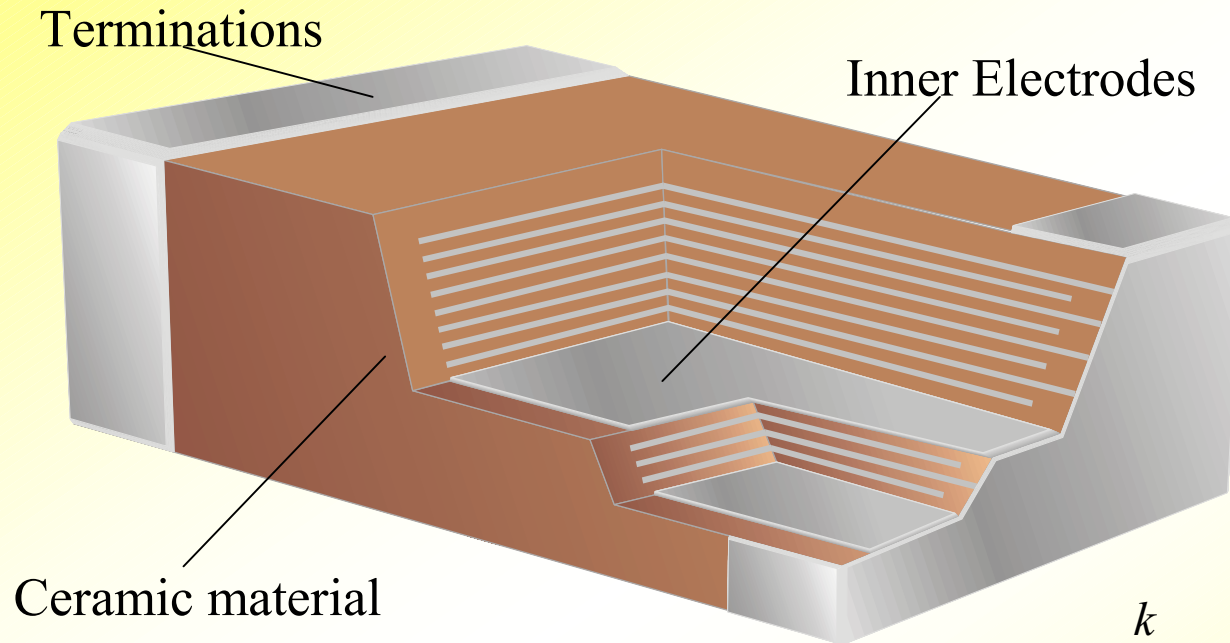


# Construction of MLCC

## MULTILAYER CERAMIC CAPACITOR



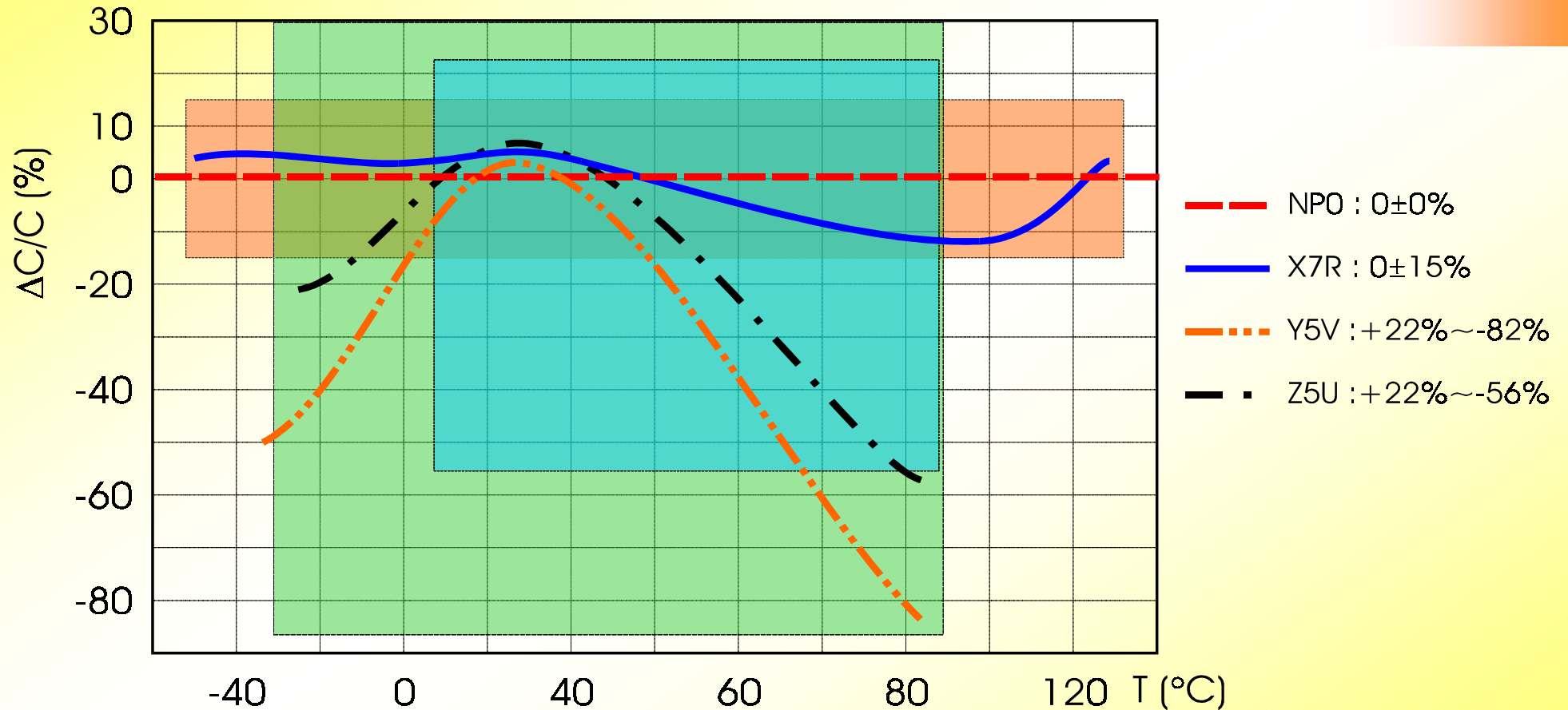
$$C = \frac{k \times A \times (N - 1)}{f \times t}$$

- $k$  : Dielectric constant
- $A$  : Area of overlapping electrodes
- $N$  : Nr. Of dielectric layers
- $t$  : Thickness of dielectric
- $f$  : Conversion factor

# Materials and Performance Characterization

Designation	Class	Temperature Range (°C)	Temp-Cap Change
Temperature compensating NP0, C0G	1	-55 to +125	± 30 ppm
Intermediate K X7R, BX	2	-55 to +125	± 15%
High K Y5V(F) Z5U(E)	2	-30 to +85 (-25 to +85) +10 to +85	+22 to -82% (+30 to -80%) +22 to -56%

# Capacitance change v.s. Temperature



# Symbols of Temperature Coefficients

## Class 2 :

Low Temp.	Symbol	High Temp.	Symbol	Max. Cap. change over temp. range (%)	Symbol
+10	Z	+45	2	±1.0	A
-30	Y	+65	4	±1.5	B
-55	X	+85	5	±2.2	C
		+105	6	±3.3	D
		+125	7	±4.7	E
		+150	8	±7.5	F
		+200	9	±10	P
				±15	R
				±22	S
				+22 to -33	T
				+22 to -56	U
				+22 to -82	V

Ex. : X7R

→ X : -55°C  
7 : +125 °C  
R : ±15%

Y5V

Y : -30 °C  
5 : +85 °C  
V : +22 to -82%

Z5U

Z : +10 °C  
5 : +85 °C  
U : +22 to -56%