

N-Channel Super Junction Power MOSFET III

General Description

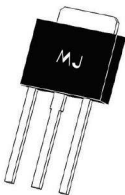
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

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-251

Application

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

V_{DS}	700	V
$R_{DS(ON)TYP}$	820	mΩ
I_D	5	A

Package Marking And Ordering Information

Device	Device Package	Marking
MJ70T900I	TO-251	MJ70T900I

Table 1. Absolute Maximum Ratings (Tc=25°C)

Parameter	Symbol	Value	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)	5	A
Continuous Drain Current at Tc=100°C	I_D (DC)	3	A
Pulsed drain current ^(Note 1)	I_{DM} (pluse)	20	A
Maximum Power Dissipation (Tc=25°C)	P_D	46	W
Derate above 25°C	P_D	0.37	W/°C
Single pulse avalanche energy ^(Note 2)	E_{AS}	52	mJ
Avalanche current ^(Note 1)	I_{AR}	0.9	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} ^(Note 1)	E_{AR}	0.14	mJ

Parameter	Symbol	Value	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	°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R _{thJC}	2.72	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R _{thJA}	75	°C/W

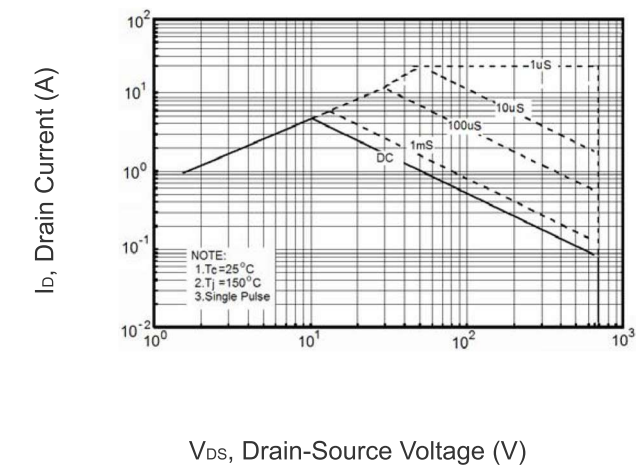
Table 3. Electrical Characteristics (T_A=25°C unless otherwise noted)

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	-	-	1	μA
Zero Gate Voltage Drain Current (Tc=125°C)	I _{DSS}	V _{DS} =700V,V _{GS} =0V	-	-	50	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 =2.5A	-	820	950	mΩ
Dynamic Characteristics						
Input Capacitance	C _{ies}	V _{DS} =50V,V _{GS} =0V F=1.0MHz	-	370	-	pF
Output Capacitance	C _{OSS}		-	25	-	pF
Reverse Transfer Capacitance	C _{rss}		-	0.5	-	pF
Total Gate Charge	Q _g	V _{DS} =480V,I _D =5A V _{GS} =10V	-	10.5	15	nC
Gate-Source Charge	Q _{gs}		-	2.6	-	nC
Gate-Drain Charge	Q _{gd}		-	5.3	-	nC
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =420V,I _D =3A R _G =5Ω,V _{GS} =10V	-	8	-	nS
Turn-on Rise Time	t _r		-	4	-	nS
Turn-Off Delay Time	t _{d(off)}		-	55	-	nS
Turn-Off Fall Time	t _f		-	11	-	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I _{SD}	T _C =25°C	-	-	5	A
Pulsed Source-drain current (Body Diode)	I _{SDM}		-	-	20	A
Forward On Voltage	V _{SD}	T _J =25°C,I _{SD} =5A,V _{GS} =0V	-	0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _J =25°C,I _F =2.5A di/dt=100A/μs	-	210	-	nS
Reverse Recovery Charge	Q _{rr}		-	0.66	-	uC
Peak reverse recovery Current	I _{rrm}		-	6.5	-	A

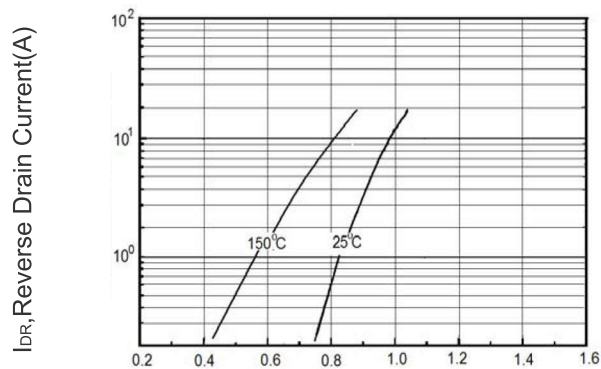
Notes

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature
2. $T_J=25^{\circ}\text{C}$, $V_{DD}=50\text{V}$, $V_G=10\text{V}$, $R_G=25\Omega$

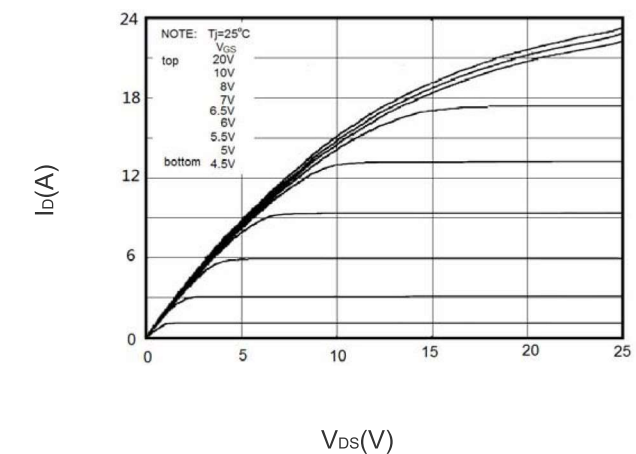
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)



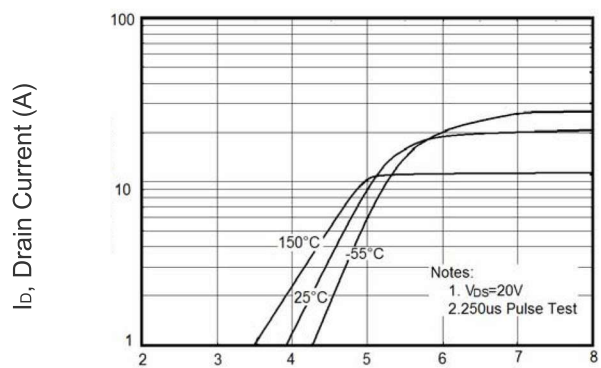
V_{DS} , Drain-Source Voltage (V)
Figure 1 Safe operating area



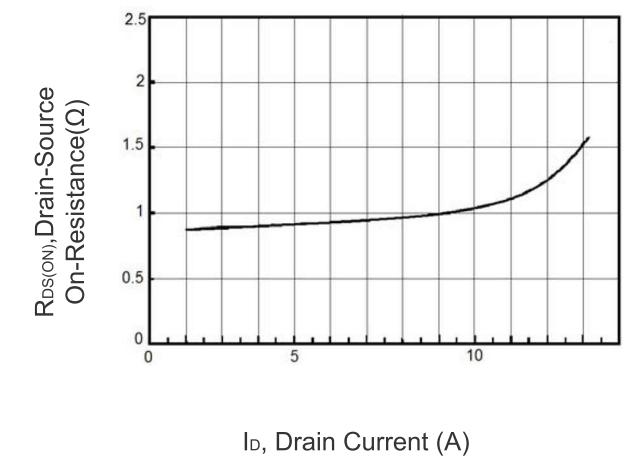
V_{SD} , Source-Drain Voltage(V)
Figure 2 Source-Drain Diode Forward Voltage



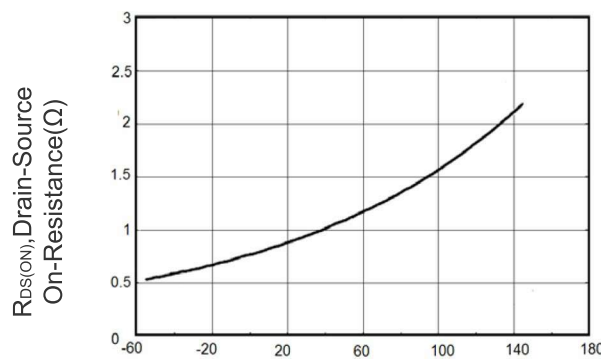
V_{DS} (V)
Figure 3 Output characteristics



V_{GS} , Gate-Source Voltage (V)
Figure 4 Transfer characteristics



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



T_J , Junction Temperature ($^{\circ}\text{C}$)
Figure 6 $R_{DS(ON)}$ vs Junction Temperature

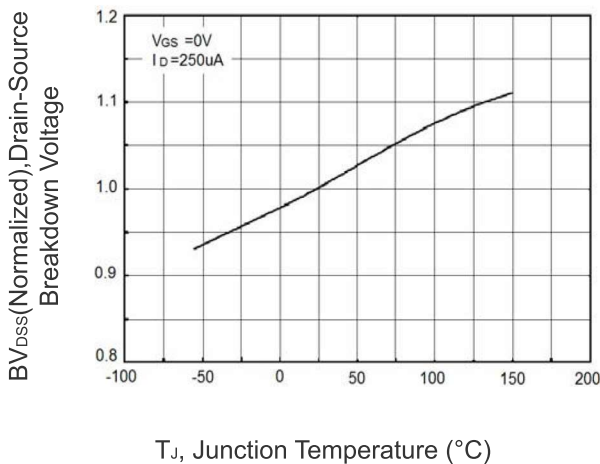


Figure 7 BV_{DSS} vs Junction Temperature

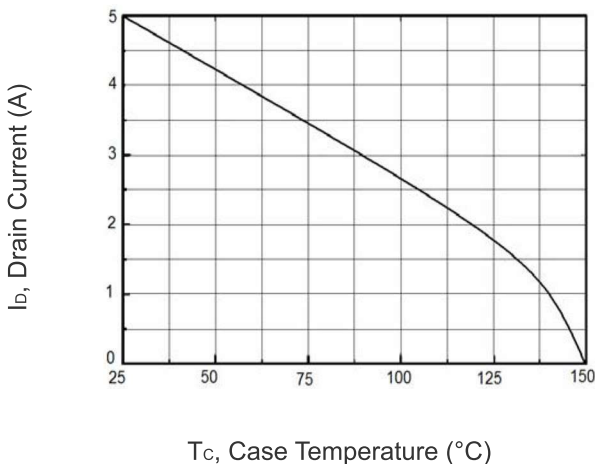


Figure 8 Maximum I_D vs Junction Temperature

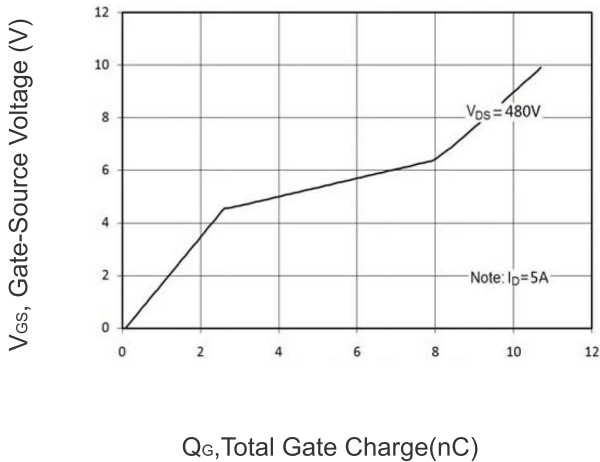


Figure 9 Gate charge waveforms

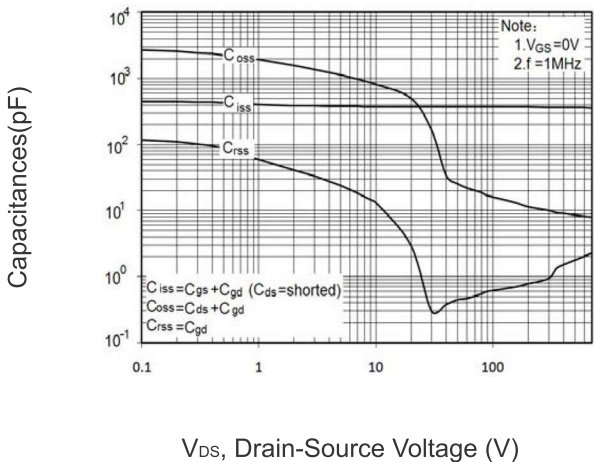


Figure 10 Capacitance

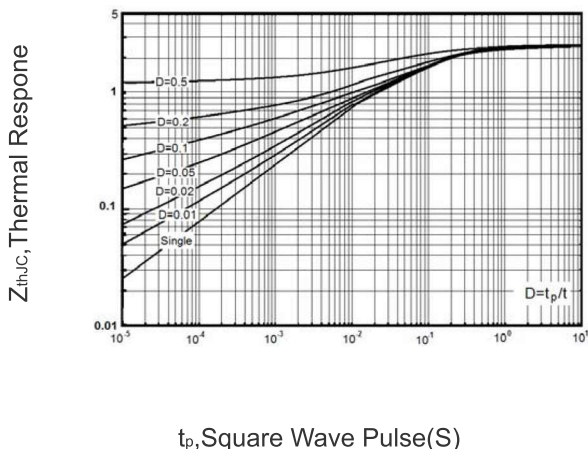
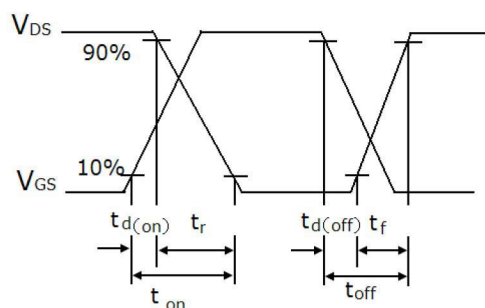


Figure 11 Transient Thermal Impedance

Test circuit



Gate charge test circuit & Waveform

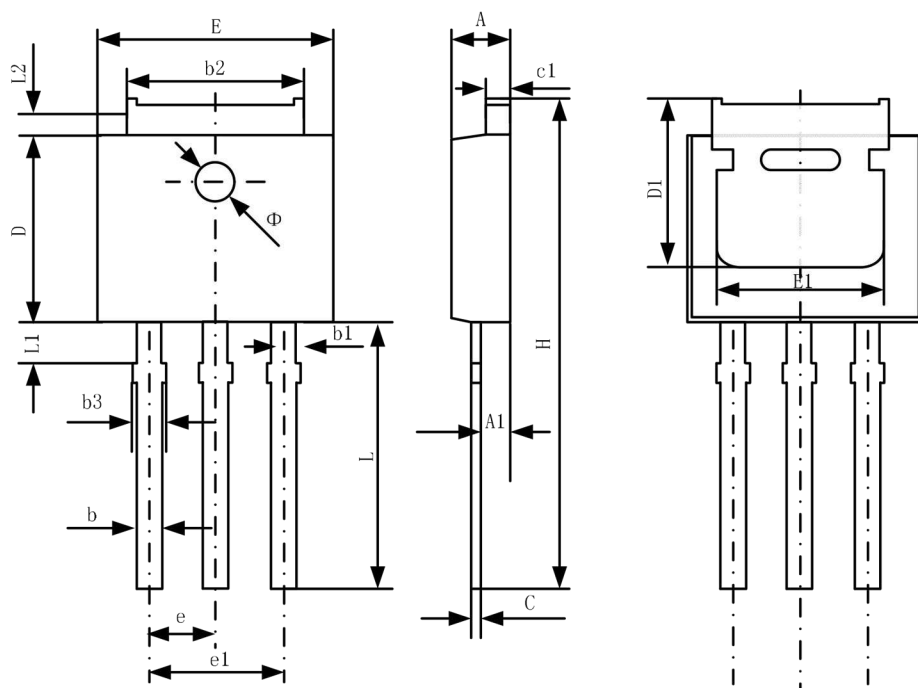


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.35	0.087	0.093
A1	0.90	1.10	0.035	0.043
b	0.56	0.69	0.022	0.027
b1	0.77	0.90	0.030	0.035
b2	5.23	5.43	0.206	0.214
b3		1.05	0.000	0.041
C	0.46	0.59	0.018	0.023
c1	0.46	0.59	0.018	0.023
D	6.00	6.20	0.236	0.244
D1	5.20		0.205	
E	6.50	6.70	0.256	0.264
E1	4.60	5.00	0.181	
e	2.24	2.34	0.088	0.092
e1	4.47	4.67	0.176	0.184
H	16.18	16.78	0.637	0.661
L	9.00	9.60	0.354	0.378
L1	0.95	1.35	0.037	0.053
L2	0.90	1.25	0.035	0.049

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