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With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



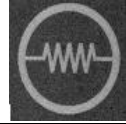
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Approval Sheet

for

**Power Cement Resistors
Low Ohmic & Low Inductance Type**

LLC Series

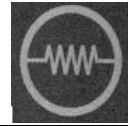
$\pm 1\%$ & $\pm 2\%$ & $\pm 3\%$ & $\pm 5\%$

YAGEO CORPORATION

Headquarters: 3F, No.233-1, Pao Chiao Rd., Xindian, Taipei, Taiwan, R.O.C.

Tel: 886-2-6629-9999 **Fax:** 886-2-6628-8885

URL: www.yageo.com



1. PRODUCT:

Power Cement Resistors. Low ohmics, tight tolerance available, low inductance for high frequency.

(LLC SERIES)

2. PART NUMBER:

Part number of the power cement resistor is identified by the name, power, tolerance, packing, temperature coefficient and resistance value.

Example :

| | | | | | |
|-------------|--------------|----------------------|---------------|---------------------------------------|------------------|
| LLC | 500 | F | B | - | 0R01 |
| (1) | (2) | (3) | (4) | (5) | (6) |
| Series Name | Power Rating | Resistance Tolerance | Packing Style | Temperature Coefficient of Resistance | Resistance Value |

(1) Style : LLC SERIES: Axial Type

(2) Power Rating : 450=4.5W 、 500=5W 、 600=6W 、 800=8W 、 10A=10W

(3) Tolerance : F=±1% 、 G=±2% 、 H=±3% 、 J = ±5%

(4) Packaging Type : B = Bulk Packing
R = Paper Taping Reel (on request)

(5) Temperature Coefficient : “-“=base on spec.

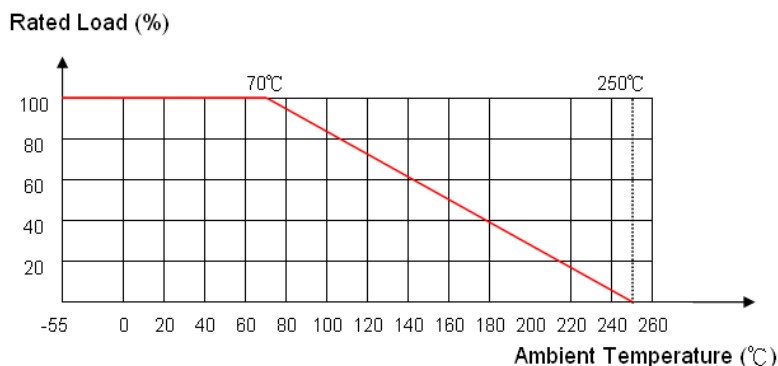
(6) Resistance Value :
Example : 0R005, 0R01, 0R1,.....



3. ELECTRICAL CHARACTERISTICS

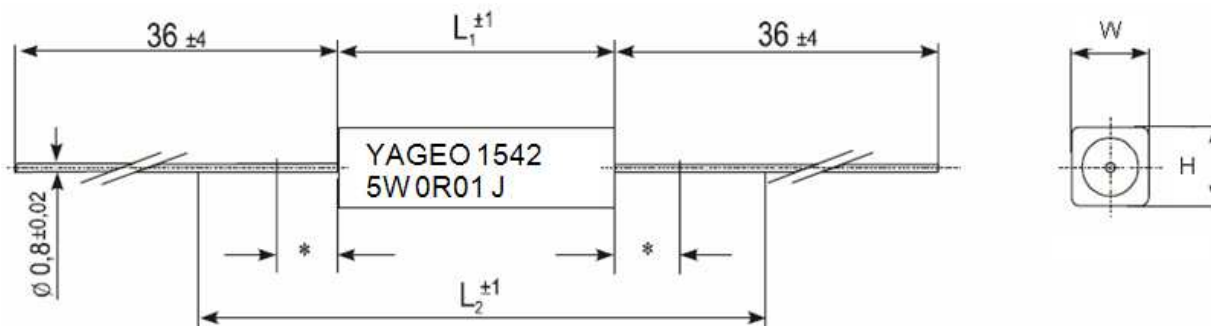
| STYLE | LLC450 | LLC500 | LLC600 | LLC800 | LLC10A |
|---|-------------------------------------|--------------|--------------|--------|------------|
| Power Rating at 70 °C | 4.5W | 5W | 6W | 8W | 10W |
| Max. Cont. Work. Voltage | $\sqrt{P70 \times R}$ | | | | |
| Thermal resistance _{cv} (°C/W) | 65 | | 50 | 35 | 30 |
| Resistance Range | 0.003Ω | 0.004~0.051Ω | 0.004~0.068Ω | | 0.005~0.1Ω |
| Insulation Voltage (1min.) | 2000V | | | | |
| Temperature Coefficient | +200~+1200PPM/°C (Depends on value) | | | | |
| Operating Temp. Range | - 55 °C to + 250 °C | | | | |

4. DERATING CURVE



5. DIMENSIONS

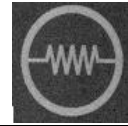
Dimensions in mm



* 6mm, reduced solderability in this area

Unit : mm

| TYPE | L1 | L2 | W | H |
|--------|----|----|---------------|---------------|
| LLC450 | 18 | 40 | 6.4 ± 0.3 | 6.4 ± 0.3 |
| LLC500 | 18 | 40 | 6.4 ± 0.3 | 6.4 ± 0.3 |
| LLC600 | 25 | 45 | 6.4 ± 0.3 | 6.4 ± 0.3 |
| LLC800 | 25 | 45 | 9.0 ± 0.3 | 9.0 ± 0.3 |
| LLC10A | 38 | 60 | 9.0 ± 0.3 | 9.0 ± 0.3 |



Measuring length L2: Resistance value is measured over the centered length L2 on terminals free of oxide and contaminations. Differing conditions require adequate corrections ($R_{\text{terminal}} = 0.4\text{m}\Omega / \text{cm}$)

6. ENVIRONMENTAL CHARACTERISTICS

(1) Short Time Over Load Test

At 2.5 times of the rated voltage applied for 5 seconds, the resistor should be free from defects after the resistor is released from load for about 30 minutes

$$\text{Short Time Overload Voltage} = 2.5 * \sqrt{\text{Power Rating} \times \text{Resistance Value}}$$

The change of the resistance value should be within $\pm 2.0\%$

(2) Voltage Proof on Insulation

The resistor shall be clamped in the trough of a 90° metal V Block. Apply the insulation voltage of 2000V between the terminals connected together with the block for about 60 seconds.

The resistor shall be able to withstand without breakdown or flashover.

(3) Temperature Coefficient Test

Test of resistors above room temperature $100^\circ\text{C} \pm 2^\circ\text{C}$ (Testing Temperature 115°C to 130°C) at the constant temperature silicon plate for over 5 minutes. Then measure the resistance value.

The Temperature Coefficient is calculated by the following equation and its value should be within the range of requested.

$$\text{Resistor Temperature Coefficient} = \frac{R - R_0}{R_0} \times \frac{1}{t - t_0} \times 10^6$$

R = Resistance value under the testing temperature

R₀ = Resistance value at the room temperature

t = The testing temperature

t₀ = Room temperature

(4) Insulation Resistance

Apply "measuring voltage" between protective coating and termination for 1 min., then measure. The measuring voltage shall be either $100\text{V} \pm 15\text{V}$ d.c. for resistors with an insulation voltage lower than 500V or $500\text{V} \pm 50\text{V}$ d.c. for resistors with an insulation voltage equal to or greater than 500V.

The test resistance should be higher than 10,000 Mohm.

(5) Solderability

Immerse the specimen into the solder pot at $245 \pm 5^\circ\text{C}$ for 3 ± 0.5 seconds.

At least 90% solder coverage on the termination.

(6) Solvent Resistance of Marking

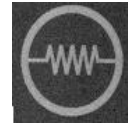
The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 5 ± 0.5 minutes.

The specimen is no deterioration of coatings and color code.

(7) Robustness of Terminations

Direct Load – Resistors shall be held by one terminal and the load shall be gradually applied in the direction of the longitudinal axis of the resistor unit the applied load reached the requirement.

The load shall be held for 10 seconds. The load of weight shall be 5 kg (50N).



(8) Damp Heat Steady State

Place the specimen in a test chamber at 40 °C and 93 % relative humidity. Apply the rated voltage to the specimen at the 1.5 hours on and 0.5 hour off cycle. The total length of test is 56 days
The change of the resistance value shall be within $\pm 0.5\%$

(9) Endurance at 70 °C

Placed in the constant temperature chamber of 70 ± 3 °C the resistor shall be connected to the lead wire at the point of 25mm. Length with each terminal, the resistors shall be arranged not much effected mutually by the temperature of the resistors and the excessive ventilation shall not be performed, for 90 minutes on and 30 minutes off under this condition the rated D.C. voltage is applied continuously for 1000+48/-0 hours then left at no-load for 1hour, measured at this time the resistance value ◦

The change of the resistance value shall be within ± 3.0 %.

There shall be no remarkable change in the appearance and the color code shall be legible after the test.

(10) Temperature Cycling Test

The temperature cycle shown in the following table shall be repeated 5 times consecutively. The measurement of the resistance value is done before the first cycle and after ending the fifth cycle, leaving in the room temperature for about 1 hour ◦

Temperature Cycling Conditions:

| Step | Temperature(°C) | Time (minute) |
|------|-----------------|---------------|
| 1 | -55 ± 3 | 30 |
| 2 | 25 ± 3 | 10 ~ 15 |
| 3 | 155 ± 3 | 30 |
| 4 | 25 ± 3 | 10 ~ 15 |

The change of the resistance value shall be within ± 0.5 %

After the test the resistor shall be free from the electrical or mechanical damage.

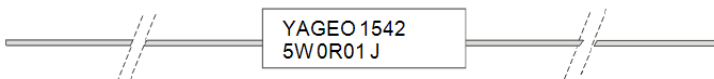
(11) Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at 260 ± 3 °C for 10 ± 1.0 seconds up to 2.5 ~ 3.5 mm.

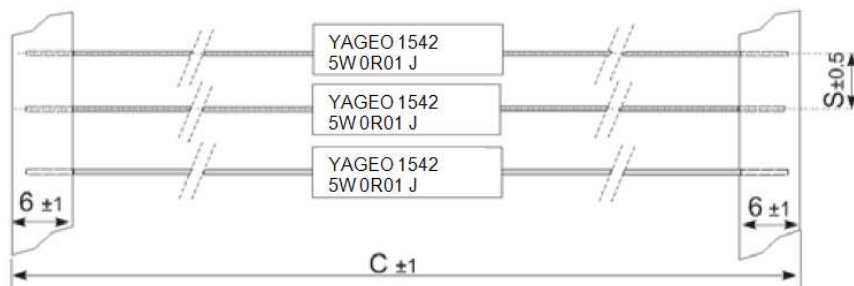
The change of the resistance value shall be within ± 0.2 %

7. PACKAGING

The standard packaging for KN in axial type is bulk, dimensions below.



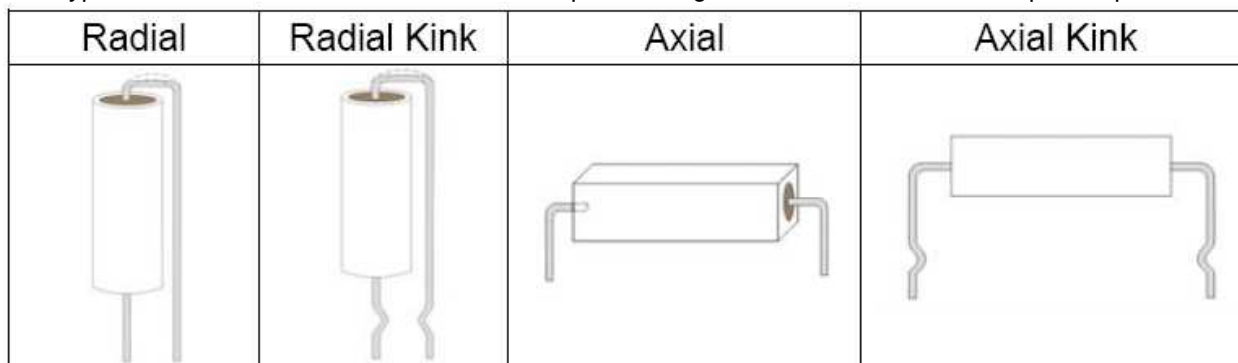
| Type | Packaging | Pieces | Pack.-Code |
|--------|-----------|--------|------------|
| LLC450 | Bulk | 200 | B |
| LLC500 | Bulk | 200 | B |
| LLC600 | Bulk | 200 | B |
| LLC800 | Bulk | 200 | B |
| LLC10A | Bulk | 200 | B |



| Type | Packaging | Pieces | Pack.-Code | C | S |
|--------|---------------|--------|------------|----|----|
| LLC450 | Taped in Reel | 1000 | R | 85 | 10 |
| LLC500 | Taped in Reel | 1000 | R | 85 | 10 |
| LLC600 | Taped in Reel | 1000 | R | 95 | 10 |
| LLC800 | Taped in Reel | 500 | R | 95 | 10 |
| LLC10A | Taped in Reel | 500 | R | 95 | 10 |

8. SPECIAL TYPE (FORMING DIMENSIONS)

This type resistor, is also available in a different pre-forming, as shown below, other's upon request.



9. Plant Address

- A. China Dongguan Plant
7-1, Gaoli Road, Gaoli Industrial Zone
Tangxia Zhen, Dongguan, Guangdong, China
(廣東省東莞市塘廈鎮高麗工業區高麗路 7-1 號)
Tel. 86-769-8772 0275
Fax. 86-769-8772 0275 #4333
- B. China Suzhou Plant
No.158, Jinchang Road, No.1 Building of Nan Bang IND. Zone,
Mu Du New District, Suzhou, China
(江蘇省蘇州市木瀆新區金長路 158 號南濱工業區 1 號)
Tel. 86-512-66518889
Fax. 86-512-66519889