

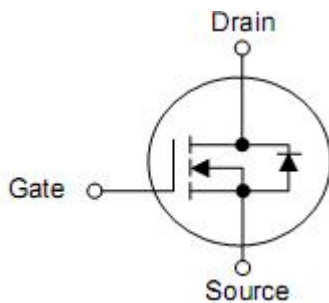
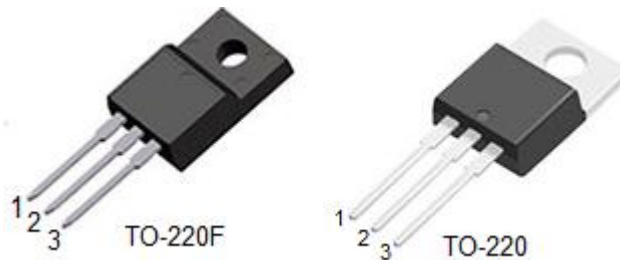
1. Features

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

2. Applications

- n Adaptor
- n Charger
- n 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

$T_C=25^{\circ}\text{C}$ 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 $V_{GS}=10\text{V}$	I_{DM}	24		A	
Single pulse avalanche energy	E_{AS}	700		mJ	
Power dissipation	P_D	$T_C=25^{\circ}\text{C}$	45	120	W
		Derate above 25°C	0.29	0.96	W/ $^{\circ}\text{C}$
Soldering Temperature Distance of 1.6mm from case for 10 seconds	T_L	300		$^{\circ}\text{C}$	
Operating junction and storage temperature range	T_J, T_{STG}	-55 to 150		$^{\circ}\text{C}$	

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	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	100	62	$^{\circ}\text{C}/\text{W}$

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	g _{fs}	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 °C to +150 °C

2) Pulse width≤380us; duty cycle≤2%.

8. Typical operating characteristics

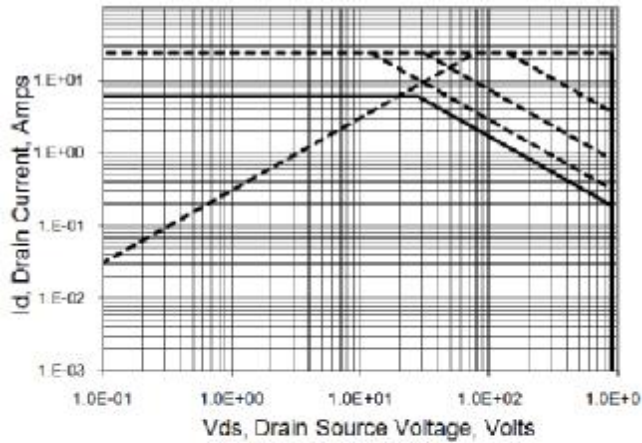


Figure 1 . Maximum Safe Operating Area

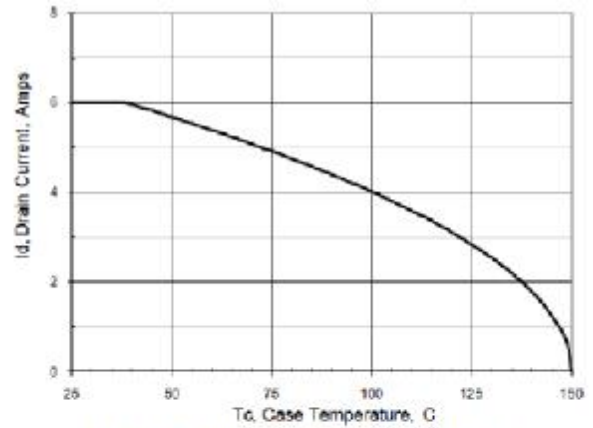


Figure 2 .Maximum Continuous Drain Current vs Case Temperature

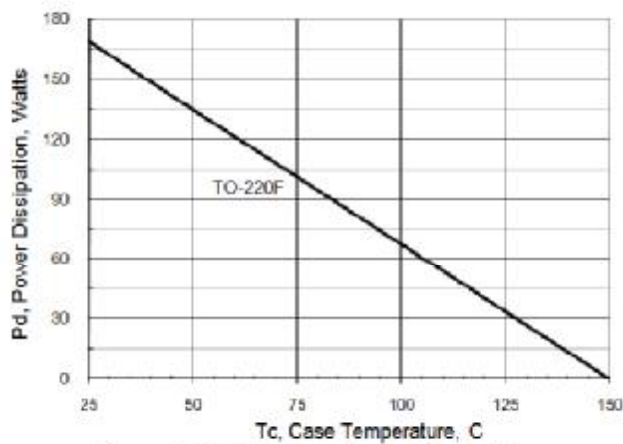


Figure 3.1 . Maximum Power Dissipation vs Case Temperature

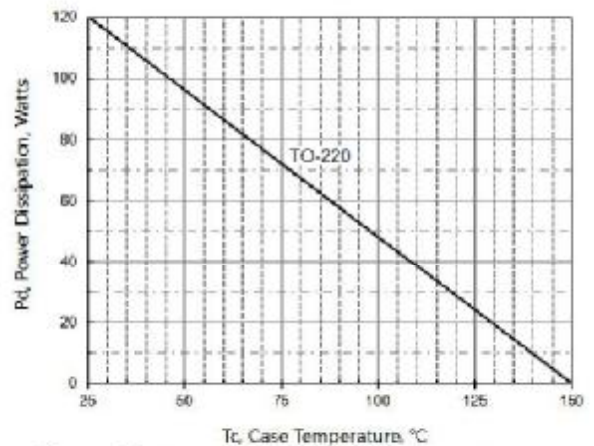


Figure 3.2. Max. Power Dissipation vs Case Temperature

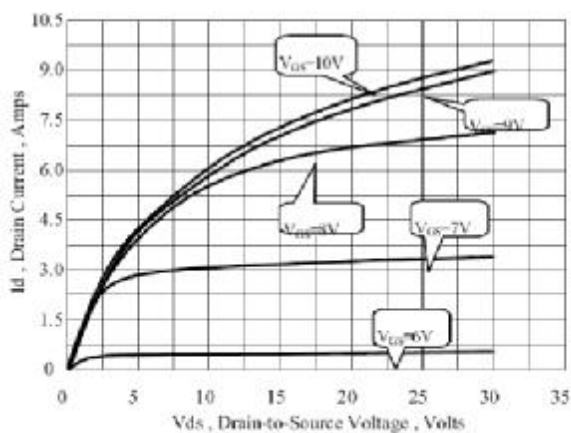


Figure 4 Typical Output Characteristics

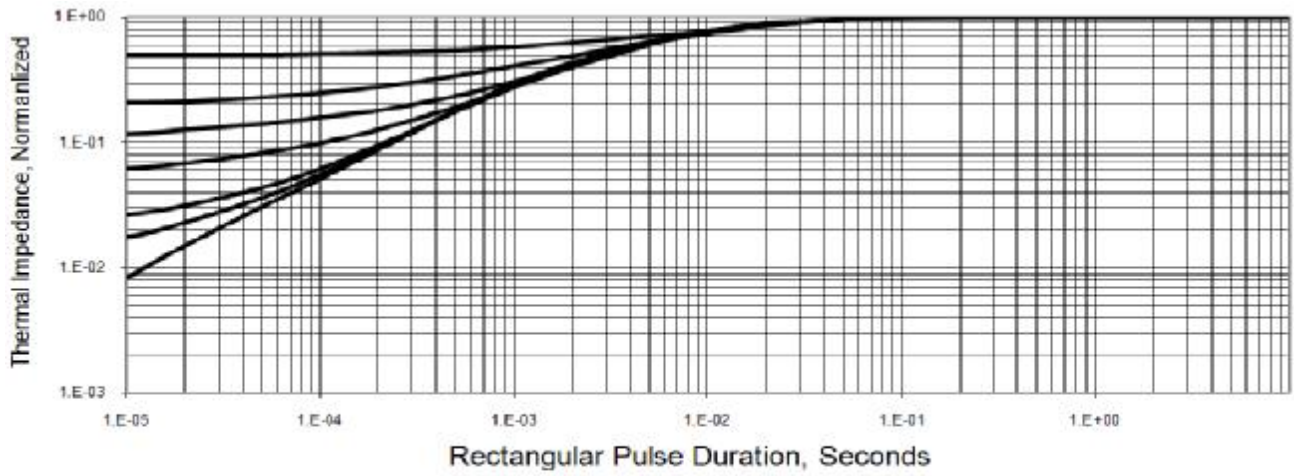


Figure 5. Maximum Transient Thermal Impedance

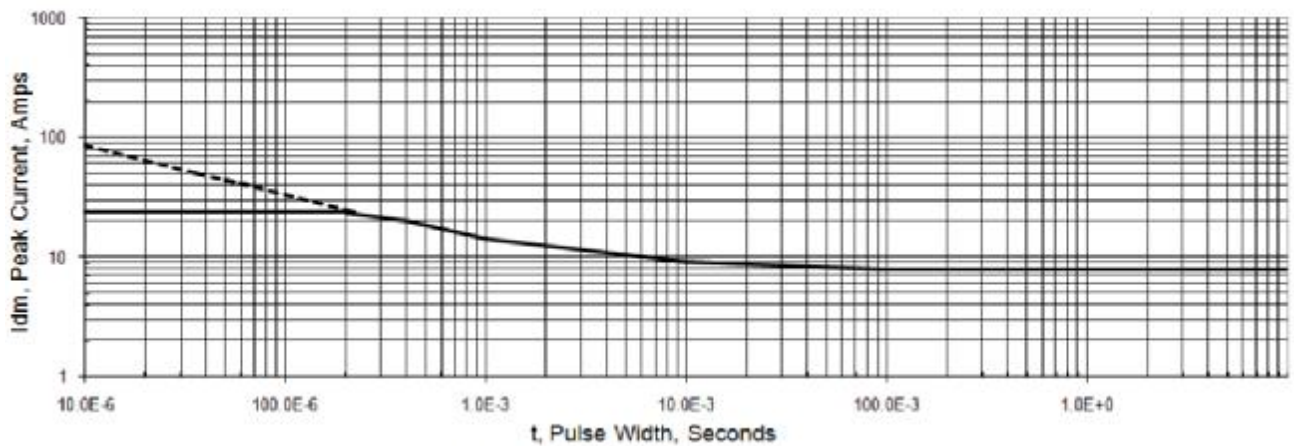


Figure 6. Peak Current Capability

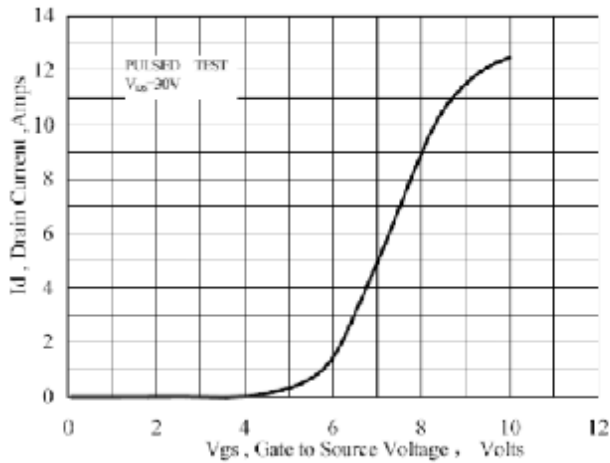


Figure 7 Typical Transfer Characteristics

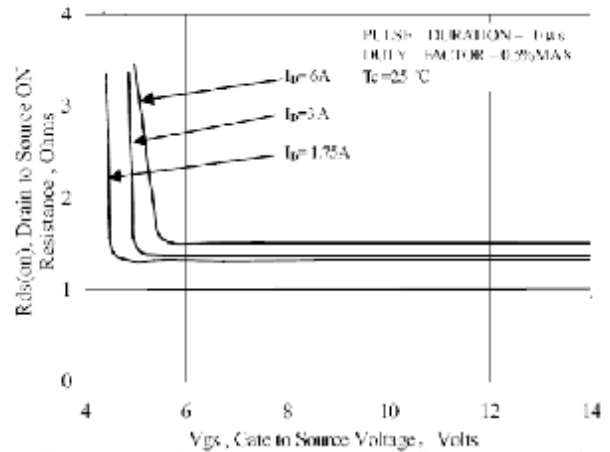


Figure 8 Typical Drain to Source ON Resistance vs Gate Voltage and Drain Current

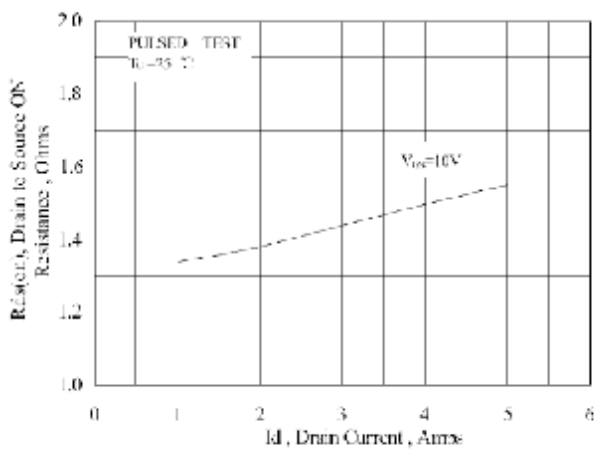


Figure 9 Typical Drain to Source ON Resistance vs Drain Current

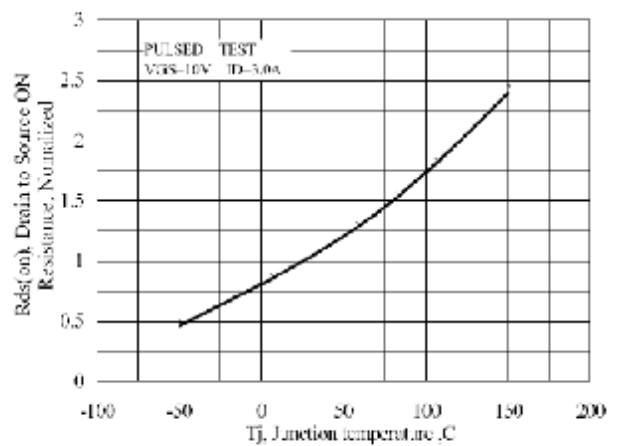


Figure 10 Typical Drain to Source on Resistance vs Junction Temperature

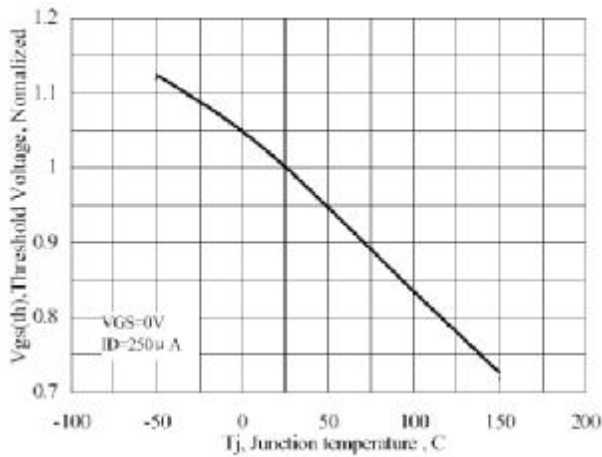


Figure 11 Typical Threshold Voltage vs Junction Temperature

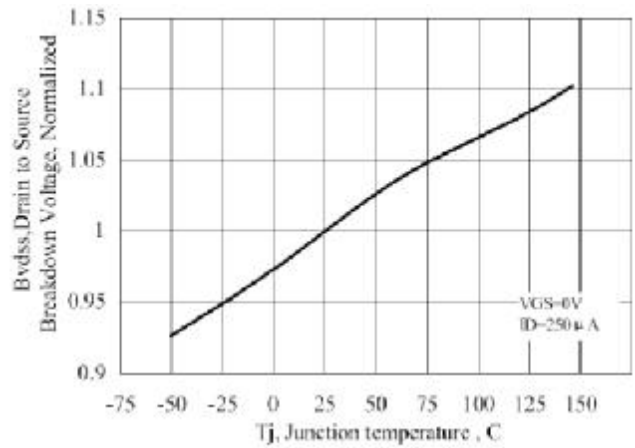


Figure 12 Typical Breakdown Voltage vs Junction Temperature

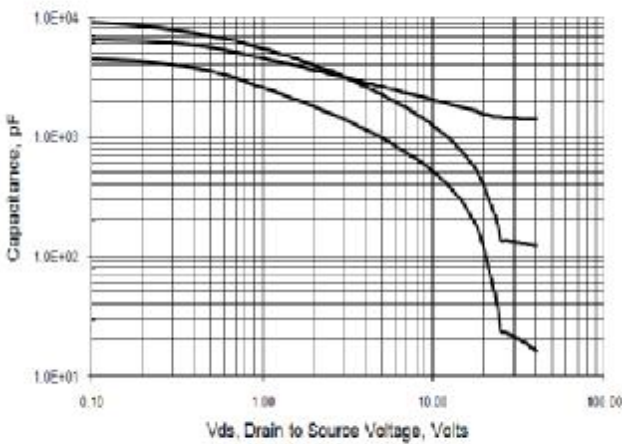


Figure 13. Capacitance vs Vds

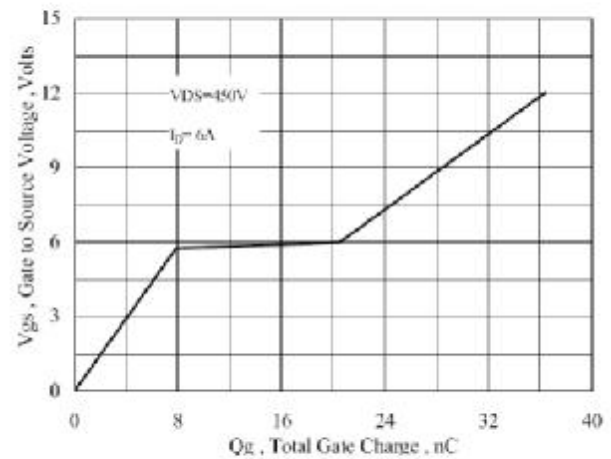


Figure 14 Typical Gate Charge vs Gate to Source Voltage

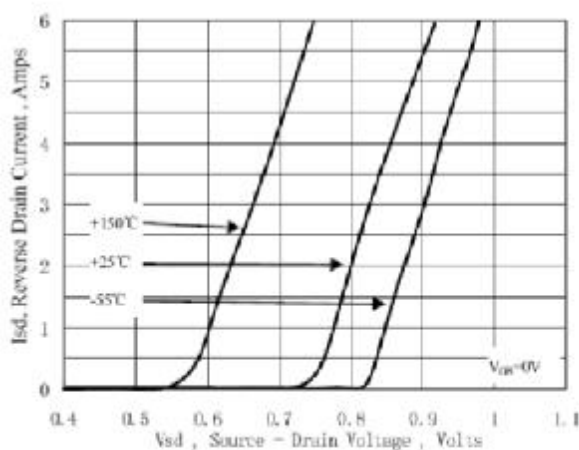


Figure 15 Typical Body Diode Transfer Characteristics

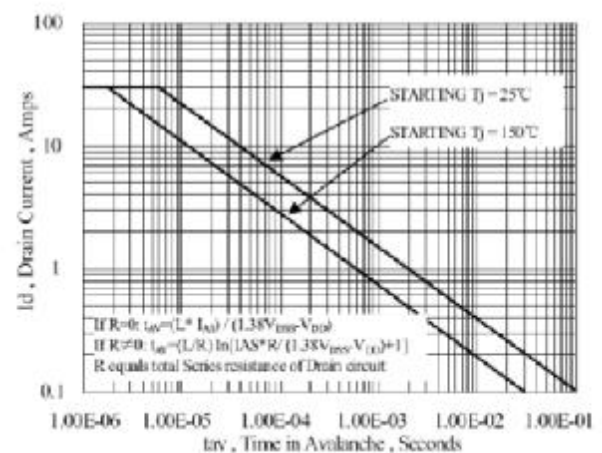


Figure 16 Unclamped Inductive Switching Capability

9. Test Circuits and Waveforms

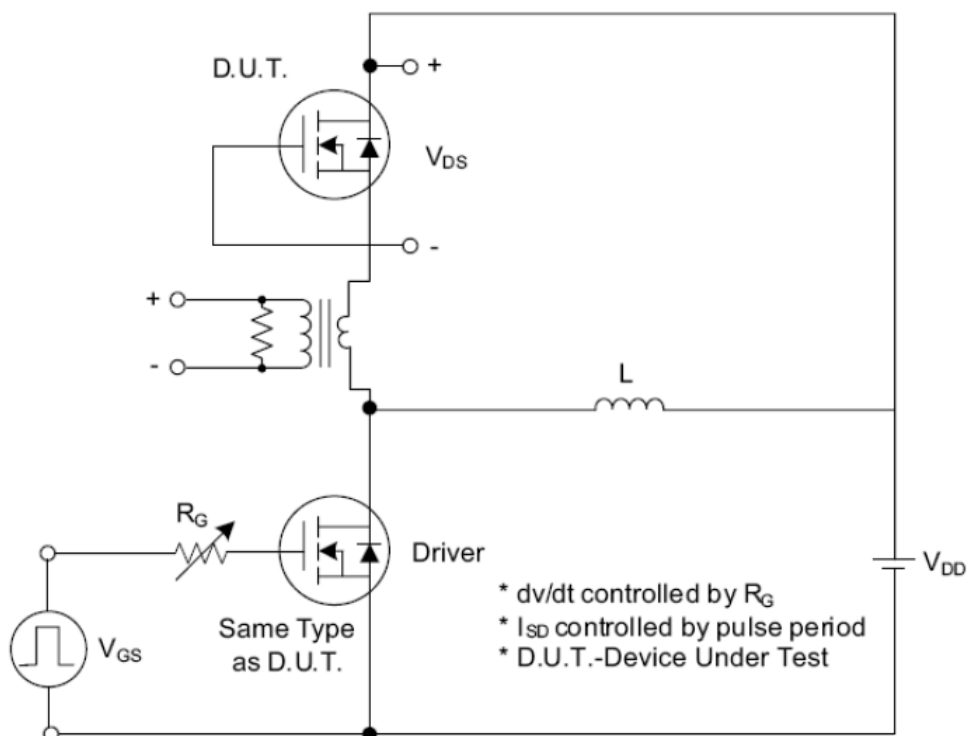


Fig. 1.1 Peak Diode Recovery dv/dt Test Circuit

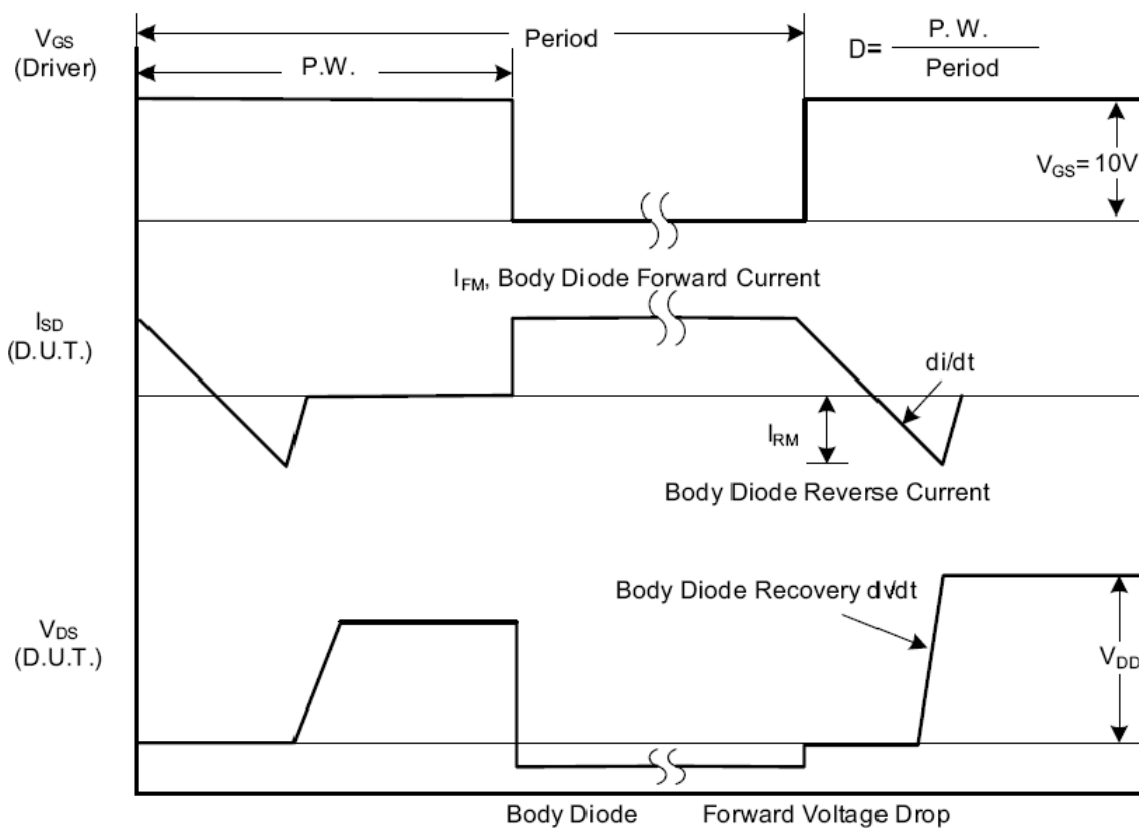


Fig. 1.2 Peak Diode Recovery dv/dt Waveforms

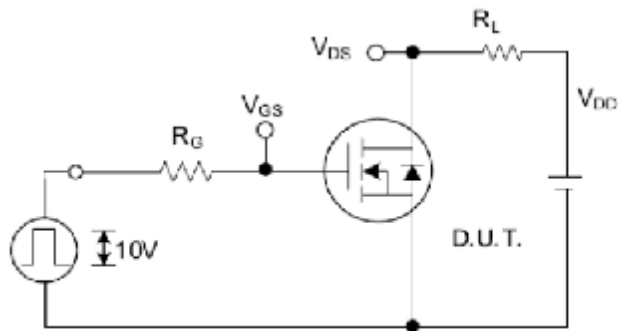


Fig. 2.1 Switching Test Circuit

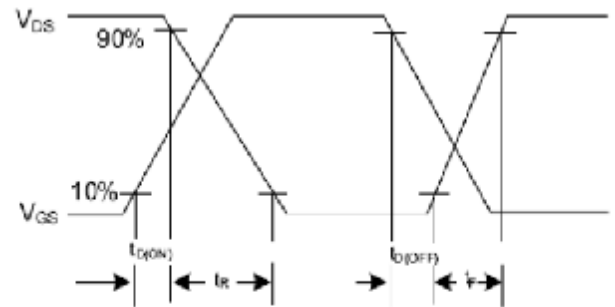


Fig. 2.2 Switching Waveforms

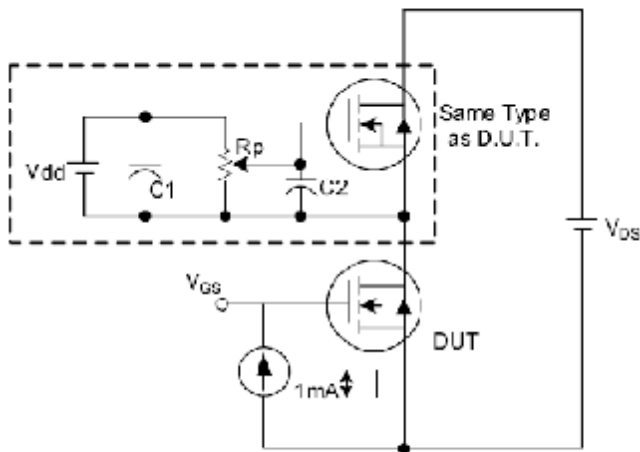


Fig. 3.1 Gate Charge Test Circuit

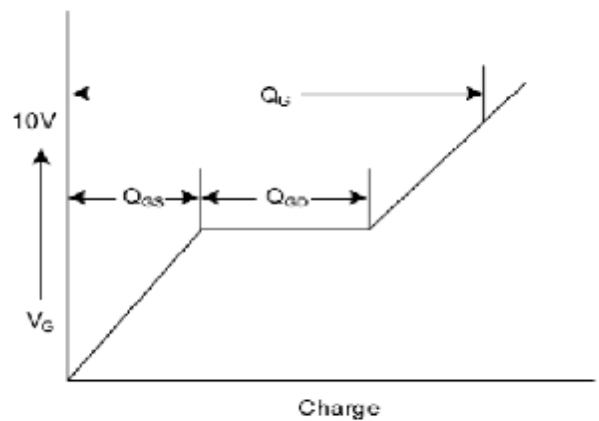


Fig. 3.2 Gate Charge Waveform

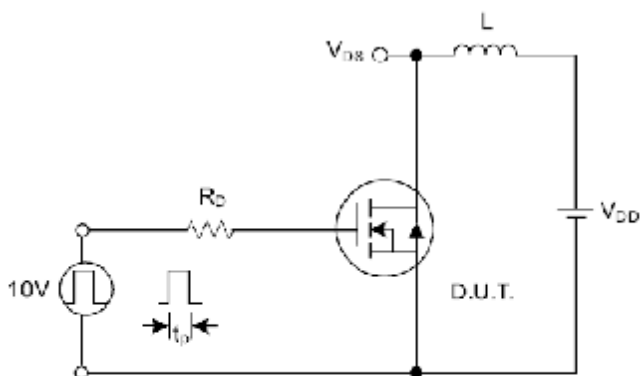


Fig. 4.1 Unclamped Inductive Switching Test Circuit

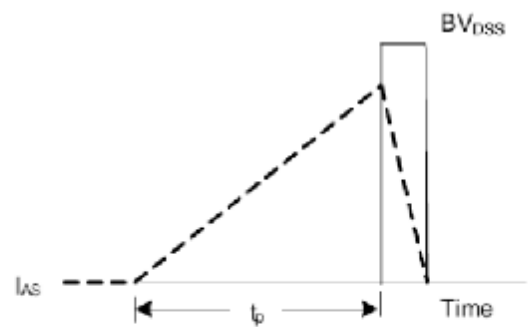


Fig. 4.2 Unclamped Inductive Switching Waveforms