

max.+105°C,for high frequency,metallized polypropylene,tape wrapped,axial capacitor

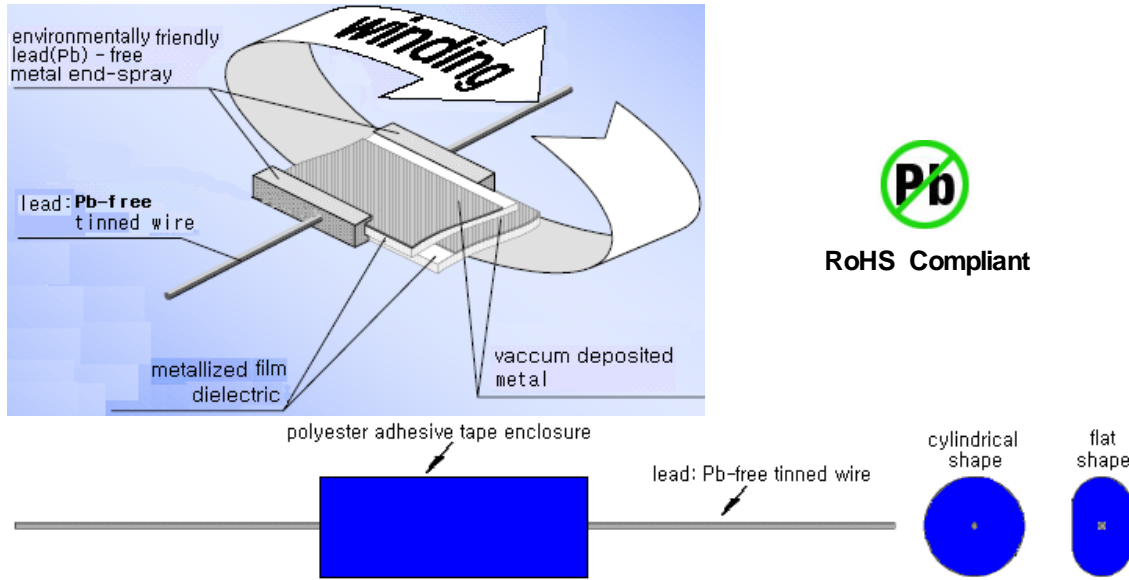
[1]Features

- Low loss.
- Self-heals.
- Excellent frequency characteristics.
- Pb(lead)-free product.
- RoHS Compliant product.

[2]Typical applications

For high frequency,high power operation (SMPS)
 For precision operation when close tolerance is needed(filtering,timing,sample & hold,integration,oscillator,temperature compensation circuit).

[3]Construction



①Style :axial.

②Winding :non-inductively wound self-healing metallized polypropylene film(vacuum deposited aluminum on polypropylene film), wrapped with polyester adhesive tape,ends sealed with flame retardant epoxy resin (UL94V-O) fill.

③Termination :central axial,Pb-free tinned leads.

[4]Specifications

①General data

Applicable standard	IEC60384-16,EIAJ RC-2347,JIS C5101-16		
Rated voltage(URDC)	250VDC,400VDC,630VDC		
Capacitance range	0.0068uF~3.3uF		
Capacitance tolerance	±2%(G),±5%(J),±10%(K) at 20°C,1Khz		
Operating temperature range (TR:+85°C,Tmax.:+105°C)	-40~+105°C *+85°C~+105°C:Derate the rated voltage as shown in the below fig. (70% of the rated voltage at +105°C)		

②Electrical data

Withstand voltage	1.6URDC for 2sec.at 20°C,between leads(1.5URDC for 1 min. for type test)		
Dissipation factor(DF)at 20°C,1Khz	0.1% max.		
Insulation resistance(Rins) at 20°C,between leads	CR ≤ 0.33uF ≥ 30,000MΩ	CR > 0.33uF ≥ 10,000s	applied for 1 min.100VDC: forURDC < 500V 500VDC: forURDC ≥ 500V

*CR = Nominal Capacitance in μF

③Environmental test data

	Test conditions	Test criteria
Damp heat test	40±2°C,R.H.:90~95% applying URDC for 500+24/0 hours	①Rins(between leads):≥0.3 x specified value in ②Electrical data ②DF:≤0.12% ③ $\frac{C}{C_0} \leq \pm 5\%$ of initial value
Endurance test	85±2°C,applying 1.25URDC for 1,000+48/0 hours	①Rins(between leads):≥0.3 x specified value in ②Electrical data ②DF:≤0.11% ③ $\frac{C}{C_0} \leq \pm 5\%$ of initial value

[5]Marking
URDC,Capacitance & tolerance are marked on the capacitor.

[6]Ordering/part number information

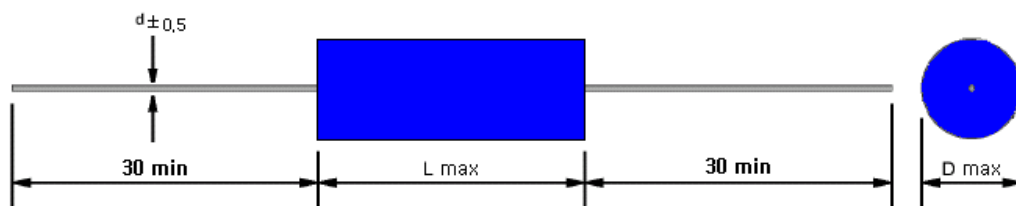
CF	91	P	F	-	2E	104	G		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

- (1)Kind of capacitor:metallized plastic film capacitor
- (2)Shape of capacitor:non-inductive wound,axial tape wrapped.
05:cylindrical shape
91:flat shape
- (3)Dielectrics:polypropylene
- (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:±2%
- (9)(10)No code for straight long leads,bulk,loose parts in a poly.bag

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

[7]Dimensions in mm

①Cylindrical shape:CF05PF series



URDC:250V

uF	L	D	d	permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses)
0.01	14.0	5.0	0.6	11.0v/μs
0.015	14.0	5.5	0.6	
0.022	14.0	6.0	0.6	
0.033	14.0	6.0	0.6	
0.047	14.0	6.5	0.6	
0.068	14.0	7.5	0.6	
0.1	14.0	8.0	0.6	7.0v/μs
0.15	14.0	8.5	0.6	
0.22	20.5	9.0	0.6	4.0v/μs
0.33	28.0	8.5	0.8	
0.47	28.0	10.0	0.8	2.5:v/μs
0.68	28.0	11.5	0.8	
1.0	33.0	12.5	0.8	
1.5	33.0	15.0	0.8	
2.2	33.0	18.0	0.8	
3.3	33.0	21.5	0.8	

URDC:400V

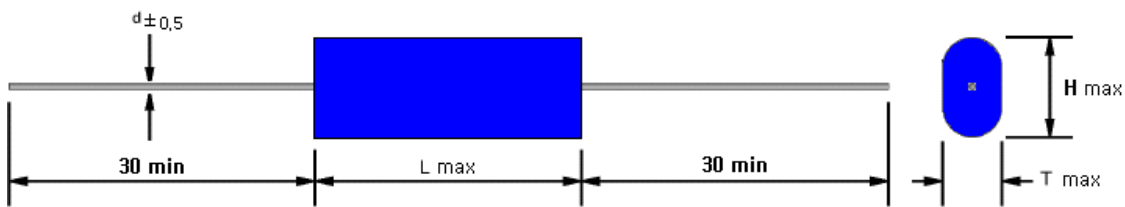
uF	L	D	d	permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses)
0.01	14.0	5.5	0.6	13.5v/μs
0.015	14.0	6.0	0.6	
0.022	14.0	7.0	0.6	
0.033	14.0	7.5	0.6	
0.047	14.0	8.0	0.6	
0.068	20.5	8.0	0.6	10.0v/μs
0.1	20.5	8.5	0.6	
0.15	20.5	8.5	0.6	6.5v/μs
0.22	28.0	9.5	0.8	
0.33	28.0	11.0	0.8	4.0v/μs
0.47	33.0	12.0	0.8	
0.68	33.0	14.0	0.8	
1.0	33.0	16.5	0.8	
1.5	33.0	20.0	0.8	

URDC:630V

uF	L	D	d	permissible $\frac{dv}{dt}$ value(≤ 10,000 pulses)
0.0068	14.0	5.5	0.6	20.0v/μs
0.01	14.0	6.5	0.6	
0.015	14.0	7.0	0.6	
0.022	14.0	8.0	0.6	15.0v/μs
0.033	20.5	7.5	0.6	
0.047	20.5	8.5	0.6	10.0v/μs
0.068	28.0	8.5	0.8	
0.1	28.0	10.0	0.8	
0.15	28.0	11.5	0.8	6.0v/μs
0.22	33.0	12.5	0.8	
0.33	33.0	15.0	0.8	
0.47	33.0	17.5	0.8	
0.68	33.0	21.0	0.8	



② Flat shape:CF91PF series



URDC:250V

uF	L	H	T	d	permissible $\frac{dv}{dt}$ value ($\leq 10,000$ pulses)
0.033	14.0	9.0	5.0	0.6	10.0v/ μ s
0.047	14.0	9.5	5.0	0.6	
0.068	14.0	9.5	5.5	0.6	
0.1	14.0	10.0	5.5	0.6	
0.15	20.5	10.5	6.0	0.6	7.0v/ μ s
0.22	20.5	10.5	7.0	0.6	
0.33	20.5	12.5	8.0	0.6	
0.47	28.0	13.0	8.0	0.8	4.0v/ μ s
0.68	28.0	16.0	9.0	0.8	
1.0	28.0	19.5	10.0	0.8	4.0v/ μ s
1.5	33.0	20.5	11.0	0.8	
2.2	33.0	25.0	13.0	0.8	

URDC:400V

uF	L	H	T	d	permissible $\frac{dv}{dt}$ value ($\leq 10,000$ pulses)
0.015	14.0	9.0	5.0	0.6	17.0v/ μ s
0.022	14.0	9.5	5.0	0.6	
0.033	14.0	9.5	5.5	0.6	
0.047	14.0	10.0	5.5	0.6	
0.068	20.5	10.5	6.0	0.6	10.0v/ μ s
0.1	20.5	11.5	6.5	0.6	
0.15	20.5	14.5	7.5	0.6	
0.22	28.0	14.5	7.5	0.8	6.5v/ μ s
0.33	28.0	17.5	8.5	0.8	
0.47	28.0	19.5	10.5	0.8	6.0v/ μ s
0.68	33.0	20.5	11.0	0.8	
1.0	33.0	25.0	13.0	0.8	

URDC:630V

uF	L	H	T	d	permissible $\frac{dv}{dt}$ value ($\leq 0,000$ pulses)
0.01	14.0	9.0	5.0	0.6	20.0v/ μ s
0.015	14.0	10.0	6.0	0.6	
0.022	14.0	11.0	7.0	0.6	
0.033	20.5	11.0	5.5	0.6	15.0v/ μ s
0.047	20.5	12.0	6.0	0.6	
0.068	20.5	13.5	7.0	0.6	
0.1	20.5	15.0	8.0	0.6	10.0v/ μ s
0.15	28.0	15.5	8.5	0.8	
0.22	28.0	19.0	10.0	0.8	
0.33	33.0	19.5	10.5	0.8	10.0v/ μ s
0.47	33.0	23.5	11.5	0.8	

*Pulse permissible current(Ao-p)=C(μ F)x permissible $\frac{dv}{dt}$ value(V/ μ 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

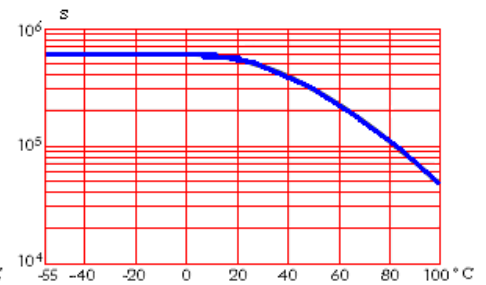
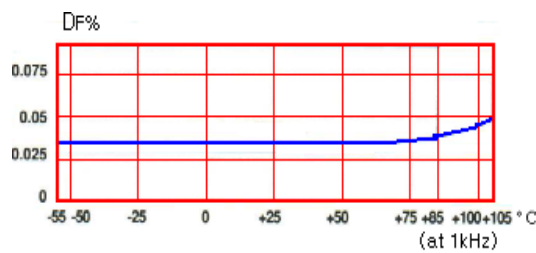
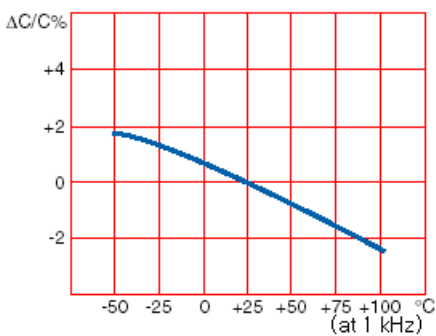
[8] Typical performance characteristics

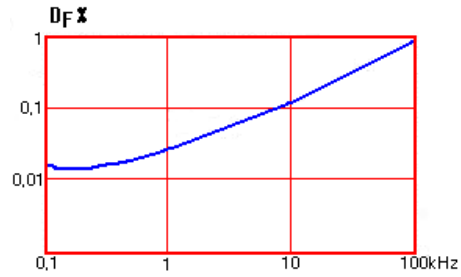
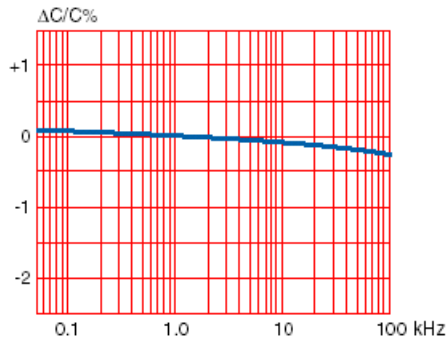
*slightly different depending on individual ratings

[Capacitance-temperature] at 1kHz

[DF-temperature] at 1kHz

[Rins-Temperature]



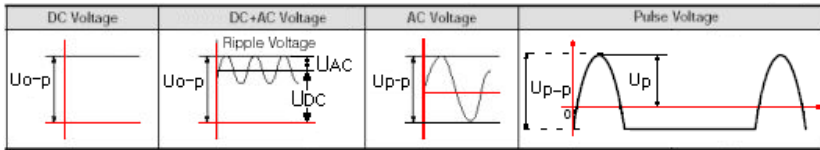


[9] Operating temperature

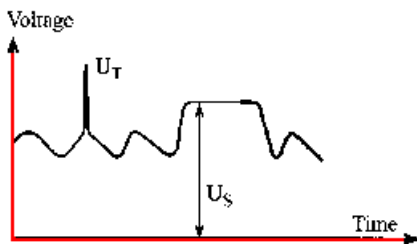
- ① In DC circuit : the operating temperature = Ta
- ② It must be noted, however, that the operating temperature will be the Th (=Ta+ΔT), not the Ta, if ① self-heating(ΔT) or ② surface heating occurs.

[10] Operating voltage(Uo-p)

[Example wave-forms]



- ① DC voltage application : $U_{o-p} < \text{the URDC}$
- ② DC+AC voltage(Ripple voltage)application : $U_{o-p}(=U_{DC} + U_{AC}) < \text{URDC}$
- ③ AC voltage with sine wave form application
 - ① at operating frequency \leq commercial frequency(50/60Hz); the operating AC voltage(Urms) < the URAC specified.
 - ② at operating frequency $>$ commercial frequency; the operating AC voltage(Urms) < the derated AC voltage, which can be determined from the "Max. permissible AC rms voltage(Urms)-frequency" graphs specified.
- ③ To avoid corona discharge; $U_{p-p} < 2\sqrt{2}URAC$
- ④ The calculated max .value of Irms($I_p = \sqrt{2}I_{rms}$) < Ao-p.
- ④ Pulse voltage application(other than a sine wave form)
 - ① The peak value(U_p) < URDC
 - ② To avoid corona discharge; U_{p-p} (including noise and transients) < $2\sqrt{2}URAC$.
 - ③ Determined $\frac{dv}{dt}$ value < the permissible $\frac{dv}{dt}$ value specified
 - ④ The ΔT in the actual circuit < max. allowable ΔT specified.
 - ⑤ The operating temperature(Th) < Tmax. specified.
- ⑤ Irregular voltage



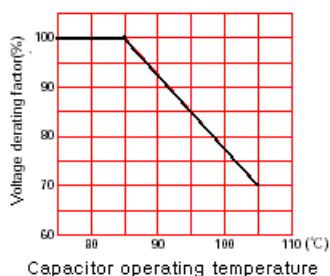
UT(Transient voltage):excessive over-shooting peak value.
 US(Surge voltage):induced by switching or faults of the system or any part of it.
 Uo-p including these irregular voltage < URDC at all times.

[11] 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°C(TR) but without exceeding +105°C(Tmax.), the UR has to be derated according to the graph below.



②When 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.

①at commercial frequency(50/60Hz),and an operating temperature of -40~+85°C(including self-heating),the URAC are specified below.

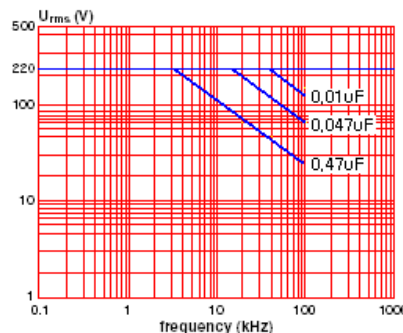
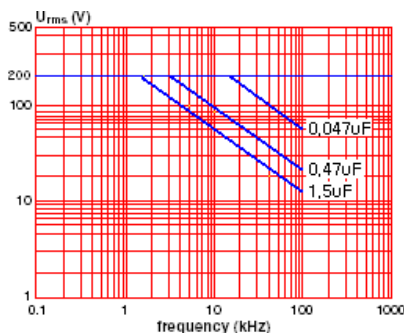
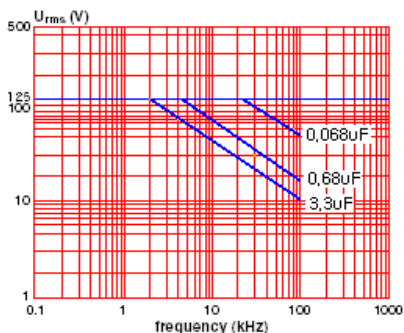
URDC	URAC(at 50/60Hz)	*Not suitable for AC mains applications
250V	125Vrms	Even if, URAC of a capacitor covers AC mains voltage range,standard film capacitors in this series are basically not suitable for operation directly connected to AC mains(e.g.across the line). For these AC mains application,the CFS series are recommended.
400V	200Vrms	
630V	220Vrms	

②at high frequency(over 60Hz),derate the URAC according to the below "max. permissible AC rms voltage(Urms)-frequency" graphs, at Th=max.+85°C and ΔT=10°C.

URDC:250V ,URAC:125Vrms(50/60Hz)

URDC:400V ,URAC:200Vrms(50/60Hz)

URDC:630V ,URAC:220Vrms(50/60Hz)

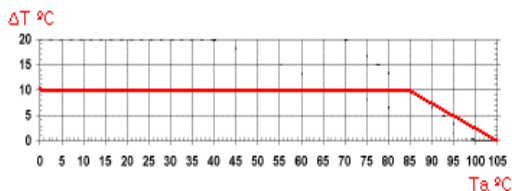


*The AC voltages mentioned refer to clean sinusoidal voltages without transients.

*max. permissible AC rms current(Irms)=2πf · C · Urms here, f:operating frequency in Hz
C:capacitance in F

Urms:obtained Urms from the above graph in V.

[12]Max. allowable ΔT



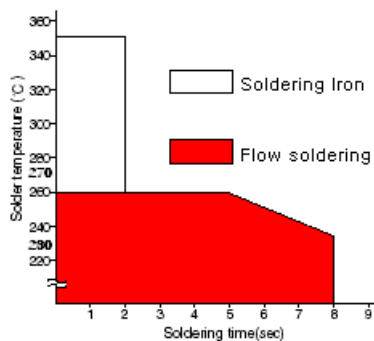
[13]Soldering operation

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.

This series of polypropylene film capacitors have lower mounting heat resisting temperature than other polyester film capacitors. Ensure that the soldering process is within specified conditions shown in below.

- ①The temperature shown below,reflect the condition seen by the capacitor wire leads.
 - ②Exposure of the capacitor body to excessive heat during pre-heat and soldering operations may result in damage to the capacitor.
 - ③When 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.
- ④avoid reflow soldering.
 - ⑤Soldering iron : The soldering iron should not make contact with the body of the capacitor.
 - ⑥Flow soldering



Pre-heat:max.110°C within 1 min.

i)During the soldering,high temperature may cause cracking of the capacitor due to the characteristics of the epoxy resin which is used for external coating of capacitors.

Set the temperature and time so that the cracking may not occurred.



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

Failures by short or by opening may result.

iii) 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](#)