■ Safety Recognized of ceramic chip capacitors

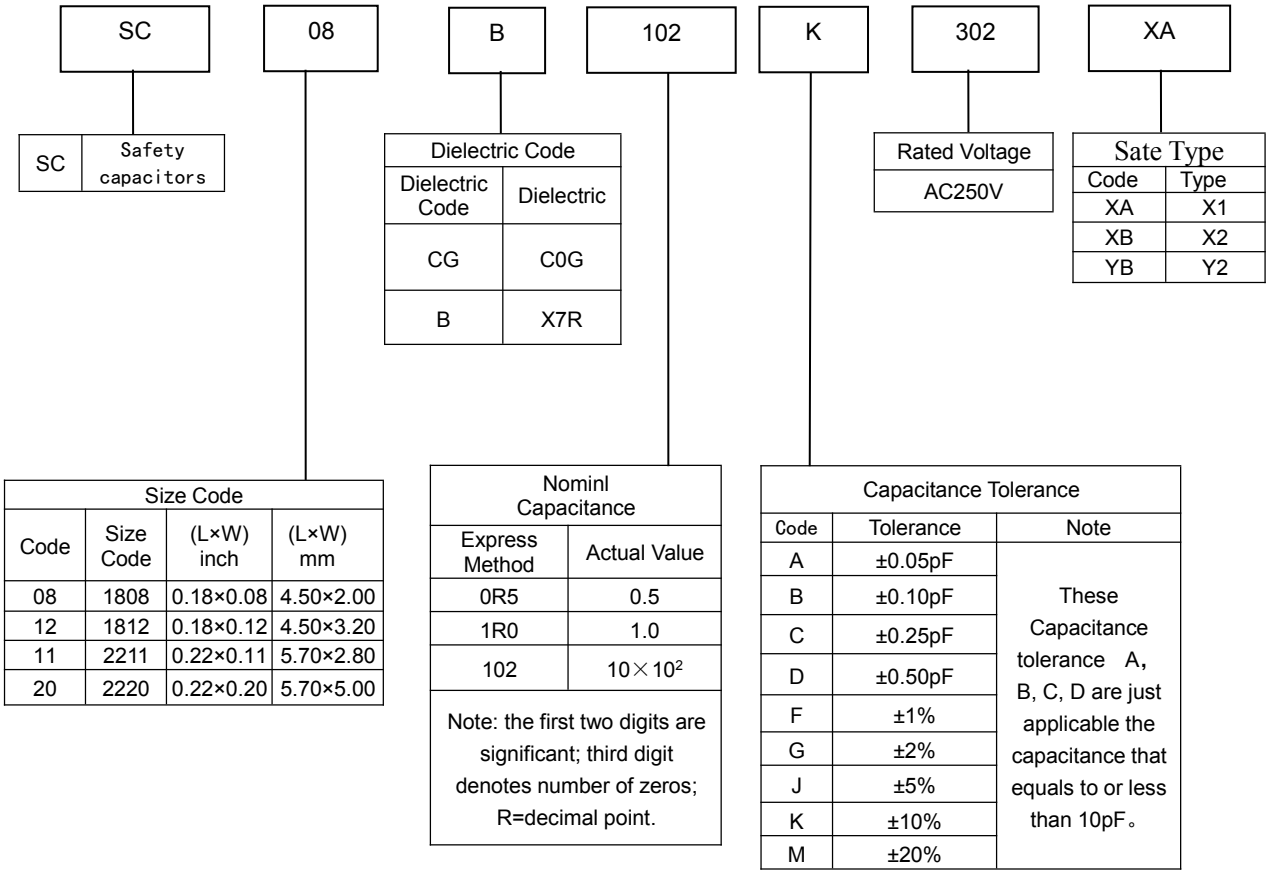
◆ Feature

* A New monolithic structure capacitor for small,high-capacitance capability of operating at high-voltage levels.
* Available for equipment base on 60384-14 standard
* Only for reflow soldering
* Fit for use on thin type equipment.

◆ Application

* Ideal for use on line filters and couplings for DAA modems without transformers.
* Ideal for use on line filters for information equipment.

◆ How To Order



SC	Safety capacitors

Dielectric Code	
Dielectric Code	Dielectric
CG	C0G
B	X7R

Rated Voltage
AC250V

Sate Type	
Code	Type
XA	X1
XB	X2
YB	Y2

Size Code			
Code	Size Code	(L×W) inch	(L×W) mm
08	1808	0.18×0.08	4.50×2.00
12	1812	0.18×0.12	4.50×3.20
11	2211	0.22×0.11	5.70×2.80
20	2220	0.22×0.20	5.70×5.00

Nominl Capacitance	
Express Method	Actual Value
0R5	0.5
1R0	1.0
102	10×10^2

Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.

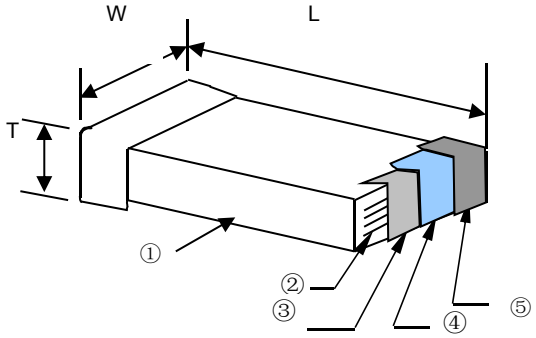
Capacitance Tolerance		
Code	Tolerance	Note
A	±0.05pF	These Capacitance tolerance A, B, C, D are just applicable the capacitance that equals to or less than 10pF。
B	±0.10pF	
C	±0.25pF	
D	±0.50pF	
F	±1%	
G	±2%	
J	±5%	
K	±10%	
M	±20%	

◆ Product application voltage

Code	Peak pulse voltage in use （kV）	Peak pulse voltage applied before durability test （kV）
XA	2.5kV＜U≤4.0kV	C_R≤1.0μF, 4 C_R＞1.0μF,4/$\sqrt{C_R}$
XB	≤2.5kV	C_R≤1.0μF, 2.5 C_R＞1.0μF,2.5/$\sqrt{C_R}$

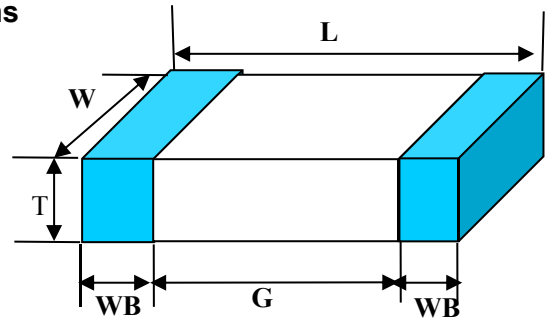
Code	Rated Voltage （V）	Peak pulse voltage applied before durability test （kV）
YB	150V≤U≤250V	5.0

◆ Product Structure



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

◆ Product Dimensions



Type		Dimensions (mm)				
British expression	Metric expression	L	W	T	WB	G
1808	4520	4.80±0.20	2.00±0.20	≤2.50	≤0.7	≥4.0
1812	4532	4.80±0.20	3.20±0.20	≤3.50	≤0.7	≥4.0
2211	5728	5.80±0.40	2.80±0.30	≤3.50	≤1.0	≥4.0
2220	5750	5.80±0.40	5.00±0.40	≤3.50	≤1.0	≥4.0

Note：We can design according to customer special requirements.

◆Temperature Coefficient /Characteristics

Dielectric	Reference Temperature Point	Temperature Coefficient	Operation Temperature Range
COG	20°C	0±30 ppm/℃	-55℃～125℃
X7R	20°C	±15%	-55℃～125℃

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

Dielectric		X7R							
Dimension		SC08			SC12		SC11	SC20	
Series/thickness		XA	XB	YB	XB	YB	YB	XB	YB
Nominal capacity	100pF	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3
	150pF								
	180pF								
	220pF								
	270pF								
	330pF								
	470pF								
	560pF								
	680pF								
	820pF			1.60±0.3 2.00±0.3					
	1nF			2.00±0.3		1.60±0.3			
	1.2nF	2.00±0.3	1.60±0.3			2.00±0.3	1.60±0.3 1.80±0.3		
	1.5nF								
	2.2nF					2.00±0.3	1.60±0.3 2.50±0.3 2.80±0.3		2.00±0.3
	3.3nF						2.00±0.3		
	4.7nF								
	10nF								
	15nF							1.80±0.30	
	18nF								
	22nF								
	27nF								
	33nF								

Note：1、Corresponding product design thickness，unit:mm；
2、We can design according to customer special requirements

Dielectric		C0G			
Dimension		SC08	SC12	SC11	SC20
Series/Thickness		YB	YB	YB	YB
Nominal capacity	5pF	1.60±0.3	1.60±0.3	1.60±0.3	1.60±0.3
	8.2pF				
	10pF				
	15pF				
	18pF				
	22pF				
	33pF				
	39pF				
	47pF				
	56pF				
	68pF				
	82pF				
	100pF				
	120pF				
	150pF	2.00±0.3	2.00±0.3		
	220pF				
	330pF				2.00±0.3
	470pF				

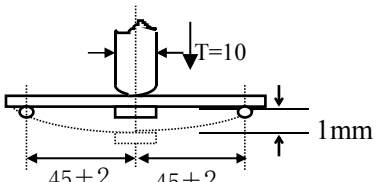
Note：1、Corresponding product design thickness，unit:mm；2、We can design according to customer special requirements

◆ Reliability Test

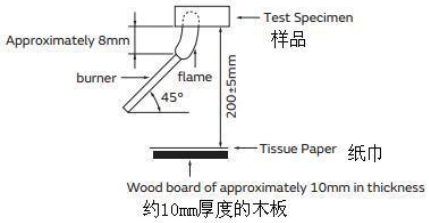
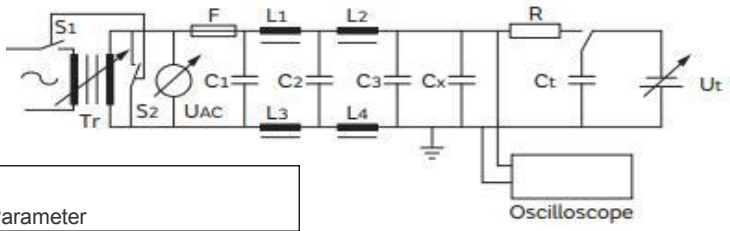
Item	Technical Specification		Test Method and Remarks		
Capacitance	Class Ⅰ	Should be within the specified tolerance.	Capacitance	Measuring Frequency	Measuring Voltage
			≤1000pF	1MHz±10%	1.0±0.2Vrms
			＞1000 pF	1KHz±10%	
	Class Ⅱ	Should be within the specified tolerance.	Test Temperature：25℃±3℃ Test Frequency：1KHz±10% Test Voltage：1.0±0.2Vrms		

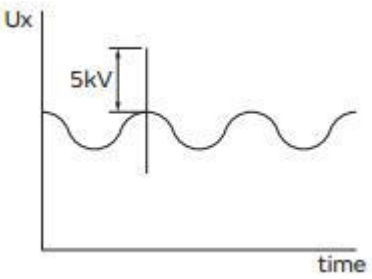
(DF, tanδ) Dissipation Factor						
	Class Ⅰ	DF		Capacitance	Measuring Frequency	Measuring Voltage
		≤1/（400+20C）		C＜30 pF	1MHz±10%	1.0±0.2Vrms
		≤0.1%		C≥30pF		
	Class Ⅱ	X7R	≤2.5%	Test Frequency：1KHz ±10% Test Voltage：1.0± 0.2Vrms		

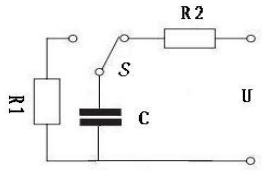
<table>
<tr><th>Item</th><th colspan="2">Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td rowspan="2">Insulation Resistance</td><td>Class Ⅰ</td><td>C≤10 nF ， Ri ≥50000MΩ
C＞10 nF ， Ri•C_R ≥500S</td><td rowspan="2">Measuring Voltage: DC500±50V
Duration: 60±5s
Test Humidity: ≤75%
Test Temperature: 25℃±3℃
Test Current: ≤50mA</td></tr>
<tr><td>Class Ⅱ</td><td>C≤25 nF, Ri≥10000MΩ
C＞25 nF, Ri•C_R＞100S</td></tr>
<tr><td>(DWV) Dielectric Withstanding Voltage</td><td colspan="2">No defects or abnormalities</td><td>No failure shoule be observed when voltage in the table is applied between the terminations for 60 sec.provided the charge/discharge current is less than 50mA.
<table>
<tr><th></th><th>测量电压
Test Voltage</th></tr>
<tr><td>XA、B</td><td>DC 1075V</td></tr>
<tr><td>YB、C</td><td>AC 1500V</td></tr>
</table></td></tr>
<tr><td>Solderability</td><td colspan="2">At least 95% of the terminal electrode is covered by new solder.
Visual Appearance: No visible damage.</td><td>Preheating conditions:80 to 120℃; 10~30s.
<table>
<tr><td>Pb-Sn soldering
Solder Temperature: 235±5℃
Duration: 2±0.5s</td><td>Lead-free soldering
Solder Temperature: 245±5℃
Duration: 2±0.5</td></tr>
</table></td></tr>
<tr><td>Resistance to Soldering Heat</td><td colspan="2"><table>
<tr><th>Item</th><th>C0G</th><th>X7R</th></tr>
<tr><td>ΔC/C</td><td>≤±2.5% or ±0.25PF，whichever is larger</td><td>±15%</td></tr>
<tr><td>DF</td><td colspan="2">Same to initial value.</td></tr>
<tr><td>IR</td><td colspan="2">Same to initial value.</td></tr>
<tr><td colspan="3">Appearance：
No visible damage.At least 95% of the terminal electrode is covered by new solder.</td></tr>
</table></td><td>Preheating conditions: 100 to 200℃; 160-120S.
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>Impulse voltage</td><td colspan="2">No permanent breakdown or flashover。</td><td>Each capacitor shall withstand 24 pulses of the same polarity, the pulse interval time shall not be less than 10S, and the peak value of pulse voltage like the follow table：
<table>
<tr><th>Code</th><th>Peak pulse voltage in use (kV)</th></tr>
<tr><td>XA</td><td>4.0</td></tr>
<tr><td>XB</td><td>2.5</td></tr>
<tr><td>YB</td><td>5</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Item</th><th>Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td>Resistance to Flexure of Substrate (Bending Strength)</td><td>
<table>
<tr><td></td><td>C0G</td><td>X7R</td></tr>
<tr><td>ΔC/C：</td><td>≤±5% or ±0.5pF,whichever is larger.</td><td>≤±10%</td></tr>
<tr><td colspan="3">Appearance: No visible damage.</td></tr>
</table>
</td><td> 

Test Board: PCB Warp: 1mm
Speed: 1mm/sec. Unit: mm
The measurement should be made with the board in the bending position.</td></tr>
<tr><td>Temperature Cycle</td><td>
<table>
<tr><td>Item</td><td>C0G</td><td>X7R</td></tr>
<tr><td>ΔC/C</td><td>≤±1% or ±1pF , whichever is larger</td><td>≤±15%</td></tr>
</table>
No visible damage.
</td><td>Preheating conditions: up-category temperature, 1h
Recovery time: 24±1h
Initial Measurement
Cycling Times: 5 times, 1 cycle, 4 steps:
<table>
<tr><th>Step</th><th>（Temperature）</th><th>(Time)</th></tr>
<tr><td>1</td><td>(Low- category temp.)：
C0G/X7R:-55℃</td><td>30min</td></tr>
<tr><td>2</td><td>(Normal temp.) : +20℃</td><td>2～3min</td></tr>
<tr><td>3</td><td>(Up- category temp.)：
C0G/X7R: +125℃</td><td>30min</td></tr>
<tr><td>4</td><td>(Normal temp.) : +20℃</td><td>2～3min</td></tr>
</table>
Recovery time after test: 24±2h</td></tr>
<tr><td>Humidity load</td><td>
<table>
<tr><td rowspan="2">ΔC/C</td><td>C0G</td><td>≤±7.5% or ±0.75pF, whichever is larger.</td></tr>
<tr><td>X7R</td><td>-12.5% ~ +12.5%</td></tr>
<tr><td>DF</td><td colspan="2">Not more than twice of initial value.</td></tr>
<tr><td rowspan="2">IR</td><td>C0G</td><td>Ri≥5000MΩ 或 Ri•C_R≥50S whichever is smaller.</td></tr>
<tr><td>X7R</td><td>Ri≥1000MΩ 或 Ri•C_R≥10S whichever is smaller.</td></tr>
<tr><td colspan="3">Appearance: No visible damage.</td></tr>
</table>
</td><td>※ Pretreatment (ClassII) :After preheating at 140℃~150℃ for 1h±10min, place at room temperature for 24±2h.
Temperature: 40±2℃ Humidity: 90~95%RH
Voltage: Rated Voltage Duration: 500h
Recovery conditions: Room temperature
Recovery Time::24h±2h</td></tr>
<tr><td>Damp heat, steady state</td><td>
<table>
<tr><td rowspan="2">ΔC/C</td><td>C0G</td><td>≤±2% or ±0.2pF, whichever is larger.</td></tr>
<tr><td>X7R</td><td>-10% ~ +10%</td></tr>
<tr><td>DF</td><td colspan="2">Not more than twice of initial value.</td></tr>
<tr><td rowspan="2">IR</td><td>C0G</td><td>.
Ri≥5000MΩ 或 Ri•C_R≥50S whichever is smaller.</td></tr>
<tr><td>X7R</td><td>Ri≥1000MΩ 或 Ri•C_R≥10S whichever is smaller.</td></tr>
<tr><td colspan="3">Appearance: No visible damage.</td></tr>
</table>
</td><td>Temperature: 40±2℃
Humidity: 90~95%RH
Duration: 500h
Recovery conditions: Room temperature
Recovery Time: 24h±2h</td></tr>
</table>

<table>
<tr><th>Item</th><th>Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td>Passive Flammability</td><td>The tissue paper shall not ignite.</td><td>The capacitor under test shall be held in the flame in the position which the tissue paper shall not ignite. best promotes burning.
Each specimen shall only be exposed once to the flame.
Time of exposure to flame : 30 s
 
</td></tr>
<tr><td>Active Flammability</td><td>Cotton yarn will not burn</td><td> 

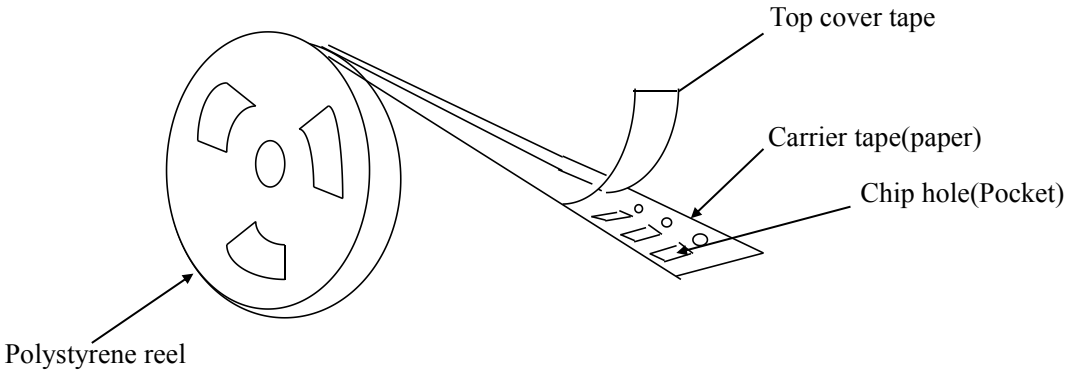
<table>
<tr><th>Code</th><th>Parameter</th></tr>
<tr><td>C1,C2</td><td>1uF±10%</td></tr>
<tr><td>C3</td><td>0.033uF±5% 10kV</td></tr>
<tr><td>L1,L2, L3,L4</td><td>1.5mH±20% 16A</td></tr>
<tr><td>Ct</td><td>3uF±5% 10Kv</td></tr>
<tr><td>R</td><td>100Ω±2%</td></tr>
<tr><td>Cx</td><td>(Sample capacitance)</td></tr>
<tr><td>UAC</td><td>UR±5%</td></tr>
<tr><td>F</td><td>（16A Fuse）</td></tr>
<tr><td>UR</td><td>(Rated voltage)</td></tr>
<tr><td>Ut</td><td>(Voltage Applied to Tantalum Capacitors for Energy Storage)</td></tr>
</table>

</td></tr>
</table>

<table>
<tr><th>Item</th><th>Technical Specification</th><th>Test Method and Remarks</th></tr>
<tr><td>Charge and discharge</td><td>
<table>
<tr><td rowspan="2">ΔC/C</td><td>C0G</td><td>≤±2% or ±0.2pF, whichever is larger.</td></tr>
<tr><td>X7R</td><td>-10% ~ +10%</td></tr>
<tr><td>DF</td><td colspan="2">Same to initial value.</td></tr>
<tr><td rowspan="2">IR</td><td>C0G</td><td>Ri≥2500MΩ或 Ri•C_R≥25S whichever is smaller.</td></tr>
<tr><td>X7R</td><td>Ri≥1000MΩ 或 Ri•C_R≥25S whichever is smaller.</td></tr>
<tr><td colspan="3">Appearance:No defects or abnormalities.</td></tr>
</table>
</td><td>As shown in the following figure, the device under test C is placed and subjected to 10000 charge and discharge cycles。
Charge voltage：Ur
Charge and discharge current：≤1A
 

<table>
<tr><th>Code</th><th>Parameter</th></tr>
<tr><td>C</td><td>Sample capacitance)</td></tr>
<tr><td>R1</td><td>Current-limiting resistor (discharge)</td></tr>
<tr><td>R2</td><td>Current-limiting resistor (charge)</td></tr>
<tr><td>U</td><td>Charge voltage</td></tr>
<tr><td>S</td><td>Switching device</td></tr>
</table>
</td></tr>
<tr><td>Termination Adhesion</td><td>No visible damage.</td><td>Applied Force: 5N Duration: 10±1S</td></tr>
<tr><td>Endurance</td><td>
<table>
<tr><td rowspan="2">ΔC/C</td><td>C0G</td><td>≤±3%或±0.3pF, whichever is larger.</td></tr>
<tr><td>X7R</td><td>-20% ~ +20%</td></tr>
<tr><td>DF</td><td colspan="2">Not more than twice of initial value.</td></tr>
<tr><td rowspan="2">IR</td><td>C0G</td><td>Ri≥4000MΩ或 Ri•C_R≥40S whichever is smaller.</td></tr>
<tr><td>X7R</td><td>Ri≥2000MΩ或 Ri•C_R≥50S whichever is smaller.</td></tr>
<tr><td colspan="3">Appearance: No visible damage.</td></tr>
</table>
</td><td>This test shall be conducted within one week after the completion of impulse voltage test.
※ Pretreatment (ClassII) :After preheating at 140℃~150℃ for 1h±10min, place at room temperature for 24±2h.
Temperature：125℃（C0G X7R） Duration: 1000h
Charge/ Discharge Current: 50mA max.
Applied Voltage：XA/XB:1.25 Rated Voltage
YB: 1.7 Rated Voltage
The capacitor is connected in series with a 47 Ω±5% resistor. Raise the voltage to 1000V once an hour for 0.1sec.
Recovery Conditions: Room Temperature
Recovery Time: :24h±2h</td></tr>
</table>

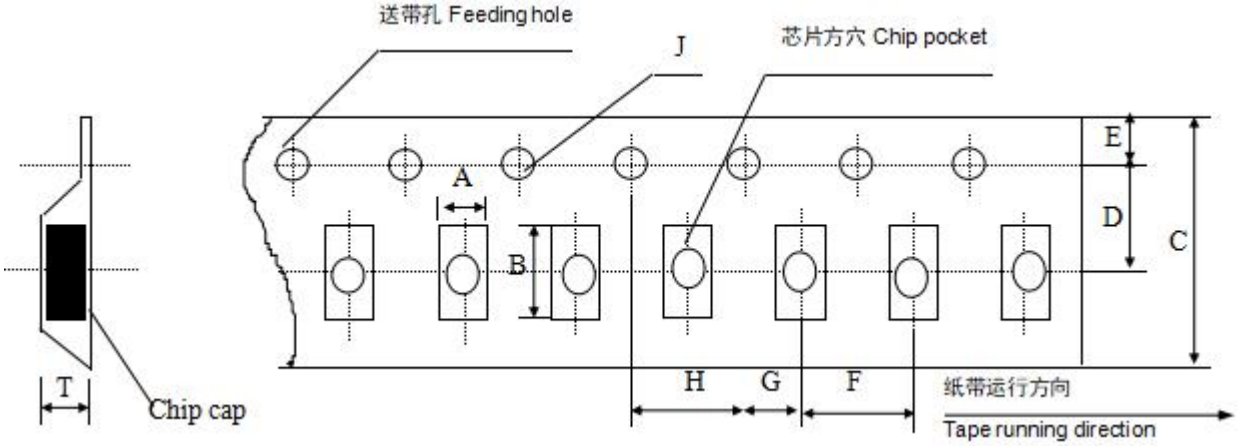
◆ Package

* Embossed Taping



*

Dimensions of embossed taping for 0805~1812 type

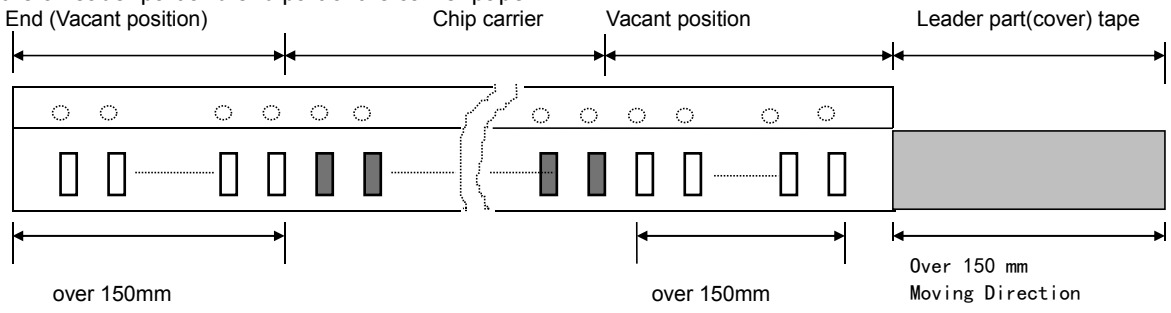


Code / Tape size	A	B	C	D*	E	F	G*	H	J	T
SC08(1808)	2.20 ± 0.10	4.95 ± 0.10	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.50 -0/+0.10	3.0 Max
SC12(1812)	3.66 ± 0.10	4.95 ± 0.10	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	8.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.55 -0/+0.10	4.0 Max
SC11(2211) SC20(2220)	6.2 ±0.1	6.7 ±0.1	12.00 ± 0.10	5.50 ± 0.05	1.75 ± 0.10	8.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.55 -0/+0.10	2.4 ± 0.10

Note：The place with "*" means where needs exactly dimensions.

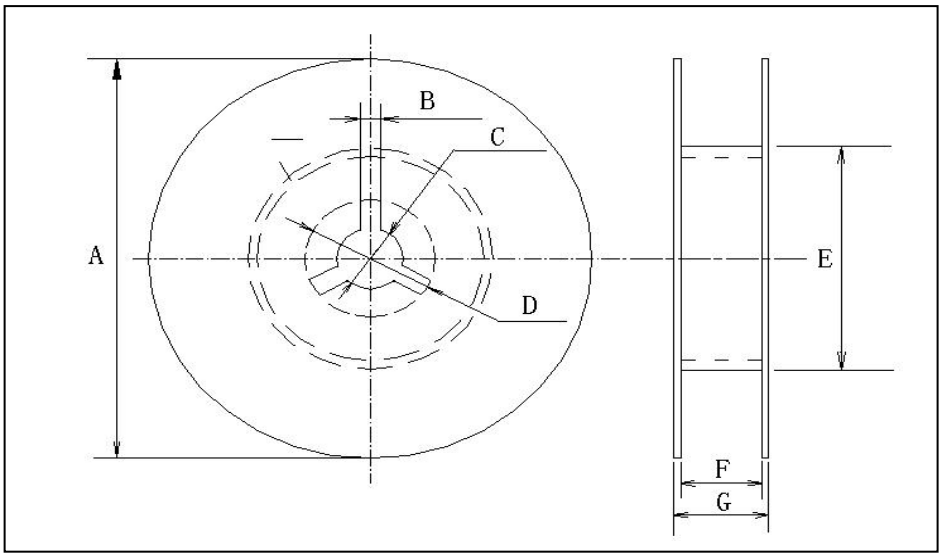
*

Structure of leader part and end part of the carrier paper



*

Reel Dimensions (unit: mm)

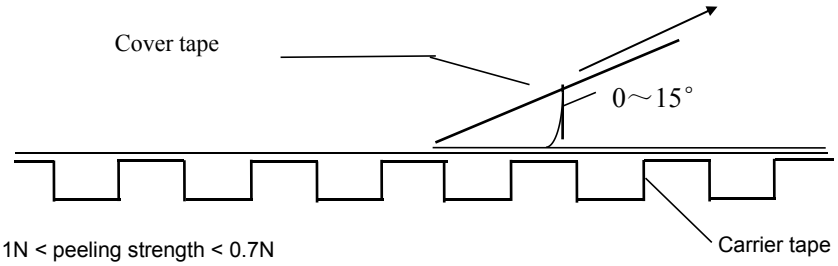


	A	B	C	D	E	F	G
7′REEL	φ178±2.0	3.0	φ13±0.5	φ21±0.8	φ50 或更大 φ50 or more	10.0±1.5	12max

* Taping specification：top tape peeling strength

Embossed Taping

Cover tape peeling direction



Standard: 0.1N < peeling strength < 0.7N

* Bulk Case Package

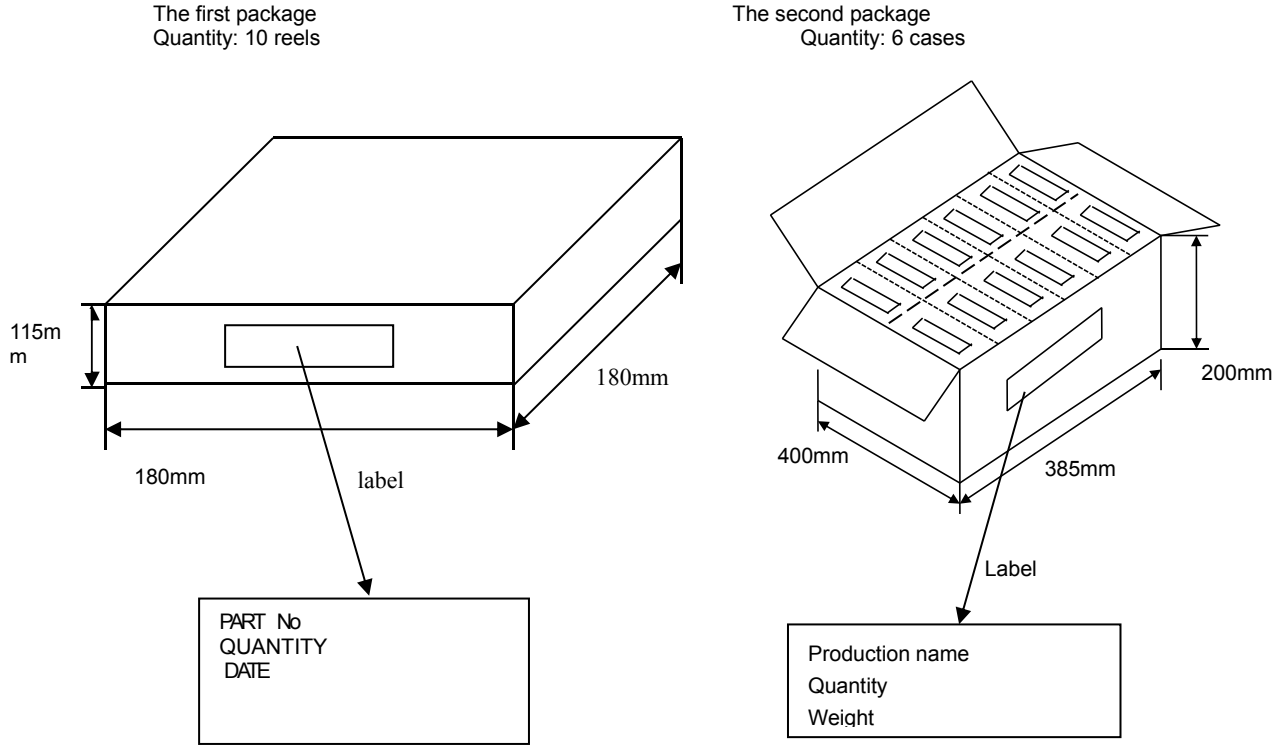
unit:mm

Symbol	A	B	T	C	D	E
Dimension	6.80±0.10	8.80±1.00	12.00±0.10	15.00+0.10/-0	2.00+0/-0.10	4.70±0.10
Symbol	F	W	G	H	L	I
Dimension	31.50+0.20/-0	36.00+0/-0.20	19.00±0.35	7.00±0.35	110.00±0.70	5.00±0.35

* Packing Quantity

(SIZE)	Package Style & Quantity unit: pcs			
	（PT）	（ET）	（BC）	（BP）
SC08 (1808)	-------	2000	-------	2000
SC12 (1812)	--------	T≤1.85mm 1000 T＞1.85mm 500	-------	2000
SC11 (2211) SC20 (2220)	--------	500	-------	500

*** Outer packing**



◆ Storage Methods

* The guaranteed period for solderability is 12 months (Under deliver package condition).

* Storage conditions：
Temperature 5~40℃ Relative Humidity 20~70%

◆ Precautions For Use

The Multi-layer Ceramic Capacitors (MLCC) may fail in a short circuit modern in an open circuit mode when subjected to severe conditions of electrical environment and / or mechanical stress beyond the specified “rating” and specified “conditions” in the specification, which will result in burn out, flaming or glowing in the worst case. Following “precautions for “safety” and Application Notes shall be taken in your major consideration. If you have a question about the precautions for handling, please contact our engineering section or factory.

* Soldering Profile

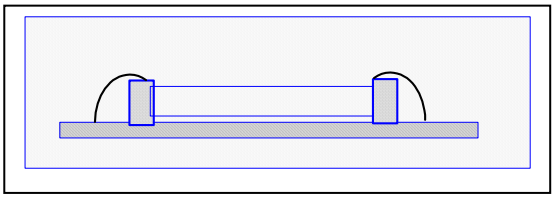
To avoid the crack problem by sudden temperature change, follow the temperature profile in the adjacent graph (refer to the graph in the enclosure page).

* 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.

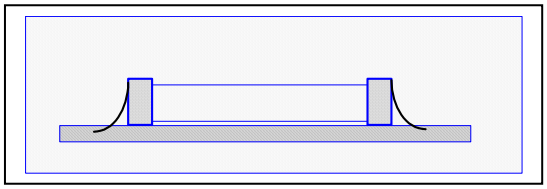
* Optimum Solder Amount for Reflow Soldering

Too much solder



Cracks tend to occur due to large stress.

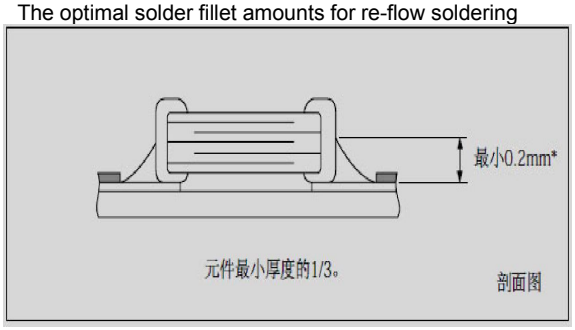
Not enough solder



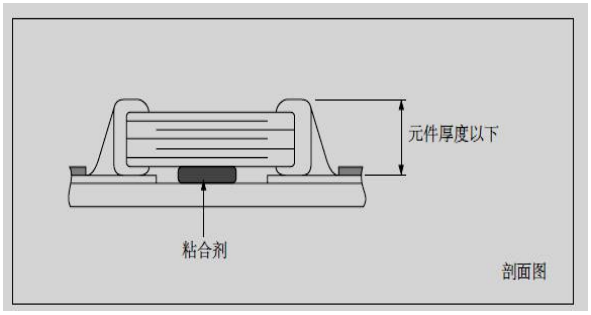
Weak holding force may cause badconnection between the capacitor and PCB.

* Recommended Soldering amounts

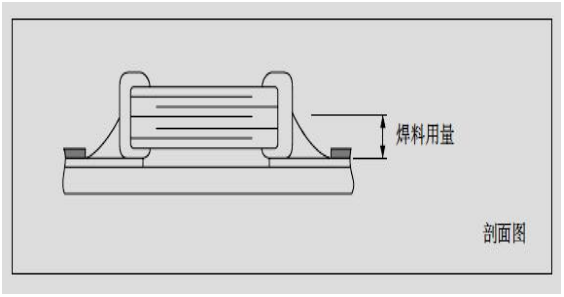
The optimal solder fillet amounts for re-flow soldering



The optimal solder fillet amounts for wave soldering



The optimal solder fillet amounts for reworking by using soldering iron



* Recommended Soldering Method

Size	Temperature Characteristics	RatedVoltage	Capacitance	Soldering Method
SC08 (1808)	C0G/X7R	/	/	R
SC12 (1812)	C0G/X7R	/	/	R
SC11 (2211)	C0G/X7R	/	/	R
SC20 (2220)	C0G/X7R	/	/	R

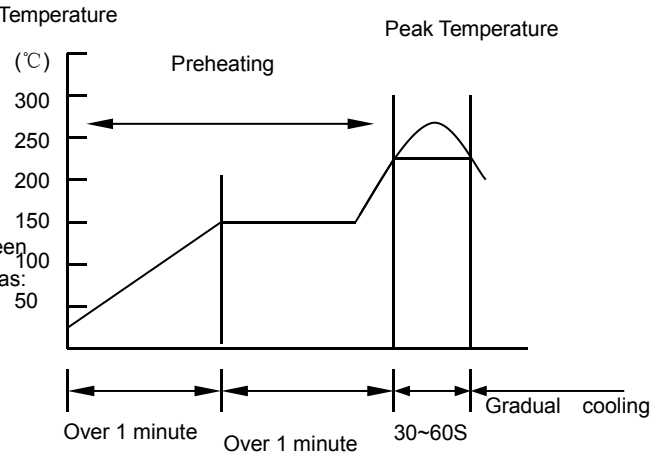
Soldering method：R—Reflow Solering
W— Wave Soldering

◆ The temperature profile for soldering

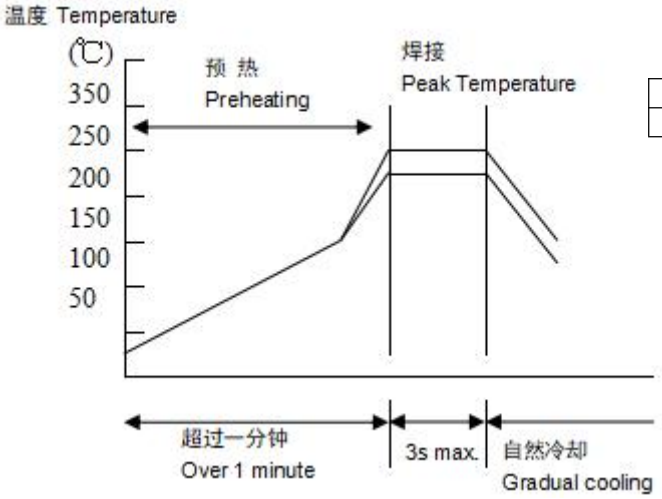
* （Re-flow soldering）

	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: T≤150℃.



* 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 as: T≤150℃.

* Hand soldering

Item	Suggestions
Preheating	△≤130℃
Temperature of soldering iron head	Highest temperature:350℃
Power of soldering iron	20W at the highest
Diameter of soldering iron head	1mm recommended
Soldering time	3s at the longest
Solder paste amount	≤1/2 chip thickness
Restricted conditions	Please avoid the derect contact between soldering iron head and ceramic components

*The latest version of the content shall prevail