

## **Product Bulletin**

## Surface Mount Ceramic Chip Capacitors High Temperature 200°C C0G MLCC



#### **Benefits and Features:**

No piezoelectric properties.
Extremely low ESR and ESL.
High thermal stability.
High ripple current capability.
Preferred capacitance solution at line frequencies and into the MHz range.
No capacitance change with respect to applied rated DC voltage.
No capacitance change with respect to temperature from -55 to +200°C.
No capacitance decay with time.

## **Applications:**

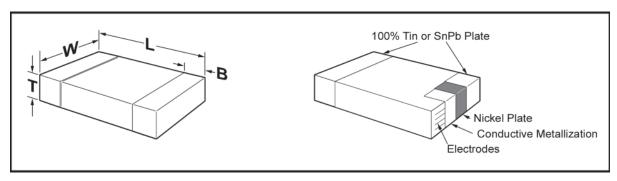
Typical applications include timing, tuning, decoupling, by-pass, filtering, transient voltage suppression, blocking and energy storage for use in extreme environments coupled with down-hole exploration, aerospace engine compartments and geophysical probes.

KEMET's High Temperature Surface Mount C0G MLCC's features a robust and proprietary base metal dielectric system that offers Ultra-High Capacitance and unsurpassed performance in extreme temperatures up to +200°C. This new platform promotes downsizing opportunities of existing High Temperature C0G technology, and allows replacement of virtually all existing X7R/BX/BR technology.

Non - polar device.

Standard capacitance ratings for these devices range from 0.5pF up to  $0.22\mu F$  in capacitance tolerance offerings of  $\pm 0.25pF$ ,  $\pm 0.5pF$ ,  $\pm 1\%$ ,  $\pm 2\%$ ,  $\pm 5\%$ ,  $\pm 10\%$ , or  $\pm 20\%$ . Temperature Coefficient of Capacitance (TCC) is  $\pm 30ppm/^{\circ}C$  from  $-55^{\circ}C$  to  $+200^{\circ}$ . Devices are available in DC voltage ratings of 10V, 16V, 25V, 50V and 100V, with a dissipation factor of 0.10%. EIA standard case sizes options include 0603, 0805, 1206, 1210, and 1812 with either nickel barrier/tin or tin/lead terminations.

### **Outline Drawing**



#### **Dimensions - Millimeters (Inches)**

EIA SIZE CODE	METRIC SIZE CODE	L LENGTH	W WIDTH	B BANDWIDTH	S SEPARATION minimum
0603	1608	1.6 (.063) ± .15 (.006)	0.8 (.032) ± .15 (.006)	0.35 (.014) ± .15 (.006)	0.7 (.028)
0805	2012	2.0 (.079) ± .20 (.008)	1.25 (.049) ± .20 (.008)	0.50 (.020) ± .25 (.010)	0.75 (.030)
1206	3216	3.2 (.126) ± .20 (.008)	1.6 (.063) ± .20 (.008)	0.50 (.020) ± .25 (.010)	N/A
1210	3225	3.2 (.126) ± .20 (.008)	2.5 (.098) ± .20 (.008)	0.50 (.020) ± .25 (.010)	N/A
1812	4532	4.5 (.177) ± .30 (.012)	3.2 (.126) ± .30 (.012)	0.60 (.024) ± .35 (.014)	N/A



### **Ordering Information**

С	1210	Н	124	J	5	G	Α	С	TU
Ceramic	Case Size (L"x W")	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance	Voltage	Dielectric	Failure Rate/ Design	End Metallization (Plated)	Packaging/Grade (C-Spec)*
	0603	H = High Temp (200°C)	2 Sig. Digits +	B = ±0.10pF	8 = 10V	G = C0G	A = N/A	C = 100% Matte Sn	Blank = Commercial
	0805		Number of	C = ±0.25pF	4 = 16V		-	L = SnPb (5% min)	Grade Bulk
	1206		Zeros*	D = ±0.5pF	3 = 25V				TU = 7" Reel Unmarked
	1210		*Use 9 for 1.0 - 9.9pF	F = ±1%	6 = 35V				TM = 7" Reel Marked
	1812		*Use 8 for 0.599pF	G = ±2%	5 = 50V				
			ex. 2.2pF = 229	J = ±5%	1 = 100V				
			ex. 0.5pF = 508	K = ±10%	2 = 200V				
				M = ±20%					

<sup>\*</sup>Please contact KEMET for ordering details if you require larger reel sizes or other packaging options.

#### **Electrical Parameters/Characteristics**

Operating Temperature Range: -55°C to +200°C

Temperature Coefficient of Capacitance (TCC) up to 200°C: ±30PPM/°C

Aging Rate (Max % Cap Loss/Decade Hour): 0%

**Dielectric Withstanding Voltage: 250%** 

**Dissipation Factor (DF) @ 25°C:** .001 (0.10%) Max

Insulation Resistance (IR) Limit @ 25°C: 1000 megohm microfarads or 100GΩ Insulation Resistance (IR) Limit @ 200°C: 10 megohm microfarads or 1GΩ

Capacitance and Dissipation Factor (DF) measured under the 1kHz and 1 Vrms if capacitance >1000pF

following conditions: 1MHz and 1 Vrms if capacitance ≤1000pF

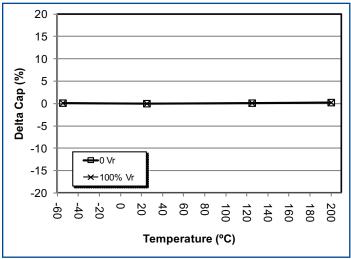
#### **Qualification/Certification**

RoHS-PRC (6/6) - 100% matte Sn termination

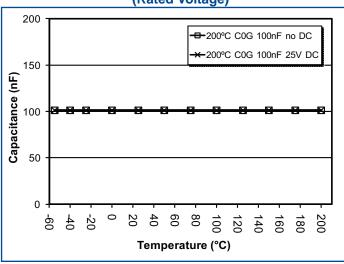
	Product Qualification Test Plan						
RELIABILITY/ ENVIRONMENTAL TESTS per MIL-STD-202/JESD22							
High Temperature Life 200°C, Rated Voltage, 2000 Hours							
Load Humidity 85°C /85%RH, Rated Voltage, 1000 Hours							
Low Voltage Humidity	85°C /85%RH, 1.5V, 1000 Hours						
Temperature Cycling	-55°C to +200°C, 50 Cycles						
Thermal Shock	-55°C to +150°C, 20s transfer, 15 min dwell, 300 Cycles						
Moisture Resistance	Cycled Temp / RH. 0V, 10 cycles @ 24 Hrs each						
PHYSICAL, M	ECHANICAL & PROCESS TESTS per MIL-STD 202/JIS-C-6429						
Resistance to Solvents	Include Aqueous wash chemical - OKEM Clean or equivalent						
Mechanical Shock and Vibration	Method 213: Figure 1, Condition F Method 204: 5 gs for 20 min,12 cycles						
Restistance to Soldering Heat	Condition B, no pre-heat of samples, Single Wave Solder						
Terminal Strength	Force of 1.8 kg for 60 seconds						
Board Flex	2mm minimum for all except 3 mm min for Class I						

#### **Electrical Characteristics**

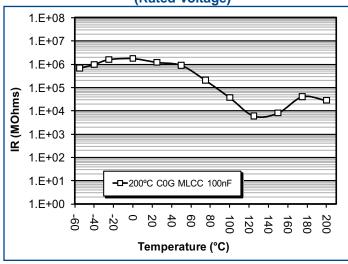
#### **Delta Cap vs. Temperature (Typical)**



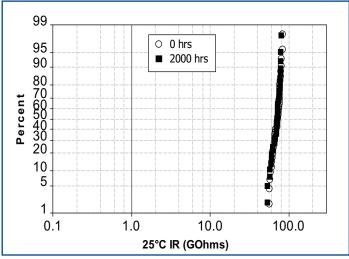
Capacitance vs. Temperature with 25V DC bias (Rated Voltage)



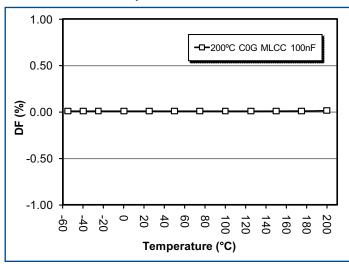
IR vs. Temperature with 25V DC bias (Rated Voltage)



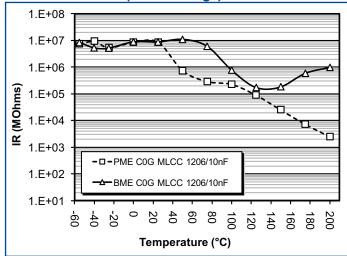
C1210H104J1GAC - Life Test IR Distribution (Lognormal)



DF vs. Temperature without DC bias.



BME vs. PME/IR vs. Temperature with 25V DC bias (Rated Voltage)





## High Temperature 200°C (0603 - 1812 Case Sizes) COG DIELECTRIC

		Series		Ten	CO	603					CO	805					C1:	206					<b>C</b> 1:	210			C18	312
Сар	Сар	Voltage	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	50V	100V
pF	Code	Voltage Code	8	4	3	5	1	2	8	4	3	5	1	2	8	4	3	5	1	2	8	4	3	5	1	2	5	1
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6,200 6,800 7,500	622 682 752	F G J K M F G J K M F G J K M	CB CB CB CB	CB CB CB CB	CB CB CB CB	CB CB			DC DC DC DC	DC DC DC DC	DC DC DC DC	DC DC DC DC	DC DC DC DC		EB EB	EB EB EB	EB EB EC	EB EB EC	EB EB EB		FB FB FC FC	FB FB FC FC	FB FB	FB FB FC FC	FG FG FC FC	10		
8,200 9,100 10,000 12,000	822 912 103 123	F G J K M F G J K M F G J K M F G J K M	CB CB CB	CB CB CB	CB CB CB				DC DC DC	DC DC DC	DC DC DC	DC DC DC	DC DC DD DE		EC ED EB	EC EC ED EB	EC ED EB EB	EC ED EB	EB EB EB EB		FE FF FG	FE FF FG	FC FC FE FF FG	FC FE FF FG	FC FE FF FB			
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		Voltage Code	8	4	3	5	1	2	8	4	3	5	1	2	8	4	3	5	1	2	8	4	3	5	1	2	5	1
Cap pF	Cap Code	Voltage	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	50V	100V
		Series			C0	603					CO	805					C1:	206					C1:	210			C18	312

## **Chip Thickness / Packaging Quantities**

# Thickness Code Reference Chart Packaging Quantity Based on Finished Chip Thickness Specifications

Thickness Code	Chip Size	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 Bu Cassette
AA	01005	0.20 ± 0.02			15000	'	
AB	0201	0.30 ± 0.03		-	15000	-	
BB	0402	0.50 ± 0.05			10000	50000	50000
СВ	0603	0.80 ± 0.07	-		4000	10000	15000
CC	0603	0.80 ± 0.10			4000	10000	
CD	0603	0.80 ± 0.15			4000	10000	
DB	0805	0.60 ± 0.10			4000	10000	10000
DC	0805	0.78 ± 0.10			4000	10000	
DD	0805	0.90 ± 0.10			4000	10000	
DE	0805	1.00 ± 0.10	2500	10000			
DF	0805	1.10 ± 0.10	2500	10000			
DG	0805	1.25 ± 0.15	2500	10000			
DH	0805	1.25 ± 0.20	2500	10000			
DL	0805	0.95 ± 0.10	4000	10000		40000	
EB EC	1206 1206	0.78 ± 0.10 0.90 ± 0.10	4000 4000	10000 10000	4000	10000	
ED	1206	1.00 ± 0.10	2500	10000			
EE	1206	1.10 ± 0.10	2500	10000		 	
EF E	1206	1.20 ± 0.15	2500	10000		-	
EG	1206	1.60 ± 0.15	2000	8000			
EH	1206	1.60 ± 0.13	2000	8000			
EJ	1206	1.70 ± 0.20	2000	8000			
EK	1206	0.80 ± 0.10	2000	8000			
EM	1206	1.25 ± 0.15	2500	10000			
EN	1206	0.95 ± 0.10	4000	10000			
FB	1210	0.78 ± 0.10	4000	10000	-		
FC	1210	0.90 ± 0.10	4000	10000	-		
FD	1210	0.95 ± 0.10	4000	10000			
FE	1210	1.00 ± 0.10	2500	10000			
FF	1210	1.10 ± 0.10	2500	10000			
FG	1210	1.25 ± 0.15	2500	10000			
FH	1210	1.55 ± 0.15	2000	8000			
FJ	1210	1.85 ± 0.20	2000	8000			
FK	1210	2.10 ± 0.20	2000	8000			
FL	1210	1.40 ± 0.15	2000	8000			
FM	1210	1.70 ± 0.20	2000	8000	-		
FN	1210	1.85 ± 0.20	2000	8000			
FO	1210	1.50 ± 0.20	2000	8000		-	
FP	1210	1.60 ± 0.20	2000	8000		-	
FR	1210	2.25 ± 0.20	2000	8000			
FS	1210	2.50 ± 0.20	1000	4000			
FT	1210	1.90 ± 0.20	1500	4000			
GB	1812	1.00 ± 0.10	1000	4000			
GC	1812	1.10 ± 0.10	1000	4000			
GD	1812	1.25 ± 0.15	1000	4000			
GE	1812	1.30 ± 0.10	1000	4000			
GF	1812	1.50 ± 0.10	1000	4000			
GG	1812	1.55 ± 0.10	1000	4000			
GH	1812	1.40 ± 0.15	1000	4000		-	-
GJ	1812	1.70 ± 0.15	1000	4000			
GK	1812	1.60 ± 0.20	1000	4000			
GL	1812	1.90 ± 0.20	1000	4000			
GM GN	1812	2.00 ± 0.20	1000	4000			
GO	1812	1.70 ± 0.20	1000	4000			<del></del>
HB	1812 1825	2.50 ± 0.20 1.10 ± 0.15	500 1000	2000 4000			
HC	1825	1.10 ± 0.15	1000	4000			
HD HD	1825	1.30 ± 0.15	1000	4000			
HE	1825	1.40 ± 0.15	1000	4000			
HF	1825	1.50 ± 0.15	1000	4000			
HG	1825	1.60 ± 0.10	1000	4000			
JB	2220	1.00 ± 0.15	1000	4000	-		
JC	2220	1.10 ± 0.15	1000	4000			
JD	2220	1.30 ± 0.15	1000	4000			
JE	2220	1.40 ± 0.15	1000	4000			
JF	2220	1.50 ± 0.15	1000	4000			
JG	2220	1.70 ± 0.15	1000	4000			
JH	2220	1.80 ± 0.15	1000	4000			
JO	2220	2.40 ± 0.15	500	2000			
JP	2220	1.60 ± 0.20	1000	4000			
KB	2225	1.00 ± 0.15	1000	4000			
KC	2225	1.10 ± 0.15	1000	4000			
KD	2225	1.30 ± 0.15	1000	4000			
KE	2225	1.40 ± 0.15	1000	4000			
	2225	1.60 ± 0.20	1000	4000			
KF	1808	1.40 ± 0.15	1000	4000			
LA							
LA LB	1808	1.60 ± 0.15	1000	4000			
LA			1000 1000 2500	4000 4000 10000			



## **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.

HMP solders ,e.g., Pb94, are recommended for high temperature applications.

#### **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.