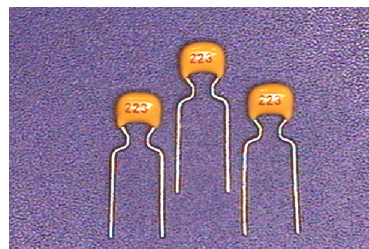


## Radial Dipped Ceramic Capacitors [General Used Capacitor – 6.3V-1KV]

### RDC Series



#### ◆ Features

- ❑ Advanced process technology produces thinner layers of ceramic dielectric and offers higher voltage rating and capacitance values
- ❑ Provides good frequency response
- ❑ High reliability
- ❑ RoHS compliant
- ❑ Halogen free available

#### ◆ Applications

- ❑ Suitable for Automotive Electronics, Power supplies
- ❑ Inverter and Converter
- ❑ Fuel pump , Water pump , Hybrid engine , Door lock , Wiper

#### ◆ Summary of Specification

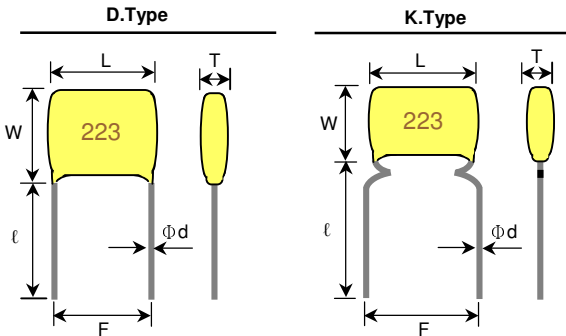
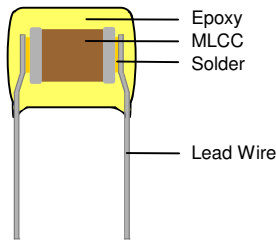
Operation Temperature	NPO,X7R : -55~+125 °C ; X5R : -55~+85 °C ; Y5V : -30~+85 °C
Rated Voltage	6.3Vdc to 1KVdc
Temperature Coefficient	NPO : $\pm 30$ ppm/ °C , -55~+125 °C (EIA Class I )
	X7R : $\pm 15$ % , -55~+125 °C (EIA Class II )
	X5R : $\pm 15$ % , -55~+85 °C (EIA Class II )
	Y5V : $\pm 22 \sim -82$ % , -30~+85 °C (EIA Class II )
Capacitance Range	NPO : 2pF to 220nF
	X7R : 150pF to 22uF
	X5R : 0.1uF to 100uF
	Y5V : 0.1uF to 100uF
Dissipation Factor	Please see RDC specification data sheet
Insulation Resistance	10GΩ or 500/C Ω whichever is smaller
Aging	NPO:0% ; X7R,X5R: 2.5 % Y5V: 6% per decade of time
Dielectric Strength	V ≤ 50 : 250% Rated Voltage
	V < 500V : 200% Rated Voltage
	500V ≤ V < 1000V: 150% Rated Voltage
	1000 ≤ V : 120% Rated Voltage

#### ◆ How To Order

RDC
X
473
K
631
EK
A
N

Product Code	Dielectric	Capacitance Unit : pF	Tolerance	Rated Voltage	Leader Style & Dimension	Lead Length & Packaging	Optional Suffix
RDC: Radial Ceramic Chip Capacitor	Ex.: N: NPO X: X7R B: X5R Y: Y5V	Ex.: 2R0:2.0pF 100:10×10 <sup>0</sup> 471:47×10 <sup>1</sup> 102:10×10 <sup>2</sup>	Ex.: C:±/0.25pF D:±/0.50pF J :±/ -5% K :±/ -10% M:±/ -20% Z:±80/ -20%	Ex.: 007:6.3Vdc 010:10Vdc 025:25Vdc 050:50Vdc 101:100Vdc 251:250Vdc 631:630Vdc 102:1000Vdc	Ex: D Type CD:4.5x5.5mm DD:4.5x5.5mm ED:5.5x7.0mm FD:7.5x8.0mm GD:7.6x9.4mm K Type CK:4.5x5.5mm DK:4.5x5.5mm EK:5.5x7.0mm FK:7.5x8.0mm	Ex.: S:5.0mm M:10.0mm L :25mm min. A: Ammo Box	Ex.: N :Halogen Free Indicator

## ◆ Structure & Dimension



Unit : mm [inches]

TYPE	L (max)	W (max)	T (max)	F	ℓ	Φd
C□	4.5 [0.157]	5.5 [0.216]	2.5 [0.098]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.5±0.1 [0.196]
D□	4.5 [0.157]	5.5 [0.216]	2.5 [0.098]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.5±0.1 [0.196]
E□	5.5 [0.216]	7.0 [0.275]	4.0 [0.157]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.5±0.1 [0.196]
F□	7.5 [0.294]	8.0 [0.314]	4.0 [0.157]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.5±0.1 [0.196]
GD	7.6 [0.299]	9.4 [0.370]	6.9 [0.272]	--	25.0+3/-1 [0.984]	0.6±0.1 [0.196]

## ◆ Capacitance Range

### NPO(N) Series

Type	C□			D□				E□					F□					GD		
WVDC	50V	100V	250V	50V	100V	250V	500V	50V	100V	250V	500V	630V	1KV	50V	100V	250V	500V	630V	1KV	
Cap Min.	5R0	5R0	2R0	100	101	101	100	153	392	332	101	101	100	104	473	223	822	822	101	
Cap Max.	332	471	151	103	472	272	681	104	333	153	682	682	102	224	104	473	223	223	183	

### X7R(X) Series

Type	C□				D□					E□								
WVDC	16V	25V	50V	100V	16V	25V	50V	100V	250V	500V	16V	25V	50V	100V	250V	500V	630V	1KV
Cap Min.	151	151	151	151	224	154	102	102	102	102	335	684	474	333	153	102	102	102
Cap Max.	474	224	104	183	225	155	334	103	223	223	156	475	225	105	224	683	683	103

Type	F□					GD								
WVDC	16V	25V	50V	100V	250V	500V	630V	1KV	50V	100V	250V	500V	630V	1KV
Cap Min.	226	475	104	104	104	683	683	103	474	474	105	224	224	393
Cap Max.	226	156	475	225	105	224	104	683	106	475	225	474	474	224

### X5R(B) Series

Type	C□				D□				E□				F□	
WVDC	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V
Cap Min.	225	474	154	104	475	334	225	105	685	685	155	155	686	226
Cap Max.	106	475	225	105	106	475	475	475	226	156	106	106	107	476

### Y5V(Y) Series

Type	C□				D□					E□					F□			
WVDC	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V
Cap Min.	474	224	104	104	475	225	105	474	104	476	226	106	475	225	476	226	106	475
Cap Max.	475	475	225	105	226	106	475	225	105	107	476	226	106	475	107	476	226	106

■ Other dimensions, capacitance values and voltages rating are available. Please contact HEC.

## RDC Series Specification & Test Condition

Item	Specification	Test Condition		
<b>Operation Temperature</b>	Please see HEC specification data sheet for details			
<b>Visual</b>	No abnormal exterior appearance	Visual Inspection		
<b>Capacitance</b>	Within The Specified Tolerance	Class      Frequency      Voltage		
<b>Quality Factor</b>	Class I (NPO): More Than 30pF : $Q \geq 1000$ 30pF & Below: $Q \geq 400 + 20C$ (C:Cap., pF)	NPO C $\leq$ 100pF    1MHz $\pm$ 10%    1.0 $\pm$ 0.2Vrms C $>$ 100pF    1KHz $\pm$ 10%		
		X7R/X5R/Y5V C $\leq$ 10uF    1KHz $\pm$ 10%    1.0 $\pm$ 0.2Vrms C $>$ 10uF    120Hz $\pm$ 20%    0.5 $\pm$ 0.2Vrms		
<b>Dissipation Factor</b>	Class II (X7R,X5R,Y5V): Please see HEC specification data sheet for details	Perform a heat treatment at 150 $\pm$ 5 $^{\circ}$ C for 30min. then place room temp. for 24 $\pm$ 2hr.		
<b>Insulation Resistance</b>	10,000M $\Omega$ or 500/C $\Omega$ whichever is smaller for rated voltage $>$ 10V and greater 100/C $\Omega$ for rated voltage $\leq$ 10V	Applied Voltage: Rated Voltage Charge Time : 60 $\pm$ 5 sec. Charge-Discharge current shall be less than 50mA current..		
<b>Withstanding Voltage</b>	No dielectric breakdown or mechanical breakdown	V $\leq$ 50 : 250% Rated Voltage V $<$ 500V : 200% Rated Voltage 500V $\leq$ V $<$ 1000V: 150% Rated Voltage 1000 $\leq$ V :120% Rated Voltage for 1~5 sec. Current is limited to less than 50mA.		
<b>Temperature Capacitance Coefficient</b>	<u>Char.</u>	<u>Temp. Range</u>	<u>Cap. Change</u>	Class I : [C2-C1/C1(T2-T1)] $\times$ 100% Class II : (C2-C1)/C1 $\times$ 100% T1:Standard Temperature(25 $^{\circ}$ C) T2:Test Temperature C1:Capacitance at Standard Temperature C2:Capacitance a Test Temperature
	NPO (N)	-55 $^{\circ}$ C ~ +125 $^{\circ}$ C	$\pm$ 30ppm/ $^{\circ}$ C	
	X7R (X)	-55 $^{\circ}$ C ~ +125 $^{\circ}$ C	$\pm$ 15%	
	X5R (B)	-55 $^{\circ}$ C ~+85 $^{\circ}$ C	$\pm$ 15%	
	Y5V (Y)	-30 $^{\circ}$ C ~+85 $^{\circ}$ C	+22% ~-82%	
<b>Lead Strength</b>	Tensile Strength	No mechanical damage such as lead breakage and loosening.	Pulling strength: 5N Holding time: 10 $\pm$ 1s	
	Bending Strength	No mechanical damage such as lead breakage or loosening.	Hold the capacitors to keep the axis vertical, bend it 90 degrees as shown below and bend back to the original position. This operation shall be done for 2~3s. and repeated for the following times. Bending force: 5N(weight :0.51kg) Test time : 2 times	
<b>Solderability</b>	Leads shall be covered by new solder more than 75% of its surface	Completely immerse both terminations in solder at 235 $\pm$ 5 $^{\circ}$ C for 2 $\pm$ 0.5s Solder : H63A Flux :Rosin Dipping :By 1.5~2.0mm from the root of lead		
<b>Resistance to Soldering Heat</b>	Appearance	No mechanical damage shall occur	Completely soak both terminations in solder at 250 $\pm$ 5 $^{\circ}$ C for 5 $\pm$ 1s	
	Capacitance	Class I (NPO): Within 2.5% or $\pm$ 0.25pF whichever is larger of initial value Class II X7R,X5R : $\leq \pm$ 10% of initial value Y5V : $\leq \pm$ 20% of initial value	Solder : H63A Flux :Rosin Dipping :By 1.5~2.0mm from the root of lead	
	Q / Tan $\delta$	To satisfy the specified initial value		
	Insulation Resistance	To satisfy the specified initial value		

## RDC Series Specification & Test Condition

Item	Specification	Test Condition														
<b>Temperature Cycle</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Class I (NPO): Within 2.5% or $\pm 0.25\mu\text{F}$ whichever is larger of initial value Class II X7R,X5R : $\leq \pm 7.5\%$ of initial value Y5V : $\leq \pm 20\%$ of initial value														
	Q / Tan $\delta$	see RDC specification data sheet														
	Insulation Resistance	To satisfy the specified initial value														
		Class II capacitor shall be set for 48 $\pm$ 4 hours at room temperature after one hour heat treatment at 150 +0/-10 °C before initial measurement. Capacitor shall be subjected to five cycles of the temperature cycle as following: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min Rated Temp.+0/-3 (-55)</td> <td>30</td> </tr> <tr> <td>2</td> <td>25</td> <td>3</td> </tr> <tr> <td>3</td> <td>Max Rated Temp.+3/-0 (125)</td> <td>30</td> </tr> <tr> <td>4</td> <td>25</td> <td>3</td> </tr> </tbody> </table>	Step	Temp.(°C)	Time(min)	1	Min Rated Temp.+0/-3 (-55)	30	2	25	3	3	Max Rated Temp.+3/-0 (125)	30	4	25
Step	Temp.(°C)	Time(min)														
1	Min Rated Temp.+0/-3 (-55)	30														
2	25	3														
3	Max Rated Temp.+3/-0 (125)	30														
4	25	3														
<b>Humidity</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Class I (NPO): Within 5% or $\pm 0.5\mu\text{F}$ whichever is larger of initial value Class II X7R,X5R : $\leq \pm 15\%$ of initial value Y5V : $\leq \pm 30\%$ of initial value														
	Q / Tan $\delta$	see RDC specification data sheet														
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller for rated voltage>10V and greater 10/C $\Omega$ for rated voltage $\leq 10\text{V}$														
		Class II capacitor shall be set for 48 $\pm$ 4 hours at room temperature after one hour heat treatment at 150 +0/-10 °C before initial measurement. Temperature : 40 $\pm$ 2 °C Relative Humidity : 90 ~95%RH Test Time : 500 +12/-0 hr Measure at room temperature after cooling for Class I : 24 $\pm$ 2 Hours Class II : 48 $\pm$ 4 Hours														
<b>High Temperature Load (Life Test)</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Class I (NPO): Within 5% or $\pm 0.5\mu\text{F}$ whichever is larger of initial value Class II X7R,X5R : $\leq \pm 15\%$ of initial value Y5V : $\leq \pm 30\%$ of initial value														
	Q / Tan $\delta$	Class I (NPO): More Than 30pF : Q $\geq 350$ 30pF & Below: Q $\geq 275+2.5\text{C}$ Class II (X7R,X5R,Y5V): see RDC specification data sheet														
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller for rated voltage>10V and greater 10/C $\Omega$ for rated voltage $\leq 10\text{V}$														
		Class II capacitors applied DC testing voltage is applied for one hour at maximum operation temperature $\pm 3^\circ\text{C}$ then shall be set for 48 $\pm$ 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage:please see HEC specification data sheet. Temperature: max. operating temperature Test Time : 1000 +48/-0 Hr Current Applied : 50mA Max Measure at room temperature after cooling for Class I : 24 $\pm$ 2 Hours Class II : 48 $\pm$ 4 Hours														
<b>Vibration</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Within the specified tolerance														
	Q / Tan $\delta$	To satisfy the specified initial value														
		Solder the capacitor on P.C. Board Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min. Repeat this for 2 hours each in 3perpendicular directions.														