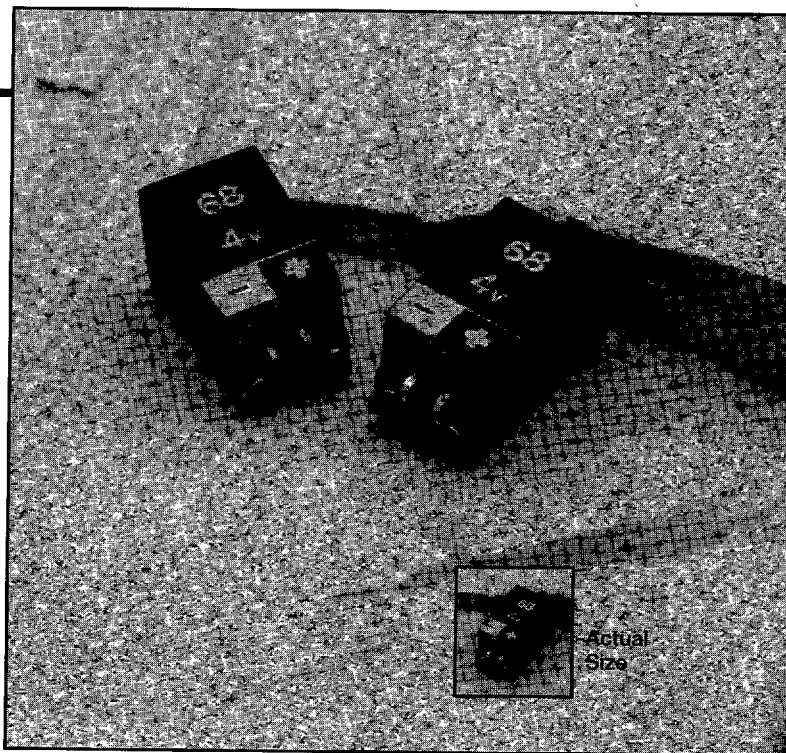


# MF Series



- **Surface Mount**
- **Low Profile  
Horizontal Chip**
- **Solvent Proof**
- **+85°C  
Maximum  
Temperature**



The MF series are the standard low profile, surface mount capacitors from United Chemi-Con. These horizontal chip type capacitors are designed for reflow soldering, and the terminals can be seen from the side to check the solderability of the capacitor. A third terminal for mechanical support is also available for the MF series.

The MF series capacitors were developed to withstand HCFC cleaning agents for five minutes by ultrasonic, vapor or immersion. This solvent proof design allows all circuit board components to be cleaned together, at the same time, without resorting to more expensive epoxy end-sealed capacitors. Refer to the Mini-Glossary for recommended cleaning conditions.

## Summary of Specifications

- **Surface mount lead terminals.**
- **Capacitance range: 0.1 to 150 $\mu$ F.**
- **Voltage range: 4 to 50VDC.**
- **Operating temperature range: -40°C to +85°C.**
- **Leakage current: 0.01CV or 3 $\mu$ A, whichever is greater, after 2 minutes at +20°C.**
- **Standard capacitance tolerance:  $\pm$ 20%**
- **Nominal case size (H $\times$ L): 3 $\times$ 6.3mm to 4.5 $\times$ 13.3mm.**
- **Rated lifetime: 2,000 hours at +85°C.**

**MF Specifications**

Item	Characteristics																																																																																																											
Operating Temperature Range	-40 to +85°C																																																																																																											
Rated Voltage Range	4 to 50VDC																																																																																																											
Capacitance Range	0.1 to 150 $\mu$ F																																																																																																											
Capacitance Tolerance	$\pm$ 20% (M) at +20°C, 120Hz																																																																																																											
Leakage Current	$I = 0.01CV$ or $3\mu A$ , whichever is greater, after 2 minutes at +20°C. Where $I$ = Leakage current ( $\mu A$ ), $C$ = Nominal capacitance ( $\mu F$ ) and $V$ = Rated voltage (V)																																																																																																											
Dissipation Factor (Tan $\delta$ )	At +20°C, 120Hz <table border="1"> <thead> <tr> <th>Rated Voltage (V)</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> </tr> </thead> <tbody> <tr> <td>Size A6</td> <td>0.76</td> <td>0.42</td> <td>0.32</td> <td>0.26</td> <td>0.20</td> <td>0.18</td> <td>0.16</td> </tr> <tr> <td>Size B6</td> <td>0.74</td> <td>0.40</td> <td>0.30</td> <td>0.24</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> </tr> <tr> <td>Size B8</td> <td>0.64</td> <td>-</td> <td>-</td> <td>-</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> </tr> <tr> <td>Size C6</td> <td>0.64</td> <td>0.40</td> <td>0.30</td> <td>0.24</td> <td>0.18</td> <td>0.16</td> <td>0.14</td> </tr> <tr> <td>Size C8</td> <td>0.52</td> <td>0.36</td> <td>0.28</td> <td>0.24</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> </tr> <tr> <td>Size D6-D13</td> <td>0.52</td> <td>0.36</td> <td>0.28</td> <td>0.24</td> <td>0.16</td> <td>0.14</td> <td>0.12</td> </tr> </tbody> </table>	Rated Voltage (V)	4	6.3	10	16	25	35	50	Size A6	0.76	0.42	0.32	0.26	0.20	0.18	0.16	Size B6	0.74	0.40	0.30	0.24	0.18	0.16	0.14	Size B8	0.64	-	-	-	0.16	0.14	0.12	Size C6	0.64	0.40	0.30	0.24	0.18	0.16	0.14	Size C8	0.52	0.36	0.28	0.24	0.16	0.14	0.12	Size D6-D13	0.52	0.36	0.28	0.24	0.16	0.14	0.12																																																			
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Low Temperature Characteristics	At 120Hz, impedance (Z) ratio between the -25°C or -40°C value and +20°C value shall not exceed the values given below. <table border="1"> <thead> <tr> <th colspan="2">Rated Voltage (V)</th> <th>4</th> <th>6.3</th> <th>10</th> <th>16</th> <th>25</th> <th>35</th> <th>50</th> </tr> </thead> <tbody> <tr> <td rowspan="6">Z(-25°C)/Z(+20°C)</td> <td>Size A6</td> <td>10</td> <td>7</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> </tr> <tr> <td>Size B6</td> <td>9</td> <td>6</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Size B8</td> <td>9</td> <td>-</td> <td>-</td> <td>-</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Size C6</td> <td>9</td> <td>6</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Size C8</td> <td>7</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td>Size D6-D13</td> <td>7</td> <td>4</td> <td>3</td> <td>2</td> <td>2</td> <td>2</td> <td>2</td> </tr> <tr> <td rowspan="6">Z(-40°C)/Z(+20°C)</td> <td>Size A6</td> <td>18</td> <td>13</td> <td>10</td> <td>8</td> <td>6</td> <td>5</td> <td>5</td> </tr> <tr> <td>Size B6</td> <td>17</td> <td>12</td> <td>9</td> <td>7</td> <td>5</td> <td>4</td> <td>4</td> </tr> <tr> <td>Size B8</td> <td>17</td> <td>-</td> <td>-</td> <td>-</td> <td>4</td> <td>3</td> <td>3</td> </tr> <tr> <td>Size C6</td> <td>17</td> <td>12</td> <td>9</td> <td>7</td> <td>5</td> <td>4</td> <td>4</td> </tr> <tr> <td>Size C8</td> <td>15</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> </tr> <tr> <td>Size D6-D13</td> <td>15</td> <td>10</td> <td>8</td> <td>6</td> <td>4</td> <td>3</td> <td>3</td> </tr> </tbody> </table>	Rated Voltage (V)		4	6.3	10	16	25	35	50	Z(-25°C)/Z(+20°C)	Size A6	10	7	5	4	3	2	2	Size B6	9	6	4	3	2	2	2	Size B8	9	-	-	-	2	2	2	Size C6	9	6	4	3	2	2	2	Size C8	7	4	3	2	2	2	2	Size D6-D13	7	4	3	2	2	2	2	Z(-40°C)/Z(+20°C)	Size A6	18	13	10	8	6	5	5	Size B6	17	12	9	7	5	4	4	Size B8	17	-	-	-	4	3	3	Size C6	17	12	9	7	5	4	4	Size C8	15	10	8	6	4	3	3	Size D6-D13	15	10	8	6	4	3	3
Rated Voltage (V)		4	6.3	10	16	25	35	50																																																																																																				
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Load Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after subjecting them to the DC rated voltage for 2,000 hours at +85°C. The sum of DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitors. Capacitance change: Size A6 : $\leq \pm 30\%$ of the initial measured value Size B6, B8, C6 : $\leq \pm 25\%$ of the initial measured value Size C8, D6-D13 : $\leq \pm 20\%$ of the initial measured value Tan $\delta$ (DF) : $\leq 200\%$ of the initial specified value Leakage current : $\leq$ initial specified value																																																																																																											
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to +20°C after exposing them for 500 hours at +85°C without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change: $\leq \pm 15\%$ of the initial measured value Tan $\delta$ (DF) : $\leq 150\%$ of the initial specified value Leakage current : $\leq$ initial specified value																																																																																																											
Others	Satisfies characteristic W of JIS C5141																																																																																																											

# MF Series

## Diagram of Dimensions

### Horizontal Chip Lead Terminals

Unit: mm

#### FC Type (Standard)

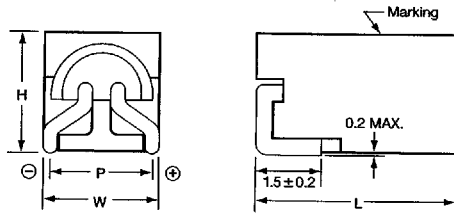


Figure 1 (A6)

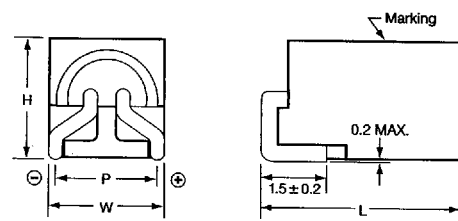


Figure 2 (B6-D13)

#### FD Type (Special Order)

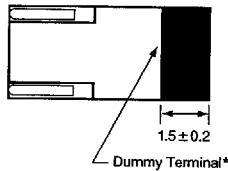


Figure 3 (A6)

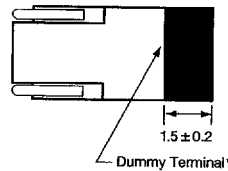


Figure 4 (B6-D13)

\*For mechanical support, copper paste coated and dried.

For tape and reel packaging and reflow soldering conditions, refer to the beginning of the Surface Mount section.

#### Case Dimensions

Case Code	L+0.2 max.	W+0.2 max.	H+0.2 max.	P±0.3	Figure
A6	6.3	3.1	3.0	2.5	1 & 3
B6	6.3	3.6	3.5	3.0	2 & 4
B8	8.3		4.0	3.5	
C6	6.3	4.1	4.0	3.5	
C8	8.3				
D6	6.3	4.6	4.5	4.0	
D8	8.3				
D10	10.3				
D13	13.3				

#### Recommended Solder Pad on PC Board

##### Without Dummy Terminal (FC)

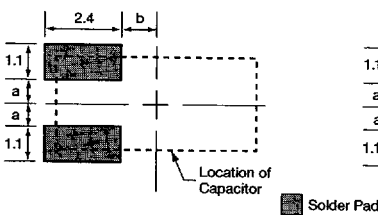


Figure 5

##### With Dummy Terminal (FD)

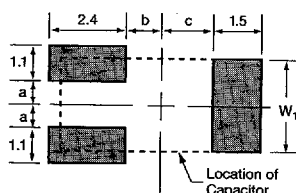


Figure 6

#### Solder Pad Dimensions

Case Code	W1	a	b	c	Figure
A6	3.1	0.75	1.2	1.65	5 & 6
B6	3.6	1.0	1.2	1.65	
B8	3.6	1.0	2.2	2.65	
C6	4.1	1.3	1.2	1.65	
C8	4.1	1.3	2.2	2.65	
D6	4.6	1.5	1.2	1.65	
D8	4.6	1.5	2.2	2.65	
D10	4.6	1.5	3.2	3.65	
D13	4.6	1.5	4.7	5.15	

## Part Numbering System for MF Series

When ordering, always specify complete catalog number for MF Series.

**MF 4 FC 68R M D8 TP**

Lead Length: TP is for Standard Taping.

Case Code: See Case Sizes in Tables.

Capacitance Tolerance: M = ±20%

Capacitance Value: Expressed in microfarads. The first two digits are significant figures, and the third digit indicates the number of zeros for capacitance of 100µF or more. R indicates the decimal point for capacitance less than 100µF (e.g. R68 = .68µF; 6R8 = 6.8µF; 68R = 68µF; 681 = 680µF; 682 = 6,800µF; 683 = 68,000µF).

Lead Configuration: FC = Horizontal Chip Lead Terminals.

DC Rated Voltage: Expressed in Volts (e.g. 4 = 4WVDC).

Series Name: Indicates Basic Capacitor Design.

**MF Series****Standard Voltage Ratings - Surface Mount**

Rated Voltage (WVDC)	Capacitance (μF)	Catalog Part Number	Nominal Case Size* H × L (mm)	Case Code	Maximum ESR (Ω) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +85°C, 120Hz
<b>4 Volts 5 Volts Surge</b>	33	MF4FC33RMC6TP	4 × 6.3	C6	32.145	19
	33	MF4FC33RMB6TP	3.5 × 8.3	B8	32.145	19
	47	MF4FC47RMC6TP	4 × 6.3	C6	22.57	21
	68	MF4FC68RMD8TP	4.5 × 8.3	D8	12.675	35
	100	MF4FC101MD10TP	4.5 × 10.3	D10	8.619	46
	150	MF4FC151MD13TP	4.5 × 13.3	D13	5.746	67
<b>6.3 Volts 8 Volts Surge</b>	10	MF6.3FC10RMA6TP	3 × 6.3	A6	69.615	8.2
	10	MF6.3FC10RMB6TP	3.5 × 6.3	B6	66.3	11
	22	MF6.3FC22RMB6TP	3.5 × 6.3	B6	30.136	16
	33	MF6.3FC33RMC6TP	4 × 6.3	C6	20.091	21
	47	MF6.3FC47RMD8TP	4.5 × 8.3	D8	12.696	29
	68	MF6.3FC68RMD10TP	4.5 × 10.3	D10	8.775	44
	100	MF6.3FC101MD13TP	4.5 × 13.3	D13	5.967	63
<b>10 Volts 13 Volts Surge</b>	6.8	MF10FC6R8MA6TP	3 × 6.3	A6	78.0	7.5
	6.8	MF10FC6R8MB6TP	3.5 × 6.3	B6	73.125	10
	15	MF10FC15RMD6TP	4.5 × 6.3	D6	33.15	19
	22	MF10FC22RMD8TP	4.5 × 8.3	D8	22.602	25
	47	MF10FC47RMD10TP	4.5 × 10.3	D10	9.874	41
	68	MF10FC68RMD13TP	4.5 × 13.3	D13	6.825	58
<b>16 Volts 20 Volts Surge</b>	4.7	MF16FC4R7MA6TP	3 × 6.3	A6	91.691	6.8
	4.7	MF16FC4R7MB6TP	3.5 × 6.3	B6	84.638	9.0
	6.8	MF16FC6R8MB6TP	3.5 × 6.3	B6	58.5	10
	10	MF16FC10RMB6TP	3.5 × 6.3	B6	39.78	12
	15	MF16FC15RMD8TP	4.5 × 8.3	D8	26.52	23
	22	MF16FC22RMD6TP	4.5 × 6.3	D6	18.082	24
	47	MF16FC47RMD13TP	4.5 × 13.3	D13	8.464	53
<b>25 Volts 32 Volts Surge</b>	3.3	MF25FC3R3MA6TP	3 × 6.3	A6	100.455	6.1
	3.3	MF25FC3R3MB6TP	3.5 × 6.3	B6	90.409	8.3
	4.7	MF25FC4R7MB6TP	3.5 × 6.3	B6	63.479	9.9
	6.8	MF25FC6R8MC6TP	4 × 6.3	C6	43.875	13
	6.8	MF25FC6R8MB8TP	3.5 × 8.3	B8	39.0	16
	10	MF25FC10RMD6TP	4.5 × 6.3	D6	26.52	18
	10	MF25FC10RMC8TP	4 × 8.3	C8	26.52	21
	15	MF25FC15RMD8TP	4.5 × 8.3	D8	17.68	25
	22	MF25FC22RMD10TP	4.5 × 10.3	D10	12.055	34
33	MF25FC33RMD13TP	4.5 × 13.3	D13	8.036	51	
<b>35 Volts 44 Volts Surge</b>	1.5	MF35FC1R5MA6TP	3 × 6.3	A6	198.9	5.3
	2.2	MF35FC2R2MA6TP	3 × 6.3	A6	135.614	5.3
	2.2	MF35FC2R2MB6TP	3.5 × 6.3	B6	120.545	7.2
	3.3	MF35FC3R3MB6TP	3.5 × 6.3	B6	80.364	8.8
	4.7	MF35FC4R7MC6TP	4 × 6.3	C6	56.426	11
	4.7	MF35FC4R7MB8TP	3.5 × 8.3	B8	49.372	14
	6.8	MF35FC6R8MD8TP	4.5 × 8.3	D8	34.125	18
	10	MF35FC10RMD8TP	4.5 × 8.3	D8	23.205	22
	15	MF35FC15RMD10TP	4.5 × 10.3	D10	15.47	30
	22	MF35FC22RMD13TP	4.5 × 13.3	D13	10.548	43
<b>50 Volts 63 Volts Surge</b>	0.1	MF50FCR10MA6TP	3 × 6.3	A6	2,652.0	1.3
	0.1	MF50FCR10MB6TP	3.5 × 6.3	B6	2,320.5	1.3
	0.15	MF50FCR15MA6TP	3 × 6.3	A6	1,768.0	1.8
	0.15	MF50FCR15MB6TP	3.5 × 6.3	B6	1,547.0	1.8
	0.22	MF50FCR22MA6TP	3 × 6.3	A6	1,205.455	2.2
	0.22	MF50FCR22MB6TP	3.5 × 6.3	B6	1,054.773	2.2

\*Refer to diagrams for detailed case size dimensions.

**MF Series****Standard Voltage Ratings - Surface Mount**

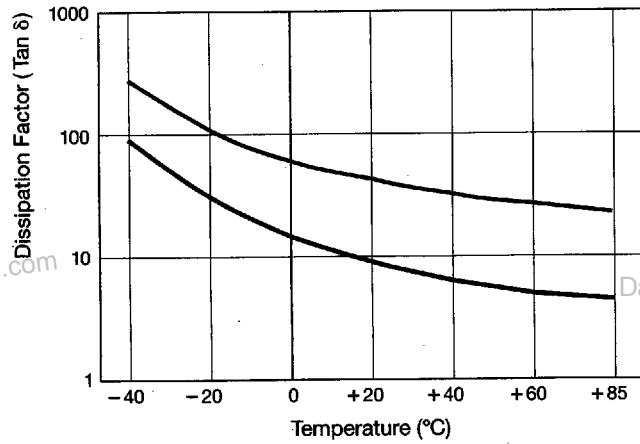
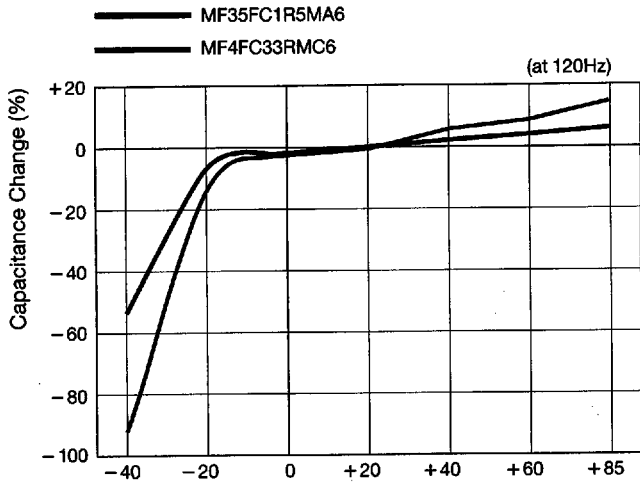
Rated Voltage (WVDC)	Capacitance ( $\mu\text{F}$ )	Catalog Part Number	Nominal Case Size* H x L (mm)	Case Code	Maximum ESR ( $\Omega$ ) at +20°C, 120Hz	Maximum Ripple Current (mA rms) at +85°C, 120Hz
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<b>50 Volts 63 Volts Surge</b>	0.33	MF50FCR33MA6TP	3 x 6.3	A6	803.636	2.6
	0.33	MF50FCR33MB6TP	3.5 x 6.3	B6	703.182	2.6
	0.47	MF50FCR47MA6TP	3 x 6.3	A6	564.255	3.2
	0.47	MF50FCR47MB6TP	3.5 x 6.3	B6	493.723	3.2
	0.68	MF50FCR68MA6TP	3 x 6.3	A6	390.0	3.8
	0.68	MF50FCR68MB6TP	3.5 x 6.3	B6	341.25	3.8
	1.0	MF50FC1R0MA6TP	3 x 6.3	A6	265.2	4.6
	1.0	MF50FC1R0MB6TP	3.5 x 6.3	B6	232.05	4.6
	1.5	MF50FC1R5MA6TP	3 x 6.3	A6	176.8	4.6
	1.5	MF50FC1R5MB6TP	3.5 x 6.3	B6	154.7	6.4
	2.2	MF50FC2R2MB6TP	3.5 x 6.3	B6	105.477	7.7
	3.3	MF50FC3R3MB8TP	3.5 x 8.3	B8	60.273	13
	4.7	MF50FC4R7MC8TP	4 x 8.3	C8	42.319	16
	6.8	MF50FC6R8MD8TP	4.5 x 8.3	D8	29.25	19
	10	MF50FC10RMD10TP	4.5 x 10.3	D10	19.89	26
15	MF50FC15RMD13TP	4.5 x 13.3	D13	13.26	38	

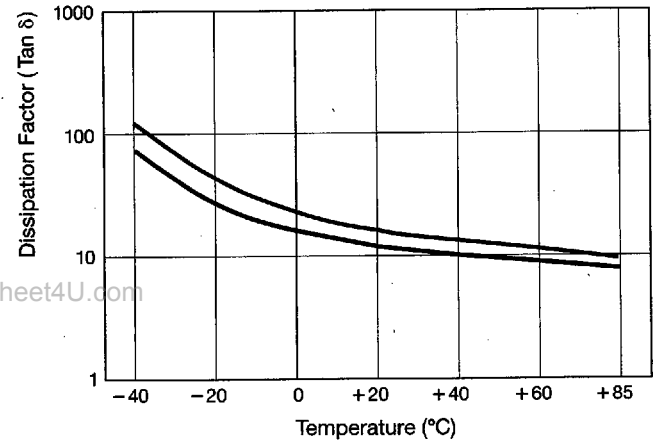
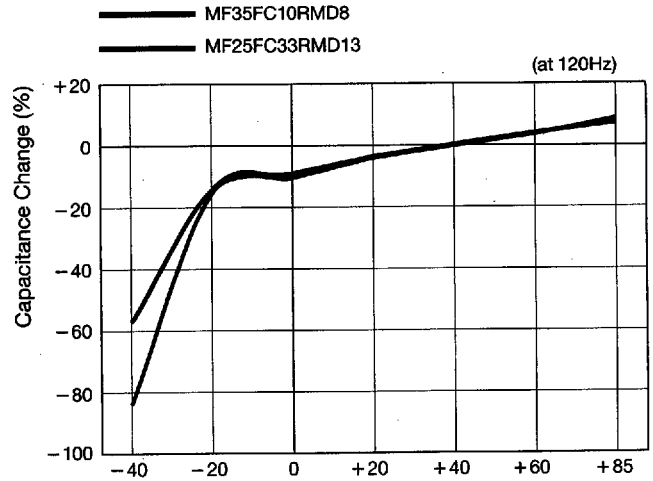
\*Refer to diagrams for detailed case size dimensions.

# MF Series

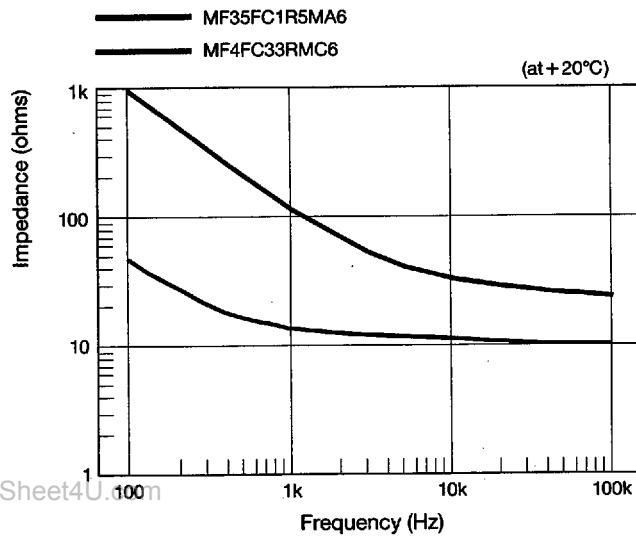
## Temperature Characteristics



## Temperature Characteristics



## Impedance - Frequency Characteristics



## Impedance - Frequency Characteristics

