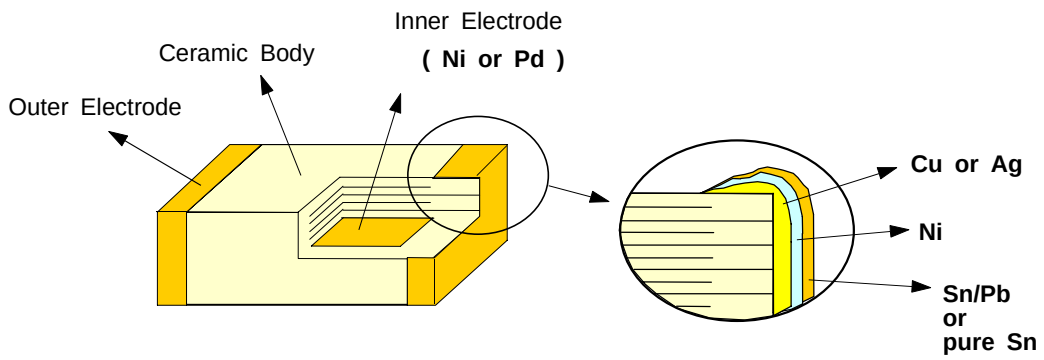
FEATURE



- Miniature Size
- Wide Capacitance, Temperature Compensation and Voltage Range
- Highly Reliable Performance
- Industry Standard Size
- Tape & Reel for Surface Mount Assembly

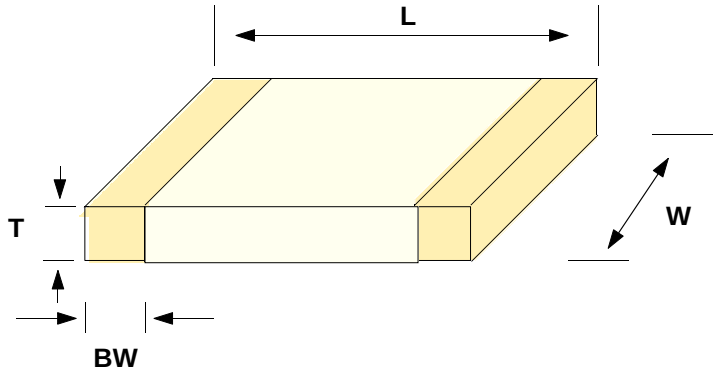
PART NUMBER CODE

CL	10	C	101	J	B	N	C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(1) SAMSUNG Multilayer Ceramic Chip Capacitor
(2) Type(Size)
(3) Capacitance Temperature Characteristics
(4) Nominal Capacitance
(5) Capacitance Tolerance
(6) Rated Voltage
(7) Chip thickness
- **N : standard thickness**
- **A : thinner than N**
- **B : thicker than N**
- **D : Pure Sn Plating**

(8) Packaging Type

CONFIGURATION AND DIMENSIONS



CODE	EIA CODE	DIMENSION (mm)			
		L	W	T (MAX)	BW
03	0201	0.6 ± 0.03	0.3 ± 0.03	0.3 ± 0.03	0.15 ± 0.05
05	0402	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05	0.2 +0.15/-0.1
10	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.3 ± 0.2
21	0805	2.0 ± 0.1	1.25 ± 0.1	1.25± 0.1	0.5+0.2/-0.3
31	1206	3.2 ± 0.2	1.6 ± 0.2	1.6 ± 0.2	0.5+0.2/-0.3
32	1210	3.2 ± 0.3	2.5 ± 0.2	2.5 ± 0.2	0.6 ± 0.3
43	1812	4.5 ± 0.4	3.2 ± 0.3	3.0 ± 0.3	0.8 ± 0.3
55	2220	5.7 ± 0.4	5.0 ± 0.4	3.0 ± 0.3	1.0 ± 0.3

CAPACITANCE TEMPERATURE CHARACTERISTIC

◆ **CLASS I (Temperature Compensation)**

Symble	EIA Code	Temperature Coefficient(PPM/C)	*Temperature Characteristics	Operation Temperature Range
C	C0G	0 ± 30	C Δ	-55 ~ +125℃
P	P2H	-150 ± 60	P Δ	
R	R2H	-220 ± 60	R Δ	
S	S2H	-330 ± 60	S Δ	
T	T2H	-470 ± 60	T Δ	
U	U2J	-750 ± 120	U Δ	
L	S2L	+350 ~ -1000	SL	

*** Temperature Characteristics**

Temperature Characteristics	below 2.0pF	2.2 ~ 3.9pF	above 4.0pF	above 10pF
C△	C0G	C0G	C0G	C0G
P△	-	PJ	PH	PH
R△	-	RJ	RH	RH
S△	-	SJ	SH	SH
T△	-	TJ	TH	TH
U△	-	UJ	UJ	UJ

J : ±120 PPM/C H : ±60 PPM/C G : ±30 PPM/C

◆ CLASS II (High Dielectric Constant)

Symble	EIA Code	Capacitance Change (△C : %)	Operation Temperature Range
A	X5R	± 15	-55 ~ +85℃
B	X7R	± 15	-55 ~ +125℃
F	Y5V	+22 ~ -82	-30 ~ +85℃

NOMINAL CAPACITANCE

The value of nominal capacitance is expressed in pico-Farad(pF) with a three-digit number. The first two digits denote significant figures and the last digit denotes the multiple of 10 in pF. For values below 1pF, the letter "R" is used as the decimal point and the last digit becomes significant.

example 100 = 10 x 10^0 = 10pF
222 = 22 x 10^2 = 2200pF
020 = 2 x 10^0 = 2pF
1R5 = 1.5pF

CAPACITANCE TOLERANCE

Temperature Characteristics	Symbol	Tolerance	Applicable Capacitance & Range
C0G(NPO) or T.C Series	B	± 0.1pF	0.5 ~ 3pF
	C	± 0.25pF	0.5 ~ 10pF
	D	± 0.5pF	
	F	± 1.0pF	
	F	± 1%	E-24 Series for over 10pF
	*G	± 2%	
	J	± 5%	
	K	± 10%	
A(X5R) B(X7R)	J	± 5%	E-12 Series
	K	± 10%	
	M	± 20%	
F(Y5V)	Z	-20% ~ +80%	E-6 Series

Please Consult us for special tolerances.

* : Option

RATED VOLTAGE

Symble	Rated Voltage(Vdc)
Q	6.3V
P	10V
O	16V
A	25V
B	50V
C	100V

PACKAGING TYPE

Symbol	Packaging	Symbol	Packaging
B	Bulk	D	Cardboard Tape, 13" Reel
P	Cassette	L	Cardboard Tape, 13" Reel
C	Cardboard Tape, 7" Reel	E	Embossed Tape, 7" Reel
O	Cardboard Tape, 10" Reel	F	Embossed Tape, 13" Reel

STANDARD CAPACITANCE STEP

Series	Capacitance Step											
E- 3	1.0				2.2				4.7			
E- 6	1.0		1.5		2.2		3.3		4.7		6.8	
E-12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2
E-24	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2
	1.1	1.3	1.6	2.0	2.4	3.0	3.6	4.3	5.1	6.2	7.5	9.1

Standard Capacitance is " Each step x 10^n "

CAPACITANCE Vs CHIP THICKNESS STANDARD

Description			0603 (0201)	1005 (0402)	1608 (0603)	2012 Type (0805)			3216 Type (1206)			3225 Type (1210)				4532 Type (1812)				5750 Type (2220)		
Dimension (mm)		L	0.6 ±0.03	1.0 ±0.05	1.6 ±0.1	2.0±0.1			3.2±0.15		3.2±0.2	3.2±0.3				4.5±0.4				5.7±0.4		
		W	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	1.25±0.1			1.6±0.15		1.6±0.2	2.5±0.2				3.2±0.3				5.0±0.4		
		T	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	0.65 ±0.1	0.85 ±0.1	1.25 ±0.1	0.85 ±0.15	1.25 ±0.15	1.6 ±0.2	1.25 ±0.2	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2	1.25 ±0.2	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2
CAPACITANCE RANGE) pF	SL	50V	-	0.5 ~ 240	0.5 ~ 1000	0.5 ~ 1000	1100 ~ 1500	1600~ 2700	0.5 ~ 2700	3000~ 5600	6200~ 8200	-	-	-	-	-	-	-	-	-	-	-
		100V	-	-	0.5 ~ 680	0.5 ~ 560	620~ 910	1000	0.5 ~ 1500	1600~ 3300	3600~ 3900	-	-	-	-	-	-	-	-	-	-	-
	C,T C (Except SL)	25V	0.5 ~ 68	0.5 ~ 220	0.5 ~ 1000	-	-	3300~ 8200	1500~ 3600	3900~ 6800	7500~ 22000	-	-	-	-	-	100000	-	-	-	-	-
		50V	-	0.5 ~ 180	0.5 ~ 1000	0.5 ~ 560	620~ 1000	1100~ 3300	0.5 ~ 2200	2400~ 4700	-	560~ 10000	11000~ 22000	24000~ 47000	-	1000~ 15000	15000~ 22000	24000~ 47000	62000~ 68000	33000~ 47000	51000~ 93000	68000~ 130000
		100V	-	-	0.5 ~ 300	0.5 ~ 430	470~ 910	1000~ 1200	0.5 ~ 2200	2400~ 3600	3900~ 5100	2200~ 7500	8200~ 10000	11000~ 13000	15000~ 18000	1000~ 13000	16000~ 20000	22000~ 24000	27000~ 36000	33000~ 39000	24000~ 47000	33000~ 72000

Multilayer Chip Capacitors - General

Description			0603 (0201)	1005 (0402)	1608 (0603)	2012 Type (0805)			3216 Type (1206)			3225 Type (1210)				4532 Type (1812)					5750 Type (2220)			
Dimension (mm)		L	0.6 ±0.03	1.0 ±0.05	1.6 ±0.1	2.0±0.1			3.2±0.15		3.2 ±0.2	3.2±0.3				4.5±0.4					5.7±0.4			
		W	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	1.25±0.1			1.6±0.15		1.6 ±0.2	2.5±0.2				3.2±0.3					5.0±0.4			
		T	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	0.65 ±0.1	0.85 ±0.1	1.25 ±0.1	0.85 ±0.15	1.25 ±0.15	1.6 ±0.2	1.25 ±0.2	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2	1.25 ±0.2	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2	3.2 ±0.3	1.6 ±0.2	2.0 ±0.2	2.5 ±0.2	3.2 ±0.3
CAPACITANCE RANGE (nF)	A (X5R)	6.3V	3.3	220	1000	-	1000	2200~ 4700	3300	6800	10000	10000	-	15000	22000	-	-	15000	47000	-	-	-	100000	-
		10V	-	100	1000	-	-	2200	-	3300	4700~ 10000	-	-	6800	10000	-	-	-	22000	47000	-	-	47000	100000
		16V	1		330	-	-	1000	-	-	-	-	-	4700	10000	-	-	-	22000	33000	-	-	22000	47000
		25V	-	-	-	-	-	-	-	-	-	-	-	-	4700	-	-	-	6800	-	-	-	-	-
	B (X7R)	6.3V	-	0.1~ 220	1000	-	-	2200~ 4700	-	-	10000	-	-	-	22000	-	-	-	33000~ 47000	-	-	-	47000~ 100000	-
		10V	-	0.1~ 100	0.1~ 470	0.1~ 270	330~ 470	560~ 2200	1~ 1000	1200~ 3300	4700	1~ 2400	2700~ 3300	3900~ 10000	-	-	-	-	22000	-	-	-	33000	-
		16V	0.1~ 1	0.1~ 82	0.1~ 220	0.1~ 200	220~ 330	390~ 1000	1~ 910	1000~ 1500	2200~ 3300	1~ 2200	-	4700	10000	-	-	6800	10000	-	-	-	22000	-
		25V	-	0.1~ 22	0.1~ 100	0.1~ 68	82~ 130	150~ 470	1~ 390	470~ 620	680~ 2200	1~ 1000	-	2200	3300~ 4700	-	-	3300	4700	-	-	-	10000	-
		50V	-	0.1~ 10	0.1~ 100	0.1~ 39	47~ 56	68~ 220	1~ 150	180~ 330	390~ 470	1~ 470	-	-	2200	10~ 1200	1500~ 2200	2700	3300	-	-	-	3300~ 4700	-
		100V	-	-	0.1~ 4.7	0.1~ 12	13~ 20	22~ 33	1~ 62	68~ 100	110~ 150	1~ 180	200~ 270	0.3~ 330	360~ 470	10~ 360	390~ 510	560	620~ 820	-	680~ 1000	680~ 1100	1000~ 1600	-
	F (Y5V)	6.3V	-	-	2200	-	-	10000	-	-	-	-	-	-	47000	-	-	-	100000	-	-	-	-	-
		10V	-	2.2~ 220	2.2~ 1000	-	-	4700	-	-	100~ 10000	-	-	-	22000	-	-	-	-	-	-	-	100000	-
		16V	-	2.2~ 220	2.2~ 470	10~ 680	820~ 1000	1200~ 2200	10~ 2200	2700~ 4700	-	100~ 6800	10000	-	-	-	-	-	-	-	-	-	-	-
		25V	-	2.2~ 33	2.2~ 330	10~ 220	270~ 470	560~ 1000	10~ 1000	1200~ 2200	2700~ 3300	100~ 3300	4700	-	-	-	-	-	10000	-	-	22000	-	-
		50V	-	2.2~ 10	2.2~ 100	10~ 68	82~ 150	180~ 470	10~ 470	560~ 680	-	100~ 1000	-	-	-	-	-	-	10000	-	-	10000	-	-

CAPACITANCE RANGE

CLASS I

Temperature Characteristics	Size	Voltage	Capacitance Range (pF)
			0.5 10 100 1000 10000 100000 1000000 10000000 100000000
SL,UJ	05 (0402)	50V	240
	10 (0603)	50V	1000
		100V	680
	21 (0805)	50V	2700
		100V	1000
	31 (1206)	50V	8200
		100V	3900
COG & TC Series	03 (0201)	25V	20
	05 (0402)	25V	220
		50V	180
	10 (0603)	25V	1000
		50V	1000
		100V	300
	21 (0805)	25V	3300 8200
		50V	3300
		100V	1200
	31 (1206)	25V	1500 22000
		50V	4700
		100V	5100
	32 (1210)	50V	560 47000
		100V	2200 18000
	43 (1812)	25V	100000
		50V	1000 68000
		100V	1000 36000
	55 (2220)	50V	33000 130000
		100V	33000 72000

CLASS II , A(X5R)

Temperature Characteristics	Size	Voltage	Capacitance Range (pF)
			10 / 100 / 1000 / 10000 / 100000 / 1000000 / 10000000 / 100000000
A(X5R)	0603 (0201)	6.3V	3300 ~ 100000
		16V	1000 ~ 100000
	1005 (0402)	6.3V	220000 ~ 1000000
		10V	100000 ~ 1000000
	1608 (0603)	6.3V	1000000 ~ 10000000
		10V	1000000 ~ 10000000
		16V	330000 ~ 4700000
	2012 (0805)	6.3V	2200000 ~ 10000000
		10V	3300000 ~ 10000000
		16V	1000000 ~ 22000000
	3216 (1206)	6.3V	3300000 ~ 22000000
		10V	3300000 ~ 22000000
	3225 (1210)	6.3V	10000000 ~ 47000000
		10V	6800000 ~ 22000000
		16V	4700000 ~ 22000000
		25V	4700000 ~ 10000000
	4532 (1812)	6.3V	15000000 ~ 47000000
		10V	22000000 ~ 47000000
		16V	22000000 ~ 33000000
		25V	6800000 ~ 10000000
	5750 (2220)	6.3V	100000000 ~ 100000000
		10V	47000000 ~ 100000000
		16V	22000000 ~ 47000000

CLASS II , B(X7R)

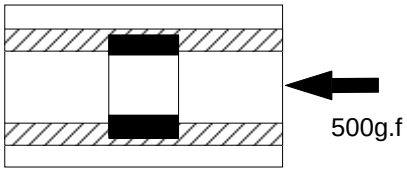
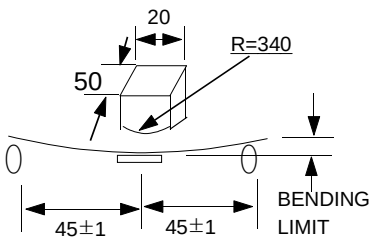
Temperature Characteristics	Size	Voltage	Capacitance Range (pF)							
			10	100	1000	10000	100000	1000000	10000000	100000000
B(X7R)	03 (0201)	16V		100	1000					
	05 (0402)	6.3V		100			220000			
		10V		100			100000			
		16V		100			82000			
		25V		100			22000			
		50V		100			10000			
	10 (0603)	6.3V						1000000		
		10V		100			470000			
		16V		100			220000			
		25V		100			100000			
		50V		100			100000			
		100V		100	4700					
	21 (0805)	6.3V					2200000	4700000		
		10V		100			2200000			
		16V		100			1000000			
		25V		100			470000			
		50V		100			220000			
		100V		100	33000					
	31 (1206)	6.3V							10000000	
		10V			1000		4700000			
		16V			1000		3300000			
		25V			1000		2200000			
		50V			1000		470000			
		100V			1000		150000			
	32 (1210)	6.3V							22000000	
		10V			1000			10000000		
		16V			1000			10000000		
		25V			1000			4700000		
		50V			1000			2200000		
		100V			1000		470000			
	43 (1812)	6.3V						33000000	47000000	
		10V							22000000	
		16V						6800000	10000000	
		25V					3300000	4700000		
		50V				10000		3300000		
		100V				10000	820000			
	55 (2220)	6.3V						47000000	100000000	
		10V							33000000	
		16V							22000000	
		25V							10000000	
		50V					100000	4700000		
		100V					680000	1600000		

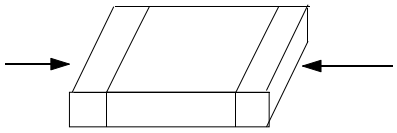
CLASS II , F(Y5V)

Temperature Characteristics	Size	Voltage	Capacitance Range (pF)
			10 / 100 / 1000 / 10000 / 100000 / 1000000 / 10000000 / 100000000
F(Y5V)	05 (0402)	10 V	2200 – 220000
		16 V	2200 – 220000
		25 V	2200 – 33000
		50 V	2200 – 10000
	10 (0603)	6.3V	2200000
		10 V	2200 – 1000000
		16 V	2200 – 470000
		25 V	2200 – 330000
		50 V	2200 – 100000
	21 (0805)	6.3V	10000000
		10 V	4700000
		16 V	10000 – 2200000
		25 V	10000 – 1000000
		50 V	10000 – 470000
	31 (1206)	10 V	100000 – 10000000
		16 V	10000 – 4700000
		25 V	10000 – 3300000
		50 V	10000 – 680000
	32 (1210)	6.3V	47000000
		10 V	22000000
		16 V	100000 – 22000000
		25 V	100000 – 4700000
		50 V	100000 – 1000000
	43 (1812)	6.3V	100000000
		25 V	10000000
		50 V	10000000
	55 (2220)	10 V	100000000
		25 V	22000000
		50 V	10000000

RELIABILITY AND TEST CONDITIONS

<table>
<tr><th>NO</th><th colspan="2">ITEM</th><th>PERFORMANCE</th><th colspan="3">TEST CONDITION</th></tr>
<tr><td>1</td><td colspan="2">APPEARANCE</td><td>NO ABNORMAL EXTERIOR APPEARANCE</td><td colspan="3">THROUGH MICROSCOPE(×10)</td></tr>
<tr><td>2</td><td colspan="2">INSULATION RESISTANCE</td><td>10,000㏁ OR 500㏁·㎌ PRODUCT WHICHEVER IS SMALLER(RATED VOLTAGE IS BELOW 16V : 10,000㏁ OR 100㏁·㎌)</td><td colspan="3">RATED VOLTAGE SHALL BE APPLIED. MEASUREMENT TIME IS 60 ~ 120 RATED VOLTAGE TIME 60 SEC.</td></tr>
<tr><td>3</td><td colspan="2">WITHSTANDING VOLTAGE</td><td>NO DIELECTRIC BREAKDOWN OR MECHANICAL BREAKDOWN</td><td colspan="3">CLASSⅠ : 300% OF THE RATED VOLTAGE FOR 1~5 SEC, CLASSⅡ : 250% OF THE RATED VOLTAGE FOR 1~5 SEC IS APPLIED WITH LESS THAN 50㎃ CURRENT</td></tr>
<tr><td rowspan="5">4</td><td rowspan="5">CAPACI-TANCE</td><td rowspan="2">CLASS Ⅰ</td><td rowspan="2">WITHIN THE SPECIFIED TOLERANCE</td><td>CAPACITANCE</td><td>FREQUENCY</td><td>VOLTAGE</td></tr>
<tr><td>≤ 1,000㎊</td><td>1㎒±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>CLASS Ⅱ</td><td rowspan="3">WITHIN THE SPECIFIED TOLERANCE</td><td>> 1,000㎊</td><td>1�kHz±10%</td></tr>
<tr><td>CAPACITANCE</td><td>FREQUENCY</td><td>VOLTAGE</td></tr>
<tr><td>≤ 10㎌</td><td>1㎑±10%</td><td>1.0± 0.2Vrms</td></tr>
<tr><td>> 10㎌</td><td>120㎐±20%</td><td>0.5± 0.1Vrms</td></tr>
<tr><td rowspan="3">5</td><td rowspan="3">Q</td><td rowspan="3">CLASS Ⅰ</td><td rowspan="3">OVER 30㎊ : Q ≥1,000
LESS THAN 30㎊: Q ≥400 +20C
(C : CAPACITANCE)</td><td>CAPACITANCE</td><td>FREQUENCY</td><td>VOLTAGE</td></tr>
<tr><td>≤ 1,000㎊</td><td>1㎒±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>> 1,000㎊</td><td>1㎑±10%</td></tr>
<tr><td rowspan="3">6</td><td rowspan="3">Tanδ</td><td rowspan="3">CLASS Ⅱ</td><td rowspan="3">1. CHAR : B
<table><tr><th>RATED VOLTAGE</th><th>DF SPEC</th></tr><tr><td>6.3V</td><td>0.05 max</td></tr><tr><td>10V</td><td>0.05 max</td></tr><tr><td>16V</td><td>0.035 max</td></tr><tr><td>25V</td><td>0.025 max</td></tr><tr><td>50V And over</td><td>0.025 max</td></tr></table>2. CHAR : F
<table><tr><th></th><th>6.3V</th><th>10V</th><th>16V</th><th>25V</th><th>50V</th></tr><tr><td>1005</td><td>-</td><td>0.125max</td><td>0.09max (C≤220nF)
0.125max (C>220nF)</td><td>0.05max</td><td>0.05max</td></tr><tr><td>1608</td><td>0.16max</td><td>0.125max</td><td>0.09max</td><td>0.05max(C≤100nF)
0.07max(C>100nF)</td><td>0.05max</td></tr><tr><td>2012</td><td>0.16max</td><td>0.125max</td><td>0.09max</td><td>0.07max</td><td>0.05max</td></tr><tr><td>3216</td><td>0.16max</td><td>0.125max</td><td>0.09max</td><td>0.07max</td><td>0.05max</td></tr><tr><td>3225</td><td>0.16max</td><td>0.125max</td><td>0.09max</td><td>0.07max(C≤6.8㎌)
0.09max(C>6.8㎌)</td><td>0.05max</td></tr><tr><td>4532</td><td>0.16max</td><td>0.16max</td><td>-</td><td>-</td><td>-</td></tr><tr><td>5750</td><td></td><td>0.125max</td><td>-</td><td>-</td><td>-</td></tr></table></td><td>CAPACITANCE</td><td>FREQUENCY</td><td>VOLTAGE</td></tr>
<tr><td>≤ 10㎌</td><td>1㎑±10%</td><td>1.0± 0.2Vrms</td></tr>
<tr><td>> 10㎌</td><td>120㎐±20%</td><td>0.5± 0.1Vrms</td></tr>
</table>

<table>
<tr><th>NO</th><th colspan="2">ITEM</th><th>PERFORMANCE</th><th>TEST CONDITION</th></tr>
<tr><td>7</td><td>CAPACITANCE TEMPERATURE COEFFICIENT</td><td>CLASS
Ⅰ</td><td>
<table>
<tr><th>CHARACTERISTIC</th><th>TEMP. COEFFICIENT (PPM/℃)</th></tr>
<tr><td>C0G</td><td>0 ± 30</td></tr>
<tr><td>PH</td><td>-150 ± 60</td></tr>
<tr><td>RH</td><td>-220 ± 60</td></tr>
<tr><td>SH</td><td>-330 ± 60</td></tr>
<tr><td>TH</td><td>-470 ± 60</td></tr>
<tr><td>UL</td><td>-750 ± 120</td></tr>
<tr><td>SL</td><td>+350 ~ -1000</td></tr>
</table>
</td><td>THESE SYMMETRICAL TOLERANCE APPLY TO 2 POINT MEASUREMENT OF TEMPERATURE COEFFICIENT: ONE AT 25 ℃ AND AT 85℃
<table>
<tr><th>STEP</th><th>TEMPERATURE</th></tr>
<tr><td>1</td><td>25 ± 2</td></tr>
<tr><td>2</td><td>MIN RATED TEMP ± 2</td></tr>
<tr><td>3</td><td>25 ± 2</td></tr>
<tr><td>4</td><td>MAX RATED TEMP ± 2</td></tr>
<tr><td>5</td><td>25 ± 2</td></tr>
</table>
</td></tr>
<tr><td>8</td><td>TEMPERATURE CHARACTERISTICS</td><td>CLASS
Ⅱ</td><td>
<table>
<tr><th>CHAR.</th><th>CAP. CHANGE(%)</th></tr>
<tr><td>A,B</td><td>±15%</td></tr>
<tr><td>F</td><td>+22% ~ -82%</td></tr>
</table>
</td><td>The change of capacitance should be got from the capacitance at 25℃.
After capacitance measured from Min. Temp. to Max. Temp., it should be calculated from the formula below.
$\frac{C2 - C1}{C1} \times 100\ \%$
C1 : CAPACITANCE AT STANDARD TEMPERATURE(25℃)
C2 : CAPACITANCE AT EACH TEMPERATURE</td></tr>
<tr><td>9</td><td colspan="2">ADHESIVE STRENGTH OF TERMINATION</td><td>NO INDICATION OF PEELING SHALL OCCUR ON THE TERMINAL ELECTRODE.</td><td>A 500g.f PRESSURE SHALL BE APPLIED FOR 10±1 SECOND.
 
</td></tr>
<tr><td>10</td><td>BENDING STRENGTH</td><td>APPEARANCE</td><td>NO MECHANICAL DAMAGE SHALL OCCUR.</td><td rowspan="5">BENDING SHALL BE APPLIED TO THE LIMIT(1mm) WITH 0.3mm/SEC. KEEP THE TEST BOARD AT THE LIMIT POINT IN 5 SEC., THEN MEASURE CAPACITANCE.
 
</td></tr>
<tr><td></td><td></td><td>CHARACTER</td><td>CHANGE OF CAPACITANCE</td></tr>
<tr><td></td><td>CAPACITANCE</td><td>CLASS I</td><td>WITHIN ±5% OR ± 0.5 pF WHICHEVER IS LARGER</td></tr>
<tr><td></td><td></td><td>CLASS II A, B</td><td>WITHIN ±12.5%</td></tr>
<tr><td></td><td></td><td>F</td><td>WITHIN ±30%</td></tr>
</table>

<table>
<tr><th>NO</th><th colspan="3">ITEM</th><th colspan="3">PERFORMANCE</th><th>TEST CONDITION</th></tr>
<tr><td>11</td><td colspan="3">SOLDERABILITY</td><td colspan="3">MORE THAN 75% OF THE TERMINAL SURFACE IS TO BE SOLDERED NEWLY, SO METAL PART(A) DOES NOT COME OUT OR DISSOLVE
  </td><td>SOLDER TEMPERATURE : 230±5c
SOLDER : H63A
FLUX : ROSIN
PRE-HEATING : AT 80~120c
FOR 10~30SEC.</td></tr>
<tr><td rowspan="7">12</td><td rowspan="7">RESISTANCE TO SOLDERING HEAT</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR</td><td rowspan="7">DIP : SOLDER TEMPERATURE OF 270±5c
DIP TIME : 10± SEC.
EACH TERMINATION SHALL BE FULLY IMMERSED AND PREHEATED AS FOLLOWING:

STEP | TEMP.(C) | TIME (SEC.)
1 | 80~100 | 60
2 | 150~180 | 60

MEASURE AT ROOM TEMP. AFTER COOLING FOR
CLASS I : 24 ± 2 HOURS
CLASS II : 48 ± 4 HOURS</td></tr>
<tr><td rowspan="3">CAPACITANCE</td><td>CHARACTERISTIC</td><td colspan="2">CAP. CHANGE</td></tr>
<tr><td>CLASS I</td><td colspan="2">WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</td></tr>
<tr><td rowspan="2">CLASS II</td><td>A,B</td><td>WITHIN ±7.5%</td></tr>
<tr><td>F</td><td>WITHIN ±20%</td></tr>
<tr><td>Q
CLASS I</td><td colspan="3">30pF AND OVER : Q≥ 1000
LESS THAN 30pF : Q≥ 400+20*C</td></tr>
<tr><td>Tan delta
CLASS II</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
<tr><td>WITHSTANDING VOLTAGE</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
<tr><td rowspan="7">13</td><td rowspan="7">VIBRATION TEST</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR.</td><td rowspan="7">THE CAPACITOR SHALL BE SUBJECTED TO A HARMONIC MOTION HAVING A TOTAL AMPLITUDE OF 1.5mm.
CHAR. | FREQUENCY RANGE
A,B,C,F | 10Hz → 55Hz → 10Hz

CHAR. | TRAVERSED TIME
A,B,C,F | 1 min

THE ENTIRE FREQUENCY RANGE, FROM 10 TO 55Hz AND RETURN TO 10Hz, SHALL BE TRAVERSED IN 1 MINUTE.

THIS CYCLE SHALL BE PERFORMED 2 HOURS IN EACH THERE MUTUALLY PERPENDICULAR DIRECTION, FOR TOTAL PERIOD OF 6 HOURS.</td></tr>
<tr><td rowspan="3">CAPACITANCE</td><td>CHARACTERISTIC</td><td colspan="2">CAP. CHANGE</td></tr>
<tr><td>CLASS I</td><td colspan="2">WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</td></tr>
<tr><td rowspan="2">CLASS II</td><td>A,B</td><td>WITHIN ±5%</td></tr>
<tr><td>F</td><td>WITHIN ±20%</td></tr>
<tr><td>Q
CLASS I</td><td colspan="3">30pF AND OVER : Q≥ 1000
LESS THAN 30pF : Q≥ 400+20*C</td></tr>
<tr><td>Tan delta
CLASS II</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
</table>

<table>
<tr><th>NO</th><th colspan="2">ITEM</th><th colspan="3">PERFORMANCE</th><th>TEST CONDITION</th></tr>
<tr><td rowspan="6">14</td><td rowspan="6">HUMIDITY (STEADY STATE)</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR</td><td rowspan="6">TEMPERATURE : 40±2℃
RELATIVE HUMIDITY : 90~95 %RH
TEST TIME : 500 +12/-0 Hr.

MEASURE AT ROOM TEMPERATURE
AFTER COOLING FOR
CLASS I : 24±2 Hr.
CLASS II : 48±4 Hr.</td></tr>
<tr><td rowspan="3">CAPACITANCE</td><td colspan="2">CHARACTERISTIC</td><td>CAPACITANCE CHANGE</td></tr>
<tr><td colspan="2">CLASS I</td><td>WITHIN ±5% OR ±0.5pF WHICHEVER IS LARGER</td></tr>
<tr><td rowspan="2">CLASS II</td><td>A,B</td><td>WITHIN ±12.5%</td></tr>
<tr><td>F</td><td>WITHIN ±30%</td></tr>
<tr><td>Q
CLASS I</td><td colspan="3">30pF AND OVER : Q≥ 350
10 ~30pF : Q≥ 275 + 2.5*C
LESS THAN 10pF : Q≥ 200 + 10*C</td></tr>
<tr><td>Tan delta
CLASS II</td><td colspan="3"><table>
<tr><th>Char.</th><th>25V and over</th><th>16V</th><th>10V</th><th>6.3V</th><th>4.0V</th></tr>
<tr><td>A,B</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.075 MAX</td><td>0.1 MAX</td></tr>
<tr><td>F</td><td>0.075 MAX</td><td>0.1 MAX (C<1.0uF)
0.125 MAX (C≥1.0uF)</td><td>0.15 MAX</td><td>0.195 MAX</td><td>0.25 MAX</td></tr>
</table></td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">MINIMUM INSULATION RESISTANCE:
1,000 Mohm OR 50Mohm*uF PRODUCT
WHICHEVER IS SMALLER</td></tr>
</table>

* THE INITIAL VALUE OF HIGH DIELECTRIC CONSTANT SERIES SHALL BE MEASURED AFTER THE HEAT TREATMENT OF 150 +0/-10C, 1Hr AND SITTING OF 48±4hr AT ROOM TEMPERATURE & ROOM HUMIDITY.

<table>
<tr><th>NO</th><th colspan="2">ITEM</th><th colspan="3">PERFORMANCE</th><th>TEST CONDITION</th></tr>
<tr><td rowspan="5">15</td><td rowspan="5">MOISTURE RESISTANCE</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR</td><td rowspan="5">APPLIED VOLTAGE : RATED VOLTAGE
TEMPERATURE : 40±2℃
RELATIVE HUMIDITY : 90~95%RH
TEST TIME : 500 +12/-0 Hr.
CURRENT APPLIED : 50mA MAX.
MEASURING AT ROOM TEMPERATURE
AFTER COOLING FOR
CLASS I : 24±2 Hr.
CLASS II : 48±4 Hr.
[INITIAL MEASUREMENT]
CLASS II : IN CASE OF BELOW 10V PRODUCT, IT SHOULD BE TREATED WITH RATED VOLTAGE FOR 1HR AT 40℃±2℃. MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR : 48±4 Hr.</td></tr>
<tr><td>CAPACITANCE</td><td colspan="3"><table><tr><td>CHARACTERISTIC</td><td colspan="2">CAPACITANCE CHANGE</td></tr><tr><td colspan="2">CLASS I</td><td>WITHIN ±7.5% OR ±0.75pF
WHICHEVER IS LARGER</td></tr><tr><td rowspan="3">CLASS II</td><td>A,B</td><td>WITHIN ±12.5%</td></tr><tr><td rowspan="2">F</td><td>WITHIN ±30%</td></tr><tr><td>[10V AND BELOW]
WITHIN +30~−40%
1005 C>0.47μF 1608 C>1μF
2012 C>4.7μF 3216 C>10μF
3225 C>22μF 4532 C>47μF</td></tr></table></td></tr>
<tr><td>Q
CLASS I</td><td colspan="3">30pF AND OVER : Q ≥ 200
30pF AND BELOW : Q ≥ 100 + 10/3*C</td></tr>
<tr><td>Tan delta
CLASS II</td><td colspan="3"><table><tr><td>Char.</td><td>25V and over</td><td>16V</td><td>10V</td><td>6.3V</td><td>4.0V</td></tr><tr><td>A,B</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.075 MAX</td><td>0.1 MAX</td></tr><tr><td>F</td><td>0.075 MAX</td><td>0.1 MAX (C 〈1.0uF)
0.125 MAX (C≥1.0uF)</td><td>0.15 MAX</td><td>0.195 MAX</td><td>0.25 MAX</td></tr></table></td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">MINIMUM INSULATION RESISTANCE:
500 Mohm OR 25Mohm*uF PRODUCT,
WHICHEVER IS SMALLER.</td></tr>
<tr><td rowspan="5">16</td><td rowspan="5">HIGH TEMPERA-TURE RESISTANCE</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR</td><td rowspan="5">APPLIED VOLTAGE : 200% OF RATED VOLTAGE
TEST TIME : 1000 +48/-0 Hr.
CURRENT APPLIED : 50mA MAX.
<table><tr><td colspan="2">CHAR.</td><td>TEMP.</td></tr><tr><td colspan="2">CLASS I</td><td>125 ± 3℃</td></tr><tr><td rowspan="3">CLASS II</td><td>A</td><td>85 ± 3℃</td></tr><tr><td>B</td><td>125 ± 3℃</td></tr><tr><td>F</td><td>85 ± 3℃</td></tr></table></td></tr>
<tr><td>CAPACITANCE</td><td colspan="3"><table><tr><td>CHARACTERISTIC</td><td colspan="2">CAP. CHANGE</td></tr><tr><td colspan="2">CLASS I</td><td>WITHIN ±3% OR ± 0.3pF,
WHICHEVER IS LARGER</td></tr><tr><td rowspan="3">CLASS II</td><td>A,B</td><td>WITHIN ±12.5%</td></tr><tr><td rowspan="2">F</td><td>WITHIN ±30%</td></tr><tr><td>[10V AND BELOW]
WITHIN +30~−40%
1005 C>0.47μF 1608 C>1μF
2012 C>4.7μF 3216 C>10μF
3225 C>22μF 4532 C>47μF</td></tr></table></td></tr>
<tr><td>Q
CLASS I</td><td colspan="3">30pF AND OVER : Q ≥ 350
10 ~ 30 pF : Q ≥ 275 + 2.5*C
LESS THAN 10pF :Q ≥ 200 + 10*C</td></tr>
<tr><td>Tan delta
CLASS II</td><td colspan="3"><table><tr><td>Char.</td><td>25V and over</td><td>16V</td><td>10V</td><td>6.3V</td><td>4.0V</td></tr><tr><td>A,B</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.05 MAX</td><td>0.075 MAX</td><td>0.1 MAX</td></tr><tr><td>F</td><td>0.075 MAX</td><td>0.1 MAX (C 〈1.0uF)
0.125 MAX (C≥1.0uF)</td><td>0.15 MAX</td><td>0.195 MAX</td><td>0.25 MAX</td></tr></table></td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">MINIMUM INSULATION RESISTANCE:
1,000 Mohm OR 50Mohm*uF PRODUCT
WHICHEVER IS SMALLER</td></tr>
</table>

<table>
<tr><th>NO</th><th colspan="2">ITEM</th><th colspan="3">PERFORMANCE</th><th>TEST CONDITION</th></tr>
<tr><td rowspan="6">17</td><td rowspan="6">TEMPERATURE CYCLE</td><td>APPEARANCE</td><td colspan="3">NO MECHANICAL DAMAGE SHALL OCCUR</td><td rowspan="6">CAPACITORS SHALL BE SUBJECTED TO FIVE CYCLES OF THE TEMPERATURE CYCLE AS FOLLOWING

STEP | TEMP.(℃) | TIME (MIN)
1 | MIN. RATED TEMP. +0/-3 | 30
2 | 25 | 2~3
3 | MAX. RATED TEMP. +3/-0 | 30
4 | 25 | 2~3

MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR
CLASS Ⅰ : 24±2 Hr.
CLASS Ⅱ : 48±4 Hr.</td></tr>
<tr><td rowspan="4">CAPACITANCE</td><td>CHARACTERISTIC</td><td colspan="2">CAP. CHANGE</td></tr>
<tr><td>CLASS Ⅰ</td><td colspan="2">WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</td></tr>
<tr><td rowspan="2">CLASS Ⅱ</td><td>A,B</td><td>WITHIN ±7.5%</td></tr>
<tr><td>F</td><td>WITHIN ±20%</td></tr>
<tr><td>Q
CLASS Ⅰ</td><td colspan="3">30 pF AND OVER : Q ≥ 1000
LESS THAN 30pF:Q ≥400 +20×C</td></tr>
<tr><td>Tanδ
CLASS Ⅱ</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
<tr><td>INSULATION RESISTANCE</td><td colspan="3">TO SATISFY THE SPECIFIED INITIAL VALUE</td></tr>
</table>

<table>
<tr><td rowspan="15">18</td><td colspan="6">Recommend Method of Soldering</td></tr>
<tr><td rowspan="15">SOLDERING GROUP BY SIZE&CAP</td><td rowspan="2">SIZE(㎜)</td><td rowspan="2">CHAR</td><td rowspan="2">CAPACITANCE</td><td colspan="2">CONDITION</td></tr>
<tr><td>FLOW</td><td>REFLOW</td></tr>
<tr><td>0603</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">-</td><td rowspan="2">○</td></tr>
<tr><td>1005</td></tr>
<tr><td rowspan="3">1608</td><td>A, B</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">F</td><td>C＜1㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥1㎌</td><td>-</td><td>○</td></tr>
<tr><td rowspan="3">2012</td><td>A, B</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">F</td><td>C＜4.7㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥4.7㎌</td><td>-</td><td>○</td></tr>
<tr><td rowspan="3">3216</td><td>A, B</td><td>-</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">F</td><td>C＜10㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥10㎌</td><td>-</td><td>○</td></tr>
<tr><td>3225</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">-</td><td rowspan="3">○</td></tr>
<tr><td>4532</td></tr>
<tr><td>5750</td></tr>
</table>

※ When Solderability Is Considered, Capacitors Are Recommended To Be Used In 12 Months.