KEMET

CHARGED.™

Ceramic Chip Capacitors / Array
SAMPLE KIT

Product-ID: CC-E12

INTRODUCTION

Ceramic chips consist of formulated ceramic dielectric materials which have been fabricated into thin layers, interspersed with metal electrodes alternately exposed on opposite edges of the laminated structure. The entire structure is then fired at high temperature to produce a monolithic block which provides high capacitance values in a small physical volume. After firing, conductive terminations are applied to opposite ends of the chip to make contact with the exposed electrodes. Standard end terminations use a nickel barrier layer and a tin overplate to provide excellent solderability for the customer.

KEMET multilayer ceramic chip capacitors are produced in plants designed specifically for chip capacitor manufacture. The process features a high degree of mechanization as well as precise controls over raw materials and process conditions. Manufacturing is supplemented by extensive Technology, Engineering and Quality Assurance programs.

KEMET ceramic chip capacitors are offered in the five most popular temperature characteristics. These are designated by the Electronics Industies Association (EIA) as the ultra-stable C0G (also known as NP0, military version BP), the stable X7R (military BX or BR), the stable X5R, and the general purpose Z5U and Y5V. A wide range of sizes are available. KEMET multilayer ceramic chip capacitors are available in KEMET's tape and reel packaging, compatible with automatic placement equipment. Bulk cassette packaging is also available (0805,0603 and 0402 only) for those pick and place machines requiring its use.

ELECTRICAL CHARACTERISTICS

1. Working Voltage:

Refers to the maximum continuous DC working voltage permissible across the entire operating temperature range. The reliability of multilayer ceramic capacitors is not extremely sensitive to voltage, and brief applications of voltage above rated will not result in immediate failure. However, reliability will be degraded by sustained exposure to voltages above rated.

2. Temperature Characteristics:

Within the EIA classifications, various temperature characteristics are identified by a three-symbol code; for example: C0G, X7R, X5R, Z5U and Y5V.

For Class I temperature compensating dielectrics (includes C0G), the first symbol designates the significant figures of the temperature coefficient in PPM per degree Celsius, the second designates the multiplier to be applied, and the third designates the tolerance in PPM per degrees Celsius. EIA temperature characteristic codes for Class I dielectrics are shown in Table 1.

Table 1 – EIA Temperature Characteristic Codes for Class I Dielectrics

Significant Figure of Temperature Coefficient		Multiplier Applied to Temperature Coefficient		Tolerance of Temperature Coefficient	
PPM per Degree C	Letter Symbol	Multi-plier	Number Symbol	PPM per Degree C	Letter Symbol
0.0	C	-1	0	± 30	G
0.3	B	-10	1	± 60	H
0.9	A	-100	2	± 120	J
1.0	M	-1000	3	± 250	K
1.5	P	-10000	4	± 500	L

KEMET supplies the C0G characteristic.

For Class II and III dielectrics (including X7R, X5R, Z5U & Y5V), the first symbol indicates the lower limit of the operating temperature range, the second indicates the upper limit of the operating temperature range, and the third indicates the maximum capacitance change allowed over the operating temperature range. EIA type designation codes for Class II and III dielectrics are shown in Table 2.

Table 2 – EIA Temperature Characteristic Codes for Class II & III Dielectrics

Low Temperature Rating		High Temperature Rating		Maximum Capacitance Shift		
Degree Celsius	Letter Symbol	Degree Celsius	Number Symbol	Percent	Letter Symbol	EIA Class
+10C	Z	+45C	2	± 1.0%	A	II
-30C	Y	+65C	4	± 1.5%	B	II
-55C	X	+85C	5	± 2.2%	C	II
		+105C	6	± 3.3%	D	II
		+125C	7	± 4.7%	E	II
		+150C	8	± 7.5%	F	II
		+200C	9	± 10.0%	P	II
				± 15.0%	R	II
				± 22.0%	S	III
				+ 22/-33%	T	III
				+22/-56%	U	III
				+22/-82%	V	III

KEMET supplies the X7R, X5R, Z5U and Y5V characteristics.

3. Capacitance Tolerance:

See tables on pages 73-76.

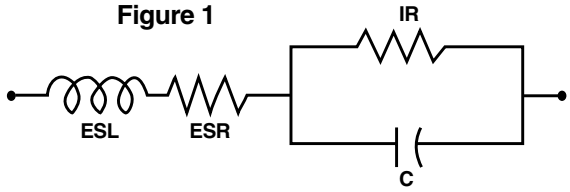
4. Capacitance:

Within specified tolerance when measured per Table 3.

The standard unit of capacitance is the farad. For practical capacitors, capacitance is usually expressed in microfarads (10^{-6} farad), nanofarads (10^{-9} farad), or picofarads (10^{-12} farad). Standard measurement conditions are listed in Table 3 - Specified Electrical Limits.

Like all other practical capacitors, multilayer ceramic capacitors also have resistance and inductance. A simplified schematic for the single frequency equivalent circuit is shown in Figure 1. At high frequency more complex models apply - see KEMET SPICE models at www.kemet.com for details.

Figure 1



C = Capacitance
ESR = Equivalent Series Resistance
ESL = Equivalent Series Inductance
IR = Insulation Resistance

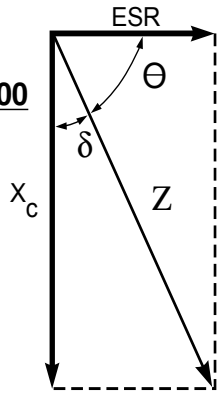
5. Dissipation Factor:
Measured under same conditions as capacitance. (See Table 3)

Dissipation factor (DF) is a measure of the losses in a capacitor under AC application. It is the ratio of the equivalent series resistance to the capacitive reactance, and is usually expressed in percent. It is normally measured simultaneously with capacitance, and under the same conditions. The vector diagram below illustrates the relationship between DF, ESR and impedance. The reciprocal of the dissipation factor is called the "Q" or quality factor. For convenience, the "Q" factor is often used for very low values of dissipation factor especially when measured at high frequencies. DF is sometimes called the "loss tangent" or "tangent δ", as shown in Figure 2.

Figure 2

$$DF(\%) = \frac{ESR \times 100}{X_C}$$

$$X_C = \frac{1}{2 \pi fC}$$



6. Impedance:

Since the parallel resistance (IR) is normally very high, the total impedance of the capacitor can be approximated by:

Figure 3

$$Z = \sqrt{ESR^2 + (X_L - X_C)^2}$$

Where: Z = Total Impedance

ESR = Equivalent Series Resistance

X_C = Capacitive Reactance = $1/(2 \pi fC)$

X_L = Inductive Reactance = $(2 \pi f)(ESL)$

The variation of a capacitor's impedance with frequency determines its effectiveness in many applications. At high frequency more detailed models apply - see KEMET SPICE models for such instances.

7. Insulation Resistance:
Measured after 2 minutes electrification at 25°C and rated voltage: Limits per Table 3.

Insulation Resistance is the measure of a capacitor to resist the flow of DC leakage current. It is sometimes referred to as "leakage resistance". Insulation resistance (IR) is the DC resistance measured across the terminals of a capacitor, represented by the parallel resistance (IR) shown in Figure 1. For a given dielectric type, electrode area increases with capacitance, resulting in a decrease in the insulation resistance. Consequently, insulation resistance limits are usually specified as the "RC" (IR x C) product, in terms of ohm-farads or megohm-micro-farads. The insulation resistance for a specific capacitance value is determined by dividing this product by the capacitance. However, as the nominal capacitance values become small, the insulation resistance calculated from the RC product reaches values which are impractical. Consequently, IR specifications usually include both a minimum RC product and a maximum limit based on the IR calculated

Table 3 – Specified Electrical Limits

Parameter	Temperature Characteristics			
	C0G	X7R/X5R	Z5U	Y5V
Capacitance & Dissipation Factor: Measured at following conditions: C0G – 1kHz and 1 vrms if capacitance >1000 pF 1MHz and 1 vrms if capacitance ≤1000 pF X7R/X5R/Y5V – 1kHz and 1 vrms* if capacitance ≤ 10 µF X7R/X5R/Y5V – 120Hz and 0.5 vrms if capacitance > 10 µF Z5U – 1kHz and 0.5 vrms				
DF Limits: **X5R <25V / Cap <564 / DF 5.0% — 50 - 200 volts – 25 volts – 16 volts – 6.3/10 volts –	0.10% 0.10% -------- --------	2.5% 2.5% 3.5% 5.0% 3.5% ** 5.0% **	4.0% 4.0% ------- 	5.0% 7.0% 7.0% 10.0%
**X5R <25V / Cap ≥564 / DF 10.0%				
Dielectric Strength: At 2.5 times rated DC voltage	Pass Subsequent IR Test			
Insulation Resistance (IR): At rated DC voltage, whichever of the two is smaller. To get IR limit, divide MΩ–µF value by the capacitance and compare to GΩ limit. Select the lower of the two limits.	1,000 MΩ – µF or 100 GΩ (100,000 MΩ)	1,000 MΩ – µF or 100 GΩ (100,000 MΩ)	100 MΩ – µF or 10 GΩ (10,000 MΩ)	100 MΩ – µF or 10 G (≥16 volt) 50 MΩ – µF or 10G (≤10v) (10,000 MΩ)
Temperature: Range, °C Capacitance Change (without DC voltage)	-55 to +125 0 ± 30 ppm/°C	X7R: -55 to +125 ±15% X5R: -55 to +85 ±15%	+10 to +85 +22% -56%	-30 to +85 +22% -82%

***Note: Some values measured at ½ volt, see X7R Table for specific details on pages 74 and 75.**

from that value. For example, a typical IR specification might read "1,000 megohm-microfarads or 100 gigohms, whichever is less". The DC leakage current may be calculated by dividing the applied voltage by the insulation resistance (Ohm's Law).

8. Dielectric Withstanding Voltage:
250% of rated voltage for 5 seconds with current limited to 50mA at 25°C. Limits per Table 3.

Dielectric withstanding voltage (DWV) is the peak DC voltage which a capacitor is designed to withstand without damage for short periods of time. All KEMET multilayer ceramic surface mount capacitors will withstand a DC test voltage of 2.5 x the rated voltage for 60 seconds.

KEMET specification limits for all electrical characteristics at standard measurement conditions are shown in Table 3. Variations in these properties caused by changing conditions (temperature, voltage, frequency, and time) are covered in the following sections.

9. Aging Rate:
Maximum % Capacitance Loss/Decade Hour
C0G - 0%
X7R - 2.0%
X5R - 5.0%
Z5U - 7.0%
Y5V - 7.0%
Actual rates may be lower. Consult factory for details.

The capacitance of Class II and III dielectric changes with time as well as with temperature, voltage and frequency. The change with time is known as "aging". It is caused by gradual realignment of the crystalline structure of the ceramic dielectric material as it is cooled below its Curie temperature, which produces a loss of capacitance with time. The aging process is predictable and follows a logarithmic decay.

The aging process is reversible. If the capacitor is heated to a temperature above its Curie point for some period of time, de-aging will occur and the capacitor will regain the capacitance lost during the aging process. The amount of de-aging depends on both the elevated temperature and the length of time at that temperature. Exposure to 150°C for one-half hour is sufficient to return the capacitor to its initial value.

Because the capacitance changes rapidly immediately after de-aging, capacitance measurements are indexed to a referee time of 1,000 hours. All Kemet capacitors are shipped to be within tolerance at the referee time of 1,000 hours after the deaging process (this time is often referred to as "last heat"). The selection of this referree time has proven practical, as the actual decline of capacitance after 1,000 hours is very low.

10. Effect of Temperature:

Both capacitance and dissipation factor are affected by variations in temperature. The maximum capacitance change with temperature is defined by the temperature characteristic.

However, this only defines an "envelope" bounded by the upper and lower operating temperatures and the minimum and maximum capacitance values. Within this "envelope", the variation with temperature depends upon the specific dielectric formulation.

Insulation resistance decreases with increasing temperature. Typically, the insulation resistance limit at maximum rated temperature is 10% of the 25°C value.

11. Effect of Voltage:

Certain high dielectric constant ceramic capacitors may show variation in values of capacitance and dissipation factor with various levels of applied AC and DC voltages. Such variation is a natural characteristic of ceramic capacitors, and should be considered by the circuit designer.

In general, ceramic capacitors with the lowest dielectric constant (C0G or NP0) are extremely stable, and show little or no variation in capacitance and/or dissipation factor. On the other hand, ceramic capacitors with the highest dielectric constant (Z5U & Y5V) may show significant variation, particularly in capacitance. Other dielectric formulations such as X7R and X5R will show less variation than Y5V, but more than C0G.

The application of AC voltages in the range of 10 to 20 VAC tends to increase the values of both the capacitance and dissipation factor, while higher AC voltages tend to produce decreases in both.

However, the variation of capacitance with applied DC is the parameter of most interest to design engineers. Figure 8 shows typical variation of capacitance with applied DC voltage for some standard dielectrics. As can be seen, the decrease in capacitance is greatest for the Y5V dielectric (the C0G is not plotted, since it would not have a perceptible capacitance nor dissipation factor change.)

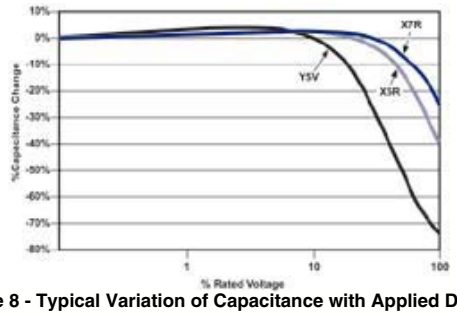


Figure 8 - Typical Variation of Capacitance with Applied DC Voltage

More detailed modelling information on the effect of various voltages on specific capacitor ratings can be obtained by use of the KEMET SPICE models, available for free downloading at our website (www.kemet.com).

12. Effect of Frequency:

Frequency affects both capacitance and dissipation factor. Typical curves for KEMET multilayer ceramic capacitors are shown in Figures 4, 5, 6 and 7.

The variation of impedance with frequency is an important consideration in the application of multilayer ceramic capacitors. Total impedance of the capacitor is

the vector summation of the capacitive reactance, the inductive reactance, and the ESR, as illustrated in Figure 2. As frequency increases, the capacitive reactance decreases. However, the series inductance (L) shown in Figure 1 produces some inductive reactance, which increases with frequency. At some frequency, the impedance ceases to be capacitive and becomes inductive. This point, at the bottom of the V-shaped impedance versus frequency curves, is the self-resonant frequency. At the self-resonant frequency, the reactance is zero, and the impedance consists of the ESR only. At high frequency more detailed models apply - See KEMET SPICE models for such instances.

Typical impedance versus frequency curves for KEMET multilayer ceramic capacitors are shown in Figures 4, 5, 6 and 7.

ENVIRONMENTAL AND PHYSICAL

13. Thermal Shock:
EIA-198, Method 202, Condition B (5 cycles -55° to + 125°C).

14. Life Test:
EIA-198, Method 201, 1000 hours at 200%* of rated voltage at 125°C. (Except 85°C for Z5U, Y5V & X5R).
See Table 4 on page 71 for limits.
*Note: 150% of rated voltage for selected high capacitance X5R values. Please contact factory.

15. Humidity Test:
EIA-198, Method 206, (Except 1000 hours,85°C, 85% RH, Rated Voltage).
See Table 4 on page 71 for limits.

16. Moisture Resistance:
EIA-198, Method 204, Condition B (20 cycles with 50 volts applied.
See Table 4 on page 71 for limits.

17. Solderability:
EIA-198, Method 301 (245°, 5 secs, Sn62 solder) 95% smooth solder on terminations. See page 14 for recommended profiles.

18. Resistance to Soldering Heat:
EIA-198, Method 302, Condition B (260°C, 10 seconds) no leaching of nickel barrier.

19. Terminal Strength:
EIA-198, Method 303, Condition D .

RELIABILITY

20. A well constructed multilayer ceramic capacitor chip is extremely reliable and, for all practical purposes, has no wearout mechanism when used within the maximum voltage and temperature ratings. Most failures occur as a result of mechanical or thermal damage during mounting on the board, or during subsequent testing. Capacitor failure may also be induced by sustained operation at voltages that exceed the rated DC voltage, voltage spikes or transients that exceed the dielectric's voltage capability, sustained operation at temperatures above the maximum rated temperature, internal defects, or excessive temperature rise due to power dissipation. As with any practical device, multilayer ceramic capacitors also possess an inherent, although low, failure rate when operated within rated conditions. The primary failure mode is by short-circuit or low insulation resistance, resulting from cracks or from dielectric breakdown at a defect site. KEMET monitors reliability with a periodic sampling program for selected values. Results are available in our FIT (Failure in Time) report for commercial chips.

21. 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.

MISAPPLICATION

22. Ceramic capacitors, like any other capacitors, may fail if they are misapplied. Some misapplications include mechanical damage, such as impact or excessive flexing of the circuit board. Others include severe mounting or rework cycles that may also introduce thermal shock. Still others include exposure to excessive voltage, current or temperature. If the dielectric layer of the capacitor is damaged by misapplication, the circuit may fail. The electrical energy of the circuit can be released as heat, which may damage the circuit board and other components as well.

ADDITIONAL INFORMATION

23. Detailed application information can be found in KEMET Engineering Bulletins.

F-2100	Surface Mount-Mounting Pad Dimensions and Considerations
F-2102	Reflow Soldering Process
F-2105	Wave Solder Process
F-2103	Surface Mount Repair
F-2110	Capacitance Monitoring while Flex Testing
F-2111	Ceramic Chip Capacitors “Flex Cracks” - Understanding and Solutions

For analysis of high frequency applications, KEMET has SPICE models of most chip capacitors. Models may be downloaded from KEMET’s website www.kemet.com.

Additional information is also available - See your KEMET representative for details or post your questions to KEMET's homepage on the web http://www.kemet.com.

TABLE 4 – ENVIRONMENTAL LIMITS

Body	Rated DC Voltage	Initial DF (%)	IR (GΩ or ΩF) whichever is less	DF (%) Post Life/ Hum/Moisture Resistance	Cap Shift (% or pf, whichever is greater) Post Life/ Hum/Moisture Resistance	IR (GΩ or ΩF) whichever is less Post Life/ Hum/Moisture Resistance
C0G	200*	0.1	100/1000	0.5	0.3% or ± 0.25 pf	10/100
	100	0.1	100/1000	0.5	0.3% or ± 0.25 pf	10/100
	50	0.1	100/1000	0.5	0.3% or ± 0.25 pf	10/100
	25	0.1	100/1000	0.5	0.3% or ± 0.25 pf	10/100
	16	0.1	100/1000	0.5	0.3% or ± 0.25 pf	10/100
X7R	200*	2.5	100/1000	3.0	± 20%	10/100
	100	2.5	100/1000	3.0	± 20%	10/100
	50	2.5	100/1000	3.0	± 20%	10/100
	25	3.5	100/1000	5.0	± 20%	10/100
	16	3.5	100/1000	5.0	± 20%	10/100
	6.3/10	5.0	100/1000	7.5	± 20%	10/100
X5R	50V all cap values	2.5	100/1000	3.0	± 20%	10/100
	25V all cap values	5.0	100/1000	7.5	± 20%	10/100
	<25≤564 cap value	5.0	100/1000	7.5	± 20%	10/100
	>564 cap value	10.0	100/1000	12.0	± 20%	10/100
Z5U	100	4.0	10/100	5.0	± 30%	1/10
	50	4.0	10/100	5.0	± 30%	1/10
	25	4.0	10/100	7.5	± 30%	1/10
Y5V	100	5.0	10/100	7.5	± 30%	1/10
	50	5.0	10/100	7.5	± 30%	1/10
	25	7.0	10/100	10.0	± 30%	1/10
	16	7.0	10/100	10.0	± 30%	1/10
	6.3/10	10.0	10/50	15.0	± 30%	1/5

*200 Volt limits not currently included in EIA-198.

PERFORMANCE CURVES
EFFECT OF FREQUENCY
(See SPICE models for specific ratings.)

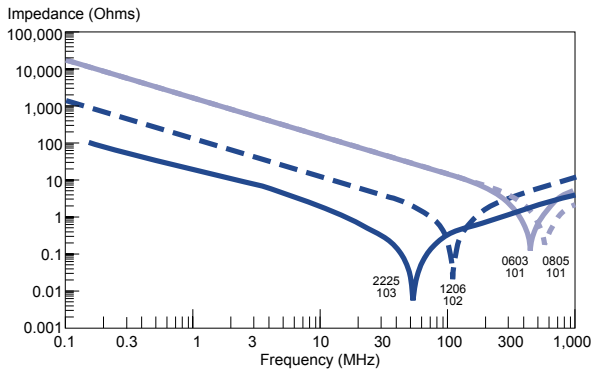


FIGURE 4. Impedance versus Frequency C0G Dielectric

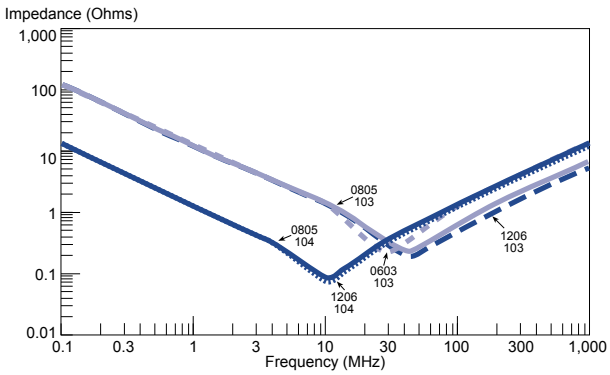


FIGURE 5 Impedance versus Frequency X7R Dielectric

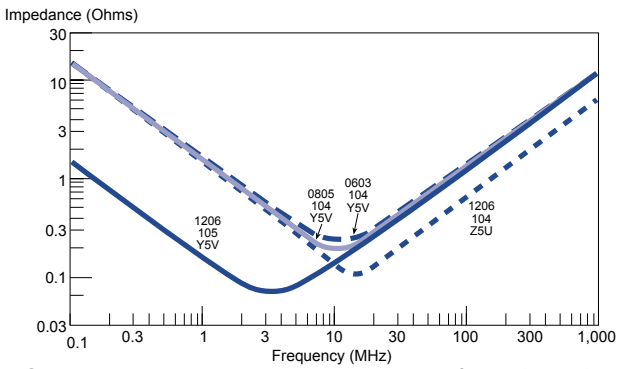


FIGURE 6. Impedance versus Frequency Z5U/Y5V Dielectric

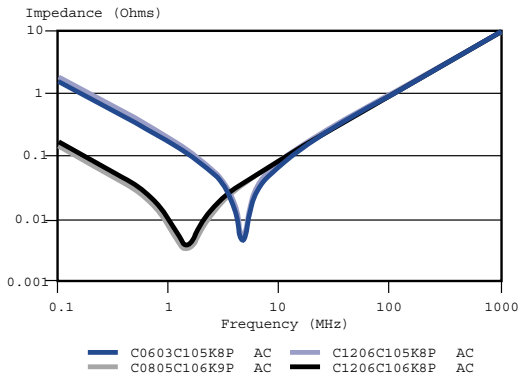


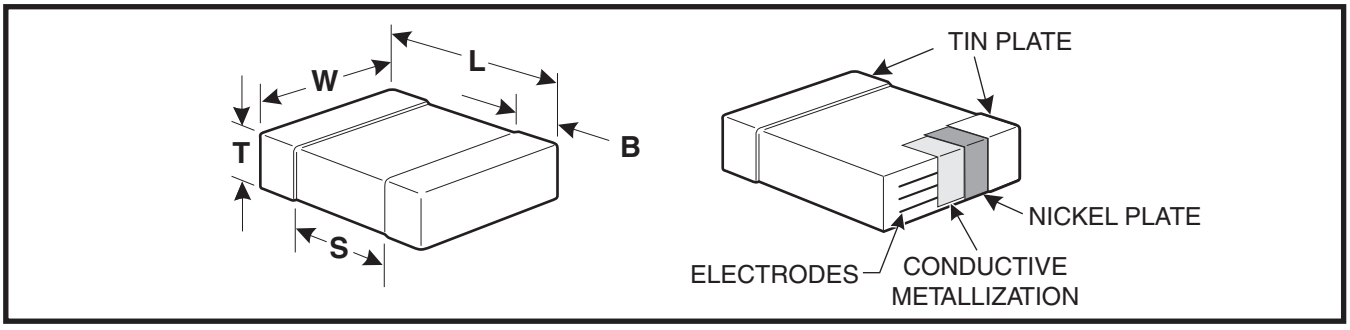
FIGURE 7. Impedence versus Frequency X5R Dielectric

CERAMIC CHIP CAPACITORS

FEATURES

- C0G (NP0), X7R, X5R, Z5U and Y5V Dielectrics
- 10, 16, 25, 50, 100 and 200 Volts
- Standard End Metalization: Tin-plate over nickel barrier
- Available Capacitance Tolerances: ±0.10 pF; ±0.25 pF; ±0.5 pF; ±1%; ±2%; ±5%; ±10%; ±20%; and +80%-20%
- Tape and reel packaging per EIA481-1. (See page 92 for specific tape and reel information.) Bulk Cassette packaging (0402, 0603, 0805 only) per IEC60286-6 and EIAJ 7201.
- RoHS Compliant

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS—MILLIMETERS AND (INCHES)

EIA SIZE CODE	METRIC SIZE CODE	L - LENGTH	W - WIDTH	T THICKNESS	B - BANDWIDTH	S SEPARATION minimum	MOUNTING TECHNIQUE
0201*	0603	0.6 (.024) ± .03 (.001)	0.3 ± (.012) ± .03 (.001)	See page 78 for thickness dimensions.	0.15 (.006) ± .05 (.002)	N/A	Solder Reflow
0402*	1005	1.0 (.04) ± .05 (.002)	0.5 (.02) ± .05 (.002)		0.20 (.008) -.40 (.016)	0.3 (.012)	
0603	1608	1.6 (.063) ± .15 (.006)	0.8 (.032) ± .15 (.006)		0.35 (.014) ± .15 (.006)	0.7 (.028)	Solder Wave + or Solder Reflow
0805*	2012	2.0 (.079) ± .20 (.008)	1.25 (.049) ± .20 (.008)		0.50 (.02) ± .25 (.010)	0.75 (.030)	
1206*	3216	3.2 (.126) ± .20 (.008)	1.6 (.063) ± .20 (.008)		0.50 (.02) ± .25 (.010)	N/A	
1210*	3225	3.2 (.126) ± .20 (.008)	2.5 (.098) ± .20 (.008)		0.50 (.02) ± .25 (.010)	N/A	
1808	4520	4.5 (.177) ± .30 (.012)	2.0 (.079) ± .20 (.008)		0.60 (.024) ± .35 (.014)	N/A	Solder Reflow
1812	4532	4.5 (.177) ± .30 (.012)	3.2 (.126) ± .30 (.012)		0.60 (.024) ± .35 (.014)	N/A	
1825*	4564	4.5 (.177) ± .30 (.012)	6.4 (.252) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	
2220	5650	5.6 (.220) ± .40 (.016)	5.0 (.197) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	
2225	5664	5.6 (.220) ± .40 (.016)	6.3 (.248) ± .40 (.016)		0.60 (.024) ± .35 (.014)	N/A	

* Note: Indicates EIA Preferred Case Sizes (Tightened tolerances apply for 0402, 0603, and 0805 packaged in bulk bassette, see page 96.)
+ For extended value 1210 case size - solder reflow only.

CAPACITOR ORDERING INFORMATION (Standard Chips - For Military see page 87)

C 0805 C 103 K 5 R A C*

CERAMIC

SIZE CODE

SPECIFICATION
C - Standard

CAPACITANCE CODE
Expressed in Picofarads (pF)
First two digits represent significant figures.
Third digit specifies number of zeros. (Use 9 for 1.0 through 9.9pF. Use 8 for 0.5 through 0.99pF)
(Example: 2.2pF = 229 or 0.50 pF = 508)

CAPACITANCE TOLERANCE
B – ±0.10pF J – ±5%
C – ±0.25pF K – ±10%
D – ±0.5pF M – ±20%
F – ±1% P – (GMV) – special order only
G – ±2% Z – +80%, -20%

VOLTAGE
1 - 100V 3 - 25V
2 - 200V 4 - 16V
5 - 50V 8 - 10V
6 - 35V 9 - 6.3V
7 - 4V

TEMPERATURE CHARACTERISTIC
Designated by Capacitance Change Over Temperature Range
G – C0G (NP0) (±30 PPM/°C)
R – X7R (±15%) (-55°C + 125°C)
P– X5R (±15%) (-55°C + 85°C)
U – Z5U (+22%, -56%) (+10°C + 85°C)
V – Y5V (+22%, -82%) (-30°C + 85°C)

FAILURE RATE LEVEL
A- Not Applicable

END METALLIZATION
C-Standard (Tin-plated nickel barrier)

*** Part Number Example: C0805C103K5RAC (14 digits - no spaces)**

C0G CAPACITANCE RANGE – 0201, 0402, 0603, 0805, 1206

Cap pF	Cap Code	Cap Tolerance	C0201*	C0402*					C0603*						C0805*						C1206*					
			25V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V	10V	16V	25V	50V	100V	200V
0.50	508	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC						
0.75	758	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC						
1.0	109	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.1	119	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.2	129	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.3	139	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.5	159	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.6	169	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
1.8	189	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
2.0	209	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
2.2	229	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
2.4	249	C,D		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
2.7	279	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
3.0	309	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
3.3	339	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
3.6	369	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
3.9	399	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
4.3	439	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
4.7	479	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
5.1	519	C,D K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
5.6	569	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
6.2	629	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
6.8	689	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
7.5	759	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
8.2	829	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
9.1	919	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
10.0	100	C,D J,K,M	AA^	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
11.0	110	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
12.0	120	C,D J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
13.0	130	C,D J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
15.0	150	C,D G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
16.0	160	C,D G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
18.0	180	C,D G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
20.0	200	C,D G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
22.0	220	C,D G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
24.0	240	C,D G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
27.0	270	D,F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
30.0	300	D,F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
33.0	330	D,F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
36.0	360	D,F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
39.0	390	D,F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
43.0	430	D,F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
47.0	470	D,F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
51.0	510	D,F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
56.0	560	F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
62.0	620	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
68.0	680	F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
75.0	750	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
82.0	820	F,G,J,K,M	AA~	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
91.0	910	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
100.0	101	F,G,J,K,M	AA~	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
110.0	111	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
120.0	121	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
130.0	131	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
150.0	151	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
160.0	161	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
180.0	181	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
200.0	201	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
220.0	221	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
240.0	241	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
270.0	271	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
300.0	301	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
330.0	331	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
360.0	361	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
390.0	391	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
430.0	431	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
470.0	471	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	EB	EB	EB	EB	EB	EB
510.0	511	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
560.0	561	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB
620.0	621	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EC
680.0	681	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EC
750.0	751	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EC
820.0	821	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EC
910.0	911	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DD	DD	EB	EB	EB	EB	EB	ED
1000.0	102	F,G,J,K,M		BB	BB	BB	BB	BB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DD	DD	EB	EB	EB	EB	EB	EE
1100.0	112	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	EB
1200.0	122	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	EB
1300.0	132	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB		DD	DD	DD	DD	DD		EB	EB	EB	EB	EC	EC
1500.0	152	F,G,J,K,M		BB	BB	BB	BB		CB	CB	CB	CB	CB		DD	DD	DD	DD	DD		EB	EB	EB	EB	ED	EC
1600.0	162	F,G,J,K,M		BB	BB	BB			CB	CB	CB	CB	CB		DD	DD	DD	DD	DD		EB	EB	EB	EB	ED	ED
1800.0	182	F,G,J,K,M		BB	BB	BB			CB	CB	CB	CB	CB		DD	DD	DD	DD	DD		EB	EB	EB	EB	ED	ED
2000.0	202	F,G,J,K,M		BB	BB	BB			CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	ED	ED
2200.0	222	F,G,J,K,M		BB	BB	BB			CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	EE	EE
2400.0	242	F,G,J,K,M							CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	EC	EC
2700.0	272	F,G,J,K,M							CB	CB	CB	CB	CB		DC	DC	DC	DC	DC		EB	EB	EB	EB	EC	EC
3000.0	302	F,G,J,K,M							CB	CB	CB	CB	CB		DD	DD	DD	DD	DC		EC	EC	EC	EC	EC	
3300.0	332	F,G,J,K,M							CB	CB	CB	CB	CB		DD	DD	DD	DD	DC		EC	EC	EC	EC	EE	
3600.0	362	F,G,J,K,M							CB	CB	CB	CB	CB		DD	DD	DD	DD	DC		EC	EC	EC	EC	EE	
3900.0	392	F,G,J,K,M							CB	CB	CB	CB	CB		DE	DE	DE	DE	DC		EC	EC	EC	EC	EF	
4300.0	432	F,G,J,K,M							CB	CB	CB	CB	CB		DE	DE	DE	DE	DC		EC	EC	EC	EC	EC	
4700.0	472	F,G,J,K,M							CB	CB	CB	CB	CB		DE	DE	DE	DE	DC		EC	EC	EC	EC	EC	
5100.0	512	F,G,J,K,M							CB	CB	CB	CB			DE	DE	DE	DE	DC		ED	ED	ED	ED	ED	
5600.0	562	F,G,J,K,M							CB	CB	CB	CB			DC	DC	DC	DC	DC		ED	ED	ED	ED	ED	
6200.0	622	F,G,J,K,M							CB	CB	CB	CB			DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	
6800.0	682	F,G,J,K,M							CB	CB	CB	CB			DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	
7500.0	752	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DC		EB	EB	EB	EB	EB	
8200.0	822	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DC		EC	EC	EC	EC	EB	
9100.0	912	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DC		EC	EC	EC	EC	EB	
10,000.0	103	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DC		ED	ED	ED	ED	EB	
12,000.0	123	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DE		EB	EB	EB	EB	EB	
15,000.0	153	F,G,J,K,M							CB	CB	CB				DC	DC	DC	DC	DG		EB	EB	EB	EB	EB	
18,000.0	183	F,G,J,K,M													DC	DC	DC	DD			EB	EB	EB	EB	EB	
22,000.0	223	F,G,J,K,M													DD	DD	DD	DF			EB	EB	EB	EB	EC	
27,000.0	273	F,G,J,K,M													DF	DF	DF				EB	EB	EB	EB	EE	
33,000.0	333	F,G,J,K,M													DG	DG	DG				EB	EB	EB	EB	EE	
47,000.0	473	F,G,J,K,M													DG	DG	DG				EC	EC	EC	EE	EH	
56,000.0	563	F,G,J,K,M																			ED	ED	ED	EF		
68,000.0	683	F,G,J,K,M																			EF	EF	EF	EH		
82,000.0	823	F,G,J,K,M																			EH	EH	EH	EH		
00,000.0	104	F,G,J,K,M																			EH	EH	EH			

*** Indicates EIA preferred chip sizes.**
NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used in 63 volt applications.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option.
Reels with such substitutions will be marked with the improved KEMET part numbers.

- **Greater or equal to J (5%) tolerance available.** • **J Tolerance Only; ^ = D Tolerance Only ~ = J,K,M Tolerance Only**

See page 78 for Thickness Code Reference Chart.

C0G CAPACITANCE RANGE – 1210, 1812, 1825, 2220, 2225

Cap pF	Cap Code	Cap Tolerance	C1210*						C1812*			C1825*			C2220			C2225		
			10V	16V	25V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V
0.5-2.4	508-249	D	FB	FB	FB	FB	FB	FB												
2.7-9.1	279-919	D K,M	FB	FB	FB	FB	FB	FB												
10.0-13.0	100-130	D J,K,M	FB	FB	FB	FB	FB	FB												
15.0-24.0	150-240	D G,J,K,M	FB	FB	FB	FB	FB	FB												
27.0-51.0	270-510	D,F,G,J,K,M	FB	FB	FB	FB	FB	FB												
56.0-82.0	560-820	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
91.0-360.0	910-361	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
390.0	391	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
430.0	431	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
470.0	471	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
510.0	511	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
560.0	561	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
620.0	621	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
680.0	681	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
750.0	751	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
820.0	821	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
910.0	911	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
1,000.0	102	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
1,100.0	112	F,G,J,K,M	FB	FB	FB	FB	FB	FB												
1,200.0	122	F,G,J,K,M	FB	FB	FB	FB	FB	FB	GB	GB	GB									
1,300.0	132	F,G,J,K,M	FB	FB	FB	FB	FB	FC												
1,500.0	152	F,G,J,K,M	FB	FB	FB	FB	FB	FE	GB	GB	GB									
1,600.0	162	F,G,J,K,M	FB	FB	FB	FB	FB	FE												
1,800.0	182	F,G,J,K,M	FB	FB	FB	FB	FB	FE	GB	GB	GB									
2,000.0	202	F,G,J,K,M	FB	FB	FB	FB	FB	FE												
2,200.0	222	F,G,J,K,M	FB	FB	FB	FB	FC	FG	GB	GB	GB									
2,400.0	242	F,G,J,K,M	FB	FB	FB	FB	FC	FC												
2,700.0	272	F,G,J,K,M	FB	FB	FB	FB	FC	FC	GB	GB	GB									
3,000.0	302	F,G,J,K,M	FB	FB	FB	FB	FC	FF												
3,300.0	332	F,G,J,K,M	FB	FB	FB	FB	FF	FF	GB	GB	GB									
3,600.0	362	F,G,J,K,M	FB	FB	FB	FB	FF	FF												
3,900.0	392	F,G,J,K,M	FB	FB	FB	FB	FF	FF	GB	GB	GB	HB	HB	HB						
4,300.0	432	F,G,J,K,M	FB	FB	FB	FB	FF	FF												
4,700.0	472	F,G,J,K,M	FF	FF	FF	FF	FG	FG	GB	GB	GD	HB	HB	HB				KB	KB	KB
5,100.0	512	F,G,J,K,M	FB	FB	FB	FB	FG	FG												
5,600.0	562	F,G,J,K,M	FB	FB	FB	FB	FG	FG	GB	GB	GH	HB	HB	HB				KB	KB	KB
6,200.0	622	F,G,J,K,M	FB	FB	FB	FB	FG													
6,800.0	682	F,G,J,K,M	FB	FB	FB	FB	FG		GB	GB	GJ	HB	HB	HB	JB	JB		KB	KB	KB
7,500.0	752	F,G,J,K,M	FC	FC	FC	FC	FC													
8,200.0	822	F,G,J,K,M	FC	FC	FC	FC	FC		GB	GH		HB	HB	HB	JB	JB		KB	KB	KB
9,100.0	912	F,G,J,K,M	FE	FE	FE	FE	FE													
10,000.0	103	F,G,J,K,M	FF	FF	FF	FF	FF		GB	GH		HB	HB	HE	JB	JB		KB	KB	KB
12,000.0	123	F,G,J,K,M	FG	FG	FG	FG	FB		GB	GG		HB	HB	HE	JB	JB		KB	KB	KB
15,000.0	153	F,G,J,K,M	FG	FG	FG	FG	FB		GB	GB		HB	HB		JB	JB		KB	KB	KE
18,000.0	183	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HE		JB	JB		KB	KB	
22,000.0	223	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HE		JB	JB		KB	KB	
27,000.0	273	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB		HB	HF		JB	JB		KB	KE	
33,000.0	333	F,G,J,K,M	FB	FB	FB	FB	FB		GB	GB					JB	JB		KB		
47,000.0	473	F,G,J,K,M	FB	FB	FB	FB	FE		GB	GB					JB	JB				
56,000.0	563	F,G,J,K,M	FB	FB	FB	FB	FF		GB	GB					JB	JB				
68,000.0	683	F,G,J,K,M	FB	FB	FB	FC	FG		GB	GB					JB	JB				
82,000.0	823	F,G,J,K,M	FC	FC	FC	FC	FH		GB	GB					JB	JB				
100,000.0	104	F,G,J,K,M	FE	FE	FE	FG	FM+		GB	GD					JB	JB				
120,000.0	124	F,G,J,K,M	FG	FG	FG	FH			GB	GH					JB	JB				
150,000.0	154	F,G,J,K,M	FH	FH	FH	FM+			GD	GN					JB	JB				
220,000.0	224	F,G,J,K,M	FK+	FK+	FK+				GK						JB	JD				
270,000.0	274	F,G,J,K,M													JB	JF				
330,000.0	334	F,G,J,K,M													JD	JH				
470,000.0	474	F,G,J,K,M													JG					
560,000.0	564	F,G,J,K,M																		

X7R CAPACITANCE RANGE – 0402, 0603, 0805, 1206

Cap pF	Cap Code	Cap Tol	C0402					C0603							C0805							C1206						
			6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V	6.3V	10V	16V	25V	50V	100V	200V
150	151	J, K, M	BB	BB	BB	BB	BB																					
180	181	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
220	221	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
270	271	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
330	331	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
390	391	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
470	471	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
560	561	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
680	681	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
820	821	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC							
1,000	102	J, K, M	BB	BB	BB	BB	BB	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	BB	BB	BB	BB	BB	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	BB	BB	BB	BB	BB	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	BB	BB	BB	BB	BB	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	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
2,700	272	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
3,300	332	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
3,900	392	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
4,700	472	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
5,600	562	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
6,800	682	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
8,200	822	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
10,000	103	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB	CB	DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
12,000	123	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DC	DC	EB	EB	EB	EB	EB	EB	EB
15,000	153	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
18,000	183	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
22,000	223	J, K, M	BB	BB	BB	BB	BB	CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DC	EB	EB	EB	EB	EB	EB	EB
27,000	273	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB
33,000	333	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EB	EB
39,000	393	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DD	DE	EB	EB	EB	EB	EB	EC	EB
47,000	473	J, K, M	BB	BB	BB	BB		CB	CB	CB	CB	CB	CB		DC	DC	DC	DC	DC	DE	DG	EB	EB	EB	EB	EB	EC	ED
56,000	563	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE	DG	EB	EB	EB	EB	EB	EB	ED
68,000	683	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED
82,000	823	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	ED
100,000	104	J, K, M	BB	BB	BB			CB	CB	CB	CB	CB			DD	DD	DD	DD	DD	DE		EB	EB	EB	EB	EB	EB	EM
120,000	124	J, K, M						CB	CB	CB		CB			DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	EM
150,000	154	J, K, M						CB	CB	CB		CD			DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC	EG
180,000	184	J, K, M						CB	CB	CB					DC	DC	DC	DC	DD			EC	EC	EC	EC	EC	EC	
220,000	224	J, K, M						CB	CB	CB	CD				DC	DC	DC	DC	DD	DG		EC	EC	EC	EC	EC	EC	
270,000	274	J, K, M						CB	CB	CB					DD	DD	DD	DD				EB	EB	EB	EB	EC	EM	
330,000	334	J, K, M						CB	CB	CB					DD	DD	DD	DD	DD			EB	EB	EB	EB	EC	EG	
390,000	394	J, K, M						CB	CB	CB					DG	DG	DG	DG	DE			EB	EB	EB	EB	EC	EG	
470,000	474	J, K, M						CB	CB	CB					DD	DD	DD	DD	DE			EC	EC	EC	EC	EC	EG	
560,000	564	J, K, M													DD	DD	DD	DG	DH			ED	ED	ED	ED	EC		
680,000	684	J, K, M													DD	DD	DD	DG	DH			EE	EE	EE	EE	ED		
820,000	824	J, K, M													DD	DD	DD	DG				EF	EF	EF	EF	ED		
1,000,000	105	J, K, M						CC*	CC*	CC*					DD	DD	DD	DG				EF	EF	EF	EG	ED		
1,200,000	125	J, K, M													DE	DE	DE					ED	ED	ED	EG	EH		
1,500,000	155	J, K, M													DG	DG	DG					EF	EF	EF	EG	EH		
1,800,000	185	J, K, M													DG	DG	DG					EF	EF	EF		EH		
2,200,000	225	J, K, M													DG	DG	DG					ED	ED	ED	EF	EH		
2,700,000	275	J, K, M																				EN	EN	EN				
3,300,000	335	J, K, M																				ED	ED	ED	EH			
3,900,000	395	J, K, M																				EF	EF	EF				
4,700,000	475	J, K, M																				EF+	EF+	EF+	EH+			
5,600,000	565	J, K, M																				EH+	EH+	EH+				
6,800,000	685	J, K, M																				EH+	EH+	EH+				
8,200,000	825	J, K, M																				EH+	EH+	EH+				
10,000,000	106	J, K, M																				EH+	EH+	EH+				

* Capacitance K or M. ontact KEMET Sales Rep for J tolerance availability. +_ Reflow Only.
NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option.
Reels with such substitutions will be marked with the improved KEMET part numbers.

See page 78 for Thickness Code Reference Chart.

X7R CAPACITANCE RANGE – 1210, 1808, 1812, 1825, 2220, 2225

Cap pF	Cap Code	Cap Tol.	C1210							C1808			C1812				C1825			C2220				C2225		
			6.3V	10V	16V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V	25V	50V	100V	200V	50V	100V	200V
2,200	222	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
2,700	272	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
3,300	332	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
3,900	392	J,K,M	FB	FB	FB	FB	FB	FB	FB																	
4,700	472	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD														
5,600	562	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD														
6,800	682	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
8,200	822	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
10,000	103	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
12,000	123	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
15,000	153	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
18,000	183	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD	LD	GB	GB	GB	GB										
22,000	223	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
27,000	273	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
33,000	333	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
39,000	393	J,K,M	FB	FB	FB	FB	FB	FB	FB	LD	LD		GB	GB	GB	GB	HB	HB	HB							
47,000	473	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD	LD		GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
56,000	563	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD	LD		GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
68,000	683	J,K,M	FB	FB	FB	FB	FB	FB	FC	LD			GB	GB	GB	GB	HB	HB	HB					KC	KC	KC
82,000	823	J,K,M	FB	FB	FB	FB	FB	FC	FF	LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
100,000	104	J,K,M	FB	FB	FB	FB	FB	FD	FG	LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
120,000	124	J,K,M	FB	FB	FB	FB	FB	FD		LD			GB	GB	GB	GB	HB	HB	HB				JC	KC	KC	KC
150,000	154	J,K,M	FC	FC	FC	FC	FC	FD		LD			GB	GB	GB	GE	HB	HB	HB				JC	KC	KC	KC
180,000	184	J,K,M	FC	FC	FC	FC	FC	FD		LD			GB	GB	GB	GF	HB	HB	HB				JC	KC	KC	KC
220,000	224	J,K,M	FC	FC	FC	FC	FC	FD					GB	GB	GB	GG	HB	HB	HB				JC	KC	KC	KC
270,000	274	J,K,M	FC	FC	FC	FC	FC	FD					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
330,000	334	J,K,M	FD	FD	FD	FD	FD	FD					GB	GB	GG	GG	HB	HB	HB	JC	JC	JC	JC	KB	KC	KC
390,000	394	J,K,M	FD	FD	FD	FD	FD						GB	GB	GG	GG	HB	HB	HD	JC	JC	JC	JC	KB	KC	KC
470,000	474	J,K,M	FD	FD	FD	FD	FD	FD					GB	GB	GG	GJ	HB	HB	HD	JC	JC	JC	JC	KB	KC	KD
560,000	564	J,K,M	FD	FD	FD	FD	FD						GC	GC	GG		HB	HD	HD	JC	JC	JC	JD	KB	KC	KD
680,000	684	J,K,M	FD	FD	FD	FD	FD						GC	GC	GG		HB	HD	HD	JC	JC	JD	JD	KB	KC	KD
820,000	824	J,K,M	FF	FF	FF	FF	FF						GE	GE	GG		HB		HF	JC	JC	JF	JF	KB	KC	KE
1,000,000	105	J,K,M	FH	FH	FH	FH	FH	FM					GE	GE	GG		HB		HF	JC	JC	JF	JF	KB	KD	KE
1,200,000	125	J,K,M	FH	FH	FH	FH	FG										HB			JC	JC			KB		KE
1,500,000	155	J,K,M	FH	FH	FH	FH	FG										HC			JC	JC			KC		
1,800,000	185	J,K,M	FH	FH	FH	FH	FG										HD			JD	JD			KD		
2,200,000	225	J,K,M	FJ	FJ	FJ	FJ	FG	FT*							GO°		HF			JF	JF			KD		
2,700,000	275	J,K,M	FE	FE	FE																					
3,300,000	335	J,K,M	FF	FF	FF	FM	FM																			
3,900,000	395	J,K,M	FG	FG	FG																					
4,700,000	475	J,K,M	FC+	FC+	FC+	FG+	FS+						GK*	GK*												
5,600,000	565	J,K,M	FF+	FF+	FF+																					
6,800,000	685	J,K,M	FG+	FG+	FG+	FM+																				
8,200,000	825	J,K,M	FH+	FH+	FH+																					
10,000,000	106	J,K,M	FH+	FH+	FH+	FS+							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	FS+	FS+																JO						
47,000,000	476	M	FS+																							

*** Capacitance tolerance K or M. Contact your local KEMET Sales Rep for J tolerance availablity.** **+ Reflow Only** **° M tolerance only**
NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option. Reels with such substitutions will be marked with the improved KEMET part numbers.

Y5V CAPACITANCE RANGE

Cap pF	Cap Code	Cap Tol.	C0402*			C0603*				C0805*					C1206*					C1210*				
			6.3V	10V	16V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
22,000	223	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
27,000	273	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
33,000	333	Z	BB	BB	BB	CB	CB	CB	CB					DC					EB					
39,000	393	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
47,000	473	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
56,000	563	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
68,000	683	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
82,000	823	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
100,000	104	Z	BB	BB	BB	CB	CB	CB	CB					DD					EB					
120,000	124	Z				CC	CC	CC	CC	DC	DC	DC	DC											
150,000	154	Z				CC	CC	CC	CC	DC	DC	DC	DC											
180,000	184	Z				CC	CC	CC	CC	DC	DC	DC	DC											
220,000	224	Z	BB			CC	CC	CC	CC	DC	DC	DC	DC	DD	EC	EC	EC	EC		FD	FD	FD	FD	FD
270,000	274	Z				CC	CC	CC	CC	DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
330,000	334	Z				CC	CC	CC	CC	DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
390,000	394	Z				CC	CC	CC		DC	DC	DC	DC		EB	EB	EB	EB		FD	FD	FD	FD	FD
470,000	474	Z	BB			CC	CC	CC		DC	DC	DC	DC		EC	EC	EC	EC		FD	FD	FD	FD	FD
560,000	564	Z				CC	CC			DD	DD	DD	DD		EB	EB	EB	EB		FD	FD	FD	FD	FD
680,000	684	Z				CC	CC			DE	DE	DE	DE		EB	EB	EB	EB		FD	FD	FD	FD	FD
820,000	824	Z				CC	CC			DG	DG	DG	DG		EB	EB	EB	EB		FF	FF	FF	FF	FF
1,000,000	105	Z	BB			CC	CC			DG	DG	DG	DG		EG	EG	EG	EG		FH	FH	FH	FH	FH
1,200,000	125	Z								DC	DC	DC			EC	EC	EC			FD	FD	FD		
1,500,000	155	Z								DC	DC	DC			EC	EC	EC			FD	FD	FD		
1,800,000	185	Z								DD	DD	DD			EC	EC	EC			FD	FD	FD		
2,200,000	225	Z								DD	DD	DD			EE	EE	EE			FD	FD	FD		
3,300,000	335	Z								DE	DE	DH			EF	EF	EF			FE	FE	FE		
4,700,000	475	Z								DH	DH	DH			EM	EM	EM			FG	FG	FG		
5,600,000	565	Z								DH	DH				EJ	EJ	EJ			FG	FG	FG		
6,800,000	685	Z								DH	DH				EJ	EJ				FH	FH	FH		
10,000,000	106	Z								DH	DH				EJ	EJ				FH	FH	FH		
15,000,000	156	Z																		FH	FH	FH		
22,000,000	226	Z													EH					FT	FT	FM		

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.
*** EIA preferred chip sizes**

+ Reflow only

See page 78 for Thickness Code Reference Chart

X5R CAPACITANCE RANGE

Cap pF	Cap Code	Cap Tol.	0201		C0402*				C0603*				C0805*					C1206*					C1210*					
			6.3V	16V	4V	6.3V	10V	16V	6.3V	10V	16V	25V	4V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	35V	50V
10,000	103	K,M		AA~																								
12,000	123	K,M				BB	BB	BB																				
15,000	153	K,M				BB	BB	BB																				
18,000	183	K,M				BB	BB	BB																				
22,000	223	K,M				BB	BB	BB																				
27,000	273	K,M				BB	BB	BB																				
33,000	333	K,M				BB	BB	BB																				
39,000	393	K,M				BB	BB	BB																				
47,000	473	K,M				BB	BB	BB																				
56,000	563	K,M				BB	BB	BB																				
68,000	683	K,M				BB	BB	BB																				
82,000	823	K,M				BB	BB	BB																				
100,000	104	K,M	AA~			BB	BB	BB																				
120,000	124	K,M																										
150,000	154	K,M																										
180,000	184	K,M																										
220,000	224	K,M				BB																						
270,000	274	K,M							CC	CC	CC										EB							
330,000	334	K,M							CC	CC	CC										EB							
390,000	394	K,M							CC	CC	CC										EB							
470,000	474	K,M							CC	CC	CC						DC				EC							
560,000	564	K,M							CC	CC	CC						DD				ED							
680,000	684	K,M							CC	CC	CC						DE				EE							
820,000	824	K,M							CC	CC	CC						DF				EF							
1,000,000	105	K,M				BB	BB		CC	CC	CC	CD		DG	DG	DG	DG				ED				FH+	FH+		FH+
1,200,000	125	K,M												DD	DD	DD					EC				FD+	FD+		
1,500,000	155	K,M												DC	DC	DC		EC	EC	EC	EC				FD+	FD+		
1,800,000	185	K,M												DD	DD	DD		EC	EC	EC	EC				FD+	FD+		
2,200,000	225	K,M				BB°			CC+	CC+	CC+			DD	DK	DD		EE	EE	EE	EE				FG+	FG+		
2,700,000	275	K,M																EF	EF	EF	EF				FG+	FG+		
3,300,000	335	K,M			BB°				CC+°					DF	DF	DH		EH	EH	EH	EH		FG+	FG+	FG+	FG+		
4,700,000	475	K,M			BB°				CC+	CC+				DH	DH	DH	DG	EH	EH	EH	EH	EH°	FG+	FG+	FG+	FG+		
5,600,000	565	K,M																					FG+	FG+	FG+	FG+		
6,800,000	685	K,M																ED	ED	EH			FG+	FG+	FG+	FG+		
8,200,000	825	K,M																ED	ED	EH			FG+	FG+	FG+	FG+		
10,000,000	106	K,M							CD°+					DK+	DK+	DK+		EH	EH	EH	EH+		FT+	FT+	FO+	FH+	FT°+	
12,000,000	126	K,M																					FD+	FD+	FG+			
15,000,000	156	K,M																					FG+	FG+	FL+			
18,000,000	186	K,M																					FG+	FG+	FH+			
22,000,000	226	K,M												DH+°				EH+	EH+°				FH+	FH+	FJ+			
27,000,000	276	K,M																										
33,000,000	336	K,M																										
39,000,000	396	K,M																										
47,000,000	476	K,M											DJ°+	DK°+				EH°+	EH°+				FQ°+	FQ+°	FQ°+			
100,000,000	107	K,M																EH°+					FQ°+					

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.

+Reflow only ° Available M ±20% tolerance only

Improved product with higher ratings and tighter capacitance tolerance product may be substituted within the same size (length, width, and thickness) at KEMET's option. Reels with such substitutions will be marked with the improved KEMET part numbers.

Z5U CAPACITANCE RANGE

(KEMET's Z5U also meets Y5V Characteristics)

Cap pF	Cap Code	Cap Tol.	C0805*		C1206*		C1210*		C1812*		C1825*		C2225	
			50V	100V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
6,800	682	M,Z	DC	DC										
8,200	822	M,Z	DC	DC										
10,000	103	M,Z	DC	DC	EB	EB								
12,000	123	M,Z	DC		EB	EB								
15,000	153	M,Z	DC		EB	EB								
18,000	183	M,Z	DC		EB	EB								
22,000	223	M,Z	DC		EB	EB								
27,000	273	M,Z	DC		EB	EB								
33,000	333	M,Z	DC		EB	EB								
39,000	393	M,Z	DD		EB	EC								
47,000	473	M,Z	DD		EB	EC	FB	FB						
56,000	563	M,Z	DD		EB	EB	FB	FB						
68,000	683	M,Z	DD		EB	EB	FB	FB						
82,000	823	M,Z	DD		EB	EB	FB	FC	GB	GB				
100,000	104	M,Z	DD		EB	EB	FB	FD	GB	GB				
120,000	124	M,Z			EC		FB	FD	GB	GB				
150,000	154	M,Z			EC		FC	FD	GB	GB				
180,000	184	M,Z			EC		FC		GB		HB	HB		
220,000	224	M,Z			EC		FC		GB		HB	HB		
270,000	274	M,Z					FC		GB		HB	HB		
330,000	334	M,Z					FD		GB		HB	HB	KB	KC
390,000	394	M,Z					FD		GB		HB	HD	KB	KC
470,000	474	M,Z					FD		GB		HB		KB	KC
560,000	564	M,Z					FD		GC		HB		KB	
680,000	684	M,Z					FD		GC		HB		KB	
820,000	824	M,Z					FF		GE		HB		KB	
1,000,000	105	M,Z					FH		GE		HB		KB	
1,200,000	125	M,Z									HB		KB	
1,500,000	155	M,Z									HB		KC	
1,800,000	185	M,Z									HB		KD	
2,200,000	225	M,Z									HB		KD	
2,700,000	275	M,Z											KD	

NOTE: For non-standard capacitance values or voltages, contact your local KEMET sales representative.
50 Volt Ceramic Chips can be used for 63 volt applications.
*** EIA preferred chip sizes**

See page 78 for Thickness Code Reference Chart.

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

Thickness Code	Chip Size	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
AA	0201	0.30 ± 0.03	N/A	N/A	15,000	N/A	N/A
BB	0402	0.50 ± 0.05	N/A	N/A	10,000	50,000	50,000
CB	0603	0.80 ± 0.07	N/A	N/A	4,000	10,000	15,000
CC	0603	0.80 ± 0.10	N/A	N/A	4,000	10,000	N/A
CD	0603	0.80 ± 0.15	N/A	N/A	4,000	10,000	N/A
DB	0805	0.60 ± 0.10	N/A	N/A	4,000	10,000	10,000
DC	0805	0.78 ± 0.10	N/A	N/A	4,000	10,000	N/A
DD	0805	0.90 ± 0.10	N/A	N/A	4,000	10,000	N/A
DE	0805	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
DF	0805	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
DG	0805	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
DH	0805	1.25 ± 0.20	2,500	10,000	N/A	N/A	N/A
DJ	0805	1.25 ± 0.20	3,000	N/A	N/A	N/A	N/A
DK	0805	1.25 ± 0.15	3,000	N/A	N/A	N/A	N/A
DL	0805	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
EB	1206	0.78 ± 0.10	4,000	10,000	4,000	10,000	N/A
EC	1206	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
ED	1206	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
EE	1206	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
EF	1206	1.20 ± 0.15	2,500	10,000	N/A	N/A	N/A
EG	1206	1.60 ± 0.15	2,000	8,000	N/A	N/A	N/A
EH	1206	1.60 ± 0.20	2,000	8,000	N/A	N/A	N/A
EJ	1206	1.70 ± 0.20	2,000	8,000	N/A	N/A	N/A
EK	1206	0.80 ± 0.10	2,000	8,000	N/A	N/A	N/A
EL	1206	1.15 ± 0.15	2,000	8,000	N/A	N/A	N/A
EM	1206	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
EN	1206	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
FB	1210	0.78 ± 0.10	4,000	10,000	N/A	N/A	N/A
FC	1210	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
FD	1210	0.95 ± 0.10	4,000	10,000	N/A	N/A	N/A
FE	1210	1.00 ± 0.10	2,500	10,000	N/A	N/A	N/A
FF	1210	1.10 ± 0.10	2,500	10,000	N/A	N/A	N/A
FG	1210	1.25 ± 0.15	2,500	10,000	N/A	N/A	N/A
FH	1210	1.55 ± 0.15	2,000	8,000	N/A	N/A	N/A
FJ	1210	1.85 ± 0.20	2,000	8,000	N/A	N/A	N/A
FK	1210	2.10 ± 0.20	2,000	8,000	N/A	N/A	N/A
FL	1210	1.40 ± 0.15	2,000	8,000	N/A	N/A	N/A
FM	1210	1.70 ± 0.20	2,000	8,000	N/A	N/A	N/A
FN	1210	1.85 ± 0.20	2,000	8,000	N/A	N/A	N/A
FO	1210	1.50 ± 0.20	2,000	8,000	N/A	N/A	N/A
FP	1210	1.60 ± 0.20	2,000	8,000	N/A	N/A	N/A
FQ	1210	2.50 ± 0.22	1,500	N/A	N/A	N/A	N/A
FR	1210	2.25 ± 0.20	2,000	8,000	N/A	N/A	N/A
FS	1210	2.50 ± 0.20	1,000	4,000	N/A	N/A	N/A
FT	1210	1.90 ± 0.20	1,500	4,000	N/A	N/A	N/A
LD	1808	0.90 ± 0.10	4,000	10,000	N/A	N/A	N/A
GB	1812	1.00 ± 0.10	1,000	4,000	N/A	N/A	N/A
GC	1812	1.10 ± 0.10	1,000	4,000	N/A	N/A	N/A
GD	1812	1.25 ± 0.15	1,000	4,000	N/A	N/A	N/A
GE	1812	1.30 ± 0.10	1,000	4,000	N/A	N/A	N/A
GF	1812	1.50 ± 0.10	1,000	4,000	N/A	N/A	N/A
GG	1812	1.55 ± 0.10	1,000	4,000	N/A	N/A	N/A
GH	1812	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
GJ	1812	1.70 ± 0.15	1,000	4,000	N/A	N/A	N/A
GK	1812	1.60 ± 0.20	1,000	4,000	N/A	N/A	N/A
GL	1812	1.90 ± 0.20	1,000	4,000	N/A	N/A	N/A
GM	1812	2.00 ± 0.20	1,000	4,000	N/A	N/A	N/A
GN	1812	1.70 ± 0.20	1,000	4,000	N/A	N/A	N/A
GO	1812	2.50 ± 0.20	500	N/A	N/A	N/A	N/A
HB	1825	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
HC	1825	1.15 ± 0.15	1,000	4,000	N/A	N/A	N/A
HD	1825	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
HE	1825	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
HF	1825	1.50 ± 0.15	1,000	4,000	N/A	N/A	N/A
JB	2220	1.00 ± 0.15	1,000	4,000	N/A	N/A	N/A
JC	2220	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
JD	2220	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
JE	2220	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A
JF	2220	1.50 ± 0.15	1,000	4,000	N/A	N/A	N/A
JG	2220	1.70 ± 0.15	1,000	4,000	N/A	N/A	N/A
JH	2220	1.80 ± 0.15	1,000	4,000	N/A	N/A	N/A
JO	2220	2.40 ± 0.15	500	2,000	N/A	N/A	N/A
KB	2225	1.00 ± 0.15	1,000	4,000	N/A	N/A	N/A
KC	2225	1.10 ± 0.15	1,000	4,000	N/A	N/A	N/A
KD	2225	1.30 ± 0.15	1,000	4,000	N/A	N/A	N/A
KE	2225	1.40 ± 0.15	1,000	4,000	N/A	N/A	N/A

This chart refers to ceramic chip thickness codes on pages 73 – 76.
Note: TU suffix represents tape and reel packaging of unmarked components.
Note: TM suffix represents tape and reel packaging of marked components.
Cases sizes ≤1210 are 8mm tape with 4mm pitch and Case Sizes >1210 are 12mm tape and 8mm pitch.

FEATURES

- Four individual capacitors inside one 1206 monolithic structure
- Saves board and inventory space
- One placement instead of four - less costly
- Easier to handle and solder than 4 smaller chips
- Tape and reel per EIA 481-1
- RoHS Compliant

CAPACITOR OUTLINE DRAWING

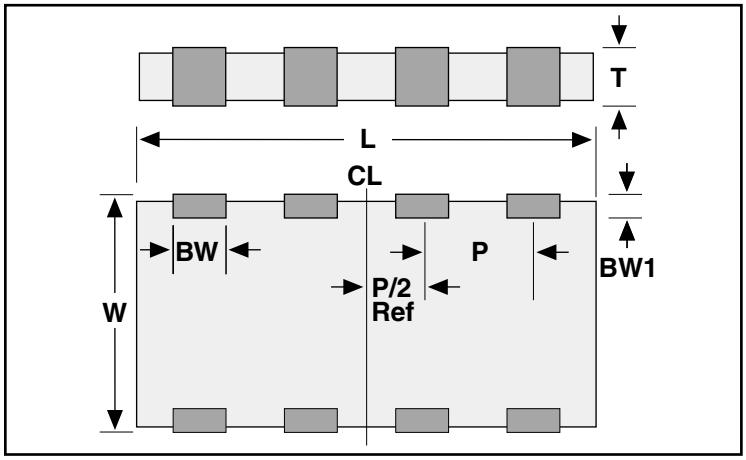


TABLE 1
EIA DIMENSIONS – MILLIMETERS (INCHES)

Size Code	Length L	Width W	Thickness T (max.)	Bandwidth BW	Bandwidth BW1	Pitch P
1632	3.2 (0.126) ± 0.2 (0.008)	1.6 (.063) ± 0.2 (.008)	0.7 - 1.35 (0.027 - 0.053)	0.40 (0.016) ± 0.2 (0.008)	0.1 - 0.5 (0.004 - 0.020)	0.8 (0.031) ± 0.1 (0.004)

Notes:
1. Metric is controlling - English for reference only.
2. Pitch (P) tolerances are non-cumulative along the package.
3. Thickness (T) depends on capacitance.

CERAMIC ARRAY ORDERING INFORMATION

C 1632 C 103 K 5 R A C

CERAMIC

EIA SIZE CODE
Ceramic chip array

SPECIFICATION
C - Standard

CAPACITANCE CODE
Expressed in Picofarads (pF)
First two digits represent significant figures.
Third digit specifies number of zeros. (Use 9 for 1.0 thru 9.9pF. (Example: 2.2pF = 229

CAPACITANCE TOLERANCE
K – ±10%: M – ±20% Standard Tolerances
Contact factory for any special requirements.

VOLTAGE
5 = 50v; 3 = 25v; 4 = 16v; 8=10v

TEMPERATURE CHARACTERISTIC
Designated by Capacitance Change Over Temperature Range
G – C0G (NP0) (±30 PPM/°C)
R – X7R (±15%)

FAILURE RATE LEVEL
A- Not Applicable

END METALLIZATION
C-Standard
(Tin-plated nickel barrier)

TABLE 2A
C0G DIELECTRIC – CAPACITANCE RANGE

Capacitance Values (pF)	KEMET Part Number	Capacitance Tolerance	10V 16V	25V	50V	100V	200V
10	C1632C100(1)(2)GAC	K,M	100	100	100	100	100
12	C1632C120(1)(2)GAC	K,M	120	120	120	120	120
15	C1632C150(1)(2)GAC	K,M	150	150	150	150	150
18	C1632C180(1)(2)GAC	K,M	180	180	180	180	180
22	C1632C220(1)(2)GAC	K,M	220	220	220	220	220
27	C1632C270(1)(2)GAC	K,M	270	270	270	270	270
33	C1632C330(1)(2)GAC	K,M	330	330	330	330	330
39	C1632C390(1)(2)GAC	K,M	390	390	390	390	390
47	C1632C470(1)(2)GAC	K,M	470	470	470	470	470
56	C1632C560(1)(2)GAC	K,M	560	560	560	560	560
68	C1632C680(1)(2)GAC	K,M	680	680	680	680	680
82	C1632C820(1)(2)GAC	K,M	820	820	820	820	820
100	C1632C101(1)(2)GAC	K,M	101	101	101	101	
120	C1632C121(1)(2)GAC	K,M	121	121	121	121	
150	C1632C151(1)(2)GAC	K,M	151	151	151	151	
180	C1632C181(1)(2)GAC	K,M	181	181	181	181	
220	C1632C221(1)(2)GAC	K,M	221	221	221		
270	C1632C271(1)(2)GAC	K,M	271	271	271		
330	C1632C331(1)(2)GAC	K,M	331	331	331		
390	C1632C391(1)(2)GAC	K,M	391	391	391		
470	C1632C471(1)(2)GAC	K,M	471	471	471		

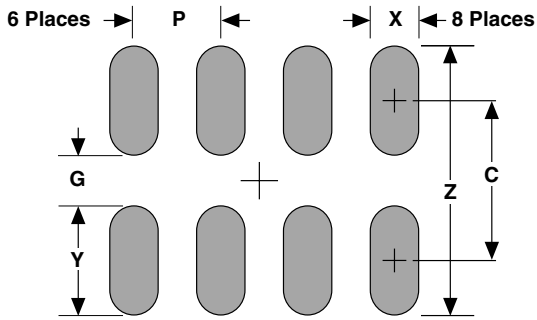
(1) To complete the KEMET part number, insert the alpha code for the tolerance desired.
K = ±10% and M = ±20% – standard tolerance. Contact factory for any special requirements.
(2) To complete the KEMET part number, insert appropriate number for voltage desired:
"5" = 50 volts, "3" = 25 volts, "4" = 16 volts, and "8" = 10 volts.

TABLE 2B
X7R DIELECTRIC – CAPACITANCE RANGE

Capacitance Values (pF)	KEMET Part Number	Capacitance Tolerance	10V 16V	25V	50V	100V	200V
330	C1632C331(1)(2)RAC	K,M	331	331	331	331	331
390	C1632C391(1)(2)RAC	K,M	391	391	391	391	391
470	C1632C471(1)(2)RAC	K,M	471	471	471	471	471
560	C1632C561(1)(2)RAC	K,M	561	561	561	561	561
680	C1632C681(1)(2)RAC	K,M	681	681	681	681	
820	C1632C821(1)(2)RAC	K,M	821	821	821	821	
1000	C1632C102(1)(2)RAC	K,M	102	102	102	102	
1200	C1632C122(1)(2)RAC	K,M	122	122	122	122	
1500	C1632C152(1)(2)RAC	K,M	152	152	152	152	
1800	C1632C182(1)(2)RAC	K,M	182	182	182	182	
2200	C1632C222(1)(2)RAC	K,M	222	222	222	222	
2700	C1632C272(1)(2)RAC	K,M	272	272	272	272	
3300	C1632C332(1)(2)RAC	K,M	332	332	332	332	
3900	C1632C392(1)(2)RAC	K,M	392	392	392	392	
4700	C1632C472(1)(2)RAC	K,M	472	472	472	472	
5600	C1632C562(1)(2)RAC	K,M	562	562	562		
6800	C1632C682(1)(2)RAC	K,M	682	682	682		
8200	C1632C822(1)(2)RAC	K,M	822	822	822		
10,000	C1632C103(1)(2)RAC	K,M	103	103	103		
12,000	C1632C123(1)(2)RAC	K,M	123	123	123		
15,000	C1632C153(1)(2)RAC	K,M	153	153	153		
18,000	C1632C183(1)(2)RAC	K,M	183	183	183		
22,000	C1632C223(1)(2)RAC	K,M	223	223	223		
27,000	C1632C273(1)(2)RAC	K,M	273				
33,000	C1632C333(1)(2)RAC	K,M	333				
39,000	C1632C393(1)(2)RAC	K,M	393				
47,000	C1632C473(1)(2)RAC	K,M	473				
56,000	C1632C563(1)(2)RAC	K,M	563				
68,000	C1632C683(1)(2)RAC	K,M	683				
82,000	C1632C823(1)(2)RAC	K,M	823				
100,000	C1632C104(1)(2)RAC	K,M	104				

(1) To complete the KEMET part number, insert the alpha code for the tolerance desired:
K = ±10% and M = ±20% – standard tolerances. Contact factory for any special requirements.
(2) To complete the KEMET part number, insert appropriate number for voltage desired:
"5" = 50 volts, "3" = 25 volts, "4" = 16 volts, and "8" = 10 volts.

1632 CERAMIC ARRAY
LAND PATTERN LAYOUT



Additional pad dimension information is available in KEMET Technical Bulletin F-2100.

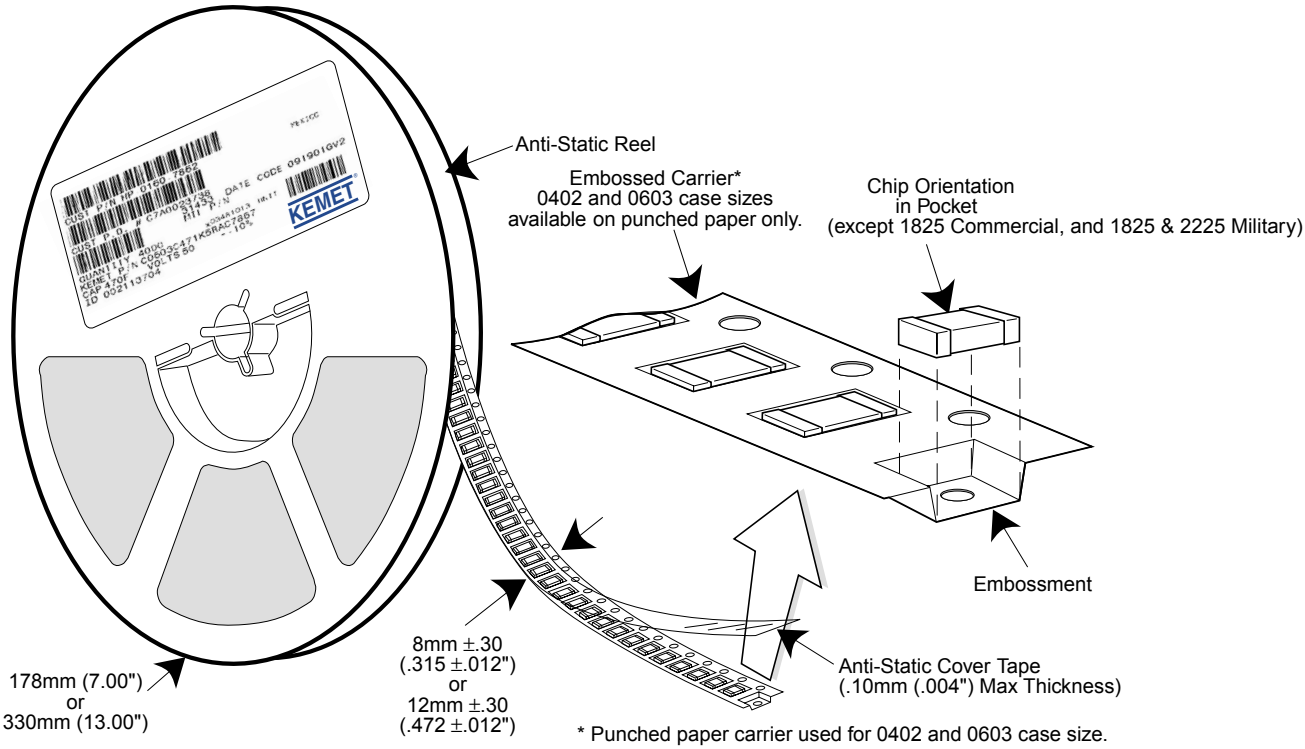
LAND PATTERN DIMENSIONS - CERAMIC CHIP CAPACITOR ARRAYS - MM

	Reflow Solder					
Dimension 3216	Z 2.80	G 0.40	X 0.52	Y(ref) 1.20	C(ref) 1.60	P(ref) 0.80

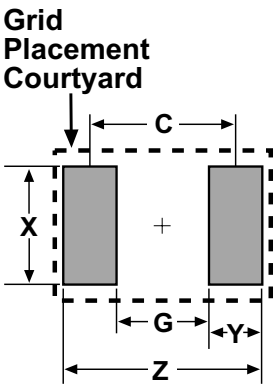
Calculation Formula
Z = Lmin + 2Jt + Tt
G = Smax - 2Jh -Th
X = Wmin + 2Js + Ts
Tt, Th, Ts = Combined tolerances

Tape & Reel Packaging

KEMET offers Multilayer Ceramic Chip Capacitors packaged in 8mm and 12mm plastic tape on 7" and 13" reels in accordance with EIA standard 481-1: Taping of surface mount components for automatic handling. This packaging system is compatible with all tape fed automatic pick and place systems. See page 78 for details on reeling quantities for commercial chips and page 87 for MIL-PRF-55681 chips.



SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM



	Reflow Solder					Wave Solder				
Dimension	Z	G	X	Y(ref)	C(ref)	Z	G	X	Y(ref)	Smin
0402	2.14	0.28	0.74	0.93	1.21	Not Recommended				
0603	2.78	0.68	1.08	1.05	1.73	3.18	0.68	0.80	1.25	1.93
0805	3.30	0.70	1.60	1.30	2.00	3.70	0.70	1.10	1.50	2.20
1206	4.50	1.50	2.00	1.50	3.00	4.90	1.50	1.40	1.70	3.20
1210	4.50	1.50	2.90	1.50	3.00	4.90	1.50	2.00	1.70	3.20
1812	5.90	2.30	3.70	1.80	4.10	Not Recommended				
1825	5.90	2.30	6.90	1.80	4.10					
2220	7.00	3.30	5.50	1.85	5.15					
2225	7.00	3.30	6.80	1.85	5.15					

Calculation Formula
Z = Lmin + 2Jt + Tt
G = Smax - 2Jh -Th
X = Wmin + 2Js + Ts
Tt, Th, Ts = Combined tolerances

Performance Notes

1. **Cover Tape Break Force:** 1.0 Kg Minimum.
2. **Cover Tape Peel Strength:** The total peel strength of the cover tape from the carrier tape shall be:

Tape Width	Peel Strength
8 mm	0.1 Newton to 1.0 Newton (10g to 100g)
12 mm	0.1 Newton to 1.3 Newton (10g to 130g)

   The direction of the pull shall be opposite the direction of the carrier tape travel. The pull angle of the carrier tape shall be 165° to 180° from the plane of the carrier tape. During peeling, the carrier and/or cover tape shall be pulled at a velocity of 300 ±10 mm/minute.
3. **Reel Sizes:** Molded tantalum capacitors are available on either 180 mm (7") reels (standard) or 330 mm (13") reels (with C-7280). Note that 13" reels are preferred.
4. **Labeling:** Bar code labeling (standard or custom) shall be on the side of the reel opposite the sprocket holes. Refer to EIA-556.

Embossed Carrier Tape Configuration: Figure 1

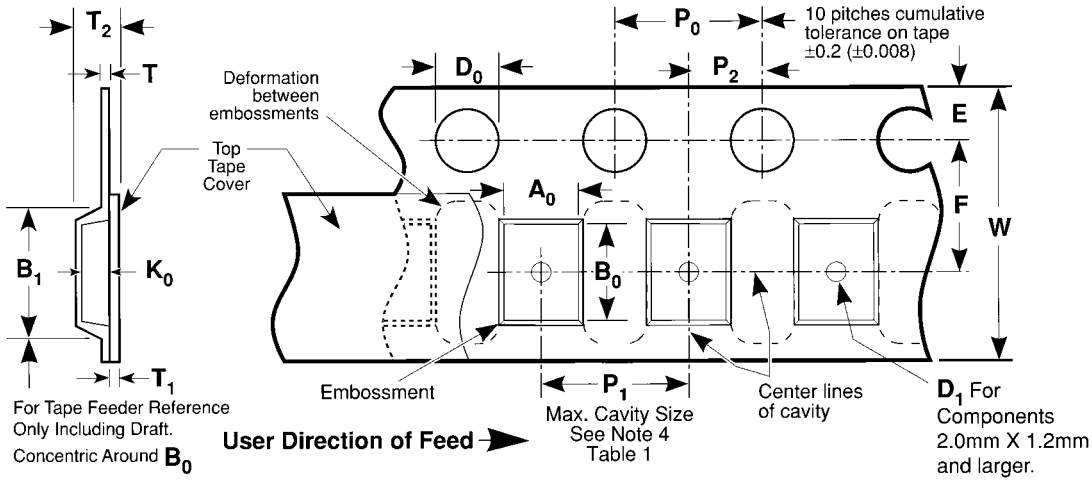


Table 1 — EMBOSSED TAPE DIMENSIONS (Metric will govern)

Constant Dimensions — Millimeters (Inches)							
Tape Size	**D_0**	**E**	**P_0**	**P_2**	**T Max**	**T_1 Max**	
8 mm and 12 mm	1.5 +0.10 -0.0 (0.059 +0.004, -0.0)	1.75 ±0.10 (0.069 ±0.004)	4.0 ±0.10 (0.157 ±0.004)	2.0 ±0.05 (0.079 ±0.002)	0.600 (0.024)	0.100 (0.004)	

Variable Dimensions — Millimeters (Inches)									
Tape Size	**Pitch**	**B_1 Max. Note 1**	**D_1 Min. Note 2**	**F**	**P_1**	**R Min. Note 3**	**T_2 Max**	**W**	**$A_0B_0K_0$ Note 4**
8 mm	Single (4 mm)	4.4 (0.173)	1.0 (0.039)	3.5 ±0.05 (0.138 ±0.002)	4.0 ±0.10 (0.157 ±0.004)	25.0 (0.984)	2.5 (0.098)	8.0 ±0.30 (.315 ±0.012)	
12 mm	Double (8 mm)	8.2 (0.323)	1.5 (0.059)	5.5 ±0.05 (0.217 ±0.002)	8.0 ±0.10 (0.315 ±0.004)	30.0 (1.181)	4.6 (0.181)	12.0 ±0.30 (0.472 ±0.012)	

NOTES

1. B1 dimension is a reference dimension for tape feeder clearance only.
2. The embossment hole location shall be measured from the sprocket hole controlling the location of the embossment. Dimensions of embossment location and hole location shall be applied independent of each other.
3. Tape with components shall pass around radius "R" without damage (see sketch A). The minimum trailer length (Fig. 2) may require additional length to provide R min. for 12 mm embossed tape for reels with hub diameters approaching N min. (Table 2)
4. The cavity defined by A_0, B_0, and K_0 shall be configured to surround the part with sufficient clearance such that the chip does not protrude beyond the sealing plane of the cover tape, the chip can be removed from the cavity in a vertical direction without mechanical restriction, rotation of the chip is limited to 20 degrees maximum in all 3 planes, and lateral movement of the chip is restricted to 0.5 mm maximum in the pocket (not applicable to vertical clearance.)

Embossed Carrier Tape Configuration (cont.)

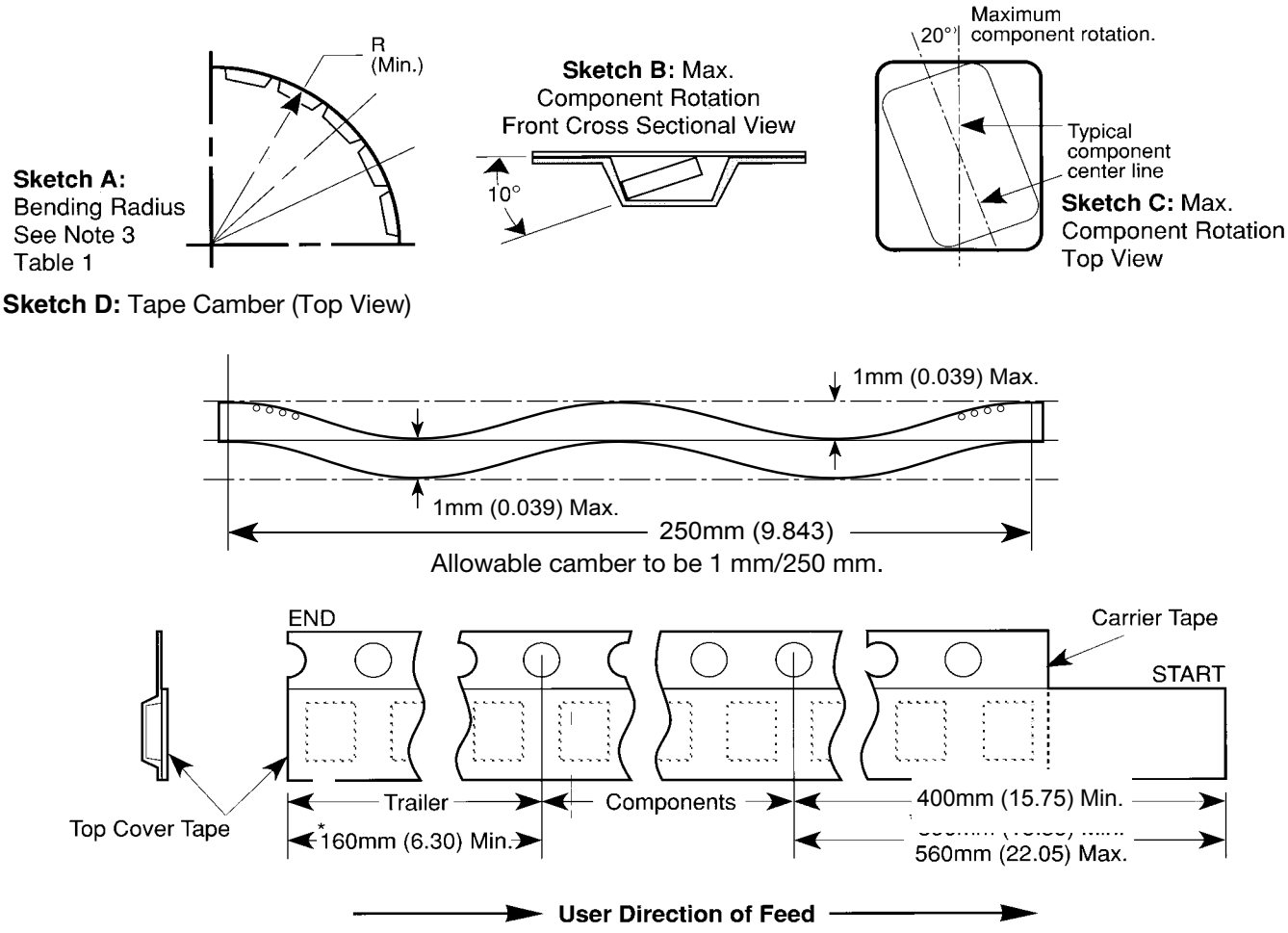


Figure 2: Tape Leader & Trailer Dimensions (Metric Dimensions Will Govern)

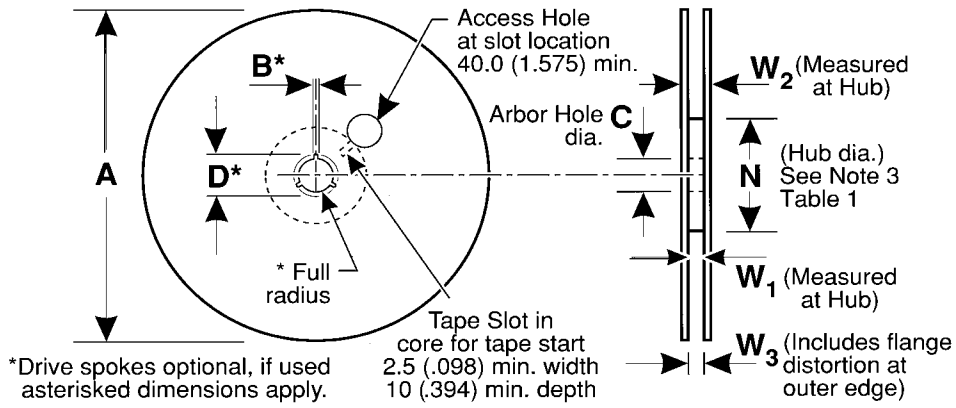


Figure 3: Reel Dimensions (Metric Dimensions will govern)

Table 2 – REEL DIMENSIONS (Metric will govern)

Tape Size	A Max	B* Min	C	D* Min	N Min	W_1	W_2 Max	W_3
8 mm	330.0 (12.992)	1.5 (0.059)	13.0 ± 0.20 (0.512 ± 0.008)	20.2 (0.795)	50.0 (1.969) See Note 3 Table 1	8.4 +1.5, -0.0 (0.331 +0.059, -0.0)	14.4 (0.567)	7.9 Min (0.311) 10.9 Max (0.429)
12 mm	330.0 (12.992)	1.5 (0.059)	13.0 ± 0.20 (0.512 ± 0.008)	20.2 (0.795)		12.4 +2.0, -0.0 (0.488 +0.078, -0.0)	18.4 (0.724)	11.9 Min (0.469) 15.4 Max (0.606)

Punched Carrier (Paper Tape) Configuration (Ceramic Chips Only):

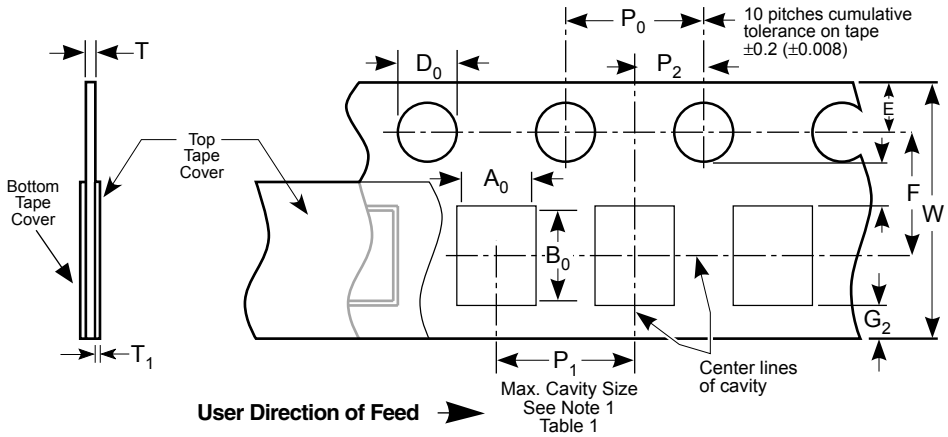


Table 1: 8 & 12mm Punched Tape
(Metric Dimensions Will Govern)

Constant Dimensions - Millimeters (Inches)

Tape Size	D_0	E	P_0	P_2	T_1	G_1	G_2	R Min.
8mm and 12mm	1.5 +0.10, -0.0 (.059 +0.004, -0.0)	1.75 ±0.10 (.069 ±0.004)	4.0 ± 0.10 (.157 ± 0.004)	2.0 ± 0.05 (.079 ± 0.002)	0.10 (.004) Max.	0.75 (.030) Min.	0.75 (.030) Min.	25 (.984) See Note 2 Table 1

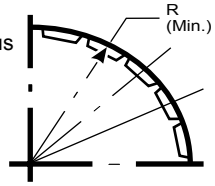
Table 1: 8 & 12mm Punched Tape
(Metric Dimensions Will Govern)

Variable Dimensions - Millimeters (Inches)

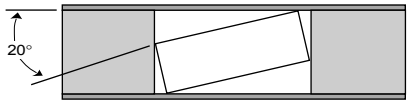
Tape Size	P_1	F	W	A_0B_0	T
8mm 1/2 Pitch	2.0 ± 0.10 (.079 ±.004) See Require-ments Section 3.3 (d)	3.5 ± 0.05 (.138 ± .002)	8.0 ± 0.3 (.315 ± 0.012)	See Note 1 Table 1	1.1mm (.043) Max. for Paper Base Tape and 1.6mm (.063) Max. for Non-Paper Base Compositions. See Note 3.
8mm	4.0 ± 0.10 (0.157 ± .004)				
12mm	4.0 ± 0.10 (0.157 ± .004)	5.5 ± 0.05 (.217 ± .002)	12.0 ± 0.3 (.472 ± .012)		
12mm Double Pitch	8.0 ± 0.10 (0.315 ± .004)				

Note:
1. A_0, B_0 and T determined by the maximum dimensions to the ends of the terminals extending from the body and/or the body dimensions of the component. The clearance between the ends of the terminals or body of the component to the sides and depth of the cavity (A_0, B_0 and T) must be within 0.05mm (.002) minimum and 0.50mm (.020) maximum. The clearance allowed must also prevent rotation of the component within the cavity of not more than 20 degrees (see sketches A and B).
2. Tape with components shall pass around radius "R" without damage.
3. KEMET nominal thicknesses are: 0402 = 0.6mm and all others 0.95mm minimum.

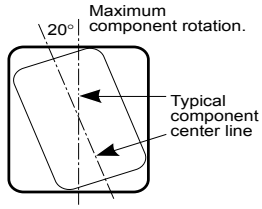
Sketch A:
Bending Radius
See Note 2
Table 1



Sketch B:
Max. Component Rotation - Front Cross Sectional View



Sketch C:
Component Rotation - Top View



Bulk Cassette Packaging (Ceramic Chips only)

(Meets Dimensional Requirements IEC-286-6 and EIAJ 7201)

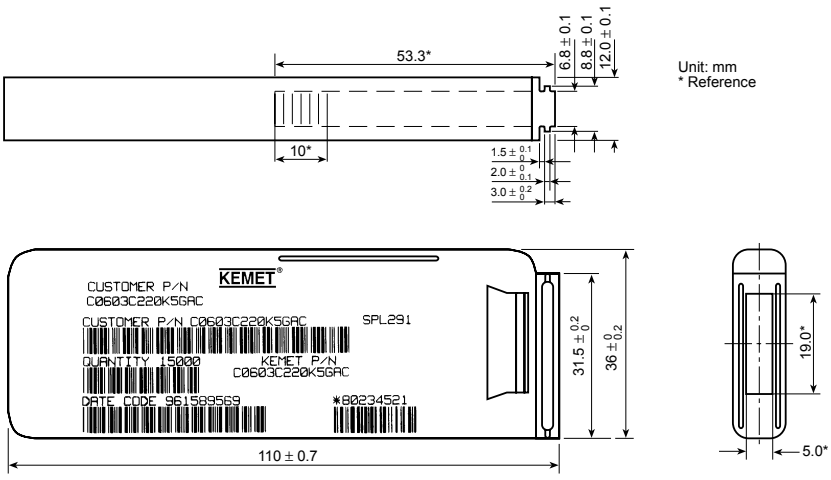


Table 2 – Capacitance Values Available In Bulk Cassette Packaging

Case Size	Dielectric	Voltage	Min. Cap Value	Max. Cap Value
0402	All	All	All	All
0603	All	All	All	All
0805	C0G	200 100 50	109 109 109	181 331 102
	X7R	200 100 50 25 16	221 221 221 221 221	392 103 273 104 104
	Y5V	25 16	104 104	224 224

Table 1 – Capacitor Dimensions for Bulk Cassette Packaging – Millimeters

Metric Size Code	EIA Size Code	Length L	Width W	Thickness T	Bandwidth B	Minimum Separation S	Number of Pcs/Cassette
1005	0402	1.0 ± 0.05	0.5 ± 0.05	0.5 ± .05	0.2 to 0.4	0.3	50,000
1608	0603	1.6 ± 0.07	0.8 ± 0.07	0.8 ± .07	0.2 to 0.5	0.7	15,000
2012	0805	2.0 ± 0.10	1.25 ± 0.10	0.6 ± .10	0.5 to 0.75	0.75	10,000

Terminations: KEMET nickel barrier layer with a tin overplate.

CAPACITOR MARKING TABLE (Marking Optional - Not Available for 0402 Size or Y5V Dielectric)

Numeral / Alpha Character	Capacitance (pF) For Various Numeral Identifiers								
	9	0	1	2	3	4	5	6	7
A	0.10	1.0	10	100	1000	10,000	100,000	1,000,000	10,000,000
B	0.11	1.1	11	110	1100	11,000	110,000	1,100,000	11,000,000
C	0.12	1.2	12	120	1200	12,000	120,000	1,200,000	12,000,000
D	0.13	1.3	13	130	1300	13,000	130,000	1,300,000	13,000,000
E	0.15	1.5	15	150	1500	15,000	150,000	1,500,000	15,000,000
F	0.16	1.6	16	160	1600	16,000	160,000	1,600,000	16,000,000
G	0.18	1.8	18	180	1800	18,000	180,000	1,800,000	18,000,000
H	0.20	2.0	20	200	2000	20,000	200,000	2,000,000	20,000,000
J	0.22	2.2	22	220	2200	22,000	220,000	2,200,000	22,000,000
K	0.24	2.4	24	240	2400	24,000	240,000	2,400,000	24,000,000
L	0.27	2.7	27	270	2700	27,000	270,000	2,700,000	27,000,000
M	0.30	3.0	30	300	3000	30,000	300,000	3,000,000	30,000,000
N	0.33	3.3	33	330	3300	33,000	330,000	3,300,000	33,000,000
P	0.36	3.6	36	360	3600	36,000	360,000	3,600,000	36,000,000
Q	0.39	3.9	39	390	3900	39,000	390,000	3,900,000	39,000,000
R	0.43	4.3	43	430	4300	43,000	430,000	4,300,000	43,000,000
S	0.47	4.7	47	470	4700	47,000	470,000	4,700,000	47,000,000
T	0.51	5.1	51	510	5100	51,000	510,000	5,100,000	51,000,000
U	0.56	5.6	56	560	5600	56,000	560,000	5,600,000	56,000,000
V	0.62	6.2	62	620	6200	62,000	620,000	6,200,000	62,000,000
W	0.68	6.8	68	680	6800	68,000	680,000	6,800,000	68,000,000
X	0.75	7.5	75	750	7500	75,000	750,000	7,500,000	75,000,000
Y	0.82	8.2	82	820	8200	82,000	820,000	8,200,000	82,000,000
Z	0.91	9.1	91	910	9100	91,000	910,000	9,100,000	91,000,000
a	0.25	2.5	25	250	2500	25,000	250,000	2,500,000	25,000,000
b	0.35	3.5	35	350	3500	35,000	350,000	3,500,000	35,000,000
d	0.40	4.0	40	400	4000	40,000	400,000	4,000,000	40,000,000
e	0.45	4.5	45	450	4500	45,000	450,000	4,500,000	45,000,000
f	0.50	5.0	50	500	5000	50,000	500,000	5,000,000	50,000,000
m	0.60	6.0	60	600	6000	60,000	600,000	6,000,000	60,000,000
n	0.70	7.0	70	700	7000	70,000	700,000	7,000,000	70,000,000
t	0.80	8.0	80	800	8000	80,000	800,000	8,000,000	80,000,000
y	0.90	9.0	90	900	9000	90,000	900,000	9,000,000	90,000,000

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a $\overline{K}$ to identify KEMET, followed by two characters (per EIA-198 - see table below) to identify the capacitance value. Note that marking is not available for size 0402 nor for any Y5V chip. In addition, the 0603 marking option is limited to the $\overline{K}$ only.

	$\overline{K}$A3	

Example shown is 1,000 pF capacitor.

CERAMIC CHIP CAPACITORS

No.	Ordercode	Casesize	Cap.	Tol.	Volt	Dielec.
1	C0603C109D1GAC	0603	1pF	±0.5pF	100	C0G
2	C0603C129C1GAC	0603	1.2pF	±0.25pF	100	C0G
3	C0603C159D1GAC	0603	1.5pF	±0.5pF	100	C0G
4	C0603C189C1GAC	0603	1.8pF	±0.25pF	100	C0G
5	C0603C209C1GAC	0603	2pF	±0.25pF	100	C0G
6	C0603C229J1GAC	0603	2.2pF	±5%	100	C0G
7	C0603C279J1GAC	0603	2.7pF	±5%	100	C0G
8	C0603C339J1GAC	0603	3.3pF	±5%	100	C0G
9	C0603C399J1GAC	0603	3.9pF	±5%	100	C0G
10	C0603C479J1GAC	0603	4.7pF	±5%	100	C0G
11	C0603C569J1GAC	0603	5.6pF	±5%	100	C0G
12	C0603C689J1GAC	0603	6.8pF	±5%	100	C0G
13	C0603C829J1GAC	0603	8.2pF	±5%	100	C0G
14	C0603C100J1GAC	0603	10pF	±5%	100	C0G
15	C0603C120J1GAC	0603	12pF	±5%	100	C0G
16	C0603C150J1GAC	0603	15pF	±5%	100	C0G
17	C0603C180J1GAC	0603	18pF	±5%	100	C0G
18	C0603C200J1GAC	0603	20pF	±5%	100	C0G
19	C0603C220J1GAC	0603	22pF	±5%	100	C0G
20	C0603C270J1GAC	0603	27pF	±5%	100	C0G
21	C0603C330J1GAC	0603	33pF	±5%	100	C0G
22	C0603C390J1GAC	0603	39pF	±5%	100	C0G
23	C0603C470J1GAC	0603	47pF	±5%	100	C0G
24	C0603C560J1GAC	0603	56pF	±5%	100	C0G
25	C0603C680J1GAC	0603	68pF	±5%	100	C0G
26	C0603C820J1GAC	0603	82pF	±5%	100	C0G
27	C0603C101J1GAC	0603	100pF	±5%	100	C0G
28	C0603C121J1GAC	0603	120pF	±5%	100	C0G
29	C0603C151J1GAC	0603	150pF	±5%	100	C0G
30	C0603C181J1GAC	0603	180pF	±5%	100	C0G
31	C0603C201J1GAC	0603	200pF	±5%	100	C0G
32	C0603C221J1GAC	0603	220pF	±5%	100	C0G
33	C0603C271J1GAC	0603	270pF	±5%	100	C0G
34	C0603C331J1GAC	0603	330pF	±5%	100	C0G
35	C0603C391J1GAC	0603	390pF	±5%	100	C0G
36	C0603C471J1GAC	0603	470pF	±5%	100	C0G
37	C0603C561J1GAC	0603	560pF	±5%	100	C0G
38	C0603C681J1GAC	0603	680pF	±5%	100	C0G
39	C0603C821J1GAC	0603	820pF	±5%	100	C0G
40	C0603C102J1GAC	0603	1nF	±5%	100	C0G
41	C0603C122J1GAC	0603	1.2nF	±5%	100	C0G
42	C0603C152J1GAC	0603	1.5nF	±5%	100	C0G
43	C0603C182J1GAC	0603	1.8nF	±5%	100	C0G
44	C0603C202J1GAC	0603	2nF	±5%	100	C0G
45	C0603C222J1GAC	0603	2.2nF	±5%	100	C0G
46	C0603C272J1GAC	0603	2.7nF	±5%	100	C0G
47	C0603C332J1GAC	0603	3.3nF	±5%	100	C0G
48	C0603C392J1GAC	0603	3.9nF	±5%	100	C0G
49	C0603C472J1GAC	0603	4.7nF	±5%	100	C0G

50	C0603C562J3GAC	0603	5.6nF	±5%	25	C0G
51	C0603C682J3GAC	0603	6.8nF	±5%	25	C0G
52	C0603C822J3GAC	0603	8.2nF	±5%	25	C0G
53	C0603C103K3GAC	0603	10nF	±10%	25	C0G
54	C0603C123K3GAC	0603	12nF	±10%	25	C0G
55	C0603C153K3GAC	0603	15nF	±10%	25	C0G
56	C0805C183K3GAC	0805	18nF	±10%	25	C0G
57	C0805C203K3GAC	0805	20nF	±10%	25	C0G
58	C0805C223K3GAC	0805	22nF	±10%	25	C0G
59	C0805C273K3GAC	0805	27nF	±10%	25	C0G
60	C0805C333K3GAC	0805	33nF	±10%	25	C0G
61	C0805C393K3GAC	0805	39nF	±10%	25	C0G
62	C0805C473K3GAC	0805	47nF	±10%	25	C0G
63	C0805C563K3RAC	0805	56nF	±10%	25	X7R
64	C0805C683K3RAC	0805	68nF	±10%	25	X7R
65	C0805C823K3RAC	0805	82nF	±10%	25	X7R
66	C0805C104K3RAC	0805	100nF	±10%	25	X7R
67	C0805C124K3RAC	0805	120nF	±10%	25	X7R
68	C0805C154K3RAC	0805	150nF	±10%	25	X7R
69	C0805C184K3RAC	0805	180nF	±10%	25	X7R
70	C0805C224K3RAC	0805	220nF	±10%	25	X7R
71	C0805C274K3RAC	0805	270nF	±10%	25	X7R
72	C0805C334K3RAC	0805	330nF	±10%	25	X7R
73	C0805C394K3RAC	0805	390nF	±10%	25	X7R
74	C0805C474K3RAC	0805	470nF	±10%	25	X7R
75	C0805C564K3RAC	0805	560nF	±10%	25	X7R
76	C0805C684K3RAC	0805	680nF	±10%	25	X7R
77	C0805C824K3RAC	0805	820nF	±10%	25	X7R
78	C0805C105K3RAC	0805	1µF	±10%	25	X7R
79	C1206C125K4RAC	1206	1.2µF	±10%	16	X7R
80	C1206C155K4RAC	1206	1.5µF	±10%	16	X7R
81	C1206C185K4RAC	1206	1.8µF	±10%	16	X7R
82	C1206C225K4RAC	1206	2.2µF	±10%	16	X7R
83	C1206C275K4RAC	1206	2.7µF	±10%	16	X7R
84	C1206C335K4RAC	1206	3.3µF	±10%	16	X7R
85	C1206C395K4RAC	1206	3.9µF	±10%	16	X7R
86	C1206C475K4RAC	1206	4.7µF	±10%	16	X7R
87	C1206C565K4RAC	1206	5.6F	±10%	16	X7R
88	C1206C685K4RAC	1206	6.8µF	±10%	16	X7R
89	C1206C825K4RAC	1206	8.2µF	±10%	16	X7R
90	C1206C106K4RAC	1206	10µF	±10%	16	X7R
91	C1206C226M8PAC	1206	22µF	±20%	10	X5R
92	C1206C476M8PAC	1206	47µF	±20%	10	X5R
93	C1206C107M9PAC	1206	100µF	±20%	6.3	X5R

CERAMIC CHIP CAPACITOR ARRAYS

No.	Ordercode	Casesize	Cap.	Tol.	Volt	Dielec.
1	C1632C473K4RAC	1632	47nF	±10%	16	X7R
2	C1632C223K3RAC	1632	22nF	±10%	25	X7R
3	C1632C101K5GAC	1632	100pF	±10%	50	C0G
4	C1632C221K5GAC	1632	220pF	±10%	50	C0G
5	C1632C102K5RAC	1632	1nF	±10%	50	X7R
6	C1632C222K5RAC	1632	2.2nF	±10%	50	X7R
7	C1632C472K5RAC	1632	4.7nF	±10%	50	X7R