

Data Sheet

Customer :

Product : High Frequency(up to 70 GHz)Thin Film
Precision Chip Resistor – ARF Series

Size: 0201/0402/0603/0805/1206

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VIKING TECH CORPORATION
光韻科技股份有限公司

No.70, Guangfu N. Rad.,
Hsin Chu Industrial Park,
Hukou Hsiang, Hsin Chu Hsien,
303, Taiwan

TEL:886-3-5972931

FAX:886-3-5972935•886-3-5973494

E-mail:sales@viking.com.tw

VIKING TECH CORPORATION KAOHSIUNG BRANCH
光韻科技股份有限公司高雄分公司

No.248-3, Sin-Sheng Rd., Cian-Jhen Dist., Kaohsiung,
806, Taiwan

TEL:886-7-8217999

FAX:886-7-8228229

E-mail:sales@viking.com.tw

Viking Electronics (WUXI) CO., LTD.
光韻電子(無錫)有限公司

No.1A,(Xixia Road),Machinery & Industry Park,
National Hi-Tech Industrial Development Zone of
Wuxi, Wuxi, Jiangsu Province, China

Zip Code:214028

TEL:86-510-85203339

FAX:86-510-85203667•86-510-85203977

E-mail:wuxisales@tmtec.com.tw

Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
06-Jun-23	06-Jun-23	06-Jun-23		
Chun	Ben Chang	Ben Chang		

【ARF Series】

High Frequency(up to 70GHz)Thin Film Precision Chip Resistor



High Frequency (up to 70GHz) Thin Film Precision Chip Resistor (ARF Series)



■ Features

- Small standard size 0201 case size
- High Frequency up to 70GHz for 0201
- High Frequency up to 50GHz for 0402 · 0603
- High purity alumina substrate
- Resistor tolerance to $\pm 0.1\%$
- Low TCR (down to $\pm 25\text{ppm}/^\circ\text{C}$)

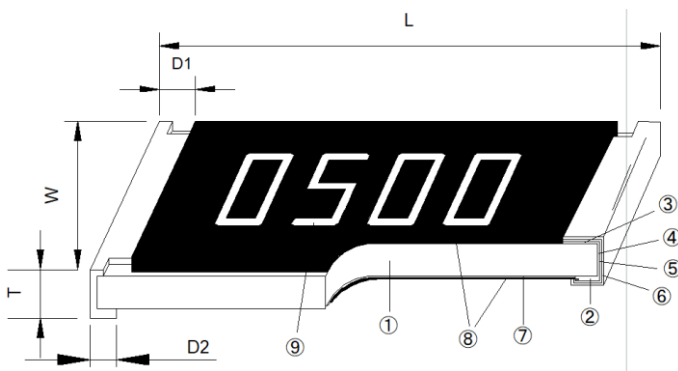
■ Applications

- Low noise amplifiers
- Attenuation
- Line Termination

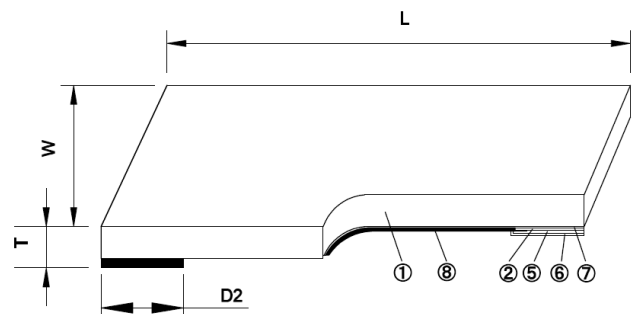
■ Typical Performance

- TCR. 25 ppm/ $^\circ\text{C}$
- TOL. 0.1%

■ Construction



0402/0603/0805/1206



0201

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

■ Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARF01	0201	0.58 \pm 0.05	0.30 \pm 0.05	0.21 \pm 0.07	-	0.15 \pm 0.10	0.12
ARF02	0402	1.00 \pm 0.07	0.50 \pm 0.07	0.38 \pm 0.15	0.20 \pm 0.15	0.20 \pm 0.15	0.73
ARF03	0603	1.55 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.15	0.30 \pm 0.20	0.50 \pm 0.20	2.08
ARF05	0805	2.00 \pm 0.15	1.25 \pm 0.15	0.45 \pm 0.15	0.30 \pm 0.20	0.35 \pm 0.20	4.15
ARF06	1206	3.05 \pm 0.20	1.55 \pm 0.20	0.45 \pm 0.15	0.45 \pm 0.20	0.35 \pm 0.25	7.59

【ARF Series】

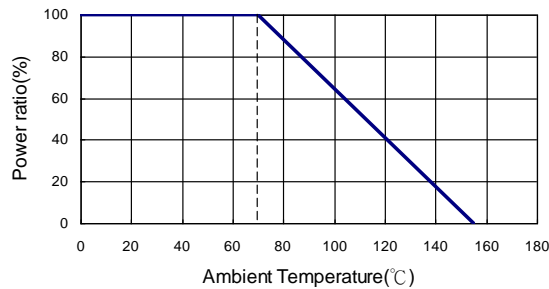
High Frequency(up to 70GHz)Thin Film Precision Chip Resistor



Part Numbering

ARF	02	B	T	C	N	0500	N
Product Type	Dimensions (LxW)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	Z: 1/32W N: 1/20W W: 1/8W P: 1/5W O: 1/3W	0500: 50Ω 1000: 100Ω 1500: 150Ω 1001: 1KΩ	:Standard Marking N: No Marking

Derating Curve

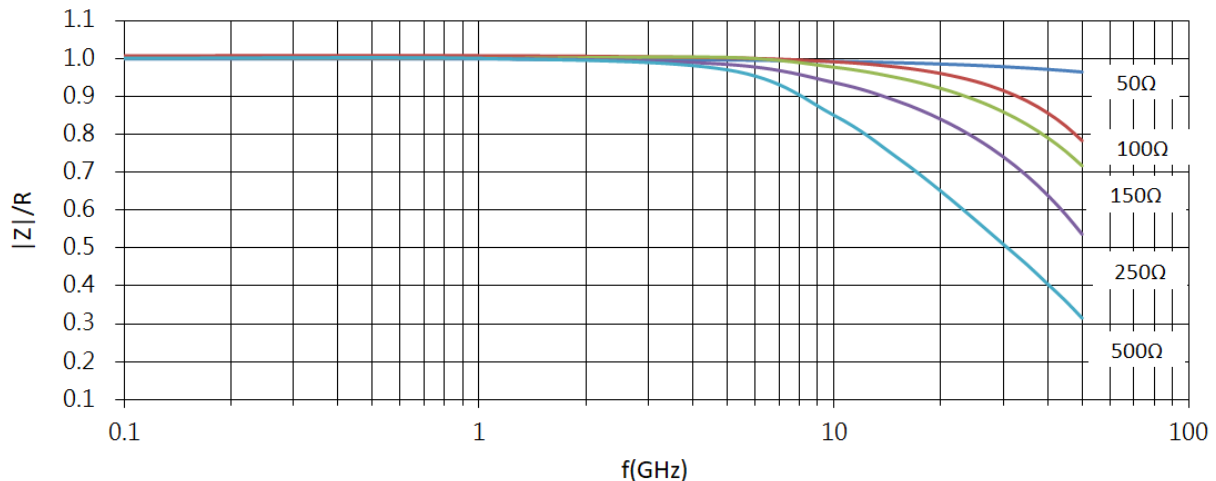


Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max Operating Voltage	Max Overload Voltage	Resistance Range				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
ARF01 (0201)	1/32W	-55°C ~ +155°C	15V	30V	25Ω~500Ω				±25 ±50
ARF02 (0402)	1/20W	-55°C ~ +155°C	30V	60V	10Ω~1KΩ				±25 ±50
ARF03 (0603)	1/8W	-55°C ~ +155°C	50V	100V	10Ω~1KΩ				±25 ±50
ARF05 (0805)	1/5W	-55°C ~ +155°C	50V	100V	10Ω~1KΩ				±25 ±50
ARF06 (1206)	1/3W	-55°C ~ +155°C	75V	150V	10Ω~1KΩ				±25 ±50

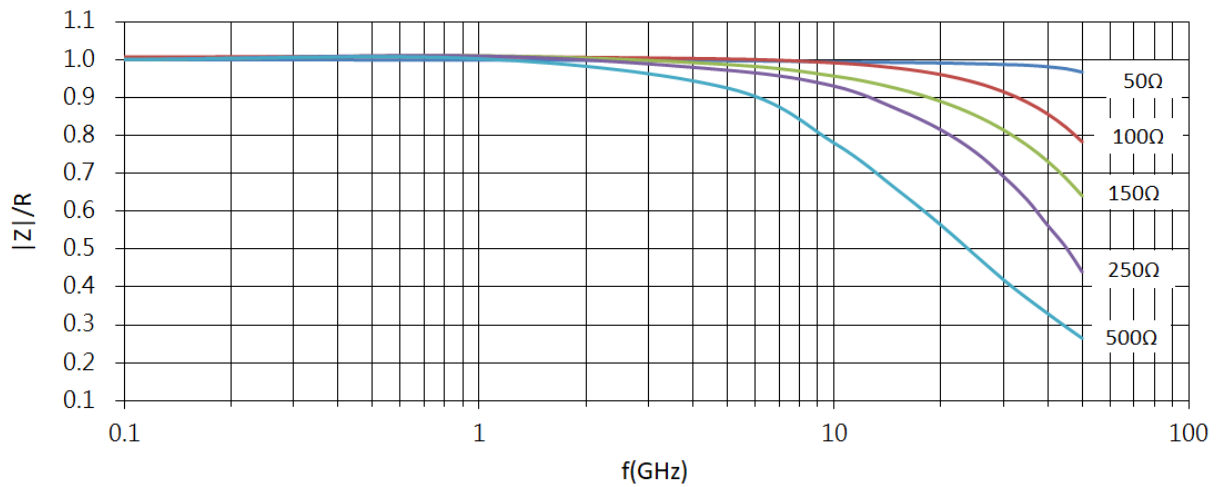
Operating Voltage= $\sqrt{P \cdot R}$ or Max. operating voltage listed above, whichever is lower.
 Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.
 ■Viking is capable of manufacturing the optional spec based on customer's requirement.

INTERNAL IMPEDANCE CURVES



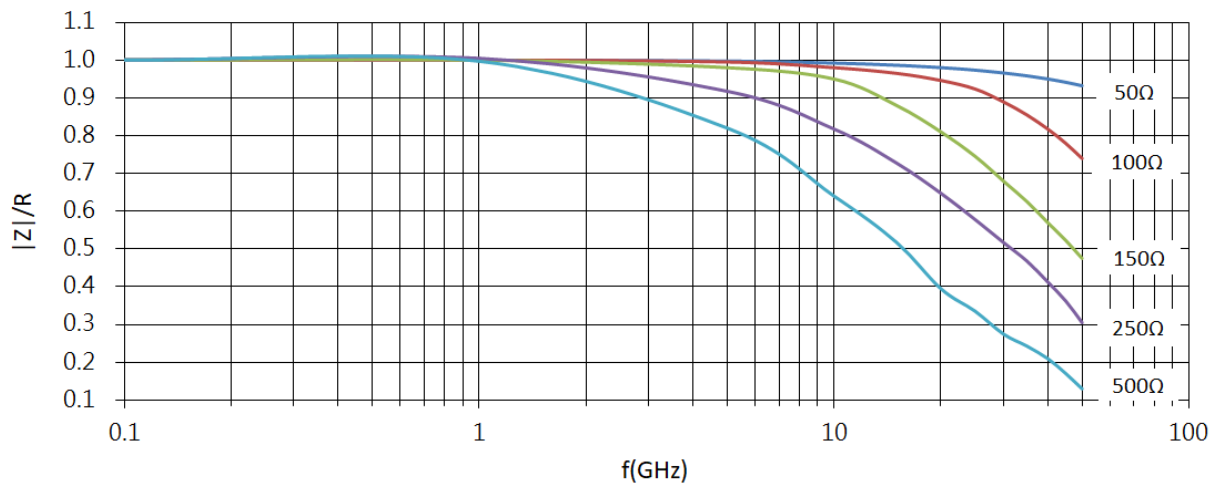
Internal impedance curve for ARF0201 size (Filp chip terminations)

INTERNAL IMPEDANCE CURVES



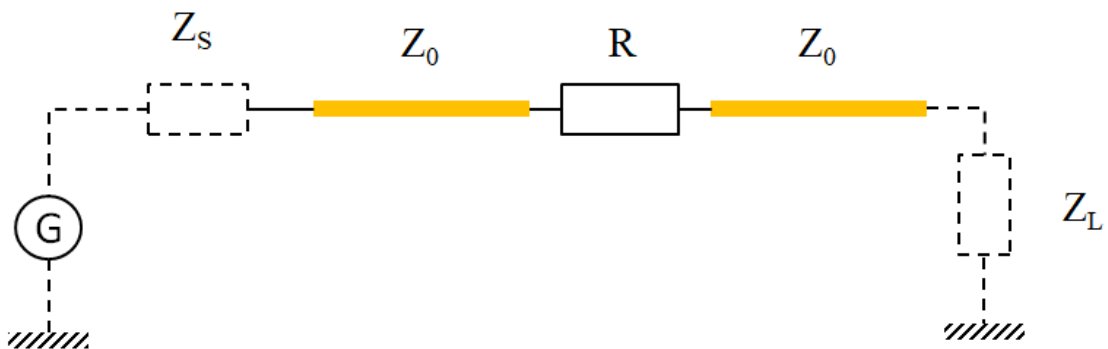
Internal impedance curve for ARF0402 size (Filp chip terminations)

INTERNAL IMPEDANCE CURVES



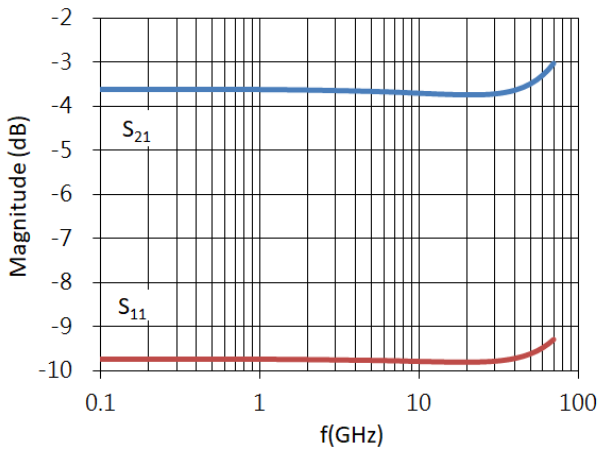
Internal impedance curve for ARF0603 size (Filp chip terminations)

Equivalent circuit for S-parameters:



S-PARAMETER

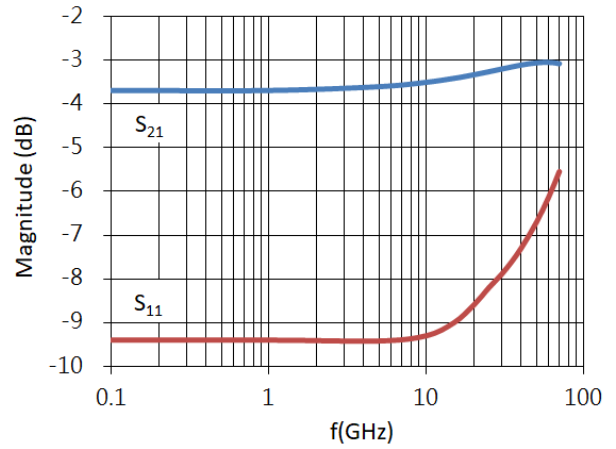
ARF0201 (Filp Chip Termination)



ARF0201 filp chip ($Z_0 = Z_I = Z_S = R = 50\Omega$)

S-PARAMETER

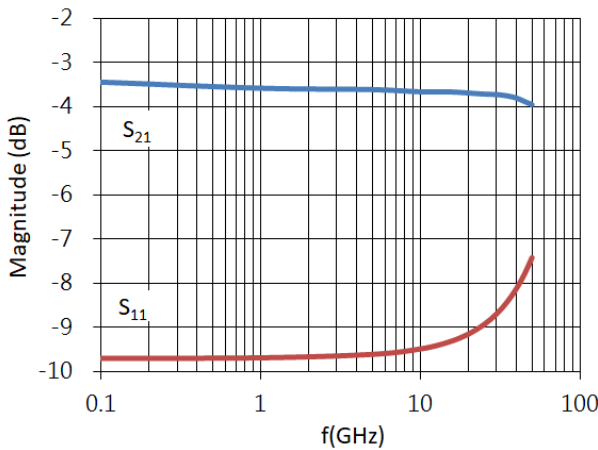
ARF0201 (Filp Chip Termination)



ARF0201 filp chip ($Z_0 = Z_I = Z_S = R = 100\Omega$)

S-PARAMETER

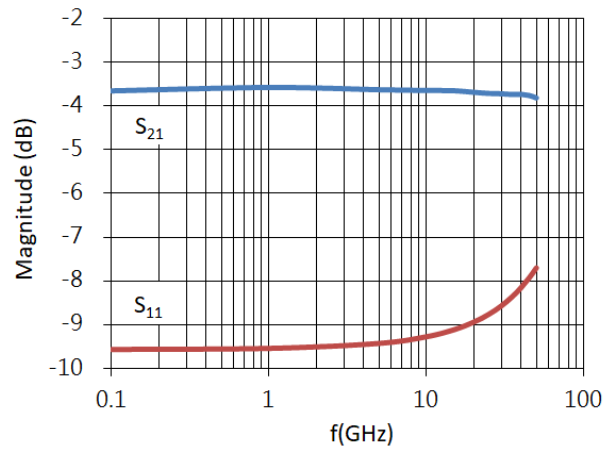
ARF0402 (Filp Chip Termination)



ARF0402 filp chip ($Z_0 = Z_I = Z_S = R = 50\Omega$)

S-PARAMETER

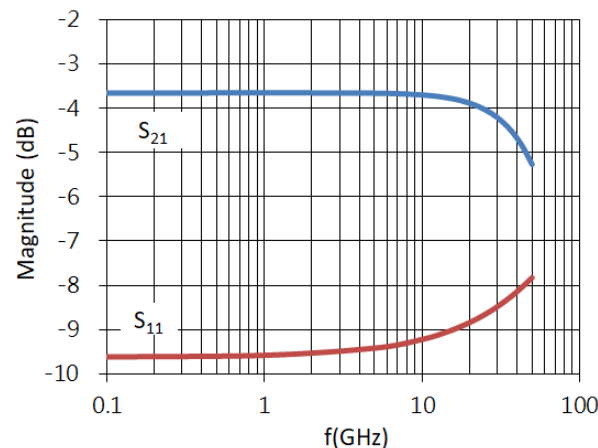
ARF0402 (Filp Chip Termination)



ARF0402 filp chip ($Z_0 = Z_I = Z_S = R = 100\Omega$)

S-PARAMETER

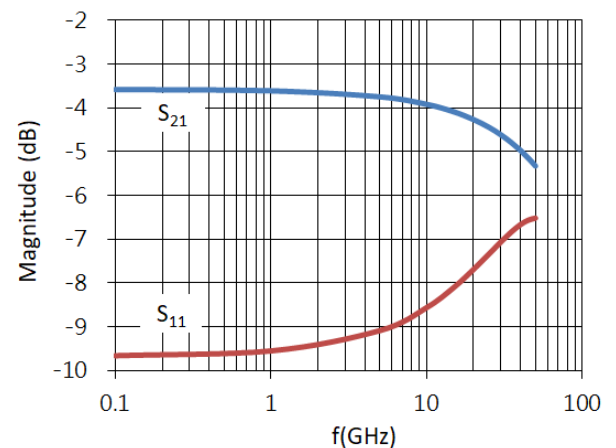
ARF0603 (Filp Chip Termination)



ARF0603 filp chip ($Z_0 = Z_I = Z_S = R = 50\Omega$)

S-PARAMETER

ARF0603 (Filp Chip Termination)



ARF0603 filp chip ($Z_0 = Z_I = Z_S = R = 100\Omega$)

【ARF Series】

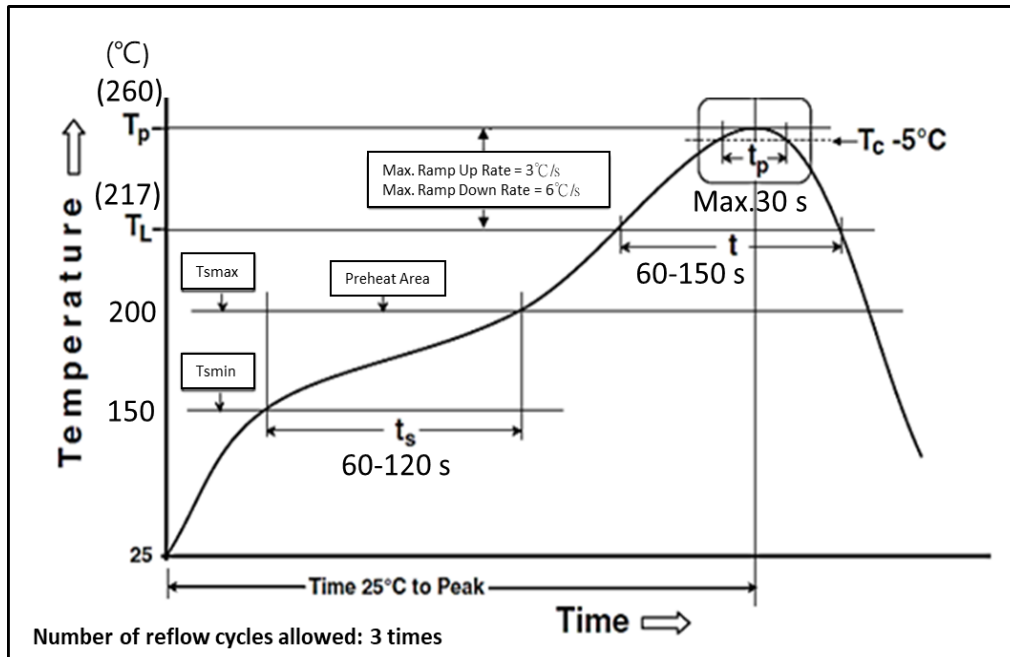
High Frequency(up to 70GHz)Thin Film Precision Chip Resistor

**■ Environmental Characteristics**

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	MIL-STD-202 Method 304 +25/-55/+25/+125/+25°C
Short Time Overload	$\Delta R \pm 0.2\%$	JIS-C-5201-1 4.13 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Insulation Resistance	>9999 M Ω	MIL-STD-202 Method 302 Apply 100V _{DC} for 1 minute
Endurance	$\Delta R \pm 0.5\%$	MIL-STD-202 Method 108 70 $\pm 2^\circ\text{C}$, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\Delta R \pm 0.5\%$	MIL-STD-202 Method 103 40 $\pm 2^\circ\text{C}$, 90~95% R.H. RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	$\Delta R \pm 0.1\%$	JIS-C-5201-1 4.33 Bending amplitude 3 mm for 60 seconds
Solderability	95% min. coverage 0201 : except	MIL-STD-202 Method 208 245 $\pm 5^\circ\text{C}$ for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$ 0201 : except	MIL-STD-202 Method 210 260 $\pm 5^\circ\text{C}$ for 10 seconds
Dielectric Withstand Voltage	By Type	MIL-STD-202 Method 301 Max. overload voltage for 1 minute
Low Temperature Operation	$\Delta R \pm 0.2\%$	JIS-C-5201-1 4.36 1 hour, -65 $^\circ\text{C}$, followed by 45 minutes of RCWV
High Temperature Exposure	$\Delta R \pm 0.5\%$	MIL-STD-202 Method 108 at +155 $^\circ\text{C}$ for 1000 hrs

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower■ **Storage Temperature: 15~28 $^\circ\text{C}$; Humidity < 80%RH**■ **Shelf Life: 2 years from production date.**

■Soldering Condition(IPC/JEDEC J-STD-020)



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T_{smin})	150 °C
Max Temperature (T_{smax})	200 °C
Preheating time (t_s) from (T_{smin} to T_{smax})	60-120 seconds
Ramp-up rate (T_L to T_p)	3 °C/second max.
Liquidous temperature (T_L)	217 °C
Time (t_L) maintained above T_L	60-150 seconds
Min. Peak temperature (T_p min)	235°C
Max. Peak temperature (T_p max)	260°C
Time (t_p) within 5 °C of the specified classification temperature (T_c)	30 seconds max.
Ramp-down rate (T_p to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

【ARF Series】

High Frequency(up to 70GHz)Thin Film Precision Chip Resistor



■ Marking

0603 3digit marking



3digit marking for Example: 14C=13K7Ω 13C=13K3Ω

68B=4K99Ω 68X=49.9Ω

0603 3digit marking for E24

Example: 101=100Ω 102=1KΩ

E24	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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Marking Table

Code	E96	Code	E96	Code	E96	Code	E96				
01	100	25	178	49	316	73	562				
02	102	26	182	50	324	74	576				
03	105	27	187	51	332	75	590				
04	107	28	191	52	340	76	604				
05	110	29	196	53	348	77	619				
06	113	30	200	54	357	78	634				
07	115	31	205	55	365	79	649				
08	118	32	210	56	374	80	665				
09	121	33	215	57	383	81	681				
10	124	34	221	58	392	82	698				
11	127	35	226	59	402	83	715				
12	130	36	232	60	412	84	732				
13	133	37	237	61	422	85	750				
14	137	38	243	62	432	86	768				
15	140	39	249	63	442	87	787				
16	143	40	255	64	453	88	806				
17	147	41	261	65	464	89	825				
18	150	42	267	66	475	90	845				
19	154	43	274	67	487	91	866				
20	158	44	280	68	499	92	887				
21	162	45	287	69	511	93	909				
22	165	46	294	70	523	94	931				
23	169	47	301	71	536	95	953				
24	174	48	309	72	549	96	976				
Code	A	B	C	D	E	F	G	H	X	Y	Z
Multiplier	10 ⁰	10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁷	10 ⁻¹	10 ⁻²	10 ⁻³

0805-1206 4digit marking

Example

Resistance	500Ω	2.2KΩ	10KΩ	12.5KΩ
marking	5000	2201	1002	1252

【ARF Series】

High Frequency(up to 70GHz)Thin Film Precision Chip Resistor

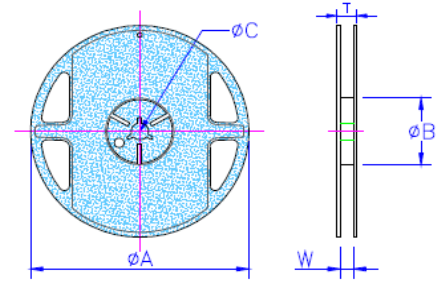


■Packaging

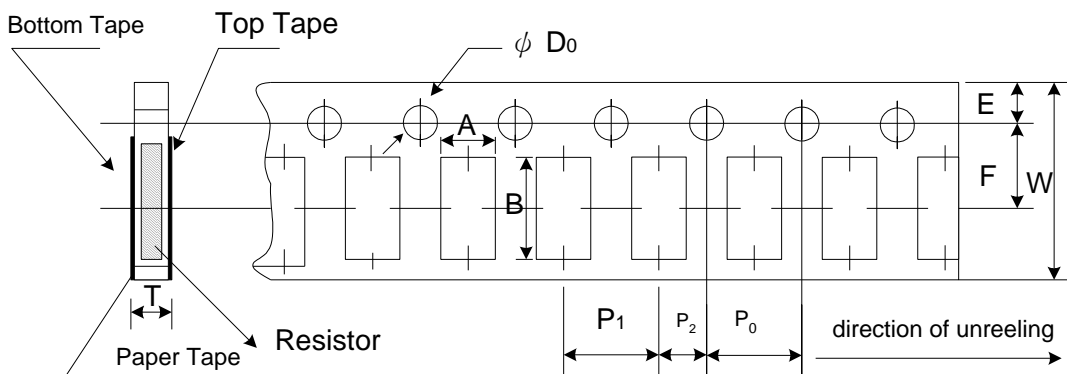
Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
ARF01	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
ARF02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
ARF03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARF05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARF06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-



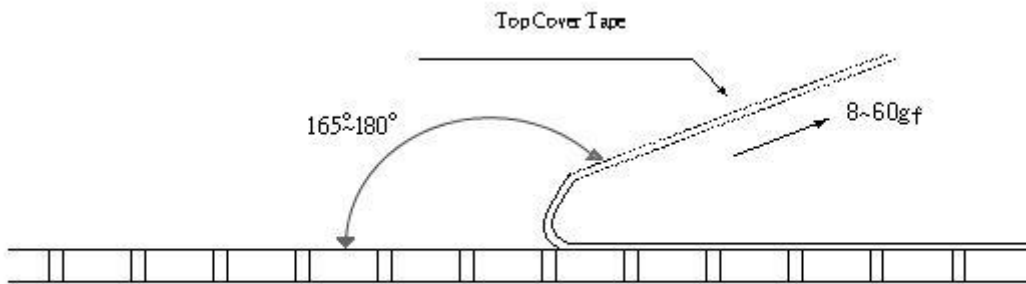
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARF01	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.42±0.02
ARF02	0.66±0.06	1.18±0.06	8.00±0.20	1.75±0.10	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.60±0.03
ARF03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARF05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARF06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

- Peel force of top cover tape
- The peel speed shall be about 300mm/min±5%
- The peel force of top cover tape shall be between 8gf to 60gf



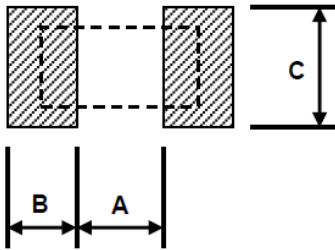
【ARF Series】

High Frequency(up to 70GHz)Thin Film Precision Chip Resistor



Recommend Land Pattern

Unit: mm



Type	A	B	C
ARF01	0.25	0.30	0.40±0.2
ARF02	0.50	0.50	0.60±0.2
ARF03	0.80	1.00	0.90±0.2
ARF05	1.00	1.00	1.35±0.2
ARF06	2.00	1.15	1.70±0.2