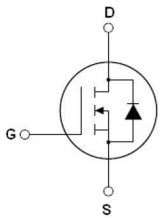
N-Channel Super Junction Power MOSFET Ⅲ

General Description

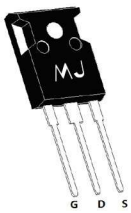
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

Features

- ◆ Optimized body diode reverse recovery performance
- ◆ 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-247

Application

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

V_{DS}	650	V
$R_{DS(ON)TYP}$	89	mΩ
I_D	38	A

□ Intrinsic fast-recovery body diode

Package Marking And Ordering Information

Device	Device Package	Marking
MJ65TF099T	TO-247	MJ65TF099T

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage (V_{GS}=0V)	V_{DS}	650	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)	38	A
Continuous Drain Current at Tc=100°C	I_D (DC)	24	A
Pulsed drain current (Note 1)	I_{DM} (pluse)	152	A
Maximum Power Dissipation (Tc=25℃)	P_D	322	W
Derate above 25°C	P_D	2.58	W/°C
Single pulse avalanche energy (Note 2)	E_{AS}	841	mJ
Avalanche current (Note 1)	I_{AR}	7	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	3.9	mJ

Parameter	Symbol	Value	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	50	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}	0.39	°C/W
Thermal Resistance，Junction-to-Ambient（Maximum）	R_{thJA}	62	°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=500μA	650	-	-	V
Zero Gate Voltage Drain Current (Tc=25℃)	I_{DSS}	V_{DS}=650V,V_{GS}=0V	-	-	3	μA
Zero Gate Voltage Drain Current (Tc=125℃)	I_{DSS}	V_{DS}=650V,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	3.5	4	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V,I_D=19A	-	89	109	mΩ
Dynamic Characteristics						
Input Capacitance	C_{iss}	V_{DS}=50V,V_{GS}=0V F=1.0MHz	-	2800	3200	pF
Output Capacitance	C_{oss}		-	97	-	pF
Reverse Transfer Capacitance	C_{rss}		-	1.5	-	pF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=38A V_{GS}=10V	-	45	55	nC
Gate-Source Charge	Q_{gs}		-	15	-	nC
Gate-Drain Charge	Q_{gd}		-	11.5	-	nC
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=380V,I_D=19A R_G=1.7Ω,V_{GS}=10V	-	16	-	nS
Turn-on Rise Time	t_r		-	13	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	71	-	nS
Turn-Off Fall Time	t_f		-	13	-	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I_{SD}	T_C=25°C	-	-	38	A
Pulsed Source-drain current (Body Diode)	I_{SDM}		-	-	152	A
Forward On Voltage	V_{SD}	T_j=25°C,I_{SD}=28A,V_{GS}=0V	-	0.9	1.2	V
Reverse Recovery Time	t_{rr}	T_j=25°C,I_F=19A di/dt=100A/μs	-	180	-	nS
Reverse Recovery Charge	Q_{rr}		-	1.6	-	uC
Peak reverse recovery Current	I_{rrm}		-	18	-	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)

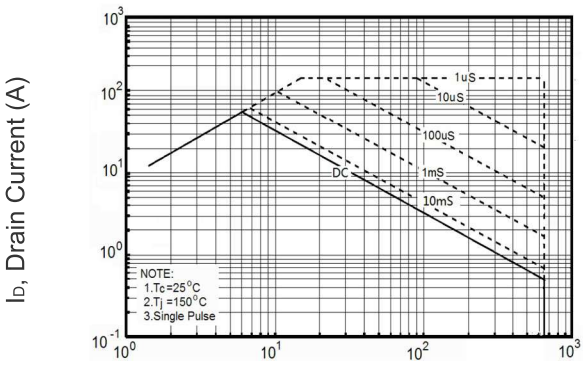


Figure 1 Safe operating area

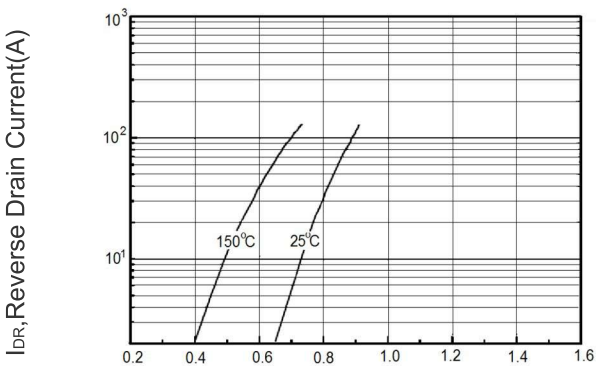


Figure 2 Source-Drain Diode Forward Voltage

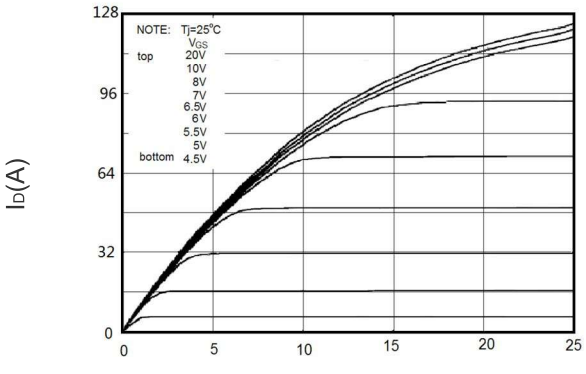


Figure 3 Output characteristics

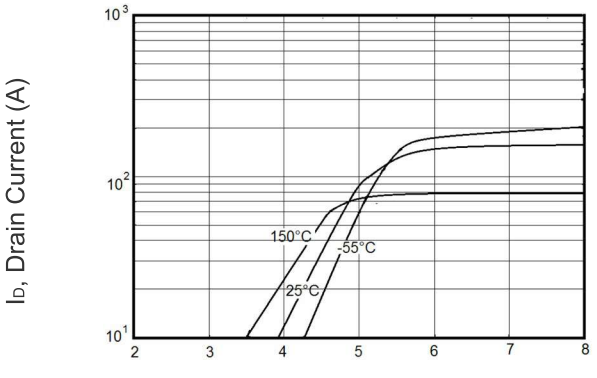


Figure 4 Transfer characteristics

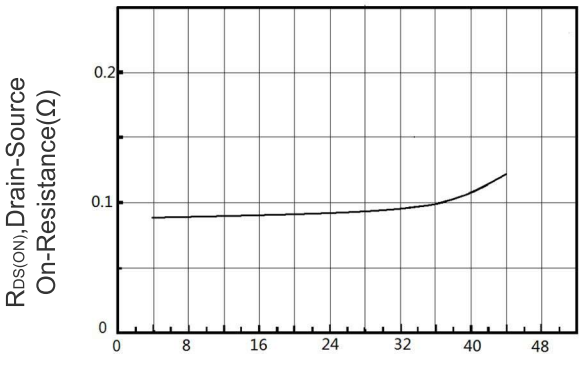


Figure 5 Static drain-source on resistance

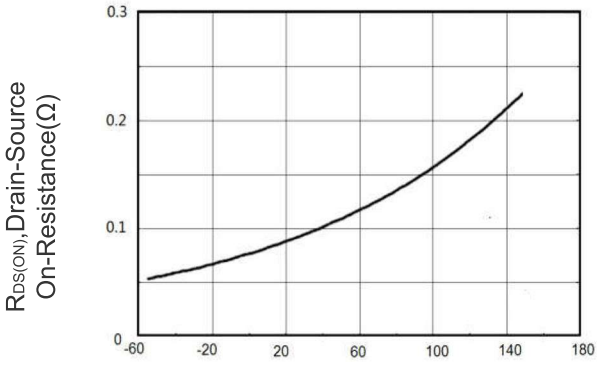


Figure 6 $R_{DS(ON)}$ vs Junction Temperature

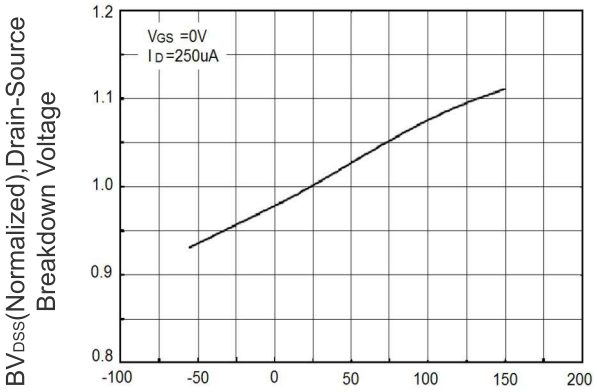


Figure 7 BV_{DSS} vs Junction Temperature

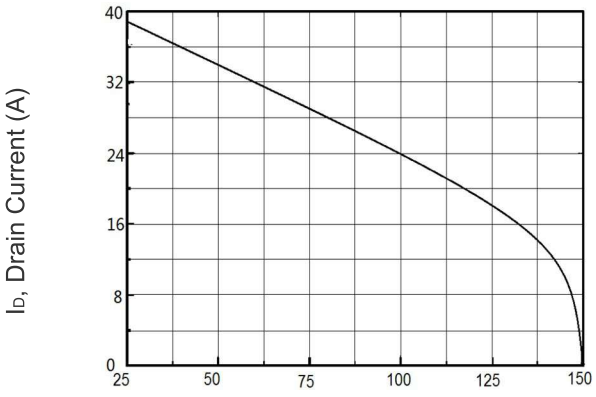


Figure 8 Maximum I_D vs Junction Temperature

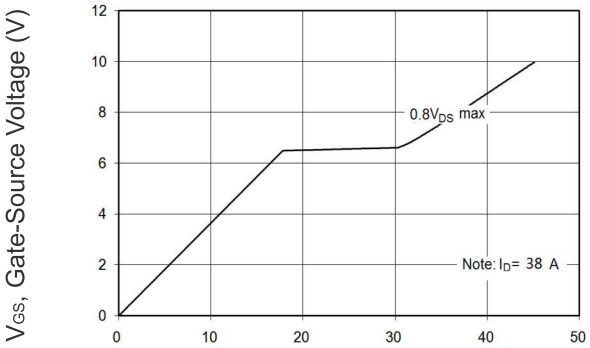


Figure 9 Gate charge waveforms

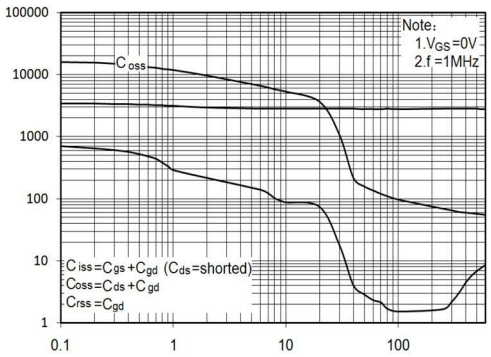
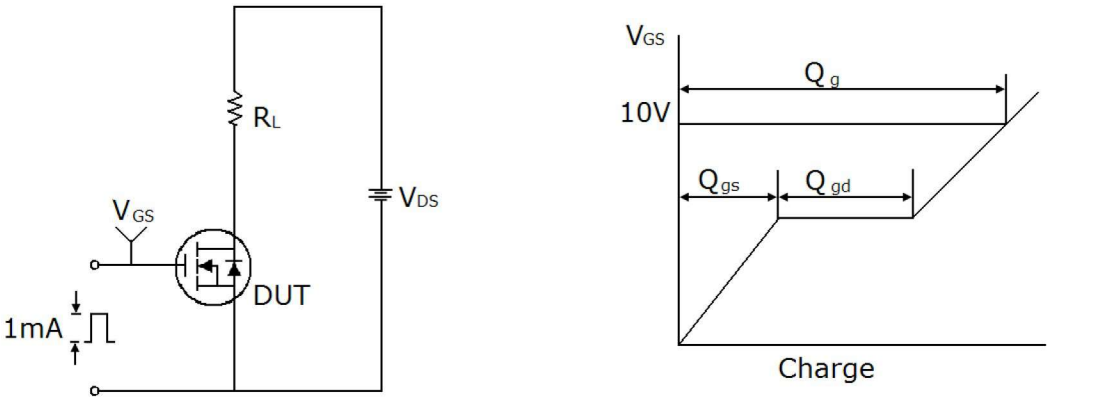
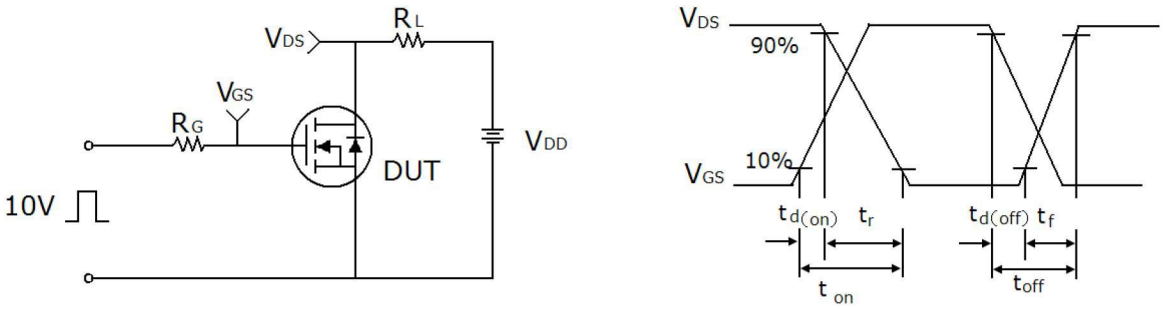


Figure 10 Capacitance

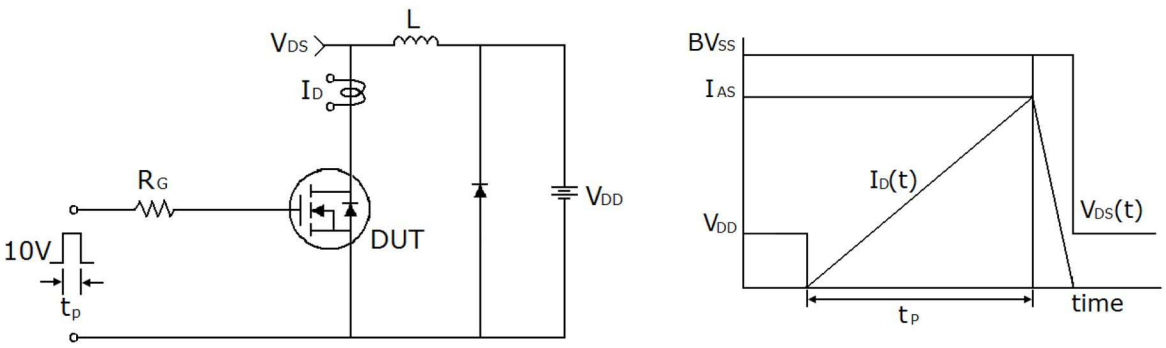
Test circuit



Gate charge test circuit & Waveform

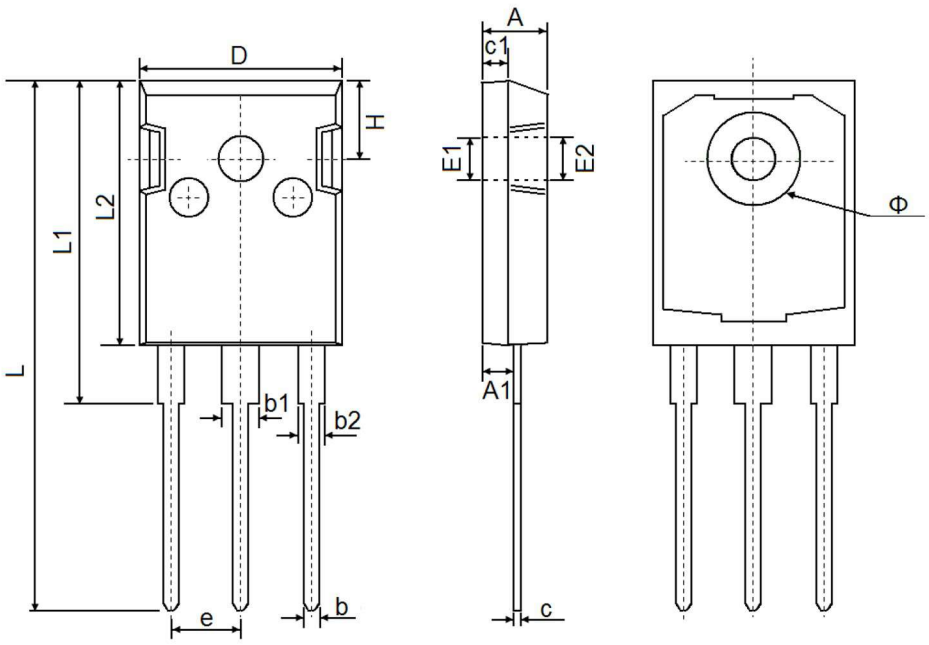


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-247 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	

Attention:

Any and all MJ power products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your MJ power representative nearest you before using any MJ power products described or contained herein in such applications.

MJ power assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all MJ power products described or contained herein.

Specifications of any and all MJ power products described or contained herein stipulate the erformance, characteristics,and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer’s products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer’s products or equipment.

MJ power Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

In the event that any or all MJ power products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. MJ power believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the MJ power product that you intend to use.

This catalog provides information as of Sep.2010. Specifications and information herein are subject to change without notice.