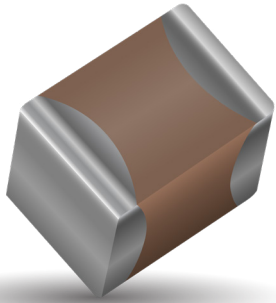


# COG (NP0) Dielectric

## General Specifications



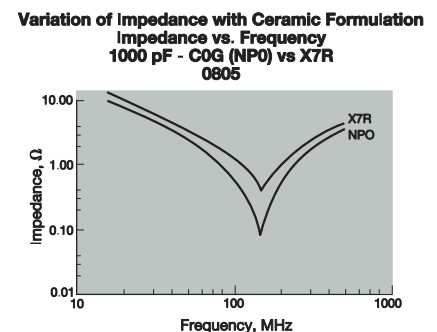
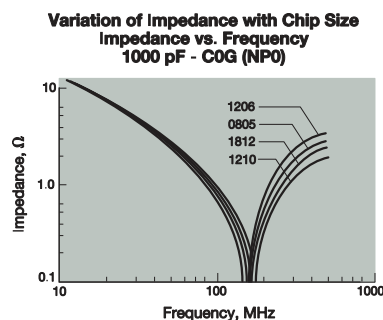
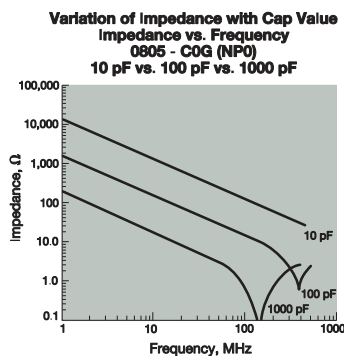
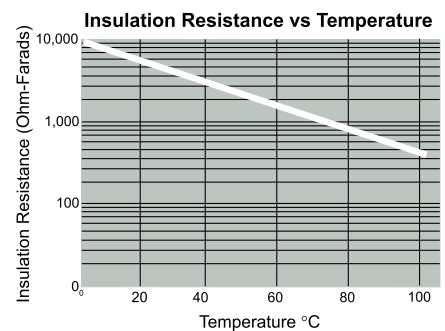
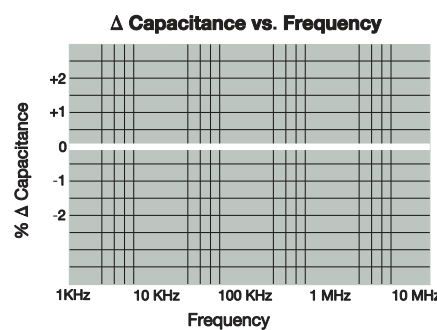
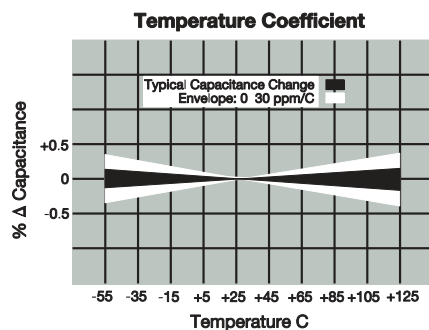
COG (NP0) is the most popular formulation of the "temperature-compensating," EIA Class I ceramic materials. Modern COG (NP0) formulations contain neodymium, samarium and other rare earth oxides. COG (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is  $0 \pm 30 \text{ ppm}/^\circ\text{C}$  which is less than  $\pm 0.3\%$  C from  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ . Capacitance drift or hysteresis for COG (NP0) ceramics is negligible at less than  $\pm 0.05\%$  versus up to  $\pm 2\%$  for films. Typical capacitance change with life is less than  $\pm 0.1\%$  for COG (NP0), one-fifth that shown by most other dielectrics. COG (NP0) formulations show no aging characteristics.

### PART NUMBER (see page 4 for complete part number explanation)



<b>0805</b>	<b>5</b>	<b>A</b>	<b>101</b>	<b>J</b>	<b>A</b>	<b>T</b>	<b>2</b>	<b>A</b>
<b>Size</b> (L" x W")	<b>Voltage</b> 6.3V = 6 10V = Z 16V = Y 25V = 3 50V = 5 100V = 1 200V = 2 250V = V 500V = 7	<b>Dielectric</b> COG (NP0) = A	<b>Capacitance Code (In pF)</b> 2 Sig. Digits + Number of Zeros	<b>Capacitance Tolerance</b> B = $\pm 10 \text{ pF}$ ( $< 10 \text{ pF}$ ) C = $\pm 25 \text{ pF}$ ( $< 10 \text{ pF}$ ) D = $\pm 50 \text{ pF}$ ( $< 10 \text{ pF}$ ) F = $\pm 1\%$ ( $\geq 10 \text{ pF}$ ) G = $\pm 2\%$ ( $\geq 10 \text{ pF}$ ) J = $\pm 5\%$ K = $\pm 10\%$	<b>Failure Rate</b> A = Not Applicable	<b>Terminations</b> T = Plated Ni and Sn	<b>Packaging</b> 2 = 7" Reel 4 = 13" Reel U = 4mm TR (01005)	<b>Special Code</b> A = Std. Product
						<b>Contact Factory For</b> 1 = Pd/Ag Term 7 = Gold Plated <b>NOT RoHS COMPLIANT</b>		<b>Contact Factory For Multiples</b>

NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers. Contact factory for non-specified capacitance values.



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# COG (NP0) Dielectric

## Specifications and Test Methods



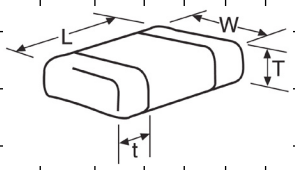
Parameter/Test		NPO Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz $\pm$ 10% for cap $\leq$ 1000 pF 1.0 kHz $\pm$ 10% for cap $>$ 1000 pF Voltage: 1.0Vrms $\pm$ .2V	
Q		$<$ 30 pF: Q $\geq$ 400+20 x Cap Value $\geq$ 30 pF: Q $\geq$ 1000		
Insulation Resistance		100,000M $\Omega$ or 1000M $\Omega$ - $\mu$ F, whichever is less	Charge device with rated voltage for 60 $\pm$ 5 secs @ room temp/humidity	
Dielectric Strength		No breakdown or visual defects	Charge device with 250% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) Note: Charge device with 150% of rated voltage for 500V devices.	
Resistance to Flexure Stresses	Appearance	No defects		
	Capacitance Variation	$\pm$ 5% or $\pm$ .5 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3		
Solderability		$\geq$ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 $\pm$ 5°C for 5.0 $\pm$ 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, $<$ 25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60sec- onds. Store at room temperature for 24 $\pm$ 2hours before measuring electrical properties.	
	Capacitance Variation	$\leq$ $\pm$ 2.5% or $\pm$ .25 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: -55°C $\pm$ 2°	30 $\pm$ 3 minutes
	Capacitance Variation	$\leq$ $\pm$ 2.5% or $\pm$ .25 pF, whichever is greater	Step 2: Room Temp	$\leq$ 3 minutes
	Q	Meets Initial Values (As Above)	Step 3: +125°C $\pm$ 2°	30 $\pm$ 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	$\leq$ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with twice rated voltage in test chamber set at 125°C $\pm$ 2°C for 1000 hours (+48, -0).  Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	Capacitance Variation	$\leq$ $\pm$ 3.0% or $\pm$ .3 pF, whichever is greater		
	Q (C=Nominal Cap)	$\geq$ 30 pF: Q $\geq$ 350 $\geq$ 10 pF, $<$ 30 pF: Q $\geq$ 275 +5C/2 $<$ 10 pF: Q $\geq$ 200 +10C		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85°C $\pm$ 2°C/ 85% $\pm$ 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.  Remove from chamber and stabilize at room temperature for 24 $\pm$ 2 hours before measuring.	
	Capacitance Variation	$\leq$ $\pm$ 5.0% or $\pm$ .5 pF, whichever is greater		
	Q	$\geq$ 30 pF: Q $\geq$ 350 $\geq$ 10 pF, $<$ 30 pF: Q $\geq$ 275 +5C/2 $<$ 10 pF: Q $\geq$ 200 +10C		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

# COG (NP0) Dielectric Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE	0101*			0201			0402			0603				0805					1206				
Soldering	Reflow Only			Reflow Only			Reflow/Wave			Reflow/Wave				Reflow/Wave					Reflow/Wave				
Packaging	All Paper			All Paper			All Paper			All Paper				Paper/Embossed					Paper/Embossed				
(L) Length	0.40 ± 0.02 (0.016 ± 0.0008)			0.60 ± 0.09 (0.024 ± 0.004)			1.00 ± 0.10 (0.040 ± 0.004)			1.60 ± 0.15 (0.063 ± 0.006)				2.01 ± 0.20 (0.079 ± 0.008)					3.20 ± 0.20 (0.126 ± 0.008)				
(W) Width	0.20 ± 0.02 (0.008 ± 0.0008)			0.30 ± 0.09 (0.011 ± 0.004)			0.50 ± 0.10 (0.020 ± 0.004)			0.81 ± 0.15 (0.032 ± 0.006)				1.25 ± 0.20 (0.049 ± 0.008)					1.60 ± 0.20 (0.063 ± 0.008)				
(t) Terminal	0.10 ± 0.04 (0.004 ± 0.0016)			0.15 ± 0.05 (0.006 ± 0.002)			0.25 ± 0.15 (0.010 ± 0.006)			0.35 ± 0.15 (0.014 ± 0.006)				0.50 ± 0.25 (0.020 ± 0.010)					0.50 ± 0.25 (0.020 ± 0.010)				
WVDC	16			25			50			16				25					50				
Cap (pF)	0.5			A			C			G				J					J				
1.0	B			A			C			G				J					J				
1.2	B			A			C			G				J					J				
1.5	B			A			C			G				J					J				
1.8	B			A			C			G				J					J				
2.2	B			A			C			G				J					J				
2.7	B			A			C			G				J					J				
3.3	B			A			C			G				J					J				
3.9	B			A			C			G				J					J				
4.7	B			A			C			G				J					J				
5.6	B			A			C			G				J					J				
6.8	B			A			C			G				J					J				
8.2	B			A			C			G				J					J				
10	B			A			C			G				J					J				
12	B			A			C			G				J					J				
15	B			A			C			G				J					J				
18	B			A			C			G				J					J				
22	B			A			C			G				J					J				
27	B			A			C			G				J					J				
33	B			A			C			G				J					J				
39	B			A			C			G				J					J				
47	B			A			C			G				J					J				
56	B			A			C			G				J					J				
68	B			A			C			G				J					J				
82	B			A			C			G				J					J				
100	B			A			C			G				J					J				
120										G				J					J				
150										G				J					J				
180										G				J					J				
220										G				J					J				
270										G				J					J				
330										G				J					J				
390										G				J					J				
470										G				J					J				
560										G				J					J				
680										G				J					J				
820										G				J					J				
1000										G				J					J				
1200										G				J					J				
1500										G				J					J				
1800										G				J					J				
2200										G				J					J				
2700										G				J					J				
3300										G				J					J				
3900										G				J					J				
4700										G				J					J				
5600										G				J					J				
6800										G				J					J				
8200										G				J					J				
Cap (µF)	0.010			A			C			G				J					J				
0.012	P			P			P			P				P					P				
0.015	P			P			P			P				P					P				
0.018	P			P			P			P				P					P				
0.022	P			P			P			P				P					P				
0.027	P			P			P			P				P					P				
0.033																							
0.039																							
0.047																							
0.068																							
0.082																							
0.1																							
WVDC	16			25			50			16				25					50				
SIZE	0101*			0201			0402			0603				0805					1206				



Letter	A	B	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.22 (0.009)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER						EMBOSS							

# COG (NP0) Dielectric

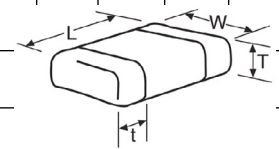
## Capacitance Range



PREFERRED SIZES ARE SHADED



SIZE	1210					1812					1825				2220			2225								
Soldering	Reflow Only																									
Packaging	Paper/Embossed					All Embossed					All Embossed				All Embossed			All Embossed								
(L) Length	3.20 ± 0.20 (0.126 ± 0.008)					4.50 ± 0.30 (0.177 ± 0.012)					4.50 ± 0.30 (0.177 ± 0.012)				5.70 ± 0.40 (0.225 ± 0.016)			5.72 ± 0.25 (0.225 ± 0.010)								
(W) Width	2.50 ± 0.20 (0.098 ± 0.008)					3.20 ± 0.20 (0.126 ± 0.008)					6.40 ± 0.40 (0.252 ± 0.016)				5.00 ± 0.40 (0.197 ± 0.016)			6.35 ± 0.25 (0.250 ± 0.010)								
(t) Terminal	0.50 ± 0.25 (0.020 ± 0.010)					0.61 ± 0.36 (0.024 ± 0.014)					0.61 ± 0.36 (0.024 ± 0.014)				0.64 ± 0.39 (0.025 ± 0.015)			0.64 ± 0.39 (0.025 ± 0.015)								
WVDC	25	50	100	200	500	25	50	100	200	500	50	100	200	50	100	200	50	100	200	50	100	200				
Cap (pF)	0.5																									
1.0																										
1.2																										
1.5																										
1.8																										
2.2																										
2.7																										
3.3																										
3.9																										
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6.8																										
8.2																										
10					J																					
12					J																					
15					J																					
18					J																					
22					J																					
27					J																					
33					J																					
39					J																					
47					J																					
56					J																					
68					J																					
82					J																					
100					J																					
120					J																					
150					J																					
180					J																					
220					J																					
270					J																					
330					J																					
390					M																					
470					M																					
560	J	J	J	J	M																					
680	J	J	J	K	P																					
820	J	J	J	K	P																					
1000	J	J	P	P	P	K	K	N	N	M	M	M	M								M	M	P			
1200	P	P	P	P	P	K	K	N	N	M	M	M	M								M	M	P			
1500	P	P	P	P	P	K	K	N	N	M	M	M	M								M	M	P			
1800	P	P	P	P	P	K	K	N	N	M	M	M	M								M	M	P			
2200	P	P	P	P	N	K	K	N	N	P	X	X	M								M	M	P			
2700	P	P	P	P		K	K	N	P	Q	X	X	M								M	M	P			
3300	P	P	P	P		K	K	N	P	Q	X	X	X					X			M	M	P			
3900	P	P	P	P		K	K	N	P	Q	X	X	X					X			M	M	P			
4700	P	P	P			K	K	N	P	Y	X	X	X				X	X	X		M	M	P			
5600	P	P	P			K	K	P	P	Y	X	X	X				X	X	X		M	M	P			
6800	P	P	P			K	K	Q	Q		X	X	X				X	X	X		M	M	P			
8200	P	P				K	M	Q	Q		X	X	X				X	X	X		M	M	P			
Cap (pF)	0.010	N	N			K	M	Q	Q		X	X	X				X	X	X		M	M	P			
0.012	N	N				K	M	Q			X	X	X				X	X	X		M	M	P			
0.015						P	P	Q			X	X	X				X	X	X		M	M	Y			
0.018						P	P	Q			X	X	X				X	X	X		M	M	Y			
0.022						P	P	Q			X	X	X				X	X	X		M	M	Y			
0.027						Q	Q	X			X	X	X				X	X	X		P	Y	Y			
0.033						Q	Q	X			X	X					X	X			X	Y	Y			
0.039						X	X	X			X						Y				X	Y	Y			
0.047						X	X	X			X						Y				X	Z				
0.068						Z	Z	Y									Z				X	Z				
0.082						Z	Z	Y									Z				X	Z				
0.1						Z	Z	Z									Z				Z	Z				



Letter	A	B	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.22 (0.009)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER						EMBOSSED							



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