

# 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  $\pm 0.3\% \Delta C$  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.



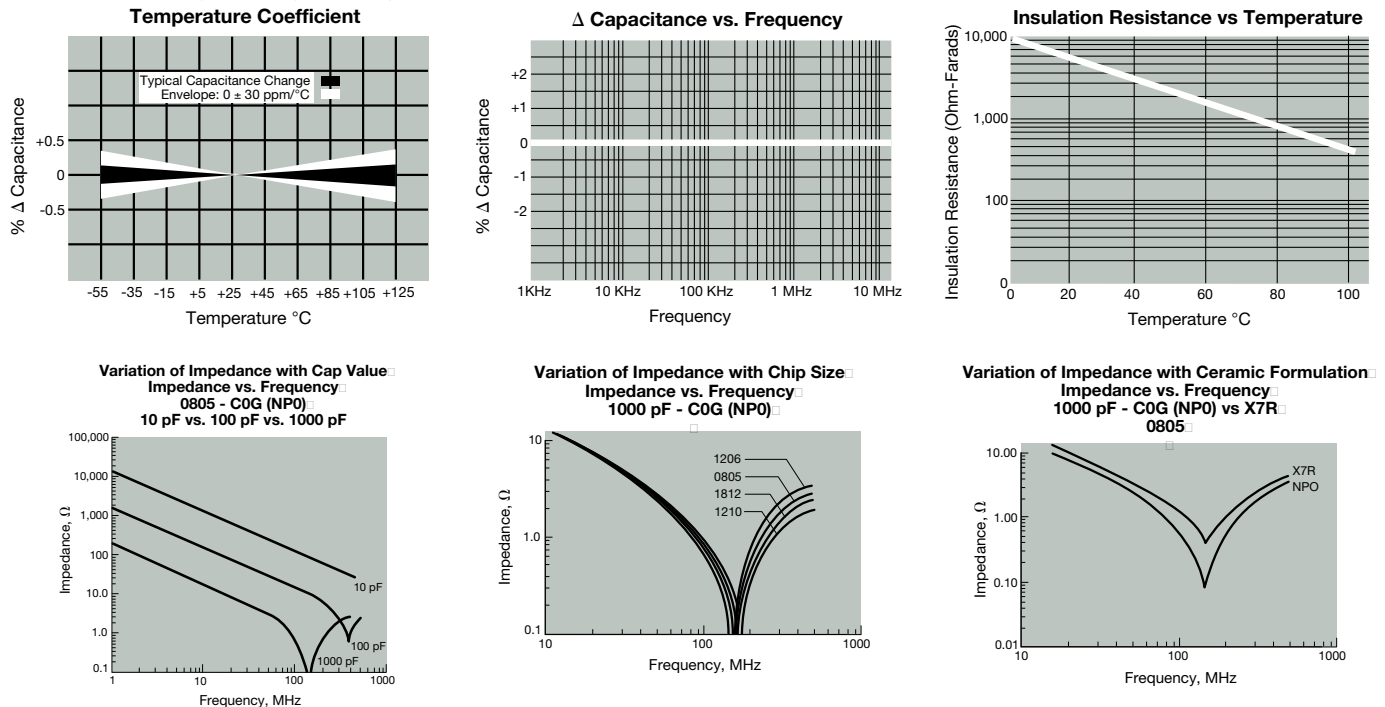
### PART NUMBER (see page 2 for complete part number explanation)

<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 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 = $\pm .10 \text{ pF}$ (<10pF) C = $\pm .25 \text{ pF}$ (<10pF) D = $\pm .50 \text{ pF}$ (<10pF) 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

**Contact Factory For**  
**1 = Pd/Ag Term**  
**7 = Gold Plated**  
**NOT RoHS COMPLIANT**

**Contact Factory For Multiples**

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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## Specifications and Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
<b>Operating Temperature Range</b>		-55°C to +125°C	Temperature Cycle Chamber	
<b>Capacitance</b>		Within specified tolerance	Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF 1.0 kHz ± 10% for cap > 1000 pF Voltage: 1.0Vrms ± .2V	
<b>Q</b>		<30 pF: Q ≥ 400+20 x Cap Value ≥30 pF: Q ≥ 1000	Charge device with rated voltage for 60 ± 5 secs @ room temp/humidity	
<b>Insulation Resistance</b>		100,000MΩ or 1000MΩ - μF, whichever is less	Charge device with 300% 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.	
<b>Dielectric Strength</b>		No breakdown or visual defects	Deflection: 2mm Test Time: 30 seconds 1mm/sec 	
<b>Resistance to Flexure Stresses</b>	Appearance	No defects		
	Capacitance Variation	±5% or ±.5 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
<b>Solderability</b>		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds	
<b>Resistance to Solder Heat</b>	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater		
	Q	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
<b>Thermal Shock</b>	Dielectric Strength	Meets Initial Values (As Above)	Step 1: -55°C ± 2°	30 ± 3 minutes
	Appearance	No visual defects	Step 2: Room Temp	≤ 3 minutes
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater	Step 3: +125°C ± 2°	30 ± 3 minutes
	Q	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature	
<b>Load Life</b>	Dielectric Strength	Meets Initial Values (As Above)	Charge device with twice rated voltage in test chamber set at 125°C ± 2°C for 1000 hours (+48, -0).  Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	Appearance	No visual defects		
	Capacitance Variation	≤ ±3.0% or ± .3 pF, whichever is greater		
	Q (C=Nominal Cap)	≥ 30 pF: Q ≥ 350 ≥10 pF, <30 pF: Q ≥ 275 +5C/2 <10 pF: Q ≥ 200 +10C		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
<b>Load Humidity</b>	Dielectric Strength	Meets Initial Values (As Above)	Store in a test chamber set at 85°C ± 2°C/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.  Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Appearance	No visual defects		
	Capacitance Variation	≤ ±5.0% or ± .5 pF, whichever is greater		
	Q	≥ 30 pF: Q ≥ 350 ≥10 pF, <30 pF: Q ≥ 275 +5C/2 <10 pF: Q ≥ 200 +10C		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		

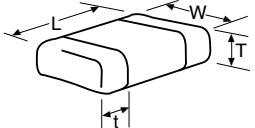
# COG (NP0) Dielectric

## Capacitance Range



PREFERRED SIZES ARE SHADED

SIZE	0101*			0201			0402			0603					0805					1206									
	Reflow Only			Reflow Only			Reflow/Wave			Reflow/Wave					Reflow/Wave					Reflow/Wave									
	All Paper			All Paper			All Paper			All Paper					Paper/Embossed					Paper/Embossed									
(L) Length	mm (in.)			mm (in.)			mm (in.)			mm (in.)					mm (in.)					mm (in.)									
(W) Width	mm (in.)			mm (in.)			mm (in.)			mm (in.)					mm (in.)					mm (in.)									
(t) Terminal	mm (in.)			mm (in.)			mm (in.)			mm (in.)					mm (in.)					mm (in.)									
WVDC	16			25 50			16 25 50			16 25 50 100 200					16 25 50 100 200					16 25 50 100 200 500									
Cap (pF)	0.5			1.0			1.2			1.5					1.8					2.2					2.7				
	3.3			3.9			4.7			5.6					6.8					8.2									
	10			12			15			18					22					27									
	33			39			47			56					68					82									
	100			120			150			180					220					270									
	330			390			470			560					680					820									
	1000			1200			1500			1800					2200					2700									
	3300			3900			4700			5600					6800					8200									
Cap (µF)	0.010			0.012			0.015			0.018					0.022					0.027									
	0.033			0.039			0.047			0.068					0.082					0.1									
WVDC	16			25 50			16 25 50			16 25 50 100 200					16 25 50 100 200					16 25 50 100 200 500									
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																						



\*EIA 01005

# COG (NP0) Dielectric



## Capacitance Range

### PREFERRED SIZES ARE SHADED

SIZE	1210					1812					1825				2220			2225				
	Reflow Only					Reflow Only					Reflow Only				Reflow Only			Reflow Only				
Soldering	Paper/Embossed					All Embossed					All Embossed				All Embossed			All Embossed				
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																					
	4.7																					
	5.6																					
	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		K	K	N	N	M	M	M	M				M	M	P		
	2200	P	P	P	P		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			K	K	N	P	Q	X	X	X			X	M	M	P		
	3900	P	P	P			K	K	N	P	Q	X	X	X			X	M	M	P		
	4700	P	P	P			K	K	N	P	Q	X	X	X	X	X	X	M	M	P		
	5600	P	P	P			K	K	P	P	X	X	X	X	X	X	X	M	M	P		
	6800	P	P	P			K	K	X	X		X	X	X	X	X	X	M	M	P		
	8200	P	P				K	M				X	X	X	X	X	X	M	M	P		
Cap (µF)	0.010	P	N				K	M				X	X	X	X	X	X	M	M	P		
	0.012	P	N				K	M				X	X	X	X	X	X	M	M	P		
	0.015						P	P				X	X	X	X	X	X	M	M	Y		
	0.018						P	P				X	X	X	X	X	X	M	M	Y		
	0.022						P	P				X	X	X	X	X		M	Y	Y		
	0.027						P	P				X	X	Y	X	X		P	Y	Y		
	0.033						P	P				X	X		X	X		X	Y	Y		
	0.039						X	X				X			Y			X	Y	Y		
	0.047						X	X				X			Y			X	Z			
	0.068						Z	Z							Z			X	Z			
	0.082						Z	Z							Z			X	Z			
	0.1						Z	Z							Z			Z	Z			
WVDC	25	50	100	200	500	25	50	100	200	500	50	100	200	50	100	200	50	100	200	50	100	200

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	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					EMBOSSSED							