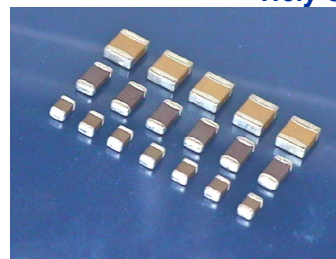


## Multilayer Ceramic Chip Capacitors [ Low Profile Capacitor – Thin Type X7R,X5R,Y5V ]

### VAC Series



Low profile high capacitance MLCC's ideally suited for height restricted needs

#### ◆ Features

- ❑ High capacitance & rated voltage with maximum height of 0.5mm(size 0603) & 0.95 mm
- ❑ Surface mount suited for Wave and Reflow soldering
- ❑ RoHS compliant

#### ◆ Application

- ❑ For small and height restricted electronic equipment and applications
- ❑ Suitable for FPD device, HDD, CD-RW, LCD device, cellular phone modules and portable devices...etc.

#### ◆ Summary of Specification

##### X7R Dielectric Characteristic

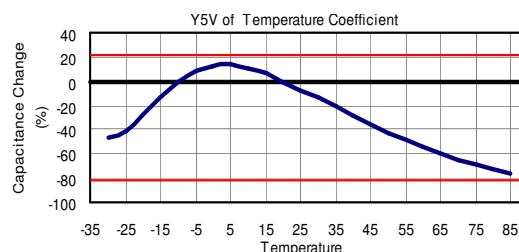
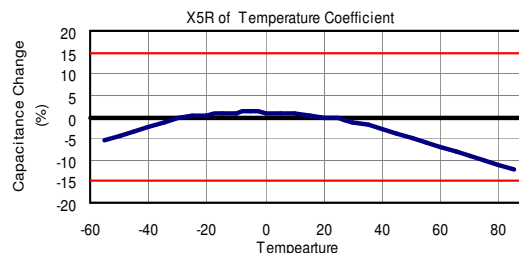
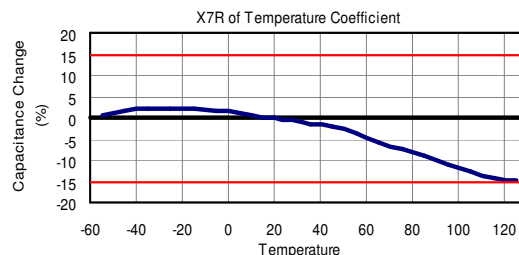
Operation Temperature : -55~+125 °C  
 Temperature Coefficient : ± 15% , -55~+85 °C (EIA Class II)  
 Capacitance Range : 1uF to 2.2uF  
 Dissipation Factor : See Spec.  
 Insulation Resistance : 10GΩ or 500/C Ω whichever is smaller  
 Aging : ≤ 2.5 % per decade hr , typical  
 Dielectric Strength : 250% Rated Voltage

##### X5R Dielectric Characteristic

Operation Temperature : -55~+85 °C  
 Temperature Coefficient : ± 15% , -55~+85 °C (EIA Class II)  
 Capacitance Range : 1uF to 22uF  
 Dissipation Factor : See Spec.  
 Insulation Resistance : 10GΩ or 500/C Ω whichever is smaller  
 Aging : ≤ 2.5 % per decade hr , typical  
 Dielectric Strength : 250% Rated Voltage

##### Y5V Dielectric Characteristic

Operation Temperature : -30~+85 °C  
 Temperature Coefficient : +22/ -82 % , -30~+85 °C (EIA Class II)  
 Capacitance Range : 1uF to 10uF  
 Dissipation Factor : See Spec.  
 Insulation Resistance : 10GΩ or 500/C Ω whichever is smaller  
 Aging : ≤ 7.0 % per decade hr , typical  
 Dielectric Strength : 250% Rated Voltage



#### ◆ How To Order

VAC

1206

B

106

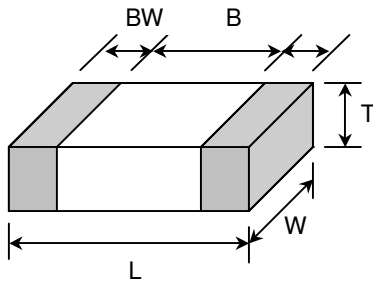
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007

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Product Code	Chip Size	Dielectric	Capacitance Unit : pF	Tolerance	Rated Voltage	Packaging
VAC: Low Profile capacitor (Thin Type)	0603 : 1.6×0.80 mm 0805 : 2.0×1.25 mm 1206 : 3.2×1.60 mm	Ex.: X:X7R B:X5R Y:Y5V	Ex.: 475:47×10 <sup>5</sup> 106:10×10 <sup>6</sup>	Ex.: K: +/- 10% M: +/- 20% Z :+80/-20%	Ex.: 007: 6.3Vdc 010: 10Vdc 016: 16Vdc 025: 25Vdc	T: Taping & Reel B: Bulk

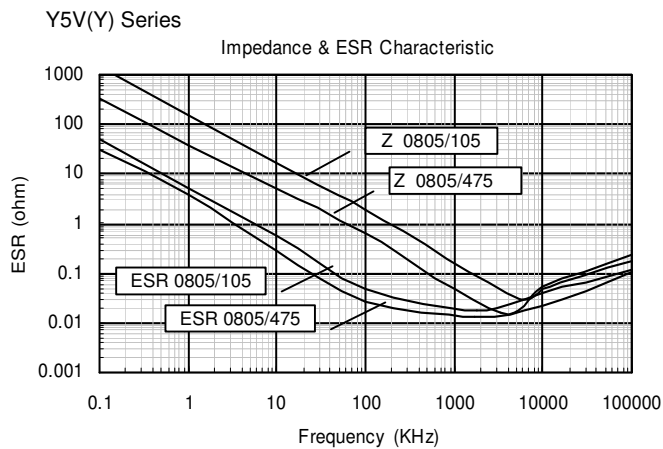
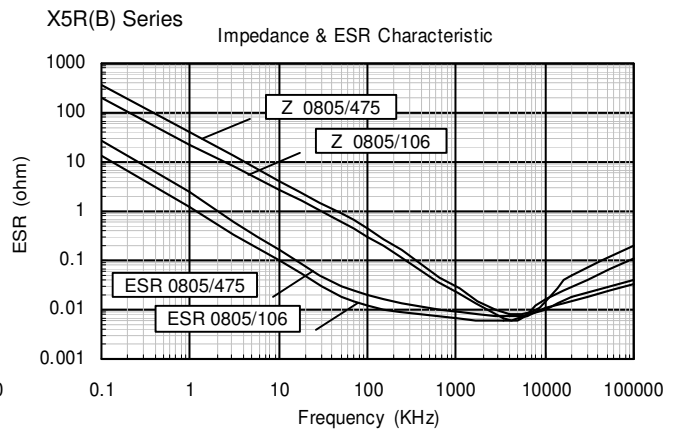
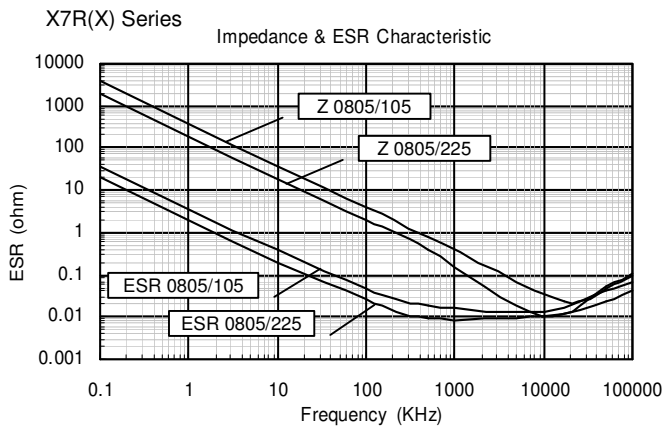
## ◆ Dimension



Unit : mm [inches]

TYPE	L	W	T (max)	B (min)	BW (min)
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031±.004]	0.50 [.020]	0.40 [.016]	0.15 [.006]
0805	2.00±0.2 [.079±.012]	1.25±0.2 [.049±.008]	0.95 [.037]	0.70 [.028]	0.20 [.008]
1206	3.20±0.3 [.126±.012]	1.60±0.2 [.063±.008]	0.95 [.037]	1.50 [.059]	0.30 [.012]

## ◆ Characteristic



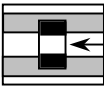
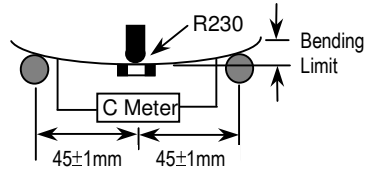
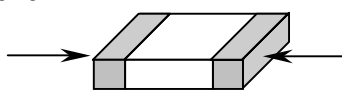
## ◆ Capacitance Range

X7R (X) Series					X5R (B) Series												Y5V (Y) Series								
Size	0805		1206		Size	0603			0805				1206				Size	0805				1206			
Code	16V	25V	16V	25V	Code	6.3V	10V	16V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	Code	6.3V	10V	16V	25V	6.3V	10V	16V	
105	B	B	B	B	105	T	T	T	B	B	B	B	B	B	B	B	105	B	B	B	B				
155	B		B	B	155				B	B	B	B			B	B	155	B	B	B					
225	B	B	B	B	225	T	T		B	B	B	B			B	B	225	B	B	B				B	
335					335				B	B					B	B	335								
475					475				B	B					B	B	475	B	B	B	B			B	
106					106				B	B					B	B	106						B		
226					226				B						B		226								

Symbol Code	T	B
Thickness (mm)	0.45±0.05	0.85±0.1

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

## VAC Series Specification & Test Condition

Item	Specification				Test Condition	
<b>Operation Temperature</b>	Char.	Operation Temp.				
	X7R (X)	-55°C ~ +125°C				
	X5R (B)	-55°C ~ +85°C				
	Y5V (Y)	-30°C ~ +85°C				
<b>Visual</b>	No abnormal exterior appearance				Visual Inspection	
<b>Capacitance</b>	Within The Specified Tolerance				Capacitance    Frequency    Voltage	
<b>Dissipation Factor</b>	Char.	25V	16V	10V	6.3V max.	$C \leq 10\mu F$ $1\text{KHz} \pm 10\%$ $1.0 \pm 0.2\text{Vrms}$
	X7R/X5R	5%	7.5%	15%	15%	$C > 10\mu F$ $120\text{Hz} \pm 20\%$ $0.5 \pm 0.2\text{Vrms}$
	Y5V	10%	12.5%	20%	20%	Perform a heat treatment at 150±5°C for 30min. then place at room temp. for 24±2hr.
<b>Insulation Resistance</b>	10,000MΩ or 500/C Ω whichever is smaller for rated voltage > 10V and greater 100/C Ω for rated voltage ≤ 10V. (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				250% of the rated voltage for 1~5 sec. Current is limited to less than 50mA	
<b>Temperature Capacitance Coefficient</b>	Char.	Temp. Range	Cap. Change		(C2-C1)/C1 × 100% C1: Capacitance at Standard Temperature (25°C) C2: Capacitance at Test Temperature. The detail condition please see HEC specification data sheet.	
	X7R(X)	-55°C ~ +125°C	± 15%			
	X5R(B)	-55°C ~ +85°C	± 15%			
	Y5V(Y)	-30°C ~ +85°C	+22/-82%			
<b>Adhesive Strength of Termination</b>	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.	
<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				
	X7R(X)	≤ ± 12.5% of initial value				
	X5R(B)	≤ ± 12.5% of initial value				
Y5V (Y)	≤ ± 30.0% 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±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.	
						
<b>Resistance to Soldering Heat</b>	Appearance	No mechanical damage shall occur			Capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10°C before initial measure.  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  Measure at room temperature after cooling for 48 ± 4 Hours	
	Capacitance	Char.	Cap. change			
		X7R(X)	≤ ±7.5% of initial value			
		X5R(B)	≤ ±7.5% of initial value			
		Y5V(Y)	≤ ±20% of initial value			
	Tanδ	To satisfy the specified initial value				
Insulation Resistance	To satisfy the specified initial value					

## VAC Series Specification & Test Condition

Item	Specification	Test Condition															
<b>Temperature Cycle</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Char. Cap. change															
		X7R(X) $\leq \pm 7.5\%$ of initial value															
		X5R(B) $\leq \pm 7.5\%$ of initial value															
		Y5V(Y) $\leq \pm 20\%$ of initial value															
Tan $\delta$	To satisfy the specified initial value																
Insulation Resistance	To satisfy the specified initial value																
<p>Capacitor shall be set for 48<math>\pm</math>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:</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</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> <p>Measure at room temperature after cooling for 48 <math>\pm</math> 4 Hours</p>			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	Char. Cap. change															
		X7R(X) $\leq \pm 12.5\%$ of initial value															
		X5R(B) $\leq \pm 12.5\%$ of initial value															
		Y5V(Y) $\leq \pm 30\%$ of initial value															
Tan $\delta$	Type 25V 16V 10V 6.3V X7R/X5R 7.5% 12.5% 25% 25% Y5V 13.5% 15% 30% 30%																
Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller for rated voltage>10V and greater 10/C $\Omega$ for rated voltage $\leq$ 10V. (C in Farad)																
<p>Capacitor shall be set for 48 <math>\pm</math> 4 hours at room temperature after one hour heat treatment at 150 +0/-10 °C before initial measurement.</p> <p>Temperature : 40 <math>\pm</math> 2 °C Relative Humidity : 90 ~95%RH Test Time : 500 +12/-0 hr</p> <p>Measure at room temperature after cooling for 48 <math>\pm</math> 4 Hours</p>																	
<b>Humidity Loading</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Char. Cap. change															
		X7R(X) $\leq \pm 15\%$ of initial value															
		X5R(B) $\leq \pm 15\%$ of initial value															
		Y5V(Y) $\leq \pm 30\%$ of initial value															
Tan $\delta$	Type 25V 16V 10V 6.3V X7R/X5R 7.5% 12.5% 25% 25% Y5V 13.5% 15% 30% 30%																
Insulation Resistance	500M $\Omega$ or 25/C $\Omega$ whichever is smaller for rated voltage>10V and greater 5/C $\Omega$ for rated voltage $\leq$ 10V. (C in Farad)																
<p>Capacitors applied DC voltage of the rated voltage is applied for one hour at maximum operation temperature <math>\pm</math> 3°C then shall be set for 48<math>\pm</math>4 hours at room temperature and the initial measurement shall be conducted.</p> <p>Applied Voltage : Rated Voltage Temperature : 40 <math>\pm</math> 2 °C Relative Humidity : 90 ~95%RH Test Time : 500 +12/-0Hr Current Applied : 50 mA Max.</p> <p>Measure at room temperature after cooling for 48 <math>\pm</math> 4 Hours</p>																	
<b>High Temperature Load (Life Test)</b>	Appearance	No mechanical damage shall occur															
	Capacitance	Char. Cap. change															
		X7R(X) $\leq \pm 15\%$ of initial value															
		X5R(B) $\leq \pm 15\%$ of initial value															
		Y5V(Y) $\leq \pm 30\%$ of initial value															
Tan $\delta$	Type 25V 16V 10V 6.3V X7R/X5R 7.5% 12.5% 25% 25% Y5V 13.5% 15% 30% 30%																
Insulation Resistance	1,000M $\Omega$ or 50/C $\Omega$ whichever is smaller for rated voltage>10V and greater 10/C $\Omega$ for rated voltage $\leq$ 10V. (C in Farad)																
<p>Capacitors applied DC testing rated voltage is applied for one hour at maximum operation temperature <math>\pm</math>3°C then shall be set for 48<math>\pm</math>4 hours at room temperature and the initial measurement shall be conducted.</p> <p>Applied Voltage :Rated Voltage Temperature : max. operating temperature Test Time : 1000 +48/-0Hr Current Applied : 50 mA Max.</p> <p>Measure at room temperature after cooling for 48 <math>\pm</math> 4 Hours</p>																	