

**max.+105°C,for high frequency,low loss,wide voltage range,metallized polypropylene film,
powder epoxy dipped,radial capacitor**

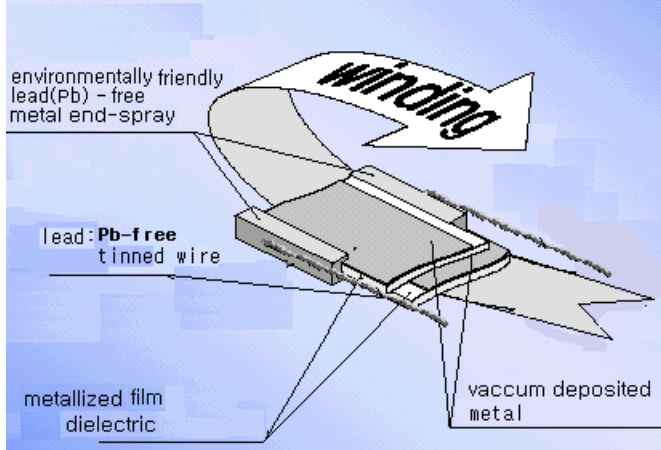
[1]Features

- 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),audio,Inverter,TV,Monitor, Electrical ballasts,Compact lamp.

[3]Construction

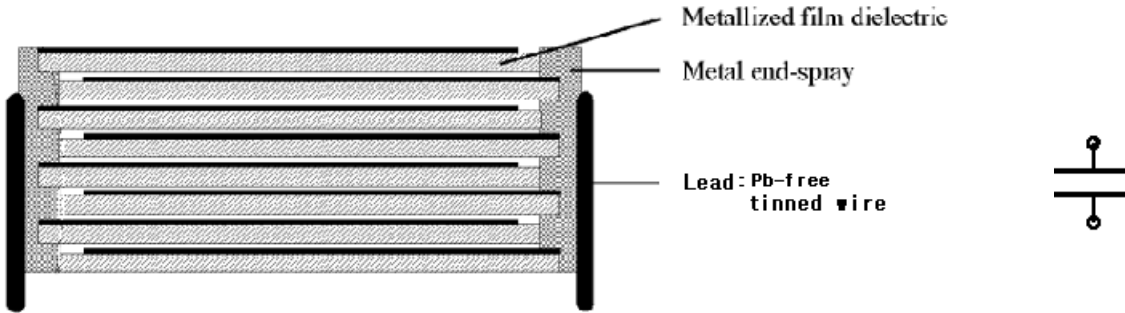


RoHS Compliant

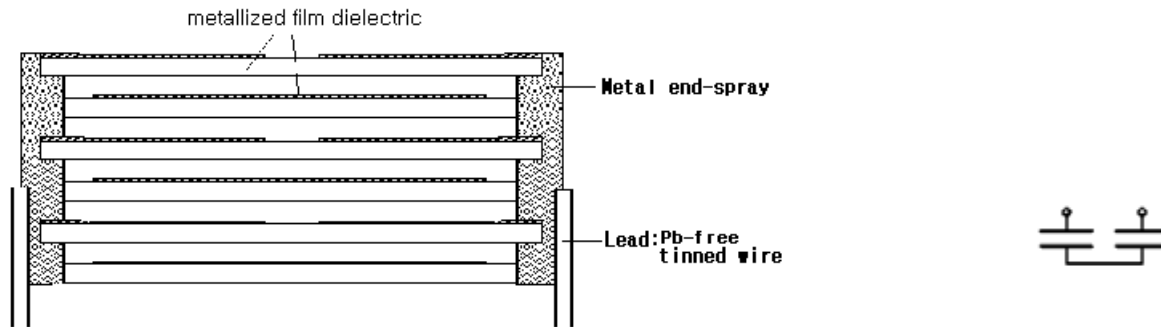
[1]Style :radial,powder epoxy dipped design.

[2]Winding :non-inductively wound self-healing metallized polypropylene film(vacuum deposited aluminum on polypropylene film).

[\[1Section:for URDC≤1000V\]](#)



[\[2sections\(internal series construction\)\]](#) *internal series multi-section construction :for URAC≥275V



[3]Termination :Pb-free tinned leads are electrically welded to the contact surface(metal end-spray)made by spraying the parts of metal contact materials on the ends of capacitor winding.

[4]Coating :multi dip,powder molded flame retardant epoxy resin(UL94V-O).

[4] Specifications

① General data

Applicable standard	IEC60384-16,EIAJ RC-2347,JIS C5101-16		
Rated voltage(URDC)	250VDC,400VDC,630VDC,1000VDC,1600VDC		
Capacitance range	0.001uF ~ 10.0uF		
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)		

② Electrical 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	CR > 0.33uF	applied for 1 min. 100VDC:for URDC < 500V 500VDC:for URDC ≥ 500V
	≥ 30,000MΩ	≥ 10,000s	

*CR = Nominal Capacitance in μF

③ Environmental test data

	Test conditions	Test criteria
Damp heat test	40±2°C,R.H.:90~95% applying URDC for 500+24/0 hours	① Rins(between leads): ≥ 0.3 x specified value in ② Electrical data ② DF: ≤ 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	① Rins(between leads): ≥ 0.3 x specified value in ② Electrical data ② DF: ≤ 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	922	P	F	-	2E	104	J	FS	0100
(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, radial epoxy dipped.

(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

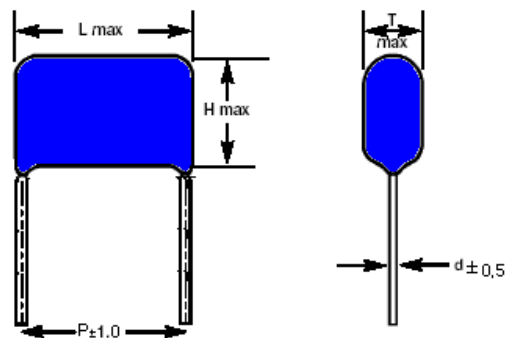
(8) *Capacitance tolerance code: ± 5%

(9) *Packaging and lead configuration code: bulk, loose parts in a poly.bag, single formed leads-inner crimped

(10) *Lead pitch: 10mm

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

[7] Dimensions in mm



URDC:250V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):33v/ μ s				
0.01	13.0	9.0	5.0	0.6
0.022	13.0	9.0	5.0	0.6
0.033	13.0	9.0	5.0	0.6
0.047	13.0	9.5	5.5	0.6
0.068	13.0	10.0	5.5	0.6
0.1	13.0	10.5	5.5	0.6
0.15	13.0	11.0	6.0	0.6
0.22	13.0	12.0	6.5	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 26v/ μ s				
0.33	18.0	14.5	8.0	0.8
0.47	18.0	15.5	8.5	0.8
0.68	18.0	16.0	9.0	0.8
1.0	18.0	17.5	11.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):19v/ μ s				
1.5	26.0	19.5	10.5	0.8
2.2	26.0	22.0	12.0	0.8
3.3	26.0	24.0	14.0	0.8
4.7	26.0	25.5	16.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):10v/ μ s				
6.8	31.5	29.0	16.0	0.8
pitch 32.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 9v/ μ s				
10.0	37.0	30.0	18.0	1.0

URDC:630V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 90v/ μ s				
0.01	13.0	9.0	5.0	0.6
0.022	13.0	11.0	5.5	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):55v/ μ s				
0.033	18.0	11.0	6.5	0.8
0.047	18.0	12.0	7.0	0.8
0.068	18.0	13.5	8.0	0.8
0.1	18.0	14.5	8.5	0.8
0.15	18.0	16.0	9.5	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):37v/ μ s				
0.22	26.0	16.0	9.0	0.8
0.33	26.0	18.0	10.0	0.8
0.47	26.0	20.0	11.0	0.8
0.68	26.0	22.5	14.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):23v/ μ s				
1.0	31.5	25.0	15.0	0.8
pitch 32.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):21v/ μ s				
1.5	37.0	28.0	16.0	1.0
2.2	37.0	31.0	19.0	1.0

URDC:400V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):60v/ μ s				
0.01	13.0	9.0	5.0	0.6
0.022	13.0	10.0	5.5	0.6
0.033	13.0	10.0	6.0	0.6
0.047	13.0	10.5	6.5	0.6
0.068	13.0	12.0	6.5	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):35v/ μ s				
0.1	18.0	12.5	7.0	0.8
0.15	18.0	13.0	7.5	0.8
0.22	18.0	15.0	8.0	0.8
0.33	18.0	16.0	9.0	0.8
0.47	18.0	18.0	11.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):25v/ μ s				
0.68	26.0	18.0	10.5	0.8
1.0	26.0	20.0	12.0	0.8
1.5	26.0	22.0	14.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):16v/ μ s				
2.2	31.5	25.0	15.0	0.8
pitch 32.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):14v/ μ s				
3.3	37.0	28.0	15.0	1.0

URDC:1000V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):113v/ μ s				
0.0033	13.0	9.5	5.0	0.6
0.0047	13.0	10.0	5.5	0.6
0.0068	13.0	11.0	6.0	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 80v/ μ s				
0.010	18.0	9.5	6.0	0.8
0.015	18.0	12.0	6.5	0.8
0.022	18.0	12.5	7.0	0.8
0.033	18.0	13.5	7.5	0.8
0.047	18.0	15.5	8.0	0.8
0.068	18.0	16.5	9.0	0.8
0.1	18.0	17.5	11.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 55v/ μ s				
0.15	26.0	17.5	12.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 35v/ μ s				
0.22	31.5	19.0	10.0	0.8
0.33	31.5	22.5	13.5	0.8
0.47	31.5	24.5	15.5	0.8
0.68	31.5	27.0	17.5	0.8
1.0	31.5	30.0	20.5	0.8

URDC:1600V

uF	L	H	T	d
pitch 15.0mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses):100v/ μ s				
0.001	18.0	10.0	5.0	0.8
0.0022	18.0	11.0	5.0	0.8
0.0033	18.0	11.5	6.0	0.8
0.0047	18.0	12.0	6.5	0.8
0.0068	18.0	13.0	8.0	0.8
0.01	18.0	14.5	9.0	0.8
0.015	18.0	17.0	10.0	0.8
0.022	18.0	17.5	11.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 65v/ μ s				
0.033	26.0	18.5	10.5	0.8
0.047	26.0	19.5	11.0	0.8
0.068	26.0	22.0	13.0	0.8
0.1	26.0	24.0	15.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value($\leq 10,000$ pulses): 45v/ μ s				
0.15	31.5	24.5	15.5	0.8
0.22	31.5	27.0	17.5	0.8
0.33	31.5	30.0	20.5	0.8

*Pulse permissible current(Ao-p)=C(uF)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

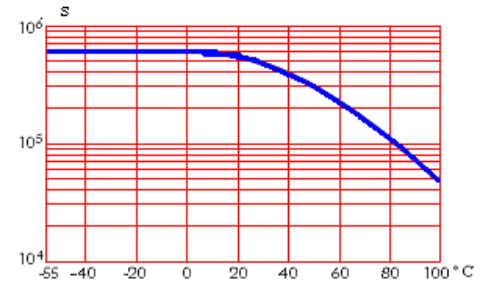
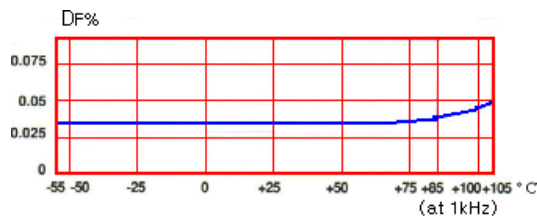
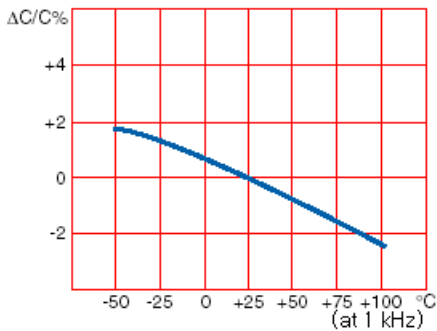
[8] Typical performance characteristics

*slightly different depending on individual ratings

[Capacitance-temperature] at 1kHz

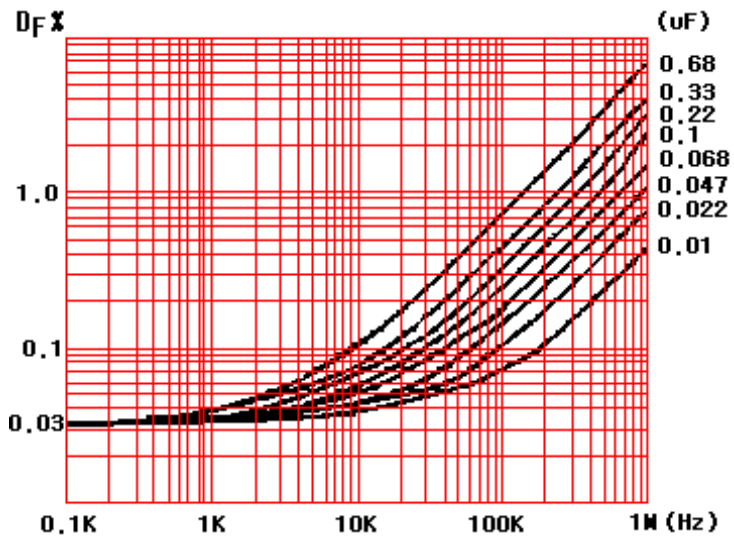
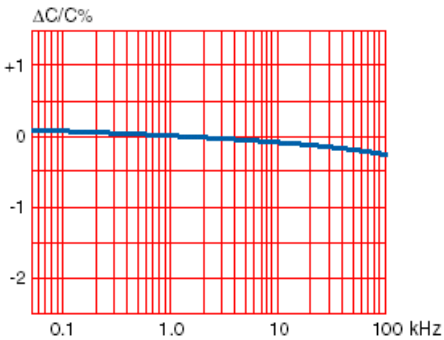
[DF-temperature] at 1kHz

[Rins-Temperature]



[Capacitance-frequency at +20°C]

[DF-frequency at +20°C]



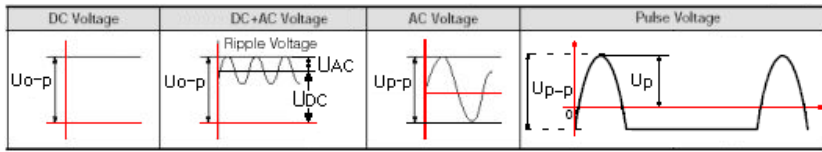
[9]Operating temperature

①In DC circuit : the operating temperature =Ta

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

[10]Operating voltage(Uo-p)

[Example wave-forms]



①DC voltage application : $U_{o-p} < \text{the URDC}$

②DC+AC voltage(Ripple voltage)application : $U_{o-p}(=U_{DC} + U_{AC}) < \text{URDC}$

③AC voltage with sine wave form application

①at operating frequency ≤ commercial frequency(50/60Hz); the operating AC voltage(Urms) < the URAC specified.

②at 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.

③To avoid corona discharge; $U_{p-p} < 2\sqrt{2}URAC$

④The calculated max. value of Irms($I_p = \sqrt{2}I_{rms}$) < Ao-p.

④Pulse voltage application(other than a sine wave form)

①The peak value(U_p) < URDC

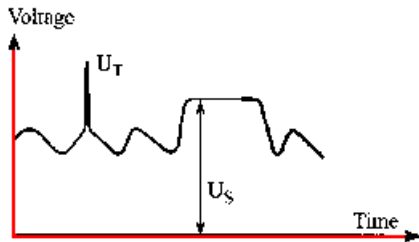
②To avoid corona discharge: U_{p-p} (including noise and transients) < $2\sqrt{2}URAC$.

③Determined $\frac{dv}{dt}$ value < the permissible $\frac{dv}{dt}$ value specified

④The ΔT in the actual circuit < max. allowable ΔT specified.

⑤The operating temperature(Th) < Tmax. specified.

⑤Irregular 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.

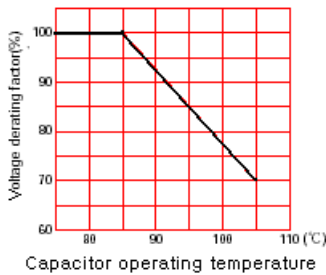
U_{o-p} including these irregular voltage < URDC at all times.

[11]Derating of rated voltage(UR)

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

①where 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 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	125Vrms	
400V	200Vrms	
630V	220Vrms	
1000V	250Vrms	
1600V	400Vrms	

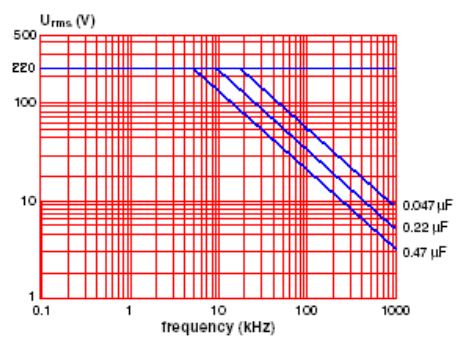
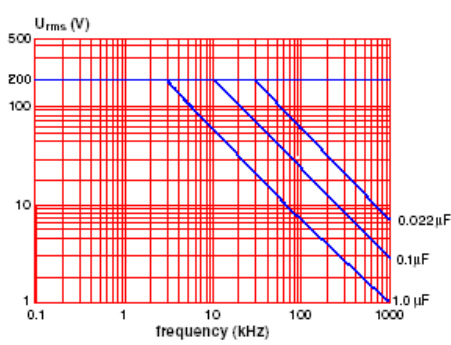
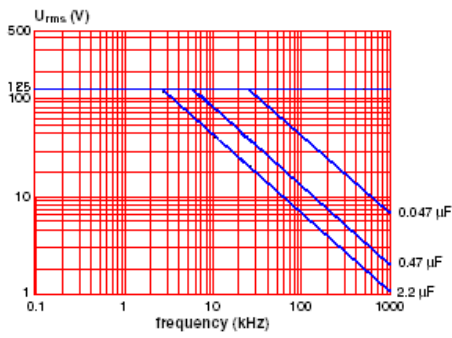
②at high frequency(over 60Hz),derate the URAC according to the below "max. permissible AC rms voltage(Urms)-frequency" graphs, at Th=max.+85°C and ΔT=10°C.



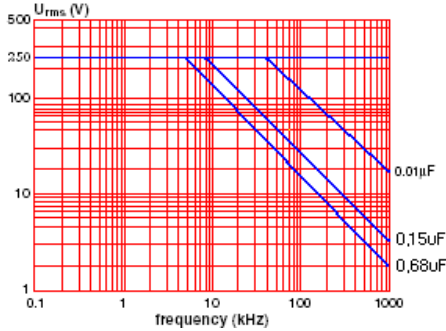
URDC:250V ,URAC:125Vrms(50/60Hz)

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

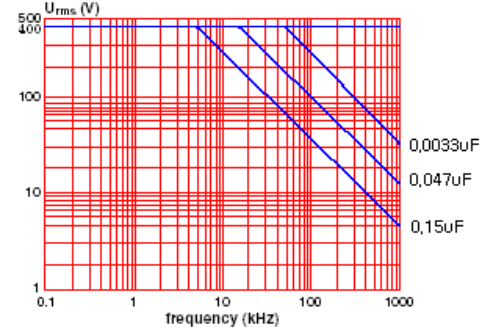
URDC:630V ,URAC:220Vrms(50/60Hz)



URDC:1000V ,URAC:250Vrms(50/60Hz)



URDC:1600V ,URAC:400Vrms(50/60Hz)



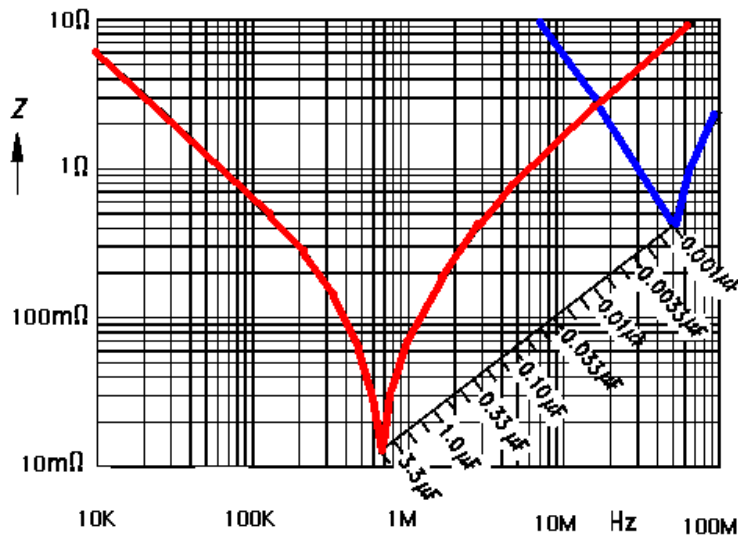
*The AC voltages mentioned refer to clean sinusoidal voltages without transients.

*max. permissible AC rms current($I_{rms}=2\pi f \cdot C \cdot U_{rms}$ here, f:operating frequency in Hz

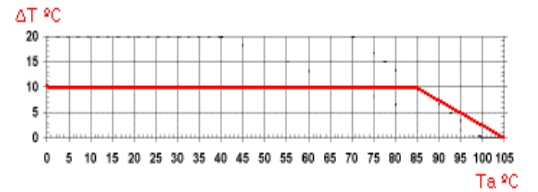
C:capacitance in F

U_{rms} :obtained U_{rms} from the above graph in V.

[12]Impedance(Z) -frequency Curve(typical values) in lead length 2.0mm



[13]Max. allowable ΔT



[14]Thermal resistance($\theta_{ha} = \frac{C}{W}$) @85°C,0.2m/s

T (mm)	Pitch(mm)			
	10.0	15.0	22.5	27.5
5.0	200	170		
6.0	170	154		
7.0	158	125		
8.0		111		
9.0		91	55	
10.0		83	50	
12.0		70	42	
14.0			40	33
16.0			35	28
18.0				25
20.0				23
22.0				22

[15]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.

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.

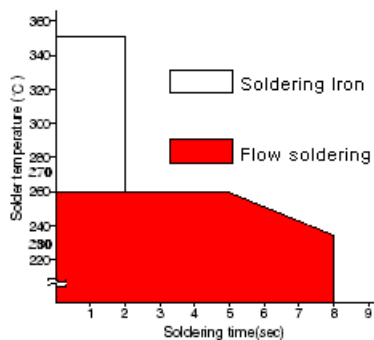
③ When combining with chip parts, avoid passing through an adhesive curing oven in order to cure the resin used for fixing. Otherwise, if the mounting heat resisting temperature is exceeded, the dielectric film will suffer heat shrinkage which induces short-circuiting.

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



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](#)