SPECIFICATION FOR APPROVAL

CUSTOMER：_____

PARTNAME：Multilayer Chip Ceramic Capacitor

SPECIFICATION：General Series

APPROVAL SHEET NO.：DRAAW108H/0-2017

ISSUED DATE：_____

MANUFACTURER			CUSTOMER		
APPROVED	**CHECKED**	**PREPARED**	**APPROVED**	**CHECKED**	**PREPARED**

File NO.	DRAAW108H/0-2017	Pages	44
File name	MLCC(specification for approval)	Date	2012.01

versi	Revise date	pages	Revise contents	register
B/0	2012-01-11	38	New version	Fang qianjun
B/1	2012-08-11	36	Add 2225、1808 tape	Wang binbin
C/0	2013-01-10	39	Change the vrsion	Wang binbin
D/0	2014-01-06	39	Update SGS Report	Wang binbin
E/0	2014-05-06	44	Change the vrsion	Zhang guoxin
F/0	2015-02-10	44	Change the vrsion	Zhang guoxin
G/0	2016-05-15	44	Change the vrsion	Zhang guoxin
H/0	2017-07-01	44	Change the vrsion	Zhang guoxin

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1. Types of Capacitor and Dielectric Material

※COG： The capacitor of this kind dielectric material is considered as Class Ⅰcapacitor, including general capacitor and high frequency COG capacitor。The electrical properties of COG capacitor are the most stable one and have little change with temperature, voltage and time. They are suited for applications where low-losses and high-stability are required, such as filters, oscillators, and timing circuits.

※ X7R、X5R： material is 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 Ⅰ. 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

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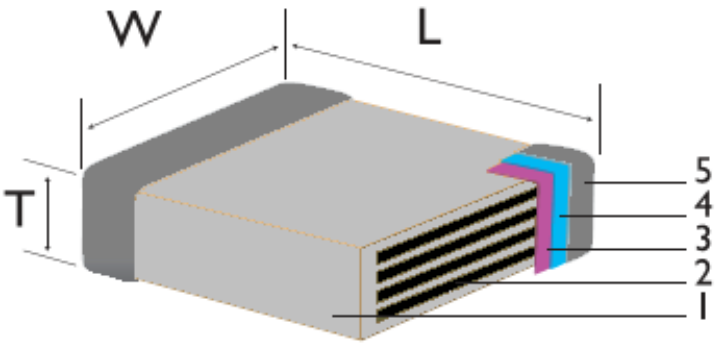
2. Product Frame



No	Material
1	Ceramic
2	Inner electrode
3	External electrode
4	Ni
5	Sn

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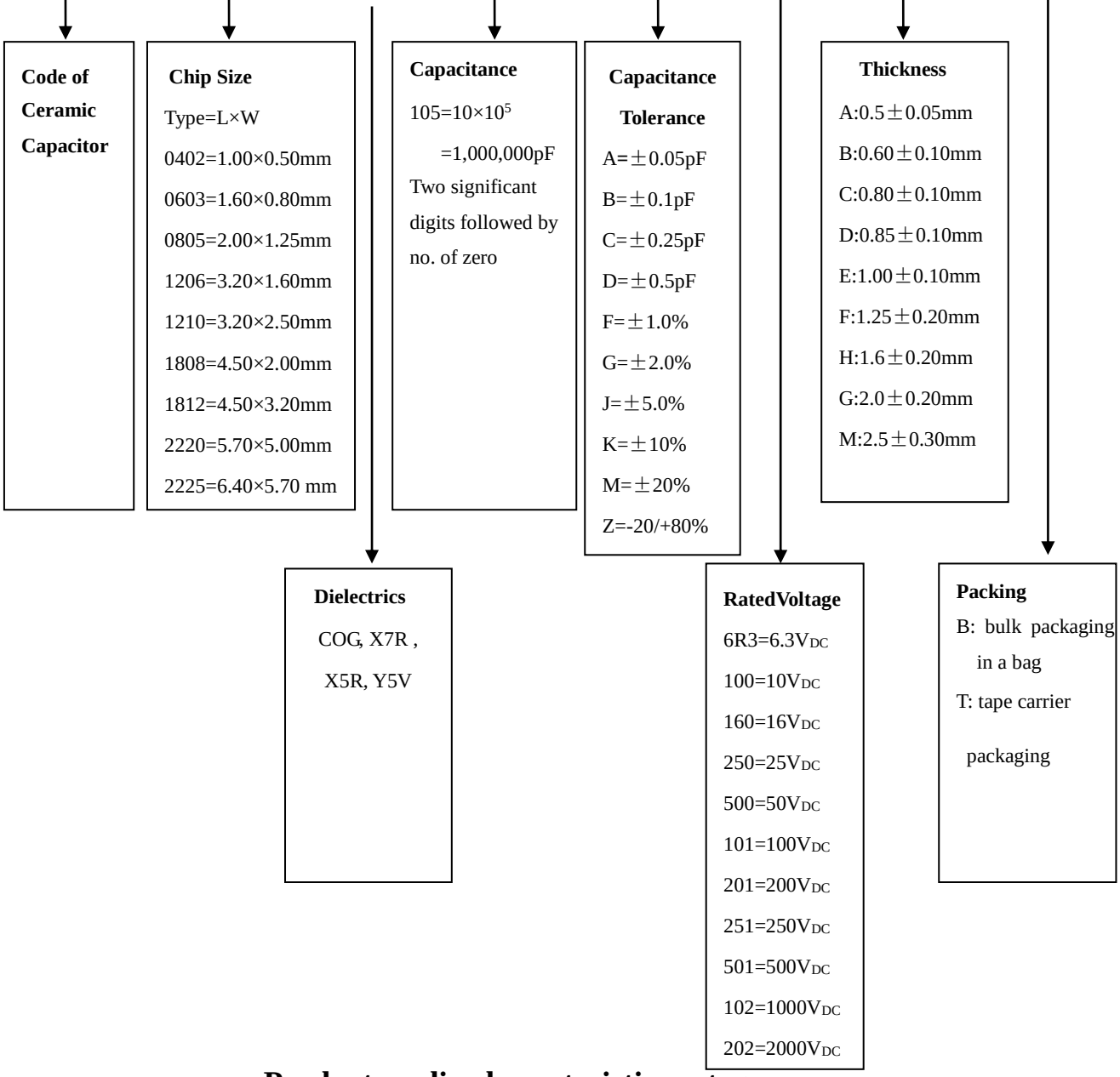
3. General Product Parts Numbering System

(Example) TCC 0805 Y5V 105 M 500 D T



Product media characteristics category

Texture	Operationg Temperature Range	Temperature Coefflcient or Temperature Characteristic
C0G	-55℃~+125℃	0±30ppm/℃
X7R	-55℃~+125℃	±15%
X5R	-55℃~+85℃	±15%
Y5V	-30℃~+85℃	+22/-82%

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4. Product Capacitance Range

0402（1005）SIZE

	COG系列		X7R系列					X5R系列					Y5V系列				
Cp V_{DC}	50	25	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
0R5	A	A															
1R0	A	A															
2R0	A	A															
3R0	A	A															
4R0	A	A															
5R0	A	A															
6R0	A	A															
7R0	A	A															
8R0	A	A															
9R0	A	A															
100	A	A															
120	A	A															
150	A	A															
180	A	A															
200	A	A															
220	A	A															
270	A	A															
300	A	A															
330	A	A															
390	A	A															
470	A	A															
560	A	A															
680	A	A															
820	A	A															
101	A	A	A	A	A	A	A	A	A	A	A	A					
121	A	A	A	A	A	A	A	A	A	A	A	A					
151	A	A	A	A	A	A	A	A	A	A	A	A					
181	A	A	A	A	A	A	A	A	A	A	A	A					
201	A	A	A	A	A	A	A	A	A	A	A	A					
221	A	A	A	A	A	A	A	A	A	A	A	A					
271	A	A	A	A	A	A	A	A	A	A	A	A					
331	A	A	A	A	A	A	A	A	A	A	A	A					
391	A	A	A	A	A	A	A	A	A	A	A	A					
471	A	A	A	A	A	A	A	A	A	A	A	A					
561	A	A	A	A	A	A	A	A	A	A	A	A					
681	A	A	A	A	A	A	A	A	A	A	A	A					
821	A	A	A	A	A	A	A	A	A	A	A	A					
102	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A

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	COG系列		X7R系列					X5R系列					Y5V系列				
Cp V_{DC}	50	25	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
152			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
182			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
222			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
272			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
332			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
472			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
562			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
103			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
153			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
183				A	A	A	A		A	A	A	A	A	A	A	A	A
223				A	A	A	A		A	A	A	A	A	A	A	A	A
273				A	A	A	A		A	A	A	A	A	A	A	A	A
333				A	A	A	A		A	A	A	A	A	A	A	A	A
393				A	A	A	A		A	A	A	A	A	A	A	A	A
473				A	A	A	A		A	A	A	A	A	A	A	A	A
563				A	A	A	A		A	A	A	A		A	A	A	A
683				A	A	A	A		A	A	A	A		A	A	A	A
104					A	A	A			A	A	A		A	A	A	A
154					A	A	A			A	A	A			A	A	A
184						A	A				A	A			A	A	A
224						A	A				A	A			A	A	A
274							A					A				A	A
334							A					A				A	A
474							A					A				A	A
684							A					A					A
105							A					A					A

Tolerance: COG(0.5pF~4.9pF): C COG(5.0pF~9.9pF): D；COG(≥10pF): F(±1%), G(±2%), J(±5%)

X7R/X5R: J(±5.0%)；K(±10%)；M(±20%)

Y5V: M(±20%)；Z(-20,+80%)

Thickness: A：0.50±0.10mm ；

Above capacitance for reference only, actual cap. Range depends on the standard products.

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0603(1608) SIZE

	0603(1608)																			
	COG系列				X7R系列							X5R系列					Y5V系列			
Cp V_{DC}	250	100	50	25	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10
0R5	c	c	c	c																
1R0	c	c	c	c																
2R0	c	c	c	c																
3R0	c	c	c	c																
4R0	c	c	c	c																
5R0	c	c	c	c																
6R0	c	c	c	c																
7R0	c	c	c	c																
8R0	c	c	c	c																
9R0	c	c	c	c																
100	c	c	c	c																
120	c	c	c	c																
150	c	c	c	c																
180	c	c	c	c																
200	c	c	c	c																
220	c	c	c	c																
270	c	c	c	c																
300	c	c	c	c																
330	c	c	c	c																
390	c	c	c	c																
470	c	c	c	c																
560	c	c	c	c																
680	c	c	c	c																
820	c	c	c	c																
101	c	c	c	c	c	c														
121	c	c	c	c	c	c														
151	c	c	c	c	c	c														
181	c	c	c	c	c	c														
201	c	c	c	c	c	c														
221	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
271	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
331	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
391	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
471	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
561		c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
681		c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
821		c	c	c	c	c	c	c	c	c	c	c	c	c	c	c				
102			c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c

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	0603(1608)																			
	COG系列				X7R系列							X5R系列					Y5V系列			
Cp V_{DC}	250	100	50	25	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10
152			c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
182				c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
222				c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
272					c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
332					c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
472					c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
562					c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
682					c	c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
103						c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
153						c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
183						c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
223						c	c	c	c	c	c	c	c	c	c	c	c	c	c	c
273							c	c	c	c	c	c	c	c	c	c	c	c	c	c
333							c	c	c	c	c	c	c	c	c	c	c	c	c	c
393							c	c	c	c	c	c	c	c	c	c	c	c	c	c
473							c	c	c	c	c	c	c	c	c	c	c	c	c	c
563							c	c	c	c	c	c	c	c	c	c	c	c	c	c
683							c	c	c	c	c	c	c	c	c	c	c	c	c	c
104							c	c	c	c	c	c	c	c	c	c	c	c	c	c
154							c	c	c	c	c	c	c	c	c	c	c	c	c	c
184							c	c	c	c	c	c	c	c	c	c	c	c	c	c
224							c	c	c	c	c	c	c	c	c	c	c	c	c	c
274							c	c	c	c	c	c	c	c	c	c	c	c	c	c
334							c	c	c	c	c	c	c	c	c	c	c	c	c	c
474							c	c	c	c	c	c	c	c	c	c	c	c	c	c
684								c	c	c	c		c	c	c	c		c	c	c
105								c	c	c	c		c	c	c	c		c	c	c
225									c	c	c			c	c	c			c	c
475										c	c				c	c				c
106											c					c				

Tolerance: COG(0.5pF~4.9pF): C COG(5.0pF~9.9pF): D；COG(≥10pF): F(±1%), G(±2%), J(±5%)

X7R/X5R: J(±5.0%)；K(±10%)；M(±20%)；Y5V: M(±20%)；Z(-20,+80%)

Thickness: C：0.80±0.1mm ； Above capacitance for reference only, actual cap. Range depends on the standard products.

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0805(2012) SIZE

	0805(2012)																							
	COG系列						X7R系列								X5R系列					Y5V系列				
Cp V_{DC}	500	250	100	50	25	16	500	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
0R5	B	B	B	B	B	B																		
1R0	B	B	B	B	B	B																		
2R0	B	B	B	B	B	B																		
3R0	B	B	B	B	B	B																		
4R0	B	B	B	B	B	B																		
5R0	B	B	B	B	B	B																		
6R0	B	B	B	B	B	B																		
7R0	B	B	B	B	B	B																		
8R0	B	B	B	B	B	B																		
9R0	B	B	B	B	B	B																		
100	B	B	B	B	B	B																		
120	B	B	B	B	B	B																		
150	B	B	B	B	B	B																		
180	B	B	B	B	B	B																		
200	B	B	B	B	B	B																		
220	B	B	B	B	B	B																		
270	B	B	B	B	B	B																		
300	B	B	B	B	B	B																		
330	B	B	B	B	B	B																		
390	B	B	B	B	B	B																		
470	B	B	B	B	B	B																		
560	B	B	B	B	B	B																		
680	B	B	B	B	B	B																		
820	B	B	B	B	B	B																		
101	B/D/F	B	B	B	B	B	F	F	F															
121	B/D/F	B	B	B	B	B	F	F	F															
151	B/D/F	B	B	B	B	B	F	F	F															
181	B/D/F	B	B	B	B	B	F	F	F															
201	B/D/F	B	B	B	B	B	F	F	F															
221	B/D/F	B	B	B	B	B	F	F	F	B	B	B	B	B	B	B	B	B	B					
271	B/D/F	B	B	B	B	B	F	F	F	B	B	B	B	B	B	B	B	B	B					
331	B/D/F	B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
391	B/D/F	B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
471	B/D/F	B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
561	D/F	B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
681		B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
821		B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D					
102		B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	D	D	D	D	D

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	0805(2012)																							
	COG系列						X7R系列								X5R系列					Y5V系列				
Cp V_{DC}	500	250	100	50	25	16	500	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
152		B	B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	D	D	D	D	D
182			B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	D	D	D	D	D
222			B	B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	D	D	D	D	D
272				B	B	B	D/F	D/F	D/F	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	B/D	D	D	D	D	D
332					D	D	F	D/F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
472					D	D	F	D/F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
562					D	D	F	D/F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
682						D	F	D/F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
103							F	D/F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
153								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
183								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
223								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
273								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
333								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
393								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
473								F	D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
563									D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
683									D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
104									D/F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
154										D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
184										D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
224										D/F	D	D	D	D	D/F	D	D	D	D	D/F	D	D	D	D
274										D/F	D	D	D	D	D/F	D	D	D	D	D/F	D	D	D	D
334										D/F	D	D	D	D	D/F	D	D	D	D	D/F	D	D	D	D
474										D/F	D/F	D/F	D	D	D/F	D/F	D/F	D	D	D/F	D/F	D/F	D	D
684										D	D/F	D/F	D	D	D	D/F	D/F	D	D	D	D/F	D/F	D	D
105										D	D/F	D/F	D	D	D	D/F	D/F	D	D	D	D/F	D/F	D	D
225											F	F	F	F		F	F	F	F		F	F	F	F
475											F	F	F	F		F	F	F	F			F	F	F
106												F	F	F			F	F	F				F	F
226													F	F				F	F					F
476														F					F					

Tolerance: COG(0.5pF~4.9pF): C COG(5.0pF~9.9pF): D； COG(≥10pF): F(±1%), G(±2%), J(±5%)

X7R/X5R: J(±5.0%)； K(±10%)； M(±20%)； Y5V: M(±20%)； Z(-20,+80%)

Thickness: B：0.60±0.1mm 、D：0.85±0.1mm、F：1.25±0.2mm； Above capacitance for reference only, actual cap. Range depends on the standard products.

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1206(3216) SIZE

	1206(3216)																														
	C0G系列									X7R系列											X5R系列					Y5V系列				
Cp V_{DC}	2000	1000	630	500	250	100	50	25	16	2000	1000	630	500	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
0R5	D	D	D	D	D	D	D	D	D																					
1R0	D	D	D	D	D	D	D	D	D																					
2R0	D	D	D	D	D	D	D	D	D																					
3R0	D	D	D	D	D	D	D	D	D																					
4R0	D	D	D	D	D	D	D	D	D																					
5R0	D	D	D	D	D	D	D	D	D																					
6R0	D	D	D	D	D	D	D	D	D																					
7R0	D	D	D	D	D	D	D	D	D																					
8R0	D	D	D	D	D	D	D	D	D																					
9R0	D	D	D	D	D	D	D	D	D																					
100	D	D	D	D	D	D	D	D	D																					
120	D	D	D	D	D	D	D	D	D																					
150	D	D	D	D	D	D	D	D	D																					
180	D	D	D	D	D	D	D	D	D																					
200	D	D	D	D	D	D	D	D	D																					
220	D/E/F	D	D	D	D	D	D	D	D																					
270	D/E/F	D	D	D	D	D	D	D	D																					
300	D/E/F	D	D	D	D	D	D	D	D																					
330	D/E/F	D	D	D	D	D	D	D	D																					
390	D/E/F	D	D	D	D	D	D	D	D																					
470	D/E/F	D	D	D	D	D	D	D	D																					
560	D/E/F	D	D	D	D	D	D	D	D																					
680	D/E/F	D	D	D	D	D	D	D	D																					
820	D/E/F	D	D	D	D	D	D	D	D																					
101	D/E/F	D/E	D	D	D	D	D	D	D	F	F	F	F	F																
121	D/E/F	D/E	D	D	D	D	D	D	D	F	F	F	F	F																
151		D/E	D	D	D	D	D	D	D	F	F	F	F	F																
181		D/E	D	D	D	D	D	D	D	F	F	F	F	F																
201		D/E	D	D	D	D	D	D	D	F	F	F	F	F																
221		D/E	D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
271		D/E	D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
331		D/E	D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
391		D/E	D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
471		D/E	D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
561			D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
681			D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
821			D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D					
102			D	D	D	D	D	D	D	F	F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D

SPECIFICATIONFOR APPROVAL	Document No.
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	1206(3216)																														
	COG系列									X7R系列											X5R系列					Y5V系列				
Cp V_{DC}	2000	1000	630	500	250	100	50	25	16	2000	1000	630	500	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
152			D	D	D	D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
182						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
222						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
272						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
332						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
472						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
562						D	D	D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
682								D	D		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
103								F	F		F	F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
153												F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
183												F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
223												F	F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
273													F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
333													F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
393													F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
473													F	F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
563														F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
683														F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
104														F	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
154															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
184															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
224															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
274															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
334															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
474															F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
684															F/H	F/H	F	F	F	F	F/H	F	F	F	F	F	F	F	F	F
105															F/H/H*	F/H/H*	F	F	F	F	F/H/H*	F	F	F	F	F	F	F	F	F
205																	E	E	E			E	E	E		E	E	E	E	
225																	F	F	F	F		F	F	F	F		F	F	F	F
475																	H/H*	H/H*	H/H*	H/H*		H/H*	H/H*	H/H*	H/H*		F	F	F	F
106																		H/H*	H/H*	H/H*			H/H*	H/H*	H/H*			F	F	F
226																			H/H*	H/H*				H/H*	H/H*				H/H*	H/H*
476																				H/H*					H/H*					

Tolerance: COG(0.5pF~4.9pF): C ;COG(5.0pF~9.9pF): D； COG(≥10pF): F(±1%), G(±2%), J(±5%)

X7R/X5R: J(±5.0%)； K(±10%)； M(±20%)； Y5V: M(±20%)； Z(-20,+80%)

Thickness: D：0.85±0.1mm、E：1.00±0.1mm、F：1.25±0.2mm、H：1.60±0.2mm、H*：1.60±0.3mm； Above capacitance for reference only, actual cap. Range depends on the standard products.

SPECIFICATIONFOR APPROVAL	Document No.
	DRAAW108H/0-2017

1210(3225) SIZE

	1210(3225)																											
	COG系列						X7R系列											X5R系列					Y5V系列					
Cp V_{DC}	2000	1000	500	250	100	50	2000	1000	630	500	250	100	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3
100	D																										
120	D																										
150	D																										
180	D																										
200	D																										
220	D																										
270	D																										
300	D																										
330	D																										
390	D																										
470	D																										
560	D																										
680	D																										
820	D																										
101	D	D	D	D	D	D																					
121	F	D	D	D	D	D																					
151	F	D	D	D	D	D																					
181	F	D	D	D	D	D																					
201	F	D	D	D	D	D																					
221	F	D	D	D	D	D	F	F	F	F	F	F															
271		D	D	D	D	D	F	F	F	F	F	F															
331		D	D	D	D	D	F	F	F	F	F	F															
391		D	D	D	D	D	F	F	F	F	F	F															
471		D	D	D	D	D	F	F	F	F	F	F															
561		F	D	D	D	D	F	F	F	F	F	F															
681		F	D	D	D	D	F	F	F	F	F	F															
821		F	D	D	D	D	F	F	F	F	F	F															
102		F	D	D	D	D	F	F	F	F	F	F															
152			D	D	D	D	F	F	F	F	F	F															
182			D	D	D	D	F	F	F	F	F	F															
222			D	D	D	D	F	F	F	F	F	F															
272			F	D	D	D		F	F	F	F	F															
332				D	D	D		F	F	F	F	F															
472				D	D	D		F	F	F	F	F															
562								F	F	F	F	F															
682								F	F	F	F	F															
103								F	F	F	F	F															
153								F	F	F	F	F															
223									H	H	F	F															
333									H	H	F	F															
473									G	G	F	F															
563											F	F															
683											F	F															
104											F	F															
154											H	H															
224											G	H															
334												G															
394												G															
474												G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
684												H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
105												H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
225													H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
475														H/G	H	H	H		H/G	H	H	H		H/G	H	H	H
106														M	G	M	M		M	G	M	M		M	G	M	M
226															M	M	M			M	M	M			M	M	M
476																M	M				M	M				M	M
107																	M					M					M

SPECIFICATIONFOR APPROVAL	Document No.
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Tolerance： COG(≥10pF): F(±1%), G(±2%), J(±5%)；X7R/X5R: J(±5.0%)；K(±10%)；M(±20%)；
Y5V: M(±20%)；Z(-20,+80%)

Thickness: D：0.85±0.1mm、F：1.25±0.2mm、H：1.60±0.2mm 、G：2.00±0.20mm M：2.50±0.30mm；

Above capacitance for reference only, actual cap. Range depends on the standard products.

SPECIFICATIONFOR APPROVAL	Document No.
	DRAAW108H/0-2017

1808(4520) SIZE

	1808(4520)												
	COG系列					X7R系列					Y5V系列		
Cp V_{DC}	2000	1000	500	250	50	2000	1000	500	250	100	50	25	16
101	F	F	F	F	F								
121	F	F	F	F	F								
151	F	F	F	F	F								
181	F	F	F	F	F								
201	F	F	F	F	F								
221	F	F	F	F	F	F	F	F	F	F			
271	F	F	F	F	F	F	F	F	F	F			
331	F	F	F	F	F	F	F	F	F	F			
391	F	F	F	F	F	F	F	F	F	F			
471	F	F	F	F	F	F	F	F	F	F			
561	F	F	F	F	F	F	F	F	F	F			
681	F	F	F	F	F	F	F	F	F	F			
821	F	F	F	F	F	F	F	F	F	F			
102	F	F	F	F	F	F	F	F	F	F			
222		F	F	F	F		F	F	F	F			
332		F	F	F	F		F	F	F	F			
472			F	F			F	F	F	F			
562				F			F	F	F	F			
103							F	F	F	F			
153							F	F	F	F			
223								F	F	F			
333								F	F	F			
473								F	F	F			
563									F	F			
683									F	F			
104									F	F			
224									F	F			
474										F			
105										F			
225											F	F	F
475												H	H
106													H

Tolerance： COG(≥10pF): F(±1%), G(±2%), J(±5%)； X7R: J(±5.0%)； K(±10%)； M(±20%)；

Y5V: M(±20%)； Z(-20,+80%)

Thickness: F：1.25±0.2mm、H：1.60±0.2mm； Above capacitance for reference only, actual cap. Range depends on the standard products.

CCTC
三环集团

SPECIFICATIONFOR APPROVAL	Document No.
	DRAAW108H/0-2017

1812（4532）SIZE

	1812(4532)																					
	COG系列							X7R系列								X5R系列			Y5V系列			
Cp V_{DC}	3000	2000	1000	500	250	100	50	2000	1000	500	250	100	50	25	16	50	25	16	50	25	16	
470	E																					
560	E																					
680	E																					
820	E																					
101	E	F	F	F	F		D															
121	H	F	F	F	F		D															
151	H	F	F	F	F		D															
181	H	F	F	F	F		D															
201	H	F	F	F	F		D															
221	H	F	F	F	F		D	F	F	F	F	F										
271		F	F	F	F		D	F	F	F	F	F										
331		F	F	F	F		D	F	F	F	F	F										
391		F	F	F	F		D	F	F	F	F	F										
471		F	F	F	F		D	F	F	F	F	F										
561		F	F	F	F		D	F	F	F	F	F										
681		F	F	F	F		D	F	F	F	F	F										
821		F	F	F	F		D	F/H	F	F	F	F										
102		F	F	F	F		D	F/H	F	F	F	F										
222				F	F			F/H	F	F	F	F										
332				F	F			F/H	F	F	F	F										
472				F	F			F/H	F	F	F	F										
562					F				F/H	F	F	F										
682						F			F/H	F	F	F										
103						F			F/H	F	F	F										
153									F/H	F	F	F										
223									F/H	F	F	F										
333										F	F	F										
473										F/H	F	F										
563										F	F	F										
683										F	F	F										
104										G	F/H	F										
224											F/H	F										
334											G	F										
474											G	F	F	F	F	F	F	F				
684												G/H	G/H	G/H	G/H	G/H	G/H	G/H				
105												G	G	G	G	G	G	G				
225													F/H	F/H	F/H	F/H	F/H	F/H	F/H	F/H	F/H	
475													G	G	G	G	G	G	G	G	G	
106														G	M		G	M		G	M	
226															M			M			M	
476																					M	
107																						

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Tolerance： COG(≥10pF): F(±1%), G(±2%), J(±5%)； X7R/X5R: J(±5.0%)； K(±10%)； M(±20%)；
Y5V: M(±20%)； Z(-20,+80%)

Thickness: D：0.85±0.1mm、E：1.00±0.1mm、F：1.25±0.2mm 、H：1.60±0.2mm 、G：2.00±0.20mm 、
M：2.50±0.30mm；

Above capacitance for reference only, actual cap. Range depends on the standard products.

SPECIFICATIONFOR APPROVAL	Document No.
	DRAAW108H/0-2017

2220(5750) SIZE

	2220(5750)												
	COG系列	X7R系列							X5R系列		Y5V系列		
Cp V_{DC}	50	2000	1000	500	250	100	50	25	50	25	50	25	16
101	E												
121	E												
151	E												
181	E												
201	E												
221	E	H	H	H	H	H							
271	E	H	H	H	H	H							
331	E	H	H	H	H	H							
391	E	H	H	H	H	H							
471	E	H	H	H	H	H							
561	E	H	H	H	H	H							
681	E	H	H	H	H	H							
821	E	H	H	H	H	H							
102	E	F/H	H	H	H	H							
222	E	F/H	H	H	H	H							
332		F/H	H	H	H	H							
472		F/H	H	H	H	H							
562		F/H	H	H	H	H							
103		F/H	H	H	H	H							
223			F/H	H	H	H							
333			F/H	H	H	H							
473			F/H	H	H	H							
563			G	G	G	G							
683			G	G	G	G							
104			G	G	G	G							
224				G	G	G							
334				G	G	G							
474					F/H/G	F/H/G	F/H/G	F/H/G	F/H/G	F/H/G			
684					F/H/G	F/H/G	F/H/G	F/H/G	F/H/G	F/H/G			
105					G	G	M	M	M	M			
155						H	H	H	H	H			
225						G	M	M	M	M	G	G	G
475						G	G	M	G	M	G	G	G
106							G	M	G	M	G	G	G
226											M	M	M
476												M	M
107													M

Tolerance： COG(≥10pF): F(±1%), G(±2%), J(±5%)； X7R: J(±5.0%)； K(±10%)； M(±20%)；

Y5V: M(±20%)； Z(-20,+80%)

Thickness: E：1.00±0.1mm、F：1.25±0.2mm 、H：1.60±0.20mm、G：2.00±0.20mm 、M：2.50±0.30mm；

Above capacitance for reference only, actual cap. Range depends on the standard products.

SPECIFICATIONFOR APPROVAL	Document No.
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2225(5764) SIZE

	2225(5764)				
	COG系列	X7R系列		Y5V系列	
Cp V_{DC}	50	400	250	50	25
101	E				
121	E				
151	E				
181	E				
201	E				
221	E				
271	E				
331	E				
391	E				
471	E				
561	E				
681	E				
821	E				
102	E	G	G		
222	E	G	G		
332	E	G	G		
472	E	G	G		
562	E	G	G		
103	E	G	G		
223	E	G	G		
333	E	G	G		
473	E	G	G		
563	E	G	G		
683		G	G		
104		G	G		
224		G	G		
334		G	G		
474		G	G		
684		G	G		
225				M	M
475				M	M
106					M

Tolerance： COG(≥10pF): F(±1%), G(±2%), J(±5%)； X7R: J(±5.0%)； K(±10%)； M(±20%)；

Y5V: M(±20%)； Z(-20,+80%)

Thickness: E：1.10±0.1mm、G：2.00±0.20mm 、M：2.50±0.30mm；

Above capacitance for reference only, actual cap. Range depends on the standard products.

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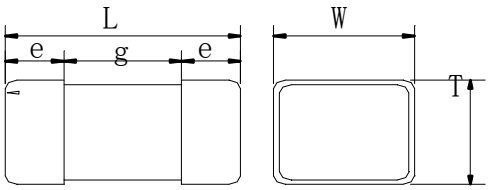
5. Dimensions

Chip Size：0402,0603,0805,1206,1210,1808,1812 ,2220 and 2225



Type	L (mm)	W (mm)	e (mm)	g min (mm)	T (mm)					
0402	1.00±0.05	0.50±0.05	0.15~0.3	0.4	0.50±0.05	——	——	——	——	——
0603	1.60±0.10	0.80±0.10	0.2~0.5	0.5	0.80±0.10	——	——	——	——	——
0603*1	1.60+0.15/-0.10*1	0.80+0.15/-0.10*1	0.2~0.5	0.5	0.80+0.15/-0.10*1	——	——	——	——	——
0805	2.00±0.10	1.25±0.10	0.2~0.7	0.7	0.60±0.10	0.85±0.10	1.25±0.20	——	——	——
0805*1	2.00±0.20*1	1.25±0.20*1	0.2~0.7	0.7	0.60±0.10	0.85±0.10	1.25±0.20	——	——	——
1206	3.20±0.20	1.60±0.20	0.3~0.8	1.6	0.85±0.10	1.00±0.10	1.25±0.20	1.60±0.20	——	——
1206*1	3.20±0.30*1	1.60±0.30*1	0.3~0.8	1.6	0.85±0.10	1.00±0.10	1.25±0.20	1.60±0.30*1	——	——
1210	3.20±0.30	2.5±0.20	0.3~0.8	1.6	0.85±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30	——
1210*1	3.20±0.40*1	2.5±0.30*1	0.3~0.8	1.6	0.85±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30	——
1808	4.50±0.30	2.0±0.20	0.3~1.5	2.5	1.25±0.20	1.60±0.20	——	——	——	——
1808*1	4.50±0.40*1	2.0±0.25*1	0.3~1.5	2.5	1.25±0.20	1.60±0.20	——	——	——	——
1812	4.50±0.30	3.2±0.30	0.3~1.5	2.5	0.85±0.10	1.00±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30
1812*1	4.50±0.40*1	3.2±0.40*1	0.3~1.5	2.5	0.85±0.10	1.00±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30
2220	5.70±0.40	5.0±0.40	0.3~1.1	3.5	1.00±0.10	1.25±0.20	1.60±0.20	2.00±0.20	2.50±0.30	
2225	5.70±0.40	6.4±0.40	0.3~1.1	3.5	1.00±0.10	2.00±0.20	2.50±0.30	——	——	

***1 Identifying the specification and model are identified as 1uF above specification product size**

SPECIFICATIONFOR APPROVAL	Document No.
	DRAAW108H/0-2017

6. Specification and Test Condition

6.1 Appearance

Dielectrics	Specification	Testing Condition
COG/X7R/X5R/Y5V	No defects or abnormalities	Visual inspection.

6.2 Dimensions

Dielectrics	Specification	Testing Condition
COG/X7R/X5R/Y5V	Within the specified dimensions	Using calipers on micrometer

6.3 Capacitance

Dielectrics	Specification	测 Testing Condition
COG	Within the specified tolerance A:±0.05pF;B:±0.1pF;C:±0.25pF; D:±0.5pF;J: ±5%	1.0±0.2Vrms, 1MHz±10% (C>1000 pF, 1.0±0.2Vrms, 1KHz±10%，)
X7R/X5R	Within the specified tolerance J: ±5%；K: ±10%； M: ±20%	1.0±0.2Vrms, 1KHz±10% （Cp＞10uF,0.5±0.1Vrms,120±24Hz）
Y5V	Within the specified tolerance M: ±20%; Z: -20%, +80%	1.0±0.2Vrms, 1KHz±10% （Cp＞10uF,0.5±0.1Vrms,120±24Hz）
Remarks：Test Temperature：25℃±3℃，Test Humidity：＜70%RH.		

6.4 Dissipation Factor

Dielectrics	Specification	Testing Condition
COG	Cp<30pF, Q≥400+20Cp; Cp≥30pF, Q≥1000	1.0±0.2Vrms,1MHz±10% ,25℃ (Cp>1000pF,1.0±0.2Vrms,1KHz±10%)
X7R/X5R	U_R≥100V，DF≤3.5% 25V≤U_R≤50V, DF≤3.5% ≤5.0%，(0402≥333,475＞ 0603≥224, 475＞0805≥684, 106＞1206＞225, 1210≥475） ≤10%（0603≥475、0805≥475、1206≥106） U_R=16V, DF≤5.0% ≤7%，（105＞0402≥104, 685＞0603≥564, 106＞0805≥105, 1206≥475, 1210≥106）; ≤10.0%，（0402≥105, 0603≥685, 0805≥106, 1206≥106, 1210≥226）; U_R=10V, DF≤7.0% DF≤10%（0402≥105， 0603≥225, 0805≥475, 1206≥106, 1210≥226） U_R =6.3V, DF≤10%	1.0±0.2Vrms, 1KHz±10%, (Cp＞10uF,0.5±0.1Vrms, 120±24Hz)
Y5V	U_R≥50V, DF≤7.0% U_R=25V, DF≤7.0% (683＞0402≥473, 474＞0603≥104, 105＞0805≥334,475＞1206≥684, 106＞1210≥105) DF ≤9.0% (0402≥683, 0603≥474, 0805≥105, 1206≥475, 1210≥106) U_R=16V, DF ≤9.0% ≤12.5%(0402≥224、0603≥225、0805≥335、 1206≥106、1210≥226、1812≥476） U_R=10V, DF ≤12.5% U_R=6.3V, DF ≤15.0%	1.0±0.2Vrms, 1KHz±10%, (Cp＞10uF,0.5±0.1Vrms, 120±24Hz) at 25℃,48hrs after annealing
Remarks：Test Temperature：25℃±3℃，Test Humidity：＜70%RH.		

SPECIFICATIONFOR APPROVAL	Document No.
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6.5 Insulation Resistance

Dielectrics	Specification	Testing Condition
COG/X7R/ X5R/Y5V	$U_R \leqslant 50V$ ，More than 10 GΩ or 100Ω·F /CR, whichever is smaller.	Charge Time:60±5sec Temperture:25℃
COG/X7R	$U_R > 50V$，More than 4 GΩ or 100Ω·F/CR，whichever is smaller.	$U_R \leqslant 400V$ $U_{测}=U_R$ $U_R > 400V$ $U_{测}=400V$； Charge Time:60±5sec Temperture:25℃
Remarks：Test Temperature：25℃±3℃，Test Humidity：＜70%RH.		

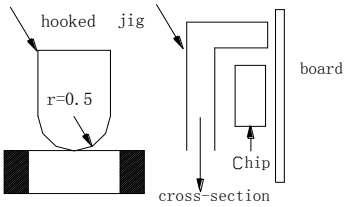
6.6 Dielectric Strength

Dielectrics	Rated voltage range	Measuring Method
COG	$U_R \leqslant 50V$	Force 300%Rated voltage for 5second. Max..current should not exceed 50 mA.
X7R/X5R/Y5V	$U_R \leqslant 50V$	Force 250%Rated voltage for 5second. Max..current should not exceed 50 mA.
COG/X7R	$100V \leqslant U_R < 500V$	Force 200%Rated voltage for 5second. Max..current should not exceed 50 mA.
	$500V \leqslant U_R < 1000V$	Force 150% Rated voltage for 5second. Max..current should not exceed 50 mA.
	$1000V \leqslant U_R < 2000V$	Force 130%Rated voltage for 5second. Max..current should not exceed 50 mA.
	$U_R \geqslant 2000V$	Force 120%Rated voltage for 5second. Max..current should not exceed 30 mA.

6.7 Temperature Coefficient of Capacitance

<table>
<tr><th>Dielectrics</th><th>Specification</th><th>Testing Condition</th></tr>
<tr><td>COG</td><td>Temperature coefficient within ±30ppm/℃;
Cp drift within ±0.2% or ±0.05pF</td><td rowspan="3">Measure capacitance under follow table list temperature:
<table><tr><th>STEP</th><th>COG, X7R</th><th>X5R</th><th>Y5V</th></tr><tr><td>1</td><td>25 ±2</td><td>25 ±2</td><td>25 ±2</td></tr><tr><td>2</td><td>-55±3</td><td>-55±3</td><td>-30±3</td></tr><tr><td>3</td><td>25 ±2</td><td>25 ±2</td><td>25 ±2</td></tr><tr><td>4</td><td>125±3</td><td>85±3</td><td>85±3</td></tr><tr><td>5</td><td>25 ±2</td><td>25 ±2</td><td>25 ±2</td></tr></table>1) COG
The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1,3 and 5.
The temperature coefficient is determined using the Capacitance measured in step 3 as a reference.
2) X7R 、X5R and Y5V
The ranges of capacitance change compared within the above 25℃ value over the temperature ranges shall be within the specified ranges.</td></tr>
<tr><td>X7R/X5R</td><td>Capacitance change within ±15%</td></tr>
<tr><td>Y5V</td><td>Capacitance change within +22%, -82%</td></tr>
</table>

6.8 Adhesion

Dielectrics	Specification	Testing Condition
COG/X7R/X5R/ Y5V	No removal of the terminations or other defect shall occur.	The pressurizing force shall be 6N (=600g*f) and the duration of application shall be 10±1sec. 

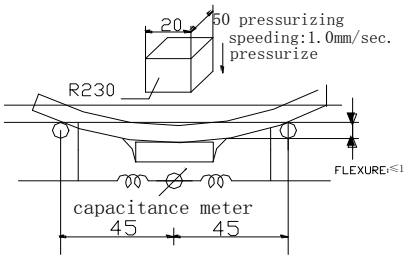
6.9 Solderability of Termination

Dielectrics	Specification	测 Testing Condition
COG X7R/X5R Y5V	95% min. coverage of both terminal electrodes and less than 5% have pin holes or rough spots.	Solder temperature: 245±5℃ Dipping time: 2±1 seconds. Completely soak both terminal electrodes in solder

6.10 Resistance to leaching

Dielectrics	Specification	Testing Condition
COG X7R/X5R Y5V	95% min. coverage of both terminal electrodes and less than 5% have pin holes or rough spots. No remarkable visual damage.	Solder temperature: 270±5℃ preheated: 120℃~150℃/60sec Dipping time: 10±1 seconds. Completely soak both terminal electrodes in solder

6.11 Bending

Dielectrics	Specification	Testing Condition
COG	No remarkable visual damage Cp change ≤ ±5% or ≤ 0.5 pF	Solder the capacitor on testing substrate and put it on testing stand. The middle part of substrate shall successively be pressurized by pressuring rod at a rated of about 1.0mm/sec. Until the deflection become means of the 1.0mm. 
X7R/X5R	No remarkable visual damage Cp change ≤ ±10%	
Y5V	No remarkable visual damage Cp change ≤ ±30%	

6.12 Resistance to Soldering Heat

Dielectrics	Specification	Testing Condition
COG	No remarkable visual damage Cp change within ±2.5% or ±0.25pF, whichever is larger. DF meets initial standard value. IR meets initial standard value.	Soldering temperature: 270±5℃ Preheating: 120~150℃ 60sec. Dipping time: 10±1 seconds. Measurement to be made after being kept at room temperature for 24±2 (COG) or 48±4(X7R ,X5R, Y5V) hours. Recov ery for the following period under the standard condition after test. *Initial measurement for high dielectric constant type Perform a heat treatment at 140~150℃ for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement.
X7R/X5R	No remarkable visual damage Cp change within ±7.5% DF meets initial standard value. IR meets initial standard value.	
Y5V	No remarkable visual damage Cp change within ±20% DF meets initial standard value. IR meets initial standard value.	

6.13 Temperature Cycle

Dielectrics	Specification	Testing Condition
COG	No remarkable visual damage Cp change within ±2.5% or ±0.25pF, whichever is larger.	To perform 5 cycles of the stated environment Step Temperature Time 1 Min. operating Temp.+0/-3℃ 30min 2 25℃ 2~3 min 3 Max. operating Temp.+3/-0℃ 30 min 4 25℃ 2~3 min Measurement to be made after being kept at room temperature for 24±2hrs (COG) or 48±4hrs (X7R, X5R, Y5V) at room temperature, then measure. *Initial measurement for high dielectric constant type Perform a heat treatment at 140~150℃ for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement.
X7R/X5R	No remarkable visual damage Cp change within ±7.5%	
Y5V	No remarkable visual damage Cp change within ±20%	

6.14 Moisture Resistance ,steady state

Dielectrics	Specification	Testing Condition
COG	No remarkable visual damage Cp change within ±5% or ±0.5pF, whichever is larger. Cp<10pF, Q≥200+10Cp; 10≤Cp<30pF, Q≥275+2.5Cp Cp≥30pF, Q≥350 R*C≥1000MΩ or 50Ω·F, whichever is smaller	Test temperature: 40±2℃ Humidity: 90~95% RH Testing time: 500 ±12hrs Measurement to be made after being kept at room temperature for 24±2hrs (COG) or 48±4hrs (X7R, X5R, Y5V) *Initial measurement for high dielectric constant type Perform a heat treatment at 140~150℃ for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement.
X7R/X5R	Cp change within ±12.5% DF:Not more than 2 times of initial value R*C≥1000MΩ or 50Ω·F, whichever is smaller	
Y5V	No remarkable visual damage Cp change within ±30% DF:Not more than 1.5 times of initial value R*C≥1000MΩ or 50Ω·F, whichever is smaller	

6.15 Damp heat with load

Dielectrics	Specification	测 Testing Condition
COG	No remarkable visual damage Cp change≤±7.5% or ±0.75pF, whichever is larger. Cp<30pF, Q≥100+10/3*Cp Cp≥30pF, Q≥200 R*C≥500MΩ or 25Ω·F, whichever is smaller	Test temperature: 40±2℃ Humidity: 90~95% RH Voltage: 100% of the rated voltage Testing time: 500 ±12hrs Measurement to be made after being kept at room temperature for 24±2hrs (COG) or 48±4hrs (X7R, X5R, Y5V) *Apply the rated DC voltage for 1 hour at 40±2℃. Remove and let sit for 48±4hrs at room temperature. Perform the initial measurement.
X7R/X5R	No remarkable visual damage Cp change≤±12.5% DF:Not more than 2 times of initial value R*C≥500MΩ or 25Ω·F, whichever is smaller	
Y5V	No remarkable visual damage Cp change≤±30% DF:Not more than 1.5 times of initial value R*C≥500MΩ or 25Ω·F , whichever is smaller	
Remarks：suitable to popular producets. Not suitable for medium and high pressure products.		

6.16 Life Test

Dielectrics	Specification	Testing Condition
COG	No remarkable visual damage Cp change≤±3% or ±0.3pF, whichever is larger. Q≥350 (Cp≥30 PF) Q≥275+(2.5* Cp) (10 pF≤Cp<30 PF) Q≥200+10*Cp (Cp<10 PF) R*C≥1000MΩ or 50Ω·F, whichever is smaller	Test temperature: Max. Operating Temp. ±3℃ Voltage: U_R＜100V 150% of the rated voltage Testing time: 1000 hrs Measurement to be made after being kept at room temperature for 24±2hrs (COG) or 48±4hrs (X7R, X5R,Y5V) *Initial measurement for high dielectric constant type Apply 150% of the rated DC voltage for one hour at the maximum operating temperature ±3℃. Remove and let sit for 48±4hrs at room temperature. Perform the initial measurement
X7R/X5R	No remarkable visual damage Cp change≤±12.5% DF:Not more than 2 times of initial value R*C≥1000MΩ or 50Ω·F, whichever is smaller	
Y5V	No remarkable visual damage Cp change≤±30% DF:Not more than 1.5 times of initial value R*C≥1000MΩ or 50Ω·F, whichever is smaller	
Remarks：suitable to popular producets. Not suitable for medium and high pressure products.		

7. Packing

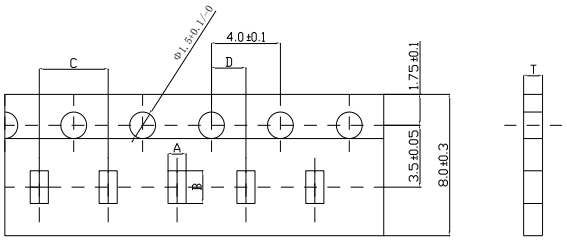
7.1 Bulk Packing

Standard packing 10Kpcs/bag; others are according to customer request.

7.2 Tape Packing

Type	Size (mm)			(pcs/reel)	
	L	W	T	Paper Tape	Plastic Tape
0402	1.0	0.5	0.5	10,000	N/A
0603	1.6	0.8	0.8	4,000	N/A
0805	2.0	1.25	＜0.85	4,000	N/A
			≥0.85	N/A	2,000（or3000）
1206	3.2	1.6	≤0.85	4,000	N/A
			＞0.85	N/A	2,000（or 3000）
1210	3.2	2.5	≤1.25	N/A	2,000
			＞1.25	N/A	2,000
1808	4.5	2.0	≤1.25	N/A	1,000
1812	4.6	3.2	≤1.25	N/A	1,000
			＞1.25	N/A	
2220	5.7	5.0	≤1.25	N/A	1,000
			＞1.25	N/A	700
2225	5.7	6.4	＞1.25	N/A	700

7.2.1 Dimensions of Packing Paper

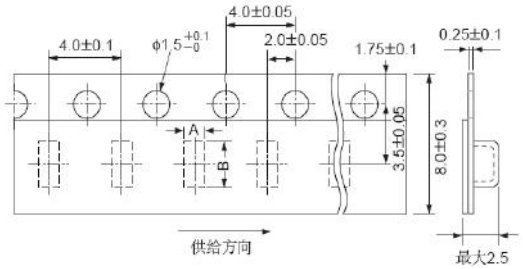


Type	A	B	C	D	T
0402	0.65±0.10	1.15±0.10	2.0±0.05	2.0±0.05	0.8max
0603	1.05±0.10	1.85±0.10	4.0±0.10	2.0±0.10	1.1max
0805	1.55±0.15	2.3±0.15	4.0±0.10	2.0±0.10	1.1max
1206	1.95±0.15	3.5±0.15	4.0±0.10	2.0±0.10	1.1max

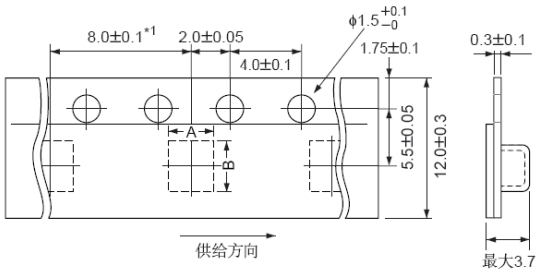
(unit: mm)

7.2.2 Dimensions of Embossed Packing

8mm宽，4mm间距编带

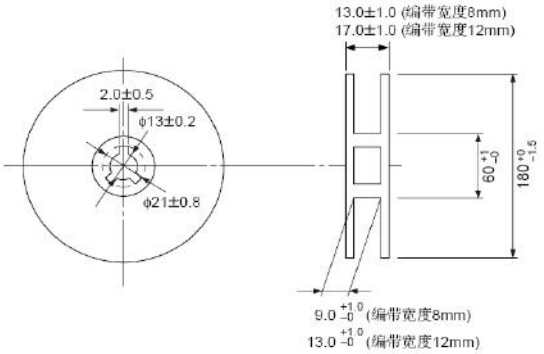


12mm宽，8mm/4mm间距编带

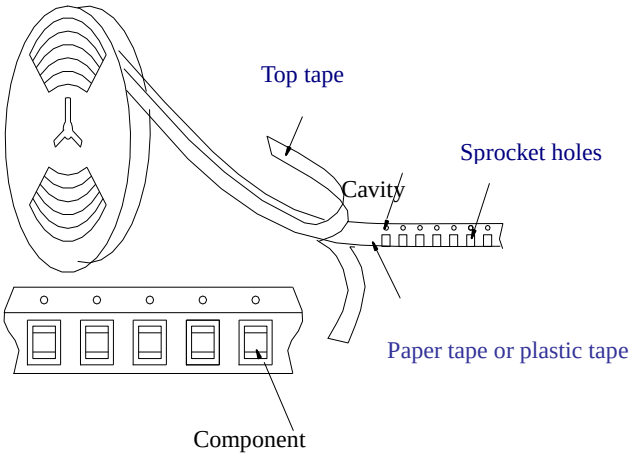


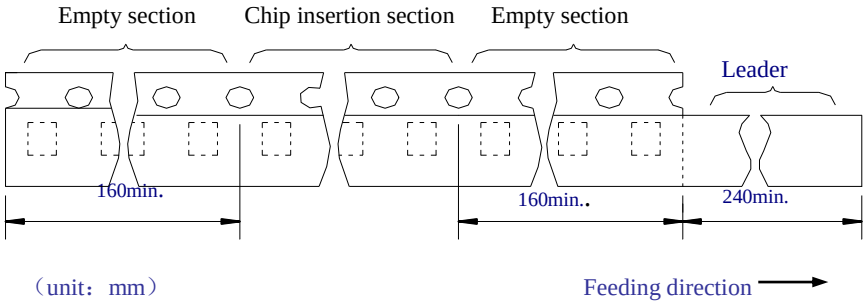
A：1.45±0.20 B：2.25±0.20 （0805） A：1.95±0.20 B：3.50±0.20 （1206） (unit: mm)
A：2.90±0.20 B：3.60±0.20 （1210） A：2.50±0.20 B：4.90±0.20 （1808）
A：3.60±0.20 B：4.90±0.20 （1812） A：5.40±0.20 B：6.10±0.20 （2220）
A：6.10±0.20 B：6.80±0.20 （2225）

7.2.3 Dimensions of Reel



7.2.4 Taping Figure





7.2.5 Taping Method

①Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.

②The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.

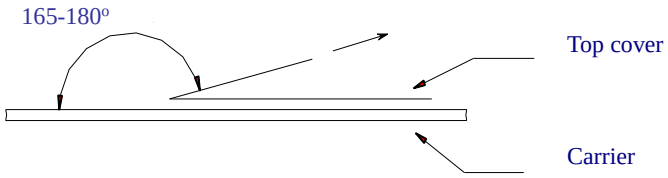
③Part of the leader and part of the empty tape shall be attached to the end of the tape as follows.

④Missing capacitors number within 0.1% of the number per reel or 1pc, whichever is greater, and are not continuous.

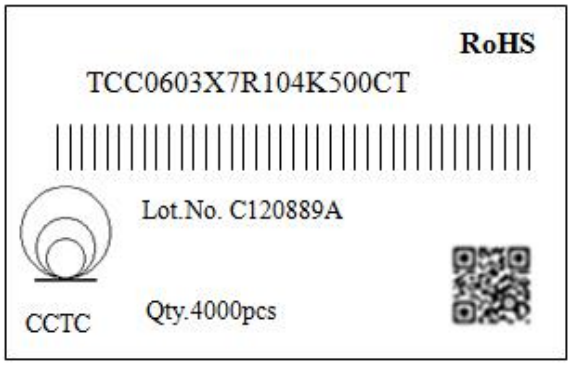
⑤The top tape and bottom tape shall not protrude beyond the edges of the tape and shall not cover sprocket holes.

⑥Cumulative tolerance of sprocket holes, 10 pitches: ±0.3mm.

⑦Peeling off force: 0.1 to 0.6N in the direction shown down.



7.2.6 Reel Label



The Contents of Label

(1) TCC 0603 X7R 104 K 500 C T

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Code of Ceramic Capacitor

② chip size,③ dielectrics,④ capacitance,⑤ tolerance,

⑥ rated voltage, ⑦ thickness, ⑧ packing

(2) Lot. No.: C120889A

(3) Qty: 4000pcs

(4) RoHS:GREEN PARTS

7.2.7. Package

7.2.7.1 Carton

7.2.7.1.1 Carton Size

L	W	H
41.0cm	38.5cm	20.2cm

7.2.7.1.2 Quantity: 240Kpcs /one carton

1 INNER BOX=40,000PCS

1 CARTON=40,000PCS × 6BOX=240,000PCS

RoHS identiflcation(according to customer request)

7.2.7.2 Inner Box

7.2.7.2.1 Size

L	W	H
18.5cm	6.5cm	19cm

7.2.7.2.2 Quantity：40Kpcs /box

1 REEL=4,000PCS

1 INNER BOX=4,000PCS × 10REEL =40,000PCS

8. Precautions on the use of MLCC

8.1 PCB Design

8.1.1 Design of Land-patterns

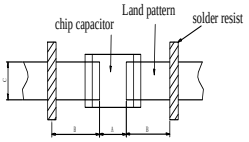
The following diagrams and tables show some examples recommended patterns to prevent excessive solder amounts (larger fillets which above the component end terminations)

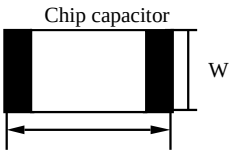
Examples of improper pattern designs are also shown.

Recommended land dimensions for a typical chip capacitor land patterns for PCBs

Recommended land dimensions for wave-soldering (unit: mm)

Speciflcation		0603	0805	1206
SIZE	L	1.6	2.0	3.2
	W	0.8	1.25	1.6
A		0.8~1.0	1.0~1.4	1.8~2.5
B		0.5~0.8	0.8~1.5	0.8~1.7
C		0.6~0.8	0.9~1.2	1.2~1.6



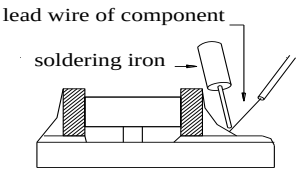
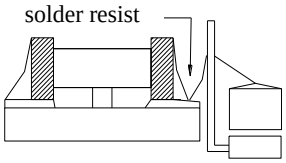
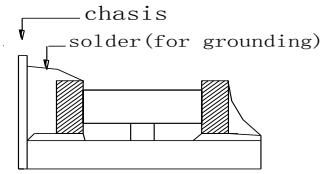
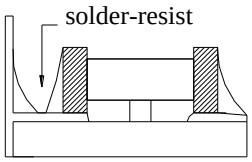
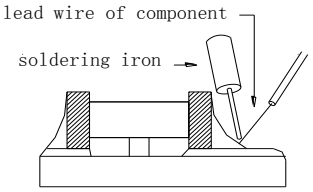
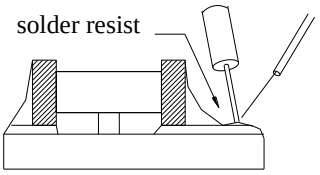


Recommended land dimensions for reflow-soldering (unit: mm, L)

Speciflcation		0402	0603	0805	1206	1210	1808	1812	2220	2225
SIZE	L	1.0	1.6	2.00	3.2	3.2	4.5	4.5	5.7	5.7
	W	0.5	0.8	1.25	1.6	2.5	2.0	3.2	5.0	6.4
A		0.35~0.45	0.6~0.8	0.8~1.2	1.8~2.5	1.8~2.5	2.5~3.4	2.5~3.4	4.0~4.6	4.0~4.6
B		0.40~0.50	0.6~0.8	0.8~1.2	1.0~1.5	1.0~1.5	1.8~2.0	1.8~2.0	2.0~2.2	2.0~2.2
C		0.45~0.55	0.6~0.8	0.9~1.6	1.2~2.0	1.6~3.2	1.4~1.8	2.3~3.5	3.5~4.8	5.0~6.2

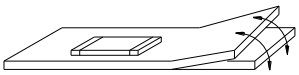
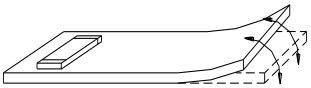
Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

Examples of good and bad solder application

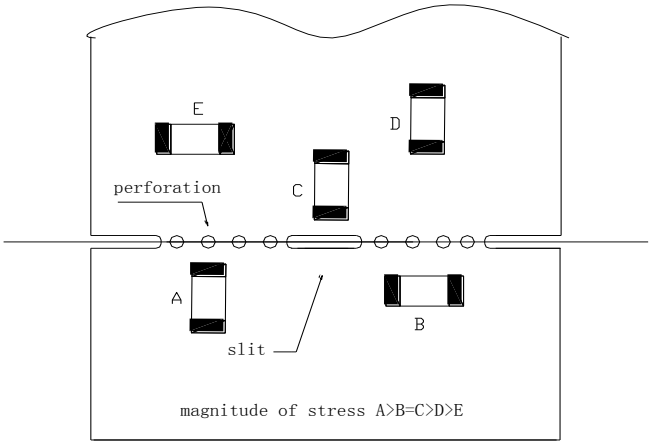
Item	Not recommended	Recommended
Mixed mounting of SMD and leaded component		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		

8.1.2 Pattern configurations

The following are examples of good and bad capacitor layout, SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection..

	Not recommended	Recommended
Deflection of the board		

To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanical stresses given depending on capacitor layout. The example below shows recommendations for better design.



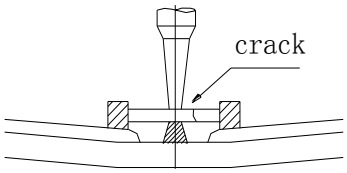
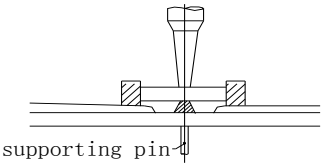
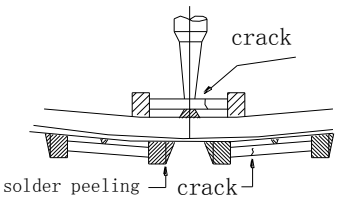
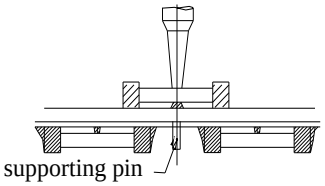
When breaking PC boards along their perforations, the amount lf mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, silt, -grooving, and perforation. Thus, any ideal SMD capacitor layout must also consider the PCB splitting procedure.

8.2 Considerations for automatic placement

Adjustment of mounting machine

①. Excessive impact load should not be imposed on the capacitors when mounting the PC boards.

②. The maintenance and inspection of the mounters should be conducted periodically.

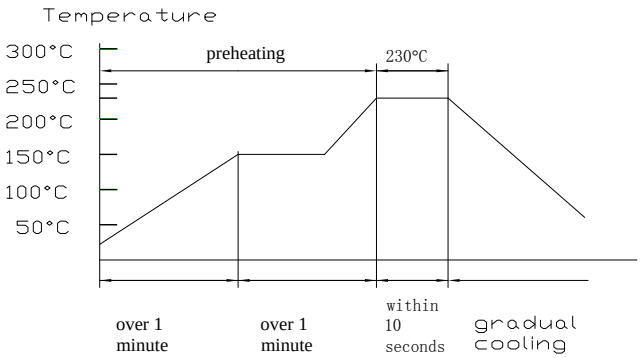
	Not recommended	Recommended
Single-sided mounting		
Double-sided mounting		

8.3 Recommended soldering profile

8.3.1 Re：①flow Soldering is recommended；②flow soldering is suitable for bigger size MLCCs

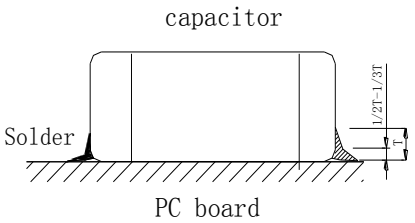
8.3.2 Recommended Sn&Pb soldering profile

Reflow soldering



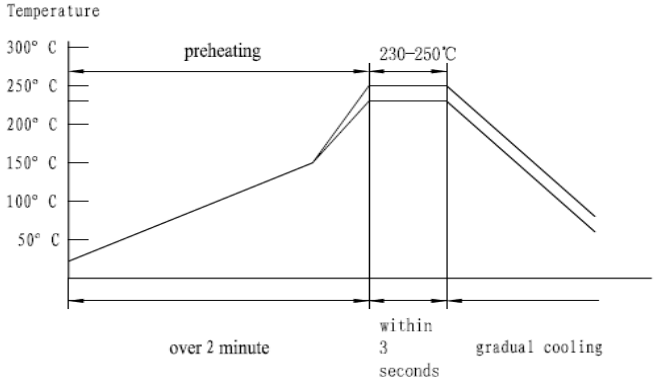
Caution

①.The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3of the thickness of the capacitor, as shown below:



②. Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible.

Wave solder profile



Caution

①.Make sure the capacitors are preheated sufficiently.

②.The temperature difference between the capacitor and melted solder should not be greater than 100 to 130℃.

①. Cooling after soldering should be gradual as possible.

Hand soldering

条件:

预热	烙铁头温度	烙铁功率	烙铁头直径	焊接时间	锡膏量	限制条件
△≤130℃	最高350℃	最大20W	建议1mm	最长5s	≤1/2芯片厚度	请勿使用烙铁头直接接触陶瓷原件

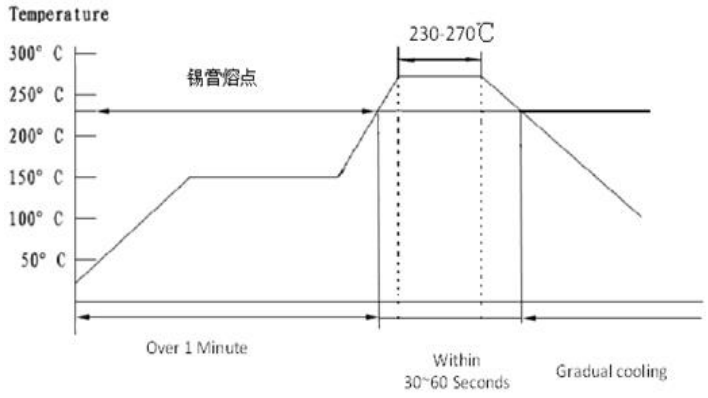
Caution

①.Use a 20w soldering iron with a maximum tip diameter of 1.0mm.

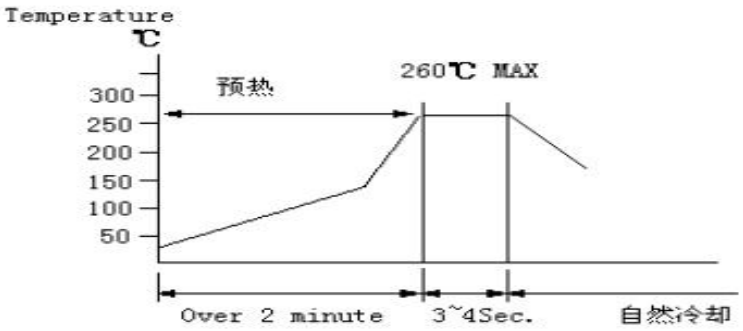
① .The soldering iron should not directly touch the capacitor.

8.3.3 Recommended Pb-Free soldering profile

Reflow solder



Wave solder profile



8.4 Handling

Breakaway PC boards (splitting along perforations)

⑴.When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of deflection or twisting to the board.

⑵.Board separation should not be done manually, but by using the appropriate devices.

8.5 Storage

⑴. Keep the storage environment conditions as following: Temperature: 5~40℃； Humidity: ≤70% RH

⑵. Don’t open the tape until the parts are to be used, and store them within one year since the date printed on the reel.

⑶. Use the chips within 3 months after the tape is opened.

⑷. The capacitance value of high dielectric constant capacitors (X7R,X5R,Y5V) will gradually decrease with the passage of time, so this should be taken into consideration in the circuit design. If such a capacitance reduction occurs, a heat treatment of 150℃ for 1 hour will return the capacitance to its initial level.