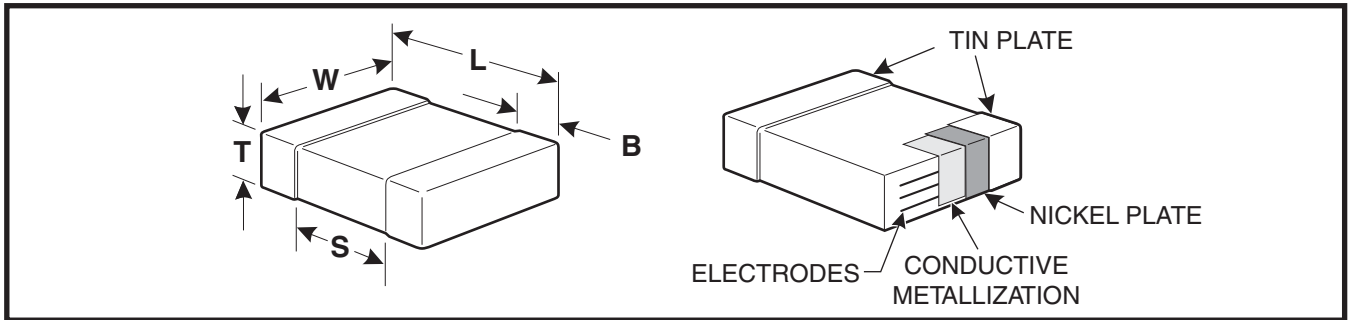


## FEATURES

- C0G (NP0), X7R, X5R, Z5U and Y5V Dielectrics
- 10, 16, 25, 50, 100 and 200 Volts
- Standard End Metallization: Tin-plate over nickel barrier
- Available Capacitance Tolerances:  $\pm 0.10$  pF;  $\pm 0.25$  pF;  $\pm 0.5$  pF;  $\pm 1\%$ ;  $\pm 2\%$ ;  $\pm 5\%$ ;  $\pm 10\%$ ;  $\pm 20\%$ ; and  $+80\%-20\%$
- Tape and reel packaging per EIA481-1. (See page 92 for specific tape and reel information.) Bulk Cassette packaging (0402, 0603, 0805 only) per IEC60286-6 and EIAJ 7201.
- RoHS Compliant

## CAPACITOR OUTLINE DRAWINGS



## DIMENSIONS—MILLIMETERS AND (INCHES)

| EIA SIZE CODE | METRIC SIZE CODE | L - LENGTH                  | W - WIDTH                         | T THICKNESS                           | B - BANDWIDTH                | S SEPARATION minimum | MOUNTING TECHNIQUE             |
|---------------|------------------|-----------------------------|-----------------------------------|---------------------------------------|------------------------------|----------------------|--------------------------------|
| 0201*         | 0603             | 0.6 (.024) $\pm$ .03 (.001) | 0.3 $\pm$ (.012) $\pm$ .03 (.001) | See page 78 for thickness dimensions. | 0.15 (.006) $\pm$ .05 (.002) | N/A                  | Solder Reflow                  |
| 0402*         | 1005             | 1.0 (.04) $\pm$ .05 (.002)  | 0.5 (.02) $\pm$ .05 (.002)        |                                       | 0.20 (.008) $\pm$ .40 (.016) | 0.3 (.012)           |                                |
| 0603          | 1608             | 1.6 (.063) $\pm$ .15 (.006) | 0.8 (.032) $\pm$ .15 (.006)       |                                       | 0.35 (.014) $\pm$ .15 (.006) | 0.7 (.028)           |                                |
| 0805*         | 2012             | 2.0 (.079) $\pm$ .20 (.008) | 1.25 (.049) $\pm$ .20 (.008)      |                                       | 0.50 (.02) $\pm$ .25 (.010)  | 0.75 (.030)          | Solder Wave + or Solder Reflow |
| 1206*         | 3216             | 3.2 (.126) $\pm$ .20 (.008) | 1.6 (.063) $\pm$ .20 (.008)       |                                       | 0.50 (.02) $\pm$ .25 (.010)  | N/A                  |                                |
| 1210*         | 3225             | 3.2 (.126) $\pm$ .20 (.008) | 2.5 (.098) $\pm$ .20 (.008)       |                                       | 0.50 (.02) $\pm$ .25 (.010)  | N/A                  |                                |
| 1808          | 4520             | 4.5 (.177) $\pm$ .30 (.012) | 2.0 (.079) $\pm$ .20 (.008)       |                                       | 0.60 (.024) $\pm$ .35 (.014) | N/A                  | Solder Reflow                  |
| 1812          | 4532             | 4.5 (.177) $\pm$ .30 (.012) | 3.2 (.126) $\pm$ .30 (.012)       |                                       | 0.60 (.024) $\pm$ .35 (.014) | N/A                  |                                |
| 1825*         | 4564             | 4.5 (.177) $\pm$ .30 (.012) | 6.4 (.252) $\pm$ .40 (.016)       |                                       | 0.60 (.024) $\pm$ .35 (.014) | N/A                  |                                |
| 2220          | 5650             | 5.6 (.220) $\pm$ .40 (.016) | 5.0 (.197) $\pm$ .40 (.016)       |                                       | 0.60 (.024) $\pm$ .35 (.014) | N/A                  |                                |
| 2225          | 5664             | 5.6 (.220) $\pm$ .40 (.016) | 6.3 (.248) $\pm$ .40 (.016)       |                                       | 0.60 (.024) $\pm$ .35 (.014) | N/A                  |                                |

\* Note: Indicates EIA Preferred Case Sizes (Tightened tolerances apply for 0402, 0603, and 0805 packaged in bulk bassette, see page 96.)

+ For extended value 1210 case size - solder reflow only.

## CAPACITOR ORDERING INFORMATION (Standard Chips - For Military see page 87)

|                                                                                                    |                                |          |            |          |          |          |          |           |                                                                   |
|----------------------------------------------------------------------------------------------------|--------------------------------|----------|------------|----------|----------|----------|----------|-----------|-------------------------------------------------------------------|
| <b>CERAMIC SIZE CODE</b>                                                                           | <b>0805</b>                    | <b>C</b> | <b>103</b> | <b>K</b> | <b>5</b> | <b>R</b> | <b>A</b> | <b>C*</b> | <b>END METALLIZATION</b>                                          |
| <b>SPECIFICATION</b>                                                                               |                                |          |            |          |          |          |          |           | C-Standard (Tin-plated nickel barrier)                            |
| <b>CAPACITANCE CODE</b>                                                                            |                                |          |            |          |          |          |          |           | <b>FAILURE RATE LEVEL</b>                                         |
| Expressed in Picofarads (pF)                                                                       |                                |          |            |          |          |          |          |           | A- Not Applicable                                                 |
| First two digits represent significant figures.                                                    |                                |          |            |          |          |          |          |           | <b>TEMPERATURE CHARACTERISTIC</b>                                 |
| Third digit specifies number of zeros. (Use 9 for 1.0 through 9.9pF. Use 8 for 0.5 through 0.99pF) |                                |          |            |          |          |          |          |           | Designated by Capacitance                                         |
| (Example: 2.2pF = 229 or 0.50 pF = 508)                                                            |                                |          |            |          |          |          |          |           | Change Over Temperature Range                                     |
| <b>CAPACITANCE TOLERANCE</b>                                                                       |                                |          |            |          |          |          |          |           | G - C0G (NP0) ( $\pm 30$ PPM/ $^{\circ}$ C)                       |
| B - $\pm 0.10$ pF                                                                                  | J - $\pm 5\%$                  |          |            |          |          |          |          |           | R - X7R ( $\pm 15\%$ ) ( $-55^{\circ}$ C + $125^{\circ}$ C)       |
| C - $\pm 0.25$ pF                                                                                  | K - $\pm 10\%$                 |          |            |          |          |          |          |           | P - X5R ( $\pm 15\%$ ) ( $-55^{\circ}$ C + $85^{\circ}$ C)        |
| D - $\pm 0.5$ pF                                                                                   | M - $\pm 20\%$                 |          |            |          |          |          |          |           | U - Z5U ( $+22\%$ , $-56\%$ ) ( $+10^{\circ}$ C + $85^{\circ}$ C) |
| F - $\pm 1\%$                                                                                      | P - (GMV) - special order only |          |            |          |          |          |          |           | V - Y5V ( $+22\%$ , $-82\%$ ) ( $-30^{\circ}$ C + $85^{\circ}$ C) |
| G - $\pm 2\%$                                                                                      | Z - $+80\%$ , $-20\%$          |          |            |          |          |          |          |           | <b>VOLTAGE</b>                                                    |
|                                                                                                    |                                |          |            |          |          |          |          |           | 1 - 100V 3 - 25V                                                  |
|                                                                                                    |                                |          |            |          |          |          |          |           | 2 - 200V 4 - 16V                                                  |
|                                                                                                    |                                |          |            |          |          |          |          |           | 5 - 50V 8 - 10V                                                   |
|                                                                                                    |                                |          |            |          |          |          |          |           | 6 - 35V 9 - 6.3V                                                  |
|                                                                                                    |                                |          |            |          |          |          |          |           | 7 - 4V                                                            |

\* Part Number Example: C0805C103K5RAC (14 digits - no spaces)

| Cap<br>pF | Cap<br>Code | Cap<br>Tolerance | C0201* |     |     |     |     |      | C0402* |     |     |     |      |      | C0603* |     |     |     |      |      | C0805* |     |     |     |      |      | C1206* |  |  |  |  |  |
|-----------|-------------|------------------|--------|-----|-----|-----|-----|------|--------|-----|-----|-----|------|------|--------|-----|-----|-----|------|------|--------|-----|-----|-----|------|------|--------|--|--|--|--|--|
|           |             |                  | 25V    | 10V | 16V | 25V | 50V | 100V | 10V    | 16V | 25V | 50V | 100V | 200V | 10V    | 16V | 25V | 50V | 100V | 200V | 10V    | 16V | 25V | 50V | 100V | 200V |        |  |  |  |  |  |
| 0.50      | 508         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 0.75      | 758         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.0       | 109         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.1       | 119         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.2       | 129         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.3       | 139         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.5       | 159         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.6       | 169         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 1.8       | 189         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 2.0       | 209         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 2.2       | 229         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 2.4       | 249         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 2.7       | 279         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 3.0       | 309         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 3.3       | 339         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 3.6       | 369         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 3.9       | 399         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 4.3       | 439         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 4.7       | 479         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 5.1       | 519         | C.D              | K.M    | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 5.6       | 569         | C.D              | J.K.M  | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 6.2       | 629         | C.D              |        | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 6.8       | 689         | C.D              | J.K.M  | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  | CB   | CB   | DC     | DC  | DC  | DC  | DC   | DC   | DC     | DC  | DC  | DC  | DC   |      |        |  |  |  |  |  |
| 7.5       | 759         | C.D              | J.K.M  | BB  | BB  | BB  | BB  |      | CB     | CB  | CB  | CB  |      |      |        |     |     |     |      |      |        |     |     |     |      |      |        |  |  |  |  |  |

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.  
50 Volt Ceramic Chips can be used in 63 volt applications.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option. Reels with such substitutions will be marked with the improved KEMET part numbers.

- ## Ceramic Surface Mount

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## C0G CAPACITANCE RANGE – 1210, 1812, 1825, 2220, 2225

| Cap<br>pF  | Cap<br>Code | Cap<br>Tolerance | C1210* |     |     |     |      |      | C1812* |      |      | C1825* |      |      | C2220 |      |      | C2225 |      |      |
|------------|-------------|------------------|--------|-----|-----|-----|------|------|--------|------|------|--------|------|------|-------|------|------|-------|------|------|
|            |             |                  | 10V    | 16V | 25V | 50V | 100V | 200V | 50V    | 100V | 200V | 50V    | 100V | 200V | 50V   | 100V | 200V | 50V   | 100V | 200V |
| 0.5-2.4    | 508-249     | D                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 2.7-9.1    | 279-910     | D                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 10.0-13.0  | 100-130     | D                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 15.0-24.0  | 150-240     | D                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 27.0-51.0  | 270-510     | D                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 56.0-82.0  | 560-820     | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 91.0-360.0 | 910-361     | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 390.0      | 391         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 430.0      | 431         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 470.0      | 471         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 510.0      | 511         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 560.0      | 561         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 620.0      | 621         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 680.0      | 681         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 750.0      | 751         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 820.0      | 821         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 910.0      | 911         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 1,000.0    | 102         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,100.0    | 112         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 1,200.0    | 122         | F                | FB     | FB  | FB  | FB  | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,300.0    | 132         | F                | FB     | FB  | FB  | FB  | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 1,500.0    | 152         | F                | FB     | FB  | FB  | FB  | FB   | FE   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,600.0    | 162         | F                | FB     | FB  | FB  | FB  | FB   | FE   |        |      |      |        |      |      |       |      |      |       |      |      |
| 1,800.0    | 182         | F                | FB     | FB  | FB  | FB  | FB   | FE   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 2,000.0    | 202         | F                | FB     | FB  | FB  | FB  | FB   | FE   |        |      |      |        |      |      |       |      |      |       |      |      |
| 2,200.0    | 222         | F                | FB     | FB  | FB  | FB  | FC   | FC   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 2,400.0    | 242         | F                | FB     | FB  | FB  | FB  | FC   | FC   |        |      |      |        |      |      |       |      |      |       |      |      |
| 2,700.0    | 272         | F                | FB     | FB  | FB  | FB  | FC   | FC   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 3,000.0    | 302         | F                | FB     | FB  | FB  | FB  | FC   | FC   |        |      |      |        |      |      |       |      |      |       |      |      |
| 3,300.0    | 332         | F                | FB     | FB  | FB  | FB  | FC   | FC   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 3,600.0    | 362         | F                | FB     | FB  | FB  | FB  | FF   | FF   |        |      |      |        |      |      |       |      |      |       |      |      |
| 3,900.0    | 392         | F                | FB     | FB  | FB  | FB  | FF   | FF   | GB     | GB   | GB   | HB     | HB   | HB   |       |      |      |       |      |      |
| 4,300.0    | 432         | F                | FB     | FB  | FB  | FB  | FF   | FF   | GB     | GB   | GB   | HB     | HB   | HB   |       |      |      | KB    | KB   | KB   |
| 4,700.0    | 472         | F                | FB     | FB  | FB  | FB  | FF   | FF   | GB     | GB   | GB   | HB     | HB   | HB   |       |      |      |       |      |      |
| 5,100.0    | 512         | F                | FB     | FB  | FB  | FB  | FG   | FG   |        |      |      |        |      |      |       |      |      |       |      |      |
| 5,600.0    | 562         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   |       |      |      | KB    | KB   | KB   |
| 6,200.0    | 622         | F                | FB     | FB  | FB  | FB  | FG   | FG   |        |      |      |        |      |      |       |      |      |       |      |      |
| 6,800.0    | 682         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 7,500.0    | 752         | F                | FB     | FB  | FB  | FB  | FC   | FC   |        |      |      |        |      |      |       |      |      |       |      |      |
| 8,200.0    | 822         | F                | FB     | FB  | FB  | FB  | FC   | FC   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 9,100.0    | 912         | F                | FB     | FB  | FB  | FB  | FE   | FE   |        |      |      |        |      |      |       |      |      |       |      |      |
| 10,000.0   | 103         | F                | FB     | FB  | FB  | FB  | FE   | FE   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 12,000.0   | 123         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 15,000.0   | 153         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 18,000.0   | 183         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 22,000.0   | 223         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 27,000.0   | 273         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 33,000.0   | 333         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 47,000.0   | 473         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 56,000.0   | 563         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 68,000.0   | 683         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 82,000.0   | 823         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 100,000.0  | 104         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 120,000.0  | 124         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 150,000.0  | 154         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 220,000.0  | 224         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 270,000.0  | 274         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 330,000.0  | 334         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 470,000.0  | 474         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |
| 560,000.0  | 564         | F                | FB     | FB  | FB  | FB  | FG   | FG   | GB     | GB   | GB   | HB     | HB   | HB   | JB    | JB   |      | KB    | KB   | KB   |

## X7R CAPACITANCE RANGE – 0402, 0603, 0805, 1206

| Cap<br>pF  | Cap<br>Code | Cap Tol | C0402 |     |     |     |     | C0603 |     |     |     |     |      |      | C0805 |     |     |     |     |      |      | C1206 |     |     |     |     |      |      |
|------------|-------------|---------|-------|-----|-----|-----|-----|-------|-----|-----|-----|-----|------|------|-------|-----|-----|-----|-----|------|------|-------|-----|-----|-----|-----|------|------|
|            |             |         | 6.3V  | 10V | 16V | 25V | 50V | 6.3V  | 10V | 16V | 25V | 50V | 100V | 200V | 6.3V  | 10V | 16V | 25V | 50V | 100V | 200V | 6.3V  | 10V | 16V | 25V | 50V | 100V | 200V |
| 150        | 151         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 180        | 181         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 220        | 221         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 270        | 271         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 330        | 331         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 390        | 391         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 470        | 471         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 560        | 561         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 680        | 681         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 820        | 821         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   |       |     |     |     |     |      |      |
| 1,000      | 102         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,200      | 122         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,500      | 152         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,800      | 182         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 2,200      | 222         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 2,700      | 272         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 3,300      | 332         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 3,900      | 392         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 4,700      | 472         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 5,600      | 562         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 6,800      | 682         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 8,200      | 822         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 10,000     | 103         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 12,000     | 123         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 15,000     | 153         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 18,000     | 183         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 22,000     | 223         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 27,000     | 273         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 33,000     | 333         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 39,000     | 393         | J, K, M | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 47,000     | 473         | J, K, M | BB    | BB  | BB  | BB  |     | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 56,000     | 563         | J, K, M | BB    | BB  | BB  | BB  |     | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 68,000     | 683         | J, K, M | BB    | BB  | BB  | BB  |     | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 82,000     | 823         | J, K, M | BB    | BB  | BB  | BB  |     | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 100,000    | 104         | J, K, M | BB    | BB  | BB  | BB  |     | CB    | CB  | CB  | CB  | CB  | CB   | CB   | CB    | CB  | CB  | CB  | CB  | CB   | CB   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 120,000    | 124         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     | CB  |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EC    | EC  | EC  | EC  | EC  | EC   | EC   |
| 150,000    | 154         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     | CB  | CD   |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EC    | EC  | EC  | EC  | EC  | EC   | EC   |
| 180,000    | 184         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EC    | EC  | EC  | EC  | EC  | EC   | EC   |
| 220,000    | 224         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     | CD  |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EC    | EC  | EC  | EC  | EC  | EC   | EC   |
| 270,000    | 274         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EC    | EC  | EC  | EC  | EC  | EC   | EC   |
| 330,000    | 334         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 390,000    | 394         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 470,000    | 474         | J, K, M |       |     |     |     |     | CB    | CB  | CB  |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EB    | EB  | EB  | EB  | EB  | EB   | EB   |
| 560,000    | 564         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | ED    | ED  | ED  | ED  | ED  | ED   | ED   |
| 680,000    | 684         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | ED    | ED  | ED  | ED  | ED  | ED   | ED   |
| 820,000    | 824         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EE    | EE  | EE  | EE  | EE  | EE   | EE   |
| 1,000,000  | 105         | J, K, M |       |     |     |     |     | CC*   | CC* | CC* |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EE    | EE  | EE  | EE  | EE  | EE   | EE   |
| 1,200,000  | 125         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EF    | EF  | EF  | EF  | EF  | EF   | EF   |
| 1,500,000  | 155         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | ED    | ED  | ED  | ED  | ED  | ED   | ED   |
| 1,800,000  | 185         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EF    | EF  | EF  | EF  | EF  | EF   | EF   |
| 2,200,000  | 225         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | ED    | ED  | ED  | ED  | ED  | ED   | ED   |
| 2,700,000  | 275         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       | DC  | DC  | DC  | DC  | DC   | DC   | EN    | EN  | EN  | EN  | EN  | EN   | EN   |
| 3,300,000  | 335         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | ED    | ED  | ED  | ED  | ED  | ED   | ED   |
| 3,900,000  | 395         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EF    | EF  | EF  | EF  | EF  | EF   | EF   |
| 4,700,000  | 475         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EF+   | EF+ | EF+ | EF+ | EF+ | EF+  | EF+  |
| 5,600,000  | 565         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EH+   | EH+ | EH+ | EH+ | EH+ | EH+  | EH+  |
| 6,800,000  | 685         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EH+   | EH+ | EH+ | EH+ | EH+ | EH+  | EH+  |
| 8,200,000  | 825         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EH+   | EH+ | EH+ | EH+ | EH+ | EH+  | EH+  |
| 10,000,000 | 106         | J, K, M |       |     |     |     |     |       |     |     |     |     |      |      |       |     |     |     |     |      |      | EH+   | EH+ | EH+ | EH+ | EH+ | EH+  | EH+  |

**Thickness Code Reference Chart**  
**Packaging Quantity Based on Finished Chip Thickness Specifications**

| Thickness Code | Chip Size | Chip Thickness Range (mm) | Qty per Reel 7" Plastic | Qty per Reel 13" Plastic | Qty per Reel 7" Paper | Qty per Reel 13" Paper | Qty per Bulk Cassette |
|----------------|-----------|---------------------------|-------------------------|--------------------------|-----------------------|------------------------|-----------------------|
| AA             | 0201      | 0.30 ± 0.03               | N/A                     | N/A                      | 15,000                | N/A                    | N/A                   |
| BB             | 0402      | 0.50 ± 0.05               | N/A                     | N/A                      | 10,000                | 50,000                 | 50,000                |
| CB             | 0603      | 0.80 ± 0.07               | N/A                     | N/A                      | 4,000                 | 10,000                 | 15,000                |
| CC             | 0603      | 0.80 ± 0.10               | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| CD             | 0603      | 0.80 ± 0.15               | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| DB             | 0805      | 0.60 ± 0.10               | N/A                     | N/A                      | 4,000                 | 10,000                 | 10,000                |
| DC             | 0805      | 0.78 ± 0.10               | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| DD             | 0805      | 0.90 ± 0.10               | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| DE             | 0805      | 1.00 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DF             | 0805      | 1.10 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DG             | 0805      | 1.25 ± 0.15               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DH             | 0805      | 1.25 ± 0.20               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DJ             | 0805      | 1.25 ± 0.20               | 3,000                   | N/A                      | N/A                   | N/A                    | N/A                   |
| DK             | 0805      | 1.25 ± 0.15               | 3,000                   | N/A                      | N/A                   | N/A                    | N/A                   |
| DL             | 0805      | 0.95 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EB             | 1206      | 0.78 ± 0.10               | 4,000                   | 10,000                   | 4,000                 | 10,000                 | N/A                   |
| EC             | 1206      | 0.90 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| ED             | 1206      | 1.00 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EE             | 1206      | 1.10 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EF             | 1206      | 1.20 ± 0.15               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EG             | 1206      | 1.60 ± 0.15               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EH             | 1206      | 1.60 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EJ             | 1206      | 1.70 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EK             | 1206      | 0.80 ± 0.10               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EL             | 1206      | 1.15 ± 0.15               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EM             | 1206      | 1.25 ± 0.15               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EN             | 1206      | 0.95 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FB             | 1210      | 0.78 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FC             | 1210      | 0.90 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FD             | 1210      | 0.95 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FE             | 1210      | 1.00 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FF             | 1210      | 1.10 ± 0.10               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FG             | 1210      | 1.25 ± 0.15               | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FH             | 1210      | 1.55 ± 0.15               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FJ             | 1210      | 1.85 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FK             | 1210      | 2.10 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FL             | 1210      | 1.40 ± 0.15               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FM             | 1210      | 1.70 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FN             | 1210      | 1.85 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FO             | 1210      | 1.50 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FP             | 1210      | 1.60 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FQ             | 1210      | 2.50 ± 0.22               | 1,500                   | N/A                      | N/A                   | N/A                    | N/A                   |
| FR             | 1210      | 2.25 ± 0.20               | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FS             | 1210      | 2.50 ± 0.20               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| FT             | 1210      | 1.90 ± 0.20               | 1,500                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| LD             | 1808      | 0.90 ± 0.10               | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| GB             | 1812      | 1.00 ± 0.10               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GC             | 1812      | 1.10 ± 0.10               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GD             | 1812      | 1.25 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GE             | 1812      | 1.30 ± 0.10               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GF             | 1812      | 1.50 ± 0.10               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GG             | 1812      | 1.55 ± 0.10               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GH             | 1812      | 1.40 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GJ             | 1812      | 1.70 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GK             | 1812      | 1.60 ± 0.20               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GL             | 1812      | 1.90 ± 0.20               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GM             | 1812      | 2.00 ± 0.20               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GN             | 1812      | 1.70 ± 0.20               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GO             | 1812      | 2.50 ± 0.20               | 500                     | N/A                      | N/A                   | N/A                    | N/A                   |
| HB             | 1825      | 1.10 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HC             | 1825      | 1.15 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HD             | 1825      | 1.30 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HE             | 1825      | 1.40 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HF             | 1825      | 1.50 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JB             | 2220      | 1.00 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JC             | 2220      | 1.10 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JD             | 2220      | 1.30 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JE             | 2220      | 1.40 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JF             | 2220      | 1.50 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JG             | 2220      | 1.70 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JH             | 2220      | 1.80 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JO             | 2220      | 2.40 ± 0.15               | 500                     | 2,000                    | N/A                   | N/A                    | N/A                   |
| KB             | 2225      | 1.00 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KC             | 2225      | 1.10 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KD             | 2225      | 1.30 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KE             | 2225      | 1.40 ± 0.15               | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |

This chart refers to ceramic chip thickness codes on pages 73 – 76.

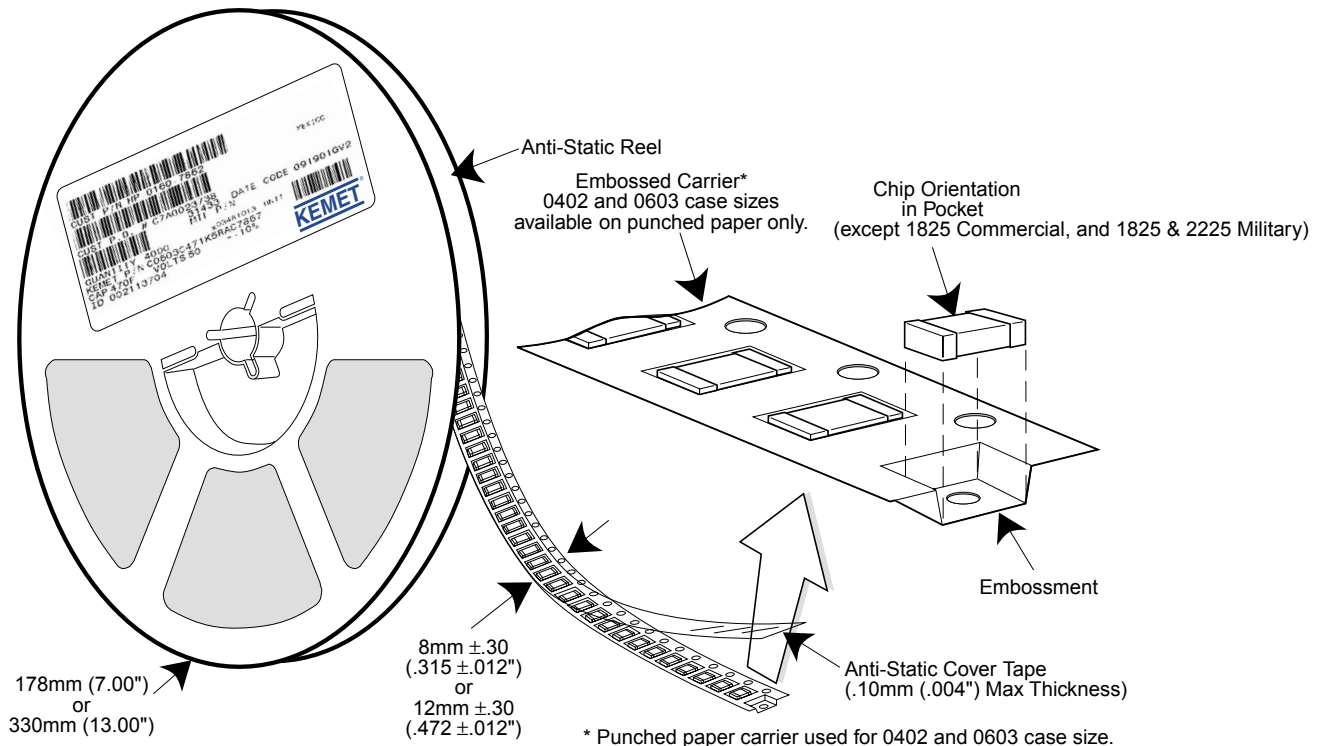
Note: TU suffix represents tape and reel packaging of unmarked components.

Note: TM suffix represents tape and reel packaging of marked components.

Cases sizes ≤1210 are 8mm tape with 4mm pitch and Case Sizes >1210 are 12mm tape and 8mm pitch.

### Tape & Reel Packaging

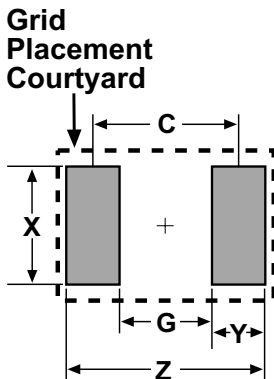
KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page 78 for details on reeling quantities for commercial chips and page 87 for MIL-PRF-55681 chips.



Case Sizes  $\leq 1210$  are 8 mm tape with 4 mm pitch.  
Case Sizes  $>1210$  are 12 mm tape with 8 mm pitch.

**Note:** TU suffix represents tape and reel packaging of unmarked components.  
TM suffix represents tape and reel packaging of marked components.

### SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM



| Dimension | Reflow Solder |      |      |        |        | Wave Solder     |      |      |        |      |
|-----------|---------------|------|------|--------|--------|-----------------|------|------|--------|------|
|           | Z             | G    | X    | Y(ref) | C(ref) | Z               | G    | X    | Y(ref) | Smin |
| 0402      | 2.14          | 0.28 | 0.74 | 0.93   | 1.21   | Not Recommended |      |      |        |      |
| 0603      | 2.78          | 0.68 | 1.08 | 1.05   | 1.73   | 3.18            | 0.68 | 0.80 | 1.25   | 1.93 |
| 0805      | 3.30          | 0.70 | 1.60 | 1.30   | 2.00   | 3.70            | 0.70 | 1.10 | 1.50   | 2.20 |
| 1206      | 4.50          | 1.50 | 2.00 | 1.50   | 3.00   | 4.90            | 1.50 | 1.40 | 1.70   | 3.20 |
| 1210      | 4.50          | 1.50 | 2.90 | 1.50   | 3.00   | 4.90            | 1.50 | 2.00 | 1.70   | 3.20 |
| 1812      | 5.90          | 2.30 | 3.70 | 1.80   | 4.10   | Not Recommended |      |      |        |      |
| 1825      | 5.90          | 2.30 | 6.90 | 1.80   | 4.10   |                 |      |      |        |      |
| 2220      | 7.00          | 3.30 | 5.50 | 1.85   | 5.15   |                 |      |      |        |      |
| 2225      | 7.00          | 3.30 | 6.80 | 1.85   | 5.15   |                 |      |      |        |      |

#### Calculation Formula

$Z = Lmin + 2Jt + Tt$   
 $G = Smax - 2Jh - Th$   
 $X = Wmin + 2Js + Ts$   
 $Tt, Th, Ts = \text{Combined tolerances}$

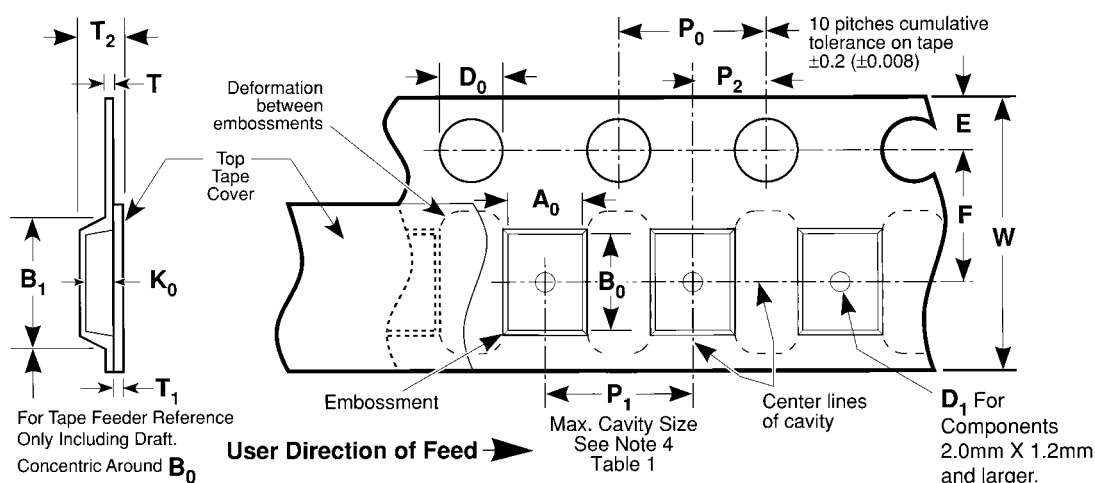
- Cover Tape Break Force:** 1.0 Kg Minimum.
- Cover Tape Peel Strength:** The total peel strength of the cover tape from the carrier tape shall be:

| Tape Width | Peel Strength                          |
|------------|----------------------------------------|
| 8 mm       | 0.1 Newton to 1.0 Newton (10g to 100g) |
| 12 mm      | 0.1 Newton to 1.3 Newton (10g to 130g) |

The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300 ±10 mm/minute.

- Reel Sizes:** Molded tantalum capacitors are available on either 180 mm (7") reels (standard) or 330 mm (13") reels (with C-7280). Note that 13" reels are preferred.
- Labeling:** Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.

### Embossed Carrier Tape Configuration: Figure 1



**Table 1 — EMBOSSED TAPE DIMENSIONS** (Metric will govern)

| Constant Dimensions — Millimeters (Inches) |                                              |                               |                               |                             |                             |                    |                    |                              |                                                        |
|--------------------------------------------|----------------------------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|--------------------|--------------------|------------------------------|--------------------------------------------------------|
| Tape Size                                  | D <sub>0</sub>                               | E                             | P <sub>0</sub>                | P <sub>2</sub>              | T Max                       | T <sub>1</sub> Max |                    |                              |                                                        |
| 8 mm<br>and<br>12 mm                       | 1.5<br>+0.10 -0.0<br>(0.059<br>+0.004, -0.0) | 1.75 ±0.10<br>(0.069 ±0.004)  | 4.0 ±0.10<br>(0.157 ±0.004)   | 2.0 ±0.05<br>(0.079 ±0.002) | 0.600<br>(0.024)            | 0.100<br>(0.004)   |                    |                              |                                                        |
| Variable Dimensions — Millimeters (Inches) |                                              |                               |                               |                             |                             |                    |                    |                              |                                                        |
| Tape Size                                  | Pitch                                        | B <sub>1</sub> Max.<br>Note 1 | D <sub>1</sub> Min.<br>Note 2 | F                           | P <sub>1</sub>              | R Min.<br>Note 3   | T <sub>2</sub> Max | W                            | A <sub>0</sub> B <sub>0</sub> K <sub>0</sub><br>Note 4 |
| 8 mm                                       | Single<br>(4 mm)                             | 4.4<br>(0.173)                | 1.0<br>(0.039)                | 3.5 ±0.05<br>(0.138 ±0.002) | 4.0 ±0.10<br>(0.157 ±0.004) | 25.0<br>(0.984)    | 2.5<br>(0.098)     | 8.0 ±0.30<br>(.315 ±0.012)   |                                                        |
| 12 mm                                      | Double<br>(8 mm)                             | 8.2<br>(0.323)                | 1.5<br>(0.059)                | 5.5 ±0.05<br>(0.217 ±0.002) | 8.0 ±0.10<br>(0.315 ±0.004) | 30.0<br>(1.181)    | 4.6<br>(0.181)     | 12.0 ±0.30<br>(0.472 ±0.012) |                                                        |

### NOTES

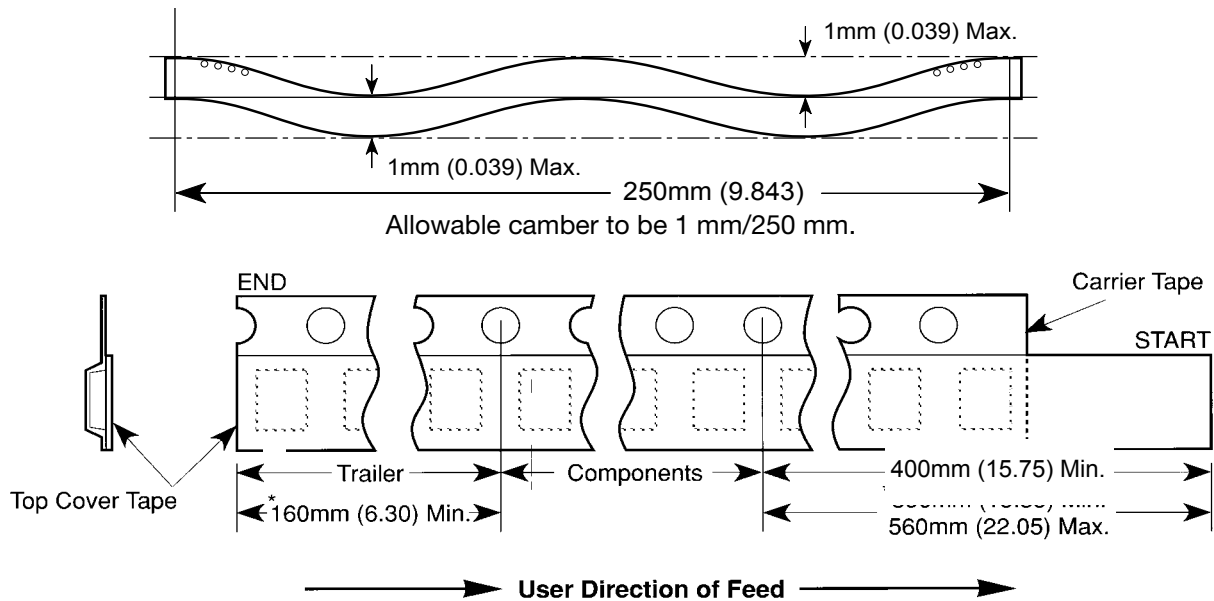
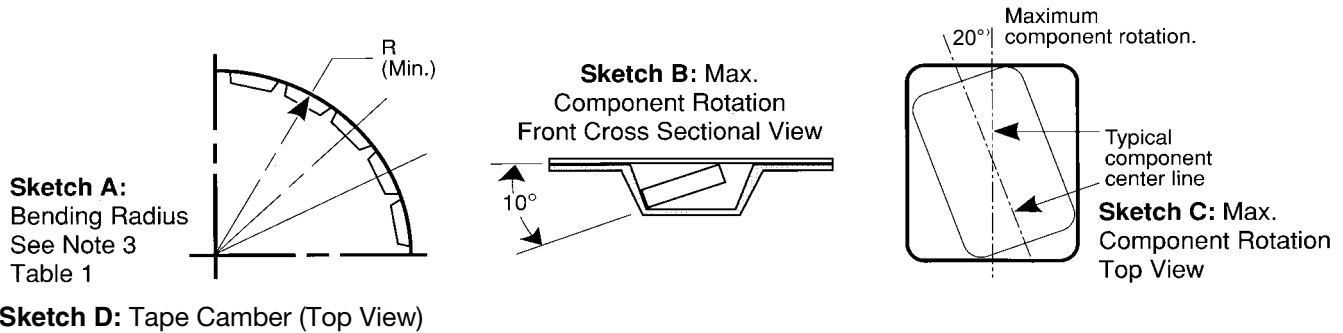
- B<sub>1</sub> dimension is a reference dimension for tape feeder clearance only.
- The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.
- Tape with components shall pass around radius "R" without damage (see sketch A). The minimum trailer length (Fig. 2) may require additional length to provide R min. for 12 mm embossed tape for reels with hub diameters approaching N min. (Table 2)
- The cavity defined by A<sub>0</sub>, B<sub>0</sub>, and K<sub>0</sub> shall be configured to surround the part with sufficient clearance such that the chip does not protrude beyond the sealing plane of the cover tape, the chip can be removed from the cavity in a vertical direction without mechanical restriction, rotation of the chip is limited to 20 degrees maximum in all 3 planes, and lateral movement of the chip is restricted to 0.5 mm maximum in the pocket (not applicable to vertical clearance.)

# TANTALUM, CERAMIC AND ALUMINUM CHIP CAPACITORS

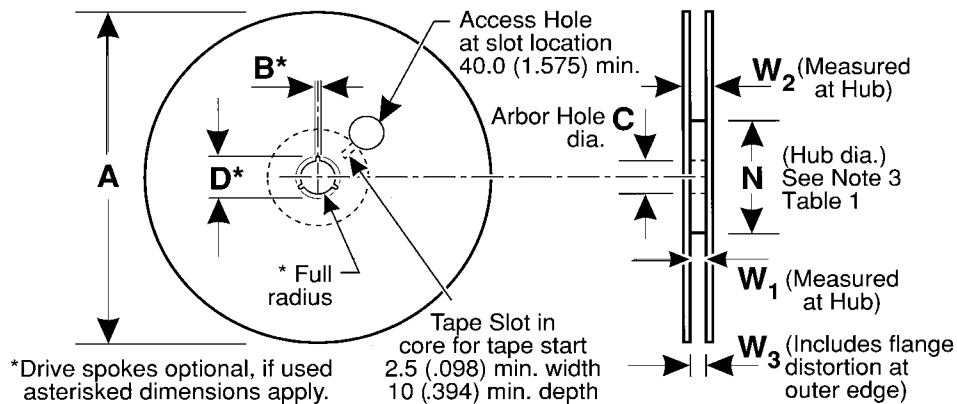


## Packaging Information

### Embossed Carrier Tape Configuration (cont.)



**Figure 2:**  
Tape Leader  
& Trailer  
Dimensions  
(Metric  
Dimensions  
Will Govern)

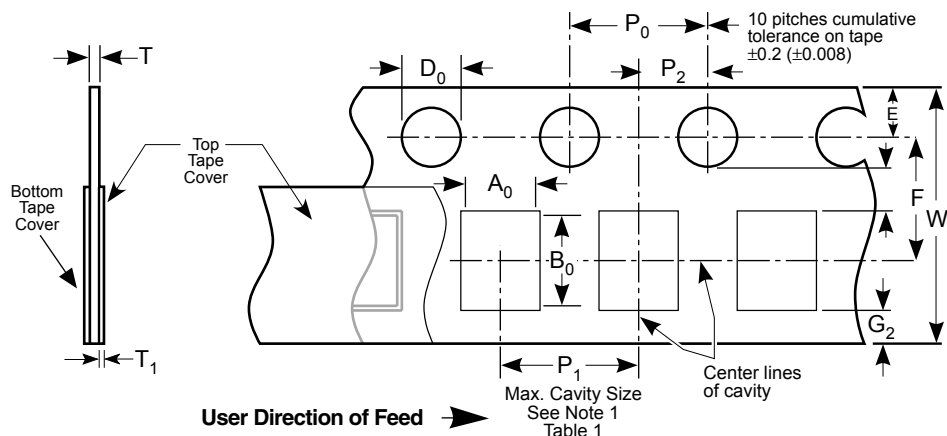


**Figure 3:** Reel Dimensions (Metric Dimensions will govern)

**Table 2 – REEL DIMENSIONS (Metric will govern)**

| Tape Size | A Max             | B* Min         | C                              | D* Min          | N Min                                       | W <sub>1</sub>                                | W <sub>2</sub> Max | W <sub>3</sub>                             |
|-----------|-------------------|----------------|--------------------------------|-----------------|---------------------------------------------|-----------------------------------------------|--------------------|--------------------------------------------|
| 8 mm      | 330.0<br>(12.992) | 1.5<br>(0.059) | 13.0 ± 0.20<br>(0.512 ± 0.008) | 20.2<br>(0.795) | 50.0<br>(1.969)<br>See<br>Note 3<br>Table 1 | 8.4<br>+1.5, -0.0<br>(0.331<br>+0.059, -0.0)  | 14.4<br>(0.567)    | 7.9 Min<br>(0.311)<br>10.9 Max<br>(0.429)  |
| 12 mm     | 330.0<br>(12.992) | 1.5<br>(0.059) | 13.0 ± 0.20<br>(0.512 ± 0.008) | 20.2<br>(0.795) |                                             | 12.4<br>+2.0, -0.0<br>(0.488<br>+0.078, -0.0) | 18.4<br>(0.724)    | 11.9 Min<br>(0.469)<br>15.4 Max<br>(0.606) |

### Punched Carrier (Paper Tape) Configuration (Ceramic Chips Only):



**Table 1: 8 & 12mm Punched Tape  
(Metric Dimensions Will Govern)**

### Constant Dimensions - Millimeters (Inches)

| Tap Size     | D <sub>0</sub>                               | E                           | P <sub>0</sub>               | P <sub>2</sub>               | T <sub>1</sub>         | G <sub>1</sub>         | G <sub>2</sub>         | R Min.                             |
|--------------|----------------------------------------------|-----------------------------|------------------------------|------------------------------|------------------------|------------------------|------------------------|------------------------------------|
| 8mm and 12mm | 1.5<br>+0.10, -0.0<br>(.059<br>+0.004, -0.0) | 1.75 ±0.10<br>(.069 ±0.004) | 4.0 ± 0.10<br>(.157 ± 0.004) | 2.0 ± 0.05<br>(.079 ± 0.002) | 0.10<br>(.004)<br>Max. | 0.75<br>(.030)<br>Min. | 0.75<br>(.030)<br>Min. | 25 (.984)<br>See Note 2<br>Table 1 |

**Table 1: 8 & 12mm Punched Tape  
(Metric Dimensions Will Govern)**

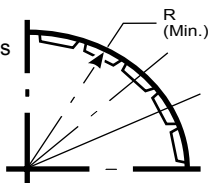
### Variable Dimensions - Millimeters (Inches)

| Tape Size               | P <sub>1</sub>                                                     | F                           | W                           | A <sub>0</sub> B <sub>0</sub> | T                                                                                                                              |
|-------------------------|--------------------------------------------------------------------|-----------------------------|-----------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 8mm<br>1/2<br>Pitch     | 2.0 ± 0.10<br>(.079 ± .004)<br>See Requirements<br>Section 3.3 (d) | 3.5 ± 0.05<br>(.138 ± .002) | 8.0 ± 0.3<br>(.315 ± 0.012) | See Note 1<br>Table 1         | 1.1mm (.043)<br>Max. for Paper<br>Base Tape and<br>1.6mm (.063)<br>Max. for Non-<br>Paper Base<br>Compositions.<br>See Note 3. |
| 8mm                     | 4.0 ± 0.10<br>(0.157 ± .004)                                       |                             |                             |                               |                                                                                                                                |
| 12mm                    | 4.0 ± 0.10<br>(0.157 ± .004)                                       | 5.5 ± 0.05<br>(.217 ± .002) | 12.0 ± 0.3<br>(.472 ± .012) |                               |                                                                                                                                |
| 12mm<br>Double<br>Pitch | 8.0 ± 0.10<br>(0.315 ± .004)                                       |                             |                             |                               |                                                                                                                                |

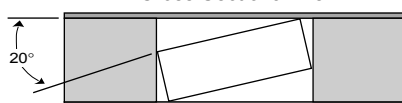
**Note:**

1.  $A_0$ ,  $B_0$  and  $T$  determined by the maximum dimensions to the ends of the terminals extending from the body and/or the body dimensions of the component. The clearance between the ends of the terminals or body of the component to the sides and depth of the cavity ( $A_0$ ,  $B_0$  and  $T$ ) must be within 0.05mm (.002) minimum and 0.50mm (.020) maximum. The clearance allowed must also prevent rotation of the component within the cavity of not more than 20 degrees (see sketches A and B).
2. Tape with components shall pass around radius "R" without damage.
3. KEMET nominal thicknesses are: 0402 = 0.6mm and all others 0.95mm minimum.

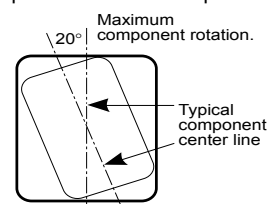
**Sketch A:**  
Bending Radius  
See Note 2  
Table 1



**Sketch B:**  
Max. Component  
Rotation - Front  
Cross Sectional View



**Sketch C:**  
Component Rotation - Top View

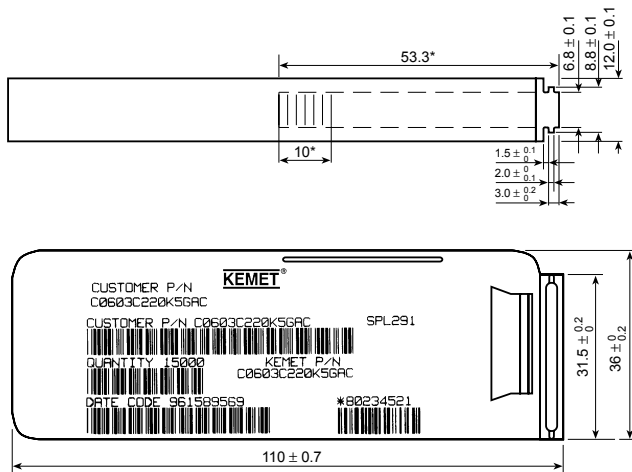


# CERAMIC CHIP CAPACITORS

## Packaging Information



### Bulk Cassette Packaging (Ceramic Chips only) (Meets Dimensional Requirements IEC-286-6 and EIAJ 7201)



Unit: mm  
\* Reference

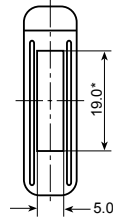


Table 2 – Capacitance Values Available In Bulk Cassette Packaging

| Case Size | Dielectric | Voltage | Min. Cap Value | Max. Cap Value |
|-----------|------------|---------|----------------|----------------|
| 0402      | All        | All     | All            | All            |
| 0603      | All        | All     | All            | All            |
| 0805      | C0G        | 200     | 109            | 181            |
|           |            | 100     | 109            | 331            |
|           |            | 50      | 109            | 102            |
|           | X7R        | 200     | 221            | 392            |
|           |            | 100     | 221            | 103            |
|           |            | 50      | 221            | 273            |
|           |            | 25      | 221            | 104            |
|           |            | 16      | 221            | 104            |
|           | Y5V        | 25      | 104            | 224            |
|           |            | 16      | 104            | 224            |
|           |            |         |                |                |

Table 1 – Capacitor Dimensions for Bulk Cassette Packaging – Millimeters

| Metric Size Code | EIA Size Code | Length L   | Width W     | Thickness T | Bandwidth B | Minimum Separation S | Number of Pcs/Cassette |
|------------------|---------------|------------|-------------|-------------|-------------|----------------------|------------------------|
| 1005             | 0402          | 1.0 ± 0.05 | 0.5 ± 0.05  | 0.5 ± .05   | 0.2 to 0.4  | 0.3                  | 50,000                 |
| 1608             | 0603          | 1.6 ± 0.07 | 0.8 ± 0.07  | 0.8 ± .07   | 0.2 to 0.5  | 0.7                  | 15,000                 |
| 2012             | 0805          | 2.0 ± 0.10 | 1.25 ± 0.10 | 0.6 ± .10   | 0.5 to 0.75 | 0.75                 | 10,000                 |

Terminations: KEMET nickel barrier layer with a tin overplate.

### CAPACITOR MARKING TABLE (Marking Optional - Not Available for 0402 Size or Y5V Dielectric)

| Alpha Character | 9    | 0   | 1  | 2   | 3    | 4      | 5       | 6         | 7          |
|-----------------|------|-----|----|-----|------|--------|---------|-----------|------------|
| A               | 0.10 | 1.0 | 10 | 100 | 1000 | 10,000 | 100,000 | 1,000,000 | 10,000,000 |
| B               | 0.11 | 1.1 | 11 | 110 | 1100 | 11,000 | 110,000 | 1,100,000 | 11,000,000 |
| C               | 0.12 | 1.2 | 12 | 120 | 1200 | 12,000 | 120,000 | 1,200,000 | 12,000,000 |
| D               | 0.13 | 1.3 | 13 | 130 | 1300 | 13,000 | 130,000 | 1,300,000 | 13,000,000 |
| E               | 0.15 | 1.5 | 15 | 150 | 1500 | 15,000 | 150,000 | 1,500,000 | 15,000,000 |
| F               | 0.16 | 1.6 | 16 | 160 | 1600 | 16,000 | 160,000 | 1,600,000 | 16,000,000 |
| G               | 0.18 | 1.8 | 18 | 180 | 1800 | 18,000 | 180,000 | 1,800,000 | 18,000,000 |
| H               | 0.20 | 2.0 | 20 | 200 | 2000 | 20,000 | 200,000 | 2,000,000 | 20,000,000 |
| J               | 0.22 | 2.2 | 22 | 220 | 2200 | 22,000 | 220,000 | 2,200,000 | 22,000,000 |
| K               | 0.24 | 2.4 | 24 | 240 | 2400 | 24,000 | 240,000 | 2,400,000 | 24,000,000 |
| L               | 0.27 | 2.7 | 27 | 270 | 2700 | 27,000 | 270,000 | 2,700,000 | 27,000,000 |
| M               | 0.30 | 3.0 | 30 | 300 | 3000 | 30,000 | 300,000 | 3,000,000 | 30,000,000 |
| N               | 0.33 | 3.3 | 33 | 330 | 3300 | 33,000 | 330,000 | 3,300,000 | 33,000,000 |
| P               | 0.36 | 3.6 | 36 | 360 | 3600 | 36,000 | 360,000 | 3,600,000 | 36,000,000 |
| Q               | 0.39 | 3.9 | 39 | 390 | 3900 | 39,000 | 390,000 | 3,900,000 | 39,000,000 |
| R               | 0.43 | 4.3 | 43 | 430 | 4300 | 43,000 | 430,000 | 4,300,000 | 43,000,000 |
| S               | 0.47 | 4.7 | 47 | 470 | 4700 | 47,000 | 470,000 | 4,700,000 | 47,000,000 |
| T               | 0.51 | 5.1 | 51 | 510 | 5100 | 51,000 | 510,000 | 5,100,000 | 51,000,000 |
| U               | 0.56 | 5.6 | 56 | 560 | 5600 | 56,000 | 560,000 | 5,600,000 | 56,000,000 |
| V               | 0.62 | 6.2 | 62 | 620 | 6200 | 62,000 | 620,000 | 6,200,000 | 62,000,000 |
| W               | 0.68 | 6.8 | 68 | 680 | 6800 | 68,000 | 680,000 | 6,800,000 | 68,000,000 |
| X               | 0.75 | 7.5 | 75 | 750 | 7500 | 75,000 | 750,000 | 7,500,000 | 75,000,000 |
| Y               | 0.82 | 8.2 | 82 | 820 | 8200 | 82,000 | 820,000 | 8,200,000 | 82,000,000 |
| Z               | 0.91 | 9.1 | 91 | 910 | 9100 | 91,000 | 910,000 | 9,100,000 | 91,000,000 |
| a               | 0.25 | 2.5 | 25 | 250 | 2500 | 25,000 | 250,000 | 2,500,000 | 25,000,000 |
| b               | 0.35 | 3.5 | 35 | 350 | 3500 | 35,000 | 350,000 | 3,500,000 | 35,000,000 |
| d               | 0.40 | 4.0 | 40 | 400 | 4000 | 40,000 | 400,000 | 4,000,000 | 40,000,000 |
| e               | 0.45 | 4.5 | 45 | 450 | 4500 | 45,000 | 450,000 | 4,500,000 | 45,000,000 |
| f               | 0.50 | 5.0 | 50 | 500 | 5000 | 50,000 | 500,000 | 5,000,000 | 50,000,000 |
| m               | 0.60 | 6.0 | 60 | 600 | 6000 | 60,000 | 600,000 | 6,000,000 | 60,000,000 |
| n               | 0.70 | 7.0 | 70 | 700 | 7000 | 70,000 | 700,000 | 7,000,000 | 70,000,000 |
| t               | 0.80 | 8.0 | 80 | 800 | 8000 | 80,000 | 800,000 | 8,000,000 | 80,000,000 |
| y               | 0.90 | 9.0 | 90 | 900 | 9000 | 90,000 | 900,000 | 9,000,000 | 90,000,000 |

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a  $\bar{K}$  to identify KEMET, followed by two characters (per EIA-198 - see table below) to identify the capacitance value. Note that marking is not available for size 0402 nor for any Y5V chip. In addition, the 0603 marking option is limited to the  $\bar{K}$  only.



Example shown is 1,000 pF capacitor.