# Chip EMIFIL ® LC Combined Type for Large Current NFE31PT□□□□1E9□ Reference Specification

### 1. Scope

This reference specification applies to Chip EMIFIL® LC Combined Type for Large Current NFE31P Series.

## 2. Part Numbering

NF	E	31	PT	220	R	<u>1E</u>	9	L
Product ID	Structure	Dimension	Features	Capacitance	Characteristics	Rated	Electrode	Packaging
		$(L \times W)$				Voltage		Code
							(L: Ta	aping / B: Bulk)

## 3. Rating

Customer Part Number			Rated Voltage	Withstanding Voltage	Rated Current	Insulation Resistance
	NFE31PT220R1E9L	00 5 000/				
	NFE31PT220R1E9B	22pF ± 30%				
	NFE31PT470C1E9L	47 5 50 0/		62.5 V (DC)	6 A (DC)	1000 MΩ min.
	NFE31PT470C1E9B	47pF ± 50 %				
	NFE31PT101C1E9L	400 5 80 0/	25 V (DC)			
	NFE31PT101C1E9B	100pF ± 80 %				
	NFE31PT221D1E9L	50.00				
	NFE31PT221D1E9B	220pF ± 50 %				
	NFE31PT471F1E9L	470 5 50 04				
	NFE31PT471F1E9B	470pF ± 50 %				
	NFE31PT152Z1E9L	4500 5 50 o/				
	NFE31PT152Z1E9B	1500pF ± 50 %				
	NFE31PT222Z1E9L	0000 5 500/				
	NFE31PT222Z1E9B	2200pF ± 50%				

<sup>•</sup> Operating Temperature: - 40 °C to + 85 °C

## 4. Standard Testing Condition

Unless otherwise specified>

Temperature: Ordinary Temp. 15 °C to 35 °C

Humidity: Ordinary Humidity 25 %(RH) to 85 %(RH)

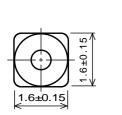
## <In case of doubt>

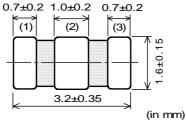
Temperature: 20 °C ± 2 °C

Humidity: 60 %(RH) to 70 %(RH)

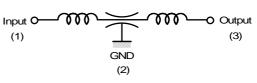
Atmospheric pressure: 86kPa to 106kPa

## 5. Style and Dimensions





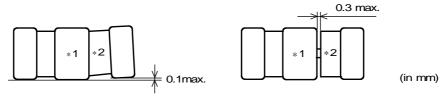
## ■ Equivalent Circuit



\* (1),(3):No Polarity

■ Unit Mass (Typical value) 0.034g

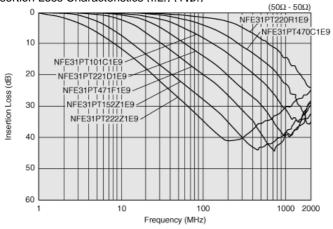
Note: Gap and bend between ceramic capacitor(\*1) and ferrite bead(\*2) may come out as illustrated below, however, these are not affect the performance, mounting and reliability of the products.



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<sup>•</sup> Storage Temperature: - 55 °C to + 125 °C





## 6. Marking

No marking

## 7. Electrical Performance

No.	Item Specification		Test Method				
7.1	Capacitance	Meet item 3.	_Table 1_				
			Capacitance Voltage Frequency	1			
			22 (pF) 1 to 5 V(rms) 1MHz ± 10%	]			
			47,100,220,470 1500 (pF) 1±0.2 V(rms) 1kHz ± 10%				
			2200 (pF) 0.1 V(rms) max. 1kHz ± 10%				
7.2	Insulation		Voltage : 25 V(DC)				
	Resistance(I.R.)		Time: 60±5 seconds				
7.3	Withstanding	roducts shall not be damaged. Test Voltage : 62.5 V(DC)					
	Voltage		Testing Time: 1 to 5 seconds				
			Limit the charging current: 10mA max.				

## 8. Mechanical Performance

No.	Item	Sp	ecification		Test Method
8.1	Appearance and Dimensions	Meet item 5.			Visual Inspection and measured with Slide Calipers
8.2	Solderability	The electrodes sl covered with new			Flux: Ethanol solution of rosin, 25(wt)% Pre-heat: 150 ± 10 °C, 60 ~ 90 s Solder: Sn-3.0Ag-0.5Cu Solder Temperature: 240 ± 3 °C Immersion Time: 3 ± 1 s Immersion and emersion rates: 25mm / s
8.3	Resistance to soldering heat	Meet Table 2.  Table 2			Flux : Ethanol solution of rosin, 25(wt)% Pre-heat : 150 ± 10 °C, 60 ~ 90 s Solder : Sn-3.0Ag-0.5Cu
		Appearance No damaged  22,47,100 within 220 (pF) ±15%  470,1500 within 2200 (pF) ±30%  I.R. meet item 3		aged	Solder Temperature : 270 ± 5 °C
				±15% within	(for NFE31PT152Z1E9□: 250±5°C) Immersion Time: 10 ± 1 s Immersion and emersion rates: 25mm / s Then measured after exposure the room
				em 3	condition for 4 to 48 hours.
	Withstanding No damaged				

## Reference Only

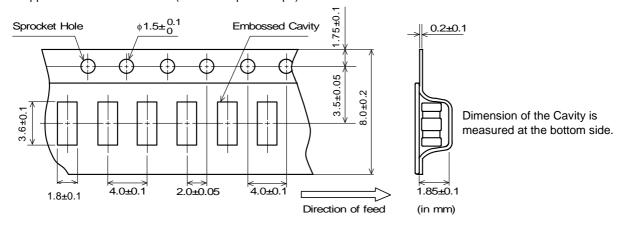
No.	Item	Specification			Test Method	
8.4	Bending Strength	Meet Table 3.  Table 3			It shall be soldered on the paper-phenol substrate. (t=1.6mm)	
		Appearance No damaged		aged	Pressure jig	
			22,47,100	within	R340 JF	
		Con Change	220 (pF)	±15%		
		Cap. Change	470,1500	within	Deflection	
			2200 (pF)	±30%		
						45 45 Product
					(in mm)	
					Deflection: 3 mm	
					Keeping Time: 30 seconds	

**9. Environment Performance** (It shall be soldered on the substrate.)

No.	Item	Sp	ecification		Test Method
9.1	Humidity	Table 4			Temperature : 40 ± 2 °C Humidity : 90 to 95 %(RH)
		Appearance	No dam 22,47,100	aged within	Time: 500 h (+ 24h, - 0h) Then measured after exposure in the room condition for 4 to 48 hours.
9.2	Heat Life	Cap. Change	220 (pF) 470,1500 2200 (pF)	±15% within ±30%	Temperature : 85 ± 2 °C Test Voltage :
		I.R. Withstanding Voltage	100 MΩ No dam	min.	22,47,100,220(pF) : Rated Voltage × 200 % 470,1500,2200(pF) : Rated Voltage × 150 % Time : 1000 h (+ 48h , - 0h)
					Then measured after exposure in the room condition for 4 to 48 hours.
9.3	Temperature Cycling	Meet Table 2.			1 Cycle 1 step: -55 °C (+ 0°C, - 3°C) / 30 ± 3 min 2 step: Room Temperature / within 5 min 3 step: +125 °C (+ 3°C, - 0°C) / 30 ± 3 min 4 step: Room Temperature / within 5 min Total of 10 cycles Then measured after exposure in the room condition for 4 to 48 hours.

## 10. Specification of Packaging

10.1. Appearance and Dimensions (8mm-wide plastic tape)



### 10.2. Specification of Taping

(1) Packing quantity (standard quantity)

2000 pcs. / reel

(2) Packing Method

Products shall be packaged in the cavity of the plastic tape and sealed with cover tape.

(3) Sprocket Hole

The sprocket holes are to the right as the tape is pulled toward the user.

(4) Spliced point

The cover tape have no spliced point.

(5) Missing components number

Missing components number within 0.1% of the number per reel or 1 pc., whichever is greater, and are not continuous. The specified quantity per reel is kept.

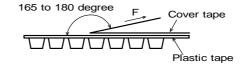
10.3. Pull Strength of Plastic Tape and Cover Tape

Plastic tape	5N min.
Cover tape	10N min.

## 10.4. Peeling off force of cover tape

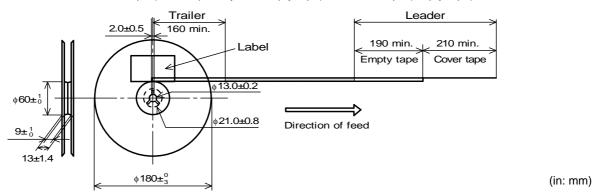
0.2N to 0.7N (minimum value is typical)

 $\ast$  Speed of Peeling off : 300 mm / min



## 10.5. Dimensions of Leader-tape, Trailer and Reel

There shall be leader-tape (cover tape only and empty tape) and trailer-tape (empty tape) as follows.



## 10.6. Marking for reel

Customer part number, MURATA part number, Inspection number(\*1), RoHS marking(\*2), Quantity, etc

\*1) « Expression of Inspection No. »

 $\begin{array}{c|c} \square \square & OOOO & \times \times \times \\ \hline (1) & (2) & (3) \end{array}$ 

(1) Factory Code

(2) Date First digit : Year / Last digit of year

Second digit : Month / Jan. to Sep.  $\rightarrow$  1 to 9, Oct. to Dec.  $\rightarrow$  O, N, D

Third, Fourth digit: Day

(3) Serial No.

\*2) « Expression of RoHS marking »

ROHS – <u>Y</u> (<u>△</u>)

(1) (2)

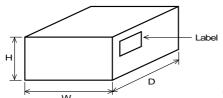
- (1) RoHS regulation conformity parts.
- (2) MURATA classification number

## 10.7. Marking for Outside package (corrugated paper box)

Customer name , Purchasing Order Number , Customer Part Number , MURATA part number , RoHS marking (\*2) , Quantity , etc

## Reference Only

### 10.8. Specification of Outer Case



Outer Case Dimensions (mm)			Standard Reel Quantity in Outer Case (Reel)
W	D	Н	(Reel)
186	186	93	5

<sup>\*</sup> Above Outer Case size is typical. It depends on a quantity of an order.

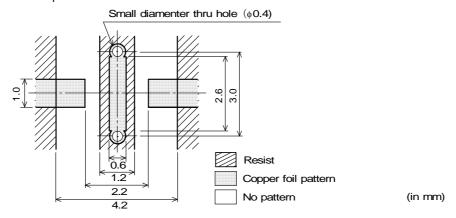
#### 11. Standard Land Dimensions

The chip EMI filter suppresses noise by conducting the high-frequency noise element to ground.

Therefore, to get enough noise reduction, feed through holes which is connected to ground-plane should be arranged according to figure to reinforce the ground-pattern.

(Standard land dimensions for reflow)

·Side on which chips are mounted



## 12. / Caution

Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- (1)Aircraft equipment (2)Aerospace equipment (3)Undersea equipment (4)Power plant control equipment
- (5)Medical equipment (6)Transportation equipment(automobiles, trains, ships, etc.) (7)Traffic signal equipment
- (8)Disaster prevention / crime prevention equipment (9)Data-processing equipment
- (10)Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

#### 13. Notice

Products can only be soldered with reflow.

If it were soldered with flow, cracks might be caused in the ceramic body.

This product is designed for solder mounting.

Please consult us in advance for applying other mounting method such as conductive adhesive.

#### 13.1. Flux and Solder

Flux	Use rosin-based flux, Do not use highly acidic flux (with chlorine content				
	exceeding 0.2(wt)%).				
	Do not use water-soluble flux.				
Solder	Use Sn-3.0Ag-0.5Cu solder				

## 13.2. Note for Assembling

#### < Thermal Shock >

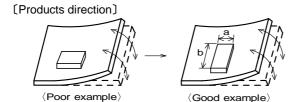
Pre-heating should be in such a way that the temperature difference between solder and products surface is limited to 100 °C max. Also cooling into solvent after soldering should be in such a way that the temperature difference is limited to 100 °C max.

## Reference Only

## 13.3. Attention Regarding P.C.B. Bending

The following shall be considered when designing P.C.B.'s and laying out products.

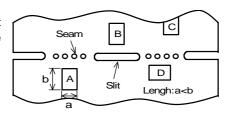
(1) P.C.B. shall be designed so that products are not subject to the mechanical stress for board warpage.



Products shall be located in the sideways direction (Length:a<br/>b) to the mechanical stress.

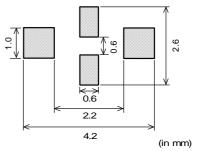
(2) Products location on P.C.B. near seam for separation. Products (A,B,C,D) shall be located carefully so that products are not subject to the mechanical stress due to warping the board.

Because they may be subjected the mechanical stress in order of A>C>B  $\cong$  D.



### 13.4. Reflow Soldering

- 1) Solder paste printing for reflow
  - Standard thickness of the solder paste should be 150μm to 200μm.
  - Use the solder cream printing pattern of the right pattern.
  - For the resist and copper foil pattern, use standard land dimensions.

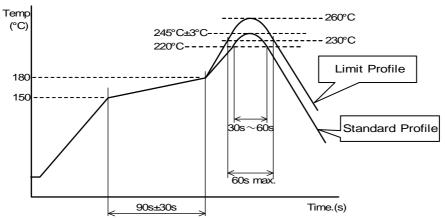


· Standard printing pattern of solder paste.

### 2) Soldering Conditions

Standard soldering profile and the limit soldering profile is as follows.

The excessive soldering conditions may cause leaching of the electrode and/or resulting in the deterioration of product quality.



	Standard Profile	Limit Profile		
Pre-heating	150°C ~ 180°C, 90s ± 30s			
Heating	above 220°C , 30s ~ 60s	above 230°C , 60s max.		
Peak temperature	245°C ± 3°C	260°C , 10s		
Cycle of reflow	2 times	2 times		



#### 13.5. Reworking with Soldering iron

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

- Pre-heating: 150°C, 1 min
- Soldering iron output: 30W max.
- Tip temperature/ Soldering time: 350°C max. / 3(+1,-0) s (NFE31PT152Z1E9: 280 °C max. / 10 s max. )
- Tip diameter:  $\phi$  3mm max.
- Times: 2times max.

Note: Do not directly touch the products with the tip of the soldering iron in order to prevent the crack on the ceramic material due to the thermal shock.

### 13.6. Cleaning Conditions

Products shall be cleaned on the following conditions.

- (1) Cleaning temperature shall be limited to 60 °C max. (40° C max. for IPA.)
- (2) Ultrasonic cleaning shall comply with the following conditions, with avoiding the resonance phenomenon at the mounted products and P.C.B.

Power: 20W / I max. Frequency: 28kHz to 40kHz Time: 5 minutes max.

- (3) Cleaner
  - 1. Cleaner
    - · Isopropyl alcohol (IPA)
  - 2. Aqueous agent
    - · PINE ALPHA ST-100S
- (4) There shall be no residual flux and residual cleaner after cleaning.

In the case of using aqueous agent, products shall be dried completely after rinse with de-ionized water in order to remove the cleaner.

(5) Other cleaning

Please contact us.

## 13.7. Operating Environment

Do not use this product under the following environmental conditions, on deterioration of the performance, such as insulation resistance may result from the use.

- (1) in the corrodible atmosphere (acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc.)
- (2) in the atmosphere where liquid such as organic solvent, may splash on the products.

## 13.8. Resin coating

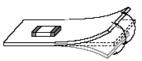
It may affect on the product's performance when using resin for coating / molding products. So please pay your careful attention in selecting resin. In prior to use, please make the reliability evaluation with the product mounted in your application set.

#### 13.9. Handling of a substrate

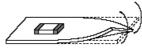
After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate.

Excessive mechanical stress may cause cracking in the product.

Bending



Twisting



### Spec. No. JENF243E-0002Q-01



P8/8

## 13.10. Storage condition

(1) Storage period

Use the products within 12 months after delivered.

Solderability should be checked if this period is exceeded.

(2) Storage environment condition

• Products should be storage in the warehouse on the following conditions.

Temperature : -10 °C to +40 °C

Humidity : 15% to 85% relative humidity No rapid change on temperature and humidity

- Don't keep products in corrosive gases such as sulfur, chlorine gas or acid, or it may cause oxidization of electrode, resulting in poor solderability.
- Products should be stored on the palette for the prevention of the influence from humidity, dust and so on.
- · Products should be stored in the warehouse without heat shock, vibration, direct sunlight and so on.
- Products should be stored under the airtight packaged condition.

#### (3) Delivery

Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

## 14. <u>Notes</u>

- (1) Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- (2) You are requested not to use our product deviating from the reference specifications.
- (3) The contents of this reference specification are subject to change without advance notice. Please approve our product specifications or transact the approval sheet for product specifications before ordering.