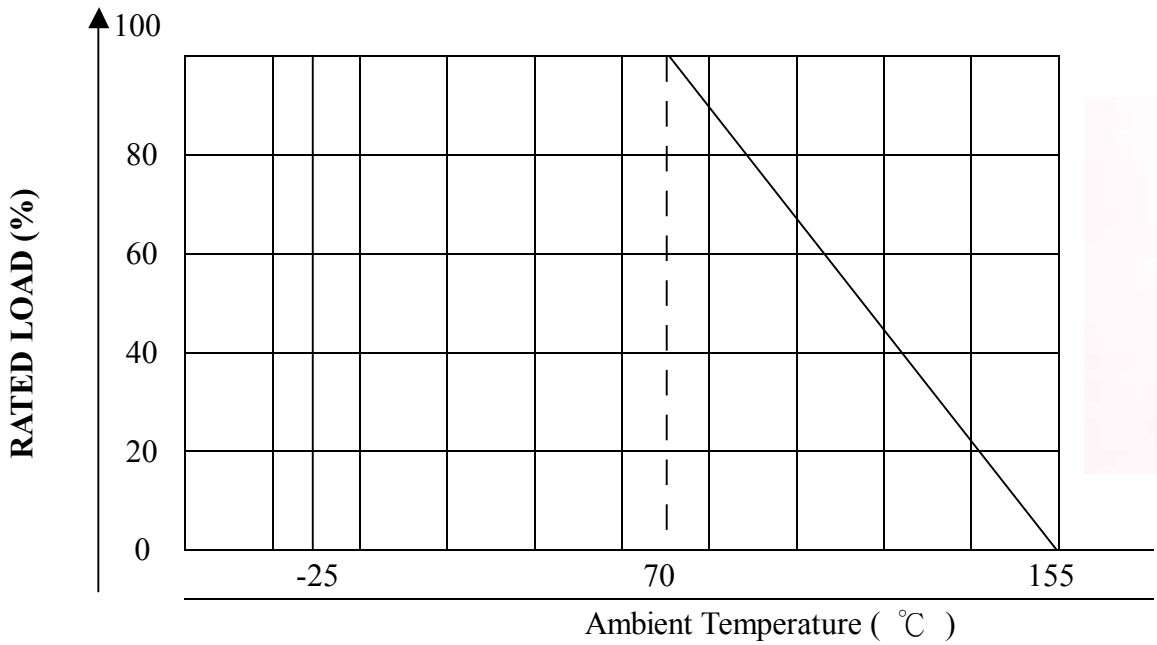
Fusible Resistors

RATING:

C.1 Rated power is the value of max. load voltage specified at the ambient temperature of 70℃. When the ambient temperature surpasses the above mentioned temperature, the value declines as per the following DERATING CURVE.



C.2 Rated Voltage:

It is calculated under the following formula:

$$E = \sqrt{P(\text{rated power}) \bullet R(\text{resistance value})}$$

E= rated voltage (V)

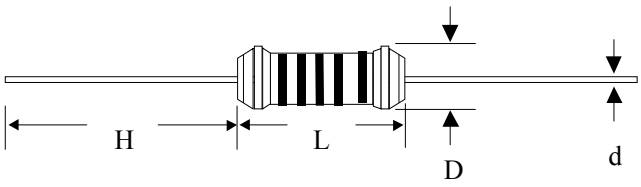
P= rated power (W)

R= total nominal resistance value (Ω)

A 1/4W FR25 resistor is tested at the ambient temperature of 70℃, the maximum working voltage is 200 V. However, in case the calculated rated voltage exceeds the maximum load voltage, such the maximum load voltage shall be regarded as its rated voltage, means whichever less.

C.3 Operating Temperature Range: -25℃ ~ +155℃

D. **DIMENSIONS:**



Unit : mm

TYPE	BODY		LEADS	
	L	D	H	d
FR25	6.5 ± 0.5	2.3 ± 0.3	27 ± 2	0.52 ± 0.05
FR50	8.8 ± 0.5	3 ± 0.5	26 ± 2	0.6 ± 0.05
FR100	11 ± 1	4 ± 0.5	26 ± 3	0.6 ± 0.05
FR200	15 ± 1	5 ± 0.5	24 ± 3	0.78 ± 0.05

E. **STRUCTURE**

E.1 Terminal :

Terminal is to be firmly connected with the resistor body, both electrically and mechanically, and allow easy soldering.

E.2 Coating:

Coating is overcoated the resistor body with light grey non-flammable paint.

E.3 Markings:

Markings are to be shown on the resistor body by color coding.

1^{st}, 2^{nd} and 3^{rd} color codes : nominal resistance value.

4^{th} color code : resistance tolerance-J (±5%) - gold color.

5^{th} color code : fusing characteristics

green color -8 times

blue color -12 times

white color -16 times

violet color -32 times

F. ELETRICAL CHARACTERISTICS:

Items	Specifications	Testing Method
Resistance value	From 2.2Ω to 100Ω , within the E-12 value series	See H.1
Temperature Coefficient	± 350 ppm /℃	See H.2
Short Time Overload	± (-2.5% + 0.05Ω)	See H.3
Voltage Withstanding	No physical damage such as breakage and burnt	See H.4
Temperature Cycling	± (2.0% + 0.05Ω)	See H.5
Moisture Proof Load Life	± (5.0% + 0.05Ω)	See H.6
Solderability	± (2.0% + 0.05Ω)	See H.7
Load Life	± (5.0% + 0.05Ω)	See H.8
Fusing Characteristics	Within 60 seconds	See H.9

G. TESTING CONDITION:

All measurements are taken under the standard testing condition at the ambient temperature of 25℃ ±2℃ and the relative humidity of 65% ±5%.

H. TESTING METHOD AND REQUIREMENTS:

H.1- Resistance Value

It is measured by bridge-method with the applied voltage not exceeding 1/10 of the rated voltage for 5 seconds; the allowable tolerance of all the resistance values within the E12 series is indicated as follows:

Tolerance Code	J	K
Actual Tolerance	±5%	±10%

H.2- Temperature Coefficient:

Take down the resistance value at the ambient temperature (25℃) and the value after the test taken at the temperature of higher than 50℃ for about 30-45 minutes, the readings will be used with the following formula to get the T.C. of ±350 PPM/℃.

$$T.C(PPM/℃) = (R - R0) / R0 \times 1/(T - T0)$$

where T0 : ambient temperature of 25℃

T : test temperature of about 75℃

R0: resistance value at ambient temperature of 25℃

R : resistance value at test temperature of 75℃

H. TESTING METHOD AND REQUIREMENTS:

H.3 Short Time Over Load:

To apply an additional 1.5 times of the rated voltage power on the tested resistor, if the voltage surpasses the maximum working voltage, follow the maximum working voltage. After 5 seconds, remove the voltage and place the resistors to the normal condition for 30 minutes, take the reading of the resistance values between pre-and-post test, by using the following formula, the resistance change rate shall be within the range of ±(2.5%+0.05Ω).

Resistance change rate %= (R-R0)/R0 x 100

where R0=Resistance value before test
R =Resistance value after test

H.4 Temperature Cycle:

Following the following 4-step temperature cycles for 5 times, there should have no mechanical damage on the resistor body, the resistance value change rate between pre-and-post test shall be within the range of ± (2.0%+0.05Ω).

Step	Temperature (℃)	Time(minutes)
1st	-25 ±3	30
2nd	Room temp.	10
3rd	+85 ± 2	30
4th	Room temp.	10

H.5 Moisture-proof Load Life:

The resistors are put into a constant temperature/ humidity oven where the temperature is 40 ± 2℃ and the relative humidity is 90~95% with the related voltage (not exceeding the maximum working voltage) for 90 minutes and then draw the resistors back to the normal room temperature for 30 minutes-take this as a test cycle. Repeat this test cycle for 500 -1,000 hours. Leave the tested pieces back to a room temperature for about 60 minutes after the test cycle, take the readings of the resistance value change between pre-and post-test, the change rate is about ±(5.0 %±0.05Ω).

H.6 Solder Heat Resistance:

95% of the circumference of the two lead wire terminals (about 4.0mm±0.8mm off the resistor body) is to be dipped into a solder pot with melted solder of 350℃±10℃ for 3.0±0.5 seconds. Thereafter, put the resistors back to normal temperature for 3 hours. Take the reading of the resistance value change rate between pre-and-post test which is about ± (2.0%+0.05Ω).

H. TESTING METHOD AND REQUIREMENTS:

H.7 Load Life:

Leave the resistors on a test stand and put all the samples inside a constant temperature oven of 70℃, be sure there is no temperature interference on the resistors in the oven, apply D.C. rated voltage (not exceeding the maximum working voltage) for 90 minutes, off power 30 minutes-take this as a test cycle. Repeat this test cycle for 1,000 hours and then leave the tested pieces back to a normal room temperature for an hour for cooling. Take the reading of the resistance value change rate between pre-and-post test which shall be within the range of ± (5%+0.05Ω).

H.8 Fusing characteristics and definition:

Product Code	Power Rating	Resistance Value	Power (times)	Fusing Time
FR25	1/4W	2Ω7	16	Within 60 Seconds

H.8.1. The power rating rating is 1/4W, the resistance value is 2Ω7, apply 16 times of the rated power on the resistor, the sample piece will be fused within 60 seconds. The fusing time calculation is as follows:

$$E=\sqrt{P \bullet R \bullet 16 \text{ times}}$$

H.8.2 Fusing definition: The value of the tested piece becomes magnitude or 100 times or above of the resistance value.

H.8.3 The fusing characteristics will differ from the standard conditions on any values under 2Ω2. Quality representative samples will be submitted for approval prior to production.

I. TERMINAL STRENGTH:

I.1 Terminal tensile:

Fix one end of the terminal firmly, apply a static load of 2.5kgs. (under 1W - 1kg) onto the other terminal for 5 seconds. No observation of any damage or breakage on the terminal.

I.2 Terminal bend:

Fix one end of the terminal firmly, turn the other terminal of 90° rotation and repeat the same test in a reverse direction. No observation of any damage or breakage on the terminal.

I. **TERMINAL STRENGHT:**

I.3 Twist withstand:

To bend the terminal at the point of about 6mm from the resistor body to 90° then catch the terminal at 0.8mm apart from the bent point end and turn it (clockwise) by 360 degrees perpendicular to the resistor axis at a speed of some 5 seconds per turn, and do the same counterclockwise again which constitutes a whole turn. Repeat the turn for 3 times. No observation of any damage or breakage on the terminal.

J. **SOLDERABILITY**

Dip the terminal into a clean solder pot containing flux at room temperature for 5 seconds, the circumference is about 95% of the length of the terminal. The flux is diluted with 25% of IPA. The ratio of the melted solder in the solder pot is tin (60%): lead (40%). During the tin melting process, stir the solder pot well to maintain a constant temperature of 230±5℃. The dipping of the terminal in the solder pot is at the speed of 25 mm/second for 5 seconds. If the terminal still wears any flux after soldering which is to be cleaned with IPA and dry up with a towel.