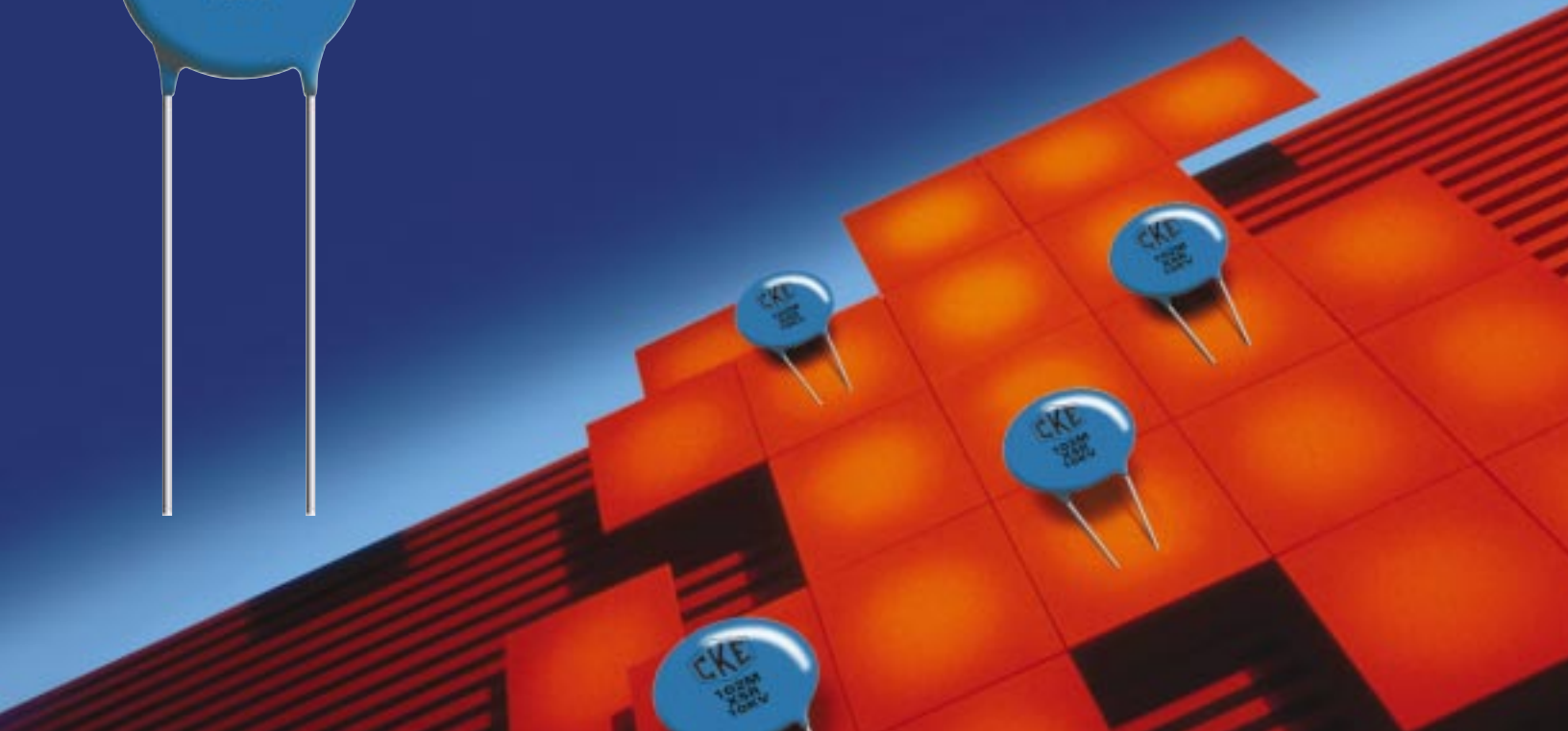
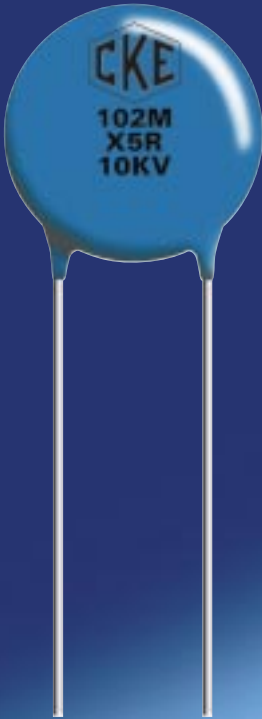


# High Voltage Ceramic Disk Capacitors



## Introduction

These ceramic capacitors use high dielectric constant ( $K > 1000$ ) ferroelectric materials based on barium titanate. Key features of this capacitor class include its non-linear temperature characteristics, reliable voltage and frequency performance and predictable change of capacitance with time. The capacitors available in this class have temperature characteristic codes of Z5P, X5P, X5R, and X7R. Z5U and X5U codes are also available having dielectric constants usually, but not necessarily, greater than 4000.

## Application

1. Voltage multipliers
2. By-pass circuits
3. Coupling circuits
4. Filtering circuits

## Specifications

### Capacitance and Dissipation Factor Measurement Methods:

Capacitance and Dissipation Factor are measured at a standard frequency of 1 KHz. A temperature of 25°C is used with an applied test voltage of less than 2 Volts AC. The allowable dissipation factor will be no greater than 2.5%.

### Voltage Ratings:

500 V<sub>DC</sub> to 15 KV<sub>DC</sub> (see tables)

### Capacitance Tolerances Available:

Tolerance	Code Letter
± 10%	K
± 20%	M
+ 80, -20%	Z
+ 100, -0%	P

### Dielectric Withstand Voltage:

Capacitors must meet the original manufacturer's specifications following application of two times the rated D.C. voltage for 5±1 seconds.

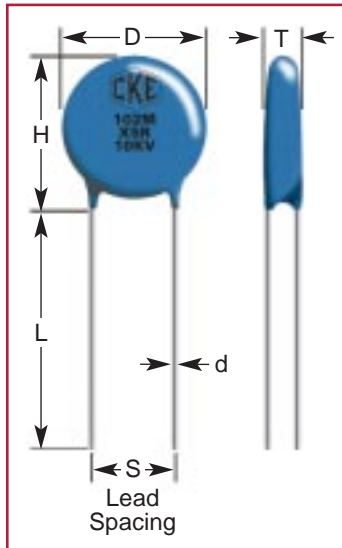
### Insulation Resistance:

Insulation resistance shall be 10,000 megohms or greater with a test temperature of 25°C. Measurements are made between component terminals following a 2 minute charge at 100 Volts DC. Charging currents will be limited to no more than 50 milliamperes.

### Temperature Characteristics Available:

The temperature characteristics table follows the EIA Standard RS-198-C. The first letter in the table indicates the low temperature limit followed by a number which sets the upper temperature limit. The final letter sets the maximum capacitance deviation acceptable over the designated range with 25°C serving as the reference point.

1st Letter	Number	Last Letter
X = -55C	5 = +85C	P = ± 10%
Y = -30C	7 = +125C	R = ± 15%
Z = +10C		U = +22, -56%



## Life Testing Method:

These capacitors are designed to withstand voltages of at least 1.5 times the rated DC voltage for at least 1000 hours at 85°C. A change of capacitance of no more than 10% is acceptable when tested 24 hours later. Dissipation Factor changes are limited to 5% with Insulation Resistance values of no less than 1000 megohms.

## Temperature Ratings:

Class II capacitors are intended to operate within the temperature limits set forth in EIA RS-198-C but may be stored at temperatures ranging from -55°C to +125°C without harm.

## Humidity Resistance:

Capacitors must have a minimum insulation resistance of 1000 megohms and a maximum Dissipation Factor of 5% following exposure to a relative humidity of 95% for 100 hours at 40°C.

## Construction

### Coating Materials:

All Capacitors with 500 VDC ratings and 1 KVDC ratings are coated with a flame retardant, baked-on phenolic coating applied using the wet-dip method. Those rated 2 KV and above, are coated with a flame retardant, dry process fluid-bed epoxy. Diameter and thickness dimensions shown in the tables apply to epoxy as well as phenolic-coated units.

### Lead Coatings:

On straight leads, the coatings shall not extend beyond 1/8 inch below the bottom of the capacitor disk. On bent or formed leads, the coating will not be allowed beyond the kink which is the seating plane of the capacitor.

### Lead Wire Material and Configurations:

Lead wire material is tin-plated copper wire of 22 or 20 AWG. Capacitors with diameters of 12 mm or less, or voltage values less than 8 KV will be of the smaller gauge. Standard lead configurations are straight and at least 1 inch long, and formed or cut leads are available on special order (drawings required on special configurations). Lead spacings are available from the tables.

## Component Marking:

Both inking and laser equipment are used to mark these components. Each capacitor shall bear the manufacturer's initials "CKE" across the top, followed by the capacitance, tolerance, temperature code and voltage where space permits. When space is limited, the temperature characteristic code may be omitted.

## Ordering Information:

Standard value components should be selected from the information provided in the tables, and orders should be placed using the convention described below. For special orders, contact CKE using the contact information provided at the end of this document.

CK2 Manufacturer's Code	Y5P Temperature Characteristics Code	102 Capacitor Value (pf)	M Capacitance Tolerance Code	10KV DC Voltage Rating
CK2 for Class II Capacitors	From Temperature Characteristics Table to the Left	3 Digits Total 1st two are Significant Third is Multiplier 0 = X1 1 = X10 2 = X100 3 = X1000 9 = X.01	K = ± 10% M = ± 20% Z = + 80, -20% P = + 100, -0%	From Table
Example: CK2Z5U471K5KV This is a capacitor with Z5U temperature characteristics, a capacitance of 470 pf, a capacitance tolerance of ± 10% with a rated DC voltage of 5 KV.				

Maximum Diameter (mm)		Lead Spacing (mm)		Maximum Capacitance Available (pF)-X5P Temperature Coefficient							
		500V <sub>DC</sub>	1KV <sub>DC</sub>	2KV <sub>DC</sub>	3KV <sub>DC</sub>	4KV <sub>DC</sub>	5KV <sub>DC</sub>	6KV <sub>DC</sub>	8KV <sub>DC</sub>	10KV <sub>DC</sub>	12KV <sub>DC</sub>
Max. Thickness (mm) ↗		4.0	5.0	5.0	6.0	6.0	7.0	7.0	8.0	9.0	10.0
7	5.0	620	390	240	160	120	100	75			
8	5.0	1200	820	500	330	250	200	160			
10	7.5	1800	1200	750	500	390	330	240	180	140	120
12	10.0	3000	2000	1200	820	560	470	360	280	220	180
14	10.0	4300	2800	1800	1200	820	680	510	420	330	270
16	12.5	5600	3900	2400	1500	1200	1000	750	560	430	360
18	12.5	8200	5000	3000	2000	1500	1200	1000	750	560	470
20	12.5	10000	6200	3900	2400	2000	1500	1200	1000	750	620

Maximum Diameter (mm)		Lead Spacing (mm)		Maximum Capacitance Available (pF)-X5U Temperature Coefficient								
		500V <sub>DC</sub>	1KV <sub>DC</sub>	2KV <sub>DC</sub>	3KV <sub>DC</sub>	4KV <sub>DC</sub>	5KV <sub>DC</sub>	6KV <sub>DC</sub>	8KV <sub>DC</sub>	10KV <sub>DC</sub>	12KV <sub>DC</sub>	15KV <sub>DC</sub>
Max. Thickness (mm) ↗		4.0	5.0	5.0	6.0	6.0	7.0	7.0	8.0	9.0	10.0	12.0
6	5.0	1000	680	470	300	240	220	180				
8	5.0	2700	1500	1000	680	560	470	430				
10	7.5	4700	3000	2200	1200	1000	820	750	470	430	390	300
12	10.0	6800	4700	3300	1800	1500	1200	1000	820	680	560	470
14	10.0	10000	6800	4700	2700	2400	2000	1800	1200	820	680	620
16	12.5	15000	8200	6200	3900	3300	2700	2400	1800	1200	1000	820
18	12.5		10000	6800	4700	3900	3300	2700	2000	1500	1200	1000
20	12.5			8200	5600	4700	3900	3600	2400			

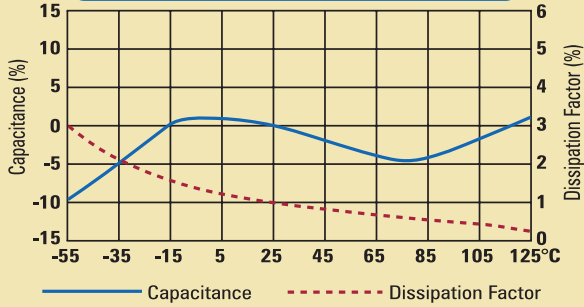
Maximum Diameter (mm)		Lead Spacing (mm)		Maximum Capacitance Available (pF)-X7R (X5R) Temperature Coefficient							
		500V <sub>DC</sub>	1KV <sub>DC</sub>	2KV <sub>DC</sub>	3KV <sub>DC</sub>	4KV <sub>DC</sub>	5KV <sub>DC</sub>	6KV <sub>DC</sub>	8KV <sub>DC</sub>	10KV <sub>DC</sub>	12KV <sub>DC</sub>
Max. Thickness (mm) ↗		4.0	5.0	5.0	6.0	6.0	7.0	7.0	8.0	9.0	10.0
6	5.0	1000	680	470	270	240	180	150			
8	5.0	2400	1500	1000	620	560	430	390			
10	7.5	4300	2700	1800	1000	910	820	680	470	390	330
12	10.0	6200	4300	2700	1800	1500	1200	1000	680	620	510
14	10.0	10000	6200	4300	2400	2200	1800	1500	1000	910	680
16	12.5		8200	5600	3600	2700	2400	2000	1500	1000	1000
18	12.5		10000	6200	3900	3300	2700	2400	1800	1200	1200
20	12.5			8200	4700	4300	3900	3900	2200	1800	1500

Maximum Diameter (mm)		Lead Spacing (mm)		Maximum Capacitance Available (pF)-Z5P Temperature Coefficient							
		500V <sub>DC</sub>	1KV <sub>DC</sub>	2KV <sub>DC</sub>	3KV <sub>DC</sub>	4KV <sub>DC</sub>	5KV <sub>DC</sub>	6KV <sub>DC</sub>	8KV <sub>DC</sub>	10KV <sub>DC</sub>	12KV <sub>DC</sub>
Max. Thickness (mm) ↗		4.0	5.0	5.0	6.0	6.0	7.0	7.0	8.0	9.0	10.0
6	5.0	560	430	300	180	150	120	100			
8	5.0	1500	1000	680	390	330	270	240			
10	7.5	2700	1800	1200	680	560	470	390	300	240	200
12	10.0	3900	2700	1800	1000	820	750	680	470	390	300
14	10.0	5600	3900	2700	1500	1200	1000	910	680	560	470
16	12.5	8200	5600	3600	2200	1800	1500	1200	820	680	560
18	12.5	10000	6300	4300	2400	2000	1800	1500	1000	820	680
20	12.5		8200	5100	3300	2700	2400	2000	1200	1000	820

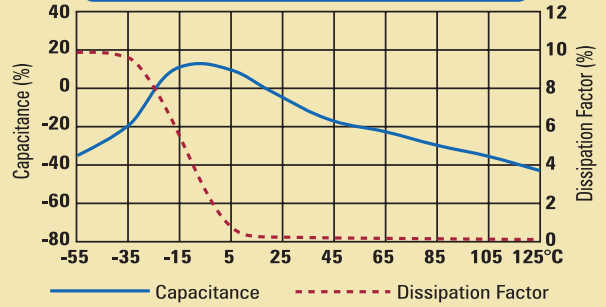
Maximum Diameter (mm)		Lead Spacing (mm)		Maximum Capacitance Available (pF)-Z5U Temperature Coefficient							
		500V <sub>DC</sub>	1KV <sub>DC</sub>	2KV <sub>DC</sub>	3KV <sub>DC</sub>	4KV <sub>DC</sub>	5KV <sub>DC</sub>	6KV <sub>DC</sub>	8KV <sub>DC</sub>	10KV <sub>DC</sub>	12KV <sub>DC</sub>
Max. Thickness (mm) ↗		4.0	5.0	5.0	6.0	6.0	7.0	7.0	8.0	9.0	10.0
6	5.0	1800	1000	750	470	390	330	270			
8	5.0	3900	1800	1000	750	560	470	430			
10	7.5	6800	3000	2200	1200	1000	820	750	560	470	390
12	10.0	10000	4700	3300	2000	1500	1200	1000	820	680	560
14	10.0	15000	7500	4700	3000	2400	2000	1800	1200	1000	820
16	12.5		10000	6800	3900	3300	2700	2200	1800	1200	1000
18	12.5			8200	4700	3900	3300	2700	2000	1500	1200
20	12.5			10000	5600	4700	3900	3600	2400	2000	1500

# CKE – CLASS II CERAMIC DISK CAPACITOR CURVES

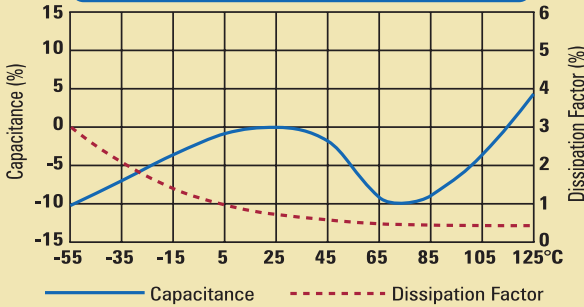
**FIGURE 1** X5P Typical Temperature Characteristic Curve



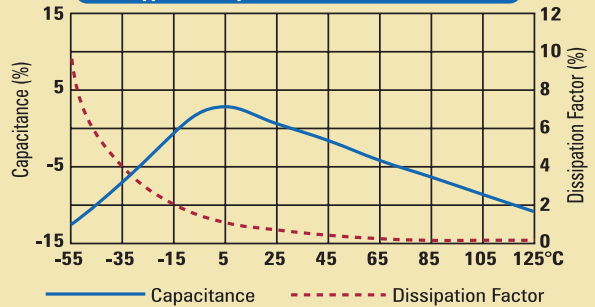
**FIGURE 2** X5U Typical Temperature Characteristic Curve



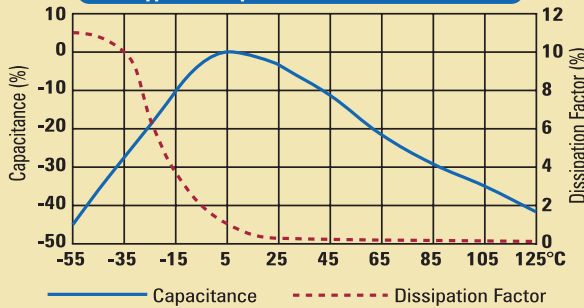
**FIGURE 3** X7R (X5R) Typical Temperature Characteristic Curve



**FIGURE 4** Z5P Typical Temperature Characteristic Curve

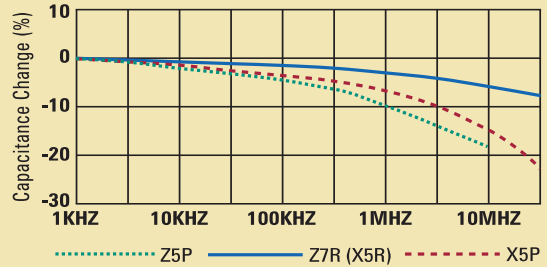


**FIGURE 5** Z5U Typical Temperature Characteristic Curve

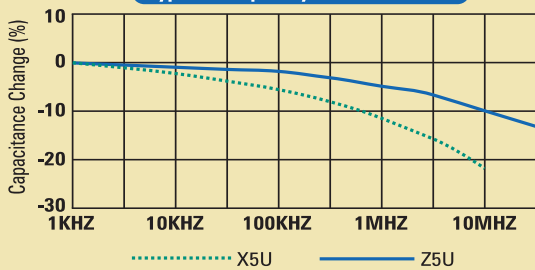


**FIGURE 6**

Typical Frequency Characteristics

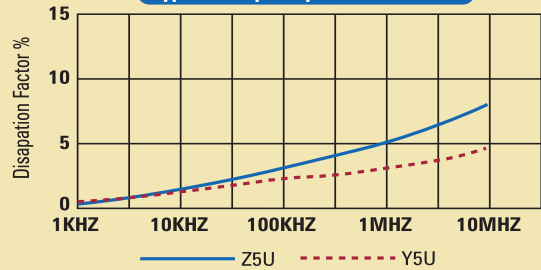


**FIGURE 7** Typical Frequency Characteristics

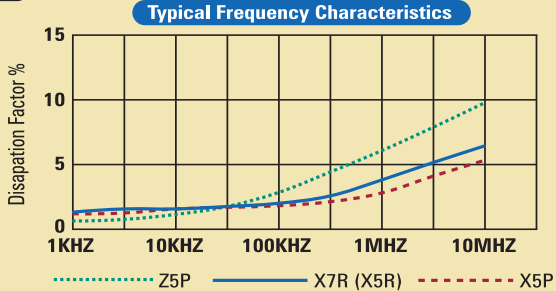


**FIGURE 8**

Typical Frequency Characteristics



**FIGURE 9** Typical Frequency Characteristics



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