

## 20V N-Channel Enhancement Mode MOSFET

### Description

The AP120N02D 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

$V_{DS} = 20V$   $I_D = 120A$

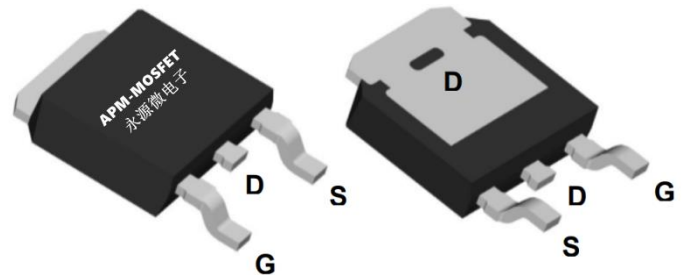
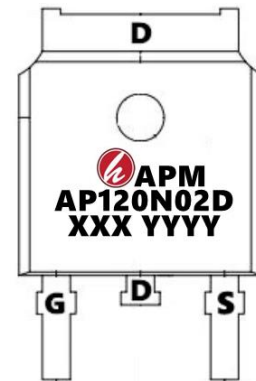
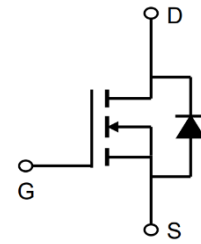
$R_{DS(ON)} < 3.0m\Omega @ V_{GS}=4.5V$  (Type: **2.1m $\Omega$** )

### Application

Battery protection

Load switch

Uninterruptible power supply



### Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP120N02D	TO-252-3L	AP120N02D XXX YYYY	2500

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

Symbol	Parameter	Max.	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, $V_{GS} @ 10V^1$	120	A
$I_D @ T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	69	A
IDM	Pulsed Drain Current <sup>note1</sup>	360	A
EAS	Single Pulsed Avalanche Energy <sup>note2</sup>	110	mJ
$P_D$	Power Dissipation	83	W
$R_{\theta JA}$	Thermal Resistance Junction-ambient	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	1.85	$^\circ C/W$
TJ, TSTG	Operating and Storage Temperature Range	-55 to +175	$^\circ C$

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

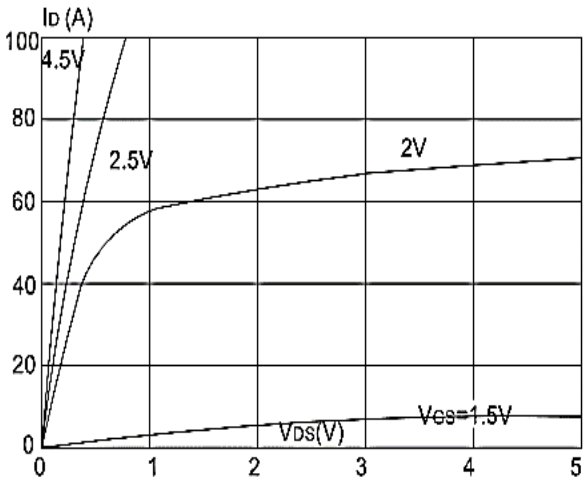
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
V(BR)DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20	22	-	V
IDSS	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V	-	-	1	μA
IGSS	Gate to Body Leakage Current	V <sub>GS</sub> = ±12V, V <sub>DS</sub> =0V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.5	0.68	1.0	V
RDS(on)	Static Drain-Source On-Resistance note3	V <sub>GS</sub> =4.5V, I <sub>D</sub> =30A	-	2.1	3.5	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =20A		3.2	4.0	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1.0MHz	-	4307	-	pF
C <sub>oss</sub>	Output Capacitance		-	501	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	321	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =10V, I <sub>D</sub> =30A, V <sub>GS</sub> =4.5V	-	48	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	3.6	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	19	-	nC
td(on)	Turn-On Delay Time	V <sub>DS</sub> =10V, I <sub>D</sub> =30A, R <sub>G</sub> =1.8Ω, V <sub>GS</sub> =4.5V	-	9.7	-	ns
t <sub>r</sub>	Turn-On Rise Time		-	37	-	ns
td(off)	Turn-Off Delay Time		-	63	-	ns
t <sub>f</sub>	Turn-Off Fall Time		-	52	-	ns
IS	Maximum Continuous Drain to Source Diode Forward Current		-	-	120	A
ISM	Maximum Pulsed Drain to Source Diode Forward Current		-	-	360	A
VSD	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>SD</sub> =30A, T <sub>J</sub> =25°C	-	-	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, I <sub>F</sub> =30A, di/dt =100A/μs	-	23	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	10	-	nC

**Note :**

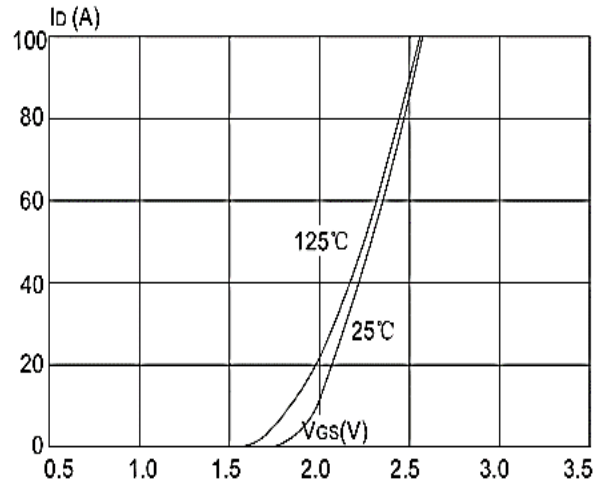
- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width .The EAS data shows Max. rating .
- 3、 The EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=16V, V<sub>G</sub>=4.5V, R<sub>G</sub>=25Ω, L=0.1mH, I<sub>AS</sub>=55A
- 4、 The power dissipation is limited by 175°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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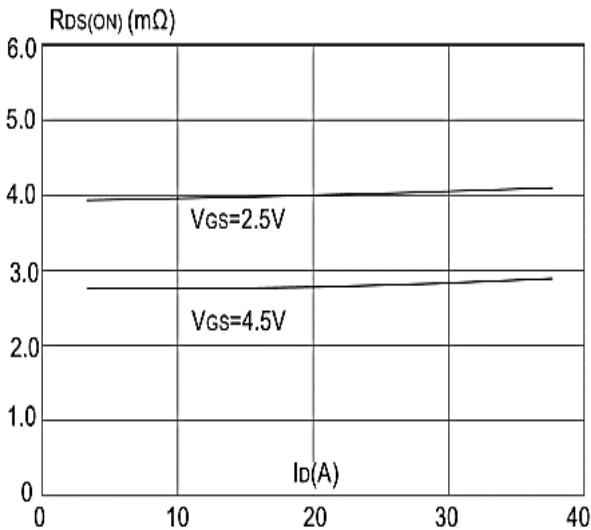
### Typical Characteristics



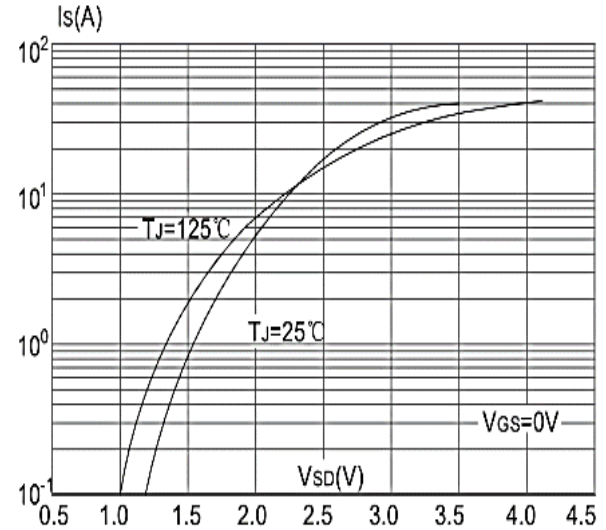
**Figure 1: Output Characteristics**



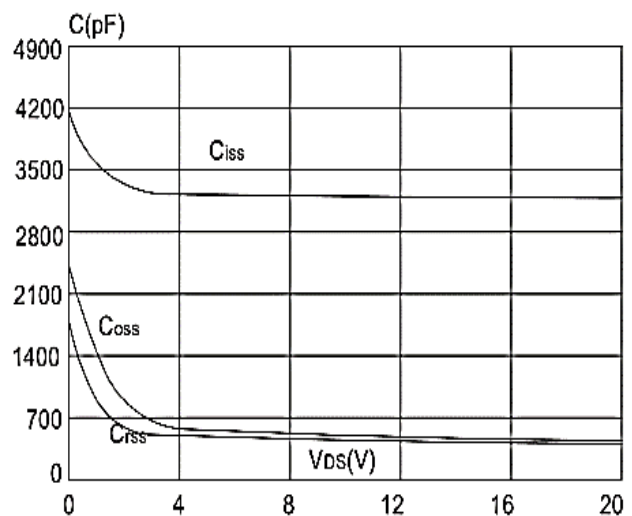
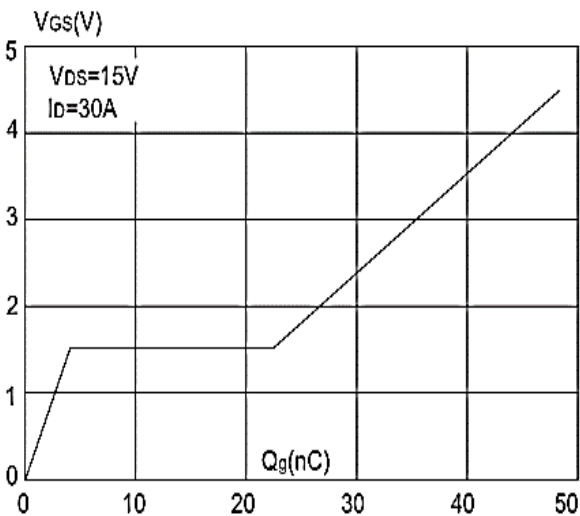
**Figure 2: Typical Transfer Characteristics**



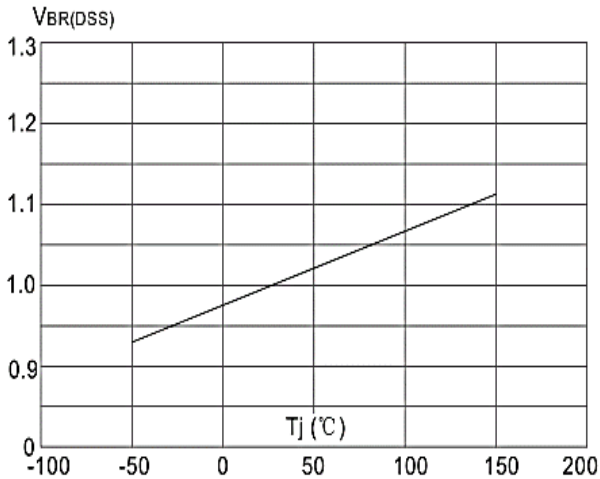
**Figure 3: On-resistance vs. Drain Current**



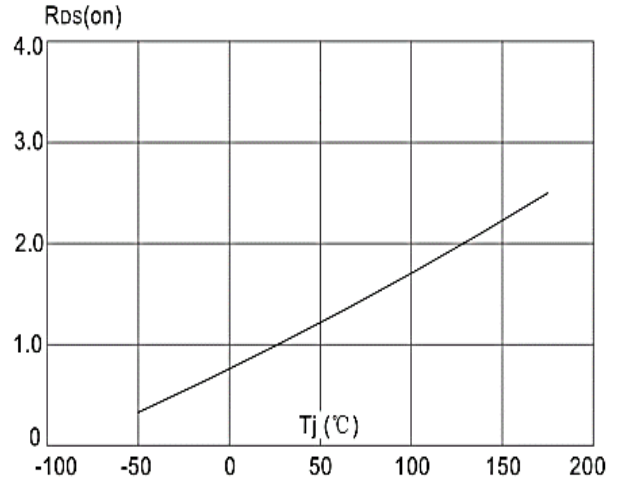
**Figure 4: Body Diode Characteristics**



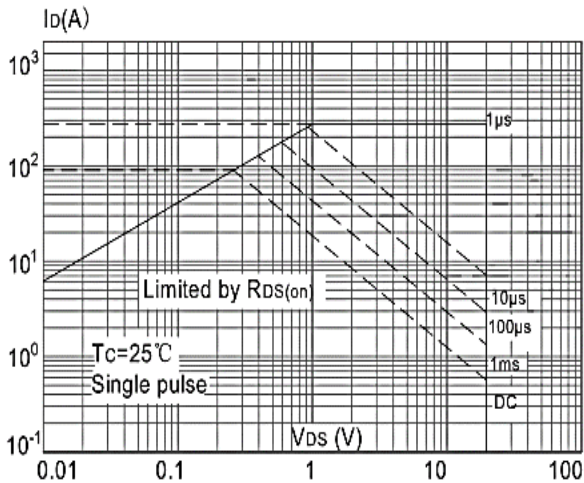
## 20V N-Channel Enhancement Mode MOSFET



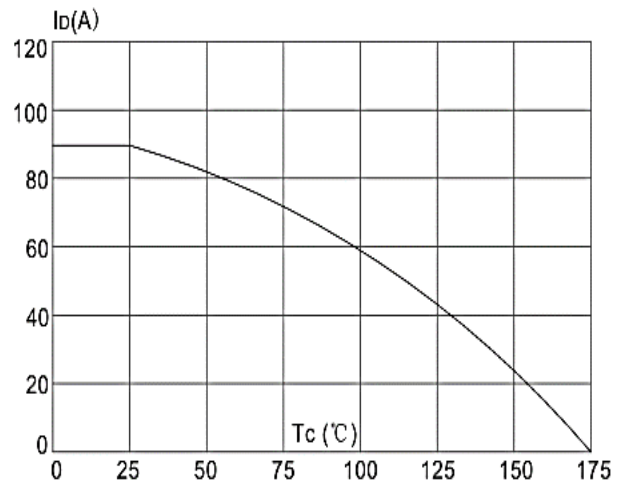
**Figure 7: Normalized Breakdown Voltage vs Junction Temperature**



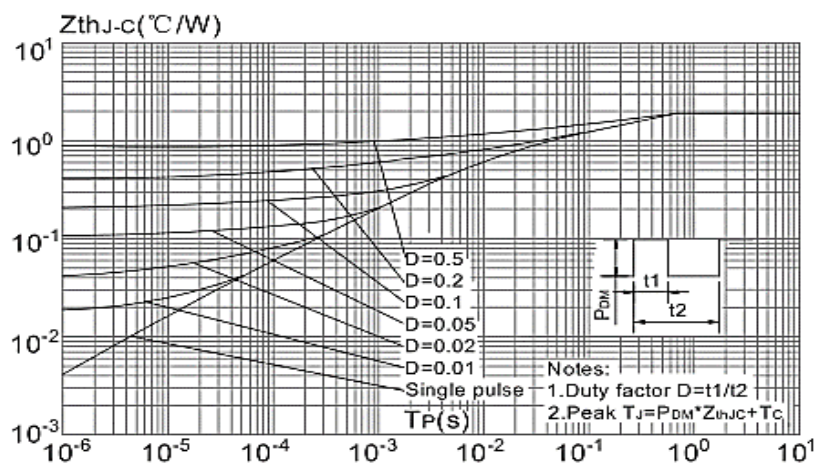
**Figure 8: Normalized on Resistance vs. Junction Temperature**



**Figure 9: Maximum Safe Operating Area**

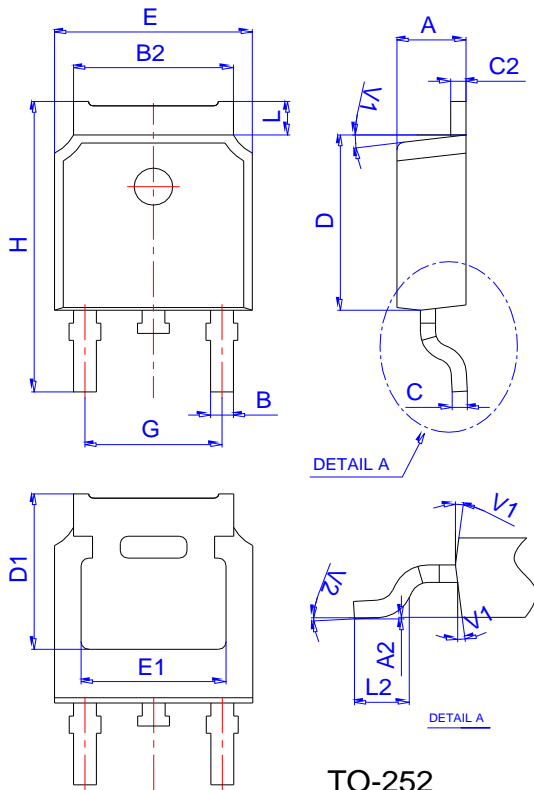


**Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature**



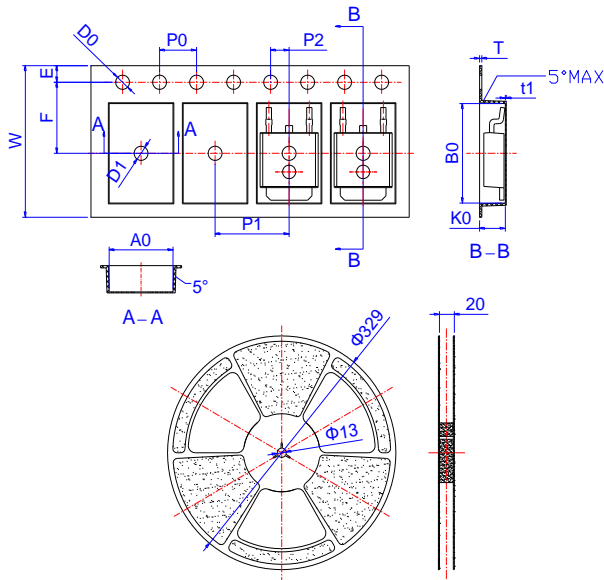
**Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambien**

### 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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## 20V N-Channel Enhancement Mode MOSFET

Edition	Date	Change
Rve1.0	2021/8/31	Initial release

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