

Data Sheet

Customer :

Product : Automotive Grade Metal Thin Film Chip Resistors – ARM..A Series

Size: 0402/0603/0805/1206

Issued Date: 2-Aug-23

Edition : REV. A4



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Automotive Grade Metal Thin Film Chip Resistors



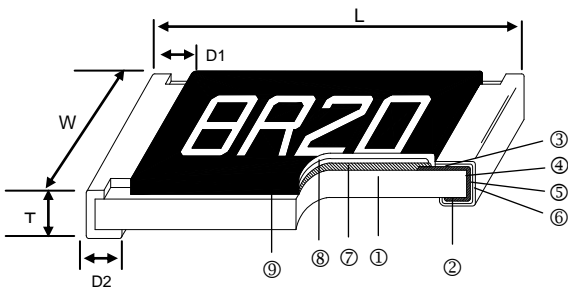
■ Features

- AEC-Q200 Compliance
- High precision resistance tolerance: $\pm 0.02\%$
- Low TCR down to $\pm 5\text{ppm}/^\circ\text{C}$
- Advanced sulfur resistance verified according to ASTM B 809

■ Applications

- Automotive
 - Telecommunication
 - Medical equipment
 - Industrial equipment
- Industrial measurement instrumentation, industrial machines
Various sensors, medical electronics

■ Construction



① 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

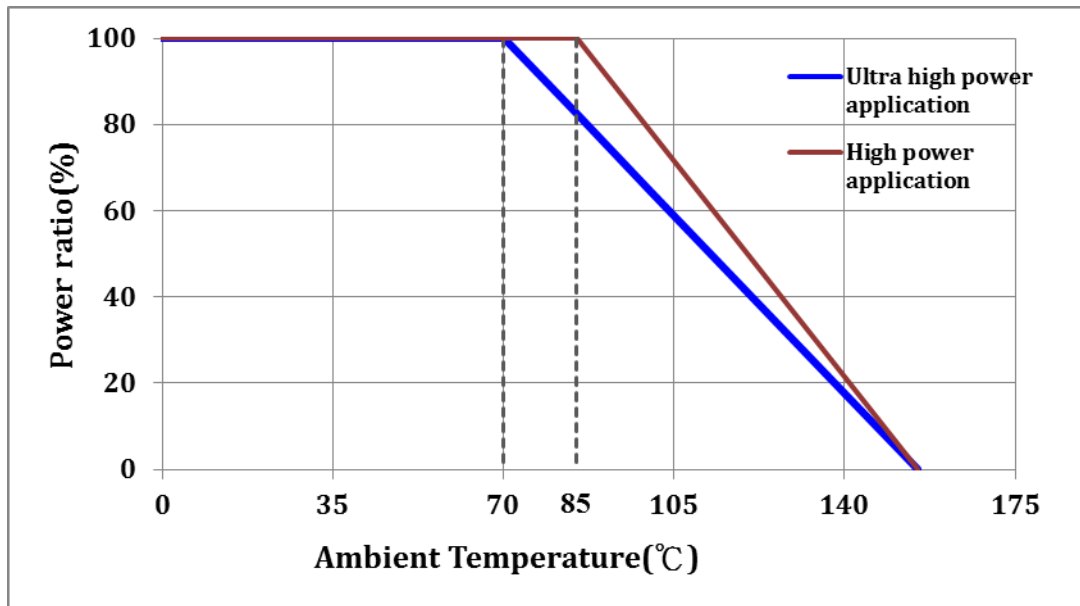
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARM02	0402	1.00 \pm 0.05	0.50 \pm 0.05	0.30 \pm 0.05	0.20 \pm 0.10	0.20 \pm 0.10	0.54
ARM03	0603	1.55 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20	1.83
ARM05	0805	2.00 \pm 0.15	1.25 \pm 0.15	0.55 \pm 0.10	0.30 \pm 0.20	0.40 \pm 0.20	4.71
ARM06	1206	3.05 \pm 0.15	1.55 \pm 0.15	0.55 \pm 0.10	0.42 \pm 0.20	0.35 \pm 0.25	9.02

■ Part Numbering

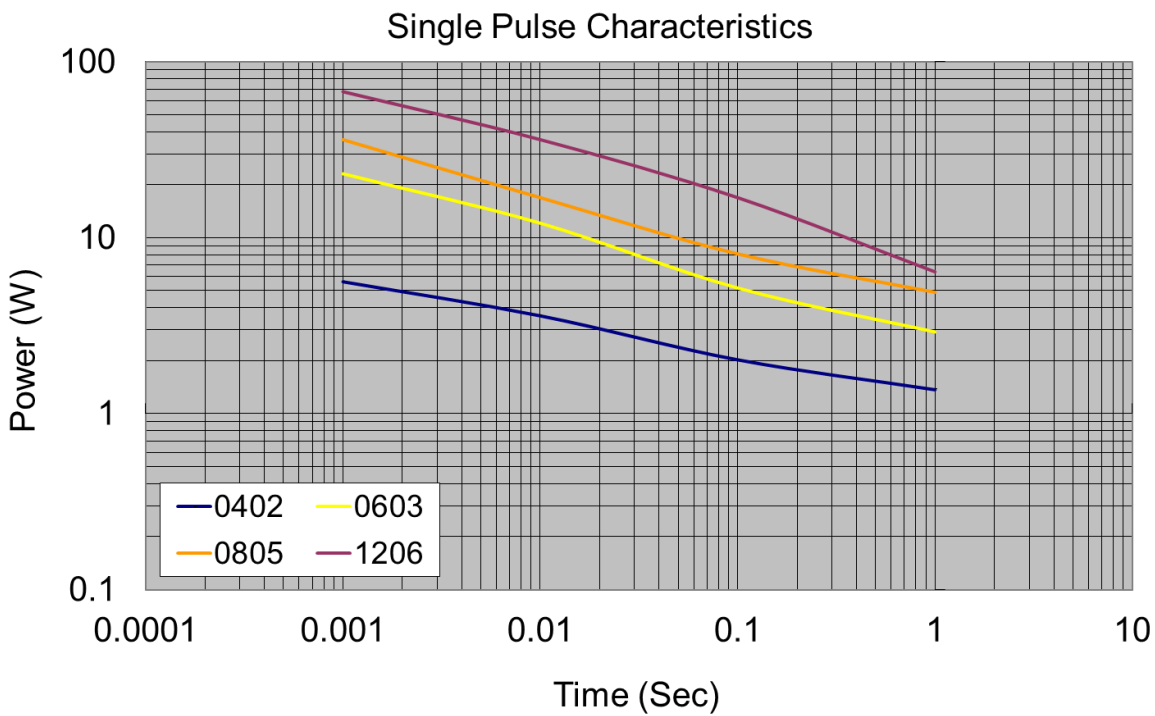
ARM	06	F	T	C		1001	A
Product Type	Dimensions (LxW)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^\circ$ C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	Q: $\pm 0.02\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ D: $\pm 0.5\%$	T: Taping Reel B: Bulk	S: ± 5 B: ± 10 C: ± 25 D: ± 50 E: ± 100	: Standard Z: 1/32W Y: 1/16W X: 1/10W M: 1/6W W: 1/8W V: 1/4W	0100: 10 Ω 10R2: 10.2 Ω 1000: 100 Ω 1001: 1K Ω 1004: 1M Ω	A: Automotive Grade NA: No Making Automotive Grade

■ Derating Curve



■ Functional Performance

Maximum pulse power limit



■ Electrical Specifications

Type	Item	Power Rating			Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
		Standard	High	Ultra high			±0.02%	±0.05%	±0.1%	±0.5%	
ARM02 (0402)	1/32W	1/16W	1/8W	75V	100V	100Ω – 3KΩ				±5	
						100Ω – 3KΩ	47Ω – 100KΩ			±10	
						100Ω – 3KΩ	47Ω – 100KΩ		47Ω – 150KΩ	±25	
						–	–	47Ω – 100KΩ	10Ω – 150KΩ	±100	
ARM03 (0603)	1/16W	1/10W	1/6W	100V	200V	100Ω – 5.1KΩ				±5	
						100Ω – 5.1KΩ	47Ω – 270KΩ			±10	
						100Ω – 5.1KΩ	47Ω – 270KΩ	47Ω – 332KΩ	47Ω – 1MΩ	±25	
						–	–	47Ω – 332KΩ	10Ω – 1MΩ	±50	
ARM05 (0805)	1/10W	1/8W	1/4W	150V	300V	100Ω – 10.2KΩ				±5	
						100Ω – 10.2KΩ	47Ω – 475KΩ			±10	
						100Ω – 10.2KΩ	47Ω – 475KΩ	47Ω – 2.7MΩ		±25	
						–	–	47Ω – 2.7MΩ	10Ω – 2.7MΩ	±50	
ARM06 (1206)	1/8W	1/4W	–	200V	400V	100Ω – 33.2KΩ				±5	
						100Ω – 33.2KΩ	47Ω – 1MΩ			±10	
						100Ω – 33.2KΩ	47Ω – 1MΩ	47Ω – 5.1MΩ		±25	
						–	–	47Ω – 5.1MΩ	10Ω – 5.1MΩ	±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.
 Operating Temperature Range=-55 ~ +155°C
 ■Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

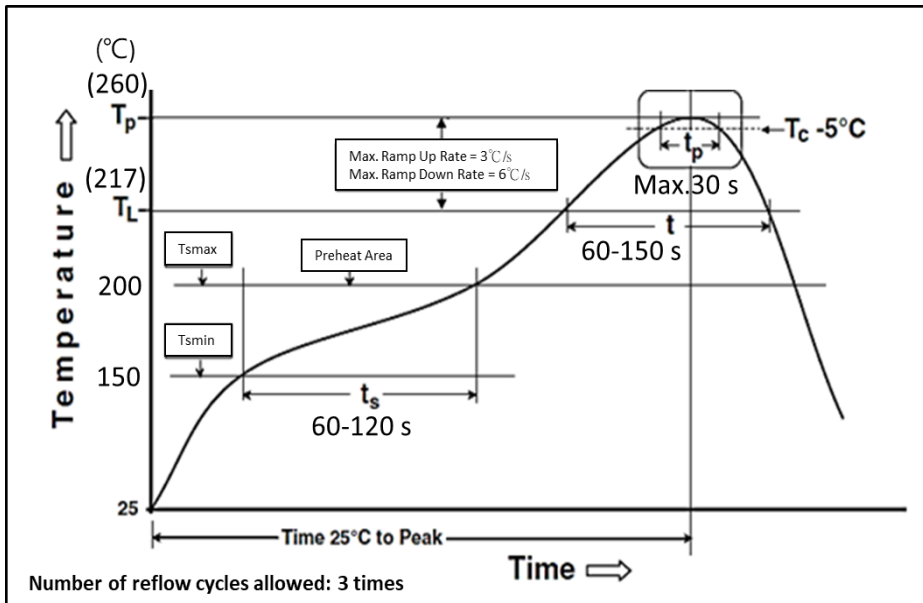
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\leq 47\Omega \Delta R \pm 0.1\%$ $\geq 47\Omega \Delta R \pm 0.05\%$ for Standard and High power rating	JIS-C-5201-1 4.13 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
	$\Delta R \pm 0.1\%$ for Ultra high power rating	
Endurance	Standard power rating at 85°C	$\Delta R \pm 0.1\%$
	High power rating at 85°C	$\Delta R \pm 0.25\%$
	Ultra high power rating at 70°C	$\Delta R \pm 0.5\%$
Biased Humidity	$\Delta R \pm 0.1\%$ for Standard power rating	MIL-STD-202 Method 103 1000 hrs 85°C/85%RH 10% of operating power.
	$\Delta R \pm 0.25\%$ for high power rating	
	$\Delta R \pm 0.5\%$ for Ultra high power rating	
High Temperature Exposure	$\leq 47\Omega \Delta R \pm 0.25\%$ $\geq 47\Omega \Delta R \pm 0.1\%$ for 0603/0805/1206 size	MIL-STD-202 Method 108 at +155°C for 1000 hrs
	$\leq 47\Omega \Delta R \pm 0.25\%$ $\geq 47\Omega \Delta R \pm 0.2\%$ for 0402 size	
Temperature Cycling	$\leq 47\Omega \Delta R \pm 0.25\%$ $\geq 47\Omega \Delta R \pm 0.1\%$	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Resistance to soldering heat	$\Delta R \pm 0.1\%$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds
Insulation Resistance	>1000 MΩ	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Apply 100V _{DC} for 1 minute
Bending Strength (Board Flex)	$\Delta R \pm 0.1\%$	JIS-C-5201-1 4.33 Bending once for 60 seconds Bending displacement: 1206 sizes: 3 mm
Solderability	95% min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Terminal strength	No broken	AEC-Q200-006 Force of 1.8kg for 60 seconds.
Mechanical Shock	$\Delta R \pm 0.1\%$	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R \pm 0.1\%$	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R \pm 0.5\%$	AEC-Q200-002 Human body model ARM02、ARM03 0.2KV ARM05、ARM06 1KV
Resistance to solvents	Marking Unsmearred	MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.

Sulfur Test	$\Delta R \pm 1\%$	ASTM-B-809-95 Modified 105±2°C no power rating for 750 hrs.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94 V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

- Storage Temperature: 15~28°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.

■ Marking

0603 3digit marking



3digit marking for Example: 14C=13K7Ω 13C=13K3Ω
68B=4K99Ω 68X=49.9Ω

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

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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0805-2512 4digit marking

Example

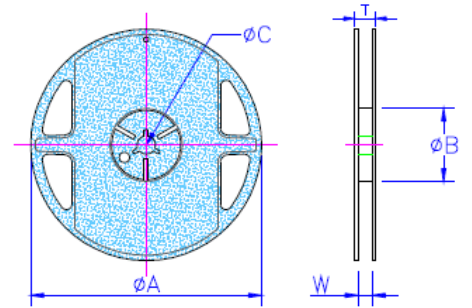
Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
marking	1000	2201	1002	4992	1003

■ Packaging

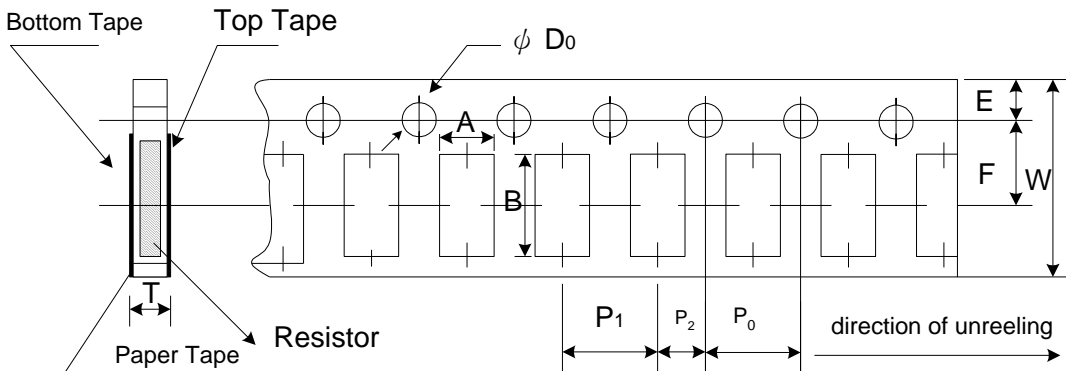
Packing Quantity & Reel Specifications

Unit : mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
ARM02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000	-
ARM03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARM05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
ARM06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-



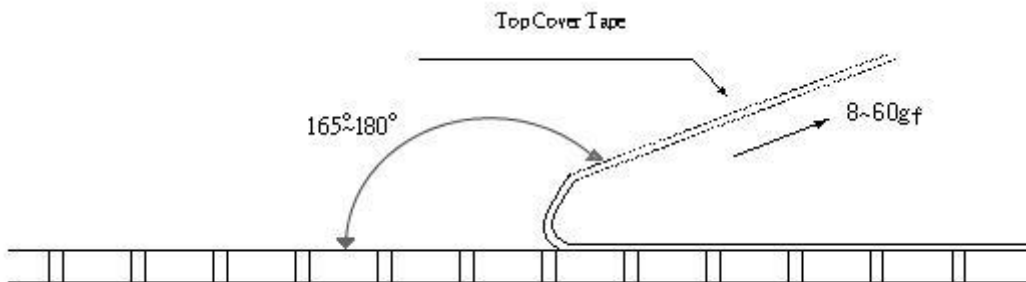
Paper Tape Specifications



Unit: mm

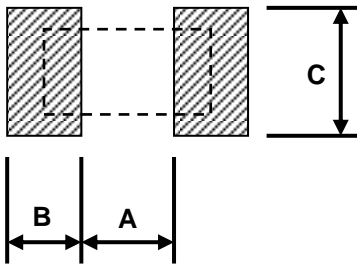
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARM02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
ARM03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARM05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
ARM06	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



■ Recommend Land Pattern

Unit: mm



Type	A	B	C
ARM02	0.50	0.50	0.60±0.2
ARM03	1.00	1.00	1.20±0.2
ARM05	1.20	1.40	1.65±0.2
ARM06	2.20	1.40	2.00±0.2

REVISION HISTORY

<u>REVISION</u>	<u>DATE</u>	<u>CHANGE NOTIFICATION</u>	<u>DESCRIPTION</u>
Version A1	Jan 28 ,2022	-	<ul style="list-style-type: none">- Add shelf life description.- Modify IR reflow profile to comply IPC/JEDEC J-STD-020.-Modify the Derating Curve.
Version A2	May 25 ,2022	-	<ul style="list-style-type: none">- Add Part Numbering code “s” for TCR ± 5 ppm product.- Add temperature for Endurance Test.
Version A3	Sep 01 ,2022	-	<ul style="list-style-type: none">- Add the following contents1. Marking Code “NA” in Part Numbering.2. Operating Temperature Range.3. Reflow Profiles Table.
Version A4	Aug 02 ,2023	-	<ul style="list-style-type: none">1. Add 0.1% product specification for ARM02 TCR100, ARM03/05/06 TCR50ppm series.2. Expand the resistance value range for 0.5% products.3. Delete Safety Precautions.