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香港柴湾安业街十二号长益工业大厦**10**字楼**A**座

HONG KONG RESISTORS MANUFACTORY

(wholly owned by Hong Kong Resistors Manufactory International Ltd.)

AN ISO 9001:2015 CERTIFIED MANUFACTURER

AN ISO 45001: 2018 MANUFACTURER

AN ISO 14001: 2015 MANUFACTURER

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DATASHEET

Name of Product: Automotive Grade Anti-Sulfurated Chip Resistor– AAS Series

Sales Executive:_____ Date: _____

制造 Prepared by	品质 Quality by	业务 Sales by	核准 Authorized by
客户 customer approval	客户 customer approval	客户 customer approval	客户 customer approval

Spec. No. AAS 2023

Rev. No.: 2022 Dec

Automotive Grade Anti-Sulfurated Chip Resistor



■Scope

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

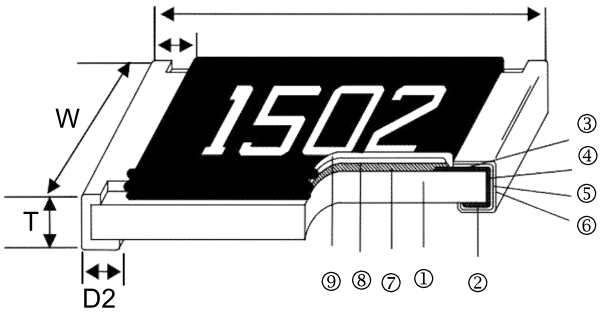
■Features

—Special construction to prevent sulfuration in a sulfur containing environment

—AEC-Q200 Compliance

—100% CCD inspection

■Construction



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

■Applications

—Automotive

—High-end Computer

—Industrial Equipment

—Automatic Equipment Controller

—Medical Equipment

—High-end Multimedia Electronics

—Outdoor Electronic Applications

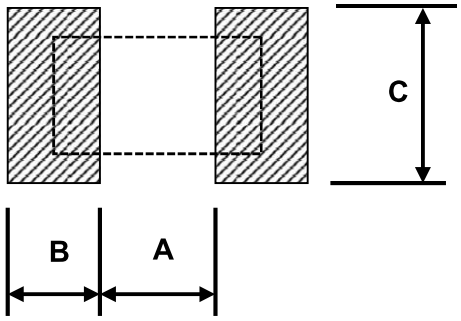
■Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)
AAS01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05
AAS02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10
AAS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
AAS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20
AAS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20
AAS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20
AAS20	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20
AAS25	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20

■Part Numbering

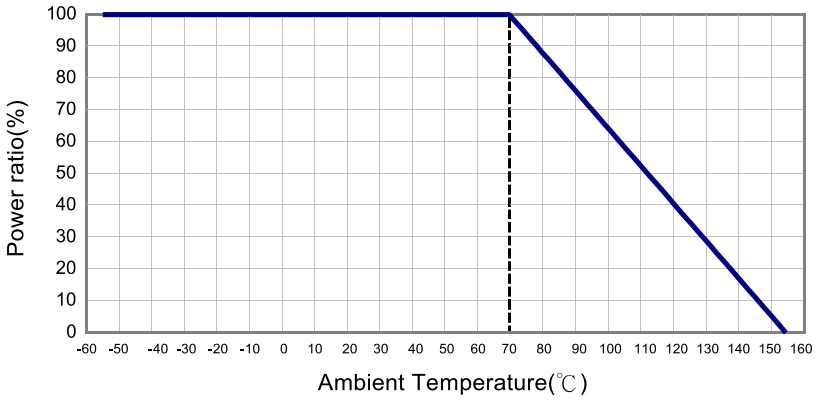
AAS	06	100R	F
Type	Size	Value	Tolerance
	01 : 0201		D : ±0.5%
	02 : 0402		J : ±5%
	03 : 0603		F : ±1%
	05 : 0805		
	06 : 1206		
	10 : 1210		
	20 : 2010		
	25 : 2512		

■Recommend Land Pattern

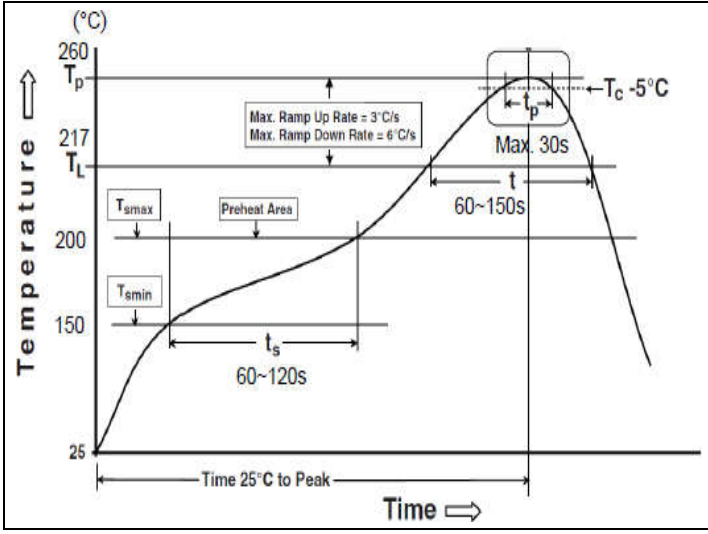


Type	A (mm)	B (mm)	C (mm)
AAS01	0.30	0.25	0.30
AAS02	0.50	0.45	0.60
AAS03	0.90	0.60	0.90
AAS05	1.20	0.70	1.30
AAS06	2.00	0.90	1.60
AAS10	2.00	0.90	2.80
AAS20	3.80	0.90	2.80
AAS25	4.90	1.60	3.50

■Derating Curve



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



Reflow Profiles	
Profile Feature	**Pb-Free Assembly**
Preheat Min. Temperature (Tsmin) Max Temperature (Tsmax) Preheating time (ts) from (Tsmin to Tsmax)	 150 °C 200 °C 60-120 seconds
Ramp-up rate (T_L to Tp)	3 °C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-150 seconds
Min. Peak temperature (Tp min)	235°C
Max. Peak temperature (Tp max)	260°C
Time (tp) within 5 °C of the specified classification temperature (Tc)	30 seconds max.
Ramp-down rate (Tp to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24,E96)	±1% (E24,E96)	±5% (E24)	
AAS01 (0201)	1/20W	-55 ~ +155°C	25V	50V	-	1Ω - 10MΩ		±200
	Jumper: 1A				-		0Ω (<50mΩ)	-
AAS02 (0402)	1/16W		50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				-		0Ω (<50mΩ)	-
AAS03 (0603)	1/10W		75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				-		0Ω (<50mΩ)	-
AAS05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				-		0Ω (<50mΩ)	-
AAS06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				-		0Ω (<50mΩ)	-
AAS10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				-		0Ω (<50mΩ)	-
AAS20 (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				-		0Ω (<50mΩ)	-
AAS25 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				-		0Ω (<50mΩ)	-

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

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

■Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			**JIS C 5201-1 4.8** **IEC 60115-1 4.8** 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	**JIS C 5201-1 4.13** **IEC 60115-1 4.13** 2.5 times RCWV or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≧10G			**JIS C 5201-1 4.6** **IEC 60115-1 4.6** Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	**MIL-STD-202 Method 108** Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	**MIL-STD-202 Method 103** 1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	**MIL-STD-202 Method 108** at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**AEC-Q200-005** Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	>95% coverage			**JIS C 5201-1 4.17** **IEC 60115-1 4.17** **J-STD-002** 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 210** 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			**JIS C 5201-1 4.7** **IEC 60115-1 4.7** 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦10%			**JIS C 5201-1 4.18** **IEC 60068-2-58 8.2.1** 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	**JESD22 Method JA-104** -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 213** 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	**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)			**AEC-Q200-002** Human body model 0201: 0.5KV 0402/0603: 1KV 0805 and above: 2KV

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Resistance to Solvents	No visible damage on appearance and marking.			**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			**AEC-Q200-006** Force of 1.8kg for 60 seconds.
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.
Sulfur Test	△R±1%		<50mΩ	**EIA-977 (Condition B)** 105±2°C, no power rating for 750 hrs.

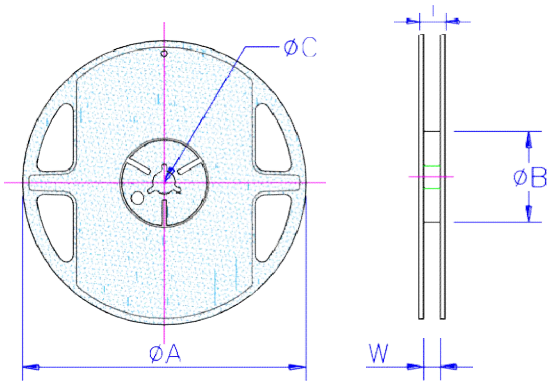
RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

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

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

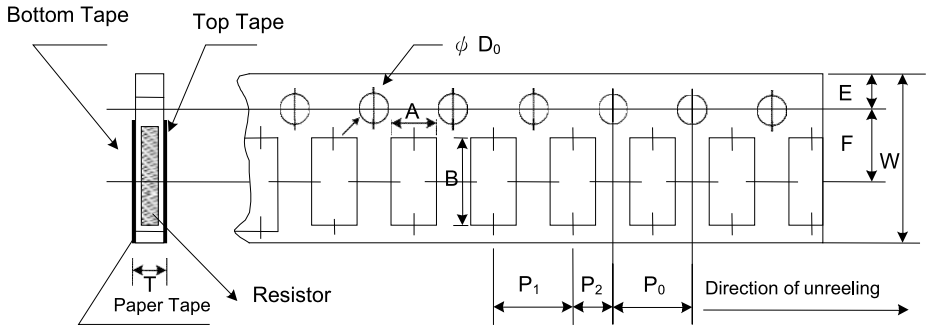
■Packaging

Reel Specifications & Packaging Quantity



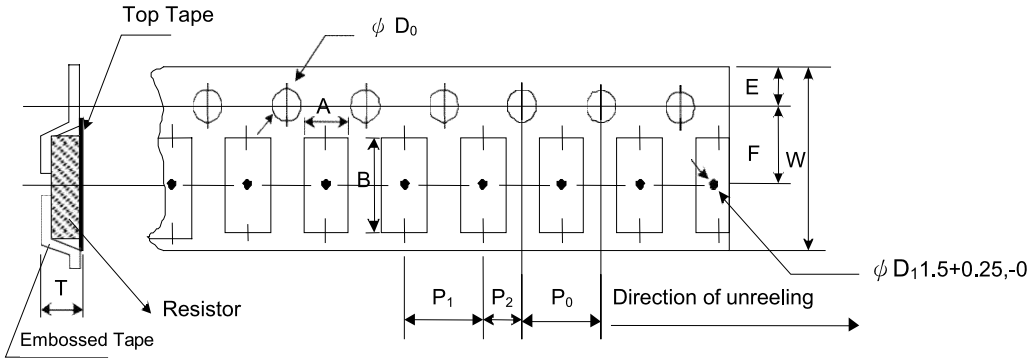
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
AAS01 AAS02	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		20K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AAS03 AAS05 AAS06 AAS10	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AAS20 AAS25	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
AAS01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
AAS02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
AAS03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
AAS05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AAS06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AAS10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
AAS20	2.8±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
AAS25	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Marking

No Marking for 0201/ 0402

Jumper for all: Letter “0”

1% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

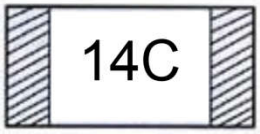
Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	1000	2201	1002	4992	1003

5% for 0603/0805/1206/1210/2010/2512: 3 digits marking in E24

Example: 101=100Ω 102=1KΩ (1st and 2nd are E24 code and 3rd 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

1% for 0603: 3 digits marking in E96



3 digits 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	X	Y		
Multiplier	10^0	10^1	10^2	10^3	10^4	10^5	10^6	10^{-1}	10^{-2}		