CQ922PG

max.+105℃,for high pulse,large current,non-inductive,polypropylene film/foil,powder epoxy dipped,radial capacitor

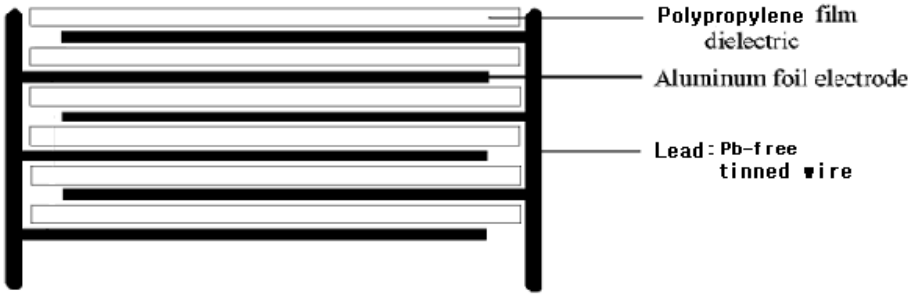
[1]Features

Excellent high pulse,high frequency performance,and high current handling capability and high insulation resistance.
Low loss and low dielectric absorption.
High-precision capacitors(close tolerance up to 1%)with little aging,long term stability,negative temperature coefficient of capacitance and almost constant.
Pb(lead)-free product
RoHS Compliant product.

[2]Typical applications

Most suitable for snubber,oscillation circuit, filter and S correction for high current and steep pulse application.
For all pulse applications with high repetition frequency like SMPS,ballasts,inverters, Monitor,TV/video telecommunications.
Polystylene capacitors alternative in audio applications and HF technique.

[3]Construction



RoHS Compliant

1 **Style :**radial,powder epoxy dipped design.
2 **Winding :**non-inductively wound with extended foil,single section construction from polypropylene film dielectric and aluminum foil electrode.
The aluminum foil electrode at each end is joined and the end will be soldered over.
3 **Termination :**Pb-free tinned leads are electrically,directly welded to the aluminum foil electrodes.
4 **Coating :**multi dip,powder molded flame retardant epoxy resin(UL94V-O).

[4]Specifications

1 **General data**

Applicable standard	IEC60384-13,EIAJ RC-2346
Rated voltage(URDC)	100VDC,250VDC,400VDC,630VDC,1000VDC
Capacitance range	0.001uF~1.0uF
Capacitance tolerance	±2%(G),±5%(J),±10%(K) at 20℃,1Khz
Operating temperature range (TR:+85℃,Tmax.:+105℃)	-40~+105℃ *+85℃~+105℃:Derate the rated voltage as shown in the below fig. (50% of the rated voltage at +105℃)

2 **Electrical data**

Withstand voltage	2.5URDC for 2sec.at 20℃,between leads (2.0URDC for 1 min. for type test)		
Dissipation factor(DF)	0.1% max. at 20℃,1Khz		
Insulation resistance(Rins) at 20℃,between leads	CR≤0.33uF ≥30,000MΩ	CR>0.33uF ≥10,000s	applied for 1 min. 100VDC: for URDC<500V 500VDC: for URDC≥500V

*CR = Nominal Capacitance in μF

3 **Environmental test data**

	Test conditions	Test criteria
Low temperature test	-40±2℃	$\frac{\Delta C}{C}$:+3%~ 0% of value in 20℃
High temperature test	85±2℃	①Rins.(between leads):≥0.1 x specified value in 2 Electrical data ② $\frac{\Delta C}{C}$:+0%~ -5% of value in 20℃
Damp heat test	40±2℃,R.H.:90~95% applying URDC for 500+24/0 hours	①Withstand voltage:2.0 x URDC for 1min. ②Rins(between leads):≥⅓ x specified value in 2 Electrical data ③DF:≤0.12% at 1Khz ④ $\frac{\Delta C}{C}$:≤ ±3% of initial value
Endurance test	85±2℃,applying 1.4URDC for 1,000+48/0 hours	①Rins(between leads):≥½ x specified value in 2 Electrical data ②DF:≤0.11% at 1Khz ③ $\frac{\Delta C}{C}$:≤ ±5% of initial value

[5]Marking

URDC,Capacitance & tolerance are marked on the capacitor.

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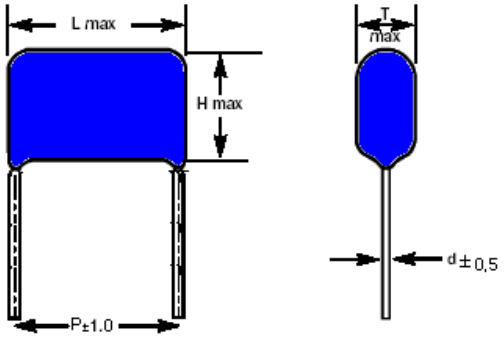
[6]Ordering/part number information

CQ	922	P	G	-	2E	153	J	FS	0100
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

(1)Kind of capacitor:plastic film/foil capacitor
(2)Shape of capacitor:non-inductive wound,Radial epoxy dipped.
(3)Dielectrics:polypropylene
(4)Operating temperature:-40℃~+105℃
(5)internal use
(6)*DC rated voltage code:250VDC
(7)*Rated capacitance in pF:15000pF=0.015uF
(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:100V

uF	L	H	T	d
pitch 7.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.001	11.0	10.0	5.5	0.6
0.0015	11.0	10.0	5.5	0.6
0.0022	11.0	10.0	5.5	0.6
0.0033	11.0	10.0	5.5	0.6
0.0047	11.0	10.5	6.0	0.6
0.0068	11.0	10.5	6.0	0.6
0.01	11.0	10.5	6.0	0.6
0.015	11.0	10.5	6.0	0.6
pitch 10.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.022	14.0	11.5	5.5	0.6
0.033	14.0	13.0	7.0	0.8
pitch 15.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.047	19.0	13.0	6.0	0.8
0.068	19.0	14.0	7.0	0.8
0.1	19.0	15.0	8.0	0.8
0.15	19.0	16.5	9.5	0.8
0.22	19.0	18.0	12.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.33	26.5	17.5	10.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.47	31.0	19.0	12.0	0.8
0.68	31.0	22.0	13.5	0.8
1.0	31.0	26.0	16.5	0.8

URDC:250V

uF	L	H	T	d
pitch 7.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,200v/μs				
0.001	11.0	10.0	5.5	0.6
0.0015	11.0	10.0	5.5	0.6
0.0022	11.0	10.0	5.5	0.6
0.0033	11.0	10.0	5.5	0.6
0.0047	11.0	10.5	6.0	0.6
0.0068	11.0	10.5	6.0	0.6
0.01	11.0	11.0	6.5	0.6
pitch 10.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.015	14.0	12.5	6.5	0.6
0.022	14.0	13.5	7.0	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.033	19.0	13.5	7.0	0.8
0.047	19.0	14.5	8.0	0.8
0.068	19.0	16.0	9.0	0.8
0.1	19.0	17.5	10.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.15	26.5	16.0	9.0	0.8
0.22	26.5	18.0	11.0	0.8
0.33	26.5	21.5	13.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.47	31.0	22.0	13.5	0.8
0.68	31.0	26.0	20.0	0.8

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URDC:400V

uF	L	H	T	d
pitch 7.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):2,000v/μs				
0.001	11.0	10.5	6.5	0.6
0.0015	11.0	10.5	6.5	0.6
0.0022	11.0	10.5	6.5	0.6
pitch 10.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.0033	14.0	11.0	6.5	0.6
0.0047	14.0	11.0	6.5	0.6
0.0068	14.0	11.0	6.5	0.6
0.01	14.0	12.0	7.0	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.015	19.0	11.0	6.5	0.6
0.022	19.0	12.0	7.5	0.6
0.033	19.0	13.5	8.0	0.8
0.047	19.0	15.5	9.5	0.8
0.068	19.0	18.0	10.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.1	26.5	16.5	10.0	0.8
0.15	26.5	19.0	12.0	0.8
0.22	26.5	21.0	14.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.33	31.0	26.0	18.0	0.8
0.47	31.0	28.0	20.0	0.8

URDC:630V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):2,500v/μs				
0.001	14.0	8.5	5.5	0.6
0.0015	14.0	9.5	6.0	0.6
0.0022	14.0	10.0	6.5	0.6
0.0033	14.0	12.0	6.5	0.6
0.0047	14.0	12.5	6.5	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,500v/μs				
0.0068	19.0	14.0	7.5	0.6
0.01	19.0	15.5	8.5	0.6
0.015	19.0	16.0	9.5	0.6
0.022	19.0	17.0	10.0	0.6
0.033	19.0	18.5	12.0	0.8
pitch 22.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.047	26.5	16.0	10.0	0.8
pitch 27.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.068	31.0	19.0	11.0	0.8
0.1	31.0	22.0	12.5	0.8
0.15	31.0	25.5	15.5	0.8
0.22	31.0	27.5	16.0	0.8

URDC:1000V

uF	L	H	T	d
pitch 10.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):2,500v/μs				
0.001	14.0	12.0	7.0	0.6
0.0015	14.0	12.5	7.5	0.6
0.0022	14.0	13.0	8.0	0.6
pitch 15.0mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):2,500v/μs				
0.0033	19.0	13.0	8.0	0.6
0.0047	19.0	14.0	9.0	0.6
0.0068	19.0	15.5	10.0	0.6
pitch 22.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.01	26.5	15.5	9.5	0.6
0.015	26.5	17.0	10.5	0.6
0.022	26.5	18.0	12.0	0.6
pitch 27.5mm permissible $\frac{dv}{dt}$ value(≤10,000 pulses):1,000v/μs				
0.033	31.0	18.5	12.0	0.8
0.047	31.0	21.0	13.5	0.8

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

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

*Usually,Ao-p is not an issue and the $\frac{dv}{dt}$ are not limited in the film/foil capacitors with leads welded directly to extended foil.

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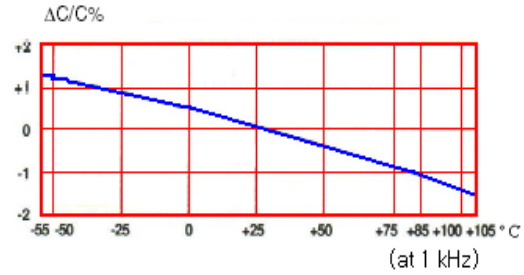
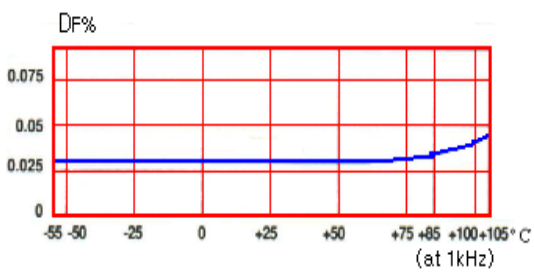
[8]Typical performance characteristics

*slightly different depending on individual ratings

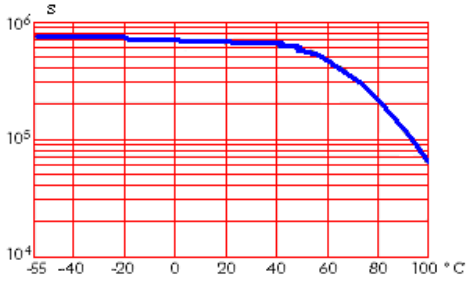
【Capacitance-temperature 】 at 1kHz



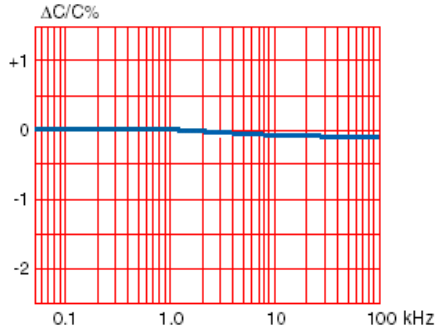
【DF-temperature 】 at 1kHz



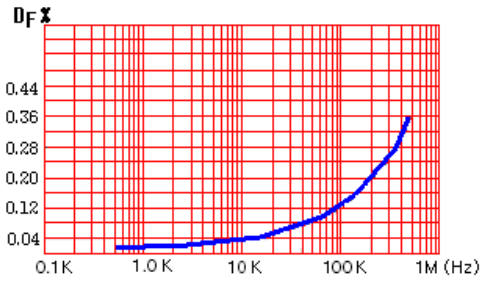
【Rins-Temperature】



【Capacitance-frequency at +20℃】



【DF-frequency at +20℃】



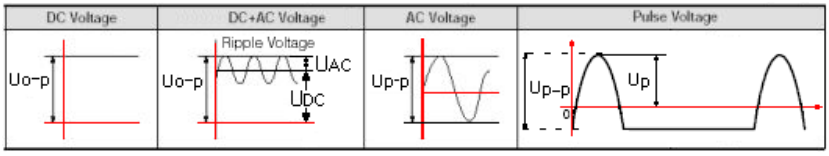
[9]Operating temperature

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 ①self-heating(ΔT) or ②surface heating occurs.

[10]Operating voltage(Uo-p)

【Example wave-forms】



1 **DC voltage application** : Uo-p ＜ the URDC

2 **DC+AC voltage(Ripple voltage)application** : Uo-p(=UDC + UAC)＜URDC

3 **AC voltage with sine wave form application**

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

❷at 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.

❸To avoid corona discharge;Up-p＜$2\sqrt{2}$URAC

❹The calculated max. value of Irms(Ip=$\sqrt{2}$Irms)＜Ao-p.

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

❶The peak value(Up)＜ URDC

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

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

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

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

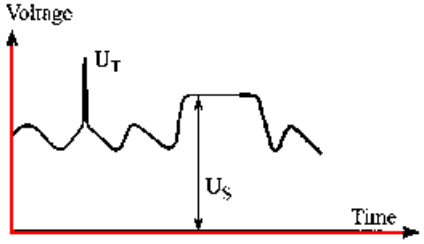
*The film/foil capacitors with leads welded directly to extended foil,Ao-p is not an issue.

Thus,the instantaneous pulse current i or the $\frac{dv}{dt}$ are not limited.

The $\frac{dv}{dt}$ are only limited by corona discharge .

However,at higher repetition frequencies,the ΔT during the pulse operation must not exceed max. allowable ΔT 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 includung these irregular voltage ＜URDC at all times.

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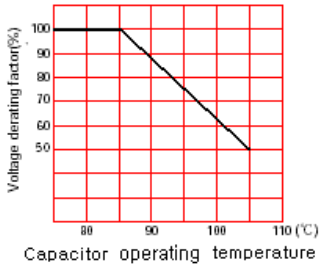
[11]Derating of rated voltage(UR)

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℃(TR) but without exceeding +105℃(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.

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

URDC	URAC(at 50/60Hz)
100V	63Vrms
250V	125Vrms
400V	200Vrms
630V	220Vrms
1000V	250Vrms

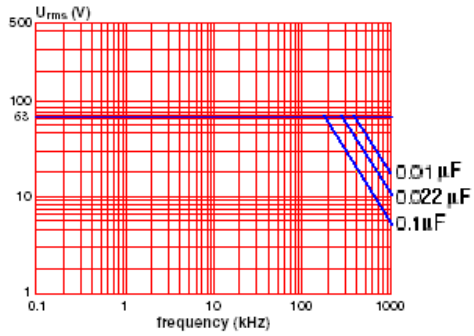
***Not suitable for AC mains applications**

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).

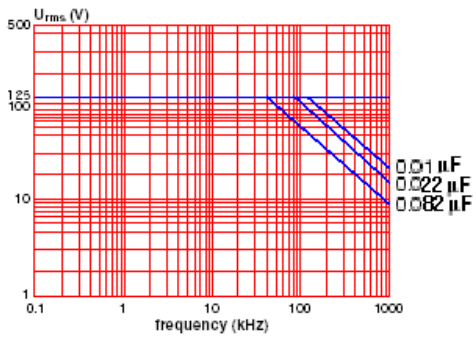
For these AC mains application,the CFS series are recommended.

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

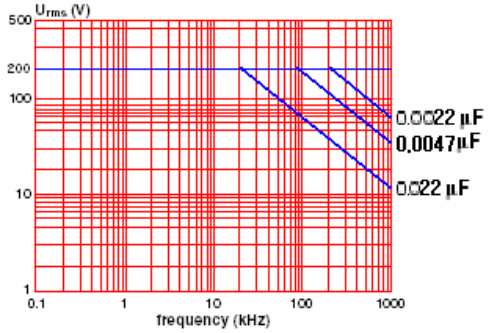
URDC:100V ,URAC:63Vrms(50/60Hz)



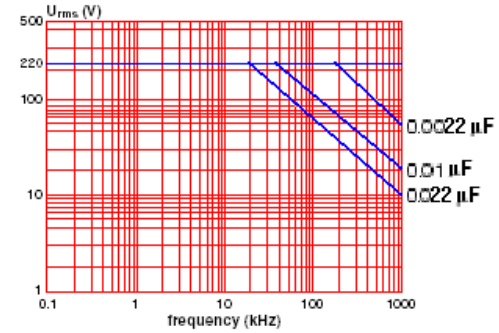
URDC:250V ,URAC:125Vrms(50/60Hz)



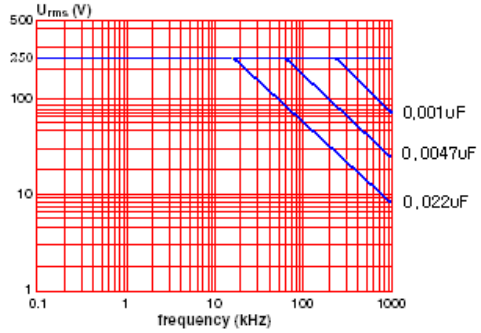
URDC:400V ,URAC:200Vrms(50/60Hz)



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



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

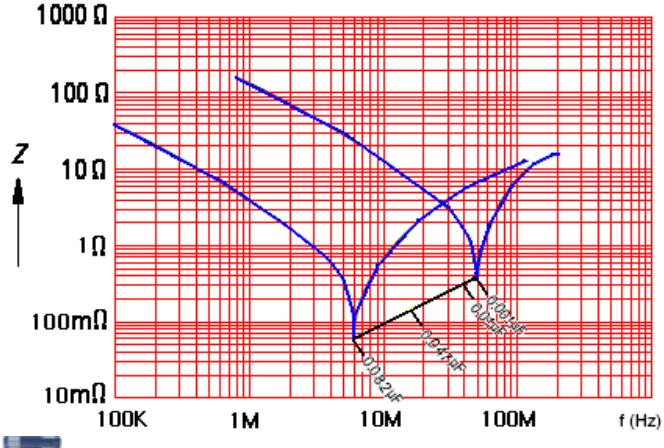


*The AC voltages mentioned refer to clean sinusoidal voltages without transients.

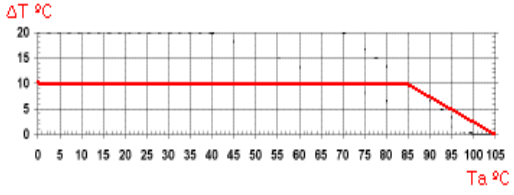
*max. permissible AC rms current(Irms)=2πf・C・Urms

here, **f:**operating frequency in Hz, **C:**capacitance in F, **Urms:**obtained Urms from the above graph in V.

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



[13]Max. allowable ΔT



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[14]Thermal resistance(Θha:$\frac{℃}{W}$) @85℃,0.2m/s

T (mm)	Pitch(mm)				
	7.5	10.0	15.0	22.5	27.5
5.5	250	167			
6.0	222	167	158		
6.5	200	154	125		
7.0		154	125		
7.5		125	111		
8.0		125	111		
8.5			91		
9.0			91	55	45
9.5			83	53	
10.0			83	50	43
10.5				48	
11.0				45	40
11.5					38
12.0			70	42	37
12.5					36
13.0				41	
13.5					32
14.0				40	33
15.5					29
16.0					28
18.0					25
19.0					24
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.

CQ922PG and CQ921PG series are sensitive for heating,due to their construction and film material.

If directly mounted on the PCB,the capacitor's inside(element)temperature may exceed mounting heat resisting temperature (110℃) due to heat from the lead,and hence a formed-lead is recommended.

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

❶The temperature shown below,reflect the condition seen by the capacitor wire leads.

❷Exposure of the capacitor body to excessive heat during pre-heat and soldering operations may result in damage to the capacitor.

❸When combining with chip parts,avoid passing through an adhesive curing oven in order to cure the resin used for fixing.

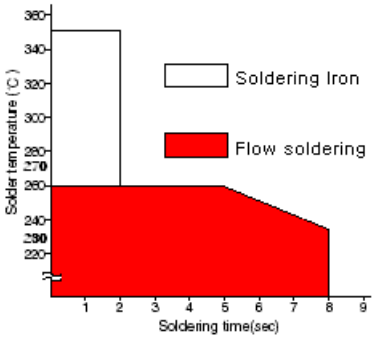
Otherwise,if the mounting heat resisting temperature is exceeded,the dielectric film will suffer heat shrinkage which induces short-circuiting.

Insert the capacitor and solder,after curing the adhesive.

❹avoid reflow soldering.

❺Soldering iron : The soldering iron should not make contact with the body of the capacitor.

❻Flow soldering



Pre-heat:max.110℃ 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

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