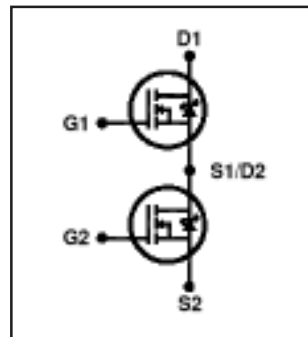


# IRFI4024H-117P

## Features

- Integrated half-bridge package
- Reduces the part count by half
- Facilitates better PCB layout
- Key parameters optimized for Class-D audio amplifier applications
- Low  $R_{DS(ON)}$  for improved efficiency
- Low  $Q_g$  and  $Q_{sw}$  for better THD and improved efficiency
- Low  $Q_{rr}$  for better THD and lower EMI
- Can delivery up to 100W per channel into 6Ω load in full-bridge configuration amplifier
- Lead-free package

Key Parameters ⑤		
$V_{DS}$	55	V
$R_{DS(ON)}$ typ. @ 10V	48	mΩ
$Q_g$ typ.	8.9	nC
$Q_{sw}$ typ.	4.3	nC
$R_{G(int)}$ typ.	2.3	Ω
$T_J$ max	150	°C



G1, G2	D1, D2	S1, S2
Gate	Drain	Source

## Description

This Digital Audio MosFET Half-Bridge is specifically designed for Class D audio amplifier applications. It consists of two power MosFET switches connected in half-bridge configuration. The latest process is used to achieve low on-resistance per silicon area. Furthermore, Gate charge, body-diode reverse recovery, and internal Gate resistance are optimized to improve key Class D audio amplifier performance factors such as efficiency, THD and EMI. These combine to make this Half-Bridge a highly efficient, robust and reliable device for Class D audio amplifier applications.

## Absolute Maximum Ratings ⑤

	Parameter	Max.	Units
$V_{DS}$	Drain-to-Source Voltage	55	V
$V_{GS}$	Gate-to-Source Voltage	±20	
$I_D$ @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	11	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	6.9	
$I_{DM}$	Pulsed Drain Current ①	44	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	14	W
$P_D$ @ $T_C = 100^\circ\text{C}$	Power Dissipation	5.4	
	Linear Derating Factor	0.11	W/°C
$E_{AS}$	Single Pulse Avalanche Energy②	7.4	mJ
$T_J$	Operating Junction and	-55 to +150	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

## Thermal Resistance ⑤

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	9.21	°C/W
$R_{\theta JA}$	Junction-to-Ambient (free air)	—	65	

## Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified) ⑤

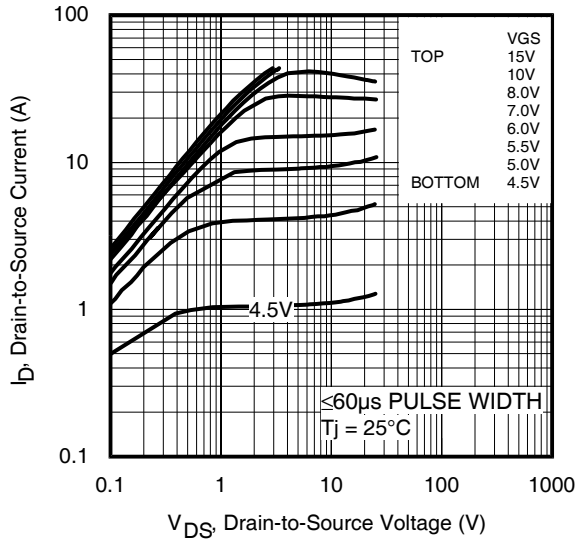
	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{DSS}$	Drain-to-Source Breakdown Voltage	55	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	54	—	mV/°C	Reference to $25^\circ\text{C}, I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	48	60	mΩ	$V_{GS} = 10V, I_D = 7.7A$ ③
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 25\mu A$
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-9.17	—	mV/°C	
$I_{DSS}$	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 55V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
$I_{GSS}$	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{GS} = -20V$
$g_{fs}$	Forward Transconductance	6.5	—	—	S	$V_{DS} = 25V, I_D = 7.7A$
$Q_g$	Total Gate Charge	—	8.9	13	nC	$V_{DS} = 44V$ $V_{GS} = 10V$ $I_D = 7.7A$ See Fig. 6 and 15
$Q_{gs1}$	Pre-Vth Gate-to-Source Charge	—	1.6	—		
$Q_{gs2}$	Post-Vth Gate-to-Source Charge	—	0.77	—		
$Q_{gd}$	Gate-to-Drain Charge	—	3.5	—		
$Q_{godr}$	Gate Charge Overdrive	—	3.0	—		
$Q_{sw}$	Switch Charge ( $Q_{gs2} + Q_{gd}$ )	—	4.3	—		
$R_{G(int)}$	Internal Gate Resistance	—	2.3	—	Ω	
$t_{d(on)}$	Turn-On Delay Time	—	5.9	—	ns	$V_{DD} = 28V, V_{GS} = 10V$ ③ $I_D = 7.7A$ $R_G = 2.5\Omega$
$t_r$	Rise Time	—	2.0	—		
$t_{d(off)}$	Turn-Off Delay Time	—	13	—		
$t_f$	Fall Time	—	3.4	—		
$C_{iss}$	Input Capacitance	—	320	—	pF	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1.0\text{MHz}$ , See Fig. 5
$C_{oss}$	Output Capacitance	—	47	—		
$C_{rss}$	Reverse Transfer Capacitance	—	31	—		
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
$L_S$	Internal Source Inductance	—	7.5	—		

## Diode Characteristics ⑤

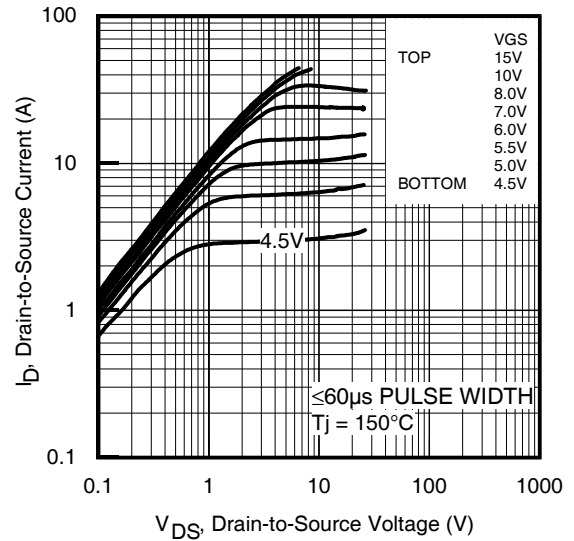
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S @ T_C = 25^\circ\text{C}$	Continuous Source Current (Body Diode)	—	—	11	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	44		
$V_{SD}$	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 7.7A, V_{GS} = 0V$ ③
$t_{rr}$	Reverse Recovery Time	—	17	26	ns	$T_J = 25^\circ\text{C}, I_F = 7.7A$
$Q_{rr}$	Reverse Recovery Charge	—	11	17	nC	$di/dt = 100A/\mu s$ ③

### Notes:

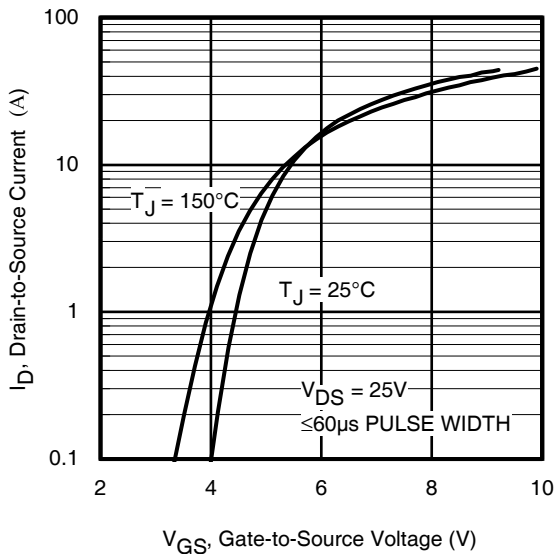
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.25\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 7.7A$ .
- ③ Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .
- ④  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ⑤ Specifications refer to single MosFET.



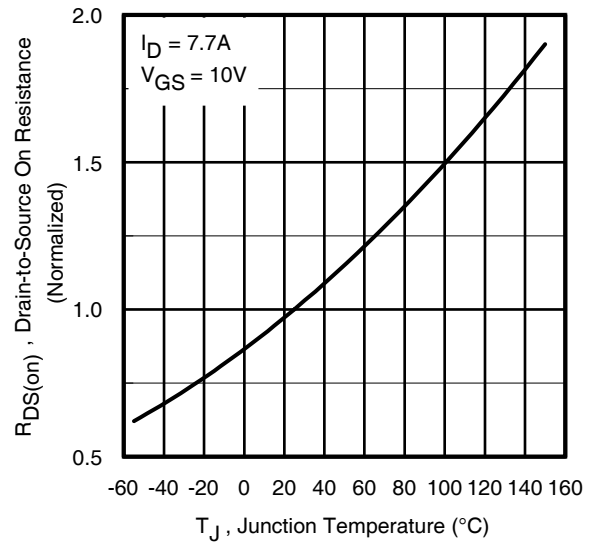
**Fig 1.** Typical Output Characteristics



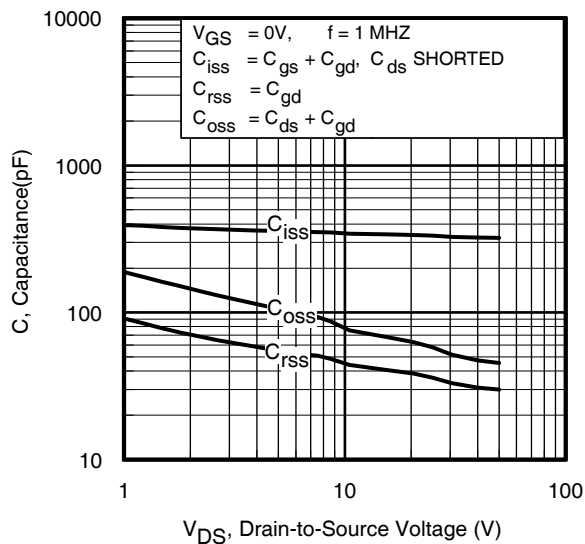
**Fig 2.** Typical Output Characteristics



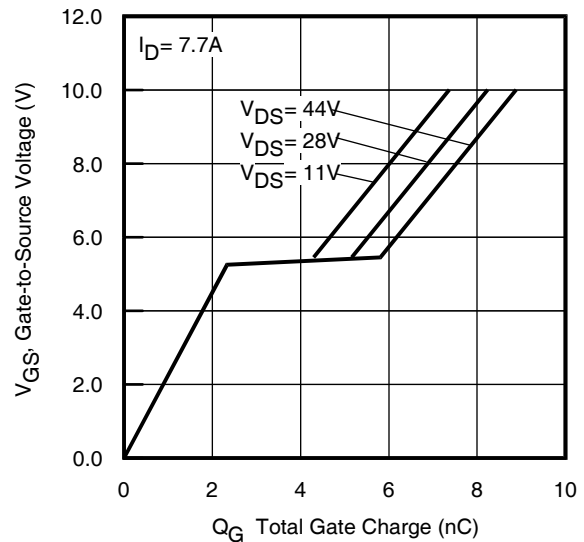
**Fig 3.** Typical Transfer Characteristics



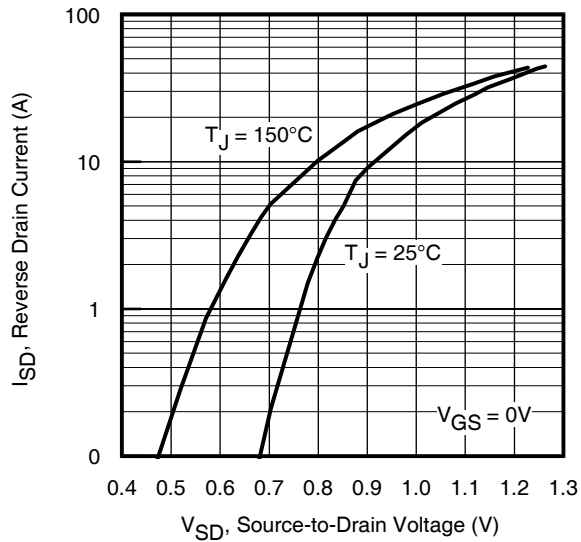
**Fig 4.** Normalized On-Resistance vs. Temperature



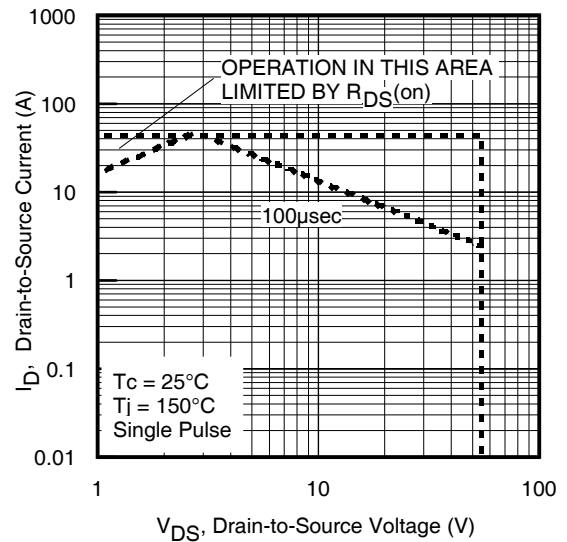
**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage  
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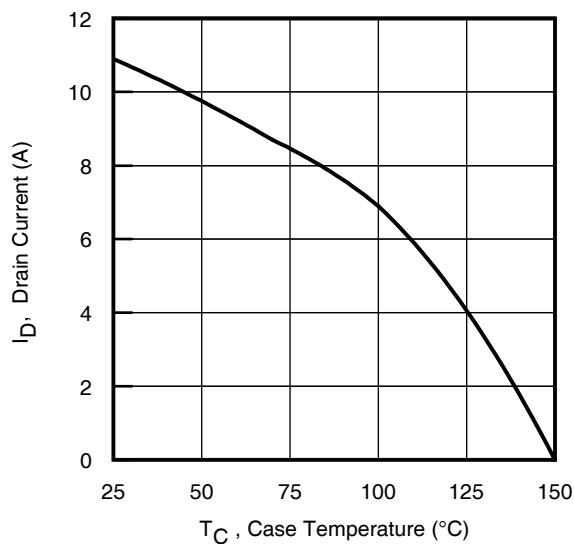
**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage



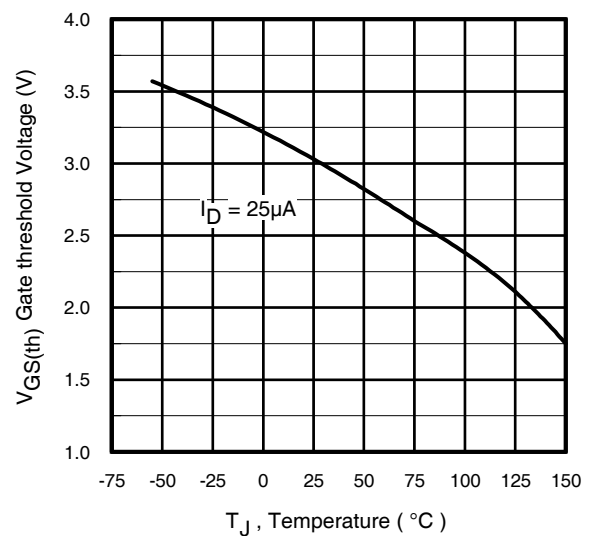
**Fig 7.** Typical Source-Drain Diode Forward Voltage



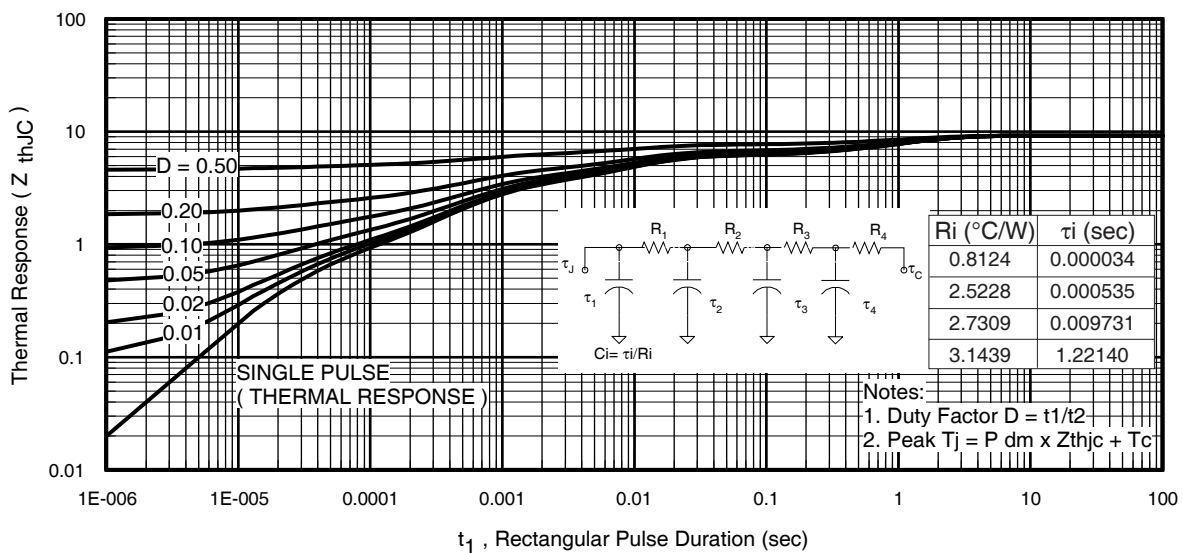
**Fig 8.** Maximum Safe Operating Area



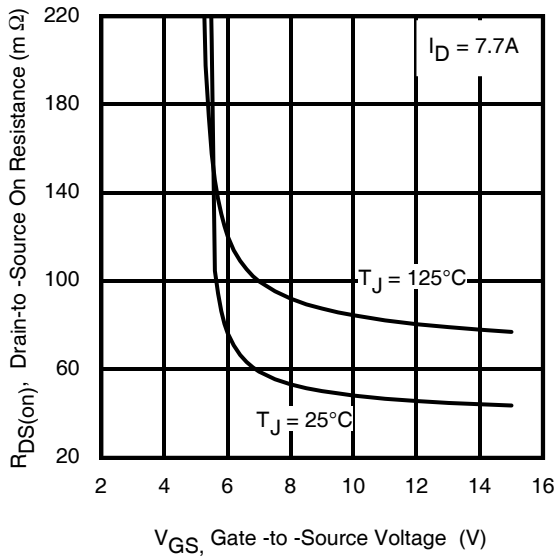
**Fig 9.** Maximum Drain Current vs. Case Temperature



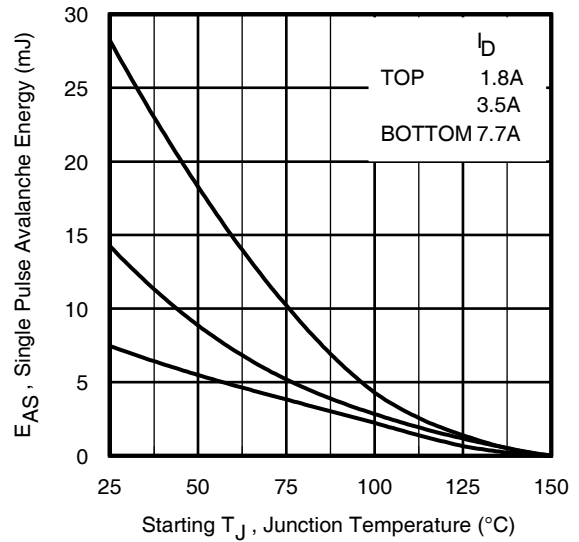
**Fig 10.** Threshold Voltage vs. Temperature



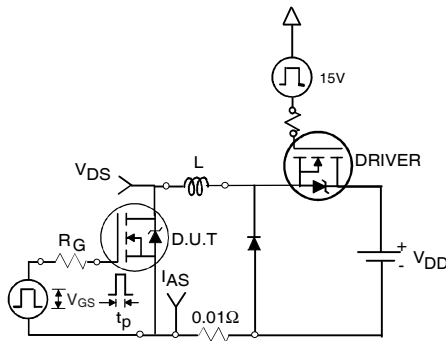
**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Case



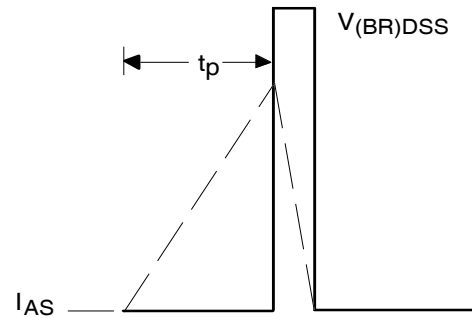
**Fig 12.** On-Resistance vs. Gate Voltage



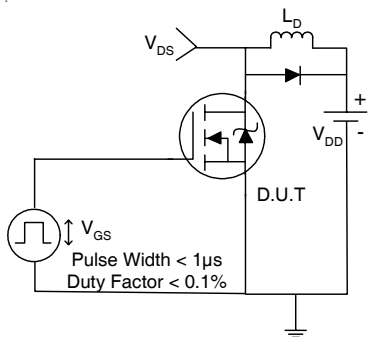
**Fig 13a.** Maximum Avalanche Energy vs. Drain Current



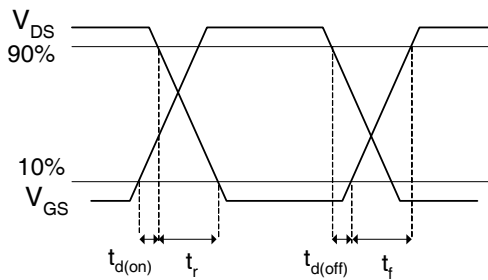
**Fig 13b.** Unclamped Inductive Test Circuit



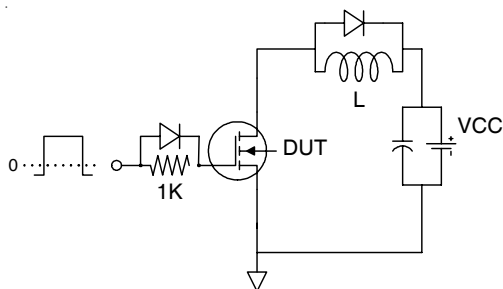
**Fig 13c.** Unclamped Inductive Waveforms



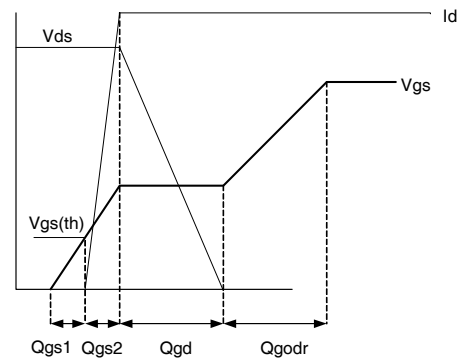
**Fig 14a.** Switching Time Test Circuit



**Fig 14b.** Switching Time Waveforms



**Fig 15a.** Gate Charge Test Circuit



**Fig 15b** Gate Charge Waveform



Note: For the most current drawings please refer to the IR website at:  
<http://www.irf.com/package/>