

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.

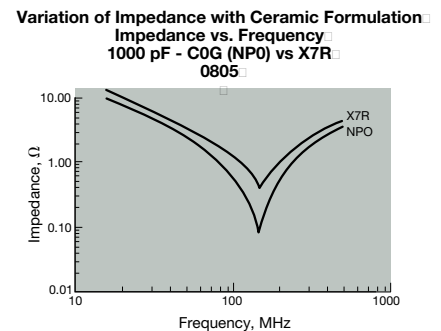
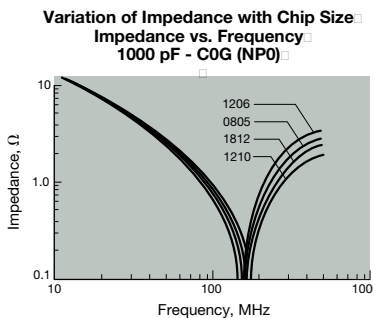
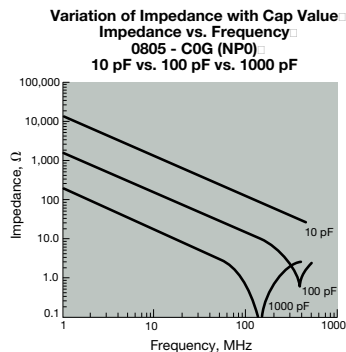
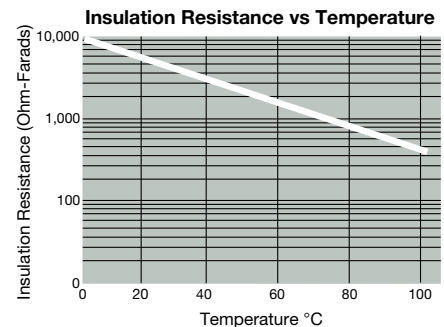
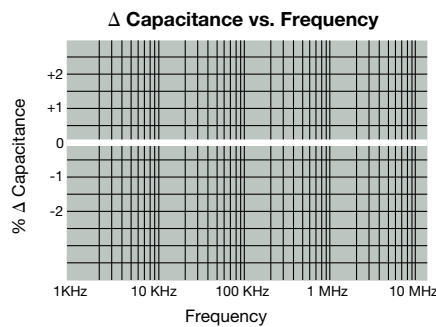
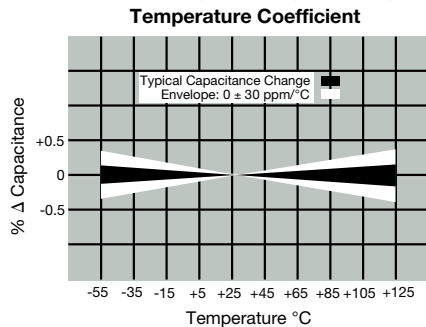
COG (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is $0 \pm 30\text{ppm}/^\circ\text{C}$ which is less than $\pm 0.3\%$ ΔC from -55°C to $+125^\circ\text{C}$. Capacitance drift or hysteresis for COG (NP0) ceramics is negligible at less 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)

0805	5	A	101	J	A	T	2	A
Size (L" x W")	Voltage	Dielectric COG (NP0) = A	Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros	Capacitance Tolerance	Failure Rate	Terminations T = Plated Ni and Sn	Packaging	Special Code
	6.3V = 6 10V = Z 16V = Y 25V = 3 50V = 5 100V = 1 200V = 2 500V = 7			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 = $\pm 10\%$	A = Not Applicable		2 = 7" Reel 4 = 13" Reel U = 4mm TR (01005)	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.



COG (NP0) Dielectric



Specifications and Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF 1.0 kHz ± 10% for cap > 1000 pF Voltage: 1.0Vrms ± .2V	
Q		<30 pF: Q ≥ 400+20 x Cap Value ≥30 pF: Q ≥ 1000	Charge device with rated voltage for 60 ± 5 secs @ room temp/humidity	
Insulation Resistance		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.	
Dielectric Strength		No breakdown or visual defects	Deflection: 2mm Test Time: 30 seconds 1mm/sec 	
Resistance to Flexure Stresses	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		
Solderability		≥ 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	
Resistance to Solder Heat	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)		
Thermal Shock	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature	
	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater	Step 2: Room Temp	≤ 3 minutes
	Q	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
Load Life	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).	
	Appearance	No visual defects	Remove from test chamber and stabilize at room temperature for 24 hours before measuring.	
	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)		
Load Humidity	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.	
	Appearance	No visual defects	Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	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)		
	Dielectric Strength	Meets Initial Values (As Above)		

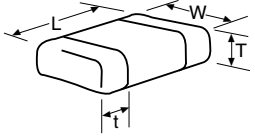
COG (NP0) Dielectric



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									
Soldering	All Paper			All Paper			All Paper			All Paper					Paper/Embossed					Paper/Embossed									
	Paper			Paper			Paper			Paper					Paper					Paper									
(L) Length	0.40 ± 0.02 (0.016 ± 0.0008)			0.60 ± 0.03 (0.024 ± 0.001)			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 ± 0.03 (0.011 ± 0.001)			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 ± 0.016)			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)									
WWDC	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					WWDC					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



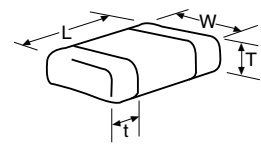
COG (NP0) Dielectric



Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		1210					1812					1825					2220					2225				
Soldering		Reflow Only					Reflow Only					Reflow Only					Reflow Only					Reflow Only				
Packaging		Paper/Embossed					All Embossed					All Embossed					All Embossed					All Embossed				
(L) Length	mm (in.)	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	mm (in.)	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	mm (in.)	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																				
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	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	X		M	M	P			
	5600	P	P	P			K	K	P	P	X	X	X	X	X	X	X	X	X	X	M	M	P			
	6800	P	P	P			K	K	X	X		X	X	X	X	X	X	X	X	X	M	M	P			
	8200	P	P				K	M				X	X	X	X	X	X	X	X	X	M	M	P			
Cap (µF)	0.010	P	N				K	M				X	X	X	X	X	X	X	X	X	M	M	P			
	0.012	P	N				K	M				X	X	X	X	X	X	X	X	X	M	M	P			
	0.015						P	P				X	X	X	X	X	X	X	X	X	M	M	Y			
	0.018						P	P				X	X	X	X	X	X	X	X	X	M	M	Y			
	0.022						P	P				X	X	X	X	X	X	X	X	X	M	Y	Y			
	0.027						P	P				X	X	Y	X	X	X	X	X	X	P	Y	Y			
	0.033						P	P				X	X		X	X		X	X		X	Y	Y			
	0.039						X	X				X			Y			X			X	Y	Y			
	0.047						X	X				X			Y			X			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			
SIZE		1210					1812					1825					2220					2225				
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)												
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