

# MJ P-Channel Enhancement Mode Power MOSFET

## Description

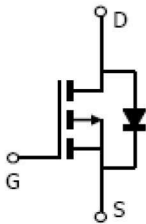
The MJ60P12AS uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

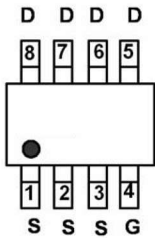
- ◆  $V_{DS} = -60V, I_D = -12A$   
 $R_{DS(ON)} < 14m\Omega @ V_{GS} = -10V$   
 $R_{DS(ON)} < 17m\Omega @ V_{GS} = -4.5V$
- ◆ High density cell design for ultra low  $R_{dson}$
- ◆ Fully characterized avalanche voltage and current
- ◆ Excellent package for good heat dissipation

## Application

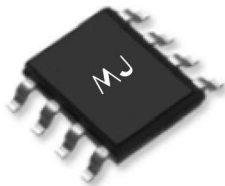
- ◆ Power switching application
- ◆ Hard switched and high frequency circuits
- ◆ DC-DC Converter



Schematic diagram



Marking and pin assignment



SOP-8 top view

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
MJ60P12AS	MJ60P12AS	SOP-8	Ø330mm	12mm	4000 units

## Absolute Maximum Ratings (TA=25℃ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	±20	V
Drain Current-Continuous	$I_D$	-12	A
Drain Current-Continuous( $T_C = 100^{\circ}C$ )	$I_{D(100^{\circ}C)}$	-8.5	A
Pulsed Drain Current	$I_{DM}$	-50	A
Maximum Power Dissipation	$P_D$	3.5	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	℃

## Thermal Characteristic

Thermal Resistance,Junction-to-Ambient <sup>(Note 2)</sup>	$R_{\theta JA}$	35	℃/W
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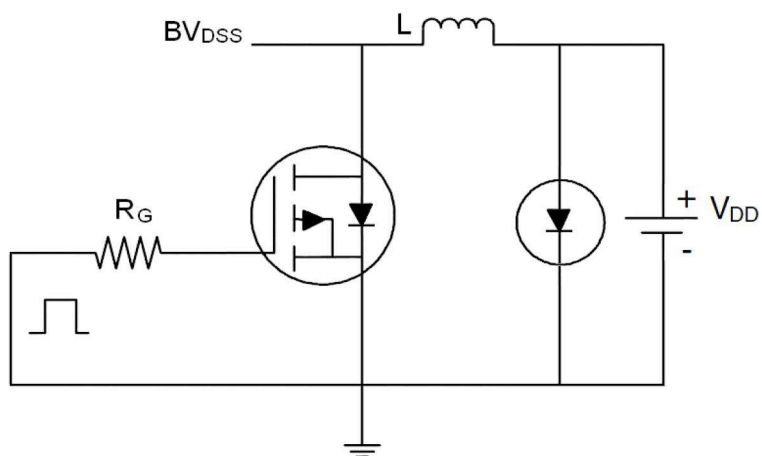
Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

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>DS</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	-1.2	-1.8	-2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =-10V, I <sub>D</sub> =-12A	-	11	14	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-12A	-	13	17	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =-5V,I <sub>D</sub> =-12A	-	40	-	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	-	5604	-	PF
Output Capacitance	C <sub>oss</sub>		-	356	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	265	-	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> =2.5Ω V <sub>GS</sub> =-10V,R <sub>GEN</sub> =6Ω	-	16	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	18	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	50	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	33	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =-30V,I <sub>D</sub> =-12A V <sub>GS</sub> =-10V	-	62.1	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	9.3	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	16.8	-	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> =-12A	-	-	-1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	-12	A

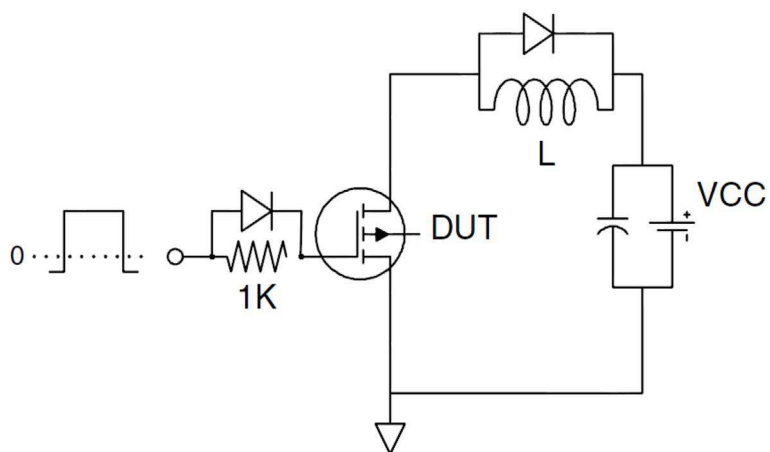
Notes:

- 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

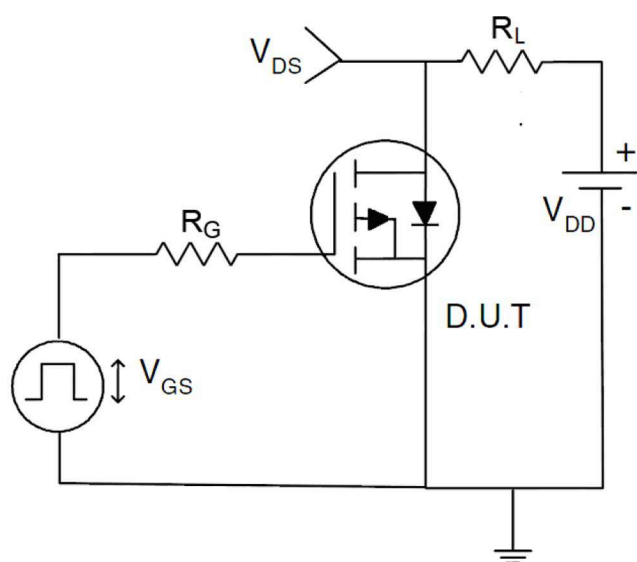
# Test circuit



EAS test Circuit

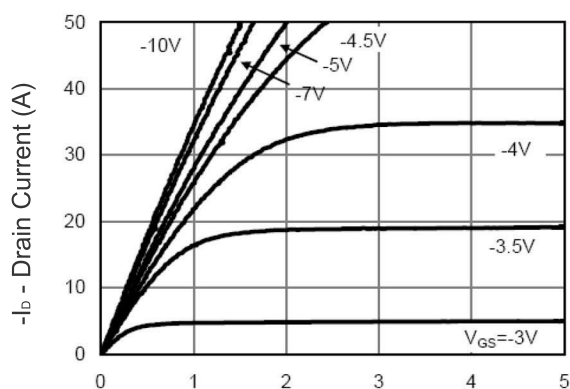


Gate charge test Circuit

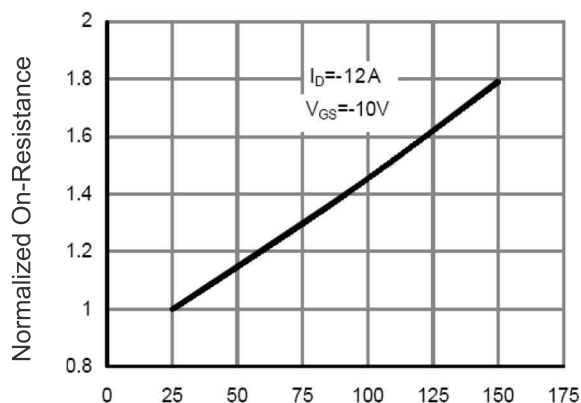


Switch Time Test Circuit

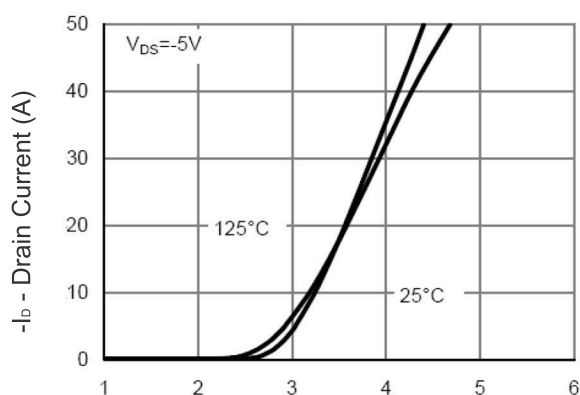
# Typical Electrical and Thermal Characteristics (Curves)



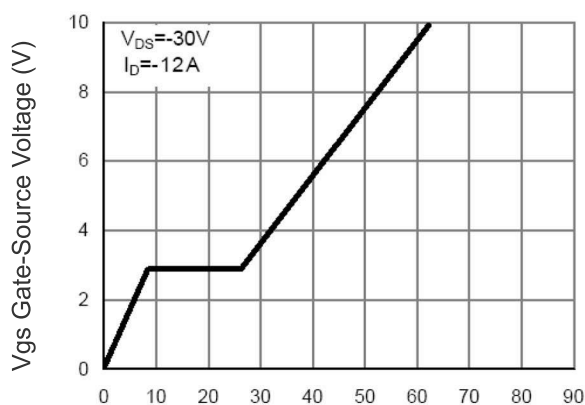
-V<sub>DS</sub> Drain-Source Voltage (V)  
Figure 1 Output Characteristics



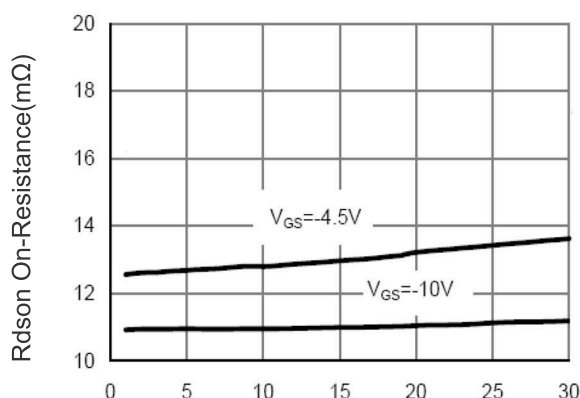
T<sub>J</sub> -Junction Temperature(°C)  
Figure 4 R<sub>DS(on)</sub>-Junction Temperature



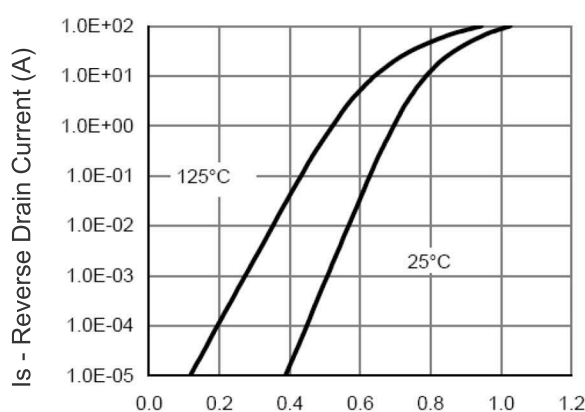
-V<sub>GS</sub> Gate-Source Voltage (V)  
Figure 2 Transfer Characteristics



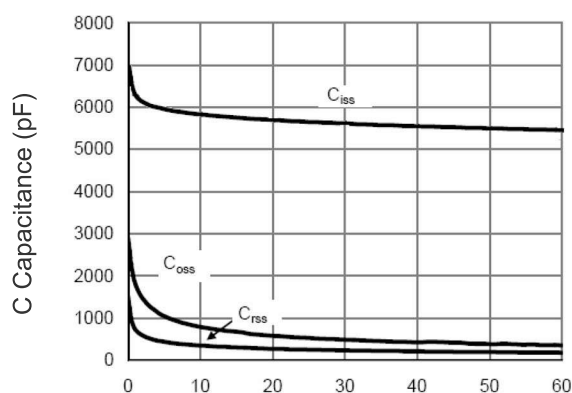
Q<sub>g</sub> Gate Charge (nC)  
Figure 5 Gate Charge



-I<sub>D</sub> - Drain Current (A)  
Figure 3 R<sub>DS(on)</sub>- Drain Current

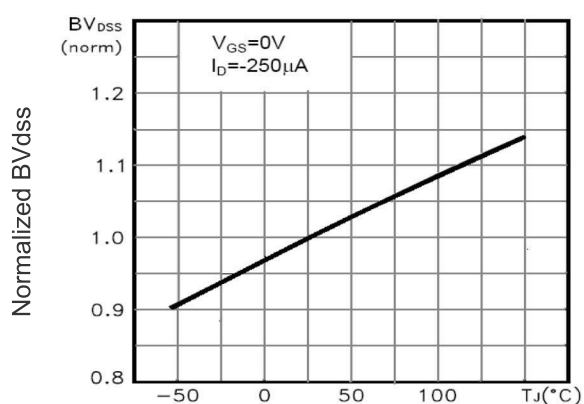


V<sub>SD</sub> Source-Drain Voltage (V)  
Figure 6 Source- Drain Diode Forward



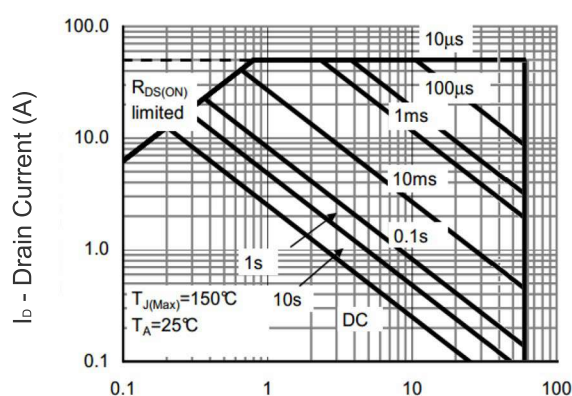
-Vds Drain-Source Voltage (V)

Figure 7 Capacitance vs Vds



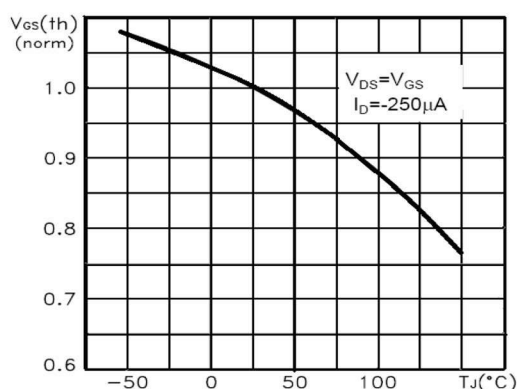
T<sub>J</sub> -Junction Temperature(°C)

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



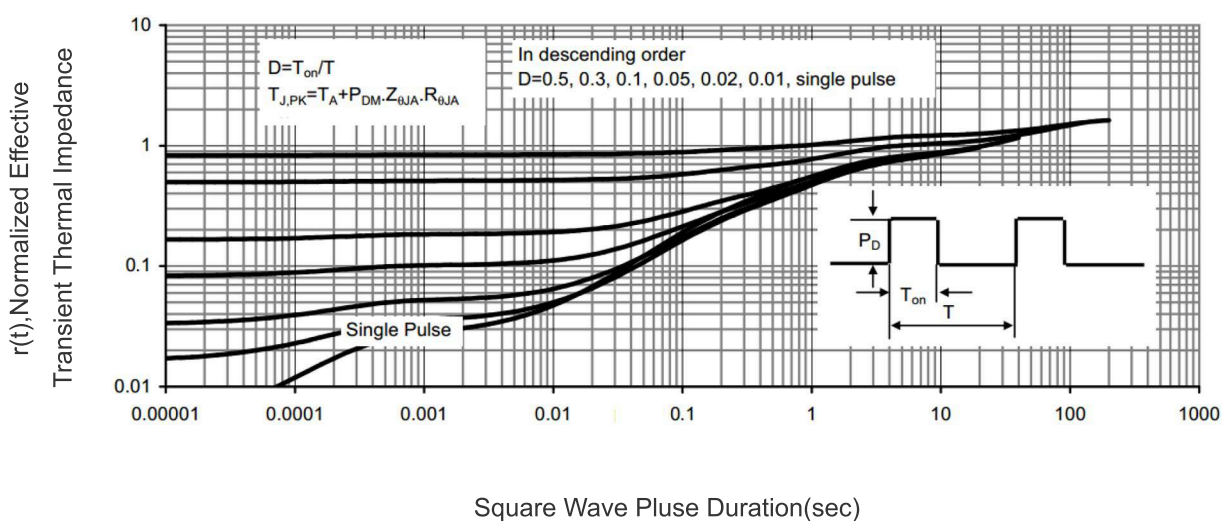
Vds Drain-Source Voltage (V)

Figure 8 Safe Operation Area



T<sub>J</sub> -Junction Temperature(°C)

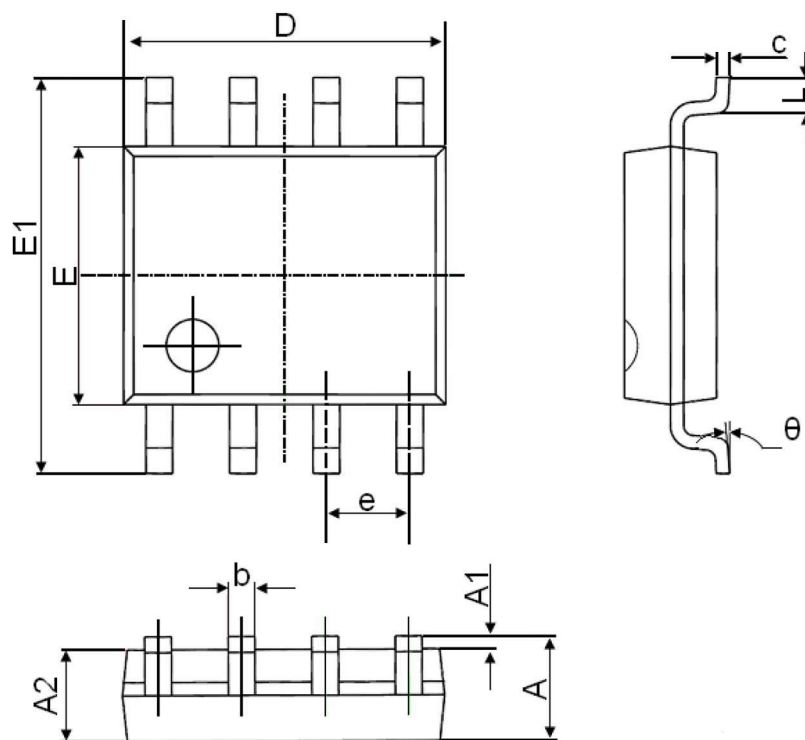
Figure 10 V<sub>GS(th)</sub> vs Junction Temperature



Square Wave Pluse Duration(sec)

Figure 11 Normalized Maximum Transient Thermal Impedance

# SOP-8 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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