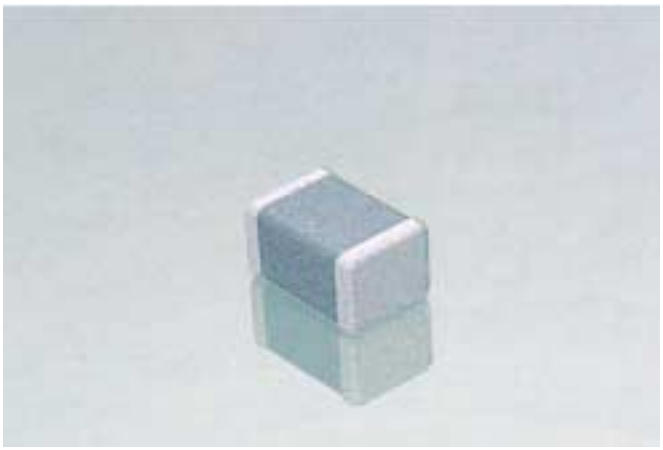
C0G (NP0) Dielectric

General Specifications



C0G (NP0) is the most popular formulation of the "temperature-compensating," EIA Class I ceramic materials. Modern C0G (NP0) formulations contain neodymium, samarium and other rare earth oxides.

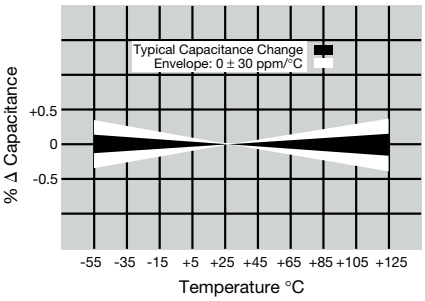
C0G (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is 0 ±30ppm/°C which is less than ±0.3% Δ C from -55°C to +125°C. Capacitance drift or hysteresis for C0G (NP0) ceramics is negligible at less than ±0.05% versus up to ±2% for films. Typical capacitance change with life is less than ±0.1% for C0G (NP0), one-fifth that shown by most other dielectrics. C0G (NP0) formulations show no aging characteristics.

The C0G (NP0) formulation usually has a "Q" in excess of 1000 and shows little capacitance or "Q" changes with frequency. Their dielectric absorption is typically less than 0.6% which is similar to mica and most films.

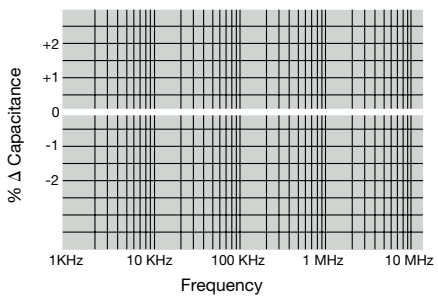
PART NUMBER (see page 2 for complete part number explanation)

0805	5	A	101	J	A	T	2	A
Size (L" x W")	**Voltage** 6.3V = 6, 10V = Z, 16V = Y, 25V = 3, 50V = 5, 100V = 1, 200V = 2	**Dielectric** C0G (NP0) = A	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros	**Capacitance Tolerance** B = ±.10 pF, C = ±.25 pF, D = ±.50 pF, F = ±1% (≥ 25 pF), G = ±2% (≥ 13 pF), J = ±5%, K = ±10%	**Failure Rate** A = Not Applicable	**Terminations** T = Plated Ni and Solder	**Packaging** 2 = 7" Reel, 4 = 13" Reel. **Contact Factory For Multiples**	**Special Code** A = Std. Product

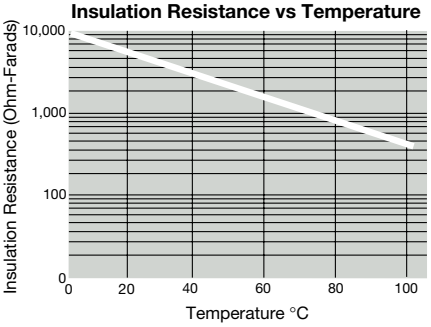
Temperature Coefficient



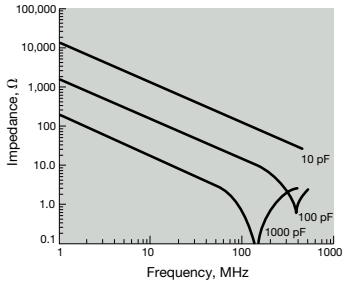
Δ Capacitance vs. Frequency



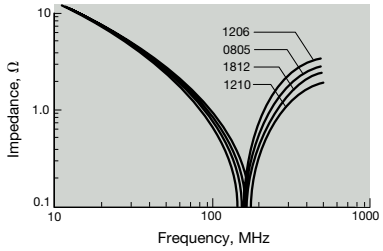
Insulation Resistance vs Temperature



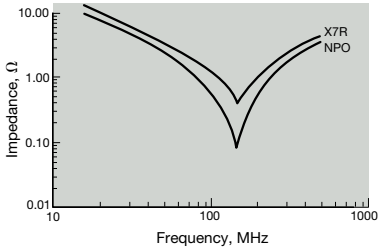
Variation of Impedance with Cap Value
Impedance vs. Frequency
0805 - C0G (NP0)
10 pF vs. 100 pF vs. 1000 pF



Variation of Impedance with Chip Size
Impedance vs. Frequency
1000 pF - C0G (NP0)

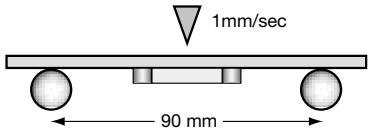


Variation of Impedance with Ceramic Formulation
Impedance vs. Frequency
1000 pF - C0G (NP0) vs X7R
0805



C0G (NP0) Dielectric

Specifications and Test Methods

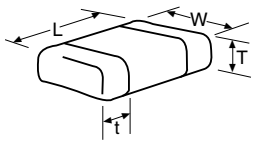
Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF 1.0 kHz ± 10% for cap > 1000 pF Voltage: 1.0Vrms ± .2V	
Q		<30 pF: Q≥ 400+20 x Cap Value ≥30 pF: Q≥ 1000		
Insulation Resistance		100,000MΩ or 1000MΩ - µF, whichever is less	Charge device with rated voltage for 60 ± 5 secs @ room temp/humidity	
Dielectric Strength		No breakdown or visual defects	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max)	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	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 ± 5ºC 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 260ºC 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)		
	Dielectric Strength	Meets Initial Values (As Above)		
Thermal Shock	Appearance	No visual defects	Step 1: -55ºC ± 2º	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: +125ºC ± 2º	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 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 125ºC ± 2ºC for 1000 hours (+48, -0). 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)		
	Dielectric Strength	Meets Initial Values (As Above)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85ºC ± 2ºC/ 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.	
	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)		

C0G (NP0) Dielectric

Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		0201			0402			0603				0805					1206				
Soldering		Reflow Only			Reflow Only			Reflow/Wave				Reflow/Wave					Reflow/Wave				
Packaging		All Paper			All Paper			All Paper				Paper/Embossed					Paper/Embossed				
L) Length	MM	0.60 ± 0.03			1.00 ± 0.10			1.60 ± 0.15				2.01 ± 0.20					3.20 ± 0.20				
	(in.)	(0.024 ± 0.001)			(0.040 ± 0.004)			(0.063 ± 0.006)				(0.079 ± 0.008)					(0.126 ± 0.008)				
(W) Width	MM	0.30 ± 0.03			0.50 ± 0.10			0.81 ± 0.15				1.25 ± 0.20					1.60 ± 0.20				
	(in.)	(0.011 ± 0.001)			(0.020 ± 0.004)			(0.032 ± 0.006)				(0.049 ± 0.008)					(0.063 ± 0.008)				
(t) Terminal	MM	0.15 ± 0.05			0.25 ± 0.15			0.35 ± 0.15				0.50 ± 0.25					0.50 ± 0.25				
	(in.)	(0.006 ± 0.002)			(0.010 ± 0.006)			(0.014 ± 0.006)				(0.020 ± 0.010)					(0.020 ± 0.010)				
WVDC		10	16	25	16	25	50	6.3	25	50	100	16	25	50	100	200	16	25	50	100	200
Cap (pF)	0.5	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	1.0	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	1.2	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	1.5	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	1.8	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	2.2	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	2.7	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	3.3	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	3.9	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	4.7	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	5.6	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	6.8	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	8.2	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	10	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	12	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	15	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	18	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	22	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	27	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	33	A	A	A	C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	39	A	A		C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	47	A	A		C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	56	A	A		C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	68	A	A		C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	82	A			C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	100	A			C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	120				C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	150				C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	180				C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	220				C	C	C	G	G	G	G	E	E	E	E	J	J	J	J	J	J
	270				C			G	G	G	G	E	E	E	J	M	J	J	J	J	J
	330				C			G	G	G	G	E	E	E	J	M	J	J	J	J	J
	390							G	G	G		J	J	J	J	M	J	J	J	J	J
	470							G	G	G		J	J	J	J	M	J	J	J	J	J
	560							G	G	G		J	J	J	J		J	J	J	J	J
	680							G	G	G		J	J	J	J		J	J	J	J	J
	820							G	G	G		J	J	J	J		J	J	J	J	M
	1000							G	G	G		J	J	J	J		J	J	J	J	Q
	1200							G				J	J	J			J	J	J	J	Q
	1500							G				J	J	J			J	J	J	M	Q
	1800							G				J	J	J			J	J	M	M	
	2200											J	J	M			J	J	M	P	
	2700											J	J	M			J	J	M	P	
	3300											N	N				J	J	M	P	
	3900											N	N				J	J	M	P	
	4700											N	N				J	J	M	P	
	5600											N					J	J	M		
	6800											N					M	M			
	8200											N					M	M			
Cap (µF)	0.010											N					M	M			
	0.012																				
	0.015																M				
	0.018																				
	0.022																				
	0.027																				
	0.033																				
	0.039																				
	0.047																				
	0.068																				
	0.082																				
	0.1																				
WVDC		10	16	25	16	25	50	6.3	25	50	100	16	25	50	100	200	16	25	50	100	200
SIZE		0201			0402			0603				0805					1206				



Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z	BB	CC
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.86 (0.034)	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)	3.05 (0.120)	3.175 (0.125)
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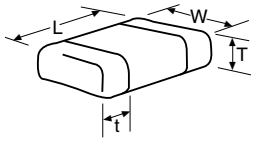
Contact Factory for Multiples

C0G (NP0) Dielectric

Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		1210				1812				1825			2220			2225		
Soldering		Reflow/Wave				Reflow Only				Reflow Only			Reflow Only			Reflow Only		
Packaging		Paper/Embossed				All Embossed				All Embossed			All Embossed			All Embossed		
(L) Length	MM	3.20 ± 0.20				4.50 ± 0.30				4.50 ± 0.30			5.70 ± 0.40			5.72 ± 0.25		
	(in.)	(0.126 ± 0.008)				(0.177 ± 0.012)				(0.177 ± 0.012)			(0.224 ± 0.016)			(0.225 ± 0.010)		
(W) Width	MM	2.50 ± 0.20				3.20 ± 0.20				6.40 ± 0.40			5.00 ± 0.40			6.35 ± 0.25		
	(in.)	(0.098 ± 0.008)				(0.126 ± 0.008)				(0.252 ± 0.016)			(0.197 ± 0.016)			(0.250 ± 0.010)		
(t) Terminal	MM	0.50 ± 0.25				0.61 ± 0.36				0.61 ± 0.36			0.64 ± 0.39			0.64 ± 0.39		
	(in.)	(0.020 ± 0.010)				(0.024 ± 0.014)				(0.024 ± 0.014)			(0.025 ± 0.015)			(0.025 ± 0.015)		
WVDC		25	50	100	200	25	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																	
	12																	
	15																	
	18																	
	22																	
	27																	
	33																	
	39																	
	47																	
	56																	
	68																	
	82																	
	100																	
	120																	
	150																	
	180																	
	220																	
	270																	
	330																	
	390																	
	470																	
	560	J	J	J	J													
	680	J	J	J	J													
	820	J	J	J	J													
	1000	J	J	J	J	K	K	K	K	M	M	M	X	X	X	P	P	P
	1200	J	J	J	J	K	K	K	K	M	M	M	X	X	X	P	P	P
	1500	J	J	J	M	K	K	K	K	M	M	M	X	X	X	P	P	P
	1800	J	J	J	M	K	K	K	K	M	M	M	X	X	X	P	P	P
	2200	J	J	M	Q	K	K	K	K	M	M	M	X	X	X	P	P	P
	2700	J	J	M	Q	K	K	K	P	M	M	M	X	X	X	P	P	P
	3300	J	J	M		K	K	K	P	M	M	M	X	X	X	P	P	P
	3900	J	J	M		K	K	K	P	M	M	M	X	X	X	P	P	P
	4700	J	J	M		K	K	K	P	M	M	M	X	X	X	P	P	P
	5600	J	J	M		K	M	M	P	M	M	M	X	X	X	P	P	P
	6800	J	J			K	M	M	X	M	M		X	X	X	P	P	P
	8200	J	J			P	P	X	X	M	M		X	X	X	P	P	P
Cap (µF)	0.010	N	N			K	P	X	X	M	M		X	X	X	P	P	P
	0.012	N	N			K	P	X		M	M		X	X	X	P	P	P
	0.015					M	P	X		P	M		X	X	X	P	P	Y
	0.018					M	P			P	M		X	X	X	P	P	Y
	0.022					M	CC			P			X	X		P	Y	Y
	0.027					M	CC			P			X	X		P	Y	Y
	0.033					M	CC			P			X	X		P	Y	Y
	0.039					M	CC			P						P	Y	Y
	0.047					CC	CC			P						P		
	0.068					CC	CC									P		
	0.082					CC	CC									P		
	0.1					CC	CC									P		
WVDC		25	50	100	200	25	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	BB	CC
Max. Thickness	0.33 (0.013)	0.56 (0.022)	0.71 (0.028)	0.86 (0.034)	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)	3.05 (0.120)	3.175 (0.125)
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Contact Factory for Multiples