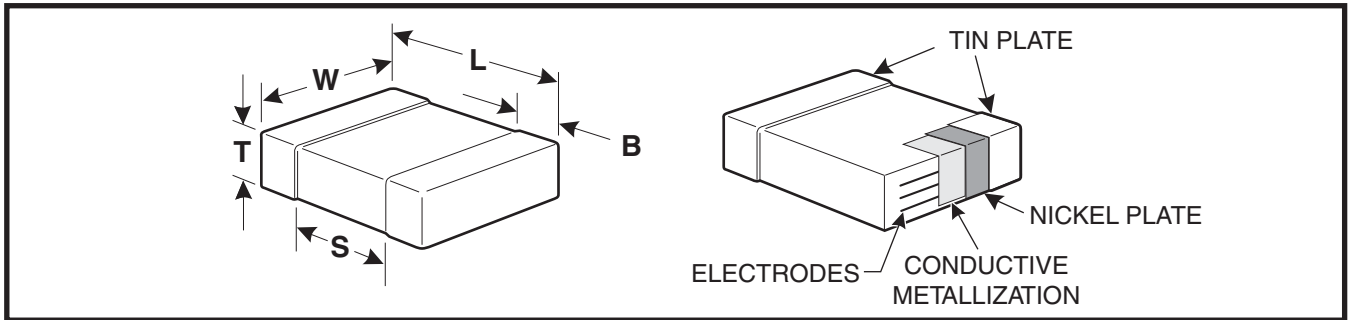


**FEATURES**

- 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) - .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)           | Solder Wave +<br>or<br>Solder Reflow |
| 0805*         | 2012             | 2.0 (.079) $\pm$ .20 (.008) | 1.25 (.049) $\pm$ .20 (.008)      |                                       | 0.50 (.02) $\pm$ .25 (.010)  | 0.75 (.030)          |                                      |
| 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                  | 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 cassette, see page 96.)

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

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

**CERAMIC SIZE CODE SPECIFICATION CAPACITANCE CODE** ——— **C 0805 C 103 K 5 R A C\***

**END METALLIZATION**  
C-Standard (Tin-plated nickel barrier)

**FAILURE RATE LEVEL**  
A- Not Applicable

**TEMPERATURE CHARACTERISTIC**  
Designated by Capacitance Change Over Temperature Range  
G – C0G (NP0) ( $\pm 30$  PPM/ $^{\circ}$ C)  
R – X7R ( $\pm 15\%$ ) ( $-55^{\circ}$ C +  $125^{\circ}$ C)  
P – X5R ( $\pm 15\%$ ) ( $-55^{\circ}$ C +  $85^{\circ}$ C)  
U – Z5U ( $+22\%$ ,  $-56\%$ ) ( $+10^{\circ}$ C +  $85^{\circ}$ C)  
V – Y5V ( $+22\%$ ,  $-82\%$ ) ( $-30^{\circ}$ C +  $85^{\circ}$ C)

**VOLTAGE**  
1 - 100V 3 - 25V  
2 - 200V 4 - 16V  
5 - 50V 8 - 10V  
6 - 35V 9 - 6.3V  
7 - 4V

**CAPACITANCE TOLERANCE**  
B –  $\pm 0.10$ pF J –  $\pm 5\%$   
C –  $\pm 0.25$ pF K –  $\pm 10\%$   
D –  $\pm 0.5$ pF M –  $\pm 20\%$   
F –  $\pm 1\%$  P – (GMV) – special order only  
G –  $\pm 2\%$  Z –  $+80\%$ ,  $-20\%$

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

## C0G CAPACITANCE RANGE – 0201, 0402, 0603, 0805, 1206

| Cap<br>pF | Cap<br>Code | Cap<br>Tolerance | C0201*  |     | C0402* |     |     |     | C0603* |     |     |      | C0805* |     |     |     | C1206* |      |      |     |     |     |     |      |      |  |
|-----------|-------------|------------------|---------|-----|--------|-----|-----|-----|--------|-----|-----|------|--------|-----|-----|-----|--------|------|------|-----|-----|-----|-----|------|------|--|
|           |             |                  | 25V     | 10V | 16V    | 25V | 50V | 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  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 0.75      | 758         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.0       | 109         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.1       | 119         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.2       | 129         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.5       | 159         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.6       | 169         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 1.8       | 189         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 2.0       | 209         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 2.2       | 229         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 2.4       | 249         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 2.7       | 279         | C,D              |         | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 3.0       | 309         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 3.3       | 339         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 3.9       | 399         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 4.3       | 439         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 4.7       | 479         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 5.1       | 519         | C,D              | K,M     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 5.6       | 569         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 6.0       | 609         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 6.2       | 629         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 6.8       | 689         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 7.0       | 709         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 7.5       | 759         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 8.2       | 829         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 9.1       | 919         | C,D              | J,K,M   | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 10.0      | 100         | C,D              | J,K,M   | AA^ | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 11.0      | 110         | C,D              | J,K,M   | AA^ | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 12.0      | 120         | C,D              | J,K,M   | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 13.0      | 130         | C,D              | J,K,M   | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 15.0      | 150         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 16.0      | 160         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 18.0      | 180         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 20.0      | 200         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 22.0      | 220         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 24.0      | 240         | C,D              | G,J,K,M | AA- | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 27.0      | 270         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 30.0      | 300         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 33.0      | 330         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 36.0      | 360         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 39.0      | 390         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 43.0      | 430         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 47.0      | 470         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 51.0      | 510         | D,F,G,J,K,M      | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 56.0      | 560         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 62.0      | 620         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 68.0      | 680         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 75.0      | 750         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 82.0      | 820         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 91.0      | 910         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 100.0     | 101         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 110.0     | 111         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 120.0     | 121         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 130.0     | 131         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 150.0     | 151         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 160.0     | 161         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 180.0     | 181         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 200.0     | 201         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 220.0     | 221         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 240.0     | 241         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 270.0     | 271         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 300.0     | 301         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 330.0     | 331         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 360.0     | 361         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 390.0     | 391         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 430.0     | 431         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 470.0     | 471         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 510.0     | 511         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 560.0     | 561         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 620.0     | 621         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 680.0     | 681         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 750.0     | 751         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 820.0     | 821         | F,G,J,K,M        | AA-     | BB  | BB     | BB  | BB  | BB  | CB     | CB  | CB  | CB   | CB     | CB  | DC  | DC  | DC     | DC   | DC   | DC  |     |     |     |      |      |  |
| 910.0     | 911         | F,G,J,K,M        | AA-     |     |        |     |     |     |        |     |     |      |        |     |     |     |        |      |      |     |     |     |     |      |      |  |

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

| Cap pF    | Cap Code | Cap Tolerance | C1210* |      |      | C1812* |      |      | C1825* |      |      | C2220 |      |      | C2225 |      |      |
|-----------|----------|---------------|--------|------|------|--------|------|------|--------|------|------|-------|------|------|-------|------|------|
|           |          |               | 25V    | 100V | 200V | 50V    | 100V | 200V | 50V    | 100V | 200V | 50V   | 100V | 200V | 50V   | 100V | 200V |
| 10.0      | 100      | D J,K,M       | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 12.0      | 120      | D J,K,M       | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 15.0      | 150      | D G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 18.0      | 180      | D G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 22.0      | 220      | D G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 27.0      | 270      | D,F,G,J,K,M   | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 33.0      | 330      | D,F,G,J,K,M   | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 39.0      | 390      | D,F,G,J,K,M   | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 47.0      | 470      | D,F,G,J,K,M   | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 56.0      | 560      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 68.0      | 680      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 82.0      | 820      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 100.0     | 101      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 120.0     | 121      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 150.0     | 151      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 180.0     | 181      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 220.0     | 221      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 270.0     | 271      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 330.0     | 331      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 390.0     | 391      | F,G,J,K,M     | FB     | FB   | FB   |        |      |      |        |      |      |       |      |      |       |      |      |
| 470.0     | 471      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 560.0     | 561      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 680.0     | 681      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 820.0     | 821      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,000.0   | 102      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,200.0   | 122      | F,G,J,K,M     | FB     | FB   | FB   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,500.0   | 152      | F,G,J,K,M     | FB     | FB   | FE   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 1,800.0   | 182      | F,G,J,K,M     | FB     | FB   | FE   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 2,200.0   | 222      | F,G,J,K,M     | FB     | FC   | FG   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 2,700.0   | 272      | F,G,J,K,M     | FB     | FC   | FG   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 3,300.0   | 332      | F,G,J,K,M     | FB     | FF   | FF   | GB     | GB   | GB   |        |      |      |       |      |      |       |      |      |
| 3,900.0   | 392      | F,G,J,K,M     | FB     | FF   | FF   | GB     | GB   | GB   | HB     | HB   | HB   |       |      |      |       |      |      |
| 4,700.0   | 472      | F,G,J,K,M     | FF     | FG   | FG   | GB     | GB   | GD   | HB     | HB   | HB   |       |      |      |       |      |      |
| 5,600.0   | 562      | F,G,J,K,M     | FB     | FG   | FG   | GB     | GB   | GH   | HB     | HB   | HB   |       |      |      |       |      |      |
| 6,800.0   | 682      | F,G,J,K,M     | FB     | FG   | FG   | GB     | GB   | GJ   | HB     | HB   | HB   |       |      |      |       |      |      |
| 8,200.0   | 822      | F,G,J,K,M     | FC     |      |      | GB     | GB   | GH   | HB     | HB   | HB   | JB    | JB   |      |       |      |      |
| 10,000.0  | 103      | F,G,J,K,M     | FF     |      |      | GB     | GB   | GG   | HB     | HB   | HE   | JB    | JB   |      |       |      |      |
| 12,000.0  | 123      | F,G,J,K,M     | FG     |      |      | GB     | GG   |      | HB     | HB   | HE   | JB    | JB   |      |       |      |      |
| 15,000.0  | 153      | F,G,J,K,M     |        |      |      |        |      |      | HB     | HB   | HE   | JB    | JB   |      |       |      |      |
| 18,000.0  | 183      | F,G,J,K,M     |        |      |      |        |      |      | HB     | HB   | HE   | JB    | JB   |      |       |      |      |
| 22,000.0  | 223      | F,G,J,K,M     | FB     |      |      |        |      |      | HB     | HE   | JB   | JB    |      |      |       |      |      |
| 27,000.0  | 273      | F,G,J,K,M     | FB     |      |      |        |      |      | HB     | HE   | JB   | JB    |      |      |       |      |      |
| 33,000.0  | 333      | F,G,J,K,M     | FB     |      |      |        |      |      |        |      |      |       |      |      |       |      |      |
| 47,000.0  | 473      | F,G,J,K,M     | FB     |      |      |        |      |      |        |      |      |       |      |      |       |      |      |
| 68,000.0  | 683      | F,G,J,K,M     | FB     |      |      |        |      |      |        |      |      |       |      |      |       |      |      |
| 100,000.0 | 104      | F,G,J,K,M     | FE     |      |      |        |      |      |        |      |      |       |      |      |       |      |      |
| 220,000.0 | 224      | F,G,J,K,M     | FK+    |      |      |        |      |      |        |      |      |       |      |      |       |      |      |

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

| Cap pF  | Cap Code | Cap Tolerance | 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      | K,M,J         | BB    | BB  | BB  | BB  | BB  |       |     |     |     |     |      |       |      |     |     |     |     |       |      |      |     |     |     |     |      |      |
| 180     | 181      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 220     | 221      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 270     | 271      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 330     | 331      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 390     | 391      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 470     | 471      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 560     | 561      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 680     | 681      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 820     | 821      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   |      |     |     |     |     |      |      |
| 1,000   | 102      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | DC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,200   | 122      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,500   | 152      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 1,800   | 182      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 2,200   | 222      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 2,700   | 272      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 3,300   | 332      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 3,900   | 392      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 4,700   | 472      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 5,600   | 562      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 6,800   | 682      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 8,200   | 822      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 10,000  | 103      | K,M,J         | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 12,000  | 123      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 15,000  | 153      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DC    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 18,000  | 183      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DD    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 22,000  | 223      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DD    | DC   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 27,000  | 273      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DD    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 33,000  | 333      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DD    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 39,000  | 393      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DD    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 47,000  | 473      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DE    | DG   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 56,000  | 563      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DE    | DG   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 68,000  | 683      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DE    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 82,000  | 823      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DE    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 100,000 | 104      | K,M,J**       | BB    | BB  | BB  | BB  | BB  | CB    | CB  | CB  | CB  | CB  | CB   | CC    | DC   | DC  | DC  | DC  | DC  | DE    | DE   | EB   | EB  | EB  | EB  | EB  | EB   | EB   |
| 120,000 | 124      | K,M,J**       |       |     |     |     |     | CB    | CB  | CB  | CB  | CB  | CB   |       | DC   | DC  | DC  | DC  | DD  | DG    |      | EC   | EC  | EC  | EC  | EC  | EC   | EM   |
| 150,000 | 154      | K,M,J**       |       |     |     |     |     | CB    | CB  | CB  | CB  | CB  | CB   | CD*   | DC   | DC  | DC  | DC  | DD  | DG    |      | EC   | EC  | EC  | EC  | EC  | EC   | EG   |
| 180,000 | 184      | K,M,J**       |       |     |     |     |     | CB    | CB  | CB  | CB  | CB  | CB   | CD*   | DC   | DC  | DC  | DC  | DD  |       |      |      |     |     |     |     |      |      |

## 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      | .30 ± .03                 | N/A                     | N/A                      | 15,000                | N/A                    | N/A                   |
| BB             | 0402      | .50 ± .05                 | N/A                     | N/A                      | 10,000                | 50,000                 | 50,000                |
| CB             | 0603      | .80 ± .07                 | N/A                     | N/A                      | 4,000                 | 10,000                 | 15,000                |
| CC             | 0603      | .80 ± .10                 | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| CD             | 0603      | .80 ± .15                 | N/A                     | N/A                      | 4,000                 | 10,000                 | N/A                   |
| DB             | 0805      | .60 ± .10                 | N/A                     | N/A                      | N/A                   | N/A                    | 10,000                |
| DC             | 0805      | .78 ± .10                 | 4,000                   | 10,000                   | 4,000                 | 10,000                 | N/A                   |
| DD             | 0805      | .90 ± .10                 | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DE             | 0805      | 1.00 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DF             | 0805      | 1.10 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DG             | 0805      | 1.25 ± .15                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DH             | 0805      | 1.25 ± .20                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DJ             | 0805      | 1.25 ± .20                | 3,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| DK             | 0805      | 1.25 ± .15                | 3,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EB             | 1206      | .78 ± .10                 | 4,000                   | 10,000                   | 4,000                 | 10,000                 | N/A                   |
| EC             | 1206      | .90 ± .10                 | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| ED             | 1206      | 1.00 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EE             | 1206      | 1.10 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EF             | 1206      | 1.20 ± .15                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EG             | 1206      | 1.60 ± .15                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EH             | 1206      | 1.60 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EJ             | 1206      | 1.70 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EK             | 1206      | .80 ± .10                 | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EL             | 1206      | 1.15 ± .15                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| EM             | 1206      | 1.25 ± .15                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| EN             | 1206      | 0.95 ± .10                | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FB             | 1210      | .78 ± .10                 | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FC             | 1210      | .90 ± .10                 | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FD             | 1210      | .95 ± .10                 | 4,000                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FE             | 1210      | 1.00 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FF             | 1210      | 1.10 ± .10                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FG             | 1210      | 1.25 ± .15                | 2,500                   | 10,000                   | N/A                   | N/A                    | N/A                   |
| FH             | 1210      | 1.55 ± .15                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FJ             | 1210      | 1.85 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FK             | 1210      | 2.10 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FL             | 1210      | 1.40 ± .15                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FM             | 1210      | 1.70 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FN             | 1210      | 1.85 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FO             | 1210      | 1.50 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FP             | 1210      | 1.60 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FQ             | 1210      | 2.5 ± .20                 | 1,500                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FR             | 1210      | 2.25 ± .20                | 2,000                   | 8,000                    | N/A                   | N/A                    | N/A                   |
| FS             | 1210      | 2.50 ± .20                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| FT             | 1210      | 1.90 ± .20                | 1,500                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GB             | 1812      | 1.00 ± .10                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GC             | 1812      | 1.10 ± .10                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GD             | 1812      | 1.25 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GE             | 1812      | 1.30 ± .10                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GF             | 1812      | 1.50 ± .10                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GG             | 1812      | 1.55 ± .10                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GH             | 1812      | 1.40 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GJ             | 1812      | 1.70 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GK             | 1812      | 1.60 ± .20                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GL             | 1812      | 1.90 ± .20                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GM             | 1812      | 2.00 ± .20                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| GN             | 1812      | 1.70 ± .20                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HB             | 1825      | 1.10 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HC             | 1825      | 1.15 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HD             | 1825      | 1.30 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HE             | 1825      | 1.40 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| HF             | 1825      | 1.50 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JB             | 2220      | 1.00 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JC             | 2220      | 1.10 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JD             | 2220      | 1.30 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JE             | 2220      | 1.40 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| JF             | 2220      | 1.50 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KB             | 2225      | 1.00 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KC             | 2225      | 1.10 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KD             | 2225      | 1.30 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |
| KE             | 2225      | 1.40 ± .15                | 1,000                   | 4,000                    | N/A                   | N/A                    | N/A                   |

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

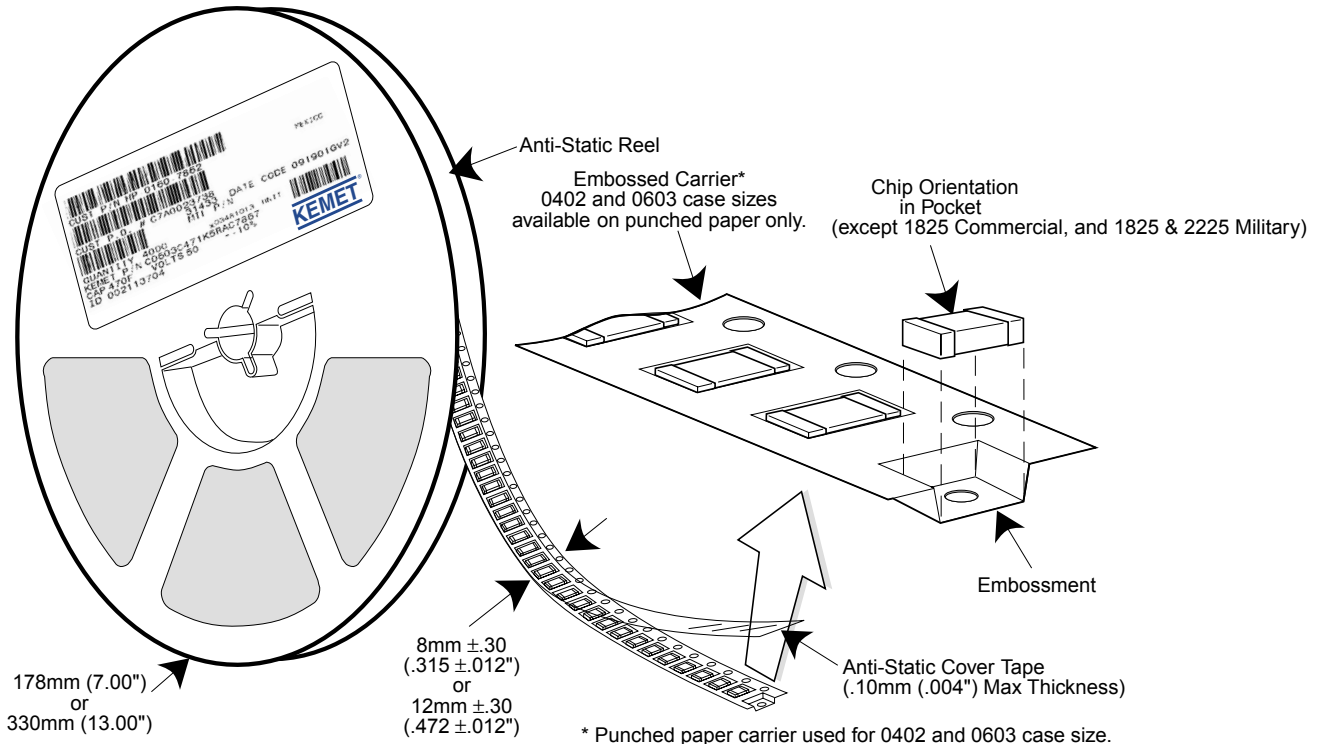
Note: TU suffix represents tape and reel packaging of unmarked components.

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

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

### Tape & Reel Packaging

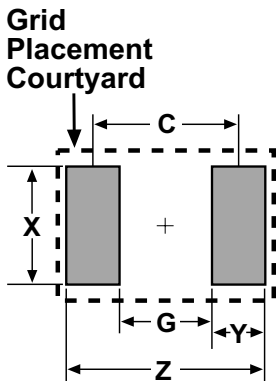
KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page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



Case Sizes ≤ 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 = Combined tolerances

# TANTALUM, CERAMIC AND ALUMINUM CHIP CAPACITORS

## Packaging Information

### Performance Notes

- 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 and 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) |  |

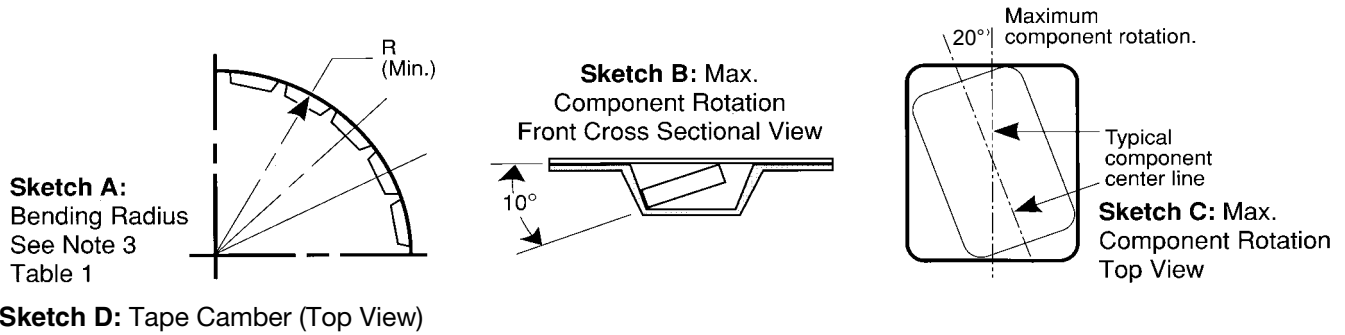
### NOTES

- 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.)

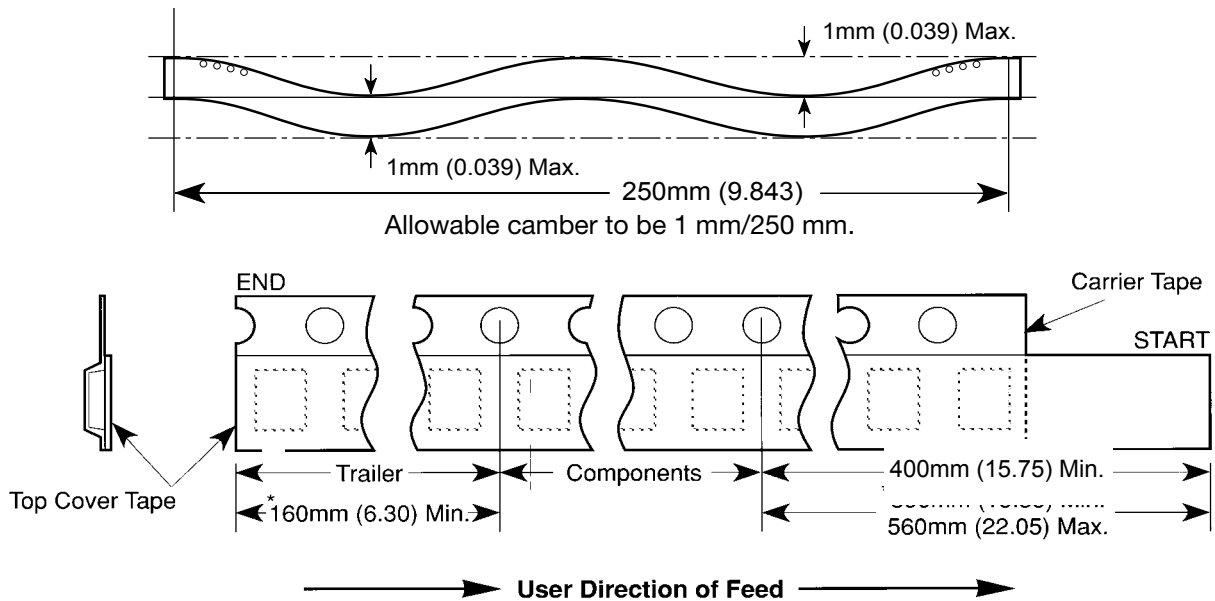


## Packaging Information

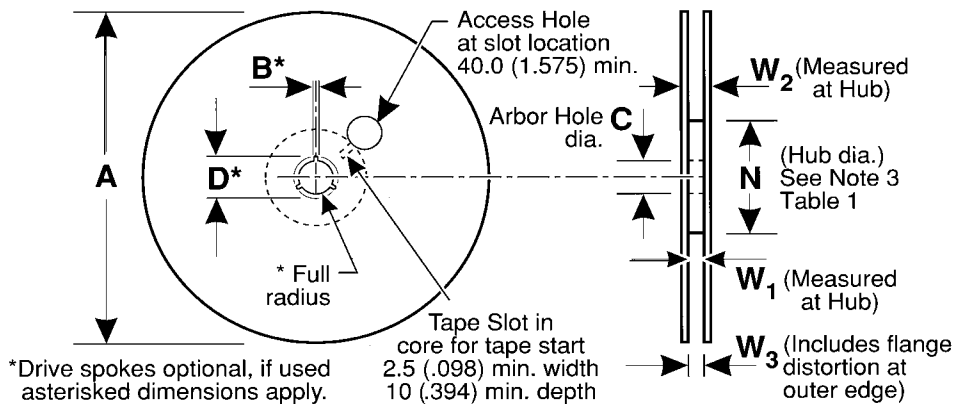
### Embossed Carrier Tape Configuration (cont.)



**Sketch D:** Tape Camber (Top View)



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

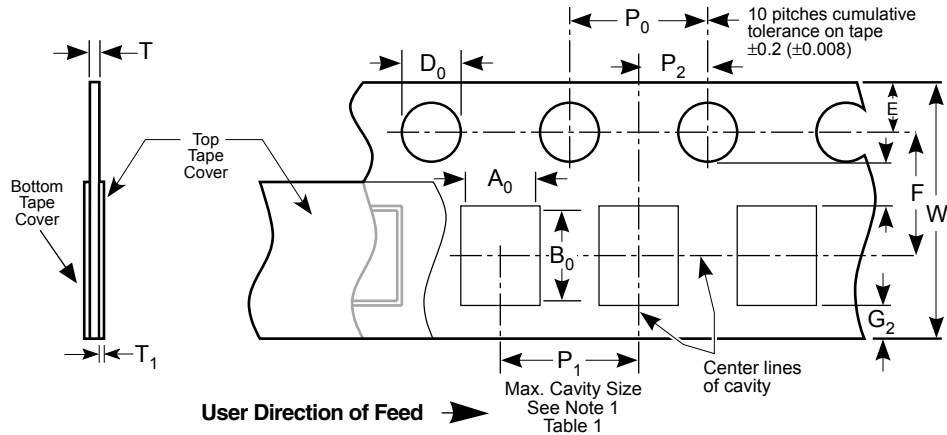


**Figure 3:** Reel Dimensions (Metric Dimensions will govern)

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

| Tape Size | A Max             | $B^*$ Min      | C                              | $D^*$ Min       | N Min                                       | $W_1$   | $W_2$ Max       | $W_3$                                      |
|-----------|-------------------|----------------|--------------------------------|-----------------|---|---|-----------------|--|
| 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) | Table 1                                     | 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)**

| Tape 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)

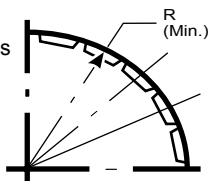
**Variable Dimensions - Millimeters (Inches)**

| 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)                                       |                             |                             |                               |  |

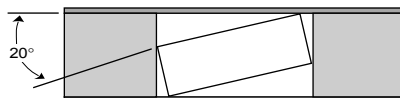
**Note:**

- A<sub>0</sub>, B<sub>0</sub> 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<sub>0</sub>, B<sub>0</sub> 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).
- Tape with components shall pass around radius "R" without damage.
- KEMET nominal thicknesses are: 0402 = 0.6mm and all others 0.95mm minimum.

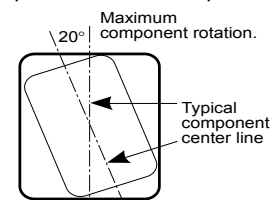
**Sketch A:**  
Bending Radius  
See Note 2  
Table 1



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

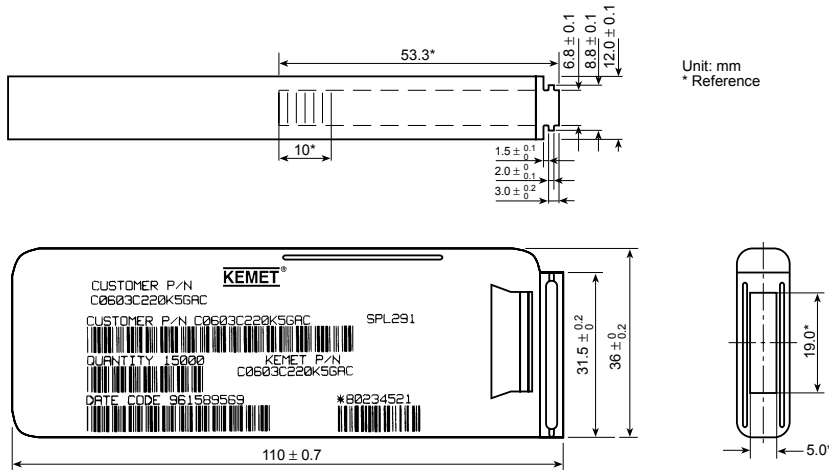


**Sketch C:**  
Component Rotation - Top View





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

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.