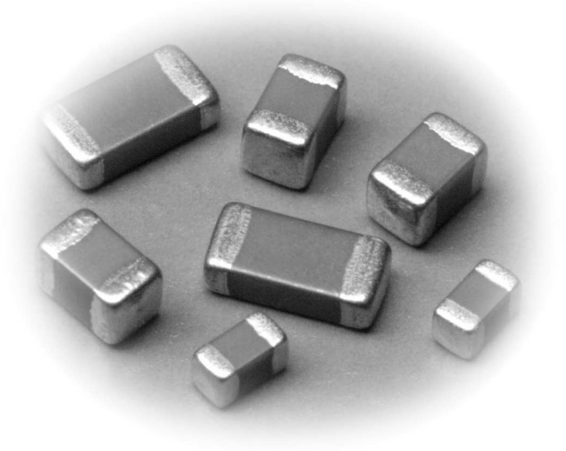
KOA SPEER ELECTRONICS, INC.

NPO, X5R, X7R, Y5V, Z5U

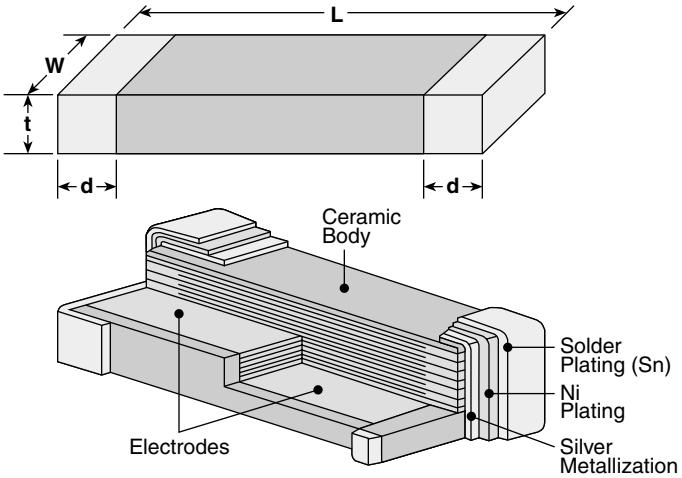
ceramic chip capacitors



features

- High Q factor
- Low T.C.C.
- Available in high capacitance values (up to 100 µF)

dimensions and construction



Case Size	Dimensions inches (mm)			
	L	W	t (Max.)	d
0402	.039±.004 (1.0±0.1)	.02±.004 (0.5±0.1)	.021 (0.55)	.01±.006 (0.25±0.15)
0603	.063±.006 (1.6±0.15)	.032±.006 (0.81±0.15)	.035 (0.9)	.014±.006 (0.35±0.15)
0805	.079±.008 (2.01±0.2)	.049±.008 (1.25±0.2)	.051 (1.3)	.02±.01 (0.50±0.25)
1206	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.059 (1.5)	.02±.01 (0.5±0.25)
1210	.126±.008 (3.2±0.2)	.098±.008 (2.5±0.2)	.067 (1.7)	.02±.01 (0.5±0.25)
1812	.177±.012 (4.5±0.3)	.126±.008 (3.2±0.2)	.067 (1.7)	.024±.014 (0.61±0.36)
1825	.177±.012 (4.5±0.3)	.252±.016 (6.4±0.4)	.067 (1.7)	.024±.014 (0.61±0.36)
2220	.224±.016 (5.7±0.4)	.197±.016 (5.0±0.4)	.087 (2.2)	.025±.015 (0.64±0.39)

ordering information

Old Part #	0805	NPO	H		T	101	K
New Part #	NPO	0805	H	T	TD	101	K
	Dielectric	Size	Voltage	Termination Material	Packaging	Capacitance	Tolerance
	NPO X5R X7R Y5V Z5U	0402 0603 0805 1206 1210 1812 1825 2220	A = 10V C = 16V E = 25V H = 50V I = 100V J = 200V K = 6.3V	T: Sn	TD: 7" paper tape TE: 7" embossed plastic TDB: 13" paper tape TED: 13" embossed plastic	NPO, X5R, X7R,Y5V: 2 significant digits + no. of zeros. "R" indicates decimal point Z5U: 2 significant digits + no. of zeros	B: ±0.1pF C: ±0.25pF D: ±0.5pF F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80, -20%

For further information on packaging, please refer to Appendix B.

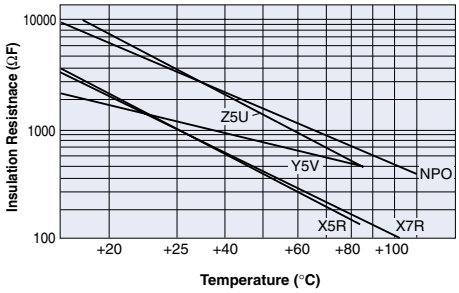
applications and ratings

Dielectric	Capacitance Range	Capacitance Tolerance*	Voltage Ratings	Dissipation Factor	T.C.C.	Test Voltage	Operating Temperature	Insulation Resistance
NPO	0.5pF - 0.033µF	B: ±0.1pF (1.0pF ~ 8.2pF) C: ±0.25pF (1.0pF ~ 8.2pF) D: ±0.5pF (5.6pF ~ 8.2pF) F: ±1%, G: ±2% J: ±5%, K: ±10%	16V 25V 50V 100V 200V	For Values >30pF: 0.1% max., ≤30pF: Q = 400 + 20 x C DF = 1/Q C is in pF	0 ± 30 ppm/°C	1.0 ± 0.2 Vrms	-55°C to +125°C	+25°C 100,000MΩ min. or 1000 MΩ - µF min. whichever is less
X5R	0.027µF - 47µF	K: ±10%	6.3V 10V 16V 25V	6.3 = 7.3% 10 = 5.0% 16 = 3.5% 25 = 3.0%	±15% (0 VDC)	1.0 ± 0.2 Vrms	-55°C to +85°C	+25°C 100,000MΩ min. or 500 MΩ - µF min. whichever is less
X7R	100pF - 1.0µF	K: ±10%	10V 16V 25V 50V 100V 200V	For 50 & 100 volts 2.5% max. 25 = 3.0% 16 = 3.5%	±15% (0 VDC)	1.0 ± 0.2 Vrms	-55°C to +125°C	+25°C 100,000MΩ min. or 1000 MΩ - µF min. whichever is less
Y5V	2200pF - 4.7µF	Z: +80, -20%	10V 16V 25V 50V	16V & 25V = 7.0% 50V = 5.0%	+22% to -82% max.	1.0 ± 0.2 Vrms	-55°C to +125°C	+25°C 10,000MΩ min. or 1000 MΩ - µF min. whichever is less
Z5U	0.01µF - 1.0µF	M: ±20% Z: +80, -20%	25V 50V	4.0% max.	+22% to -56% max.	0.5 ± 0.2 Vrms	-55°C to +125°C	+25°C 10,000MΩ min. or 1000 MΩ - µF min. whichever is less

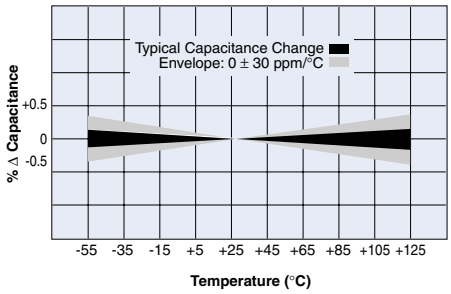
* Special tolerances available, please consult factory.

environmental applications

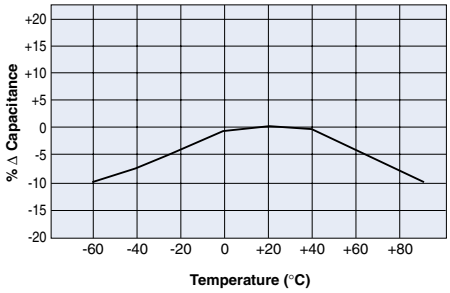
Insulation Resistance vs Temp.



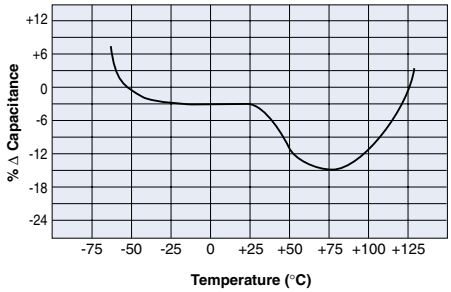
NPO - Temperature Coefficient



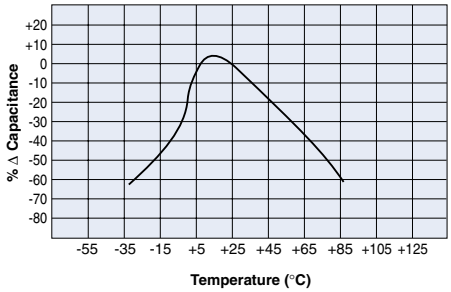
X5R - Temperature Coefficient



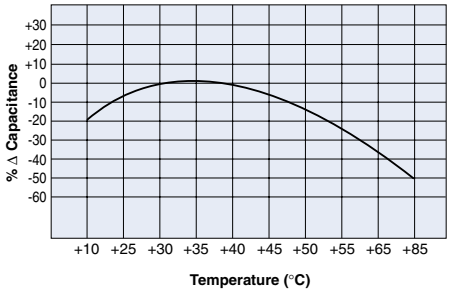
X7R - Temperature Coefficient



Y5V - Temperature Coefficient



Z5U - Temperature Coefficient



NPO capacitance voltage availability

Size				0402*			0603*		0805			1206				1210		
Capacitance values pF	Capacitance values µF	Capacitance values Code	WVDC	16	25	50	50	100	50	100	200	25	50	100	200	50	200	500
0.47		R47																
0.56		R56																
0.68		R68																
0.82		R82																
1		1R0																
1.2		1R2PF																
1.5		1R5PF																
1.8		1R8PF																
2.2		2R2PF																
2.7		2R7PF																
3.3		3R3PF																
3.9		3R9PF																
4.7		4R7PF																
5.6		5R6PF																
6.8		6R8PF																
8.2		8R2PF																
10		100PF																
12		120PF																
15		150PF																
18		180PF																
22		220PF																
27		270PF																
33		330PF																
39		390PF																
47		470PF																
56		560PF																
68		680PF																
82		820PF																
100	.0001	101PF																
120	.00012	121PF																
150	.00015	151PF																
180	.00018	181PF																
220	.00022	221PF																
270	.00027	271PF																
330	.00033	331PF																
390	.00039	391PF																
470	.00047	471PF																
560	.00056	561PF																
680	.00068	681PF																
820	.00082	821PF																
1000	.0010	102PF																
1200	.0012	122PF																
1500	.0015	152PF																
1800	.0018	182PF																
2200	.0022	222PF																
2700	.0027	272PF																
3300	.0033	332PF																
3900	.0039	392PF																
4700	.0047	472PF																
5600	.0056	562PF																
6800	.0068	682PF																
8200	.0082	822PF																
10000	.010	103PF																
12000	.012	123PF																
15000	.015	153PF																
18000	.018	183PF																
22000	.022	223PF																
27000	.027	273PF																
33000	.033	333PF																
39000	.039	393PF																

* IR and vapor phase solder only recommended

Capacitance tolerance available:
R47 ~ 8R2 = C: ±0.25 pF, 5R6 ~ 8R2 = D ±0.5 pF, 10 ~ 393 = J ±5%, F ±1%, G ±2%

X5R capacitance voltage availability

Size	0402			0603				0805				1206				1210				1812				2220
Capacitance values pF μF	6.3	10	16	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	6.3
100																								
150																								
220																								
330																								
470																								
680																								
1000																								
1200																								
1500																								
1800																								
2200																								
2700																								
3300																								
3900																								
4700																								
5600																								
6800																								
8200																								
0.010																								
0.012																								
0.015																								
0.018																								
0.022																								
0.027																								
0.033																								
0.039																								
0.047																								
0.056																								
0.068																								
0.082																								
0.10																								
0.12																								
0.15																								
0.18																								
0.22																								
0.27																								
0.33																								
0.47																								
0.56																								
0.68																								
0.82																								
1.0																								
1.2																								
1.5																								
1.8																								
2.2																								
3.3																								
4.7																								
6.8																								
10																								
22																								
47																								
100																								

Capacitance tolerance available: ±10%

X7R capacitance voltage availability

Size			0402*			0603*					0805						1206						1210		
Capacitance values pF	µF	Code	16	25	50	10	16	25	50	100	10	16	25	50	100	200	10	16	25	50	100	200	50	100	200
100	.0001	101PF																							
120	.00012	121PF																							
150	.00015	151PF																							
180	.00018	181PF																							
220	.00022	221PF																							
270	.00027	271PF																							
330	.00033	331PF																							
390	.00039	391PF																							
470	.00047	471PF																							
560	.00056	561PF																							
680	.00068	681PF																							
820	.00082	821PF																							
1000	.0010	102PF																							
1200	.0012	122PF																							
1500	.0015	152PF																							
1800	.0018	182PF																							
2200	.0022	222PF																							
2700	.0027	272PF																							
3300	.0033	332PF																							
3900	.0039	392PF																							
4700	.0047	472PF																							
5600	.0056	562PF																							
6800	.0068	682PF																							
8200	.0082	822PF																							
10000	.010	103PF																							
12000	.012	123PF																							
15000	.015	153PF																							
18000	.018	183PF																							
22000	.022	223PF																							
27000	.027	273PF																							
33000	.033	333PF																							
39000	.039	393PF																							
47000	.047	473PF																							
56000	.056	563PF																							
68000	.068	683PF																							
82000	.082	823PF																							
100000	.100	104PF																							
120000	.120	124PF																							
150000	.150	154PF																							
180000	.180	184PF																							
220000	.220	224PF																							
270000	.270	274PF																							
330000	.330	334PF																							
390000	.390	394PF																							
470000	.470	474PF																							
560000	.560	564PF																							
680000	.680	684PF																							
1000000	1.00	105PF																							
1200000	1.20	125PF																							
1500000	1.50	155PF																							
1800000	1.80	185PF																							
2200000	2.20	225PF																							

* IR and vapor phase solder only recommended

Capacitance tolerance available: ±10%

Y5V capacitance voltage availability

Size			0402*		0603*				0805				1206				1210
Capacitance values pF	µF	Code	16	50	10	16	25	50	10	16	25	50	10	16	25	50	25
2200	.0022	222PF															
2700	.0027	272PF															
3300	.0033	332PF															
3900	.0039	392PF															
4700	.0047	472PF															
5600	.0056	562PF															
6800	.0068	682PF															
8200	.0082	822PF															
10000	.010	103PF															
12000	.012	123PF															
15000	.015	153PF															
18000	.018	183PF															
22000	.022	223PF															
27000	.027	273PF															
33000	.033	333PF															
39000	.039	393PF															
47000	.047	473PF															
56000	.056	563PF															
68000	.068	683PF															
82000	.082	823PF															
100000	.100	104PF															
120000	.120	124PF															
150000	.150	154PF															
180000	.180	184PF															
220000	.220	224PF															
270000	.270	274PF															
330000	.330	334PF															
390000	.390	394PF															
470000	.470	474PF															
560000	.560	564PF															
680000	.680	684PF															
820000	.820	824PF															
1000000	1.0	105PF															
1200000	1.2	125PF															
1500000	1.5	155PF															
1800000	1.8	185PF															
2200000	2.2	225PF															
2700000	2.7	275PF															
3300000	3.3	335PF															
3900000	3.9	395PF															
4700000	4.7	475PF															
5600000	5.6	565PF															
6800000	6.8	685PF															
10000000	10	106PF															

* IR and vapor phase solder only recommended

Capacitance tolerance available: +80, -20%

Z5U capacitance voltage availability

Size			0603*		0805	1206	1210
Capacitance values pF	µF	Code	25	50	50	50	50
2200	.0022	222PF					
2700	.0027	272PF					
3300	.0033	332PF					
3900	.0039	392PF					
4700	.0047	472PF					
5600	.0056	562PF					
6800	.0068	682PF					
8200	.0082	822PF					
10000	.010	103PF					
12000	.012	123PF					
15000	.015	153PF					
18000	.018	183PF					
22000	.022	223PF					
27000	.027	273PF					
33000	.033	333PF					
39000	.039	393PF					
47000	.047	473PF					
56000	.056	563PF					
68000	.068	683PF					
82000	.082	823PF					
100000	.100	104PF					
120000	.120	124PF					
150000	.150	154PF					
180000	.180	184PF					
220000	.220	224PF					
270000	.270	274PF					
330000	.330	334PF					
390000	.390	394PF					
470000	.470	474PF					
560000	.560	564PF					
680000	.680	684PF					
820000	.820	824PF					
1000000	1.0	105PF					
1500000	1.5	155PF					

* IR and vapor phase solder only recommended

Capacitance tolerance: +80,-20%