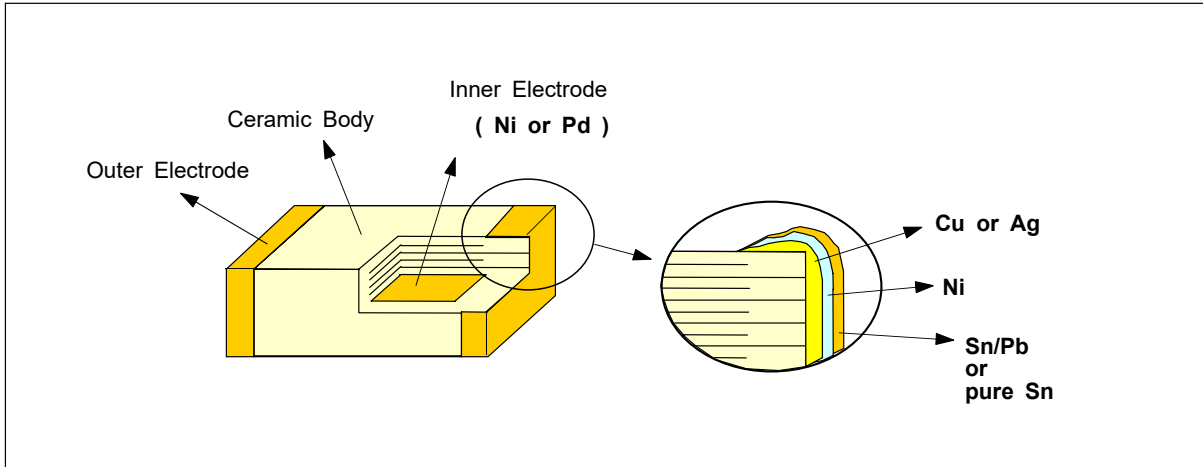


## FEATURE



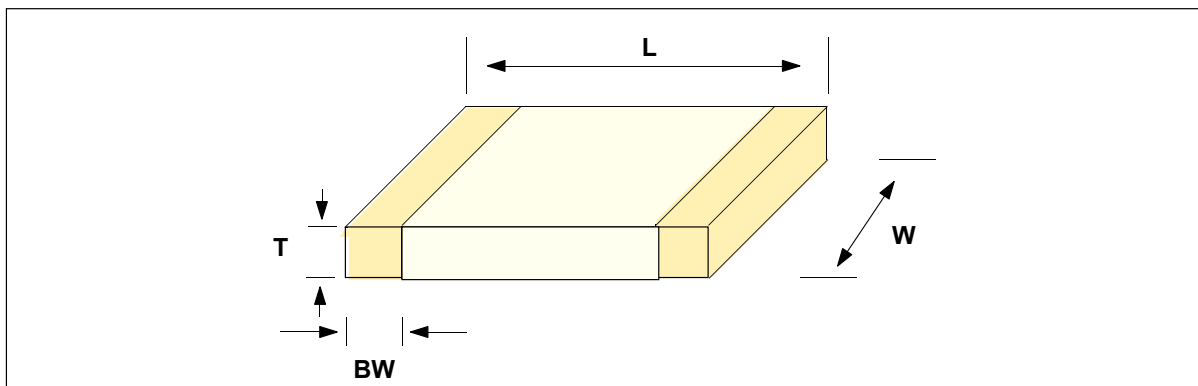
- Miniature Size
- Wide Capacitance, Temperature Compensation and Voltage Range
- Highly Reliable Performance
- Industry Standard Size
- Tape & Reel for Surface Mount Assembly

## PART NUMBER CODE

<b><u>CL</u></b>	<b><u>10</u></b>	<b><u>C</u></b>	<b><u>101</u></b>	<b><u>J</u></b>	<b><u>B</u></b>	<b><u>N</u></b>	<b><u>C</u></b>
(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°C
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 Δ	C0G	C0G	C0G	C0G
P Δ	-	PJ	PH	PH
R Δ	-	RJ	RH	RH
S Δ	-	SJ	SH	SH
T Δ	-	TJ	TH	TH
U Δ	-	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 ( Δ C : %)	Operation Temperature Range
A	X5R	± 15	-55 ~ +85°C
B	X7R	± 15	-55 ~ +125°C
F	Y5V	+22 ~ -82	-30 ~ +85°C

## 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 × 10<sup>0</sup> = 10pF  
 222 = 22 × 10<sup>2</sup> = 2200pF  
 020 = 2 × 10<sup>0</sup> = 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	E-24 Series for over 10pF
	F	± 1%	
	*G	± 2%	
	J	± 5%	
A(X5R) B(X7R)	K	± 10%	E-12 Series
	J	± 5%	
	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<sup>n</sup> "

# Multilayer Chip Capacitors - General

## 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)
	<b>L</b>	0.6 ±0.03	1.0 ±0.05	1.6 ±0.1	2.0 ±0.1	3.2 ±0.15	3.2 ±0.3	4.5 ±0.4
<b>W</b>	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	1.25 ±0.1	1.6 ±0.15	2.5 ±0.2	3.2 ±0.3	5.0 ±0.4
<b>T</b>	0.3 ±0.03	0.5 ±0.05	0.8 ±0.1	0.65 ±0.1 1.25 ±0.1	0.85 ±0.15 1.25 ±0.15	1.25 ±0.2 1.6 ±0.2	1.25 ±0.2 1.6 ±0.2	1.6 ±0.2 2.0 ±0.2 2.5 ±0.2
<b>50V</b>	-	0.5 ~ 240	0.5 ~ 1000	1100 ~ 1500 1600 ~ 2700	0.5 ~ 2700 3000 ~ 5600	-	-	-
<b>100V</b>	-	-	0.5 ~ 680	620 ~ 910 1000	1600 ~ 3300 3600 ~ 3900	-	-	-
<b>25V</b>	0.5 ~ 68	0.5 ~ 220	0.5 ~ 1000	3300 ~ 8200	1500 ~ 3600 3900 ~ 6800	-	100000	-
<b>50V</b>	-	0.5 ~ 180	0.5 ~ 1000	620 ~ 1000 1100 ~ 3300	0.5 ~ 2200 2400 ~ 4700	11000 ~ 22000 24000 ~ 47000	15000 ~ 22000 24000 ~ 47000	33000 ~ 47000 51000 ~ 93000 62000 ~ 68000
<b>100V</b>	-	-	0.5 ~ 300	470 ~ 910 1000 ~ 1200	0.5 ~ 2200 2400 ~ 3600	8200 ~ 10000 11000 ~ 13000	16000 ~ 20000 22000 ~ 24000	33000 ~ 39000 24000 ~ 47000 27000 ~ 36000

CAPACITANCE RANGE (PF)



**CAPACITANCE RANGE**

**CLASS I**

Temperature Characteristics	Size	Voltage	Capacitance Range (pF)										
			0.5	10	100	1000	10000	100000	1000000	10000000	100000000		
<b>SL,UJ</b>	05 (0402)	50V			240								
	10 (0603)	50V				1000							
		100V			680								
	21 (0805)	50V				2700							
		100V				1000							
	31 (1206)	50V					8200						
100V						3900							
<b>COG &amp; TC Series</b>	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		
<b>A(X5R)</b>	0603 (0201)	6.3V				■ 3300						
		16V				■ 1000						
	1005 (0402)	6.3V						■ 220000				
		10V						■ 100000				
	1608 (0603)	6.3V							■ 1000000			
		10V							■ 1000000			
		16V							■ 330000			
	2012 (0805)	6.3V							2200000 ■ 4700000			
		10V							3300000 ■ 4700000			
		16V							1000000 ■ 2200000			
	3216 (1206)	6.3V							3300000 ■ 10000000			
		10V							3300000 ■ 10000000			
	3225 (1210)	6.3V							10000000 ■ 22000000			
		10V							6800000 ■ 10000000			
		16V							4700000 ■ 10000000			
		25V							■ 4700000			
	4532 (1812)	6.3V							15000000 ■ 47000000			
		10V							22000000 ■ 47000000			
		16V							22000000 ■ 33000000			
		25V							■ 6800000			
5750 (2220)	6.3V									■ 100000000		
	10V							47000000 ■ 100000000				
	16V							22000000 ■ 47000000				



## CLASS II , B(X7R)

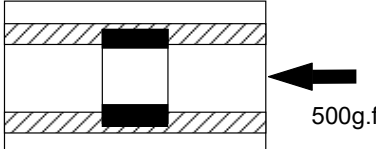
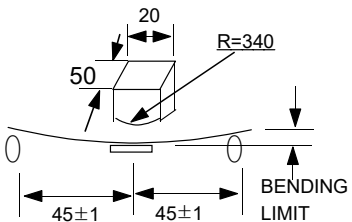
Temperature Characteristics	Size	Voltage	Capacitance Range (pF)								
			10	100	1000	10000	100000	1000000	10000000	100000000	
<b>B(X7R)</b>	03 (0201)	16V		100	1000						
		6.3V		100			220000				
	05 (0402)	10V		100			100000				
		16V		100			82000				
		25V		100			22000				
		50V		100			10000				
	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

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

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

NO	ITEM	PERFORMANCE	TEST CONDITION												
11	SOLDERABILITY	<p>MORE THAN 75% OF THE TERMINAL SURFACE IS TO BE SOLDERED NEWLY, SO METAL PART(A) DOES NOT COME OUT OR DISSOLVE</p> 	<p>SOLDER TEMPERATURE : 230±5c            SOLDER : H63A            FLUX : ROSIN            PRE-HEATING : AT 80~120c            FOR 10~30SEC.</p>												
12	RESISTANCE TO SOLDERING HEAT	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR	<p>DIP : SOLDER TEMPERATURE OF 270±5c            DIP TIME : 10± SEC.            EACH TERMINATION SHALL BE FULLY IMMERSED AND PREHEATED AS FOLLOWING:</p> <table border="1" data-bbox="1026 798 1383 945"> <thead> <tr> <th>STEP</th> <th>TEMP.(C)</th> <th>TIME (SEC.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80~100</td> <td>60</td> </tr> <tr> <td>2</td> <td>150~180</td> <td>60</td> </tr> </tbody> </table> <p>MEASURE AT ROOM TEMP. AFTER COOLING FOR            CLASS I : 24 ± 2 HOURS            CLASS II : 48 ± 4 HOURS</p>	STEP	TEMP.(C)	TIME (SEC.)	1	80~100	60	2	150~180	60		
		STEP	TEMP.(C)		TIME (SEC.)										
		1	80~100		60										
		2	150~180		60										
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE	<table border="1" data-bbox="600 640 795 934"> <thead> <tr> <th>CLASS I</th> <th>A,B</th> <th>WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</th> </tr> </thead> <tbody> <tr> <td>CLASS II</td> <td>A,B</td> <td>WITHIN ±7.5%</td> </tr> <tr> <td></td> <td>F</td> <td>WITHIN ±20%</td> </tr> </tbody> </table>	CLASS I	A,B	WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER	CLASS II	A,B	WITHIN ±7.5%		F	WITHIN ±20%
			CLASS I		A,B		WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER								
			CLASS II		A,B		WITHIN ±7.5%								
	F	WITHIN ±20%													
Q	CLASS I	30pF AND OVER : Q≥ 1000 LESS THAN 30pF : Q≥ 400+20°C													
Tan delta	CLASS II	TO SATISFY THE SPECIFIED INITIAL VALUE													
INSULATION RESISTANCE		TO SATISFY THE SPECIFIED INITIAL VALUE													
WITHSTANDING VOLTAGE		TO SATISFY THE SPECIFIED INITIAL VALUE													
13	VIBRATION TEST	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR.	<p>THE CAPACITOR SHALL BE SUBJECTED TO A HARMONIC MOTION HAVING A TOTAL AMPLITUDE OF 1.5mm.</p> <table border="1" data-bbox="1010 1381 1356 1465"> <thead> <tr> <th>CHAR.</th> <th>FREQUENCY RANGE</th> </tr> </thead> <tbody> <tr> <td>A,B,C,F</td> <td>10Hz → 55Hz → 10Hz</td> </tr> </tbody> </table> <table border="1" data-bbox="1010 1486 1356 1558"> <thead> <tr> <th>CHAR.</th> <th>TRAVERSED TIME</th> </tr> </thead> <tbody> <tr> <td>A,B,C,F</td> <td>1 min</td> </tr> </tbody> </table> <p>THE ENTIRE FREQUENCY RANGE, FROM 10 TO 55Hz AND RETURN TO 10Hz, SHALL BE TRAVERSED IN 1 MINUTE.</p> <p>THIS CYCLE SHALL BE PERFORMED 2 HOURS IN EACH THERE MUTUALLY PERPENDICULAR DIRECTION, FOR TOTAL PERIOD OF 6 HOURS.</p>	CHAR.	FREQUENCY RANGE	A,B,C,F	10Hz → 55Hz → 10Hz	CHAR.	TRAVERSED TIME	A,B,C,F	1 min			
		CHAR.	FREQUENCY RANGE												
		A,B,C,F	10Hz → 55Hz → 10Hz												
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		A,B,C,F	1 min												
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE	<table border="1" data-bbox="600 1354 795 1648"> <thead> <tr> <th>CLASS I</th> <th>A,B</th> <th>WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</th> </tr> </thead> <tbody> <tr> <td>CLASS II</td> <td>A,B</td> <td>WITHIN ±5%</td> </tr> <tr> <td></td> <td>F</td> <td>WITHIN ±20%</td> </tr> </tbody> </table>	CLASS I	A,B	WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER	CLASS II	A,B	WITHIN ±5%		F	WITHIN ±20%
			CLASS I		A,B		WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER								
CLASS II	A,B		WITHIN ±5%												
	F	WITHIN ±20%													
Q	CLASS I	30pF AND OVER : Q≥ 1000 LESS THAN 30pF : Q≥ 400+20°C													
Tan delta	CLASS II	TO SATISFY THE SPECIFIED INITIAL VALUE													
INSULATION RESISTANCE		TO SATISFY THE SPECIFIED INITIAL VALUE													

NO	ITEM	PERFORMANCE	TEST CONDITION			
14	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR	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.			
	CAPACITANCE	CHARACTERISTIC		CAPACITANCE CHANGE		
		CLASS I		WITHIN ±5% OR ±0.5pF WHICHEVER IS LARGER		
		CLASS II		A,B	WITHIN ±12.5%	
	F			WITHIN ±30%		
	Q CLASS I	30pF AND OVER : $Q \geq 350$ 10 ~30pF : $Q \geq 275 + 2.5^{\circ}C$ LESS THAN 10pF : $Q \geq 200 + 10^{\circ}C$				
Tan delta CLASS II	Char.	25V and over	16V	10V	6.3V	4.0V
	A,B	0.05 MAX	0.05 MAX	0.05 MAX	0.075 MAX	0.1 MAX
	F	0.075 MAX	0.1 MAX (C<1.0uF) 0.125 MAX (C≥1.0uF)	0.15 MAX	0.195 MAX	0.25 MAX
INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 1,000 Mohm OR 50Mohm*uF PRODUCT WHICHEVER IS SMALLER					

\* 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.

NO	ITEM	PERFORMANCE	TEST CONDITION																
15	MOISTURE RESISTANCE	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR																
		CAPACITANCE	CHARACTERISTIC	CAPACITANCE CHANGE															
			CLASS I		WITHIN $\pm 7.5\%$ OR $\pm 0.75\mu\text{F}$ WHICHEVER IS LARGER														
			CLASS II	A,B	WITHIN $\pm 12.5\%$														
				F	WITHIN $\pm 30\%$ [ 10V AND BELOW ] WITHIN $+30\sim -40\%$ 1005 C>0.47 $\mu\text{F}$ 1608 C>1 $\mu\text{F}$ 2012 C>4.7 $\mu\text{F}$ 3216 C>10 $\mu\text{F}$ 3225 C>22 $\mu\text{F}$ 4532 C>47 $\mu\text{F}$														
		Q CLASS I	30pF AND OVER : Q $\geq$ 200 30pF AND BELOW : Q $\geq$ 100 + 10/3 $^{\circ}\text{C}$																
Tan delta CLASS II	<table border="1"> <thead> <tr> <th>Char.</th> <th>25V and over</th> <th>16V</th> <th>10V</th> <th>6.3V</th> <th>4.0V</th> </tr> </thead> <tbody> <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 &lt; 1.0<math>\mu\text{F}</math>) 0.125 MAX (C <math>\geq</math> 1.0<math>\mu\text{F}</math>)</td> <td>0.15 MAX</td> <td>0.195 MAX</td> <td>0.25 MAX</td> </tr> </tbody> </table>	Char.	25V and over	16V	10V	6.3V	4.0V	A,B	0.05 MAX	0.05 MAX	0.05 MAX	0.075 MAX	0.1 MAX	F	0.075 MAX	0.1 MAX (C < 1.0 $\mu\text{F}$ ) 0.125 MAX (C $\geq$ 1.0 $\mu\text{F}$ )	0.15 MAX	0.195 MAX	0.25 MAX
Char.	25V and over	16V	10V	6.3V	4.0V														
A,B	0.05 MAX	0.05 MAX	0.05 MAX	0.075 MAX	0.1 MAX														
F	0.075 MAX	0.1 MAX (C < 1.0 $\mu\text{F}$ ) 0.125 MAX (C $\geq$ 1.0 $\mu\text{F}$ )	0.15 MAX	0.195 MAX	0.25 MAX														
INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 500 Mohm OR 25Mohm* $\mu\text{F}$ PRODUCT, WHICHEVER IS SMALLER.																		
16	HIGH TEMPERATURE RESISTANCE	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR																
		CAPACITANCE	CHARACTERISTIC	CAP. CHANGE															
			CLASS I		WITHIN $\pm 3\%$ OR $\pm 0.3\text{pF}$ , WHICHEVER IS LARGER														
			CLASS II	A,B	WITHIN $\pm 12.5\%$														
				F	WITHIN $\pm 30\%$ [ 10V AND BELOW ] WITHIN $+30\sim -40\%$ 1005 C>0.47 $\mu\text{F}$ 1608 C>1 $\mu\text{F}$ 2012 C>4.7 $\mu\text{F}$ 3216 C>10 $\mu\text{F}$ 3225 C>22 $\mu\text{F}$ 4532 C>47 $\mu\text{F}$														
		Q CLASS I	30pF AND OVER : Q $\geq$ 350 10 ~ 30 pF : Q $\geq$ 275 + 2.5 $^{\circ}\text{C}$ LESS THAN 10pF : Q $\geq$ 200 + 10 $^{\circ}\text{C}$																
Tan delta CLASS II	<table border="1"> <thead> <tr> <th>Char.</th> <th>25V and over</th> <th>16V</th> <th>10V</th> <th>6.3V</th> <th>4.0V</th> </tr> </thead> <tbody> <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 &lt; 1.0<math>\mu\text{F}</math>) 0.125 MAX (C <math>\geq</math> 1.0<math>\mu\text{F}</math>)</td> <td>0.15 MAX</td> <td>0.195 MAX</td> <td>0.25 MAX</td> </tr> </tbody> </table>	Char.	25V and over	16V	10V	6.3V	4.0V	A,B	0.05 MAX	0.05 MAX	0.05 MAX	0.075 MAX	0.1 MAX	F	0.075 MAX	0.1 MAX (C < 1.0 $\mu\text{F}$ ) 0.125 MAX (C $\geq$ 1.0 $\mu\text{F}$ )	0.15 MAX	0.195 MAX	0.25 MAX
Char.	25V and over	16V	10V	6.3V	4.0V														
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INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 1,000 Mohm OR 50Mohm* $\mu\text{F}$ PRODUCT WHICHEVER IS SMALLER																		
			<p>APPLIED VOLTAGE : 200% OF RATED VOLTAGE</p> <p>TEST TIME : 1000 +48/-0 Hr.</p> <p>CURRENT APPLIED : 50mA MAX.</p> <table border="1"> <thead> <tr> <th>CHAR.</th> <th>TEMP.</th> </tr> </thead> <tbody> <tr> <td>CLASS I</td> <td>125 <math>\pm</math> 3<math>^{\circ}\text{C}</math></td> </tr> <tr> <td rowspan="3">CLASS II</td> <td>A</td> <td>85 <math>\pm</math> 3<math>^{\circ}\text{C}</math></td> </tr> <tr> <td>B</td> <td>125 <math>\pm</math> 3<math>^{\circ}\text{C}</math></td> </tr> <tr> <td>F</td> <td>85 <math>\pm</math> 3<math>^{\circ}\text{C}</math></td> </tr> </tbody> </table> <p>[INITIAL MEASUREMENT] CLASS II : IN CASE OF BELOW 10V PRODUCT, IT SHOULD BE TREATED WITH RATED VOLTAGE FOR 1HR AT 40<math>^{\circ}\text{C} \pm 2^{\circ}\text{C}</math>. MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR : 48<math>\pm</math>4 Hr.</p>	CHAR.	TEMP.	CLASS I	125 $\pm$ 3 $^{\circ}\text{C}$	CLASS II	A	85 $\pm$ 3 $^{\circ}\text{C}$	B	125 $\pm$ 3 $^{\circ}\text{C}$	F	85 $\pm$ 3 $^{\circ}\text{C}$					
CHAR.	TEMP.																		
CLASS I	125 $\pm$ 3 $^{\circ}\text{C}$																		
CLASS II	A	85 $\pm$ 3 $^{\circ}\text{C}$																	
	B	125 $\pm$ 3 $^{\circ}\text{C}$																	
	F	85 $\pm$ 3 $^{\circ}\text{C}$																	

NO	ITEM		PERFORMANCE		TEST CONDITION													
17	TEMPERATURE CYCLE	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR		CAPACITORS SHALL BE SUBJECTED TO FIVE CYCLES OF THE TEMPERATURE CYCLE AS FOLLOWING													
		CAPACITANCE	CHARACTERISTIC			CAP. CHANGE												
			CLASS I			WITHIN $\pm 2.5\%$ OR $\pm 0.25\mu\text{F}$ WHICHEVER IS LARGER												
			CLASS II	A,B		WITHIN $\pm 7.5\%$												
				F		WITHIN $\pm 20\%$												
		Q CLASS I	30 pF AND OVER : Q $\geq$ 1000 LESS THAN 30pF:Q $\geq$ 400 +20×C			<table border="1"> <thead> <tr> <th>STEP</th> <th>TEMP.(°C)</th> <th>TIME (MIN)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MIN. RATED TEMP. +0/-3</td> <td>30</td> </tr> <tr> <td>2</td> <td>25</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>MAX. RATED TEMP. +3/-0</td> <td>30</td> </tr> <tr> <td>4</td> <td>25</td> <td>2~3</td> </tr> </tbody> </table>	STEP	TEMP.(°C)	TIME (MIN)	1	MIN. RATED TEMP. +0/-3	30	2	25	2~3	3	MAX. RATED TEMP. +3/-0	30
STEP	TEMP.(°C)	TIME (MIN)																
1	MIN. RATED TEMP. +0/-3	30																
2	25	2~3																
3	MAX. RATED TEMP. +3/-0	30																
4	25	2~3																
Tan $\delta$ CLASS II	TO SATISFY THE SPECIFIED INITIAL VALUE																	
INSULATION RESISTANCE	TO SATISFY THE SPECIFIED INITIAL VALUE																	

MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR  
CLASS I : 24±2 Hr.  
CLASS II : 48±4 Hr.

**Recommend Method of Soldering**

18	SOLDERING GROUP BY SIZE&CAP	SIZE(mm)	CHAR	CAPACITANCE	CONDITION	
					FLOW	REFLOW
					0603	-
1005	-	-	-	●		
1608	A, B	-	-	●	●	
	F	C < 1 $\mu\text{F}$	-	●	●	
		C $\geq$ 1 $\mu\text{F}$	-	-	●	
2012	A, B	-	-	●	●	
	F	C < 4.7 $\mu\text{F}$	-	●	●	
		C $\geq$ 4.7 $\mu\text{F}$	-	-	●	
3216	A, B	-	-	●	●	
	F	C < 10 $\mu\text{F}$	-	●	●	
		C $\geq$ 10 $\mu\text{F}$	-	-	●	
3225	-	-	-	-	●	
4532	-	-	-	-	●	
5750	-	-	-	-	●	

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