Multilayer Ceramic Chip Capacitors

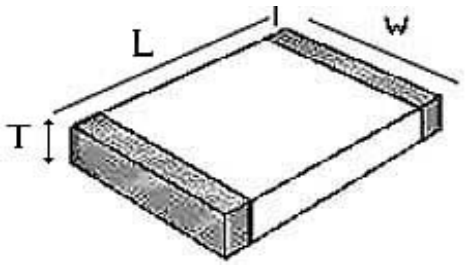
Part Number System

0805 C 104 K 5 N T 4

1 2 3 4 5 6 7 8

1. Size Code-Standard

Size	Length (mm)	Width (mm)	Thickness (mm)
0201	0.60±0.03	0.30±0.03	0.30±0.03
0402	1.00±0.05	0.50±0.05	0.90 max
0603	1.6±0.20	0.8±0.20	0.90 max
0805	2.0±0.20	1.25±0.20	1.40 max
1206	3.2±0.20	1.6±0.20	1.30 max
1210	3.2±0.20	2.5±0.20	1.90 max
1808	4.5±0.40	2.0±0.20	1.90 max
1812	4.5±0.50	3.2±0.40	2.50 max
1825	4.5±0.50	6.3±0.50	2.50 max
2220	5.6±0.40	5.0±0.50	2.50 max
2225	5.6±0.50	6.3±0.50	2.50 max
3035	7.6±0.50	9.0±0.50	3.00 max



Note: 1825 package is available by special order only. Contact your local distributor for available C-V combinations.

Thickness dimensions apply to parts rated 100 WVDC or less, and in the standard ranges. For higher voltage ratings, please contact us. For extended range, see the appropriate chart.

2. Temperature Coefficient

Letter	EIA Code	Temperature Coefficient	TC Tolerance	Operating Temperature
A	COG	0 ppm/°C	±30 ppm/°C	-55~+125°C
B	X5R	±10%	N/A	-55~+85°C
C	X7R	±15%	N/A	-55~+125°C
E	Z5U	+22~-56%	N/A	+10~+85°C
G	Y5V	+22~-82%	N/A	-30~+85°C

Note: Z5U is being phased out of production. Please substitute Y5V product.

3. Capacitance Value Code

The three-digit code represents the value in picofarads (pF). The first two digits are significant figures and the last

digit specifies the number of zeros following the first two. For values below 10pf, the letter "R" designates the decimal point.

Example:

2R2=2.2pF • 471=470pF • 103=.01uF

4. Capacitance Tolerance

Letter	Tolerance	Letter	Tolerance
B*	±0.1pF	J	±5.0%
C*	±0.25pF	K	±10.0%
D*	±0.50pF	M	±20.0%
F	±1.0%	Z	+80/-20%
G	±2.0%	P	+100/-0%

**for values 10pF and less only*

5. Voltage Code

Symbol	Voltage	Symbol	Voltage
6	6	V	250
Z	10	7	500
Y	16	A	1000
3	25	S	1500
5	50	G	2000
1	100	H	3000
2	200	J	4000

6. Terminations

Letter	Termination
N	Nickel Barrier
P*	Palladium Silver*

**Not for new designs.*

7.Packaging

Letter	Packaging
T	Tape & Reel
B	Bulk

8. Qty per reel (X 1000)

Examples: 4= 4000
1.5= 1,500
10= 10,000

Capacitance Range-NPO

WVDC	0201	0402	0603	0805	1206	1210
25		1.0~470	0.5~1000	0.5~3300	0.5~4700	560~10000
50	1~22	1.0~220	0.5~820	0.5~2200	0.5~3900	560~6800
100		0.5~100	0.5~560	0.5~1000	0.5~1500	560~4700
200		0.5~68	0.5~330	0.5~820	0.5~1000	100~4700
250		0.5~47	0.5~150	0.5~470	0.5~1000	100~4700
500				0.5~470	0.5~820	100~2200
1000				0.5~330	0.5~470	100~1000
2000					1.0~270	100~560

Note: All values in pF. Additional values and special requests are available; contact your local distributor.

WVDC	1808	1812	2220	2225	3035
25	.015~.027	.001~.015	.001~.056	.001~.022	.001~.1
50	.0068~.018	.001~.01	.015~.056	.001~.022	.001~.047
100	.0056~.01	.001~.01	.01~.047	.001~.01	.001~.033
200	4700~6800	.001~.0068	.0068~.033	.001~.0082	.001~.022
250	4700~6800	4700~7500	.0068~.022	.001~.0056	.001~.018
500	2200~3300	150~5600	.0047~.01	.001~.0056	.01~.018
1000	1000~2200	150~4700	3300~6800	.001~.0033	.001~.0082
2000	220~1000	150~2200	1500~3300	.001~.0022	.001~.0012
3000	10~470	10~1000	470~1500	680~1500	
4000	10~150	10~330	220~1000	680~1500	

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor

Capacitance Range-X7R

WVDC	0201	0402	0603	0805	1206	1210
16	1500~3300	100~22000	.033~.1	.1~.47	.22~1.0	.47~1.0
25	560~1200	100~10000	100~33000	330~.1uF	.001~.22	.001~.330
50	47~470	100~3900	100~22000	330~47000	.001~.1	.001~.22
100			100~4700	330~22000	.001~.068	.001~.1
200				2200~15000	220~22000	.0022~.068
250				2200~12000	220~22000	.0022~.047
500				220~10000	220~22000	.0022~.047
1000				220~2200	220~4700	.001~.015
2000					68~1000	180~1500

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor.

WVDC	1808	1812	2220	2225	3035
16	.68~1.0	.68~1.2	1.0~1.5	1.5~2.2	
25	.47~1.0	.01~.47	.68~1.5	.01~1.0	.01~2.2
50	.22~.68	.01~.33	.68~1.0	.01~1.0	.01~2.2
100	.22~.33	.01~.22	.47~1.0	.01~.47	.01~1.0
200	.1~.22	.0068~.1	.33~.68	.015~.47	.01~1.0
250	.1~.22	.0047~.12	.33~.68	.018~.39	.0068~1.0
500	.033~.082	.0047~.12	.1~.22	.018~.39	.0068~1.0
1000	.01~.033	.0022~.027	.033~.1	.0082~.1	
2000	1500~3900	330~3300	.0068~.015	.0012~.01	
3000	220~1000	220~2200	2200~4700	.0033~.01	
4000	220~560	220~1000	680~2200	220~6800	

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor.

Capacitance Range-X7R Extended Range

WVDC	0402	0603	0805	0805	0805	0805	1206	1206	1206
10	.033~0.1	.15~.47	.22~.27	.33~.47	.56~1.0	2.2	1.0~1.2	1.5~2.2	4.7
T (mm)	0.5±0.05	0.8±0.07	0.6±0.1	0.85±0.1	1.25±0.1	1.25±0.1	0.85±0.1	1.15±0.1	1.6±0.15

Capacitance Range- X5R Extended Range

Size	0402	0603	0805	1206	1210	1812	2220
6	1	.68~1.0	2.2~4.7	4.7~10	22	47	100
10	.068~.22	.33~.47	2.2~4.7	3.3~10	10~22	22	
16				4.7			
T(mm)	0.5±0.05	0.8±0.07	1.25±0.1	1.6±0.2	2.5±0.2	2.5±0.2	2.5±0.2

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor.

Capacitance Range- Y5V Top

Size	0402	0603	0805	1206	1210	1812	2220	2225	3035
16V	.001~.1	.01~.22	.33~.22	1.0~4.7	3.3~10.0	6.8~15	10~22	10~22	
25V	.001~.022	.0022~.22	.01~1.0	.01~1.2	.1~1.5	.15~3.3	6.8~22	.68~4.7	1.0~10.0
50V	.001~.015	.0022~.15	.01~.68	.01~1.0	.1~1.0	.15~2.2	4.7~10	.68~3.3	1.0~6.8
100V	1500~4700	.01~.033	.01~.22	.01~.33	.22~.68	.1~1.0	1.0~3.3	2.2~3.3	
200V	1000~1500	3300~6800	.0047~.033	.0047~.1	.047~.22	.15~.47	.33~1.0	.68~1.5	
250V	1000~1500	3300~6800	.0047~.033	.0047~.068	.047~.15	.15~.47	.33~.68	.47~1.0	

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor.

Capacitance Range- Y5V Extended Range

Size	0402	0603	0805	1206	1210
6V	.47~1.0	2.2	10	22	47
	0.5±0.05	0.8±0.07	1.25±0.11	1.6±0.15	2.0±0.2

Size	0402	0603	0805	1206	1206	1210	1210	1812
10V	.22	.47~2.2	2.2~4.7	2.2~10	15~22	10	22	47
	0.5±0.05	0.8±0.07	1.25±0.11	1.15±0.1	1.6±.015	1.9±0.2	2.0±0.2	2.5±0.2

Note: Shaded areas in uF; all others in pF. Additional values and special requests available; contact your local distributor.

Performance Characteristics

Specification		Test Method
Capacitance	Within Specified Tolerance	
Dissipation Factor (tan δ or Q)	Class 1: C<30pf: Q≥400+20xC C≥30pF: Q≥1000 Class 2: X7R: DF≤100GΩ Y5V: DF≤.5%	Class 1:C<1000pF:1MHz±10%, 0.5~5Vrms C≥1000pF: 1KHz±10%, 1.0±0.2Vrms Class 2: 1KHz±10%, 1.0±0.2Vrms

Insulation Resistance (IR)		C≤.01uF:IR≥1000GΩ C>.01uF:IR≥1000/C	Apply rated voltage for 60 seconds at room temperature and normal humidity (70%RH max)
Dielectric Withstand Voltage		No evidence of damage or flashover during the test.	Apply 2.5 times rated voltage for 5 seconds, charge and discharge current <50mA.
Life Test **(high temperature loading test)**	DC	Class 1: No more than ±3% or ±0.3pF whichever is less Class 2: X7R: ±10% max Y5V: ±20% max	Apply two times rated voltage at max operating temperature for 1000 hrs, surge current not exceeding 50mA. Samples measured after being stored at room temperature for 24 hours (Class1), or 48 hours (Class 2).
	Q or DF	Class 1: C<10pf: Q≥200+10xC 10<C<30pF: Q≥275+5/2C C≥30pF: Q≥350 Class 2: X7R: DF≤5% Y5V: DF≤7.5%	
	IR	1000MΩ or 50ΩF minimum, whichever is less	
Moisture Resistance Test	DC	Class 1: No more than ±5% or ±0.5pF whichever is larger Class 2: X7R: ±10% max Y5V: ±30% max	Test samples subjected to 40°C, 90-95% RH for 500 hours. Samples measured after being stored at room temperature for 24 hours (class 1), or 48 hours (Class2).
	Q or DF	Class 1: C<10pf: Q≥200+10xC 10<C<30pF: Q≥275+5/2C C≥30pF: Q≥350 Class 2: X7R: DF≤5% Y5V: DF≤7.5%	
	IR	1000MΩ or 50ΩF minimum, whichever is less	
Moisture Resistance Load Test	DC	Class 1: No more than ±7.5% or ±0.75pF whichever is larger Class 2: X7R: ±10% max Y5V: ±30% max	Test samples subjected to rated voltage at 40°C, 90-95% RH for 500 hours, surge current not exceeding 50mA. Samples measured after being stored at room temperature for 24 hours (class 1), or 48 hours (Class 2).
	Q or DF	Class 1: C<30pf: Q≥100+100/3xC C≥30pF: Q≥200 Class 2: X7R: DF≤5% Y5V: DF≤7.5%	
	IR	500MΩ or 25ΩF minimum, whichever is less	
Temperature Cycle	DC	Class 1: No more than ±2.5% or ±0.25pF whichever is larger Class 2: X7R: ±5% max Y5V: ±20% max	5 cycles are done as follows: 1. 15 minutes at room temperature 2. 30 minutes at minimum rated temperature. 3.30 minutes at room temperature. 4.30 minutes at maximum rated temperature. After 5 cycles, samples measured after being stored at room temperature for 24 hours (Class 1) or 48 hours (Class 2).
	Q or DF	As originally specified.	
	IR	As originally specified.	

Solderability		Termination area at least 95% covered with a new solder coating. No cracks or exposure of ceramic at terminations caused by melting.	Test samples are completely immersed in molten solder (Sn63) at 230°C±5°C for 4±0.5 seconds.
Resistance to Solder Heat	DC	Class 1: No more than ±2.5% or ±0.25pF whichever is larger Class 2: X7R: ±5% max Y5V: ±20% max	Sample preheat: 1. 80°~100°C for two minutes. 2. 150°~180°C for two minutes. 3. 270°C±5°C for 3±0.5 seconds. DC measurement to be made after storing at room temperature for 24 hours.
	Q or DF	As originally specified.	
	IR	As originally specified.	