
	1500				c					G	G			J	J	J	J	J	J		J	J	J	J	J	J	м
	2200				c					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	3300			С	C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	4700			c	C C					G	G			Ĵ	J	J	J	Ĵ	J		J	J	J	Ĵ	Ĵ	J	M
	6800		С	c						G	G			J	J	J	J	J	J		J	J	J	J	J	J	P
Сар	0.010		C	C						G	G			J	J	J	J	J	J		J	J	J	J	J	J	P
(μF)	0.015		c	U					G	G	0			J	J	J	J	J	J		J	J	J	J	J	M	
(μι)	0.022		c						G	G				J	J	J	J	J	N		J	J	J	J	J	M	
	0.022		C						G	G				J	J	J	J	N			J	J	J	J	J	M	
	0.033		U					G	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	P	
	0.008	С		C*			G	G	G	G				J	J	J	J	N			J	J	J	J	P	P	<u> </u>
		U		し <sup>^</sup>		G		G	G	G				-			-				-		-			P	
	0.15 0.22					-	G G							J	J	J	N	N			J	J	J	J	Q		
	0.22					G	G							J	J	N	N N	N N			J	J	J	J P	Q		
									14							N					J	J		P	Q		
	0.47 0.68								J*					N	N	N	N	N			M	M	M		Q		
	1.0						J*	J*						N N	N N	N N*					M	M	Q	Q O	Q		
	-						J^	J^						IN	IN	IN^					P		Q	Q	Q		
	1.5					14										P*						Q	Q				
	2.2	L				J*		<u> </u>			<u> </u>	<u> </u>				P*		<u> </u>			Q	Q	Q				<u> </u>
	3.3													P*	P*						0*	0*	0*				
	4.7												D*		P*						Q*	Q*	Q*				
	10												P*	Р						0.4	Q*	Q*	Q				
	22																			Q*							
	47																										
14.0.15	100	4.0	1.5	0.5	50	6.0	10	1.	0.5	50	100	000		10	1.	0.5	50	100	000	6.0	10	1.	0.5	50	100	000	500
WVD		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			LD	02					LD03							LD05				LD06							

Letter	А	С	E	G	J	К	М	N	Р	Q	Х	Y	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	OSSED			

= Under Development

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# X7R – Capacitance Range

#### **PREFERRED SIZES ARE SHADED**

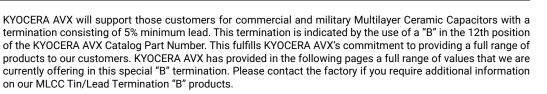
											Ш									
SIZE					LD10					LD	12		LD	013			20	-	LC	014
Solderin	g				eflow On					Reflov			Reflo	w Only		Reflo				w Only
Packagir	ng				er/Embos					All Emb				bossed		All Em				bossed
(L) Length	mm				.20 + 0.2					4.50 ±				± 0.30			± 0.50			± 0.25
(_) _og	(in.)			(0.1	26 ± 0.0	08)				(0.177 ±				± 0.012)			± 0.020)			± 0.010)
W) Width	mm				.50 ± 0.2					3.20 ±				± 0.40			± 0.40			± 0.25
,	(in.)				98 ± 0.0					(0.126 ± 0.61 ±				<u>± 0.016)</u> ± 0.36			<u>± 0.016)</u> ± 0.39			± 0.010) ± 0.39
(t) Terminal	mm (in.)				.50 ± 0.2 20 ± 0.0					(0.024 ±				± 0.36 ± 0.014)			± 0.39 ± 0.015)			± 0.39 ± 0.015)
WVDC		10	16	25	50 ± 0.0	10)	200	500	50	100	200	500	50	100	25	50	100	200	50	100
Сар	100	10	10	20		100	200	500		100	200	500	50	100	25	50	100	200	50	100
(pF)	150																			
(1-1)	220																		 6	
	330									1			1			t 🖌	-1		-VV-~	
	470																$\frown$		)) fī	-
	680															Ļ				
	1000																	**		
	1500	J	J	J	J	J	J	М										<b>™</b> t		
	2200	J	J	J	J	J	J	M									1		<u> </u>	
	3300	J	J	J	J	J	J	М												
	4700 6800	J	J	J	J	J	J	M M												
Сар	0.010	J		J	J	J	J	M	K	K	К	К	м	м		X	X	X	м	Р
	0.010	J	J	J	J	J	J	P	K	K	K	P	M	M		x	x	x	M	P
	0.022	J	J	J	J	J	J	0	ĸ	ĸ	ĸ	P	м	M		x	X	X	M	P
	0.033	J	 	J	J	J	J	0	K	K	K	X	M	M		X	X	X	M	P
	0.047	J	J	J	J	J	J	``	к	к	к	z	м	м		x	x	x	м	Р
	0.068	J	J	J	J	J	М		к	к	к	z	м	М		X	X	X	М	Р
	0.10	J	J	J	J	J	М		K	K	K	Z	M	М		Х	X	X	М	Р
	0.15	J	J	J	J	М	Z		К	К	Р		М	М		X	X	X	M	Р
	0.22	J	J	J	J	Р	Z		K	K	Р		М	М		Х	X	Х	М	Р
	0.33	J	J	J	J	Q			K	М	Х		М	М		X	X	X	M	Р
	0.47	M	M	M	M	Q			K	P			M	M		X	X	X	M	P
	0.68	M	<u>M</u> N	P P	X X	X Z			M	Q X			M	P		X X	X X		M	P P
	1.0	N N	N N	Z	Z	Z			Z	Z			M	P		X			M	X
	2.2	X	X	Z	Z	Z			z	z						X	X		M	^
	3.3	X	X X	Z	Z	-			Z	-			1			X	Z			
	4.7	x	x	z	z				z	Z						x	Z			
	10	Z	Z	z	z											Z	z			
	22	Z	Z										1		Z					
	47	Z																		
	100																			
WVDC		10	16	25	50	100	200	500	50	100	200	500	50	100	25	50	100	200	50	100
SIZE					LD10					LD	12			013		LD	20			014

Letter	А	С	E	G	J	K	М	N	Р	Q	Х	Y	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			

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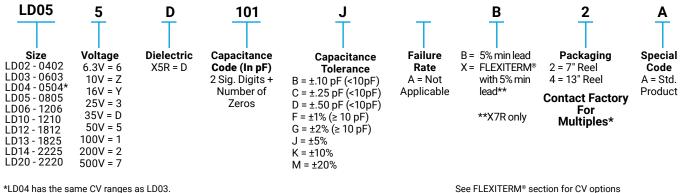
### X5R – General Specifications



**Not RoHS Compliant** 

🔇 КУОСЕRа

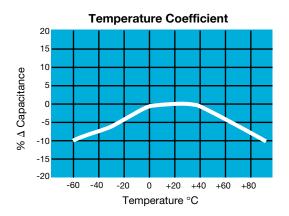
#### PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

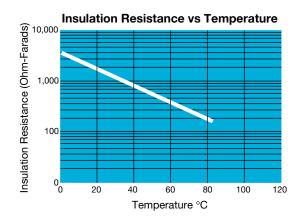


\*LD04 has the same CV ranges as LD03.

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

#### **TYPICAL ELECTRICAL CHARACTERISTICS**





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### **X5R – Specifications and Test Methods**

Parame	ter/Test	X5R Specification Limits	Measuring	Conditions					
Operating Tem	perature Range	-55°C to +85°C	Temperature C	ycle Chamber					
Capac	itance	Within specified tolerance							
Dissipati	on Factor	≤ 2.5% for ≥ 50V DC rating ≤ 3.0% for 25V, 35V DC rating ≤ 12.5% Max. for 16V DC rating and lower Contact Factory for DF by PN	Freq.: 1.0 k Voltage: 1.0 For Cap > 10 μF, 0	Vrms ± .2V					
Insulation	Resistance	10,000MΩ or 500MΩ - μF, whichever is less	Charge device with 120 ± 5 secs @ roc						
Dielectric	Strength	No breakdown or visual defects	Charge device with 250 1-5 seconds, w/charge limited to 50	and discharge current					
	Appearance	No defects	Deflectio	n: 2mm					
Resistance to	Capacitance Variation	≤ ±12%	Test Time: 3						
Flexure Stresses	Dissipation Factor	Meets Initial Values (As Above)							
	Insulation Resistance	≥ Initial Value x 0.3	90 mm						
Solder	ce to rees           Capacitance           Variation           Pactor           Insulation           Resistance           Solderability           Appearance           Capacitance           Variation           Resistance           Capacitance           Variation           Resistance           Dissipation           Factor           Insulation           Resistance           Dielectric           Strength           Appearance           Capacitance           Variation           Resistance           Dielectric           Strength <t< td=""><td>≥ 95% of each terminal should be covered with fresh solder</td><td colspan="7">Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds</td></t<>	≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds						
	Appearance	No defects, <25% leaching of either end terminal							
		≤ ±7.5%	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.						
Resistance to Solder Heat		Meets Initial Values (As Above)							
	Appearance Capacitance Variation Capacitance Variation Factor Insulation Resistance Dielectric Strength Appearance Capacitance Variation Dissipation	Meets Initial Values (As Above)	hours before measuring	g electrical properties.					
		Meets Initial Values (As Above)		T					
	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes					
		≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes					
Thermal Shock		Meets Initial Values (As Above)	Step 3: +85°C ± 2°	30 ± 3 minutes					
		Meets Initial Values (As Above)	Step 4: Room Temp ≤ 3 minutes						
		Meets Initial Values (As Above)	Repeat for 5 cycles 24 ± 2 hours at ro	and measure after om temperature					
	Appearance	No visual defects							
	Variation	≤ ±12.5%	Charge device with 1.5 chamber set at 85°C : (+48, -0). Note: Contac	± 2°C for 1000 hours					
Load Life		≤ Initial Value x 2.0 (See Above)	specification part num	pers that are tested at					
	Resistance	≥ Initial Value x 0.3 (See Above)	<ul> <li>&lt; 1.5X rated voltage.</li> <li>Remove from test chamber and stabilize at room</li> </ul>						
		Meets Initial Values (As Above)	temperature for 24 ± 2 h	ours before measuring.					
		No visual defects							
	Variation	≤ ±12.5%	Store in a test chamber s 5% relative humidi	ty for 1000 hours					
Load Humidity		≤ Initial Value x 2.0 (See Above)	(+48, -0) with rated	l voltage applied.					
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from chamber temperature an 24 ± 2 hours bef	d humidity for					
	Dielectric Strength	Meets Initial Values (As Above)		ore medouning.					

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### X5R – Capacitance Range

#### **PREFERRED SIZES ARE SHADED**

					•												Œ																				
SIZ				L	002					L	D03	3					LD	05					LD	06					L	.D10	)				LD	12	
Solder	ing		R	eflo	N/W	ave				Reflo	w/V	Vave	9			Re	flow	/Wav	'e			Re	flow	/Wav	ve			1	Reflo	ow/V	Vave						
Packag	ging				⊃ар					All					P			nbos		d	Ρ		r/Er			d		Pa		'Emb		ed					
(L) Length	mm				± 0.					1.60								0.20					.20 ±							0 ± 0							
., -	(in.) mm				±0. ±0.	004)		-	((	0.063								0.00					126 ±					((		6 ± 0 0 ± 0		)					_
W) Width	(in.)					004)			((	0.032								0.20					.00 <u>1</u> )63 <u>t</u>					((		0±0 8±0		)					
(t) Terminal	mm		(	).25	± 0.	15		1		0.35	5±0	).15				0	.50 ±	0.25	5			0	.50 ±	0.2	5				0.5	0 ± 0	.25						-
WVD	(in.)	4				006)	50			0.014				50	6 2			0.01		50	6 21		)20 ±			50	4			$\frac{0 \pm 0}{16}$			50	6.3	101	25	г
Cap	100	4	0.5	10	10	23	30	4	0.5	10	10	25	30	30	0.3	10	10	23	30	50	0.5	10	10	20	30	30	4	0.5	10	10	25	30	50	0.5	10	20	F
(pF)	150																																		1		
(pi)	220						С																														l
	330						C																									-			$\vdash$		ł
	470						С																							1/	$\rightarrow$	$\geq$	$\leq$	<b>₹</b> _V	V	_	
	680						С																					7	<	~	<			7	_<	<u> </u>	
	1000						С																				—		(					L	ノニ	Ł	
	1500						С																							<u> </u>	l	$\downarrow$	/				
	2200						С																									-					
	3300						С																									`t∣					
	4700					С								G																	1	1					I
	6800					С								G																							
Сар	0.010					С								G																							
(µF)	0.015					С						G	G	G																							
	0.022				С	С						G	G	G						Ν															$\square$		ļ
	0.033				С							G	G	G						Ν																	
	0.047				С	С						G	G	G						Ν																	
	0.068			С	C			-				G		G						N	_	_													$\vdash$		ł
	0.10 0.15			C	С	С						G G		G				N N	NI	Ν																	
	0.15		C*								G	G						N	N N							Q											
	0.22		0								G	G						N	IN							Q									$\vdash$		ł
	0.33	C*	C*								G							N						Q	Q								x		1		
	0.68		Ŭ								G							N						4	Y								~		1		l
	1.0	C*	C*	C*					G	G		J*					Ν	N		P*				Q	Q						Х	X	х				t
	1.5	-		-					-	-																									í I		l
	2.2	C*						G*	G*	J*	J*					Ν	Ν	Ν					Q	Q							Ζ	х					l
	3.3		1					J*	J*	J*	J*				Ν	Ν					Х	Х													$\square$		Ì
	4.7							J*	J*	J*					N	Ν	N*	N*			x	х	Х	Х						Q	Ζ						I
	10							К*							Р	Р	Р				х	х	х	х					Х	Ζ	Z					Ζ	I
	22														P*						Х	Х	Х	Х				Ζ	Ζ	Ζ	Z						ſ
	47																				Х							Z*									I
	100																										Z*	Z	1.0								ļ
	WVDC	4	6.3				50	4	6.3				35	50	6.3	10		25	35	50	6.3	10		25	35	50	4	6.3	_			35	50	6.3			1
	SIZE			L	002					L	D03	3					LD	05					LD	06					L	.D10	)				LD.	12	

Letter	A	С	E	G	J	К	М	N	Р	Q	Х	Y	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	DSSED			

#### \*Optional Specifications – Contact factory

NOTE: Contact factory for non-specified capacitance values

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