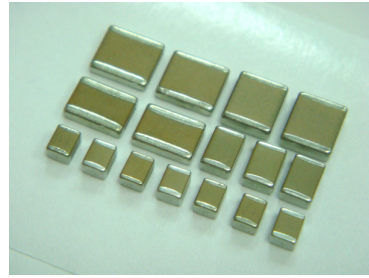


## Multilayer Ceramic Chip Capacitors [ High Cap. X7R ]

### HCX Series



#### ◆ Features

- Rated working voltage of 50 to 100Vdc
- Small size & high capacitance
- Excellent bias, high temperature stability & low  $\tan \delta$
- Low ESR and excellent ripple current characteristics
- RoHS compliant

#### ◆ Application

- DC-DC Converters (filter)
- Industrial Controls
- Power Supplies
- Surge Protection

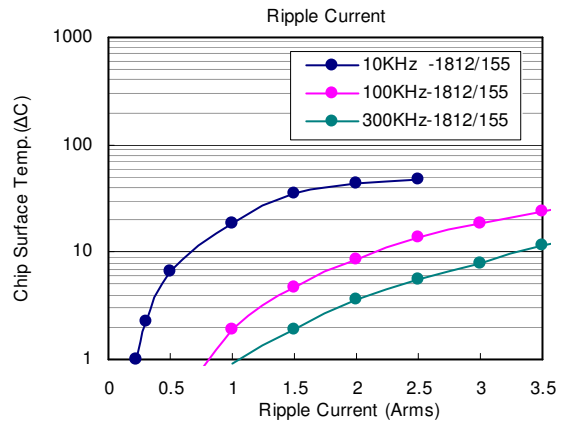
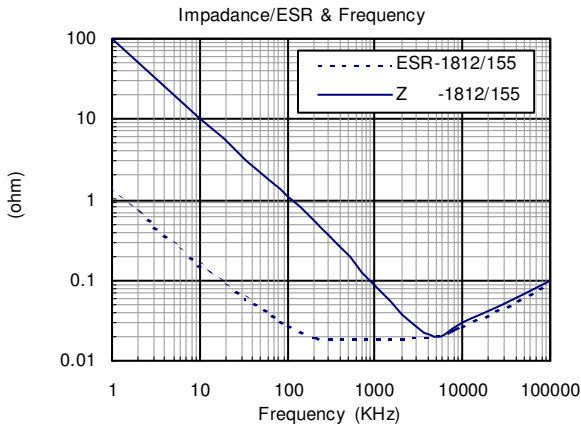
#### ◆ Summary of Specification

Operation Temperature	-55~+125 °C
Rated Voltage	50V to 100Vdc
Temperature Coefficient	X7R : $\leq \pm 15\%$ at -55~+125 °C (EIA Class II )
Capacitance Range	100nF ~ 10uF
Dissipation Factor :	2.5% max. at 1KHz 25°C
Insulation Resistance	10G $\Omega$ or 500/C $\Omega$ whichever is smaller (C in Farad )
Dielectric Strength	50V : 250% rated voltage for 5 second @ 50mA max. current
	100V : 200% rated voltage for 5 second @ 50mA max. current
Capacitance Tolerance	$\pm 10\%$ , $\pm 20\%$
Aging	2.5% per decade hr , typical

#### ◆ How To Order

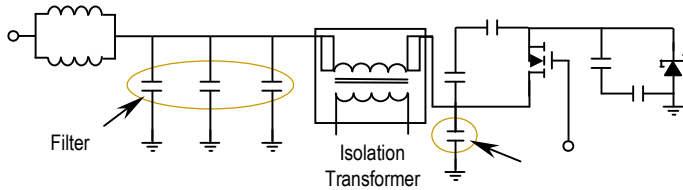
C	1210	X	225	K	101	T	X
<b>Product Code</b>	<b>Chip Size</b>	<b>Dielectric</b>	<b>Capacitance Unit : pF</b>	<b>Tolerance</b>	<b>Rated Voltage</b>	<b>Packaging</b>	<b>Special Requirement</b>
C:MLCC (Multilayer Ceramic Chip of Capacitor)	Ex.: 1210 : 3.2×2.5 mm 1812 : 4.6×3.2 mm 1825 : 4.6×6.35 mm 2220 : 5.7×5.0 mm 2225 : 5.7×6.35 mm	X: X7R	Ex.: 102:10×10 <sup>2</sup> 224:22×10 <sup>4</sup> 105:10×10 <sup>5</sup>	Ex.: K: +/- 10% M: +/- 20%	Ex.: 050:50Vdc 101:100Vdc	T: Taping & Reel B: Bulk	Ex.: O: Arc Prevention Coating X: Cushion Termination (Super Term)

## ◆ Characteristic

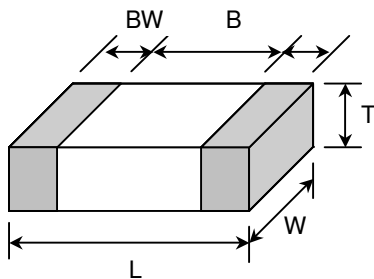


## ◆ Application Example Circuit

DC-DC Converter



## ◆ Dimension



Unit : mm [inches]

TYPE	L	W	T (max)	B (min)	BW (min)
1210	3.20±0.3 [.126±.012]	2.50±0.2 [.098±.008]	2.60 [.102]	1.60 [.063]	0.30 [.012]
1812	4.60±0.3 [.181±.012]	3.20±0.3 [.126±.012]	3.00 [.118]	2.50 [.098]	0.30 [.012]
1825	4.60±0.3 [.181±.012]	6.35±0.4 [.250±.016]	3.00 [.118]	2.50 [.137]	0.30 [.012]
2220	5.70±0.4 [.220±.016]	5.00±0.4 [.197±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]
2225	5.70±0.4 [.220±.016]	6.35±0.4 [.250±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]

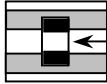
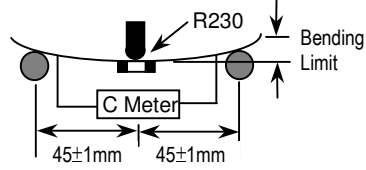
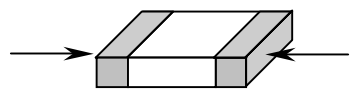
## ◆ Capacitance Range

Size	Code	1210		1812		1825		2220		2225	
		50V	100V	50V	100V	50V	100V	50V	100V	50V	100V
104	100nF	C	C	D	D/E	D	D				
154	150nF	C	C	D	D/E	D	D				
224	220nF	C	C	D	D/E	D	D				
334	330nF	C	C	D	D/E	D	D				
474	470nF	C	C	D	E	D	D	E	E	D	D
564	560nF	D	D	D	E	D	D	E	E	D	D
684	680nF	D	E	D	E	D	E	E	E	D	D
105	1uF	E	F	D	E	D	E	F	F	D	E
155	1.5uF	F	G	E	F	E	F	F	F	E	F
225	2.2uF	G	G	F	F	F	F	F	F	F	F
335	3.3uF			F	F	F	F	F	F	F	F
475	4.7uF			F	F	F	F	F	F	F	F
685	6.8uF							G	F	F	F
106	10uF							H	G		

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.

**HCX Series Specification & Test Condition**

Item	Specification	Test Condition								
<b>Operation Temperature</b>	-55°C ~ +125°C									
<b>Visual</b>	No Abnormal Exterior Appearance	Visual Inspection								
<b>Capacitance</b>	Within The Specified Tolerance	Frequency      Voltage								
<b>Dissipation Factor</b>	0.025 max.	1KHz±10%      1.0±0.2Vrms								
		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)	Applied Voltage : Rated Voltage Charge Time : 60±5 sec. Charge-Discharge current shall be less than 50mA current.								
<b>Withstanding Voltage</b>	No dielectric breakdown or mechanical breakdown	50V: 250% Rated Voltage 100V: 200% Rated Voltage for 1~5 sec. Current is limited to less than 50mA.								
<b>Temperature Capacitance Coefficient</b>	<table border="1"> <thead> <tr> <th>Temp. Range</th> <th>Cap. Change</th> </tr> </thead> <tbody> <tr> <td>-55°C ~ +125°C</td> <td>± 15%</td> </tr> </tbody> </table>	Temp. Range	Cap. Change	-55°C ~ +125°C	± 15%	(C2-C1)/C1 × 100% C1:Capacitance at Standard Temperature(25°C) C2:Capacitance at Test Temperature				
Temp. Range	Cap. Change									
-55°C ~ +125°C	± 15%									
<b>Adhesive Strength of Termination</b>	No indication of peeling shall occur on the terminal electrode.	 <p>5N-f      A 5N-f (≈ 0.5Kg-f) pull force shall be applied for 10±1 sec.</p>								
<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.								
	<table border="1"> <thead> <tr> <th>Char.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>X7R (X)</td> <td>≤ ± 12.5% of initial Value</td> </tr> </tbody> </table>	Char.	Capacitance Change	X7R (X)	≤ ± 12.5% of initial Value					
Char.	Capacitance Change									
X7R (X)	≤ ± 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.	<p>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.</p>								
										
<b>Resistance to Soldering Heat</b>	<table border="1"> <tbody> <tr> <td>Appearance</td> <td>No mechanical damage shall occur</td> </tr> <tr> <td>Capacitance</td> <td>within ±7.5% of initial Value</td> </tr> <tr> <td>Tanδ</td> <td>To satisfy the specified initial value</td> </tr> <tr> <td>Insulation Resistance</td> <td>To satisfy the specified initial value</td> </tr> </tbody> </table>	Appearance	No mechanical damage shall occur	Capacitance	within ±7.5% of initial Value	Tanδ	To satisfy the specified initial value	Insulation Resistance	To satisfy the specified initial value	<p>Class II capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10°C before initial measurement.</p> <p>Preheat : at 150±10°C for 60~120sec. Dip : solder temperature of 260±5°C Dip Time : 10 ± 1sec. Immersing Speed : 25±10% mm/s Solder : H63A Flux : Rosin</p> <p>Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours</p>
Appearance	No mechanical damage shall occur									
Capacitance	within ±7.5% of initial Value									
Tanδ	To satisfy the specified initial value									
Insulation Resistance	To satisfy the specified initial value									

**HCX Series Specification & Test Condition**

Item	Specification	Test Condition															
<b>Temperature Cycle</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Within $\pm 7.5\%$ of initial value															
	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 +0/-10 °C before initial measurement. Capacitor shall be subjected to five cycles of the temperature cycle as following: <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</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</td> <td>30</td> </tr> <tr> <td>4</td> <td>25</td> <td>3</td> </tr> </tbody> </table> Measure at room temperature after cooling for 48 $\pm$ 4 Hours	Step	Temp.(°C)	Time(min)	1	Min Rated Temp.+0/-3	30	2	25	3	3	Max Rated Temp.+3/-0	30	4	25	3
Step	Temp.(°C)	Time(min)															
1	Min Rated Temp.+0/-3	30															
2	25	3															
3	Max Rated Temp.+3/-0	30															
4	25	3															
<b>Humidity</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Within $\pm 12.5\%$ of initial value															
	Tan $\delta$	0.05 max.															
	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 +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 48 $\pm$ 4 Hours															
<b>High Temperature Loading (Life Test)</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Within $\pm 15\%$ of initial value															
	Tan $\delta$	0.05 max.															
	Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller. (C in Farad)															
		For Class II capacitors, DC testing voltage is applied for one hour at maximum operation temperature $\pm 3^\circ\text{C}$ then shall set for 48 $\pm$ 4 hours at room temperature and the initial measurement shall be conducted. Load/Life Conditions: Caps rated <100V 200% Rated Voltage Caps rated $\geq$ 100V 150% Rated Voltage 1210/100V $\geq$ 1.0uF 120% Rated Voltage Temperature : max.operating temperature Test Time : 1000 +48/-0Hr Current Applied : 50 mA Max. Measure at room temperature after cooling for 48 $\pm$ 4 Hours															
<b>Vibration</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Within the specified tolerance															
	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 1 min. Repeat this for 2 hours each in 3 perpendicular directions.															