

## Product Specification Bulletin

### Surface Mount Tip & Ring Ceramic Chip Capacitors

KEMET's 250 VDC or Tip & Ring MLCC capacitors are designed and rated for telecommunication ringer circuits where the capacitor is used to block -48 to -52 Volt DC of line voltage and pass a 16-25 Hz AC signal pulse of 70 Vrms to 90 Vrms. The surface mount ceramic capacitors are excellent replacements for high voltage leaded film devices. The smaller SMT footprints save valuable board space which is critical when creating new designs, and the capacitors are able to withstand today's higher lead-free reflow processing temperatures. The ceramic MLCC have excellent high frequency filtering characteristics, low ESR, and high temperature reflow capabilities.

KEMET Tip and Ring capacitors are available in standard EIA case sizes and standard capacitance values from 0.001µF to 1.2µF. The capacitors have pure tin (100% Matte Sn) plated terminations and are 100% lead free which is ideal for new environmentally demanding designs.

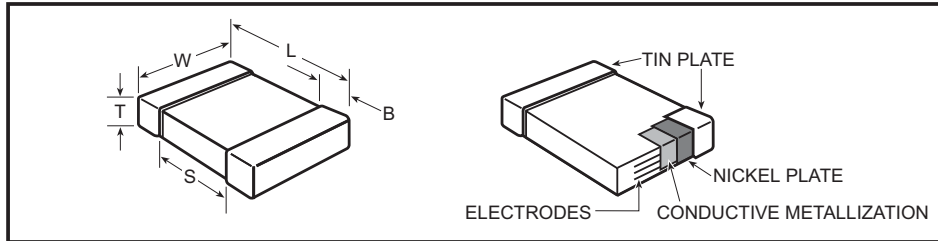
**Applications:**

- Telecommunication Ringing Circuits
- Switch Mode Power Supply Snubber Circuits
- High Voltage DC Blocking
- High Voltage Coupling

**Markets:**

- Phone Lines
- Analog and Digital Modems
- FAX Machines
- Wireless Base Stations, Ethernet
- Digital Video Recording Set-Top Boxes
- Satellite Dish
- Cable Set-Top Boxes
- High Voltage Power Supply, DC/DC Converters
- Ethernet, POS, ATM Hardware

### Outline Drawing



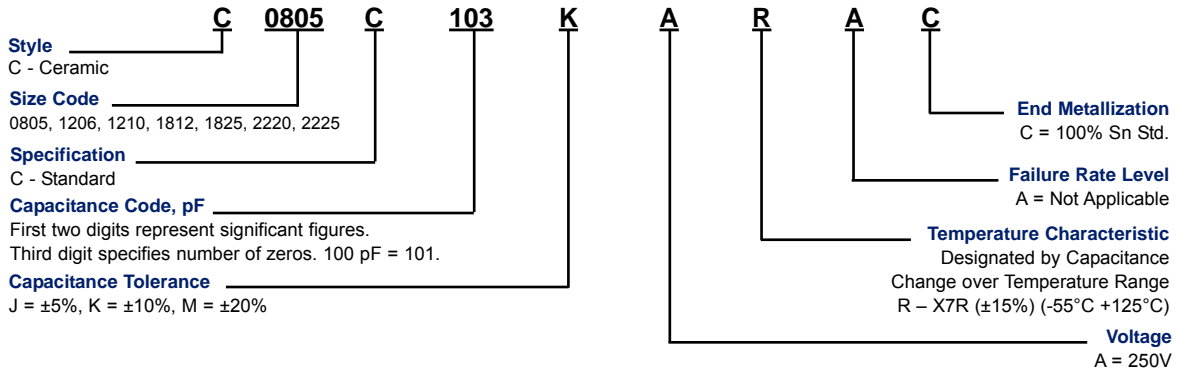
**Table 1 – Dimensions - Millimeters (Inches)**

| Metric Code | EIA Size Code | L - Length                   | W - Width                    | B - Bandwidth                 | Band Separation |
|-------------|---------------|------------------------------|------------------------------|-------------------------------|-----------------|
| 2012        | 0805          | 2.0 (0.079)<br>± 0.2 (0.008) | 1.2 (0.049)<br>± 0.2 (0.008) | 0.5 (0.02)<br>± 0.25 (0.010)  | 0.75 (0.030)    |
| 3216        | 1206          | 3.2 (0.126)<br>± 0.2 (0.008) | 1.6 (0.063)<br>± 0.2 (0.008) | 0.5 (0.02)<br>± 0.25 (0.010)  | N/A             |
| 3225        | 1210          | 3.2 (0.126)<br>± 0.2 (0.008) | 2.5 (0.098)<br>± 0.2 (0.008) | 0.5 (0.02)<br>± 0.25 (0.010)  | N/A             |
| 4532        | 1812          | 4.5 (0.177)<br>± 0.3 (0.012) | 3.2 (0.126)<br>± 0.3 (0.012) | 0.6 (0.024)<br>± 0.35 (0.014) | N/A             |
| 4564        | 1825          | 4.5 (0.177)<br>± 0.3 (0.012) | 6.4 (0.250)<br>± 0.4 (0.016) | 0.6 (0.024)<br>± 0.35 (0.014) | N/A             |
| 5650        | 2220          | 5.6 (0.224)<br>± 0.4 (0.016) | 5.0 (0.197)<br>± 0.4 (0.016) | 0.6 (0.024)<br>± 0.35 (0.014) | N/A             |
| 5664        | 2225          | 5.6 (0.224)<br>± 0.4 (0.016) | 6.4 (0.250)<br>± 0.4 (0.016) | 0.6 (0.024)<br>± 0.35 (0.014) | N/A             |

Note: For thickness dimensions, see Table 2.



## Capacitor Ordering Information



## General Performance Characteristics & Electrical Parameters 250 VDC

|                             |   |
|-----------------------------|---|
| EIA Case Sizes              | 0805, 1206, 1210, 1812, 1825, 2220, 2225  |
| Capacitance Range           | 0.001µF to 1.2µF  |
| Test Parameters             | Capacitance and Dissipation Factor measured at 1.0 ± 0.2 Vrms and 1.0 ± 0.2 kHz |
| Operating Temperature Range | -55°C to +125°C   |
| Temperature Characteristic  | -55°C to +125°C X7R: ±15% (0% VDC)  |
| Capacitance Tolerances      | J = ±5%, K = ±10%, M = ±20%   |
| Dissipation Factor          | ≤2.5%   |
| Aging Rate                  | 2.5% per decade hour  |
| Voltage Rating              | 250 VDC   |
| 25°C IR @ Rated Voltage     | 1000MΩ-µF or 100GΩ, whichever is less   |
| Dielectric Strength (DMV)   | 250% of Rated Voltage 5 ± 1 seconds and charge/discharge not exceeding 50mA     |

## Marking

These chips are supplied unmarked. If required, they can be laser-marked as an extra cost option. Details on the marking format are included in KEMET Surface Mount Catalog F3102 on page 96.

## Soldering Process

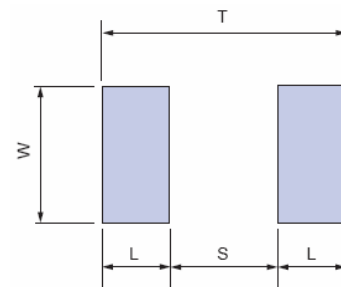
The 0805 and 1206 sizes are suitable for either reflow or wave soldering. Sizes 1210 and larger should be limited to reflow soldering only. All sizes incorporate the standard KEMET barrier layer of pure nickel with an overplating of pure tin for excellent solderability and resistance to leaching of the termination.

## Packaging

KEMET High Voltage Surface Mount MLCC capacitors are available packaged in tape and reel configuration.

## Recommended Solder Pad Dimensions

| Chip Size | T - Total Length |       | S - Separation |       | W - Pad Width |       | L - Pad Length |       |
|-----------|------------------|-------|----------------|-------|---------------|-------|----------------|-------|
|           | mm               | in.   | mm             | in.   | mm            | in.   | mm             | in.   |
| 0805      | 3.30             | 0.130 | 0.70           | 0.028 | 1.60          | 0.063 | 1.30           | 0.051 |
| 1206      | 4.50             | 0.177 | 1.50           | 0.059 | 2.00          | 0.079 | 1.50           | 0.059 |
| 1210      | 4.50             | 0.177 | 1.50           | 0.059 | 2.90          | 0.114 | 1.50           | 0.059 |
| 1812      | 5.90             | 0.232 | 2.30           | 0.091 | 3.70          | 0.146 | 1.80           | 0.071 |
| 1825      | 5.90             | 0.232 | 2.30           | 0.091 | 6.90          | 0.272 | 1.80           | 0.071 |
| 2220      | 7.00             | 0.276 | 3.30           | 0.130 | 5.50          | 0.217 | 1.85           | 0.073 |
| 2225      | 7.00             | 0.276 | 3.30           | 0.130 | 6.80          | 0.268 | 1.85           | 0.073 |



**Table 2 - X7R Dielectric Capacitance Values**

| Cap Code<br>pF | 0805 | 1206 | 1210 | 1812 | 1825 | 2220 | 2225 |
|----------------|------|------|------|------|------|------|------|
| 180            | DC   |      |      |      |      |      |      |
| 220            | DC   |      |      |      |      |      |      |
| 270            | DC   |      |      |      |      |      |      |
| 330            | DC   |      |      |      |      |      |      |
| 390            | DC   |      |      |      |      |      |      |
| 470            | DC   |      |      |      |      |      |      |
| 560            | DC   |      |      |      |      |      |      |
| 680            | DC   |      |      |      |      |      |      |
| 820            | DC   |      |      |      |      |      |      |
| 1,000          | DC   | EB   |      |      |      |      |      |
| 1,200          | DC   | EB   |      |      |      |      |      |
| 1,500          | DC   | EB   |      |      |      |      |      |
| 1,800          | DC   | EB   |      |      |      |      |      |
| 2,200          | DC   | EB   | FB   |      |      |      |      |
| 2,700          | DC   | EB   | FB   |      |      |      |      |
| 3,300          | DC   | EB   | FB   |      |      |      |      |
| 3,900          | DC   | EB   | FB   |      |      |      |      |
| 4,700          | DC   | EB   | FB   |      |      |      |      |
| 5,600          | DC   | EB   | FB   |      |      |      |      |
| 6,800          | DC   | EB   | FB   | GB   |      |      |      |
| 8,200          | DC   | EB   | FB   | GB   |      |      |      |
| 10,000         | DC   | EB   | FB   | GB   |      |      |      |
| 12,000         | DC   | EB   | FB   | GB   |      |      |      |
| 15,000         | DC   | EB   | FB   | GB   |      |      |      |
| 18,000         | DC   | EB   | FB   | GB   |      |      |      |
| 22,000         | DC   | EB   | FB   | GB   |      |      |      |
| 27,000         |      | EB   | FB   | GB   |      |      |      |
| 33,000         |      | EB   | FB   | GB   |      |      |      |
| 39,000         |      | EB   | FB   | GB   |      |      |      |
| 47,000         |      | ED   | FC   | GB   |      |      |      |
| 56,000         |      | ED   | FC   | GB   |      |      |      |
| 68,000         |      | ED   | FC   | GB   |      |      |      |
| 82,000         |      | ED   | FF   | GB   |      |      |      |
| 100,000        |      | EM   | FG   | GB   |      |      |      |
| 120,000        |      |      |      | GB   |      |      |      |
| 150,000        |      |      |      | GE   |      |      |      |
| 180,000        |      |      |      | GG   |      |      |      |
| 220,000        |      |      |      | GG   |      |      |      |
| 270,000        |      |      |      | GG   |      |      |      |
| 330,000        |      |      |      | GG   |      |      |      |
| 390,000        |      |      |      | GG   |      |      |      |
| 470,000        |      |      |      | GJ   | HD   | JC   | KD   |
| 560,000        |      |      |      |      | HD   | JD   | KD   |
| 680,000        |      |      |      |      | HD   | JD   | KD   |
| 820,000        |      |      |      |      | HF   | JF   | KE   |
| 1,000,000      |      |      |      |      | HF   | JF   | KE   |
| 1,200,000      |      |      |      |      |      |      | KE   |

**Thickness Code (mm) & Reeling Quantities**

| Thickness Code | Series | Dimension   | 7" Reel Qty. | 13" Reel Qty. |
|----------------|--------|-------------|--------------|---------------|
| DC             | 0805   | 0.78 ± 0.10 | 4000         | 10000         |
| EB             | 1206   | 0.78 ± 0.10 | 4000         | 10000         |
| ED             | 1206   | 1.00 ± 0.10 | 2500         | 10000         |
| EM             | 1206   | 1.25 ± 0.15 | 2500         | 10000         |
| FB             | 1210   | 0.78 ± 0.10 | 4000         | 10000         |
| FC             | 1210   | 0.90 ± 0.10 | 4000         | 10000         |
| FF             | 1210   | 1.10 ± 0.10 | 2500         | 10000         |
| FG             | 1210   | 1.25 ± 0.10 | 2500         | 10000         |
| FH             | 1210   | 1.55 ± 0.15 | 2000         | 8000          |
| GB             | 1812   | 1.00 ± 0.10 | 1000         | 4000          |
| GE             | 1812   | 1.30 ± 0.15 | 1000         | 4000          |
| GF             | 1812   | 1.55 ± 0.10 | 1000         | 4000          |
| GG             | 1812   | 1.50 ± 0.15 | 1000         | 4000          |
| GJ             | 1812   | 1.70 ± 0.15 | 1000         | 4000          |
| HD             | 1825   | 1.30 ± 0.15 | 1000         | 4000          |
| HF             | 1825   | 1.50 ± 0.15 | 1000         | 4000          |
| JC             | 2220   | 1.10 ± 0.15 | 1000         | 4000          |
| JD             | 2220   | 1.30 ± 0.15 | 1000         | 4000          |
| JF             | 2220   | 1.50 ± 0.15 | 1000         | 4000          |
| KD             | 2225   | 1.30 ± 0.15 | 1000         | 4000          |
| KE             | 2225   | 1.40 ± 0.15 | 1000         | 4000          |