

# DATASHEET

**Product Name** Automotive Thick Film Chip Resistors

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**Part Name** CQ Series

**File No.** SMD-SP -018

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Royal Technology (Thailand) Co., Ltd.

## 1. Scope

- 1.1 This datasheet is the characteristics of Automotive Thick Film Chip Resistors manufactured by UNI-ROYAL Application automobile.
- 1.2 AEC-Q200 qualified
- 1.3 Anti-Sulfidation
- 1.4 Application car、IPAD、LED Lamps、Intelligent home appliances , Medical equipment, Kinds of industrial control devices & industrial supplies
- 1.5 Compliant with RoHS directive.
- 1.6 Halogen free requirement.

## 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.: CQ01,CQ02,CQ03,CQ05,CQ06,CQ07,CQ10,CQ12

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

| E.g.: W=Normal Size |     | “1~G” = “1~16” |     |     |     |      |      |      |    |
|---------------------|-----|----------------|-----|-----|-----|------|------|------|----|
| Wattage             | 3/4 | 1/2            | 1/3 | 1/4 | 1/8 | 1/10 | 1/16 | 1/20 | 1  |
| Normal Size         | 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%

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.: T=Tape/Reel

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

4=4,000pcs

5=5,000pcs

C=10,000pcs

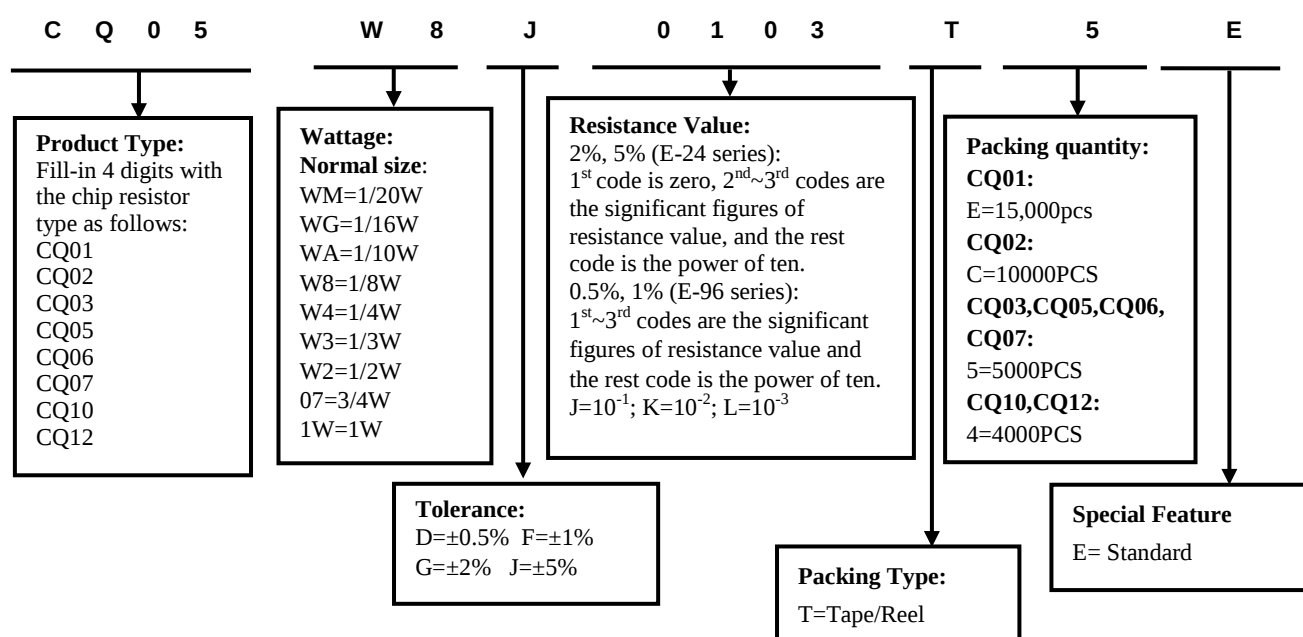
E=15,000pcs

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

E = Standard

## 3. Ordering Procedure

(Example: CQ05 1/8W ±5% 10K Ω T/R-5000 )



## 4. Marking

4.1 Normally, the marking of CQ01,CQ02 resistors as following



4.2 Normally, the marking of 0Ω CQ03, 0Ω CQ05, 0Ω CQ06, 0Ω CQ07, 0Ω CQ10, 0Ω CQ12, resistors as following



0 → 0Ω

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

4.5 Standard E-96 series values of CQ03 ≤±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 CQ03 ≤±1% marking)

| Code       | A               | B               | C               | D               | E               | F               | G               | H               | X                | Y                | Z                |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 <sup>0</sup> | 10 <sup>1</sup> | 10 <sup>2</sup> | 10 <sup>3</sup> | 10 <sup>4</sup> | 10 <sup>5</sup> | 10 <sup>6</sup> | 10 <sup>7</sup> | 10 <sup>-1</sup> | 10 <sup>-2</sup> | 10 <sup>-3</sup> |

Standard E-96 series Resistance Value code (for CQ03≤±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



$$1.96K\Omega = 196 \times 10^1 \Omega = 29B$$



$$12.4\Omega = 124 \times 10^{-1} \Omega = 10X$$

4.6 Standard E-24 and not belong to E-96 series values ( $\leq \pm 1\%$ ) of 0603 size: the marking is the same as 5% tolerance but marking as underline.



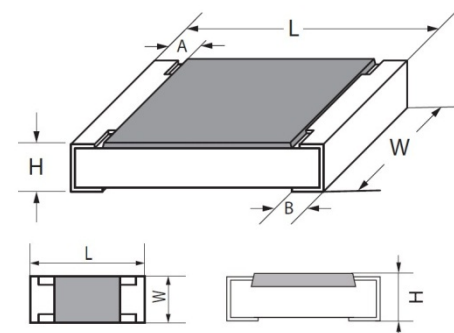
$$\underline{333} = 33K\Omega$$



$$\underline{680} = 68\Omega$$

## 5. Dimension

| Type       | Dimension(mm) |                  |           |           |           |
|------------|---------------|------------------|-----------|-----------|-----------|
|            | L             | W                | H         | A         | B         |
| CQ01(0201) | 0.60±0.03     | 0.30±0.03        | 0.23±0.03 | 0.12±0.05 | 0.15±0.05 |
| CQ02(0402) | 1.00±0.10     | 0.50±0.05        | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| CQ03(0603) | 1.60±0.10     | 0.80±0.10        | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| CQ05(0805) | 2.00±0.15     | 1.25 ±0.15/-0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| CQ06(1206) | 3.10±0.15     | 1.55±0.15/-0.10  | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| CQ07(1210) | 3.10±0.10     | 2.50±0.15        | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| CQ10(2010) | 5.00±0.10     | 2.50±0.20        | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| CQ12(2512) | 6.35±0.10     | 3.20±0.20        | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |



## 6. Resistance Range

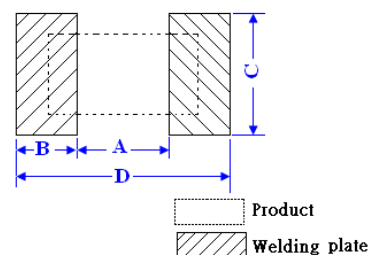
| Type | Power Rating | Resistance Range |              |              |              |
|------|--------------|------------------|--------------|--------------|--------------|
|      |              | ±0.5%            | ±1.0%        | ±2.0%        | ±5.0%        |
| CQ01 | 1/20W        | 1Ω-10MΩ          | 1Ω-10MΩ      | 1Ω-10MΩ      | 1Ω-10MΩ      |
| CQ02 | 1/16W        | 1Ω-10MΩ          | 0.1Ω-10MΩ    | 0.1Ω-10MΩ    | 0.1Ω-10MΩ    |
| CQ03 | 1/10W        | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| CQ05 | 1/8W         | 1Ω-10MΩ          | 0.1Ω≤R<10MΩ  | 0.1Ω≤R≤10MΩ  | 0.1Ω≤R≤10MΩ  |
|      | 1/4W         | ---              | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| CQ06 | 1/4W         | 1Ω-10MΩ          | 0.1Ω≤R<10MΩ  | 0.1Ω≤R≤10MΩ  | 0.1Ω≤R≤10MΩ  |
|      | 1/3W         | ---              | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω | 0.01Ω≤R<0.1Ω |
| CQ07 | 1/2W         | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| CQ10 | 3/4W         | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |
| CQ12 | 1W           | 1Ω-10MΩ          | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   | 0.01Ω-10MΩ   |

## 7. Ratings

| Type | Max. Working Voltage | Max. Overload Voltage | Dielectric withstanding Voltage | Resistance Value of Jumper | Rated Current of Jumper | Max. Overload Current of Jumper | Operating Temperature |
|------|----------------------|-----------------------|---------------------------------|----------------------------|-------------------------|---------------------------------|-----------------------|
| CQ01 | 25V                  | 50V                   | 50V                             | <50mΩ                      | 0.5A                    | 1A                              | -55℃~155℃             |
| CQ02 | 50V                  | 100V                  | 100V                            | <50mΩ                      | 1A                      | 2A                              | -55℃~155℃             |
| CQ03 | 75V                  | 150V                  | 300V                            | <50mΩ                      | 1A                      | 2A                              | -55℃~155℃             |
| CQ05 | 150V                 | 300V                  | 500V                            | <50mΩ                      | 2A                      | 5A                              | -55℃~155℃             |
| CQ06 | 200V                 | 400V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| CQ07 | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| CQ10 | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |
| CQ12 | 200V                 | 500V                  | 500V                            | <50mΩ                      | 2A                      | 10A                             | -55℃~155℃             |

## 8. Soldering pad size recommended

| Type | Dimension(mm) |           |          |          |
|------|---------------|-----------|----------|----------|
|      | A             | B         | C        | D        |
| CQ01 | 0.3±0.05      | 0.35±0.05 | 0.4±0.05 | 1.0±0.05 |
| CQ02 | 0.50±0.05     | 0.45±0.05 | 0.5±0.05 | 1.4±0.05 |
| CQ03 | 0.8±0.05      | 0.65±0.05 | 0.8±0.05 | 2.1±0.05 |
| CQ05 | 1.0±0.1       | 1.0±0.1   | 1.3±0.1  | 3.0±0.1  |
| CQ06 | 2.0±0.1       | 1.1±0.1   | 1.6±0.1  | 4.2±0.1  |
| CQ07 | 2.0±0.1       | 1.1±0.1   | 2.6±0.1  | 4.2±0.1  |
| CQ10 | 3.6±0.1       | 1.3±0.1   | 2.6±0.1  | 6.2±0.1  |
| CQ12 | 4.9±0.1       | 1.6±0.1   | 3.3±0.1  | 8.1±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, and derate to zero when temperature rise from 70 to 155°C.

Voltage rating:

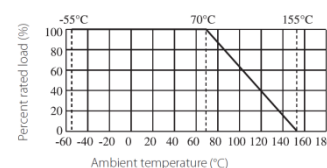
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

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

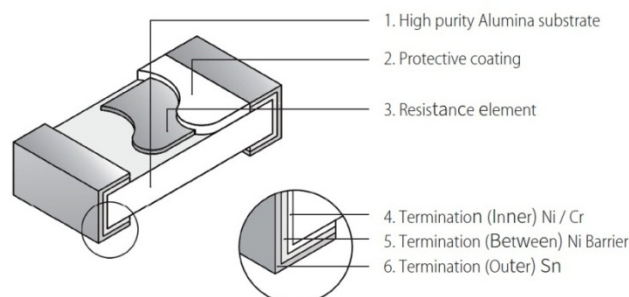
Remark: RCWV: Rating Continuous Working Voltage (Volt.) P: power rating (Watt) R: nominal resistance (Ω)

In no case 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.



## 10. Structure



## 11. Performance Specification

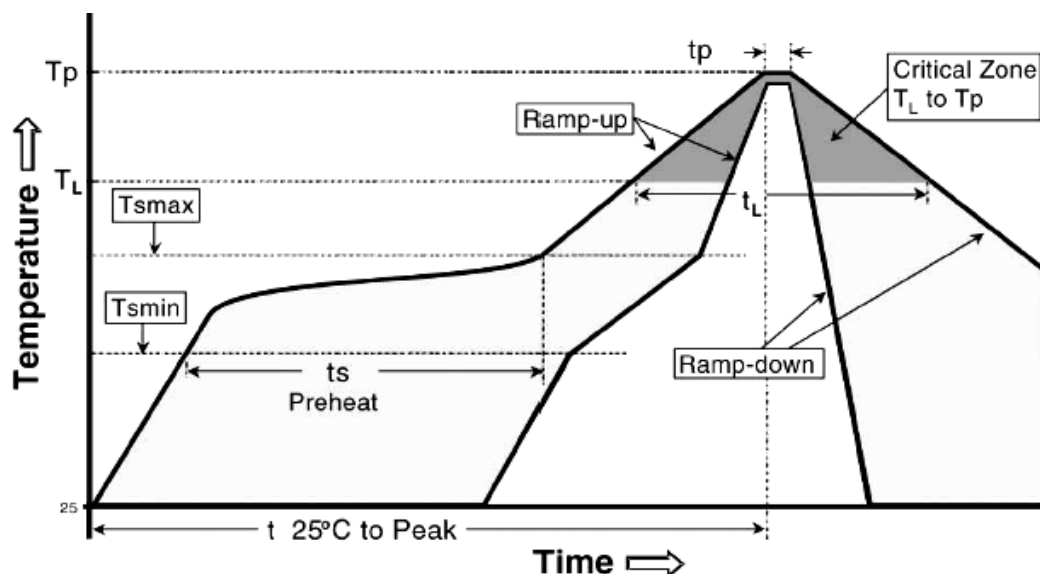
| Characteristic                      | Limits                                                                                                                                                                                                                                                                                                                                                                                                                                              | Ref. Standards                                     | Test Methods                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operational life                    | ±2%,±5%: ±(3.0%+0.1Ω)<br>±0.5%,±1%: ±(1.0%+0.1Ω)                                                                                                                                                                                                                                                                                                                                                                                                    | MIL-STD-202<br>Method 108                          | 70°C rated power, at RCWV or Max. Working Voltage whichever less, 1000h (1.5 hours "ON", 0.5 hour "OFF"). Measurement at 24±4hours after test conclusion.                                                                                                                                                                                                                         |
|                                     | <100mΩ                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                    | Apply to rate current for 0 Ω                                                                                                                                                                                                                                                                                                                                                     |
| Electrical Characterization (T.C.R) | CQ01:<br>1Ω≤R≤10Ω: -100~+350PPM/°C<br>>10Ω: ±200PPM/°C<br>CQ02:<br>0.1Ω≤R<1Ω: ±800PPM/°C<br>1Ω≤R≤10Ω: ±200PPM/°C<br>>10Ω: ±100PPM/°C<br>CQ03:<br>0.01Ω≤R≤0.03Ω: ±1500 PPM/°C<br>0.03Ω<R≤0.05Ω: ±1000 PPM/°C<br>0.05Ω<R<1Ω: ±800PPM/°C<br>1Ω≤R≤10Ω: ±200PPM/°C<br>>10Ω: ±100PPM/°C<br>CQ05,CQ06,CQ07,CQ10, CQ12:<br>0.01Ω≤R≤0.015Ω: ±1500PPM/°C<br>0.015Ω<R≤0.03Ω: ±1000PPM/°C<br>0.03Ω<R<1Ω: ±800PPM/°C<br>1Ω≤R≤10Ω: ±200PPM/°C<br>>10Ω: ±100PPM/°C | 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/°C)<br>R <sub>1</sub> : Resistance Value at room temperature (t <sub>1</sub> ) ;<br>R <sub>2</sub> : Resistance at test temperature (t <sub>2</sub> )<br>t <sub>1</sub> : +25°C or specified room temperature<br>t <sub>2</sub> : Test temperature (-55°C or 125°C) |

|                                     |                                                                                                |                                                             |                                                                                                                                                                                                                                            |
|-------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Short-time overload                 | $\pm 0.5\%, \pm 1\%: \pm (1.0\% + 0.05\Omega)$<br>$\pm 2\%, \pm 5\%: \pm (2.0\% + 0.05\Omega)$ | GB/T 5729 4.13<br>JIS-C-5201 4.13<br>IEC 60115-1<br>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..                                                                                                 |
|                                     | <50mΩ                                                                                          |                                                             | Apply max Overload current for 0Ω                                                                                                                                                                                                          |
| External Visual                     | Marking Complete , no mechanical damage                                                        | MIL-STD-883<br>Method 2009                                  | Electrical test not required. Inspect device construction, marking and workmanship                                                                                                                                                         |
| Physical Dimension                  | Reference 5.0 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 Complete , no mechanical damage                                                        | MIL-STD-202<br>Method 215                                   | Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.                                                                                                                                                    |
| Terminal Strength                   | Not broken                                                                                     | AEC-Q200-006                                                | 0201:2N,0402:5N; others:17.7N, 60±1 seconds.                                                                                                                                                                                               |
| High Temperature Exposure (Storage) | $\pm (1.0\% + 0.1\Omega)$                                                                      | MIL-STD-202<br>Method 108                                   | Upper Temperature. 1000hrs. Unpowered.<br>Measurement at 24±4 hours after test conclusion.                                                                                                                                                 |
|                                     | <100mΩ                                                                                         |                                                             |                                                                                                                                                                                                                                            |
| Temperature Cycling                 | $\pm (1.0\% + 0.1\Omega)$                                                                      | JESD22 Method<br>JA-104                                     | 1000 Cycles (-55°C to +155°C). Measurement at 24±4 hours after test conclusion.                                                                                                                                                            |
|                                     | <100mΩ                                                                                         |                                                             |                                                                                                                                                                                                                                            |
| Biased Humidity                     | $\pm 2\%, \pm 5\%: \pm (3.0\% + 0.05\Omega)$<br>$\pm 0.5\%, \pm 1\%: \pm (1.0\% + 0.05\Omega)$ | MIL-STD-202<br>Method 103                                   | 1000 hours 85°C, 85%RH.<br>Note: Specified conditions: 10% of operating power.<br>Measurement at 24±4 hours after test conclusion.                                                                                                         |
|                                     | <100mΩ                                                                                         |                                                             | Apply to rate current for 0 Ω                                                                                                                                                                                                              |
| Mechanical Shock                    | $\pm (1.0\% + 0.1\Omega)$                                                                      | MIL-STD-202<br>Method 213                                   | Half sine wave, acceleration 100g's, each three times in X, Y and Z directions, pulse width 6ms.                                                                                                                                           |
| 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                                 | $\pm (3.0\% + 0.1\Omega)$                                                                      | 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-020E                                                  | For both leaded & SMD. Electrical test not required. 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, 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                          | $\pm (1.0\% + 0.05\Omega)$                                                                     | AEC-Q200-005                                                | Bending 2mm(min) for 60+5sec                                                                                                                                                                                                               |
|                                     | <50mΩ                                                                                          |                                                             |                                                                                                                                                                                                                                            |
| 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<br>Method 210                                   | Condition B No per-heat of samples.<br>Dipping the resistor into a solder bath having a temperature of 260°C±5°C and hold it for 10±1 seconds                                                                                              |
|                                     | <50mΩ                                                                                          |                                                             |                                                                                                                                                                                                                                            |
| Sulfuration test                    | $\pm (1.0\% + 0.05\Omega)$                                                                     | ASTM B-809-95                                               | Sulfur(saturated vapor) , Temperature: 60±2°C<br>Humidity: 86 ~ 90%RH, 1000H .                                                                                                                                                             |

## 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)

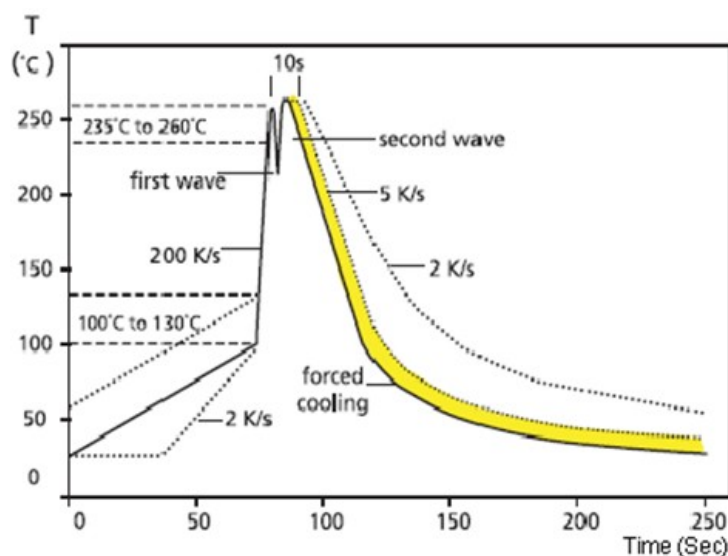


| Profile Feature                                                                                                                                 | Lead (Pb)-Free solder            |
|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Preheat:<br>Temperature Min (T <sub>smin</sub> )<br>Temperature Max (T <sub>smax</sub> )<br>Time (T <sub>smin</sub> to T <sub>smax</sub> ) (ts) | 150°C<br>200°C<br>60 -120seconds |
| Average ramp-up rate :<br>(T <sub>smax</sub> to T <sub>p</sub> )                                                                                | 3°C / second max.                |
| Time maintained above :<br>Temperature (T <sub>L</sub> )<br>Time (t <sub>L</sub> )                                                              | 217°C<br>60-150 seconds          |
| Peak Temperature (T <sub>p</sub> )                                                                                                              | 260°C                            |
| Time within $\begin{smallmatrix} +0^{\circ}\text{C} \\ -5 \end{smallmatrix}$ of actual peak Temperature (t <sub>p</sub> ) <sup>2</sup>          | 10 seconds                       |
| Ramp-down Rate                                                                                                                                  | 6°C/second max.                  |
| Time 25°C 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<sub>2</sub> Re-flow furnace .

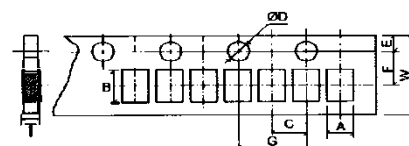
11.2 Recommend Wave Soldering Profile : (Apply to 0603 and above size)



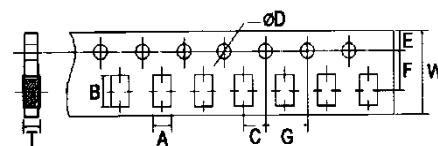
## 12. Packing

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

| Type | A         | B         | C<br>±0.05 | $\Phi D_{-0}^{+0.1}$ | E<br>±0.1 | F<br>±0.05 | G<br>±0.1 | W<br>±0.2 | T         |
|------|-----------|-----------|------------|----------------------|-----------|------------|-----------|-----------|-----------|
| CQ01 | 0.40±0.05 | 0.70±0.05 | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.42±0.1  |
| CQ02 | 0.65±0.1  | 1.20±0.1  | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.42±0.05 |

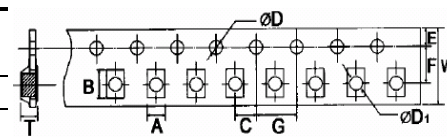


| Type | A<br>±0.2 | B<br>±0.2 | C<br>±0.05 | $\Phi D_{-0}^{+0.1}$ | E<br>±0.1 | F<br>±0.05 | G<br>±0.1 | W<br>±0.2 | T<br>±0.1 |
|------|-----------|-----------|------------|----------------------|-----------|------------|-----------|-----------|-----------|
| CQ03 | 1.10      | 1.90      | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.67      |
| CQ05 | 1.65      | 2.40      | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.81      |
| CQ06 | 2.00      | 3.60      | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.81      |
| CQ07 | 2.80      | 3.50      | 2.00       | 1.50                 | 1.75      | 3.50       | 4.00      | 8.00      | 0.75      |



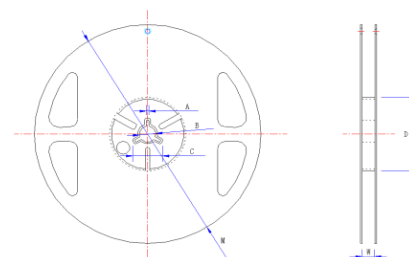
### 12.2 Dimension of plastic taping: (Unit: mm)

| Type | A<br>±0.2 | B<br>±0.2 | C<br>±0.05 | $\Phi D_{-0}^{+0.1}$ | $\Phi D1_{-0}^{+0.25}$ | E<br>±0.1 | F<br>±0.05 | G<br>±0.1 | W<br>±0.2 | T<br>±0.1 |
|------|-----------|-----------|------------|----------------------|------------------------|-----------|------------|-----------|-----------|-----------|
| CQ10 | 2.90      | 5.60      | 2.00       | 1.50                 | 1.50                   | 1.75      | 5.50       | 4.00      | 12.00     | 1.00      |
| CQ12 | 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±0.5 | B±0.5 | C±0.5 | D±1  | M±2   | W±1  |
|------|----------|-----------|-------|-------|-------|------|-------|------|
| CQ01 | Paper    | 15,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ02 | Paper    | 10,000pcs | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ03 | Paper    | 5,000pcs  | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ05 | Paper    | 5,000pcs  | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ06 | Paper    | 5,000pcs  | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ07 | Paper    | 5,000pcs  | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 10.0 |
| CQ10 | Embossed | 4,000pcs  | 2.0   | 13.0  | 21.0  | 60.0 | 178.0 | 13.8 |
| CQ12 | 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.

13.4 This product is used for automotive electronics. UNI-ROYAL will not be responsible for any damage, expense or loss caused by the use of this specification in any special environment. This series of products are suitable for automotive electronics applications, as shown below, If there are other applications, you need to confirm with UNI-ROYAL whether they are applicable:

- Control unit for information, entertainment, navigation, audio;
- Control unit for comfortable doors, windows, seat;
- Control unit for internal lighting.

## 14. Record

| Version | Description                                                            | Page | Date         | Amended by  | Checked by  |
|---------|------------------------------------------------------------------------|------|--------------|-------------|-------------|
| 1       | First version                                                          | 1~7  | Mar.20, 2018 | Haiyan Chen | Nana Chen   |
| 2       | Modify the product name                                                | 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 adding vulcanization              | 6    | Mar.05, 2019 | Haiyan Chen | Yuhua Xu    |
| 5       | 1.Modify the reflow curve and add the wave soldering curve             | 6    | Apr.30, 2020 | Haiyan Chen | Yuhua Xu    |
|         | 2. Notes for improvement                                               | 7    |              |             |             |
| 6       | Add CQ03 Marking<br>Modify characteristic                              | 3~4  | Sep.29, 2022 | Song Nie    | Haiyan Chen |
| 7       | 1.Add the low resistance range of CQ03 to CQ12                         | 4    | Feb.02, 2024 | Junying Ye  | Haiyan Chen |
|         | 2. Modify the limits of temperature coefficient and ESD                | 5~6  |              |             |             |
|         | 3. Modify the High Temperature Exposure、 Temperature Cycling 0Ω Limits | 6    |              |             |             |
| 8       | Add the low resistance range of CQ02                                   | 4    | Jan.13, 2025 | Junying Ye  | Haiyan Chen |
| 9       | 1.Cancel the hydrogen sulfide test                                     | 6    | Apr.18, 2025 | Haiyan Chen | Yuhua Xu    |
|         | 2.Modify the test temperature of ASTMB-809-85                          | 6    |              |             |             |
|         | 3. Modify the "W" dimension of CQ07                                    | 4    |              |             |             |
| 10      | Add the 0.5% resistance value range of CQ01                            | 4    | Jun.21, 2025 | Haiyan Chen | Yuhua Xu    |
| 11      | Add the CQ01 dielectric withstanding voltage                           | 4    | Jul.28, 2025 | Haiyan Chen | Yuhua Xu    |
| 12      | Modify Performance Specification                                       | 5~6  | Jan.08, 2026 | Xiaoli Liu  | Haiyan Chen |

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