

Class I Dielectrics

Multilayer Ceramic Capacitors are generally divided into classes which are defined by the capacitance temperature characteristics over specified temperature ranges. These are designated by alpha numeric codes. Code definitions are summarised below and are also available in the relevant national and international specifications.

Capacitors within this class have a dielectric constant range from 10 to 100. They are used in applications which require ultra stable

dielectric characteristics with negligible dependence of capacitance and dissipation factor with time, voltage and frequency. They exhibit the following characteristics:-

- Time does not significantly affect capacitance and dissipation factor (Tan δ) – no ageing.
- Capacitance and dissipation factor are not affected by voltage.
- Linear temperature coefficient.

		Class I Dielectrics							
		COG/NPO (Porcelain)	P90 (Porcelain)	COG/NPO		X8G	Class I High Temperature		
		Ultra stable	Ultra stable	Ultra stable		Ultra stable	Ultra stable		
Dielectric classifications	IECQ-CECC	-	-	1B/CG		-	-	-	
	EIA	COG/NPO	P90	COG/NPO		X8G	-	-	
	MIL	-	-	CG (BP)		-	-	-	
Ordering code	DLI	CF	AH	-	-	-	-	-	
	Novacap	-	-	-	N	-	F	D, RD	
	Syfer	-	-	Q, U	C	H	-	G	
	Voltronics	F	H	Q	-	-	-	-	
Rated temperature range		-55°C to +125°C	-55°C to +125°C	-55°C to +125°C	-55°C to +125°C	-55°C to +150°C	-55°C to +160°C	-55°C to +200°C	
Maximum capacitance change over temperature range	No DC voltage applied	0 ± 15 ppm/°C	± 20 ppm/°C	0 ± 30 ppm/°C	± 30 ppm/°C	0 ± 30 ppm/°C	0 ± 30 ppm/°C	0 ± 30 ppm/°C	
	Rated DC voltage applied	-							
Tangent of loss angle (tan δ)		≤0.05		≤0.0005 @1MHz	$\frac{>50pF \leq 0.0015}{\leq 50pF \ 0.0015 (15 + 0.7)} \frac{15 + 0.7}{Cr}$		≤0.001		
Insulation resistance (Ri)	Time constant (Ri x Cr)	@25°C = 10 ⁶ MΩ min @125°C = 10 ⁵ MΩ min		100GΩ or 1000s (whichever is the least)			@25°C = 100GΩ or 1000ΩF @160°C & 200°C = 1GΩ or 10ΩF (whichever is the least)		
Capacitance Tolerance	Cr <4.7pF	±0.05pF, ±0.10pF, ±0.25pF, ±0.5pF							
	Cr ≥4.7 to <10pF	±0.10pF, ±0.25pF, ±0.5pF							
	Cr ≥10pF	±1%, ±2%, ±5%, ±10%							
Dielectric strength Voltage applied for 5 seconds. Charging current limited to 50mA maximum.	≤200V	2.5 times	2.5 times	2.5 times		2.5 times	2.5 times		
	>200V to <500V			Rated voltage + 250V			Rated voltage + 250V		
	500V to ≤1kV			1.5 times			1.5 times		
	>1kV to ≤1.2kV		N/A		1.25 times		1.25 times		
	>1.2kV		1.2 times		1.2 times		1.2 times		
Climatic category (IEC)	Chip	55/125/56	55/125/56	55/125/56		-	-		
	Dipped	-	-	-	55/125/21	-	-		
	Discoidal	-	-	-	55/125/56	-	-		
Ageing characteristic (Typical)		Zero							
Approvals	Syfer Chip	-	-	-	QC-32100	-	-		