

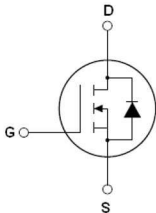
N-Channel Super Junction Power MOSFET III

General Description

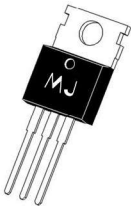
The series of devices use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

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-220

Application

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

V_{DS}	650	V
$R_{DS(ON)TYP}$	290	m Ω
I_D	11.5	A

Package Marking And Ordering Information

Device	Device Package	Marking
MJ65T360	TO-220	MJ65T360

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

Parameter	Symbol	MJ65T360	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	650	V
Gate-Source Voltage ($V_{DS}=0V$) AC ($f>1\text{ Hz}$)	V_{GS}	± 30	V
Continuous Drain Current at $T_c=25^{\circ}C$	I_D (DC)	11.5	A
Continuous Drain Current at $T_c=100^{\circ}C$	I_D (DC)	7	A
Pulsed drain current ^(Note 1)	I_{DM} (pluse)	46	A
Maximum Power Dissipation ($T_c=25^{\circ}C$)	P_D	101	W
Derate above 25℃	P_D	0.81	W/℃
Single pulse avalanche energy ^(Note 2)	E_{AS}	144	mJ
Avalanche current ^(Note 1)	I_{AR}	6	A
Repetitive Avalanche energy, t_{AR} limited by T_{jmax} ^(Note 1)	E_{AR}	0.5	mJ

Parameter	Symbol	MJ65T360	Unit
Drain Source voltage slope, $V_{DS} \leq 480\text{ V}$	dv/dt	50	V/ns
Reverse diode dv/dt , $V_{DS} \leq 480\text{ V}, I_{SD} < I_D$	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	MJ65T360	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R _{thJC}	1.24	°C/W
Thermal Resistance, Junction-to-Ambient (Maximum)	R _{thJA}	62	°C/W

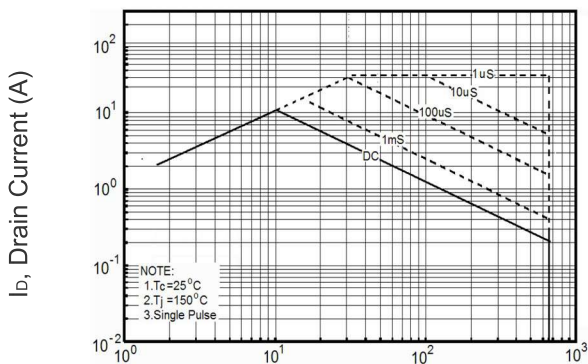
Table 3. Electrical Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	650	-	-	V
Zero Gate Voltage Drain Current (Tc=25°C)	I _{DSS}	V _{DS} =650V,V _{GS} =0V	-	0.05	1	μA
Zero Gate Voltage Drain Current (Tc=125°C)	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 =7A	-	290	360	mΩ
Dynamic Characteristics						
Input Capacitance	C _{ies}	V _{DS} =50V,V _{GS} =0V F=1.0MHz	-	870	-	PF
Output Capacitance	C _{OSS}		-	54	-	PF
Reverse Transfer Capacitance	C _{rss}		-	1.8	-	PF
Total Gate Charge	Q _g	V _{DS} =480V,I _D =11.5A V _{GS} =10V	-	19	-	nC
Gate-Source Charge	Q _{gs}		-	6	-	nC
Gate-Drain Charge	Q _{gd}		-	6.5	-	nC
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =380V,I _D =5.5A R _G =3Ω,V _{GS} =10V	-	11	-	nS
Turn-on Rise Time	t _r		-	8	-	nS
Turn-Off Delay Time	t _{d(off)}		-	58	70	nS
Turn-Off Fall Time	t _f		-	9	14	nS
Source- Drain Diode Characteristics						
Source-drain current (Body Diode)	I _{SD}	T _C =25°C	-	-	11.5	A
Pulsed Source-drain current (Body Diode)	I _{SDM}		-	-	46	A
Forward On Voltage	V _{SD}	T _J =25°C,I _{SD} =11.5A,V _{GS} =0V	-	0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _J =25°C,I _F =5.8A di/dt=100A/μs	-	220	-	nS
Reverse Recovery Charge	Q _{rr}		-	2.2	-	uC
Peak reverse recovery Current	I _{rrm}		-	19	-	A

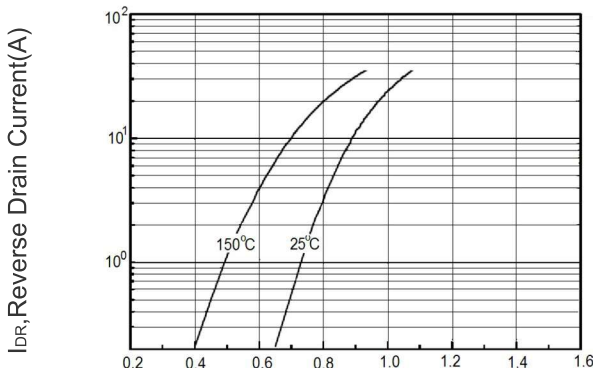
Notes

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

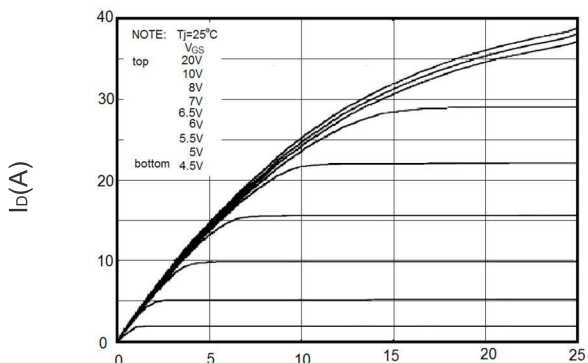
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)



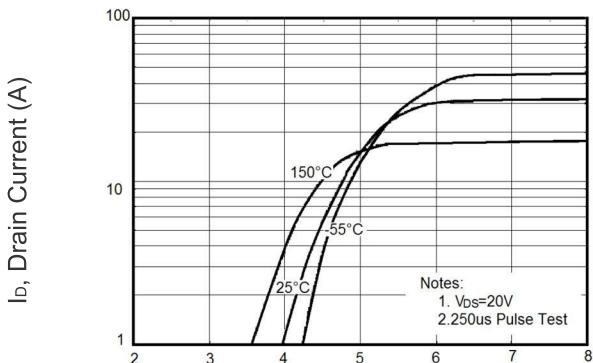
V_{DS} , Drain-Source Voltage (V)
Figure 1 Safe operating area



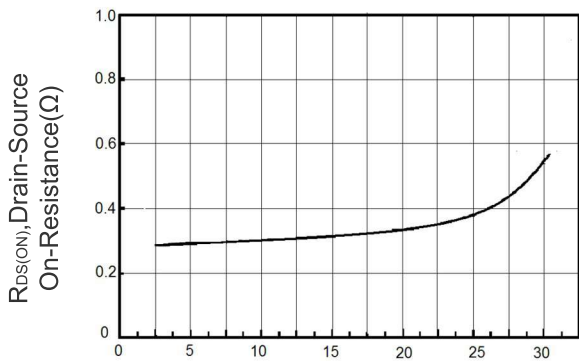
V_{SD} , Source-Drain Voltage(V)
Figure 2 Source-Drain Diode Forward Voltage



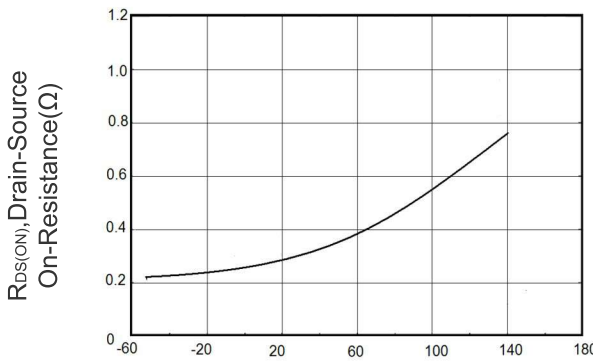
V_{DS} (V)
Figure 3 Output characteristics



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

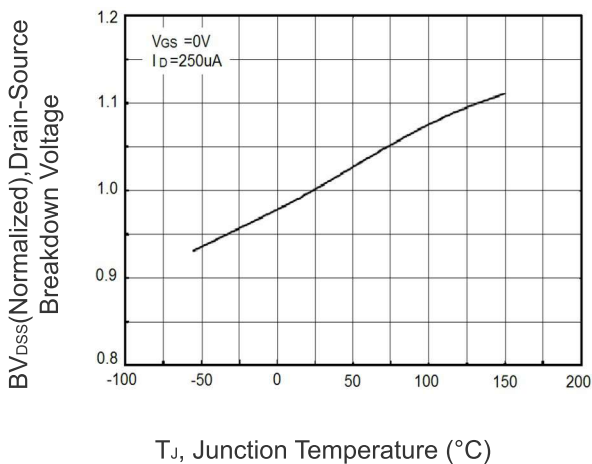


Figure 7 BV_{DSS} vs Junction Temperature

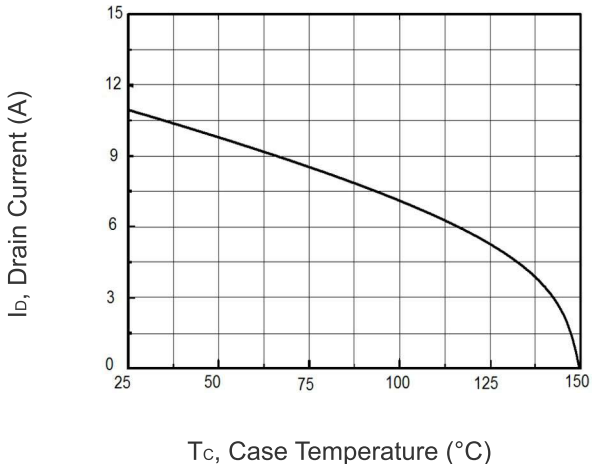


Figure 8 Maximum I_D vs Junction Temperature

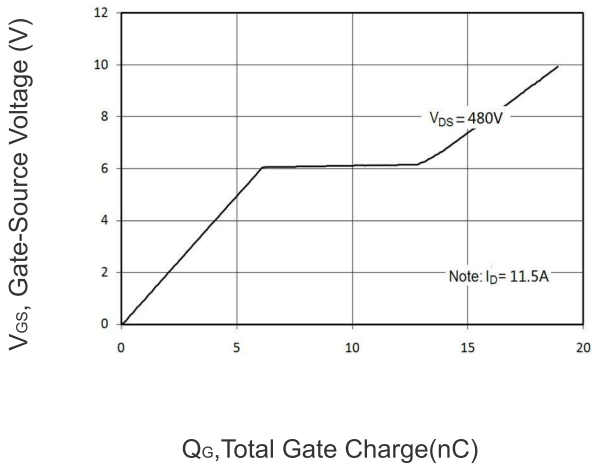


Figure 9 Gate charge waveforms

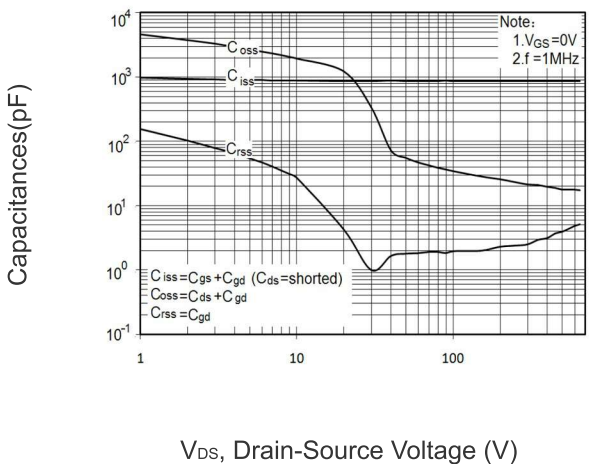


Figure 10 Capacitance

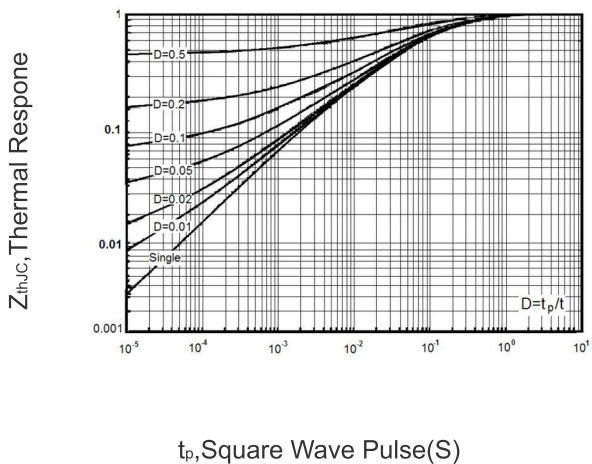
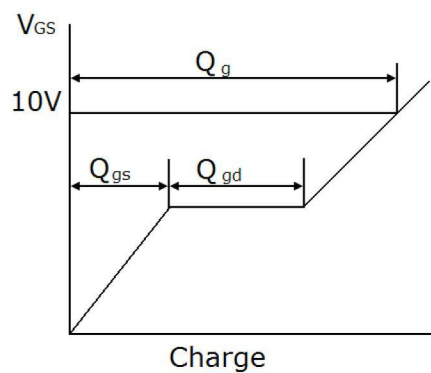
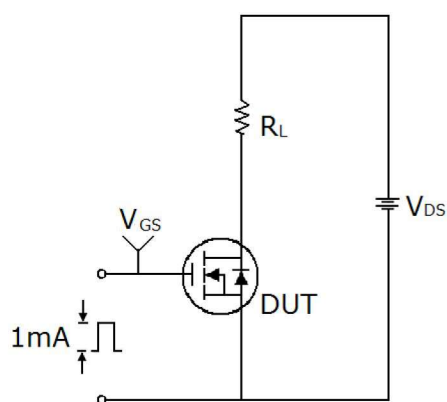
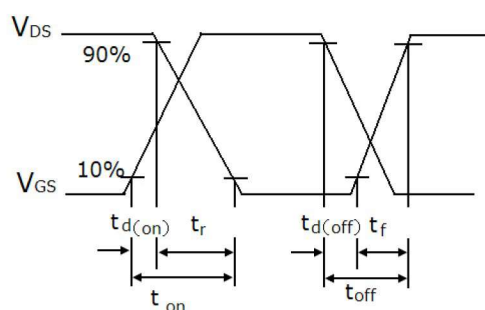
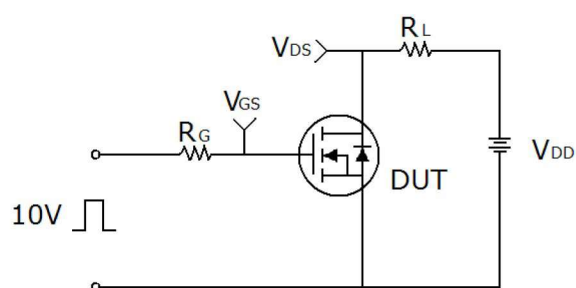


Figure 11 Transient Thermal Impedance

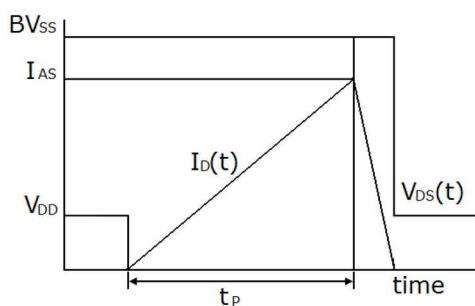
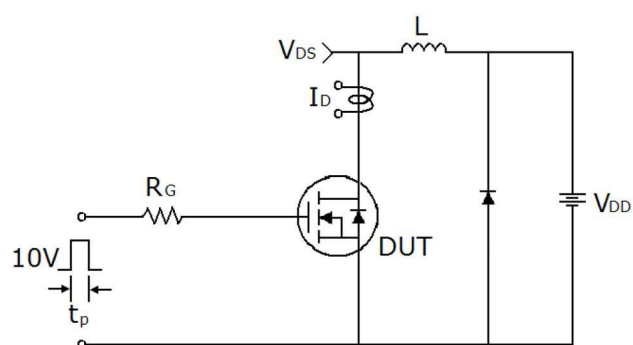
Test circuit



Gate charge test circuit & Waveform

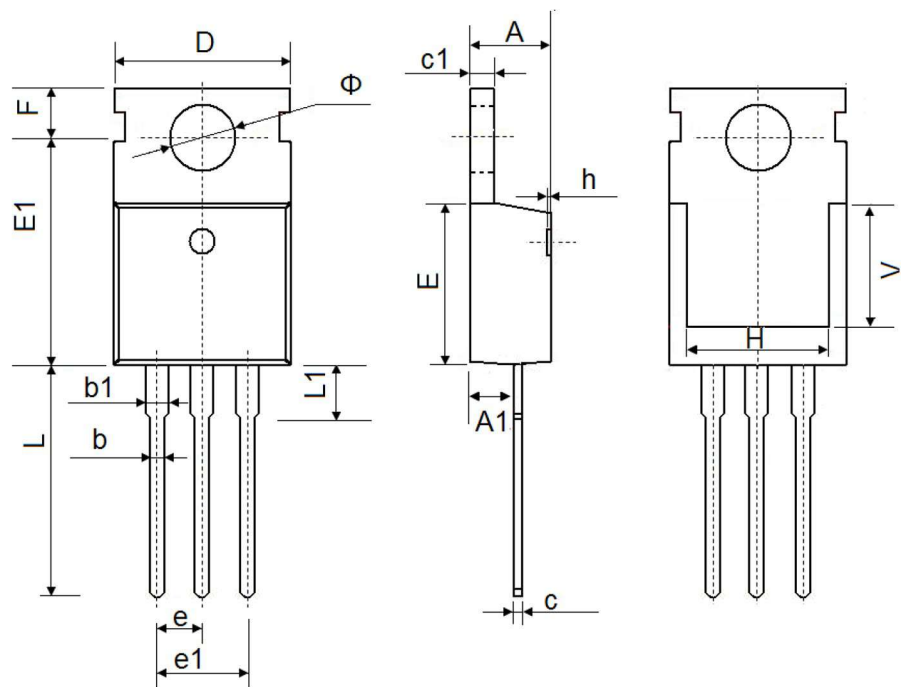


Switch Time Test Circuit



Unclamped Inductive Switching Test Circuit & Waveforms

TO-220-3L-C Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

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