

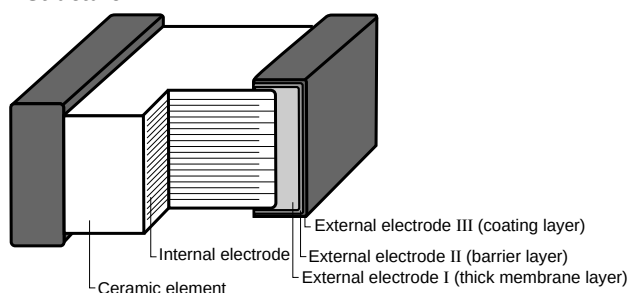
Multi-layer ceramic chip capacitors

MCH03 (0603 size, chip capacitor)

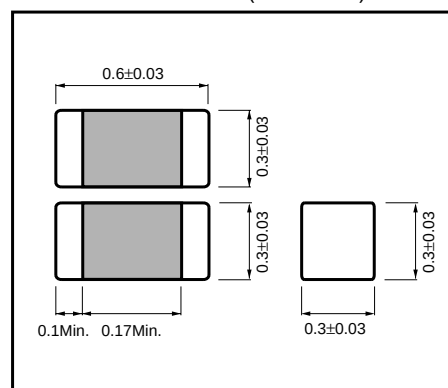
●Features

- 1) Small size (0.6 x 0.3 x 0.3 mm) makes it perfect for lightweight portable devices.
- 2) Comes packed either in tape to enable automatic mounting.
- 3) Precise uniformity of shape and dimensions facilitates 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 unit (pcs.)
K	0.3mm	Paper tape (width 8 mm, pitch 2 mm)	φ180mm (7in.)	15,000

Reel (φ180, φ330mm) : compatible with EIAJ ET-7200A

Packaging style

Part No.



Rated voltage	
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(C0G)	-55~+125	0±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	-25~+85	±10%		J	± 5% (11pF or more)
FN	(X7R)	(-55~+125)	(±15%)		K	± 10%
	F	-25~+85	+30%, -80%		Z	+ 80%, -20%
	(Y5V)	(-30~+85)	(+22%, -82%)			

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Ceramic capacitors

●Capacitance range

For thermal compensation

Part number		MCH03
Capacitance (pF)	Temperature characteristics	A (CG) (C0G)
	Rated voltage (V)	25V
	Tolerance	
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		
9.1		
10		

Part number		MCH03
Capacitance (pF)	Temperature characteristics	A (CG) (C0G)
	Rated voltage (V)	25V
	Tolerance	
11	J (± 5%)	
12		
13		
15		
16		
18		
20		
22		
24		
27		
30		
33		
36		
39		
43		
47		

Product thickness (mm) 0.3±0.03

High dielectric constant

Part number		MCH03	
Capacitance (pF)	Temperature characteristics	CN (R) (B) (X7R)	FN (F) (Y5V)
	Rated voltage (V)	25V	25V
	Tolerance	K (±10%)	Z (+80, -20%)
100			
150			
200			
330			
470			
680			
1,000			
1,500			
2,200			
4,700			
10,000			

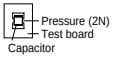
Product thickness (mm) 0.3±0.03

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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)
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 : $1 \pm 0.1\text{MHz}$ Measurement voltage : $1 \pm 0.1\text{Vrms}$. Over 1000pF Measurement frequency : $1 \pm 0.1\text{kHz}$ Measurement voltage : $1 \pm 0.1\text{Vrms}$.
Dissipation factor ($\tan\delta$)		$100/(400+20C)\%$ or less: Less than 30 pF 0.1% or less : 30 pF or larger	
Insulation resistance (IR)		$10,000\text{M}\Omega$ or $500\text{M}\Omega \cdot \mu\text{F}$, whichever is smaller	Based on paragraph 7.6 Measurement is made after rated voltage is applied for $60 \pm 5\text{s}$.
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 $0 \pm 30\text{ppm}/^\circ\text{C}$	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 2N for $10 \pm 1\text{s}$ 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 $24 \pm 2\text{ hrs.}$ later. 
	Rate of capacitance change	Must be within initial tolerance.	
	Dissipation factor ($\tan\delta$)	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: $235 \pm 5^\circ\text{C}$ Soldering time : $2 \pm 0.5\text{s}$
Resistance to soldering heat	Appearance	There must be no mechanical damage.	Based on paragraph 8.14. Soldering temperature: $260 \pm 5^\circ\text{C}$ Soldering time : $5 \pm 0.5\text{s}$ Preheating : $150 \pm 10^\circ\text{C}$ for 1 to 2 min.
	Rate of capacitance change	$\pm 2.5\%$ or $\pm 0.25\text{ pF}$, whichever is larger.	
	Dissipation factor ($\tan\delta$)	Must satisfy initial specified value.	
	Insulation resistance	$10,000\text{M}\Omega$ or $500\text{M}\Omega \cdot \mu\text{F}$, 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 $24 \pm 2\text{ hrs.}$
	Rate of capacitance change	$\pm 2.5\%$ or $\pm 0.25\text{ pF}$, whichever is larger.	
	Dissipation factor ($\tan\delta$)	Must satisfy initial specified value.	
	Insulation resistance	$10,000\text{M}\Omega$ or $500\text{M}\Omega \cdot \mu\text{F}$, whichever is smaller	
Humidity load test	Appearance	There must be no mechanical damage.	Based on paragraph 9.9 Test temperature: $40 \pm 2^\circ\text{C}$ Relative humidity: 90% to 95% Applied voltage : rated voltage Test time : 500 to 524 hrs. Capacitance measured after $24 \pm 2\text{ hrs.}$
	Rate of capacitance change	$\pm 7.5\%$ or $\pm 0.75\text{ pF}$, whichever is larger.	
	Dissipation factor ($\tan\delta$)	0.5% or less	
	Insulation resistance	$500\text{M}\Omega$ or $25\text{M}\Omega \cdot \mu\text{F}$, 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 $\times 200\%$ Test time : 1,000 to 1,048 hrs. Capacitance measured after $24 \pm 2\text{ hrs.}$
	Rate of capacitance change	$\pm 3.0\%$ or $\pm 0.3\text{ pF}$, whichever is larger.	
	Dissipation factor ($\tan\delta$)	0.3% or less	
	Insulation resistance	$1,000\text{M}\Omega$ or $50\text{M}\Omega \cdot \mu\text{F}$, 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)		10,000MΩ 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 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 2N 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

(Paper taping) Pulling direction

Symbol	C	D	E	F	H	J	t	t1
Dimensions	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	2.0 ±0.05	4.0 ±0.1	φ1.5 +0.1 0	0.37 ±0.02	0.5 MAX.

Symbol	A	B
Size		
0603	0.37±0.03	0.67±0.03

Reel

φ180 mm plastic reel

Label position

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Ceramic capacitors

● Electrical characteristics

■ A (C0G) Characteristics

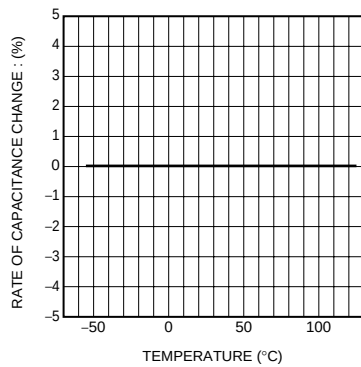


Fig.1 Capacitance-temperature characteristics

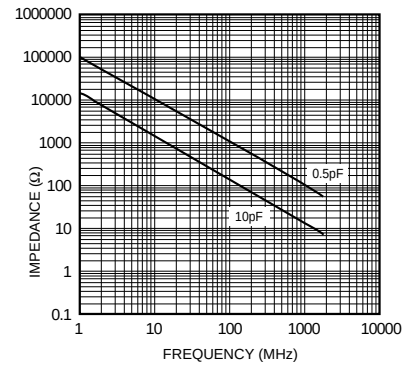


Fig.2 Impedance-frequency characteristics

■ CN (X7R) Characteristics

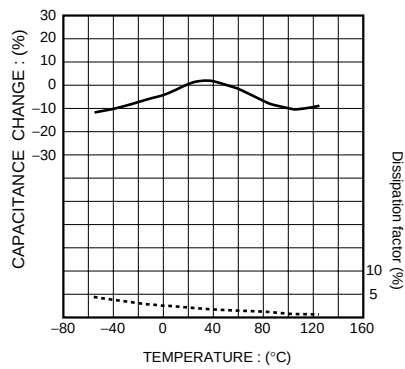


Fig.3 Capacitance-temperature characteristics

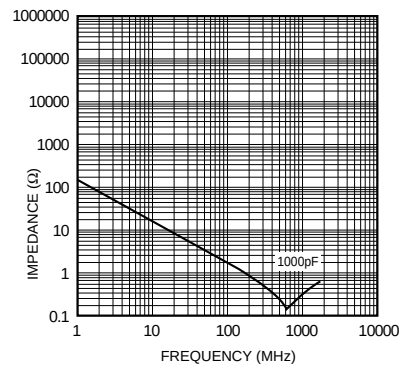


Fig.4 Impedance-frequency characteristics

■ FN (Y5V) Characteristics

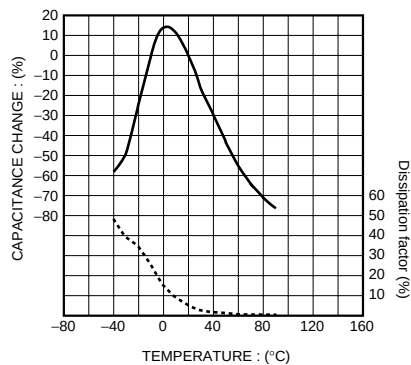


Fig.5 Capacitance-temperature characteristics

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