

-30V P-Channel Enhancement Mode MOSFET

Description

The AP3401MI-L 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

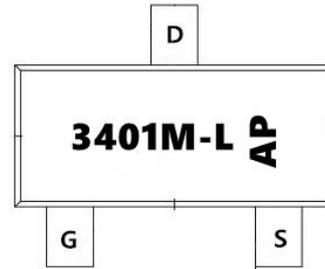
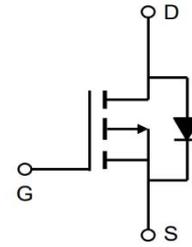
$V_{DS} = -30V$ $I_D = -4.2A$

$R_{DS(ON)} < 55m\Omega$ @ $V_{GS}=10V$ (Type: 45m Ω)

$R_{DS(ON)} < 68m\Omega$ @ $V_{GS}=4.5V$ (Type: 53m Ω)

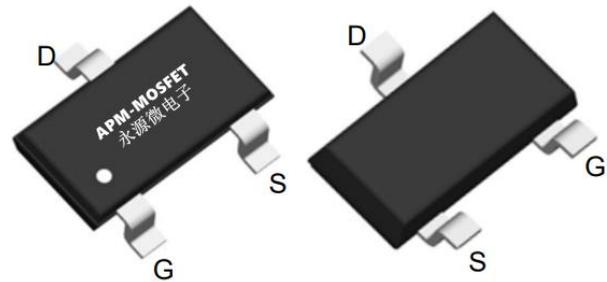
Application

- Battery protection
- Load switch
- Uninterruptible power supply



Top View

Bottom View



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP3401MI-L	SOT23-3L	3401M-L AP	3000

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

Symbol	Parameter	Max.	Units
V_{DSS}	Drain-Source Voltage	-30	V
V_{GSS}	Gate-Source Voltage	± 12	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-4.2	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-2.7	A
IDM	Pulsed Drain Current ^{note1}	-16.8	A
P_D	Power Dissipation $T_A = 25^\circ C$	1.5	W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	125	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	124	$^\circ C/W$
TJ, TSTG	Operating and Storage Temperature Range	-55 to +150	$^\circ C$



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

Symbol	Parameter	Test Condition	Min	Typ	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D = -250μA	-30	-	-	V
IDSS	Zero Gate Voltage Drain Current	V _{DS} = -30V, V _{GS} =0V,	-	-	-1	μA
IGSS	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} = ±12V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = -250μA	-0.5	-0.9	-1.5	V
RDS(on)	Static Drain-Source on-Resistance note2	V _{GS} = -10V, I _D = -4A	-	45	55	mΩ
		V _{GS} = -4.5V, I _D = -3A	-	53	68	
		V _{GS} = -2.5V, I _D = -1A	-	72	96	V
Ciss	Input Capacitance	V _{DS} = -15V, V _{GS} =0V, f=1.0MHz	-	500	-	pF
Coss	Output Capacitance		-	80	-	pF
Crss	Reverse Transfer Capacitance		-	2	-	pF
Q _g	Total Gate Charge	V _{DS} = -15V, I _D = -4.2A, V _{GS} = -10V	-	8.5	-	nC
Q _{gs}	Gate-Source Charge		-	1.8	-	nC
Q _{gd}	Gate-Drain("Miller") Charge		-	2.7	-	nC
td(on)	Turn-on Delay Time	V _{DD} = -15V, I _D = -1A, V _{GS} = -10V, R _{GEN} =2.5Ω	-	7	-	ns
tr	Turn-on Rise Time		-	3	-	ns
td(off)	Turn-off Delay Time		-	20	-	ns
t _f	Turn-off Fall Time		-	12	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	-4.2	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-16.8	A
VSD	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S = -4.2A	-	-0.8	-1.2	V

Note :

- 1、 The data tested by surface mounted on a 1 inch 2 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 ID and IDM , in real applications , should be limited by total power dissipation.

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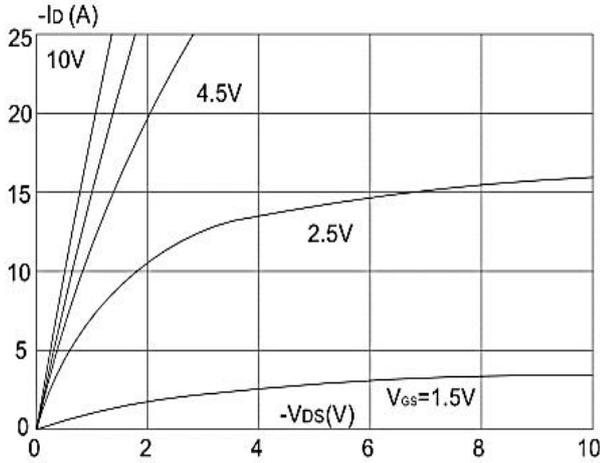


Figure 1: Output Characteristics

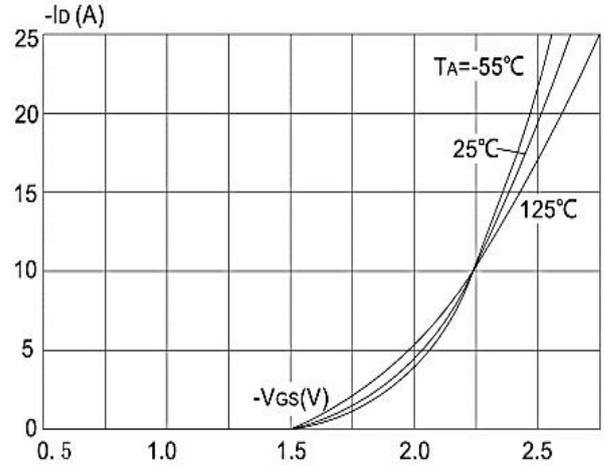


Figure 2: Typical Transfer Characteristics

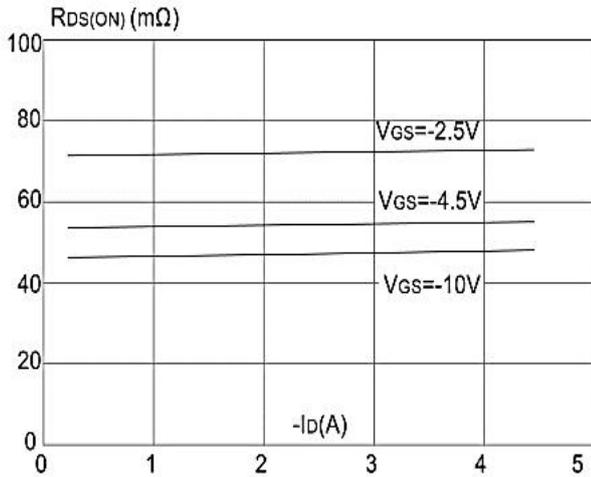


Figure 3: On-resistance vs. Drain Current

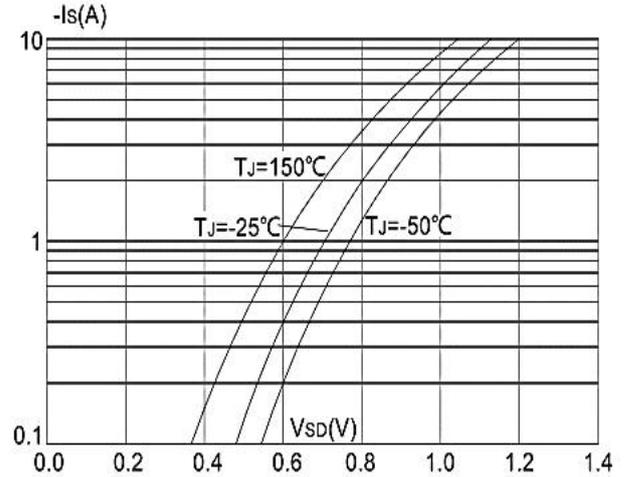


Figure 4: Body Diode Characteristics

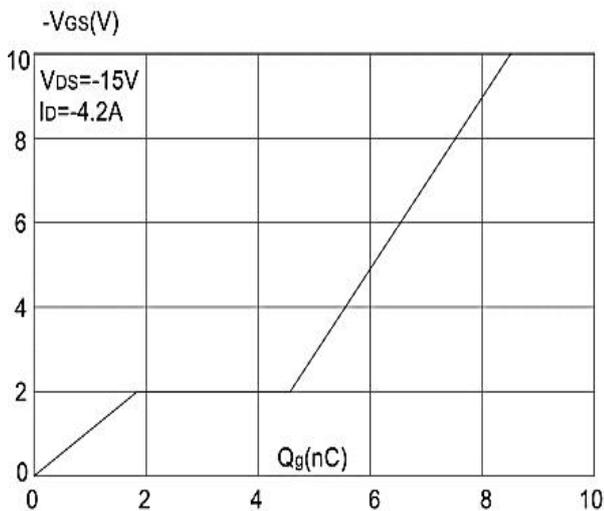


Figure 5: Gate Charge Characteristics

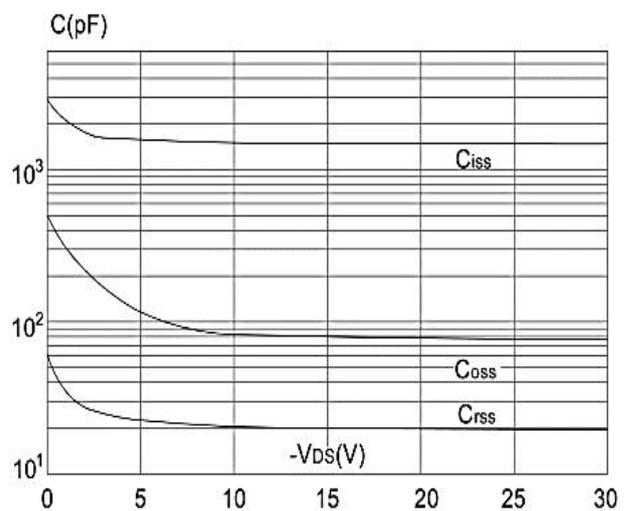


Figure 6: Capacitance Characteristics

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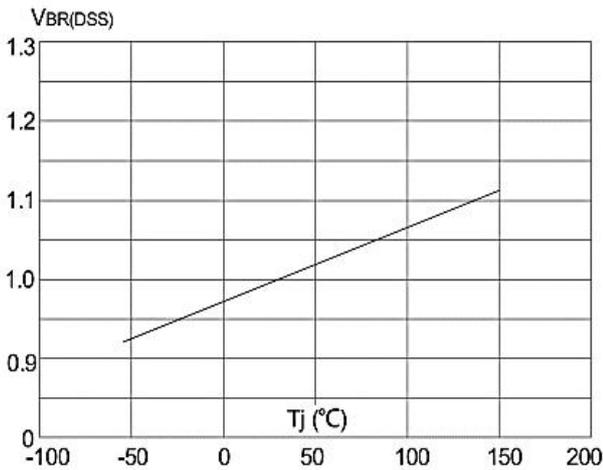


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

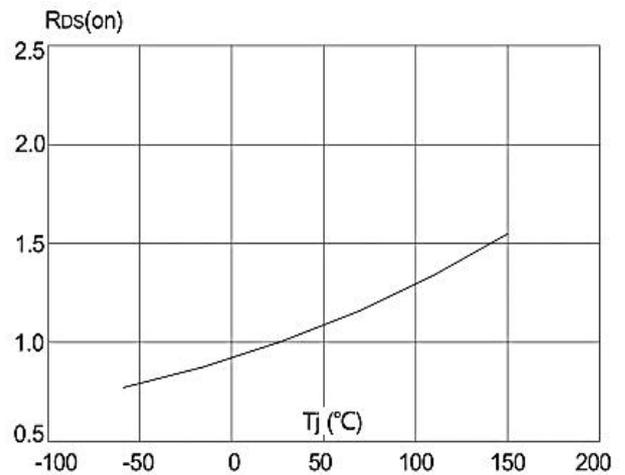


Figure 8: Normalized on Resistance vs. Junction Temperature

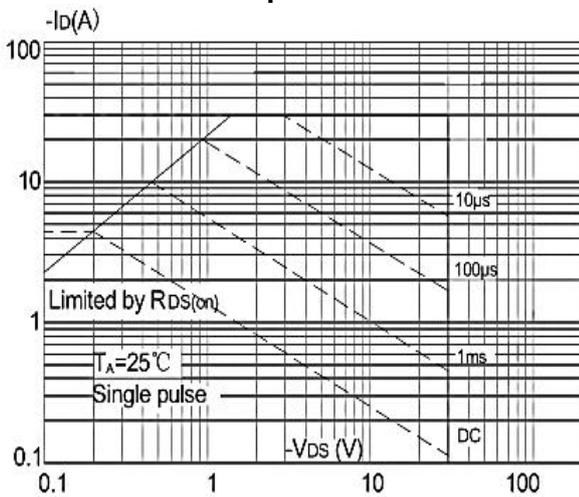


Figure 9: Maximum Safe Operating Area

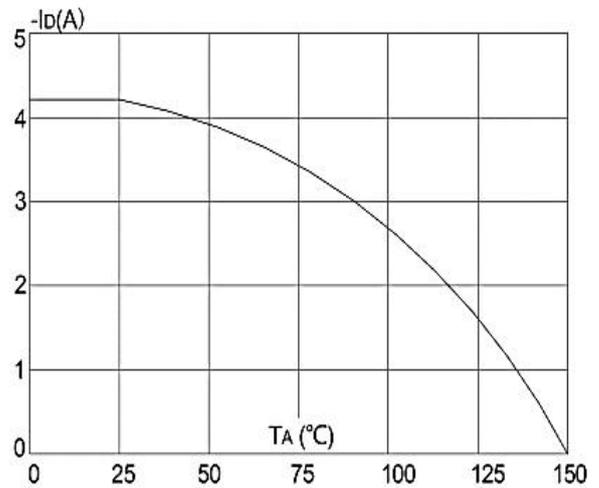


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

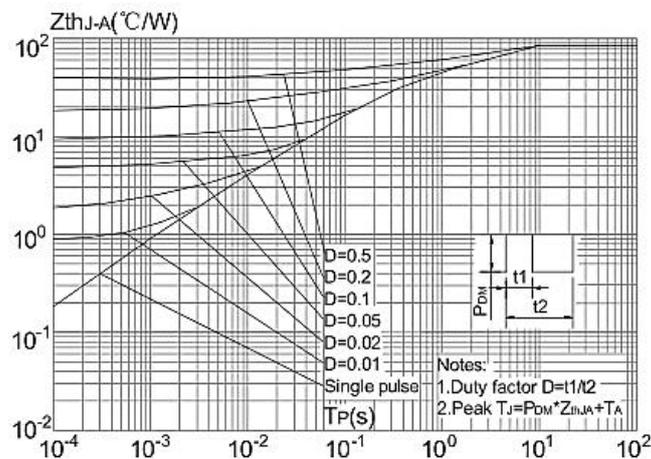
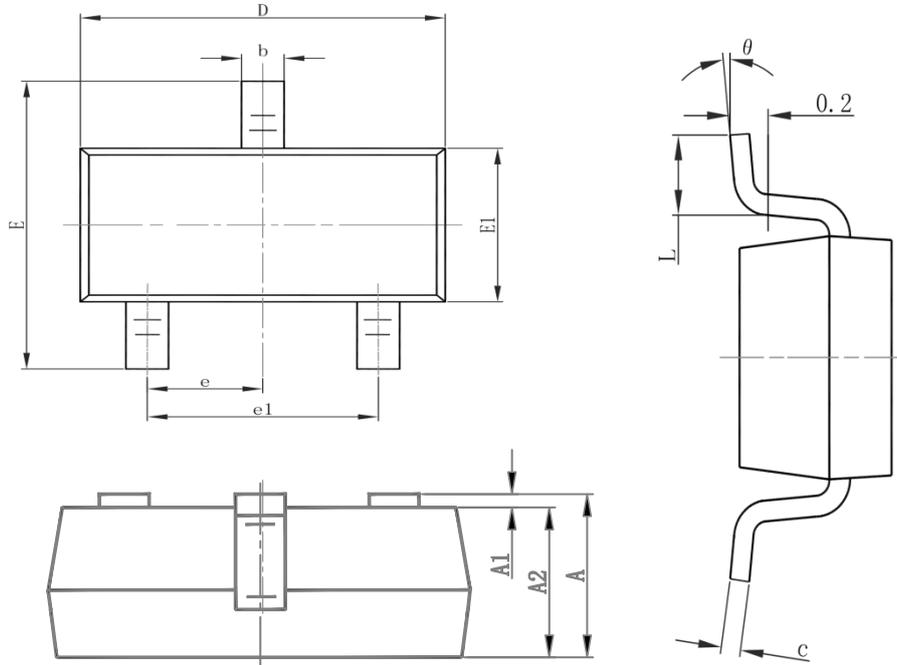


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Package Mechanical Data-SOT23-3-SLS-Single



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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Edition	Date	Change
Rve1.0	2022/8/31	Initial release

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