

-60V P-Channel Enhancement Mode MOSFET

Description

The AP15P06DF 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

$V_{DS} = -60V$ $I_D = -15A$

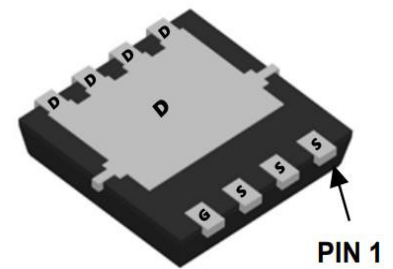
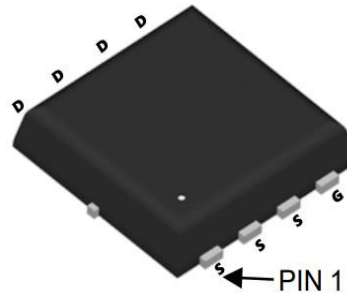
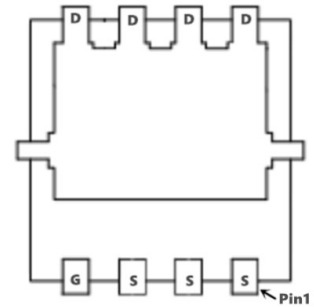
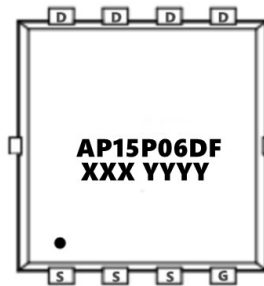
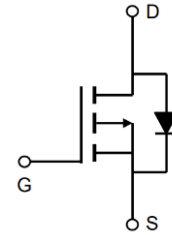
$R_{DS(ON)} < 85m\Omega$ @ $V_{GS}=10V$ (Type: **68mΩ**)

Application

Brushless motor

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP15P06DF	PDFN3*3-8L	AP15P06DF XXXX YYYY	5000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-60	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-15	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-8.3	A
I_{DM}	Pulsed Drain Current ²	-30	A
EAS	Single Pulse Avalanche Energy ³	29.8	mJ
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	31.3	W
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	2	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	25	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	4.0	$^\circ C/W$



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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-60	---	---	V
ΔBVDSS/ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.03	---	V/°C
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-3A	---	68	85	mΩ
		V _{GS} =-4.5V, I _D =-2A	---	90	110	
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.2	1.75	-2.5	V
IDSS	Drain-Source Leakage Current	V _{DS} =-48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-48V, V _{GS} =0V, T _J =55°C	---	---	5	
IGSS	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
gfs	Forward Transconductance	V _{DS} =-5V, I _D =-3A	---	8.5	---	S
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-48V, V _{GS} =-4.5V, I _D =-3A	---	12.1	---	nC
Q _{gs}	Gate-Source Charge		---	2.2	---	
Q _{gd}	Gate-Drain Charge		---	6.3	---	
Td(on)	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A	---	9.2	---	ns
T _r	Rise Time		---	20.1	---	
Td(off)	Turn-Off Delay Time		---	46.7	---	
T _f	Fall Time		---	9.4	---	
Ciss	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	1137	---	pF
Coss	Output Capacitance		---	76	---	
Crss	Reverse Transfer Capacitance		---	50	---	
IS	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	-13	A
VSD	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V

Note :

- 1、 The data tested by surface mounted on a 1 inch 2 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 =-24A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 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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P-Channel Typical Characteristics

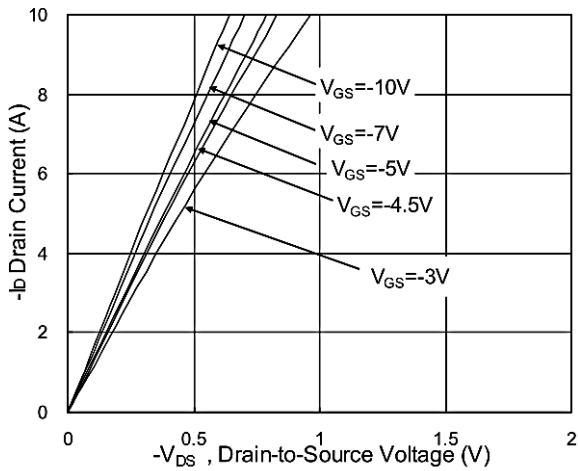


Fig.1 Typical Output Characteristics

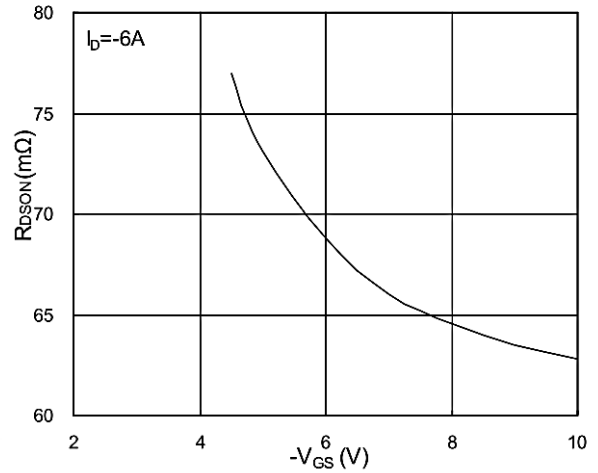


Fig.2 On-Resistance v.s Gate-Source

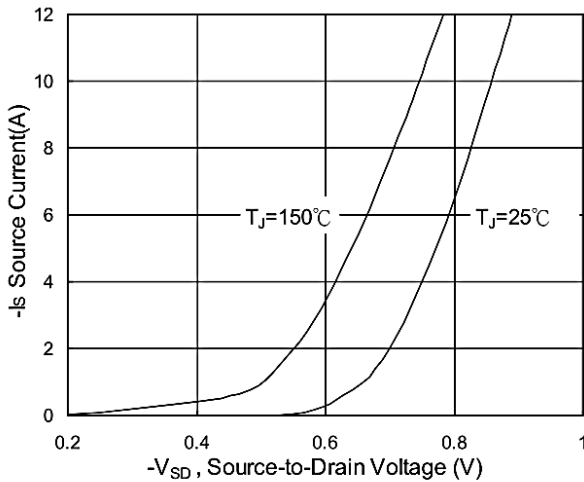


Fig.3 Forward Characteristics of Reverse

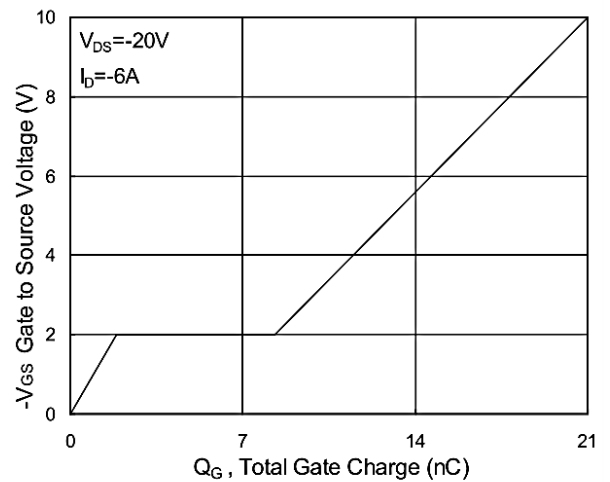


Fig.4 Gate-Charge Characteristics

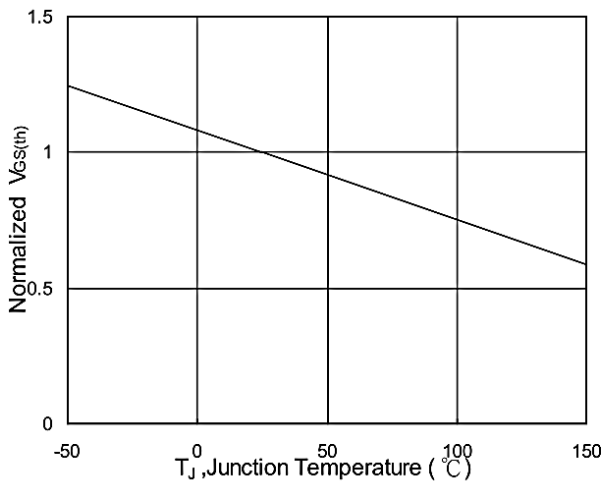


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

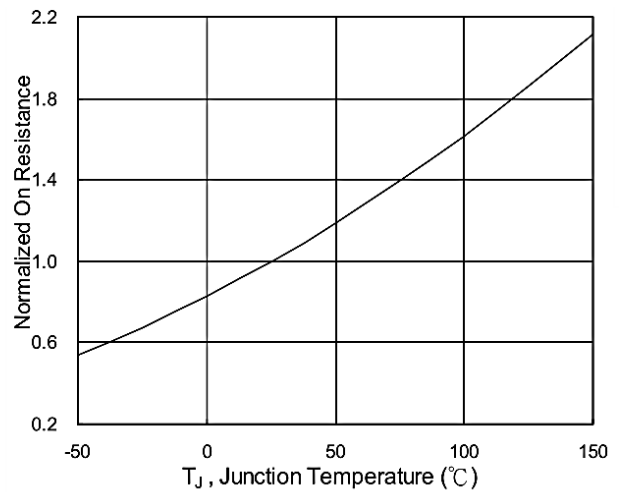


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

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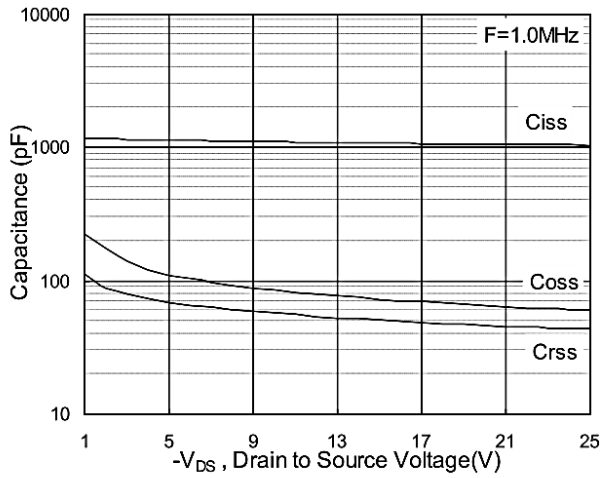


Fig.7 Capacitance

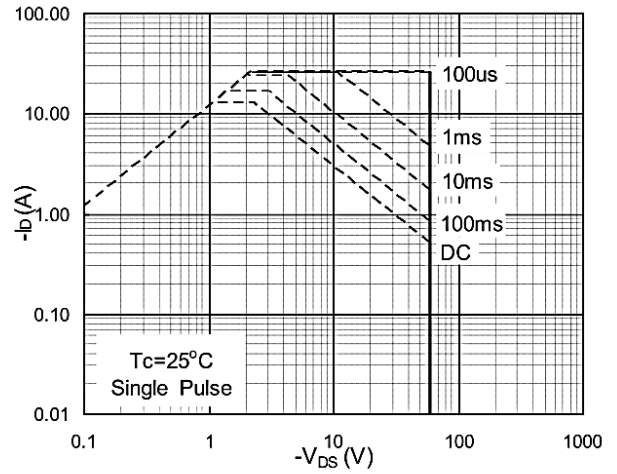


Fig.8 Safe Operating Area

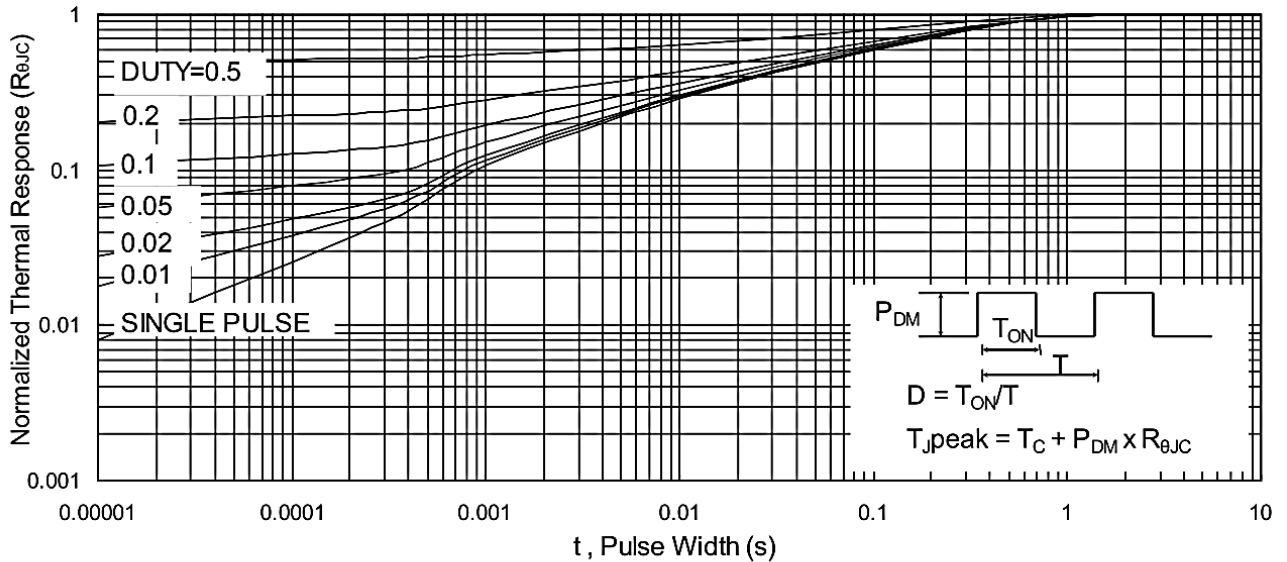


Fig.9 Normalized Maximum Transient Thermal Impedance

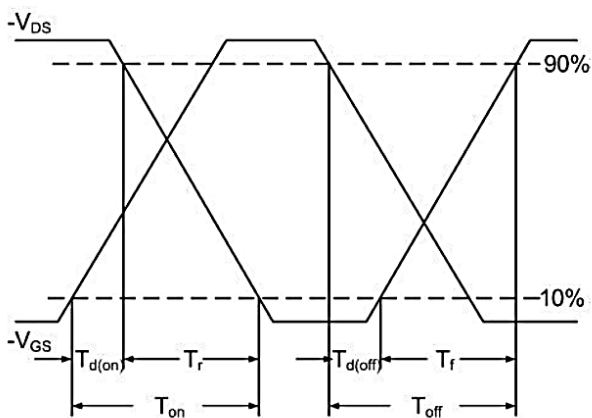


Fig.10 Switching Time Waveform

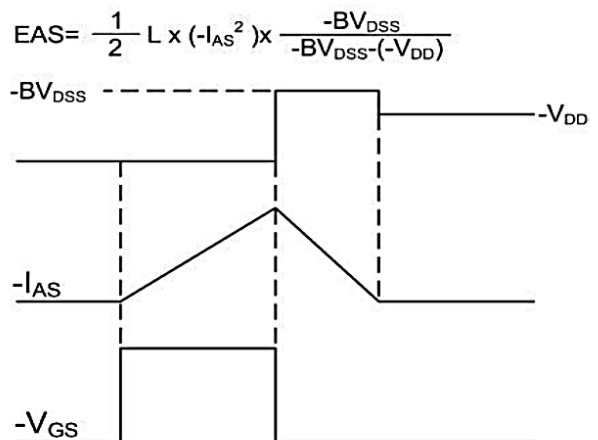
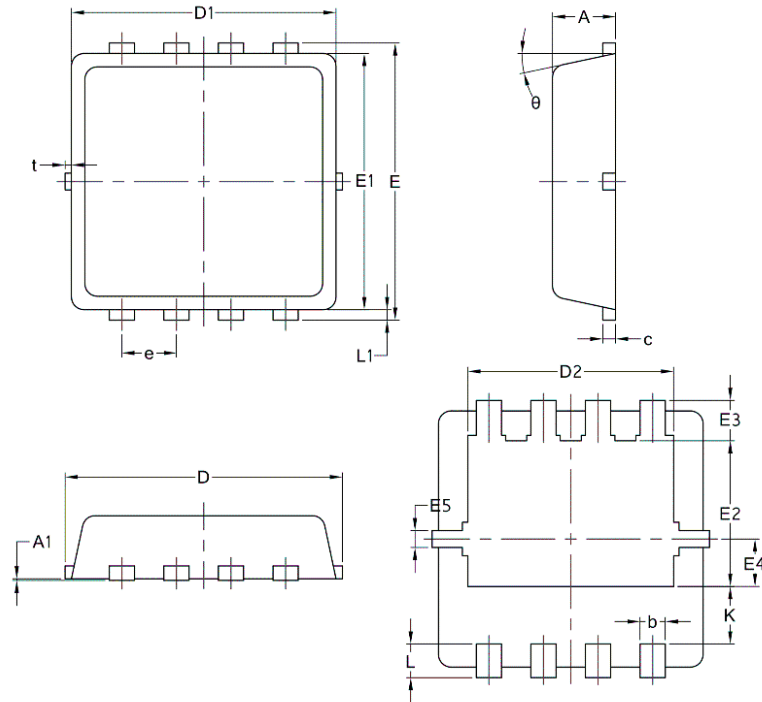


Fig.11 Unclamped Inductive Switching Waveform

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS} - (-V_{DD})}$$

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