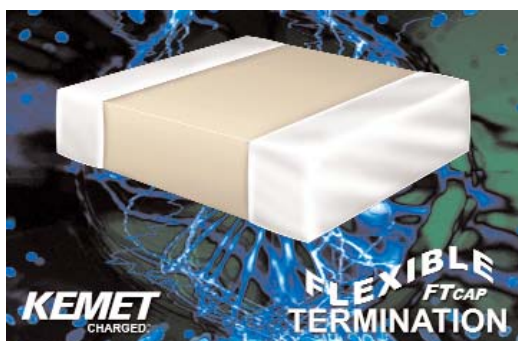
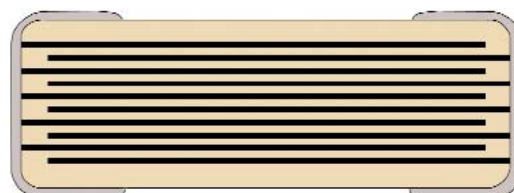
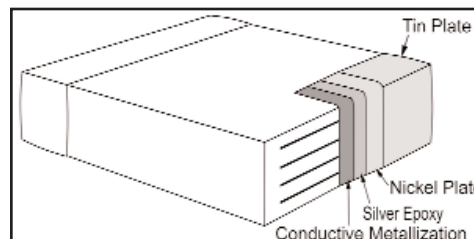
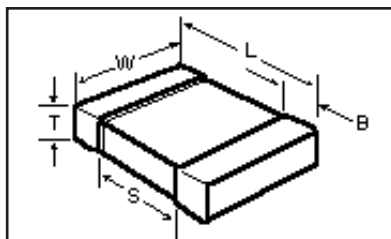


## Surface Mount Ceramic Chip Capacitors / *FT-CAP* / Flexible Terminations


**Standard Electrode Internal Design**

**Outline Drawing**


The “Flexible Termination (FT-CAP)” capacitor is a surface mount multi-layer ceramic capacitor that incorporates a unique, flexible termination system that is integrated with standard termination materials. A conductive silver epoxy is utilized between the conductive metallization and nickel barrier finish in order to establish pliability while maintaining terminal strength, solderability and electrical performance. This technology was developed to address the primary failure mode of MLCC’s, flex cracks, which are typically the result of excessive shear stresses produced during board flexure. Flexible termination technology directs board flex stress away from the ceramic body and into the conductive epoxy area, therefore mitigating flex cracks which can result in low-IR or short-circuit failures. The FT-CAP offers up to 5mm of flex-bend capability, complementing our current “Open Mode”, “Floating Electrode (FE-CAP)” and “Floating Electrode with Flexible Termination (FF-CAP)” product lines by providing our customers with a complete portfolio of flex solutions.

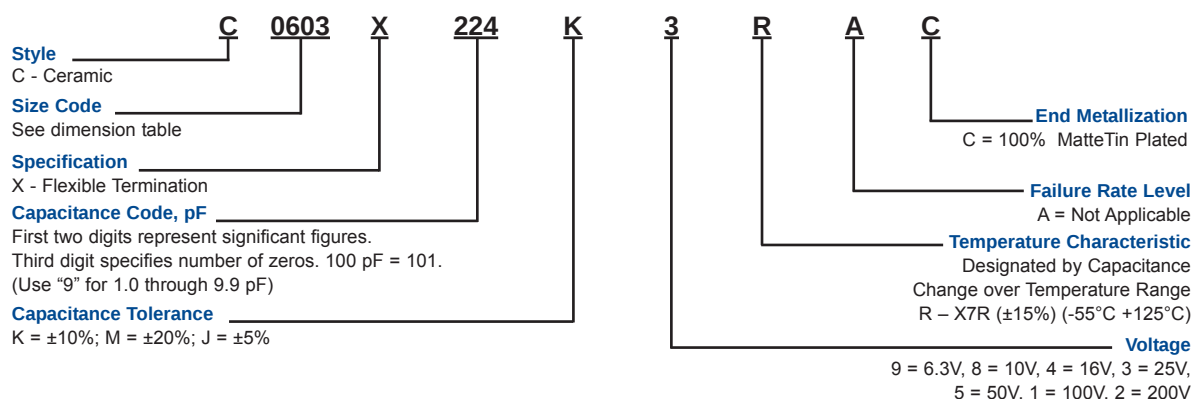
| Dimensions – Millimeters (Inches) |                  |                          |                           |                           |              |
|-----------------------------------|------------------|--------------------------|---------------------------|---------------------------|--------------|
| EIA Size Code                     | Metric Size Code | L Length                 | W Width                   | B Bandwidth               | S Separation |
| 0603                              | 1608             | 1.6 (.063) ± 0.20 (.008) | 0.8 (.031) ± 0.15 (.006)  | 0.35 (.014) ± 0.15 (.006) | 0.70 (.028)  |
| 0805                              | 2012             | 2.1 (.083) ± 0.30 (.012) | 1.25 (.049) ± 0.20 (.008) | 0.50 (.020) ± 0.25 (.010) | 0.75 (.030)  |
| 1206                              | 3216             | 3.3 (.130) ± 0.30 (.012) | 1.6 (.063) ± 0.20 (.008)  | 0.50 (.020) ± 0.25 (.010) | -            |
| 1210                              | 3225             | 3.4 (.134) ± 0.40 (.016) | 2.5 (.098) ± 0.20 (.008)  | 0.50 (.020) ± 0.25 (.010) | -            |
| 1808                              | 4520             | 4.7 (.185) ± 0.50 (.020) | 2.0 (.079) ± 0.20 (.008)  | 0.60 (.024) ± 0.35 (.014) | -            |
| 1812                              | 4532             | 4.6 (.181) ± 0.40 (.016) | 3.2 (.126) ± 0.30 (.021)  | 0.60 (.024) ± 0.35 (.014) | -            |
| 1825                              | 4564             | 4.6 (.181) ± 0.40 (.016) | 6.4 (.250) ± 0.40 (.016)  | 0.60 (.024) ± 0.35 (.014) | -            |
| 2220                              | 5650             | 5.9 (.232) ± 0.75 (.030) | 5.0 (.197) ± 0.40 (.016)  | 0.60 (.024) ± 0.35 (.014) | -            |
| 2225                              | 5664             | 5.9 (.232) ± 0.75 (.030) | 6.4 (.250) ± 0.40 (.016)  | 0.60 (.024) ± 0.35 (.014) | -            |

See “Capacitance Range” tables next page for capacitor chip thickness code specification. Capacitor chip thickness dimensions are detailed in the “Thickness Code Reference Chart” on page 5.

## Qualification/Certification

Automotive Grade Available: AEC-Q200 Rev. C  
RoHS-PRC (6/6) - 100% matte tin termination

## Ordering Information



## Electrical Parameters

As detailed in the KEMET Surface Mount Catalog F3102 for X7R, with following specific requirements based on room temperature ( $25^{\circ}\text{C}$ ) parameters:

- Operating Range:  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ , with no-bias capacitance shift limited to  $\pm 15\%$  over that range.
- Insulation Resistance (IR) measured after 2 minutes at rated voltage @  $25^{\circ}\text{C}$ : Limit is 1000 megohm microfarads or 100,000 M $\Omega$ , whichever of the two is smaller.
- Capacitance and Dissipation Factor (DF) measured under the following conditions:
  - 1kHz and 1 Vrms if capacitance  $\leq 10\mu\text{F}$
  - 120Hz and 0.5 Vrms if capacitance  $> 10\mu\text{F}$

- DF Limits are:

|                |      |
|----------------|------|
| 50 - 200 Volts | 2.5% |
| 16 - 25 Volts  | 3.5% |
| 6.3/10 Volts   | 5.0% |

## Soldering Process

All parts incorporate the standard KEMET barrier layer of pure nickel, with an overplate of pure tin to provide excellent solderability as well as resistance to leaching. The recommended techniques are as follows:

- 1210-2225 case sizes - Solder Reflow
- 0603/0805/1206 case sizes – Solder Wave/Solder Reflow

## Marking

These chips will be supplied unmarked. If required, they can be laser-marked as an extra option. Details on the marking format are included in KEMET Surface Mount catalog F3102.

***In general, the information in the KEMET Surface Mount catalog F3102 applies to these capacitors. The information in this bulletin supplements that in the catalog.***

RoHS Compliant



# Product Availability - 0603 thru 1210 Case Sizes

| FT-CAP / FLEXIBLE TERMINATION / X7R DIELECTRIC (0603 - 1210 Case Sizes) |             |                  |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
|-------------------------------------------------------------------------|-------------|------------------|-----------------------------------------------------------------------------------|-----|-----|-----|-----|------|------|------|--------|-----|-----|-----|------|------|------|-----|--------|-----|-----|------|------|------|-----|-----|--------|-----|------|------|--|--|--|--|
| Cap<br>pF                                                               | Cap<br>Code | Series           | C0603X                                                                            |     |     |     |     |      |      |      | C0805X |     |     |     |      |      |      |     | C1206X |     |     |      |      |      |     |     | C1210X |     |      |      |  |  |  |  |
|                                                                         |             | Voltage          | 6.3V                                                                              | 10V | 16V | 25V | 50V | 100V | 200V | 6.3V | 10V    | 16V | 25V | 50V | 100V | 200V | 6.3V | 10V | 16V    | 25V | 50V | 100V | 200V | 6.3V | 10V | 16V | 25V    | 50V | 100V | 200V |  |  |  |  |
|                                                                         |             | Voltage<br>Code  | 9                                                                                 | 8   | 4   | 3   | 5   | 1    | 2    | 9    | 8      | 4   | 3   | 5   | 1    | 2    | 9    | 8   | 4      | 3   | 5   | 1    | 2    | 9    | 8   | 4   | 3      | 5   | 1    | 2    |  |  |  |  |
|                                                                         |             | Cap<br>Tolerance | Product Availability and Chip Thickness Codes - See "ThicknessCodeReferenceChart" |     |     |     |     |      |      |      |        |     |     |     |      |      |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 180                                                                     | 181         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 220                                                                     | 221         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 270                                                                     | 271         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 330                                                                     | 331         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 390                                                                     | 391         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 470                                                                     | 471         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 560                                                                     | 561         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 680                                                                     | 681         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 820                                                                     | 821         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |
| 1,000                                                                   | 102         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   |      |     |     |        |     |      |      |  |  |  |  |
| 1,200                                                                   | 122         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   |      |     |     |        |     |      |      |  |  |  |  |
| 1,500                                                                   | 152         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   |      |     |     |        |     |      |      |  |  |  |  |
| 1,800                                                                   | 182         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   |      |     |     |        |     |      |      |  |  |  |  |
| 2,200                                                                   | 222         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 2,700                                                                   | 272         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 3,300                                                                   | 332         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 3,900                                                                   | 392         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 4,700                                                                   | 472         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 5,600                                                                   | 562         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 6,800                                                                   | 682         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 8,200                                                                   | 822         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 10,000                                                                  | 103         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   | CB   | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 12,000                                                                  | 123         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 15,000                                                                  | 153         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DC   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 18,000                                                                  | 183         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DD   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 22,000                                                                  | 223         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DD   | DC   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 27,000                                                                  | 273         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DD   | DE   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 33,000                                                                  | 333         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DD   | DE   | EB   | EB  | EB     | EB  | EB  | EB   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 39,000                                                                  | 393         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DD   | DE   | EB   | EB  | EB     | EB  | EB  | EC   | EB   | FB   | FB  | FB  | FB     | FB  | FB   | FB   |  |  |  |  |
| 47,000                                                                  | 473         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  | CB   |      | DC   | DC     | DC  | DC  | DC  | DE   | DG   | EB   | EB  | EB     | EB  | EB  | EC   | ED   | FB   | FB  | FB  | FB     | FB  | FB   | FC   |  |  |  |  |
| 56,000                                                                  | 563         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  |      |      | DD   | DD     | DD  | DD  | DD  | DE   | DG   | EB   | EB  | EB     | EB  | EB  | EB   | ED   | FB   | FB  | FB  | FB     | FB  | FB   | FC   |  |  |  |  |
| 68,000                                                                  | 683         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  |      |      | DD   | DD     | DD  | DD  | DD  | DE   |      | EB   | EB  | EB     | EB  | EB  | EB   | ED   | FB   | FB  | FB  | FB     | FB  | FB   | FC   |  |  |  |  |
| 82,000                                                                  | 823         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  |      |      | DD   | DD     | DD  | DD  | DD  | DE   |      | EB   | EB  | EB     | EB  | EB  | EB   | ED   | FB   | FB  | FB  | FB     | FB  | FB   | FC   |  |  |  |  |
| 100,000                                                                 | 104         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  |      |      | DD   | DD     | DD  | DD  | DD  | DE   |      | EB   | EB  | EB     | EB  | EB  | EB   | EM   | FB   | FB  | FB  | FB     | FB  | FD   | FG   |  |  |  |  |
| 120,000                                                                 | 124         | J,K,M            | CB                                                                                | CB  | CB  | CB  | CB  |      |      | DC   | DC     | DC  | DC  | DD  | DG   |      | EC   | EC  | EC     | EC  | EC  | EC   | EM   | FB   | FB  | FB  | FB     | FB  | FD   |      |  |  |  |  |
| 150,000                                                                 | 154         | J,K,M            | CB                                                                                | CB  | CB  | CD  | CD  |      |      | DC   | DC     | DC  | DC  | DD  | DG   |      | EC   | EC  | EC     | EC  | EC  | EC   | EG   | FC   | FC  | FC  | FC     | FC  | FD   |      |  |  |  |  |
| 180,000                                                                 | 184         | J,K,M            | CB                                                                                | CB  | CB  |     |     |      |      | DC   | DC     | DC  | DC  | DD  | DG   |      | EC   | EC  | EC     | EC  | EC  | EC   |      | FC   | FC  | FC  | FC     | FC  | FD   |      |  |  |  |  |
| 220,000                                                                 | 224         | J,K,M            | CB                                                                                | CB  | CB  | CD  |     |      |      | DC   | DC     | DC  | DC  | DD  | DG   |      | EC   | EC  | EC     | EC  | EC  | EC   |      | FC   | FC  | FC  | FC     | FC  | FD   |      |  |  |  |  |
| 270,000                                                                 | 274         | J,K,M            | CB                                                                                | CB  | CB  |     |     |      |      | DD   | DD     | DD  | DD  | DD  |      |      | EB   | EB  | EB     | EB  | EB  | EC   | EM   | FC   | FC  | FC  | FC     | FC  | FD   |      |  |  |  |  |
| 330,000                                                                 | 334         | J,K,M            | CB                                                                                | CB  | CB  |     |     |      |      | DD   | DD     | DD  | DD  | DD  |      |      | EB   | EB  | EB     | EB  | EC  | EG   |      | FD   | FD  | FD  | FD     | FD  | FD   |      |  |  |  |  |
| 390,000                                                                 | 394         | J,K,M            | CB                                                                                | CB  | CB  |     |     |      |      | DG   | DG     | DG  | DG  | DE  |      |      | EB   | EB  | EB     | EB  | EC  | EG   |      | FD   | FD  | FD  | FD     | FD  | FD   |      |  |  |  |  |
| 470,000                                                                 | 474         | J,K,M            | CB                                                                                | CB  | CB  |     |     |      |      | DD   | DD     | DD  | DD  | DE  |      |      | EC   | EC  | EC     | EC  | EC  | EG   |      | FD   | FD  | FD  | FD     | FD  | FD   |      |  |  |  |  |
| 560,000                                                                 | 564         | J,K,M            |                                                                                   |     |     |     |     |      |      | DD   | DD     | DD  | DG  | DH  |      |      | ED   | ED  | ED     | ED  | EC  |      |      | FD   | FD  | FD  | FD     | FD  | FF   |      |  |  |  |  |
| 680,000                                                                 | 684         | J,K,M            |                                                                                   |     |     |     |     |      |      | DD   | DD     | DD  | DG  | DH  |      |      | EE   | EE  | EE     | EE  | ED  |      |      | FD   | FD  | FD  | FD     | FD  | FG   |      |  |  |  |  |
| 820,000                                                                 | 824         | J,K,M            |                                                                                   |     |     |     |     |      |      | DD   | DD     | DD  | DG  |     |      |      | EF   | EF  | EF     | EF  | ED  |      |      | FF   | FF  | FF  | FF     | FF  | FL   |      |  |  |  |  |
| 1,000,000                                                               | 105         | J,K,M            |                                                                                   |     |     |     |     |      |      | DD   | DD     | DD  | DG  |     |      |      | EF   | EF  | EF     | EG  | ED  |      |      | FH   | FH  | FH  | FH     | FH  | FM   |      |  |  |  |  |
| 1,200,000                                                               | 125         | J,K,M            |                                                                                   |     |     |     |     |      |      | DE   | DE     | DE  |     |     |      |      | ED   | ED  | ED     | EG  | EH  |      |      | FH   | FH  | FH  | FH     | FG  |      |      |  |  |  |  |
| 1,500,000                                                               | 155         | J,K,M            |                                                                                   |     |     |     |     |      |      | DG   | DG     | DG  |     |     |      |      | EF   | EF  | EF     | EG  | EH  |      |      | FH   | FH  | FH  | FH     | FG  |      |      |  |  |  |  |
| 1,800,000                                                               | 185         | J,K,M            |                                                                                   |     |     |     |     |      |      | DG   | DG     | DG  |     |     |      |      | EF   | EF  | EF     | EH  |     |      |      | FH   | FH  | FH  | FH     | FG  |      |      |  |  |  |  |
| 2,200,000                                                               | 225         | J,K,M            |                                                                                   |     |     |     |     |      |      | DG   | DG     | DG  |     |     |      |      | ED   | ED  | ED     | EH  |     |      |      | FJ   | FJ  | FJ  | FJ     | FG  |      |      |  |  |  |  |
| 2,700,000                                                               | 275         | J,K,M            |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      | EN   | EN  | EN     | EH  |     |      |      | FE   | FE  | FE  | FG     | FH  |      |      |  |  |  |  |
| 3,300,000                                                               | 335         | J,K,M            |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      | ED   | ED  | ED     | EH  |     |      |      | FF   | FF  | FF  | FM     | FM  |      |      |  |  |  |  |
| 3,900,000                                                               | 395         | J,K,M            |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      | EF   | EF  | EF     | EH  |     |      |      | FG   | FG  | FG  | FG     | FK  |      |      |  |  |  |  |
| 4,700,000                                                               | 475         | J,K,M            |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      | EF   | EF  | EF     | EH  |     |      |      | FC   | FC  | FC  | FG     | FS  |      |      |  |  |  |  |
| 5,600,000                                                               | 565         | J,K,M            |                                                                                   |     |     |     |     |      |      |      |        |     |     |     |      |      |      |     |        |     |     |      |      |      |     |     |        |     |      |      |  |  |  |  |

# Product Availability - 1808 thru 2225 Case Sizes

| FT-CAP / FLEXIBLE TERMINATION / X7R DIELECTRIC (1808 - 2225 Case Sizes) |          |               |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
|-------------------------------------------------------------------------|----------|---------------|-----------------------------------------------------------------------------------|------|------|------|--------|-----|------|------|--------|------|------|--------|-----|------|------|--------|------|------|
| Cap<br>pF                                                               | Cap Code | Series        | C1808X                                                                            |      |      |      | C1812X |     |      |      | C1825X |      |      | C2220X |     |      |      | C2225X |      |      |
|                                                                         |          | Voltage       | 50V                                                                               | 100V | 200V | 250V | 25V    | 50V | 100V | 200V | 50V    | 100V | 200V | 25V    | 50V | 100V | 200V | 50V    | 100V | 200V |
|                                                                         |          | Voltage Code  | 5                                                                                 | 1    | 2    | A    | 3      | 5   | 1    | 2    | 5      | 1    | 2    | 3      | 5   | 1    | 2    | 5      | 1    | 2    |
|                                                                         |          | Cap Tolerance | Product Availability and Chip Thickness Codes - See "ThicknessCodeReferenceChart" |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 2,200                                                                   | 222      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 2,700                                                                   | 272      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 3,300                                                                   | 332      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 2,900                                                                   | 392      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 4,700                                                                   | 472      | J,K,M         | LD                                                                                | LD   | LD   |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 5,600                                                                   | 562      | J,K,M         | LD                                                                                | LD   | LD   |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 6,800                                                                   | 682      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 8,200                                                                   | 822      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 10,000                                                                  | 103      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 12,000                                                                  | 123      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 15,000                                                                  | 153      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 18,000                                                                  | 183      | J,K,M         | LD                                                                                | LD   | LD   |      | GB     | GB  | GB   | GB   |        |      |      |        |     |      |      |        |      |      |
| 22,000                                                                  | 223      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      |        |      |      |
| 27,000                                                                  | 273      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      |        |      |      |
| 33,000                                                                  | 333      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      |        |      |      |
| 39,000                                                                  | 393      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      |        |      |      |
| 47,000                                                                  | 473      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      | KC     | KC   | KC   |
| 56,000                                                                  | 563      | J,K,M         | LD                                                                                | LD   |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      | KC     | KC   | KC   |
| 68,000                                                                  | 683      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   |        |     |      |      | KC     | KC   | KC   |
| 82,000                                                                  | 823      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 100,000                                                                 | 104      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 120,000                                                                 | 124      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GB   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 150,000                                                                 | 154      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GE   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 180,000                                                                 | 184      | J,K,M         | LD                                                                                |      |      |      | GB     | GB  | GB   | GF   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 220,000                                                                 | 224      | J,K,M         |                                                                                   |      |      |      | GB     | GB  | GB   | GG   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KC     | KC   | KC   |
| 270,000                                                                 | 274      | J,K,M         |                                                                                   |      |      |      | GB     | GB  | GG   | GG   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KB     | KC   | KC   |
| 330,000                                                                 | 334      | J,K,M         |                                                                                   |      |      |      | GB     | GB  | GG   | GG   | HB     | HB   | HB   | JC     | JC  | JC   | JC   | KB     | KC   | KC   |
| 390,000                                                                 | 394      | J,K,M         |                                                                                   |      |      |      | GB     | GB  | GG   | GG   | HB     | HB   | HD   | JC     | JC  | JC   | JC   | KB     | KC   | KC   |
| 470,000                                                                 | 474      | J,K,M         |                                                                                   |      |      |      | GB     | GB  | GG   | GJ   | HB     | HB   | HD   | JC     | JC  | JC   | JC   | KB     | KC   | KD   |
| 560,000                                                                 | 564      | J,K,M         |                                                                                   |      |      |      | GC     | GC  | GG   |      | HB     | HD   | HD   | JC     | JC  | JC   | JC   | KB     | KC   | KD   |
| 680,000                                                                 | 684      | J,K,M         |                                                                                   |      |      |      | GC     | GC  | GG   |      | HB     | HD   | HD   | JC     | JC  | JD   | JD   | KB     | KC   | KD   |
| 820,000                                                                 | 824      | J,K,M         |                                                                                   |      |      |      | GE     | GE  | GG   |      | HB     | HF   | HF   | JC     | JC  | JF   | JF   | KB     | KC   | KE   |
| 1,000,000                                                               | 105      | J,K,M         |                                                                                   |      |      |      | GE     | GE  | GG   |      | HB     | HF   | HF   | JC     | JC  | JF   | JF   | KB     | KD   | KE   |
| 1,200,000                                                               | 125      | J,K,M         |                                                                                   |      |      |      |        |     |      |      | HB     |      |      | JC     | JC  |      |      | KB     | KE   | KE   |
| 1,500,000                                                               | 155      | J,K,M         |                                                                                   |      |      |      |        |     |      |      | HC     |      |      | JC     | JC  |      |      | KC     |      |      |
| 1,800,000                                                               | 185      | J,K,M         |                                                                                   |      |      |      |        |     |      |      | HD     |      |      | JD     | JD  |      |      | KD     |      |      |
| 2,200,000                                                               | 225      | J,K,M         |                                                                                   |      |      |      |        |     |      |      | HF     |      |      | JF     | JF  |      |      | KD     |      |      |
| 2,700,000                                                               | 275      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 3,300,000                                                               | 335      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 3,900,000                                                               | 395      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 4,700,000                                                               | 475      | J,K,M         |                                                                                   |      |      |      | GK     | GK  |      |      |        |      |      |        |     |      |      |        |      |      |
| 5,600,000                                                               | 565      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 6,800,000                                                               | 685      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 8,200,000                                                               | 825      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 10,000,000                                                              | 106      | J,K,M         |                                                                                   |      |      |      | GK     |     |      |      |        |      |      | JF     | JO  |      |      |        |      |      |
| 12,000,000                                                              | 126      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 15,000,000                                                              | 156      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      | JO     |     |      |      |        |      |      |
| 18,000,000                                                              | 186      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      |        |     |      |      |        |      |      |
| 22,000,000                                                              | 226      | J,K,M         |                                                                                   |      |      |      |        |     |      |      |        |      |      | JO     |     |      |      |        |      |      |
| Cap<br>pF                                                               | Cap Code | Voltage Code  | 5                                                                                 | 1    | 2    | A    | 3      | 5   | 1    | 2    | 5      | 1    | 2    | 3      | 5   | 1    | 2    | 5      | 1    | 2    |
|                                                                         |          | Voltage       | 50V                                                                               | 100V | 200V | 250V | 25V    | 50V | 100V | 200V | 50V    | 100V | 200V | 25V    | 50V | 100V | 200V | 50V    | 100V | 200V |
|                                                                         |          | Series        | C1808X                                                                            |      |      |      | C1812X |     |      |      | C1825X |      |      | C2220X |     |      |      | C2225X |      |      |

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## Thickness Code Reference Chart

| Chip Size | Thickness Code | 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 |
|-----------|----------------|---------------------------|-------------------------|--------------------------|-----------------------|------------------------|-----------------------|
| 0603      | CB             | 0.80 ± 0.07               | -                       | -                        | 4,000                 | 10,000                 | 15,000                |
| 0603      | CC             | 0.80 ± 0.10               | -                       | -                        | 4,000                 | 10,000                 | -                     |
| 0603      | CD             | 0.80 ± 0.15               | -                       | -                        | 4,000                 | 10,000                 | -                     |
| 0805      | DB             | 0.60 ± 0.10               | -                       | -                        | 4,000                 | 10,000                 | 10,000                |
| 0805      | DC             | 0.78 ± 0.10               | -                       | -                        | 4,000                 | 10,000                 | -                     |
| 0805      | DD             | 0.90 ± 0.10               | -                       | -                        | 4,000                 | 10,000                 | -                     |
| 0805      | DE             | 1.00 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 0805      | DF             | 1.10 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 0805      | DG             | 1.25 ± 0.15               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 0805      | DH             | 1.25 ± 0.20               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 0805      | DL             | 0.95 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1206      | EB             | 0.78 ± 0.10               | 4,000                   | 10,000                   | 4,000                 | 10,000                 | -                     |
| 1206      | EC             | 0.90 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1206      | ED             | 1.00 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1206      | EE             | 1.10 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1206      | EF             | 1.20 ± 0.15               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1206      | EG             | 1.60 ± 0.15               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1206      | EH             | 1.60 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1206      | EJ             | 1.70 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1206      | EK             | 0.80 ± 0.10               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1206      | EM             | 1.25 ± 0.15               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1206      | EN             | 0.95 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FB             | 0.78 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FC             | 0.90 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FD             | 0.95 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FE             | 1.00 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FF             | 1.10 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FG             | 1.25 ± 0.15               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1210      | FH             | 1.55 ± 0.15               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FJ             | 1.85 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FK             | 2.10 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FL             | 1.40 ± 0.15               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FM             | 1.70 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FN             | 1.85 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FO             | 1.50 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FP             | 1.60 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FR             | 2.25 ± 0.20               | 2,000                   | 8,000                    | -                     | -                      | -                     |
| 1210      | FS             | 2.50 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1210      | FT             | 1.90 ± 0.20               | 1,500                   | 4,000                    | -                     | -                      | -                     |
| 1632      | MA             | 0.80 ± 0.10               | 4,000                   | 10,000                   | -                     | -                      | -                     |
| 1808      | LD             | 0.90 ± 0.10               | 2,500                   | 10,000                   | -                     | -                      | -                     |
| 1808      | LA             | 1.40 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1808      | LB             | 1.60 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1808      | LC             | 2.00 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GB             | 1.00 ± 0.10               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GC             | 1.10 ± 0.10               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GD             | 1.25 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GE             | 1.30 ± 0.10               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GF             | 1.50 ± 0.10               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GG             | 1.55 ± 0.10               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GH             | 1.40 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GJ             | 1.70 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GK             | 1.60 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GL             | 1.90 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GM             | 2.00 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GN             | 1.70 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1812      | GO             | 2.50 ± 0.20               | 500                     | -                        | -                     | -                      | -                     |
| 1825      | HB             | 1.10 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1825      | HC             | 1.15 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1825      | HD             | 1.30 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1825      | HE             | 1.40 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1825      | HF             | 1.50 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 1825      | HG             | 1.60 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JB             | 1.00 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JC             | 1.10 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JD             | 1.30 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JE             | 1.40 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JF             | 1.50 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JP             | 1.60 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JG             | 1.70 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JH             | 1.80 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2220      | JO             | 2.40 ± 0.15               | 500                     | 2,000                    | -                     | -                      | -                     |
| 2225      | KB             | 1.00 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2225      | KC             | 1.10 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2225      | KD             | 1.30 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2225      | KE             | 1.40 ± 0.15               | 1,000                   | 4,000                    | -                     | -                      | -                     |
| 2225      | KF             | 1.60 ± 0.20               | 1,000                   | 4,000                    | -                     | -                      | -                     |