

### ● General Description

The AGM2309EL combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

This device is ideal for load switch and battery protection applications.

### ● Features

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

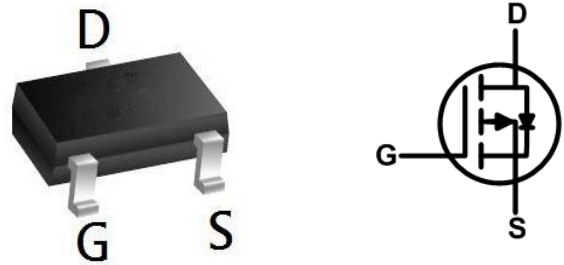
### ● Application

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

### Product Summary

BVDSS	RDSON	ID
-60V	160mΩ	-2A

### SOT-23 Pin Configuration



### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
2309	AGM2309EL	SOT-23	178mm	8mm	3000

**Table 1. Absolute Maximum Ratings (TA=25°C)**

Symbol	Parameter	Value	Unit
VDS	Drain-Source Voltage (VGS=0V)	-60	V
VGS	Gate-Source Voltage (VDS=0V)	±20	V
ID	Drain Current-Continuous(TA=25°C) <b>(Note 1)</b>	-2.0	A
	Drain Current-Continuous(TA=100°C)	-1.2	A
IDM (pluse)	Drain Current-Continuous@ Current-Pulsed <b>(Note 2)</b>	-8.0	A
PD	Maximum Power Dissipation(TA=25°C)	1.0	w
TJ,TSTG	Operating Junction and Storage Temperature Range	-55 To 150	°C

**Table 2. Thermal Characteristic**

Symbol	Parameter	Typ	Max	Unit
RθJA	Thermal Resistance Junction-ambient (Steady State) <sup>1</sup>	---	125	°C/W

**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
BVDSS	Drain-Source Breakdown Voltage	VGS=0V ID=250μA	-60	--	--	V
IDSS	Zero Gate Voltage Drain Current	VDS=-60V,VGS=0V	--	--	-1	μA
IGSS	Gate-Body Leakage Current	VGS=±20V,VDS=0V	--	--	±100	nA
VGS(th)	Gate Threshold Voltage	VDS=VGS,ID=-250μA	-1.0	-1.5	-2.5	V
gFS	Forward Transconductance	VDS=-10V,ID=-2A	--	--	--	S
RDS(on)	Drain-Source On-State Resistance	VGS=-10V, ID=-2A	--	160	200	mΩ
		VGS=-4.5V, ID=-1A	--	200	300	mΩ
<b>Dynamic Characteristics</b>						
Ciss	Input Capacitance	VDS=-30V,VGS=0V, F=1MHZ	--	310	--	pF
Coss	Output Capacitance		--	22	--	pF
Crss	Reverse Transfer Capacitance		--	15	--	pF
Rg	Gate resistance	VGS=0V, VDS=0V,f=1.0MHz	--	--	--	Ω
<b>Switching Times</b>						
td(on)	Turn-on Delay Time	VGS=-10V,VDS=-30V, ID=-2A,RGEN=3.3Ω	--	41	--	nS
tr	Turn-on Rise Time		--	22	--	nS
td(off)	Turn-Off Delay Time		--	25	--	nS
tf	Turn-Off Fall Time		--	32	--	nS
Qg	Total Gate Charge	VGS=-10V, VDS=-30V, ID=-2A	--	5.4	--	nC
Qgs	Gate-Source Charge		--	1.1	--	nC
Qgd	Gate-Drain Charge		--	1.6	--	nC
<b>Source-Drain Diode Characteristics</b>						
ISD	Source-Drain Current(Body Diode)		--	--	-2.0	A
VSD	Forward on Voltage	VGS=0V,IS=-2A	--	--	-1.2	V
trr	Reverse Recovery Time	IF=-2A , dl/dt=100A/μs , TJ=25°C	--	--	--	ns
Qrr	Reverse Recovery Charge		--	--	--	nc

Notes 1.The maximum current rating is package limited.

Notes 2.Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3.EAS condition: TJ=25°C

Typical Characteristics

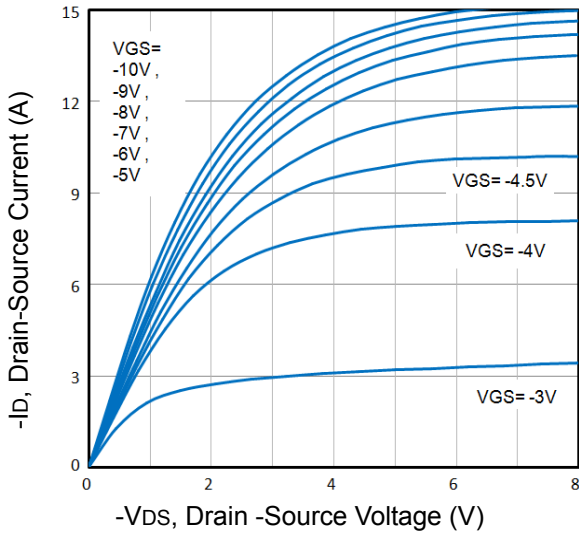


Fig1. Typical Output Characteristics

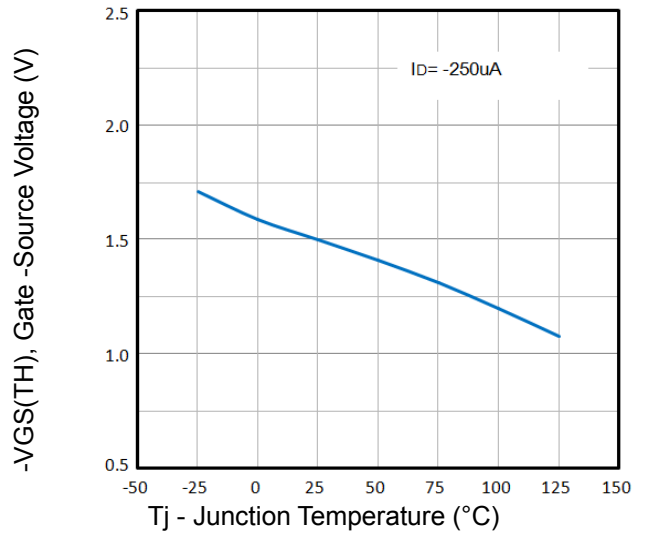


Fig2. Normalized Threshold Voltage Vs. Temperature

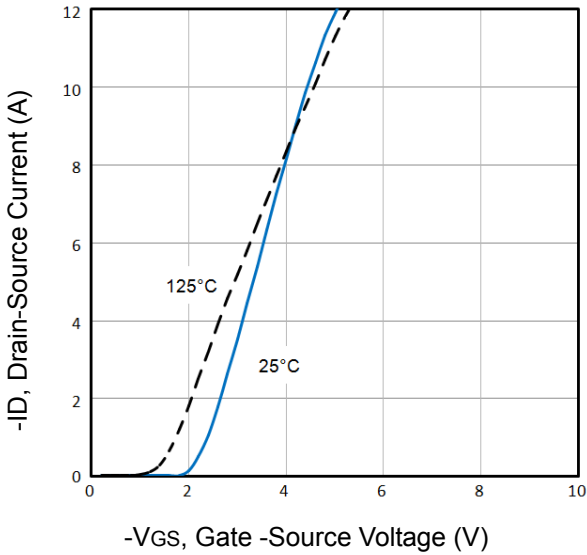


Fig3. Typical Transfer Characteristics

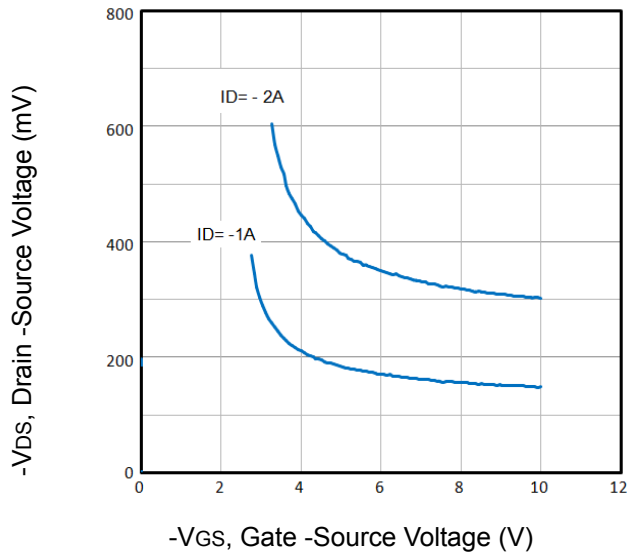


Fig4. Drain-Source Voltage vs Gate-Source Voltage

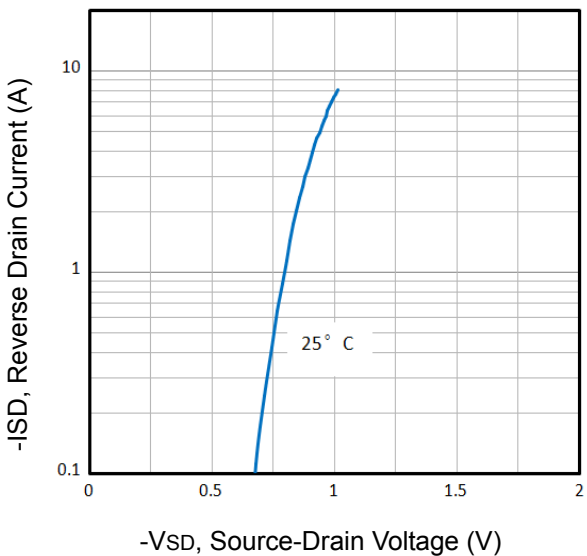


Fig5. Typical Source-Drain Diode Forward Voltage

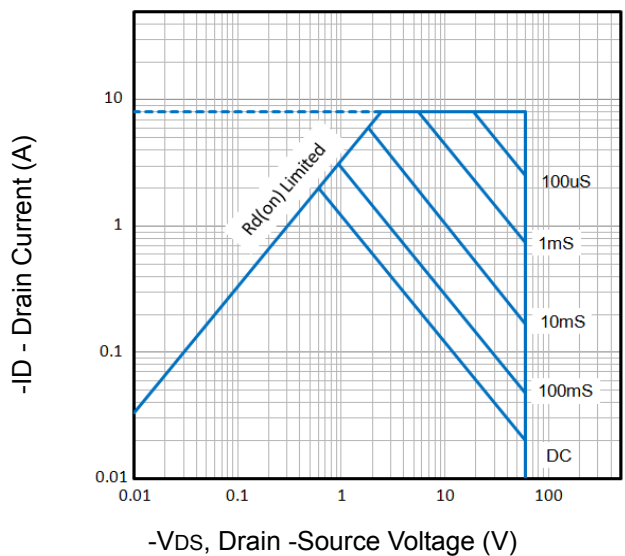
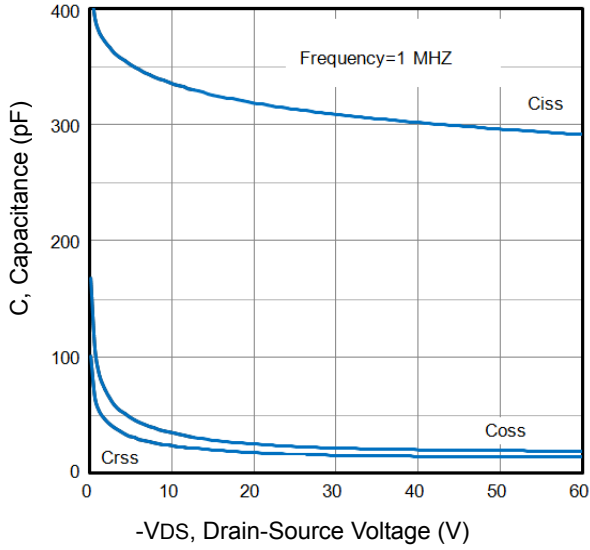
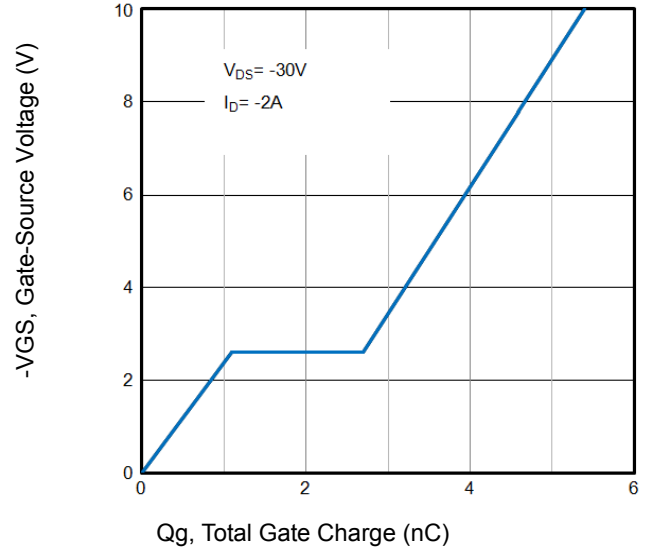


Fig6. Maximum Safe Operating Area

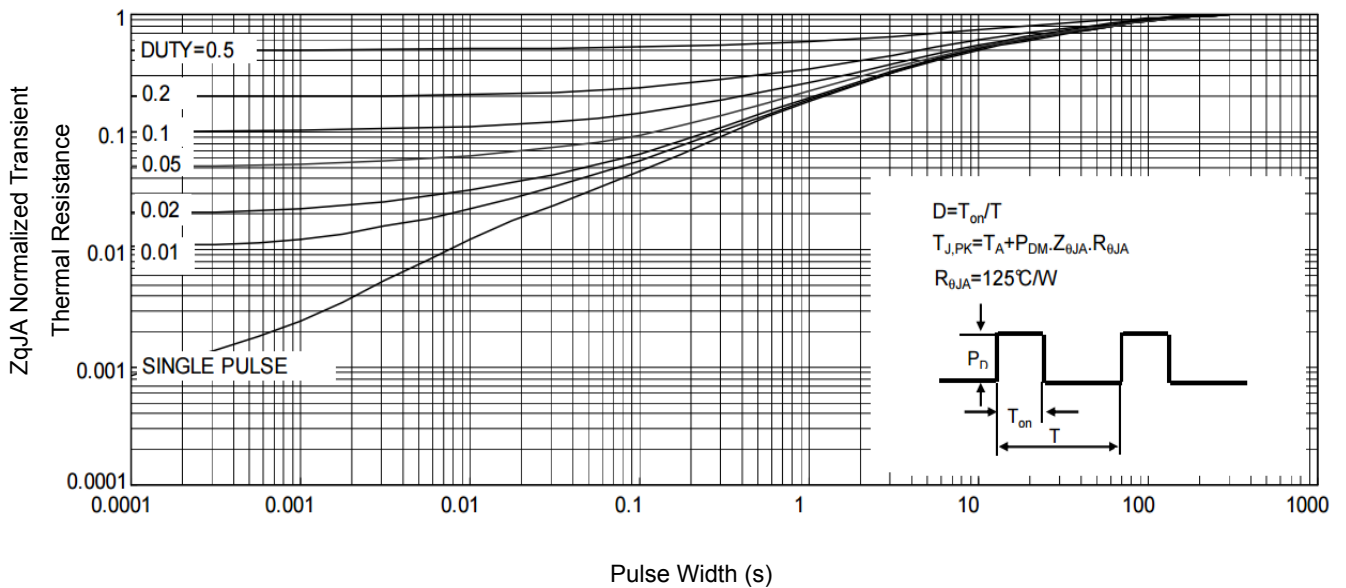
### Typical Characteristics



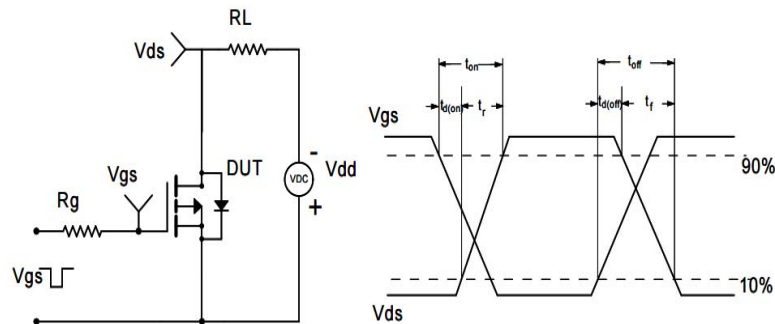
**Fig7.** Typical Capacitance Vs. Drain-Source Voltage



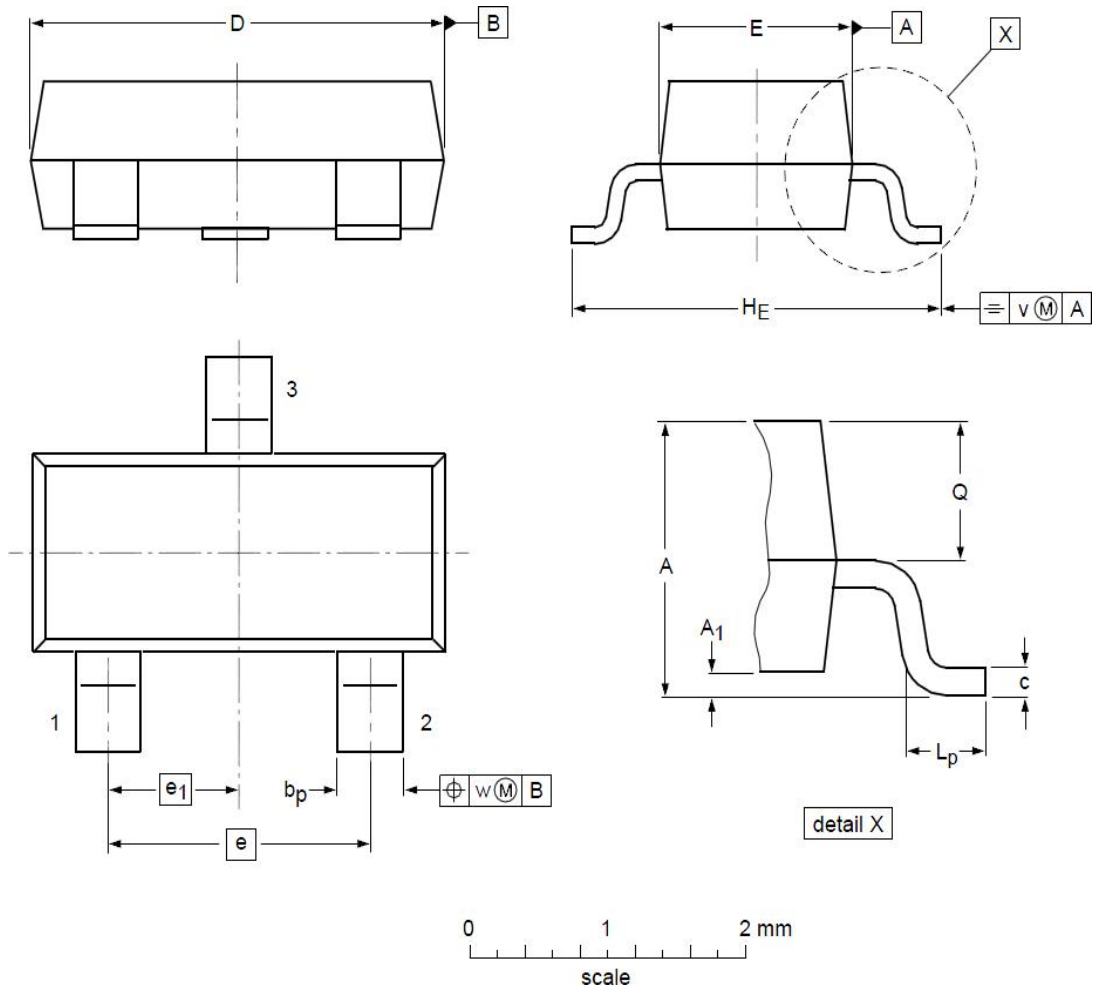
**Fig8.** Typical Gate Charge Vs. Gate-Source Voltage



**Fig9.** Normalized Maximum Transient Thermal Impedance



**Fig10.** Switching Time Test Circuit and waveforms

**Package Mechanical Data-SOT-23**

**DIMENSIONS ( unit : mm )**

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
<b>A</b>	0.90	1.01	1.15	<b>A<sub>1</sub></b>	0.01	0.05	0.10
<b>b<sub>p</sub></b>	0.30	0.42	0.50	<b>c</b>	0.08	0.13	0.15
<b>D</b>	2.80	2.92	3.00	<b>E</b>	1.20	1.33	1.40
<b>e</b>	--	1.90	--	<b>e<sub>1</sub></b>	--	0.95	--
<b>H<sub>E</sub></b>	2.25	2.40	2.55	<b>L<sub>p</sub></b>	0.30	0.42	0.50
<b>Q</b>	0.45	0.49	0.55	<b>v</b>	--	0.20	--
<b>w</b>	--	0.10	--				


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