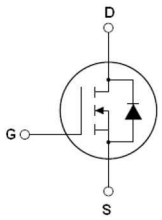
N-Channel Super Junction Power MOSFET Ⅲ

General Description

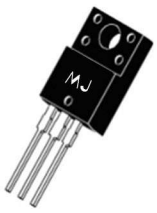
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

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
$R_{DS(ON)TYP}$	680	mΩ
I_D	7	A

Package Marking And Ordering Information

Device	Device Package	Marking
MJ70T680F	TO-220F	MJ70T680F

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

Parameter	Symbol	MJ70T680F	Unit
Drain-Source Voltage (V_{GS}=0V)	V_{DS}	700	V
Gate-Source Voltage (V_{DS}=0V) ,AC (f>1 Hz)	V_{GS}	±30	V
Continuous Drain Current at Tc=25°C	I_D (DC)	7*	A
Continuous Drain Current at Tc=100°C	I_D (DC)	4.5*	A
Pulsed drain current (Note 1)	I_{DM} (pluse)	28*	A
Maximum Power Dissipation (Tc=25℃)	P_D	31.4	W
Derate above 25°C	P_D	0.25	W/°C
Single pulse avalanche energy (Note 2)	E_{AS}	101	mJ
Avalanche current (Note 1)	I_{AR}	1.5	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	0.28	mJ

Parameter	Symbol	MJ70T680F	Unit
Drain Source voltage slope, V_{DS} ≤480 V	dv/dt	50	V/ns
Reverse diode dv/dt, V_{DS} ≤480 V,I_{SD}<I_D	dv/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55...+150	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	MJ70T680F	Unit
Thermal Resistance，Junction-to-Case（Maximum）	R_{thJC}	3.98	°C/W
Thermal Resistance，Junction-to-Ambient（Maximum）	R_{thJA}	80	°C/W

Table 3. Electrical Characteristics (T_A=25℃ 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℃)	I_{DSS}	V_{DS}=700V,V_{GS}=0V	-	-	1	μA
Zero Gate Voltage Drain Current (Tc=125℃)	I_{DSS}	V_{DS}=700V,V_{GS}=0V	-	-	100	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	3	-	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V,I_D=3.5A	-	680	760	mΩ
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=50V,V_{GS}=0V F=1.0MHz	-	435	-	pF
Output Capacitance	C_{oss}		-	28	-	pF
Reverse Transfer Capacitance	C_{rss}		-	3.3	-	pF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=7A V_{GS}=10V	-	11	-	nC
Gate-Source Charge	Q_{gs}		-	3.5	-	nC
Gate-Drain Charge	Q_{gd}		-	5	-	nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=420V,I_D=3.5A R_G=4.7Ω,V_{GS}=10V	-	8.5	-	nS
Turn-on Rise Time	t_r		-	7	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	59	77	nS
Turn-Off Fall Time	t_f		-	9.5	16	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I_{SD}	T_C=25°C	-	-	7	A
Pulsed Source-drain current (Body Diode)	I_{SDM}		-	-	28	A
Forward On Voltage	V_{SD}	T_j=25°C,I_{SD}=7A,V_{GS}=0V	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	T_j=25°C,I_F=3.5A di/dt=100A/μs	-	210	-	nS
Reverse Recovery Charge	Q_{rr}		-	0.85	-	uC
Peak reverse recovery Current	I_{rrm}		-	8	-	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)

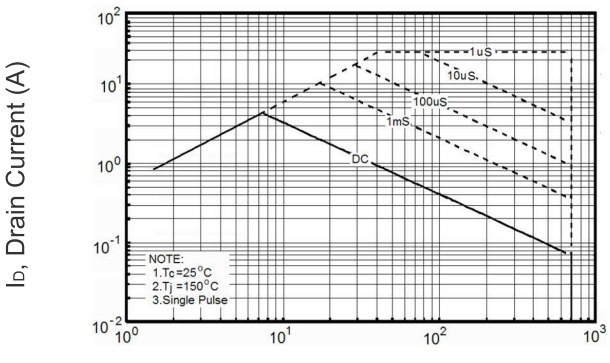


Figure 1 Safe operating area

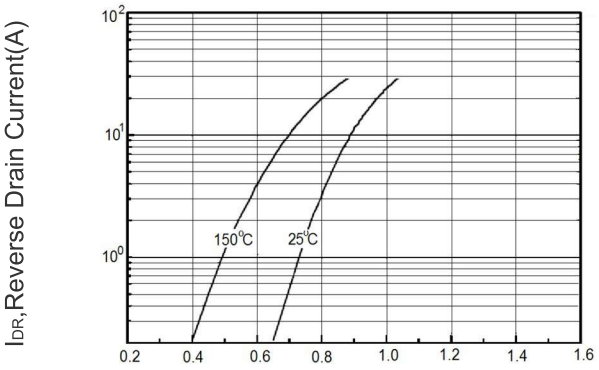


Figure 2 Source-Drain Diode Forward Voltage

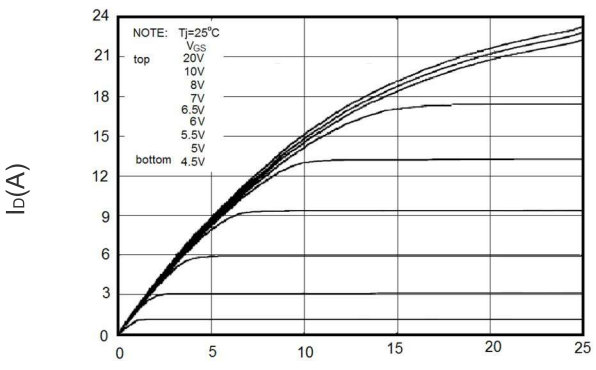


Figure 3 Output characteristics

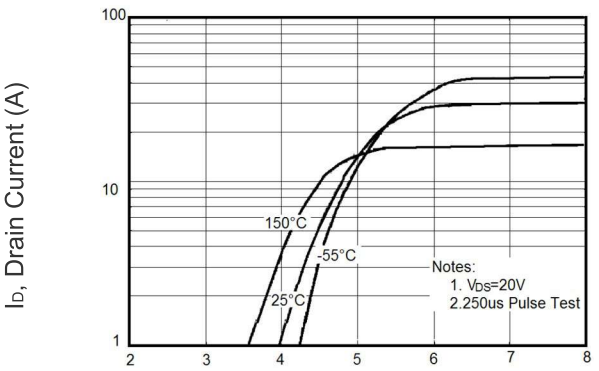


Figure 4 Transfer characteristics

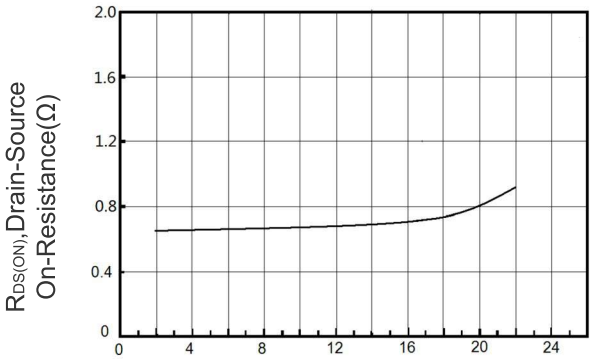


Figure 5 Static drain-source on resistance

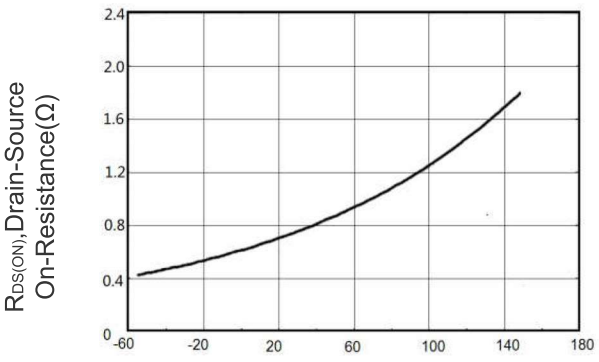


Figure 6 $R_{DS(ON)}$ vs Junction Temperature

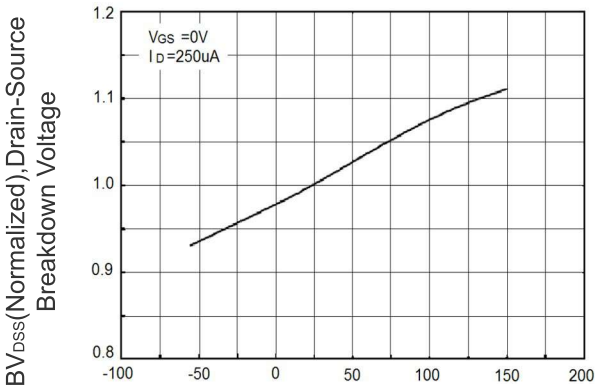


Figure 7 BV_{DSS} vs Junction Temperature

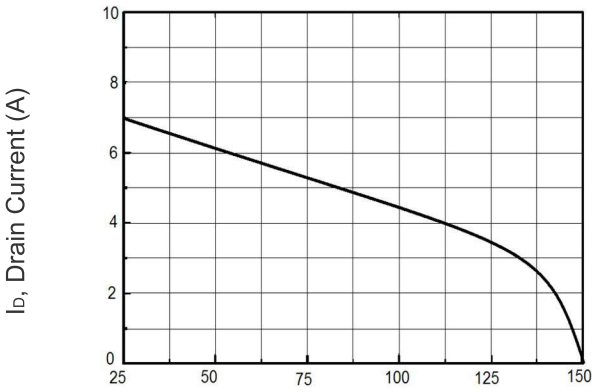


Figure 8 Maximum I_D vs Junction Temperature

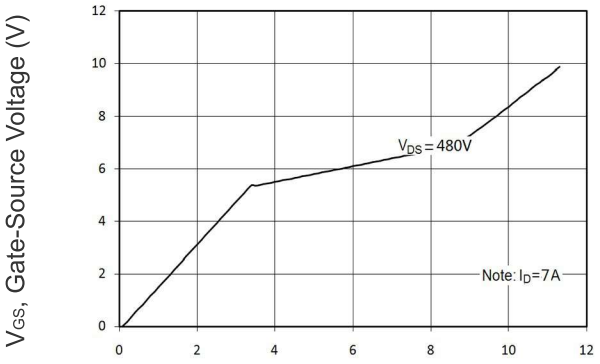


Figure 9 Gate charge waveforms

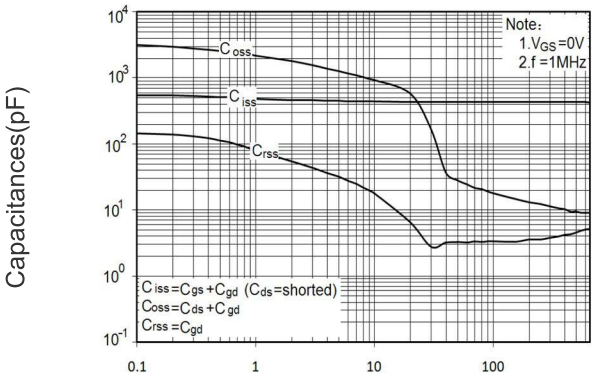


Figure 10 Capacitance

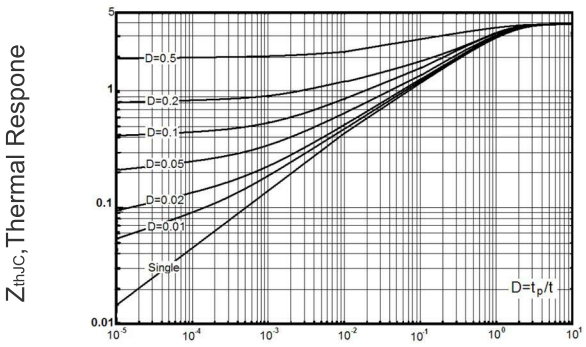
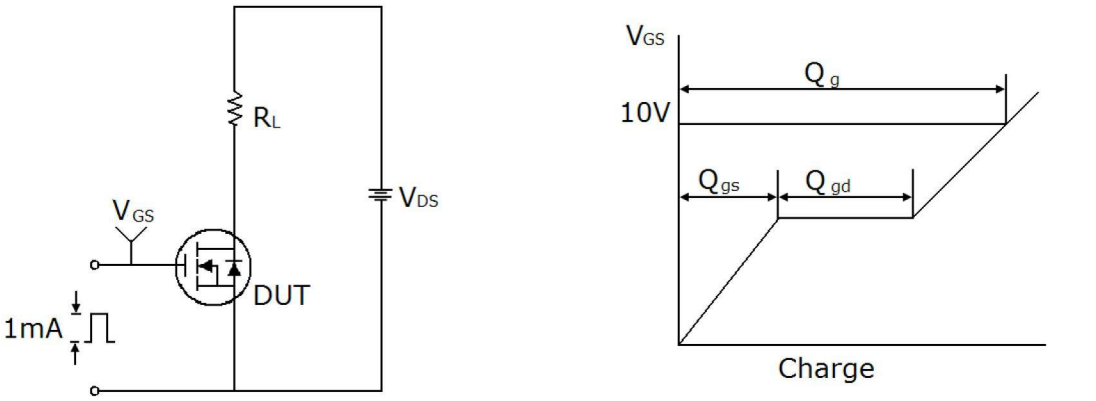
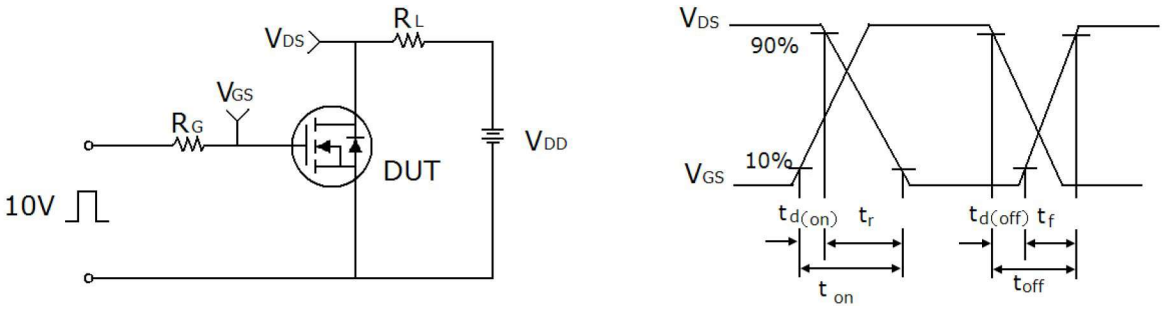


Figure 11 Transient Thermal Impedance

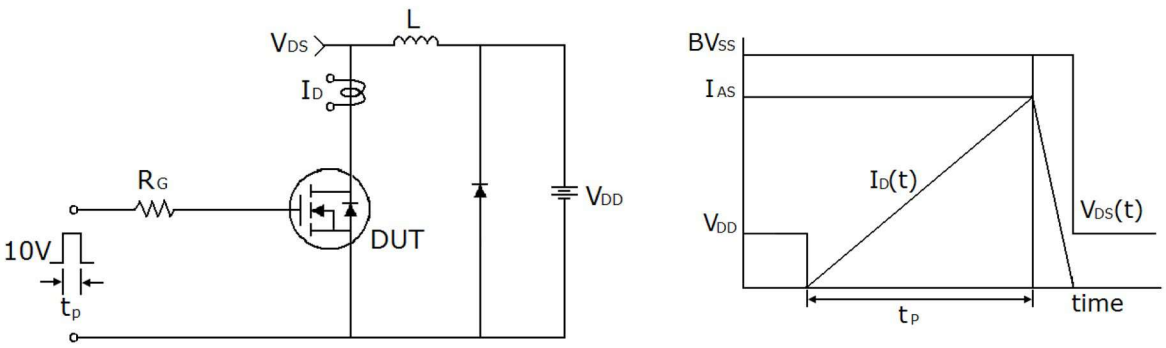
Test circuit



Gate charge test circuit & Waveform

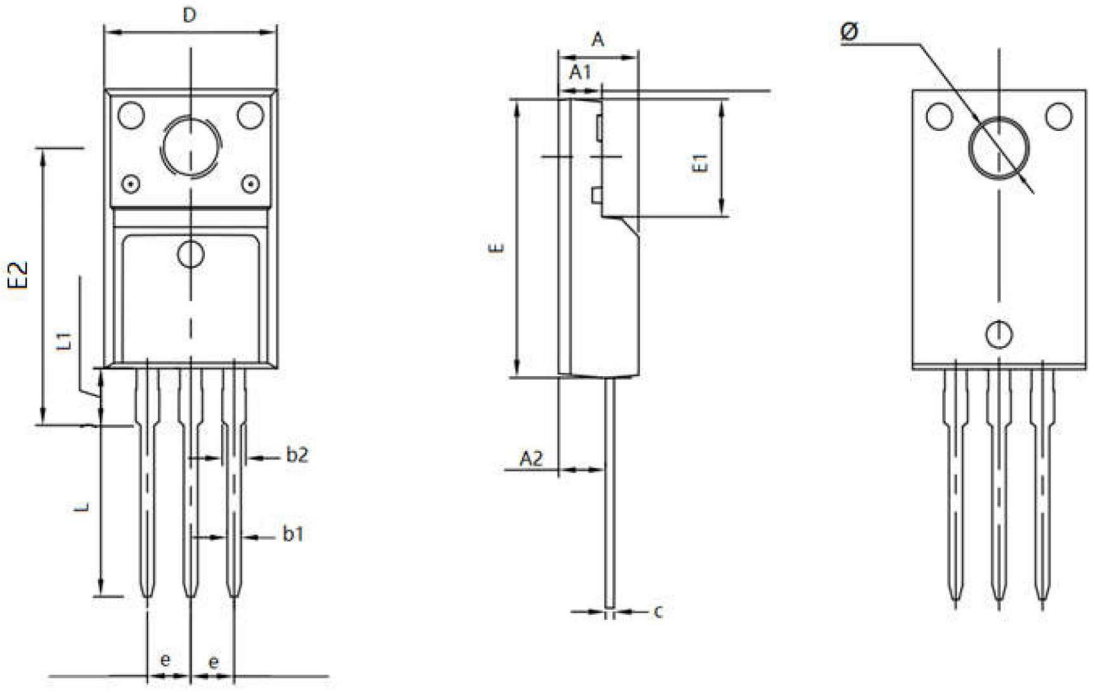


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-220F Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.500	4.900	0.177	0.193
A1	2.340	2.740	0.092	0.108
A2	2.560	2.960	0.101	0.117
b1	0.700	0.900	0.028	0.035
b2	1.180	1.580	0.046	0.062
c	0.400	0.600	0.016	0.024
D	9.960	10.360	0.392	0.408
E	15.670	15.970	0.617	0.629
E1	6.500	6.900	0.256	0.272
E2	15.500	16.100	0.610	0.634
e	2.540 TYP		0.100 TYP	
Φ	3.080	3.280	0.121	0.129
L	12.640	13.240	0.498	0.521
L1	3.030	3.430	0.119	0.135

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