

## -30V P-Channel Enhancement Mode MOSFET

### Description

The AP30P03D 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

$V_{DS} = -30V$   $I_D = -38A$

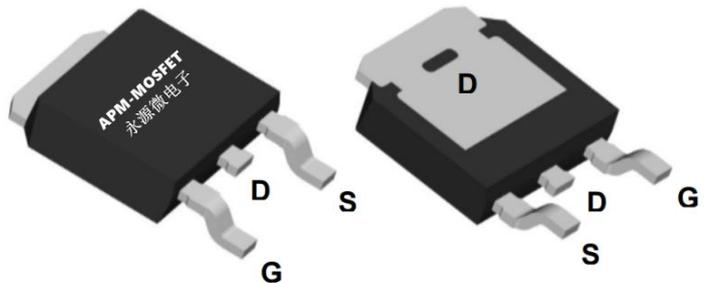
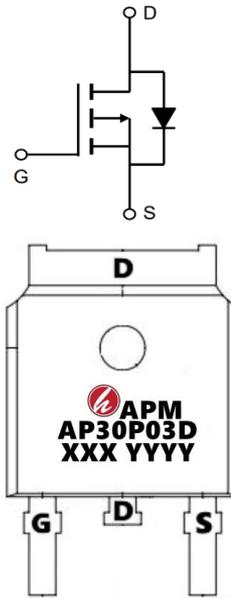
$R_{DS(ON)} < 16m\Omega$  @  $V_{GS} = -10V$  (Type: 12m $\Omega$ )

### Application

Lithium battery protection

Wireless impact

Mobile phone fast charging



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP30P03D	TO-252-3L	AP30P03D XXX YYYY	2500

### Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_{D@TC=25^\circ C}$	Continuous Drain Current, $V_{GS} @ -10V_1$	-38	A
$I_{D@TC=100^\circ C}$	Continuous Drain Current, $V_{GS} @ -10V_1$	-25	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-70	A
$E_{AS}$	Single Pulse Avalanche Energy <sup>3</sup>	172.2	mJ
$I_{AS}$	Avalanche Current	-38	A
$P_{D@TC=25^\circ C}$	Total Power Dissipation <sup>4</sup>	34.7	W
TSTG	Storage Temperature Range	-55 to 150	°C
$T_J$	Operating Junction Temperature Range	-55 to 150	°C
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	62.5	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	3.6	°C/W

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

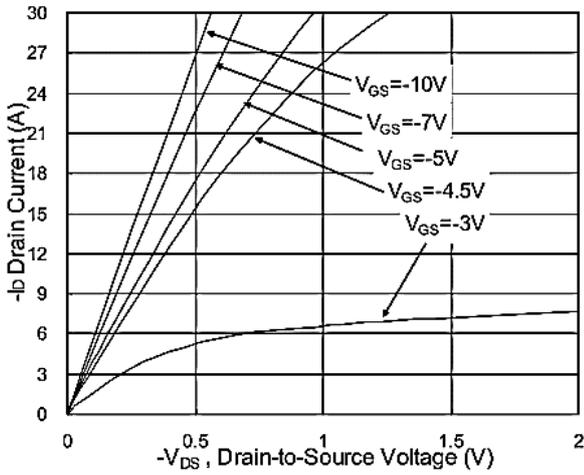
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-30	-33	-	V
IDSS	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -30V, V <sub>GS</sub> =0V,	-	-	-1	μA
IGSS	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.2	-1.5	-2.5	V
RDS(on)	Static Drain-Source on-Resistance note3	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A	-	12	16	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A	-	18	25	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V, V <sub>GS</sub> =0V, f=1.0MHz	-	1550	-	pF
C <sub>oss</sub>	Output Capacitance		-	327	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	278	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -15V, I <sub>D</sub> = -9.1A, V <sub>GS</sub> = -10V	-	30	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	5.3	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	7.6	-	nC
td(on)	Turn-on Delay Time	V <sub>DD</sub> = -15V, I <sub>D</sub> = -6A, V <sub>GS</sub> = -10V, R <sub>GEN</sub> =2.5Ω	-	14	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	20	-	ns
td(off)	Turn-off Delay Time		-	95	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	65	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	-10	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-40	A
VSD	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -11A	-	-0.8	-1.2	V

#### Note :

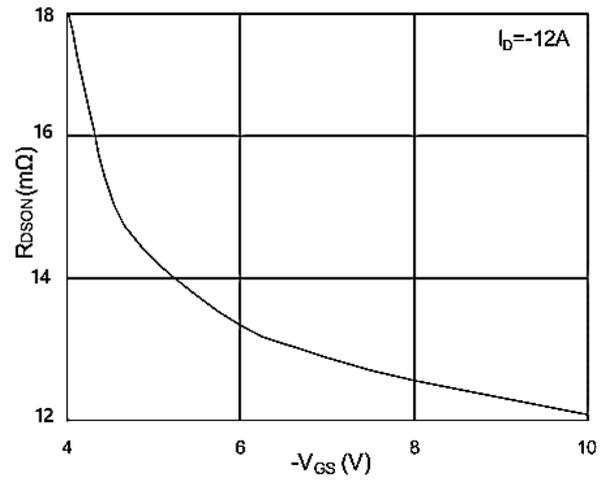
- 1、 The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≅ 300us , duty cycle ≅ 2%
- 3、 The EAS data shows Max. rating . The test condition is VDD=-25V,VGS=-10V,L=0.1mH,IAS=-5A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

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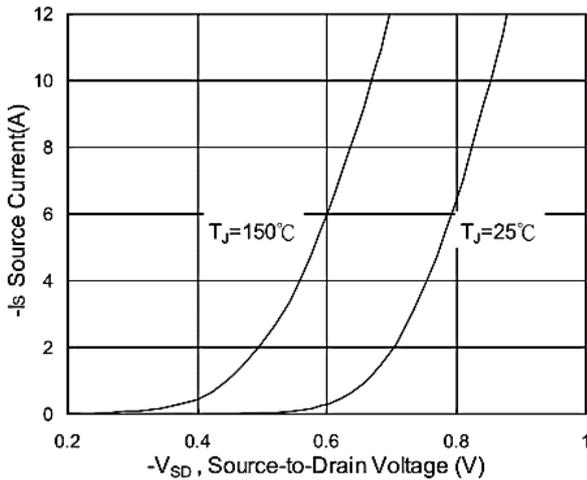
### Typical Characteristics



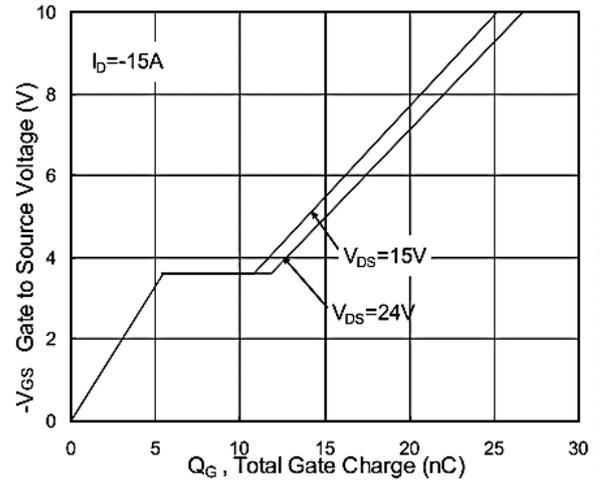
**Fig.1 Typical Output Characteristics**



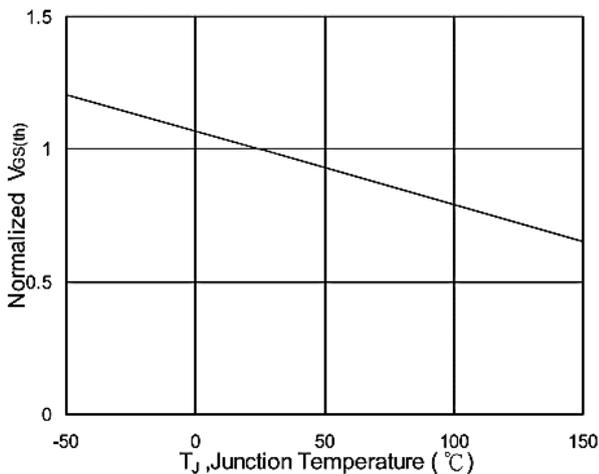
**Fig.2 On-Resistance v.s Gate-Source**



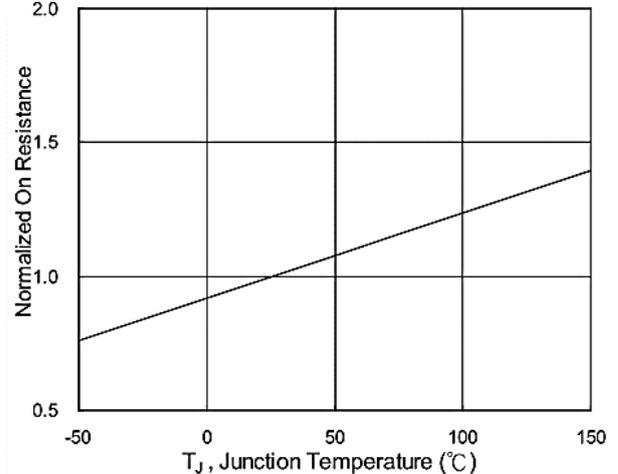
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**

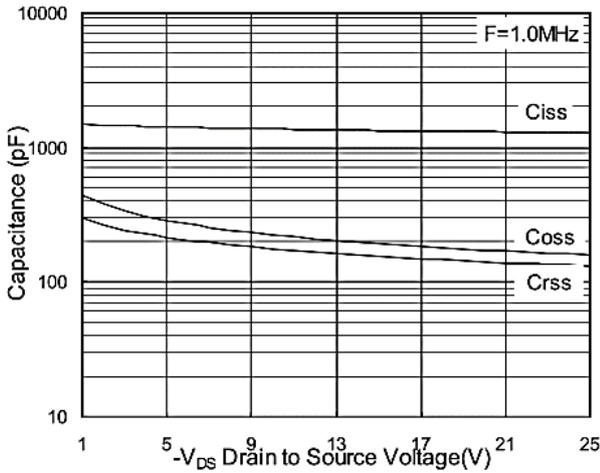


**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**

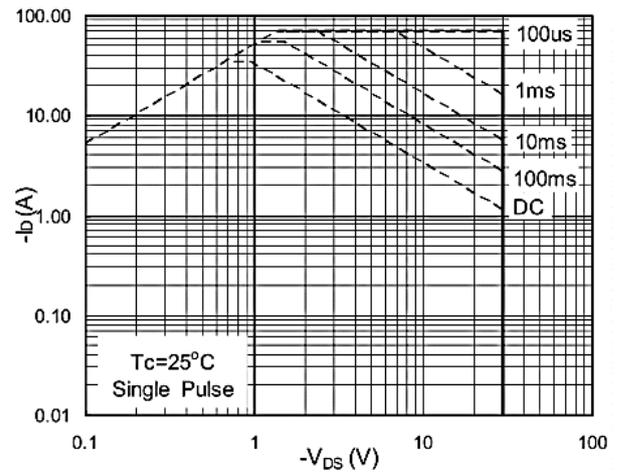


**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**

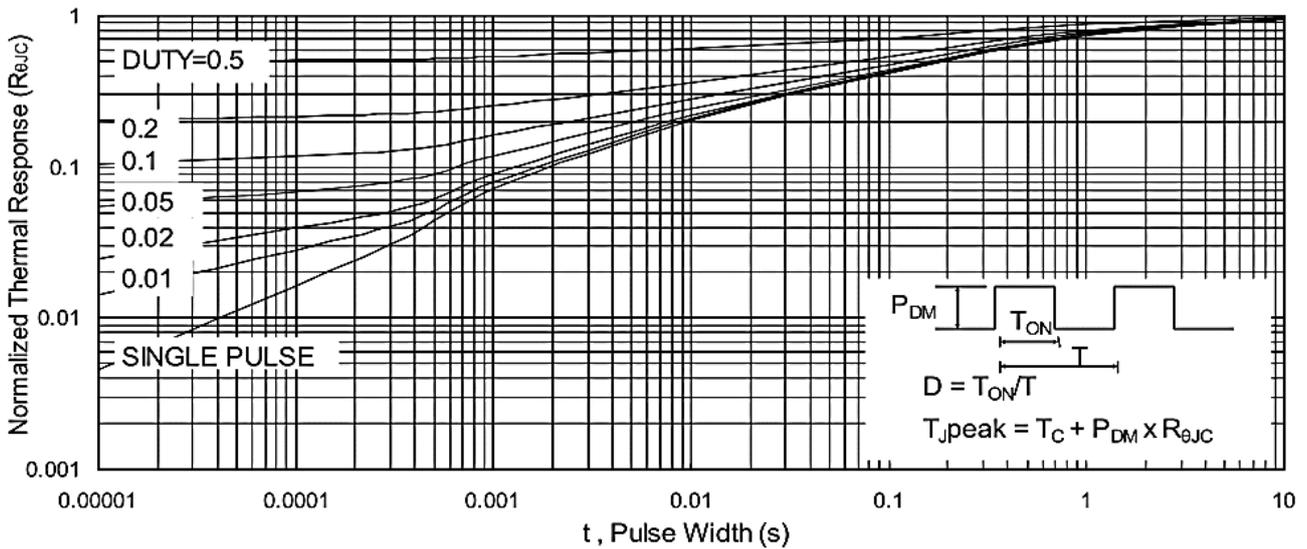
**-30V P-Channel Enhancement Mode MOSFET**



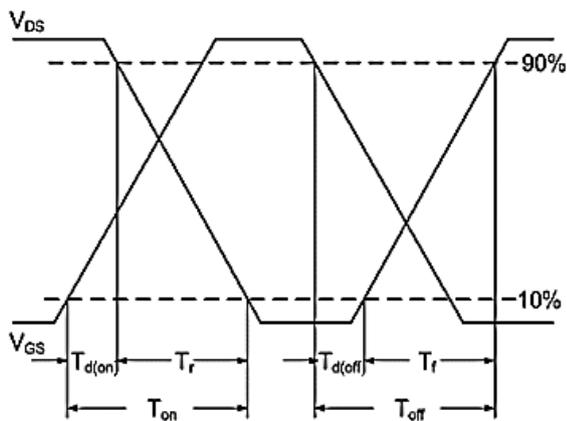
**Fig.7 Capacitance**



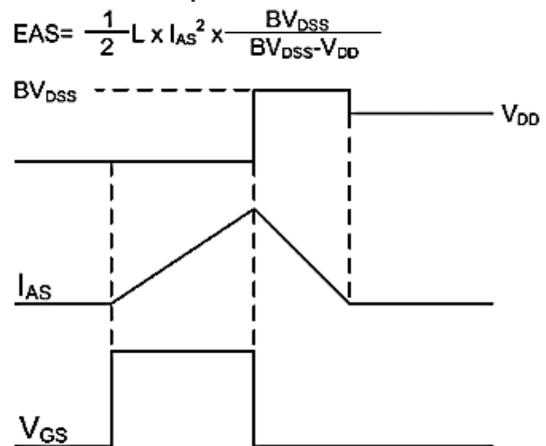
**Fig.8 Safe Operating Area**



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



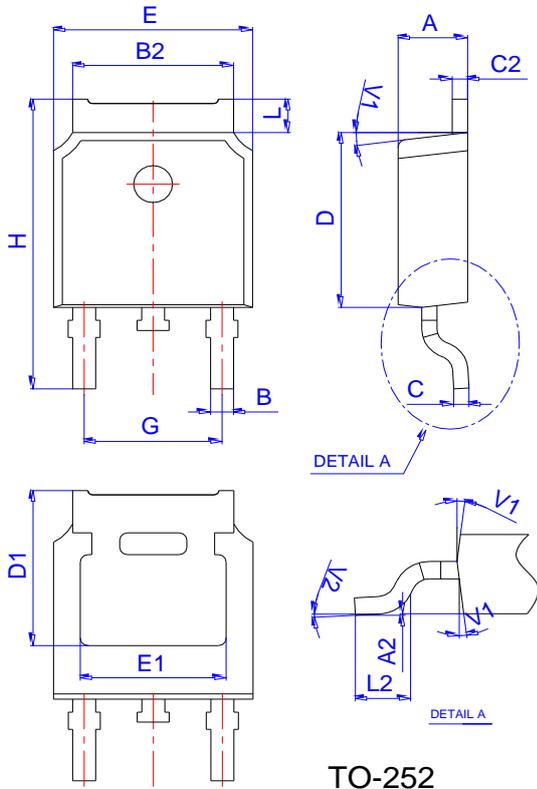
**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

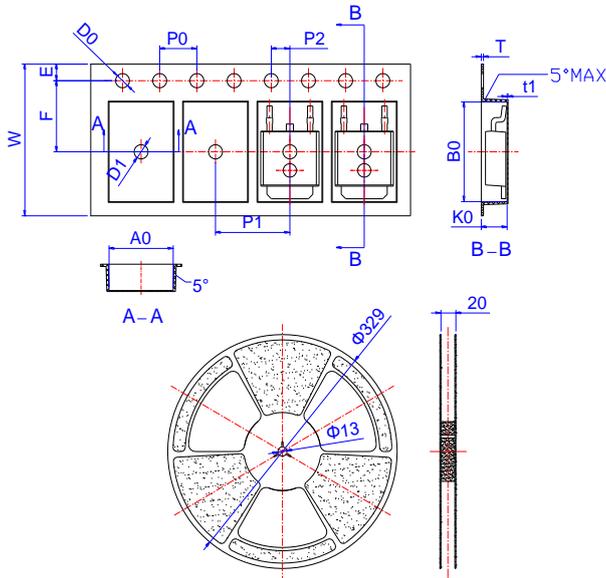
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### Package Mechanical Data:TO-252-3L



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2		0°	6°	0°		6°

### Reel Specification-TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583

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Edition	Date	Change
REV3.0	2018/7/31	Initial release
REV3.1	2022/4/31	Change layout format
REV3.2	2023/4/28	Reduce RDS (on)

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