

# MMBF0201NL, MVMBF0201NL

## 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
- 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			mAdc
– Continuous @ $T_A = 25^\circ\text{C}$	$I_D$	300	
– Continuous @ $T_A = 70^\circ\text{C}$	$I_D$	240	
– Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ )	$I_{DM}$	750	
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	$^\circ\text{C}$

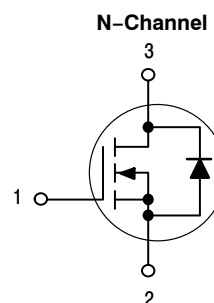
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.



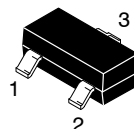
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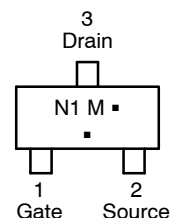
**300 mAmps – 20 Volts**  
 **$R_{DS(on)} = 1 \Omega$**



#### 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†
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.

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 10\ \mu\text{A}$ )	$V_{(BR)DSS}$	20	–	–	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 16\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 16\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$I_{DSS}$	–	–	1.0 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 ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{Adc}$ )	$V_{GS(th)}$	1.0	1.7	2.4	Vdc
Static Drain-to-Source On-Resistance ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 300\ \text{mAdc}$ ) ( $V_{GS} = 4.5\text{ Vdc}$ , $I_D = 100\ \text{mAdc}$ )	$r_{DS(on)}$	–	0.75 1.0	1.0 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	( $V_{DD} = 15\text{ Vdc}$ , $I_D = 300\ \text{mAdc}$ , $R_L = 50\ \Omega$ )	$t_{d(on)}$	–	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  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
2. Switching characteristics are independent of operating junction temperature.

TYPICAL ELECTRICAL CHARACTERISTICS

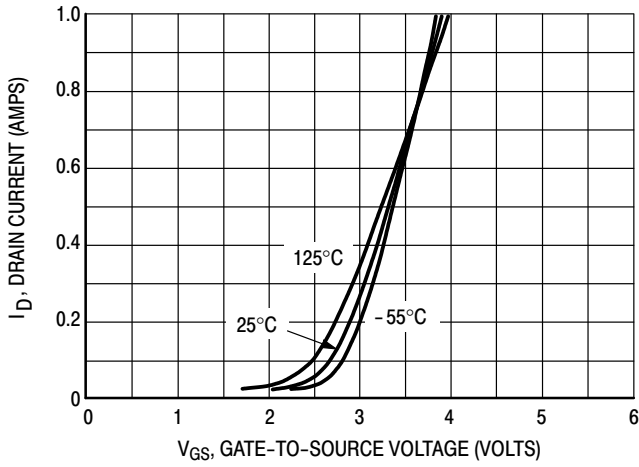


Figure 1. Transfer Characteristics

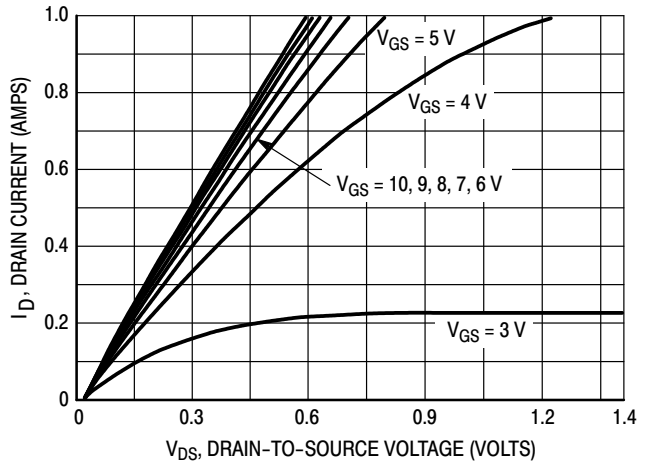


Figure 2. On-Region Characteristics

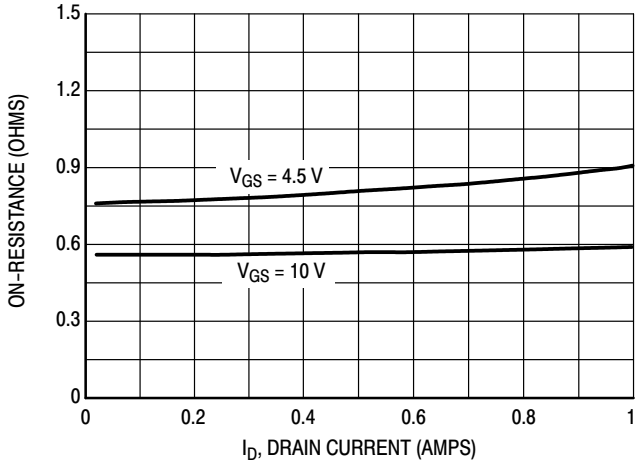


Figure 3. On-Resistance versus Drain Current

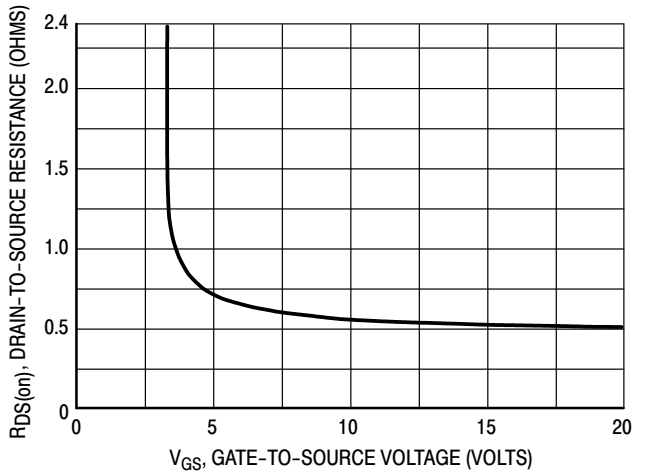


Figure 4. On-Resistance versus Gate-to-Source Voltage

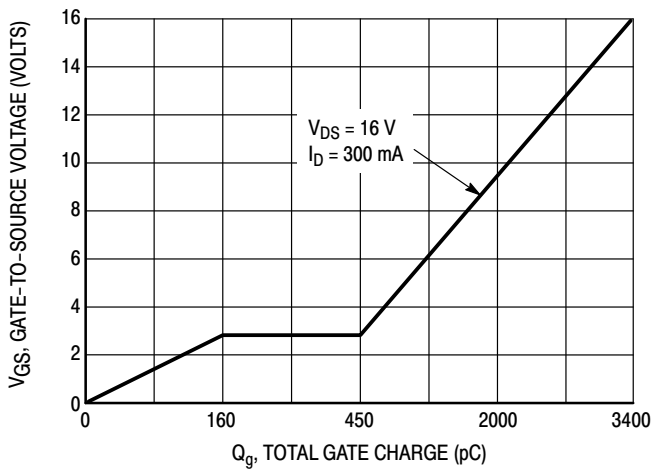


Figure 5. Gate Charge

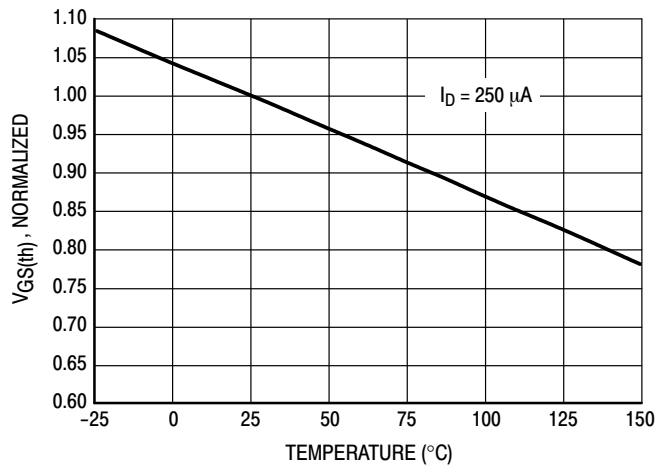


Figure 6. Threshold Voltage Variance Over Temperature

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## TYPICAL ELECTRICAL CHARACTERISTICS

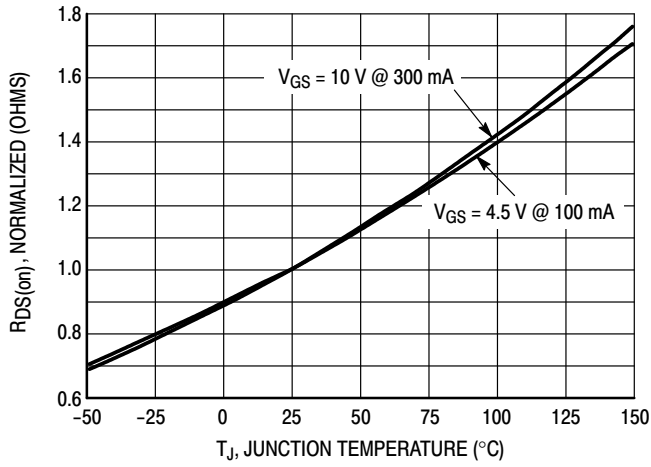


Figure 7. On-Resistance versus Junction Temperature

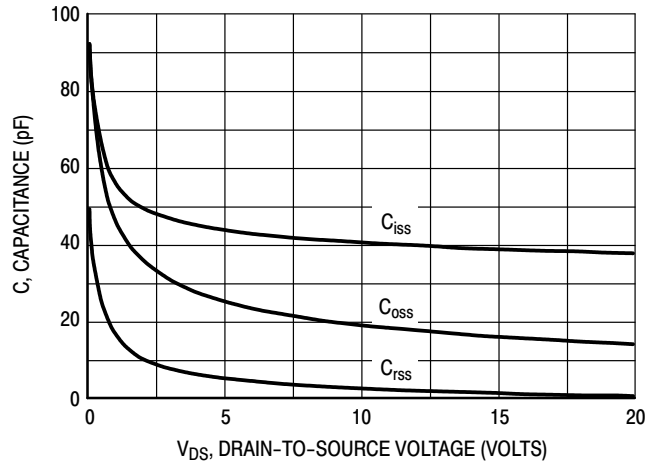


Figure 8. Capacitance

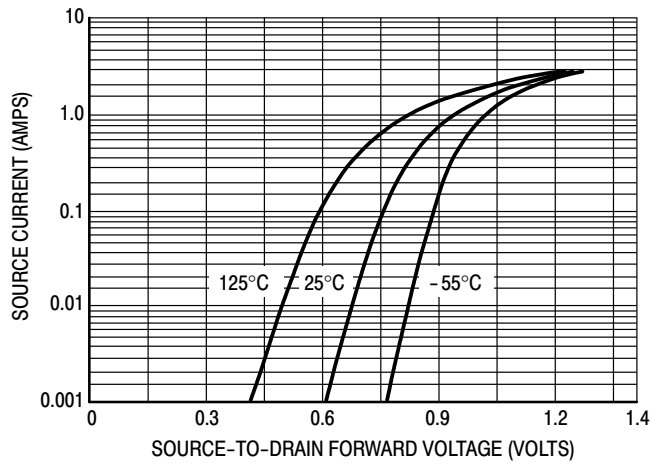
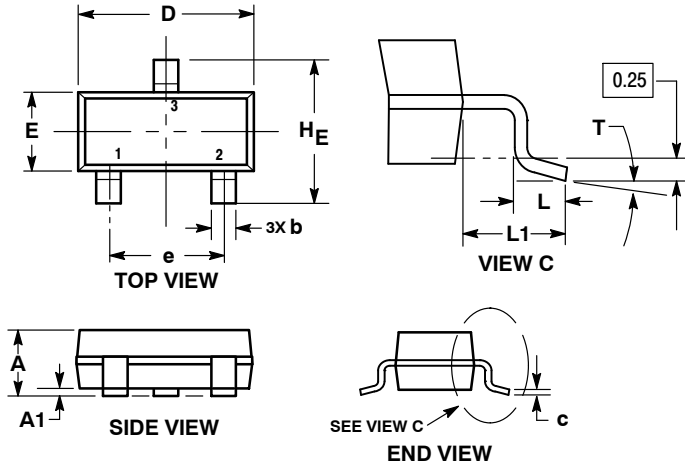


Figure 9. Source-to-Drain Forward Voltage versus Continuous Current ( $I_S$ )

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## PACKAGE DIMENSIONS

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



**NOTES:**

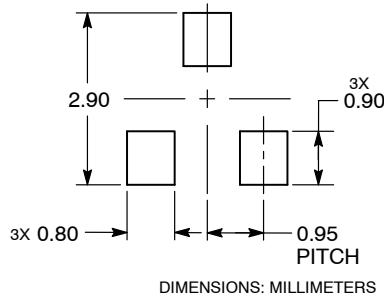
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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°

**STYLE 21:**

1. GATE
2. SOURCE
3. DRAIN

### RECOMMENDED 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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