

# FM4001-AF-Q1 THRU FM4007-AF-Q1

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# FM4001-AF-Q1 THRU FM4007-AF-Q1

## 1.0A Surface Mount General Purpose Rectifiers 50V-1000V

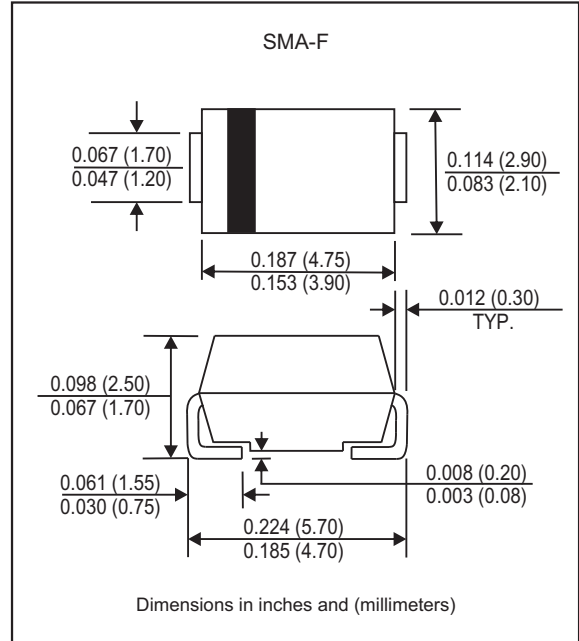
### Features

- For surface mounted applications
- Low reverse leakage
- Built-in strain relief, ideal for automated placement
- High forward surge current capability
- Lead free finish, RoHS compliant
- Qualified to AEC-Q101 standards for high reliability
- Suffix "-H" indicates Halogen-free parts, ex. FM4001-AF-Q1-H.

### Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Case : Molded plastic, DO-214AC / SMA-F
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any
- Weight : Approximated 0.07 gram

### Package outline



### Maximum ratings (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| PARAMETER                                                             | SYMBOLS   | FM4001-AF-Q1 | FM4002-AF-Q1 | FM4003-AF-Q1 | FM4004-AF-Q1 | FM4005-AF-Q1 | FM4006-AF-Q1 | FM4007-AF-Q1 | UNIT               |
|-----------------------------------------------------------------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------------|
| Maximum repetitive peak reverse voltage                               | $V_{RRM}$ | 50           | 100          | 200          | 400          | 600          | 800          | 1000         | V                  |
| Maximum RMS voltage                                                   | $V_{RMS}$ | 35           | 70           | 140          | 280          | 420          | 560          | 700          | V                  |
| Maximum DC blocking voltage                                           | $V_{DC}$  | 50           | 100          | 200          | 400          | 600          | 800          | 1000         | V                  |
| Maximum average forward rectified current                             | $I_O$     | 1.0          |              |              |              |              |              |              | A                  |
| Peak forward surge current 8.3ms single half sine-wave (JEDEC method) | $I_{FSM}$ | 30           |              |              |              |              |              |              | A                  |
| Typical junction capacitance (Note 1)                                 | $C_J$     | 18           |              |              |              |              |              |              | pF                 |
| Operating junction temperature range                                  | $T_J$     | -55 to +150  |              |              |              |              |              |              | $^{\circ}\text{C}$ |
| Storage temperature range                                             | $T_{STG}$ | -55 to +150  |              |              |              |              |              |              | $^{\circ}\text{C}$ |

### Electrical characteristics (AT $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| PARAMETER                                                                                                  | SYMBOLS | FM4001-AF-Q1 | FM4002-AF-Q1 | FM4003-AF-Q1 | FM4004-AF-Q1 | FM4005-AF-Q1 | FM4006-AF-Q1 | FM4007-AF-Q1 | UNIT          |
|------------------------------------------------------------------------------------------------------------|---------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Maximum instantaneous forward voltage at $I_F=1.0\text{A}$                                                 | $V_F$   | 1.1          |              |              |              |              |              |              | V             |
| Maximum DC reverse current $T_A=25^{\circ}\text{C}$ at rated DC blocking voltage $T_A=100^{\circ}\text{C}$ | $I_R$   | 2.0<br>200.0 |              |              |              |              |              |              | $\mu\text{A}$ |

### Thermal characteristics

| PARAMETER                                               | SYMBOLS         | FM4001-AF-Q1 | FM4002-AF-Q1 | FM4003-AF-Q1 | FM4004-AF-Q1 | FM4005-AF-Q1 | FM4006-AF-Q1 | FM4007-AF-Q1 | UNIT                        |
|---------------------------------------------------------|-----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-----------------------------|
| Typical thermal resistance junction to ambient (Note 2) | $R_{\theta JA}$ | 80           |              |              |              |              |              |              | $^{\circ}\text{C}/\text{W}$ |

Note1: Measured at 1MHz and applied reverse voltage of 4.0V D.C.  
2: P.C.B. mounted with 0.2x0.2"(5.0x5.0mm) copper pad areas

## Rating and characteristic curves (FM4001-AF-Q1 THRU FM4007-AF-Q1)

Fig.1 FORWARD CURRENT DERATING CURVE

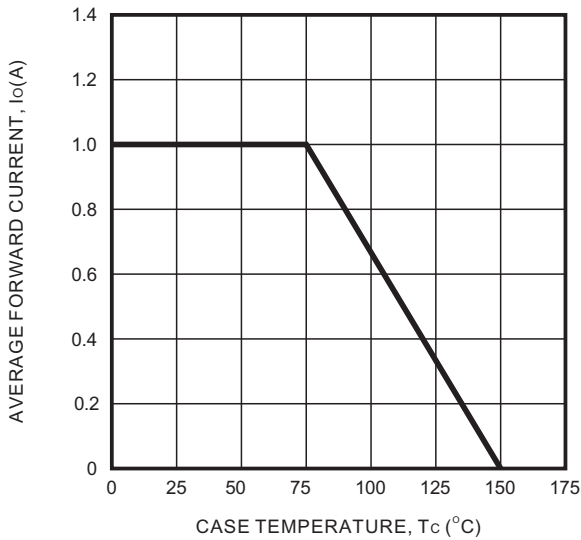


Fig.2 TYPICAL FORWARD CHARACTERISTICS

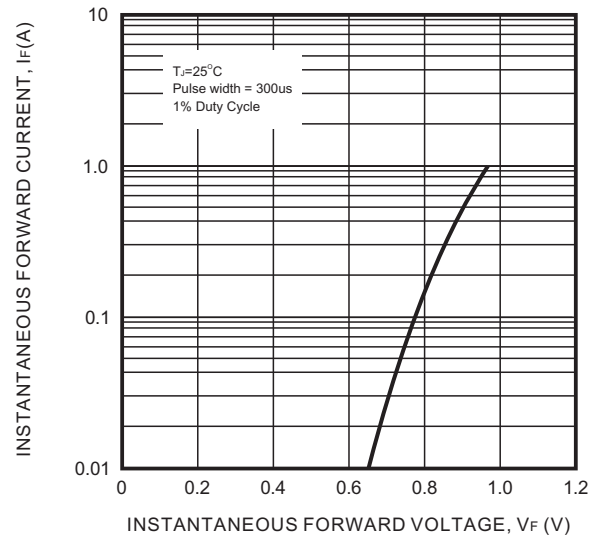


Fig.3 MAXIMUM NON-REPETITIVE PEAK FORWARD SURGE CURRENT

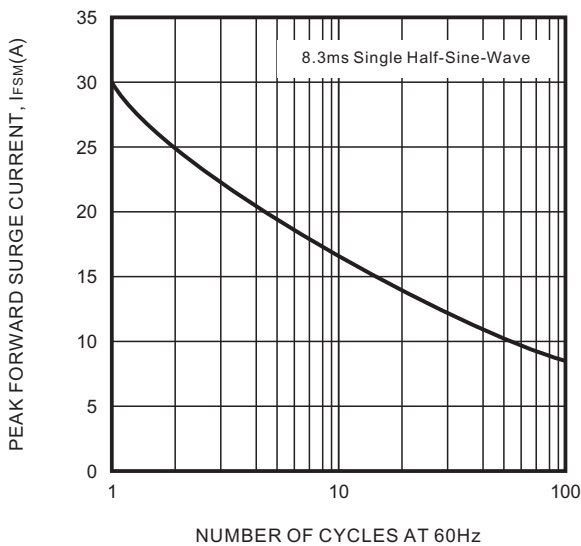
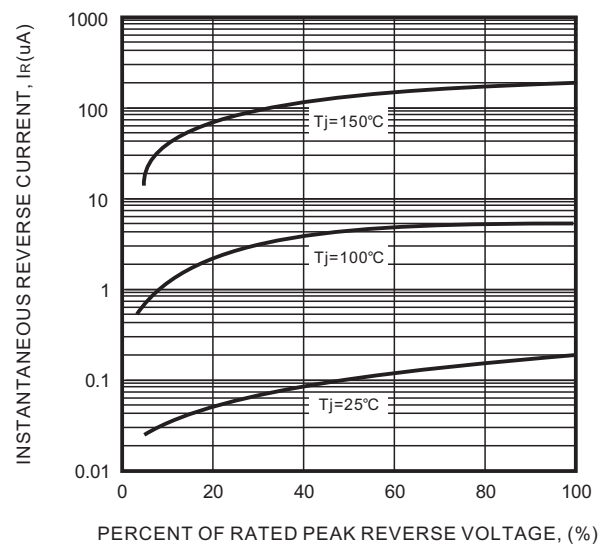


Fig.4 TYPICAL REVERSE CHARACTERISTICS

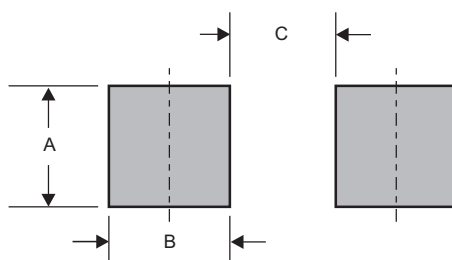


**FM4001-AF-Q1 THRU FM4007-AF-Q1****Pinning information**

| Pin                        | Simplified outline                                                                | Symbol                                                                              |
|----------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Pin1 cathode<br>Pin2 anode |  |  |

**Marking**

| Type number  | Marking code |
|--------------|--------------|
| FM4001-AF-Q1 | M1V          |
| FM4002-AF-Q1 | M2V          |
| FM4003-AF-Q1 | M3V          |
| FM4004-AF-Q1 | M4V          |
| FM4005-AF-Q1 | M5V          |
| FM4006-AF-Q1 | M6V          |
| FM4007-AF-Q1 | M7V          |

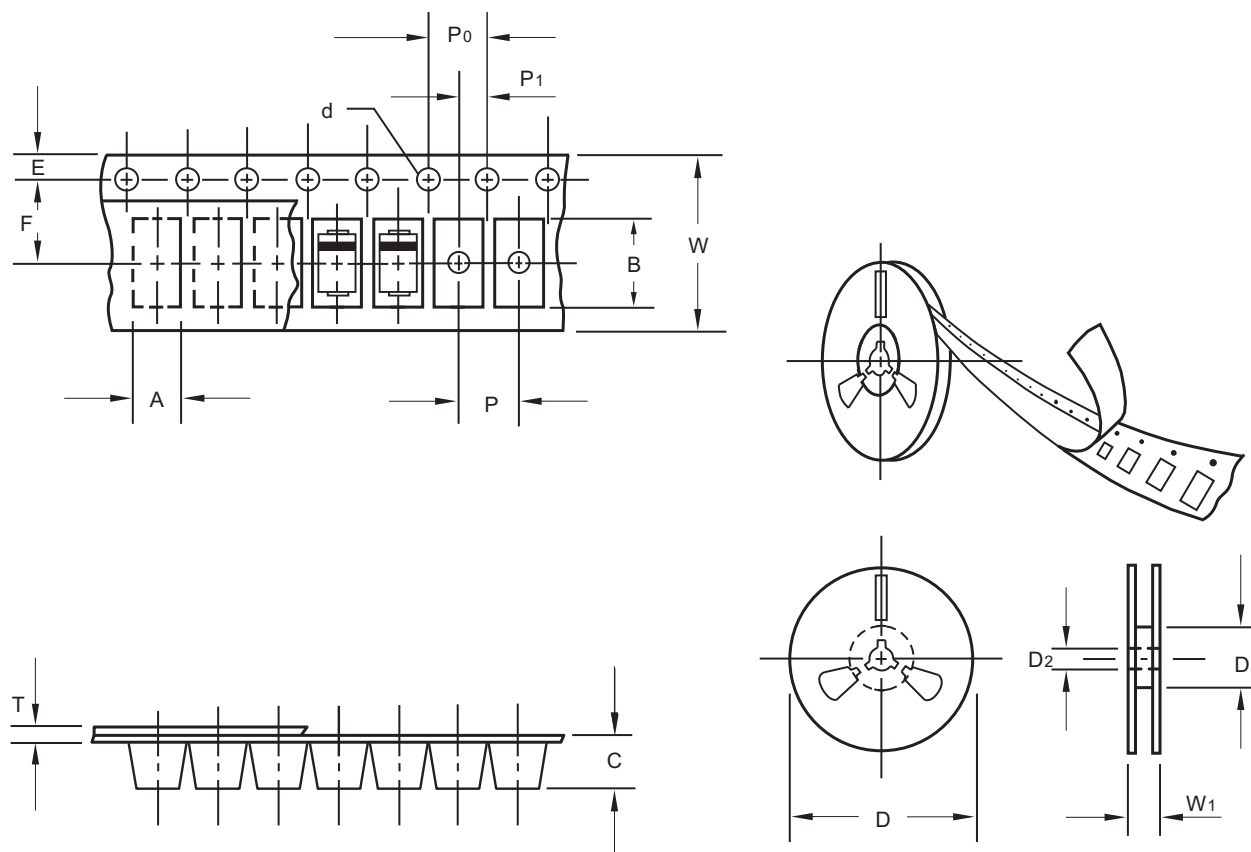
**Suggested solder pad layout**

Dimensions in inches and (millimeters)

| PACKAGE | A            | B            | C           |
|---------|--------------|--------------|-------------|
| SMA-F   | 0.068 (1.70) | 0.104 (2.60) | 0.060(1.50) |

## FM4001-AF-Q1 THRU FM4007-AF-Q1

## Packing information



unit:mm

| Item                      | Symbol         | Tolerance | SMA-F  |
|---------------------------|----------------|-----------|--------|
| Carrier width             | A              | 0.1       | 2.79   |
| Carrier length            | B              | 0.1       | 5.33   |
| Carrier depth             | C              | 0.1       | 2.36   |
| Sprocket hole             | d              | 0.1       | 1.50   |
| 13" Reel outside diameter | D              | 2.0       | 330.00 |
| 13" Reel inner diameter   | D <sub>1</sub> | min       | 72.00  |
| 7" Reel outside diameter  | D              | 2.0       | 178.00 |
| 7" Reel inner diameter    | D <sub>1</sub> | min       | 62.00  |
| Feed hole diameter        | D <sub>2</sub> | 0.5       | 13.00  |
| Sprocket hole position    | E              | 0.1       | 1.75   |
| Punch hole position       | F              | 0.1       | 5.50   |
| Punch hole pitch          | P              | 0.1       | 4.00   |
| Sprocket hole pitch       | P <sub>0</sub> | 0.1       | 4.00   |
| Embossment center         | P <sub>1</sub> | 0.1       | 2.00   |
| Overall tape thickness    | T              | 0.1       | 0.30   |
| Tape width                | W              | 0.3       | 12.00  |
| Reel width                | W <sub>1</sub> | 1.0       | 18.00  |

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

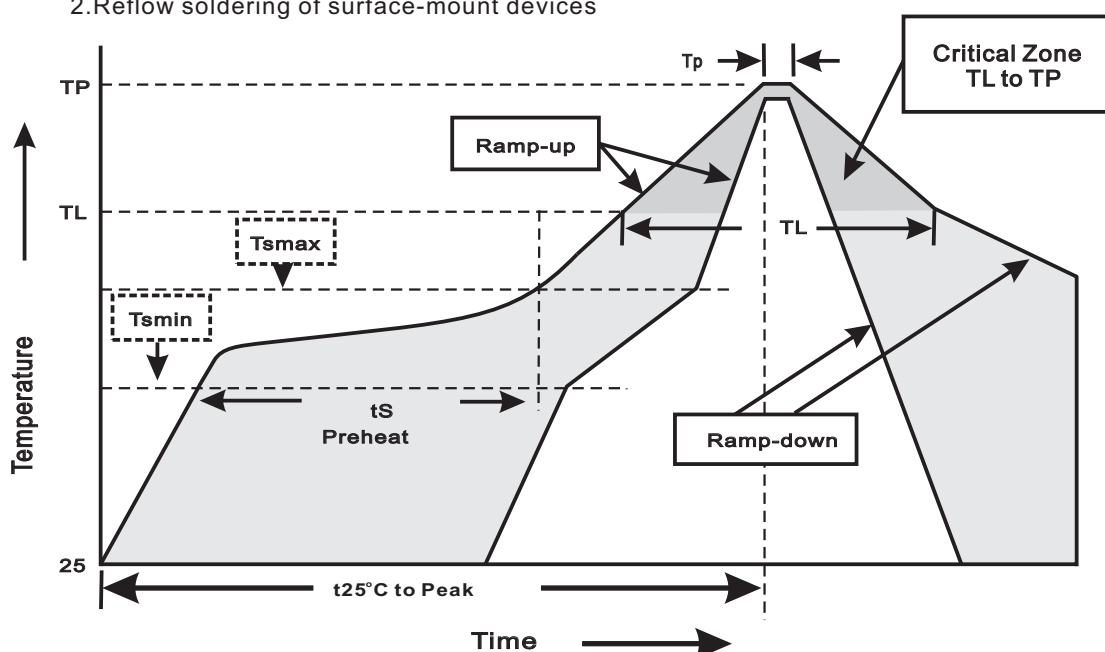
## FM4001-AF-Q1 THRU FM4007-AF-Q1

## Reel packing

| PACKAGE | REEL SIZE | REEL (pcs) | COMPONENT SPACING (m/m) | BOX (pcs) | INNER BOX (m/m) | REEL DIA, (m/m) | CARTON SIZE (m/m) | CARTON (pcs) | APPROX. GROSS WEIGHT (kg) |
|---------|-----------|------------|-------------------------|-----------|-----------------|-----------------|-------------------|--------------|---------------------------|
| SMA-F   | 13"       | 5,000      | 4.0                     | 10,000    | 335*335*38      | 330             | 350*330*360       | 80,000       | 13.50                     |

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



## 3.Reflow soldering

| Profile Feature                                                                                                               | Soldering Condition         |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Average ramp-up rate(T <sub>L</sub> to T <sub>P</sub> )                                                                       | <3°C/sec                    |
| Preheat<br>-Temperature Min(T <sub>smin</sub> )<br>-Temperature Max(T <sub>smax</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>smax</sub> to T <sub>L</sub><br>-Ramp-upRate                                                                           | <3°C/sec                    |
| Time maintained above:<br>-Temperature(T <sub>L</sub> )<br>-Time(t <sub>L</sub> )                                             | 217°C<br>60~260sec          |
| Peak Temperature(T <sub>P</sub> )                                                                                             | 255°C-0/+5°C                |
| Time within 5°C of actual Peak Temperature(t <sub>p</sub> )                                                                   | 10~30sec                    |
| Ramp-down Rate                                                                                                                | <6°C/sec                    |
| Time 25°C to Peak Temperature                                                                                                 | <6minutes                   |

**FM4001-AF-Q1 THRU FM4007-AF-Q1****High reliability test capabilities**

| Item Test                                          | Conditions                                                                                                                                                      | Reference                     |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1. MSL Preconditioning                             | 24hr brake@125°C + 168hrs @ 85°C/85%R.H +<br>3x IR @260°C + 1flux<br>immersion + alcohol + DI H <sub>2</sub> O rinse                                            | JESD22-A113                   |
| 2. Operation Life                                  | T <sub>A</sub> =25°C, Rated Current (I <sub>o</sub> = I <sub>o</sub> max.) Test Duration:1000hrs                                                                | MIL-STD-750D<br>METHOD 1027.3 |
| 3. High Temperature Reverse Bias                   | 80% rated V <sub>R</sub> (T <sub>j</sub> =T <sub>j</sub> max.) Test Duration: 1000hrs                                                                           | JESD22-A108                   |
| 4. High Temperature Storage Life                   | T <sub>A</sub> =125°C Test Duration: 1000hrs                                                                                                                    | JESD22-A103                   |
| 5. Temperature Cycling                             | 55°C to +125°C dwelled for 30 min.<br>and transferred for 5min. total 10 cycles.                                                                                | JESD22-A104                   |
| 6. Autoclave                                       | P=2atm T <sub>A</sub> =121°C RH=100% Test Duration 96 hrs.                                                                                                      | JESD22-A102                   |
| 7. Intermittent Operational Life                   | T <sub>A</sub> = 25°C,<br>On/IO Max. 2min, Off/2min, Test Cycles:15000 cycle                                                                                    | MIL-STD-750E<br>METHOD 1037   |
| 8. Solderability                                   | 245±5°C for 5sec.                                                                                                                                               | J-STD-002                     |
| 9. Moisture Resistance                             | T <sub>A</sub> =85°C/85% Relative humidity Test Duration: 1000hrs                                                                                               | MIL-STD-750E<br>METHOD 1021.2 |
| 10. Resistance To Solder Heat                      | 260±5°C for 10sec.                                                                                                                                              | JESD22-B-106                  |
| 11. High Temperature<br>High Humidity Reverse Bias | T <sub>A</sub> =85°C/85% with device reverse biased at 80% of rated<br>breakdown voltage up to a maximum of 1000V or limit of<br>chamber Test Duration: 1000hrs | JESD22-A101                   |