AP90N02NF

20V N-Channel Enhancement Mode MOSFET

Description

The AP90N02NF 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.
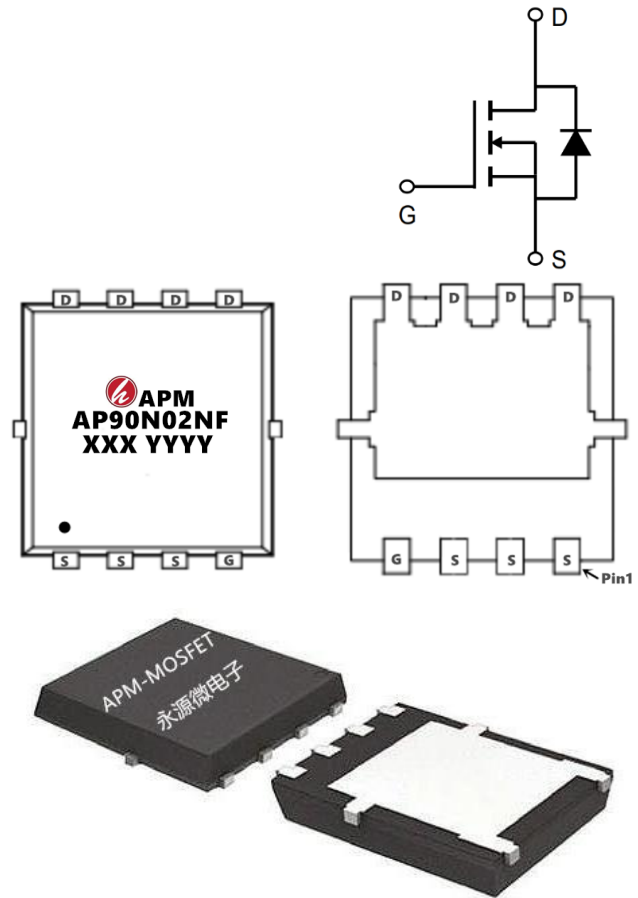
General Features

V_{DS} = 20V I_D =90 A

$R_{DS(ON)}$ < 2mΩ @ V_{GS}=10V

Application

Battery protection

Load switch

Uninterruptible power supply

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP90N02NF	PDFN5*6-8L	AP90N02NF XXX YYYY	5000

Absolute Maximum Ratings (T_C=25℃ unless otherwise noted)

Symbol	Parameter	Rating	Units
VDS	Drain-Source Voltage	20	V
VGS	Gate-Source Voltage	±12	V
I_D@T_C=25℃	Continuous Drain Current[1]	90	A
I_D@T_C=100℃	Continuous Drain Current[1]	48	A
IDM	Pulsed Drain Current[2]	270	A
EAS	Single Pulse Avalanche Energy[3]	80	mJ
IAS	Avalanche Current	40	A
P_D@T_C=25℃	Total Power Dissipation[4]	83	W
TSTG	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃
$R_{\theta}JA$	Thermal Resistance Junction-ambient [1](t≦10S)	20	℃/W
$R_{\theta}JA$	Thermal Resistance Junction-ambient [1](Steady State)	55	℃/W
$R_{\theta}JC$	Thermal Resistance Junction-case [1]	1.5	℃/W

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Electrical Characteristics (T$_C$=25℃ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
BVDSS	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	20	23	---	V
VGS(th)	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	0.5	0.68	1.0	V
RDS(ON)	Static Drain-Source On-Resistance[2]	V$_{GS}$=10V , I$_D$=20A	---	1.6	2.0	mΩ
RDS(ON)	Static Drain-Source On-Resistance[2]	V$_{GS}$=4.5V , I$_D$=20A		1.9	2.5	mΩ
RDS(ON)	Static Drain-Source On-Resistance[2]	V$_{GS}$=2.5V , I$_D$=20A	---	2.8	3.8	mΩ
IDSS	Drain-Source Leakage Current	V$_{DS}$=16V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=16V , V$_{GS}$=0V , T$_J$=125℃	---	---	5	
IGSS	Gate-Source Leakage Current	V$_{GS}$=±10V , V$_{DS}$=0V	---	---	±10	uA
Rg	Gate Resistance	V$_{DS}$=0V , V$_{GS}$=0V , f=1MHz	---	1.2	---	Ω
Q$_g$	Total Gate Charge (10V)	V$_{DS}$=15V , V$_{GS}$=10V , I$_D$=20A	---	77	---	nC
Qgs	Gate-Source Charge		---	8.7	---	
Qgd	Gate-Drain Charge		---	14	---	
Td(on)	Turn-On Delay Time	V$_{DD}$=15V , V$_{GS}$=10V , R$_G$=3□, I$_D$=20A	---	10.2	---	ns
T$_r$	Rise Time		---	11.7	---	
Td(off)	Turn-Off Delay Time		---	56.4	---	
T$_f$	Fall Time		---	16.2	---	
Ciss	Input Capacitance	V$_{DS}$=10V , V$_{GS}$=0V , f=1MHz	---	4307	---	pF
Coss	Output Capacitance		---	501	---	
Crss	Reverse Transfer Capacitance		---	321	---	
IS	Continuous Source Current[1,5]	V$_G$=V$_D$=0V , Force Current	---	---	50	A
VSD	Diode Forward Voltage[2]	V$_{GS}$=0V , I$_S$=1A , T$_J$=25℃	---	---	1.2	V
trr	Reverse Recovery Time	IF=20A , di/dt=100A/µs , T$_J$=25℃	---	22	---	nS
Q$_{rr}$	Reverse Recovery Charge		---	72	---	nC

Note :

1、The data tested by surface mounted on a 1 inch2 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=16V,VGS=10V,L=0.1mH,IAS=39A

4、The power dissipation is limited by 175℃ junction temperature

5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.
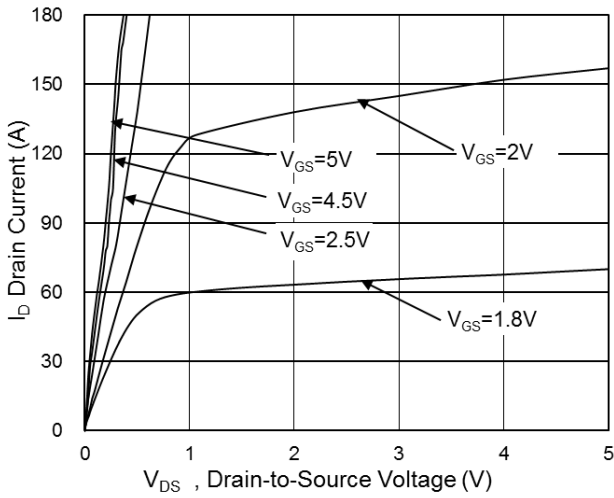
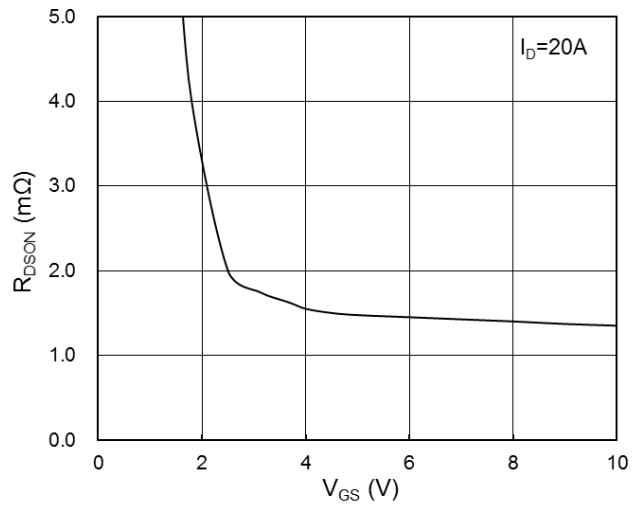## Typical Characteristics

Fig.1 Typical Output Characteristics
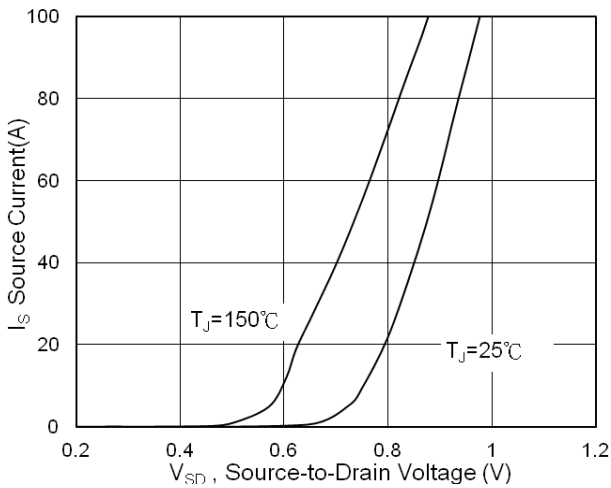

Fig.2 On-Resistance vs. Gate-Source Voltage

Fig.3 Forward Characteristics of Reverse

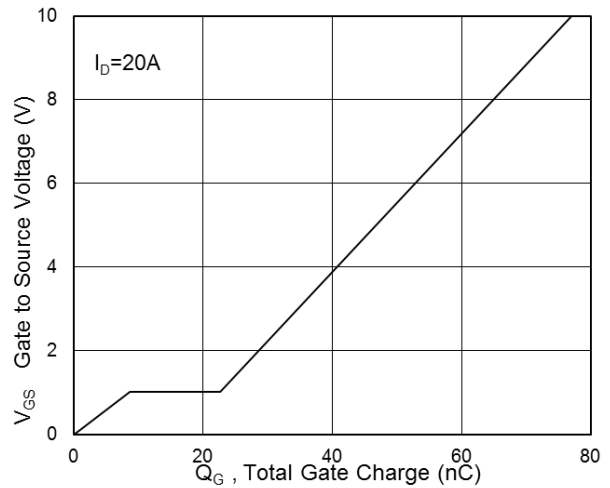**Fig.4 Gate-Charge Characteristics**

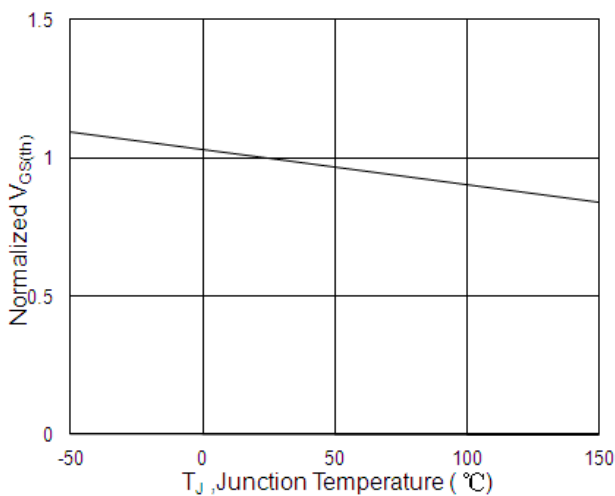**Fig.5 Normalized $V_{GS(th)}$ vs. T_J**
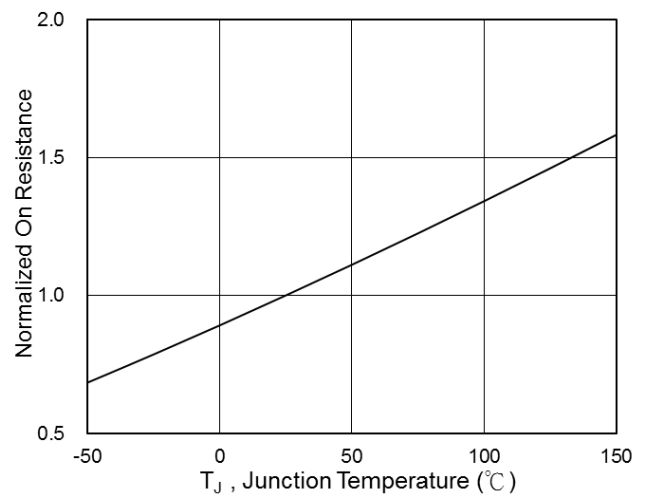
Fig.6 Normalized R_{DSON} vs. T_J

AP90N02NF RVE1.0　　　　　　　　　　　　　　　　　　　永源微電子科技有限公司
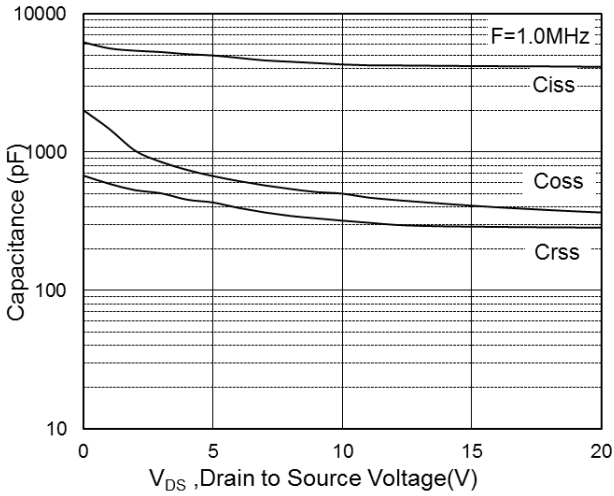
Fig.7 Capacitance
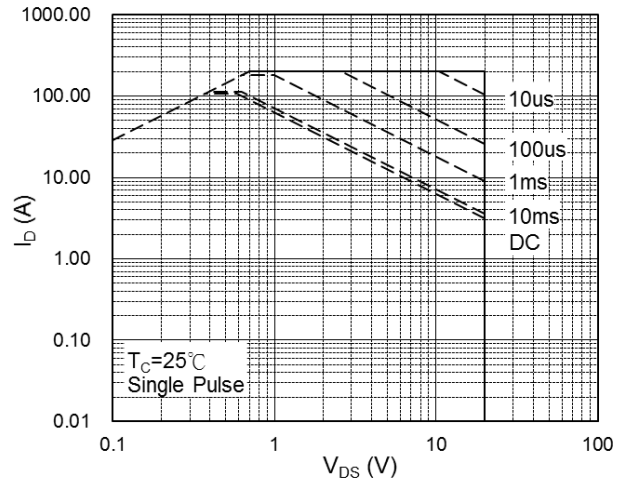
Fig.8 Safe Operating Area

$D = T_{ON}/T$

$T_{Jpeak} = T_C + P_{DM} X R_{\theta JC}$

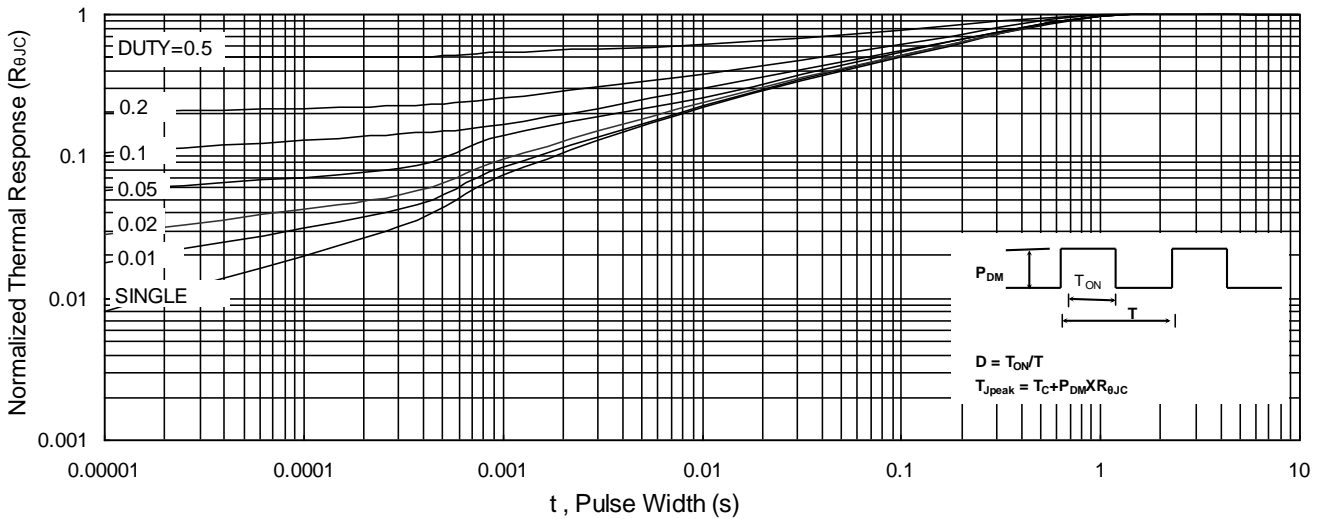**Fig.9 Normalized Maximum Transient Thermal Impedance**
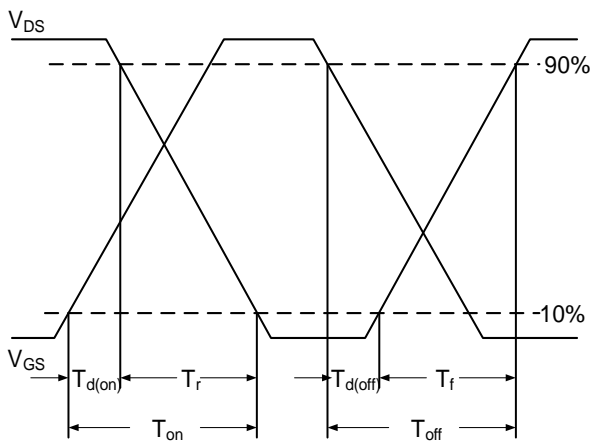
Fig.10 Switching Time Waveform

$$EAS = \frac{1}{2}L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$
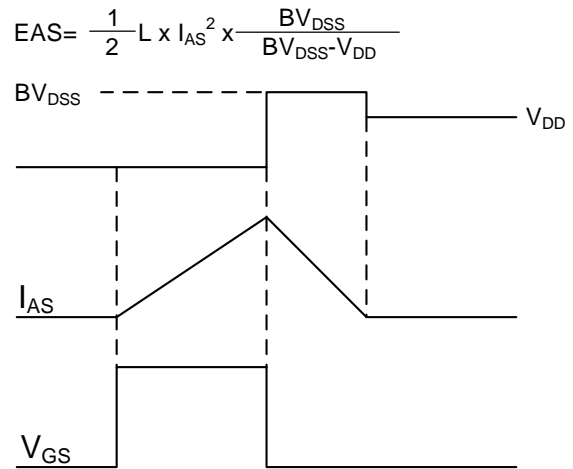
Fig.11 Unclamped Inductive Switching Waveform

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Package Mechanical Data-DFN5*6-8L-JQ Single
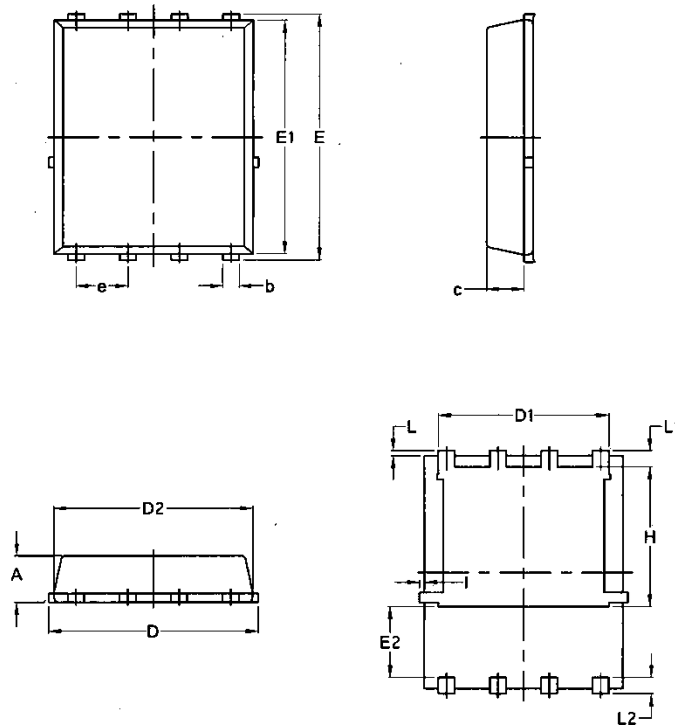
Symbol	Common			
	mm		Inch	
	Mim	Max	Min	Max
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.824	0.0970	0.0324	0.082
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	/	0.0630	/
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	/	0.18	/	0.0070

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Edition	Date	Change
Rve1.0	2020/3/31	Initial release

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