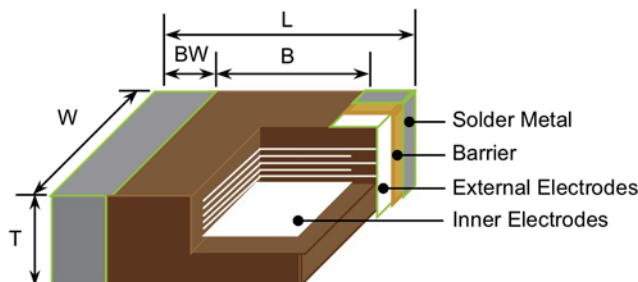


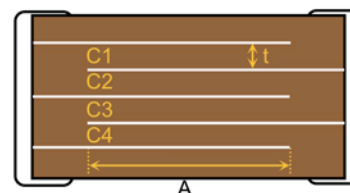
The Multilayer Ceramic Chip Capacitors supplied in bulk, cassette or taped & reel package are ideally suitable for thick-film Hybrid circuits and automatic surface mounting on printed circuit boards.

Mainly used in electric circuit for by-pass, filtering and smoothing circuit.

◆ Shapes and Dimensions



Cross Section



Dimension (mm) [inches]					
EIA style	L	W	Tmax.	BWmin	Bmin.
0201	0.60±0.03 [.024±.002]	0.30±0.03 [.011±.002]	0.33 [.013]	0.10 [.004]	0.20 [.008]
0402	1.00±0.05 [.039±.002]	0.50±0.05 [.020±.002]	0.55 [.022]	0.15 [.006]	0.30 [.012]
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031±.004]	1.00 [.039]	0.15 [.006]	0.40 [.016]
0805	2.00±0.20 [.079±.008]	1.25±0.20 [.049±.008]	1.45 [.057]	0.20 [.008]	0.70 [.028]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.063±.008]	1.80 [.071]	0.30 [.012]	1.50 [.059]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.098±.008]	2.60 [.102]	0.30 [.012]	1.60 [.063]
1808	4.60±0.30 [.181±.012]	2.00±0.20 [.079±.008]	2.20 [.087]	0.30 [.012]	2.50 [.098]
1812	4.60±0.30 [.181±.012]	3.20±0.30 [.126±.012]	3.00 [.118]	0.30 [.012]	2.50 [.098]
1825	4.60±0.30 [.181±.012]	6.35±0.40 [.250±.016]	3.40 [.118]	0.30 [.012]	2.50 [.098]
2208	5.70±0.40 [.220±.016]	2.00±0.20 [.197±.008]	2.20 [.087]	0.30 [.012]	3.50 [.137]
2211	5.70±0.40 [.220±.016]	2.80±0.40 [.110±.016]	3.00 [.118]	0.30 [.012]	3.50 [.137]
2220	5.70±0.40 [.220±.016]	5.00±0.40 [.197±.016]	3.40 [.133]	0.30 [.012]	3.50 [.137]
2225	5.70±0.40 [.220±.016]	6.35±0.40 [.250±.016]	3.40 [.133]	0.30 [.012]	3.50 [.137]

$$C = \epsilon_0 \cdot \epsilon \frac{A \cdot N}{t}$$

C : Capacitance
 ϵ_0 : Dielectric constant in the air
 ϵ : Proportional dielectric constant
 A : Overlap Area
 t : Dielectric Thickness
 N : Layers

◆ Nominal Capacitance and Tolerance

1. Standard Combination of Nominal Capacitance and Tolerance			
Class	EIA Symbol	Tolerance	Nominal Capacitor
I	NP0	J (±5%), K (±10%)	E-12
II	X7R	K (±10%), M (±20%)	E-3, E-6 E-12 Series
	X7T	K (±10%), M (±20%)	E-3, E-6 Series
	X7P	K (±10%), M (±20%)	E-3, E-6 Series
	X6S	K (±10%), M (±20%)	E-3, E-6 Series
	X5R	K (±10%), M (±20%)	E-3, E-6 Series

2. E Series (Standard Number)										
E-Series	Application Capacitance									
E-3	1.0		2.2		4.7					
E-6	1.0	1.5	2.2	3.3	4.7	6.8				
E12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6 6.8 8.2

◆EIA Designations

For Class I Dielectrics

Coefficient of capacitance (ppm/ °C)	Multiplier applicable to column	Tolerance of temp. coeff.(ppm/ °C)
0.0 C	-1.0 0	30 G
1.0 M	-10 1	60 H
1.5 P	-100 2	120 J
2.2 R	-1000 3	250 K
3.3 S	-10000 4	500 L
4.7 T	+1 5	1000 M
7.5 U	+10 6	2500 N
	+100 7	
	+1000 8	
	+10000 9	

Ex.: C0G Negative 0±30ppm/ °C
U2J Negative 750±120ppm/ °C

For Class II Dielectrics

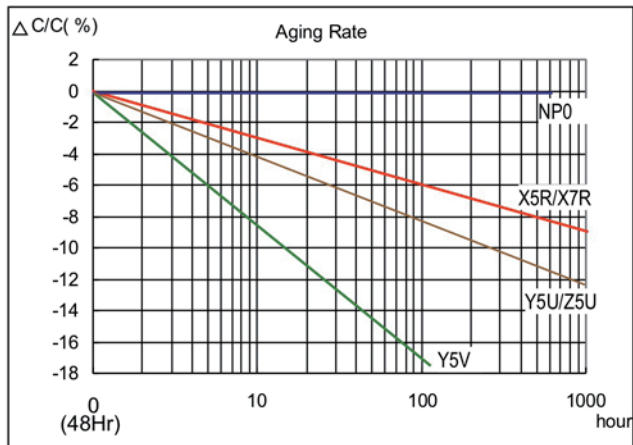
Low Temp. Symbol	High Temp. Symbol	Max. %ΔC Symbol
-55°C X	+45°C 3	±1.0% A
-30°C Y	+65°C 4	±1.2% B
+10°C Z	+85°C 5	±2.2% C
	+105°C 6	±3.3% D
	+125°C 7	±4.7% E
	+150 °C 8	±7.5% F
	+200 °C 9	±10.0% P
		±15.0% R
		±22.0% S
		+22% /-33% T
		+22% /-56% U
		+22% /-82% V

Ex.: X7R -55 ~ +125 °C ±15%
Y5V -30 ~ +85 °C +22%/-82%

◆Operating Temperature Range

Class	EIA Symbol	Dielectric Code	Temperature Range(°C)	Capacitance Change	Reference Temperature
I	NP0	N	-55°C ~ +125 °C	0±30 ppm/°C	25°C
	SL	L	-25°C ~ +85 °C	+350/-1000 ppm/°C	25°C
II	X7R	X	-55°C ~ +125°C	±15%	25°C
	X6S	S	-55°C ~ +105°C	±22%	25°C
	X7P	P	-55°C ~ +125°C	±10%	25°C
	X7T	T	-55°C ~ +125°C	+22% /-33%	25°C
	X7S	R	-55°C ~ +125°C	±22%	25°C
	X5R	B	-55°C ~ +85°C	±15%	25°C

◆ Dielectric Material – Aging Rate



Aging Rate

NP0: 0

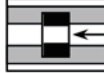
X7R/X5R : 1 ~ 4 % / decade

Y5U/Z5U : 4~6% / decade

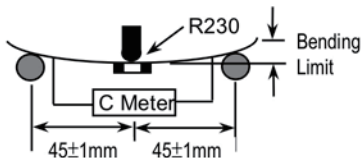

Y5V : 6~10 % / decade

After performing De-Aging at 150±5 °C for 30 minutes and Placement at room temperature for 48 hours.

Specifications & Test Conditions

Item	Specification			Test Conditions	
Operating Temperature	Char.	Operating Temp.			
	NP0(N)	-55°~ +125°C			
	X7R (X)	-55°C~ +125°C			
	X5R (B)	-55°C~ +85°C			
	X7P (P)	-55°C~+125°C			
	X7T(T)	-55°C~+125°C			
	X6S (S)	-55°C~+105°C			
Visual	No abnormal exterior appearance			Visual Inspection	
Capacitance	Within the specified tolerance			Char. NP0	Frequency Voltage
Quality Factor	Class I (NP0):				
	More Than 30pF : $Q \geq 1000$ 30pF & Below: $Q \geq 400 + 20C$ (C: Cap., pF)			$C \leq 1000\text{pF}$ $C > 1000\text{pF}$	$1\text{MHz} \pm 10\%$ $1\text{KHz} \pm 10\%$ $1.0 \pm 0.2\text{Vrms}$
Dissipation Factor	Class II (X7R/X5R/X7P/X7T/X6S):			$C \leq 10\mu\text{F}$	$1\text{KHz} \pm 10\%$ $1.0 \pm 0.2\text{Vrms}$
	Please check the summary of specification of each product series			$C > 10\mu\text{F}$	$120\text{Hz} \pm 20\%$ $0.5 \pm 0.2\text{Vrms}$
				Perform a heat temperature at $150 \pm 5^\circ\text{C}$ for 30min. then place at room temp. for $24 \pm 2\text{hrs}$.	
Insulation Resistance	10,000M Ω or 500/C Ω , whichever is smaller for rated voltage > 10V and greater 100/C Ω for rated voltage $\leq 10\text{V}$.			Applied voltage : rated voltage Charge time : 60 ± 5 sec. Charge-discharge current shall be less than 50mA current.	
	X1/Y2 and X2: 10G Ω min			Applied voltage: 500V charge time 60 sec	
Dielectric Withstand Voltage (DWV) (Unless otherwise stated on product descriptions)	No dielectric breakdown or mechanical breakdown			200% /150%/120%/100% Rated Voltage For information which product has which applied voltage, please contact with HEC sales representative. Voltage ramp up rate $\leq 500\text{v/sec}$ for 1~5 sec. charge/discharge Current is 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. X Capacitor : Applied voltage 1075Vdc(4.3Ur) Y Capacitor: Applied Voltage 1500Vac For 1 Min. Current limited to less than 50mA	
	X1/Y2 and X2				
Temperature Capacitance Coefficient	Char.	Temp. Range	Cap. Change	ClassI:	
	NP0(N)	-55°C~+125°C	$\pm 30\text{ppm}/^\circ\text{C}$	$[C2-C1/C1(T2-T1)] \times 100\%$	
	X7R (X)	-55°C~ +125°C	$\pm 15\%$	Class II :	
	X5R (B)	-55°C~ +85°C	$\pm 15\%$	$(C2-C1)/C1 \times 100\%$	
	X7P (P)	-55°C~+125°C	$\pm 10\%$	T1:Standard temperature(25°C)	
	X7T(T)	-55°C~+125°C	$+ 22\%/-33\%$	T2:Test temperature	
	X6S (S)	-55°C~+105°C	$\pm 22\%$	C1:Capacitance at standard temperature C2:Capacitance at test temperature	
Adhesive Strength of Termination	No indication of peeling shall occur on the terminal electrode.			 <p>≤ 0603 size : $5\text{N} (\approx 0.5 \text{ Kg}\cdot\text{f})$ > 0603 size : $10\text{N} (\approx 1.0 \text{ Kg}\cdot\text{f})$ pull force shall be applied for 10 ± 1 sec.</p>	

Specifications & Test Conditions


Item	Specification		Test Conditions															
Resistance to Flexure of Substrate	No mechanical damage or capacitance change more than the following table.		The board should bend 1.0mm with a rate of 1.0 mm/sec. 															
	Char.	Capacitance Change																
	NP0(N)	≦ ± 5.0% of initial value																
	X7R (X)	≦ ± 12.5% of initial value																
	X5R (B)	≦ ± 12.5% of initial value																
	X7P (P)	≦ ± 12.5% of initial value																
	X7T (T)	≦ ± 12.5% of initial value																
	X6S (S)	≦ ± 12.5% of initial value																
Solderability	More than 90% of the termination surface should be soldered so the metal part does not come out or dissolve . 		Solder Temperature : 245±5℃ Dip Time : 5 ± 0.5 sec. Immersing Speed : 25±10% mm/s Solder : Lead Free Solder Flux : Rosin Preheat : At 80~120 °C For 10~30 sec.															
	Resistance to Soldering Heat	Appearance	No mechanical damage shall occur	Class II capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measuring. Preheat : at 150±10℃ for 60~120sec. Dip : solder temperature of 260±5℃ Dip Time : 10 ± 1sec. Immersing Speed : 25±10% mm/s Flux : Rosin														
Capacitance		Class I (NP0): Within 2.5% or ±0.25pF, whichever is larger of initial value Class II : <table><tr><td>Char.</td><td>Cap. change</td></tr><tr><td>X7R(X)</td><td>Within ± 10%</td></tr><tr><td>X5R(B)</td><td>Within ± 10%</td></tr><tr><td>X7P(P)</td><td>Within ± 10%</td></tr><tr><td>X7T(T)</td><td>Within ± 10%</td></tr><tr><td>X6S (S)</td><td>Within ± 10%</td></tr></table>	Char.		Cap. change	X7R(X)	Within ± 10%	X5R(B)	Within ± 10%	X7P(P)	Within ± 10%	X7T(T)	Within ± 10%	X6S (S)	Within ± 10%			
Char.	Cap. change																	
X7R(X)	Within ± 10%																	
X5R(B)	Within ± 10%																	
X7P(P)	Within ± 10%																	
X7T(T)	Within ± 10%																	
X6S (S)	Within ± 10%																	
	Q / Tanδ	To satisfy the specified initial value	Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															
	Insulation Resistance	To satisfy the specified initial value																
Temperature Cycle	Appearance	No mechanical damage shall occur	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 measuring. Capacitor shall be subjected to five cycles of the temperature cycle as following: <table><tr><td>Step</td><td>Temp.(℃)</td><td>Time(min)</td></tr><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></table>	Step	Temp.(℃)	Time(min)	1	Min Rated Temp.+0/-3	30	2	25	3	3	Max Rated Temp.+3/-0	30	4	25	3
	Step	Temp.(℃)		Time(min)														
1	Min Rated Temp.+0/-3	30																
2	25	3																
3	Max Rated Temp.+3/-0	30																
4	25	3																
	Capacitance	Class I (NP0): Within 2.5% or ±0.25pF, whichever is larger of initial value <table><tr><td>Char.</td><td>Cap. change</td></tr><tr><td>X7R(X)</td><td>Within ± 7.5%</td></tr><tr><td>X5R(B)</td><td>Within ± 7.5%</td></tr><tr><td>X7P(P)</td><td>Within ± 7.5%</td></tr><tr><td>X7T(T)</td><td>Within ± 7.5%</td></tr><tr><td>X6S(S)</td><td>Within ± 7.5%</td></tr></table>	Char.	Cap. change	X7R(X)	Within ± 7.5%	X5R(B)	Within ± 7.5%	X7P(P)	Within ± 7.5%	X7T(T)	Within ± 7.5%	X6S(S)	Within ± 7.5%				
Char.	Cap. change																	
X7R(X)	Within ± 7.5%																	
X5R(B)	Within ± 7.5%																	
X7P(P)	Within ± 7.5%																	
X7T(T)	Within ± 7.5%																	
X6S(S)	Within ± 7.5%																	
	Q / Tanδ	To satisfy the specified initial value	Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															
	Insulation Resistance	To satisfy the specified initial value																

Specifications & Test Conditions

Item	Specification	Test Conditions
Humidity	Appearance	No mechanical damage shall occur
	Capacitance	Class I NP0: Within 5.0% or $\pm 0.5\text{pF}$, whichever is larger of initial value Class II : Char. Cap. change X7R(X) Within $\pm 15\%$ X5R(B) Within $\pm 15\%$ X7P(P) Within $\pm 15\%$ X7T(T) Within $\pm 15\%$ X6S(S) Within $\pm 15\%$
		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 : $500 \pm 12/-0$ hr
		Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours
	Q	
	Class I	30pF & over : $Q \geq 350$ 10 to 30pF : $Q \geq 275 + 2.5C$ 30pF & below: $Q \geq 200 + 10C$
	Tan δ	please contact with HEC sales
	Class II	
	Insulation Resistance	1,000M Ω or 50/C Ω , whichever is smaller for rated voltage $> 10\text{V}$ and greater 10/C Ω for rated voltage $\leq 10\text{V}$. (C in Farad)
High Temperature Load (Life Test)	Appearance	No mechanical damage shall occur
	Capacitance	Class I NP0: Within 5.0% or $\pm 0.5\text{pF}$, whichever is larger of initial value Class II : Char. Cap. change X7R(X) Within $\pm 15\%$ X5R(B) Within $\pm 15\%$ X7P(P) Within $\pm 15\%$ X7T(T) Within $\pm 15\%$ X6S(S) Within $\pm 15\%$
		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 ± 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage :
		For information which product has which applied voltage, please contact with HEC sales representative
		Temperature : max. operating temperature Test Time : $1000 \pm 48/-0$ Hr Current applied : 50 mA max.
	Q	
	Class I	30pF & Over : $Q \geq 350$ 10 to 30pF : $Q \geq 275 + 2.5C$ 30pF & Below: $Q \geq 200 + 10C$
	Tan δ	please contact with HEC sales
	Class II	
	Insulation Resistance	1,000M Ω or 50/C Ω , whichever is smaller Max. Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours

Specifications & Test Conditions			
Item		Specification	Test Conditions
Vibration	Appearance	No mechanical damage shall occur	Solder the capacitor on P.C. board.
	Capacitance	Within the specified tolerance	Vibrate the capacitor with an amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min.
	Q / Tanδ	To satisfy the specified initial value	Repeat this for 2 hours each in 3 perpendicular directions.

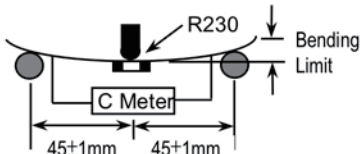
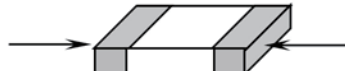
Specifications & Test Conditions

Item	Specification			Test Conditions		
Operating Temperature	Char.	Operating Temp.				
	NP0(N)	-55°~ +125°C				
	X7R (X)	-55°C~ +125°C				
	X7S (R)	-55°C~ +125°C				
	X5R (B)	-55°C~ +85°C				
	X6S (S)	-55°C~+105°C				
Visual	No abnormal exterior appearance			Visual Inspection		
Capacitance	Within the specified tolerance			Char. NP0	Frequency	Voltage
Quality Factor	Class I (NP0): More Than 30pF : $Q \geq 1000$ 30pF & Below: $Q \geq 400 + 20C$ (C: Cap., pF)			$C \leq 1000\text{pF}$	1MHz±10%	1.0±0.2Vrms
				$C > 1000\text{pF}$	1KHz±10%	
Dissipation Factor	Class II (X7R/X5R/X7P/X7T/X7S/X6S): Please check the summery of specification of each product series			$C \leq 10\mu\text{F}$	1KHz±10%	1.0±0.2Vrms 0.5±0.2Vrms
				$C > 10\mu\text{F}$	120Hz±20%	0.5±0.2Vrms
				Perform a heat temperature at 150±5°C for 30min. then place at room temp. for 24±2hrs.		
Insulation Resistance	10,000MΩ or 500/C Ω, whichever is smaller for rated voltage>10V and greater 100/C Ω for rated voltage≤10V.			Applied Voltage: Rated Voltage Charge Time : 60±5 sec. Charge-Discharge current shall be less than 50mA current		
Dielectric Withstand Voltage (DWV) (Unless otherwise stated on product descriptions)	No dielectric breakdown or mechanical breakdown			250% of the rated voltage for 1~5 sec. charge/discharge Current is less than 50mA		
Temperature Capacitance Coefficient	Char.	Temp. Range	Cap. Change	ClassI: [C2-C1/C1(T2-T1)] × 100%		
	NP0(N)	-55°C~+125°C	± 30ppm/°C	Class II : (C2-C1)/C1 × 100%		
	X7R (X)	-55°C~ +125°C	± 15%	T1:Standard temperature(25°C)		
	X7S (R)	-55°C~ +125°C	± 22%	T2:Test temperature		
	X5R (B)	-55°C~ +85°C	± 15%	C1:Capacitance at standard temperature		
	X6S (S)	-55°C~+105°C	± 22%	C2:Capacitance at test temperature 0.2Vrms shall be applied.		
Adhesive Strength of Termination	No indication of peeling shall occur on the terminal electrode.					

\leq 0603 size : 5N(\approx 0.5 Kg·f)
 $>$ 0603 size : 10N(\approx 1.0 Kg·f)

pull force shall be applied for 10 \pm 1 sec.

Specifications & Test Conditions

Item	Specification		Test Conditions															
Resistance to Flexure of Substrate	No mechanical damage or capacitance change more than the following table.		The board should bend 1.0mm with a rate of 1.0 mm/sec. 															
	Char.	Capacitance Change																
	NP0(N)	≦ ± 5.0% of initial value																
	X7R (X)	≦ ± 12.5% of initial value																
	X7S (R)	≦ ± 12.5% of initial value																
	X5R (B)	≦ ± 12.5% of initial value																
	X6S (S)	≦ ± 12.5% of initial value																
Solderability	More than 90% of the termination surface should be soldered so the metal part does not come out or dissolve . 		Solder Temperature : 245±5℃ Dip Time : 5 ± 0.5 sec. Immersing Speed : 25±10% mm/s Solder : Lead Free Solder Flux : Rosin Preheat : At 80~120 °C For 10~30sec.															
Resistance to Soldering Heat	Appearance	No mechanical damage shall occur	Class II capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measuring. Preheat : at 150±10℃ for 60~120sec. Dip : solder temperature of 260±5℃ Dip Time : 10 ± 1sec. Immersing Speed : 25±10% mm/s Flux : Rosin															
	Capacitance	Class I (NP0): Within 2.5% or ±0.25pF, whichever is larger of initial value Class II : Char. Cap. change X7R(X) ≤ ±7.5% of initial value X7S(R) ≤ ±7.5% of initial value X5R(B) ≤ ±7.5% of initial value X6S (S) ≤ ±7.5% of initial value																
	Q / Tanδ	To satisfy the specified initial value	Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															
	Insulation Resistance	To satisfy the specified initial value																
Temperature Cycle	Appearance	No mechanical damage shall occur	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 measuring. Capacitor shall be subjected to five cycles of the temperature cycle as following:															
	Capacitance	Class I (NP0): Within 2.5% or ±0.25pF, whichever is larger of initial value Char. Cap. change X7R(X) Within ± 7.5% X7S(R) Within ± 7.5% X5R(B) Within ± 7.5% X6S(S) Within ± 7.5%																
	Q / Tanδ	To satisfy the specified initial value	<table><tr><th>Step</th><th>Temp.(℃)</th><th>Time(min)</th></tr><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></table>	Step	Temp.(℃)	Time(min)	1	Min Rated Temp.+0/-3	30	2	25	3	3	Max Rated Temp.+3/-0	30	4	25	3
Step	Temp.(℃)	Time(min)																
1	Min Rated Temp.+0/-3	30																
2	25	3																
3	Max Rated Temp.+3/-0	30																
4	25	3																
	Insulation Resistance	To satisfy the specified initial value	Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours															

Specifications & Test Conditions

Item	Specification	Test Conditions
Humidity	Appearance	No mechanical damage shall occur
	Capacitance	Class I (NP0): Within 5.0% or $\pm 0.5\text{pF}$, whichever is larger of initial value Class II: Char. Cap. change X7R(X) Within $\pm 12.5\%$ X7S(R) Within $\pm 12.5\%$ X5R(B) Within $\pm 12.5\%$ X6S(S) Within $\pm 12.5\%$
	Q	30pF & over : $Q \geq 350$
	Class I	10 to 30pF : $Q \geq 275+2.5C$ 30pF & below: $Q \geq 200+10C$
	Tan δ	please contact with HEC sales
	Class II	
	Insulation Resistance	1000M Ω or 50/C Ω , whichever is smaller for rated voltage > 10V and greater 10/C Ω for rated voltage $\leq 10V$
		Class II capacitors applied DC voltage of the rated voltage is applied for one hour at maximum operation temperature then shall be set for 48 ± 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage : Rated Voltage Temperature : $40 \pm 2^\circ\text{C}$ Relative Humidity : 90 ~ 95%RH Test Time : 500 Hrs Max. Current Applied : 50 mA Max. Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours
Damp Heat/ Steady State (Test for the product under 100Vdc)	Appearance	No mechanical damage shall occur
	Capacitance	Class I (NP0): Within 7.5% or $\pm 0.75\text{pF}$, whichever is larger of initial value Class II: Char. Cap. change X7R(X) $\leq \pm 12.5\%$ of initial value X7S(R) $\leq \pm 12.5\%$ of initial value X5R(B) $\leq \pm 12.5\%$ of initial value X6S(S) $\leq \pm 12.5\%$ of initial value
	Q	30pF & Over : $Q \geq 350$
	Class I	10 to 30pF : $Q \geq 275+2.5C$ 30pF & Below: $Q \geq 200+10C$
	Tan δ	please contact with HEC sales
	Class II	
	Insulation Resistance	500M Ω or 25/C Ω , whichever is smaller for rated voltage > 10V and greater 5/C Ω for rated voltage $\leq 10V$. (C in Farad)
		Class II capacitors applied DC voltage of the rated voltage is applied for one hour at maximum Operating temperature $\pm 3^\circ\text{C}$ then shall be set for 48 ± 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage : Rated Voltage Temperature : $40 \pm 2^\circ\text{C}$ Relative humidity : 90 ~ 95%RH Test time : 500 +12/-0Hr Current applied : 50 mA Max. Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours

Specifications & Test Conditions

Item	Specification	Test Conditions
High Temperature Load (Life Test)	Appearance	No mechanical damage shall occur
	Capacitance	Class I (NP0): Within 5.0% or $\pm 0.5\text{pF}$, whichever is larger of initial value Class II : Char. Cap. change X7R(X) Within $\pm 12.5\%$ X7S(R) Within $\pm 12.5\%$ X5R(B) Within $\pm 12.5\%$ X6S(S) Within $\pm 12.5\%$
		The capacitors applied DC testing voltage is applied for one hour at maximum operation temperature then shall be set for 48 ± 4 hours at room temperature and the initial measurement shall be conducted.
		Applied Voltage: Rated Voltage However: The class I applied voltage 200% of rated voltage.
		Temperature: max. operation temperature Test Time : 1000 Hrs Max. Current Applied : 50mA Max
		Measure at room temperature after cooling for Class I : 24 ± 2 Hours Class II : 48 ± 4 Hours
	Q Class I	30pF & Over : $Q \geq 350$ 10 to 30pF : $Q \geq 275 + 2.5C$ 30pF & Below: $Q \geq 200 + 10C$
	Tan δ Class II	please contact with HEC sales
	Insulation Resistance	1,000M Ω or 50/C Ω , whichever is smaller . For rated voltage > 10V and greater 10/C Ω for rated voltage $\leq 10V$. (C in Farad)
Vibration	Appearance	No mechanical damage shall occur
	Capacitance	Within the specified tolerance
	Q / Tan δ	To satisfy the specified initial value
		Solder the capacitor on P.C. board. Vibrate the capacitor with an 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.