

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 $0 \pm 30 \text{ ppm}/^\circ\text{C}$ which is less than $\pm 0.3\%$ C from -55°C to $+125^\circ\text{C}$. Capacitance drift or hysteresis for C0G (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 C0G (NP0), one-fifth that shown by most other dielectrics.

PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)



0805

Size
(L" x W")

5

Voltage
4= 4.0V
6= 6.3V
Z= 10V
Y=16V
3=25V
5= 50V
1=100V
2=200V
V=250V
7=500V

A

Dielectric
C0G (NP0) = A

101

Capacitance Code (In pF)
2 Sig. Digits + Number of Zeros

J

Capacitance Tolerance
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

Failure Rate
A = Not Applicable

T

Terminations
T = Plated Ni and Sn

2

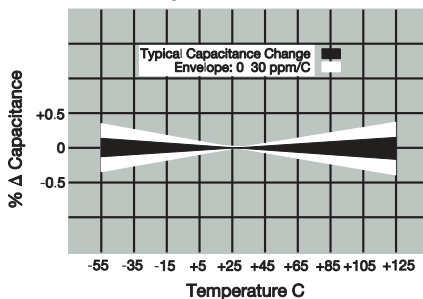
Packaging
2 = 7" Reel
4 = 13" Reel
U = 4mm TR (01005)

A

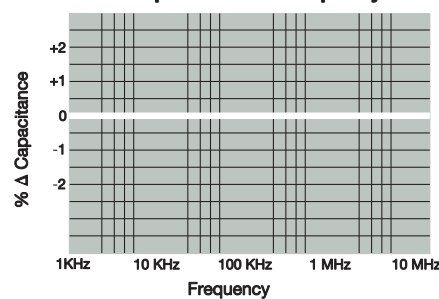
Special Code
A = Std. Product

Contact Factory For Multiples

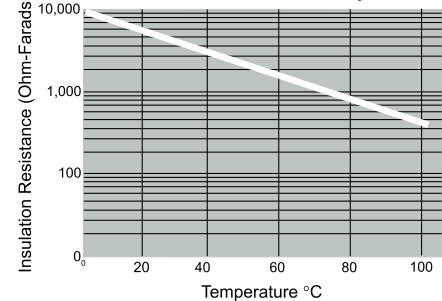
Temperature Coefficient



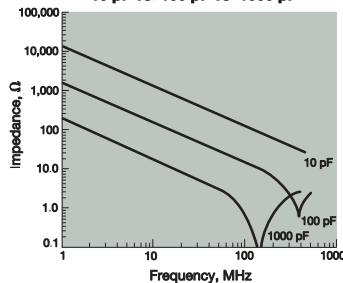
Δ Capacitance vs. Frequency



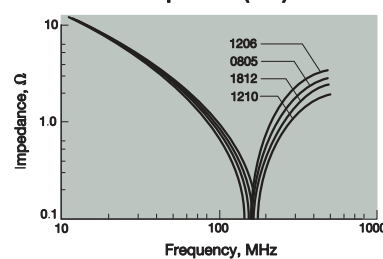
Insulation Resistance vs Temperature



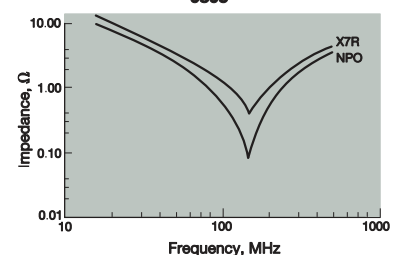
Variation of Impedance with Cap Value
Impedance vs. Frequency
0805 - C0G (NP0)
10 pF vs. 100 pF vs. 1000 pF



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

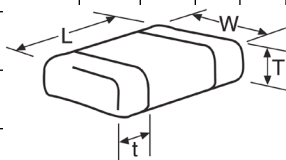
Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 MHz $\pm$ 10% for cap $\leq$ 1000 pF	
Q		<30 pF: Q $\geq$ 400+20 x Cap Value $\geq$ 30 pF: Q $\geq$ 1000	1.0 kHz $\pm$ 10% for cap > 1000 pF	
Insulation Resistance		10,000M Ω or 500M Ω - μ F, whichever is less	Voltage: 1.0Vrms $\pm$.2V	
Dielectric Strength		No breakdown or visual defects	Charge device with rated voltage for 60 $\pm$ 5 secs @ room temp/humidity	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 1mm/sec 	
	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 $\pm$ 2 hours 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)		
	Dielectric Strength	Meets Initial Values (As 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)		

C0G (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	mm (in.)	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)
(W) Width	mm (in.)	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)
(t) Terminal	mm (in.)	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)
WVDC	16	25 50	16 25 50	16 25 50 100 200	16 25 50 100 200 250	16 25 50 100 200 250 500
Cap (pF)	0.5	A	A	C	C	C
	1.0	B	A	C	C	C
	1.2	B	A	C	C	C
	1.5	B	A	C	C	C
	1.8	B	A	C	C	C
	2.2	B	A	C	C	C
	2.7	B	A	C	C	C
	3.3	B	A	C	C	C
	3.9	B	A	C	C	C
	4.7	B	A	C	C	C
	5.6	B	A	C	C	C
	6.8	B	A	C	C	C
	8.2	B	A	C	C	C
	10	B	A	C	C	C
	12	B	A	C	C	C
	15	B	A	C	C	C
	18	B	A	C	C	C
	22	B	A	C	C	C
	27	B	A	C	C	C
	33	B	A	C	C	C
	39	B	A	C	C	C
	47	B	A	C	C	C
	56	B	A	C	C	C
	68	B	A	C	C	C
	82	B	A	C	C	C
	100	B	A	C	C	C
	120		A	C	C	C
	150		A	C	C	C
	180		A	C	C	C
	220		A	C	C	C
	270			C	C	C
	330			C	C	C
	390			C	C	C
	470			C	C	C
	560			C	C	C
	680			C	C	C
	750			C	C	C
	820			C	C	C
	1000			C	C	C
	1200			G	G	G
	1500			G	G	G
	1800			G	G	G
	2200			G	G	G
	2700			G	G	G
	3300			G	G	G
	3900			G	G	G
	4700			G	G	G
	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 50 100 200 250	16 25 50 100 200 250 500
SIZE	0101*	0201	0402	0603	0805	1206



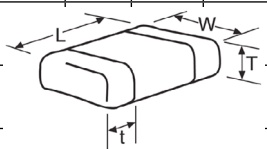
Letter	A	B	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.22 (0.009)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER						EMBOSSD							

C0G (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
Cap (pF)		3.9																		
	4.7																			
	5.6																			
	6.8																			
	8.2																			
	10	M	M	M	M	M	P	P	P	P	P									
	12	M	M	M	M	M	P	P	P	P	P									
	15	M	M	M	M	M	P	P	P	P	P									
	18	M	M	M	M	M	P	P	P	P	P									
	22	M	M	M	M	M	P	P	P	P	P									
	27	M	M	M	M	M	P	P	P	P	P									
	33	M	M	M	M	M	P	P	P	P	P									
	39	M	M	M	M	M	P	P	P	P	P									
	47	P	P	P	P	P	P	P	P	P	P									
	56	P	P	P	P	P	P	P	P	P	P									
	68	P	P	P	P	P	P	P	P	P	P									
	82	P	P	P	P	P	P	P	P	P	P									
	100	P	P	P	P	P	P	P	P	P	P									
	120	P	P	P	P	P	P	P	P	P	P									
	150	P	P	P	P	P	P	P	P	P	P									
	180	P	P	P	P	P	P	P	P	P	P									
	220	P	P	P	P	P	P	P	P	P	P									
	270	P	P	P	P	P	P	P	P	P	P									
	330	P	P	P	P	P	P	P	P	P	P									
	390	P	P	P	P	P	P	P	P	P	P									
	470	P	P	P	P	P	P	P	P	P	P									
	560	P	P	P	P	P	P	P	P	P	P									
	680	P	P	P	P	P	P	P	P	P	P									
	820	P	P	P	P	P	P	P	P	P	P									
	1000	P	P	P	P	P	P	P	P	P	P	M	M	M				M	M	P
	1200	P	P	P	P	P	P	P	P	P	P	M	M	M				M	M	P
	1500	P	P	P	P	P	P	P	P	P	P	M	M	M				M	M	P
	1800	P	P	P	P	P	P	P	P	P	P	M	M	M				M	M	P
	2200	P	P	P	P	P	P	P	P	P	P	X	X	M				M	M	P
	2700	P	P	P	P	P	P	P	P	P	Q	X	X	M				M	M	P
	3300	P	P	P	P	P	P	P	P	P	Q	X	X	X			X	M	M	P
	3900	P	P	P	P	P	P	P	P	P	Q	X	X	X			X	M	M	P
	4700	P	P	P	P	P	P	P	P	P	Y	X	X	X	X	X	X	M	M	P
	5600	P	P	P	P	P	P	P	P	P	Y	X	X	X	X	X	X	M	M	P
	6800	P	P	P	X	X	P	P	Q	Q	Y	X	X	X	X	X	X	M	M	P
	8200	P	P	P	X	X	P	P	Q	Q	Y	X	X	X	X	X	X	M	M	P
Cap (μF)	0.010	P	P	X	X	X	P	P	Q	Q	Y	X	X	X	X	X	X	M	M	P
	0.012	X	X	X	X	X	P	P	Q	X	Y	X	X	X	X	X	X	M	M	P
	0.015	X	X	X	Z	Z	P	P	Q	X	Y	X	X	X	X	X	X	M	M	Y
	0.018	X	X	Z	Z		P	P	X	X	Y	X	X	X	X	X	X	M	M	Y
	0.022	X	X	Z	Z		P	P	X	X		X	X	X	X	X		M	Y	Y
	0.027	X	Z	Z	Z		Q	X	X	Z		X	X	Y	X	X		P	Y	Y
	0.033	X	Z	Z	Z		Q	X	X	Z		X	X		X	X		X	Y	Y
	0.039	Z	Z	Z			X	X	Z	Z		X			Y			X	Y	Y
	0.047	Z	Z	Z			X	X	Z	Z		X			Y			X	Z	
	0.068						Z	Z	Z						Z			X	Z	
	0.082						Z	Z	Z						Z			X	Z	
	0.1						Z	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
SIZE		1210					1812					1825			2220			2225		



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							