

-55V P-Channel Enhancement Mode MOSFET

Description

The AP4P05AI 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

$V_{DS} = -60V$ $I_D = -4.0A$

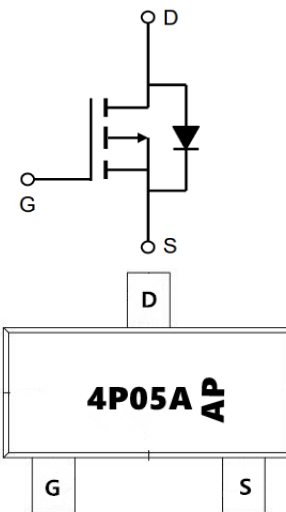
$R_{DS(ON)} < 150m\Omega$ @ $V_{GS} = -10V$ (Type: 115m Ω)

Application

Battery protection

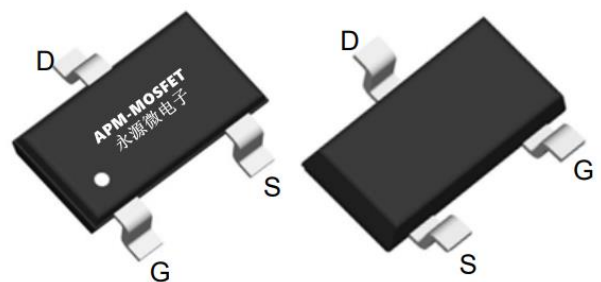
Load switch

Uninterruptible power supply



Top View

Bottom View



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP4P05AI	SOT23L	4P05A-AP	3000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-55	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-4.0	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-2.3	A
I_{DM}	Pulsed Drain Current ²	-16	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ³	1	W
TSTG	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	125	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	80	$^\circ C/W$

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Electrical Characteristics (TC=25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-55	-58	---	V
$\Delta BVDSS/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C, $I_D=-1mA$	---	-0.021	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-1.5A$	---	115	150	mΩ
		$V_{GS}=-4.5V, I_D=-1A$	---	135	160	mΩ
VGS(th)	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.08	---	mV/°C
IDSS	Drain-Source Leakage Current	$V_{DS}=-48V, V_{GS}=0V, T_J=25^\circ C$	---	---	1	uA
IDSS		$V_{DS}=-48V, V_{GS}=0V, T_J=55^\circ C$	---	---	5	
IGSS	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	±100	nA
gfs	Forward Transconductance	$V_{DS}=-5V, I_D=-1.5A$	---	5.9	---	S
Qg	Total Gate Charge (-4.5V)	$V_{DS}=-20V, V_{GS}=-4.5V, I_D=-1.5A$	---	4.6	---	nC
Qgs	Gate-Source Charge		---	1.4	---	nC
Qgd	Gate-Drain Charge		---	1.62	---	nC
Td(on)	Turn-On Delay Time	$V_{DS}=-15V, V_{GS}=-10V, R_G=3.3\Omega, I_D=-1A$	---	17.4	---	ns
Tr	Rise Time		---	5.4	---	ns
Td(off)	Turn-Off Delay Time		---	37.2	---	ns
Tf	Fall Time		---	2.4	---	ns
Ciss	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	---	531	---	pF
Coss	Output Capacitance		---	59	---	pF
Crss	Reverse Transfer Capacitance		---	38	---	pF
IS	Continuous Source Current ^{1,4}	$V_G=V_D=0V, \text{Force Current}$	---	---	-1.7	A
ISM	Pulsed Source Current ^{2,4}		---	---	-7	A
VSD	Diode Forward Voltage ²	$V_{GS}=0V, I_S=-1A, T_J=25^\circ C$	---	---	-1.2	V

Note :

- 1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 20Z copper.
- 2、The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
- 3、The power dissipation is limited by 150°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

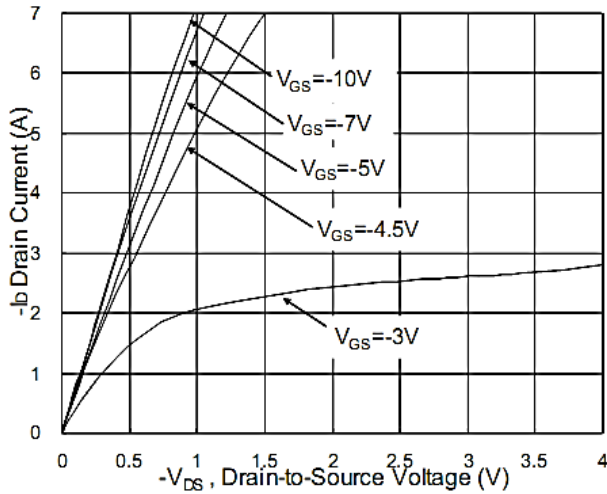


Fig.1 Typical Output Characteristics

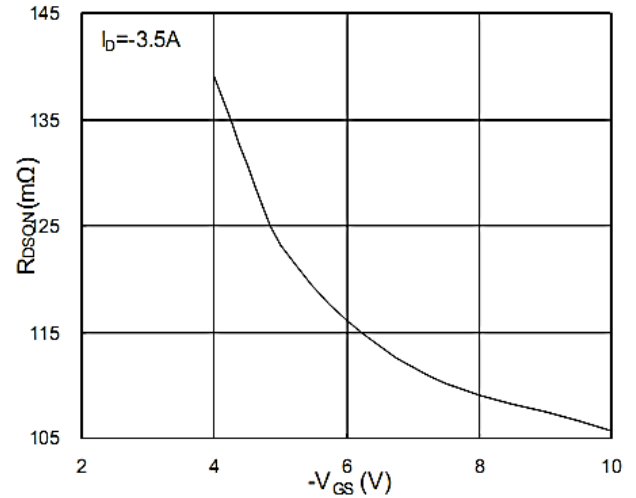


Fig.2 On-Resistance v.s Gate-Source

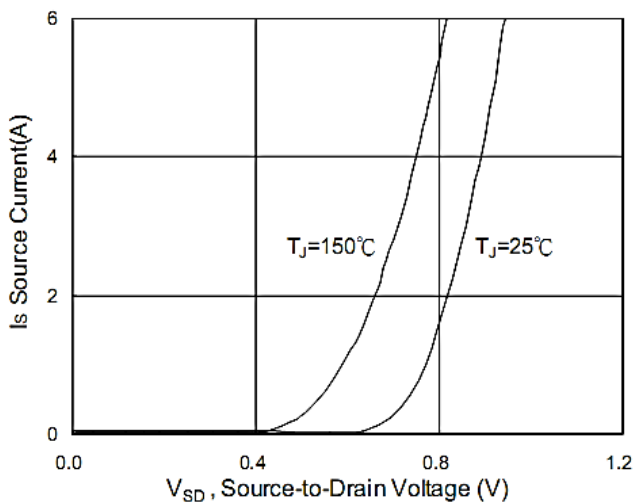


Fig.3 Forward Characteristics Of Reverse

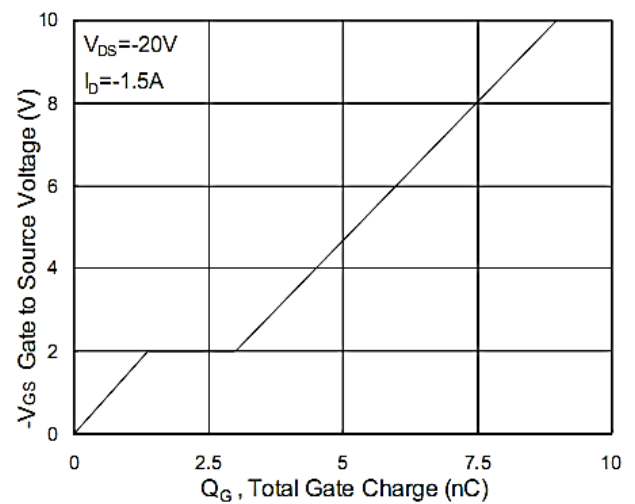


Fig.4 Gate-Charge Characteristics

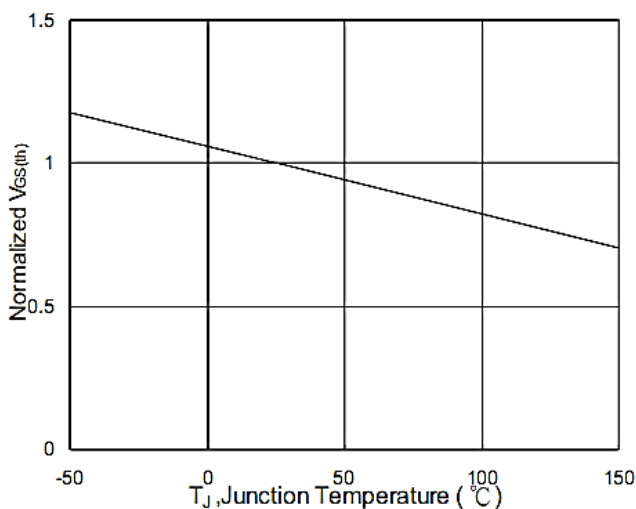


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

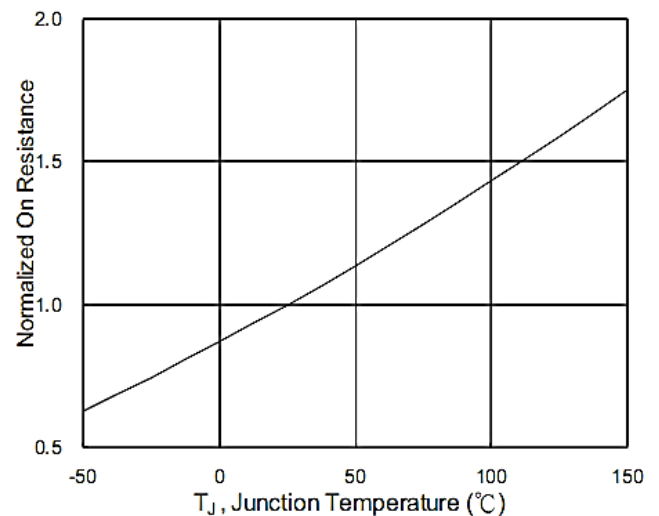


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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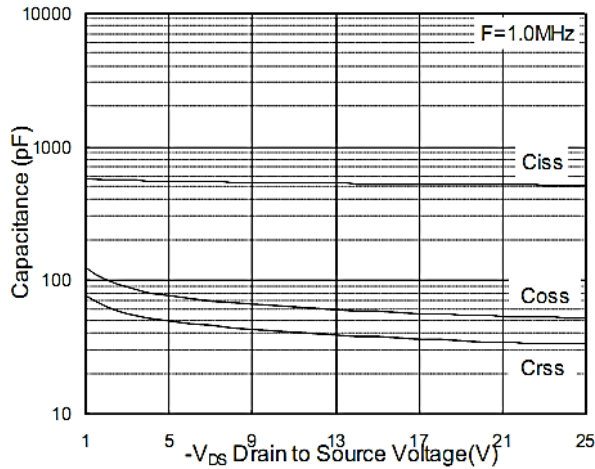


Fig.7 Capacitance

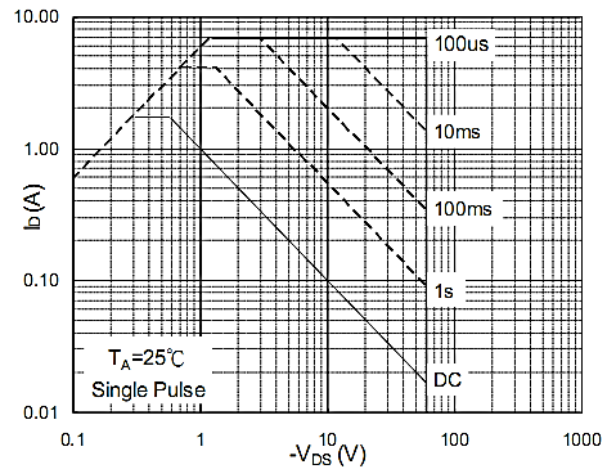


Fig.8 Safe Operating Area

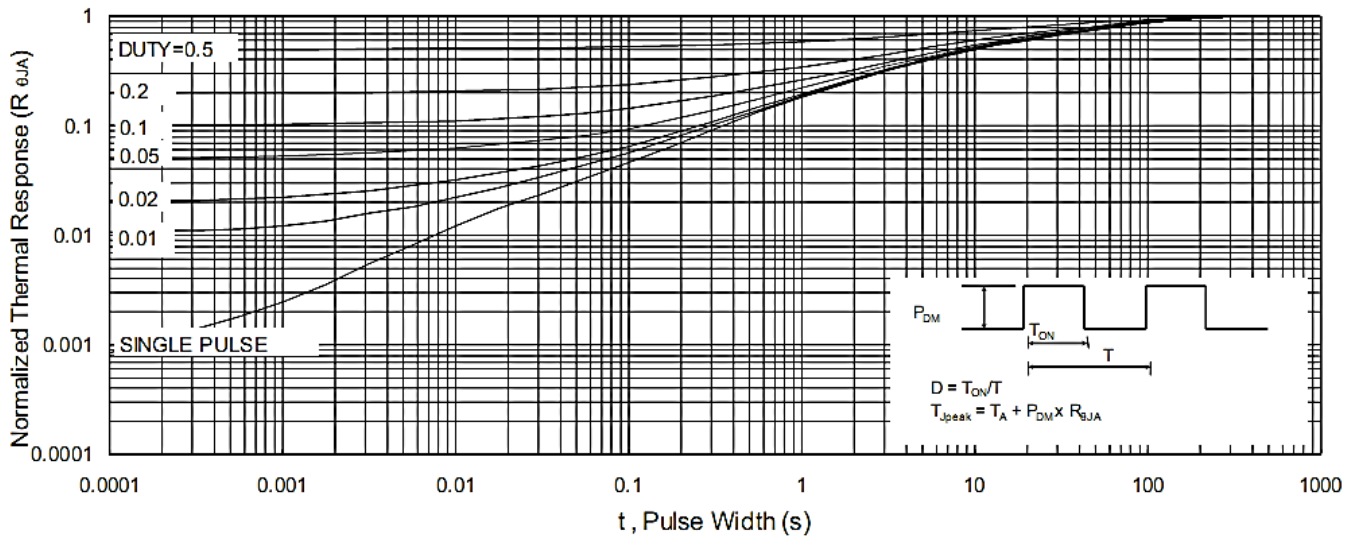


Fig.9 Normalized Maximum Transient Thermal Impedance

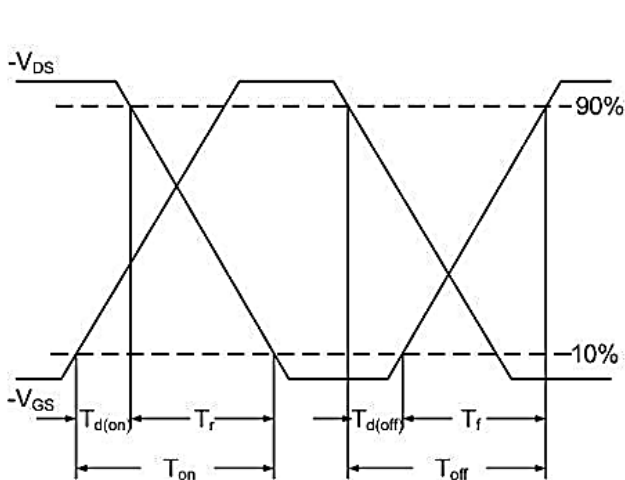


Fig.10 Switching time waveform

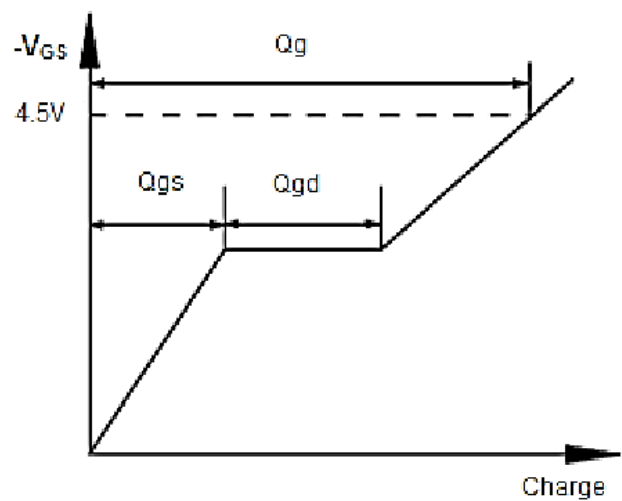
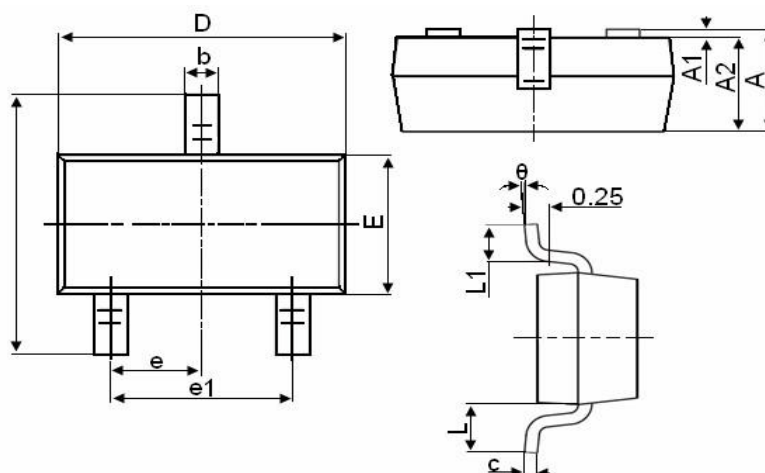


Fig.11 Gate Charge waveform

Package Mechanical Data-SOT23-XC-Single



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

-55V P-Channel Enhancement Mode MOSFET**Attention**

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Edition	Date	Change
Rve1.0	2021/4/13	Initial release

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