



**Is Now Part of**



**ON Semiconductor®**

**To learn more about ON Semiconductor, please visit our website at**  
**[www.onsemi.com](http://www.onsemi.com)**

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.



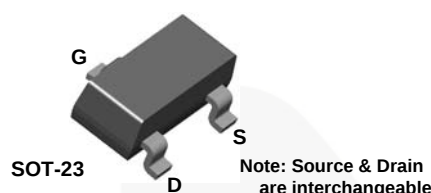
January 2015

# MMBFJ309 / MMBFJ310

## N-Channel RF Amplifier

### Description

This device is designed for VHF/UHF amplifier, oscillator and mixer applications. As a common gate amplifier, 16 dB at 100 MHz and 12 dB at 450 MHz can be realized. Sourced from process 92. Source & Drain are interchangeable.



### Ordering Information

| Part Number | Top Mark | Package   | Packing Method |
|-------------|----------|-----------|----------------|
| MMBFJ309    | 6U       | SOT-23 3L | Tape and Reel  |
| MMBFJ310    | 6T       | 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                               | 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<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  | $^\circ\text{C/W}$   |

#### Note:

3. Device mounted on FR-4 PCB  $36\text{mm} \times 18\text{mm} \times 1.5\text{mm}$ ; mounting pad for the collector lead minimum  $6\text{cm}^2$ .

## Electrical Characteristics

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

| Symbol                       | Parameter                                      | Conditions                                                           |          | Min.  | Typ.  | 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                        |          | -25   |       |       | V      |
| I <sub>GSS</sub>             | Gate Reverse Current                           | V <sub>GS</sub> = -15 V, V <sub>DS</sub> = 0                         |          |       |       | -1.0  | nA     |
|                              |                                                | V <sub>GS</sub> = -15 V, V <sub>DS</sub> = 0, T <sub>A</sub> = 125°C |          |       |       | -1.0  | μA     |
| V <sub>GS(off)</sub>         | Gate-Source Cut-Off Voltage                    | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.0 nA                      | MMBFJ309 | -1.0  |       | -4.0  | V      |
|                              |                                                |                                                                      | MMBFJ310 | -2.0  |       | -6.5  |        |
| On Characteristics           |                                                |                                                                      |          |       |       |       |        |
| I <sub>DSS</sub>             | Zero-Gate Voltage Drain Current <sup>(4)</sup> | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0                          | MMBFJ309 | 12    |       | 30    | mA     |
|                              |                                                |                                                                      | MMBFJ310 | 24    |       | 60    |        |
| V <sub>GS(f)</sub>           | Gate-Source Forward Voltage                    | V <sub>DS</sub> = 0, I <sub>G</sub> = 1.0 mA                         |          |       |       | 1.0   | V      |
| Small Signal Characteristics |                                                |                                                                      |          |       |       |       |        |
| Re <sub>(yis)</sub>          | Common-Source Input Conductance                | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 MHz          | MMBFJ309 |       | 0.7   |       | mmhos  |
|                              |                                                |                                                                      | MMBFJ310 |       | 0.5   |       |        |
| Re <sub>(yos)</sub>          | Common-Source Output Conductance               | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 MHz          |          |       | 0.25  |       | mmhos  |
| G <sub>pg</sub>              | Common-Gate Power Gain                         | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 MHz          |          |       | 16    |       | dB     |
| Re <sub>(yfs)</sub>          | Common-Source Forward Transconductance         | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 MHz          |          |       | 12    |       | mmhos  |
| Re <sub>(yig)</sub>          | Common-Gate Input Conductance                  | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 MHz          |          |       | 12    |       | mmhos  |
| g <sub>fs</sub>              | Common-Source Forward Transconductance         | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 1.0 kHz          | MMBFJ309 | 10000 |       | 20000 | μmhos  |
|                              |                                                |                                                                      | MMBFJ310 | 8000  |       | 18000 |        |
| g <sub>oss</sub>             | Common-Source Output Conductance               | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 1.0 kHz          |          |       |       | 150   | μmhos  |
| g <sub>fg</sub>              | Common-Gate Forward Conductance                | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 1.0 kHz          | MMBFJ309 |       | 13000 |       | μmhos  |
|                              |                                                |                                                                      | MMBFJ310 |       | 12000 |       |        |
| g <sub>og</sub>              | Common-Gate Output Conductance                 | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 1.0 kHz          | MMBFJ309 |       | 100   |       | μmhos  |
|                              |                                                |                                                                      | MMBFJ310 |       | 150   |       |        |
| C <sub>dg</sub>              | Drain-Gate Capacitance                         | V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 V, f = 1.0 MHz            |          |       | 2.0   | 2.5   | pF     |
| C <sub>sg</sub>              | Source-Gate Capacitance                        | V <sub>DS</sub> = 0, V <sub>GS</sub> = -10 V, f = 1.0 MHz            |          |       | 4.1   | 5.0   | pF     |
| NF                           | Noise Figure                                   | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 450 MHz          |          |       | 3.0   |       | dB     |
| e <sub>n</sub>               | Equivalent Short-Circuit Input Noise Voltage   | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 mA, f = 100 Hz           |          |       | 6.0   |       | nV/√Hz |

### Note:

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

## Typical Performance Characteristics

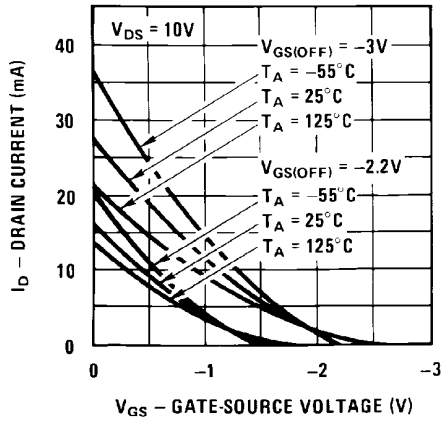


Figure 1. Transfer Characteristics

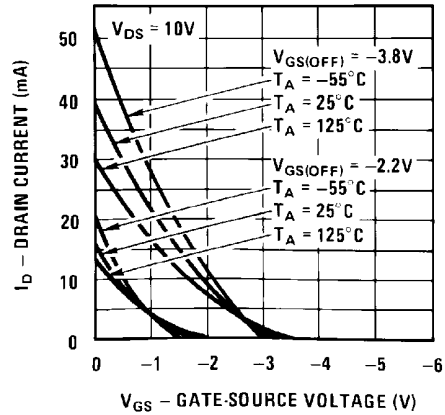


Figure 2. Transfer Characteristics

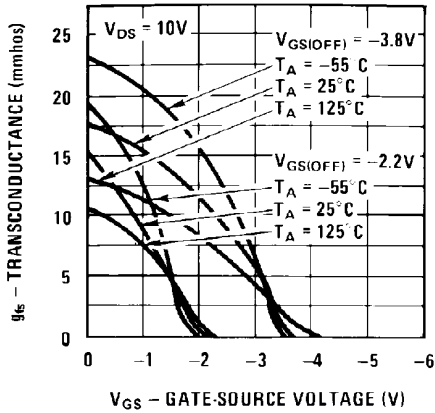


Figure 3. Transfer Characteristics

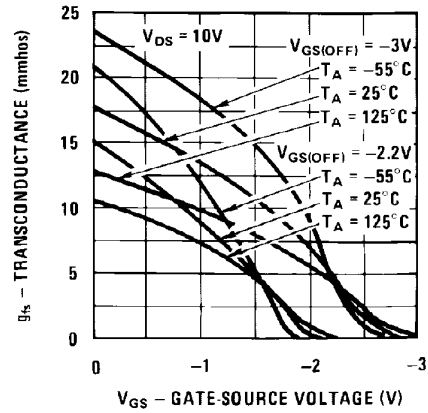


Figure 4. Transfer Characteristics

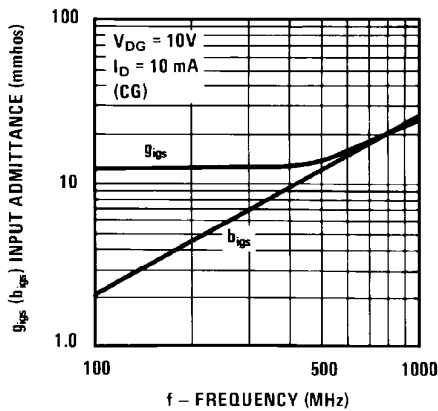


Figure 5. Input Admittance

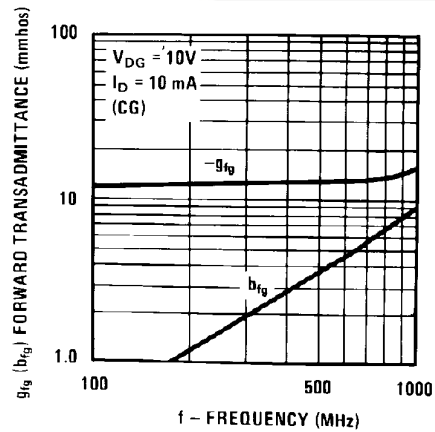


Figure 6. Forward Transadmittance

## Typical Performance Characteristics (Continued)

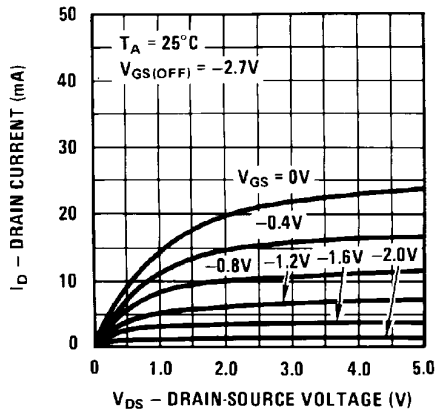


Figure 7. Common Drain-Source

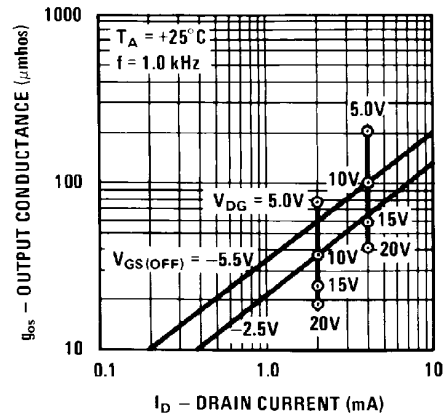


Figure 8. Output Conductance vs. Drain Current

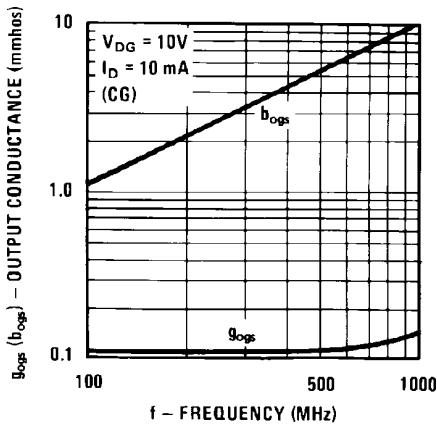


Figure 9. Output Admittance

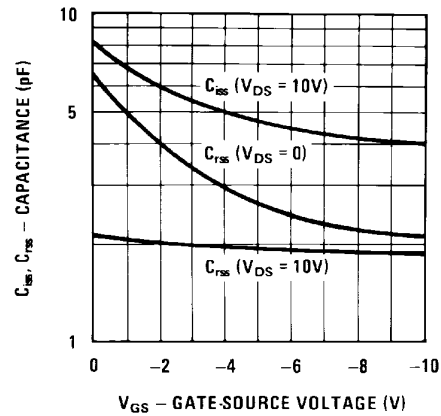


Figure 10. Capacitance vs. Voltage

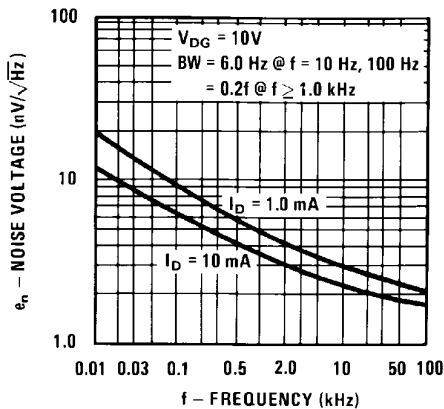


Figure 11. Noise Voltage vs. Frequency

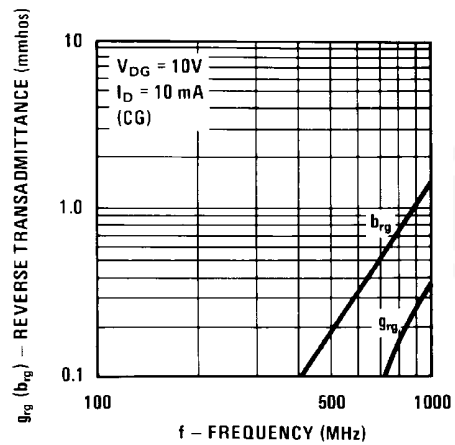


Figure 12. Reverse Transadmittance

## Typical Performance Characteristics (Continued)

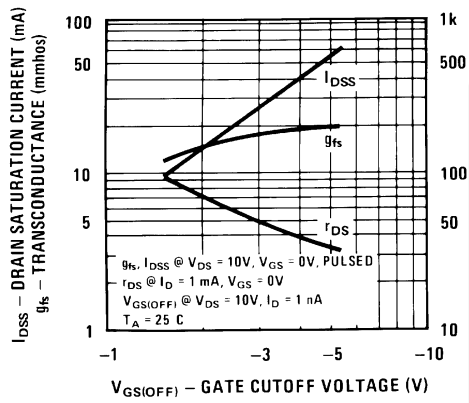


Figure 13. Parameter Interactions

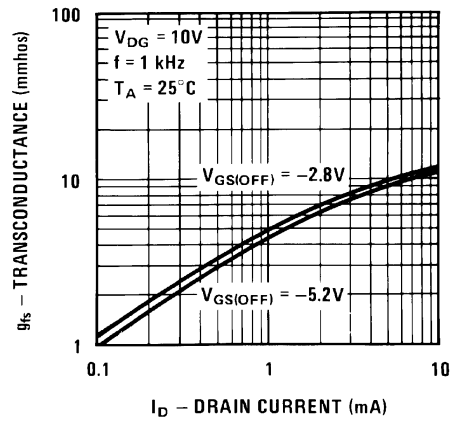


Figure 14. Transconductance vs. Drain Current

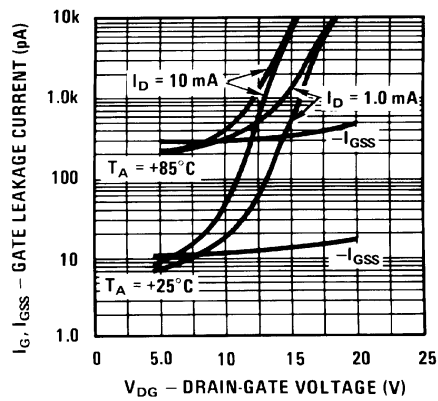


Figure 15. Leakage Current vs. Voltage

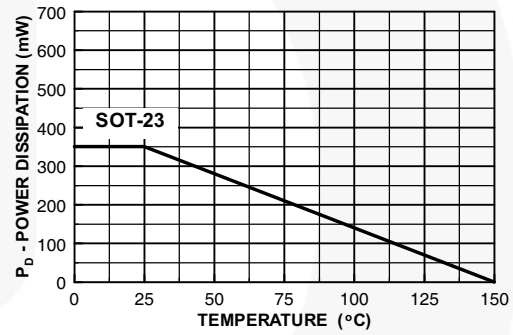


Figure 16. Power Dissipation vs. Ambient Temperature





## TRADEMARKS

The following includes products registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™  
AttitudeEngine™  
Awinda®  
AX-CAP®  
BitSiC™  
Build it Now™  
CorePLUS™  
CorePOWER™  
CROSSVOLT™  
CTL™  
Current Transfer Logic™  
DEUXPEED®  
Dual Cool™  
EcoSPARK®  
EfficientMax™  
ESBC™  
**F**®  
Fairchild®  
Fairchild Semiconductor®  
FACT Quiet Series™  
FACT®  
FAST®  
FastvCore™  
FETBench™  
FPS™

F-PFS™  
FRFET®  
Global Power Resource<sup>SM</sup>  
GreenBridge™  
Green FPS™  
Green FPS™ e-Series™  
Gmax™  
GTO™  
IntelliMAX™  
ISOPLANAR™  
Making Small Speakers Sound Louder and Better™  
MegaBuck™  
MICROCOUPLER™  
MicroFET™  
MicroPak™  
MicroPak2™  
MillerDrive™  
MotionMax™  
MotionGrid®  
MTi®  
MTx®  
MVN®  
mWSaver®  
OptoHiT™  
OPTOLOGIC®

OPTOPLANAR®  
  
PowerTrench®  
PowerXS™  
Programmable Active Droop™  
QFET®  
QS™  
Quiet Series™  
RapidConfigure™  
  
Saving our world, 1mW/W/kW at a time™  
SignalWise™  
SmartMax™  
SMART START™  
Solutions for Your Success™  
SPM®  
STEALTH™  
SuperFET®  
SuperSOT™-3  
SuperSOT™-6  
SuperSOT™-8  
SupreMOS®  
SyncFET™  
Sync-Lock™

 SYSTEM GENERAL®  
TinyBoost®  
TinyBuck®  
TinyCalc™  
TinyLogic®  
TINYOPTO™  
TinyPower™  
TinyPWM™  
TinyWire™  
TranSiC™  
TriFault Detect™  
TRUECURRENT®  
µSerDes™  
 SerDes™  
UHC®  
Ultra FRFET™  
UniFET™  
VCX™  
VisualMax™  
VoltagePlus™  
XS™  
Xsens™  
仙童™

\* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT <http://www.fairchildsemi.com>. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

## ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, [www.fairchildsemi.com](http://www.fairchildsemi.com), under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

## PRODUCT STATUS DEFINITIONS

### Definition of Terms

| Datasheet Identification | Product Status        | Definition                                                                                                                                                                                          |
|--------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advance Information      | Formative / In Design | Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.                                                                       |
| Preliminary              | First Production      | Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| No Identification Needed | Full Production       | Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.                                               |
| Obsolete                 | Not In Production     | Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.                                                    |

Rev. I73

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada

**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910

**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)

**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local  
Sales Representative

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[onsemi:](#)

[MMBFJ310\\_Q](#)