

General Description

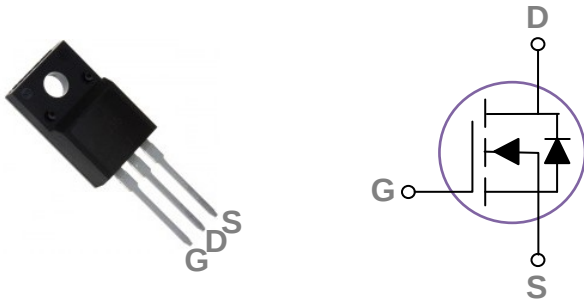
These N-Channel enhancement mode power field effect transistors are planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
500V	0.6Ω	12A

Features

- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

TO220F Pin Configuration



Applications

- High efficient switched mode power supplies
- TV Power
- Adapter/charger
- Server Power
- PV Inverter / UPS

Absolute Maximum Ratings $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	500	V
V_{GS}	Gate-Source Voltage	± 30	V
I_D	Drain Current – Continuous ($T_C=25^{\circ}\text{C}$)	12	A
	Drain Current – Continuous ($T_C=100^{\circ}\text{C}$)	7.6	A
I_{DM}	Drain Current – Pulsed ¹	48	A
EAS	Single Pulse Avalanche Energy ²	72	mJ
IAS	Single Pulse Avalanche Current ²	12	A
P_D	Power Dissipation ($T_C=25^{\circ}\text{C}$)	39	W
	Power Dissipation – Derate above 25°C	0.31	W/ $^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	3	$^{\circ}\text{C}/\text{W}$

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	500	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.5	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =500V, V _{GS} =0V, T _J =25°C	---	---	1	μA
		V _{DS} =400V, V _{GS} =0V, T _J =125°C	---	---	10	μA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±30V, V _{DS} =0V	---	---	±100	nA

On Characteristics

R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =5A	---	0.5	0.6	Ω
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250μA	3	4	5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-8	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =10V, I _D =2A	---	7.5	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{3,4}	V _{DS} =400V, V _{GS} =10V, I _D =2A	---	37.7	60	nC
Q _{gs}	Gate-Source Charge ^{3,4}		---	11.1	20	
Q _{gd}	Gate-Drain Charge ^{3,4}		---	12.4	24	
T _{d(on)}	Turn-On Delay Time ^{3,4}	V _{DD} =300V, V _{GS} =10V, R _G =25Ω I _D =1A	---	18	36	ns
T _r	Rise Time ^{3,4}		---	25	50	
T _{d(off)}	Turn-Off Delay Time ^{3,4}		---	42	84	
T _f	Fall Time ^{3,4}		---	68	136	
C _{iss}	Input Capacitance	V _{DS} =25V, V _{GS} =0V, F=1MHz	---	2150	3000	pF
C _{oss}	Output Capacitance		---	125	180	
C _{rss}	Reverse Transfer Capacitance		---	12	24	
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	---	3	6	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		---	---	24	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1	V
t _{rr}	Reverse Recovery Time ³	V _{GS} =0V, I _S =1A, dI/dt=100A/μs	---	---	---	ns
Q _{rr}	Reverse Recovery Charge ³	T _J =25°C	---	---	---	μC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=50V, V_{GS}=10V, L=1mH, I_{AS}=12A, R_G=25Ω, Starting T_J=25°C.
3. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

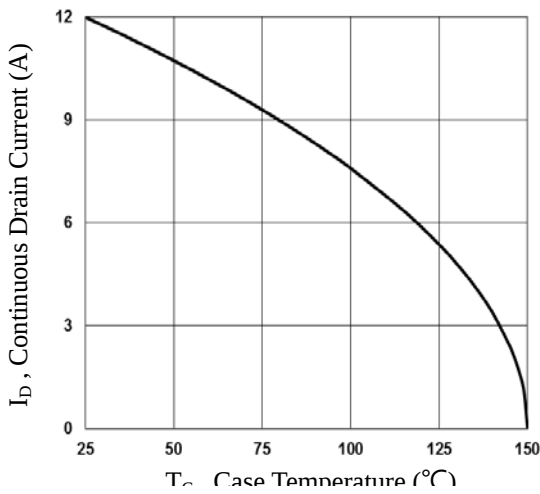
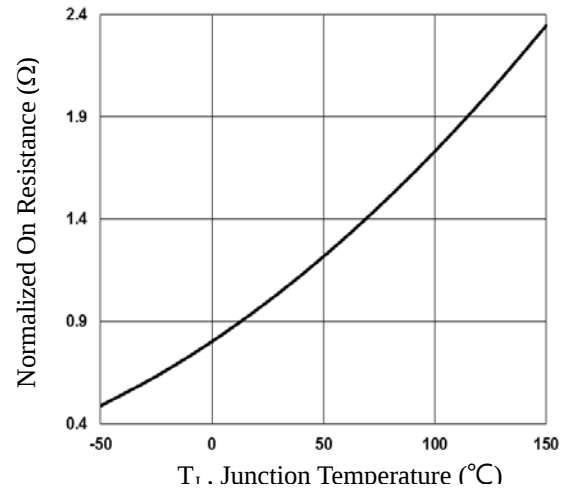
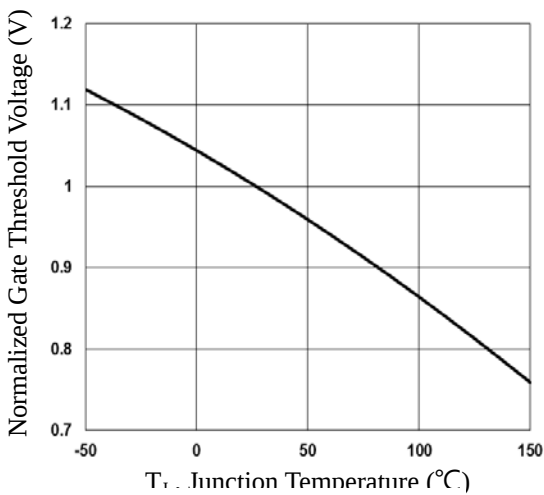
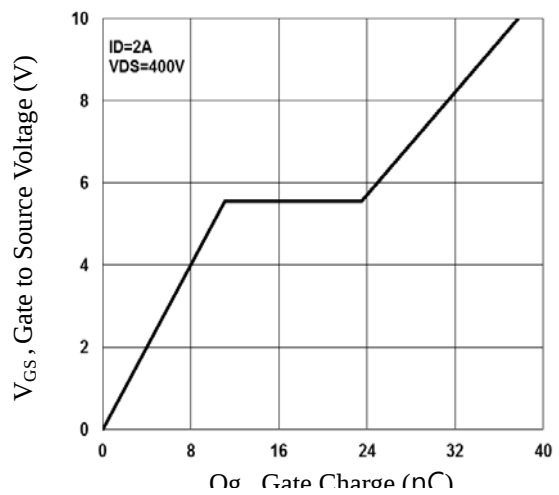

Fig.1 Continuous Drain Current vs. T_C

Fig.2 Normalized $R_{DS(on)}$ vs. T_J

Fig.3 Normalized V_{th} vs. T_J


Fig.4 Gate Charge Waveform

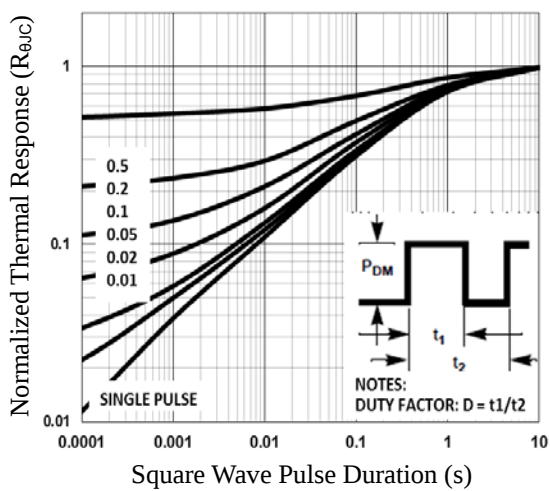


Fig.5 Normalized Transient Impedance

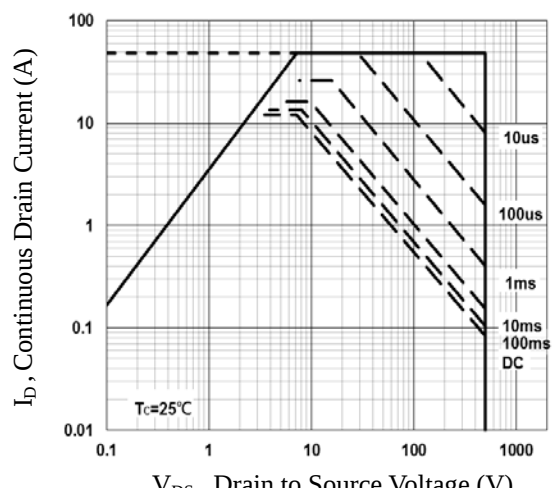


Fig.6 Maximum Safe Operation Area

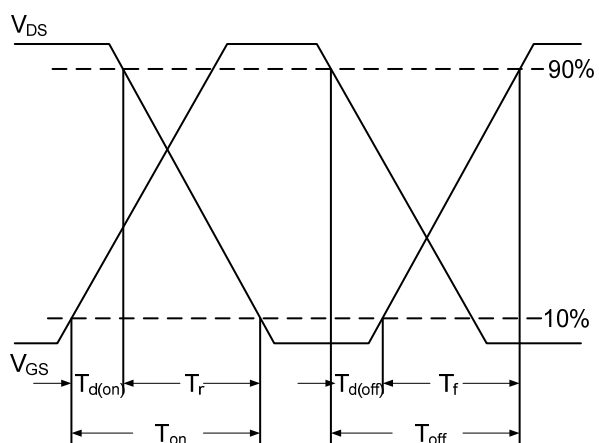


Fig.7 Switching Time Waveform

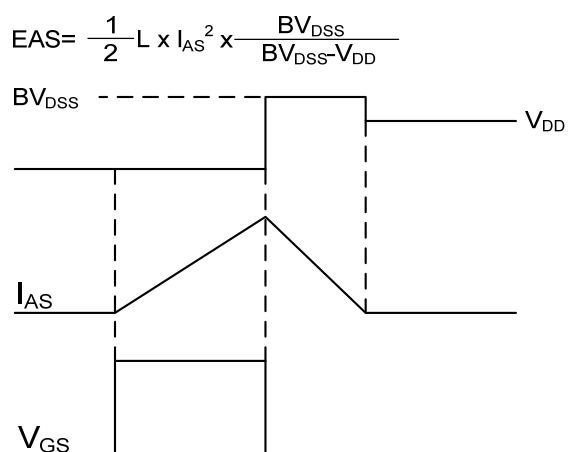
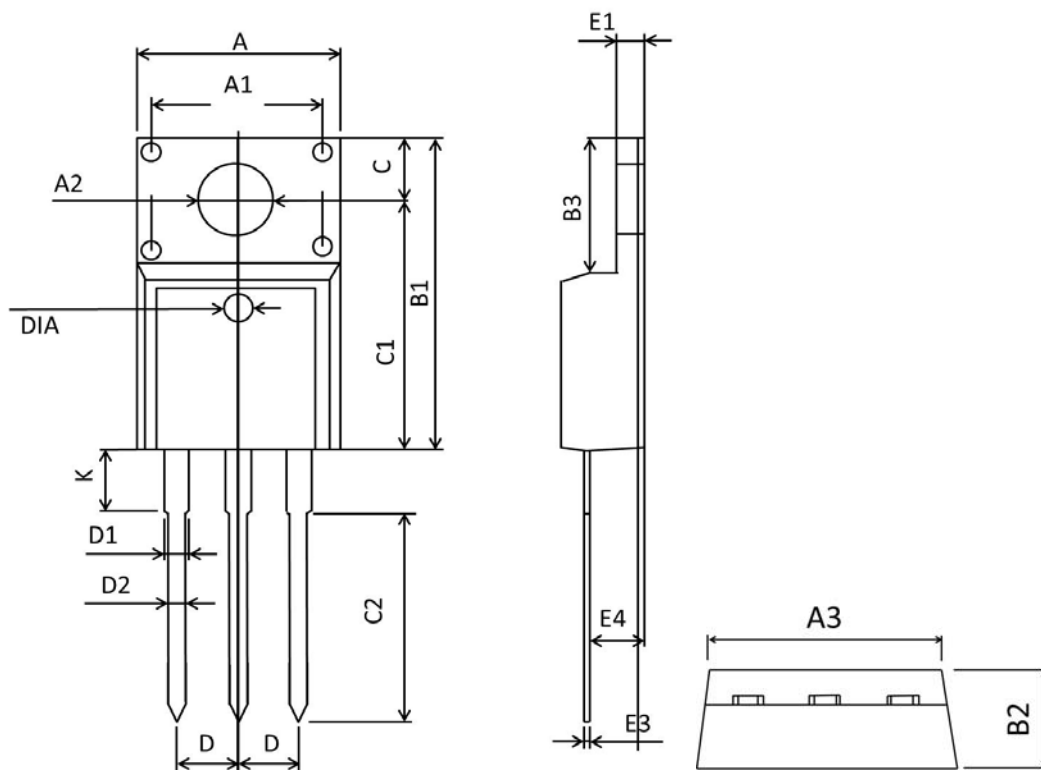


Fig.8 EAS Waveform

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

TO220F 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