

# MMBF2201N, NVF2201N

## Power MOSFET 300 mAmps, 20 Volts

### N-Channel SC-70/SOT-323

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 SC-70/SOT-323 Surface Mount Package Saves Board Space
- NVF 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	$V_{DS}$	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 @ $T_A = 25^\circ\text{C}$ (Note 1) Derate above $25^\circ\text{C}$	$P_D$	150 1.2	mW mW/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to 150	$^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	833	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes, for 10 seconds	$T_L$	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Mounted on G10/FR4 glass epoxy board using minimum recommended footprint.

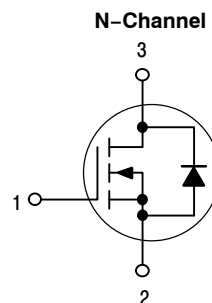


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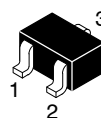
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300 mAmps, 20 Volts

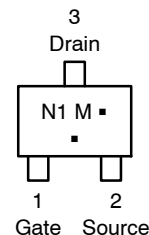
$R_{DS(on)} = 1 \Omega$



#### MARKING DIAGRAM AND PIN ASSIGNMENT



SC-70/SOT-323  
CASE 419  
STYLE 8



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

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping†
MMBF2201NT1G	SOT-323 (Pb-Free)	3000 / Tape & Reel
NVF2201NT1G*	SOT-323 (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<sub>A</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 10 μA)	V <sub>(BR)DSS</sub>	20	-	-	Vdc	
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 16 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 16 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	-	-	1.0 10	μAdc	
Gate-Body Leakage Current (V <sub>GS</sub> = ± 20 Vdc, V <sub>DS</sub> = 0)	I <sub>GSS</sub>	-	-	±100	nAdc	
<b>ON CHARACTERISTICS (Note 2)</b>						
Gate Threshold Voltage (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc)	V <sub>GS(th)</sub>	1.0	1.7	2.4	Vdc	
Static Drain-to-Source On-Resistance (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 300 mAdc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 100 mAdc)	r <sub>DS(on)</sub>	-	0.75 1.0	1.0 1.4	Ω	
Forward Transconductance (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 200 mAdc)	g <sub>FS</sub>	-	450	-	mMhos	
<b>DYNAMIC CHARACTERISTICS</b>						
Input Capacitance	(V <sub>DS</sub> = 5.0 V)	C <sub>ISS</sub>	-	45	-	pF
Output Capacitance	(V <sub>DS</sub> = 5.0 V)	C <sub>OSS</sub>	-	25	-	
Transfer Capacitance	(V <sub>DG</sub> = 5.0 V)	C <sub>RSS</sub>	-	5.0	-	
<b>SWITCHING CHARACTERISTICS (Note 3)</b>						
Turn-On Delay Time	(V <sub>DD</sub> = 15 Vdc, I <sub>D</sub> = 300 mAdc, R <sub>L</sub> = 50 Ω)	t <sub>d(on)</sub>	-	2.5	-	ns
Rise Time		t <sub>r</sub>	-	2.5	-	
Turn-Off Delay Time		t <sub>d(off)</sub>	-	15	-	
Fall Time		t <sub>f</sub>	-	0.8	-	
Gate Charge (See Figure 5)		Q <sub>T</sub>	-	1400	-	pC
<b>SOURCE-DRAIN DIODE CHARACTERISTICS</b>						
Continuous Current	I <sub>S</sub>	-	-	0.3	A	
Pulsed Current	I <sub>SM</sub>	-	-	0.75		
Forward Voltage (Note 3)	V <sub>SD</sub>	-	0.85	-	V	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperature.

## TYPICAL CHARACTERISTICS

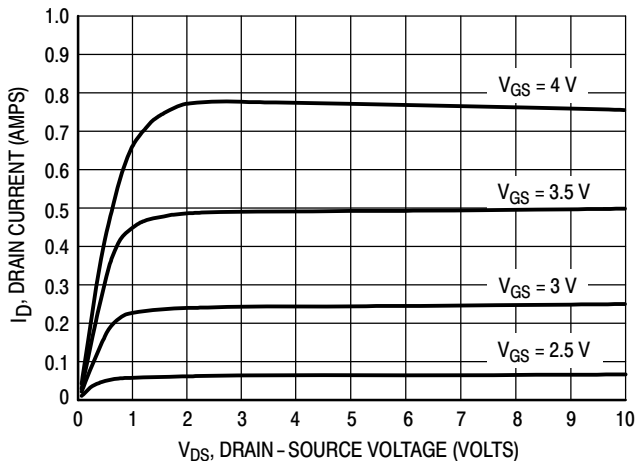


Figure 1. Typical Drain Characteristics

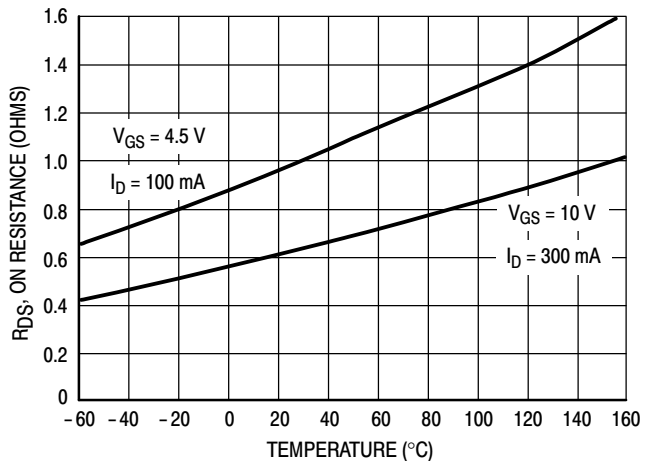
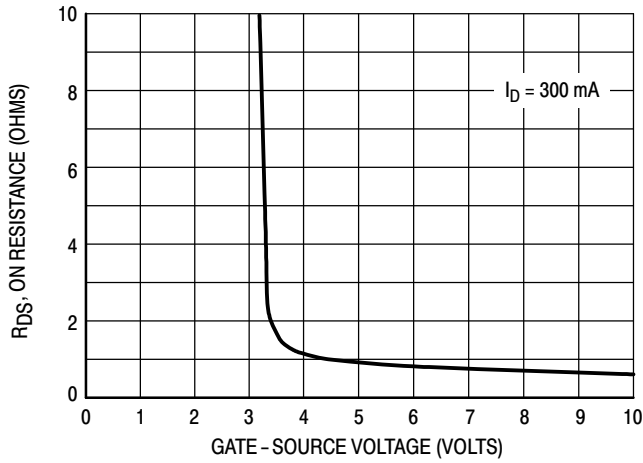


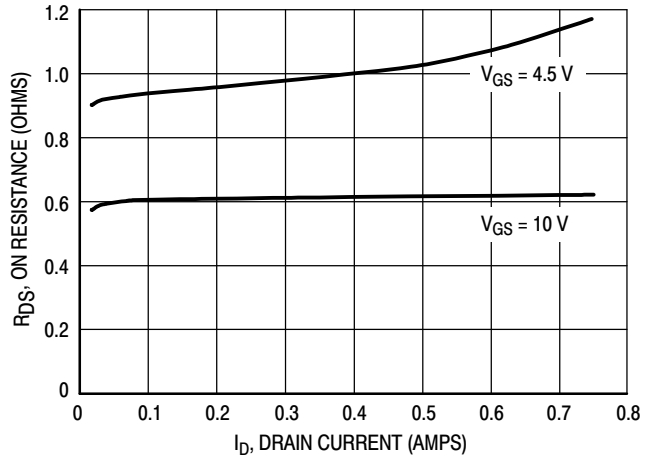
Figure 2. On Resistance versus Temperature

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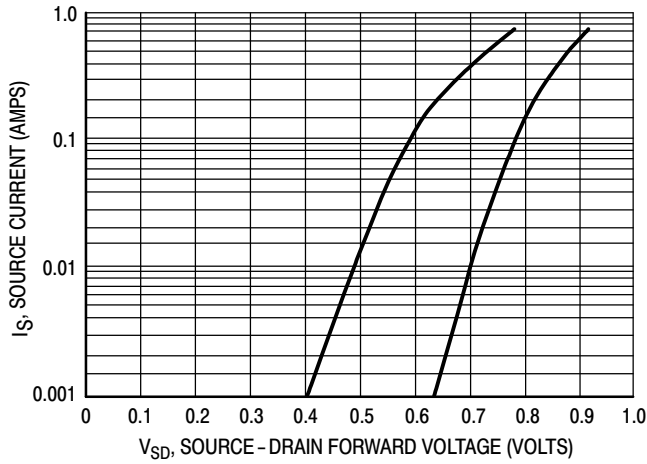
## TYPICAL CHARACTERISTICS



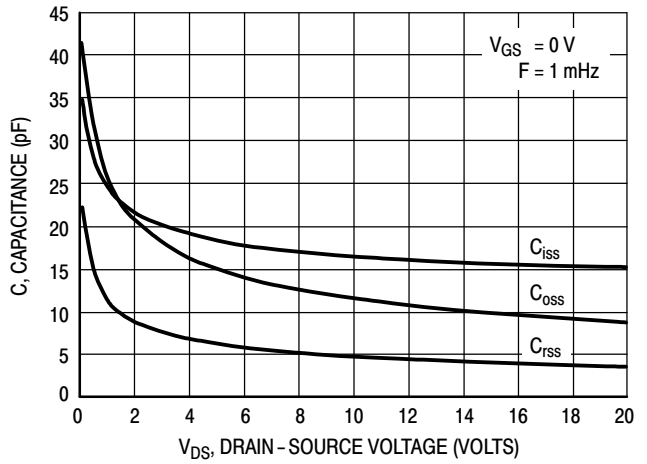
**Figure 3. On Resistance versus Gate-Source Voltage**



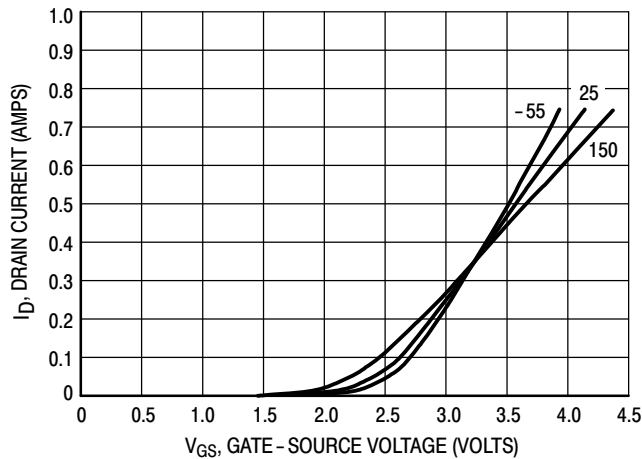
**Figure 4. On Resistance versus Drain Current**



**Figure 5. Source-Drain Forward Voltage**



**Figure 6. Capacitance Variation**

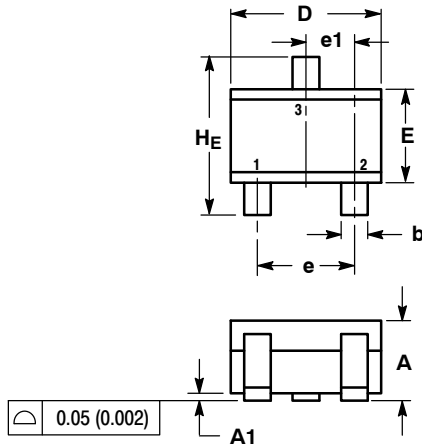


**Figure 7. Transfer Characteristics**

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## PACKAGE DIMENSIONS

### SC-70 (SOT-323) CASE 419-04 ISSUE N

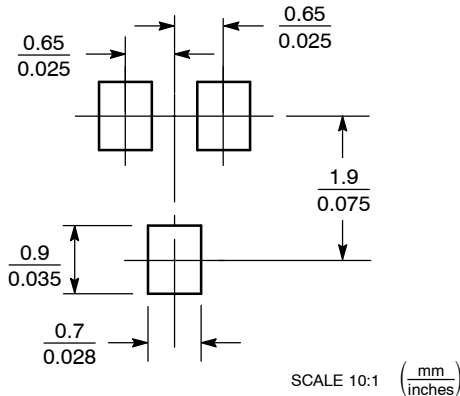


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 REF		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
HE	2.00	2.10	2.40	0.079	0.083	0.095

- STYLE 8:  
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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