

60V, 9.2A, 18mΩ N-channel Power Trench MOSFET

JMTP170N06D

Features

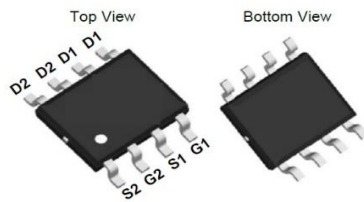
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS Tested
- Halogen-free; RoHS-compliant
- Pb-free plating

Applications

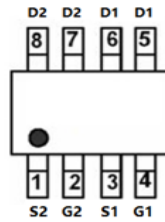
- Load Switch
- PWM Application
- Power Management

Product Summary

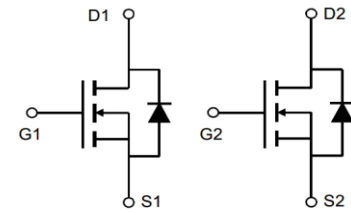
Parameters	Value	Unit
V_{DSS}	60	V
$V_{GS(th)_{Typ}}$	1.6	V
$I_D(@V_{GS}=10V)$	9.2	A
$R_{DS(ON)_{Typ}}(@V_{GS}=10V)$	16.7	mΩ
$R_{DS(ON)_{Typ}}(@V_{GS}=4.5V)$	18.3	mΩ



SOP-8L_Dual



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMTP170N06D	170N06D	3	Tape&Reel	SOP-8	4000	48000

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	60	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_A = 25^\circ\text{C}$	9.2
		$T_A = 100^\circ\text{C}$	5.8
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	59	mJ
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	1.4
		$T_A = 100^\circ\text{C}$	0.6
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 ⁽³⁾	121	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽⁴⁾	89	

**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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	μA
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.1	1.6	2.1	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁵⁾	$V_{GS} = 10\text{V}, I_D = 9\text{A}$	-	16.7	20.4	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 5\text{A}$	-	18.3	24.4	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	2	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	1912	2676	3613	pF
C_{oss}	Output Capacitance		85	119	161	pF
C_{rss}	Reverse Transfer Capacitance		69	96	130	pF
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 9\text{A}$	36	50	68	nC
Q_{gs}	Gate Source Charge		-	9	-	nC
Q_{gd}	Gate Drain("Miller") Charge		-	8	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}$ $I_D = 9\text{A}, R_{GEN} = 3\Omega$	-	9	-	ns
t_r	Turn-On Rise Time		-	15	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	44	-	ns
t_f	Turn-Off Fall Time		-	7	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	9	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	37	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 9\text{A}$	-		1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 9\text{A}, di/dt = 100\text{A}/\mu\text{s}$	15	21	29	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	21	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 0.5\text{mH}$, $I_{AS} = 15.4\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ is measured with the device mounted on a minimum recommended pad of 2oz copper FR4 PCB.
 4. $R_{\theta JA}$ is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB.
 5. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.



Typical Performance Characteristics

Figure 1: Power De-rating

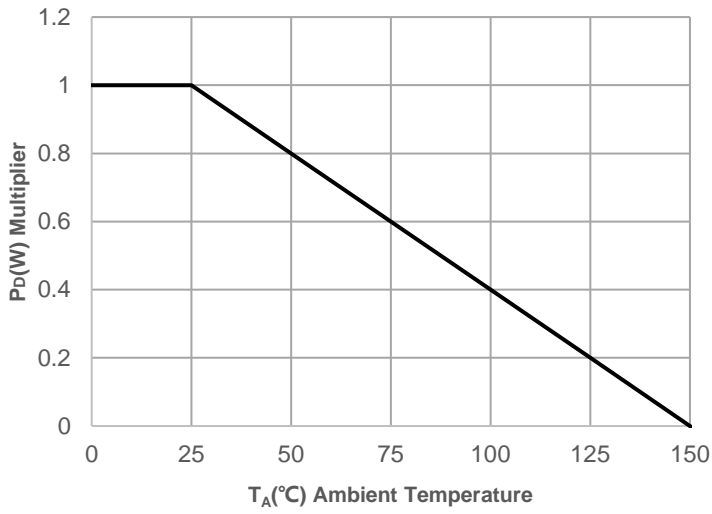


Figure 2: Current De-rating

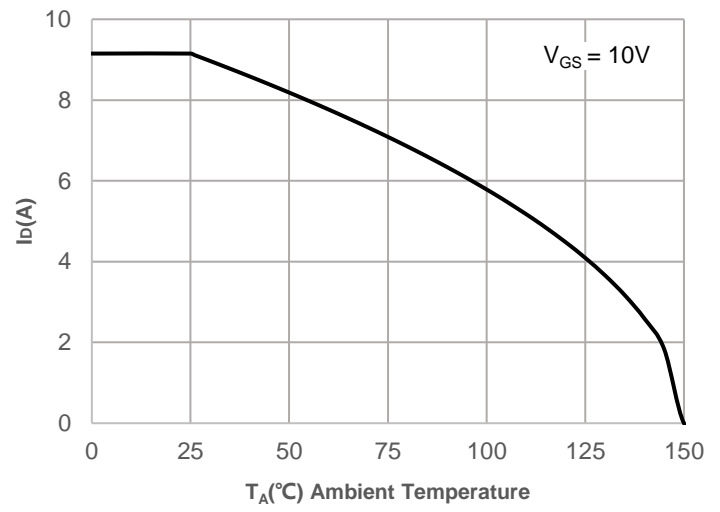


Figure 3: Normalized Maximum Transient Thermal Impedance

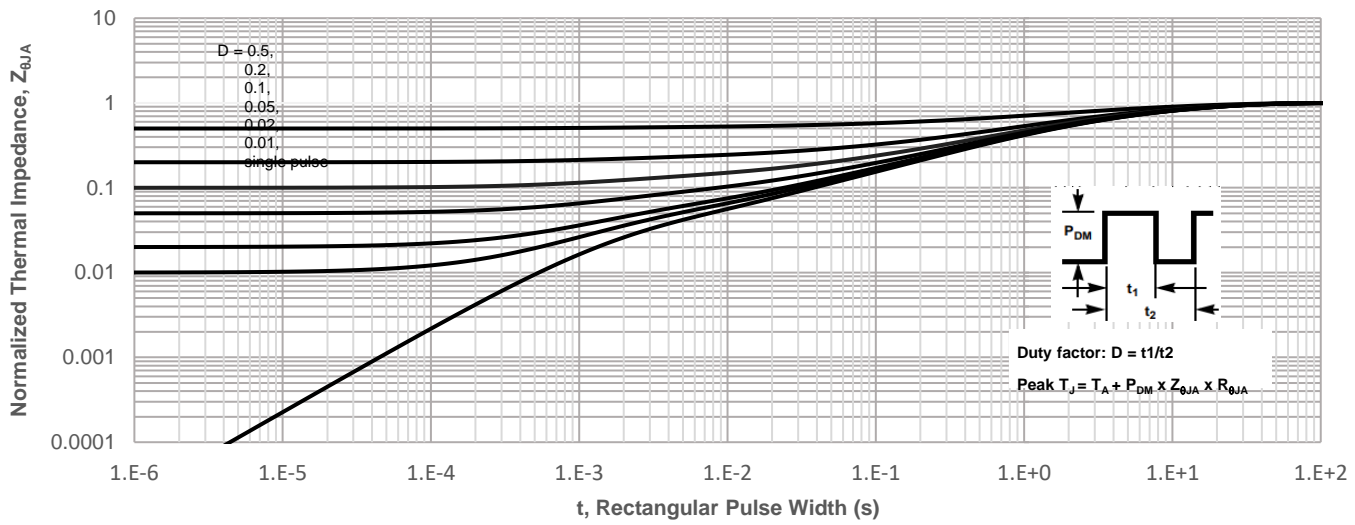
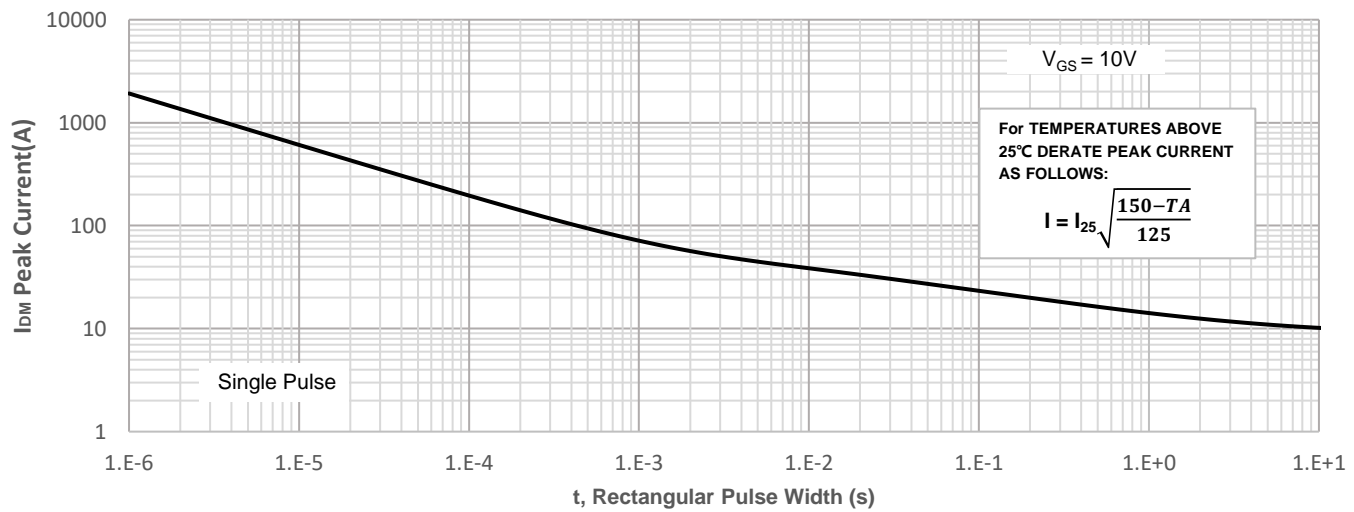
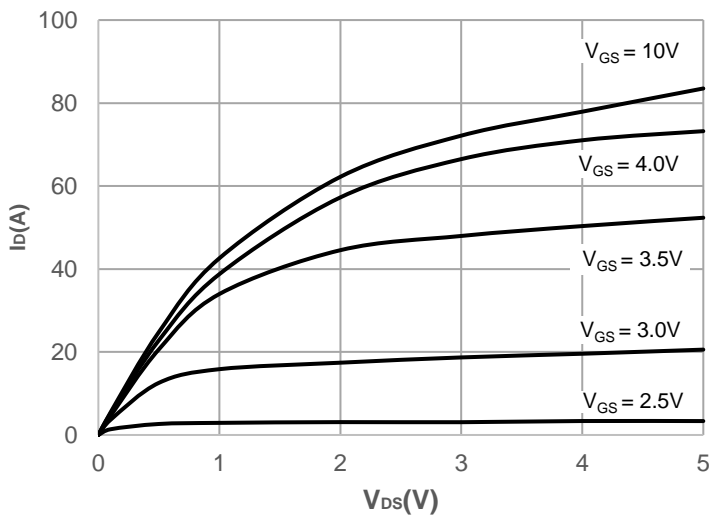
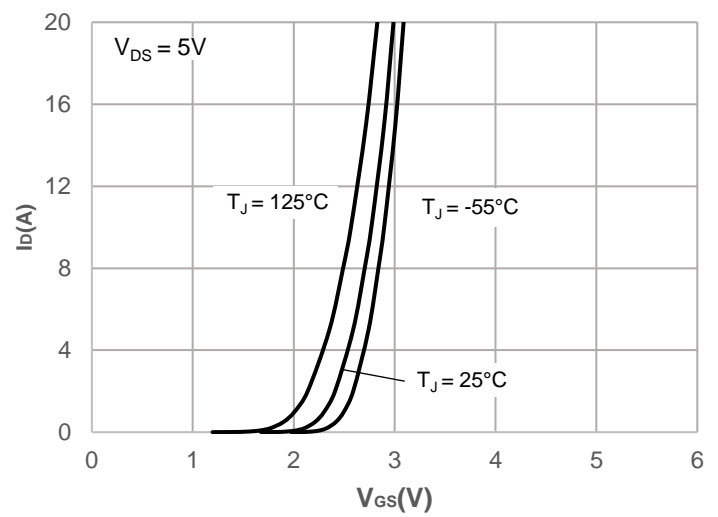
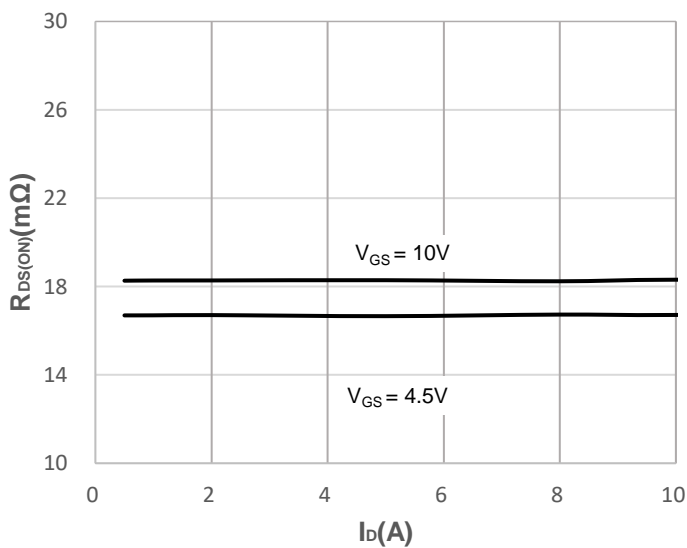
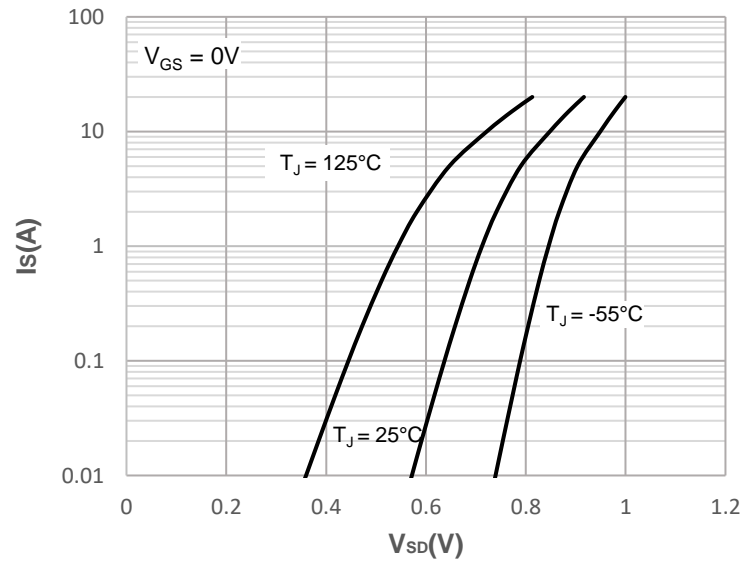
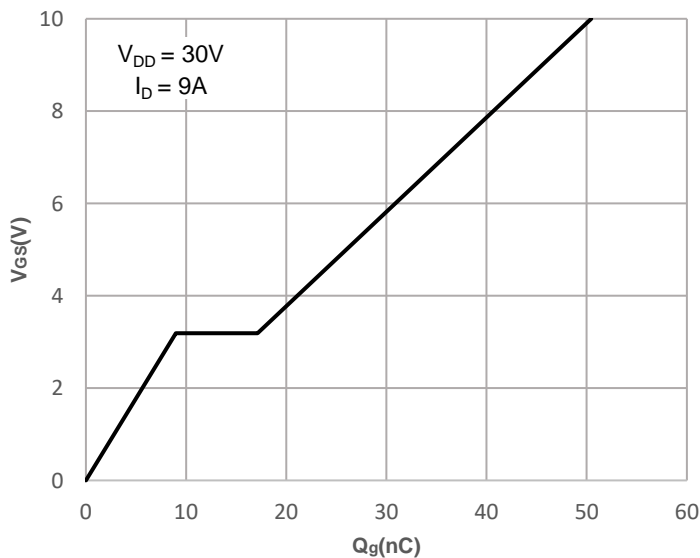
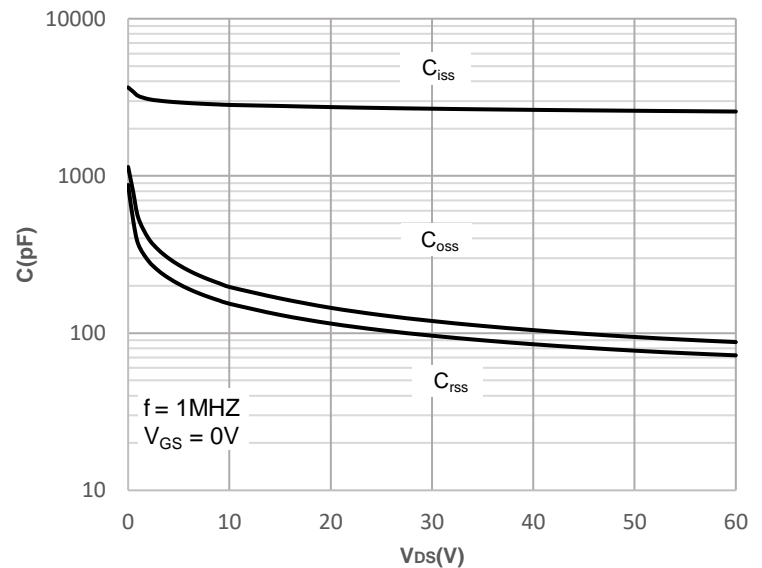


Figure 4: Peak Current Capacity



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

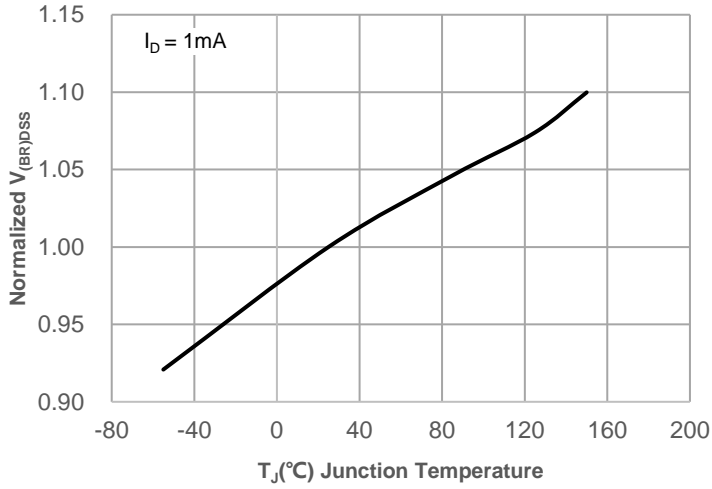


Figure 12: Normalized on Resistance vs. Junction Temperature

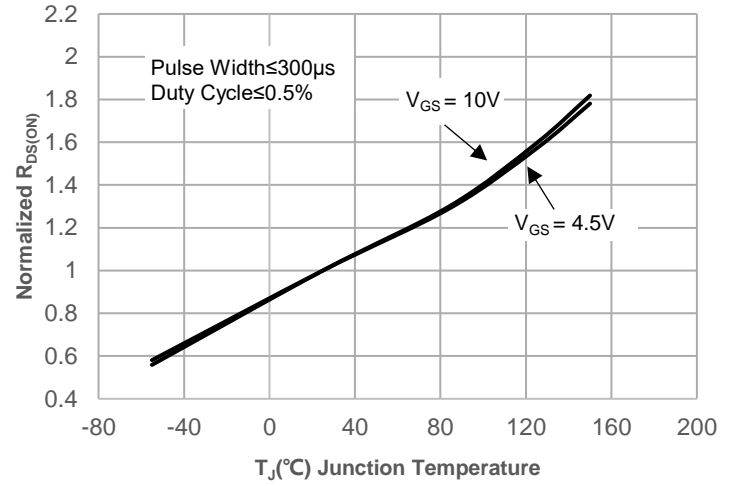


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

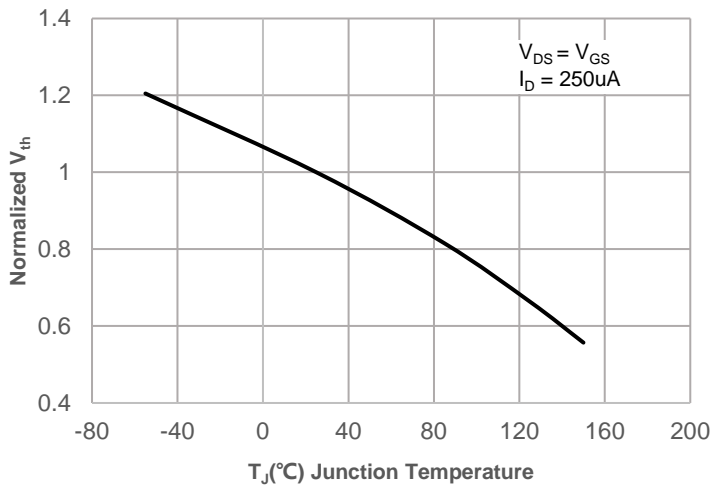


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

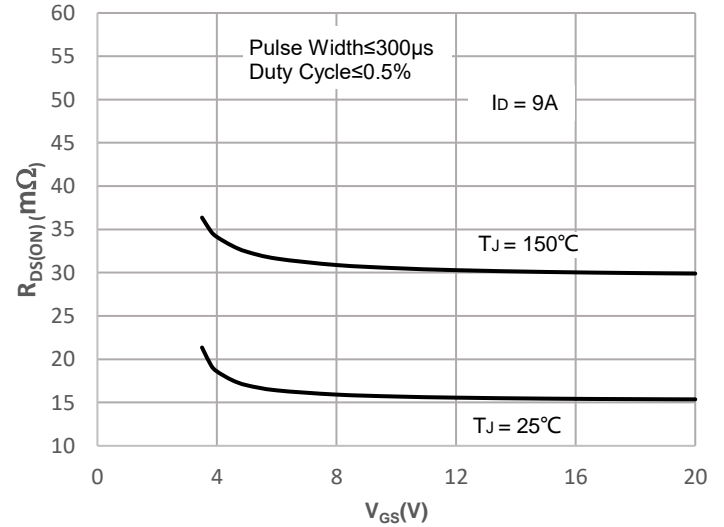
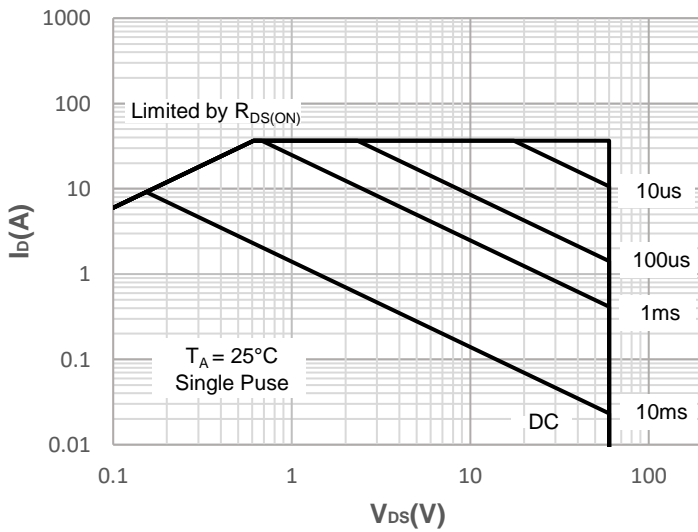
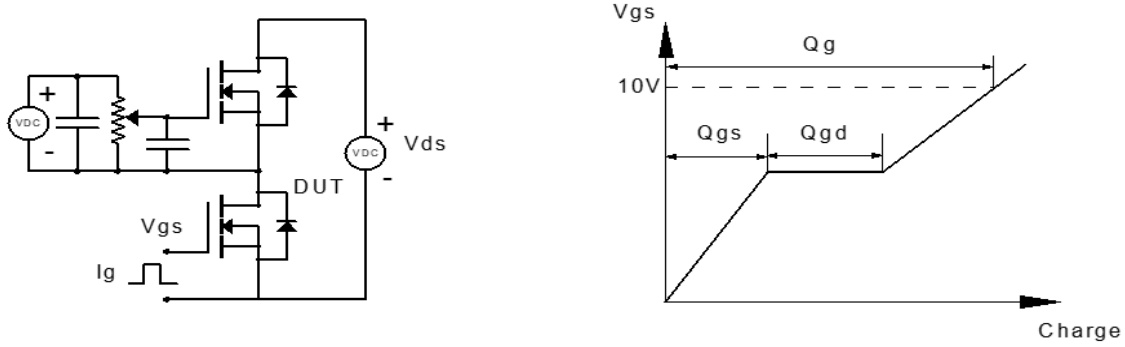
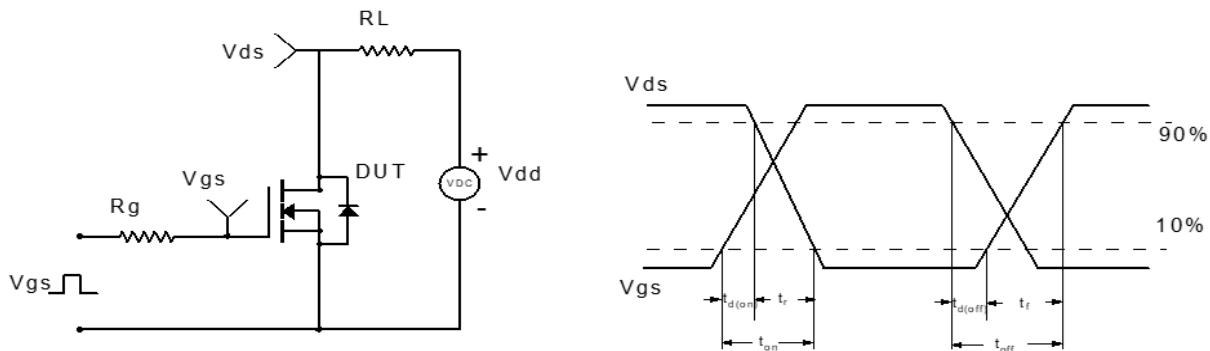
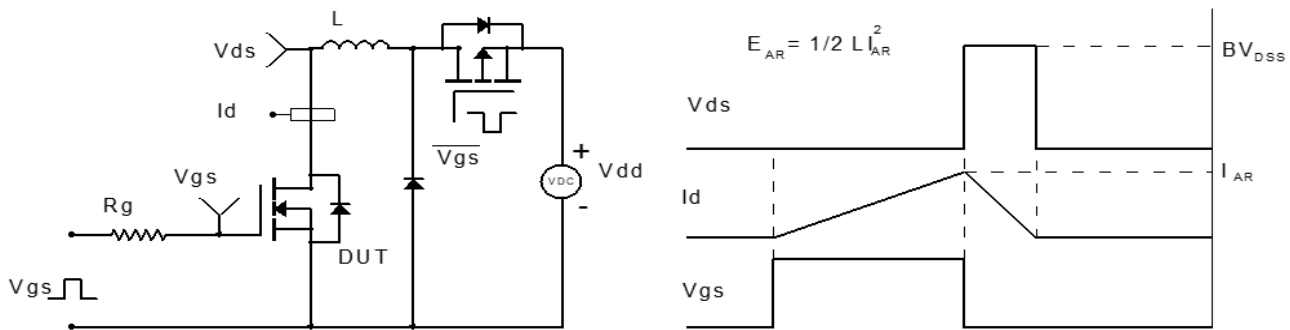
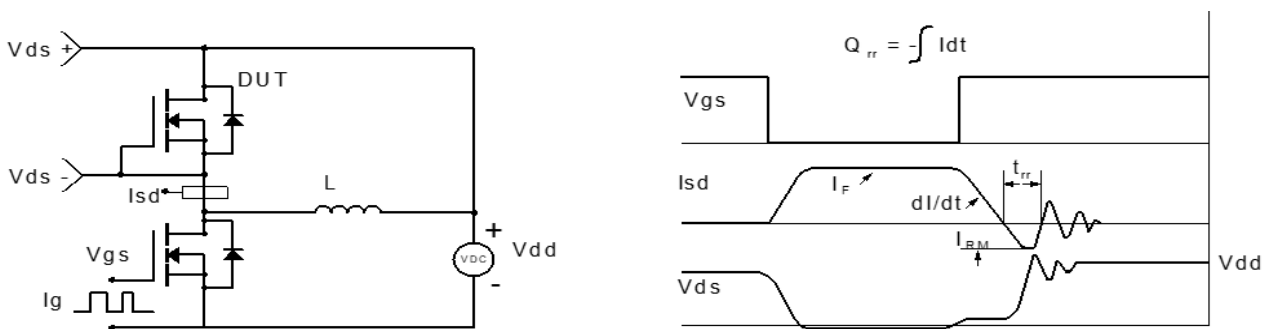
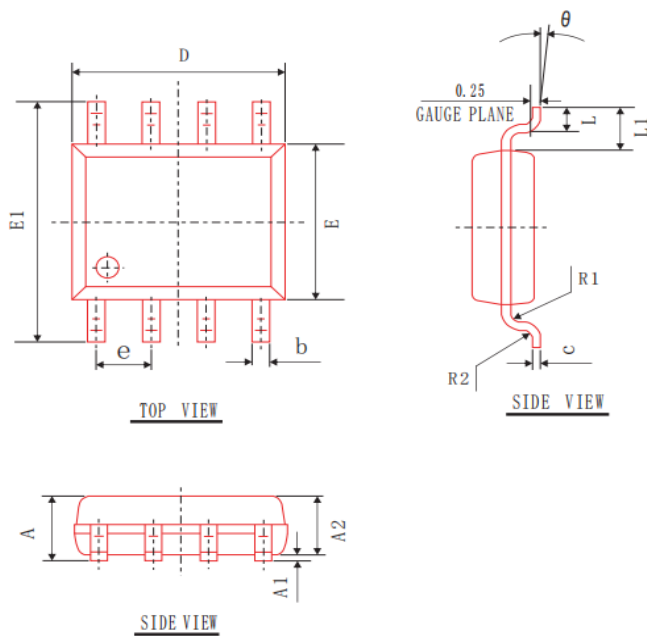


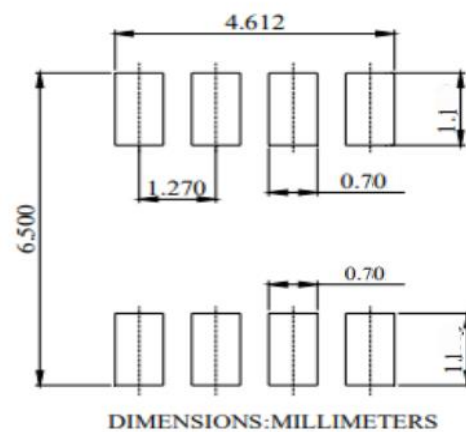
Figure 15: Maximum Safe Operating Area



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(SOP-8L)

 COMMON DIMENSIONS
(UNITS OF MEASURE=mm)

SYMBOL	MIN	NOM	MAX
A	1.40	1.60	1.80
A1	0.05	0.15	0.25
A2	1.35	1.45	1.55
b	0.30	0.40	0.50
c	0.153	0.203	0.253
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
L	0.45	0.70	1.00
θ	2°	4°	6°
L 1	1.04 REF		
e	1.27 BSC		
R1	0.07 TYP		
R2	0.07 TYP		

Recommended Footprint


DIMENSIONS: MILLIMETERS

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