

Ceramic Disc Capacitors [High Voltage Disc Capacitor]

HDC Series – 1KVdc to 6KVdc



HDC Series (ceramic disc capacitors) are ideal for use in general electronic products with voltage ratings from 1KV to 6KV.

◆ Features

- Wide operation temperature
- Low loss at wide range of frequency
- High reliability
- RoHS compliant
- Halogen Free available

◆ Applications

- Suitable for LAN/WLAN interface
- Ballast circuit of back-lighting inverter
- DC-DC converters,
- Snubber circuit of switching power supplies
- Modems & communication

◆ Summary of Specification

Operation Temperature	NPO/SL : -55~+125 °C
	X7R/Y5P/Y5S : -55~+125°C
	Y5U/Y5V : -25~+105°C
Capacitance Range	2pF to 100nF
Rated Voltage	1KVdc to 6KVdc
Temperature Coefficient	NPO : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55~+125 °C (EIA Class I)
	SL : $+350 \sim -1000\text{ppm}/^\circ\text{C}$, -25~+85 °C (EIA Class I)
	Y5S : $\leq \pm 22\%$, -25~+85 °C
	X7R : $\leq \pm 15\%$, -55~+125 °C (EIA Class II)
	Y5P: $\leq \pm 10\%$;Y5U: $+22\%/-56\%$;Y5V: $+22\%/-82\%$, -25~+85 °C(EIA Class II)
Dissipation Factor :	Please see HEC specification data sheet
Insulation Resistance	10GΩ or 500/C Ω whichever is smaller
Aging	NPO:0% ; SL :1.5% per decade of time
	X7R, Y5P, Y5S: 3.5 % per decade of time
	Y5U: 5.0 %; Y5V:7.5% per decade of time
Dielectric Strength	V \leq 2KV : 200% Rated Voltage
	3KV : 175% Rated Voltage
	6KV : 150% Rated Voltage

◆ How To Order

HDC
S
3R0
C
602
7
A
A
N

Product Code	Dielectric	Capacitance Unit : pF	Tolerance	Rated Voltage	Lead Space	Lead Length & Packaging	Lead Shape Style	Optional Suffix
HDC: Ceramic Disc Capacitor	Ex.: N:NPO S:SL L:Y5S X:X7R P:Y5P Y:Y5V E:Y5U	Ex.: 2R0:2pF 100:10x10 ⁰ 151:15x10 ¹	Ex.: C: +/-0.25pF D: +/-0.5pF H: +/- 3% J: +/- 5% K: +/- 10% M: +/- 20%	Ex.: 102:1000Vdc 202:2000Vdc 302:3000Vdc 602:6000Vdc	Ex.: 5 : 5.00mm 6 : 6.35mm 7 : 7.50mm A : 10.0mm B : 12.5mm	Ex.: H:3.1mm C:3.5mm S:5.0mm M:10.0mm L: 25mm min. T: Tape Reel A: Ammo Box	Ex.: S Type 1: $\phi=0.50\text{mm}$ 2: $\phi=0.60\text{mm}$ 3: $\phi=0.65\text{mm}$ 4: $\phi=0.80\text{mm}$ D Type 9: $\phi=0.50\text{mm}$ A: $\phi=0.60\text{mm}$ B: $\phi=0.65\text{mm}$ C: $\phi=0.80\text{mm}$	Ex.: N :Halogen Free Indicator

HDC Series Specification & Test Condition

Item	Specification		Test Condition			
Operating Temperature Range	Char.	Operation Temp.				
	NPO(N)	-55°C ~ +125°C				
	SL(S)	-55°C ~ +125°C				
	Y5S(L)	-55°C ~ +125°C				
	X7R(X)	-55°C ~ +125°C				
	Y5P(P)	-55°C ~ +125°C				
	Y5U(E)	-25°C ~ +105°C				
	Y5V(Y)	-25°C ~ +105°C				
Capacitance	Within specified tolerance.		Char.	Frequency	Voltage	
Quality Factor	Class I (NPO/SL):		NPO/SL	1MHz±10%	5.0Vrms max.	
	More Than 30pF : $Q \geq 1000$		Y5S/X7R/Y5P	1KHz±10%		
	30pF & Below : $Q \geq 400+20C$ (C:Capacitance)		Y5U/Y5V	1KHz±10%		
Dissipation Factor	Class II : Y5S(L)/X7R(X)/Y5P(P) : D.F. $\leq 2.5\%$ Y5U(E)/Y5V(Y) : D.F. $\leq 5.0\%$		The measurement at reference temperature 25 °C.			
Insulation Resistance	10,000MΩ or 500/C Ω whichever is smaller (C: in Farad)		Applied Voltage : 500±5Vdc Charge Time : 60±5sec. Is applied less than 50mA current.			
Dielectric Strength	Between Lead Wires	No Failure	V≤2KV:200% of Rated Voltage V≥3KV 175% of Rated Voltage V≥6KV 150% of Rated Voltage For 1~5 sec. Current is limited to less than 50mA.			
	Body Insulation	No Failure	The capacitor is place in the container with metal balls of diameter 1mm so that each lead wire, short circuited is kept about 2mm off the ball and AC1250Vrms (NPO/SL) [DC1.3KV (Y5S/X7R/Y5P/Y5U/Y5V)] is applied for 1 to 5s. between capacitor lead wires and small metals. Current is limited to less than 50mA.			
Temperature Capacitance Coefficient	Char.	Operation Temp.	Cap.Change	Class I (NPO/SL):		
	NPO(N)	-55°C ~ +125°C	0±30ppm/ °C	[C2-C1/C1(T2-T1)] × 100%		
	SL(S)	-30°C ~ +85°C	+350~ -1000 ppm	Class II (X7R/Y5S/Y5P/Y5U/Y5V):		
	Y5S(L)	-30°C ~ +85°C	± 22%	(C2-C1)/C1 × 100%		
	X7R(X)	-55°C ~ +125°C	± 15%	T1:Standard Temperature(25°C)		
	Y5P(P)	-30°C ~ +85°C	± 10%	T2:Test Temperature		
	Y5U(E)	-30°C ~ +85°C	+22 ~ -56%	C1:Capacitance at Standard Temperature		
	Y5V(Y)	-30°C ~ +85°C	+22 ~ -82%	C2:Capacitance at Test Temperature		
Strength of Terminal	Tensile Strength	Lead wire shall not be disconnected and capacitor shall not be damaged.	Nominal cross section area (mm)	Wire Diameter (mm)	Tensile Force (N)	Holding Time (s)
			0.07-0.2	0.3-0.5	5	10 ±1
			Over 0.2-0.5	over0.5-0.8	10	
	Bending Strength	Lead wire shall not be disconnected and capacitor shall not be damaged.	Nominal cross section area (mm)	Wire Diameter (mm)	Tensile Force (N)	Mass of Weight (Kg)
			0.07-0.2	0.3-0.5	2.5	10 ±1
			Over 0.2-0.5	over0.5-0.8	5	

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Solderability of leads	More than 75% of the circumferential surface dipped into solder shall be covered with new solder.	Solder Temperature : 235±5°C Dip Time : 2 ± 0.5 sec. Solder: H60A or H63A Flux: Ethanol solution of Rosin (25wt%) Immersion depth: 1.5 to 2mm Immersion speed: 25±2.5mm/s																																							
Resistance to Soldering Heat	<p>Appearance No mechanical damage shall occur</p> <hr/> <p>Capacitance Class I (NPO/SL): Within±2.5% or ±0.25pF whichever is larger of initial value Class II (Y5S/X7R/Y5P/Y5U/Y5V):</p> <table border="1"> <thead> <tr> <th>Char.</th> <th>Cap.Change</th> </tr> </thead> <tbody> <tr> <td>Y5S(L)</td> <td>≤±5% of initial value</td> </tr> <tr> <td>X7R(X)</td> <td>≤±5% of initial value</td> </tr> <tr> <td>Y5P(P)</td> <td>≤±5% of initial value</td> </tr> <tr> <td>Y5U(E)</td> <td>≤±20% of initial value</td> </tr> <tr> <td>Y5V(Y)</td> <td>≤±20% of initial value</td> </tr> </tbody> </table> <hr/> <p>Withstand Voltage (Between Terminal) No dielectric breakdown or abnormality</p>	Char.	Cap.Change	Y5S(L)	≤±5% of initial value	X7R(X)	≤±5% of initial value	Y5P(P)	≤±5% of initial value	Y5U(E)	≤±20% of initial value	Y5V(Y)	≤±20% of initial value	<p>The lead wire shall be immersed into the melted solder of 350±10°C (body diameter 5.0mm max 260±5°C) up to about 1.5 to 2.0mm from the main body for 3.5 ±0.5 sec. (body diameter 5.0mm max 5±0.5sec.)</p> <p>Class I : Measurement under room temperature after test for 1 to 2Hr</p> <p>Class II : The capacitor shall be pre-treatment stored at 85±2°C for 1hr, then placed at room temperature for 24±2hr before initial measurements. The capacitor shall stored for 24±2hr at room temperature.</p>																											
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Temperature and Dipping Cycle	<p>Appearance No mechanical damage shall be occur</p> <hr/> <p>Capacitance Class I (NPO/SL): Within 5.0% or ±0.5pF whichever is larger of initial value Class II (Y5S/X7R/Y5P/Y5U/Y5V):</p> <table border="1"> <thead> <tr> <th>Char.</th> <th>Cap.Change</th> </tr> </thead> <tbody> <tr> <td>Y5S(L)</td> <td>≤±10% of initial value</td> </tr> <tr> <td>X7R(X)</td> <td>≤±10% of initial value</td> </tr> <tr> <td>Y5P(P)</td> <td>≤±10% of initial value</td> </tr> <tr> <td>Y5U(E)</td> <td>≤±30% of initial value</td> </tr> <tr> <td>Y5V(Y)</td> <td>≤±30% of initial value</td> </tr> </tbody> </table> <hr/> <p>Q / Tanδ Class I (NPO/SL): More Than 30pF : Q≥350 30pF & Below : Q≥275+2.5C Class II : Y5S/X7R/Y5P : D.F. ≤5.0% Y5U/Y5V : D.F. ≤7.5%</p> <hr/> <p>Insulation Resistance 1,000MΩ or 50/C Ω whichever is smaller. (C: in Farad)</p> <hr/> <p>Withstand Voltage (Between Terminal) No dielectric breakdown or abnormality</p>	Char.	Cap.Change	Y5S(L)	≤±10% of initial value	X7R(X)	≤±10% of initial value	Y5P(P)	≤±10% of initial value	Y5U(E)	≤±30% of initial value	Y5V(Y)	≤±30% of initial value	<p>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>After 5 temperature cycle then consecutively to 2 dipping cycles</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time(min)</th> <th>Dipping Liquid</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>65 +5/-0</td> <td>15±2</td> <td>Pure Water</td> </tr> <tr> <td>2</td> <td>0±3</td> <td>15±2</td> <td>Salt Water</td> </tr> </tbody> </table> <p>Class I : Measurement under room temperature after test for 1 to 2Hr</p> <p>Class II : The capacitor shall be pre-treatment stored at 85±2°C for 1hr, then placed at room temperature for 24±2hr before initial measurements. The capacitor shall stored for 24±2hr at room temperature.</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	3	Step	Temp.(°C)	Time(min)	Dipping Liquid	1	65 +5/-0	15±2	Pure Water	2	0±3	15±2	Salt Water
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HDC Series Specification & Test Condition

Item	Specification	Test Condition													
Humidity (Under Steady State)	Appearance	No mechanical damage shall occur													
	Capacitance	<p>Class I (NPO/SL): Within 5.0% or $\pm 0.5\text{pF}$ whichever is larger of initial value</p> <p>Class II (Y5S/X7R/Y5P/Y5U/Y5V):</p> <table border="1"> <thead> <tr> <th>Char.</th> <th>Cap.Change</th> </tr> </thead> <tbody> <tr> <td>Y5S(L)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>X7R(X)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>Y5P(P)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>Y5U(E)</td> <td>$\leq \pm 30\%$ of initial value</td> </tr> <tr> <td>Y5V(Y)</td> <td>$\leq \pm 30\%$ of initial value</td> </tr> </tbody> </table>	Char.	Cap.Change	Y5S(L)	$\leq \pm 10\%$ of initial value	X7R(X)	$\leq \pm 10\%$ of initial value	Y5P(P)	$\leq \pm 10\%$ of initial value	Y5U(E)	$\leq \pm 30\%$ of initial value	Y5V(Y)	$\leq \pm 30\%$ of initial value	<p>Temperature : $40 \pm 2^\circ\text{C}$ Relative Humidity : 90 ~95%RH Test Time : 500 +24/-0 hr</p> <p>Class I : Measurement under room temperature after test for 1 to 2Hr</p> <p>Class II : The capacitor shall be pre-treatment stored at $85 \pm 2^\circ\text{C}$ for 1hr, then placed at room temperature for $24 \pm 2\text{hr}$ before initial measurements.</p> <p>The capacitor shall stored for $24 \pm 2\text{hr}$ at room temperature</p>
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Q / Tan δ	<p>Class I (NPO/SL): More Than 30pF : $Q \geq 350$ 30pF & Below : $Q \geq 275 + 2.5C$</p> <p>Class II : Y5S/X7R/Y5P : D.F. $\leq 5.0\%$ Y5U/Y5V : D.F. $\leq 7.5\%$</p>														
Insulation Resistance	1,000M Ω or 50/C Ω whichever is smaller. (C: in Farad)														
Humidity Loading	Appearance	No mechanical damage shall occur													
	Capacitance	<p>Class I (NPO/SL) : Within 7.5% or $\pm 0.75\text{pF}$ whichever is larger of initial value</p> <p>Class II (Y5S/X7R/Y5P/Y5U/Y5V):</p> <table border="1"> <thead> <tr> <th>Char.</th> <th>Cap.Change</th> </tr> </thead> <tbody> <tr> <td>Y5S(L)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>X7R(X)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>Y5P(P)</td> <td>$\leq \pm 10\%$ of initial value</td> </tr> <tr> <td>Y5U(E)</td> <td>$\leq \pm 30\%$ of initial value</td> </tr> <tr> <td>Y5V(Y)</td> <td>$\leq \pm 30\%$ of initial value</td> </tr> </tbody> </table>	Char.	Cap.Change	Y5S(L)	$\leq \pm 10\%$ of initial value	X7R(X)	$\leq \pm 10\%$ of initial value	Y5P(P)	$\leq \pm 10\%$ of initial value	Y5U(E)	$\leq \pm 30\%$ of initial value	Y5V(Y)	$\leq \pm 30\%$ of initial value	<p>Temperature : $40 \pm 2^\circ\text{C}$ Relative Humidity : 90 ~95%RH Test Time : 500 +24/-0 hr Applied Voltage : 100% of Rated Voltage Is applied less than 50mA current.</p> <p>Class I : Measurement under room temperature after test for 1 to 2Hr</p> <p>Class II : The capacitor shall be pre-treatment stored at $85 \pm 2^\circ\text{C}$ for 1hr, then placed at room temperature for $24 \pm 2\text{hr}$ before initial measurements.</p> <p>The capacitor shall stored for $24 \pm 2\text{hr}$ at room temperature</p>
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Q / Tan δ	<p>Class I (NPO/SL): More Than 30pF : $Q \geq 200$ 30pF & Below : $Q \geq 100 + (10/3)C$</p> <p>Class II : Y5S/X7R/Y5P : D.F. $\leq 5.0\%$ Y5U/Y5V : D.F. $\leq 7.5\%$</p>														
Insulation Resistance	500M Ω or 25/C Ω whichever is smaller. (C: in Farad)														

HDC Series Specification & Test Condition

Item	Specification	Test Condition
High Temperature Load (Life Test)	Appearance	Applied Voltage: 150% of rated voltage However: The rated voltage is more than 5KVDC, applied voltage of 120% rated voltage. Temperature: max. operation temperature Test Time : 1000 +48/-0 Hr Is applied less than 50mA current. Class I : Measurement under room temperature after test for 1 to 2Hr. Class II : The capacitor shall be pre-treatment stored at 85±2°C for 1hr, then placed at room temperature for 24±2hr before initial measurements.. The capacitor shall stored for 24±2hr at room temperature.
	Capacitance	
	Q / Tanδ	
	Insulation Resistance	
Vibration	Appearance	The capacitor shall firmly be solder to the supporting terminal and vibration which is 10 to 55Hz in the vibration frequency range 1.5mm in total amplitude and about 1mm in the rate of vibration change from 10Hz to 55Hz and back to 10Hz is applied for a total of 6 hours ; 2 hours each in three mutually perpendicular directions.
	Capacitance	
	Q / Tan δ	