MJ P-Channel Enhancement Mode Power MOSFET

Description

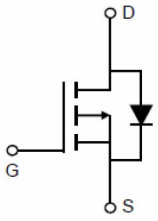
The MJ2309 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge .
This device is well suited for use as a load switch or in PWM applications.

General Features

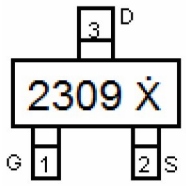
- ◆ V_{DS}=-60V,I_D=-1.6A
  $R_{DS(ON)}$ <160mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$ <200mΩ @ V_{GS}=-4.5V
- ◆ High density cell design for ultra low Rdson
- ◆ Fully characterized avalanche voltage and current
- ◆ Excellent package for good heat dissipation

Application

- ◆ Load switch
- ◆ PWM application



Schematic diagram



Marking and pin Assignment

SOT-23 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
2309 X	MJ2309	SOT-23	Ø180mm	8 mm	3000 units

Absolute Maximum Ratings (T_C =25 ℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{DS}	±20	V
Drain Current-Continuous	I_D	-1.6	A
Pulsed Drain Current (Note 1)	I_{DM}	-8	A
Maximum Power Dissipation	P_D	-1.5	W
Operating Junction and Storage Temperature Range	T_J ,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient (Note 2)	$R_{\theta JA}$	83.3	℃/W

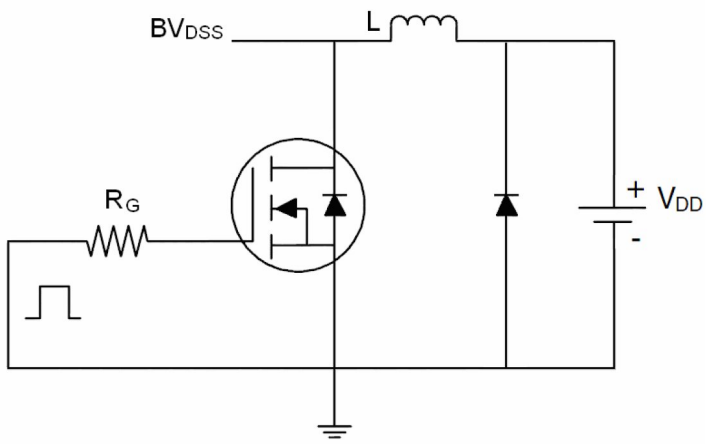
Electrical Characteristics (T_A =25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_D=-250μA	-60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-60V,V_{GS}=0V	-	-	-1	μA
Gate-Body Leakage Current	I_{GSS}	V_{DS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS} ,I_D=-250μA	-1.4	-2.0	-2.6	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-1.5A	-	140	160	mΩ
		V_{GS}=-4.5V, I_D=-1.5A	-	160	200	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-1.5A	-	3	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{lss}	V_{DS}=-30V,V_{GS}=0V, F=1.0MHz	-	444.2	-	PF
Output Capacitance	C_{oss}		-	19.6	-	PF
Reverse Transfer Capacitance	C_{rss}		-	17.9	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V,I_D=-1.5A V_{GS}=-10V,R_{GEN}=3Ω	-	40	-	nS
Turn-on Rise Time	t_r		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	V_{DS}=-30V,I_D=-1.5A, V_{GS}=-10V	-	11.3	-	nC
Gate-Source Charge	Q_{gs}		-	2.7	-	nC
Gate-Drain Charge	Q_{gd}		-	1.6	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=-1.5A	-	-	-1.2	V
Diode Forward Current (Note 2)	I_S		-	-	-1.6	A
Reverse Recovery Time	t_{rr}	T_J= 25°C, I_F=-1.5A di/dt=-100A/μs (Note3)	-	25		nS
Reverse Recovery Charge	Q_{rr}		-	31		nC

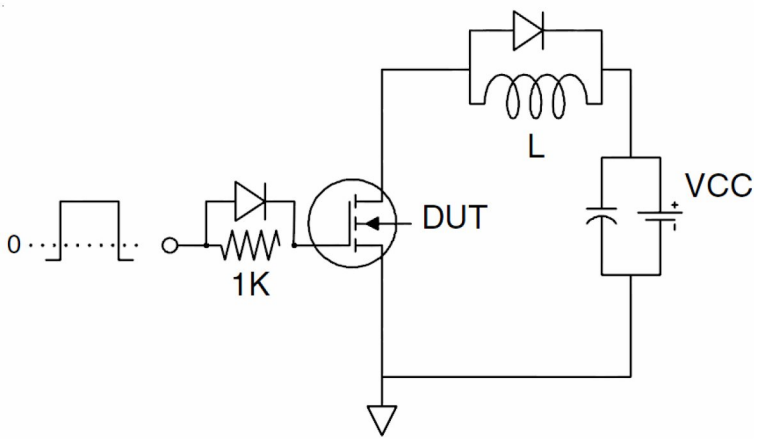
Notes:

① Repetitive Rating: Pulse width limited by maximum junction temperature.
② Surface Mounted on FR4 Board, t ≤ 10 sec.
③ Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
④ Guaranteed by design, not subject to production

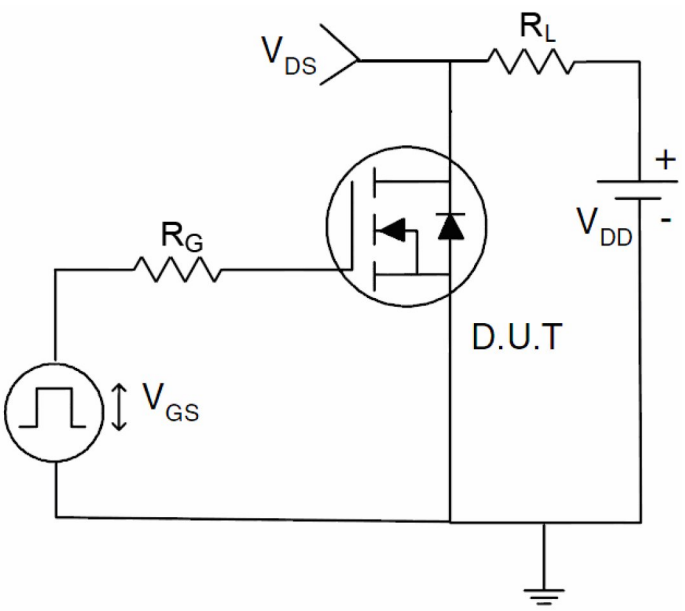
EAS test Circuit



EAS test Circuit



Gate charge test Circuit



Switch Time Test Circuit

Typical Electrical and Thermal Characteristics (Curves)

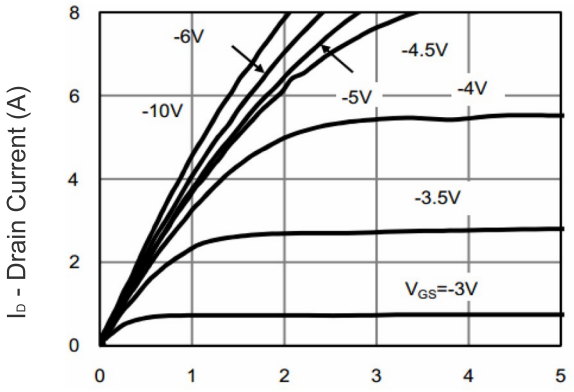


Figure 1 Output Characteristics

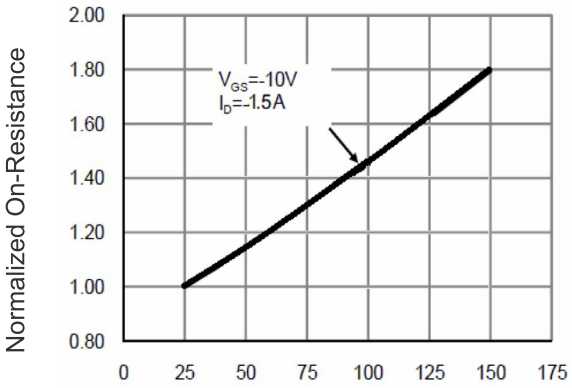


Figure 4 Rdson-Junction Temperature

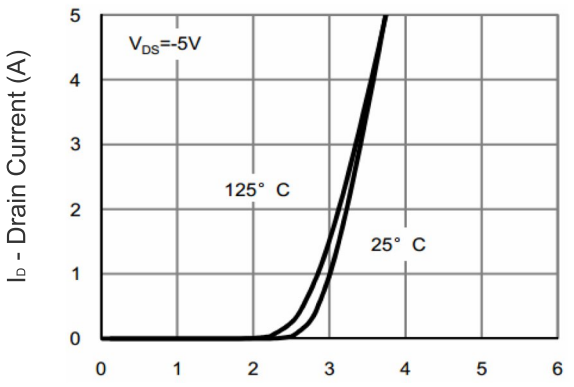


Figure 2 Transfer Characteristics

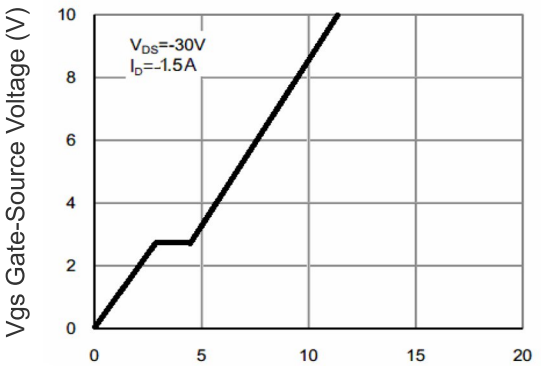


Figure 5 Gate Charge

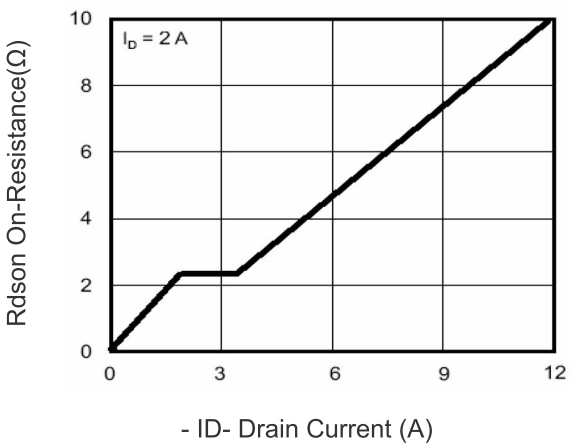


Figure 3 Rdson- Drain Current

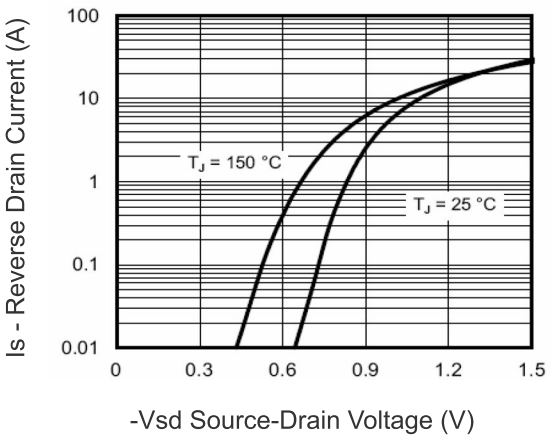


Figure 6 Source- Drain Diode Forward

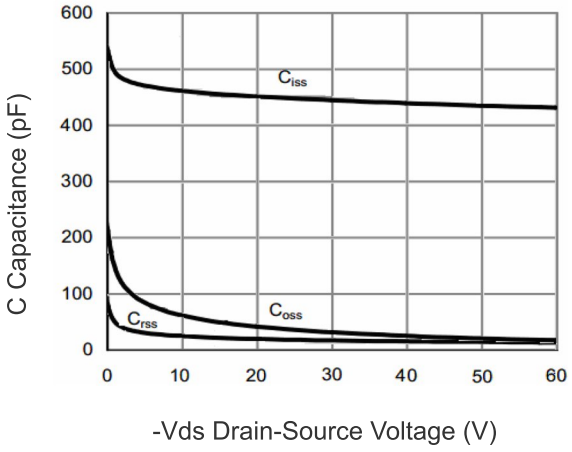


Figure 7 Capacitance vs Vds

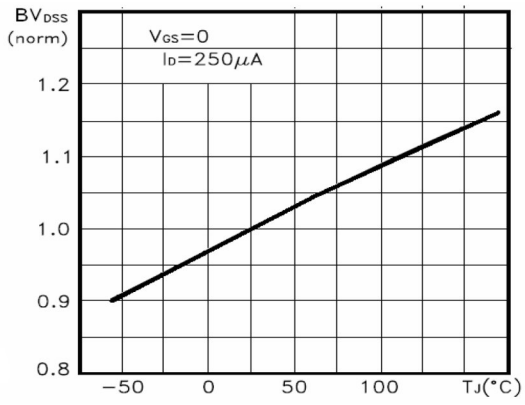


Figure 9 BVDSS vs Junction Temperature

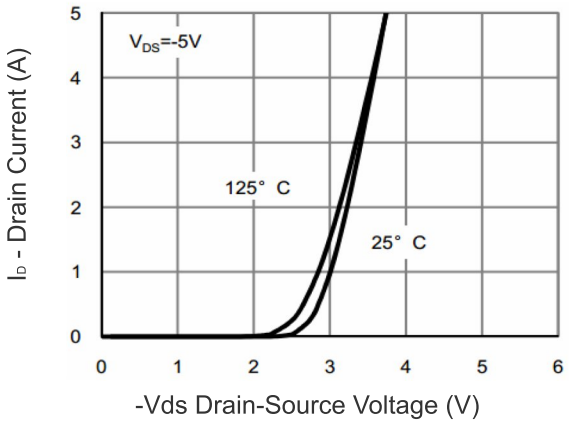


Figure 8 Safe Operation Area

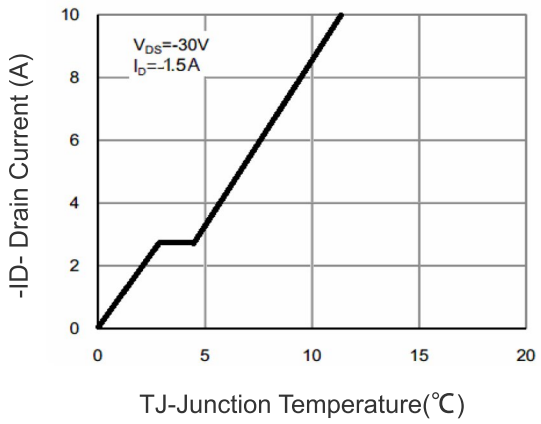


Figure 10 ID Current De-rating

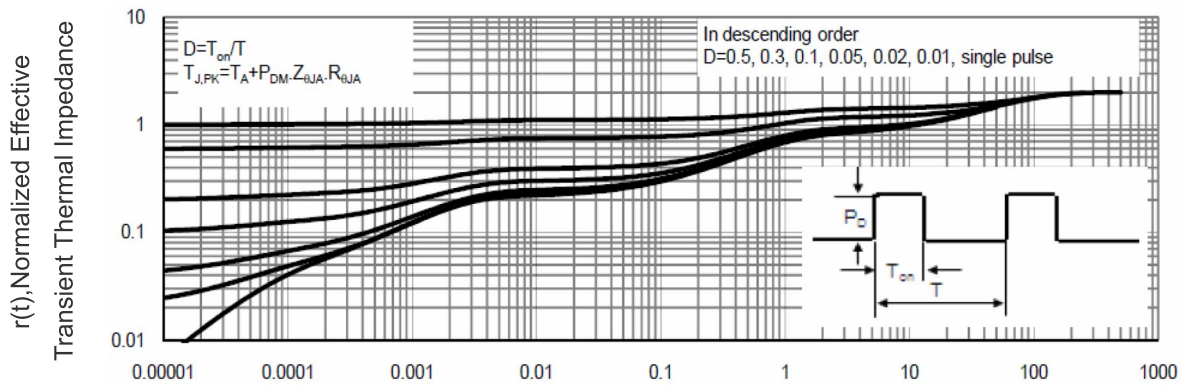
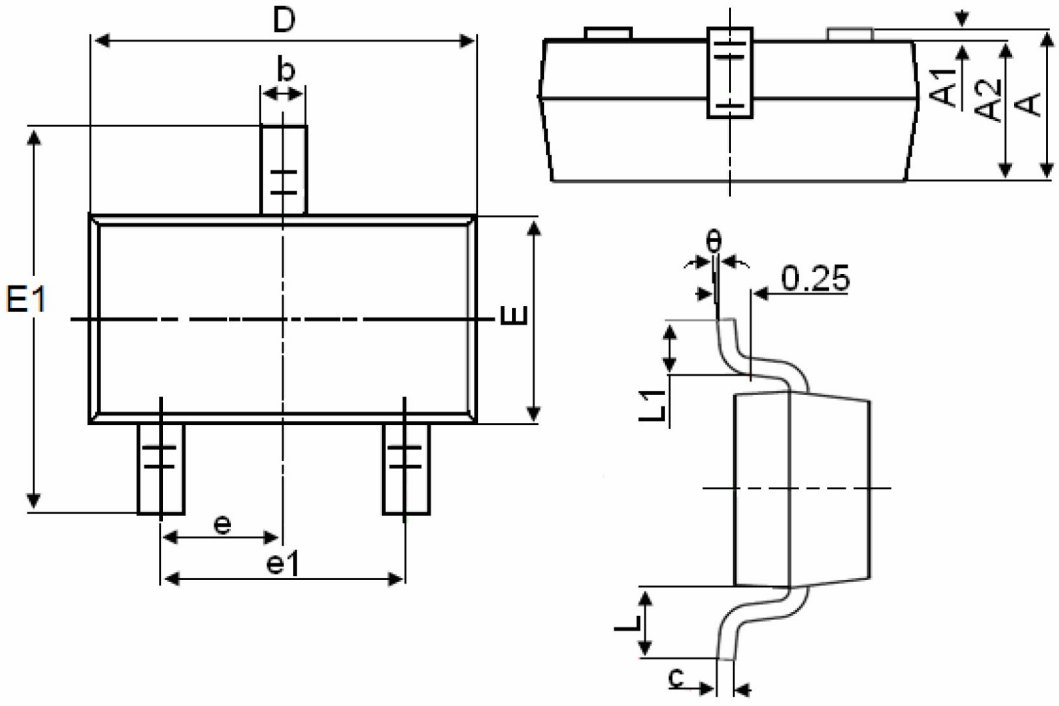


Figure 11 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes:

① All dimensions are in millimeters.
② Tolerance ±0.10mm (4 mil) unless otherwise specified
③ Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
④ Dimension L is measured in gauge plane.
⑤ Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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