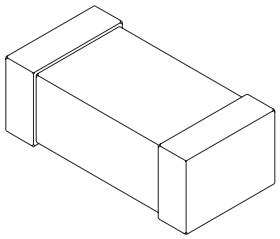
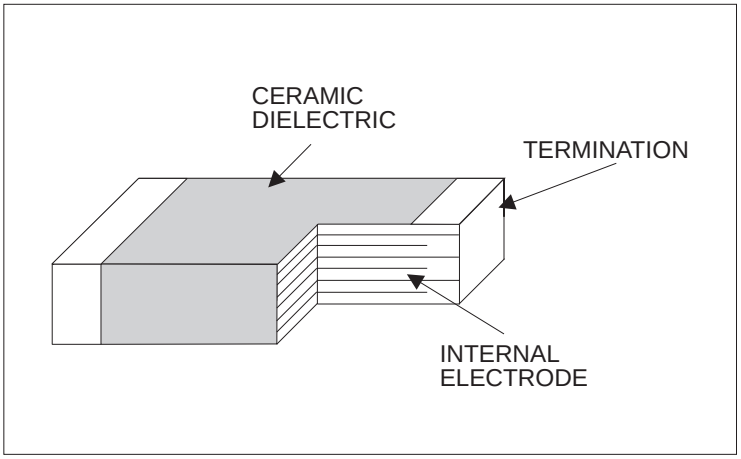
Ceramic Chip Capacitors



Description	Series	Capacitance Range	Circuit	Page
Ceramic Capacitors	NPO Series	10 pF ~ 0.01 uF		2-4
	Z5U Series	1K pF ~ 1 uF		2-6
	X7R Series	390 pF ~ 0.47 uF		2-8
	Axial-Leaded Epoxy • Coated	10 pF ~ 0.47 uF		2-10
	Radial-Leaded Epoxy • Dipped	10 pF ~ 2 uF		2-14



Application

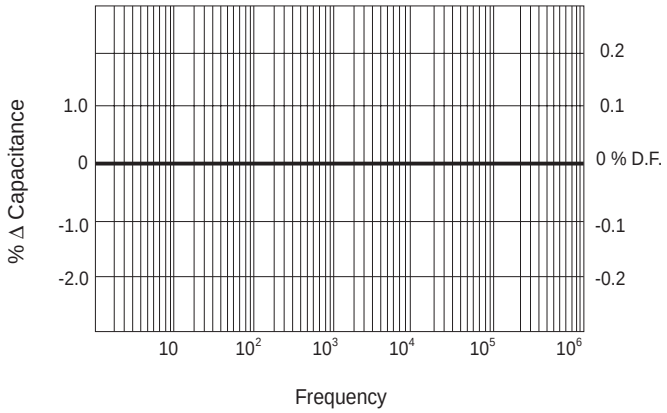
NPO (COG) dielectric properties suiter for precision circuits, requiring stable dielectric characteristics:

* Negligible dependence of capacitance and dissipation factor on time, voltage, and frequency
* Low-loss (High Q)
* Predictable linear temperature coefficient
* No Piezoelectric behavior

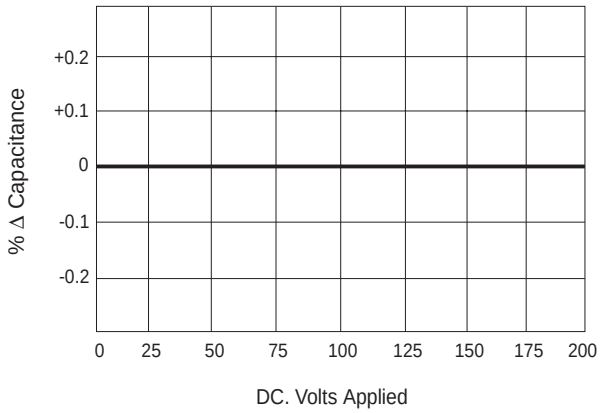
General Specification

- Operating temperature range -55°C ~ +125°C
- Capacitance Range: 10pF ~ 0.01uF
- Capacitance Tolerance: ±0.25pF, ±0.5pF, ±5%, ±10%
- Voltage Ratings, 50VDC, 100VDC, 200VDC
- Dissipation Factor (1 KHz, or MHz, 1 Vrms, 25°C) 0.15% Max
- Insulation Resistance (rated voltage applied at 25°C) 100,000 megohms or 1,000 Ohm-Farads min.
- Dielectric strength > 2.5X WV. DC.

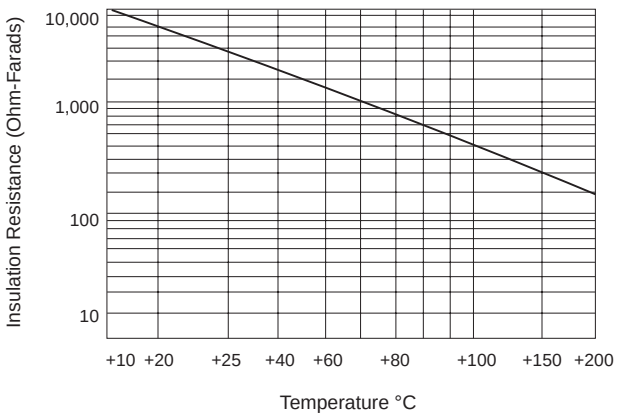
Δ C, D.F. vs. Frequency Coefficient



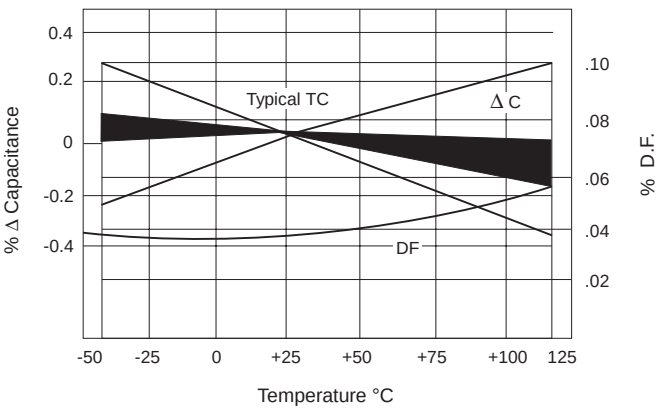
Δ C, vs. Voltage Coefficient



Insulation Resistance vs. Temp



Δ C,D.F. vs. Temperature Coefficient



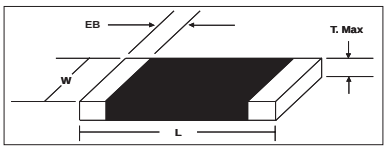
Ceramic Chip Capacitors · NPO & COG Dielectric

Part Number System

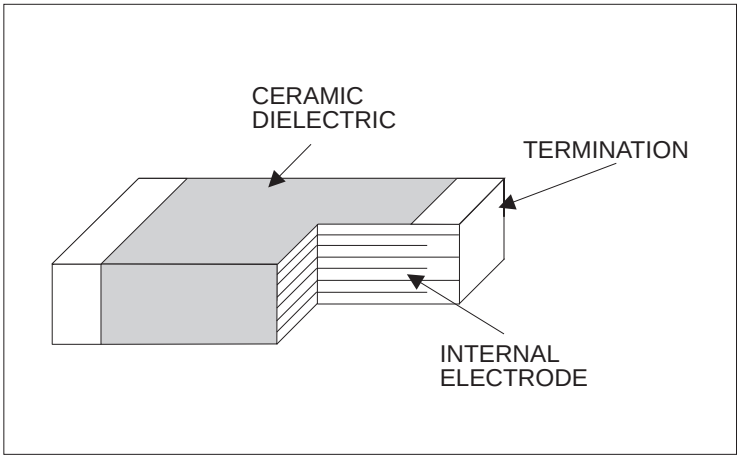
0805	COG	472	K	H	P	T
SIZE see chart	DIELECTIC COG (NPO)	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE C = +-0.25PF D = +-0.50PF F = +-1% J = +-5% K = +-10% M = +-20%	VOLTAGE CODE H = 50VDC T = 100VDC U = 200VDC	TERMINATION CODE P = pd/Ag S = Silver R = Solder N = Nickel barrier	PACKING CODE B = Bulk T = Taped & Reeled

SIZES AND VALUES AVAILABLE

1:1 STYLE		0805		1206		1210		1805		1808		1812		2220	
* L (mm, in)		2.0	0.080	3.2	0.126	3.2	0.126	4.5	0.177	4.5	0.177	4.5	0.177	5.6	0.220
* W(mm, in)		1.25	0.050	1.6	0.063	2.5	0.098	1.25	0.05	2.0	0.079	3.2	0.126	5.0	0.197
T Max(mm, in)		1.25	0.050	1.25	0.050	1.5	0.060	1.25	0.050	1.5	0.060	1.9	0.075	2.0	0.079
EB Min(mm, in)		0.2	0.008	0.3	0.012	0.3	0.012	0.3	0.012	0.3	0.012	0.3	0.012	0.3	0.012
CAP. (PF)	Tol.	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200
10	J.K.																					
12	J.K.																					
15	J.K.																					
18	J.K.																					
22	J.K.																					
27	J.K.																					
33	J.K.																					
39	J.K.																					
47	J.K.																					
58	J.K.																					
68	J.K.																					
82	J.K.																					
100	J.K.																					
120	J.K.																					
150	J.K.																					
180	J.K.																					
220	J.K.																					
270	J.K.																					
330	J.K.																					
390	J.K.																					
470	J.K.																					
560	J.K.																					
680	J.K.																					
820	J.K.																					
1,000	J.K.																					
1,200	J.K.																					
1,500	J.K.																					
1,800	J.K.																					
2,200	J.K.																					
2,700	J.K.																					
3,300	J.K.																					
3,900	J.K.																					
4,700	J.K.																					
5,600	J.K.																					
6,800	J.K.																					
8,200	J.K.																					
10,000	J.K.																					



* Tolerance +-0.01", 7% Whichever is greater



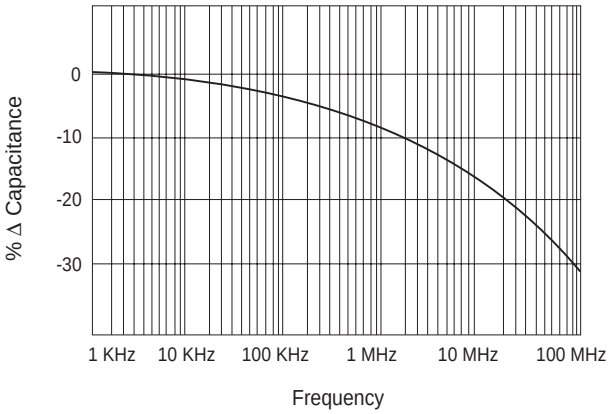
Application

The Hi-K (Z5U, Y5V) dielectrics deliver high capacitance density and are ideally suited for applications where space is at a premium, or as replacement for tantalum capacitors. Typical applications include use as by-pass or decoupling elements. Best performance is obtained at or near room Temperature, with low D.C. bias (<25 VDCW).

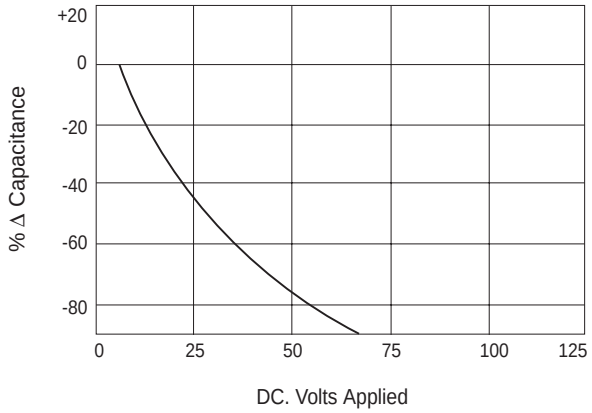
General Specification

- Operating temperature range -30°C ~ +85°C
- Capacitance Range: 1000pF ~ 1.0uF
- Capacitance Tolerance: ±20%, -20%, +80%
- Voltage Ratings, 25VDC, 50VDC, 100VDC
  (0603 Size: 16VDC, 50VDC, 100VDC)
- Dissipation Factor (1 KHz 0.5Vrms, 25 °C) 5% Max
- Insulation Resistance (rated voltage applied at 25°C) 10,000 megohms or 500 Ohm-Farads min
- Dielectric strength > 2.5X WV. DC.

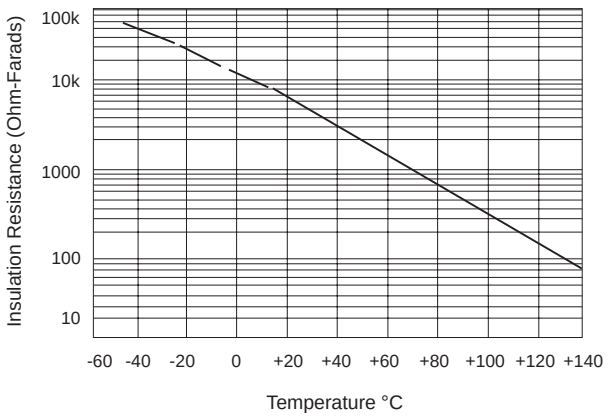
Δ C. vs. Frequency Coefficient



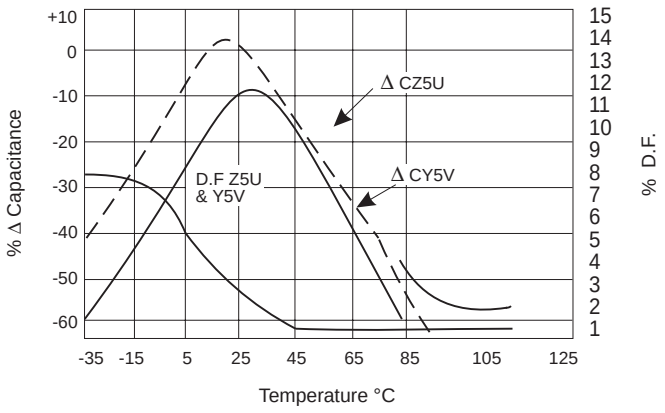
Δ C, vs. Voltage Coefficient



Insulation Resistance vs. Temp.



Δ C,D.F. vs. Temperature Coefficient



Ceramic Chip Capacitors · Z5U & Y5V Dielectric

Part Number System

0805	Y5V	472	M	H	N	T
SIZE see chart	DIELECTRIC Z5U & Y5V	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE M = ±20% Z = +80% -20%	VOLTAGE CODE C = 16VDC E = 25VDC H = 50VDC T = 100VDC	TERMINATION CODE P = Pd/Ag S = Silver R = Solder N = Nickel	PACKING CODE B = Bulk T = Taped & reeled

SIZES AND VALUES AVAILABLE

1:1 STYLE		0603			0805			1206			1210			1812			2220		
* L (mm,in)		1.6	0.063		2.0	0.080		3.2	0.126		3.2	0.126		4.5	0.177		5.6	0.220	
* W (mm,in)		0.8	0.031		1.25	0.050		1.6	0.063		2.5	0.098		3.2	0.126		5.0	0.197	
T Max(mm,in)		0.9	0.035		1.25	0.050		1.25	0.050		1.5	0.060		1.9	0.075		2.0	0.079	
EB MIN(mm,in)		0.2	0.008		0.2	0.008		0.3	0.012		0.3	0.012		0.3	0.012		0.3	0.012	
CAP.(PF)	Tol.	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)
		16	25	50	25	50	100	25	50	100	25	50	100	25	50	100	25	50	100
390	M.Z.																		
470	M.Z.																		
560	M.Z.																		
680	M.Z.																		
820	M.Z.																		
1,000	M.Z.																		
1,200	M.Z.																		
1,500	M.Z.																		
1,800	M.Z.																		
2,200	M.Z.																		
2,700	M.Z.																		
3,300	M.Z.																		
3,900	M.Z.																		
4,700	M.Z.																		
5,600	M.Z.																		
6,800	M.Z.																		
10,000	M.Z.																		
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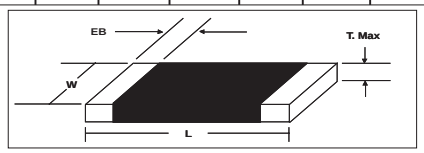
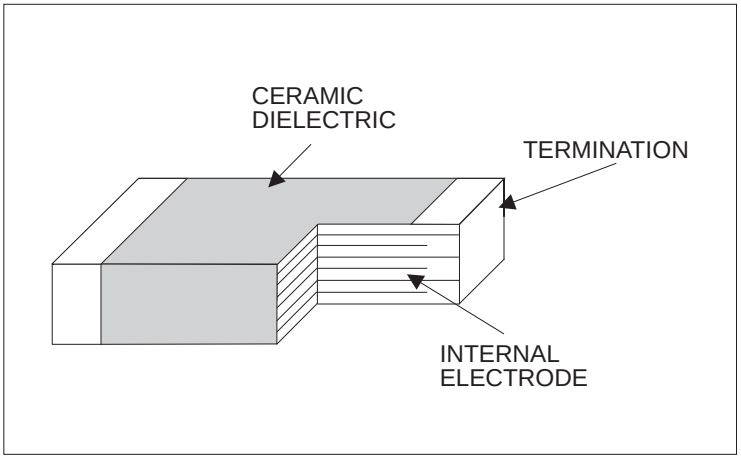
47,000	M.Z.																		
68,000	M.Z.																		
100,000	M.Z.																		
150,000	M.Z.																		
220,000	M.Z.																		
330,000	M.Z.																		
470,000	M.Z.																		
680,000	M.Z.																		
1,000,000	M.Z.																		



* Tolerance +-0.01", 7% Whichever is greater

Gray for Z5U, Y5V Values Available

Black for Y5V



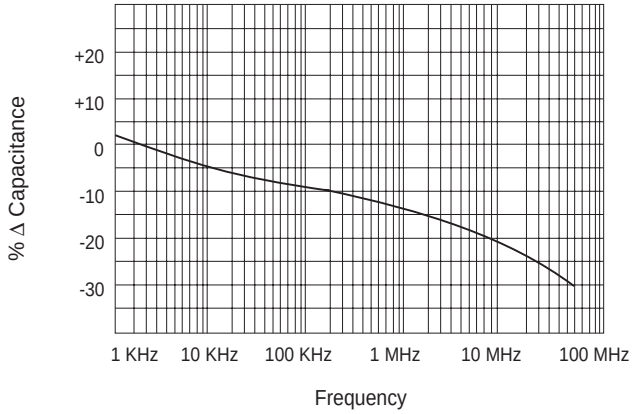
Application

X7R & BX dielectric properties; suited for by-pass and coupling purposes, filtering, frequency discrimination, DC blockage, and as voltage transient suppression elements.

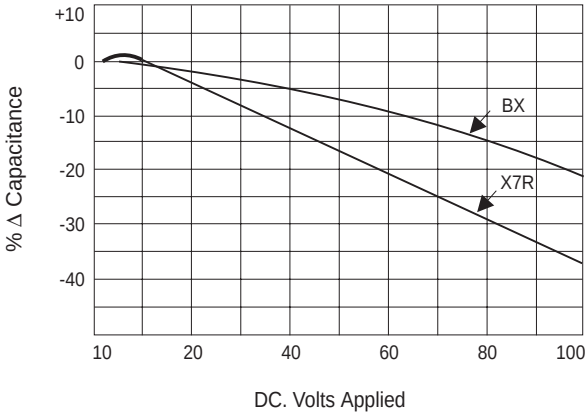
General Specification

- Operating temperature range -55°C ~ +125°C
- Capacitance Range: 390pF ~ 0.47uF
- Capacitance Tolerance: ±5%, ±10%, ±20%
- Voltage Ratings, 50VDC, 100VDC, 200VDC
- Dissipation Factor (1 KHz, 1.0 Vrms, 25°C) 2.5% Max
- Insulation Resistance (rated Voltage applied at 25°C) 100,000 megohms or 1,000 Ohm-Farads min
- Dielectric strength > 2.5X WV. DC.

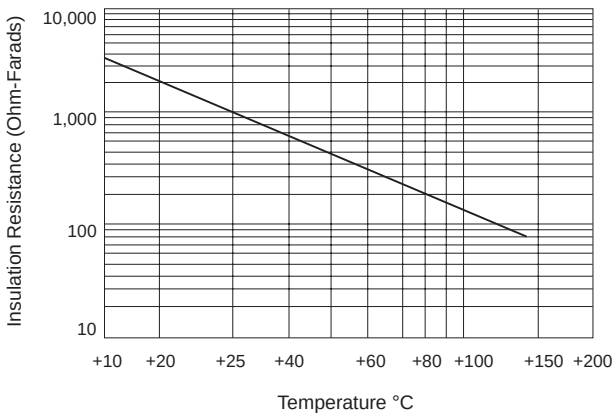
Δ C. vs. Frequency Coefficient



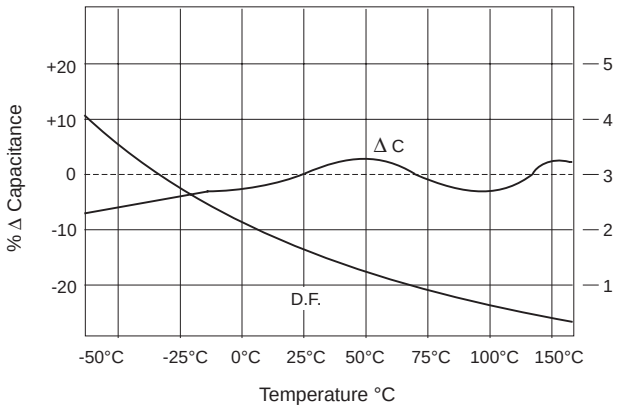
Δ C, vs. Voltage Coefficient



Insulation Resistance vs. Temp



Δ C,D.F. vs. Temperature Coefficient



Ceramic Chip Capacitors · X7R & BX Dielectric

Part Number System

0805	BX	472	K	H	N	T
SIZE see chart	DIELECTIC BX & X7R	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE J = +/-5% K = +/-10% M = +/-20%	VOLTAGE CODE C = 16VDC E = 25VDC H = 50VDC T = 100VDC U = 200VDC	TERMINATION CODE P = pd/Ag S = Silver R = Solder N = Nickel barrier	PACKING CODE B = Bulk T = Taped & Reeled

SIZES AND VALUES AVAILABLE

1:1 STYLE		0603			0805			1206			1210			1812			2220		
* L (mm, in)		1.6	0.063		2.0	0.080		3.2	0.126		3.2	0.126		4.5	0.177		5.6	0.220	
* W(mm, in)		0.8	0.031		1.25	0.050		1.6	0.063		2.5	0.098		3.2	0.126		5.0	0.197	
T Max(mm, in)		0.9	0.035		1.25	0.050		1.25	0.050		1.5	0.060		1.9	0.075		2.0	0.079	
EB Min(mm, in)		0.2	0.008		0.2	0.008		0.3	0.012		0.3	0.012		0.3	0.012		0.3	0.012	
CAP. (PF)	Tol.	WV (DC) 16	WV (DC) 25	WV (DC) 50	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200	WV (DC) 50	WV (DC) 100	WV (DC) 200
390	K.M																		
470	K.M																		
560	K.M																		
680	K.M																		
820	K.M																		
1,000	K.M																		
1,200	K.M																		
1,500	K.M																		
1,800	K.M																		
2,200	K.M																		
2,700	K.M																		
3,300	K.M																		
3,900	K.M																		
4,700	K.M																		
5,600	K.M																		
6,800	K.M																		
8,200	K.M																		
10,000	K.M																		
12,000	K.M																		
15,000	K.M																		
18,000	K.M																		
22,000	K.M																		
27,000	K.M																		
33,000	K.M																		
39,000	K.M																		
47,000	K.M																		
56,000	K.M																		
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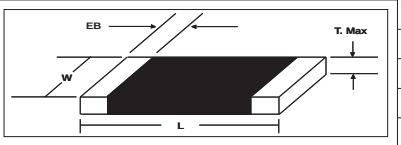
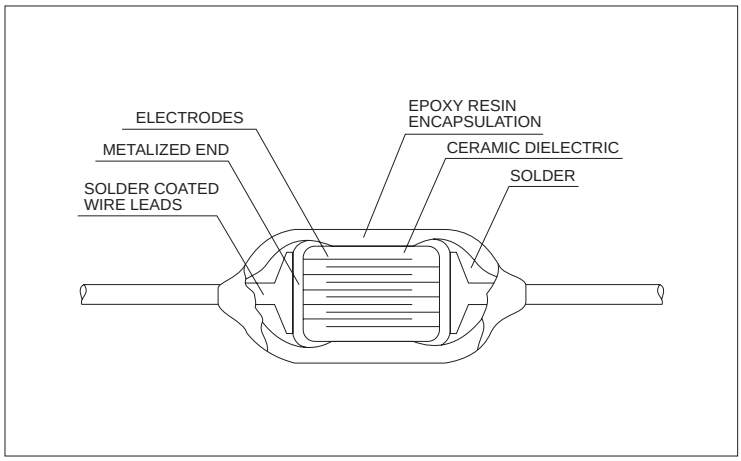
150,000	K.M																		
180,000	K.M																		
220,000	K.M																		
270,000	K.M																		
330,000	K.M																		
390,000	K.M																		
470,000	K.M																		



* Tolerance +/-0.01", 7% Whichever is greater

Multilayer Ceramic Capacitors

Axial-Leaded, Epoxy • Coated



Introduction

T.S.C. Axial-Leaded Epoxy coated multilayer ceramic chip capacitors are manufactured with modern proven technology exchanged with a U.S. based manufacturer. The process features a high degree of mechanization, operating under precise control while using the highest quality material. A continuous quality assurance program is also maintained to ensure consistent high quality capacitors. T.S.C. capacitors feature superior humidity characteristics, longer life, lower inductance.

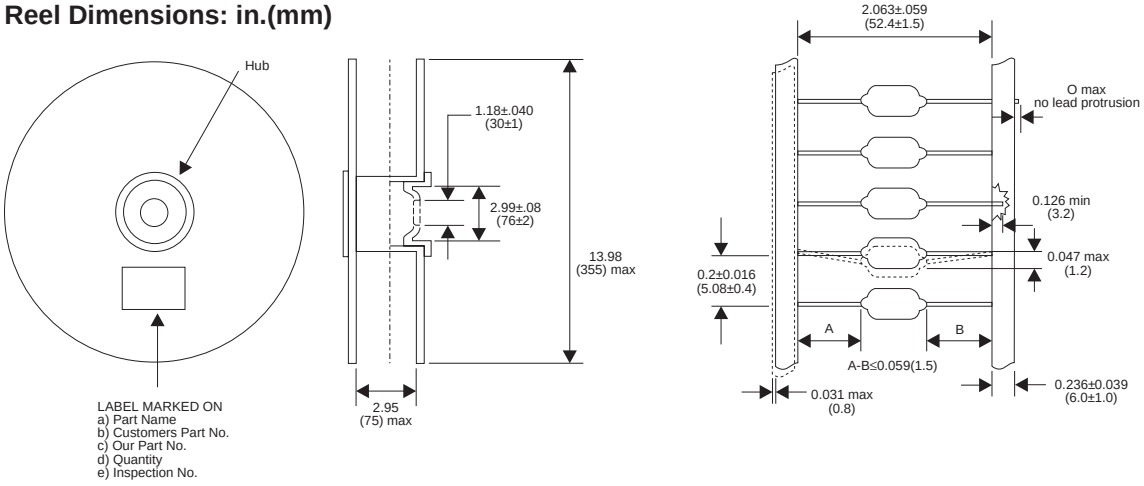
Features

- Wide capacitance, T.C., voltage and tolerance range
- Industry standard sizes
- Tape and Reel available for auto-insertion
- Marking standard or to customer specification

General Specifications

Code Dielectric EIA	COG	X7R	Z5U/Y5V
Temperature Characteristics	0±30ppm/°C, C>20 pF 0+120ppm/°C, C≤20pF -40	DC±15% maximum over -55°C to +125°C	DC+22%, -56 maximum over +10°C to +85°C
Category (Operating) Temperature Range	-55°C to +125°C	-55°C to +125°C	-25°C to +85°C
Measuring Conditions for Capacitance and D.F.	1MHz, 1 Vrms, C≤1000pF 1KHz, 1 Vrms, C>1000pF	1KHz, 1 Vrms	1KHz, 0.5 Vrms
Dissipation Factor (D.F.) and Tangent of Loss Angle (tan ∝)	≤0.15%	≤2.5%	≤4.0%
Insulation Resistance (I.R.) after 60 secs charging at rated Voltage 25°C	≥100 Gohms or ≤1,000 MΩ • µF whichever is less	≥100 Gohms or ≤1,000 MΩ • µF whichever is less	≥100 Gohms or ≤1,000 MΩ • µF whichever is less
Voltage Proof, 25°C	2.5xRated Voltage	2.5xRated Voltage	2.5xRated Voltage
Capacitance Aging	0	=1.5% per decade hour	=5% per decade hour

Tape & Reel Dimensions: in.(mm)

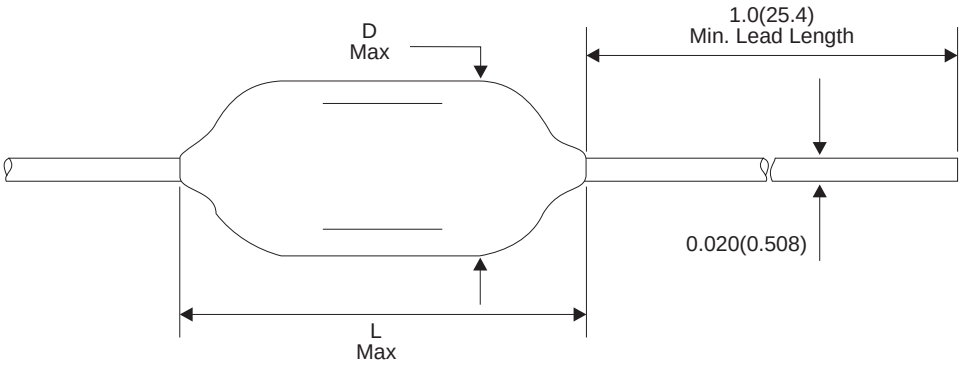


Multilayer Ceramic Capacitors

Part Number System

AD1O	COG	472	K	H	T
TYPE AND SIZE	TEMPERATURE CHARACTERISTICS COG=0±30ppm (Note 1), -55°C to +125°C X7R= ±55%, -55°C to +125°C Z5U= +22, -56%, +10°C to +85°C Y5V= +22, -82%, +10°C to +85°C	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE C = ±0.25PF D = ±0.50PF F = ±1% J = ±5% K = ±10% M = ±20%	VOLTAGE CODE H = 50VDC T = 100VDC U = 200VDC	PACKING CODE B = Bulk T = Taped & Reeled

Dimensions Inches (Millimeters)



EIA Characteristics	Dimensions: Inches (Millimeters)		
Type and Size	AD10	AD20	AD30
Length L	.170 (4.32)	.260 (6.60)	.290 (7.37)
Diameter D	.100 (2.54)	.100 (2.54)	.150 (3.81)

Marking

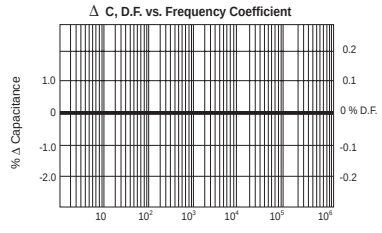
- Capacitance are marked in 3 digits for capacitance above 100PF, and marked in actual value for capacitance 100PF and below
- Capacitance tolerance are marked in code symbol.
- Temperature Characteristics: **C=COG, X=X7R, Z=Z5U, Y=Y5V**

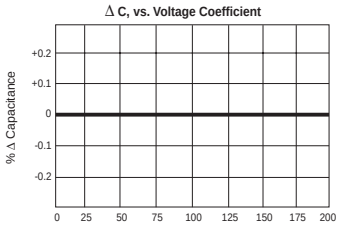
SIZE CODE	Capacitance	Tolerance	Rated Voltage	Temp. Char.
AD 10	0	------	------	------
AD 20	0	0	0	------
AD 30	0	0	0	0

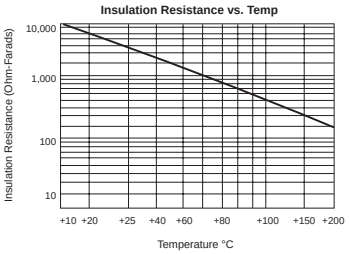
Capacitance Range

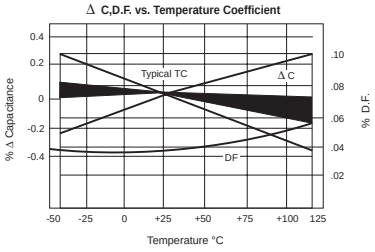
Dielectric Code		COG						X7R						Z5U		Z5U Y5V		Y5V	
Size Code		AD10		AD20		AD30		AD10		AD20		AD30		AD10		AD20		AD30	
Cap	W V.DC	50	100	50	100	50	100	50	100	50	100	50	100	25	50	25	50	25	50
10 12 15	100 120 150																		
18 22 27	180 220 270																		
33 39 47	330 390 470																		
56 68 82	560 680 820																		
100 120 150	101 121 151																		
180 220 270	181 221 271																		
330 390 470	331 391 471																		
560 680 820	561 681 821																		
1000 1200 1500	102 122 152																		
1800 2200 2700	182 222 272																		
3300 3900 4700	332 392 472																		
5600 6800 8200	562 682 822																		
.01 .012 .015	103 123 153																		
.018 .022 .027	183 223 273																		
.033 .047 .056	333 473 563																		
.068 .082 .1	683 823 104																		
.12 .15 .18	124 154 184																		
.22 .27 .33	224 274 334																		
.39 .47	394 474																		

NPO/COG

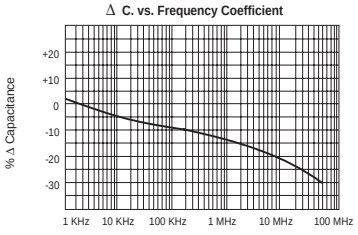


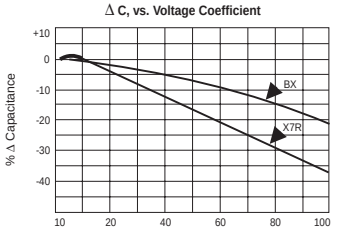


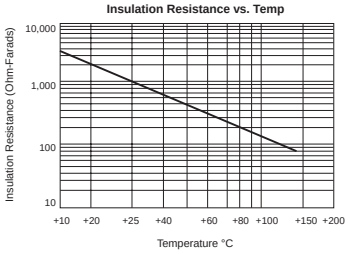


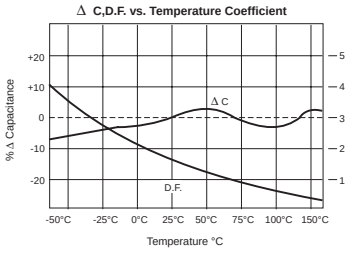


BX/X7R

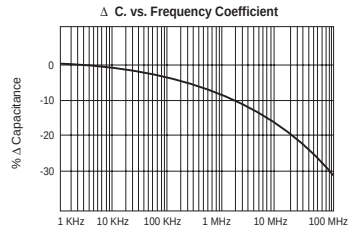


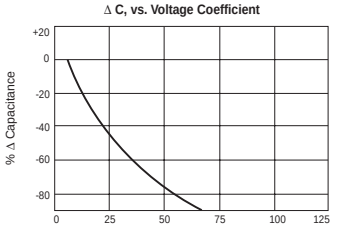


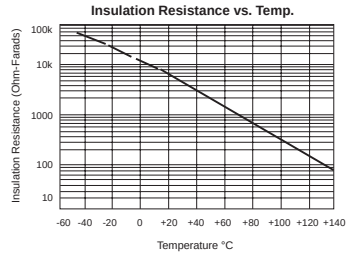


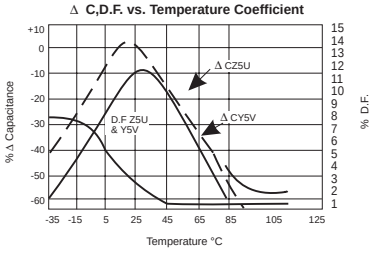


Z5U/Y5V



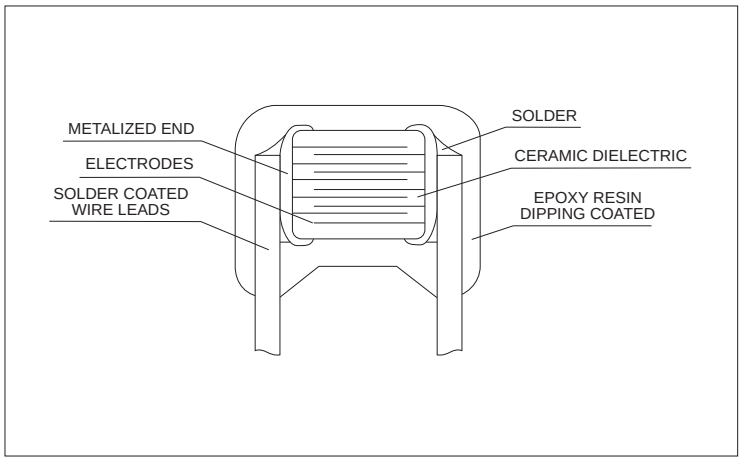






Multilayer Ceramic Capacitors

Radial-Leaded, Epoxy • Dipped



Introduction

T.S.C. Axial-Leaded Epoxy coated multilayer ceramic chip capacitors are manufactured with modern proven technology exchanged with a U.S. based manufacturer. The process features a high degree of mechanization, operating under precise control while using the highest quality material. A continuous quality assurance program is also maintained to ensure consistent high quality capacitors. T.S.C. capacitors feature superior humidity characteristics, longer life, lower inductance.

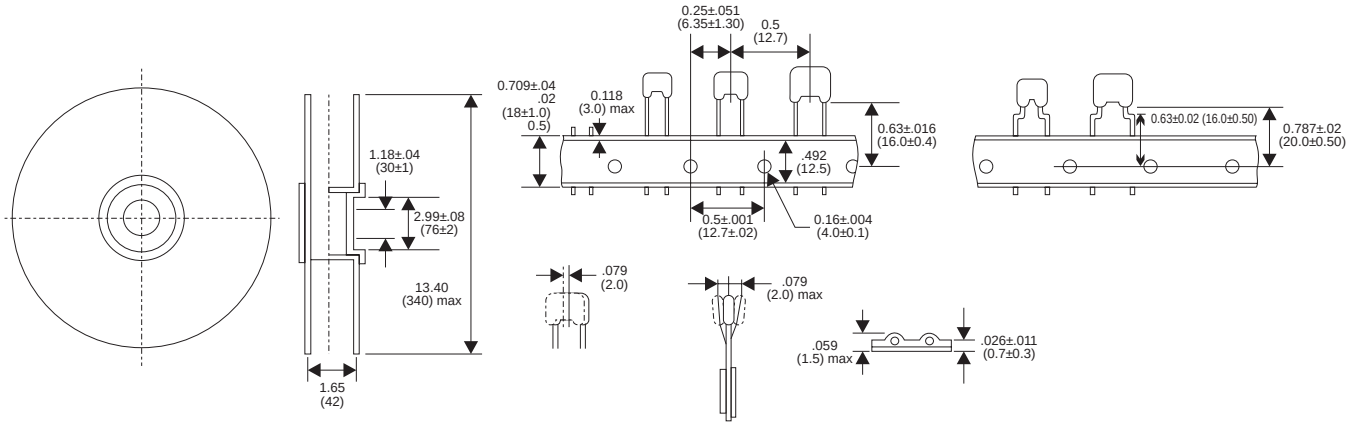
Features

- Wide capacitance, T.C., voltage and tolerance range
- Industry standard sizes
- Tape and Reel available for auto-insertion
- Marking standard or to customer specification

General Specifications

Code Dielectric EIA	COG	X7R	Z5U/Y5V
Temperature Characteristics	0±30ppm/°C, C>20 pF 0+120ppm/°C, C≤20pF -40	Δ C±15% maximum over -55°C to +125°C	Δ C+22%, -56 maximum over +10°C to +85°C
Category (Operating) Temperature Range	-55°C to +125°C	-55°C to +125°C	-25°C to +85°C
Measuring Conditions for Capacitance and D.F.	1MHz, 1 Vrms, C≤1000pF 1KHz, 1 Vrms, C>1000pF	1KHz, 1 Vrms	1KHz, 0.5 Vrms
Dissipation Factor (D.F.) and Tangent of Loss Angle (tan ∝)	≤0.15%	≤2.5%	≤4.0%
Insulation Resistance (I.R.) after 60 secs charging at rated Voltage 25°C	≥100 Gohms or ≤1,000 MΩ • µF whichever is less	≥100 Gohms or ≤1,000 MΩ • µF whichever is less	≥100 Gohms or ≤1,000 MΩ • µF whichever is less
Voltage Proof, 25°C	2.5xRated Voltage	2.5xRated Voltage	2.5xRated Voltage
Capacitance Aging	0	=1.5% per decade hour	=5% per decade hour

Tape & Reel Dimensions: in.(mm)

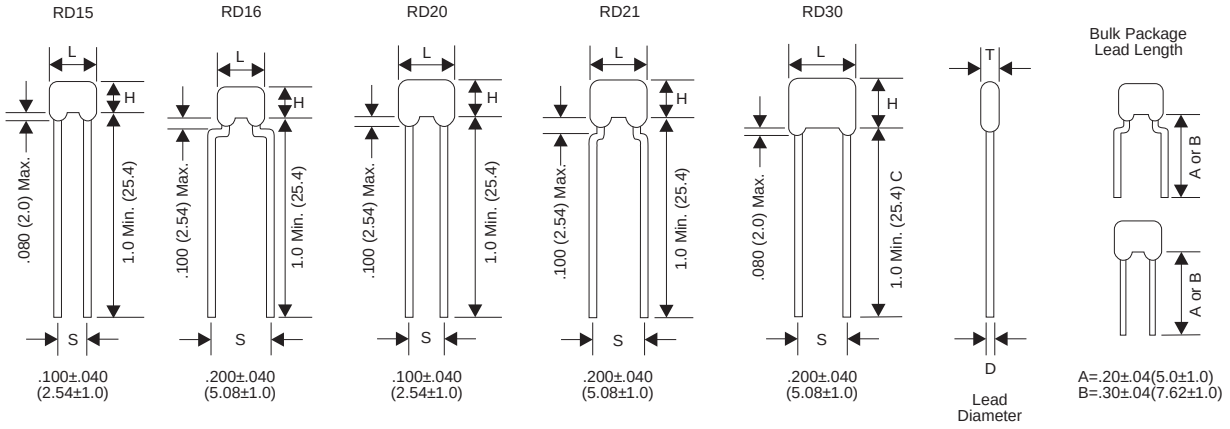


Multilayer Ceramic Capacitors

Part Number System

AD1O	COG	472	K	H	T
TYPE AND SIZE	TEMPERATURE CHARACTERISTICS COG= 0±30ppm X7R = ±15% Z5U = +22, -56% Y5V = +22, -82%	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE J = ±5% K = ±10% M = ±20%	VOLTAGE CODE H = 50VDC T = 100VDC U = 200VDC	PACKING CODE B = Bulk T = Taped & Reeled

Type and Size
Dimensions Inches (Millimeters)



Size

Style	L max	H max	T max	S max	D
RD 15	.150" (3.81)	.150" (3.81)	.100" (2.54)	.100" (2.54)	.020" (0.508)
RD 16	.150" (3.81)	.150" (3.81)	.100" (2.54)	.200" (5.08)	.020" (0.508)
RD 20	.200" (5.08)	.200" (5.08)	.125" (3.18)	.100" (2.54)	.020" (0.508)
RD 21	.200" (5.08)	.200" (5.08)	.125" (3.18)	.200" (5.08)	.020" (0.508)
RD 30	.300" (7.62)	.300" (7.62)	.150" (3.81)	.200" (5.08)	.020" (0.508)

Marking

- Capacitance are marked in 3 digits for capacitance above 100PF, and marked in actual value for capacitance 100PF and below
- Capacitance tolerance are marked in code symbol.
- Temperature Characteristics: **C=COG, X=X7R, Z=Z5U, Y=Y5V**

SIZE CODE	Capacitance	Tolerance	Rated Voltage	Temp. Char.
RD15, RD16, RD18	0	------	------	------
RD20, RD21, RD23	0	0	0	------
RD30	0	0	0	0

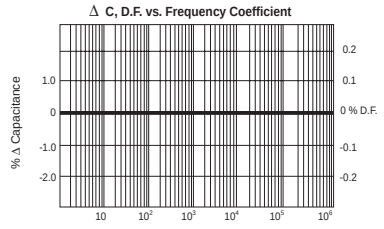
Multilayer Ceramic Capacitors

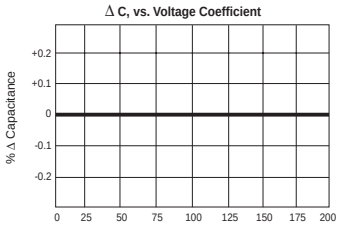
Capacitance Range

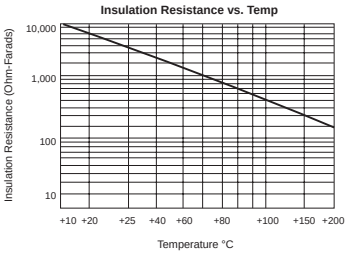
Dielectric Code		COG						X7R						Z5U		Z5U Y5V		Y5V	
Size Code		RD15	RD16	RD20	RD21	RD30		RD15	RD16	RD20	RD21	RD30		RD15	RD16	RD20	RD21	RD30	
Cap	W V.DC	50	100	50	100	50	100	50	100	50	100	50	100	25	50	25	50	25	50
10 12 15	100 120 150																		
18 22 27	180 220 270																		
33 39 47	330 390 470																		
56 68 82	560 680 820																		
100 120 150	101 121 151																		
180 220 270	181 221 271																		
330 390 470	331 391 471																		
560 680 820	561 681 821																		
1000 1200 1500	102 122 152																		
1800 2200 2700	182 222 272																		
3300 3900 4700	332 392 472																		
5600 6800 8200	562 682 822																		
.01 .012 .015	103 123 153																		
.018 .022 .027	183 223 273																		
.033 .047 .056	333 473 563																		
.068 .082 .1	683 823 104																		
.12 .15 .18	124 154 184																		
.22 .27 .33	224 274 334																		
.39 .47 .56	394 474 564																		
.68 .82 1.0	684 824 105																		
1.2 1.5 2.0	125 155 205																		

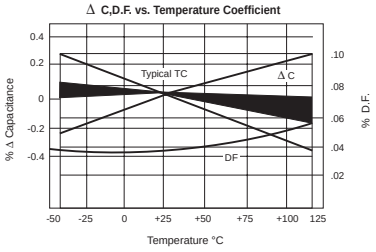
TSC Electronics, Ltd. Tel: (310) 534-2738 • Fax: (310) 534-3216 • http://www.tscgroup.com

NPO/COG

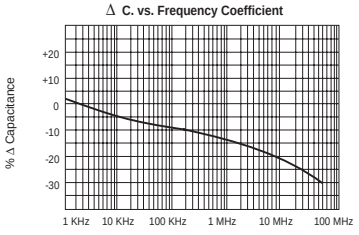


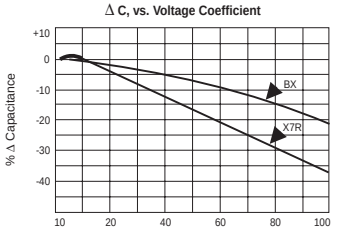


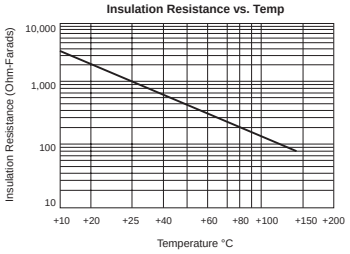


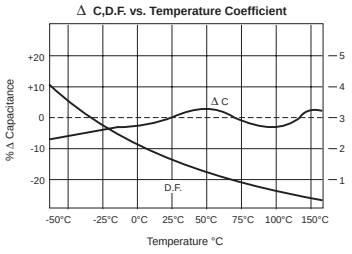


BX/X7R

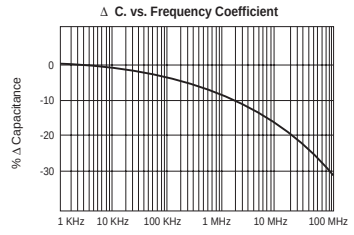


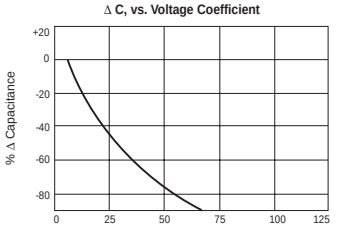


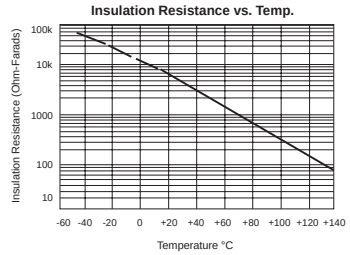


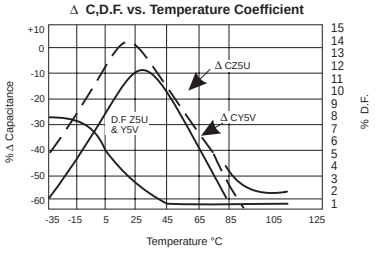


Z5U/Y5V



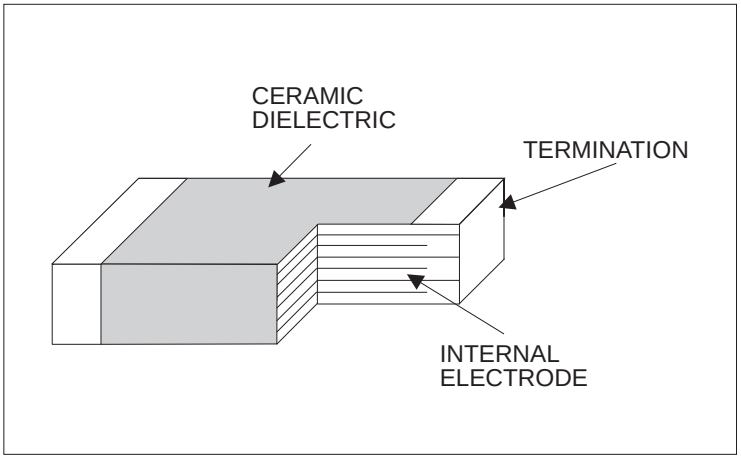






High Voltage Chip Capacitors

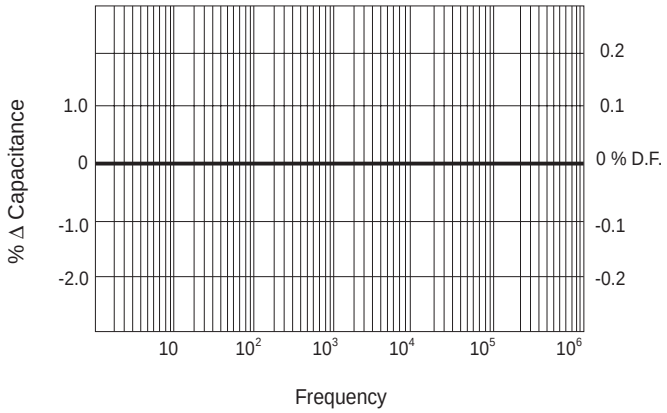
NPO & COG Dielectric



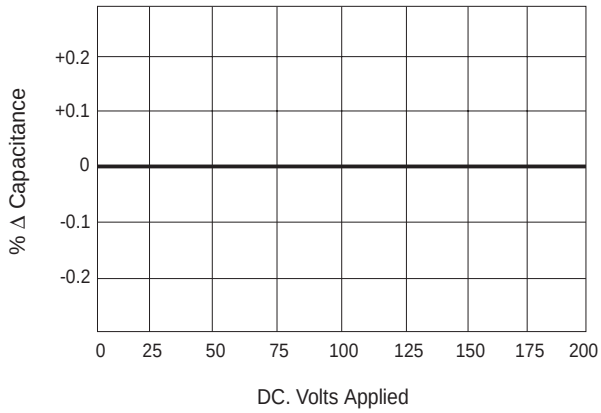
Application
NPO (COG) dielectric properties suiter for precision circuits, requiring stable dielectric characteristics:
* Negligible dependence of capacitance and dissipation factor on time, voltage, and frequency
* Low-loss (High Q)
* Predictable linear temperature coefficient
* No Piezoelectric behavior

General Specification
- Operating temperature range -55°C ~ +125°C
- Capacitance Range: 100pF ~ 0.047uF
  (25°C, 1.0±0.2 Vrms at 1kHz)
- Capacitance Tolerance: ±5pF, ±10pF, ±20%
- Voltage Ratings, 600VDC, 1000VDC, 2000VDC, 3000VDC
- Dissipation Factor (+25°C, 1.0±0.2 Vrms, 1kHz) 0.1% Max
- Insulation Resistance (+25°C, at 500 VDC)
  100,000 megohms min or 1,000 MΩ-µF min, whichever is less
- Insulation Resistance (+125°C, at 500 VDC)
  10,000 megaohms min or 100 MΩ-µF min, whichever is less
- Dielectric strength 120% rated voltage for 5 seconds at 50 mamp max current.

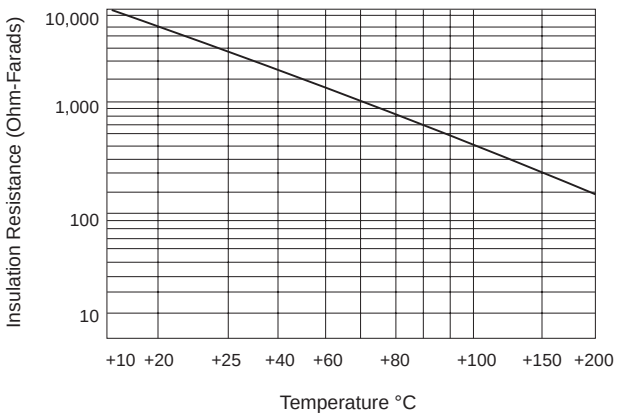
Δ C, D.F. vs. Frequency Coefficient



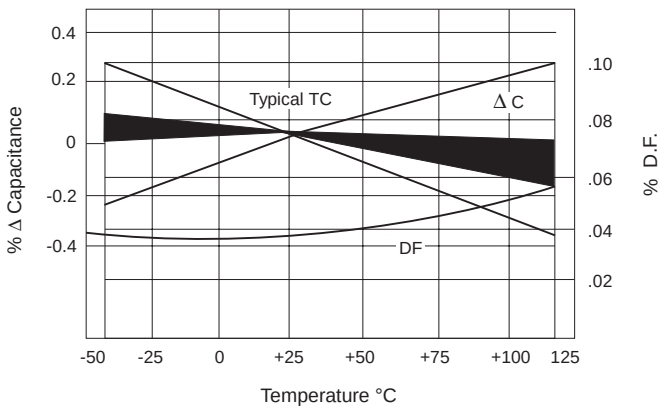
Δ C, vs. Voltage Coefficient



Insulation Resistance vs. Temp



Δ C,D.F. vs. Temperature Coefficient



High Voltage Chip Capacitors

Part Number System

1206	HVN	472	K	H	T
SIZE see chart	DIELECTIC COG (NPO)	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE C = +-0.25PF D = +-0.50PF F = +-1% J = +-5% K = +-10% M = +-20%	VOLTAGE CODE 601 = 600VDC 102 = 1000VDC 202 = 2000VDC 302 = 3000VDC	PACKING CODE X = Bulk T = Taped on Reel M = Magazine

SIZES AND VALUES AVAILABLE

1:1 STYLE		1206			1210			1806				1812				2225			
*L (mm, in)		3.18	.125		3.18	.125		4.45	.180			4.45	.175			5.72	.225		
*W (mm, in)		1.58	.062		2.41	.095		1.65	.063			3.18	.125			6.35	.250		
T Max(mm, in)		1.27	.050		1.65	.065		1.65	.063			1.65	.065			1.65	.065		
EB Min(mm, in)		.508	.020		.508	.020		.508	.020			.508	.020			.508	.020		
CAP.(PF)	Tol.	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)
		600	1000	2000	600	1000	2000	600	1000	2000	3000	600	1000	2000	3000	600	1000	2000	3000
10	J,K																		
12	J,K																		
15	J,K																		
18	J,K																		
22	J,K																		
27	J,K																		
33	J,K																		
39	J,K																		
47	J,K																		
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270	J,K																		
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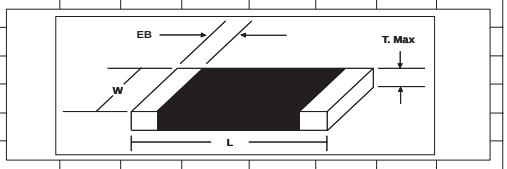
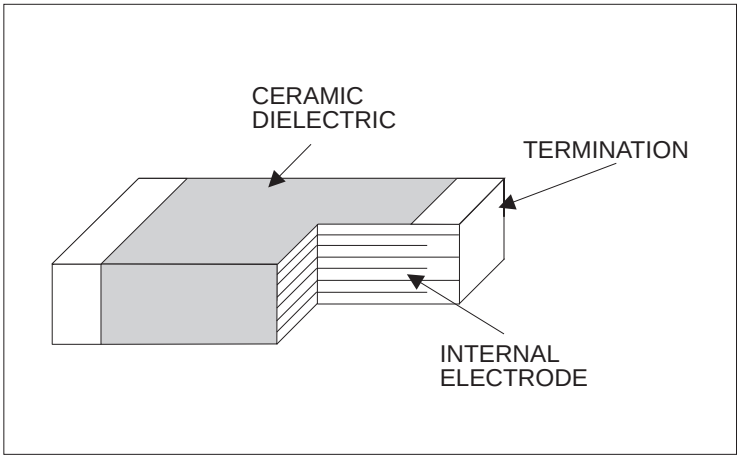
390	J,K																		
470	J,K																		
560	J,K																		
680	J,K																		
820	J,K																		
1,000	J,K																		
1,200	J,K																		
1,500	J,K																		
1,800	J,K																		
2,200	J,K																		
2,700	J,K																		
3,300	J,K																		
3,900	J,K																		
4,700	J,K																		
5,600	J,K																		
6,800	J,K																		
8,200	J,K																		
12,000	J,K																		



* Tolerance +-0.01", 7% Whichever is greater

High Voltage Chip Capacitors

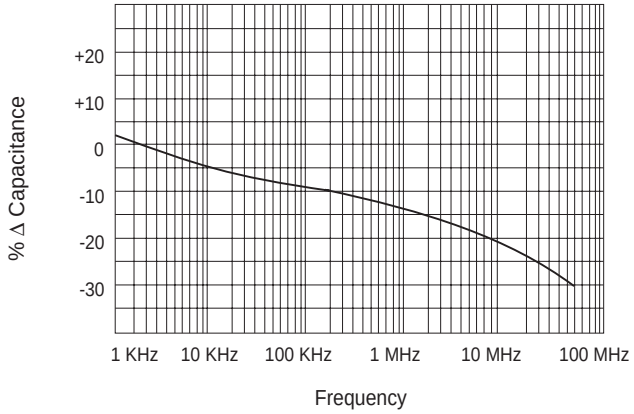
X7R & BX Dielectric



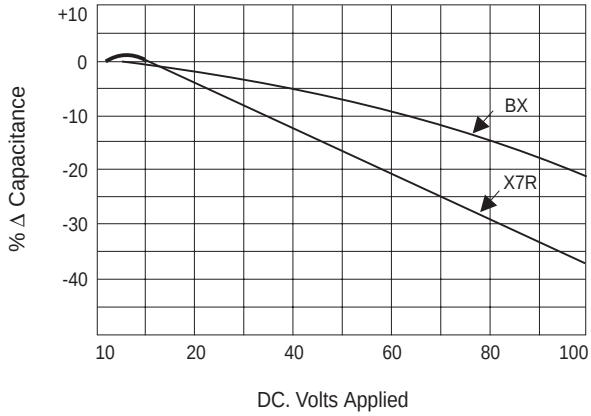
Application
X7R & BX dielectric properties; suited for by-pass and coupling purposes, filtering, frequency discrimination, DC blockage, and as voltage transient suppression elements.

General Specification
- Operating temperature range -55°C ~ +125°C
- Capacitance Range: 100pF ~ 0.56uF
  (25°c, 1.0±0.2 Vrms, 1kHz)
- Capacitance Tolerance: ±5%, ±10%, ±20%
- Voltage Ratings, 600VDC, 1000VDC, 1500VDC, 2000VDC, 3000VDC
- Dissipation Factor (+25°C, 1.0±0.2 Vrms, 1kHz) 2.5% Max
- Insulation Resistance (+25°C, at 500 VDC) 100,000 megohms min or 1000 MW-µF min, whichever is less
- Insulation Resistance (+125°C, at 500 VDC) 10,000 megaohms min or 100 MW-µF min, whichever is less
- Dielectric strength 120% rated voltage for 5 seconds at 50 mamp max current.

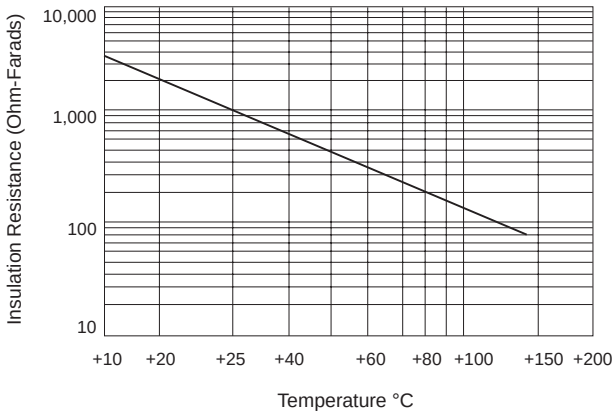
Δ C. vs. Frequency Coefficient



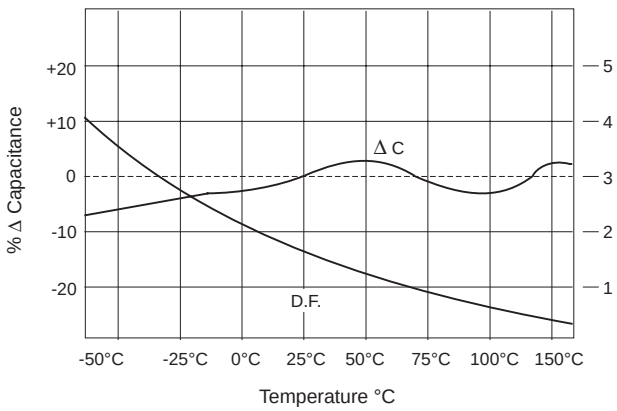
Δ C, vs. Voltage Coefficient



Insulation Resistance vs. Temp



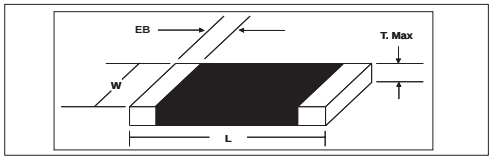
Δ C,D.F. vs. Temperature Coefficient



High Voltage Chip Capacitors

Part Number System

1206	HVX	472	K	H	T
SIZE see chart	DIELECTIC BX & X7R	CAPACITANCE CODE 1st two digits are signifi. third digit denotes number of zeros to follow 472 = 4700PF R denotes decimal 2R7 = 2.7PF	TOLERANCE CODE J = +/-5% K = +/-10% M = +/-20%	VOLTAGE CODE 601 = 600VDC 102 = 1000VDC 152 = 1500VDC 202 = 2000VDC 302 = 3000VDC	PACKING CODE X = Bulk T = Taped on Reel M = Magazine



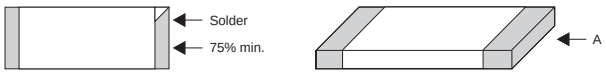
SIZES AND VALUES AVAILABLE

1:1 STYLE		1206			1210			1806			1812				2225				
*L (mm, in)		3.18	.125		3.18	.125		4.45	.180		4.45	.175			5.72	.225			
*W (mm, in)		1.58	.062		2.41	.095		1.65	.063		3.18	.125			6.35	.250			
T Max(mm, in)		1.27	.050		1.65	.065		1.65	.063		1.65	.065			1.65	.065			
EB Min(mm, in)		.508	.020		.508	.020		.508	.020		.508	.020			.508	.020			
CAP.(PF)	Tol.	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)	WV (DC)
		600	1000	1500	600	1000	1500	600	1000	1500	600	1000	1500	2000	600	1000	1500	2000	2500
560	K,M																		
680	K,M																		
820	K,M																		
1,000	K,M																		
1,200	K,M																		
1,500	K,M																		
1,800	K,M																		
2,200	K,M																		
2,700	K,M																		
3,300	K,M																		
3,900	K,M																		
4,700	K,M																		
5,600	K,M																		
6,800	K,M																		
8,200	K,M																		
10,000	K,M																		
12,000	K,M																		
15,000	K,M																		
18,000	K,M																		
22,000	K,M																		
27,000	K,M																		
33,000	K,M																		
39,000	K,M																		
47,000	K,M																		
56,000	K,M																		
68,000	K,M																		
82,000	K,M																		
220,000	K,M																		

* Tolerance +-0.01", 7% Whichever is greater

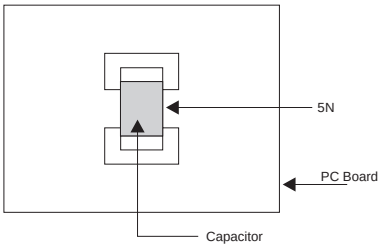
Multilayer Ceramic Chip Capacitor

Performance and Test Conditions

Criteria	Class I	Class II	Test Conditions
Operating temperature range	COG: -55 to +125°C (-67 to +257°F)	X7R: -55 to +125°C (-67 to 257°F) Z5U: 10 to 85°C (50 to 185°F) Y5V: -30 to +85°C (-22 to +185°F)	Conforms to (EIA RS198)
Exterior appearance and structure	No abnormal exterior appearance and structural dimensions are based on individual standards.		Micrometer
Withstanding voltage	No dielectric breakdown nor mechanical breakdown.		Class I: 300% of rated voltage, 1 to 5 sec. Class II: 250% of rated voltage, 1 to 5 sec.
Insulation resistance	Minimum insulation resistance: 10000MΩ or 500MΩ•μF, whichever is smaller. 16Vdc ratings: 10000MΩ or 100MΩ•μF, whichever is smaller.		Rated voltage shall be applied, Measurement is taken after one minute. 16Vdc rating: Measurement voltage is 25Vdc.
Capacitance	Within specified tolerance.		1000pF max. 1 MHz±20%, 5Vrms max. 1000pF min. 1 kHz±10%, 1.0±0.2Vrms.
Q or dielectric dissipation factor (tan δ)	Q 30pF min. Q≤1000 less than 30pF Q≤400+20•C (C is nominal capacitance)	Temperature characteristic: X7R / Y5V / Z5U Dielectric dissipation factor (tan δ): 0.03 max. / 0.05 max. / 0.04 max.	
Capacitance temperature coefficient	Temperature coefficient symbol: COG Temperature coefficient symbol: 0 ± 30 Temperature characteristics: X7R / Y5V / Z5U Capacitance change (%): ±15 / +22, -82 / +22, +56		
Solderability	Solder to cover more than 75% of the terminal surface. And no exposure of ceramic and electrodes on plane A on both sides. 		Solder temperature: 235±5°C (455±9°C) Dipping: 10 to 15mm depth (.394 to .591 inches) Dip time: 2±0.5 sec. Solder: H63A (eutectic solder) Flux: Rosin
Solder heat resistance — Exterior	No abnormalities		Preheat: 150±10°C (302 to 50°C) 1 to 2 minutes Dip: Solder temperature 260±5°C (500±9°C) Dip time: 5±0.5 sec. Solder: H63A (eutectic solder) Flux: Rosin Cooling: Natural heat dissipation for 24±2 hours, Class I 48±4 hours, Class II Measurement: Measure at room temperature.
Capacitance change	±2.5% or ±0.25pF, whichever larger	Temperature characteristic: X7R / Y5V / Z5U Capacitance change (%): ±7.5 / ±20 / ±20	
Q or dielectric dissipation factor (tan δ)	Q 30pF min Q≤1000 less than 30pF Q≤400+20°C (C is nominal capacitance.)	Temperature characteristic: X7R / Y5V / Z5U Dielectric dissipation factor (tan δ): 0.03 max. / 0.05 max. / 0.04 max.	
Insulation resistance	Minimum insulation resistance: 10000MΩ or 500MΩ•μF, whichever is smaller. 16Vdc ratings: 10000MΩ or 100MΩ•μF product, whichever is smaller.		
Withstanding voltage	No dielectric breakdown or mechanical breakdown.		

Multilayer Ceramic Chip Capacitor

Performance and Test Conditions

Criteria		Class I	Class II			Test Conditions
Robustness of terminations		No indications of pealing of materialized terminations.				 5N of force to be applied from the side for 10±1 seconds.
Temperature cycle	Exterior	No mechanical damage.				Subject the capacitor to the four steps in order as specified below. Repeat the procedure five times. Then leave the capacitor at room temperature and humidity for 48±4 hours before measuring. step 1 Min. operating temp. ±3°C(5.4°F) 30±3 minutes step 2 room temperature 2~5 minutes step 3 Max. operating temp. ±2°C(3.6°F) 30±3 minutes step 4 room temperature 2~5 minutes
	Capacitance change	±2.5% or ±0.25pF, whichever larger	Temperature characteristic	X7R	Y5V	Z5U
			Capacitance change (%)	±7.5	±20	±20
	Q or dielectric dissipation factor (tan δ)	Q 30pF min Q≤1000 less than 30pF Q≤400+20°C (C is nominal capacitance.)	Temperature characteristic	X7R	Y5V	Z5U
			Dielectric dissipation factor (tan δ)	0.03 max.	0.05 max.	0.04 max.
	Insulation resistance	Minimum insulation resistance: 10000MΩ or 100MΩ•μF, whichever is smaller. 16Vdc ratings: 10000MΩ or 100MΩ•μF product, whichever is smaller.				
	Withstanding voltage	No dielectric breakdown or mechanical breakdown.				
High temperature resistance	Exterior	No mechanical damage.				Temperature: 85±3°C (185±5.4°F) Voltage: 200% of rated voltage Time: 1000 +48 -0 hours Charging current: 50mA max.
	Capacitance Change	±3% or ±0.3pF, whichever is larger.	Temperature characteristic	X7R	Y5V	Z5U
			Capacitance change (%)	±15	±30	±30
	Q or dielectric dissipation factor (tan d)	Q 30pF min. Q≤350 10pF to 30pF excl. Q≤275 + 5/2•C less than 10pF Q≤200±10•C (C is nominal capacitance.)	Temperature characteristic	X7R	Y5V	Z5U
			Dielectric dissipation factor (tan δ)	0.05 max.	0.075 max.	0.075 max.
	Isulation resistance	Minimum insulation resistance: 1000MΩ or 50MΩ•μF, whichever is smaller. 16Vdc ratings: 1000MΩ or 50MΩ•μF product, whichever is smaller.				
Humidity resistance	Exterior	No mechanical damage.				Temperature: 40±20°C (104±36°C) Relative humidity: 90 to 95% RH Voltage: rated voltage Time: 500 +24 -0 hours Charging current: 50mA max.
	Capacitance change	±7.5% or ±0.75pF, whichever is larger.	Temperature characteristic	X7R	Y5V	Z5U
			Capacitance change (%)	±12.5	±30	±30
	Q or dielectric dissipation factor (tan d)	Q 30pF min. Q≤200 less than 30pF Q≤100+10/3•C (C is nominal capacitance.)	Temperature characteristic	X7R	Y5V	Z5U
			Dielectric dissipation factor (tan δ)	0.05 max.	0.075 max.	0.075 max.
	Insulation resistance	Minimum insulation resistance: 500MΩ or 25MΩ•μF, whichever is smaller. 16Vdc ratings: 500MΩ or 5Ω•μF, whichever is smaller.				

Tape Dimensions

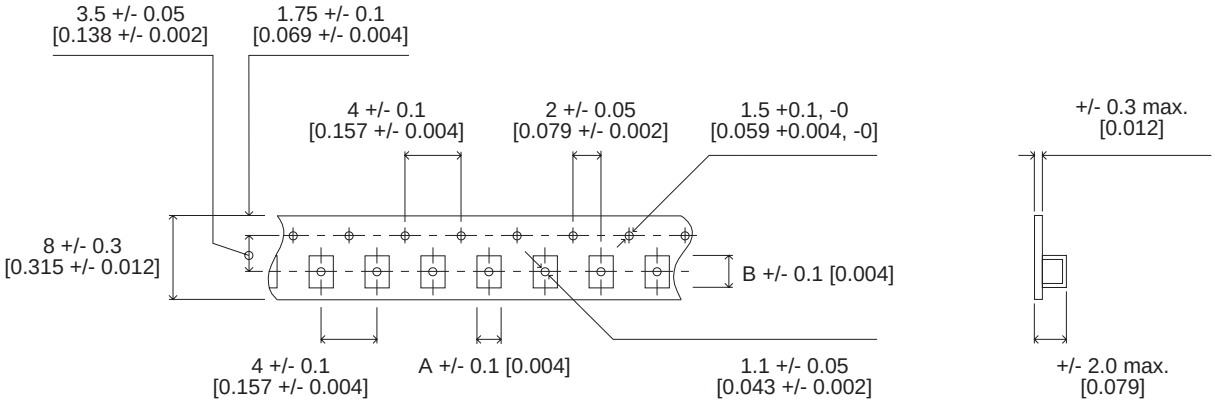
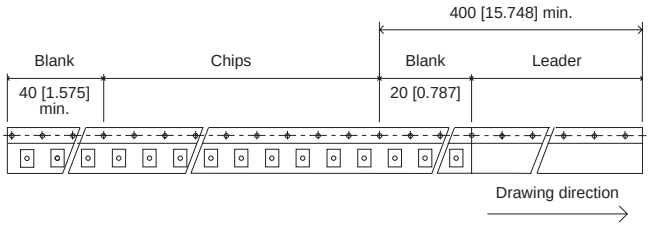


Fig. 1

TAPE DIMENSIONS

Size Code	A	B	Fig.
0805	1.5±0.2 [0.043±.008]	2.3±0.2 [0.091±.008]	1
1206	1.9±0.2 [0.059±.008]	3.5±0.2 [0.138±.008]	1
1210	2.9±0.2 [0.114±.008]	3.6±0.2 [0.142±.008]	1
1805			1
1808			1
1812	3.6±0.2 [0.142±.006]	4.9±0.15 [0.193±.006]	2
2220	5.4±0.2 [0.213±.008]	6.9±0.2 [0.272±.006]	2

Dimensions in mm [inches].



• The pitch holes shift only within +/- 0.3mm [0.012 inches] for cumulative 10 pitches.

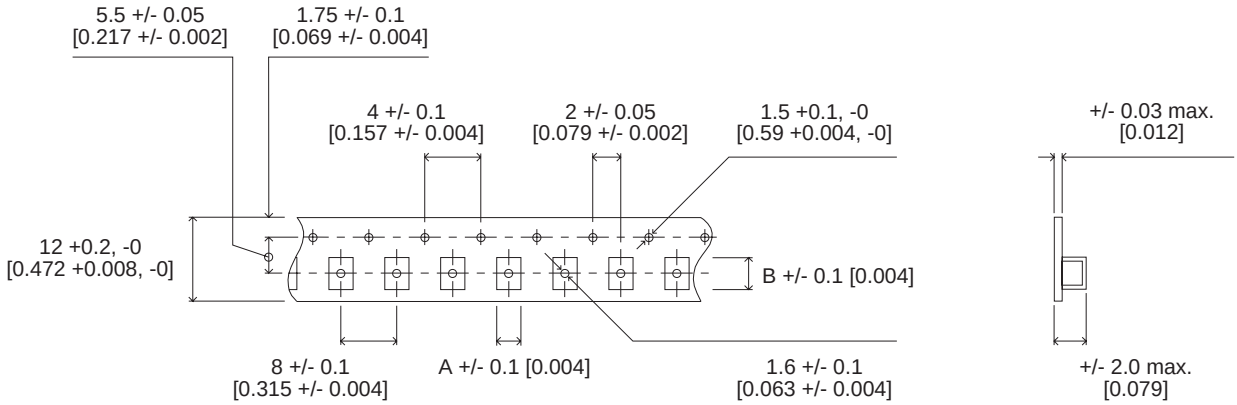


Fig. 2