

# MJ N-Channel Enhancement Mode Power MOSFET

## Description

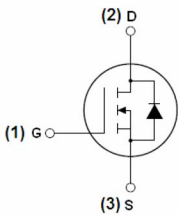
The MJ0160AG uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

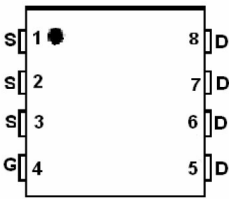
- ◆  $V_{DS}=100V, I_D=60A$   
 $R_{DS(ON)}<17m\Omega$  @  $V_{GS}=10V$  (Typ:13.5m $\Omega$ )
- ◆ Special process technology for high ESD capability
- ◆ High density cell design for ultra low  $R_{dson}$
- ◆ Fully characterized avalanche voltage and current
- ◆ Good stability and uniformity with high  $E_{AS}$
- ◆ Excellent package for good heat dissipation

## Application

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



Schematic Diagram



Marking and pin assignment



DFN5X6-8L top view

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ0160AG	MJ0160AG	DFN 5X6 -8L	-	-	-

## Absolute Maximum Ratings (Tc =25 °Cunless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	100	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous	$I_D$	60	A
Drain Current-Continuous( $T_C=100^{\circ}C$ )	$I_{D(100^{\circ}C)}$	40	A
Pulsed Drain Current	$I_{DM}$	190	A
Maximum Power Dissipation	$P_D$	65	W
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	580	mJ
Derating factor		0.44	W/°C
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	°C

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	2.3	°C/W
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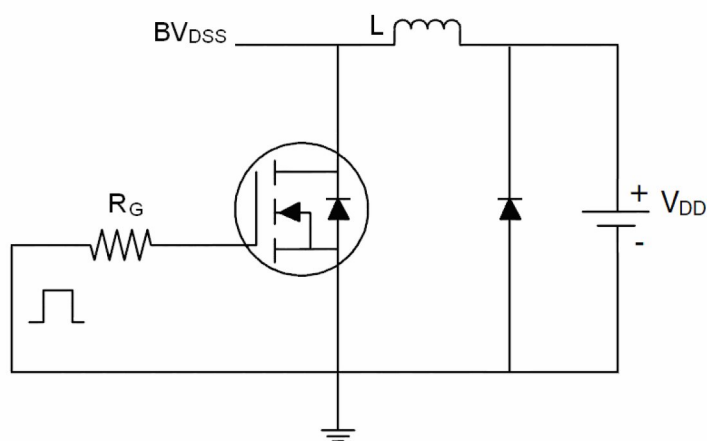
Electrical Characteristics (Tc =25℃unless otherwise noted)

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	100	110	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =100V,V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =±20V,V <sub>S</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> =30A	-	13.5	17	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =5V,I <sub>D</sub> =30A	32	-	-	S
Dynamic Characteristics <sup>(Note 4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V,V <sub>GS</sub> =0V, F=1.0MHz	-	2534.8	-	PF
Output Capacitance	C <sub>oss</sub>		-	173.7	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	91.9	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V,R <sub>G</sub> =2.5Ω V <sub>GS</sub> =10V,R <sub>L</sub> =1Ω	-	15	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	11	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	52	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	13	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =50V,I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	70.4	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	15	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	28.7	-	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> =30A	-	0.85	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	60	A
Reverse Recovery Time	t <sub>rr</sub>	T <sub>J</sub> =25°C, I <sub>F</sub> =30A di/dt=100A/μs <sup>(Note 3)</sup>	-	33	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	54	-	nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible(turn-on is dominated by LS+LD)				

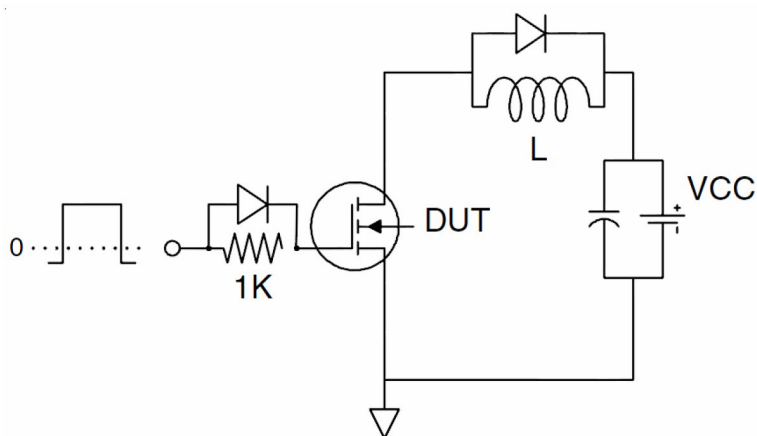
Notes:

- ① Repetitive Rating: Pulse width limited by maximum junction temperature.
- ② Surface Mounted on FR4 Board, t≤10sec.
- ③ Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%.
- ④ Guaranteed by design, not subject to production
- ⑤ EAS condition：Tj=25℃,V<sub>DD</sub>=50V,V<sub>G</sub>=10V,L=0.5mH,R<sub>G</sub>=25Ω

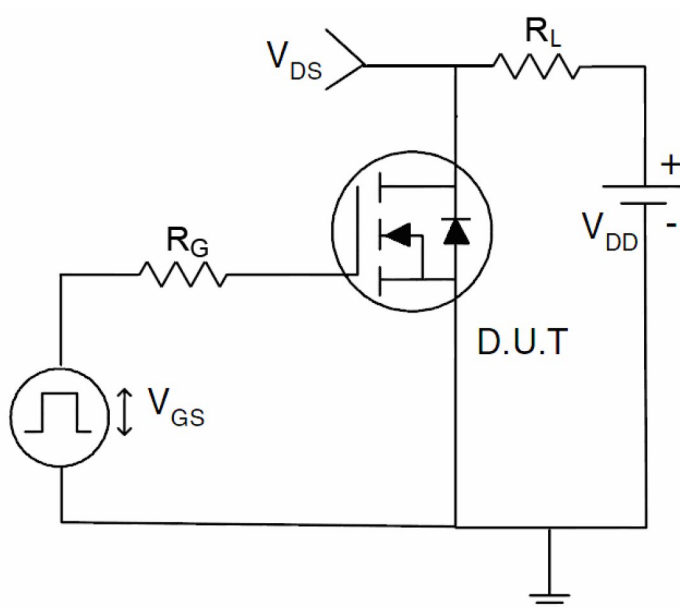
## Test Circuit



EAS test Circuit

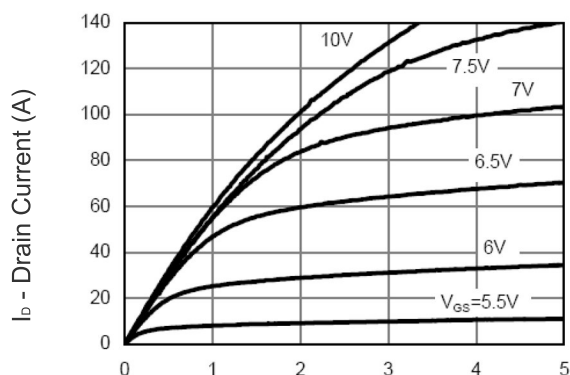


Gate charge test Circuit

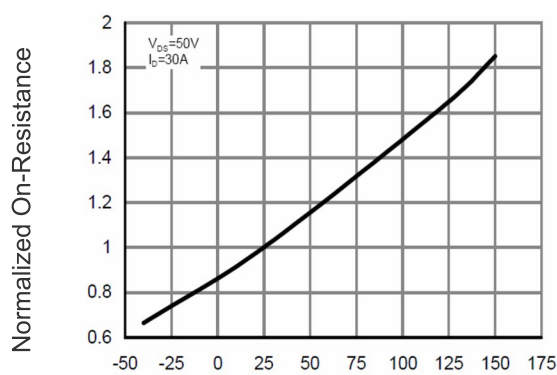


Switch Time Test Circuit

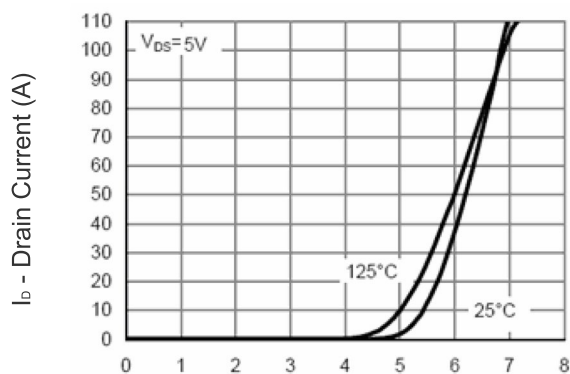
# Typical Electrical and Thermal Characteristics (Curves)



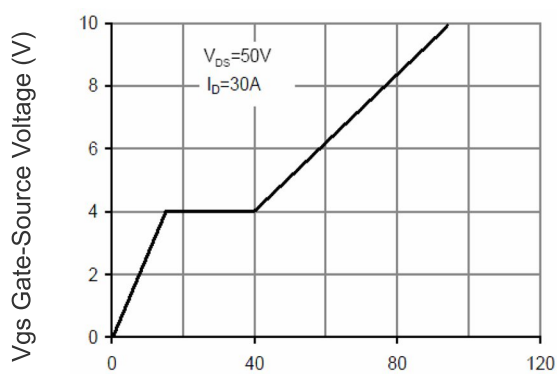
Vds Drain-Source Voltage (V)  
Figure 1 Output Characteristics



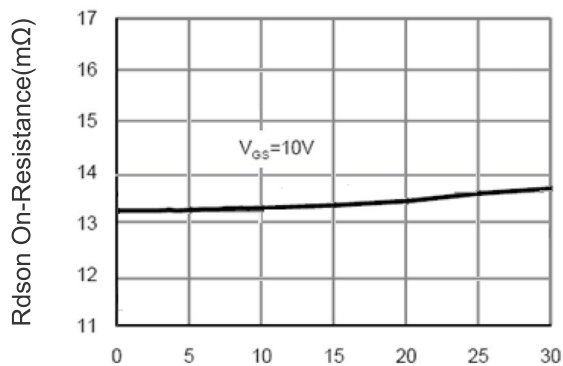
TJ -Junction Temperature(°C)  
Figure 4 Rdson-Junction Temperature



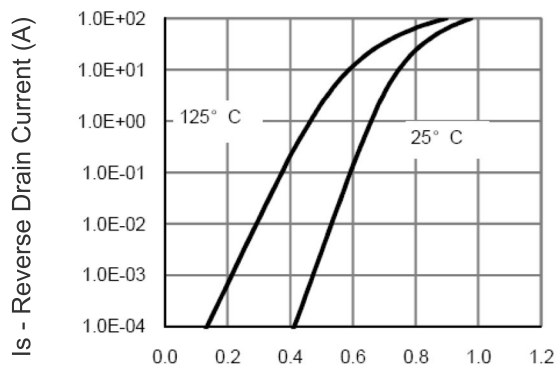
Vgs Gate-Source Voltage (V)  
Figure 2 Transfer Characteristics



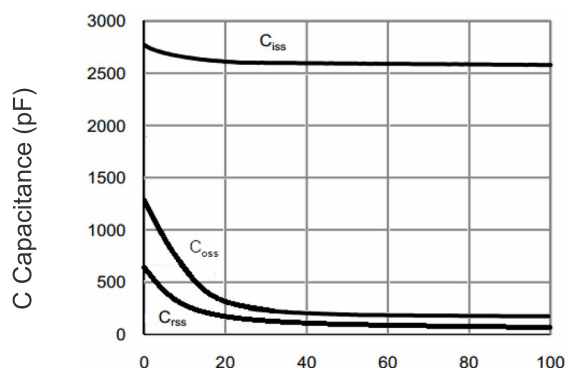
Qg Gate Charge (nC)  
Figure 5 Gate Charge



Id - Drain Current (A)  
Figure 3 Rdson- Drain Current

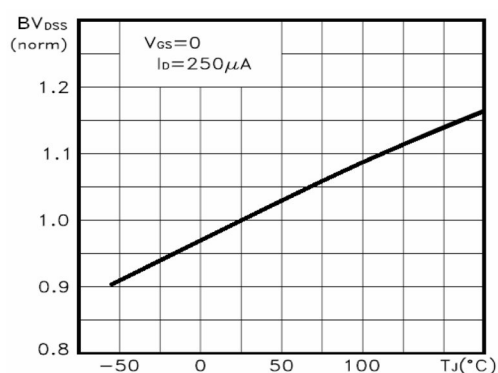


Vsd Source-Drain Voltage (V)  
Figure 6 Source- Drain Diode Forward



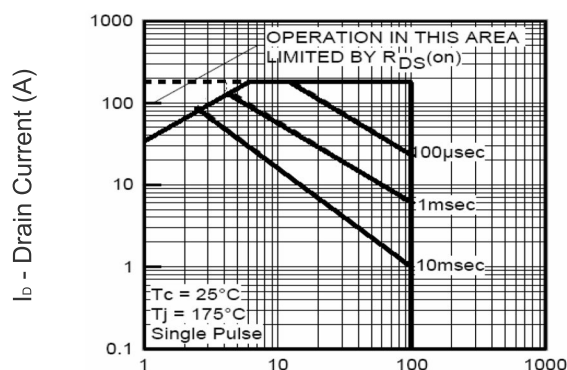
Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



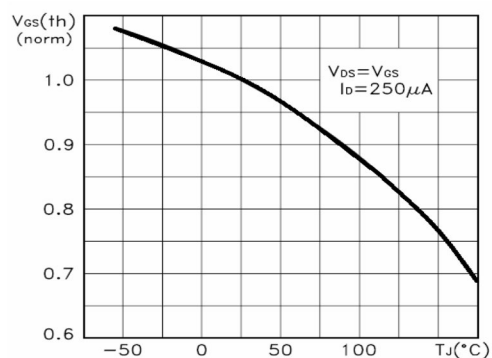
Tj -Junction Temperature(°C)

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

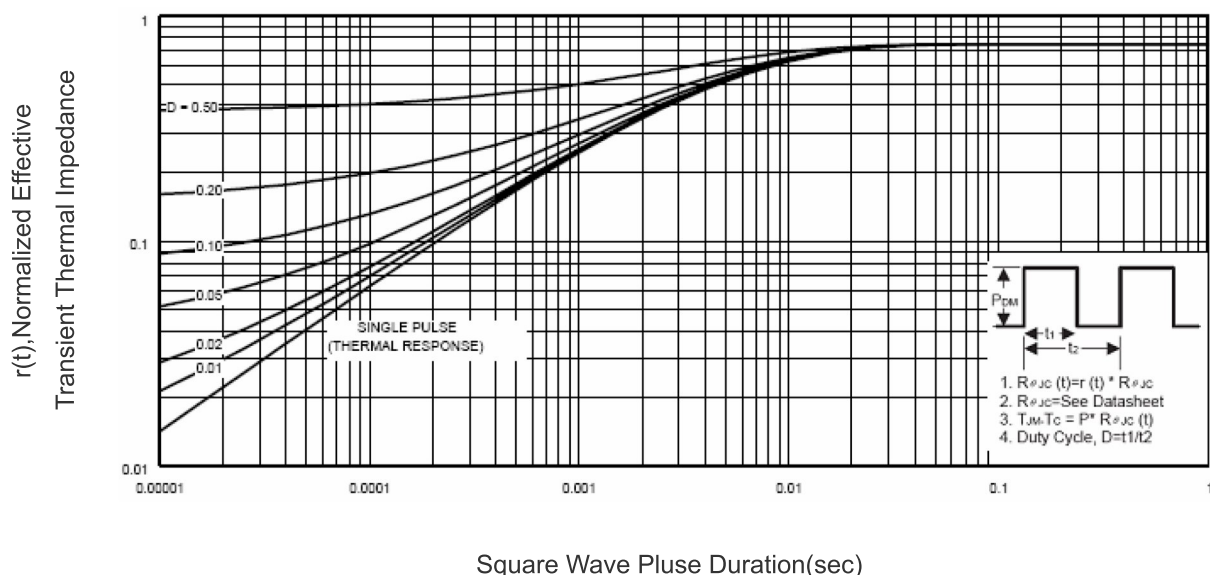
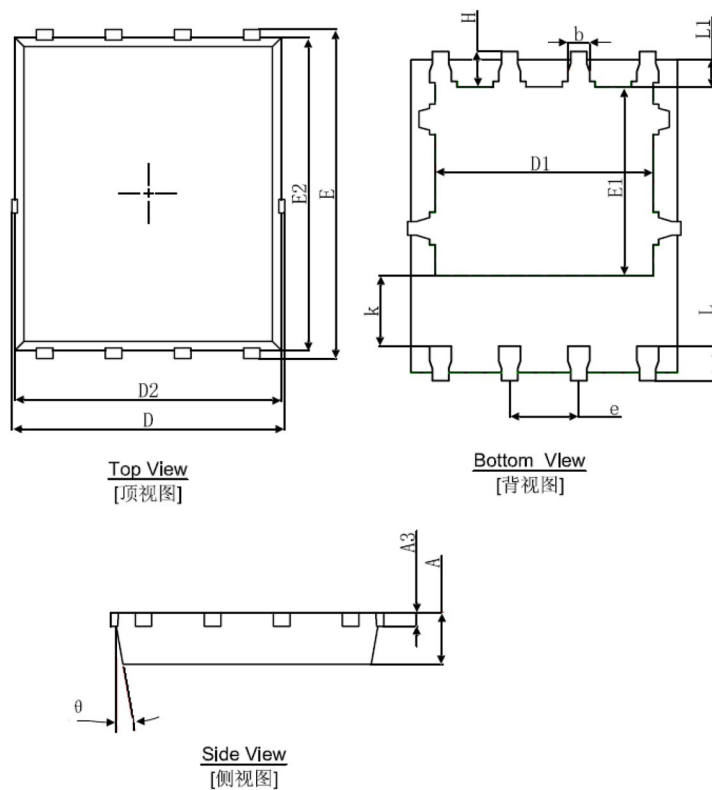


Figure 11 Normalized Maximum Transient Thermal Impedance

# DFN5X6-8L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039
A3	0.254REF.		0.010REF.	
D	4.944	5.096	0.195	0.201
E	5.974	6.126	0.235	0.241
D1	3.910	4.110	0.154	0.162
E1	3.375	3.575	0.133	0.141
D2	4.824	4.976	0.190	0.196
E2	5.674	5.826	0.223	0.229
K	1.190	1.390	0.047	0.055
b	0.035	0.450	0.014	0.018
e	1.270(TYP.)		0.050(TYP.)	
L	0.559	0.711	0.022	0.028
L1	0.424	0.576	0.017	0.023
H	0.574	0.726	0.023	0.029
θ	8°	12°	8°	12°

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