

Data Sheet

Customer :

Product :	Automotive Grade Metal Thin Film Chip Resistors – ARM..A Series
Size:	0402/0603/0805/1206
Issued Date:	01-Sep-22
Edition :	REV. A3



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Automotive Grade Metal Thin Film Chip Resistors



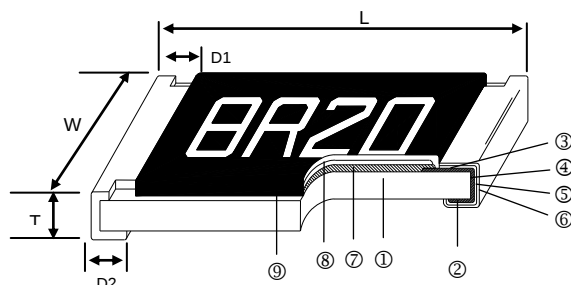
Features

- 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

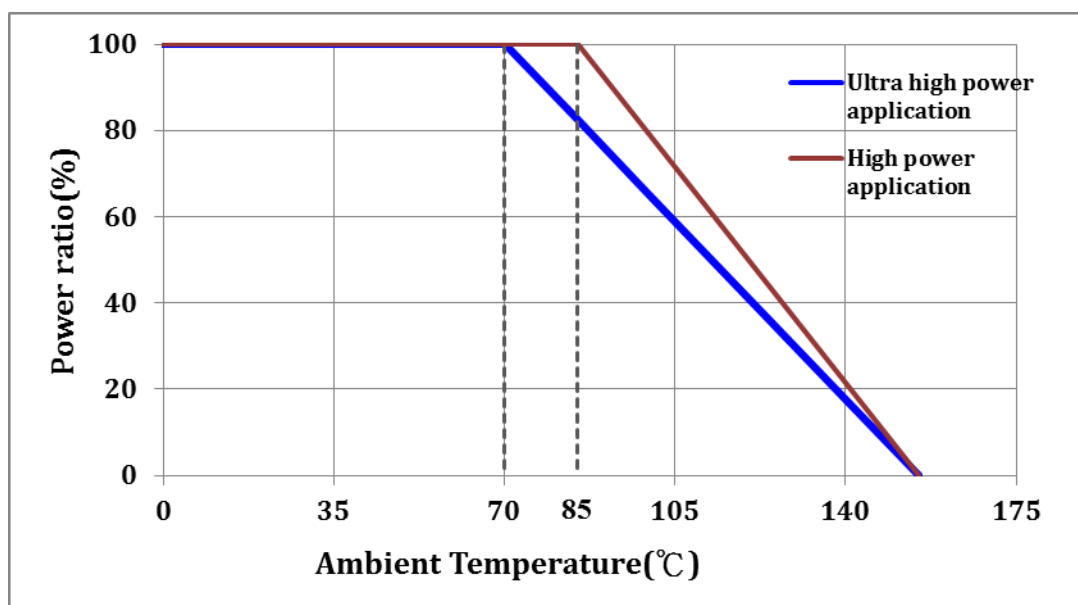
Unit: mm

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

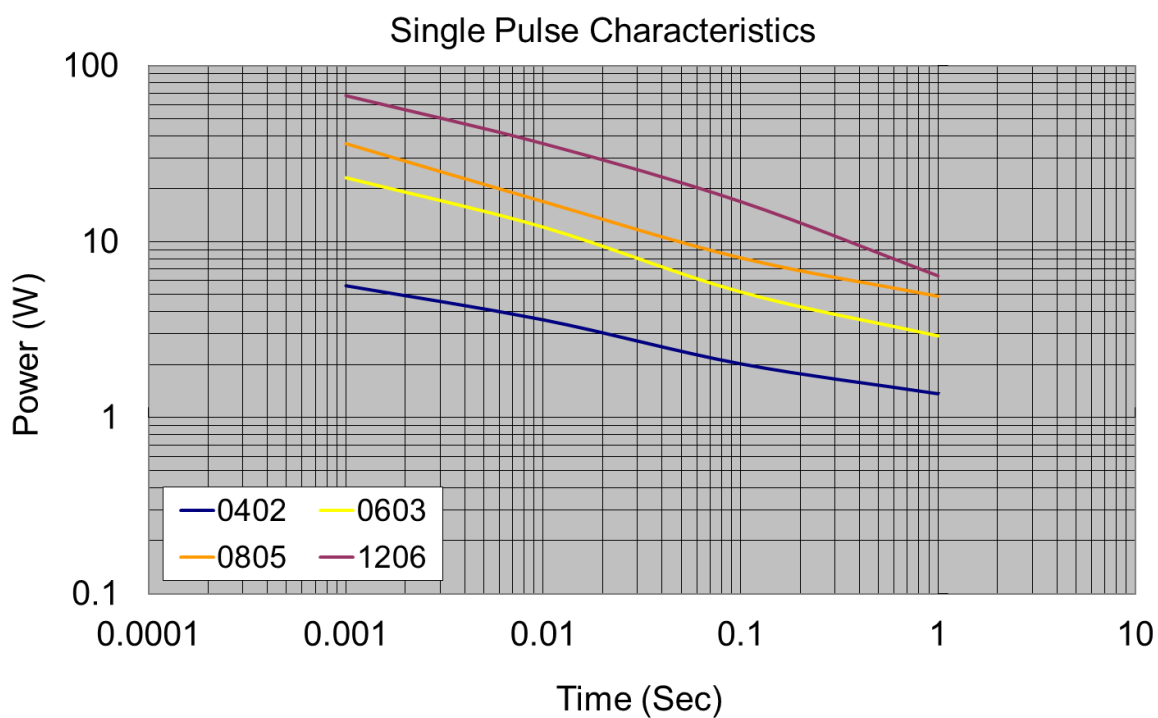
ARM	06	B	T	C		1001	A	025
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking	Code
	02: 0402 03: 0603 05: 0805 06: 1206	Q: $\pm 0.02\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ D: $\pm 0.5\%$	T: Taping Reel B: Bulk	S: ± 5 B: ± 10 C: ± 25 D: ± 50	: Standard 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
						–	–	–	10Ω – 47Ω		±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
						–	–	–	10Ω – 47Ω		±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
						–	–	–	10Ω – 47Ω		±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
						–	–	–	10Ω – 47Ω		±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℃~+125℃, 25℃ is the reference temperature
Short Time Overload	≤47Ω ΔR±0.1% ≥47Ω ΔR±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
	ΔR±0.1% for Ultra high power rating		
Endurance	Standard power rating at 85℃	ΔR±0.1%	MIL-STD-202 Method 108 RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
	High power rating at 85℃	ΔR±0.25%	
	Ultra high power rating at 70℃	ΔR±0.5%	
Biased Humidity	ΔR±0.1% for Standard power rating		MIL-STD-202 Method 103 1000 hrs 85℃/85%RH 10% of operating power.
	ΔR±0.25% for high power rating		
	ΔR±0.5% for Ultra high power rating		
High Temperature Exposure	≤47Ω ΔR±0.25% ≥47Ω ΔR±0.1% for 0603/0805/1206 size		MIL-STD-202 Method 108 at +155℃ for 1000 hrs
	≤47Ω ΔR±0.25% ≥47Ω ΔR±0.2% for 0402 size		
Temperature Cycling	≤47Ω ΔR±0.25% ≥47Ω ΔR±0.1%		JESD22 Method JA-104 -55℃ to +125℃, 1000 cycles
Resistance to soldering heat	ΔR±0.1%		JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5℃ 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)	ΔR±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℃ for 3 seconds
Terminal strength	No broken		AEC-Q200-006 Force of 1.8kg for 60 seconds.
Mechanical Shock	ΔR±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	ΔR±0.1%		MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	ΔR±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.

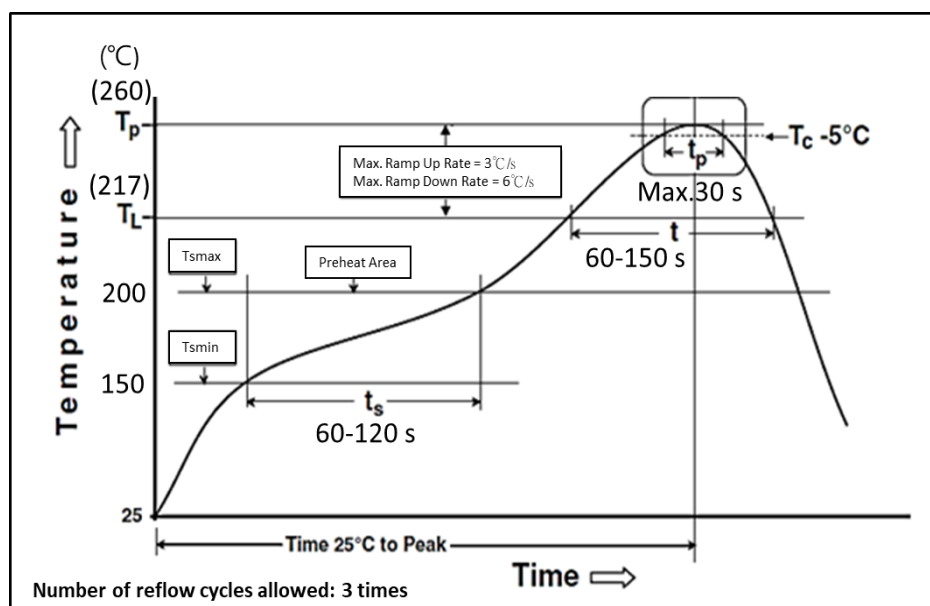
Sulfur Test	$\Delta R \pm 1\%$	ASTM-B-809-95 Modified 105 $\pm$ 2 $^{\circ}$ C no power rating for 750 hrs.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94 V-0 or V-1 are acceptable. Electrical test not required.

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

■ **Storage Temperature: 15~28 $^{\circ}$ 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 $^{\circ}$ C
Max Temperature (T_{smax})	200 $^{\circ}$ C
Preheating time (t_s) from (T_{smin} to T_{smax})	60-120 seconds
Ramp-up rate (T_L to T_p)	3 $^{\circ}$ C/second max.
Liquidous temperature (T_L)	217 $^{\circ}$ C
Time (t_L) maintained above T_L	60-150 seconds
Min. Peak temperature (T_p min)	235 $^{\circ}$ C
Max. Peak temperature (T_p max)	260 $^{\circ}$ C
Time (t_p) within 5 $^{\circ}$ C of the specified classification temperature (T_c)	30 seconds max.
Ramp-down rate (T_p to T_L)	6 $^{\circ}$ C/second max.
Time 25 $^{\circ}$ 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

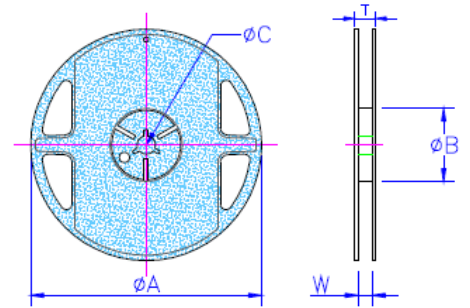
Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
marking	1000	2201	1002	4992	1003

■ Packaging

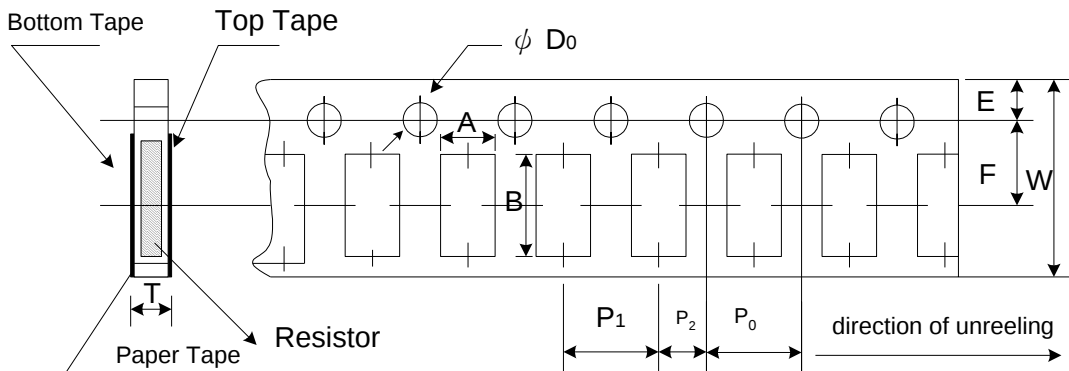
Packing Quantity & Reel Specifications

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	-



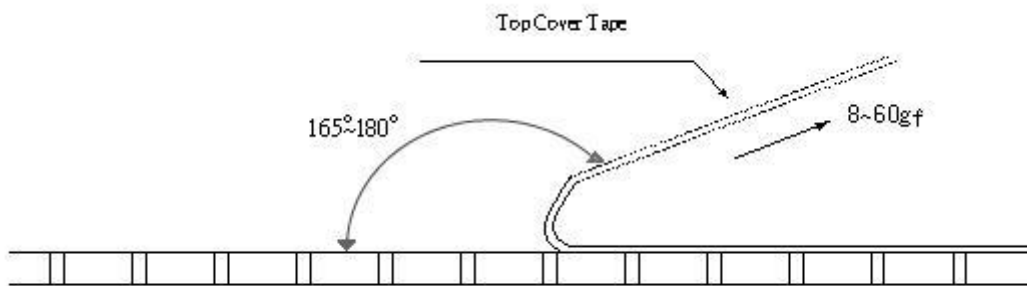
Paper Tape Specifications



Unit: mm

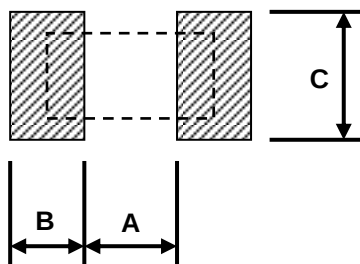
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARM02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
ARM03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
ARM05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10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

Safety Precautions

- Install the following fail-safe design systems to ensure safety. If these products are used in equipment, the defects of these products may cause casualties or other severe damage, such as damage to vehicles (cars, trains, ships), traffic lights, medical equipment, aviation Aerospace equipment, electric heating equipment, combustion/gas equipment, rotating equipment, and disaster/crime prevention equipment.
 - ★ The system is equipped with protection circuits and protection devices.
 - ★ The system is equipped with redundant circuits or other systems to prevent an unsafe state in the event of a single failure.
 - ★ The system is equipped with a system to prevent the spread of fire or prevent malfunctions.

REVISION HISTORY

<u>REVISION</u>	<u>DATE</u>	<u>CHANGE NOTIFICATION</u>	<u>DESCRIPTION</u>
Version A1	Jan 28 ,2022	-	- Add shelf life description. - Modify IR reflow profile to comply IPC/JEDEC J-STD-020. -Modify the Derating Curve.
Version A2	May 25 ,2022	-	- Add Part Numbering code “s” for TCR ± 5 ppm product. - Add temperature for Endurance Test.
Version A3	Sep 01 ,2022	-	- Add the following contents 1. Marking Code “NA” in Part Numbering. 2. Operating Temperature Range. 3. Reflow Profiles Table.