

N-Channel Super Junction Power MOSFET II

General Description

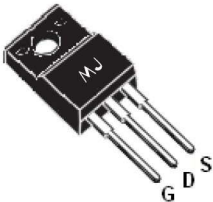
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

Features

- ◆ New technology for high voltage device
- ◆ Low on-resistance and low conduction losses
- ◆ Small package
- ◆ Ultra Low Gate Charge cause lower driving requirements
- ◆ 100% Avalanche Tested
- ◆ ROHS compliant



Schematic diagram



TO-220F

Application

- ◆ Power factor correction (PFC)
- ◆ Switched mode power supplies(SMPS)
- ◆ Uninterruptible Power Supply (UPS)

V_{DS}	700	V
$R_{DS(ON)TYP.}$	165	m Ω
I_D	21	A

Package Marking And Ordering Information

Device	Device Package	Marking
MJ70R180F	TO-220F	MJ70R180F

Table 1. Absolute Maximum Ratings (Tc=25℃)

Parameter	Symbol	MJ70R180F	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	700	V
Gate-Source Voltage ($V_{DS}=0V$)	V_{GS}	±30	V
Continuous Drain Current at Tc=25℃	I_D (DC)	21*	A
Continuous Drain Current at Tc=100℃	I_D (DC)	13.2*	A
Pulsed drain current ^(Note 1)	I_{DM} (pluse)	63*	A
Maximum Power Dissipation (Tc=25℃)	P_D	34	W
Derate above 25℃	P_D	0.27	W/℃
Single pulse avalanche energy ^(Note 2)	E_{AS}	690	mJ
Avalanche current ^(Note 1)	I_{AR}	7	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} ^(Note 1)	E_{AR}	1	mJ

Parameter	Symbol	MJ70R180F	Unit
Drain Source voltage slope, $V_{DS} \leq 480 V$	dv/dt	50	V/ns
Reverse diode dv/dt, $V_{DS} \leq 480 V, I_{SD} < I_D$	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150	℃

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	MJ70R180F	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R _{thJC}	3.67	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R _{thJA}	80	°C/W

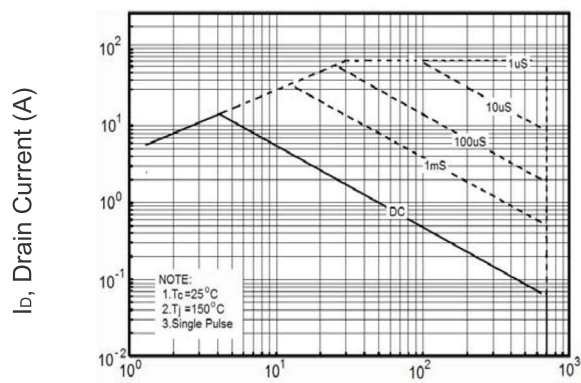
Table 3. Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	700	-	-	V
Zero Gate Voltage Drain Current (Tc=25°C)	I _{DSS}	V _{DS} =700V,V _{GS} =0V	-	0.05	1	μA
Zero Gate Voltage Drain Current (Tc=125°C)	I _{DSS}	V _{DS} =700V,V _{GS} =0V	-	-	100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±30V,V _{DS} =0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	2.5	3	3.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V,I _D =10.5A	-	165	190	mΩ
Dynamic Characteristics						
Forward Transconductance	g _{FS}	V _{DS} =20V,I _D =10.5A	-	17.5	-	S
Input Capacitance	C _{ies}	V _{DS} =50V,V _{GS} =0V F=1.0MHz	-	1950	-	PF
Output Capacitance	C _{oss}		-	150	-	PF
Reverse Transfer Capacitance	C _{rss}		-	5	-	PF
Total Gate Charge	Q _g	V _{DS} =480V,I _D =21A V _{GS} =10V	-	45	70	nC
Gate-Source Charge	Q _{gs}		-	9	-	nC
Gate-Drain Charge	Q _{gd}		-	18	-	nC
Intrinsic gate resistance	R _G	f=1 MHz open drain	-	1	-	Ω
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V,I _D =11A R _G =4Ω,V _{GS} =10V	-	11	-	nS
Turn-on Rise Time	t _r		-	6	-	nS
Turn-Off Delay Time	t _{d(off)}		-	61	100	nS
Turn-Off Fall Time	t _f		-	4.5	12	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I _{SD}	T _C =25°C	-	-	21	A
Pulsed Source-drain current (Body Diode)	I _{SDM}		-	-	63	A
Forward On Voltage	V _{SD}	T _J =25°C,I _{SD} =21A,V _{GS} =0V	-	0.9	1.3	V
Reverse Recovery Time	t _{rr}	T _J =25°C,I _F =21A di/dt=100A/μs	-	310	-	nS
Reverse Recovery Charge	Q _{rr}		-	5	-	uC
Peak reverse recovery current	I _{rrm}		-	28	-	A

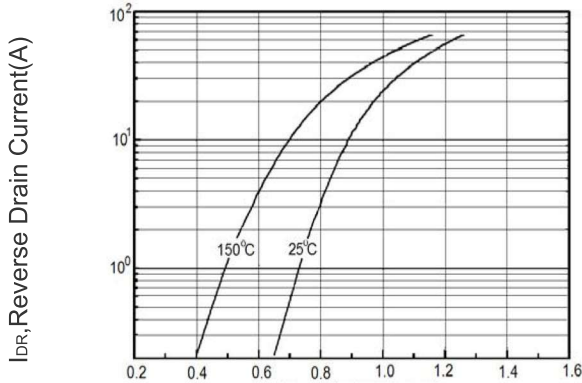
Notes

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature
- 2.T_J=25℃,V_{DD}=50V,V_G=10V, R_G=25Ω

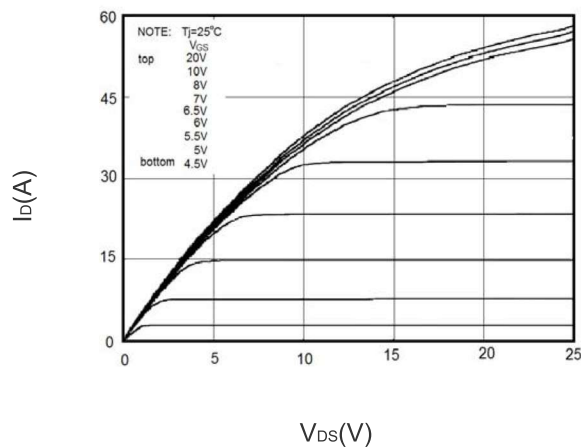
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)



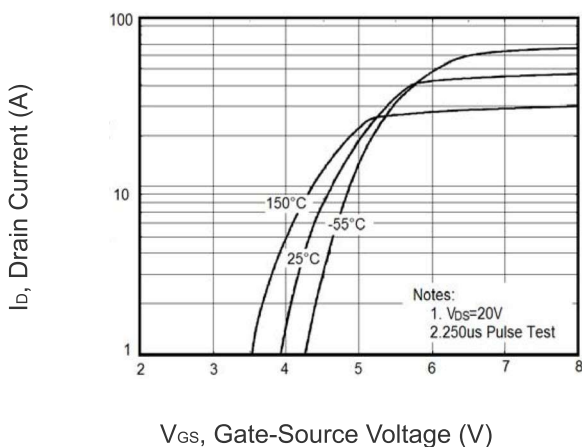
VDs, Drain-Source Voltage (V)
Figure 1 Safe operating area



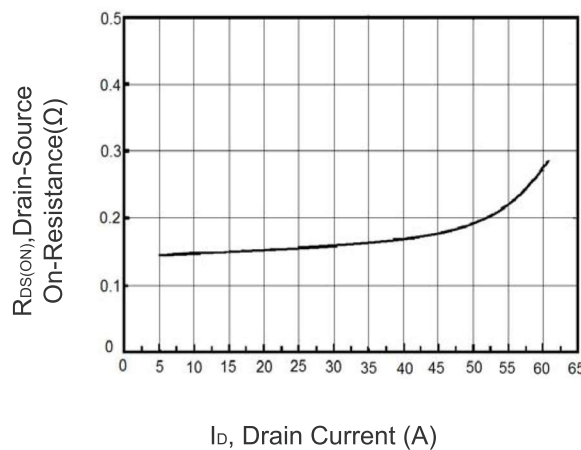
VSD,Source-Drain Voltage(V)
Figure 2 Source-Drain Diode Forward Voltage



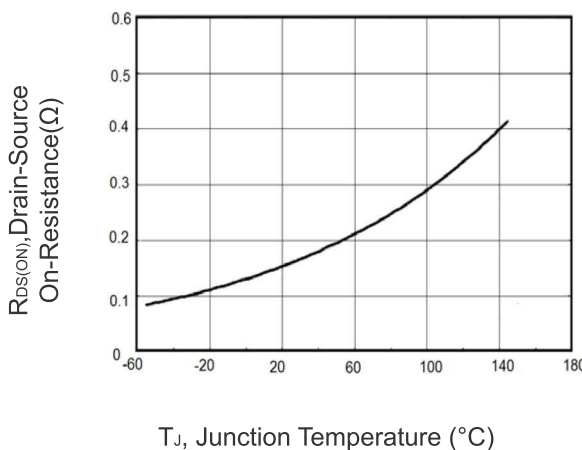
VDS(V)
Figure 3 Output characteristics



VGS, Gate-Source Voltage (V)
Figure 4 Transfer characteristics



ID, Drain Current (A)
Figure 5 Static drain-source on resistance



TJ, Junction Temperature (°C)
Figure 6 RDS(ON) vs Junction Temperature

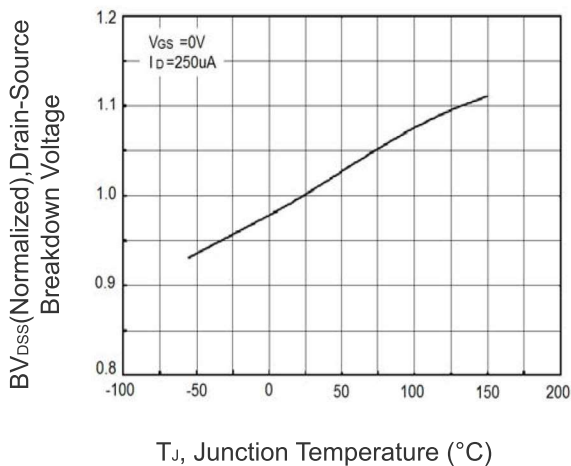


Figure 7 BV_{DSS} vs Junction Temperature

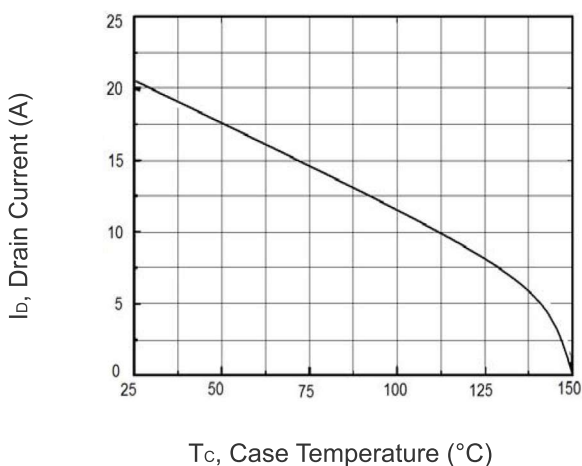


Figure 8 Maximum I_D vs Junction Temperature

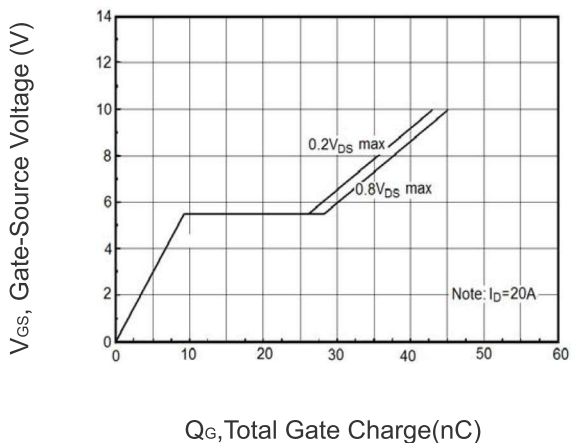


Figure 9 Gate charge waveforms

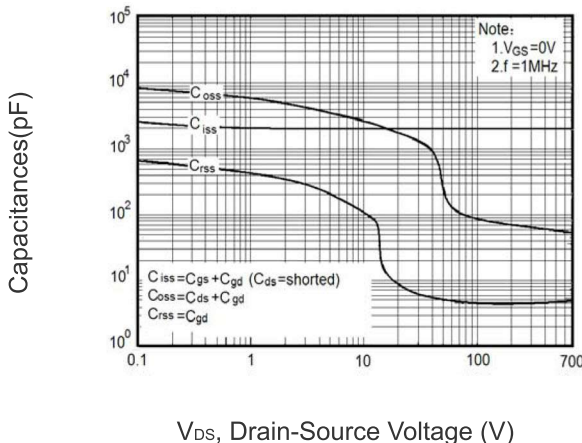


Figure 10 Capacitance

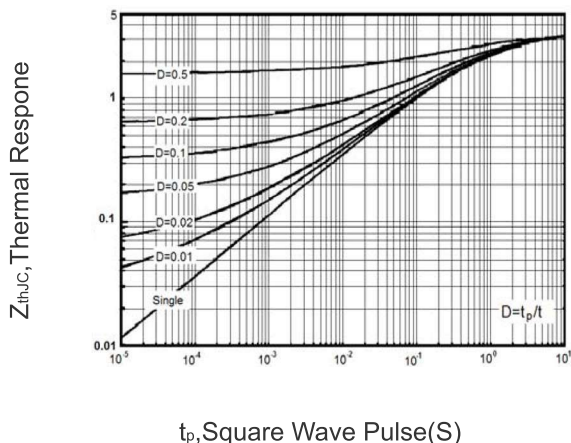
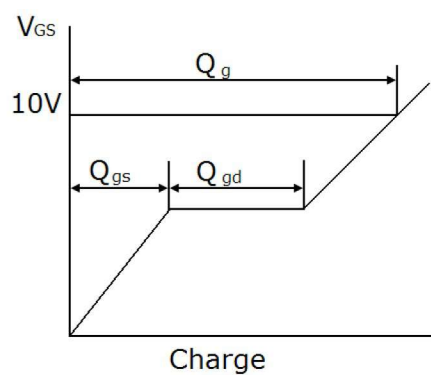


Figure 11 Transient Thermal Impedance

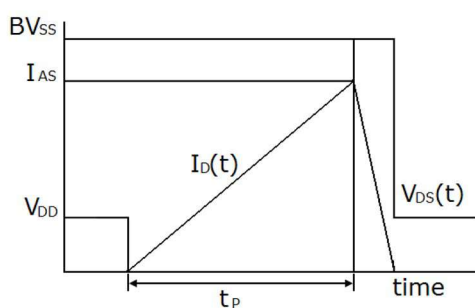
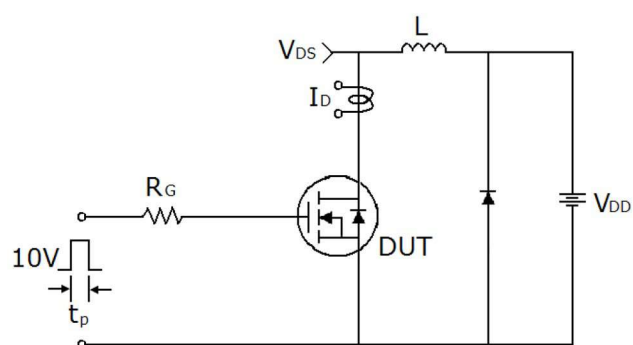
Test circuit



Gate charge test circuit & Waveform

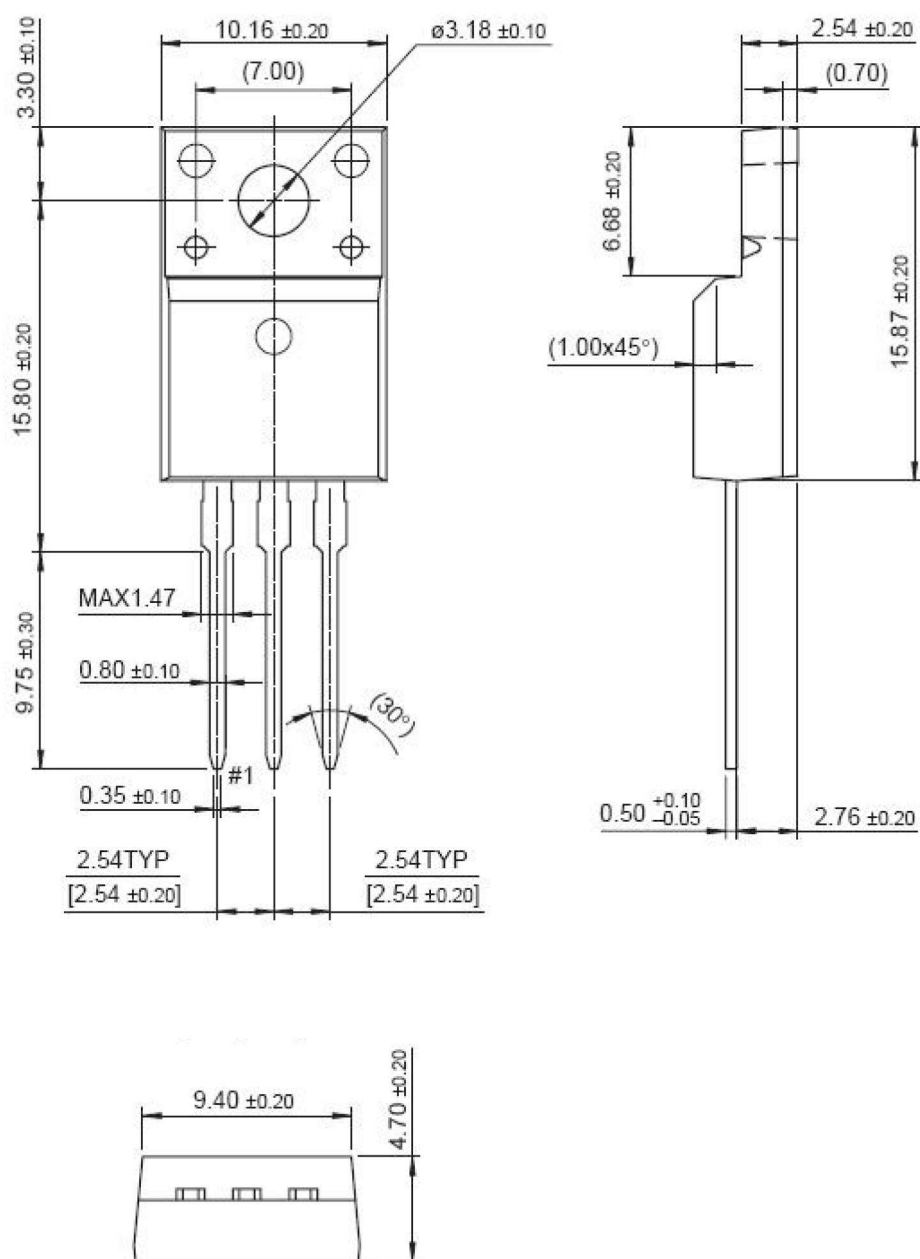


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-220F Package Information



Dimensions in Millimeters

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