

-20V P-Channel Enhancement Mode MOSFET

Description

The AP20P02DF 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

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

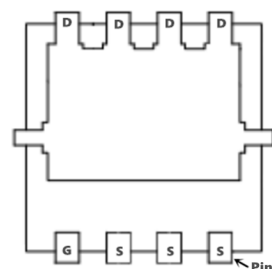
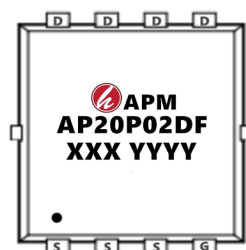
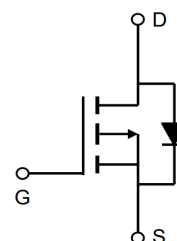
$R_{DS(ON)} < 9m\Omega$ @ $V_{GS} = -10V$

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP20P02DF	PDFN3*3-8L	20P30	3000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-20	V
V_{GS}	Gate-Source Voltage	± 8	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-20	A
$I_D @ T_C = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-18	A
I_{DM}	Pulsed Drain Current ²	-100	A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ³	29	W
$P_D @ T_C = 70^\circ C$	Total Power Dissipation ³	19	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	75	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹ ($t \leq 10s$)	40	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	4.2	$^\circ C/W$

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Electrical Characteristics (TA=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-20	-24	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.012	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-4.5V, I _D =-10A	---	6.5	9	mΩ
		V _{GS} =-2.5V, I _D =-8A	---	8.7	11.5	
		V _{GS} =-1.8V, I _D =-6A	---	13	15	
V _{GS(th)}	Gate Threshold Voltage		-0.3	-0.6	-1.0	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient	V _{GS} =V _{DS} , I _D =-250uA	---	2.94	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-20V, V _{GS} =0V, T _J =25°C	---	---	1	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±8V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-10A	---	43	---	S
Q _g	Total Gate Charge (-4.5V)		---	63	---	nC
Q _{gs}	Gate-Source Charge	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-10A	---	9.1	---	
Q _{gd}	Gate-Drain Charge		---	13	---	
T _{d(on)}	Turn-On Delay Time		---	15.8	---	ns
T _r	Rise Time	V _{DD} =-10V, V _{GS} =-4.5V, R _G =3.3Ω, I _D =-10A	---	76.8	---	
T _{d(off)}	Turn-Off Delay Time		---	193	---	
T _f	Fall Time		---	186.4	---	
C _{iss}	Input Capacitance		---	5783	---	pF
C _{oss}	Output Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	509	---	
C _{rss}	Reverse Transfer Capacitance		---	431	---	
I _S	Continuous Source Current ^{1,4}	V _G =V _D =0V, Force Current	---	---	-10.7	A
I _{SM}	Pulsed Source Current ^{2,4}		---	---	-60	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-10A, dI/dt=100A/μs, T _J =25°C	---	27	---	nS
Q _{rr}	Reverse Recovery Charge		---	17.8	---	nC

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper.

2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%

3. The power dissipation is limited by 150°C junction temperature

4. The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

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Typical Characteristics

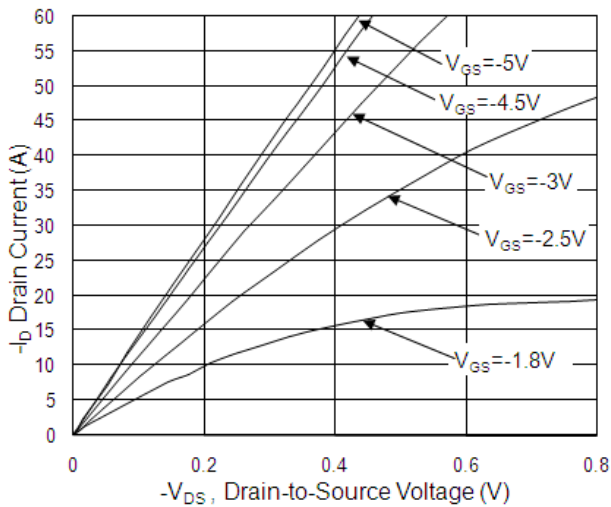


Fig.1 Typical Output Characteristics

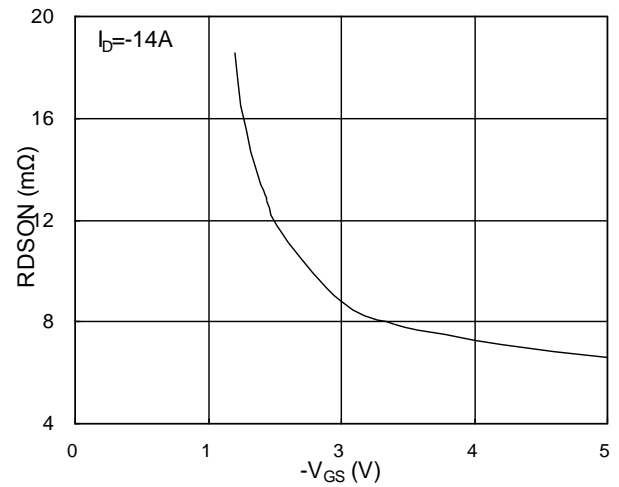


Fig.2 On-Resistance vs. G-S Voltage

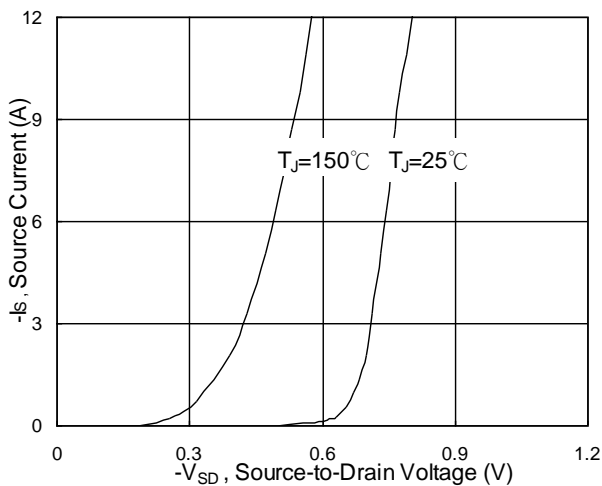


Fig.3 Forward Characteristics of Reverse

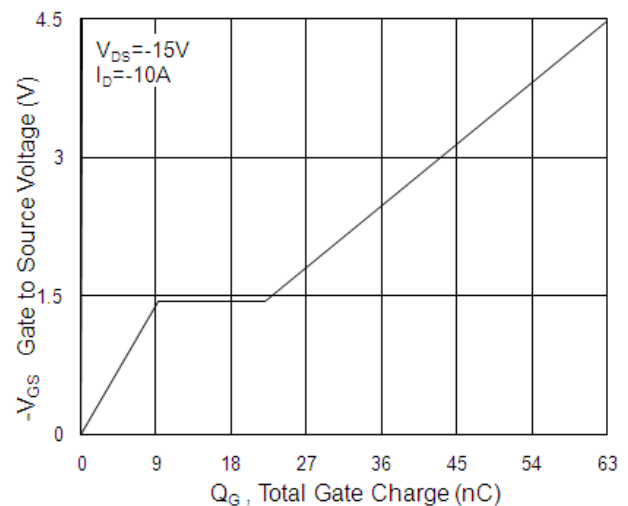


Fig.4 Gate-charge Characteristics

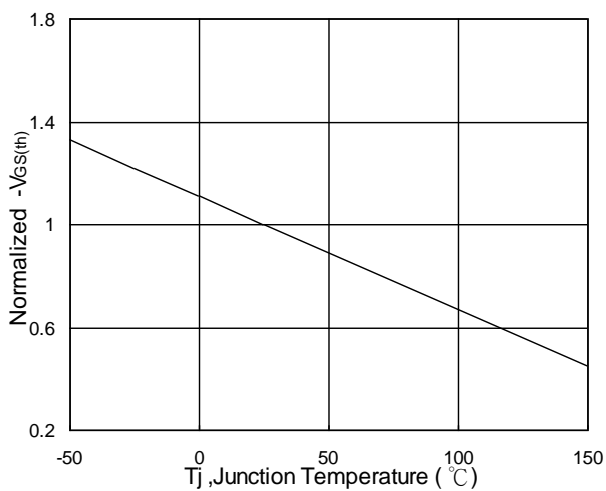


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

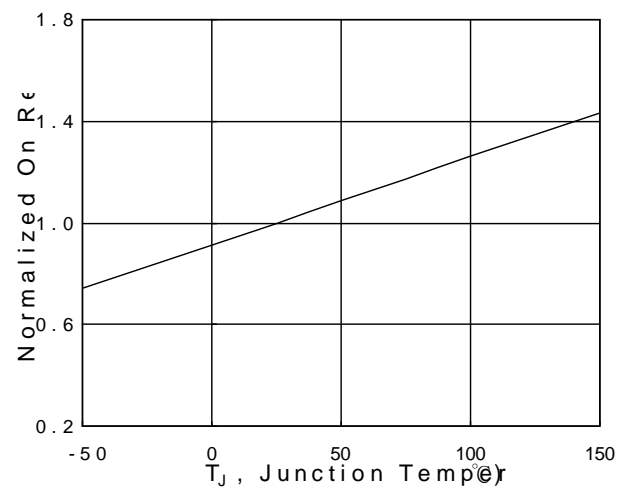


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

-20V P-Channel Enhancement Mode MOSFET

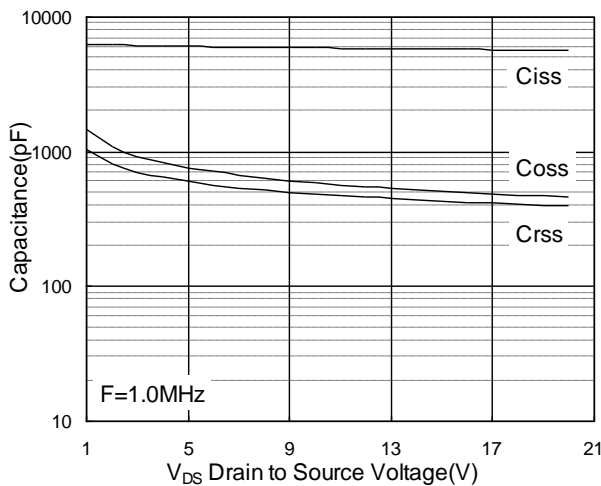


Fig.7 Capacitance

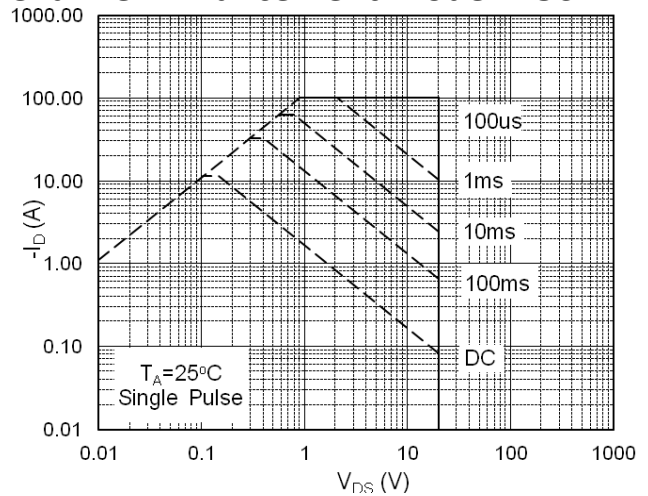


Fig.8 Safe Operating Area

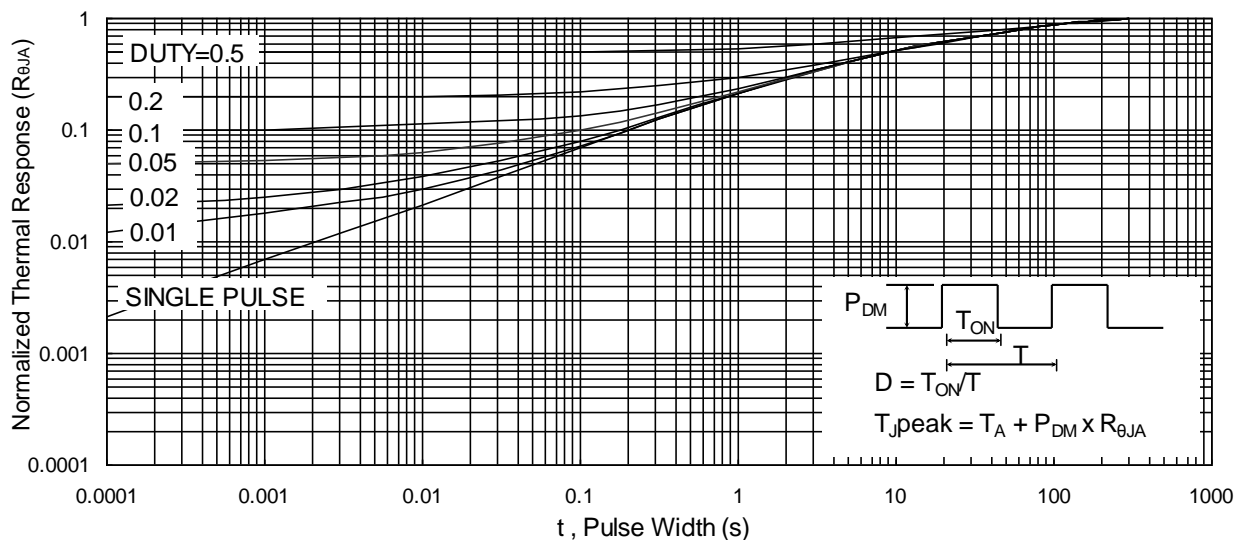


Fig.9 Normalized Maximum Transient Thermal Impedance

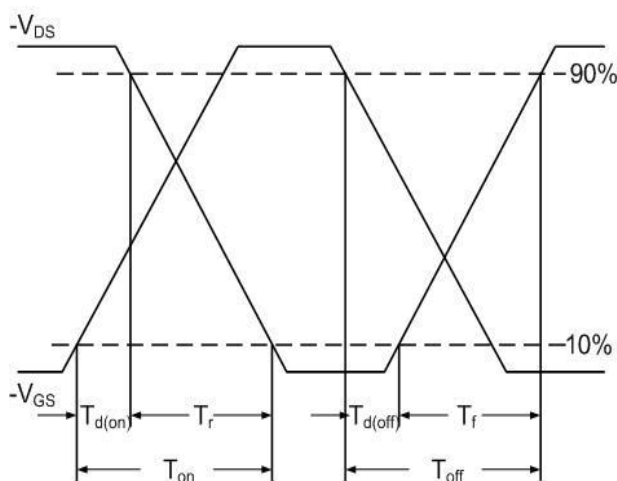


Fig.10 Switching Time Waveform

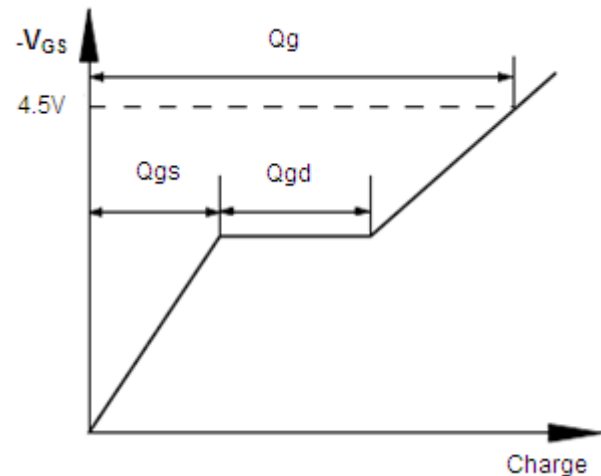
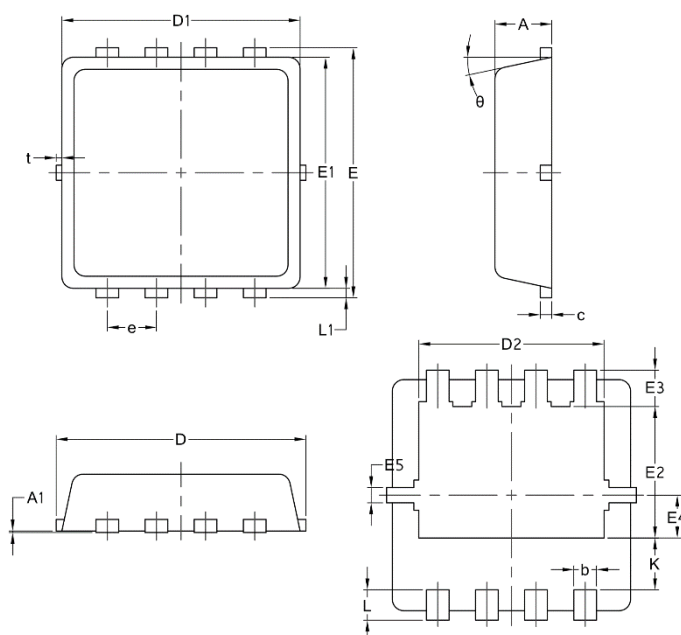


Fig.11 Gate Charge Waveform

Package Mechanical Data-DFN3*3-8L-JQ Single



Symbol	Common		
	mm		
	Mim	Nom	Max
A	0.70	0.75	0.85
A1	/	/	0.05
b	0.20	0.30	0.40
c	0.10	0.152	0.25
D	3.15	3.30	3.45
D1	3.00	3.15	3.25
D2	2.29	2.45	2.65
E	3.15	3.30	3.45
E1	2.90	3.05	3.20
E2	1.54	1.74	1.94
E3	0.28	0.48	0.65
E4	0.37	0.57	0.77
E5	0.10	0.20	0.30
e	0.60	0.65	0.70
K	0.59	0.69	0.89
L	0.30	0.40	0.50
L1	0.06	0.125	0.20
t	0	0.075	0.13
Φ	10	12	14

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