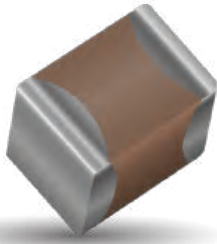


Automotive MLCC

General Specifications



GENERAL DESCRIPTION

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

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

HOW TO ORDER

| 0805 | 5 | A | 104 | K | 4 | T | 2 | A |
|---|---|--|--|---|---|---|---|--|
| Size 0402 0603 0805 1206 1210 1812 | Voltage 6.3V = 6 10V = Z 16V = Y 25V = 3 35V = D 50V = 5 100V = 1 200V = 2 500V = 7 | Dielectric NP0 = A X7R = C X8R = F | Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros e.g. 10 F = 106 | Capacitance Tolerance B = ± 0.1pF (<10pF)* C = ± 0.25pF (<10pF)* D = ± 0.5pF (<10pF)* F = ± 1%* G = ± 2%* J = ± 5% (<=1µF) K = ± 10% M = ± 20% | Failure Rate 4=Automotive | Terminations T = Plated Ni and Sn Z = FLEXITERM®** U = Conductive Epo **X7R X8R only | Packaging 2 = 7" Reel 4 = 13" Reel | Special Code A = Std.Product |
| | | | | | Contact factory for availability of Tolerance Options for Specific Part Numbers. | | | |
| | | | | | NOTE: Contact factory for non-specified capacitance values 0402 case size available in T termination only. | | | |
| | | | | | *NPO only | | | |

COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

| | Commercial | Automotive |
|--|--|---|
| Administrative | Standard Part Numbers. No restriction on who purchases these parts. | Specific Automotive Part Number. Used to control supply of product to Automotive customers. |
| Lot Qualification (Destructive Physical Analysis - DPA) | As per EIA RS469 | Increased sample plan stricter criteria. |
| Visual/Cosmetic Quality | Standard process and inspection | 100% inspection |
| Application Robustness | Standard sampling for accelerated wave solder on X7R dielectrics | Increased sampling for accelerated wave solder on X7R and NP0 followed by lot by lot reliability testing. |

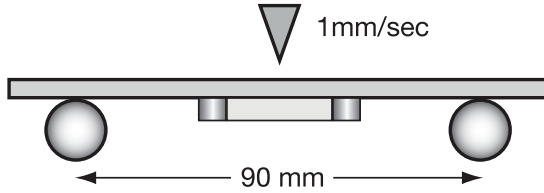
All Tests have Accept/Reject Criteria 0/1

Automotive MLCC

NP0/X7R Dielectric

FLEXITERM FEATURES

- a) Bend Test
The capacitor is soldered to the PC Board as shown:



Typical bend test results are shown below:

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

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

Automotive MLCC-NP0

Capacitance Range



| Case Size | | 0402 | | | | | 0603 | | | | | 0805 | | | | | | 1206 | | | | | | 1210 | | | | | | | | |
|--------------|----------|--------------------------------|----|-----|----|----|--------------------------------|-----|-----|----|----|--------------------------------|-----|-----|-----|-----|----|--------------------------------|-----|-----|-----|-----|-----|--------------------------------|----|-----|-----|-----|-----|-----|------|---|
| Length (L) | mm (in.) | 1.00 ± 0.10 (0.040 ± 0.004) | | | | | 1.60 ± 0.15 (0.063 ± 0.006) | | | | | 2.01 ± 0.20 0.079 ± 0.008 | | | | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | | | | | |
| Width (W) | mm (in.) | 0.50 ± 0.10 (0.020 ± 0.004) | | | | | 0.81 ± 0.15 (0.032 ± 0.006) | | | | | 1.25 ± 0.20 (0.049 ± 0.008) | | | | | | 1.60 ± 0.20 (0.063 ± 0.008) | | | | | | 2.50 ± 0.20 (0.098 ± 0.008) | | | | | | | | |
| Terminal (t) | mm (in.) | 0.25 ± 0.15 (0.010 ± 0.006) | | | | | 0.35 ± 0.15 (0.014 ± 0.006) | | | | | 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | | | |
| CAP | CAP Code | 25 | 50 | 100 | 25 | 50 | 100 | 200 | 250 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 25 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 | 50 | 100 | 200 | 250 | 500 | 630 | 1000 | |
| 0.5 | 0R5 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 1 | 1R0 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 5 | 5R0 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 10 | 100 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 12 | 120 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 15 | 150 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 18 | 180 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 22 | 220 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 27 | 270 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 33 | 330 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 39 | 390 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 47 | 470 | C | C | C | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 56 | 560 | C | C | C | G | G | G | G | G | J | J | J | J | J | N | | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 68 | 680 | C | C | C | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | J | J | J | J | J | J | J | |
| 82 | 820 | C | C | C | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | N | N | N | |
| 100 | 101 | C | C | C | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | Q | Q | N | N | N | N | N | N | N | N | |
| 120 | 121 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 150 | 151 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 180 | 181 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 220 | 221 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 270 | 271 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 330 | 331 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 390 | 391 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 430 | 431 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 470 | 471 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | Q | Q | N | N | N | N | P | P | X | |
| 560 | 561 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | M | Q | Q | Q | Q | N | N | N | N | P | P | P | |
| 680 | 681 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | M | Q | Q | Q | Q | N | N | N | N | P | P | P | |
| 1,000 | 102 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | M | Q | Q | Q | Q | N | N | N | N | P | P | X | |
| 1,200 | 122 | | | | G | G | G | G | G | J | J | J | J | N | | N | N | N | N | | | | | | N | N | N | N | P | P | | |
| 1,500 | 152 | | | | G | G | G | G | G | J | J | J | J | N | | N | N | N | N | | | | | | N | N | N | N | P | P | | |
| 2,200 | 222 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | J | J | N | N | N | N | P | K | K | |
| 2,700 | 272 | | | | G | G | G | G | G | J | J | J | J | N | | J | J | J | J | J | J | J | J | J | J | N | N | N | N | P | K | K |
| 3,300 | 332 | | | | G | G | G | G | G | J | J | J | J | N | | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | |
| 3,900 | 392 | | | | G | G | G | G | G | J | J | J | J | N | | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | |
| 4,700 | 472 | | | | G | G | G | G | G | J | J | J | J | N | | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | |
| 5,600 | 562 | | | | G | G | G | G | G | J | J | J | J | N | | | | | | | | | | | | | | | | M | M | |
| 6,800 | 682 | | | | G | G | G | G | G | J | J | J | J | N | | | | | | | | | | | | | | | | M | M | |
| 8,200 | 822 | | | | G | G | G | G | G | J | J | J | J | N | | | | | | | | | | | | | | | | P | P | |
| 10,000 | 103 | | | | G | G | G | G | G | J | J | J | J | N | | | | | | | | | | | | | | | | X | X | |
| 12,000 | 123 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 15,000 | 153 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 18,000 | 183 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 22,000 | 223 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 27,000 | 273 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 33,000 | 333 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | |
| 39,000 | 393 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 47,000 | 473 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 56,000 | 563 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 68,000 | 683 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82,000 | 823 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100,000 | 104 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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

Automotive MLCC - X8R

Capacitance Range



| SIZE | | | 0603 | | | 0805 | | | 1206 | |
|-----------|------|-------|-------------|-----|------|-------------|-----|------|-------------|-----|
| Soldering | | | Reflow/Wave | | | Reflow/Wave | | | Reflow/Wave | |
| WVDC | WVDC | | 25V | 50V | 100V | 25V | 50V | 100V | 25V | 50V |
| 472 | pF | 4700 | G | G | G | J | J | J | J | J |
| 562 | | 5600 | G | G | G | J | J | J | J | J |
| 682 | | 6800 | G | G | G | J | J | J | J | J |
| 822 | | 8200 | G | G | G | J | J | J | J | J |
| 103 | uF | 0.01 | G | G | G | J | J | J | J | J |
| 123 | | 0.012 | G | G | | J | J | N | J | J |
| 153 | | 0.015 | G | G | | J | J | N | J | J |
| 183 | | 0.018 | G | G | | J | J | N | J | J |
| 223 | | 0.022 | G | G | | J | J | N | J | J |
| 273 | | 0.027 | G | G | | J | J | | J | J |
| 333 | | 0.033 | G | G | | J | J | | J | J |
| 393 | | 0.039 | G | G | | J | J | | J | J |
| 473 | | 0.047 | G | G | | J | J | | J | J |
| 563 | | 0.056 | G | | | N | N | | 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 | M |
| 474 | | 0.47 | | | | | | | M | Q |
| 684 | | 0.68 | | | | | | | Q | Q |
| 824 | | 0.82 | | | | | | | Q | Q |
| 105 | | 1 | | | | | | | Q | Q |
| WVDC | WVDC | | 25V | 50V | 100V | 25V | 50V | 100V | 25V | 50V |
| SIZE | | | 0603 | | | 0805 | | | 1206 | |

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