

Messrs.

Date:

APPROVAL SHEET

Product Name : Medium / High Voltage Multilayer Ceramic Chip apacitors

Part No. : FL Series

Description : Low Dissipation, Size 0805~2225, X7E, 100V to 500V

PREPARED BY	APPROVED BY

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SPECIFICATION FOR

MEDIUM / HIGH VOLTAGE MULTILAYER CERAMIC CHIP
CAPACITORS

Part No. : FL Series

Description : Low Dissipation, Size 0805~2225 X7E, 100V to 500V

<u>DRAWN BY</u>	<u>CHECKED BY</u>	<u>APPROVED BY</u>
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1. INTRODUCTION

FL Series green type capacitors are manufactured by using green materials without lead and cadmium. These capacitors feature series connection of multi-layer capacitor units in a MLCC to realize high voltage performance. Reliable performances are built-in through exact formulation of dielectric powders, preparation of conductive paste, advanced automatic manufacturing, and strict quality control to assure excellent control in dielectric thickness, electrode integrity, and electrode-to-termination continuity.

2. FEATURES

- a. Low ESR and Low Tan δ
- b. Excellent DC Bias
- c. Provide Good Ripple Characteristic.
- d. Excellent Temperature Coefficient
- e. RoHS & SS-00259 compliant
- f. HALOGEM compliant

3. APPLICATIONS

- a. Power supply.
- b. Strobe trigger circuit for digital cameras.
- c. Telecommunication (ADSL, Modem, Splitter)
- d. Audio circuit
- e. Lighting

4. HOW TO ORDER

<u>FL</u>	<u>32</u>	<u>X</u>	<u>102</u>	<u>K</u>	<u>101</u>	<u>E</u>	<u>C</u>	<u>G</u>
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Packaging	Thickness	Control Code
Table1.	Table2	Table3	Table4	Table5	Table6	Table7	Table8	Table9

Reference document with No.11 reference table detail.

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Tmax (mm)	M _b min (mm)
0805 (2012)	2.10±0.20	1.25±0.20	See No.11 Reference Table	0.50±0.20
1206 (3216)	3.30±0.30	1.60+0.30/-0.10		0.60±0.20
1210 (3225)	3.30±0.40	2.50±0.30		0.75±0.35
1812 (4532)	4.60±0.50	3.20±0.30		0.75±0.35
1825 (4563)	4.60±0.50	6.30±0.40		0.75±0.35
2220 (5750)	5.70±0.50	5.00±0.40		0.85±0.35
2225 (5763)	5.70±0.50	6.30±0.40		0.85±0.35

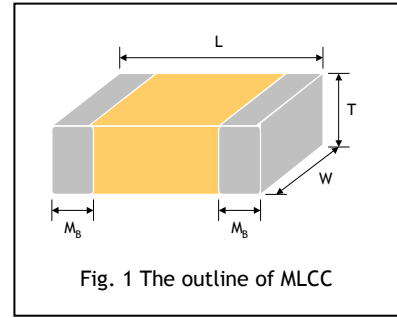


Fig. 1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	X7E
Size	0805, 1206, 1210, 1812, 1825, 2220, 2225
Capacitance range*	100pF ~ 1.2μF
Capacitance tolerance	Reference to Table5
Rated voltage (WVDC)	100V, 200V, 250V, 500V
Tan δ	U _R <200V: 1.4% max. ; U _R ≥200V: 1.0% max.
Insulation resistance at U _R **	≥10GΩ or R·C≥500Ω·F whichever is smaller
Operating temperature	-55 to +125°C
Capacitance characteristic	±15%
Termination	Ag / Ni / Sn

* Measured at the condition of 30~70% related humidity.
Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

**Measured at 500VDC for 60 sec, for U_R>500VDC

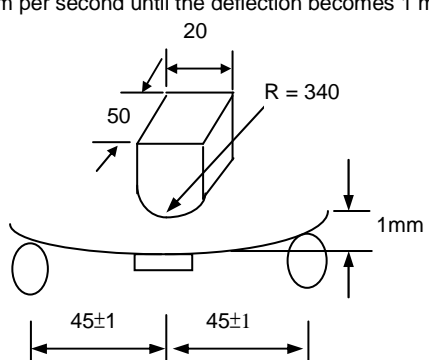
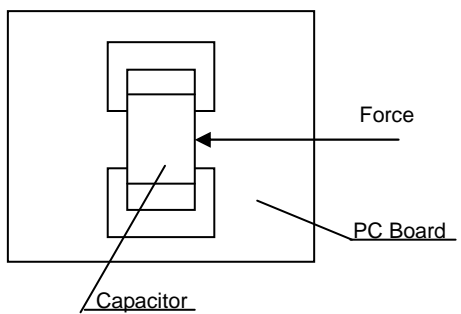
7. CAPACITANCE RANGE

	DIELECTRIC		X7E									
	SIZE	0805	1206		1210			1812	1825	2220		
	RATED VOLTAGE	250	100	250	500	100	250	500	100	100	100	250
Capacitance	100pF (101)	X										
	120pF (121)	X										
	150pF (151)	X	C	C	C							
	180pF (181)	X	C	C	C							
	220pF (221)	X	C	C	C							
	270pF (271)	X	C	C	C							
	330pF (331)	X	C	C	C							
	390pF (391)	X	C	C	C							
	470pF (471)	X	C	C	C	E	E	D	E	E	F	F
	560pF (561)	X	C	C	C	E	E	D	E	E	F	F
	680pF (681)	X	C	C	C	E	E	D	E	E	F	F
	820pF (821)	X	C	C	C	E	E	D	E	E	F	F
	1,000pF (102)	X	C	C	C	E	E	D	E	E	F	F
	1,200pF (122)	X	C	C	C	E	E	D	E	E	F	F
	1,500pF (152)	X	C	C	C	E	E	D	E	E	F	F
	1,800pF (182)	X	C	C	C	E	E	D	E	E	F	F
	2,200pF (222)	X	C	C	C	E	E	D	E	E	F	F
	2,700pF (272)	X	C	C	C	E	E	D	E	E	F	F
	3,300pF (332)	X	C	C	C	E	E	D	E	E	F	F
	3,900pF (392)	X	C	C	C	E	E	D	E	E	F	F
	4,700pF (472)	X	C	C	C	E	E	D	E	E	F	F
	5,600pF (562)	X	C	C	C	E	E	D	E	E	F	F
	6,800pF (682)	X	C	C	C	E	E	D	E	E	F	F
	8,200pF (822)	X	C	C	C	E	E	D	E	E	F	F
	0.010μF (103)	X	C	C	C	E	E	D	E	E	F	F
	0.012μF (123)	X	C	C	C	E	E	D	E	E	F	F
	0.015μF (153)	X	C	C	C	E	E	D	E	E	F	F
	0.018μF (183)	C	C	C	E	E	E	D	E	E	F	F
	0.022μF (223)	C	C	C	E	E	E	D	E	E	F	F
	0.027μF (273)		C	C	E	E	E	D	E	E	F	F
	0.033μF (333)		C	C	E	E	E	D	E	E	F	F
	0.039μF (393)		C	C		E	E	E	E	E	F	F
	0.047μF (473)		C	C		E	E	E	E	E	F	F
	0.056μF (563)		C	E		E	E		E	E	F	F
	0.068μF (683)		C	E		E	E		E	E	F	F
	0.082μF (823)		C	E		E	E		E	E	F	F
	0.10μF (104)		C	E		E	E		E	E	F	F
	0.12μF (124)		C			E	E		E	E	F	F
	0.15μF (154)		E			E	E		E	E	F	F
	0.18μF (184)		E			E			E	E	F	F
0.22μF (224)		E			E			E	E	F	F	
0.27μF (274)					E			E	E	F	F	
0.33μF (334)					E			E	E	F	F	
0.39μF (394)								E	E	F	F	
0.47μF (474)								E	E	F	F	
0.56μF (564)								E	F	F	F	
0.68μF (684)								F	F	F	G	
0.82μF (824)								F	F	F		
1.0μF (105)								G	F	F		
1.2μF (125)										G		

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements															
1.	Visual and Dimensions	---	* No remarkable defect. * Dimensions to confirm to individual specification sheet.															
2.	Capacitance	1.0±0.2Vrms, 1kHz±10%	* Shall not exceed the limits given in the detailed spec.															
3.	D.F. (Dissipation Factor)		U _R < 200V: D.F ≤ 1.40% U _R ≥ 200V: D.F ≤ 1.00%															
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>X7E</td> <td>-55~125°C at 25°C</td> </tr> </tbody> </table>	T.C.	Operating Temp	X7E	-55~125°C at 25°C	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>X7E</td> <td>Within ±4.7%</td> </tr> </tbody> </table>	T.C.	Capacitance Change	X7E	Within ±4.7%							
T.C.	Operating Temp																	
X7E	-55~125°C at 25°C																	
T.C.	Capacitance Change																	
X7E	Within ±4.7%																	
5.	Insulation Resistance	To apply voltage at U _R (500V max.) for 60 sec.	≥10GΩ or R·C≥500Ω·F whichever is smaller.															
6.	Dielectric Strength	<table border="1"> <thead> <tr> <th>Rated vol.(V)</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>≤ 250</td> <td>2.0 times of U_R</td> </tr> <tr> <td>250<V≤500</td> <td>1.5 times of U_R</td> </tr> </tbody> </table> * Duration: 1 to 5 sec.	Rated vol.(V)	Condition	≤ 250	2.0 times of U _R	250<V≤500	1.5 times of U _R	* No evidence of damage or flashover during test.									
Rated vol.(V)	Condition																	
≤ 250	2.0 times of U _R																	
250<V≤500	1.5 times of U _R																	
7.	Solderability	* Solder temperature: 235±5°C * Dipping time: 5±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: 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 temp. for 48±4 hrs.	* No remarkable damage. * Cap change is within ±7.5% * 25% max. leaching on each edge.															
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: 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 temp. for 48±4 hrs.	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	* No remarkable damage. * Cap change is within ±15% * Q/D.F. ≤1.5 × Initial requirement * I.R. ≥ 0.25 × initial requirements.
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																
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.	* No remarkable damage. * Cap change is within ±15% * Q/D.F. ≤1.5 × Initial requirement * I.R. ≥ 0.25 × initial requirements.															

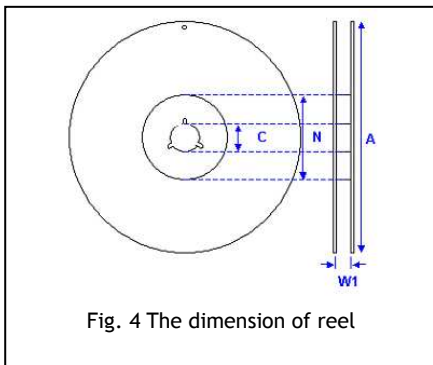
8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements
11.	High Temperature Load (Endurance)	<ul style="list-style-type: none"> * Test temp.: 125±3°C * To apply voltage: <ul style="list-style-type: none"> (1) 100V<U_R≤250V: 200% of rated voltage. (2) 250<U_R≤500V: 150% of rated voltage. (3) U_R≥630V: 120% of rated voltage. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 48±4 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change is within ±20% * D.F value ≤7.0% * I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
12.	Resistance to Flexure of Substrate	<ul style="list-style-type: none"> * The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: X7E: within ±10.0% <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>
13.	Adhesive Strength of Termination	<ul style="list-style-type: none"> * Capacitors mounted on a substrate. A force of 5N(0603) or 17N(> 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 sec. 	<ul style="list-style-type: none"> * No remarkable damage or removal of the terminations.
14.	Vibration Resistance	<ul style="list-style-type: none"> * Vibration frequency: 10 ~ 2000 Hz * Applied force : 5G max * Duration : 20 min * Cycle : 12 cycles * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) 	<ul style="list-style-type: none"> * No remarkable damage. * Q/D.F.: To meet initial spec. * Cap change: X7E: within ±10.0%

9. PACKAGE DIMENSION AND QUANTITY

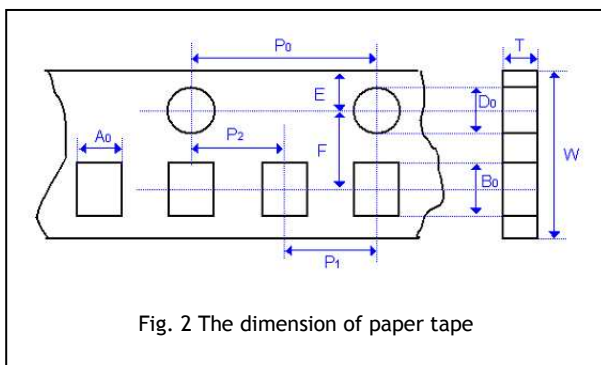
Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0805 (2012)	0.80±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
1206 (3216)	0.80±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1210 (3225)	1.40±0.15	-	-	2k	10k
	1.60±0.20	-	-	2k	-
1812 (4532)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	3k
1825 (4563)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
2220 (5750)	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-

Unit: pieces

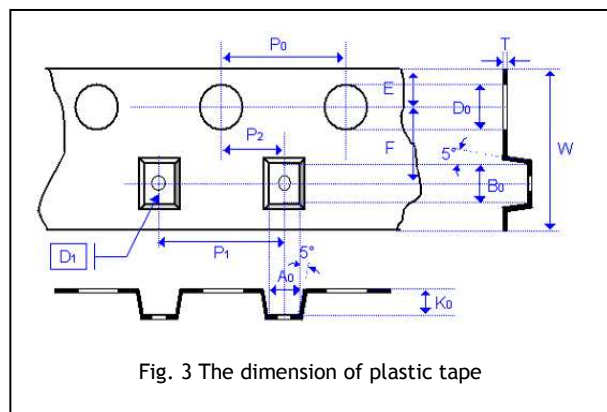


Size	0805, 1206, 1210			1812, 1825, 2220
	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W ₁	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±1.0	178.0±0.10
N	60.5±1.0	100.0±1.0	100±1.0	80.0±1.0

9-1. CARDBOARD TAPE DIMENSIONS



9-2. EMBOSSED TAPE DIMENSIONS



Size	0805		1206			1210	1812		1825	
Chip Thickness	0.80±0.10	1.25±0.10	0.80±0.10	1.25±0.10	1.60±0.20	1.40±0.15 1.60±0.20	1.60±0.20 2.00±0.20	2.50±0.30	1.60±0.20 2.00±0.20	2.50±0.20
A ₀	1.50±0.10	<1.65	2.00±0.10	<2.00	<2.00	<3.05	<3.90	<3.90	<6.80	<6.80
B ₀	2.30±0.10	<2.40	3.50±0.10	<3.60	<3.70	<3.80	<5.30	<5.30	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05	0.30±0.10	0.30±0.10
K ₀	-	<2.50	-	<2.50	<2.50	<2.50	<2.50	<3.00	<2.50	<3.10
W	8.00±0.10	8.00±0.20	8.00±0.10	8.00±0.20	8.00±0.20	8.00±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±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	4.00±0.10
10xP ₀	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20
P ₁	4.00±0.10	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	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	2.00±0.05
D ₀	1.55±0.05	1.50±0.10/-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	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	1.50±0.10	1.50±0.10
E	1.75±0.05	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	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	5.50±0.05	5.50±0.05

Size	2220	
Chip Thickness	2.00±0.20	2.50±0.30
A ₀	<5.80	<5.80
B ₀	<6.50	<6.50
T	0.30±0.10	0.30±0.10
K ₀	<2.50	<3.10
W	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10
10xP ₀	40.0±0.20	40.0±0.20
P ₁	8.00±0.10	8.00±0.10
P ₂	2.00±0.05	2.00±0.05
D ₀	1.50±0.10/-0.0	1.50±0.10/-0.0
D ₁	1.50±0.10	1.50±0.10
E	1.75±0.1	1.75±0.10
F	5.50±0.05	5.50±0.05

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 capacitors should be used within 6 months 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 4°C per second and the final preheat temperature should be within 100°C of the soldering temperature for small chips such as 0805 and 1206, within 50°C of the soldering temperature for bigger chips such as 1210, 1808, 1812, 1825, 2220 and 2225, etc.

SOLDERING

Use mildly 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.

Hand soldering with temperature-controlled iron not exceeding 30 watts and diameter of tip less than 1.2 mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260°C.

Refer IPC/JEDEC J-STD-020D Method recommended soldering profiles :

Reflow not sooner than 15 minutes and not longer than 4 hrs after removal from the temperature/humidity chamber, subject the sample to 3 cycle of the appropriate reflow conditions as defined as blow Table description.

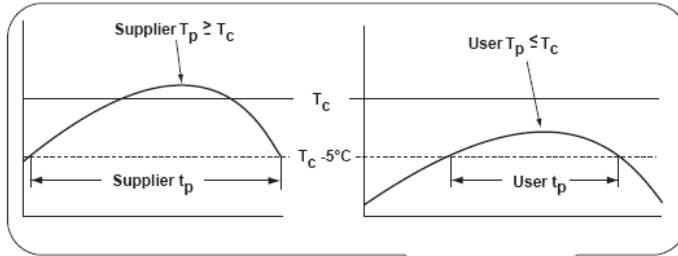
Profile Feature	Pb-Free Assembly
Preheat/Soak	
Temperature Min.(T _{smin})	150°C
Temperature Max.(T _{smax})	200°C
Time(t _s) from (T _{smin} to T _{smax})	60 to 120 seconds
Ramp-up rate(T _L to T _p)	3°C/second max.
Liquidous temperature(T _L)	217°C
Time(t _L) maintained above T _L	60 to 150 seconds
Peak package body temperature(T _p)	For user T _p must not exceed the Classification temp 260°C For suppliers T _p must equal or exceed the Classification temp 260°C
Time(T _p)* within 5°C of the specified classification temperature(T _c)	30* second
Ramp-down rate (T _p to T _L)	6°C/second max.
Time 25°C to peak temperature 260°C	8 minutes max.

Lead-free : Soldering temperature = 235 to 260°C, depending on product.

Maximum temperature = Minimum temperature(235°C)+ ΔT + Tolerance for oven process and measurement(5 ~ 7°C)

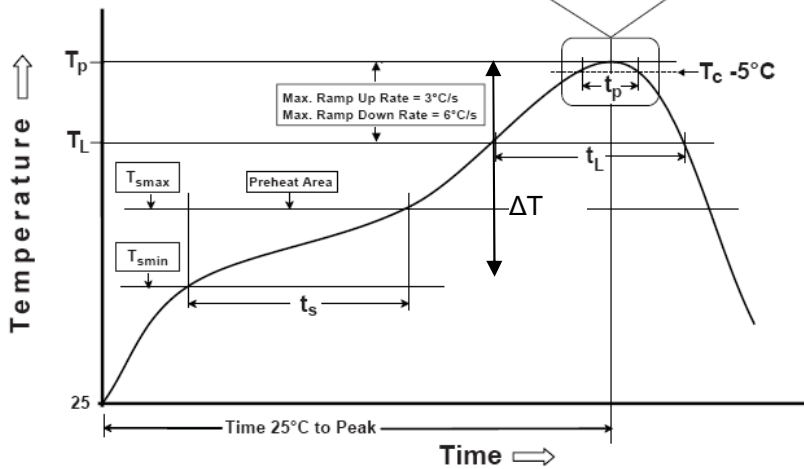
Time at peak temperature = 10sec, Dwell above 217°C = 90sec, Ramping rate = 3°C/sec(heating) and 6°C/sec(heating).

Classification Reflow Profiles



Chip Size	ΔT
0805, 1206	100 °C
1210, 1812, 1825, 2220,	50 °C

Soldering	Solder Temp.(T _c)	Soldering Time (t _p)
Reflow	235 – 260 °C	< 15 sec.
Wave	230 – 260 °C	< 5 sec.



Note : For example , T_c is 260°C and time t_p is 15sec.
for user : The peak temperature must not exceed 260°C. The time above 255°C must not exceed 15 seconds.

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. A cooling rate not exceeding 4°C per second should be used when forced cooling is necessary.

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.

11.REFERENCE TABLE

<u>FL</u>	<u>31</u>	<u>X</u>	<u>102</u>	<u>K</u>	<u>101</u>	<u>E</u>	<u>C</u>	<u>G</u>
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Packaging	Thickness	Control Code
Table1.	Table2	Table3	Table4	Table5	Table6	Table7	Table8	Table9

Table 1 PDC family			
Code	Description	Code	Description
FL	Low Dissipation Series		

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

Table 3 Dielectric Material Characteristics			
Code	Description	Code	Description
N	C0G(NPO)	X	X7R
B	X5R	F	Y5V

Table 4 Capacitance Rule Code					
Two significant digits followed by no. of zeros. And R is in place of decimal point.					
Code	Description	Code	Description	Code	Description
R47	0.47pF	100	$100=10 \times 10^0$ =10pF	104	$104=10 \times 10^4$ =100nF
0R5	0.5pF	102	$102=10 \times 10^2$ =1000pF	106	$106=10 \times 10^6$ =10μF

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

Table 6 Rated voltage

General Purpose							
Code	Description	Code	Description	Code	Description	Code	Description
6R3	6.3VDC	101	100VDC	102	1000VDC	402	4000VDC
100	10VDC	201	200VDC	152	1500VDC	502	5000VDC
160	16VDC	251	250VDC	202	2000VDC	602	6000VDC
250	25VDC	501	500VDC	252	2500VDC		
500	50VDC	631	630VDC	302	3000VDC		

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

Table 8 Thickness Description

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

Table 9 Special Control Code

Code	Description	Code	Description
G	RoHS Compliant		