

# Specification Sheet

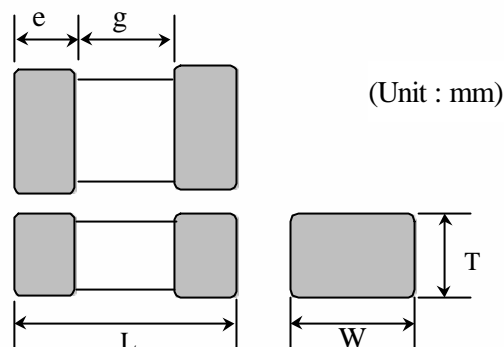
<Chip Monolithic Ceramic Capacitor>

Murata Global P/N : GRM188R71H272KA01D (0603,X7R,2700pF,50V)

Corresponding products for RoHS directive

## 1.Dimensions (Unit : mm)

L	1.6+/-0.1
W	0.8+/-0.1
T	0.8+/-0.1
E	0.2 to 0.5
g	0.5 min.



## 2. Rated Value

TC code	R7
TC	X7R
Temp.Coeff or Cap.Change	+/-15% at -55 to 125°C
CAP. , CAP.TOL	2700pF , +/-10%
DC Rated Voltage	50V
Size Code	0603

## 3.Packaging

Specification	Packaging unit [pcs/reel]
φ178 Paper Tape Carrier Packaging	4000

## 4.Specification

Please refer to next page.

### △Note

- (1) This specification sheet is applied for CHIP MONOLITHIC CERAMIC CAPACITOR used for General Electronics equipment for your design.
- (2) Please contact our sales representative or product engineers before using our products for the application listed below.
  - ① Aircraft equipment
  - ② Aerospace equipment
  - ③ Undersea equipment
  - ④ Medical equipment
  - ⑤ Transportation equipment
  - ⑥ Traffic signal equipment
  - ⑦ Disaster prevention / crime prevention equipment
  - ⑧ Application of similar complexity and/or requirements to the applications listed in the above.
- (3) Solderability of Tin plating termination chip might be deteriorated when low temperature soldering profile where peak solder temperature is below the Tin melting point is used. Please confirm the solderability of Tin plating termination chip before use.
- (4) Use of Sn-Zn based solder will deteriorate reliability of MLCC. Please contact murata factory for the use of Sn-Zn based solder in advance.
- (5) This specification sheet has only typical specification because there is no space for detailed specifications. Therefore, please approve our product specification or transact the approval sheet for product specification before your ordering. Especially, please read rating and CAUTION (for storage, operating, rating, soldering, mounting, and handling) in them to prevent smoking and /or burning, etc.
- (6) You are able to read a detailed specification of our some products listed in this specification sheet in the web-site of MURATA (<http://www.murata.com/>) before to require our product specification or to transact the approval sheet.
- (7) Product specifications are subject to change without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

Product Engineering Department  
Monolithic Ceramic Capacitor Group  
FUKUI MURATA MFG. CO., LTD.

No.	Item	Specification		Test Method																																								
		Temperature Compensating Type	High Dielectric Type																																									
1	Operating Temperature Range	-55°C to +125°C	R6 : -55°C to +85°C    R7 : -55°C to +125°C C8 : -55°C to +105°C    E4 : 10°C to +85°C F5 : -30°C to +85°C	Reference Temperature : 25°C																																								
2	Rated Voltage	See the previous pages		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, $V_{P-P}^P$ or $V_{D-P}^P$ , whichever is larger, should be maintained within the rated voltage range.																																								
3	Appearance	No defects or abnormalities		Visual inspection.																																								
4	Dimension	Within the specified dimensions		Using calipers or Microscope. (GRM02 size is based on Microscope)																																								
5	Dielectric Strength	No defects or abnormalities		No failure should be observed when 300% of the rated voltage ( $\Delta C$ to 7U and 1X) or 250% of the rated voltage (R6, R7,C8,E4 and F5) is applied between the terminations for 1 to 5 seconds, provided the charge/ discharge current is less than 50mA.																																								
6	Insulation Resistance	More than 10,000M $\Omega$ or 500 $\Omega$ ·F (whichever is smaller)		The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging.																																								
7	Capacitance	Within the specified tolerance		The capacitance/Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table.																																								
8	Q/ Dissipation Factor (D.F.)	30pF and over : $Q \geq 1000$  30pF and below : $Q \geq 400+20C$  C:Nominal Capacitance (pF)	[R6,R7,C8] W.V.:100V : 0.025max.(C < 0.068 $\mu$ F) : 0.05max.(C $\geq$ 0.068 $\mu$ F) W.V.:25/50V : 0.025max. W.V.:16/10V : 0.035max. W.V.:6.3V/4V : 0.05max. (C < 3.3 $\mu$ F) : 0.1max.(C $\geq$ 3.3 $\mu$ F) [E4] W.V.:25Vmin : 0.025max. [F5] W.V.:25Vmin. : 0.05max. (C < 0.1 $\mu$ F) : 0.09max. (C $\geq$ 0.1 $\mu$ F) W.V.:16/10V:0.125max. W.V.:6.3V:0.15max.	<table><tr><th>Char.</th><th><math>\Delta C</math> to 7U, 1X (1000pF and below)</th><th><math>\Delta C</math> to 7U, 1X (more than 1000pF) R6,R7,C8,F5 (C <math>\leq</math> 10<math>\mu</math>F)</th><th>R6,R7,F5 (C &gt; 10<math>\mu</math>F)</th><th>E4</th></tr><tr><th>Item</th><td></td><td></td><td></td><td></td></tr><tr><td>Frequency</td><td>1<math>\pm</math>0.1MHz</td><td>1<math>\pm</math>0.1kHz</td><td>120<math>\pm</math>24Hz</td><td>1<math>\pm</math>0.1kHz</td></tr><tr><td>Voltage</td><td>0.5 to 5Vrms</td><td>1<math>\pm</math>0.2Vrms</td><td>0.5<math>\pm</math>0.1Vrms</td><td>0.5<math>\pm</math>0.05Vrms</td></tr></table>	Char.	$\Delta C$ to 7U, 1X (1000pF and below)	$\Delta C$ to 7U, 1X (more than 1000pF) R6,R7,C8,F5 (C $\leq$ 10 $\mu$ F)	R6,R7,F5 (C > 10 $\mu$ F)	E4	Item					Frequency	1 $\pm$ 0.1MHz	1 $\pm$ 0.1kHz	120 $\pm$ 24Hz	1 $\pm$ 0.1kHz	Voltage	0.5 to 5Vrms	1 $\pm$ 0.2Vrms	0.5 $\pm$ 0.1Vrms	0.5 $\pm$ 0.05Vrms																				
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9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance. (Table A -1)	<table><tr><th>Char.</th><th>Temp. Range</th><th>Reference Temp.</th><th>Cap. Change</th></tr><tr><td>R6</td><td>-55°C to +85°C</td><td rowspan="5">25°C</td><td>Within <math>\pm 15\%</math></td></tr><tr><td>R7</td><td>-55°C to +125°C</td><td>Within <math>\pm 15\%</math></td></tr><tr><td>C8</td><td>-55°C to +105°C</td><td>Within <math>\pm 22\%</math></td></tr><tr><td>E4</td><td>+10°C to +85°C</td><td>+22 Within 56 %</td></tr><tr><td>F5</td><td>-30°C to +85°C</td><td>+22 Within 82 %</td></tr></table>	Char.	Temp. Range	Reference Temp.	Cap. Change	R6	-55°C to +85°C	25°C	Within $\pm 15\%$	R7	-55°C to +125°C	Within $\pm 15\%$	C8	-55°C to +105°C	Within $\pm 22\%$	E4	+10°C to +85°C	+22 Within 56 %	F5	-30°C to +85°C	+22 Within 82 %																				
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Temperature Coefficient	Within the specified tolerance. (Table A -1)																																											
Capacitance Drift	Within $\pm 0.2\%$ or $\pm 0.05$ pF (Whichever is larger.) *Not apply to 1X/25V																																											
				<p>The capacitance change should be measured after 5 min. at each specified temperature stage.</p> <p>(1) Temperature Compensating Type</p> <p>The temperature coefficient is determined using the capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step1 through 5 (<math>\Delta C</math>: +25°C to +125°C, other temp. coeffs.: +25°C to +85°C) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A-1. The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in the step 1,3 and 5 by the cap value in step 3.</p> <table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>1</td><td>25<math>\pm</math>2</td></tr><tr><td>2</td><td>-55<math>\pm</math>3(for<math>\Delta C</math> to 7U/1X/R6/R7/C8) -30<math>\pm</math>3(for F5), 10<math>\pm</math>3(for E4)</td></tr><tr><td>3</td><td>25<math>\pm</math>2</td></tr><tr><td>4</td><td>125<math>\pm</math>3(for <math>\Delta C</math>/R7), 105<math>\pm</math>3(for C8) 85<math>\pm</math>3(for other TC)</td></tr><tr><td>5</td><td>25<math>\pm</math>2</td></tr></table> <p>(2) High Dielectric Constant Type</p> <p>The ranges of capacitance change compared with the 25°C value over the temperature ranges shown in the table should be within the specified ranges.</p> <p>Initial measurement for high dielectric constant type.</p> <p>Perform a heat treatment at 150+0/-10°C for one hour and then set for 24<math>\pm</math>2 hours at room temperature.</p> <p>Perform the initial measurement.</p>	Step	Temperature(°C)	1	25 $\pm$ 2	2	-55 $\pm$ 3(for $\Delta C$ to 7U/1X/R6/R7/C8) -30 $\pm$ 3(for F5), 10 $\pm$ 3(for E4)	3	25 $\pm$ 2	4	125 $\pm$ 3(for $\Delta C$ /R7), 105 $\pm$ 3(for C8) 85 $\pm$ 3(for other TC)	5	25 $\pm$ 2																												
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10	Adhesive Strength of Termination	No removal of the terminations or other defect should occur.		<p>Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply *10N force in parallel with the test jig for 10<math>\pm</math>1sec.</p> <p>The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock</p> <p>*5N (GR<math>\square</math>15, GRM18) 2N (GR<math>\square</math>03), 1N (GR<math>\square</math>02)</p> <table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GR<math>\square</math>02</td><td>0.2</td><td>0.56</td><td>0.23</td></tr><tr><td>GR<math>\square</math>03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GR<math>\square</math>15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr><tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr><tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr><tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table> <p>(in:mm)</p>	Type	a	b	c	GR $\square$ 02	0.2	0.56	0.23	GR $\square$ 03	0.3	0.9	0.3	GR $\square$ 15	0.4	1.5	0.5	GRM18	1.0	3.0	1.2	GRM21	1.2	4.0	1.65	GRM31	2.2	5.0	2.0	GRM32	2.2	5.0	2.9	GRM43	3.5	7.0	3.7	GRM55	4.5	8.0	5.6
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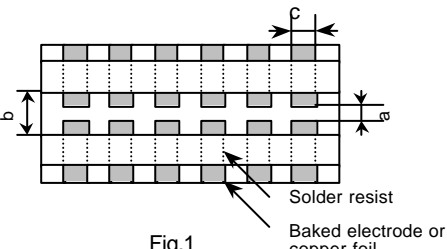
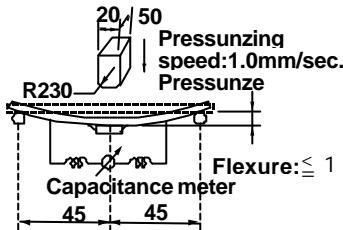
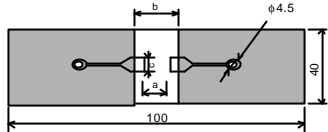


Fig.1

Solder resist

Baked electrode or copper foil

No.	Item		Specification		Test Method																																								
			Temperature Compensating Type	High Dielectric Type																																									
11	Vibration	Appearance	No defects or abnormalities																																										
	Resistance	Capacitance	Within the specified tolerance																																										
		Q/D.F.	30pF and over:Q ≥1000  30pF and below: Q ≥ 400+20C  C:Nominal Capacitance (pF)	[R6,R7,C8] W.V.:100V : 0.025max.(C < 0.068μF) : 0.05max.(C ≥ 0.068μF) W.V.:25/50V :0.025max. W.V.:16/10V :0.035max. W.V.:6.3V/4V :0.05max.(C < 3.3μF) :0.1max.(C ≥ 3.3μF) [E4] W.V.:25Vmin. :0.025max [F5] W.V.:25Vmin. :0.05max.(C < 0.1μF) :0.09max.(C ≥ 0.1μF) W.V.:16/10V:0.125max. W.V.:6.3V:0.15max.																																									
12	Deflection		No crack or marked defect should occur <div> Fig.3</div>		Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig 3for 5±1sec. The soldering should be done by the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. <div> Fig.2 t : 1.6mm (GR□02/03,GR□15:0.8mm) <table><tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr><tr><td>GR□02</td><td>0.2</td><td>0.56</td><td>0.23</td></tr><tr><td>GR□03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr><tr><td>GR□15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr><tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr><tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr><tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr><tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr><tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr><tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr></table> (in:mm)</div>	Type	a	b	c	GR□02	0.2	0.56	0.23	GR□03	0.3	0.9	0.3	GR□15	0.4	1.5	0.5	GRM18	1.0	3.0	1.2	GRM21	1.2	4.0	1.65	GRM31	2.2	5.0	2.0	GRM32	2.2	5.0	2.9	GRM43	3.5	7.0	3.7	GRM55	4.5	8.0	5.6
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13	Solderability of Termination		75% of the terminations is to be soldered evenly and continuously		Immerse the capacitor in a solution of ethanol(JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight propotion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating , immerse in an eutectic solder solution for 2±0.5 seconds at 230±5°C or Sn-3.0Ag-0.5Cu solder solution for 2±0.5 seconds at 245±5°C.																																								
14	Resistance to Soldering Heat		The measured and observed characteristics should satisfy the specifications in the following table		Preheat the capacitor at *120 to 150°C for 1 minute. Immerse the capacitor in an eutectic solder solution* or Sn-3.0Ag-0.5Cu solder solution at 270±5°C for 10±0.5 seconds. Set at room temperature for 24±2 hours, then measure. *Not apply to GRM02  · Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10°C for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement.  *Preheating for GRM32/43/55 <table><tr><th>Step</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>100°C to 120°C</td><td>1 min.</td></tr><tr><td>2</td><td>170°C to 200°C</td><td>1 min.</td></tr></table>	Step	Temperature	Time	1	100°C to 120°C	1 min.	2	170°C to 200°C	1 min.																															
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	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6,R7,C8:Within ±7.5% E4,F5:Within ±20%																																										
	Q/D.F.	30pF and over:Q ≥1000  30pF and below: Q ≥ 400+20C  C:Nominal Capacitance (pF)	[R6,R7,C8] W.V.:100V : 0.025max.(C < 0.068μF) : 0.05max.(C ≥ 0.068μF) W.V.:25/50V :0.025max. W.V.:16/10V :0.035max. W.V.:6.3V/4V :0.05max(C < 3.3μF) :0.1max.(C ≥ 3.3μF) [E4] W.V.:25Vmin :0.025max [F5] W.V.:25Vmin :0.05max.(C < 0.1μF) :0.09max.(C ≥ 0.1μF) W.V.:16/10V:0.125max. W.V.:6.3V:0.15max.																																										
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	Dielectric Strength	No defects																																											

No.	Item	Specification		Test Method															
		Temperature Compensating Type	High Dielectric Type																
15	Temperature Cycle	The measured and observed characteristics should satisfy the specifications in the following table		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments shown in the following table. Set for 24±2 hours at room temperature, then measure <table><tr><th>Step</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><td>Temp.(°C)</td><td>Min. Operating Temp. +0/-3</td><td>Room Temp.</td><td>Max. Operating Temp. +3/-0</td><td>Room Temp.</td></tr><tr><td>Time (min.)</td><td>30±3</td><td>2 to 3</td><td>30±3</td><td>2 to 3</td></tr></table> · Initial measurement for high dielectric constant type Perform a heat treatment at 150+0/-10 °C for one hour and then set at room temperature for 24±2 hours. Perform the initial measurement	Step	1	2	3	4	Temp.(°C)	Min. Operating Temp. +0/-3	Room Temp.	Max. Operating Temp. +3/-0	Room Temp.	Time (min.)	30±3	2 to 3	30±3	2 to 3
	Step	1	2		3	4													
	Temp.(°C)	Min. Operating Temp. +0/-3	Room Temp.		Max. Operating Temp. +3/-0	Room Temp.													
	Time (min.)	30±3	2 to 3		30±3	2 to 3													
	Appearance	No defects or abnormalities																	
	Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	R6,R7,C8:Within ±7.5% E4,F5:Within ±20%																
Q/D.F.	30pF and over:Q ≥ 1000  30pF and below: Q ≥ 400+20C  C:Nominal Capacitance (pF)	[R6,R7,C8] W.V.:100V : 0.025max. (C < 0.068μF) : 0.05max.(C ≥ 0.068μF) W.V.:25/50V :0.025max. W.V.:16/10V :0.035max. W.V.:6.3V/4V :0.05max. (C < 3.3μF) :0.1max. (C ≥ 3.3μF)  [E4] W.V.:25Vmin. :0.025max [F5] W.V.:25Vmin. :0.05max. (C < 0.1μF) :0.09max.(C ≥ 0.1μF) W.V.:16/10V:0.125max. W.V.:6.3V:0.15max.																	
I.R.	More than 10,000MΩ or 500Ω·F (Whichever is smaller)																		
	Dielectric Strength	No defects																	
16	Humidity Steady State	The measured and observed characteristics should satisfy the specifications in the following table		Set the capacitor at 40±2°C and in 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure.															
	Appearance	No defects or abnormalities																	
	Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	R6,R7,C8:Within ±12.5% E4,F5:Within ±30%																
	Q/D.F.	30pF and over:Q ≥ 350 10pF and over, Q ≥ 275 + $\frac{5}{2}$ C  30pF and below: Q ≥ 200+10C C:Nominal Capacitance(pF)	[R6,R7,C8] W.V.:100V : 0.05max. (C < 0.068μF) : 0.075max. (C ≥ 0.068μF) W.V.:25/50V :0.05max. W.V.:16/10V :0.05max. W.V.:6.3V/4V:0.075max. (C < 3.3μF) :0.125max. (C ≥ 3.3μF)  [E4] W.V.:25Vmin.:0.05max. [F5] W.V.:25Vmin. :0.075max. (C < 0.1μF) :0.125max. (C ≥ 0.1μF) W.V.:16/10V:0.15max. W.V.:6.3V:0.2max.																
	I.R.	More than 1,000MΩ or 50Ω·F (Whichever is smaller)																	
	Dielectric Strength	No defects																	
17	Humidity Load	The measured and observed characteristics should satisfy the specifications in the following table		Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.  ·Initial measurement for F5/16Vmax. Apply the rated DC voltage for 1 hour at 40±2°C . Remove and set for 24±2 hours at room temperature. Perform initial measurement.															
	Appearance	No defects or abnormalities																	
	Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	R6,R7,C8:Within ±12.5% E4:Within ±30% F5:Within ±30% (W.V. >10V) F5:Within +30/-40% (W.V. ≤ 10V)																
	Q/D.F.	30pF and over:Q ≥ 200  30pF and below: Q ≥ 100 + $\frac{10}{3}$ C C:Nominal Capacitance(pF)	[R6,R7,C8] W.V.:100V : 0.05max. (C < 0.068μF) : 0.075max. (C ≥ 0.068μF) W.V.:25/50V :0.05max. W.V.:16/10V :0.05max. W.V.:6.3V/4V:0.075max. (C < 3.3μF) :0.125max. (C ≥ 3.3μF)  [E4] W.V.:25Vmin.:0.05max. [F5] W.V.:25Vmin. :0.075max. (C < 0.1μF) :0.125max. (C ≥ 0.1μF) W.V.:16/10V:0.15max. W.V.:6.3V:0.2max.																
	I.R.	More than 500MΩ or 25Ω·F (Whichever is smaller)																	
	Dielectric Strength	No defects																	

No.	Item	Specification		Test Method
		Temperature Compensating Type	High Dielectric Type	
18	High Temperature Load	The measured and observed characteristics should satisfy the specifications in the following table		Apply 200% of the rated voltage at the maximun operating temperature ±3°C for 1000±12 hours . Set for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.  -Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage at the maximun operating temperature ±3°C for one hour. Remove and set for 24±2 hours at room temperature.Perform initial measurement.
	Appearance	No defects or abnormalities		
	Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	R6,R7,C8:Within ±12.5% E4:Within ±30% F5:Within±30% (Cap<1.0 ≥μF) F5:Within +30/-40% (Cap≥ 1.0μF)	
	Q/D.F.	30pF and over:Q ≥350 10pF and over, 30pF and below:  Q ≥ 275+ 5/2 C  10pF and below: Q ≥ 200+10C  C:Nominal Capacitance(pF)	[R6,R7,C8] W.V.:100V : 0.05max.(C < 0.068μF) : 0.075max. (C ≥ 0.068μF)  W.V.:25/50V :0.05max. W.V.:16/10V :0.05max. W.V.:6.3V /4V :0.075max. (C < 3.3μF) :0.125max. (C ≥ 3.3μF) [E4] W.V.:25Vmin.:0.05max. [F5] W.V.:25Vmin. :0.075max. (C< 0.1μF) :0.125max.(C ≥ 0.1μF) W.V.:16/10V:0.15max. W.V.:6.3V:0.2max.	
	I.R.	More than 1,000MΩor 50Ω·F(Whichever is smaller)		
	Dielectric Strength	No defects		

Table A-1

Char.	Nominal Values (ppm/ $^{\circ}\text{C}$ ) Note 1	Capacitance Change from $25^{\circ}\text{C}$ (%)					
		-55		-30		-10	
		Max.	Min.	Max.	Min.	Max.	Min.
5C	$0 \pm 30$	0.58	-0.24	0.40	-0.17	0.25	-0.11
6C	$0 \pm 60$	0.87	-0.48	0.59	-0.33	0.38	-0.21
6P	$-150 \pm 60$	2.33	0.72	1.61	0.50	1.02	0.32
6R	$-220 \pm 60$	3.02	1.28	2.08	0.88	1.32	0.56
6S	$-330 \pm 60$	4.09	2.16	2.81	1.49	1.79	0.95
6T	$-470 \pm 60$	5.46	3.28	3.75	2.26	2.39	1.44
7U	$-750 \pm 120$	8.78	5.04	6.04	3.47	3.84	2.21
1X	$+350 \sim -1000$	-	-	-	-	-	-

Note 1: Nominal values denote the temperature coefficient within a range of  $25^{\circ}\text{C}$  to  $125^{\circ}\text{C}$  (for  $\Delta C$ )/ $85^{\circ}\text{C}$  (for other TC).