PSA 信昌電子陶瓷股份有限公司

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Messrs. : 一般共用

Date : 2021/12/22

APPROVAL SHEET

Product Name : Safety Certified Multilayer Ceramic Chip Capacitors

Part No. : FK / FH Series

Description : X1/Y2 & X2 Class, Size 1808~2220, C0G/X7R, 250Vac & UL 62368-1 Certified, Size 1206, X7R, 2.5KVdc

PREPARED BY	APPROVED BY

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SPECIFICATION

FOR

Product Name : Safety Certified Multilayer Ceramic Chip Capacitors

Part No. : FK / FH Series

Description : X1/Y2 & X2 Class, Size 1808~2220, C0G/X7R, 250Vac & UL 62368-1 Certified, Size 1206, X7R, 2.5KVdc

SPEC. No. : FKFH-000-001-18
DATE : 2021/12/22

DRAWN BY	CHECEKED BY	APPROVED BY
Jane Hsiao	Yvens Chou	Jason Lin

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Prosperity Dielectrics Co., Ltd.

1. INTRODUCTION

PROSPERITY's SAFETY CERTIFIED CAPACITORS are designed for surge or lightning immunity in modem facsimile and other equipments. The capacitors of FK series are class X1/Y2 compliant, and the capacitors of FH series are class X2 compliant respectively.

The green type capacitors in FK/FH series are manufactured by using environmentally friendly materials without lead or cadmium.

The terminations are composed of plated nickel and pure tin to feature the superior leaching resistance during soldering.

2. FEATURES

a. High reliability and stability.
b. Small size and high capacitance.
c. Safety standard approval by :
   EN 60384-14 : 2013/A1 : 2016
   IEC 60384-14 : 2013/AMD1 : 2016
   UL 60384-14 (Ed 2.0) UL 62368-1 (2nd Edition)
d. Certificate number :
   R 50041666 & R 50359148 by TUV.
   E346791 (FOWX2/8) by UL, E231248 by UL.
e. CQC20001247849 by CQC (FK series)
   CQC20001247848 by CQC (FH series)
f. License No. ENEC-03020 (FK series)
   License No. ENEC-03021 (FH series)
g. RoHS and HALOGEN compliant.

3. APPLICATIONS

a. Modem.
b. Facsimile.
c. Telephone.
d. Other electronic equipment for lighting or surge protection and isolation.

4. HOW TO ORDER

FK	08	N	100	J	502	E	F	G
PDC Family	Size	Dielectric	Capacitance	Tolerance	Impulse Voltage	Packaging	Thickness	Customer Code
Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8	Table 9

Table 1 PDC Family

Code	Description
FK	Safety X1 & Y2 series
FH	Safety X2 series

Table 2 Size

Code	Description	Code	Description	Code	Description
06	1206 (3216)	12	1812 (4532)	20	2220 (5750)
08	1808 (4520)	21	2211 (5728)		

Table 3 Dielectric Material Characteristics

Code	Description	Code	Description
N	C0G	X	X7R

Table 4 Capacitance Rule Code

Code	Description	Code	Description
0R5	0.5pF	104	104=10x10^4=100nF

Table 5 Tolerance

Code	Description	Code	Description	Code	Description
A	±0.05 pF	D	±0.50 pF	J	±5 %
B	±0.10 pF	F	±1 %	K	±10 %
C	±0.25 pF	G	±2 %	M	±20 %

Table 6 Impulse Voltage

Code	Description	Code	Description	Code	Description
252 (FH06X)	2.5KV	302 (FH series)	2.5KV	502	5KV
				602	6KV

Table 7 Packaging Type

Code	Description	Code	Description
B	Bulk	E	Embossed Tape

Table 8 Thickness Description

Code	Description	Code	Description	Code	Description
C	1.25±0.10 mm	E	1.60±0.20 mm	G	2.50±0.30 mm
D	1.40±0.15 mm	F	2.00±0.20 mm	H	2.80±0.30 mm

Table 9 Customer Code

Code	Description	Code	Description	Code	Description
G	RoHs compliant	Q	Anti-Arcing	E	Anti-Bending
H	High reliability	Z	Anti-Arcing+Anti-Bending		

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M_B (mm)
1206(3216)	3.30±0.40	1.60±0.20	See No.4 Reference Table 8	0.50±0.25
1808(4520)	4.50+0.6/-0.3	2.00±0.30		0.50±0.25
1812(4532)	4.50+0.6/-0.3	3.20±0.40		0.50±0.25
2211(5728)	5.70±0.50	2.80±0.40		0.60±0.30
2220(5750)	5.70±0.50	5.00±0.50		0.60±0.30

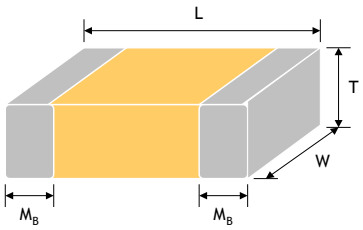

Fig. 5.1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	C0G	X7R	
Size	1808, 1812, 2211	1808, 1812, 2211, 2220	1206
Rated voltage	250Vac		2.5KVdc
Capacitance range	X1/Y2 Class (Impulse 6KV) : 4pF ~ 100pF X1/Y2 Class (Impulse 5KV) : 3pF ~ 720pF X2 Class : 3pF ~ 1000pF	X1/Y2 Class : 100pF ~ 4700pF X2 Class : 100pF ~ 56000pF	100pF ~ 1000pF
Capacitance tolerance	Cap. Rang: Cap.<10pF — Tolerance Spec.: A (±0.05pF), B (±0.1pF), C (±0.25pF)D (±0.5pF) Cap. Rang: 10pF≤Cap. — Tolerance Spec.: F (±1%), G (±2%), J (±5%), K (±10%), M (±20%)	J (±5%) K (±10%) M (±20%)	
Tan δ	Cap. Range: Cap.<30pF — Q Spec.: Q≥400+20C Cap. Range: Cap.≥30pF — Q Spec.: Q≥1000	≤2.5%	
Capacitance & Tan δ Test condition	Measured at the condition of 30~70% related humidity		
	For 25°C at ambient temperature	Preconditioning for Class II MLCC : Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement	
	Cap. Rang: Cap.≤1000pF — Test Condition: 1.0±0.2Vrms, 1.0MHz±10% Cap. Rang: Cap.>1000pF — Test Condition: 1.0±0.2Vrms, 1.0KHz±10%	1.0±0.2Vrms, 1.0KHz±10%, at 25°C ambient temperature	
Insulation resistance	≥100GΩ or RxC≥1000Ω-F, whichever is smaller	≥10GΩ or RxC≥500Ω-F, whichever is smaller	
Operating temperature	-55°C to +125°C		
Temperature coefficient	±30ppm /°C	±15%	
Termination	Cu or Ag/Ni/Sn (lead-free termination)		

7. CAPACITANCE RANGE

Class		X1/Y2 (FK series)								X2 (FH series)					
Rated voltage		250Vac													2.5KVdc
Certificated		TUV / UL / CQC (IEC 60384-14)													UL 62368
Dielectric		C0G				X7R				C0G		X7R			X7R
Cap.(pF)	EIA Size	1808	1812	2211	2211	1808	1812	2211	2220	1808	1812	1808	1812	2220	1206
	Impulse	5KV (502)			6KV (602)	5KV (502)				2.5KV (302)					(252)
3.0	3R0	D								D					
3.3	3R3	D													
4.0	4R0	D		F	F					D					
4.7	4R7	D		F	F										
5.0	5R0	D		F	F					D					
5.6	5R6	D		F	F										
6.0	6R0	D		F	F					D					
6.8	6R8	D		F	F										
7.0	7R0	D		F	F					D					
8.0	8R0	D		F	F					D					
8.2	8R2	D		F	F										
9.0	9R0	D								D					
10	100	D	C	F	F					D	C				
12	120	D	C	F	F					D	C				
15	150	D	C	F	F					D	C				
18	180	D	C	F	F					D					
22	220	D	C	F	F					D	C				
27	270	D	C	F	F					D	C				
33	330	D	C	F	F					D	C				
39	390	E	C	F	F					E	C				
47	470	E	C	F	F					E	C				
56	560	E	C	F	F					E	C				
68	680	E	C	F	G					E	C				
82	820	E	C	F	G					E	C				
100	101	F	C	F	H	E		E		F	C				C
120	121	F	C	G		E*		E*		F	C				C
130	131	F	C					E*							C
150	151	F	C	G		E*	E*	E*		F	C	E			C
160	161	F	C	G		E*			F*			E			C
180	181	F	C	G		E*	E*	E*	F*	F	C	E			C
220	221	F	F	G		E*	E*	E*	F*	F	C	E			C
270	271	F	F	G		F*	E*	E*	F*	F	D	E	E		C
300	301		F									E	E		C
330	331		F	G		F*	E*	E*	F*	F	D	E	E		C
390	391		F	G		F*	E*	E*	F*	F	D	E	E		C
470	471		F	G		F*	E*	F*	F*	F	E	E	E		C
560	561			G		F*	E*	F*	F*	F	F	E	E		C
680	681			G		F*	F*	F*	F*	F	F	E	E		C
720	721								F*	F			E		C
820	821					F*	F*	F*	F*	F	G	E	E		C
1000	102					F*	G*	G*	F*	F	G	F	E		C
1200	122							G*	G*			F	E		
1500	152							G*	G*			F	F		
1800	182							G*	G*			F	F		
2200	222							G*	G*			F	G		
2700	272							H*	F/G*				G		
3300	332								G*				G		
3900	392								G*				G		
4700	472								F/G*				G		
5600	562												G		
6800	682														
8200	822														
10000	103													G	
12000	123													G	
15000	153													G	
18000	183													G	
22000	223													H	
27000	273													H*	
33000	333													H*	
39000	393													H*	
47000	473													H*	
56000	563													H*	

"*" Surface coating only.

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>Item</th><th>Standard Methods</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual examination and Dimensions</td><td>IEC 60384-1 4.1</td><td>---</td><td>* No remarkable defect.
* Dimensions to confirm to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>IEC 60384-1 4.2.2</td><td rowspan="2">* Class I : (C0G)
Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%.
Cap.>1000pF, 1.0±0.2Vrms, 1KHz±10%.

* Class II : (X7R)
1.0±0.2Vrms, 1KHz±10%.</td><td>* Capacitance is within specified tolerance.
* C_R means rated capacitance for conform to the E6 series of preferred values given in IEC 60063.</td></tr>
<tr><td>3.</td><td>Q/D.F. (Dissipation Factor)</td><td>IEC 60384-1 4.2.3</td><td><table><tr><th>Dielectric</th><th>Q/D.F.</th><th>Remark</th></tr><tr><td rowspan="2">Class I (C0G)</td><td>Q≥1000</td><td>Cap.≥30pF</td></tr><tr><td>Q≥400+20C</td><td>Cap.<30pF</td></tr><tr><td>Class II (X7R)</td><td>D.F.≤2.5%</td><td>-</td></tr></table></td></tr>
<tr><td>4.</td><td>Temperature Coefficient</td><td>IEC 60384-21/22 4.6</td><td>* With no electrical load.<table><tr><th>T.C.</th><th>Operating Temp.</th></tr><tr><td>C0G</td><td>-55~125°C at 25°C</td></tr><tr><td>X7R</td><td>-55~125°C at 25°C</td></tr></table></td><td><table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G</td><td>±30ppm/°C</td></tr><tr><td>X7R</td><td>±15%</td></tr></table></td></tr>
<tr><td>5.</td><td>Voltage proof (Dielectric Strength)</td><td>IEC 60384-14 4.2.1</td><td>* To apply voltage :
X Capacitor : 1075Vdc (4.3U_R).
Y Capacitor : 1500Vac.
* Duration : 60 sec.
* The charge current shall not exceed 0.05A.
* The voltage shall be raised from the near zero to the test voltage a rate not exceeding 150V(r.m.s.)/sec.
* For FH06X series : 1500Vac / 1~5 sec.
* For FK20X series : 4000Vdc / 1~5 sec. (Validation by UL)
* For FK08X series : 3000Vdc / 1~5 sec. (Internal validation by PDC)</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>6.</td><td>Insulation Resistance</td><td>IEC 60384-21/22 4.5.3</td><td><table><tr><th>Rated Vol.(V)</th><th>Apply Voltage</th><th>Charge Current</th><th>Charge Time</th></tr><tr><td>>500</td><td>500Vdc</td><td>≤50mA</td><td>60 sec.</td></tr></table></td><td><table><tr><th>Dielectric</th><th>Requirements</th></tr><tr><td>Class I (C0G)</td><td>≥100GΩ or RxC≥1000Ω-F, whichever is smaller</td></tr><tr><td>Class II (X7R)</td><td>≥10GΩ or RxC≥500Ω-F, whichever is smaller</td></tr></table></td></tr>
<tr><td>7.</td><td>Solderability</td><td>IEC 60384-21/22 4.10</td><td>* Solder temperature : 235±5°C (1206).
* Solder temperature : 245±5°C (1808~2220).
* Dipping time : 2.0±0.5 sec.</td><td>* 75% min. coverage of all metalized area.</td></tr>
<tr><td>8.</td><td>Resistance to Soldering Heat</td><td>IEC 60384-14 4.4
IEC 60384-21/22 4.9</td><td>* Solder temperature : 260±5°C.
* Dipping time : 10±1 sec.
* Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.
* Measurement to be made after keeping at room temperature for 24±2 hrs (Class I) and 48±4 hrs (Class II).</td><td>* Appearance :
No remarkable damage.
* Cap. change :
C0G within ±2.5% or ±0.25pF, whichever is larger.
X7R within ±7.5%.
* D.F. value :
C0G to meet initial requirement.
X7R to meet initial requirement.
* I.R. : ≥1GΩ.</td></tr>
</table>

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

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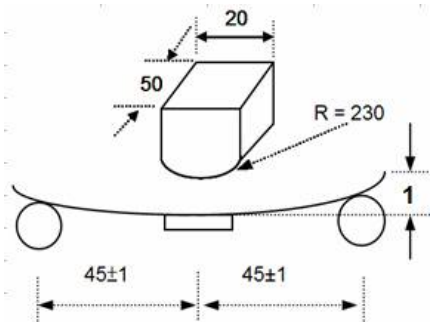
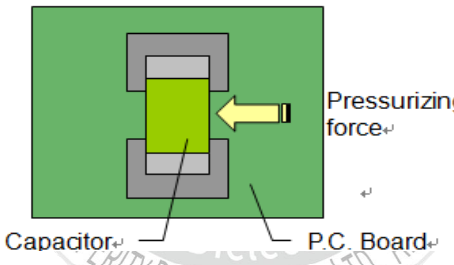
<tr><th>No.</th><th>Item</th><th>Standard Methods</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>9.</td><td>Temperature Cycle</td><td>IEC 60384-21/22 4.11</td><td>* Conduct the five cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp.(°C)</th><th>Time(min.)</th></tr>
<tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temp.</td><td>2~3</td></tr>
<tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temp.</td><td>2~3</td></tr>
</table>
* Measurement to be made after keeping at room temperature for 24±2 hrs (Class I) and 48±4 hrs (Class II).</td><td>* Appearance :
No remarkable damage.
* Cap. change :
C0G within ±2.5% or ±0.25pF, whichever is larger.
X7R within ±7.5%.
* D.F. value :
C0G to meet initial requirement.
X7R≤150% of initial requirement.
* I.R. : To meet initial requirement.</td></tr>
<tr><td>10.</td><td>Humidity (Damp Heat) Steady State</td><td>IEC 60384-14 4.12</td><td>* Test temp. : 40±2°C.
* Humidity : 90~95% RH.
* Test time : 500 +24/-0hrs.
* Applied voltage : 250Vac. (FH06X series without the voltage)
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) and 48±4 hrs (Class II).</td><td>* Appearance :
No remarkable damage.
* Cap. change :
C0G within ±3.0% or ±2.0pF, whichever is larger.
X7R within ±15%.
* D.F. value :
C0G≤0.25%.
X7R≤200%.
* I.R. : ≥1GΩ or RxC≥25Ω-F, whichever is smaller.</td></tr>
<tr><td>11.</td><td>Passive Flammability</td><td>IEC 60384-14 4.17
IEC 60384-1 4.38</td><td>* Volume sample : 21.56 mm^3
* Flame exposure time : 5 sec. Max.
* Category of flammability : C.</td><td>* Capacitor didn't burn at all.
(FH06X series not include)</td></tr>
<tr><td>12.</td><td>Active Flammability</td><td>IEC 60384-14 4.17
IEC 60384-1 4.38</td><td>* The capacitors applied UR (250Vac). Then each sample shall be subjected to 20 discharges from a tank capacitor, charge to a voltage that, when discharged, places Ui 2500V for X2, Ui 5000V for X1Y2 across the capacitor under test. The interval between successive discharges shall be 5 sec.</td><td>* The cheese cloth shall not burn with a flame.
(FH06X series not include)</td></tr>
<tr><td>13.</td><td>High Temperature Load (Endurance)</td><td>IEC 60384-14 4.14</td><td>* Impulse Voltage :
Each individual capacitor shall be subjected to a Vp = 5.0KV (X1Y2 Class Impulse 5KV) or Vp = 2.5KV (X2 Class Impulse 2.5KV) impulse for three times before applied to endurance test.
* Test temp. : 125±3°C.
* Test time : 1000 +48/-0 hrs.
* Applied voltage :
X capacitor : 1.25U_R (312.5Vac).
Y capacitor : 1.70U_R (425Vac).
Once every hour the voltage shall be increased to 1000Vrms for 0.1 sec.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) and 48±4 hrs (Class II).

For FH06X series :
* Test temp. : 125±3°C.
* To apply voltage : 2.5KVdc.
* Test time : 1000 +24/-0 hrs.
* Measurement to be made after keeping at room temp. for 48±4 hrs.</td><td>* Appearance :
No mechanical damage.
* Cap. change :
C0G within ±5.0% or ±0.5pF, whichever is larger.
X7R within ±20%.
* D.F. value :
C0G≤0.25%.
X7R≤5.0%.
* I.R. : ≥1GΩ.
* Dielectric strength satisfies the specified initial value. (FH06X series not include)</td></tr>
</table>

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>Item</th><th>Standard Methods</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>14.</td><td>Resistance to Flexure of Substrate</td><td>IEC 60384-21/22 4.8</td><td>* Capacitors mounted on a substrate. The board shall be bent 1mm with a rate of 1mm/sec.
 

Unit ： mm</td><td>* No remarkable damage.
<table>
<tr><th>Dielectric</th><th>Cap. Change</th></tr>
<tr><td>Class I (C0G)</td><td>Within ±3.0% or ±2.0pF, whichever is larger</td></tr>
<tr><td>Class II (X7R)</td><td>Within ±12.5%</td></tr>
</table>
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)</td></tr>
<tr><td>15.</td><td>Adhesive Strength of Termination</td><td>IEC 60384-21/22 4.15
IEC 60384-1 4.13</td><td>* Capacitors mounted on a substrate. A force of 10N applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 sec.
 
</td><td>* No remarkable damage or removal of the terminations.</td></tr>
<tr><td>16.</td><td>Vibration</td><td>IEC 60384-1 4.17</td><td>* Reflow solder the capacitors on P. C. Board before test.
* Vibration frequency : 10~55 Hz/min.
* Total amplitude : 1.5mm.
* Repeat the conditions for 2 hours each in 3 perpendicular directions.
* Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) and 48±4 hrs (Class II).</td><td>* No remarkable damage.
* Cap. change and Q/D.F. : To meet initial spec.</td></tr>
</table>

9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Plastic tape	
		7" reel	13" reel
1206(3216)	1.25±0.10	3k	10k
1808(4520)	1.25±0.10	2k	10k
	1.40±0.15	2k	10k
	1.60±0.20	2k	8k
	2.00±0.20	1k	6k
1812(4532)	1.25±0.10	1k	-
	1.60±0.20	1k	-
	2.00±0.20	1k	-
	2.50±0.30	0.5k	3k
2211(5728)	1.60±0.20	1k	-
	2.00±0.20	1k	-
	2.50±0.30	0.5k	-
	2.80±0.30	0.5k	-
2220(5750)	2.00±0.20	1k	-
	2.50±0.30	0.5k	2k

REEL DIMENSIONS		
Size	1206	1808, 1812, 2211, 2220
Reel size	7"	7"
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2
W_1	8.4 +1.5/-0	12.4 +2.0/-0
A	178.0 ±0.1	178.0 ±0.1
N	60.0 +1.0/-0	60.0 +1.0/-0

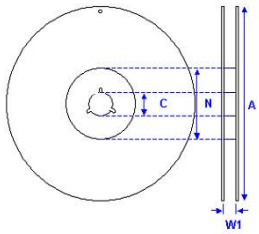


Fig. 9.1 The dimension of reel

9.1. EMBOSSED TAPE DIMENSIONS

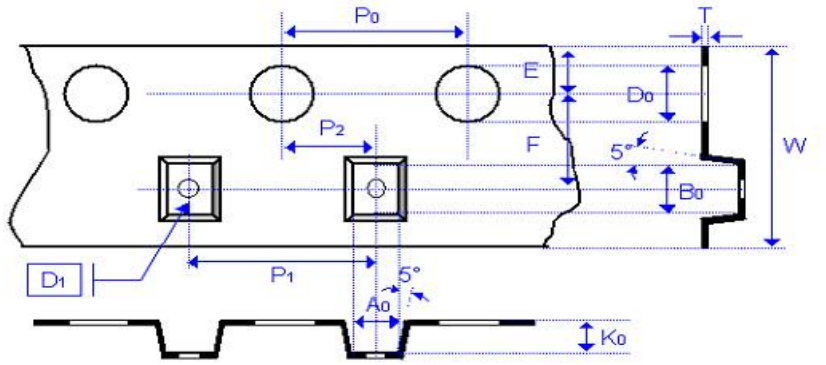


Fig. 9.2 The dimension of plastic tape

Size	1206	1808		1812		2211		2220	
Chip Thickness	1.25±0.10	1.25±0.10 1.40±0.15 1.60±0.20	2.00±0.20	1.25±0.10 1.60±0.20 2.00±0.20	2.50±0.30	1.60±0.20 2.00±0.20	2.50±0.30 2.80±0.30	2.00±0.20	2.50±0.30 2.80±0.30
A_0	<2.00	<2.50	<2.50	<3.90	<3.90	<3.30	<3.30	<5.80	<5.80
B_0	<3.60	<5.30	<5.30	<5.30	<5.30	<6.50	<6.50	<6.50	<6.50
T	0.23±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10
K_0	<2.50	<2.50	<2.50	<2.50	<3.00	<2.50	<3.10	<2.50	<3.10
W	8.00±0.10	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20	12.00±0.20
P_0	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
$10xP_0$	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P_1	4.00±0.10	4.00±0.10	4.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0	1.50+0.10/-0
D_1	1.00±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	3.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm	mm	mm	mm

10. APPLICATION NOTES

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended :
Indoors under 5 ~ 40°C and 20% ~ 70% RH.
No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

HANDLING

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

PREHEAT

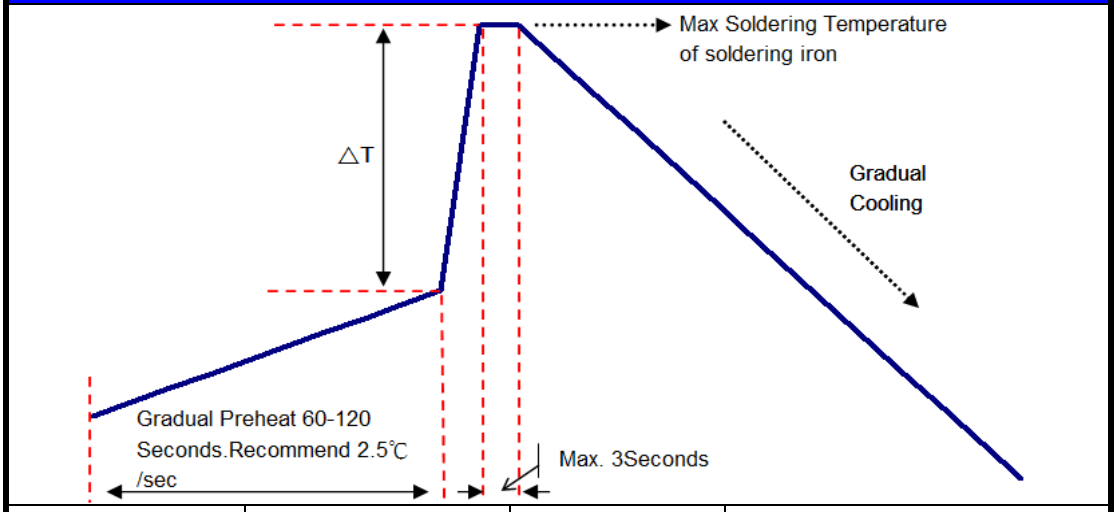
In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3°C per second.

SOLDERING

Use mildly activated rosin fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

a.) Hand soldering :

Fig. 10.1 Hand Soldering Profile



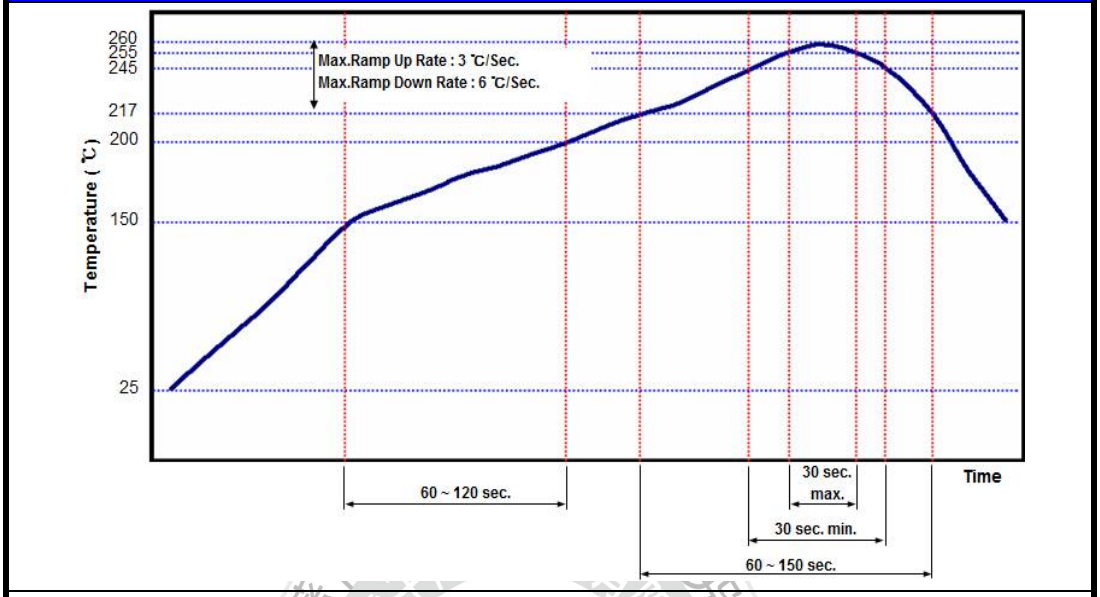
Chip Size	Pre-Heat temp.	ΔT	Max. soldering iron temp.
≤1206	≥150°C	≤150°C	≤350°C
1210~2225	≥150°C	≤130°C	≤280°C

* Soldering iron tip diameter ≤1.0 mm and wattage max. 20W.
* The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.
* The required amount of solder shall be melted on the soldering tip.
* The tip of iron should not contact the ceramic body directly.
* The Capacitors shall be cooled gradually at room temperature after soldering.
* Forced air cooling is not allowed.

10. APPLICATION NOTES

b.) Reflow soldering :

Fig. 10.2 Reflow soldering profile

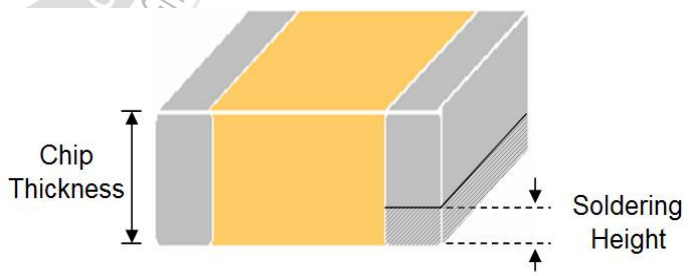


For Sn/Ag/Cu Series solder paste (Pb-Free)

c.) Wave soldering :

Do not apply wave soldering for size >1206 products, the condition for FH06X series products please contact with our sales representative.

Soldering height :

The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less. (Reference from IPC-610E)	

COOLING

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

CLEANING

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.