700V N-Channel MOSFETs

PJR04N70L

General Description

These N-Channel enhancement mode power field effect transistors are using Super Junction 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
700V	0.93Ω	4A

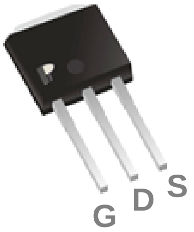
Features

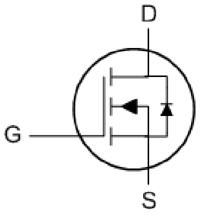
- *4A,700V, RDS(ON) =0.93Ω@VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

Applications

- *High efficient switched mode power supplies*
- *LED Lighting*
- *Adapter/charger*

TO251 Pin Configuration





Absolute Maximum Ratings (Tc=25℃ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	700	V
V_{GS}	Gate-Source Voltage	±30	V
I_D	Drain Current – Continuous (T_C=25˚C)	4	A
	Drain Current – Continuous (T_C=100˚C)	2.5	A
I_{DM}	Drain Current – Pulsed (Note 1)	12	A
EAS	Single Pulse Avalanche Energy (Note 2)	45	mJ
IAS	Single Pulse Avalanched Current (Note 2)	3	A
P_D	Power Dissipation (T_C=25˚C)	50	W
	Power Dissipation – Derate above 25˚C	0.4	W/˚C
T_{STG}	Storage Temperature Range	-55 to 150	˚C
T_J	Operating Junction Temperature Range	-55 to 150	˚C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	˚C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	2.5	˚C/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=250uA	700	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=700V , V_{GS}=0V , T_J=25˚C	---	---	1	uA
		V_{DS}=700V , V_{GS}=0V , T_J=125˚C	---	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=2A	---	0.83	0.93	Ω
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	2.5	3.5	4.5	V

Dynamic and switching Characteristics

Q_g	Total Gate Charge (10V)	V_{DS}=480V , V_{GS}=10V , I_D=2A (Note 4,5)	---	13	20	nC
Q_{gs}	Gate-Source Charge		---	3	6	
Q_{gd}	Gate-Drain Charge		---	6	12	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=300V , V_{GS}=10V , R_G=12Ω, I_D=2A (Note 4,5)	---	13	20	ns
T_r	Rise Time		---	12	19	
$T_{d(off)}$	Turn-Off Delay Time		---	31	50	
T_f	Fall Time		---	9	17	
C_{iss}	Input Capacitance	V_{DS}=25V , V_{GS}=0V , F=1MHz	---	450	700	pF
C_{oss}	Output Capacitance		---	300	450	
C_{rss}	Reverse Transfer Capacitance		---	5	10	

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	---	---	4	A
I_{SM}	Pulsed Source Current		---	---	8	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=2A , T_J=25˚C	---	---	1.2	V
t_{rr}	Reverse Recovery Time	I_S=4A , dI/dt=100A/µs , T_J=25˚C	---	220	---	ns
Q_{rr}	Reverse Recovery Charge	(Note 4)	---	1.6	---	uC

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V_{DD}=50V,V_{GS}=10V,L=10mH,I_{AS}=3A.,R_G=1.46Ω, Starting T_J=25˚C.
3. I_{SD} ≦ 2A,di/dt ≦ 200A/us, V_{DD} ≦ BV_{DSS}, Starting T_J=25˚C.
4. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
5. Essentially independent of operating temperature.

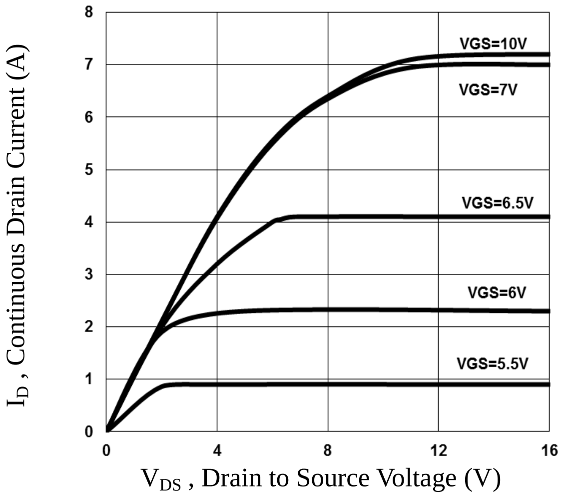


Fig.1 Output Characteristics

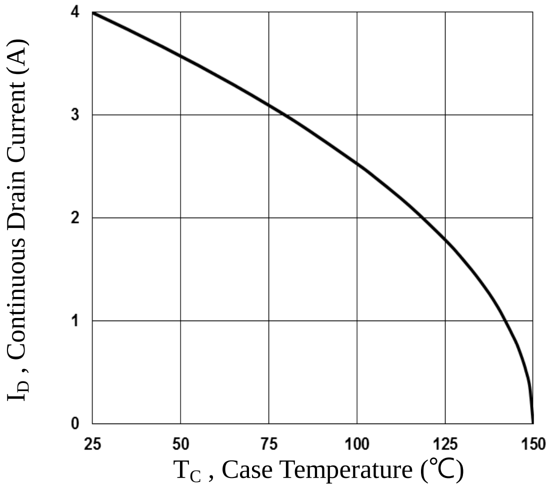


Fig.2 Continuous Drain Current vs. T_C

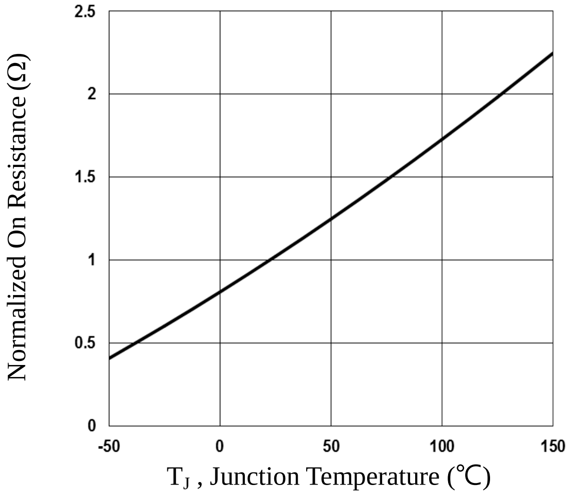


Fig.3 Normalized RDSON vs. T_J

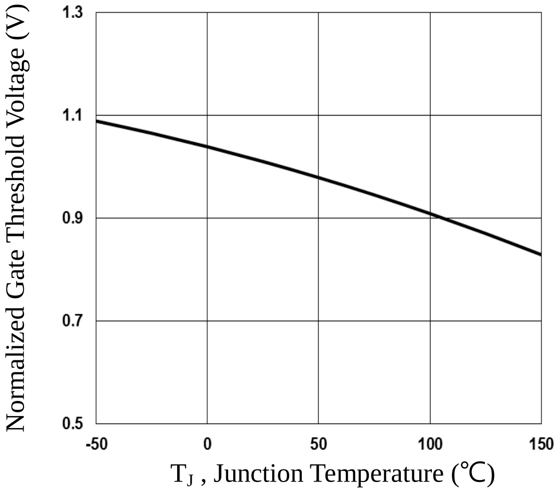


Fig.4 Normalized V_{th} vs. T_J

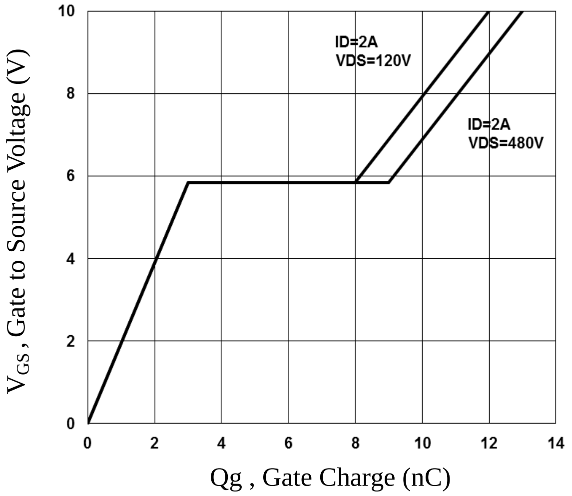


Fig.5 Gate Charge Waveform

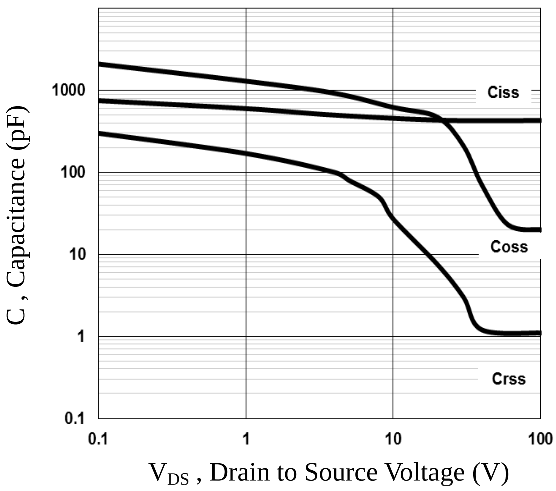


Fig.6 Capacitance Characteristics

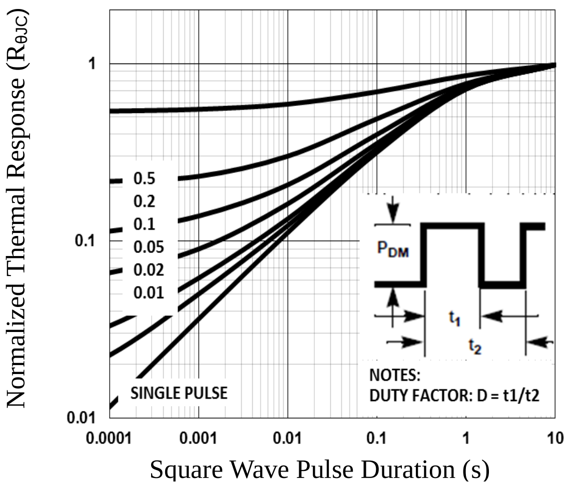


Fig.7 Normalized Transient Impedance

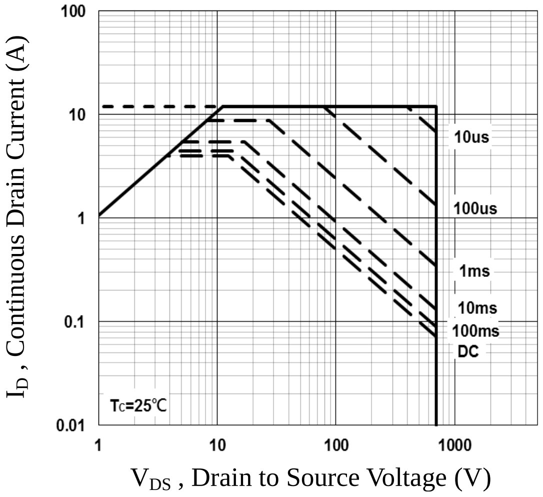


Fig.8 Maximum Safe Operation Area

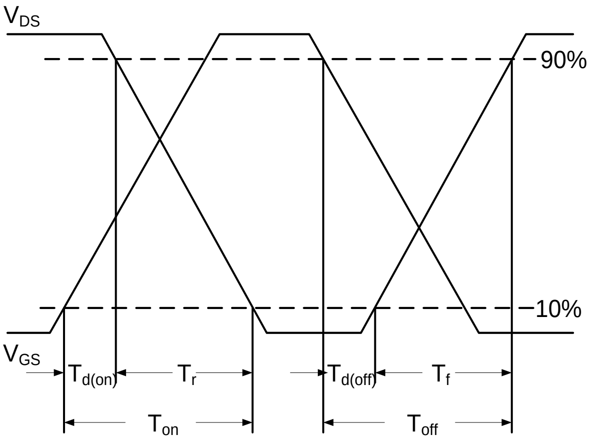


Fig.9 Switching Time Waveform

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

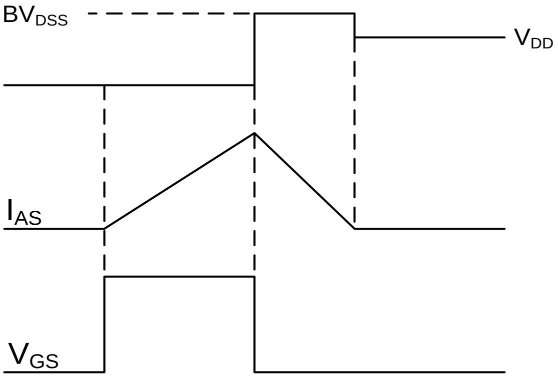
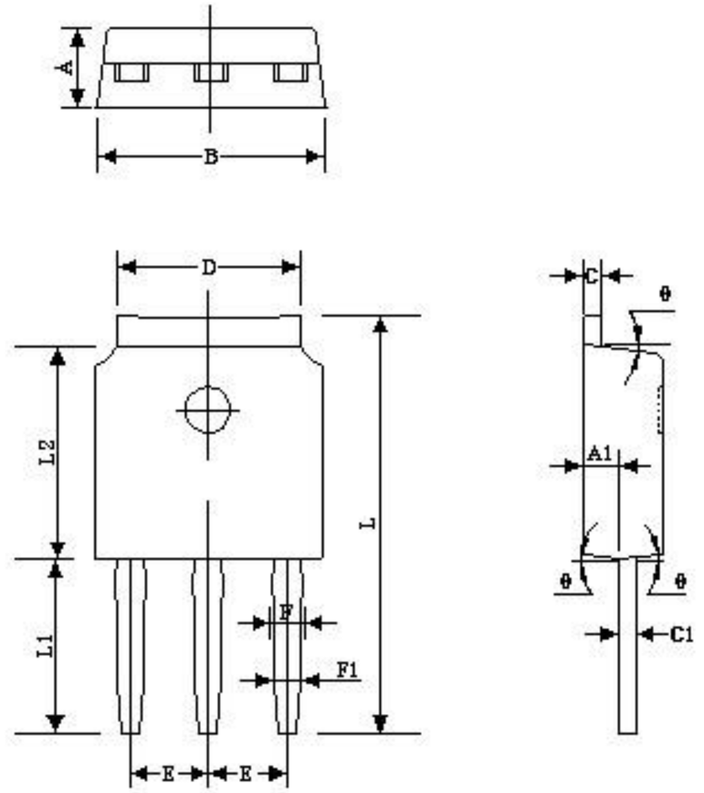


Fig.10 EAS Waveform

TO251 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	2.400	2.200	0.094	0.087
A1	1.110	0.910	0.044	0.036
B	6.700	6.500	0.264	0.256
C	0.580	0.460	0.023	0.018
C1	0.580	0.460	0.023	0.018
D	5.460	5.100	0.215	0.201
E	2.386	2.186	0.094	0.086
F	0.940	0.740	0.037	0.029
F1	0.860	0.660	0.034	0.026
L	12.300	11.700	0.484	0.461
L1	5.200	4.800	0.205	0.189
L2	6.200	6.000	0.244	0.236
θ	9°	3°	9°	3°