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Date : 2021/12/02

APPROVAL SHEET

Product Name : High Capacitance Multilayer Ceramic Chip Capacitors

Part No. : FS32X106K101EGG

Description : Size 1210, X7R, 10 μ F, \pm 10%, 100V

PREPARED BY	APPROVED BY

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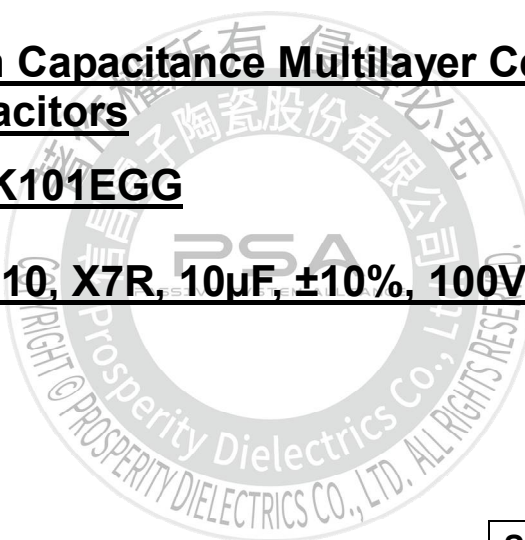
SPECIFICATION

FOR

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SPEC. No. : FS-083-037-01

DATE : 2021/12/02

DRAWN BY	CHECEKED BY	APPROVED BY
<i>Jane Hsiao</i>	<i>Yvens Chou</i>	<i>Hsinyuan Hsu</i>

1. INTRODUCTION

PDC FS Series green type capacitors are manufactured by using environmental friendly material without lead or cadmium. These capacitors feature series connection of multi-layer capacitor units in a MLCC to realize high voltage performance. This special design can distribute voltage gradients throughout the entire capacitor, so as to prevent short circuit failure. It is a safety design for LCD back-lighting inverter application.

2. FEATURES

- Realize high capacitance in small sizes.
- Capacitor with lead-free termination (pure Tin).
- RoHS compliant.
- HALOGEN compliant.
- Surface mount suited for wave and reflow soldering.
- High reliability and no polarity.

3. APPLICATIONS

- Digital circuit coupling or decoupling applications.
- For bypassing.
- Ideal for smoothing circuits.
- DC to DC converter.

4. HOW TO ORDER

FS	32	X	106	K	101	E	G	G
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Packaging	Thickness	Control 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
FS	High Capacitance Capacitor $\geq 1\mu\text{F}$ (105)

Table 2	Size					
Code	Description	Code	Description	Code	Description	
03	0201 (0603)	31	1206 (3216)	46	1825 (4563)	
15	0402 (1005)	32	1210 (3225)	52	2211 (5728)	
18	0603 (1608)	42	1808 (4520)	55	2220 (5750)	
21	0805 (2012)	43	1812 (4532)	56	2225 (5763)	

Table 3	Dielectric Material Characteristics			
Code	Description	Code	Description	
N	C0G	X	X7R	
B	X5R	F	Y5V	
S	X6S	A	X7S	

Table 4	Capacitance Rule Code			
Code	Description	Code	Description	
R47	0.47pF	102	$102=10 \times 10^2=1000\text{pF}$	
OR5	0.5pF	104	$104=10 \times 10^4=100\text{nF}$	
100	$100=10 \times 10^0=10\text{pF}$	106	$106=10 \times 10^6=10\mu\text{F}$	

Table 5	Tolerance					
Code	Description	Code	Description	Code	Description	
A	$\pm 0.05 \text{ pF}$	I	-10% ~ 0%	Q	$\pm 0.03 \text{ pF}$	
B	$\pm 0.10 \text{ pF}$	J	$\pm 5 \%$	Z	-20% ~ +80%	
C	$\pm 0.25 \text{ pF}$	K	$\pm 10 \%$	X	+10% ~ +20%	
D	$\pm 0.50 \text{ pF}$	L	0% ~ +10%			
F	$\pm 1 \%$	M	$\pm 20 \%$			
G	$\pm 2 \%$	N	-5% ~ +10%			
H	$\pm 3 \%$	P	$\pm 0.02 \text{ pF}$			

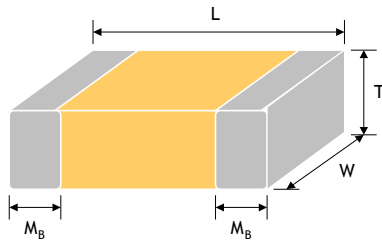
Table 6	Rated Voltage					
Code	Description	Code	Description	Code	Description	
6R3	6.3Vdc	201	200Vdc	152	1500Vdc	
100	10Vdc	251	250Vdc	202	2000Vdc	
160	16Vdc	401	400Vdc	302	3000Vdc	
250	25Vdc	501	500Vdc	402	4000Vdc	
500	50Vdc	631	630Vdc	502	5000Vdc	
101	100Vdc	102	1000Vdc	602	6000Vdc	

Table 7	Packaging Type			
Code	Description	Code	Description	
B	Bulk	T	Tray package	
E	Tape and 7" Reel, Embossed Tape	P	Tape and 7" Reel, Paper Tape	
K	Tape and 10" Reel, Embossed Tape	D	Tape and 10" Reel, Paper Tape	
L	Tape and 13" Reel, Embossed Tape	G	Tape and 13" Reel, Paper Tape	
V	Tape and 7" Reel, Embossed Tape(Reduce quantity)			

Table 8	Thickness Description					
Code	Description	Code	Description	Code	Description	
A	$0.60 \pm 0.10 \text{ mm}$	I	$1.25 \pm 0.20 \text{ mm}$	Q	$0.50 +0.02/-0.05 \text{ mm}$	
B	$0.8 + 0.15/-0.10 \text{ mm}$	J	$1.15 \pm 0.15 \text{ mm}$	R	$3.10 \pm 0.30 \text{ mm}$	
C	$1.25 \pm 0.10 \text{ mm}$	K	$0.50 \pm 0.20 \text{ mm}$	S	$0.80 \pm 0.07 \text{ mm}$	
D	$1.40 \pm 0.15 \text{ mm}$	L	$0.30 \pm 0.03 \text{ mm}$	T	$0.85 \pm 0.10 \text{ mm}$	
E	$1.60 \pm 0.20 \text{ mm}$	M	$0.95 \pm 0.10 \text{ mm}$	U	$0.50 \pm 0.10 \text{ mm}$	
F	$2.00 \pm 0.20 \text{ mm}$	N	$0.50 \pm 0.05 \text{ mm}$	V	$0.20 \pm 0.02 \text{ mm}$	
G	$2.50 \pm 0.30 \text{ mm}$	O	$3.50 \pm 0.20 \text{ mm}$	X	$0.80 \pm 0.10 \text{ mm}$	
H	$2.80 \pm 0.30 \text{ mm}$	P	$1.60 +0.3/-0.10 \text{ mm}$	Z	$0.25 \pm 0.03 \text{ mm}$	

Table 9	Special Control Code	
Code	Description	
G	RoHS Compliant	

5. EXTERNAL DIMENSIONS

Size Inch (mm)	1210(3225)	
L (mm)	3.30±0.40	
W (mm)	2.50±0.30	
Code / T (mm)	G / 2.50±0.30	
M_B (mm)	0.75±0.35	
		Fig. 5.1 The outline of MLCC

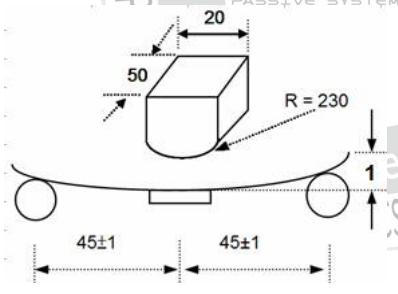
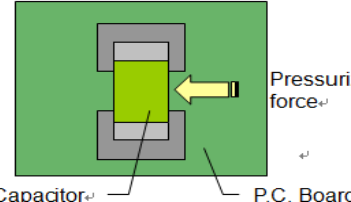
6. GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	1210
Rated voltage (WVDC)	100V
Capacitance range	10μF
Capacitance tolerance	K(±10%)
Tan δ	≤10.0%
Capacitance & Tan δ Test condition	Measured at the condition of 30~70% related humidity for 25°C at ambient temperature Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement Apply 1.0±0.2Vrms, 1KHz±10% for Cap.≤10μF, at 25°C ambient temperature
Insulation resistance	RxC≥50Ω-F, whichever is smaller
Operating temperature	-55°C to +125°C
Temperature coefficient	±15%
Termination	Cu/Ni/Sn (lead-free termination)

7. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																									
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																									
2.	Capacitance		* Shall not exceed the limits given in the detailed spec.																									
3.	Q/D.F. (Dissipation Factor)	* Class II : 1.0±0.2Vrms, 1KHz±10%	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Rated Vol.(V)</th> <th>Q/D.F.</th> </tr> </thead> <tbody> <tr> <td>Class II</td> <td>100V</td> <td>D.F.≤10.0%</td> </tr> </tbody> </table>	Dielectric	Rated Vol.(V)	Q/D.F.	Class II	100V	D.F.≤10.0%																			
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4.	Temperature Coefficient	* With no electrical load. <table border="1"> <thead> <tr> <th>T.C.</th> <th>Operating Temp.</th> </tr> </thead> <tbody> <tr> <td>X7R</td> <td>-55~125°C at 25°C</td> </tr> </tbody> </table>	T.C.	Operating Temp.	X7R	-55~125°C at 25°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>X7R</td> <td>Within ±15%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	X7R	Within ±15%																	
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5.	Dielectric Strength	* To apply 250% of rated voltage. * Duration : 1 to 5 sec. * Charge and discharge current less than 50mA.	* No evidence of damage or flash over during test.																									
6.	Insulation Resistance	<table border="1"> <thead> <tr> <th>Rated Vol.(V)</th> <th>Apply Voltage</th> <th>Charge Time</th> </tr> </thead> <tbody> <tr> <td>≤100</td> <td>1.0 times of U_R</td> <td>Max, 120 sec.</td> </tr> </tbody> </table>	Rated Vol.(V)	Apply Voltage	Charge Time	≤100	1.0 times of U _R	Max, 120 sec.	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Requirements</th> </tr> </thead> <tbody> <tr> <td>Class II</td> <td>RxC≥50Ω-F, whichever is smaller</td> </tr> </tbody> </table>	Dielectric	Requirements	Class II	RxC≥50Ω-F, whichever is smaller															
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7.	Solderability	* Solder temperature : 235±5°C. * Dipping time : 2±0.5 sec.	* 75% min. coverage of all metalized area.																									
8.	Resistance to Soldering Heat	* 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. * Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temperature for 48±4 hrs (Class II).	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Class II (X7R)</th> </tr> </thead> <tbody> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±7.5%</td> </tr> <tr> <td>D.F.</td> <td>≤100% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥100% of initial requirement</td> </tr> <tr> <td>Leaching</td> <td>25% max. leaching on each edge</td> </tr> </tbody> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±7.5%	D.F.	≤100% of initial requirement	I.R.	≥100% of initial requirement	Leaching	25% max. leaching on each edge													
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9.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <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> </tbody> </table> * Before initial measurement (Class II only) : Perform 150 +0/-10°C for 1 hr and then set for 48±4 hrs at room temp. * Measurement to be made after keeping at room temperature for 48±4 hrs (Class II).	Step	Temp.(°C)	Time(min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Class II (X7R)</th> </tr> </thead> <tbody> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±7.5%</td> </tr> <tr> <td>D.F.</td> <td>≤150% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥100% of initial requirement</td> </tr> </tbody> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±7.5%	D.F.	≤150% of initial requirement	I.R.	≥100% of initial requirement
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10.	Humidity (Damp Heat) Steady State	* Test temp. : 40±2°C. * Humidity : 90~95% RH. * Test time : 500 +24/-0hrs. * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	<table border="1"> <thead> <tr> <th>Dielectric</th> <th>Class II (X7R)</th> </tr> </thead> <tbody> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±12.5%</td> </tr> <tr> <td>D.F.</td> <td>≤200% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥1GΩ or RxC≥10Ω-F, whichever is smaller</td> </tr> </tbody> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±12.5%	D.F.	≤200% of initial requirement	I.R.	≥1GΩ or RxC≥10Ω-F, whichever is smaller															
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7. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements										
11.	Humidity (Damp Heat) Load	* Reflow solder the capacitors on a P.C. Board before test. * Test temp. : 40±2°C. * Humidity : 90~95% RH. * Test time : 500 +24/-0hrs. * To apply voltage : Rated voltage. * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	<table border="1"> <tr> <td>Dielectric</td> <td>Class II (X7R)</td> </tr> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±12.5%</td> </tr> <tr> <td>D.F.</td> <td>≤200% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥500MΩ or RxC≥25Ω-F, whichever is smaller</td> </tr> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±12.5%	D.F.	≤200% of initial requirement	I.R.	≥500MΩ or RxC≥25Ω-F, whichever is smaller
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12.	High Temperature Load (Endurance)	* Test temp. : 125±3°C. * Apply voltage : 100% of rated voltage. * Test time : 1000 +24/-0 hrs. * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	<table border="1"> <tr> <td>Dielectric</td> <td>Class II (X7R)</td> </tr> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±12.5%</td> </tr> <tr> <td>D.F.</td> <td>≤200% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥1GΩ or RxC≥10Ω-F, whichever is smaller</td> </tr> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±12.5%	D.F.	≤200% of initial requirement	I.R.	≥1GΩ or RxC≥10Ω-F, whichever is smaller
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13.	Resistance to Flexure of Substrate	* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm.  <p style="text-align: right;">Unit : mm</p>	<table border="1"> <tr> <td>Dielectric</td> <td>Class II (X7R)</td> </tr> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within ±12.5%</td> </tr> </table> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)</p>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within ±12.5%				
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14.	Adhesive Strength of Termination	* Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(>0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second. 	* No remarkable damage or removal of the terminations.										
			15.	Vibration	* Vibration frequency : 10~55 Hz/min. * Total amplitude : 1.5mm. * Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions) * Before initial measurement (Class II only) : To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 48±4 hrs (Class II).	<table border="1"> <tr> <td>Dielectric</td> <td>Class II (X7R)</td> </tr> <tr> <td>External Appearance</td> <td>No remarkable damage</td> </tr> <tr> <td>Cap. Change</td> <td>Within the specified tolerance</td> </tr> <tr> <td>D.F.</td> <td>≤100% of initial requirement</td> </tr> <tr> <td>I.R.</td> <td>≥100% of initial requirement</td> </tr> </table>	Dielectric	Class II (X7R)	External Appearance	No remarkable damage	Cap. Change	Within the specified tolerance	D.F.
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8. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0201(0603)	0.30±0.03	15k	70k	-	-
	0.30±0.05	15k	-	-	-
	0.30±0.09	15k	-	-	-
0402(1005)	0.50±0.05	10k	50k	-	-
	0.50 +0.02/-0.05	10k	50k	-	-
	0.50±0.20	10k	-	-	-
0603(1608)	0.50±0.10	4k	-	-	-
	0.80±0.07	4k	15k	-	-
	0.80 +0.15/-0.10	4k	15k	-	-
0805(2012)	0.50±0.10	4k	15k	-	-
	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
1206(3216)	0.80±0.10	4k	15k	-	-
	0.85±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.15±0.15	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	10k
	1.60 +0.30/-0.10	-	-	2k	9k
1210(3225)	0.85±0.10	-	-	3k	10k
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.00±0.20	-	-	1k	6k
1808(4520)	2.50±0.30	-	-	1k	6k
	1.25±0.10	-	-	2k	10k
	1.60±0.20	-	-	2k	8k
1812(4532)	2.00±0.20	-	-	1k	6k
	1.25±0.10	-	-	1k	5k
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	3k
1825(4563)	2.80±0.30	-	-	0.5k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
2220(5750)	2.80±0.30	-	-	0.5k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
2225(5763)	2.80±0.30	-	-	0.5k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-

Unit : pcs

8. PACKAGE DIMENSION AND QUANTITY

8.1. EMBOSSED TAPE DIMENSIONS

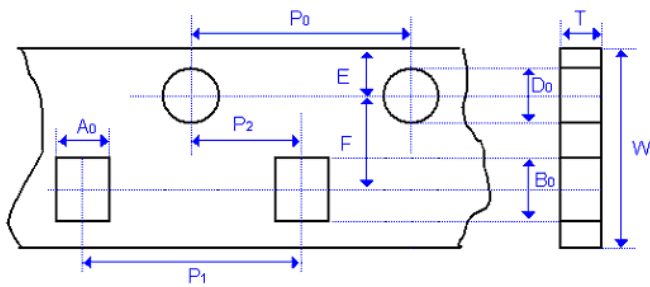


Fig. 8.1 The dimension of paper tape

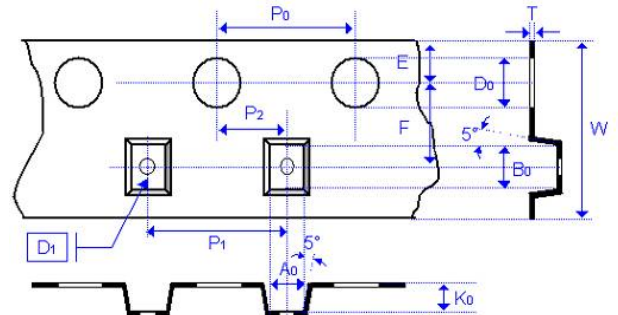


Fig. 8.2 The dimension of plastic tape

Size	0201	0402	0603		0805	
Chip Thickness	0.30±0.03	0.50±0.05 0.50±0.10	0.80±0.07	0.80 +0.15/-0.1	0.80±0.10	1.25±0.10 1.25±0.20
A ₀	0.39±0.07	0.70±0.20	1.00 +0.05/-0.1	1.02 +0.05/-0.1	1.50±0.10	<1.65
B ₀	0.69±0.07	1.20±0.20	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≤0.50	≤0.80	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05
K ₀	-	-	-	-	-	<2.50
W	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 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
10xP ₀	40.00±0.10	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	2.00±0.05	2.00±0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±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
D ₀	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.50 +0.10/-0
D ₁	-	-	-	-	-	1.00±0.10
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
Unit :	mm	mm	mm	mm	mm	mm

Size	1206			1210		1812	
Chip Thickness	0.80±0.10	0.95±0.10 1.25±0.10	1.60±0.20 1.60+0.3/-0/1	0.95±0.10 1.25±0.10 1.60±0.20	2.50±0.30	1.25±0.10 1.60±0.20 2.00±0.20	2.50±0.30
A ₀	2.00±0.10	<2.00	<2.00	<3.05	<3.10	<3.90	<3.90
B ₀	3.50±0.10	<3.60	<3.70	<3.80	<4.00	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05
K ₀	-	<2.50	<2.50	<2.50	<3.50	<2.50	<3.00
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	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
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
P ₁	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±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
D ₀	1.55±0.05	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	1.00±0.10	1.00±0.10	1.00±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
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05	5.50±0.05
Unit :	mm	mm	mm	mm	mm	mm	mm

8. PACKAGE DIMENSION AND QUANTITY

Size	1825		2220		2225	
Chip Thickness	1.60±0.20 2.00±0.20	2.50±0.30	1.40±0.15 1.60±0.20 2.00±0.20	2.50±0.30	1.60±0.20 2.00±0.20	2.50±0.30
A ₀	<6.80	<6.80	<5.80	<5.80	<6.80	<6.80
B ₀	<5.30	<5.30	<6.50	<6.50	<6.50	<6.50
T	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10
K ₀	<2.50	<3.10	<2.50	<3.10	<2.50	<3.10
W	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
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
P ₁	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
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
D ₁	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
F	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

8.2. REEL DIMENSIONS

Size	0201, 0402, 0603, 0805, 1206, 1210		1808, 1812, 1825, 2220, 2225
Reel size	7"	13"	7"
C	13.0 +0.5/-0.2	13.0 +0.7/-0.3	13.0 +0.5/-0.2
W ₁	8.4 +1.5/-0	8.4 +2.0/-0	12.4 +2.0/-0
A	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	100 ±1.0	60.0 +1.0/-0

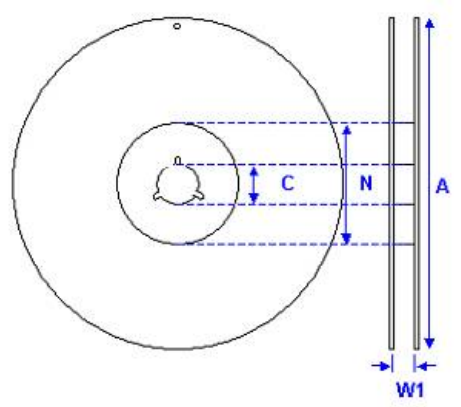


Fig. 8.3 The dimension of reel

9. 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.

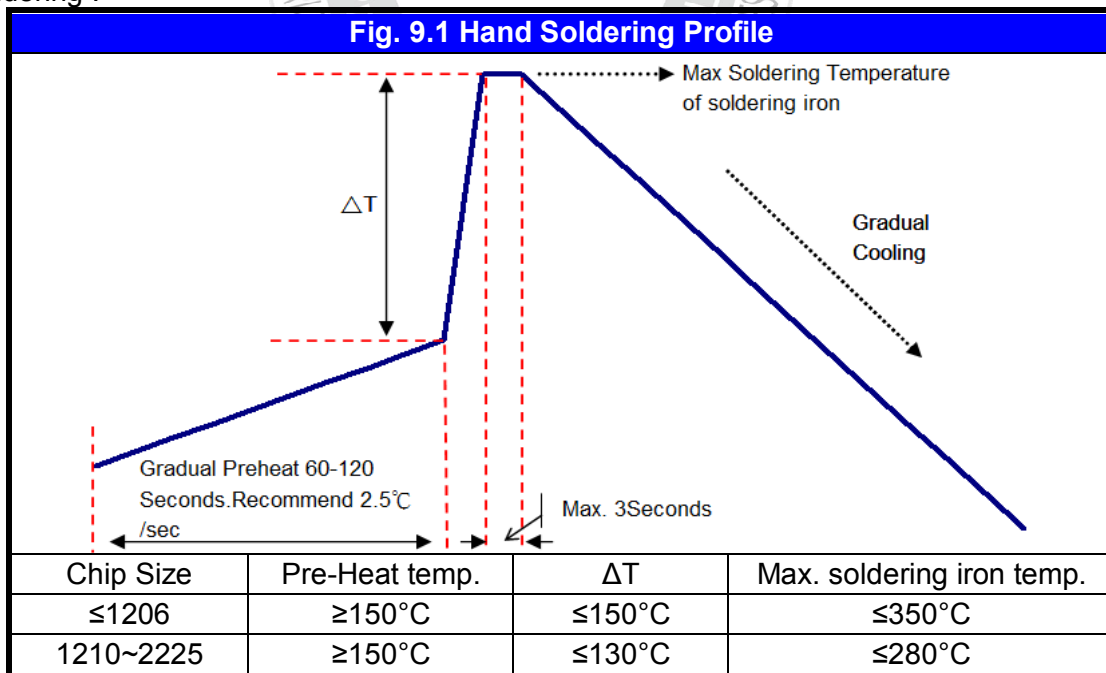
PREHEAT

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.

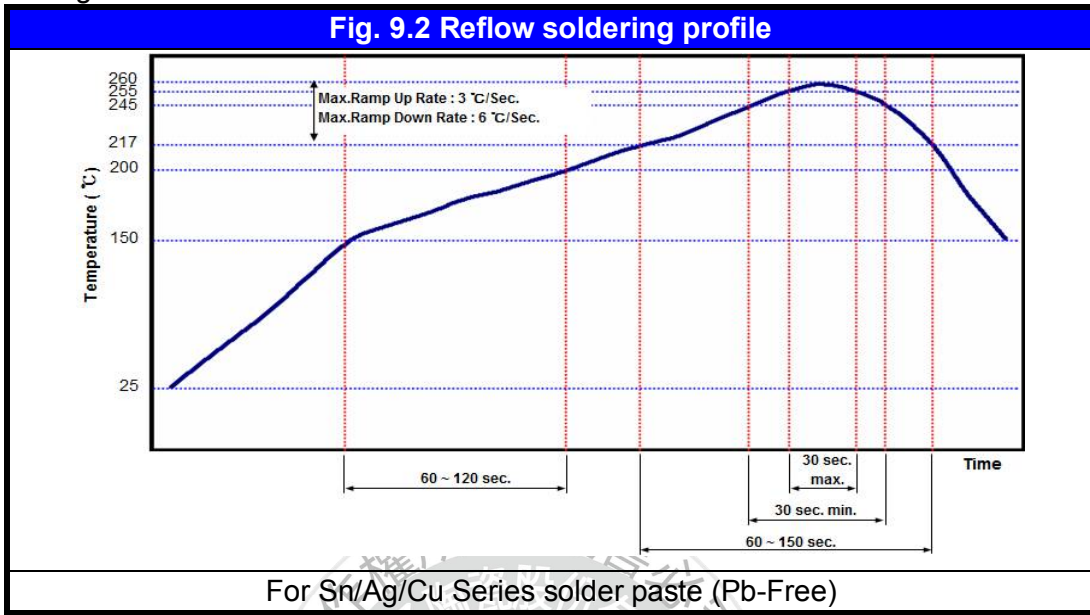
* The tip of iron should not contact the ceramic body directly.

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

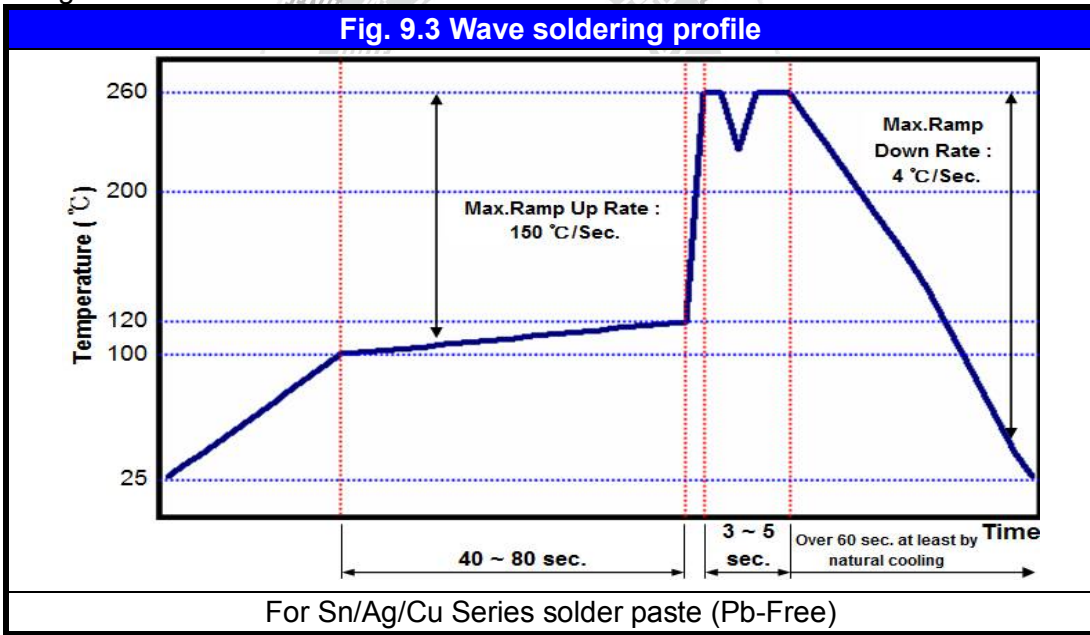
* Forced air cooling is not allowed.

9. APPLICATION NOTES

b.) Reflow soldering :



c.) Wave soldering :



Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class I	All	X	O
0603 (1608)	Class I	All	O	O
0805 (2012)	Class I	All	O	O
1206 (3216)	Class I	All	O	O
		Thickness >0.95mm	X	O
≥1210 (3225)	Class I	All	X	O
Coating Products	All	All	X	O

9. APPLICATION NOTES

Soldering conditions :
 Class II :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class II	All	X	O
0603 (1608)	Class II	Cap. <2.2μF	O	O
		Cap. ≥2.2μF	X	O
0805 (2012)	Class II	Thickness ≤ 0.95mm	O	O
		Thickness > 0.95mm	X	O
1206 (3216)	Class II	Thickness ≤ 0.95mm	O	O
		Thickness > 0.95mm	X	O
≥1210 (3225)	Class II	All	X	O
Coating Products	All	All	X	O

Soldering height :

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

The diagram illustrates a cross-section of a chip on a substrate. The chip is shown in yellow and grey. A vertical double-headed arrow indicates the 'Chip Thickness'. A horizontal dashed line with a downward arrow indicates the 'Soldering Height' from the substrate surface to the top of the chip.

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.

