# MGSF1N03LT1

**Preferred Device**

# Power MOSFET

## 30 V, 2.1 A, Single 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. Typical applications are dc−dc converters and power management in portable and battery−powered products such as computers, printers, PCMCIA cards, cellular and cordless telephones.

- Low $R_{DS(on)}$ Provides Higher Efficiency and Extends Battery Life
- Miniature SOT−23 Surface Mount Package Saves Board Space
- Pb−Free Package is Available

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

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain−to−Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate−to−Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | 2.1 | A |
| | | $T_A$ = 85°C | | 1.5 | |
| | t ≤ 10 s | $T_A$ = 25°C | | 2.8 | |
| Power Dissipation (Note 1) | Steady State | $T_A$ = 25°C | $P_D$ | 0.73 | W |
| Continuous Drain Current (Note 2) | Steady State | $T_A$ = 25°C | $I_D$ | 1.6 | A |
| | | $T_A$ = 85°C | | 1.1 | |
| Power Dissipation (Note 2) | | $T_A$ = 25°C | $P_D$ | 0.42 | W |
| Pulsed Drain Current | tp = 10 μs | | $I_{DM}$ | 6.0 | A |
| ESD Capability (Note 3) | C = 100 pF, RS = 1500 Ω | | ESD | 125 | V |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{STG}$ | −55 to 150 | °C |
| Source Current (Body Diode) | | | $I_S$ | 2.1 | A |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | $T_L$ | 260 | °C |

**THERMAL RESISTANCE RATINGS**

| Parameter | Symbol | Max | Unit |
|---|---|---|---|
| Junction−to−Ambient − Steady State (Note 1) | $R_{\theta JA}$ | 170 | °C/W |
| Junction−to−Ambient − t < 10 s (Note 1) | $R_{\theta JA}$ | 100 | |
| Junction−to−Ambient − Steady State (Note 2) | $R_{\theta JA}$ | 300 | |

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. Surface−mounted on FR4 board using 1 in sq pad size.
2. Surface−mounted on FR4 board using the minimum recommended pad size.
3. ESD Rating Information: HBM Class 0.

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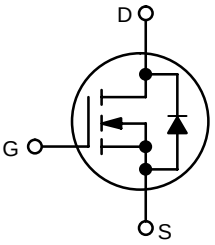
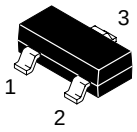
| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | $I_D$ MAX |
|---|---|---|
| 30 V | 80 mΩ @ 10 V | 2.1 A |
| | 125 mΩ @ 4.5 V | |

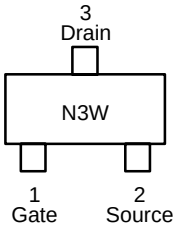
**N−Channel**




**MARKING DIAGRAM/ PIN ASSIGNMENT**




**SOT−23**
**CASE 318**
**STYLE 21**




N3 = Specific Device Code
W = Work Week

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| MGSF1N03LT1 | SOT−23 | 3000/Tape & Reel |
| MGSF1N03LT3 | SOT−23 | 10000/Tape & Reel |
| MGSF1N03LT3G | SOT−23 (Pb−Free) | 10000/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification 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 μAdc) | | $V_{(BR)DSS}$ | 30 | − | − | Vdc |
| Zero Gate Voltage Drain Current ($V_{DS}$ = 30 Vdc, $V_{GS}$ = 0 Vdc)<br>($V_{DS}$ = 30 Vdc, $V_{GS}$ = 0 Vdc, $T_J$ = 125°C) | | $I_{DSS}$ | <br>−<br>− | <br>−<br>− | <br>1.0<br>10 | μAdc |
| Gate−Body Leakage Current ($V_{GS}$ = ± 20 Vdc, $V_{DS}$ = 0 Vdc) | | $I_{GSS}$ | − | − | ±100 | nAdc |
| **ON CHARACTERISTICS** (Note 1) | | | | | | |
| 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, $I_D$ = 1.2 Adc)<br>($V_{GS}$ = 4.5 Vdc, $I_D$ = 1.0 Adc) | | $r_{DS(on)}$ | <br>−<br>− | <br>0.08<br>0.125 | <br>0.10<br>0.145 | Ohms |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Input Capacitance | ($V_{DS}$ = 5.0 Vdc) | $C_{iss}$ | − | 140 | − | pF |
| Output Capacitance | ($V_{DS}$ = 5.0 Vdc) | $C_{oss}$ | − | 100 | − | |
| Transfer Capacitance | ($V_{DG}$ = 5.0 Vdc) | $C_{rss}$ | − | 40 | − | |
| **SWITCHING CHARACTERISTICS** (Note 2) | | | | | | |
| Turn−On Delay Time | ($V_{DD}$ = 15 Vdc, $I_D$ = 1.0 Adc, $R_L$ = 50 Ω) | $t_{d(on)}$ | − | 2.5 | − | ns |
| Rise Time | | $t_r$ | − | 1.0 | − | |
| Turn−Off Delay Time | | $t_{d(off)}$ | − | 16 | − | |
| Fall Time | | $t_f$ | − | 8.0 | − | |
| Gate Charge (See Figure 6) | | $Q_T$ | − | 6000 | − | pC |
| **SOURCE−DRAIN DIODE CHARACTERISTICS** | | | | | | |
| Continuous Current | | $I_S$ | − | − | 0.6 | A |
| Pulsed Current | | $I_{SM}$ | − | − | 0.75 | |
| Forward Voltage (Note 2) | | $V_{SD}$ | − | 0.8 | − | V |

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

## TYPICAL ELECTRICAL CHARACTERISTICS

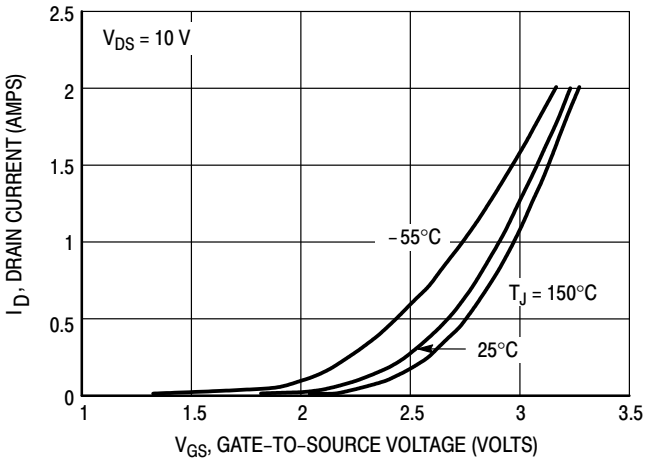



**Figure 1. Transfer Characteristics**

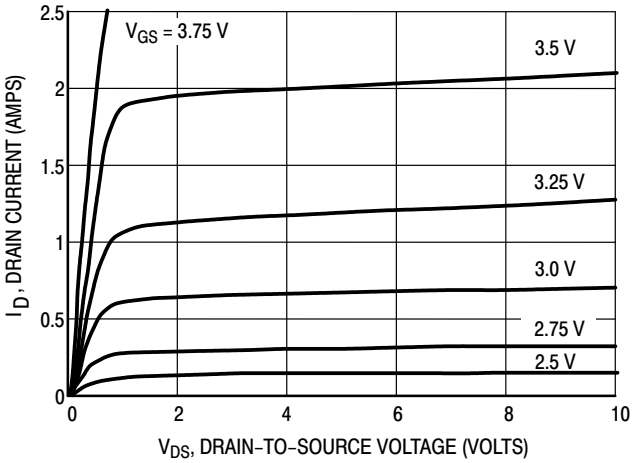



**Figure 2. On−Region Characteristics**

## TYPICAL ELECTRICAL CHARACTERISTICS

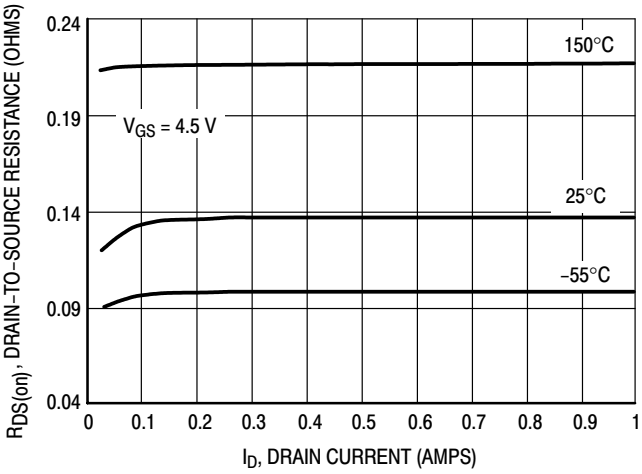



**Figure 3. On−Resistance versus Drain Current**

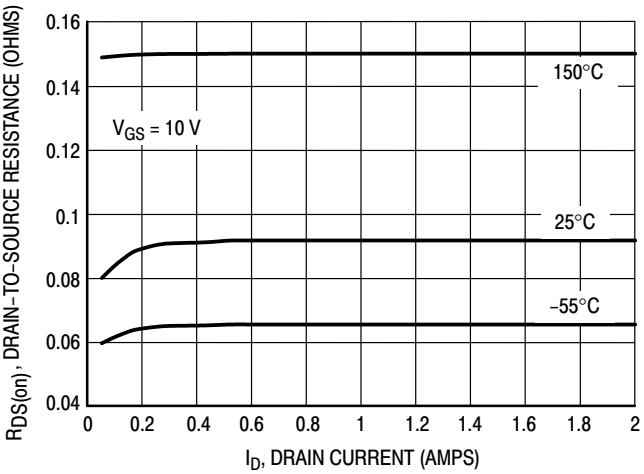



**Figure 4. On−Resistance versus Drain Current**

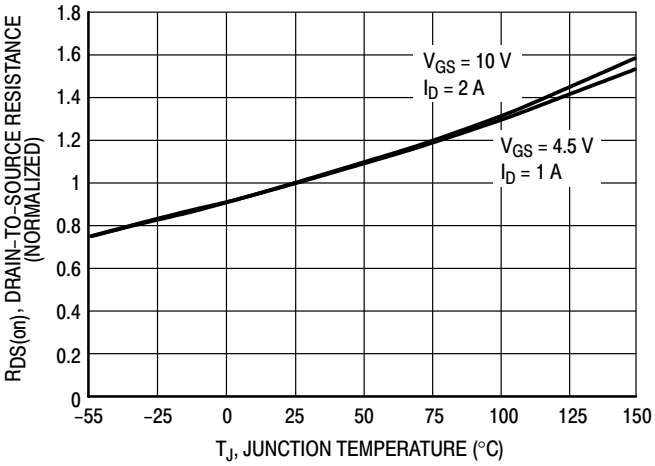



**Figure 5. On−Resistance Variation with Temperature**

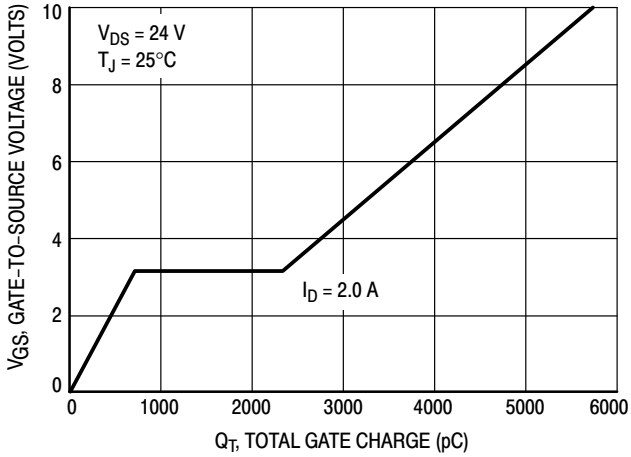



**Figure 6. Gate Charge**

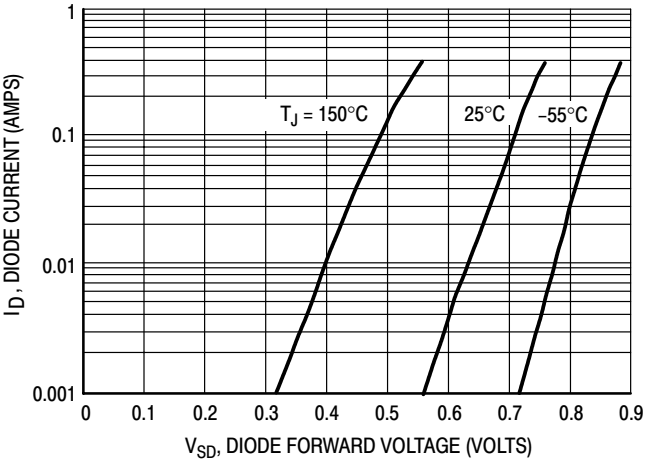



**Figure 7. Body Diode Forward Voltage**

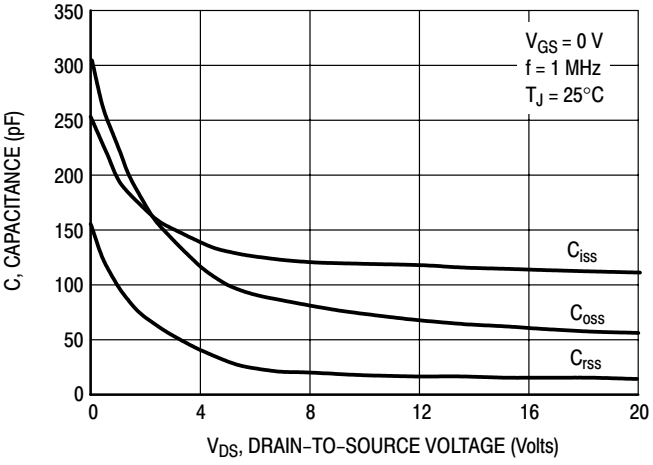
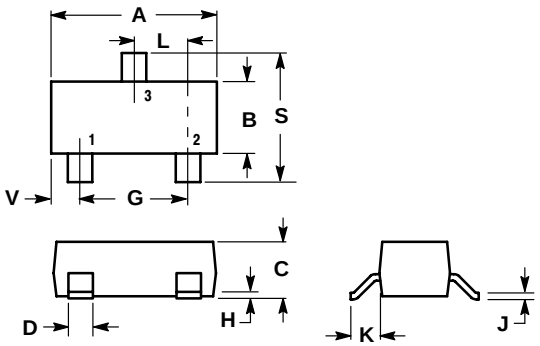



**Figure 8. Capacitance**

## PACKAGE DIMENSIONS

**SOT−23**
CASE 318−09
ISSUE AK

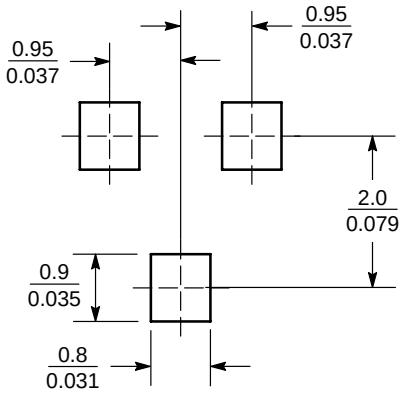



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318−01 THRU −07 AND −09 OBSOLETE, NEW STANDARD 318−08.

| | 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*




SCALE 10:1 $\left(\frac{\text{mm}}{\text{inches}}\right)$

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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