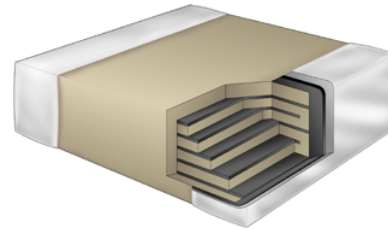


# CBR Series, C0G Dielectric, Ultra High Q, Low ESR, 6.3VDC-250VDC (RF & Microwave) Preliminary

## Overview

KEMET's CBR series surface mount multilayer ceramic capacitors (MLCCs) in C0G dielectric feature a robust and exceptionally stable base metal electrode dielectric system that provides excellent low loss performance (High Q). These devices offer extremely low ESR and high self-resonance characteristics, and are well suited for resonant circuit applications or those where Q and stability of capacitance characteristics are required. CRF series capacitors exhibits no change in capacitance with respect to time and voltage and boasts a negligible change in capacitance with reference to ambient temperature. Capacitance change is limited to  $\pm 30\text{ppm}/^\circ\text{C}$  from  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ .

CBR series devices are suitable for many circuit applications including RF power amplifiers, mixers, oscillators, low noise amplifiers, filter networks, antenna tuning, timing circuits, delay lines and MRI imaging coils.



## Benefits

- $-55^\circ\text{C}$  to  $+125^\circ\text{C}$  operating temperature range
- Ultra High Q
- Base metal electrode (BME) dielectric system
- Pb-Free and RoHS compliant
- 0201, 0402, 0603 and 0805 case sizes (inches)
- DC voltage ratings of 6.3V, 10V, 25V, 50V, 100V and 250V
- Capacitance offerings ranging from 0.1pF up to 100pF
- Available capacitance tolerances of  $\pm 0.05\text{pF}$ ,  $\pm 0.1\text{pF}$ ,  $\pm 0.25\text{pF}$ ,  $\pm 0.5\text{pF}$ ,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$  and  $\pm 10\%$
- No piezoelectric noise
- Low ESR
- High thermal stability
- No capacitance change with respect to applied rated DC voltage
- Negligible capacitance change with respect to temperature
- No capacitance decay with time

- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated termination finish allowing for excellent solderability

## Applications

Typical applications include critical timing, tuning, bypass, coupling, feedback, filtering, impedance matching and DC blocking.

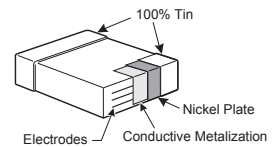
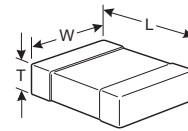
Field applications include wireless and cellular base stations, wireless LAN, subscriber based wireless services, wireless broadcast equipment, satellite communications, RF PA modules, filters, VCOs, PAs, matching networks, RF modules, satellite communications and medical electronics.

## Ordering Information

| CBR    | 02   | C                     | 330   | F   | 9   | G          | A                 | C                  | TU                       |
|--------|--|-----------------------|---|---|---|------------|-------------------|--------------------|--------------------------|
| Series | Case Size (L"x W")                               | Specification/ Series | Capacitance Code (pF)   | Capacitance Tolerance   | Voltage   | Dielectric | Termination Style | Termination Finish | Packaging/Grade (C-Spec) |
| CBR    | 02 = 0201<br>04 = 0402<br>06 = 0603<br>08 = 0805 | C = Standard          | 2 Sig. Digits + Number of Zeros<br>Use 9 for 1.0 - 9.9pF<br>Use 8 for 0.5 - .99pF<br>ex. 2.2pF = 229<br>ex. 0.5pF = 508 | A = $\pm 0.05\text{pF}$<br>B = $\pm 0.1\text{pF}$<br>C = $\pm 0.25\text{pF}$<br>D = $\pm 0.5\text{pF}$<br>F = $\pm 1\%$<br>G = $\pm 2\%$<br>J = $\pm 5\%$ | 9 = 6.3V<br>8 = 10V<br>3 = 25V<br>5 = 50V<br>1 = 100V<br>A = 250V | G = C0G    | A = N/A           | C = 100% Matte Sn  | TU = 7" Reel Unmarked    |

One WORLD One Brand One Strategy One Focus One Team One KEMET

## Dimensions – Millimeters (Inches)



| Case Size (in.) | Case Size (mm) | L Length                  | W Width                   | T Thickness               | B Bandwidth                              | Mounting Technique           |
|-----------------|----------------|---------------------------|---------------------------|---------------------------|--|------------------------------|
| 0201            | 0603           | 0.60 (.024) ± 0.03 (.001) | 0.30 (.012) ± 0.03 (.001) | 0.30 (.012) ± 0.03 (.001) | 0.15 (.006) ± 0.05 (.002)                | Solder Reflow Only           |
| 0402            | 1005           | 1.00 (.040) ± 0.05 (.002) | 0.50 (.020) ± 0.05 (.002) | 0.50 (.020) ± 0.05 (.002) | 0.25 (.010) + 0.05 (.002) / -0.10 (.004) |                              |
| 0603            | 1608           | 1.60 (.063) ± 0.10 (.004) | 0.80 (.031) ± 0.10 (.004) | 0.80 (.031) ± 0.07 (.003) | 0.40 (.016) ± 0.15 (.006)                | Solder Wave or Solder Reflow |
| 0805            | 2012           | 2.00 (.079) ± 0.20 (.008) | 1.25 (.049) ± 0.20 (.008) | 0.85 (.031) ± 0.10 (.004) | 0.50 (.020) ± 0.20 (.008)                |                              |

## Electrical Parameters/Characteristics

| Item  | Parameters/Characteristics  |
|---|---|
| Operating Temperature Range:  | -55°C to +125°C   |
| Capacitance Change with Reference to +25°C and 0 Vdc Applied (TCC): | 0 ± 30PPM/°C  |
| Aging Rate (Max % Cap Loss/Decade Hour):                            | 0%  |
| Dielectric Withstanding Voltage (DWV):                              | See Dielectric Withstanding Voltage Table (5 ± 1 seconds and charge/discharge not exceeding 50mA) |
| Quality Factor (Q):   | ≥ 1000 for capacitance values ≥ 30pF<br>≥ 400 + 20C for capacitance values < 30pF                 |
| Insulation Resistance (IR) Limit @ 25°C:                            | 10 <sup>5</sup> Megohms minimum (Rated voltage applied for 120 ± 5 secs)                          |
| Insulation Resistance (IR) Limit @ 125°C:                           | 10 <sup>4</sup> Megohms minimum (Rated voltage applied for 120 ± 5 secs)                          |

Capacitance and Quality Factor (Q) measured under the following conditions:

1MHz ± 100kHz and 1.0 ± 0.2 Vrms if capacitance ≤ 1000pF

1kHz ± 50Hz and 1.0 ± 0.2 Vrms if capacitance > 1000pF

Note: When measuring capacitance it is important to ensure the set voltage level is held constant. The HP4284 & Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

| Dielectric Withstanding Voltage (DWV) |       |      |
|---------------------------------------|-------|------|
| DWV                                   | 250%  | 200% |
| Rated Voltage (VDC)                   | ≤100V | 250V |

## Environmental Compliance

Pb-Free and RoHS compliant

**Table 1 – CBR Series (0201 - 0805 Case Sizes)**

| Case Size (in.)     |          | 0201   |    |         | 0402    |     | 0603    |         |     | 0805    |         |     |
|---------------------|----------|--|----|---------|---------|-----|---------|---------|-----|---------|---------|-----|
| Voltage Code        |          | 9  | 8  | 3       | 5       | 1   | 5       | 1       | A   | 5       | 1       | A   |
| Rated Voltage (VDC) |          | 6.3  | 10 | 25      | 50      | 100 | 50      | 100     | 250 | 50      | 100     | 250 |
| Cap                 | Cap Code | Capacitance & Capacitance Tolerance Availability |    |         |         |     |         |         |     |         |         |     |
| 0.1 pF              | 108      | A, B, C  |    |         | A, B, C |     |         | A, B, C |     |         | A, B, C |     |
| 0.2 pF              | 208      |  |    |         |         |     |         |         |     |         |         |     |
| 0.3 pF              | 308      |  |    |         |         |     |         |         |     |         |         |     |
| 0.4 pF              | 408      |  |    |         |         |     |         |         |     |         |         |     |
| 0.5 pF              | 508      |  |    |         |         |     |         |         |     |         |         |     |
| 0.6 pF              | 608      |  |    |         |         |     |         |         |     |         |         |     |
| 0.7 pF              | 708      |  |    |         |         |     |         |         |     |         |         |     |
| 0.8 pF              | 808      |  |    |         |         |     |         |         |     |         |         |     |
| 0.9 pF              | 908      |  |    |         |         |     |         |         |     |         |         |     |
| 1.0 pF              | 109      |  |    |         |         |     |         |         |     |         |         |     |
| 1.8 pF              | 189      |  |    |         |         |     |         |         |     |         |         |     |
| 2.2 pF              | 229      |  |    |         |         |     |         |         |     |         |         |     |
| 2.4 pF              | 249      |  |    |         |         |     |         |         |     |         |         |     |
| 2.7 pF              | 279      |  |    |         |         |     |         |         |     |         |         |     |
| 3.0 pF              | 309      |  |    |         |         |     |         |         |     |         |         |     |
| 3.3 pF              | 339      |  |    |         |         |     |         |         |     |         |         |     |
| 3.6 pF              | 369      |  |    |         |         |     |         |         |     |         |         |     |
| 3.9 pF              | 399      |  |    |         |         |     |         |         |     |         |         |     |
| 4.3 pF              | 439      |  |    |         |         |     |         |         |     |         |         |     |
| 4.7 pF              | 479      |  |    |         |         |     |         |         |     |         |         |     |
| 5.1 pF              | 519      | B, C, D  |    |         | B, C, D |     |         | B, C, D |     |         | B, C, D |     |
| 5.6 pF              | 569      |  |    |         |         |     |         |         |     |         |         |     |
| 6.2 pF              | 629      |  |    |         |         |     |         |         |     |         |         |     |
| 6.8 pF              | 689      |  |    |         |         |     |         |         |     |         |         |     |
| 7.5 pF              | 759      |  |    |         |         |     |         |         |     |         |         |     |
| 8.2 pF              | 829      |  |    |         |         |     |         |         |     |         |         |     |
| 9.1 pF              | 919      |  |    |         |         |     |         |         |     |         |         |     |
| 10 pF               | 100      |  |    |         |         |     |         |         |     |         |         |     |
| 11 pF               | 110      | F, G, J  |    | F, G, J |         |     | F, G, J |         |     | F, G, J |         |     |
| 12 pF               | 120      |  |    |         |         |     |         |         |     |         |         |     |
| 13 pF               | 130      |  |    |         |         |     |         |         |     |         |         |     |
| 15 pF               | 150      |  |    |         |         |     |         |         |     |         |         |     |
| 16 pF               | 160      |  |    |         |         |     |         |         |     |         |         |     |
| 18 pF               | 180      |  |    |         |         |     |         |         |     |         |         |     |
| 20 pF               | 200      |  |    |         |         |     |         |         |     |         |         |     |
| 22 pF               | 220      |  |    |         |         |     |         |         |     |         |         |     |
| 24 pF               | 240      |  |    |         |         |     |         |         |     |         |         |     |
| 27 pF               | 270      |  |    |         |         |     |         |         |     |         |         |     |
| 30 pF               | 300      |  |    |         |         |     |         |         |     |         |         |     |
| 33 pF               | 330      |  |    |         |         |     |         |         |     |         |         |     |
| 36 pF               | 360      |  |    |         |         |     |         |         |     |         |         |     |
| 39 pF               | 390      |  |    |         |         |     |         |         |     |         |         |     |
| 43 pF               | 430      |  |    |         |         |     |         |         |     |         |         |     |
| 47 pF               | 470      |  |    |         |         |     |         |         |     |         |         |     |
| 56 pF               | 560      |  |    |         |         |     |         |         |     |         |         |     |
| 68 pF               | 680      |  |    |         |         |     |         |         |     |         |         |     |
| 82 pF               | 820      |  |    |         |         |     |         |         |     |         |         |     |
| 100 pF              | 101      |  |    |         |         |     |         |         |     |         |         |     |
| Cap                 | Cap Code | 6.3  | 10 | 25      | 50      | 100 | 50      | 100     | 250 | 50      | 100     | 250 |
| Cap                 | Cap Code | 9  | 8  | 3       | 5       | 1   | 5       | 1       | A   | 5       | 1       | A   |
|                     |          | 0201   |    |         | 0402    |     | 0603    |         |     | 0805    |         |     |

## Soldering Process

Recommended Soldering Technique:

- Solder wave or solder reflow for 0603 & 0805 case sizes
- 0201 & 0402 case sizes are limited to solder reflow only

Recommended Soldering Profile:

- KEMET recommends following the guidelines outlined in IPC/JEDEC J-STD-020

Recommended Solder Alloys: Pb-Free

| Alloy   | Composition              | Solidus | Liquidous |
|---------|--------------------------|---------|-----------|
| In50    | 50 In, 50 Pb             | 180 °C  | 209 °C    |
| In52    | 52 In, 48 Sn             | 118 °C  | 118 °C    |
| Sn62    | 62.5 Sn, 36.1 Pb, 1.4 Ag | 179 °C  | 179 °C    |
| Sn63    | 63 Sn, 37 Pb             | 183 °C  | 183 °C    |
| Pb-Free | 95.5 Sn, 3.8 Ag, 0.7 Cu  | 217 °C  | 217 °C    |
| Hi-Temp | 5 Sn, 93.5 Pb, 1.5 Ag    | 296 °C  | 301 °C    |
| Sn5     | 5 Sn, 95 Pb              | 308 °C  | 312 °C    |

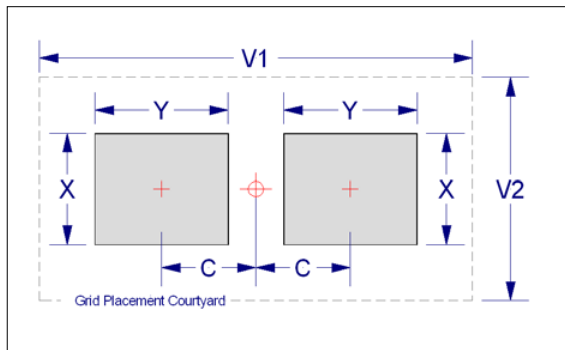
**Table 2 – Chip Capacitor Land Pattern Design Recommendations per IPC-7351 (mm)**

| Case Size (in.) | Case Size (mm) | Density Level A: Maximum (Most) Land Protrusion |      |      |      |      | Density Level B: Median (Nominal) Land Protrusion |      |      |      |      | Density Level C: Minimum (Least) Land Protrusion |      |      |      |      |
|-----------------|----------------|---|------|------|------|------|---|------|------|------|------|--|------|------|------|------|
|                 |                | C   | Y    | X    | V1   | V2   | C   | Y    | X    | V1   | V2   | C  | Y    | X    | V1   | V2   |
| 0201            | 0603           | 0.38  | 0.56 | 0.52 | 1.80 | 1.00 | 0.33  | 0.46 | 0.42 | 1.50 | 0.80 | 0.28   | 0.36 | 0.32 | 1.20 | 0.60 |
| 0402            | 1005           | 0.50  | 0.72 | 0.72 | 2.20 | 1.20 | 0.45  | 0.62 | 0.62 | 1.90 | 1.00 | 0.40   | 0.52 | 0.52 | 1.60 | 0.80 |
| 0603            | 1608           | 0.90  | 1.15 | 1.10 | 4.00 | 2.10 | 0.80  | 0.95 | 1.00 | 3.10 | 1.50 | 0.60   | 0.75 | 0.90 | 2.40 | 1.20 |
| 0805            | 2012           | 1.00  | 1.35 | 1.55 | 4.40 | 2.60 | 0.90  | 1.15 | 1.45 | 3.50 | 2.00 | 0.75   | 0.95 | 1.35 | 2.80 | 1.70 |

**Density Level A:** For low-density product applications. Recommended for wave solder applications and provides a wider process window for reflow solder processes. KEMET only recommends wave soldering of 0603(1608) and 0805(2012) case sizes.

**Density Level B:** For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.

**Density Level C:** For high component density product applications. Before adapting the minimum land pattern variations the user should perform qualification testing based on the conditions outlined in IPC standard 7351 (IPC-7351).



## Storage and Handling

Ceramic chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature – reels may soften or warp, and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40 degrees C, and maximum storage humidity not exceed 70% relative humidity. In addition, temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulfur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within 1.5 years of receipt.

## Other KEMET Resources

| Tools                          |   |
|--------------------------------|---|
| Resource                       | Location  |
| Configure A Part: CapEdge      | <a href="http://capacitoredge.kemet.com">http://capacitoredge.kemet.com</a> |
| SPICE & FIT Software           | <a href="http://www.kemet.com/spice">http://www.kemet.com/spice</a>         |
| Search Our FAQs: KnowledgeEdge | <a href="http://www.kemet.com/keask">http://www.kemet.com/keask</a>         |

| Product Information                                  |   |
|--|---|
| Resource   | Location  |
| Products   | <a href="http://www.kemet.com/products">http://www.kemet.com/products</a>                 |
| Technical Resources (Including Soldering Techniques) | <a href="http://www.kemet.com/technicalpapers">http://www.kemet.com/technicalpapers</a>   |
| RoHS Statement                                       | <a href="http://www.kemet.com/rohs">http://www.kemet.com/rohs</a>                         |
| Quality Documents                                    | <a href="http://www.kemet.com/qualitydocuments">http://www.kemet.com/qualitydocuments</a> |

| Product Request         |   |
|-------------------------|---|
| Resource                | Location  |
| Sample Request          | <a href="http://www.kemet.com/sample">http://www.kemet.com/sample</a> |
| Engineering Kit Request | <a href="http://www.kemet.com/kits">http://www.kemet.com/kits</a>     |

| Contact            |   |
|--------------------|---|
| Resource           | Location  |
| Website            | <a href="http://www.kemet.com">www.kemet.com</a>                                    |
| Contact Us         | <a href="http://www.kemet.com/contact">http://www.kemet.com/contact</a>             |
| Investor Relations | <a href="http://www.kemet.com/ir">http://www.kemet.com/ir</a>                       |
| Call Us            | 1-877-MyKEMET   |
| Twitter            | <a href="http://twitter.com/kemetcapacitors">http://twitter.com/kemetcapacitors</a> |

## Disclaimer

All product specifications, statements, information and data (collectively, the "Information") are subject to change without notice.

All Information given herein is believed to be accurate and reliable, but is presented without guarantee, warranty, or responsibility of any kind, expressed or implied.

Statements of suitability for certain applications are based on our knowledge of typical operating conditions for such applications, but are not intended to constitute – and we specifically disclaim – any warranty concerning suitability for a specific customer application or use. This Information is intended for use only by customers who have the requisite experience and capability to determine the correct products for their application. Any technical advice inferred from this Information or otherwise provided by us with reference to the use of our products is given gratis, and we assume no obligation or liability for the advice given or results obtained.

Although we design and manufacture our products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

## KEMET Corporation World Headquarters

2835 KEMET Way  
Simpsonville, SC 29681

Mailing Address:  
P.O. Box 5928  
Greenville, SC 29606

www.kemet.com  
Tel: 864-963-6300  
Fax: 864-963-6521

### Corporate Offices

Fort Lauderdale, FL  
Tel: 954-766-2800

## North America

### Southeast

Lake Mary, FL  
Tel: 407-855-8886

### Northeast

Wilmington, MA  
Tel: 978-658-1663

West Chester, PA  
Tel: 610-692-4642

### Central

Schaumburg, IL  
Tel: 847-882-3590

Carmel, IN  
Tel: 317-706-6742

### West

Milpitas, CA  
Tel: 408-433-9950

### Mexico

Zapopan, Jalisco  
Tel: 52-33-3123-2141

## Europe

### Southern Europe

Geneva, Switzerland  
Tel: 41-22-715-0100

Paris, France  
Tel: 33-1-4646-1009

Sasso Marconi, Italy  
Tel: 39-051-939111

Milan, Italy  
Tel: 39-02-57518176

Rome, Italy  
Tel: 39-06-23231718

Madrid, Spain  
Tel: 34-91-804-4303

### Central Europe

Landsberg, Germany  
Tel: 49-8191-3350800

Dortmund, Germany  
Tel: 49-2307-3619672

Kwidzyn, Poland  
Tel: 48-55-279-7025

### Northern Europe

Bishop's Stortford, United Kingdom  
Tel: 44-1279-757201

Weymouth, United Kingdom  
Tel: 44-1305-830747

Coatbridge, Scotland  
Tel: 44-1236-434455

Färjestaden, Sweden  
Tel: 46-485-563934

Espoo, Finland  
Tel: 358-9-5406-5000

## Asia

### Northeast Asia

Hong Kong  
Tel: 852-2305-1168

Shenzhen, China  
Tel: 86-755-2518-1306

Beijing, China  
Tel: 86-10-5829-1711

Shanghai, China  
Tel: 86-21-6447-0707

Taipei, Taiwan  
Tel: 886-2-27528585

### Southeast Asia

Singapore  
Tel: 65-6586-1900

Penang, Malaysia  
Tel: 60-4-6430200

Bangalore, India  
Tel: 91-806-53-76817

*Note: KEMET reserves the right to modify minor details of internal and external construction at any time in the interest of product improvement. KEMET does not assume any responsibility for infringement that might result from the use of KEMET Capacitors in potential circuit designs. KEMET is a registered trademark of KEMET Electronics Corporation.*