

# MJ N-Channel Enhancement Mode Power MOSFET

## Description

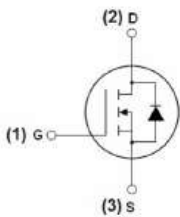
The MJ60H15AD uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

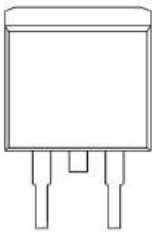
- ◆  $V_{DS} = 60V, I_D = 150A$   
 $R_{DS(ON)} < 4.0m\Omega @ V_{GS} = 10V$
- ◆ High density cell design for ultra low  $R_{dson}$
- ◆ Fully characterized avalanche voltage and current
- ◆ Good stability and uniformity with high  $E_{AS}$
- ◆ Excellent package for good heat dissipation
- ◆ Special process technology for high ESD capability

## Application

- ◆ Power switching application
- ◆ Hard switched and High frequency circuits
- ◆ Uninterruptible power supply



Schematic diagram



Marking and pin assignment



TO-263-2L top view

100% UIS TESTED! 100%  $\Delta V_{ds}$  TESTED!

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ60H15AD	MJ60H15AD	TO-263-2L	-	-	-

## Absolute Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	150	A
Drain Current-Continuous( $T_c = 100^\circ\text{C}$ )	$I_{D(100^\circ\text{C})}$	105	A
Pulsed Drain Current	$I_{DM}$	600	A
Maximum Power Dissipation	$P_D$	220	W
Derating factor		1.47	W/ $^\circ\text{C}$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	900	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^\circ\text{C}$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	0.68	$^\circ\text{C/W}$
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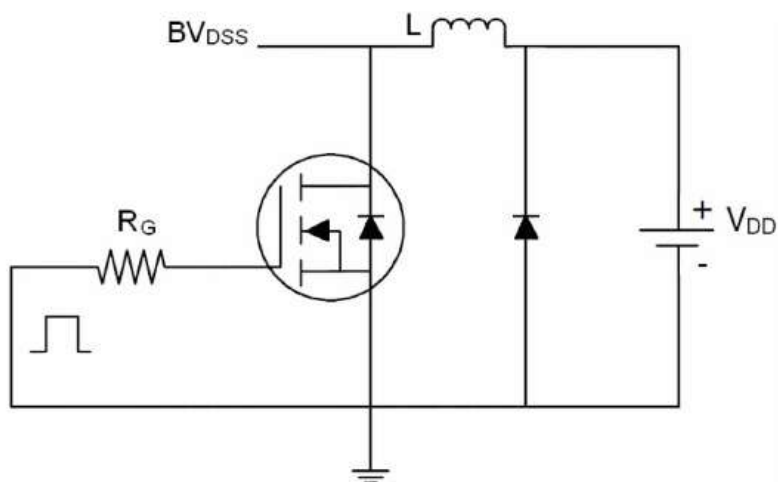
Electrical Characteristics (T<sub>c</sub> =25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =±20V,V <sub>GS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =75A	-	3.1	4.0	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =50V,I <sub>D</sub> =75A	80	-	-	S
Dynamic Characteristics <sup>(Note 4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V,V <sub>GS</sub> =0V F=1.0MHz	-	5451	-	PF
Output Capacitance	C <sub>oss</sub>		-	609	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	488	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V,R <sub>L</sub> =0.4Ω V <sub>GS</sub> =10V,R <sub>G</sub> =2.5Ω	-	25	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	23	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	90	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	38	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V,I <sub>D</sub> =75A V <sub>GS</sub> =10V	-	130.8	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	22.8	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	56.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V,I <sub>S</sub> =75A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	150	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =75A di/dt= 100A/μs <sup>(Note 3)</sup>	-	-	60	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	-	80	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible(turn-on is dominated by LS+LD)				

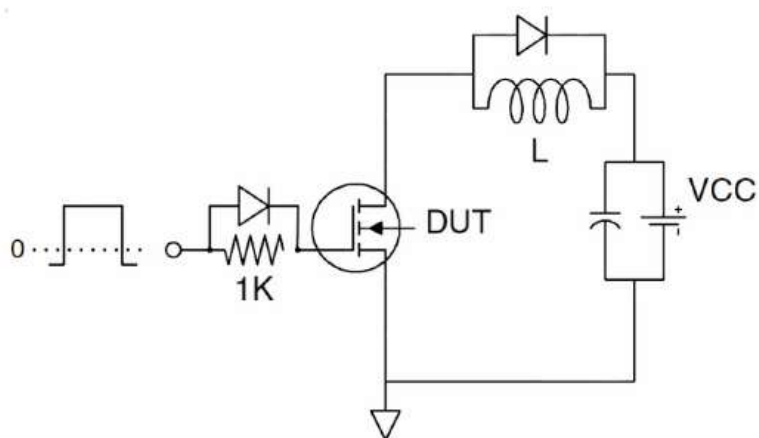
## Notes:

- 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
- ⑤ EAS condition: T<sub>J</sub>=25℃,V<sub>DD</sub>=30V,V<sub>G</sub>=10V,L=0.5mH,R<sub>G</sub>=25Ω

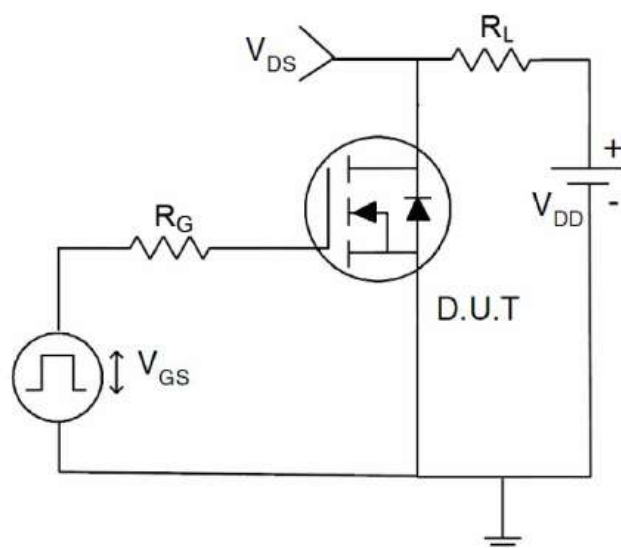
## Test circuit



EAS test Circuit

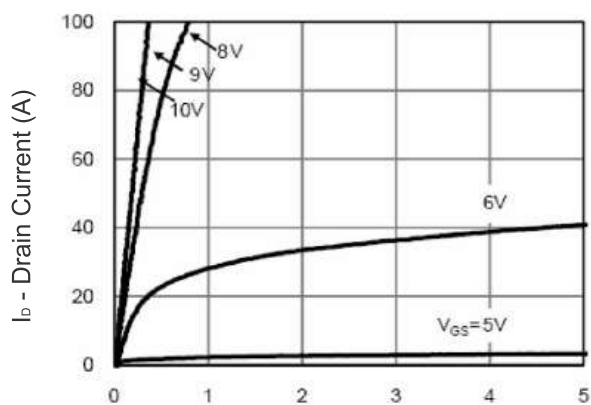


Gate charge test Circuit

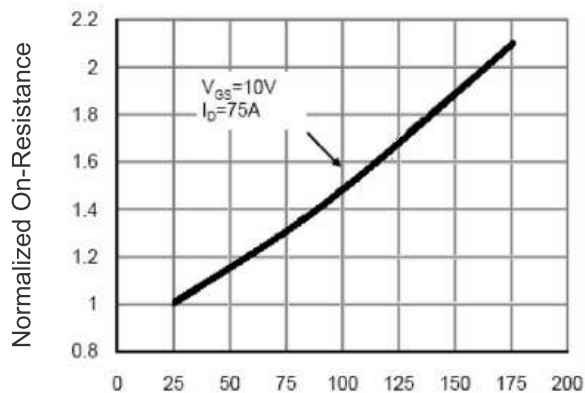


Switch Time Test Circuit

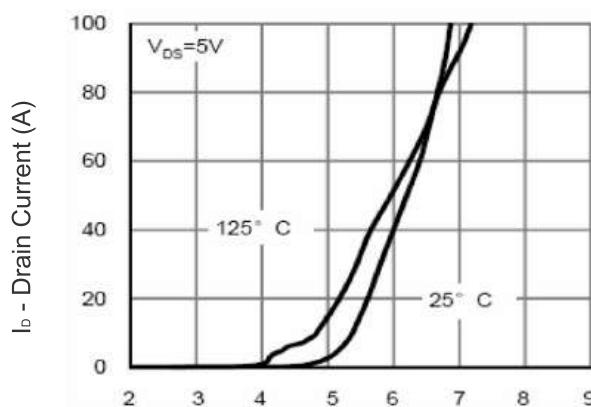
## Typical Electrical and Thermal Characteristics (Curves)



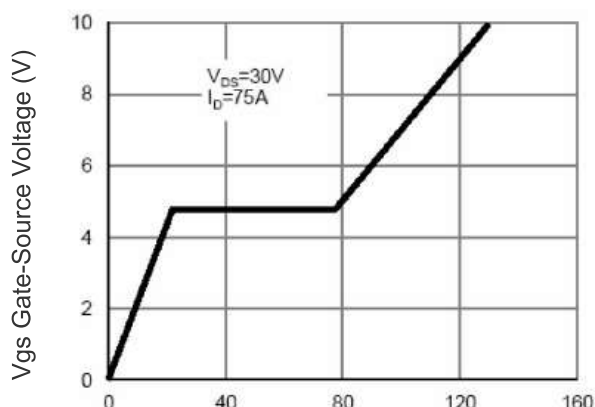
V<sub>ds</sub> Drain-Source Voltage (V)  
Figure 1 Output Characteristics



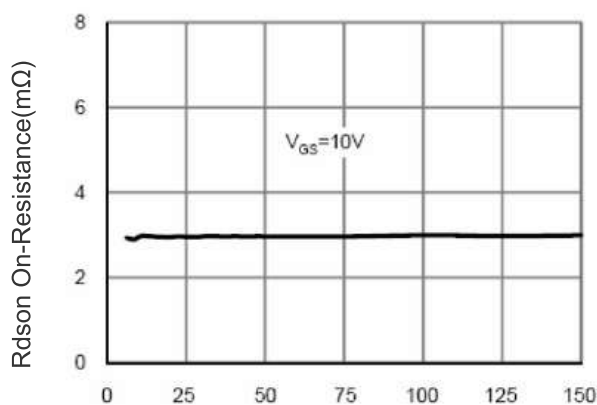
T<sub>j</sub> -Junction Temperature(°C)  
Figure 4 Rdson-Junction Temperature



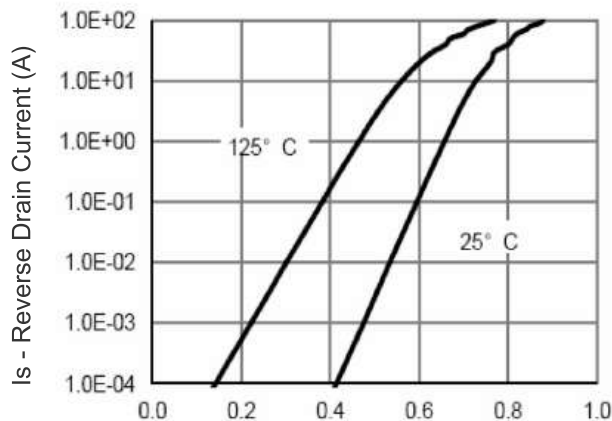
V<sub>gs</sub> Gate-Source Voltage (V)  
Figure 2 Transfer Characteristics



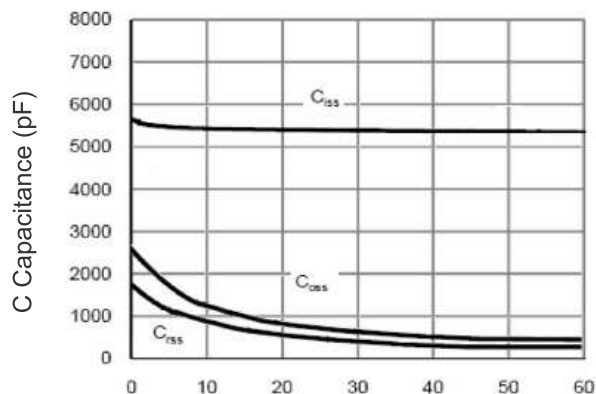
Q<sub>g</sub> Gate Charge (nC)  
Figure 5 Gate Charge



I<sub>D</sub> - Drain Current (A)  
Figure 3 Rdson- Drain Current

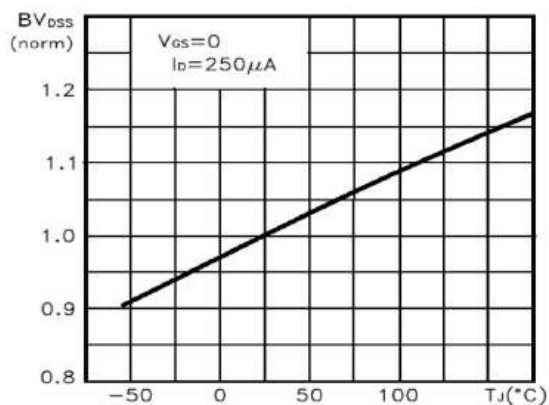


V<sub>sd</sub> Source-Drain Voltage (V)  
Figure 6 Source- Drain Diode Forward



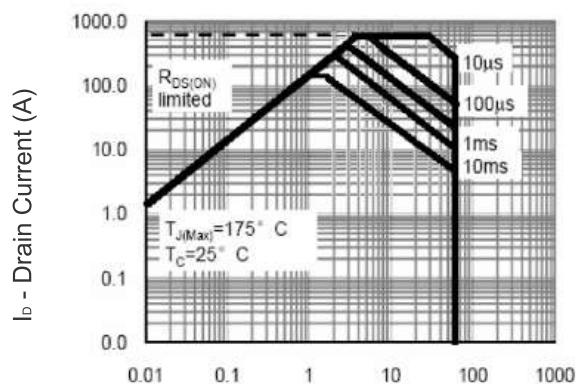
Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



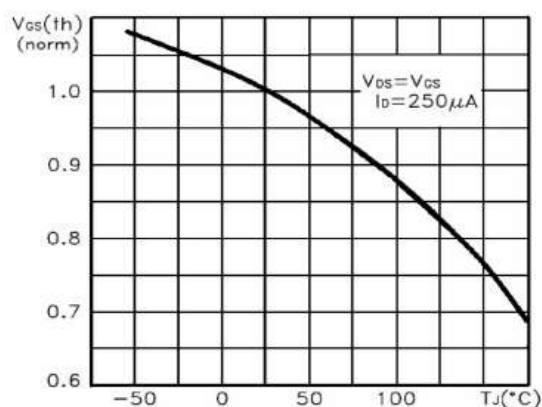
TJ -Junction Temperature(°C)

Figure 9 BV<sub>DSS</sub> vs Junction Temperature



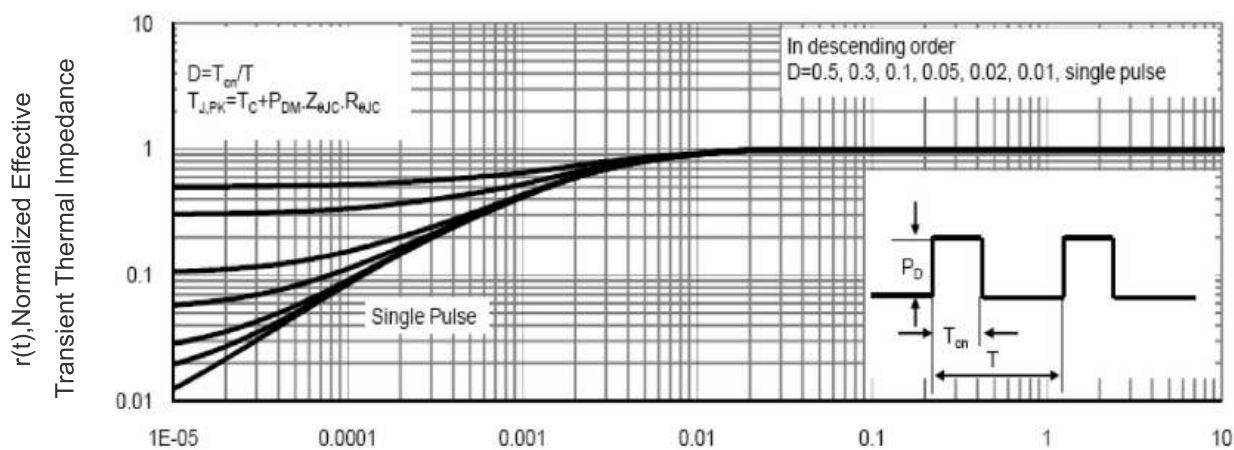
Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area



TJ -Junction Temperature(°C)

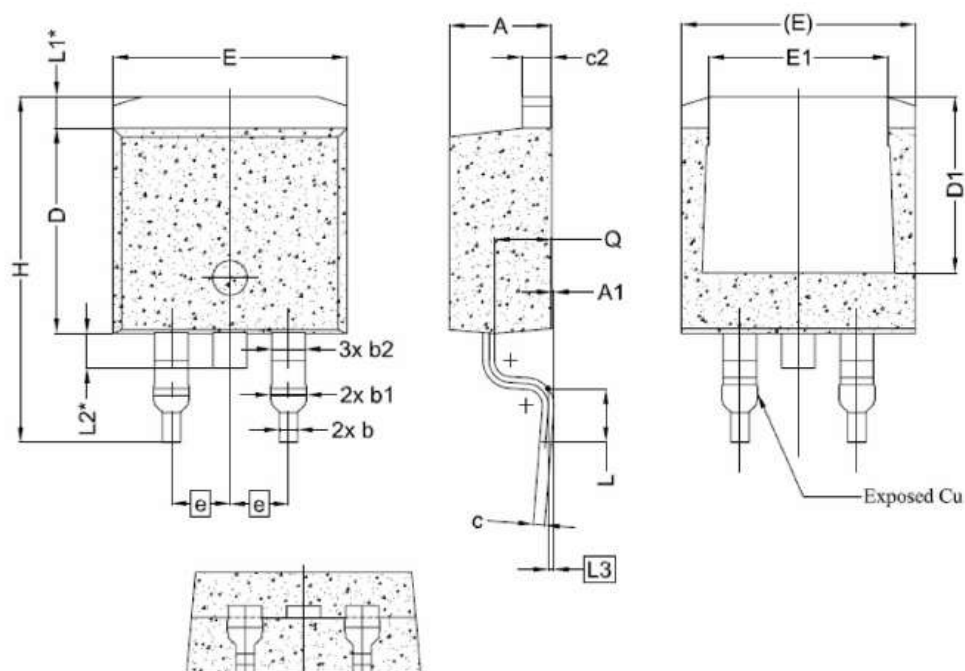
Figure 10 V<sub>GS(th)</sub> vs Junction Temperature



Square Wave Pluse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

## TO-263-2L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	4.24	4.44	4.64
A1	0.00	0.10	0.25
b	0.70	0.80	0.90
b1	1.20	1.55	1.75
b2	1.20	1.45	1.70
c	0.40	0.50	0.60
c2	1.15	1.27	1.40
D	8.82	8.92	9.02
D1	6.86	7.65	-
E	9.96	10.16	10.36
E1	6.89	7.77	7.89
e	2.54BSC		
H	14.61	15.00	15.88
L	1.78	2.32	2.79
L1	1.36 REF.		
L2	1.50 REF.		
L3	0.25 BSC		
Q	2.30	2.48	2.70



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