

## Data Sheet

Customer:

Product: Automotive Grade Thick Film Flat Array Chip  
Resistor – CNF..A Series

Size: 0402x2/0402x4/0603x4

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## Automotive Grade Thick Film Flat Array Chip Resistor

### ■ Scope

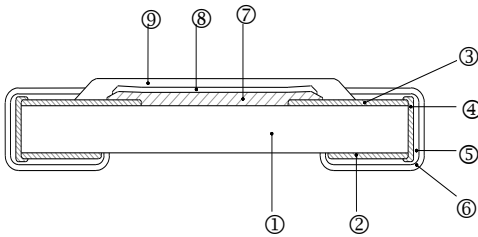
- This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.



### ■ Features

- AEC-Q200 Qualified
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- 100% CCD inspection

### ■ Construction

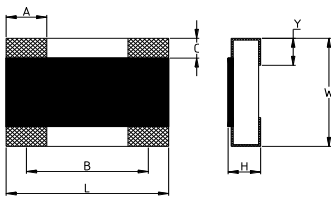


### ■ Applications

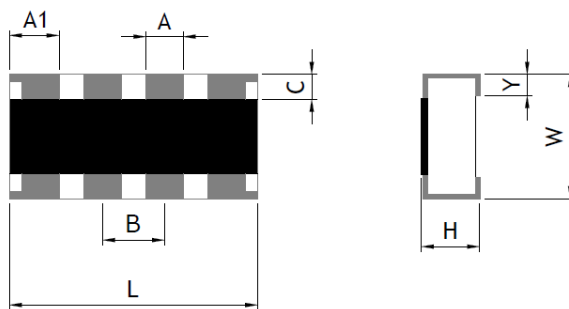
- Automotive Industry
- Entertainment
- Computer & Related Products
- Communication Equipment
- Power Equipment
- Measuring Instrument

① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

### ■ Dimensions



CNF22



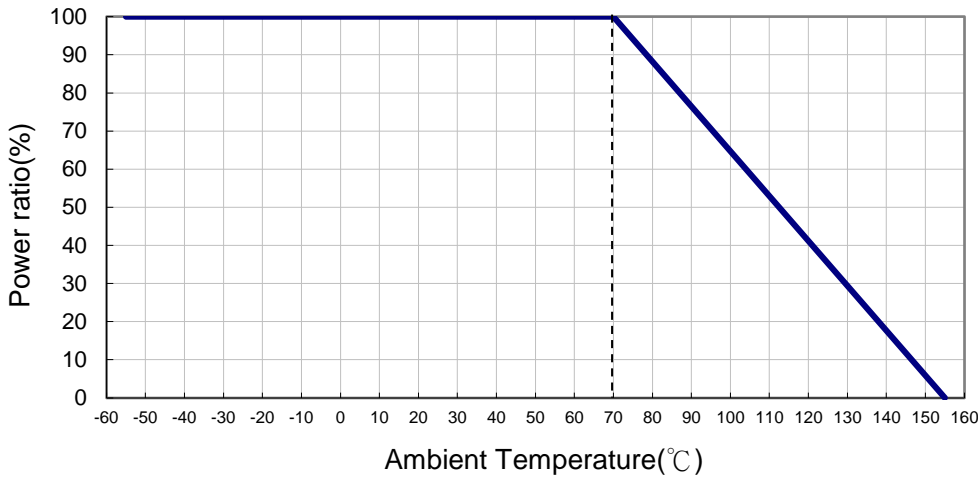
CNF42/CNF43

Type	Number of Resistors	L (mm)	W (mm)	H (mm)	A (mm)	A1 (mm)	B (mm)	C (mm)	Y (mm)	Weight (g) (1000pcs)
CNF22	2	1.25±0.10	1.00±0.10	0.35±0.10	0.43±0.1	-	0.82±0.05	0.18±0.15	0.26±0.15	1.6
CNF42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.3±0.10	0.40±0.10	0.5±0.10	0.20±0.10	0.35±0.15	3.3
CNF43	4	3.20±0.10	1.60±0.15	0.55±0.10	0.5±0.15	0.65±0.10	0.8±0.05	0.23±0.15	0.47±0.15	9.0

**Part Numbering**

CNF	22	F	T	F	Y	1000	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	22: 0402x2 42: 0402x4 43: 0603x4	F: ±1% J: ±5% or Jumper	T: Taping Reel	F: ±200 -: No specified (For Jumper)	Y: 1/16W X: 1/10W W: 1/8W	0030: 3Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ R0R0: 0Ω	A : Automotive Grade

**Derating Curve**



**Electrical Specifications**

Item Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
						±1% (E24,E96)	±5% (E24)	
CNF22	1/16W	-55 ~ +155°C	25V	50V	2	1Ω - 1MΩ		±200
	Jumper: 1A					-	0Ω (<50mΩ)	-
CNF42	1/16W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A					-	0Ω (<50mΩ)	-
CNF43	1/10W 1/8W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A					-	0Ω (<50mΩ)	-

Operating Voltage= $\sqrt{P \cdot R}$  or Max. Operating Voltage listed above, whichever is lower.

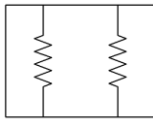
Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  or Max. Overload Voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

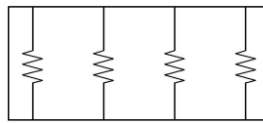
■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

■ **Shelf Life: 2 years from production date.**

**Equivalent Circuit Diagram**

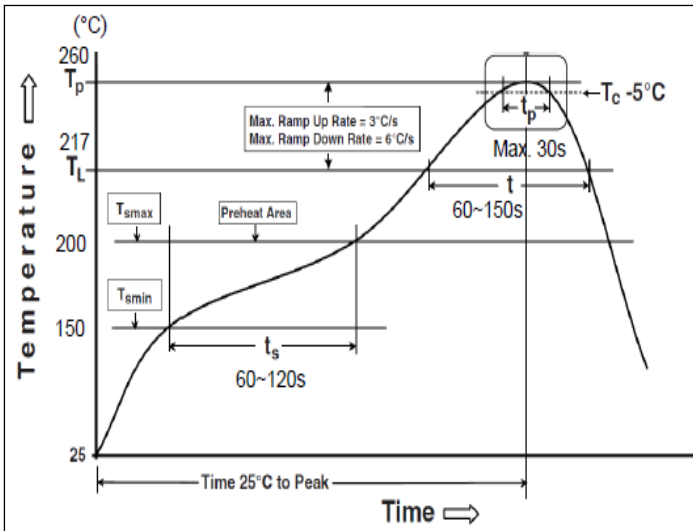


CNF22



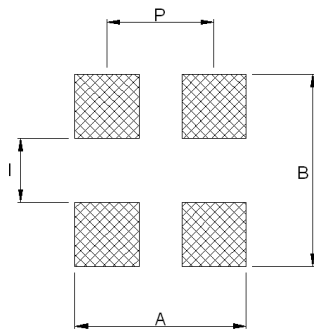
CNF42/CNF43

**Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)**

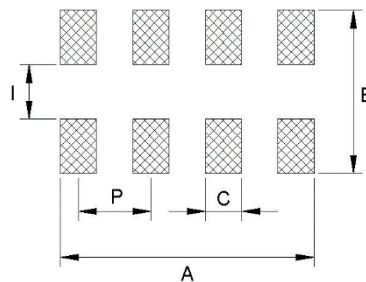


Reflow Profiles	
Profile Feature	Pb-Free Assembly
<b>Preheat</b>	
Min. Temperature (T <sub>sm</sub> )	150 °C
Max Temperature (T <sub>sm</sub> )	200 °C
Preheating time (t <sub>s</sub> ) from (T <sub>sm</sub> to T <sub>sm</sub> )	60-120 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3 °C/second max.
Liquidous temperature (T <sub>L</sub> )	217 °C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60-150 seconds
Min. Peak temperature (T <sub>p</sub> min)	235°C
Max. Peak temperature (T <sub>p</sub> max)	260°C
Time (t <sub>p</sub> ) within 5 °C of the specified classification temperature (T <sub>c</sub> )	30 seconds max.
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

**Recommend Land Pattern**



CNF22



CNF42/CNF43

Type	A (mm)	B (mm)	C (mm)	I (mm)	P (mm)
CNF22	1.50	1.25	-	0.35	0.80
CNF42	2.10	1.80	0.30	0.50	0.50
CNF43	3.10	2.85	0.45	0.80	0.80

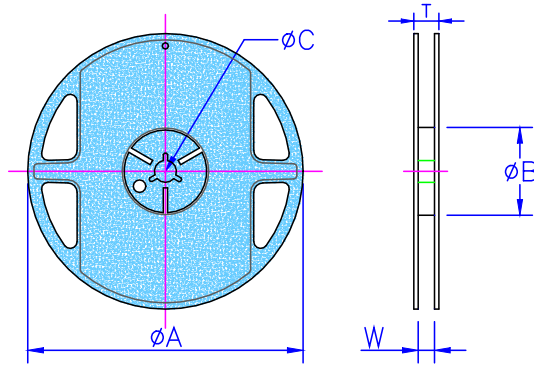
**Environmental Characteristics**

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			<b>JIS-C-5201-1 4.8</b> <b>IEC-60115-1 4.8</b> At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	<b>JIS-C-5201-1 4.13</b> <b>IEC-60115-1 4.13</b> RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G			<b>JIS-C-5201-1 4.6</b> <b>IEC-60115-1 4.6</b> Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	<b>MIL-STD-202 Method 108</b> Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	<b>MIL-STD-202 Method 103</b> 1000 hrs 85°C/85%RH 10% of operating power (≤ 100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	<b>MIL-STD-202 Method 108</b> at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>AEC-Q200-005</b> Bending once for 60 seconds with 3mm
Solderability	95% min. coverage			<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> <b>J-STD-002</b> 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>MIL-STD-202 Method 210</b> 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			<b>JIS-C-5201-1 4.7</b> <b>IEC-60115-1 4.7</b> 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%			<b>JIS-C-5201-1 4.18</b> <b>IEC-60068-2-58 8.2.1</b> 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	<b>JESD22 Method JA-104</b> -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>MIL-STD-202 Method 213</b> Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	<b>MIL-STD-202 Method 204</b> 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)			<b>AEC-Q200-002</b> Human body model CNF22/CNF42: 0.5KV CNF43: 1KV
Resistance to Solvents	No visible damage on appearance and marking.			<b>MIL-STD-202 Method 215</b> Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			<b>AEC-Q200-006</b> Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			<b>UL-94</b> V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%	△R±5%	<100mΩ	<b>EIA-977 (Condition A)</b> 60±2°C, no power rating for 500 hrs.

RCWV(Rated Continuous Working Voltage)=√(P\*R) or Max. Operating Voltage whichever is lower.

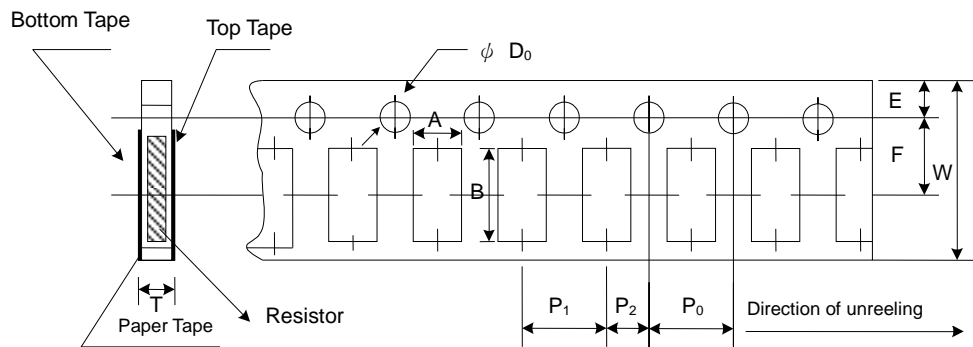
**■Packaging**

Reel Specifications & Packaging Quantity



Type	Packaging Quantity		Tape Width	Reel Diameter	$\Phi A$ (mm)	$\Phi B$ (mm)	$\Phi C$ (mm)	W (mm)	T (mm)
CNF22	Paper	10K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
CNF42	Paper	10K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
CNF43	Paper	5K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5

Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P <sub>0</sub> (mm)	P <sub>1</sub> (mm)	P <sub>2</sub> (mm)	$\Phi D_0$ (mm)	T (mm)
CNF22	1.20±0.1	1.45±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.43±0.1
CNF42	1.20±0.1	2.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1
CNF43	1.95±0.1	3.50±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1

**■Marking**

No Marking for CNF22

Jumper for CNF42/CNF43: Letter "0"

1% for CNF42/CNF43: 4 digits marking (non-including E24 series)

Example:

Resistance	102 $\Omega$	2.49K $\Omega$	30.1K $\Omega$	49.9K $\Omega$	121K $\Omega$
marking	1020	2491	3012	4992	1213

1%&5% for CNF42/CNF43: 3 digits marking in E24

Example: 101=100 $\Omega$  102=1K $\Omega$  (1<sup>st</sup> and 2<sup>nd</sup> are E24 code and 3<sup>rd</sup> code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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**REVISION HISTORY**

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A	Sep 20, 2022	-	- New product release
Version A1	Mar 08, 2023	-	- Electrical Specifications updated
Version A2	Jul 08, 2024	-	- Modify the descriptions in the Features