

JMSH0401MGQ

Features

Ultra-low ON-resistance, $R_{DS(ON)}$
 Low Gate Charge
 100% UIS Tested
 100% V_{DS} Tested
 Halogen-free; RoHS-compliant
 AEC-Q101 Qualified

Applications

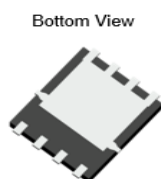
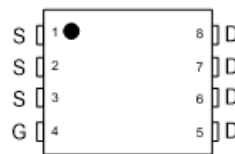
Load Switch
 PWM Application
 General A Application

Product Summary

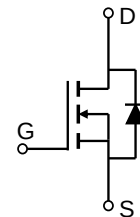
Parameters	Value	Unit
V_{DSS}	40	V
$V_{GS(th_Typ)}$	2.7	V
$I_D(@V_{GS}=10V)$	223	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	1.4	mΩ



PDFN5X6-8L



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH0401MGQ-13	SH0401MQ	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°C	223	A
		T _C = 100°C	158	
I _{DM}	Pulsed Drain Current ⁽¹⁾		Refer to Fig.4	A
E _{AS}	Single Pulsed Avalanche Energy ⁽²⁾		459	mJ
P _D	Power Dissipation	T _C = 25°C	157	W
		T _C = 100°C	78	
T _{J STG}	Junction & Storage Temperature Range		-55 to 175	°C

Thermal Characteristics

Symbol	Parameter	Max	Unit
R	Thermal Resistance, Junction to Ambient ⁽³⁾	42	$^\circ\text{C/W}$
R	Thermal Resistance, Junction to Case	1.0	$^\circ\text{C/W}$

**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	μ
I _{GSS}	Gate-Body Leakage Current	V _{DS} = 0V, V _{GS} = ±20V	-	-	±100	
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250μA	1.9	2.7	3.5	V
R _{DS(ON)}	Static Drain-Source ON-Resistance ⁽⁴⁾	V _{GS} = 10V, I _D = 20A	-	1.4	1.7	mΩ
Dynamic Characteristics						
R _g	Gate Resistance	f = 1MHz	-	0.9	-	Ω
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 20V, f = 1MHz	2589	3625	4893	pF
C _{oss}	Output Capacitance		1413	1979	2671	pF
C _{rss}	Reverse Transfer Capacitance		113	158	213	pF
Q _g	Total Gate Charge	V _{GS} = 0 to 10V V _{DS} = 20V, I _D = 20A	42	59	80	nC
Q _{gs}	Gate Source Charge		11	15	21	nC
Q _{gd}	Gate Drain("Miller") Charge		12	16	22	nC
Switching Characteristics						
t _{d(on)}	Turn-On DelayTime	V _{GS} = 10V, V _{DD} = 20V I _D = 20A, R _{GEN} = 3Ω	-	16	-	ns
t _r	Turn-On Rise Time		-	29	-	ns
t _{d(off)}	Turn-Off DelayTime		-	35	-	ns
t _f	Turn-Off Fall Time		-	13	-	ns
Body Diode Characteristics						
I _S	Maximum Continuous Body Diode Forward Current		-	-	223	A
I _{SM}	Maximum Pulsed Body Diode Forward Current		-	-	891	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	37	52	70	ns
Qrr	Body Diode Reverse Recovery Charge		-	66	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 20\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{AS} = 17.5\text{A}$, $V_{DD} = 0\text{V}$ 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 $\leq$ $\frac{A}{B}$ 1:3 $\leq$ 0.5%.





Typical Performance Characteristics

Figure 1: Power De-rating

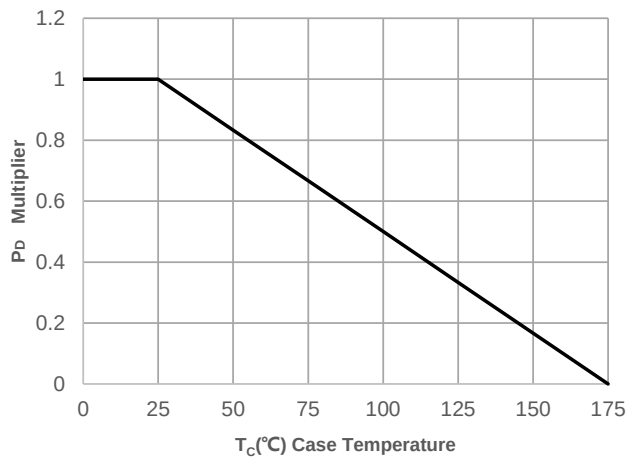
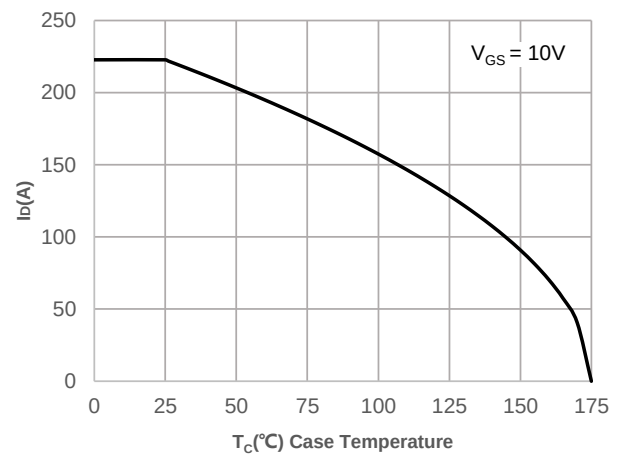
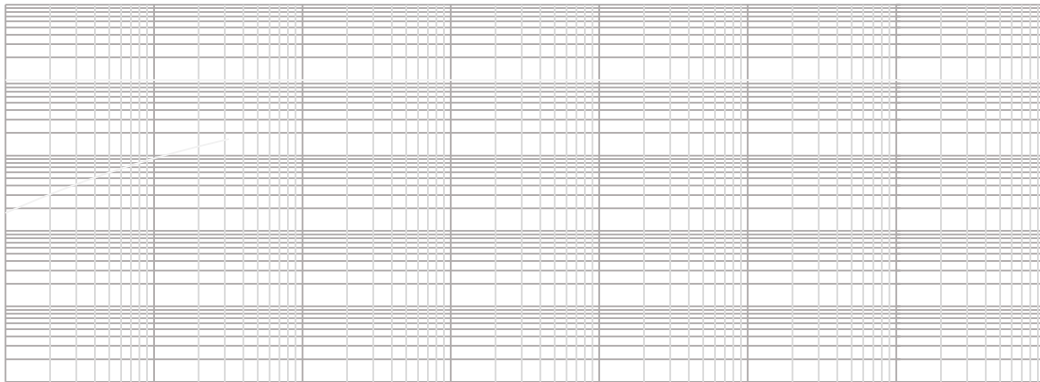


Figure 2: Current De-rating



Typical Performance Characteristics

Figure 5: Output Characteristics

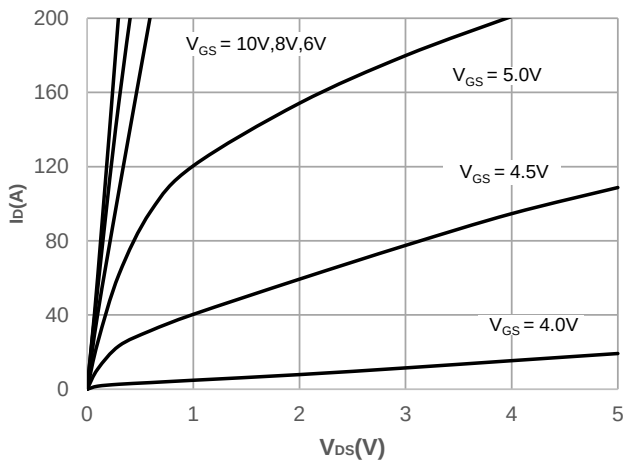


Figure 6: Typical Transfer Characteristics

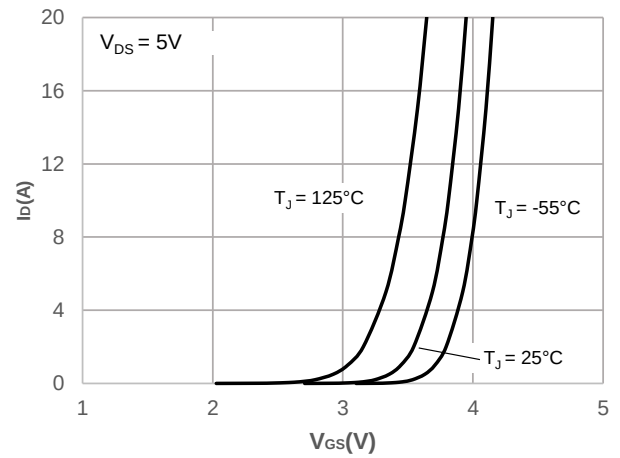


Figure 7: On-resistance vs. Drain Current

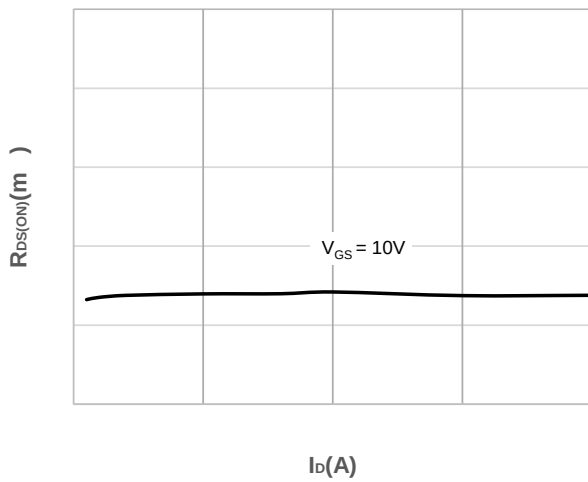


Figure 8: Body Diode Characteristics

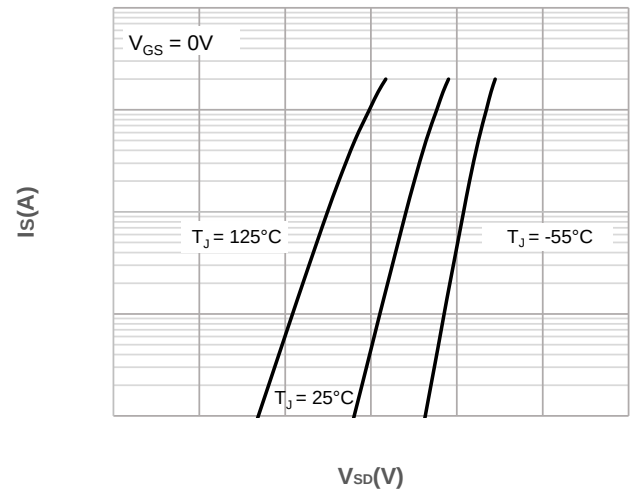


Figure 9: Gate Charge Characteristics

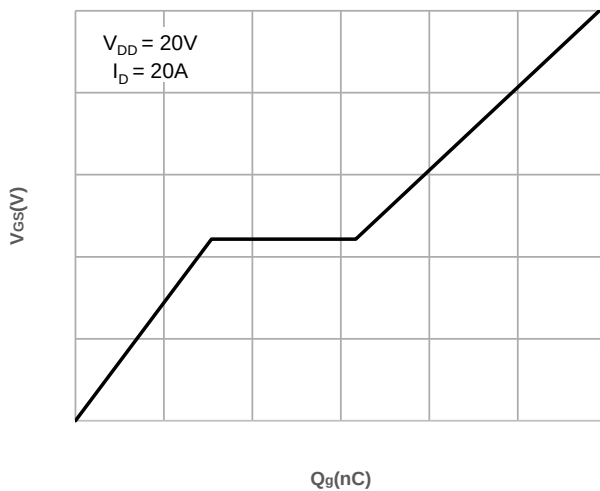
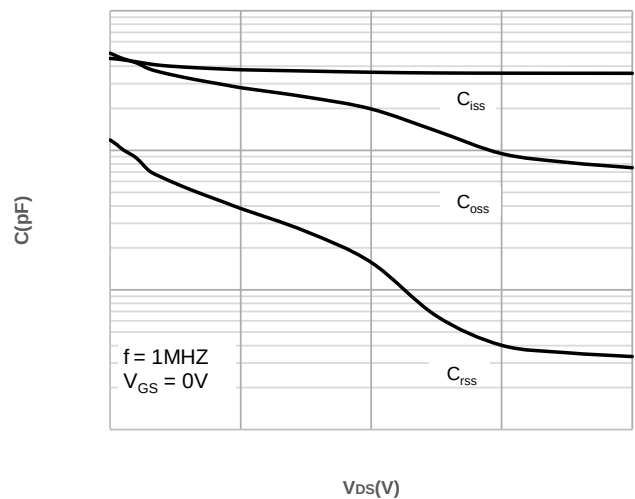


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

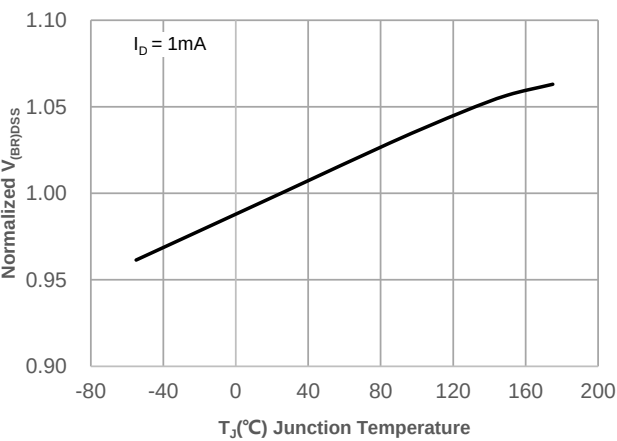


Figure 12: Normalized on Resistance vs. Junction Temperature

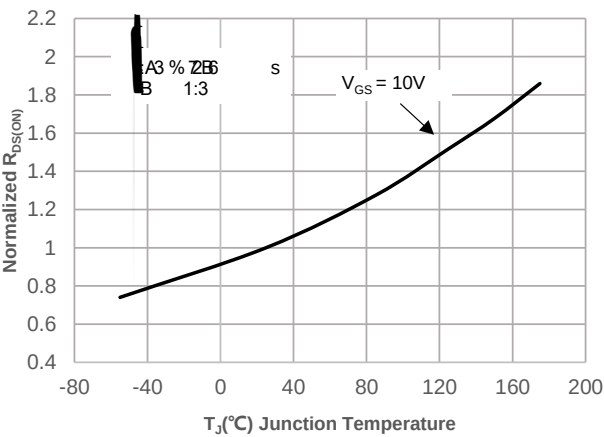
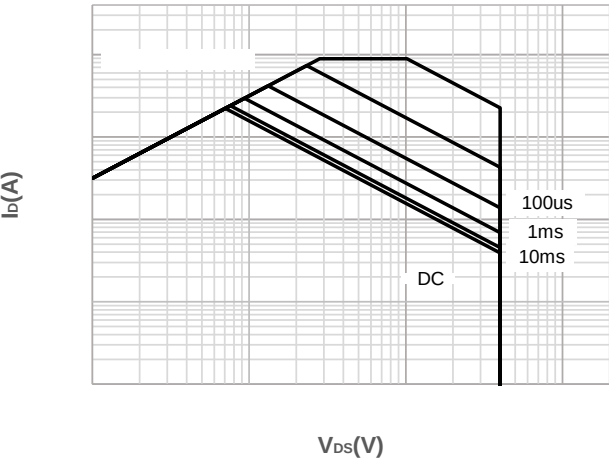


Figure 15: Maximum Safe Operating Area



Test Circuit



Figure 1: Gate Charge Test Circuit & Waveform

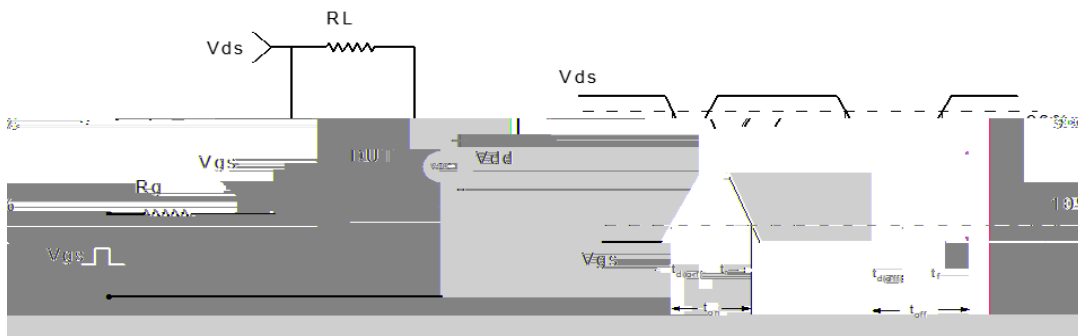


Figure 2: Resistive Switching Test Circuit & Waveform

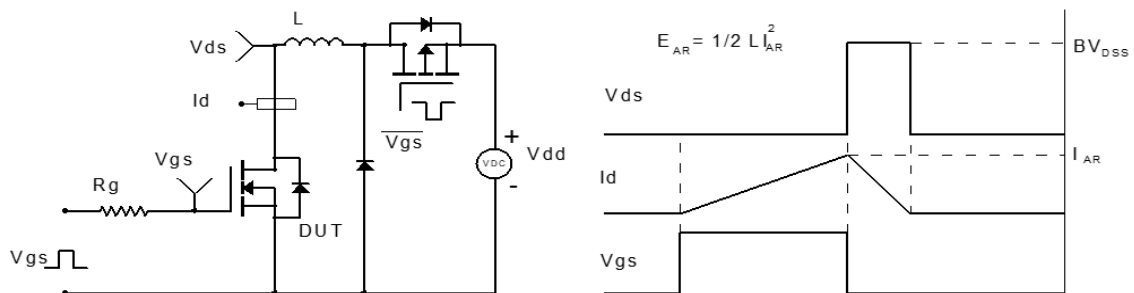


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

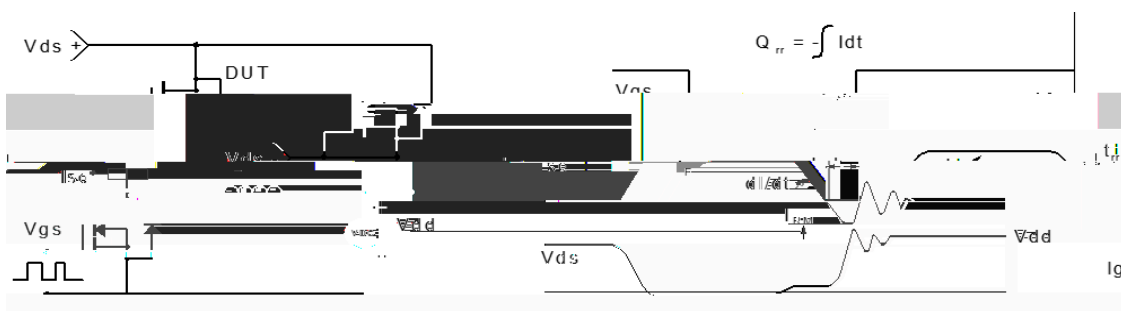
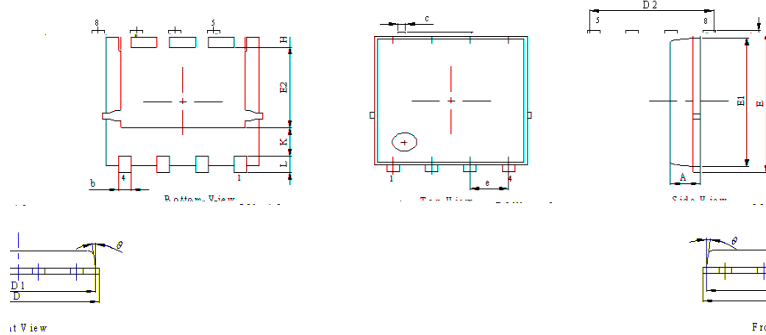


Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(PDFN5X6-8L)

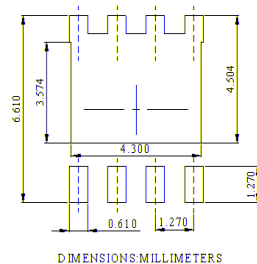
Package Outline



- NOTES:
1. Dimension and tolerance per ASME Y14.5M, 1994.
 2. All dimensions in millimeter (angle in degree).
 3. Dimensions D1 and E1 do not include mold flash protrusions or gate burrs.

DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.9	1	1.15
b	0.31	0.41	0.51
C	0.24	0.32	0.4
D	5	5.2	5.4
D1	4.95	5.05	5.15
D2	4	4.1	4.2
E	6.05	6.15	6.25
E1	5.5	5.6	5.7
E2	3.42	3.53	3.63
e	1.27BSC		
H	0.6	0.7	0.8
L	0.5	0.7	0.8
K	1.23 REF		
O			10

Ordering Footprint



Recommended S

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