

# 60V, 31A, 13.7mΩ Dual N-channel Power SGT MOSFET

## JMSL0611PGD

### Features

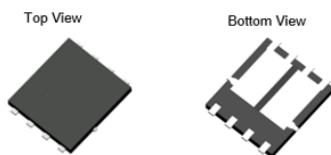
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant

### Applications

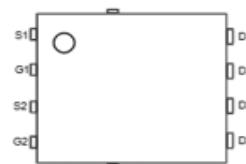
- Load Switch
- PWM Application
- Power Management

### Product Summary

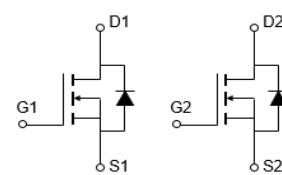
Parameters	Value	Unit
$V_{DSS}$	60	V
$V_{GS(th)}_{Typ}$	1.6	V
$I_D(@V_{GS}=10V)$	31	A
$R_{DS(ON)}_{Typ}(@V_{GS}=10V)$	10.7	mΩ
$R_{DS(ON)}_{Typ}(@V_{GS}=4.5V)$	13.7	mΩ



PDFN5X6-8L-D



Pin Assignment



Schematic Diagram

### Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMSL0611PGD-13	L0611PD	1	Tape&Reel	PDFN5x6-8L-D	5000	50000

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-to-Source Voltage	60	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	31	A
		19	
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	47	mJ
$P_D$	Power Dissipation	22	W
		9	
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 150	°C

### Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	58	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.6	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$V_{(\text{BR})\text{DSS}}$	Drain-Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	$\mu\text{A}$
$I_{\text{GSS}}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.1	1.6	2.0	V
$R_{\text{DS(ON)}}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	-	10.7	14.0	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 15\text{A}$	-	13.7	17.8	$\text{m}\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	1.6	-	$\Omega$
$C_{\text{iss}}$	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	517	723	976	pF
$C_{\text{oss}}$	Output Capacitance		265	371	501	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		19	26	36	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 20\text{A}$	14	19	26	nC
$Q_{gs}$	Gate Source Charge		-	4.4	-	nC
$Q_{gd}$	Gate Drain("Miller") Charge		-	4.4	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}$ $I_D = 20\text{A}, R_{\text{GEN}} = 3\Omega$	-	5	-	ns
$t_r$	Turn-On Rise Time		-	16	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	15	-	ns
$t_f$	Turn-Off Fall Time		-	4	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current	-	-	31	A	
$I_{SM}$	Maximum Pulsed Body Diode Forward Current	-	-	122	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	$I_F = 20\text{A}, di/dt = 100\text{A/us}$	17	24	32	ns
$Qrr$	Body Diode Reverse Recovery Charge		-	13	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.

2. E<sub>AS</sub> condition: Starting  $T_J=25^\circ\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_{GS}=10\text{V}$ ,  $R_G=25\text{ohm}$ ,  $L=3\text{mH}$ ,  $I_{AS}=5.6\text{A}$ ,  $V_{DD}=0\text{V}$  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

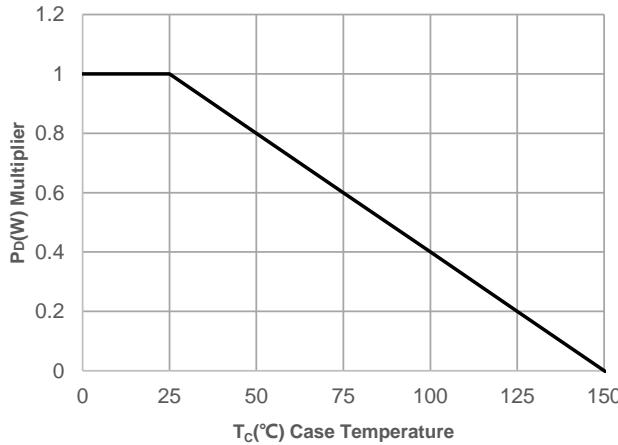


Figure 2: Current De-rating

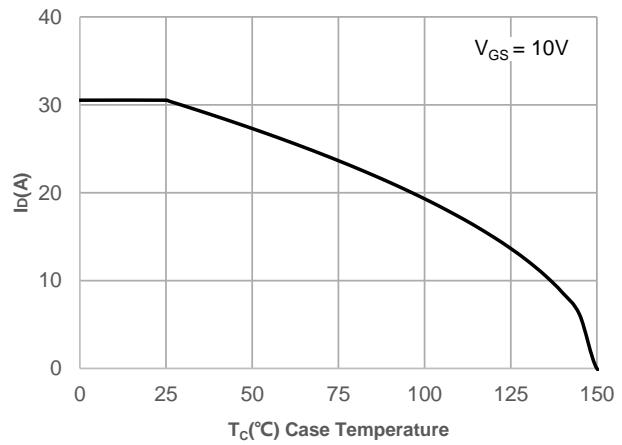


Figure 3: Normalized Maximum Transient Thermal Impedance

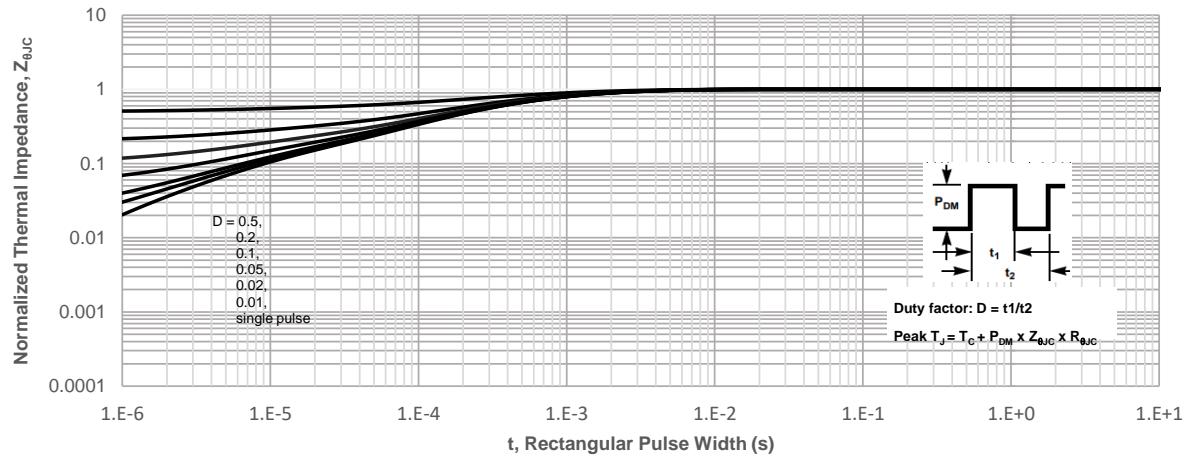
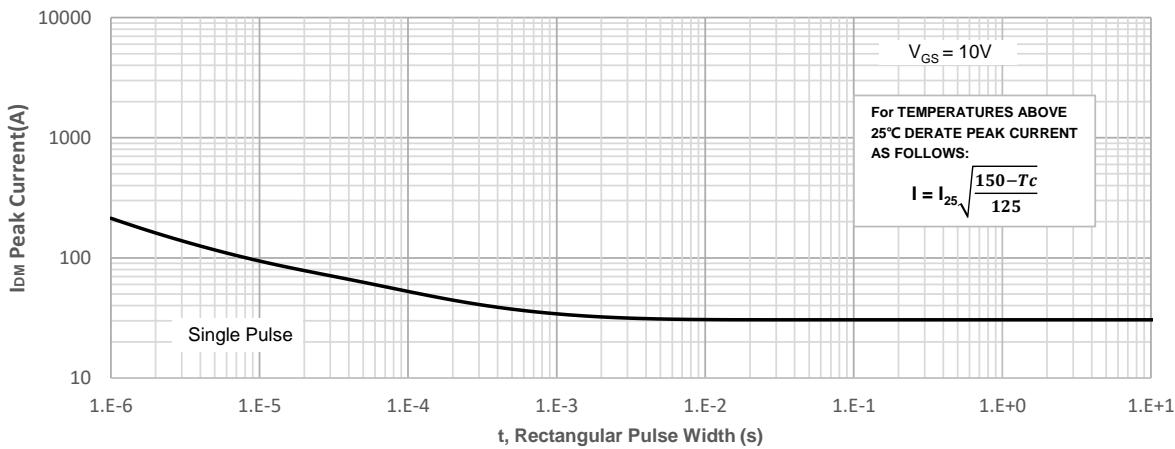


Figure 4: Peak Current Capacity



## Typical Performance Characteristics

Figure 5: Output Characteristics

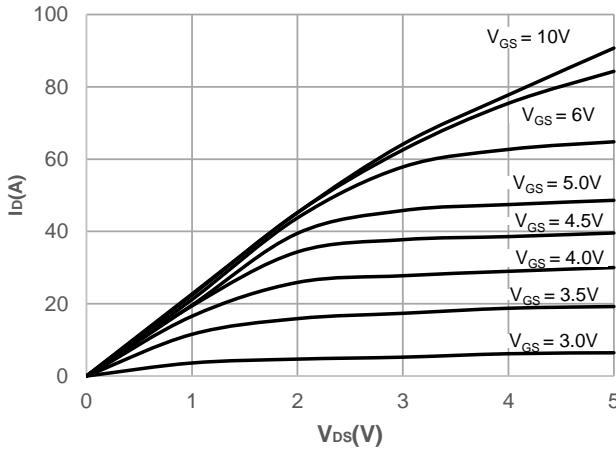


Figure 6: Typical Transfer Characteristics

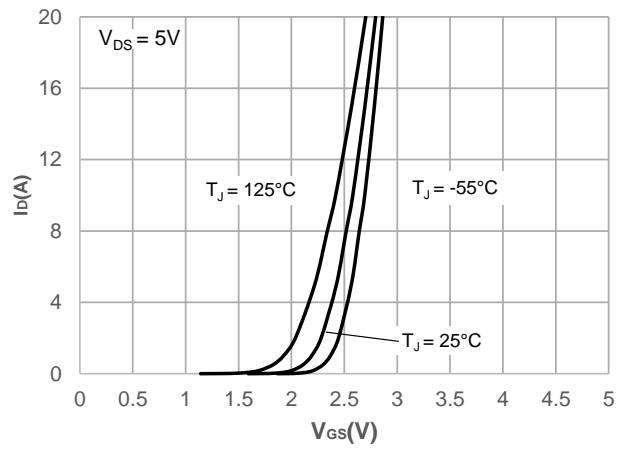


Figure 7: On-resistance vs. Drain Current

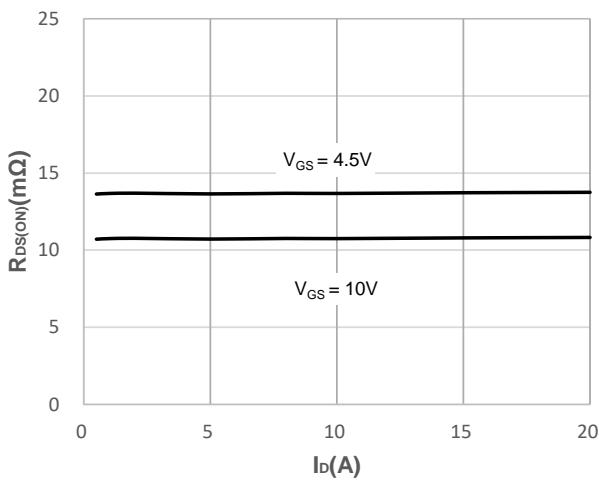


Figure 8: Body Diode Characteristics

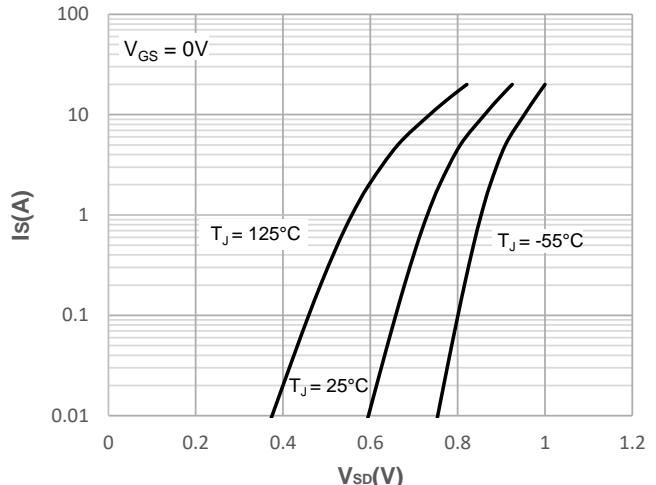


Figure 9: Gate Charge Characteristics

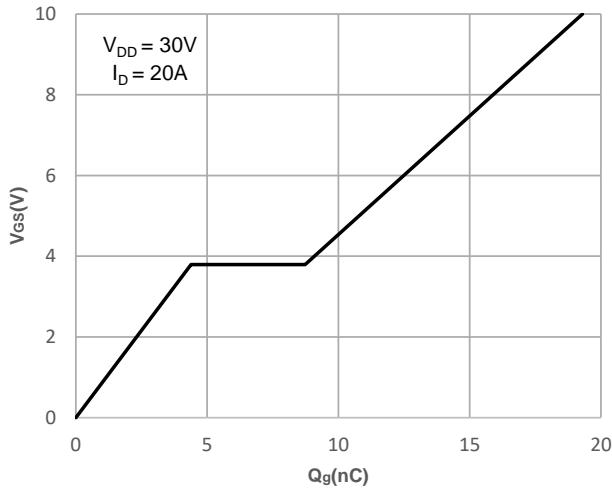
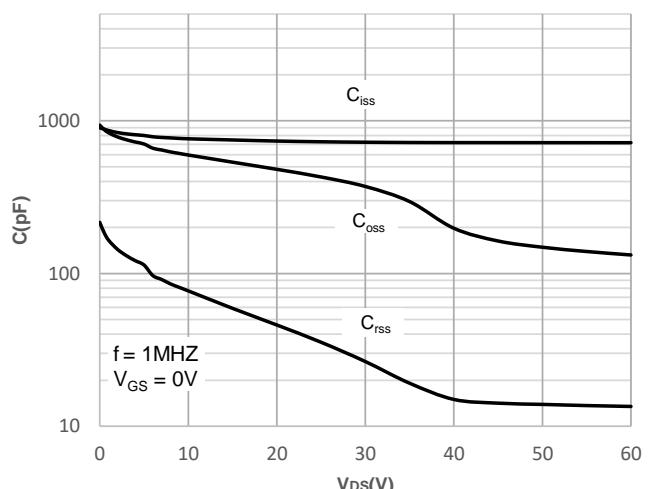


Figure 10: Capacitance Characteristics



## Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

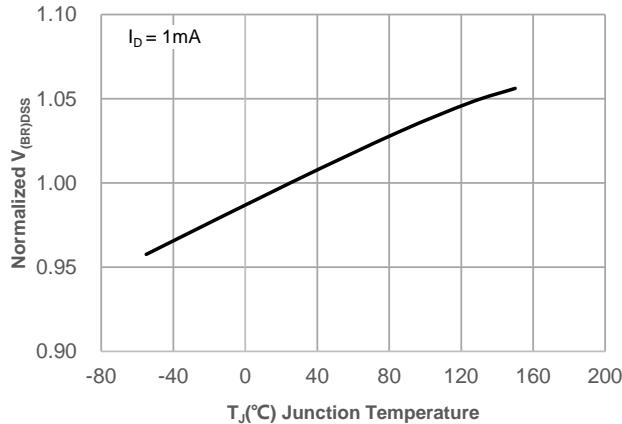


Figure 12: Normalized on Resistance vs. Junction Temperature

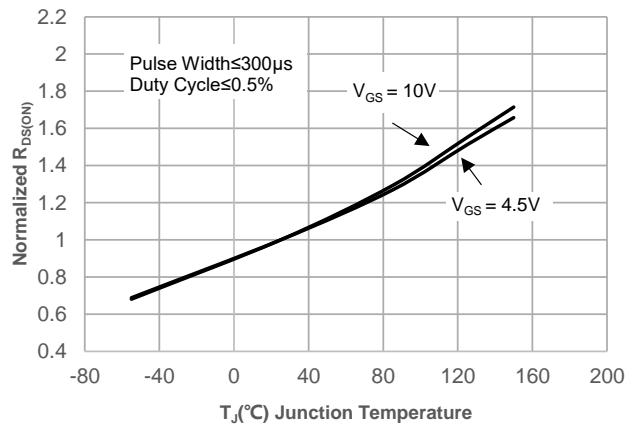


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

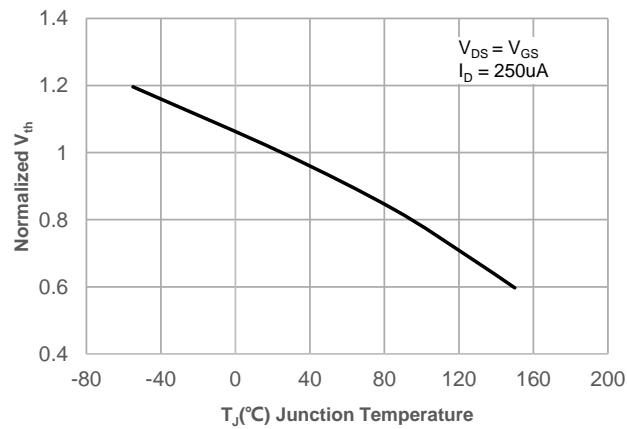


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

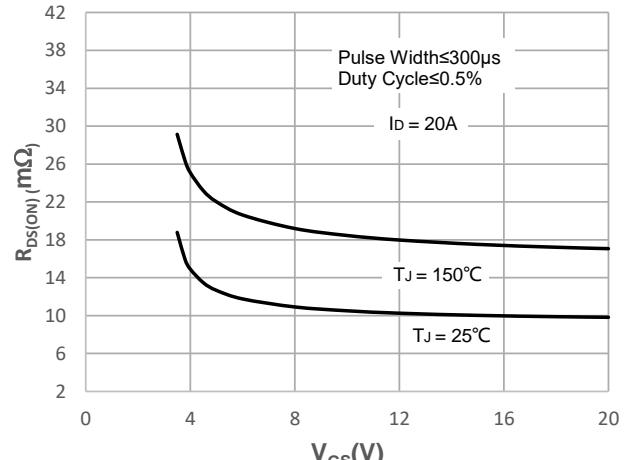
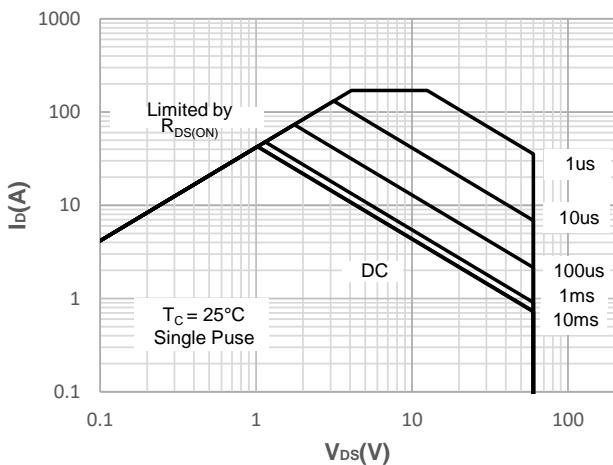
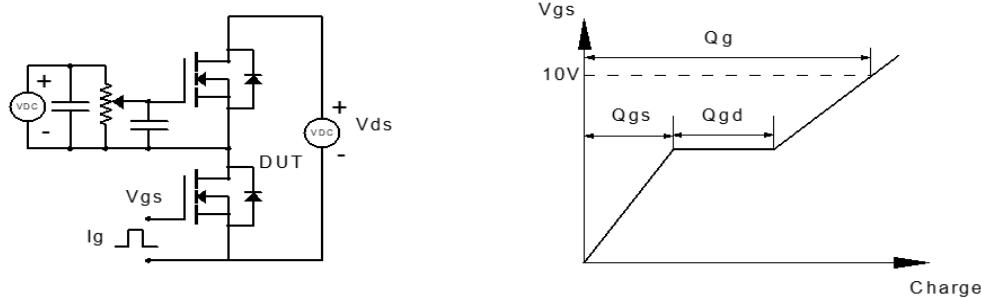


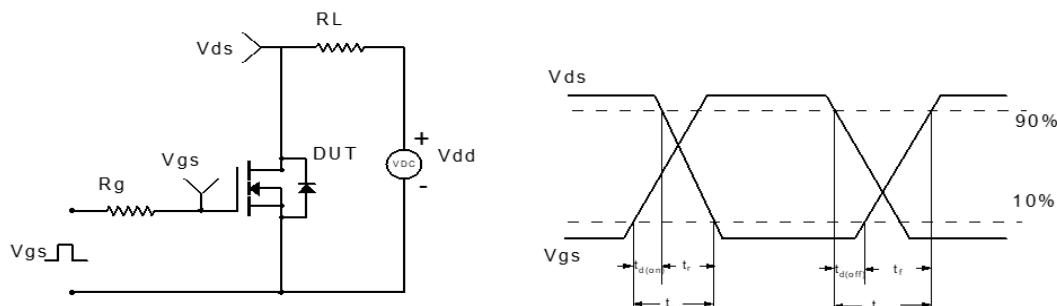
Figure 15: Maximum Safe Operating Area



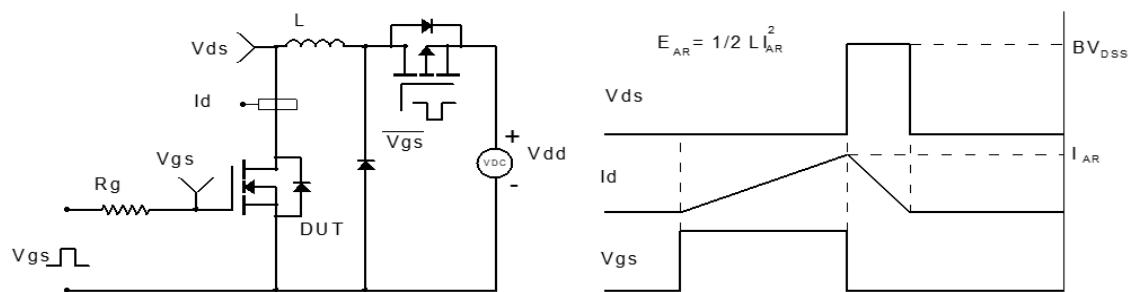
## Test Circuit



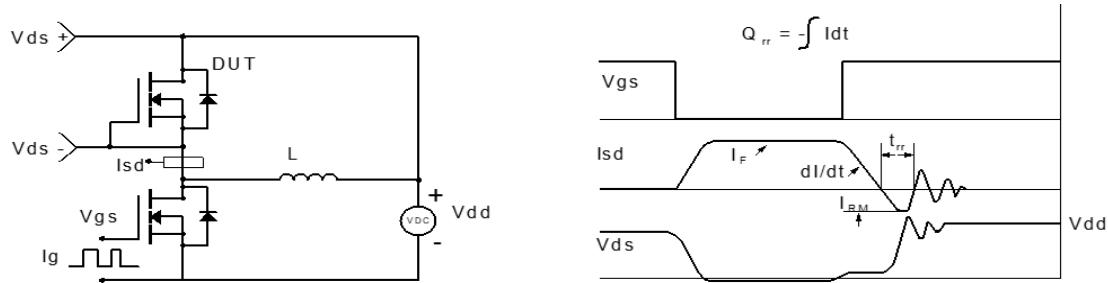
**Figure 1: Gate Charge Test Circuit & Waveform**



**Figure 2: Resistive Switching Test Circuit & Waveform**



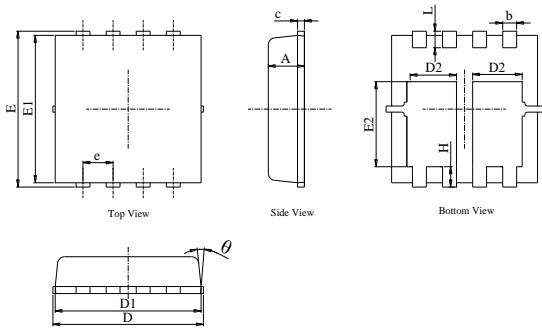
**Figure 3: Unclamped Inductive Switching Test Circuit & Waveform**



**Figure 4: Diode Recovery Test Circuit & Waveform**

## Package Mechanical Data(PDFN5X6-8L-D)

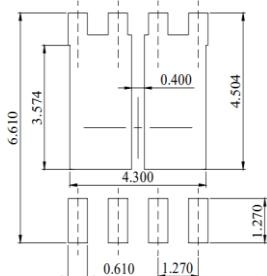
Package Outline



NOTES:  
1. DIMENSIONING AND TOLERANCING 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	1.15
A1	0.00	—	0.10
b	0.31	0.41	0.51
b1	0.15	0.25	0.35
c	0.24	0.32	0.40
DIM	4.95	5.05	5.15
D1	4.00	4.10	4.20
D2	0.50	0.60	0.70
E	6.05	6.15	6.25
E1	5.50	5.60	5.70
E2	3.31	3.41	3.51
e	1.27BSC		
H	0.60	0.70	0.80
L	0.50	0.70	0.80
L1	—	—	0.13
a	—	—	12°

Recommended Soldering Footprint



DIMENSIONS: MILLIMETERS

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