Approval Sheet

for

Cement Resistors
Vertical Lead Type

SQM & NSM series

±5%

YAGEO CORPORATION

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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	Jul 16, 2007	Sara Lin	Joyce Chung
01	add new type: SQM15S	Oct 03, 2008	Lynn Chen	Joyce Chung
02	Adjust the derating curve for 3W to 15W	Oct 28, 2008	Lynn Chen	Joyce Chung
03	Adjust the resistance range for MO type	Nov 15, 2010	Feng Ye	Allen Wu
04	1. Non-inductive style's electrical characteristics is include 2. The environmental characteristics are adjusted	Jan 13, 2011	Feng Ye	Ken Hsu
05	Dimension map is changed	Jul 15, 2011	Feng Ye	Ken Hsu
06	Dimension map is changed	Sep 13, 2011	Feng Ye	Ken Hsu
07	Packaging code of "F" is included	Feb 19, 2013	Feng Ye	Ken Hsu
08	Revise the description of packaging type code "B"	Jun. 20, 2013	Feng Ye	Ken Hsu
09	Delete SQM15S type Revised the resistance range	Mar. 05, 2014	Feng Ye	Flora Shen
10	Added marking	Oct. 31, 2014	Feng Ye	Flora Shen
11	Revised the resistance range of fiberglass based wire-wound type	Dec. 24, 2015	Feng Ye	Flora Shen

1. PRODUCT:

The resistors are ceramic housed resistors with fibreglass based wirewound or ceramic rod wirewound or metal oxide core. The materials used and the construction techniques ensure excellent flame resistance, arc resistance and moisture resistance as well as self-extinguishing capabilities.
VERTICAL LEAD TYPE.

2. PART NUMBER:

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

Example：

SQM	**10A**	**J**	**B**	**-**	**10R**
(1) Series Name	**(2)** Power Rating	**(3)** Resistance Tolerance	**(4)** Packing Style	**(5)** Temperature Coefficient of Resistance	**(6)** Resistance Value

(1) Style：SQM or NSM

(2) Power Rating： 200=2W, 300=3W, 500=5W, 700=7W ,

10A=10W, 10S=10WS

(3) Tolerance： J = ±5%

(4) Packaging Type：B ＝ Bulk with wirewound or metal oxide or fiberglass
W ＝ Bulk with wirewound sub-assembly for resistance value
M ＝ Bulk with metal oxide sub-assembly for resistance value
F ＝ Bulk with fiberglass wire-wound sub-assembly

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

(6) Resistance Value：E24 Series

Example：0R1、1R、10R、100R、10K……

3. ELECTRICAL CHARACTERISTICS

TABLE I NORMAL STYLE

STYLE	SQM200	SQM300	SQM500	SQM700	SQM10A	SQM10S
Power Rating at 40 ℃		3W	5W	7W	10W	
Power Rating at 70 ℃	2W					
Maximum Working Voltage	250V	350V		500V		
Maximum Overload Voltage	500V	700V		1000V		
Voltage Proof	500V	700V		1000V		
Resistance Range (Ceramic based wirewound)	0.1Ω~36Ω	0.1Ω~68Ω	0.1Ω~130Ω	0.1Ω~330Ω	0.1Ω~510Ω	0.1Ω~270Ω
Resistance Range (Metal Oxide Film)	39Ω~1MΩ	75Ω~1MΩ	150Ω~1MΩ	360Ω~1MΩ	560Ω~1MΩ	300Ω~1MΩ
Resistance Range (Fiberglass based wirewound)	0.1Ω~1KΩ	0.1Ω~4.7KΩ			0.1Ω~5K6Ω	0.1Ω~4.7KΩ
Operating Temp. Range	- 55 ℃ to + 155 ℃					
Temperature Coefficient	± 300ppm/ ℃					

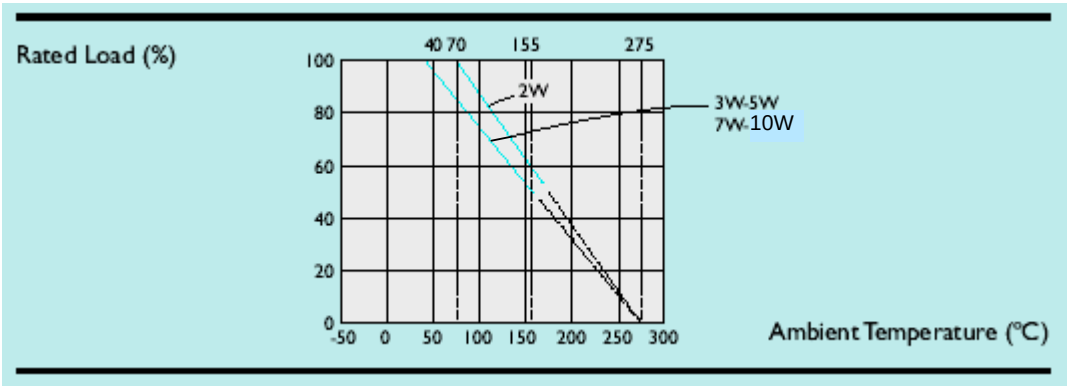
TABLE II NON-INDUCTIVE STYLE

STYLE	NSM200	NSM300	NSM500	NSM700	NSM10A	NSM10S
Power Rating at 40 ℃		3W	5W	7W	10W	
Power Rating at 70 ℃	2W					
Maximum Working Voltage	250V	350V		500V		
Maximum Overload Voltage	500V	700V		1000V		
Voltage Proof	500V	700V		1000V		
Resistance Range (Ceramic based wirewound)	0.1Ω~10Ω	0.1Ω~30Ω	0.15Ω~65Ω	0.27Ω~100Ω		
Operating Temp. Range	- 55 ℃ to + 155 ℃					
Temperature Coefficient	± 300ppm/ ℃					

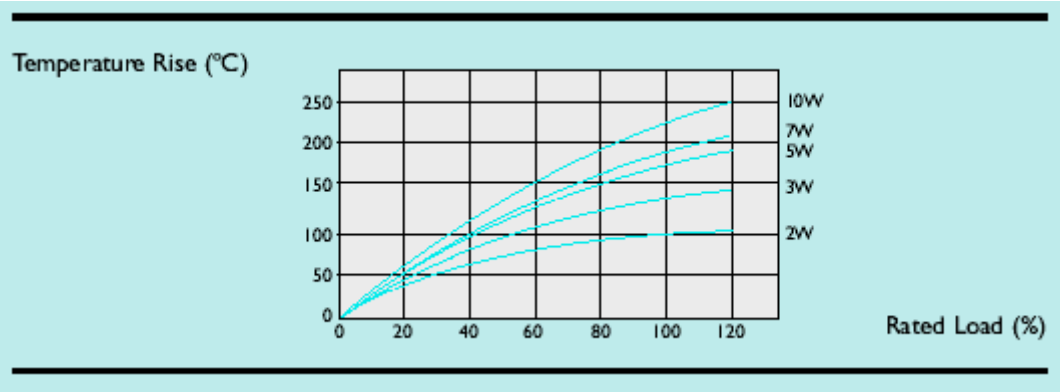
＊ 1. Below or over this resistance range on request.

4. DERATING CURVE & TEMPERATURE RISE

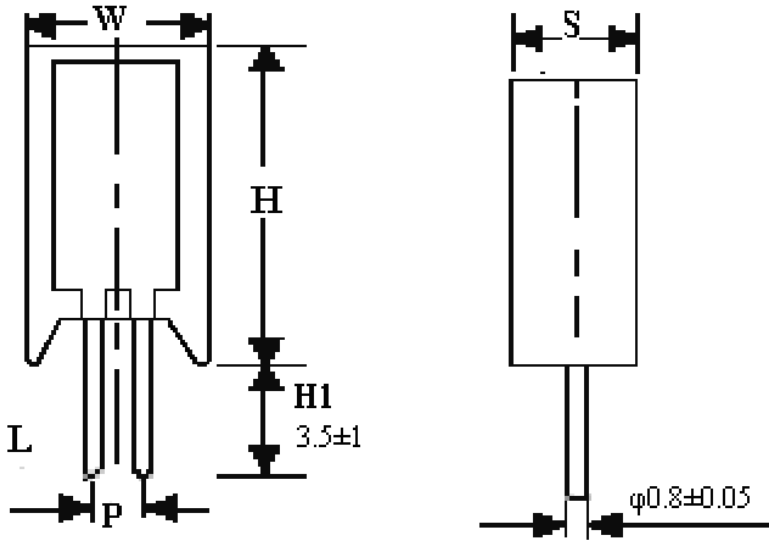
Derating Curve



Temperature Rise



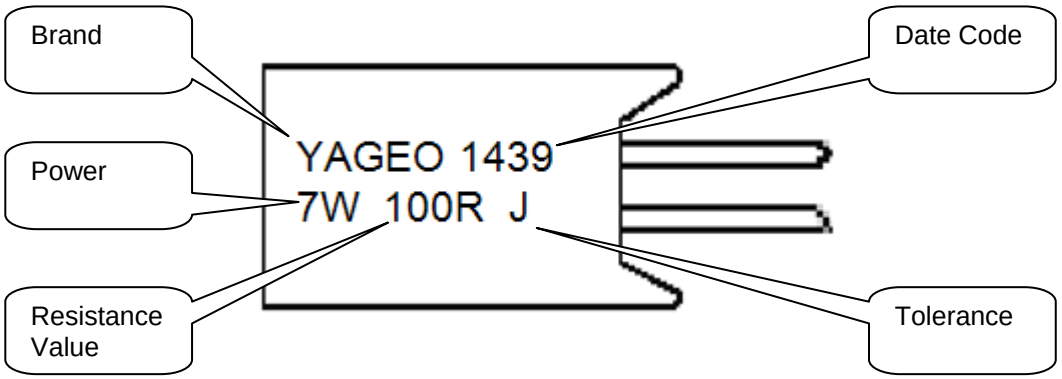
5. DIMENSIONS



unit: : mm

STYLE		DIMENSION			
STD	Non-Inductive	H	W	S	P
SQM200	NSM200	20±1.5	11.0±1.0	7.0±1.0	5^{+2-1}
SQM300	NSM300	25±1.5	12.0±1.0	8.0±1.0	5^{+2-1}
SQM500	NSM500	25±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM700	NSM700	39±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM10A	NSM10A	51±1.5	13.0±1.0	9.0±1.0	5^{+2-1}
SQM10S	NSM10S	35±1.5	16.0±1.0	12.0±1.0	7^{+2-1}

6. Marking



7. ENVIRONMENTAL CHARACTERISTICS

(1) Short Time Over Load Test

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

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

The change of the resistance value should be within ± (2 % + 0.05Ω)

(2) Voltage Proof

The resistor shall be clamped in the trough of a 90° metal V Block. Apply the insulation voltage specified in the “Table I &II“ 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 125°C to 130°C (Testing Temperature) at the constant temperature silicon plate for over 4 to 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.

$$\text{Re}\,sistor \quad Temperature \quad Coefficien\,t = \frac{R-R_0}{R_0}\times\frac{1}{t-t_0}\times 10^6$$

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 100V±15V d.c. for resistors with an insulation voltage lower than 500V or 500V±50V d.c. for resistors with an insulatin voltage equal to or greater than 500V.
The test resistance should be high than 1,000M ohm.

(5) Solderability

Immerse the specimen into the solder pot at 235 ± 5 °C for 3 ± 0.5 seconds.
At least 95% 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 ≧ 2.5 kg (24.5N).

(8) Pulse Overload

Apply 4 times of rated voltage to the specimen at the 1 second on and 25 seconds off cycle, subjected to voltage application cycles specified in 10,000 times。
The change of the resistance value shall be within ± (2.0% + 0.05 Ω)

(9) Lamp Heat Steady State

Place the specimen in a test chamber at 40 ± 2 °C and 90 ~ 95 % relative humidity. Apply the 0.1 times 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 ± 5 % + 0.05 Ω

(10) 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 ± 5 % + 0.05 Ω .
There shall be no remarkable change in the appearance and the color code shall be legible after the test.

(11)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 ± (2.0 % + 0.05 Ω)
After the test the resistor shall be free from the electrical or mechanical damage.

(12)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 ~ 2.5 mm.
The change of the resistance value shall be within ± 1.0 % + 0.05 Ω

8. Plant Address

A. China Dongguan Plant
7-1, Gaoli Road, Gaoli Industrial Zone
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B. China Suzhou Plant
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