

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 Industries 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	Multiplier	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:

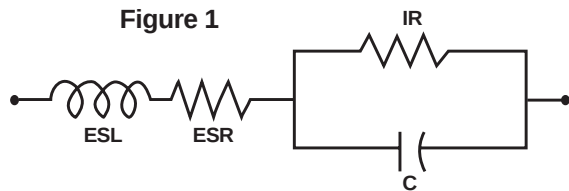
See tables on pages 47-50.

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.

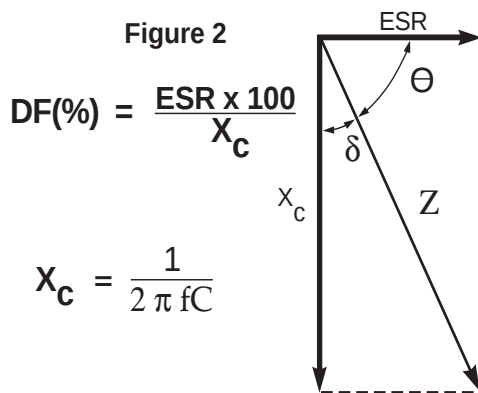
Like all other practical capacitors, multilayer ceramic capacitors also have resistance and inductance. A simplified schematic for the single frequency equivalent circuit is shown in Figure 1. At high frequency more complex models apply - see KEMET SPICE models at www.kemet.com for details.



C = Capacitance
ESL = Equivalent Series Inductance
ESR = Equivalent Series Resistance
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.



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 = $1/(2 \pi f C)$

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

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:	50 - 200 volts – 0.10% 25 volts – 0.10% 16 volts – ----- 6.3/10 volts – -----	2.5% 3.5% 3.5% 5.0%	4.0% 4.0% -----	5.0% 7.0% 7.0% 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 48 and 49.

reaches values which are impractical. Consequently, IR specifications usually include both a minimum RC product and a maximum limit based on the IR calculated 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 - 2.5%
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 as 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 usually delayed for at least 10 - 24 hours after the de-aging process, which is often referred to as the “last heat”. In addition, manu-

facturers utilize the aging rates to set factory test limits which will bring the capacitance within the specified tolerance at some future time, to allow for customer receipt and use.

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

11. Effect of Voltage:

C0G ceramic capacitors are not affected by variations in applied AC or DC voltages. For Class II and III ceramic capacitors (including X7R, X5R, Z5U and Y5V), variations in voltage affect the capacitance and dissipation factor. The application of DC voltages higher than 5 vdc reduces both the capacitance and dissipation factor. The application of AC voltages up to 10-20 vac tends to increase both capacitance and dissipation factor. At higher AC voltages, both capacitance and dissipation factor begin to decrease.

Typical curves showing the effect of applied AC and DC voltage are shown in Figure 7 for KEMET X7R capacitors, and Figure 8 for KEMET Z5U. See SPICE models on the KEMET website for further information.

12. Effect of Frequency:

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

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 and 6.

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 and Y5V).
See Table 4 on page 44 for limits.
15. **Humidity Test:**
EIA-198, Method 206, (Except 1000 hours, 85°C, 85% RH, Rated Voltage).
See Table 4 on page 44 for limits.
16. **Moisture Resistance:**
EIA-198, Method 204, Condition B (20 cycles with 50 volts applied.
See Table 4 on page 44 for limits.
17. **Solderability:**
EIA-198, Method 301 (245°, 5 secs, Sn62 solder) 95% smooth solder on terminations.
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 select-

ed 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

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.

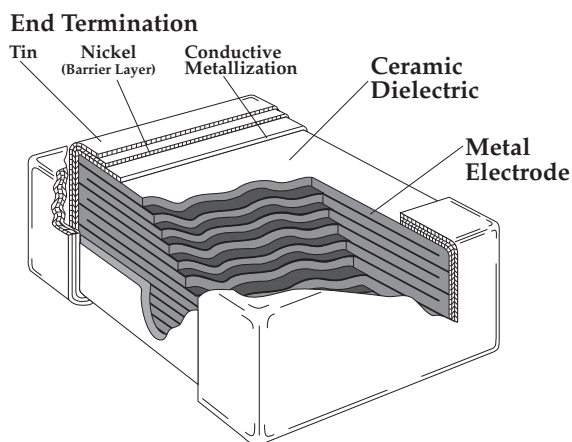
Additional information is also available - See your KEMET representative for details or post your questions to KEMET's homepage on the web <http://www.kemet.com>.

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/X5R	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
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.

CONSTRUCTION



TYPICAL PERFORMANCE CURVES (See SPICE models for specific ratings.)

EFFECT OF FREQUENCY

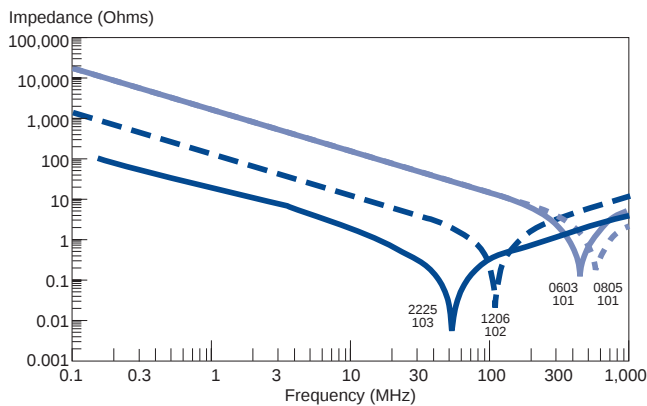


FIGURE 4. Impedance versus Frequency C0G Dielectric

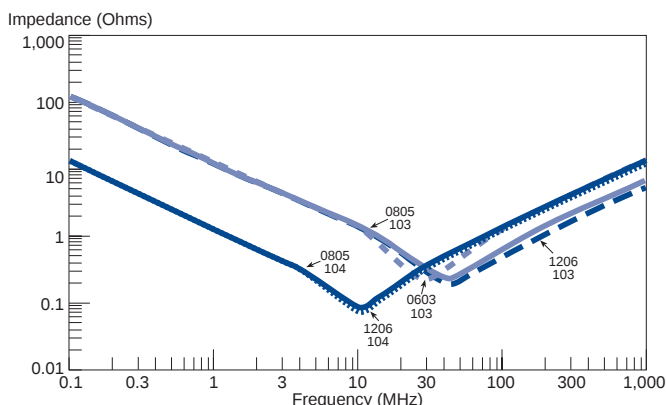


FIGURE 5 Impedance versus Frequency X7R Dielectric

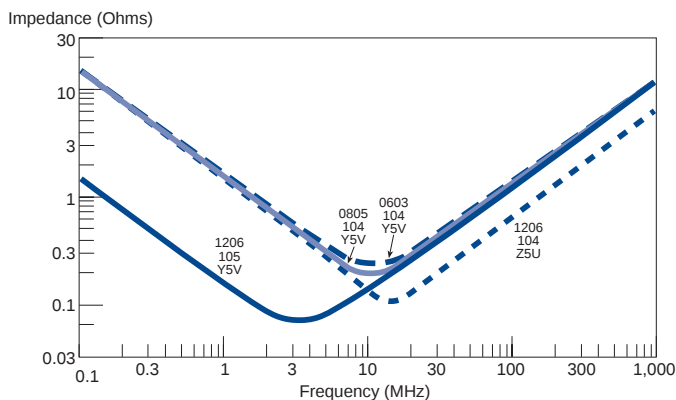


FIGURE 6. Impedance versus Frequency Z5U/Y5V Dielectric

EFFECT OF VOLTAGE

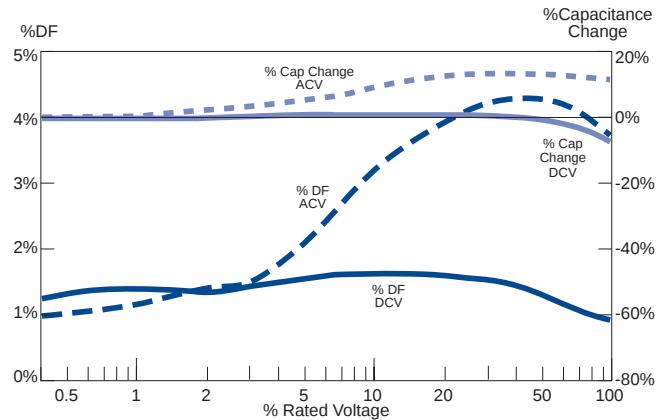


FIGURE 7. X7R Capacitance & DF versus Applied AC/DC Voltages

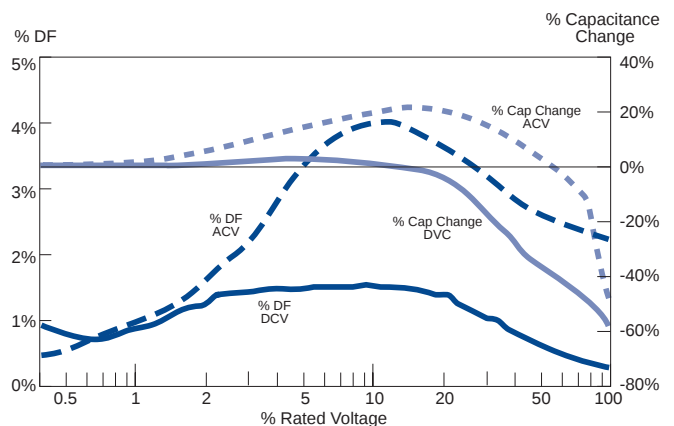
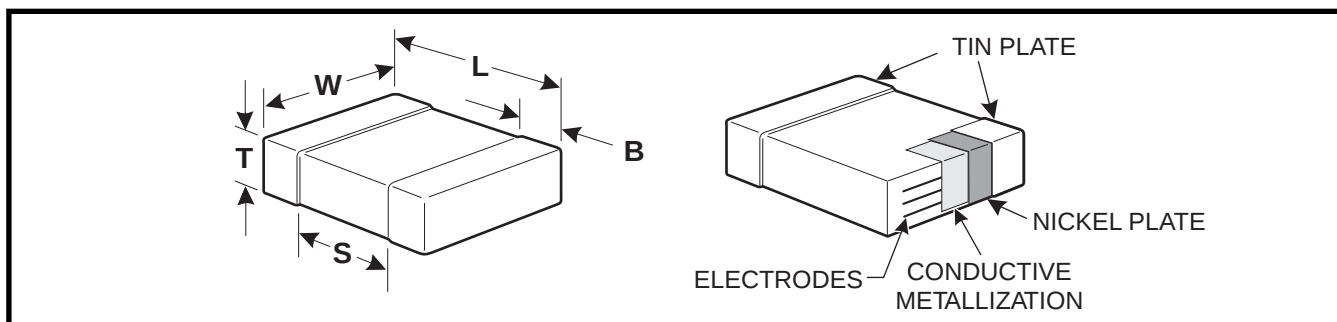


FIGURE 8. Z5U Capacitance & DF versus Applied AC/DC Voltages

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; $\pm 1\%$; $\pm 2\%$; $\pm 5\%$; $\pm 10\%$; $\pm 20\%$; and $+80\%$ - 20%
- Tape and reel packaging per EIA481-1. (See page 59 for specific tape and reel information.) Bulk Cassette packaging (0402, 0603, 0805 only) per IEC60286-6 and EIAJ 7201.

CAPACITOR OUTLINE DRAWINGS



DIMENSIONS—MILLIMETERS AND (INCHES)

EIA SIZE CODE	METRIC SIZE CODE (Ref only)	L # LENGTH	W # WIDTH	T (EIA) # THICKNESS MAX.	B BANDWIDTH	S MIN. SEPARATION	MOUNTING TECHNIQUE
0402*	1005	1.0 (.04) ± .05(.002)	0.5 (.02) ± .05 (.002)	0.55 (.022)	0.20 (0.008)-0.40 (0.016)	0.3 (.012)	Solder Reflow
0603*	1608	1.6 (.063) ± 0.15 (.006)	0.8 (.032) ± 0.15 (.006)	0.9 (.035)	0.35 (.014) ±0.15 (.006)	0.7 (.028)	Solder Wave ↑ or Solder Reflow
0805*	2012	2.0 (.079) ± 0.2 (.008)	1.25 (.049) ± 0.2 (.008)	1.3 (.051)	0.5 (.02) ±.25 (.010)	0.75 (.030)	
1206*	3216	3.2 (.126) ± 0.2 (.008)	1.6 (.063) ± 0.2 (.008)	1.5 (.059)	0.5 (.02) ±.25 (.010)	N/A	
1210*	3225	3.2 (.126) ± 0.2 (.008)	2.5 (.098) ± 0.2 (.008)	1.7 (.067)	0.5 (.02) ±.25 (.010)	N/A	
1812	4532	4.5 (.177) ± 0.3 (.012)	3.2 (.126) ± 0.3 (.012)	1.7 (.067)	0.6 (.024) ±.35 (.014)	N/A	
1825*	4564	4.5 (.177) ± 0.3 (.012)	6.4 (.252) ± 0.4 (.016)	1.7 (.067)	0.6 (.024) ±.35 (.014)	N/A	Solder Reflow
2220	5650	5.6 (.220) ± 0.4 (.016)	5.0 (.197) ± 0.4 (.016)	1.8 (.071)	0.6 (.024) ±.35 (.014)	N/A	
2225	5664	5.6 (.220) ± 0.4 (.016)	6.3 (.248) ± 0.4 (.016)	2.0 (.079)	0.6 (.024) ±.35 (.014)	N/A	

* Note: Indicates EIA Preferred Case Sizes (Tightened tolerances apply for 0402, 0603, and 0805 packaged in bulk cassette, see page 63.)

#Note: These thicknesses are EIA maximums. Most chips are considerably thinner. Consult factory for details. Also, some extended values may be slightly thicker than EIA maximums.

† For extended value 1210 case size – solder reflow only.

CAPACITOR ORDERING INFORMATION (Standard Chips - For Military see page 53)

CERAMIC _____ **C** **0805** **C** **10**

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 thru 9.9pF. Use 8 for 0.5 through 0.99pF)

(Example: 2.2pF = 229 or 0.50 pF = 508)

CAPACITANCE TOLERANCE

B – $\pm 0.10\text{pF}$	J – $\pm 5\%$
C – $\pm 0.25\text{pF}$	K – $\pm 10\%$
D – $\pm 0.5\text{pF}$	M – $\pm 20\%$
F – $\pm 1\%$	P – (GMV) – special order only
G – $\pm 2\%$	Z – $+80\%, -20\%$

- END METALLIZATION
C-Standard
(Tin-plated nickel barrier)
FAILURE RATE LEVEL
A- Not Applicable

TEMPERATURE CHARACTERISTIC
Designated by Capacitance
Change Over Temperature Range

- G – C0G (NP0) (± 30 PPM/ $^{\circ}$ C)
- R – X7R ($\pm 15\%$) (-55° C + 125° C)
- P – X5R ($\pm 15\%$) (-55° C + 85° C)
- U – Z5U ($+22\%$, -56%) ($+10^{\circ}$ C + 85° C)
- V – Y5V ($+22\%$, -82%) (-30° C + 85° C)

VOLTAGE

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

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

[illegible]

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.

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

CAP. PF	CAP. TOL.	C1210*			C1812*			C1825*			C2220			C2225		
		50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V
10	C,D J,K,M	100	100	100												
12	C,D J,K,M	120	120	120												
15	C,D G,J,K,M	150	150	150												
18	C,D G,J,K,M	180	180	180												
22	C,D G,J,K,M	220	220	220												
27	D,F,G,J,K,M	270	270	270												
33	D,F,G,J,K,M	330	330	330												
39	D,F,G,J,K,M	390	390	390												
47	D,F,G,J,K,M	470	470	470												
56	F,G,J,K,M	560	560	560												
68	F,G,J,K,M	680	680	680												
82	F,G,J,K,M	820	820	820												
100	F,G,J,K,M	101	101	101												
120	F,G,J,K,M	121	121	121												
150	F,G,J,K,M	151	151	151												
180	F,G,J,K,M	181	181	181												
220	F,G,J,K,M	221	221	221												
270	F,G,J,K,M	271	271	271												
330	F,G,J,K,M	331	331	331												
390	F,G,J,K,M	391	391	391												
470	F,G,J,K,M	471	471	471	471	471	471									
560	F,G,J,K,M	561	561	561	561	561	561									
680	F,G,J,K,M	681	681	681	681	681	681									
820	F,G,J,K,M	821	821	821	821	821	821									
1000	F,G,J,K,M	102	102	102	102	102	102									
1200	F,G,J,K,M	122	122	122	122	122	122									
1500	F,G,J,K,M	152	152	152	152	152	152									
1800	F,G,J,K,M	182	182	182	182	182	182									
2200	F,G,J,K,M	222	222	222	222	222	222									
2700	F,G,J,K,M	272	272	272	272	272	272									
3300	F,G,J,K,M	332	332	332	332	332	332									
3900	F,G,J,K,M	392	392	392	392	392	392	392	392	392						
4700	F,G,J,K,M	472	472	472	472	472	472	472	472	472				472	472	472
5600	F,G,J,K,M	562	562	562	562	562	562	562	562	562				562	562	562
6800	F,G,J,K,M	682	682	682	682	682	682	682	682	682	682	682	682	682	682	682
8200	F,G,J,K,M	822	822	822	822	822	822	822	822	822	822	822	822	822	822	822
10,000	F,G,J,K,M	103			103	103		103	103	103	103	103	103	103	103	103
12,000	F,G,J,K,M	123						123	123	123	123	123	123	123	123	123
15,000	F,G,J,K,M							153	153	153	153	153	153	153	153	153
18,000	F,G,J,K,M							183	183	183	183	183	183	183	183	183
22,000	F,G,J,K,M							223	223	223	223	223	223	223	223	223
27,000	F,G,J,K,M							273	273	273	273	273	273	273	273	273
33,000	F,G,J,K,M													333		

X7R CAPACITANCE RANGE – 0402, 0603, 0805, 1206

CAP PF	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	K,M,J	151	151	151	151	151																					
180	K,M,J	181	181	181	181	181	181	181	181	181	181	181	181	221	221	221	221	221	221	221							
220	K,M,J	221	221	221	221	221	221	221	221	221	221	221	221	271	271	271	271	271	271	271							
270	K,M,J	271	271	271	271	271	271	271	271	271	271	271	271	331	331	331	331	331	331	331							
330	K,M,J	331	331	331	331	331	331	331	331	331	331	331	331	391	391	391	391	391	391	391							
390	K,M,J	391	391	391	391	391	391	391	391	391	391	391	391	471	471	471	471	471	471	471							
470	K,M,J	471	471	471	471	471	471	471	471	471	471	471	471	561	561	561	561	561	561	561							
560	K,M,J	561	561	561	561	561	561	561	561	561	561	561	561	681	681	681	681	681	681	681							
680	K,M,J	681	681	681	681	681	681	681	681	681	681	681	681	821	821	821	821	821	821	821							
820	K,M,J	821	821	821	821	821	821	821	821	821	821	821	821	102	102	102	102	102	102	102							
1000	K,M,J	102	102	102	102	102	102	102	102	102	102	102	102	122	122	122	122	122	122	122	102						
1200	K,M,J	122	122	122	122	122	122	122	122	122	122	122	122	152	152	152	152	152	152	152	102	102					
1500	K,M,J	152	152	152	152	152	152	152	152	152	152	152	152	182	182	182	182	182	182	182	102	102	102				
1800	K,M,J	182	182	182	182	182	182	182	182	182	182	182	182	222	222	222	222	222	222	222	102	102	102	102			
2200	K,M,J	222	222	222	222	222	222	222	222	222	222	222	222	272	272	272	272	272	272	272	102	102	102	102	102		
2700	K,M,J	272	272	272	272	272	272	272	272	272	272	272	272	332	332	332	332	332	332	332	102	102	102	102	102	102	
3300	K,M,J	332	332	332	332	332	332	332	332	332	332	332	332	392	392	392	392	392	392	392	102	102	102	102	102	102	102
3900	K,M,J	392	392	392	392	392	392	392	392	392	392	392	392	472	472	472	472	472	472	472	102	102	102	102	102	102	102
4700	K,M,J	472	472	472	472	472	472	472	472	472	472	472	472	562	562	562	562	562	562	562	102	102	102	102	102	102	102
5600	K,M,J	562	562	562	562	562	562	562	562	562	562	562	562	682	682	682	682	682	682	682	102	102	102	102	102	102	102
6800	K,M,J	682	682	682	682	682	682	682	682	682	682	682	682	822	822	822	822	822	822	822	102	102	102	102	102	102	102
8200	K,M,J	822	822	822	822	822	822	822	822	822	822	822	822	103	103	103	103	103	103	103	102	102	102	102	102	102	102
10,000	K,M,J	103	103	103	103	103	103	103	103	103	103	103	103	123	123	123	123	123	123	123	102	102	102	102	102	102	102
12,000	K,M,J						123	123	123	123	123#			153	153	153	153	153	153	153	102	102	102	102	102	102	102
15,000	K,M,J						153	153	153	153	153#			183	183	183	183	183	183	183	102	102	102	102	102	102	102
18,000	K,M,J						183	183	183	183	183#			223	223	223	223	223	223	223	102	102	102	102	102	102	102
22,000	K,M,J						223	223	223	223	223#			273	273	273	273	273	273	273	102	102	102	102	102	102	102
27,000	K,M,J						273	273	273	273				333	333	333	333	333	333	333	102	102	102	102	102	102	102
33,000	K,M,J						333	333	333	333				393	393	393	393	393	393	393	102	102	102	102	102	102	102
39,000	K,M,J						393	393	393	393				473	473	473	473	473	473	473	102	102	102	102	102	102	102
47,000	K,M,J						473	473	473	473				563	563	563	563	563#	563	563	102	102	102	102	102	102	102
56,000	K,M,J						563	563	563	563				683	683	683	683	683#	683	683	102	102	102	102	102	102	102
68,000	K,M,J						683	683	683	683				823	823	823	823	823#	823	823	102	102	102	102	102	102	102
82,000	K,M,J						823	823	823	823				104	104	104	104	104#	104	104	102	102	102	102	102	102	102
100,000	K,M,J						104#	104#	104#	104#				124	124	124	124	124	124	124	102	102	102	102	102	102	102
120,000	K,M,J						124#	124#	124#	124#				154	154	154	154	154	154	154	102	102	102	102	102	102	102
150,000	K,M,J						154#	154#	154#	154#				184	184	184	184	184	184	184	102	102	102	102	102	102	102
180,000	K,M,J						184#	184#	184#	184#				224	224	224	224	224	224	224	102	102	102	102	102	102	102
220,000	K,M,J						224#	224#	224#	224#				274	274	274	274	274	274	274	102	102	102	102	102	102	102
270,000	K,M,J													334	334	334	334	334	334	334	102	102	102	102	102	102	102
330,000	K,M,J													394	394	394	394	394	394	394	102	102	102	102	102	102	102
390,000	K,M,J													474	474	474	474	474	474	474	102	102	102	102	102	102	102
470,000	K,M,J													564	564	564	564	564	564	564	102	102	102	102	102	102	102
560,000	K,M,J													684	684	684	684	684	684	684	102	102	102	102	102	102	102
680,000	K,M,J													824	824	824	824	824	824	824	102	102	102	102	102	102	102
820,000	K,M,J													105	105	105	105	105	105	105	105@	105@	105@	105@	105@	105@	105@
1,000,000	K,M,J																				105@	105@	105@	105@	105@	105@	105@
1,200,000	K,M,J																				125@	125@	125@	125@	125@	125@	125@
1,500,000	K,M,J																				155@	155@	155@	155@	155@	155@	155@
1,800,000	K,M,J																				185@	185@	185@	185@	185@	185@	185@
2,200,000	K,M,J																				225@	225@	225@	225@	225@	225@	225@

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

CAP. PF	CAP. TOL.	C1210*							C1812*			C1825*			C2220			C2225		
		6.3V	10V	16V	25V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V	50V	100V	200V
2200	K,M,J	222	222	222	222	222	222	222												
2700	K,M,J	272	272	272	272	272	272	272												
3300	K,M,J	332	332	332	332	332	332	332												
3900	K,M,J	392	392	392	392	392	392	392												
4700	K,M,J	472	472	472	472	472	472	472												
5600	K,M,J	562	562	562	562	562	562	562												
6800	K,M,J	682	682	682	682	682	682	682	682	682	682									
8200	K,M,J	822	822	822	822	822	822	822	822	822	822									
10,000	K,M,J	103	103	103	103	103	103	103	103	103	103									
12,000	K,M,J	123	123	123	123	123	123	123	123	123	123									
15,000	K,M,J	153	153	153	153	153	153	153	153	153	153									
18,000	K,M,J	183	183	183	183	183	183	183	183	183	183									
22,000	K,M,J	223	223	223	223	223	223	223	223	223	223	223	223	223						
27,000	K,M,J	273	273	273	273	273	273	273	273	273	273	273	273	273						
33,000	K,M,J	333	333	333	333	333	333	333	333	333	333	333	333	333						
39,000	K,M,J	393	393	393	393	393	393	393	393	393	393	393	393	393						
47,000	K,M,J	473	473	473	473	473	473	473	473	473	473	473	473	473				473	473	473
56,000	K,M,J	563	563	563	563	563	563	563	563	563	563	563	563	563				563	563	563
68,000	K,M,J	683	683	683	683	683	683	683	683	683	683	683	683	683				683	683	683
82,000	K,M,J	823	823	823	823	823	823	823	823	823	823	823	823	823				823	823	823
100,000	K,M,J	104	104	104	104	104	104	104	104	104	104	104	104	104				104	104	104
120,000	K,M,J	124	124	124	124	124	124	124	124	124	124	124	124	124				124	124	124
150,000	K,M,J	154	154	154	154	154	154	154	154	154	154	154	154	154				154	154	154
180,000	K,M,J	184	184	184	184	184	184	184	184	184	184	184	184	184				184	184	184
220,000	K,M,J	224	224	224	224	224	224	224	224	224	224	224	224	224				224	224	224
270,000	K,M,J	274	274	274	274	274#	274#	274#	274	274	274	274	274	274	274	274	274	274	274	274
330,000	K,M,J	334	334	334	334	334#	334#	334#	334	334	334	334	334	334	334	334	334	334	334	334
390,000	K,M,J	394	394	394	394	394#	394#	394#	394	394	394	394	394	394	394	394	394	394	394	394
470,000	K,M,J	474	474	474	474	474#	474#	474#	474	474	474	474	474	474	474	474	474	474	474	474
560,000	K,M,J	564	564	564	564	564#	564#	564#	564	564	564	564	564	564	564	564	564	564	564	564
680,000	K,M,J	684	684	684	684	684#	684#	684#	684	684	684	684	684	684	684	684	684	684	684	684
820,000	K,M,J	824	824	824	824	824#	824#	824#	824	824	824	824	824	824	824	824	824	824	824	824
1,000,000	K,M,J	105	105	105	105	105#	105#	105#	105	105	105	105	105	105	105	105	105	105	105	105
1,200,000	K,M,J	125	125	125	125															
1,500,000	K,M,J	155	155	155	155															
1,800,000	K,M,J	185	185	185																
2,200,000	K,M,J	225	225	225																
2,700,000	K,M,J	275	275	275																
3,300,000	K,M,J	335	335																	
3,900,000	K,M,J	395	395																	
4,700,000	K,M,J	475	475																	

* 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 for 63 volt applications.

Extended Range Values – Cap and DF measured @ 0.5 Vrms.

X5R CAPACITANCE RANGE

CAP. PF	CAP. TOL.	1206*			1210*			
		6.3V	10V	16V	6.3V	10V	16V	25V
1,500,000	K, M	155	155	155				
1,800,000	K, M	185	185	185			185	185
2,200,000	K, M	225	225	225			225	225
3,300,000	K, M	335	335	335			335	
4,700,000	K, M	475	475	475	475†	475†	475†	
6,800,000	K, M				685†	685†		
10,000,000	K, M				106†	106†		

* Indicates EIA preferred chip sizes.

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

† Reflow only

Z5U CAPACITANCE RANGE (KEMET's Z5U also meets Y5V Characteristics)

CAP. PF	CAP. TOL	C0805*		C1206*		C1210*		C1812*		C1825*		C2225	
		50V	100V	50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
6800	M,Z	682	682										
8200	M,Z	822	822										
10,000	M,Z	103	103	103	103								
12,000	M,Z	123		123	123								
15,000	M,Z	153		153	153								
18,000	M,Z	183		183	183								
22,000	M,Z	223		223	223								
27,000	M,Z	273		273	273								
33,000	M,Z	333		333	333								
39,000	M,Z	393		393	393								
47,000	M,Z	473		473		473	473						
56,000	M,Z	563		563		563	563						
68,000	M,Z	683		683		683	683						
82,000	M,Z	823		823		823	823	823	823				
100,000	M,Z	104		104		104		104	104				
120,000	M,Z			124		124		124	124				
150,000	M,Z			154		154		154	154				
180,000	M,Z			184		184				184	184		
220,000	M,Z			224		224				224	224		
270,000	M,Z					274				274	274		
330,000	M,Z					334				334	334	334	334
390,000	M,Z							394		394	394	394	394
470,000	M,Z							474		474	474	474	474
560,000	M,Z							564		564	564	564	564
680,000	M,Z							684		684	684	684	684
820,000	M,Z							824		824	824	824	824
1,000,000	M,Z							105		105	105	105	105
1,200,000	M,Z									125	125	125	125
1,500,000	M,Z									155	155	155	155
1,800,000	M,Z										185	185	185
2,200,000	M,Z											225	225

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

Y5V CAPACITANCE RANGE

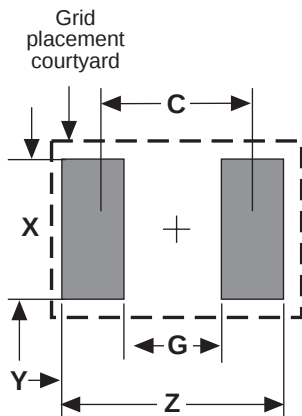
CAP. PF	CAP. TOL.	C0603*				C0805*					C1206*					C1210*				
		6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
22,000	M, Z	223	223	223	223	223	223	223	223	223										
33,000	M, Z	333	333	333	333	333	333	333	333	333										
47,000	M, Z	473	473	473	473	473	473	473	473	473										
68,000	M, Z	683	683	683	683	683	683	683	683	683										
100,000	M, Z	104	104	104	104	104	104	104	104	104										
150,000	M, Z	154	154	154	154	154	154	154	154	154										
220,000	M, Z	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
330,000	M, Z					334	334	334	334	334	334	334	334	334	334	334	334	334	334	334
470,000	M, Z					474	474	474	474	474	474	474	474	474	474	474	474	474	474	474
680,000	M, Z					684	684	684	684	684	684	684	684	684	684	684	684	684	684	684
1,000,000	M, Z					105	105	105			105	105	105	105	105	105	105	105	105	105
2,200,000	M, Z										225	225	225			225	225	225		
3,300,000	M, Z										335	335	335			335	335	335		
4,700,000	M, Z										475	475	475			475†	475†	475†		
6,800,000																685†	685†	685†		
10,000,000																106†	106†	106†		

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

SURFACE MOUNT LAND DIMENSIONS - CERAMIC CHIP CAPACITORS - MM



Dimension	Reflow Solder						Wave Solder				
	Z	G	X	Y(ref)	C(ref)		Z	G	X	Y(ref)	Smin
0402	2.14	0.28	0.74	0.93	1.21						
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		6.30	2.30	2.60	2.00	4.30
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

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

Capacitor Outline Drawing

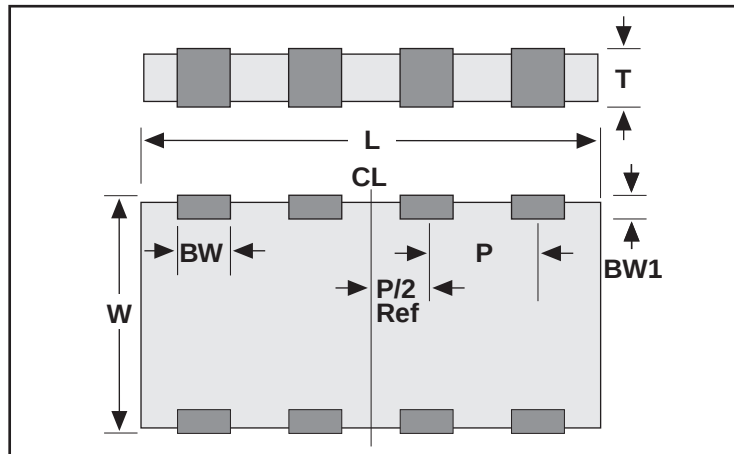


Table 1
EIA Dimensions – Millimeters (Inches)

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

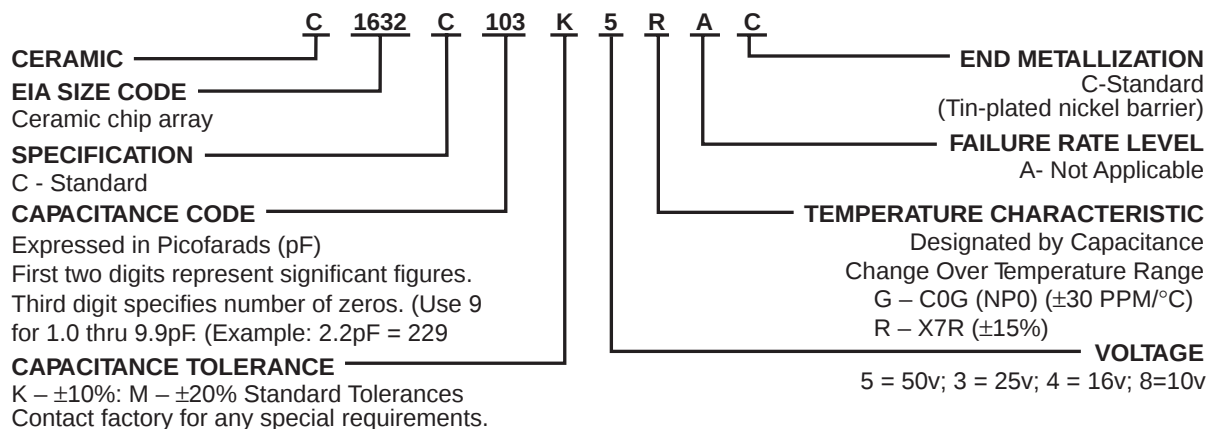


Table 2a
C0G Dielectric – Capacitance Range

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		

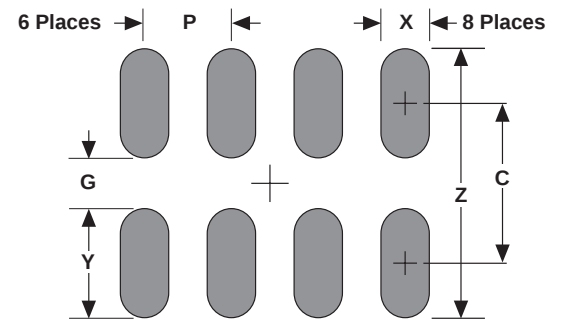
- (1) To complete the KEMET part number, insert the alpha code for the tolerance desired.
K = ±10% and M = ±20% – standard tolerance. Contact factory for any special requirements.
(2) To complete the KEMET part number, insert appropriate number for voltage desired:
"5" = 50 volts, "3" = 25 volts, "4" = 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	Z	G	X	Y(ref)	C(ref)
3216	2.80	0.40	0.52	1.20	1.60

Calculation Formula

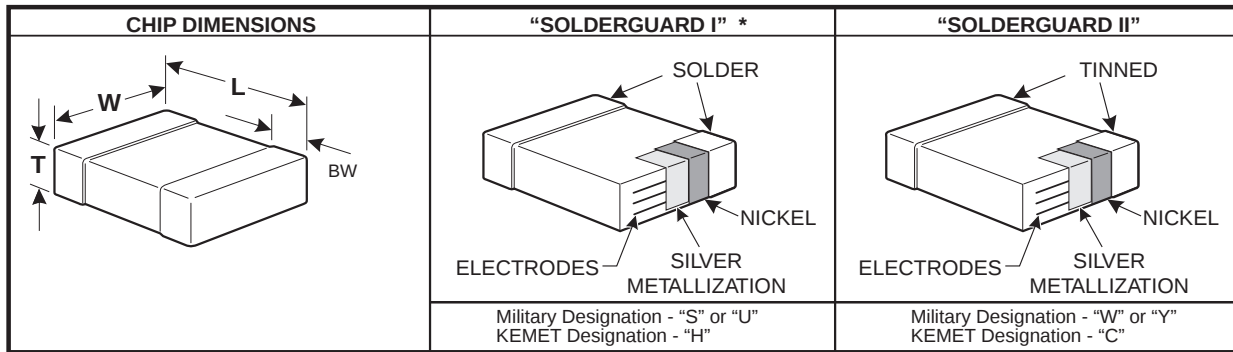
$$Z = L_{min} + 2J_t + T_t$$

$$G = S_{max} - 2J_h - T_h$$

$$X = W_{min} + 2J_s + T_s$$

T_t, T_h, T_s = Combined tolerances

CAPACITOR OUTLINE DRAWINGS



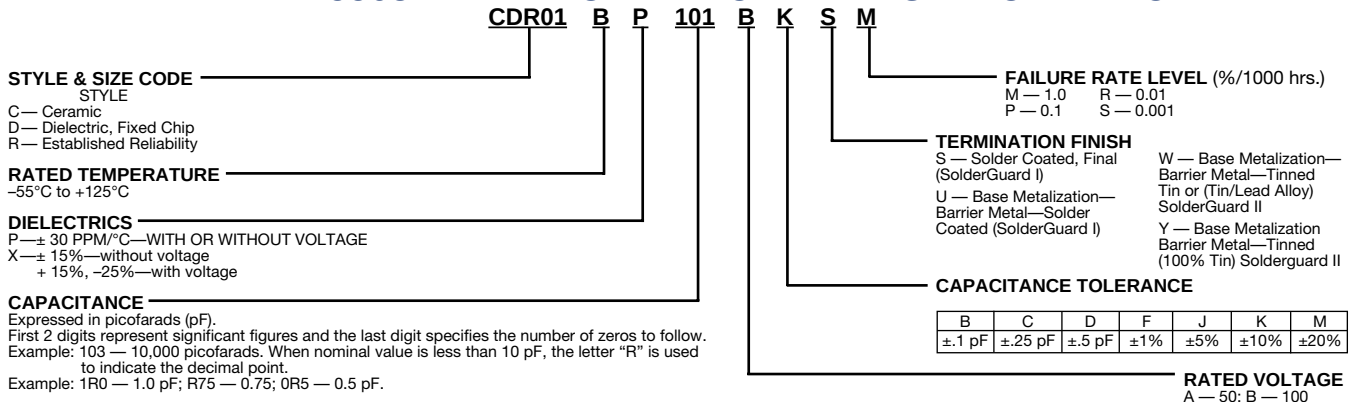
DIMENSIONS—MILLIMETERS AND (INCHES)

STYLE	KEMET SIZE CODE	L	W	T		BW
				MIN.	MAX.	
CDR01	C0805	2.03 ±.38 (.080 ±.015)	1.27 ±.38 (.050 ±.015)	.56 (.022)	1.40 (.055)	.51 ± 0.25 (.020 ±.010)
CDR02	C1805	4.57 ±.38 (.180 ±.015)	1.27 ±.38 (.050 ±.015)	.56 (.022)	1.40 (.055)	.51 ± 0.25 (.020 ±.010)
CDR03	C1808	4.57 ±.38 (.180 ±.015)	2.03 ±.38 (.080 ±.015)	.56 (.022)	2.03 (.080)	.51 ± 0.25 (.020 ±.010)
CDR04	C1812	4.57 ±.38 (.180 ±.015)	3.18 ±.38 (.125 ±.015)	.56 (.022)	2.03 (.080)	.51 ± 0.25 (.020 ±.010)
CDR05	C1825	4.57 $\left(\begin{smallmatrix} +.51 \\ .180 \\ -.38 \end{smallmatrix} \right)$ $\left(\begin{smallmatrix} +.020 \\ .180 \\ -.015 \end{smallmatrix} \right)$	6.35 $\left(\begin{smallmatrix} +.51 \\ .250 \\ -.38 \end{smallmatrix} \right)$ $\left(\begin{smallmatrix} +.020 \\ .250 \\ -.015 \end{smallmatrix} \right)$	.51 (.020)	2.03 (.080)	.51 ± 0.25 (.020 ±.010)
CDR06	C2225	5.72 ±.51 (.225 ±.020)	6.35 ±.51 (.250 ±.020)	.51 (.020)	2.03 (.080)	.51 ± 0.25 (.020 ±.010)
CDR31	C0805	2.00 ±.20 (.078 ±.008)	1.25 ±.20 (.049 ±.008)		1.30 (.051)	.50 ± 0.20 (.020 ±.008)
CDR32	C1206	3.20 ±.20 (.125 ±.008)	1.60 ±.20 (.062 ±.008)		1.30 (.051)	.50 ± 0.20 (.020 ±.008)
CDR33	C1210	3.20 ±.25 (.125 ±.010)	2.50 ±.25 (.098 ±.010)		1.50 (.059)	.50 ± 0.25 (.020 ±.010)
CDR34	C1812	4.50 ±.25 (.176 ±.010)	3.20 ±.25 (.125 ±.010)		1.50 (.059)	.50 ± 0.25 (.020 ±.010)
CDR35	C1825	4.50 ±.30 (.176 ±.012)	6.40 ±.30 (.250 ±.012)		1.50 (.059)	.50 ± 0.30 (.020 ±.012)

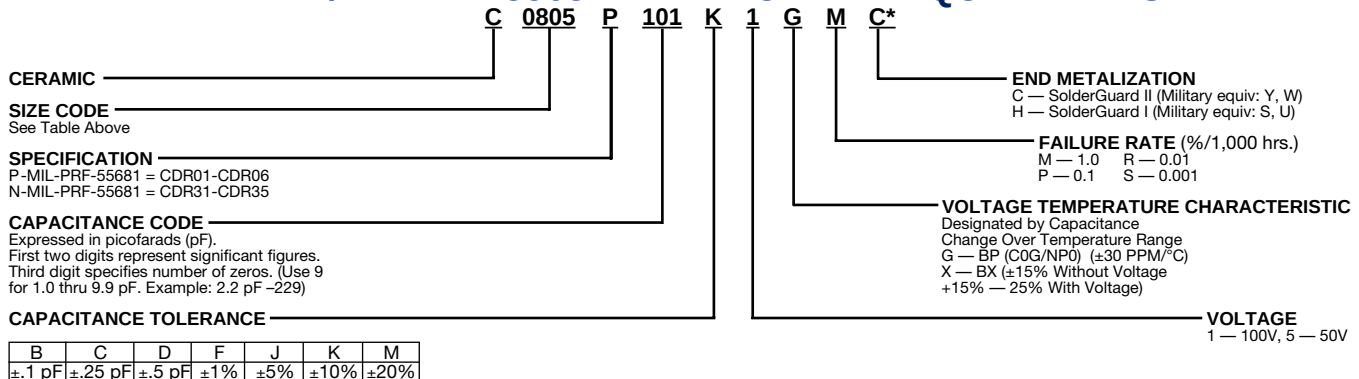
Note: For Solderguard I (MIL-C55681 "S" or "U" Endmets), the length, width and thickness positive tolerances (including bandwidth) cited above are allowed to increase by the following amounts:

	Length	Width/Thickness
CDR01	0.51MM (.020)	0.38MM (.015)
CDR02-06	0.64MM (.025)	0.38MM (.015)
CDR31-35	0.60MM (.023)	0.30MM (.012)

MIL-PRF-55681 PART NUMBER ORDERING INFORMATION



KEMET/MIL-PRF-55681 PART NUMBER EQUIVALENTS



* Part Number Example: C0805P101K1GMC (14 digits - no spaces)

KEMET Electronics Corporation, P.O. Box 5928, Greenville, S.C. 29606, (864) 963-6300

RATINGS & PART NUMBER REFERENCE

CHARACTERISTIC	CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — C0805 SIZE (MILITARY CDR01)				
BP	10	J,K	C0805P100(3)1G(4)C	CDR01BP100B(3)W(4)
	12	J	C0805P120J1G(4)C	CDR01BP120BJW(4)
	15	J,K	C0805P150(3)1G(4)C	CDR01BP150B(3)W(4)
	18	J	C0805P180J1G(4)C	CDR01BP180BJW(4)
	22	J,K	C0805P220(3)1G(4)C	CDR01BP220B(3)W(4)
	27	J	C0805P270J1G(4)C	CDR01BP270BJW(4)
	33	J,K	C0805P330(3)1G(4)C	CDR01BP330B(3)W(4)
	39	J	C0805P390J1G(4)C	CDR01BP390BJW(4)
	47	J,K	C0805P470(3)1G(4)C	CDR01BP470B(3)W(4)
	56	J	C0805P560J1G(4)C	CDR01BP560BJW(4)
BP or BX	68	J,K	C0805P680(3)1G(4)C	CDR01BP680B(3)W(4)
	82	J	C0805P820J1G(4)C	CDR01BP820BJW(4)
	100	J,K	C0805P101(3)1G(4)C	CDR01BP101B(3)W(4)
	120	J,K	C0805P121(3)1(2)(4)C	CDR01B(1)121B(3)W(4)
	150	J,K	C0805P151(3)1(2)(4)C	CDR01B(1)151B(3)W(4)
	180	J,K	C0805P181(3)1(2)(4)C	CDR01B(1)181B(3)W(4)
	220	K,M	C0805P221(3)1X(4)C	CDR01BX221B(3)W(4)
	270	K	C0805P271K1X(4)C	CDR01BX271BKW(4)
	330	K,M	C0805P331(3)1X(4)C	CDR01BX331B(3)W(4)
	390	K	C0805P391K1X(4)C	CDR01BX391BKW(4)
BX	470	K,M	C0805P471(3)1X(4)C	CDR01BX471B(3)W(4)
	560	K	C0805P561K1X(4)C	CDR01BX561BKW(4)
	680	K,M	C0805P681(3)1X(4)C	CDR01BX681B(3)W(4)
	820	K	C0805P821K1X(4)C	CDR01BX821BKW(4)
	1,000	K,M	C0805P102(3)1X(4)C	CDR01BX102B(3)W(4)
	1,200	K	C0805P122K1X(4)C	CDR01BX122BKW(4)
	1,500	K,M	C0805P152(3)1X(4)C	CDR01BX152B(3)W(4)
	1,800	K	C0805P182K1X(4)C	CDR01BX182BKW(4)
	2,200	K,M	C0805P222(3)1X(4)C	CDR01BX222B(3)W(4)
	2,700	K	C0805P272K1X(4)C	CDR01BX272BKW(4)
BX	3,300	K,M	C0805P332(3)1X(4)C	CDR01BX332B(3)W(4)
	50 Volt — C0805 SIZE (MILITARY CDR01)			
	3,900	K	C0805P392K5X(4)C	CDR01BX392AKW(4)
	4,700	K,M	C0805P472(3)5X(4)C	CDR01BX472A(3)W(4)
	100 Volt — C1805 SIZE (MILITARY CDR02)			
	220	J,K	C1805P221(3)1G(4)C	CDR02BP221B(3)W(4)
	270	J	C1805P271J1G(4)C	CDR02BP271BJW(4)
	3,900	K	C1805P392K1X(4)C	CDR02BX392BKW(4)
	4,700	K,M	C1805P472(3)1X(4)C	CDR02BX472B(3)W(4)
	5,600	K	C1805P562K1X(4)C	CDR02BX562BKW(4)
BX	6,800	K,M	C1805P682(3)1X(4)C	CDR02BX682B(3)W(4)
	8,200	K	C1805P822K1X(4)C	CDR02BX822BKW(4)
	10,000	K,M	C1805P103(3)1X(4)C	CDR02BX103B(3)W(4)
	50 Volt — C1805 SIZE (MILITARY CDR02)			
	12,000	K	C1805P123K5X(4)C	CDR02BX123AKW(4)
	15,000	K,M	C1805P153(3)5X(4)C	CDR02BX153A(3)W(4)
	18,000	K	C1805P183K5X(4)C	CDR02BX183AKW(4)
	22,000	K,M	C1805P223(3)5X(4)C	CDR02BX223A(3)W(4)
	100 Volt — C1808 SIZE (MILITARY CDR03)			
	330	J,K	C1808P331(3)1G(4)C	CDR03BP331B(3)W(4)
BP	390	J	C1808P391J1G(4)C	CDR03BP391BJW(4)
	470	J,K	C1808P471(3)1G(4)C	CDR03BP471B(3)W(4)

CHARACTERISTIC	CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — C1808 SIZE (MILITARY CDR03) (Cont'd)				
BP	560	J	C1808P561J1G(4)C	CDR03BP561BJW(4)
	680	J,K	C1808P681(3)1G(4)C	CDR03BP681B(3)W(4)
	820	J	C1808P821J1G(4)C	CDR03BP821BJW(4)
	1,000	J,K	C1808P102(3)1G(4)C	CDR03BP102B(3)W(4)
BX	12,000	K	C1808P123K1X(4)C	CDR03BX123BKW(4)
	15,000	K,M	C1808P153(3)1X(4)C	CDR03BX153B(3)W(4)
	18,000	K	C1808P183K1X(4)C	CDR03BX183BKW(4)
	22,000	K,M	C1808P223(3)1X(4)C	CDR03BX223B(3)W(4)
	27,000	K	C1808P273K1X(4)C	CDR03BX273BKW(4)
	33,000	K,M	C1808P333(3)1X(4)C	CDR03BX333B(3)W(4)
50 Volt — C1808 SIZE (MILITARY CDR03)				
BX	39,000	K	C1808P393K5X(4)C	CDR03BX393AKW(4)
	47,000	K,M	C1808P473(3)5X(4)C	CDR03BX473A(3)W(4)
	56,000	K	C1808P563K5X(4)C	CDR03BX563AKW(4)
	68,000	K,M	C1808P683(3)5X(4)C	CDR03BX683A(3)W(4)
100 Volt — C1812 SIZE (MILITARY CDR04)				
BP	1,200	J	C1812P122J1G(4)C	CDR04BP122BJW(4)
	1,500	J,K	C1812P152(3)1G(4)C	CDR04BP152B(3)W(4)
	1,800	J	C1812P182J1G(4)C	CDR04BP182BJW(4)
	2,200	J,K	C1812P222(3)1G(4)C	CDR04BP222B(3)W(4)
	2,700	J	C1812P272J1G(4)C	CDR04BP272BJW(4)
	3,300	J,K	C1812P332(3)1G(4)C	CDR04BP332B(3)W(4)
BX	39,000	K	C1812P393K1X(4)C	CDR04BX393BKW(4)
	47,000	K,M	C1812P473(3)1X(4)C	CDR04BX473B(3)W(4)
	56,000	K	C1812P563K1X(4)C	CDR04BX563BKW(4)
	50 Volt — C1812 SIZE (MILITARY CDR04)			
BX	82,000	K	C1812P823K5X(4)C	CDR04BX823AKW(4)
	100,000	K,M	C1812P104(3)5X(4)C	CDR04BX104A(3)W(4)
	120,000	K	C1812P124K5X(4)C	CDR04BX124AKW(4)
	150,000	K,M	C1812P154(3)5X(4)C	CDR04BX154A(3)W(4)
	180,000	K	C1812P184K5X(4)C	CDR04BX184AKW(4)
	100 Volt — C1825 SIZE (MILITARY CDR05)			
BP	3,900	J,K	C1825P392(3)1G(4)C	CDR05BP392B(3)W(4)
	4,700	J,K	C1825P472(3)1G(4)C	CDR05BP472B(3)W(4)
	5,600	J,K	C1825P562(3)1G(4)C	CDR05BP562B(3)W(4)
BX	68,000	K,M	C1825P683(3)1X(4)C	CDR05BX683B(3)W(4)
	82,000	K	C1825P823K1X(4)C	CDR05BX823BKW(4)
	100,000	K,M	C1825P104(3)1X(4)C	CDR05BX104B(3)W(4)
	120,000	K	C1825P124K1X(4)C	CDR05BX124BKW(4)
	150,000	K,M	C1825P154(3)1X(4)C	CDR05BX154B(3)W(4)
50 Volt — C1825 SIZE (MILITARY CDR05)				
BX	220,000	K,M	C1825P224(3)5X(4)C	CDR05BX224A(3)W(4)
	270,000	K	C1825P274K5X(4)C	CDR05BX274AKW(4)
	330,000	K,M	C1825P334(3)5X(4)C	CDR05BX334A(3)W(4)
100 Volt — C2225 SIZE (MILITARY CDR06)				
BP	6,800	J,K	C2225P682(3)1G(4)C	CDR06BP682B(3)W(4)
	8,200	J,K	C2225P822(3)1G(4)C	CDR06BP822B(3)W(4)
	10,000	J,K	C2225P103(3)1G(4)C	CDR06BP103B(3)W(4)
50 Volt — C2225 SIZE (MILITARY CDR06)				
BX	390,000	K	C2225P394K5X(4)C	CDR06BX394AKW(4)
	470,000	K,M	C2225P474(3)5X(4)C	CDR06BX474A(3)W(4)

- (1) To complete Part Number for Dielectric, insert P or X symbol – as defined by Military specification.
- (2) To complete Part Number for Dielectric, insert G or X symbol. ("G" for Military "BP," or "X" for Military "BX.")
- (3) To complete Part Number, insert Capacitance Tolerance Symbol (when applicable) as available in MIL-PRF-55681: B – ± 0.1 pF, C – ± 0.25 pF, D – ± 0.5 pF, F – $\pm 1\%$, J – $\pm 5\%$, K – $\pm 10\%$, M – $\pm 20\%$. **NOTE: Available tolerances are listed in columns above.**
- (4) To complete Part Number, insert Failure Rate Symbol: M – 1.0%; P – 0.1%; R – 0.01%; S – .001%.

Note: All MIL-PRF-55681 and KEMET Part Numbers tabulated above assume use of Solderguard II (MIL-PRF-55681 "W"; KEMET "C") end metalization. If MIL-PRF-55681 "U" or "S" (KEMET "H") or MIL-PRF-55681 "Y" (KEMET "C") is required, please change designators accordingly.

RATINGS & PART NUMBER REFERENCE

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BP — C0805 SIZE (MILITARY CDR31)			
1.0	B,C	C0805N109(3)1G(4)C	CDR31BP1R0B(3)W(4)
1.1	B,C	C0805N119(3)1G(4)C	CDR31BP1R1B(3)W(4)
1.2	B,C	C0805N129(3)1G(4)C	CDR31BP1R2B(3)W(4)
1.3	B,C	C0805N139(3)1G(4)C	CDR31BP1R3B(3)W(4)
1.5	B,C	C0805N159(3)1G(4)C	CDR31BP1R5B(3)W(4)
1.6	B,C	C0805N169(3)1G(4)C	CDR31BP1R6B(3)W(4)
1.8	B,C	C0805N189(3)1G(4)C	CDR31BP1R8B(3)W(4)
2.0	B,C	C0805N209(3)1G(4)C	CDR31BP2R0B(3)W(4)
2.2	B,C	C0805N229(3)1G(4)C	CDR31BP2R2B(3)W(4)
2.4	B,C	C0805N249(3)1G(4)C	CDR31BP2R4B(3)W(4)
2.7	B,C,D	C0805N279(3)1G(4)C	CDR31BP2R7B(3)W(4)
3.0	B,C,D	C0805N309(3)1G(4)C	CDR31BP3R0B(3)W(4)
3.3	B,C,D	C0805N339(3)1G(4)C	CDR31BP3R3B(3)W(4)
3.6	B,C,D	C0805N369(3)1G(4)C	CDR31BP3R6B(3)W(4)
3.9	B,C,D	C0805N399(3)1G(4)C	CDR31BP3R9B(3)W(4)
4.3	B,C,D	C0805N439(3)1G(4)C	CDR31BP4R3B(3)W(4)
4.7	B,C,D	C0805N479(3)1G(4)C	CDR31BP4R7B(3)W(4)
5.1	B,C,D	C0805N519(3)1G(4)C	CDR31BP5R1B(3)W(4)
5.6	B,C,D	C0805N569(3)1G(4)C	CDR31BP5R6B(3)W(4)
6.2	B,C,D	C0805N629(3)1G(4)C	CDR31BP6R2B(3)W(4)
6.8	B,C,D	C0805N689(3)1G(4)C	CDR31BP6R8B(3)W(4)
7.5	B,C,D	C0805N759(3)1G(4)C	CDR31BP7R5B(3)W(4)
8.2	B,C,D	C0805N829(3)1G(4)C	CDR31BP8R2B(3)W(4)
9.1	B,C,D	C0805N919(3)1G(4)C	CDR31BP9R1B(3)W(4)
10	F,J,K	C0805N100(3)1G(4)C	CDR31BP100B(3)W(4)
11	F,J,K	C0805N110(3)1G(4)C	CDR31BP110B(3)W(4)
12	F,J,K	C0805N120(3)1G(4)C	CDR31BP120B(3)W(4)
13	F,J,K	C0805N130(3)1G(4)C	CDR31BP130B(3)W(4)
15	F,J,K	C0805N150(3)1G(4)C	CDR31BP150B(3)W(4)
16	F,J,K	C0805N160(3)1G(4)C	CDR31BP160B(3)W(4)
18	F,J,K	C0805N180(3)1G(4)C	CDR31BP180B(3)W(4)
20	F,J,K	C0805N200(3)1G(4)C	CDR31BP200B(3)W(4)
22	F,J,K	C0805N220(3)1G(4)C	CDR31BP220B(3)W(4)
24	F,J,K	C0805N240(3)1G(4)C	CDR31BP240B(3)W(4)
27	F,J,K	C0805N270(3)1G(4)C	CDR31BP270B(3)W(4)
30	F,J,K	C0805N300(3)1G(4)C	CDR31BP300B(3)W(4)
33	F,J,K	C0805N330(3)1G(4)C	CDR31BP330B(3)W(4)
36	F,J,K	C0805N360(3)1G(4)C	CDR31BP360B(3)W(4)
39	F,J,K	C0805N390(3)1G(4)C	CDR31BP390B(3)W(4)
43	F,J,K	C0805N430(3)1G(4)C	CDR31BP430B(3)W(4)
47	F,J,K	C0805N470(3)1G(4)C	CDR31BP470B(3)W(4)
51	F,J,K	C0805N510(3)1G(4)C	CDR31BP510B(3)W(4)
56	F,J,K	C0805N560(3)1G(4)C	CDR31BP560B(3)W(4)
62	F,J,K	C0805N620(3)1G(4)C	CDR31BP620B(3)W(4)
68	F,J,K	C0805N680(3)1G(4)C	CDR31BP680B(3)W(4)
75	F,J,K	C0805N750(3)1G(4)C	CDR31BP750B(3)W(4)
82	F,J,K	C0805N820(3)1G(4)C	CDR31BP820B(3)W(4)

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BP — C0805 SIZE (MILITARY CDR31)			
91	F,J,K	C0805N910(3)1G(4)C	CDR31BP910B(3)W(4)
100	F,J,K	C0805N101(3)1G(4)C	CDR31BP101B(3)W(4)
110	F,J,K	C0805N111(3)1G(4)C	CDR31BP111B(3)W(4)
120	F,J,K	C0805N121(3)1G(4)C	CDR31BP121B(3)W(4)
130	F,J,K	C0805N131(3)1G(4)C	CDR31BP131B(3)W(4)
150	F,J,K	C0805N151(3)1G(4)C	CDR31BP151B(3)W(4)
160	F,J,K	C0805N161(3)1G(4)C	CDR31BP161B(3)W(4)
180	F,J,K	C0805N181(3)1G(4)C	CDR31BP181B(3)W(4)
200	F,J,K	C0805N201(3)1G(4)C	CDR31BP201B(3)W(4)
220	F,J,K	C0805N221(3)1G(4)C	CDR31BP221B(3)W(4)
240	F,J,K	C0805N241(3)1G(4)C	CDR31BP241B(3)W(4)
270	F,J,K	C0805N271(3)1G(4)C	CDR31BP271B(3)W(4)
300	F,J,K	C0805N301(3)1G(4)C	CDR31BP301B(3)W(4)
330	F,J,K	C0805N331(3)1G(4)C	CDR31BP331B(3)W(4)
360	F,J,K	C0805N361(3)1G(4)C	CDR31BP361B(3)W(4)
390	F,J,K	C0805N391(3)1G(4)C	CDR31BP391B(3)W(4)
430	F,J,K	C0805N431(3)1G(4)C	CDR31BP431B(3)W(4)
470	F,J,K	C0805N471(3)1G(4)C	CDR31BP471B(3)W(4)
50 Volt — BP — C0805 SIZE (MILITARY CDR31)			
510	F,J,K	C0805N511(3)5G(4)C	CDR31BP511A(3)W(4)
560	F,J,K	C0805N561(3)5G(4)C	CDR31BP561A(3)W(4)
620	F,J,K	C0805N621(3)5G(4)C	CDR31BP621A(3)W(4)
680	F,J,K	C0805N681(3)5G(4)C	CDR31BP681A(3)W(4)
100 Volt — BX — C0805 SIZE (MILITARY CDR31)			
470	K,M	C0805N471(3)1X(4)C	CDR31BX471B(3)W(4)
560	K,M	C0805N561(3)1X(4)C	CDR31BX561B(3)W(4)
680	K,M	C0805N681(3)1X(4)C	CDR31BX681B(3)W(4)
820	K,M	C0805N821(3)1X(4)C	CDR31BX821B(3)W(4)
1,000	K,M	C0805N102(3)1X(4)C	CDR31BX102B(3)W(4)
1,200	K,M	C0805N122(3)1X(4)C	CDR31BX122B(3)W(4)
1,500	K,M	C0805N152(3)1X(4)C	CDR31BX152B(3)W(4)
1,800	K,M	C0805N182(3)1X(4)C	CDR31BX182B(3)W(4)
2,200	K,M	C0805N222(3)1X(4)C	CDR31BX222B(3)W(4)
2,700	K,M	C0805N272(3)1X(4)C	CDR31BX272B(3)W(4)
3,300	K,M	C0805N332(3)1X(4)C	CDR31BX332B(3)W(4)
3,900	K,M	C0805N392(3)1X(4)C	CDR31BX392B(3)W(4)
4,700	K,M	C0805N472(3)1X(4)C	CDR31BX472B(3)W(4)
50 Volt — BX — C0805 SIZE (MILITARY CDR31)			
5,600	K,M	C0805N562(3)5X(4)C	CDR31BX562A(3)W(4)
6,800	K,M	C0805N682(3)5X(4)C	CDR31BX682A(3)W(4)
8,200	K,M	C0805N822(3)5X(4)C	CDR31BX822A(3)W(4)
10,000	K,M	C0805N103(3)5X(4)C	CDR31BX103A(3)W(4)
12,000	K,M	C0805N123(3)5X(4)C	CDR31BX123A(3)W(4)
15,000	K,M	C0805N153(3)5X(4)C	CDR31BX153A(3)W(4)
18,000	K,M	C0805N183(3)5X(4)C	CDR31BX183A(3)W(4)

- (1) To complete Part Number for Dielectric, insert P or X symbol – as defined by Military specification.
- (2) To complete Part Number for Dielectric, insert G or X symbol. ("G" for Military "BP," or "X" for Military "BX.")
- (3) To complete Part Number, insert Capacitance Tolerance Symbol (when applicable) as available in MIL-PRF-55681: B – ± 0.1 pF, C – ± 0.25 pF, D – ± 0.5 pF, F – $\pm 1\%$, J – $\pm 5\%$, K – $\pm 10\%$, M – $\pm 20\%$. **NOTE: Available tolerances are listed in columns above.**
- (4) To complete Part Number, insert Failure Rate Symbol: M – 1.0%; P – 0.1%; R – 0.01%; S – 0.001%.

Note: All MIL-PRF-55681 and KEMET Part Numbers tabulated above assume use of Solderguard II (MIL-PRF-55681 "W"; KEMET "C") end metal-ization. If MIL-PRF-55681 "U" or "S" (KEMET "H") or MIL-PRF-55681 "Y" (KEMET "C") is required, please change designators accordingly.

MARKING

See page 63 for MIL-PRF-55681 Marking

RATINGS & PART NUMBER REFERENCE

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BP — C1206 SIZE (MILITARY CDR32)			
1.0	B,C	C1206N109(3)1G(4)C	CDR32BP1R0B(3)W(4)
1.1	B,C	C1206N119(3)1G(4)C	CDR32BP1R1B(3)W(4)
1.2	B,C	C1206N129(3)1G(4)C	CDR32BP1R2B(3)W(4)
1.3	B,C	C1206N139(3)1G(4)C	CDR32BP1R3B(3)W(4)
1.5	B,C	C1206N159(3)1G(4)C	CDR32BP1R5B(3)W(4)
1.6	B,C	C1206N169(3)1G(4)C	CDR32BP1R6B(3)W(4)
1.8	B,C	C1206N189(3)1G(4)C	CDR32BP1R8B(3)W(4)
2.0	B,C	C1206N209(3)1G(4)C	CDR32BP2R0B(3)W(4)
2.2	B,C	C1206N229(3)1G(4)C	CDR32BP2R2B(3)W(4)
2.4	B,C	C1206N249(3)1G(4)C	CDR32BP2R4B(3)W(4)
2.7	B,C,D	C1206N279(3)1G(4)C	CDR32BP2R7B(3)W(4)
3.0	B,C,D	C1206N309(3)1G(4)C	CDR32BP3R0B(3)W(4)
3.3	B,C,D	C1206N339(3)1G(4)C	CDR32BP3R3B(3)W(4)
3.6	B,C,D	C1206N369(3)1G(4)C	CDR32BP3R6B(3)W(4)
3.9	B,C,D	C1206N399(3)1G(4)C	CDR32BP3R9B(3)W(4)
4.3	B,C,D	C1206N439(3)1G(4)C	CDR32BP4R3B(3)W(4)
4.7	B,C,D	C1206N479(3)1G(4)C	CDR32BP4R7B(3)W(4)
5.1	B,C,D	C1206N519(3)1G(4)C	CDR32BP5R1B(3)W(4)
5.6	B,C,D	C1206N569(3)1G(4)C	CDR32BP5R6B(3)W(4)
6.2	B,C,D	C1206N629(3)1G(4)C	CDR32BP6R2B(3)W(4)
6.8	B,C,D	C1206N689(3)1G(4)C	CDR32BP6R8B(3)W(4)
7.5	B,C,D	C1206N759(3)1G(4)C	CDR32BP7R5B(3)W(4)
8.2	B,C,D	C1206N829(3)1G(4)C	CDR32BP8R2B(3)W(4)
9.1	B,C,D	C1206N919(3)1G(4)C	CDR32BP9R1B(3)W(4)
10	F,J,K	C1206N100(3)1G(4)C	CDR32BP100B(3)W(4)
11	F,J,K	C1206N110(3)1G(4)C	CDR32BP110B(3)W(4)
12	F,J,K	C1206N120(3)1G(4)C	CDR32BP120B(3)W(4)
13	F,J,K	C1206N130(3)1G(4)C	CDR32BP130B(3)W(4)
15	F,J,K	C1206N150(3)1G(4)C	CDR32BP150B(3)W(4)
16	F,J,K	C1206N160(3)1G(4)C	CDR32BP160B(3)W(4)
18	F,J,K	C1206N180(3)1G(4)C	CDR32BP180B(3)W(4)
20	F,J,K	C1206N200(3)1G(4)C	CDR32BP200B(3)W(4)
22	F,J,K	C1206N220(3)1G(4)C	CDR32BP220B(3)W(4)
24	F,J,K	C1206N240(3)1G(4)C	CDR32BP240B(3)W(4)
27	F,J,K	C1206N270(3)1G(4)C	CDR32BP270B(3)W(4)
30	F,J,K	C1206N300(3)1G(4)C	CDR32BP300B(3)W(4)
33	F,J,K	C1206N330(3)1G(4)C	CDR32BP330B(3)W(4)
36	F,J,K	C1206N360(3)1G(4)C	CDR32BP360B(3)W(4)
39	F,J,K	C1206N390(3)1G(4)C	CDR32BP390B(3)W(4)
43	F,J,K	C1206N430(3)1G(4)C	CDR32BP430B(3)W(4)
47	F,J,K	C1206N470(3)1G(4)C	CDR32BP470B(3)W(4)
51	F,J,K	C1206N510(3)1G(4)C	CDR32BP510B(3)W(4)
56	F,J,K	C1206N560(3)1G(4)C	CDR32BP560B(3)W(4)
62	F,J,K	C1206N620(3)1G(4)C	CDR32BP620B(3)W(4)
68	F,J,K	C1206N680(3)1G(4)C	CDR32BP680B(3)W(4)
75	F,J,K	C1206N750(3)1G(4)C	CDR32BP750B(3)W(4)
82	F,J,K	C1206N820(3)1G(4)C	CDR32BP820B(3)W(4)
91	F,J,K	C1206N910(3)1G(4)C	CDR32BP910B(3)W(4)
100	F,J,K	C1206N101(3)1G(4)C	CDR32BP101B(3)W(4)

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BP — C1206 SIZE (MILITARY CDR32)			
110	F,J,K	C1206N111(3)1G(4)C	CDR32BP111B(3)W(4)
120	F,J,K	C1206N121(3)1G(4)C	CDR32BP121B(3)W(4)
130	F,J,K	C1206N131(3)1G(4)C	CDR32BP131B(3)W(4)
150	F,J,K	C1206N151(3)1G(4)C	CDR32BP151B(3)W(4)
160	F,J,K	C1206N161(3)1G(4)C	CDR32BP161B(3)W(4)
180	F,J,K	C1206N181(3)1G(4)C	CDR32BP181B(3)W(4)
200	F,J,K	C1206N201(3)1G(4)C	CDR32BP201B(3)W(4)
220	F,J,K	C1206N221(3)1G(4)C	CDR32BP221B(3)W(4)
240	F,J,K	C1206N241(3)1G(4)C	CDR32BP241B(3)W(4)
270	F,J,K	C1206N271(3)1G(4)C	CDR32BP271B(3)W(4)
300	F,J,K	C1206N301(3)1G(4)C	CDR32BP301B(3)W(4)
330	F,J,K	C1206N331(3)1G(4)C	CDR32BP331B(3)W(4)
360	F,J,K	C1206N361(3)1G(4)C	CDR32BP361B(3)W(4)
390	F,J,K	C1206N391(3)1G(4)C	CDR32BP391B(3)W(4)
430	F,J,K	C1206N431(3)1G(4)C	CDR32BP431B(3)W(4)
470	F,J,K	C1206N471(3)1G(4)C	CDR32BP471B(3)W(4)
510	F,J,K	C1206N511(3)1G(4)C	CDR32BP511B(3)W(4)
560	F,J,K	C1206N561(3)1G(4)C	CDR32BP561B(3)W(4)
620	F,J,K	C1206N621(3)1G(4)C	CDR32BP621B(3)W(4)
680	F,J,K	C1206N681(3)1G(4)C	CDR32BP681B(3)W(4)
750	F,J,K	C1206N751(3)1G(4)C	CDR32BP751B(3)W(4)
820	F,J,K	C1206N821(3)1G(4)C	CDR32BP821B(3)W(4)
910	F,J,K	C1206N911(3)1G(4)C	CDR32BP911B(3)W(4)
1,000	F,J,K	C1206N102(3)1G(4)C	CDR32BP102B(3)W(4)
50 Volt — BP — C1206 SIZE (MILITARY CDR32)			
1,100	F,J,K	C1206N112(3)5G(4)C	CDR32BP112A(3)W(4)
1,200	F,J,K	C1206N122(3)5G(4)C	CDR32BP122A(3)W(4)
1,300	F,J,K	C1206N132(3)5G(4)C	CDR32BP132A(3)W(4)
1,500	F,J,K	C1206N152(3)5G(4)C	CDR32BP152A(3)W(4)
1,600	F,J,K	C1206N162(3)5G(4)C	CDR32BP162A(3)W(4)
1,800	F,J,K	C1206N182(3)5G(4)C	CDR32BP182A(3)W(4)
2,000	F,J,K	C1206N202(3)5G(4)C	CDR32BP202A(3)W(4)
2,200	F,J,K	C1206N222(3)5G(4)C	CDR32BP222A(3)W(4)
100 Volt — BX — C1206 SIZE (MILITARY CDR32)			
4,700	K,M	C1206N472(3)1X(4)C	CDR32BX472B(3)W(4)
5,600	K,M	C1206N562(3)1X(4)C	CDR32BX562B(3)W(4)
6,800	K,M	C1206N682(3)1X(4)C	CDR32BX682B(3)W(4)
8,200	K,M	C1206N822(3)1X(4)C	CDR32BX822B(3)W(4)
10,000	K,M	C1206N103(3)1X(4)C	CDR32BX103B(3)W(4)
12,000	K,M	C1206N123(3)1X(4)C	CDR32BX123B(3)W(4)
15,000	K,M	C1206N153(3)1X(4)C	CDR32BX153B(3)W(4)
50 Volt — BX — C1206 SIZE (MILITARY CDR32)			
18,000	K,M	C1206N183(3)5X(4)C	CDR32BX183A(3)W(4)
22,000	K,M	C1206N223(3)5X(4)C	CDR32BX223A(3)W(4)
27,000	K,M	C1206N273(3)5X(4)C	CDR32BX273A(3)W(4)
33,000	K,M	C1206N333(3)5X(4)C	CDR32BX333A(3)W(4)
39,000	K,M	C1206N393(3)5X(4)C	CDR32BX393A(3)W(4)

- (1) To complete Part Number for Dielectric, insert P or X symbol – as defined by Military specification.
 (2) To complete Part Number for Dielectric, insert G or X symbol. ("G" for Military "BP," or "X" for Military "BX.")
 (3) To complete Part Number, insert Capacitance Tolerance Symbol (when applicable) as available in MIL-PRF-55681: B – ± 0.1 pF, C – ± 0.25 pF, D – ± 0.5 pF, F – $\pm 1\%$, J – $\pm 5\%$, K – $\pm 10\%$, M – $\pm 20\%$. **NOTE: Available tolerances are listed in columns above.**
 (4) To complete Part Number, insert Failure Rate Symbol: M – 1.0%; P – 0.1%; R – 0.01%; S – .001%.

Note: All MIL-PRF-55681 and KEMET Part Numbers tabulated above assume use of Solderguard II (MIL-PRF-55681 "W"; KEMET "C") end metalization. If MIL-PRF-55681 "U" or "S" (KEMET "H") or MIL-PRF-55681 "Y" (KEMET "C") is required, please change designators accordingly.

RATINGS & PART NUMBER REFERENCE

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BP — C1210 SIZE (MILITARY CDR33)			
1,000	F,J,K	C1210N102(3)1G(4)C	CDR33BP102B(3)W(4)
1,100	F,J,K	C1210N112(3)1G(4)C	CDR33BP112B(3)W(4)
1,200	F,J,K	C1210N122(3)1G(4)C	CDR33BP122B(3)W(4)
1,300	F,J,K	C1210N132(3)1G(4)C	CDR33BP132B(3)W(4)
1,500	F,J,K	C1210N152(3)1G(4)C	CDR33BP152B(3)W(4)
1,600	F,J,K	C1210N162(3)1G(4)C	CDR33BP162B(3)W(4)
1,800	F,J,K	C1210N182(3)1G(4)C	CDR33BP182B(3)W(4)
2,000	F,J,K	C1210N202(3)1G(4)C	CDR33BP202B(3)W(4)
2,200	F,J,K	C1210N222(3)1G(4)C	CDR33BP222B(3)W(4)
50 Volt — BP — C1210 SIZE (MILITARY CDR33)			
2,400	F,J,K	C1210N242(3)5G(4)C	CDR33BP242A(3)W(4)
2,700	F,J,K	C1210N272(3)5G(4)C	CDR33BP272A(3)W(4)
3,000	F,J,K	C1210N302(3)5G(4)C	CDR33BP302A(3)W(4)
3,300	F,J,K	C1210N332(3)5G(4)C	CDR33BP332A(3)W(4)
100 Volt — BX — C1210 SIZE (MILITARY CDR33)			
15,000	K,M	C1210N153(3)1X(4)C	CDR33BX153B(3)W(4)
18,000	K,M	C1210N183(3)1X(4)C	CDR33BX183B(3)W(4)
22,000	K,M	C1210N223(3)1X(4)C	CDR33BX223B(3)W(4)
27,000	K,M	C1210N273(3)1X(4)C	CDR33BX273B(3)W(4)
50 Volt — BX — C1210 SIZE (MILITARY CDR33)			
39,000	K,M	C1210N393(3)5X(4)C	CDR33BX393A(3)W(4)
47,000	K,M	C1210N473(3)5X(4)C	CDR33BX473A(3)W(4)
56,000	K,M	C1210N563(3)5X(4)C	CDR33BX563A(3)W(4)
68,000	K,M	C1210N683(3)5X(4)C	CDR33BX683A(3)W(4)
82,000	K,M	C1210N823(3)5X(4)C	CDR33BX823A(3)W(4)
100,000	K,M	C1210N104(3)5X(4)C	CDR33BX104A(3)W(4)
100 Volt — BP — C1812 SIZE (MILITARY CDR34)			
2,200	F,J,K	C1812N222(3)1G(4)C	CDR34BP222B(3)W(4)
2,400	F,J,K	C1812N242(3)1G(4)C	CDR34BP242B(3)W(4)
2,700	F,J,K	C1812N272(3)1G(4)C	CDR34BP272B(3)W(4)
3,000	F,J,K	C1812N302(3)1G(4)C	CDR34BP302B(3)W(4)
3,300	F,J,K	C1812N332(3)1G(4)C	CDR34BP332B(3)W(4)
3,600	F,J,K	C1812N362(3)1G(4)C	CDR34BP362B(3)W(4)
3,900	F,J,K	C1812N392(3)1G(4)C	CDR34BP392B(3)W(4)
4,300	F,J,K	C1812N432(3)1G(4)C	CDR34BP432B(3)W(4)
4,700	F,J,K	C1812N472(3)1G(4)C	CDR34BP472B(3)W(4)
50 Volt — BP — C1812 SIZE (MILITARY CDR34)			
5,100	F,J,K	C1812N512(3)5G(4)C	CDR34BP512A(3)W(4)
5,600	F,J,K	C1812N562(3)5G(4)C	CDR34BP562A(3)W(4)
6,200	F,J,K	C1812N622(3)5G(4)C	CDR34BP622A(3)W(4)
6,800	F,J,K	C1812N682(3)5G(4)C	CDR34BP682A(3)W(4)
7,500	F,J,K	C1812N752(3)5G(4)C	CDR34BP752A(3)W(4)
8,200	F,J,K	C1812N822(3)5G(4)C	CDR34BP822A(3)W(4)
9,100	F,J,K	C1812N912(3)5G(4)C	CDR34BP912A(3)W(4)
10,000	F,J,K	C1812N103(3)5G(4)C	CDR34BP103A(3)W(4)

CAP. pF	AVAIL. TOL.	KEMET CAPACITORS	MIL-PRF-55681 PART NUMBER
100 Volt — BX — C1812 SIZE (MILITARY CDR34)			
27,000	K,M	C1812N273(3)1X(4)C	CDR34BX273B(3)W(4)
33,000	K,M	C1812N333(3)1X(4)C	CDR34BX333B(3)W(4)
39,000	K,M	C1812N393(3)1X(4)C	CDR34BX393B(3)W(4)
47,000	K,M	C1812N473(3)1X(4)C	CDR34BX473B(3)W(4)
56,000	K,M	C1812N563(3)1X(4)C	CDR34BX563B(3)W(4)
50 Volt — BX — C1812 SIZE (MILITARY CDR34)			
100,000	K,M	C1812N104(3)5X(4)C	CDR34BX104A(3)W(4)
120,000	K,M	C1812N124(3)5X(4)C	CDR34BX124A(3)W(4)
150,000	K,M	C1812N154(3)5X(4)C	CDR34BX154A(3)W(4)
180,000	K,M	C1812N184(3)5X(4)C	CDR34BX184A(3)W(4)
100 Volt — BP — C1825 SIZE (MILITARY CDR35)			
4,700	F,J,K	C1825N472(3)1G(4)C	CDR35BP472B(3)W(4)
5,100	F,J,K	C1825N512(3)1G(4)C	CDR35BP512B(3)W(4)
5,600	F,J,K	C1825N562(3)1G(4)C	CDR35BP562B(3)W(4)
6,200	F,J,K	C1825N622(3)1G(4)C	CDR35BP622B(3)W(4)
6,800	F,J,K	C1825N682(3)1G(4)C	CDR35BP682B(3)W(4)
7,500	F,J,K	C1825N752(3)1G(4)C	CDR35BP752B(3)W(4)
8,200	F,J,K	C1825N822(3)1G(4)C	CDR35BP822B(3)W(4)
9,100	F,J,K	C1825N912(3)1G(4)C	CDR35BP912B(3)W(4)
10,000	F,J,K	C1825N103(3)1G(4)C	CDR35BP103B(3)W(4)
50 Volt — BP — C1825 SIZE (MILITARY CDR35)			
11,000	F,J,K	C1825N113(3)5G(4)C	CDR35BP113A(3)W(4)
12,000	F,J,K	C1825N123(3)5G(4)C	CDR35BP123A(3)W(4)
13,000	F,J,K	C1825N133(3)5G(4)C	CDR35BP133A(3)W(4)
15,000	F,J,K	C1825N153(3)5G(4)C	CDR35BP153A(3)W(4)
16,000	F,J,K	C1825N163(3)5G(4)C	CDR35BP163A(3)W(4)
18,000	F,J,K	C1825N183(3)5G(4)C	CDR35BP183A(3)W(4)
20,000	F,J,K	C1825N203(3)5G(4)C	CDR35BP203A(3)W(4)
22,000	F,J,K	C1825N223(3)5G(4)C	CDR35BP223A(3)W(4)
100 Volt — BX — C1825 SIZE (MILITARY CDR35)			
56,000	K,M	C1825N563(3)1X(4)C	CDR35BX563B(3)W(4)
68,000	K,M	C1825N683(3)1X(4)C	CDR35BX683B(3)W(4)
82,000	K,M	C1825N823(3)1X(4)C	CDR35BX823B(3)W(4)
100,000	K,M	C1825N104(3)1X(4)C	CDR35BX104B(3)W(4)
120,000	K,M	C1825N124(3)1X(4)C	CDR35BX124B(3)W(4)
150,000	K,M	C1825N154(3)1X(4)C	CDR35BX154B(3)W(4)
50 Volt — BX — C1825 SIZE (MILITARY CDR35)			
180,000	K,M	C1825N184(3)5X(4)C	CDR35BX184A(3)W(4)
220,000	K,M	C1825N224(3)5X(4)C	CDR35BX224A(3)W(4)
270,000	K,M	C1825N274(3)5X(4)C	CDR35BX274A(3)W(4)
330,000	K,M	C1825N334(3)5X(4)C	CDR35BX334A(3)W(4)
390,000	K,M	C1825N394(3)5X(4)C	CDR35BX394A(3)W(4)
470,000	K,M	C1825N474(3)5X(4)C	CDR35BX474A(3)W(4)

- (1) To complete Part Number for Dielectric, insert P or X symbol – as defined by Military specification.
 (2) To complete Part Number for Dielectric, insert G or X symbol. ("G" for Military "BP," or "X" for Military "BX.")
 (3) To complete Part Number, insert Capacitance Tolerance Symbol (when applicable) as available in MIL-PRF-55681: B – ± 0.1 pF, C – ± 0.25 pF, D – ± 0.5 pF, F – $\pm 1\%$, J – $\pm 5\%$, K – $\pm 10\%$, M – $\pm 20\%$. **NOTE: Available tolerances are listed in columns above.**
 (4) To complete Part Number, insert Failure Rate Symbol: M – 1.0%; P – 0.1%; R – 0.01%; S – 0.001%.

Note: All MIL-PRF-55681 and KEMET Part Numbers tabulated above assume use of Solderguard II (MIL-PRF-55681 "W"; KEMET "C") end metal-ization. If MIL-PRF-55681 "U" or "S" (KEMET "H") or MIL-PRF-55681 "Y" (KEMET "C") is required, please change designators accordingly.

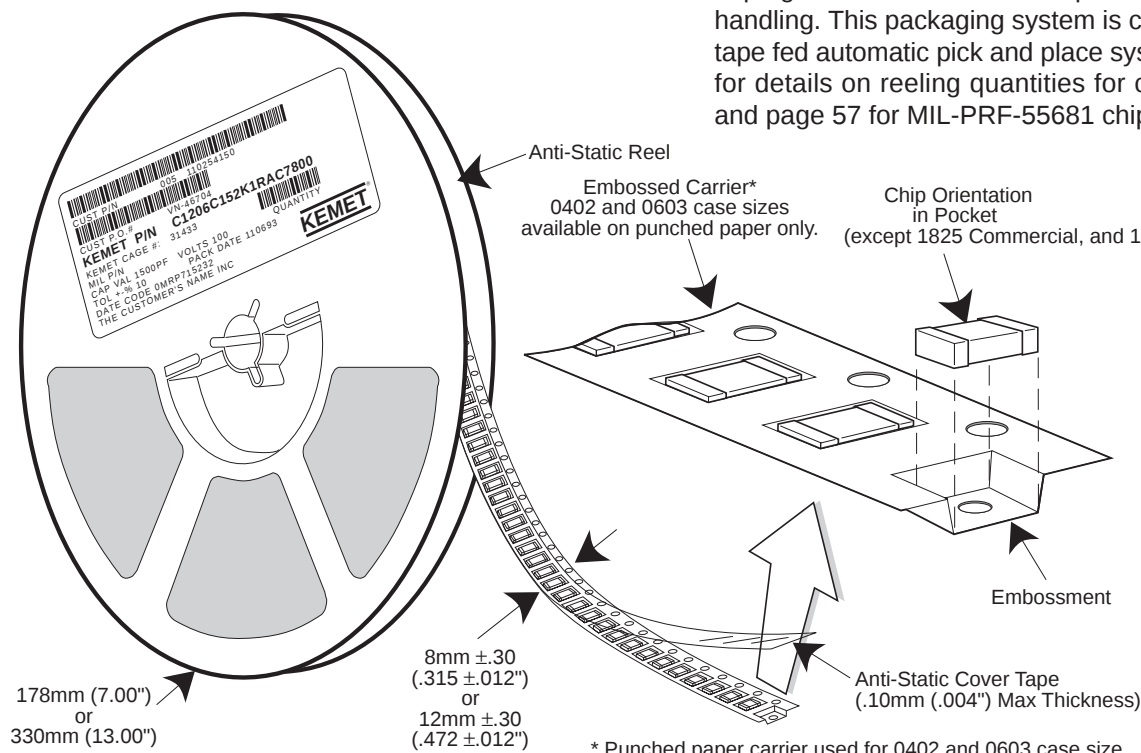
MIL-PRF-55681 MAXIMUM INDIVIDUAL PACKAGING QUANTITIES

CHIP SIZE	REELED	BULK - STD BAG	BULK - ANTI-STATIC BAG	CHIP SIZE	REELED	BULK - STD BAG	BULK - ANTI-STATIC BAG
C0805	2,500	25,000	10,000	C1808	2,500	7,500	3,000
C1206	2,500	25,000	10,000	C1812	1,100	7,500	3,000
C1210	2,500	25,000	10,000	C1825	1,100	7,500	1,000
C1805	2,500	7,500	3,000	C2225	1,100	5,000	1,000

MIL-PRF-55681 chips available in 7" reels only.

Tape and 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 below for details on reeling quantities for commercial chips and page 57 for MIL-PRF-55681 chips.



* Punched paper carrier used for 0402 and 0603 case size.

TABLE 1 - Commercial Standard Reeling Description

Tape and Reeling in Accordance with EIA 481-1 – Minimum Shipping Quantity: 1 Full Reel

Ceramic Chip Case Size/ All Dielectrics	Tape Type	Tape Width	Qty. Per 7" Reel (2) (Note Exceptions)	Qty. Per 13" Reel (2)
0402	Punched Paper (2) (4)	8 mm	10,000	50,000
0603	Punched Paper (2) (4)	8 mm	4,000	10,000
0805, 1206, 1210	Embossed Plastic (1) (2) (3)	8 mm	4,000	10,000
1812, 1825, 2220, 2225	Embossed Plastic (1) (2)	12 mm	1,000	4,000

Notes: 1. Cover Tape on embossed tape is anti-static.
2. All reels are anti-static.
3. Punched paper tape is also available for selected ratings in 0805, 1206 & 1210.
4. All standard paper tape is 4 mm pitch (distance between chips), except for 0402, which is 2 mm pitch.

TABLE 3 - Exceptions to Standard Quantities Per 7" Reel

Case Size/ Dielectric	Qty. Per 7" Reel	6.3 Volts	10 Volts	16 Volts	25 Volts	50 Volts	100 Volts	200 Volts
0805/C0G	2,500					≥222	≥122	≥561
0805/X7R	2,500	≥334	≥334	≥334	≥334	≥334		
0805/Y5V	2,500			≥824				
1206/C0G	2,500					≥562	≥182*	≥102
								≥182
1206/X7R	2,500		≥824#	≥824	≥824	≥154		
1206/Y5V	2,500		≥185	≥185				
1210/C0G	2,500					≥103	≥392	≥152
1210/X7R	2,500						≥154	≥823
1210/Y5V	2,500		≥335	≥335				
1210/Y5V	2,000		≥106					
1210/X5R	2,000		≥106					

When 7" reels are ordered, cap codes equal to or higher than those in the above table will be packaged at 2,500 pieces per reel, due to the increased thickness of these higher ratings (includes any chip greater than 0.041" (1.04mm) in nominal plus tolerance thickness).

1206/125 X7R 10 volts is an exception - reeled at 4,000 per reel.

* 1206/272 C0G 100 volts is an exception - reeled at 4,000 per reel.

Note: 1210/Y5V/X5R - 13" reels - 8000 per reel

For MIL-PRF-55681 reeling see page 57.

TABLE 2 - Paper Tape Reeling

Dielectric	Volts	0402	0603	0805	1206	1210
C0G	50	All	All	508-122	109-272	100-622(2)
	100	—	All	508-821	109-122	100-182
	200	—	All	109-391	109-561	100-122
X7R	6.3/10	All	All	221-224	102-564	222-274(1)
	16	All	All	221-333	102-564	222-274(1)
				124-224		
	25	—	All	221-333	102-564	222-274(1)
				124-224		
	50	All	All	221-333	102-104	222-274(1)
Z5U	100	—	All	221-123	102-333	222-683
	200	—	All	221-682	102-223	222-393
Y5V	50	—	—	682-104	103-224	—
	100	—	—	682-103	103-393	—
	6.3/10/16	—	All	223-684	224-105	224-225
	25	—	All	223-474	224-105	224-105
	50	—	—	223-104	—	—

Capacitance codes that can be reeled in paper tape are listed above.

Note: 7" reels contain 4,000 chips in paper tape (10,000 for 0402 in 2 mm pitch)
13" reels contain 10,000 chips in paper tape (50,000 for 0402 in 2 mm pitch)

(1) Paper Tape is not available for 154-224 capacitance values

(2) Paper Tape is not available for 472 capacitance value

Performance Notes

- Cover Tape Break Force:** 1.0 Kg Minimum.
- 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.
- 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.
- 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

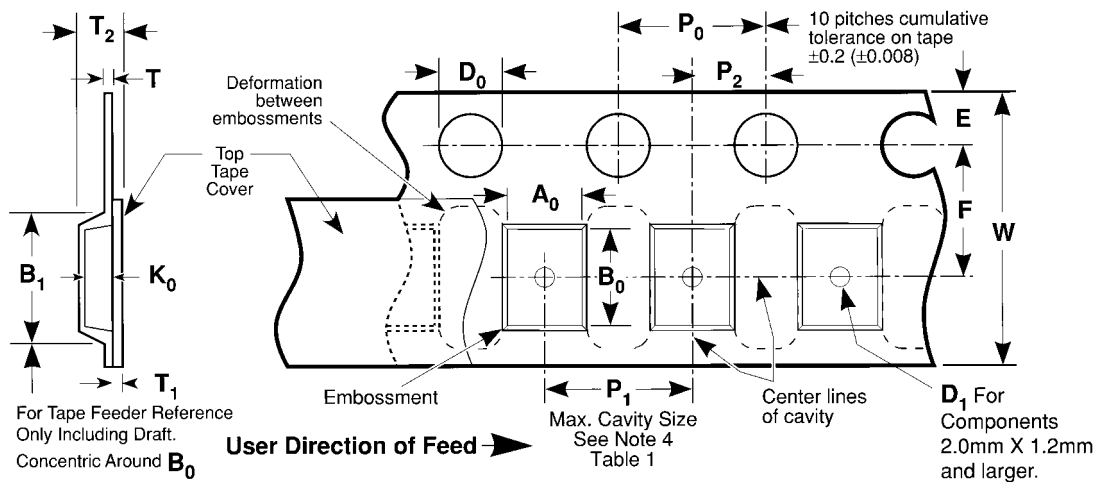


Table 1 — EMBOSSED TAPE DIMENSIONS (Metric will govern)

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 ₀ B ₀ K 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 +0.3 -0.1 (0.315 +0.012, -0.004)	
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

- B₁ dimension is a reference dimension for tape feeder clearance only.
- 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.
- 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)
- The cavity defined by A₀, B₀, and K₀ 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.)

Tantalum & Embossed Carrier Tape Configuration (cont.)

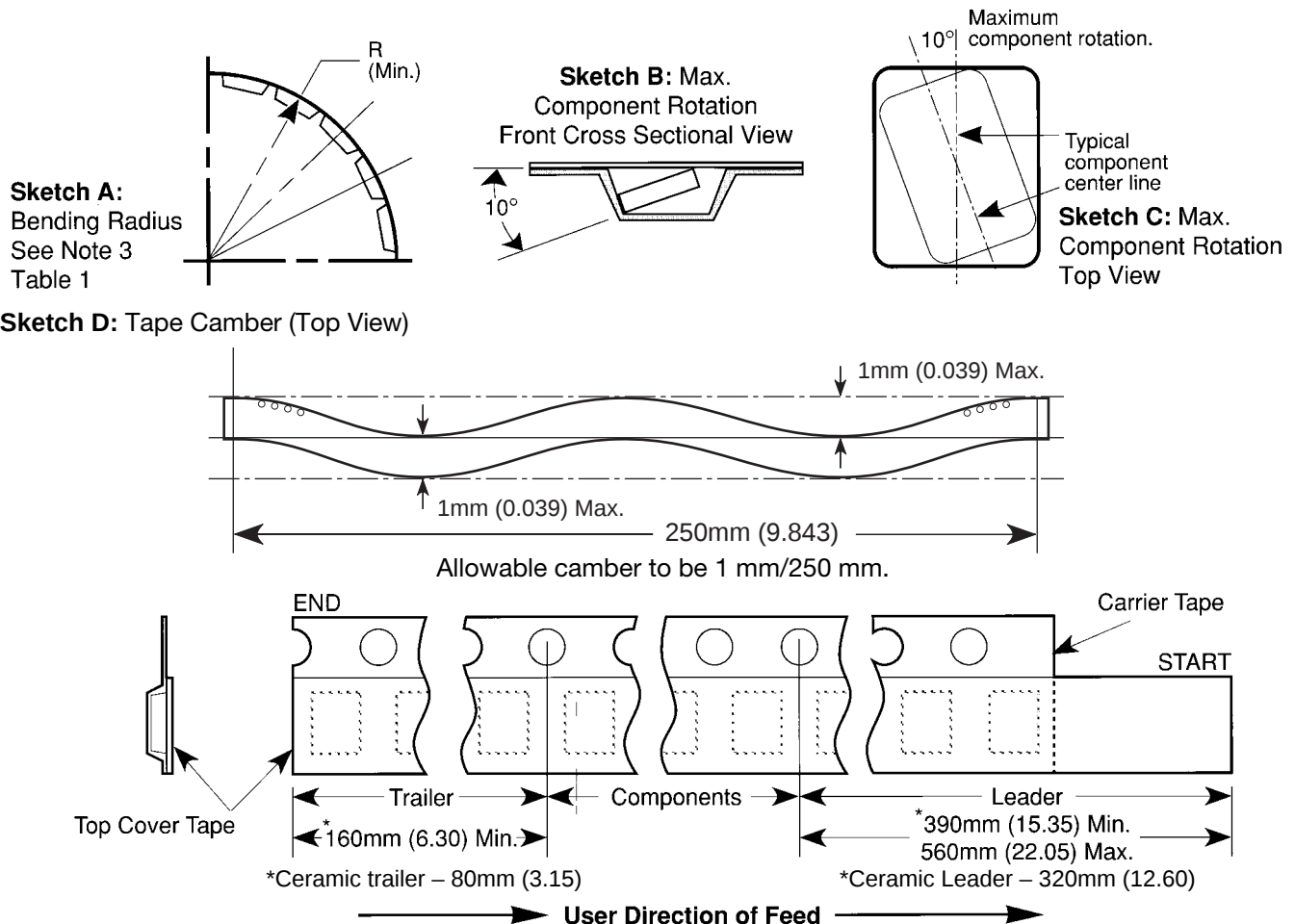


Figure 2:
Tape Leader
& Trailer
Dimensions
(Metric
Dimensions
Will Govern)

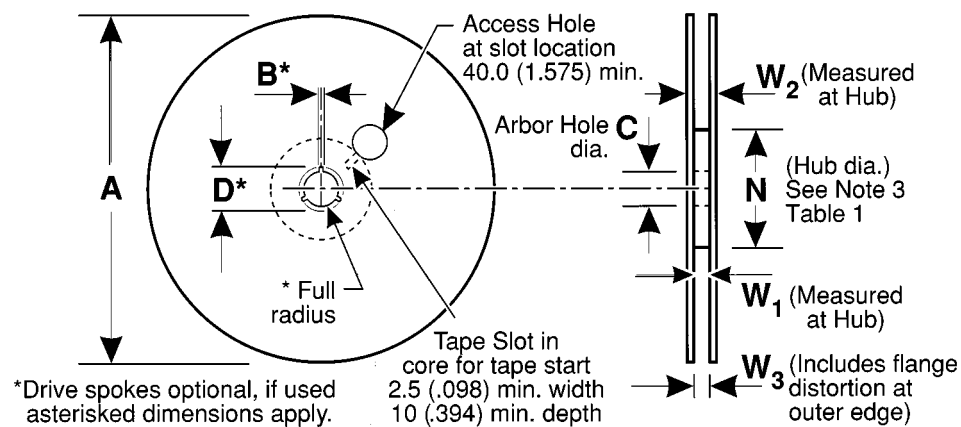


Figure 3: Reel Dimensions (Metric Dimensions will govern)

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	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)	Table 1	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):

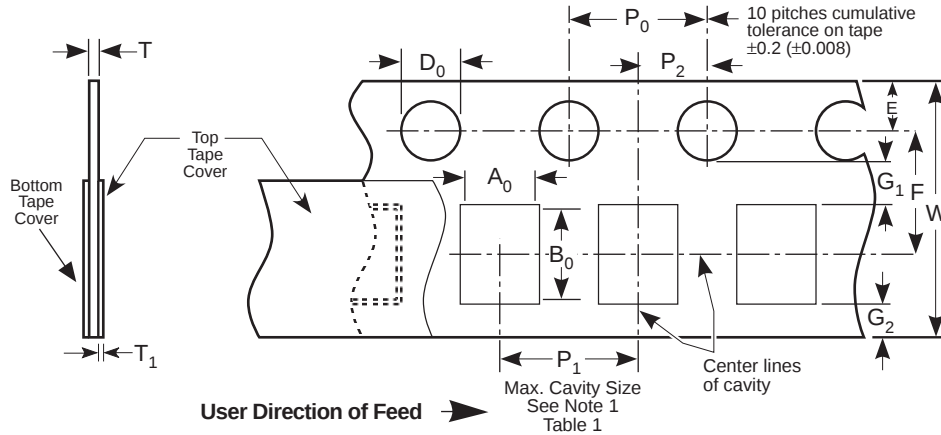


Table 1: 8 & 12mm Punched Tape
(Metric Dimensions Will Govern)

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 $\pm$ 0.10 (.069 $\pm$ 0.004)	4.0 $\pm$ 0.10 (.157 $\pm$ 0.004)	2.0 $\pm$ 0.05 (.079 $\pm$ 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)

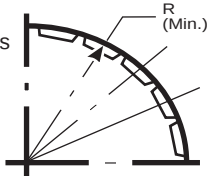
Variable Dimensions - Millimeters (Inches)

Tape Size	P ₁	F	W	A ₀ B ₀	T
8mm 1/2 Pitch	2.0 ± 0.10 (.079 ± .004) See Requirements Section 3.3 (d)	3.5 ± 0.05 (.138 ± .002)	8.0 + 0.3, - 0.1 (.315 + .012, -.004)	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)				

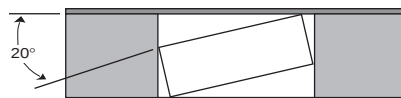
Note:

- 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).
- Tape with components shall pass around radius "R" without damage.
- KEMET nominal thicknesses are: 0402 = 0.6mm and all others 0.95mm minimum.

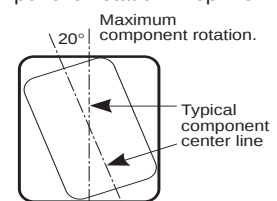
Sketch A:
Bending Radius
See Note 2
Table 1



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)

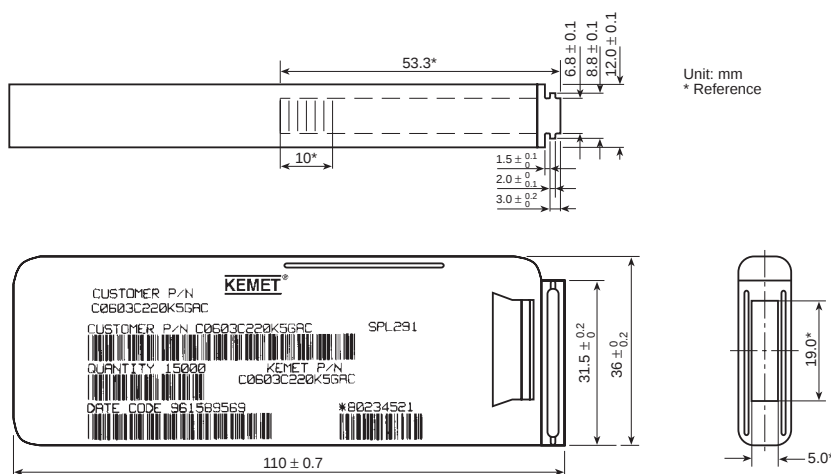


Table 2 – Capacitance Values Available In Bulk Cassette Packaging

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

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

Laser marking is available as an extra-cost option for most KEMET ceramic chips. Such marking is two sided, and includes a $\bar{K}$ 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 $\bar{K}$ only.



Example shown is 1,000 pF capacitor.