

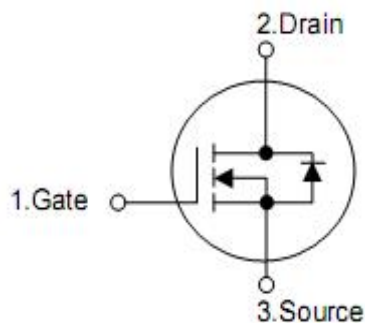
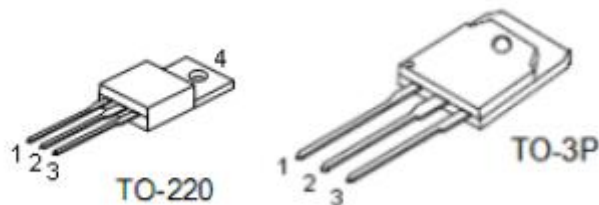
## 1. General Features

- n Proprietary New Planar Technology
- n  $R_{DS(ON),typ.}=100m\Omega@V_{GS}=10V$
- n Low Gate Charge Minimize Switching Loss
- n Fast Recovery Body Diode

## 2. Applications

- n DC-DC Converters
- n DC-AC Inverters for UPS
- n SMPS and Motor controls

## 3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

## 4. Ordering Information

Part Number	Package	Brand
KNP9130A	TO-220	KIA
KNH9130A	TO-3P	KIA

## 5. Absolute maximum ratings

(Tc= 25 °C , unless otherwise specified)

Symbol	Parameter	Rating		Unit
		TO-220	TO-3P	
V <sub>DSS</sub>	Drain-to-Source Voltage <sup>[1]</sup>	250		V
V <sub>GSS</sub>	Gate-to-Source Voltage	±20		
I <sub>D</sub>	Continuous Drain Current	40		A
	Continuous Drain Current@ Tc=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	1250		mJ
dv /dt	Peak Diode Recovery dv/dt <sup>[3]</sup>	5.0		V/ns
P <sub>D</sub>	Power Dissipation	125	150	W
	Derating Factor above 25 °C	1.0	1.2	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		

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

## 6. Thermal characteristics

Symbol	Parameter	Rating		Unit
		TO-220	TO-3P	
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	1.0	0.83	°C /W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	62		

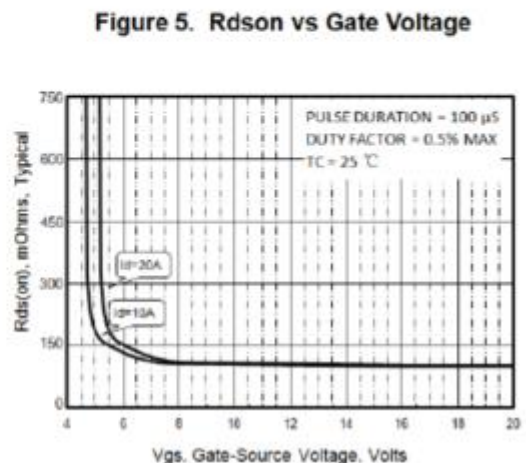
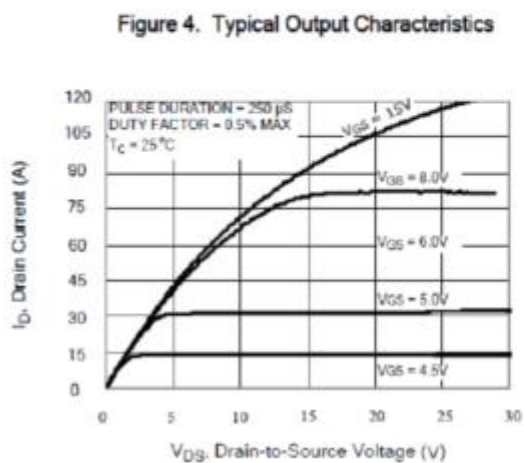
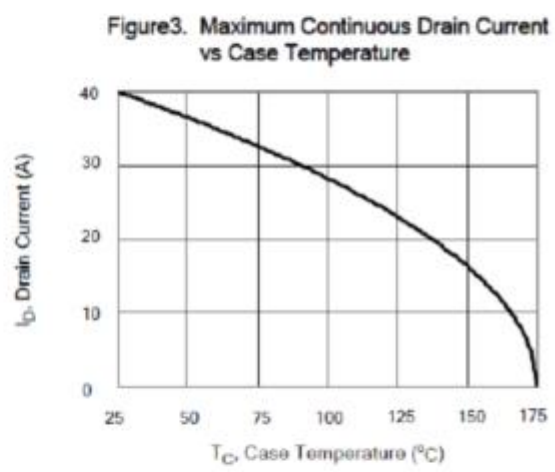
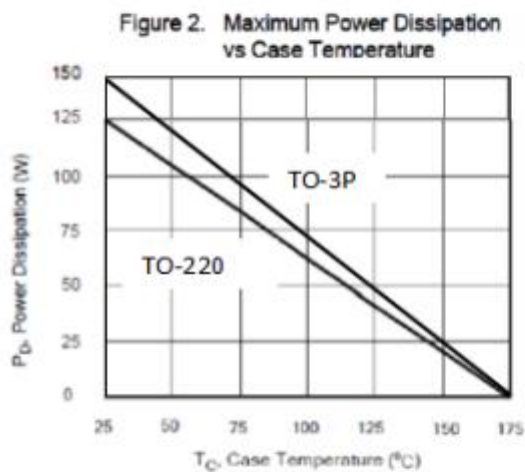
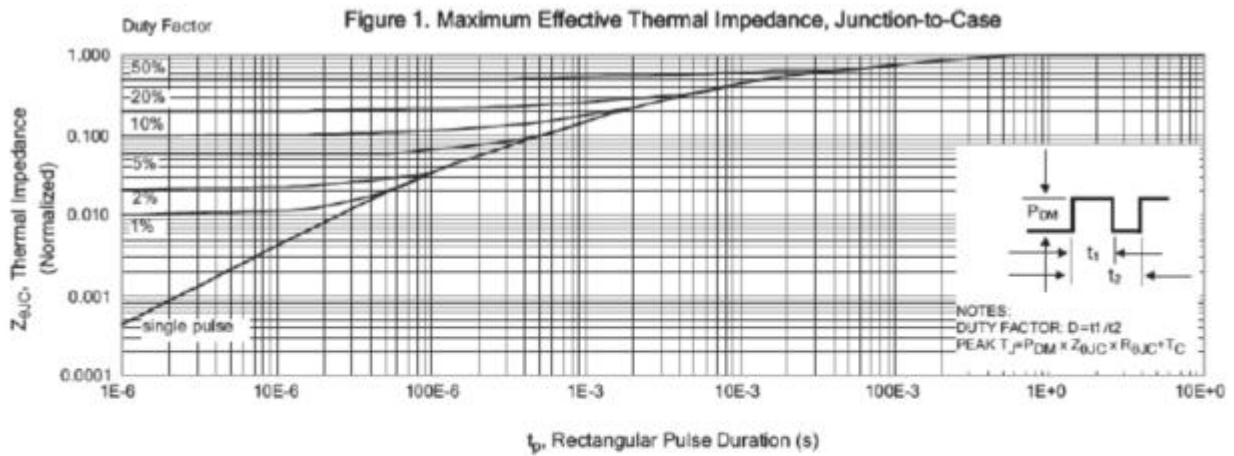
## 6. Electrical characteristics

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> =250uA	300	--	--	V
I <sub>DSS</sub>	Drain-to-Source Leakage Current	V <sub>DS</sub> =250V, V <sub>GS</sub> =0V	--	--	1	uA
		V <sub>DS</sub> =200V, 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> =+20V, V <sub>DS</sub> =0V	--	--	+100	nA
		V <sub>GS</sub> =-20V, 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> =20A	--	100	150	mΩ
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	2.0	--	4.0	V
g <sub>FS</sub>	Forward Transconductance <sup>[4]</sup>	V <sub>DS</sub> =15V, I <sub>D</sub> =20A	--	60	--	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	--	3100	--	pF
C <sub>oss</sub>	Output Capacitance		--	250	--	
C <sub>rss</sub>	Reverse Transfer Capacitance		--	80	--	
Q <sub>g</sub>	Total Gate Charge	V <sub>DD</sub> =100V, I <sub>D</sub> =20A, V <sub>GS</sub> =0 to 10V	--	95	--	nC
Q <sub>gs</sub>	Gate-to-Source Charge		--	15	--	
Q <sub>gd</sub>	Gate-to-Drain (Miller) Charge		--	40	--	
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> =100V, I <sub>D</sub> =20A, V <sub>GS</sub> = 10V, R <sub>G</sub> =3.9Ω	--	20	--	nS
t <sub>rise</sub>	Rise Time		--	32	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	64	--	
t <sub>fall</sub>	Fall Time		--	26	--	
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	--	--	40	A
I <sub>SM</sub>	Pulsed Source Current <sup>[4]</sup>		--	--	160	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> =40A, V <sub>GS</sub> =0V	--	--	1.5	V
t <sub>rr</sub>	Reverse recovery time	V <sub>GS</sub> =0V, I <sub>F</sub> =20A, diF/dt=100A/μs	--	255	--	ns
Q <sub>rr</sub>	Reverse recovery charge		--	400	--	uC

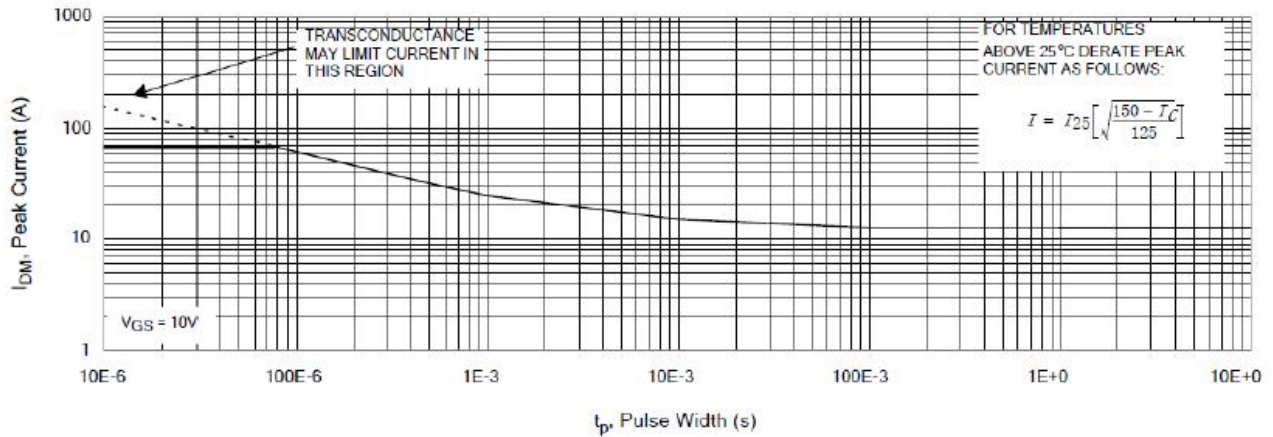
Note:

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>=20A 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%.

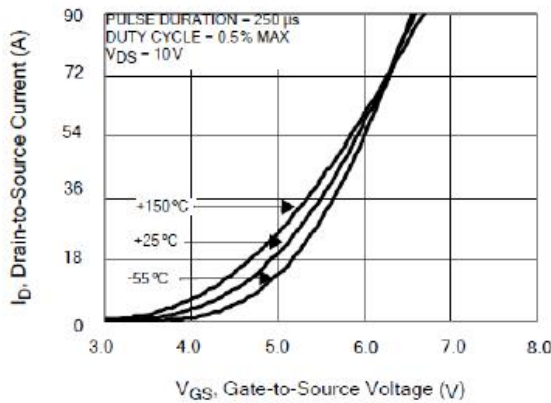
**7. Test circuits and waveforms**



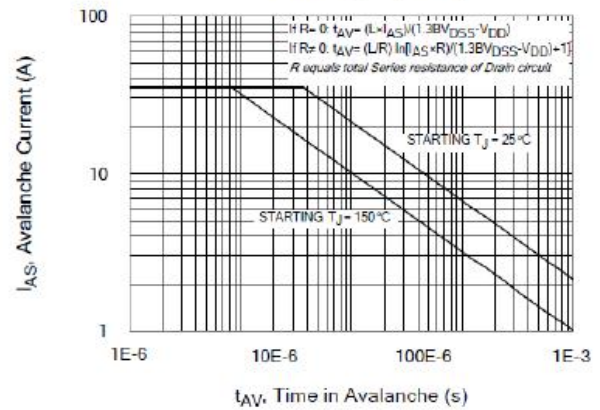
**Figure 6. Maximum Peak Current Capability**



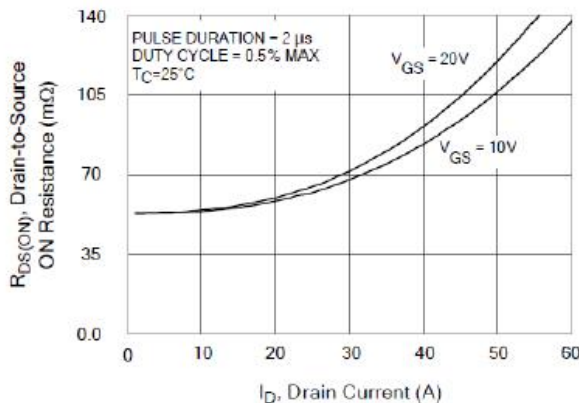
**Figure 7. Typical Transfer Characteristics**



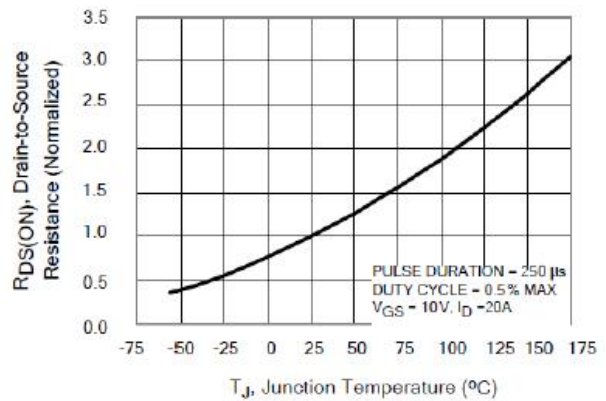
**Figure 8. Unclamped Inductive Switching Capability**



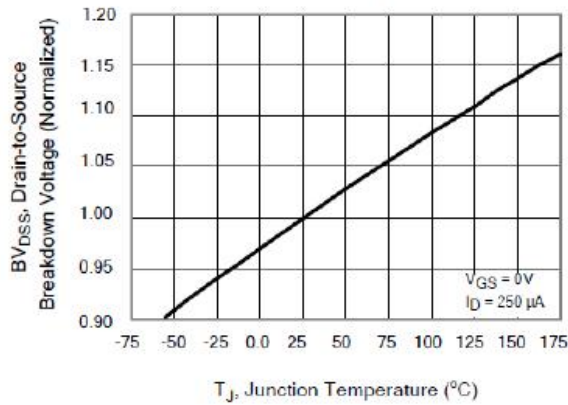
**Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current**



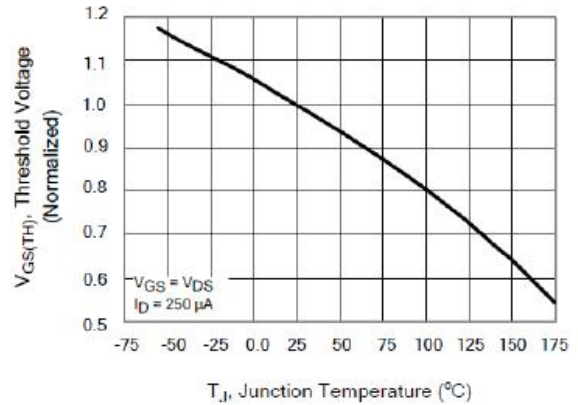
**Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature**



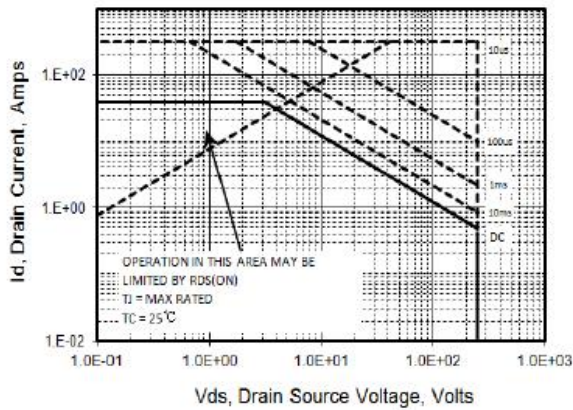
**Figure 11. Typical Breakdown Voltage vs Junction Temperature**



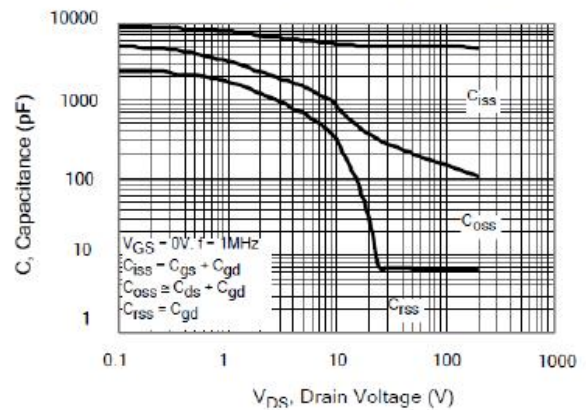
**Figure 12. Typical Threshold Voltage vs Junction Temperature**



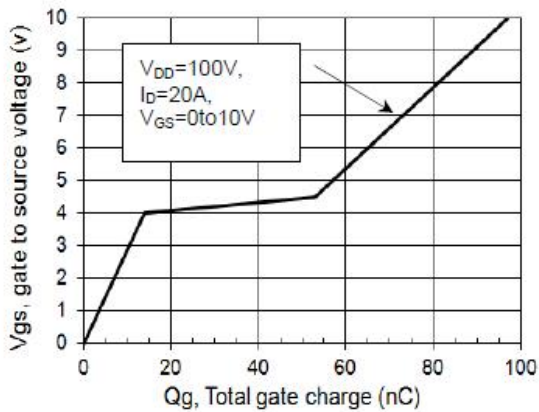
**Figure 13. Maximum Safe Operating Area**



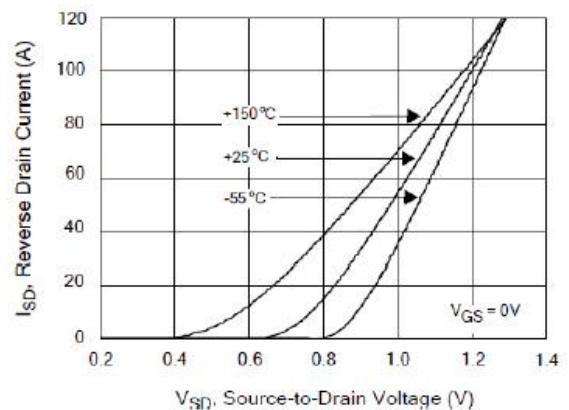
**Figure 14. Typical Capacitance vs Drain-to-Source Voltage**



**Figure 15. Typical Gate Charge**



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



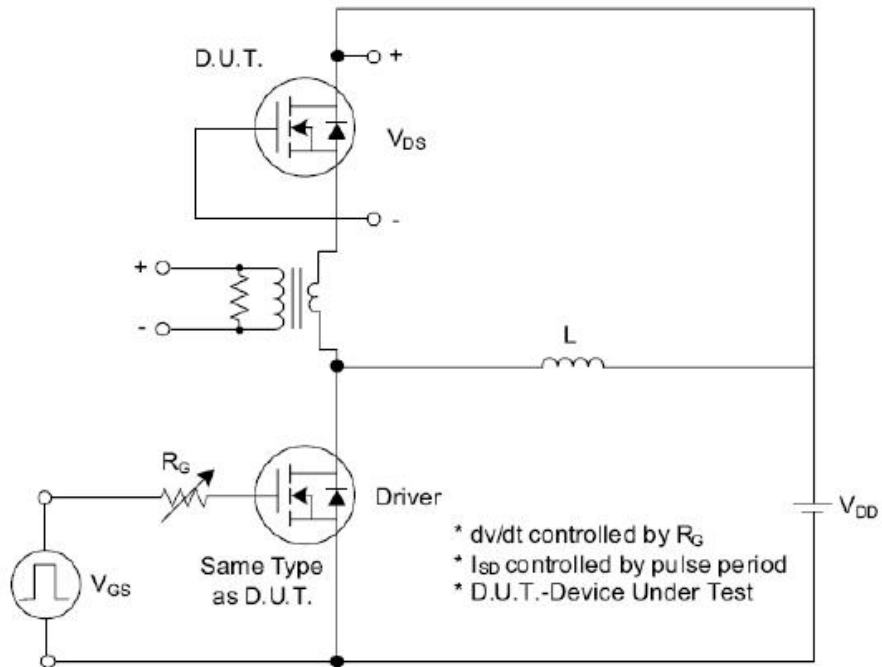


Fig. 1.1 Peak Diode Recovery  $dv/dt$  Test Circuit

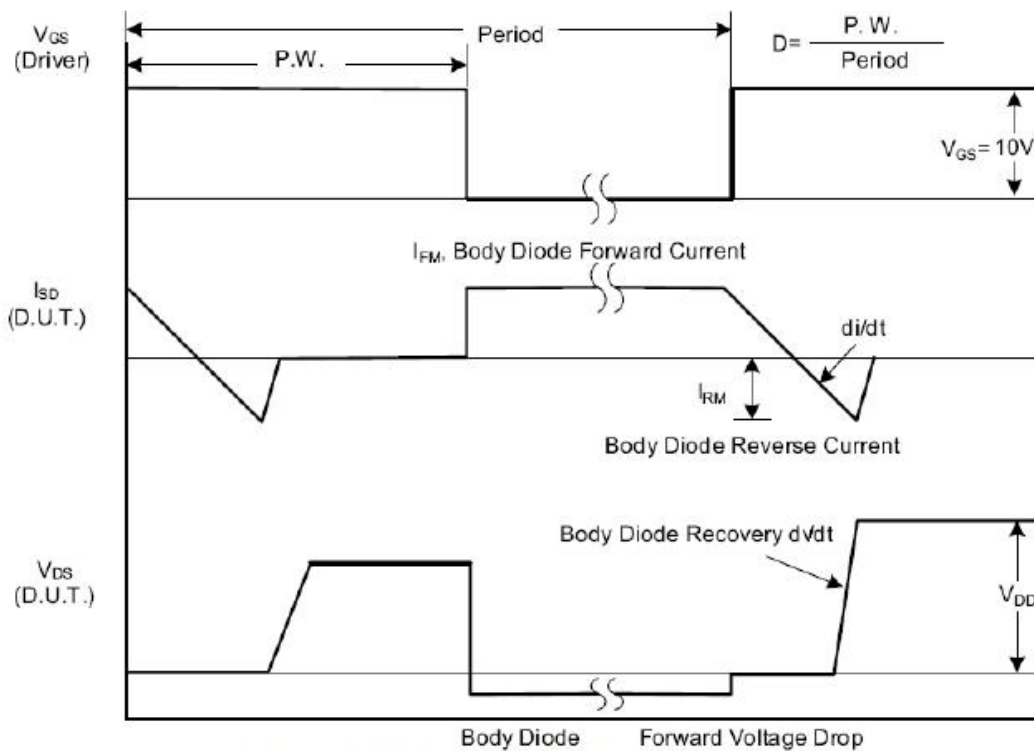


Fig. 1.2 Peak Diode Recovery  $dv/dt$  Waveforms