MMBF2201NT1, 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
- AEC−Q101 Qualified and PPAP Capable − NVF2201N
- These Devices are Pb−Free and are RoHS Compliant

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	20	Vdc
Gate−to−Source Voltage − Continuous	V_{GS}	± 20	Vdc

Drain Current
  − Continuous @ T_A = 25°C
  − Continuous @ T_A = 70°C
  − Pulsed Drain Current ($t_p \leq$ 10 μs)
	I_D
	I_D
	I_{DM}
		300
		240
		750
			mAdc

Total Power Dissipation @ T_A = 25°C (Note 1) Derate above 25°C	P_D	150 1.2	mW mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	− 55 to 150	°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	833	°C/W
Maximum Lead Temperature for Soldering Purposes, for 10 seconds	T_L	260	°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.
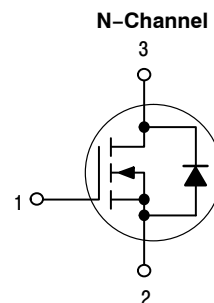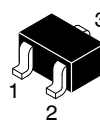1. Mounted on G10/FR4 glass epoxy board using minimum recommended footprint.

300 mAMPS, 20 VOLTS
$R_{DS(on)}$ = 1 Ω
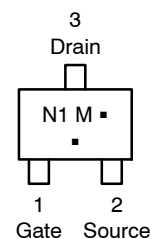
N−Channel

MARKING DIAGRAM AND PIN ASSIGNMENT

SC−70/SOT−323
CASE 419
STYLE 8

N1 M
3 Drain
1 Gate   2 Source

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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 10 μA)		$V_{(BR)DSS}$	20	–	–	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 16 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 16 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)		I_{DSS}	– –	– –	1.0 10	μAdc
Gate–Body Leakage Current (V_{GS} = ± 20 Vdc, V_{DS} = 0)		I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS (Note 2)						
Gate Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μAdc)		$V_{GS(th)}$	1.0	1.7	2.4	Vdc
Static Drain–to–Source On–Resistance (V_{GS} = 10 Vdc, I_D = 300 mAdc) (V_{GS} = 4.5 Vdc, I_D = 100 mAdc)		$r_{DS(on)}$	– –	0.75 1.0	1.0 1.4	Ω
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 200 mAdc)		g_{FS}	–	450	–	mMhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 5.0 V)	C_{iss}	–	45	–	pF
Output Capacitance	(V_{DS} = 5.0 V)	C_{oss}	–	25	–	
Transfer Capacitance	(V_{DG} = 5.0 V)	C_{rss}	–	5.0	–	
SWITCHING CHARACTERISTICS (Note 3)						
Turn–On Delay Time	(V_{DD} = 15 Vdc, I_D = 300 mAdc, R_L = 50 Ω)	$t_{d(on)}$	–	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 3)		V_{SD}	–	0.85	–	V

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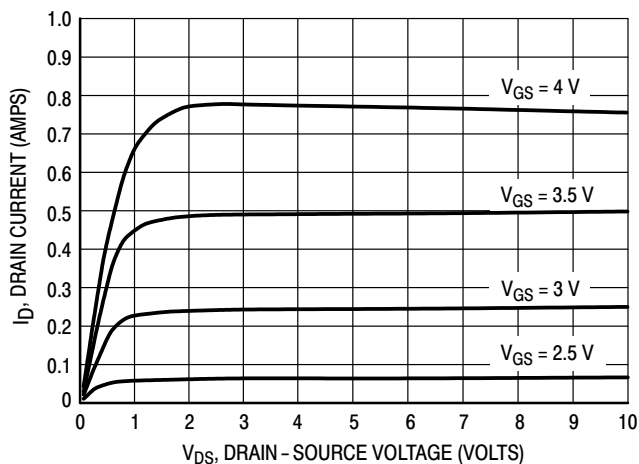
TYPICAL CHARACTERISTICS
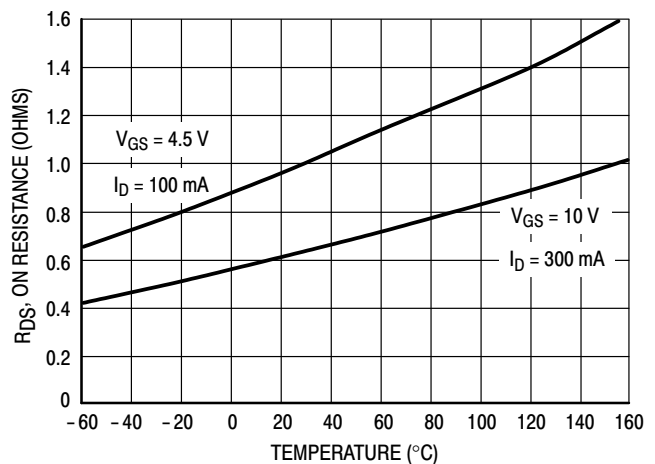

Figure 1. Typical Drain Characteristics

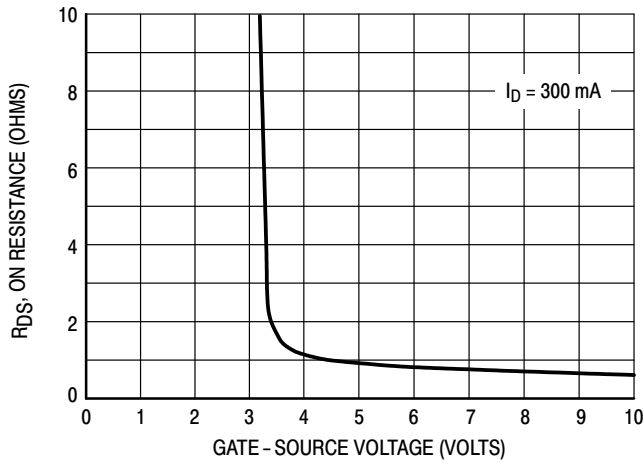**Figure 2. On Resistance versus Temperature**

TYPICAL CHARACTERISTICS
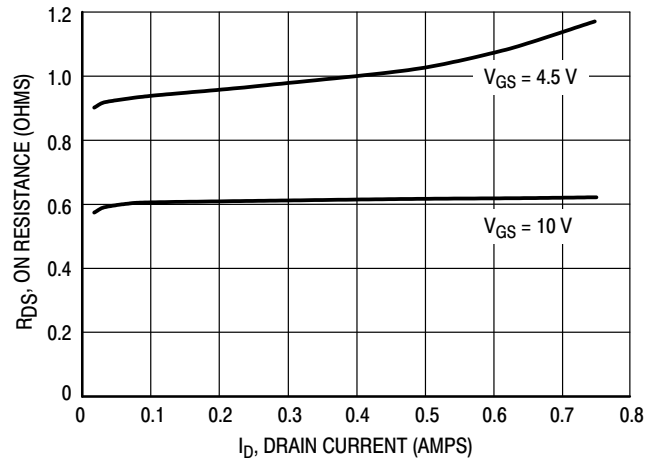
Figure 3. On Resistance versus Gate – Source Voltage

(Plot: R_{DS}, ON RESISTANCE (OHMS) vs GATE – SOURCE VOLTAGE (VOLTS); $I_D = 300$ mA)

Figure 4. On Resistance versus Drain Current

(Plot: R_{DS}, ON RESISTANCE (OHMS) vs I_D, DRAIN CURRENT (AMPS); $V_{GS} = 4.5$ V, $V_{GS} = 10$ V)
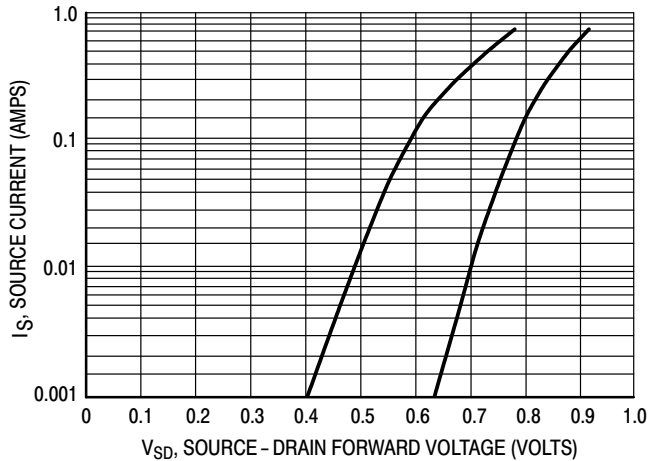
Figure 5. Source – Drain Forward Voltage

(Plot: I_S, SOURCE CURRENT (AMPS) vs V_{SD}, SOURCE – DRAIN FORWARD VOLTAGE (VOLTS))
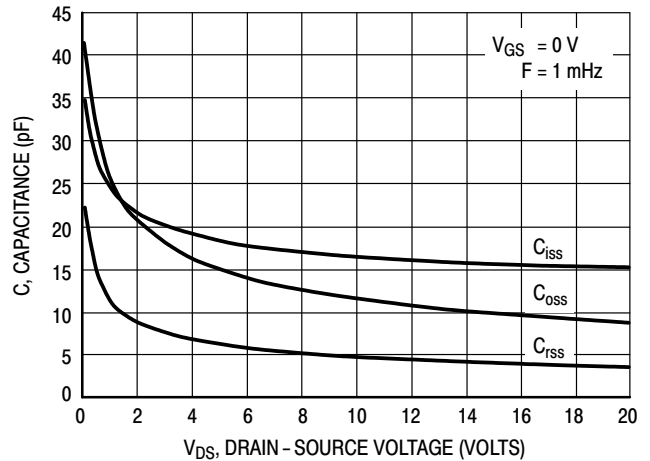
Figure 6. Capacitance Variation

(Plot: C, CAPACITANCE (pF) vs V_{DS}, DRAIN – SOURCE VOLTAGE (VOLTS); $V_{GS} = 0$ V, $F = 1$ mHz; C_{iss}, C_{oss}, C_{rss})
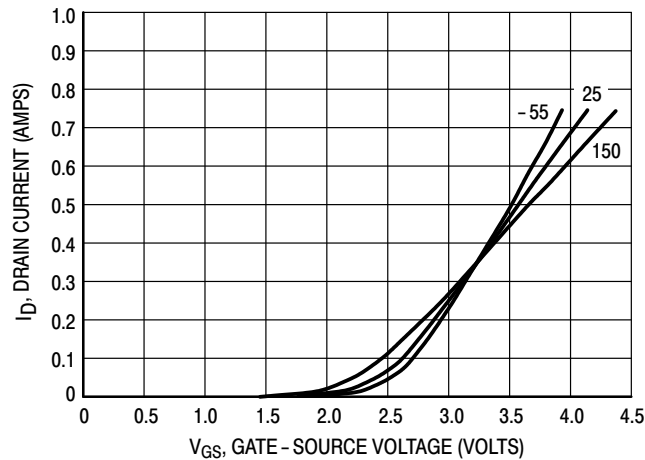
Figure 7. Transfer Characteristics

(Plot: I_D, DRAIN CURRENT (AMPS) vs V_{GS}, GATE – SOURCE VOLTAGE (VOLTS); curves at –55, 25, 150)

PACKAGE DIMENSIONS

SC−70 (SOT−323)
CASE 419−04
ISSUE N
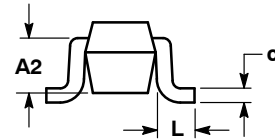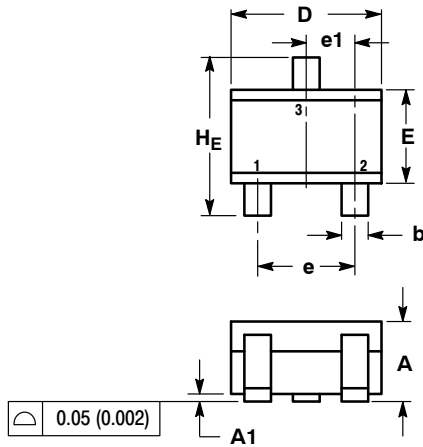
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

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
H$_E$	2.00	2.10	2.40	0.079	0.083	0.095

STYLE 8:
PIN 1. GATE
2. SOURCE
3. DRAIN

0.05 (0.002)

SOLDERING FOOTPRINT*

$\frac{0.65}{0.025}$

$\frac{0.65}{0.025}$

$\frac{1.9}{0.075}$

$\frac{0.9}{0.035}$

$\frac{0.7}{0.028}$

SCALE 10:1 $\left(\frac{mm}{inches}\right)$
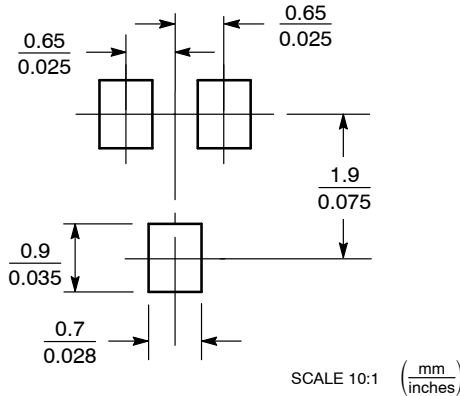
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.