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.

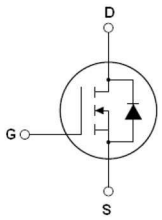
Features

- ◆ 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

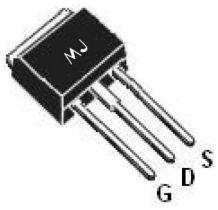
Application

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

$V_{DS@T_{jmax}}$	710	V
$R_{DS(ON)TYP}$	2.2	Ω
I_D	2	A



Schematic diagram



TO-251

Package Marking And Ordering Information

Device	Device Package	Marking
MJ65R2K2I	TO-251	MJ65R2K2I

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)	V_{GS}	±30	V
Continuous Drain Current at Tc=25°C	I_D (DC)	2	A
Continuous Drain Current at Tc=100°C	I_D (DC)	1.3	A
Pulsed drain current (Note 1)	I_{DM} (pluse)	6	A
Maximum Power Dissipation (Tc=25℃)	P_D	23	W
Derate above 25°C	P_D	0.184	W/°C
Single pulse avalanche energy (Note 2)	E_{AS}	45	mJ
Avalanche current (Note 1)	I_{AR}	1	A
Repetitive Avalanche energy , t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	0.06	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	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}	5.4	°C/W
Thermal Resistance，Junction-to-Ambient（Maximum）	R_{thJA}	75	°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	650	-	-	V
Zero Gate Voltage Drain Current (Tc=25℃)	I_{DSS}	V_{DS}=650V,V_{GS}=0V	-	-	1	μA
Zero Gate Voltage Drain Current (Tc=125℃)	I_{DSS}	V_{DS}=650V,V_{GS}=0V	-	-	10	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=1A	-	2200	2500	mΩ
Dynamic Characteristics						
Forward Transconductance	g_{FS}	V_{DS}=20V,I_D=1A	-	2	-	S
Input Capacitance	C_{ies}	V_{DS}=50V,V_{GS}=0V F=1.0MHz	-	190	-	PF
Output Capacitance	C_{oss}		-	13	-	PF
Reverse Transfer Capacitance	C_{rss}		-	1.1	-	PF
Total Gate Charge	Q_g	V_{DS}=480V,I_D=2A V_{GS}=10V	-	3.2	10	nC
Gate-Source Charge	Q_{gs}		-	0.6	-	nC
Gate-Drain Charge	Q_{gd}		-	1.2	-	nC
Intrinsic gate resistance	R_G	f=1 MHz open drain	-	9	-	Ω
Switching times						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=380V,I_D=1A R_G=50Ω,V_{GS}=10V	-	6	-	nS
Turn-on Rise Time	t_r		-	3	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	65	-	nS
Turn-Off Fall Time	t_f		-	11	-	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I_{SD}	T_C=25°C	-	-	2	A
Pulsed Source-drain current (Body Diode)	I_{SDM}		-	-	6	A
Forward On Voltage	V_{SD}	T_j=25°C,I_{SD}=2A,V_{GS}=0V	-	1	1.3	V
Reverse Recovery Time	t_{rr}	T_j=25°C,I_F=2A di/dt=100A/μs	-	140	-	nS
Reverse Recovery Charge	Q_{rr}		-	0.65	-	uC
Peak reverse recovery current	I_{rrm}		-	9	-	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)

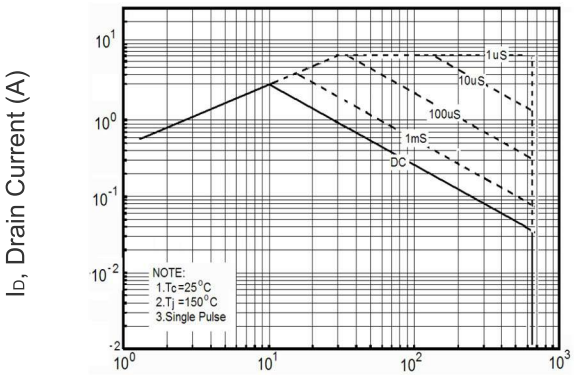


Figure 1 Safe operating area

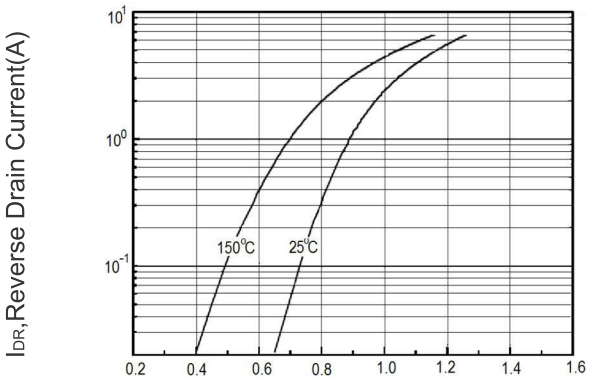


Figure 2 Source-Drain Diode Forward Voltage

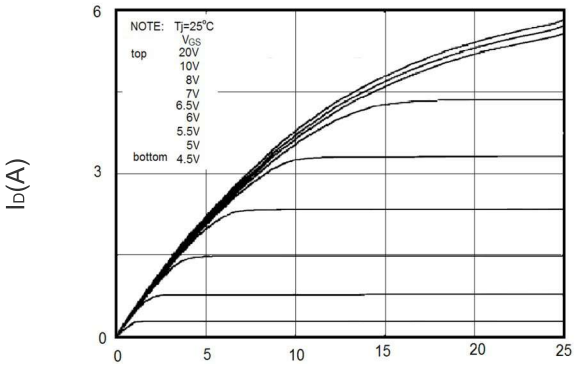


Figure 3 Output characteristics

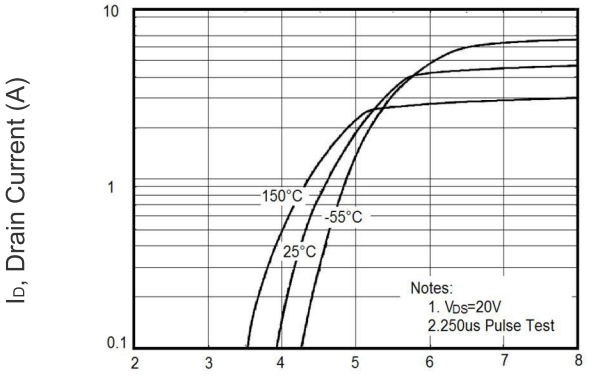


Figure 4 Transfer characteristics

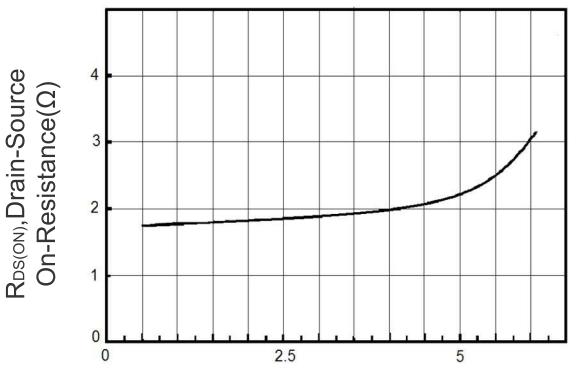


Figure 5 Static drain-source on resistance

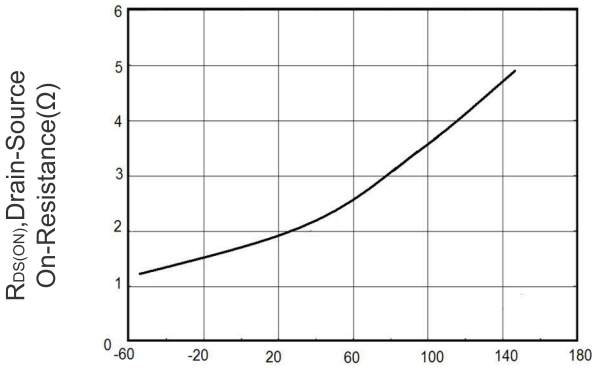


Figure 6 $R_{DS(ON)}$ vs Junction Temperature

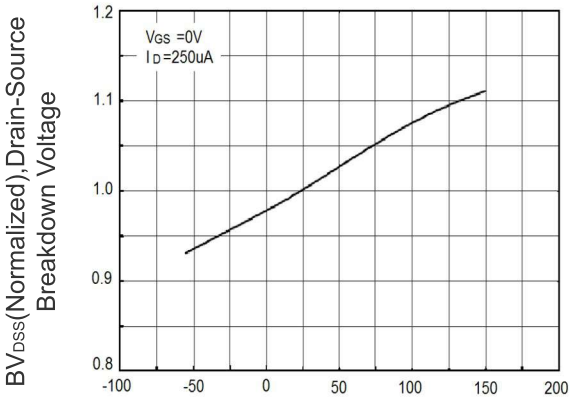


Figure 7 BV_{DSS} vs Junction Temperature

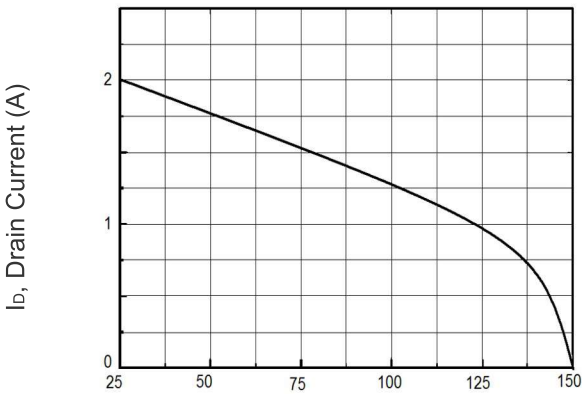


Figure 8 Maximum I_D vs Junction Temperature

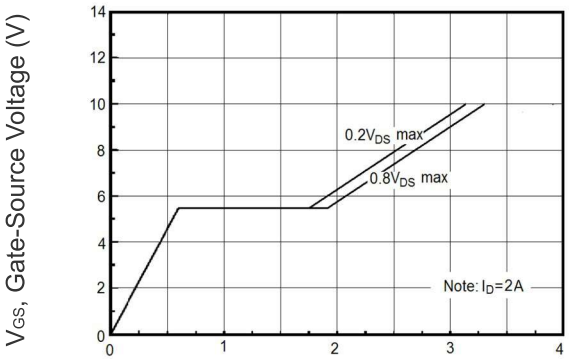


Figure 9 Gate charge waveforms

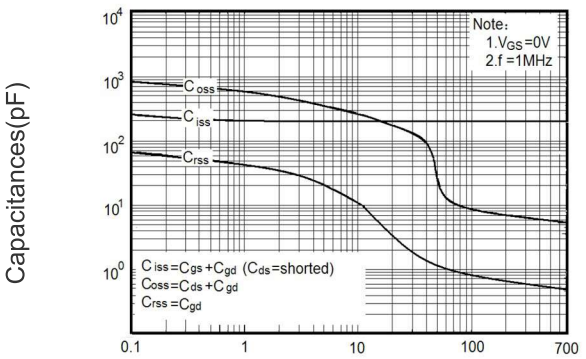


Figure 10 Capacitance

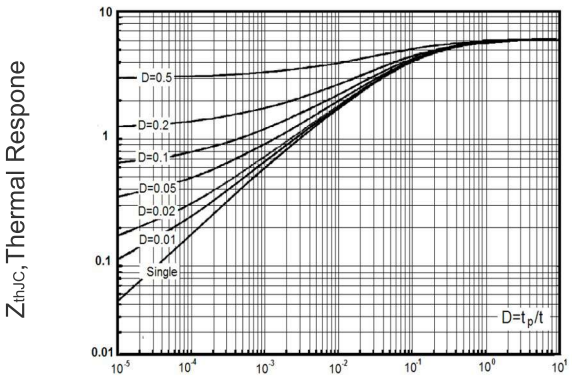
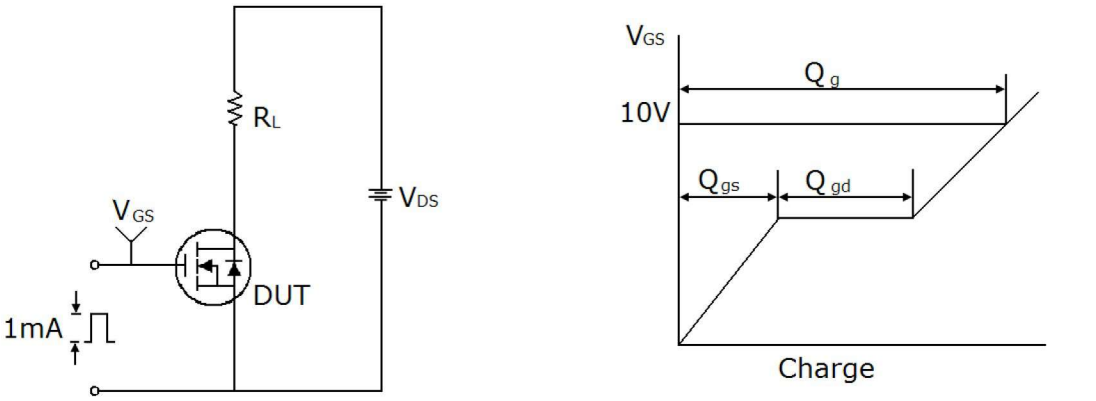
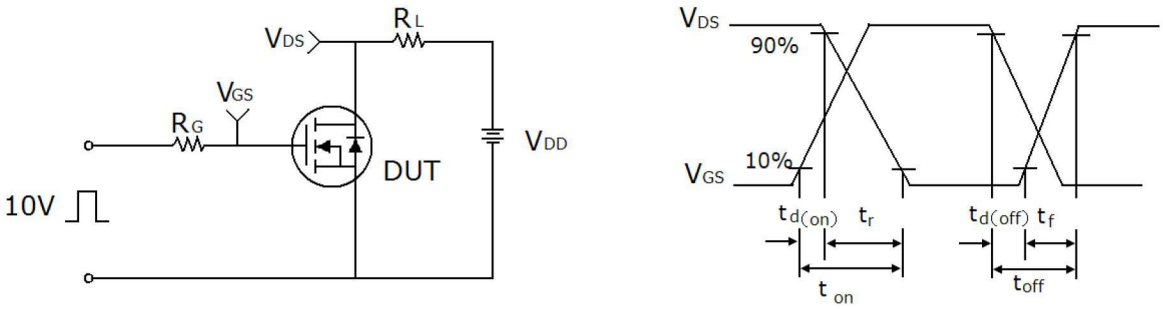


Figure 11 Transient Thermal Impedance

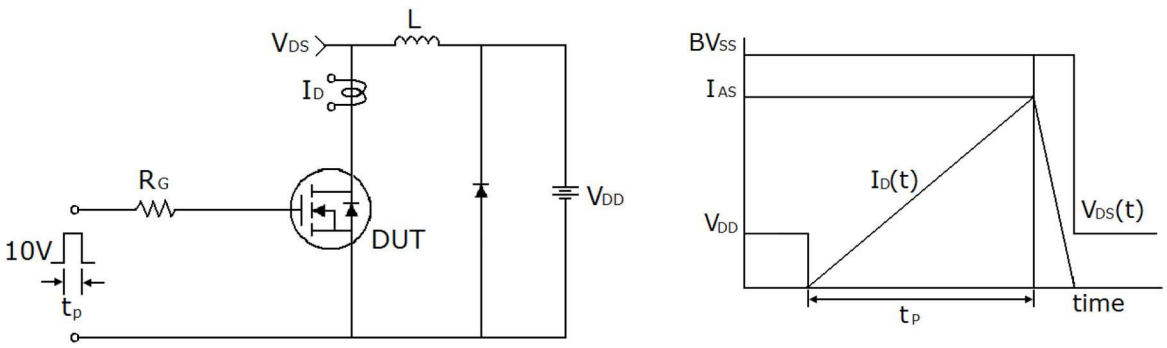
Test circuit



Gate charge test circuit & Waveform

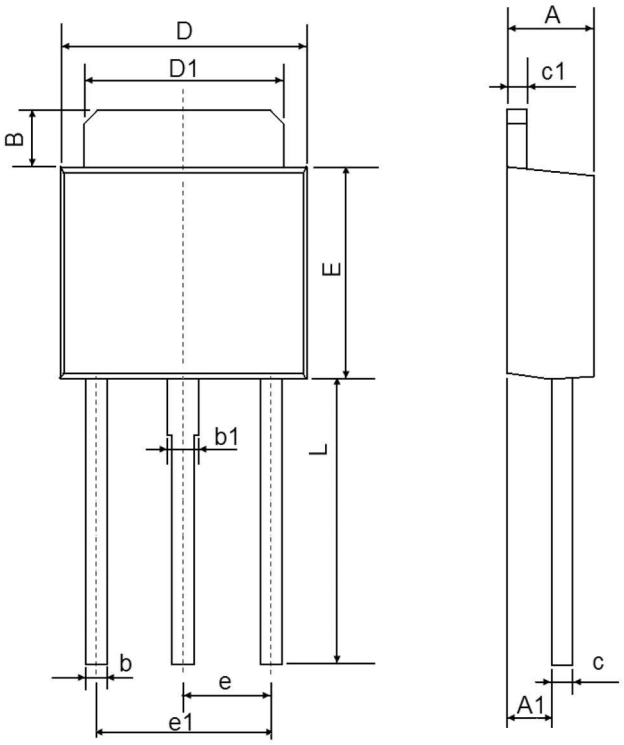


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-251 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	1.050	1.350	0.042	0.054
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311

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