

MOSFET – N-Channel, SOT-23

2.8 A, 20 V

**MGSF2N02EL,
MVSF2N02EL**

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

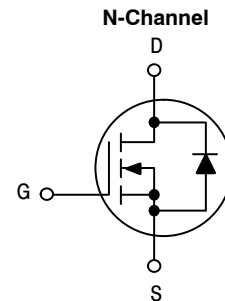
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	20	Vdc
Gate-to-Source Voltage – Continuous	V_{GS}	± 8.0	Vdc
Drain Current	I_D	2.8	A
– Continuous @ $T_A = 25^\circ\text{C}$	I_{DM}	5.0	
– Single Pulse ($t_p = 10\ \mu\text{s}$)			
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	P_D	1.25	W
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Thermal Resistance Junction-to-Ambient (Note 1)	$R_{\theta JA}$	100	$^\circ\text{C/W}$
Thermal Resistance Junction-to-Ambient (Note 2)		300	
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

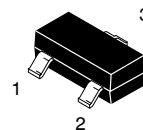
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. 1" Pad, $t < 10\ \text{sec}$.
2. Min pad, steady state.

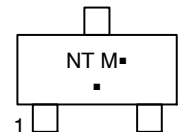
2.8 A, 20 V
 $R_{DS(on)} = 85\ \text{m}\Omega$ (max)



MARKING DIAGRAM

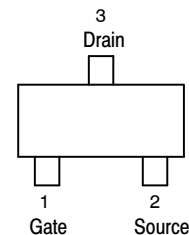


**SOT-23
CASE 318
STYLE 21**



xxx = Specific Device Code
M = Date Code
■ = Pb-Free Package

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

MGSF2N02EL, MVSF2N02EL

ELECTRICAL CHARACTERISTICS (T_A = 25 °C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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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	(V _{DS} = 5.0 Vdc, V _{GS} = 0 V, f = 1.0 MHz)	C _{iss}	–	150	–	pF
Output Capacitance		C _{oss}	–	130	–	
Transfer Capacitance		C _{rss}	–	45	–	

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V _{DD} = 16 Vdc, I _D = 2.8 Adc, V _{gs} = 4.5 V, R _G = 2.3 Ω)	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	(V _{DS} = 16 Vdc, I _D = 1.75 Adc, V _{GS} = 4.0 Vdc) (Note 3)	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

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

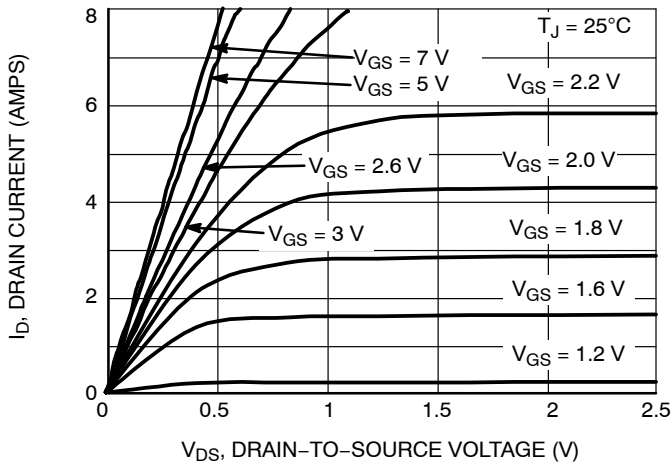


Figure 1. On-Region Characteristics

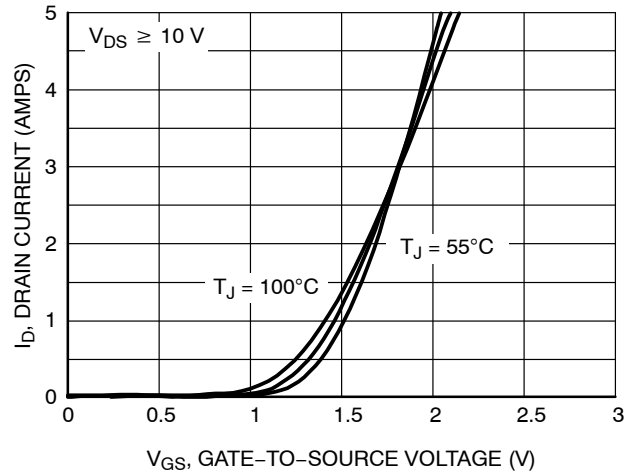


Figure 2. Transfer Characteristics

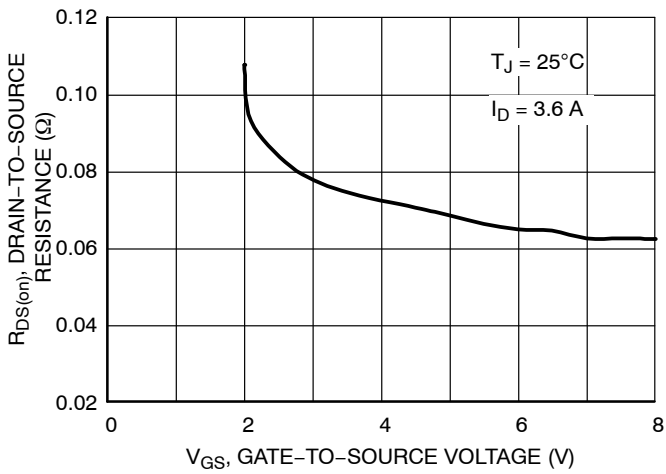


Figure 3. On-Resistance vs. Gate-to-Source Voltage

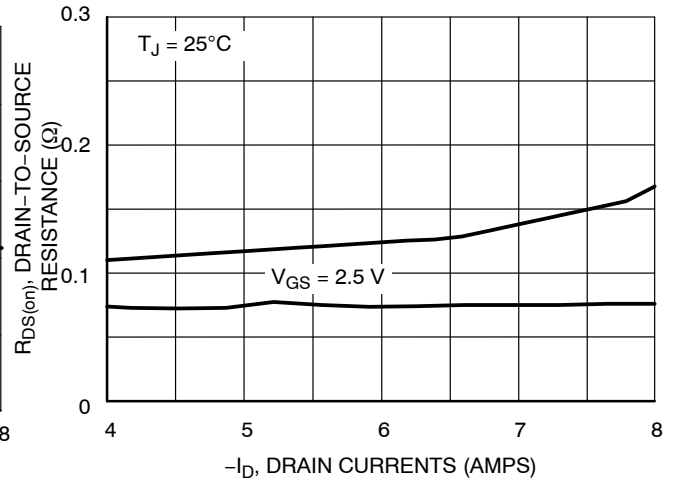


Figure 4. On-Resistance vs. Gate Voltage

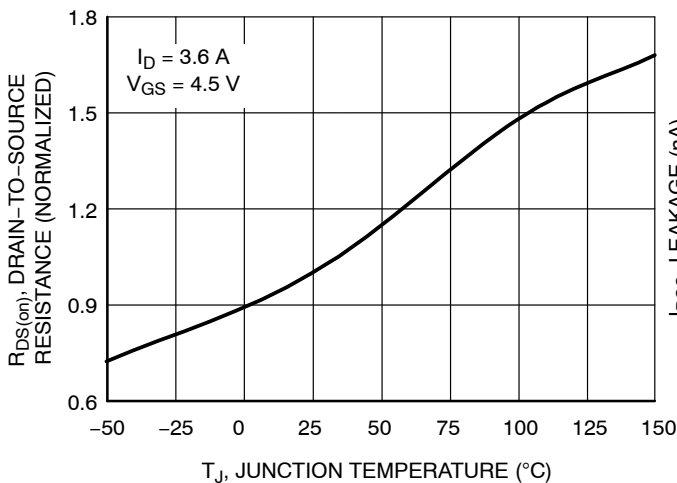


Figure 5. On-Resistance Variation with Temperature

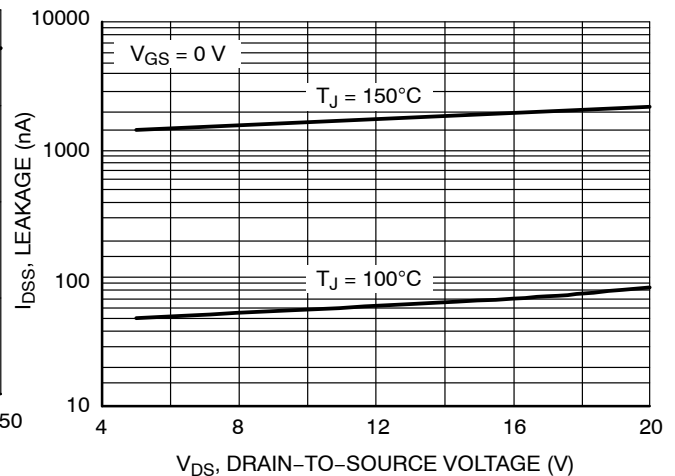


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

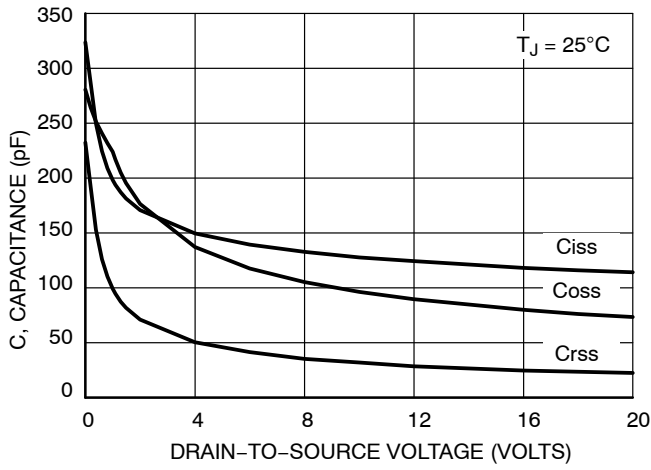


Figure 7. Capacitance Variation

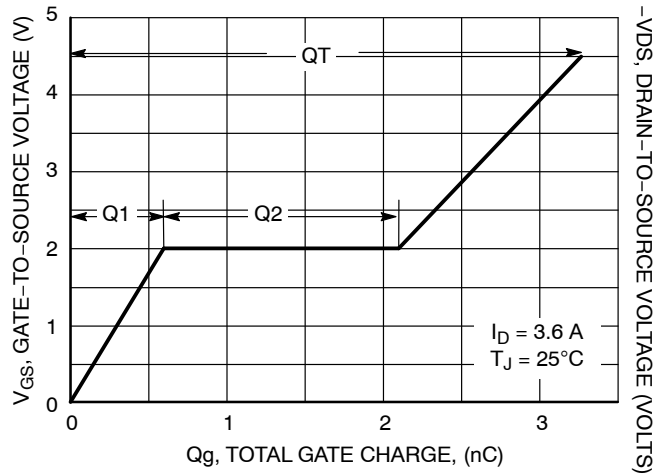


Figure 8. Gate-to-Source Voltage vs. Total Charge

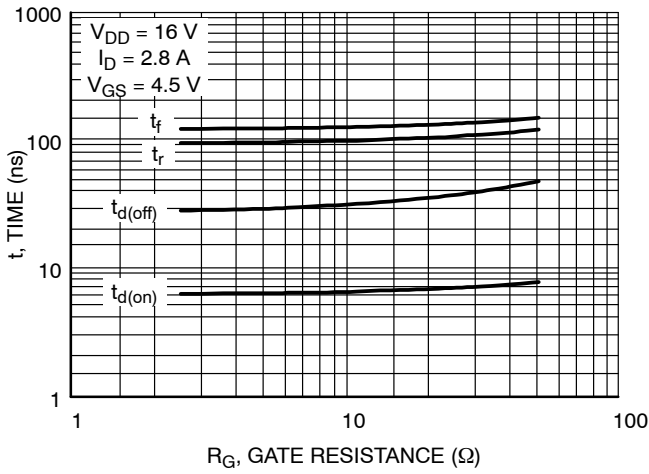


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

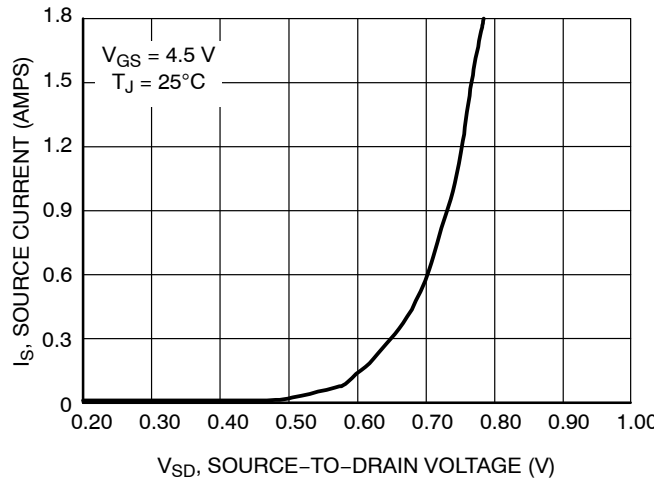


Figure 10. Diode Forward Voltage vs. Current

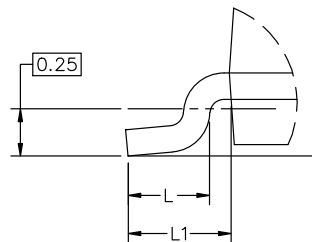
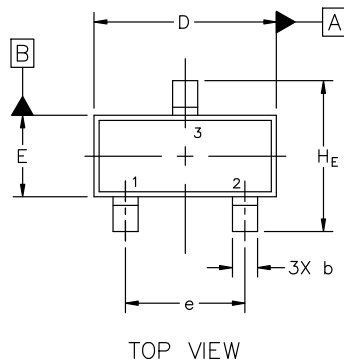


SCALE 4:1

SOT-23 (TO-236) 2.90x1.30x1.00 1.90P

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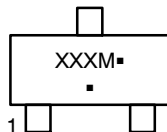


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: 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.

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. Some products may not follow the Generic Marking.



RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

STYLES ON PAGE 2

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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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