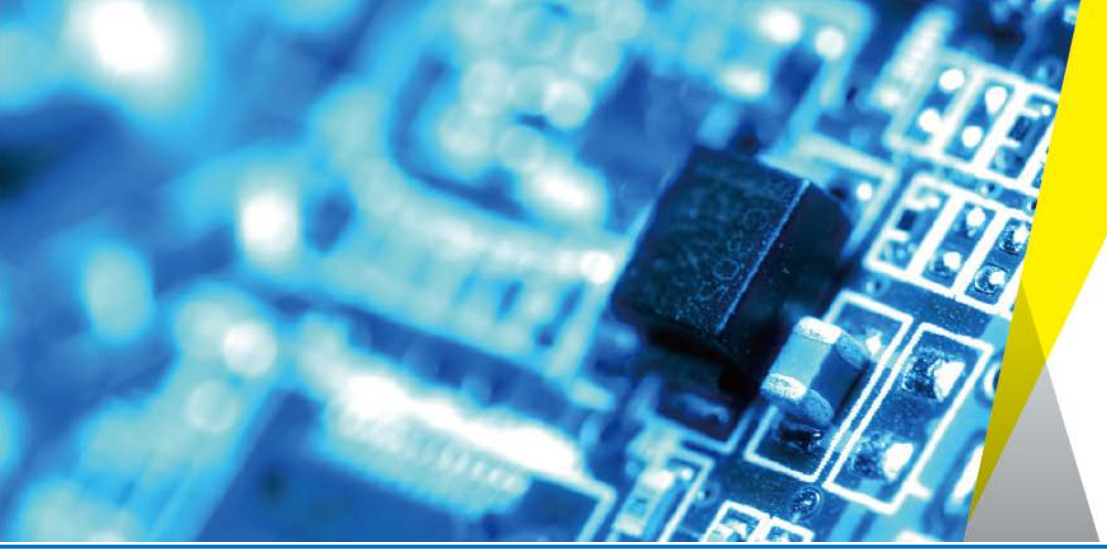


# DATASHEET

| | |
|---|---|
| **Product Name** | **High-Power Thick Film Chip Resistors** |
| **Part Name** | **HP Series** |
| **File No.** | **SMD-SP-003** |


**Uniroyal Electronics Global Co., Ltd.**

88#, Longteng Road, Economic & Technical Development Zone, Kunshan, Jiangsu, China

| | |
|---|---|
| Tel | +86 512 5763 1411 / 22 /33 |
| Email | marketing@uni-royal.cn |
| 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 High Power Thick Film Chip Resistors manufactured by UNI-ROYAL.
1.2 High power standard size
1.3 Suitable for both wave & re-flow soldering
1.4 AEC-Q200 qualified
1.5Application：AV adapters，LCD back-light，camera strobe ect.
1.6 Compliant with RoHS directive.
1.7 Halogen free requirement.

## 2. Part No. System

Part No. includes 14 codes shown as below:
2.1 1st~4th codes: Part name. E.g.: HP02、HP03、HP05、HP06、HP07、HP10、HP11、HP12
2.2 5th~6th codes: Power rating.

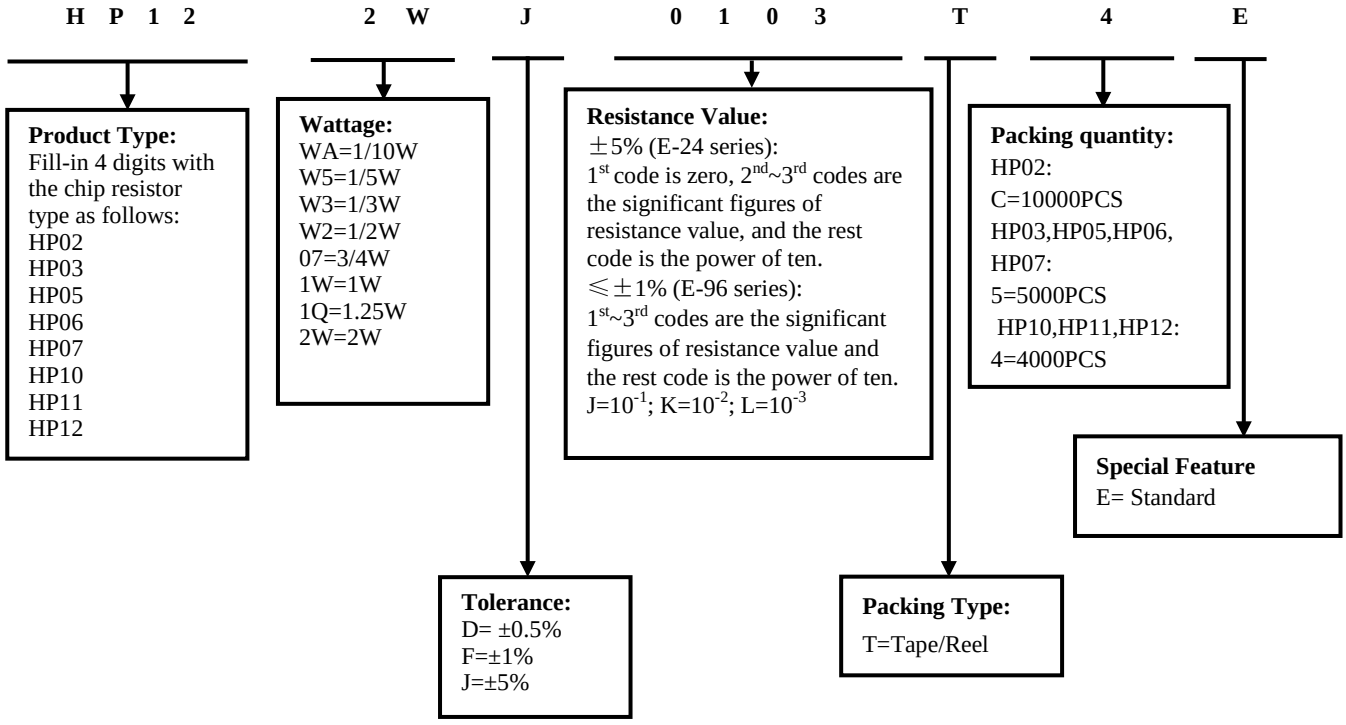
E.g.: W=Normal Size "1~G" = "1~16"

| Wattage | 3/4 | 1/2 | 1/3 | 1/5 | 1/10 | 1 | 1.25 | 2 |
|---|---|---|---|---|---|---|---|---|
| Normal Size | 07 | W2 | W3 | W5 | WA | 1W | 1Q | 2W |

If power rating is equal or lower than 1 watt, 5th code would be "W" and 6th code would be a number or letter.
E.g.: WA=1/10W W3=1/3W
2.3 7th code: Tolerance. E.g.: D= ±0.5% F=±1% J=±5%
2.4 8th~11th codes: Resistance Value.
2.4.1 If value belongs to standard value of E-24 series, the 8th code is zero, 9th~10th codes are the significant figures of resistance value, and the 11th code is the power of ten.
2.4.2 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.
2.4.3 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=$10^{-4}$
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.
4=4,000pcs 5=5,000pcs C=10,000pcs
2.5.3 14th code: Special features.
E = Standard

## 3. Ordering Procedure

**(Example: HP12 2W ±5% 10KΩ T/R-4000)**



## 4. Marking

4.1 For HP02 size. Due to the very small size of the resistor's body, there is no marking on the body.

4.2 Normally, the making of 0Ω HP03, 0Ω HP05, 0Ω HP06,0Ω HP07, 0Ω HP10,0Ω HP11, 0Ω HP12 resistors as following


0 → 0Ω

4.3 ±5% tolerance products (E-24 series):
3 codes.
1st~2nd codes are the significant figures of resistance value, and the rest code is the power of ten.


333 → 33KΩ

4.4 ±0.5%,±1% tolerance products (E-96 series):
4 codes.
1st~3rd codes are the significant figures of resistance value, and the rest code is the power of ten.
Letter "R" in mark means decimal point.


2701 → 2.7KΩ

4.5 More than HP05 specifications (including) 4 digits, Product below 1Ω, show as following, the first digit Is "R" which as decimal point.


R300 → 0.3Ω

4.6 Standard E-96 series values of HP03≤±1% : due to the small size of the resistor's body, 3 digits marking will be used to indicate the accurate resistance value by using the following multiplier & resistance code.

Multiplier Code (for HP03 ≤±1% marking)

| Code | A | B | C | D | E | F | G | H | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Multiplier | $10^0$ | $10^1$ | $10^2$ | $10^3$ | $10^4$ | $10^5$ | $10^6$ | $10^7$ | $10^{-1}$ | $10^{-2}$ | $10^{-3}$ |

Standard E-96 series Resistance Value code (for HP03≤±1% marking)

| Value | Code | Value | Code | Value | Code | Value | Code |
|---|---|---|---|---|---|---|---|
| 100 | 01 | 178 | 25 | 316 | 49 | 562 | 73 |
| 102 | 02 | 182 | 26 | 324 | 50 | 576 | 74 |
| 105 | 03 | 187 | 27 | 332 | 51 | 590 | 75 |
| 107 | 04 | 191 | 28 | 340 | 52 | 604 | 76 |
| 110 | 05 | 196 | 29 | 348 | 53 | 619 | 77 |
| 113 | 06 | 200 | 30 | 357 | 54 | 634 | 78 |
| 115 | 07 | 205 | 31 | 365 | 55 | 649 | 79 |
| 118 | 08 | 210 | 32 | 374 | 56 | 665 | 80 |
| 121 | 09 | 215 | 33 | 383 | 57 | 681 | 81 |
| 124 | 10 | 221 | 34 | 392 | 58 | 698 | 82 |
| 127 | 11 | 226 | 35 | 402 | 59 | 715 | 83 |
| 130 | 12 | 232 | 36 | 412 | 60 | 732 | 84 |
| 133 | 13 | 237 | 37 | 422 | 61 | 750 | 85 |
| 137 | 14 | 243 | 38 | 432 | 62 | 768 | 86 |
| 140 | 15 | 249 | 39 | 442 | 63 | 787 | 87 |
| 143 | 16 | 255 | 40 | 453 | 64 | 806 | 88 |
| 147 | 17 | 261 | 41 | 464 | 65 | 825 | 89 |
| 150 | 18 | 267 | 42 | 475 | 66 | 845 | 90 |
| 154 | 19 | 274 | 43 | 487 | 67 | 866 | 91 |
| 158 | 20 | 280 | 44 | 499 | 68 | 887 | 92 |
| 162 | 21 | 287 | 45 | 511 | 69 | 909 | 93 |
| 165 | 22 | 294 | 46 | 523 | 70 | 931 | 94 |
| 169 | 23 | 301 | 47 | 536 | 71 | 953 | 95 |
| 174 | 24 | 309 | 48 | 549 | 72 | 976 | 96 |

So the resistance value are marked as the following examples


1.96KΩ=196×10$^{1}$Ω=29B


12.4Ω=124×10$^{-1}$Ω=10X

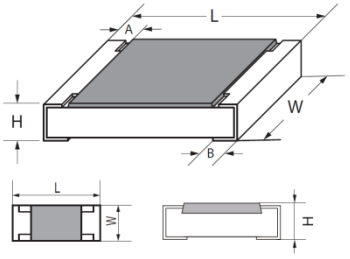
4.7 Standard E-24 and not belong to E-96 series values (≤±1%) of 0603 size: the marking is the same as 5% tolerance but marking as underline.


333=33KΩ


680=68Ω

## 5. Dimension

| Type | Dimension(mm) | | | | |
|---|---|---|---|---|---|
| | L | W | H | A | B |
| HP02(0402) | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| HP03(0603) | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| HP05(0805) | 2.00±0.15 | 1.25+0.15/ -0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| HP06(1206) | 3.10±0.15 | 1.55+0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| HP07(1210) | 3.10±0.10 | 2.50±0.15 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| HP10(2010) | 5.00±0.10 | 2.50±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| HP11(1812) | 4.50±0.20 | 3.20±0.20 | 0.55±0.20 | 0.50±0.20 | 0.50±0.20 |
| HP12(2512) | 6.35±0.10 | 3.20±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |

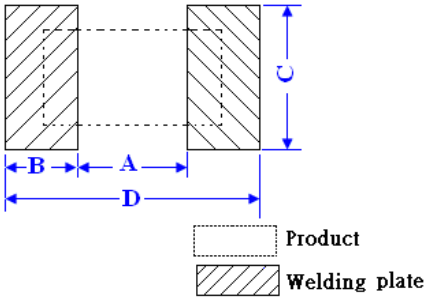



## 6. Resistance Range

| Type | Size | Power Rating | Resistance Range of 0.5%,1% ,5% | Max. Working Voltage/Current | Max. Overload Voltage/ Current | Dielectric withstanding Voltage | Operating Temperature |
|---|---|---|---|---|---|---|---|
| HP02 | 0402 | 1/10W | 1Ω~10M | 50V | 100V | 100V | -55℃~155℃ |
| | | | 0Ω:≤10mΩ | 3A | 6A | | |
| HP03 | 0603 | 1/5W | 0.1Ω~10M | 75V | 150V | 300V | -55℃~155℃ |
| | | | 0Ω:≤8mΩ | 5A | 10A | | |
| HP05 | 0805 | 1/3W | 0.01Ω~10M | 150V | 300V | 500V | -55℃~155℃ |
| | | | 0Ω:≤5mΩ | 6A | 12A | | |
| HP06 | 1206 | 1/2W | 0.01Ω~10M | 200V | 400V | 500V | -55℃~155℃ |
| | | | 0Ω:≤5mΩ | 10A | 20A | | |
| HP07 | 1210 | 3/4W | 0.1Ω~10M | 200V | 500V | 500V | -55℃~155℃ |
| | | | 0Ω:≤4mΩ | 12A | 24A | | |
| HP10 | 2010 | 1W | 0.01Ω~10M | 200V | 500V | 500V | -55℃~155℃ |
| | | | 0Ω:≤5mΩ | 12A | 24A | | |
| HP11 | 1812 | 1.25W | 0.1Ω~10M | 200V | 500V | 500V | -55℃~155℃ |
| | | | 0Ω:≤5mΩ | 12A | 24A | | |
| HP12 | 2512 | 2W | 0.01Ω~10M | 300V | 500V | 500V | -55℃~155℃ |
| | | | 0Ω:≤5mΩ | 16A | 32A | | |

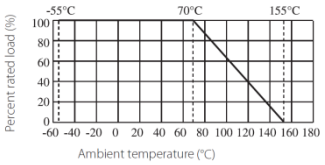
## 7. Soldering pad size recommended

| Type | Dimension(mm) | | | |
|---|---|---|---|---|
| | A | B | C | D |
| HP02 | 0.5±0.05 | 0.5±0.05 | 0.6±0.05 | 1.5±0.05 |
| HP03 | 0.8±0.05 | 0.8±0.05 | 0.9±0.05 | 2.4±0.05 |
| HP05 | 1.0±0.1 | 1±0.1 | 1.4±0.1 | 3±0.1 |
| HP06 | 2.0±0.1 | 1.1±0.1 | 1.8±0.1 | 4.2±0.1 |
| HP07 | 2.0±0.1 | 1.1±0.1 | 2.9±0.1 | 4.2±0.1 |
| HP10 | 3.6±0.1 | 1.4±0.1 | 3±0.1 | 6.4±0.1 |
| HP11 | 3.0±0.1 | 1.4±0.1 | 3.7±0.1 | 5.8±0.1 |
| HP12 | 4.9±0.1 | 1.35±0.1 | 3.7±0.1 | 7.6±0.1 |




## 8. Derating Curve

Power rating will change based on continuous load at ambient temperature from -55 to 155℃.
It is constant between -55 to 70℃, and derate to zero when temperature rise from 70 to 155℃.

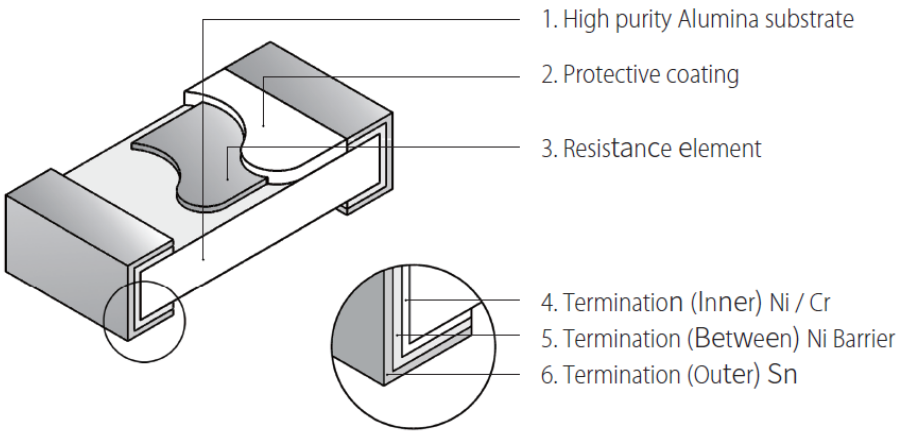



Voltage rating:
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

$$RCWV = \sqrt{P \times R}$$

Remark: RCWV: Rating Continuous Working Voltage (Volt.)  P: power rating (Watt)  R: nominal resistance (Ω)
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.
The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is lower.

## 9. Structure



## 10. Performance Specification

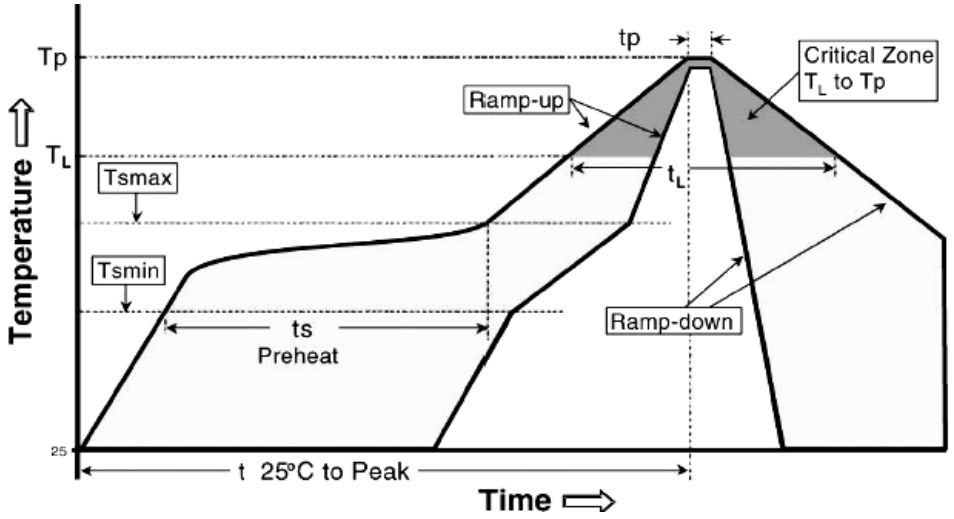
| Characteristic | Limits | Ref. Standards | Test Methods |
|---|---|---|---|
| Operational life | ±0.5%,±1%: ±(1.0%+0.1Ω)<br>±5%: ±(3.0%+0.1Ω) | MIL-STD-202 Method 108 | 125℃, at 36% of operating power, 1000H(1.5 hours "ON", 0.5 hour "OFF"). Measurement at 24±4 hours after test conclusion. |
| | HP02:<20mΩ;HP03<16 mΩ;<br>HP05、HP06、HP10、HP11、HP12: <10 mΩ<br>HP07: <8mΩ | | Apply to rate current for 0 Ω |
| Electrical Characterization（T.C.R） | HP02:<br>1Ω≤R≤10Ω: ±400 PPM/℃<br>10Ω＜R≤100Ω: ±200 PPM/℃<br>100Ω＜R≤10M: ±100 PPM/℃<br>HP03：<br>0.1Ω≤R＜0.2Ω: ±200PPM/℃<br>0.2Ω≤R≤10M: ±100 PPM/℃<br>HP05：<br>10mΩ≤R≤15mΩ:±800ppm/℃<br>15mΩ<R≤25mΩ: ±600ppm/℃<br>25mΩ<R≤50mΩ: ±400ppm/℃<br>50mΩ<R<0.1Ω: ±200ppm/℃<br>0.1Ω≤R≤10M: ±100ppm/℃<br>HP06:<br>10mΩ≤R<15mΩ: ±700 ppm/℃<br>15mΩ≤R<30mΩ: ±400 ppm/℃<br>30mΩ≤R<50mΩ: ±300 ppm/℃<br>50mΩ≤R<0.1Ω: ±150 ppm/℃<br>0.1Ω≤R≤10M:±100 ppm/℃<br>HP10:<br>10mΩ≤R<15mΩ: 0~+800 ppm/℃<br>15mΩ≤R<50mΩ: 0~+600 ppm/℃<br>50mΩ≤R<10M: ±100 ppm/℃<br>HP07、HP11: ±100PPM/℃<br>HP12:<br>10mΩ≤R<20mΩ: 0~+800ppm/℃<br>20mΩ≤R≤50mΩ: 0~+400ppm/℃<br>50mΩ<R≤10M: ±100ppm/℃ | GB/T 5729 4.8<br>JIS-C-5201 4.8<br>IEC 60115-1 6.2 | Natural resistance changes per temp. Degree centigrade<br>$\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃)<br>$R_1$: Resistance Value at room temperature （$t_1$）;<br>$R_2$: Resistance at test temperature （$t_2$）<br>$t_1$: +25°C or specified room temperature<br>$t_2$: Test temperature（-55℃or 125℃） |
| Short-time overload | ±0.5%,±1%: ±(1.0%+0.1Ω)<br>±5%: ±(2.0%+0.1Ω) | GB/T 5729 4.13<br>JIS-C-5201 4.13<br>IEC 60115-1 8.1.4.2 | Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds.. |
| | HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | | Apply max Overload current for 0Ω |
| External Visual | Marking Complete , no mechanical damage | MIL-STD-883 Method 2009 | Electrical test not required. Inspect device construction, marking and workmanship |
| Physical Dimension | Reference 5 Dimension Standards | JESD22 MH Method JB-100 | Verify physical dimensions to the applicable device detail specification.<br>Note: User(s) and Suppliers spec. Electrical test not required. |
| Resistance to Solvent | Marking Complete , no mechanical damage | MIL-STD-202 Method 215 | Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents. |
| Terminal Strength | Not broken | AEC-Q200-006 | HP02:5N; others:17.7N, 60±1 seconds. |
| High Temperature Exposure (Storage) | ±0.5%,±1%: ±(1.0%+0.1Ω)<br>±5%: ±(3.0%+0.1Ω) | MIL-STD-202 Method 108 | 1000hrs. @T=155℃.Unpowered. Measurement at 24±4 hours after test conclusion. |
| | HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | | |

| | | | |
|---|---|---|---|
| Temperature Cycling | ±(1.0%+0.05Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | JESD22 Method JA-104 | 1000 Cycles (-55℃ to +155℃). Measurement at 24±4 hours after test conclusion. |
| Biased Humidity | ±0.5%,±1%: ±(1.0%+0.05Ω)<br>±5%: ±(3.0%+0.05Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | MIL-STD-202 Method 103 | 1000 hours 85℃,85%RH.<br>Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion.<br>Apply to rate current for 0 Ω |
| Mechanical Shock | ±0.5%,±1%: ±(1.0%+0.1Ω)<br>±5%: ±(2.0%+0.1Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | MIL-STD-202 Method 213 | Half sine wave, acceleration 100g's, each three times in X, Y and Z directions, pulse width 6ms. |
| Vibration | ±0.5%,±1%: ±(1.0%+0.1Ω)<br>±5%: ±(2.0%+0.1Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | MIL-STD-202 Method 204 | 5g's for 20 min., 12cycle each of 3 orientations. Note: Use 8"*5"PCB. 031" thick 7 secure points onone long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz. |
| ESD | ±(3.0%+0.1Ω) | AEC-Q200-002 | With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of ±500V,±1KV, ±2KV, ±4KV, ±8KV, The electrometer reading shall be within ±10% for voltages from 500V to ≦800V. |
| Solderability | Coverage must be over 95%. | J-STD-002 | For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions:<br>a) Method B 4hrs at 155℃ dry heat, the dip in bath with 245±3℃,5±0.5s.<br>b) Method D: at 260±3℃, 30±0.5s.. |
| 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. |
| Board Flex | ±(1.0%+0.05Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | AEC-Q200-005 | Bending 2mm(min) for 60+5sec |
| Flame Retardance | No flame | AEC-Q200-001 | Only requested, when voltage/power will increase the surface temp to 350℃.Apply voltage from 9V to 32V. No flame; No explosion. |
| Resistance to Soldering Heat | ±(1.0%+0.05Ω)<br>HP02: ≤10mΩ;HP03≤8 mΩ;<br>HP05、HP06、HP10、HP11、HP12: ≤5mΩ<br>HP07: ≤4mΩ | MIL-STD-202 Method 210 | Condition B No per-heat of samples.<br>Dipping the resistor into a solder bath having a temperature of 260℃±5℃ and hold it for 10±1 seconds |

## 11. Soldering Condition

**(This is for recommendation, please customer perform adjustment according to actual application)**

11.1 Recommend Reflow Soldering Profile：(solder : Sn96.5 / Ag3 / Cu0.5)

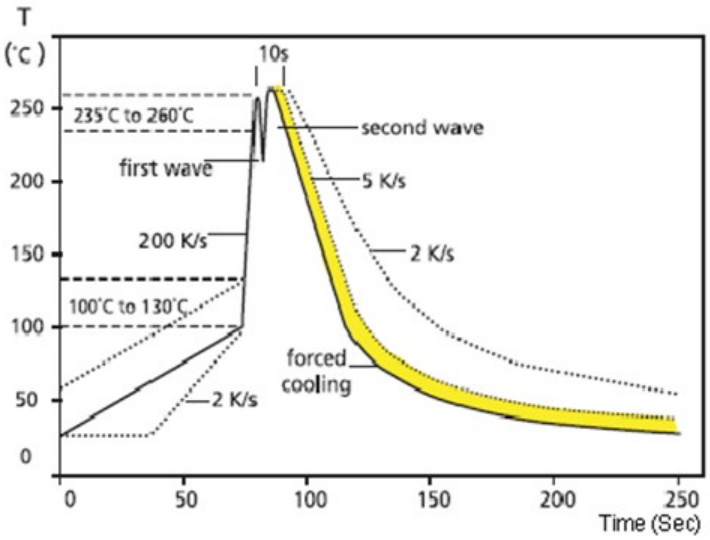



| Profile Feature | Lead (Pb)-Free solder |
|---|---|
| Preheat：<br>Temperature Min ($Ts_{min}$)<br>Temperature Max ($Ts_{max}$)<br>Time ($Ts_{min}$ to $Ts_{max}$ ) (ts) | <br>150℃<br>200℃<br>60 -120 seconds |
| Average ramp-up rate：<br>(Ts max to Tp) | <br>3℃ / second max. |
| Time maintained above :<br>Temperature ($T_L$)<br>Time ($t_L$) | <br>217℃<br>60-150 seconds |
| Peak Temperature (Tp) | 260℃ |
| Time within $^{+0}_{-5}$℃ of actual peak Temperature (tp)[2] | 10 seconds |
| Ramp-own Rate | 6℃/second max. |
| Time 25℃ to Peak Temperature | 8minutes max. |

Allowed Re-flow times : 2 times

Remark : To avoid discoloration phenomena of chip on terminal electrodes, we suggest use $N_2$ Re-flow furnace .

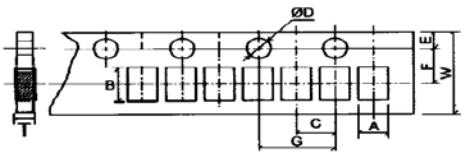
11.2 Recommend Wave Soldering Profile：(Apply to 0603 and above size)



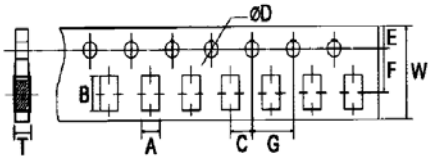
## 12. Packing

12.1 Dimension of Paper Taping :(Unit: mm)

| Type | A ±0.1 | B ±0.1 | C ±0.05 | ΦD$^{+0.1}_{-0}$ | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.05 |
|---|---|---|---|---|---|---|---|---|---|
| HP02 | 0.65 | 1.20 | 2.00 | 1.50 | 1.75 | 3.5 | 4.00 | 8.0 | 0.42 |

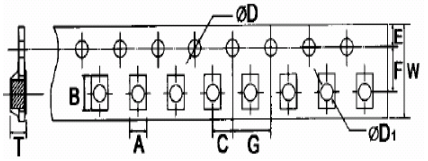



| TYPE | A ±0.2 | B ±0.2 | C ±0.05 | ΦD$^{+0.1}_{-0}$ | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.10 |
|---|---|---|---|---|---|---|---|---|---|
| HP03 | 1.10 | 1.90 | 2.00 | 1.50 | 1.75 | 3.5 | 4.00 | 8.00 | 0.67 |
| HP05 | 1.65 | 2.40 | 2.00 | 1.50 | 1.75 | 3.5 | 4.00 | 8.00 | 0.81 |
| HP06 | 2.00 | 3.60 | 2.00 | 1.50 | 1.75 | 3.5 | 4.00 | 8.00 | 0.81 |
| HP07 | 2.80 | 3.50 | 2.00 | 1.50 | 1.75 | 3.5 | 4.00 | 8.00 | 0.75 |



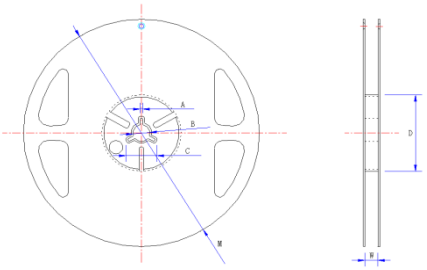

12.2 Dimension of plastic taping：(Unit: mm)

| Type | A ±0.2 | B ±0.2 | C ±0.05 | ΦD$^{+0.1}_{-0}$ | ΦD1$^{+0.25}_{-0}$ | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|---|---|---|---|---|---|---|---|---|---|---|
| HP10 | 2.9 | 5.6 | 2.0 | 1.5 | 1.5 | 1.75 | 5.5 | 4.0 | 12.0 | 1.0 |
| HP11 | 3.5 | 4.8 | 2.0 | 1.5 | 1.5 | 1.75 | 5.5 | 4.0 | 12.0 | 1.0 |
| HP12 | 3.5 | 6.7 | 2.0 | 1.5 | 1.5 | 1.75 | 5.5 | 4.0 | 12.0 | 1.0 |




12.3 Dimension of Reel：(Unit: mm)

| Type | Taping | Qty/Reel | A±0.5 | B±0.5 | C±0.5 | ΦD±1 | ΦL±2 | W±1 |
|---|---|---|---|---|---|---|---|---|
| HP02 | Paper | 10,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| HP03 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| HP05 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| HP06 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| HP07 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| HP10 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| HP11 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| HP12 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |



## 13. Note

13.1. UNI-ROYAL recommend the storage condition temperature: 15℃~35℃, humidity :25%~75%.
(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.

13.2. 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.

13.3. 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 $Cl_2$, $H_2S_3$ $NH_3$, $SO_2$, $NO_2$, Br etc.

## 14. Record

| Version | Description | Page | Date | Amended by | Checked by |
|---|---|---|---|---|---|
| 1 | First version | 1~8 | May.22, 2020 | Haiyan Chen | Yuhua Xu |
| 2 | 1.Add 0603 Marking<br>2. Add 0Ω the greater than the Max Overload Curren<br>3. Modify terminal strength test conditions | 3~4<br>4<br>6 | Sep.19, 2022 | Haiyan Chen | Yuhua Xu |
| 3 | Modify ESD test | 7 | Feb.19, 2024 | Song Nie | Haiyan Chen |
| 4 | Modify temperature cycling test | 5 | Aug.10, 2024 | Haiyan Chen | Yuhua Xu |
| 5 | The IEC60115 reference standard is modified | 6 | Oct.30, 2024 | Haiyan Chen | Yuhua Xu |
| 6 | 1.Add the ±0.5% tolerance<br>2.Modify the "W" dimension of HP07 | 2,4<br>4 | Apr.17, 2025 | Haiyan Chen | Yuhua Xu |