

60V N-Channel Enhancement Mode MOSFET

Description

The AP12N06S 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.

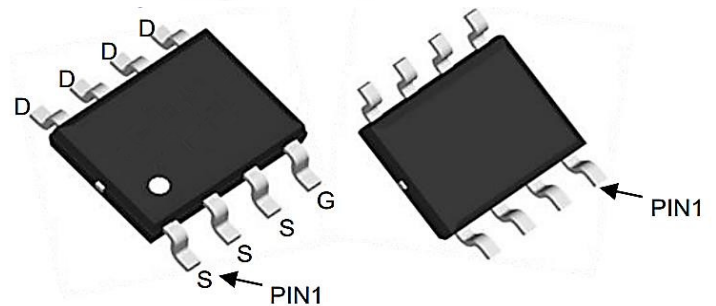
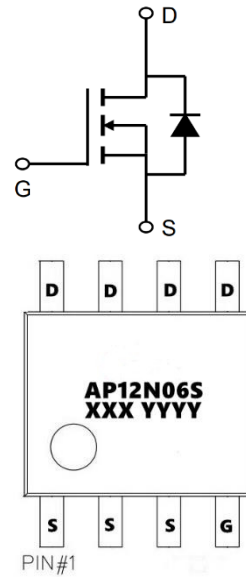
General Features

$V_{DS} = 60V$ $I_D = 12A$

$R_{DS(ON)} < 32m\Omega$ @ $V_{GS}=10V$ (Type: 24m Ω)

Application

- Battery protection
- Load switch
- Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP12N06S	SOP-8L	AP12N06S XXX YYYYY	3000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	12	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	11	A
I_{DM}	Pulsed Drain Current ²	36	A
EAS	Single Pulse Avalanche Energy ³	25.5	mJ
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	34.7	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 ¹	85	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	28	$^\circ\text{C/W}$

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Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
BVDSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	60	65	---	V
ΔBVDSS/ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.063	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =15A	---	24	32	mΩ
		V _{GS} =4.5V, I _D =10A	---	33	42	
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	1.6	2.5	V
ΔVGS(th)	V _{GS(th)} Temperature Coefficient		---	-5.24	---	mV/°C
IDSS	Drain-Source Leakage Current	V _{DS} =48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =48V, V _{GS} =0V, T _J =55°C	---	---	5	
IGSS	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
gfs	Forward Transconductance	V _{DS} =5V, I _D =15A	---	17	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	3.2	---	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =48V, V _{GS} =4.5V, I _D =12A	---	12.6	---	nC
Q _{gs}	Gate-Source Charge		---	3.2	---	
Q _{gd}	Gate-Drain Charge		---	6.3	---	
Td(on)	Turn-On Delay Time	V _{DD} =30V, V _{GS} =10V , R _G =3.3Ω, I _D =10A	---	8	---	ns
T _r	Rise Time		---	14.2	---	
Td(off)	Turn-Off Delay Time		---	24.4	---	
T _f	Fall Time		---	4.6	---	
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	1378	---	pF
C _{oss}	Output Capacitance		---	86	---	
Crss	Reverse Transfer Capacitance		---	64	---	
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	23	A
ISM	Pulsed Source Current ^{2,5}		---	---	46	A
VSD	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V

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 ≤ 300us, duty cycle ≤ 2%
- 3、The power dissipation is limited by 150°C junction temperature
- 4、The data is theoretically the same as ID and IDM, in real applications, should be limited by total power dissipation.

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Typical Characteristics

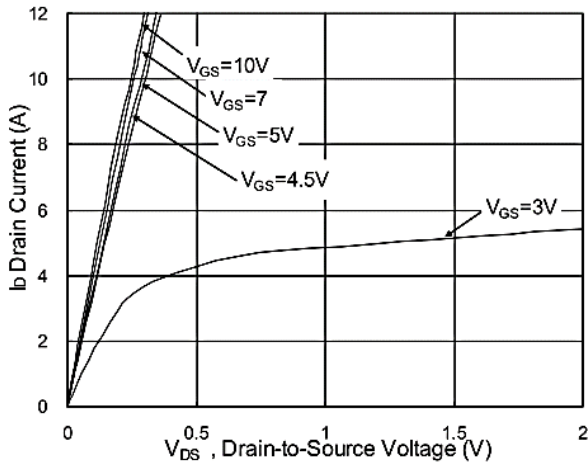


Fig.1 Typical Output Characteristics

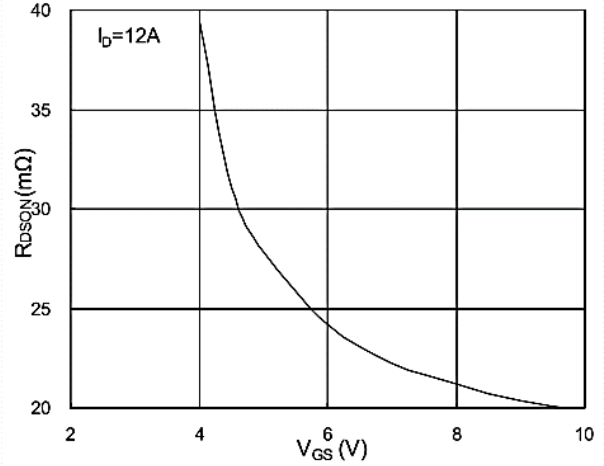


Fig.2 On-Resistance v.s Gate-Source

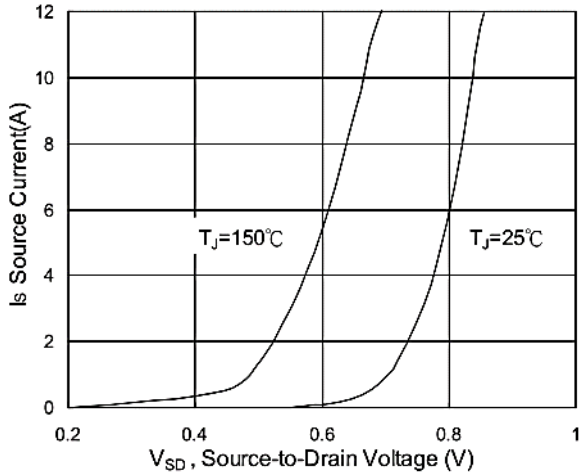


Fig.3 Forward Characteristics of Reverse

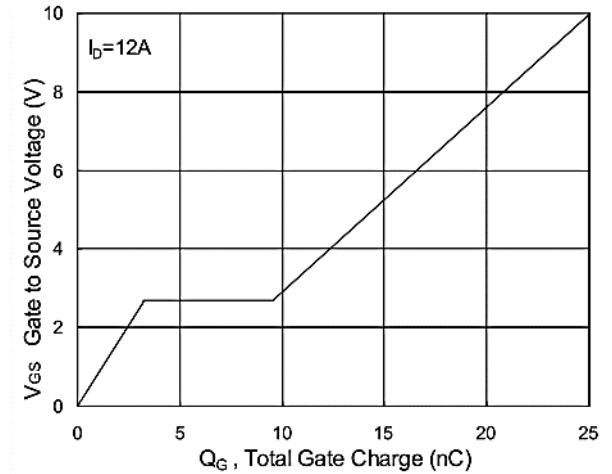


Fig.4 Gate-Charge Characteristics

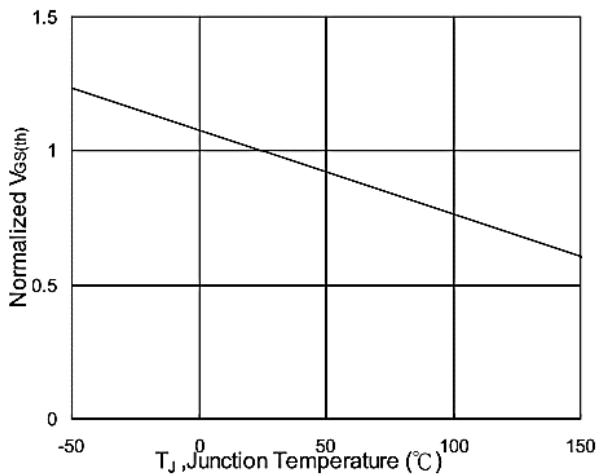


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

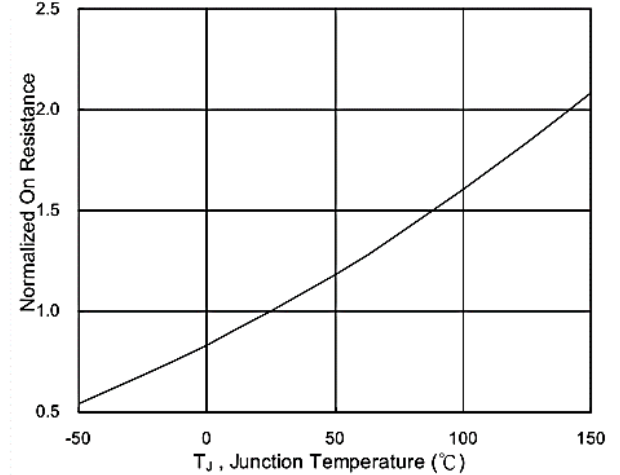


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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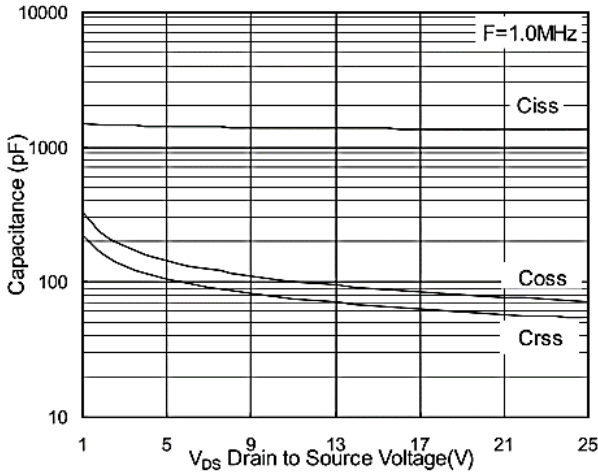


Fig.7 Capacitance

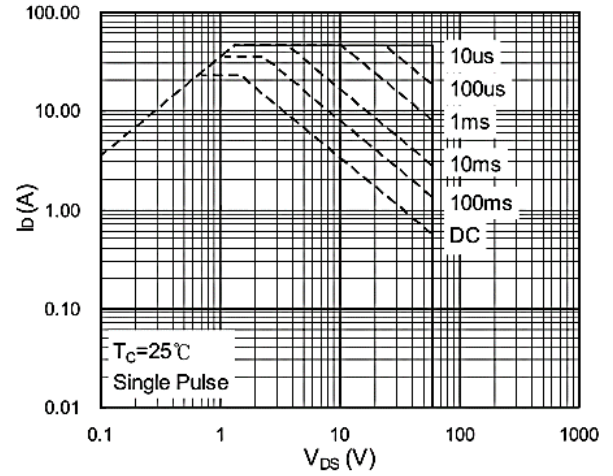


Fig.8 Safe Operating Area

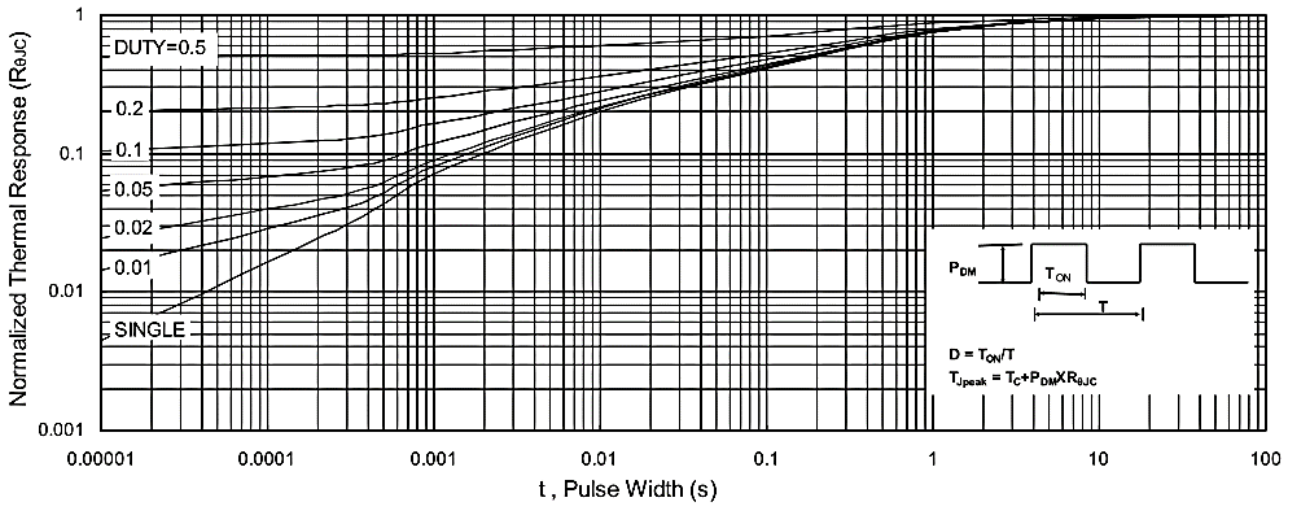


Fig.9 Normalized Maximum Transient Thermal Impedance

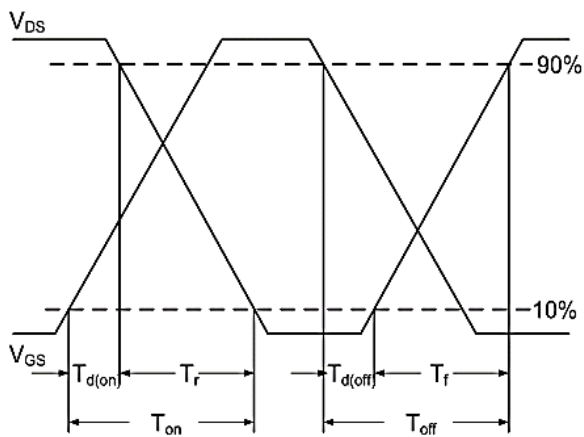


Fig.10 Switching Time Waveform

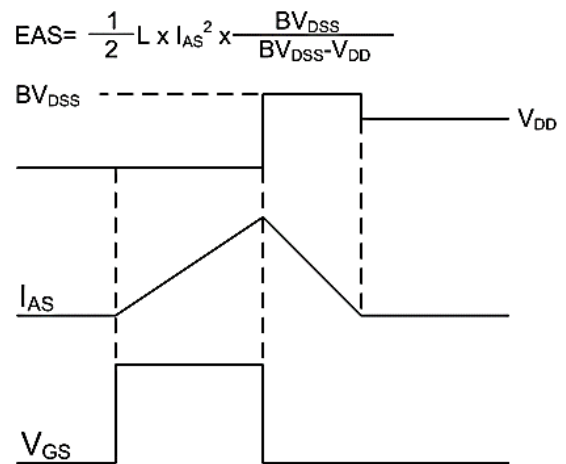
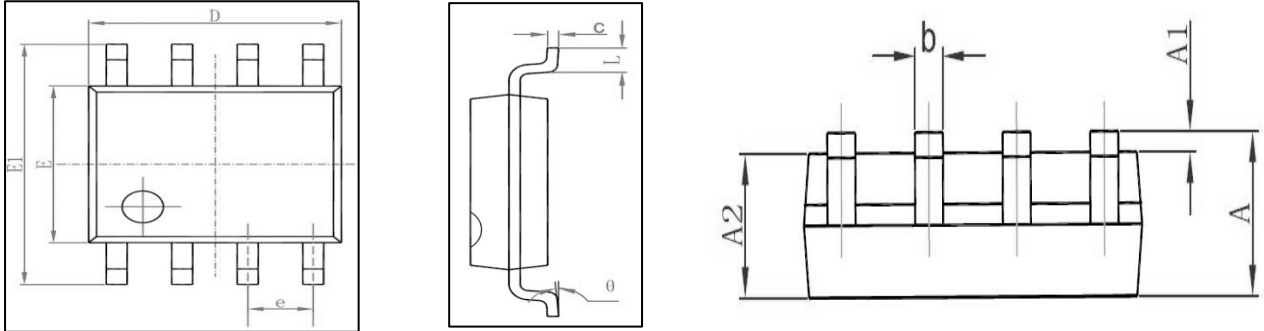
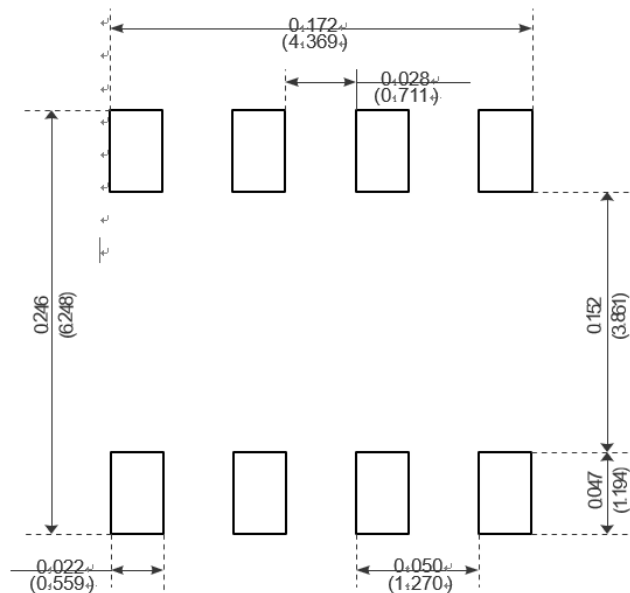


Fig.11 Unclamped Inductive Waveform

Package Mechanical Data-SOP-8


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	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°


Recommended Minimum Pads