


|  |                 |      |            |
|--|-----------------|------|------------|
| <br>毫欧电阻 毫欧制造 | Ho 高精密晶圆电阻系列规格书 | 系列号  | Ho         |
|  |                 | 修订日期 | 2019-05-08 |
|  |                 | 版本号  | Ho-A0      |

# 规格书 Specification

制造商:深圳市毫欧电子有限公司

适用: 本规格书适用于深圳市毫欧电子有限公司高精密晶圆电阻系列产品选型。

包括: Ho0102/ Ho0204/ Ho0207

## ■ 产品特点 Features:

符合 AEC-Q200 标准, 薄膜技术, 出色的整体稳定性, Ni 阻挡层上的 Sn 终止

严格公差低至  $\pm 0.1\%$  极低 TCR 低至  $\pm 10 \text{ PPM} / ^\circ \text{C}$  高额定功率高达 1 瓦

SMD 启用结构无铅且符合 RoHS 标准

## ■ 产品名称 Product Name

晶圆电阻

## ■ 产品型号 Product number

**Ho0204-1/4W-10R-1%-15ppm**

| 供应商     | 封装   | 额定功率(W) | 阻值(mR)     | 精度(%)   | 温度系数 TAR (ppm) |
|---------|------|---------|------------|---------|----------------|
| Ho 毫欧电子 | 0102 | 1/8~0.3 | 8.2R~1MR   | 0.1%~5% | 15~100         |
|         | 0204 | 1/4~2/5 | 0.1R~3.4MR | 0.1%~5% | 10~100         |
|         | 0207 | 1/2~1   | 0.1R~3.4MR | 0.1%~5% | 10~100         |



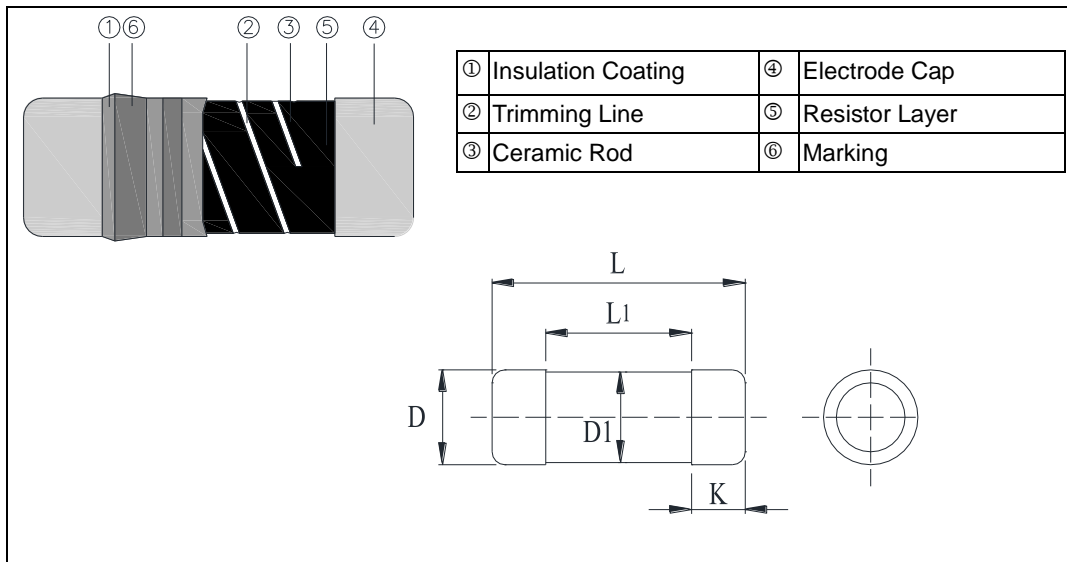
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## Ho 高精精密晶圆电阻系列规格书

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### ■ 产品尺寸 Product Size



产品尺寸:

| 型号      | L(mm)     | L1(mm) | Φ D(mm)   | Φ D1(mm)   | K(mm)     |
|---------|-----------|--------|-----------|------------|-----------|
| Ho 0102 | 2.20±0.10 | 1.1    | 1.10±0.10 | D +0/-0.15 | 0.45±0.05 |
| Ho0204  | 3.50±0.2  | 1.7    | 1.40±0.15 | D +0/-0.2  | 0.8±0.1   |
| Ho0207  | 5.90±0.2  | 2.9    | 2.20±0.20 | D +0/-0.2  | 1.3±0.1   |

### ■ 电气参数 Electrical parameter

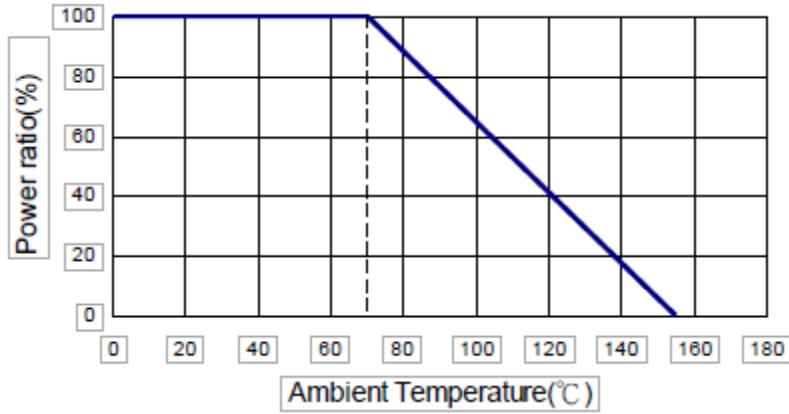
|                                    |                 |
|------------------------------------|-----------------|
| 额定功率 Rated power                   | 1/8~1W          |
| 阻值范围 Resistance range              | 0.1R~3.4MR      |
| 额定压降 Max. Operating Voltage        | 150V~350V       |
| 准确度等级 AccuracyClass                | 0.1%、5%         |
| 电阻温度系数 T.C.R ( ppm / °C )          | ± 10~± 100      |
| 工作温度范围 Operating Temperature Range | -55 °C ~+155 °C |

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■ 功率曲线 Power curve

操作温度范围 -55 ~ +155 °C 电阻温度达到 70 °C 时降功率示意图



■ 额定电流计算公式 The rated current is calculated by the following Formu

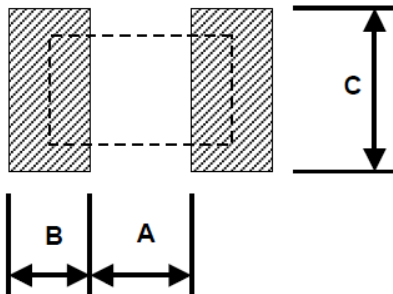
I : Rated Current (A)

P : Rated Power (W)

R : Resistance Value (Ω)

$$I = \sqrt{P/R}$$

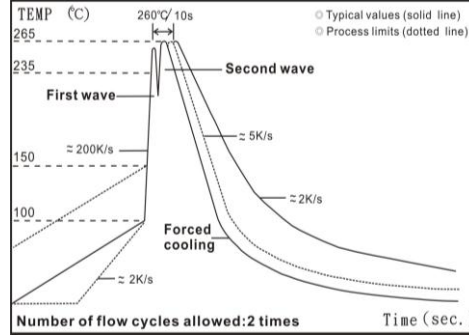
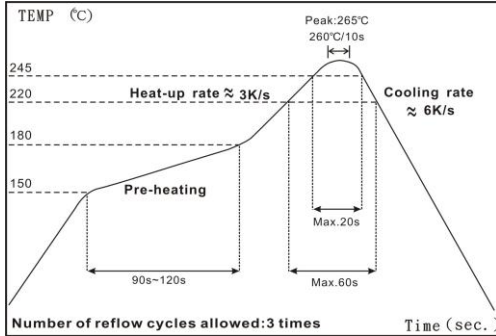
■ 建议焊盘尺寸 Recommended Solder Pad Dimension



| 型号     | A(mm) | B(mm) | C(mm) |
|--------|-------|-------|-------|
| Ho0102 | 1     | 0.8   | 1.5   |
| Ho0204 | 1.6   | 1.2   | 1.6   |
| Ho0207 | 3.0   | 1.7   | 2.4   |

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■ 建议焊接参数 / Recommended Customer Soldering Parameters



- (1) Time of IR reflow soldering at maximum temperature point 260°C : 10s
- (2) Time of wave soldering at maximum temperature point 260°C : 10s
- (3) Time of soldering iron at maximum temperature point 410°C : 5s

■ 标准电气规范 Standard Electrical Specifications

| Item<br>Type | Power Rating<br>at 70 °C | Operating Temp.<br>Range | Max.<br>Operating Voltage | Max.<br>Overload Voltage | Resistance Range |             |             |            |      | TCR<br>(PPM/°C) |     |
|--------------|--------------------------|--------------------------|---------------------------|--------------------------|------------------|-------------|-------------|------------|------|-----------------|-----|
|              |                          |                          |                           |                          | ±0.1%            | ±0.25%      | ±0.5%       | ±1%        | ±5%  |                 |     |
| 0102         | 1/8W<br>Jumper:2A        | -55 ~ +155°C             | 150V                      | 300V                     | 100Ω-56KΩ        |             |             |            |      | -               | ±15 |
|              |                          |                          |                           |                          | 100Ω-82KΩ        | 49.9Ω-200KΩ | 49.9Ω-390KΩ | -          | ±25  |                 |     |
|              |                          |                          |                           |                          | -                | 8.2Ω-1MΩ    |             |            | ±50  |                 |     |
|              |                          |                          |                           |                          | -                | 40Ω-1MΩ     |             |            | ±100 |                 |     |
|              |                          |                          |                           |                          | -                | 0Ω(<15mΩ)   |             |            | -    |                 |     |
| 0204         | 1/4W<br>Jumper:2A        | -55 ~ +155°C             | 200V                      | 400V                     | 49.9Ω-20KΩ       |             |             |            |      | ±10             |     |
|              |                          |                          |                           |                          | 10Ω-300KΩ        |             |             |            |      | ±15             |     |
|              |                          |                          |                           |                          | 10Ω-1MΩ          | 10Ω-3.4MΩ   | 1Ω-3.4MΩ    | ±25        |      |                 |     |
|              |                          |                          |                           |                          | 10Ω-1MΩ          | 1Ω-1MΩ      | 1Ω-3.4MΩ    | 0.2Ω-3.4MΩ | ±50  |                 |     |
|              |                          |                          |                           |                          | -                | 0.1Ω-1MΩ    |             |            | ±100 |                 |     |
| 0207         | 1/2W<br>Jumper:4A        | -55 ~ +155°C             | 300V                      | 600V                     | 49.9Ω-20KΩ       |             |             |            |      | ±10             |     |
|              |                          |                          |                           |                          | 10Ω-300KΩ        |             |             |            |      | ±15             |     |
|              |                          |                          |                           |                          | 10Ω-1MΩ          | 10Ω-3.4MΩ   | 1Ω-3.4MΩ    | ±25        |      |                 |     |
|              |                          |                          |                           |                          | 10Ω-1MΩ          | 1Ω-1MΩ      | 1Ω-3.4MΩ    | 0.2Ω-3.4MΩ | ±50  |                 |     |
|              |                          |                          |                           |                          | -                | 0.1Ω-1MΩ    |             |            | ±100 |                 |     |
| -            | 0Ω(<15mΩ)                |                          |                           | -                        |                  |             |             |            |      |                 |     |

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## ■ 高功率等级电气规范 High Power Rating 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%         | ±5% |              |      |
| 0102      | 1/5W                 | -55 ~ +155°C          | 200V                   | 400V                  | 100Ω-56KΩ        |           |             |             |     | -            | ±15  |
|           |                      |                       |                        |                       | -                | 100Ω-82KΩ | 49.9Ω-200KΩ | 49.9Ω-390KΩ | -   | ±25          |      |
|           | -                    |                       |                        |                       | 8.2Ω-1MΩ         |           |             | -           | ±50 |              |      |
|           | -                    |                       |                        |                       | 40Ω-1MΩ          |           | -           | ±100        |     |              |      |
| 0204      | 2/5W                 | -55 ~ +155°C          | 200V                   | 400V                  | 10Ω-300KΩ        |           |             |             |     | -            | ±15  |
|           |                      |                       |                        |                       | 10Ω-1MΩ          |           | 10Ω-3.4MΩ   | 1Ω-3.4MΩ    | -   | ±25          |      |
|           |                      |                       |                        |                       | 10Ω-1MΩ          | 1Ω - 1MΩ  | 1Ω - 3.4MΩ  | 0.2Ω-3.4MΩ  | -   | ±50          |      |
|           |                      |                       |                        |                       | -                |           |             | 0.1Ω-1MΩ    |     | -            | ±100 |
| 0207      | 1W                   | -55 ~ +155°C          | 350V                   | 700V                  | 10Ω-300KΩ        |           |             |             |     | -            | ±15  |
|           |                      |                       |                        |                       | 10Ω-1MΩ          |           | 10Ω-3.4MΩ   | 1Ω-3.4MΩ    | -   | ±25          |      |
|           |                      |                       |                        |                       | 10Ω-1MΩ          | 1Ω-1MΩ    | 1Ω-3.4MΩ    | 0.2Ω-3.4MΩ  | -   | ±50          |      |
|           |                      |                       |                        |                       | -                |           |             | 0.1Ω-1MΩ    |     | -            | ±100 |

## ■ 环境特征 Environmental Characteristics

| Item   | Requirement   |        | Test Method  |
|--|---|--------|--|
|  | 5% and Below  | Jumper |  |
| Temperature Coefficient of Resistance (T.C.R.) | As Spec   |        | <b>JIS-C-5201-1 4.8</b><br><b>IEC-60115-1 4.8</b><br>-55°C~+125°C, 25°C is the reference temperature                                     |
| Short Time Overload                            | 10Ω-270KΩ: ±(0.1%+0.05Ω)<br><10Ω & >270KΩ: ±(0.15%+0.05Ω)<br>0102: ±(0.15%+0.05Ω) | <15mΩ  | <b>JIS-C-5201-1 4.13</b><br><b>IEC-60115-1 4.13</b><br>RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds                |
| Insulation Resistance                          | ≥10G  |        | <b>JIS-C-5201-1 4.6</b><br><b>IEC-60115-1 4.6</b><br>Max. Overload Voltage for 1 minute  |
| Operational Life                               | 10Ω-270KΩ: ±(0.25%+0.05Ω)<br><10Ω & >270KΩ: ±(0.5%+0.05Ω)<br>0102: ±(0.5%+0.05Ω)  | <15mΩ  | <b>MIL-STD-202 Method 108</b><br>Condition D Steady State TA=125°C at derated power.<br>Measurement at 24±4 hours after test conclusion. |
| Biased Humidity                                | 10Ω-270KΩ: ±(0.5%+0.05Ω)<br><10Ω & >270KΩ: ±(1%+0.05Ω)<br>0102: ±(2%+0.05Ω)       | <15mΩ  | <b>MIL-STD-202 Method 103</b><br>1000 hrs 85°C/85%RH 10% of operating power.   |
| High Temperature Exposure                      | 10Ω-270KΩ: ±(0.25%+0.05Ω)<br><10Ω & >270KΩ: ±(1%+0.05Ω)<br>0102: ±(1%+0.05Ω)      | <15mΩ  | <b>MIL-STD-202 Method 108</b><br>at +155°C for 1000 hrs  |
| Board Flex                                     | 10Ω-270KΩ: ±(0.1%+0.05Ω)<br><10Ω & >270KΩ: ±(0.5%+0.05Ω)<br>0102: ±(0.5%+0.05Ω)   | <15mΩ  | <b>AEC-Q200-005</b><br>Bending once for 60 seconds with 2mm  |

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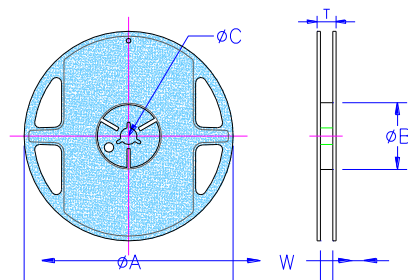


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|                              |   |       |   |
|------------------------------|---|-------|---|
| Board Flex                   | 10Ω-270KΩ: $\pm(0.1\%+0.05\Omega)$<br><10Ω & >270KΩ: $\pm(0.5\%+0.05\Omega)$<br>0102: $\pm(0.5\%+0.05\Omega)$   | <15mΩ | <b>AEC-Q200-005</b><br>Bending once for 60 seconds with 2mm   |
| Solderability                | 95% min. coverage   |       | <b>JIS-C-5201-1 4.17</b><br><b>IEC-60115-1 4.17</b><br><b>J-STD-002</b><br>245±5°C for 3 seconds                                    |
| Resistance to Soldering Heat | 10Ω-270KΩ: $\pm(0.1\%+0.05\Omega)$<br><10Ω & >270KΩ: $\pm(0.25\%+0.05\Omega)$<br>0102: $\pm(0.25\%+0.05\Omega)$ | <15mΩ | <b>MIL-STD-202 Method 210</b><br>260±5°C for 10 seconds   |
| Voltage Proof                | No breakdown or flashover   |       | <b>JIS-C-5201-1 4.7</b><br><b>IEC-60115-1 4.7</b><br>1.42 times Max. Operating Voltage for 1 minute                                 |
| Leaching                     | Individual leaching area $\leq 5\%$<br>Total leaching area $\leq 10\%$  |       | <b>JIS-C-5201-1 4.18</b><br><b>IEC-60068-2-58 8.2.1</b><br>260±5°C for 30 seconds   |
| Temperature Cycling          | 10Ω-270KΩ: $\pm(0.25\%+0.05\Omega)$<br><10Ω & >270KΩ: $\pm(0.5\%+0.05\Omega)$<br>0102: $\pm(1\%+0.05\Omega)$    | <15mΩ | <b>JESD22 Method JA-104</b><br>-55°C to +125°C, 1000 cycles   |
| Mechanical Shock             | $\pm(0.25\%+0.05\Omega)$  | <15mΩ | <b>MIL-STD-202 Method 213</b><br>Wave Form: Tolerance for half sine shock pulse.<br>Peak value is 100g's. Normal duration (D) is 6. |
| Vibration                    | $\pm(0.5\%+0.05\Omega)$   | <15mΩ | <b>MIL-STD-202 Method 204</b><br>5 g's for 20 min., 12 cycles each of 3 orientations,<br>10-2000 Hz                                 |
| ESD                          | $\pm(0.5\%+0.05\Omega)$   | <15mΩ | <b>AEC-Q200-002</b><br>Human body, 2KV  |
| Resistance to Solvents       | No visible damage on appearance and marking.  |       | <b>MIL-STD-202 Method 215</b><br>Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.                  |
| Terminal Strength            | No broken   |       | <b>AEC-Q200-006</b><br>Force of 1.8kg for 60 seconds.   |

## ■ 包装



包装数量和卷轴规格

| Type   | Reel Diameter | ΦA (mm)   | ΦB (mm)  | ΦC (mm)  | W (mm)   | T (mm)   | Emboss Plastic Tape (EA) |
|--------|---------------|-----------|----------|----------|----------|----------|--------------------------|
| Ho0102 | 7 inch        | 178.5±1.5 | 60.0+1.0 | 13.0±0.2 | 9.0±0.5  | 12.5±0.5 | 3,000                    |
| Ho0204 | 7 inch        | 178.5±1.5 | 60.0+1.0 | 13.0±0.2 | 9.0±0.5  | 12.5±0.5 | 3,000                    |
| Ho0207 | 7 inch        | 178.5±1.5 | 60.0+1.0 | 13.0±0.5 | 13.0±0.5 | 15.5±0.5 | 2,000                    |

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