

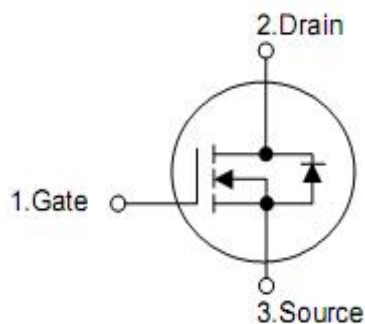
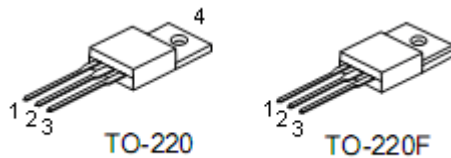
## 1. General Features

- n Proprietary New Planar Technology
- n  $R_{DS(ON),typ.}=0.35\Omega@V_{GS}=10V$
- n Low Gate Charge Minimize Switching Loss
- n Fast Recovery Body Diode

## 2. Applications

- n Ballast and Lighting
- n DC-AC Inverter
- n Other Applications

## 3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

## 4. Ordering Information

Part Number	Package	Brand
KNP6140A	TO-220	KIA
KNF6140A	TO-220F	KIA

## 5. Absolute maximum ratings

(T<sub>c</sub>= 25 °C , unless otherwise specified)

Symbol	Parameter	KNP6140A	KNF6140A	Unit
V <sub>DSS</sub>	Drain-to-Source Voltage <sup>[1]</sup>	400		V
V <sub>GSS</sub>	Gate-to-Source Voltage	±30		
I <sub>D</sub>	Continuous Drain Current	10	10*	A
	Continuous Drain Current@ T <sub>c</sub> =100 °C	Figure3		
I <sub>DM</sub>	Pulsed Drain Current at V <sub>GS</sub> =10V <sup>[2]</sup>	Figure6		
E <sub>AS</sub>	Single Pulse Avalanche Energy	650		mJ
dv /dt	Peak Diode Recovery dv/dt <sup>[3]</sup>	5.0		V/ns
P <sub>D</sub>	Power Dissipation	140	45	W
	Derating Factor above 25 °C	1.12	0.37	W/ °C
T <sub>L</sub> T <sub>PAK</sub>	Maximum Temperature for Soldering Leads at 0.063in (1.6mm) from Case for 10 seconds, Package Body for 10 seconds	300 260		°C
T <sub>J</sub> &T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to 150		

\*Drain current limited by maximum junction temperature

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

## 6. Thermal characteristics

Symbol	Parameter	KNP6140A	KNF6140A	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	0.89	2.7	°C /W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62	100	

## 7. Electrical characteristics

OFF Characteristics		(T <sub>J</sub> =25°C, unless otherwise specified)				
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
B <sub>V</sub> DSS	Drain-to-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	400	--	--	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> =400V, V <sub>GS</sub> =0V	--	--	1	μA
		V <sub>DS</sub> =320V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	--	--	100	
I <sub>GSS</sub>	Gate-to-Source Leakage Current	V <sub>GS</sub> =+30V, V <sub>DS</sub> =0V	--	--	+100	nA
		V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V	--	--	-100	
ON Characteristics		(T <sub>J</sub> =25°C, unless otherwise specified)				
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R <sub>DS(ON)</sub>	Static Drain-to-Source On-Resistance <sup>[4]</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =5A	--	0.35	0.5	Ω
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.0	--	4.0	V
g <sub>FS</sub>	Forward Transconductance <sup>[4]</sup>	V <sub>DS</sub> =20V, I <sub>D</sub> =10A	--	12	--	S
Dynamic Characteristics		Essentially independent of operating temperature				
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1.0MHZ	--	1254	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	21	--	
C <sub>oss</sub>	Output Capacitance		--	150	--	
Q <sub>g</sub>	Total Gate Charge	V <sub>DD</sub> =200V, I <sub>D</sub> =10A, V <sub>GS</sub> =0 to 10V	--	28	--	nC
Q <sub>gs</sub>	Gate-to-Source Charge		--	7.0	--	
Q <sub>gd</sub>	Gate-to-Drain (Miller) Charge		--	11	--	
Resistive Switching Characteristics		Essentially independent of operating temperature				
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>DD</sub> =200V, I <sub>D</sub> =10A, V <sub>GS</sub> =10V, R <sub>G</sub> =12Ω	--	14	--	nS
t <sub>rise</sub>	Rise Time		--	25	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	44	--	
t <sub>fall</sub>	Fall Time		--	28	--	
Source-Drain Body Diode Characteristics		(T <sub>J</sub> =25°C, unless otherwise specified)				
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>SD</sub>	Continuous Source Current <sup>[4]</sup>	Integral PN-diode in MOSFET	--	--	10	A
I <sub>SM</sub>	Pulsed Source Current <sup>[4]</sup>		--	--	40	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =10A, V <sub>GS</sub> =0V	--	--	1.5	V
t <sub>rr</sub>	Reverse recovery time	V <sub>GS</sub> =0V, I <sub>F</sub> =10A, diF/dt=100A/μs	--	303	--	ns
Q <sub>rr</sub>	Reverse recovery charge		--	1.8	--	μC

Note:

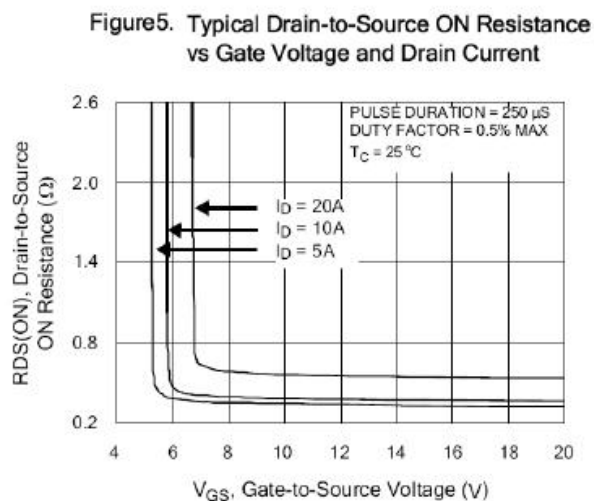
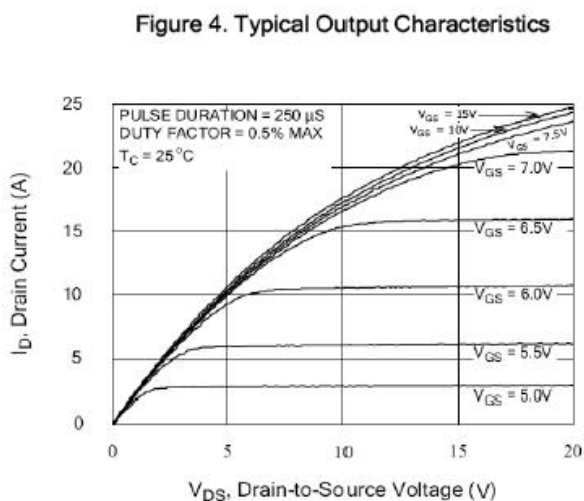
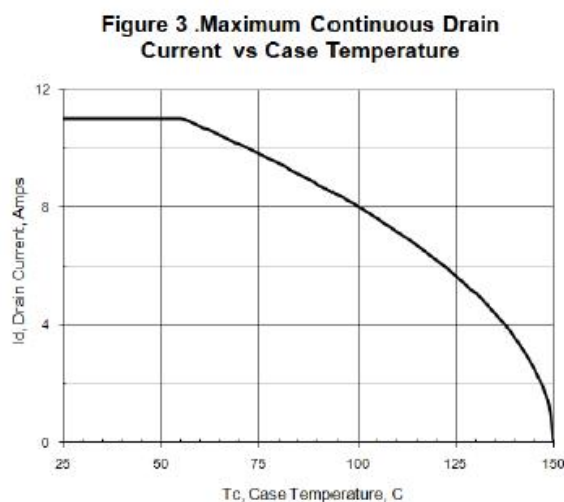
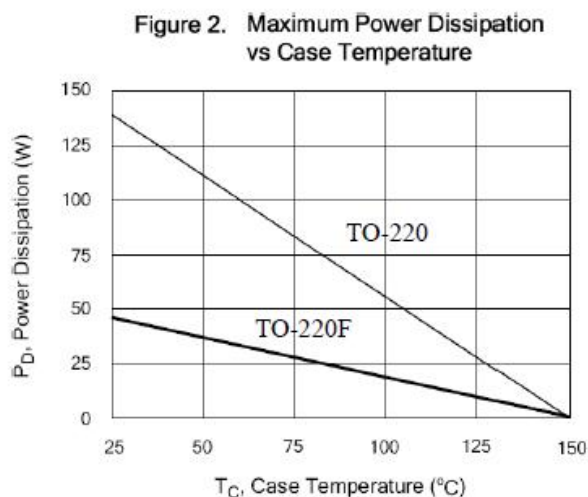
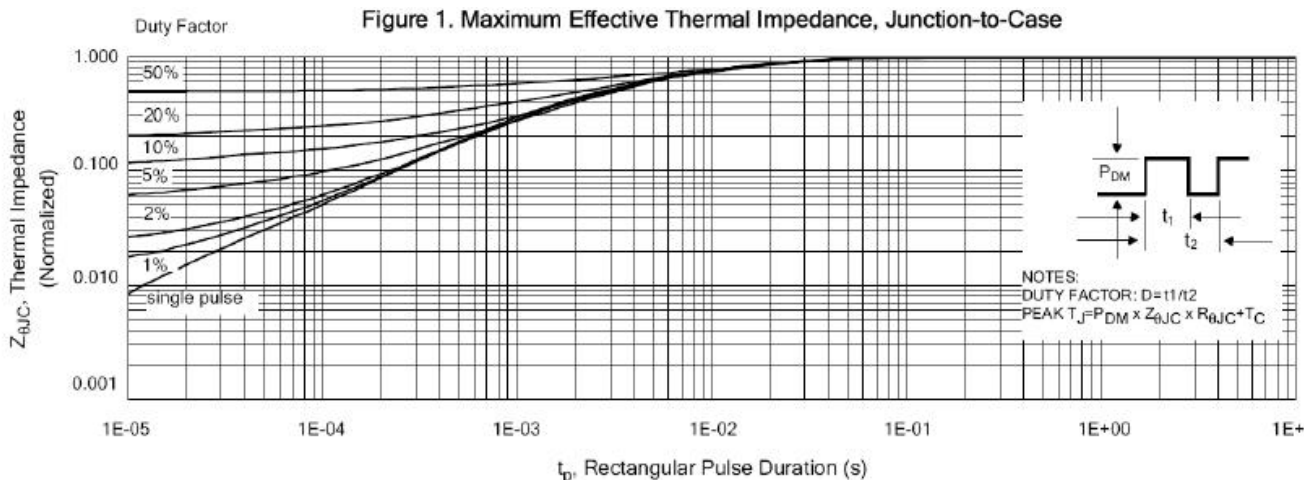
1. T<sub>J</sub>=+25°C to +150°C

2. Repetitive rating; pulse width limited by maximum junction temperature.

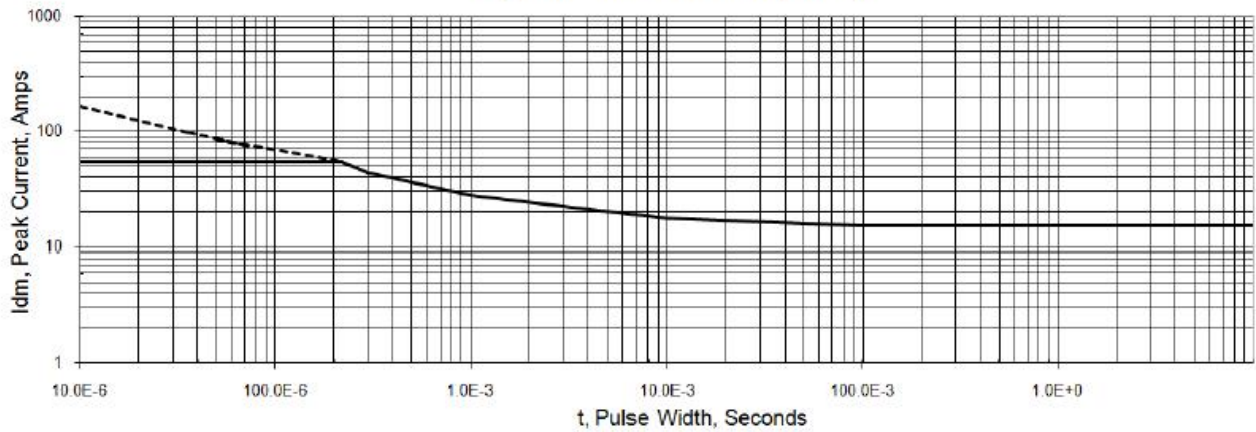
3. I<sub>SD</sub>=10A di/dt<100A/μs, V<sub>DD</sub><B<sub>V</sub>DSS, T<sub>J</sub>=+150°C.

4. Pulse width≤380μs; duty cycle≤2%.

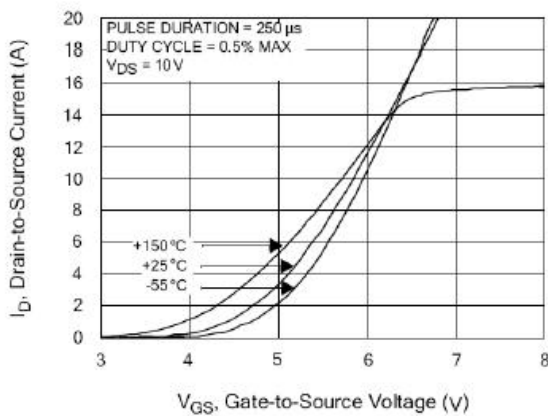
**8. Test circuits and waveforms**



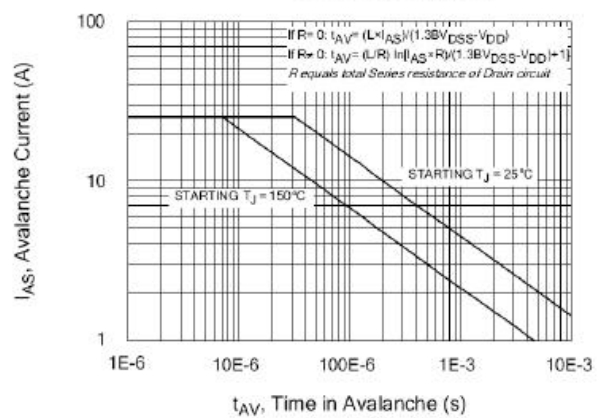
**Figure 6. Peak Current Capability**



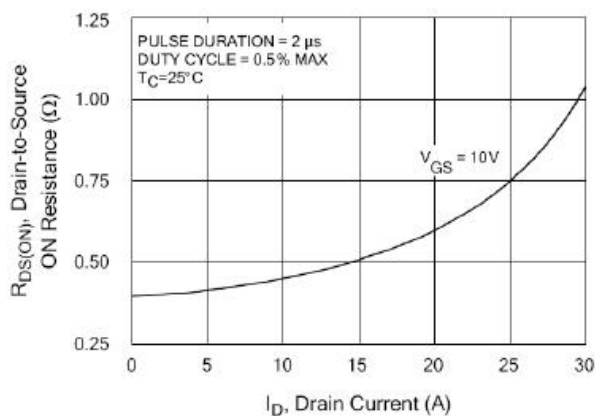
**Figure 7. Typical Transfer Characteristics**



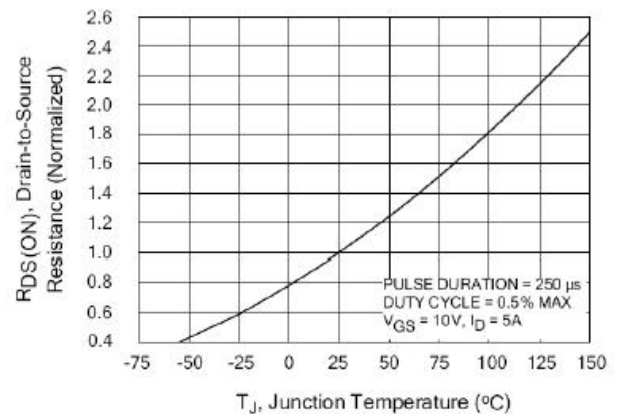
**Figure 8. Unclamped Inductive Switching Capability**



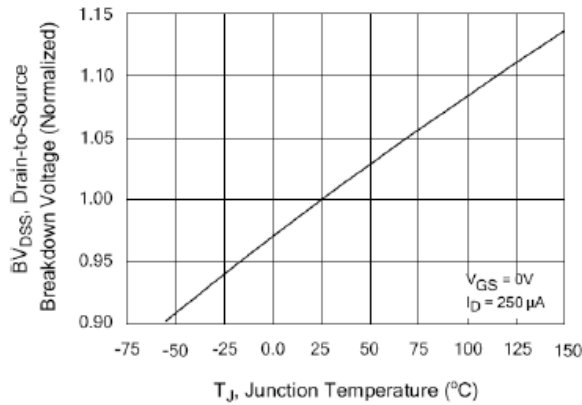
**Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current**



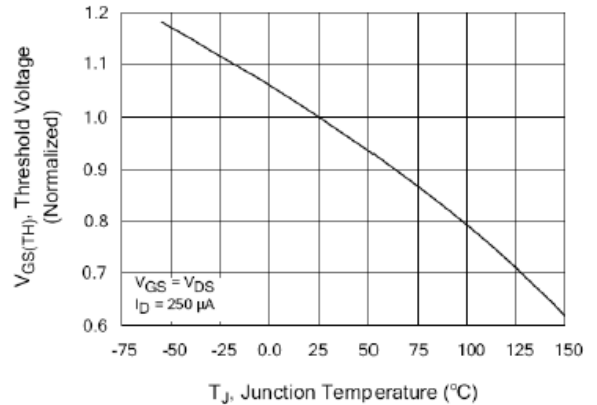
**Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature**



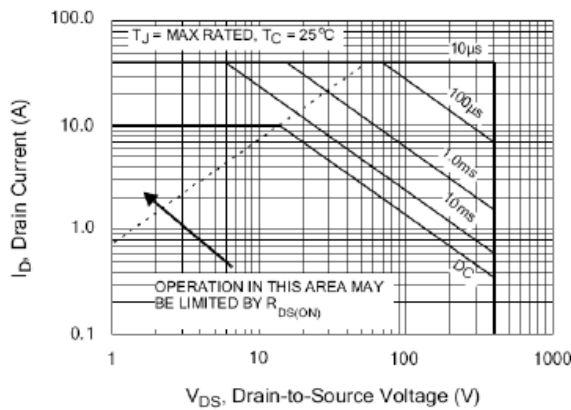
**Figure 11. Typical Breakdown Voltage vs Junction Temperature**



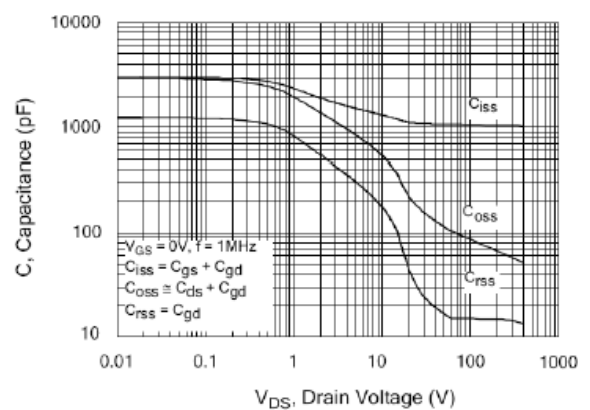
**Figure 12. Typical Threshold Voltage vs Junction Temperature**



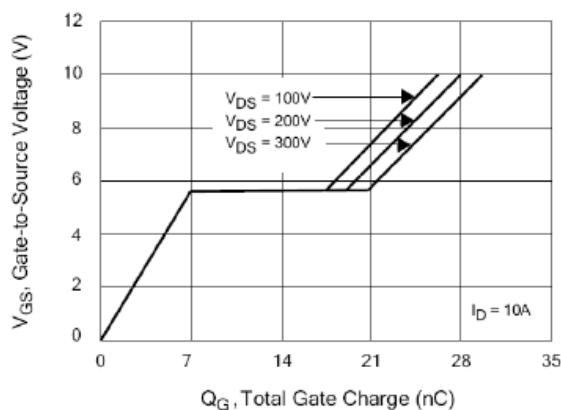
**Figure 13. Maximum Forward Bias Safe Operating Area**



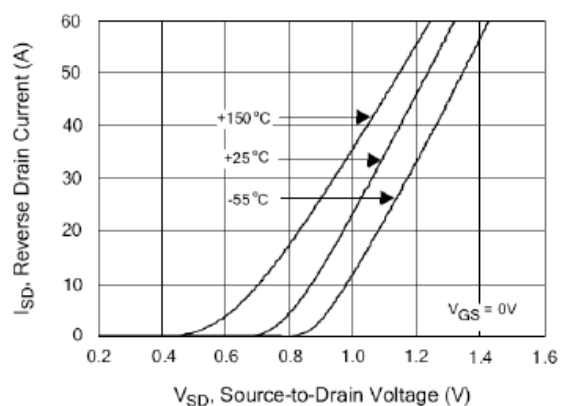
**Figure 14. Typical Capacitance vs Drain-to-Source Voltage**



**Figure 15. Typical Gate Charge vs Gate-to-Source Voltage**



**Figure 16. Typical Body Diode Transfer Characteristics**



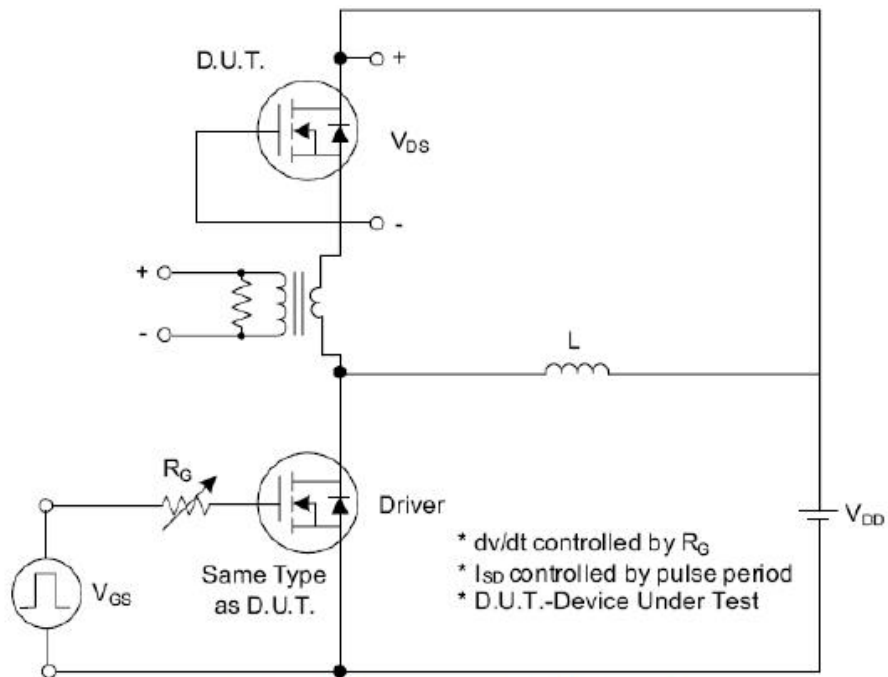


Fig. 1.1 Peak Diode Recovery  $dv/dt$  Test Circuit

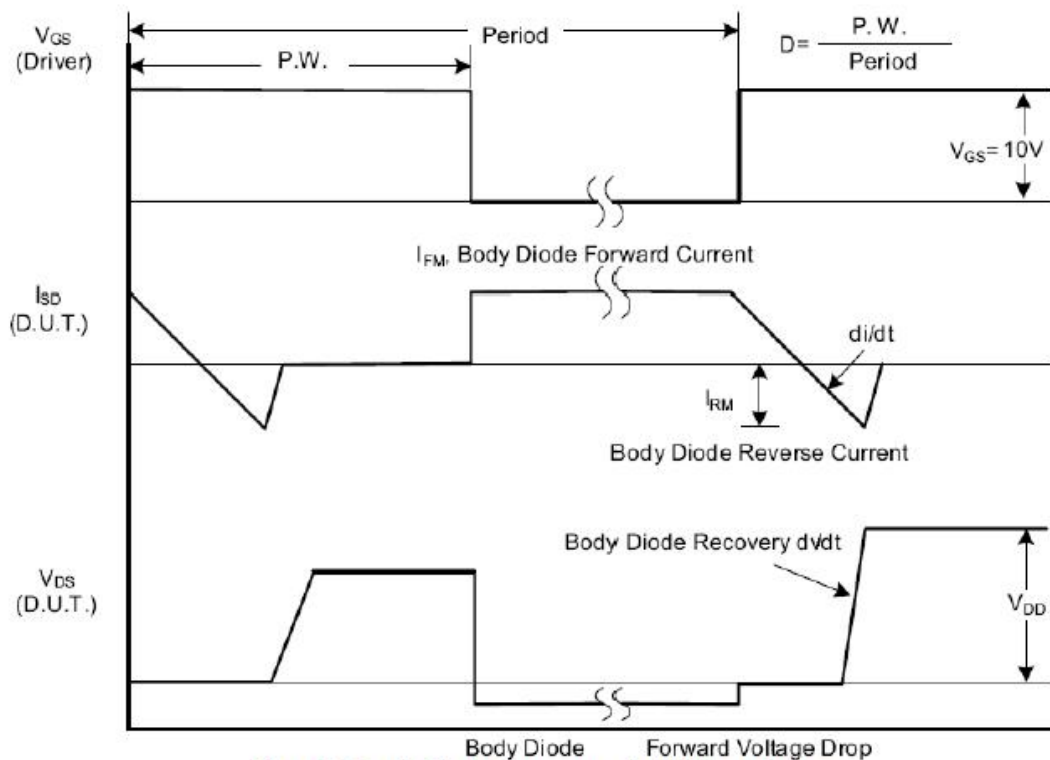


Fig. 1.2 Peak Diode Recovery  $dv/dt$  Waveforms

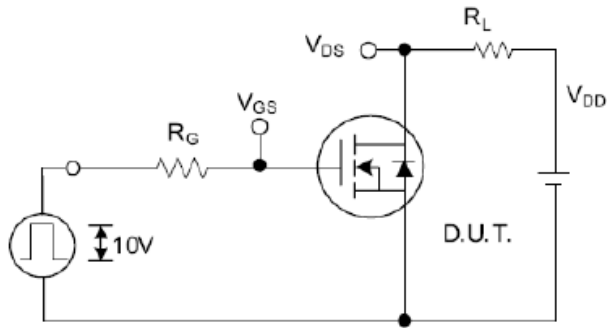


Fig. 2.1 Switching Test Circuit

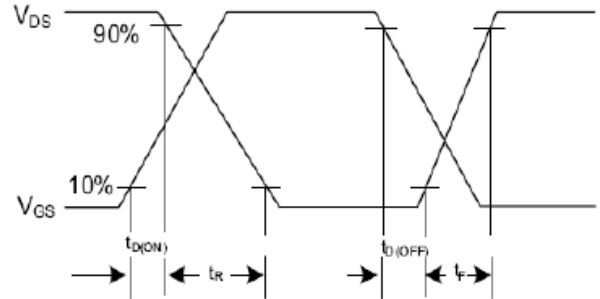


Fig. 2.2 Switching Waveforms

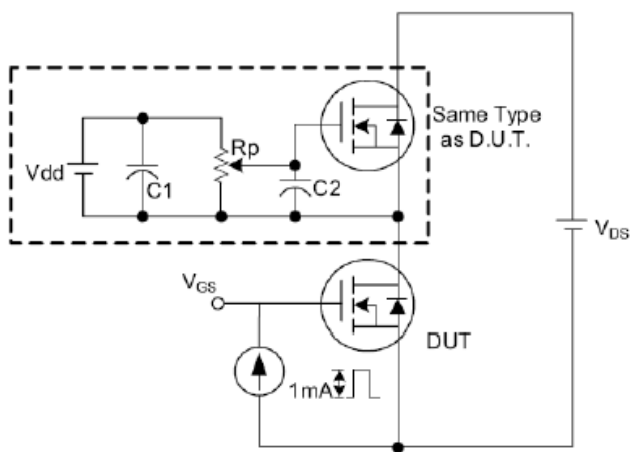


Fig. 3. 1 Gate Charge Test Circuit

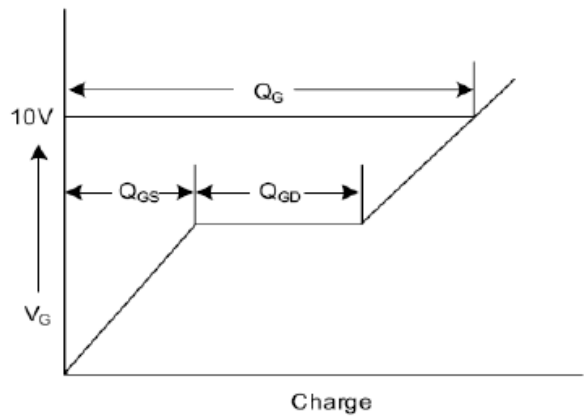


Fig. 3. 2 Gate Charge Waveform

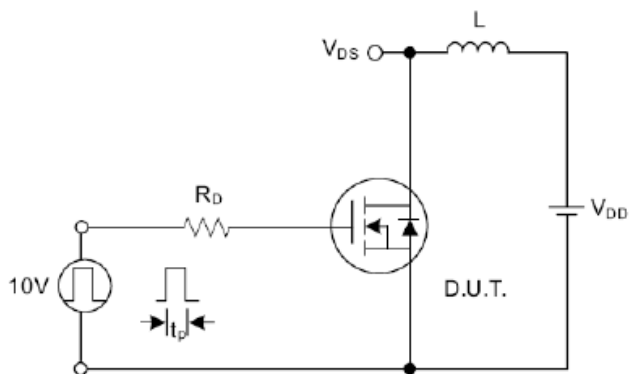


Fig. 4.1 Unclamped Inductive Switching Test Circuit

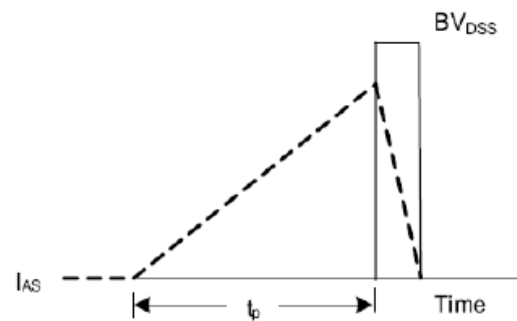


Fig. 4.2 Unclamped Inductive Switching Waveforms