

# MOSFET - N-Channel, SOT-23

300 mA, 20 V

MMBF0201NL,  
MVMBF0201NL

These miniature surface mount MOSFETs low  $R_{DS(on)}$  assure minimal power loss and conserve energy, making these devices ideal for use in small power management circuitry. Typical applications are dc-dc converters, power management in portable and battery-powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

## Features

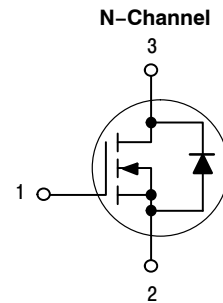
- Low  $R_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature SOT-23 Surface Mount Package Saves Board Space
- MVMBF Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable\*
- These Devices are Pb-Free and are RoHS Compliant

## MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

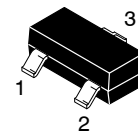
| Rating                                                                                                                                                                                                                                                | Symbol                     | Value             | Unit               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------------|--------------------|
| Drain-to-Source Voltage                                                                                                                                                                                                                               | $V_{DSS}$                  | 20                | Vdc                |
| Gate-to-Source Voltage – Continuous                                                                                                                                                                                                                   | $V_{GS}$                   | $\pm 20$          | Vdc                |
| Drain Current <ul style="list-style-type: none"> <li>– Continuous @ <math>T_A = 25^\circ\text{C}</math></li> <li>– Continuous @ <math>T_A = 70^\circ\text{C}</math></li> <li>– Pulsed Drain Current (<math>t_p \leq 10 \mu\text{s}</math>)</li> </ul> | $I_D$<br>$I_D$<br>$I_{DM}$ | 300<br>240<br>750 | mAdc               |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$                                                                                                                                                                                                    | $P_D$                      | 225               | mW                 |
| Operating and Storage Temperature Range                                                                                                                                                                                                               | $T_J, T_{stg}$             | - 55 to 150       | $^\circ\text{C}$   |
| Thermal Resistance, Junction-to-Ambient                                                                                                                                                                                                               | $R_{\theta JA}$            | 556               | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds                                                                                                                                                                        | $T_L$                      | 260               | $^\circ\text{C}$   |

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.

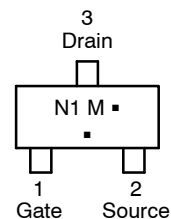
300 mAMPS – 20 VOLTS  
 $R_{DS(on)} = 1 \Omega$



## MARKING DIAGRAM AND PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



N1 = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

## ORDERING INFORMATION

| Device          | Package          | Shipping†          |
|-----------------|------------------|--------------------|
| MMBF0201NLT1G   | SOT-23 (Pb-Free) | 3000 / Tape & Reel |
| MVMBF0201NLT1G* | SOT-23 (Pb-Free) | 3000 / Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMBF0201NL, MVMBF0201NL

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                                                                                 |               |        |        |           |                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------|-----------|-----------------|
| Drain-to-Source Breakdown Voltage<br>( $V_{GS} = 0\text{ Vdc}$ , $I_D = 10\text{ }\mu\text{A}$ )                                                                                | $V_{(BR)DSS}$ | 20     | –      | –         | Vdc             |
| Zero Gate Voltage Drain Current<br>( $V_{DS} = 16\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )<br>( $V_{DS} = 16\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ ) | $I_{DSS}$     | –<br>– | –<br>– | 1.0<br>10 | $\mu\text{Adc}$ |
| Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0$ )                                                                                                       | $I_{GSS}$     | –      | –      | $\pm 100$ | nAdc            |

### ON CHARACTERISTICS (Note 1)

|                                                                                                                                                           |              |        |             |            |          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|-------------|------------|----------|
| Gate Threshold Voltage<br>( $V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{Adc}$ )                                                                        | $V_{GS(th)}$ | 1.0    | 1.7         | 2.4        | Vdc      |
| Static Drain-to-Source On-Resistance<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 300\text{ mAdc}$ )<br>( $V_{GS} = 4.5\text{ Vdc}$ , $I_D = 100\text{ mAdc}$ ) | $r_{DS(on)}$ | –<br>– | 0.75<br>1.0 | 1.0<br>1.4 | $\Omega$ |
| Forward Transconductance ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 200\text{ mAdc}$ )                                                                           | $g_{FS}$     | –      | 450         | –          | mMhos    |

### DYNAMIC CHARACTERISTICS

|                      |                             |           |   |     |   |    |
|----------------------|-----------------------------|-----------|---|-----|---|----|
| Input Capacitance    | ( $V_{DS} = 5.0\text{ V}$ ) | $C_{iss}$ | – | 45  | – | pF |
| Output Capacitance   | ( $V_{DS} = 5.0\text{ V}$ ) | $C_{oss}$ | – | 25  | – |    |
| Transfer Capacitance | ( $V_{DG} = 5.0\text{ V}$ ) | $C_{rss}$ | – | 5.0 | – |    |

### SWITCHING CHARACTERISTICS (Note 2)

|                            |                                                                                         |              |   |      |   |    |
|----------------------------|-----------------------------------------------------------------------------------------|--------------|---|------|---|----|
| Turn-On Delay Time         | (V <sub>DD</sub> = 15 Vdc, I <sub>D</sub> = 300 mAdc,<br>R <sub>L</sub> = 50 $\Omega$ ) | $t_{d(on)}$  | – | 2.5  | – | ns |
| Rise Time                  |                                                                                         | $t_r$        | – | 2.5  | – |    |
| Turn-Off Delay Time        |                                                                                         | $t_{d(off)}$ | – | 15   | – |    |
| Fall Time                  |                                                                                         | $t_f$        | – | 0.8  | – |    |
| Gate Charge (See Figure 5) |                                                                                         | $Q_T$        | – | 1400 | – | pC |

### SOURCE-DRAIN DIODE CHARACTERISTICS

|                          |          |   |      |      |   |
|--------------------------|----------|---|------|------|---|
| Continuous Current       | $I_S$    | – | –    | 0.3  | A |
| Pulsed Current           | $I_{SM}$ | – | –    | 0.75 |   |
| Forward Voltage (Note 2) | $V_{SD}$ | – | 0.85 | –    | V |

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.

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
2. Switching characteristics are independent of operating junction temperature.

TYPICAL ELECTRICAL CHARACTERISTICS

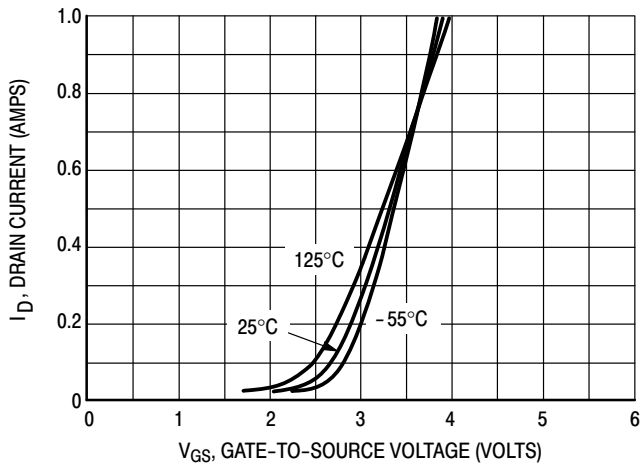


Figure 1. Transfer Characteristics

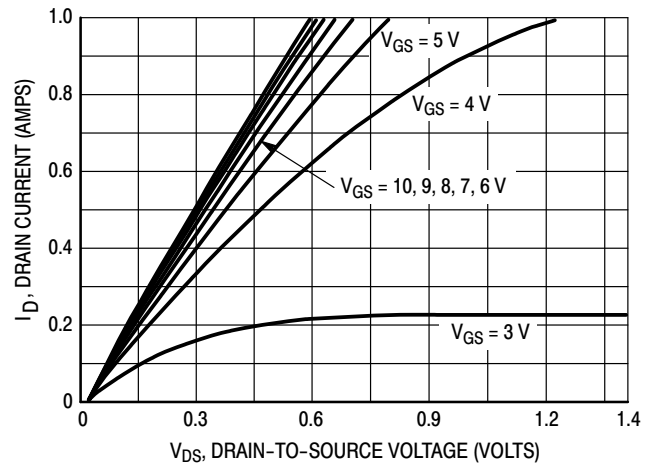


Figure 2. On-Region Characteristics

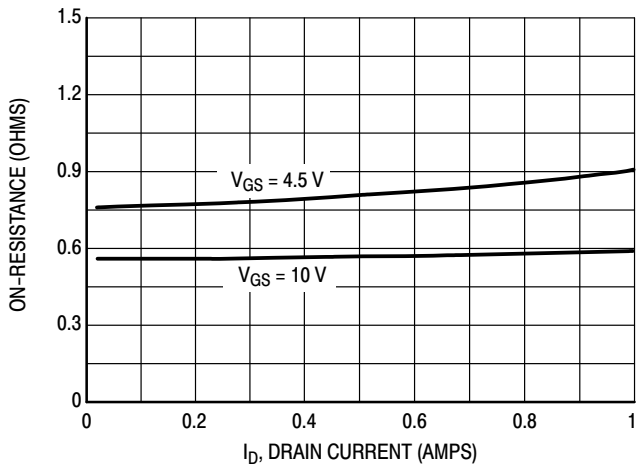


Figure 3. On-Resistance versus Drain Current

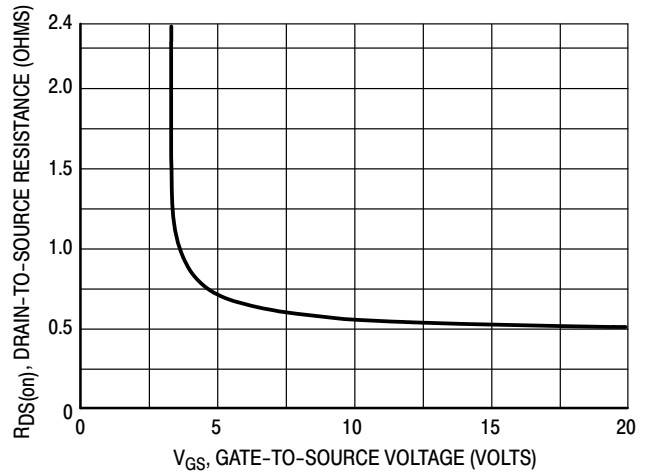


Figure 4. On-Resistance versus Gate-to-Source Voltage

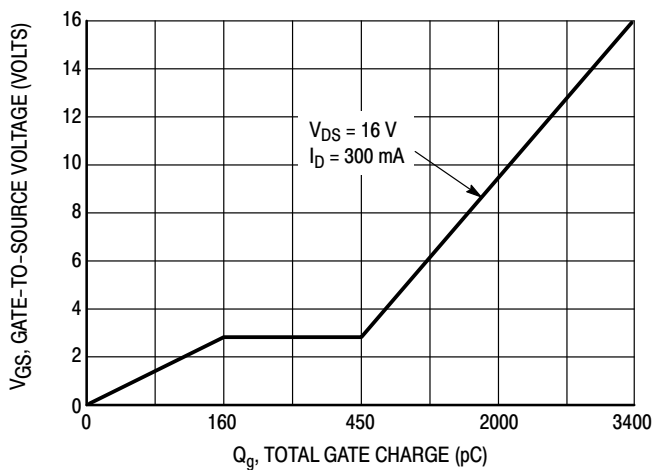


Figure 5. Gate Charge

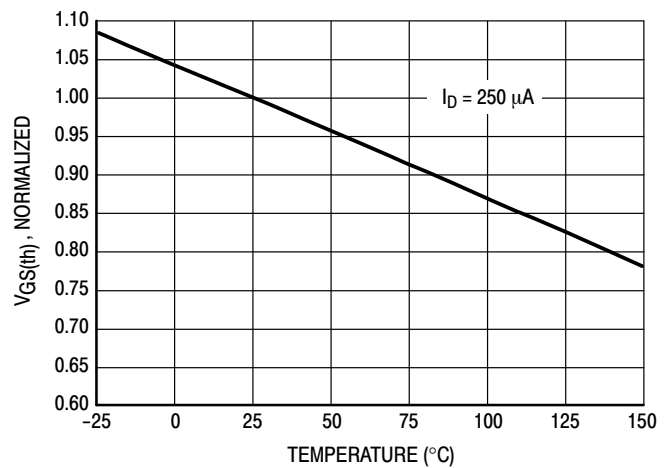


Figure 6. Threshold Voltage Variance Over Temperature

TYPICAL ELECTRICAL CHARACTERISTICS

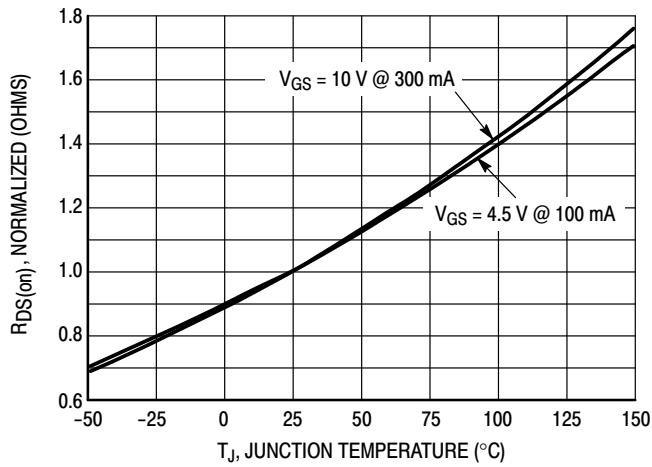


Figure 7. On-Resistance versus Junction Temperature

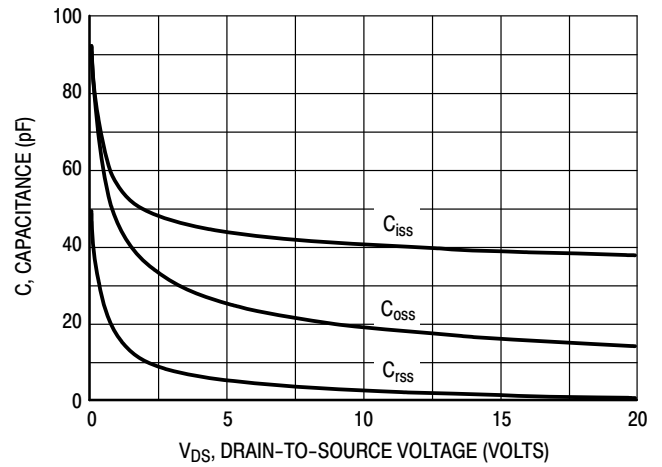


Figure 8. Capacitance

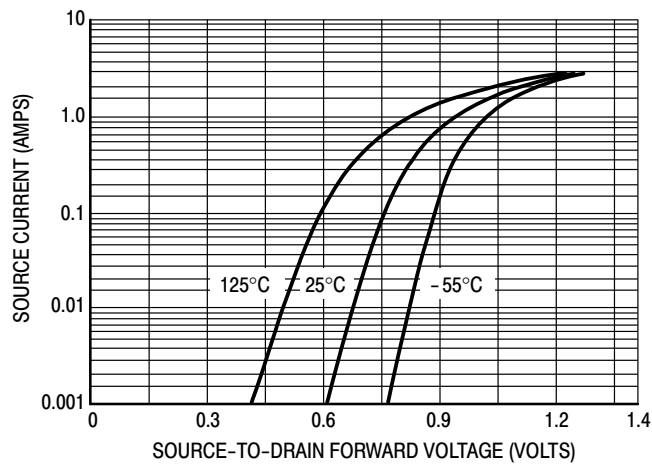
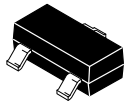


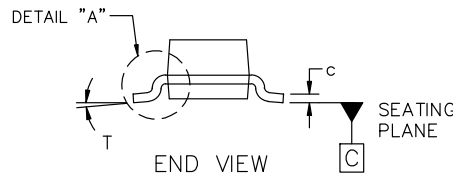
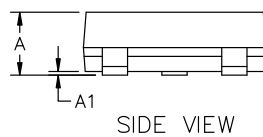
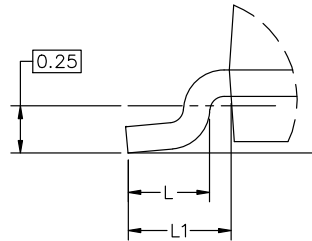
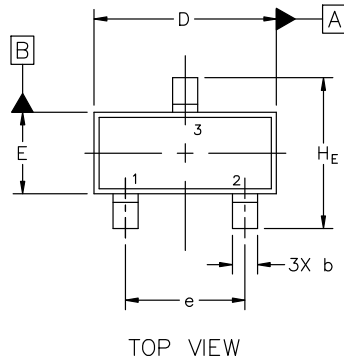
Figure 9. Source-to-Drain Forward Voltage versus Continuous Current ( $I_S$ )



SCALE 4:1

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CASE 318  
ISSUE AU

DATE 14 AUG 2024

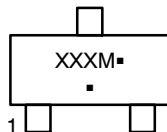


| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 1.20 | 1.30 | 1.40 |
| e           | 1.78 | 1.90 | 2.04 |
| L           | 0.30 | 0.43 | 0.55 |
| L1          | 0.35 | 0.54 | 0.69 |
| HE          | 2.10 | 2.40 | 2.64 |
| T           | 0°   | ---  | 10°  |

NOTES:

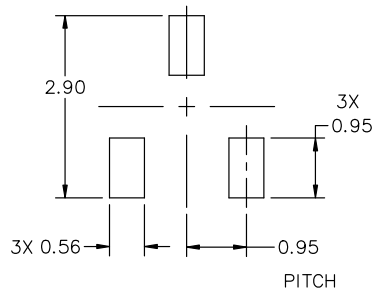
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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. Some products may not follow the Generic Marking.



RECOMMENDED  
MOUNTING FOOTPRINT

\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

STYLES ON PAGE 2

|                  |                                      |                                                                                                                                                                                     |
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|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

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