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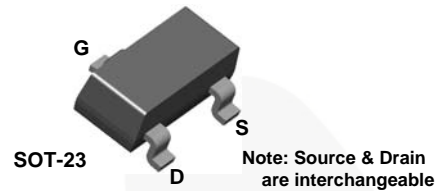


January 2015

# MMBF4391 / MMBF4392 / MMBF4393 N-Channel Switch

## Description

This device is designed for low level analog switching, sample and hold circuits and chopper stabilized amplifiers. Sourced from process 51. See J111 for characteristics.



## Ordering Information

| Part Number | Top Mark | Package   | Packing Method |
|-------------|----------|-----------|----------------|
| MMBF4391    | 6J       | SOT-23 3L | Tape and Reel  |
| MMBF4392    | 6K       | SOT-23 3L | Tape and Reel  |
| MMBF4393    | 6G       | 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:

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.

MMBF4391 / MMBF4392 / MMBF4393 — N-Channel Switch

### Thermal Characteristics<sup>(3)</sup>

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

| Symbol          | Parameter                               | Max. | Unit                      |
|-----------------|---|------|---------------------------|
| $P_D$           | Total Device Dissipation                | 350  | mW                        |
|                 | Derate Above $25^\circ\text{C}$         | 2.8  | mW/ $^\circ\text{C}$      |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 357  | $^\circ\text{C}/\text{W}$ |

**Note:**

3. 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          |               |
|----------------------------|--|---|----------|------|---------------|---------------|
| <b>Off Characteristics</b> |  |   |          |      |               |               |
| $V_{(BR)GSS}$              | Gate-Source Breakdown Voltage                  | $I_G = 1.0 \mu\text{A}, V_{DS} = 0$                                       | -30      |      | V             |               |
| $I_{GSS}$                  | Gate Reverse Current                           | $V_{GS} = -15 \text{ V}, V_{DS} = 0$                                      |          | -1.0 | nA            |               |
|                            |  | $V_{GS} = -15 \text{ V}, V_{DS} = 0, T_A = 150^\circ\text{C}$             |          | -0.2 | $\mu\text{A}$ |               |
| $V_{GS(off)}$              | Gate-Source Cut-Off Voltage                    | $V_{DS} = 20 \text{ V}, I_D = 1.0 \text{ nA}$                             | MMBF4391 | -4.0 | -10.0         | V             |
|                            |  |   | MMBF4392 | -2.0 | -5.0          |               |
|                            |  |   | MMBF4393 | -0.5 | -3.0          |               |
| $V_{GS(f)}$                | Gate-Source Forward Voltage                    | $I_G = 1.0 \text{ mA}, V_{DS} = 0$  |          | 1.0  | V             |               |
| $I_{D(off)}$               | Drain Cut-Off Leakage Current                  | $V_{DS} = 20 \text{ V}, V_{GS} = -12 \text{ V}$                           | MMBF4391 |      | 0.1           | nA            |
|                            |  | $V_{DS} = 20 \text{ V}, V_{GS} = -7.0 \text{ V}$                          | MMBF4392 |      | 0.1           |               |
|                            |  | $V_{DS} = 20 \text{ V}, V_{GS} = -5.0 \text{ V}$                          | MMBF4393 |      | 0.1           |               |
|                            |  | $V_{DS} = 20 \text{ V}, V_{GS} = -12 \text{ V}, T_A = 150^\circ\text{C}$  | MMBF4391 |      | 0.2           | $\mu\text{A}$ |
|                            |  | $V_{DS} = 20 \text{ V}, V_{GS} = -7.0 \text{ V}, T_A = 150^\circ\text{C}$ | MMBF4392 |      | 0.2           |               |
|                            |  | $V_{DS} = 20 \text{ V}, V_{GS} = -5.0 \text{ V}, T_A = 150^\circ\text{C}$ | MMBF4393 |      | 0.2           |               |
| <b>On Characteristics</b>  |  |   |          |      |               |               |
| $I_{DSS}$                  | Zero-Gate Voltage Drain Current <sup>(4)</sup> | $V_{DS} = 20 \text{ V}, V_{GS} = 0$                                       | MMBF4391 | 50   | 150           | mA            |
|                            |  |   | MMBF4392 | 25   | 75            |               |
|                            |  |   | MMBF4393 | 5.0  | 30            |               |
| $V_{DS(on)}$               | Drain-Source On Voltage                        | $I_D = 12 \text{ mA}, V_{GS} = 0$   | MMBF4391 |      | 0.4           | V             |
|                            |  | $I_D = 6.0 \text{ mA}, V_{GS} = 0$  | MMBF4392 |      | 0.4           |               |
|                            |  | $I_D = 3.0 \text{ mA}, V_{GS} = 0$  | MMBF4393 |      | 0.4           |               |
| $r_{DS(on)}$               | Drain-Source On Resistance                     | $I_D = 1.0 \text{ mA}, V_{GS} = 0$  | MMBF4391 |      | 30            | $\Omega$      |
|                            |  |   | MMBF4392 |      | 60            |               |
|                            |  |   | MMBF4393 |      | 100           |               |

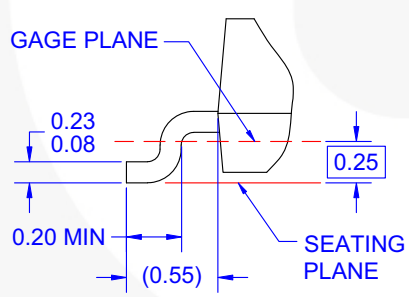
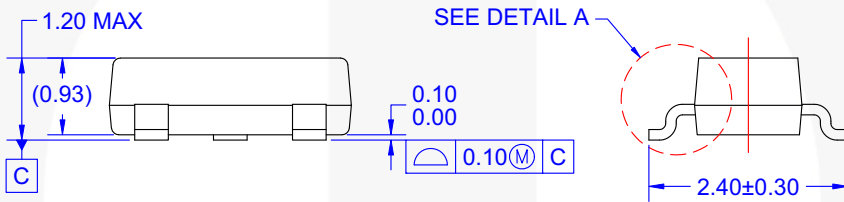
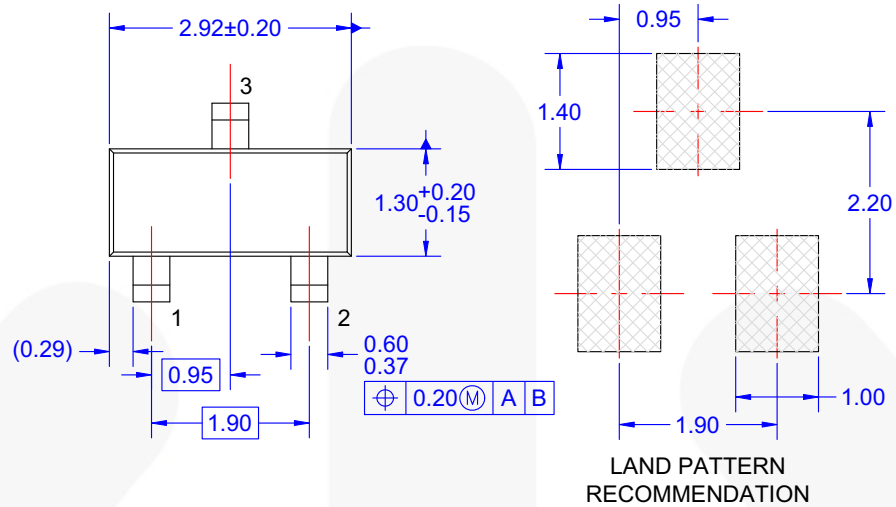
**Note:**

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

**Electrical Characteristics** (Continued)Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol                              | Parameter                    | Conditions   | Min.     | Max. | Unit     |
|-------------------------------------|------------------------------|--|----------|------|----------|
| <b>Small Signal Characteristics</b> |                              |  |          |      |          |
| $r_{ds(on)}$                        | Drain-Source On Resistance   | $V_{DS} = V_{GS} = 0, f = 1\text{kHz}$                 | MMBF4391 | 30   | $\Omega$ |
|                                     |                              |  | MMBF4392 | 60   |          |
|                                     |                              |  | MMBF4393 | 100  |          |
| $C_{iss}$                           | Input Capacitance            | $V_{DS} = 20\text{ V}, V_{GS} = 0, f = 1.0\text{ MHz}$ |          | 14   | pF       |
| $C_{rss}$                           | Reverse Transfer Capacitance | $V_{GS} = -12\text{ V}, f = 1.0\text{ MHz}$            | MMBF4391 | 3.5  | pF       |
|                                     |                              | $V_{GS} = -7.0\text{ V}, f = 1.0\text{ MHz}$           | MMBF4392 | 3.5  |          |
|                                     |                              | $V_{GS} = -5.0\text{ V}, f = 1.0\text{ MHz}$           | MMBF4393 | 3.5  |          |
| <b>Switching Characteristics</b>    |                              |  |          |      |          |
| $t_r$                               | Rise Time                    | $I_{D(on)} = 12\text{ mA}$                             | MMBF4391 | 5.0  | ns       |
|                                     |                              | $I_{D(on)} = 6.0\text{ mA}$                            | MMBF4392 | 5.0  |          |
|                                     |                              | $I_{D(on)} = 3.0\text{ mA}$                            | MMBF4393 | 5.0  |          |
| $t_f$                               | Fall Time                    | $V_{GS(off)} = 12\text{ V}$                            | MMBF4391 | 15   | ns       |
|                                     |                              | $V_{GS(off)} = 6.0\text{ V}$                           | MMBF4392 | 20   |          |
|                                     |                              | $V_{GS(off)} = 3.0\text{ V}$                           | MMBF4393 | 30   |          |
| $t_{on}$                            | Turn-On Time                 | $I_{D(on)} = 12\text{ mA}$                             | MMBF4391 | 15   | ns       |
|                                     |                              | $I_{D(on)} = 6.0\text{ mA}$                            | MMBF4392 | 15   |          |
|                                     |                              | $I_{D(on)} = 3.0\text{ mA}$                            | MMBF4393 | 15   |          |
| $t_{off}$                           | Turn-Off Time                | $V_{GS(off)} = 12\text{ V}$                            | MMBF4391 | 20   | ns       |
|                                     |                              | $V_{GS(off)} = 6.0\text{ V}$                           | MMBF4392 | 35   |          |
|                                     |                              | $V_{GS(off)} = 3.0\text{ V}$                           | MMBF4393 | 50   |          |

Physical Dimensions



- 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

**DETAIL A**  
SCALE: 2X

Figure 1. 3-LEAD, SOT23, JEDEC TO-236, LOW PROFILE





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