

100V, 274A, 3.2mΩ N-channel Power SGT MOSFET

JMSH1002NS

Features

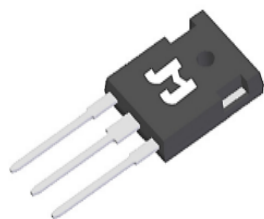
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- 100% UIS TESTED
- 100% ΔV_{ds} TESTED
- Halogen-free; RoHS-compliant
- Pb-free plating

Applications

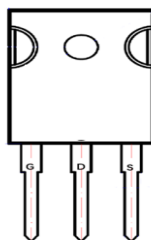
- Load Switch
- PWM Application
- Power Management

Product Summary

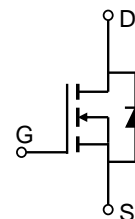
Parameters	Value	Unit
V_{DSS}	100	V
$V_{GS(th_Typ)}$	2.8	V
$I_D(@V_{GS}=10V)$	274	A
$R_{DS(ON)_Typ}(@V_{GS}=10V)$	3.2	mΩ



TO-247-3L(DPAK) Top View



Pin Assignment



Schematic Diagram

Ordering Information

Device	Marking	MSL	Form	Package	Reel Size	Reel(pcs)	Per Carton (pcs)
JMSH1002NS	SH1002N	NA	Tube	TO-247-3L	13"	30	2250

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	100	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	274
		$T_C = 100^\circ\text{C}$	194
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy ⁽²⁾	942	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	526
		$T_C = 100^\circ\text{C}$	211
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⁾	43	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.2	

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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	100	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 100\text{V}, V_{GS} = 0\text{V}$	-	-	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	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.9	2.8	3.6	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁴⁾	$V_{GS} = 10\text{V}, I_D = 15\text{A}$	-	3.2	4.2	m Ω
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$	-	7741	-	pF
C_{oss}	Output Capacitance		-	1316	-	pF
C_{rss}	Reverse Transfer Capacitance		-	21	-	pF
Q_g	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 50\text{V}, I_D = 20\text{A}$	-	114	-	nC
Q_{gs}	Gate Source Charge		-	35	-	nC
Q_{gd}	Gate Drain("Miller") Charge		-	28	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}, V_{DD} = 50\text{V}$ $I_D = 20\text{A}, R_{GEN} = 3\Omega$	-	26	-	ns
t_r	Turn-On Rise Time		-	26	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	55	-	ns
t_f	Turn-Off Fall Time		-	28	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	274	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	1095	A
V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 20\text{A}$	-		1.2	V
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 20\text{A}, di/dt = 100\text{A/us}$	-	88	-	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	194	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 15\text{V}$, $V_G = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 1\text{mH}$, $I_{AS} = 44\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. $R_{\theta JA}$ 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

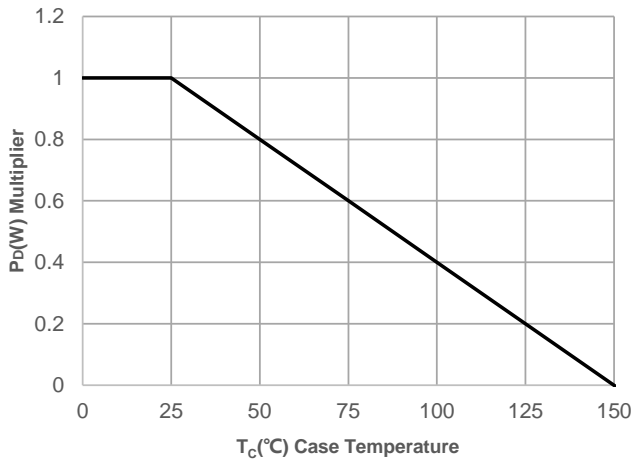


Figure 2: Current De-rating

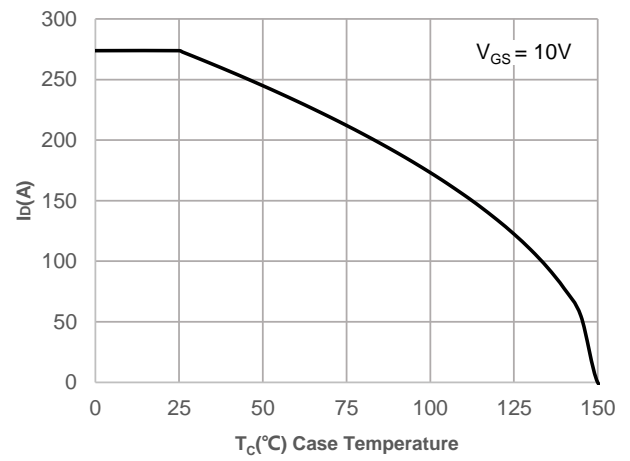


Figure 3: Normalized Maximum Transient Thermal Impedance

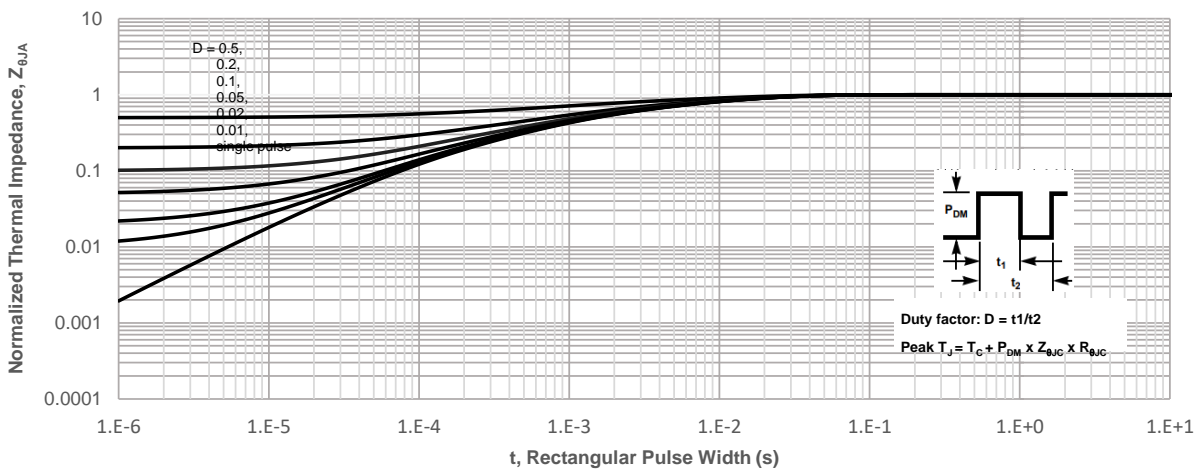
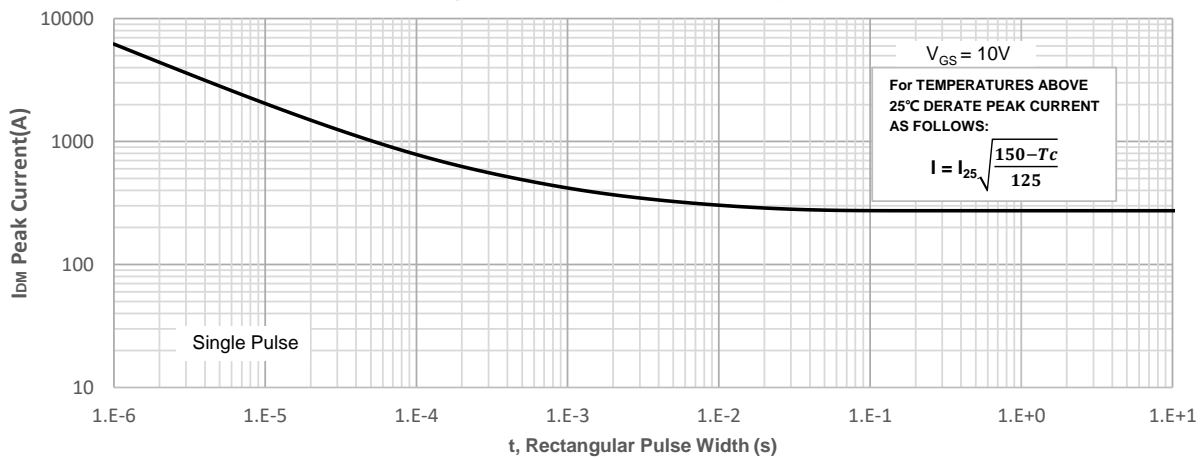
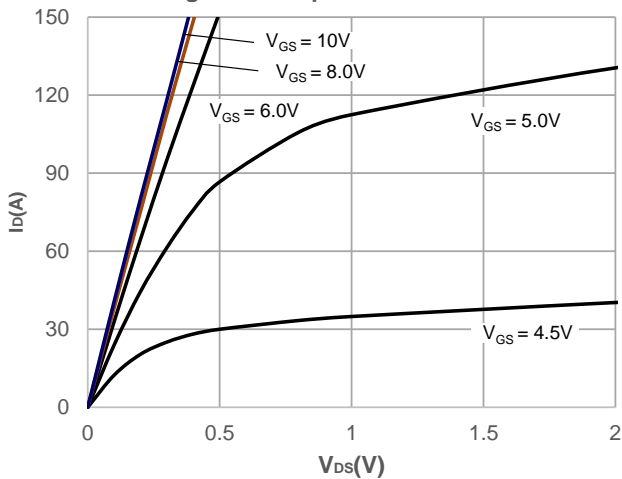
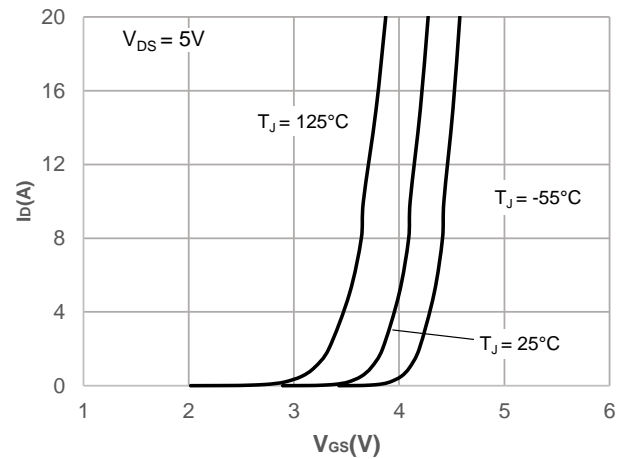
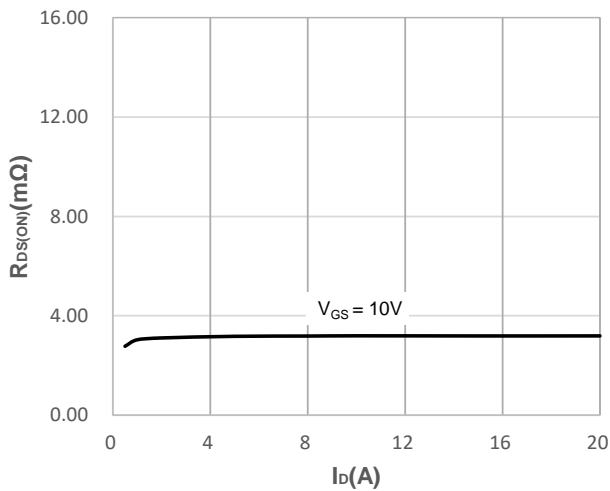
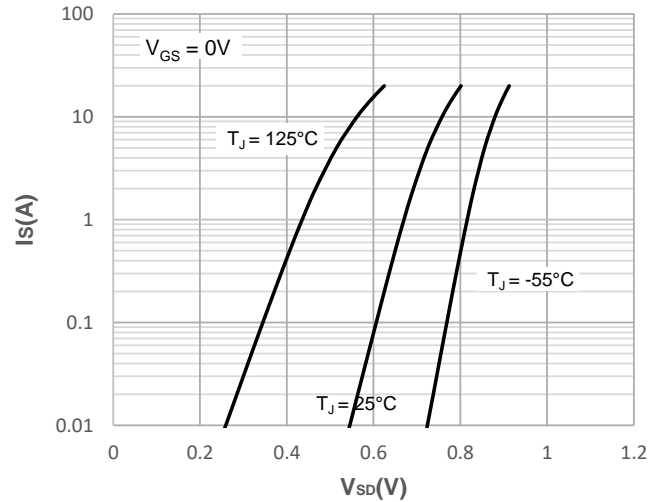
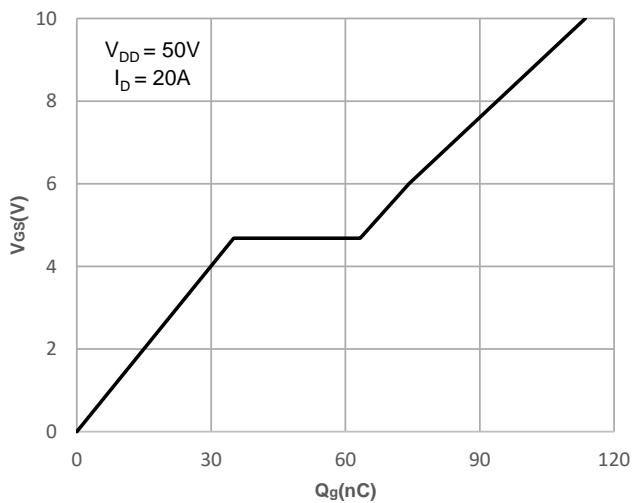
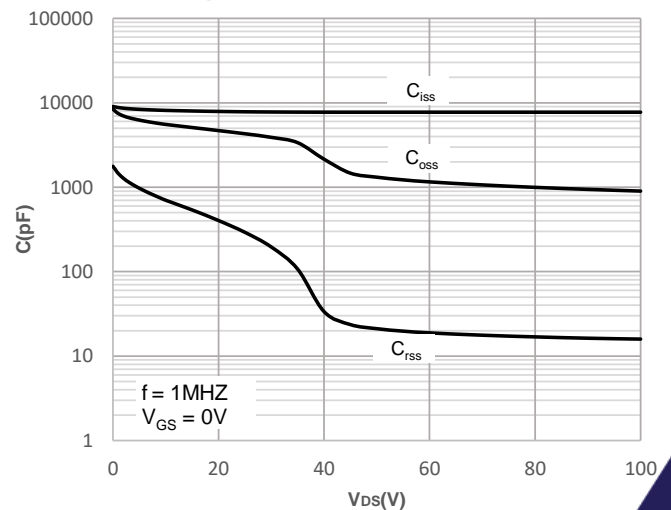


Figure 4: Peak Current Capacity



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

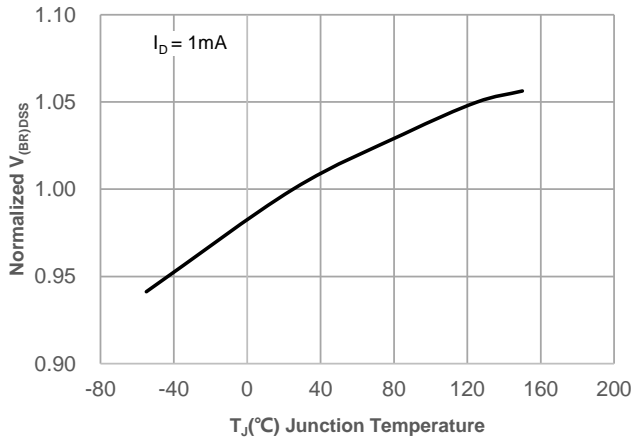


Figure 12: Normalized on Resistance vs. Junction Temperature

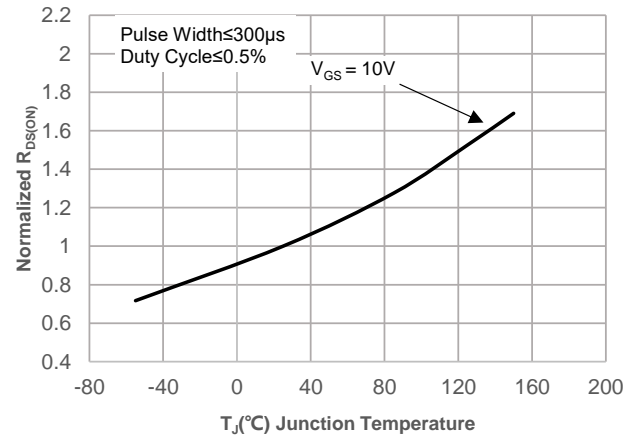


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

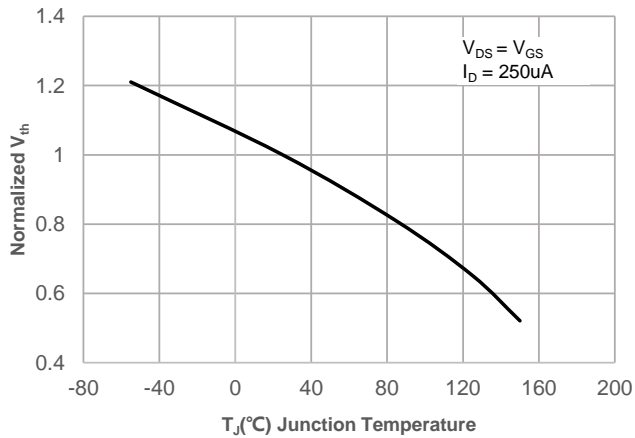


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

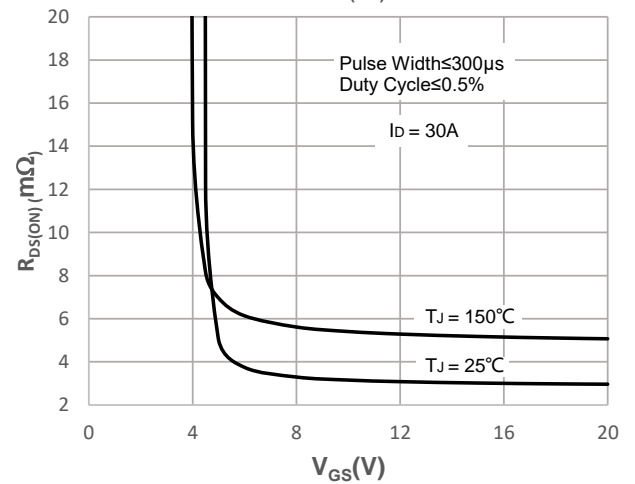
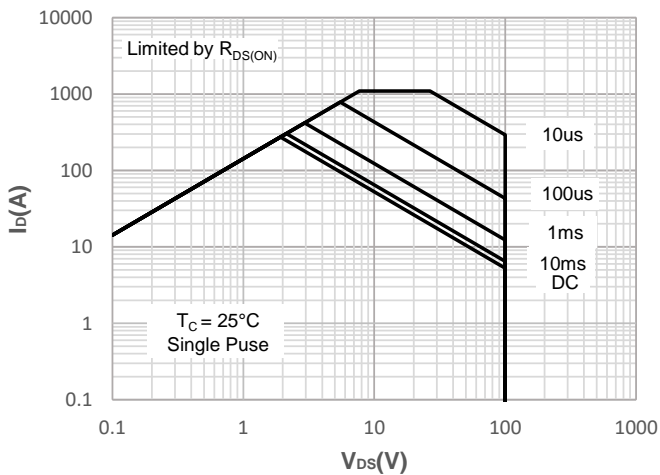


Figure 15: Maximum Safe Operating Area



Test Circuit

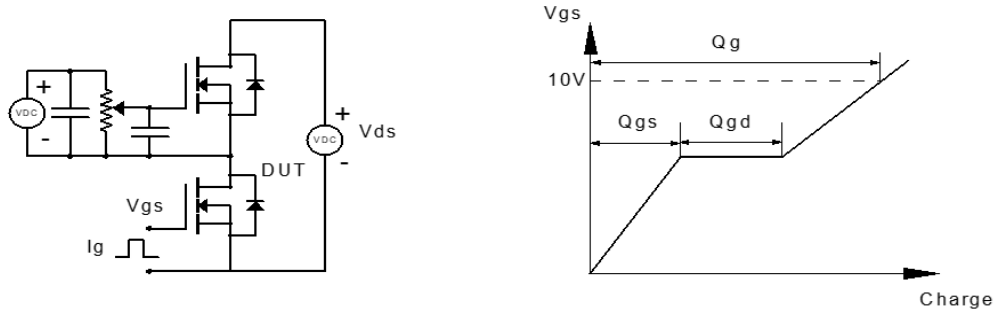


Figure 1: Gate Charge Test Circuit & Waveform

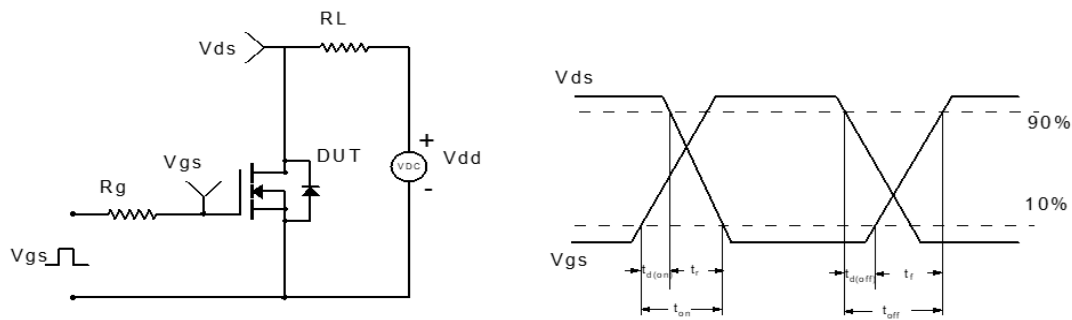


Figure 2: Resistive Switching Test Circuit & Waveform

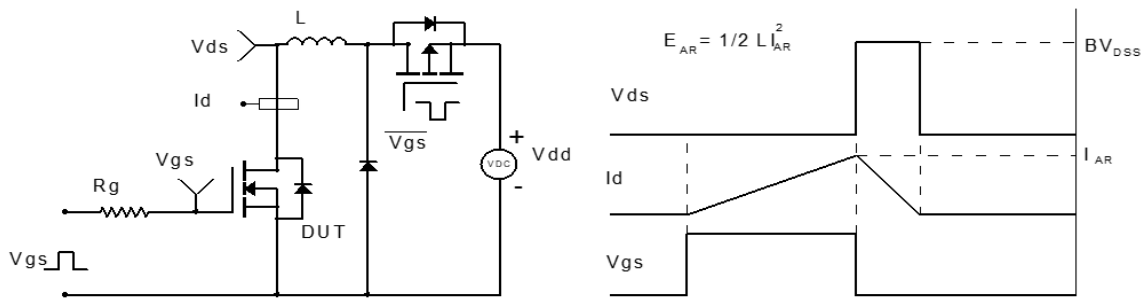


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

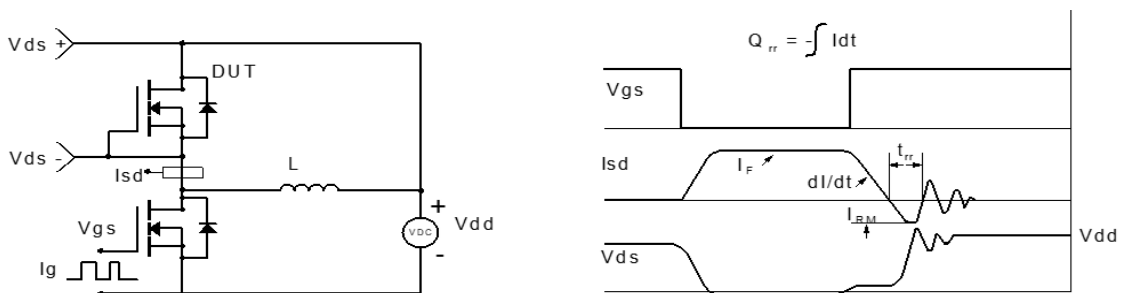
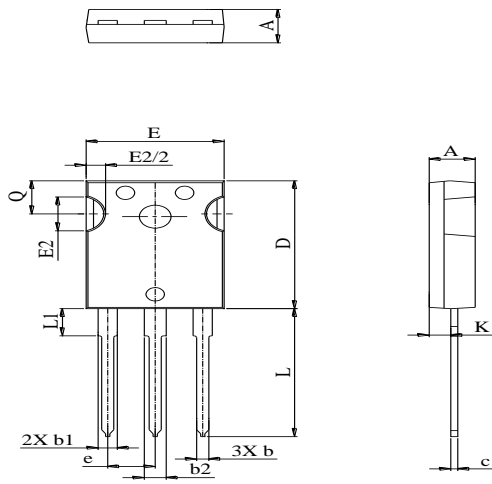


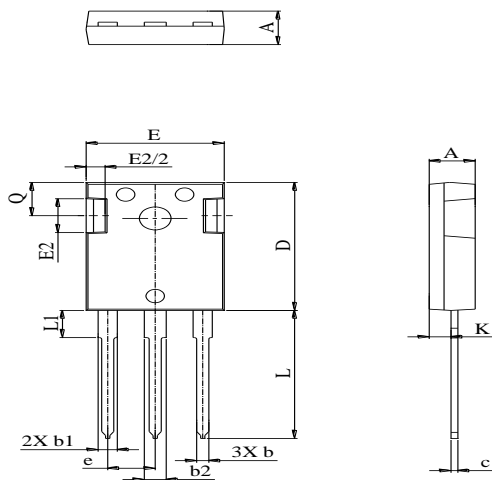
Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(TO-247-3L)

Type_A Package Outline


DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.80	5.02	5.21
b	1.00	1.20	1.40
b1	1.90	2.00	2.39
b2	2.87	3.00	3.22
c	0.41	0.60	0.79
D	20.80	21.00	21.20
E	15.50	15.94	16.13
E2	4.32	-	5.49
L	19.70	20.07	20.32
L1	4.00	-	4.40
K	2.20	-	2.50
Q	-	5.80	-
e	5.44 BSC		

Type_B Package Outline


DIM.	MILLIMETER		
	MIN.	NOM.	MAX.
A	4.80	5.02	5.21
b	1.00	1.20	1.40
b1	1.90	2.00	2.39
b2	2.87	3.00	3.22
c	0.41	0.60	0.79
D	20.80	21.00	21.20
E	15.50	15.94	16.13
E2	4.32	-	5.49
L	19.70	20.07	20.32
L1	4.00	-	4.40
K	2.20	-	2.50
Q	-	5.80	-
e	5.44 BSC		

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