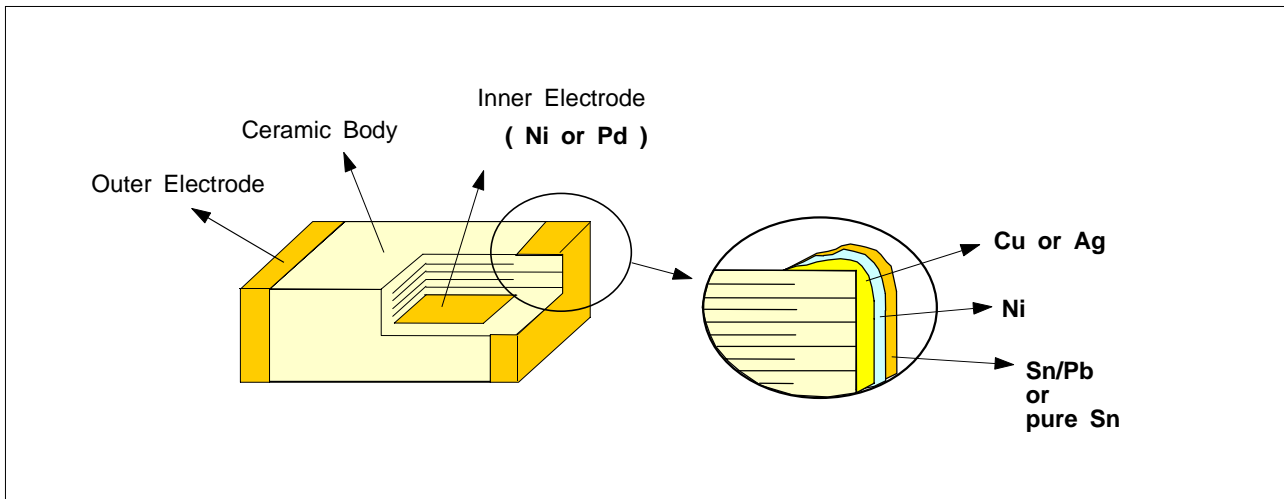


FEATURE



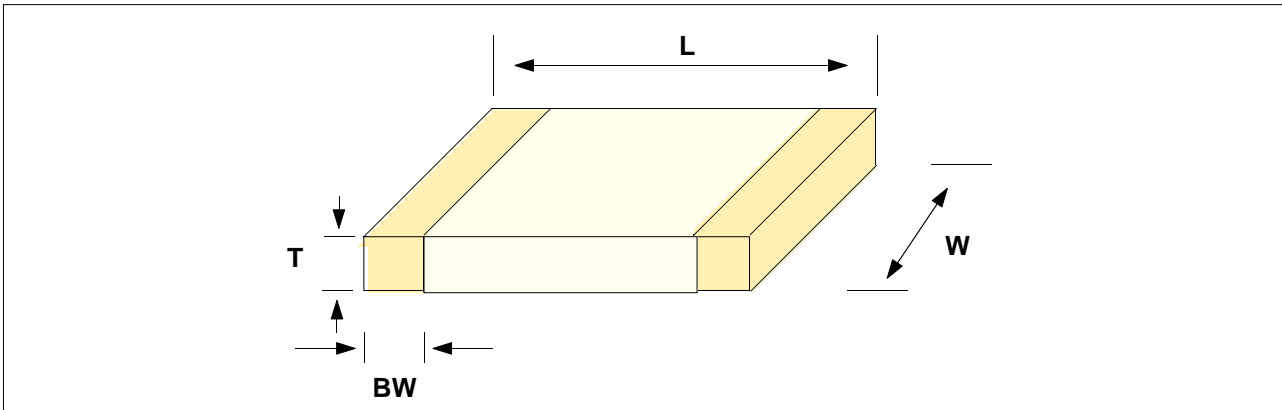
- Miniature Size
- Wide Capacitance, Temperature Compensation and Voltage Range
- Highly Reliable Performance
- Industry Standard Size
- Tape & Reel for Surface Mount Assembly

PART NUMBER CODE

<u>CL</u>	<u>10</u>	<u>C</u>	<u>101</u>	<u>J</u>	<u>B</u>	<u>N</u>	<u>C</u>
(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℃
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 10⁰ = 10pF
 222 = 22 x 10² = 2200pF
 020 = 2 x 10⁰ = 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
	M	± 20%	
	F(Y5V)	Z	

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 10ⁿ "

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

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				
		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)

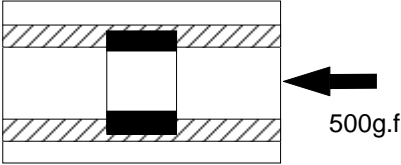
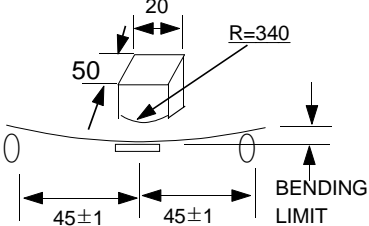
Temperature Characteristics	Size	Voltage	Capacitance Range (pF)										
			10	100	1000	10000	100000	1000000	10000000	100000000			
B(X7R)	03 (0201)	16V		100	1000								
	05 (0402)	6.3V		100			220000						
		10V		100			100000						
		16V		100			82000						
		25V		100			22000						
		50V		100			10000						
	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					

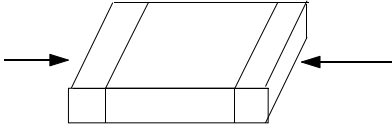
CLASS II , F(Y5V)

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

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 <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> 2. CHAR : F <table border="1"> <thead> <tr> <th></th> <th>6.3V</th> <th>10V</th> <th>16V</th> <th>25V</th> <th>50V</th> </tr> </thead> <tbody> <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≤6.8μF) 0.09max(C>6.8μF)</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> </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		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	-	-	-	CAPACITANCE	FREQUENCY	VOLTAGE
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NO	ITEM		PERFORMANCE		TEST CONDITION																												
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		CHAR.	CAP. CHANGE(%)																														
A,B	±15%																																
F	+22% ~ -82%																																
II																																	
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="1029 851 1412 1008"> <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	<p>WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</p>							
			CLASS I										
			CLASS II		A,B		WITHIN ±7.5%						
					F		WITHIN ±20%						
Q	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="1013 1467 1380 1568"> <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="1013 1579 1380 1668"> <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										
		CHAR.	TRAVERSED TIME										
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		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE	<p>WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</p>							
			CLASS I										
			CLASS II		A,B		WITHIN ±5%						
F	WITHIN ±20%												
Q	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 ≥ 350 10 ~30pF : Q ≥ 275 + 2.5°C LESS THAN 10pF : Q ≥ 200 + 10°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~ -40% 1005 C>0.47 μF 1608 C>1 μF 2012 C>4.7 μF 3216 C>10 μF 3225 C>22 μF 4532 C>47 μF															
Q CLASS I	30pF AND OVER : Q \geq 200 30pF AND BELOW : Q \geq 100 + 10/3°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 <1.0uF) 0.125 MAX (C \geq1.0uF)</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 <1.0uF) 0.125 MAX (C \geq 1.0uF)	0.15 MAX	0.195 MAX	0.25 MAX	
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F	0.075 MAX	0.1 MAX (C <1.0uF) 0.125 MAX (C \geq 1.0uF)	0.15 MAX	0.195 MAX	0.25 MAX															
INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 500 Mohm OR 25Mohm*uF 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~ -40% 1005 C>0.47 μF 1608 C>1 μF 2012 C>4.7 μF 3216 C>10 μF 3225 C>22 μF 4532 C>47 μF															
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INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 1,000 Mohm OR 50Mohm*uF PRODUCT WHICHEVER IS SMALLER																			
			<p>APPLIED VOLTAGE : RATED VOLTAGE</p> <p>TEMPERATURE : 40\pm2°C</p> <p>RELATIVE HUMIDITY : 90~95%RH</p> <p>TEST TIME : 500 +12/-0 Hr.</p> <p>CURRENT APPLIED : 50mA MAX.</p> <p>MEASURING AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24\pm2 Hr. CLASS II : 48\pm4 Hr.</p> <p>[INITIAL MEASUREMENT] CLASS II : IN CASE OF BELOW 10V PRODUCT, IT SHOULD BE TREATED WITH RATED VOLTAGE FOR 1HR AT 40°C\pm2°C. MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR : 48\pm4 Hr.</p>																	
			<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 \pm 3°C</td> </tr> <tr> <td rowspan="3">CLASS II</td> <td>A</td> <td>85 \pm 3°C</td> </tr> <tr> <td>B</td> <td>125 \pm 3°C</td> </tr> <tr> <td>F</td> <td>85 \pm 3°C</td> </tr> </tbody> </table>	CHAR.	TEMP.	CLASS I	125 \pm 3°C	CLASS II	A	85 \pm 3°C	B	125 \pm 3°C	F	85 \pm 3°C						
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CLASS II	A	85 \pm 3°C																		
	B	125 \pm 3°C																		
	F	85 \pm 3°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 $\pm 0.25\text{pF}$ 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: $Q \geq 400 + 20 \times C$					<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
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4	25	2-3																		
Tan δ 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

	SIZE(mm)	CHAR	CAPACITANCE	CONDITION	
				FLOW	REFLOW
18	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.