

-20V P-Channel Enhancement Mode MOSFET

Description

The AP2301DI 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

$V_{DS} = -20V$ $I_D = -2.1A$

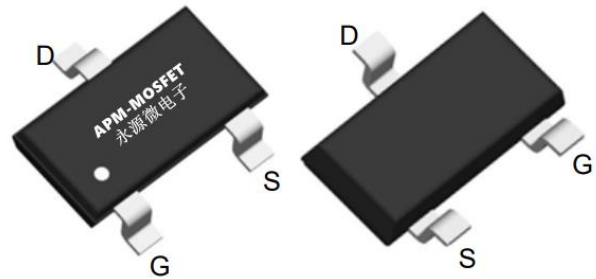
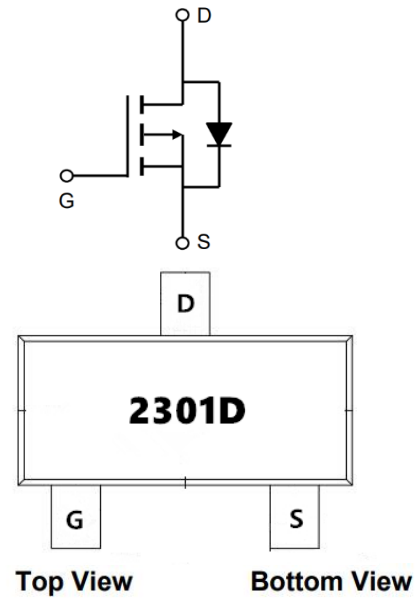
$R_{DS(ON)} < 150m\Omega$ @ $V_{GS} = -4.5V$ (Type: 118m Ω)

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP2301DI	SOT23L	2301D	3000

Absolute Maximum Ratings ($T_c = 25^\circ C$ 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, $V_{GS} @ -4.5V^1$	-2.1	A
$I_{D@T_A=70^\circ C}$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-0.8	A
I_{DM}	Pulsed Drain Current ²	-7.2	A
$P_{D@T_A=25^\circ C}$	Total Power Dissipation ³	1.0	W
$P_{D@T_A=70^\circ C}$	Total Power Dissipation ³	0.5	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	125	$^\circ C/W$
$R_{\theta JC}$	Thermal resistance, junction-case	32	$^\circ C/W$

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D= -250\mu A$	-20	-24	-	V
IDSS	Zero Gate Voltage Drain Current	$V_{DS}= -20V, V_{GS}= 0V,$	-	-	-1	μA
IGSS	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}= \pm 12V$	-	-	± 100	nA
VGS(th)	Gate Threshold Voltage	$V_{DS}= V_{GS}, I_D= -250\mu A$	-0.4	-0.7	-1.0	V
RDS(on)	Static Drain-Source on-Resistance	$V_{GS}= -4.5V, I_D= -2A$	-	118	150	m Ω
		$V_{GS}= -2.5V, I_D= -1A$	-	165	190	
Ciss	Input Capacitance	$V_{DS}= -10V, V_{GS}= 0V, f= 1.0MHz$	-	34	-	pF
Coss	Output Capacitance		-	24	-	pF
Crss	Reverse Transfer Capacitance		-	23	-	pF
Qg	Total Gate Charge	$V_{DS}= -10V, I_D= -2A, V_{GS}= -4.5V$	-	2.4	-	nC
Qgs	Gate-Source Charge		-	0.6	-	nC
Qgd	Gate-Drain(“Miller”) Charge		-	0.4	-	nC
td(on)	Turn-on Delay Time	$V_{DD}= -10V, R_L=5\Omega, R_{GEN}=3\Omega, V_{GS}= -4.5V,$	-	5	-	ns
tr	Turn-on Rise Time		-	18	-	ns
td(off)	Turn-off Delay Time		-	79	-	ns
t _f	Turn-off Fall Time		-	42	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	-2.1	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-7.2	A
VSD	Drain to Source Diode Forward Voltage	$V_{GS}= 0V, I_S= -2A$	-	-	-1.2	V

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 $\Delta 300\mu s$, duty cycle $\Delta 2\%$
- 3、The power dissipation is limited by 150 $^{\circ}\text{C}$ 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.

Typical Characteristics

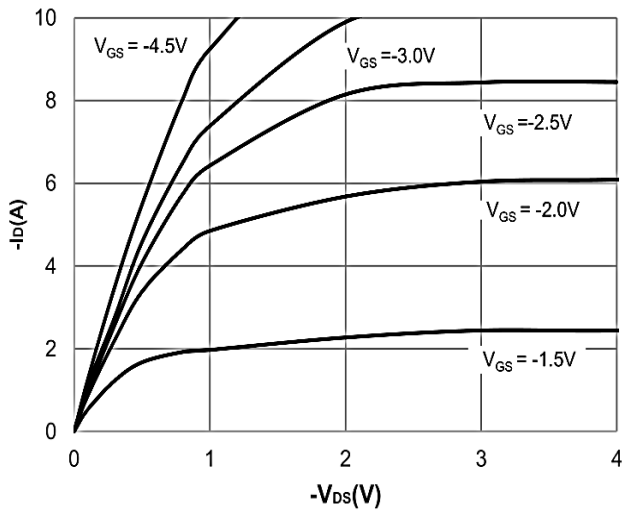


Figure1: Output Characteristics

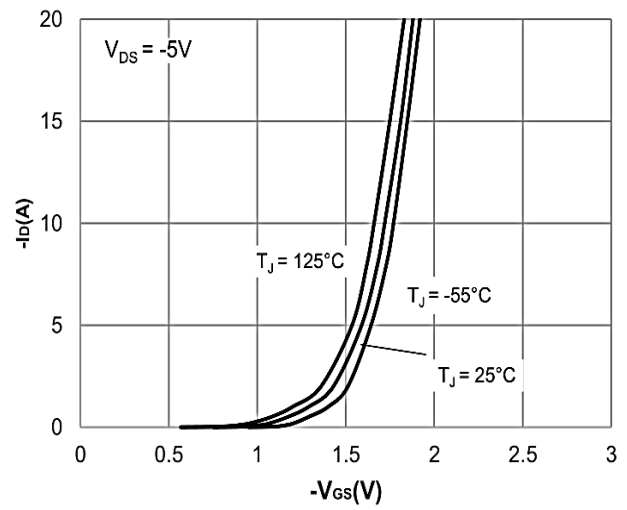


Figure 2: Typical Transfer Characteristics

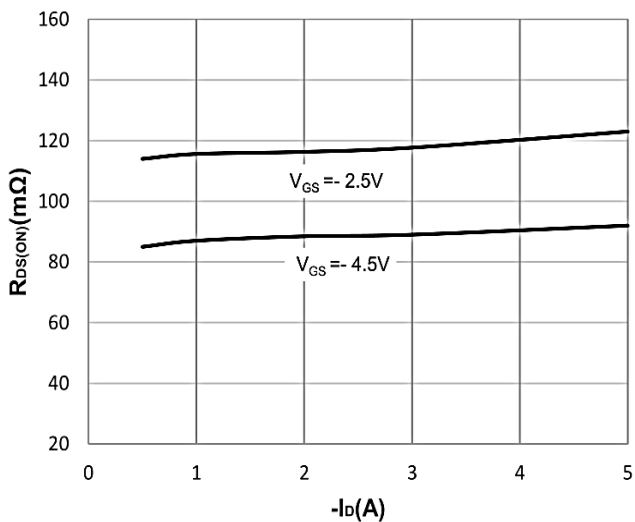


Figure 3: On-resistance vs. Drain Current

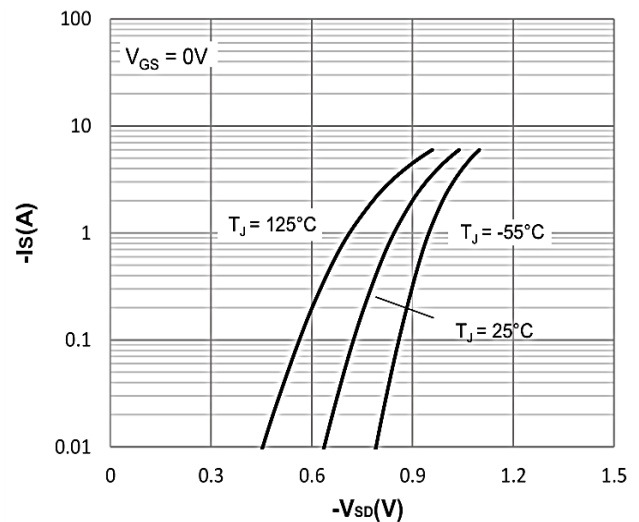


Figure 4: Body Diode Characteristics

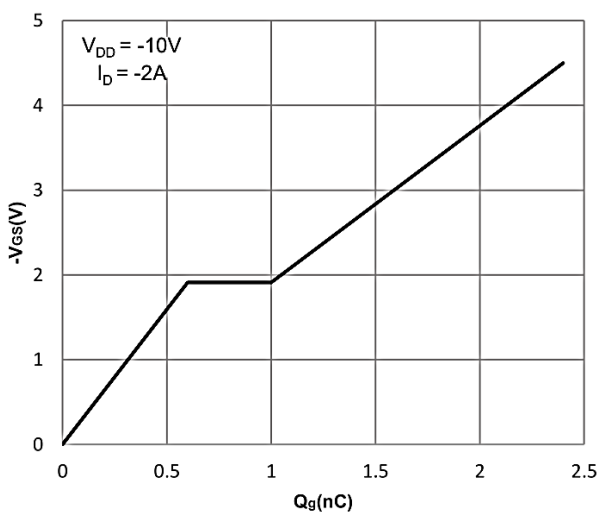


Figure 5: Gate Charge Characteristics

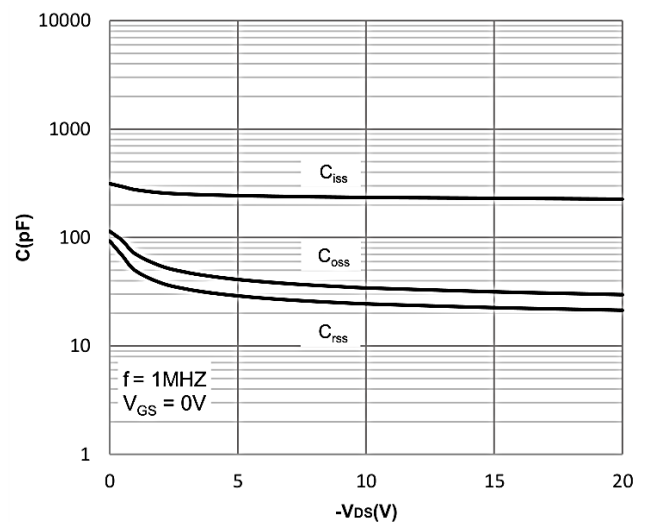


Figure 6: Capacitance Characteristics

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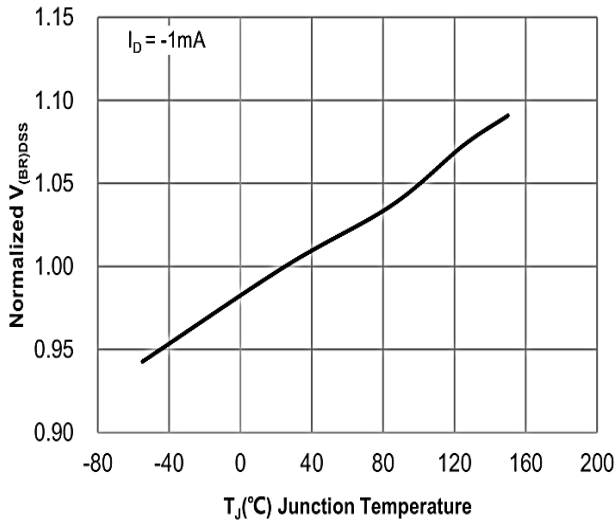


Figure 7: Normalized Breakdown voltage vs. Junction Temperature

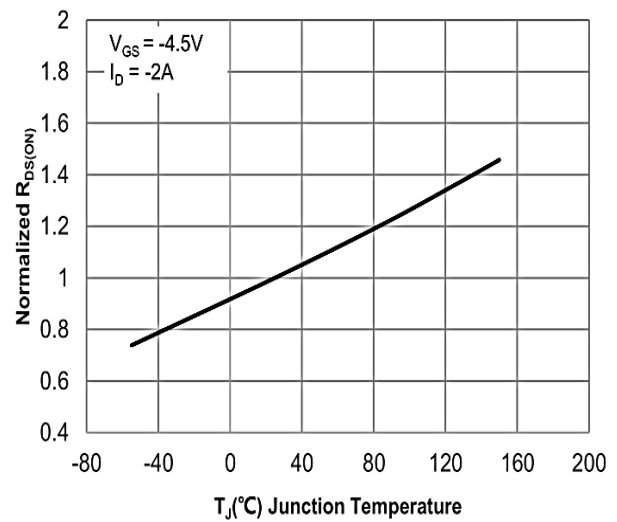


Figure 8: Normalized on Resistance vs. Junction Temperature

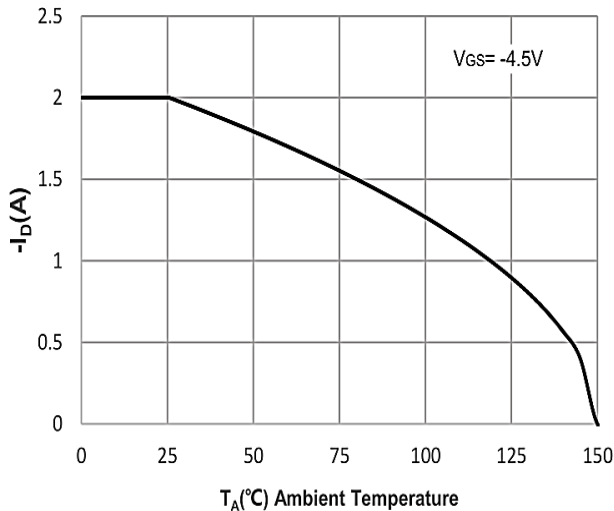


Figure 9: Maximum Safe Operating Area

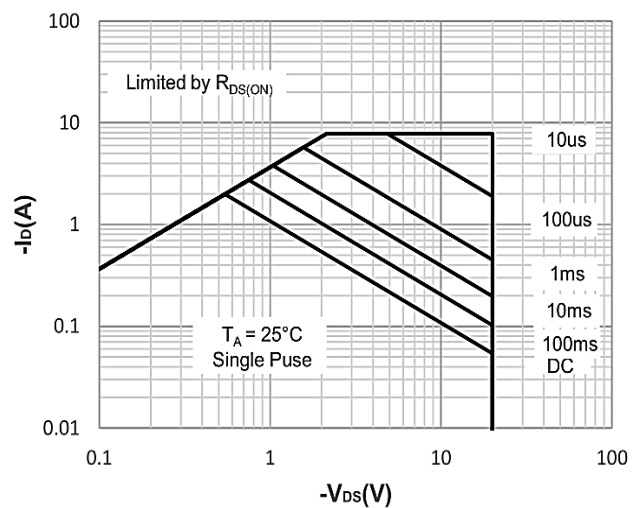


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

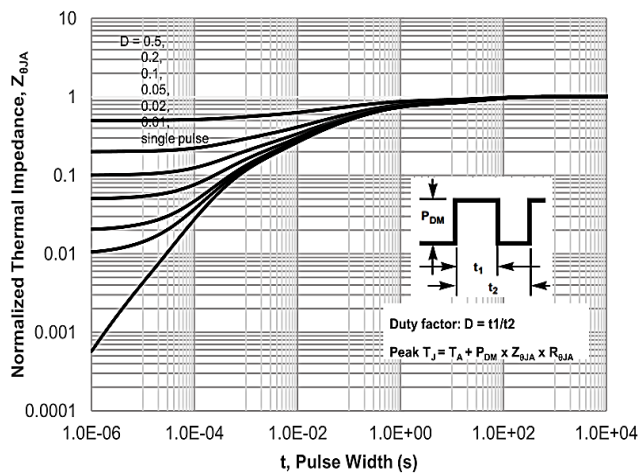


Figure 11: Normalized Maximum Transient Thermal Impedance

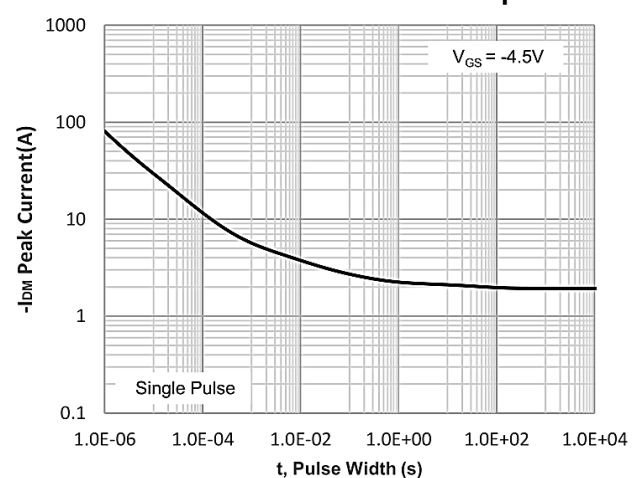
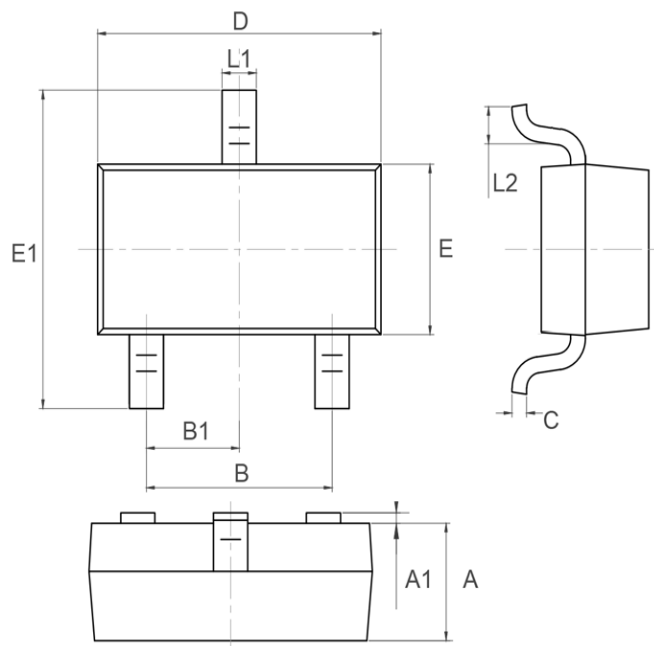


Figure 12: Peak Current Capacity

Package Mechanical Data-SOT23L



Symbol	Dim in mm		
	Min	Typ	Max
A	0.9	1	1.1
A1	0	0.05	0.1
B	1.8	1.9	2
B1	0.95TYP		
C	0.08	0.115	0.15
D	2.8	2.9	3
E	1.2	1.3	1.4
E1	2.25	2.4	2.55
L1	0.3	0.4	0.5
L2	0.2	0.35	0.5

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Edition	Date	Change
REV1.0	2021/4/31	Initial release

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