

# FM320-AL THRU FM3200-AL

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# FM320-AL THRU FM3200-AL

## 3.0A Surface Mount Schottky Barrier Rectifiers - 20V-200V

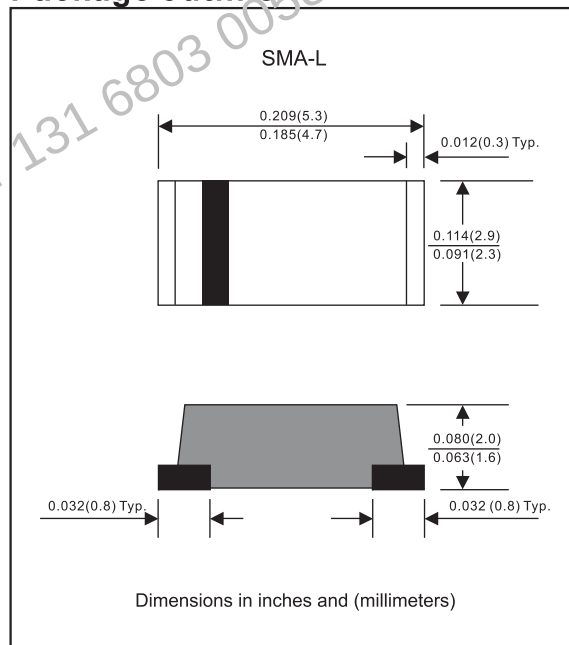
### Features

- Batch process design, excellent power dissipation offers better reverse leakage current and thermal resistance.
- Low profile surface mounted application in order to optimize board space.
- Low power loss, high efficiency.
- High current capability, low forward voltage drop.
- High surge capability.
- Guardring for overvoltage protection.
- Ultra high-speed switching.
- Silicon epitaxial planar chip, metal silicon junction.
- Lead-free parts meet environmental standards of MIL-STD-19500 /228
- Suffix "-H" indicates Halogen free parts, ex. FM320-AL-H.

### Mechanical data

- Epoxy:UL94-V0 rated flame retardant
- Case : Molded plastic, DO-214AC / SMA-L
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any
- Weight : Approximated 0.05 gram

### Package outline



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

| PARAMETER                  | CONDITIONS                                                            | Symbol          | MIN. | TYP. | MAX. | UNIT                 |
|----------------------------|-----------------------------------------------------------------------|-----------------|------|------|------|----------------------|
| Forward rectified current  | See Fig.1                                                             | $I_O$           |      |      | 3.0  | A                    |
| Forward surge current      | 8.3ms single half sine-wave superimposed on rate load (JEDEC methode) | $I_{FSM}$       |      |      | 80   | A                    |
| Reverse current            | $V_R = V_{RRM} \quad T_J = 25^{\circ}\text{C}$                        | $I_R$           |      |      | 0.5  | mA                   |
|                            | $V_R = V_{RRM} \quad T_J = 100^{\circ}\text{C}$                       |                 |      |      | 20   |                      |
| Thermal resistance         | Junction to ambient                                                   | $R_{\theta JA}$ |      | 52   |      | $^{\circ}\text{C/W}$ |
|                            | Junction to case                                                      | $R_{\theta JC}$ |      | 26   |      | $^{\circ}\text{C/W}$ |
| Diode junction capacitance | f=1MHz and applied 4V DC reverse voltage                              | $C_J$           |      | 250  |      | pF                   |
| Storage temperature        |                                                                       | $T_{STG}$       | -65  |      | +175 | $^{\circ}\text{C}$   |

| SYMBOLS   | V <sub>RRM</sub> <sup>*1</sup><br>(V) | V <sub>RMS</sub> <sup>*2</sup><br>(V) | V <sub>R</sub> <sup>*3</sup><br>(V) | V <sub>F</sub> <sup>*4</sup><br>(V) | Operating temperature<br>T <sub>J</sub> , (°C) |
|-----------|---------------------------------------|---------------------------------------|-------------------------------------|-------------------------------------|------------------------------------------------|
| FM320-AL  | 20                                    | 14                                    | 20                                  | 0.50                                | -55 to +125                                    |
| FM330-AL  | 30                                    | 21                                    | 30                                  |                                     |                                                |
| FM340-AL  | 40                                    | 28                                    | 40                                  |                                     |                                                |
| FM350-AL  | 50                                    | 35                                    | 50                                  | 0.70                                | -55 to +150                                    |
| FM360-AL  | 60                                    | 42                                    | 60                                  |                                     |                                                |
| FM380-AL  | 80                                    | 56                                    | 80                                  | 0.85                                |                                                |
| FM3100-AL | 100                                   | 70                                    | 100                                 |                                     |                                                |
| FM3150-AL | 150                                   | 105                                   | 150                                 | 0.90                                |                                                |
| FM3200-AL | 200                                   | 140                                   | 200                                 | 0.92                                |                                                |

\*1 Repetitive peak reverse voltage

\*2 RMS voltage

\*3 Continuous reverse voltage

\*4 Maximum forward voltage@ $I_F=3.0\text{A}$

## Rating and characteristic curves (FM320-AL THRU FM3200-AL)

FIG.1-TYPICAL FORWARD CURRENT DERATING CURVE

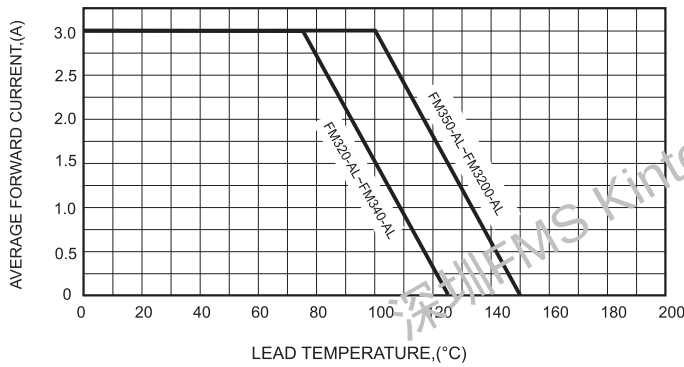


FIG.2-TYPICAL FORWARD CHARACTERISTICS

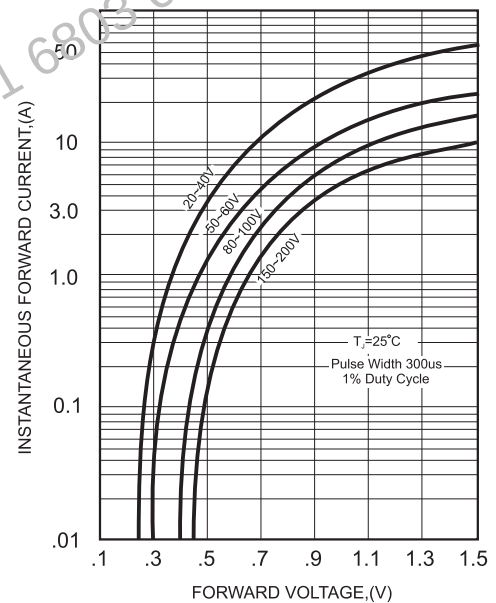


FIG.3-MAXIMUM NON-REPETITIVE FORWARD SURGE CURRENT

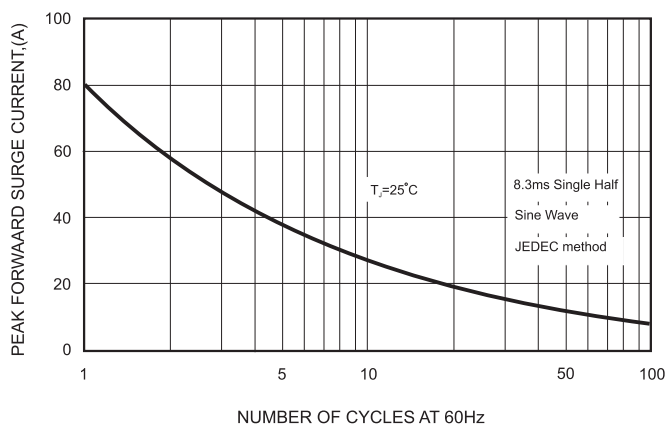


FIG.5 - TYPICAL REVERSE CHARACTERISTICS

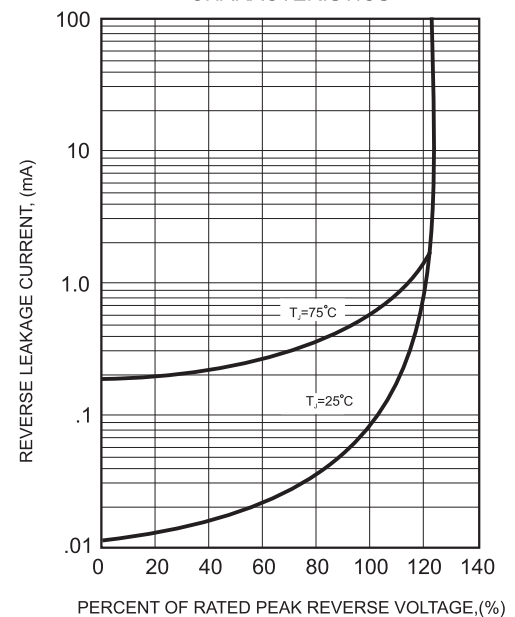
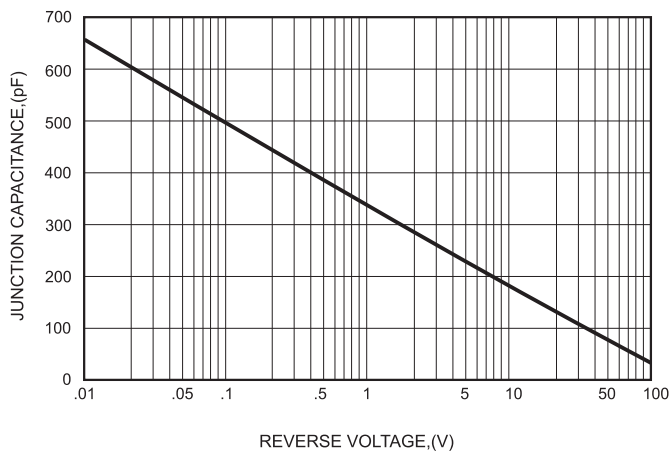


FIG.4-TYPICAL JUNCTION CAPACITANCE

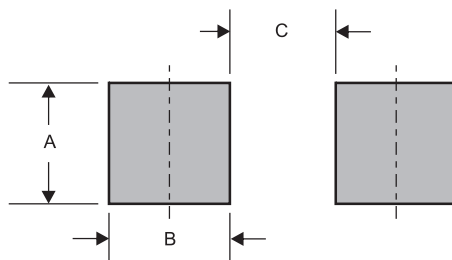


**FM320-AL THRU FM3200-AL****Pinning information**

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

**Marking**

| Type number | Marking code |
|-------------|--------------|
| FM320-AL    | SS32         |
| FM330-AL    | SS33         |
| FM340-AL    | SS34         |
| FM350-AL    | SS35         |
| FM360-AL    | SS36         |
| FM380-AL    | SS38         |
| FM3100-AL   | S310         |
| FM3150-AL   | S315         |
| FM3200-AL   | S320         |

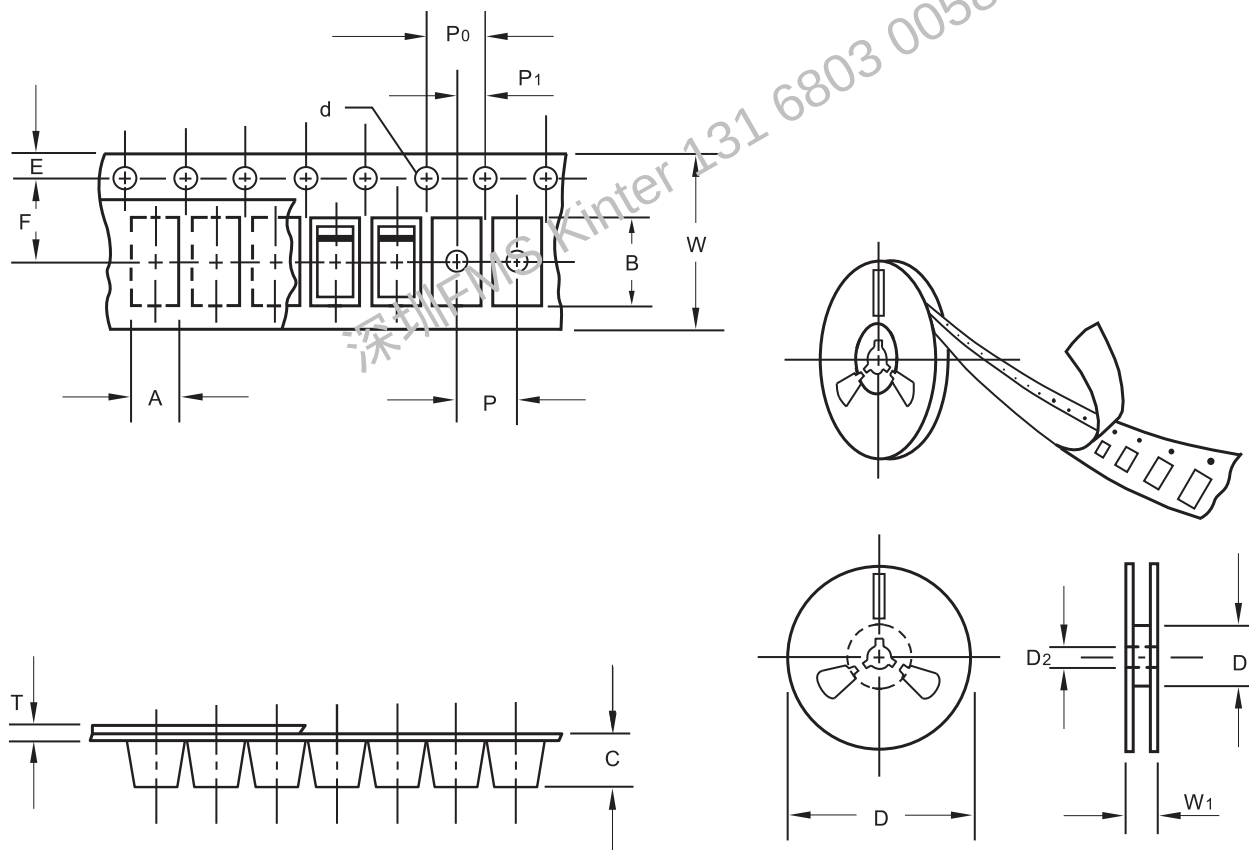
**Suggested solder pad layout**

Dimensions in inches and (millimeters)

| PACKAGE | A            | B            | C            |
|---------|--------------|--------------|--------------|
| SMA-L   | 0.110 (2.80) | 0.059 (1.50) | 0.110 (2.80) |

## FM320-AL THRU FM3200-AL

## Packing information



unit:mm

| Item                      | Symbol | Tolerance | SMA-L  |
|---------------------------|--------|-----------|--------|
| Carrier width             | A      | 0.1       | 2.90   |
| Carrier length            | B      | 0.1       | 5.50   |
| Carrier depth             | C      | 0.1       | 2.10   |
| Sprocket hole             | d      | 0.1       | 1.50   |
| 13" Reel outside diameter | D      | 2.0       | 330.00 |
| 13" Reel inner diameter   | D1     | min       | 50.00  |
| 7" Reel outside diameter  | D      | 2.0       | 178.00 |
| 7" Reel inner diameter    | D1     | min       | 62.00  |
| Feed hole diameter        | D2     | 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       | P0     | 0.1       | 4.00   |
| Embossment center         | P1     | 0.1       | 2.00   |
| Overall tape thickness    | T      | 0.1       | 0.23   |
| Tape width                | W      | 0.3       | 12.00  |
| Reel width                | W1     | 1.0       | 18.00  |

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

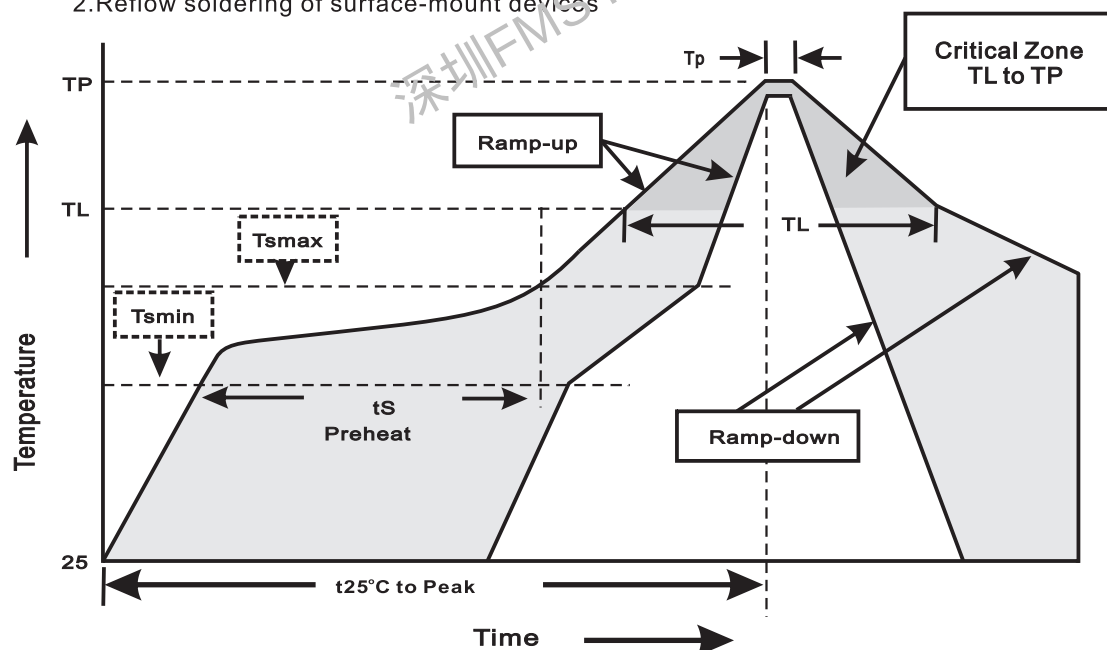
## FM320-AL THRU FM3200-AL

## 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-L   | 7"        | 2,000      | 4.0                     | 20,000    | 183*170*183     | 178             | 382*356*387       | 160,000      | 15.5                      |
| SMA-L   | 13"       | 7,500      | 4.0                     | 15,000    | 337*337*37      | 330             | 350*330*360       | 120,000      | 14.2                      |

## 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>smmin</sub> )<br>-Temperature Max(T <sub>smmax</sub> )<br>-Time(min to max)(t <sub>s</sub> ) | 150°C<br>200°C<br>60~120sec |
| T <sub>smmax</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                   |

**FM320-AL THRU FM3200-AL****High reliability test capabilities**

| Item Test                         | Conditions                                                                                                                               | Reference                     |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 1. Solder Resistance              | at $260 \pm 5^\circ\text{C}$ for $10 \pm 2$ sec.<br>immerse body into solder $1/16" \pm 1/32"$                                           | MIL-STD-750D<br>METHOD-2031   |
| 2. Solderability                  | at $245 \pm 5^\circ\text{C}$ for 5 sec.                                                                                                  | MIL-STD-202F<br>METHOD-208    |
| 3. High Temperature Reverse Bias  | $V_R = 80\%$ rate at $T_A = 125^\circ\text{C}$ for 168 hrs.                                                                              | MIL-STD-750D<br>METHOD-1038   |
| 4. Forward Operation Life         | Rated average rectifier current at $T_A = 25^\circ\text{C}$ for 500hrs.                                                                  | MIL-STD-750D<br>METHOD-1027   |
| 5. Intermittent Operation Life    | $T_A = 25^\circ\text{C}$ , $I_F = I_O$<br>On state: power on for 5 min.<br>off state: power off for 5 min.<br>on and off for 500 cycles. | MIL-STD-750D<br>METHOD-1036   |
| 6. Pressure Cooker                | $15P_{SIG}$ at $T_A = 121^\circ\text{C}$ for 4 hrs.                                                                                      | JESD22-A102                   |
| 7. Temperature Cycling            | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ dwelled for 30 min.<br>and transferred for 5min. total 10 cycles.                            | MIL-STD-750D<br>METHOD-1051   |
| 8. Thermal Shock                  | $0^\circ\text{C}$ for 5 min. rise to $100^\circ\text{C}$ for 5 min. total 10 cycles.                                                     | MIL-STD-750D<br>METHOD-1056   |
| 9. Forward Surge                  | 8.3ms single half sine-wave superimposed<br>on rated load, one surge.                                                                    | MIL-STD-750D<br>METHOD-4066-2 |
| 10. Humidity                      | at $T_A = 85^\circ\text{C}$ , RH=85% for 1000hrs.                                                                                        | MIL-STD-750D<br>METHOD-1021   |
| 11. High Temperature Storage Life | at $175^\circ\text{C}$ for 1000 hrs.                                                                                                     | MIL-STD-750D<br>METHOD-1031   |



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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



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