

Dielectric Characteristics

Capacitor Selection

Multilayer capacitors (MLC) and single layer capacitors are categorized by performance with temperature. Component selection is typically determined by dielectric performance, electrical environment and temperature stability. In determining the proper component for a specific application, the following information should be considered.

Dielectric Type

There are three basic dielectric classes (characteristics) available:

DIELECTRIC PROPERTIES

Dielectric Type	Stability Class	Description
BP (NPO and COG)	Ultra Stable Class I	Effects on electrical properties are minimal with temperature, frequency or time. Used in applications which require stable performance.
BQ, BR, BX and X7R	Stable Class II	Effects on electrical properties predictably change with temperature, voltage, frequency and time. Selected for applications where blocking, coupling, by-passing and frequency discriminating elements are used. Offers higher capacitance than Class I (COG).
Z5U and Y5V	General Purpose Class II	Exhibits a greater variation of properties with temperature. Dielectric constant is higher than Class I and Class II dielectrics. Extremely high capacitance per unit volume and used in general performance applications.

Dielectric Characteristics

NPO (COG)

Operating Temperature Range	-55°C to 125°C
Temperature Coefficient	0 ± 30 ppm/°C
Dissipation Factor001 (0.1%) max. @ 25°C
Insulation Resistance: 25°C	10 ⁶ Megohms
125°C	10 ⁵ Megohms
Dielectric Withstanding Voltage	50 to 200V, 2.5 x VDCW
	201 to 500V, 1.5 x VDCW, or 500V*,
	>500V, 1.2 VDCW, or 750V*
Aging Rate	0% per decade hour
Test Parameters	1 KHz, 1.0 ± 0.2 VRMS, 25°C
	1 MHz for capacitance
	≤1,000 pF

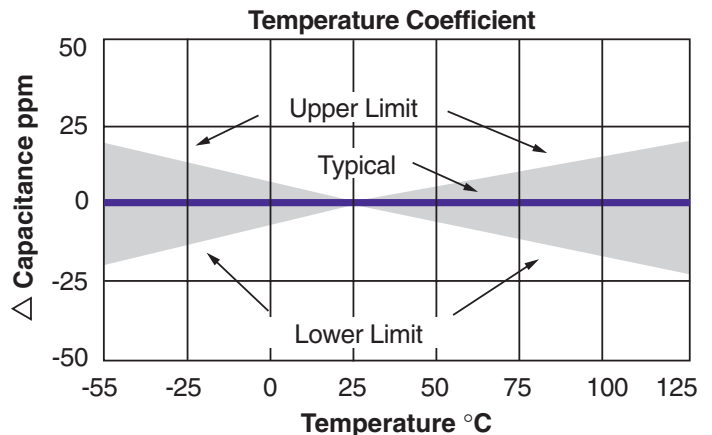
* Whichever is greater

Capacitor Size

The capacitor body size impacts its utility to the design requirements in respect to capacitance value and voltage rating. Typically smaller units are less expensive and provide for greater space savings. Because mass affects the thermal response of the chips, size should be considered when selecting the attachment method to the circuit.

TERMINATION MATERIAL

Material Type	Recommended Usage
Silver Palladium	Nonmagnetic application requirements. Recommended for conductive epoxy and leaded attachment methods. For soldering applications, use solder reflow below 230°C.
Silver	Most ductile of the available termination methods. Used in applications which will be leaded, to minimize thermal stresses.

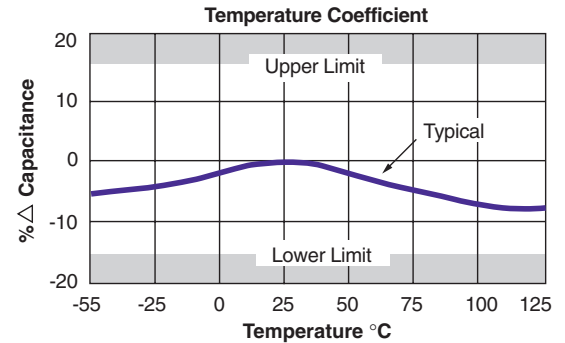


Dielectric Characteristics

Dielectric Characteristics Continued

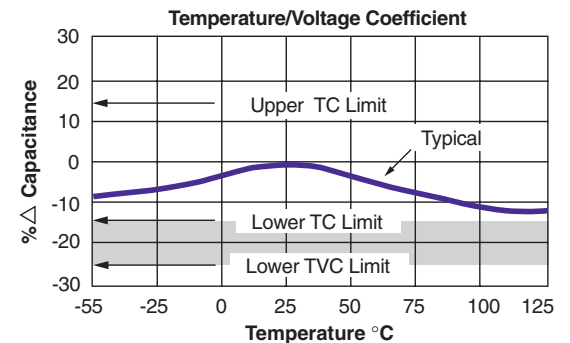
X7R

Operating Temperature Range	-55°C to 125°C
Temperature Coefficient	± 15% ΔC max.
Dissipation Factor025 (2.5%) max. @ 25°C
Insulation Resistance: 25°C	10 ⁶ Megohms
125°C	10 ⁵ Megohms
Dielectric Withstanding Voltage	50 to 200V, 2.5 x VDCW
	201 to 500V, 1.5 x VDCW, or 500V*,
	>500V, 1.2 VDCW, or 750V*
Aging Rate	<2.0% per decade hour
Test Parameters	1 KHZ, 1.0 VRMS ± 0.2 VRMS, 25°C



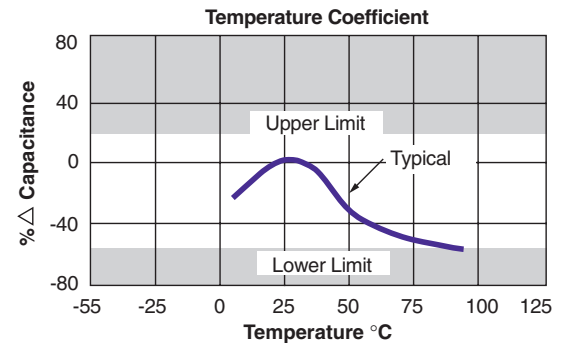
BX

Operating Temperature Range	-55°C to 125°C
Temperature Coefficient	± 15% ΔC max.
Temperature Voltage Coefficient	+ 15% - 25% ΔC max.
Dissipation Factor025 (2.5%) max. @ 25°C
Insulation Resistance: 25°C	10 ⁶ Megohms
125°C	10 ⁵ Megohms
Dielectric Withstanding Voltage	50 to 200V, 2.5 x VDCW
	201 to 500V, 1.5 x VDCW, or 500V*,
	>500V, 1.2 VDCW, or 750V*
Aging Rate	2.0% per decade hour
Test Parameters	1 KHZ, 1.0 VRMS ± 0.2 VRMS, 25°C



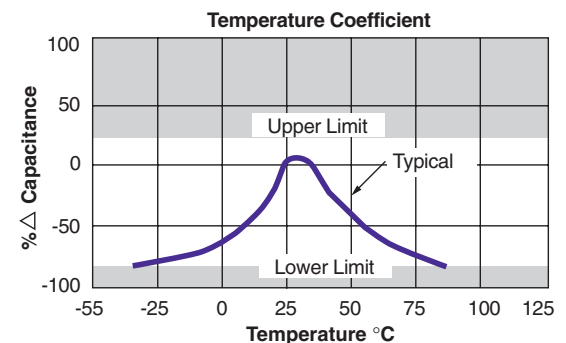
Z5U

Operating Temperature Range	+10°C to 85°C
Temperature Coefficient	+ 22% - 56% ΔC max.
Dissipation Factor030 (3.0%) max. @ 25°C
Insulation Resistance: 25°C	10 ⁵ Megohms
Dielectric Withstanding Voltage	50 to 200V, 2.5 x VDCW
	250V, 1.5 x VDCW
Aging Rate	-2.0% per decade hour
Test Parameters	1 KHZ, 0.5 VRMS ± 0.1 VRMS, 25°C



Y5V

Operating Temperature Range	-30°C to 85°C
Temperature Coefficient	+ 22% - 82% ΔC max.
Dissipation Factor050 (5.0%) max. @ 25°C
Insulation Resistance: 25°C	10 ⁵ Megohms
Dielectric Withstanding Voltage	50 to 200V, 2.5 x VDCW
	250V, 1.5 x VDCW
Aging Rate	-2.0% per decade hour
Test Parameters	1 KHZ, 1.0 VRMS ± 0.2 VRMS, 25°C



* Whichever is greater