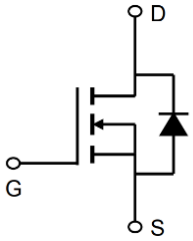
AP50N04DF

40V N-Channel Enhancement Mode MOSFET



Description

The AP50N04DF 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} = 40V I_D =50A

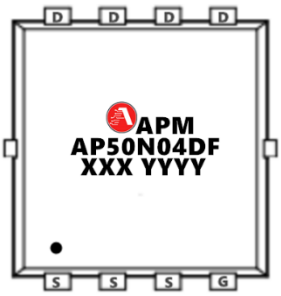
$R_{DS(ON)}$ < 18mΩ @ V_{GS}=10V （**Type：13mΩ**）

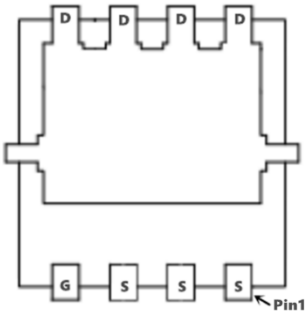
Application

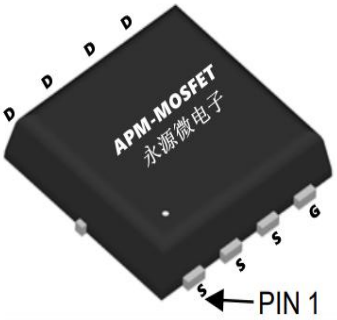
VBUS

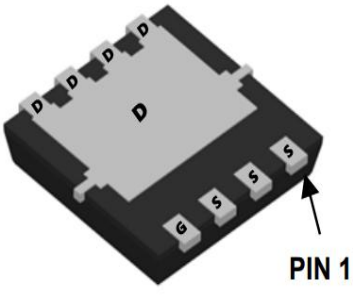
Wireless impact

Mobile phone fast charging









Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP50N04DF	PDFN3*3-8L	AP50N04DF XXX YYYY	5000

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

Symbol	Parameter	Value	Unit
VDS	Drain-Source Voltage	40	V
VGS	Gate-Source Voltage	±20	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	50	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	25	A
IDM	Pulsed Drain Current[2]	180	A
EAS	Single Pulse Avalanche Energy[3]	313	mJ
IAS	Avalanche Current	25	A
P_D@T_C=25℃	Total Power Dissipation[4]	31.3	W
TSTG	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃
R_{θ}JA	Thermal Resistance Junction-ambient	62.5	℃/W
R_{θ}JC	Thermal Resistance Junction-Case[1]	3	℃/W

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	40	44	---	V
△BVDSS/△TJ	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.034	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=5A	---	13	18	mΩ
		V_{GS}=4.5V , I_D=4A	---	18	36	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.2	1.6	2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.56	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=32V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=32V , V_{GS}=0V , T_J=55℃	---	---	5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=5A	---	14	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	2.6	---	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=20V , V_{GS}=4.5V , I_D=5A	---	5.5	---	nC
Q_{gs}	Gate-Source Charge		---	1.25	---	
Q_{gd}	Gate-Drain Charge		---	2.5	---	
Td(on)	Turn-On Delay Time	V_{DD}=20V , V_{GS}=10V , R_G=3.3Ω I_D=1A	---	8.9	---	ns
T_r	Rise Time		---	2.2	---	
Td(off)	Turn-Off Delay Time		---	41	---	
T_f	Fall Time		---	2.7	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	593	---	pF
Coss	Output Capacitance		---	76	---	
Crss	Reverse Transfer Capacitance		---	56	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	6.1	A
ISM	Pulsed Source Current[2,5]		---	---	23	A
VSD	Diode Forward Voltage[2]	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

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=25V,VGS=10V,L=0.1mH,IAS=25A
4、The power dissipation is limited by 150℃ 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

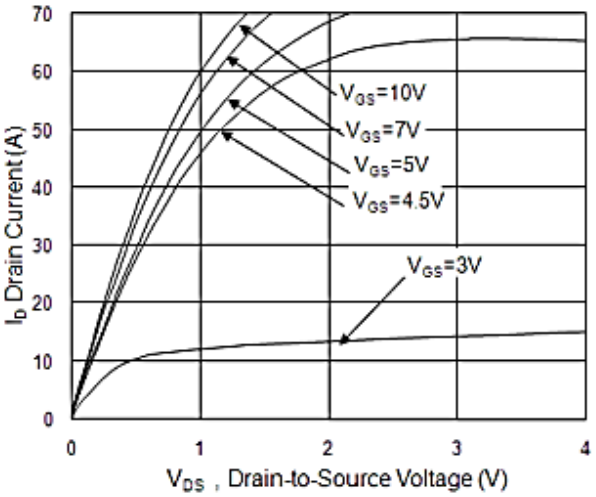


Fig.1 Typical Output Characteristics

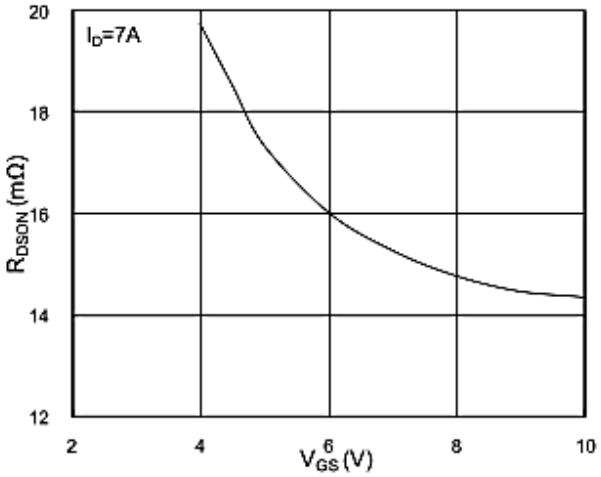


Fig.2 On-Resistance vs. G-S Voltage

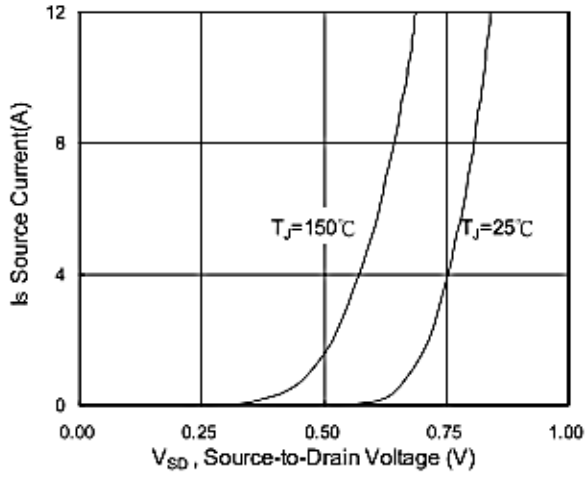


Fig.3 Forward Characteristics of Reverse

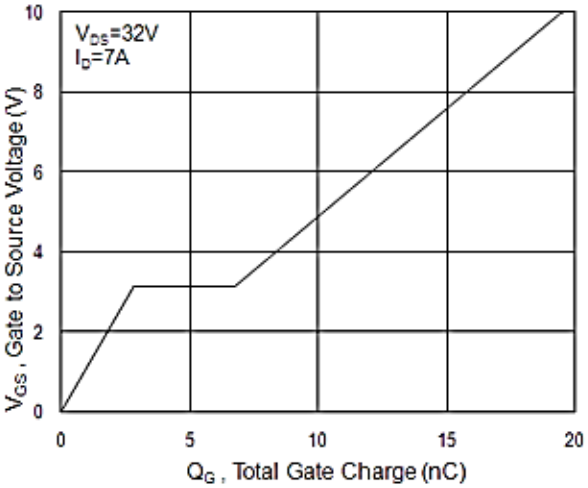


Fig.4 Gate-Charge Characteristics

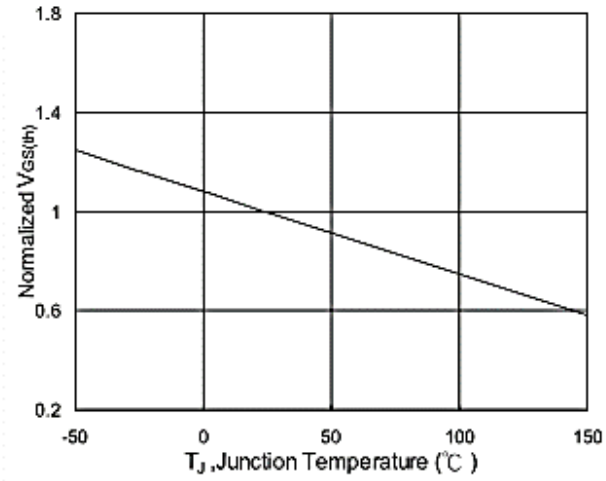


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

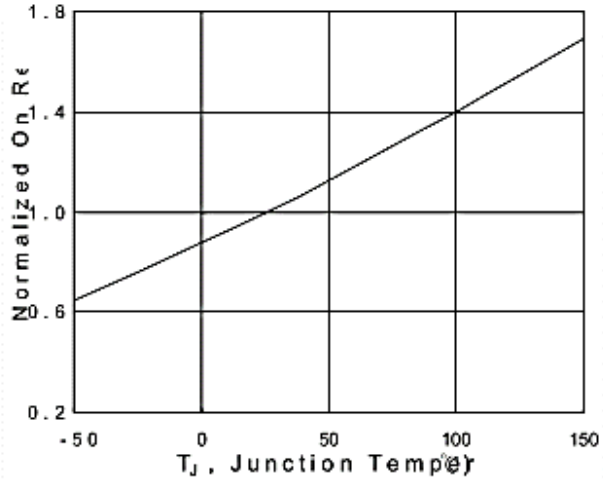


Fig.6 Normalized R_{DSON} vs. T_J

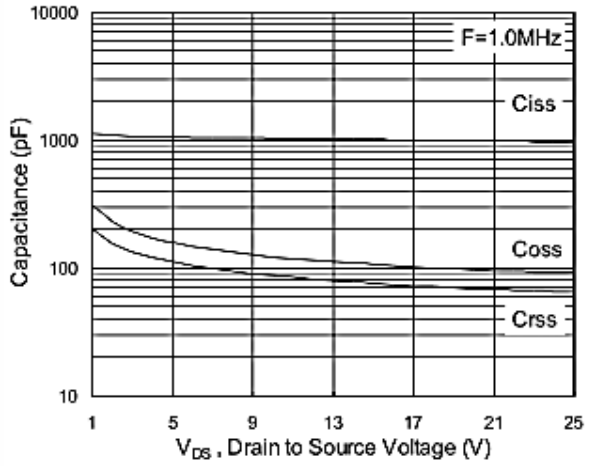


Fig.7 Capacitance

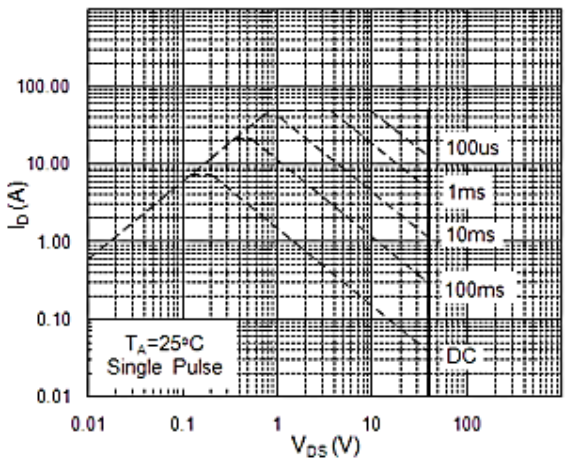


Fig.8 Safe Operating Area

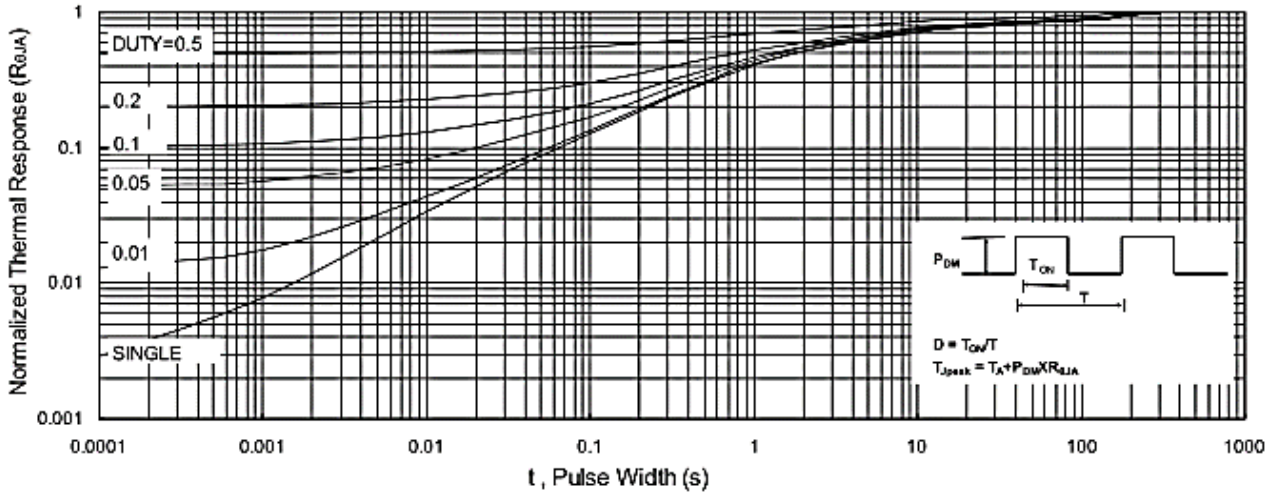


Fig.9 Normalized Maximum Transient Thermal Impedance

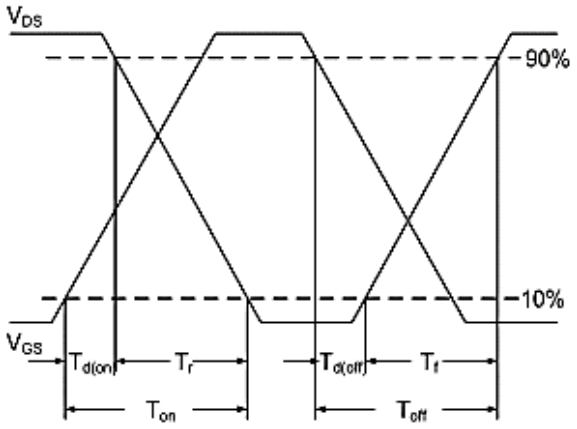


Fig.10 Switching Time Waveform

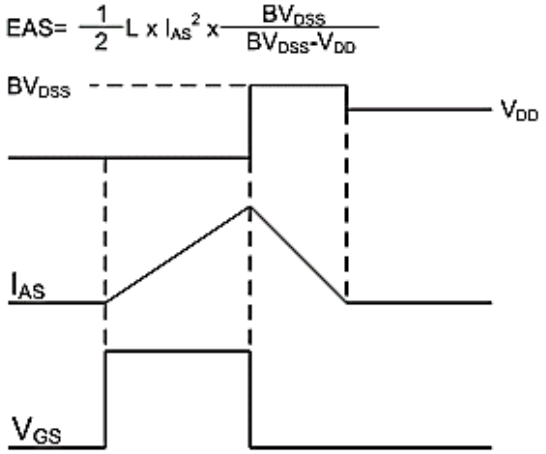
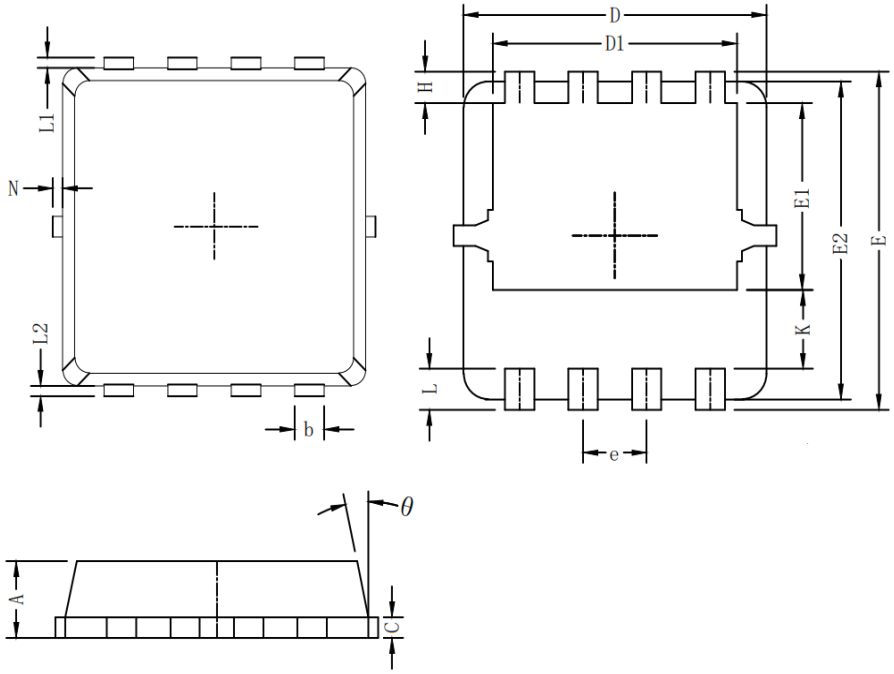


Fig.11 Unclamped Inductive Switching Waveform

Package Mechanical Data-PDFN3*3-8L



Symbol	Dimensions In Millimeters		
	min.	typ.	max.
A	0.60	0.75	0.90
b	0.20	0.30	0.40
C	0.15	0.20	0.25
D	3.00	3.10	3.20
D1	2.30	2.45	2.60
E	3.15	3.30	3.45
E1	1.43	1.73	1.93
E2	2.90	3.05	3.20
e	0.65BSC		
H	0.20	0.35	0.50
K	0.57	0.77	0.87
L	0.30	0.40	0.50
L1/L2	0.1REF		
θ	8°	10°	13°
N	0.00		0.15

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Edition	Date	Change
REV1.0	2024/4/10	Initial release

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