## 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 | Voltage | Dielectric | Capacitance | Capacitance | Failure | Terminations | Packaging | Special Code |
| 0402 | $6.3 \mathrm{~V}=6$ | NP0 = A | Code (In pF) | Tolerance | Rate | T=PlatedNi and Sn | $2=7$ " Reel | A = Std. Product |
| 0603 | $10 \mathrm{~V}=\mathrm{Z}$ | X7R = C | 2 Sig. Digits + | $\mathrm{B}= \pm 0.1 \mathrm{pF}(<10 \mathrm{pF})^{*}$ | 4=Automotive | Z=FLEXITERM ${ }^{\text {®** }}$ | $4=13$ " Reel |  |
| 0805 | $16 \mathrm{~V}=\mathrm{Y}$ | $\mathrm{X} 8 \mathrm{R}=\mathrm{F}$ | Number of Zeros | $\mathrm{C}= \pm 0.25 \mathrm{pF}(<10 \mathrm{pF}){ }^{*}$ | 4=Automotive | U = Conductive Epo |  |  |
| 1210 | $25 \mathrm{~V}=3$ |  | e.g. $10 \mathrm{~F}=106$ | $\mathrm{D}= \pm 0.5 \mathrm{pF}(<10 \mathrm{pF}) *$ |  |  |  |  |
| 1812 | $35 \mathrm{~V}=\mathrm{D}$ |  |  | $\mathrm{F}= \pm 1 \%^{*}$ |  | **X7R X8Ronly |  |  |
|  | $50 \mathrm{~V}=5$ |  |  | $\mathrm{G}= \pm 2 \%$ * |  |  |  |  |
|  | $100 \mathrm{~V}=1$ |  |  | $J= \pm 5 \%$ (< $=1 \mu \mathrm{~F})$ | Contact factory | for availability of Tole | ance Options for | Specific Part Numbers. |
|  | $200 \mathrm{~V}=2$ |  |  | $\mathrm{K}= \pm 10 \%$ | Contactactory | foriluy of |  | Speific Par Numbers. |
|  | $500 \mathrm{~V}=7$ |  |  | $\mathrm{M}= \pm 20 \%$ | NOTE: Contac | factory for non-spec ase size available in $T$ | fied capacitance termination only. |  |
|  |  |  |  | *NPO only |  |  |  |  |

COMMERCIAL VS AUTOMOTIVE MLCC PROCESS COMPARISON

|  | Commercial | Automotive |
| :---: | :--- | :--- |
| Administrative | Standard Part Numbers. <br> No restriction on who purchases these parts. | Specific Automotive Part Number. sed to control supply of <br> product to Automotive customers. |
| Lot Qualification (Destructive <br> 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 <br> X7R dielectrics | Increased sampling for accelerated wave solder on X7R and <br> NP0 followed by lot by lot reliability testing. |

[^0]
## Automotive MLCC

## 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 | $>2 m m$ | $>5$ |
| 0805 | $>2 m m$ | $>5$ |
| 1206 | $>2 m m$ | $>5$ |

a) Temperature Cycle testing

FLEXITERM ${ }^{\circledR}$ has the ability to withstand at least 1000 cycles between $-55^{\circ} \mathrm{C}$ and $+125^{\circ} \mathrm{C}$

Automotive MLCC-NPO

## Capacitance Range

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


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

Automotive MLCC - X7R

## Capacitance Range

| Size |  | 0402 |  |  | 0603 |  |  |  |  |  |  | 0805 |  |  |  |  |  | 1206 |  |  |  |  |  |  | 1210 |  |  |  |  |  | 1812 |  | 2220 |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Soldering |  | Reflow/Wave |  |  | Reflow/Wave |  |  |  |  |  |  | Reflow/Wave |  |  |  |  |  | Reflow/Wave |  |  |  |  |  |  | Reflow Only |  |  |  |  |  | Reflow Only |  | Reflow Only |  |  |  |  |  |
| $\begin{gathered} \text { (L) } \\ \text { Length } \\ \hline \end{gathered}$ | $\begin{aligned} & \hline \mathrm{mm} \\ & \text { (in.) } \end{aligned}$ | $\begin{gathered} 1 \pm 0.1 \\ (0.04 \pm 0.004) \\ \hline \end{gathered}$ |  |  | $\begin{gathered} 1.6 \pm 0.15 \\ (0.063 \pm 0.006) \\ \hline \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 2.01 \pm 0.2 \\ (0.079 \pm 0.008) \\ \hline \end{gathered}$ |  |  |  |  |  | $\begin{gathered} 3.2 \pm 0.2 \\ (0.126 \pm 0.008) \\ \hline \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 3.2 \pm 0.2 \\ (0.126 \pm 0.008) \\ \hline \end{gathered}$ |  |  |  |  |  | $\begin{gathered} 4.5 \pm 0.3 \\ (0.177 \pm 0.012) \\ \hline \end{gathered}$ |  | $\begin{gathered} 5.7 \pm 0.5 \\ (0.224 \pm 0.02) \\ \hline \end{gathered}$ |  |  |  |  |  |
| (W) Width | $\begin{aligned} & \mathrm{mm} \\ & \text { (in.) } \end{aligned}$ | $\begin{gathered} 0.5 \pm 0.1 \\ (0.02 \pm 0.004) \\ \hline \end{gathered}$ |  |  | $\begin{gathered} 0.81 \pm 0.15 \\ (0.032 \pm 0.006) \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 1.25 \pm 0.2 \\ (0.049 \pm 0.008) \end{gathered}$ |  |  |  |  |  | $\begin{gathered} 1.6 \pm 0.2 \\ (0.063 \pm 0.008) \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 2.5 \pm 0.2 \\ (0.098 \pm 0.008) \\ \hline \end{gathered}$ |  |  |  |  |  | $\begin{array}{c\|} \hline 3.2 \pm 0.2 \\ (0.126 \pm 0.008) \\ \hline \end{array}$ |  | $\begin{gathered} 5 \pm 0.4 \\ (0.197 \pm 0.016) \\ \hline \end{gathered}$ |  |  |  |  |  |
| $\begin{array}{\|c\|} \hline(\mathrm{t}) \\ \text { Terminal } \end{array}$ | $\mathrm{mm}_{\text {(in.) }}$ | $\begin{gathered} 0.25 \pm 0.15 \\ (0.01 \pm 0.006) \\ \hline \end{gathered}$ |  |  | $\begin{gathered} 0.35 \pm 0.15 \\ (0.014 \pm 0.006) \\ \hline \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 0.5 \pm 0.25 \\ (0.02 \pm 0.01) \\ \hline \end{gathered}$ |  |  |  |  |  | $\begin{gathered} 0.5 \pm 0.25 \\ (0.02 \pm 0.01) \\ \hline \end{gathered}$ |  |  |  |  |  |  | $\begin{gathered} 0.5 \pm 0.25 \\ (0.02 \pm 0.01) \\ \hline \end{gathered}$ |  |  |  |  |  | $\begin{gathered} 0.61 \pm 0.36 \\ (0.024 \pm 0.014) \\ \hline \end{gathered}$ |  | $\begin{gathered} 0.64 \pm 0.39 \\ (0.025 \pm 0.015) \\ \hline \end{gathered}$ |  |  |  |  |  |
| WVDC |  | 16 V | 25 V | 50 V | 10 V | 16 V | 25 V | 50 V | 100 v | 200 V | 250V | 16 V | 25 V | 50 V | 100 V | 200 V | 250V | 16 V | 25 V | 50 V | 100 V | 200 V | 250 V | 500v | 16 V | 25 V | 50 V | 100 V | 200 V | 250 V | 50 V | 100V | 25 V | 50V | 100v | 200 V | 250 V | 500 V |
| 101 | 100 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 221 | 220 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 271 | 270 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 331 | 330 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 391 | 390 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 471 | 470 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 561 | 560 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 681 | 680 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 821 | 820 | c | c | c | G | G | G | G | G | G |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | Q |  |  |  |  |  |  |  |  |
| 102 | 1000 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 122 | 1220 | c | c | c | G | G | G | G | G | G | G | J | J | J | $J$ | J | J | $J$ | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 152 | 1500 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | $J$ | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 182 | 1800 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 222 | 2200 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 272 | 2700 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 332 | 3300 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 392 | 3900 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 472 | 4700 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 562 | 5600 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 682 | 6800 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 822 | 8200 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | $J$ | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 103 | Cap 0.01 | c | c | c | G | G | G | G | G | G | G | J | J | J | J | J | J | J | J | J | J | J | J | J | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 123 | (uF) 0.012 | c |  |  | G | G | G | G | G |  |  | J | J | J | N | N | N | J | J | J | J | J | J |  | K | к | K | K | M | Q | K | K |  |  |  |  |  |  |
| 153 | 0.015 | c |  |  | G | G | G | G | G |  |  | J | J | $J$ | N | N | N | J | $J$ | J | J | J | J |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 183 | 0.018 | c |  |  | G | G | G | G | G |  |  | J | J | J | N | N | N | J | $J$ | J | J | J | J |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 223 | 0.022 | c |  |  | G | G | G | G | G |  |  | J | J | J | N | N | N | J | J | J | J | Q | Q |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 273 | 0.027 | c |  |  | G | G | G | G | J |  |  | J | J | J | N | N | N | J | J | J | J | Q | Q |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 333 | 0.033 | c |  |  | G | G | G | G | J |  |  | J | J | J | N | N | N | J | J | J | J | Q | Q |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 393 | 0.039 |  |  |  | G | G | G | G | J |  |  | J | J | $J$ | N | N | N | J | J | J | J | Q | Q |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 473 | 0.047 |  |  |  | G | G | G | G | J |  |  | J | J | J | N | N | N | J | J | J | M | Q | Q |  | K | K | K | K | M | Q | K | K |  |  |  |  |  |  |
| 563 | 0.056 |  |  |  | G | G | G | G | J |  |  | J | J | J | N |  |  | J | J | J | M | Q | Q |  | K | K | K | M | M | Q | K | K |  |  |  |  |  |  |
| 683 | 0.068 |  |  |  | G | G | G | G | $J$ |  |  | $J$ | J | J | N |  |  | $J$ | J | $J$ | M | Q | Q |  | K | K | K | M | M | Q | K | K |  |  |  |  |  |  |
| 823 | 0.082 |  |  |  | G | G | 6 | G | J |  |  | J | J | J | N |  |  | J | J | J | M | Q | Q |  | K | K | K | M | Q | Q | K | K |  |  |  |  |  |  |
| 104 | 0.1 |  |  |  | G | G | G | G | J |  |  | J | J | J | N |  |  | J | J | J | M | Q | Q |  | K | K | K | M | Q | Q | K | K |  |  |  |  |  | x |
| 124 | 0.12 |  |  |  | G | J | J |  |  |  |  | J | J | N | N |  |  | J | J | M | M | Q | Q |  | K | K | K | P | Q | Q | K | K |  |  |  |  |  |  |
| 154 | 0.15 |  |  |  | G | J | J |  |  |  |  | M | N | N | N |  |  | $J$ | J | M | M | Q | Q |  | K | K | K | P | Q | Q | K | K |  |  |  |  |  |  |
| 224 | 0.22 |  |  |  | G | J | J |  |  |  |  | M | N | N | N |  |  | J | M | M | Q | Q | Q |  | M | M | M | P | Q | Q | M | M |  |  |  |  |  |  |
| 334 | 0.33 |  |  |  |  |  |  |  |  |  |  | N | N | N | N |  |  | J | M | P | 0 |  |  |  | P | P | P | Q | z | z | x | x |  |  |  |  |  |  |
| 474 | 0.47 |  |  |  |  |  |  |  |  |  |  | N | N | N | N |  |  | M | M | P | Q |  |  |  | P | P | P | Q |  |  | x | x |  |  |  |  |  |  |
| 684 | 0.68 |  |  |  |  |  |  |  |  |  |  | N | N | N | N |  |  | M | Q | Q | Q |  |  |  | P | P | Q | x |  |  | x | x |  |  |  |  |  |  |
| 105 | 1 |  |  |  |  |  |  |  |  |  |  | N | N | N | N |  |  | M | Q | Q | Q |  |  |  | P | Q | Q | z |  |  | x | x |  | z | z | x | x |  |
| 155 | 1.5 |  |  |  |  |  |  |  |  |  |  | N | N | N |  |  |  | Q | Q | Q | Q |  |  |  | P | Q | z | z |  |  | x |  |  | z | z | z | z |  |
| 225 | 2.2 |  |  |  |  |  |  |  |  |  |  | N | N | N |  |  |  | Q | Q | Q | Q |  |  |  | z | z | z | z |  |  | z | z |  | z | z |  |  |  |
| 335 | 3.3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Q | Q | Q |  |  |  |  | x | z | z | z |  |  | z |  |  | z | z |  |  |  |
| 475 | 4.7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | Q | Q | Q |  |  |  |  | x | z | z | z |  |  | z |  |  | z | z |  |  |  |
| 106 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | z | z | z |  |  |  | z |  | z | z | z |  |  |  |
| 226 | 22 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | z |  |  |  |  |  |
| WVDC |  | 16 V | 25 V | 50 V | 10V | 16 V | 25 V | 50 V | 100 V | 200V | 250 V | 16 V | 25 V | 50 V | 100 V | 200 V | 250 V | 16 V | 25 V | 50 V | 100 V | 200 V | 250 V | 500V | 16 V | 25 V | 50 V | 100 V | 200 V | 250 V | 50 V | 100V | 25 V | 50 V | 100 V | 200 V | 250 V | 500 V |
| Size |  | 0402 |  |  | 0603 |  |  |  |  |  |  | 0805 |  |  |  |  |  | 1206 |  |  |  |  |  |  | 1210 |  |  |  |  |  | 1812 |  | 2220 |  |  |  |  |  |


| Letter | A | C | E | G | J | K | M | N | P | Q | X | Y | Z |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Max. Thickness | $\begin{gathered} 0.33 \\ (0.013) \\ \hline \end{gathered}$ | $\begin{gathered} 0.56 \\ (0.022) \\ \hline \end{gathered}$ | $\begin{gathered} 0.71 \\ (0.028) \\ \hline \end{gathered}$ | $\begin{gathered} 0.90 \\ (0.035) \\ \hline \end{gathered}$ | $\begin{gathered} 0.94 \\ (0.037) \\ \hline \end{gathered}$ | $\begin{gathered} 1.02 \\ (0.04) \\ \hline \end{gathered}$ | $\begin{gathered} 1.27 \\ (0.05) \\ \hline \end{gathered}$ | $\begin{gathered} 1.40 \\ (0.055) \\ \hline \end{gathered}$ | $\begin{gathered} 1.52 \\ (0.060) \\ \hline \end{gathered}$ | $\begin{gathered} 1.78 \\ (0.07) \\ \hline \end{gathered}$ | $\begin{gathered} 2.29 \\ (0.09) \\ \hline \end{gathered}$ | $\begin{aligned} & 2.54 \\ & (0.1) \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 2.79 \\ (0.11) \\ \hline \end{gathered}$ |
|  | PAPER |  |  |  |  | EMBOSSED |  |  |  |  |  |  |  |

Automotive MLCC - X8R

## Capacitance Range

| SIZE |  |  | 0603 |  |  | 0805 |  |  | 1206 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Soldering |  |  | Reflow/Wave |  |  | Reflow/Wave |  |  | Reflow/Wave |  |
| WVDC | WVDC |  | 25V | 50V | 100V | 25 V | 50V | 100V | 25V | 50 V |
| 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 |  | 25 V | 50V | 100V | 25 V | 50V | 100V | 25 V | 50 V |
| SIZE |  |  | 0603 |  |  | 0805 |  |  | 1206 |  |


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


[^0]:    All Tests have Accept/Reject Criteria 0/1

