

60V N-Channel Enhancement Mode MOSFET

Description

The AP5N06MI 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

$V_{DS} = 60V$ $I_D = 5A$

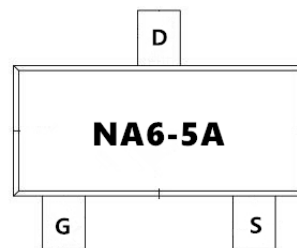
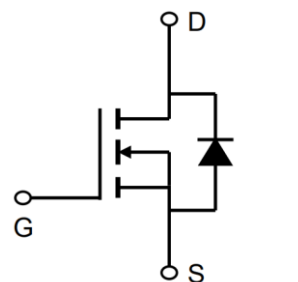
$R_{DS(ON)} < 38m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

Load switch

Automotive lighting



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP5N06MI	SOT-23-3L	NA6-5A	3000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V ¹	5	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, V_{GS} @ 10V ¹	3.5	A
I_{DM}	Pulsed Drain Current ²	18	A
EAS	Single Pulse Avalanche Energy ³	22	mJ
I_{AS}	Avalanche Current	21	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation ⁴	1.5	W
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}C$
T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	85	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	25	$^{\circ}C/W$

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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	---	---	V
ΔBVDSS/ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.044	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =4A	---	28	38	mΩ
		V _{GS} =4.5V, I _D =2A	---	35	50	
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.0	1.76	2.5	V
ΔVGS(th)	VGS(th) Temperature Coefficient		---	-4.8	---	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 =4A	---	28.3	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	2.5	---	Ω
Q _g	Total Gate Charge (10V)	V _{DS} =48V, V _{GS} =10V, I _D =4A	---	19	---	nC
Q _{gs}	Gate-Source Charge		---	2.6	---	
Q _{gd}	Gate-Drain Charge		---	4.1	---	
Td(on)	Turn-On Delay Time	V _{DD} =30V, V _{GS} =10V, R _G =3.3Ω, I _D =4A	---	3	---	ns
T _r	Rise Time		---	34	---	
Td(off)	Turn-Off Delay Time		---	23	---	
T _f	Fall Time		---	6	---	
Ciss	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	1027	---	pF
Coss	Output Capacitance		---	65	---	
Crss	Reverse Transfer Capacitance		---	46	---	
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	4.5	A
I _{SM}	Pulsed Source Current ^{2,5}		---	---	18	A
VSD	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
trr	Reverse Recovery Time	I _F =4A, dI/dt=100A/μs, T _J =25°C	---	12.1	---	nS
Q _{rr}	Reverse Recovery Charge		---	6.7	---	nC

Note :

- 1、The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.
- 2、The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、The EAS data shows Max. rating . The test condition is VDD=25V,VGS=10V,L=0.1mH,IAS=21A
- 4、The power dissipation is limited by 150°C junction temperature
- 5 、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

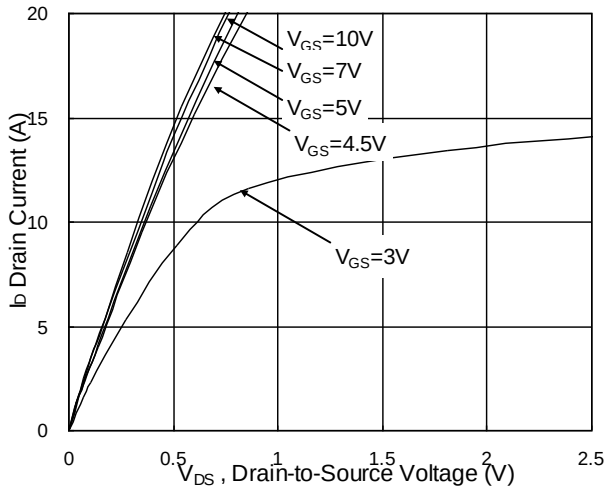


Fig.1 Typical Output Characteristics

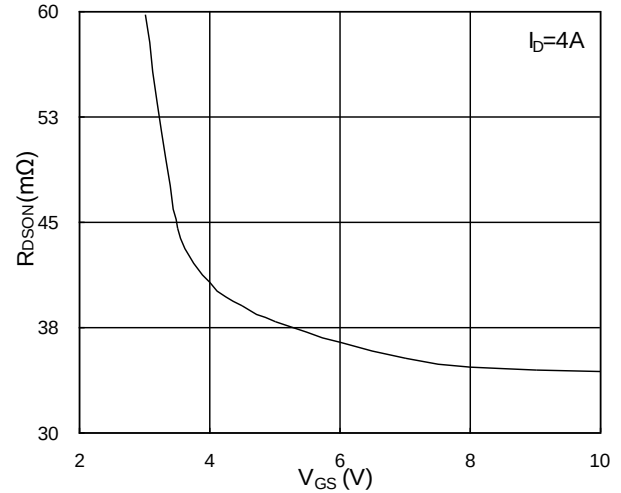


Fig.2 On-Resistance vs. Gate-Source

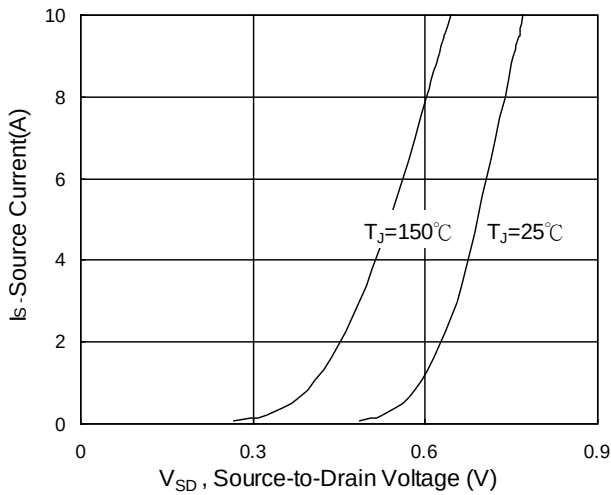


Fig.3 Forward Characteristics Of Reverse

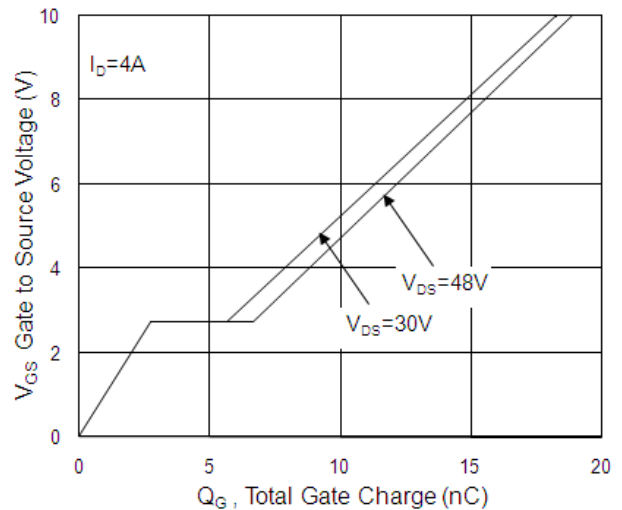


Fig.4 Gate-Charge Characteristics

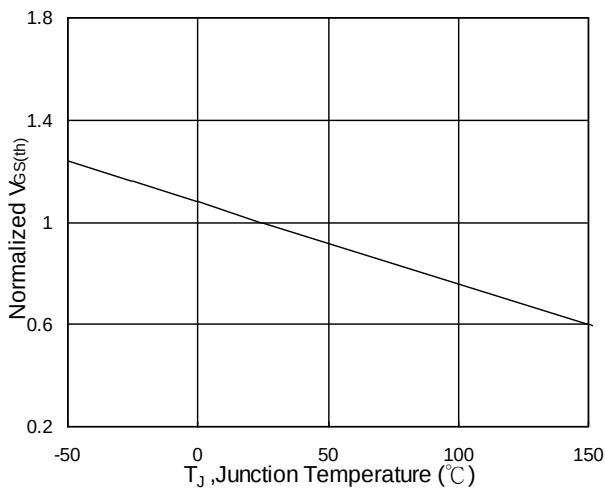


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

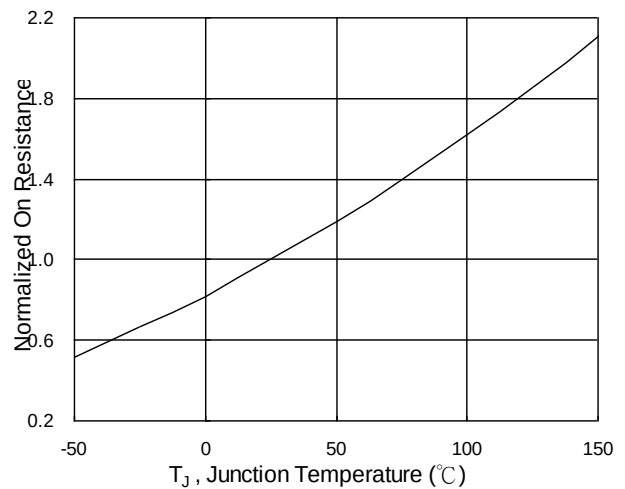


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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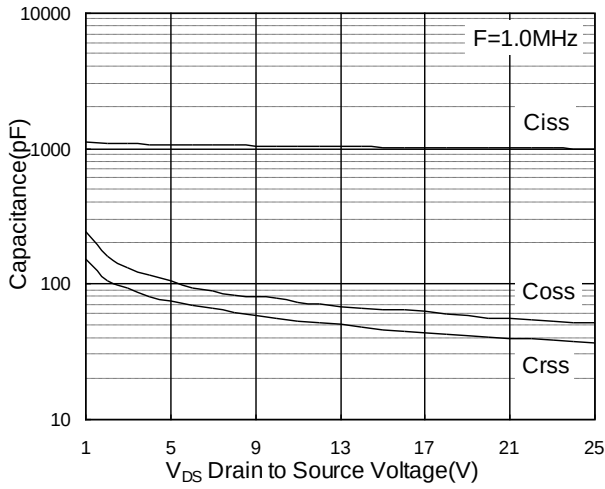


Fig.7 Capacitance

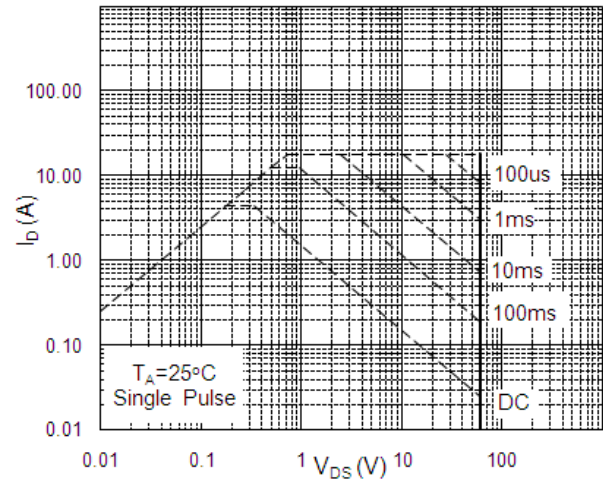


Fig.8 Safe Operating Area

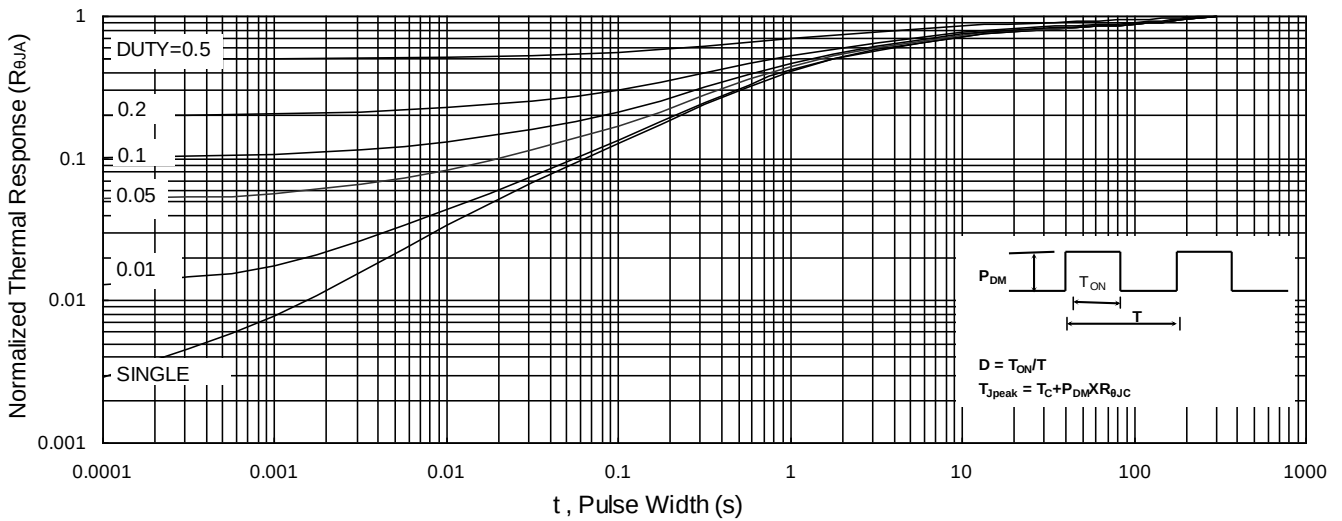


Fig.9 Normalized Maximum Transient Thermal Impedance

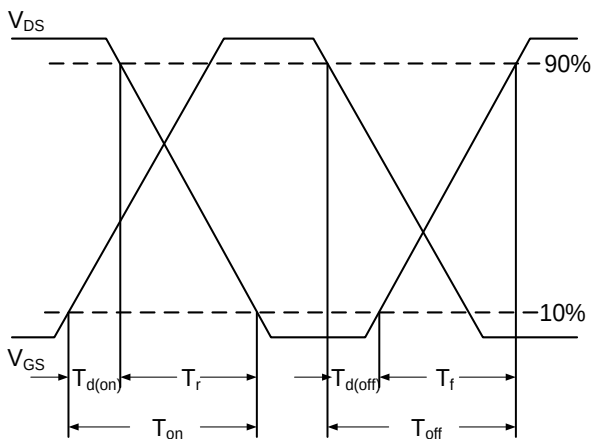


Fig.10 Switching Time Waveform

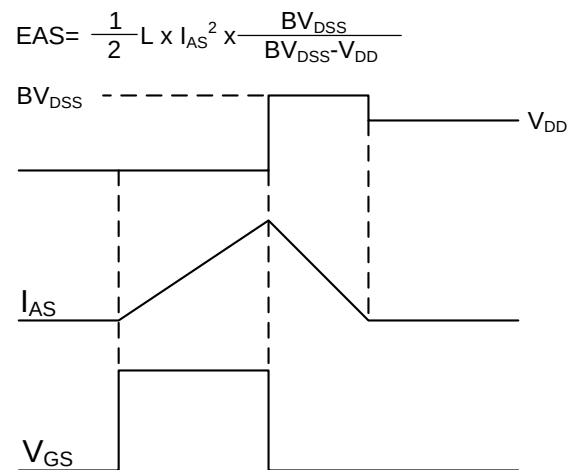
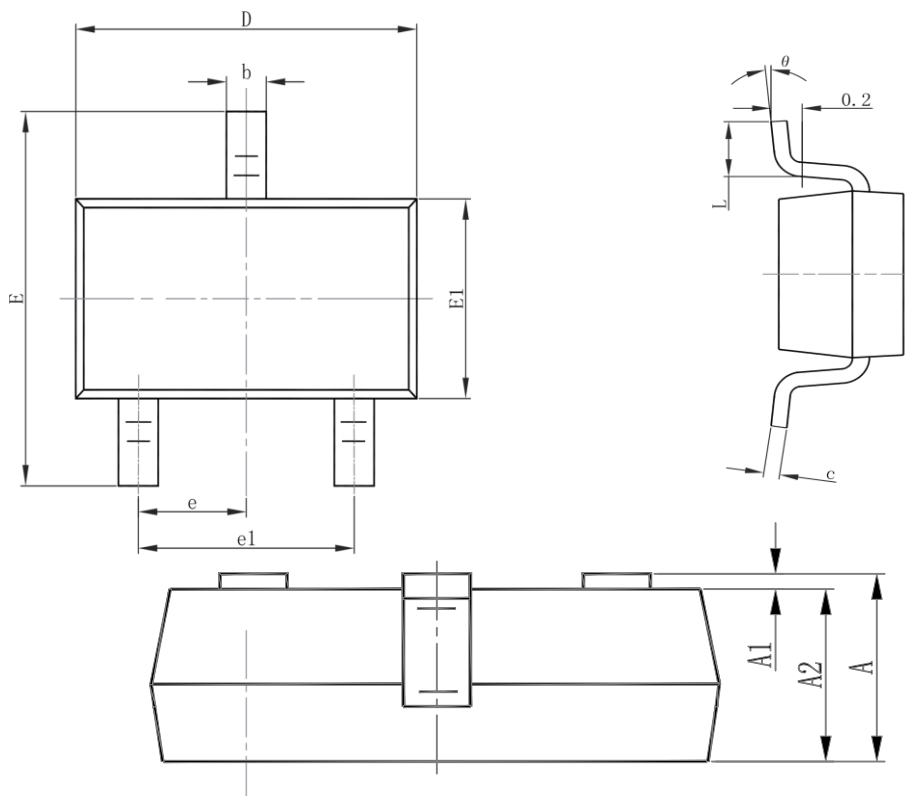


Fig.11 Unclamped Inductive Switching Waveform

Package Mechanical Data-SOT23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

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