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SPECIFICATION FOR APPROVAL

DATE :

CUSTOMER :

PART NAME :

Metal Strip Type Halogen Free Current Sensing Resistors

CUSTOMER'S DWG. NO. :

CUSTOMER'S PART NO. :

PDC PART NO. :

FMF SERIES APPROVED

DESCRIPTION. :

| RESULT | ACTION | " V " | CUSTOMER'S SIGNATURE | NOTE |
|----------------------|--------|-------|----------------------|------|
| FULL APPROVED | | | | |
| CONDITIONAL APPROVED | | | | |
| REJECTED | | | | |

| OUR ACTION | SIGNATURE |
|-------------|-------------|
| PREPARED By | Jenny Tseng |
| CHECKED By | Tony Chou |
| APPROVED By | Byron Tsai |

CUSTOMER SIGNATURE FOR
ACCEPTANCE

| | |
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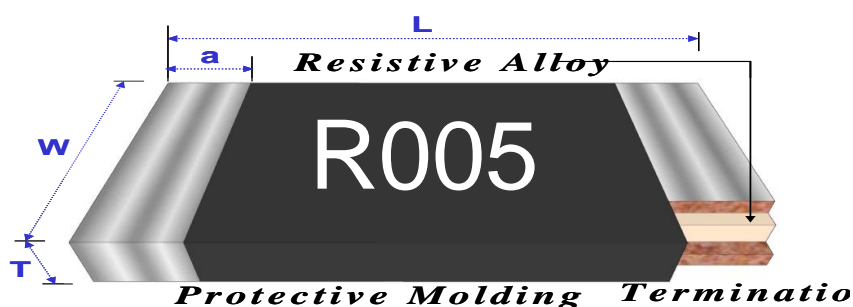
1. Features

- High power rating and low TCR.
- Low resistance and high precision (1%).
- Low inductance design, less than 1.0nH available.
- Excellent reliability and suitable cost.
- Suitable for lead free soldering.
- High precision trimming implement.
- RoHS compliant & Halogen Free.

2.Applications

- Switching model power supply.
- Battery pack.
- Notebook, Tablet PC
- Test Instrument.
- Power Amplifier.

3.Dimension and Construction



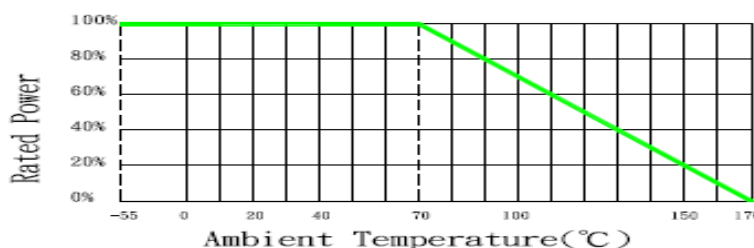
| Item | Protective Molding | Resistive Element | Internal Terminal | External Terminal |
|----------|--------------------|-------------------|-------------------|-------------------|
| Material | Resin | Alloy Metal | Copper | Solder |

Unit : mm

| Type | L | W | T | a |
|-----------------|-----------|-----------|-----------|-----------|
| FMF06 3m~30m | 3.10±0.20 | 1.65±0.20 | 0.60±0.20 | 0.60±0.20 |
| FMF25 3m~220m | 6.20±0.20 | 3.25±0.20 | 0.60±0.20 | 0.80±0.20 |
| FMF25 3W series | 6.20±0.20 | 3.25±0.20 | 0.65±0.20 | 0.80±0.20 |
| FMF25 1m~2m | 6.40±0.20 | 3.25±0.20 | 0.70±0.20 | 2.00±0.20 |

4.Power Derating Curve

Operating Temperature Range: -55 to +170 deg.C



5. Rating

Table A.

| Rating Type | Tolerance (%) | Rating 70°C (W) | Max. Working Current (Voltage)* | Max. Overload Current (Voltage)* | Alloy Type | Temperature coefficient of Resistance (ppm/°C)** | Resistance (mΩ) *** |
|-----------------------------|---|-----------------------|--|---|---------------|---|---|
| FMF06 1206 | ±1%(F) ±2%(G) ±5%(J) | 0.5 | 12.9A (111mV) | 28.9A (250mV) | Low EMF | ±70 | 3,4,5,6,7,8,9, 10,15,20,25 |
| | | | 10.0A (111mV) | 22.4A (250mV) | Standard | ±50 | 5,10,15,15.5 18,20,25,30 |
| | | 1 | 18.3A (158mV) | 40.8A (354mV) | Low EMF | ±70 | 3,4,5,6,7,8,9, 10,15,20,25 |
| | | | 14.1A (173mV) | 31.6A (387mV) | Standard | ±50 | 5,10,15,15.5 18,20,25,30 |
| FMF25 2512 | ±1%(F) ±2%(G) ±5%(J) | 1 | 31.6A (158mV) | 70.7A (354mV) | Low EMF | ±70 | 1,2,3,4,5 10,15,20,25 |
| | | | 18.3A (469mV) | 40.8A (1049mV) | Standard | ±50 | 3,4,5,6,7,8,9,10 12,15,20,22,25,30 33,35,40,50,60,70 75,80,100 |
| | | 2 | 44.7A (224mV) | 100A (500mV) | Low EMF | ±70 | 1,2,3,4,5 10,15,20,25 |
| | | | 25.8A (663mV) | 57.7A (1483mV) | Standard | ±50 | 3,4,5,6,7,8,9,10 12,15,20,22,25,30 33,35,40,50,60,70 75,80,100 |

Note:

- (i) $E = \sqrt{P \cdot R}$ or Max. Working Voltage whichever is lower.
- (ii) E : Working Voltage(V) , P : Rated Power (W) , R : Resistance Value(Ω)
- (iii) Solder-pad and trace size should be >300 mm² and board surface temperature should not exceed 105°C when applying rated power
- (iv) * : Related number are depend on specific items only. ** : TCR Hot (+25~+155°C).
*** : Special requests and details please contact factory.

Table B.

| Rating Type | Rating 70°C (W) | Max. Working Current (Voltage)* | Max. Overload Current (Voltage)* | Resistance Tolerance (%) | Temperature coefficient of Resistance (ppm/°C)** | Resistance (mΩ) *** |
|-----------------------------------|--------------------|--|---|--------------------------------|---|---|
| FMF25 2512 Low EMF | 3 | 31.6A (245mV) | 70.7A (548mV) | ±1%(F) ±2%(G) ±5%(J) | ±70 | 3,4,5,6,7,8,9,10 |
| | | | | | ±50 | 20 |
| FMF25 2512 Standard | 3 | 24.5A (812mV) | 54.8A (1817mV) | ±1%(F) ±2%(G) ±5%(J) | ±70 | 5,6,8,10 |
| | | | | | ±50 | 12,14,15,16,18,20 25,30,33,35,40,50 60,75,80,100 |

Note:

- (v) $E = \sqrt{P \cdot R}$ or Max. Working Voltage whichever is lower.
- (vi) E : Working Voltage(V) , P : Rated Power (W) , R : Resistance Value(Ω)
- (vii) Solder-pad and trace size should be >300 mm² and board surface temperature should not exceed 105°C when applying rated power
- (viii) * : Related number are depend on specific items only. ** : TCR Hot (+25~+155°C).
*** : Special requests and details please contact factory.

Table C. Metal Jumper

| Rating Type | Max. Working Current | Max. Overload Current | Resistance |
|---|-------------------------|--------------------------|-------------------|
| FMF06 1206 FMF06JTH000 -LH | 80A | 100A | Max. 0.2mΩ |
| FMF25 2512 FMF25JPJ000 -LH | 120A | 150A | Max. 0.1mΩ |

※Temperature Coefficient Resistance not applicable.

6.Part Number

| Type | Size | Tolerance | Packing | Watt | Value | TCR | Special Code |
|------------|-----------------|--------------------------------|--|--|---|-------------------------------------|--|
| FMF | 06 :1206 | F :±1% | T :Paper Tape 4Kpcs (For 1206) | F : 1/2W | XXXX 4 digit | ∓ : As Rating Info | General LH : Standard |
| | 25 :2512 | G :±2% J :±5% | P :Plastic Tape 4Kpcs (For 2512) | H : 1W J : 2W K : 3W | Jumper : 000_ _: means blank. | X : Code of R001.R002. | Low EMF AEC-Q200 LHM : Standard BHM : Low EMF |

Example :

FMF25FPJR005-BH

→Metal strip, 2512 size, ±1%, plastic tape, 2W, 5mΩ , low emf

FMF25FPKR010-BHM

→Metal strip, 2512 size, ±1%, plastic tape, 3W, 10mΩ , low emf, AEC-Q200

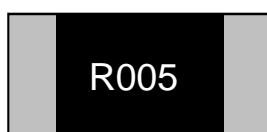
FMF25FPJR002XBH

→Metal strip, 2512 size, ±1%, plastic tape, 2W, 2mΩ , low emf, General

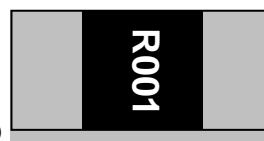
7.Marking

FMF 1206/2512

TOP : Marking. (4 Digits marking to identify the resistance value.)



R005=5mΩ /15L5=15.5mΩ

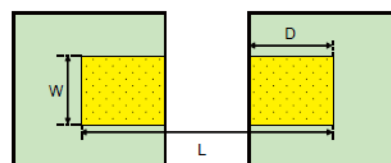


R001=1 mΩ

Recommend Solder Pad Dimensions :

| Type | W | D | L |
|----------------------------------|------|------|------|
| FMF06 | 1.80 | 1.30 | 4.70 |
| FMF25 | 3.70 | 1.60 | 7.60 |
| FMF25 R001/R002 | 4.00 | 3.00 | 7.30 |

Unit:mm



8. Reliability Performance (AEC-Q200)

* Normal test items for standard product.

| Test Item | Specification | Test Method (AEC-Q200. IEC 60115) |
|-------------------------------------|---|--|
| *DC Resistance | F : $\pm 1\%$ 、G : $\pm 2\%$ 、J : $\pm 5\%$ | AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value. |
| High Temperature Exposure (Storage) | J、G : $\Delta R \leq \pm(3\%+0.5m\Omega)$ F : $\Delta R \leq \pm(1\%+0.5m\Omega)$ | AEC-Q200 TABLE 7.3 1000 hrs. @ T=125°C. Unpowered. Measurement at 24 ± 2 hours after test conclusion. |
| *Temperature Cycling | J、G : $\Delta R \leq \pm(1\%+1m\Omega)$ F : $\Delta R \leq \pm(0.5\%+1m\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.4 1000 Cycles (-55°C to +125°C). Measurement at 24 ± 2 hours after test conclusion. |
| Moisture Resistance | J、G : $\Delta R \leq \pm(1\%+0.5m\Omega)$ F : $\Delta R \leq \pm(0.5\%+0.5m\Omega)$ | AEC-Q200 TABLE 7.6 Test 65°C/80~100%RH/10Cycles. Measurement at 24 ± 2 hours after test conclusion. (t=24hrs/cycle). |
| Biased Humidity | J、G : $\Delta R \leq \pm(3\%+0.5m\Omega)$ F : $\Delta R \leq \pm(1\%+0.5m\Omega)$ | AEC-Q200 TABLE 7.7 1000 hours 85°C/85%RH. 10% of operating power. Measurement at 24 ± 2 hours after test conclusion. |
| Operational Life | J、G : $\Delta R \leq \pm(3\%+0.5m\Omega)$ F : $\Delta R \leq \pm(1\%+0.5m\Omega)$ | AEC-Q200 TABLE 7.8 Test 1000hr @ TA=125°C at specified rated power. Measurement at 24 ± 2 hours after test conclusion. |
| External Visual | No visual damage and refer PDC marking code. | AEC-Q200 TABLE 7.9 Inspect device construction, marking and workmanship. |
| Physical Dimension | Within the spec. | AEC-Q200 TABLE 7.10 Verify physical dimensions to the applicable device detail specification. |

| | | |
|-----------------------------------|---|---|
| Mechanical Shock | Within product specification tolerance and no visible damage. | AEC-Q200 TABLE 7.13 Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec. |
| Vibration | No mechanical damage. | AEC-Q200 TABLE 7.14 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz. |
| *Resistance to Solder Heat | J、G : $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.15 Solder dipping @ 270°C ±5°C for 10sec.±1sec. |
| Thermal Shock | J、G : $\Delta R \leq \pm(1\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(0.5\% + 0.5m\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.16 -55 to 155°C / dwell time 15min/ Max transfer time 20sec/ 300cycles. |
| ESD | $\Delta R \leq \pm(1\% + 0.5m\Omega)$ No mechanical damage. | AEC-Q200-002 Test contact min. 1KV. |
| *Solder Ability | Over 95% of termination must be covered with solder. | AEC-Q200 TABLE 7.18 a)Baking 155°C 4H, dipping 235°C 5s b)Steam 1H, dipping 215°C 5s c)Steam 1H, dipping 260°C 7s |
| Flammability | Refer UL-94. | AEC-Q200 TABLE 7.20 UL-94 V-0 or V-1 are acceptable |
| *Board Flex | J、G : $\Delta R \leq \pm(1\% + 1m\Omega)$ F : $\Delta R \leq \pm(0.5\% + 1m\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.21 Bending 2mm 2512.1206 |
| Terminal Strength | No mechanical damage | AEC-Q200 TABLE 7.22 Force 1 Kg for 60 seconds. |

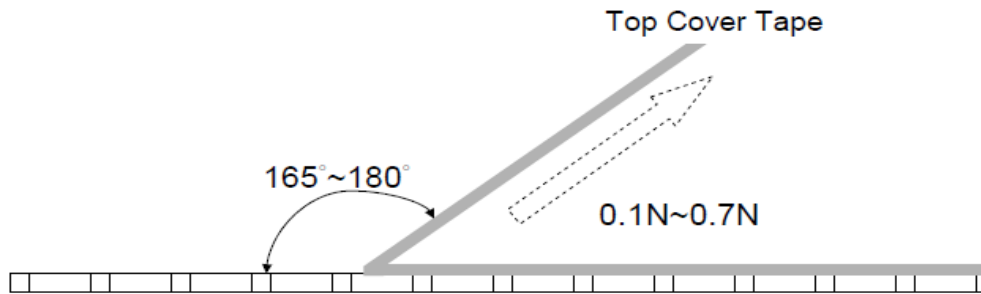
| | | |
|---|--|--|
| *Short Time Overload | J · G : $\Delta R \leq \pm(2\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(1\% + 0.5m\Omega)$ | IEC 60115-1, Clause 4.13 5 × Rated power for 5 seconds |
| *Load Life Humidity | J · G : $\Delta R \leq \pm(3\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(1\% + 0.5m\Omega)$ | IEC 60115-1, Clause 4.24 40±2°C with relative humidity 90% ~ 95% D.C. rated voltage for 1.5 hours ON 30 minutes OFF. Cycle repeated 1000 hours. |
| *Temperature Coefficient of Resistance (TCR) | Within the spec. | IEC 60115-1, Clause 4.8 $TCR = \frac{R_2 - R_1}{R_1} \times 10^6 / (T_2 - T_1)$ Test temperature : 25°C ~ +155°C TCR(ppm/°C) = (R ₂ -R ₁)/R ₁ ×1 / (T ₂ -T ₁)×10 ⁶ (+25~ -55°C please contact factory.) |
| *Load Life | J · G : $\Delta R \leq \pm(3\% + 0.5m\Omega)$ F : $\Delta R \leq \pm(1\% + 0.5m\Omega)$ | IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at 70±2°C. Cycle repeated 1000 hours. |
| *Insulation Resistance | Between termination and coating must over 1000MΩ | IEC 60115-1, Clause 4.6 Test voltage : 100±15V |

9. PACKAGING

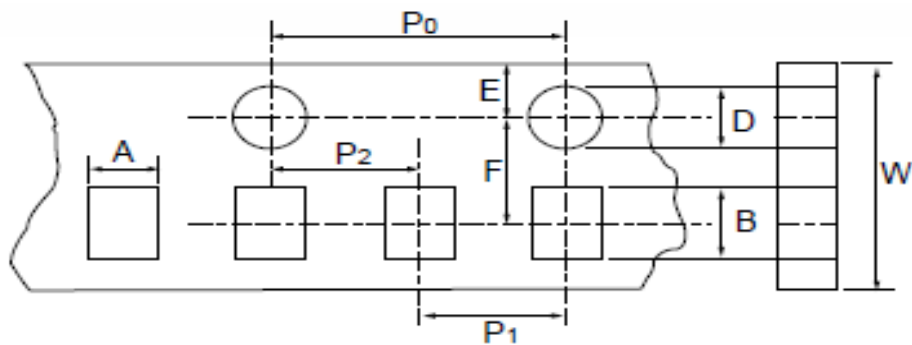
9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall be between 0.1 to 0.7N



9.2 Tape Packaging Dimensions

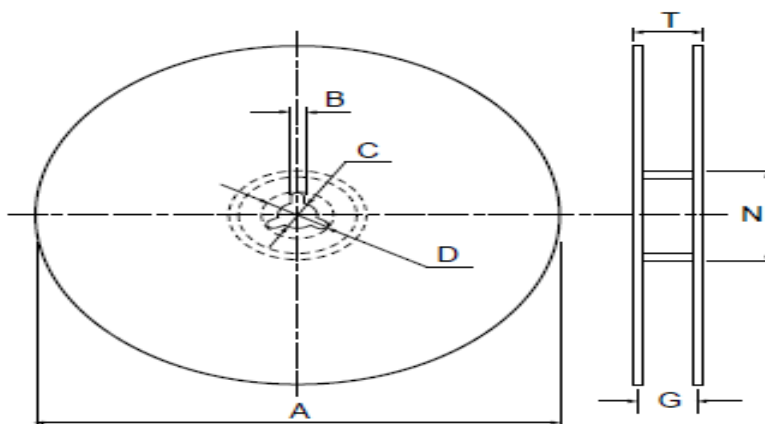


- Accumulated dimensional tolerance $40 \pm 0.2 \text{ mm}$

| Size | A | B | W | F | E | P1 | P2 | P0 | D |
|------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1206 | 2.00 ± 0.20 | 3.60 ± 0.20 | 8.00 ± 0.30 | 3.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | 1.50 ± 0.10 |
| 2512 | 3.50 ± 0.20 | 6.75 ± 0.20 | 12.0 ± 0.30 | 5.50 ± 0.05 | 1.75 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 4.00 ± 0.10 | 1.50 ± 0.10 |

unit : mm

9.3 Reel Dimensions



| Size | Packaging Q'ty | A | N | C | D | B | G | T |
|------|----------------|-----------|-----------|----------|----------|---------|----------|----------|
| 1206 | 4kpcs/Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 2512 | 4kpcs/Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 16.7max. |
| | 8kpcs/Reel | 254.0±2.0 | 100.0±0.5 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 20.0max. |
| | 16kpcs/Reel | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 20.0max. |

10. Storage & Handling

... Products are recommended to be used up within one year as ensured shelf life.

Check solder ability in case shelf life extension is needed.

... To store products with following condition:

Temperature: 5 to 40°C ; Humidity: 20 to 70% relative humidity.

Precaution for use :

The AEC-Q200 series resistors is mainly used on general automotive equipment without safety considerations. Please contact our company in advanced if you intend to use resistor for designing the equipment which may damage itself and the safety of third party. If necessary, please consider to add the protect circuit in devising process and obtaining fully safety evaluation. The contents of the acknowledgment is only used for our parent company, marketing subsidiaries and official marketing agents who purchase our products. Not applicable for the other nonofficial channels.

※ All product specification and data are subject to change without notice.