AP40N02DF

20V N-Channel Enhancement Mode MOSFET

Description

The AP40N02DF 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 =40A

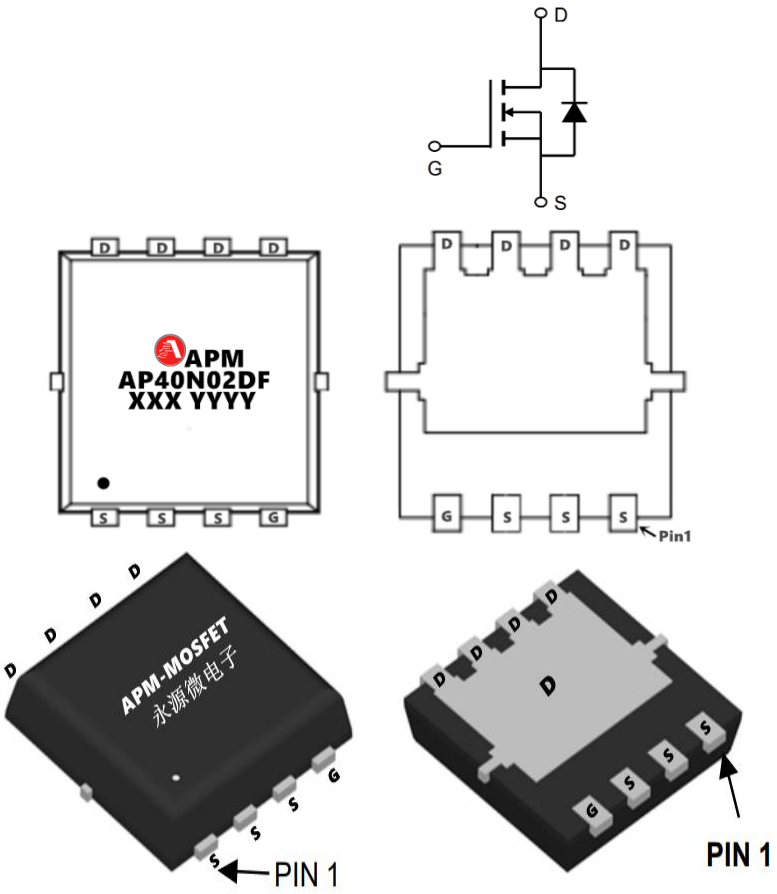
$R_{DS(ON)}$ < 9mΩ @ V_{GS}=4.5V （**Type：7.0mΩ**）

Application

3.3V MCU Drive

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP40N02DF	PDFN3X3-8L	AP40N02DF XXX YYYY	3000

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

Symbol	Parameter	Max.	Units
VDSS	Drain-Source Voltage	20	V
VGSS	Gate-Source Voltage	±12	V
ID@TA=25℃	Continuous Drain Current, VGS @ 4.5V	40	A
ID@TA=70℃	Continuous Drain Current, VGS @ 4.5V	25	A
IDM	Pulsed Drain Current note1	110	A
IAS	Avalanche Current	38	A
EAS	Single Pulsed Avalanche Energy note2	130	mJ
PD@TA=25℃	Power Dissipation	37	W
TJ, TSTG	Operating and Storage Temperature Range	-55 to +175	℃
RθJA	Thermal Resistance Junction-Ambient [1]	85	℃/W
RθJC	Thermal Resistance, Junction to Case	4.8	℃/W

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

Symbol	Parameter	Condition	Min	Typ	Max	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=250μA	20	22	-	V
IDSS	Zero Gate Voltage Drain Current	V_{DS}=20V,V_{GS}=0V	-	-	1	μA
IGSS	Gate-Body Leakage Current	V_{GS}=±12V,V_{DS}=0V	-	-	±100	nA
VGS(th)	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	0.5	0.65	1.2	V
RDS(ON)	Drain-Source On-State Resistance	V_{GS}=4.5V, I_D=6A	-	7.0	9.0	mΩ
RDS(ON)	Drain-Source On-State Resistance	V_{GS}=2.5V, I_D=5A	-	9.3	12	mΩ
gFS	Forward Transconductance	V_{DS}=5V,I_D=20A	10	-	-	S
C_{lss}	Input Capacitance	V_{DS}=10V,V_{GS}=0V, F=1.0MHz		625		PF
Coss	Output Capacitance			162		PF
C_{rss}	Reverse Transfer Capacitance			105		PF
td(on)	Turn-on Delay Time	VGS=10V,VDS=10V RL=0. 5Ω,RGEN=3Ω	-	4.5	-	nS
t_r	Turn-on Rise Time		-	9.2	-	nS
td(off)	Turn-Off Delay Time		-	18.7	-	nS
t_f	Turn-Off Fall Time		-	3.3	-	nS
Q_g	Total Gate Charge	VGS=10V,VDS=10V,ID=20A		15		nC
Q_{gs}	Gate-Source Charge			1.8		nC
Q_{gd}	Gate-Drain Charge			2.8		nC
VSD	Diode Forward Voltage (Note 3)	V_{GS}=0V,I_S=25A	-	-	1.2	V
I_S	Diode Forward Current (Note 2)		-	-	25	A
t_{rr}	Reverse Recovery Time	TJ = 25°C, IF = 20A di/dt = 100A/μs	-	18	-	nS
Qrr	Reverse Recovery Charge		-	9.5	-	nC
ton	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

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 power dissipation is limited by 150℃ 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

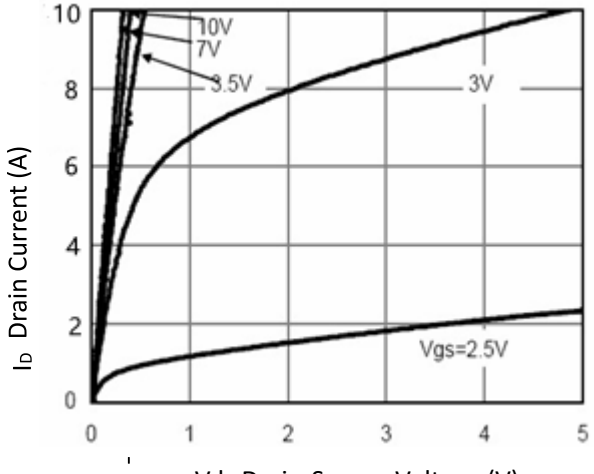


Figure 1 Output Characteristics

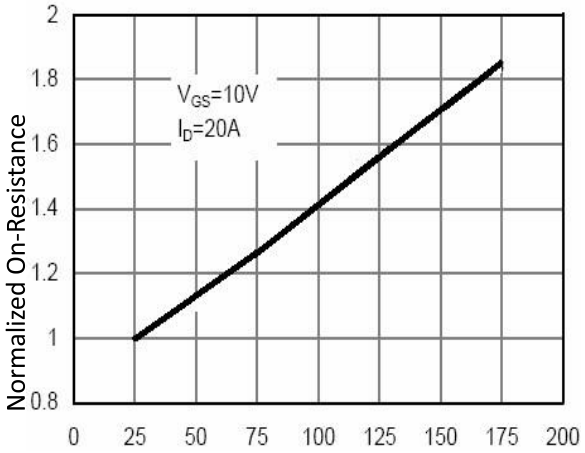


Figure 4 Rdson-Junction Temperature

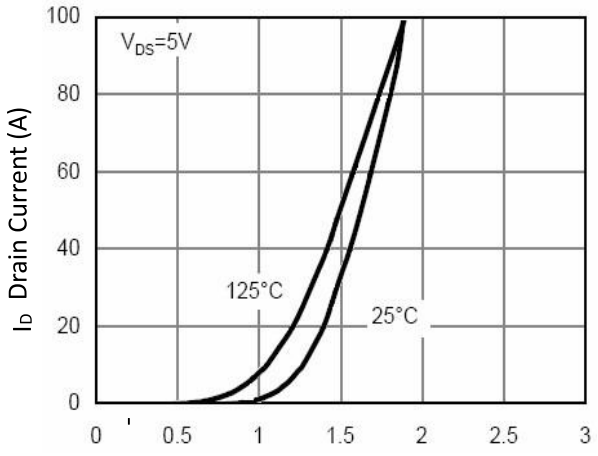


Figure 2 Transfer Characteristics

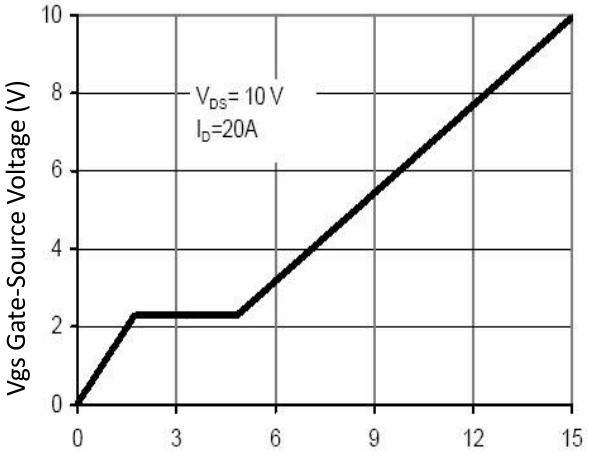


Figure 5 Gate Charge

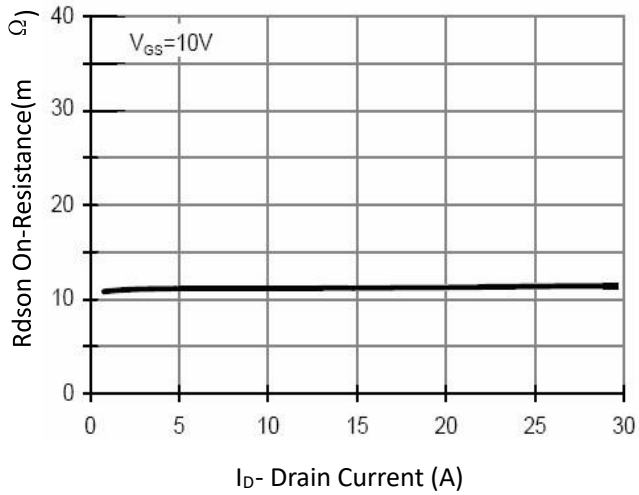


Figure 3 Rdson- Drain Current

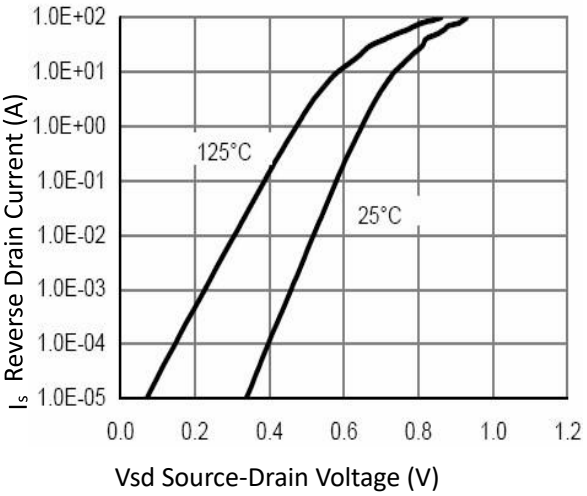


Figure 6 Source- Drain Diode Forward

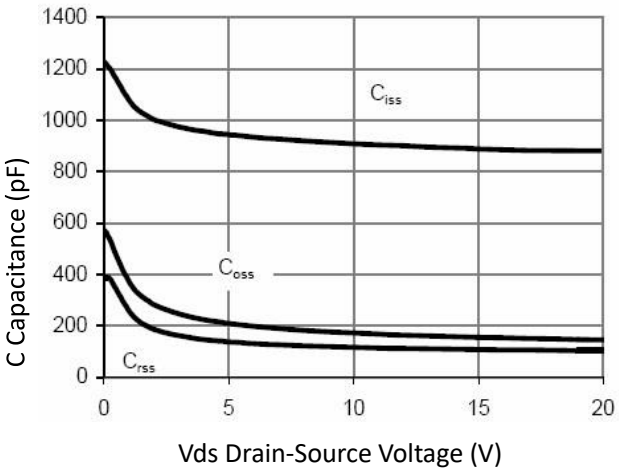


Figure 7 Capacitance vs Vds

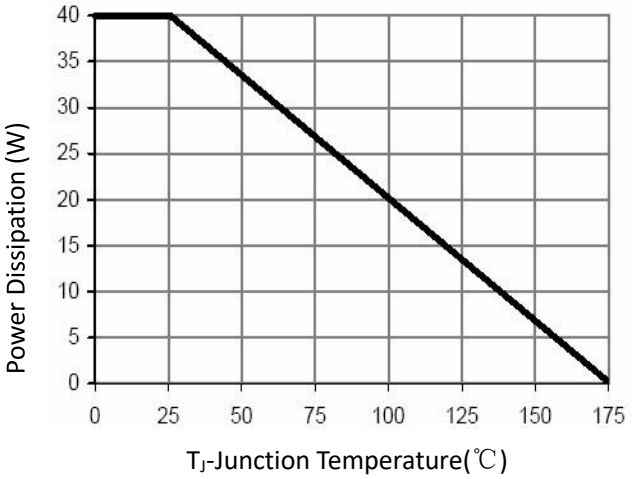


Figure 9 Power De-rating

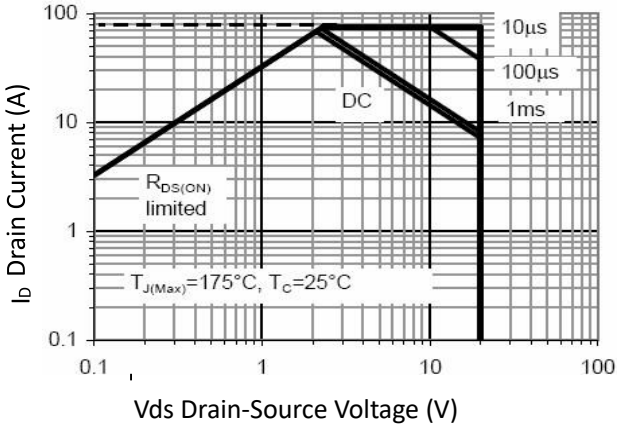


Figure 8 Safe Operation Area

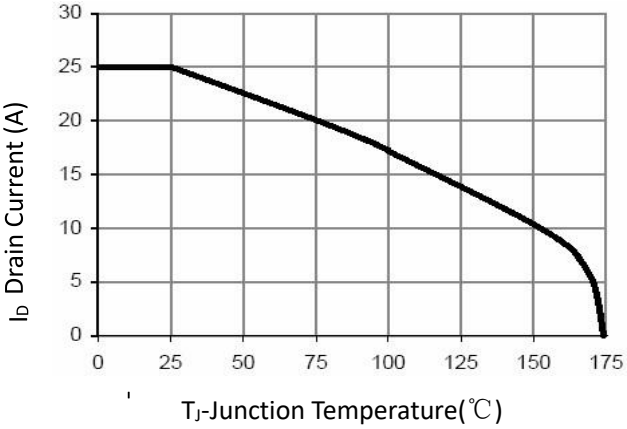


Figure 10 Current De-rating

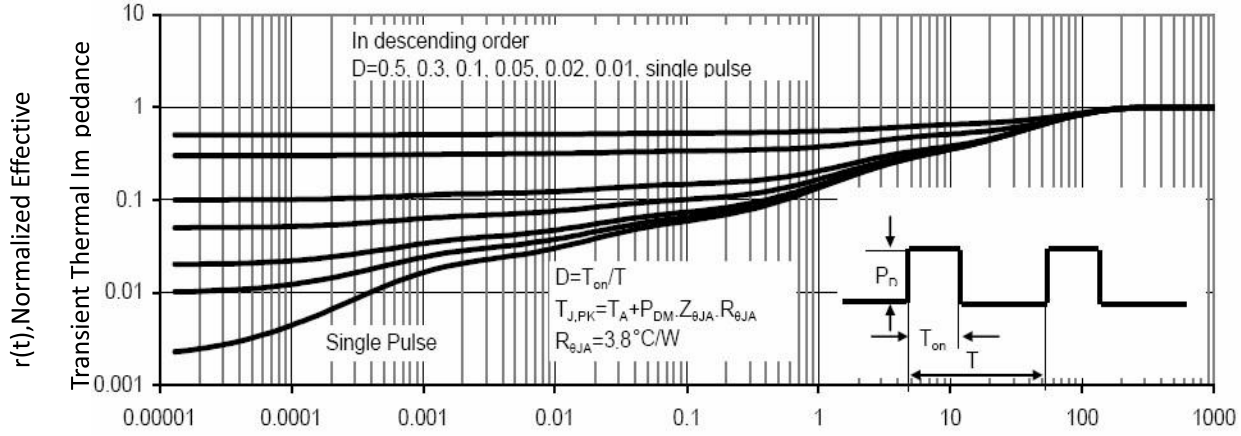
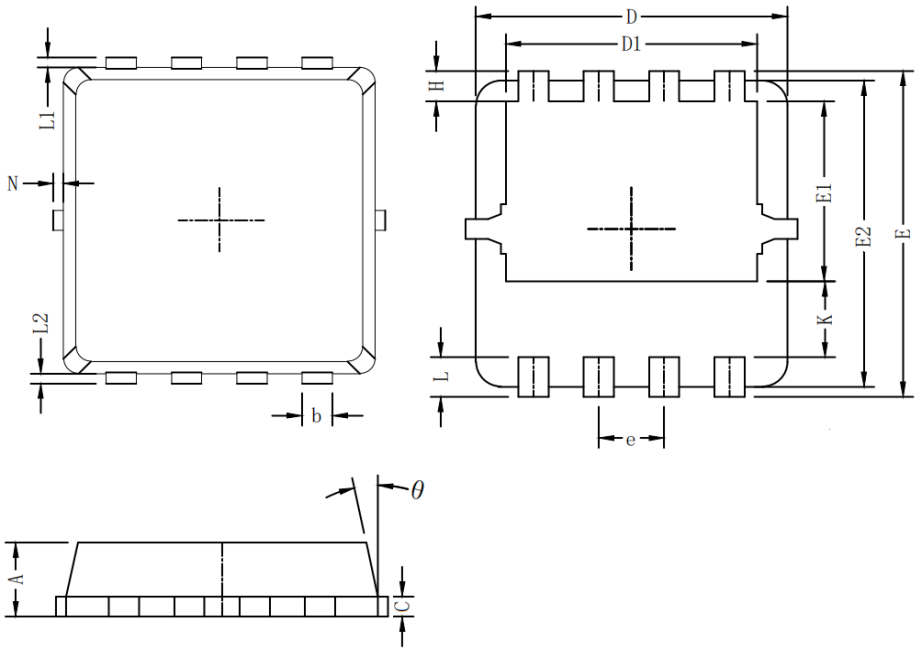


Figure 11 Normalized Maximum Transient Thermal Impedance

Package Mechanical Data-PDFN3X3-8L



Symbol	Dim in mm		
	Min	Typ	Max
A	0.6	0.75	0.9
b	0.2	0.3	0.4
C	0.15	0.2	0.25
D	3	3.1	3.2
D1	2.3	2.45	2.6
E	3.15	3.3	3.45
E1	1.43	1.73	1.93
E2	2.9	3.05	3.2
e	0.65BSC		
H	0.2	0.35	0.5
K	0.57	0.77	0.87
L	0.3	0.4	0.5
L1/L2	0.1REF		
θ	8°	10°	13°
N	0		0.15

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Edition	Date	Change
REV1.0	2023/9/31	Initial release