

## 30V N-Channel Enhancement Mode MOSFET

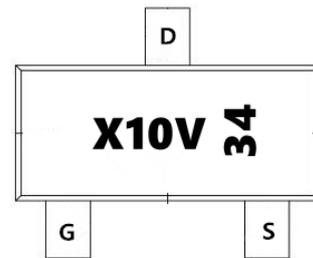
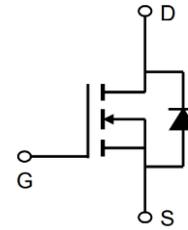
### Description

The AP3410MI uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS}=30V$   $I_D=13A$

$R_{DS(ON)} < 15m\Omega$  @  $V_{GS}=10V$  (Type: 11m $\Omega$ )



### Application

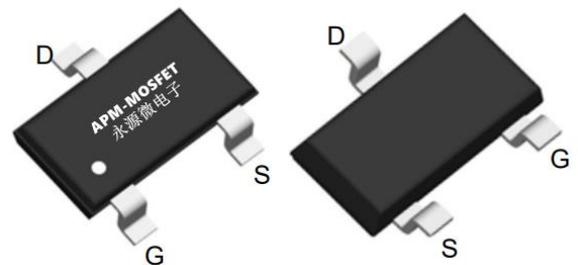
Battery protection

Load switch

Uninterruptible power supply

Top View

Bottom View



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP3410MI	SOT23-3L	X10V-34	3000

### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup>	13	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup>	8.5	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	39	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	11	mJ
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation <sup>4</sup>	4.2	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	125	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	3	$^\circ\text{C/W}$

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

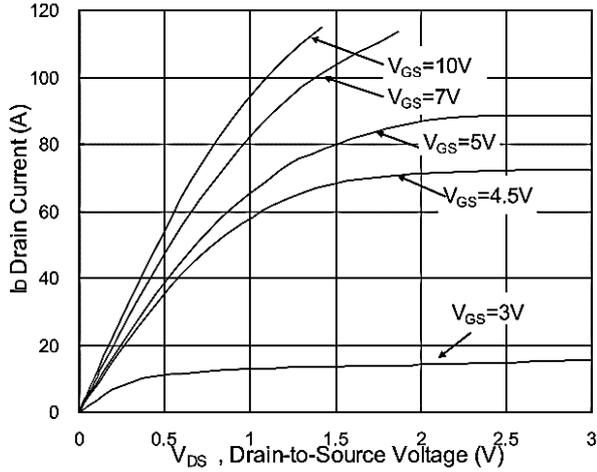
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	32	---	V
$\Delta BVDSS/\Delta T_J$	BVDSS Temperature Coefficient	Reference to $25^\circ\text{C}, I_D=1\text{mA}$	---	0.0193	---	$V/^\circ\text{C}$
RDS(ON)	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=10V, I_D=6A$	---	11	15	m $\Omega$
		$V_{GS}=4.5V, I_D=5A$	---	18	25	
VGS(th)	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3.97	---	mV/ $^\circ\text{C}$
IDSS	Drain-Source Leakage Current	$V_{DS}=24V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	uA
		$V_{DS}=24V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	5	
IGSS	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
gfs	Forward Transconductance	$V_{DS}=5V, I_D=30A$	---	34	---	S
R <sub>g</sub>	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1\text{MHz}$	---	1.8	---	$\Omega$
Q <sub>g</sub>	Total Gate Charge (4.5V)	$V_{DS}=15V, V_{GS}=4.5V, I_D=15A$	---	9.8	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	4.2	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	3.6	---	
Td(on)	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V$ $R_G=3.3\Omega$ $I_D=15A$	---	4	---	ns
T <sub>r</sub>	Rise Time		---	8	---	
Td(off)	Turn-Off Delay Time		---	31	---	
T <sub>f</sub>	Fall Time		---	4	---	
C <sub>iss</sub>	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, f=1\text{MHz}$	---	940	---	pF
C <sub>oss</sub>	Output Capacitance		---	131	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	109	---	
I <sub>s</sub>	Continuous Source Current <sup>1,5</sup>	$V_G=V_D=0V, \text{Force Current}$	---	---	43	A
ISM	Pulsed Source Current <sup>2,5</sup>		---	---	112	A
VSD	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=6A, T_J=25^\circ\text{C}$	---	---	1	V
t <sub>rr</sub>	Reverse Recovery Time	$I_F=30A, dI/dt=100A/\mu s,$ $T_J=25^\circ\text{C}$	---	8.5	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	2.2	---	nC

#### Note :

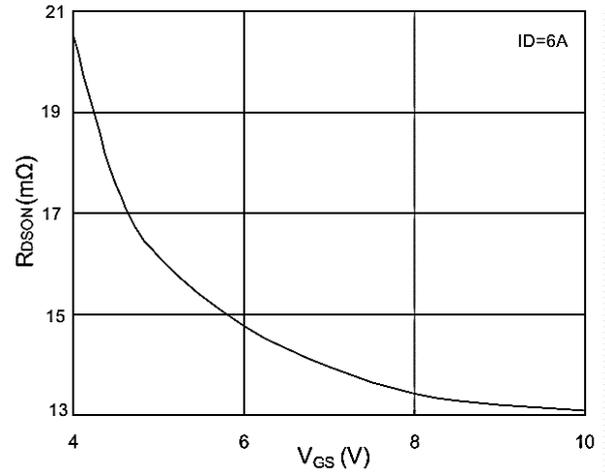
- 1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
- 2、The data tested by pulsed , pulse width  $\cong 300\mu s$  , duty cycle  $\cong 2\%$
- 3、The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 4、The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

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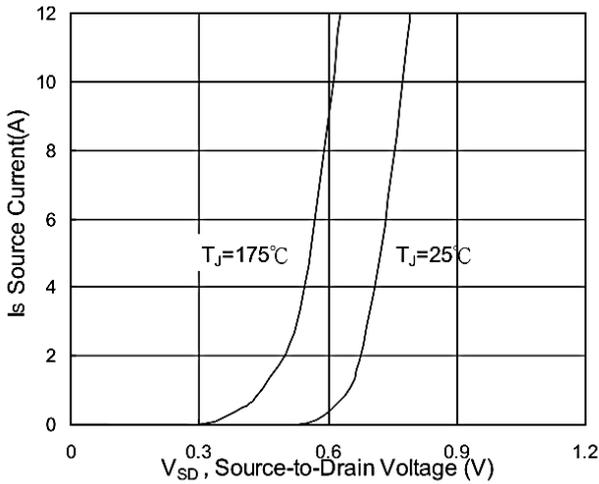
**Typical Characteristics**



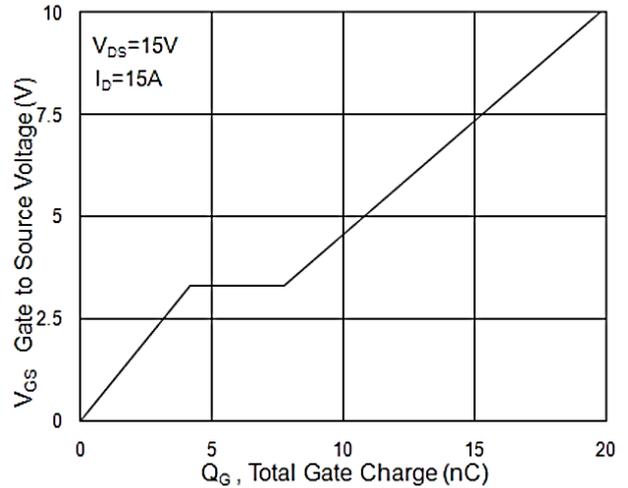
**Fig.1 Typical Output Characteristics**



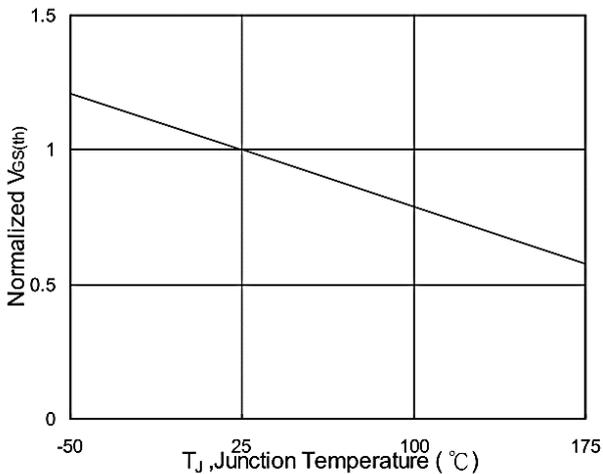
**Fig.2 On-Resistance vs. G-S Voltage**



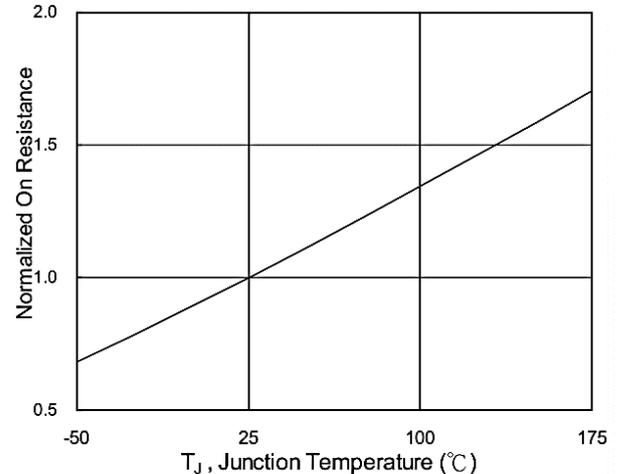
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



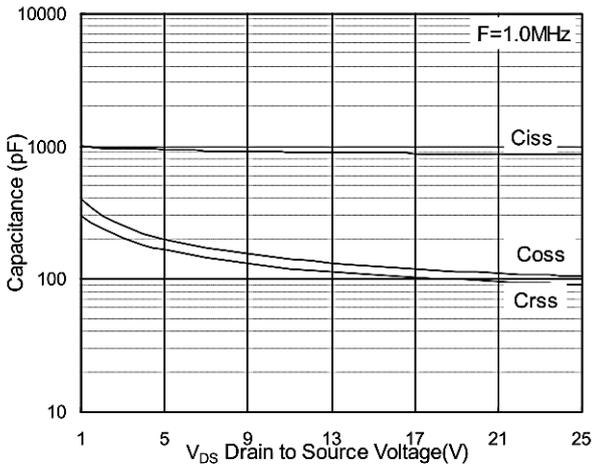
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



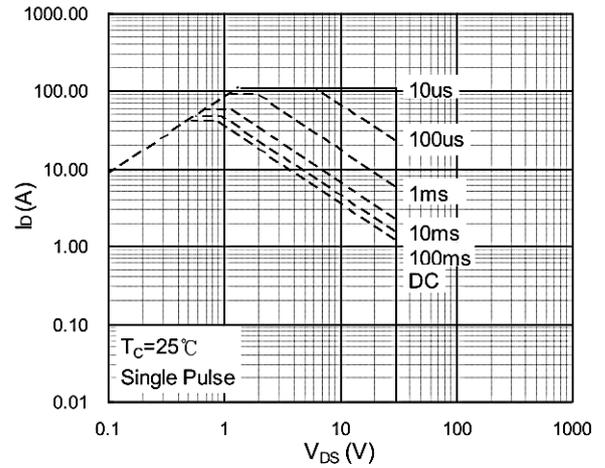
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



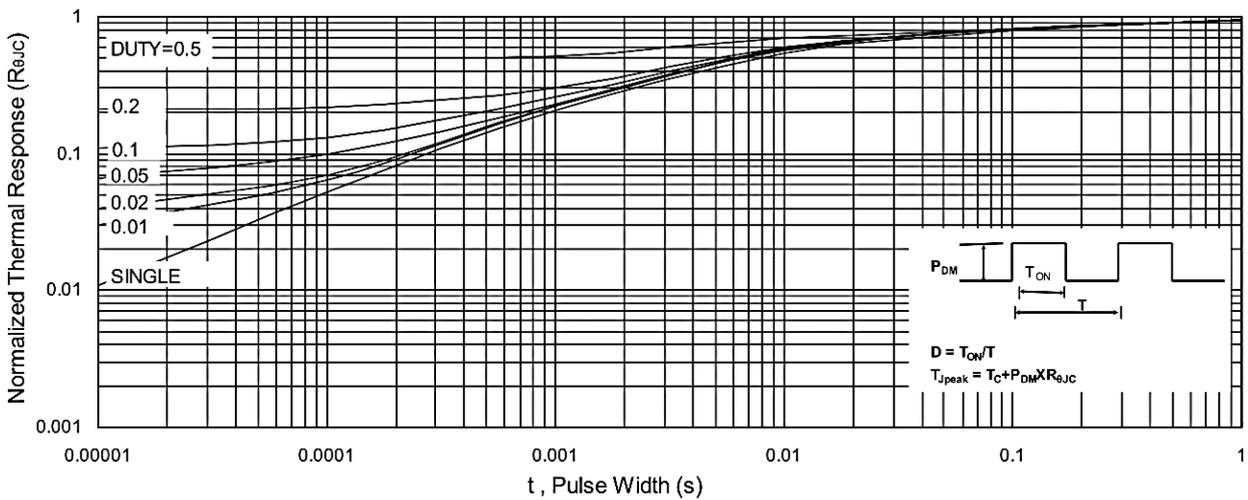
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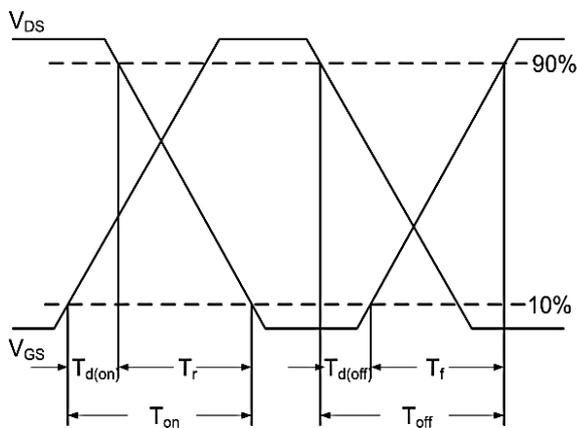
**Fig.7 Capacitance**



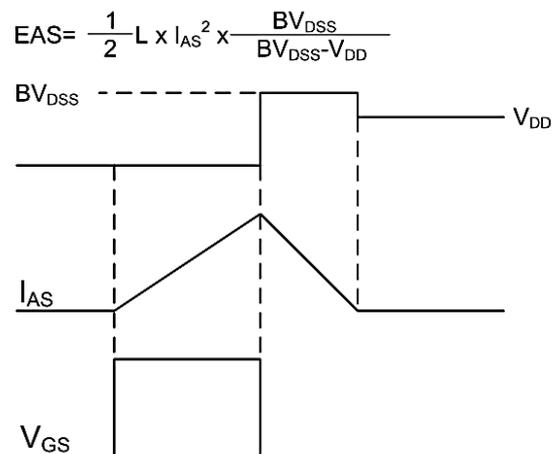
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



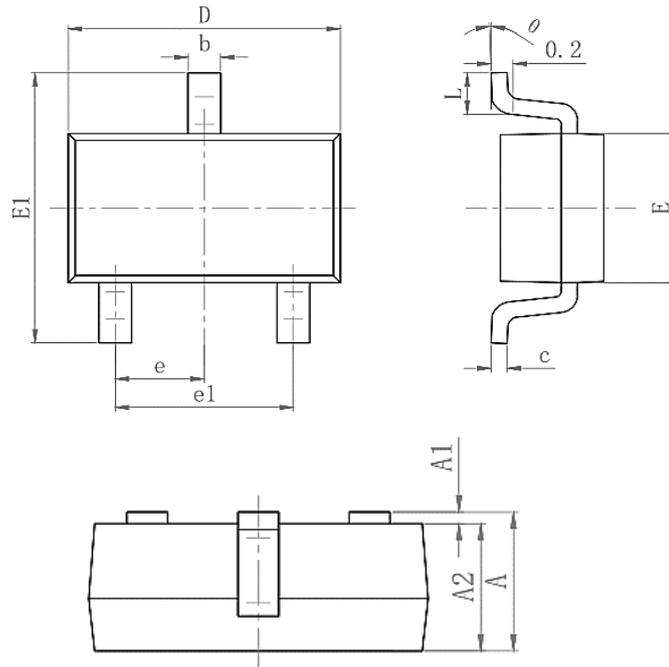
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

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### Package Mechanical Data-SOT23-3L-Single



Symbol	Dimensions in Millimeters	
	mm	
	Min	Max
A	1.05	1.25
A1	0.000	0.100
A2	1.05	1.15
b	0.25	0.45
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950 (BSC)	
e1	1.800	2.000
L	0.300	0.500
$\theta$	0°	8°

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Edition	Date	Change
Rve1.0	2021/10/8	Initial release

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