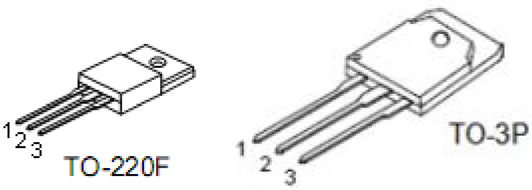
1. Features

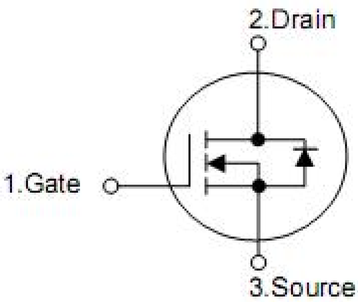
- Advanced Planar Process
- $R_{DS(ON),(typ.)}$=170mΩ@V_{GS}=10V
- Low Gate Charge Minimize Switching Loss
- Rugged Poly silicon Gate Structure

2. Features

- BLDC Motor Driver
- Electric Welder
- High Efficiency SMPS

3. Pin configuration





Pin	Function
1	Gate
2	Drain
3	Source

4. Ordering Information

Part Number	Package	Brand
KNF7650A	TO-220F	KIA
KNH7650A	TO-3P	KIA

5. Absolute maximum ratings

TC=25 ºC unless otherwise specified

Parameter	Symbol	Ratings		Unit
		To-220F	TO-3P	
Drain-to-Source Voltage	V_{DSS}	500		V
Gate-to-Source Voltage	V_{GSS}	±30		
Continuous Drain Current	I_D	25		A
Continuous Drain Current @ Tc=100 ºC		16		
Pulsed Drain Current at V_{GS}=10V [2,4]	I_{DM}	100		
Single Pulse Avalanche Energy	E_{AS}	1800		mJ
Peak Diode Recovery dv/dt[3]	dv/dt	5.0		
Power Dissipation	P_D	105	290	W
Derating Factor above 25 ºC		0.84	2.33	W/ ºC
Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	T_L T_{PAK}	300 260		ºC
Operating and Storage Temperature Range	T_J& T_{STG}	-55 to 150		

Caution: Stresses greater than those listed in the "Absolute Maximum Ratings" may cause permanent damage to the device.

6. Thermal characteristics

Parameter	Symbol	Ratings		Units
		To-220F	TO-3P	
Thermal resistance, junction-ambient	$R_{θJA}$	100	-	ºC/W
Thermal resistance, Junction-case	$R_{θJC}$	1.19	0.43	

7. Electrical characteristics

(T_J=25°C,unless otherwise notes)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Off characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V,I_D=250μA	500	-	-	V
Drain-to-source Leakage Current	I_{DSS}	V_{DS}=500V ,V_{GS}=0V	-	-	1	μA
		V_{DS}=400V , V_{GS}=0V T_C=125ºC,	-	-	125	μA
Gate-body leakage current	I_{GSS}	V_{GS}=30V,V_{DS}=0V	-	-	+100	nA
		V_{GS}=-30V,V_{DS}=0V	-	-	-100	nA
On characteristics						
Static drain-source on-resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=14A	-	170	210	mΩ
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	2.0	-	4.0	V
Forward Transconductance	gfs	V_{DS}=30V,I_D=14A	-	30	-	S
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V, f=1MHz	-	4280	-	pF
Output capacitance	C_{oss}		-	1400	-	pF
Reverse transfer capacitance	C_{rss}		-	185	-	pF
Total gate charge						
Turn-on delay time	$t_{d(on)}$	V_{DD}=250V,I_D=14A, V_{GS}=10V,R_G=10Ω	-	24	-	ns
Rise time	t_r		-	40	-	ns
Turn-off delay time	$t_{d(off)}$		-	100	-	ns
Fall time	t_f		-	35	-	ns
Total gate charge	Q_g	V_{DS}=250V,I_D=28A , V_{GS}=0 to10V	-	76	-	nC
Gate-source charge	Q_{gs}		-	20	-	nC
Gate-drain charge	Q_{gd}		-	19	-	nC
Drain-source diode characteristics						
Drain-source diode forward voltage	V_{SD}	V_{GS}=0V,I_s=18A	-	-	1.5	V
Continuous drain-source current [2]	I_{SD}	Integral pn-diode In MOSFET	-	-	25	A
Pulsed drain-source current[2]	I_{SM}		-	-	100	A
Reverse recovery time	t_{rr}	V_{GS}=0V,I_F=28A DI_F/dt=100A/μs	-	530	-	ns
Reverse recovery charge	Q_{rr}		-	4.5	-	μC

Note: 1.TJ=+25°C to +150°C
2.Silicon limited current only.
3.Package limited current
4.Repetitive rating; pulse width by maximum junction temperature
5.Pulse width≤380μs; duty cycle≤2%

8. Typical Characteristics

Figure 1. Maximum Transient Thermal Impedance

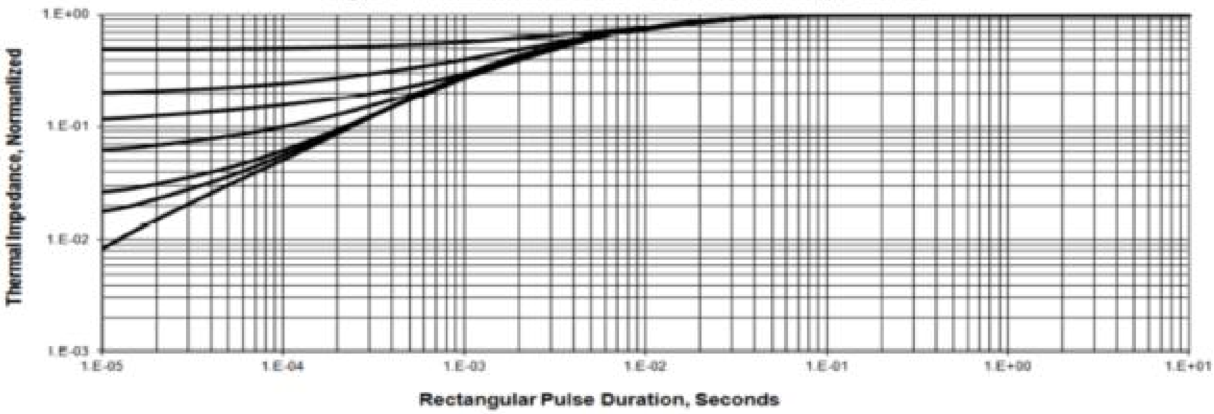


Figure 2 . Max. Power Dissipation vs Case Temperature

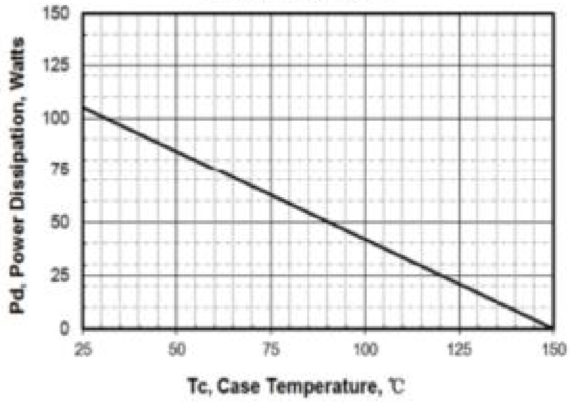


Figure 3 .Maximum Continuous Drain Current vs Tc

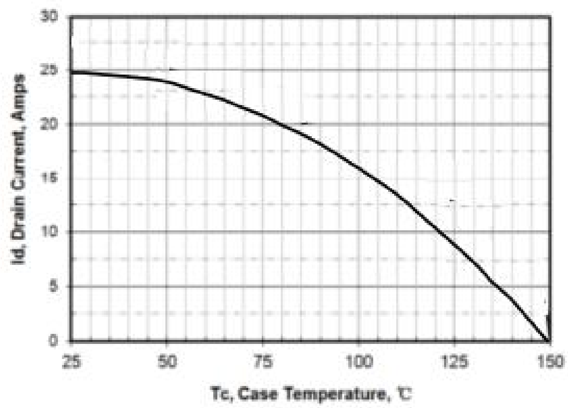


Figure 4. Output Characteristics

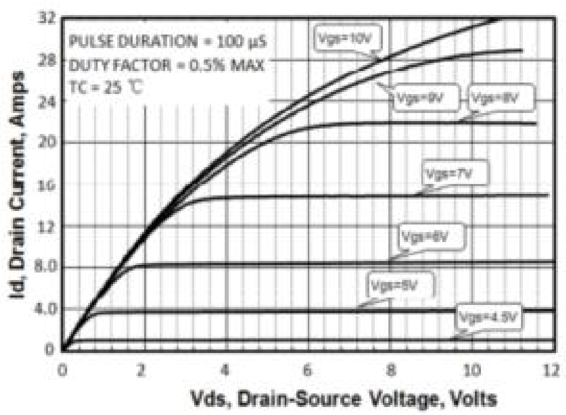


Figure 5. Rdson vs Gate Voltage

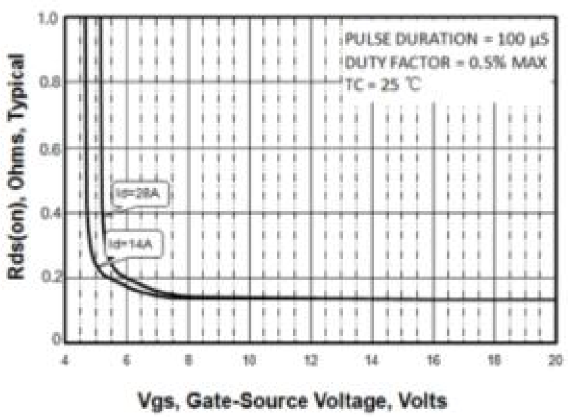


Figure 6. Peak Current Capability

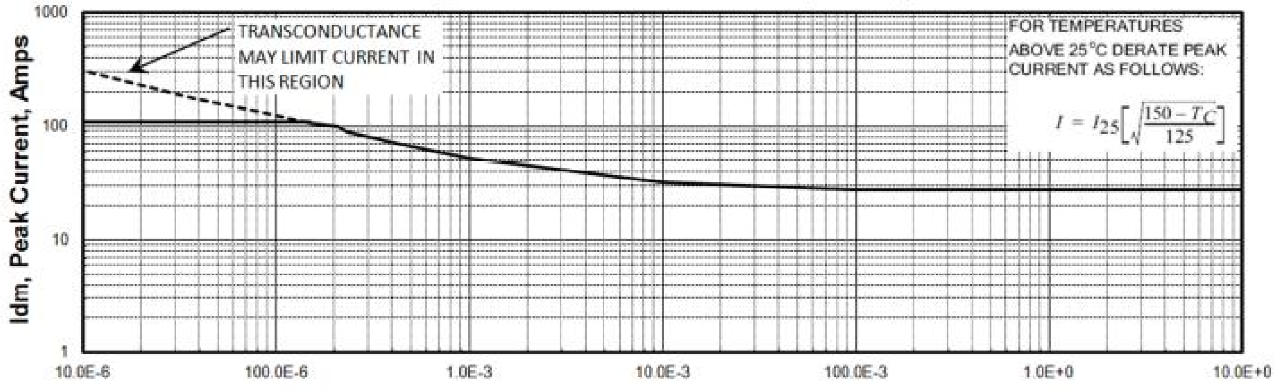


Figure 7. Transfer Characteristics

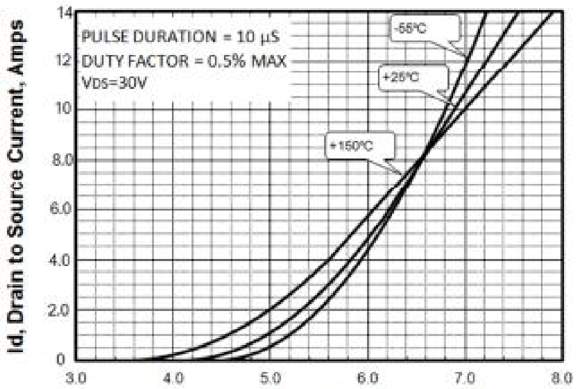


Figure 8. Unclamped Inductive Switching Capability

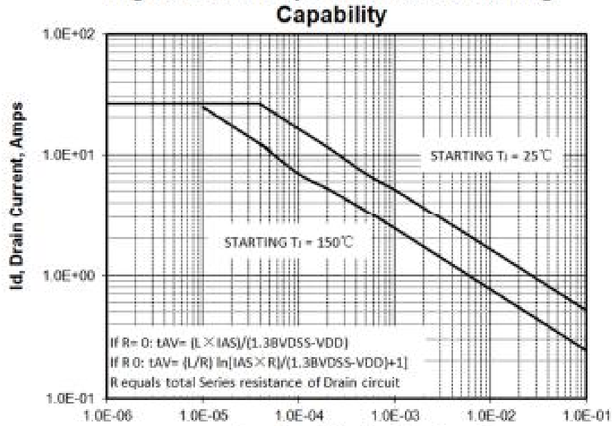


Figure 9. Drain to Source ON Resistance vs Drain Current

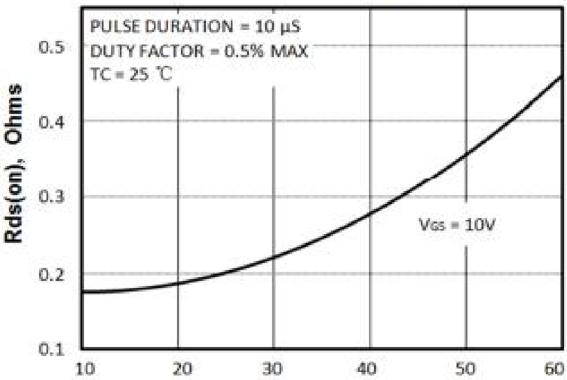


Figure 10. Rdson vs Junction Temperature

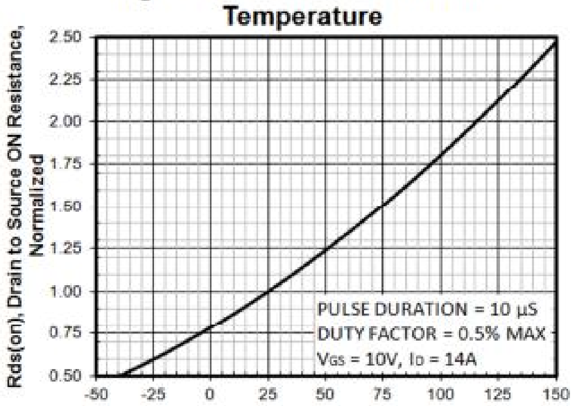


Figure 11.Breakdown Voltage vs Temperature

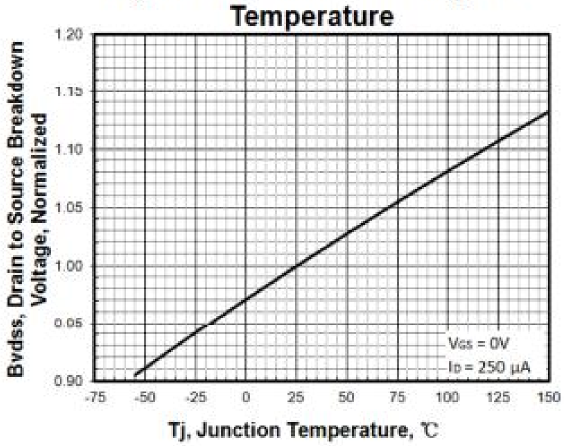


Figure 12.Threshold Voltage vs Temperature

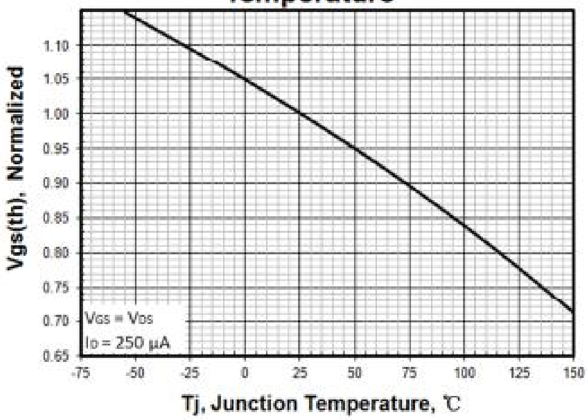


Figure 13 . Maximum Safe Operating Area

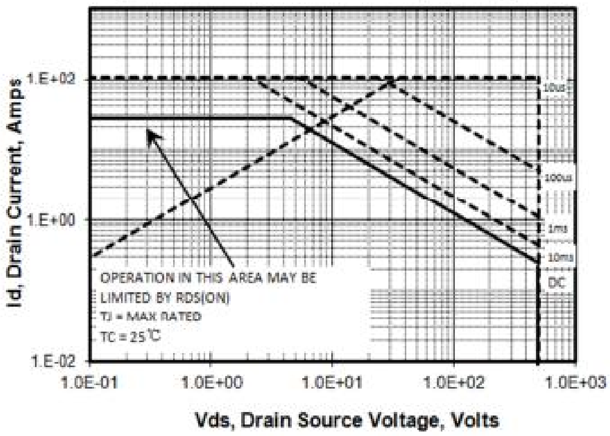


Figure 14. Capacitance vs Vds

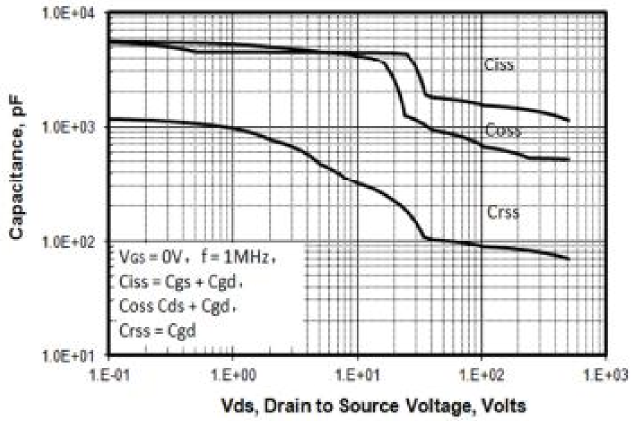


Figure 15 .Typical Gate Charge

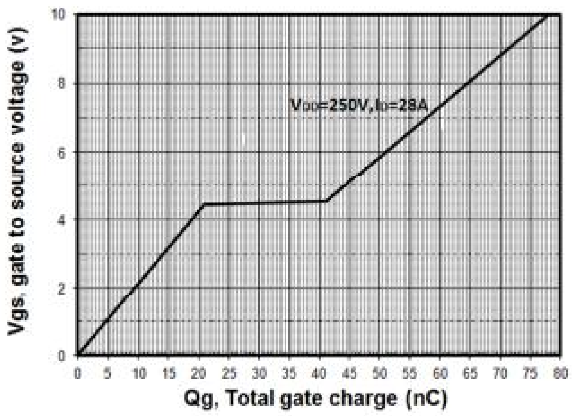
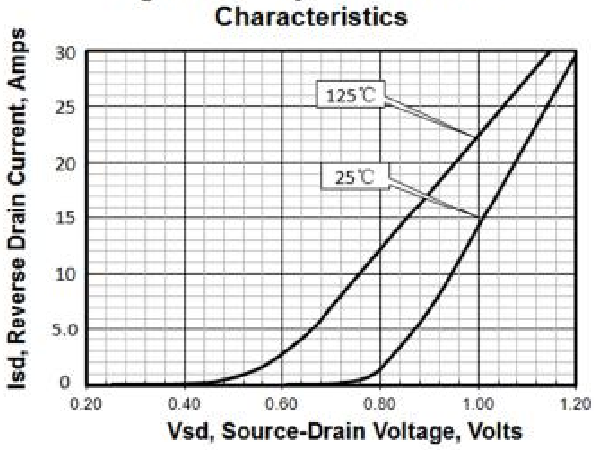


Figure 16.Body Diode Transfer Characteristics



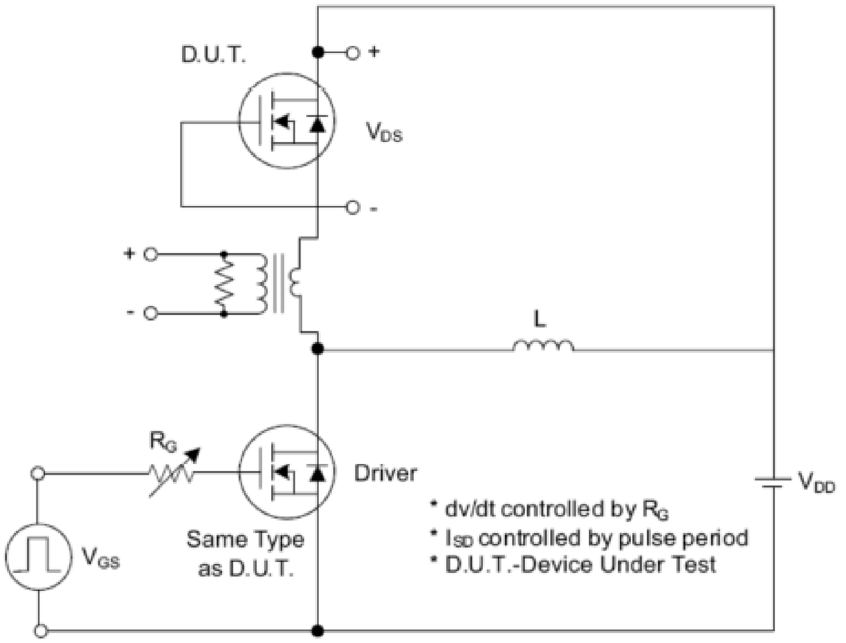


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

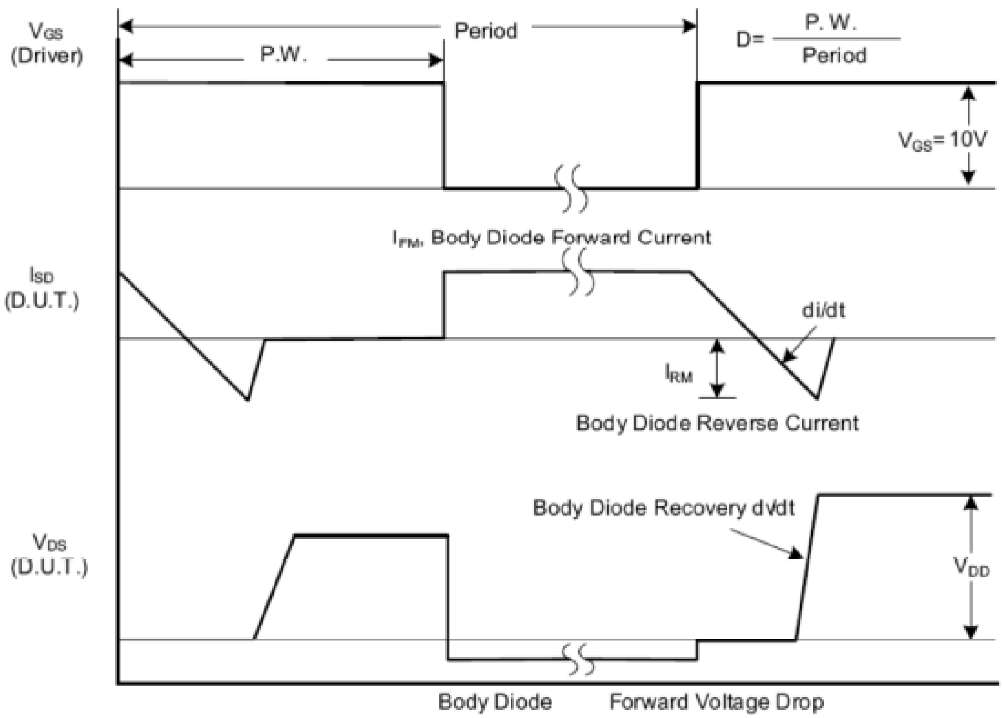


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

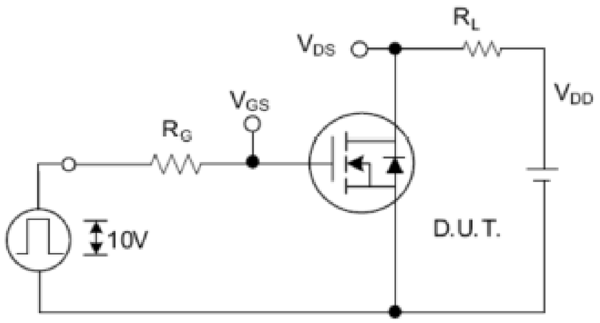


Fig. 2.1 Switching Test Circuit

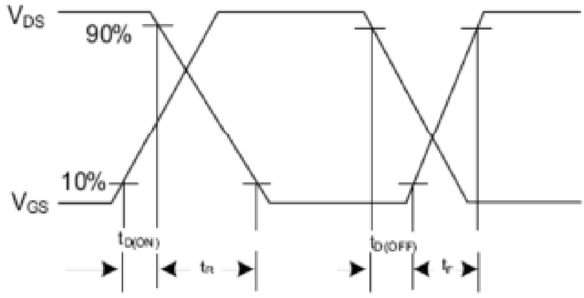


Fig. 2.2 Switching Waveforms

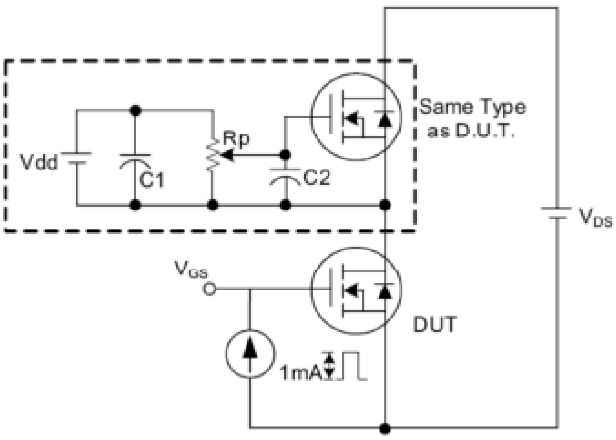


Fig. 3 . 1 Gate Charge Test Circuit

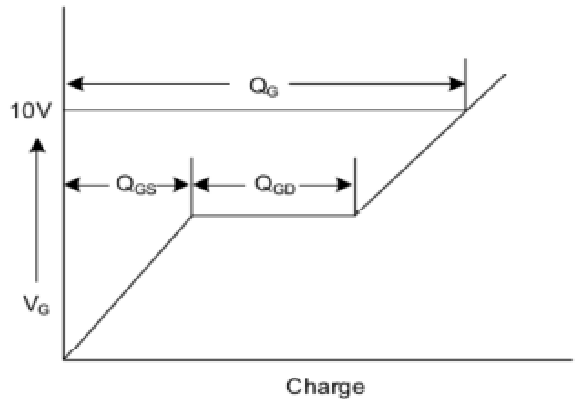


Fig. 3 . 2 Gate Charge Waveform

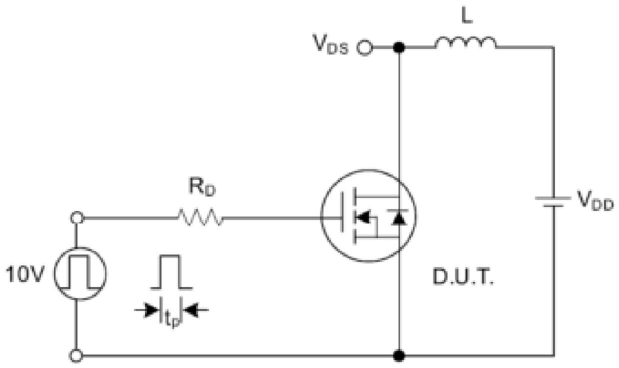


Fig. 4.1 Unclamped Inductive Switching Test Circuit

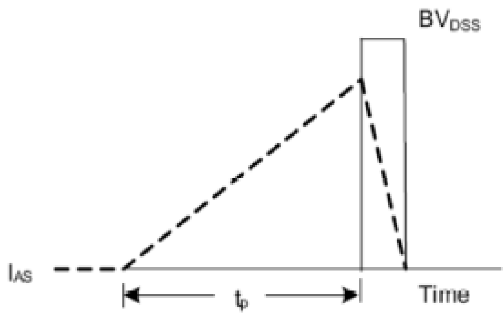


Fig. 4.2 Unclamped Inductive Switching Waveforms