

MGSF2N02EL

Preferred Device

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

- Pb-Free Packages are Available
- 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

Applications

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

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	20	Vdc
Gate-to-Source Voltage - Continuous	V_{GS}	± 8.0	Vdc
Drain Current			A
- Continuous @ $T_A = 25^\circ\text{C}$	I_D	2.8	
- Single Pulse ($t_p = 10 \mu\text{s}$)	I_{DM}	5.0	
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.25	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Thermal Resistance			$^\circ\text{C/W}$
Junction-to-Ambient (Note 1)	$R_{\theta JA}$	100	
Junction-to-Ambient (Note 2)		300	
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.

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

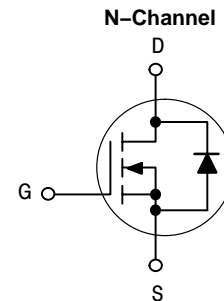
This document contains information on a new product. Specifications and information herein are subject to change without notice.



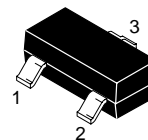
ON Semiconductor®

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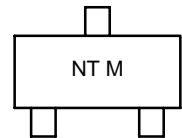
2.8 A, 20 V
 $R_{DS(on)} = 85 \text{ m}\Omega$ (max)



MARKING DIAGRAM

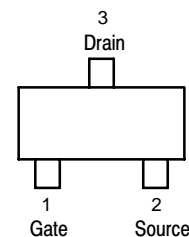


SOT-23
CASE 318
STYLE 21



NT = Device Code
M = Date Code

PIN ASSIGNMENT



ORDERING INFORMATION

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

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

MGSF2N02EL

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) ($V_{GS} = 0\text{ Vdc}$, $I_D = 10\ \mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	20 –	– 22	– –	Vdc mV/°C
Zero Gate Voltage Drain Current ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 20\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	– –	– –	1.0 10	μAdc
Gate-Source Leakage Current ($V_{GS} = \pm 8.0\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	–	–	± 100	nA

ON CHARACTERISTICS (Note 3)

Gate-Source Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{Adc}$) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	0.5 –	– –2.3	1.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance ($V_{GS} = 4.5\text{ Vdc}$, $I_D = 3.6\text{ A}$) ($V_{GS} = 2.5\text{ Vdc}$, $I_D = 3.1\text{ A}$)	$R_{DS(on)}$	– –	78 105	85 115	m Ω

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 5.0\text{ Vdc}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{iss}	–	150	–	pF
Output Capacitance		C_{oss}	–	130	–	
Transfer Capacitance		C_{riss}	–	45	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$(V_{DD} = 16\text{ Vdc}$, $I_D = 2.8\text{ Adc}$, $V_{gs} = 4.5\text{ V}$, $R_G = 2.3\ \Omega$)	$t_{d(on)}$	–	6.0	–	ns
Rise Time		t_r	–	95	–	
Turn-Off Delay Time		$t_{d(off)}$	–	28	–	
Fall Time		t_f	–	125	–	
Gate Charge	$(V_{DS} = 16\text{ Vdc}$, $I_D = 1.75\text{ Adc}$, $V_{GS} = 4.0\text{ Vdc}$) (Note 3)	Q_T	–	3.5	–	nC
		Q_{gs}	–	0.6	–	
		Q_{gd}	–	1.5	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward Voltage	$(I_S = 1.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) (Note 3)	V_{SD}	– –	0.76 –	1.2 –	V
Reverse Recovery Time		$(I_S = 1.0\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $di_S/dt = 100\text{ A}/\mu\text{s}$) (Note 3)	t_{rr}	–	104	–
	t_a		–	42	–	
	t_b		–	62	–	
Reverse Recovery Stored Charge	Q_{RR}		–	0.20	–	μC

3. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperature.

ORDERING INFORMATION

Device	Package	Shipping†
MGSF2N02ELT1	SOT-23	3,000 Tape & Reel
MGSF2N02ELT1G	SOT-23 (Pb-Free)	3,000 Tape & Reel
MGSF2N02ELT3	SOT-23	10,000 Tape & Reel
MGSF2N02ELT3G	SOT-23 (Pb-Free)	10,000 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.

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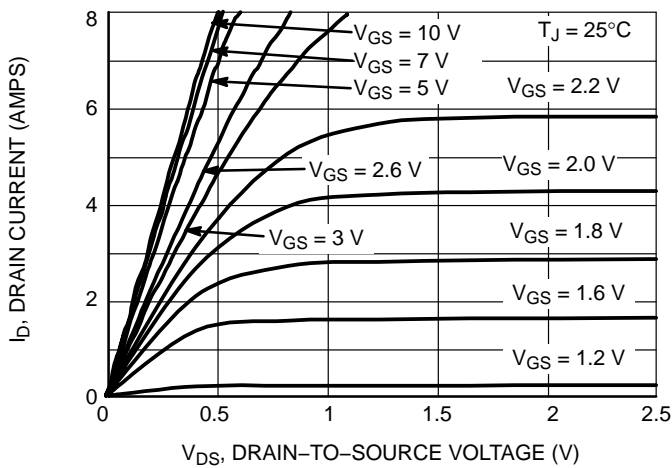


Figure 1. On-Region Characteristics

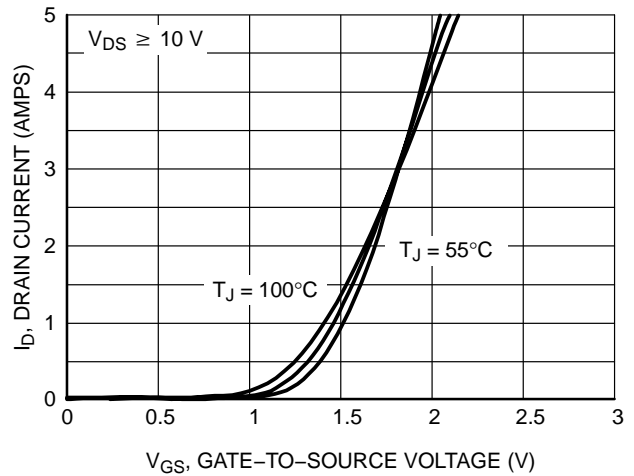


Figure 2. Transfer Characteristics

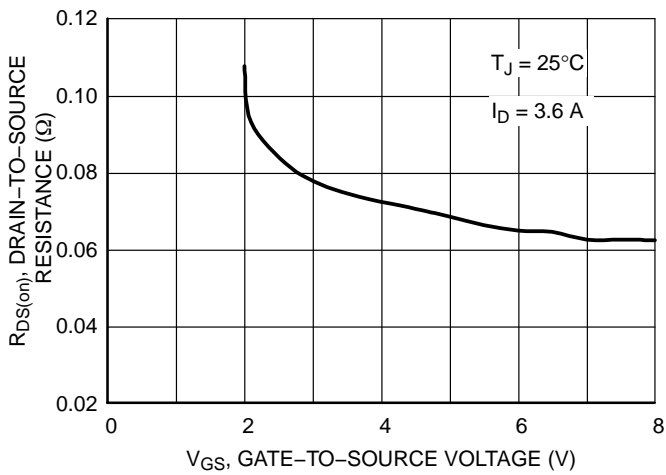


Figure 3. On-Resistance vs. Gate-to-Source Voltage

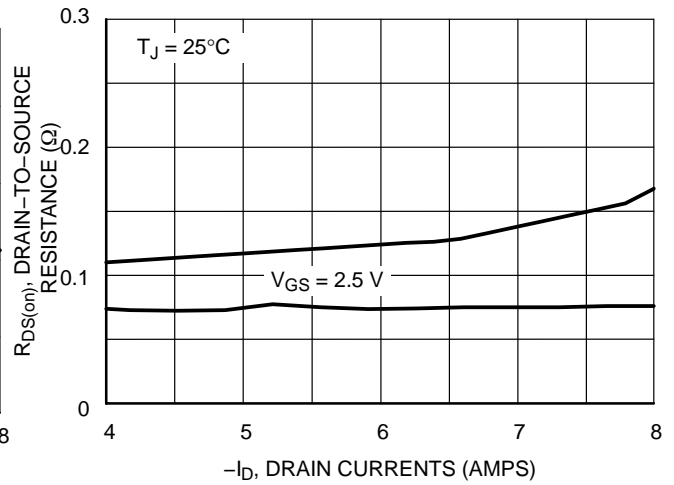


Figure 4. On-Resistance vs. Drain Currents

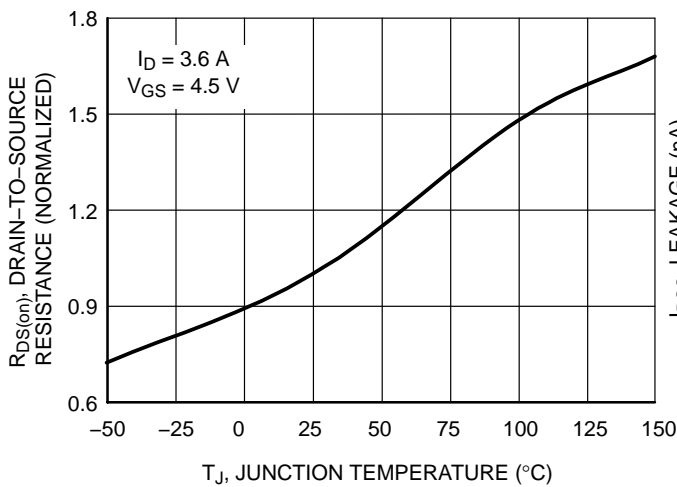


Figure 5. On-Resistance Variation with Temperature

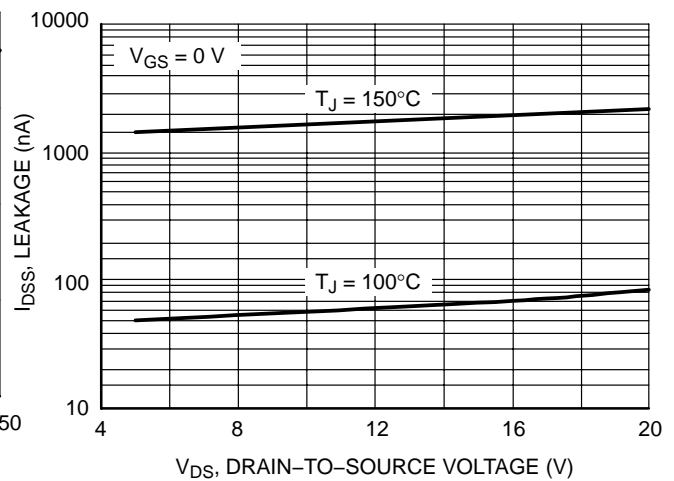


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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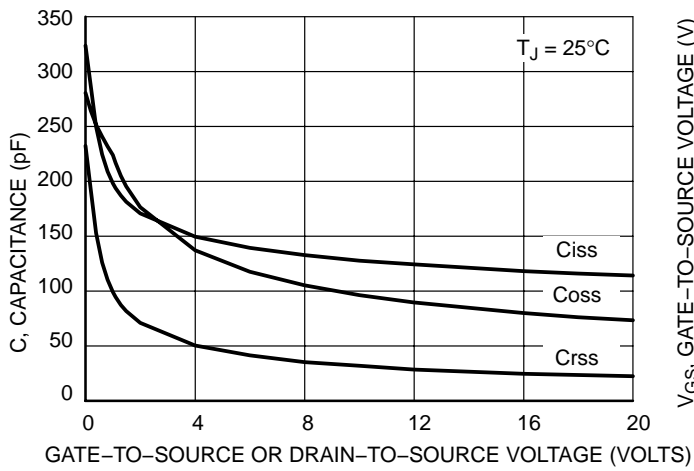


Figure 7. Capacitance Variation

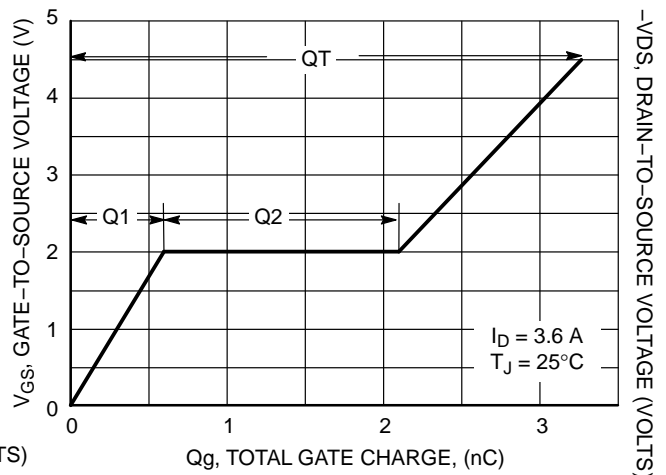


Figure 8. Gate-to-Source Voltage vs. Total Charge

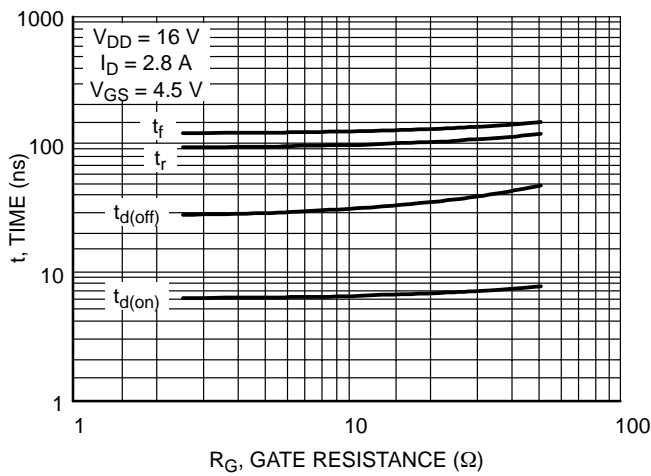


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

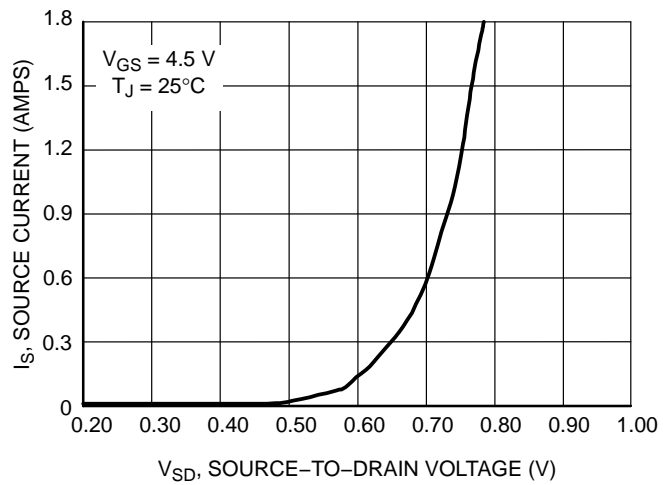
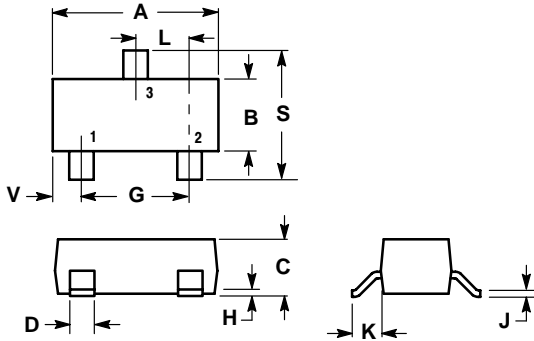


Figure 10. Diode Forward Voltage vs. Current

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PACKAGE DIMENSIONS

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



NOTES:

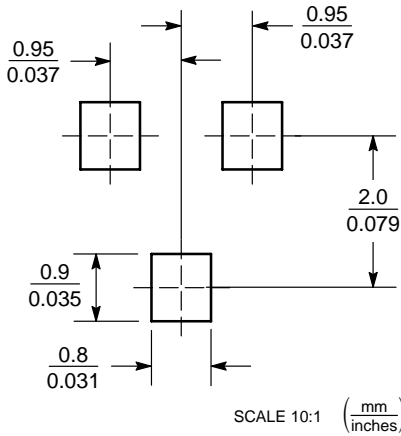
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-03 AND -07 OBSOLETE, NEW STANDARD 318-08.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

STYLE 21:


- PIN 1. GATE
- SOURCE
- 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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