

## -30V P-Channel Enhancement Mode MOSFET

### Description

The AP3407AI 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.

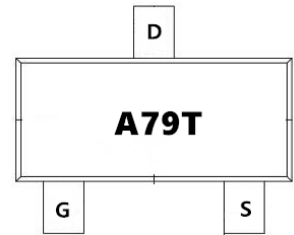
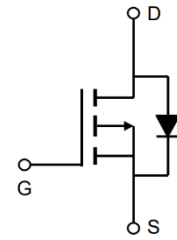
### General Features

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

$R_{DS(ON)} < 65m\Omega$  @  $V_{GS} = -10V$

### Application

Lithium battery protection  
 Wireless impact  
 Mobile phone fast charging



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP3407AI	SOT-23	A79T	3000

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-4.2	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-3.1	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-17	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>3</sup>	1.32	W
$P_D @ T_A = 70^\circ C$	Total Power Dissipation <sup>3</sup>	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 <sup>1</sup>	125	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ )	95	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	80	$^\circ C/W$



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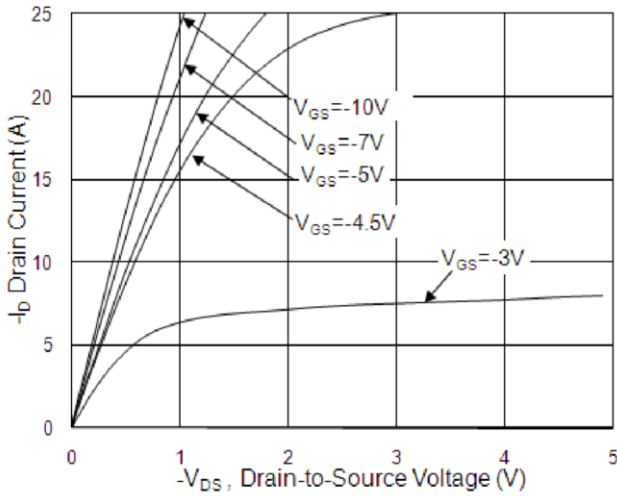
### Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-30	-36	---	V
ΔBVDSS/ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.023	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-3A	---	50	65	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	---	65	90	
VGS(th)	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.2	-1.6	-2.5	V
ΔVGS(th)	V <sub>GS(th)</sub> Temperature Coefficient		---	4	---	mV/°C
IDSS	Drain-Source Leakage Current	V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
IGSS	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
gfs	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A	---	11	---	S
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A	---	6.4	9.0	nC
Q <sub>gs</sub>	Gate-Source Charge		---	2.3	3.2	
Q <sub>gd</sub>	Gate-Drain Charge		---	1.9	2.7	
Td(on)	Turn-On Delay Time	V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω, I <sub>D</sub> =-3A	---	2.8	5.6	ns
T <sub>r</sub>	Rise Time		---	8.4	15.1	
Td(off)	Turn-Off Delay Time		---	39	78.0	
T <sub>f</sub>	Fall Time		---	6	12.0	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz	---	583	816	pF
C <sub>oss</sub>	Output Capacitance		---	100	140	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	80	112	
I <sub>s</sub>	Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-3.3	A
ISM	Pulsed Source Current <sup>2,4</sup>		---	---	-17	A
VSD	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>s</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V
t <sub>rr</sub>	Reverse Recovery Time	IF=-3A, di/dt=100A/μs, T <sub>J</sub> =25°C	---	7.8	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	2.5	---	nC

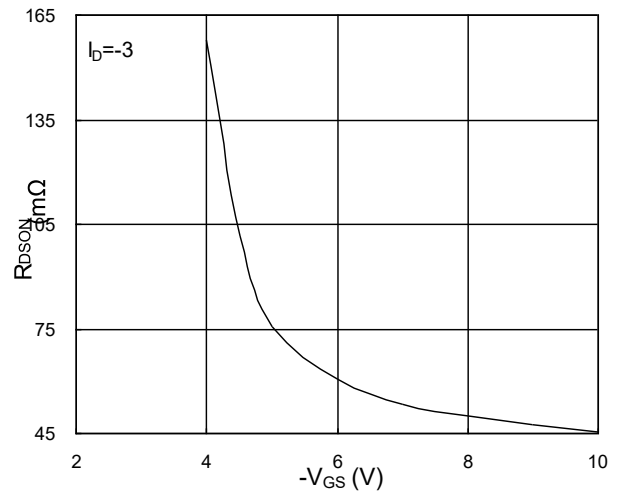
Note : .

- 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 ≅ 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.

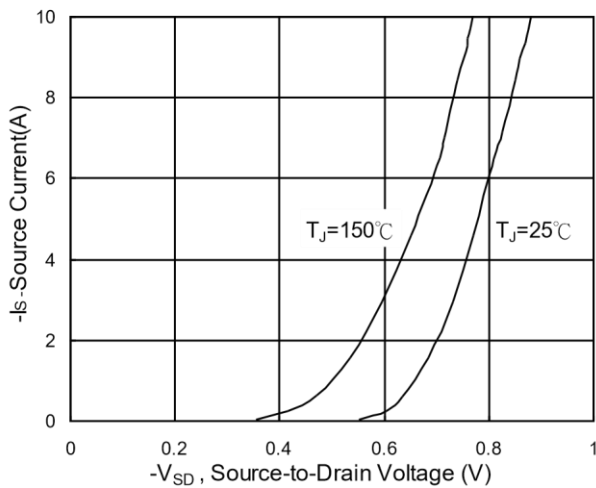
**Typical Characteristics**



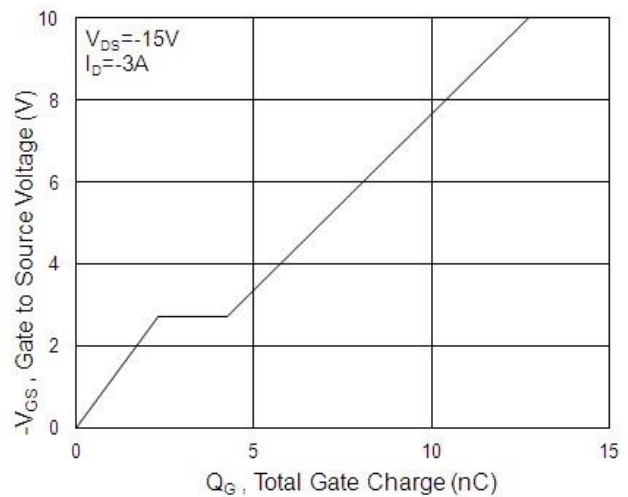
**Fig.1 Typical Output Characteristics**



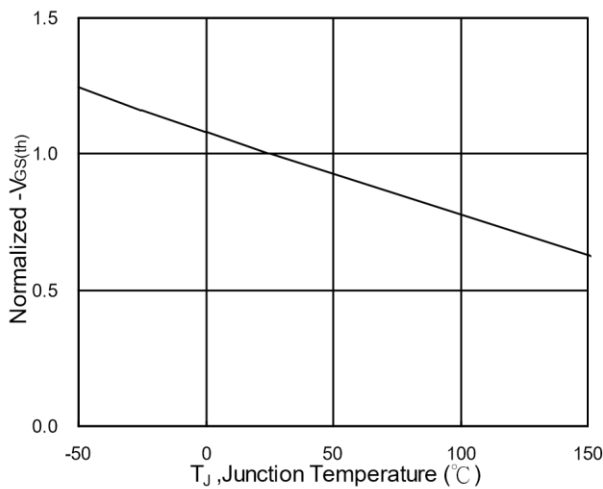
**Fig.2 On-Resistance v.s Gate-Source**



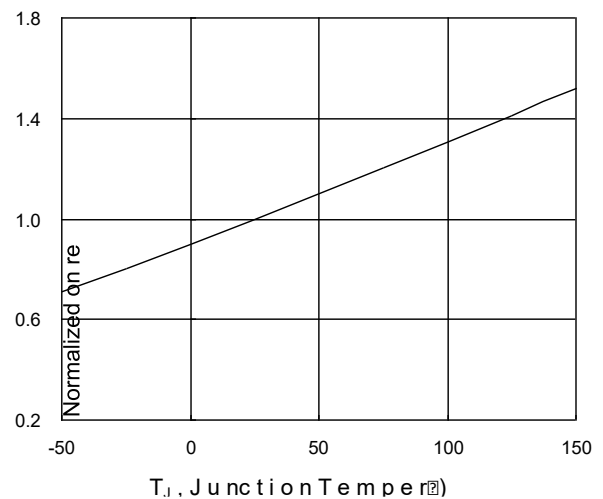
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**



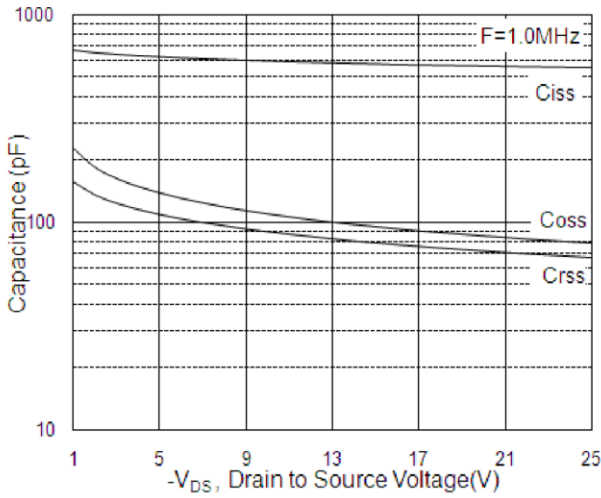
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



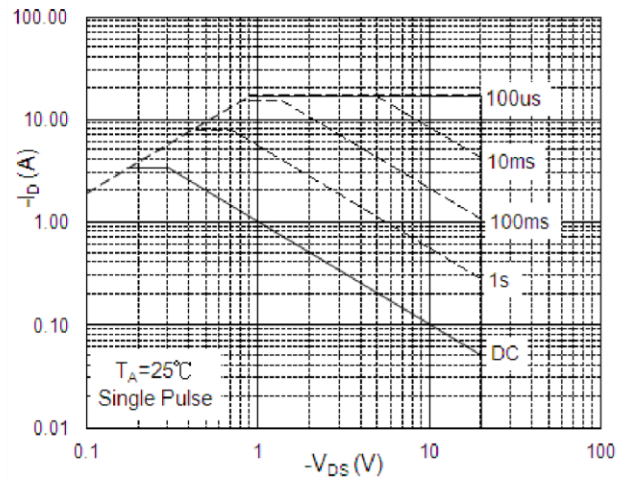
**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**



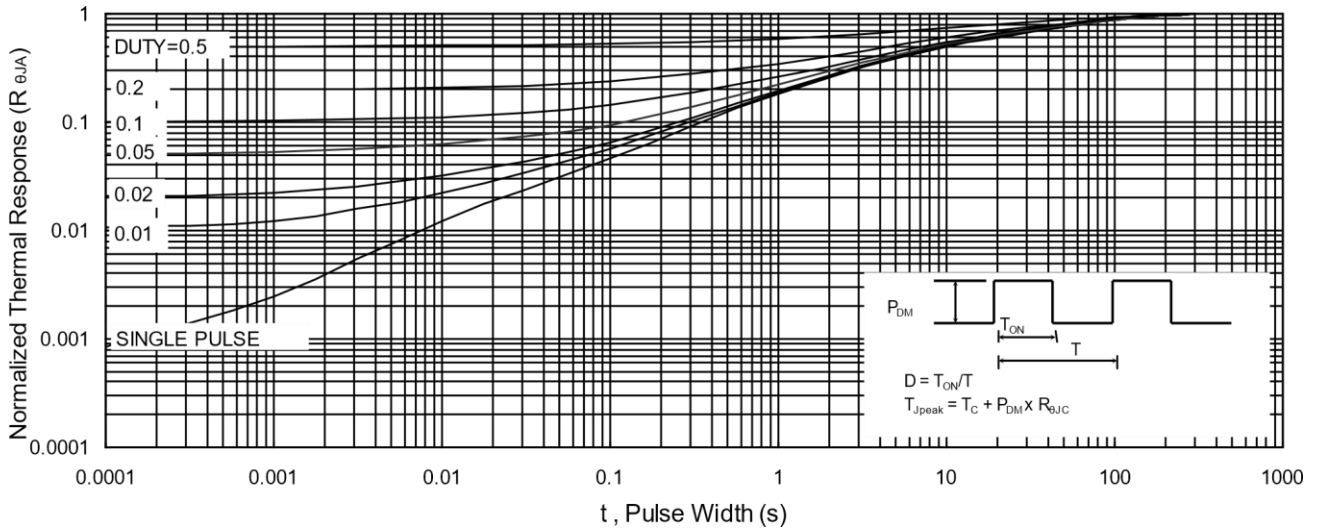
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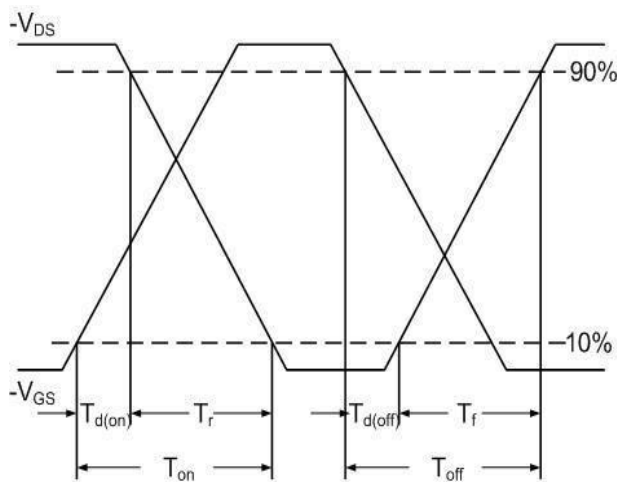
**Fig.7 Capacitance**



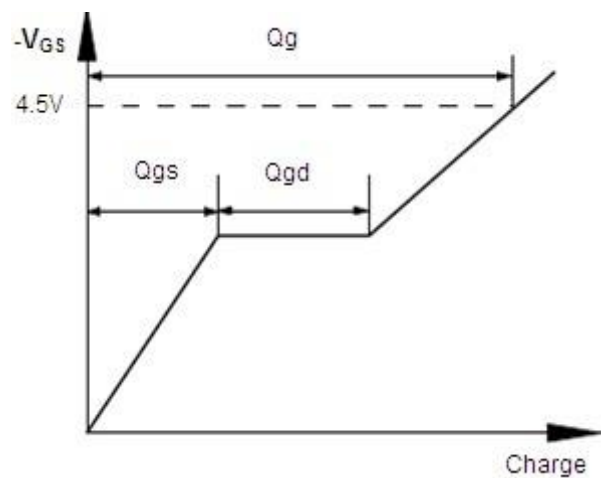
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

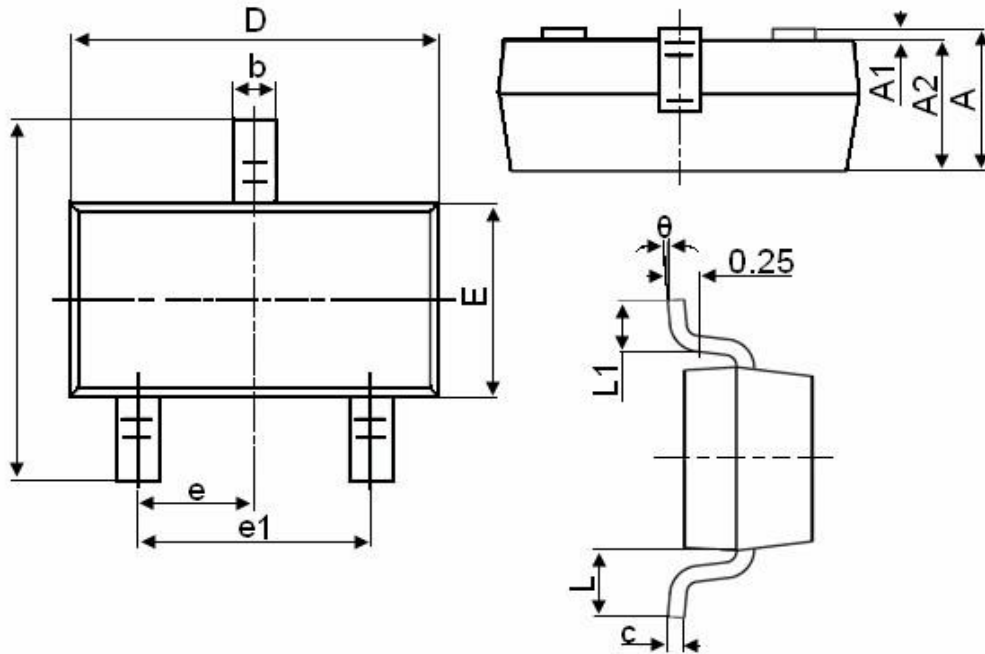


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

### Package Mechanical Data-SOT-23-XC



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
$\theta$	0°	8°

**-30V P-Channel Enhancement Mode MOSFET****Attention**

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