

JMSH04060G3L

Features

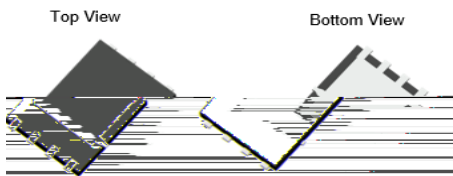
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- 100% Vds Tested
- Halogen-free; RoHS-compliant

Applications

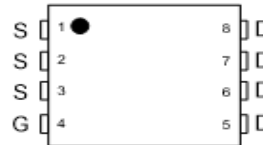
- Load Switch
- PWM Application
- Power Management

Product Summary

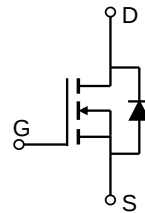
Parameters	Value	Unit
V_{DSS}	40	V
$V_{GS(th_Typ)}$	2.8	V
$I_D(@V_{GS}=10V)$	87	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	4.8	mΩ



PDFN5X6-8L



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH04060G3L-13	SH040603L	1	Tape&Reel	PDFN5x6-8L	5000	50000

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	40	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$: 87 $T_C = 100^\circ\text{C}$: 62	A
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	106	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$: 83 $T_C = 100^\circ\text{C}$: 42	W
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max	Unit
R	Thermal Resistance, Junction to Ambient ⁽³⁾	45	$^\circ\text{C/W}$
R	Thermal Resistance, Junction to Case	1.8	

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	I _D = 250μA, V _{GS} = 0V	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 32V, V _{GS} = 0V	-	-	1.0	μA
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	2.0	2.8	4.0	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 20A	-	4.8	6.0	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	1.6	-	Ω
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz	-	1068	1450	pF
C _{oss}	Output Capacitance		-	355	480	pF
C _{rss}	Reverse Transfer Capacitance		-	10	20	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 20V, I _D = 20A	-	15	-	nC
Q _{gs}	Gate Source Charge		-	6	-	nC
Q _{gd}	Gate Drain("Miller") Charge		-	2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 20V I _D = 20A, R _{GEN} = 3Ω	-	10	-	ns
t _r	Turn-On Rise Time		-	28	-	ns
t _{d(off)}	Turn-Off DelayTime		-	15	-	ns
t _f	Turn-Off Fall Time		-	3	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	87	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	350	A
V _{SD}	Body Diode Forward Voltage	V _{GS} = 0V, I _S = 20A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I _F = 20A, di/dt = 100A/us	11	22	32	ns
Qrr	Body Diode Reverse Recovery Charge		-	12	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 8.4\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. R is measured with the device mounted on a 1inch^2 pad of 2oz copper FR4 PCB.
 4. Pulse Test: Pulse Width $\leq$ $\leq 0.5\%$.

Typical Performance Characteristics

Figure 1: Power De-rating

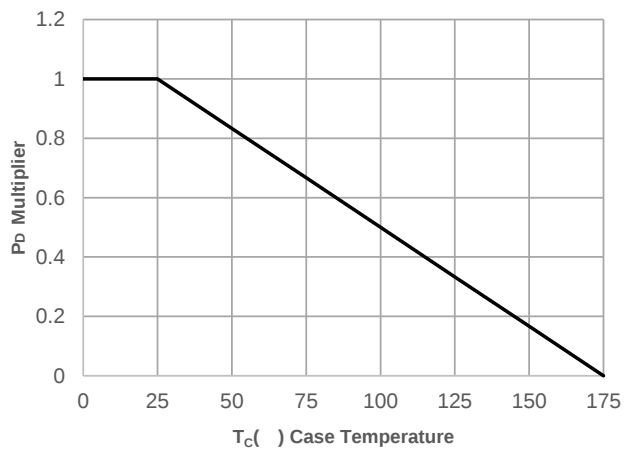
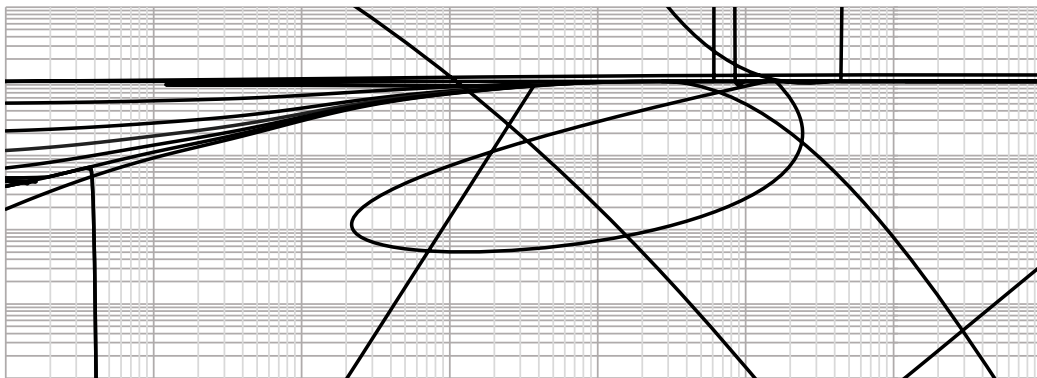
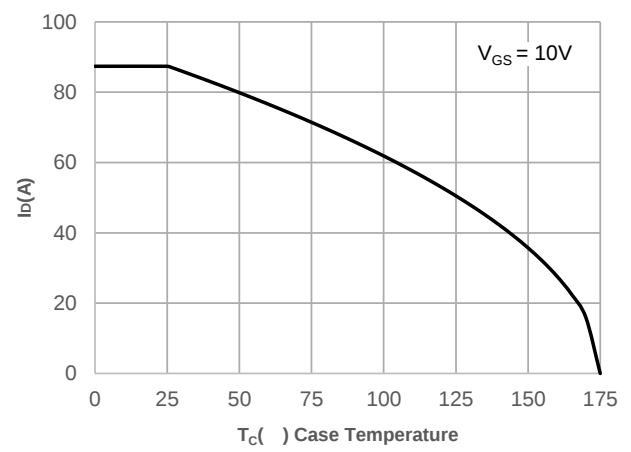
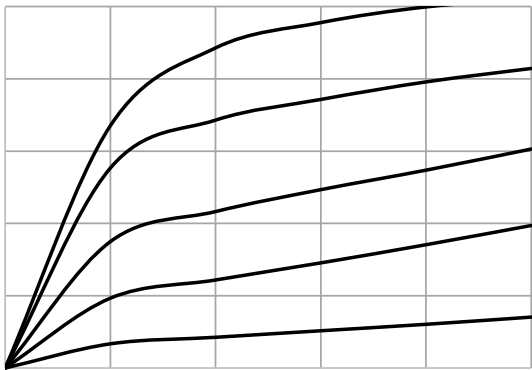


Figure 2: Current De-rating



Typical Performance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown Voltage vs. Junction Temperature

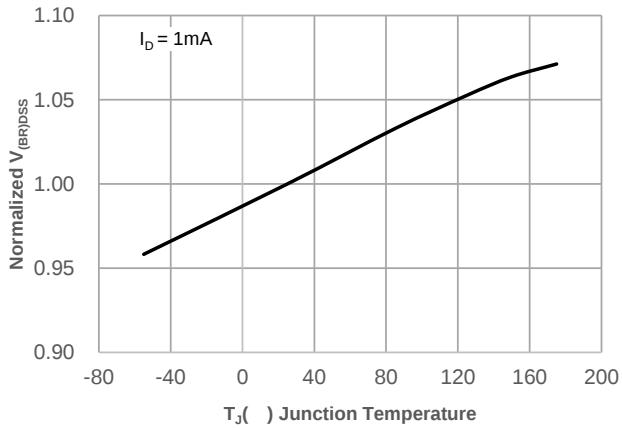


Figure 12: Normalized on Resistance vs. Junction Temperature

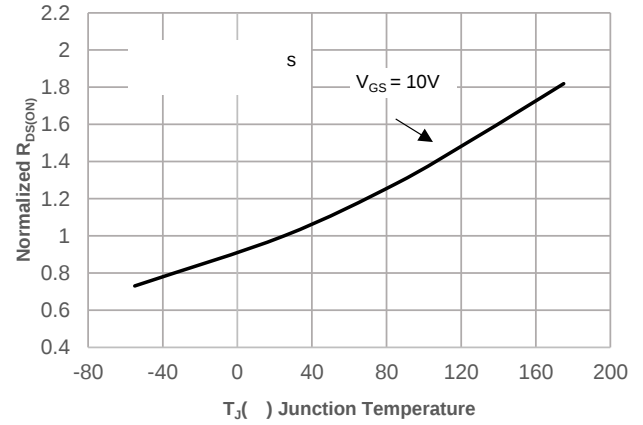


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

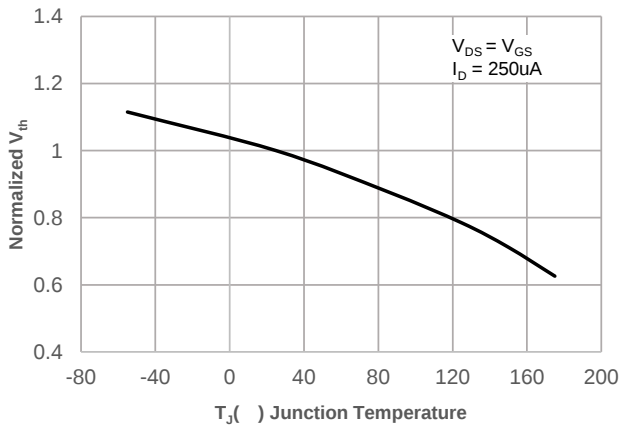


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

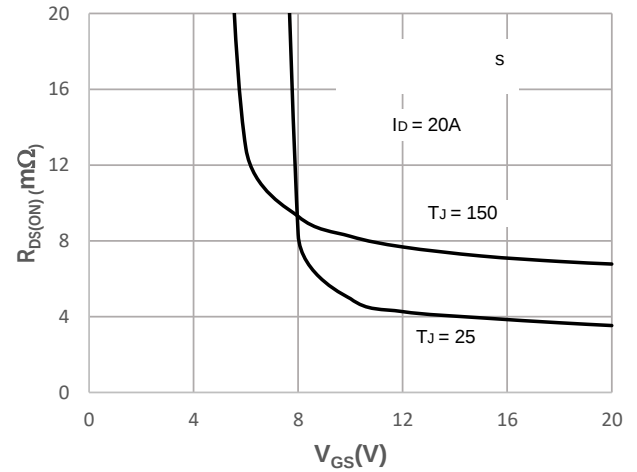
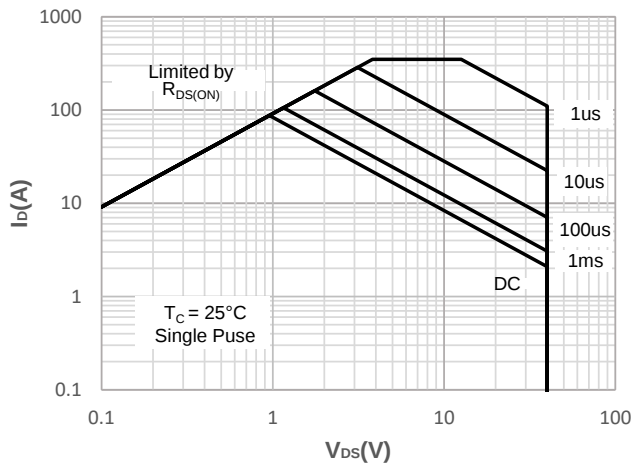


Figure 15: Maximum Safe Operating Area



Test Circuit



Figure 1: Gate Charge Test Circuit & Waveform

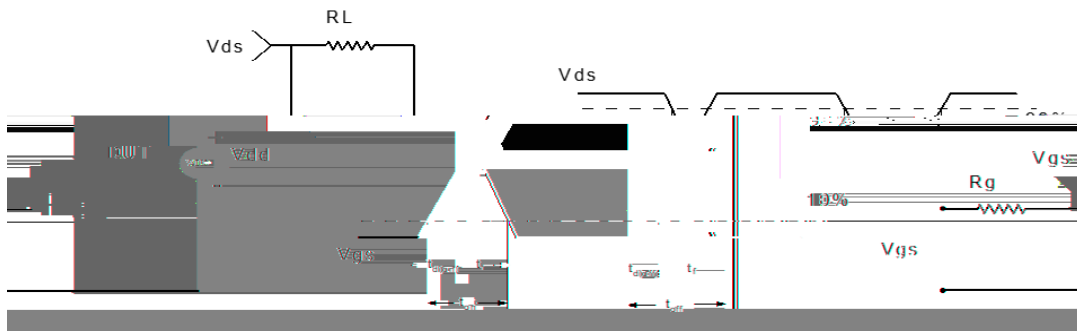


Figure 2: Resistive Switching Test Circuit & Waveform

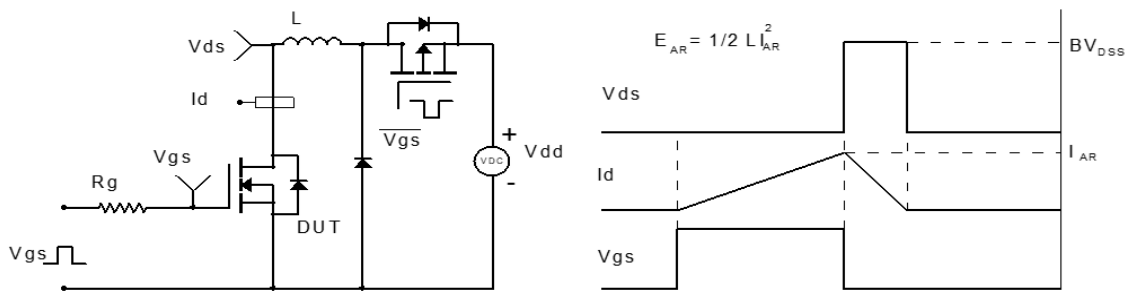


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

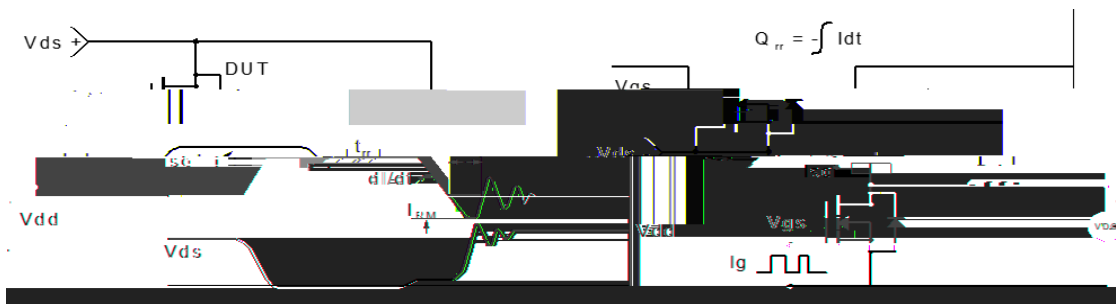
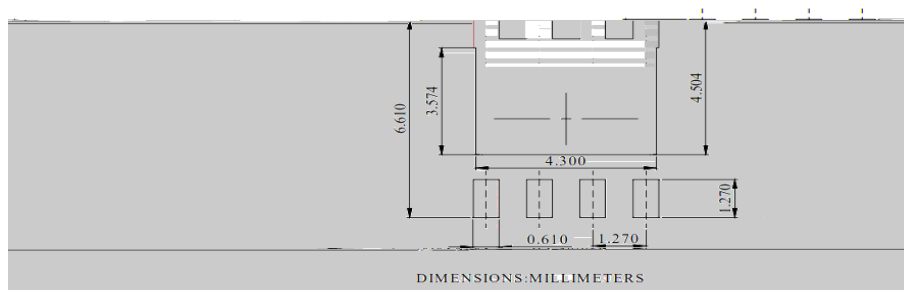


Figure 4: Diode Recovery Test Circuit & Waveform

Figure 10 consists of two schematic diagrams, (a) and (b), illustrating the proposed system. Diagram (a) is a top view showing a robot (labeled 'Robot') positioned on a platform. A camera (labeled 'Camera') is mounted on the robot. The robot is connected to a control unit (labeled 'Control Unit') via a cable. The control unit is connected to a power source (labeled 'Power Source') via a cable. The robot is also connected to a sensor (labeled 'Sensor') via a cable. The sensor is connected to a display (labeled 'Display') via a cable. The robot is also connected to a motor (labeled 'Motor') via a cable. The motor is connected to a wheel (labeled 'Wheel') via a cable. The robot is also connected to a battery (labeled 'Battery') via a cable. The battery is connected to a power source (labeled 'Power Source') via a cable. The robot is also connected to a camera (labeled 'Camera') via a cable. The camera is connected to a display (labeled 'Display') via a cable. The robot is also connected to a sensor (labeled 'Sensor') via a cable. The sensor is connected to a display (labeled 'Display') via a cable. The robot is also connected to a motor (labeled 'Motor') via a cable. The motor is connected to a wheel (labeled 'Wheel') via a cable. The robot is also connected to a battery (labeled 'Battery') via a cable. The battery is connected to a power source (labeled 'Power Source') via a cable. Diagram (b) is a side view showing the robot (labeled 'Robot') positioned on a platform. A camera (labeled 'Camera') is mounted on the robot. The robot is connected to a control unit (labeled 'Control Unit') via a cable. The control unit is connected to a power source (labeled 'Power Source') via a cable. The robot is also connected to a sensor (labeled 'Sensor') via a cable. The sensor is connected to a display (labeled 'Display') via a cable. The robot is also connected to a motor (labeled 'Motor') via a cable. The motor is connected to a wheel (labeled 'Wheel') via a cable. The robot is also connected to a battery (labeled 'Battery') via a cable. The battery is connected to a power source (labeled 'Power Source') via a cable. The robot is also connected to a camera (labeled 'Camera') via a cable. The camera is connected to a display (labeled 'Display') via a cable. The robot is also connected to a sensor (labeled 'Sensor') via a cable. The sensor is connected to a display (labeled 'Display') via a cable. The robot is also connected to a motor (labeled 'Motor') via a cable. The motor is connected to a wheel (labeled 'Wheel') via a cable. The robot is also connected to a battery (labeled 'Battery') via a cable. The battery is connected to a power source (labeled 'Power Source') via a cable.

SYMBOLS:			D. KENNEDY			D. KENNEDY		
	MIN	NOM	MAX	MIN	NOM	MAX		
*A	0.000	1.000	1.150	0.035	0.039	0.045		
A1	0.000		0.000	0.000		0.002		
B	0.246	0.254	0.350	0.018	0.019	0.014		
C	0.241	0.241	0.241	0.010	0.010	0.010		
D	1.270	1.270	1.270	0.050	0.050	0.050		
E	1.990	5.050	1.910	0.195	0.199	0.100		
F	0.000	4.100	0.120	0.157	0.161	0.100		
G		0.125	0.125	0.000	0.000	0.000		
H		0.050	0.050		0.050	0.050		
I	5.500	5.600	5.700	0.217	0.220	0.220		
J				0.160	0.160	0.160		
K				0.160	0.160	0.160		
L				0.160	0.160	0.160		
M				0.160	0.160	0.160		
N				0.160	0.160	0.160		
O				0.160	0.160	0.160		
P				0.160	0.160	0.160		
Q				0.160	0.160	0.160		
R				0.160	0.160	0.160		
S				0.160	0.160	0.160		
T				0.160	0.160	0.160		
U				0.160	0.160	0.160		
V				0.160	0.160	0.160		
W				0.160	0.160	0.160		
X				0.160	0.160	0.160		
Y				0.160	0.160	0.160		
Z				0.160	0.160	0.160		
AA				0.160	0.160	0.160		
AB				0.160	0.160	0.160		
AC				0.160	0.160	0.160		
AD				0.160	0.160	0.160		
AE				0.160	0.160	0.160		
AF				0.160	0.160	0.160		
AG				0.160	0.160	0.160		
AH				0.160	0.160	0.160		
AI				0.160	0.160	0.160		
AJ				0.160	0.160	0.160		
AK				0.160	0.160	0.160		
AL				0.160	0.160	0.160		
AM				0.160	0.160	0.160		
AN				0.160	0.160	0.160		
AO				0.160	0.160	0.160		
AP				0.160	0.160	0.160		
AQ				0.160	0.160	0.160		
AR				0.160	0.160	0.160		
AS				0.160	0.160	0.160		
AT				0.160	0.160	0.160		
AU				0.160	0.160	0.160		
AV				0.160	0.160	0.160		
AW				0.160	0.160	0.160		
AX				0.160	0.160	0.160		
AY				0.160	0.160	0.160		
AZ				0.160	0.160	0.160		
BA				0.160	0.160	0.160		
BB				0.160	0.160	0.160		
BC				0.160	0.160	0.160		
BD				0.160	0.160	0.160		
BE				0.160	0.160	0.160		
BF				0.160	0.160	0.160		
BG				0.160	0.160	0.160		
BH				0.160	0.160	0.160		
BI				0.160	0.160	0.160		

Recommended Cold-Chamber Freezing: -100°C for 24 hr.



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