60V P-Channel MOSFETs

General Description

These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

BVDSS	RDSON	ID
-60V	68mΩ	-12A

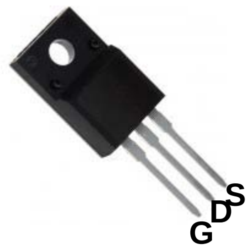
Features

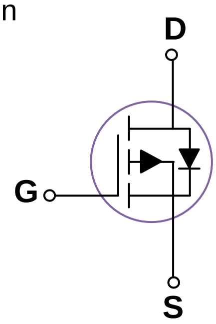
- *-60V,-12A, RDS(ON) =68mΩ@VGS = -10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

Applications

- *Motor Drive*
- *Power Tools*
- *LED Lighting*

TO-220F Pin Configuration





Absolute Maximum Ratings **Tc=25℃ unless otherwise noted**

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-60	V
V_{GS}	Gate-Source Voltage	±25	V
I_D	Drain Current – Continuous (T_C=25℃)	-12	A
	Drain Current – Continuous (T_C=100℃)	-7.6	A
I_{DM}	Drain Current – Pulsed[1]	-72	A
EAS	Single Pulse Avalanche Energy[2]	31	mJ
IAS	Single Pulse Avalanche Current[2]	-25	A
P_D	Power Dissipation (T_C=25℃)	17	W
	Power Dissipation – Derate above 25℃	0.14	W/℃
T_{STG}	Storage Temperature Range	-50 to 150	℃
T_J	Operating Junction Temperature Range	-50 to 150	℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	7.5	℃/W

Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-60	---	---	V
△BV_{DSS}/△T_J	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.05	---	V/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-60V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-48V , V_{GS}=0V , T_J=125℃	---	---	-10	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=± 25V , V_{DS}=0V	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V , I_D=-6A	---	54	68	mΩ
		V_{GS}=-4.5V , I_D=-3A	---	72	85	mΩ
$V_{GS(th)}$	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		---	5	---	mV/℃
gfs	Forward Transconductance	V_{DS}=-10V , I_D=-6A	---	8.5	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge[3,4]	V_{DS}=-30V , V_{GS}=-10V , I_D=-6A	---	16.4	24	nC
Q_{gs}	Gate-Source Charge[3,4]		---	2.8	5.6	
Q_{gd}	Gate-Drain Charge[3,4]		---	3.6	7	
$T_{d(on)}$	Turn-On Delay Time[3,4]	V_{DD}=-30V , V_{GS}=-10V , R_G=6Ω I_D=-1A	---	8.3	16	ns
T_r	Rise Time[3,4]		---	29.6	56	
$T_{d(off)}$	Turn-Off Delay Time[3,4]		---	51.7	98	
T_f	Fall Time[3,4]		---	15.6	30	
C_{iss}	Input Capacitance	V_{DS}=-30V , V_{GS}=0V , F=1MHz	---	870	1260	pF
C_{oss}	Output Capacitance		---	70	100	
C_{rss}	Reverse Transfer Capacitance		---	42	60	
R_g	Gate resistance	V_{GS}=0V, V_{DS}=0V, F=1MHz	---	16	32	Ω

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	-12	A
I_{SM}	Pulsed Source Current		---	---	-48	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1	V
t_{rr}	Reverse Recovery Time[3]	V_{GS}=0V,I_S=-1A , dI/dt=100A/µs T_J=25℃	---	---	---	ns
Q_{rr}	Reverse Recovery Charge[3]		---	---	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=-25V,V_{GS}=-10V,L=0.1mH,I_{AS}=-32A.,R_G=25Ω, Starting T_J=25℃
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.

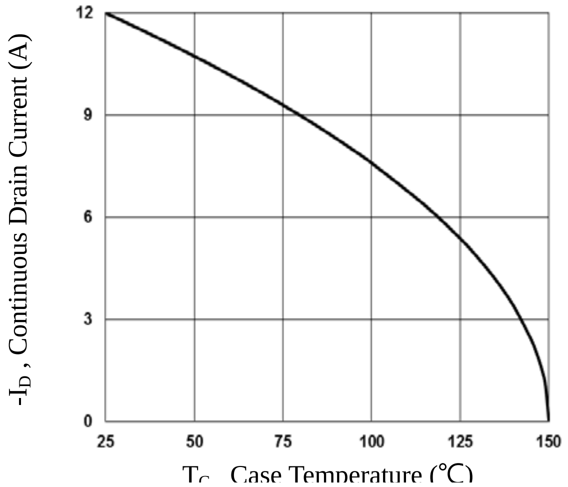


Fig.1 Continuous Drain Current vs. T_C

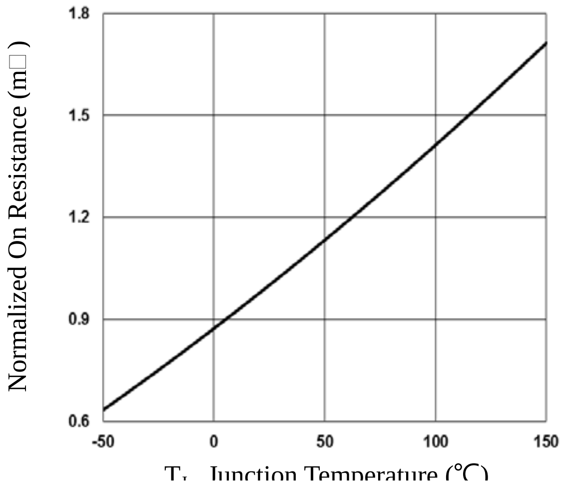


Fig.2 Normalized RDSON vs. T_J

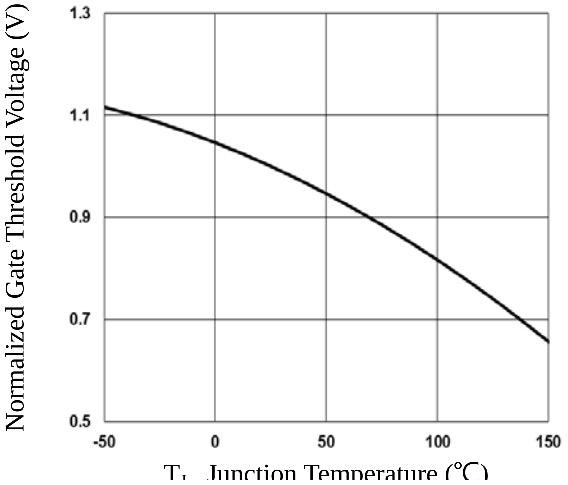


Fig.3 Normalized V_{th} vs. T_J

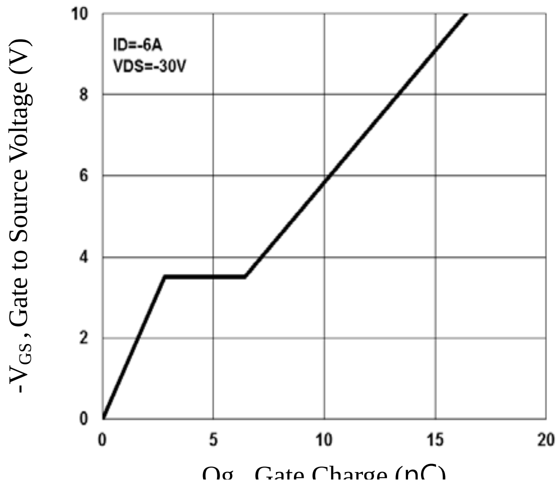


Fig.4 Gate Charge Waveform

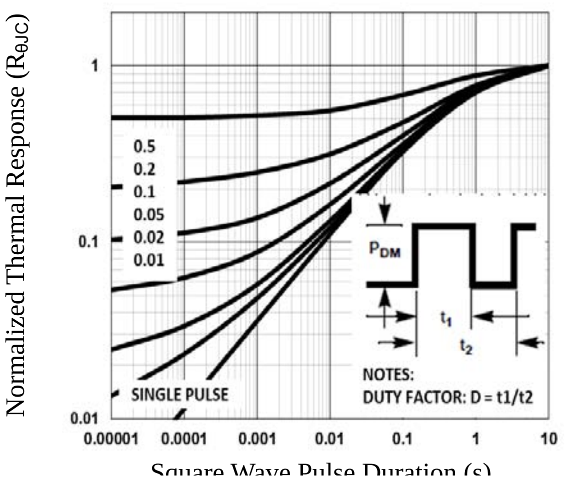


Fig.5 Normalized Transient Impedance

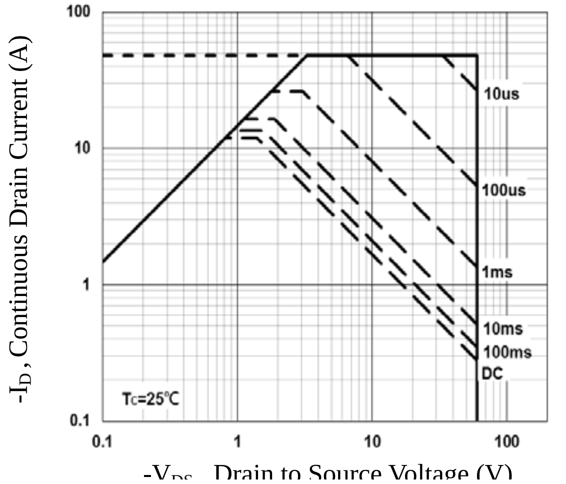


Fig.6 Maximum Safe Operation Area

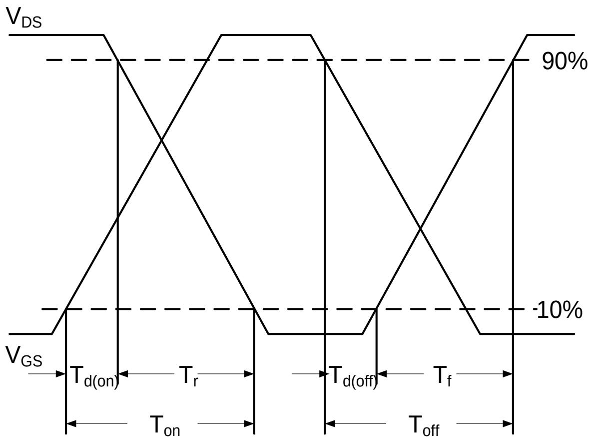


Fig.7 Switching Time Waveform

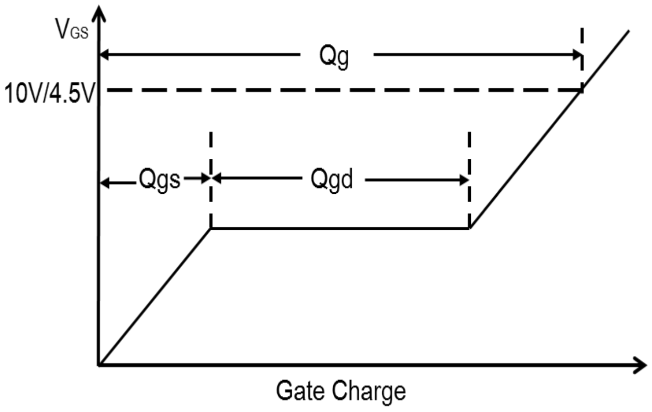
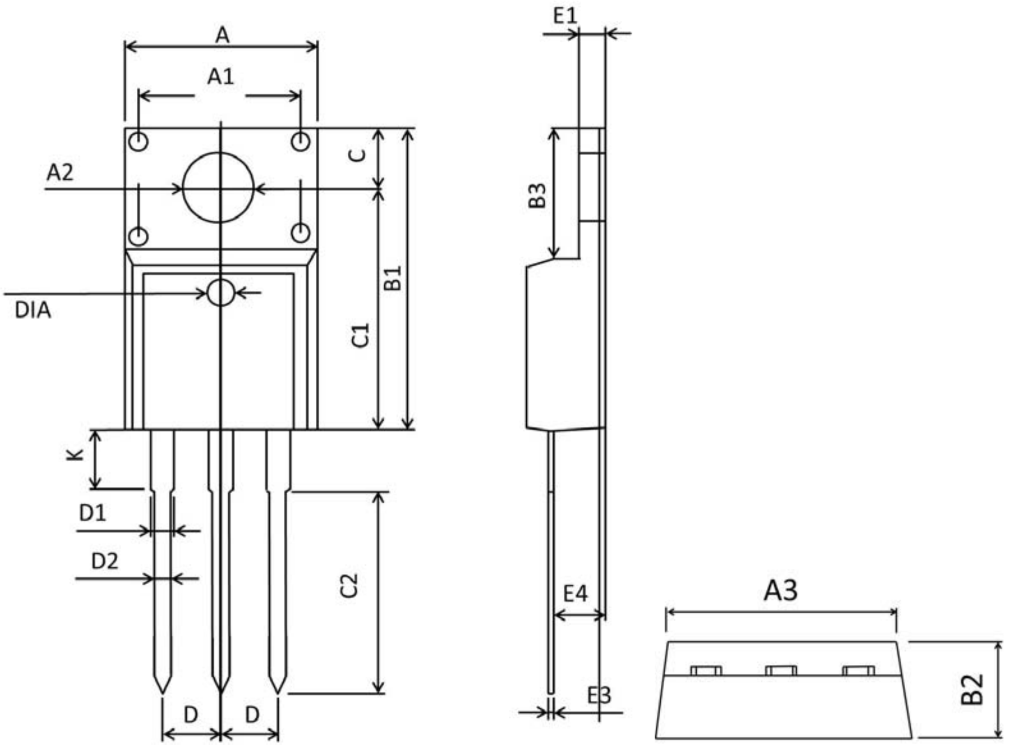


Fig.8 Gate Charge Waveform

TO-220F PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	9.860	10.460	0.389	0.411
A1	6.900	7.100	0.272	0.279
A2	3.100	3.500	0.123	0.137
B1	9.500	9.900	0.375	0.389
B2	4.500	4.900	0.178	0.192
B3	6.480	6.880	0.256	0.271
C	3.100	3.500	0.123	0.137
C1	12.270	12.870	0.484	0.506
C2	12.580	13.380	0.496	0.526
D	2.490	2.590	0.099	0.101
D1	1.070	1.470	0.043	0.057
D2	0.700	0.900	0.028	0.035
K	2.900	3.300	0.115	0.129
E1	2.340	2.740	0.093	0.107
E3	0.400	0.600	0.016	0.023
E4	2.560	2.960	0.101	0.116
DIA	1.45	1.55	0.058	0.061