



## Description

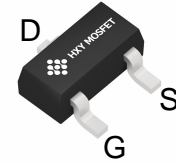
The MGSF2N02EL uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

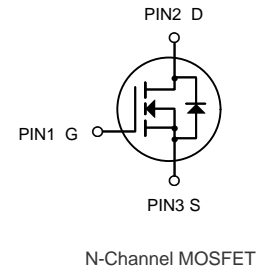
$V_{DS} = 20V$   $I_D = 2.3A$   
 $R_{DS(ON)} < 60m\Omega @ V_{GS}=4.5V$

## Application

Battery protection  
Load switch  
Uninterruptible power supply



SOT-23



## Ordering Information

Product ID	Pack	Brand	Qty(PCS)
MGSF2N02EL	SOT-23	HXY MOSFET	3000

## Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D$	Drain Current-Continuous	2.3	A
$I_{DM}$	Drain Current-Pulsed (Note 1)	16	A
$P_D$	Maximum Power Dissipation	0.9	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	139	$^\circ C/W$



**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	20	22	-	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Body Leakage Current	$I_{GSS}$	$V_{GS}=\pm 12V, V_{DS}=0V$	-	-	$\pm 100$	nA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	0.5	0.75	1.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=2.5V, I_D=2.0A$	-	54	72	m $\Omega$
		$V_{GS}=4.5V, I_D=2.3A$	-	48	60	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS}=5V, I_D=2.3A$	-	8	-	S
Input Capacitance	$C_{iss}$	$V_{DS}=10V, V_{GS}=0V,$ $F=1.0\text{MHz}$	-	260	-	PF
Output Capacitance	$C_{oss}$		-	48	-	PF
Reverse Transfer Capacitance	$C_{rss}$		-	27	-	PF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=10V, R_L=3.3\Omega$ $V_{GS}=4.5V, R_{GEN}=6\Omega$	-	2.5	-	nS
Turn-on Rise Time	$t_r$		-	3.2	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	21	-	nS
Turn-Off Fall Time	$t_f$		-	3	-	nS
Total Gate Charge	$Q_g$	$V_{DS}=10V, I_D=2.3A,$ $V_{GS}=4.5V$	-	2.9	5	nC
Gate-Source Charge	$Q_{gs}$		-	0.4	-	nC
Gate-Drain Charge	$Q_{gd}$		-	0.6	-	nC
Diode Forward Voltage <sup>(Note 3)</sup>	$V_{SD}$	$V_{GS}=0V, I_S=2.3A$	-	0.75	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	$I_S$		-	-	3.3	A

**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production



### Typical Electrical and Thermal Characteristics

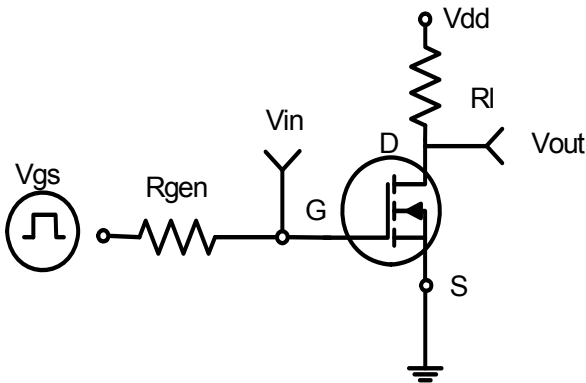


Figure 1: Switching Test Circuit

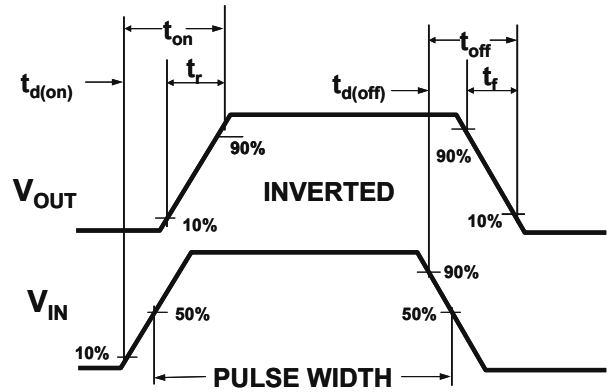


Figure 2: Switching Waveforms

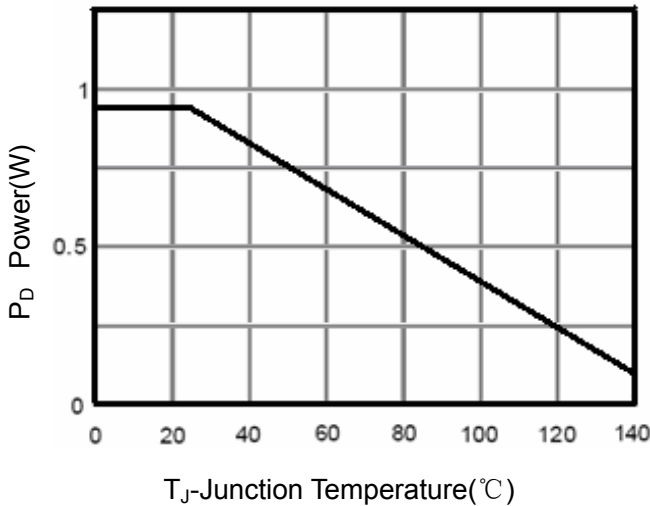


Figure 3 Power Dissipation

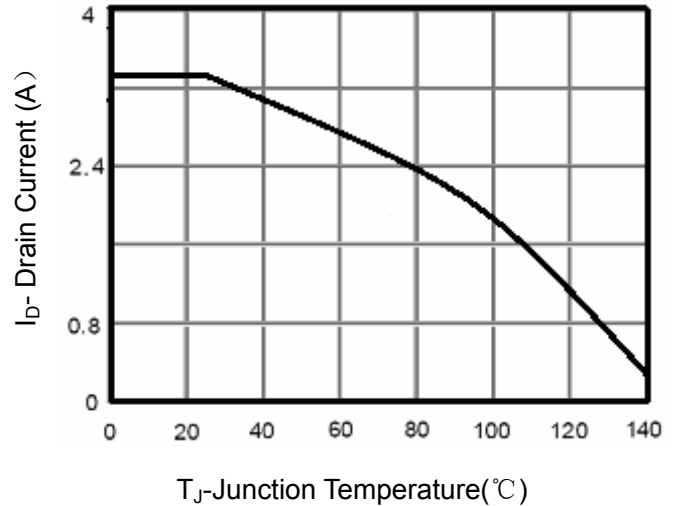


Figure 4 Drain Current

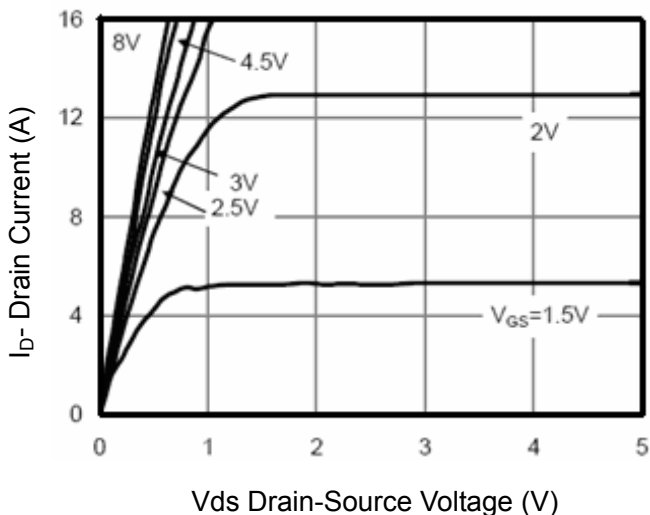


Figure 5 Output Characteristics

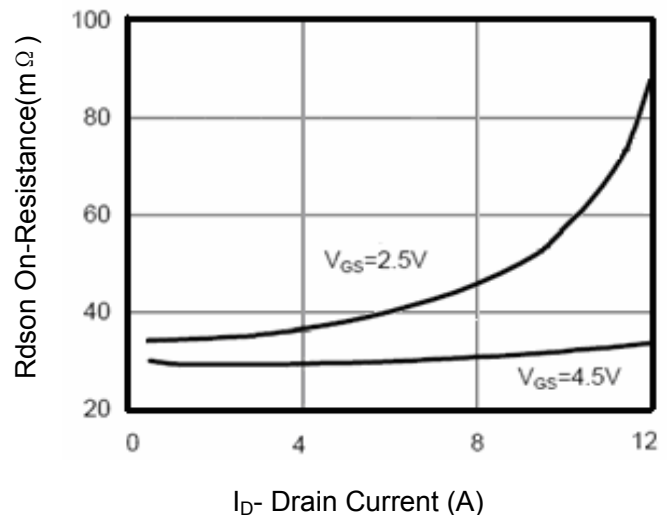


Figure 6 Drain-Source On-Resistance

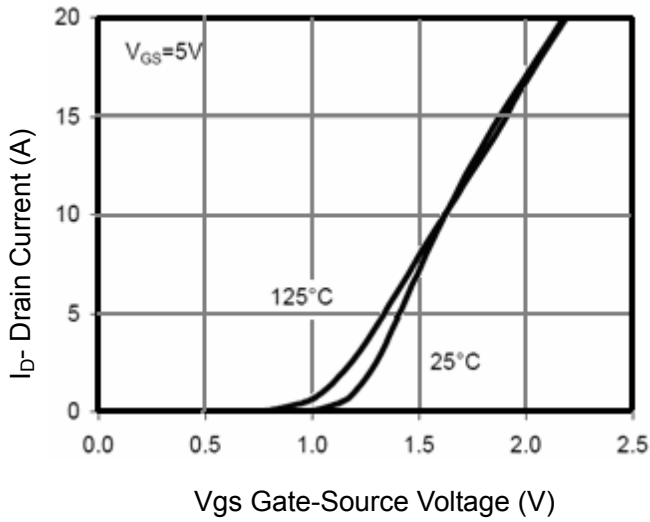


Figure 7 Transfer Characteristics

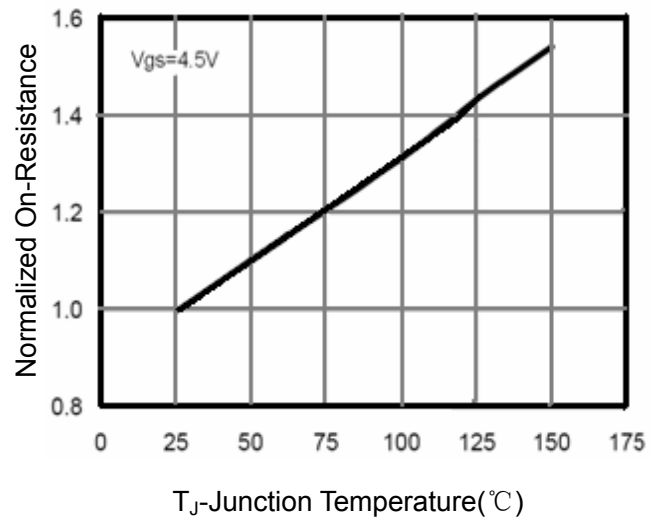


Figure 8 Drain-Source On-Resistance

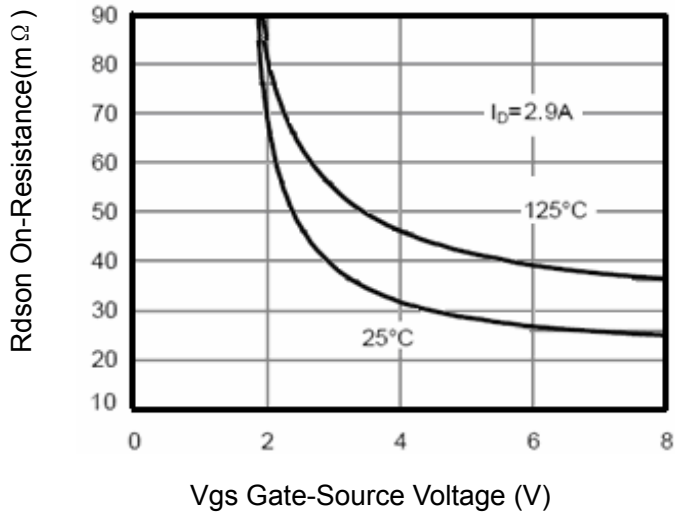


Figure 9 Rdson vs Vgs

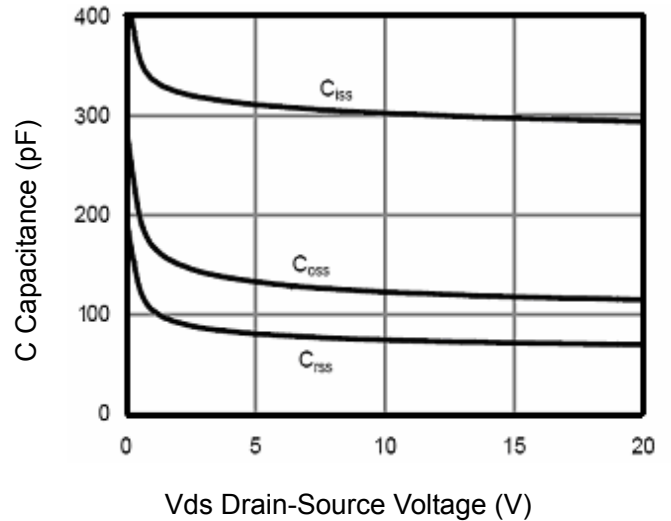


Figure 10 Capacitance vs Vds

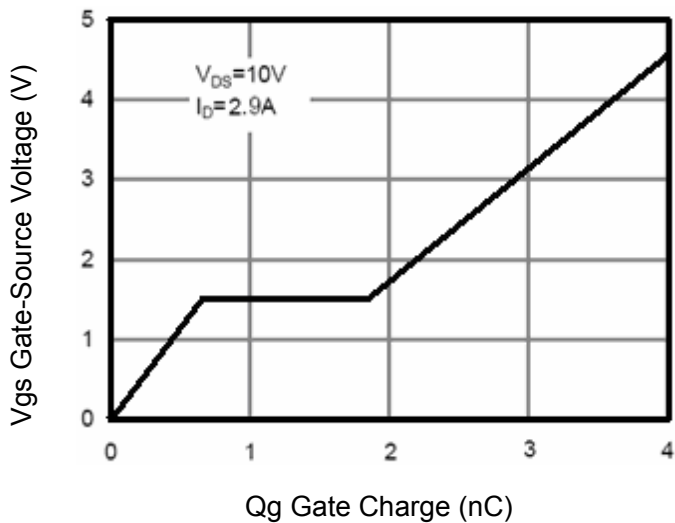


Figure 11 Gate Charge

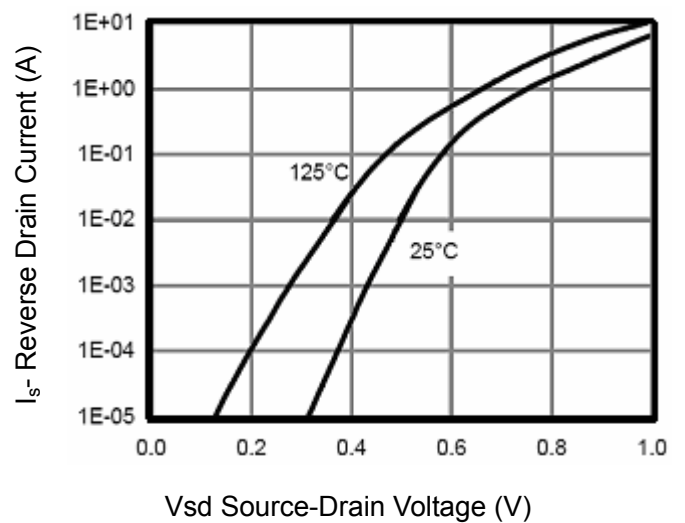
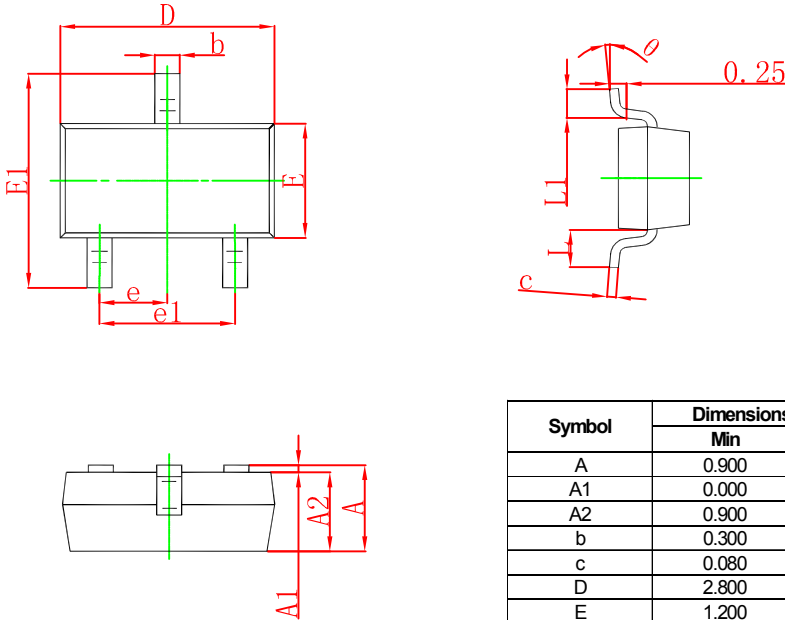


Figure 12 Source- Drain Diode Forward

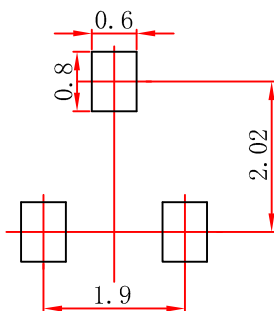


### SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

### SOT-23 Suggested Pad Layout



**Note:**

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.



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