

# EMI FILTER

## MCF18 (1608 (0603) size, 4A)

**●Features**

- 1) Small package.
- 2) Suitable for noise reduction for power supply lines.
- 3) The entire series is rated at 4A.
- 4) Low inner resistance, low dissipation internal.

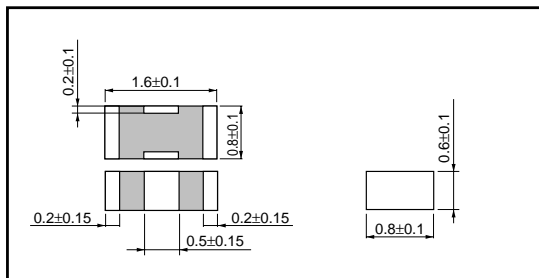
**●Quick Reference**

The design and specifications are subject to change without prior notice. Please check the most recent technical specifications prior to placing orders or using the product. For more detail information regarding packaging style code, please check product designation.

Part No.	Model Name	Capacitance (pF)	Capacitance tolerance (%)	Temperature characteristics		Rated voltage (V)	Rated current (A/DC)	Insulation resistance(MΩ)	Operating temperature(°C)	Thickness (mm)
				code						
MCF18	MCF182CN102M04AK	1000	M (±20)	CN	Rate of capacitance change ±15%	25	4	1000 Min.	-55 to +125	0.6
	MCF182CN222M04AK	2200								
	MCF182CN332M04AK	3300								
	MCF182CN472M04AK	4700								
	MCF182CN103M04AK	10000								
	MCF182CN223M04AK	22000								
	MCF182CN473M04AK	47000								
	MCF183CN104M04AK	100000				16		500 Min.		
	☆ MCF184CN224M04AK	220000				10		230 Min.		
	☆ MCF184CN474M04AK	470000				6.3		110 Min.		
	☆ MCF188CN105M04AK	1000000						50 Min.	-55 to +85	

☆ Under development

**●Dimensions (Unit : mm)**



**●Part No. Explanation**

Code	Rated current
04A	4A

Code	Product thickness	Packaging specifications	Reel	Basic ordering unit(pcs.)
K	0.6mm	Paper tape(width 8mm, pitch 4mm)	φ180mm (7inch)	4,000

Reel(φ180mm)-Compatible with JEITA standard "EIAJ ET-7200B"

**Rated current**      **Packaging Style**

Part No.      **M C F 1 8 2 C N 3 3 2 M 0 4 A K**

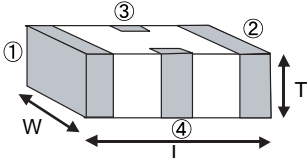
Rated voltage	
Code	Voltage
2	25V
3	16V
4	10V
8	6.3V

**Temperature characteristic code**  
:Refer to quick reference table.

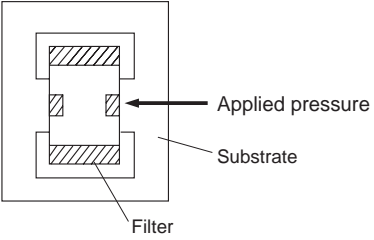
Nominal capacitance	Capacitance tolerance	
	Code	Tolerance
3-digit designation according to IEC	M	±20%

## EMI Filters

## •Performance and test method

No.	Items	Performance	Test Method						
1	Appearance and dimensions	No marked defects shall be allowed for appearance.	Using a Magnifier.						
2	Withstanding voltage	No dielectrical breakdown or other damage shall be allowed.	<p>Voltage shall be applied as per Table1.</p> <table border="1"> <caption>Table 1</caption> <thead> <tr> <th>Charac-teristic</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td>250% Rated voltage</td> </tr> </tbody> </table> <p>Voltage shall be applied for 1 to 5s with 50mA charging and discharging current.</p>	Charac-teristic	Voltage	CN	250% Rated voltage		
Charac-teristic	Voltage								
CN	250% Rated voltage								
3	Insulation resistance	Not less than 1000M $\Omega$ or 100M $\Omega$ · $\mu$ F, whichever is less.	Measurements shall be made after 60+/-5s period of the rated voltage						
4	Capacitance	Capacitance shall be within specified tolerance range.	<p>Measurements shall be made under the conditions specified in Table 2.</p> <table border="1"> <caption>Table 2</caption> <thead> <tr> <th>Characteristics</th> <th>Frequency · Voltage</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td>1+/-0.1kHz 1+/-0.1Vrms.</td> </tr> </tbody> </table>	Characteristics	Frequency · Voltage	CN	1+/-0.1kHz 1+/-0.1Vrms.		
Characteristics	Frequency · Voltage								
CN	1+/-0.1kHz 1+/-0.1Vrms.								
5	Dielectric loss tangent	CN $\tan \delta \leq 3.0\%$	Measurements shall be made under the conditions specified in Table 2.						
6	Resistance	<p>Within specified tolerance range</p> <table border="1"> <thead> <tr> <th>Rated current</th> <th>between①-② terminal resistance</th> <th>between③-④ terminal resistance</th> </tr> </thead> <tbody> <tr> <td>4A</td> <td>20m<math>\Omega</math>Max.</td> <td>2000m<math>\Omega</math>Max.</td> </tr> </tbody> </table>	Rated current	between①-② terminal resistance	between③-④ terminal resistance	4A	20m $\Omega$ Max.	2000m $\Omega$ Max.	<p>Measurement current 100mA max</p> 
Rated current	between①-② terminal resistance	between③-④ terminal resistance							
4A	20m $\Omega$ Max.	2000m $\Omega$ Max.							

## EMI Filters

No.	Items		Performance		Test Method				
7	Temperature characteristic	Without voltage application	CN	$\pm 15\%$ ( $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ )	If required measurements shall be made at a given temperature.				
8	Solderability		More than 75% of each end termination shall be covered with new solder.		The solder specified in SnAg3.0Cu0.5 shall be used. And the flux containing 25% rosin and ethanol solution shall be used. The specimens shall be immersed into the solder at $235\pm 5^{\circ}\text{C}$ for $2\pm 0.5\text{s}$ so that both end terminations are completely under solder.				
9	Resistance to solder in heat	Appearance	Without mechanical damage.		The solder specified in SnAg3.0Cu0.5 shall be used. The specimens shall be immersed into the solder at $260\pm 5^{\circ}\text{C}$ for $5\pm 0.5\text{s}$ so that both end terminations are completely under the solder. Pre-heating at $150\pm 10^{\circ}\text{C}$ for 1 to 2min Initial measurements prior to test shall be performed after the thermal Pre-conditioning specified in Remarks (1). Final measurements shall be made after the specimens have been left at room temperature as per Table3.				
		Change rate from initial value	CN	Within $\pm 7.5\%$					
		Dielectric loss tangent	Within specified initial value.						
		Insulation resistance	Within specified initial value.						
<p style="text-align: center;">Table3</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Characteristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td><math>48\pm 4\text{ h}</math></td> </tr> </tbody> </table>						Characteristic	Time	CN	$48\pm 4\text{ h}$
Characteristic	Time								
CN	$48\pm 4\text{ h}$								
10	End termination adherence		Without peeling or sign of peeling shall be allowed on the end terminations.		<p>A 5N weight for <math>10\pm 1\text{s}</math> shall be applied to the soldered specimens as shown by the arrow mark in the below sketch.</p> 				

## EMI Filters

No.	Items		Performance		Test Method																			
11	Bending strength	Appearance	Without mechanical damage.		Glass epoxy board with soldered specimens shall be bent till 1mm by 1.0mm/s.																			
12	Vibration	Appearance	Without mechanical damage.		<p>The specimens shall be soldered on the specified test jig.</p> <p>Initial measurements shall be made after the thermal pre-conditioning specified in Remarks(1).</p> <p>Final measurements shall be made after the specimens have been left at room temperature as per Table3.</p> <p>[Condition]</p> <p>Directions : 2h each in X, Y and Z directions Total : 6h</p> <p>Frequency range : 10 to 55 to 10Hz(1min)</p> <p>Applitude : 1.5mm</p> <p>(shall not exceed acceleration196m/s<sup>2</sup>)</p> <p>Table3</p> <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td>48+/-4 h</td> </tr> </tbody> </table>	Charac-teristic	Time	CN	48+/-4 h															
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Dielectric loss tangent	Within specified initial value.																							
13	Temperature cycling	Appearance	Without mechanical damage.		<p>The specimens shall be soldered on the test jig shown in Remarks.</p> <p>Temperature cycle : 100cycles Initial measurements prior to test shall be performed after the thermal per-conditioning specified in Remarks (1).</p> <p>Final measurements shall be made after the specimens have been left at room temperature as per Table3.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min operating temp.+/-3</td> <td>30+/-3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>≤ 3</td> </tr> <tr> <td>3</td> <td>Max operating temp.+/-3</td> <td>30+/-3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>≤ 3</td> </tr> </tbody> </table> <p>Table3</p> <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td>48+/-4 h</td> </tr> </tbody> </table>	Step	Temp. (°C)	Time (min)	1	Min operating temp.+/-3	30+/-3	2	Room temp.	≤ 3	3	Max operating temp.+/-3	30+/-3	4	Room temp.	≤ 3	Charac-teristic	Time	CN	48+/-4 h
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## EMI Filters

No.	Items	Performance	Test Method				
14	Humidity (Steady)	Appearance	Without mechanical damage.				
		Change rate from initial value	CN      Within $\pm 12.5\%$				
		Dielectric tangent	CN $\tan \delta \leq 200\%$ initial spec.				
		Insulation resistance	Not less than $500M\Omega$ or $10M\Omega \cdot \mu F$ , whichever is less.				
			Test temperature : $60 \pm 2^\circ C$ Relative humidity : 90 to 95% Test time : $500 \pm 24/0$ h Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2). Final measurements have been left at room temperature as per Table3.  Table3 <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td><math>48 \pm 4</math> h</td> </tr> </tbody> </table>	Charac-teristic	Time	CN	$48 \pm 4$ h
Charac-teristic	Time						
CN	$48 \pm 4$ h						
15	Humidity life test	Appearance	Without mechanical damage.				
		Change rate from initial value	CN      Within $\pm 12.5\%$				
		Dielectric loss tangent	CN $\tan \delta \leq 200\%$ initial spec.				
		Insulation resistance	Not less than $500M\Omega$ or $10M\Omega \cdot \mu F$ , whichever is less.				
			Test temperature : $60 \pm 2^\circ C$ Relative humidity : 90 to 95% Voltage : Rated voltage Test time : $500 \pm 24/0$ h Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2). Final measurements shall be made after the specimens have been left at room temperature as per Table3.  Table3 <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td><math>48 \pm 4</math> h</td> </tr> </tbody> </table>	Charac-teristic	Time	CN	$48 \pm 4$ h
Charac-teristic	Time						
CN	$48 \pm 4$ h						
16	Heat life test	Appearance	Without mechanical damage.				
		Change rate from initial value	CN      Within $\pm 15\%$				
		Dielectric loss tangent	CN $\tan \delta \leq 200\%$ initial spec.				
		Insulation resistance	Not less than $1000M\Omega$ or $50M\Omega \cdot \mu F$ , whichever is less.				
			Test temperature : $125 \pm 2^\circ C$ Voltage : Rated voltage x 200% Test time : $1000 \pm 48/0$ h Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2). Final measurements shall be made after the specimens have been left at room temperature as per Table3.  Table3 <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>CN</td> <td><math>48 \pm 4</math> h</td> </tr> </tbody> </table>	Charac-teristic	Time	CN	$48 \pm 4$ h
Charac-teristic	Time						
CN	$48 \pm 4$ h						

## [Remarks]

## Pre-conditioning

If specified in test method of as per 3(Performance and test method), capacitors of CN, characteristics shall be pre-conditioned as follows.

## (1) Thermal pre-conditioning

Prior to initial measurements, specimens shall be conditioned at a temperature of  $150 \pm 10^\circ C$  for a period of 1hr., and shall be allowed to stabilize at room temperature for  $48 \pm 4$ h

## (2) Voltage pre-conditioning

Prior to initial measurements, voltage specified as a test condition shall be applied to specimens for a period of 1hr., and the specimens shall be allowed to stabilize at room temperature for  $48 \pm 4$ h

EMI Filters

●Packaging specifications

Taping dimensions	Reel dimensions																																		
<table border="1" style="margin: 0 auto;"> <thead> <tr> <th>Symbol</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</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>4.0 +/-0.1</td> <td>2.0 +/-0.05</td> <td>4.0 +/-0.1</td> <td>φ1.5 +0.1/-0</td> <td>0.9 MAX.</td> <td>1.2 MAX.</td> </tr> </tbody> </table> <p style="text-align: right;">(Unit : mm)</p> <table border="1" style="margin: 0 auto;"> <thead> <tr> <th>Symbol</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>MCF18</td> <td>1.0 +/-0.05</td> <td>1.8 +/-0.05</td> </tr> </tbody> </table> <p style="text-align: center;">(Unit : mm)</p>	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	φ1.5 +0.1/-0	0.9 MAX.	1.2 MAX.	Symbol	A	B	MCF18	1.0 +/-0.05	1.8 +/-0.05	<p>As per EIAJ ET-7200A</p> <p>(Unit : mm)</p> <table border="1" style="margin: 0 auto;"> <thead> <tr> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> </thead> <tbody> <tr> <td>φ180<sup>+0</sup><sub>-1.5</sub></td> <td>φ60<sup>+1.0</sup><sub>-0</sub></td> <td>9.0<sup>+1.0</sup><sub>-0</sub></td> <td>φ13± 0.2</td> </tr> </tbody> </table>	A	B	C	D	φ180 <sup>+0</sup> <sub>-1.5</sub>	φ60 <sup>+1.0</sup> <sub>-0</sub>	9.0 <sup>+1.0</sup> <sub>-0</sub>	φ13± 0.2
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●Electrical characteristics

■ CN (X7R) Characteristics

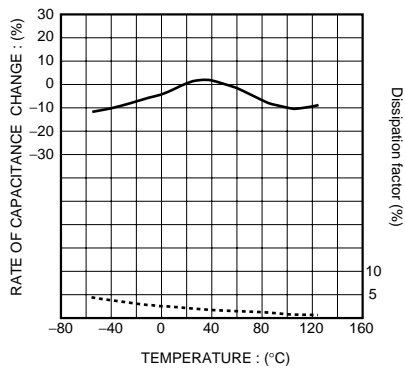


Fig.1 Capacitance - temperature characteristics

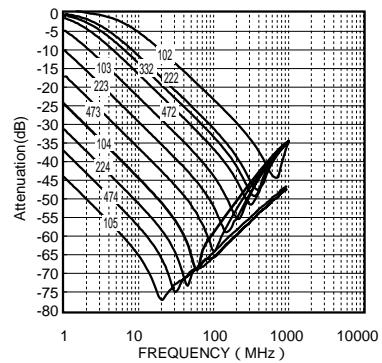


Fig.2 Attenuation characteristics

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