



**UNI-ROYAL**  
厚聲集團

# DATA SHEET

**Product Name** Automotive High Power Thick Film Chip Resistors

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**Part Name** HQ Series

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Aeon Technology Corporation

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## 1. Scope

- 1.1 This specification for approve relates to the Automotive High Power Thick Film Chip Resistors manufactured by UNI-ROYAL.  
 1.2 Suitable for reflow & wave soldering  
 1.3 Application car

## 2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1<sup>st</sup>~4<sup>th</sup> codes: Part name. E.g.: HQ02, HQ03, HQ05, HQ06, HQ07, HQ10, HQ12

2.2 5<sup>th</sup>~6<sup>th</sup> codes: Power rating.

| E.g.: W=Normal Size |      | “1~G” = “1~16” |     |     |     |     |      |      |      |    |
|---------------------|------|----------------|-----|-----|-----|-----|------|------|------|----|
| Wattage             | 1/32 | 3/4            | 1/2 | 1/3 | 1/4 | 1/8 | 1/10 | 1/16 | 1/20 | 1  |
| Normal Size         | WH   | 07             | W2  | W3  | W4  | W8  | WA   | WG   | WM   | 1W |

If power rating is equal or lower than 1 watt, 5<sup>th</sup> code would be “W” and 6<sup>th</sup> code would be a number or letter.

E.g.: WA=1/10W

W4=1/4W

2.3 7<sup>th</sup> code: Tolerance. E.g.: D=±0.5%

F=±1%

G=±2%

J=±5%

K= ±10%

2.4 8<sup>th</sup>~11<sup>th</sup> codes: Resistance Value.

2.4.1 If value belongs to standard value of E-24 series, the 8<sup>th</sup> code is zero, 9<sup>th</sup>~10<sup>th</sup> codes are the significant figures of resistance value, and the 11<sup>th</sup> code is the power of ten.

2.4.2 If value belongs to standard value of E-96 series, the 8<sup>th</sup>~10<sup>th</sup> codes are the significant figures of resistance value, and the 11<sup>th</sup> code is the power of ten.

2.4.3 11<sup>th</sup> codes listed as following:

0=10<sup>0</sup> 1=10<sup>1</sup> 2=10<sup>2</sup> 3=10<sup>3</sup> 4=10<sup>4</sup> 5=10<sup>5</sup> 6=10<sup>6</sup> J=10<sup>-1</sup> K=10<sup>-2</sup> L=10<sup>-3</sup> M=10<sup>-4</sup>

2.5 12<sup>th</sup>~14<sup>th</sup> codes.

2.5.1 12<sup>th</sup> code: Packaging Type. E.g.: C=Bulk

T=Tape/Reel

2.5.2 13<sup>th</sup> code: Standard Packing Quantity.

4=4,000pcs

5=5,000pcs

C=10,000pcs

D=20,000pcs

E=15,000pcs

Chip Product: BD=B/B-20000pcs

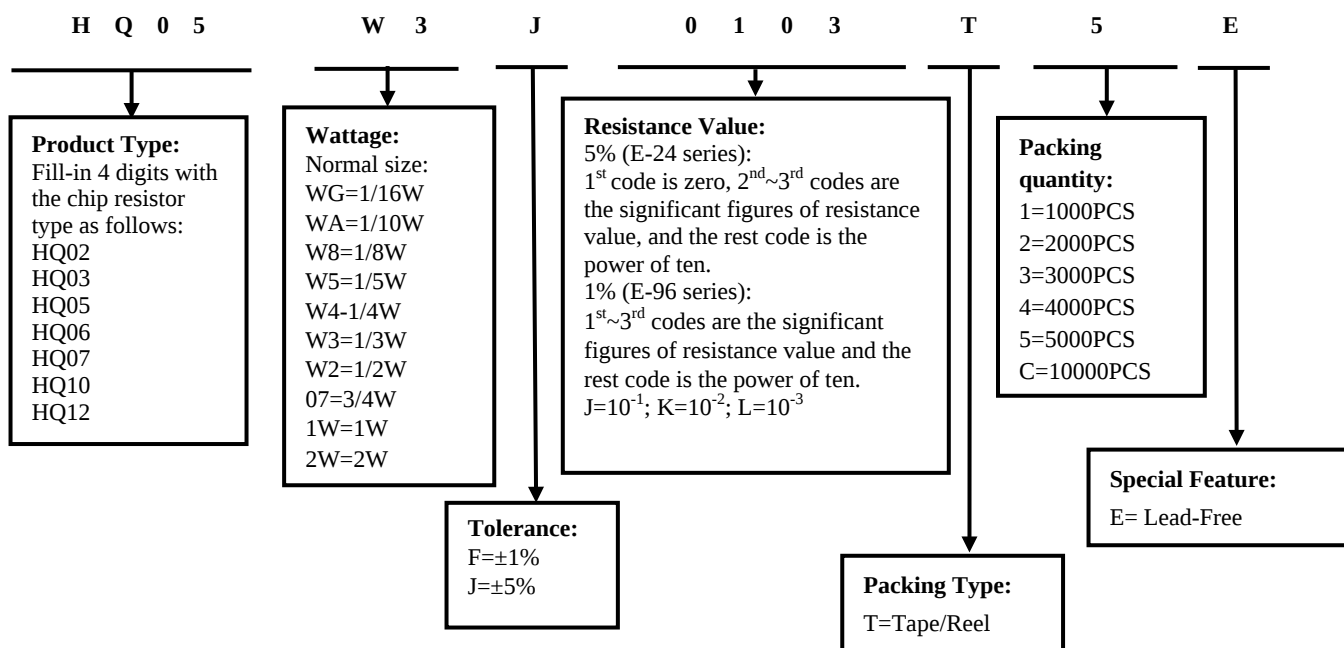
TC=T/R-10000pcs

2.5.3 14<sup>th</sup> code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

## 3. Ordering Procedure

(Example: HQ05 1/3W ±5% 10KΩ T/R-5000)



#### 4. Marking

4.1 For HQ02 size. Due to the very small size of the resistor's body, there is no marking on the body.



4.2 Normally, the marking of 0Ω HQ03, 0Ω HQ05, 0Ω HQ06, 0Ω HQ07, 0Ω HQ10, 0Ω HQ12 resistors as following



0 → 0

4.3 ±5% tolerance products (E-24 series):

3 codes.

1<sup>st</sup>~2<sup>nd</sup> codes are the significant figures of resistance value, and the rest code is the power of ten.



333 → 33KΩ

4.4 ±1% tolerance products (E-96 series):

4 codes.

1<sup>st</sup>~3<sup>rd</sup> codes are the significant figures of resistance value, and the rest code is the power of ten.

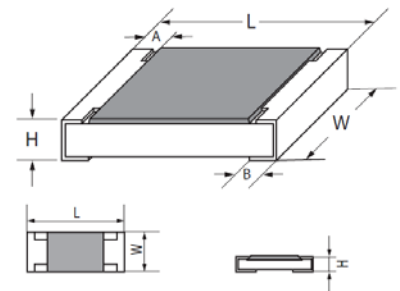
Letter "R" in mark means decimal point.



2701 → 2.7KΩ

#### 5. Dimension

| Type       | Dimension(mm) |                 |           |           |           |
|------------|---------------|-----------------|-----------|-----------|-----------|
|            | L             | W               | H         | A         | B         |
| HQ02(0402) | 1.00±0.10     | 0.50±0.05       | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| HQ03(0603) | 1.60±0.10     | 0.80±0.10       | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| HQ05(0805) | 2.00±0.15     | 1.25±0.15/-0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| HQ06(1206) | 3.10±0.15     | 1.55±0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| HQ07(1210) | 3.10±0.10     | 2.60±0.20       | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| HQ10(2010) | 5.00±0.10     | 2.50±0.20       | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| HQ12(2512) | 6.35±0.10     | 3.20±0.20       | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |



#### 6. Resistance Range

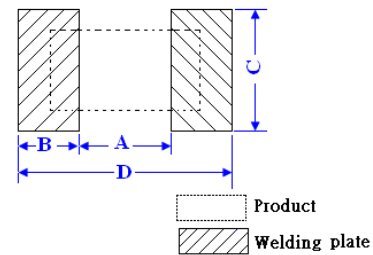
| Type | Power Rating<br>at 70°C | Power Rating<br>at 125°C | Resistance Range |        |
|------|-------------------------|--------------------------|------------------|--------|
|      |                         |                          | 1.0%             | 5.0%   |
| HQ02 | 1/10W                   | 1/16W                    | 1Ω~10M           | 1Ω~10M |
| HQ03 | 1/5W                    | 1/10W                    | 1Ω~10M           | 1Ω~10M |
| HQ05 | 1/3W                    | 1/8W                     | 1Ω~10M           | 1Ω~10M |
| HQ06 | 1/2W                    | 1/4W                     | 1Ω~10M           | 1Ω~10M |
| HQ07 | 3/4W                    | 1/3W                     | 1Ω~10M           | 1Ω~10M |
| HQ10 | 1W                      | 3/4W                     | 1Ω~10M           | 1Ω~10M |
| HQ12 | 2W                      | 1W                       | 1Ω~10M           | 1Ω~10M |

#### 7. Ratings

| Type | Max.<br>Working<br>Voltage | Max.<br>Overload<br>Voltage | Dielectric<br>withstanding<br>Voltage | Resistance<br>Value of<br>Jumper | Rated<br>Current of<br>Jumper | Max.<br>Overload<br>Current of<br>Jumper | Operating<br>Temperature |
|------|----------------------------|-----------------------------|---------------------------------------|----------------------------------|-------------------------------|------------------------------------------|--------------------------|
| HQ02 | 50V                        | 100V                        | 100V                                  | <50mΩ                            | 1A                            | 2A                                       | -55°C~155°C              |
| HQ03 | 75V                        | 100V                        | 300V                                  | <50mΩ                            | 1A                            | 2A                                       | -55°C~155°C              |
| HQ05 | 150V                       | 300V                        | 500V                                  | <50mΩ                            | 2A                            | 5A                                       | -55°C~155°C              |
| HQ06 | 200V                       | 400V                        | 500V                                  | <50mΩ                            | 2A                            | 10A                                      | -55°C~155°C              |
| HQ07 | 200V                       | 500V                        | 500V                                  | <50mΩ                            | 2A                            | 10A                                      | -55°C~155°C              |
| HQ10 | 200V                       | 500V                        | 500V                                  | <50mΩ                            | 2A                            | 10A                                      | -55°C~155°C              |
| HQ12 | 200V                       | 500V                        | 500V                                  | <50mΩ                            | 2A                            | 10A                                      | -55°C~155°C              |

## 8. Soldering pad size recommended

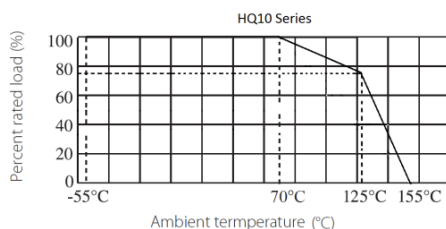
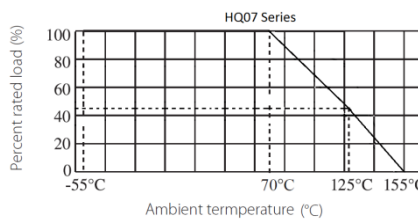
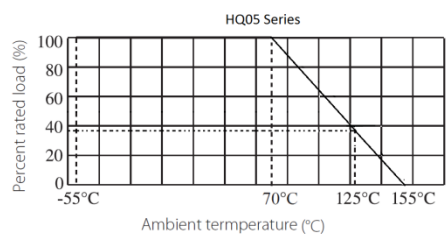
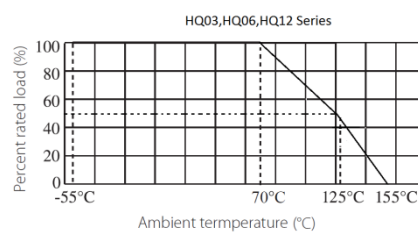
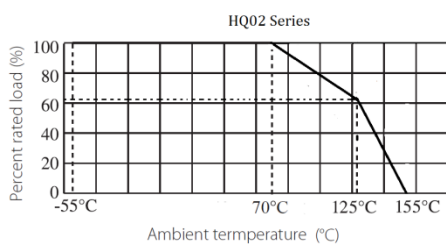
| Type | Dimension(mm) |          |          |          |
|------|---------------|----------|----------|----------|
|      | A             | B        | C        | D        |
| HQ02 | 0.5±0.05      | 0.5±0.05 | 0.6±0.05 | 1.5±0.05 |
| HQ03 | 0.8±0.05      | 0.8±0.05 | 0.9±0.05 | 2.4±0.05 |
| HQ05 | 1.0±0.1       | 1±0.1    | 1.4±0.1  | 3±0.1    |
| HQ06 | 2.0±0.1       | 1.1±0.1  | 1.8±0.1  | 4.2±0.1  |
| HQ07 | 2.0±0.1       | 1.1±0.1  | 2.9±0.1  | 4.2±0.1  |
| HQ10 | 3.6±0.1       | 1.4±0.1  | 3±0.1    | 6.4±0.1  |
| HQ12 | 4.9±0.1       | 1.35±0.1 | 3.7±0.1  | 7.6±0.1  |



## 9. Derating Curve

Power rating will change based on continuous load at ambient temperature from -55 to 155°C.

It is constant between -55 to 70°C or 125°C, and derate to zero when temperature rise from 70°C or 125°C to 155°C.



### Voltage rating:

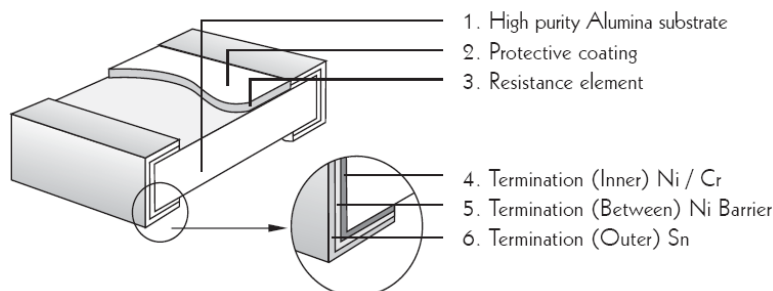
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

Remark: RCWV: Rating Continuous Working Voltage (Volt.) P: power rating (Watt) R: nominal resistance (Ω)

In no case, the rated DC or RMS AC continuous working voltage must be greater than the applicable maximum value. The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is lower.

## 10. Structure



**11. Performance Specification**

| Characteristic                      | Limits                                                                                                                                    | Ref. Standards             | Test Method                                                                                                                                                                                                                                |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational life                    | $\pm 5\%: \pm(3.0\%+0.1\Omega)$<br>$\pm 1\%: \pm(1.0\%+0.1\Omega)$                                                                        | MIL-STD-202<br>Method 108  | 70°C or 125°C of operating power, 1000H (1.5 hours "ON", 0.5 hour "OFF").<br>Note: Power Rating Refer to item 6.                                                                                                                           |
|                                     | $<100\text{m}\Omega$                                                                                                                      |                            | Apply to rate current for 0 $\Omega$                                                                                                                                                                                                       |
| Electrical Characterization         | $1\Omega < R \leq 10\Omega : \pm 200\text{PPM}/^\circ\text{C}$<br>$10\Omega < R \leq 10\text{M}\Omega : \pm 100\text{PPM}/^\circ\text{C}$ | User Spec                  | Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.                                                                     |
| Short-time overload                 | $\pm 1\%: \pm(1.0\%+0.05\Omega)$<br>$\pm 5\%: \pm(2.0\%+0.05\Omega)$                                                                      | JIS-C-5201                 | 4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..                                                                                            |
| External Visual                     | No Mechanical Damage                                                                                                                      | MIL-STD-883<br>Method 2009 | Electrical test not required.<br>Inspect device construction, marking and workmanship                                                                                                                                                      |
| Physical Dimension                  | Reference 5. Dimension Standards                                                                                                          | JESD22 MH<br>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 Unsmear                                                                                                                           | MIL-STD-202<br>Method 215  | Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.                                                                                                                                                    |
| Terminal Strength                   | Not broken                                                                                                                                | JIS-C-6429                 | Force of 1.8kg for 60 seconds.                                                                                                                                                                                                             |
| High Temperature Exposure (Storage) | $\pm(1.0\%+0.1\Omega)$                                                                                                                    | MIL-STD-202<br>Method 108  | 1000hrs. @T=155°C. Unpowered. Measurement at 24±2 hours after test conclusion.                                                                                                                                                             |
|                                     | $<50\text{m}\Omega$                                                                                                                       |                            | Apply to rate current for 0 $\Omega$                                                                                                                                                                                                       |
| Temperature Cycling                 | $\pm(1.0\%+0.1\Omega)$                                                                                                                    | JESD22 Method<br>JA-104    | 1000 Cycles (-55°C to +155°C). Measurement at 24±2 hours after test conclusion.                                                                                                                                                            |
|                                     | $<50\text{m}\Omega$                                                                                                                       |                            | Apply to rate current for 0 $\Omega$                                                                                                                                                                                                       |
| Biased Humidity                     | $\pm 5\%: \pm(3.0\%+0.05\Omega)$<br>$\pm 1\%: \pm(1.0\%+0.05\Omega)$                                                                      | MIL-STD-202<br>Method 103  | 1000 hours 85°C, 85%RH.<br>Note: Specified conditions: 10% of operating power.<br>Measurement at 24±2 hours after test conclusion.                                                                                                         |
|                                     | $<100\text{m}\Omega$                                                                                                                      |                            | Apply to rate current for 0 $\Omega$                                                                                                                                                                                                       |
| Mechanical Shock                    | $\pm(1.0\%+0.1\Omega)$                                                                                                                    | MIL-STD-202<br>Method 213  | Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.                                                                                                                                            |
| Vibration                           | $\pm(1.0\%+0.1\Omega)$                                                                                                                    | MIL-STD-202<br>Method 204  | 5g's for 20 min., 12cycle each of 3 orientations.<br>Note: Use 8"×5"PCB. 031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz. |
| ESD                                 | $\pm(1.0\%+0.1\Omega)$                                                                                                                    | AEC-Q200-002               | Test condition: HQ02: 0.5KV; HQ03: 1KV; HQ05: 2KV; HQ06: 3KV; HQ07、HQ10、HQ12: 5KV                                                                                                                                                          |
| Solderability                       | Coverage must be over 95%.                                                                                                                | J-STD-002                  | For both leaded & SMD. Electrical test not required.<br>Magnification 50X. Conditions:<br>a) Method B 4hrs at 155°C dry heat, the dip in bath with 245°C, 5s.<br>b) Method D: at 260°C, 60s.                                               |
| 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.                                                                                                                                                                                   |

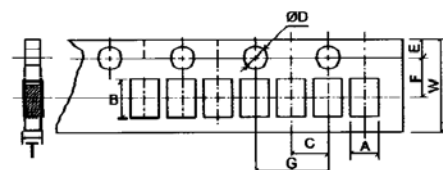
|                              |                         |                        |                                                                                                                                                      |
|------------------------------|-------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Board Flex                   | $\pm(1.0\%+0.05\Omega)$ | JIS-C-6429             | 2mm (Min)                                                                                                                                            |
|                              | $<50m\Omega$            |                        | Apply to rate current for 0 $\Omega$                                                                                                                 |
| Flame Retardance             | No flame                | AEC-Q200-001           | Only requested, when voltage/power will increase the surface temp to 350°C. Apply voltage from 9V to 32V. No flame; No explosion.                    |
| Resistance to Soldering Heat | $\pm(1.0\%+0.05\Omega)$ | MIL-STD-202 Method 210 | Condition B No per-heat of samples. Note: Single Wave Solder-Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body. |
|                              | $<50m\Omega$            |                        | Apply to rate current for 0 $\Omega$                                                                                                                 |
| Sulfuration test             | $\pm(1.0\%+0.05\Omega)$ | ASTM B-809-95          | sulfur(saturated vapor) , Temperature: 50 $\pm$ 2 °C H 86 ~ 90%RH, 1000H .                                                                           |

Sulfuration test : H<sub>2</sub>S 3~5PPM 50 °C $\pm$  91 $\pm$ 5%RH $\pm$ 0.05% ;  $\pm$ 1%:(1.0%+0.05 $\Omega$ )

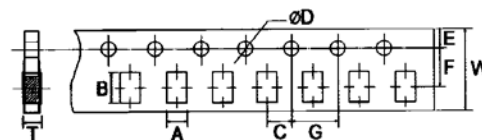
## 12. Packing

### 12.1 Dimension of Paper Taping :(Unit: mm)

| Type | A<br>$\pm 0.1$ | B<br>$\pm 0.1$ | C<br>$\pm 0.05$ | $\Phi D^{+0.1}_{-0}$ | E<br>$\pm 0.1$ | F<br>$\pm 0.05$ | G<br>$\pm 0.1$ | W<br>$\pm 0.2$ | T<br>$\pm 0.05$ |
|------|----------------|----------------|-----------------|----------------------|----------------|-----------------|----------------|----------------|-----------------|
| HQ02 | 0.65           | 1.20           | 2.00            | 1.50                 | 1.75           | 3.50            | 4.00           | 8.00           | 0.42            |

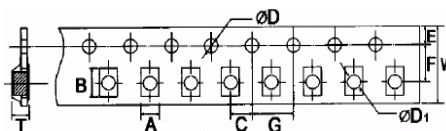


| Type | A<br>$\pm 0.2$ | B<br>$\pm 0.2$ | C<br>$\pm 0.05$ | $\Phi D^{+0.1}_{-0}$ | E<br>$\pm 0.1$ | F<br>$\pm 0.05$ | G<br>$\pm 0.1$ | W<br>$\pm 0.2$ | T<br>$\pm 0.1$ |
|------|----------------|----------------|-----------------|----------------------|----------------|-----------------|----------------|----------------|----------------|
| HQ03 | 1.10           | 1.90           | 2.0             | 1.5                  | 1.75           | 3.5             | 4.0            | 8.0            | 0.67           |
| HQ05 | 1.65           | 2.40           | 2.0             | 1.5                  | 1.75           | 3.5             | 4.0            | 8.0            | 0.81           |
| HQ06 | 2.00           | 3.60           | 2.0             | 1.5                  | 1.75           | 3.5             | 4.0            | 8.0            | 0.81           |
| HQ07 | 2.80           | 3.50           | 2.0             | 1.5                  | 1.75           | 3.5             | 4.0            | 8.0            | 0.75           |



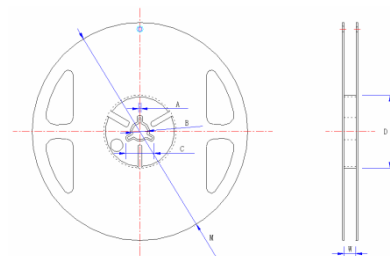
### 12.2 Dimension of plastic taping: (Unit: mm)

| Type | A<br>$\pm 0.2$ | B<br>$\pm 0.2$ | C<br>$\pm 0.05$ | $\Phi D^{+0.1}_{-0}$ | $\Phi D1^{+0.25}_{-0}$ | E<br>$\pm 0.1$ | F<br>$\pm 0.05$ | G<br>$\pm 0.1$ | W<br>$\pm 0.2$ | T<br>$\pm 0.1$ |
|------|----------------|----------------|-----------------|----------------------|------------------------|----------------|-----------------|----------------|----------------|----------------|
| HQ10 | 2.90           | 5.60           | 2.00            | 1.50                 | 1.50                   | 1.75           | 5.50            | 4.00           | 12.00          | 1.00           |
| HQ12 | 3.50           | 6.70           | 2.00            | 1.50                 | 1.50                   | 1.75           | 5.50            | 4.00           | 12.00          | 1.00           |



### 12.3 Dimension of Reel : (Unit: mm)

| Type | Taping   | Qty/Reel  | A $\pm 0.5$ | B $\pm 0.5$ | C $\pm 0.5$ | D $\pm 1$ | M $\pm 2$ | W $\pm 1$ |
|------|----------|-----------|-------------|-------------|-------------|-----------|-----------|-----------|
| HQ02 | Paper    | 10,000pcs | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 10.0      |
| HQ03 | Paper    | 5,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 10.0      |
| HQ05 | Paper    | 5,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 10.0      |
| HQ06 | Paper    | 5,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 10.0      |
| HQ07 | Paper    | 5,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 10.0      |
| HQ10 | Embossed | 4,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 13.8      |
| HQ12 | Embossed | 4,000pcs  | 2.0         | 13.0        | 21.0        | 60.0      | 178.0     | 13.8      |



## 13. Note

13.1. UNI-ROYAL recommend products store in warehouse with temperature between 15 to 35°C under humidity between 25 to 75%RH.

Even under storage conditions recommended above, solder ability of products will be degraded stored over 1 year old.

13.2. Cartons must be placed in correct direction which indicated on carton, otherwise the reel or wire will be deformed.

13.3. Storage conditions as below are inappropriate:

- Stored in high electrostatic environment
- Stored in direct sunshine, rain, snow or condensation.

**14. Record**

| Version | Description                                                  | Page | Date         | Amended by  | Checked by |
|---------|--------------------------------------------------------------|------|--------------|-------------|------------|
| 1       | First version                                                | 1~7  | Mar.20, 2018 | Haiyan Chen | Nana Chen  |
| 2       | 1. Modify the product name<br>2. Modify the Power            | 1~7  | Nov.22, 2018 | Haiyan Chen | Nana Chen  |
| 3       | Modify characteristic                                        | 5~6  | Feb.16, 2019 | Haiyan Chen | Yuhua Xu   |
| 4       | Experimental method and standard for<br>adding vulcanization | 6    | Mar.05, 2019 | Haiyan Chen | Yuhua Xu   |
| 5       | Modify the Power                                             | 4    | May.23, 2019 | Haiyan Chen | Yuhua Xu   |

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[RTT203000FTE](#) [RTT2056R0FTE](#) [CR2010F470KE04Z](#) [RTT018451FTH](#) [RTT021802DTH](#) [0402WGF510LTCE](#) [0201WMJ0200TEE](#)  
[TR0603B26K7P0550Z](#) [0201WMF5102TEE](#) [1210W2J047KT5E](#) [YLR12-2-4F-W](#) [HOT\(0.25x1.3\)-3.2-0R-I](#) [HOT\(0.4x1.5\)-5.2-0R-I](#)  
[HoT\(0.45x1.5\)-8.2-0R-I](#) [0201WMF1103TEE](#) [0201WMF7152TEE](#) [1210W2J0124T5E](#) [201007J010LT4E](#) [201007J0360T4E](#) [201007J0430T4E](#)  
[0805W8F931KT5E](#) [1206W4F5231T5E](#) [1210W2J0620T5E](#) [201007J0822T4E](#) [0201WMF1005TCE](#) [0201WMF1212TCE](#) [0201WMF1373TCE](#)  
[0201WMF1400TCE](#) [0201WMF2000TEE](#) [0201WMF2001TCE](#) [0201WMF226JTCE](#) [0201WMF2672TCE](#) [0201WMF2803TCE](#)  
[0201WMF357JTCE](#) [0201WMF3743TCE](#) [0201WMF430JTCE](#) [0201WMF4990TCE](#) [0201WMF5104TCE](#) [0201WMF510JTEE](#)  
[0201WMF5110TCE](#) [0201WMF6652TEE](#) [0201WMF6812TCE](#) [0201WMF8200TCE](#)