

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

JMSH1509PG

Features	Product Summary		
• Excellent $R_{DS(ON)}$ and Low Gate Charge	Parameters	Value	Unit
• 100% UIS Tested	V_{DSS}	150	V
• 100% ΔV_{ds} Tested	$V_{GS(th),Typ}$	3.0	V
• Halogen-free; RoHS-compliant	$I_D(@V_{GS}=10V)$	88	A
	$R_{DS(ON),Typ}(@V_{GS}=10V)$	9.1	mΩ

Applications

- Load Switch
- PWM Application
- Power Management





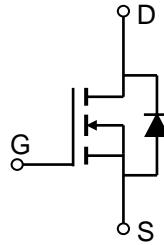
Top View



Bottom View



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	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	89
		$T_C = 100^\circ\text{C}$	56
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	389	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	156
		$T_C = 100^\circ\text{C}$	63
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽³⁾	41	°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						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	150	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 120\text{V}$, $V_{GS} = 0\text{V}$	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}$, $V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.1	3.0	4.0	V
$R_{\text{DS}(\text{ON})}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$	-	9.1	9.9	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	3.6	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 75\text{V}$, $f = 1\text{MHz}$	2375	3325	4488	pF
C_{oss}	Output Capacitance		234	328	443	pF
C_{rss}	Reverse Transfer Capacitance		10	14	19	pF
Q_g	Total Gate Charge	$V_{GS} = 0$ to 10V $V_{DS} = 75\text{V}$, $I_D = 20\text{A}$	36	51	68	nC
Q_{gs}	Gate Source Charge		13	18	24	nC
Q_{gd}	Gate Drain("Miller") Charge		10	14	18	nC
Switching Characteristics						
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{GS} = 10\text{V}$, $V_{DD} = 75\text{V}$ $I_D = 20\text{A}$, $R_{\text{GEN}} = 2.7\Omega$	-	19	-	ns
t_r	Turn-On Rise Time		-	45	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time		-	49	-	ns
t_f	Turn-Off Fall Time		-	31	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current	-	-	88	-	A
I_{SM}	Maximum Pulsed Body Diode Forward Current	-	-	352	-	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 20\text{A}$	-		1.2	V
trr	Body Diode Reverse Recovery Time	$I_F = 20\text{A}$, $\text{di}/\text{dt} = 100\text{A}/\text{us}$	61	86	116	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	258	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 75\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 3\text{mH}$, $I_{\text{AS}} = 16.1\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
3. $R_{\theta\text{JA}}$ is measured with the device mounted on a 1inch² 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

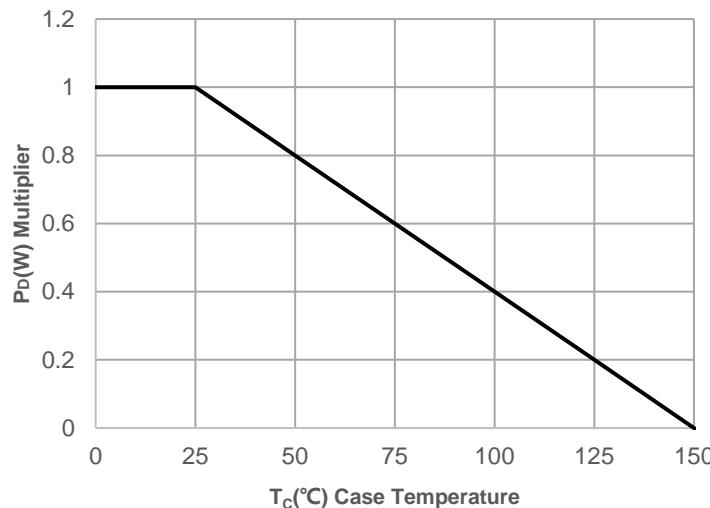


Figure 2: Current De-rating

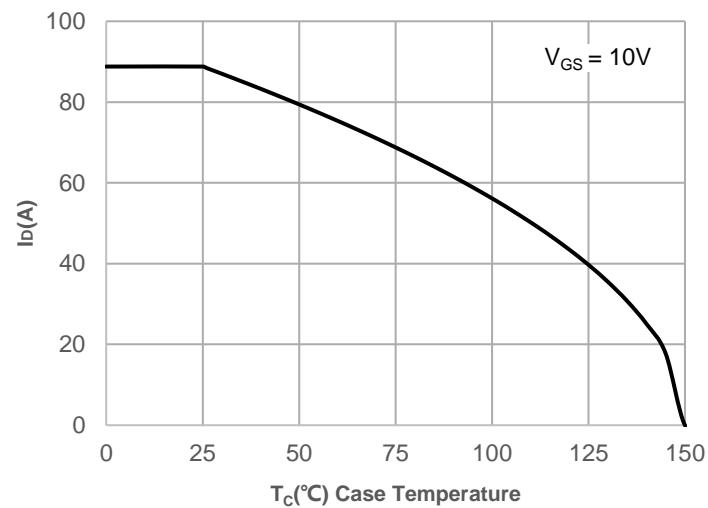


Figure 3: Normalized Maximum Transient Thermal Impedance

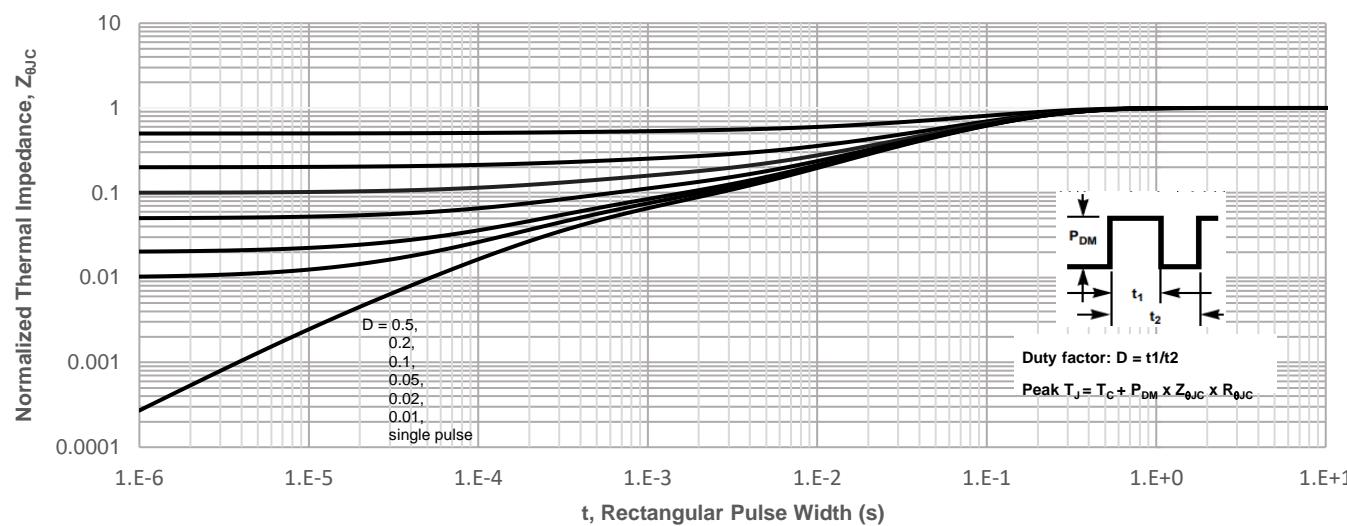
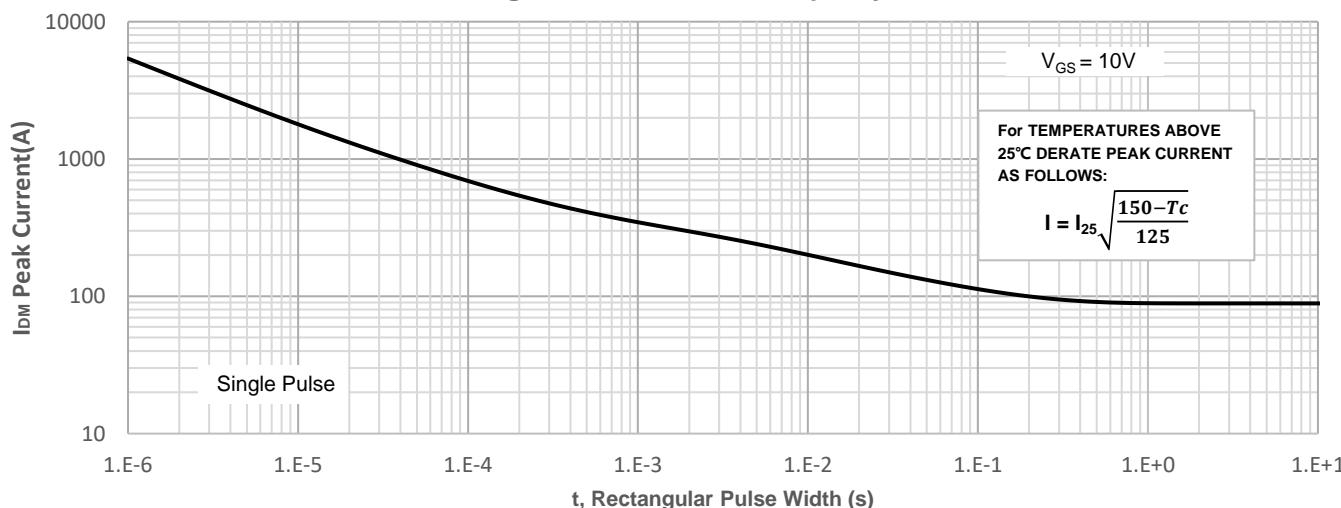


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

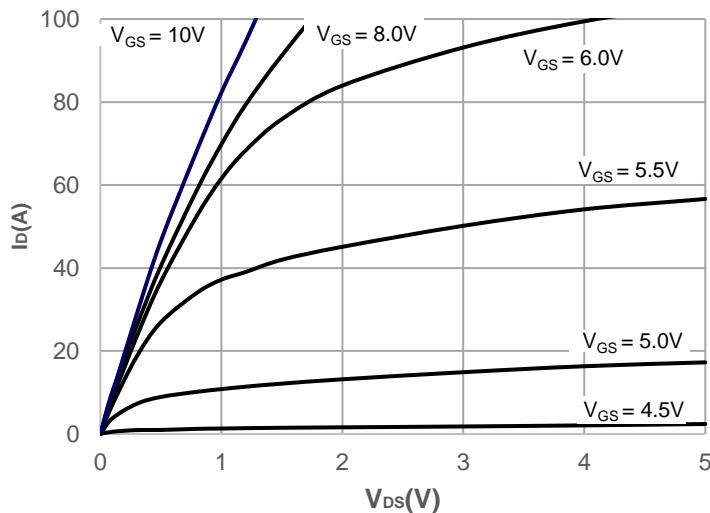


Figure 6: Typical Transfer Characteristics

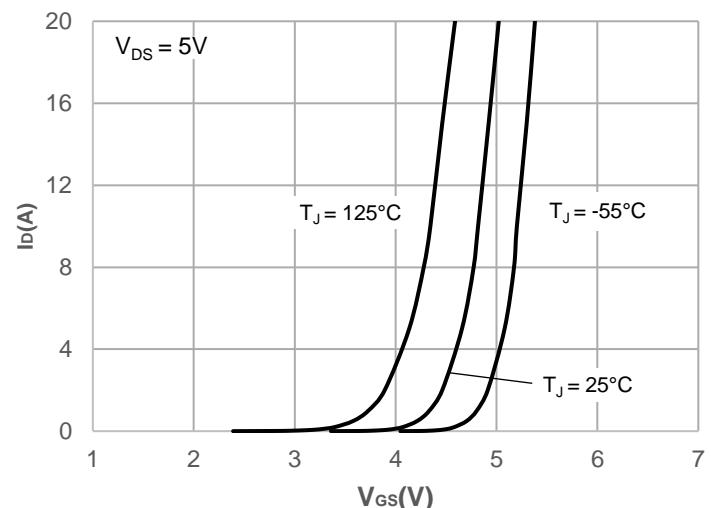


Figure 7: On-resistance vs. Drain Current

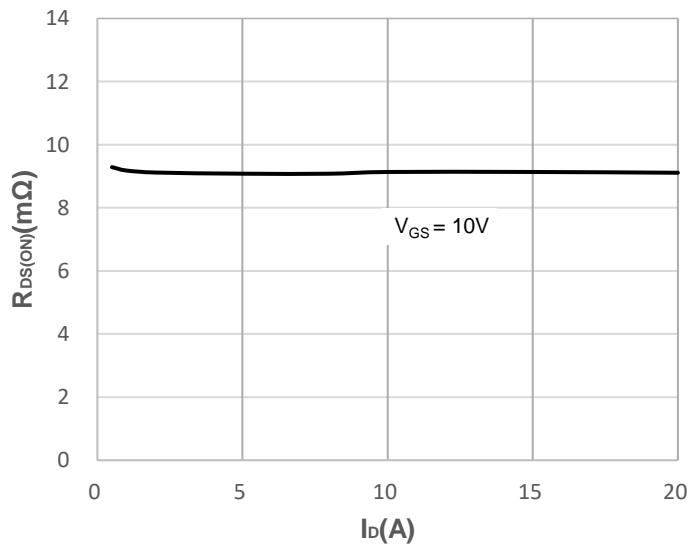


Figure 8: Body Diode Characteristics

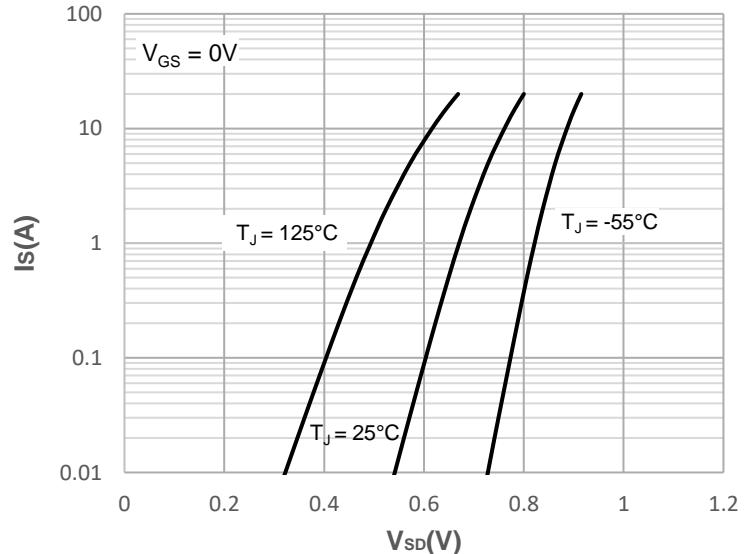


Figure 9: Gate Charge Characteristics

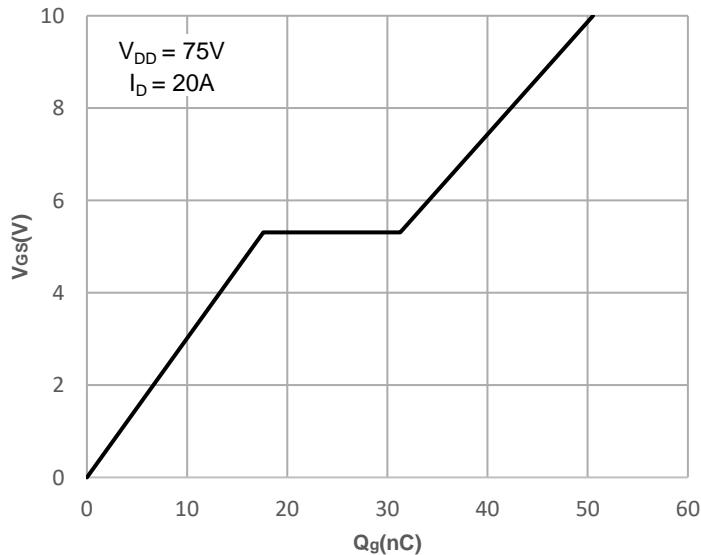
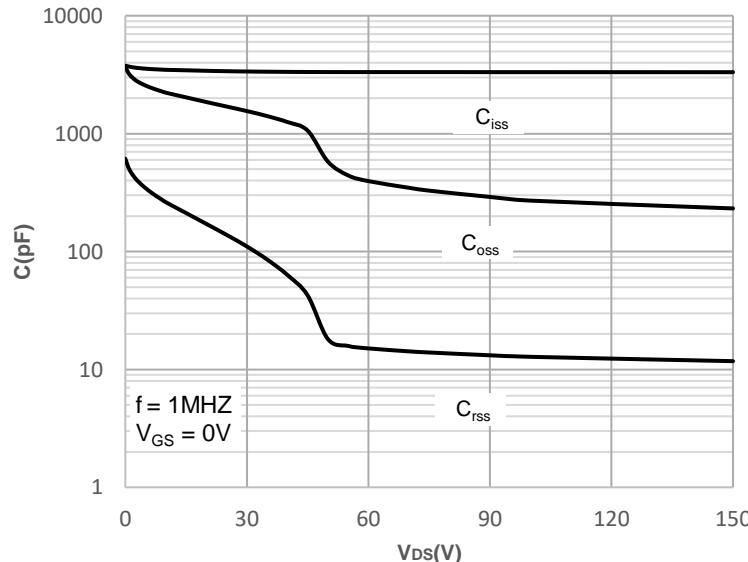


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

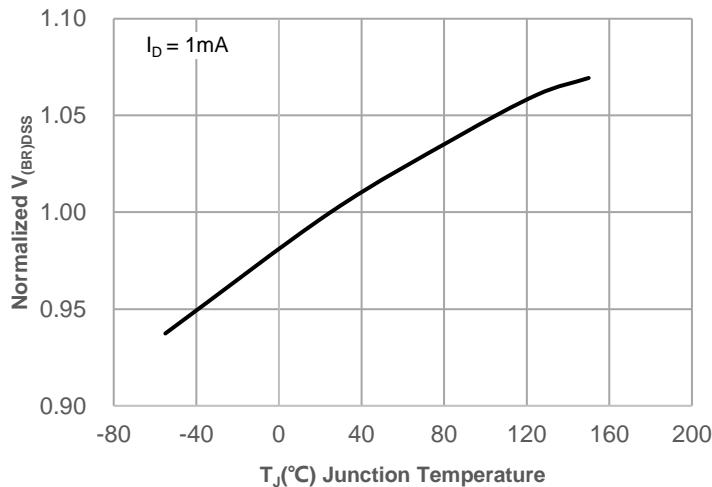


Figure 12: Normalized on Resistance vs. Junction Temperature

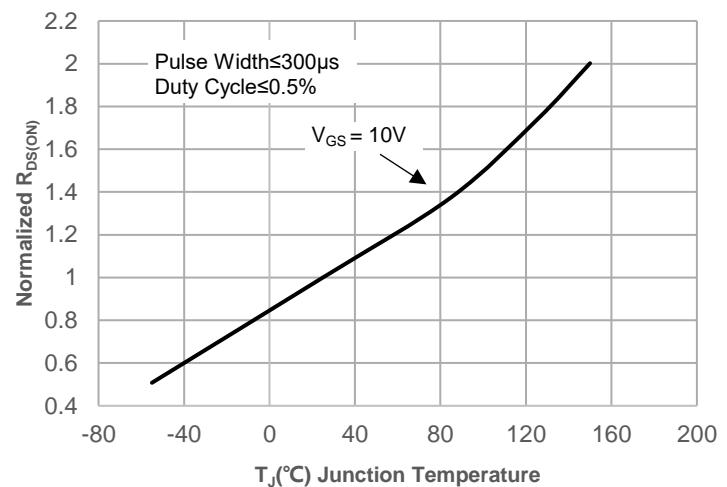


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

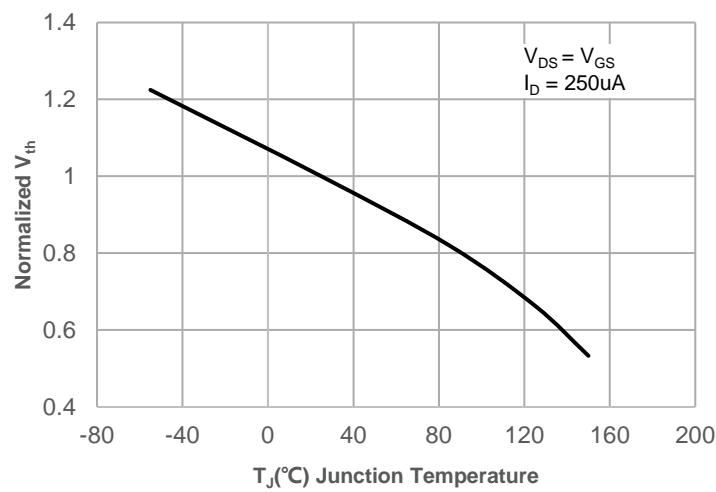


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

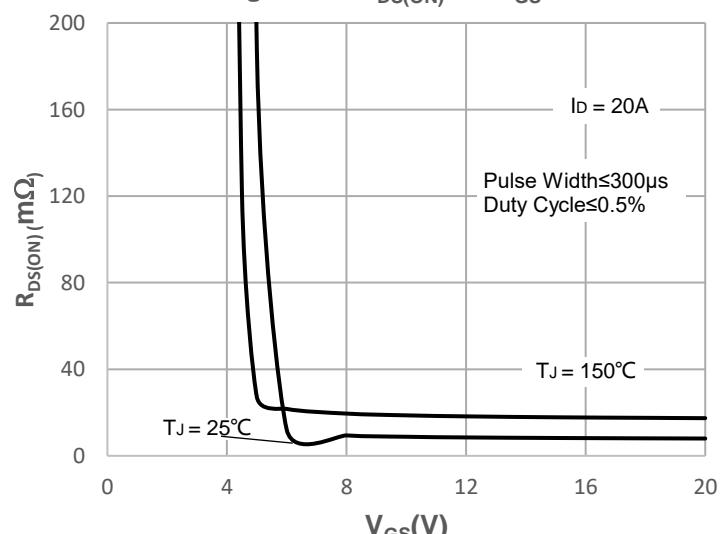
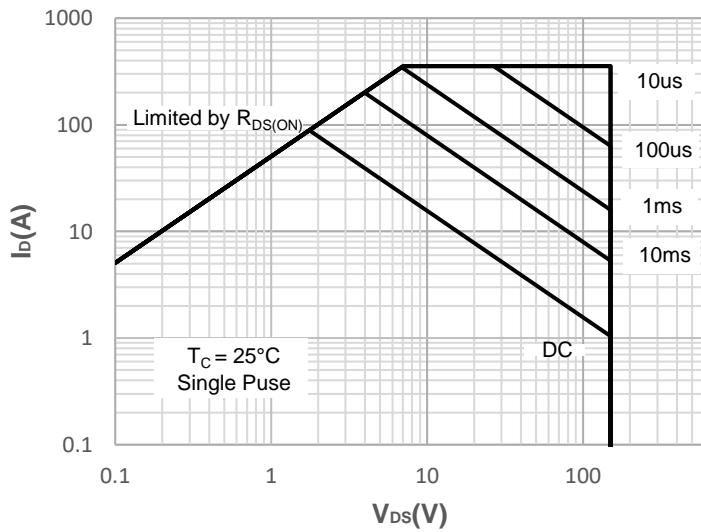


Figure 15: Maximum Safe Operating Area



Test Circuit

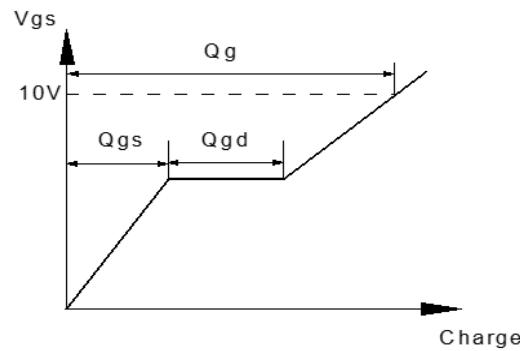
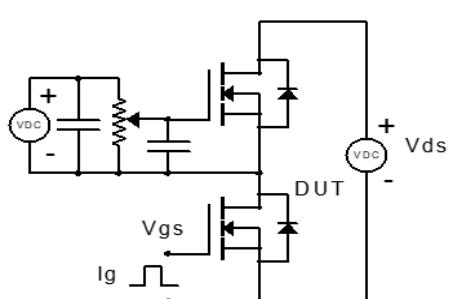


Figure 1: Gate Charge Test Circuit & Waveform

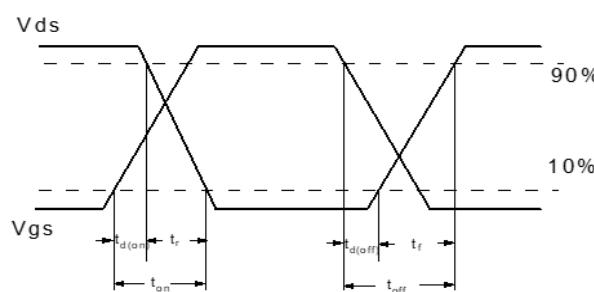
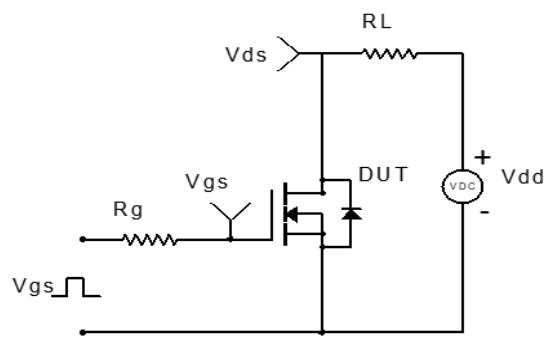


Figure 2: Resistive Switching Test Circuit & Waveform

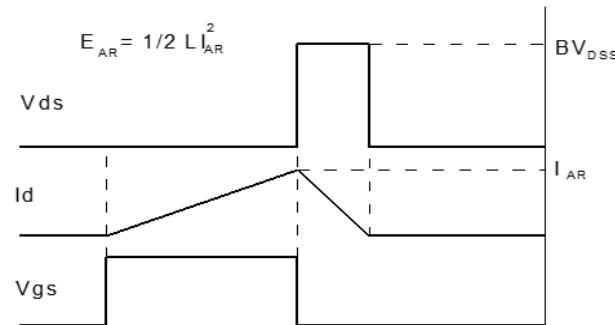
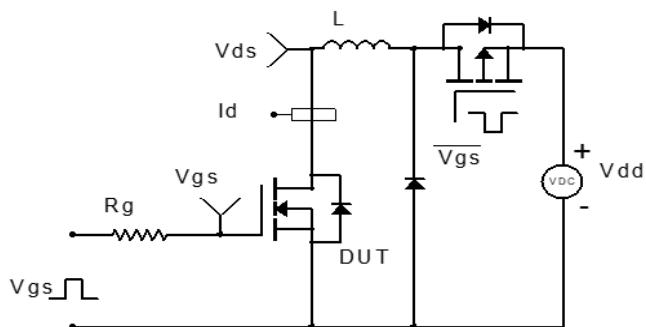


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

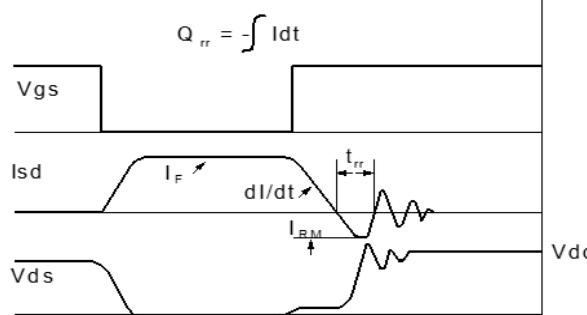
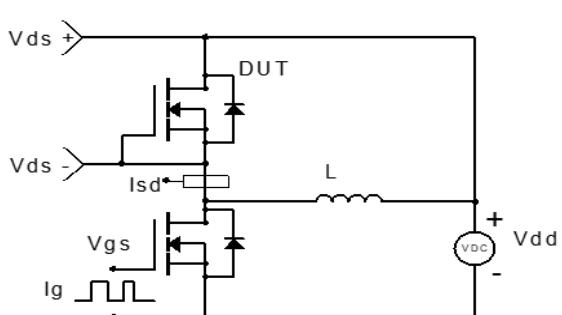
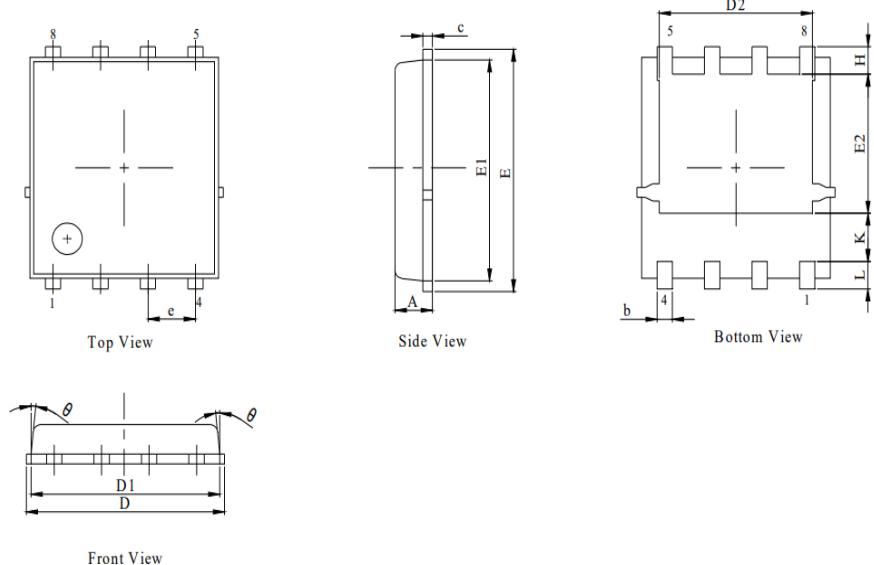


Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(PDFN5x6-8L)

Package Outline

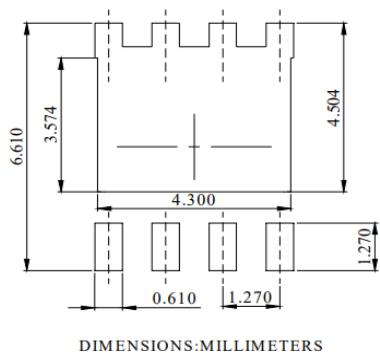


DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	0.9	1	1.15
b	0.31	0.41	0.51
C	0.24	0.32	0.4
D	5	5.2	5.4
D1	4.95	5.05	5.15
D2	4	4.1	4.2
E	6.05	6.15	6.25
E1	5.5	5.6	5.7
E2	3.42	3.53	3.63
e	1.27±0.03		
H	0.6	0.7	0.8
L	0.5	0.7	0.8
K	1.23 REF		
Ø	10		

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.

Recommended Soldering Footprint



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