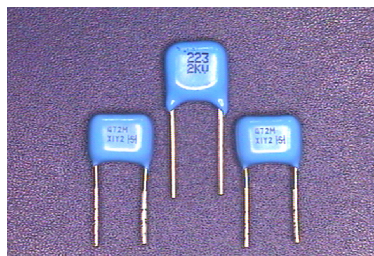


## Radial Dipped Ceramic Capacitors [Ultra High Voltage Radial Capacitor – 2KV-5KV]

### RDH 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 Power supplies , Surge protection
- Industrial control circuits , Voltage multipliers ,
- Data isolation

#### ◆ Summary of Specification

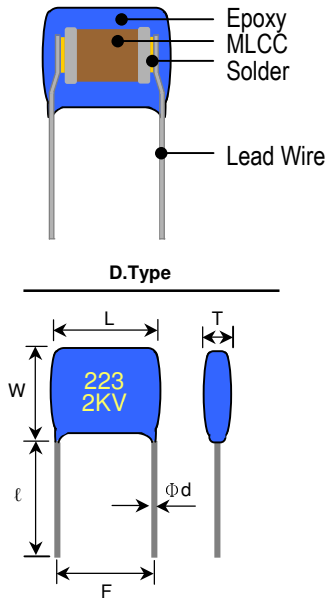
Operation Temperature	-55~+125 °C
Rated Voltage	2KV to 5KV
Temperature Coefficient	NPO : $\leq \pm 30\text{ppm}/^\circ\text{C}$ , -55~+125 °C (EIA Class I )
	X7R : $\leq \pm 15\%$ , -55~+125 °C (EIA Class II )
Capacitance Range	NPO :2pF to 56nF
	X7R :100pF to 390nF
Dissipation Factor :	NPO : $Q \geq 1000$
	X7R : D.F. $\leq 2.5\%$
Insulation Resistance	10G $\Omega$ or 500/C $\Omega$ whichever is smaller
Aging	NPO:0% ; X7R: 2.5 %
Dielectric Strength	1000 $\leq V$ :120% Rated Voltage

#### ◆ How To Order

RDH
X
102
K
202
HK
T
N

Product Code	Dielectric	Capacitance Unit : pF	Tolerance	Rated Voltage	Leader Style	Packaging	Optional Suffix
RDH: Radial Dipped Ultra High Voltage Capacitor	Ex.: N: NPO X: X7R	Ex.: 100:10 $\times 10^0$ 471:47 $\times 10^1$ 102:10 $\times 10^2$	Ex.: C: +/-0.25pF D: +/-0.50pF J : +/- 5% K : +/-10% M: +/-20%	Ex.: 102:1000Vdc 202:2000Vdc 302:3000Vdc 402:4000Vdc 502:5000Vdc	EX: Size GD:5.5x4.0 HD:5.5x4.5 I D:5.5x4.0	T: Taping &Reel B: Bulk	Ex.: N :Halogen Free Indicator

## ◆ Structure & Dimension



Unit : mm [inches]

TYPE	L (max)	W (max)	T (max)	F (Max.)	ℓ	Φd
ED	5.5 [0.216]	7.0 [0.275]	4.0 [0.157]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
FD	7.5 [0.294]	8.0 [0.314]	4.0 [0.157]	5.0±1 [0.196]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
GD	7.6 [0.299]	9.4 [0.370]	6.9 [0.272]	6.54 [0.257]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
HD	9.40 [0.370]	7.62 [0.300]	6.86 [0.270]	7.55 [0.296]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
ID	12.0 [0.470]	10.2 [0.400]	8.13 [0.320]	10.2 [0.400]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
JD	14.5 [0.570]	12.7 [0.500]	8.13 [0.320]	12.8 [0.503]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
KD	17.0 [0.670]	15.2 [0.600]	8.13 [0.320]	15.36 [0.603]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
LD	19.6 [0.770]	18.3 [0.720]	8.13 [0.320]	17.86 [0.701]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]
MD	22.1 [0.870]	19.1 [0.750]	8.13 [0.320]	20.46 [0.804]	25.0+3/-1 [0.984]	0.6±0.1 [0.196]

## ◆ Capacitance Range

### NPO(N) Series

Type	ED		FD				GD				HD				ID			
WVDC	2KV	3KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV
Cap Min.	100	2R0	2R0	2R0	2R0	2R0	100	100	100	2R0	100	100	100	100	100	100	100	100
Cap Max.	391	390	102	102	151	101	681	331	221	151	152	681	331	221	332	152	102	471

Type	JD				KD				LD				MD			
WVDC	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV
Cap Min.	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cap Max.	682	332	222	102	103	472	393	182	153	682	472	332	563	333	223	682

### X7R(R) Series

Type	ED	FD			GD				HD				ID			
WVDC	2KV	2KV	3KV	4KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV
Cap Min.	101	101	101	101	151	151	151	151	221	221	221	221	221	221	221	221
Cap Max.	152	472	272	102	103	332	272	102	153	682	222	102	473	333	103	682

Type	JD				KD				LD				MD			
WVDC	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV	2KV	3KV	4KV	5KV
Cap Min.	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331
Cap Max.	104	683	223	103	154	683	223	103	224	154	473	333	394	184	563	393

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

## RDH Series Specification & Test Condition

Item	Specification	Test Condition
<b>Operation Temperature</b>	-55 to +125°C	
<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 ≥1000 30pF & Below: Q ≥ 400+20C (C:Cap., pF)	NPO C≤100pF    1MHz±10%    1.0±0.2Vrms C>100pF    1KHz±10%
		X7R      1KHz±10%      1.0±0.2Vrms
<b>Dissipation Factor</b>	Class II (X7R): Maximum 0.025	Perform a heat treatment at 150±5°C for 30min. then place room temp. for 24 ±2hr.
<b>Insulation Resistance</b>	10,000MΩ or 500/C Ω whichever is smaller. (C in Farad)	V> 500V, Applied 500Vdc Charge Time : 60sec. Is applied less than 50mA current.
<b>Withstanding Voltage</b>	No dielectric breakdown or mechanical breakdown	1000 ≤ 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)] × 100%  Class II : (C2-C1)/C1 × 100% T1:Standard Temperature(25°C) T2:Test Temperature C1:Capacitance At Standard Temperature C2:Capacitance At Test Temperature
	NPO(N)    -55°C ~ +125°C    ± 30ppm/°C X7R (X)    -55°C ~ +125°C    ± 15%	
<b>Lead Strength</b>	Tensile Strength    No mechanical damage such as lead breakage and losing.	Holding the body of the part, apply the pulling force to the lead as indicated below. Pulling strength: 5N Holding time: 10±1s
	Bending Strength    No mechanical damage such as lead breakage and losing.	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± 5°C for 2±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 immerse both terminations in solder at 250± 5°C for 5±1s
	Capacitance    Class I (NPO): Within 2.5% or ±0.25pF whichever is larger of initial value Class II (X7R): Within ±10% of initial value	Solder : H63A Flux : Rosin Dipping :By 1.5~2.0mm from the root of lead
	Q / Tanδ      To satisfy the specified initial value	
	Insulation Resistance    To satisfy the specified initial value	

## RDH 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 $\pm 0.25\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 7.5\%$ of initial value														
	Q / Tan $\delta$	To satisfy the specified initial value														
	Insulation Resistance	To satisfy the specified initial value														
	<p>Class II capacitor shall be set for <math>48 \pm 4</math> hours at room temperature after one hour heat treatment at <math>150 +0/-10</math> °C before initial measurement. Capacitor shall be subjected to five cycles of the temperature cycle as following:</p> <table border="1"> <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> <p>Measure at room temperature after cooling for Class I : <math>24 \pm 2</math> Hours Class II : <math>48 \pm 4</math> Hours</p>		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 $\pm 0.5\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 15\%$ of initial value														
	Q / Tan $\delta$	Class I (NPO): More Than 30pF : $Q \geq 350$ 30pF & Below: $Q \geq 275 + 2.5C$ Class II (X7R): Maximum $\pm 5.0\%$														
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller. (C in Farad)														
	<p>Class II capacitor shall be set for <math>48 \pm 4</math> hours at room temperature after one hour heat treatment at <math>150 +0/-10</math> °C before initial measurement. Temperature : <math>40 \pm 2</math> °C Relative Humidity : 90 ~95%RH Test Time : 500 +12/-0 hr Measure at room temperature after cooling for Class I : <math>24 \pm 2</math> Hours Class II : <math>48 \pm 4</math> Hours</p>															
<b>High Temperature Load (Life Test)</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Class I (NPO): Within 3% or $\pm 0.3\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 15\%$ of initial value														
	Q / Tan $\delta$	Class I (NPO): More Than 30pF : $Q \geq 350$ 30pF & Below: $Q \geq 275 + 2.5C$ Class II (X7R): Maximum $\pm 5\%$														
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller. (C in Farad)														
	<p>Solder the capacitor on P.C. board shown in Fig 2. before testing. Apply the voltage below at <math>125 \pm 2</math> °C for 1000 +48/-0h Applied Voltage :</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Applied Voltage</th> </tr> </thead> <tbody> <tr> <td><math>V \leq 250\text{Vdc}</math></td> <td>150% Rated Voltage</td> </tr> <tr> <td><math>250\text{Vdc} &lt; V &lt; 1\text{KVdc}</math></td> <td>120% Rated Voltage</td> </tr> <tr> <td>More Than 1KVdc(include 1KV)</td> <td>100% Rated Voltage</td> </tr> </tbody> </table> <p>Temperature : max. operating temperature Test Time : 1000 +12/-0Hr Current Applied : 50 mA Max. Measure at room temperature after cooling for Class I : <math>24 \pm 2</math> Hours Class II : <math>48 \pm 4</math> Hours</p>		Rated Voltage	Applied Voltage	$V \leq 250\text{Vdc}$	150% Rated Voltage	$250\text{Vdc} < V < 1\text{KVdc}$	120% Rated Voltage	More Than 1KVdc(include 1KV)	100% Rated Voltage						
Rated Voltage	Applied Voltage															
$V \leq 250\text{Vdc}$	150% Rated Voltage															
$250\text{Vdc} < V < 1\text{KVdc}$	120% Rated Voltage															
More Than 1KVdc(include 1KV)	100% Rated Voltage															
<b>Vibration</b>	Appearance	No mechanical damage shall occur														
	Capacitance	Within the specified tolerance														
	Q / Tan $\delta$	To satisfy the specified initial value														
<p>Solder the capacitor on P.C. Board shown in Fig 2. before testing. Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2 hours each in 3perpendicular directions.</p>																