CMS-XXXX

SUMMARY

Types of Dielectric Material and Capacitor

※HIGH FREQUENCY TYPE: The capacitor of this kind dielectric material is considered as Class I capacitor, including high frequency COG, COH capacitor and temperature compensating capacitor such as HG, LG, PH, RH,SH, TH, UJ, SL. The electrical properties of COG, COH capacitor are the most stable one and change invariablly with temperature, voltage and time. They are suited for applications where low-losses and high-stability are required, HG,LG,PH,RH,SH,TH,UJ,SL capacitor's capacitance changes with temperature.They are suited for applications where low-losses and temperature compensating circuits.

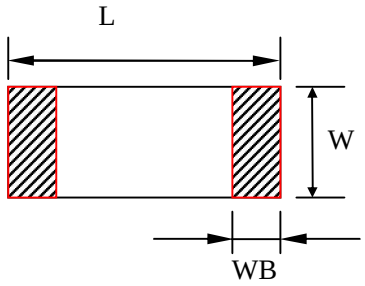
X7R、X5R、X7S、X6S：X7R、X5R、 X7S、X6S a kind of material has high dielectric constant. The capacitor made of this kind material is considered as Class II capacitor whose capacitance is higher than that of class. These capacitors are classified as having a semi-stable temperature characteristic and used over a wide temperature range, such in these kinds of circuits, DC-blocking, decoupling, bypassing, frequency discriminating etc.

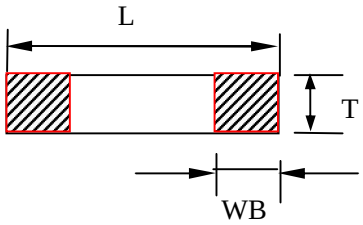
Y5V：The capacitor made of this kind of material is the highest dielectric constant of all ceramic capacitors. They are used over a moderate temperature range in application where high capacitance is required because of its unstable temperature coefficient, but where moderate losses and capacitance changes can be tolerated. Its capacitance and dissipation factors are sensible to measuring conditions, such as temperature and voltage, etc.

Z5U：The capacitor made of this kind of material is considered as Class II capacitor, whose temperature characteristic is between that of X7R and Y5V. The capacitance of this kind of capacitor is unstable and sensible to temperature and voltage. Ideally suited for bypassing and decoupling application circuits operating with low DC bias in the environment approaches to room temperature.

DIMENSIONS AND STRUCTURE

DIMENSIONS

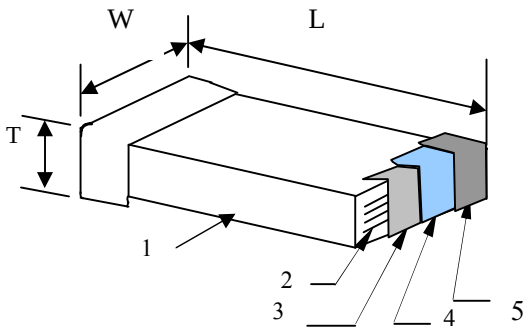




Type		Dimensions (mm)			
British expression	Metric expression	L	W	T	WB
0201	0603	0.6±0.03	0.3±0.03	0.3±0.03	0.15±0.10
0402	1005	1.00±0.05	0.50±0.05	0.50±0.05	0.25±0.10
0603	1608	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.10
0805	2012	2.00±0.20	1.25±0.20	≤0.55 0.80±0.20 1.00±0.20 1.25±0.20	0.50±0.20
1206	3216	3.20±0.30	1.60±0.30	0.80±0.20 1.00±0.20 1.25±0.20 1.60±0.30	0.60±0.30
1210	3225	3.20±0.30	2.50±0.30	≤2.80	0.60±0.30
1808	4520	4.50±0.40	2.00±0.20	≤2.20	0.60±0.30
1812	4532	4.50±0.40	3.20±0.30	≤3.50	0.60±0.30
2220	5750	5.70±0.40	5.00±0.40	≤3.50	0.60±0.30
2225	5763	5.70±0.50	6.30±0.50	≤6.20	0.60±0.30
3012	7632	7.60±0.50	3.20±0.30	≤8.10	0.60±0.30
3035	7690	7.60±0.50	9.00±0.50	≤8.10	0.60±0.30

Note： We can design according to customer special requirements

STRUCTURE



NO	Name
1	Ceramic dielectric
2	Inner electrodee
3	Substrate electrode
4	Nickel Layer
5	Tin Layer

HOW TO ORDER

0805	CG	101	J	500	N	T
①	②	③	④	⑤	⑥	⑦

NOTES

①DIMENSIONS

Size Code	0201	0402	0603	0805	1206	1210	1808	1812	2220	2225	3035
(L×W) inch	0.02×0.01	0.04×0.02	0.06×0.03	0.08×0.05	0.12×0.06	0.12×0.10	0.18×0.08	0.18×0.12	0.22×0.20	0.22×0.25	0.30×0.35
(L×W) mm	0.60×0.30	1.00×0.50	1.60×0.80	2.00×1.25	3.20×1.60	3.20×2.50	4.50×2.00	4.50×3.20	5.70×5.00	5.70×6.30	7.60×9.00

DIELECTRIC STYLE

(Dielectric Code)	CG	CH	HG	LG	PH	RH	SH	TH	UJ	SL	X	B	BS	DS	E	F
(Dielectric)	COG	COH	HG	LG	PH	RH	SH	TH	UJ	SL	X5R	X7R	X7S	X6S	Z5U	Y5V

③ NOMINAL CAPACITANCE (unit)：pF

(Express Method)	(Actual Value)	
0R5	0.5	Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
1R0	1.0	
102	10×10^2	
224	22×10^4	
…	…	

④ CAPACITANCE TOLERANCE

(Code)	A	B	C	D	F	G	J	K	M	S	Z
(Tolerance)	± 0.05pF	± 0.10pF	± 0.25pF	± 0.5pF	± 1.0%	± 2.0%	± 5.0%	±10%	±20%	+50% -20%	+80% -20%

A、B、C、D ≤ 10pF

Note：These capacitance tolerance A，B, C, D are just applicable the capacitance that equals to or less than 10pF

⑤ RATED VOLTAGE (unit)：V

(Express Method))	(Actual Value))	Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
6R3	6.3	
500	50×10^{0}	
201	20×10^{1}	
102	10×10^{2}	
…	…	

⑥ TERMINAL MATERIAL STYLES

（Termination Styles）	**(Express Method)**
（Silver Solderable Termination）	S
（Copper Solderable Termination）	C
（Nickel Barrier Termination）	N

⑦ PACKAGE STYLES

B	T
（Bulk Bag）	（Taping Package）

Temperature Coefficient /Characteristics

Dielectric	Reference Temperature Point	Temperature Coefficient	Operation Temperature Range
COG	20°C	0±30 ppm/℃	-55℃～125℃
COH	20°C	0±60 ppm/℃	-55℃～125℃
HG	20°C	-33±30 ppm/℃	-25℃～85℃
LG	20°C	-75±30 ppm/℃	-25℃～85℃
PH	20°C	-150± 60 ppm/℃	-25℃～85℃
RH	20°C	-220± 60 ppm/℃	-25℃～85℃
SH	20°C	-330± 60 ppm/℃	-25℃～85℃
TH	20°C	-470± 60 ppm/℃	-25℃～85℃
UJ	20°C	-750± 120 ppm/℃	-25℃～85℃
SL	20°C	-1000～+140 ppm/℃	-25℃～85℃
X7R	20°C	±15%	-55℃～125℃
X5R	20°C	±15%	-55℃～85℃
X7S	20°C	±22%	-55℃～125℃
X6S	20°C	±22%	-55℃～105℃
Z5U	20°C	-56%～+22%	10℃～85℃
Y5V	20°C	-80%～+30%	-25℃～85℃

Note：Nominal temperature coefficient and allowed tolerance of class Ⅰ are decided by the changing of the capacitance between 20°C and 85°C. Nominal temperature coefficient of class Ⅱ are decided by the temperature of 20°C.

Capacitance Range and Operating Voltage

Size Code	Rated Voltage	Capacitance	
		COG(NPO)(PF)	Y5V (Z5U)(PF)
0201	4V	——	——
	6.3V	——	10,000～100,000
	10V	——	——
	16V	——	10,000
	25V	——	——
	50V	0.5～100	——
0402	4V	——	——
	6.3V	——	1,000～1,000,000
	10V	——	1,000～1,000,000
	16V	——	1,000～220,000
	25V	——	1,000～220,000
	50V	0.1～1,000	1,000～100,000
0603	4V	——	——
	6.3V	——	1,000～10,000,000
	10V	——	1,000～10,000,000
	16V	——	1,000～2,200,000
	25V	——	1,000～2,200,000
	50V	0.1～6,800	1,000～1,000,000
0805	4V	——	——
	6.3V	——	1,000～22,000,000
	10V	——	1,000～22,000,000
	16V	——	1,000～22,000,000
	25V	——	1,000～10,000,000
	50V	0.3～22,000	1,000～4,700,000

Size Code	Rated Voltage	Capacitance	
		COG(NPO)(PF)	Y5V (Z5U)(PF)
1206	4V	——	——
	6.3V	——	1,000～47,000,000
	10V	——	1,000～47,000,000
	16V	——	1,000～47,000,000
	25V	——	1,000～10,000,000
	50V	0.3～100,000	1,000～10,000,000
1210	6.3V	——	4,700～100,000,000
	10V	——	4,700～47,000,000
	16V	——	4,700～22,000,000
	25V	——	4,700～10,000,000
	50V	10～100,000	4,700～10,000,000
1808	6.3V	——	——
	10V	——	——
	16V	——	——
	25V	——	——
	50V	10～100,000	——
1812	6.3V	——	10,000～100,000,000
	10V	——	10,000～100,000,000
	16V	——	10,000～22,000,000
	25V	——	10,000～10,000,000
	50V	10～100,000	10,000～10,000,000

Size Code	Rated Voltage	Capacitance			
		X7R (PF)	X7S(PF)	X5R(uF)	X6S(uF)
0201	4V	——	——	0.015 uF～1uF	——
	6.3V	——	——	0.015 uF～1uF	——
	10V	100～10,000	——	0.015 uF～0.1 uF	——
	16V	100～10,000	——	——	——
	25V	100～10,000	——	——	——
	50V	——	——	——	——
0402	4V	——	——	0.1uF~10uF	0.1~2.2 uF
	6.3V	100～470,000	100,000～470,000	0.1uF~4.7uF	0.1~2.2 uF
	10V	100～470,000	100,000～470,000	0.1uF~4.7uF	0.1~1 uF
	16V	100～220,000	47,000～220,000	0.1uF~2.2 uF	——
	25V	100～100,000	22,000～100,000	0.1uF~2.2 uF	——
	50V	100～100,000	4,700～100,000	0.047uF~0.1 uF	——
0603	4V	——	——	0.47uF～22uF	0.1~10 uF
	6.3V	150～2,200,000	470,000～2,200,000	0.47uF～22uF	0.1~10 uF
	10V	150～2,200,000	470,000～2,200,000	0.47uF～10uF	0.1~10 uF
	16V	150～1,000,000	470,000～1,000,000	0.47uF～10uF	0.1~4.7 uF
	25V	150～1,000,000	470,000～1,000,000	0.47uF～10uF	0.1~4.7 uF
	50V	150～470,000	——	0.47uF～1uF	——
0805	4V	——	——	1uF～47uF	0.1~47 uF
	6.3V	150～10,000,000	1,000,000～10,000,000	1uF～47uF	0.1~22 uF
	10V	150～10,000,000	1,000,000～10,000,000	1uF～22uF	0.1~10 uF
	16V	150～4,700,000	1,000,000～4,700,000	1uF～22uF	0.1~10 uF
	25V	150～4,700,000	1,000,000～4,700,000	1uF～10uF	0.1~10 uF
	50V	150～1,000,000	——	——	——

Size Code	Rated Voltage	Capacitance			
		X7R (PF)	X7S (PF)	X5R(uF)	X6S(uF)
1206	4V	——	——	2.2uF ~100uF	——
	6.3V	200～22,000,000	2,200,000～22,000,000	2.2uF～100uF	0.1~100 uF
	10V	200～22,000,000	2,200,000～22,000,000	2.2uF～47uF	0.1~22 uF
	16V	200～10,000,000	2,200,000～10,000,000	2.2uF～22uF	0.1~22 uF
	25V	200～10,000,000	1,500,000～10,000,000	2.2uF～22uF	0.1~10 uF
	50V	200～4,700,000	1,000,000～4,700,000	2.2uF～10uF	——
1210	6.3V	220～47,000,000	——	47uF～100uF	0.1~100 uF
	10V	220～47,000,000	——	4.7uF～100uF	0.1~47 uF
	16V	220～22,000,000	3,300,000～22,000,000	4.7uF～47uF	0.1~22 uF
	25V	220～22,000,000	2,200,000～22,000,000	4.7uF～22uF	0.1~22 uF
	50V	220～10,000,000	1,000,000～10,000,000	——	——
1808	6.3V	220～4,700,000	——	4.7uF～100uF	——
	10V	220～4,700,000	——	4.7uF～47uF	——
	16V	220～4,700,000	——	4.7uF～22uF	——
	25V	220～4,700,000	——	4.7uF～10uF	——
	50V	220～4,700,000	——	——	——
1812	6.3V	——	——	10uF～100uF	——
	10V	——	——	10uF～47uF	——
	16V	470～6,800,000	——	4.7uF～22uF	——
	25V	470～6,800,000	——	4.7uF～10uF	——
	50V	470～4,700,000	——	——	——

Note：We can design according to customer special requirements.

Hi-Q COG MLCC

Application:

Hi-Q COG capacitors are ideally suited for RF and microwave application requiring high Q, low ESR, and high resonant frequency。

●Note for CQ and CG:

※The following Q value is just confirmed by general customer. If there is a higher requirement for Q value requirements, we can design and produce according to the special requirements。

※For the customer whose requirements for frequency is between 1MHz and 2.4GHz or higher frequency, we can design it according to their requirements。

※The frequency of CQ is a little higher than that of CG. Please choose them according to your requirements。

Capacitance value and Q value

Capacitance (pF)	Q value at 300MHz		Capacitance (pF)	Q value at 300MHz		Capacitance (pF)	Q value at 300MHz	
	0805	0603		0805	0603		0805	0603
4.7	≥1000	≥800	12	≥400	≥320	30	≥150	≥120
5.2	≥900	≥720	13	≥375	≥300	33	≥140	≥112
5.6	≥850	≥680	14	≥350	≥280	36	≥130	≥104
6.2	≥800	≥640	15	≥325	≥260	39	≥120	≥96
6.8	≥700	≥560	16	≥300	≥240	43	≥110	≥88
7.5	≥650	≥520	18	≥250	≥200	47	≥100	≥80
8.2	≥575	≥460	20	≥225	≥180	56	≥80	≥80
9.1	≥525	≥420	22	≥215	≥172	62	≥80	≥80
10	≥500	≥400	24	≥200	≥160	68	≥80	≥80
11	≥450	≥360	27	≥175	≥140	82	≥80	≥80

HIGH VOLTAGE MLCC

Middle & high voltage MLCC is a kind of special design 、special technology MLCC that bases on the technology of general MLCC. This kind of MLCC has stable high voltage reliability and suitable to SMT. Middle & high MLCC is widely applicable for many direct high voltage circuits in which it can improve the performance of the circuit.

APPLICATIONS

※Analog & Digital Modems
※LAN/WAN Interface
※Lighting Ballast Circuits
※Voltage Multipliers
※DC-DC Converters
※Back-lighting Inverters

unit: pF

		Capacitance		
Size Code	Rated Voltage	NPO	X7R	Y5V
0603	100V	0.5～1,000	150～100,000	2,200～100,000
	200V	0.5～470	150～10,000	——
	250V	0.5～470	150～10,000	——
0805	100V	0.5～3,300	150～100,000	10,000～100,000
	200V	0.1～1,500	150～22,000	10,000～47,000
	250V	0.1～1,500	150～22,000	10,000～47,000
	500V	0.1～470	150～10,000	——
	630V	0.1～470	150～10,000	——
	1000V	0.1～100	——	——
1206	100V	0.5～3,300	150～1,000,000	15,000～470,000
	200V	0.1～2,700	150～220,000	10,000～220,000
	250V	0.1～2,700	150～220,000	10,000～220,000
	500V	0.1～1,500	150～33,000	——
	630V	0.1～1,500	150～33,000	——
	1000V	0.1～1,000	150～10,000	——
	2000V	0.1～270	150～2,700	——

unit: pF

Size Code	Rated Voltage	Capacitance		
		NPO	X7R	Y5V
1210	100V	1.0～6,800	150～2,200,000	15,000～1,000,000
	200V	1.0～3,300	150～220,000	15,000～470,000
	250V	1.0～3,300	150～220,000	15,000～470,000
	500V	1.0～2,200	150～68,000	——
	630V	1.0～2,200	150～68,000	——
	1000V	1.0～1,000	150～22,000	——
	2000V	1.0～470	150～10,000	——
	3000V	——	150～680	——
	4000V	——	150～680	——
1808	100V	2.0～4,700	220～2,200,000	150,000～1,000,000
	200V	2.0～3,900	220～220,000	10,000～390,000
	250V	2.0～3,900	220～220,000	10,000～390,000
	500V	2.0～2,700	220～68,000	——
	630V	2.0～2,700	220～68,000	——
	1000V	2.0～1,000	150～22,000	——
	2000V	2.0～470	150～10,000	——
	3000V	2.0～330	150～4,700	——
	4000V	2.0～33	150～2,200	——
	5000V	2.0～33	——	——
1812	100V	3.0～10,000	270～1,000,000	150,000～2,200,000
	200V	3.0～6,800	270～560,000	100,000～470,000
	250V	3.0～6,800	270～560,000	100,000～470,000
	500V	3.0～4,700	270～150,000	——
	630V	3.0～4,700	270～150,000	——
	1000V	3.0～1,200	270～56,000	——
	2000V	3.0～1,000	270～12,000	——
	3000V	3.0～560	270～4,700	——
	4000V	3.0～220	270～3,300	——
	5000V	3.0～68	——	——
1825	100V	3.0～22,000	12,000～1,200,000	150,000～2,200,000
	200V	3.0～8,200	12,000～1,000,000	100,000～470,000
	250V	3.0～8,200	12,000～1,000,000	100,000～470,000
	500V	3.0～5,600	1,000～470,000	——
	630V	3.0～5,600	1,000～470,000	——
	1000V	3.0～1,800	1,000～100,000	——
	2000V	3.0～1,000	1,000～22,000	——
	3000V	3.0～680	1,000～10,000	——
	4000V	3.0～470	1,000～6,800	——
	5000V	3.0～82	——	——

Size Code	Rated Voltage	Capacitance		
		NPO	X7R	Y5V
2220	100V	5.0～27,000	22,000～1,200,000	150,000～1,500,000
	200V	5.0～12,000	22,000～1,000,000	100,000～1,000,000
	250V	5.0～12,000	22,000～1,000,000	100,000～1,000,000
	500V	5.0～6,800	1,500～470,000	——
	630V	5.0～6,800	1,500～470,000	——
	1000V	5.0～3,900	1,500～100,000	——
	2000V	5.0～1,000	1,500～33,000	——
	3000V	5.0～680	1,500～10,000	——
	4000V	5.0～560	1,500～6,800	——
	5000V	5.0～120	——	——
2225	100V	5.0～27,000	2,200～2,200,000	250,000～3,300,000
	200V	5.0～12,000	2,200～2,200,000	220,000～2,200,000
	250V	5.0～12,000	2,200～2,200,000	220,000～2,200,000
	500V	5.0～6,800	2,200～470,000	——
	630V	5.0～6,800	2,200～470,000	——
	1000V	5.0～3,900	2,200～100,000	——
	2000V	5.0～1,000	2,200～47,000	——
	3000V	5.0～680	2,200～15,000	——
	4000V	5.0～560	2,200～6,800	——
	5000V	5.0～120	——	——
3012	100V	5.0～27,000	150～3,300,000	15,000～1,500,000
	200V	5.0～12,000	150～2,200,000	15,000～1,000,000
	250V	5.0～12,000	150～1,200,000	——
	500V	5.0～6,800	150～220,000	——
	630V	5.0～6,800	150～150,000	——
	1000V	5.0～3,900	150～47,000	——
	2000V	5.0～1,000	150～33,000	——
	3000V	5.0～1,000	150~10,000	——
	4000V	5.0～1,000	150~8,200	——
3035	100V	5.0～27,000	47,000～4,700,000	10,000～2,200,000
	200V	5.0～12,000	47,000～2,200,000	10,000～2,200,000
	250V	5.0～12,000	47,000～2,200,000	10,000～2,200,000
	500V	5.0～6,800	5,600～1,000,000	——
	630V	5.0～6,800	5,600～470,000	——
	1000V	5.0～3,900	5,600～56,000	——
	2000V	5.0～1,000	5,600～47,000	——

Note：We can design according to customer special requirements.

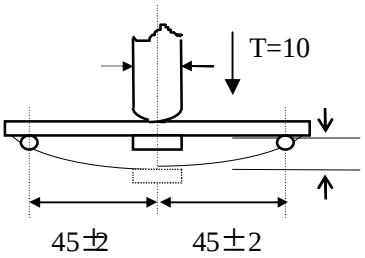
Measurement method of dielectric withstanding voltage for high voltage MLCC

Rated voltage range	Measuring Method
100V≤Vr＜500V	Force 200%Rated voltage for 5 second. Max..current should not exceed 50 mA.
500V≤Vr≤1000V	Force 150%Rated voltage for 5 second. Max..current should not exceed 50 mA. .
1000V＜Vr≤2000V	Force 120%Rated voltage for 5 second. Max..current should not exceed 50 mA. .
2000V＜Vr≤5000V	Force 200%Rated voltage for 5 second. Max..current should not exceed 10 mA.

Reliability Test

<table>
<tr><th>Item</th><th colspan="2">Technical Specification</th><th colspan="3">Test Method and Remarks</th></tr>
<tr><td rowspan="5">Capacitance</td><td rowspan="3">Class Ⅰ</td><td rowspan="3">Should be within the specified tolerance.</td><td>Capacitance</td><td>Measuring Frequency</td><td>Measuring Voltage</td></tr>
<tr><td>≤1000pF</td><td>1MHZ±10%</td><td rowspan="2">1.0±0.2Vrms</td></tr>
<tr><td>＞1000 pF</td><td>1KHZ±10%</td></tr>
<tr><td rowspan="2">Class Ⅱ</td><td rowspan="2">Should be within the specified tolerance.</td><td colspan="3">Test Temprature: 25℃±3℃
C≤10μF：
Test Frequency: 1KHZ±10%
Test Voltage: 1.0±0.2Vrms
C＞10μF
X7R、X5R、X7S、X6S、Y5V
Test Frequency: 120±24 HZ
Test Voltage: 0.5±0.1Vrms
Z5U：
Test Frequency: 1±0.1KHZ
Test Voltage: 0.5±0.05Vrms</td></tr>
<tr><td rowspan="5">(DF, tan δ) Dissipation Factor</td><td rowspan="5">Class Ⅰ</td><td>DF</td><td>Capacitance</td><td>Measuring Frequency</td><td>Measuring Voltage</td></tr>
<tr><td>≤0.56%</td><td>Cr＜5 pF</td><td>1MHZ±10%</td><td rowspan="4">1.0±0.2Vrms</td></tr>
<tr><td>1.5[(150/Cr)+7]×10^{-4}</td><td>5pF≤Cr＜50 pF</td><td>1MHZ±10%</td></tr>
<tr><td>≤0.15%</td><td>50pF≤Cr≤1000 pF</td><td>1MHZ±10%</td></tr>
<tr><td>≤0.15%</td><td>＞1000 pF</td><td>1KHZ±10%</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="7">Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td rowspan="7">(DF, tan δ) Dissipation Factor</td><td rowspan="4">Class Ⅱ</td><td rowspan="2">X7R/ X5R X7S/ X6S (≥ 0402)</td><td>≥ 50V</td><td>25V</td><td>16V</td><td>10V</td><td>6.3V</td><td rowspan="2">C≤10μF
Test Frequency: 1KHZ±10%
Test Voltage: 1.0±0.2Vrms</td></tr>
<tr><td>≤ 2.5%</td><td>≤3.5% （C＜ 0.47μF） ≤10.0% （C ≥ 0.47μF）</td><td>≤3.5% （C＜ 0.47μF） ≤10.0% （C ≥ 0.47μF）</td><td>≤5.0% （C＜ 0.15μF） ≤10.0% （C ≥ 0.15μF）</td><td>≤5.0% （C＜ 0.15μF） ≤10.0% （C ≥ 0.15μF）</td></tr>
<tr><td rowspan="2">X7R/ X5R X7S/ X6S (＜ 0402)</td><td>≥ 50V</td><td>25V</td><td>16V</td><td>10V</td><td>6.3V</td><td rowspan="2">C＞10μF
X7R、X5R、X7S、X6S、Y5V
Test Frequency: 120±24 HZ
Test Voltage: 0.5±0.1Vrms Z5U
:1±0.1KHZ
Test Frequency: 1±0.1KHZ
Test Voltage: 0.5±0.05Vrms</td></tr>
<tr><td>≤ 3.5%</td><td>≤5.0%</td><td>≤5.0% （C＜ 0.047μF） ≤10% （C ＞ 0.047μF）</td><td>≤7.5% （C＜ 0.047μF） ≤10% （C ＞ 0.047μF）</td><td>≤7.5% （C＜ 0.047μF） ≤10% （C ＞ 0.047μF）</td></tr>
<tr><td rowspan="2">Y5V Z5U</td><td colspan="2">≥25V</td><td colspan="2">16V</td><td>10V</td><td>6.3V</td></tr>
<tr><td colspan="2">≤7.0% (C＜1.0μF) ≤9.0% (C≥1.0μF)</td><td colspan="2">≤15%</td><td>≤15%</td><td>≤15%</td></tr>
<tr><td rowspan="3">(IR) Insulation Resistance</td><td>Class Ⅰ</td><td colspan="7">C≤10 nF, Ri≥50000MΩ
C＞10 nF, Ri CR≥500S</td><td rowspan="3">Measuring Voltage: Rated Voltage（Max 500V）
Duration: 60±5s
Test Humidity: ≤75%
Test Temprature: 25℃±5℃
Test Current: ≤50mA</td></tr>
<tr><td rowspan="2">Class Ⅱ</td><td>X7R/ X5R/ X7S/ X6S</td><td colspan="6">C≤25 nF, Ri≥10000MΩ
C＞25 nF, Ri CR＞100S</td></tr>
<tr><td>Y5V Z5U</td><td colspan="6">C≤25 nF, Ri≥4000MΩ
C＞25 nF, Ri CR＞100S</td></tr>
<tr><td>(DWV) Dielectric Withstanding Voltage</td><td colspan="7">No breakdown or damage.</td><td>Measuring Voltage:
Class Ⅰ:300% Rated voltage
Class Ⅱ:250% Rated voltage
Duration: 1～5s
Charge/ Discharge Current: 50mA max.
(This method excludes high-voltage MLCC)</td></tr>
</table>

<table>
<tr><th>Item</th><th colspan="4">Technical Specification</th><th colspan="2">Test Method and Remarks</th></tr>
<tr><td rowspan="2">Solderability</td><td colspan="4" rowspan="2">At least 95% of the terminal electrode is covered by new solder.
Visual Appearance: No visible damage.</td><td colspan="2">Preheating conditions:80 to 120℃; 10~30s.</td></tr>
<tr><td>Solder Temperature: 235±5℃
Duration: 2±0.5s</td><td>Solder Temperature: 245±5℃
Duration: 2±0.5s</td></tr>
<tr><td rowspan="5">Resistance to Soldering Heat</td><td>Item</td><td>NPO to SL</td><td>X7R/X5R/ X7S/X6S</td><td>Y5V, Z5U</td><td colspan="2" rowspan="5">Preheating conditions: 100 to 200℃; 10±2min.
Solder Temperature: 265±5℃
Duration: 10±1s
Clean the capacitor with solvent and examine it with a 10X(min.) microscope.
Recovery Time: 24±2h
Recovery condition: Room temperature</td></tr>
<tr><td>ΔC/C</td><td>≤±0.5% or ±0.5PF, whichever is larger</td><td>-5~+10%</td><td>-10~+20%</td></tr>
<tr><td>DF</td><td colspan="3">Same to initial value. .</td></tr>
<tr><td>IR</td><td colspan="3">Same to initial value. value.</td></tr>
<tr><td colspan="4">Appearance：No visible damage.At least 95% of the terminal electrode is covered by new solder</td></tr>
<tr><td rowspan="2">Resistance to Flexure of Substrate (Bending Strength)</td><td colspan="4">Appearance: No visible damage. .</td><td colspan="2" rowspan="2"> 

Test Board: Al2O3 or PCB
Warp: 1mm
Speed: 0.5mm/sec.
Unit: mm
The measurement should be made with the board in the bending position.</td></tr>
<tr><td colspan="2">ΔC/C</td><td colspan="2">≤±10%</td></tr>
</table>

<table>
<tr><th>Item</th><th>Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td>Termination Adhesion</td><td>No visible damage. .</td><td>Applied Force: 5N Duration: 10±1S</td></tr>
<tr><td>Temperature Cycle</td><td>ΔC/C:

Class Ⅰ: ≤±1% or ±1pF, whichever is larger.
Class Ⅱ:
B,X,BS,DS: ≤±10%
E,F: ≤±20%</td><td>Initial Measurement
Cycling Times: 5 times, 1 cycle, 4 steps:
<table>
<tr><th>Step</th><th>Temperature（℃）</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>Low-category temp. (NPO/X7R/X7S/X6S/X5R:-55 Y5V:-25 Z5U:+10)</td><td>30</td></tr>
<tr><td>2</td><td>Normal temp. (+20)</td><td>2～3</td></tr>
<tr><td>3</td><td>Up-category temp. (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)</td><td>30</td></tr>
<tr><td>4</td><td>Normal temp. (+20)</td><td>2～3</td></tr>
</table>
Recovery time after test: 24±2h</td></tr>
<tr><td rowspan="5">Moisture Resistance</td><td>ΔC/C:</td><td>Class Ⅰ: ≤±2% or ±1pF,
whichever is larger.
Class Ⅱ: B,X,BS,DS:≤±10</td><td rowspan="5">Temperature：40±2℃
Humidity：90~95%RH
Duration：500h
Recovery conditions：Room temperature
Recovery Time：24h (Class1) or 48h (Class2)</td></tr>
<tr><td>DF</td><td>Not more than twice of initial value.</td></tr>
<tr><td rowspan="2">IR</td><td>Class Ⅰ: Ri≥2500MΩ或 Ri CR≥ 25S whichever is smaller.</td></tr>
<tr><td>Class Ⅱ: Ri≥1000MΩ或 Ri CR≥ 25S whichever is smaller.</td></tr>
<tr><td colspan="2">Appearance: No visible damage. .</td></tr>
</table>

Item	Technical Specification		Test Method and Remarks
Life Test	Δ C/C	Class Ⅰ:≤±2% or ±1pF, whichever is larger. Class Ⅱ: B,X,BS,DS: ≤±20% E,F: ≤±30%	Low-Voltage（≤100V） Applied Voltage: 1.5 × Rated Voltage Duration: 1000h Temperature：125℃（NPO、X7R、X7S） 85℃（X5R、 Y5V）105℃（X6S） Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2)
	DF	Not more than twice of initial value.	
	IR	Class Ⅰ: Ri≥4000MΩ或 Ri CR≥ 40S whichever is smaller.	
		Class Ⅱ: Ri≥2000MΩ或 Ri CR≥ 50S whichever is smaller.	
	Visual Appearance: No visible damage.		
Middle &high voltage Life Test	Δ C/C	Class Ⅰ:≤±2% or ±1pF, whichever is larger. Class Ⅱ: B,X,BS,DS: ≤±20% E,F: ≤±30%	Applied Voltage: 100V≤Rated Voltage＜500V：2 Multiple 500V≤Rated Voltage≤1000V：1.5 Multiple ＞1000V Rated Voltage：1.2 Multiple Duration: 1000h Charge/ Discharge Current: 50mA max. Temperature：125℃（NPO X7R、X7S）；85℃（X5R、 Y5V）105℃（X6S） Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2)
	DF	Not more than twice of initial value. .	
	IR	Class Ⅰ: Ri≥4000MΩ或 Ri CR≥ 40S whichever is smaller.	
		Class Ⅱ: Ri≥2000MΩ或 Ri CR≥ 50S whichever is smaller.	
	Visual Appearance: No visible damage. e.		

Note：Pretreatment (only for class2 capacitor)

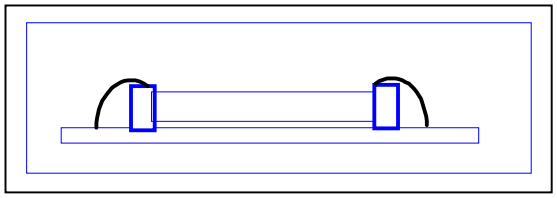
Pretreatment (only for class2 capacitor) is a method to treat the capacitor before measurement. First, place the capacitor in the up-category temperature or other specified higher temperature environment for 1hour. Then recovery the capacitor at standard pressure conditions for 24±1hours。

2. Manual Soldering

Manual soldering can pose a great risk of creating thermal cracks in capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator's careless 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 pay much attention to the selection of the soldering iron tip and temperature contact of the tip.

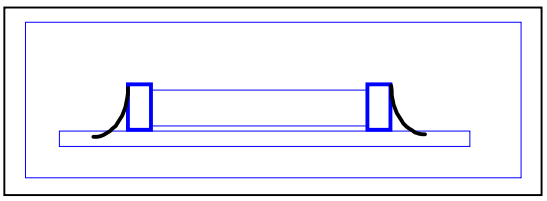
3. Optimum Solder Amount for Reflow Soldering

Too much solder



Cracks tend to occur due to large stress.

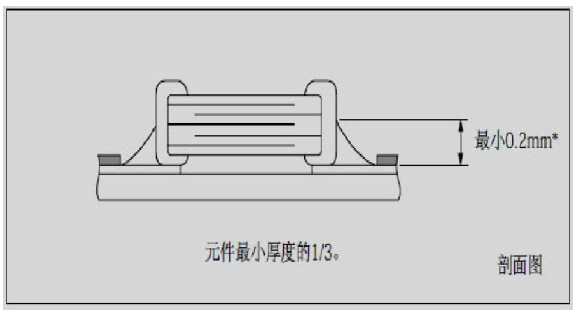
Not enough solder



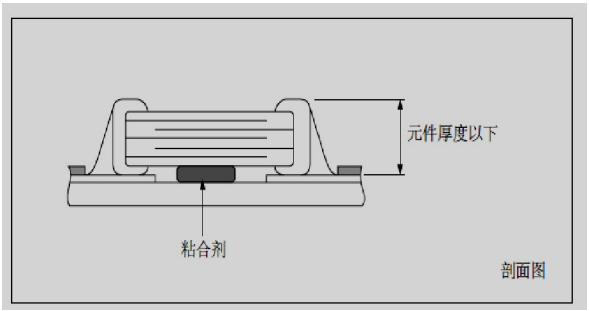
Weak holding force may cause bad connection between the capacitor and PCB.

4. Recommended Soldering amounts

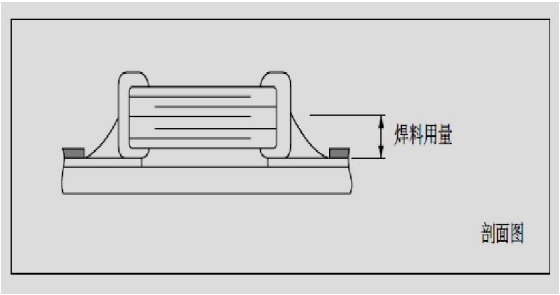
4.1
The optimal solder fillet amounts for re-flow soldering



4.2
The optimal solder fillet amounts for wave soldering



4.3The optimal solder fillet amounts for reworking by using soldering iron



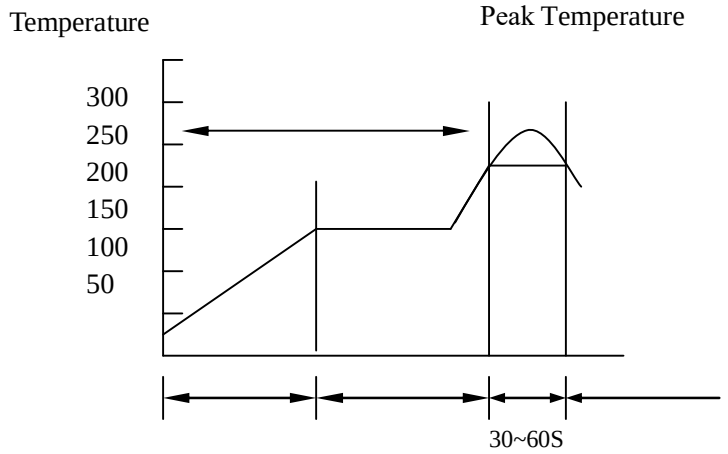
Recommended Soldering Method

Size	Temperature Characteristics	RatedVoltage	Capacitance	Soldering Method
0201	NPO	/		R
	X7R/X5R/X7S/X6S	/		R
	Y5V	/		R
0402	NPO	/		R
	X7R/X5R/X7S/X6S	/		R
	Y5V	/		R
0603	NPO	/		R/W
	X7R/X5R/X7S/X6S	/	C≥1uf	R
			C＜1uf	R/W
	Y5V	/	C≥1uf	R
			C＜1uf	R/W
0805	NPO	/	/	R/W
	X7R/X5R/X7S/X6S	/	C≥4.7uf	R
			C＜4.7uf	R/W
	Y5V	/	C≥1uf	R
			C＜1uf	R/W
1206	NPO	/	/	R/W
	X7R/X5R/X7S/X6S	/	C≥10uf	R
			C＜10uf	R/W
	Y5V	/	C≥10uf	R
			C＜10uf	R/W
≥1210	NPO	/	/	R
	X7R/X5R/X7S/X6S	/	/	R
	Y5V	/	/	R

Soldering method：R-Reflow Solering
W-Wave Soldering

The temperature profile for soldering

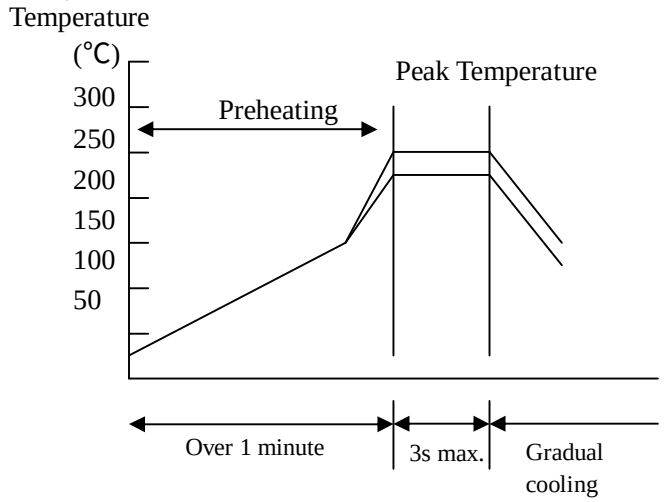
（Re-flow soldering ）



	Pb-Sn soldering	Lead-free soldering
Peak temperature	230℃～250℃	240℃～260℃

While in preheating,please keep the temperature difference between soldering temperature and surface temperature of chips as:
e

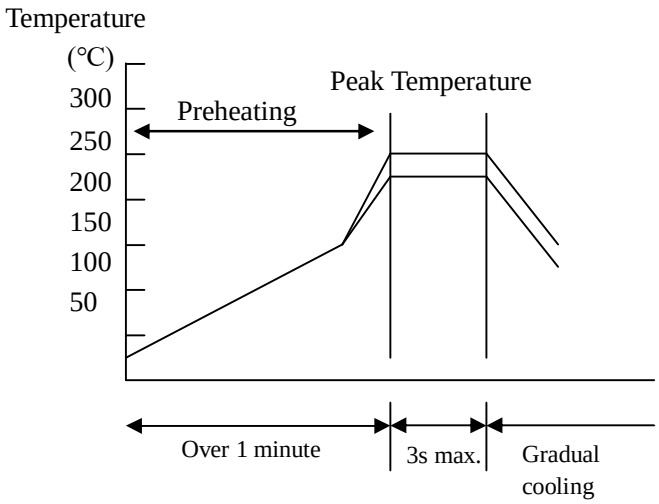
（Wave soldering）



	Pb-Sn soldering	Lead-free soldering
Peak temperature	230℃～260℃	240℃～270℃

While in preheating,please keep the temperature difference between soldering temperature and surface temperature of chips

Hand soldering



Conditions

Preheating	Temperature of soldering ironhead	Power of soldering iron	Diameter of soldering iron head	Soldering time	Solder paste amount	Restricted conditions
△≤130°C	Highest temperature:300°C	20W at the highest	1mm recommended	3s at the longest	≤1/2 chip thickness	Please avoid the derect contact between soldering iron head and ceramic components