

200V, 100A, 8.6mΩ N-channel Power Strong MOSFET
JMSH2010PCQ
Features

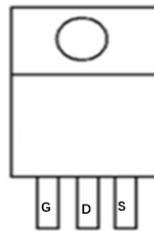
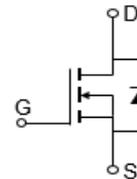
- Ultra-low ON-resistance, $R_{DS(ON)}$
- Low Gate Charge
- High Current Carrying Capability
- Fully Characterized UIS and SOA
- Halogen-free; RoHS-compliant
- AEC-Q101 Qualified

Product Summary

Parameters	Value	Unit
V_{DSS}	200	V
$V_{GS(th_Typ)}$	3.0	V
$I_D(@V_{GS}=10V)$	100	A
$R_{DS(ON_Typ)}(@V_{GS}=10V)$	8.6	mΩ

Applications

- Uninterruptible Power System
- PWM Application
- General Automotive Application


TO-220-3L

Pin Assignment

Schematic Diagram
Ordering Information

Device	Marking	MSL	Form	Package	Tube(pcs)	Per Carton (pcs)
JMSH2010PCQ-U	SH2010PQ	N/A	Tube	TO-220-3L	50	5000

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

Symbol	Parameter	Value	Unit
V_{DS}	Drain-to-Source Voltage	200	V
V_{GS}	Gate-to-Source Voltage	± 20	V
I_D	Continuous Drain Current	$T_C = 25^\circ\text{C}$	100
		$T_C = 100^\circ\text{C}$	71
I_{DM}	Pulsed Drain Current ⁽¹⁾	Refer to Fig.4	A
E_{AS}	Single Pulsed Avalanche Energy	$L = 0.1\text{mH}^{(2)}$	494
		$L = 0.23\text{mH}^{(3)}$	609
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	304
		$T_C = 100^\circ\text{C}$	152
T_J, T_{STG}	Junction & Storage Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Max	Unit
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient ⁽⁴⁾	63	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.5	



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	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 160\text{V}$, $V_{GS} = 0\text{V}$	-	-	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	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	2.1	3.0	3.9	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance ⁽⁵⁾	$V_{GS} = 10\text{V}$, $I_D = 20\text{A}$	-	8.6	11.2	m Ω
Dynamic Characteristics						
R_g	Gate Resistance	$f = 1\text{MHz}$	-	4.6	-	Ω
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$, $V_{DS} = 100\text{V}$, $f = 1\text{MHz}$	6277	8788	11864	pF
C_{oss}	Output Capacitance		325	455	615	pF
C_{rss}	Reverse Transfer Capacitance		12	17	23	pF
Q_g	Total Gate Charge	$V_{GS} = 0$ to 10V $V_{DS} = 100\text{V}$, $I_D = 20\text{A}$	43	60	81	nC
Q_{gs}	Gate Source Charge		15	22	29	nC
Q_{gd}	Gate Drain ("Miller") Charge		10	15	20	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}$, $V_{DD} = 100\text{V}$ $I_D = 20\text{A}$, $R_{GEN} = 2.7\Omega$	-	13.6	-	ns
t_r	Turn-On Rise Time		-	37	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	67	-	ns
t_f	Turn-Off Fall Time		-	30	-	ns
Body Diode Characteristics						
I_S	Maximum Continuous Body Diode Forward Current		-	-	100	A
I_{SM}	Maximum Pulsed Body Diode Forward Current		-	-	399	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	$I_F = 20\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$	140	196	265	ns
Q_{rr}	Body Diode Reverse Recovery Charge		-	702	-	nC

- Notes:
1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
 2. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 100\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 0.1\text{mH}$, $I_{AS} = 99.4\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 3. E_{AS} condition: Starting $T_J = 25^\circ\text{C}$, $V_{DD} = 100\text{V}$, $V_{GS} = 10\text{V}$, $R_G = 25\text{ohm}$, $L = 0.23\text{mH}$, $I_{AS} = 72.8\text{A}$, $V_{DD} = 0\text{V}$ during time in avalanche.
 4. $R_{\theta JA}$ is measured with the device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.
 5. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$.

Typical Performance Characteristics

Figure 1: Power De-rating

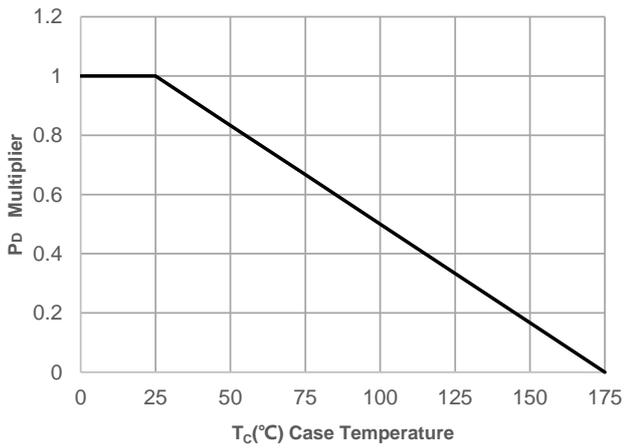


Figure 2: Current De-rating

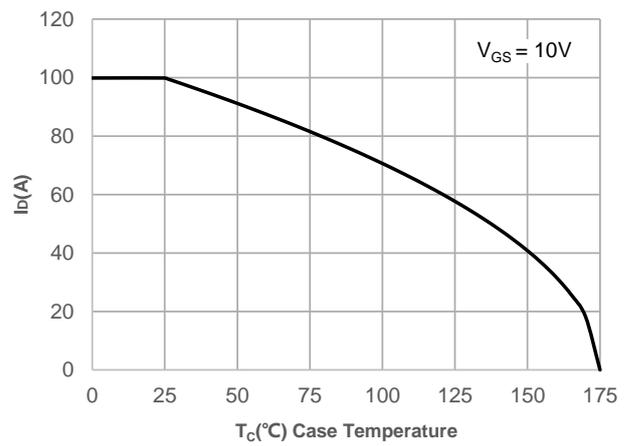


Figure 3: Normalized Maximum Transient Thermal Impedance

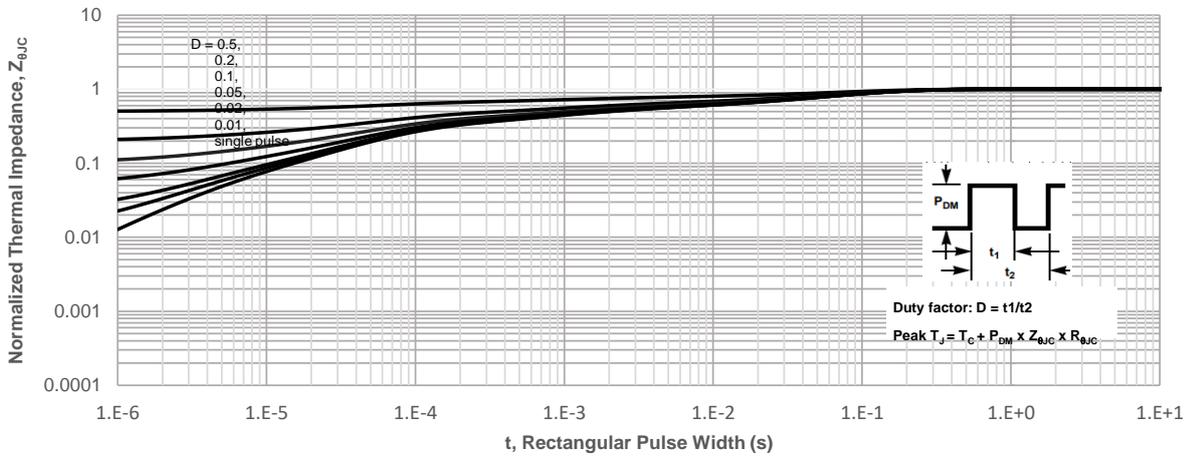
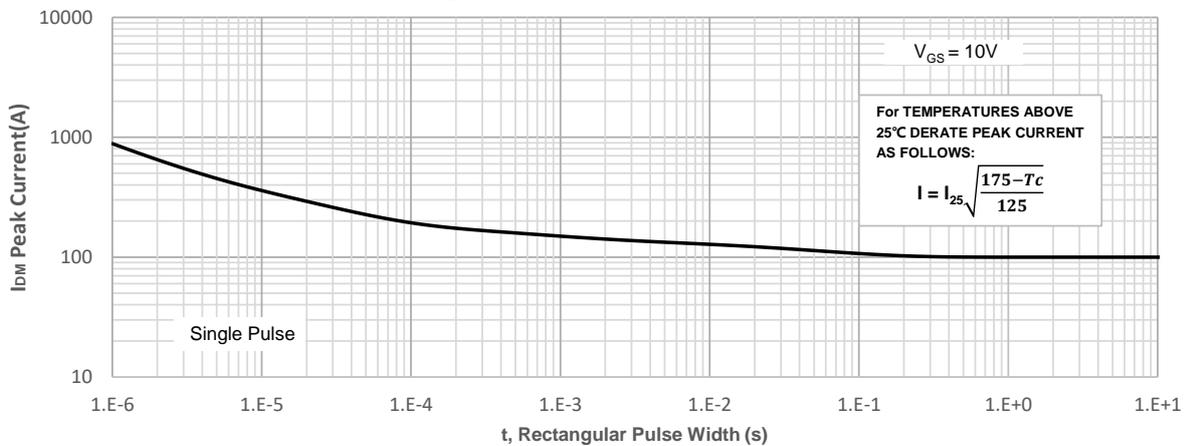
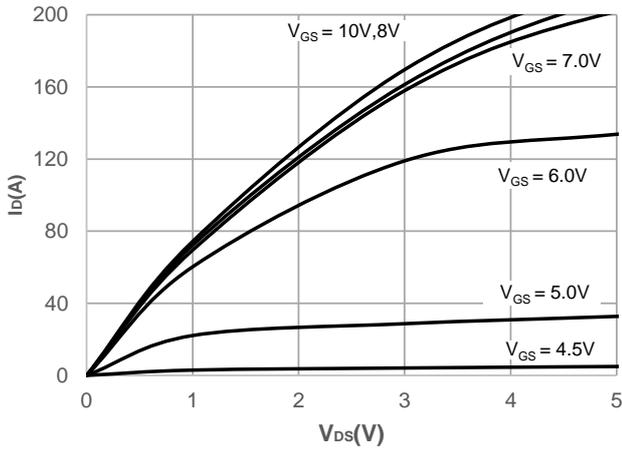
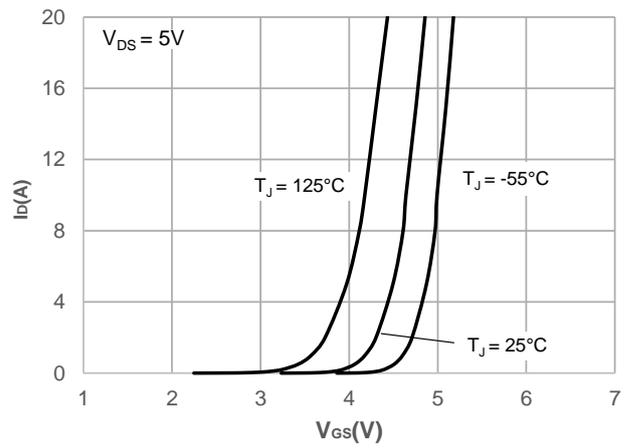
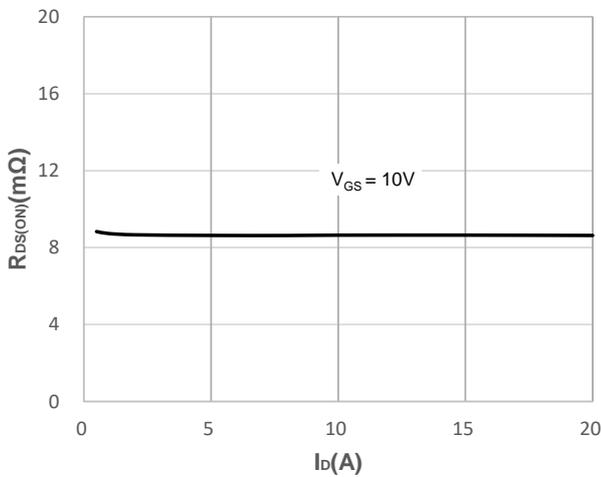
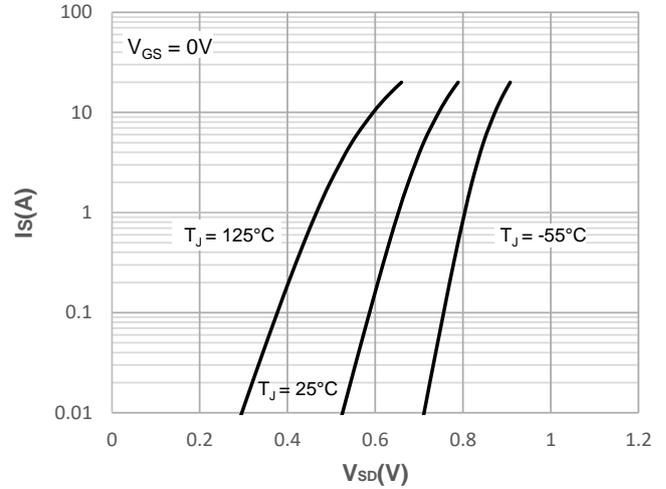
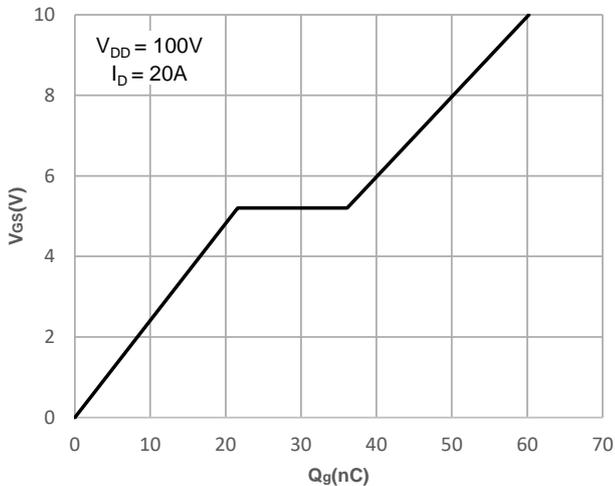
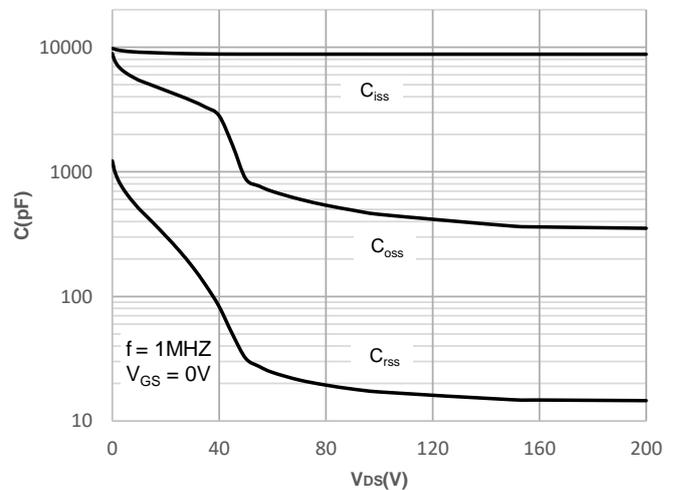


Figure 4: Peak Current Capacity



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

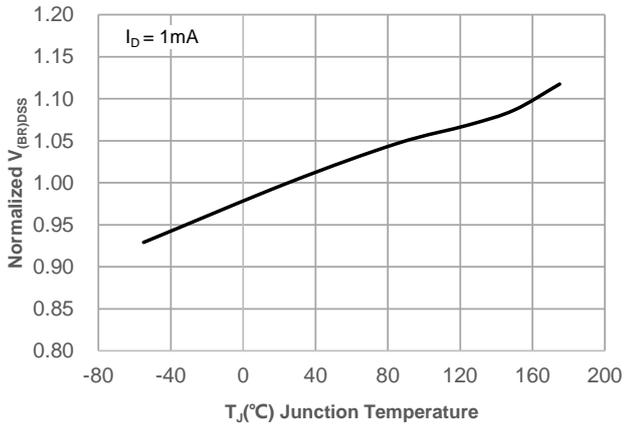


Figure 12: Normalized on Resistance vs. Junction Temperature

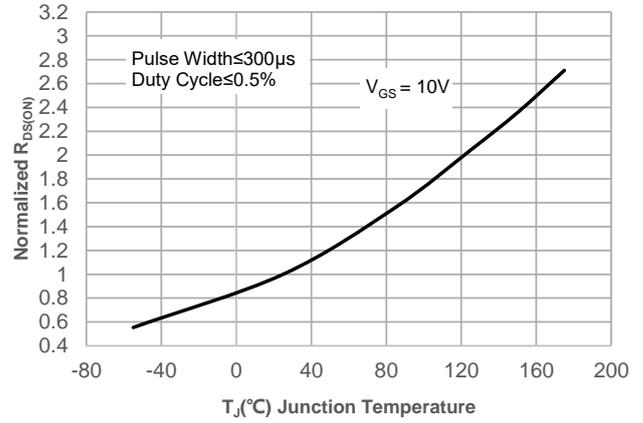


Figure 13: Normalized Threshold Voltage vs. Junction Temperature

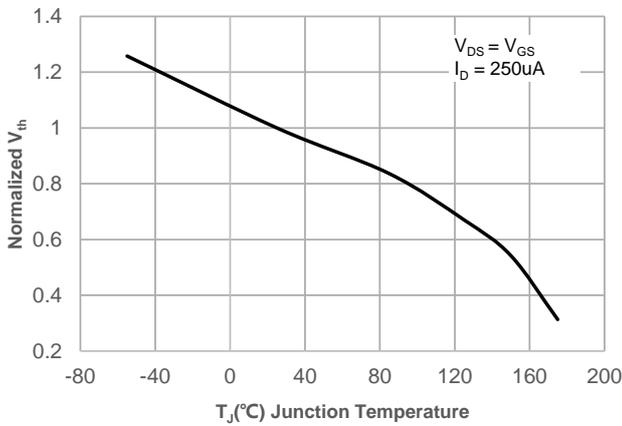


Figure 14: $R_{DS(ON)}$ vs. V_{GS}

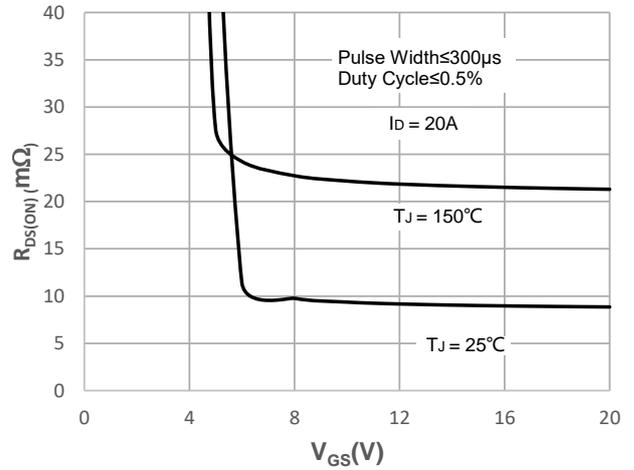
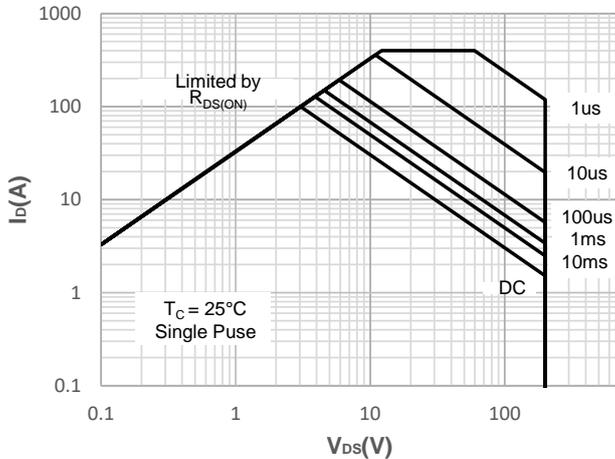


Figure 15: Maximum Safe Operating Area



Test Circuit

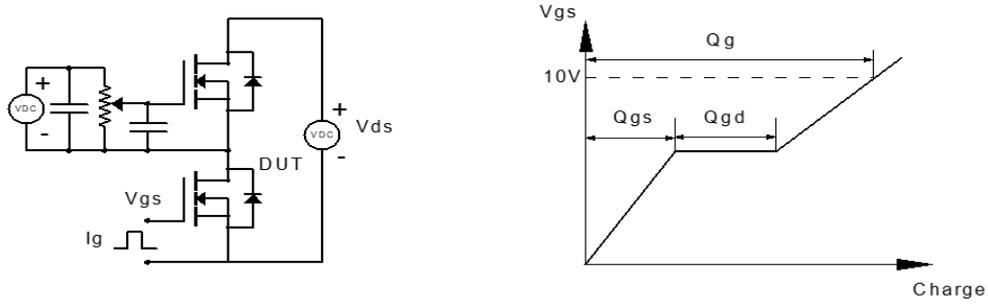


Figure 1: Gate Charge Test Circuit & Waveform

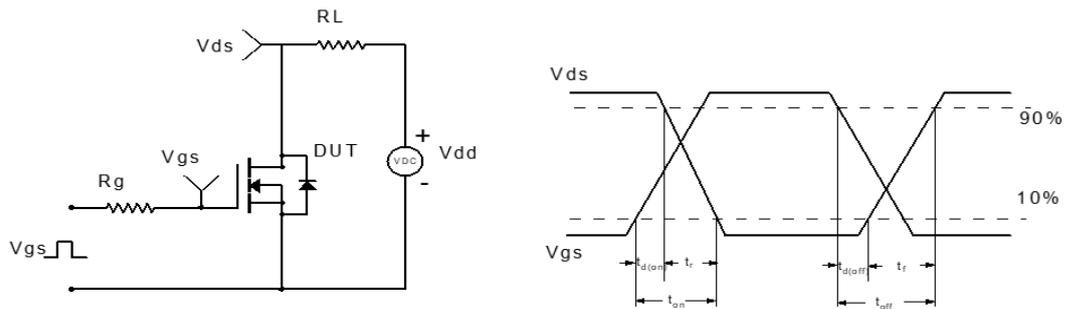


Figure 2: Resistive Switching Test Circuit & Waveform

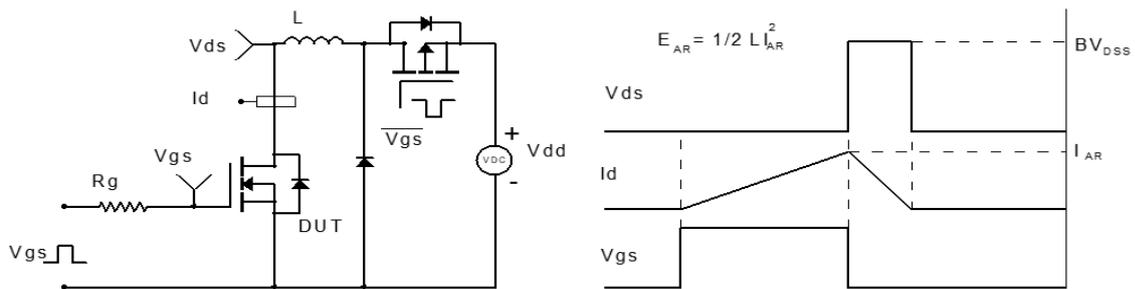


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

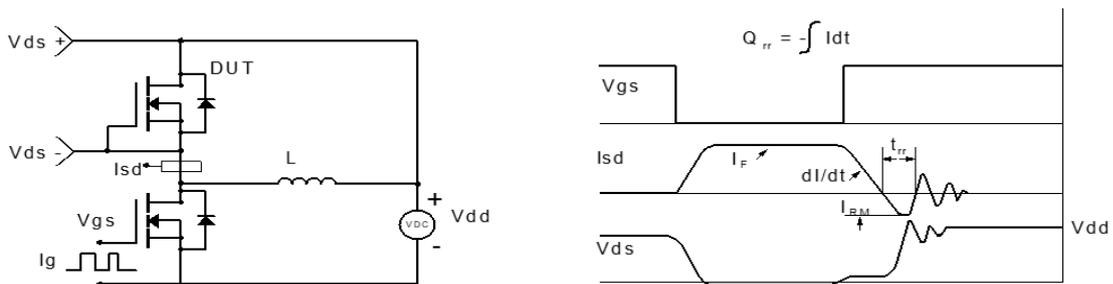
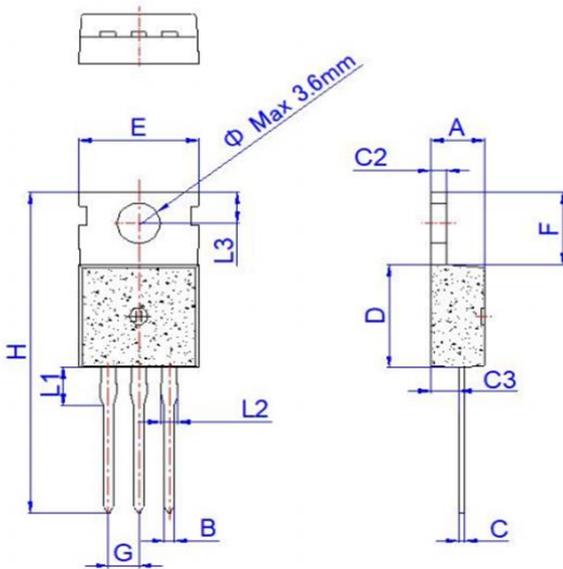


Figure 4: Diode Recovery Test Circuit & Waveform



Package Mechanical Data(TO-220-3L)

Package Outline



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.173		0.181
B	0.70		0.90	0.028		0.035
C	0.45		0.60	0.018		0.024
C2	1.23		1.32	0.048		0.052
C3	2.20		2.60	0.087		0.102
D	8.90		9.90	0.350		0.390
E	9.90		10.3	0.390		0.406
F	6.30		6.90	0.248		0.272
G		2.54			0.1	
H	28.0		29.8	1.102		1.173
L1		3.39			0.133	
L2	1.14		1.70	0.045		0.067
L3	2.65		2.95	0.104		0.116
Φ		3.6			0.142	

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