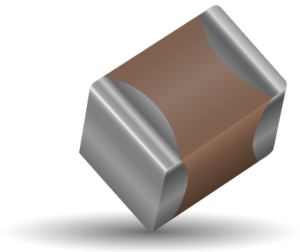
C0G (NP0) Dielectric, KGM Series

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% 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.

HOW TO ORDER

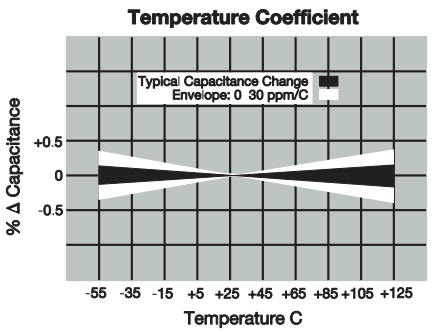
KGM	21	A	CG	2J	102	F	L
General Purpose Tin/Nickel Finish	**Size** 02 = 0101 03 = 0201 05 = 0402 15 = 0603 21 = 0805 31 = 1206 32 = 1210 43 = 1812 44 = 1825 55 = 2220 56 = 2225	See Cap Chart	CG = C0G	**Voltage** 0G = 4.0V 0J = 6.3V 1A = 10V 1C = 16V 1E = 25V 1H = 50V 2A = 100V 2D = 200V 2E = 250V 2H = 500V	**Capacitance Code Code (in pF)** 2 Significant Digits +Number of zeros eg. 10µF = 106 10nF = 103 47pF = 470	**Capacitance Tolerance** B = ±.10pF (<10pF)* C = ±.25pF (<10pF)* D = ±.50pF (<10pF)* F = ±1% (≥10pF)* G = ±2% (≥10pF)* J = ±5% (≥10pF) K = ±10% (≥10pF) M = ±20% *C0G only	See Table Below

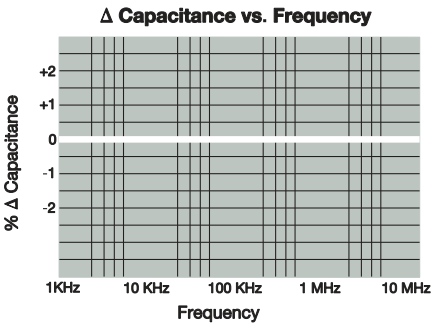
RoHS COMPLIANT

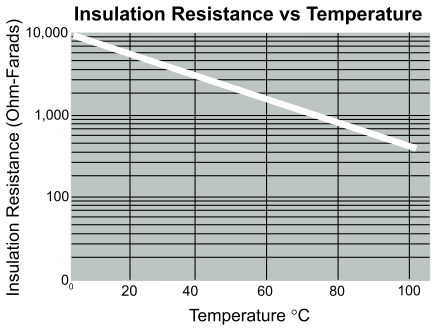
PACKAGING CODES

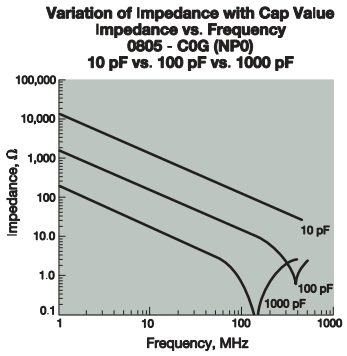
Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13"Embossed
02	0101	0402	H		n/a	
03	0201	0603	H		N	
05	0402	1005	H		N	
15	0603	1608	T		M	
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225		U		L
43	1812	4532		V		S
44	1825	4564		V		S
55	2220	5750		V		S
56	2225	5763		V		S

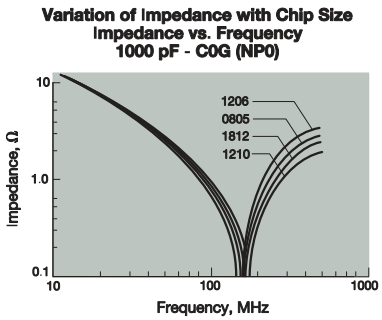
*thickness determines paper or plastic embossed packaging

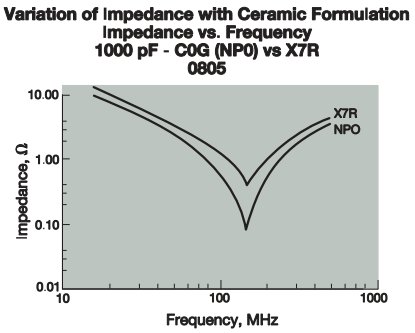






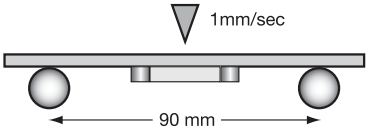






C0G (NP0) Dielectric, KGM Series

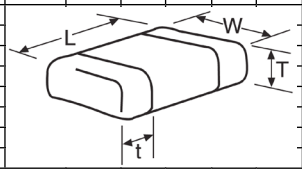
Specifications and Test Methods

Parameter/Test		NP0 Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance <30 pF: Q≥ 400+20 x Cap Value ≥30 pF: Q≥ 1000	Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF 1.0 kHz ± 10% for cap > 1000 pF Voltage: 1.0Vrms ± .2V	
Q				
Insulation Resistance		10,000MΩ or 500MΩ - 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 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	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 60sec- onds. Store at room temperature for 24 ± 2hours 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, KGM Series

Capacitance Range

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	0.4 ± 0.02	0.60± 0.03		1.0± 0.10			1.60± 0.15					2.01±0.20						3.20±0.20						
	(in.)	(0.016±0.0008)	(0.024± 0.001)		(0.040±0.004)			(0.063± 0.006)					(0.079±0.008)						(0.126±0.008)						
W) Width	mm	0.20±0.02	0.30±0.03		0.50±0.10			0.81±0.15					1.25±0.20						1.60±0.20						
	(in.)	(0.008±0.0008)	(0.011±0.001)		(0.020±0.004)			(0.032±0.006)					(0.049±0.008)						(0.063±0.008)						
(t) Terminal	mm	0.10±0.04	0.15±0.05		0.25±0.15			0.35±0.15					0.50±0.25						0.50±0.25						
	(in.)	(0.004±0.0016)	(0.006±0.002)		(0.010±0.006)			(0.014±0.006)					(0.02±0.010)						(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	0.5	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
(pF)	1.0	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	1.2	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	1.5	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	1.8	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	2.2	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	2.7	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	3.3	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	3.9	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	4.7	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	5.6	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	6.8	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	8.2	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	10	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	12	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	15	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	18	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	22	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	27	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	33	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	39	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	47	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	56	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	68	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	82	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	100	A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	120		A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B
	150		A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	E	B	B	B	B	B	B	B
	180		A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	E	B	B	B	B	B	B	B
	220		A	A	A	A	A	A	A	A	A	A	B	B	B	B	E	E	B	B	B	B	B	B	B
	270				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	B	V	V
	330				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	B	V	V
	390				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	B	V	V
	470				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	V	V	V
	560				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	V	T	T
	680				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	V	T	T
	820				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	V	A	A
	1000				A	A	A	A	A	A	A	B	B	B	B	B	E	E	B	B	B	B	V	A	A
	1200							B	B	B	B		B	B	B	B	A	A	B	B	B	B	V	A	A
	1500							B	B	B	B		B	B	B	B	A	A	B	B	B	B	T	A	A
	1800							B	B	B	B		B	B	B	B	A	A	B	B	B	B	D	A	A
	2200							B	B	B			A	A	A	A	A	A	B	B	B	V	D	A	A
	2700							B	B	B			A	A	A	A	A	A	B	B	B	V	D	A	A
	3300							B	B	B			A	A	A	A	A	A	B	V	V	T	D	A	A
	3900							B	B	B			A	A	A	A	A	A	B	V	V	T	A	A	A
	4700							B	B	B			A	A	A	A	A	A	B	T	T	T	A	A	A
	5600												A	A	A	A			B	T	T	A	A	A	A
	6800												A	A	A	A			V	T	T	A	A	A	A
	8200												A	A	A	A			D	A	A	A	A	A	
	0.010												A	A	A	A			D	A	A	A	A	A	
	(µF) 0.012																		H	H	H	H			
	0.015																		H	H	H	H			
	0.018																		H	H	H	H			
	0.022																		H	H	H	H			
	0.027																		H	H	H				
	0.033																		H	H	H				
	0.039																		H	H	H				
	0.047																		H	H	H				
	0.068																		H	H	H				
	0.082																		H	H	H				
	0.100																		H	H	H				
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						

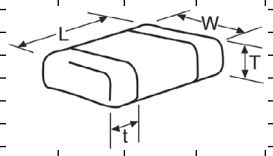


Case Size	0101 (KGM 02)	0201 (KGM03)	0402 (KGM05)	0603 (KGM15)		0805 (KGM21)			1206 (KGM31)					
Thickness Letter	A	A	A	A	B	B	E	A	B	V	T	D	A	H
Max Thickness (mm)	0.22	0.33	0.56	0.90	0.95	0.94	1.35	1.45	0.94	1.22	1.35	1.45	1.80	1.90
Carrier Tape	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	H	H	H	T	T	T	U	U	T	U	U	U	U	U
Packaging Code 13"reel	n/a	N	N	M	M	M	L	L	M	L	L	L	L	L
	PAPER					EMBOSSED (EMB)								

C0G (NP0) Dielectric, KGM Series

Capacitance Range

SIZE		1210					1812					1825			2220			2225		
Soldering		Reflow Only					Reflow Only					Reflow Only			Reflow Only			Reflow Only		
Packaging		All 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)			(0.225 ±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	WVDC	25	50	100	200	500	25	50	100	200	500	50	100	200	50	100	200	50	100	200
	Cap 3.9																			
	(pF) 4.7																			
	5.6																			
	6.8																			
	8.2																			
	10	E	E	E	E	E	B	B	B	B	B									
	12	E	E	E	E	E	B	B	B	B	B									
	15	E	E	E	E	E	B	B	B	B	B									
	18	E	E	E	E	E	B	B	B	B	B									
	22	E	E	E	E	E	B	B	B	B	B									
	27	E	E	E	E	E	B	B	B	B	B									
	33	E	E	E	E	E	B	B	B	B	B									
	39	E	E	E	E	E	B	B	B	B	B									
	47	E	E	E	E	E	B	B	B	B	B									
	56	E	E	E	E	E	B	B	B	B	B									
	68	E	E	E	E	E	B	B	B	B	B									
	82	E	E	E	E	E	B	B	B	B	B									
	100	E	E	E	E	E	B	B	B	B	B									
	120	E	E	E	E	E	B	B	B	B	B									
	150	E	E	E	E	E	B	B	B	B	B									
	180	E	E	E	E	E	B	B	B	B	B									
	220	E	E	E	E	E	B	B	B	B	B									
	270	E	E	E	E	E	B	B	B	B	B									
	330	E	E	E	E	E	B	B	B	B	B									
	390	E	E	E	E	E	B	B	B	B	B									
	470	E	E	E	E	E	B	B	B	B	B									
	560	E	E	E	E	E	B	B	B	B	B									
	680	E	E	E	E	E	B	B	B	B	B									
	820	E	E	E	E	E	B	B	B	B	B									
	1,000	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	1200	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	1500	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	1800	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	2200	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	2700	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	3300	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	3900	E	E	E	E	E	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	4700	E	E	E	H	H	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	5600	E	E	E	H	H	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	6800	E	E	E	H	H	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	8200	E	E	E	H	H	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	Cap 0.010	E	H	H	J	J	B	B	B	B	B	C	C	C	Z	Z	Z	D	D	D
	(µF) 0.012	H	H	H	J	J	B	B	B	E	E	C	C	C	Z	Z	Z	D	D	D
	0.015	H	H	J	L	L	B	B	B	E	E	C	C	C	Z	Z	Z	D	D	D
	0.018	J	J	L	L		B	B	E	F	F	C	C	C	Z	Z	Z	D	D	D
	0.022	J	L	L	L		B	B	E	F	F	C	C	C	Z	Z	Z	D	D	D
	0.027	L	L	L	L		E	E	F	J		C	C	C	Z	Z	Z	D	D	D
	0.033	L	L	L	L		E	E	F			C	C	C	Z	Z	Z	D	D	D
	0.039	L	L	L			J	J	J			C	C	C	Z	Z	Z	D	D	D
	0.047	L	L	L			J	J	J			C	C	C	Z	Z	C	D	D	D
	0.068						J	J	J			C	C	F	Z	Z	C	D	D	G
	0.082						J	J	J			C	F		Z	C		D	D	G
	0.100						J	J	J			F	F		C	C		D	G	G
	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		



Case Size	1210 (KGM 32)				1812 (KGM 43)					1825 (KGM 44)		2220 (KGM 55)			2225 (KGM56)	
Thickness Letter	E	H	J	L	B	E	F	J	C	F	Z	C	D	G	E	G
Max Thickness (mm)	1.45	1.8	2.21	2.80	1.45	1.8	2.21	2.80	2.21	2.80	2.21	2.80	2.21	2.80	2.29	2.80
Carrier Tape	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7"reel	U	U	U	U	V	V	V	V	V	V	V	V	V	V	V	V
Packaging Code 13"reel	L	L	L	L	S	S	S	S	S	S	S	S	S	S	S	S
	EMBOSSED (EMB)															