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ON Semiconductor®

# J175 / J176 / MMBFJ175 / MMBFJ176 / MMBFJ177

## P-Channel Switch

### Description

This device is designed for low-level analog switching sample-and-hold circuits and chopper-stabilized amplifiers. Sourced from process 88.



Figure 1. J175 / J176 Device Package

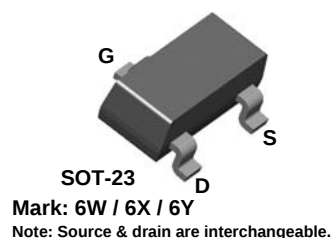


Figure 2. MMBFJ175 / 176 / 177 Device Package

### Ordering Information

| Part Number | Marking | Package   | Packing Method |
|-------------|---------|-----------|----------------|
| J175-D26Z   | J175    | TO-92 3L  | Tape and Reel  |
| J176-D74Z   | J176    | TO-92 3L  | Ammo           |
| MMBFJ175    | 6W      | SOT-23 3L | Tape and Reel  |
| MMBFJ176    | 6X      | SOT-23 3L | Tape and Reel  |
| MMBFJ177    | 6Y      | SOT-23 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                               | -30          | V                |
| $V_{GS}$       | Gate-Source Voltage                              | 30           | V                |
| $I_{GF}$       | Forward Gate Current                             | 50           | mA               |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to + 150 | $^\circ\text{C}$ |

### Notes:

- These ratings are based on a maximum junction temperature of  $150^\circ\text{C}$ .
- These are steady-state limits. ON 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                      |
|-----------------|-----------------------------------------|----------------------------|-----------------------------------------------------|---------------------------|
|                 |                                         | J175 / J176 <sup>(3)</sup> | MMBFJ175 /<br>MMBFJ176 /<br>MMBFJ177 <sup>(3)</sup> |                           |
| $P_D$           | Total Device Dissipation                | 350                        | 225                                                 | mW                        |
|                 | Derate Above $25^\circ\text{C}$         | 2.8                        | 1.8                                                 | mW/ $^\circ\text{C}$      |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case    | 125                        |                                                     | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 357                        | 556                                                 | $^\circ\text{C}/\text{W}$ |

### Note:

- 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.

## 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> = 1.0 μA, V <sub>DS</sub> = 0     |                    | 30   |       | V    |
| I <sub>GSS</sub>     | Gate Reverse Current                           | V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0      |                    |      | 1.0   | nA   |
| V <sub>GS(off)</sub> | Gate-Source Cut-Off Voltage                    | V <sub>DS</sub> = -15 V, I <sub>D</sub> = -10 nA | J175 /<br>MMBFJ175 | 3.0  | 6.0   | V    |
|                      |                                                |                                                  | J176 /<br>MMBFJ176 | 1.0  | 4.0   |      |
|                      |                                                |                                                  | MMBFJ177           | 0.8  | 2.5   |      |
| On Characteristics   |                                                |                                                  |                    |      |       |      |
| I <sub>DSS</sub>     | Zero-Gate Voltage Drain Current <sup>(4)</sup> | V <sub>DS</sub> = -15 V, I <sub>GS</sub> = 0     | J175 /<br>MMBFJ175 | -7.0 | -60.0 | mA   |
|                      |                                                |                                                  | J176 /<br>MMBFJ176 | -2.0 | -25.0 |      |
|                      |                                                |                                                  | MMBFJ177           | -1.5 | -20.0 |      |
| r <sub>DS(on)</sub>  | Drain-Source On Resistance                     | V <sub>DS</sub> ≤ 0.1 V, V <sub>GS</sub> = 0     | J175 /<br>MMBFJ175 |      | 125   | Ω    |
|                      |                                                |                                                  | J176 /<br>MMBFJ176 |      | 250   |      |
|                      |                                                |                                                  | MMBFJ177           |      | 300   |      |

**Note:**

4. Pulse test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2.0\%$ .

## Typical Performance Characteristics

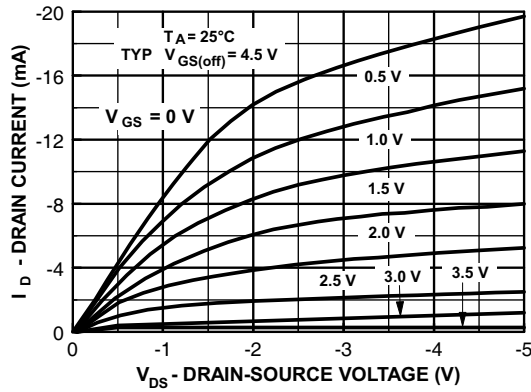


Figure 3. Common Drain-Source

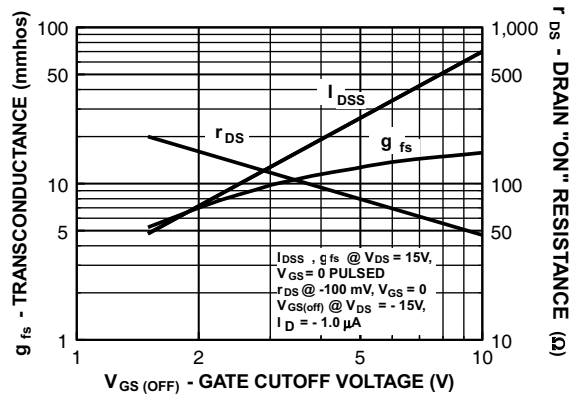


Figure 4. Parameter Interactions

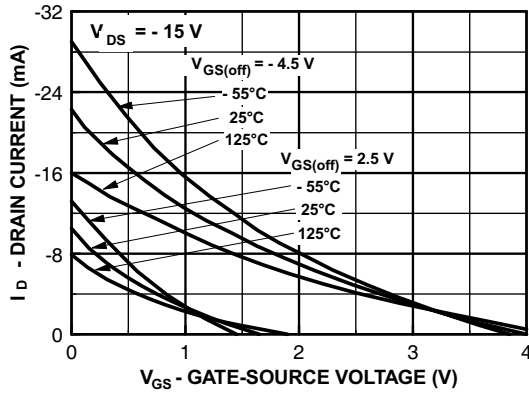


Figure 5. Transfer Characteristics

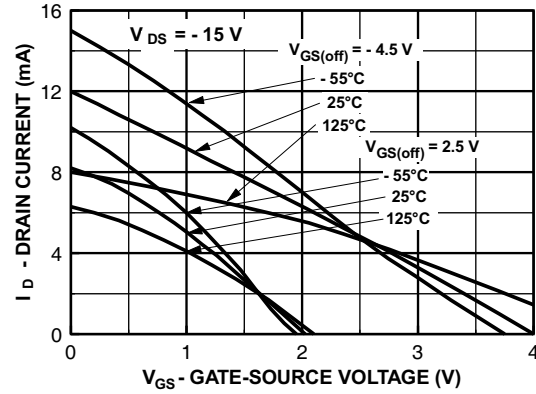


Figure 6. Transfer Characteristics

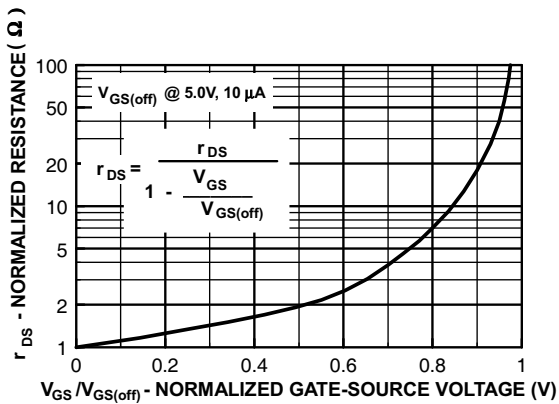


Figure 7. Normalized Drain Resistance vs. Bias Voltage

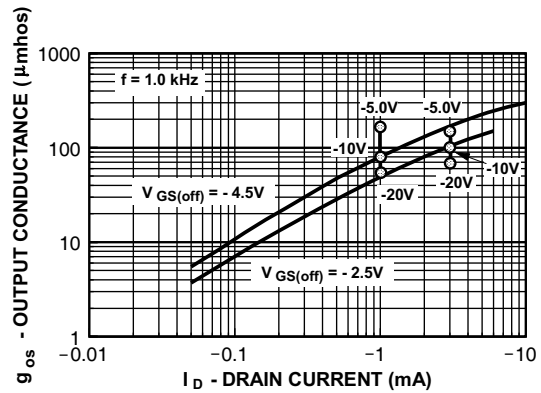


Figure 8. Output Conductance vs. Drain Current

## Typical Performance Characteristics (Continued)

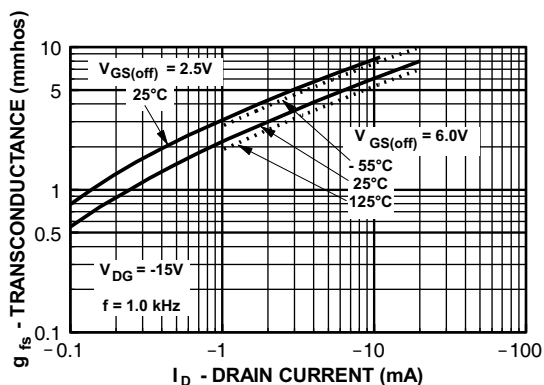


Figure 9. Transconductance vs. Drain Current

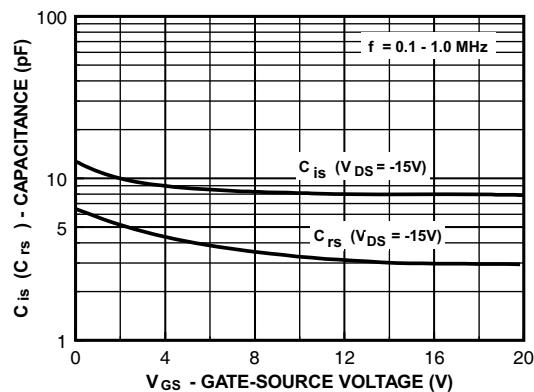


Figure 10. Capacitance vs. Voltage

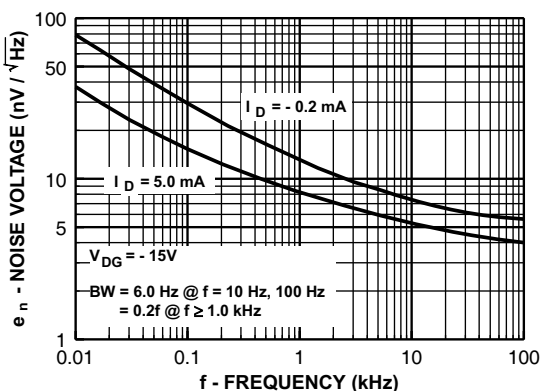


Figure 11. Noise Voltage vs. Frequency

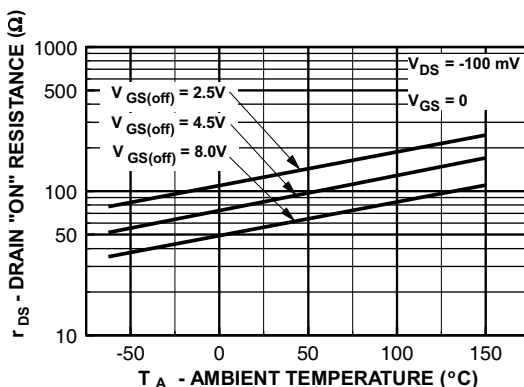


Figure 12. Channel Resistance vs. Temperature

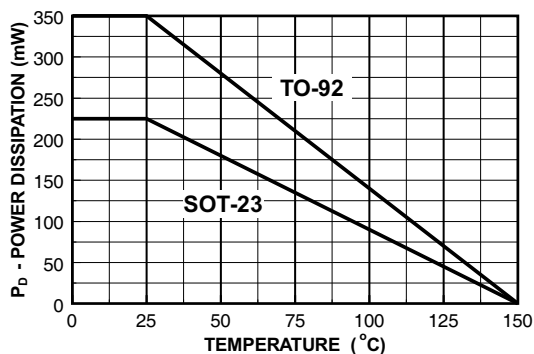
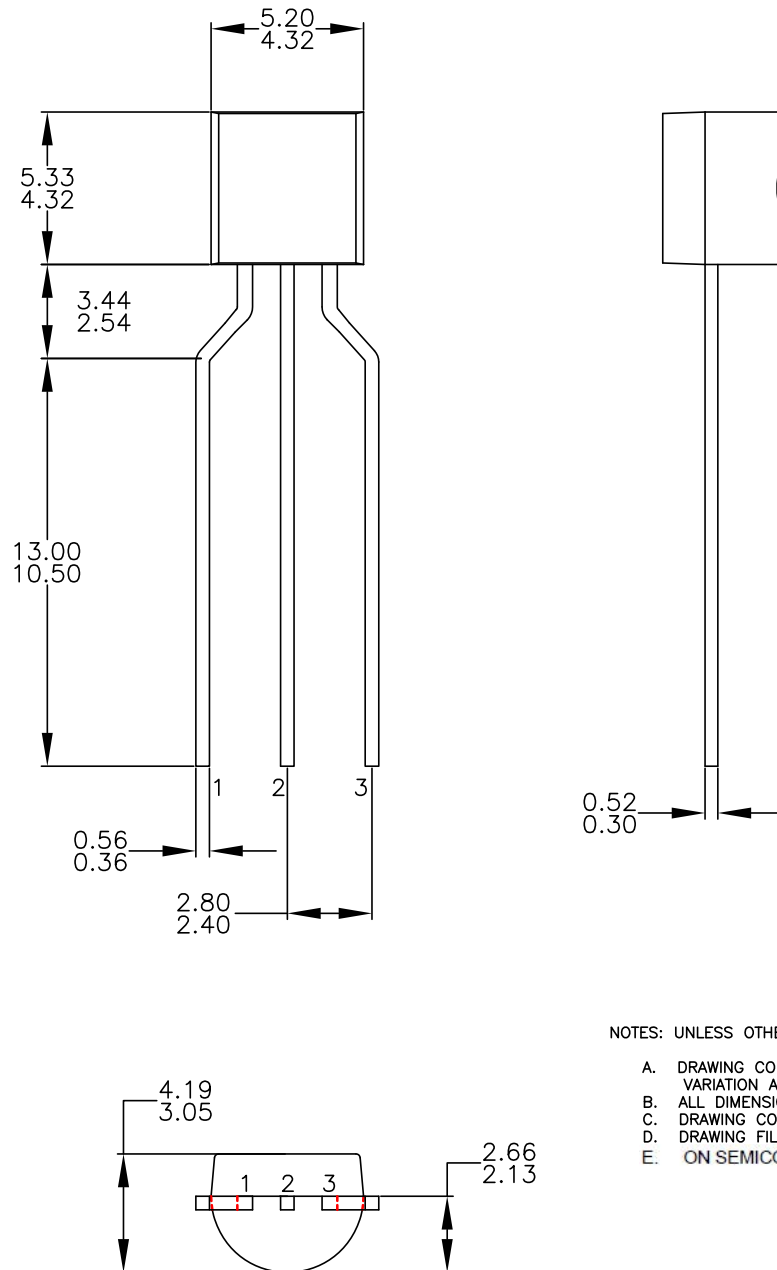


Figure 13. Power Dissipation vs. Ambient Temperature

## Physical Dimensions

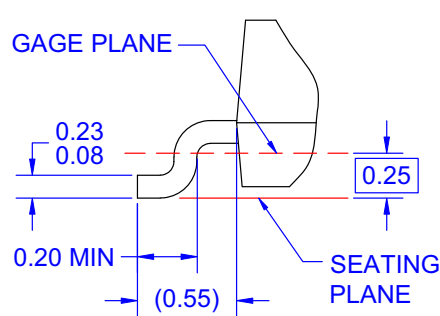
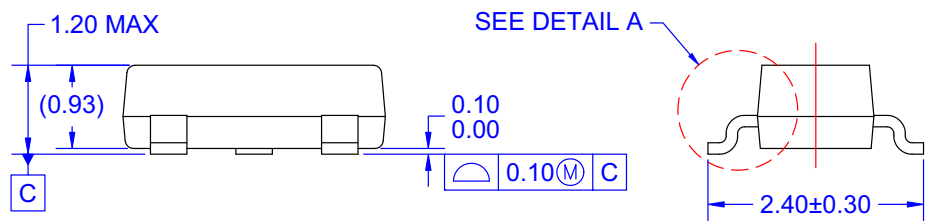
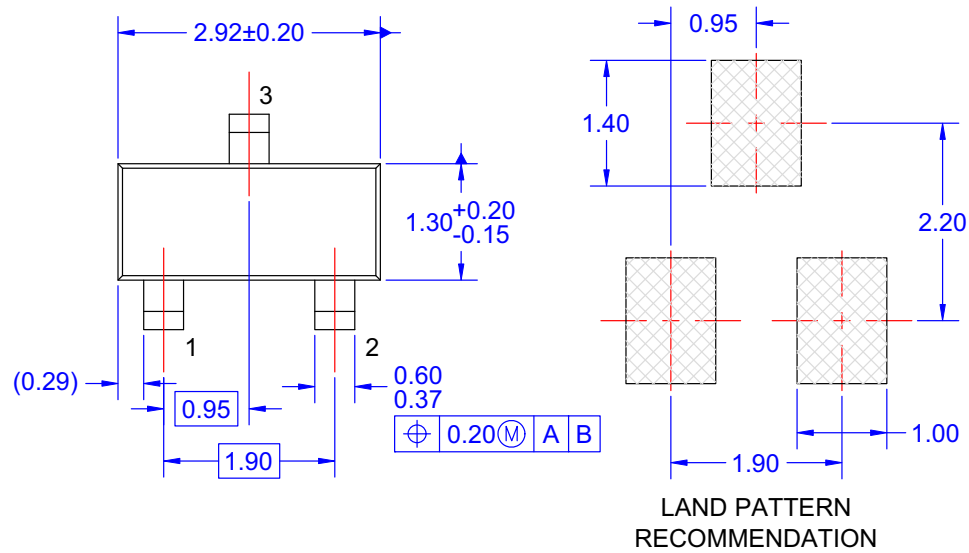


NOTES: UNLESS OTHERWISE SPECIFIED

- A. DRAWING CONFORMS TO JEDEC MS-013, VARIATION AC.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DRAWING CONFORMS TO ASME Y14.5M-2009.
- D. DRAWING FILENAME: MKT-ZA03FREX3.
- E. ON SEMICONDUCTOR

Figure 14. 3-Lead, TO-92, Molded, 0.2 In Line Spacing Lead Form

# Physical Dimensions (Continued)



**DETAIL A**  
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

- A) REFERENCE JEDEC REGISTRATION TO-236, VARIATION AB, ISSUE H.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE INCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M - 1994.
- E) DRAWING FILE NAME: MA03DREV10

**Figure 15. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE**

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