Approval Sheet

for

Metal Film Resistors
Fusible Type

FRM series

±2% & ±5%

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Rev.	Description	Issue Date	Drawn	Approved
00	issue new spec.	Jul 16, 2007	Sara Lin	Joyce Chung

Description	Metal Film Resistors, Fusible Type		
Series	FRM	Rev.	00

1. PRODUCT:

FLAME-PROOF METAL FILM FUSIBLE RESISTORS

(Normal & Miniature Style)

2. PART NUMBER:

Part number of the flame-proof metal film fusible resistor is identified by the name, power, tolerance, packing, temperature coefficient, special type and resistance value. The 5th color band is white to represent fusible resistors.

Example：

FRM	-50	J	T	-	52-	47R
(1) Series Name	(2) Power Rating	(3) Resistance Tolerance	(4) Packing Style	(5) Temperature Coefficient of Resistance	(6) Special Type	(7) Resistance Value

(1) Style： FRM SERIES

(2) Power Rating： -25=1/4W 、 50S=1/2W 、 -50=1/2W、1WS=1W 、 100=1W、 2WS=2W、 200=2W、3WS=3W

(3) Tolerance： G=±2% 、 J=±5%

(4) Packaging Type： R＝Paper Taping Reel
T＝Tape on Box Packing
B＝Bulk Packing

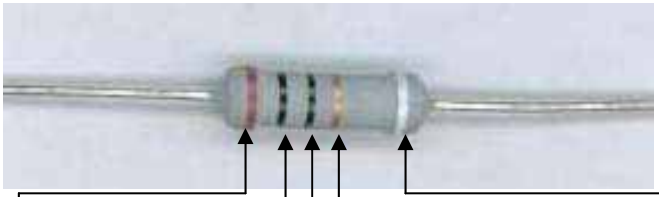
(5) Temperature Coefficient

(6) Special Type： 26-=26mm
52-=52.4mm
73-=73mm
MB=MB-Type Forming
PN=PANAsert (rated watts -25 & 50s size only)
AV=Avlsert (rated watts -25 & 50s size only)

(7) Resistance Value：E24 Series

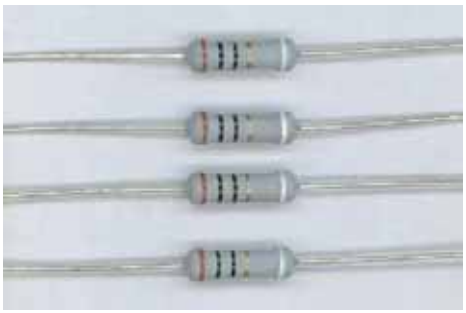
Example： 1R、1R2、1R5、10R、12R、15R、100R……

3. BAND-CODE:

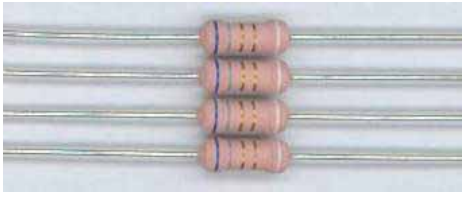


COLOR	1ST BAND	2ND BAND	MULTIPLIER	TOLERANCE	
BLACK		0	1Ω		
BROWN	1	1	10Ω		
RED	2	2	100Ω	± 2 % (G)	
ORANGE	3	3	1KΩ		
YELLOW	4	4	10KΩ		
GREEN	5	5	100KΩ		
BLUE	6	6	1MΩ		
VIOLET	7	7	10MΩ		
GREY	8	8			
WHITE	9	9			FUSIBLE
GOLD			0.1Ω	± 5 % (J)	
SILVER			0.01Ω		

The Surface for Normal Size： (Grey color)



The Surface for Miniature Size： (Pink color)



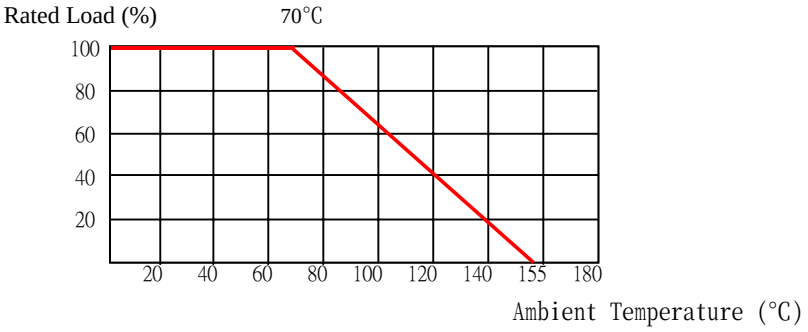
4. ELECTRICAL CHARACTERISTICS

Table I

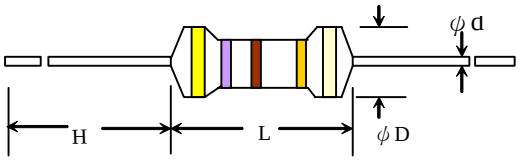
STYLE	FRM-25	FRM50S	FRM-50	FRM1WS	FRM100	FRM2WS	FRM200	FRM3WS
Power Rating at 70 ℃	1/4W	1/2W		1W		2W		3W
Maximum Working Voltage	200V		250V		300V		350V	
Maximum Overload Voltage	400V		500V		600V		700V	
Dielectric Withstanding Voltage	250V				350V			
Resistance Range	4.7Ω ~ 560Ω (±2%) for E24 series & 2.2Ω~560Ω(±5%) for E24 series							
Operating Temp. Range	- 55 ℃ to + 155 ℃							
Temperature Coefficient	±200 ppm /℃							

* Below or over this resistance on request.

5. POWER DERATING CURVE



6. DIMENSIONS



STYLE		DIMENSION			
Normal	Miniature	L	φD	H	φd
FRM-25	FRM50S	6.3±0.5	2.4±0.2	28±2.0	0.55±0.05
FRM-50	FRM1WS	9.0±0.5	3.3±0.3	26±2.0	0.55±0.05
FRM100	FRM2WS	11.5±1.0	4.5±0.5	35±2.0	0.8±0.05
FRM200	FRM3WS	15.5±1.0	5.0±0.5	33±2.0	0.8±0.05

7. ENVIRONMENTAL CHARACTERISTICS

(1) Fusing characteristics

Fusing Voltage = $\sqrt{X * \text{Power Rating} \times \text{Resistance Value}}$

x = 16 or 25

$R < 2.0\Omega$ Fusing time within 30 seconds at 25 times of rated power

$R > 2.2\Omega$ Fusing time within 30 seconds at 16 times of rated power

Fusing residual resistive value at least 100 times rated resistance

(2) Short Time OverLoad Test

At 2.5 times of the rated voltage. (If the voltage exceeds the maximum load voltage, the maximum load voltage will be used as 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

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 % + 0.05Ω

(3) Dielectric Withstanding Voltage

The resistor is placed on the metal V Block. Apply a Table I dielectric withstanding between the terminals connected together with the block for about 60 seconds.
The resistor shall be able to withstand without breakdown or flashover.

(4) Temperature Coefficient Test

Test of resistors above room temperature 100°C ± 2°C (Testing Temperature 115°C to 130°C) 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.

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

R = Resistance value under the testing temperature
R_0 = Resistance value at the room temperature
t = The testing temperature
t_o = Room temperature

(5) Insulation Resistance

Apply test terminal on lead and resistor body.
The test resistance should be high than 100M ohm.

(6) Solderability

Immerse the specimen into the solder pot at 260 ± 5 °C for 5 ± 0.5 seconds.
At least 95% solder coverage on the termination.

(7) Resistance to Solvent

The specimen into the appropriate solvent of IPA condition of ultrasonic machine for 1 minutes.
The specimen is no deterioration of coatings and color code.

(8) Terminal Strength

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 reacheds 5 pounds ◦
The load shall be held for 10 seconds. The load of weight shall be ≧ 2.5 kg (24.5N).

(9) Pulse Overload

Apply 3 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 time ◦
The change of the resistance value shall be within ± 1.0% + 0.05 Ω

(10) Load Life in Humidity

Place the specimen in a test chamber at 40 ± 2 °C and 90 ~ 95 % 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 1,000 hours
The change of the resistance value shall be within ± 5 % + 0.05 Ω

(11) Load Life Test

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.

(12) 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 ◦
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.

Temperature Cycling Conditions:

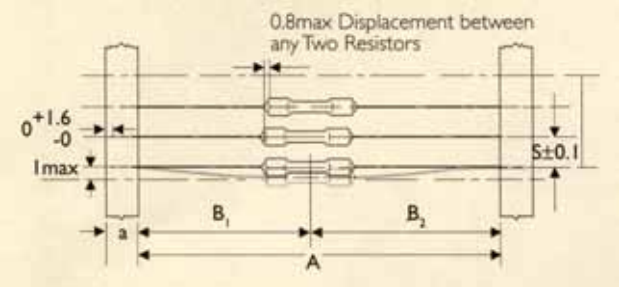
Step	Temperature(°C)	Time (minute)
1	-55 ± 3	30
2	25 ± 3	2 ~ 3
3	155 ± 3	30
4	25 ± 3	2 ~ 3

(13) Resistance to Soldering Heat

The terminal lead shall be dipped into the solder pot at 350 ± 10 °C for 3 ± 0.5 seconds up to 3 mm.
The change of the resistance value shall be within ± 1.0 % + 0.05 Ω

8. PACKING METHODS

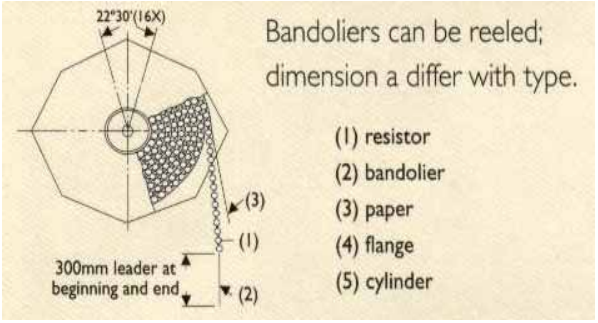
Bandolier for Axial leads

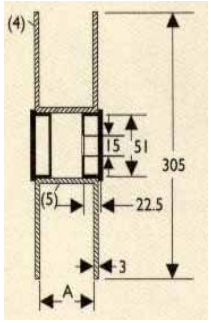


STYLE DIMENIONS Unit: : mm

Normal	Miniature	a	A	B1-B2	S (spacing)	T (max. deviation of spacing)
FRM-25	FRM50S	6 ± 0.5	52.4 ± 1.0	1.2	5	1 mm per 10 spacing 0.5 mm per 5 spacing
			26.0 ± 1.0	1.0		
FRM-50	FRM1WS	6 ± 0.5	52.4 ± 1.0	1.2	5	
FRM100	FRM2WS	6 ± 0.5	73.0 ± 1.5	1.5	5	
			52.4 ± 1.0	1.2		
FRM200	FRM3WS	6 ± 0.5	73.0 ± 1.5	1.5	10	
			52.4 ± 1.0	1.2		

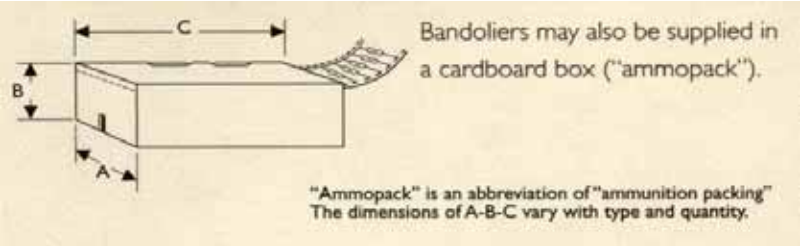
9. TAPE ON REEL PACKING





STYLE		TAPE ON REEL	
Normal	Miniature	ACROSS FLANGE (A)	Qty per reel
FRM-25	FRM50S	72	5,000
FRM-50	FRM1WS	72	2,500
FRM100	FRM2WS	95	2,000
FRM200	FRM3WS	95	1,000

10. TAPE ON BOX PACKING



STYLE		Standard Lead Length			Short Lead Length			Qty per box
Normal	Miniature	W (A)	H (B)	L (C)	W (A)	H (B)	L (C)	
FRM-25	FRM50S	81	104	260	48	102	255	5,000
FRM-50	FRM1WS	73	45	258	____	____	____	1,000
FRM100	FRM2WS	103	78	260	81	91	260	1,000
FRM200	FRM3WS	103	94	260	81	91	260	1,000

11. Plant Address

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