GENERAL INFORMATION

✦ *GENERAL*

The multilayer chip ceramic capacitors consist of formulated ceramic dielectric materials in layers interspersed with metal electrode layers. The entire structure is fired together at high temperature, after which conductive terminations are applied on opposite ends to contact protruding electrode edges.

✦ *DIELECTRIC TYPE*

Skymos ceramic multilayer chip capacitors are offered in three most popular temperature characteristics. They are designed according to international specification EIA as the ultra-stable CG, know as NPO (COG), the stable X7R and the general purpose Y5V (Z5U).

NPO dielectric is made of ceramic materials which are not ferroelectric. This yields a superior stability characteristic, but relatively low capacitance. Both X7R and Y5V (Z5U) are made from ferroelectric materials, principally barium titanate.

The NPO capacitors are used in applications which require very stable characteristics with no dependence of capacitance and dissipation factor (tan δ) on time, voltage and frequency. The dissipation factor (tan δ) is relatively low.

Capacitors of the ferroelectric types have a nonlinear temperature characteristics, the capacitance and tan δ are affected by time voltage and frequency. The dissipation factor is usually higher than NPO.

✦ *AGING*

Ferroelectric materials also exhibit a time dependence, known as aging. It is believed that this behavior is due to strain energy of the ferroelectric domains striving for orientation relative to one another after their formation. Thus, ferroelectric materials exhibit an aging of the dielectric constant after cooling below the Curie temperature, which is logarithmic with time.

The aging rate of capacitors is expressed in terms of decade hours. X7R dielectrics, for example, ages at 2% per decade hour; i.e. the capacitors will lose 2% capacity between 1 and 10 hours after cooling, and additional 2% between 10 and 100 hours and an additional 2% between 100 and 1000 hours.

The aging process of ferroelectrics is reversible. Heating the material past the Curie point reverts the domains structure to its previous state and the aging process starts anew. Users should be aware that certain capacitor attachment processes do exceed the Curie temperature of the dielectric and, therefore, a temporary increase in capacitance should be expected. The rated C-tolerance of capacitors is defined for 100 hours of aging.

✦ *VOLTAGE EFFECTS*

Ferroelectric materials are also affected by applied voltage, both AC and DC. As the voltage is increase towards the rated voltage, the capacitance will decrease. This decrease in capacitance is a function of dielectric thickness and dielectrics itself. This decrease in capacitance is due to a polarizing effect in the ferroelectric material.

✦ *CUSTOMER TESTING*

Because of the temperature and voltage effects, caution must be used in establishing a testing sequence. Dielectric strength and insulation resistance tests both apply DC voltage and depress capacitance, so capacitance should be measured prior to the voltage tests. For temperature tests, it is recommendable that X7R and Y5V capacitors be de-aged for 2 hours at 150°C and stabilized at room temperature for 24 hours before capacitance measurements are done.

※ For more information on capacitors, dielectrics and performances, please contact us directly.

■ FEATURES

- Ceramic capacitor specially designed for High voltage applications
- Capacitance range : up to 10μF
- Rated Voltage : up to 10KVdc
- Sizes : from 0402 up to 7565
- COG(NPO) and X7R temperature characteristics
- Operating temperature range : -55°C to +125°C
- Compliant to Standard IEC 384-10

■ APPLICATIONS

- DC-DC converters
- Voltage multipliers
- Radio and TV receiver
- Modems, Interfaces
- Other electrical appliances where high voltage is present

■ TECHNICAL DATA

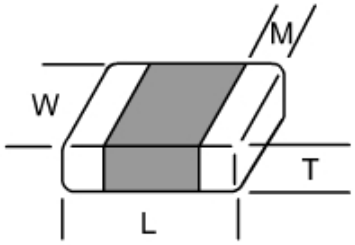
PARAMETER	DIELECTRIC		
	COG (NPO)	X7R	Y5V
Measuring Frequency (for C, tanδ)	1 MHz for C≤1000pF 1 KHz for C>1000pF	1 MHz for C≤1000pF 1 KHz for C>1000pF	1KHz
Capacitance Tolerance	C, D, G, J, K, M	K, M, Z	M, Z
Dissipation Factor tanδ	15 10^{-4} for C≥50pF or $1.5(150/C+7)10^{-4}$	350 10^{-4}	350 10^{-4}
Measuring Voltage (C, tanδ)	1 Vrms	0.3 Vrms	0.3 Vrms
Rated Voltage	16V, 25V, 50V, 100V, 200V, 300V, 500V		
Test Voltage	16 – 100V 2.5 x Ur 200 – 500V 1.5 x Ur + 100V		
Insulating Resistance Ri	≥10GΩ or RixC≥100ΩF whichever is less	≥4GΩ or RixC≥100ΩF whichever is less	≥4GΩ or RixC≥100ΩF whichever is less
Measuring Voltage (for Ri)	16 – 500V Ur		
Temperature Range	-55°C to +125°C	-55°C to +125°C	-25°C to +85°C
Temperature Characteristics	0 ± 30 ppm/°C	± 15%	+30% / -80%
Climatic Category	55 / 125 / 56	55 / 125 / 56	25 / 85 / 21
Reference Temperature	23 °C		
Voltage Dependence	No	Yes	Yes
Aging (per hour decade)	0	<2%	<6%
Termination (chip)	(AgPd or Ni barrier or Cu/Sn), Cu/Sn for leaded		
Packaging	Bulk or Tape & Reel		
Standard	IEC 384 – 10 IEC 384 – 8,9 for leaded IEC 60286 – 3 for taped SMD		

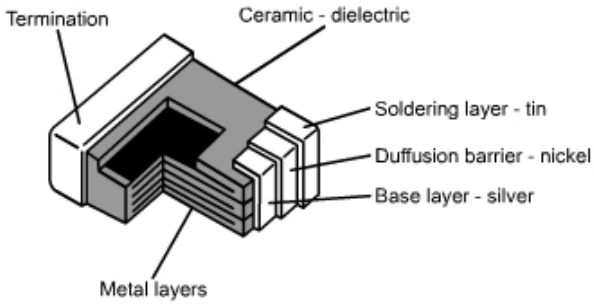
* *Capacitance tolerance (see Ordering Code)*

*** Units rated above 1000V may require conformal coating in use to preclude arcing over the chip surf*

■ CONSTRUCTION AND DIMENSIONS

Size	L	W	T (max)
0402	1.00 ±0.05	0.50 ±0.05	0.50 ±0.05
0603	1.60±0.10	0.80 ±0.15	0.80 ±0.15
0805	2.00 ±0.20	1.25 ±0.20	0.70 ±0.20 1.00 ±0.20 1.25 ±0.20
1206	3.20 ±0.30	1.60 ±0.20	0.70 ±0.20 1.00 ±0.20 1.25 ±0.20
1210	3.20 ±030	2.50 ±0.30	1.25 ±0.30 1.50 ±0.30
1808	4.50 ±0.40	2.00 ±0.20	≦2.00
1812	4.50 ±0.40	3.20 ±0.30	≦2.50
2225	5.70 ±0.50	6.30 ±0.50	≦2.50
3530	7.60 ±0.50	9.00 ±0.50	≦3.50





■ ORDERING CODE

SMC	-	0805	-	B	-	102	-	K	-	501	-	N	-	T
[1]		[2]		[3]		[4]		[5]		[6]		[7]		[8]

[1] **Product Type :** SMC (≦500V)

[2] **Dielectric :** C-CG (NPO) ; B-X7R ; F/Y-Y5V ; E/Z-Z5U

[3] **Size Code :** See Chip Size Table

[4] **Capacitance :** 2 Sig. Digits + Number of Zero

Example: C<1pF(R82 = 0.82pF) ; 1<C<10pF(8R2 = 8.2pF) ; C≧10pF(100 = 10pF ; 332 = 3300pF)

[5] **Capacitance Tolerance :**

C±0.25pF ; D±0.5pF ; F±1% ; G±2% ; J±5% ; K±10% ; M±20% ; Z+80-20%

[6] **Rated Voltage :** 2 Sig. Digits + Number of Zero

Example: 160=16V ; 500=50V ; 101=100V ; 201=200V ; 301=300V ; 501=500V

[7] **Termination :** S – AgPd ; N – Nickel barrier ; C – Cu/Sn

[8] **Packing :** B-Bulk ; T-Tape & Reel

■ HIGH VOLTAGE CHIP CAPACITOR 1 – 10KV

✦ TECHNICAL DATA

PARAMETER	COG (NPO)	X7R
Capacitance Tolerance	J, K, M, S	K, M, S, Z
Dissipation Factor tanδ	15 10^{-4}	350 10^{-4}
Measuring Voltage (C, tanδ)	1 Vrms	0.3 Vrms
Rated Voltage	1KV – 10KV	
Test Voltage	1.2 xUr	
Insulating Resistance Ri	≥10GΩ or RixC≥100ΩF whichever is less	≥4GΩ or RixC≥100ΩF whichever is less
Measuring Voltage (for Ri)	500V	500V
Temperature Range	-55°C to +125°C	-55°C to +125°C
Temperature Characteristics	0 ± 30 ppm/°C	± 15%
Climatic Category	55 / 125 / 56	55 / 125 / 56
Reference Temperature	23°C	
Voltage Dependence	No	Yes
Aging (per hour decade)	0	< 2%
Termination	AgPd or Ni barrier or Cu/Sn	
Packaging	Bulk	
Standard	IEC 384-10	

Size	4020	4040	4540	5040	5440	5550	6560	6660	7565
L(mm)	10.2±1.00	10.2±1.00	11.4±1.10	12.7±1.30	13.7±1.40	14.0±1.40	16.5±1.70	16.8±1.70	19.0±1.90
W(mm)	5.08±0.51	10.2±1.00	10.2±1.00	10.2±1.00	10.2±1.00	12.7±1.30	15.2±1.50	15.2±1.50	16.5±1.70
T(mm)	5.1	5.1	5.1	5.1	6.4	6.4	6.4	6.4	6.4

■ ORDERING CODE

SHC	-	1812	-	B	-	102	-	K	-	501	-	N	-	T
[1]		[2]		[3]		[4]		[5]		[6]		[7]		[8]

[1] **Product Type :** SHC (≧1000V)

[2] **Dielectric :** C-CG (NPO) ; B-X7R ; F/Y-Y5V ; E/Z-Z5U

[3] **Size Code:** See Chip Size Table

[4] **Capacitance :** 2 Sig. Digits + Number of Zero

Example: C<1pF(R82 = 0.82pF) ; 1<C<10pF(8R2 = 8.2pF) ; C≧10pF(100 = 10pF ; 332 = 3300pF)

[5] **Capacitance Tolerance :**

C±0.25pF ; D±0.5pF ; F±1% ; G±2% ; J±5% ; K±10% ; M±20% ; Z+80-20%

[6] **Rated Voltage :** 2 Sig. Digits + Number of Zero

Example: 160=16V ; 500=50V ; 101=100V ; 201=200V ; 301=300V ; 501=500V

[7] **Termination :** S – AgPd ; N – Nickel barrier ; C – Cu/Sn

[8] **Packing :** B-Bulk ; T-Tape & Reel

■ General COG MLCC

Dimensions, Capacitance Range and Operating Voltage

Size	L	W	T	WB	Rated Voltage (V)	Capacitance (pF)
0402	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.25 ± 0.10	21	1.0 ~ 470
					50	1.0 ~ 220
0603	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.10	0.30 ± 0.10	25	1.0 ~ 1000
					50	0.5 ~ 820
					100	0.5 ~ 820
					200	0.5 ~ 330
0805	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0. ± 0.20	25	0.5 ~ 3300
					50	0.5 ~ 2200
					100	0.5 ~ 1000
					200	0.5 ~ 820
					500	0.5 ~ 470
1206	3.20 ± 0.30	1.60 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0.50 ± 0.25	25	0.5 ~ 4700
					50	0.5 ~ 3900
					100	0.5 ~ 2700
					200	0.5 ~ 1000
					500	0.5 ~ 820
					1000	0.5 ~ 470
					2000	0.5 ~ 100
1210	3.20 ± 0.30	2.50 ± 0.30	1.25 ± 0.30 1.50 ± 0.30	0.75 ± 0.25	25	560 ~ 10000
					50	560 ~ 7500
					100	10 ~ 4700
					200	10 ~ 2700
					500	10 ~ 1800
					1000	10 ~ 820
					2000	10 ~ 220
1808	4.50 ± 0.40	2.00 ± 0.20	≦ 2.00	0.75 ± 0.25	25	10 ~ 8200
					50	10 ~ 6800
					100	10 ~ 4700
					200	10 ~ 2700
					500	10 ~ 1800
					1000	10 ~ 820
					2000	10 ~ 220
1812	4.50 ± 0.40	3.20 ± 0.30	≦ 2.50	0.75 ± 0.20	25	10~ 15000
					50	10 ~ 10000
					100	10 ~ 10000
					200	10 ~ 5600
					500	10 ~ 2700
					1000	10 ~ 1000
					2000	10 ~ 330
					3000	10 ~ 270
2225	5.70 ± 0.50	6.30 ± 0.50	≦ 2.50	1.00 ± 0.25	25	1000 ~ 4700
					50	1000 ~ 22000
					100	10 ~ 22000
					200	10 ~ 12000
					500	10 ~ 3900
					1000	10 ~ 2200
					2000	10 ~ 1000
					3000	10 ~ 680
3035	7.60 ± 0.50	9.00 ± 0.50	≦ 3.00	1.00 ± 0.25	25	1000 ~ 100000
					50	1000 ~ 47000
					100	1000 ~ 33000
					200	1000 ~ 22000
					500	1000 ~ 18000
					1000	1000 ~ 8200
					2000	1000 ~ 3300

**Specified requirements can be offered upon request*

■ General X7R MLCC

Dimensions, Capacitance Range and Operating Voltage

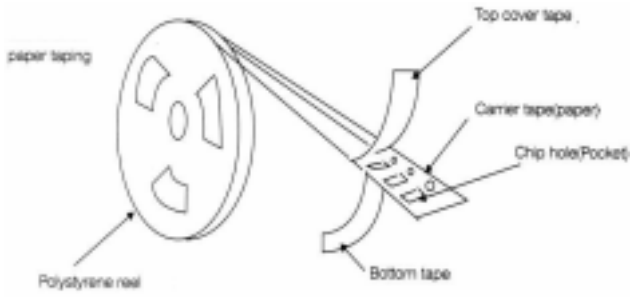
Size	L	W	T	WB	Rated Voltage (V)	Capacitance (pF)
0402	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.25 ± 0.10	16	100 ~ 10000
					25	100 ~ 10000
					50	100 ~ 10000
0603	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.10	0.30 ± 0.10	25	100 ~ 100000
					50	100 ~ 100000
					100	100 ~ 10000
					200	100 ~ 5600
0805	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0.50 ± 0.20	25	150 ~ 220000
					50	150 ~ 220000
					100	150 ~ 33000
					200	150 ~ 22000
					500	150 ~ 12000
1206	3.20 ± 0.30	1.60 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0.50 ± 0.25	25	1000 ~ 220000
					50	470 ~ 150000
					100	150 ~ 100000
					200	150 ~ 68000
					500	150 ~ 15000
					1000	150 ~ 3300
					2000	150 ~ 1000
1210	3.20 ± 0.30	2.50 ± 0.30	1.25 ± 0.30 1.50 ± 0.30	0.75 ± 0.25	25	1000 ~ 330000
					50	470 ~ 220000
					100	150 ~ 220000
					200	150 ~ 100000
					500	150 ~ 27000
					1000	150 ~ 10000
					2000	150 ~ 2200
1808	4.50 ± 0.40	2.00 ± 0.20	≦ 2.00	0.75 ± 0.25	25	3300 ~ 470000
					50	3300 ~ 330000
					100	150 ~ 220000
					200	150 ~ 100000
					500	150 ~ 27000
					1000	150 ~ 10000
					2000	150 ~ 2200
					3000	150 ~ 1000
1812	4.50 ± 0.40	3.20 ± 0.30	≦ 2.50	0.75 ± 0.20	25	4700 ~ 470000
					50	4700 ~ 330000
					100	150 ~ 330000
					200	150 ~ 100000
					500	150 ~ 33000
					1000	150 ~ 15000
					2000	150 ~ 2200
					3000	150 ~ 1000
2225	5.70 ± 0.50	6.30 ± 0.50	≦ 2.50	1.00 ± 0.25	25	10000 ~ 2000000
					50	10000 ~ 1200000
					100	150 ~ 1200000
					200	150 ~ 100000
					500	150 ~ 68000
					1000	150 ~ 33000
					2000	150 ~ 10000
					3000	150 ~ 3300
3035	7.60 ± 0.50	9.00 ± 0.50	≦ 3.00	1.00 ± 0.25	25	10000 ~ 4700000
					50	10000 ~ 2200000
					100	1000 ~ 2200000
					200	1000 ~ 1000000
					500	1000 ~ 150000
					1000	1000 ~ 100000
					2000	1000 ~ 22000
					3000	1000 ~ 10000

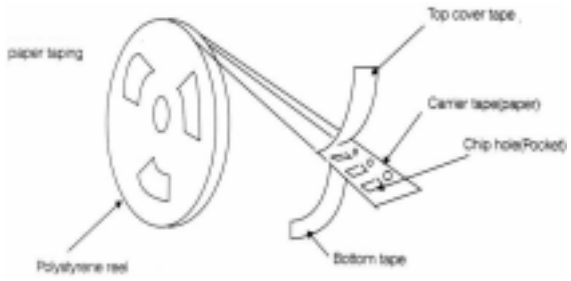
■ General Y5V / Z5U MLCC

Dimensions, Capacitance Range and Operating Voltage

Size	L	W	T	WB	Rated Voltage (V)	Capacitance (pF)
0402	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.25 ± 0.10	16	1000 ~ 100000
					25	1000 ~ 100000
					50	1000 ~ 100000
0603	1.60 ± 0.10	0.80 ± 0.10	0.80 ± 0.10	0.30 ± 0.10	25	2200 ~ 1000000
					50	2200 ~ 1000000
					100	2200 ~ 68000
0805	2.00 ± 0.20	1.25 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0.50 ± 0.20	25	10000 ~ 1000000
					50	10000 ~ 1000000
					100	10000 ~ 100000
					200	10000 ~ 56000
1206	3.20 ± 0.30	1.60 ± 0.20	0.70 ± 0.20 1.00 ± 0.20 1.25 ± 0.20	0.50 ± 0.25	25	10000 ~ 1200000
					50	10000 ~ 1000000
					100	10000 ~ 220000
					200	10000 ~ 1000000
1210	3.20 ± 0.30	2.50 ± 0.30	1.25 ± 0.30 1.50 ± 0.30	0.75 ± 0.25	25	100000 1500000
					50	100000 1500000
					100	10000 ~ 560000
					200	10000 ~ 150000
1808	4.50 ± 0.40	2.00 ± 0.20	≦ 2.00	0.75 ± 0.25	25	100000 ~ 2200000
					50	100000 ~ 2000000
					100	10000 ~ 560000
					200	10000 ~ 150000
1812	4.50 ± 0.40	3.20 ± 0.30	≦ 2.50	0.75 ± 0.20	25	100000 ~ 3300000
					50	100000 ~ 2200000
					100	10000 ~ 1000000
					200	10000 ~ 220000
2225	5.70 ± 0.50	6.30 ± 0.50	≦ 2.50	1.00 ± 0.25	25	150000 ~ 4700000
					50	150000 ~ 3300000
					100	10000 ~ 2000000
					200	10000 ~ 220000
3035	7.60 ± 0.50	9.00 ± 0.50	≦ 3.00	1.00 ± 0.25	25	220000 ~ 10000000
					50	220000 ~ 6800000
					100	150000 ~ 2000000
					200	150000 ~ 680000

■ PACKING STYLE





SIZE	0402	0603	0805	1206	1210	1812
Paper Taping (PCS)	10000	4000	4000	3000 / 4000		
Embossed Taping (PCS)			2500	2500	2000	2000