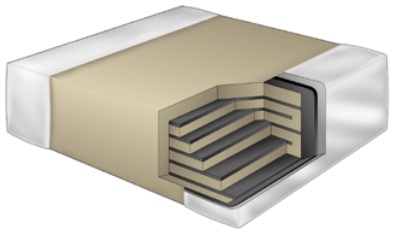
Surface Mount Multilayer Ceramic Capacitors (SMD MLCCs) for High Power Application

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 ±30ppm/ºC from -55°C to +125°C.

CBR series devices are 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°C to +125°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 ±0.05pF, ±0.1pF, ±0.25pF, ±0.5pF, ±1%, ±2%, ±5% and ±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 04= 0402 06 = 0603 08 = 0805	C = Standard	2 Sig. Digits + Number of Zeros Use 9 for 1.0 - 9.9pF Use 8 for 0.5 - .99pF ex. 2.2pF = 229 ex. 0.5pF = 508	A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5%	9 = 6.3V 8 = 10V 3 = 25V 5 = 50V 1 = 100V A = 250V	G = C0G	A = N/A	C = 100% Matte Sn	TU = 7" Reel Unmarked

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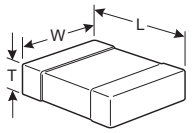
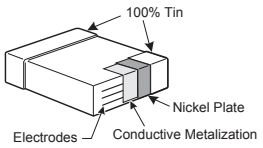
Dimensions – Millimeters (Inches)





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 ≥ 400 + 20C for capacitance values < 30pF
Insulation Resistance (IR) Limit @ 25°C:	10^5 Megohms minimum (Rated voltage applied for 120 ± 5 secs)
Insulation Resistance (IR) Limit @ 125°C:	10^4 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

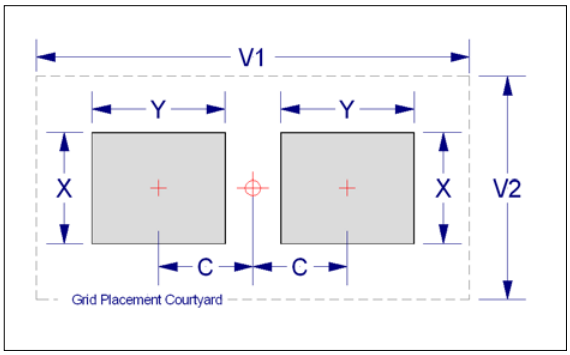
Table 1 – CBR Series (0201 - 0805 Case Sizes)

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							
0.2 pF	208											
0.3 pF	308						A, B, C			A, B, C		
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			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
		9	8	3	5	1	5	1	A	5	1	A
		0201			0402		0603			0805		

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	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

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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.

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Coatbridge, Scotland
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