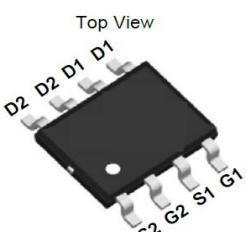
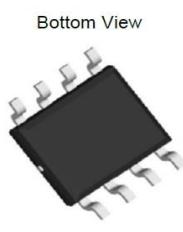


60V, 11A, 13.4mΩ N-channel Power Trench MOSFET

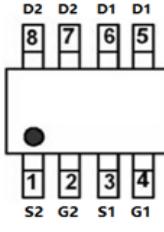
JMTP110N06D

Features	Product Summary		
• Excellent $R_{DS(ON)}$ and Low Gate Charge	V_{DSS}	60	V
• 100% UIS Tested	$V_{GS(th)}_{Typ}$	1.5	V
• 100% ΔV_{ds} Tested	$I_D(@V_{GS}=10V)$	11	A
• Halogen-free; RoHS-compliant	$R_{DS(ON)}_{Typ}(@V_{GS}=10V)$	12.5	mΩ
• Pb-free plating	$R_{DS(ON)}_{Typ}(@V_{GS}=4.5V)$	13.4	mΩ

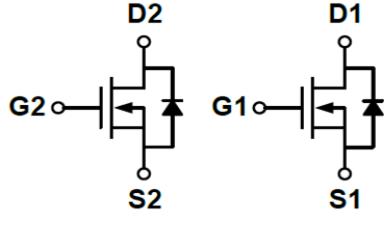
Applications	RoHS	Pb
• Load Switch		
• PWM Application		
• Power Management		

SOP-8



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel(pcs)	Per Carton (pcs)
JMTP110N06D	11N06D	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	$T_A = 25^\circ\text{C}$	11	A
		$T_A = 100^\circ\text{C}$	6.8	
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A	
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	144	mJ	
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$	3.1	W
		$T_A = 100^\circ\text{C}$	1.3	
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⁾	98	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽⁴⁾	40	

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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	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						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.1	1.5	2.0	V
$R_{\text{DS}(\text{ON})}$	Static Drain-Source ON-Resistance ⁽⁵⁾	$V_{GS} = 10\text{V}, I_D = 11\text{A}$	-	12.5	14.0	$\text{m}\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 8\text{A}$	-	13.4	18.0	$\text{m}\Omega$
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	2.4	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	3055	4277	5774	pF
C_{oss}	Output Capacitance		130	183	247	pF
C_{rss}	Reverse Transfer Capacitance		105	147	198	pF
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 30\text{V}, I_D = 11\text{A}$	56	79	106	nC
Q_{gs}	Gate Source Charge		10	14	19	nC
Q_{gd}	Gate Drain("Miller") Charge		9	12	17	nC
Switching Characteristics						
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}$ $I_D = 11\text{A}, R_{\text{GEN}} = 3\Omega$	-	10	-	ns
t_r	Turn-On Rise Time		-	19	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time		-	73	-	ns
t_f	Turn-Off Fall Time		-	18	-	ns
Body Diode Characteristics						
I_s	Maximum Continuous Body Diode Forward Current	-	-	11	-	A
I_{SM}	Maximum Pulsed Body Diode Forward Current	-	-	43	-	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}, I_s = 11\text{A}$	-		1.2	V
trr	Body Diode Reverse Recovery Time	$I_F = 11\text{A}, \text{di/dt} = 100\text{A/us}$	18	25	34	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	28	-	nC

Notes:

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

2. E_{AS} condition: Starting $T_J=25^\circ\text{C}$, $V_{DD}=30\text{V}$, $V_{GS}=10\text{V}$, $R_G=25\text{ohm}$, $L=3\text{mH}$, $I_{AS}=9.8\text{A}$, $V_{DD}=0\text{V}$ 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

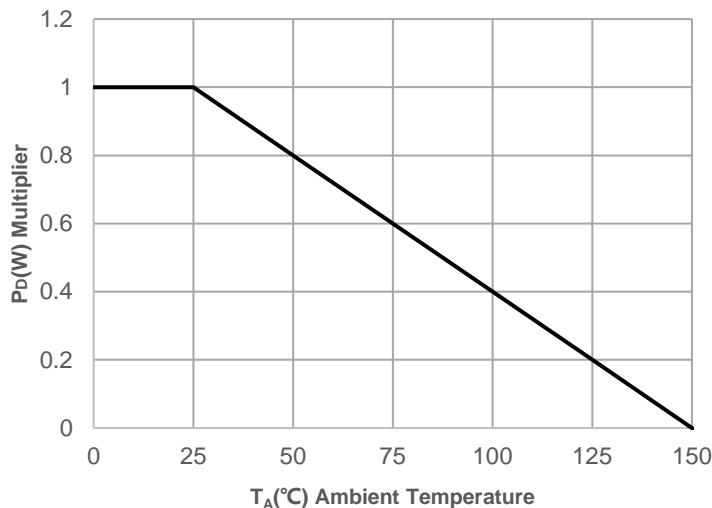


Figure 2: Current De-rating

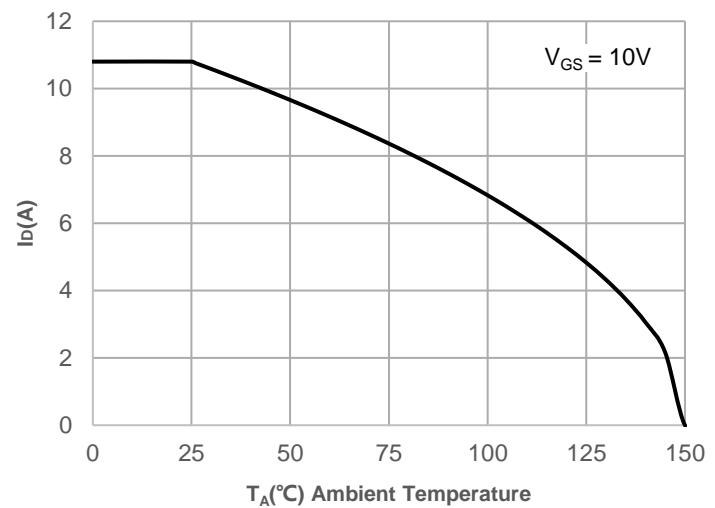


Figure 3: Normalized Maximum Transient Thermal Impedance

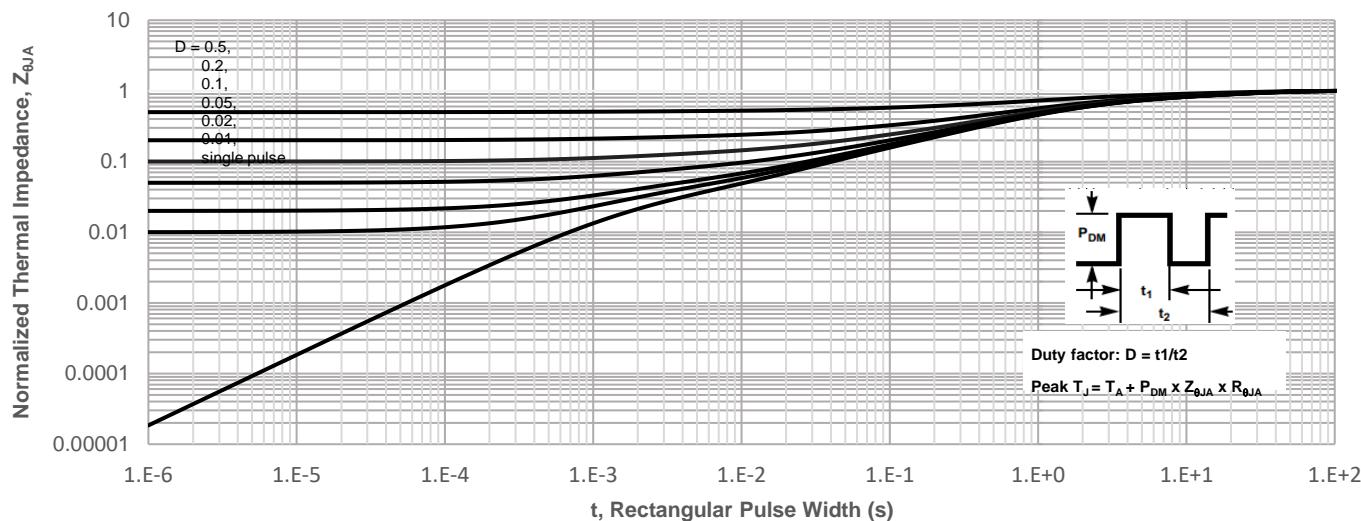
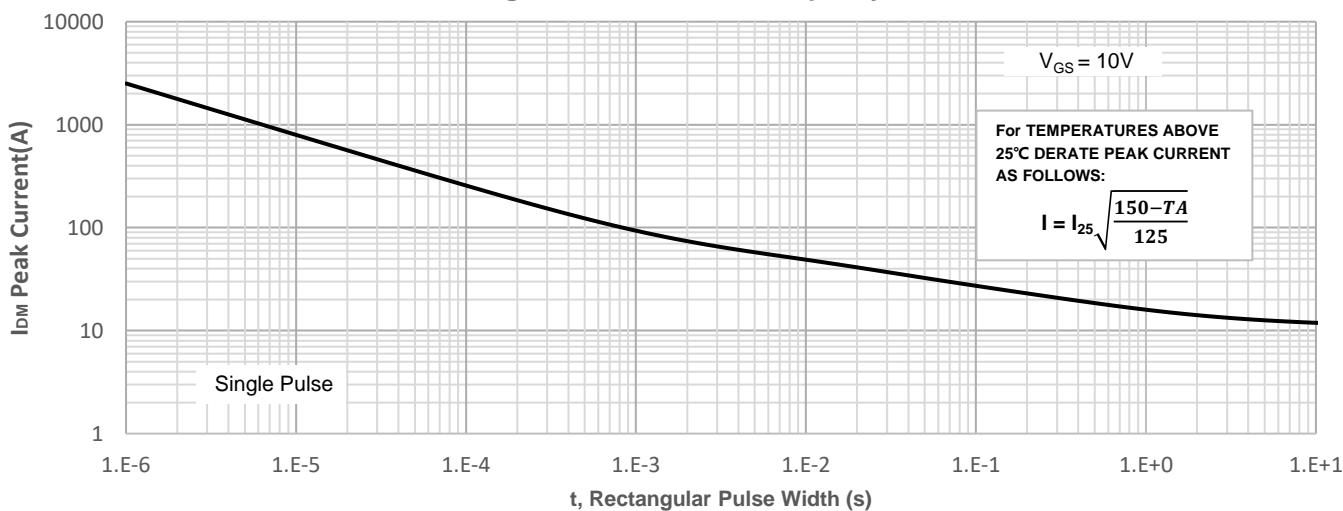


Figure 4: Peak Current Capacity



Typical Performance Characteristics

Figure 5: Output Characteristics

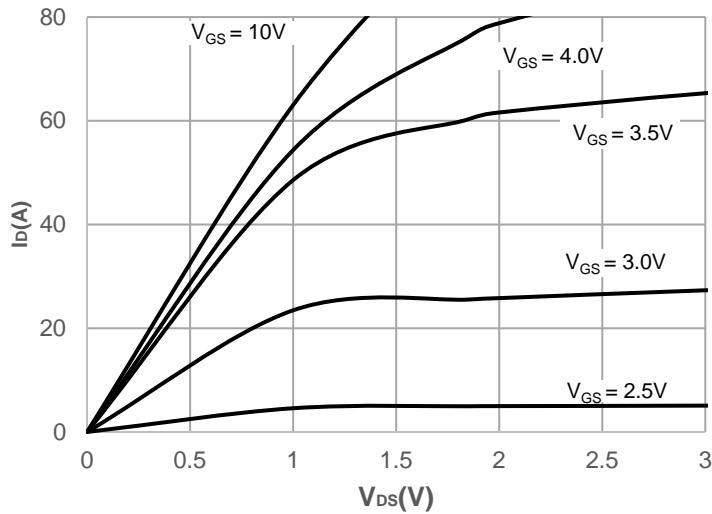


Figure 6: Typical Transfer Characteristics

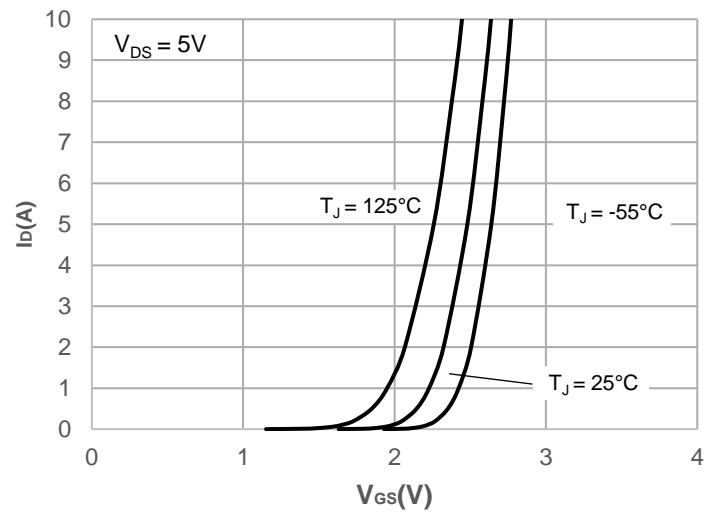


Figure 7: On-resistance vs. Drain Current

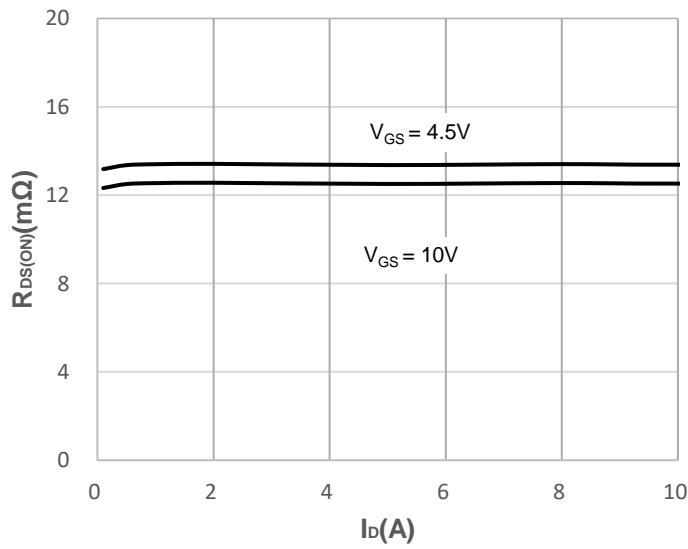


Figure 8: Body Diode Characteristics

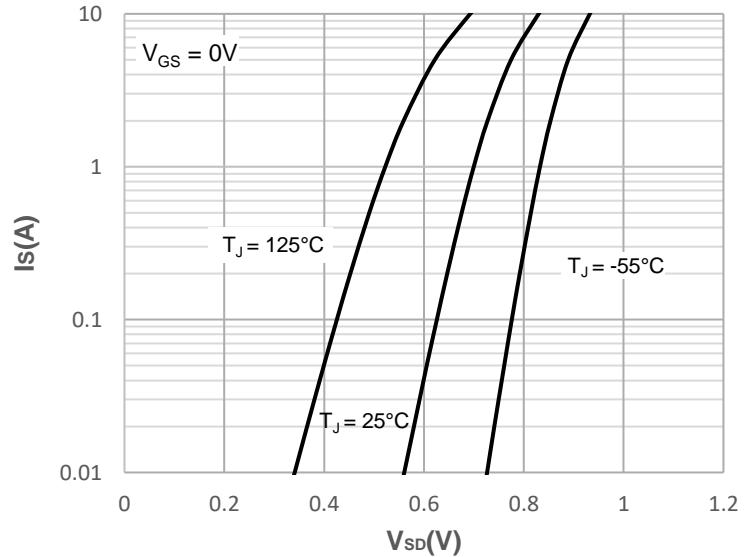


Figure 9: Gate Charge Characteristics

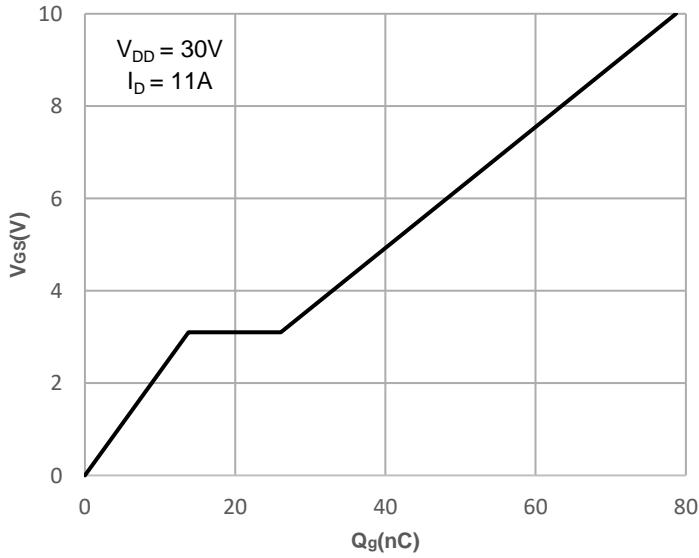
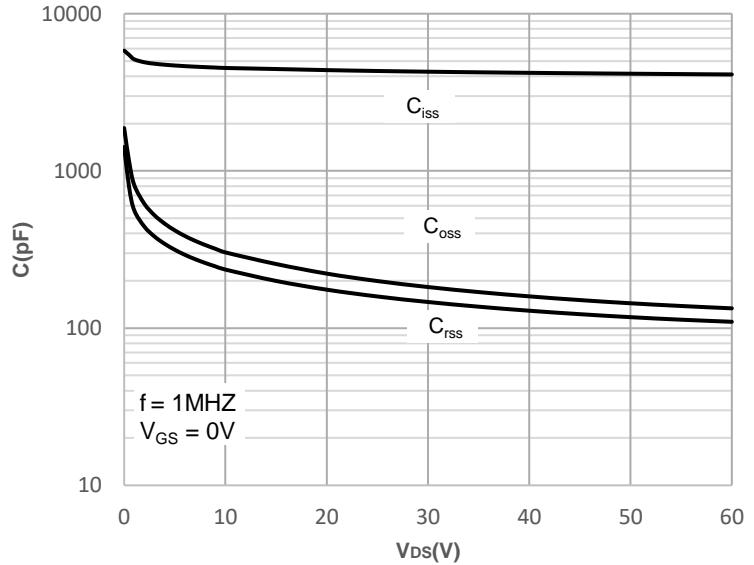


Figure 10: Capacitance Characteristics



Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

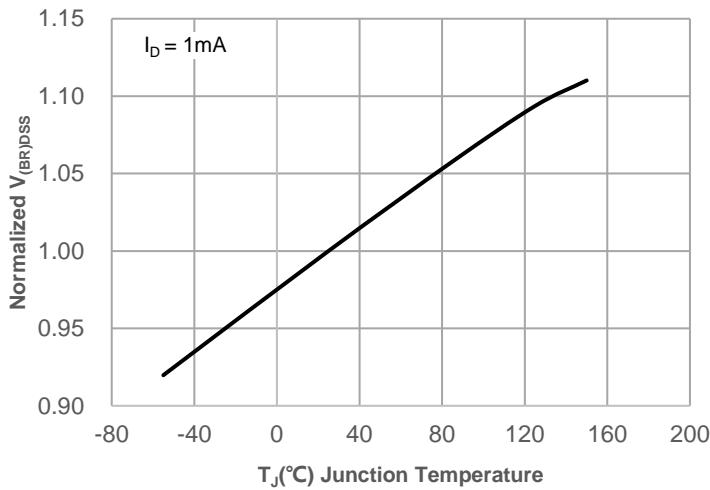


Figure 12: Normalized on Resistance vs. Junction Temperature

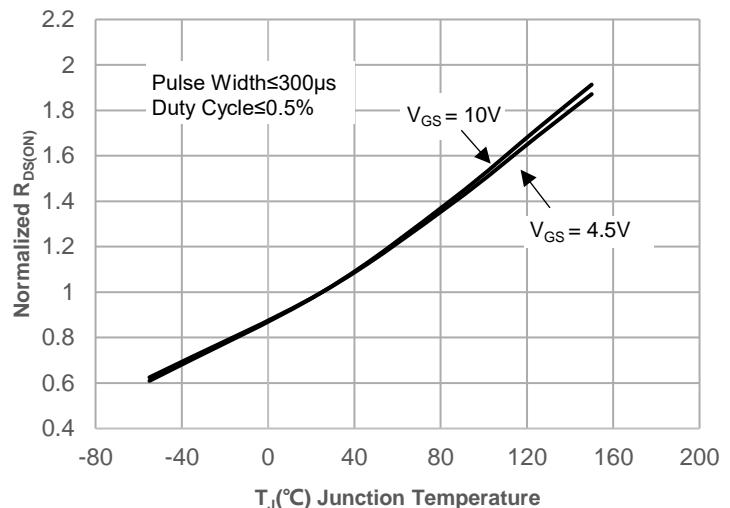


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

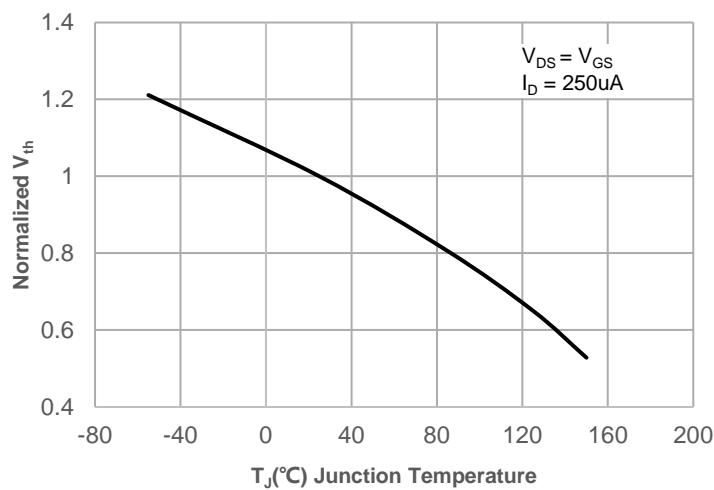


Figure 14: R_{D_S(ON)} vs. V_{GS}

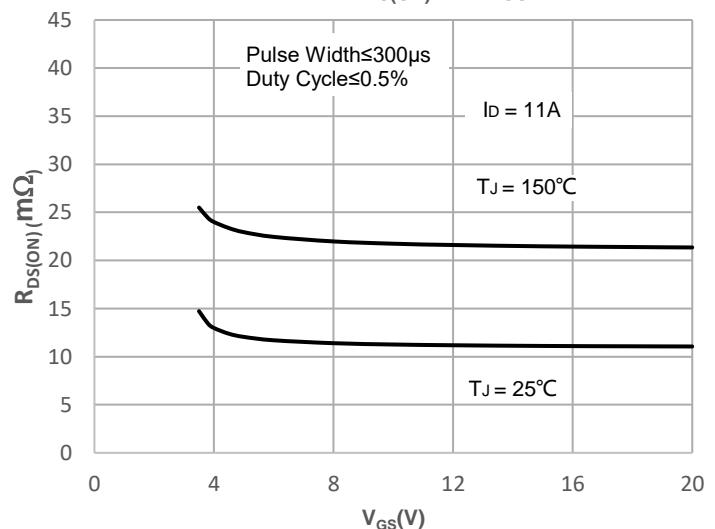
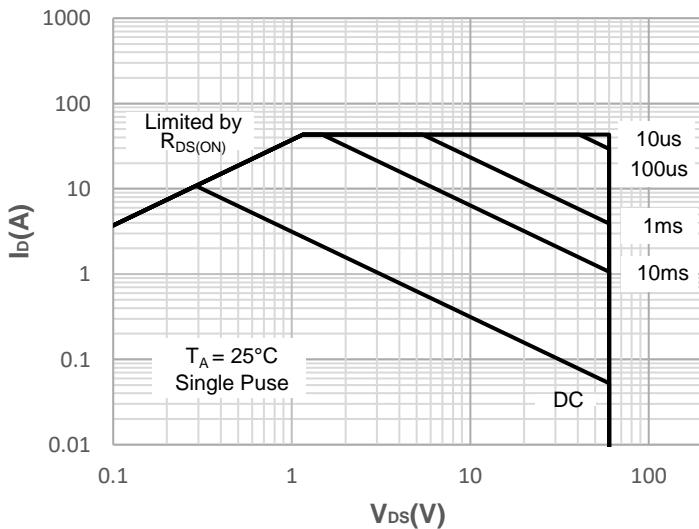


Figure 15: Maximum Safe Operating Area



Test Circuit

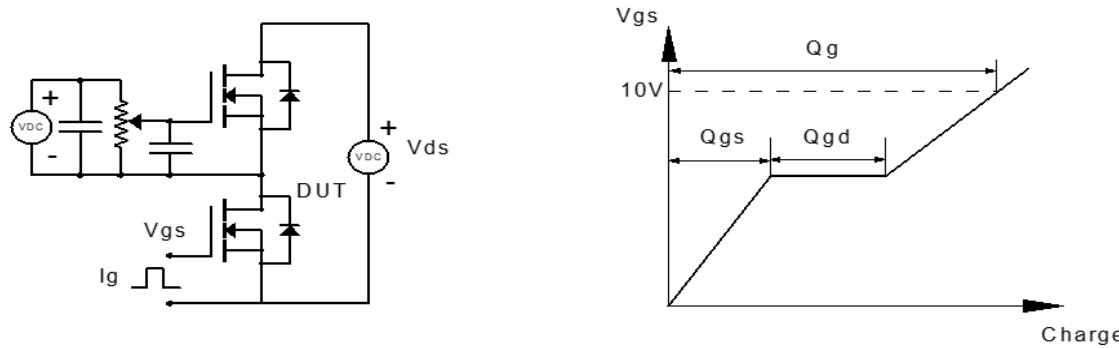


Figure 1: Gate Charge Test Circuit & Waveform

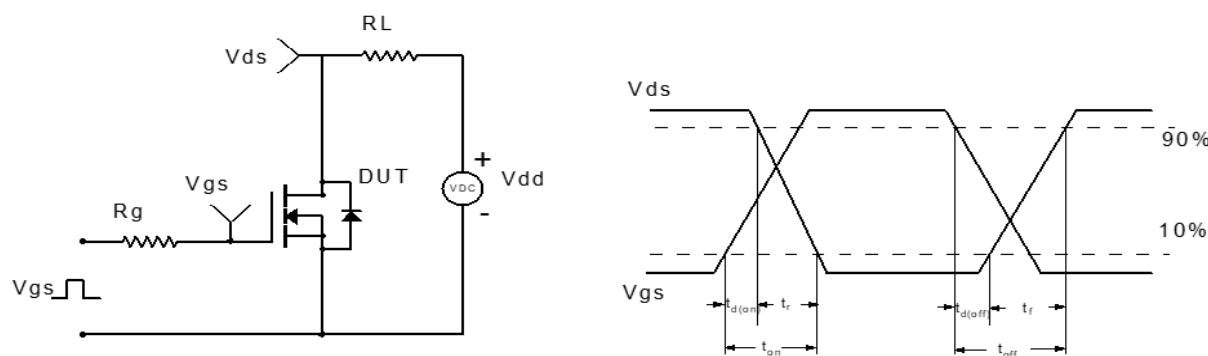


Figure 2: Resistive Switching Test Circuit & Waveform

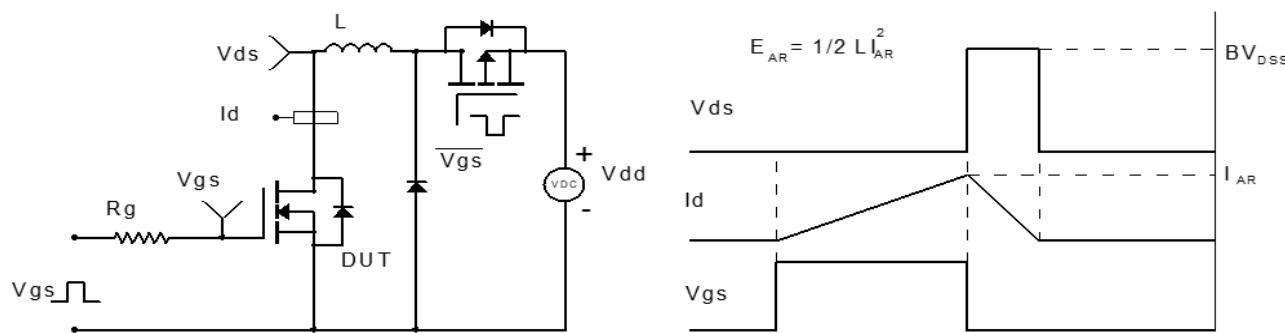


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

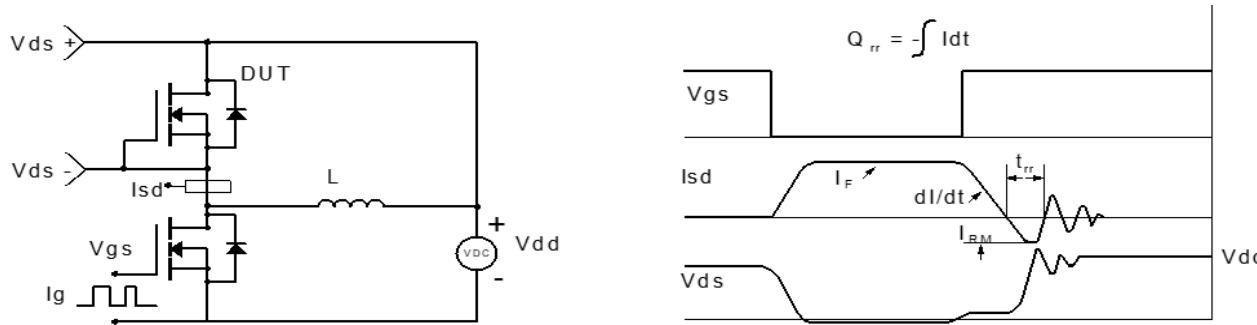
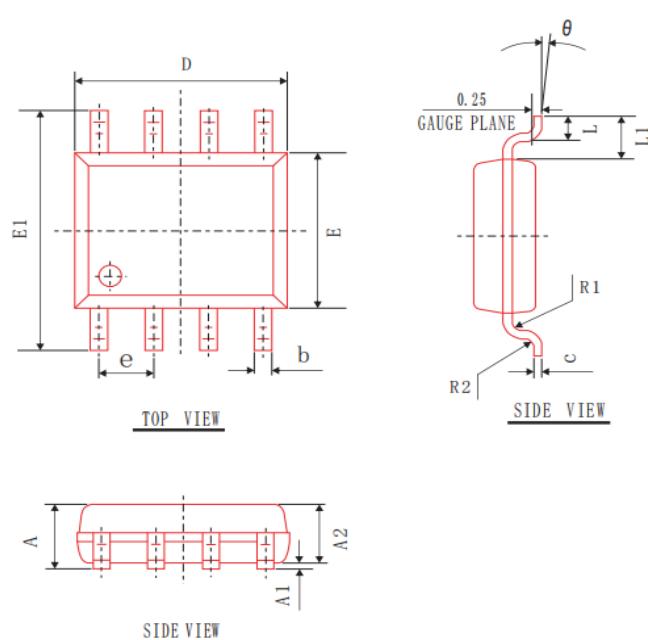


Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(SOP-8)

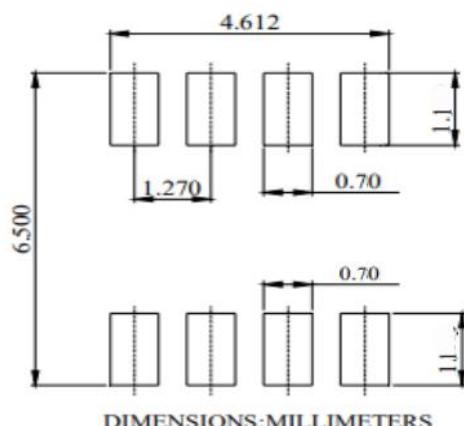
Package Outline



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°
L1		1.04 REF	
e		1.27 BSC	
R1		0.07 TYP	
R2		0.07 TYP	

Recommended Footprint



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