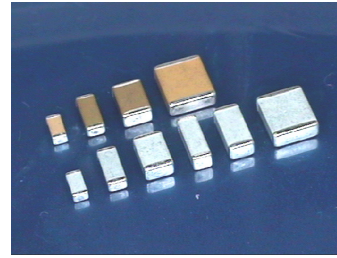


Multilayer Ceramic Chip Capacitors [High Voltage Capacitor]

HVC Series – Ultra High Voltage (3KV-5KV)



◆ Features

- ❑ Polymer termination (Superterm) to inhibit mechanical cracking
- ❑ Special internal electrode design offers the highest voltage rating
- ❑ Surface mount suited for wave and reflow soldering
- ❑ High reliability
- ❑ RoHS compliant

◆ Applications

- ❑ Suitable for LCD back-lighting inverter , DC-DC converters, modems and power supplies

◆ Summary of Specification

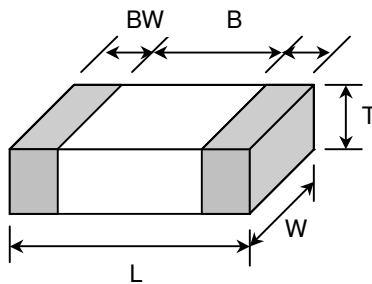
Operation Temperature	-55~+125 °C
Rated Voltage	3KVdc to 5KVdc
Temperature Coefficient	NPO : $\leq \pm 30\text{ppm}/^\circ\text{C}$, -55~+125 °C (EIA Class I)
	SL : $\leq +350/-1000\text{ppm}/^\circ\text{C}$, -25~+85 °C (EIA Class I)
	X7R : $\leq \pm 15\%$, -55~+125 °C (EIA Class II)
Capacitance Range	NPO :2pF to 1.0nF ; SL : 220pF to 1000pF ; X7R :150pF to 2.7nF
Dissipation Factor :	NPO : $Q \geq 1000$; X7R : D.F. $\leq 2.5\%$
Insulation Resistance	10G Ω 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	1808	N	5R0	C	302	T	X
Product Code	Chip Size	Dielectric	Capacitance Unit : pF	Tolerance	Rated Voltage	Packaging	Special Requirement
C: MLCC (Multilayer Ceramic Chip of Capacitor)	Ex.: 1206 : 3.2×1.6mm 1808 : 4.6×2.0mm 1812 : 4.6×3.2mm 2208 : 5.7×2.0mm 2211 : 5.7×2.8mm 2220 : 5.7×5.0mm	Ex.: N: NPO L: SL X: X7R	Ex.: 2R0:2.0pF 100:10×10 ⁰ 471:47×10 ¹ 102:10×10 ²	Ex.: C:±/-0.25pF D:±/-0.50pF J :±/- 5% K :±/-10% M:±/-20%	Ex.: 302:3000Vdc 502:5000Vdc	T: Taping & Reel B: Bulk	Ex.: O: Arc Prevention Coating X: Cushion Termination (Super Term)

◆ Dimension

Unit : mm [inches]

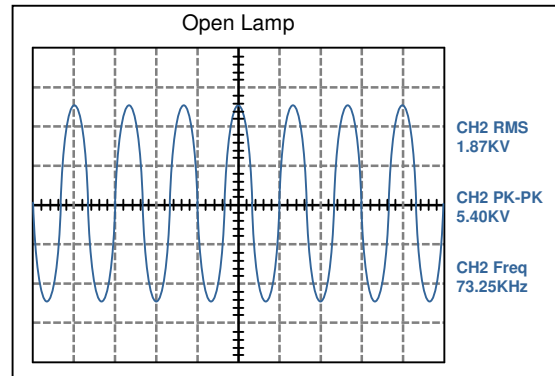
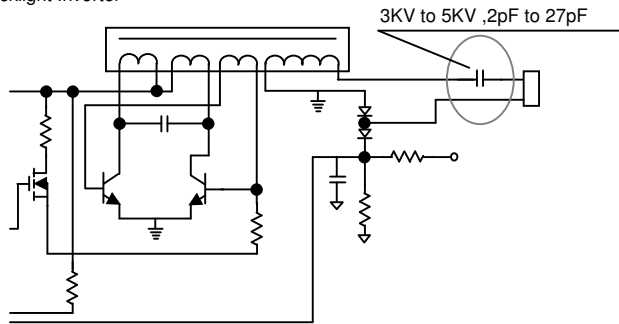


TYPE	L	W	T (max)	B (min)	BW (min)
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.126±.012]	1.80 [.071]	1.50 [.059]	0.30 [.012]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.126±.012]	2.60 [.102]	1.60 [.059]	0.30 [.012]
1808	4.60±0.30 [.181±.012]	2.00±0.20 [.079±.008]	2.20 [.087]	2.50 [.098]	0.30 [.012]
1812	4.60±0.30 [.181±.012]	3.20±0.30 [.126±.012]	3.00 [.118]	2.50 [.098]	0.30 [.012]
2208	5.7±0.40 [.220±.016]	2.00±0.20 [.079±.008]	2.20 [.087]	3.50 [.137]	0.30 [.012]
2211	5.7±0.40 [.220±.016]	2.80±0.40 [.110±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]
2220	5.7±0.40 [.220±.016]	5.00±0.40 [.197±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]

◆ Application

Example Circuit

Backlight Inverter

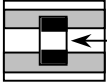
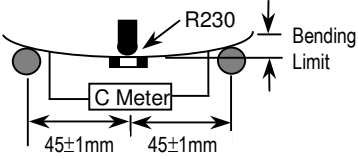
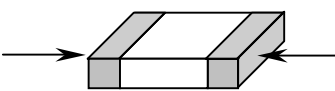


◆ Capacitance Range

Temperature Characteristic	Size	Rated Voltage	Capacitance Range (pF)																															
			2R0	3R3	3R9	5R0	8R0	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122
NPO	1206	3KV	DDDDDDDDDDDDDEEE																															
	1808	3KV	DDDDDDDDDDDDDDDDDDDEEEEF EF EF EF EF F F F F F F																															
		5KV	FFFFFFFFFFFFFFFF																															
	1812	3KV	DDDDDDDDDDDDDDDDFFFFFFFFFFFFFFFF																															
	2208	5KV	FFFFFFFFFFFFFFFF																															
	2211	5KV	FFFFFFFFFFFFFFFF																															
2220	5KV	FFFFFFFFFFFFFFFFFFFF FFF																																
SL	1808	3KV	EEEEEEFFFF F NEW!																															
Temperature Characteristic	Size	Rated Voltage	Capacitance Range (pF)																															
			151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563
X7R	1808	3KV	DDDDDDDDDDDDDEFFF																															
		4KV	DDDDDEDEDEDEDEDEDEDEDE																															
	1812	3KV	DDDEEEFFF																															
Symbol Code	S	O	A	B	C	D	E	F	G	H																								
Thickness(mm)	0.3±0.03	0.5±0.05	0.6±0.1	0.85±0.1	1.0±0.1	1.25±0.15	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2																								

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

HVC Series Specification & Test Condition

Item	Specification	Test Condition		
Operation Temperature	-55 to +125°C			
Visual	No abnormal exterior appearance	Visual Inspection		
Capacitance	Within The Specified Tolerance	Class Frequency Voltage		
Quality Factor	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±10% 1.0±0.2Vrms $C > 100\text{pF}$ 1KHz±10%		
		X7R 1KHz±10% 1.0±0.2Vrms		
Dissipation Factor	Class II (X7R): Maximum 0.025	Perform a heat treatment at 150±5°C for 30min. then place room temp. for 24±2hr.		
Insulation Resistance	10,000MΩ or 500/C Ω whichever is smaller. (C in Farad)	$V \leq 500\text{V}$, Rated Voltage $V > 500\text{V}$, Applied 500Vdc Charge Time : 60sec. Is applied less than 50mA current.		
Withstanding Voltage	No dielectric breakdown or mechanical breakdown	$V < 500\text{V}$: 200% Rated Voltage $500\text{V} \leq V < 1000\text{V}$: 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.		
Temperature Capacitance Coefficient	Char.	Temp. Range	Cap. Change	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	
	SL (L)	-25°C ~ +85°C	+350/-1000ppm /°C	
	X7R (X)	-55°C ~ +125°C	± 15%	
Adhesive Strength of Termination	No indication of peeling shall occur on the terminal electrode.	 5N-f A 5N-f(≈0.5Kg-f) pull force shall be applied for 10±1 sec.		
Resistance to Flexure of Substrate	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)	≤ ± 5.0% of initial value			
X7R (X)	≤ ± 12.5% of initial value			
Solderability	More than 90% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve . 	Solder Temperature : 245±5°C Dip Time : 5 ± 0.5 sec. Immersing Speed : 25±10% mm/s Solder : H63A Flux : Rosin Preheat : At 80~120 °C For 10~30sec.		

HVC Series Specification & Test Condition

Item	Specification	Test Condition															
Resistance to Soldering Heat	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 δ	To satisfy the specified initial value															
	Insulation Resistance	To satisfy the specified initial value															
		Class II capacitor shall be set for 48 ± 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 ± 1 sec. Immersing Speed : $25 \pm 10\%$ mm/s Solder : H63A Flux : Rosin															
		Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															
Temperature Cycle	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 δ	To satisfy the specified initial value															
	Insulation Resistance	To satisfy the specified initial value															
		Class II capacitor shall be set for 48 ± 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.($^\circ\text{C}$)</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.($^\circ\text{C}$)	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 ± 2 Hours Class II : 48 ± 4 Hours															
Humidity	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 δ	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 Ω or 50/C Ω whichever is smaller. (C in Farad)															
		Class II capacitor shall be set for 48 ± 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 +12/-0 hr															
		Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															

HVC Series Specification & Test Condition

Item	Specification	Test Condition								
High Temperature Load (Life Test)	Appearance	No mechanical damage shall occur								
	Capacitance	<p>Class I (NPO/SL): Within 3% or $\pm 0.3\text{pF}$ whichever is larger of initial value</p> <p>Class II (X7R): Within $\pm 15\%$ of initial value</p>								
	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 (X7R): Maximum 5%</p>								
	Insulation Resistance	1,000M Ω or 50/C Ω whichever is smaller. (C in Farad)								
		<p>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\pm4 hours at room temperature and the initial measurement shall be conducted.</p> <p>Applied Voltage :</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Applied Voltage</th> </tr> </thead> <tbody> <tr> <td>$V \leq 250\text{Vdc}$</td> <td>150% Rated Voltage</td> </tr> <tr> <td>$250\text{Vdc} < V < 1\text{KVdc}$</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. operation temperature Test Time : 1000 +12/-0Hr Current Applied : 50 mA Max.</p> <p>Measure at room temperature after cooling for Class I : 24 \pm 2 Hours Class II : 48 \pm 4 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									
Vibration	Appearance	No mechanical damage shall occur								
	Capacitance	Within the specified tolerance								
	Q / Tan δ	To satisfy the specified initial value								
		<p>Solder the capacitor on P.C. board.</p> <p>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.</p> <p>Repeat this for 2 hours each in 3 perpendicular directions.</p>								