

General Multilayer Ceramic Capacitors



MLCC is an electronic part that temporarily stores an electrical charge and the most prevalent type of capacitor today. New technologies have enabled the MLCC manufacturers to follow the trend dictated by smaller and smaller electronic devices such as Cellular telephones, Computers, DSC, DVC

General Features

- Miniature Size
- Wide Capacitance and Voltage Range
- Tape & Reel for Surface Mount Assembly
- Low ESR

Applications

- General Electronic Circuit

Part Numbering



Samsung Multilayer Ceramic Capacitor Size(mm) Capacitance Temperature Characteristic Nominal Capacitance Capacitance Tolerance Rated Voltage Thickness Option Product & Plating Method Samsung Control Code Reserved For Future Use Packaging Type

Samsung Multilayer Ceramic Capacitor

SIZE(mm)

Code	EIA CODE	Size(mm)
03	0201	0.6 × 0.3
05	0402	1.0 × 0.5
10	0603	1.6 × 0.8
21	0805 2.0 × 1.25	
31	1206 3.2 × 1.6	
32	1210	3.2 × 2.5
43	1812	4.5 × 3.2
55	2220	5.7 × 5.0



Code	Temperature Characteristics				Temperature Range	
С		COG	С	0 ± 30(ppm/)		
Р		P2H	Р	-150 ± 60		
R		R2H	R	-220 ± 60		
S	Class	S2H	S	-330 ± 60	-55 ~ +125	
Т		T2H	Т	-470 ± 60		
U		U2J	U	-750 ± 60		
L		S2L	S	+350 ~ -1000		
Α		X5R	X5R	±15%	-55 ~ +85	
В	Class	X7R	X7R	±15%	-55 ~ +125	
Х	01855	X6S	X6S	±22%	-55 ~ +105	
F		Y5V	Y5V	+22 ~ -82%	-30 ~ +85	

CAPACITANCE TEMPERATURE CHARACTERISTIC

Temperature Characteristic

Temperature Characteristics	Below 2.0pF	2.2 ~ 3.9pF	Above 4.0pF	Above 10pF
С	C0G	C0G	C0G	C0G
Р	-	P2J	P2H	P2H
R	-	R2J	R2H	R2H
S	-	S2J	S2H	S2H
т	-	T2J	T2H	T2H
U	-	U2J	U2J	U2J

 $J: \pm 120 PPM/ \ , H: \pm 60 PPM/ \ , G: \pm 30 PPM/$

NOMINAL CAPACITANCE

Nominal capacitance is identified by 3 digits.

The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. 'R' identifies a decimal point.

Example

Code	Nominal Capacitance	
1R5	1.5pF	
103	10,000pF, 10nF, 0.01 µ F	
104	100,000pF, 100nF, 0.1 µ F	



CAPACITANCE TOLERANCE

Code	Tolerance	Nominal Capacitance
А	±0.05pF	
В	± 0.1pF	
С	± 0.25pF	Less than 10pF (Including 10pF)
D	± 0.5pF	(mendaling Topi)
F	±1pF	
F	±1%	
G	±2%	
J	±5%	More than 10pE
К	±10%	More than 10pF
м	±20%	
Z	+80, -20%	

RATED VOLTAGE

Code	Rated Voltage	Code	Rated Voltage
R	4.0V	D	200 V
Q	6.3V	E	250 V
Р	10V	G	500V
0	16V	н	630V
A	25V	I	1,000V
L	35V	J	2,000V
В	50V	к	3,000V
С	100V		



THICKNESS OPTION

Size	Code	Thickness(T)	Size	Code	Thickness(T)
0201(0603)	3	0.30±0.03		F	1.25±0.20
0402(1005)	5	0.50 ± 0.05		н	1.6±0.20
0603(1608)	8	0.80±0.10	1812(4532)	I	2.0±0.20
	Α	0.65±0.10		J	2.5±0.20
0005(0040)	С	0.85±0.10		L	3.2±0.30
0805(2012)	F	1.25±0.10		F	1.25±0.20
	Q	1.25±0.15		н	1.6±0.20
	С	0.85±0.15	2220(5750)	I	2.0±0.20
1206(3216)	F	1.25±0.15		J	2.5±0.20
	Н	1.6±0.20		L	3.2±0.30
	F	1.25±0.20			
	н	1.6±0.20			
1210(3225)	I	2.0±0.20			
	J	2.5±0.20			
	v	2.5±0.30			

PRODUCT & PLATING METHOD

Code	Electrode	Termination	Plating Type
Α	Pd	Ag	Sn_100%
N	Ni	Cu	Sn_100%
G	Cu	Cu	Sn_100%

SAMSUNG CONTROL CODE

Code	Code Description of the code		Description of the code
Α	Array (2-element)	N	Normal
В	Array (4-element)	Р	Automotive
С	High - Q	L	LICC



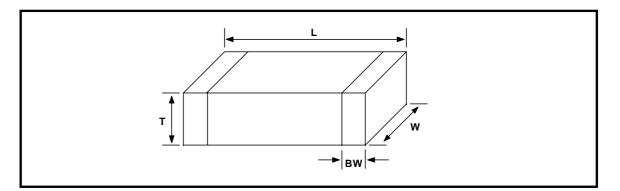
RESERVED FOR FUTURE USE

Code	Description of the code
N	Reserved for future use

PACKAGING TYPE

Code	Packaging Type	Code	Packaging Type
В	Bulk	F	Embossing 13" (10,000EA)
Р	Bulk Case	L	Paper 13" (15,000EA)
С	Paper 7"	0	Paper 10"
D	Paper 13" (10,000EA)	S	Embossing 10"
E	Embossing 7"		

APPEARANCE AND DIMENSION



CODE	EIA CODE				
CODE		L	W	T (MAX)	BW
03	0201	0.6 ± 0.03	0.3 ± 0.03	0.33	0.15 ± 0.05
05	0402	1.0 ± 0.05	0.5 ± 0.05	0.55	0.2 +0.15/-0.1
10	0603	1.6 ± 0.1	0.8 ± 0.1	0.9	0.3 ± 0.2
21	0805	2.0 ± 0.1	1.25 ± 0.1	1.35	0.5 +0.2/-0.3
24	1206	3.2 ± 0.15	1.6 ± 0.15	1.40	0.5 +0.2/-0.3
31	1206	3.2 ± 0.2	1.6 ± 0.2	1.8	0.5 +0.3/-0.3
22	1010	3.2 ± 0.3	2.5 ± 0.2	2.7	
32	1210	3.2 ± 0.4	2.5 ± 0.3	2.8	0.6 ± 0.3
43	1812	4.5 ± 0.4	3.2 ± 0.3	3.5	0.8 ± 0.3
55	2220	5.7 ± 0.4	5.0 ± 0.4	3.5	1.0 ± 0.3



SAMSUNG ELECTRO-MECHANICS

NO	ITE	М	PERI	FORMANCE	TEST	CONDITION					
1	Appea	rance	No Abnormal Exterior	Appearance	Through Microscope(×10)					
2	Insula Resist		10,000MΩ or 500MΩ·μF v Rated Voltage is belov 10,000MΩ or 100MΩ·μF v	v 16V ;	Apply the Rated Voltage	Apply the Rated Voltage For 60 ~ 120 Sec.					
3	Withsta Volta	0	No Dielectric Breakdov Mechanical Breakdown		Class :250% of the Rated	Class : 300% of the Rated Voltage for 1~5 sec. Class :250% of the Rated Voltage for 1~5 sec. is applied with less than 50mA current					
					Capacitance Frequency Volt						
		Class	Within the specifie	d tolerance	1,000 pF	1MHz ±1 0%					
	Capacita				>1,000 pF	1kHz ±1 0%	0.5 ~ 5 Vrms				
4	nce				Capacitance	Frequency	Voltage				
		Class	Within the specifi	ed tolerance	10 <i>µ</i> F	1kHz ±1 0%	1.0±0.2Vrms				
					>10µF	120Hz±20%	0.5±0.1Vrms				
			Capacitance 30pF :	Q 1,000	Capacitance	Frequency	Voltage				
5	Q	Class	< 30pF	: Q 400 +20C	1,000 pF	1MHz ±1 0%					
			(C	: Capacitance)	>1,000 pF	1kHz ±1 0%	0.5 ~ 5 Vrms				
			1. Characteristic : A()	(5R), B(X7R), X(X6S)	Capacitance	Frequency	Voltage				
							Rated Voltage	Spec	10 <i>µ</i> F	1kHz ±1 0%	1.0±0.2Vrms
								25V	0.025 max	>10 µF	120Hz±20%
			16V	0.035 max							
			10V	0.05 max							
			6.3V	0.05 max/ 0.10max*1							
			2. Characteristic : F()	(5V)	1812 C 47uF, 2220 All Low Profile Capa						
6	Tan	Class	Rated Voltage	Spec	*2 0603 C 0.47uF, 08						
	, in the second se		50V	0.05 max, 0.07max* ²	*3. 0402 C 0.033uF, 06 All 0805, 1206 size		_				
			35V	0.07 max	*4 1210 C>6.8uF	1210 C 0.80	F				
			25V	0.05 max/ 0.07 max* ³ / 0.09max* ⁴	*5 0402 C 0.22uF						
			16V	0.09 max/ 0.125max*⁵							
			10V	0.125 max/ 0.16max* ⁶							
			6.3V	0.16max	J						



SAMSUNG ELECTRO-MECHANICS

General Capacitors

NO	ITE	Μ		PERFOR	MANCE		TEST CONDITION		
						Capacitance s	shall be measured by the steps		
					Temp. Coefficient	shown in the	following table.		
			Characte	eristics	(PPM/)	Step	Temp.()		
			COC	G	0 ± 30	1	25 ± 2		
		Olasa	РН		-150 ± 60	2	Min. operating temp. ± 2		
		Class	RH		-220 ± 60	3	25 ± 2		
			SH		-330 ± 60	4	Max. operating temp ± 2		
			ТН		-470 ± 60	5	25 ± 2		
			UL		-750 ± 120	(1) Class	23 ± 2		
			SL		+350 ~ -1000		Coefficient shall be calculated from		
	Temperature					the formula as below. Temp, Coefficient = $\frac{C2 - C1}{C1 \times T} \times 10^6$ [ppm/			
7	Characteristics of Capacitance								
	-						ance at step 3		
					Canaaitanaa Changa	C2: Capacita	ance at 85		
			Characte	Characteristics Capacitance Chang with No Bias		T: 60 (=8	35 -25)		
		Class	A(X5 B(X7	R)/ 7R)	±15%	(2) CLASS			
			X(X6	S)	±22%	Capacitance (Change shall be calculated from the		
			F(Y5	5V)	+22% ~ -82%	formula as be			
						$C = \frac{C2}{C2}$	<u>C1</u> × 100(%)		
							ance at step 3 ance at step 2 or 4		
							* Pressure for 10±1 sec.		
							201 case size.		
8	Adhesive	-	No Indication Of Peeling Shall Occur On The						
	of Termi	nation		Terminal Electrode.			5 00g.f		
		Apperance	No mecha	anical dam	nage shall occur.	Bending limit			
					1	Test speed ;			
			Charact	teristics	Capacitance Change		board at the limit point in 5 sec., e capacitance.		
						Then measure	e capacitance.		
					Within $\pm 5\%$ or ± 0.5				
			Clas	ss I	pF whichever is		20 ∠ ► R=340*		
0	Bending				larger	50			
9	Strength	0		A(X5R)/					
		Capacitance		B(X7R)/	Within ±12.5%				
				X(X6S)					
			Class II			45±1	45±1		
						D 000 5			
				F(Y5V)	Within ±30%	<u>K=230 For</u>	0201 Case size		
						<u> </u>			



SAMSUNG ELECTRO-MECHANICS

10 Solderability be soldered newly. So metal part does not come out or dissolve Solder Temp. 245±5 1 Temp. 10 Solderability Apperance No mechanical damage shall occur. Flux RMA Typ. Dip Time 11 Apperance No mechanical damage shall occur. Solder Temperature : 270±5 11 Resistance to Soldering heat Capacitance Characteristics Capacitance Change Ulass Solder Temperature : 270±5 11 Resistance to Soldering heat Q (Class A(X5RV) B(X7R) Within ±7.5% B(X7R) Solder Temperature : 270±5 11 Resistance to Soldering heat Q (Class Capacitance 30pf : Q 1000 <30pf : Q 400+20xC (Class Solder temperature : 270±5 11 Soldering heat Q (Class Capacitance 30pf : Q 1000 <30pf : Q 400+20xC (Class Soldering heat 11 Gass Within the specified initial value Issualtion Resistance Within the specified initial value 11 No mechanical damage shall occur. The capacitor shall be subjected 1 Hamonic Motion having a total at 1.5m changing frequency from 1 and back to 10Hz In 1 min. 12 Vibration Test Capacitance Characteristics Capacitance Change Within ±5% 12 Vibration Test Capacitance Characteristics Capacitance Change Within ±5% 13 Capacitance	NO	IT	EM		PERFO	ORMANCE	TEST CONDITION				
10 Solderability come out or dissolve Imp. 245±5 1 10 Solderability Imp. Imp. 245±5 1 10 Solderability Imp. Imp. Imp. Imp. Imp. 10 Solderability Imp. Imp. Imp. Imp. Imp. 10 Solderability Imp. Imp. Imp. Imp. Imp. 11 Apperance No mechanical damage shall occur. Solder Temperature : 270±5 Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance to Imp. Capacitance Imp. Imp. Imp. Imp. 11 Resistance Imp. Capacitance Imp. <				More Thar	n 95% of th	e terminal surface is to	Solder	Sn-3Ag-0.50	Cu 63Sn-37P	b	
10 Solderability Image: Soldera					-	metal part does not	Solder	245.5	235±5		
11 Apperance No mechanical damage shall occur. Solder Temperature : 270±5 11 Apperance No mechanical damage shall occur. Solder Temperature : 270±5 11 Resistance to Capacitance Within ±2.5% or class Dip Time : 10±1 sec. 11 Resistance to Capacitance A(X5R)/ B(X7R) Within ±7.5% 11 Soldering heat Q (Class) Capacitance 30pF : Q 1000 - 30pF : Q 400+20xC (Class) Stefer Temperature : 270±5 11 Soldering heat Q (Class) Capacitance 30pF : Q 1000 - 30pF : Q 400+20xC (Class) Each termination shall be fully im preheated as below : 11 Soldering heat Q (Class) Capacitance 30pF : Q 400+20xC (Class) Each termination shall be fully im preheated as below : 11 Soldering heat Q (Class) Capacitance 30pF : Q 400+20xC (Class) Leave the capacitor in ambient co specified time' before measureme ' 24 ± 2 hours (Class) 11 Tan (Class) Within the specified initial value Heave the capacitor shall be subjected is larger 12 Vbration Test Appearance No mechanical damage shall occur. The capacitor shall be subjected i larger 12 Vbration Test Capacitance Capacitance Capa	10	Cold	robility.	come out	or dissolve	,,			230±0		
Apperance No mechanical damage shall occur. Solder Temperature : 270±5 Solder Temperature : 270±5 Solder Temperature : 270±5 Dip Time : 10±1 sec. Each termination shall be fully impreheated as below : 11 Resistance to Soldering heat Capacitance A(X5RV) Class Within ±2.5% or ±0.25pF whichever is larger Solder Temperature : 270±5 Dip Time : 10±1 sec. Each termination shall be fully impreheated as below : 11 Resistance to Soldering heat A(X5RV) (Class) Within ±7.5% Solder Temperature : 270±5 Dip Time : 10±1 sec. Each termination shall be fully impreheated as below : 11 Resistance to Soldering heat Capacitance 30pF : Q 1000 <30pF : Q		20106	ability				Flux RMA Type				
11 Apperance No mechanical damage shall occur. Solder Temperature : 270±5 11 Resistance to Characteristics Capacitance Within ±2.5% or ±0.25pF whichever is larger 11 Resistance to Class A(X5R)/ B(X7R) Within ±7.5% Solder Temperature : 270±5 11 Soldering heat Q (Class) Class A(X5R)/ B(X7R) Within ±7.5% Solder Temperature : 270±5 11 Soldering heat Q (Class) Capacitance Within ±7.5% Solder Temperature : 270±5 11 80/ering heat Q (Class) Capacitance 30pF : Q 1000 Solder Temperature : 270±5 11 80/ering heat Q (Class) Capacitance 30pF : Q 400+20xC (Class) Leave the capacitor in ambient cospecified initial value 11 Tan (Class) Within the specified initial value Leave the capacitor in ambient cospecified initial value 11 Insulation Resistance Within the specified initial value Heave the capacitor is analytic transition value 11 Insulation Resistance Characteristics Capacitance Change The capacitor shall be subjected in that value 11 Appearance No mechanical damage shall occur. Characteristics <							Dip Time	3±0.3 sec	. 5±0.5 sec	;.	
11 Resistance to Soldering heat Characteristics Capacitance Charage Dip Time : 10±1 sec. Each termination shall be fully impreheated as below : 11 Resistance to Soldering heat Class A(X5R)/ B(X7R) Within ±2.5% or ±0.25pF whichever is larger STEP TEMP.() TIME() 11 Resistance to Soldering heat Q (Class) Class A(X5R)/ B(X7R) Within ±15% Eave the capacitor in ambient conspective of the capacitor of the capacitor in ambient conspective of the capacitor of the capacitor of the capacitor in ambient conspective of the capacitor of the capacitor in ambient conspective of the capacitor of the capacito							Pre-heating at 80~120 for 10~30 sec.				
11 Resistance to Soldering heat Capacitance Class Within ±2.5% or ±0.25pF whichever is larger Each termination shall be fully impreheated as below : larger 11 Resistance to Soldering heat Capacitance A(X5R)/ B(X7R) Within ±7.5% STEP TEMP.() TIME(1 11 Resistance to Soldering heat Q Capacitance 30pF : Q 1000 (Class) Capacitance 30pF : Q 1000 (Class) : Capacitance : Q 1000 : 24 ± 2 hours (Class) 1 Insulation Resistance Within the specified initial value : 24 ± 2 hours (Class) : 48 ± 4 hours (Class) 1 Insulation Resistance Within the specified initial value : 24 ± 2 hours (Class) : 48 ± 4 hours (Class) 1 Appearance No mechanical damage shall occur. : Appearance : Capacitance Change : Afterminic Motion having a total at 1.5mm changing frequency from 1 and back to 10Hz In 1 min. 12 Vibration			Apperance	No mecha	anical dam	age shall occur.	Solder Ten	nperature : 270:	±5		
11 Resistance to Soldering heat Capacitance Class A(X5R)/ B(X7R) Within ±7.5% Within ±15% STEP TEMP.() TIME(1 11 Resistance to Soldering heat Q (Class) Capacitance A(X5R)/ B(X7R) Within ±7.5% Within ±15% STEP TEMP.() TIME(1 Q (Class) Capacitance 30pF :Q 1000 e 2 (Class) Capacitance 30pF :Q 1000 (Class) 11 No Class 11 Resistance to Soldering heat Q (Class) Capacitance 30pF :Q 1000 11 No 12 Tan (Class) 13 14 Appearance Within the specified initial value 14 Appearance No mechanical damage shall occur.				Charac	teristics	Capacitance Change					
11 Resistance to Soldering heat Capacitance Capacitance A(X5R)' B(X7R) Within ±7.5% Within ±15% X(X6S) Soldering heat STEP TEMP.() TIME[1 80-100 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 150-180 6 2 2 150-180 6 2 150-180 6 3 1000 1000 1000 3 1000 1000 1000 1000 3 10 1000 1000 1000 10 10 1000 1000 1000 10 10 1000 1000 1000 10 10 1000 1000 1000 10 1000 1000 <t< td=""><td></td><td></td><td></td><td></td><td></td><td>Within ±2.5% or</td><td colspan="3" rowspan="2">Each termination shall be fully immersed a preheated as below :</td><td>and</td></t<>						Within ±2.5% or	Each termination shall be fully immersed a preheated as below :			and	
11 Resistance to Soldering heat Capacitance A(X5R)/ B(X7R) Within ±7.5% Within ±15% STEP TEMP.() TIME(1 11 Soldering heat Q (Class Capacitance 30pF :Q 1000 <30pF				Clas	S						
$11 \begin{bmatrix} 11\\ 11\\ 11\\ 11\\ 12\\ 12\\ 12\\ 12\\ 12\\ 12\\$			Capacitance			larger	STEP	TEMP()	TIME(SEC.)	7	
$11 \begin{array}{ c c c c c } \hline & Class & Within \pm 15\% & Class & Within \pm 15\% & Class & Within \pm 20\% & Class & Within \pm 20\% & Class & Class & OpF & Q & 1000 & Specified time* before measureme ^{*}24 \pm 2 hours (Class) & Class & & (Class) & (Clas $					· ·	Within ±7.5%	+		60	1	
11 Resistance to Soldering heat Image: Capacitance 30pF : Q 1000 (Class) Leave the capacitor in ambient co specified time* before measureme * 24 ± 2 hours (Class) Image: Capacitance 1 Image: Capacitance 30pF : Q 400+20xC (Class) Leave the capacitor in ambient co specified time* before measureme * 24 ± 2 hours (Class) Image: Capacitance 1 Image: Capacitance 1 Within the specified initial value Image: Capacitance 1 Image: Capacitance 1 Within the specified initial value Image: Capacitance 1 Within the specified initial value Within the specified initial value Withstanding Voltage Within the specified initial value The capacitor shall be subjected in targer Appearance No mechanical damage shall occur. The capacitor shall be subjected in targer Capacitance 1 Capacitance Class Within ±2.5% or ±0.25pF whichever is larger 112 Vibration Test Capacitance A(X5R)/ B(X7R) Within ±10%				Class		Within 15%	+		60	1	
11 Notice to solution to solution to the solution of the capacitor in ambein to the capacitor in ambein to specified time to capacitor in ambein to capacitance (Class) 11		Desistance to			. ,						
Q Cupbendiaties output is q 1000 Specified initial value (Class) (Class) (Cic Capacitance) Tan Within the specified initial value 48 ± 4 hours (Class) Insulation Resistance Within the specified initial value Withstanding Within the specified initial value 48 ± 4 hours (Class) Withstanding Within the specified initial value 48 ± 4 hours (Class) Voltage Within the specified initial value 48 ± 4 hours (Class) Appearance No mechanical damage shall occur. 48 ± 4 hours (Class) Capacitance Characteristics Capacitance Change Capacitance Class Within ±2.5% or ±0.25pF whichever is larger Insum changing frequency from 1 1.5mm changing frequency from 1 Image: Capacitance A(X5R)/ B(X7R) Within ±5% KX66) Within ±10% Repeat this for 2hours each in 3	11			Caracitar			1			or	
12 Vibration Test (Class) (Class) (C: Capacitance) 48 ± 4 hours (Class) 12 Vibration Test (Class) (C: Capacitance) 48 ± 4 hours (Class) 12 Vibration Test (Class) (Vithin the specified initial value 48 ± 4 hours (Class) 12 Vibration Test (Class) (Vithin the specified initial value 48 ± 4 hours (Class) 12 Vibration Test (Class) (Vithin the specified initial value 48 ± 4 hours (Class)		Coldoning Hour	Q	Capacitan							
12 Vibration Test Tan (Class) Within the specified initial value 12 Vibration Test Within the specified initial value 12 Vibration Test Appearance No mechanical damage shall occur. 12 Vibration Test Characteristics Capacitance B(X7R) Within ±2.5% or ±0.25pF whichever is larger The capacitor shall be subjected to Harmonic Motion having a total an 1.5mm changing frequency from 1 and back to 10Hz In 1 min.			(Class)		<00pi						
12 Vibration			Tan			· · · · ·					
Resistance Within the specified initial value Withstanding Voltage Within the specified initial value Appearance No mechanical damage shall occur. Appearance No mechanical damage shall occur. Characteristics Capacitance Change Class Within ±2.5% or ±0.25pF whichever is larger The capacitor shall be subjected to Harmonic Motion having a total an 1.5mm changing frequency from 1 and back to 10Hz In 1 min. Vibration Test Vibration Test A(X5R)/ B(X7R) Within ±5% Repeat this for 2hours each in 3 perpendicular directions				Within the	e specified	initial value					
Resistance Withstanding Voltage Within the specified initial value Appearance No mechanical damage shall occur. Appearance No mechanical damage shall occur. Characteristics Capacitance Change Class Within ±2.5% or ±0.25pF whichever is larger 12 Vibration Test Vibration Test A(X5R)/ X(X6S) Within ±10%			Insulation			1-91-1 - 1 -					
Voltage Within the specified initial value Voltage Appearance No mechanical damage shall occur. Appearance No mechanical damage shall occur. Characteristics Capacitance Change Class Within ±2.5% or ±0.25pF whichever is larger Capacitance A(X5R)/ B(X7R) Vibration A(X5R)/ X(X6S) Test X(X6S)			Resistance		e specified						
12 Vibration Test Characteristics Capacitance Class Within ±2.5% or ±0.25pF whichever is larger The capacitor shall be subjected to Harmonic Motion having a total and 1.5mm changing frequency from 1 and back to 10Hz In 1 min. 12 Vibration A(X5R)/ B(X7R) Within ±5% X(X6S) Within ±10% Repeat this for 2hours each in 3 perpendicular directions			-	Within the specified initial value							
12 Vibration Test Vibration Test X(X6S)			Appearance	No mecha	No mechanical damage shall occur.						
12 Vibration Test Vibration Test X(X6S) Within ±2.5% or ±0.25pF whichever is larger The capacitor shall be subjected to Harmonic Motion having a total and 1.5mm changing frequency from 1 and back to 10Hz In 1 min. Repeat this for 2hours each in 3 perpendicular directions				Charact	teristics	Capacitance Change	_				
12 Vibration Class ±0.25pF whichever is larger Harmonic Motion having a total as 1.5mm changing frequency from 1 and back to 10Hz In 1 min. 12 Vibration A(X5R)/ B(X7R) Within ±5% Repeat this for 2hours each in 3 perpendicular directions							The capac	tor shall be sul	bjected to a		
12 Vibration Capacitance A(X5R)/ B(X7R) Within ±5% and back to 10Hz In 1 min. 12 Test X(X6S) Within ±10% Repeat this for 2hours each in 3 perpendicular directions				Clas	S			-			
12 Vibration Class A(X5R)' B(X7R) Within ±5% Repeat this for 2hours each in 3 Test X(X6S) Within ±10% perpendicular directions			Conocitores			larger				55Hz	
12 Test X(X6S) Within ±10% perpendicular directions		Vibration	Capacitance	Class	1	Within ±5%					
polpoliaidala allocation	12				X(X6S)	Within ±10%			ch in 3 mutually		
					F(Y5V)	Within ±20%	Perpendicu				
Q (Class) Within the specified initial value				Within the	e specified	initial value					
Tan (Class) Within the specified initial value				Within the	e specified	initial value					
Insulation Resistance Within the specified initial value				Within the	e specified	initial value					





SAMSUNG ELECTRO-MECHANICS

General Capacitors

NO	ITE	M		PERFO	RMANCE	TEST CONDITION
		Appearance	No mechanic	cal damage shal		Temperature : 40±2
				cteristics	Capacitance Change	Relative humidity : 90~95 %RH
			Chald			Duration time : $500 + 12/-0$ hr.
			Cla	ISS	Within ±5.0% or ±0.5pF	
					whichever is larger	Leave the capacitor in ambient
		Capacitance		A(X5R)/		condition for specified time* before
			Class	B(X7R)/	Within ±12.5%	
				X(X6S)		
				F(Y5V)	Within ±30%	CLASS : 24±2 Hr.
			Capacitance	30pF : Q	350	CLASS : 48±4 Hr.
	Humidity	Q	·	-	275 + 2.5×C	
13	(Steady	CLASS	· ·		$200 + 10 \times C$ (C: Capacitance)	
	State)		· ·	istic : A(X5R),	2. Characteristic : F(Y5V)	
	Olaloy			B(X7R)		
			0.05max (16)	. ,	0.075max (25V and over)	
		_	0.075max (10	,	0.1max (16V, C<1.0µF)	
		Tan	0.075max (10	- /	0.125max(16V, C 1.0μF)	
		CLASS	(6.3V excep	t Table 1)	0.15max (10V)	
			0.125max*		0.195max (6.3V)	
			(refer to Tab	ie 1)		
		Insulation	4 000 10		. "	
		Resistance	1,000 ML2 or	50MΩ.µF whiche.v	ver is smaller.	
		Appearance	No mechanic	cal damage shal	l occur.	Applied Voltage : rated voltage
			Chara	cteristics	Capacitance Change	Temperature : 40±2
					Within ±5.0% or ±0.5pF	Humidity : :90~95%RH
			Cla	ISS	whichever is larger	Duration Time : 500 + 12/-0 Hr.
						Charge/Discharge Current : 50mA max.
				A(X5R)/	Within ±12.5%	Perform the initial measurement according to
		Capacitance		B(X7R)/	Within ±12.5%	Note1.
				X(X6S)	Within ±30%	
			Class		Within ±30%	
				F(Y5V)	Within +30~ - 40%	Perform the final measurement according to
					In case of Table 2 *	Note2.
	Moisture	Q	Capacitance	30pF:Q 2	00	
14	Resistance	(Class)	Capacitance	<30 pF : Q 10	00 + 10/3×C (C: Capacitance)	
				-		-
			1. Characteri	istic : A(X5R),	2. Characteristic : F(Y5V)	
			0.05	B(X7R)		
			0.05max (16)	,	0.075max (25V and over)	
			0.075max (10	UV)	0.1max (16V, C<1.0µF)	
		Tan	0.075max		0.125max(16V, C 1.0μF)	
		(Class)	(6.3V excep	ot Table 1)	0.15max (10V)	
			0.125max*		0.195max (6.3V)	
			(refer to Tal	ble 1)		
			X(X6S) 0.11r	max (6.3V and b	pelow)	
						-
		Insulation	500	5MΩ·µF whicheve		





SAMSUNG ELECTRO-MECHANICS

NO	ITE	М		PER	FORMANCE		TEST CONDIT	ION		
		Appearance	No mechanio	cal damage	shall occur.	···	oltage : 200%* of the ire : max. operating t	-		
			Charact	eristics	Capacitance Change	Duration Time : 1000 +48/-0 Hr.				
			Close		Within $\pm 3\%$ or ± 0.3 pF,		Charge/Discharge Current : 50mA max.			
			Class		Whichever is larger	* refer to	table(3): 150%/100	% of the rated		
		Capacitance		A(X5R)/ B(X7R)	Within ±12.5%	voltage				
			Class	X(X6S)	Within ±25%	Perform th	e initial measurement	according to		
			Class		Within ±30%	Note1 for	Class			
				F(Y5V)	Within +30~ - 40%					
					* In case of Table 2	Perform th	e final measurement	according to		
		Q	Capacitance	30pF : 0		Note2.				
	High	(Class)		tance <30 p < 10pF ·O	F : Q 275 + 2.5×C 200 +10×C (C: Capacitance)					
15	Temperature		1. Character			-				
	Resistance	Resistance B(X7R)								
		0.05max 0.075max								
			(16V and o	,	(25V and over)					
		_	0.075max (1 0.075max	UV)	0.1max(16V, C<1.0μF) 0.125max(16V, C 1.0μF)					
		(Class)	(6.3V except	ot Table 1)	0.15max (10V)					
		(Class)	0.125max*	10010 1)	0.195max (6.3V)					
			(refer to Ta	ble 1)						
			X(X6S) 0.11	max (6.3V a	ind below)					
		Insulation Resistance	1,000 MΩ or	50MΩ·µF whi	chever is smaller.					
		Appearance	No mechanio	al damage	shall occur.	Capacitor	r shall be subjected	d to 5 cycles.		
			Charact	eristics	Capacitance Change	Condition	for 1 cycle :			
			Class		Within ±2.5% or ±0.25pF	Step	Temp.()	Time(min.)		
					Whichever is larger	1	Min. operating	30		
		Capacitance	Class	A(X5R)/ B(X7R)/	Within ±7.5%	2	temp.+0/-3 25	2~3		
16	Temperature			X(X6S)	Within ±15%	3	Max. operating	30		
0	Cycle			F(Y5V)	Within ±20%		temp.+3/-0	30		
		Q	Within the -	opolified inter-		4	25	2~3		
		(Class)	Within the s	pecinea initia	ai value	Leave the	e capacitor in amb	ient condition		
		Tan	Within the s	pecified initia	al value		fied time* before m	easurement		
		(Class)				* 24 ± 2 hours (Class)				
		Insulation	Within the s	pecified initia	al value	48 ± 4	hours (Class)			
		Resistance								



SAMSUNG ELECTRO-MECHANICS

RELIABILTY TEST CONDITION

		Reco	ommended Sold	ering Method		
		Size	Temperature		Cond	ition
		inch (mm)	Characteristic	Capacitance	Flow	Reflow
		0201 (0603)	-	-	-	
		0402 (1005)				
			Class I	-		
		0603 (1608)	Class II	C < 1µF		
			Class II	C 1 <i>µ</i> F	-	
	Recommended Soldering Method By Size & Capacitance	0805 (2012)	Class I	-		
18			Class II	C < 4.7μF		
				C 4.7μF	-	
	-,		Array	-	-	
			Class I	-		
		1206 (3216)	Class II	C < 10 <i>µ</i> F		
		1200 (3210)		C 10 <i>µ</i> F	-	
			Array	-	-	
		1210 (3225)				
		1808 (4520)			_ [
		1812 (4532)	-	-	-	
		2220 (5750)				

Note1. Initial Measurement For Class

Perform the heat treatment at 150 \pm +0/-10 for 1 hour. Then Leave the capacitor in ambient condition for 48±4 hours before measurement.

Note2. Latter Measurement

1. CLASS

Leave the capacitor in ambient condition for 24±2 hours before measurement

*Table2.

Then perform the measurement.

2. Class

Perform the heat treatment at 150 + 0/-10 for 1 hour. Then Leave the capacitor in ambient condition for 48 ± 4 hours before measurement. Then perform the measurement.

*Table1.

Tan	0.125max*						
Tan Class A(X5R), B(X7R)	0.1 0201 C 0402 C 0603 C 0805 C 1206 C 1210 C 1812 C 2220 C All Low P	0.022μF 0.22μF 2.2μF 4.7μF 10.0μF 22.0μF 47.0μF 100.0μF					
	Capacitors	(P.16).					

<u> </u>		
High Tem	perature Re	sistance test
C (Y5V)	+30-	~ - 40%
	0402 C	0.47 <i>µ</i> F
	0603 C	2.2µF
Class	0805 C	4.7μF
Class F(Y5V)	1206 C	10.0 <i>µ</i> F
F(15V)	1210 C	22.0 <i>µ</i> F
	1812 C	47.0 <i>µ</i> F
	2220 C	100.0 <i>µ</i> F
L		

*Table3.

	High Temperature Resistance test												
Applied Voltage		f the rated oltage		f the rated Itage									
Class A(X5R), B(X7R), X(X6S), F(Y5V)	0201 C 0402 C 0603 C 0805 C 1206 C 1210 C All Low Capacitor		0201 C 0402 C 0603 C 0805 C 1206 C 1210 C 1812 C 2220 C	0.022μF 0.47μF 2.2μF 4.7μF 10.0μF 22.0μF 47.0μF 100.0μF									

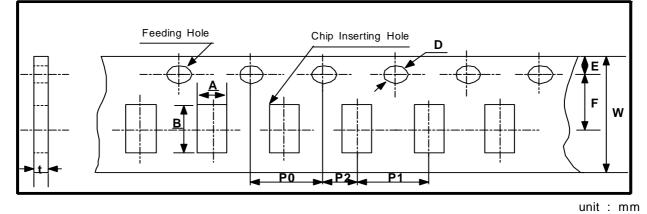
Note3. All Size In Reliability Test Condition Section is "inch"



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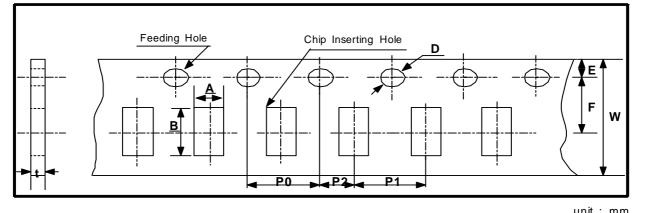
PACKAGING

CARDBOARD PAPER TAPE (4mm)



	vmbol ype	Α	В	W	F	E	P1	P2	P0	D	t
D i m	0603 (1608)	1.1 ±0.2	1.9 ±0.2								
e n s	0805 (2012)	1.6 ±0.2	2.4 ±0.2	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	1.5 +0.1/-0	1.1 Below
i o n	1206 (3216)	2.0 ±0.2	3.6 ±0.2	•							

CARDBOARD PAPER TAPE (2mm)



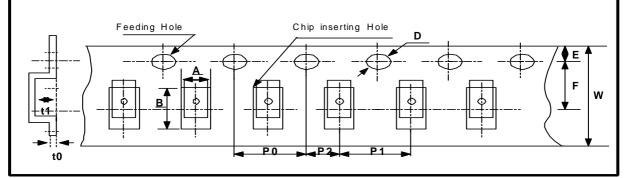
Symbol Type		А	В	w	F	Е	P1	P2	P0	D	t
D i m e	0201 (0603)	0.38 ±0.03	0.68 ±0.03	8.0	3.5	1.75	2.0	2.0	4.0	1.5	0.37 ±0.03
n s i o n	0402 (1005)	0.62 ±0.04	1.12 ±0.04	±0.3	±0.05	±0.1	±0.05	±0.05	±0.1	+0.1/-0.03	0.6 ±0.05



SAMSUNG ELECTRO-MECHANICS

PACKAGING

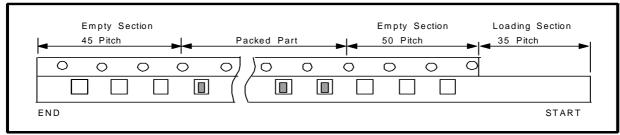
EMBOSSED PLASTIC TAPE



unit:mm

	m bol ype	А	В	w	F	Е	P1	P 2	P 0	D	t1	t0
	0805 (2012)	1.45 ±0.2	2.3 ±0.2									
D	1206 (3216)	1.9 ±0.2	3.5 ±0.2	8.0 ±0.3	3.5 ±0.05		4.0 ±0.1				2.5 max	
m e	1210 (3225)	2.9 ±0.2	3.7 ±0.2			1.75		2.0	4.0	1.5 +0.1/-0		0.6
n s i	1808 (4520)	2.3 ±0.2	4.9 ±0.2			±0.1		±0.05	±0.1	+0.17-0		Below
o n	1812 (4532)	3.6 ±0.2	4.9 ±0.2	12.0 ±0.3	5.60 ±0.05		8.0 ±0.1				3.8 max	
	2220 (5750)	5.5 ±0.2	6.2 ±0.2									

TAPING SIZE

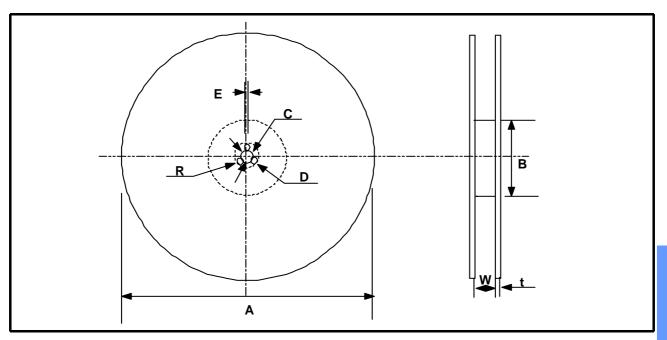


Туре	Symbol	Size	Cardboard Paper Tape	Symbol	Size	Embossed Plastic Tape
	0201(06	0201(0603)	10,000		All Size 3216 1210(3225),1808(4520) (t 1.6mm)	2,000
7" Reel	С	0402(1005)	10,000	E	1210(3225)(t 2.0mm)	1,000
		OTHERS	4,000		1808(4520)(t 2.0mm)	1,000
10" Reel	0	-	10,000	-	-	-
	D	0402(1005)	50,000		All Size 3216 1210(3225),1808(4520) (t<1.6mm)	10,000
		OTHERS	10,000		1210(3225)(1.6 t<2.0mm) 1206(3216)(1.6 t)	Plastic Tape 2,000 1,000 1,000 -
13" Reel	0603	0603(1608)	10,000 or 15,000	F	1210(3225),1808(4520) (t 2.0mm)	4,000
	L	0805(2012) (t 0.85mm)	15,000 or 10,000(Option)		1812(4532)(t 2.0mm)	4,000
		1206(3216) (t 0.85mm)	10,000		1812(4532)(t>2.0mm) 5750(2220)	2,000



PACKAGING

REEL DIMENSION



unit : mm

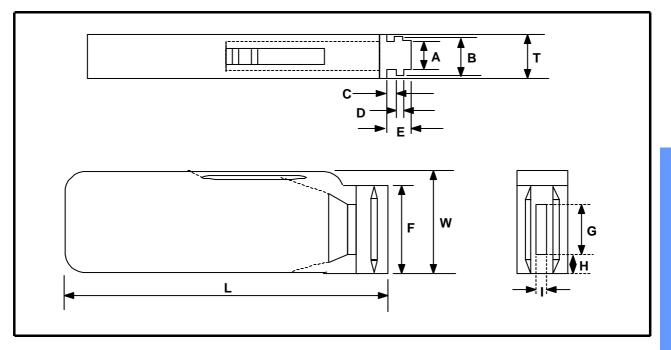
Symbol	Α	В	С	D	E	W	t	R
7" Reel	180+0/ -3	60+1/ -3	42 . 0.2		20.05	0.45	1.2 ± 0.2	1.0
13" Reel	330±2.0	80+1/ -3	13±0.3	25±0.5	2.0±0.5	9±1.5	2.2±0.2	1.0

General Capacitors



BULK CASE PACKAGING

- Bulk case packaging can reduce the stock space and transportation costs.
- The bulk feeding system can increase the productivity.
- It can eliminate the components loss.



unit : mm

Symbol	Α	В	Т	С	D	E
Dimension	6.8±0.1	8.8±0.1	12±0.1	1.5+0.1/-0	2+0/-0.1	3.0+0.2/-0

Symbol	F	W	G	Н	L	I
Dimension	31.5+0.2/-0	36+0/-0.2	19±0.35	7±0.35	110±0.7	5±0.35

QUANTITY OF BULK CASE PACKAGING

unit : pcs

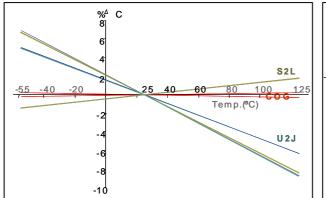
Cina	0402(4005)	0602(1608)		05(2012)	
Size	0402(1005)	0603(1608)	T=0.65mm	T=0.85mm	
Quantity	50,000	10,000 or 15,000	10,000	5,000 or 10,000	

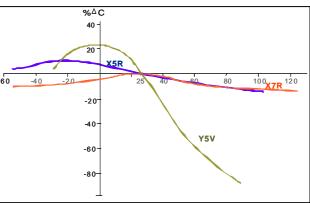


APPLICATION MANUAL

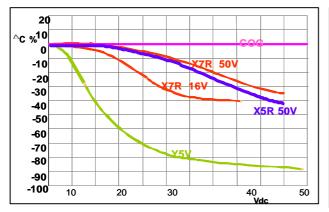
ELECTRICAL CHARACTERISTICS

CAPACITANCE - TEMPERATURE CHARACTERISTICS

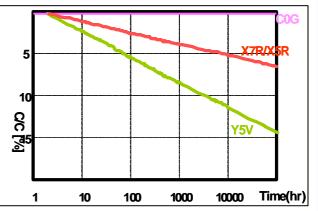




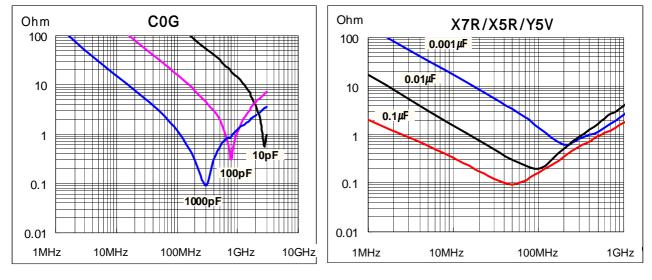
CAPACITANCE - DC VOLTAGE CHARACTERISTICS







IMPEDANCE - FREQUENCY CHARACTERISTICS





STORAGE CONDITION

Storage Environment

The electrical characteristics of MLCCs were degraded by the environment of high temperature or humidity. Therefore, the MLCCs shall be stored in the ambient temperature and the relative humidity of less than 40 and 70%, respectively.

Guaranteed storage period is within 6 months from the outgoing date of delivery.

Corrosive Gases

Since the solderability of the end termination in MLCC was degraded by a chemical atmosphere such as chlorine, acid or sulfide gases, MLCCs must be avoid from these gases.

Temperature Fluctuations

Since dew condensation may occur by the differences in temperature when the MLCCs are taken out of storage, it is important to maintain the temperature-controlled environment.

DESIGN OF LAND PATTERN

When designing printed circuit boards, the shape and size of the lands must allow for the proper amount of solder on the capacitor.

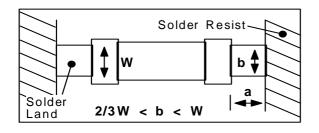
The amount of solder at the end terminations has a direct effect on the crack.

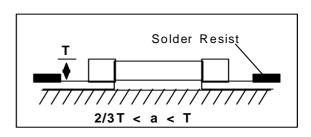
The crack in MLCC will be easily occurred by the tensile stress which was due to too much amount

of solder. In contrast, if too little solder is applied, the termination strength will be insufficiently.

Use the following illustrations as guidelines for proper land design.

Recommendation of Land Shape and Size.







ADHESIVES

When flow soldering the MLCCs, apply the adhesive in accordance with the following conditions.

Requirements for Adhesives

They must have enough adhesion, so that, the chips will not fall off or move during the handling of the circuit board.

They must maintain their adhesive strength when exposed to soldering temperature.

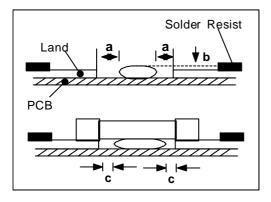
They should not spread or run when applied to the circuit board.

They should harden quickly. They should not corrode the circuit board or chip material.

They should be a good insulator. They should be non-toxic, and not produce harmful gases, nor be harmful when touched.

Application Method

It is important to use the proper amount of adhesive. Too little and much adhesive will cause poor adhesion and overflow into the land, respectively.



		unit : mm
Туре	21	31
а	0.2 min	0.2 min
b	70~100µm	70~100µm
С	> 0	> 0

Adhesive hardening Characteristics

To prevent oxidation of the terminations, the adhesive must harden at 160 or less, within 2 minutes or less.

MOUNTING

Mounting Head Pressure

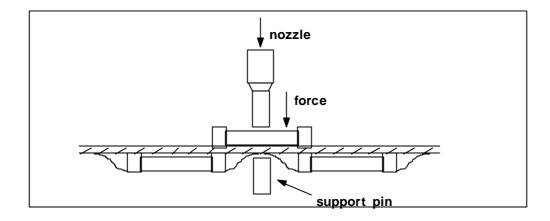
Excessive pressure will cause crack to MLCCs. The pressure of nozzle will be 300g maximum during mounting.



Bending Stress

When double-sided circuit boards are used, MLCCs first are mounted and soldered onto one side of the board. When the MLCCs are mounted onto the other side,

it is important to support the board as shown in the illustration. If the circuit board is not supported, the crack occur to the ready-installed MLCCs by the bending stress.



Manual Soldering

Manual soldering can pose a great risk of creating thermal cracks in chip capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator's carelessness may cause the tip of the soldering iron to come into direct contact with the ceramic body of the capacitor.

Therefore the soldering iron must be handled carefully, and close attention must be paid to the selection of the soldering iron tip and to temperature control of the tip.

Amount of Solder

Too much Solder	Cracks tend to occur due to large stress
Not enough Solder	Weak holding force may cause bad connections or detaching of the capacitor
Good	-



Cooling

Natural cooling using air is recommended. If the chips are dipped into solvent for cleaning, the temperature difference(T) must be less than 100

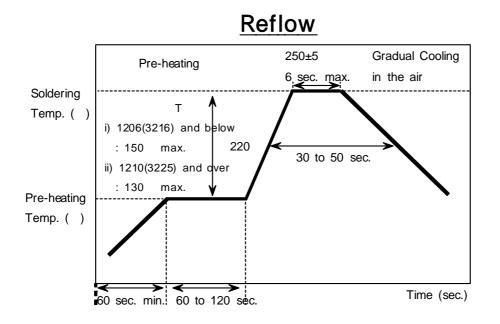
Cleaning

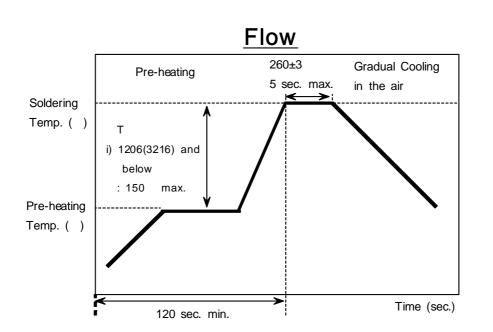
If rosin flux is used, cleaning usually is unnecessary. When strongly activated flux is used, chlorine in the flux may dissolve into some types of cleaning fluids, thereby affecting the chip capacitors. This means that the cleaning fluid must be carefully selected, and should always be new.

Notes for Separating Multiple, Shared PC Boards.

A multi-PC board is separated into many individual circuit boards after soldering has been completed. If the board is bent or distorted at the time of separation, cracks may occur in the chip capacitors. Carefully choose a separation method that minimizes the bending often circuit board.

Recommended Soldering Profile





The Inside Edge

Soldering Iron

Variation of Temp.	Soldering	Pre-heating	Soldering	Cooling
	Temp()	Time (Sec)	Time(Sec)	Time(Sec)
T 130	300±10 max	60	4	-

Condition of Iron facilities					
Wattage	Tip Diameter	Soldering Time			
20W Max	3mm Max	4 Sec Max			

* Caution - Iron Tip Should Not Contact With Ceramic Body Directly.

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