40V 0.56mΩ N-Ch Power MOSFET

Features

- Ultra-low $R_{DS(ON)}$
- Low Gate Charge
- 100% UIS Tested, 100% R_g Tested
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant

Product Summary

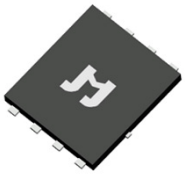
Parameter	Value	Unit
V_{DS}	40	V
$V_{GS(th)\_Typ}$	2.8	V
I_D (@ V_{GS} = 10V) (1)	384	A
$R_{DS(ON)\_Typ}$ (@ V_{GS} = 10V)	0.56	mΩ

Applications

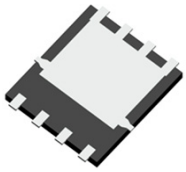
- Power Management in Computing, CE, IE 4.0, Communications
- Current Switching in DC/DC & AC/DC (SR) Sub-systems
- Load Switching, Quick/Wireless Charging, Motor Driving

PDFN5x6-8L

Top View

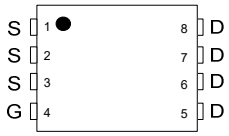


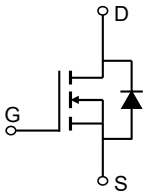
Bottom View



Pin Configuration

Top View





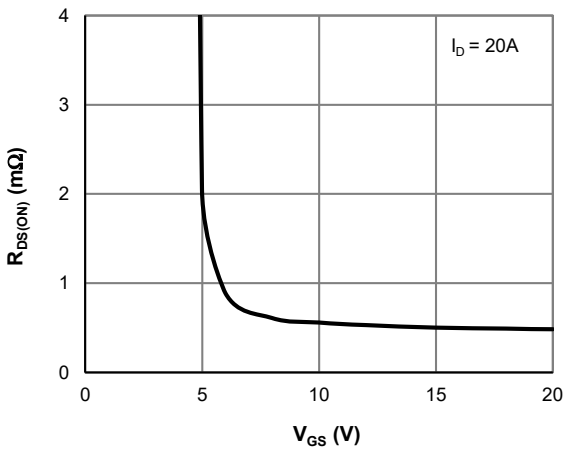
Ordering Information

Device	Package	# of Pins	Marking	MSL	T_J (°C)	Media	Quantity (pcs)
JMSH040SAG-13	PDFN5x6-8L	8	SH040SA	1	-55 to 150	13-inch Reel	5000

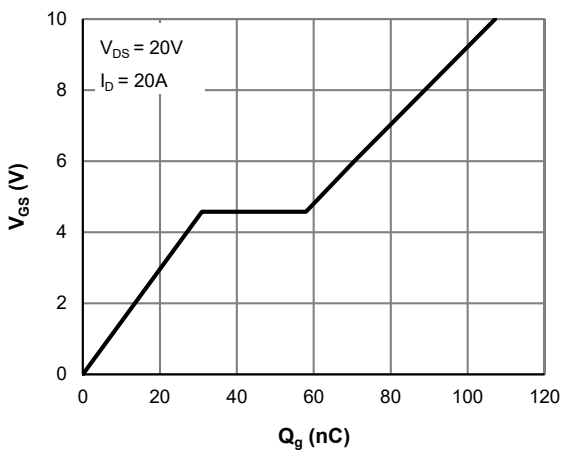
Absolute Maximum Ratings (@ T_A = 25°C unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DS}	40	V
Gate-to-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (1)	T_C = 25°C	I_D	384	A
	T_C = 100°C		242	
Pulsed Drain Current (2)		I_{DM}	1238	A
Avalanche Energy (3)		E_{AS}	864	mJ
Power Dissipation (4)	T_C = 25°C	P_D	178	W
	T_C = 100°C		71	
Junction & Storage Temperature Range		T_J, T_{STG}	-55 to 150	°C

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



Gate Charge



Electrical Characteristics (@ T_J = 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
STATIC PARAMETERS						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 250μA, V_{GS} = 0V	40			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 32V, V_{GS} = 0V			1.0	μA
		T_J = 55°C			5.0	
Gate-Body Leakage Current	I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V			±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	2.2	2.8	3.4	V
Static Drain-Source ON-Resistance	$R_{DS(ON)}$	V_{GS} = 10V, I_D = 20A		0.56	0.68	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 5V, I_D = 20A		81		S
Diode Forward Voltage	V_{SD}	I_S = 1A, V_{GS} = 0V		0.63	1.0	V
Diode Continuous Current	I_S	T_C = 25°C			178	A
DYNAMIC PARAMETERS (5)						
Input Capacitance	C_{iss}	V_{GS} = 0V, V_{DS} = 20V, f = 1MHz		7445		pF
Output Capacitance	C_{oss}			5755		pF
Reverse Transfer Capacitance	C_{rss}			282		pF
Gate Resistance	R_g	V_{GS} = 0V, V_{DS}= 0V, f = 1MHz		2.5		Ω
SWITCHING PARAMETERS (5)						
Total Gate Charge (@ V_{GS} = 10V)	Q_g	V_{GS} = 0 to 10V V_{DS} = 20V, I_D = 20A		107		nC
Total Gate Charge (@ V_{GS} = 6.0V)	Q_g			68		nC
Gate Source Charge	Q_{gs}			31		nC
Gate Drain Charge	Q_{gd}			27		nC
Turn-On DelayTime	$t_{D(on)}$	V_{GS} = 10V, V_{DS} = 20V R_L = 1.0Ω, R_{GEN} = 3Ω		21		ns
Turn-On Rise Time	t_r			35		ns
Turn-Off DelayTime	$t_{D(off)}$			64		ns
Turn-Off Fall Time	t_f			35		ns
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20A, dI_F/dt = 100A/μs		87		ns
Body Diode Reverse Recovery Charge	Q_{rr}	I_F = 20A, dI_F/dt = 100A/μs		169		nC

Thermal Performance

Parameter	Symbol	Typ.	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	48	°C/W
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.70	0.90	°C/W

Notes:

1. Computed continuous current assumes the condition of T_{J_Max} while the actual continuous current depends on the thermal & electro-mechanical application board design.
2. This single-pulse measurement was taken under T_{J_Max} = 150°C.
3. E_{AS} of 864 mJ is based on starting T_J = 25°C,L = 3.0mH, I_{AS} = 24A, V_{GS} = 10V, V_{DD} = 20V; 100% test at L = 0.5mH, I_{AS} = 45A. T_{J_Max} = 150°C.
4. The power dissipation P_D is based on T_{J_Max} = 150°C.
5. This value is guaranteed by design hence it is not included in the production test.

Typical Electrical & Thermal Characteristics

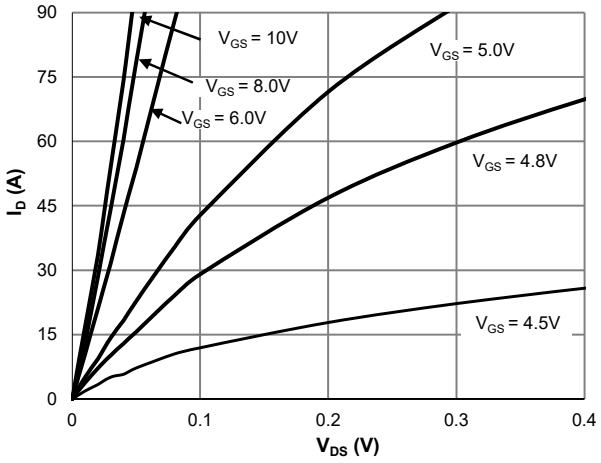


Figure 1: Saturation Characteristics

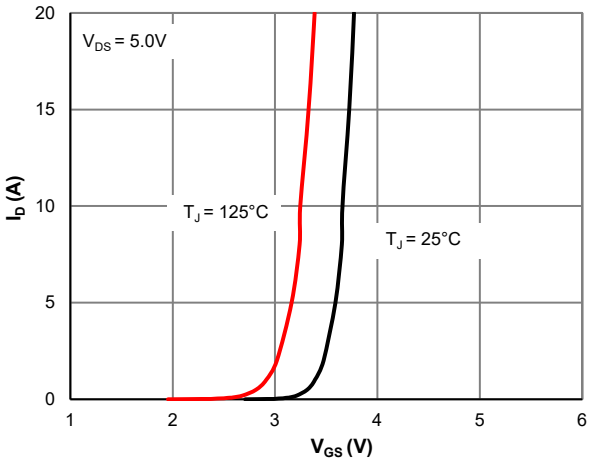


Figure 2: Transfer Characteristics

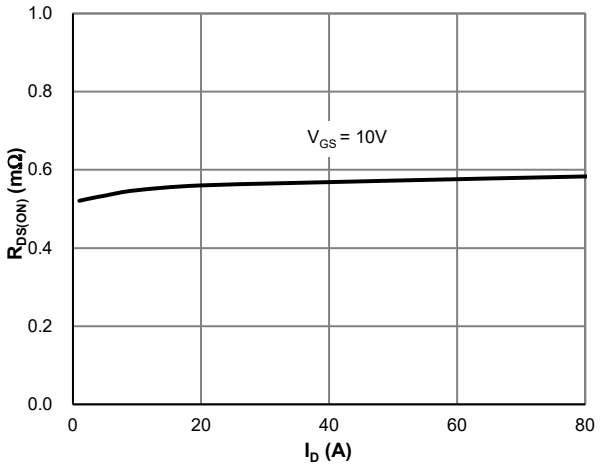


Figure 3: $R_{DS(ON)}$ vs. Drain Current

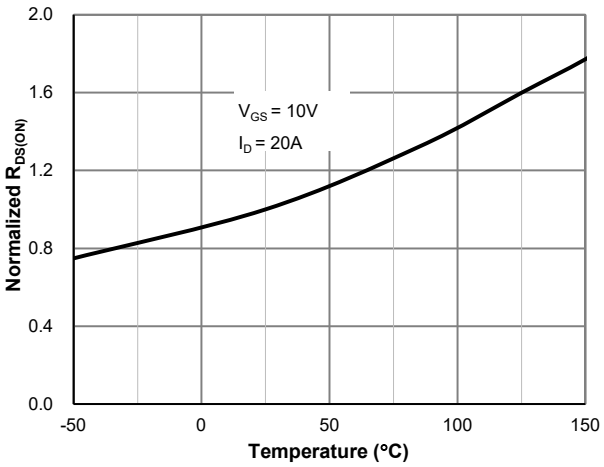


Figure 4: $R_{DS(ON)}$ vs. Junction Temperature

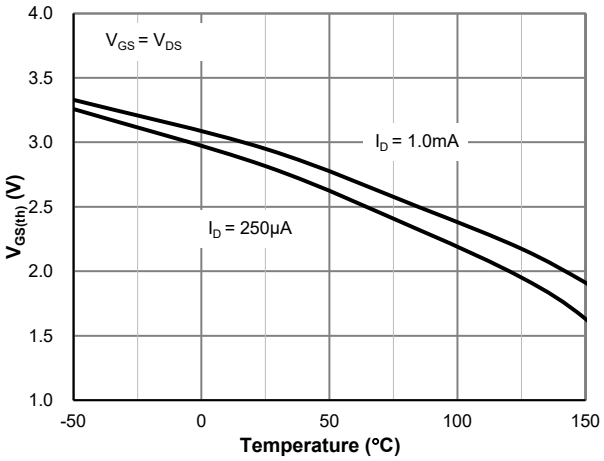


Figure 5: $V_{GS(th)}$ vs. Junction Temperature

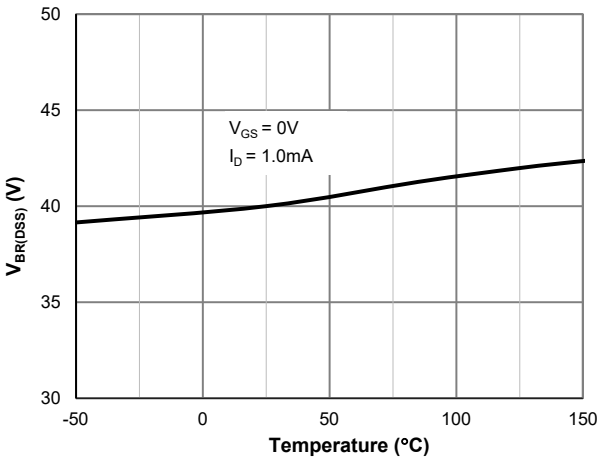


Figure 6: $V_{BR(DSS)}$ vs. Junction Temperature

Typical Electrical & Thermal Characteristics

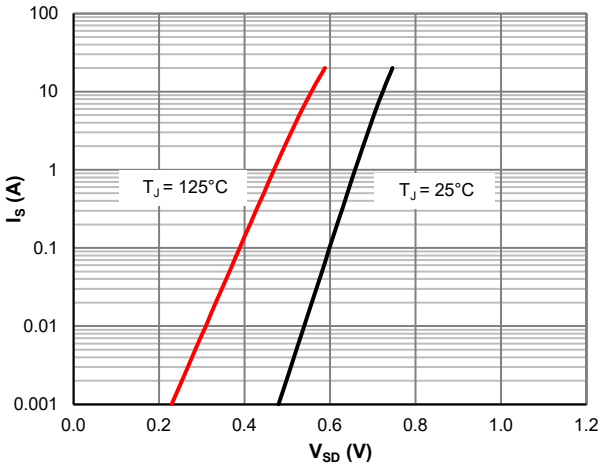


Figure 7: Body-Diode Characteristics

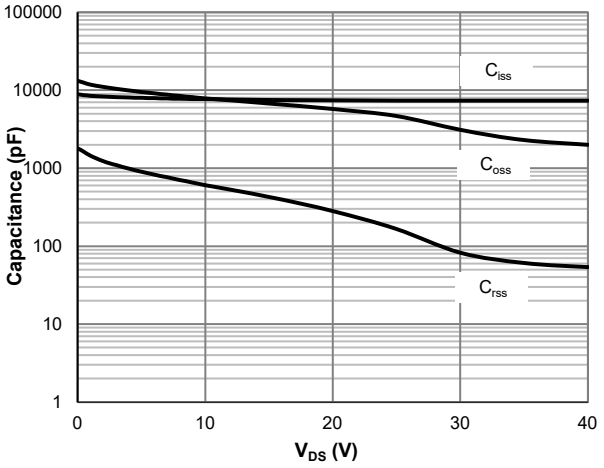


Figure 8: Capacitance Characteristics

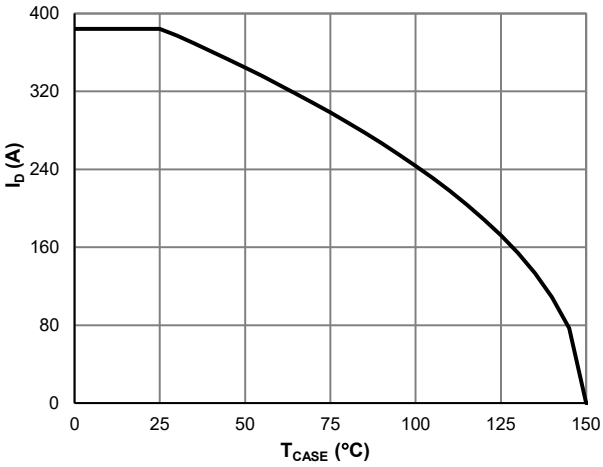


Figure 9: Current De-rating

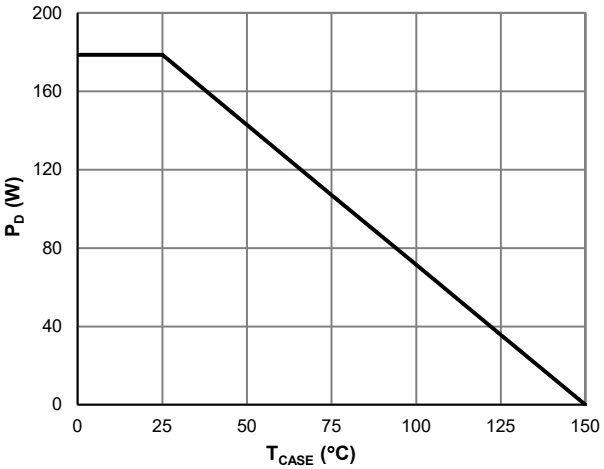


Figure 10: Power De-rating

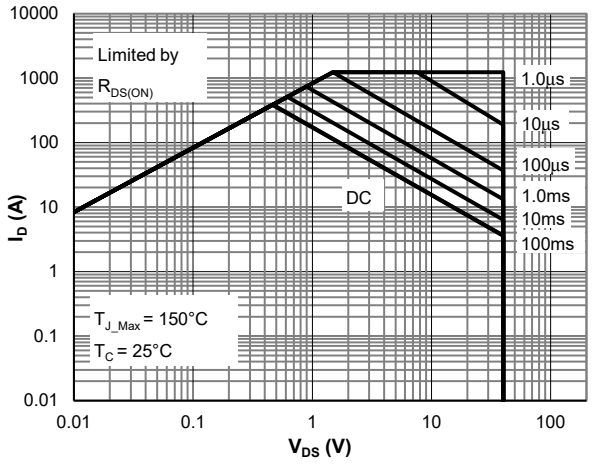


Figure 11: Maximum Safe Operating Area

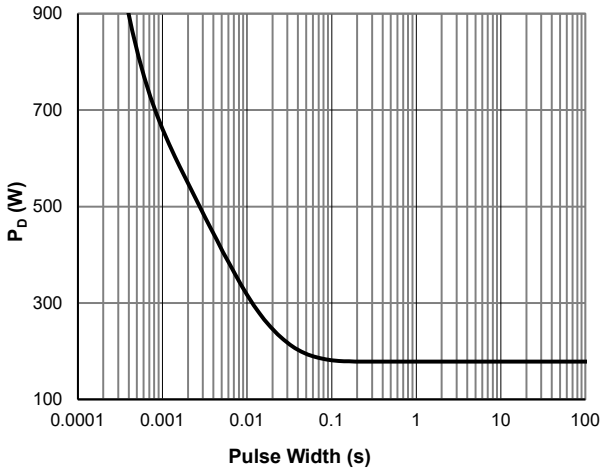


Figure 12: Single Pulse Power Rating, Junction-to-Case

Typical Electrical & Thermal Characteristics

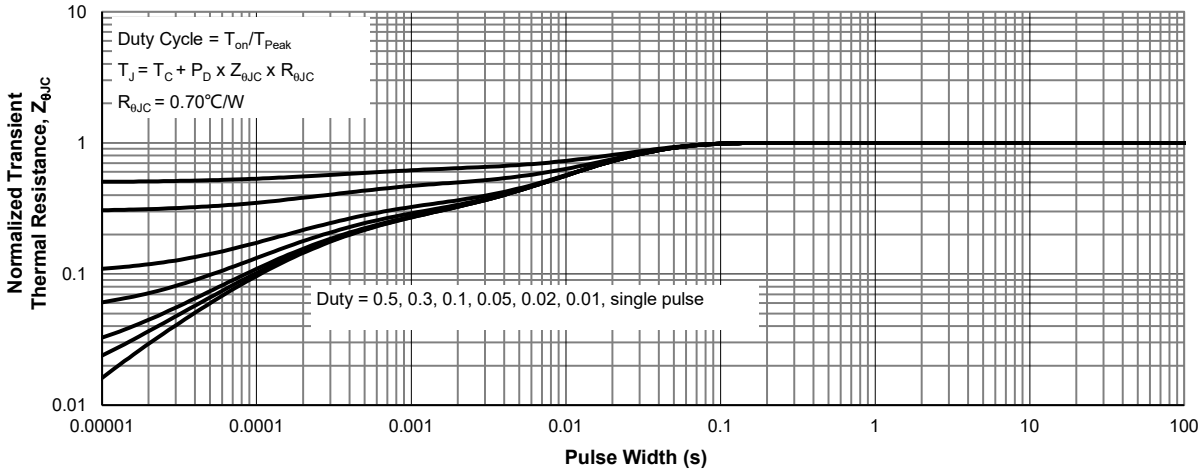
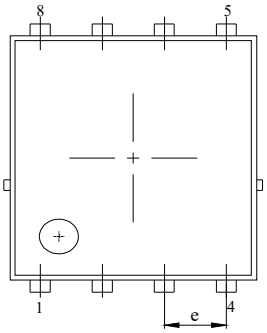


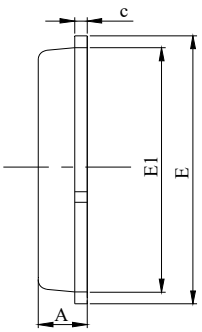
Figure 13: Normalized Maximum Transient Thermal Impedance

PDFN5x6-8L Package Information

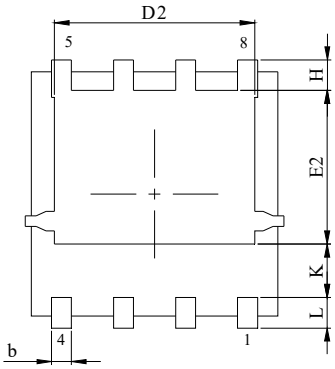
Package Outline



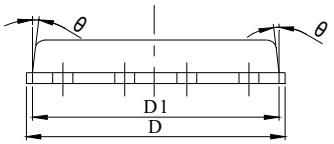
Top View



Side View



Bottom View

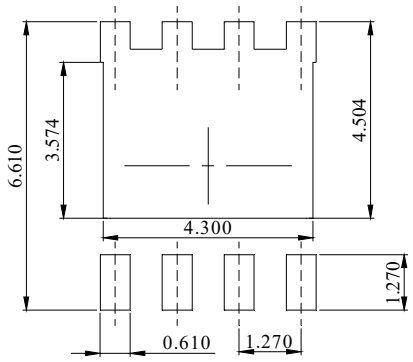


Front View

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	0.90	1.00	1.10
b	0.31	0.41	0.51
c	0.20	0.25	0.30
D	5.00	5.20	5.40
D1	4.95	5.05	5.15
D2	4.00	4.10	4.20
E	6.05	6.15	6.25
E1	5.50	5.60	5.70
E2	3.42	3.53	3.63
e		1.27BSC	
H	0.60	0.70	0.80
L	0.50	0.70	0.80
K		1.23 REF	
θ	-	-	10°

Recommended Soldering Footprint



DIMENSIONS:MILLIMETERS