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January 2015

## J109 / MMBFJ108 N-Channel Switch

### Features

- This device is designed for digital switching applications where very low on resistance is mandatory.
- Sourced from process 58

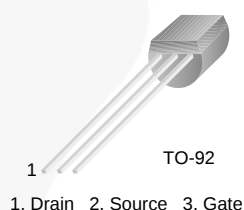


Figure 1. J109 Device Package

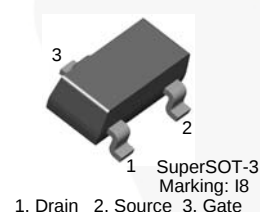


Figure 2. MMBFJ108 Device Package

### Ordering Information

| Part Number | Top Mark | Package  | Packing Method |
|-------------|----------|----------|----------------|
| J109        | J109     | TO-92 3L | Bulk           |
| J109_D26Z   | J109     | TO-92 3L | Tape and Reel  |
| MMBFJ108    | I8       | SSOT 3L  | Tape and Reel  |

### Absolute Maximum Ratings<sup>(1), (2)</sup>

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol         | Parameter                                        | Value      | Unit             |
|----------------|--------------------------------------------------|------------|------------------|
| $V_{DG}$       | Drain-Gate Voltage                               | 25         | V                |
| $V_{GS}$       | Gate-Source Voltage                              | -25        | V                |
| $I_{GF}$       | Forward Gate Current                             | 10         | mA               |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |

#### Notes:

1. These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .
2. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty-cycle operations.

## Thermal Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol          | Parameter                               | Max.                |                         | Unit                 |
|-----------------|-----------------------------------------|---------------------|-------------------------|----------------------|
|                 |                                         | J109 <sup>(3)</sup> | MMBFJ108 <sup>(4)</sup> |                      |
| $P_D$           | Total Device Dissipation                | 625                 | 350                     | mW                   |
|                 | Derate Above $25^\circ\text{C}$         | 5.0                 | 2.8                     | mW/ $^\circ\text{C}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 125                 |                         | $^\circ\text{C/W}$   |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 200                 | 357                     | $^\circ\text{C/W}$   |

### Notes:

3. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.  
 4. Device mounted on FR-4 PCB 36mm x 18mm x 1.5mm; mounting pad for the collector lead minimum 6cm<sup>2</sup>.

## Electrical Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol                                      | Parameter                                      | Conditions                                                           |          | Min. | Max.  | Unit |
|---------------------------------------------|------------------------------------------------|----------------------------------------------------------------------|----------|------|-------|------|
| Off Characteristics                         |                                                |                                                                      |          |      |       |      |
| V <sub>(BR)GSS</sub>                        | Gate-Source Breakdown Voltage                  | I <sub>G</sub> = -10 μA, V <sub>DS</sub> = 0                         |          | -25  |       | V    |
| I <sub>GSS</sub>                            | Gate Reverse Current                           | V <sub>GS</sub> = -15 V, V <sub>DS</sub> = 0                         |          |      | -3.0  | nA   |
|                                             |                                                | V <sub>GS</sub> = -15 V, V <sub>DS</sub> = 0, T <sub>A</sub> = 100°C |          |      | -200  |      |
| V <sub>GS(off)</sub>                        | Gate-Source Cut-Off Voltage                    | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 10 nA                       | MMBFJ108 | -3.0 | -10.0 | V    |
|                                             |                                                |                                                                      | J109     | -2.0 | -6.0  |      |
| On Characteristics                          |                                                |                                                                      |          |      |       |      |
| I <sub>DSS</sub>                            | Zero-Gate Voltage Drain Current <sup>(5)</sup> | V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0                          | MMBFJ108 | 80   |       | mA   |
|                                             |                                                |                                                                      | J109     | 40   |       |      |
| r <sub>DS(on)</sub>                         | Drain-Source On Resistance                     | V <sub>DS</sub> ≤ 0.1 V, V <sub>GS</sub> = 0                         | MMBFJ108 |      | 8.0   | Ω    |
|                                             |                                                |                                                                      | J109     |      | 12    |      |
| Small Signal Characteristics                |                                                |                                                                      |          |      |       |      |
| C <sub>dg(on)</sub><br>C <sub>sg(off)</sub> | Drain-Gate &Source-Gate On Capacitance         | V <sub>DS</sub> = 0, V <sub>GS</sub> = 0, f = 1.0 MHz                |          |      | 85    | pF   |
| C <sub>dg(off)</sub>                        | Drain-Gate Off Capacitance                     | V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 V, f = 1.0 MHz            |          |      | 15    | pF   |
| C <sub>sg(off)</sub>                        | Source-Gate Off Capacitance                    | V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 V, f = 1.0 MHz            |          |      | 15    | pF   |

### Note:

5. Pulse test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

## Typical Performance Characteristics

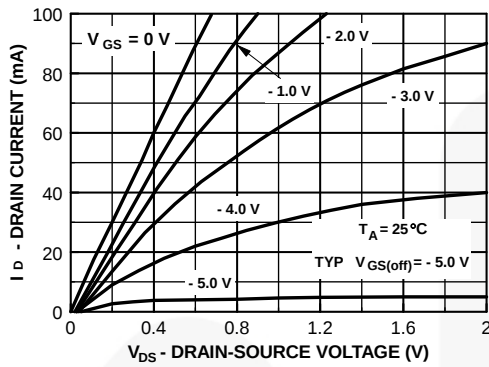


Figure 3. Common Drain-Source

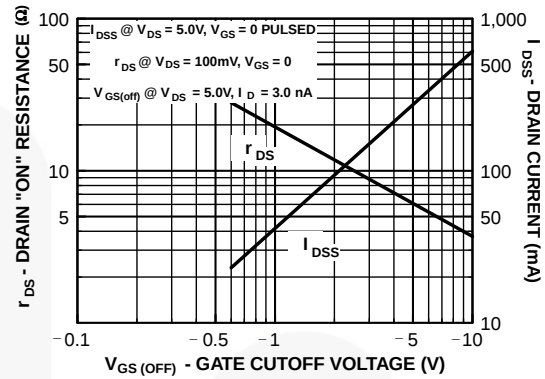


Figure 4. Parameter Interactions

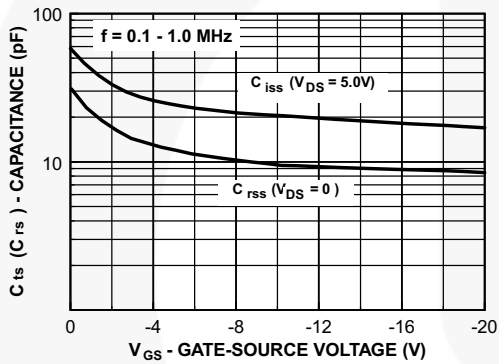


Figure 5. Common Drain-Source

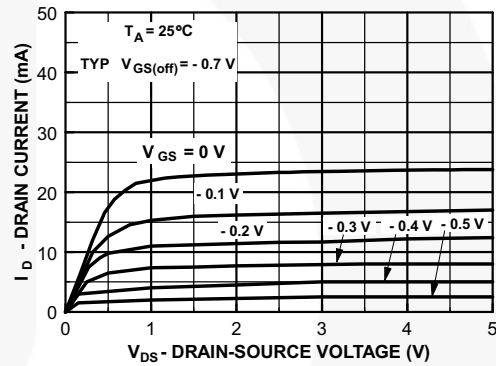


Figure 6. Common Drain-Source

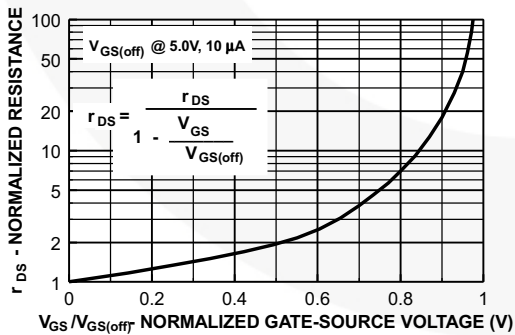


Figure 7. Normalized Drain Resistance vs. Bias Voltage

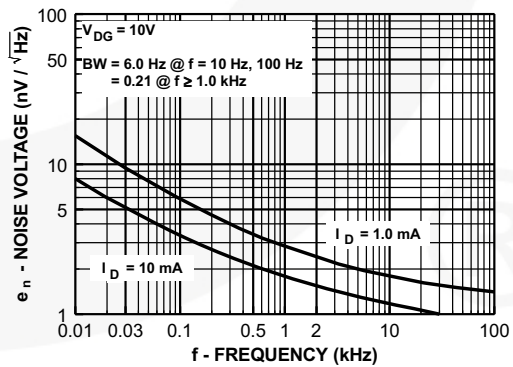


Figure 8. Noise Voltage vs. Frequency

## Typical Performance Characteristics (Continued)

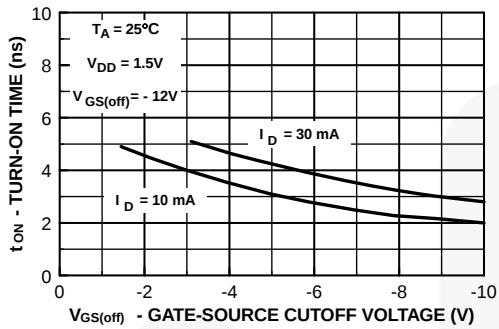


Figure 9. Switching Turn-On Time vs. Gate-Source Cut-Off Voltage

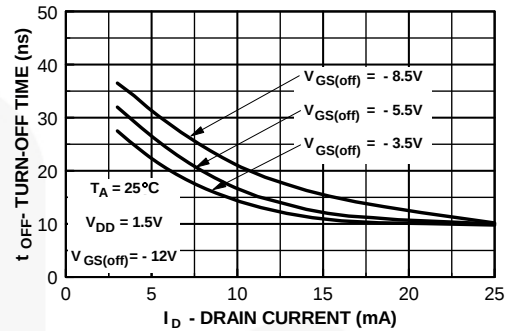


Figure 10. Switching Turn-On Time vs. Drain Current

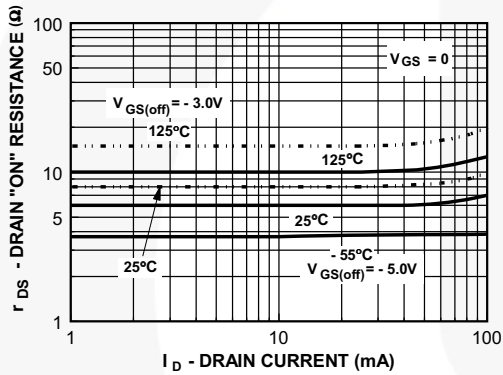


Figure 11. On Resistance vs. Drain Current

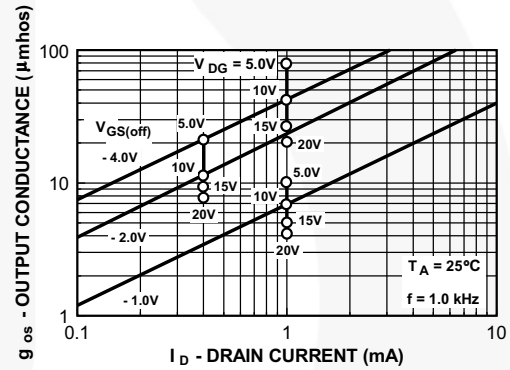


Figure 12. Output Conductance vs. Drain Current

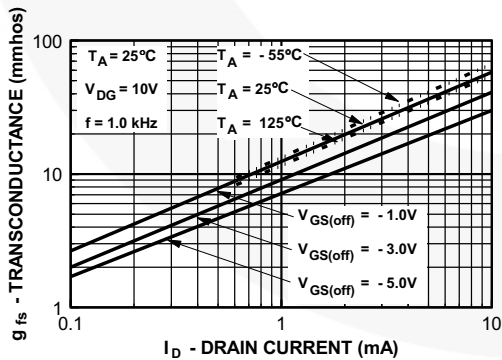


Figure 13. Transconductance vs. Drain Current

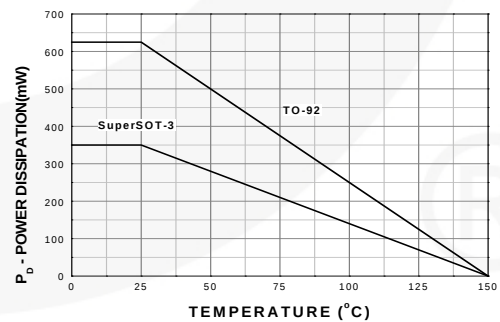
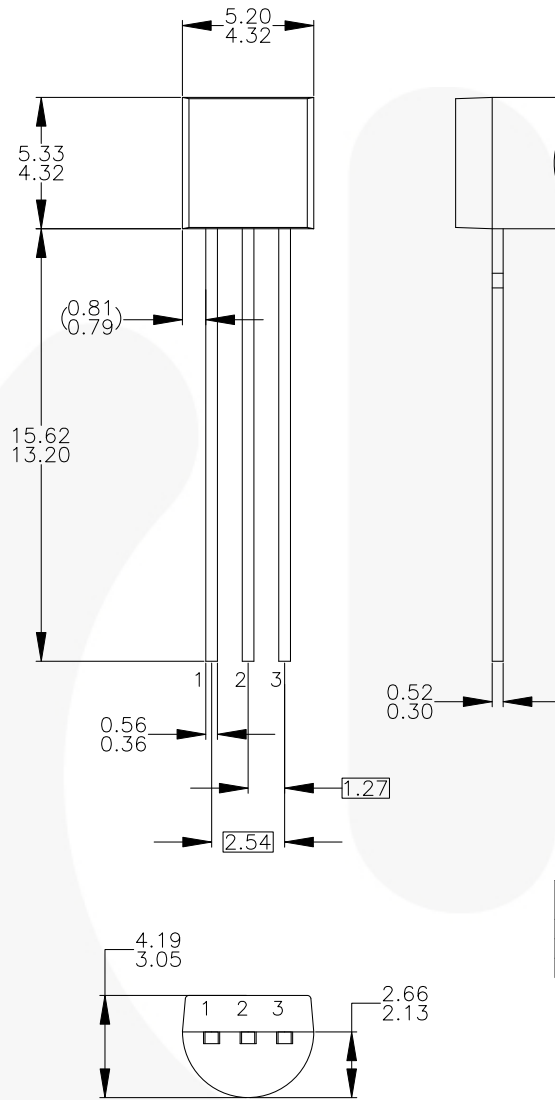


Figure 14. Power Dissipation vs. Ambient Temperature

## Physical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

| PIN | 92 |   |   | 94 |   |   | 96 |   |   | 97 |   |   | 98 |   |   |
|-----|----|---|---|----|---|---|----|---|---|----|---|---|----|---|---|
|     | P  | F | M | P  | F | M | P  | F | M | P  | F | M | P  | F | M |
| 1   | E  | S | S | E  | S | S | B  | D | G | C  | G | D | C  | G | D |
| 2   | B  | D | G | C  | G | D | E  | S | S | B  | D | G | E  | S | S |
| 3   | C  | G | D | B  | D | G | C  | G | D | E  | S | S | B  | D | G |

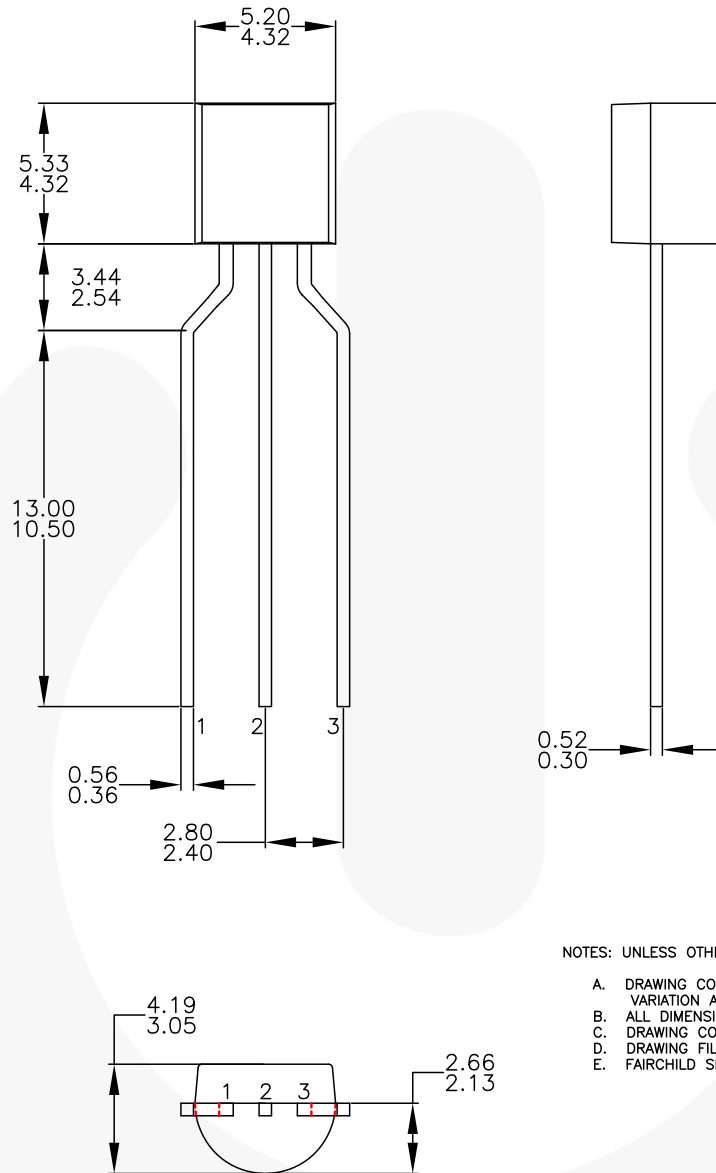
LEGEND:

P - BIPOLAR      E - EMITTER      D - DRAIN  
F - JFET          B - BASE          S - SOURCE  
M - DMOS        C - COLLECTOR      G - GATE

- E) FOR PACKAGE 92, 94, 96, 97 AND 98:  
PIN CONFIGURATION DRAIN "D" AND SOURCE "S"  
ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03DREV3.

Figure 15. 3-Lead, TO-92, JEDEC TO-92 Compliant Straight Lead Configuration, Bulk Type

**Physical Dimensions** (Continued)

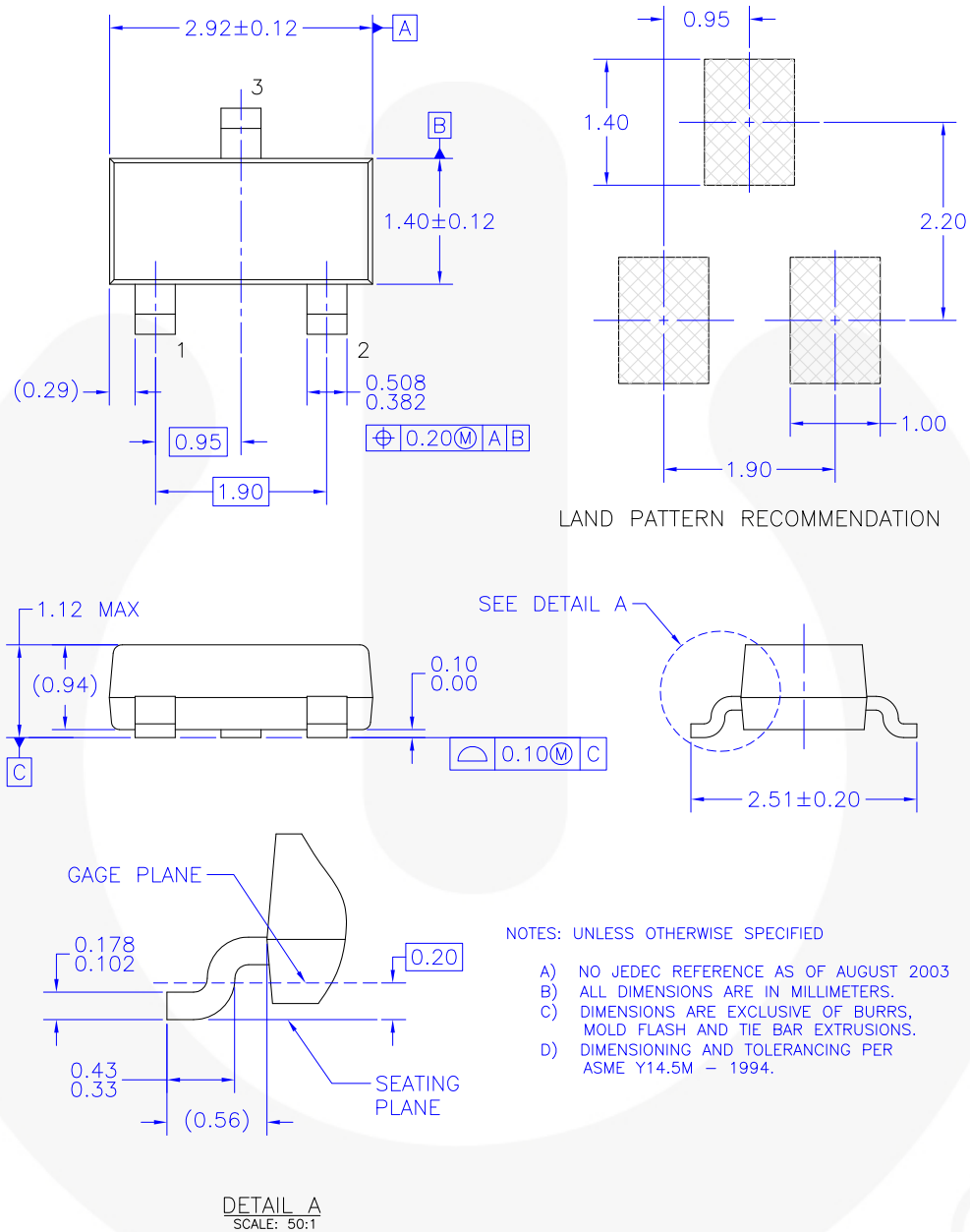


NOTES: UNLESS OTHERWISE SPECIFIED

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- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5M-2009.
- D. DRAWING FILENAME: MKT-ZA03FREV3.
- E. FAIRCHILD SEMICONDUCTOR.

**Figure 16. 3-Lead, TO-92, Molded, 0.2 In Line Spacing Lead Form, Ammo, Tape and Reel Type**

Physical Dimensions (Continued)



MA03BREV B

Figure 17. MOLDED PACKAGE, SUPERSOT, 3-LEAD



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