

# 150V, 88A, 9.1mΩ N-channel Power SGT MOSFET

## JMSH1509PG

### Features

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

### Applications

- Load Switch
- PWM Application
- Power Management

### Product Summary

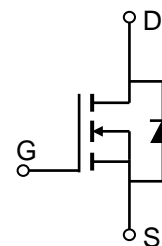
Parameters	Value	Unit
$V_{DSS}$	150	V
$V_{GS(th\_Typ)}$	3.0	V
$I_D (@V_{GS}=10V)$	88	A
$R_{DS(ON\_Typ)} (@V_{GS}=10V)$	9.1	mΩ



PDFN5X6-8L



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSH1509PG-13	SH1509P	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	150	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	A
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	389	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	W
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	41	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.8	

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

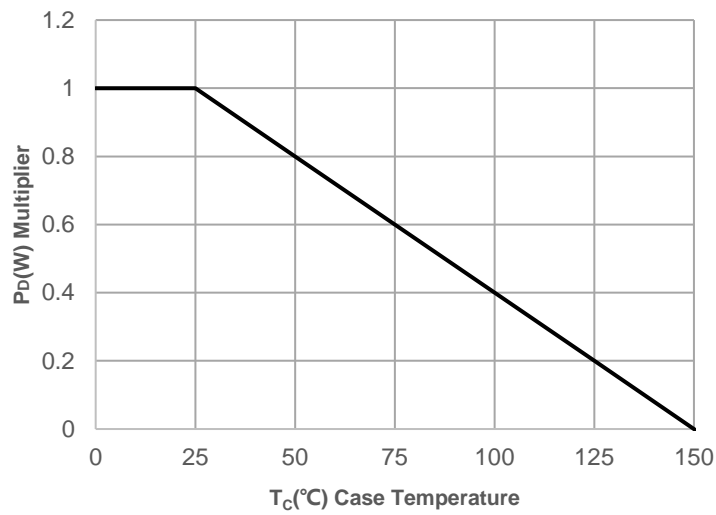
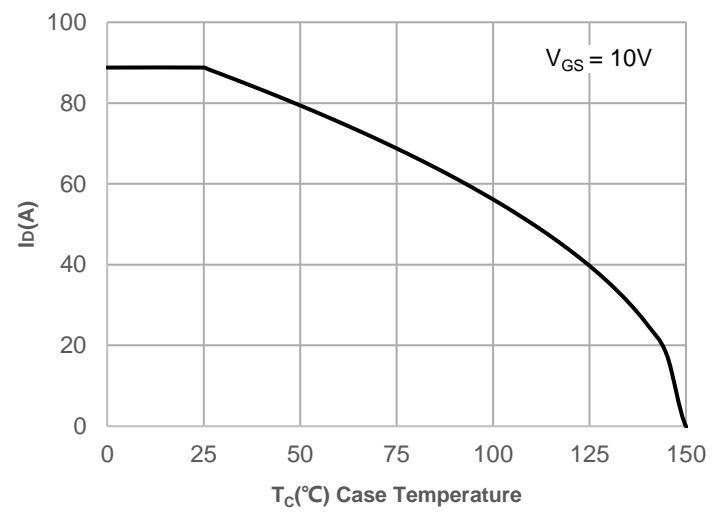
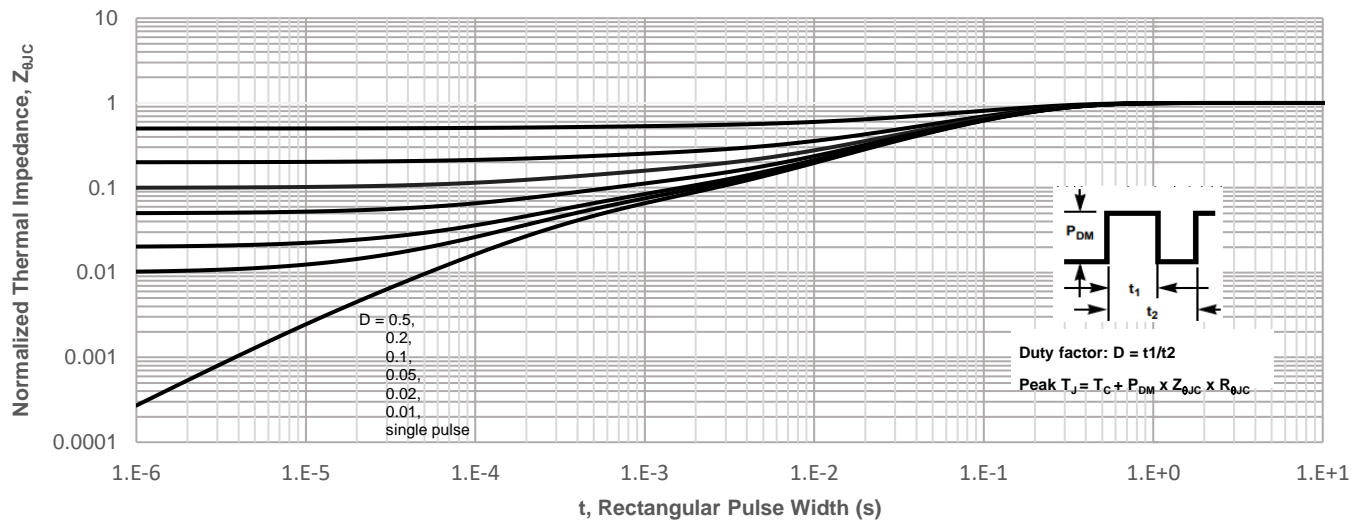
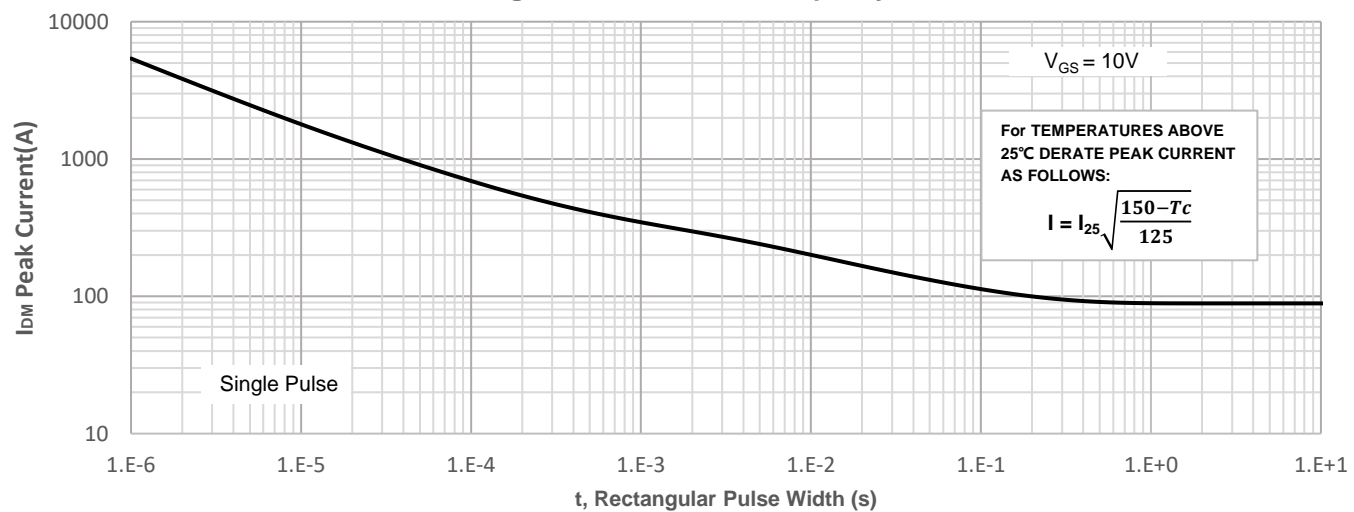
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> = 250μA, V <sub>GS</sub> = 0V	150	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 120V, V <sub>GS</sub> = 0V	-	-	1.0	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
On Characteristics						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA	2.1	3.0	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source ON-Resistance <sup>(4)</sup>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A	-	9.1	9.9	mΩ
Dynamic Characteristics						
R <sub>g</sub>	Gate Resistance	f = 1MHz	-	3.6	-	Ω
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 75V, f = 1MHz	2375	3325	4488	pF
C <sub>oss</sub>	Output Capacitance		234	328	443	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		10	14	19	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = 0 to 10V V <sub>DS</sub> = 75V, I <sub>D</sub> = 20A	36	51	68	nC
Q <sub>gs</sub>	Gate Source Charge		13	18	24	nC
Q <sub>gd</sub>	Gate Drain("Miller") Charge		10	14	18	nC
Switching Characteristics						
t <sub>d(on)</sub>	Turn-On DelayTime	V <sub>GS</sub> = 10V, V <sub>DD</sub> = 75V I <sub>D</sub> = 20A, R <sub>GEN</sub> = 2.7Ω	-	19	-	ns
t <sub>r</sub>	Turn-On Rise Time		-	45	-	ns
t <sub>d(off)</sub>	Turn-Off DelayTime		-	49	-	ns
t <sub>f</sub>	Turn-Off Fall Time		-	31	-	ns
Body Diode Characteristics						
I <sub>S</sub>	Maximum Continuous Body Diode Forward Current		-	-	88	A
I <sub>SM</sub>	Maximum Pulsed Body Diode Forward Current		-	-	352	A
V <sub>SD</sub>	Body Diode Forward Voltage	V <sub>GS</sub> = 0V, I <sub>S</sub> = 20A	-		1.2	V
trr	Body Diode Reverse Recovery Time	I <sub>F</sub> = 20A, di/dt = 100A/us	61	86	116	ns
Qrr	Body Diode Reverse Recovery Charge		-	258	-	nC

Notes:

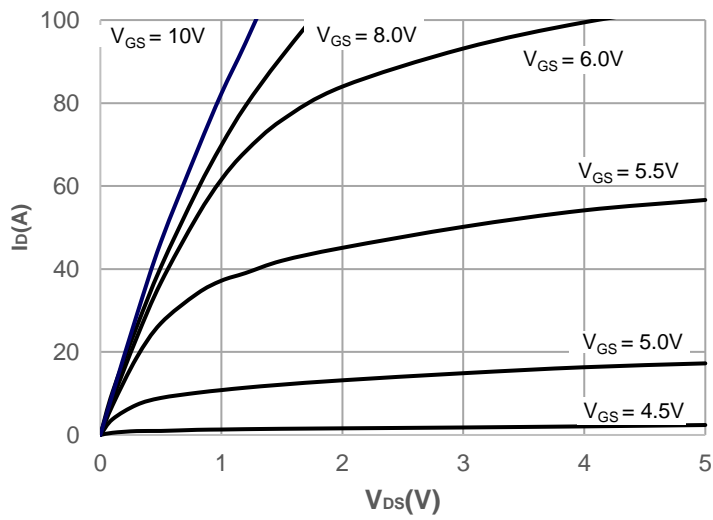
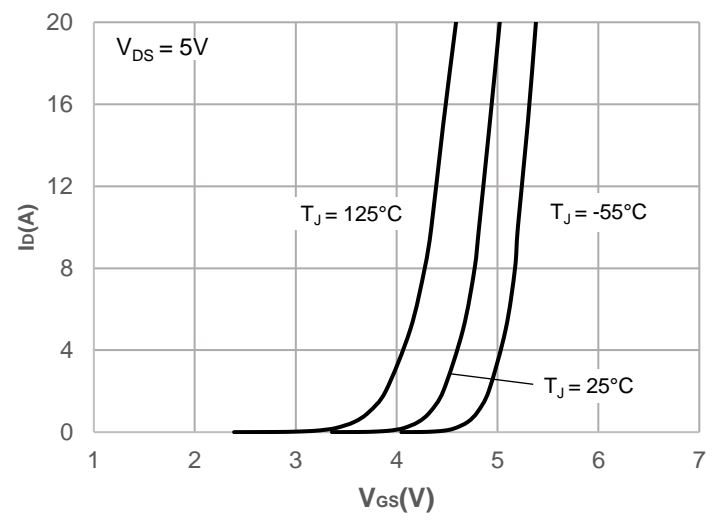
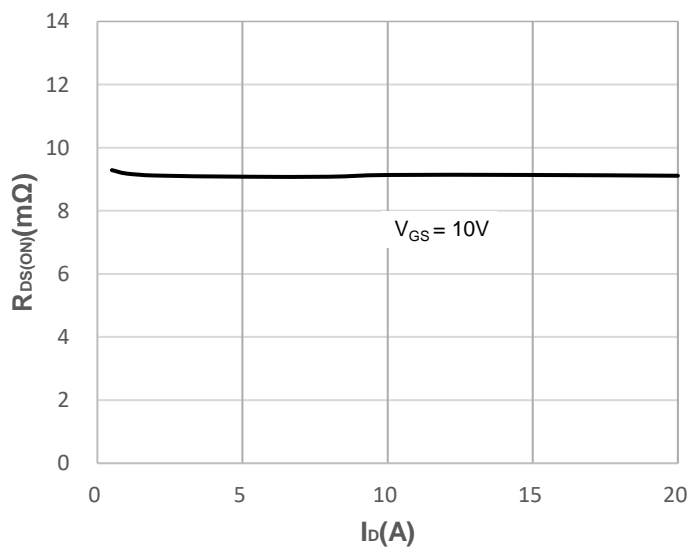
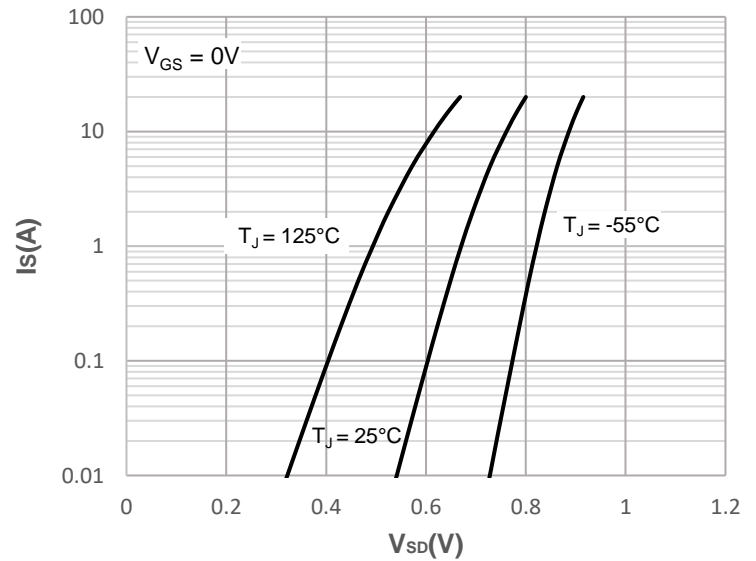
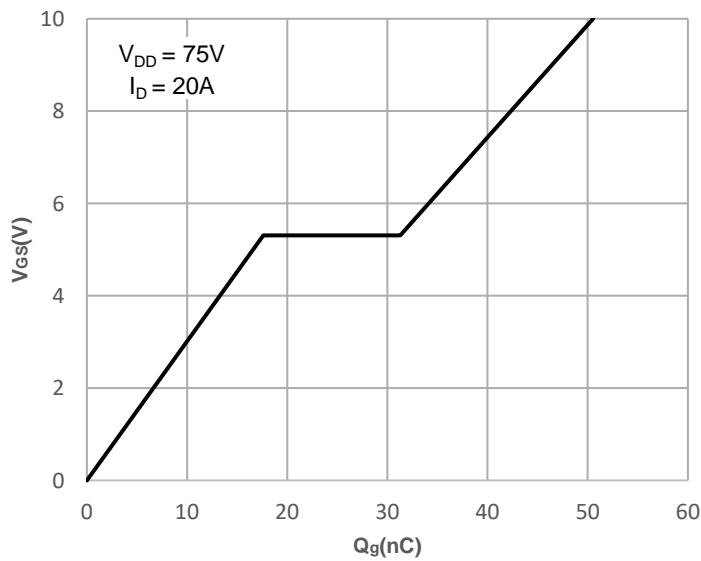
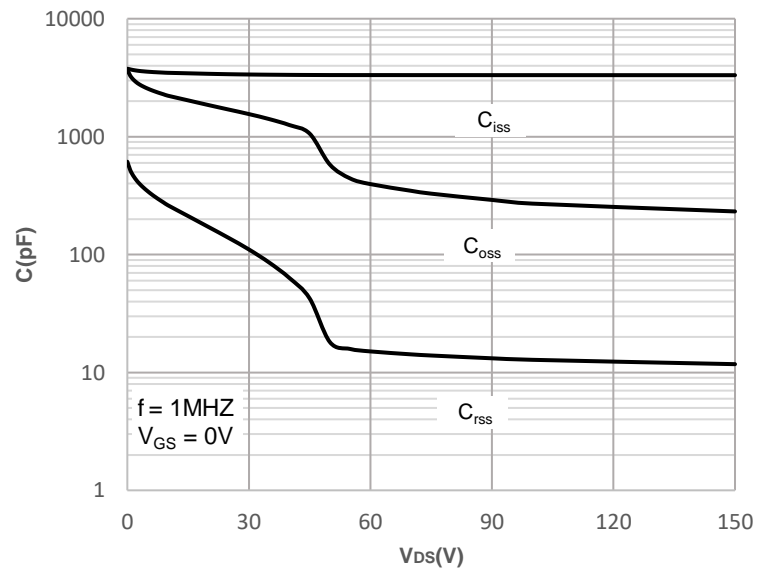
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2.  $E_{AS}$  condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 75\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\Omega$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 16.1\text{A}$ ,  $V_{DD} = 0\text{V}$  during time in avalanche.
3.  $R_{\theta JA}$  is measured with the device mounted on a 1inch<sup>2</sup> pad of 2oz copper FR4 PCB.
4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



## Typical Performance Characteristics

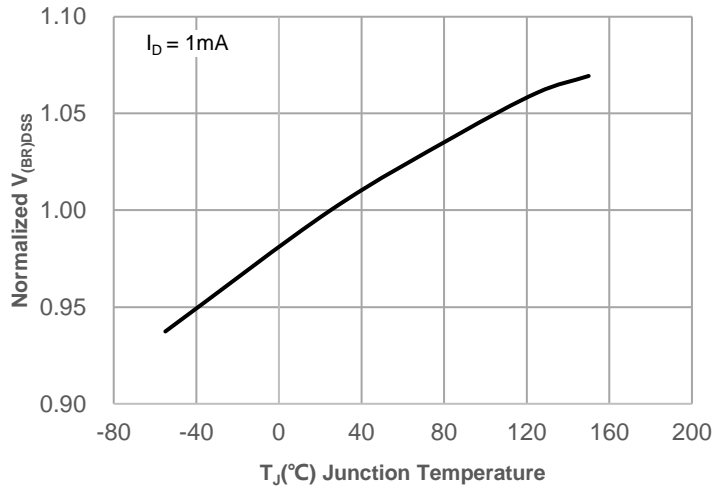
**Figure 1: Power De-rating**

**Figure 2: Current De-rating**

**Figure 3: Normalized Maximum Transient Thermal Impedance**

**Figure 4: Peak Current Capacity**


## Typical Performance Characteristics

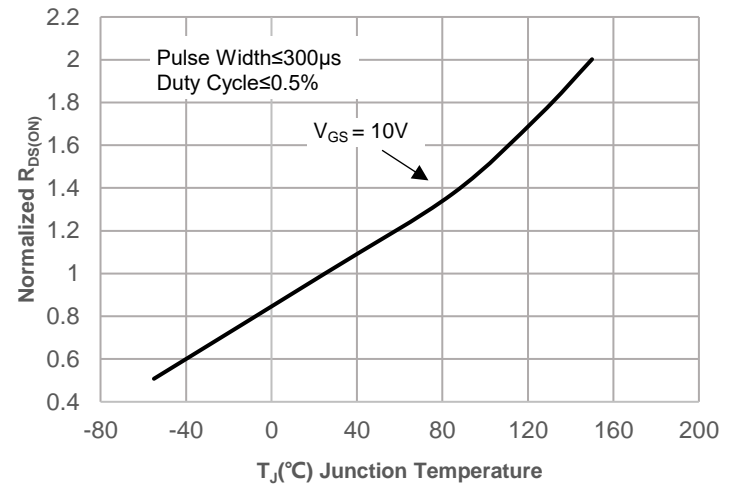
**Figure 5: Output Characteristics**

**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

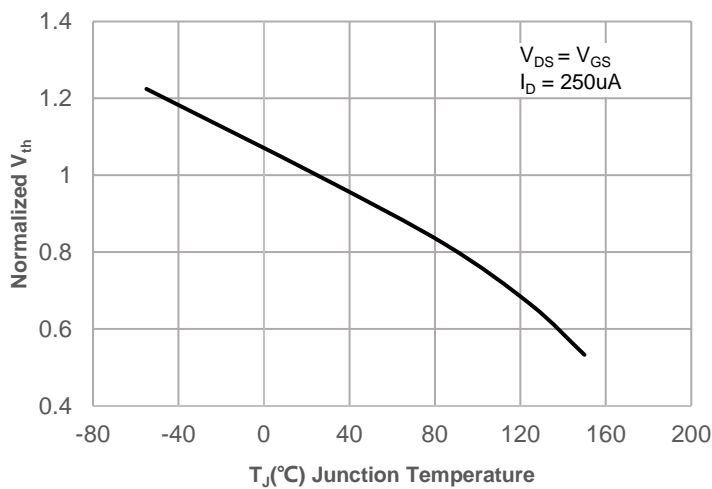
**Figure 11: Normalized Breakdown voltage vs. Junction Temperature**



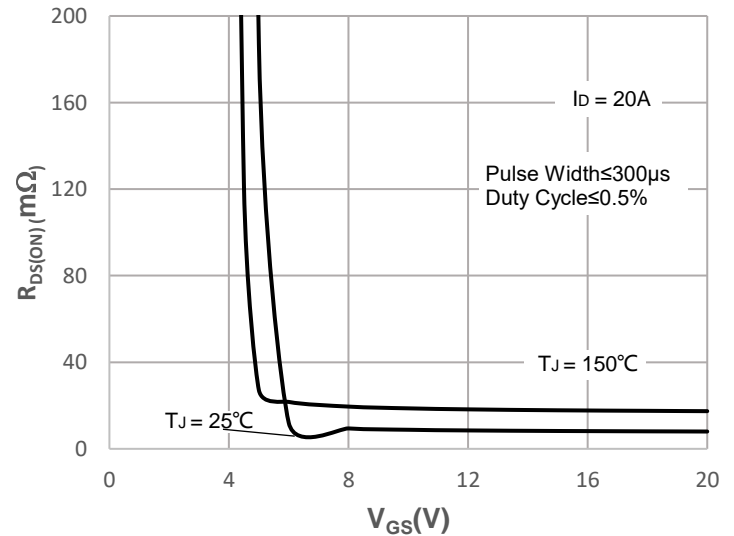
**Figure 12: Normalized on Resistance vs. Junction Temperature**



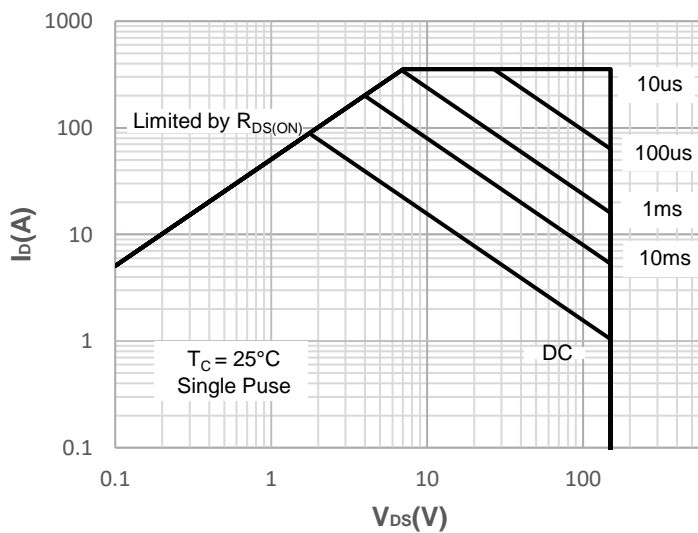
**Figure 13: Normalized Threshold Voltage vs. Junction Temperature**



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



**Figure 15: Maximum Safe Operating Area**



## Test Circuit

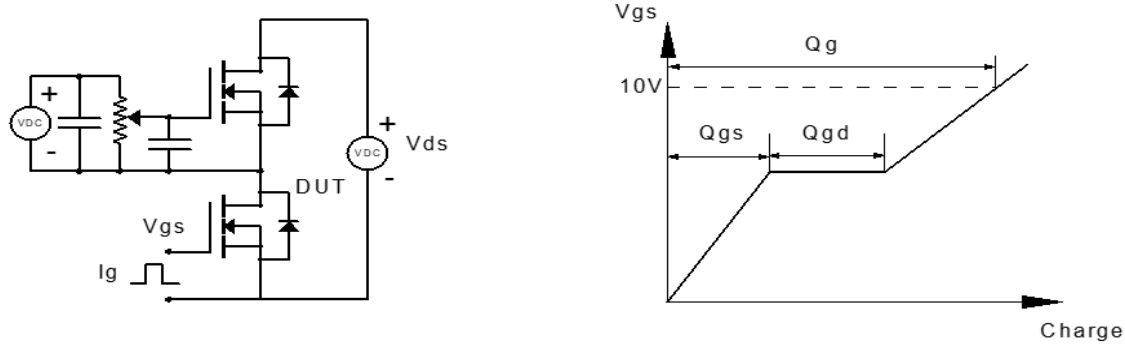


Figure 1: Gate Charge Test Circuit & Waveform

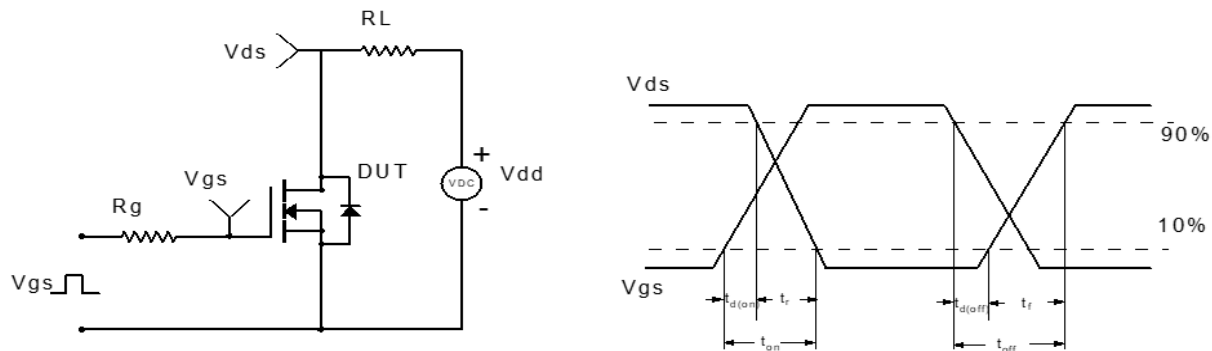


Figure 2: Resistive Switching Test Circuit & Waveform

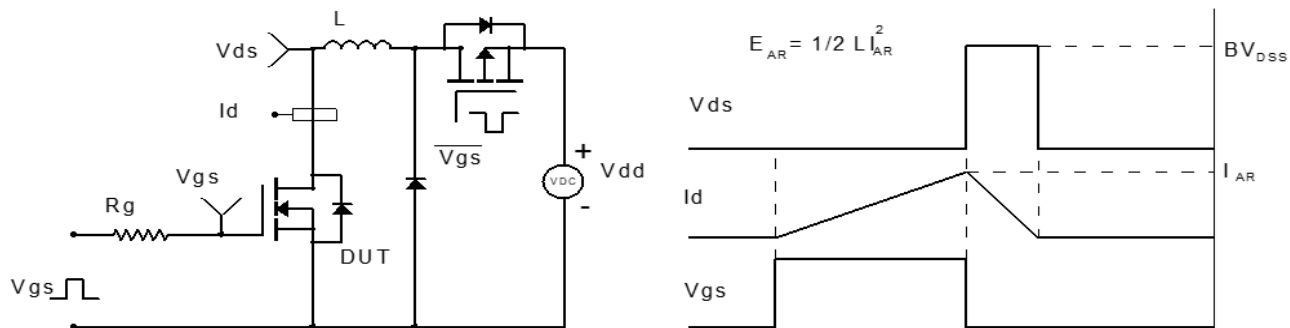


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

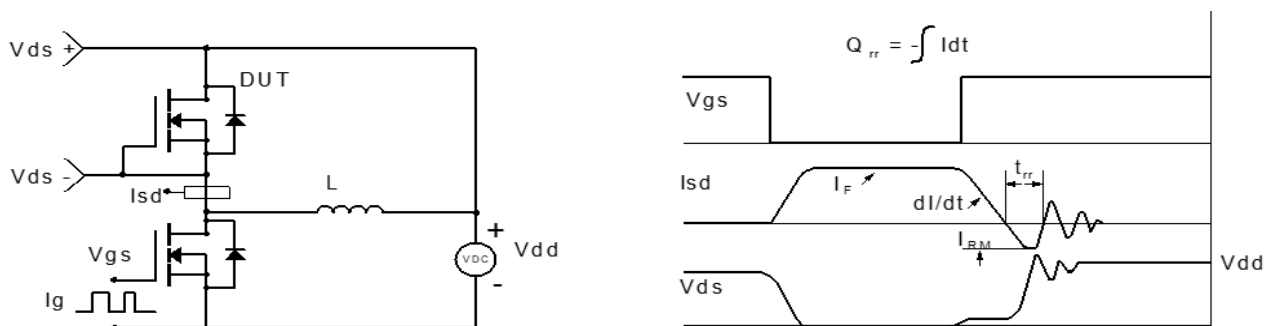
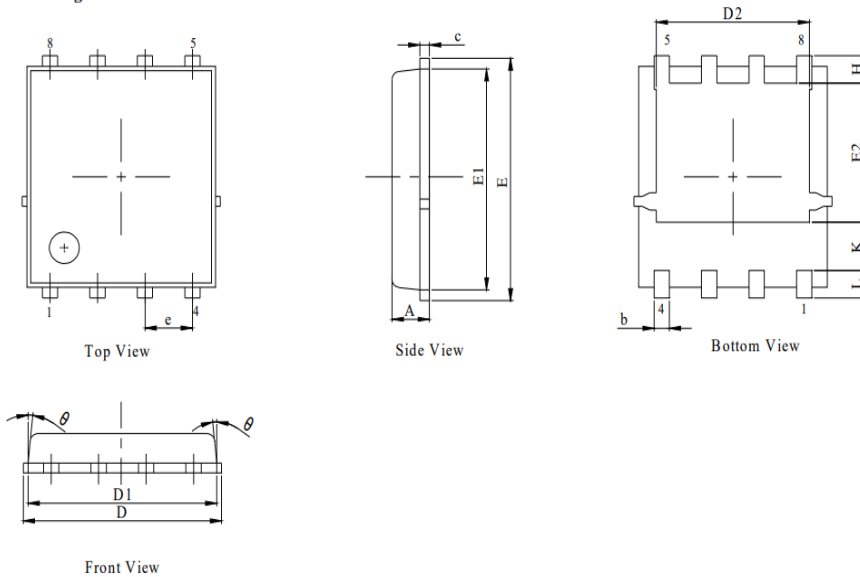


Figure 4: Diode Recovery Test Circuit & Waveform



## Package Mechanical Data(PDFN5x6-8L)

### Package Outline

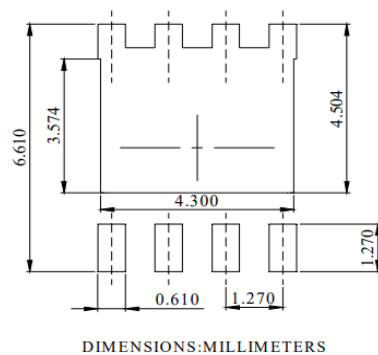


#### NOTES:

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		
0			10

### Recommended Soldering Footprint



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