

## -20V P-Channel Enhancement Mode MOSFET

### Description

The AP2311MI uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

### General Features

$V_{DS} = -20V$   $I_D = -7.2A$

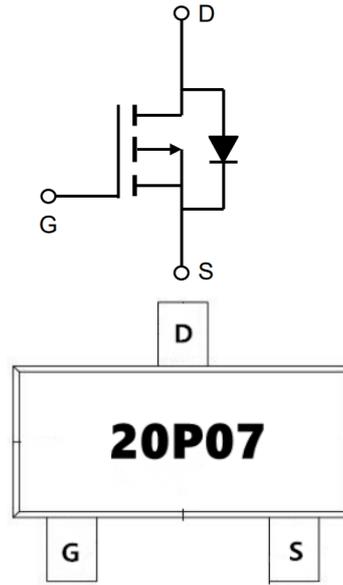
$R_{DS(ON)} < 22m\Omega$  @  $V_{GS}=4.5V$  (Type: 18m $\Omega$ )

### Application

Battery protection

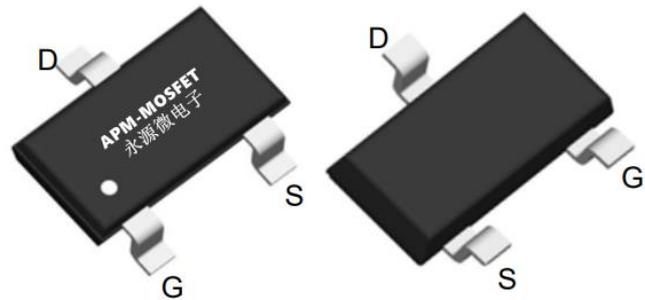
Load switch

Uninterruptible power supply



Top View

Bottom View



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP2311MI	SOT23-3L	20P07	3000

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

Symbol	Parameter	Rating	Units
$V_{DSS}$	Drain-Source Voltage	-20	V
$V_{GSS}$	Gate-Source Voltage	$\pm 12$	V
$I_D @ T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-7.2	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	-5.6	A
IDM	Pulsed Drain Current <sup>note1</sup>	-48	A
$P_D @ T_C=25^\circ C$	Power Dissipation	1.6	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	125	$^\circ C/W$
TJ, TSTG	Operating and Storage Temperature Range	-55 to +150	$^\circ C$

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### Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	VGS=0V, ID=-250μA	-20	-23	-	V
IDSS	Zero Gate Voltage Drain Current	VDS =-12V, VGS = 0V,	-	-	-1	μA
IGSS	Gate to Body Leakage Current	VDS =0V, VGS = ±12V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	VDS=VGS, ID=-250μA	-0.5	-0.65	-1.0	V
RDS(on)	Static Drain-Source on-Resistance note2	VGS=-4.5V, ID=-6.0A	-	18	22	mΩ
RDS(on)	Static Drain-Source on-Resistance note2	VGS=-2.5V, ID=-4.2A	-	22	30	mΩ
Ciss	Input Capacitance	VDS=-6V, VGS=0V f=1.0MHz	-	1100	-	pF
Coss	Output Capacitance		-	390	-	pF
Crss	Reverse Transfer Capacitance		-	300	-	pF
Qg	Total Gate Charge	VDS=-4V, ID=-4.1A, VGS = -4.5V	-	11.5	-	nC
Qgs	Gate-Source Charge		-	1.5	-	nC
Qgd	Gate-Drain("Miller") Charge		-	3.2	-	nC
td(on)	Turn-on Delay Time	VDD =-4V, ID=-3.3A, RG=1.0Ω, VGEN=-4.5V, RL=1.2Ω	-	25	-	ns
tr	Turn-on Rise Time		-	45	-	ns
td(off)	Turn-off Delay Time		-	72	-	ns
tf	Turn-off Fall Time		-	60	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	-8.1	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-48	A
VSD	Drain to Source Diode Forward Voltage	VGS=0V, IS =-4.1A	-	-	-1.2	V
trr	Reverse Recovery Time	VGS=0V, IS=-4.1A, di/dt=100A/μs	-	20	-	ns
Qrr	Reverse Recovery Charge		-	9	-	nC

**Note :**

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> 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<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

Typical Characteristics

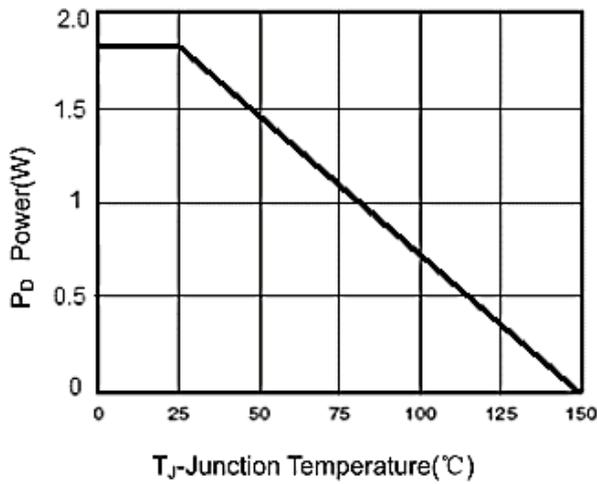


Figure 1 Power Dissipation

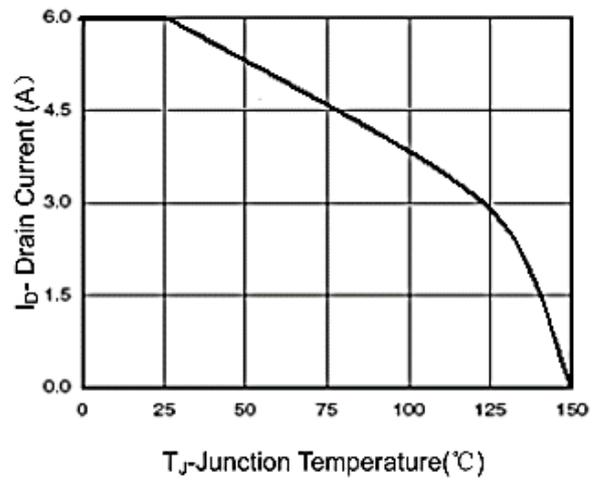


Figure 2 Drain Current

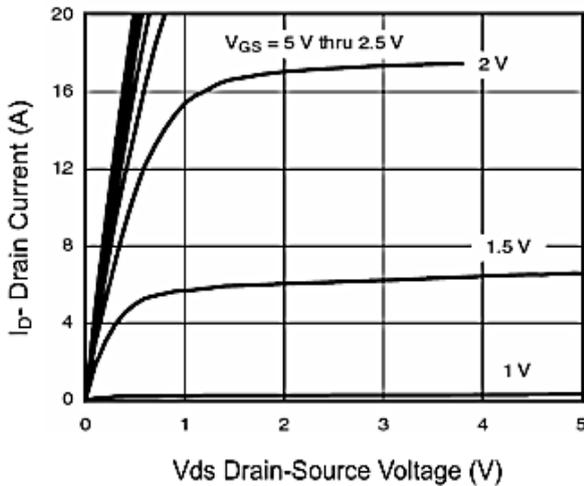


Figure 3 Output Characteristics

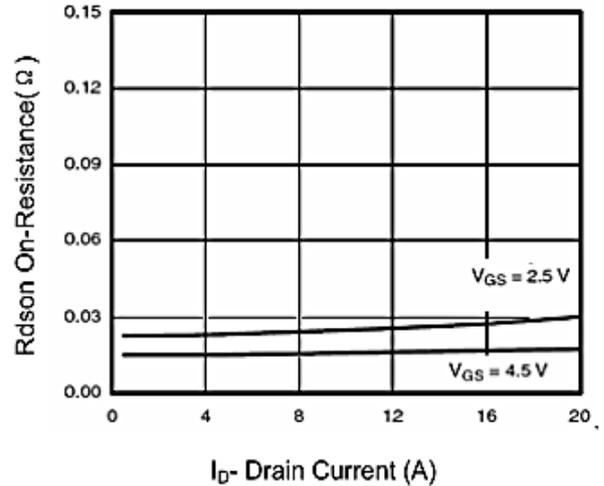


Figure 4 Drain-Source On-Resistance

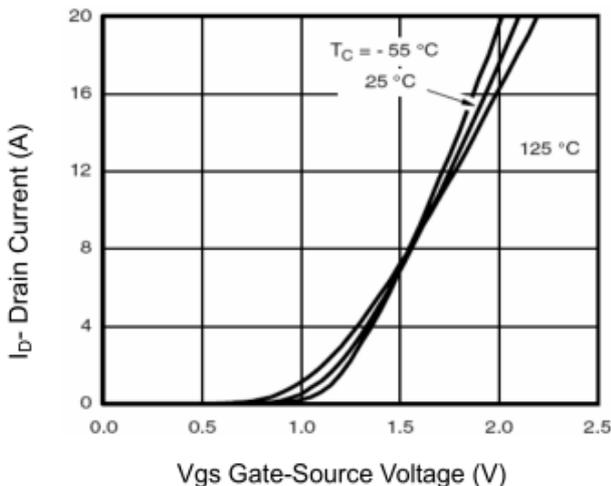


Figure 5 Transfer Characteristics

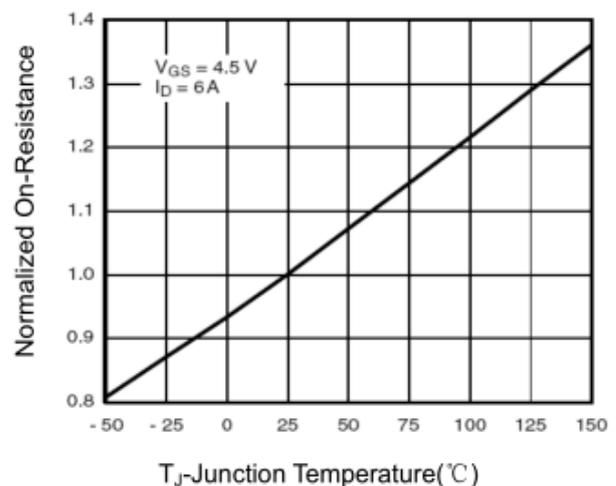
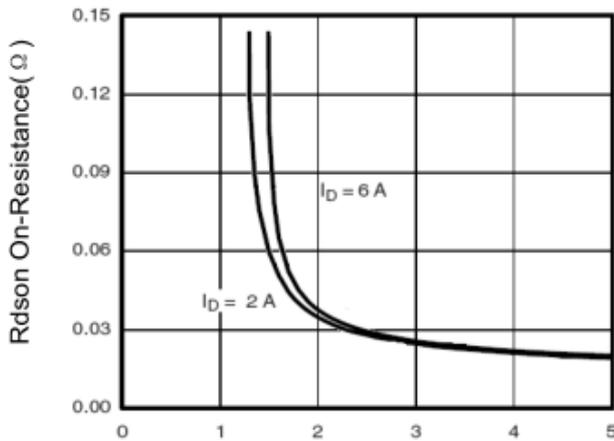
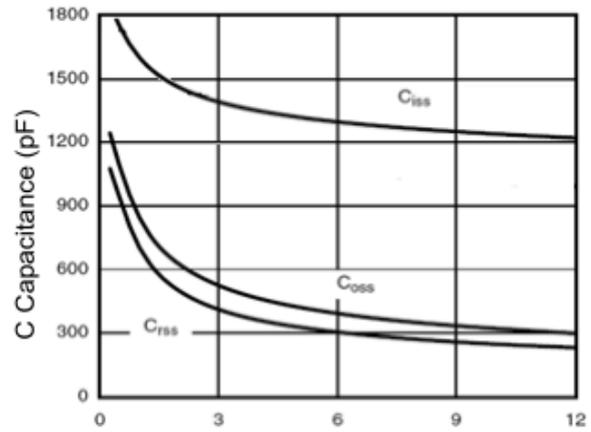


Figure 6 Drain-Source On-Resistance

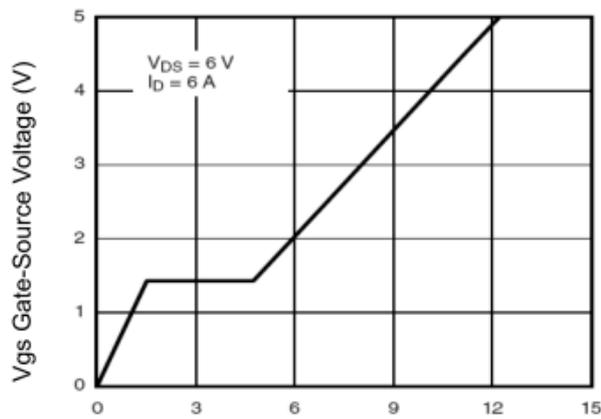
**-20V P-Channel Enhancement Mode MOSFET**



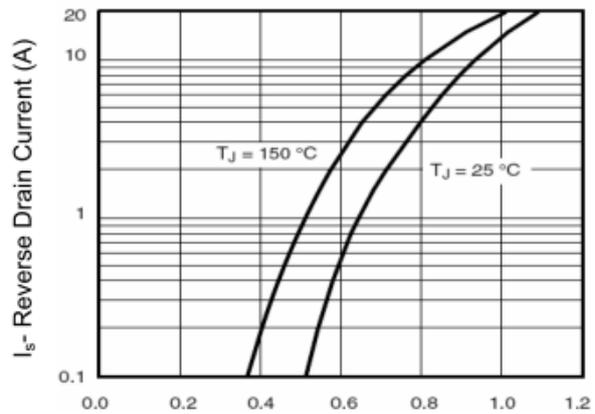
Vgs Gate-Source Voltage (V)  
**Figure 7 Rdson vs Vgs**



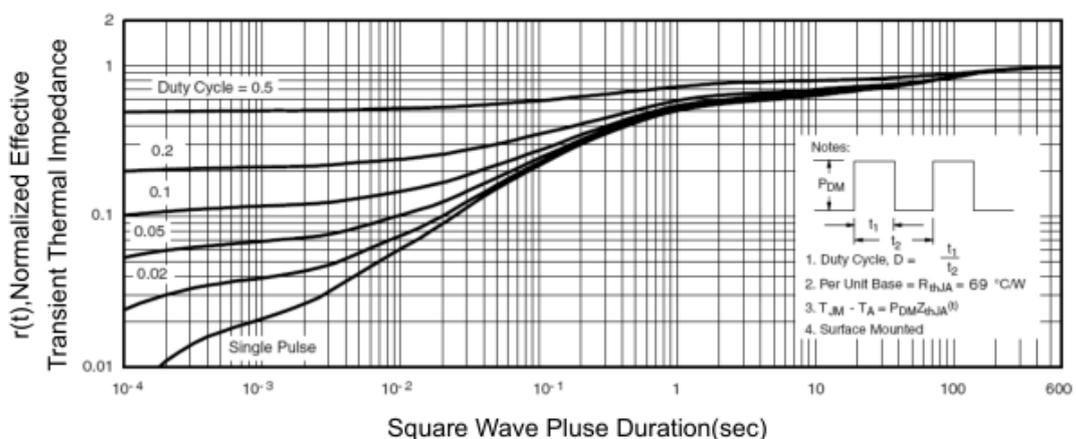
Vds Drain-Source Voltage (V)  
**Figure 8 Capacitance vs Vds**



Qg Gate Charge (nC)  
**Figure 9 Gate Charge**



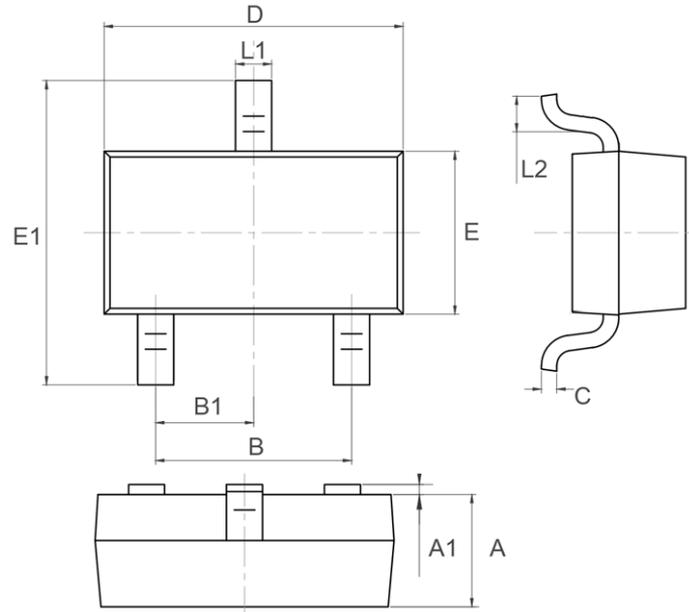
Vsd Source-Drain Voltage (V)  
**Figure 10 Source- Drain Diode Forward**



**Figure 12 Normalized Maximum Transient Thermal Impedance**

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## Package Mechanical Data: SOT23-3L



Symbol	Dim in mm		
	Min	Nom	Max
A	0.70	0.75	0.80
A1	--	0.02	0.05
A2	0.18	0.20	0.25
b	0.20	0.27	0.34
D	1.95	2.00	2.05
E	1.95	2.00	2.05
D1	0.80	0.90	1.00
E1	0.90	1.00	1.10
D2	0.20	0.30	0.40
E2	0.65	0.75	0.85
L	0.20	0.25	0.35
h	0.20	0.25	0.30
e	0.65 BSC		

**-20V P-Channel Enhancement Mode MOSFET****Attention**

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Edition	Date	Change
REV1.0	2020/9/8	Initial release
REV1.1	2023/9/8	Improve voltage resistance

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