



## MULTILAYER CERAMIC CHIP CAPACITORS

### **C Series Commercial Grade High Temperature Application**

Type:

C1005 [EIA CC0402]  
C1608 [EIA CC0603]  
C2012 [EIA CC0805]  
C3216 [EIA CC1206]  
C3225 [EIA CC1210]  
C4532 [EIA CC1812]  
C5750 [EIA CC2220]

Issue date:  
Jun 2015



## REMINDERS

Please read before using this product

### SAFETY REMINDERS



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Notice: Effective January 2013, TDK will use a new catalog number which adds product thickness and packaging specification detail. This new catalog number should be referenced on all catalog orders going forward, and is not applicable for OEM part number orders. Please be aware the last five digits of the catalog number will differ from the item description (internal control number) on the product label. Contact your local TDK Sales representative for more information.

(Example)

Catalog Issued date	Catalog Number	Item Description (On Delivery Label)
Prior to January 2013	C1608C0G1E103J	C1608C0G1E103JT000N
January 2013 and Later	C1608C0G1E103J080AA	C1608C0G1E103JT000N



## C Series High Temperature Application

Type: C1005 [EIA CC0402], C1608 [EIA CC0603], C2012 [EIA CC0805],  
C3216 [EIA CC1206], C3225 [EIA CC1210], C4532 [EIA CC1812], C5750 [EIA CC2220]



### Features



- With a maximum temperature of 150°C and a capacitance change within ±15%, the series is suited for devices that operate in high-temperature environments.
- Excellent DC bias properties.

Parameters	Specifications
Temperature	-55 to 150°C
Characteristics	ΔC/C: ±15% or 0 ± 30ppm
Operating Temperature	-55 to +150°C
Dissipation Factor	5% maximum
Insulation Resistance	10 GΩ or 500 MΩ • μF minimum
Voltage Proof	2.5 • Rated Voltage or 3 • Rated Voltage for 1 to 5 seconds Charge/Discharge ≤ 50 mA

### Applications



- Automotive applications (engine rooms)
- Measurement instruments used at high temperature environments
- LCD display
- Sensor Module
- Smoothing and decoupling applications for other devices that operate at high temperature

### Shape & Dimensions



L	Body Length
W	Body Width
T	Body Height
B	Terminal Width
G	Terminal Spacing



### Catalog Number Construction

C • 3225 • X8R • 1C • 106 • K • 250 • A • B

#### Series Name

#### Dimensions L x W (mm)

Code	Length	Width	Terminal
C1005	1.00 ± 0.05	0.50 ± 0.05	0.10 min.
C1608	1.60 ± 0.10	0.80 ± 0.10	0.20 min.
C2012	2.00 ± 0.20	1.25 ± 0.20	0.20 min.
C3216	3.20 ± 0.20	1.60 ± 0.20	0.20 min.
C3225	3.20 ± 0.40	2.50 ± 0.30	0.20 min.
C4532	4.50 ± 0.40	3.20 ± 0.40	0.20 min.
C5750	5.70 ± 0.40	5.00 ± 0.40	0.20 min.

\*Dimensional tolerances are typical values.

#### Temperature Characteristics

Temperature Characteristics	Temperature Coefficient or Capacitance Change	Temperature Range
NP0	0 ± 30ppm/°C	-55 to +150°C
X8R	±15%	-55 to +150°C

#### Rated Voltage (DC)

Code	Voltage (DC)	Code	Voltage (DC)
1C	16V	2A	100V
1E	25V	2E	250V
1H	50V	2W	450V
		2J	630V

#### Nominal Capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

Ex. 0R2 = 0.2pF; 103 = 10,000pF; 105 = 1,000,000pF = 1,000nF

#### Capacitance Tolerance

Code	Tolerance
C	± 0.25pF
D	± 0.50pF
J	± 5%
K	± 10%
M	± 20%

#### Nominal Thickness

Code	Thickness	Code	Thickness
050	0.50 mm	230	2.30 mm
060	0.60 mm	250	2.50 mm
080	0.80 mm	280	2.80 mm
085	0.85 mm	320	3.20 mm
115	1.15 mm		
125	1.25 mm		
160	1.60 mm		
200	2.00 mm		

#### Packaging Style

Code	Style
A	178 mm Reel, 4 mm Pitch
B	178 mm Reel, 2 mm Pitch
K	178 mm Reel, 8 mm Pitch

#### Special Reserved Code

Code	Description
A, B	TDK Internal Code



## Capacitance Range Chart

## EIA CC0402 [C1005]

### Capacitance Range Chart

Temperature Characteristics: NP0 ( $0 \pm 30\text{ppm}/^\circ\text{C}$ ), X8R ( $\pm 15\%$ )  
 Rated Voltage: 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Code	Tolerance	NP0		X8R			
			2A (100V)	1H (50V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
1	010	C: $\pm 0.25\text{pF}$						
1.5	1R5	D: $\pm 0.50\text{pF}$						
2	020	J: $\pm 5\%$						
2.2	2R2	K: $\pm 10\%$						
3	030	M: $\pm 20\%$						
3.3	3R3							
4	040							
4.7	4R7							
5	050							
6	060							
6.8	6R8							
7	070							
8	080							
9	090							
10	100							
12	120							
15	150							
18	180							
22	220							
27	270							
33	330							
39	390							
47	470							
56	560							
68	680							
82	820							
100	101							
120	121							
150	151							
180	181							
220	221							
270	271							
330	331							
390	391							
470	471							
560	561							
680	681							
820	821							
1,000	102							
1,500	152							
2,200	222							
3,300	332							
4,700	472							
6,800	682							
10,000	103							
15,000	153							
22,000	223							
33,000	333							
47,000	473							

Standard Thickness  
 0.50 mm



## Capacitance Range Chart

## EIA CC0603 [C1608]

### Capacitance Range Chart

Temperature Characteristics: NPO ( $0 \pm 30\text{ppm}/^\circ\text{C}$ ), X8R ( $\pm 15\%$ )  
 Rated Voltage: 250V (2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Code	Tolerance	NPO		
			2E (250V)	2A (100V)	1H (50V)
1	010	C: $\pm 0.25\text{pF}$ D: $\pm 0.50\text{pF}$ J: $\pm 5\%$			
2	1R5				
2	020				
2	2R2				
3	030				
3	3R3				
4	040				
5	4R7				
5	050				
6	060				
7	6R8				
7	070				
8	080				
9	090				
10	100				
12	120				
15	150				
18	180				
22	220				
27	270				
33	330				
39	390				
47	470				
56	560				
68	680				
82	820				
100	101				
120	121				
150	151				
180	181				
220	221				
270	271				
330	331				
390	391				
470	471				
560	561				
680	681				
820	821				
1,000	102				
1,200	122				
1,500	152				
1,800	182				
2,200	222				
2,700	272				
3,300	332				
3,900	392				
4,700	472				
5,600	562				
6,800	682				
8,200	822				
10,000	103				

Capacitance (pF)	Code	Tolerance	X8R			
			2A (100V)	1H (50V)	1E (25V)	1C (16V)
1,000	102	K: $\pm 10\%$ M: $\pm 20\%$				
1,500	152					
2,200	222					
3,300	332					
4,700	472					
6,800	682					
10,000	103					
15,000	153					
22,000	223					
33,000	333					
47,000	473					
68,000	683					
100,000	104					
150,000	154					
220,000	224					
330,000	334					
470,000	474					

Standard Thickness  
 0.80 mm



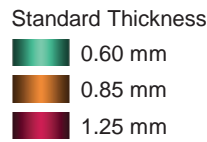
## Capacitance Range Chart

## EIA CC0805 [C2012]

### Capacitance Range Chart

Temperature Characteristics: NP0 (0 ± 30ppm/°C), X8R (±15%)  
 Rated Voltage: 450V(2W), 250V(2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)

Capacitance (pF)	Code	Tolerance	NP0				X8R			
			2W (450V)	2E (250V)	2A (100V)	1H (50V)	2A (100V)	1H (50V)	1E (25V)	1C (16V)
100	101	J: ± 5%	█							
120	121	K: ± 10%	█							
150	151	M: ± 20%	█							
180	181		█							
220	221		█							
270	271		█							
330	331		█							
390	391		█							
470	471		█							
560	561		█							
680	681		█							
820	821		█							
1,000	102		█		█					
1,200	122		█		█					
1,500	152		█		█					
1,800	182		█		█					
2,200	222		█		█					
2,700	272		█		█					
3,300	332		█	█	█	█				
3,900	392		█	█	█	█				
4,700	472		█	█	█	█				
5,600	562		█	█	█	█				
6,800	682		█	█	█	█				
8,200	822		█	█	█	█				
10,000	103			█	█	█				
15,000	153			█	█	█				
22,000	223				█	█	█			
33,000	333					█	█			
47,000	473						█	█		
68,000	683							█	█	
100,000	104								█	█
150,000	154									█
220,000	224									█
330,000	334									█
470,000	474									█
680,000	684									█
1,000,000	105									█





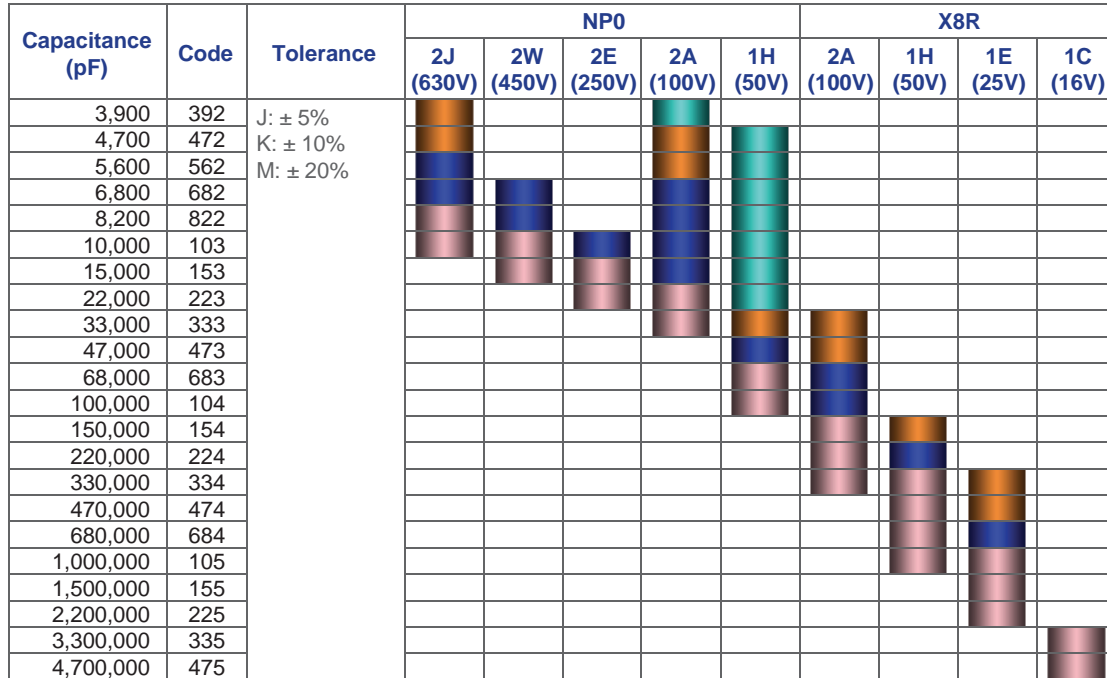
## Capacitance Range Chart

## EIA CC1206 [C3216]

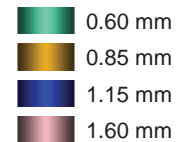
### Capacitance Range Chart

Temperature Characteristics: NP0 (0 ± 30ppm/°C), X8R (±15%)

Rated Voltage: 630V(2J), 450V(2W), 250V(2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)



Standard Thickness



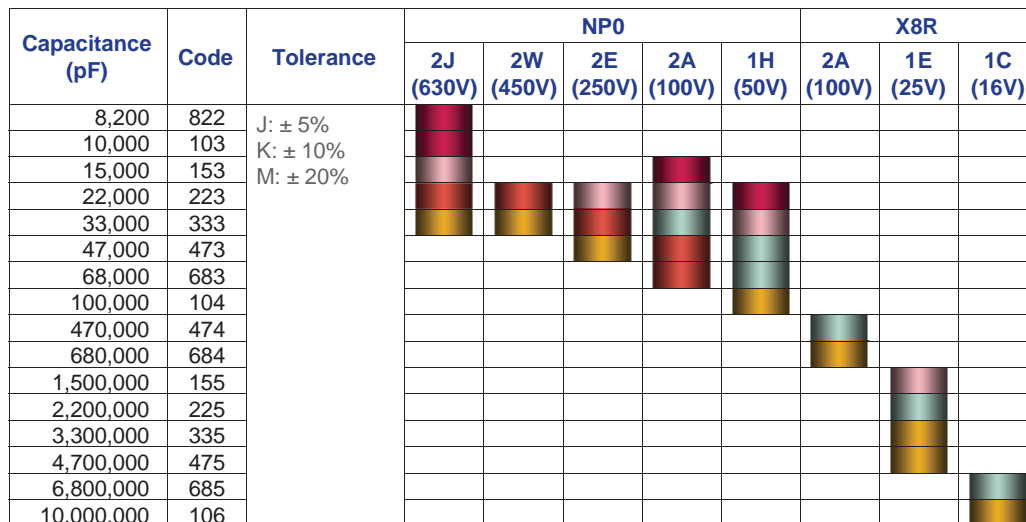
## Capacitance Range Chart

## EIA CC1210 [C3225]

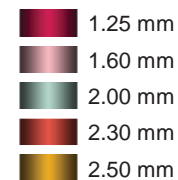
### Capacitance Range Chart

Temperature Characteristics: NP0 (0 ± 30ppm/°C), X8R (±15%)

Rated Voltage: 630V(2J), 450V(2W), 250V(2E), 100V (2A), 50V (1H), 25V (1E), 16V (1C)



Standard Thickness





## Capacitance Range Chart

## EIA CC1812 [C4532]

### Capacitance Range Chart

Temperature Characteristics: NP0 (0 ± 30ppm/°C)  
 Rated Voltage: 630V(2J), 450V(2W), 250V(2E), 100V (2A), 50V (1H)

Capacitance (pF)	Code	Tolerance	NP0				
			2J (630V)	2W (450V)	2E (250V)	2A (100V)	1H (50V)
33,000	333	J: ± 5%					
47,000	473						
68,000	683						
100,000	104						
150,000	154						
220,000	224						

Standard Thickness

- 1.60 mm
- 2.00 mm
- 2.30 mm
- 2.50 mm
- 3.20 mm



## Capacitance Range Chart

## EIA CC2220 [C5750]

### Capacitance Range Chart

Temperature Characteristics: NP0 (0 ± 30ppm/°C)  
 Rated Voltage: 450V(2W), 250V(2E), 100V (2A)

Capacitance (pF)	Code	Tolerance	NP0		
			2W (450V)	2E (250V)	2A (100V)
100,000	104	J: ± 5%			
150,000	154				

Standard Thickness

- 2.30 mm
- 2.80 mm











## Capacitance Range Table

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C, ±15%)

Capacitance	Size	Thickness (mm)	Capacitance Tolerance	Catalog Number			
				Rated Voltage Edc: 100V	Rated Voltage Edc: 50V	Rated Voltage Edc: 25V	Rated Voltage Edc: 16V
150 pF	1005	0.50 ± 0.05	± 10%	C1005X8R2A151K050BA	C1005X8R1H151K050BA		
			± 20%	C1005X8R2A151M050BA	C1005X8R1H151M050BA		
220 pF	1005	0.50 ± 0.05	± 10%	C1005X8R2A221K050BA	C1005X8R1H221K050BA		
			± 20%	C1005X8R2A221M050BA	C1005X8R1H221M050BA		
330 pF	1005	0.50 ± 0.05	± 10%	C1005X8R2A331K050BA	C1005X8R1H331K050BA		
			± 20%	C1005X8R2A331M050BA	C1005X8R1H331M050BA		
470 pF	1005	0.50 ± 0.05	± 10%	C1005X8R2A471K050BA	C1005X8R1H471K050BA		
			± 20%	C1005X8R2A471M050BA	C1005X8R1H471M050BA		
680 pF	1005	0.50 ± 0.05	± 10%	C1005X8R2A681K050BA	C1005X8R1H681K050BA		
			± 20%	C1005X8R2A681M050BA	C1005X8R1H681M050BA		
1 nF	1005	0.50 ± 0.05	± 10%	C1005X8R2A102K050BA	C1005X8R1H102K050BA		
			± 20%	C1005X8R2A102M050BA	C1005X8R1H102M050BA		
	1608	0.80 ± 0.10	± 10%	C1608X8R2A102K080AA	C1608X8R1H102K080AA		
			± 20%	C1608X8R2A102M080AA	C1608X8R1H102M080AA		
1.5 nF	1005	0.50 ± 0.05	± 10%	C1005X8R2A152K050BA	C1005X8R1H152K050BA		
			± 20%	C1005X8R2A152M050BA	C1005X8R1H152M050BA		
	1608	0.80 ± 0.10	± 10%	C1608X8R2A152K080AA	C1608X8R1H152K080AA		
			± 20%	C1608X8R2A152M080AA	C1608X8R1H152M080AA		
2.2 nF	1005	0.50 ± 0.05	± 10%	C1005X8R2A222K050BA	C1005X8R1H222K050BA		
			± 20%	C1005X8R2A222M050BA	C1005X8R1H222M050BA		
	1608	0.80 ± 0.10	± 10%	C1608X8R2A222K080AA	C1608X8R1H222K080AA		
			± 20%	C1608X8R2A222M080AA	C1608X8R1H222M080AA		
3.3 nF	1005	0.50 ± 0.05	± 10%	C1005X8R2A332K050BB	C1005X8R1H332K050BA		
			± 20%	C1005X8R2A332M050BB	C1005X8R1H332M050BA		
	1608	0.80 ± 0.10	± 10%	C1608X8R2A332K080AA	C1608X8R1H332K080AA		
			± 20%	C1608X8R2A332M080AA	C1608X8R1H332M080AA		
4.7 nF	1005	0.50 ± 0.05	± 10%		C1005X8R1H472K050BA		
			± 20%		C1005X8R1H472M050BA		
	1608	0.80 ± 0.10	± 10%	C1608X8R2A472K080AA	C1608X8R1H472K080AA		
			± 20%	C1608X8R2A472M080AA	C1608X8R1H472M080AA		
6.8 nF	1005	0.50 ± 0.05	± 10%		C1005X8R1H682K050BB	C1005X8R1E682K050BA	
			± 20%		C1005X8R1H682M050BB	C1005X8R1E682M050BA	
	1608	0.80 ± 0.10	± 10%	C1608X8R2A682K080AA	C1608X8R1H682K080AA		
			± 20%	C1608X8R2A682M080AA	C1608X8R1H682M080AA		
10 nF	1005	0.50 ± 0.05	± 10%		C1005X8R1H103K050BB	C1005X8R1E103K050BA	
			± 20%		C1005X8R1H103M050BB	C1005X8R1E103M050BA	
	1608	0.80 ± 0.10	± 10%	C1608X8R2A103K080AA	C1608X8R1H103K080AA		
			± 20%	C1608X8R2A103M080AA	C1608X8R1H103M080AA		
15 nF	1005	0.50 ± 0.05	± 10%			C1005X8R1E153K050BB	
			± 20%			C1005X8R1E153M050BB	
	1608	0.80 ± 0.10	± 10%	C1608X8R2A153K080AA	C1608X8R1H153K080AA		
			± 20%	C1608X8R2A153M080AA	C1608X8R1H153M080AA		
22 nF	1005	0.50 ± 0.05	± 10%			C1005X8R1E223K050BB	
			± 20%			C1005X8R1E223M050BB	
	1608	0.80 ± 0.10	± 10%	C1608X8R2A223K080AB	C1608X8R1H223K080AA		
			± 20%	C1608X8R2A223M080AB	C1608X8R1H223M080AA		
2012	1.25 ± 0.20	± 10%	C2012X8R2A223K125AA				
		± 20%	C2012X8R2A223M125AA				
33 nF	1005	0.50 ± 0.05	± 10%				C1005X8R1C333K050BB
			± 20%				C1005X8R1C333M050BB
	1608	0.80 ± 0.10	± 10%	C1608X8R2A333K080AB	C1608X8R1H333K080AA		
			± 20%	C1608X8R2A333M080AB	C1608X8R1H333M080AA		
	2012	1.25 ± 0.20	± 10%	C2012X8R2A333K125AB			
			± 20%	C2012X8R2A333M125AB			
3216	0.85 ± 0.15	± 10%	C3216X8R2A333K085AA				
		± 20%	C3216X8R2A333M085AA				



## Capacitance Range Table

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C, ±15%)

Capacitance	Size	Thickness (mm)	Capacitance Tolerance	Catalog Number			
				Rated Voltage Edc: 100V	Rated Voltage Edc: 50V	Rated Voltage Edc: 25V	Rated Voltage Edc: 16V
47 nF	1005	0.50 ± 0.05	± 10%				C1005X8R1C473K050BB
			± 20%				C1005X8R1C473M050BB
	1608	0.80 ± 0.10	± 10%		C1608X8R1H473K080AA		
			± 20%		C1608X8R1H473M080AA		
2012	1.25 ± 0.20	± 10%	C2012X8R2A473K125AB				
		± 20%	C2012X8R2A473M125AB				
3216	0.85 ± 0.15	± 10%	C3216X8R2A473K085AA				
		± 20%	C3216X8R2A473M085AA				
68 nF	1608	0.80 ± 0.10	± 10%		C1608X8R1H683K080AB	C1608X8R1E683K080AA	
			± 20%		C1608X8R1H683M080AB	C1608X8R1E683M080AA	
	2012	1.25 ± 0.20	± 10%	C2012X8R2A683K125AB	C2012X8R1H683K125AA		
			± 20%	C2012X8R2A683M125AB	C2012X8R1H683M125AA		
3216	1.15 ± 0.15	± 10%	C3216X8R2A683K115AA				
		± 20%	C3216X8R2A683M115AA				
100 nF	1608	0.80 ± 0.10	± 10%		C1608X8R1H104K080AB	C1608X8R1E104K080AA	
			± 20%		C1608X8R1H104M080AB	C1608X8R1E104M080AA	
	2012	1.25 ± 0.20	± 10%		C2012X8R1H104K125AA		
			± 20%		C2012X8R1H104M125AA		
3216	1.15 ± 0.15	± 10%	C3216X8R2A104K115AA				
		± 20%	C3216X8R2A104M115AA				
150 nF	1608	0.80 ± 0.10	± 10%			C1608X8R1E154K080AB	
			± 20%			C1608X8R1E154M080AB	
	2012	0.85 ± 0.15	± 10%			C2012X8R1E154K085AA	
			± 20%			C2012X8R1E154M085AA	
	3216	0.85 ± 0.15	± 10%		C3216X8R1H154K125AB		
			± 20%		C3216X8R1H154M125AB		
3216	1.60 ± 0.20	± 10%	C3216X8R2A154K160AA				
		± 20%	C3216X8R2A154M160AA				
220 nF	1608	0.80 ± 0.10	± 10%			C1608X8R1E224K080AB	
			± 20%			C1608X8R1E224M080AB	
	2012	1.25 ± 0.20	± 10%		C2012X8R1H224K125AB	C2012X8R1E224K125AA	
			± 20%		C2012X8R1H224M125AB	C2012X8R1E224M125AA	
	3216	1.15 ± 0.15	± 10%		C3216X8R1H224K115AA		
			± 20%		C3216X8R1H224M115AA		
3216	1.60 ± 0.20	± 10%	C3216X8R2A224K160AB				
		± 20%	C3216X8R2A224M160AB				
330 nF	1608	0.80 ± 0.10	± 10%				C1608X8R1C334K080AB
			± 20%				C1608X8R1C334M080AB
	2012	1.25 ± 0.20	± 10%			C2012X8R1E334K125AA	
			± 20%			C2012X8R1E334M125AA	
3216	0.85 ± 0.15	± 10%			C3216X8R1E334K085AA		
		± 20%			C3216X8R1E334M085AA		
470 nF	1608	0.80 ± 0.10	± 10%				C1608X8R1C474K080AB
			± 20%				C1608X8R1C474M080AB
	2012	1.25 ± 0.20	± 10%			C2012X8R1E474K125AB	
			± 20%			C2012X8R1E474M125AB	
	3216	0.85 ± 0.15	± 10%			C3216X8R1E474K085AA	
			± 20%			C3216X8R1E474M085AA	
3216	1.60 ± 0.20	± 10%		C3216X8R1H474K160AA			
		± 20%		C3216X8R1H474M160AA			
3225	2.00 ± 0.20	± 10%	C3225X8R2A474K200AB				
		± 20%	C3225X8R2A474M200AB				



## Capacitance Range Table

### Class 2 (Temperature Stable)

Temperature Characteristics: X8R (-55 to +150°C, ±15%)

Capacitance	Size	Thickness (mm)	Capacitance Tolerance	Catalog Number			
				Rated Voltage Edc: 100V	Rated Voltage Edc: 50V	Rated Voltage Edc: 25V	Rated Voltage Edc: 16V
680 nF	2012	1.25 ± 0.20	± 10%				C2012X8R1C684K125AB
			± 20%				C2012X8R1C684M125AB
	3216	1.15 ± 0.15	± 10%			C3216X8R1E684K115AA	
			± 20%			C3216X8R1E684M115AA	
	3216	1.60 ± 0.20	± 10%		C3216X8R1H684K160AB		
			± 20%		C3216X8R1H684M160AB		
3225	2.50 ± 0.30	± 10%	C3225X8R2A684K250AB				
		± 20%	C3225X8R2A684M250AB				
1 µF	2012	1.25 ± 0.20	± 10%				C2012X8R1C105K125AB
			± 20%				C2012X8R1C105M125AB
3216	1.60 ± 0.20	± 10%		C3216X8R1H105K160AB	C3216X8R1E105K160AA		
		± 20%		C3216X8R1H105M160AB	C3216X8R1E105M160AA		
1.5 µF	3216	1.60 ± 0.20	± 10%			C3216X8R1E155K160AB	
			± 20%			C3216X8R1E155M160AB	
3225	1.60 ± 0.20	± 10%			C3225X8R1E155K160AA		
		± 20%			C3225X8R1E155M160AA		
2.2 µF	3216	1.60 ± 0.20	± 10%			C3216X8R1E225K160AB	
			± 20%			C3216X8R1E225M160AB	
3225	2.00 ± 0.20	± 10%			C3225X8R1E225K200AA		
		± 20%			C3225X8R1E225M200AA		
3.3 µF	3216	1.60 ± 0.20	± 10%				C3216X8R1C335K160AB
			± 20%				C3216X8R1C335M160AB
3225	2.50 ± 0.30	± 10%			C3225X8R1E335K250AA		
		± 20%			C3225X8R1E335M250AA		
4.7 µF	3216	1.60 ± 0.20	± 10%				C3216X8R1C475K160AB
			± 20%				C3216X8R1C475M160AB
3225	2.50 ± 0.30	± 10%			C3225X8R1E475K250AB		
		± 20%			C3225X8R1E475M250AB		
6.8 µF	3225	2.00 ± 0.20	± 10%				C3225X8R1C685K200AB
			± 20%				C3225X8R1C685M200AB
10 µF	3225	2.50 ± 0.30	± 10%				C3225X8R1C106K250AB
			± 20%				C3225X8R1C106M250AB