MGSF2N02EL, MVSF2N02EL

Power MOSFET

2.8 Amps, 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 space sensitive power management circuitry.

Features

- Low $R_{DS(on)}$ Provides Higher Efficiency and Extends Battery Life
- Miniature SOT−23 Surface Mount Package Saves Board Space
- I_{DSS} Specified at Elevated Temperature
- AEC Q101 Qualified − MVSF2N02EL
- These Devices are Pb−Free and are RoHS Compliant

Applications

- DC−DC Converters
- Power Management in Portable and Battery Powered Products, ie: Computers, Printers, PCMCIA Cards, Cellular and Cordless Telephones

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}	± 8.0	Vdc
Drain Current − Continuous @ T_A = 25°C − Single Pulse (t_p = 10 μs)	 I_D I_{DM}	 2.8 5.0	A
Total Power Dissipation @ T_A = 25°C	P_D	1.25	W
Operating and Storage Temperature Range	T_J, T_{stg}	− 55 to 150	°C
Thermal Resistance Junction−to−Ambient (Note 1) Thermal Resistance Junction−to−Ambient (Note 2)	$R_{\theta JA}$	 100 300	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case 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.

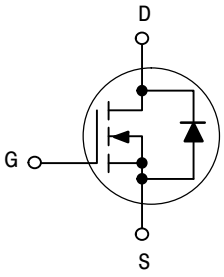
1. 1” Pad, t < 10 sec.
2. Min pad, steady state.

ON Semiconductor®

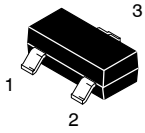
http://onsemi.com

2.8 A, 20 V
$R_{DS(on)}$ = 85 mΩ (max)

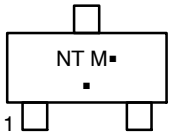
N−Channel



MARKING DIAGRAM

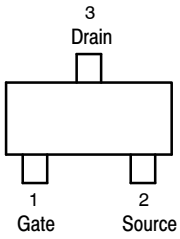


SOT−23
CASE 318
STYLE 21



xxx = Specific Device Code
M = Date Code
▪ = Pb−Free Package

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain−to−Source Breakdown Voltage (Note 3) (V_{GS} = 0 Vdc, I_D = 10 μAdc) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	 20 –	 – 22	 – –	 Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)	I_{DSS}	 – –	 – –	 1.0 10	 μAdc
Gate−Source Leakage Current (V_{GS} = ± 8.0 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	–	–	±100	nA
ON CHARACTERISTICS (Note 3)					
Gate−Source Threshold Voltage (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	 0.5 –	 – −2.3	 1.0 –	 Vdc mV/°C
Static Drain−to−Source On−Resistance (V_{GS} = 4.5 Vdc, I_D = 3.6 A) (V_{GS} = 2.5 Vdc, I_D = 3.1 A)	$R_{DS(on)}$	 – –	 78 105	 85 115	 mΩ
DYNAMIC CHARACTERISTICS					
Input Capacitance	(V_{DS} = 5.0 Vdc, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}	–	150	–	pF
Output Capacitance		C_{oss}	–	130	–	
Transfer Capacitance		C_{rss}	–	45	–	
SWITCHING CHARACTERISTICS (Note 4)						
Turn−On Delay Time	(V_{DD} = 16 Vdc, I_D = 2.8 Adc, V_{gs} = 4.5 V, R_G = 2.3 Ω)	$t_{d(on)}$	–	6.0	–	ns
Rise Time		t_r	–	95	–	
Turn−Off Delay Time		$t_{d(off)}$	–	28	–	
Fall Time		t_f	–	125	–	
Gate Charge	(V_{DS} = 16 Vdc, I_D = 1.75 Adc, V_{GS} = 4.0 Vdc) (Note 3)	Q_T	–	3.5	–	nC
		Q_{gs}	–	0.6	–	
		Q_{gd}	–	1.5	–	
SOURCE−DRAIN DIODE CHARACTERISTICS						
Forward Voltage	(I_S = 1.0 Adc, V_{GS} = 0 Vdc) (Note 3)	V_{SD}	 – –	 0.76 –	 1.2 –	V
Reverse Recovery Time	(I_S = 1.0 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 3)	t_{rr}	–	104	–	ns
		t_a	–	42	–	
		t_b	–	62	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.20	–	μC

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

ORDERING INFORMATION

Device	Package	Shipping†
MGSF2N02ELT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MVSF2N02ELT1G	SOT−23 (Pb−Free)	3,000 / 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.

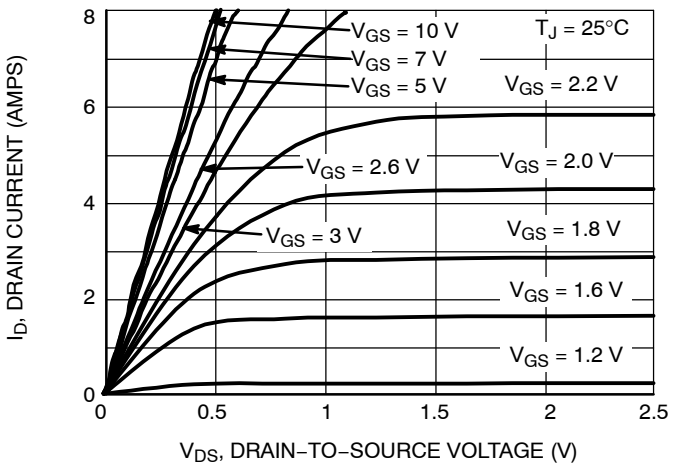


Figure 1. On−Region Characteristics

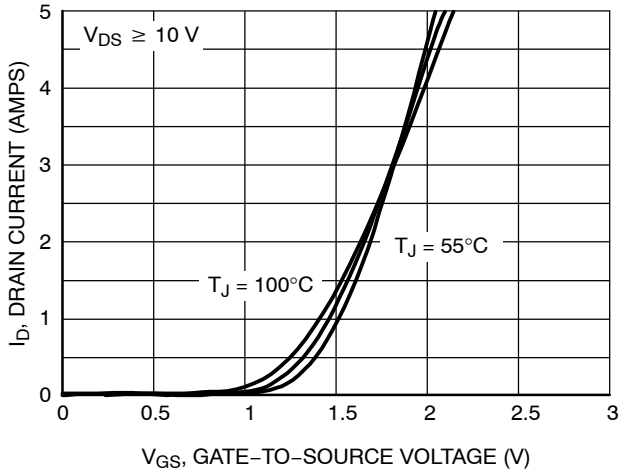


Figure 2. Transfer Characteristics

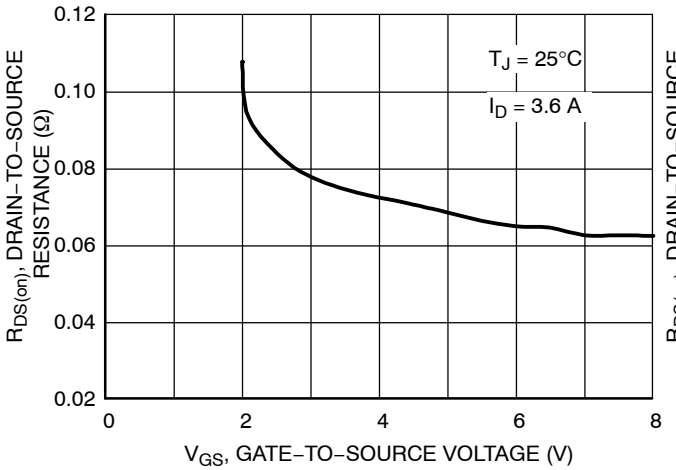


Figure 3. On−Resistance vs. Gate−to−Source Voltage

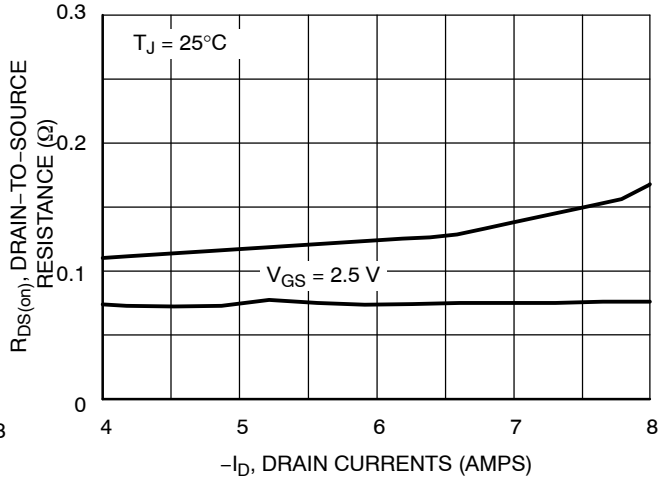


Figure 4. On−Resistance vs. Gate Voltage

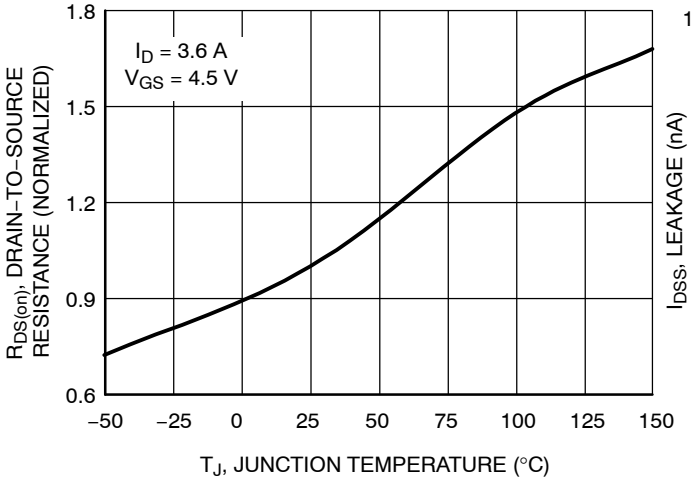


Figure 5. On−Resistance Variation with Temperature

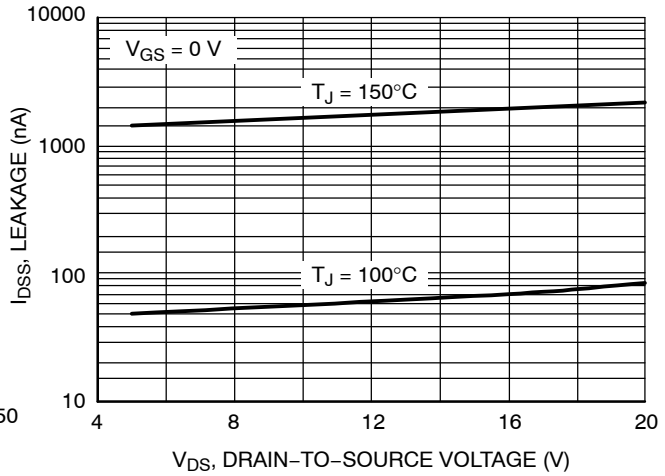


Figure 6. Drain−to−Source Leakage Current vs. Voltage

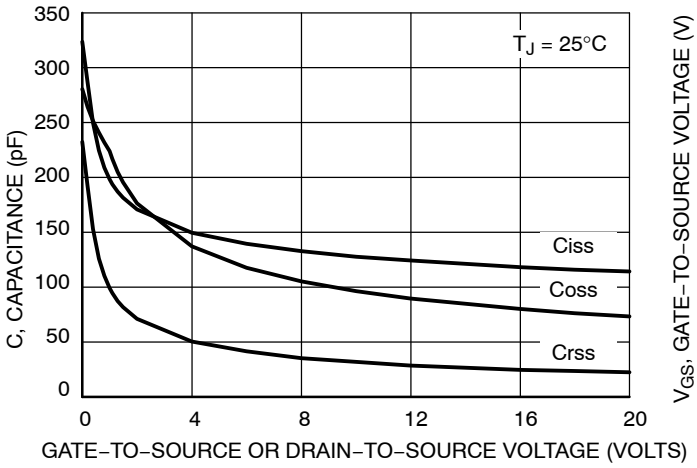


Figure 7. Capacitance Variation

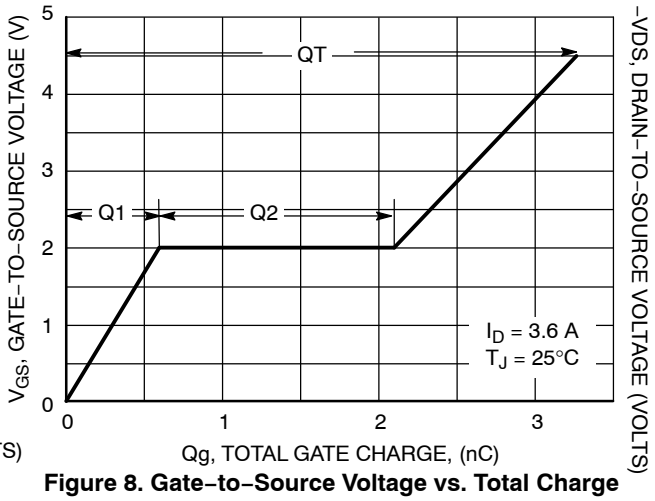


Figure 8. Gate−to−Source Voltage vs. Total Charge

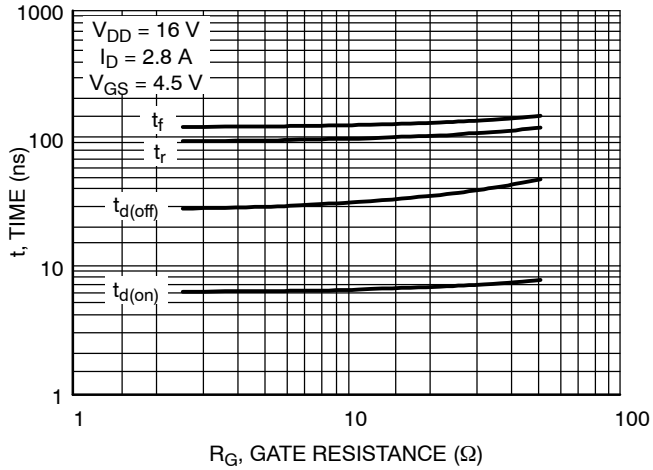


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

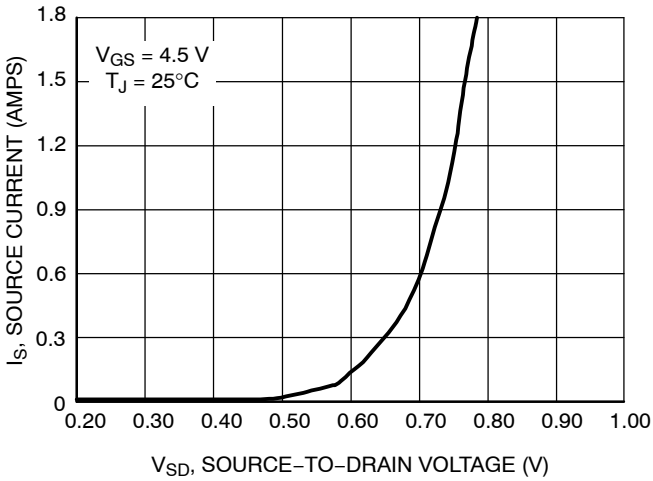
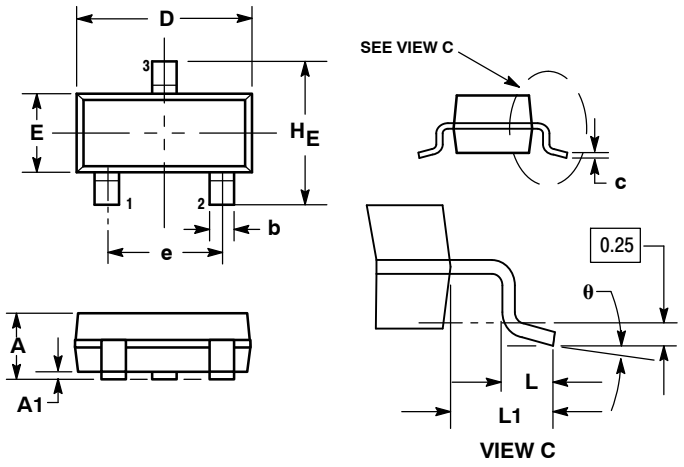


Figure 10. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AP

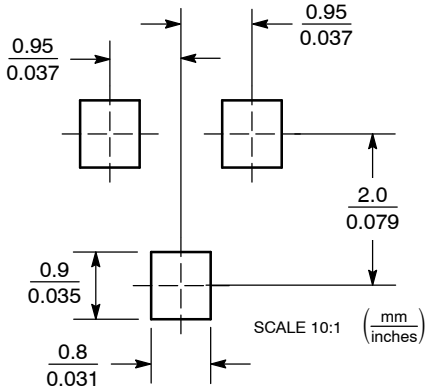


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	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
H_E	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	−−−	10°	0°	−−−	10°

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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5773−3850

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative