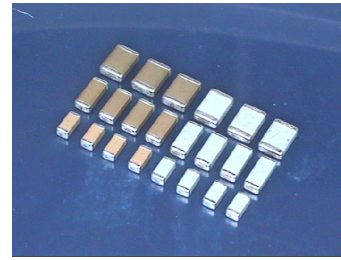


## Multilayer Ceramic Chip Capacitors [ High Voltage Capacitor ]

### HVC Series – High Voltage Capacitors (2KV)



This series is offered in C0G(NPO), SL and X7R temperature characteristic in sizes 1206 to 2220 and pass DWV or 1500VAC and 2250VDC Hi-Pot test available to prevent arcing.

#### ◆ Features

- ❑ Standard for telecommunication devices (IEEE802.3) in LAN interface.
- ❑ Available with proprietary coating to prevent arcing and pass Hi-Pot test
- ❑ Suitable for surface mounting using wave or reflow soldering processes
- ❑ Special internal electrode design offers the highest voltage rating
- ❑ RoHS compliant

#### ◆ Application

- ❑ Suitable for telecommunication devices in LAN interface
- ❑ Ballast applications capacitor for back light inverter applications

#### ◆ Summary of Specification

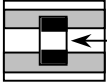
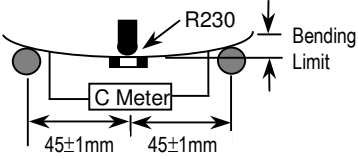
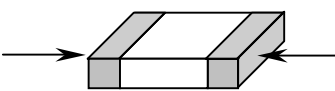
Operation Temperature	-55~+125 °C
Rated Voltage	2KVdc
Temperature Coefficient	NPO : $\leq \pm 30\text{ppm}/^\circ\text{C}$ , -55~+125 °C (EIA Class I )
	SL : $\leq +350/-1000\text{ppm}/^\circ\text{C}$ , -25~+85 °C (EIA Class I )
	X7R : $\leq \pm 15\%$ , -55~+125 °C (EIA Class II )
Capacitance Range	NPO :2pF to 470pF ; SL : 220pF to 1000pF ; X7R :150pF to 10nF
Dissipation Factor :	NPO : $Q \geq 1000$ ; X7R : D.F. $\leq 2.5\%$
Insulation Resistance	10GΩ or 500/C Ω whichever is smaller
Aging	NPO: 0% per decade of time
	SL: 1.5 % per decade of time
	X7R: 2.5 % per decade of time
Dielectric Strength	120% Rated Voltage

#### ◆ How To Order

C	1206	X	102	K	202	T	O
<b>Product Code</b> C: MLCC (Multilayer Ceramic Chip of Capacitor)	<b>Chip Size</b> Ex.: 1206 : 3.2×1.6mm 1808 : 4.6×2.0mm 1812 : 4.6×3.2mm 2220 : 5.7×5.0mm	<b>Dielectric</b> Ex.: N: NPO L: SL X: X7R	<b>Capacitance Unit : pF</b> Ex.: 2R0:2.0pF 100:10×10 <sup>0</sup> 471:47×10 <sup>1</sup> 102:10×10 <sup>2</sup>	<b>Tolerance</b> Ex.: C:±/0.25pF D:±/0.50pF J :±/ 5% K :±/-10% M:±/-20%	<b>Rated Voltage</b> Ex.: 202:2000Vdc	<b>Packaging</b> T: Taping & Reel B: Bulk	<b>Special Requirement</b> Ex.: O: Arc Prevention Coating X: Cushion Termination (Super Term)



## HVC 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/SL): More Than 30pF : $Q \geq 1000$ 30pF & Below: $Q \geq 400+20C$ (C:Cap., pF)	NPO/SL $C \leq 100\text{pF}$ 1MHz $\pm 10\%$ 1.0 $\pm 0.2V_{rms}$ $C > 100\text{pF}$ 1KHz $\pm 10\%$		
		X7R                    1KHz $\pm 10\%$ 1.0 $\pm 0.2V_{rms}$		
<b>Dissipation Factor</b>	Class II (X7R): Maximum 0.025	Perform a heat treatment at 150 $\pm 5^\circ\text{C}$ for 30min. then place room temp. for 24 $\pm 2$ hr.		
<b>Insulation Resistance</b>	10,000M $\Omega$ or 500/C $\Omega$ whichever is smaller. (C in Farad)	$V \leq 500V$ , Rated Voltage $V > 500V$ , Applied 500Vdc Charge Time : 60sec. Is applied less than 50mA current.		
<b>Withstanding Voltage</b>	No dielectric breakdown or mechanical breakdown	$V < 500V$ : 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.  Withstanding voltage testing requires immersion of the element in a isolation fluid prevent arcing on the chip surface, at voltage over 1000Vdc.		
<b>Temperature Capacitance Coefficient</b>	Char.	Temp. Range	Cap. Change	Class I : [C2-C1/C1(T2-T1)] $\times 100\%$  Class II : (C2-C1)/C1 $\times 100\%$ T1:Standard Temperature(25 $^\circ\text{C}$ ) T2:Test Temperature C1:Capacitance At Standard Temperature C2:Capacitance At Test Temperature
	NPO(N)	-55 $^\circ\text{C}$ ~ +125 $^\circ\text{C}$	$\pm 30\text{ppm}/^\circ\text{C}$	
	SL (L)	-25 $^\circ\text{C}$ ~ +85 $^\circ\text{C}$	+350/-1000ppm / $^\circ\text{C}$	
	X7R (X)	-55 $^\circ\text{C}$ ~ +125 $^\circ\text{C}$	$\pm 15\%$	
<b>Adhesive Strength of Termination</b>	No indication of peeling shall occur on the terminal electrode.	 5N-f      A 5N-f( $\approx 0.5\text{Kg-f}$ ) pull force shall be applied for 10 $\pm 1$ sec.		
<b>Resistance to Flexure of Substrate</b>	No mechanical damage or capacitance change more than the following table.	The board shall be bent 1.0mm with a rate of 1.0 mm/sec.		
	Char.	Capacitance Change		
NPO(N)/SL(L)	$\leq \pm 5.0\%$ of initial value			
X7R (X)	$\leq \pm 12.5\%$ of initial value			
<b>Solderability</b>	More than 90% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve .  	Solder Temperature : 245 $\pm 5^\circ\text{C}$ Dip Time : 5 $\pm$ 0.5 sec. Immersing Speed : 25 $\pm 10\%$ mm/s Solder : H63A Flux : Rosin Preheat : At 80~120 $^\circ\text{C}$ For 10~30sec.		

## HVC Series Specification & Test Condition

Item	Specification	Test Condition															
<b>Resistance to Soldering Heat</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NPO/SL): Within 2.5% or $\pm 0.25\text{pF}$ whichever is larger of initial value Class II (X7R): Within $\pm 10\%$ of initial value															
	Q / Tan $\delta$	To satisfy the specified initial value															
	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 $150 \pm 0/-10^\circ\text{C}$ before initial measure. Preheat : at $150 \pm 10^\circ\text{C}$ for 60~120sec. Dip : solder temperature of $260 \pm 5^\circ\text{C}$ Dip Time : $10 \pm 1$ sec. Immersing Speed : $25 \pm 10\%$ mm/s Solder : H63A Flux : Rosin															
		Measure at room temperature after cooling for Class I : $24 \pm 2$ Hours Class II : $48 \pm 4$ Hours															
<b>Temperature Cycle</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NPO/SL): 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															
		Class II capacitor shall be set for $48 \pm 4$ hours at room temperature after one hour heat treatment at $150 \pm 0/-10^\circ\text{C}$ before initial measure. Capacitor shall be subjected to five cycles of the temperature cycle as following:															
		<table border="1"> <thead> <tr> <th>Step</th> <th>Temp.(<math>^\circ\text{C}</math>)</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.( $^\circ\text{C}$ )	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.( $^\circ\text{C}$ )	Time(min)															
1	Min Rated Temp.+0/-3 (-55)	30															
2	25	3															
3	Max Rated Temp.+3/-0 (125)	30															
4	25	3															
		Measure at room temperature after cooling for Class I : $24 \pm 2$ Hours Class II : $48 \pm 4$ Hours															
<b>Humidity</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Class I (NPO/SL): 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/SL): More Than 30pF : $Q \geq 350$ 30pF & Below: $Q \geq 275 + 2.5C$ Class II (X7R): Maximum 5.0%															
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller. (C in Farad)															
		Class II capacitor shall be set for $48 \pm 4$ hours at room temperature after one hour heat treatment at $150 \pm 0/-10^\circ\text{C}$ before initial measure. Temperature : $40 \pm 2^\circ\text{C}$ Relative Humidity : 90 ~95%RH Test Time : $500 \pm 12/-0$ hr															
		Measure at room temperature after cooling for Class I : $24 \pm 2$ Hours Class II : $48 \pm 4$ Hours															

## HVC Series Specification & Test Condition

Item	Specification	Test Condition								
<b>High Temperature Load (Life Test)</b>	Appearance	Class II capacitors applied DC voltage (following table) 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 : <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9e1f2;">Rated Voltage</th> <th style="background-color: #d9e1f2;">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>	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									
Capacitance	Class I (NPO/SL): 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/SL): More Than 30pF : $Q \geq 350$ 30pF & Below: $Q \geq 275 + 2.5C$ Class II (X7R): Maximum 5%									
Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller. (C in Farad)									
<b>Vibration</b>	Appearance	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 1 min. Repeat this for 2 hours each in 3 perpendicular directions.								
	Capacitance		Within the specified tolerance							
	Q / Tan $\delta$		To satisfy the specified initial value							