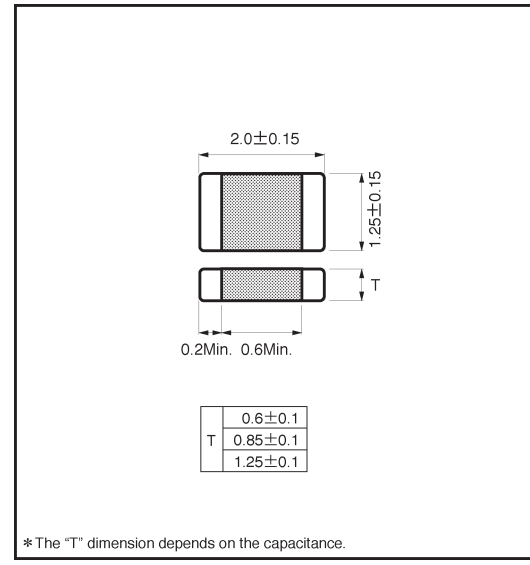
Multi–layer ceramic chip capacitors
MCH21 (2012 (0805) size, chip capacitor)

●Features

1) Small size (2.0 x 1.25 x 0.6 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 facilitates highly efficient automatic mounting.
4) Solder–coated terminals offer superior solderbility and resistance to soldering heat.

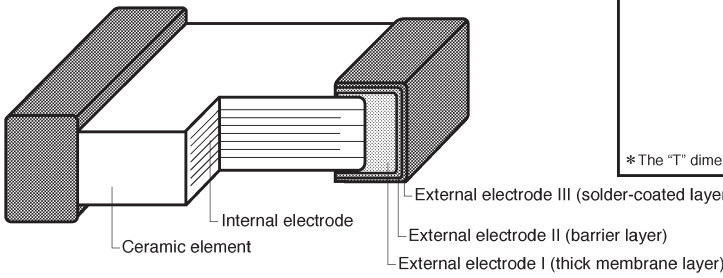
●External dimensions (Units: mm)



T	0.6±0.1
	0.85±0.1
	1.25±0.1

∗The "T" dimension depends on the capacitance.

●Structure



●Product Designation

Code	Product thickness	Packaging specification	Reel	Basic ordering unit (pcs.)
K	0.6,0.85mm	Paper tape (with 8 mm, pich 4 mm)	φ180mm (7in.)	4,000
L	0.6,0.85mm	Paper tape (with 8 mm, pich 4 mm)	φ330mm (13in.)	16,000
P	1.25mm	Plastic tape (with 8 mm, pich 4 mm)	φ180mm (7in.)	3,000
Q	1.25mm	Plastic tape (with 8 mm, pich 4 mm)	φ330mm (13in.)	12,000
C	0.6mm	Bulk case	—	10,000
	0.85,1.25mm	Bulk case	—	5,000

Reel (φ180,φ330mm) : compatible with EIAJ ETX-7001
Bulk case: according to EIAJ ET-7201A

Part No. — **Packaging style**

M	C	H	2	1	2	F	1	0	4	Z	K

Rated voltage

Code	Voltage
2	25V
3	16V
5	50V

Capacitance-temperature characteristics				Nominal capacitance	Capacitance tolerance	
Code	EIA code	Operating temperature (℃)	Temp. coefficient or percent change		Code	tolerance
A	C0G	−55 to +125	0±30ppm / ℃※	3-digit designation according to IEC	C	±0.25pF (0.5~5pF)
					D	±0.5pF (5.1~10pF)
					J	±5% (11pF or more)
C	X7R	−55 to +125 (−25 to +85)	±15% (±10%)		K	±10%
F	Y5V	−30 to +85	+22%,−82%		Z	+80%,−20%

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

●Capacitance range

For thermal compensation

Part number		MCH21
Capacitance (pF)	Temperature characteristics	A (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		
3.9		
4		
4.3		
4.7		
5		
5.1	D (±0.5pF)	
5.6		
6		
6.2		
6.8		
7		
7.5		
8		
8.2		
9		
9.1		
10		
11	J (±5%)	
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		MCH21
Capacitance (pF)	Temperature characteristics	A (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		
1,100		
1,200		
1,300		
1,500		
1,600		
1,800		
2,000		
2,200		
2,400		
2,700		
3,000		
3,300		
3,600		
3,900		
4,300		
4,700		
5,100		
5,600		
6,200		
6,800		
7,500		
8,200		
9,100		
10,000		
11,000		
12,000		
13,000		

Product thickness (mm)	0.6±0.1	0.85±0.1	1.25±0.1

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

High dielectric constant

Part number		MCH21					
Capacitance (pF)	Temperature characteristics	C (X7R)			F (Y5V)		
	Rated voltage (V)	50	25	16	50	25	16
	Tolerance	K (±10%)			Z (+80, −20%)		
220 270 330		0.6					
390 470 560		0.6					
680 820 1,000		0.6			0.6		
1,200 1,500 1,800		0.6					
2,200 2,700 3,300		0.6			0.6		
3,900 4,700 5,600		0.6			0.6		
6,800 8,200 10,000 (0.01 μF)		0.6			0.6		
12,000 15,000 18,000		0.6			0.6		
22,000 27,000 33,000		0.6 0.85 0.85	0.6 0.6		0.6 0.6		
39,000 47,000 56,000		0.85 1.25 1.25	0.6 0.85 0.85		0.6		
68,000 82,000 100,000 (0.1 μF)		1.25	0.85 1.25 1.25		0.6 0.85	0.6	
120,000 150,000 180,000			1.25 1.25	1.25	1.25	0.6	
220,000 270,000 330,000				1.25	1.25	0.85 1.25	
390,000 470,000 560,000						1.25	
680,000 1,000,000 (1 μF) 1,200,000							1.25
1,500,000 1,800,000 2,200,000							

Product thickness (mm) 0.6±0.1 0.85±0.1 1.25±0.1

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

●Characteristics

Class 1 (For thermal compensation)

Item \ Temperature characteristics		A (C0G)	Test methods/conditions (based on JIS C 5102)
Operating temperature		−55℃～+125℃	———
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.
Tan δ		100/(400+20C)% or less (Less than 30 pF) 0.1% or less (30 pF or larger)	
Insulation resistance (IR)		10,000 MΩ or larger, or 500 ΩF or larger, 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/℃	The temperature coefficients in table 12, paragraph 7.12 are calculated at 20℃ and high temperature.
Terminal adherence		No detachment or signs of detachment.	Based on paragraph 8.11. 2 Apply 5N (0.51 kg・f) 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.	
	Tan δ	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℃ 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℃ Soldering time : 5±0.5s Preheating : 150±10℃ for 1 to 2 min.
	Rate of capacitance change	±2.5% or less, or ±0.25 pF or less, whichever is larger.	
	Tan δ	Must satisfy initial specified value.	
	Insulation resistance	10,000 MΩ or larger, or 500 ΩF or larger, 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: 10 Capacitance measured after 24±2 hrs.
	Rate of capacitance change	±2.5% or less, or ±0.25 pF or less, whichever is larger.	
	Tan δ	Must satisfy initial specified value.	
	Insulation resistance	10,000 MΩ or larger, or 500 ΩF or larger, whichever is smaller	
Humidity load test	Appearance	There must be no mechanical damage.	Based on paragraph 9.9 Test temperature: 40±2℃ 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 less, or ±0.75 pF or less, whichever is larger.	
	Tan δ	0.5% or less	
	Insulation resistance	500 MΩ or larger, or 25 ΩF or larger, 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 x 200% Test time : 1,000 to 1,048 hrs. Capacitance measured after 24±2 hrs.
	Rate of capacitance change	±3.0% or less, or ±0.3 pF or less, whichever is larger.	
	Tan δ	0.3% or less	
	Insulation resistance	1,000 MΩ or larger, or 50 ΩF or larger, whichever is smaller	

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

Class 2 (High dielectric constant)

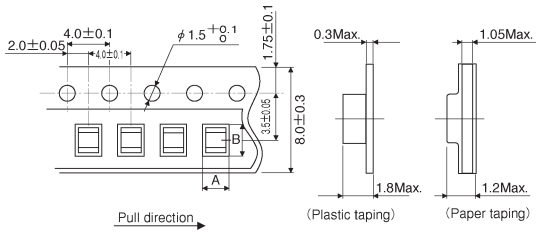
Item \ Temperature characteristics		C (X7R)	F (Y5V)	Test methods/conditions (based on JIS C 5102)
Operating temperature		−55℃～+125℃	−30℃～+85℃	———
Nominal capacitance (C)		Must be within the specified tolerance range.		Based on paragraph 7.8 Measured at room temperature and standard humidity. Measurement frequency: 1 ±0.1 kHz Measurement voltage : 0.1 ±0.2 Vrms.
Tan δ		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 larger, or 500 ΩF or larger, 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, are calculated at 20℃ and high temperature.
Terminal adherence		No peeling or sign of peeling on terminal.		Based on paragraph 8.11. 2 Apply 5N (0.51 kg·f) 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.		
	Tan δ	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℃ 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℃ Soldering time : 5±0.5s Preheating : 150±10℃ for 1 to 2 min.
	Rate of capacitance change	Within ±5.0%	Within ±20.0%	
	Tan δ	Must satisfy initial specified value.		
	Insulation resistance	10,000 MΩ or larger, or 500 ΩF or larger, 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: 10 Capacitance measured after 48 ±4 hrs.
	Rate of capacitance change	Within ±7.5%	Within ±20.0%	
	Tan δ	Must satisfy initial specified value.		
	Insulation resistance	10,000 MΩ or larger, or 500 ΩF or larger, whichever is smaller		
Humidity load test	Appearance	There must be no mechanical damage.		Based on paragraph 9.9 Test temperature : 40 ±2℃ 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%	
	Tan δ	5.0%or less	7.5% or less (when rated voltage is 16V: 10.0%)	
	Insulation resistance	500 MΩ or larger, or 25 ΩF or larger, 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 x 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%	
	Tan δ	5.0% or less	7.5% or less (when rated voltage is 16V: 10.0%)	
	Insulation resistance	1,000MΩ or larger, or 50 ΩF or larger, whichever is smaller		

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

●Packaging specifications

(Units : mm)

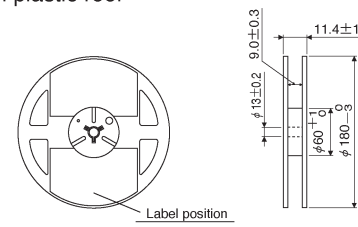
Taping



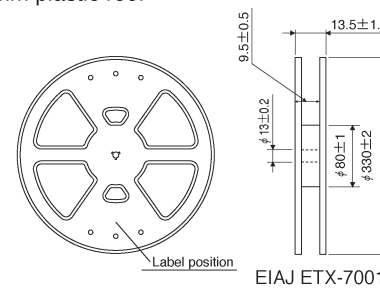
Style \ Symbol	A	B
Paper taping	1.65±0.1	2.4±0.1
Plastic taping	1.45±0.1	2.25±0.1

Reel

φ180 mm plastic reel

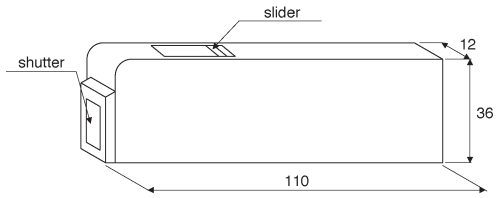


φ330 mm plastic reel



EIAJ ETX-7001 compliant

Bulk case



EIAJ ET-7201A compliant

MCH 21	10,000pcs/case
	5,000pcs/case

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

●Electrical characteristics

■A (C0G) Characteristics

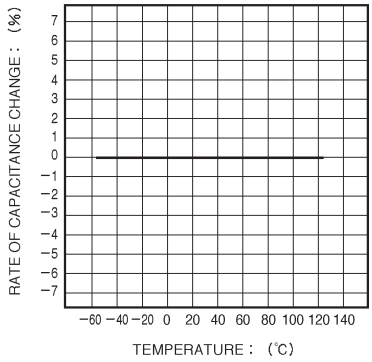


Fig.1 Capacitance-temperature characteristics

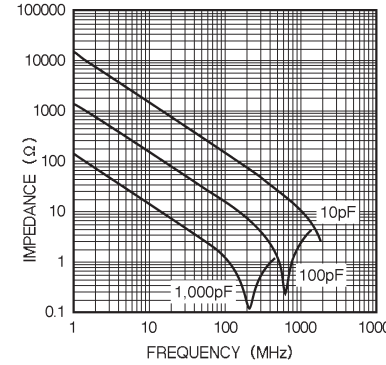


Fig.2 Impedance-frequency characteristics

■C (X7R) Characteristics

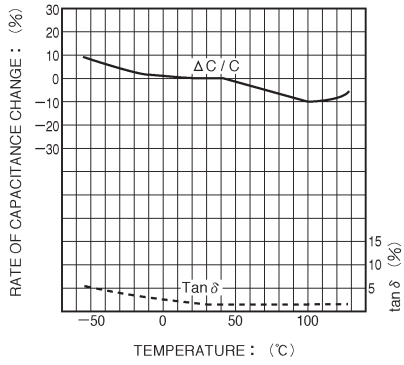


Fig.3 Capacitance-temperature characteristics

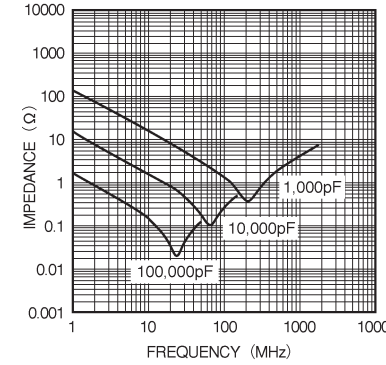


Fig.4 Impedance-frequency characteristics

■F (Y5V) Characteristics

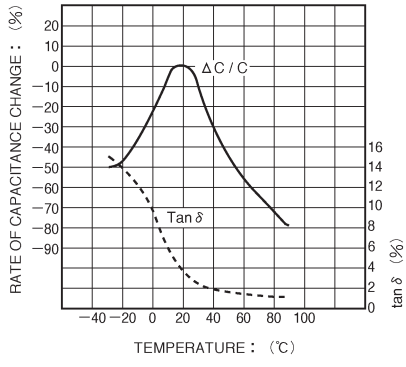


Fig.5 Capacitance-temperature characteristics

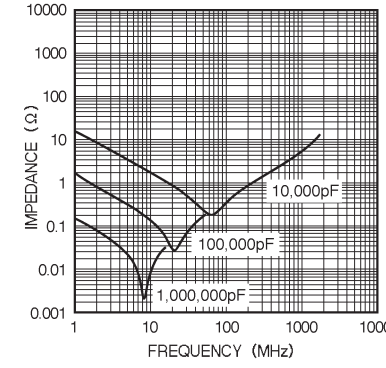


Fig.6 Impedance-frequency characteristics

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

■Temperature cycling test

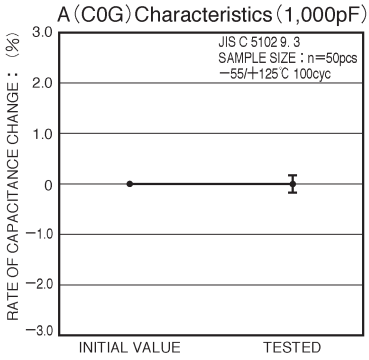


Fig.7 Rate of capacitance change

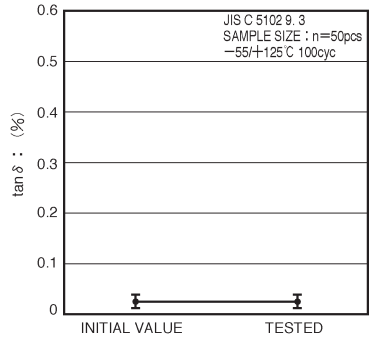


Fig.8 Tan δ

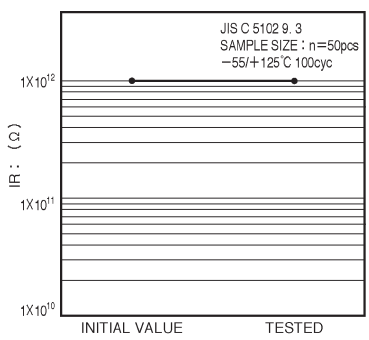


Fig.9 Insulation resistance

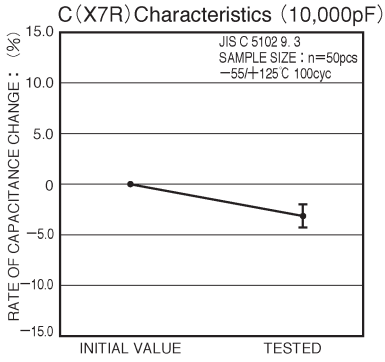


Fig.10 Rate of capacitance change

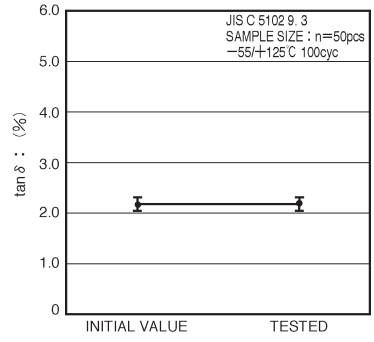


Fig.11 Tan δ

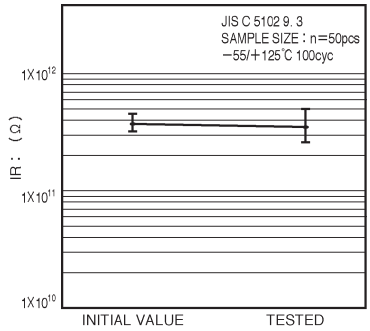


Fig.12 Insulation resistance

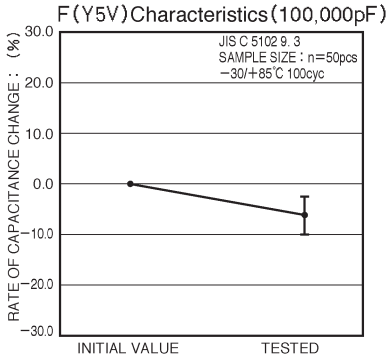


Fig.13 Rate of capacitance change

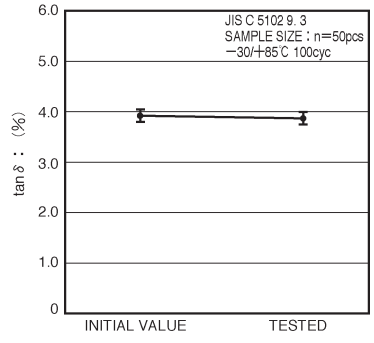


Fig.14 Tan δ

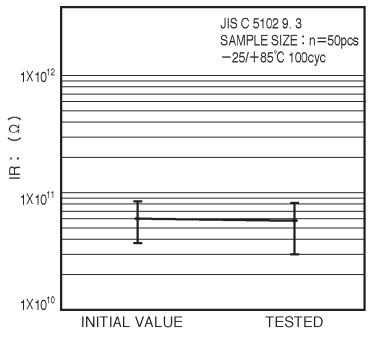


Fig.15 Insulation resistance

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

■High-temperature load test

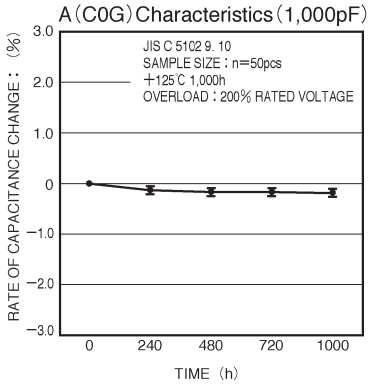


Fig.16 Rate of capacitance change

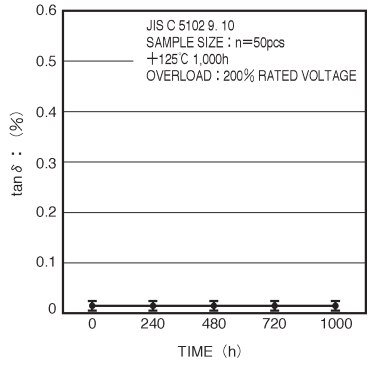


Fig.17 Tan δ

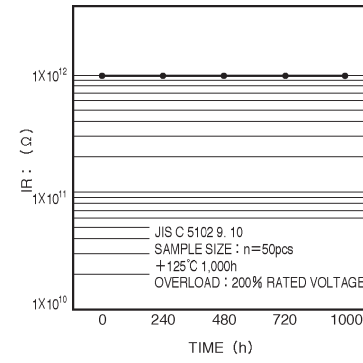


Fig.18 Insulation resistance

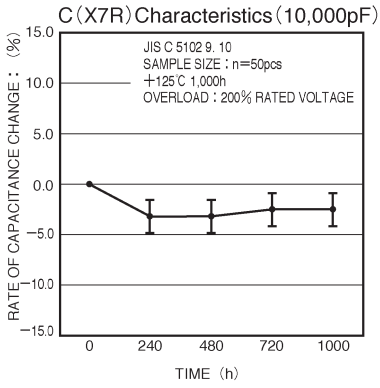


Fig.19 Rate of capacitance change

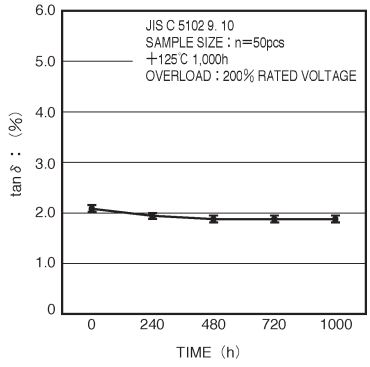


Fig.20 Tan δ

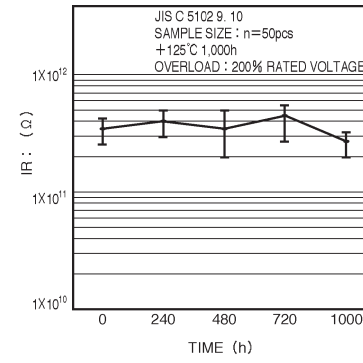


Fig.21 Insulation resistance

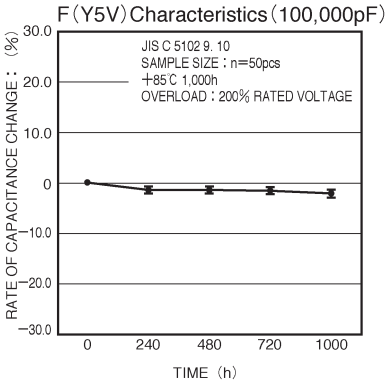


Fig.22 Rate of capacitance change

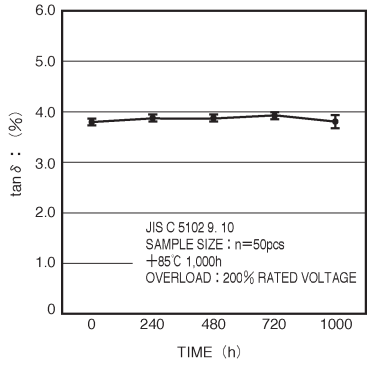


Fig.23 Tan δ

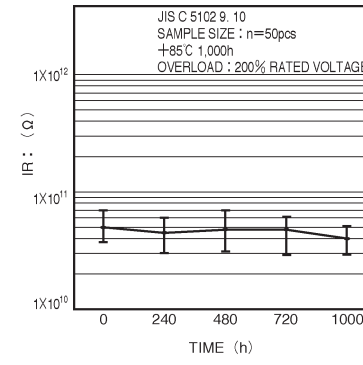


Fig.24 Insulation resistance

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

■Humidty load test

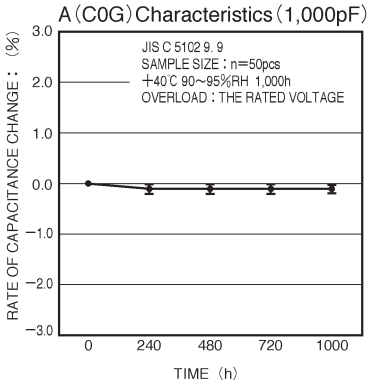


Fig.25 Rate of capacitance change

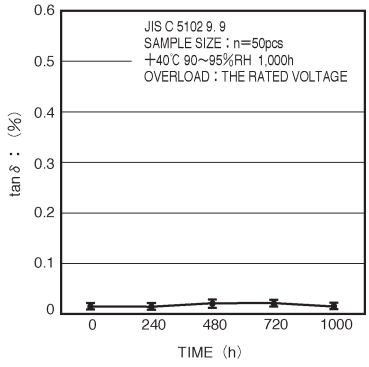


Fig.26 Tan δ

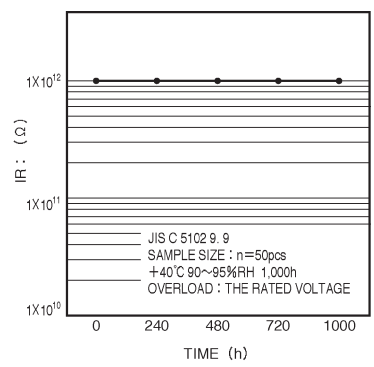


Fig.27 Insulation resistance

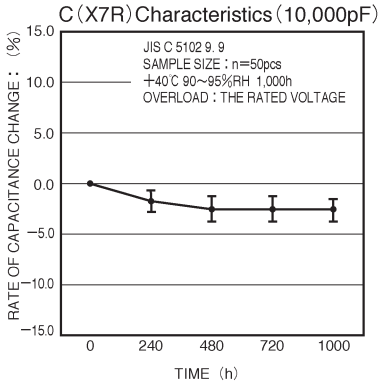


Fig.28 Rate of capacitance change

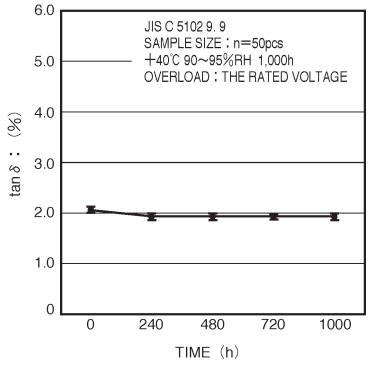


Fig.29 Tan δ

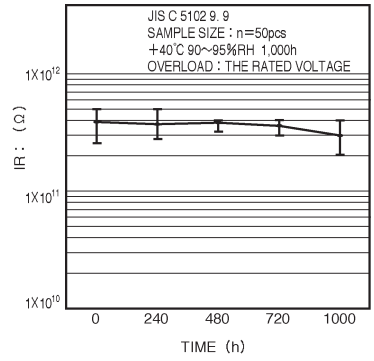


Fig.30 Insulation resistance

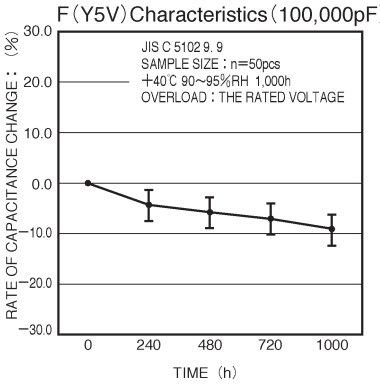


Fig.31 Rate of capacitance change

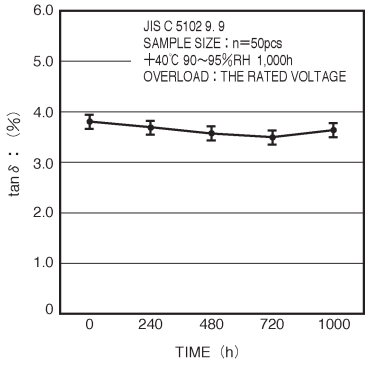


Fig.32 Tan δ

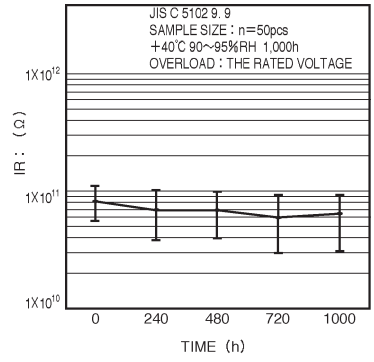


Fig.33 Insulation resistance

*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.