MGSF2N02EL, MVSF2N02EL

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
- AEC Q101 Qualified and PPAP Capable − MVSF2N02EL
- These Devices are Pb−Free and are RoHS Compliant

Applications

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

ON Semiconductor®

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

N−Channel

MARKING DIAGRAM

SOT−23
CASE 318
STYLE 21
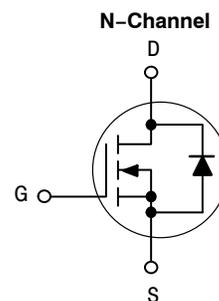
NT M▪
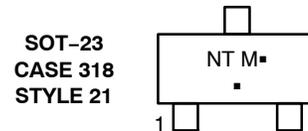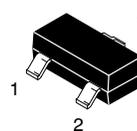
xxx	= Specific Device Code
M	= Date Code
▪	= Pb−Free Package

PIN ASSIGNMENT

3
Drain

1   2
Gate   Source
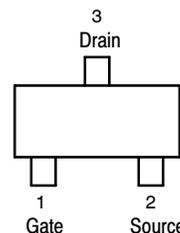
ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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)
	$R_{\theta JA}$	100
		
		300
			°C/W

Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°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.
1. 1" Pad, t < 10 sec.
2. Min pad, steady state.

MGSF2N02EL, MVSF2N02EL

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) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	20 –	– 22	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 20 Vdc, V_{GS} = 0 Vdc, T_J = 125°C)	I_{DSS}	– –	– –	1.0 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 (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)	$V_{GS(th)}$	0.5 –	– −2.3	1.0 –	Vdc mV/°C
Static Drain−to−Source On−Resistance (V_{GS} = 4.5 Vdc, I_D = 3.6 A) (V_{GS} = 2.5 Vdc, I_D = 3.1 A)	$R_{DS(on)}$	– –	78 105	85 115	mΩ
DYNAMIC CHARACTERISTICS					
Input Capacitance	C_{iss}	–	150	–	pF
Output Capacitance	C_{oss}	–	130	–	
Transfer Capacitance	C_{rss}	–	45	–	
(V_{DS} = 5.0 Vdc, V_{GS} = 0 V, f = 1.0 MHz)					
SWITCHING CHARACTERISTICS (Note 4)					
Turn−On Delay Time	$t_{d(on)}$	–	6.0	–	ns
Rise Time	t_r	–	95	–	
Turn−Off Delay Time	$t_{d(off)}$	–	28	–	
Fall Time	t_f	–	125	–	
(V_{DD} = 16 Vdc, I_D = 2.8 Adc, V_{gs} = 4.5 V, R_G = 2.3 Ω)					
Gate Charge	Q_T	–	3.5	–	nC
	Q_{gs}	–	0.6	–	
	Q_{gd}	–	1.5	–	
(V_{DS} = 16 Vdc, I_D = 1.75 Adc, V_{GS} = 4.0 Vdc) (Note 3)					
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	t_{rr}	–	104	–	ns
	t_a	–	42	–	
	t_b	–	62	–	
(I_S = 1.0 Adc, V_{GS} = 0 Vdc, dI_S/ dt = 100 A/μs) (Note 3)					
Reverse Recovery Stored Charge	Q_{RR}	–	0.20	–	μC

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.

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

ORDERING INFORMATION

Device	Package	Shipping†
MGSF2N02ELT1G	SOT−23 (Pb−Free)	3,000 / Tape & Reel
MVSF2N02ELT1G*		

†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.

*MVSF Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

TYPICAL CHARACTERISTICS
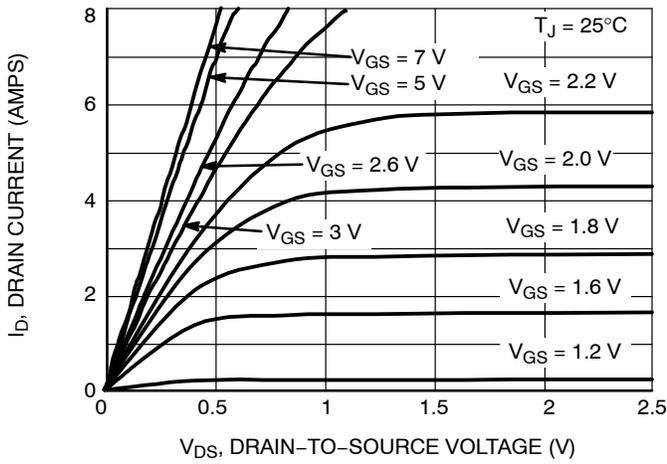
Figure 1. On−Region Characteristics
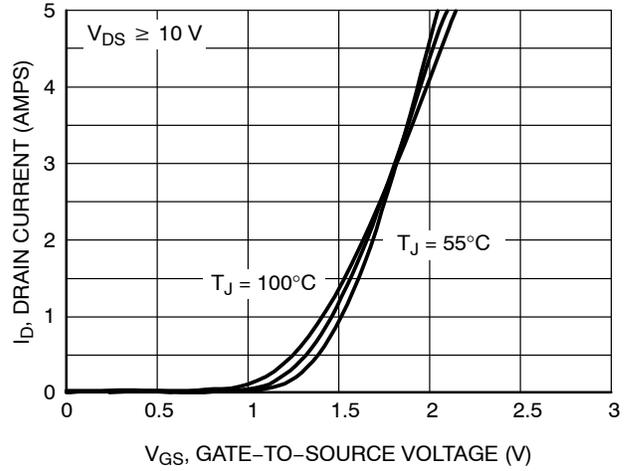

Figure 2. Transfer Characteristics
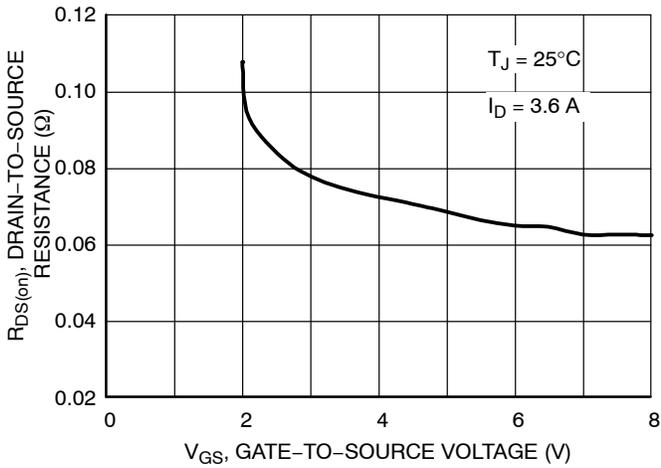
Figure 3. On−Resistance vs. Gate−to−Source Voltage
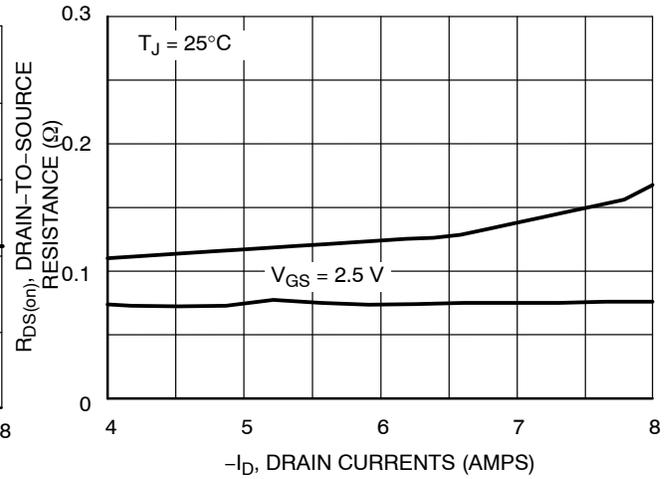
Figure 4. On−Resistance vs. Gate Voltage
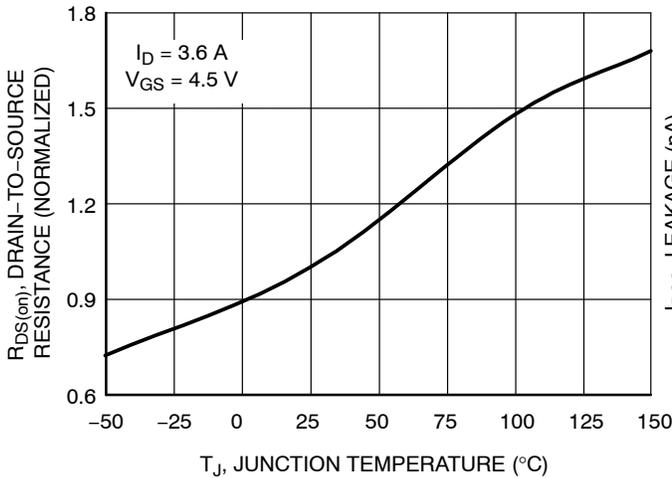
Figure 5. On−Resistance Variation with Temperature
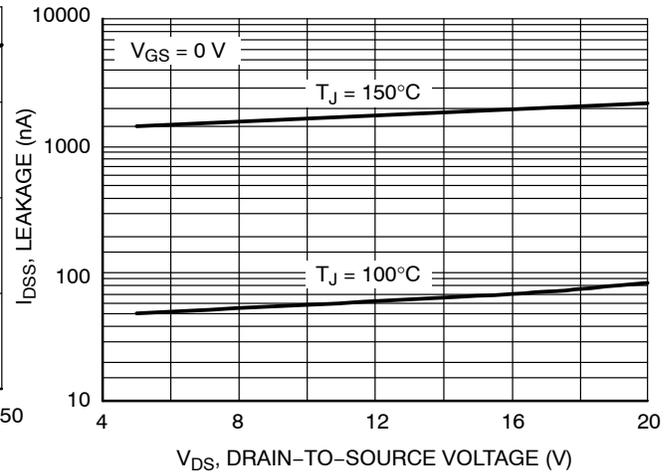
Figure 6. Drain−to−Source Leakage
Current vs. Voltage

TYPICAL CHARACTERISTICS
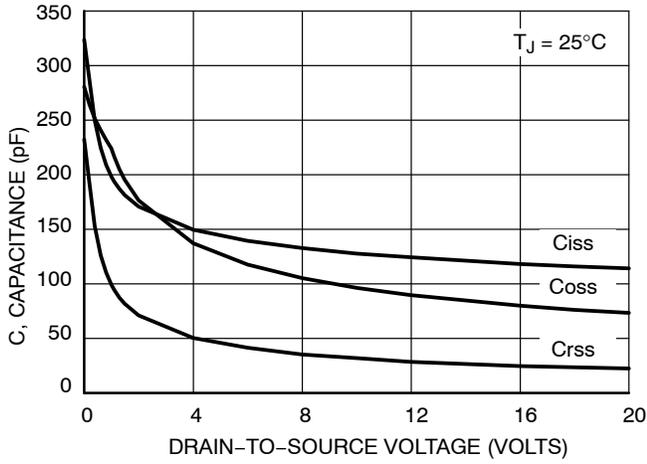
Figure 7. Capacitance Variation
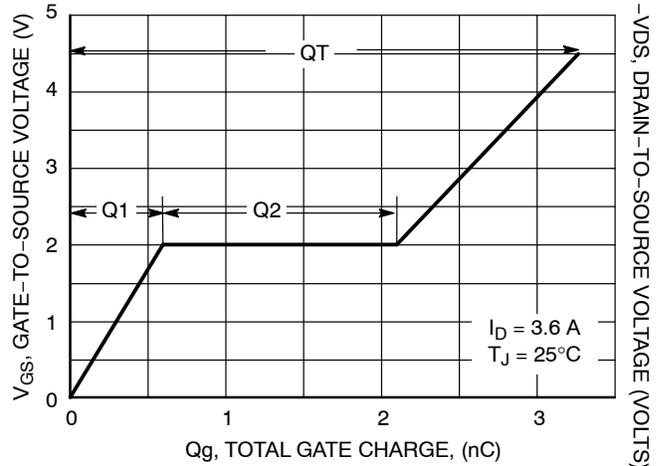
Figure 8. Gate−to−Source Voltage vs. Total Charge
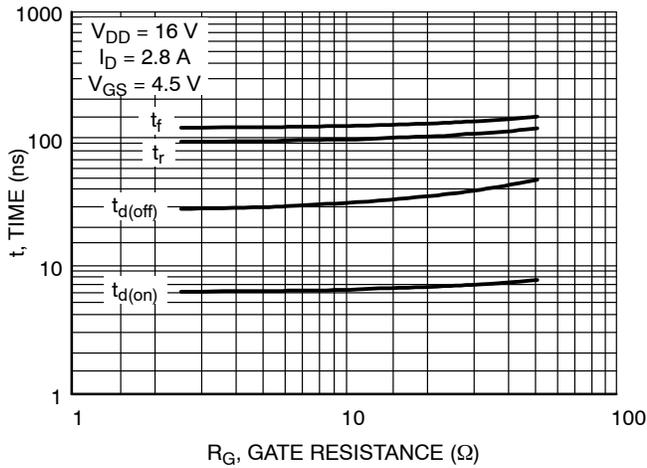
Figure 9. Resistive Switching Time Variation vs. Gate Resistance
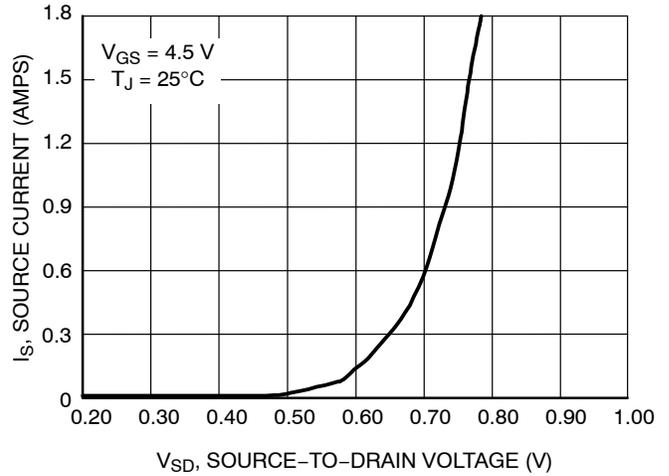
Figure 10. Diode Forward Voltage vs. Current

MGSF2N02EL, MVSF2N02EL

PACKAGE DIMENSIONS

SOT−23 (TO−236)
CASE 318−08
ISSUE AP
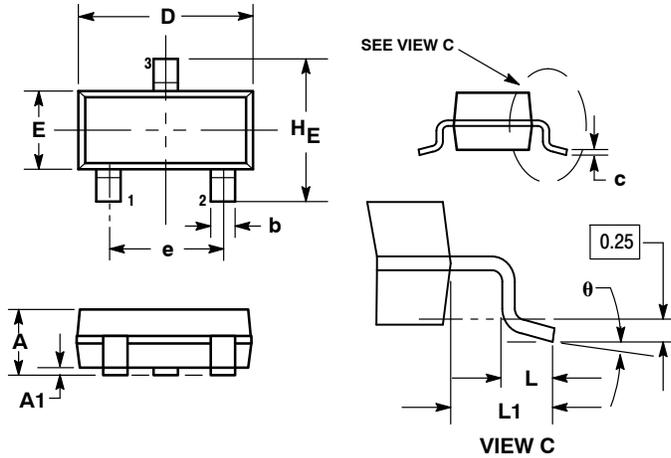
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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:
PIN 1. GATE
2. SOURCE
3. DRAIN

SOLDERING FOOTPRINT*

$\frac{0.95}{0.037}$

$\frac{0.95}{0.037}$

$\frac{2.0}{0.079}$

$\frac{0.9}{0.035}$

$\frac{0.8}{0.031}$

SCALE 10:1 $\left(\frac{mm}{inches}\right)$
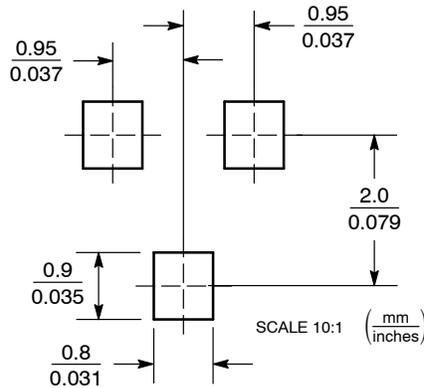
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MGSF2N02EL/D