AP06350C

60V P-Channel MOSFET

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- Green Device Available

Product Summary

V_{DS}	-60	V
I_D	-35	A
$R_{DS(ON)}$ (at V_{GS}=-10V)	25	mΩ
$R_{DS(ON)}$ (at V_{GS}=-4.5V)	33	mΩ

Applications

- High Frequency Point-of-Load,Synchronous Buck Converter
- Networking DC-DC Power System
- Load Switch
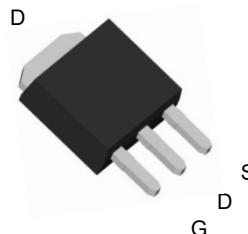
TO-251 Top View
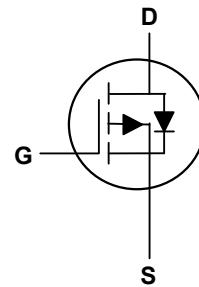
Absolute Maximum Ratings(T_A=25℃, unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current, VGS @ -10V[1]	I_D@T_C=25℃	-35	A
Continuous Drain Current, VGS @ -10V[1]	I_D@T_C=100℃	-27	A
Pulsed Drain Current[2]	I_{DM}	-70	A
Single Pulse Avalanche Energy[3]	EAS	113	mJ
Avalanche Current	I_{AS}	47.6	A
Total Power Dissipation[4]	P_D@T_C=25℃	52.1	W
Storage Temperature Range	T_{STG}	-55 to 150	℃
Operating Junction Temperature Range	T_J	-55 to 150	℃

Thermal Characteristics

Parameter	Symbol	Typ	Max	Unit
Thermal Resistance Junction-Ambient[1]	$R_{θJA}$	---	62	℃/W
Thermal Resistance Junction-Case[1]	$R_{θJC}$	---	2.4	℃/W

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	BV$_{DSS}$	V$_{GS}$=0V , I$_D$=-250uA	-60	---	---	V
BV$_{DSS}$ Temperature Coefficient	△BV$_{DSS}$/△T$_J$	Reference to 25℃ , I$_D$=-1mA	---	-0.035	---	V/℃
Static Drain-Source On-Resistance[2]	R$_{DS(ON)}$	V$_{GS}$=-10V , I$_D$=-18A	---	---	25	mΩ
		V$_{GS}$=-4.5V , I$_D$=-12A	---	---	33	mΩ
Gate Threshold Voltage	V$_{GS(th)}$	V$_{GS}$=V$_{DS}$, I$_D$ =-250uA	-1.0	---	-2.5	V
V$_{GS(th)}$ Temperature Coefficient	△V$_{GS(th)}$		---	4.28	---	mV/℃
Drain-Source Leakage Current	I$_{DSS}$	V$_{DS}$=-48V, V$_{GS}$=0V, T$_J$=25℃	---	---	1	uA
		V$_{DS}$=-48V, V$_{GS}$=0V, T$_J$=55℃	---	---	5	uA
Gate-Source Leakage Current	I$_{GSS}$	V$_{GS}$=±20V , V$_{DS}$=0V	---	---	±100	nA
Forward Transconductance	gfs	V$_{DS}$=-10V, I$_D$=-18A	---	23	---	S
Gate Resistance	R$_g$	V$_{DS}$=0V , V$_{GS}$=0V , f=1MHz	---	7	---	Ω
Total Gate Charge	Q$_g$	V$_{DS}$=-20V , V$_{GS}$=-4.5V , I$_D$=-12A	---	25	---	nC
Gate-Source Charge	Q$_{gs}$		---	6.7	---	
Gate-Drain Charge	Q$_{gd}$		---	5.5	---	
Turn-On Delay Time	T$_{d(on)}$	V$_{DD}$=-15V , V$_{GS}$=-10V , R$_G$=3.3Ω, I$_D$=-1A	---	38	---	ns
Rise Time	T$_r$		---	23.6	---	
Turn-Off Delay Time	T$_{d(off)}$		---	100	---	
Fall Time	T$_f$		---	6.8	---	
Input Capacitance	C$_{iss}$	V$_{DS}$=-15V , V$_{GS}$=0V , f=1MHz	---	3635	---	pF
Output Capacitance	C$_{oss}$		---	224	---	
Reverse Transfer Capacitance	C$_{rss}$		---	141	---	

Drain-Source Diode Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Continuous Source Current[1,5]	I$_S$	V$_G$=V$_D$=0V , Force Current	---	---	-35	A
Pulsed Source Current[2,5]	I$_{SM}$		---	---	-70	A
Diode Forward Voltage[2]	V$_{SD}$	V$_{GS}$=0V , I$_S$=-1A , T$_J$=25℃	---	---	-1	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 V$_{DD}$=-25V,V$_{GS}$=-10V,L=0.1mH

4.The power dissipation is limited by 150℃ 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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Typical Characteristics
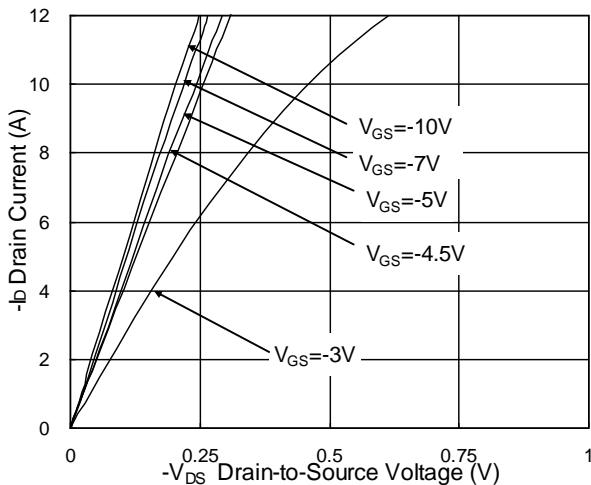
Fig.1 Typical Output Characteristics

V_{GS}=-10V
V_{GS}=-7V
V_{GS}=-5V
V_{GS}=-4.5V
V_{GS}=-3V

-I_D Drain Current (A)
-V_{DS} Drain-to-Source Voltage (V)
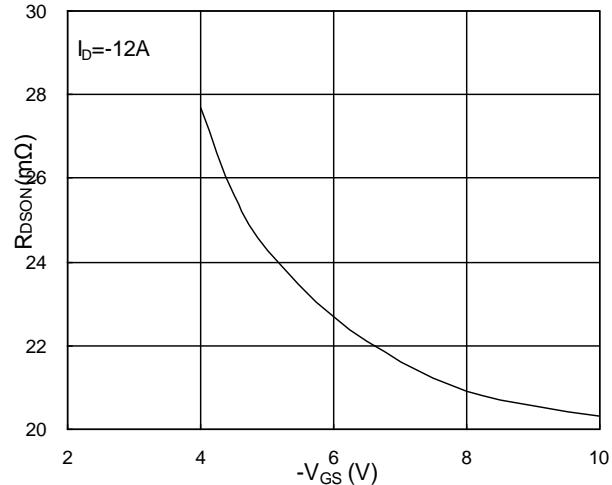
Fig.2 On-Resistance vs. G-S Voltage

I_D=-12A

R_{DSON}(mΩ)
-V_{GS} (V)
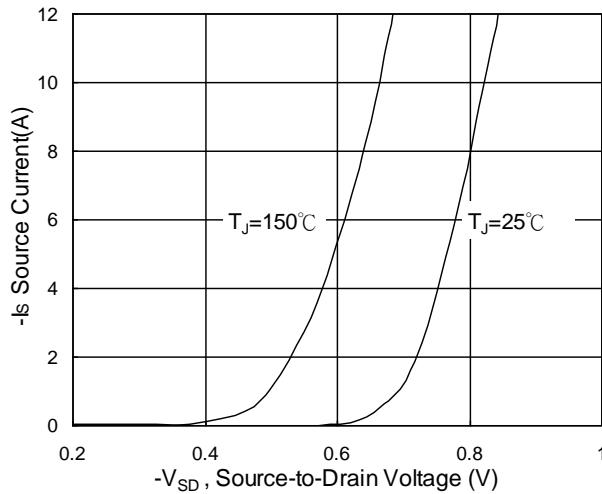
Fig.3 Forward Characteristics of Reverse

T_J=150℃
T_J=25℃

-I_S Source Current(A)
-V_{SD} , Source-to-Drain Voltage (V)
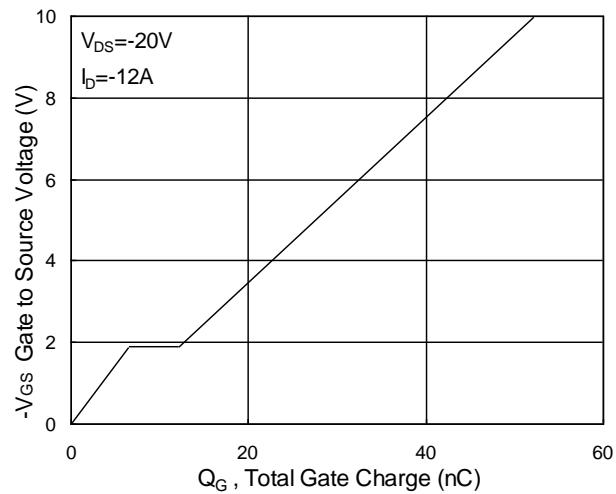
Fig.4 Gate-Charge Characteristics

V_{DS}=-20V
I_D=-12A

-V_{GS} Gate to Source Voltage (V)
Q_G , Total Gate Charge (nC)
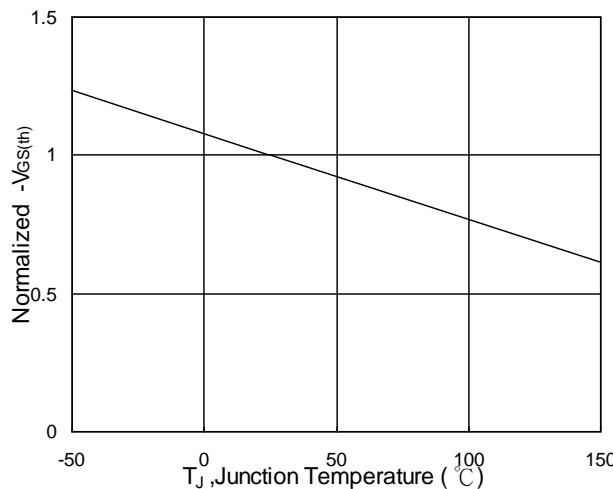
Fig.5 Normalized $V_{GS(th)}$ vs. T_J

Normalized -$V_{GS(th)}$
T_J ,Junction Temperature (℃)
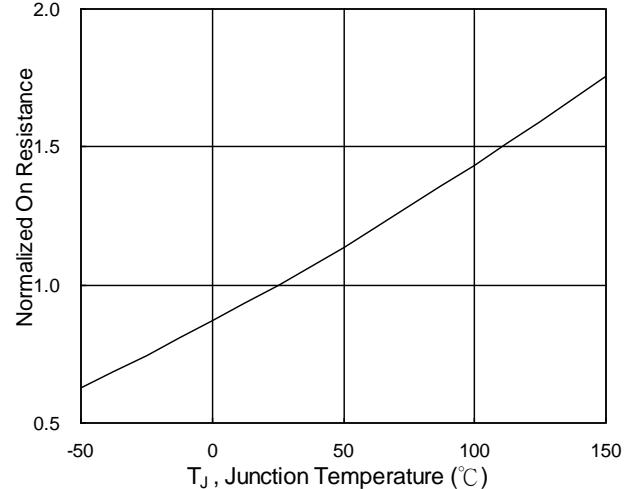
Fig.6 Normalized R_{DSON} vs. T_J

Normalized On Resistance
T_J , Junction Temperature (℃)
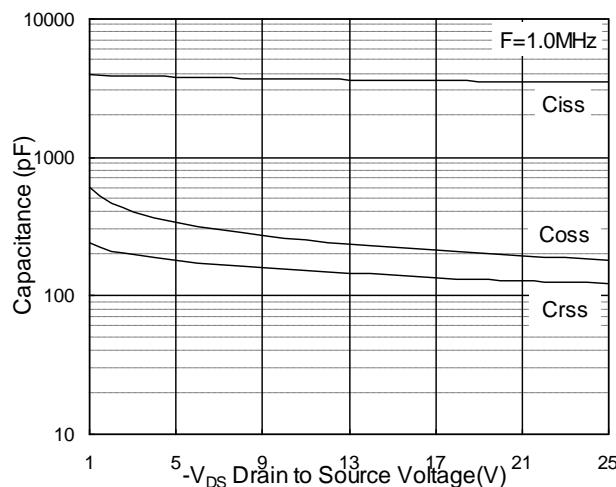
Fig.7 Capacitance
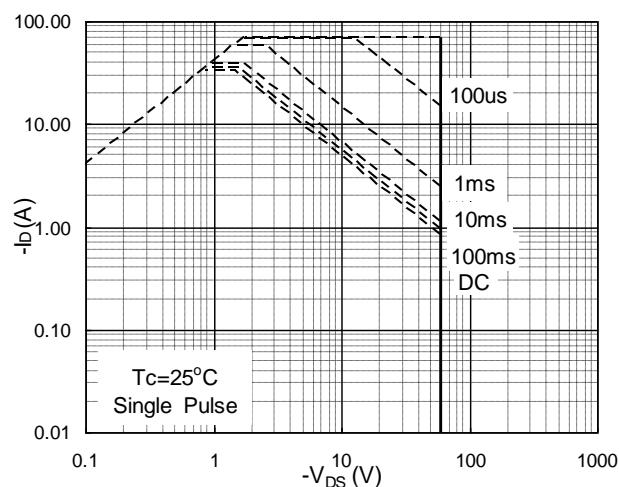
Fig.8 Safe Operating Area
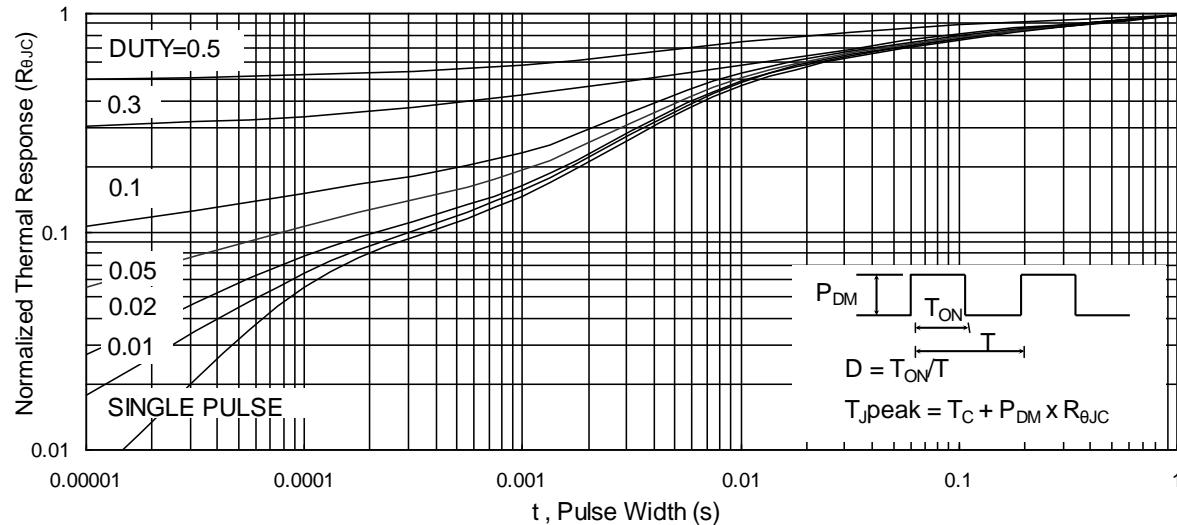
Fig.9 Normalized Maximum Transient Thermal Impedance

$$T_J peak = T_C + P_{DM} \times R_{\theta JC}$$

$$D = T_{ON}/T$$
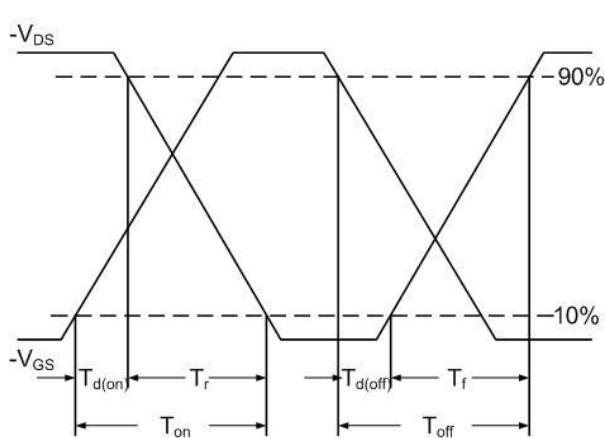
Fig.10 Switching Time Waveform

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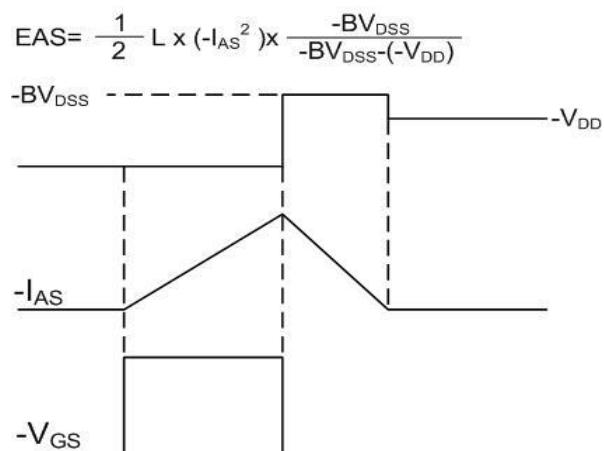
Fig.11 Unclamped Inductive Waveform

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TO-251 Package Outline Dimensions
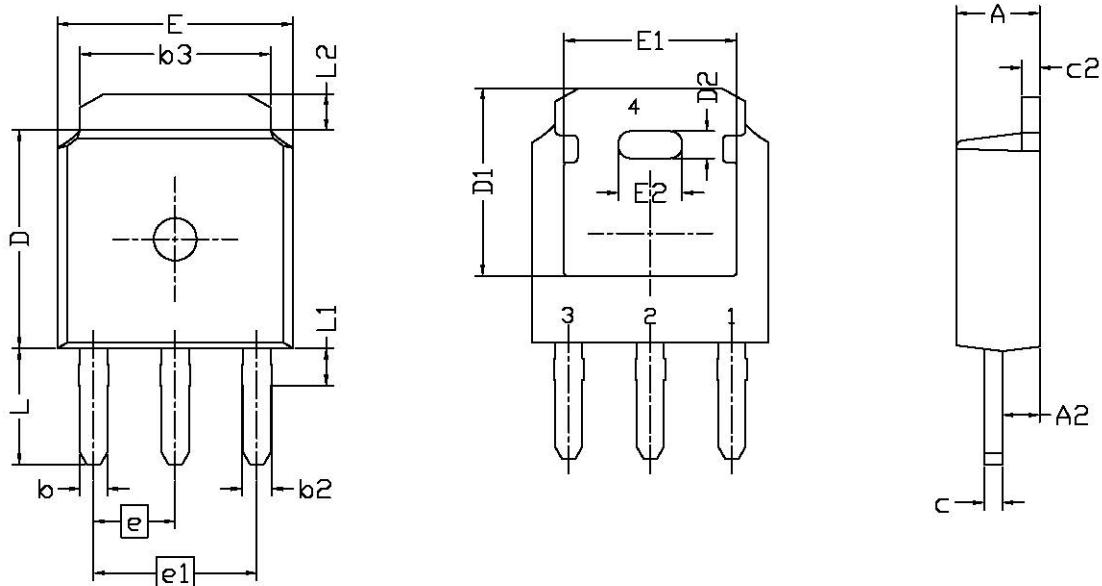
Symbol	Dimensions (unit:mm)			Symbol	Dimensions (unit:mm)		
	Min	Typ	Max		Min	Typ	Max
A	2.20	2.30	2.39	A2	0.90	1.00	1.14
b	0.63	0.76	0.85	b2	0.76	0.85	1.05
b3	5.10	5.40	5.60	C	0.46	0.51	0.61
C2	0.46	0.51	0.61	D	5.90	6.10	6.30
D1	5.25 REF			D2	0.508 BSC		
E	6.35	6.55	6.70	E1	5.06 REF		
E2	1.524 BSC			e	2.29 BSC		
e1	4.57 BSC			L	3.70	4.00	4.40
L1	1.15 REF			L2	0.90	1.06	1.20