

# MGSF1N02L, MVGSF1N02L

## MOSFET - Power: 750 mAmps, 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. 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.

#### Features

- Low  $R_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature SOT-23 Surface Mount Package Saves Board Space
- MVGSF Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable\*
- These Devices are Pb-Free and are RoHS Compliant

#### 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  | $V_{GS}$          | $\pm 20$    | Vdc                |
| Drain Current<br>- Continuous @ $T_A = 25^\circ\text{C}$<br>- Pulsed Drain Current ( $t_p \leq 10 \mu\text{s}$ ) | $I_D$<br>$I_{DM}$ | 750<br>2000 | mA                 |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$   | $P_D$             | 400         | mW                 |
| Operating and Storage Temperature Range  | $T_J, T_{stg}$    | -55 to 150  | $^\circ\text{C}$   |
| Thermal Resistance, Junction-to-Ambient  | $R_{\theta JA}$   | 300         | $^\circ\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds                                   | $T_L$             | 260         | $^\circ\text{C}$   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

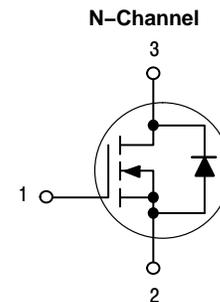


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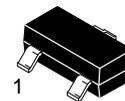
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750 mAmps, 20 Volts

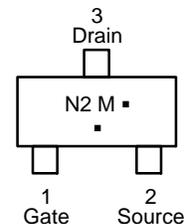
$R_{DS(on)} = 90 \text{ m}\Omega$



#### MARKING DIAGRAM/ PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



N2 = Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)  
\*Date Code orientation and overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

| Device         | Package             | Shipping†          |
|----------------|---------------------|--------------------|
| MGSF1N02LT1G   | SOT-23<br>(Pb-Free) | 3000 / Tape & Reel |
| MVGSF1N02LT1G* | SOT-23<br>(Pb-Free) | 3000 / 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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## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |                      |    |   |           |      |
|---|----------------------|----|---|-----------|------|
| Drain-to-Source Breakdown Voltage<br>(V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 10 μAdc)  | V <sub>(BR)DSS</sub> | 20 | - | -         | Vdc  |
| Zero Gate Voltage Drain Current<br>(V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc)<br>(V <sub>DS</sub> = 20 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C) | I <sub>DSS</sub>     | -  | - | 1.0<br>10 | μAdc |
| Gate-Body Leakage Current (V <sub>GS</sub> = ± 20 Vdc, V <sub>DS</sub> = 0 Vdc)   | I <sub>GSS</sub>     | -  | - | ±100      | nAdc |

### ON CHARACTERISTICS (Note 1)

|   |                     |     |                |                |     |
|---|---------------------|-----|----------------|----------------|-----|
| Gate Threshold Voltage<br>(V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc)   | V <sub>GS(th)</sub> | 1.0 | 1.7            | 2.4            | Vdc |
| Static Drain-to-Source On-Resistance<br>(V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 1.2 Adc)<br>(V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 1.0 Adc) | r <sub>DS(on)</sub> | -   | 0.075<br>0.115 | 0.090<br>0.130 | Ω   |

### DYNAMIC CHARACTERISTICS

|                      |                             |                  |   |     |   |    |
|----------------------|-----------------------------|------------------|---|-----|---|----|
| Input Capacitance    | (V <sub>DS</sub> = 5.0 Vdc) | C <sub>iss</sub> | - | 125 | - | pF |
| Output Capacitance   | (V <sub>DS</sub> = 5.0 Vdc) | C <sub>oss</sub> | - | 120 | - |    |
| Transfer Capacitance | (V <sub>DG</sub> = 5.0 Vdc) | C <sub>rss</sub> | - | 45  | - |    |

### SWITCHING CHARACTERISTICS (Note 2)

|                            |  |                     |   |      |   |    |
|----------------------------|--|---------------------|---|------|---|----|
| Turn-On Delay Time         | (V <sub>DD</sub> = 15 Vdc, I <sub>D</sub> = 1.0 Adc,<br>R <sub>L</sub> = 50 Ω) | t <sub>d(on)</sub>  | - | 2.5  | - | ns |
| Rise Time                  |  | t <sub>r</sub>      | - | 1.0  | - |    |
| Turn-Off Delay Time        |  | t <sub>d(off)</sub> | - | 16   | - |    |
| Fall Time                  |  | t <sub>f</sub>      | - | 8.0  | - |    |
| Gate Charge (See Figure 6) |  | Q <sub>T</sub>      | - | 6000 | - | pC |

### SOURCE-DRAIN DIODE CHARACTERISTICS

|                          |                 |   |     |      |   |
|--------------------------|-----------------|---|-----|------|---|
| Continuous Current       | I <sub>S</sub>  | - | -   | 0.6  | A |
| Pulsed Current           | I <sub>SM</sub> | - | -   | 0.75 | - |
| Forward Voltage (Note 2) | V <sub>SD</sub> | - | 0.8 | -    | V |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

## TYPICAL ELECTRICAL CHARACTERISTICS

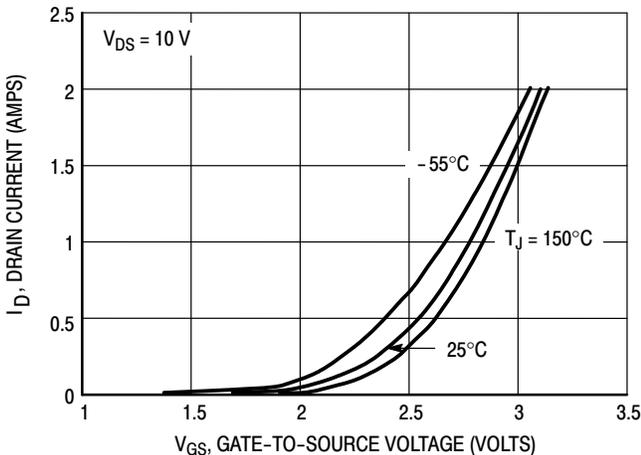


Figure 1. Transfer Characteristics

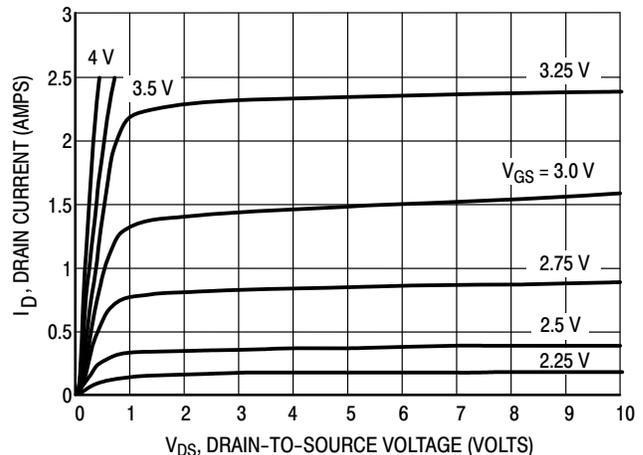


Figure 2. On-Region Characteristics

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## TYPICAL ELECTRICAL CHARACTERISTICS

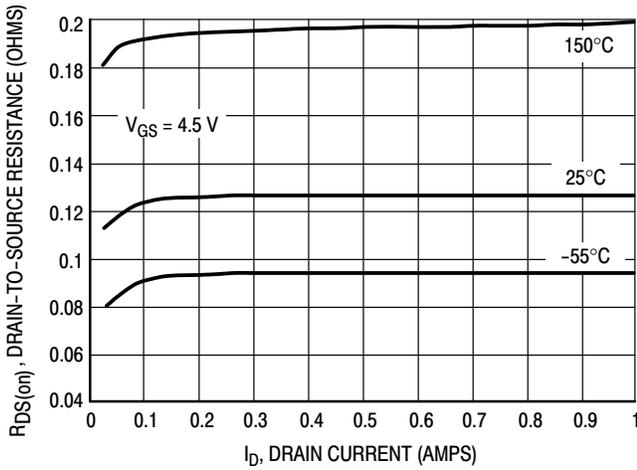


Figure 3. On-Resistance versus Drain Current

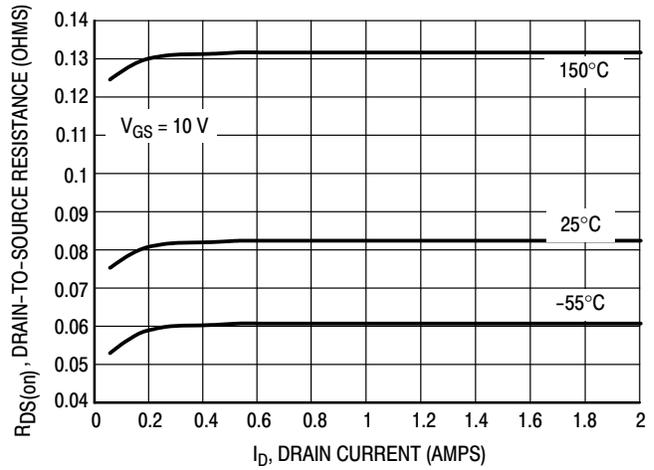


Figure 4. On-Resistance versus Drain Current

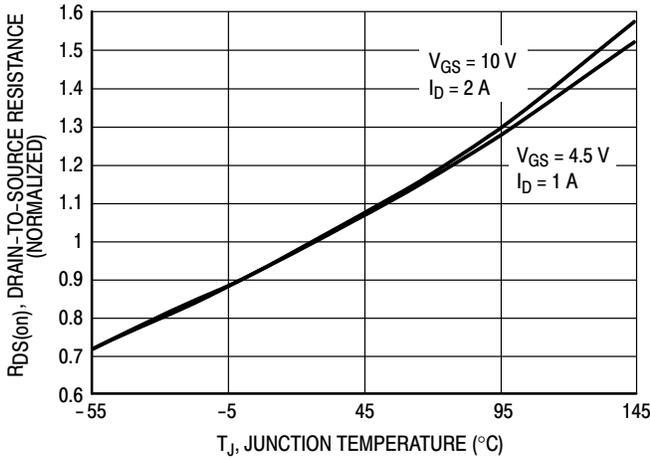


Figure 5. On-Resistance Variation with Temperature

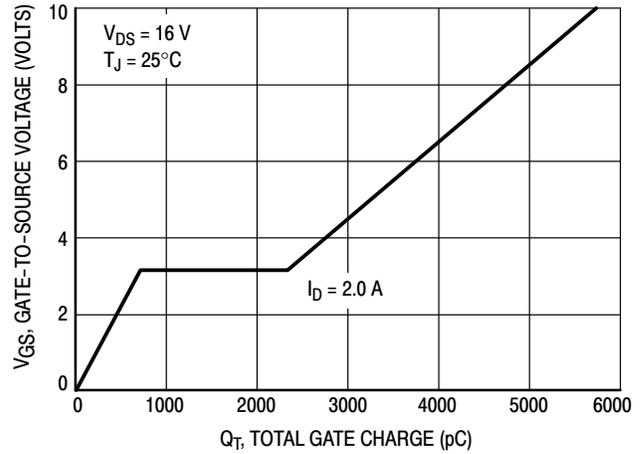


Figure 6. Gate Charge

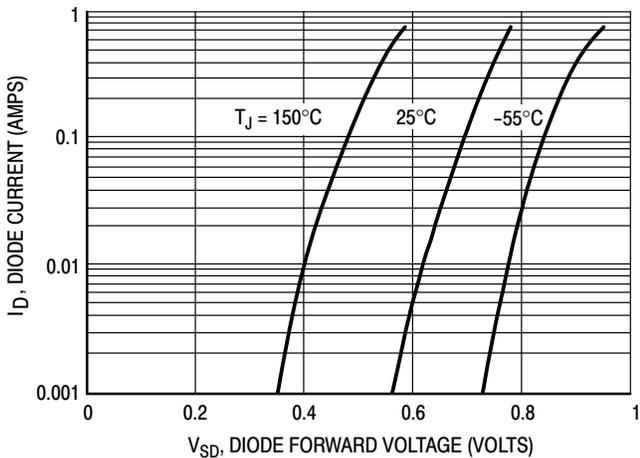


Figure 7. Body Diode Forward Voltage

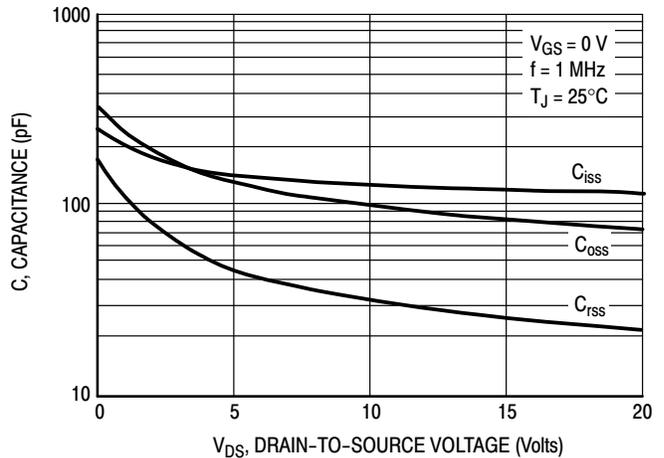
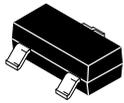


Figure 8. Capacitance

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

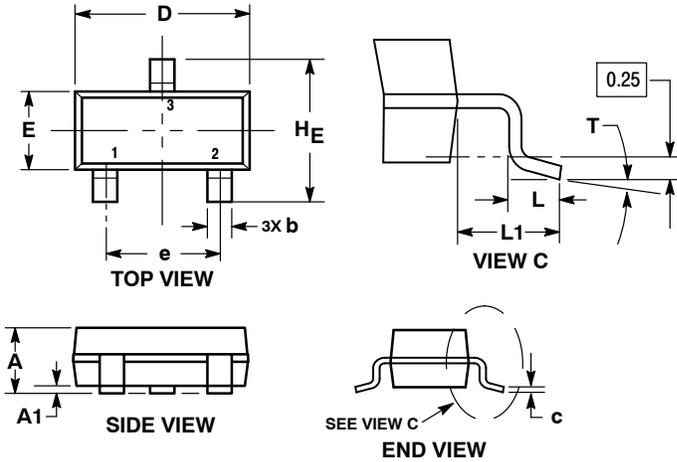
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### SOT-23 (TO-236) CASE 318-08 ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

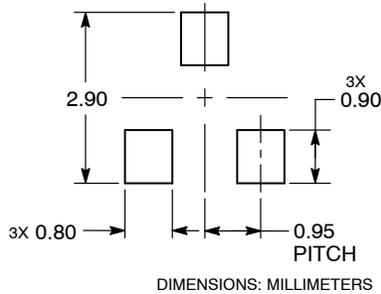


NOTES:

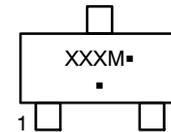
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.000  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.017 | 0.020 |
| c   | 0.08        | 0.14 | 0.20 | 0.003  | 0.006 | 0.008 |
| 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 | 0.080 |
| L   | 0.30        | 0.43 | 0.55 | 0.012  | 0.017 | 0.022 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.027 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

### RECOMMENDED SOLDERING FOOTPRINT



### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

|                         |                        |  |
|-------------------------|------------------------|--|
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