

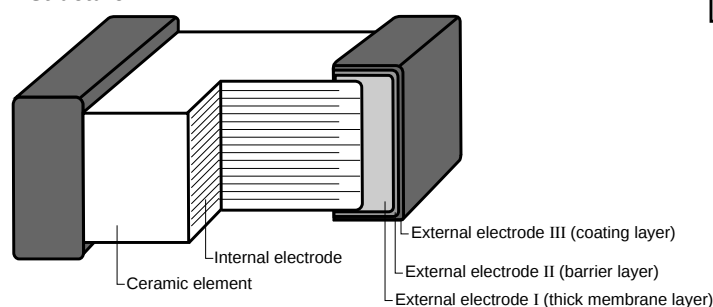
Multi-layer ceramic chip capacitors

MCH18 (1608 (0603) size, chip capacitor)

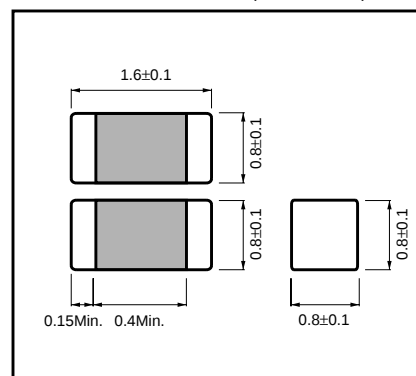
●Features

- 1) Small size (1.6 x 0.8 x 0.8 mm) makes it perfect for lightweight portable devices.
- 2) Comes packed either in tape to enable automatic mounting or in bulk cases.
- 3) Precise uniformity of shape and dimensions highly efficient automatic mounting.
- 4) Barrier layer and end terminations to improve solderability.

●Structure



●External dimensions (Units : mm)



●Product designation

Code	Product thickness	Packaging specifications	Reel	Basic ordering (pcs.)
K	0.8mm	Paper tape (width 8 mm, pitch 4 mm)	φ180mm (7in.)	4,000
L	0.8mm	Paper tape (width 8 mm, pitch 4 mm)	φ330mm (13in.)	16,000
C	0.8mm	Bulk case	—	15,000

Ree l(φ180,φ330mm) : compatible with EIAJ ET-7200A
Bulk case : compatible with EIAJ ET-7201A

Packaging style

Part No.



Code	Voltage
2	25V
3	16V
5	50V

Capacitance-temperature characteristics				Nominal capacitance	Capacitance tolerance	
Code	Code	Operating temperature (°C)	Temp. coefficient or percent change		Code	tolerance
A	CG(COG)	-55~+125	±30ppm/°C	3-digit designation according to IEC	C	±0.25pF (0.5 ~ 5pF)
CN	R	-55~+125	±15%		D	±0.5pF (5.1 ~ 10pF)
	B (X7R)	-25~+85 (-55~+125)	±10% (±15%)		J	±5% (11pF or more)
FN	F (Y5V)	-25~+85 (-30~+85)	+30%, -80% (+22%, -82%)		K	±10%
					Z	+80%, -20%

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Ceramic capacitors

●Capacitance range

For thermal compensation

Part number.		MCH18
Capacitance(pF)	Temperature characteristics	A (CG) (C0G)
	Rated voltage (V) Tolerance	50
0.5	C (± 0.25pF)	
0.75		
1		
1.1		
1.2		
1.3		
1.5		
1.6		
1.8		
2		
2.2		
2.4		
2.7		
3		
3.3		
3.6	D (± 0.5pF)	
3.9		
4		
4.3		
4.7		
5		
5.1		
5.6		
6		
6.2		
6.8		
7		
7.5		
8		
8.2		
9	J (± 5%)	
9.1		
10		
11		
12		
13		
15		
16		
18		
20		
22		
24		
27		
30		
33		
36		
39		
43		
47		
51		
56		
62		
68		
75		
82		
91		
100		

Part number.		MCH18
Capacitance (pF)	Temperature characteristics	A (CG) (C0G)
	Rated voltage (V) Tolerance	50
110	J (± 5%)	
120		
130		
150		
160		
180		
200		
220		
240		
270		
300		
330		
360		
390		
430		
470		
510		
560		
620		
680		
750		
820		
910		
1,000		

 Product thickness (mm) 0.8 ± 0.1

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Ceramic capacitors

High dielectric constant

Part number		MCH18				
Capacitance(pF)	Temperature characteristics	CN (R) (B) (X7R)		FN (F) (Y5V)		
	Rated voltage (V)	50	25	50	25	16
	Tolerance	K ($\pm 10\%$)		Z (+80%, -20%)		
220						
270						
330						
390						
470						
560						
680						
820						
1,000						
1,200						
1,500						
1,800						
2,200						
2,700						
3,300						
3,900						
4,700						
5,600						
6,800						
8,200						
10,000 (0.01 μ F)						
12,000						
15,000						
18,000						
22,000						
27,000						
33,000						
39,000						
47,000						
56,000						
68,000						
82,000						
100,000 (0.1 μ F)						
120,000						
150,000						
180,000						
220,000						
270,000						
330,000						
390,000						
470,000						
560,000						
680,000						
1,000,000 (1 μ F)						
1,200,000						
1,500,000						
1,800,000						
2,200,000						

Product thickness (mm) 0.8 $\pm$ 0.1

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Ceramic capacitors

● Characteristics

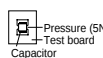
Class 1 (For thermal compensation)

Temperature characteristics		A (CG) (C0G)	Test methods / conditions (based on JIS C 5102)
Item			
Operating temperature		-55°C ~ +125°C	—
Nominal capacitance (C)		Must be within the specified tolerance range.	Based on paragraph 7.8 and paragraph 9 Measured at room temperature and standard humidity. 1000pF or less Measurement frequency : 1± 0.1MHz Measurement voltage : 1± 0.1Vrms. Over 1000pF Measurement frequency : 1± 0.1kHz Measurement voltage : 1± 0.1Vrms.
Dissipation factor (tan δ)		100 / (400 + 20C)% or less (Less than 30 pF) 0.1% or less (30 pF or larger)	
Insulation resistance (IR)		10,000MΩ or 500MΩ·μF, whichever is smaller	Based on paragraph 7.6 Measurement is made after rated voltage is applied for 60 ± 5s.
Withstanding voltage		The insulation must not be damaged.	Based on paragraph 7.1 Apply 300% of the rated voltage for 1 to 5s then measure.
Temperature characteristics		Within 0 ± 30ppm / °C	The temperature coefficients in table 12, paragraph 7.12 are calculated at 20°C and high temperature.
Terminal adherence		No detachment or signs of detachment.	Based on paragraph 8.11.2 Apply 5N for 10 ± 1s in the direction indicated by the arrow. 
Resistance to vibration	Appearance	There must be no mechanical damage.	Chip is mounted to a board in the manner shown on the right, subjected to vibration (type A in paragraph 8.2), and measured 24 ± 2 hrs. later. 
	Rate of capacitance change	Must be within initial tolerance.	
	Dissipation factor (tanδ)	Must satisfy initial specified value.	
Solderability		At least 3 / 4 of the surface of the two terminals must be covered with new solder.	Based on paragraph 8.13 Soldering temperature : 235 ± 5°C Soldering time : 2 ± 0.5s
Resistance to soldering heat	Appearance	There must be no mechanical damage.	Based on paragraph 8.14 Soldering temperature : 260 ± 5°C Soldering time : 5 ± 0.5s Preheating : 150 ± 10°C for 1 to 2 min.
	Rate of capacitance change	± 2.5% or ± 0.25 pF, whichever is larger.	
	Dissipation factor (tanδ)	Must satisfy initial specified value.	
	Insulation resistance	10,000MΩ or 500MΩ·μF, whichever is smaller	
	Withstanding voltage	The insulation must not be damaged.	
Temperature cycling	Appearance	There must be no mechanical damage.	Based on paragraph 9.3 Number of cycles : 5 Capacitance measured after 24 ± 2 hrs.
	Rate of capacitance change	± 2.5% ± 0.25 pF, whichever is larger.	
	Dissipation factor (tanδ)	Must satisfy initial specified value.	
	Insulation resistance	10,000MΩ or 500MΩ·μF, whichever is smaller	
Humidity load test	Appearance	There must be no mechanical damage.	Based on paragraph 9.9 Test temperature : 40 ± 2°C Relative humidity : 90% to 95% Applied voltage : rated voltage Test time : 500 to 524 hrs. Capacitance measured after 24 ± 2 hrs.
	Rate of capacitance change	± 7.5% or ± 0.75 pF, whichever is larger.	
	Dissipation factor (tanδ)	0.5% or less	
	Insulation resistance	500MΩ or 25MΩ·μF, whichever is smaller	
High-temperature load test	Appearance	There must be no mechanical damage.	Based on paragraph 9.10 Test temperature : Max. operating temp. Applied voltage : rated voltage × 200% Test time : 1,000 to 1,048 hrs. Capacitance measured after 24 ± 2 hrs.
	Rate of capacitance change	± 3.0% or ± 0.3 pF, whichever is larger.	
	Dissipation factor (tanδ)	0.3% or less	
	Insulation resistance	1,000MΩ or 50MΩ·μF, whichever is smaller	

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Ceramic capacitors

Class 2 (High dielectric constant)

Temperature characteristics		CN (R) (B) (X7R)	FN (F) (Y5V)	Test methods/conditions (based on JIS C 5102)
Item				
Operating temperature		-55°C ~ +125°C	-30°C ~ +85°C	—
Nominal capacitance (C)		Must be within the specified tolerance range.		Based on paragraph 7.8 Measured at room temperature and standard humidity. Measurement frequency: 1 ± 0.1 kHz Measurement voltage : 1.0 ± 0.2 Vrms.
Dissipation factor (tanδ)		2.5% or less (when rated voltage is 16V: 3.5% or less)	5.0% or less (when rated voltage is 16V: 7.5% or less)	
Insulation resistance (IR)		10,000 MΩ or 500 MΩ · μF, whichever is smaller		Based on paragraph 7.6 Measurement is made after rated voltage is applied for 60 ± 5s.
Withstanding voltage		The insulation must not be damaged.		Based on paragraph 7.1 Apply 250% of the rated voltage for 1 to 5s then measure
Temperature characteristics		Within ± 15%	+ 22, + 82%	The temperature coefficients in paragraph 7.12, table 8, condition B, are based on measurements carried out at 20°C, with no voltage applied.
Terminal adherence		No detachment or signs of detachment		Based on paragraph 8. 11. 2. Apply 5N for 10 ± 1s in the direction indicated by the arrow. 
Resistance to vibration	Appearance	There must be no mechanical damage.		Chip is mounted to a board in the manner shown on the right, subjected to vibration (type A in paragraph 8.2), and measured 48 ± 4 hrs. later. 
	Rate of capacitance change	Must be within initial tolerance.		
	Dissipation factor (tanδ)	Must satisfy initial specified value.		
Solderability		At least 3/4 of the surface of the two terminals must be covered with new solder.		Based on paragraph 8. 13 Soldering temperature: 235 ± 5°C Soldering time : 2 ± 0.5s
Resistance to soldering heat	Appearance	There must be no mechanical damage.		Based on paragraph 8. 14. Soldering temperature: 260 ± 5°C Soldering time : 5 ± 0.5s Preheating : 150 ± 10°C for 1 to 2 min.
	Rate of capacitance change	Within ± 5.0%	Within ± 20.0%	
	Dissipation factor (tanδ)	Must satisfy initial specified value.		
	Insulation resistance	10,000MΩ or 500MΩ · μF, whichever is smaller		
	Withstanding voltage	The insulation must not be damaged.		
Temperature cycling	Appearance	There must be no mechanical damage.		Based on paragraph 9.3 Number of cycles : 5 Capacitance measured after 48 ± 4 hrs.
	Rate of capacitance change	Within ± 7.5%	Within ± 20.0%	
	Dissipation factor (tanδ)	Must satisfy initial specified value.		
	Insulation resistance	10,000MΩ or 500MΩ · μF, whichever is smaller		
Humidity load test	Appearance	There must be no mechanical damage.		Based on paragraph 9.9 Test temperature: 40 ± 2°C Relative humidity: 90% to 95% Applied voltage : rated voltage Test time : 500 to 524 hrs. Capacitance measured after 48 ± 4 hrs.
	Rate of capacitance change	± 12.5% or less	Within ± 30.0%	
	Dissipation factor (tanδ)	5.0% or less	7.5% or less (when rated voltage is 16V: 10.0%)	
	Insulation resistance	500MΩ or 25MΩ · μF, whichever is smaller		
High-temperature load test	Appearance	There must be no mechanical damage.		Based on paragraph 9.10 Test temperature: Max. operating temp. Applied voltage : rated voltage × 200% Test time : 1,000 to 1,048 hrs. Capacitance measured after 48 ± 4 hrs.
	Rate of capacitance change	Within ± 10.0%	Within ± 30.0%	
	Dissipation factor (tanδ)	5.0% or less	7.5% or less (when rated voltage is 16V: 10.0%)	
	Insulation resistance	1,000MΩ or 50MΩ · μF, whichever is smaller		

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Ceramic capacitors

●Packaging specifications

(Units : mm)

Taping

Diagram illustrating the dimensions for a paper tape. The dimensions are labeled as follows:

- ϕJ : Hole diameter
- C : Total width
- D : Distance between holes
- E : Hole diameter
- F : Distance from edge to first hole
- G : Distance between holes
- H : Distance from last hole to edge
- t : Thickness
- $t1$: Width of the tape edge

(Paper taping)

Pulling direction

Symbol	C	D	E	F	G	H	J	t	t1
Dimensions	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	$\phi 1.5$ $^{+0.1}_0$	1.05 MAX.	1.2 MAX.

Symbol Size	A	B
1608	1.0 ± 0.1	1.8 ± 0.1

Reel

φ180 mm plastic reel

Diagram illustrating the dimensions for a φ180 mm plastic reel. The dimensions are labeled as follows:

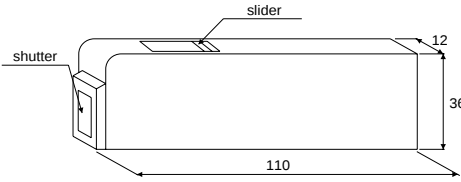
- $\phi 180 \pm 1.5$: Reel diameter
- $\phi 60 \pm 1.0$: Hub diameter
- 11.4 ± 1.0 : Hub width
- 9.0 ± 0.3 : Flange thickness
- $\phi 13 \pm 0.2$: Flange hole diameter
- Label position

φ330 mm plastic reel

Diagram illustrating the dimensions for a φ330 mm plastic reel. The dimensions are labeled as follows:

- $\phi 330 \pm 2.0$: Reel diameter
- $\phi 80 \pm 1.0$: Hub diameter
- 13.5 ± 1.0 : Hub width
- 9.5 ± 0.5 : Flange thickness
- $\phi 13 \pm 0.2$: Flange hole diameter
- Label position

EIAJ ET-7200A compliant

Bulk case			
			
EIAJ ET-7201A compliant	<table border="1"> <tr> <td>MCH18</td> <td>15,000pcs / case</td> </tr> </table>	MCH18	15,000pcs / case
MCH18	15,000pcs / case		

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Ceramic capacitors

●Electrical characteristics

■ A (C0G) Characteristics

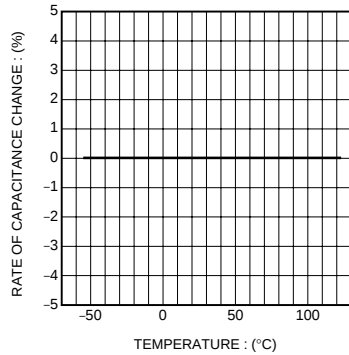


Fig.1 Capacitance - temperature characteristics

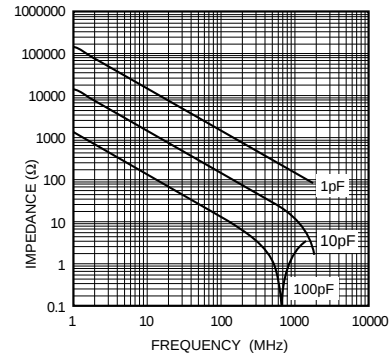


Fig.2 Impedance - frequency characteristics

■ CN (X7R) Characteristics

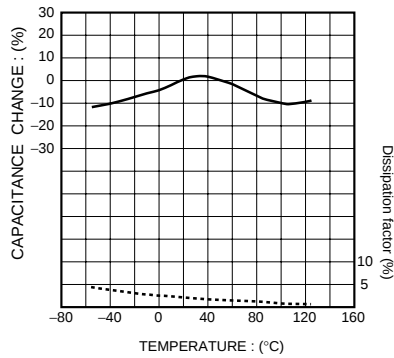


Fig.3 Capacitance - temperature characteristics

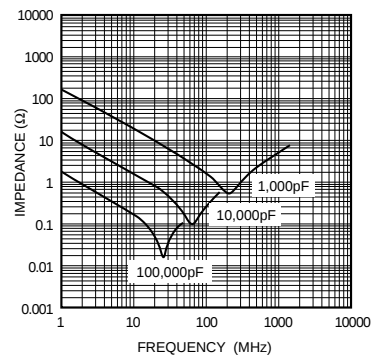


Fig.4 Impedance - frequency characteristics

■ FN (Y5V) Characteristics

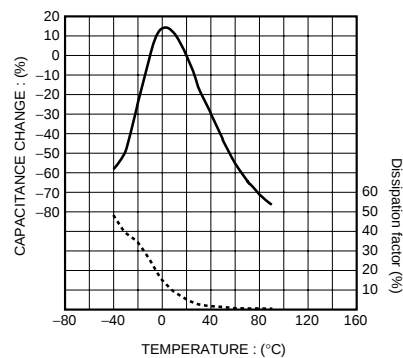


Fig.5 Capacitance - temperature characteristics

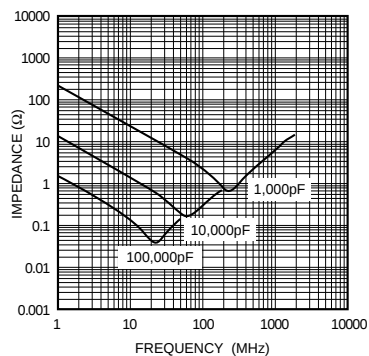


Fig.6 Impedance - frequency characteristics

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Ceramic capacitors

■ Temperature cycling test

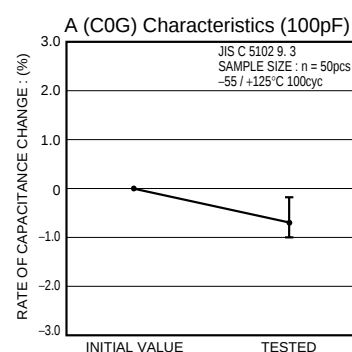


Fig.7 Rate of capacitance change

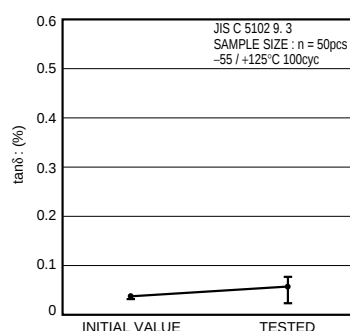


Fig.8 tanδ

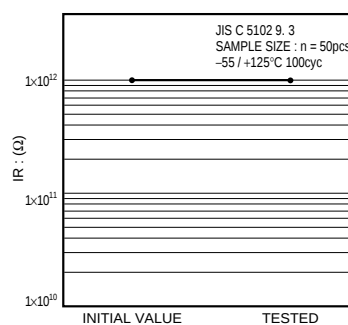


Fig.9 Insulation resistance

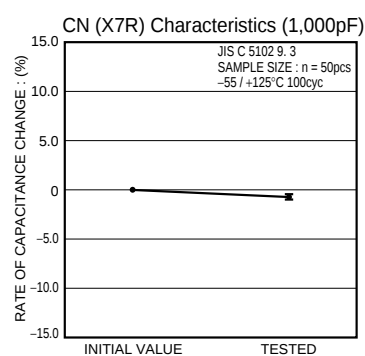


Fig.10 Rate of capacitance change

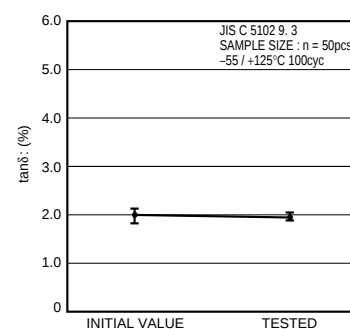


Fig.11 tanδ

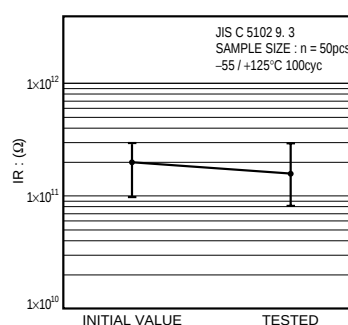


Fig.12 Insulation resistance

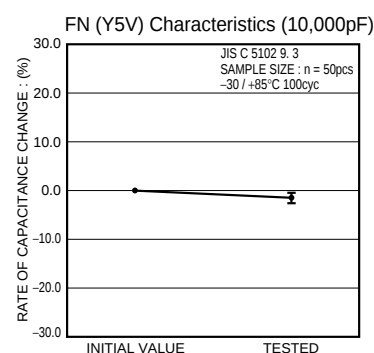


Fig.13 Rate of capacitance change

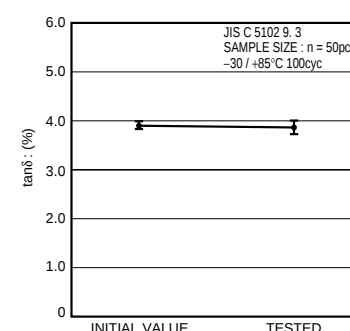


Fig.14 tanδ

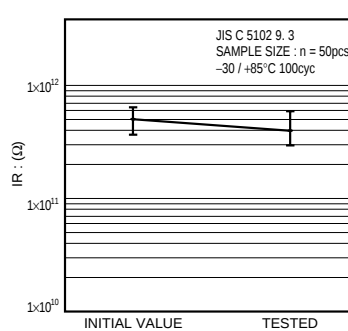


Fig.15 Insulation resistance

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Ceramic capacitors

■ High-temperature load test

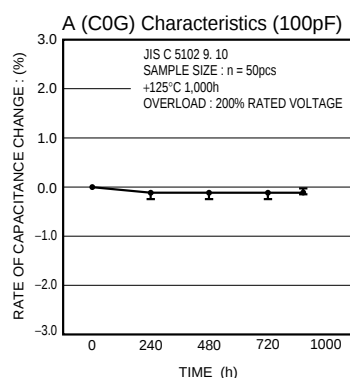


Fig.16 Rate of capacitance change

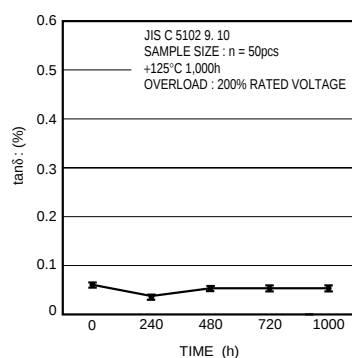
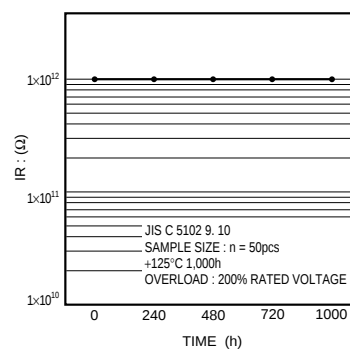
Fig.17 $\tan\delta$ 

Fig.18 Insulation resistance

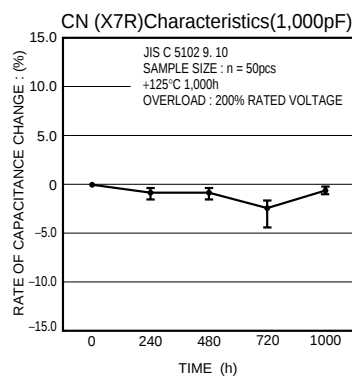


Fig.19 Rate of capacitance change

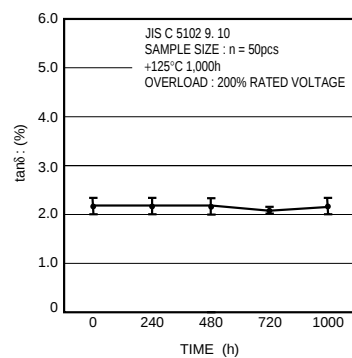
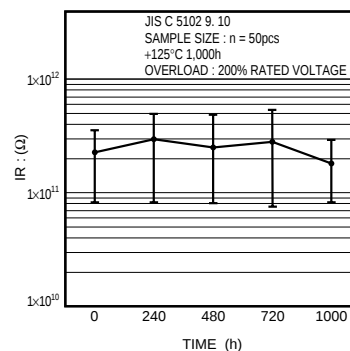
Fig.20 $\tan\delta$ 

Fig.21 Insulation resistance

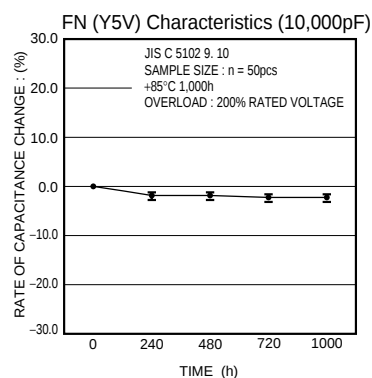


Fig.22 Rate of capacitance change

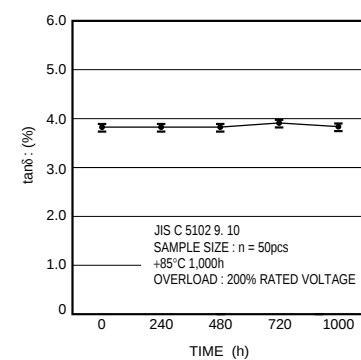
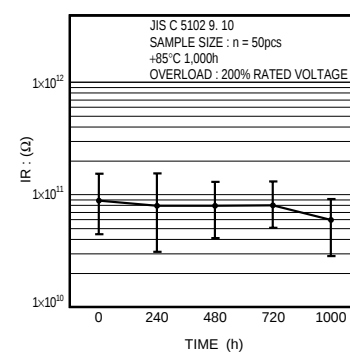
Fig.23 $\tan\delta$ 

Fig.24 Insulation resistance

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Ceramic capacitors

■ Humidity load test

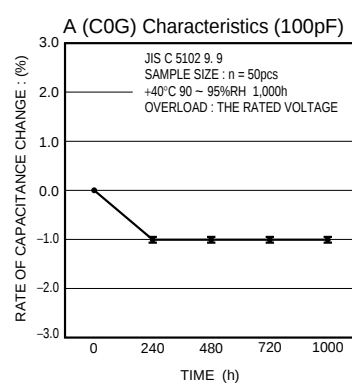


Fig.25 Rate of capacitance change

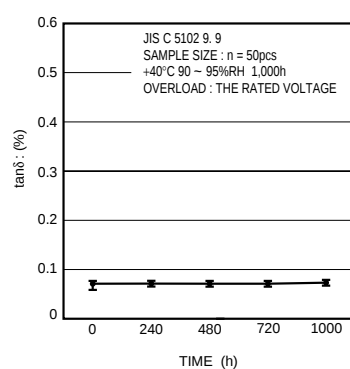
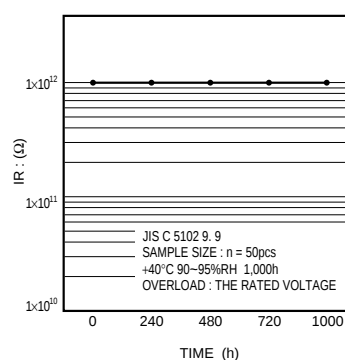
Fig.26 $\tan \delta$ 

Fig.27 Insulation resistance

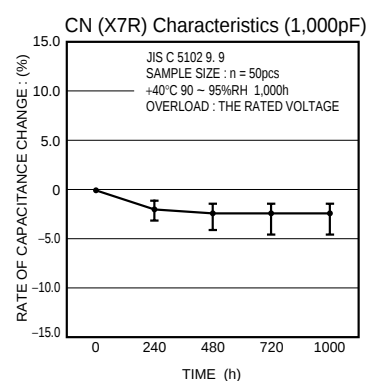


Fig.28 Rate of capacitance change

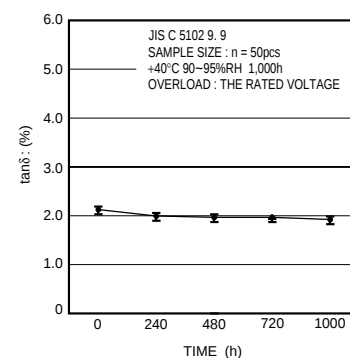
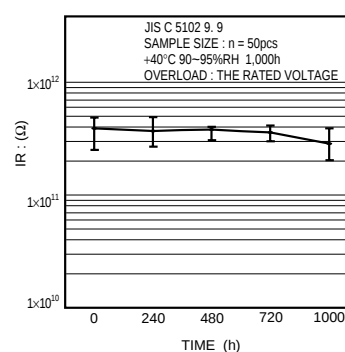
Fig.29 $\tan \delta$ 

Fig.30 Insulation resistance

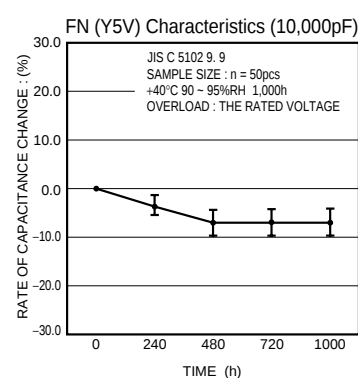


Fig.31 Rate of capacitance change

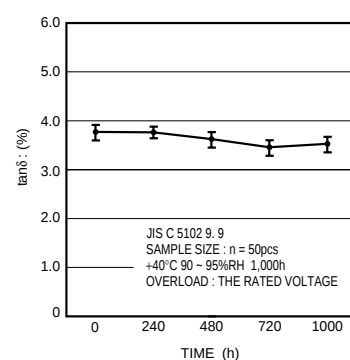
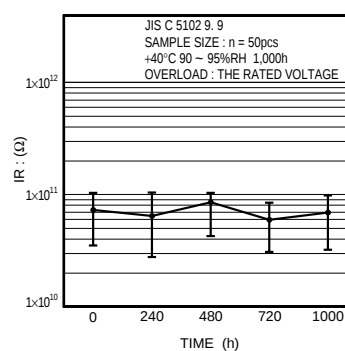
Fig.32 $\tan \delta$ 

Fig.33 Insulation resistance

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