

# MGSF1N03L, MVGSF1N03L

## 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.

### Features

- Low  $R_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature SOT-23 Surface Mount Package Saves Board Space
- AEC-Q101 Qualified and PPAP Capable – MVGSF1N03LT1
- These Devices are Pb-Free and are RoHS Compliant

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

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		$V_{DSS}$	30	V
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V
Continuous Drain Current $R_{\theta JL}$	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	A
			$T_A = 85^\circ\text{C}$	
Power Dissipation $R_{\theta JL}$	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	W
Continuous Drain Current (Note 1)	Steady State	$I_D$	$T_A = 25^\circ\text{C}$	A
			$T_A = 85^\circ\text{C}$	1.2
Power Dissipation (Note 1)		$T_A = 25^\circ\text{C}$	$P_D$	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$	6.0	A
ESD Capability (Note 3)	$C = 100 \text{ pF}$ , $R_S = 1500 \Omega$	ESD	125	V
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$
Source Current (Body Diode)		$I_S$	2.1	A
Lead Temperature for Soldering Purposes (1/8" from case for 10 sec)		$T_L$	260	$^\circ\text{C}$

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Foot – Steady State	$R_{\theta JL}$	180	$^\circ\text{C}/\text{W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	300	
Junction-to-Ambient – $t < 10 \text{ s}$ (Note 1)	$R_{\theta JA}$	250	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	400	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface-mounted on FR4 board using 650 mm<sup>2</sup>, 1 oz. Cu pad size.
2. Surface-mounted on FR4 board using 50 mm<sup>2</sup>, 1 oz. Cu pad size.
3. ESD Rating Information: HBM Class 0.

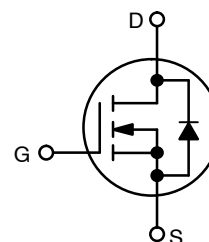


ON Semiconductor®

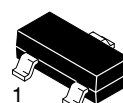
<http://onsemi.com>

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	$I_D$ MAX
30 V	80 m $\Omega$ @ 10 V	2.1 A
	125 m $\Omega$ @ 4.5 V	

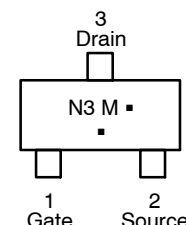
### N-Channel



### MARKING DIAGRAM/ PIN ASSIGNMENT



SOT-23  
CASE 318  
STYLE 21



- N3 = Specific Device Code
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

Device	Package	Shipping†
MGSF1N03LT1G	SOT-23 Pb-Free	3000 / Tape & Reel
MGSF1N03LT3G	SOT-23 (Pb-Free)	10000 / Tape & Reel
MVGSF1N03LT1G	SOT-23 (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 Specification Brochure, BRD8011/D.

# MGSF1N03L, MVGSF1N03L

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 10\ \mu\text{Adc}$ )	$V_{(BR)DSS}$	30	-	-	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 30\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) ( $V_{DS} = 30\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ , $T_J = 125^\circ\text{C}$ )	$I_{DSS}$	-	-	1.0 10	$\mu\text{Adc}$
Gate-Body Leakage Current ( $V_{GS} = \pm 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	-	-	$\pm 100$	nAdc

## ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage ( $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{Adc}$ )	$V_{GS(th)}$	1.0	1.7	2.4	Vdc
Static Drain-to-Source On-Resistance ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 1.2\text{ Adc}$ ) ( $V_{GS} = 4.5\text{ Vdc}$ , $I_D = 1.0\text{ Adc}$ )	$r_{DS(on)}$	-	0.08 0.125	0.10 0.145	$\Omega$

## DYNAMIC CHARACTERISTICS

Input Capacitance	( $V_{DS} = 5.0\text{ Vdc}$ )	$C_{iss}$	-	140	-	pF
Output Capacitance	( $V_{DS} = 5.0\text{ Vdc}$ )	$C_{oss}$	-	100	-	
Transfer Capacitance	( $V_{DG} = 5.0\text{ Vdc}$ )	$C_{rss}$	-	40	-	

## SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	(V <sub>DD</sub> = 15 Vdc, I <sub>D</sub> = 1.0 Adc, R <sub>L</sub> = 50 $\Omega$ )	$t_{d(on)}$	-	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 5)	$V_{SD}$	-	0.8	-	V

- Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperature.

## TYPICAL ELECTRICAL CHARACTERISTICS

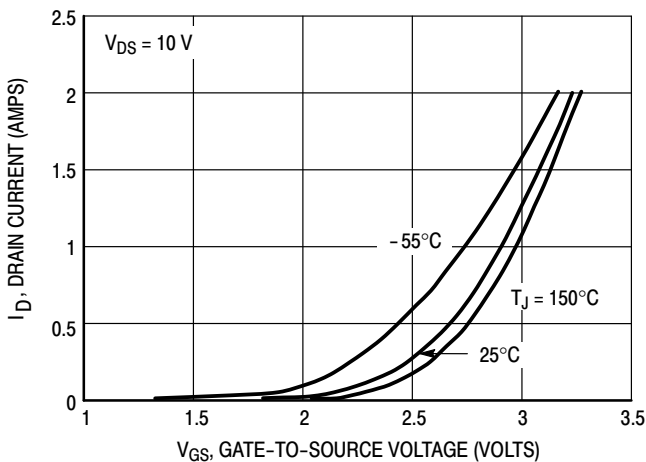


Figure 1. Transfer Characteristics

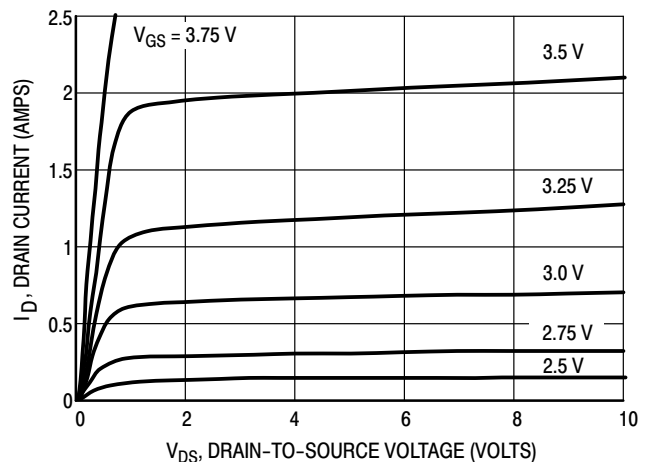


Figure 2. On-Region Characteristics

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## TYPICAL ELECTRICAL CHARACTERISTICS

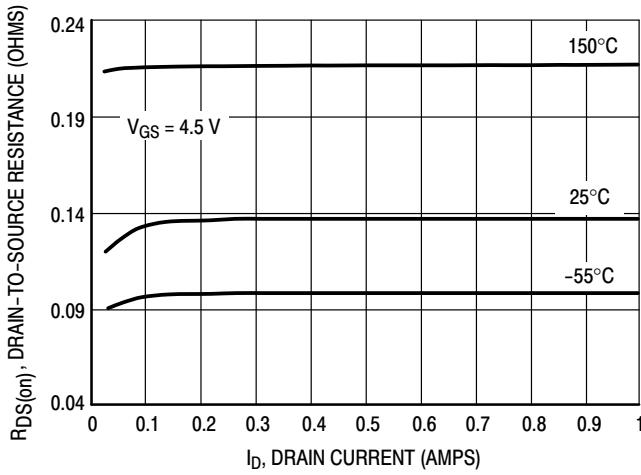


Figure 3. On-Resistance versus Drain Current

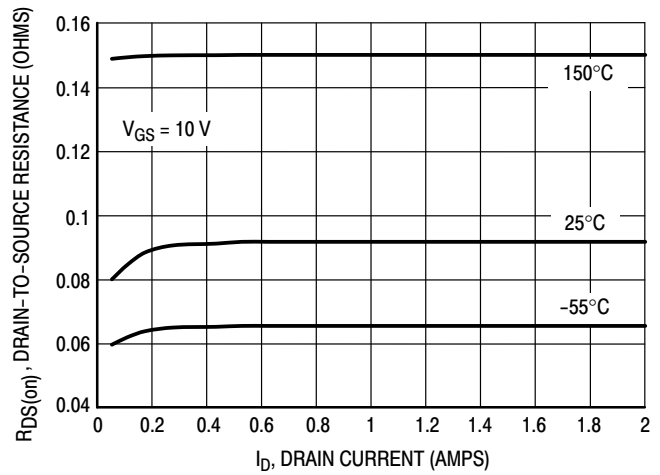


Figure 4. On-Resistance versus Drain Current

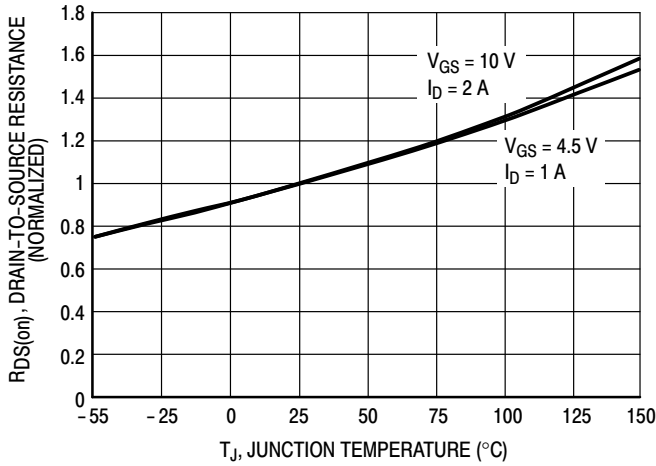


Figure 5. On-Resistance Variation with Temperature

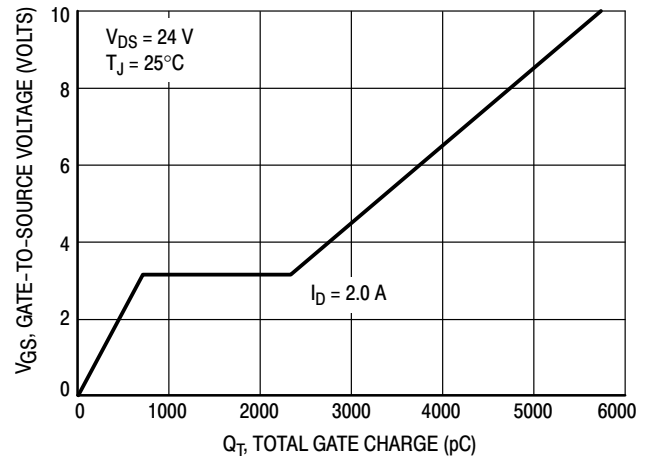


Figure 6. Gate Charge

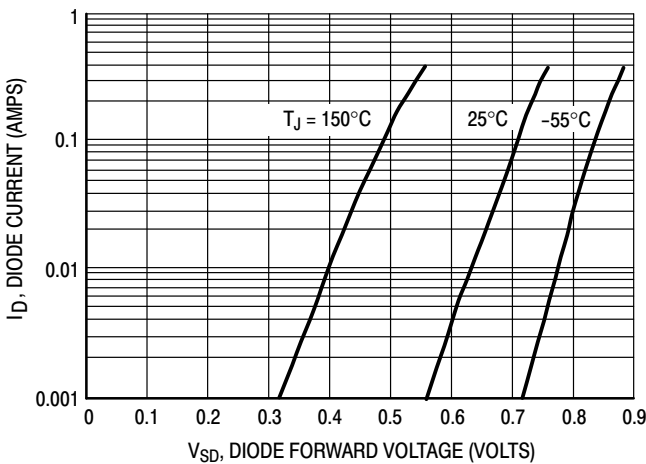


Figure 7. Body Diode Forward Voltage

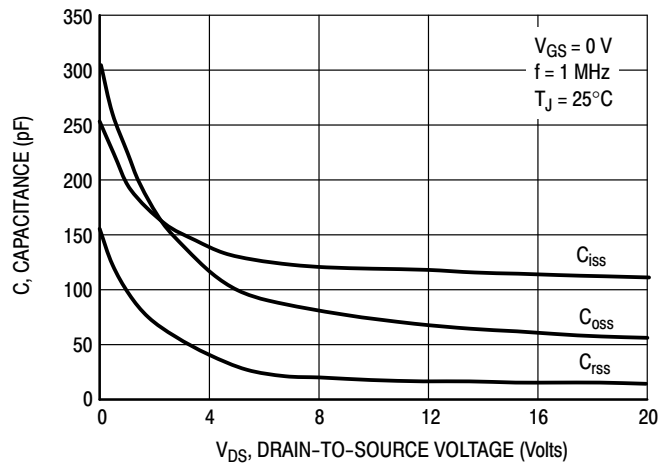
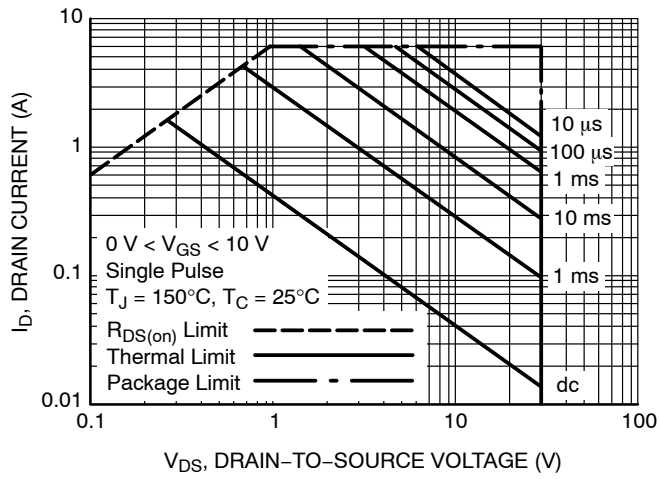


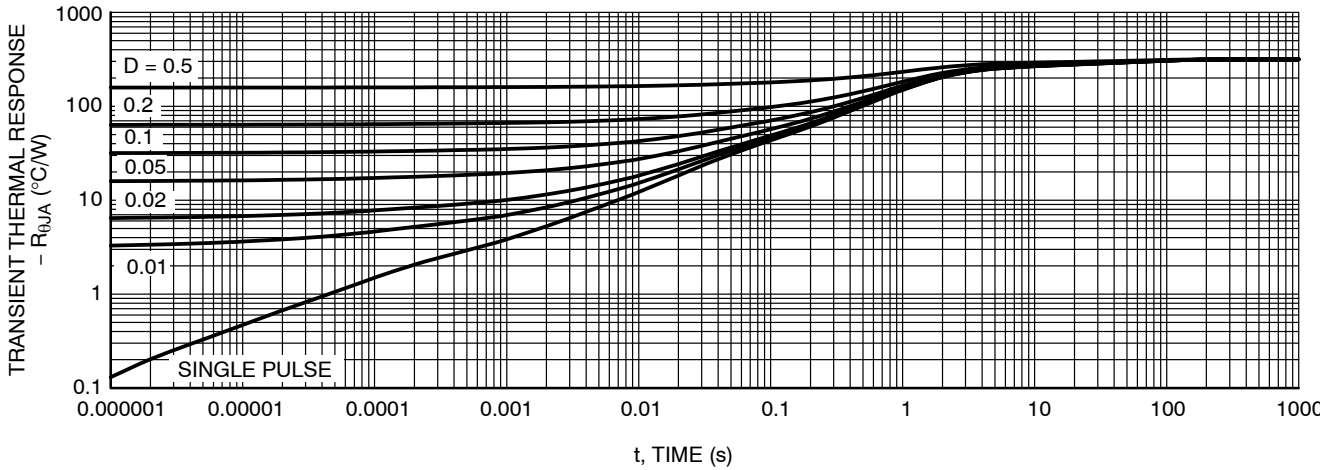
Figure 8. Capacitance

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## TYPICAL ELECTRICAL CHARACTERISTICS



**Figure 9. Maximum Rated Forward Biased Safe Operating Area**

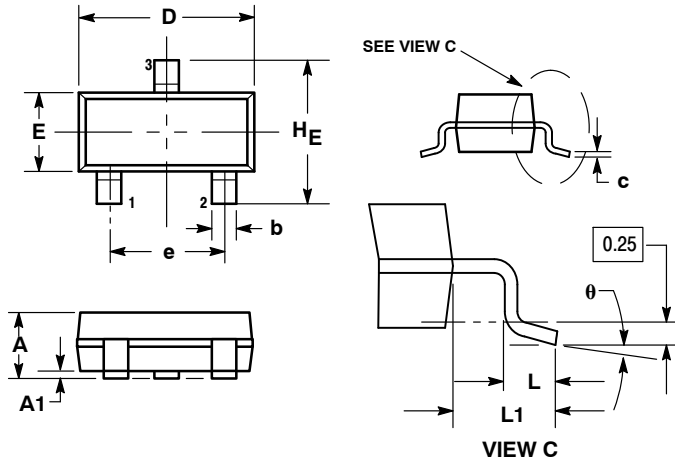


**Figure 10. Thermal Response**

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## PACKAGE DIMENSIONS

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



NOTES:

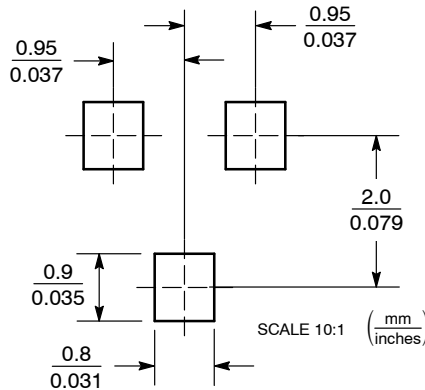
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	0.044
A1	0.01	0.06	0.10	0.001	0.002	0.004
b	0.37	0.44	0.50	0.015	0.018	0.020
c	0.09	0.13	0.18	0.003	0.005	0.007
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	0.081
L	0.10	0.20	0.30	0.004	0.008	0.012
L1	0.35	0.54	0.69	0.014	0.021	0.029
HE	2.10	2.40	2.64	0.083	0.094	0.104
θ	0°	---	10°	0°	---	10°

STYLE 21:

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.

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