

-20V P-Channel Enhancement Mode MOSFET

Description

The AP2305AI 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

$V_{DS} = -20V$ $I_D = -4.9A$

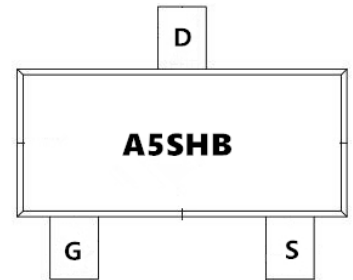
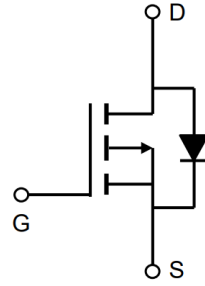
$R_{DS(ON)} < 38m\Omega @ V_{GS} = -4.5V$

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP2305AI	SOT-23	A5SHB	3000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	± 12	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-4.9	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.9	A
I_{DM}	Pulsed Drain Current ²	-14	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ³	1.31	W
$P_D @ T_A = 70^\circ C$	Total Power Dissipation ³	0.84	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	120	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹ ($t \leq 10s$)	95	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-20	---	---	V
∂BV _{DSS} /∂T _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.014	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-4.5V, I _D =-4.9A	---	32	38	mΩ
		V _{GS} =-2.5V, I _D =-3.4A	---	45	55	
		V _{GS} =-1.8V, I _D =-2A	---	65	85	
V _{GS(th)}	Gate Threshold Voltage		-0.4	---	-1.0	V
∂V _{GS(th)}	V _{GS(th)} Temperature Coefficient	V _{GS} =V _{DS} , I _D =-250uA	---	3.95	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-16V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-16V, V _{GS} =0V, T _J =55°C	---	---	-5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-3A	---	12.8	---	S
Q _g	Total Gate Charge (-4.5V)		---	10.2	14.3	nC
Q _{gs}	Gate-Source Charge	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-3A	---	1.89	2.6	
Q _{gd}	Gate-Drain Charge		---	3.1	4.3	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-10V, V _{GS} =-4.5V, R _G =3.3Ω, I _D =-3A	---	5.6	11.2	ns
T _r	Rise Time		---	40.8	73	
T _{d(off)}	Turn-Off Delay Time		---	33.6	67	
T _f	Fall Time		---	18	36	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	857	1200	pF
C _{oss}	Output Capacitance		---	114	160	
C _{rss}	Reverse Transfer Capacitance		---	108	151	
I _S	Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	---	---	-4.9	A
I _{SM}	Pulsed Source Current ^{2,4}		---	---	-14	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V
t _{rr}	Reverse Recovery Time	I _F =-3A, di/dt=100A/μs, T _J =25°C	---	21.8	---	nS
Q _{rr}	Reverse Recovery Charge	T _J =25°C	---	6.9	---	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 ∅ 300us, duty cycle ∅ 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

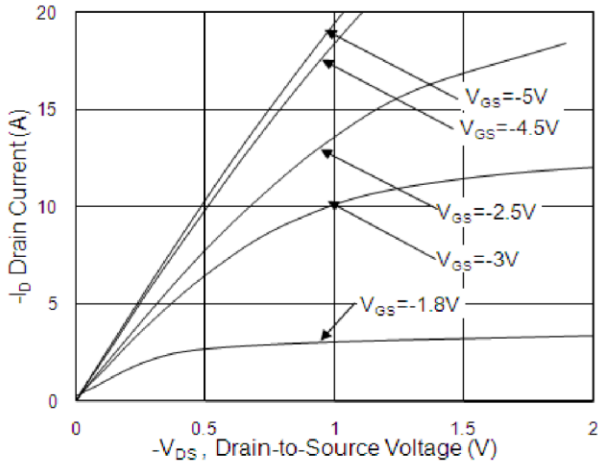


Fig.1 Typical Output Characteristics

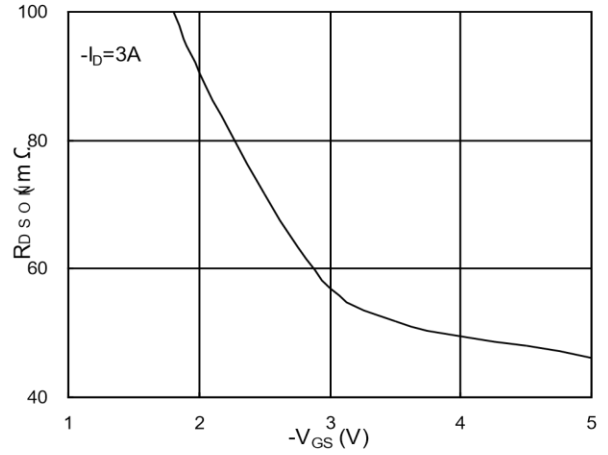


Fig.2 On-Resistance vs. G-S Voltage

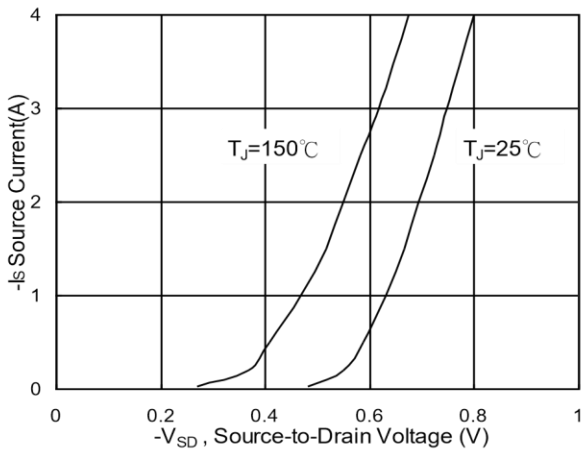


Fig.3 Forward Characteristics of Reverse

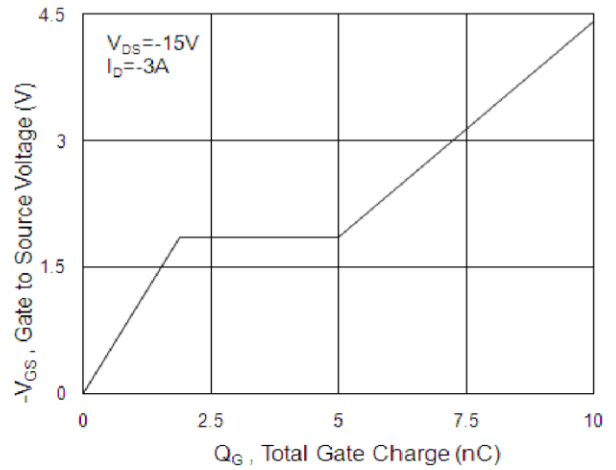


Fig.4 Gate-charge Characteristics

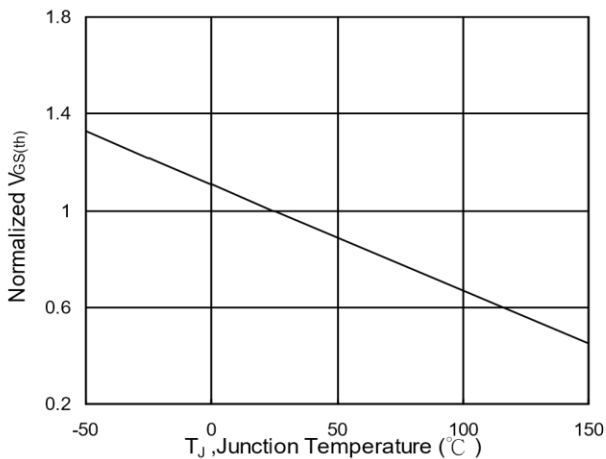


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

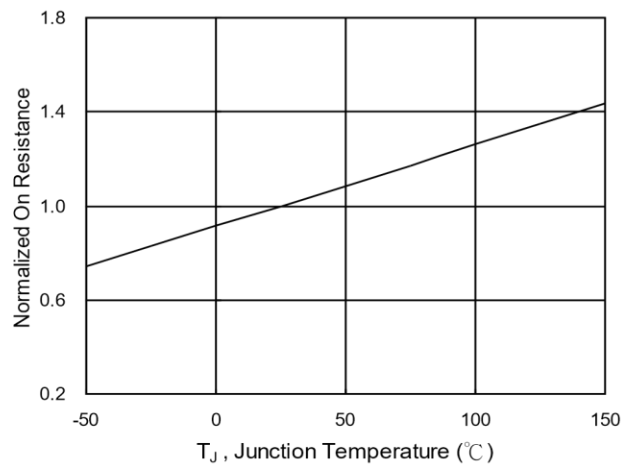


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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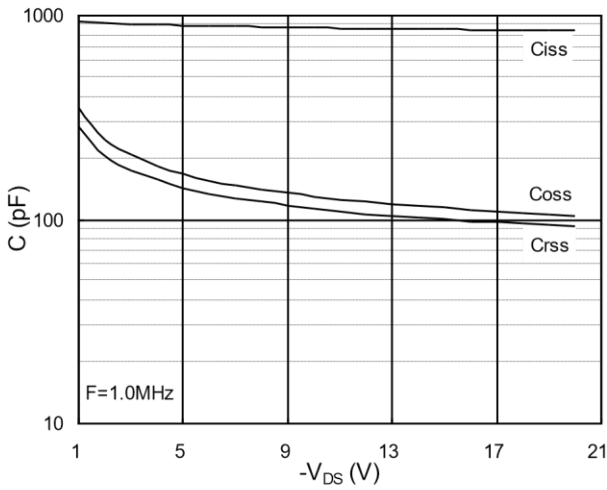


Fig.7 Capacitance

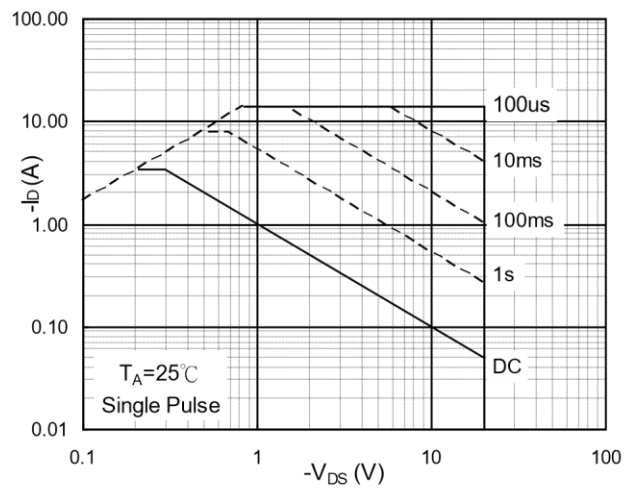


Fig.8 Safe Operating Area

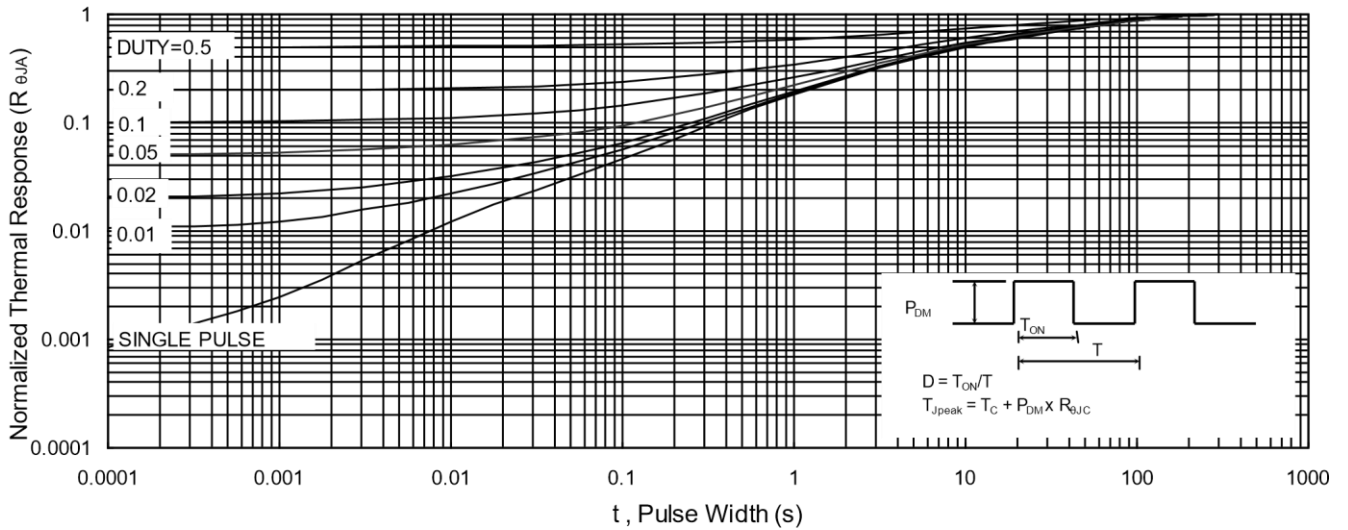


Fig.9 Normalized Maximum Transient Thermal Impedance

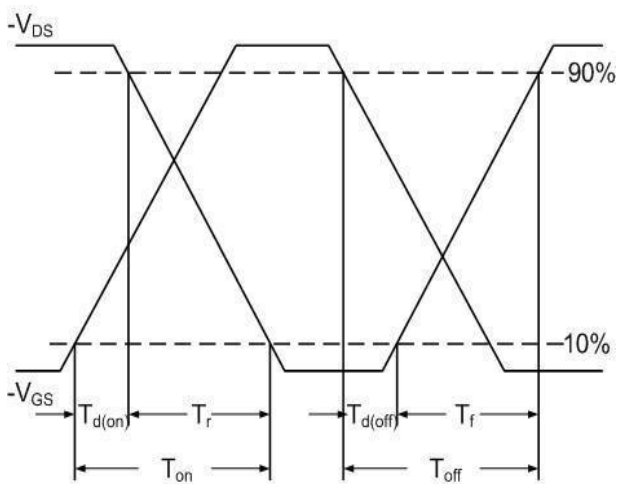


Fig.10 Switching Time Waveform

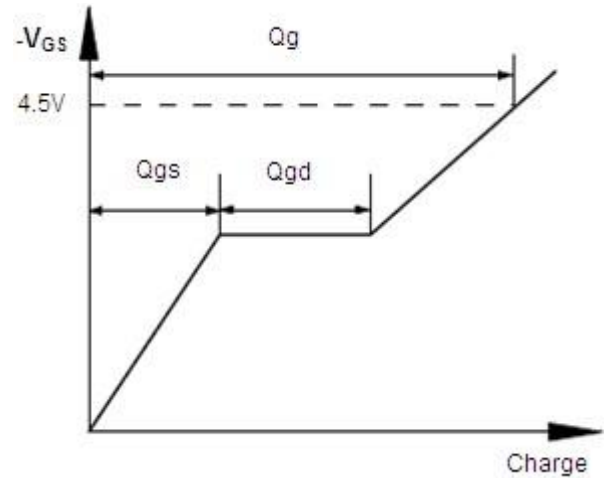
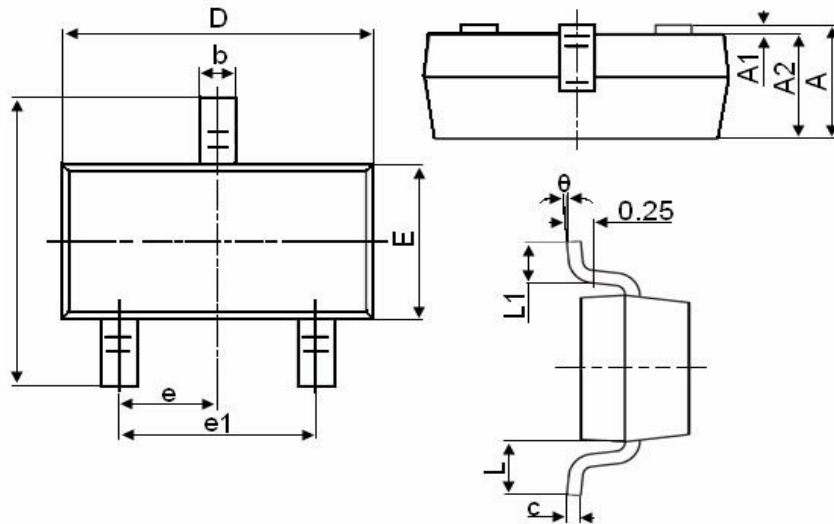


Fig.11 Gate Charge Waveform

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Package Mechanical Data-SOT-23



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°

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