MGSF2N02EL, MVSF2N02EL

MOSFET – N-Channel, SOT-23

2.8 A, 20 V

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

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.
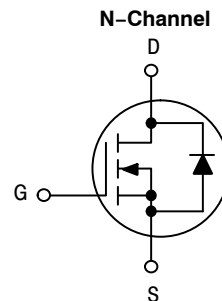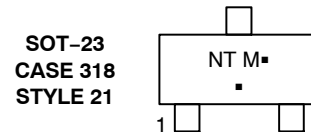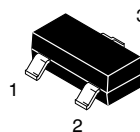1. 1" Pad, t < 10 sec.
2. Min pad, steady state.

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
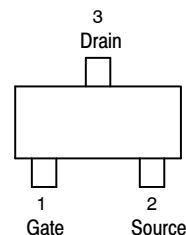
ORDERING INFORMATION

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

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	−	
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	−	
Gate Charge	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}	− −	0.76 −	1.2 −	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

Dynamic characteristics test conditions: (V_{DS} = 5.0 Vdc, V_{GS} = 0 V, f = 1.0 MHz)

Switching characteristics test conditions: (V_{DD} = 16 Vdc, I_D = 2.8 Adc, V_{gs} = 4.5 V, R_G = 2.3 Ω)

Gate charge test conditions: (V_{DS} = 16 Vdc, I_D = 1.75 Adc, V_{GS} = 4.0 Vdc) (Note 3)

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.

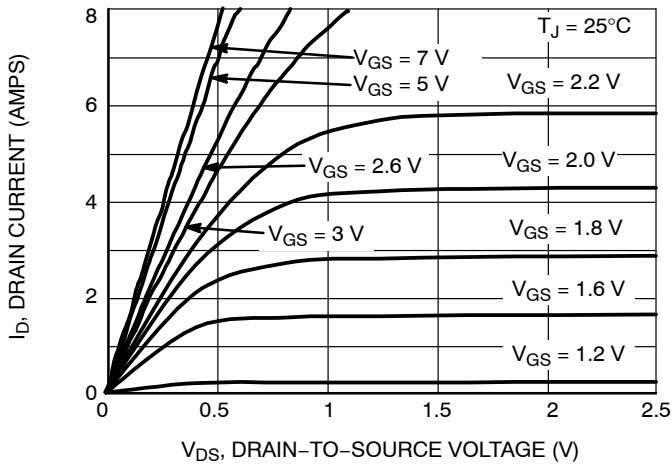# MGSF2N02EL, MVSF2N02EL

TYPICAL CHARACTERISTICS
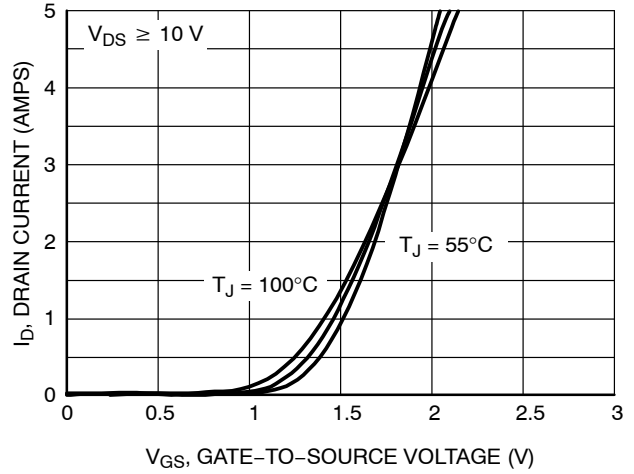

Figure 1. On−Region Characteristics

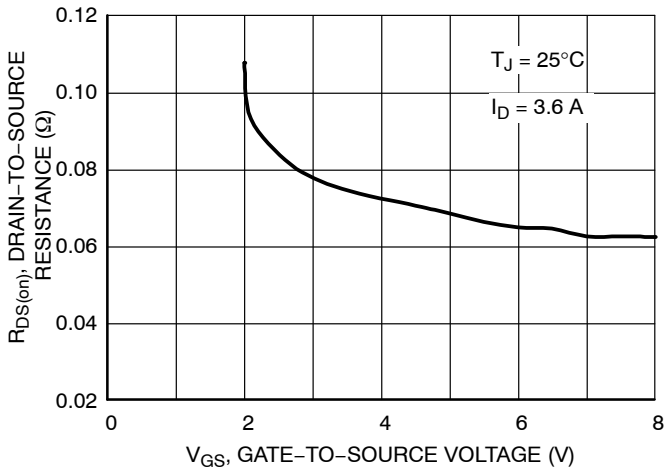Figure 2. Transfer Characteristics

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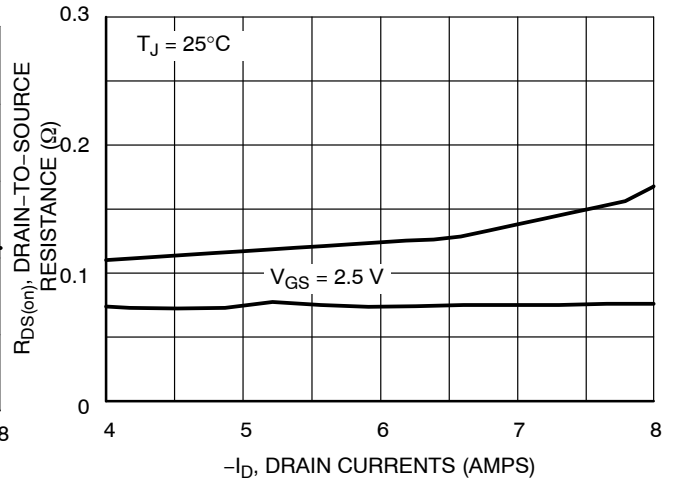

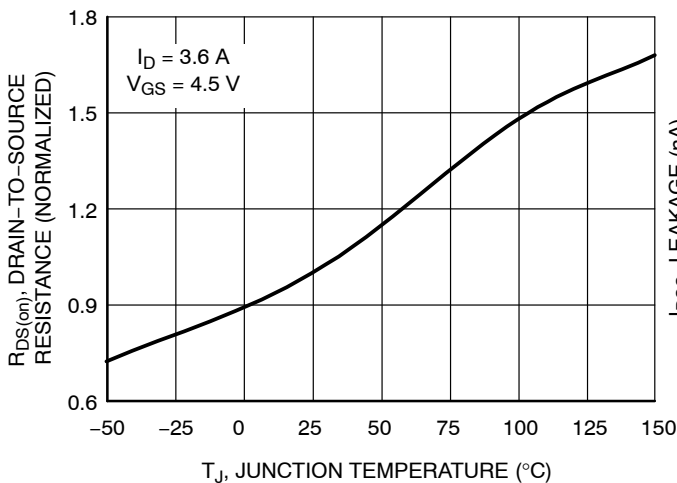Figure 4. On−Resistance vs. Gate Voltage
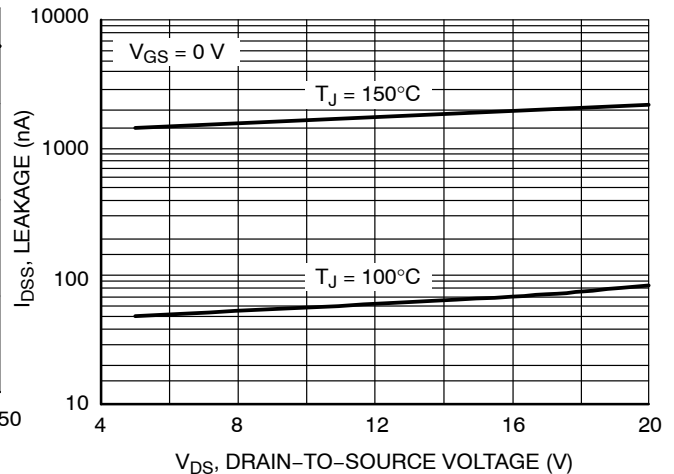

Figure 5. On−Resistance Variation with Temperature

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

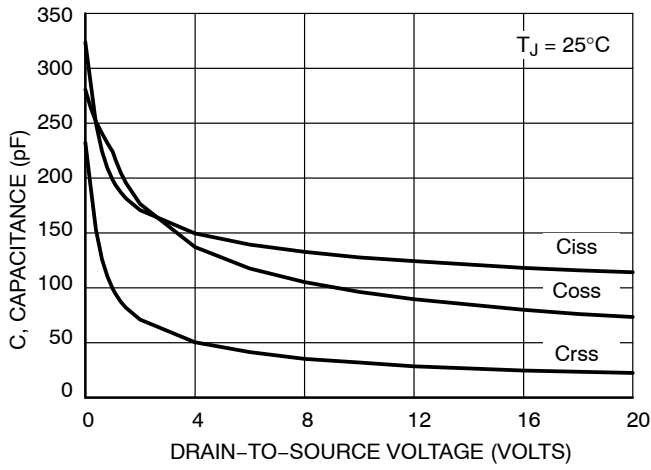# MGSF2N02EL, MVSF2N02EL

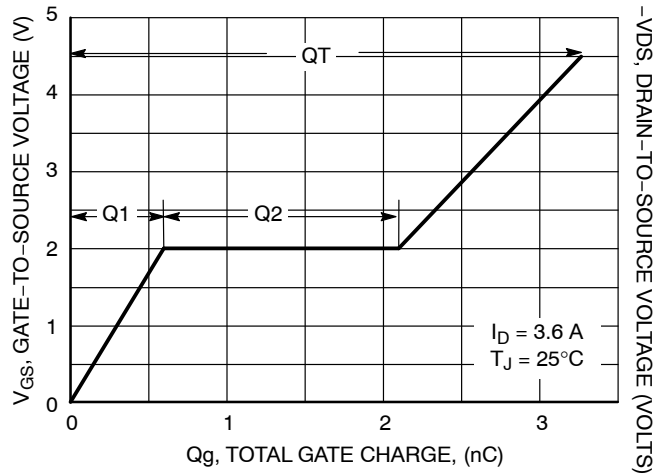## TYPICAL CHARACTERISTICS

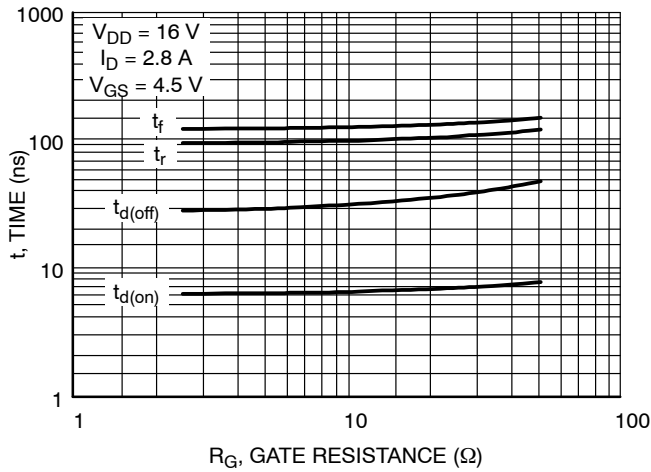**Figure 7. Capacitance Variation**

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

Figure 9. Resistive Switching Time Variation vs. Gate Resistance
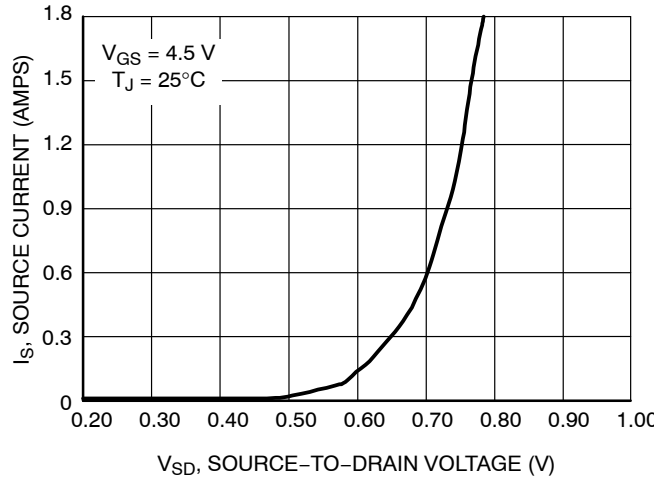
Figure 10. Diode Forward Voltage vs. Current

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

ON Semiconductor®
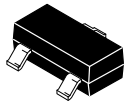
SOT−23 (TO−236)
CASE 318−08
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1

TOP VIEW

3X **b**

SIDE VIEW

VIEW C

END VIEW

SEE VIEW C

0.25

RECOMMENDED SOLDERING FOOTPRINT

2.90

3X 0.80

3X 0.90

0.95
PITCH

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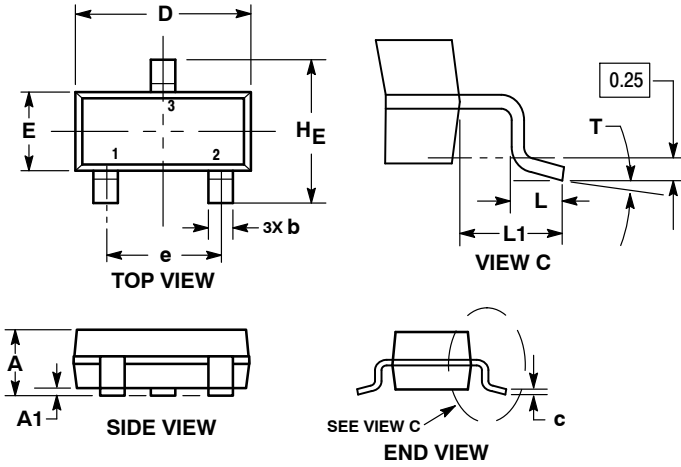
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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
H$_E$	2.10	2.40	2.64	0.083	0.094	0.104
T	0°	---	10°	0°	---	10°

GENERIC MARKING DIAGRAM*

XXXM■

1
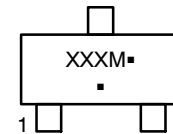
XXX = Specific Device Code
M   = Date Code
■   = Pb−Free Package

*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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DESCRIPTION:	SOT−23 (TO−236)	PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

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