

**General Description**

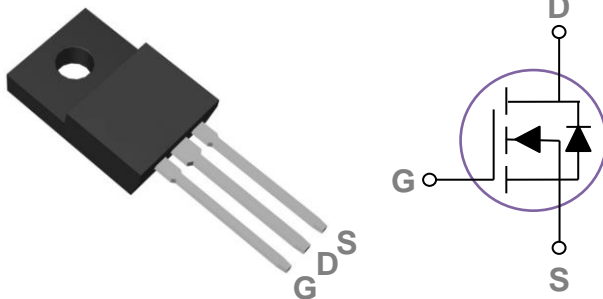
These N-Channel enhancement mode power field effect transistors are planar stripe, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
650V	0.75Ω	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** Tc=25°C unless otherwise noted

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	650	V
V <sub>GS</sub>	Gate-Source Voltage	±30	V
I <sub>D</sub>	Drain Current – Continuous (T <sub>C</sub> =25°C)	12	A
	Drain Current – Continuous (T <sub>C</sub> =100°C)	7.6	A
I <sub>DM</sub>	Drain Current – Pulsed <sup>1</sup>	48	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	405	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	9	A
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> =25°C)	52	W
	Power Dissipation – Derate above 25°C	0.42	W/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction to Case	---	2.4	°C/W

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**
**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	μA
		V <sub>DS</sub> =520V, V <sub>GS</sub> =0V, T <sub>J</sub> =100°C	---	---	10	μA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	---	---	±100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =4A	---	0.62	0.75	Ω
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	2	3	4	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =30V, I <sub>D</sub> =3A	---	9	---	S

**Dynamic and switching Characteristics**

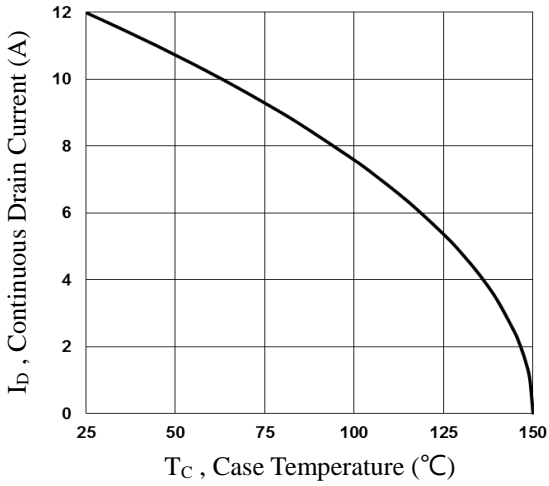
Q <sub>g</sub>	Total Gate Charge <sup>3,4</sup>	V <sub>DS</sub> =520V, V <sub>GS</sub> =10V, I <sub>D</sub> =4A	---	45	90	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>3,4</sup>		---	7.9	16	
Q <sub>gd</sub>	Gate-Drain Charge <sup>3,4</sup>		---	16.5	32	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>3,4</sup>	V <sub>DD</sub> =300V, V <sub>GS</sub> =10V, R <sub>G</sub> =25Ω I <sub>D</sub> =4A	---	45	90	ns
T <sub>r</sub>	Rise Time <sup>3,4</sup>		---	68	136	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>3,4</sup>		---	128	240	
T <sub>f</sub>	Fall Time <sup>3,4</sup>		---	42	84	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1MHz	---	1640	3200	pF
C <sub>oss</sub>	Output Capacitance		---	150	300	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	22	44	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	2	4	Ω

**Drain-Source Diode Characteristics and Maximum Ratings**

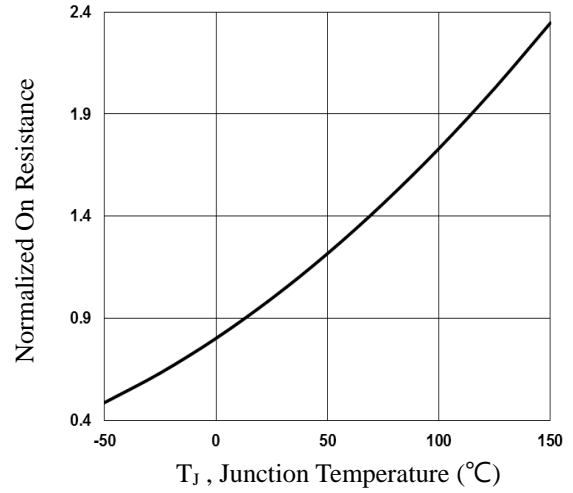
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	12	A
I <sub>SM</sub>	Pulsed Source Current		---	---	24	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1	V

Note :

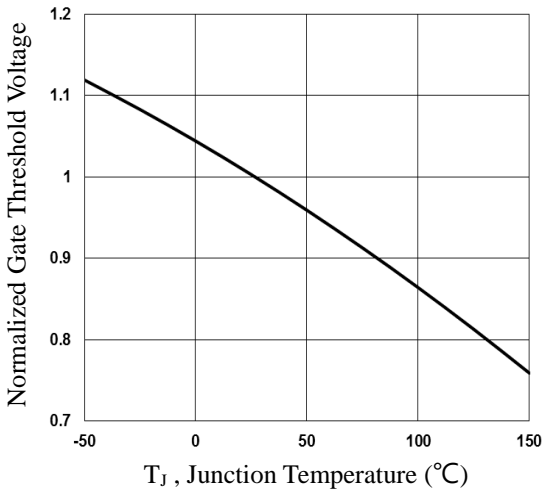
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, L=10mH, I<sub>AS</sub>=9A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



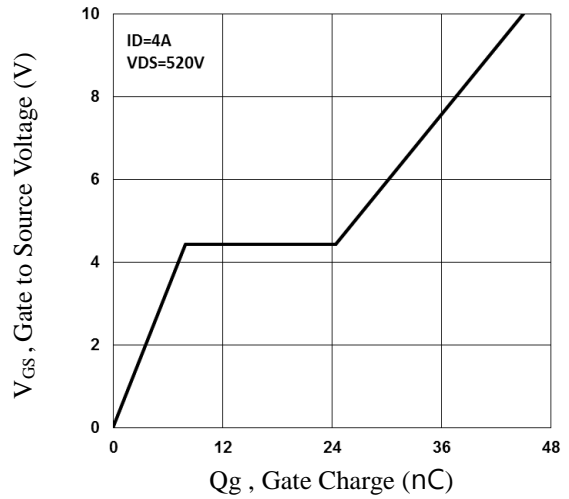
**Fig.1 Continuous Drain Current vs.  $T_c$**



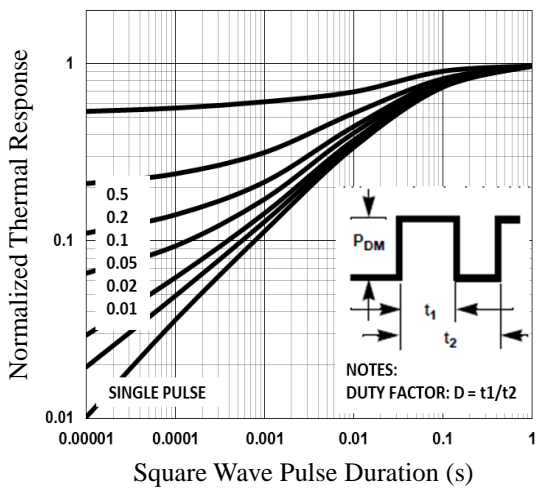
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



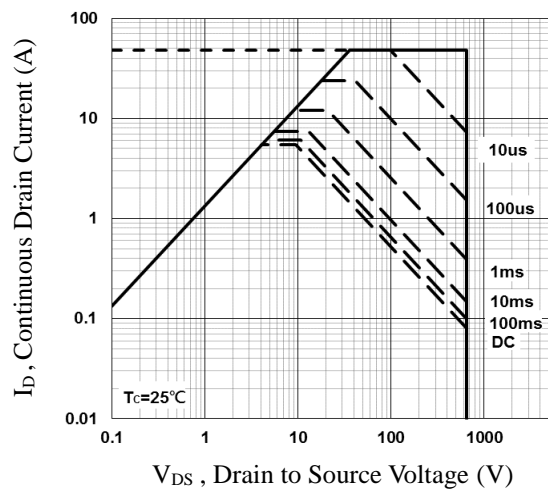
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



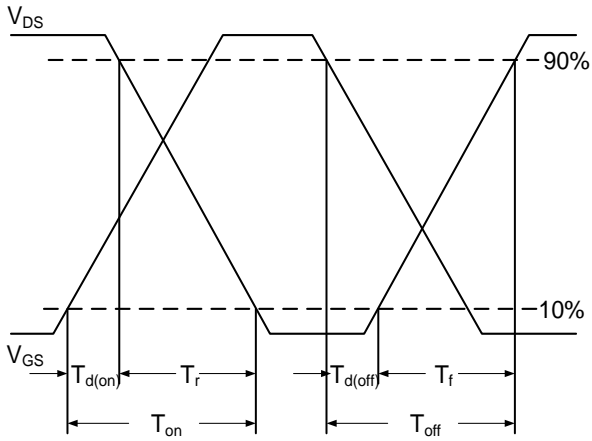
**Fig.4 Gate Charge Waveform**



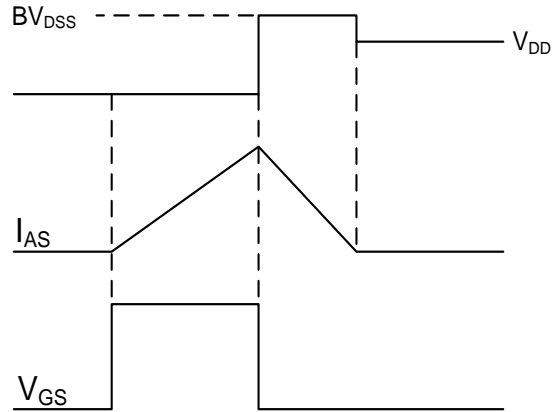
**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**

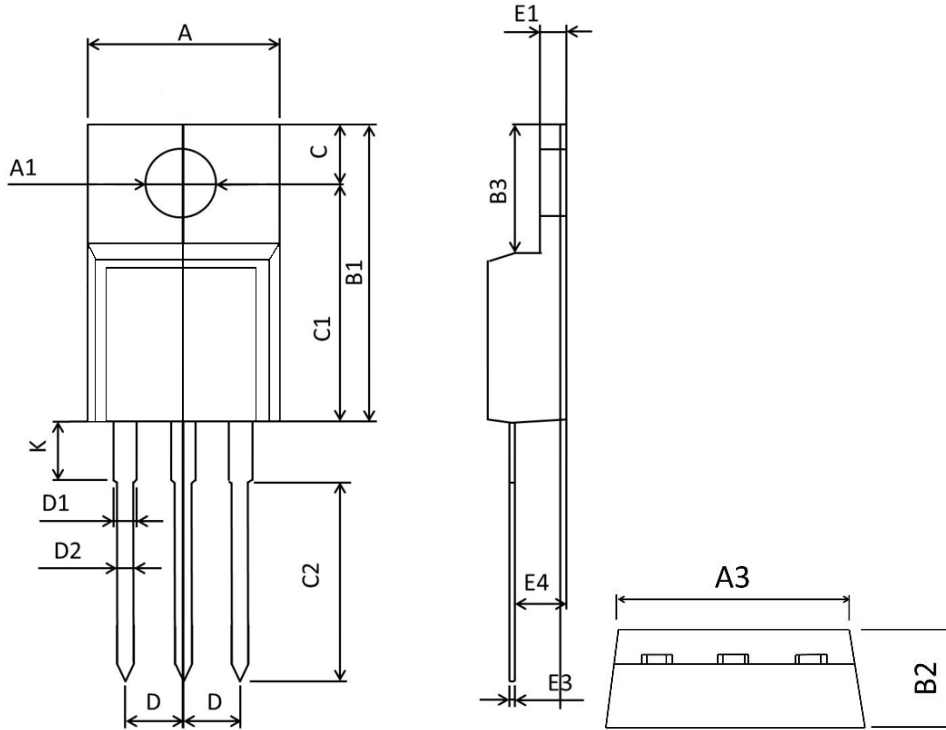


**Fig.7 Switching Time Waveform**



**Fig.8 EAS Waveform**

**TO220F PACKAGE INFORMATION**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	9.860	10.460	0.389	0.411
A1	3.100	3.500	0.122	0.138
B1	15.450	16.300	0.608	0.642
B2	4.400	5.000	0.173	0.197
B3	6.280	7.100	0.247	0.280
C	3.100	3.500	0.122	0.138
C1	12.270	12.870	0.483	0.507
C2	9.600	10.520	0.378	0.414
D	2.540BSC		0.1BSC	
D1	1.070	1.470	0.042	0.058
D2	0.600	1.000	0.024	0.039
K	2.800	3.500	0.110	0.138
E1	2.340	2.740	0.092	0.108
E3	0.350	0.650	0.014	0.026
E4	2.460	2.960	0.097	0.117