

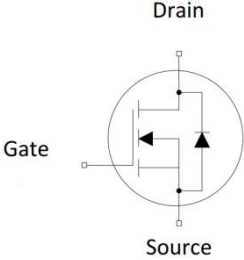


**60V N-Channel DTMOS**

General Description <ul style="list-style-type: none"> ● Trench Power SGT technology ● Very low on-resistance $R_{DS(ON)}$ ● Low Gate Charge ● Excellent Gate Charge x $R_{DS(ON)}$ Product Applications <ul style="list-style-type: none"> ● High Frequency Switching and Synchronous Rectification 		Product Summary <table> <tr> <td>V_{DS}</td> <td>60V</td> </tr> <tr> <td>ID (at VGS=10V)</td> <td>70A</td> </tr> <tr> <td>RDS(ON) (at VGS=10V)</td> <td>< 3mΩ</td> </tr> <tr> <td colspan="2">100% UIS Tested</td> </tr> </table> 		V_{DS}	60V	ID (at VGS=10V)	70A	RDS(ON) (at VGS=10V)	< 3m Ω	100% UIS Tested	
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ID (at VGS=10V)	70A										
RDS(ON) (at VGS=10V)	< 3m Ω										
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 TO-220FP-NL G D S		 Drain Gate Source									
Device	Package	Form	Marking								
TSR15N06A	TO-220FP-NL	Tube	R15N06A								

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

Parameter	Symbol	Maximum	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	70
		$T_C = 100^\circ\text{C}$	56
Pulsed Drain Current ^A	I_{DM}	280	A
Avalanche Current ^A	I_{AS}	28	A
Single Pulse Avalanche Energy ^A	E_{AS}	609	mJ
Power Dissipation ^C	P_D	$T_C = 25^\circ\text{C}$	32.9
		$T_C = 100^\circ\text{C}$	13.2
Operating Junction and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Maximum	Units
Maximum Junction-to-Case	R_{thJC}	3.8	$^\circ\text{C}/\text{W}$
Maximum Junction-to-Ambient	R_{thJA}	60	



Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted)							
Symbol	Parameter	Conditions	Value			Units	
			Min	Typ	Max		
STATIC PARAMETERS							
BV_{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	$V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$	$T_J = 25^\circ\text{C}$	--	--	1	μA
			$T_J = 100^\circ\text{C}$	--	--	100	
I_{GSS}	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	--		± 100	nA	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	2	3	4	V	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}, I_D = 50\text{A}$	--	2.5	3	$\text{m}\Omega$	
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{V}, I_D = 50\text{A}$	--	140	--	S	
V_{SD}	Diode Forward Voltage	$I_S = 50\text{A}, V_{GS} = 0\text{V}$	--	--	1	V	
I_S	Maximum Body-Diode Continuous Current ^B		--	--	50	A	
DYNAMIC PARAMETERS							
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$	--	7700	--	pF	
C_{oss}	Output Capacitance		--	667	--		
C_{rss}	Reverse Transfer Capacitance		--	66	--		
SWITCHING PARAMETERS							
$Q_g(10\text{V})$	Total Gate Charge	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 50\text{A}$	--	138	--	nC	
Q_{gs}	Gate Source Charge		--	37	--		
Q_{gd}	Gate Drain Charge		--	35.5	--		
$t_{D(on)}$	Turn-On Delay Time	$V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 50\text{A}, R_G = 3\Omega$	--	35	--	ns	
t_r	Turn-On Rise Time		--	22	--		
$T_{D(off)}$	Turn-Off Delay Time		--	105	--		
t_f	Turn-Off Fall Time		--	45	--		
t_{rr}	Body Diode Reverse Recovery Time	$I_F = 50\text{A}, di/dt = 500\text{A}/\mu\text{s}$	--	50	--	ns	
Q_{rr}	Body Diode Reverse Recovery Charge		--	110	--	nC	

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

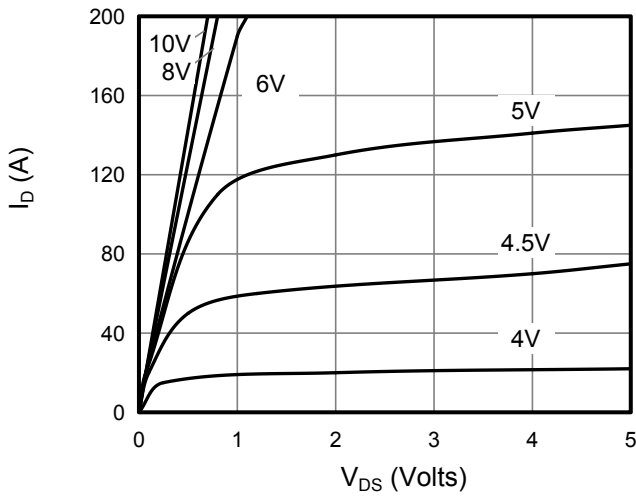


Figure 1: On-Region Characteristics

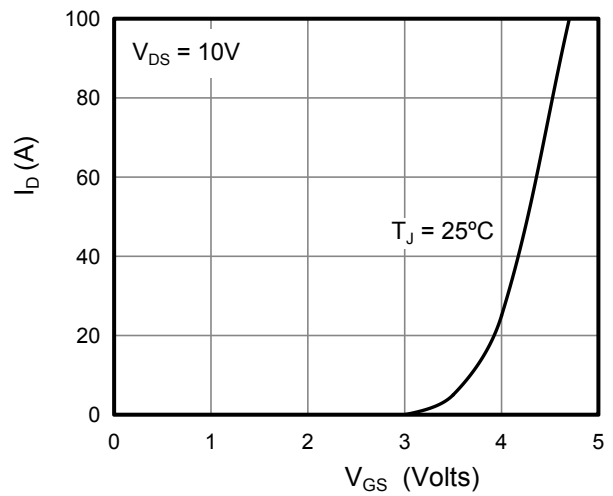


Figure 2: Transfer Characteristics

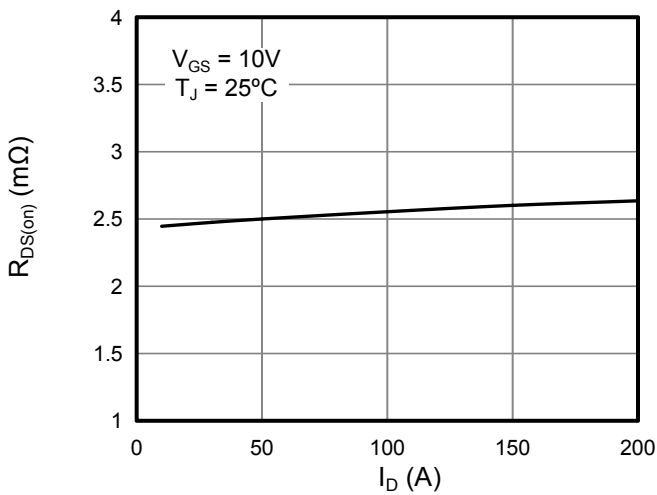


Figure 3: On-Resistance vs. Drain Current

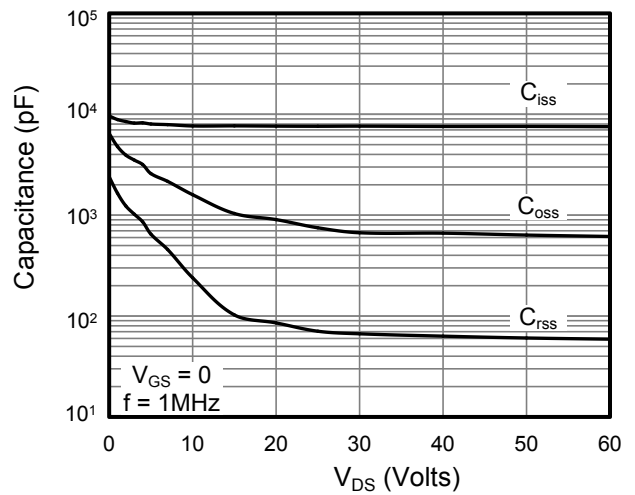


Figure 4: Capacitance Characteristics

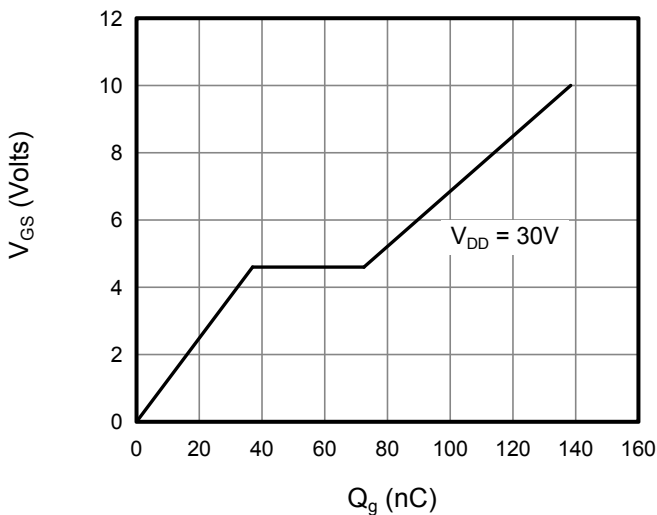


Figure 5: Gate Charge Characteristics

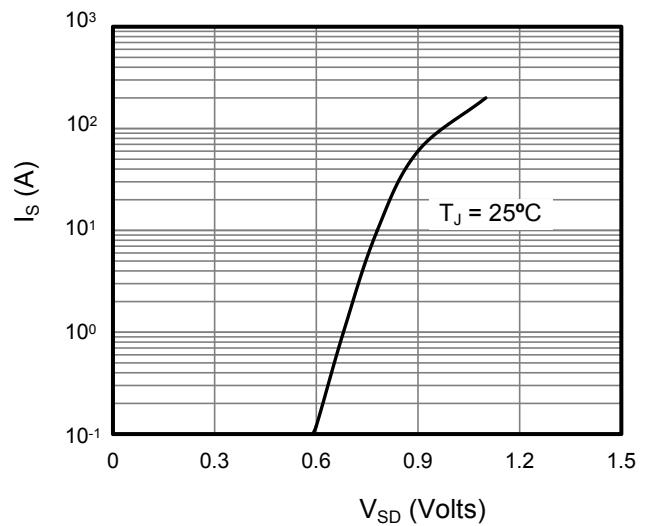


Figure 6: Body Diode Forward Voltage



Typical Characteristics $T_j = 25^\circ\text{C}$, unless otherwise noted

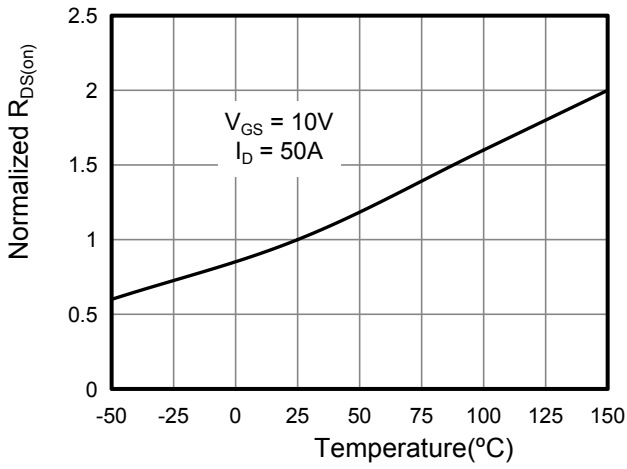


Figure 7: On-Resistance vs. Junction Temperature

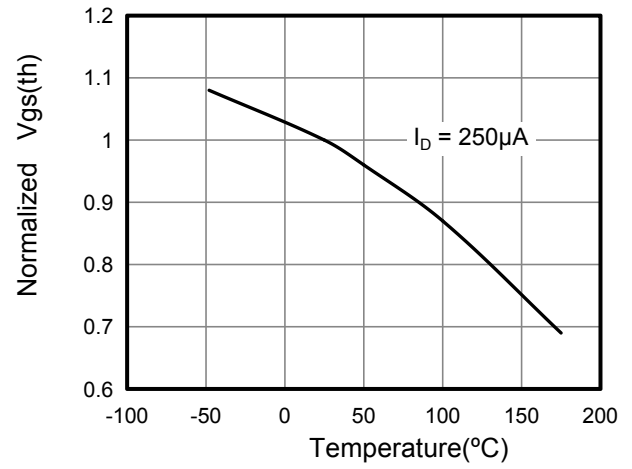


Figure 8: $V_{GS(th)}$ vs. Junction Temperature

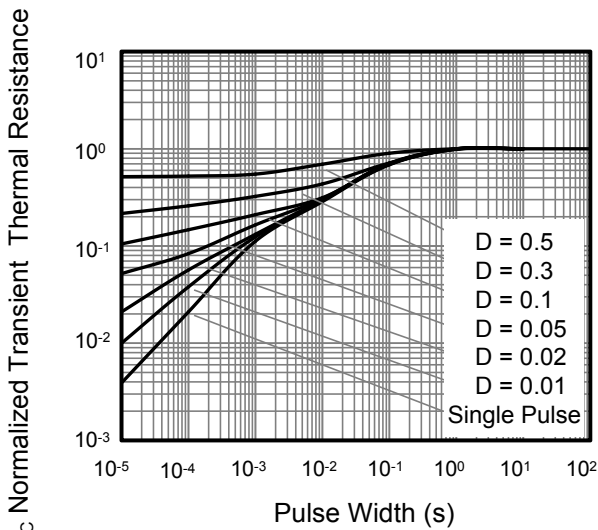


Figure 9: Normalized Transient Thermal Resistance

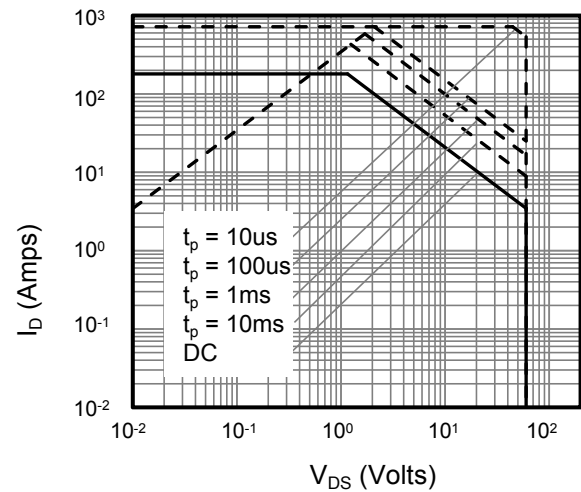


Figure 10: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveform

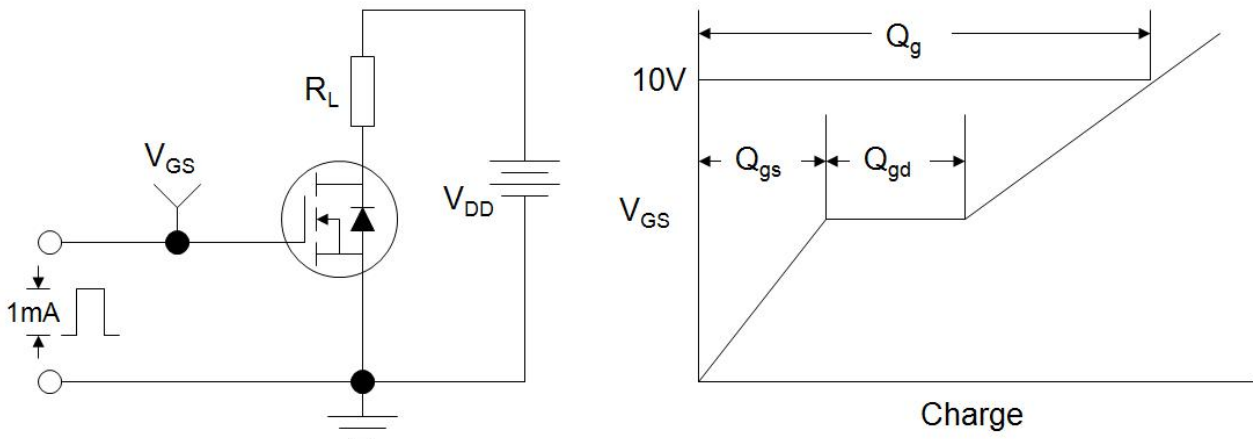


Figure B: Resistive Switching Test Circuit and Waveform

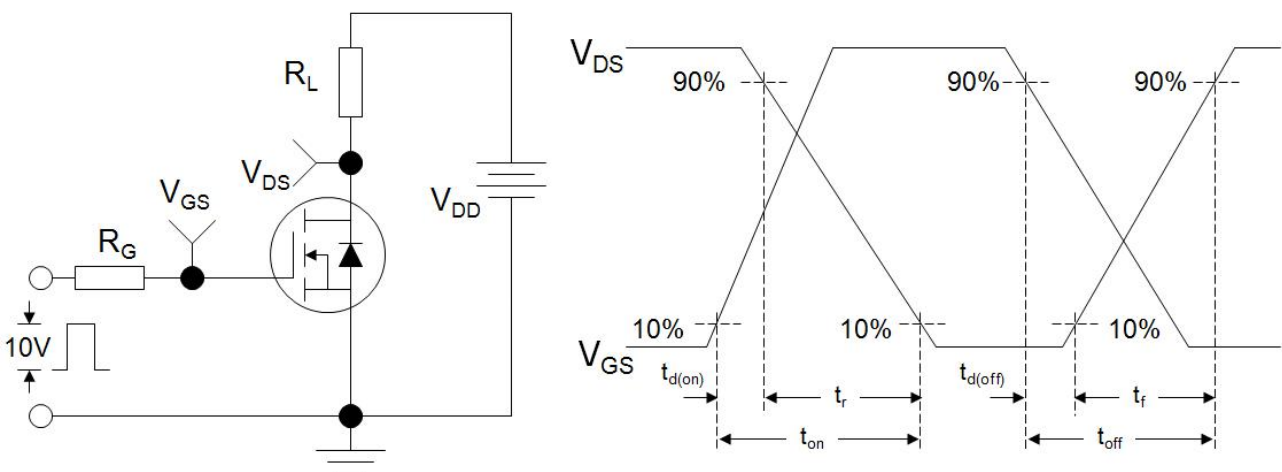
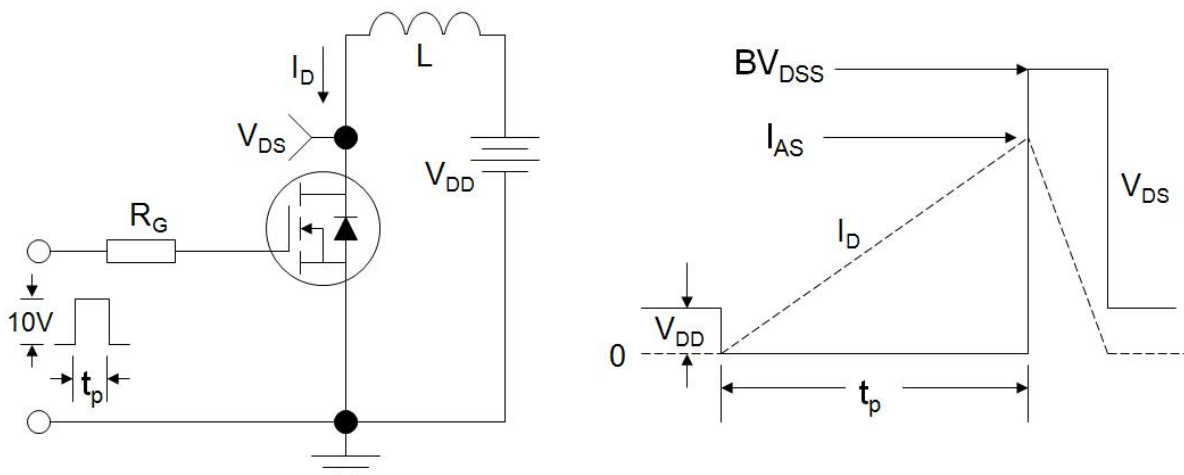
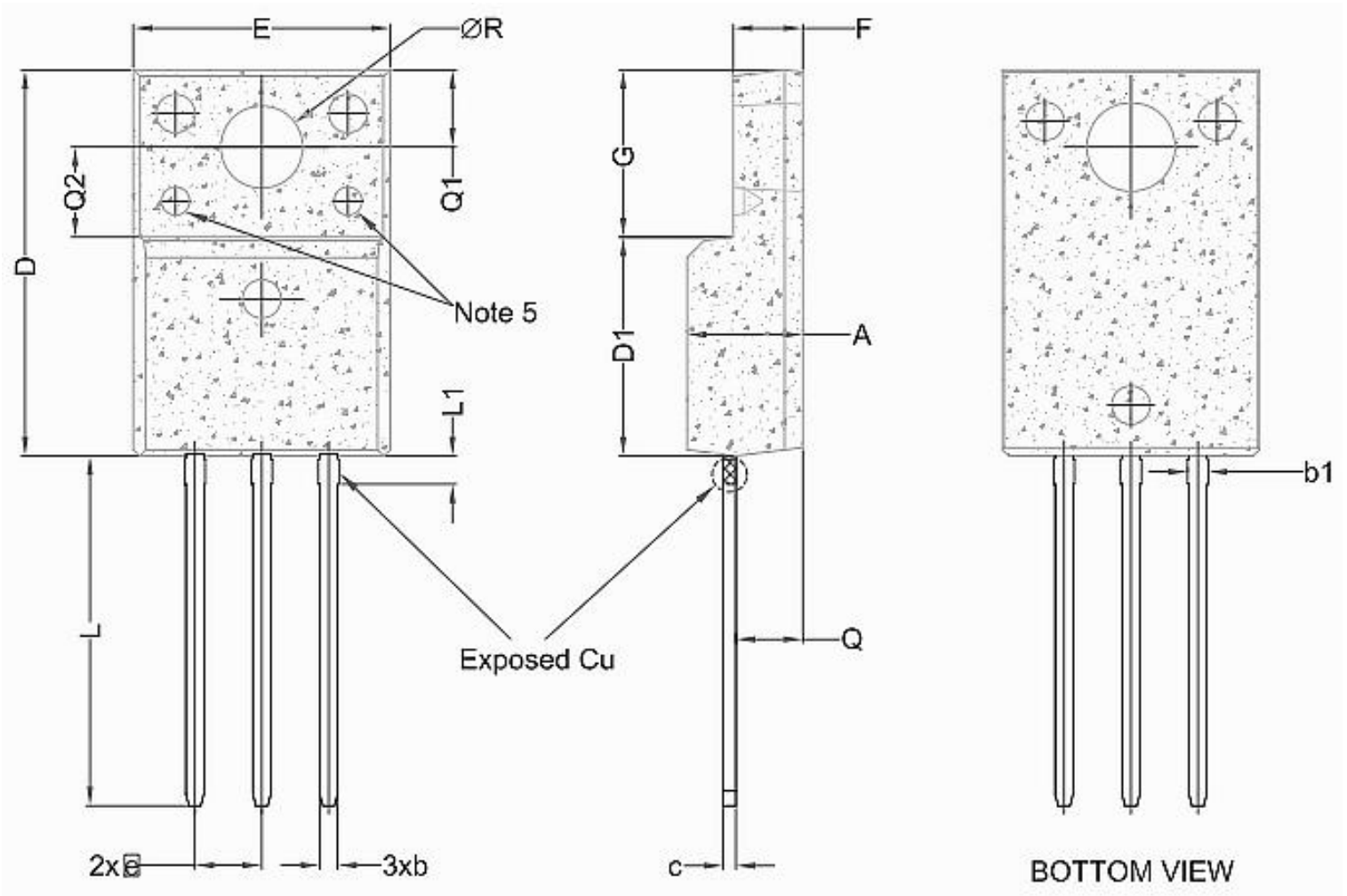


Figure C: Unclamped Inductive Switching Test Circuit and Waveform





TO-220FP-NL (封装厂 M)



Unit:mm				Unit:mm			
Symbol	Min.	Nom	Max.	Symbol	Min.	Nom	Max.
A	4.30	4.50	4.70	F	2.50	2.70	2.90
b	0.60	0.70	0.80	G	6.30	6.50	6.70
b1	0.60	0.80	0.90	L	13.40	13.60	13.80
c	0.45	0.50	0.60	L1	1.00	1.10	1.20
D	14.70	15.00	15.30	Q	2.50	2.60	2.70
D1	8.50 REF			Q1	2.90	3.00	3.10
e	2.60BSC			Q2	3.50 REF		
E	9.70	10.00	10.30	ΦR	3.00	3.20	3.40



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