

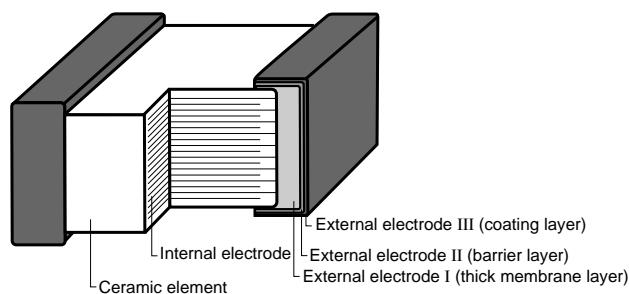
Multi-layer ceramic chip capacitors

MCH03 (0603 size, chip capacitor)

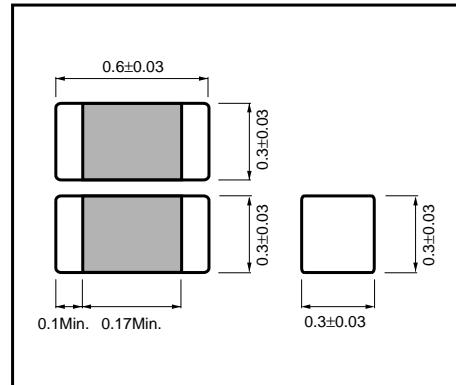
●Features

- 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

Part No.	Code	Product thickness	Packaging specifications	Reel	Basic ordering unit (pcs.)																																							
MCH032FN103ZK	K	0.3mm	Paper tape (width 8 mm, pitch 2 mm)	ø180mm (7in.)	15,000																																							
Reel (ø180, ø330mm) : compatible with EIAJ ET-7200A																																												
Packaging style																																												
<table border="1"> <thead> <tr> <th colspan="4">Capacitance-temperature characteristics</th> <th rowspan="2">Nominal capacitance</th> <th rowspan="2">Capacitance tolerance</th> </tr> <tr> <th>Code</th> <th>Code</th> <th>Operating temperature (°C)</th> <th>Temp. coefficient or percent change</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>25V</td> <td>A (CG(CoG))</td> <td>-55~+125</td> <td>0±30ppm/°C</td> <td>C ± 0.25pF (0.5 ~ 5pF)</td> </tr> <tr> <td>3</td> <td>16V</td> <td>CN (R)</td> <td>-55~+125</td> <td>±15%</td> <td>D ± 0.5pF (5.1 ~ 10pF)</td> </tr> <tr> <td>5</td> <td>50V</td> <td>(X7R)</td> <td>-25~+85 (-55~+125)</td> <td>±10% (±15%)</td> <td>J ± 5% (11pF or more)</td> </tr> <tr> <td colspan="4">FN (F)</td><td>+30%~80% (+22%, -82%)</td><td>K ± 10%</td> </tr> <tr> <td colspan="4"></td><td></td><td>Z + 80%, -20%</td> </tr> </tbody> </table>					Capacitance-temperature characteristics				Nominal capacitance	Capacitance tolerance	Code	Code	Operating temperature (°C)	Temp. coefficient or percent change	2	25V	A (CG(CoG))	-55~+125	0±30ppm/°C	C ± 0.25pF (0.5 ~ 5pF)	3	16V	CN (R)	-55~+125	±15%	D ± 0.5pF (5.1 ~ 10pF)	5	50V	(X7R)	-25~+85 (-55~+125)	±10% (±15%)	J ± 5% (11pF or more)	FN (F)				+30%~80% (+22%, -82%)	K ± 10%						Z + 80%, -20%
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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	D (± 0.5pF)	□
2.4		□
2.7		□
3		□
3.3		□
3.6		□
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

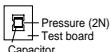
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Ceramic capacitors

●Characteristics

Class 1 (For thermal compensation)

Temperature characteristics		A (CG) (C0G)	Test methods/conditions (based on JIS C 5102)
Item			
Operating temperature		-55°C ~ 125°C	
Nominal capacitance (C)		Must be within the specified tolerance range.	
Dissipation factor (tanδ)		100/(400+20C)% or less: Less than 30 pF 0.1% or less : 30 pF or larger	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.
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 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 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% 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	
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)

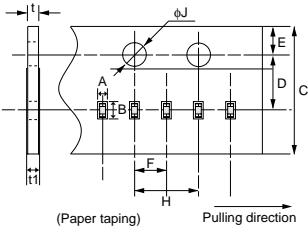
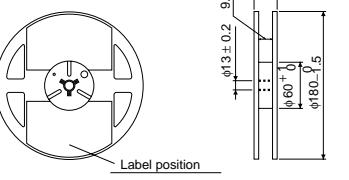
Temperature characteristics		CN (R) (B) (X7R)	FN (F) (Y5V)	Test methods/conditions (based on JIS C 5102)	
Item		-55°C ~ +125°C	-30°C ~ +85°C	—	
Operating temperature		Must be within the specified tolerance range.		Based on paragraph 7.8 Measured at room temperature and standard humidity, Measurement frequency: 1 ± 0.1 kHz Measurement voltage : 1.0 ± 0.2 Vrms.	
Nominal capacitance (C)		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)	
Dissipation factor (tanδ)		10,000MΩ or 500MΩ · μF, whichever is smaller		Based on paragraph 7.6 Measurement is made after rated voltage is applied for 60 ± 5s.	
Insulation resistance (IR)		The insulation must not be damaged.		Based on paragraph 7.1 Apply 250% of the rated voltage for 1 to 5s then measure.	
Withstanding voltage		Temperature characteristics		Within ± 15% + 22, + 82%	
Temperature characteristics		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.			
	Rate of capacitance change	Within ± 5.0%	Within ± 20.0%	Based on paragraph 8. 14. Soldering temperature : 260 ± 5°C Soldering time : 5 ± 0.5s Preheating : 150 ± 10°C for 1 to 2 min.	
	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		Reel																		
		φ180 mm plastic reel																		
																				
<table border="1"> <thead> <tr> <th>Symbol</th><th>C</th><th>D</th><th>E</th><th>F</th><th>H</th><th>J</th><th>t</th><th>t1</th></tr> </thead> <tbody> <tr> <td>Dimensions</td><td>8.0 ±0.3</td><td>3.5 ±0.05</td><td>1.75 ±0.1</td><td>2.0 ±0.05</td><td>4.0 ±0.1</td><td>φ1.5 +0.1 -0.1</td><td>0.37 ±0.02</td><td>0.5 MAX.</td></tr> </tbody> </table>		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 -0.1	0.37 ±0.02	0.5 MAX.	
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Size	Symbol	A	B																	
0603		0.37±0.03	0.67±0.03																	

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Ceramic capacitors

● Electrical characteristics

■ A (C0G) Characteristics

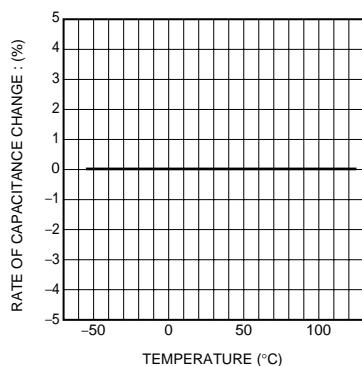


Fig.1 Capacitance-temperature characteristics

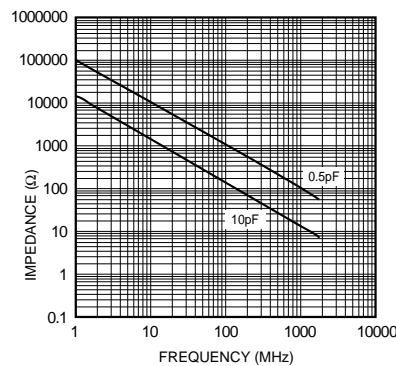


Fig.2 Impedance-frequency characteristics

■ CN (X7R) Characteristics

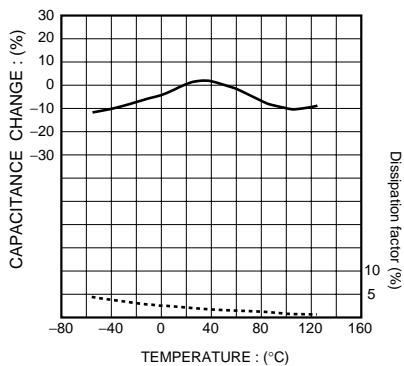


Fig.3 Capacitance-temperature characteristics

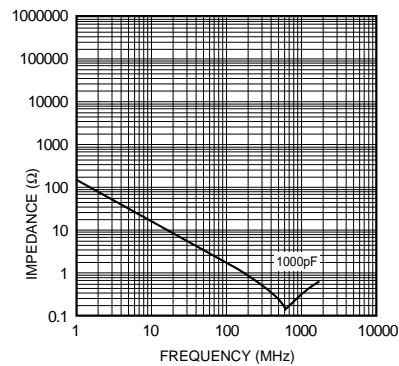


Fig.4 Impedance-frequency characteristics

■ FN (Y5V) Characteristics

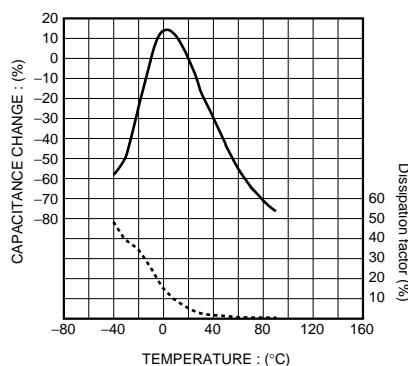


Fig.5 Capacitance-temperature characteristics

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