

# MMBF0201NLT1

Preferred Device

## Power MOSFET 300 mAmps, 20 Volts

### N-Channel SOT-23

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
- Pb-Free Package is Available

#### 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<br>– Continuous @ $T_A = 25^\circ\text{C}$<br>– Continuous @ $T_A = 70^\circ\text{C}$<br>– Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ ) | $I_D$<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               | $^\circ\text{C}$   |

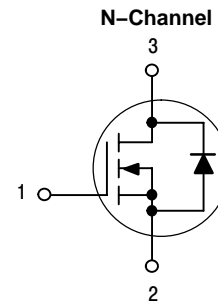
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.



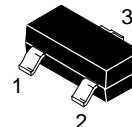
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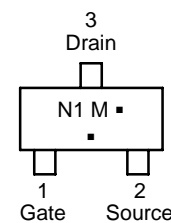
**300 mAmps – 20 Volts**  
 **$R_{DS(on)} = 1 \Omega$**



#### 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†        |
|---------------|---------------------|------------------|
| MMBF0201NLT1  | SOT-23              | 3000 Tape & Reel |
| MMBF0201NLT1G | SOT-23<br>(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.

Preferred devices are recommended choices for future use and best overall value.

# MMBF0201NLT1

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

### ON CHARACTERISTICS (Note 1)

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

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

TYPICAL ELECTRICAL CHARACTERISTICS

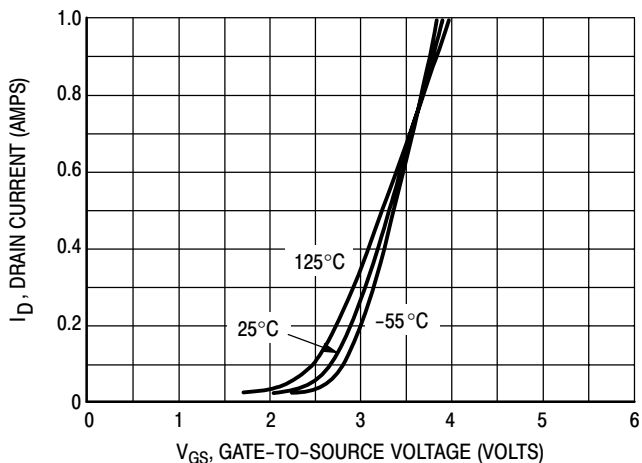


Figure 1. Transfer Characteristics

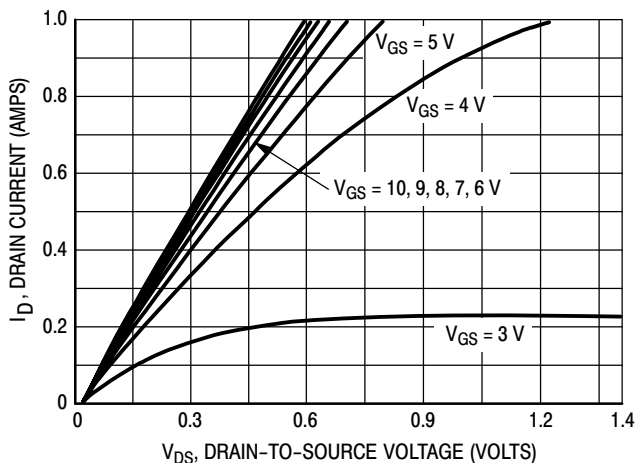


Figure 2. On-Region Characteristics

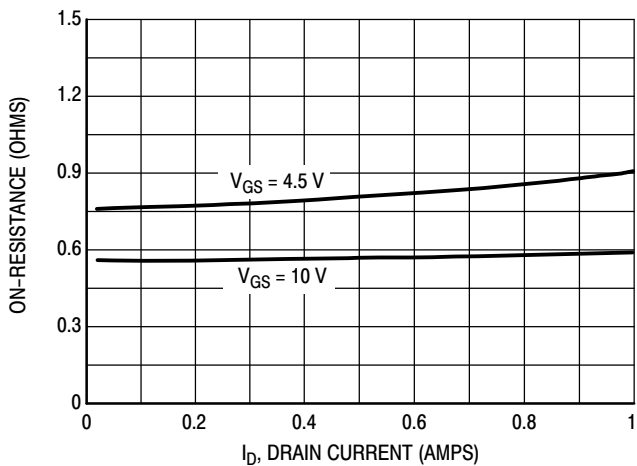


Figure 3. On-Resistance versus Drain Current

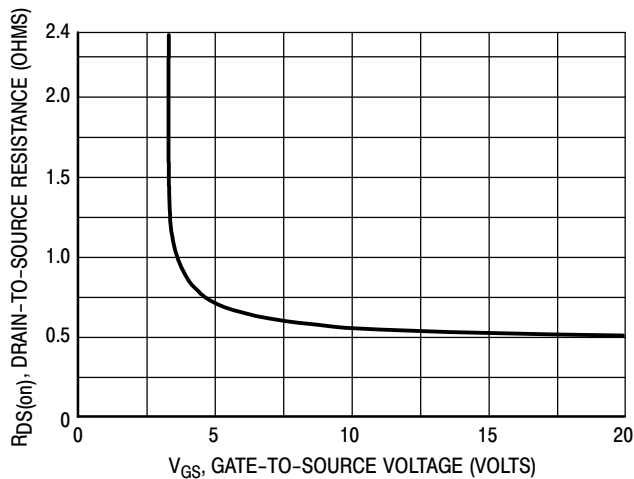


Figure 4. On-Resistance versus Gate-to-Source Voltage

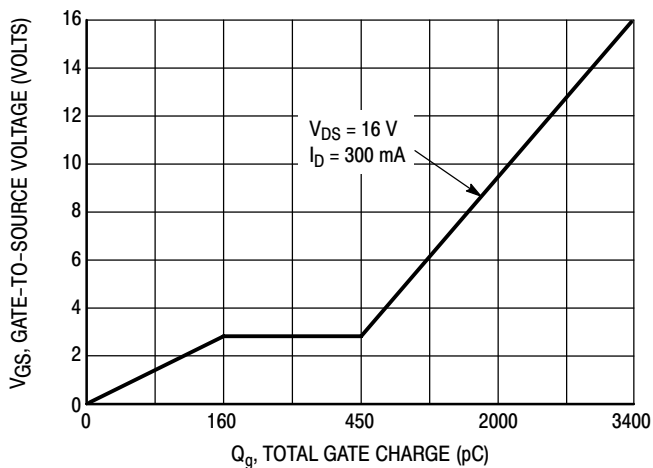


Figure 5. Gate Charge

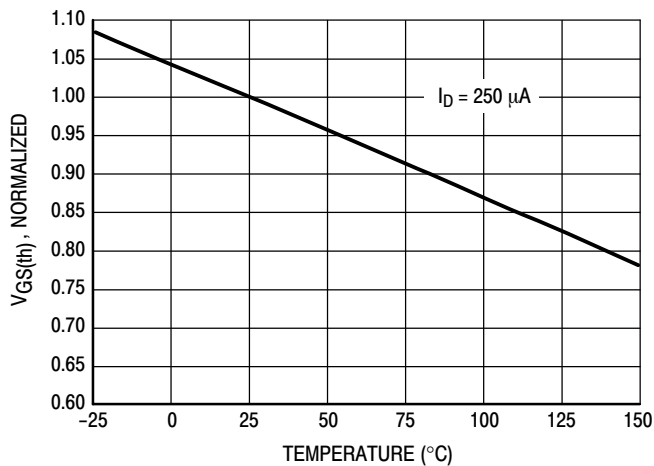


Figure 6. Threshold Voltage Variance Over Temperature

TYPICAL ELECTRICAL CHARACTERISTICS

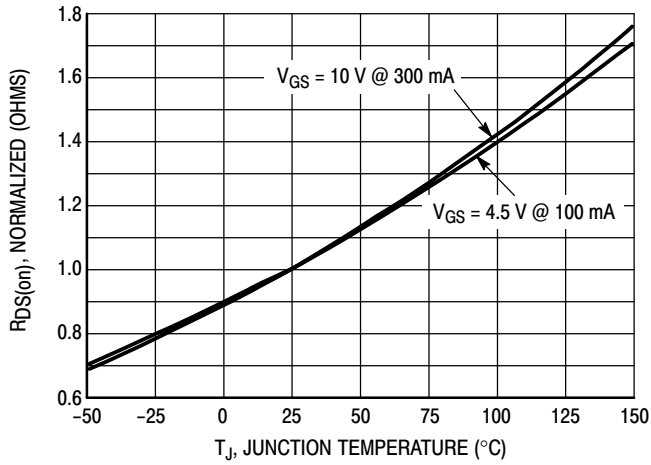


Figure 7. On-Resistance versus Junction Temperature

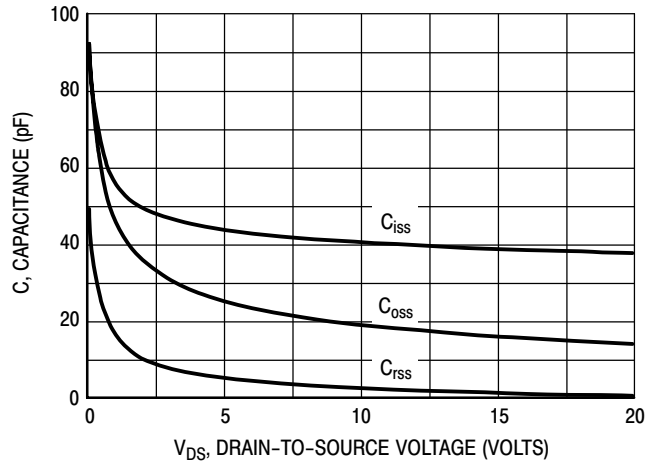


Figure 8. Capacitance

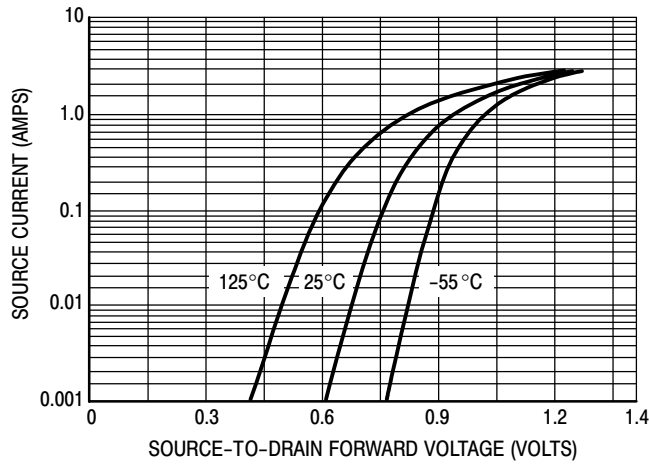
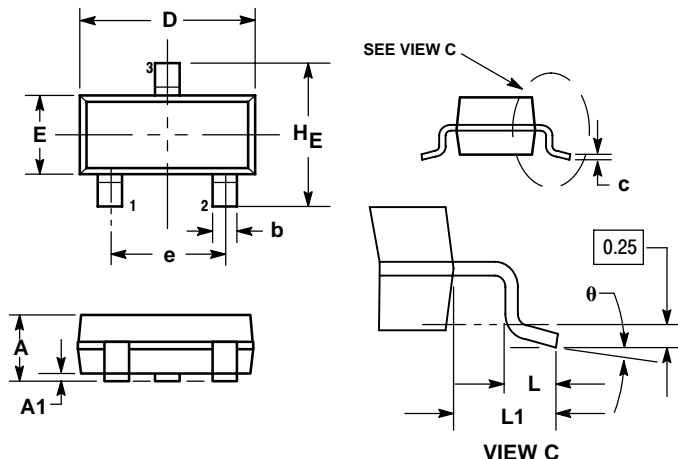


Figure 9. Source-to-Drain Forward Voltage versus Continuous Current ( $I_S$ )

# MMBF0201NLT1

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AN

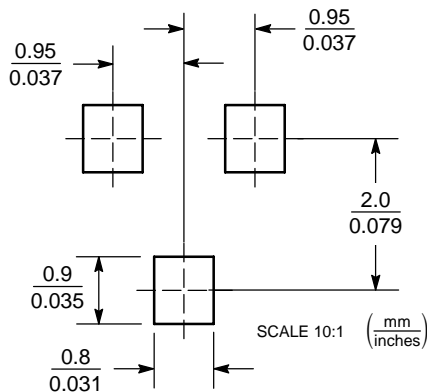


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.018 | 0.020 |
| c   | 0.09        | 0.13 | 0.18 | 0.003  | 0.005 | 0.007 |
| 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 | 0.081 |
| L   | 0.10        | 0.20 | 0.30 | 0.004  | 0.008 | 0.012 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.029 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |

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

### SOLDERING FOOTPRINT\*



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

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