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

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

FL	06	X	223	K	631	E	E	G
PDC Family	**Size**	**Dielectric**	**Capacitance**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness**	**Control Code**
	Inch (mm) **05:** 0805(2012) **06:** 1206(3216) **10:** 1210(3225) **12:** 1812(4532) **18:** 1825(4563) **20:** 2220(5750)	**X:** X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10^0 =10pF	**J**=±5% **K**=±10% **M**=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. **101:** 100V **201:** 200V **251:** 250V **501:** 500V **631:** 630V **102:** 1000V **202:** 2000V **302:** 3000V	**E:** Tape and Reel, Embossed Tape **P:** Tape and Reel, Cardboard tape No Code: Bulk	**B:** 0.80±0.10mm **C:** 1.25±0.10mm **D:** 1.40±0.15mm **E:** 1.60±0.20 mm **F:** 2.00±0.20 mm **G:** 2.50±0.30 mm	**G:** RoHS compliant

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Tmax (mm)	M_B min (mm)
0805 (2012)	2.00±0.20	1.25±0.20	1.45	0.30
1206 (3216)	3.20±0.20	1.60±0.20	1.80	0.30
1210 (3225)	3.20±0.40	2.50±0.30	2.80	0.30
1812 (4532)	4.50±0.40	3.20±0.30	2.80	0.26
1825 (4563)	4.60±0.30	6.30±0.40	3.00	0.30
2220 (5750)	5.70±0.40	5.00±0.40	3.00	0.30

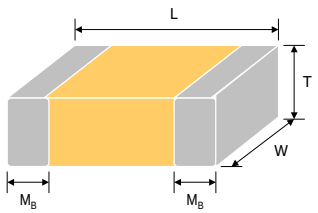


Fig. 1 The outline of MLCC

6.GENERAL ELECTRICAL DATA

Dielectric	X7R
Size	0805, 1206, 1210, 1812, 1825, 2220
Capacitance range*	470pF ~ 1.2μF
Capacitance tolerance	J (±5%), K (±10%), M(±20%)
Rated voltage (WVDC)	100V, 200V, 250V, 350V, 500V, 630V, 2000V
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

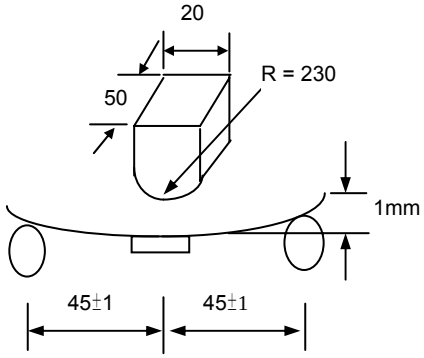
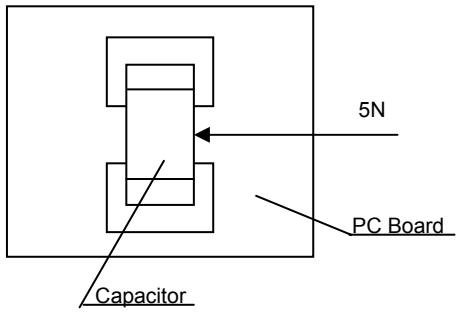
7-1. 0805, 1206, 1210, 1812, 2220 Sizes.

DIELECTRIC		X7R																
	SIZE	0805			1206					1210				1812		1825	2220	
	RATED	200	250	350	100	250	350	500	630	100	200	250	630	100	2000	100	100	250
Capacitance	100pF (101)																	
	120pF (121)																	
	150pF (151)																	
	180pF (181)																	
	220pF (221)																	
	270pF (271)																	
	330pF (331)																	
	390pF (391)																	
	470pF (471)																	
	560pF (561)																	
	680pF (681)																	
	820pF (821)																	
	1,000pF (102)																	
	1,200pF (122)																	
	1,500pF (152)																	
	1,800pF (182)																	
	2,200pF (222)																	
	2,700pF (272)																	
	3,300pF (332)																	
	3,900pF (392)																	
	4,700pF (472)																	
	5,600pF (562)																	
	6,800pF (682)																	
	8,200pF (822)																	
	0.010μF (103)																	
	0.012μF (123)																	
	0.015μF (153)																	
	0.018μF (183)																	
	0.022μF (223)																	
	0.027μF (273)																	
	0.033μF (333)																	
	0.039μF (393)																	
	0.047μF (473)																	
	0.056μF (563)																	
	0.068μF (683)																	
	0.082μF (823)																	
	0.10μF (104)																	
	0.12μF (124)																	
	0.15μF (154)																	
	0.18μF (184)																	
	0.22μF (224)																	
	0.27μF (274)																	
	0.33μF (334)																	
	0.39μF (394)																	
	0.47μF (474)																	
	0.56μF (564)																	
	0.68μF (684)																	
	0.82μF (824)																	
	1.0μF (105)																	
	1.2μF (125)																	

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>Item</th><th>Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Visual and Mechanical</td><td>---</td><td>* No remarkable defect.
* Dimensions to conform to individual specification sheet.</td></tr>
<tr><td>2.</td><td>Capacitance</td><td>1.0±0.2Vrms, 1kHz±10%</td><td>* Shall not exceed the limits given in the detailed spec.</td></tr>
<tr><td>3.</td><td>D.F. (Dissipation Factor)</td><td></td><td>U_R < 200V: D.F ≤ 1.40%
U_R ≥ 200V: D.F ≤ 1.00%</td></tr>
<tr><td>4.</td><td>Temperature Coefficient</td><td>With no electrical load.<table><tr><th>T.C.</th><th>Operating Temp</th></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>X7R</td><td>Within ±15%</td></tr></table></td></tr>
<tr><td>5.</td><td>Insulation Resistance</td><td>To apply voltage at U_R (500V max.) for 60 sec.</td><td>≥10GΩ or R·C≥500Ω-F whichever is smaller.</td></tr>
<tr><td>6.</td><td>Dielectric Strength</td><td>* To apply voltage:
U_R= 100V =2.5 times of U_R
U_R =200V/250V =2 times of U_R
U_R =350/500V =1.5 times of U_R
U_R >500V =1.2 times of U_R
* Duration: 1 to 5 sec.</td><td>* No evidence of damage or flashover during test.</td></tr>
<tr><td>7.</td><td>Solderability</td><td>* Solder temperature: 235±5°C
* Dipping time: 5±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>* 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.</td><td>* No remarkable damage.
* Cap change is within ±7.5%
* 25% max. leaching on each edge.</td></tr>
<tr><td>9.</td><td>Temperature Cycle</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>* 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.</td><td>* No remarkable damage.
* Cap change is within ±15%
* Q/D.F. ≤1.5 X Initial requirement
* I.R.≥ 0.25 X initial requirements.</td></tr>
<tr><td>10.</td><td>Humidity (Damp Heat) Steady State</td><td>* 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.</td><td>* No remarkable damage.
* Cap change is within ±15%
* Q/D.F. ≤1.5 X Initial requirement
* I.R.≥ 0.25 X initial requirements.</td></tr>
<tr><td>11.</td><td>High Temperature Load (Endurance)</td><td>* Test temp.:
125±3°C
* To apply voltage:
(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.</td><td>* No remarkable damage.
* Cap change is within ±20%
* D.F value ≤7.0%
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS (Cont.)

No.	Item	Test Condition	Requirements
12.	**Resistance to Flexure of Substrate**	* 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.  	* No remarkable damage. * Cap change: X7R: within ±10.0% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)
13.	**Adhesive Strength of Termination**	* Capacitors mounted on a substrate. A force of 5N applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 sec.  	* No remarkable damage or removal of the terminations.