

# Switch, N-Channel

## MMBF4093

### Features

- This Device is Designed for Low Level Analog Switching Applications, Sample and Hold Circuits and Chopper Stabilized Amplifiers.
- Sourced from Process 51.
- This is a Pb-Free and a Halide Free Device

### ABSOLUTE MAXIMUM RATINGS (Note 1), (Note 2)

(T<sub>A</sub> = 25°C unless otherwise noted)

| Symbol                            | Parameter                                        | Value        | Unit |
|-----------------------------------|--------------------------------------------------|--------------|------|
| V <sub>DG</sub>                   | Drain–Gate Voltage                               | 40           | V    |
| V <sub>GS</sub>                   | Gate–Source Voltage                              | –40          | V    |
| I <sub>GF</sub>                   | Forward Gate Current                             | 50           | mA   |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Junction Temperature Range | –55 to + 150 | °C   |

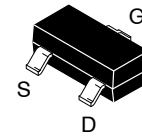
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. These ratings are based on a maximum junction temperature of 150°C.
2. These are steady-state limits. onsemi should be consulted on applications involving pulsed or low-duty cycle operations.

### THERMAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

| Symbol           | Characteristic                                   | Max | Unit  |
|------------------|--------------------------------------------------|-----|-------|
| P <sub>D</sub>   | Total Device Dissipation                         | 350 | mW    |
|                  | Derate above 25°C                                | 2.8 | mW/°C |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient (Note 3) | 357 | °C/W  |

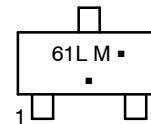
3. Device mounted on FR–4 PCB 1.6" × 1.6" × 0.06".



SOT-23  
CASE 318-08

Note: Source & Drain are interchangeable

### MARKING DIAGRAM



61L = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device   | Package             | Shipping†            |
|----------|---------------------|----------------------|
| MMBF4093 | SOT-23<br>(Pb-Free) | 3000 / Tape and Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](http://BRD8011/D).

# MMBF4093

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Symbol | Parameter | Test Conditions | Min | Max | Unit |
|--------|-----------|-----------------|-----|-----|------|
|--------|-----------|-----------------|-----|-----|------|

### OFF CHARACTERISTICS

|               |                               |                                                                                                                                    |      |              |          |
|---------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------|--------------|----------|
| $V_{(BR)GSS}$ | Gate–Source Breakdown Voltage | $I_G = 1\ \mu\text{A}$ , $V_{DS} = 0$                                                                                              | –40  | –            | V        |
| $V_{GS(off)}$ | Gate–Source Cut–Off Voltage   | $V_{DS} = 20\ \text{V}$ , $I_D = 1\ \text{nA}$                                                                                     | –1.0 | –5.0         | V        |
| $I_{DGO}$     | Drain–Gate Leakage Current    | $V_{DG} = 20\ \text{V}$ , $I_S = 0$<br>$V_{DG} = 20\ \text{V}$ , $I_S = 0$ , $T_A = 150^\circ\text{C}$                             | –    | –200<br>–400 | pA<br>nA |
| $I_D(off)$    | Drain Cutoff Leakage Current  | $V_{DS} = 20\ \text{V}$ , $V_{GS} = -6\ \text{V}$<br>$V_{DS} = 20\ \text{V}$ , $V_{GS} = -6\ \text{V}$ , $T_A = 150^\circ\text{C}$ | –    | 200<br>400   | pA<br>nA |

### ON CHARACTERISTICS

|              |                                          |                                        |   |     |          |
|--------------|------------------------------------------|----------------------------------------|---|-----|----------|
| $I_{DSS}$    | Zero–Gate Voltage Drain Current (Note 4) | $V_{DS} = 20\ \text{V}$ , $I_{GS} = 0$ | 8 | –   | mA       |
| $V_{DS(on)}$ | Drain–Source On Voltage                  | $I_D = 2.5\ \text{mA}$ , $V_{GS} = 0$  | – | 0.2 | V        |
| $r_{DS(on)}$ | Drain–Source On Resistance               | $I_D = 1\ \text{mA}$ , $V_{GS} = 0$    | – | 80  | $\Omega$ |

### SMALL SIGNAL CHARACTERISTICS

|              |                              |                                                                          |   |    |          |
|--------------|------------------------------|--------------------------------------------------------------------------|---|----|----------|
| $r_{DS(on)}$ | Drain–Source On Resistance   | $V_{DS} = V_{GS} = 0$ , $f = 1\ \text{kHz}$                              | – | 80 | $\Omega$ |
| $C_{iss}$    | Input Capacitance            | $V_{DS} = 20\ \text{V}$ , $V_{GS} = 0\ \text{V}$ , $f = 1.0\ \text{MHz}$ | – | 16 | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance | $V_{DS} = -20\ \text{V}$ , $f = 1.0\ \text{MHz}$                         | – | 5  | pF       |

### SWITCHING CHARACTERISTICS

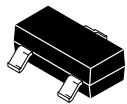
|           |               |                               |   |    |    |
|-----------|---------------|-------------------------------|---|----|----|
| $t_{on}$  | Turn–On Time  | $I_{D(on)} = 3.0\ \text{mA}$  | – | 60 | ns |
| $t_{off}$ | Turn–Off Time | $V_{GS(off)} = 3.0\ \text{V}$ | – | 80 | ns |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 1\%$ .

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

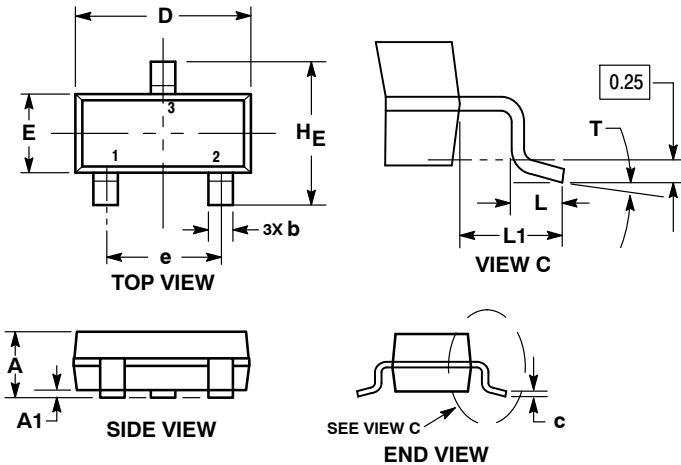
ON Semiconductor®



## SOT-23 (TO-236) CASE 318-08 ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

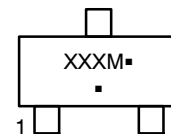


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.000  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.017 | 0.020 |
| c   | 0.08        | 0.14 | 0.20 | 0.003  | 0.006 | 0.008 |
| D   | 2.80        | 2.90 | 3.04 | 0.110  | 0.114 | 0.120 |
| E   | 1.20        | 1.30 | 1.40 | 0.047  | 0.051 | 0.055 |
| e   | 1.78        | 1.90 | 2.04 | 0.070  | 0.075 | 0.080 |
| L   | 0.30        | 0.43 | 0.55 | 0.012  | 0.017 | 0.022 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.027 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

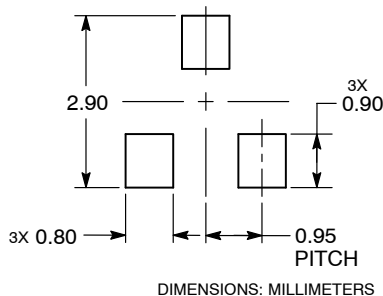
### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

### RECOMMENDED SOLDERING FOOTPRINT



STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

|                         |                        |                                                                                                                                                                                  |
|-------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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