# 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°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<br>− Continuous @ $T_A$ = 25°C<br>− Single Pulse ($t_p$ = 10 μs) | <br>$I_D$<br>$I_{DM}$ | <br>2.8<br>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<br>Junction−to−Ambient (Note 1)<br>Thermal Resistance<br>Junction−to−Ambient (Note 2) | $R_{\theta JA}$ | <br>100<br><br>300 | °C/W |
| Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds | $T_L$ | 260 | °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.

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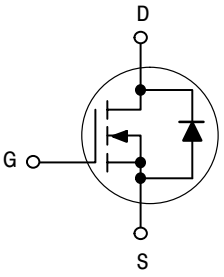
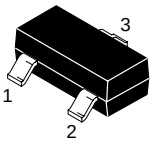
**2.8 A, 20 V**
**$R_{DS(on)}$ = 85 mΩ (max)**

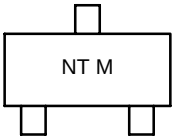
**N−Channel**




**MARKING DIAGRAM**

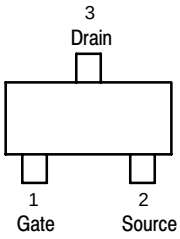



**SOT−23**
**CASE 318**
**STYLE 21**




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.

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

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain−to−Source Breakdown Voltage (Note 3)<br>($V_{GS}$ = 0 Vdc, $I_D$ = 10 μAdc)<br>Temperature Coefficient (Positive) | | $V_{(BR)DSS}$ | <br>20<br>− | <br>−<br>22 | <br>−<br>− | <br>Vdc<br>mV/°C |
| Zero Gate Voltage Drain Current<br>($V_{DS}$ = 20 Vdc, $V_{GS}$ = 0 Vdc)<br>($V_{DS}$ = 20 Vdc, $V_{GS}$ = 0 Vdc, $T_J$ = 125°C) | | $I_{DSS}$ | <br>−<br>− | <br>−<br>− | <br>1.0<br>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<br>($V_{DS}$ = $V_{GS}$, $I_D$ = 250 μAdc)<br>Threshold Temperature Coefficient (Negative) | | $V_{GS(th)}$ | <br>0.5<br>− | <br>−<br>−2.3 | <br>1.0<br>− | <br>Vdc<br>mV/°C |
| Static Drain−to−Source On−Resistance<br>($V_{GS}$ = 4.5 Vdc, $I_D$ = 3.6 A)<br>($V_{GS}$ = 2.5 Vdc, $I_D$ = 3.1 A) | | $R_{DS(on)}$ | <br>−<br>− | <br>78<br>105 | <br>85<br>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) | $V_{SD}$ | <br>−<br>− | <br>0.76<br>− | <br>1.2<br>− | 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† |
|---|---|---|
| MGSF2N02ELT1 | SOT−23 | 3,000 Tape & Reel |
| MGSF2N02ELT1G | SOT−23<br>(Pb−Free) | 3,000 Tape & Reel |
| MGSF2N02ELT3 | SOT−23 | 10,000 Tape & Reel |
| MGSF2N02ELT3G | SOT−23<br>(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.

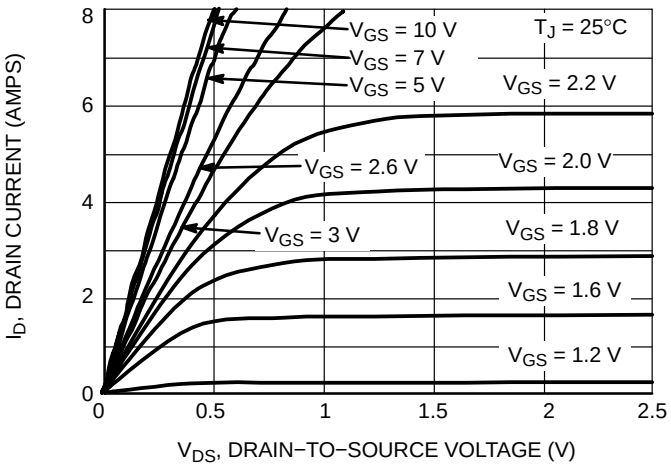



**Figure 1. On−Region Characteristics**

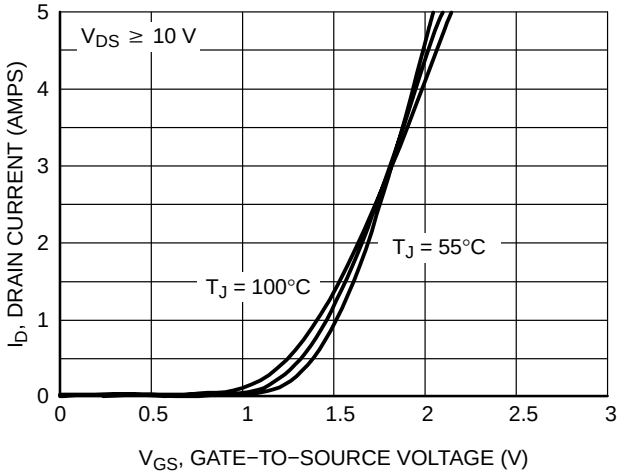



**Figure 2. Transfer Characteristics**

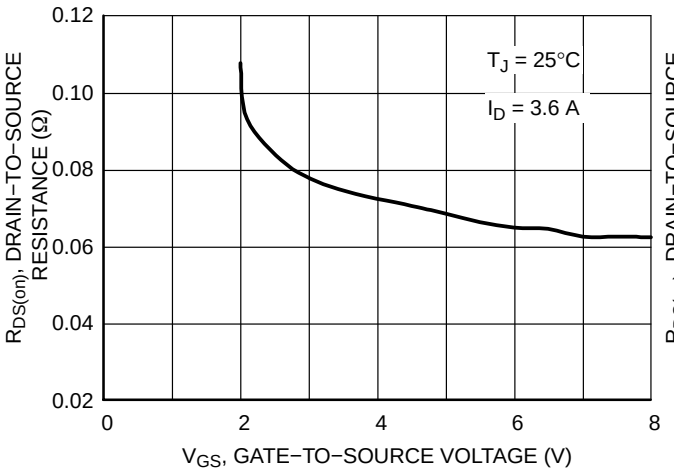



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

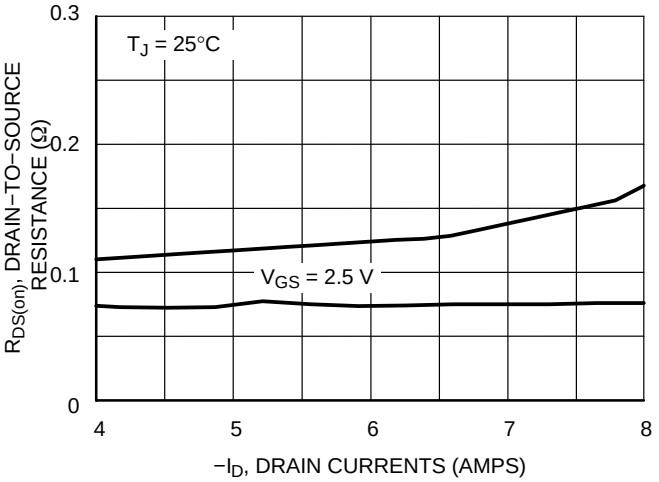



**Figure 4. On−Resistance vs. Gate Voltage**

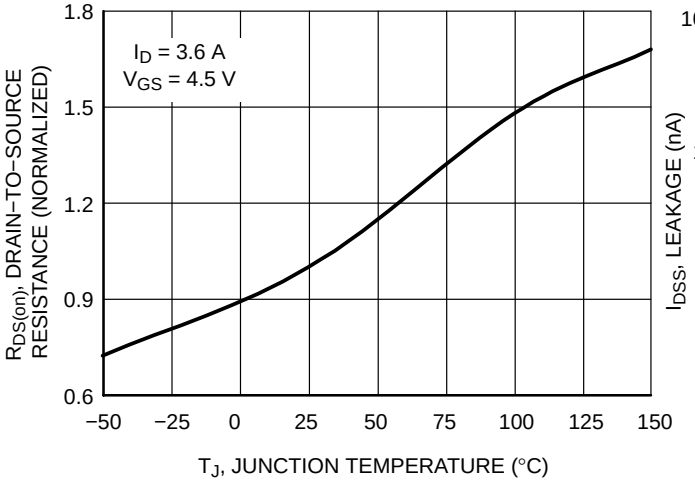



**Figure 5. On−Resistance Variation with Temperature**

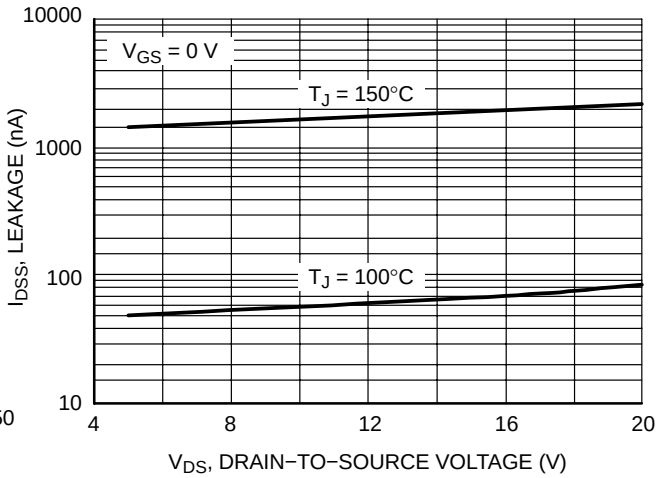



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

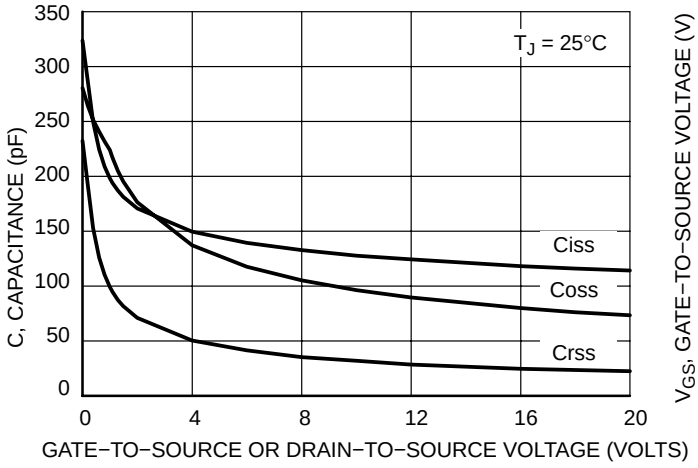



**Figure 7. Capacitance Variation**

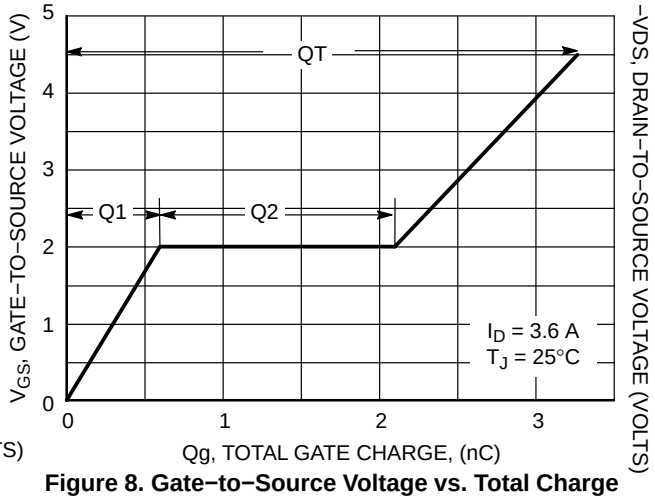



**Figure 8. Gate−to−Source Voltage vs. Total Charge**

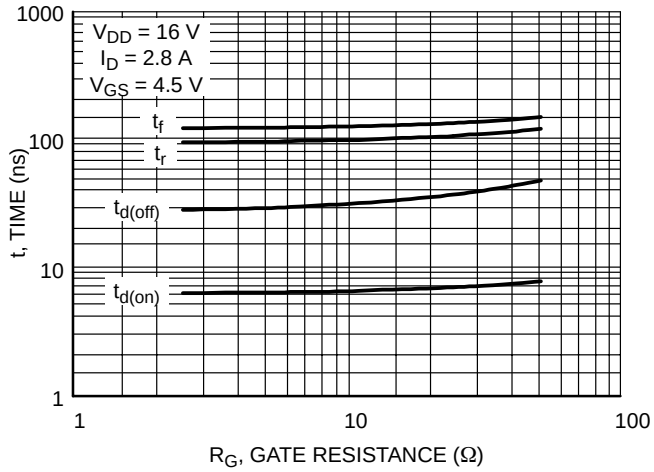



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

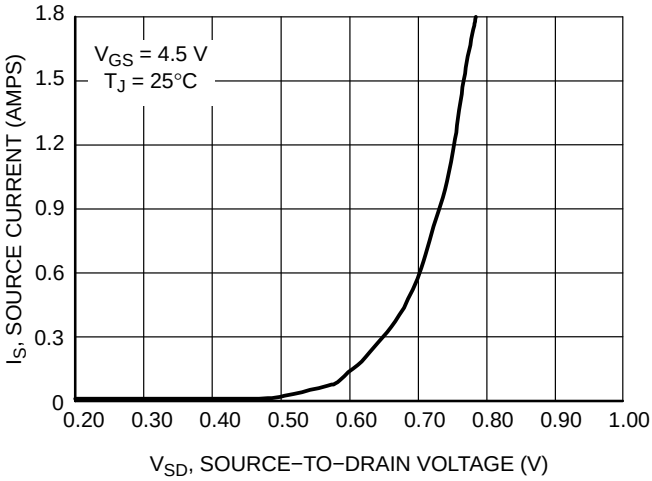
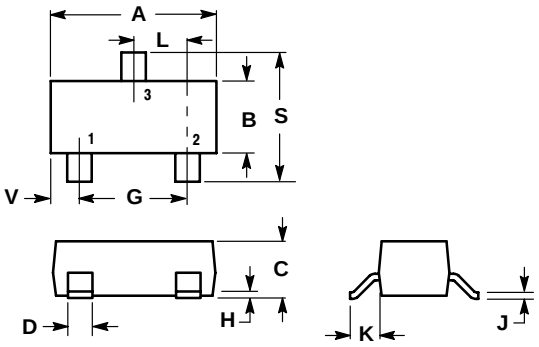



**Figure 10. Diode Forward Voltage vs. Current**

## PACKAGE DIMENSIONS

**SOT−23 (TO−236)**
CASE 318−08
ISSUE AJ

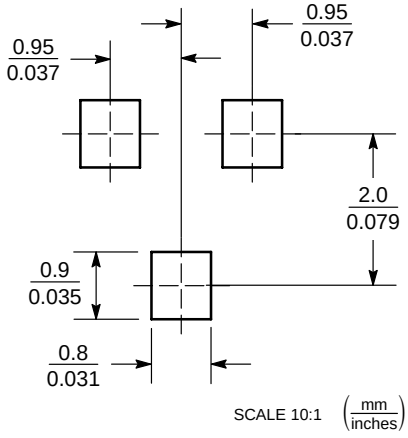



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−03 AND −07 OBSOLETE, NEW STANDARD 318−08.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | 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

## 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

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