# (FMF) Power Metal Film Flame-Proof Resistors

**Token Electronics Industry Co., Ltd.**

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## ▶ Product Introduction

### Flame Proof Resistor (FMF), low TCR, low noise and high precision for telecommunication, consumer products.

**Features :**
- High power in small packages, Low electrical noise.
- Outstanding stability under a wide range of electrical and environmental stresses.
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes.
- Compatible with "Restriction of the use of Hazardous Substances" (RoHS) directive 2011/65/EU.

**Applications :**
- Ballasts, Amplifiers, Power Supplies, Telecommunications
- Household Appliances, Automotive, Computer, Precision Controls
- Test Equipment and Instrumentation, Medical Equipment, Security Monitoring

Token Electronics is a global engineering electronics supplier for performance-critical applications, introducing the (FMF) series of Power Metal Film Flame-Proof Resistors. Offering a combination of high precision and handling high power conditions, this resistor is ideal for measuring power line voltage for power condition and energy metering monitoring.

Token (FMF) Flame-Proof Resistor is designed to provide an alternative options between Power Metal Oxide Resistors (RSS, RSN) and Precision Metal-Film Resistors (MF). The (FMF) takes the power handling with flame-proof advantage of metal oxide resistors and inherits the precision tolerance of (MF) metal film resistors to provide a solution for customers looking for an industrial grade flame-proof resistors.

The power of Flame-Proof Resistor (FMF) is rated at 1/4, 1/2WS, 1/2W, 1W, 2WS, 2W, 3WS, 3W, 5WS, 5W, and 7WS respectively. Standard values from 0.1Ω to 10MΩ are available, E24, E-96, and E-192 nominal standard series provides adequate "'close value match" choice for designers. Maximum overload voltage specifies up to 1000V at 5W normal size or 7WS minimum size.

The (FMF) resistors have excellent high power characteristics to improve reliability and reduce faults. With precision levels of ±0.1% resistance tolerance and ±15ppm/°C TCR they free up designers' error budgets, enabling savings elsewhere in the circuit. Accuracy is ± 0.1%, ± 0.25%, ± 0.5%, ± 1%, ± 2%, and ± 5% precision tolerance, which saves the designer's error budget and free up other parts of the circuit.

Structurally the resistors include a homogeneous sputtered metal alloy film on a high-aluminum ceramic rod and protect with flame-proof coating. The resistance value in the film was adjusted to the final value by laser spiral cutting. The terminals on both ends of the resistor are covered with a pure tin coating to avoid aging the contacts and a low melting point solder can be used thereon. Contact us with your specific needs. For more information, please link to Token official website "General Purpose Resistors".

## ▶ Dimensions & Specifications

### Specifications & Dimensions (Unit: mm) (FMF)

| Style FMF | | Dimensions (Unit: mm) | | | | Operating Temp. Range (℃) | Max Working Voltage (V) | | Max Overload Voltage (V) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Normal | Mini | L | D | H | d ± 0.1 | | Normal | Mini | Normal | Mini |
| 1/4W | 1/2WS | 6.3±0.5 | 2.3±0.3 | 28±2.0 | 0.55 | -55 ~ +155 | 300 | 200 | 500 | 400 |
| 1/2W | 1WS | 9.0±1.0 | 3.2±0.5 | 26±3.0 | 0.65 | | 350 | 250 | 600 | 500 |
| 1W | 2WS | 11.5±1.0 | 4.5 ±0.5 | 33 ±3.0 | 0.78 | | 350 | 300 | 700 | 600 |
| 2W | 3WS | 15.5±1.0 | 5.0±0.5 | 32±3.0 | 0.78 | | 350 | 350 | 700 | 700 |
| 3W | 5WS | 17.5±1.0 | 6.5±0.5 | 35±3.0 | 0.78 | | 500 | 350 | 1000 | 700 |
| 5W | 7WS | 24.5±1.0 | 8.5±0.5 | 35±3.0 | 0.78 | | 600 | 500 | 1000 | 800 |
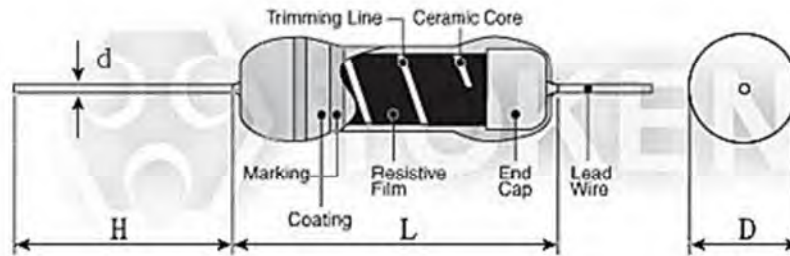


**Specifications & Dimensions (Unit: mm) (FMF)**

● **Remark:**
The maximum value of D.C. voltage or A.C. voltage (commercial frequency effective value) capable of being applied continuously to resistors at the rated ambient temperature. Rated voltage shall be calculated from the following formula. However, it shall not exceed the maximum working voltage.
Rated Voltage (RCWV) = √Rated Power (W) x Nominal Resistance Value (Ω)

## Resistance & TCR

### Resistance & TCR Range (FMF)

| Style | | Tolerance (%) | TCR (ppm/℃)/ Ω | | | | |
|---|---|---|---|---|---|---|---|
| Normal | Mini | | ±15 | ±25 | ±50 | ±100 | ±200 |
| 1/4W | 1/2WS | ±5% | | | | | 0.1Ω~10MΩ |
| | | ±2% | | | | | 0.1Ω~10MΩ |
| | | ±1% | 10Ω~1MΩ | 10Ω~10MΩ | 10Ω~10M | 0.1Ω~10MΩ | 0.1Ω~10MΩ |
| | | ±0.5% | 10Ω~1MΩ | 10Ω~10MΩ | 10Ω~10M | 0.1Ω~10MΩ | |
| | | ±0.25% | 10Ω~1MΩ | 10Ω~1MΩ | 10Ω~1MΩ | 0.1Ω~1MΩ | |
| | | ±0.1% | 10Ω~1MΩ | 10Ω~1MΩ | 10Ω~1MΩ | | |
| 1/2W | 1WS | ±5% | | | | | 0.1Ω~10MΩ |
| | | ±2% | | | | | 0.1Ω~10MΩ |
| | | ±1% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | 0.1Ω~10MΩ |
| | | ±0.5% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | |
| | | ±0.25% | | 10Ω~1MΩ | 10Ω~1MΩ | 0.1Ω~1MΩ | |
| | | ±0.1% | | 10Ω~1MΩ | 10Ω~1MΩ | | |
| 1W | 2WS | ±5% | | | | | 0.1Ω~10M |
| | | ±2% | | | | | 0.1Ω~10M |
| | | ±1% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | 0.1Ω~10M |
| | | ±0.5% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | |
| | | ±0.25% | | 10Ω~1MΩ | 10Ω~1MΩ | 0.1Ω~1MΩ | |
| | | ±0.1% | | 10Ω~1MΩ | 10Ω~1MΩ | | |
| 2W | 3WS | ±5% | | | | | 0.1Ω~10MΩ |
| | | ±2% | | | | | 0.1Ω~10MΩ |
| | | ±1% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | 0.1Ω~10MΩ |
| | | ±0.5% | | 10Ω~1MΩ | 10Ω~10MΩ | 0.1Ω~10MΩ | |
| | | ±0.25% | | 10Ω~1MΩ | 10Ω~1MΩ | 0.1Ω~1MΩ | |
| | | ±0.1% | | 10Ω~1MΩ | 10Ω~1MΩ | | |
| 3W | 5WS | ±5% | | | | | 0.1Ω~10MΩ |
| | | ±2% | | | | | 0.1Ω~10MΩ |
| | | ±1% | | | | 0.1Ω~100KΩ | 0.1Ω~10MΩ |
| | | ±0.5% | | | | 10Ω~100KΩ | |
| 5W | 7WS | ±5% | | | | | 0.1Ω~100KΩ |
| | | ±2% | | | | | 0.1Ω~100KΩ |
| | | ±1% | | | | 0.1Ω~100KΩ | 0.1Ω~100KΩ |
| | | ±0.5% | | | | 10Ω~100KΩ | |

* Resistance standard decade values E-24, E-96, E-192.

# Electrical Performance

## Electrical Performance (FMF)

| Test Characteristics | Test Methods | Performance Requirement |
|---|---|---|
| **Resistance** | Measuring points at 10mm±1mm from the end cap. | Within regulated tolerance |
| **T.C.R.** | Room temperature /100°C up. | ± 15, ± 25, ± 50, ± 100,± 200ppm/℃ |
| **Short Time Overload** | Rated voltageX2.5 or Max. overload voltage for 5s whichever less. | ±(2%+0.1Ω) |
| **Solderability** | 260°C±5°C, 2s±0.5s | 90% Coverage Min. |
| **Terminal strength** | Direct load: 25N, 10s<br>Twist test:360°, 5 times<br>Bending test:5N, 90°, 2 times | No mechanical damages |
| **Moisture resistance** | 40°C±2°C, 90%~95%RH, 1000Hrs, 1.5Hrs on/0.5Hr off cycle | ±(5%+0.1Ω) |
| **Load Life** | 70°C±2°C, 1000Hrs, 1.5Hr on/0.5Hr off cycle. | ±(5%+0.1Ω) |

# ► Derating Curve & Temperature

## Hot-Spot Temperature (FMF)

**HOT-SPOT TEMPERATURE**
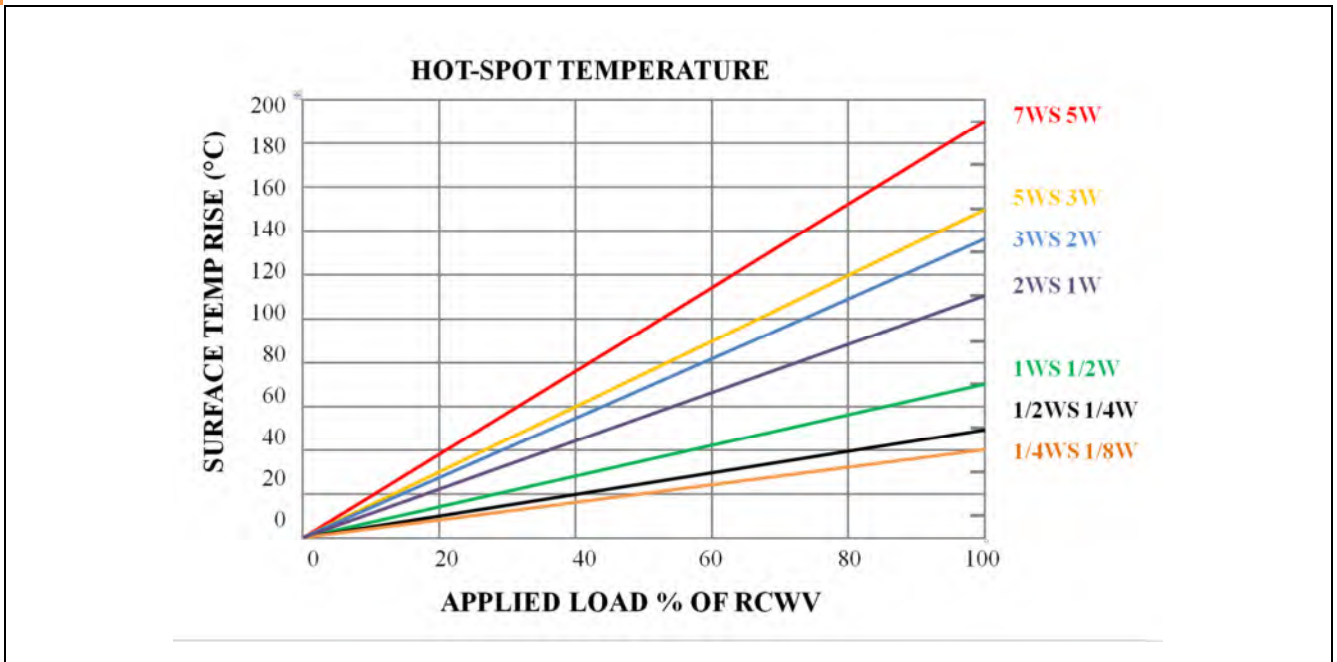


## Derating Curve (FMF)

**Power Graph**
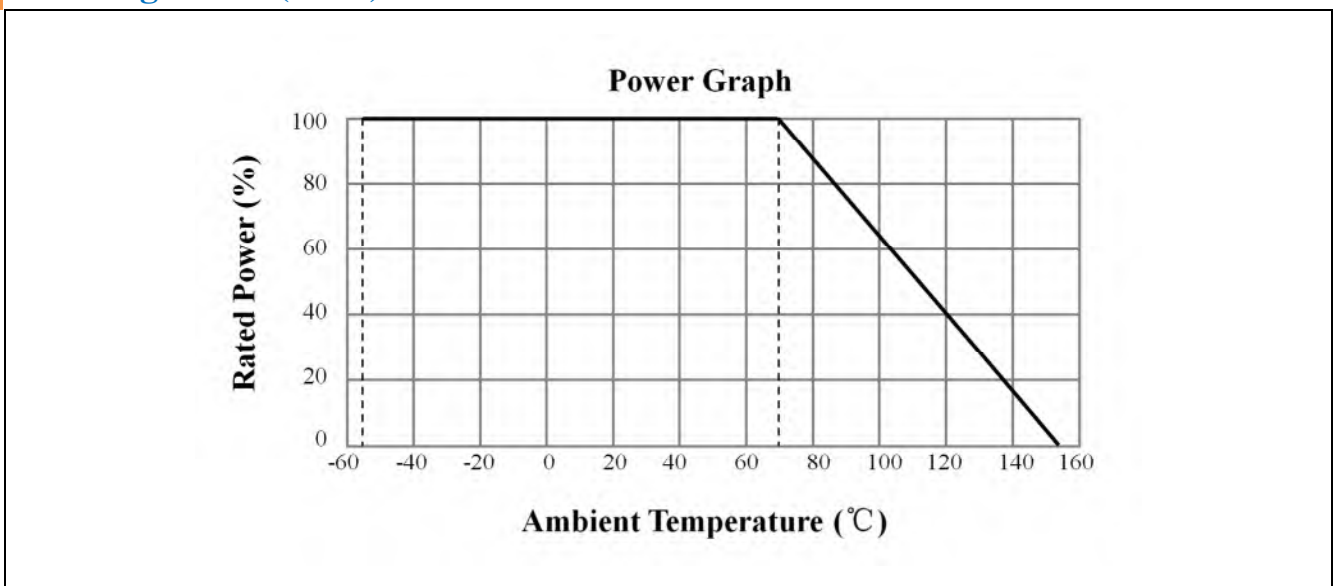
## ▶ Order Codes

### Order Codes (MF)

| FMF | - | 1/2W | 100R | J | | T52 |
|---|---|---|---|---|---|---|
| Part Number | | Rated Power (W) | Resistance Value (Ω) | Resistance Tolerance (%) | TCR(ppm/℃) | Package |
| FMF | | 1/4W | 10R / 10Ω | J / ±5% | / ±200ppm/℃ | T52 / Taping 52mm/Box. |
| | | 1/2WS | 100R / 100Ω | G / ±2% | C1 / ±100ppm/℃ | T73 / Taping 73mm/Box. |
| | | 1/2W | 1K / 1KΩ | F / ±1% | C2 / ±50ppm/℃ | T88 / Taping 88mm/Box. |
| | | 1W | 10K / 10KΩ | D / ±0.5% | C3 / ±25ppm/℃ | |
| | | 2WS | | | C5 / ±15ppm/℃ | |
| | | 2W | | | | |
| | | 3WS | | | | |
| | | 3W | | | | |
| | | 5WS | | | | |
| | | 5W | | | | |
| | | 7WS | | | | |

# ▶ General Information

### General Purpose Resistors with Customized Service

Token Electronics is expanding business to include a broad range of General Purpose Resistor products designed for high volume applications. This expanded range of commercial resistor presents a more comprehensive product offering for Customer Experience Management (CEM) and other high volume customers that require quality products at competitive pricing.

Backed by the same customer service, technical support and quality assurance that Token has always provided, these new commercial products enable you the opportunity to source a wider range of resistors from a trusted supplier.

### General Use

When an ambient temperature exceeds a rated ambient temperature, resistor shall be applied on the derating curve by derating the load power. General purpose resistor under overloads is not combustion resistant and is likely to emit, flame, gas, smoke, red heat, etc. Flame retardant resistor generally emits smoke and red heat in a certain power and over but do not emit fire or flame.

When resistors are shielded or coated with resin etc., stress from the storage heat and the resins are applied. So, performance and reliability should be checked well before use.

When a voltage higher than rated is applied in a short time (single pulse, repeated pulses, surge, etc.), it does not necessarily ensure safety that an effective wattage is not higher than a rated wattage. Then consult with us with your specified pulse wave shape. Resistors shall be used in a condition causing no dew condensation.

Keep temperature from rising by choosing resistor with a higher rated capacity; do not use a component having the exact load value required. For considerations of safety in extended period applications, the rating should be more than four times higher than the actual wattage involved, but never use resistors at less than 25% of its rated power.

In applications where resistors are subject to intermittent current surges and spikes, be sure in advance that the components selected are capable of withstanding brief durations of increased load.

Do not exceed the recommended rated load. Resistor must use within the rated voltage range to prevent the shortening of service life and/or failure of the wound resistance elements.

Minimum load: Resistor must be utilized at 1/10 or more of the rated voltage to prevent poor conductance due to oxidation build-up. For basic particulars for cautions, refer to EIAJ Technical Report RCR-2121 "Guidance for care note on fixed-resistors".