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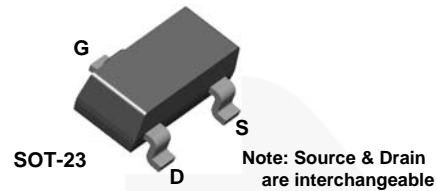


January 2015

# 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.

### 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	

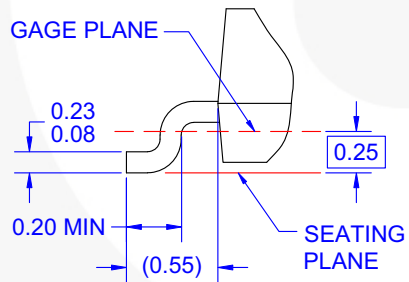
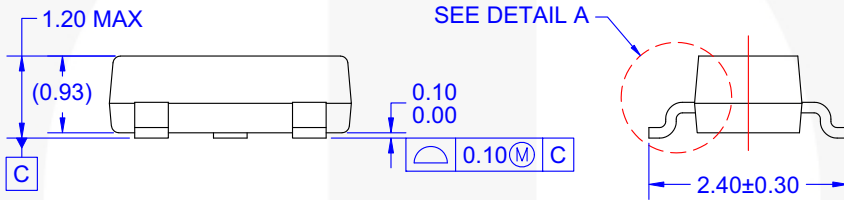
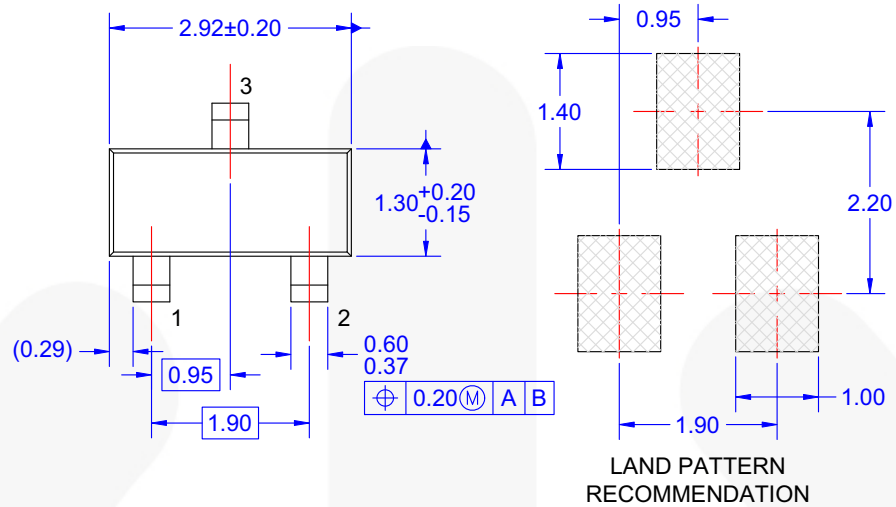
**Note:**

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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