AP2309MI

-20V P-Channel Enhancement Mode MOSFET

Description

The AP2309MI 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

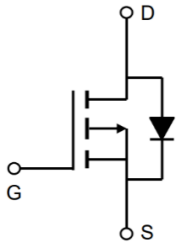
V_{DS} = -20V I_D =-12A

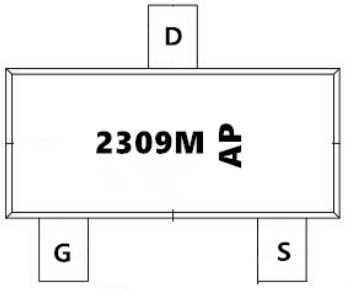
$R_{DS(ON)}$ < 15mΩ @ V_{GS}=-4.5V **（Type：10mΩ）**

Application

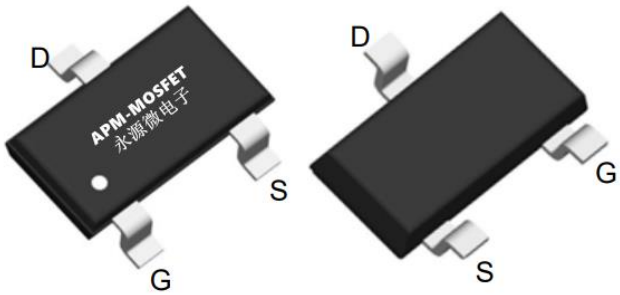
electronic cigarette

Load switch





Top View Bottom View



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP2309MI	SOT23-3L	2309M AP	3000

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	Rating	Units
VDS	Drain-Source Voltage	-20	V
VGS	Gate-Source Voltage	±12	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ -4.5V[1]	-12	A
I_D@T_C=70℃	Continuous Drain Current, V_{GS} @ -4.5V[1]	-8.5	A
IDM	Pulsed Drain Current[2]	-36	A
P_D@T_C=25℃	Total Power Dissipation[3]	2.4	W
TSTG	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃
$R_{\theta}JA$	Thermal Resistance Junction-Ambient [1]	125	℃/W
$R_{\theta}JC$	Thermal Resistance Junction-Case[1]	3.9	℃/W

Electrical Characteristics (T_J=25℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-to-Source breakdown voltage	V_{GS} = 0V, ID = 250μA	-20	-24	—	V
$R_{DS(on)}$	Static Drain-to-Source on-resistance	V_{GS} =-4.5V, I_D =-10A	—	10	15	mΩ
		V_{GS} =-2.5V, I_D =-8.9A	—	12	16	
VGS(th)	Gate threshold voltage	V_{DS} = V_{GS}, I_D = 250μA	-0.5	0.6	-1.2	V
IDSS	Drain-to-Source leakage current	V_{DS} = -12V,V_{GS} = 0V	—	—	-1	μA
IGSS	Gate-to-Source forward leakage	V_{GS} = 8V	—	—	100	nA
		V_{GS} = -8V	—	—	-100	
gFS	Forward Transconductance	V_{DS} = -5V, I_D =-10A	-3	—	—	S
Q_g	Total gate charge	I_D = -10A, V_{DD}=-6V, V_{GS} = -4.5V	—	21	—	nC
Q_{gs}	Gate-to-Source charge		—	2.5	—	
Q_{gd}	Gate-to-Drain("Miller") charge		—	6	—	
$t_{d(on)}$	Turn-on delay time	V_{GS}=-4.5V, V_{DD}=-6V, I_D = -10A, R_{GEN}=6Ω	—	30	—	ns
t_r	Rise time		—	48	—	
$t_{d(off)}$	Turn-Off delay time		—	97	—	
t_f	Fall time		—	65	—	
C_{iss}	Input capacitance	V_{GS} = 0V V_{DS} = -6V f = 1MHz	—	2138	—	pF
Coss	Output capacitance		—	273	—	
C_{rss}	Reverse transfer capacitance		—	236	—	
I_S	Continuous Source Current (Body Diode)	MOSFET symbol showing the integral reverse p-n junction diode.	—	—	-30	A
ISM	Pulsed Source Current (Body Diode)		—	—	-90	A
V_{SD}	Diode Forward Voltage	I_S=-2A, V_{GS}=0V	—	-0.77	-1.2	V
t_{rr}	Reverse Recovery Time	T_J = 25°C, I_F =-10A, di/dt = 100A/μs	—	16	—	ns
Q_{rr}	Reverse Recovery Charge		—	5.9	—	uC

Note :

1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The power dissipation is limited by 150℃ junction temperature

4、The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

Typical Characteristics

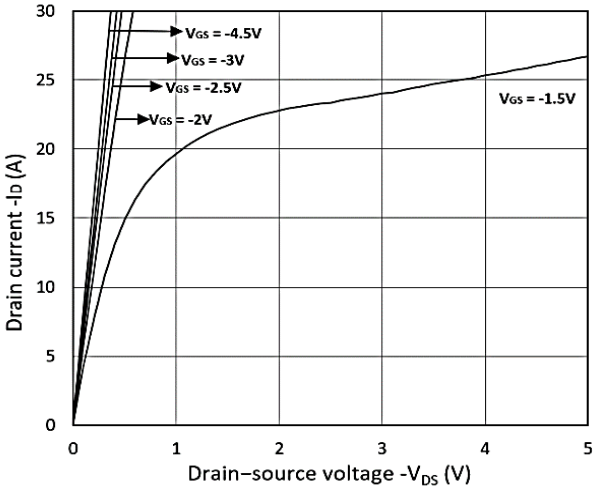


Figure 1. Output Characteristics

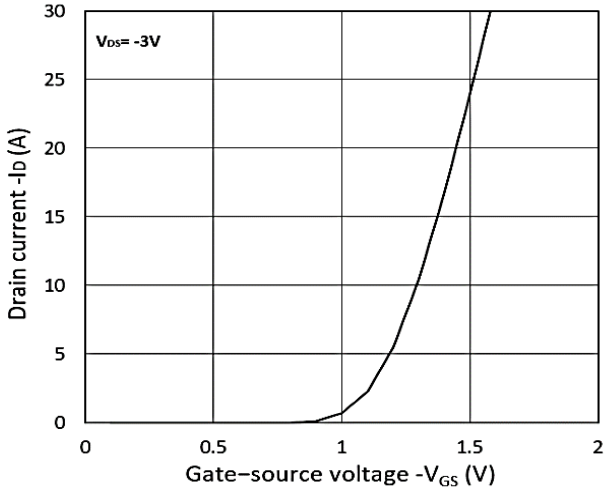


Figure 2. Transfer Characteristics

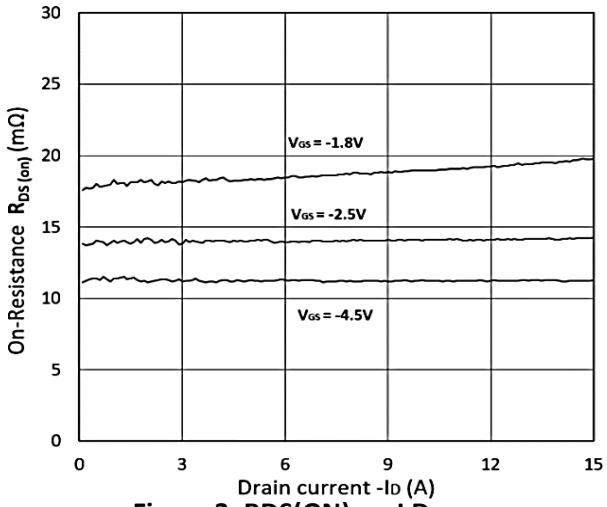


Figure 3. RDS(ON) vs. I D

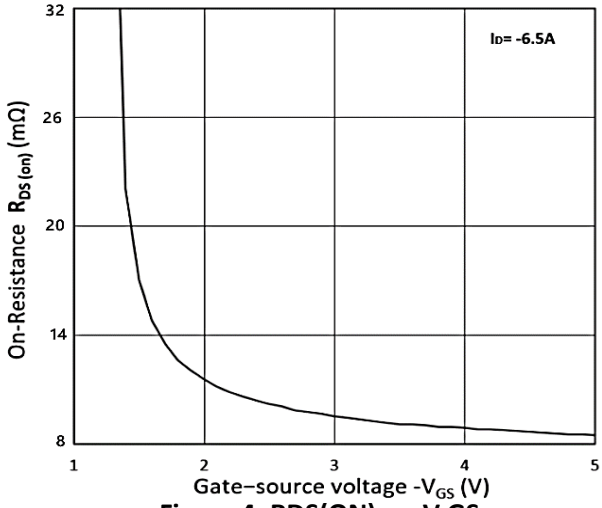


Figure 4. RDS(ON) vs. V GS

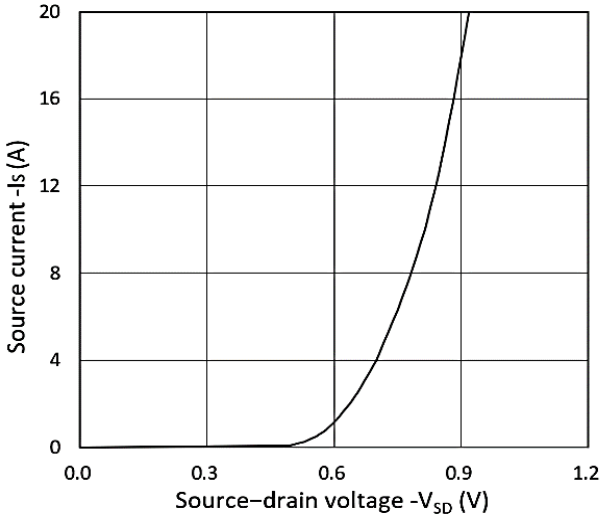


Figure 5. Forward Characteristics of Reverse

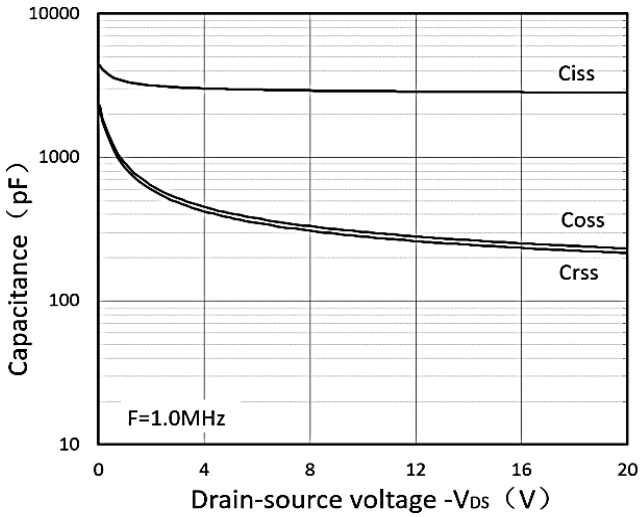


Figure 6. Capacitance Characteristics

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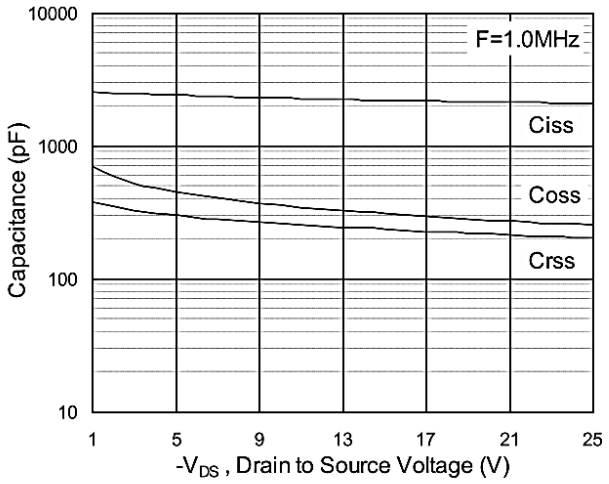


Fig.7 Capacitance

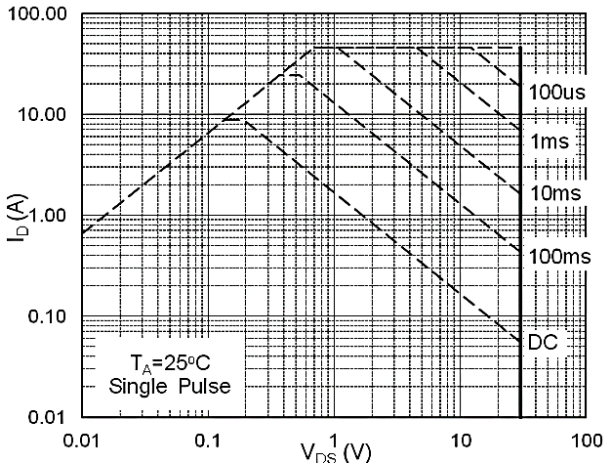


Fig.8 Safe Operating Area

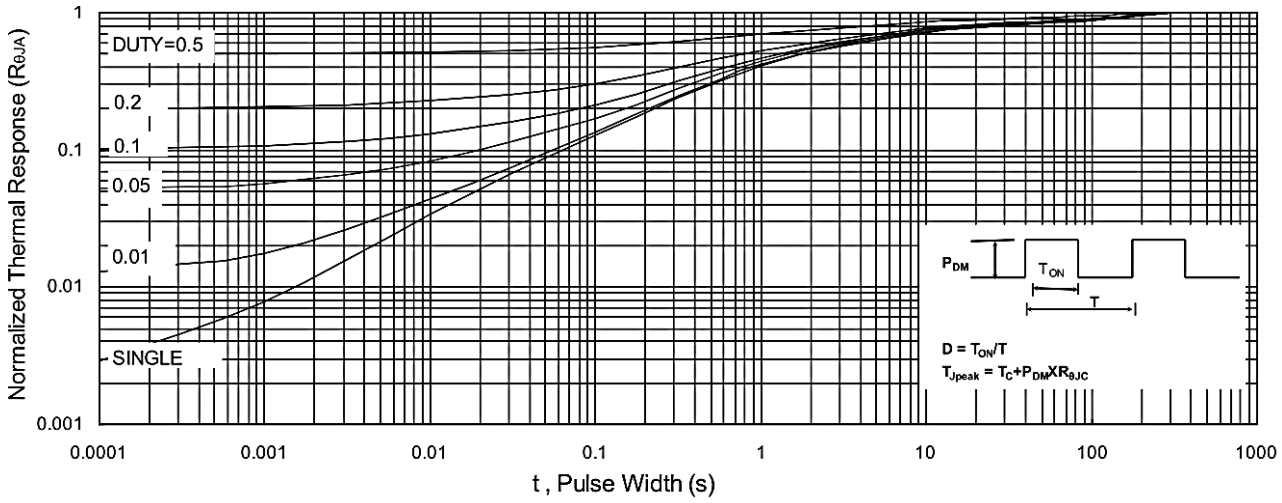


Fig.9 Normalized Maximum Transient Thermal Impedance

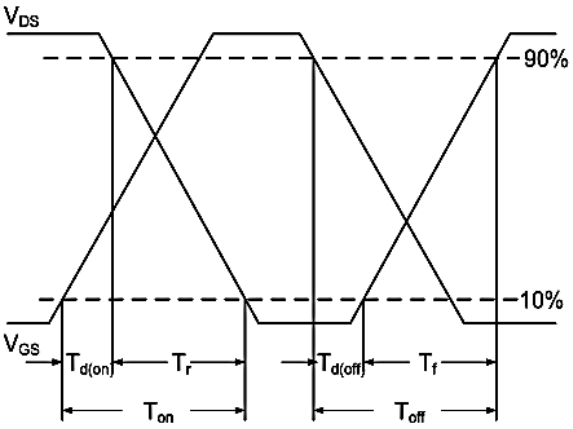


Fig.10 Switching Time Waveform

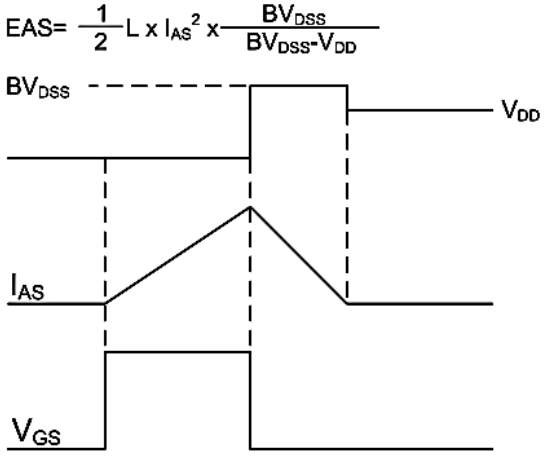
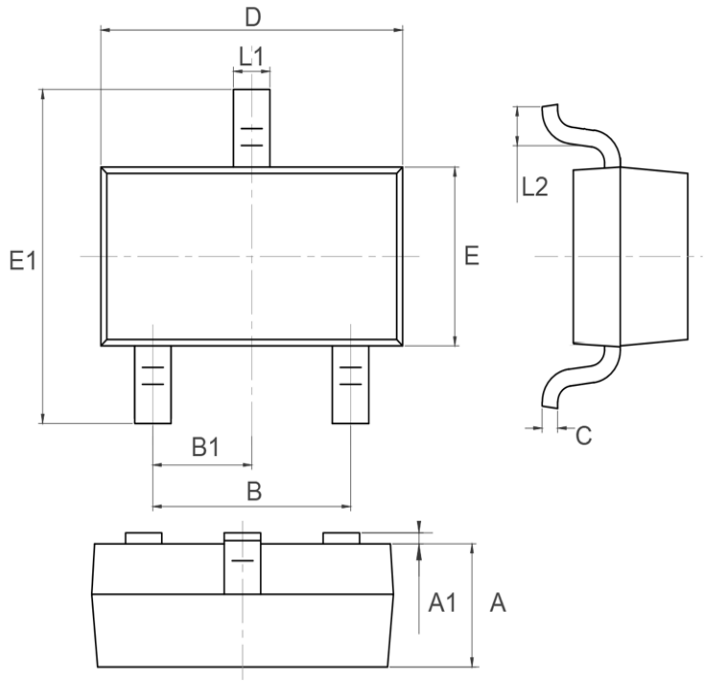


Fig.11 Unclamped Inductive Switching Waveform

Package Mechanical Data-SOT23-3L-Single



Symbol	Dim in mm		
	Min	Typ	Max
A	1	1.1	1.2
A1	0	0.05	0.1
B	1.8	1.9	2
B1		0.95TYP	
C	0.1	0.15	0.2
D	2.82	2.92	3.02
E	1.5	1.6	1.7
E1	2.65	2.8	2.95
L1	0.3	0.4	0.5
L2	0.3	0.45	0.6

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Edition	Date	Change
REV1.0	2024/3/31	Initial release