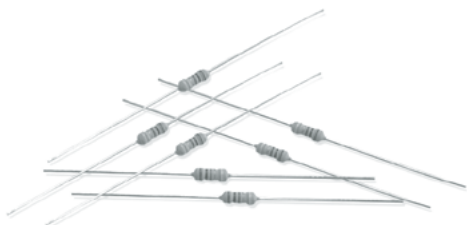


Metal Film Resistors

Fusible & Flame-Proof Type

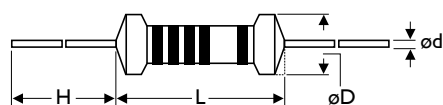
Normal & Miniature Style [FRM Series]



INTRODUCTION

The FRM Series Metal Film Fusible & Flame-Proof Resistors are manufactured using a vacuum sputtering system to deposit multiple layers of mixed metal alloys and passivative materials onto a carefully treated high grade ceramic substrate. After a helical groove has been cut in the resistive layer; tinned connecting leads of electrolytic copper are welded to the end-caps. The resistors are coated with layers of gray color lacquer for normal size & pink color lacquer for miniature size. Overload protection without risk of fire. Wide range of overload currents.

DIMENSIONS



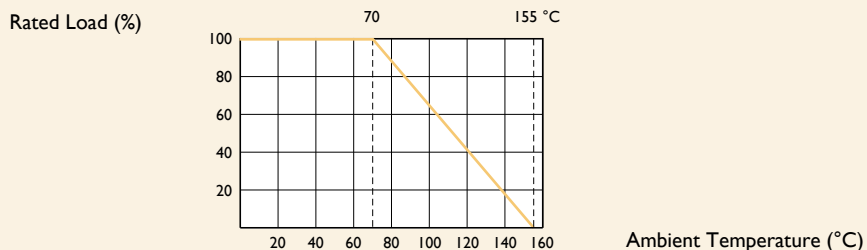
5th color code: white

FEATURES

| | |
|--|------------------------|
| Power Rating | 1/4W, 1/2W, 1W, 2W, 3W |
| Resistance Tolerance | ±2%, ±5% |
| T.C.R. | ±200ppm/°C |
| Flameproof Multi-layer Coating Meets | UL-94V-0 |
| Flameproof Feature Meets Overload Test | UL-1412 |

DERATING CURVE

For resistors operated in ambient temperatures above 70°C, power rating must be derated in accordance with the curve below.



FUSING CHARACTERISTICS

$0.1 \leq R \leq 1\Omega$ Fusing time within 30 seconds at 36 times of rated power

$1 < R \leq 2.0\Omega$ Fusing time within 30 seconds at 25 times of rated power

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

Fusing residual resistive value at least 100 times rated resistance

Unit: mm

| STYLE | | DIMENSION | | | |
|--------|-----------|-----------|---------|--------|-----------|
| Normal | Miniature | L | øD | H | ød |
| 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 |

Note:

ELECTRICAL CHARACTERISTICS

| STYLE | FRM-25 | FRM50S | FRM-50 | FRMIWS | FRMI00 | FRM2WS | FRM200 | FRM3WS |
|-----------------------------|---|--------|--------|--------|--------|--------|--------|--------|
| Power Rating at 70°C | 1/4W | 1/2W | | 1W | | 2W | | 3W |
| Maximum Working Voltage | $\sqrt{P \times R}$ | | | | | | | |
| Voltage Proof on Insulation | 250V | | | | 350V | | | |
| Resistance Range | 1Ω - 560Ω (±2%) for E24 series value & 0.1Ω - 560Ω (±5%) for E24 series value | | | | | | | |
| Operating Temp. Range | -55°C to +155°C | | | | | | | |
| Temperature Coefficient | ±200ppm/°C | | | | | | | |

Note: Special value is available on request

ENVIRONMENTAL CHARACTERISTICS

| PERFORMANCE TEST | TEST METHOD | | APPRAISE |
|-------------------------------|------------------|--|---|
| Short Time Overload | IEC 60115-1 4.13 | 2.5 times RCWV for 5 Sec. | ±2.0%+0.05Ω |
| Voltage Proof on Insulation | IEC 60115-1 4.7 | in V-block for 60 Sec., test voltage by type | By type |
| Temperature Coefficient | IEC 60115-1 4.8 | -55°C to +155°C | By type |
| Insulation Resistance | IEC 60115-1 4.6 | in V-block for 60 Sec. | >100MΩ |
| Solderability | IEC 60115-1 4.17 | 235±5°C for 3±0.5 Sec. | 95% Min. coverage |
| Solvent Resistance of Marking | IEC 60115-1 4.30 | IPA for 5±0.5 Min. with ultrasonic | No deterioration of coatings and markings |
| Robustness of Terminations | IEC 60115-1 4.16 | Direct load for 10 Sec. in the direction of the terminal leads | ≥2.5kg (24.5N) |
| Periodic-pulse Overload | IEC 60115-1 4.39 | 4 times RCWV 10,000 cycles (1 Sec. on, 25 Sec. off) | ±1.0%+0.05Ω |
| Damp Heat Steady State | IEC 60115-1 4.24 | 40±2°C, 90-95% RH for 56 days, loaded with 0.1 times RCWV | ±5.0%+0.05Ω |
| Endurance at 70°C | IEC 60115-1 4.25 | 70±2°C at RCWV for 1,000 Hr. (1.5 Hr. on, 0.5 Hr. off) | ±5.0%+0.05Ω |
| Temperature Cycling | IEC 60115-1 4.19 | -55°C ⇌ Room Temp. ⇌ +155°C ⇌ Room Temp. (5 cycles) | ±2.0%+0.05Ω |
| Resistance to Soldering Heat | IEC 60115-1 4.18 | 260±3°C for 10±1 Sec., immersed to a point 3±0.5mm from the body | ±1.0%+0.05Ω |
| Accidental Overload Test | IEC 60115-1 4.26 | 4 times RCWV for 1 Min. | No evidence of flaming or arcing |

Note: RCWV(Rated Continuous Working Voltage) = $\sqrt{\text{Power Rating} \times \text{Resistance Value}}$ or Max. working voltage listed above, whichever less.

Revision: 201304