

**110V, 209A, 2.6mΩ N-channel Power SGT MOSFET**
**JMSH1102QS**
**Features**

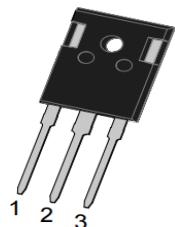
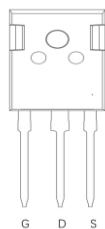
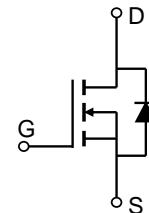
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- 100% UIS Tested
- 100%  $\Delta V_{ds}$  Tested
- Halogen-free; RoHS-compliant

**Product Summary**

Parameters	Value	Unit
$V_{DSS}$	110	V
$V_{GS(th)}_{Typ}$	3.1	V
$I_D(@V_{GS}=10V)$	209	A
$R_{DS(ON)}_{Typ}(@V_{GS}=10V)$	2.6	mΩ

**Applications**

- Load Switch
- PWM Application
- Power Management


**TO-247-3L Top View**

**Pin Assignment**

**Schematic Diagram**
**Ordering Information**

Device	Marking	MSL	Form	Package	Tube(pcs)	Per Carton (pcs)
JMSH1102QS-U	SH1102Q	N/A	Tube	TO-247-3L	30	2250

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-to-Source Voltage	110	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	209	A
		132	
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	Refer to Fig.4	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	1488	mJ
$P_D$	Power Dissipation	284	W
		114	
$T_J, T_{STG}$	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>	33	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.44	

**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	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	110	-	-	V
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 88\text{V}, V_{GS} = 0\text{V}$	-	-	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	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2.2	3.1	4.1	V
$R_{\text{DS(ON)}}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}, I_D = 20\text{A}$	-	2.6	3.4	$\text{m}\Omega$
<b>Dynamic Characteristics</b>						
$R_g$	Gate Resistance	$f = 1\text{MHz}$	-	2.4	-	$\Omega$
$C_{\text{iss}}$	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 50\text{V}, f = 1\text{MHz}$	7416	10382	14015	pF
$C_{\text{oss}}$	Output Capacitance		1242	1739	2348	pF
$C_{\text{rss}}$	Reverse Transfer Capacitance		27	37	50	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ to } 10\text{V}$ $V_{DS} = 50\text{V}, I_D = 20\text{A}$	108	152	205	nC
$Q_{\text{gs}}$	Gate Source Charge		35	49	66	nC
$Q_{\text{gd}}$	Gate Drain("Miller") Charge		24	34	46	nC
<b>Switching Characteristics</b>						
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DD} = 50\text{V}$ $I_D = 20\text{A}, R_{\text{GEN}} = 6.2\Omega$	-	44	-	ns
$t_r$	Turn-On Rise Time		-	65	-	ns
$t_{d(\text{off})}$	Turn-Off Delay Time		-	128	-	ns
$t_f$	Turn-Off Fall Time		-	77	-	ns
<b>Body Diode Characteristics</b>						
$I_S$	Maximum Continuous Body Diode Forward Current	-	-	209	A	
$I_{SM}$	Maximum Pulsed Body Diode Forward Current	-	-	837	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	$I_F = 20\text{A}, di/dt = 100\text{A/us}$	72	101	136	ns
$Qrr$	Body Diode Reverse Recovery Charge		-	324	-	nC

Notes:

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

2. E<sub>AS</sub> condition: Starting  $T_J = 25^\circ\text{C}$ ,  $V_{DD} = 50\text{V}$ ,  $V_{GS} = 10\text{V}$ ,  $R_G = 25\text{ohm}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 31.5\text{A}$ ,  $V_{DD} = 0\text{V}$  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

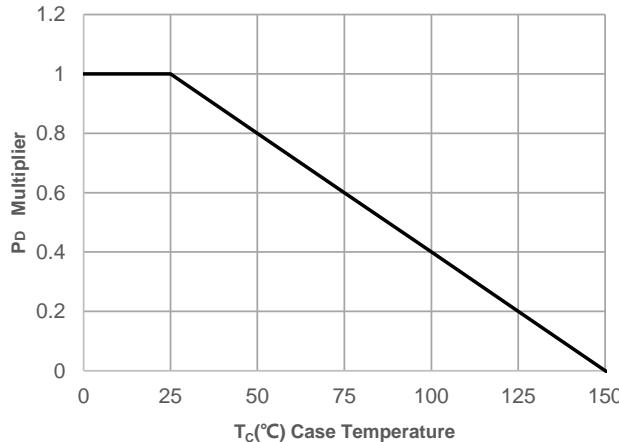


Figure 2: Current De-rating

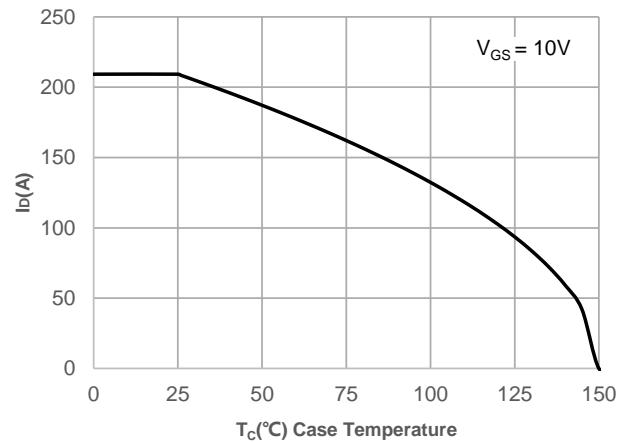


Figure 3: Normalized Maximum Transient Thermal Impedance

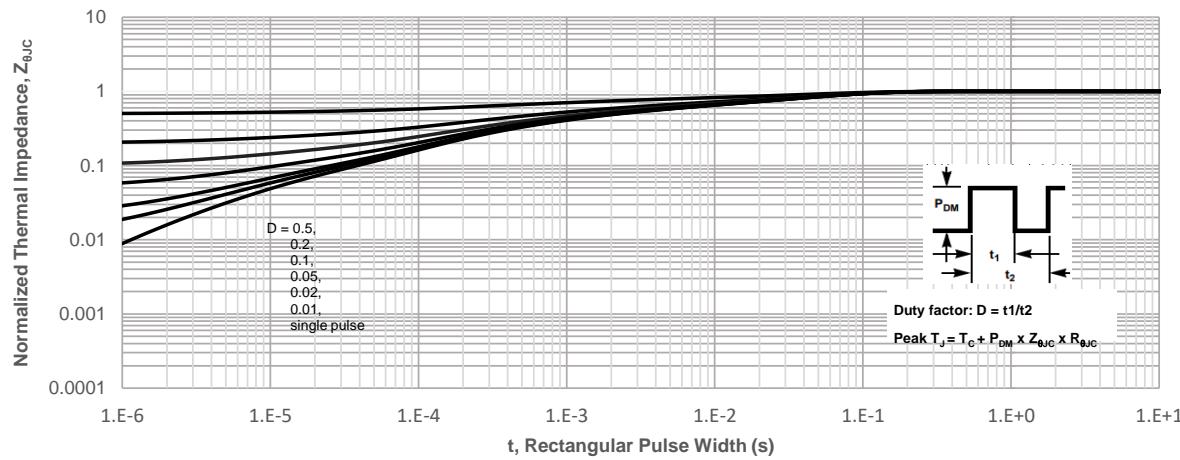
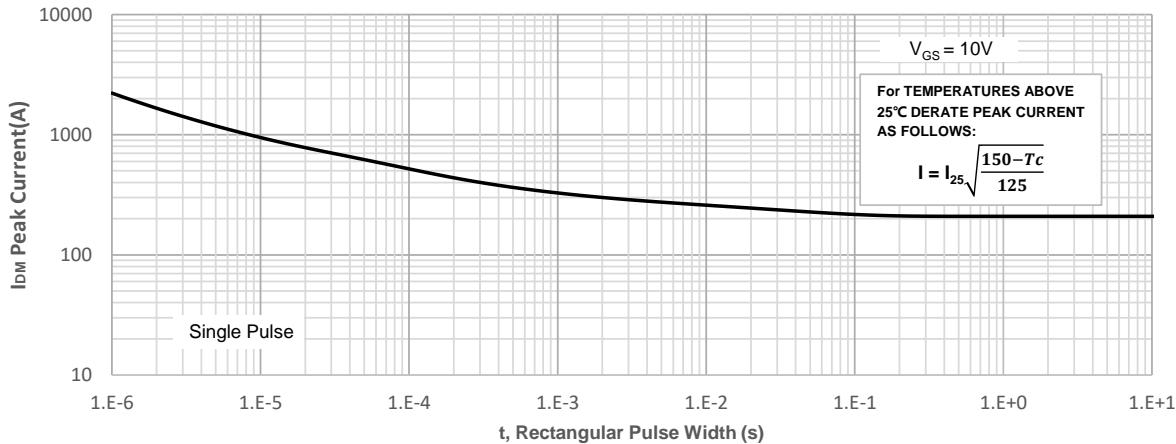


Figure 4: Peak Current Capacity



## Typical Performance Characteristics

Figure 5: Output Characteristics

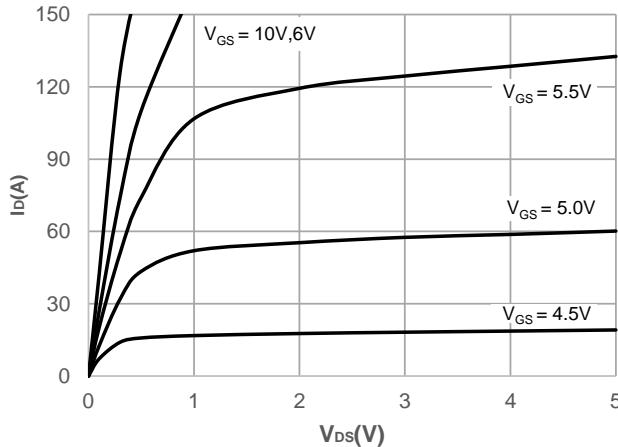


Figure 6: Typical Transfer Characteristics

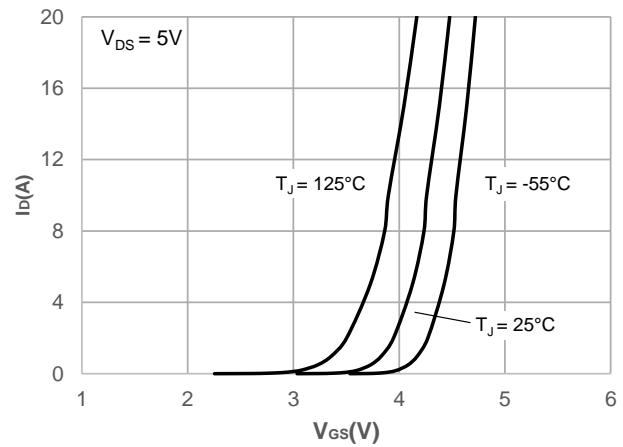


Figure 7: On-resistance vs. Drain Current

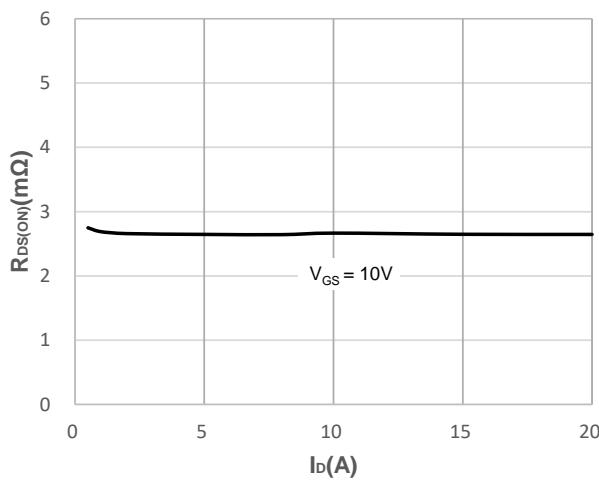


Figure 8: Body Diode Characteristics

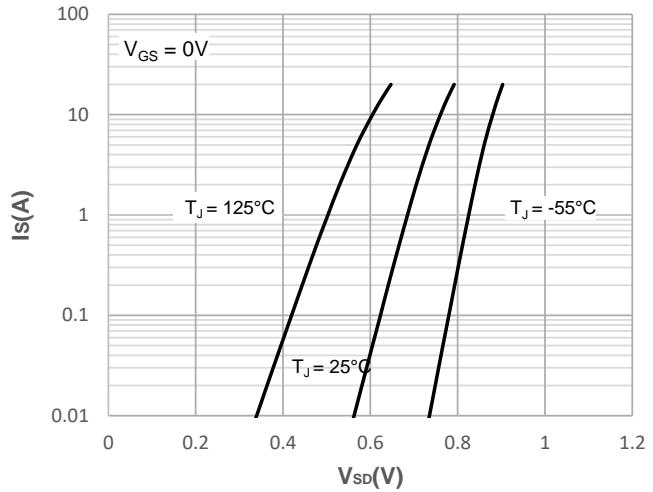


Figure 9: Gate Charge Characteristics

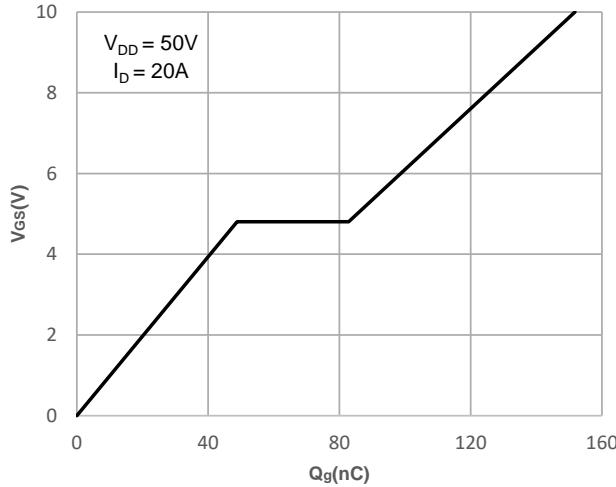
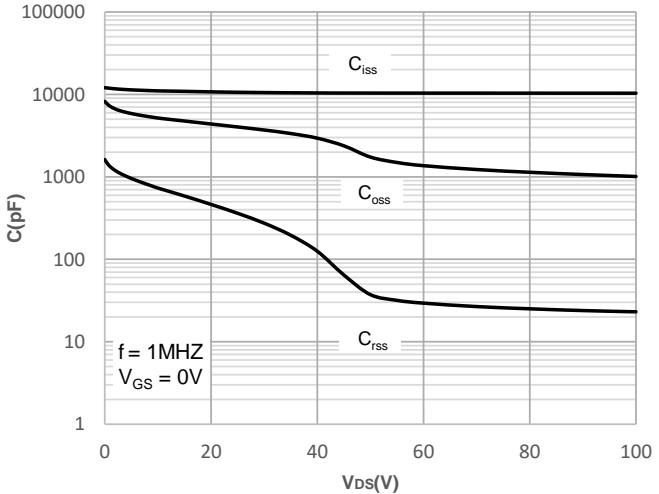


Figure 10: Capacitance Characteristics



## Typical Performance Characteristics

Figure 11: Normalized Breakdown voltage vs. Junction Temperature

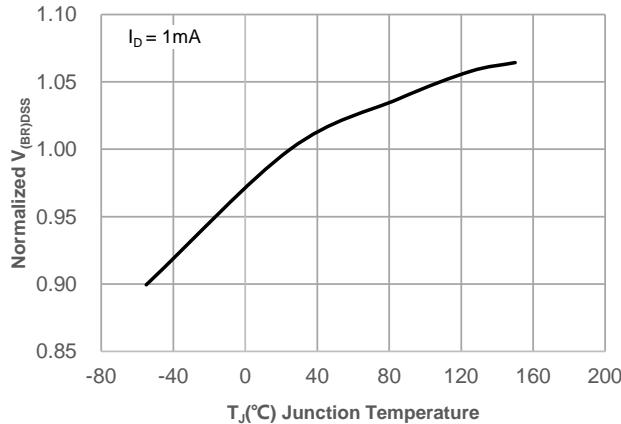


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

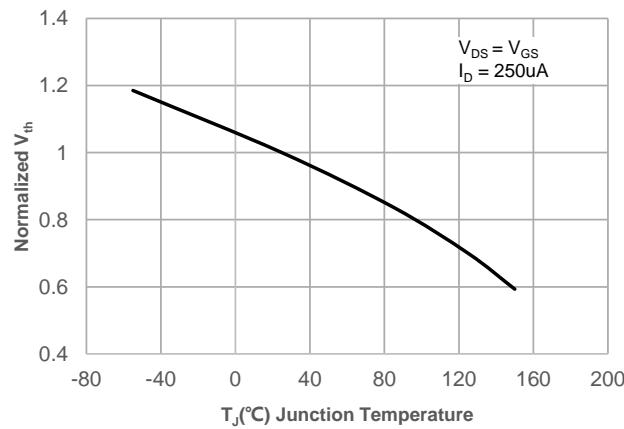


Figure 12: Normalized on Resistance vs. Junction Temperature

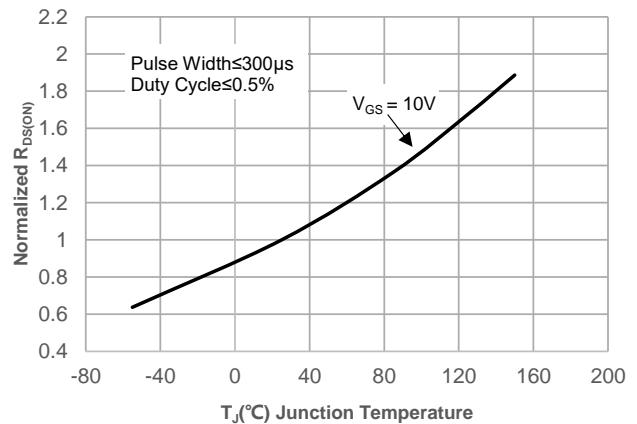


Figure 14:  $R_{DS(ON)}$  vs.  $V_{GS}$

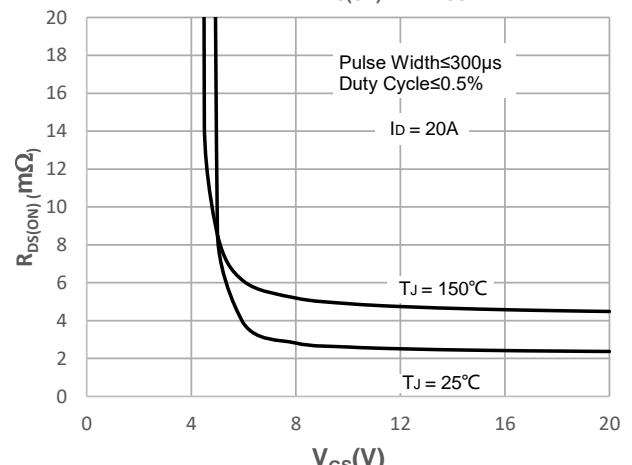
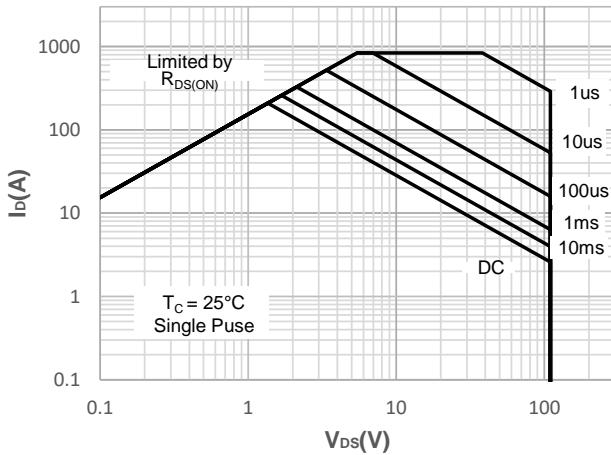
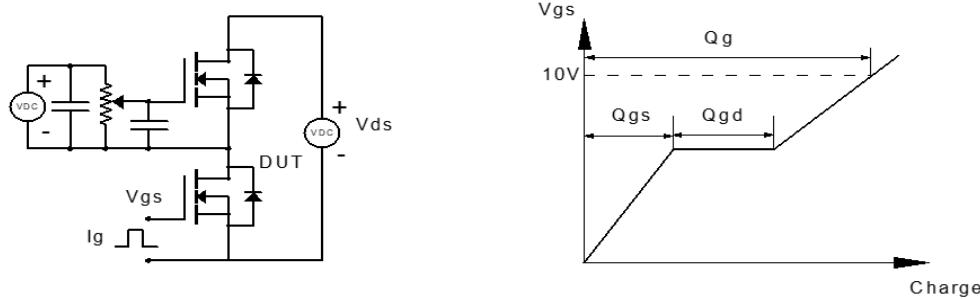


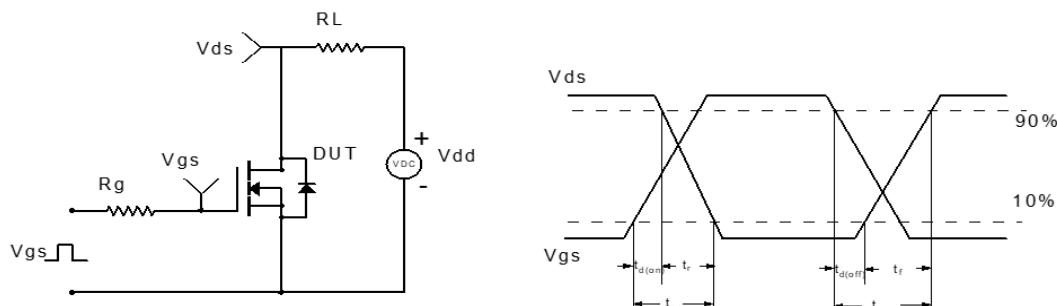
Figure 15: Maximum Safe Operating Area



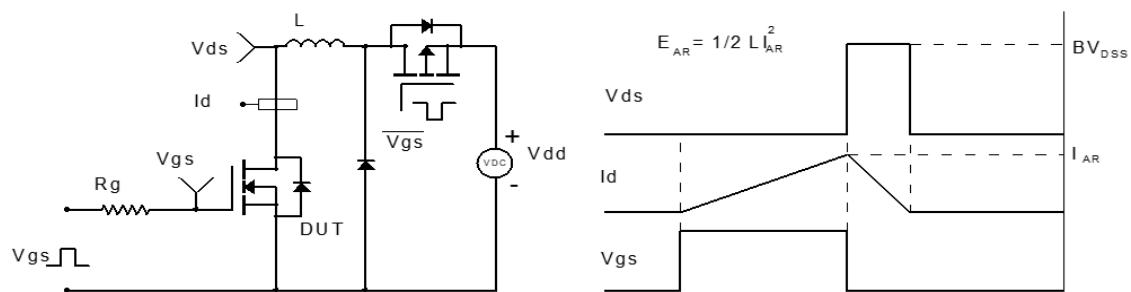
## Test Circuit



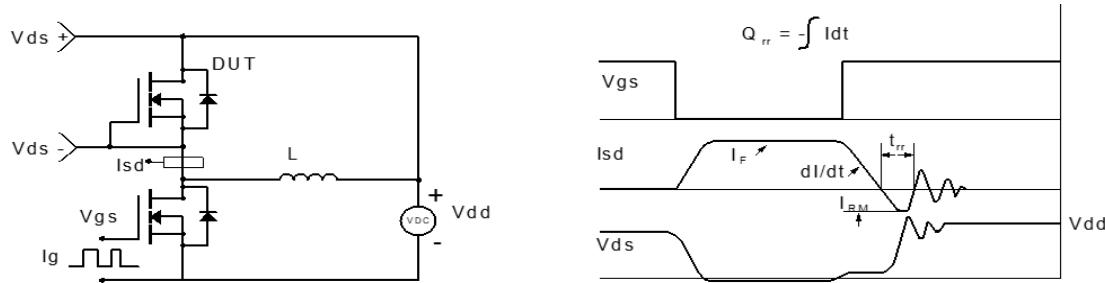
**Figure 1: Gate Charge Test Circuit & Waveform**



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



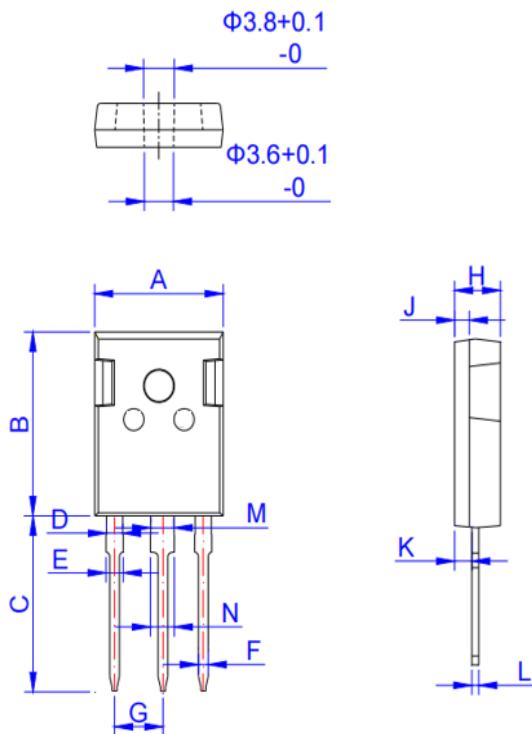
**Figure 3: Unclamped Inductive Switching Test Circuit & Waveform**



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

## Package Mechanical Data(TO-247-3L)

### Package Outline



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.50	15.80	16.10	0.610	0.622	0.634
B	20.80	21.00	21.20	0.819	0.827	0.835
C	19.70	20.00	20.30	0.776	0.787	0.799
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.90	2.10	2.30	0.075	0.083	0.091
F	1.00	1.20	1.40	0.039	0.047	0.055
G	5.25		5.65	0.207		0.222
H	4.80	5.00	5.20	0.189	0.197	0.205
J	1.90	2.00	2.10	0.075	0.079	0.083
K	2.20	2.35	2.50	0.087	0.093	0.098
L	0.41	0.60	0.79	0.016	0.024	0.031
M	2.80	3.00	3.20	0.110	0.118	0.126
N	2.90	3.10	3.30	0.114	0.122	0.130

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