### COG (NPO) Dielectric, KGM Series

### **General Specifications**

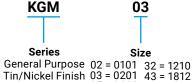




COG (NPO) is the most popular formulation of the "temperature-compensating," EIA Class I ceramic materials. Modern COG (NPO) formulations contain neodymium, samarium and other rare earth oxides.

COG (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is 0 ±30ppm/°C which is less than ±0.3% C from -55°C to +125°C. Capacitance drift or hysteresis for COG (NPO) 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 COG (NP0), one-fifth that shown by most other dielectrics. COG (NP0) formulations show no aging characteristics.

#### **HOW TO ORDER**



31 = 1206

CG

**Thickness** 

**Dielectric** See Cap Chart CG = C0G 0G = 4.0V

1H = 50V0J = 6.3V2A = 100V 1A = 10V 2D = 200V1C = 16V 2E = 250V1E = 25V 2H = 500V

1E

Voltage

101 Capacitance

+Number of zeros eg.  $10\mu F = 106$ 10nF = 103

Code Code (in pF) 2 Significant Digits 47pF = 470

M

Capacitance Tolerance A\* = +/-0.05pFB = +/-0.1pFC = +/-0.25pFD = +/-0.5pFF = +/-1% G\* = +/-2% J = +/-5%

K = +/-10%\*COG Only

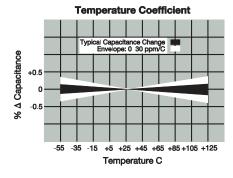


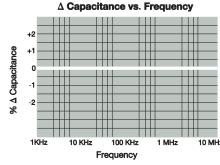
**Packaging** See Table Below

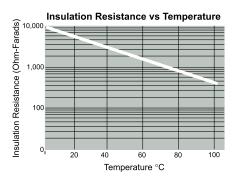


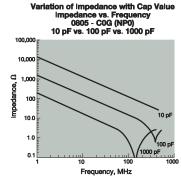
#### **PACKAGING CODES**

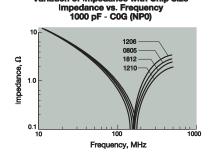
Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13"Embossed
02	0101	0402	Н		n/a	
03	0201	0603	Н		N	
05	0402	1005	Н		N	
15	0603	1608	Т		М	
21	0805	2012	Т	U	М	L
31	1206	3216	Т	U	М	L
32	1210	3225		U		L
43	1812	4532		V		s
44	1825	4564		V		s
55	2220	5750		V		s
56	2225	5763		V		s



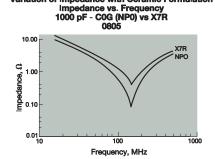








Variation of Impedance with Chip Size



Variation of Impedance with Ceramic Formulation

🔣 📞 The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

## COG (NPO) Dielectric, KGM Series





Parame	ter/Test	NP0 Specification Limits	Measuring Conditions					
	perature Range	-55°C to +125°C	Temperature Cycle Chamber					
	citance Q	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					
Insulation	Resistance	10,000MΩ or 500MΩ - $\mu$ F, 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.					
	Appearance	No defects						
Resistance to	Capacitance Variation	±5% or ±.5 pF, whichever is greater	Deflection: 2mm Test Time: 30 seconds  1mm/sec					
Flexure	Q	Meets Initial Values (As Above)	V					
Stresses	Insulation Resistance	≥ Initial Value x 0.3	90 mm					
Solde	rability	≥ 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					
	Appearance	No defects, <25% leaching of either end terminal						
	Capacitance Variation	≤ ±2.5% or ±.25 pF, whichever is greater	Dip device in eutectic solder at 260°C for					
Resistance to	Q	Meets Initial Values (As Above)	60 sec- onds. Store at room temperature					
Solder Heat	Insulation Resistance	Meets Initial Values (As Above)	for 24 ± 2hours before measuring electrical properties.					
	Dielectric Strength	Meets Initial Values (As Above)						
	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					
Thermal Shock	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					
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 hours at room temperature					
	Appearance	No visual defects	-					
	Capacitance Variation	≤ ±3.0% or ± .3 pF, whichever is greater	Charge device with twice rated voltage in test					
Load Life	Q (C=Nominal Cap)	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C	chamber set at 125°C ± 2°C for 1000 hours (+48, -0).					
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from test chamber and stabilize at room temperature for 24 hours before measuring.					
	Dielectric Strength	Meets Initial Values (As Above)						
	Appearance	No visual defects						
	Capacitance Variation	≤ ±5.0% or ± .5 pF, whichever is greater	Store in a test chamber set at 85°C ± 2°C/ 85% ±					
Load Humidity	Q	≥ 30 pF: Q≥ 350 ≥10 pF, <30 pF: Q≥ 275 +5C/2 <10 pF: Q≥ 200 +10C	5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.					
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.					
	Dielectric Strength	Meets Initial Values (As Above)						

# **COG (NP0) Dielectric, KGM Series**





S	IZE	0101*	02	01		0402		0603						0805						1206					
	dering	Reflow Only	Reflov		Ref	low/W	ave		Re	eflow/W						low/Wav	re				R	eflow/W			
Pacl	kaging	All Paper	All P	aper	Δ	II Pape	er			All Pap	er				Paper	/Embos	sed				Pap	er/Emb	ossed		
(L) Length	mm	0.4 ± 0.02	0.60±	0.03	1	.0± 0.1	10		1	1.60± 0.	.15				2.	01±0.20						3.20±0.:	20		
(L) Length	(in.)	(0.016±0.0008)	(0.024±			40±0.0				063± 0.						79±0.00	8)					.126±0.			
W) Width	mm	0.20±0.02	0.30			50±0.				0.81±0.						25±0.20						1.60±0.:			
	(in.)	(0.008±0.0008)	(0.011±			20±0.0		-	(0.032±0.006)				(0.049±0.008)							(0.063±0.008)					
(t) Terminal	mm (in.)	0.10±0.04 (0.004±0.0016)	0.15			25±0.		-	0.35±0.15			0.50±0.25 (0.02±0.010)						0.50±0.25 (0.020±0.010)							
Terrinia	WVDC	16	25	50	16	25	0±0.006) (0.014±0.006) 25 50 16 25 50 100						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	200 A	В	B	B	В	B	B	В	B	В	В	B	B	B
	(pF) 1.0	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	1.2	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	1.5	A	A	A	A	Α	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	1.8	A A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B B	B	B B	B	B B	B B	B	B B	B B
	2.7	Ā	A	A	A	A	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	3.3	A	Α	Α	Α	Α	Α	Α	Α	Α	A	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	3.9	A	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	4.7	A	A	A	A	Α	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	5.6 6.8	A A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B B	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	В	В	В	В	В	В	В	В	В	В	В	В	В
	10	A	A	A	A	Α	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	12	А	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	15	A	A	A	A	Α	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	18 22	A A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B B	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	В	В	В	В	В	В	В	В	В	В	В	В	В
	33	A	A	Α	Α	Α	Α	Α	Α	Α	A	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	39	A	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	47	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	56	A A	A	A	A	Α	A	A	A	A	A	A	B	В	B	B	B B	B	B B	В	B B	В	B	B B	B B
	68 82	A	A	A	A	A	A	A	A	A	A	A	В	B	В	В	В	В	В	B	В	B B	В	В	В
	100	A	A	A	A	A	A	A	A	A	A	A	В	В	В	В	В	В	В	В	В	В	В	В	В
	120				Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	В	В	В	В	В	В	В	В
	150				Α	Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	K	В	В	В	В	В	В	В
	180 220				A	Α	A	A	A	A	A	A	B	B	B	B	B K	K	B B	B	B	B B	B B	B B	B B
	270				A	A	A	A	A	A	A	A B	В	В	В	В	K	K	В	В	В	В	В	В	В
	330				A	A	A	A	A	A	A	В	В	В	В	В	K	K	В	В	В	В	В	В	В
	390				Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	K	K	В	В	В	В	В	В	В
	470				Α	Α	Α	Α	Α	Α	Α	В	В	В	В	В	K	K	В	В	В	В	В	В	В
	560				A	Α	A	A	A	A	A	В	В	В	В	В	K	K	В	В	В	В	В	В	В
	680 820				A	A	A	A	A	A	A	B	B	B	B	B	K	K	B B	B	B	B B	B B	B B	B B
	1000				A	A	A	A	A	A	A	В	В	В	В	В	K	K	В	В	В	В	В	В	В
	1200							В	В	В	В		В	В	В	В	F	F	В	В	В	В	В	В	В
	1500							В	В	В	В		В	В	В	В	F	F	В	В	В	N	E	E	E
	1800 2200		-				-	B	B	B	В		B F	В	B F	B F	F	F	В	В	N	E	E	E	E E
	2700							В	В	В		<u> </u>	F	F	F	F	F	F	B B	B	N N	E	E	E E	E
	3300							В	В	В			F	F	F	F	F	F	В	В	N	E	E	E	E
	3900							В	В	В			F	F	F	F	F	F	В	В	N	Е	K	K	K
	4700						<u> </u>	В	В	В			F	F	F	F	F	F	В	В	N	E	K	K	K
	5600 6800	1	-				-	-	-	-	-	-	F	F	F	F		-	B	B	N	E	K	K K	K K
	8200												F	F	F	F			N E	N E	N E	E	K	K	N
	0.010												F	F	F	F			E	E	E	E	K	K	
	(μF) 0.012												F	F	F				K	K	K	K			
	0.015			>	-	~	W-												K	K	K	K			
	0.018 0.022	1	-	سينا			7	<	-			-	-			-		-	K	K	K	K			
	0.022		- (	_	$\overline{}$		1)	ÎT			1								K	K	K				
	0.027		(	_ `	1	_	1	-											K	K	K	K			
	0.039		1		4			-											K	K	K				
	0.047		1		4.7				oxdot										K	K	K				
	0.068				. 1	1	1												K	K	K				
-	0.082 0.100					-	-	<u> </u>	-	-		-	<u> </u>	-	1	-		-	K	K	K				
W	VDC	16	25	50	16	25	50	16	25	50	100	200	16	25	50	100	200	250	16	25	50	100	200	250	500
	IZE	0101*	02			0402				0603						0805						1206			

Case Size	0101 (KGM 02)	0201 (KGM03)	0402 (KGM05)	0603 (k	(GM15)	30	305 (KGM2	1206 (KGM31)					
Thickness Letter	Α	Α	Α	Α	В	В	F	K	В	Е	K	N	
Max Thickness (mm)	0.22	0.33	0.55	0.90	0.95	0.94	1.52	1.40	0.94	1.52	2.29	1.27	
Carrier Tape	PAPER	PAPER	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	
Packaging Code 7"reel	Н	Н	Н	Т	Т	Т	U	U	Т	U	U	U	
Packaging Code 13"reel	n/a	N	N	М	М	М	L	L	М	L	L	L	
		ı	PAPER			EMBOSSED (EMB)							



## **COG (NP0) Dielectric, KGM Series**





S	IZE			1210					1812				1825			2220		2225			
	dering			Reflow Onl	V			Reflow Only					Reflow Onl	v	F	Reflow Onl	٧	R	eflow Only	,	
	kaging			II Embosse					I Embosse				II Emboss			II Emboss			Embosse		
(L)	mm			3.20 ± 0.20					4.50 ± 0.30				4.50 ± 0.30			5.70 ±0.40			.72 ±0.25		
Length	(in.)		(0	0.126± 0.00	18)			(0	.177±0.01	2)			177 ± 0.0			.225 ±0.01			225 ±0.01		
(W)	mm			2.50±0.20					3.20 ±0.20			6.40 ±0.40				5.00 ±0.40			6.35 ±0.25		
Width	(in.)		((	0.098±0.00					.126 ±0.00				.252±0.01			.197 ±0.01		(0.250 ±0.010)			
(t)	mm			0.50±0.25					0.61 ±0.36				0.61±0.36		(0	0.64 ±0.39	)	0.64 ±0.39			
Terminal	(in.)			0.30±0.23 0.020±0.01					.024 ±0.01				.024±0.01			.025 ±0.01		(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	
WVDC	Cap 3.9	23	30	100	200	300	23	30	100	200	300	30	100	200	30	100	200	30	100	200	
	(pF) 4.7																			$\vdash$	
	(pr) 4.7 5.6																			$\vdash$	
																				$\vdash$	
	6.8															<del> </del>	-	-			
	8.2	0															سسيا		711-2		
	10	С	С	С	С	С	С	С	С	С	С					*/	$\sim$	_	1		
	12	С	С	С	С	С	С	С	С	С	С					- (	-	٦ _	レゼ		
	15	С	С	С	С	С	С	С	С	С	С					_ `					
	18	С	С	С	С	С	С	С	С	С	С					<b></b>	Ī.	e e			
	22	С	С	С	С	С	С	С	С	С	С				-	<u> </u>	٦	E			
	27	С	С	С	С	С	С	С	С	С	С									$\vdash$	
	33	С	С	С	С	С	С	С	С	С	С									$\vdash$	
	39	С	С	С	С	С	С	С	С	С	С					-				$\vdash$	
	47	F	F	F	F	F	С	С	С	С	С				-	-				$\vdash$	
	56	F	F	F	F	F	С	С	С	С	С									$\vdash \vdash \vdash$	
	68	F	F	F	F	F	С	С	С	С	С									$\vdash$	
	82	F	F	F	F	F	С	С	С	С	С										
	100	F	F	F	F	F	С	С	С	С	С										
	120	F	F	F	F	F	С	С	С	С	С										
	150	F	F	F	F	F	С	С	С	С	С									ldot	
	180	F	F	F	F	F	С	С	С	С	С									$\square$	
	220	F	F	F	F	F	С	С	С	С	С										
	270	F	F	F	F	F	С	С	С	С	С										
	330	F	F	F	F	F	С	С	С	С	С										
	390	F	F	F	F	F	С	С	С	С	С										
	470	F	F	F	F	F	С	С	С	С	С										
	560	F	F	F	F	F	С	С	С	С	С										
	680	F	F	F	F	F	С	С	С	С	С										
	820	F	F	F	F	F	С	С	С	С	С										
	1,000	F	F	F	F	F	С	С	С	С	С	D	D	D	Α	Α	Α	E	E	E	
	1200	F	F	F	F	F	С	С	С	С	С	D	D	D	Α	Α	Α	E	E	E	
	1500	F	F	F	F	F	С	С	С	С	С	D	D	D	Α	Α	Α	E	E	E	
	1800	F	F	F	F	F	С	С	С	С	С	D	D	D	Α	Α	Α	E	E	E	
	2200	F	F	F	F	F	С	С	С	С	С	D	D	D	Α	Α	Α	E	E	E	
	2700	F	F	F	F	F	С	С	С	С	D	D	D	D	Α	Α	Α	E	E	E	
	3300	F	F	F	F	F	С	С	С	С	D	D	D	D	Α	Α	Α	E	E	E	
	3900	F	F	F	F	F	С	С	С	С	D	D	D	D	Α	Α	Α	E	E	Е	
	4700	F	F	F	F	F	С	С	С	С	Н	D	D	D	Α	Α	Α	E	E	E	
	5600	F	F	F	F	F	С	С	С	С	Н	D	D	D	Α	Α	Α	Е	E	Е	
	6800	F	F	F	K	K	С	С	D	D	Н	D	D	D	Α	Α	Α	E	E	Е	
	8200	F	F	F	K	К	С	С	D	D	Н	D	D	D	Α	Α	Α	E	E	Е	
	Cap 0.010	F	F	K	K	K	С	С	D	D	Н	D	D	D	Α	Α	Α	E	E	Е	
	(μF) 0.012	K	K	K	K	K	С	С	D	G	Н	D	D	D	Α	Α	Α	E	Е	Е	
	0.015	K	K	K	L	L	С	С	D	G	Н	D	D	D	Α	Α	Α	E	E	F	
	0.018	K	K	L	L		С	С	G	G	Н	D	D	D	Α	Α	Α	E	E	F	
	0.022	K	K	L	L		С	С	G	G		D	D	D	Α	Α	Α	E	F	F	
	0.027	K	L	L	L		D	G	G	J		D	D	D	Α	Α	Α	E	F	F	
	0.033	K	L	L	L		D	G	G	J		D	D	D	Α	Α	Α	E	F	F	
	0.039	L	L	L			G	G	J	J		D	D	D	В	В	В	E	F	F	
	0.047	L	L	L			G	G	J	J		D	D	D	В	В	С	E	G	G	
	0.068						J	J	J			D	D	F	С	С	С	E	G	G	
	0.082		ļ				J	J	J		ļ	D	F		С	С		E	G	G	
	0.100						J	J	J			F	F		С	С		G	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		
		· <u></u>	_	· <u></u>								· <u></u>	· <u></u>	· <u></u>		· <u></u>		· <u></u>		_	

Case Size			18	12 (KGM 4	13)		1825 (k	(GM 44)	22	20 (KGM 5	2225 (KGM56)					
Thickness Letter	С	F	K	L	Н	С	D	G	J	D	F	Α	В	С	Е	G
Max Thickness (mm)	1.27	1.52	2.29	2.80	2.54	1.52	1.78	2.29	2.80	2.29	2.80	2.29	2.54	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	٧	V	٧	٧	V	V	V	V
Packaging Code 13"reel	L	L	L	L	S	S	S	S	S	S	S	S	S	S	S	S
								EMBOS	SED (EME	3)						

