650V N-Channel MOSFETs

PJF20N65N

General Description

These N-Channel enhancement mode power field effect transistors are using super junction MOS 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
650V	190mΩ	20A

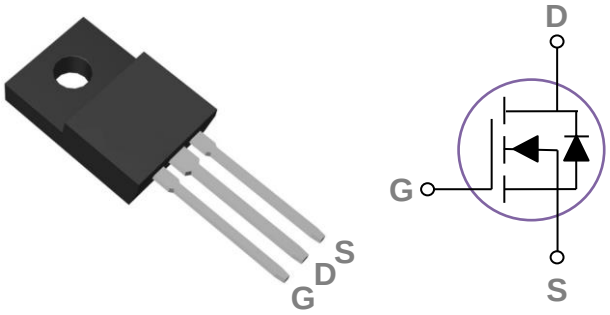
Features

- *650V,20A, RDS(ON) =190mΩ@VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

Applications

- *PFC Power Supply Stages*
- *Motor Control*
- *DC-DC Converters*
- *Adapter*

TO220F Pin Configuration



Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	650	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current – Continuous (T_C=25℃)	20	A
	Drain Current – Continuous (T_C=100℃)	12.5	A
I_{DM}	Drain Current – Pulsed[1]	80	A
EAS	Single Pulse Avalanche Energy	420	mJ
P_D	Power Dissipation (T_C=25℃)	45	W
	Power Dissipation – Derate above 25℃	0.36	W/℃
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 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	---	2.75	℃/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=1mA	650	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=650V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=520V , V_{GS}=0V , T_J=125℃	---	---	10	uA
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=10A	---	160	190	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	2	3	4	V

Dynamic and switching Characteristics

Q_g	Total Gate Charge [2,3]	V_{DS}=480V , V_{GS}=10V , I_D=10A	---	47	70	nC
Q_{gs}	Gate-Source Charge[2,3]		---	5	8	
Q_{gd}	Gate-Drain Charge[2,3]		---	14	21	
$T_{d(on)}$	Turn-On Delay Time[2,3]	V_{DS}=480V , V_{GS}=10V , R_G=25Ω , I_D=10A	---	32	48	ns
T_r	Rise Time[2,3]		---	73	110	
$T_{d(off)}$	Turn-Off Delay Time[2,3]		---	146	220	
T_f	Fall Time[2,3]		---	47	70	
C_{iss}	Input Capacitance	V_{DS}=100V , V_{GS}=0V , F=1MHz	---	1400	2100	pF
C_{oss}	Output Capacitance		---	55	85	
C_{rss}	Reverse Transfer Capacitance		---	1.3	4.6	
R_g	Total Gate Charge [2,3]	V_{GS}=0V, V_{DS}=0V, F=1MHz	---	8	---	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	---	---	20	A
I_{SM}	Pulsed Source Current		---	---	40	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=10A , T_J=25℃	---	---	1.4	V
t_{rr}	Reverse Recovery Time	V_R=400V, I_S=10A	---	310	---	ns
Q_{rr}	Reverse Recovery Charge	di/dt=100A/μs, T_J=25℃	---	4.4	---	uC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

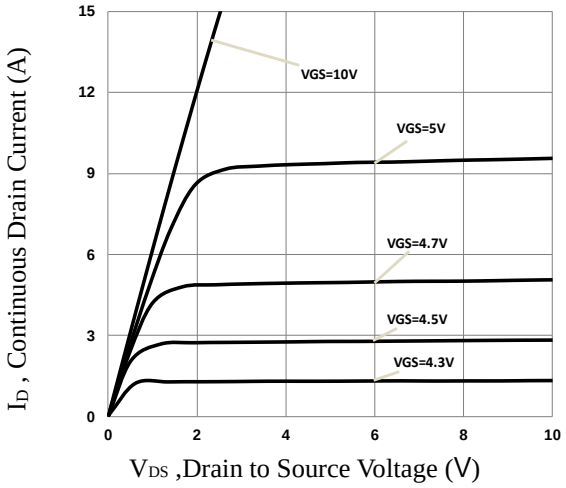


Fig.1 Typical Output Characteristics

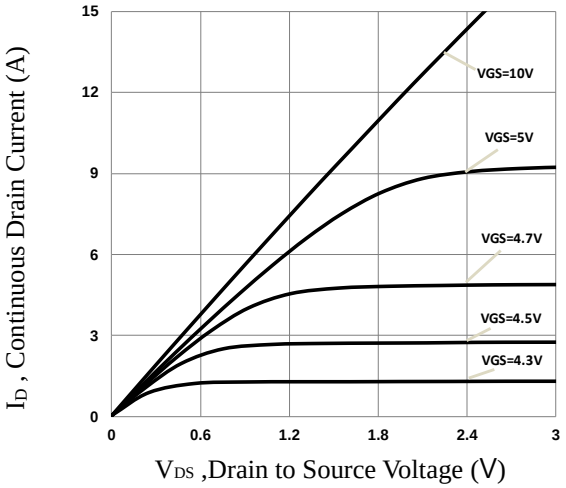


Fig.2 Typical Output Characteristics

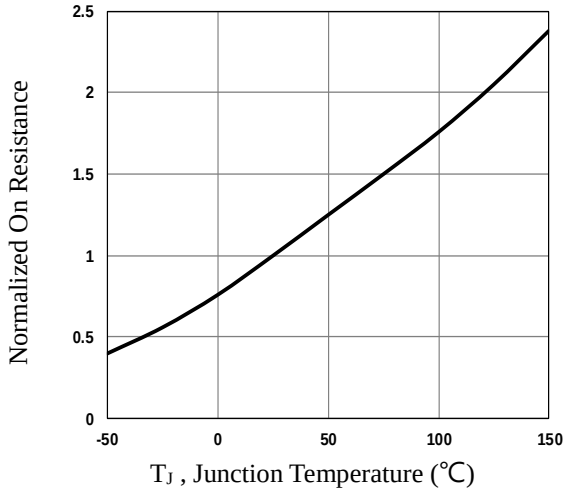


Fig.3 Normalized RDSON vs. T_J

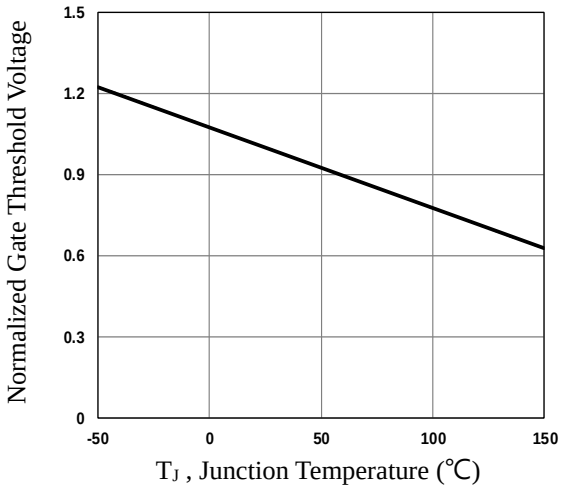


Fig.4 Normalized V_{th} vs. T_J

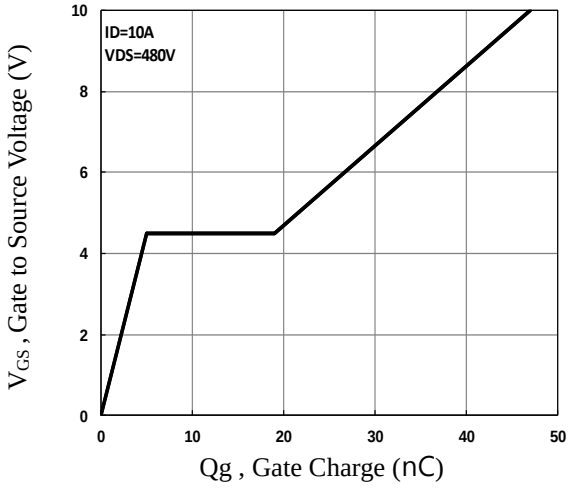


Fig.5 Gate Charge Characteristics

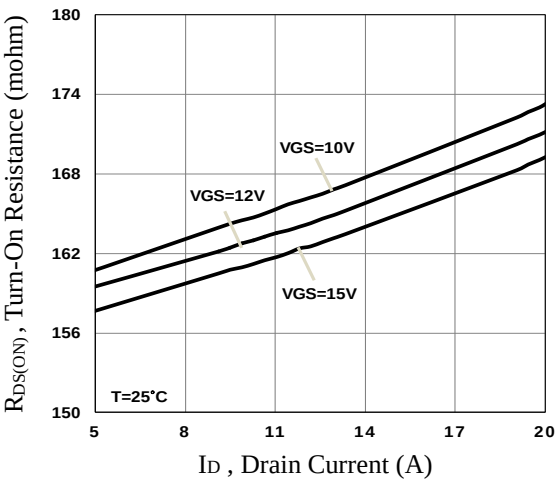


Fig.6 Turn-On Resistance vs. ID

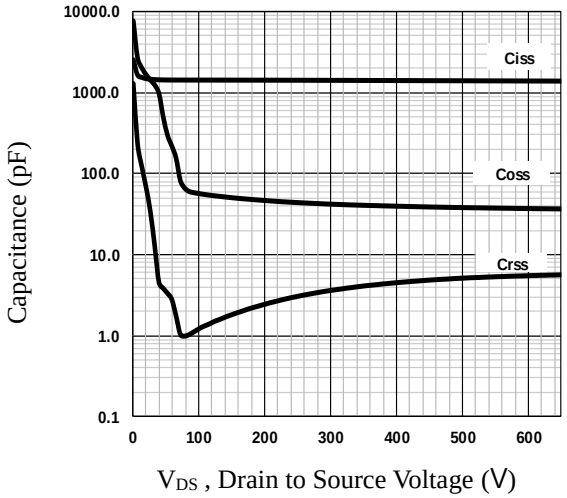


Fig.7 Capacitance Characteristics

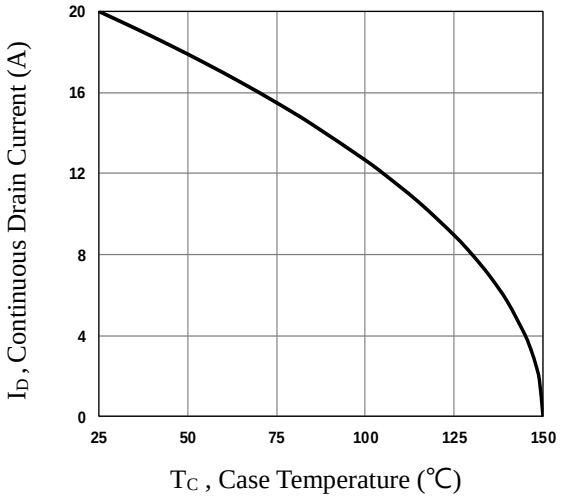


Fig.8 Continuous Drain Current vs. T_C

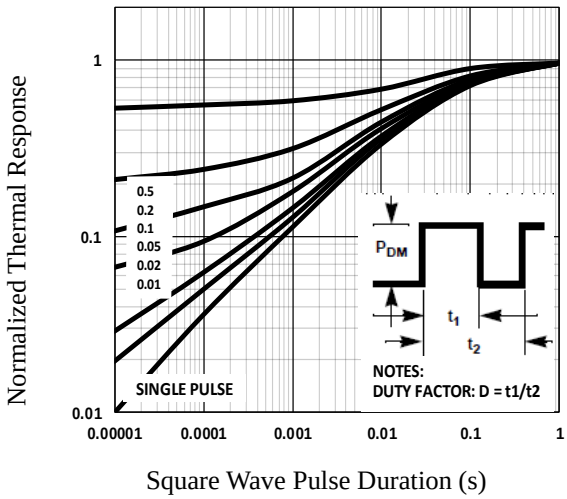


Fig.9 Normalized Transient Impedance

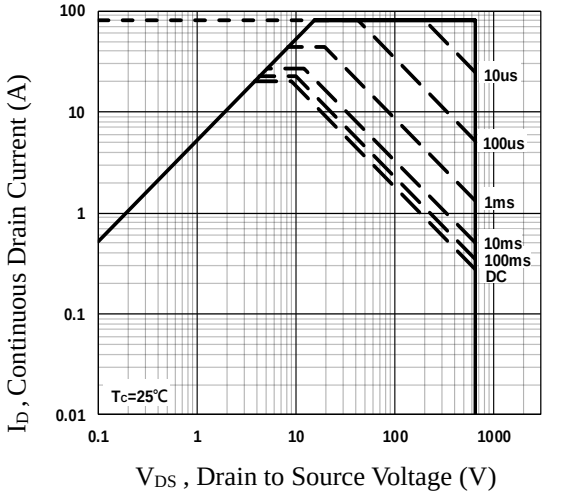


Fig.10 Maximum Safe Operation Area

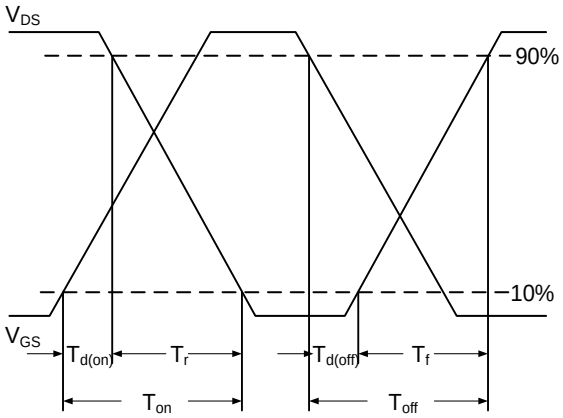


Fig.11 Switching Time Waveform

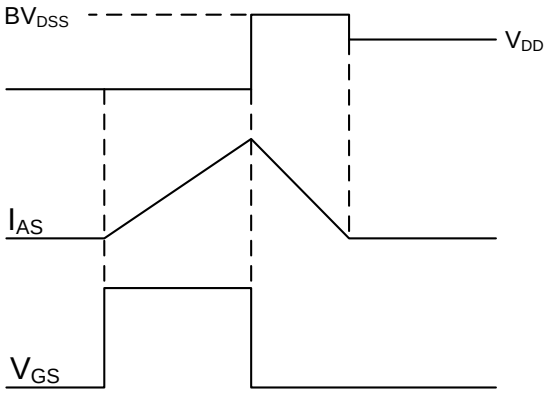
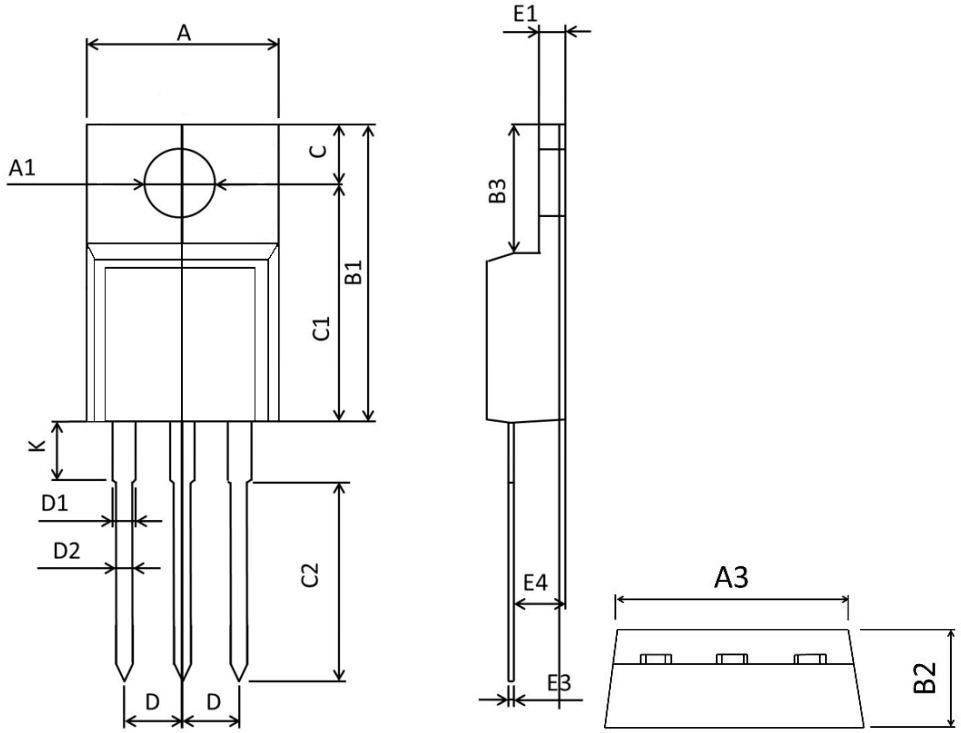


Fig.12 EAS Waveform

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