1. Features

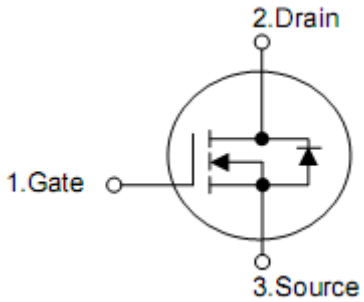
- Advanced Planar Process
- $R_{DS(ON)}$=2.4Ω(typ.)@V_{GS}=10V
- RoHS Compliant
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

2. Applications

- Adaptor
- Charger
- SMPS Standby Power

3. Pin configuration

TO-220F



Pin	Function
1	Gate
2	Drain
3	Source

4. Ordering Information

Part Number	Package	Brand
KNF4N65F	TO-220F	KIA

5. Absolute maximum ratings

(T_C= 25 ºC, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain-to-Source Voltage [1)]	V_{DSS}	650	V
Gate-to-Source Voltage	V_{GSS}	±30	V
Continuous Drain Current	I_D	4.0	A
Pulsed Drain Current at V_{GS}=10V	I_{DM}	16	A
Single Pulse Avalanche Energy	EAS	70	mJ
Power Dissipation	P_D	24	W
Derating Factor above 25ºC	P_D	0.19	W/ºC
Soldering Temperature Distance of 1.6mm from case for 10 seconds	T_L	300	ºC
Operating and Storage Temperature Range	T_J&T_{STG}	-55 to 150	ºC

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

6. Thermal characteristics

Parameter	Symbol	Ratings	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	5.2	ºC/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	100	ºC/W

7. Electrical characteristics

(T_J=25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-to-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V, I_D=250uA	650	-	-	V
Drain-to-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	-	-	1	uA
		V_{DS}=520V, V_{GS}=0V T_J=125°C	-	-	100	uA
Gate-to-Source Leakage Current	I_{GSS}	V_{GS}=±30V, V_{DS}=0V	-	-	±0.1	uA
Drain-to-Source ON Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=2A	-	2.4	3.0	Ω
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250uA	2.0	-	4.0	V
Forward Transconductance	gfs	V_{DS}=15V,I_D=2A	-	5.0	-	S
Input Capacitance	C_{iss}	V_{GS}=0V,V_{DS}=25V, f=1.0MHZ	-	560	-	pF
Reverse Transfer Capacitance	C_{oss}		-	40	-	
Output Capacitance	C_{rss}		-	2.8	-	
Total Gate Charge	Q_g	V_{DD}=325V,I_D=4A, V_{GS}=0 to 10V	-	10	-	nC
Gate-to-Source Charge	Q_{gs}		-	2.5	-	
Gate-to-Drain (Miller) Charge	Q_{gd}		-	3.6	-	
Turn-on Delay Time	$t_{d(ON)}$	V_{DD}=325V, I_D=4A, R_G=25Ω,V_{GS}=10V	-	14	-	nS
Rise Time	t_{rise}		-	15	-	
Turn-Off Delay Time	$t_{d(OFF)}$		-	20	-	
Fall Time	t_{fall}		-	7	-	
Continuous Source Current [2]	I_{SD}	Integral PN-diode in MOSFET	-	-	4.0	A
Pulsed Source Current [2]	I_{SM}		-	-	16	A
Forward Voltage	V_{SD}	I_S=4A, V_{GS}=0V	-	-	1.5	V
Reverse recovery time	t_{rr}	I_F=I_S, V_{GS}=0V di/dt=100A/us,	-	200	-	ns
Reverse recovery charge	Q_{rr}		-	820	-	nC

Note:
1) T_J=+25°C to +150.
2) Pulse width≤380us; duty cycle≤2%.

8. Typical Characteristics

Figure 1. Maximum Transient Thermal Impedance

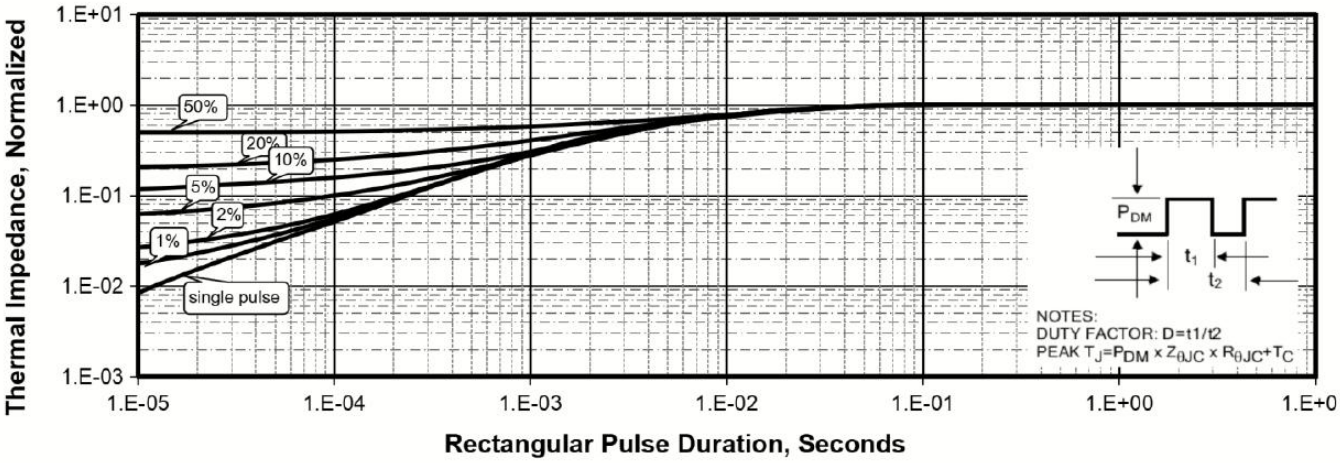


Figure 2 . Max. Power Dissipation vs Case Temperature

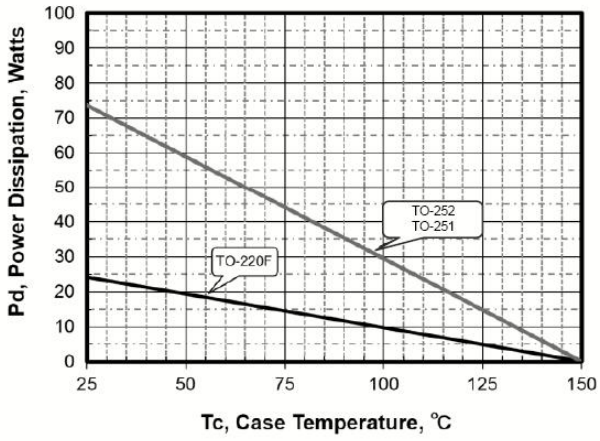


Figure 3 .Maximum Continuous Drain Current vs Tc

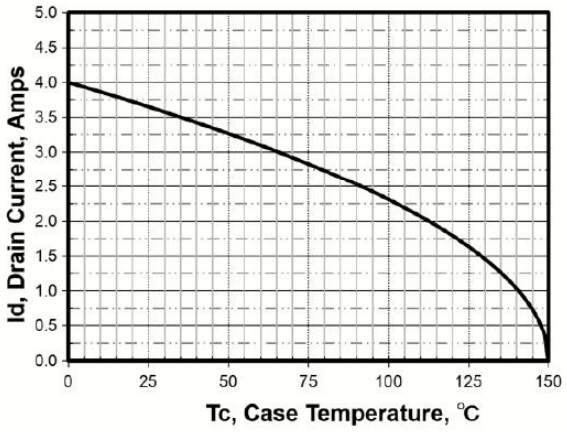


Figure 4. Typical Output Characteristics

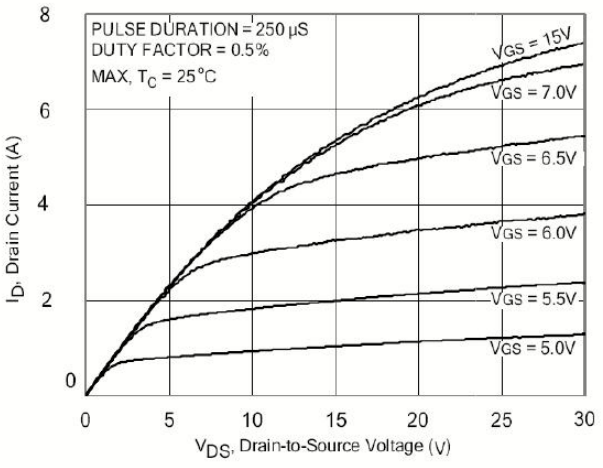


Figure 5. Rdson vs Gate Voltage

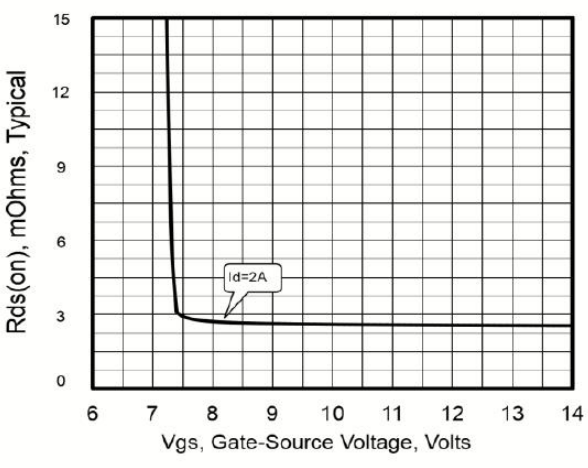


Figure 6. Maximum Peak Current Capability

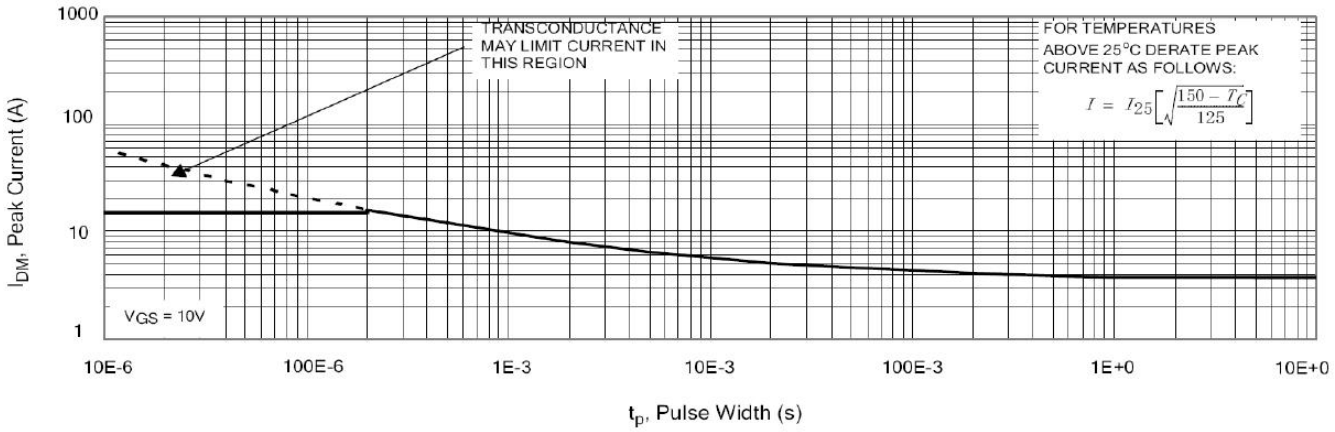


Figure 7. Typical Transfer Characteristics

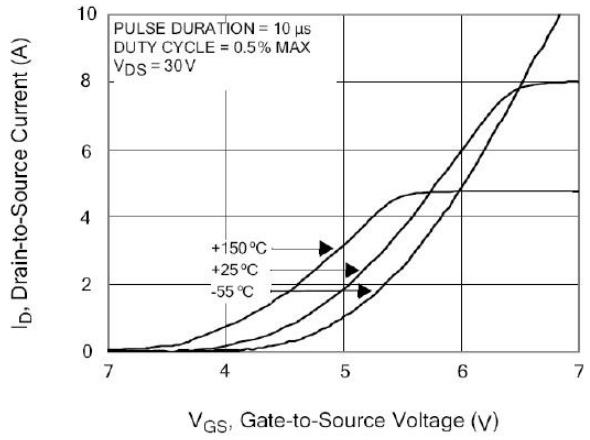


Figure 8. Unclamped Inductive Switching Capability

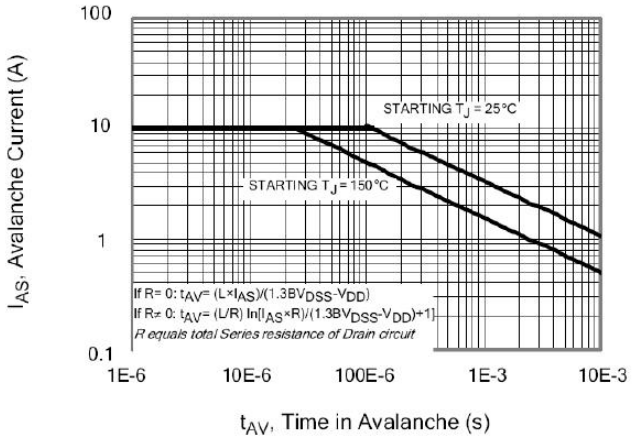


Figure 9. Drain to Source ON Resistance vs Drain Current

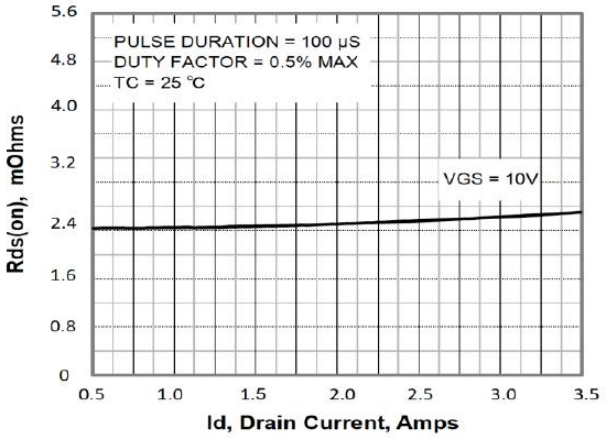


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature

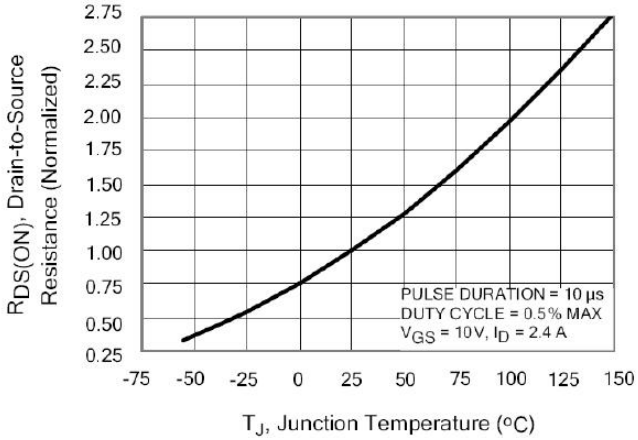


Figure 11. Typical Breakdown Voltage vs Junction Temperature

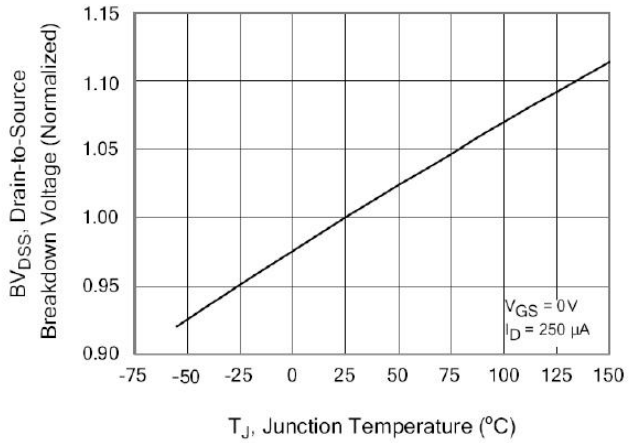


Figure 12. Typical Threshold Voltage vs Junction Temperature

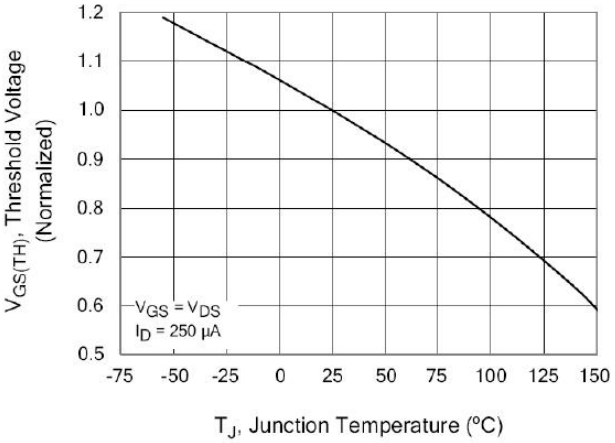


Figure 13 . Maximum Safe Operating Area TO-252 TO-251

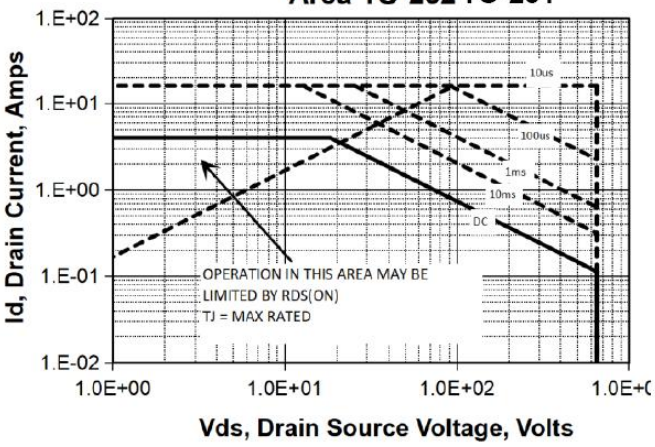


Figure 14 . Maximum Safe Operating Area TO-220F

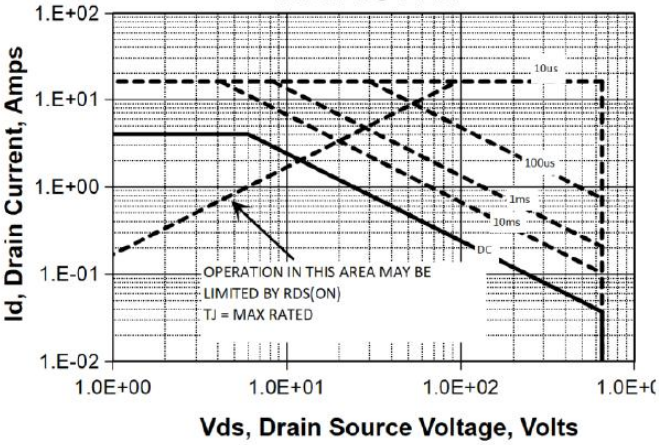


Figure 15 .Typical Gate Charge

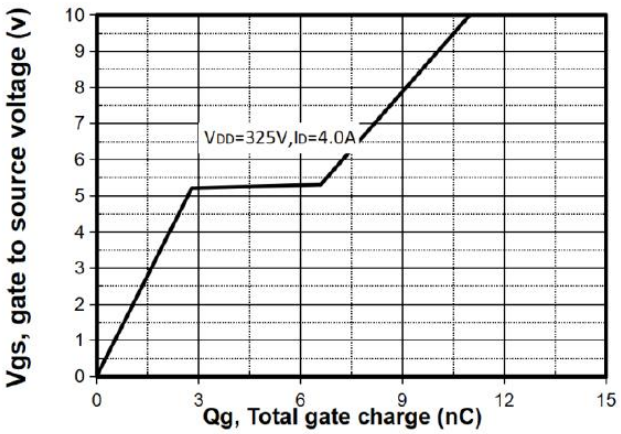
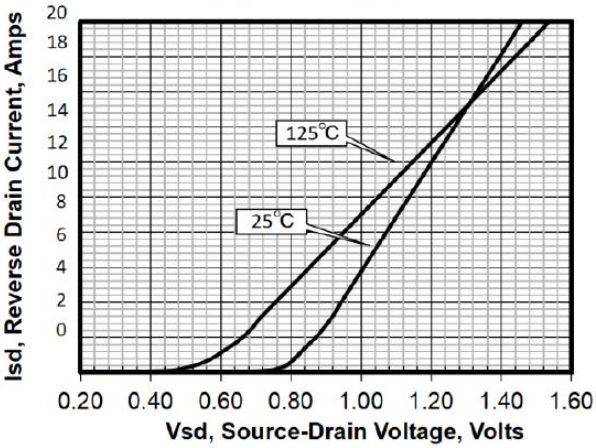


Figure 16.Body Diode Transfer Characteristics



9. Test Circuits and Waveforms

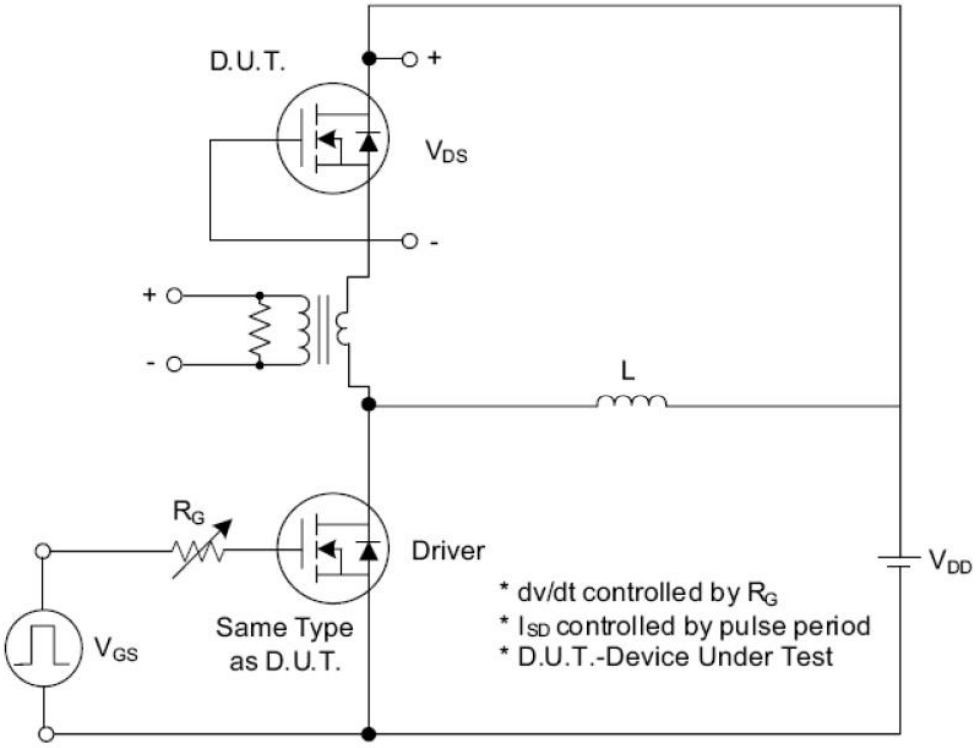


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

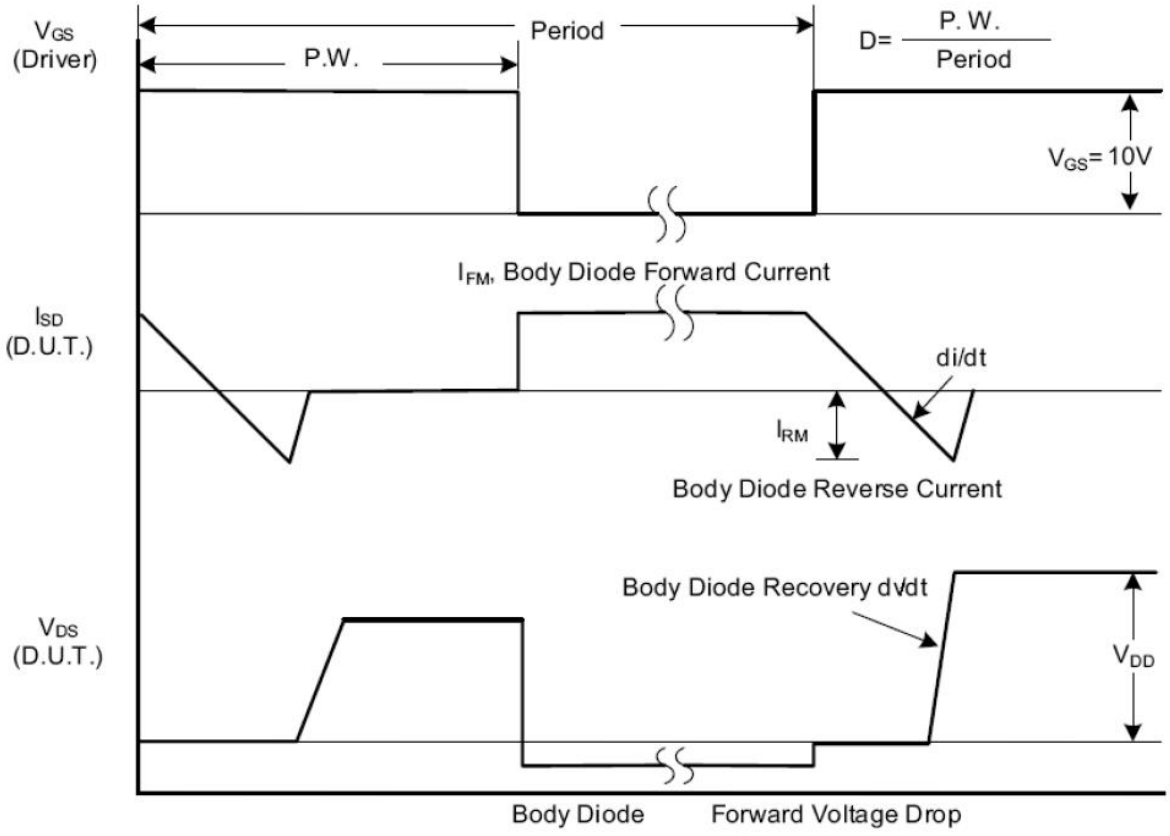


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

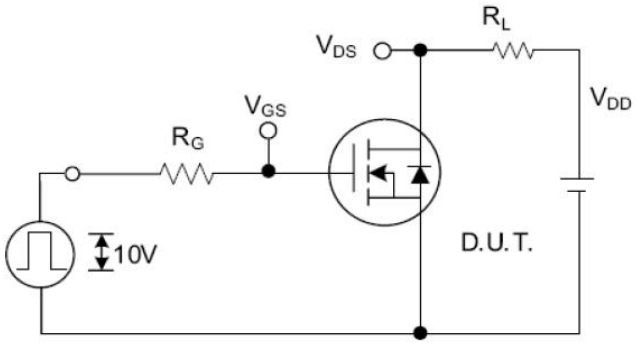


Fig. 2.1 Switching Test Circuit

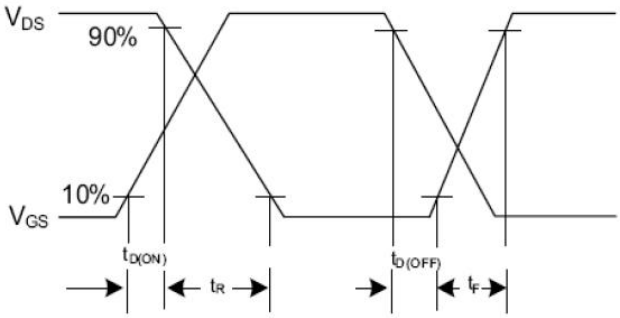


Fig. 2.2 Switching Waveforms

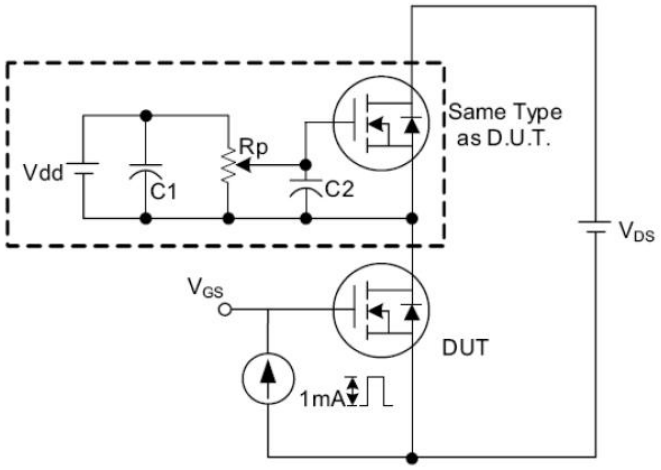


Fig. 3 . 1 Gate Charge Test Circuit

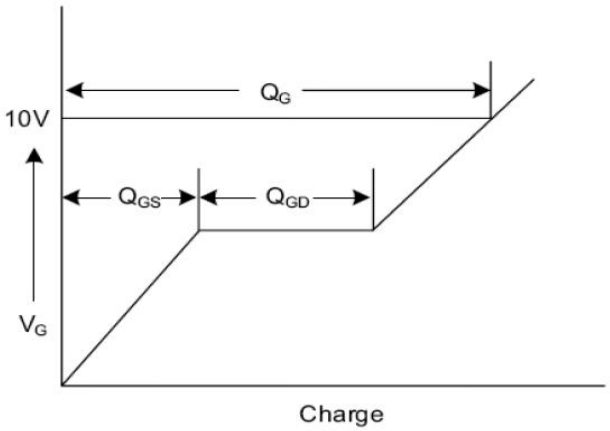


Fig. 3 . 2 Gate Charge Waveform

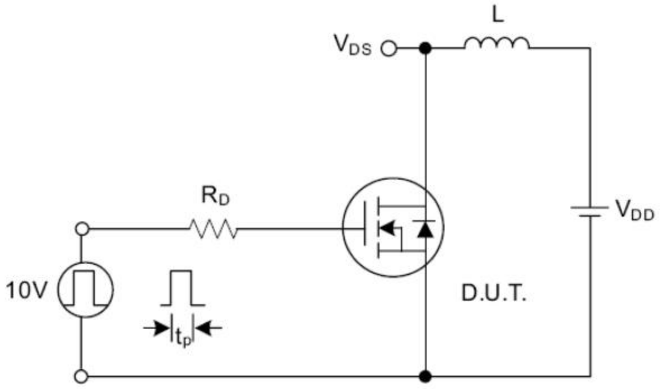


Fig. 4.1 Unclamped Inductive Switching Test Circuit

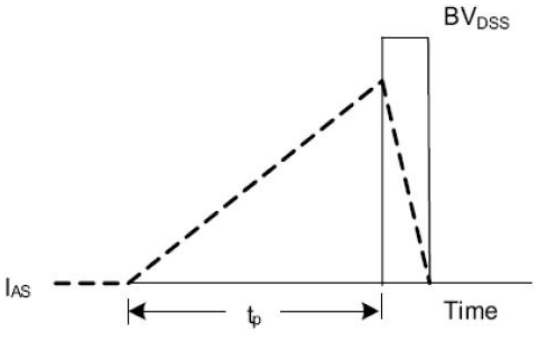


Fig. 4.2 Unclamped Inductive Switching Waveforms