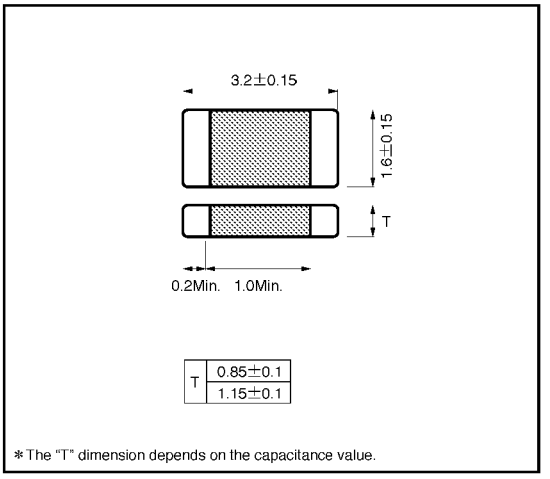
Ceramic capacitors

Multi–layer ceramic chip capacitors
MCH31 (3216 (1206) size, chip capacitor)

●Features

1) Small size (3.2 x 1.6 x 0.85 mm) makes it perfect for lightweight portable devices.
2) Comes packed either in taping to enable automatic mounting.
3) Precise uniformity of shape and dimensions facilitates highly efficient automatic mounting.
4) Solder–coated terminals offer superior solderability and resistance to soldering heat.

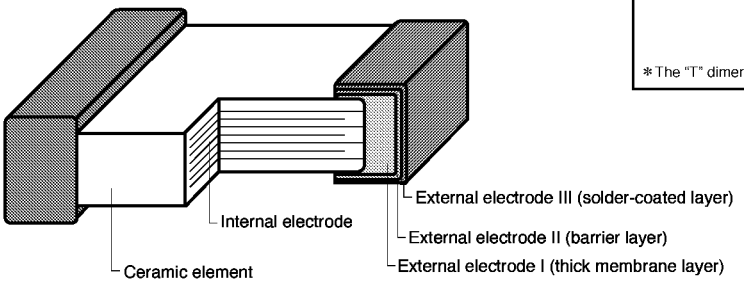
●External dimensions (Units: mm)



T	0.85±0.1
	1.15±0.1

* The "T" dimension depends on the capacitance value.

Structure



●Product Designation

Code	Product thickness	Packaging specifications	Reel	Basic ordering unit (pcs.)
K	0.85mm	Paper tape (width 8mm,pitch 4mm)	φ180mm (7in.)	4,000
L	0.85mm	Paper tape (width 8mm,pitch 4mm)	φ330mm (13in.)	16,000
P	1.15mm	Plastic tape (width 8mm,pitch 4mm)	φ180mm (7in.)	3,000
Q	1.15mm	Plastic tape (width 8mm,pitch 4mm)	φ330mm (13in.)	12,000

Reel (φ180,φ330mm) : compatible EIAJ ETX-7001

Part No. — **Packaging style**

M	C	H	3	1	5	C	1	0	4	K	K

Rated voltage

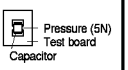
Code	Voltage
2	25V
3	16V
5	50V

Capacitance-temperature characteristics				Nominal capacitance	Capacitance tolerance	
Code	EIA code	Operating temperature range (℃)	Temp. coefficient or percent change		Code	tolerance
A	C0G	−55 to +125	0±30ppm / ℃	3-digit designation according to IEC	J	±5%
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.

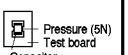
●Characteristics

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. Over 1000pF Measurement frequency : 1±0.1kHz Measurement voltage : 1±0.1Vrms.
Tan δ		0.1% or less	
Insulation resistance (IR)		10,000 MΩ or larger, or 500 ΩF or larger, whichever is smaller	Based on paragraph 7.6 is applied for 60±5s Measurement is made after rated voltage.
Withstanding voltage		The insulation must not be damaged.	Based on paragraph 7.1 for 1 to 5s then measure Apply 300% of the rated voltage.
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)

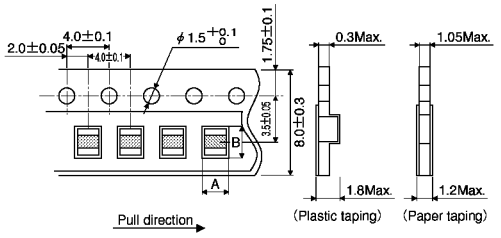
Item \ Temperature characteristics		C (X7R)	F (Y5V)	Test methods / conditions (based on JIS C 5102)
Operating temperature		−55℃～+125℃	−30℃～+85℃	———
Nominal capacitance (C)		Must be within the specified tolerance range.		Based on paragraph 7.8 Measured at room temperature and standard humidity. Measurement frequency : 1 ±0.1 kHz Measurement voltage : 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 is applied for 60±5s Measurement is made after rated voltage.
Withstanding voltage		The insulation must not be damaged.		Based on paragraph 7.1 for 1 to 5s then measure Apply 250% of the rated voltage.
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℃, with no voltage applied.
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 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	Within ±12.5%	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 500 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)

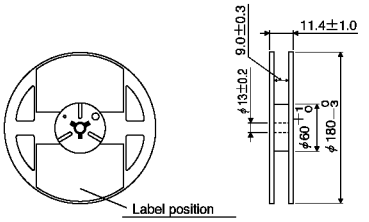
Taping



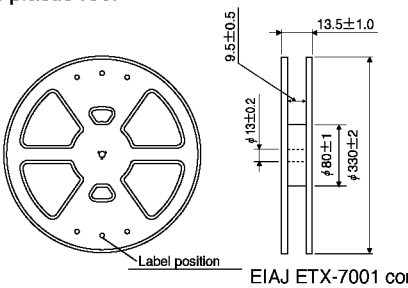
Style \ Symbol	A	B
Paper taping	2.0±0.1	3.5±0.1
Plastic taping	1.9±0.1	3.5±0.1

Reel

φ180mm plastic reel



φ330mm plastic reel



EIAJ ETX-7001 compliant

*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

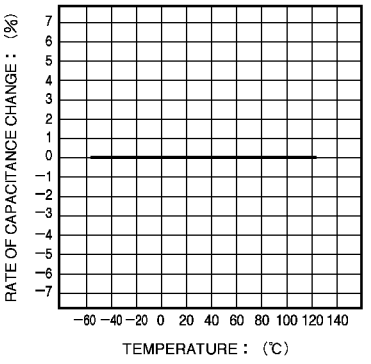


Fig.1 Capacitance - temperature characteristics

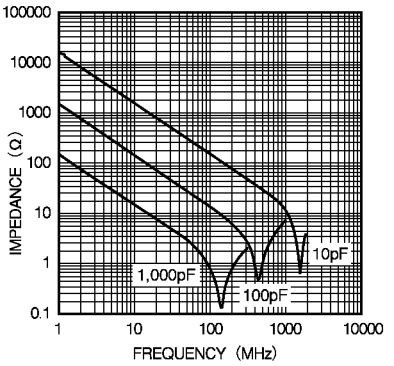


Fig.2 Impedance - frequency characteristics

■C (X7R) Characteristics

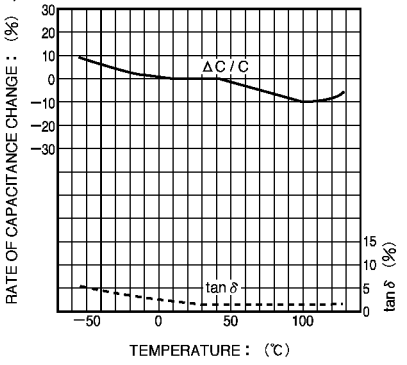


Fig.3 Capacitance - temperature characteristics

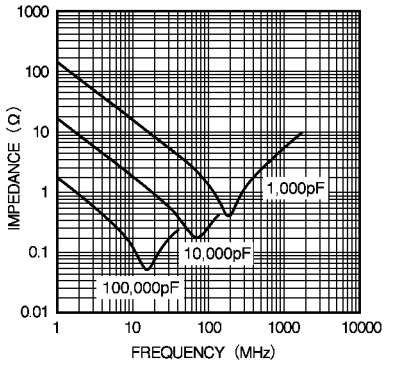


Fig.4 Impedance - frequency characteristics

■F (Y5V) Characteristics

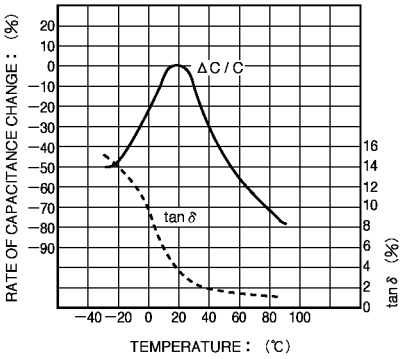


Fig.5 Capacitance - temperature characteristics

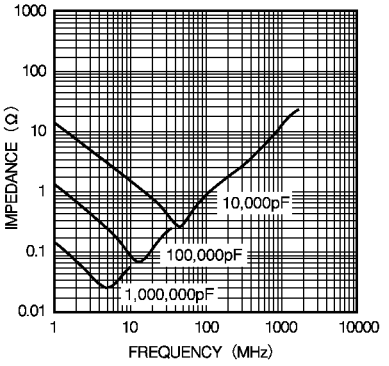


Fig.6 Impedance - frequency characteristics

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

■Temperature cycling test

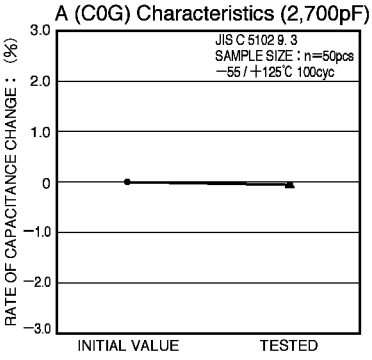


Fig.7 Rate of capacitance change

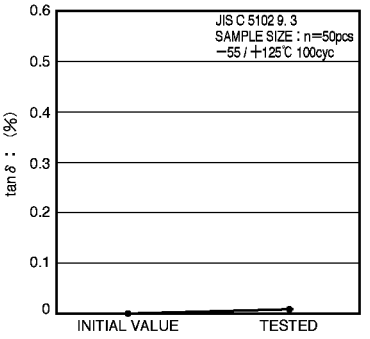


Fig.8 Tan δ

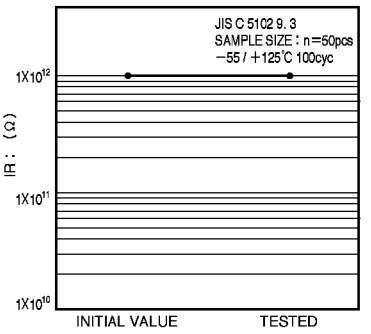


Fig.9 Insulation resistance

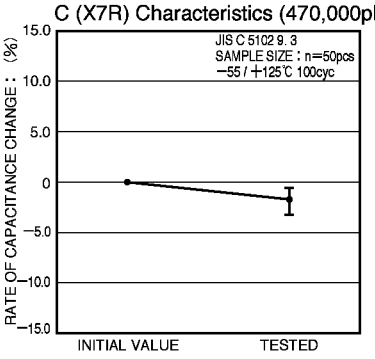


Fig.10 Rate of capacitance change

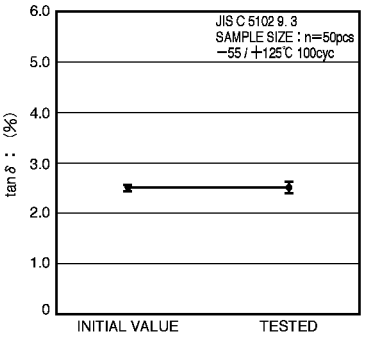


Fig.11 Tan δ

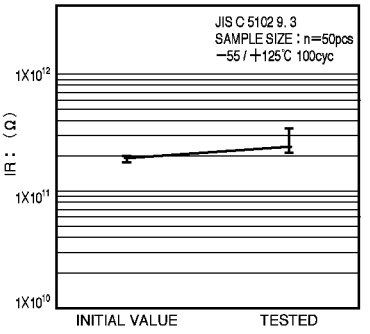


Fig.12 Insulation resistance

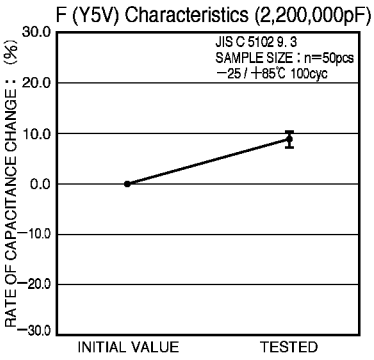


Fig.13 Rate of capacitance change

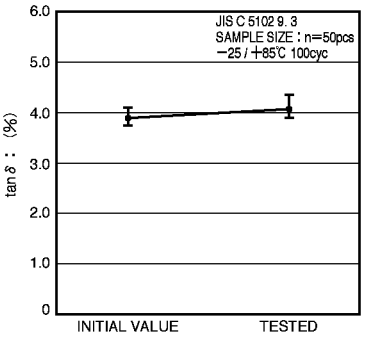


Fig.14 Tan δ

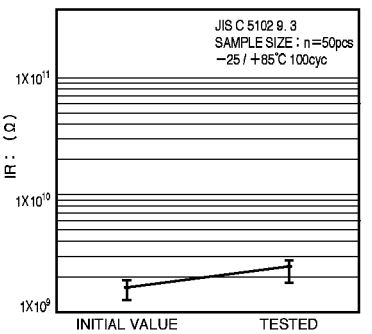


Fig.15 Insulation resistance

*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

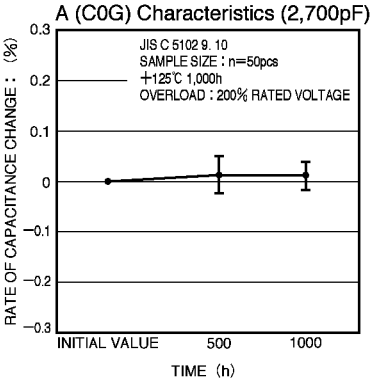


Fig.16 Rate of capacitance change

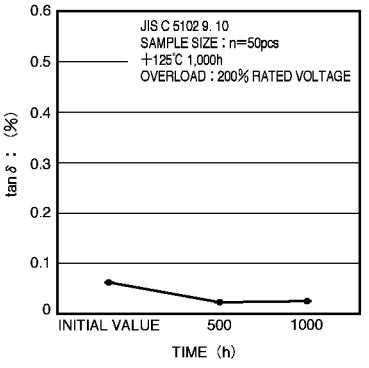


Fig.17 Tan δ

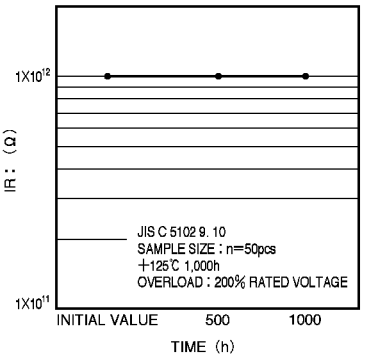


Fig.18 Insulation resistance

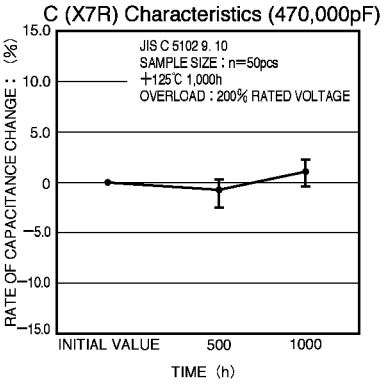


Fig.19 Rate of capacitance change

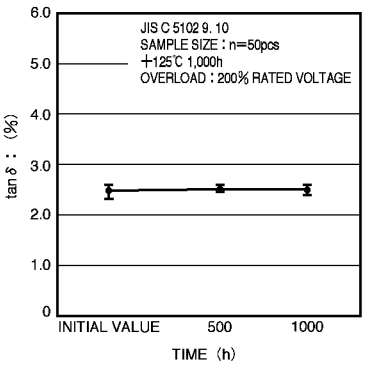


Fig.20 Tan δ

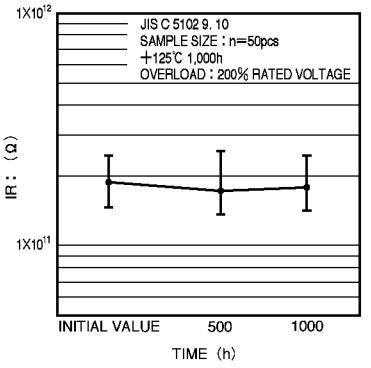


Fig.21 Insulation resistance

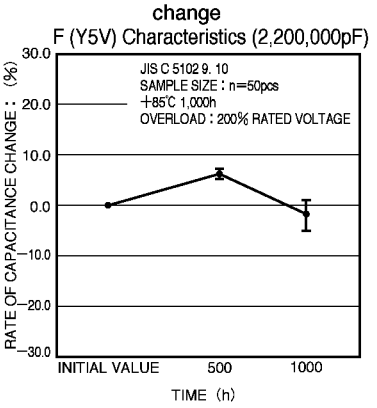


Fig.22 Rate of capacitance change

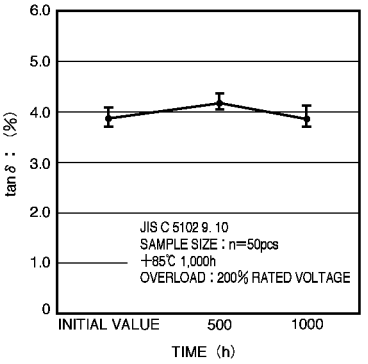


Fig.23 Tan δ

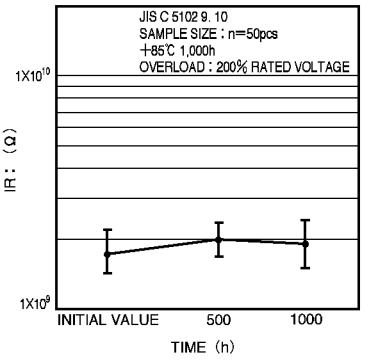


Fig.24 Insulation resistance

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

■Humidity load test

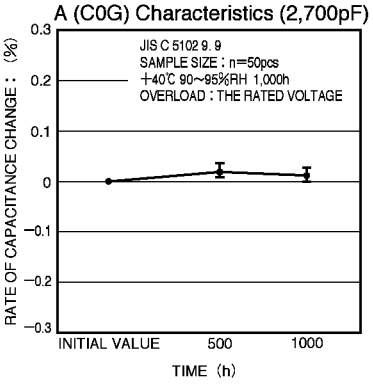


Fig.25 Rate of capacitance change

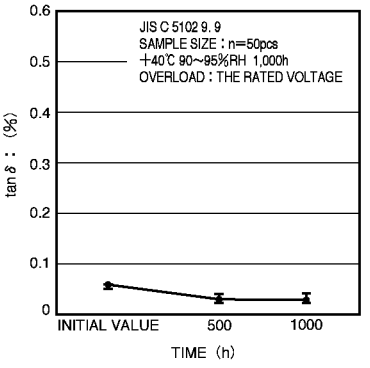


Fig.26 Tan δ

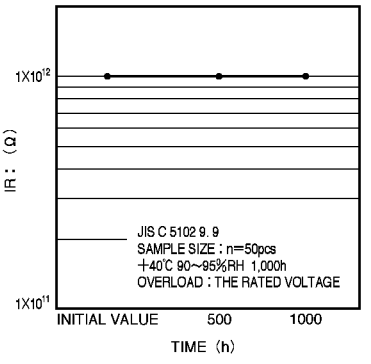


Fig.27 Insulation resistance

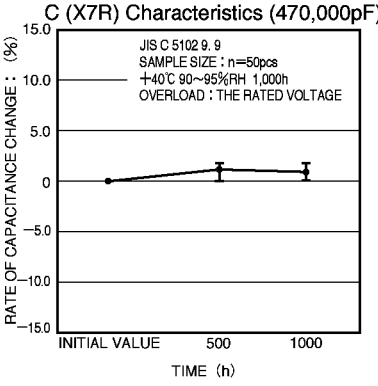


Fig.28 Rate of capacitance change

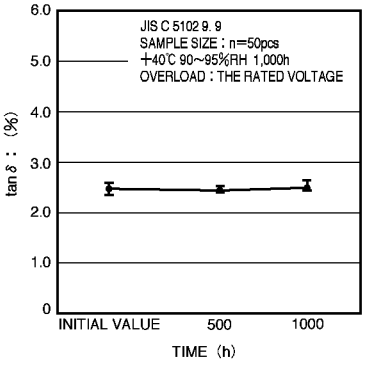


Fig.29 Tan δ

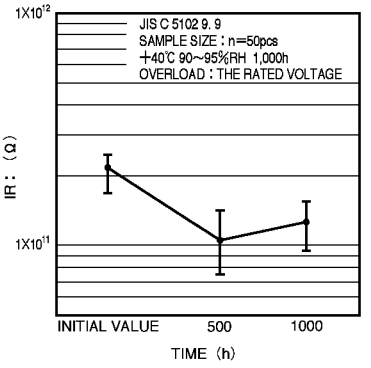


Fig.30 Insulation resistance

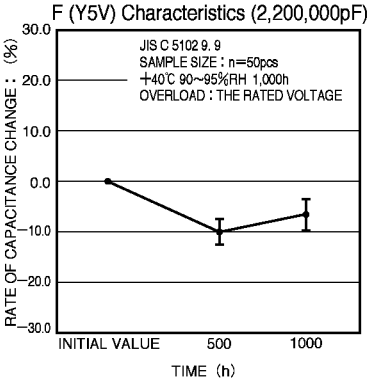


Fig.31 Rate of capacitance change

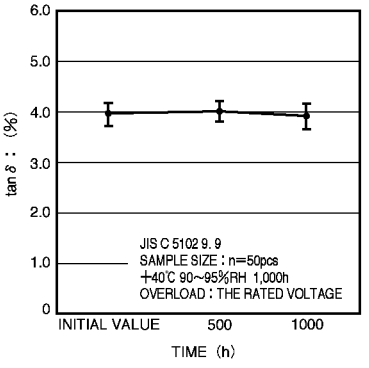


Fig.32 Tan δ

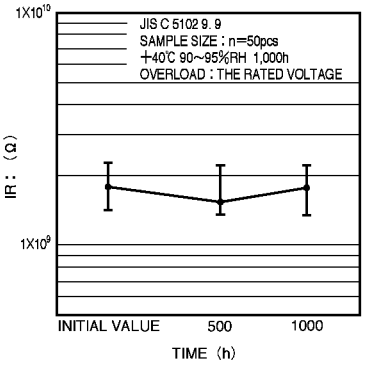


Fig.33 Insulation resistance

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