MGSF2N02EL

ON Semiconductor®

http://onsemi.com

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

Applications

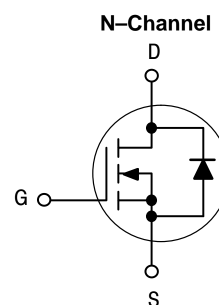
- DC–DC Converters
- Power Management in Portable and Battery Powered Products, ie: Computers, Printers, PCMCIA Cards, Cellular and Cordless Telephones

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

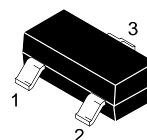
Rating	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DSS}	20	Vdc
Gate–to–Source Voltage – Continuous	V_{GS}	± 8.0	Vdc
Drain Current – Continuous @ T_A = 25°C – Single Pulse (t_p = 10 μs)	 I_D I_{DM}	 2.8 5.0	A
Total Power Dissipation @ T_A = 25°C	P_D	1.25	W
Operating and Storage Temperature Range	T_J, T_{stg}	– 55 to 150	°C
Thermal Resistance – Junction–to–Ambient (Note 1) Thermal Resistance – Junction–to–Ambient (Note 2)	$R_{θJA}$	100 300	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°C

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

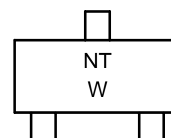
2.8 AMPS
20 VOLTS
$R_{DS(on)}$ = 85 mΩ (max)



MARKING DIAGRAM

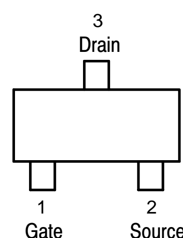


SOT–23
CASE 318
STYLE 21



NT = Device Code
W = Work Week

PIN ASSIGNMENT



ORDERING INFORMATION

Device	Package	Shipping
MGSF2N02ELT1	SOT–23	3000 Tape & Reel
MGSF2N02ELT3	SOT–23	10,000 Tape & Reel

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

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

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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)		$V_{(BR)DSS}$	20	–	–	Vdc
Temperature Coefficient (Positive)			–	22	–	mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc)		I_{DSS}	–	–	1.0	μAdc
(V_{DS} = 20 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)			–	–	10	
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)		$V_{GS(th)}$	0.5	–	1.0	Vdc
Threshold Temperature Coefficient (Negative)			–	–2.3	–	mV/°C
Static Drain–to–Source On–Resistance (V_{GS} = 4.5 Vdc, I_D = 3.6 A)		$R_{DS(on)}$	–	78	85	mΩ
(V_{GS} = 2.5 Vdc, I_D = 3.1 A)			–	105	115	
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.

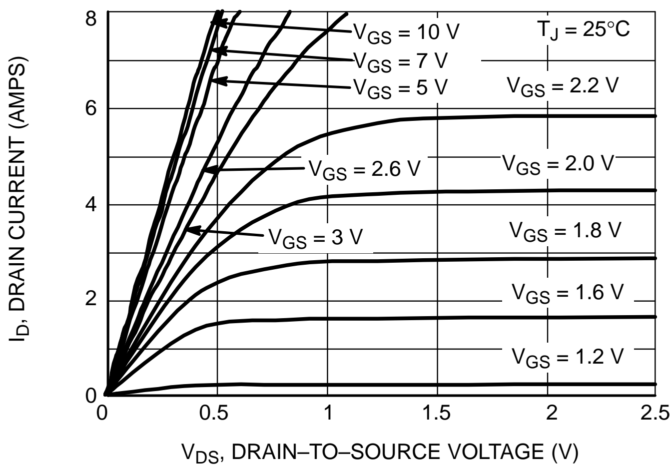


Figure 1. On–Region Characteristics

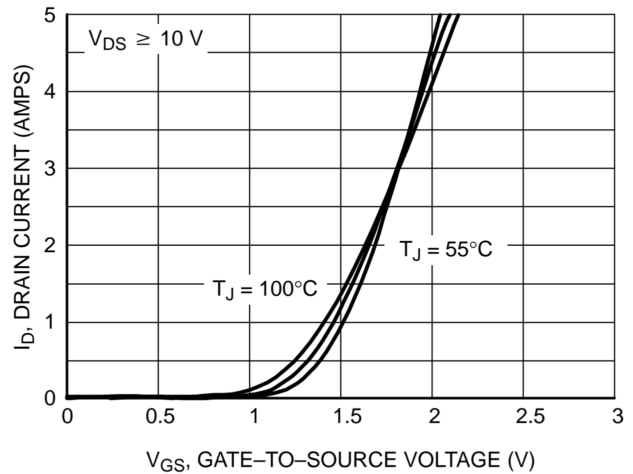


Figure 2. Transfer Characteristics

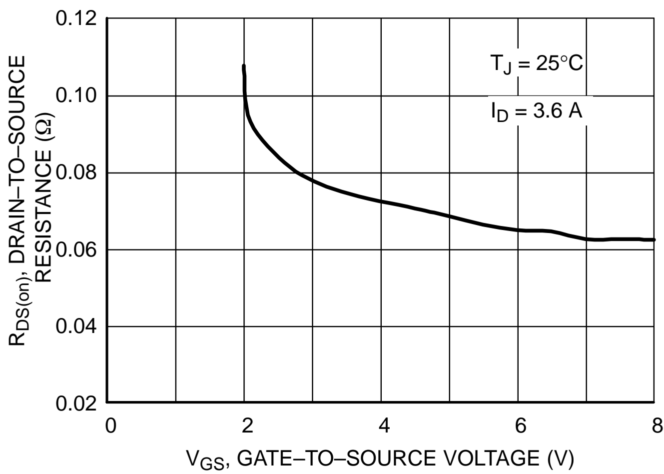


Figure 3. On–Resistance vs. Gate–to–Source Voltage

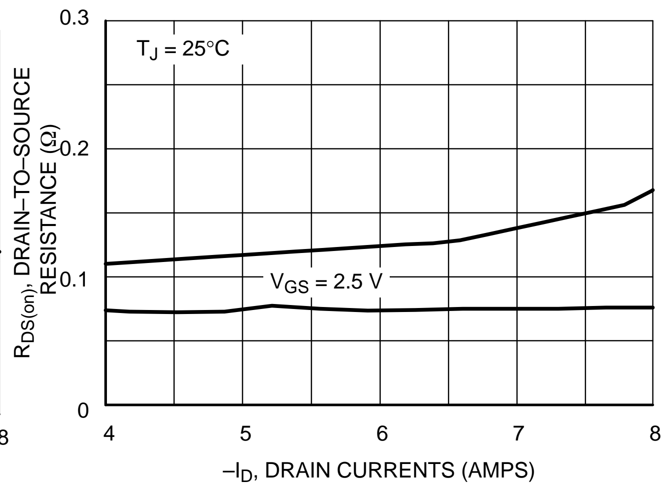


Figure 4. On–Resistance vs. Gate Voltage

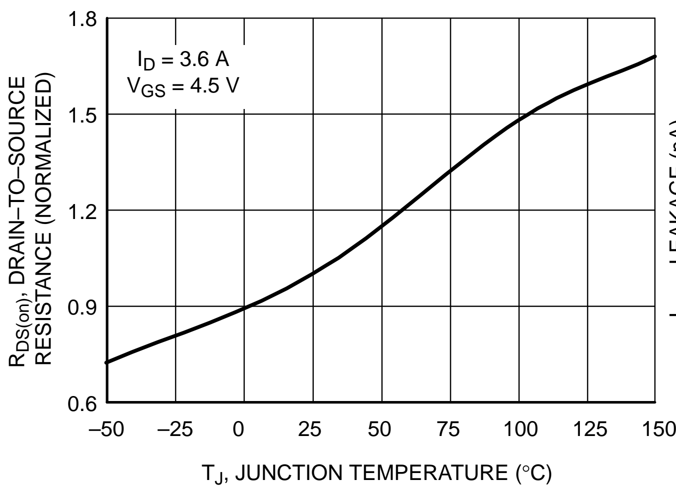


Figure 5. On–Resistance Variation with Temperature

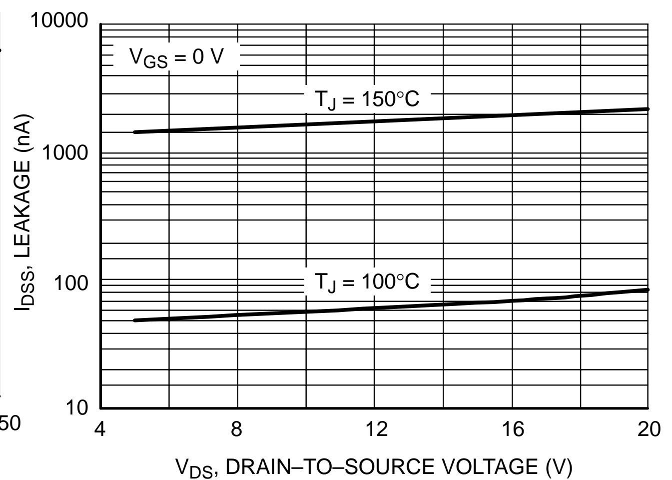


Figure 6. Drain–to–Source Leakage Current vs. Voltage

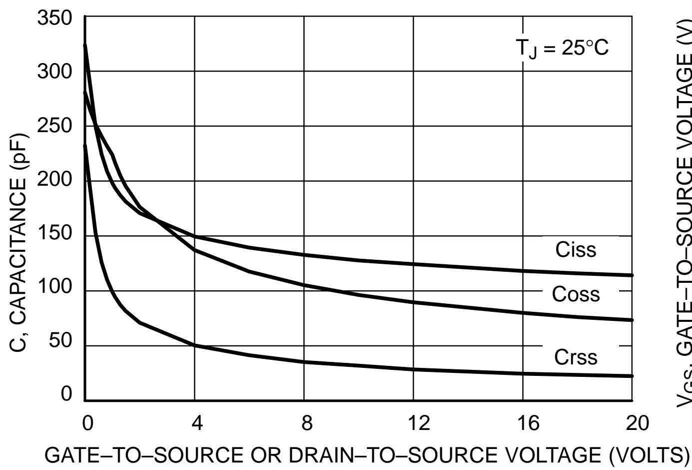


Figure 7. Capacitance Variation

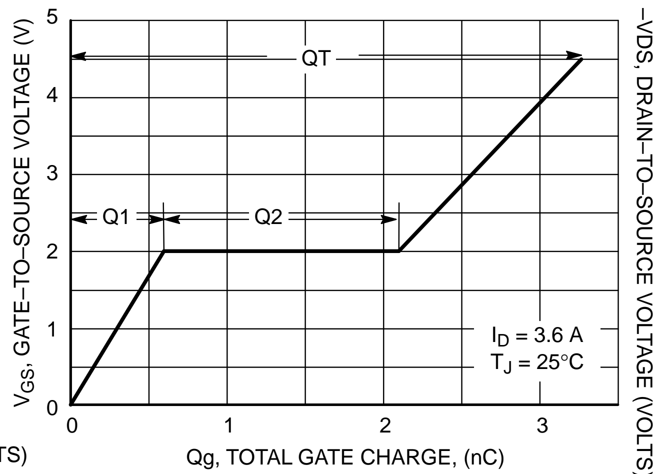


Figure 8. Gate–to–Source Voltage vs. Total Charge

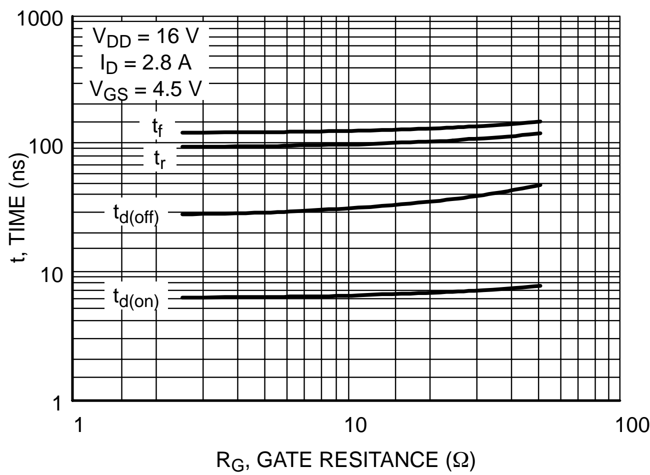


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

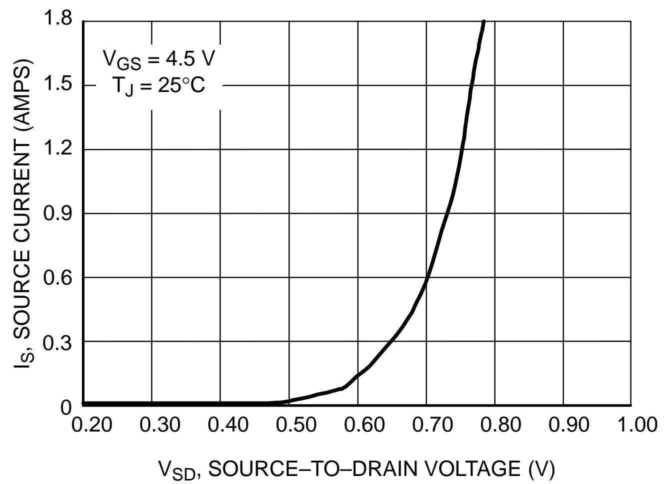
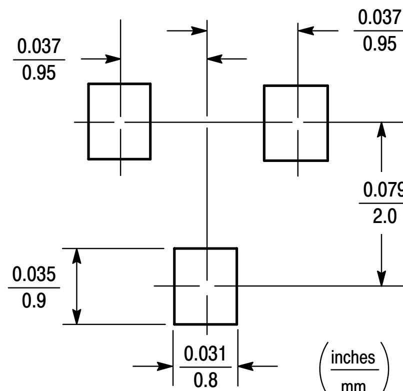


Figure 10. Diode Forward Voltage vs. Current

INFORMATION FOR USING THE SOT–23 SURFACE MOUNT PACKAGE

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



SOLDERING PRECAUTIONS

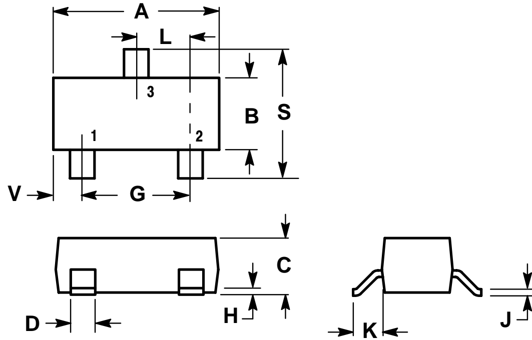
The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference shall be a maximum of 10°C.
- The soldering temperature and time shall not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes. Gradual cooling should be used as the use of forced cooling will increase the temperature gradient and result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling.

* Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

PACKAGE DIMENSIONS

SOT–23 (TO–236)
CASE 318–08
ISSUE AH



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
2. SOURCE
3. DRAIN

Notes

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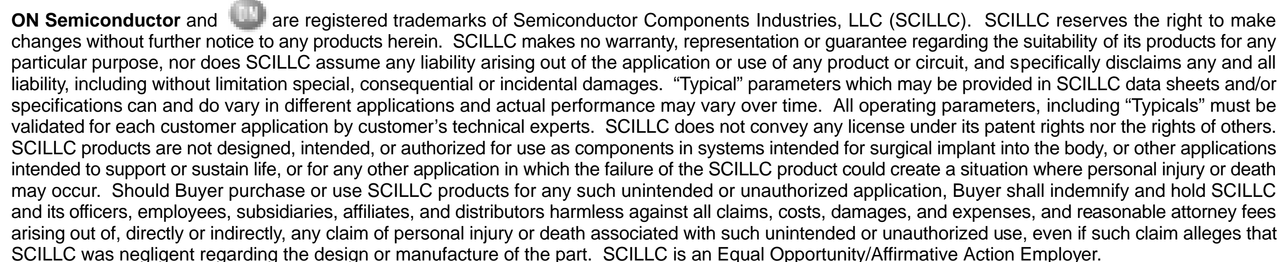
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