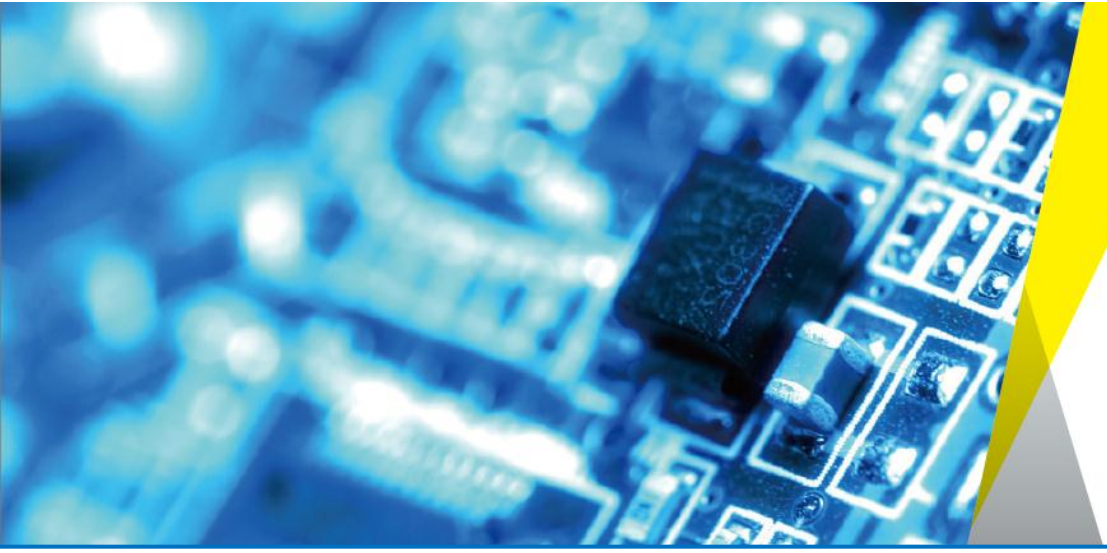

# DATASHEET

| | |
|---|---|
| **Product Name** | **Alloy Shunt Resistors** |
| **Part Name** | **RA Series** |
| **File No.** | **SMD-SP-042** |


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| | |
|---|---|
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| Manufacture Plant | Uniroyal Electronics Industry Co., Ltd. |
| | Aeon Technology Corporation |
| | Royal Electronic Factory (Thailand) Co., Ltd. |
| | Royal Technology (Thailand) Co., Ltd. |

## 1. Scope

1.1 This datasheet is the characteristics of Alloy Shunt Resistors manufactured by UNI-ROYAL.
1.2 Electron beam welding.
1.3 Ideal for pulse application
1.4 RoHS Compliant.
1.5 AEC-Q200 qualified.

## 2. Part No. System

Part No. includes 14 codes shown as below:
2.1 1st~4th codes: Part name. E.g.: RA12,RA20,RA30
2.2 5th~6th codes: Power rating.

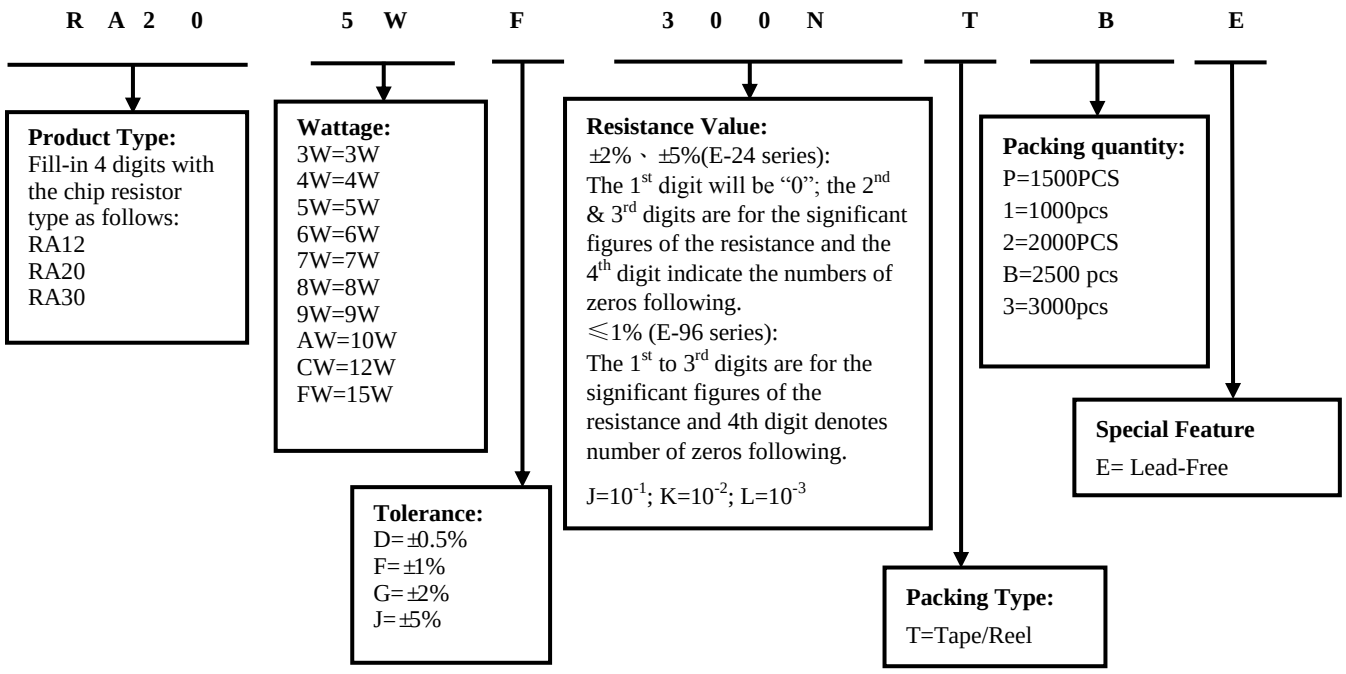
| Wattage | 3 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 15 |
|---|---|---|---|---|---|---|---|---|---|
| Normal Size | 3W | 5W | 6W | 7W | 8W | 9W | AW | CW | FW |

2.3 7th code: Tolerance. E.g.: D=±0.5% F=±1% G=±2% G=±2%
2.4 8th~11th codes: Resistance Value.
2.4.1 If value belongs to standard value of E-96 series, the 8th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.
2.4.2 11th codes listed as following:
0=$10^0$ 1=$10^1$ 2=$10^2$ 3=$10^3$ 4=$10^4$ 5=$10^5$ 6=$10^6$ J=$10^{-1}$ K=$10^{-2}$ L=$10^{-3}$ M=$10^{-4}$ N=$10^{-5}$ P=$10^{-6}$

2.5 12th~14th codes.
2.5.1 12th code: Packaging Type. E.g.: T=Tape/Reel
2.5.2 13th code: Standard Packing Quantity.
1=1000pcs 2=2000pcs B=2500 pcs 3=3000pcs
2.5.3 14th code: Special features.
E = Environmental Protection, Lead Free, or Standard type.

## 3. Ordering Procedure

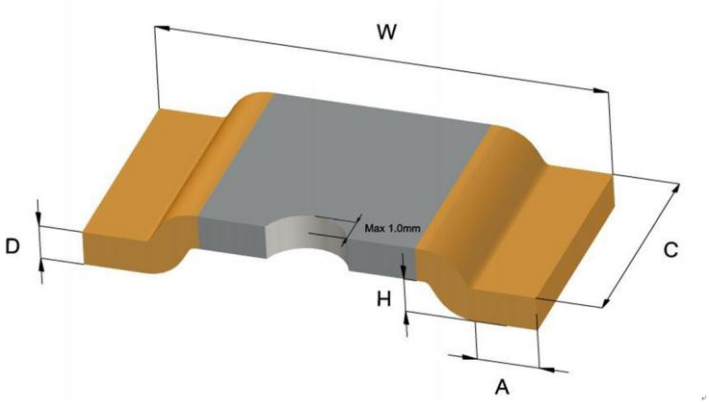
**(Example: RA20 5W ±1% 3mΩ T/R-2500)**




## 4.Marking

R001 1%→ R001: 1mΩValue 1%： ±1% Tolerance

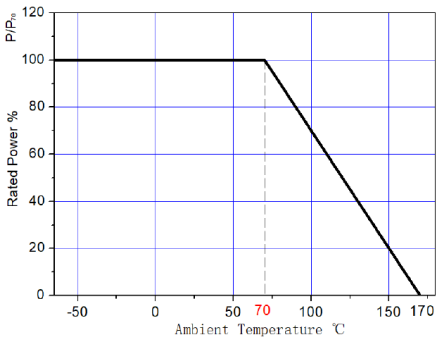
## 5. Dimension & Ratings



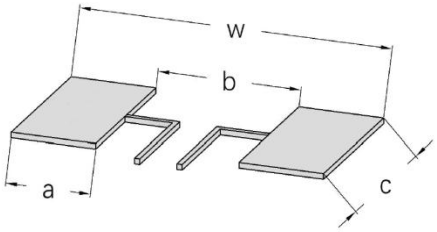

| Type | Power Rating | Resistance Range (mΩ) | TCR (ppm/℃)* | D±0.1 (mm) | W (mm) | A (mm) | C (mm) | H (mm) | Tolerance | Operating Temperature |
|---|---|---|---|---|---|---|---|---|---|---|
| RA12 (2512) | 6W | 0.2 | ±175 | 1.4 | 6.3±0.2 | 1.2±0.2 | 3.1±0.3 | 0.5±0.1 | ±0.5% ±1% ±2% ±5% | -65℃ ~170℃ |
| | 6W | 0.3 | ±175 | 1.5 | | | | | | |
| | 6W | 0.5 | ±115 | 0.93 | | | | | | |
| | 6W | 1 | ±100 | 0.45 | | | | | | |
| | 6W | 1.2 | ±70 | 1.08 | | | | | | |
| | 6W | 1.5 | ±70 | 0.86 | | | | | | |
| | 6W | 2 | ±70 | 0.65 | | | | | | |
| | 4W | 2.5 | ±70 | 0.5 | | | | | | |
| | 4W | 3 | ±70 | 0.43 | | | | | | |
| | 4W | 4 | ±70 | 0.31 | | | | | | |
| | 3W | 5 | ±70 | 0.28 | | | | | | |
| RA20 (3920) | 12W | 0.2 | ±200 | 1.64 | 10±0.2 | 2.2±0.2 | 5.1±0.4 | 0.5±0.1 | | |
| | 10W | 0.3 | ±150 | 1.37 | | | | | | |
| | 9W | 0.4 | ±100 | 0.97 | | | | | | |
| | 9W | 0.5 | ±70 | 0.83 | | | | | | |
| | 8W | 0.7 | ±70 | 0.55 | | | | | | |
| | 7W | 1 | ±50 | 0.4 | | | | | | |
| | 8W | 1 | ±50 | 1.16 | | | | | | |
| | 6W | 1.5 | ±50 | 0.75 | | | | | | |
| | 6W | 2 | ±50 | 0.60 | | | | | | |
| | 5W | 2.5 | ±50 | 0.47 | | | | | | |
| | 5W | 3 | ±50 | 0.37 | | | | | | |
| | 5W | 4 | ±50 | 0.28 | | | | | | |
| | 5W | 5 | ±50 | 0.28 | | | | | | |
| RA30 (5930) | 15W | 0.1 | ±200 | 2.0 | 15±0.3 | 4.2±0.3 | 7.6±0.4 | 0.5±0.1 | | |
| | 15W | 0.2 | ±100 | 1.5 | | | | | | |
| | 12W | 0.25 | ±100 | 1.2 | | | | | | |
| | 10W | 0.3 | ±100 | 0.98 | | | | | | |
| | 10W | 0.35 | ±100 | 0.83 | | | | | | |
| | 10W | 0.4 | ±100 | 0.75 | | | | | | |
| | 10W | 0.5 | ±75 | 0.6 | | | | | | |
| | 10W | 0.6 | ±75 | 0.5 | | | | | | |
| | 10W | 0.75 | ±75 | 0.41 | | | | | | |
| | 9W | 1 | ±50 | 0.86 | | | | | | |
| | 8W | 1.5 | ±50 | 0.61 | | | | | | |
| | 7W | 2 | ±50 | 0.4 | | | | | | |
| | 7W | 2.5 | ±50 | 0.34 | | | | | | |
| | 7W | 3 | ±50 | 0.29 | | | | | | |

***TCR（ppm/℃）：Test conditions at 20℃~120℃.**

## 6. Derating Curve




## 7. Recommended Solder Pad Layout(Unit： mm)




| Type | w±0.2 | c±0.2 | a±0.2 | b±0.2 |
|---|---|---|---|---|
| RA12 | 7 | 3.4 | 1.8 | 3.4 |
| RA20 | 11 | 6.2 | 2.7 | 5.6 |
| RA30 | 16 | 8.75 | 5.2 | 5.6 |

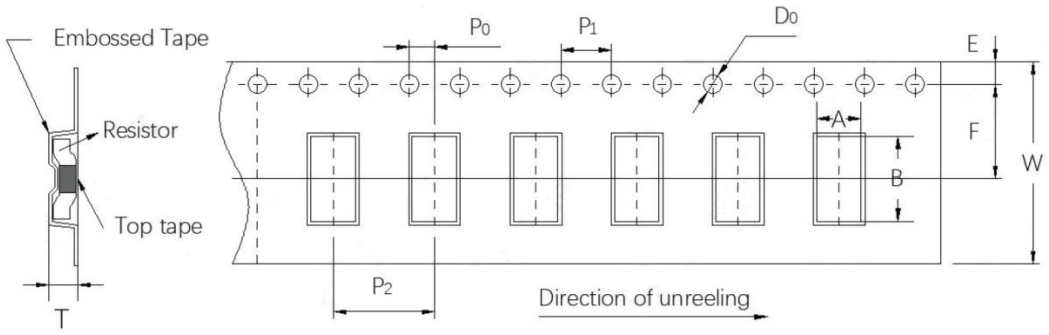
## 8. Performance Specification

| Characteristic | Test Methods | Limits |
|---|---|---|
| High Temperature Exposure | **MIL-STD-202 Method 108**<br>1000 hrs. (T=170℃) , unpowered. Measurement at 24±4 hours after test conclusion . | ±0.5% |
| Temperature Cycling | **JESD22 Method JA-104**<br>1000 Cycles(-55℃ to +155℃) , unpowered. Minimum dwell time 15min. at each temperature extreme. Maximum transition time 1 min. . Measurement at least 24hours after test conclusion . | ±0.5% |
| Humidity Bias | **MIL-STD-202 Method 103**<br>1000hrs. (85℃/85%RH) .<br>Note: Specify conditions: 10% of rate power.<br>Measurement at 24±4 hours after test conclusion . | ±0.5% |
| High Temperature Operating Life | **MIL-STD-202 Method 108**<br>1000 hrs.(T=125℃).<br>Rate power was applied to the products intermittently: 90 minutes ON and 30 minutes OFF .<br>Measurement at 24±4 hours after test conclusion . | ±0.5% |
| Resistance to Soldering Heat | **MIL-STD-202 Method 210**<br>250℃ ±5℃， 30s±5s | ±0.5% |
| Solderability | **J-STD-002C**<br>Steam ageing for 8 hours (93℃);<br>2) Weld bath temperature 245℃ ±5℃, duration5±0.5S . | 95% Coverage Min |
| Vibration | **MIL-STD-202 Method 204**<br>20 min.(5 g's) , test from10Hz-2000 Hz, 12 cycles each of 3 orientations . | ±0.5% |
| Board Flex Test | **AEC-Q200-005 REV A,**<br>Apply an external force once to the circuit board, bend at least Dx = 2mm, duration 60+5 S . | ±0.5% |
| Terminal Strength (SMD) | **AEC-Q200-006 REV A**<br>Apply an external force once to the side of the test device, the force is 17.7N (1.8kg), duration 60+1S . | ±0.5% |

| | | |
|---|---|---|
| Mechanical Shock | **MIL-STD-202H Method 213**<br>1) Pulse waveform: Half-Sine pulse.<br>2) Accelerate peak: 100g.<br>3) Pulse duration: 6ms.<br>4) Orientation & Shock time: ±X, ±Y, ±Z; 3 times each orientation, total 18 times | ±0.5% |
| ESD | **AEC-Q200-002 REV-B**<br>1) Direct Contact (DC): ±6kV;<br>2) Air Discharge (AD): ±12kV, ±16kV, ±25kV; | ±0.5% |
| Resistance to Solvents | **MIL-STD-202H Method 215**<br>Note: Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents . | There was no missing, faded, smeared, blurred, or shifted (dislodged) with the marks. There was no crack, separation, crazing, swelling, softening, degradation on the samples. |
| Flame Retardance | **AEC-Q200-001 REV B**<br>1) Test current: 100%, 115%, 130%, 150% (rated current).<br>2) Test duration: 1h. | The temperature is not higher than 350℃ for more than 10 seconds, no flame, no explosion. |
| Short Time Overload | Apply 5 times the rated power for 5 seconds and release the load for about 30 minutes, then measure its resistance variance rate. | ±0.5% |

## 9. Packing

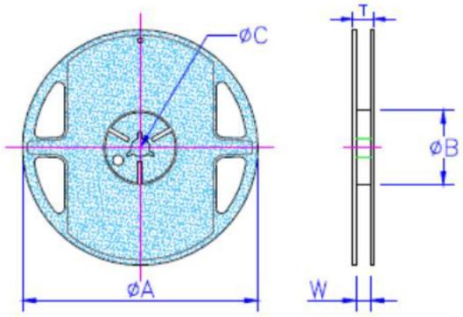
9.1 Dimension of plastic taping: (Unit: mm)




| Type | A ±0.15 | B ±0.15 | W ±0.3 | E ±0.15 | F ±0.15 | $P_0$ ±0.15 | $P_1$ ±0.15 | $P_2$ ±0.15 | $D_0$ ±0.15 | T ±0.15 | *Quantity (pcs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RA12 0.2mΩ | 3.6 | 6.7 | 16 | 1.75 | 7.5 | 2 | 4 | 8 | 1.50 | According to product thickness | 1000 |
| RA12 0.3mΩ | 3.7 | 6.9 | 16 | 1.75 | 7.5 | 2 | 4 | 8 | 1.50 | | 1000 |
| RA12 0.5mΩ | 3.5 | 6.7 | 12 | 1.75 | 5.5 | 2 | 4 | 4 | 1.50 | | 2000 |
| RA12 0.6~1mΩ | 3.5 | 6.7 | 12 | 1.75 | 5.5 | 2 | 4 | 4 | 1.50 | | 3000 |
| RA12 1.1~1.5mΩ | 3.5 | 6.7 | 12 | 1.75 | 5.5 | 2 | 4 | 4 | 1.50 | | 2000 |
| RA12 1.5~5mΩ | 3.5 | 6.7 | 12 | 1.75 | 5.5 | 2 | 4 | 4 | 1.50 | | 3000 |
| RA20 0.2mΩ | 5.8 | 10.6 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2000 |
| RA20 0.3mΩ | 5.6 | 10.65 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 1500 |
| RA20 0.4mΩ | 5.8 | 10.5 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2500 |
| RA20 0.5mΩ | 5.7 | 10.4 | 16 | 1.75 | 7.5 | 2 | 4 | 12 | 1.50 | | 2500 |
| RA20 0.7mΩ | 5.8 | 10.5 | 16 | 1.75 | 7.5 | 2 | 4 | 12 | 1.50 | | 2500 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RA20 7W-1mΩ | 5.8 | 10.5 | 16 | 1.75 | 7.5 | 2 | 4 | 12 | 1.50 | | 2500 |
| RA20 8W-1mΩ | 5.8 | 10.5 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2500 |
| RA20 1.5~5mΩ | 5.8 | 10.5 | 16 | 1.75 | 7.5 | 2 | 4 | 12 | 1.50 | | 2500 |
| RA30 0.1mΩ | 8.5 | 15.7 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 1000 |
| RA30 0.2mΩ | 8.5 | 15.7 | 24 | 1.75 | 11.5 | 2 | 4 | 16 | 1.50 | | 1000 |
| RA30 0.3~0.35mΩ | 8.5 | 15.7 | 24 | 1.75 | 11.5 | 2 | 4 | 16 | 1.50 | | 1500 |
| RA30 0.4~0.5mΩ | 8.1 | 15.5 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2000 |
| RA30 0.6~0.8mΩ | 8.5 | 15.7 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2000 |
| RA30 1mΩ | 8.1 | 15.5 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2000 |
| RA30 2~3mΩ | 8.5 | 15.7 | 24 | 1.75 | 11.5 | 2 | 4 | 12 | 1.50 | | 2000 |

9.2 Dimension of Reel：(Unit: mm)




| Type | ΦA ±0.5 | ΦB ±0.5 | ΦC ±0.5 | W ±0.5 | T ±0.5 |
|---|---|---|---|---|---|
| RA12 W=12 | 178 | 60 | 13 | 12.5 | 21 |
| RA12 W=16 | 203 | 60 | 13 | 16.5 | 21 |
| RA20 W=24 | 330 | 100 | 13 | 24.5 | 29 |
| RA20 W=16 | 330 | 100 | 13 | 16.5 | 21 |
| RA30 | 330 | 100 | 13 | 24.5 | 29 |

**10. Note**

10.1. UNI-ROYAL recommend the storage condition temperature: 15 to 35℃ under humidity between 25 to 75%RH (Put condition for individual product).Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old. (Put condition for each product) may be degraded.

10.2. Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

10.3. Product performance and soldered connections may deteriorate if the products are stored in the following places:
a. Storage in high Electrostatic.
b. Storage in direct sunshine、rain and snow or condensation.
c. Where the products are exposed to sea winds or corrosive gases, including $Cl_2$, $H_2S$, $NH_3$, $SO_2$, $NO_2$，Br，etc.

## 11.Record

| Version | Description | Page | Date | Amended by | Checked by |
|---|---|---|---|---|---|
| 1 | First version | 1~6 | Apr.28,2023 | Haiyan Chen | Yuhua Xu |
| 2 | 2.1. Add RA30-0.25/0.3/0.35/0.4/0.6 value of resistance； | 3 | Jan.04,2024 | Haiyan Chen | Yuhua Xu |
| | 2.2. Modify RA30-0.2 packaging quantity，Change from 1.5K/ disk to 1K/ disk; | 5 | | | |
| | 2.3. Modify RA30-0.3 packaging quantity，Change from 2K/ disk to 1.5K/ disk; | 5 | | | |
| | 2.4. Modify RA20-0.3 packaging quantity，Change from 2K/ disk to 1.5K/ disk; | 5 | | | |
| | 2.5. Modify RA12-1.5 packaging quantity, Modified from 3K/ disk to 2K/ disk; | 5 | | | |
| | 2.6. Modify RA12-0.2/0.3 Dimension of Reel, Changed from 7 inches to 8 inches. | 5 | | | |
| 3 | 1. Improve the carrier information of RA30 packaging and correct the carrier size tolerance<br>2. Update and modify performance specification<br>3. Update pad size | 6<br>4~5<br>4 | Jul.15,2024 | Junying Ye | Haiyan Chen |
| 4 | 1. hoisting power<br>2. Update part description in durability test;<br>3. Updated RA20 package braid rules | 3<br>4~5<br>6 | Sep.02,2024 | Haiyan Chen | Yuhua Xu |
| 5 | 1. Increase the RA12 1mΩ power<br>2. Modify the RA20 2mΩ D value<br>3. Modify the packaging | 3<br>3<br>5~6 | Mar.07,2025 | Haiyan Chen | Yuhua Xu |

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