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Date : 2020/12/25

APPROVAL SHEET

Product Name : Safety Certified Multilayer Ceramic Chip Capacitors

Part No. : FK20X472K502EGQ

Description : X1Y2 Class, Size 2220, X7R, 4.7nF, $\pm 10\%$, 250Vac

PREPARED BY	APPROVED BY

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SPECIFICATION

FOR

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Part No. : FK20X472K502EGQ

Description : X1Y2 Class, Size 2220, X7R, 4.7nF, $\pm 10\%$, 250Vac

SPEC. No. : FK-083-001-01

DATE : 2020/12/25

DRAWN BY	CHECEKED BY	APPROVED BY
<i>Jane Hsiao</i>	<i>Yvens Chou</i>	<i>Joseph Ling</i>

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

- High reliability and stability.
- Small size and high capacitance.
- 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)
- Certificate number :
 R 50041666 & R 50359148 by TUV.
 E346791 (FOWX2/8) by UL, E231248 by UL
- CQC20001247849 by CQC (FK series)
 CQC20001247848 by CQC (FH series)
- License No. ENEC-03020 (FK series)
 License No. ENEC-03021 (FH series)
- RoHS and HALOGEN compliant.



3. APPLICATIONS

- Modem.
- Facsimile.
- Telephone.
- Other electronic equipment for lighting or surge protection and isolation.



4. HOW TO ORDER

FK	20	X	472	K	502	E	G	Q
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 6		Impulse Voltage			
Code	Description	Code	Description	Code	Description
252 (FH06X)	2.5KV	302 (FH series)	2.5KV	502	5KV
				602	6KV

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 7		Packaging Type	
Code	Description	Code	Description
B	Bulk	E	Embossed Tape

Table 3		Dielectric Material Characteristics	
Code	Description	Code	Description
N	C0G	X	X7R

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 4		Capacitance Rule Code	
Code	Description	Code	Description
0R5	0.5pF	104	$104=10 \times 10^4=100\text{nF}$

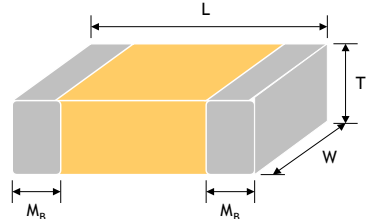
Table 9		Customer Code			
Code	Description	Code	Description	Code	Description
G	RoHs compliant	Q	Anti-Arcing	E	Anti-Bending
H	High reliability	Z	Anti-Arcing+Anti-Bending		

Table 5		Tolerance			
Code	Description	Code	Description	Code	Description
D	±0.50 pF	G	±2 %	K	±10 %
F	±1 %	J	±5 %	M	±20 %

Specification No. : FK-083-001-01

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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	<table><tr><th>Cap. Rang</th><th>Tolerance Spec.</th></tr><tr><td>Cap.<10pF</td><td>D (±0.5pF)</td></tr><tr><td>10pF≤Cap.</td><td>F (±1%), G (±2%), J (±5%), K (±10%), M (±20%)</td></tr></table>		Cap. Rang	Tolerance Spec.	Cap.<10pF	D (±0.5pF)	10pF≤Cap.	F (±1%), G (±2%), J (±5%), K (±10%), M (±20%)	J (±5%) K (±10%) M (±20%)		
Cap. Rang	Tolerance Spec.										
Cap.<10pF	D (±0.5pF)										
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Tan δ	<table><tr><th>Cap. Range</th><th>Q Spec.</th></tr><tr><td>Cap.<30pF</td><td>Q≥400+20C</td></tr><tr><td>Cap.≥30pF</td><td>Q≥1000</td></tr></table>		Cap. Range	Q Spec.	Cap.<30pF	Q≥400+20C	Cap.≥30pF	Q≥1000	≤2.5%		
Cap. Range	Q Spec.										
Cap.<30pF	Q≥400+20C										
Cap.≥30pF	Q≥1000										
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								
	<table><tr><th>Cap. Rang</th><th>Test Condition</th></tr><tr><td>Cap.≤1000pF</td><td>1.0±0.2Vrms, 1.0MHZ±10%</td></tr><tr><td>Cap.>1000pF</td><td>1.0±0.2Vrms, 1.0KHZ±10%</td></tr></table>		Cap. Rang	Test Condition	Cap.≤1000pF	1.0±0.2Vrms, 1.0MHZ±10%	Cap.>1000pF	1.0±0.2Vrms, 1.0KHZ±10%	1.0±0.2Vrms, 1.0KHZ±10%, at 25°C ambient temperature		
	Cap. Rang	Test Condition									
Cap.≤1000pF	1.0±0.2Vrms, 1.0MHZ±10%										
Cap.>1000pF	1.0±0.2Vrms, 1.0KHZ±10%										
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)										

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7. 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

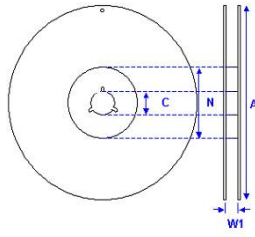
REEL DIMENSIONS			
Size	1206	1808, 1812, 2211, 2220	
Reel size	7"	7"	
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2	
W ₁	8.4 +1.5/-0	12.4 +2.0/-0	
A	178.0 ±0.1	178.0 ±0.1	
N	60.0 +1.0/-0	60.0 +1.0/-0	

Fig. 7.1 The dimension of reel

7.1. EMBOSSED TAPE DIMENSIONS

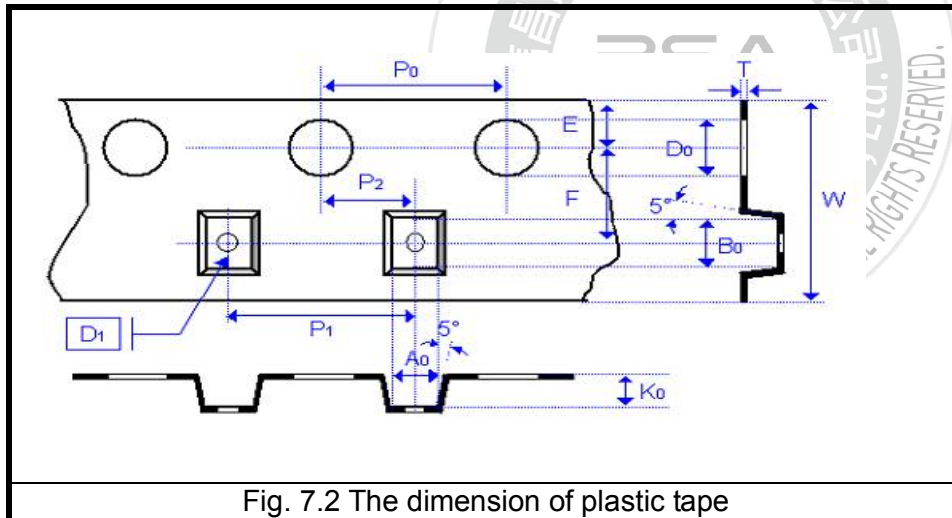


Fig. 7.2 The dimension of plastic tape

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

8. 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.

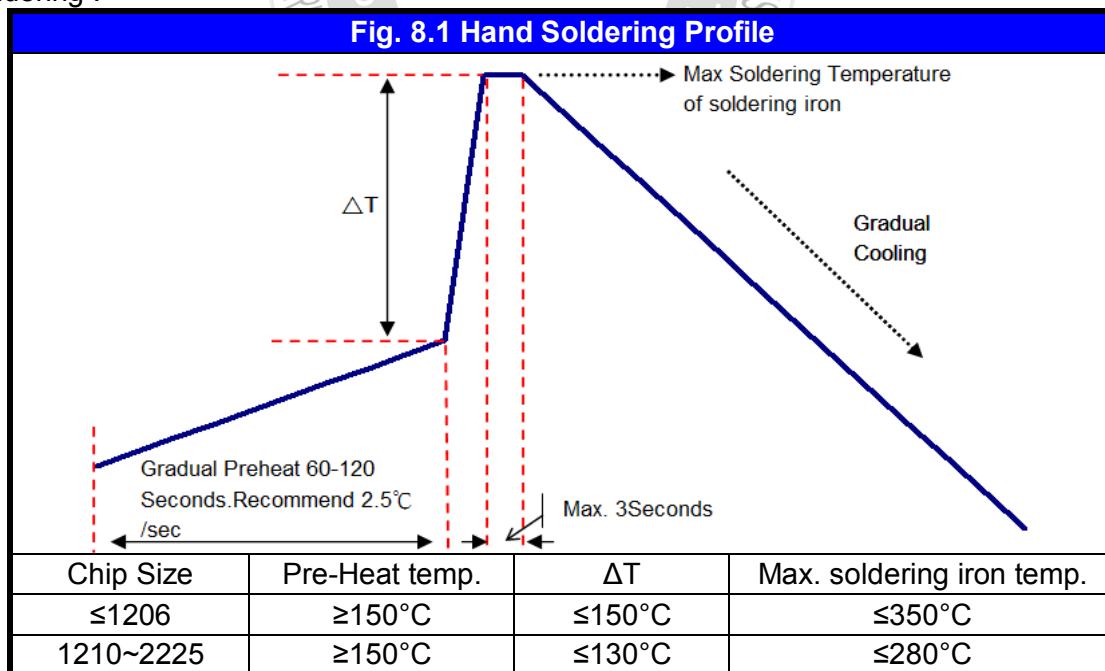
PREHEAT

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 middy activated rosin RA and RMA 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 :



* 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.

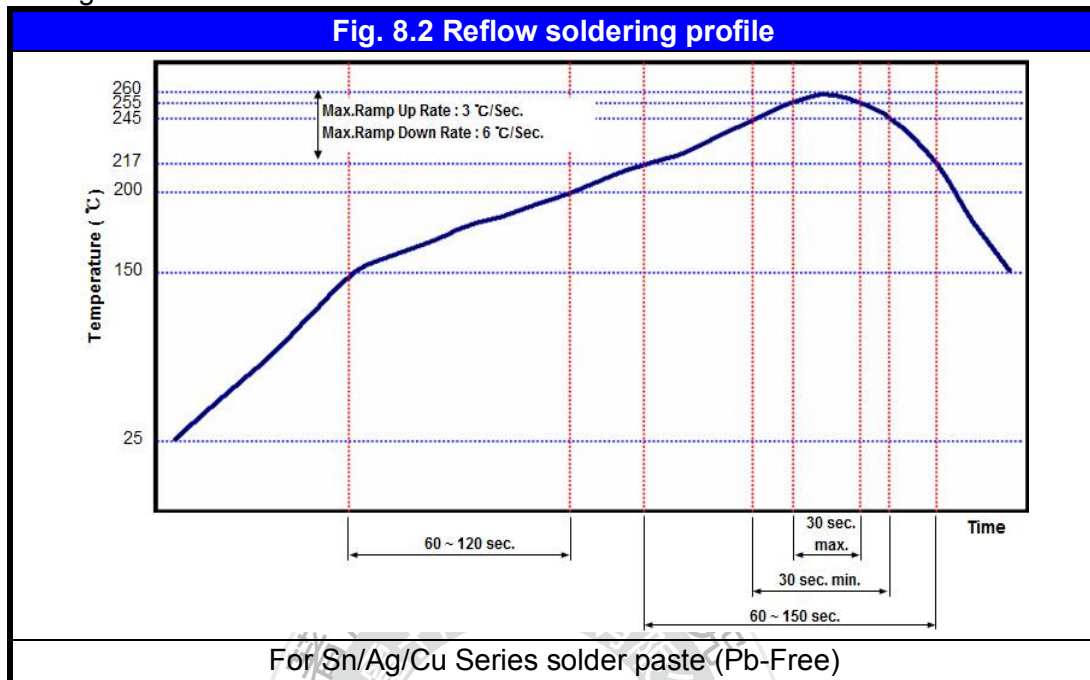
* The tip of iron should not contact the ceramic body directly.

* The Capacitors shall be cooled gradually at room temperature after soldering.

* Forced air cooling is not allowed.

8. APPLICATION NOTES

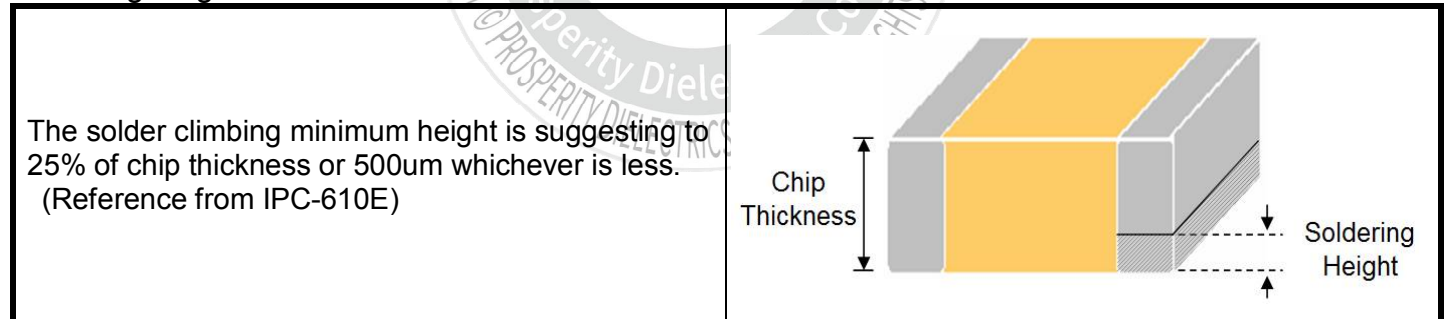
b.) Reflow soldering :



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 :



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.