

# On-Board Type (DC) EMI Suppression Filters(EMIFIL<sup>®</sup>)

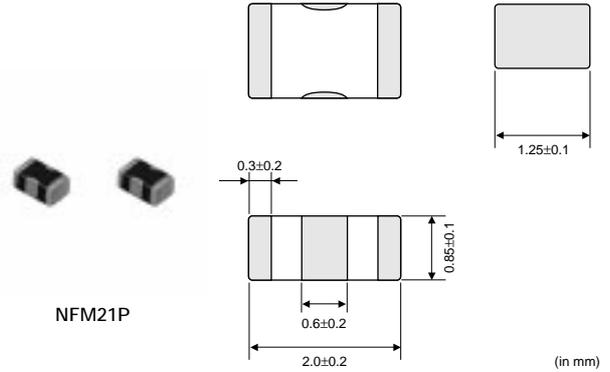
## Chip EMIFIL<sup>®</sup> for Large Current NFM21P/NFM3DP/NFM41P/NFM55P Series

### NFM21P Series

NFM21P is 3 terminal structure component. This product can be applied to large current DC power lines. NFM21P is suitable for noise suppression of DC power lines where relatively operates large current.

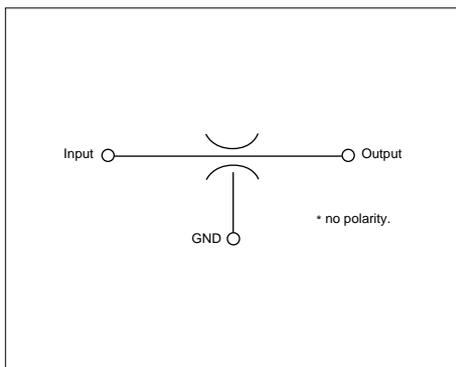
#### ■ Features

1. The rated current of 4A is suitable for IC's individual power line.
2. Small dimension enables higher density packaging. NFM21P is much smaller size.(2.0x1.25x0.85mm)
3. Murata's original internal electrode structure design which realizes excellent EMI suppression effect from low frequency to high frequency.

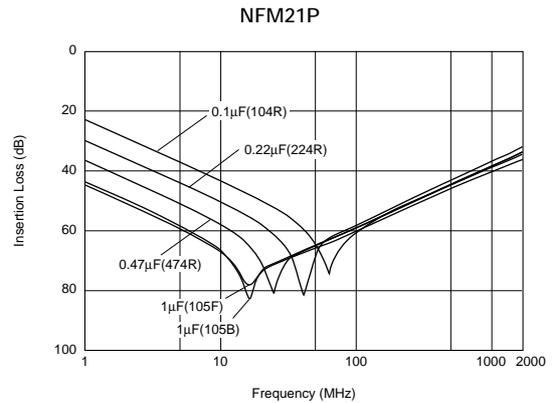


Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM21PC104R1E3	100000 +20%,-20%	25	2	1000 min.	-55 to 125
NFM21PC224R1C3	220000 +20%,-20%	16	2	1000 min.	-55 to 125
NFM21PC474R1C3	470000 +20%,-20%	16	2	1000 min.	-55 to 125
NFM21PC105B1A3	1000000 +20%,-20%	10	4	500 min.	-40 to 85
NFM21PC105F1C3	1000000 +80%,-20%	16	2	500 min.	-40 to 85

#### ■ Equivalent Circuit



#### ■ Insertion Loss Characteristics



## NFM3DP Series

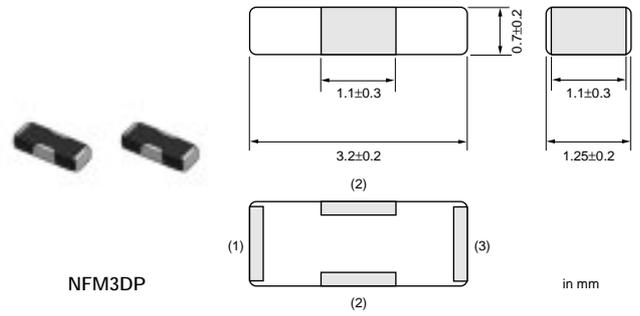
The chip solid "EMIFIL" NFM3DP is a chip type 3-terminal capacitor with high rated current of 2A. This series is suited for noise suppression in DC power supply lines of digital instruments.

### ■ Features

1. Large rated current (2A) and low voltage drop due to a small DC resistance (0.05ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.

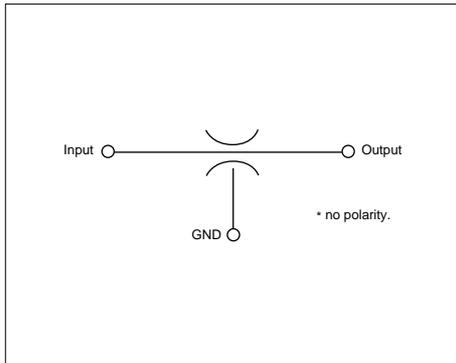
### ■ Applications

- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment

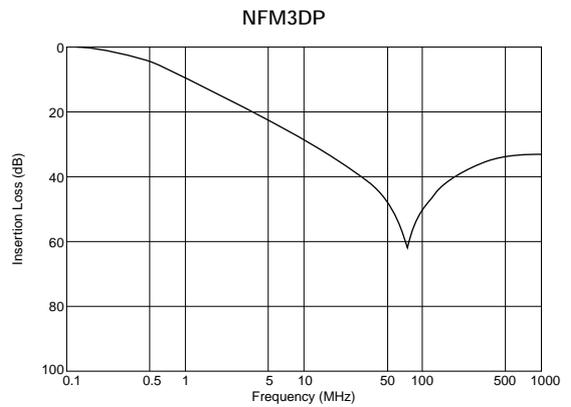


Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM3DPC223R1H2	22000 +20%, -20%	50	2	1000 min.	-55 to 85

### ■ Equivalent Circuit



### ■ Insertion Loss Characteristics



## NFM41P Series

Chip solid "EMIFIL" NFM41P are 3 terminal structure SMT components. These components are able to be applied to large current DC power lines. NFM41P are suitable in noise suppression DC lines where relatively large currents operate.

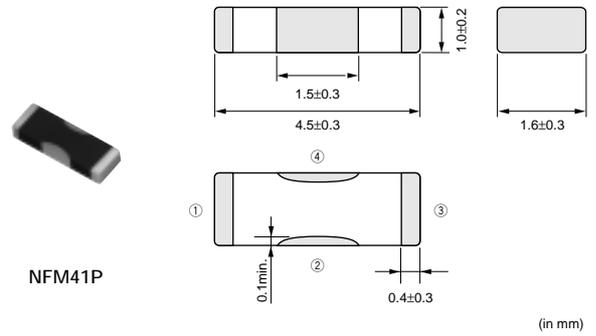
Using base metal to the electrode.

### Features

1. Large rated current (2A) and low voltage drop due to a small DC resistance (0.04ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.

### Applications

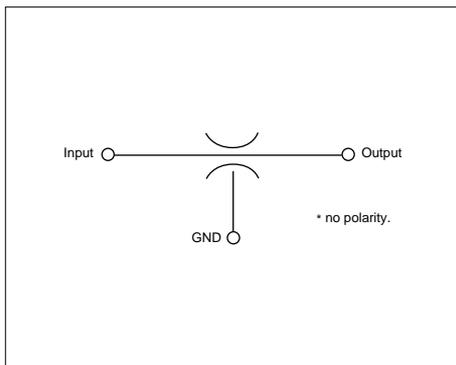
- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment



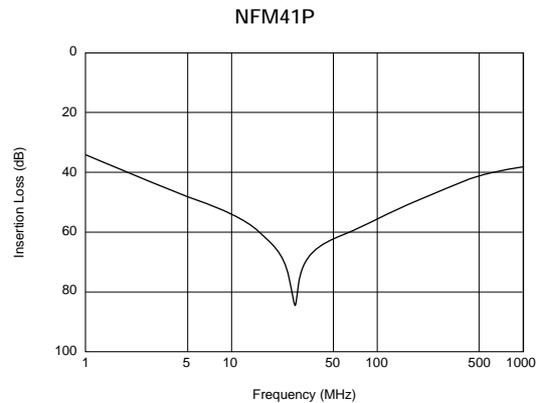
NFM41P

Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM41PC204F1H3	200000 +80%, -20%	50	2	1000 min.	-55 to 85

### Equivalent Circuit



### Insertion Loss Characteristics



**NFM55P Series**

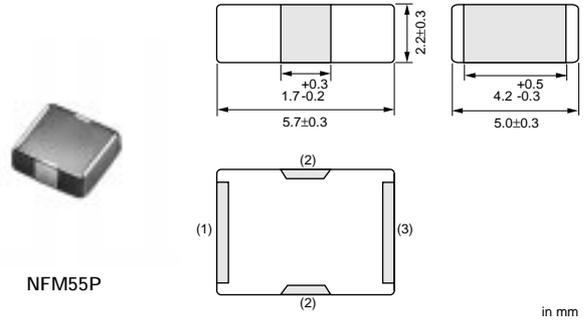
The chip solid "EMIFIL" NFM55P is a chip type 3-terminal capacitor with high rated current of 6A. This series is suited for noise suppression in DC power lines where high rated current and large capacitance is required.

**■ Features**

1. Large rated current (6A) and low voltage drop due to a small DC resistance (0.01ohm) are suitable for the application in DC power line.
2. High electrostatic capacitance and remarkable high frequency performance are effective for the immunity against the surge noise and the pulse noise.
3. Only reflow soldering should be applied.

**■ Applications**

- Personal computers, Word processors and Peripherals
- Telephones, PPCs, Communication equipments, etc.
- Digital TVs, VCRs
- Telecommunication equipment



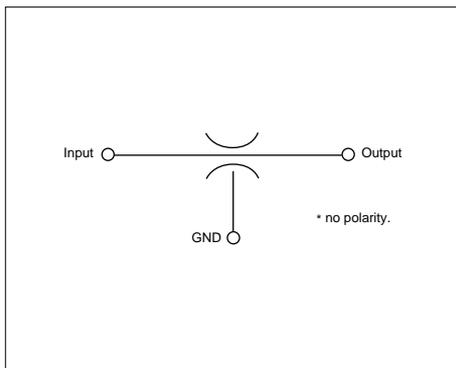
NFM55P

in mm

11

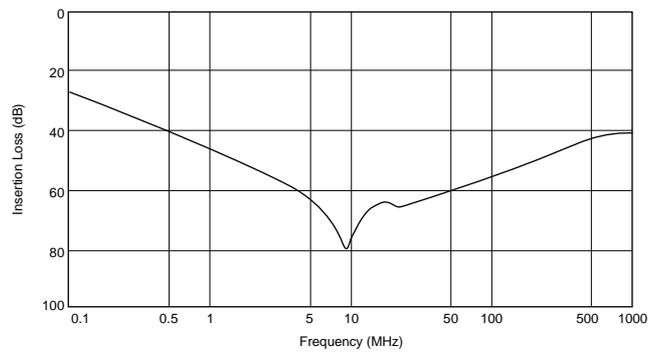
Part Number	Capacitance (pF)	Rated Voltage (Vdc)	Rated Current (A)	Insulation Resistance (M ohm)	Operating Temperature Range (°C)
NFM55PC155F1H4	1500000 +80%,-20%	50	6	100 min.	-55 to 85

**■ Equivalent Circuit**



**■ Insertion Loss Characteristics**

NFM55P



# NFM/NFR/NFL Series Notice (Soldering and Mounting)

## 1. Standard Land Pattern Dimensions

The capacitor type chip EMI suppression filters (NF□ series) suppress noise by conducting the high-frequency noise element to ground. Therefore, to obtain maximum performance from these filters, the ground pattern should be made as large as possible during the PCB design stage. As shown in the right, one side of the PCB is used for chip mounting, and the other is used for grounding. Small diameter feedthrough holes are then used to connect the grounds on each side of the PCB. This reduces the high-frequency impedance of the grounding and maximizes the filter's performance. Please contact us if using thinner land pad than 18μm for NFM55P.

**For Reflow Soldering**

Chip mounting side      Back side

Small diameter thru hole  $\phi 0.4-\phi 0.6$

Ground pattern

Connect to ground pattern of mounting side

Part Number	Size (mm)			
	a	b	c	d
<b>NFM21C/NFM21P</b> <b>NFR21G/NFL21S</b>	0.8	1.4	2.6	0.6
<b>NFM3DC</b> <b>NFM3DP</b>	1.4	2.5	4.4	1.0
<b>NFM41C</b> <b>NFM41P</b>	2.0	3.5	6.0	1.2

Legend:  Land  
 Solder Resist

**NFM55P**

Small diameter thru hole  $\phi 1.0-\phi 2.0$

(in mm)

- NFM21C/21P, NFR21G, NFL21S and NFM55P are specially adapted for reflow soldering.

**For Flow Soldering**

Chip mounting side      Back side

Small diameter thru hole  $\phi 0.4-\phi 0.6$

Ground pattern

Connect to ground pattern of mounting side

Part Number	Size (mm)						
	a	b	c	d	e	f	g
<b>NFM3DC</b> <b>NFM3DP</b>	1.0	1.4	2.5	4.4	1.0	2.0	2.4
<b>NFM41C</b> <b>NFM41P</b>	1.5	2.0	3.5	6.0	1.2	2.6	3.0

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## NFM/NFR/NFL Series Notice (Soldering and Mounting)

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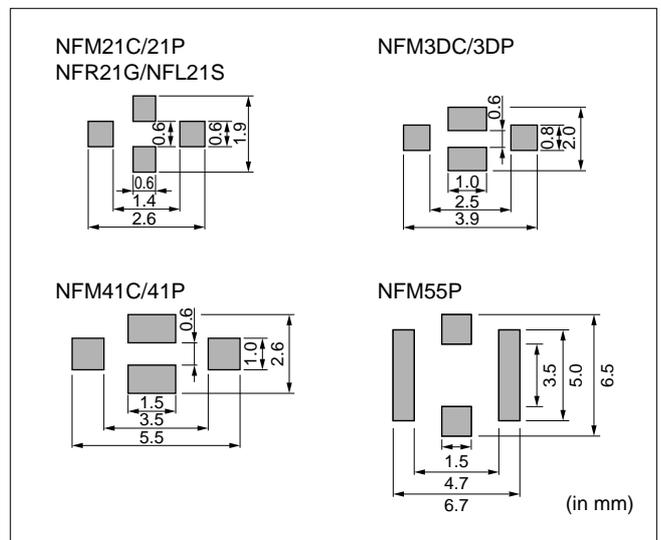
### 2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip EMI suppression filters, the printing must be conducted in accordance with the following cream solder paste printing conditions. If too much solder is applied, the chip will prone to be damaged by mechanical and thermal stress from the PCB and may crack. In contrast, if too little solder is applied, there is the potential that the termination strength will be insufficient, creating the potential for detachment. Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the EMI suppression filter, apply the adhesive in accordance with the following conditions. If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

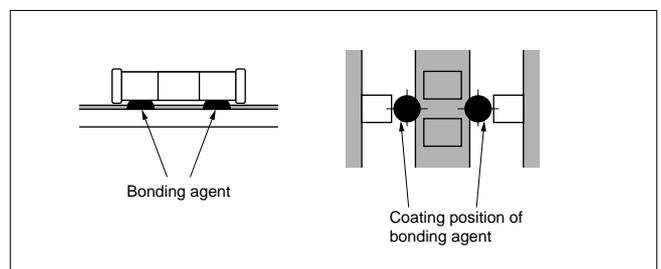
#### (1) Solder Paste Printing

- ① Coat the solder paste a thickness
  - 100µm to 150µm : NFM21C/21P/3DC/3DP  
NFR21G  
NFL21S
  - 100µm to 200µm : NFM41C/41P
  - 150µm to 200µm : NFM55P
- ② Use H60A solder for pattern printing.



#### (2) Adhesive Application

- Apply 0.1mg for NFM41C/41P and 0.06mg for NFM3DC/3DP of bonding agent at each chip, and ensure not to cover electrodes.



Continued on the following page.

## NFM/NFR/NFL Series Notice (Soldering and Mounting)

Continued from the preceding page.

### 3. Standard Soldering Conditions

#### (1) SOLDERING METHODS

Use flow and reflow soldering methods only.  
 Use standard soldering conditions when soldering chip EMI suppression filters.  
 In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

#### (2) SOLDERING TEMPERATURE AND TIME

To prevent external electrode solder leaching and performance deterioration, solder within the temperature and time combinations illustrated by the slanted lines in the following graphs. If soldering is repeated, please note that the allowed time is the accumulated time.

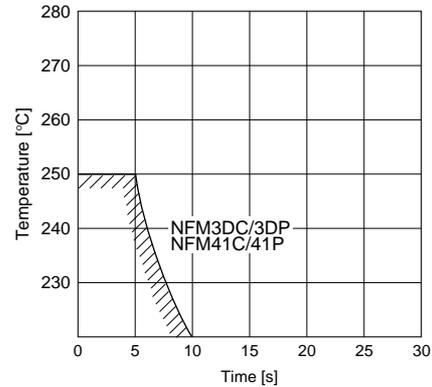
Solder : H60A H63A solder(JIS Z 3238)

Flux :

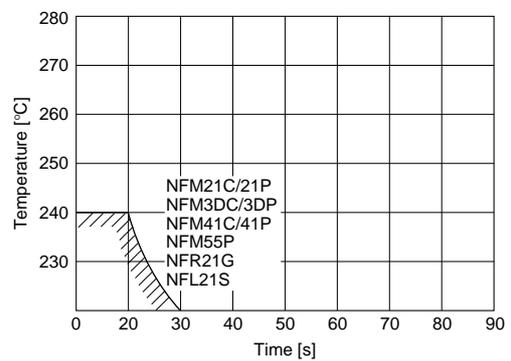
- Use Rosin-based fulx(when using RA type solder, clean products sufficiently to avoid residual fulx.
- Do not use strong acidic fulx(with chlorine content exceeding 0.20wt%)
- Do not use water-soluble fulx.

#### (3) SOLDERING CONDITIONS

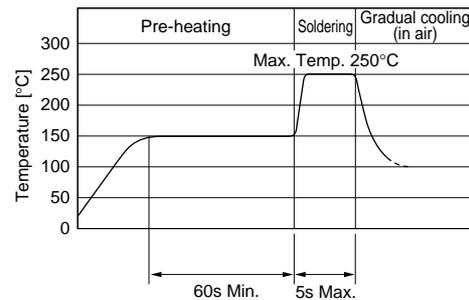
Allowable Flow Soldering Temperature and Time



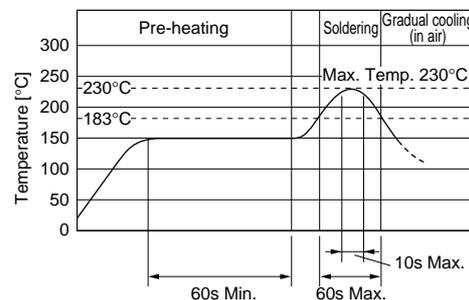
Allowable Reflow Soldering Temperature and Time



Flow Solder



Reflow Solder



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## NFM/NFR/NFL Series Notice (Soldering and Mounting)

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### (4) REWORKING WITH SOLDER IRON

The following conditions must be strictly followed when using a soldering iron.

Pre-heating	: 150°C 60 second Min.
Soldering iron power output	: 30W Max.
Temperature of soldering iron tip	: 280°C Max.
Soldering time	: 10 second Max.

Do not allow the tip of the soldering iron directly to contact the chip.

For additional methods of reworking with soldering iron, please contact Murata engineering.

### 4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature : 60degree C max. (40degree C max. for CFC alternatives and alcohol cleaning agents)

(2) Ultrasonic

Output : 20W/liter max.

Duration : 5 minutes max.

Frequency : 28kHz to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

a) CFC alternatives and alcohol cleaning agents

Isopropyl alcohol (IPA)

HCFC-225

b) Aqueous cleaning agent

Surface active agent (Clean Thru 750H)

Hydrocarbon (Techno Cleaner 335)

High grade alcohol (Pine Alpha ST-100S)

Alkaline saponifier ( Aqua Cleaner 240 -cleaner should be diluted within 20% using deionized water.)

(4) Ensure that flux residue is completely removed.

Component should be thoroughly dried after aqueous agent has been removed with deionized water.

(5) Some products may become slightly whitened.

However, product performance or usage is not affected. For additional cleaning methods, please contact Murata engineering.

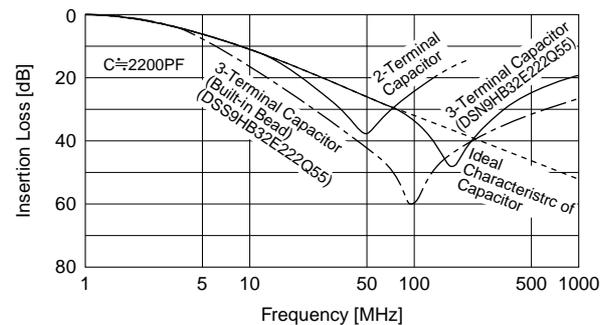
# Outlines of EMI Suppression Filter (EMIFIL<sup>®</sup>) for DC Line

- Chip Solid EMIFIL<sup>®</sup>
- T-type Chip EMIFIL<sup>®</sup>
- Disk Type EMIFIL<sup>®</sup>

<p>Chip Solid EMIFIL<sup>®</sup> .....P.69–74 P.87–90</p> <p>NFM21C      NFM21P      NFA6CC</p> <p>NFM3DC      NFAC1C      NFA31C</p>	<p>T-type Chip EMIFIL<sup>®</sup> .....P.84–86</p> <p>NFE31P      NFE61P/H</p>
<p>Disk Type EMIFIL<sup>®</sup> .....P.132–137</p> <p>DS□6      DS□9      DS□9H</p>	

- This capacitor type EMI suppression filter has a large noise suppression effect at frequencies ranging from a few MHz to hundreds of MHz. This type of filter is used widely as a universal, high performance EMI suppression component.
- The chip solid EMIFIL<sup>®</sup> incorporates a built-in three-terminal capacitor, eliminating the lead wire and thereby increasing the high-frequency performance characteristic.
- The T-type chip EMIFIL<sup>®</sup> is a chip EMI suppression filter with a built-in feed-thru capacitor. The use of ferrite beads on input and output terminals minimizes resonance with surrounding circuits.
- Whatever the situation, 3-terminal construction reduces residual inductance, thereby substantially improving noise suppression at frequencies over 10MHz.

[Comparison of Insertion Loss Characteristics]



A 3-terminal capacitor has a high self resonance frequency than general 2-terminal type and exhibits effective noise suppression at high frequency

### Chip EMIFIL® Capacitor Type

(Global Part Number) **NF** **M** **3D** **CC** **102** **R** **1H** **3** **L**  
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

#### ① Product ID

Product ID	
<b>NF</b>	Chip EMI Filters Capacitor Type

#### ② Structure

Code	Structure
<b>M</b>	Capacitor Type

#### ③ Dimension (L×W)

Code	Dimension (L×W)	EIA
<b>21</b>	2.00×1.25mm	0805
<b>3D</b>	3.20×1.25mm	1206
<b>31</b>	3.20×1.60mm	1206
<b>41</b>	4.50×1.60mm	1806
<b>55</b>	5.70×5.00mm	2200

#### ④ Features

Code	Features
<b>CC</b>	Capacitor Type for Signal Lines
<b>PC</b>	Capacitor Type for Large Current
<b>HC</b>	Capacitor Type for Automotive Electronics

#### ⑤ Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two figures.

#### ⑥ Capacitance Change

Code	Capacitance Change
<b>B</b>	±10%
<b>F</b>	+30/-80%
<b>R</b>	±15%
<b>U</b>	-750 ±120ppm
<b>S</b>	+350 to -1000ppm

#### ⑦ Rated Voltage

Code	Rated Voltage
<b>1A</b>	10V
<b>1C</b>	16V
<b>1E</b>	25V
<b>1H</b>	50V
<b>2A</b>	100V

#### ⑧ Electrode/Others

Expressed by a figure.

Ex.)

Code	Electrode
<b>3</b>	Sn Plating
<b>4</b>	Solder Coating
<b>9</b>	Others

#### ⑨ Packaging

Code	Packaging
<b>L</b>	Plastic Taping (ø180mm Reel)
<b>B</b>	Bulk
<b>D</b>	Paper Taping (ø180mm Reel)