

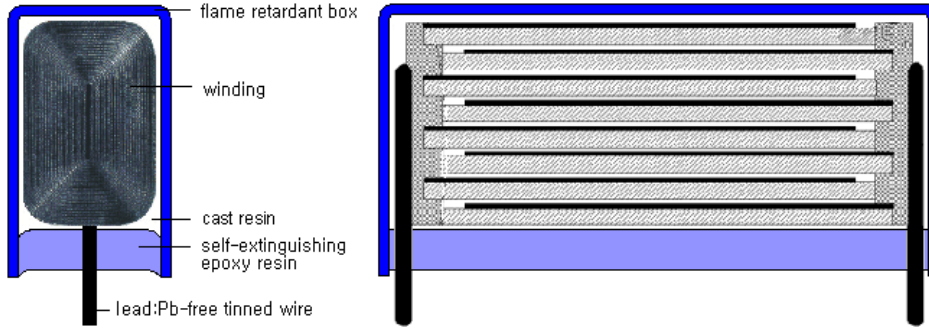
**[1]Features**

- Self-heals.
- Small size.
- Pb(lead)-free product.
- RoHS Compliant product.

**[2]Typical applications**

For general purpose;blocking,coupling,decoupling,by-pass,discharge,energy storage on low frequency & low pulse but larger current, high frequency & high pulse operation.

**[3]Construction**



**RoHS Compliant**

**[1]Style** :radial,rectangular thermo-plastic box.

**[2]Winding** :non-inductively wound self-healing metallized polyester film(vacuum deposited aluminum on polyester film),encapsulated with self-extinguishing epoxy resin in a flame retardant box(UL 94V-0).

**[3]Termination** :Pb-free tinned leads.

**[4]Specifications**

**[1]General data**

<b>Applicable standard</b>	IEC60384-2,JIS C5115
<b>Rated voltage(URDC)</b>	100VDC,250VDC,400VDC,630VDC,1000VDC
<b>Capacitance range</b>	0.001uF~10.0uF
<b>Capacitance tolerance</b>	±5%(J),±10%(K) at 20℃,1Khz
<b>Operating temperature range</b> (TR:+85℃,Tmax.:+105℃)	-40~+105℃ <span style="color:red">*+85℃~+105℃:Derate the rated voltage as shown in the below fig.</span> (70% of the rated voltage at +105℃)

**[2]Electrical data**

<b>Withstand voltage</b>	1.6URDC for 2sec.at 20℃,between leads(1.6URDC for 1 min. for type test)			
<b>Dissipation factor(DF)</b> at 20℃,1Khz	CR ≤ 1.0uF:0.8% max. CR > 1.0uF:1.0% max.			
<b>Insulation resistance(Rins)</b> at 20℃,between leads		CR ≤ 0.33uF	CR > 0.33uF	applied for 1 min. 100VDC:for URDC < 500V 500VDC:for URDC ≥ 500V
	URDC ≤ 100V	≥ 15,000MΩ	≥ 5,000s	
	URDC > 100V	≥ 30,000MΩ	≥ 10,000s	

\*CR = Nominal Capacitance in μF

**[3]Environmental test data**

	Test conditions	Test criteria
<b>Damp heat test</b>	40±2℃,R.H.:90~95% applying URDC for 500+24/0 hours	①Rins(between leads):≥0.5 x specified value in [2]Electrical data ②DF:≤ 1.1% ③ $\frac{\Delta C}{C}$ : ≤ ±5% of initial value
<b>Endurance test</b>	85±2℃,applying 1.25URDC for 1,000+48/0 hours	①Rins(between leads):≥0.5 x specified value in [2]Electrical data ②DF:≤ 1.2% ③ $\frac{\Delta C}{C}$ : ≤ ±7% of initial value

**[5]Marking**

URDC,Capacitance & tolerance are marked on the capacitor.

**[6]Ordering/part number information**

<b>CF</b>	<b>99</b>	<b>M</b>	<b>F</b>	<b>-</b>	<b>2E</b>	<b>104</b>	<b>K</b>	<b>C</b>	<b>050</b>
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

- (1)Kind of capacitor:metallized plastic film capacitor
- (2)Shape of capacitor:rectangular,thermo-plastic box,radial.
- (3)Dielectrics:polyester

(4) Operating temperature: -40 °C ~ +105 °C

(5) internal use

(6) \*DC rated voltage code: 250VDC

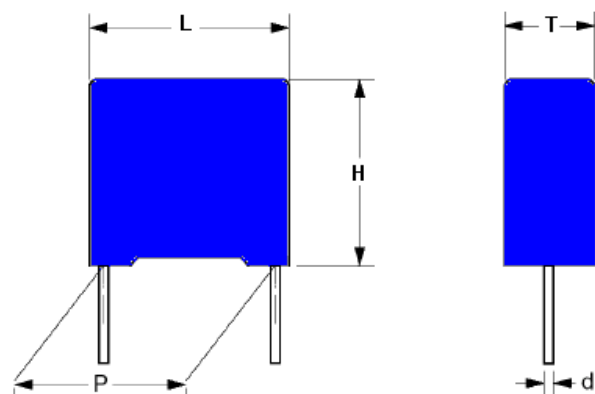
(7) \*Rated capacitance in pF: 100,000pF=0.1uF

(8) \*Capacitance tolerance code: ±10%

(9)(10) \*Packaging and lead configuration code: bulk, loose parts in a poly.bag. with cut leads 5mm

\*For further details, refer to  [\[Part numbering system & taping specification\]](#)

**[7] Dimensions in mm**



**URDC:100V**

uF	L	H	T	d
<b>pitch 5.0mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 10v/μs				
0.001	7.2	6.5	2.5	0.6
0.0015	7.2	6.5	2.5	0.6
0.0022	7.2	6.5	2.5	0.6
0.0033	7.2	6.5	2.5	0.6
0.0047	7.2	6.5	2.5	0.6
0.0068	7.2	6.5	2.5	0.6
0.01	7.2	6.5	2.5	0.6
0.015	7.2	6.5	2.5	0.6
0.022	7.2	6.5	2.5	0.6
0.033	7.2	6.5	2.5	0.6
0.047	7.2	6.5	2.5	0.6
0.068	7.2	6.5	2.5	0.6
0.1	7.2	7.5	3.5	0.6
0.15	7.2	9.5	4.5	0.6
0.22	7.2	9.5	4.5	0.6
0.33	7.2	10.0	5.0	0.6
0.47	7.2	11.0	6.0	0.6
<b>pitch 7.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 6v/μs				
0.68	10.5	11.0	5.0	0.6
1.0	10.5	12.0	6.0	0.8
<b>pitch 10.0mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 5v/μs				
0.22	13.0	9.0	4.0	0.6
0.33	13.0	11.0	5.0	0.6
0.47	13.0	11.0	5.0	0.6
0.68	13.0	12.0	6.0	0.6
1.0	13.0	12.0	6.0	0.6
<b>pitch 15.0mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 3v/μs				
1.5	18.0	13.5	7.5	0.6
2.2	18.0	14.5	8.5	0.6
<b>pitch 22.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 2v/μs				
3.3	26.5	16.0	7.0	0.8
4.7	26.5	17.0	8.5	0.8
<b>pitch 27.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 1v/μs				
6.8	32.0	22.0	13.0	0.8
10.0	32.0	30.0	15.0	0.8

**URDC:250V**

uF	L	H	T	d
<b>pitch 7.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 15v/μs				
0.01	10.5	6.5	3.5	0.6
0.015	10.5	6.5	3.5	0.6
0.022	10.5	6.5	3.5	0.6
0.033	10.5	6.5	3.5	0.6
0.047	10.5	9.0	4.0	0.6
0.068	10.5	9.0	4.0	0.6
0.1	10.5	11.0	5.0	0.6
0.15	10.5	12.0	6.0	0.6
0.22	10.5	12.0	6.0	0.6
<b>pitch 10.0mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 11v/μs				
0.10	13.0	11.0	5.0	0.6
0.15	13.0	11.0	5.0	0.6
0.22	13.0	11.0	5.0	0.6
<b>pitch 15.0mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 7v/μs				
0.33	18.0	11.0	5.0	0.6
0.47	18.0	12.0	6.0	0.6
0.68	18.0	13.5	7.5	0.6
1.0	18.0	14.5	8.5	0.6
<b>pitch 22.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 4v/μs				
1.5	26.5	17.0	8.5	0.8
2.2	26.5	18.5	10.0	0.8
3.3	26.5	18.5	10.0	0.8
<b>pitch 27.5mm</b> permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses): 3v/μs				
4.7	32.0	20.0	15.0	0.8
6.8	32.0	33.0	18.0	0.8
10.0	32.0	37.0	22.0	0.8



**URDC:400V**

uF	L	H	T	d
<b>pitch 7.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses):30v/ $\mu$ s				
<b>0.0047</b>	10.5	6.5	3.5	0.6
<b>0.0068</b>	10.5	6.5	3.5	0.6
<b>0.01</b>	10.5	9.0	4.0	0.6
<b>0.015</b>	10.5	9.0	4.0	0.6
<b>0.022</b>	10.5	11.0	5.0	0.6
<b>0.033</b>	10.5	12.0	6.0	0.6
<b>0.047</b>	10.5	12.0	6.0	0.6
<b>pitch 10.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses):20v/ $\mu$ s				
<b>0.022</b>	13.0	9.0	4.0	0.6
<b>0.033</b>	13.0	9.0	4.0	0.6
<b>pitch 15.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses):10v/ $\mu$ s				
<b>0.047</b>	18.0	11.0	5.0	0.6
<b>0.068</b>	18.0	11.0	5.0	0.6
<b>0.1</b>	18.0	12.0	6.0	0.6
<b>0.15</b>	18.0	13.5	7.5	0.6
<b>0.22</b>	18.0	14.5	8.5	0.6
<b>0.33</b>	18.0	14.5	8.5	0.6
<b>pitch 22.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 5.5v/ $\mu$ s				
<b>0.47</b>	26.5	18.5	10.0	0.8
<b>0.68</b>	26.5	18.5	10.0	0.8
<b>pitch 27.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 5v/ $\mu$ s				
<b>1.0</b>	32.0	20.0	11.0	0.8
<b>1.5</b>	32.0	22.0	13.0	0.8

**URDC:630V**

uF	L	H	T	d
<b>pitch 7.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 40v/ $\mu$ s				
<b>0.001</b>	10.5	6.5	3.5	0.6
<b>0.0015</b>	10.5	6.5	3.5	0.6
<b>0.0022</b>	10.5	6.5	3.5	0.6
<b>0.0033</b>	10.5	6.5	3.5	0.6
<b>0.0047</b>	10.5	9.0	4.0	0.6
<b>0.0068</b>	10.5	9.0	4.0	0.6
<b>0.010</b>	10.5	11.0	5.0	0.6
<b>0.015</b>	10.5	11.0	5.0	0.6
<b>0.022</b>	10.5	12.0	6.0	0.6
<b>0.033</b>	10.5	12.0	6.0	0.6
<b>0.047</b>	10.5	12.0	6.0	0.6
<b>pitch 10.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 30v/ $\mu$ s				
<b>0.015</b>	13.0	11.0	5.0	0.6
<b>0.022</b>	13.0	12.0	6.0	0.6
<b>pitch 15.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 15v/ $\mu$ s				
<b>0.033</b>	18.0	12.0	6.0	0.6
<b>0.047</b>	18.0	12.0	6.0	0.6
<b>0.068</b>	18.0	13.5	7.5	0.6
<b>pitch 22.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 8v/ $\mu$ s				
<b>0.1</b>	26.5	15.0	6.0	0.8
<b>0.15</b>	26.5	16.0	7.0	0.8
<b>0.22</b>	26.5	17.0	8.5	0.8
<b>0.33</b>	26.5	18.5	10.0	0.8
<b>pitch 27.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 7v/ $\mu$ s				
<b>0.47</b>	32.0	20.0	11.0	0.8
<b>0.68</b>	32.0	22.0	13.0	0.8



## URDC:1000V

uF	L	H	T	d
<b>pitch 7.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 80v/ $\mu$ s				
0.001	10.5	9.0	4.0	0.6
0.0015	10.5	9.0	4.0	0.6
0.0022	10.5	9.0	4.0	0.6
0.0033	10.5	9.0	4.0	0.6
0.0047	10.5	11.0	5.0	0.6
0.0068	10.5	11.0	5.0	0.6
0.010	10.5	11.0	5.0	0.6
0.015	10.5	12.0	6.0	0.6
<b>pitch 10.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 60v/ $\mu$ s				
0.0047	13.0	11.0	5.0	0.6
0.0068	13.0	12.0	6.0	0.6
<b>pitch 15.0mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 15v/ $\mu$ s				
0.01	18.0	11.0	5.0	0.6
0.015	18.0	11.0	5.0	0.6
0.022	18.0	13.0	7.5	0.6
<b>pitch 22.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 15v/ $\mu$ s				
0.033	26.5	15.0	6.0	0.8
0.047	26.5	15.0	6.0	0.8
0.068	26.5	16.0	7.0	0.8
0.1	26.5	18.5	10.0	0.8
<b>pitch 27.5mm</b> permissible $\frac{dv}{dt}$ value( $\leq 10,000$ pulses): 10v/ $\mu$ s				
0.15	32.0	20.0	11.0	0.8
0.22	32.0	22.0	13.0	0.8

\*Pulse permissible current(Ao-p)=C( $\mu$ F) $\times$  permissible  $\frac{dv}{dt}$  value(V/ $\mu$ s).

If, the operating pulse voltage < the URDC, the max. permissible  $\frac{dv}{dt}$  value can be  $\frac{URDC}{U_{p-p}} \times$  permissible  $\frac{dv}{dt}$  value

### [8] Operating temperature

① In DC circuit : the operating temperature =Ta

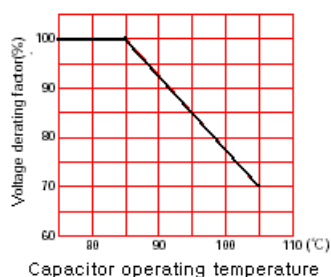
② It must be noted, however, that the operating temperature will be the Th(=Ta+ $\Delta$ T), not the Ta, if ① self-heating( $\Delta$ T) or ② surface heating occurs.

### [9] Derating of rated voltage(UR)

The UR has to be derated, for operation at higher temperature and in AC circuit.

#### ① where operating temperature is high

If capacitors are used in temperature exceeds +85 $^{\circ}$ C(TR) but without exceeding +105 $^{\circ}$ C(Tmax.), the UR has to be derated according to the graph below.



#### ② when used in an AC circuit

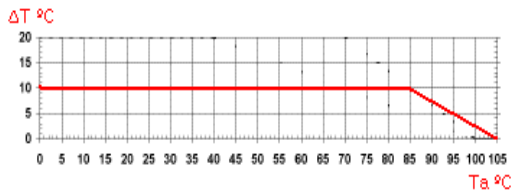
If DC rated capacitors are used in an AC circuit, the operating AC voltage should be derated due to heat generation or corona discharge.

At commercial frequency(50/60Hz), and an operating temperature of -40~+85 $^{\circ}$ C (including self-heating), the URAC are specified below.

URDC	URAC(at 50/60Hz)	
100V	63Vrms	*Not suitable for AC mains applications Even if, URAC of a capacitor covers AC mains voltage range, standard film capacitors in this series are basically not suitable for operation directly connected to AC mains(e.g. across the line). For these AC mains application, the CFS series are recommended.
250V	160Vrms	
400V	200Vrms	
630V	220Vrms	
1000V	250Vrms	



## [10]Max. allowable $\Delta T$



## [11]Soldering operation

In soldering, heat stress to the capacitors has great influence on the change of characteristics of the capacitor, lead to an increase in failures (short circuit) and poor reliability.

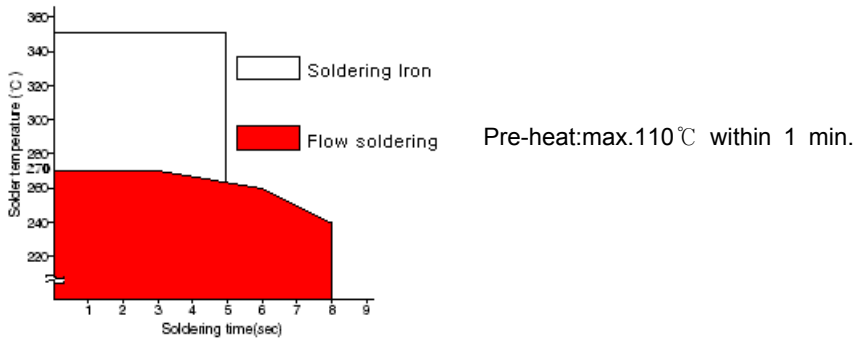
Apart from being dependent on the solder bath temperature and soldering time, the heat stress is also affected by initial (pre-heating) and the post-soldering (cooling) temperatures.

Ensure that the soldering process is within specified conditions shown in below.

- ① The temperature shown below, reflect the condition seen by the capacitor wire leads.
- ② Exposure of the capacitor body to excessive heat during pre-heat and soldering operations may result in damage to the capacitor.
- ③ When combining with chip parts, avoid passing through an adhesive curing oven in order to cure the resin used for fixing. Otherwise, if the mounting heat resisting temperature is exceeded, the dielectric film will suffer heat shrinkage which induces short-circuiting.

Insert the capacitor and solder, after curing the adhesive.

- ④ avoid reflow soldering.
- ⑤ Soldering iron : The soldering iron should not make contact with the body of the capacitor.
- ⑥ Flow soldering



i ) Do not move the capacitor after soldering for a minimum of 20sec.

Failures by short or by opening may result.

ii ) If re-work is needed, wait until the capacitor temperature is equal to room temperature.

Do not re-work more than twice.

\*For further details, refer to [General technical information of film capacitors for use in electronics](#)