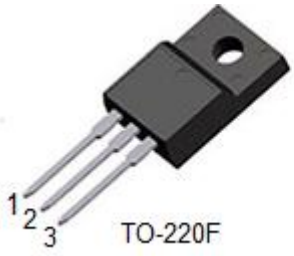
1. Features

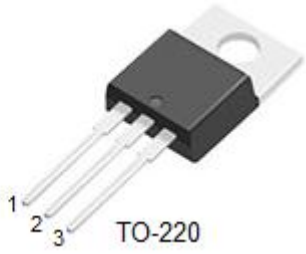
- $R_{DS(ON)}$=1.6Ω(typ.)@V_{GS}=10V
- RoHS Compliant
- Low Gate Charge Minimize Switching Loss
- Fast Recovery Body Diode

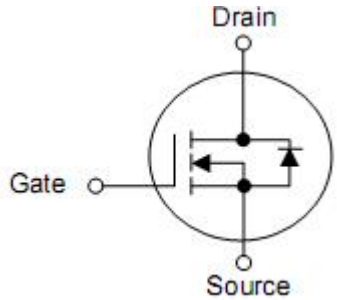
2. Applications

- Adaptor
- Charger
- SMPS Standby Power

3. Symbol







Pin	Function
1	Gate
2	Drain
3	Source

4. Ordering Information

Part Number	Package	Brand
KNF4590A	TO-220F	KIA
KNP4590A	TO-220	KIA

5. Absolute maximum ratings

T_C=25°C unless otherwise noted

Parameter		Symbol	Rating		Units
			TO-220F	TO-220	
Drain-source voltage		V_{DSS}	900		V
Gate-to-Source Voltage		V_{GSS}	±30		V
Continuous drain current		I_D	6		A
Pulsed Drain Current at V_{GS}=10V		I_{DM}	24		A
Single pulse avalanche energy		E_{AS}	700		mJ
Power dissipation	T_C=25°C	P_D	45	120	W
	Derate above 25°C		0.29	0.96	W/°C
Soldering Temperature Distance of 1.6mm from case for 10 seconds		T_L	300		°C
Operating junction and storage temperature range		T_J ,T_{STG}	-55 to150		℃

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

6. Thermal characteristics

Parameter	Symbol	Rating		Unit
		TO-220F	TO-220	
Thermal resistance junction-case	$R_{\theta JC}$	2.78	1.04	℃/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	100	62	℃/W

7. Electrical characteristics

(T_J=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V,I_D=250uA	900	-	-	V
Drain-source leakage current	I_{DSS}	V_{DS}=900V, V_{GS}=0V	-	-	1	uA
		V_{DS}=720V, T_J=125°C	-	-	100	uA
Gate-source forward leakage	I_{GSS}	V_{GS}=±30V, V_{DS}=0V	-	-	±100	nA
Drain-source on-resistance	$R_{DS(on)}$	V_{GS}=10V,I_D=3A	-	1.6	2.0	Ω
Gate threshold voltage	$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250uA	3.0	-	5.0	V
Forward Transconductance	gfs	V_{DS}=15V,I_D=3A	-	8.0	-	S
Input capacitance	C_{iss}	V_{DS}=25V,V_{GS}=0V f=1MHz	-	1462	-	pF
Reverse transfer capacitance	C_{rss}		-	24	-	pF
Output capacitance	C_{oss}		-	132	-	pF
Total gate charge(10V)	Q_g	V_{DD}=450V, I_D=6A V_{GS}=0~10V	-	38	-	nC
Gate-source charge	Q_{gs}		-	8.1	-	nC
Gate-drain charge	Q_{gd}		-	15	-	nC
Turn-on delay time	$t_{d(on)}$	V_{DD}=450V,V_{GS}=10V, R_G=9.1Ω, I_D=6A		23		ns
Rise time	t_r			46		ns
Turn-off delay time	$t_{d(off)}$			32		ns
Fall time	t_f			38		ns
Continuous Source Current [2]	I_{SD}	Integral PN-diode in MOSFET			6	A
Pulsed Source Current [2]	I_{SM}		-	-	24	A
Diode forward voltage	V_{SD}	I_S=6A,V_{GS}=0V,	-	-	1.5	V
Reverse Recovery Time	t_{rr}	V_{GS}=0V,I_F=I_S dI_F/dt=100A/μs	-	390	-	nS
Reverse Recovery Charge	Q_{rr}		-	1.4	-	nC

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

8. Typical operating characteristics

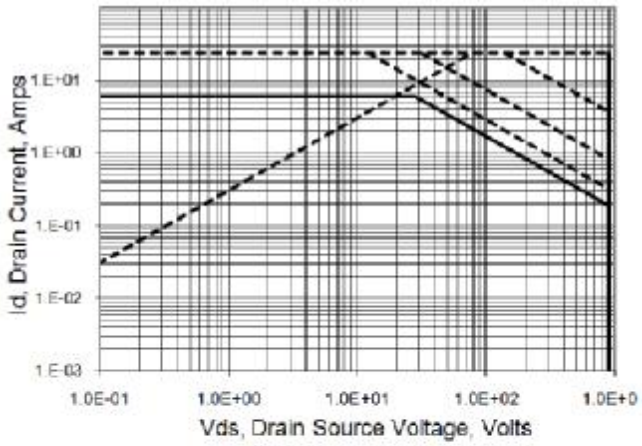


Figure 1 . Maximum Safe Operating Area

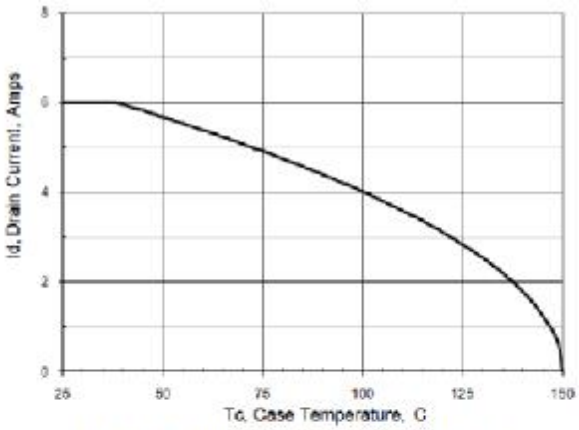


Figure 2.Maximum Continuous Drain Current vs Case Temperature

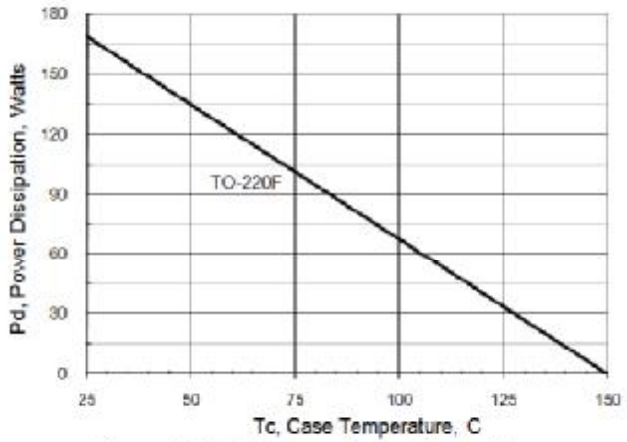


Figure 3.1 . Maximum Power Dissipation vs Case Temperature

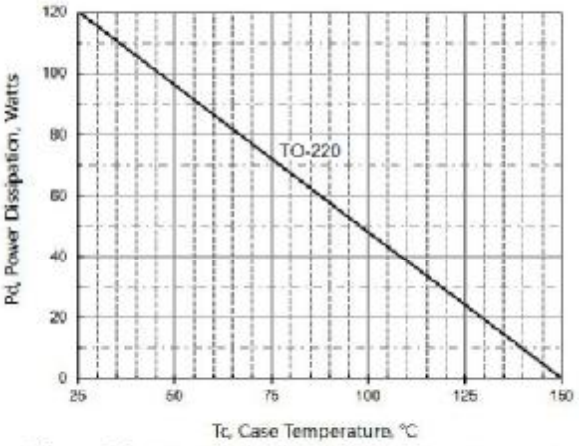


Figure 3.2. Max. Power Dissipation vs Case Temperature

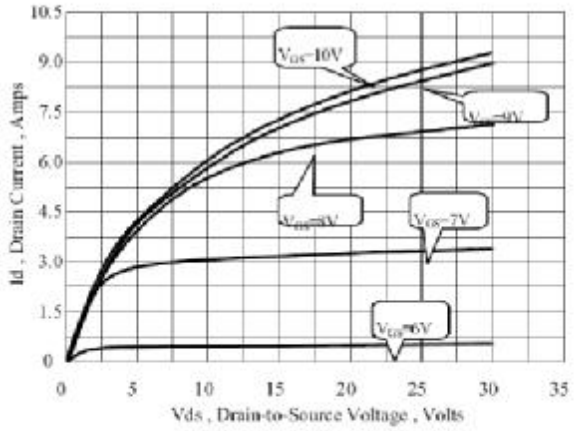


Figure 4 Typical Output Characteristics

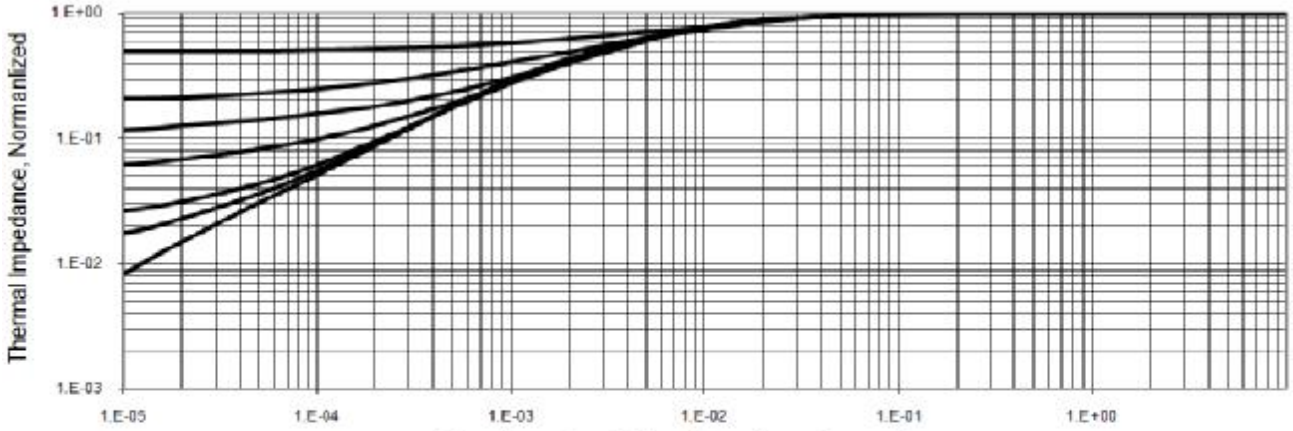


Figure 5. Maximum Transient Thermal Impedance

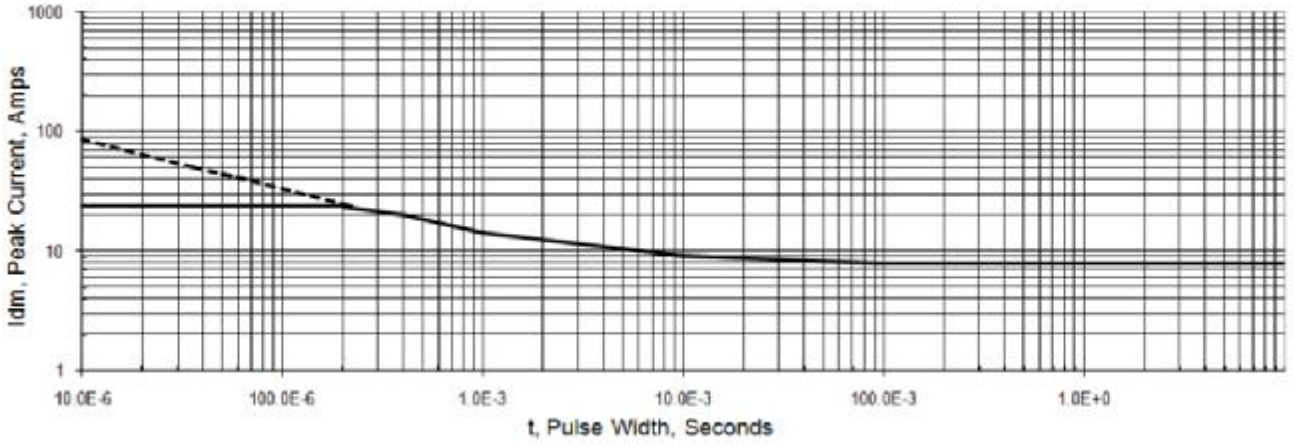


Figure 6. Peak Current Capability

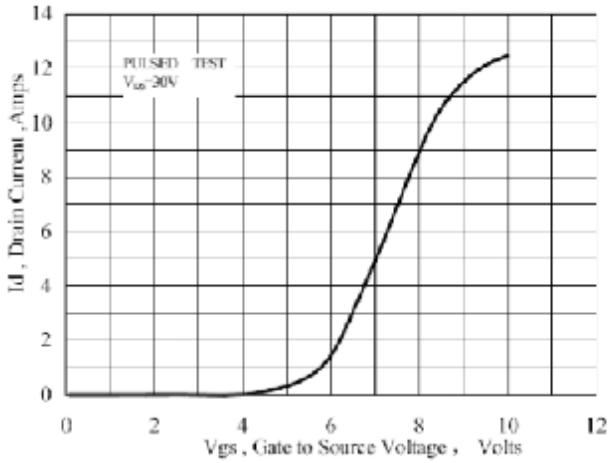


Figure 7 Typical Transfer Characteristics

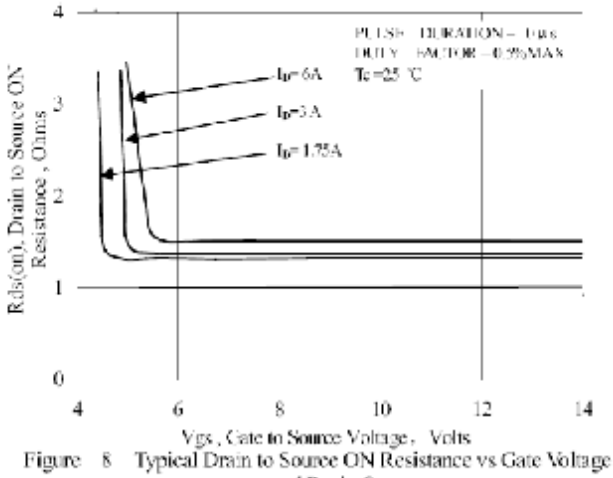


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

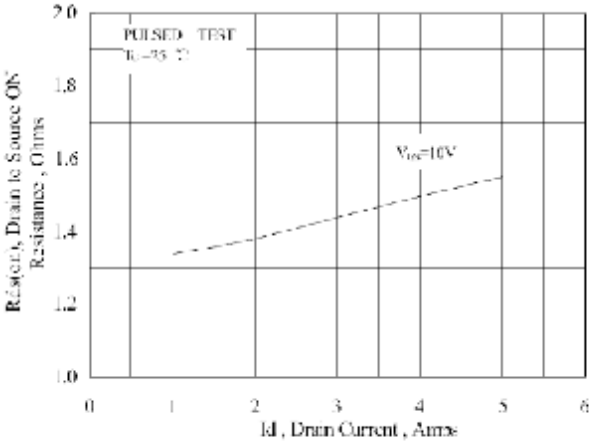


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

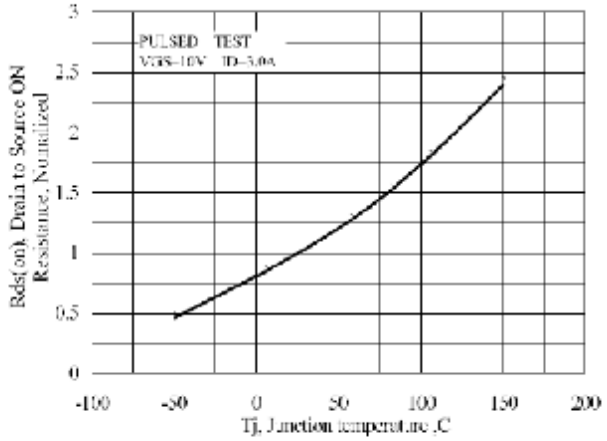


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

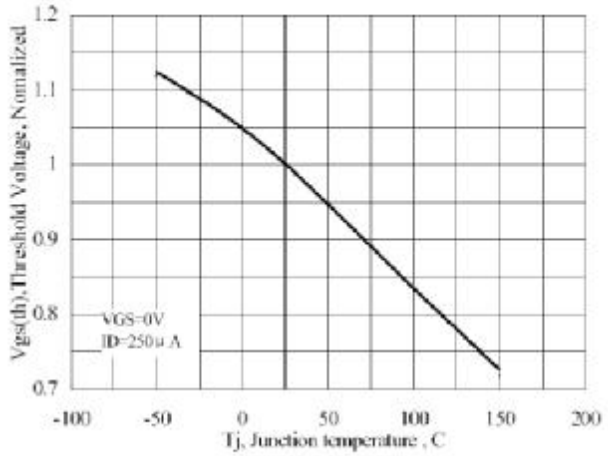


Figure 11 Typical Theshold Voltage vs Junction Temperature

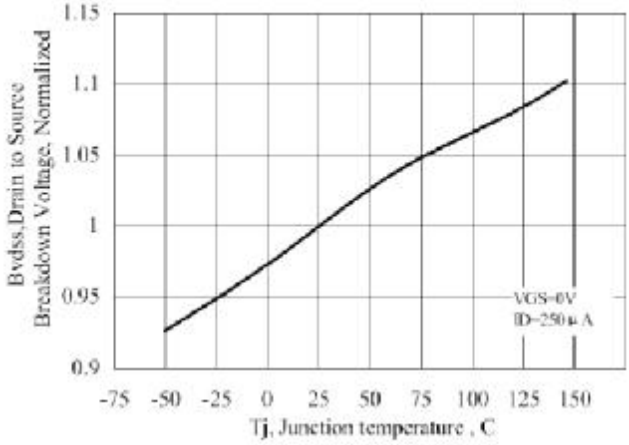


Figure 12 Typical Breakdown Voltage vs Junction Temperatu

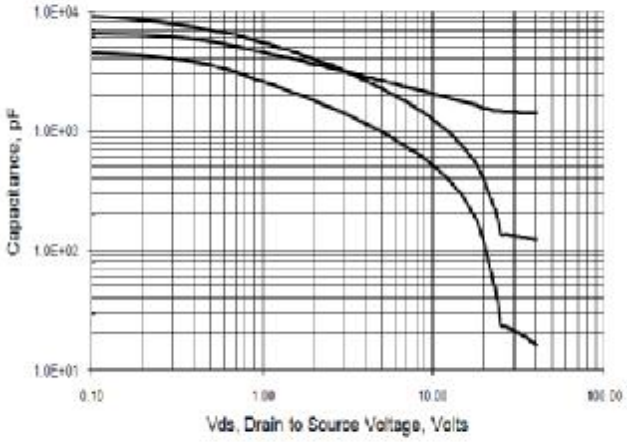


Figure 13. Capacitance vs Vds

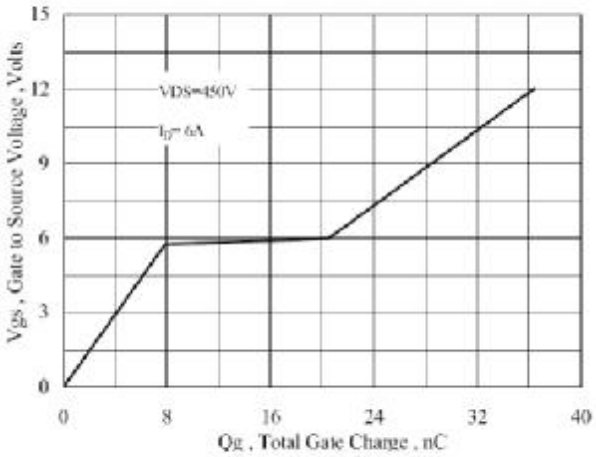


Figure 14 Typical Gate Charge vs Gate to Source Voltage

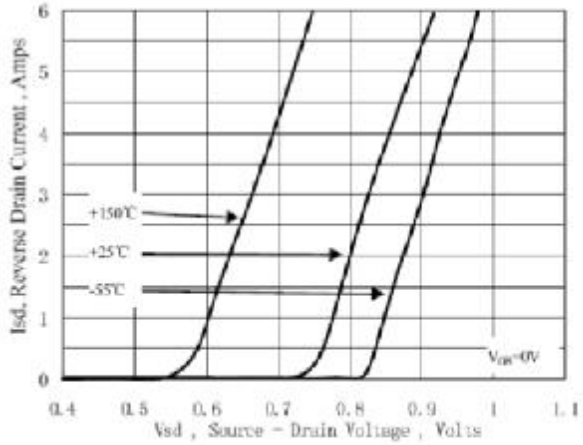


Figure 15 Typical Body Diode Transfer Characteristics

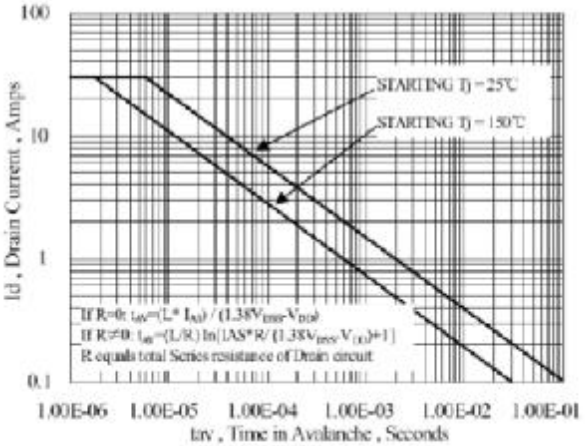


Figure 16 Unclamped Inductive Switching Capability

9. Test Circuits and Waveforms

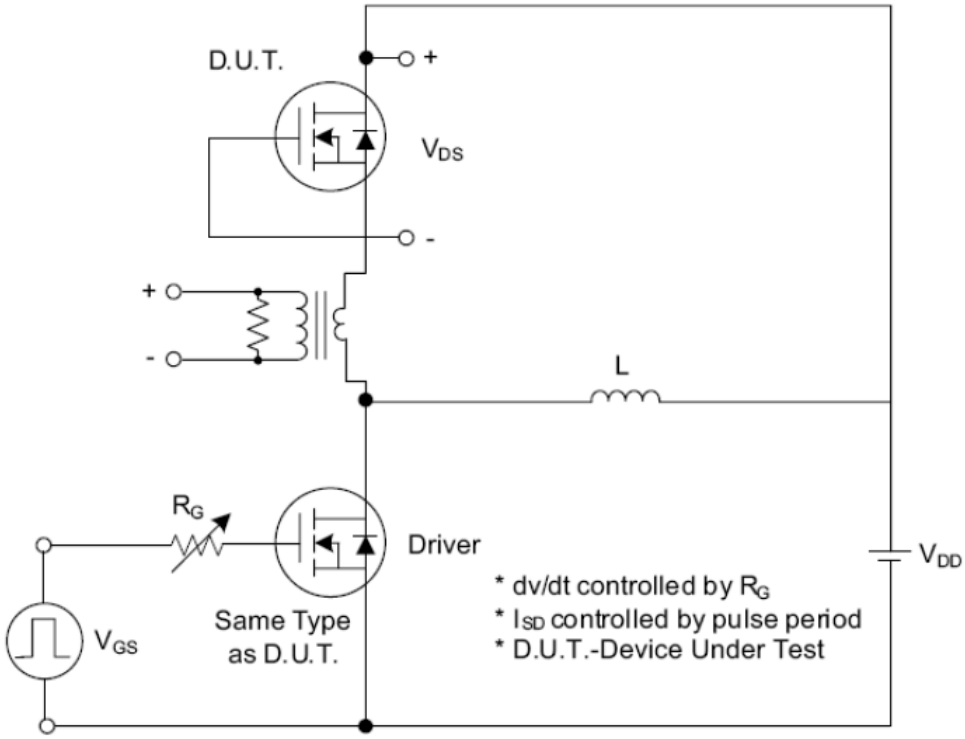


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

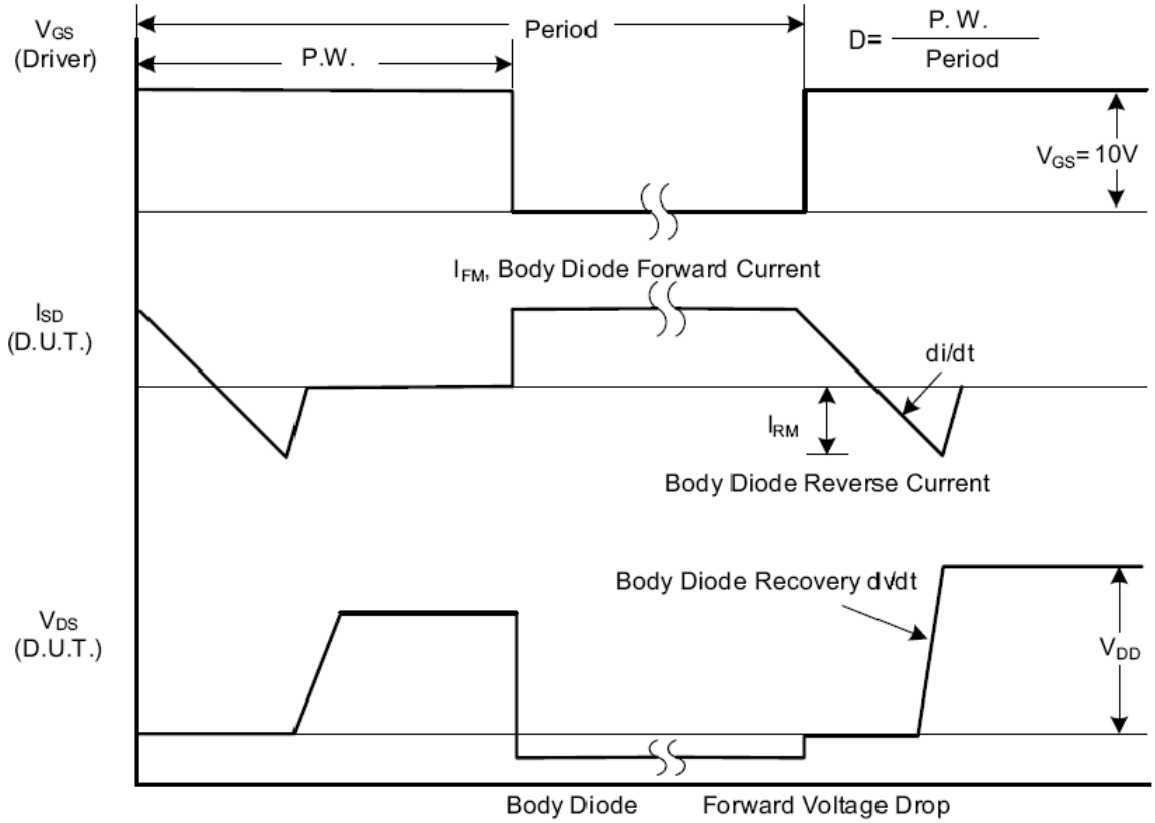


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

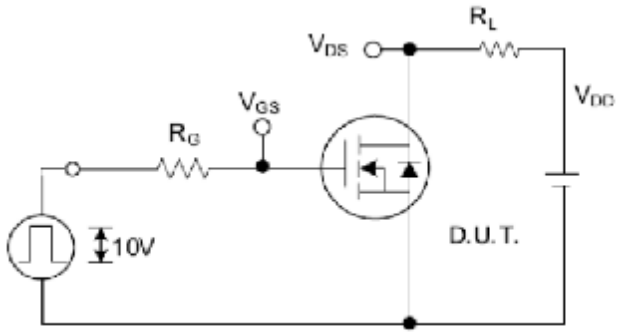


Fig. 2.1 Switching Test Circuit

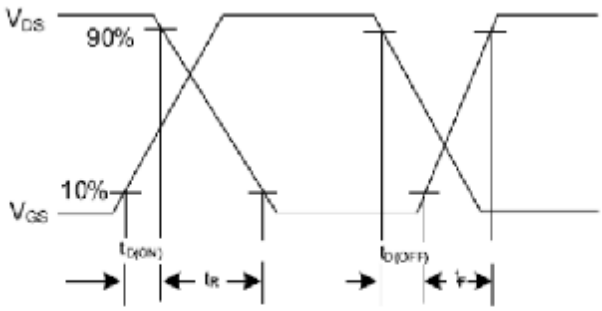


Fig. 2.2 Switching Waveforms

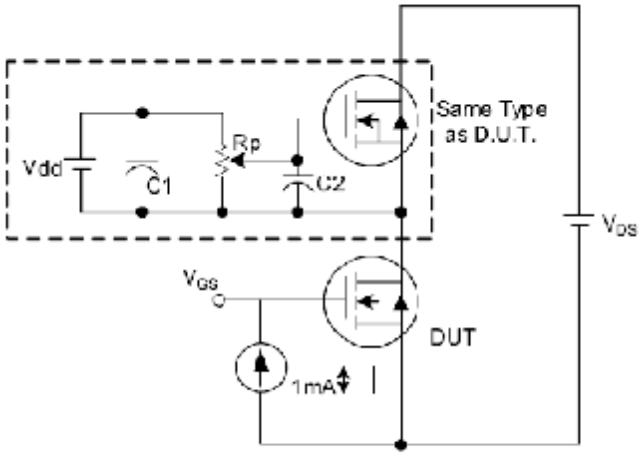


Fig. 3 . 1 Gate Charge Test Circuit

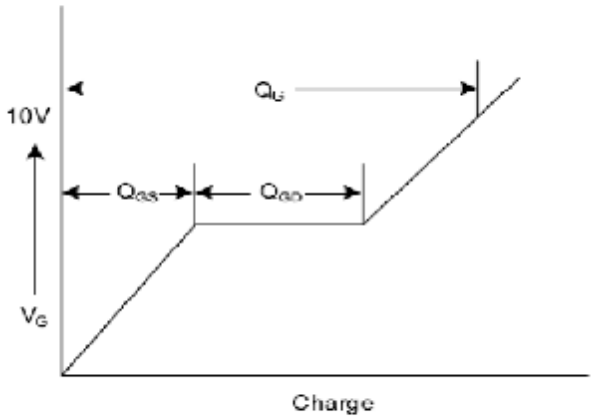


Fig. 3 . 2 Gate Charge Waveform

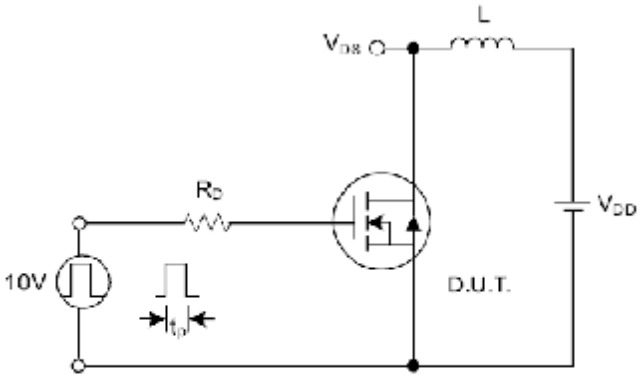


Fig. 4.1 Unclamped Inductive Switching Test Circuit

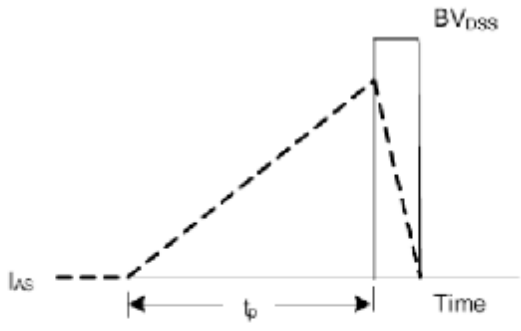


Fig. 4.2 Unclamped Inductive Switching Waveforms