

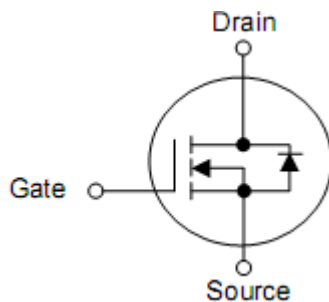
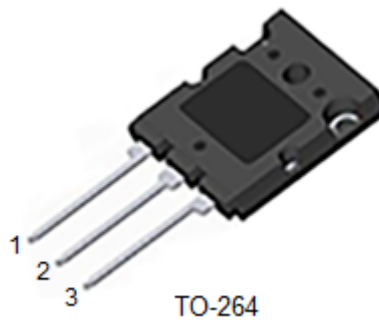
## 1. Features

- $R_{DS(ON)}=300m\Omega(\text{typ.})@V_{GS}=10V$
- Advanced Planar Process
- Low Gate Charge Minimize Switching Loss
- Rugged Poly silicon Gate Structure

## 2. Applications

- BLDC Motor Driver
- Electric Welder
- High Efficiency SMPS

## 3. Symbol



Pin	Function
1	Gate
2	Drain
3	Source

## 4. Ordering Information

Part Number	Package	Brand
KNK7590A	TO-264	KIA

## 5. Absolute maximum ratings

$T_C=25^{\circ}\text{C}$  unless otherwise noted

Parameter	Symbol	Rating	Units	
Drain-source voltage <sup>1)</sup>	$V_{DSS}$	900	V	
Gate-to-Source Voltage	$V_{GSS}$	$\pm 30$	V	
Continuous drain current	$T_C=25^{\circ}\text{C}$	$I_D$	24	A
	$T_C=100^{\circ}\text{C}$	$I_D$	15	A
Pulsed Drain Current at $V_{GS}=10\text{V}$ <sup>2),4)</sup>	$I_{DM}$	96	A	
Single pulse avalanche energy	$E_{AS}$	3200	mJ	
Peak Diode Recovery $dv/dt$ <sup>3)</sup>	$dv/dt$	5.0	V/ns	
Power dissipation	$T_C=25^{\circ}\text{C}$	$P_D$	660	W
	Derate above $25^{\circ}\text{C}$		5.26	W/ $^{\circ}\text{C}$
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	$^{\circ}\text{C}$	
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
Thermal resistance junction-case	$R_{\theta JC}$	0.19	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	55	$^{\circ}\text{C/W}$

## 7. Electrical characteristics

 (T<sub>C</sub>=25°C unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	900	-	-	V
Drain-source leakage current	I <sub>DSS</sub>	V <sub>DS</sub> =900V, V <sub>GS</sub> =0V	-	-	5	uA
		V <sub>DS</sub> =720V, T <sub>J</sub> =125°C			125	uA
Gate-source forward leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	-	-	±100	nA
Drain-source on-resistance <sup>4)</sup>	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =12A	-	300	420	mΩ
Gate threshold voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.5	-	4.5	V
Forward Transconductance <sup>4)</sup>	g <sub>fs</sub>	V <sub>DS</sub> =25V, I <sub>D</sub> =12A	-	18	-	S
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V f=1MHz	-	7400	-	pF
Reverse transfer capacitance	C <sub>rss</sub>		-	98	-	pF
Output capacitance	C <sub>oss</sub>		-	580	-	pF
Total gate charge(10V)	Q <sub>g</sub>	V <sub>DD</sub> =450V, I <sub>D</sub> =12A V <sub>GS</sub> =0~10V	-	180	-	nC
Gate-source charge	Q <sub>gs</sub>		-	42	-	nC
Gate-drain charge	Q <sub>gd</sub>		-	60	-	nC
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =450V, V <sub>GS</sub> =10V, R <sub>G</sub> =10Ω, I <sub>D</sub> =12A	-	58	-	ns
Rise time	t <sub>r</sub>		-	148	-	ns
Turn-off delay time	t <sub>d(off)</sub>		-	85	-	ns
Fall time	t <sub>f</sub>		-	125	-	ns
Continuous Source Current <sup>2)</sup>	I <sub>SD</sub>	Integral PN-diode in MOSFET	-	-	24	A
Pulsed Source Current <sup>2)</sup>	I <sub>SM</sub>		-	-	96	A
Diode forward voltage	V <sub>SD</sub>	I <sub>S</sub> =24A, V <sub>GS</sub> =0V,	-	-	1.5	V
Reverse Recovery Time	t <sub>rr</sub>	V <sub>GS</sub> =0V, I <sub>F</sub> =24A, dI <sub>F</sub> /dt=100A/μs	-	900	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>		-	2.0	-	nC

Note:

- 1) T<sub>J</sub>=+25 °C to +150 °C
- 2) Silicon limited current only.
- 3) Package limited current.
- 4) Repetitive rating; pulse width limited by maximum junction temperature.
- 5) Pulse width≤380us; duty cycle≤2%.

8. Typical operating characteristics

Figure 1. Maximum Transient Thermal Impedance

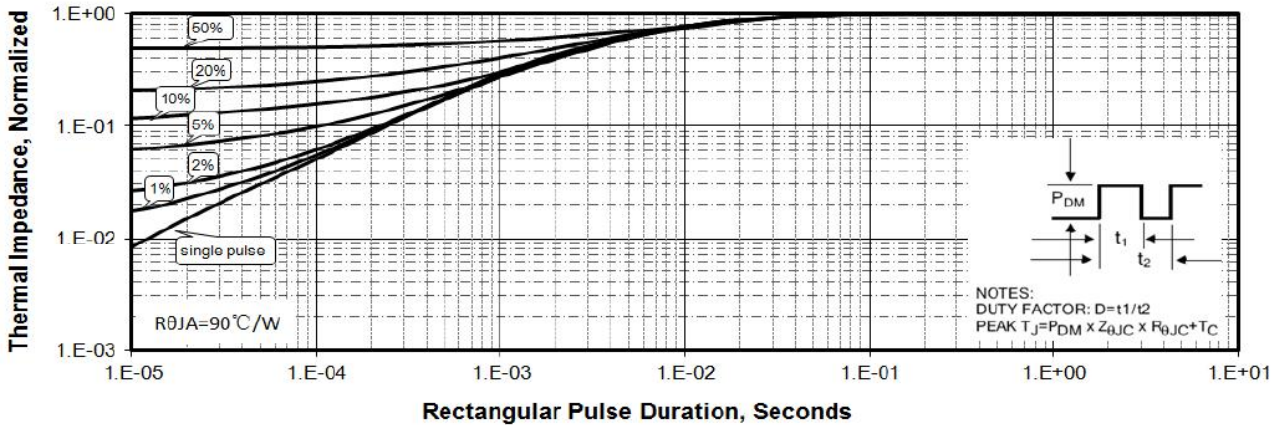


Figure 2 . Max. Power Dissipation vs Case Temperature

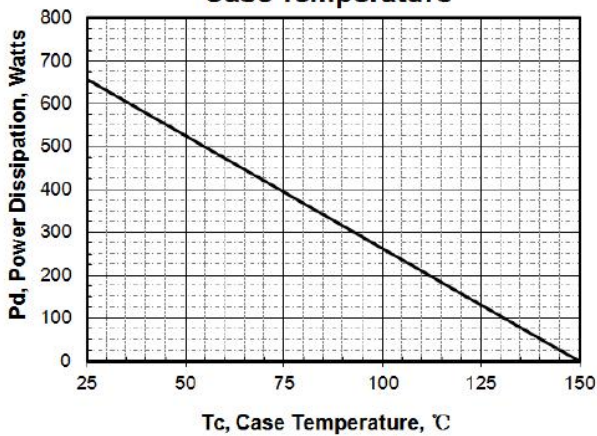


Figure 3 .Maximum Continuous Drain Current vs Tc

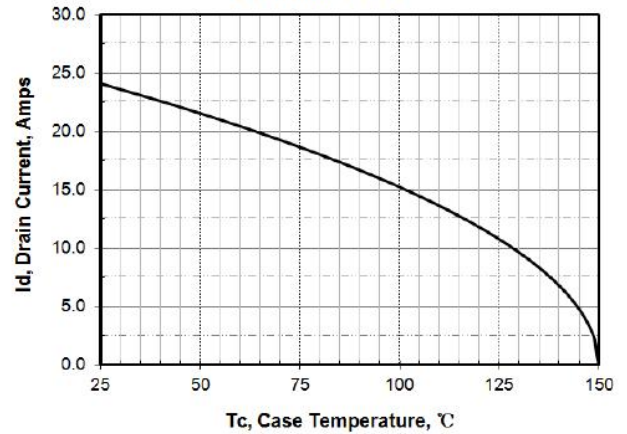


Figure 4. Output Characteristics

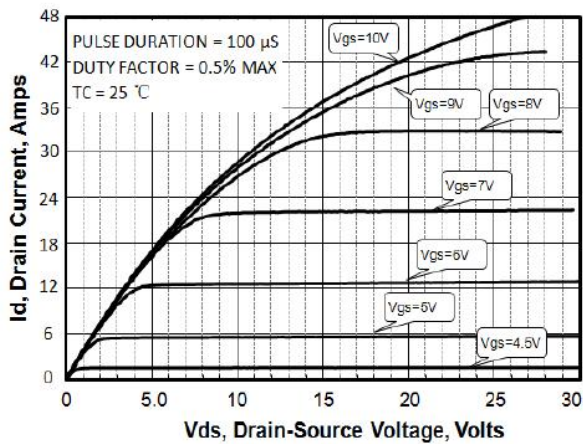
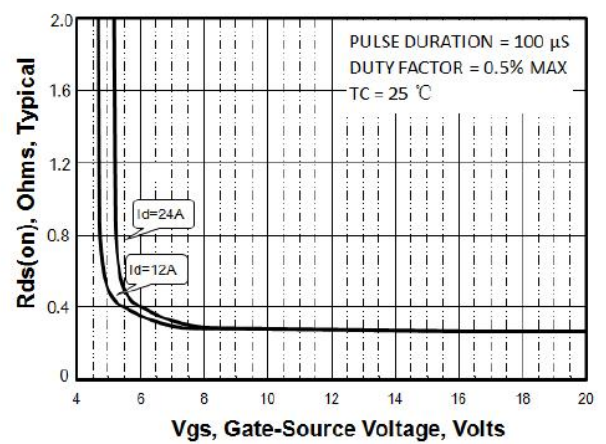
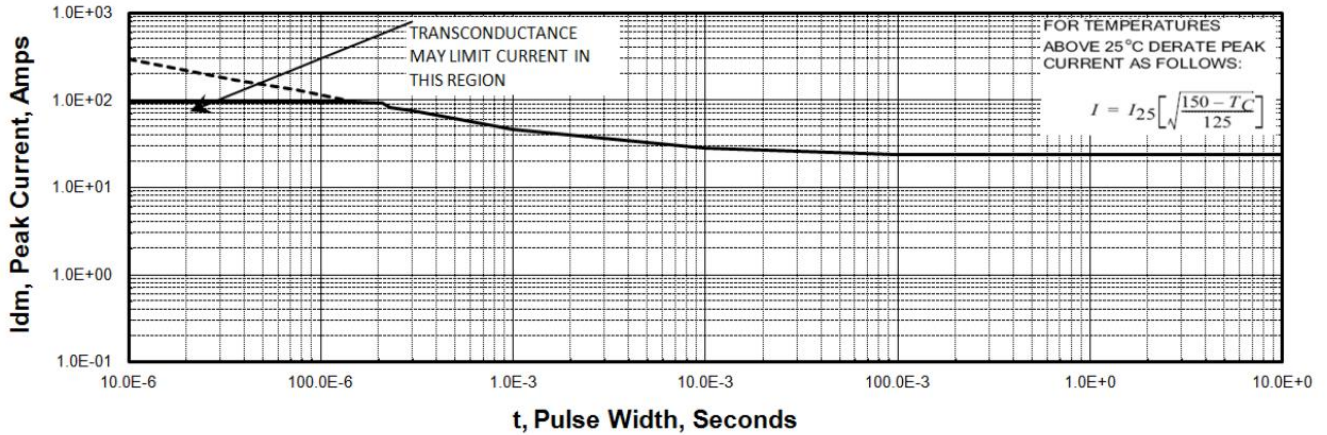


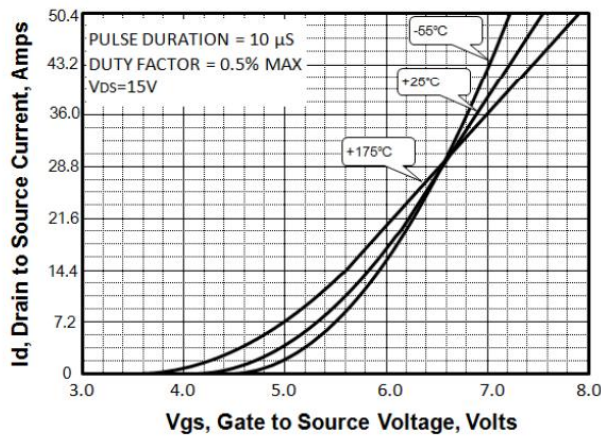
Figure 5. Rds(on) vs Gate Voltage



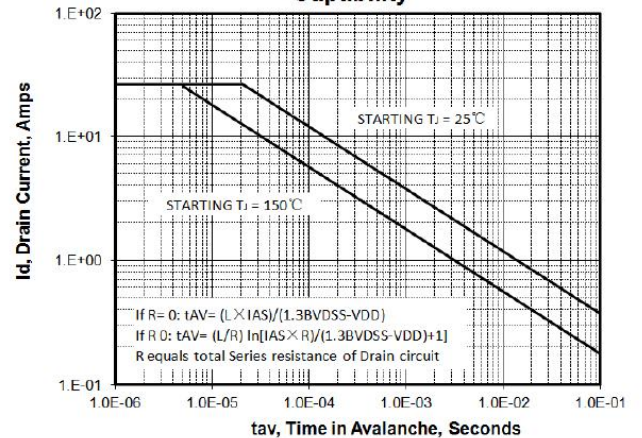
**Figure 6. Peak Current Capability**



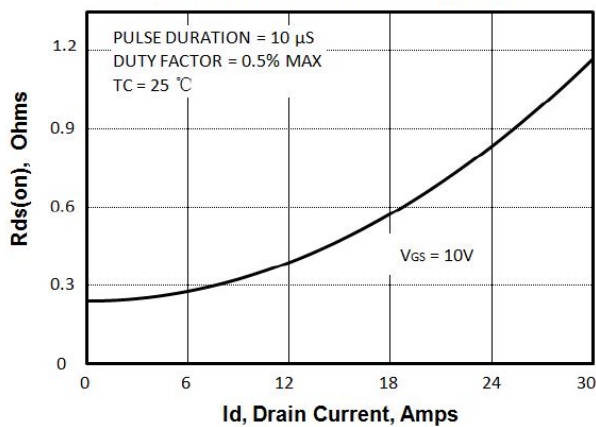
**Figure 7. Transfer Characteristics**



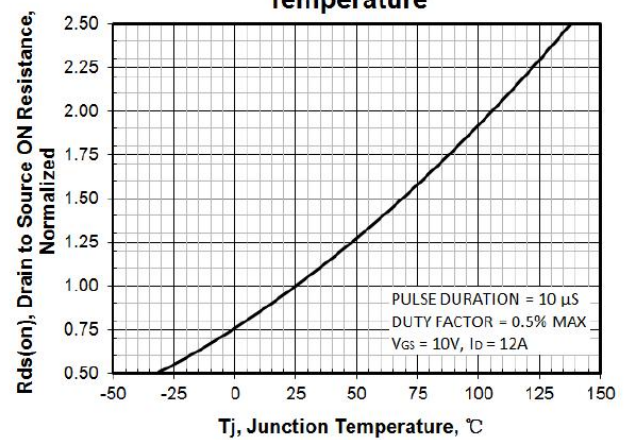
**Figure 8. Unclamped Inductive Switching Capability**



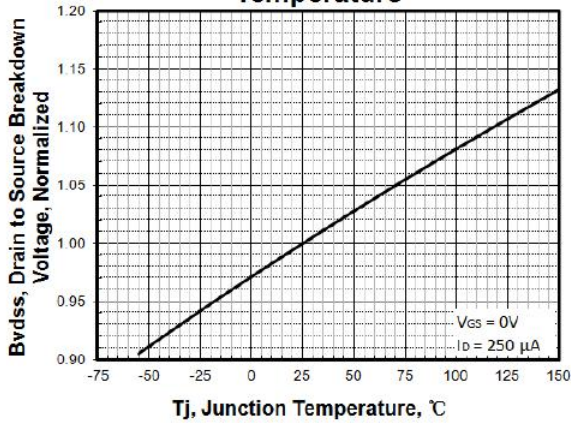
**Figure 9. Drain to Source ON Resistance vs Drain Current**



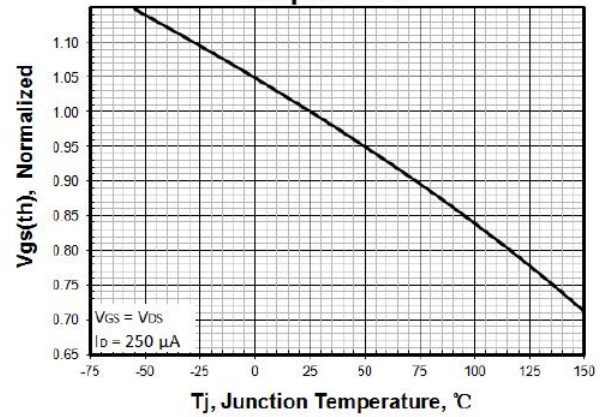
**Figure 10. Rds(on) vs Junction Temperature**



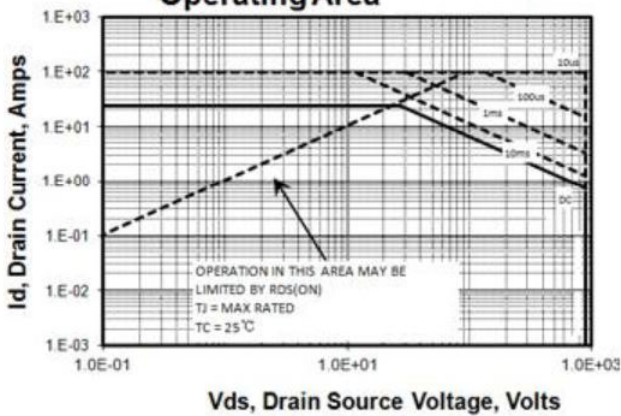
**Figure 11. Breakdown Voltage vs Temperature**



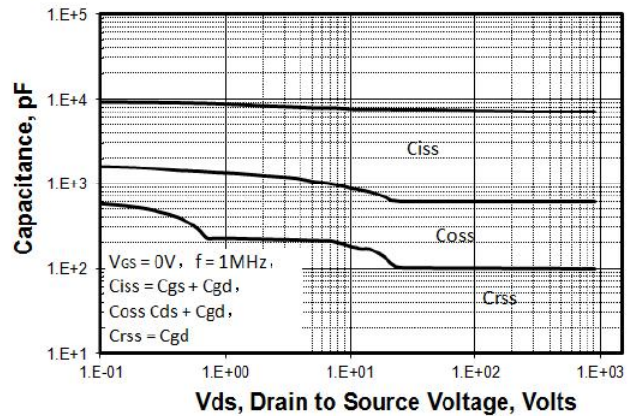
**Figure 12. Threshold Voltage vs Temperature**



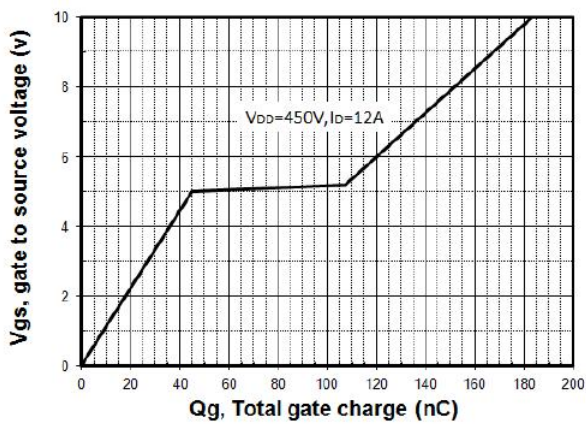
**Figure 13. Maximum Safe Operating Area**



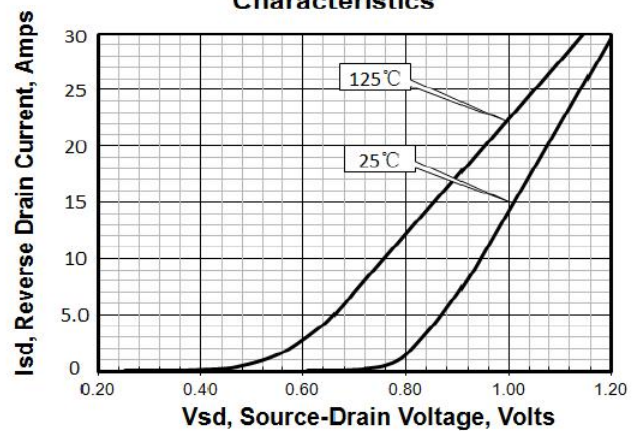
**Figure 14. Capacitance vs Vds**



**Figure 15. Typical Gate Charge**



**Figure 16. Body Diode Transfer Characteristics**



**9. Test Circuits and Waveforms**

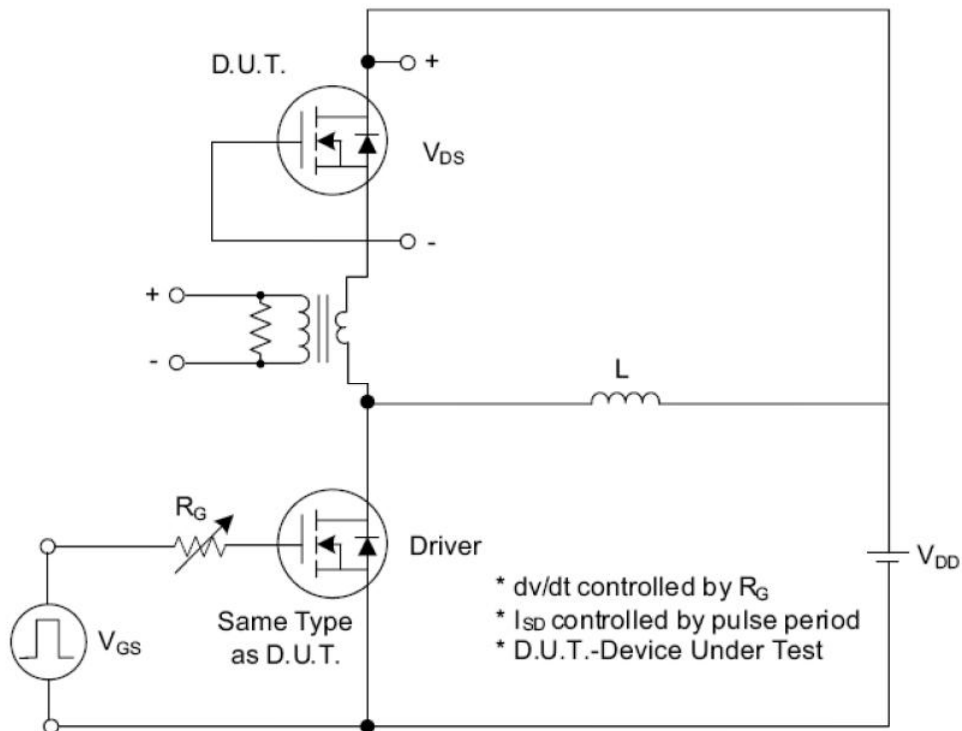


Fig. 1.1 Peak Diode Recovery  $dv/dt$  Test Circuit

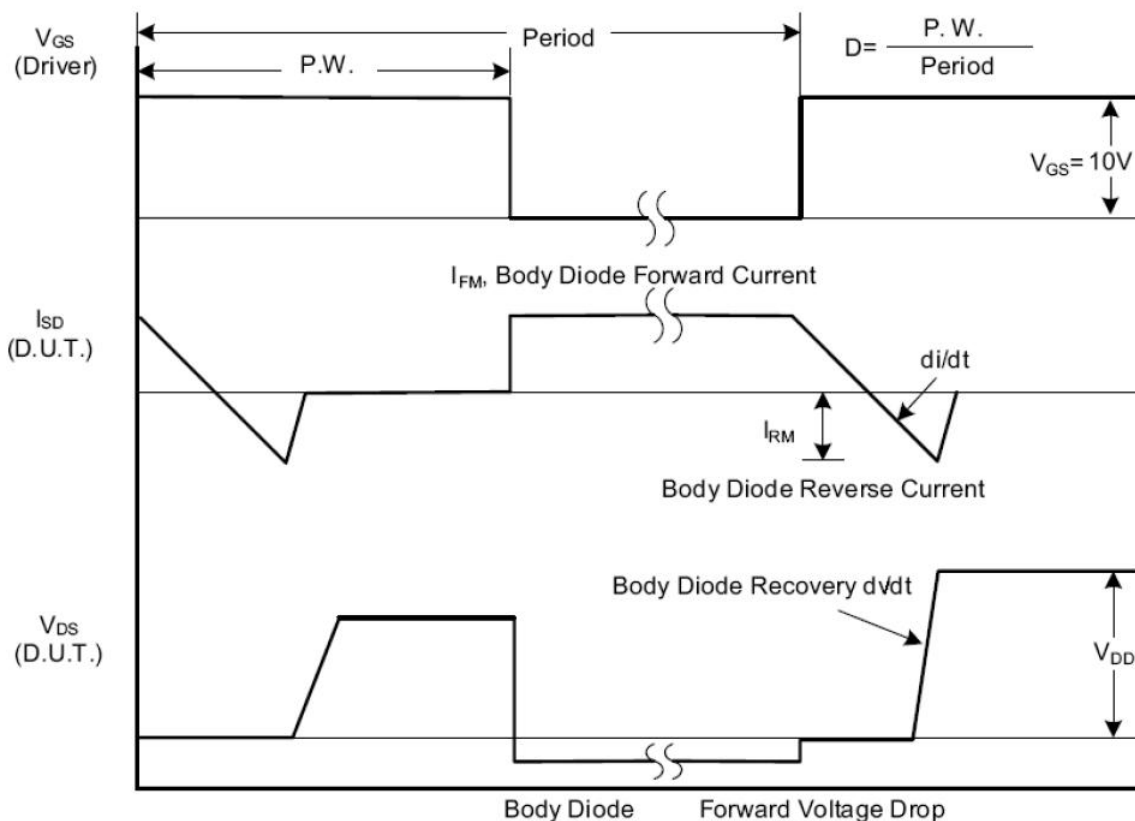


Fig. 1.2 Peak Diode Recovery  $dv/dt$  Waveforms

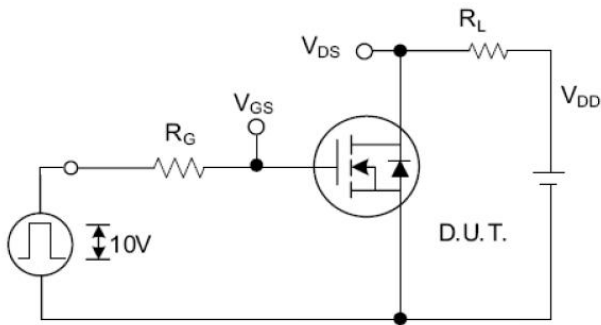


Fig. 2.1 Switching Test Circuit

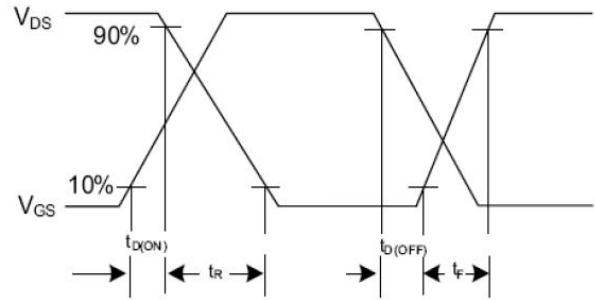


Fig. 2.2 Switching Waveforms

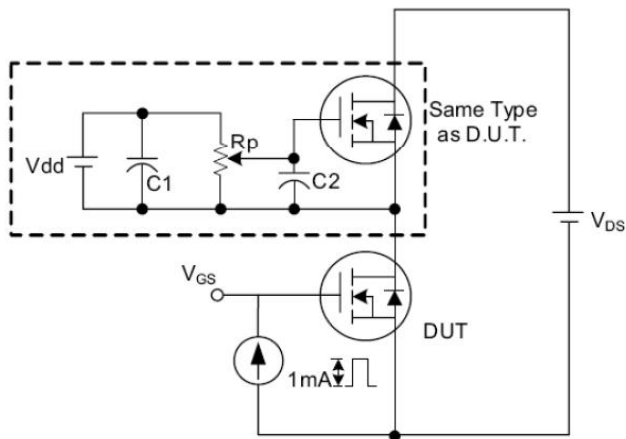


Fig. 3.1 Gate Charge Test Circuit

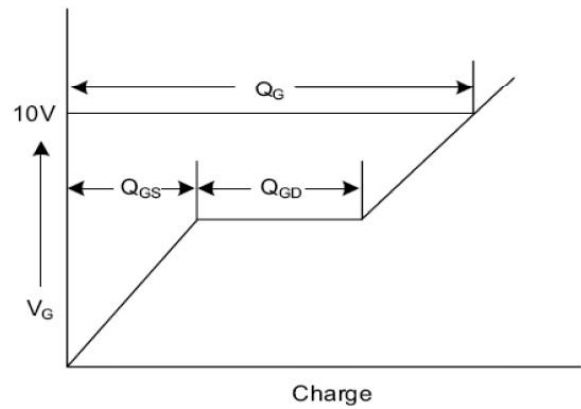


Fig. 3.2 Gate Charge Waveform

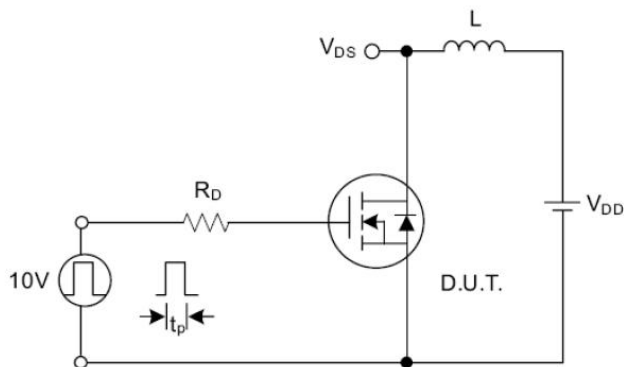


Fig. 4.1 Unclamped Inductive Switching Test Circuit

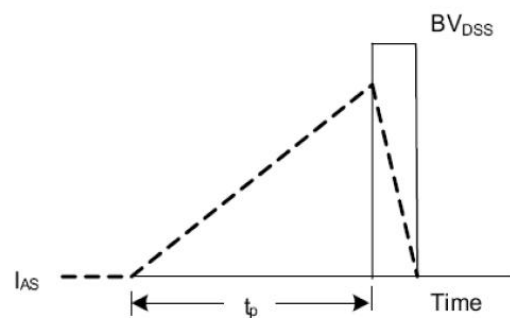


Fig. 4.2 Unclamped Inductive Switching Waveforms