FTU45N06N

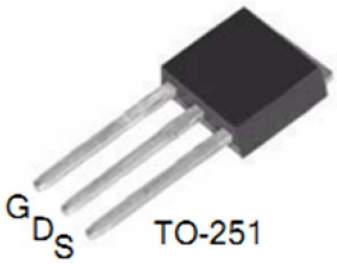
N-Channel MOSFET

Lead Free Package and Finish

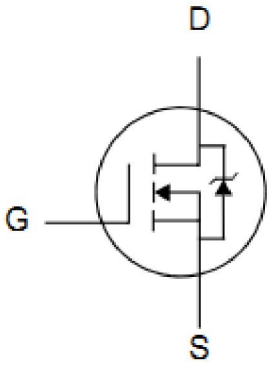
Applications:
- Adaptor
- Charger
- SMPS

V_{DSS}	$R_{DS(ON)(Typ.)}$	I_D
60V	33mΩ	21A

Features:
- RoHS Compliant
- Low ON Resistance
- Low Gate Charge
- Peak Current vs Pulse Width Curve
- Inductive Switching Curves



Packages
Not to Scale



Ordering Information

PART NUMBER	PACKAGE	BRAND
FTU45N06N	TO-251	***IPS***

Absolute Maximum Ratings T_J=25℃ unless otherwise specified

Symbol	Parameter	Rating	Units
V_{DSS}	Drain-to-Source Voltage	60	V
I_D	Continuous Drain Current T_C=25℃	21	A
	Continuous Drain Current T_C=100℃	13.7	A
I_{DM} [a1]	Pulsed Drain Current	84	A
E_{AS} [a2]	Avalanche Energy	42.25	mJ
P_D	Power Dissipation T_C=25℃	31	W
	Derating Factor above 25℃	0.248	W/℃
V_{GS}	Gate-to-Source Voltage	±20	V
T_J and T_{STG}	Operating Junction and Storage Temperature Range	150，-55 to150	℃
T_L	MaximumTemperature for Soldering	300	℃

Thermal Resistance

Symbol	Parameter	Max.	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	4	℃/W	Water cooled heatsink, P_D adjusted for a peak junction temperature of +150℃.
$R_{\theta JA}$	Junction-to-Ambient	100		1 cubic foot chamber, free air.

OFF Characteristics T_C=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	60	--	--	V	V_{GS}=0V, I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	V_{DS}=60V, V_{GS}=0V T_J=25℃
		--	--	100		V_{DS}=48V, V_{GS}=0V T_J=125℃
I_{GSS}	Gate-to-Source Forward Leakage	--	--	+100	nA	V_{GS}=+20V
	Gate-to-Source Reverse Leakage	--	--	-100		V_{GS}= -20V

ON Characteristics T_J=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(ON)}$	StaticDrain-to-Source On-Resistance	--	33	45	mΩ	V_{GS}=10V, I_D=5A
		--	49	66	mΩ	V_{GS}=4.5V, I_D=3A
$V_{GS(TH)}$	Gate Threshold Voltage	1.8	--	2.8	V	V_{DS}=V_{GS},I_D=250μA
Pulse width ≤300μs; duty cycle≤ 2%						

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R_g	Gate Resistance	--	3	--	Ω	f=1MHz,
C_{iss}	Input Capacitance	--	504	--	pF	V_{GS}= 0V,V_{DS} = 30V f =1.0MHz
C_{oss}	Output Capacitance	--	56.9	--		
C_{rss}	Reverse Transfer Capacitance	--	32.7	--		
$Q_{g(V_{GS}=4.5V)}$	Total Gate Charge	--	5.6	--	nC	I_D=10A,V_{DD}=30V V_{GS} = 4.5V/10V
$Q_{g(V_{GS}=10V)}$	Total Gate Charge		11.2			
Q_{gs}	Gate-to-Source Charge	--	2	--		
Q_{gd}	Gate-to-Drain (“Miller”) Charge	--	3.3	--		

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	8	--	ns	V_{DD}=30V, I_D=10A, V_{GS}=10V R_G=3Ω
t_{rise}	Rise Time	--	3.6	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	19.2	--		
t_{fall}	Fall Time	--	3.2	--		

Source-Drain Diode Characteristics T_J=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	--	--	21	A	T_C=25℃
I_{SM}	Maximum Pulsed Current (Body Diode)	--	--	84	A	
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_{SD}=10A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	22.6	--	ns	di/dt=100A/us
Q_{rr}	Reverse Recovery Charge	--	16.7	--	nC	Is=10A
Pulse width ≤300μs; duty cycle ≤ 2%						

Notes:

*1. Repetitive rating; pulse width limited by maximum junction temperature.

*2. L=0.5mH, I_{AS}=13A, Start T_J=25℃

Characteristics Curve：

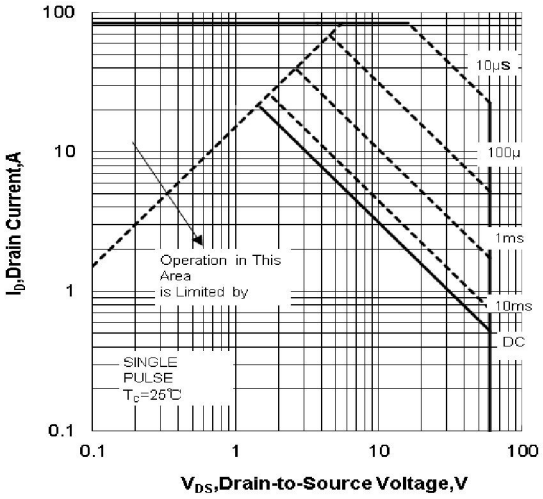


Figure 1. Maximum Safe Operating Area

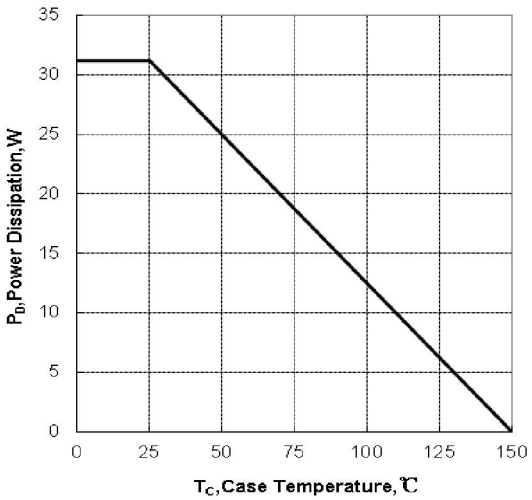


Figure 2. Maximum Power Dissipation vs Case Temperature

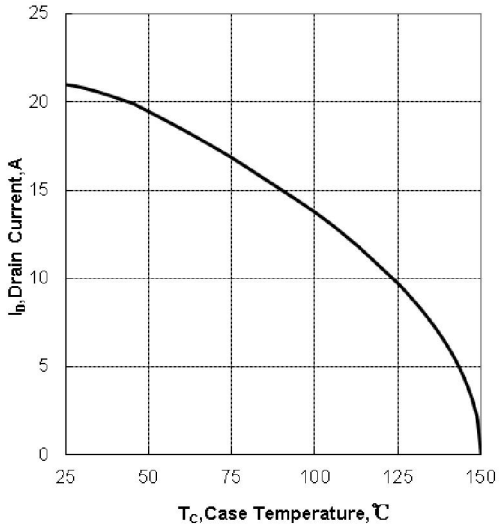


Figure 3. Maximum Continuous Drain Current vs Case Temperature

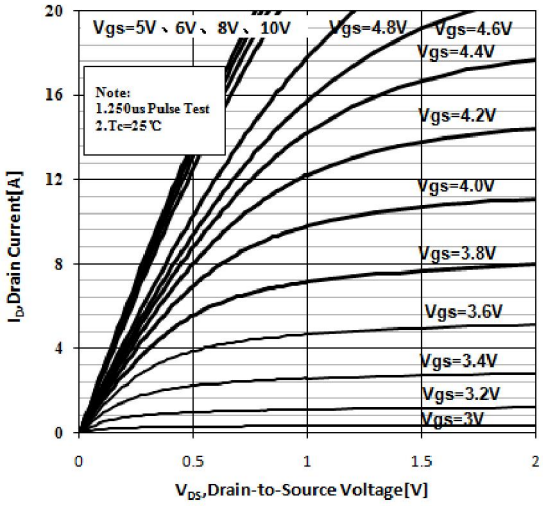


Figure 4. Typical output Characteristics

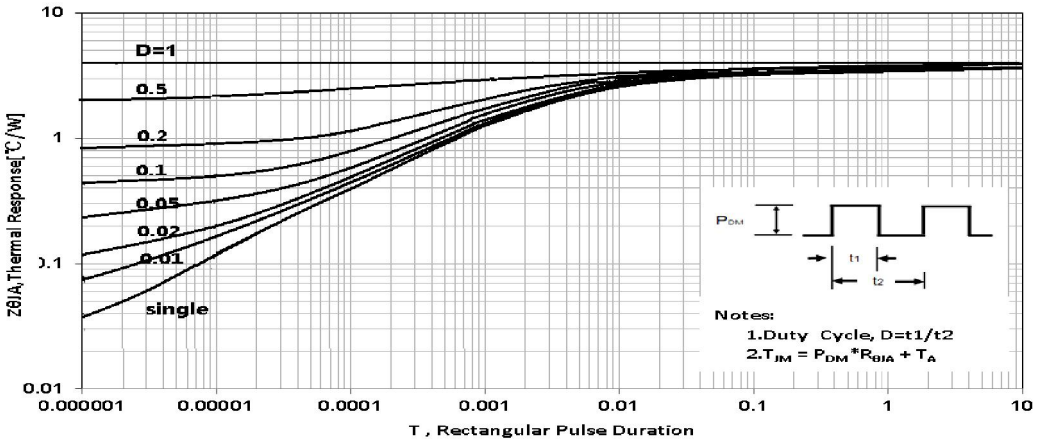


Figure 5 Maximum Effective Thermal Impedance , Junction to Case

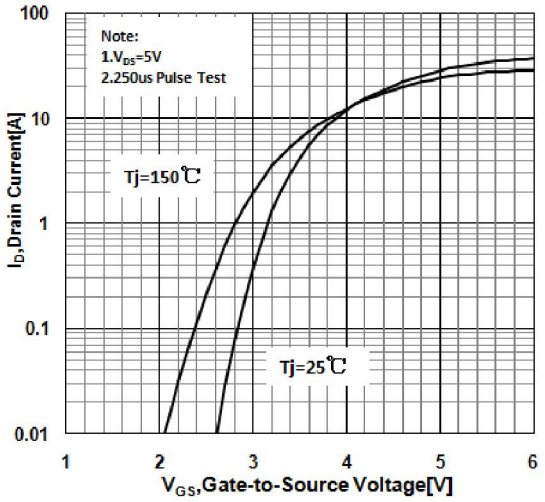


Figure 6 Typical Transfer Characteristics

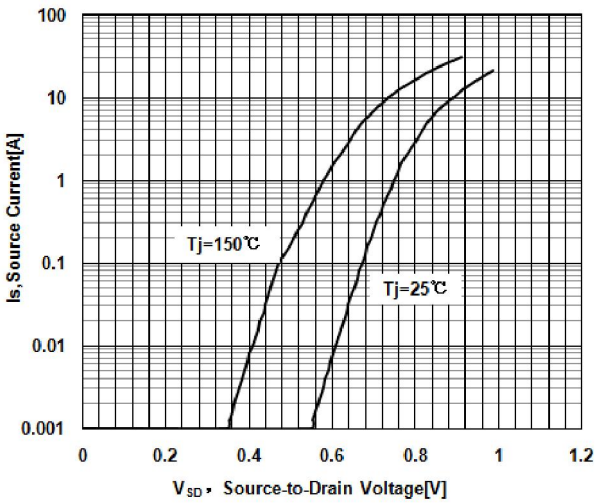


Figure 7 Typical Body Diode Transfer Characteristics

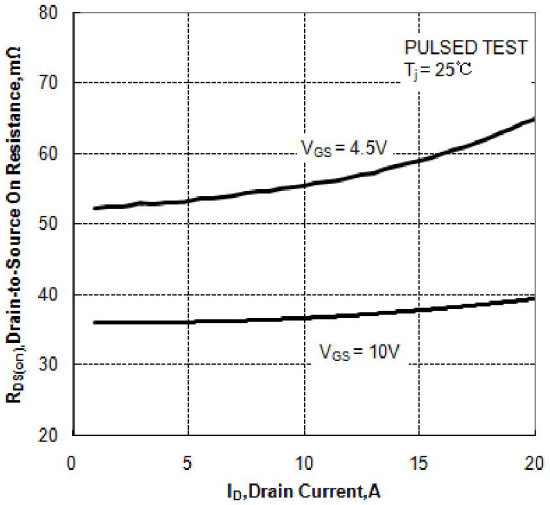


Figure 8. Drain-to-Source On Resistance vs Drain Current

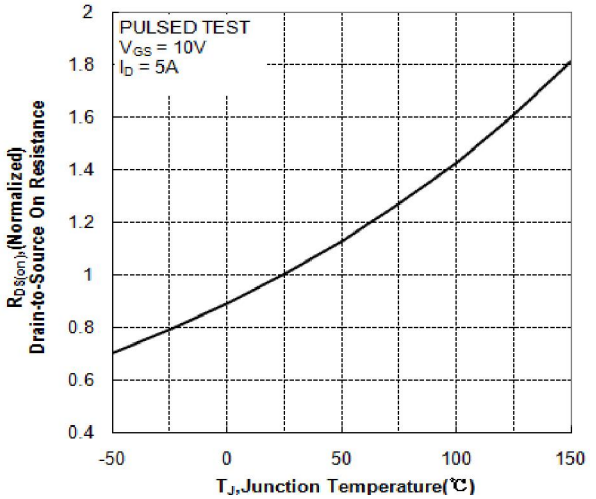


Figure 9. Normalized On Resistance vs Junction Temperature

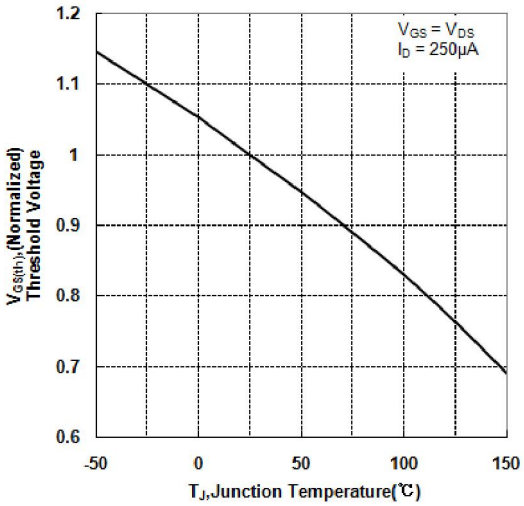


Figure10. Normalized Threshold Voltage vs Junction Temperature

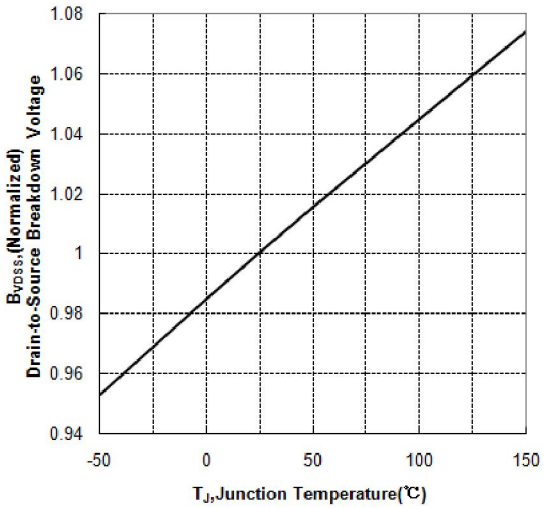


Figure 11. Normalized Breakdown Voltage vs Junction Temperature

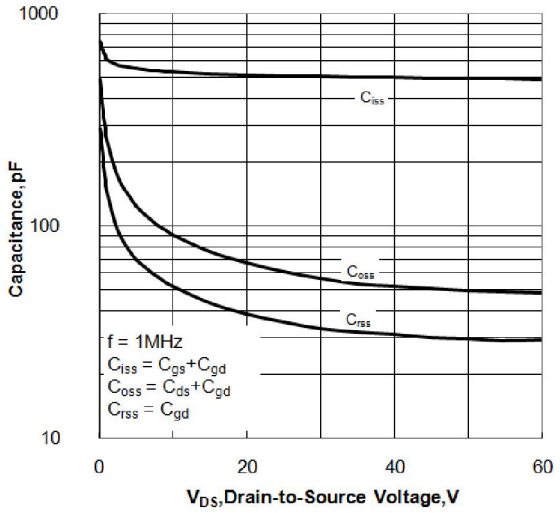


Figure 12. Capacitance Characteristics

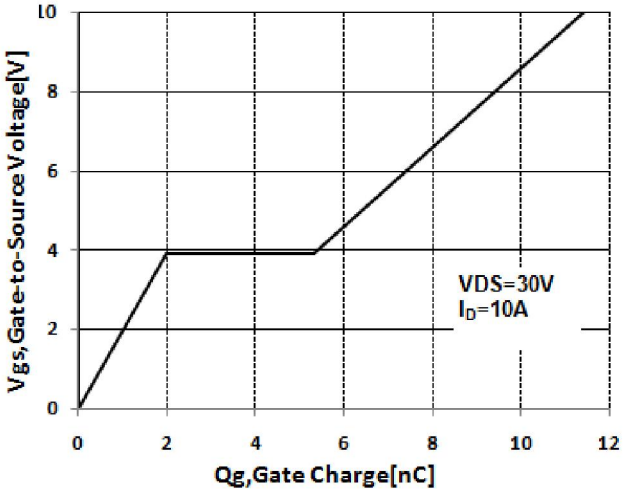


Figure 13. Typical Gate Charge vs Gate to Source Voltage

Test Circuits and Waveforms

Figure 14. Gate Charge Test Circuit

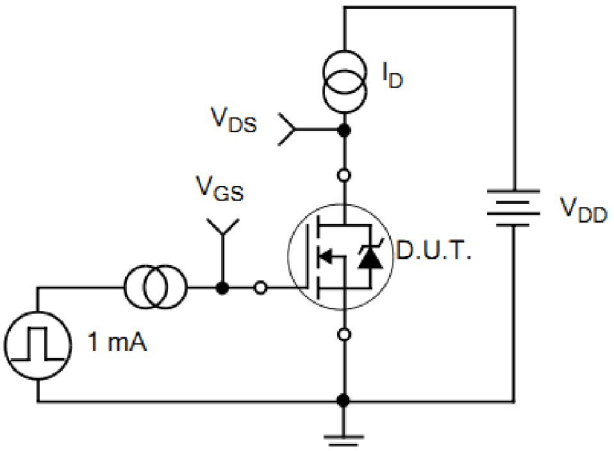


Figure 15. Gate Charge Waveforms

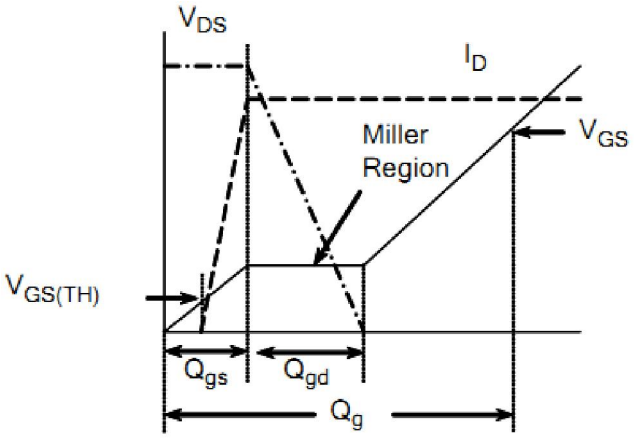


Figure 16. Resistive Switching Test Circuit

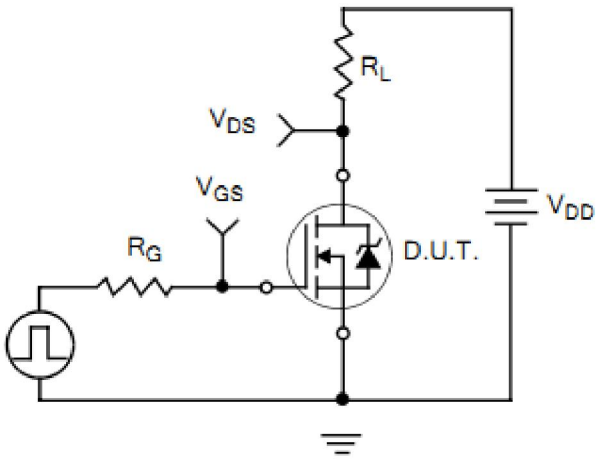


Figure 17. Resistive Switching Waveforms

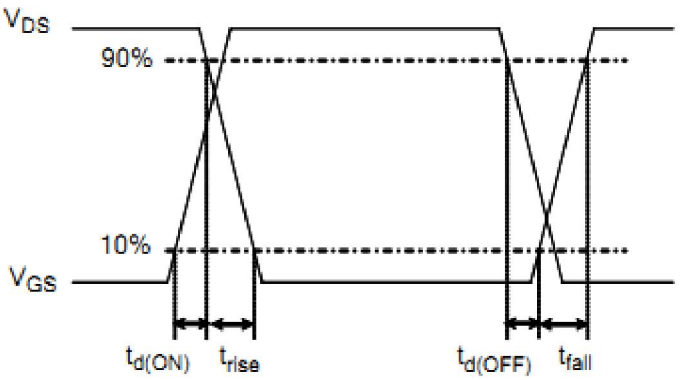


Figure 18. Diode Reverse Recovery Test Circuit

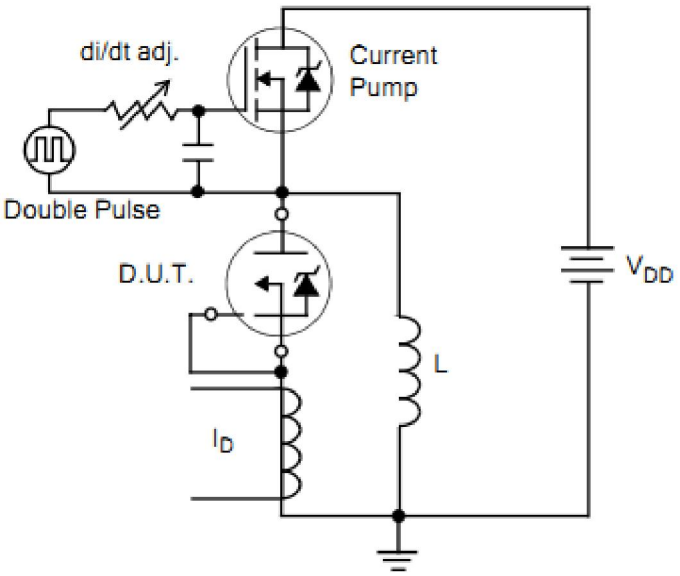


Figure 19. Diode Reverse Recovery Waveform

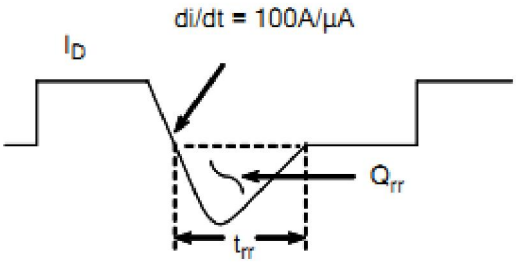


Figure20.Unclamped Inductive Switching Test Circuit

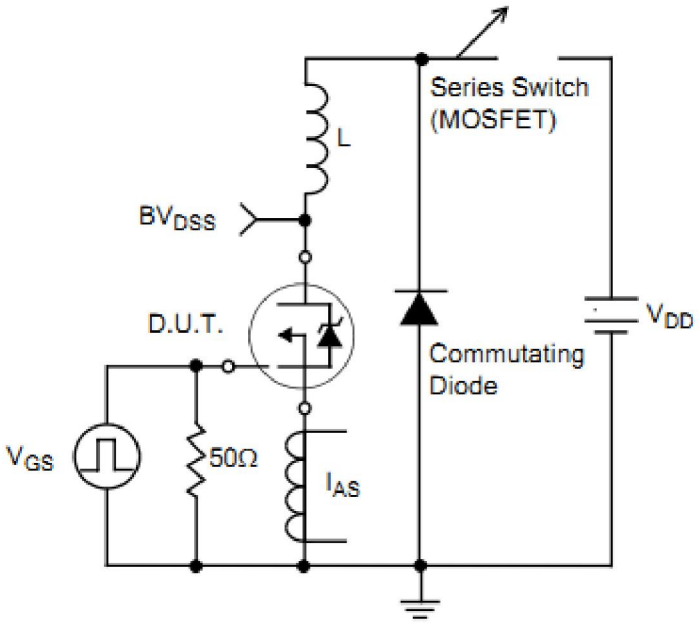
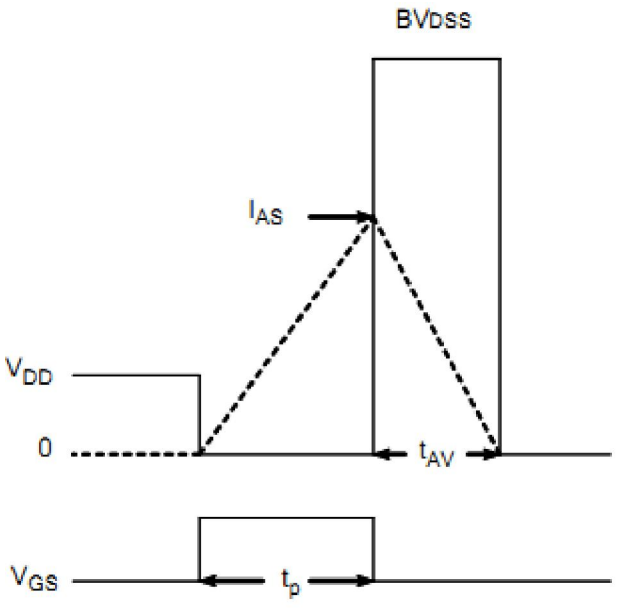


Figure21.Unclamped Inductive Switching Waveform



$$E_{AS} \quad \frac{I_{AS}{}^2 L}{2}$$

Disclaimers:

InPower Semiconductor Co., Ltd (IPS) reserves the right to make changes without notice in order to improve reliability, function or design and to discontinue any product or service without notice. Customers should obtain the latest relevant information before orders and should verify that such information is current and complete. All products are sold subject to IPS's terms and conditions supplied at the time of order acknowledgement.

InPower Semiconductor Co., Ltd warrants performance of its hardware products to the specifications at the time of sale, Testing reliability and quality control are used to the extent IPS deems necessary to support this warrantee. Except where agreed upon by contractual agreement, testing of all parameters of each product is not necessarily performed.

InPower Semiconductor Co., Ltd does not assume any liability arising from the use of any product or circuit designs described herein. Customers are responsible for their products and applications using IPS's components. To minimize risk, customers must provide adequate design and operating safeguards.

InPower Semiconductor Co., Ltd does not warrant or convey any license either expressed or implied under its patent rights, nor the rights of others. Reproduction of information in IPS's data sheets or data books is permissible only if reproduction is without modification or alteration. Reproduction of this information with any alteration is an unfair and deceptive business practice. InPower Semiconductor Co., Ltd is not responsible or liable for such altered documentation.

Resale of IPS's products with statements different from or beyond the parameters stated by InPower Semiconductor Co., Ltd for that product or service voids all express or implied warrantees for the associated IPS's product or service and is unfair and deceptive business practice. InPower Semiconductor Co., Ltd is not responsible or liable for any such statements.

Life Support Policy:

InPower Semiconductor Co., Ltd's products are not authorized for use as critical components in life support devices or systems without the expressed written approval of InPower Semiconductor Co., Ltd.

As used herein:

1. Life support devices or systems are devices or systems which:
   a. are intended for surgical implant into the human body,
   b. support or sustain life,
   c. whose failure to perform when properly used in accordance with instructions for used provided in the labeling, can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.