



Description

The AP4410GM 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

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

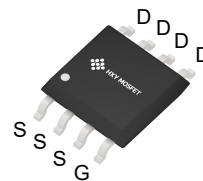
$R_{DS(ON)} < 13m\Omega$ @ $V_{GS}=10V$

Application

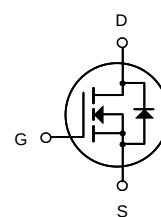
Battery protection

Load switch

Uninterruptible power supply



SOP-8



N-Channel MOSFET

Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
AP4410GM	SOP-8	HXY MOSFET	3000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	30	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_A=25^\circ C$	Continuous Drain Current ¹	13	A
$I_D@T_A=70^\circ C$	Continuous Drain Current ¹	7	A
I_{DM}	Pulsed Drain Current ²	41	A
EAS	Single Pulse Avalanche Energy ³	15	mJ
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	12	W
T_{STG}	Storage Temperature Range	-55 to 150	°C
T_J	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹ (t≤10s)	85	°C/W
	Thermal Resistance Junction-ambient ¹	25	°C/W



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	30	---	---	V
$\Delta BV_{DSS}/\Delta T$	BVDSS Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.034	---	$V/^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=7A$	---	9.5	13	$m\Omega$
		$V_{GS}=4.5V$, $I_D=4A$	---	15	19	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	1.4	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3.84	---	$mV/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=24V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=24V$, $V_{GS}=0V$, $T_J=55^\circ\text{C}$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=7A$	---	6.2	---	S
R_g	Gate Resistance	$V_{DS}=0V$, $V_{GS}=0V$, $f=1MHz$	---	1.04	2.1	Ω
Q_g	Total Gate Charge (4.5V)	$V_{DS}=15V$, $V_{GS}=4.5V$, $I_D=7A$	---	6	8.4	nC
Q_{gs}	Gate-Source Charge		---	2.2	3.1	
Q_{gd}	Gate-Drain Charge		---	2	2.8	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V$, $V_{GS}=10V$, $R_G=3.3\Omega$ $I_D=7A$	---	1.2	2.4	ns
T_r	Rise Time		---	40	72.0	
$T_{d(off)}$	Turn-Off Delay Time		---	18	36.0	
T_f	Fall Time		---	7.2	14.4	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $f=1MHz$	---	783	1316	pF
C_{oss}	Output Capacitance		---	127	167.8	
C_{rss}	Reverse Transfer Capacitance		---	89	122.6	

Diode Characteristics

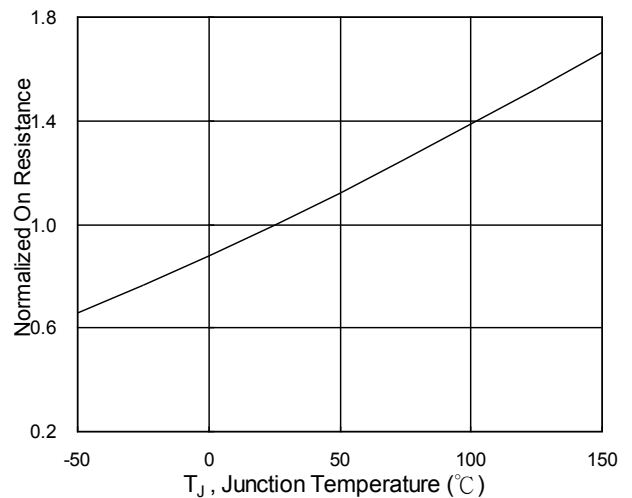
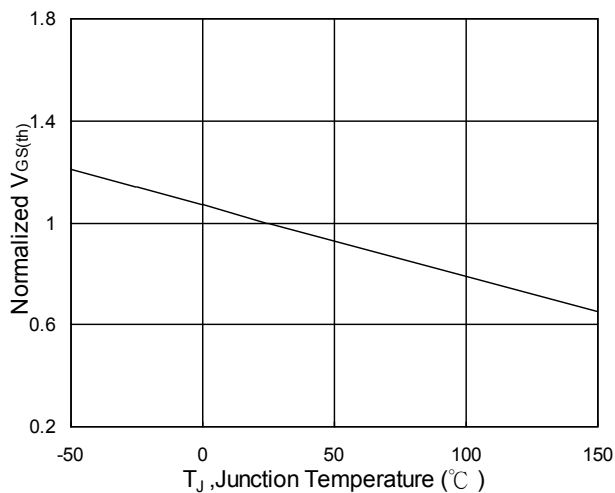
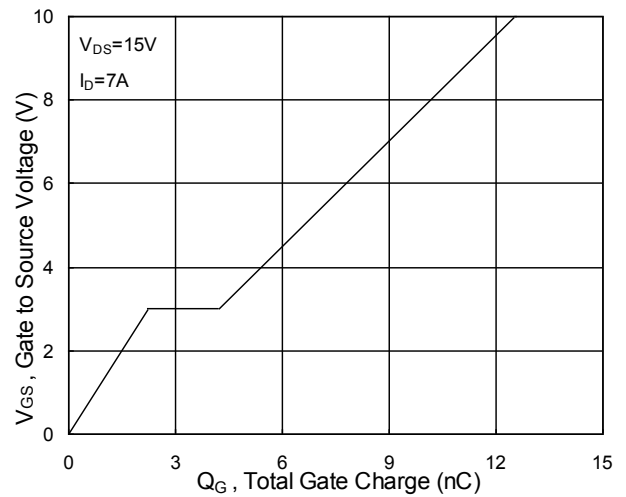
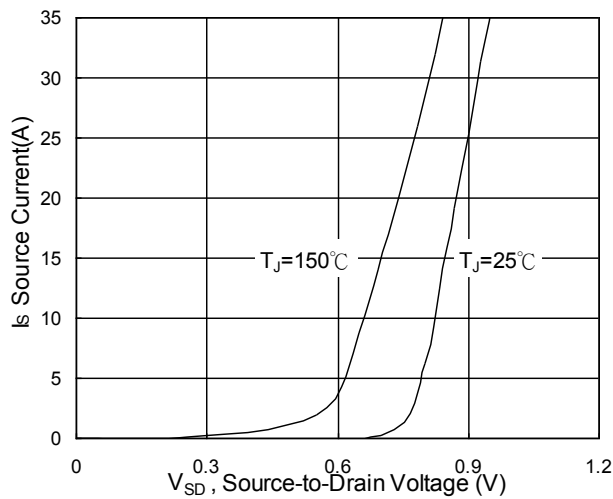
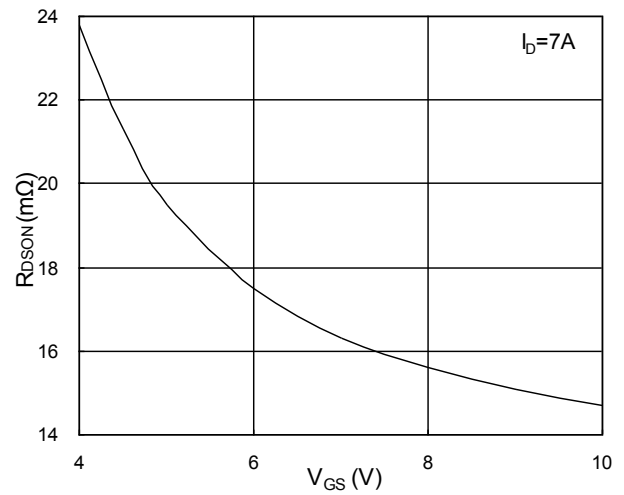
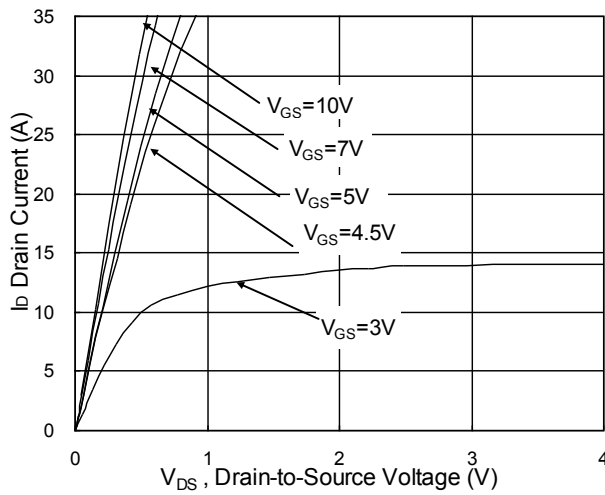
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,5}	$V_G=V_D=0V$, Force Current	---	---	7	A
I_{SM}	Pulsed Source Current ^{2,5}		---	---	35	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^\circ\text{C}$	---	---	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=7A$, $dI/dt=100A/\mu s$, $T_J=25^\circ\text{C}$	---	7.2	---	nS
Q_{rr}	Reverse Recovery Charge		---	2.9	---	nC

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=20A$
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.



Typical Characteristics



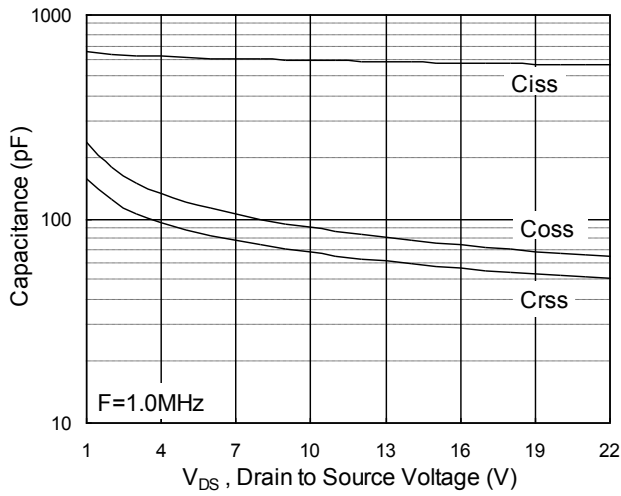


Fig.7 Capacitance

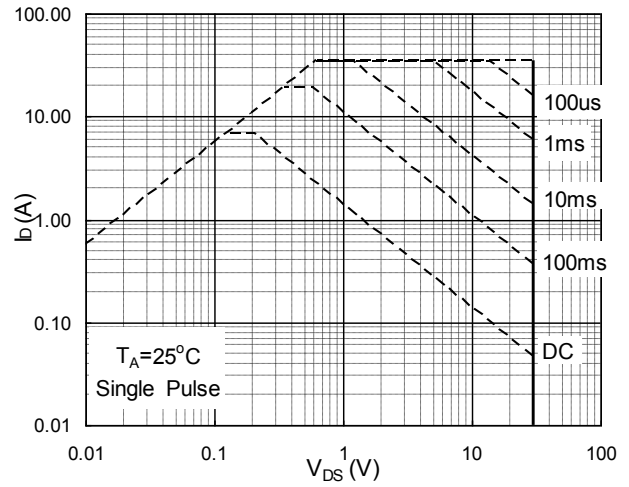


Fig.8 Safe Operating Area

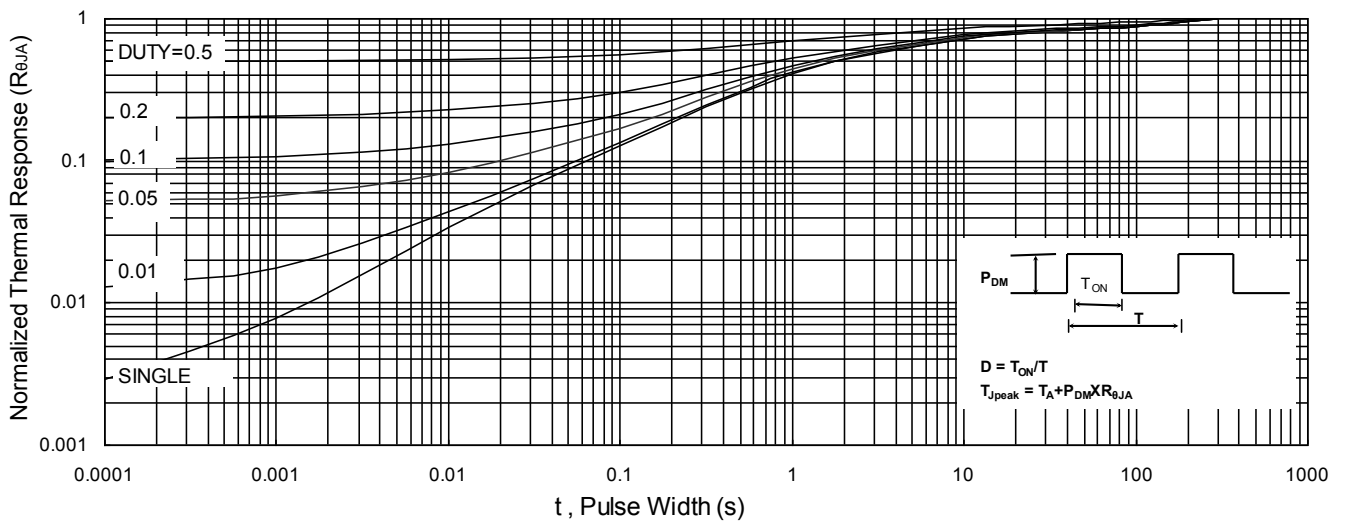


Fig.9 Normalized Maximum Transient Thermal Impedance

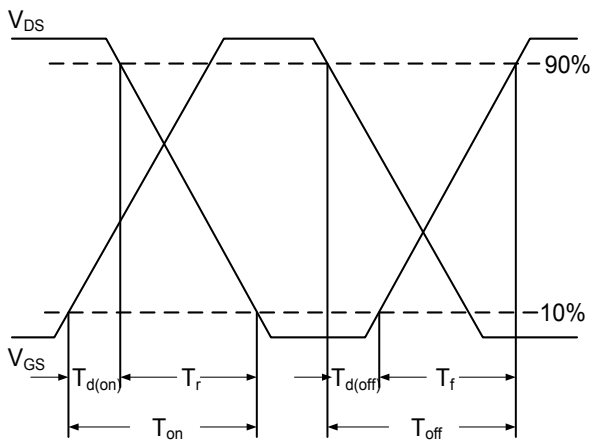


Fig.10 Switching Time Waveform

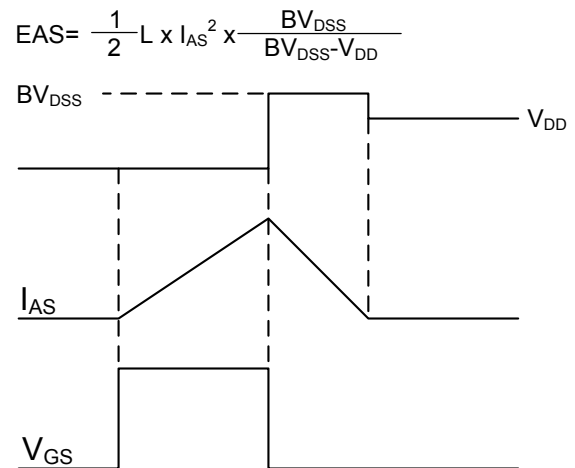
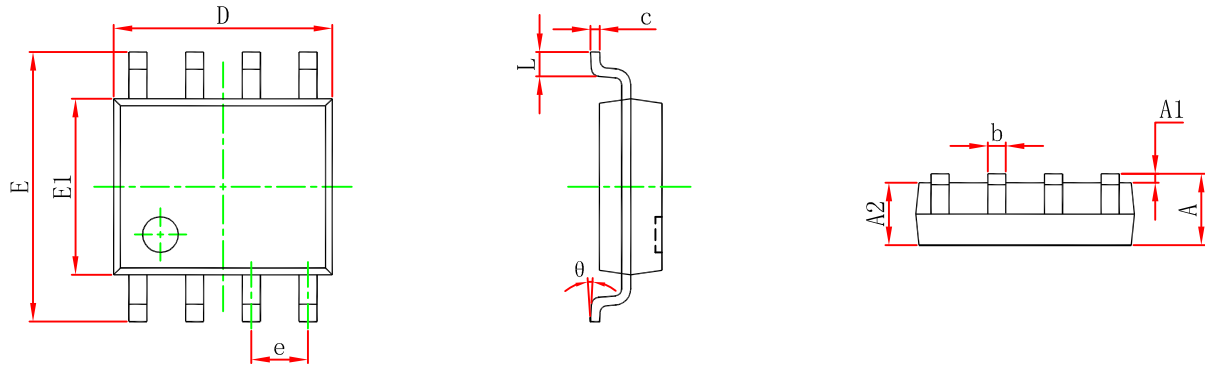


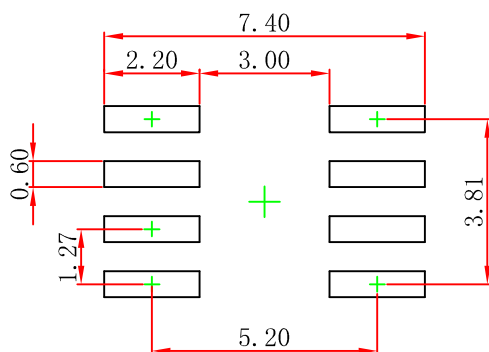
Fig.11 Unclamped Inductive Switching Waveform



SOP-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



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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