

# **DATA SHEET**

**Product Name Automotive Thick Film Chip Resistors** 

Part Name CQ Series

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Brands RoyalOhm UniOhm











#### 1. Scope

- 1.1 This specification for approve relates to the Automotive Thick Film Chip Resistors manufactured by UNI-ROYAL Application automobile.
- 1.2The test items follow the test standard of AEC-Q200.
- 1.3Anti-Sulfidetion
- 1.4 Application car、IPAD、LED Lamps、Intelligent home appliances, Medical equipment, Kinds of industrial control devices &industrial supplies

#### 2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th 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~	"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 lower or equal than 1 watt, 5th code would be "W" and 6th code would be a number or letter.

E.g.: WA=1/10W

W4=1/4W

2.3  $7^{th}$  code: Tolerance. E.g.: D= $\pm 0.5\%$  F= $\pm 1\%$ 

G=±2%

J=±5%

 $K = \pm 10\%$ 

2.4 8th~11th codes: Resistance Value.

- 2.4.1 If value belongs to standard value of ≥5% series, 8th code would be zero,9th~10th codes are significant figures of the resistance and 11th code is the power of ten.
- 2.4.2 If value belongs to standard value of  $\leq 2\%$  series,  $8^{th} \sim 10^{th}$  codes are significant figures of the resistance, and  $11^{th}$  code is the power of ten.
- 2.4.3 11<sup>th</sup> 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 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=4000pcs 5=5000pcs C=10000pcs D=20000pcs

E=15000pcs

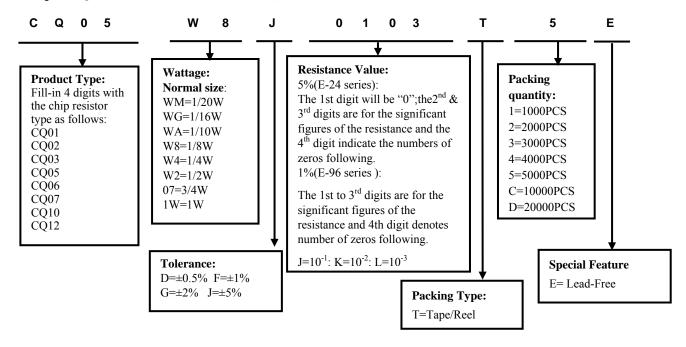
Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

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

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

#### 3. Ordering Procedure

(Example: CQ05 1/8W  $\pm$ 5% 10K  $\Omega$  T/R-5000 )

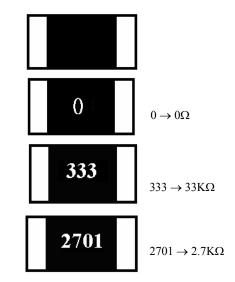




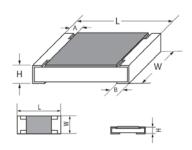


#### 4. Marking

- (1) Normally, the making of CQ01,CQ02 resistors as following
- (2) Normally, the making of  $0\Omega$  CQ03,  $0\Omega$  CQ05,  $0\Omega$  CQ06,  $0\Omega$  CQ07,  $0\Omega$  CQ10,  $0\Omega$  CQ12, resistors as following
- (3) ±5%Tolerance:The first two digits are significant figures of resistance and the third denotes number of zeros following
- (4) ±1% Tolerance: 4 digits, first three digits are significant; forth digit is number of zeros. Letter r is decimal point.



### 5. <u>Dimension</u>



Type					
Туре	L	W	Н	A	В
CQ01(0201)	$0.60\pm0.03$	$0.30\pm0.03$	$0.23\pm0.03$	$0.12\pm0.05$	0.15±0.05
CQ02(0402)	1.00±0.10	$0.50\pm0.05$	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	2.60±0.20	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

	Power Rating	Resistance Range				
Type	at 70°C	1.0%	5.0%			
CQ01	1/20W	$1\Omega$ - $10M\Omega$	1Ω-10ΜΩ			
CQ02	1/16W	1Ω-10ΜΩ	1Ω-10ΜΩ			
CQ03	1/10W	$1\Omega$ - $10M\Omega$	1Ω-10ΜΩ			
CQ05	1/8W	$1\Omega$ - $10M\Omega$	1Ω-10ΜΩ			
CQ06	1/4W	$1\Omega$ - $10M\Omega$	$1\Omega$ - $10$ M $\Omega$			
CQ07	1/2W	$1\Omega$ - $10$ M $\Omega$	$1\Omega$ - $10$ M $\Omega$			
CQ10	3/4W	$1\Omega$ - $10M\Omega$	$1\Omega$ - $10$ M $\Omega$			
CQ12	1W	$1\Omega$ - $10M\Omega$	1Ω-10ΜΩ			

#### 7. Ratings

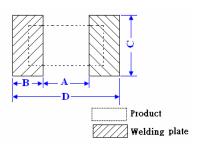
Туре	Max. Working Voltage	Max. Overload Voltage	Dielectric withstanding Voltage	Resistance Value of Jumper	Rated Current of Jumper	Max. Overload Current of Jumper	Operating Temperature
CQ01	25V	50V	/	$<$ 50m $\Omega$	0.5A	1A	-55℃~155℃
CQ02	50V	100V	100V	$<$ 50m $\Omega$	1A	2A	-55°C~155°C
CQ03	75V	150V	300V	<50mΩ	1A	2A	-55°C~155°C
CQ05	150V	300V	500V	$<$ 50m $\Omega$	2A	5A	-55℃~155℃
CQ06	200V	400V	500V	$<$ 50m $\Omega$	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°C~155°C







#### 8. Recommend the size of welding plate

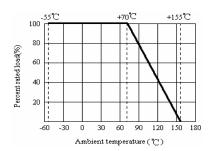


Type	Dimension(mm)							
Турс	A	В	C	D				
CQ01	$0.3 \pm 0.05$	$0.35 \pm 0.05$	$0.4 \pm 0.05$	$1.0\pm0.05$				
CQ02	$0.50\pm0.05$	$0.45 \pm 0.05$	$0.5 \pm 0.05$	$1.4 \pm 0.05$				
CQ03	0.8±0.05	0.65±0.05	0.8±0.05	2.1±0.05				
CQ05	1.0±0.1	1.0±0.1	1.3±0.1	3.0±0.1				
CQ06	$2.0\pm0.1$	1.1±0.1	$1.6 \pm 0.1$	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

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. For temperature in excess of 70°C, the load shall be derated as shown in figure 1

Figure 1



#### 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:

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

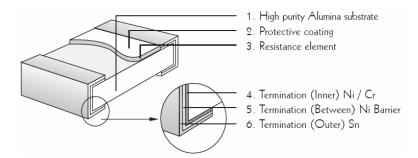
Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

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 less

#### 10. Structure









# 11. Performance Specification

Characteristic	Limits	Ref. Standards	Test Methods
Operational life	±5%: ±(3.0%+0.1Ω) ±1%: ±(1.0%+0.1Ω)	MIL-STD-202	125°C, at 36% of operating power, 1000H(1.5 hours "ON", 0.5 hour "OFF").
-	<100mΩ		Apply to rate current for $0 \Omega$
Electrical Characterization	CQ01: $1\Omega < R \le 10\Omega: -100 \sim +350 PPM/^{\circ}C \\ > 10\Omega: \pm 200 PPM/^{\circ}C \\ CQ02 \sim CQ12: \\ 1\Omega \le R \le 10\Omega: \pm 200 PPM/^{\circ}C \\ > 10\Omega: \pm 100 PPM/^{\circ}C$	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	±1%: ±(1.0%+0.05Ω) ±5%: ±(2.0%+0.05Ω)	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
	<50mΩ	NIII GED 002	Apply max Overload current for $0\Omega$
External Visual	No Mechanical Damage	MIL-STD-883 Method 2009	Electrical test not required.Inspect device construction, marking and workmanship
Physical Dimension	Reference 2.0 Dimension Standards	JESD22 MH Method JB-100	Verify physical dimensions to the applicable device detail specification.  Note: User(s) and Suppliers spec. Electrical test not required.
Resistance to Solvent	Marking Unsmeared	MIL-STD-202 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	±(1.0%+0.1Ω)	MIL-STD-202	1000hrs. @T=155°C.Unpowered. Measurement at 24±2 hours after test conclusion.
Exposure (Storage)	<50mΩ	Method 108	Apply to rate current for $0 \Omega$
Temperature Cycling	±(1.0%+0.1Ω)	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C). Measurement at 24±2 hours after test conclusion.
Cycling	<50mΩ	371 101	Apply to rate current for $0 \Omega$
Biased Humidity	±5%: ±(3.0%+0.05Ω) ±1%: ±(1.0%+0.05Ω)	MIL-STD-202 Method 103	1000 hours 85℃,85%RH.  Note: Specified conditions: 10% of operating power.  Measurement at 24±2 hours after test conclusion.
	<100mΩ		Apply to rate current for $0 \Omega$
Mechanical Shock	±(1.0%+0.1Ω)	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.1Ω)	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	±(1.0%+0.1Ω)	AEC-Q200-002	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of $\pm 500\text{V}, \pm 1\text{KV}, \pm 2\text{KV}, \pm 4\text{KV}, \pm 8\text{KV}$ , The electrometer reading shall be within $\pm 10\%$ for voltages from 500V to $\leq 800\text{V}$ .
Solderability	Coverage must be over 95%.	J-STD-002	For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions: a) Method B 4hrs at 155°C dry heat, the dip in bath with 245°C,5s. b) Method B: at 215°C,5s. c) 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.
	±(1.0%+0.05Ω)		2mm (Min)
Board Flex	` '	JIS-C-6429	` '





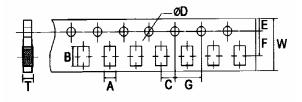


Flame Retardance	No flame	AEC-Q200-001	Only requested, when voltage/power will increase the surface temp to 350°C. Apply voltage from 9V to 32V. No flame; No explosion.		
Resistance to Soldering Heat	±(1.0%+0.05Ω)	MIL-STD-202 Method 210	Condition B No per-heat of samples. Note: Single Wave Solder-Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.		
Soluting Heat	<50mΩ	11100110 u <b>2</b> 10	Apply to rate current for $0 \Omega$		
Sulfuration test	±5%:(5.0%+0.05Ω) ±1%:(1.0%+0.05Ω)	ASTM B-809-95	sulfur(saturated vapor) , Temperature: $50\pm2^{\circ}$ C Humidity: $86\sim90\%$ RH, $1000$ H .		

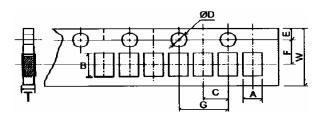
Sulfuration test: H<sub>2</sub>S 3~5PPM 50°C±2°C 91%~93%RH 1000H

 $\pm 5\%:(5.0\%+0.05\,\Omega); \pm 1\%:(1.0\%+0.05\,\Omega)$ 

# **12.** Packing of Surface Mount Resistors 12.1 Dimension of Paper Taping :(Unit: mm)

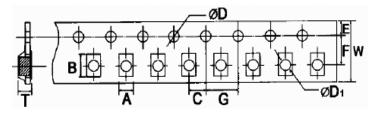


Туре	A	В	C ±0.05	+0.1 ΦD -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	Т
CQ01	0.40±0.05	0.70±0.05	2.00	1.50	1.75	3.50	4.00	8.00	0.42±0.1
CQ02	0.65±0.1	1.20±0.1	2.00	1.50	1.75	3.50	4.00	8.00	0.42±0.05



Type	A ±0.2	B ±0.2	C ±0.05	+0.1 ФD -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±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 Embossed Taping: (Unit: mm)

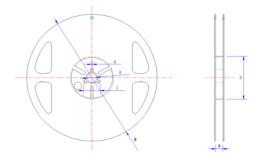


Type	A ±0.2	B ±0.2	C ±0.05	+0.1 \$\phi D \] - 0	+0.25 \$\phi D1	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
CQ10	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
CQ12	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00





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



Туре	Taping	Qty/Reel	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
CQ01	Paper	10,000pcs	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 the storage condition temperature: 15°C~35°C, 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.

# 14. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~7	Mar.20, 2018	Chen Haiyan	Chen Nana
2	Modify the product name	1~7	Nov.22, 2018	Chen Haiyan	Chen Nana
3	Modify the Performance Specification	5~6	Feb.16, 2019	Chen Haiyan	Xu Yuhua
4	Experimental method and standard for adding vulcanization	6	Mar.05, 2019	Chen Haiyan	Xu Yuhua

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