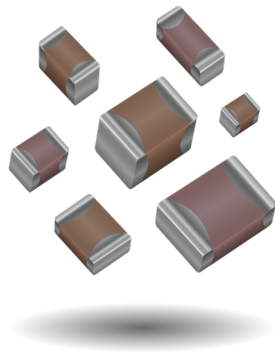


# MLCC Tin/Lead Termination "B" (LD Series)

## 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

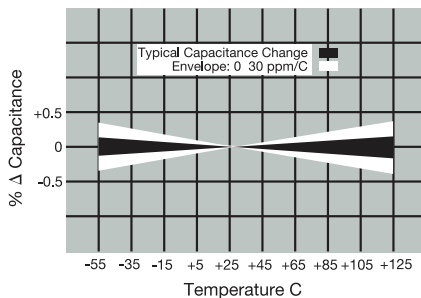
| LD05                                                                                                                                                | 5                                                                                                   | A                                             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

\*LD04 has the same CV ranges as LD03.

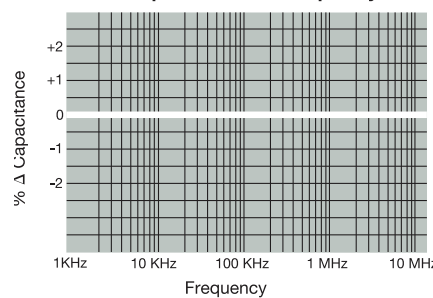
See FLEXITERM® section for CV options

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

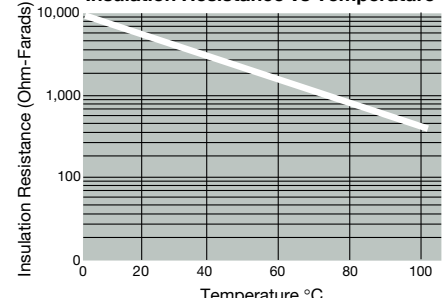
Temperature Coefficient



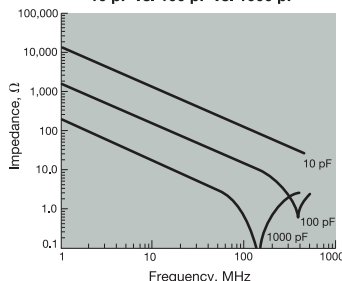
Δ Capacitance vs. Frequency



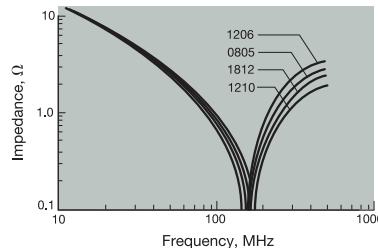
Insulation Resistance vs Temperature



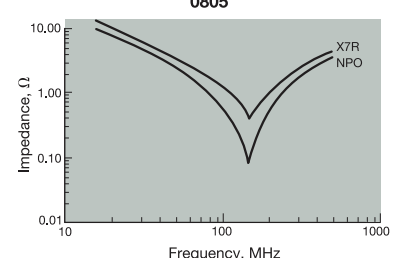
Variation of Impedance with Cap Value  
Impedance vs. Frequency  
0805 - C0G (NP0)  
10 pF vs. 100 pF vs. 1000 pF



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

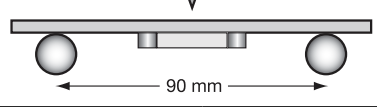


Variation of Impedance with Ceramic Formulation  
Impedance vs. Frequency  
1000 pF - C0G (NP0) vs X7R  
0805



# MLCC Tin/Lead Termination “B”

## C0G (NP0) – Specifications and Test Methods

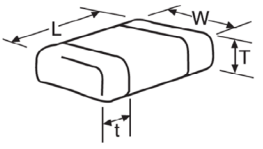
| Parameter/Test                 |                       | NP0 Specification Limits                                                                                  | Measuring Conditions                                                                                                                                                                                                                            |                    |
|--------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 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<br>1.0 kHz $\pm$ 10% for cap $>$ 1000 pF<br>Voltage: 1.0Vrms $\pm$ .2V                                                                                                                          |                    |
| Q                              |                       | $<30$ pF: $Q \geq 400+20 \times \text{Cap Value}$<br>$\geq 30$ pF: $Q \geq 1000$                          |                                                                                                                                                                                                                                                 |                    |
| Insulation Resistance          |                       | 100,000M $\Omega$ or 1000M $\Omega$ - $\mu$ F,<br>whichever is less                                       | Charge device with rated voltage for<br>60 $\pm$ 5 secs @ room temp/humidity                                                                                                                                                                    |                    |
| Dielectric Strength            |                       | No breakdown or visual defects                                                                            | Charge device with 250% of rated voltage for<br>1-5 seconds, w/charge and discharge current<br>limited to 50 mA (max)<br>Note: Charge device with 150% of rated voltage<br>for 500V devices.                                                    |                    |
| Resistance to Flexure Stresses | Appearance            | No defects                                                                                                | Deflection: 2mm<br>Test Time: 30 seconds<br>1mm/sec<br>                                                                                                      |                    |
|                                | Capacitance Variation | $\pm 5\%$ or $\pm 5$ pF, whichever is greater                                                             |                                                                                                                                                                                                                                                 |                    |
|                                | Q                     | Meets Initial Values (As Above)                                                                           |                                                                                                                                                                                                                                                 |                    |
|                                | Insulation Resistance | $\geq$ Initial Value $\times$ 0.3                                                                         |                                                                                                                                                                                                                                                 |                    |
| Solderability                  |                       | $\geq 95\%$ of each terminal should be covered<br>with fresh solder                                       | Dip device in eutectic solder at 230 $\pm$ 5°C<br>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<br>seconds. Store at room temperature for 24 $\pm$ 2<br>hours before measuring electrical properties.                                                                                             |                    |
|                                | Capacitance Variation | $\leq \pm 2.5\%$ or $\pm 25$ 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 $\pm 25$ pF, whichever is greater                                                     | Step 2: Room Temp                                                                                                                                                                                                                               | $\leq$ 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                                                                                                                                                                                                                               | $\leq$ 3 minutes   |
|                                | Dielectric Strength   | Meets Initial Values (As Above)                                                                           | Repeat for 5 cycles and measure after<br>24 hours at room temperature                                                                                                                                                                           |                    |
| Load Life                      | Appearance            | No visual defects                                                                                         | Charge device with twice rated voltage in test<br>chamber set at 125°C $\pm$ 2°C<br>for 1000 hours (+48, -0).<br><br>Remove from test chamber and stabilize at room<br>temperature for 24 hours<br>before measuring.                            |                    |
|                                | Capacitance Variation | $\leq \pm 3.0\%$ or $\pm .3$ pF, whichever is greater                                                     |                                                                                                                                                                                                                                                 |                    |
|                                | Q                     | $\geq 30$ pF: $Q \geq 350$<br>$\geq 10$ pF, $<30$ pF: $Q \geq 275 + 5C/2$<br>$<10$ pF: $Q \geq 200 + 10C$ |                                                                                                                                                                                                                                                 |                    |
|                                | Insulation Resistance | $\geq$ Initial Value $\times$ 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% $\pm$<br>5% relative humidity for 1000 hours<br>(+48, -0) with rated voltage applied.<br><br>Remove from chamber and stabilize at room<br>temperature for 24 $\pm$ 2 hours before measuring. |                    |
|                                | Capacitance Variation | $\leq \pm 5.0\%$ or $\pm .5$ pF, whichever is greater                                                     |                                                                                                                                                                                                                                                 |                    |
|                                | Q                     | $\geq 30$ pF: $Q \geq 350$<br>$\geq 10$ pF, $<30$ pF: $Q \geq 275 + 5C/2$<br>$<10$ pF: $Q \geq 200 + 10C$ |                                                                                                                                                                                                                                                 |                    |
|                                | Insulation Resistance | $\geq$ Initial Value $\times$ 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   | 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               |      |     |     |     |     |  |
| Cap (pF)     | 8200  |                 |      |    |    |                 |      |     |     |                 |      |     |     | M   | M               |      |     |     |     |     |  |
|              | 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<br>(0.013) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040) | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090) | 2.54<br>(0.100) | 2.79<br>(0.110) |
| PAPER          |                 |                 |                 |                 |                 | EMBOSSED        |                 |                 |                 |                 |                 |                 |                 |

# 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            |     |     |

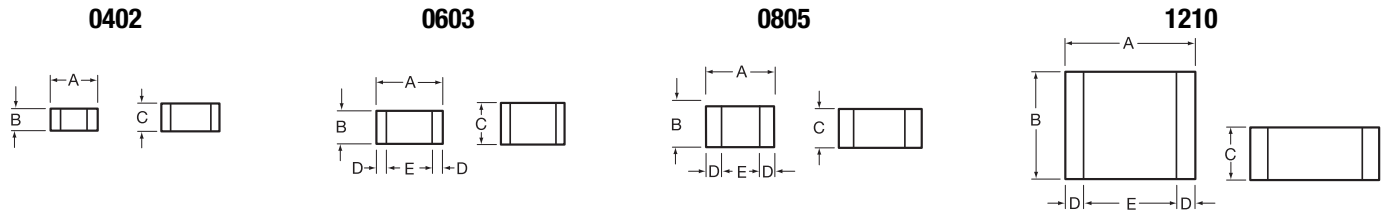
| Letter         | A               | C               | E               | G               | J               | K               | M               | N               | P               | Q               | X               | Y               | Z               |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|---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

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

### 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<sup>12</sup> Ω min. @ 25°C and rated WVDC  
 10<sup>11</sup> 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        |

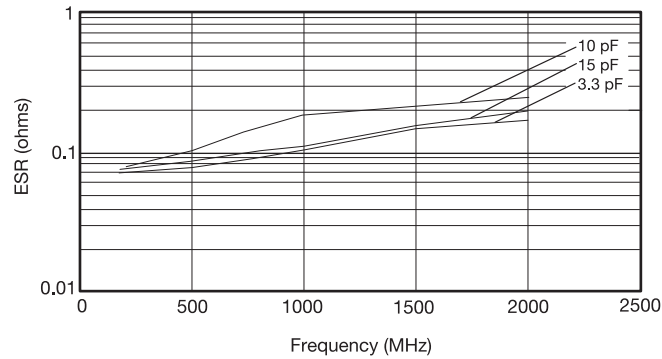
# MLCC Tin/Lead Termination "B"

## C0G (NP0), Sn/Pb – Capacitance Range

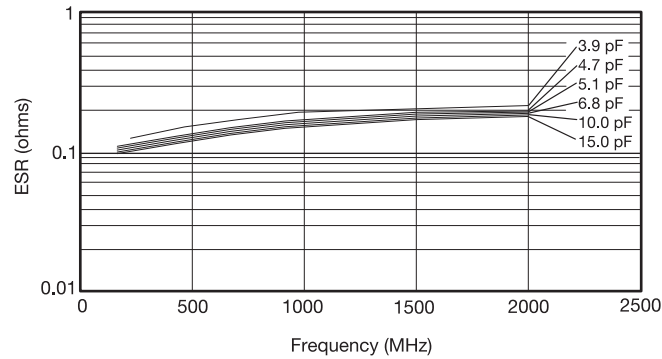


### ULTRA LOW ESR, "U" SERIES

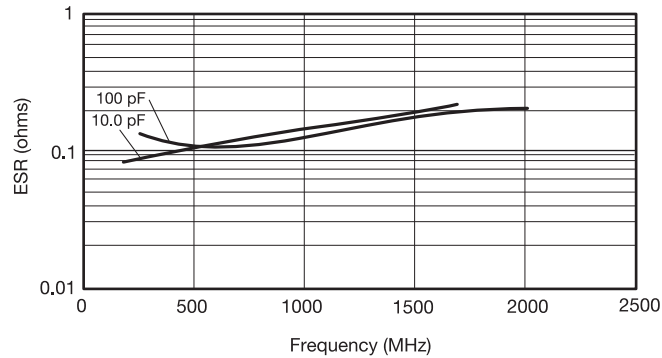
TYPICAL ESR vs. FREQUENCY  
0402 "U" SERIES



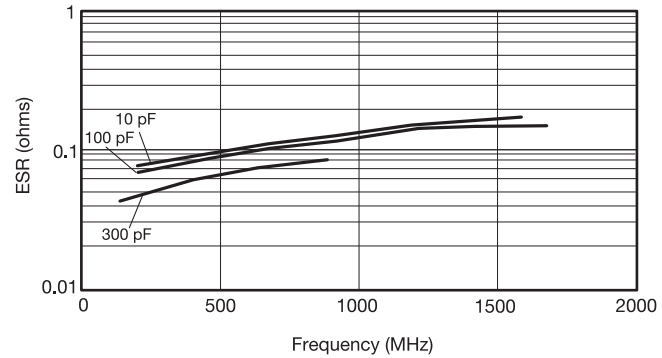
TYPICAL ESR vs. FREQUENCY  
0603 "U" SERIES



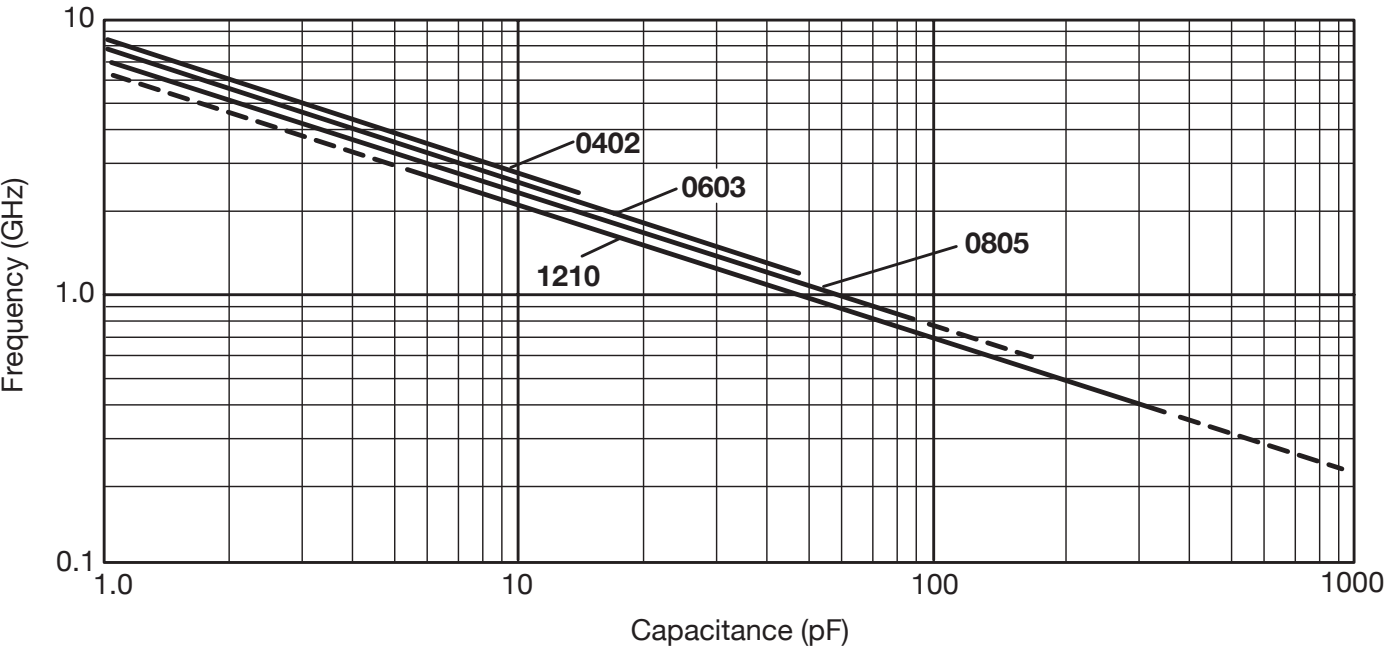
TYPICAL ESR vs. FREQUENCY  
0805 "U" SERIES



TYPICAL ESR vs. FREQUENCY  
1210 "U" SERIES

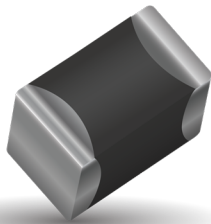


### TYPICAL SERIES RESONANT FREQUENCY "U" SERIES CHIP



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

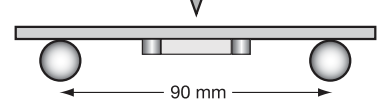
LD04 has the same CV ranges as LD03.

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%<br>Voltage: 1.0Vrms $\pm$ .2V                                                                                                                                                                                                          |                    |
| Dissipation Factor             |                       | $\leq$ 2.5% for $\geq$ 50V DC rating<br>$\leq$ 3.5% for 25V DC and 16V DC rating |                                                                                                                                                                                                                                                                 |                    |
| Insulation Resistance          |                       | 100,000M $\Omega$ or 1000M $\Omega$ - $\mu$ F,<br>whichever is less              | Charge device with rated voltage for<br>120 $\pm$ 5 secs @ room temp/humidity                                                                                                                                                                                   |                    |
| Dielectric Strength            |                       | No breakdown or visual defects                                                   | Charge device with 250% of rated voltage for<br>1-5 seconds, w/charge and discharge current<br>limited to 50 mA (max)<br>Note: Charge device with 150% of rated voltage<br>for 500V devices.                                                                    |                    |
| Resistance to Flexure Stresses | Appearance            | No defects                                                                       | Deflection: 2mm<br>Test Time: 30 seconds<br>                                                                                                                                 |                    |
|                                | 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<br>with fresh solder               | Dip device in eutectic solder at 230 $\pm$ 5°C<br>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<br>seconds. Store at room temperature for 24 $\pm$ 2<br>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<br>24 $\pm$ 2 hours at room temperature                                                                                                                                                                                   |                    |
| Load Life                      | Appearance            | No visual defects                                                                | Charge device with 1.5 rated voltage ( $\leq$ 10V) in<br>test chamber set at 150°C $\pm$ 2°C<br>for 1000 hours (+48, -0)<br><br>Remove from test chamber and stabilize at room<br>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% $\pm$<br>5% relative humidity for 1000 hours<br>(+48, -0) with rated voltage applied.<br><br>Remove from chamber and stabilize at room<br>temperature and humidity for<br>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”

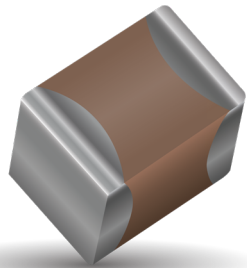
## X8R – Capacitance Range

| 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<br>(0.013) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040) | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090) | 2.54<br>(0.100) | 2.79<br>(0.110) |
|                | PAPER           |                 |                 |                 |                 | EMBOSSED        |                 |                 |                 |                 |                 |                 |                 |

# 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**

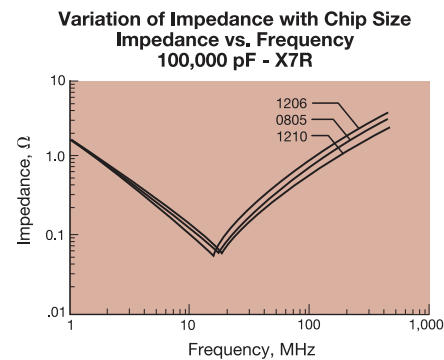
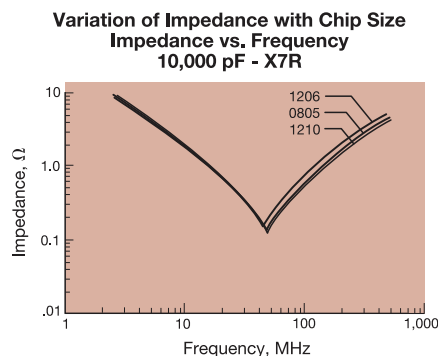
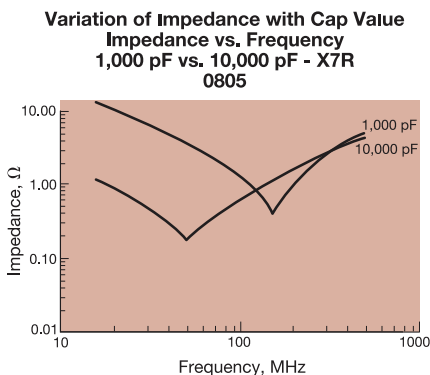
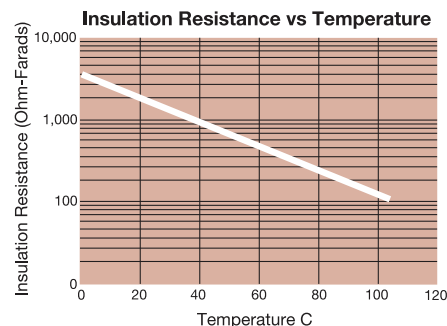
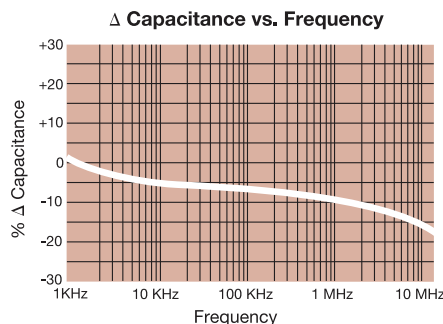
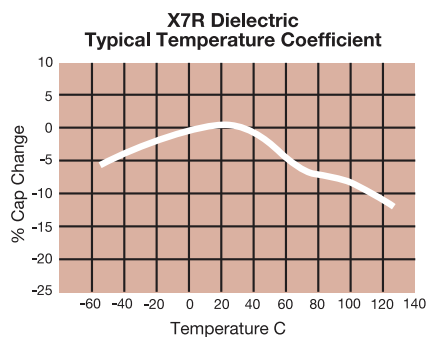
### PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

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

\*LD04 has the same CV ranges as LD03.

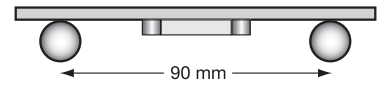
See FLEXITERM® section for CV options

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%<br>Voltage: 1.0Vrms $\pm$ .2V                                                                                                                                                                                                          |                    |
| Dissipation Factor                   |                       | $\leq$ 10% for $\geq$ 50V DC rating<br>$\leq$ 12.5% for 25V DC rating<br>$\leq$ 12.5% for 25V and 16V DC rating<br>$\leq$ 12.5% for $\leq$ 10V DC rating |                                                                                                                                                                                                                                                                 |                    |
| Insulation Resistance                |                       | 100,000M $\Omega$ or 1000M $\Omega$ - $\mu$ F,<br>whichever is less                                                                                      | Charge device with rated voltage for<br>120 $\pm$ 5 secs @ room temp/humidity                                                                                                                                                                                   |                    |
| Dielectric Strength                  |                       | No breakdown or visual defects                                                                                                                           | Charge device with 250% of rated voltage for<br>1-5 seconds, w/charge and discharge current<br>limited to 50 mA (max)<br>Note: Charge device with 150% of rated voltage<br>for 500V devices.                                                                    |                    |
| Resistance to<br>Flexure<br>Stresses | Appearance            | No defects                                                                                                                                               | Deflection: 2mm<br>Test Time: 30 seconds<br>1mm/sec<br>                                                                                                                      |                    |
|                                      | 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<br>with fresh solder                                                                                       | Dip device in eutectic solder at 230 $\pm$ 5°C<br>for 5.0 $\pm$ 0.5 seconds                                                                                                                                                                                     |                    |
| Resistance to<br>Solder Heat         | Appearance            | No defects, <25% leaching of either end terminal                                                                                                         | Dip device in eutectic solder at 260°C for 60<br>seconds. Store at room temperature for 24 $\pm$ 2<br>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<br>24 $\pm$ 2 hours at room temperature                                                                                                                                                                                   |                    |
| Load Life                            | Appearance            | No visual defects                                                                                                                                        | Charge device with 1.5 rated voltage ( $\leq$ 10V) in<br>test chamber set at 125°C $\pm$ 2°C<br>for 1000 hours (+48, -0)<br><br>Remove from test chamber and stabilize at room<br>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%<br>relative humidity for 1000 hours<br>(+48, -0) with rated voltage applied.<br><br>Remove from chamber and stabilize at room<br>temperature and humidity for<br>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<br>(in.) | 1.00 ± 0.10<br>(0.040 ± 0.004) |    |    |    | 1.60 ± 0.15<br>(0.063 ± 0.006) |    |    |    |    |     | 2.01 ± 0.20<br>(0.079 ± 0.008) |     |    |    |    |    | 3.20 ± 0.20<br>(0.126 ± 0.008) |     |     |    |    |    |    |     |     |     |
| (W) Width    | mm<br>(in.) | 0.50 ± 0.10<br>(0.020 ± 0.004) |    |    |    | 0.81 ± 0.15<br>(0.032 ± 0.006) |    |    |    |    |     | 1.25 ± 0.20<br>(0.049 ± 0.008) |     |    |    |    |    | 1.60 ± 0.20<br>(0.063 ± 0.008) |     |     |    |    |    |    |     |     |     |
| (t) Terminal | mm<br>(in.) | 0.25 ± 0.15<br>(0.010 ± 0.006) |    |    |    | 0.35 ± 0.15<br>(0.014 ± 0.006) |    |    |    |    |     | 0.50 ± 0.25<br>(0.020 ± 0.010) |     |    |    |    |    | 0.50 ± 0.25<br>(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   |                                |     | J  | J  | J  | J  | N                              |     |     | J  | J  | J  | J  | J   | M   |     |
|              | 0.068       |                                |    |    |    |                                |    |    |    | G  | G   |                                |     | J  | J  | J  | J  | N                              |     |     | J  | J  | J  | J  | J   | P   |     |
|              | 0.10        | C                              |    | C* |    |                                |    |    |    | G  | G   |                                |     | J  | J  | J  | J  | N                              |     |     | J  | J  | J  | J  | 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<br>(0.013) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040) | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090) | 2.54<br>(0.100) | 2.79<br>(0.110) |
|                | PAPER           |                 |                 |                 |                 | EMBOSSED        |                 |                 |                 |                 |                 |                 |                 |

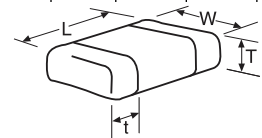
 = Under Development

# MLCC Tin/Lead Termination "B"

## X7R – Capacitance Range

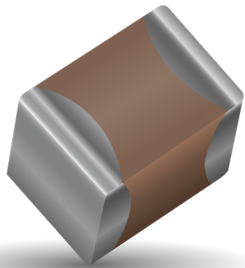
PREFERRED SIZES ARE SHADED

|              |             |  |    |    |    |     |     |     |  |     |     |     |  |     |  |    |     |     |  |     |
|--------------|-------------|-----------------------------------------------------------------------------------|----|----|----|-----|-----|-----|-----------------------------------------------------------------------------------|-----|-----|-----|-------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------|----|-----|-----|-------------------------------------------------------------------------------------|-----|
| 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<br>(in.) | 3.20 ± 0.20<br>(0.126 ± 0.008)                                                    |    |    |    |     |     |     | 4.50 ± 0.30<br>(0.177 ± 0.012)                                                    |     |     |     | 4.50 ± 0.30<br>(0.177 ± 0.012)                                                      |     | 5.70 ± 0.50<br>(0.224 ± 0.020)                                                      |    |     |     | 5.72 ± 0.25<br>(0.225 ± 0.010)                                                      |     |
| (W) Width    | mm<br>(in.) | 2.50 ± 0.20<br>(0.098 ± 0.008)                                                    |    |    |    |     |     |     | 3.20 ± 0.20<br>(0.126 ± 0.008)                                                    |     |     |     | 6.40 ± 0.40<br>(0.252 ± 0.016)                                                      |     | 5.00 ± 0.40<br>(0.197 ± 0.016)                                                      |    |     |     | 6.35 ± 0.25<br>(0.250 ± 0.010)                                                      |     |
| (t) Terminal | mm<br>(in.) | 0.50 ± 0.25<br>(0.020 ± 0.010)                                                    |    |    |    |     |     |     | 0.61 ± 0.36<br>(0.024 ± 0.014)                                                    |     |     |     | 0.61 ± 0.36<br>(0.024 ± 0.014)                                                      |     | 0.64 ± 0.39<br>(0.025 ± 0.015)                                                      |    |     |     | 0.64 ± 0.39<br>(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        | J                                                                                 | J  | J  | J  | J   | J   | M   |                                                                                   |     |     |     |                                                                                     |     |                                                                                     |    |     |     |                                                                                     |     |
|              | 2200        | J                                                                                 | J  | J  | J  | J   | J   | M   |                                                                                   |     |     |     |                                                                                     |     |                                                                                     |    |     |     |                                                                                     |     |
|              | 3300        | J                                                                                 | J  | J  | J  | J   | J   | M   |                                                                                   |     |     |     |                                                                                     |     |                                                                                     |    |     |     |                                                                                     |     |
|              | 4700        | J                                                                                 | J  | J  | J  | J   | J   | M   |                                                                                   |     |     |     |                                                                                     |     |                                                                                     |    |     |     |                                                                                     |     |
|              | 6800        | J                                                                                 | J  | J  | J  | J   | J   | M   |                                                                                   |     |     |     |                                                                                     |     |                                                                                     |    |     |     |                                                                                     |     |
| Cap (μF)     | 0.010       | J                                                                                 | J  | J  | J  | J   | J   | M   | K                                                                                 | K   | K   | K   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.015       | 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   | Q   | K                                                                                 | K   | K   | P   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.033       | J                                                                                 | J  | J  | J  | J   | J   | Q   | K                                                                                 | K   | K   | X   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.047       | J                                                                                 | J  | J  | J  | J   | J   |     | K                                                                                 | K   | K   | Z   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.068       | J                                                                                 | J  | J  | J  | J   | M   |     | K                                                                                 | K   | K   | Z   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.10        | J                                                                                 | J  | J  | J  | J   | M   |     | K                                                                                 | K   | K   | Z   | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.15        | J                                                                                 | J  | J  | J  | M   | Z   |     | K                                                                                 | K   | P   |     | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.22        | J                                                                                 | J  | J  | J  | P   | Z   |     | K                                                                                 | K   | P   |     | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.33        | J                                                                                 | J  | J  | J  | Q   |     |     | K                                                                                 | M   | X   |     | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.47        | M                                                                                 | M  | M  | M  | Q   |     |     | K                                                                                 | P   |     |     | M                                                                                   | M   |                                                                                     | X  | X   | X   | M                                                                                   | P   |
|              | 0.68        | M                                                                                 | M  | P  | X  | X   |     |     | M                                                                                 | Q   |     |     | M                                                                                   | P   |                                                                                     | X  | X   |     | M                                                                                   | P   |
|              | 1.0         | N                                                                                 | N  | P  | X  | Z   |     |     | M                                                                                 | X   |     |     | M                                                                                   | P   |                                                                                     | X  | X   |     | M                                                                                   | P   |
|              | 1.5         | N                                                                                 | N  | Z  | Z  | Z   |     |     | Z                                                                                 | Z   |     |     | M                                                                                   |     |                                                                                     | X  | X   |     | M                                                                                   | X   |
|              | 2.2         | X                                                                                 | X  | Z  | Z  | Z   |     |     | Z                                                                                 | Z   |     |     |                                                                                     |     |                                                                                     | X  | X   |     | M                                                                                   |     |
|              | 3.3         | X                                                                                 | X  | Z  | Z  |     |     |     | Z                                                                                 | Z   |     |     |                                                                                     |     |                                                                                     | X  | Z   |     |                                                                                     |     |
|              | 4.7         | X                                                                                 | X  | Z  | Z  |     |     |     | Z                                                                                 |     |     |     |                                                                                     |     |                                                                                     | X  | Z   |     |                                                                                     |     |
|              | 10          | Z                                                                                 | Z  | Z  | Z  |     |     |     |                                                                                   |     |     |     |                                                                                     |     |                                                                                     | Z  | Z   |     |                                                                                     |     |
|              | 22          | Z                                                                                 | Z  |    |    |     |     |     |                                                                                   |     |     |     |                                                                                     |     | 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                                                                              |    |    |    |     |     |     | LD12                                                                              |     |     |     | LD13                                                                                |     | LD20                                                                                |    |     |     | LD14                                                                                |     |



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

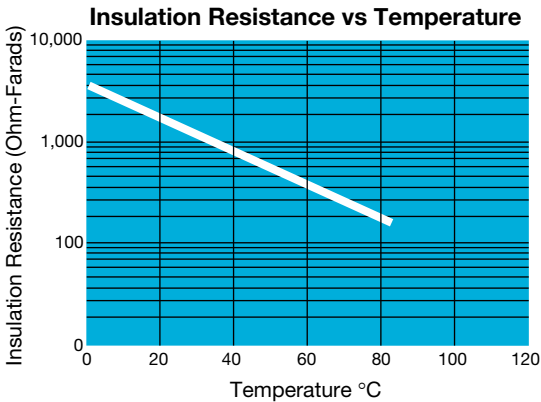
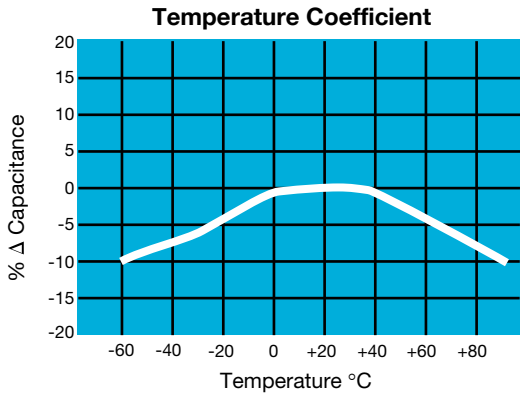
| LD05                                                                                                                                                | 5                                                                                                   | D          | 101                             | J                                                                                                                                             |                    | B                                                    | 2                                        | A                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------|------------------------------------------|----------------------------------|
| Size                                                                                                                                                | Voltage                                                                                             | Dielectric | Capacitance Code (In pF)        | Capacitance Tolerance                                                                                                                         | Failure Rate       | B = 5% min lead<br>X = FLEXITERM® with 5% min lead** | Packaging<br>2 = 7" Reel<br>4 = 13" Reel | Special Code<br>A = Std. Product |
| LD02 - 0402<br>LD03 - 0603<br>LD04 - 0504*<br>LD05 - 0805<br>LD06 - 1206<br>LD10 - 1210<br>LD12 - 1812<br>LD13 - 1825<br>LD14 - 2225<br>LD20 - 2220 | 6.3V = 6<br>10V = Z<br>16V = Y<br>25V = 3<br>35V = D<br>50V = 5<br>100V = 1<br>200V = 2<br>500V = 7 | X5R = D    | 2 Sig. Digits + Number of Zeros | B = ±10 pF (<10pF)<br>C = ±.25 pF (<10pF)<br>D = ±.50 pF (<10pF)<br>F = ±1% (≥ 10 pF)<br>G = ±2% (≥ 10 pF)<br>J = ±5%<br>K = ±10%<br>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

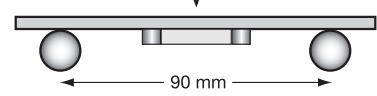
NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.  
Contact factory for non-specified capacitance values.

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%<br>Voltage: 1.0Vrms $\pm$ .2V<br>For Cap > 10 $\mu$ F, 0.5Vrms @ 120Hz                                                                                                                                                                                                                        |                    |
| Dissipation Factor             |                       | $\leq$ 2.5% for $\geq$ 50V DC rating<br>$\leq$ 3.0% for 25V, 35V DC rating<br>$\leq$ 12.5% Max. for 16V DC rating and lower Contact Factory for DF by PN |                                                                                                                                                                                                                                                                                                                        |                    |
| Insulation Resistance          |                       | 10,000M $\Omega$ or 500M $\Omega$ - $\mu$ 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<br>Test Time: 30 seconds<br>1mm/sec<br>                                                                                                                                                                             |                    |
|                                | 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.<br><br>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.<br><br>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)                                                                                                                          |                                                                                                                                                                                                                                                                                                                        |                    |

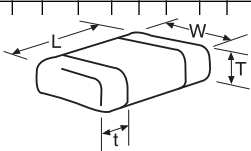
MLCC Tin/Lead Termination "B"

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          | 1.00 ± 0.10     |     |    |    |    | mm          | 1.60 ± 0.15     |     |    |    |    | mm             | 2.01 ± 0.20     |     |    |    |    | mm             | 3.20 ± 0.20     |     |    |    |    | mm             | 3.20 ± 0.20     |     |     |    |    |      |    |     |     |    |    |    |
| (in.)        |             | (0.040 ± 0.004) |     |    |    |    | (in.)       | (0.063 ± 0.006) |     |    |    |    | (in.)          | (0.079 ± 0.008) |     |    |    |    | (in.)          | (0.126 ± 0.008) |     |    |    |    | (in.)          | (0.126 ± 0.008) |     |     |    |    |      |    |     |     |    |    |    |
| W) Width     | mm          | 0.50 ± 0.10     |     |    |    |    | mm          | 0.81 ± 0.15     |     |    |    |    | mm             | 1.25 ± 0.20     |     |    |    |    | mm             | 1.60 ± 0.20     |     |    |    |    | mm             | 2.50 ± 0.20     |     |     |    |    |      |    |     |     |    |    |    |
| (in.)        |             | (0.020 ± 0.004) |     |    |    |    | (in.)       | (0.032 ± 0.006) |     |    |    |    | (in.)          | (0.049 ± 0.008) |     |    |    |    | (in.)          | (0.063 ± 0.008) |     |    |    |    | (in.)          | (0.098 ± 0.008) |     |     |    |    |      |    |     |     |    |    |    |
| (t) Terminal | mm          | 0.25 ± 0.15     |     |    |    |    | mm          | 0.35 ± 0.15     |     |    |    |    | mm             | 0.50 ± 0.25     |     |    |    |    | mm             | 0.50 ± 0.25     |     |    |    |    | mm             | 0.50 ± 0.25     |     |     |    |    |      |    |     |     |    |    |    |
| (in.)        |             | (0.010 ± 0.006) |     |    |    |    | (in.)       | (0.014 ± 0.006) |     |    |    |    | (in.)          | (0.020 ± 0.010) |     |    |    |    | (in.)          | (0.020 ± 0.010) |     |    |    |    | (in.)          | (0.020 ± 0.010) |     |     |    |    |      |    |     |     |    |    |    |
| 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         |                 |     |    |    |    |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 330         |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 470         |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 680         |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 1000        |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 1500        |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 2200        |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 3300        |                 |     |    |    | C  |             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 4700        |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 6800        |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
| Cap (μF)     | 0.010       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.015       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.022       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.033       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.047       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.068       |                 |     |    |    | C  |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.10        |                 |     |    | C  | C  | C           |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.15        |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.22        |                 |     |    | C* |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.33        |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.47        |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 0.68        |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 1.0         |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 1.5         |                 |     |    |    |    |             |                 |     |    |    |    | G              |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 2.2         |                 |     |    |    |    |             |                 |     |    |    |    | G*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 3.3         |                 |     |    |    |    |             |                 |     |    |    |    | G*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 4.7         |                 |     |    |    |    |             |                 |     |    |    |    | J*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 10          |                 |     |    |    |    |             |                 |     |    |    |    | J*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 22          |                 |     |    |    |    |             |                 |     |    |    |    | J*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 47          |                 |     |    |    |    |             |                 |     |    |    |    | J*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 100         |                 |     |    |    |    |             |                 |     |    |    |    | J*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 22          |                 |     |    |    |    |             |                 |     |    |    |    | K*             |                 |     |    |    |    |                |                 |     |    |    |    |                |                 |     |     |    |    |      |    |     |     |    |    |    |
|              | 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<br>(0.013) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040) | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090) | 2.54<br>(0.100) | 2.79<br>(0.110) |
|                | PAPER           |                 |                 |                 |                 | EMBOSS          |                 |                 |                 |                 |                 |                 |                 |

\*Optional Specifications – Contact factory

NOTE: Contact factory for non-specified capacitance values