ITP20N50R

N-Channel MOSFET

Lead Free Package and Finish

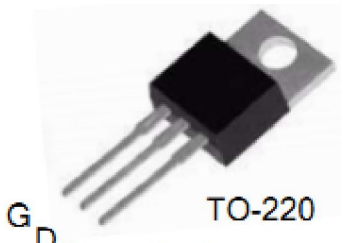
Applications:

- Adaptor
- Charger
- SMPS

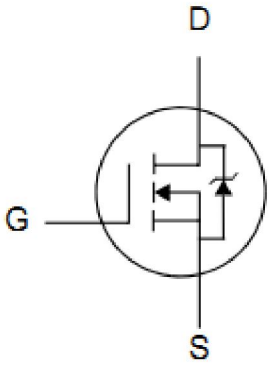
V_{DSS}	$R_{DS(ON)}$(Typ.)	I_D
500V	0.24Ω	20A

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
ITP20N50R	TO-220	***IPS***

Absolute Maximum Ratings

T_C=25℃ unless otherwise specified

Symbol	Parameter	ITP20N50R	Units
V_{DSS}	Drain-to-Source Voltage	500	V
I_D	Continuous Drain Current	20	A
	Continuous Drain Current T_C =100℃	12.5	A
I_{DM}	Pulsed Drain Current (NOTE *1)	80	A
P_D	Power Dissipation	230	W
	Derating Factor above 25℃	1.84	W/℃
V_{GS}	Gate-to-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy(NOTE *2)	1200	mJ
dv/dt	Peak Diode Recovery dv/dt(NOTE *3)	5	V/ns
T_L	Maximum Temperature for Soldering	300	℃
T_J and T_{STG}	Operating Junction and Storage Temperature Range	150，-55 to150	

Thermal Resistance

Symbol	Parameter	Typ.	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	0.54	℃/W	Water cooled heatsink, P_D adjusted for a peak junction temperature of +150℃.
$R_{\theta JA}$	Junction-to-Ambient	62.5		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	500	--	--	V	V_{GS}=0V, I_D=250μA
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	V_{DS}=500V, V_{GS}=0V T_J=25℃
		--	--	100		V_{DS}=400V, V_{GS}=0V T_J=125℃
I_{GSS}	Gate-to-Source Forward Leakage	--	--	+100	nA	V_{GS}=+30V
	Gate-to-Source Reverse Leakage	--	--	-100		V_{GS}= -30V

ON Characteristics T_J=25℃ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(ON)}$	StaticDrain-to-Source On-Resistance	--	0.24	0.3	Ω	V_{GS}=10V, I_D=10A
$V_{GS(TH)}$	Gate Threshold Voltage	2	--	4	V	V_{DS}=V_{GS},I_D=250μA
g_{fs}	Forward Transconductance	--	18	--	S	V_{DS}=15V, I_D=10A
Pulse width ≤300μs; duty cycle≤ 2%						

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	2919	--	pF	V_{GS}= 0V,V_{DS} = 25V f =1.0MHz
C_{oss}	Output Capacitance	--	277	--		
C_{rss}	Reverse Transfer Capacitance	--	16	--		
Q_g	Total Gate Charge	--	52	--	nC	I_D=20A,V_{DD}=400V V_{GS} = 10V
Q_{gs}	Gate-to-Source Charge	--	12.6	--		
Q_{gd}	Gate-to-Drain (“Miller”) Charge	--	18.6	--		

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	34	--	ns	V_{DD}=250V, I_D=20A, V_G=10V R_G=10Ω
t_{rise}	Rise Time	--	65	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	82	--		
t_{fall}	Fall Time	--	45	--		

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

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I_S	Continuous Source Current (Body Diode)	--	--	20	A	T_C=25℃
I_{SM}	Maximum Pulsed Current (Body Diode)	--	--	80	A	
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_{SD}=20A, V_{GS}=0V
t_{rr}	Reverse Recovery Time	--	535	--	ns	I_F= I_S di/dt=100A/us
Q_{rr}	Reverse Recovery Charge	--	5671	--	nC	
Pulse width ≤300μs; duty cycle ≤ 2%						

Notes:

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

*2. L=10mH, I_D=15.5A, Start T_J=25℃

*3. I_{SD} =20A,di/dt ≤100A/us,V_{DD}≤BV_{DS}, Start T_J=25℃

Characteristics Curve：

Figure 1.Maximum Effective Thermal Impedance，Junction-to-Case

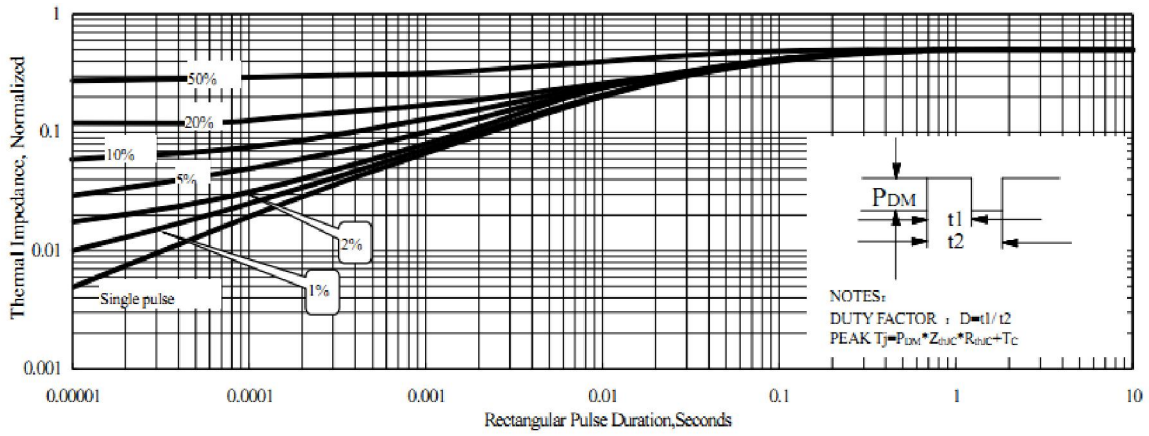


Figure2.Max. Power Dissipation vs Case Temperature

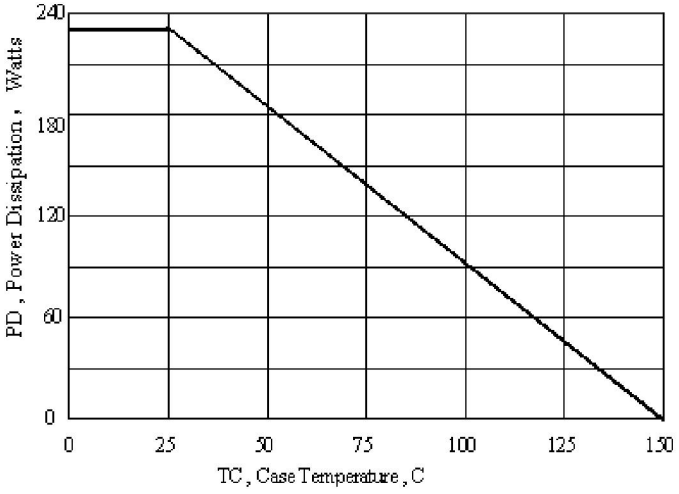


Figure3.Max. Drain Current vs Case Temperature

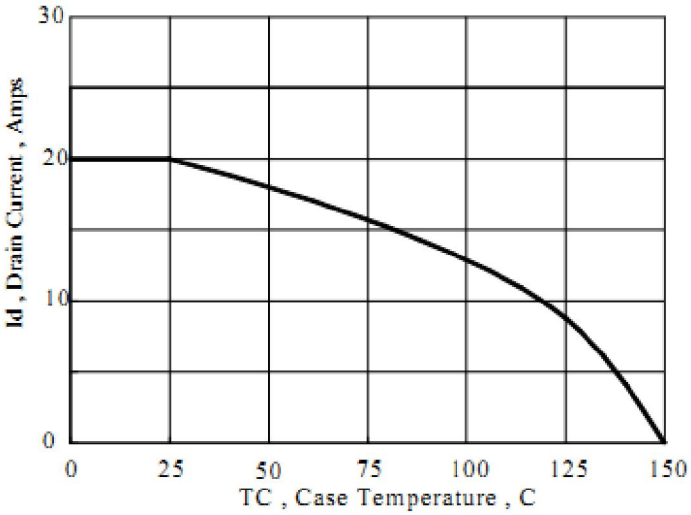


Figure 4.Typical Output Characteristics

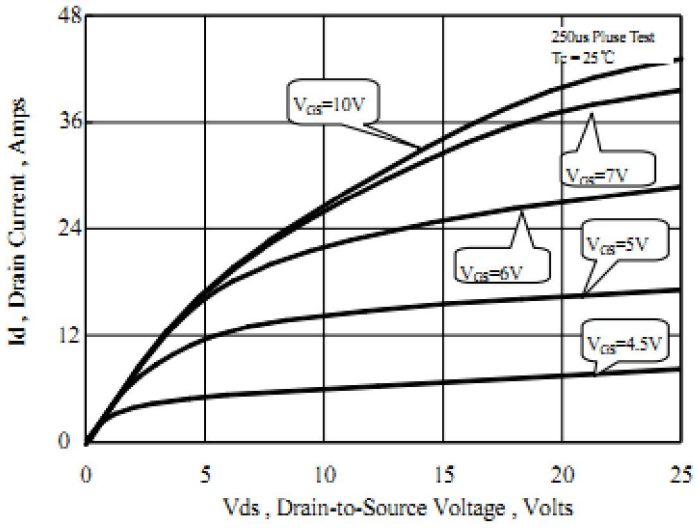


Figure 5. Typical Transfer Characteristics

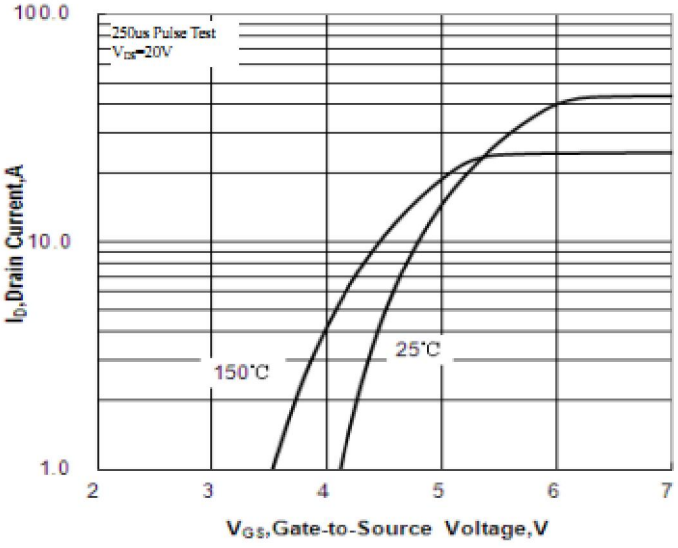


Figure 6. Typical Body Diode Transfer Characteristics

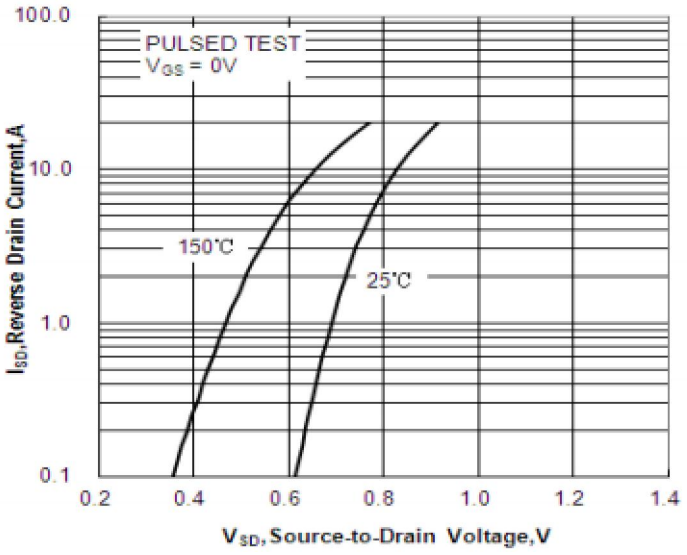


Figure 7. Typical on Resistance VS Drain Current

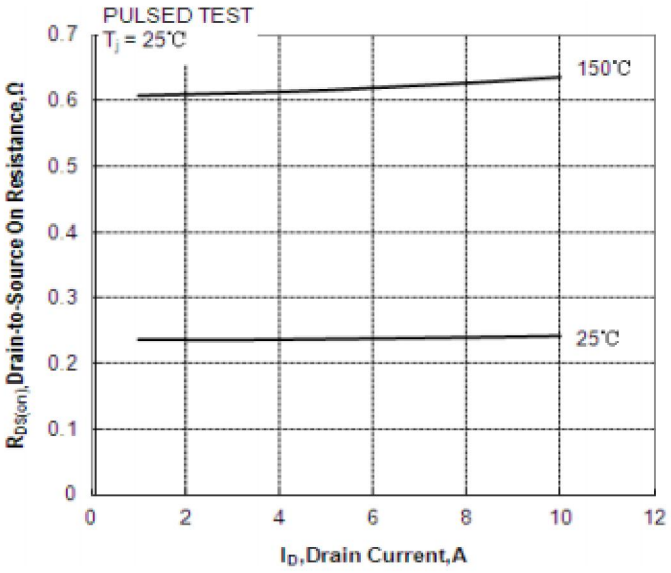


Figure 8. Capacitance VS Drain-to-Source Voltage

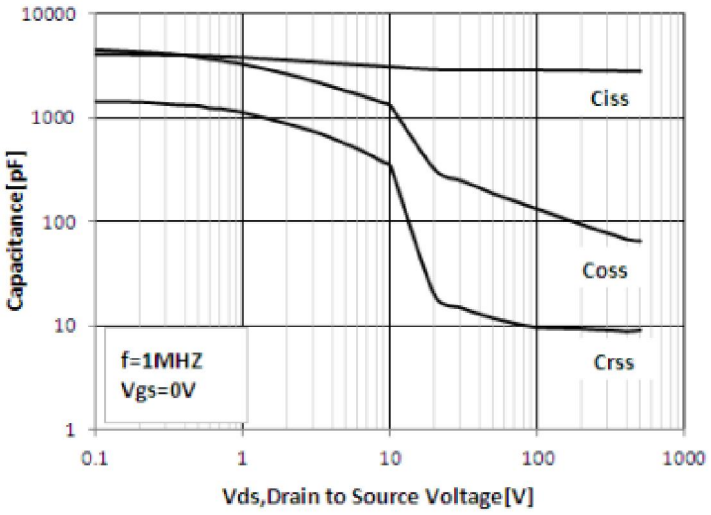


Figure 9. Gate Charge VS Gate-to-Source Voltage

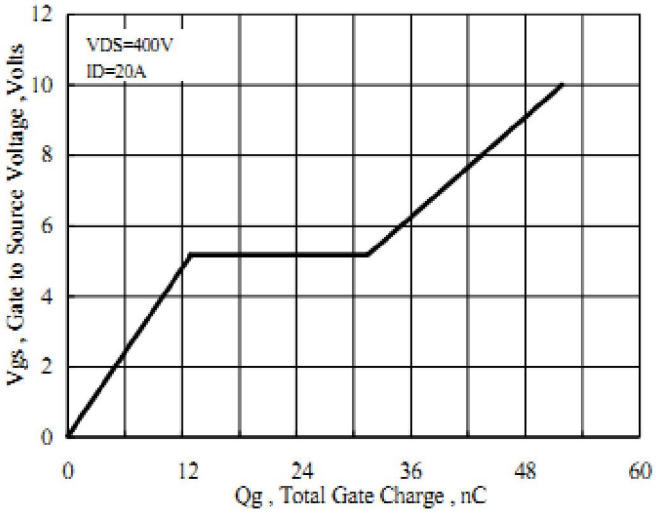


Figure 10. Breakdown Voltage VS Temperature

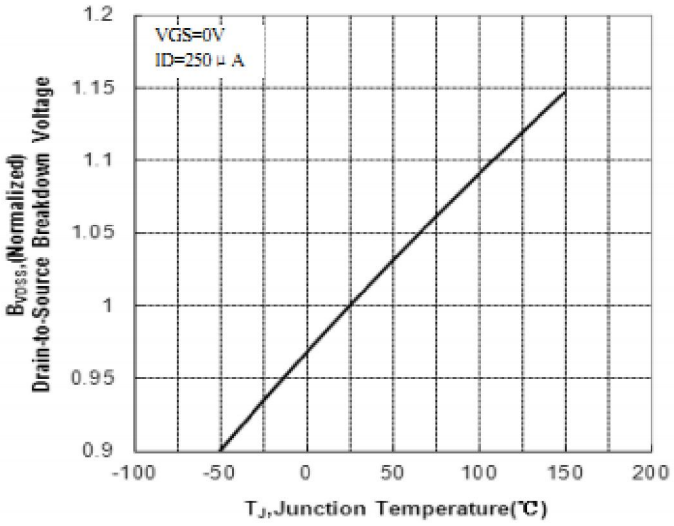


Figure 11. on-Resistance VS Temperature

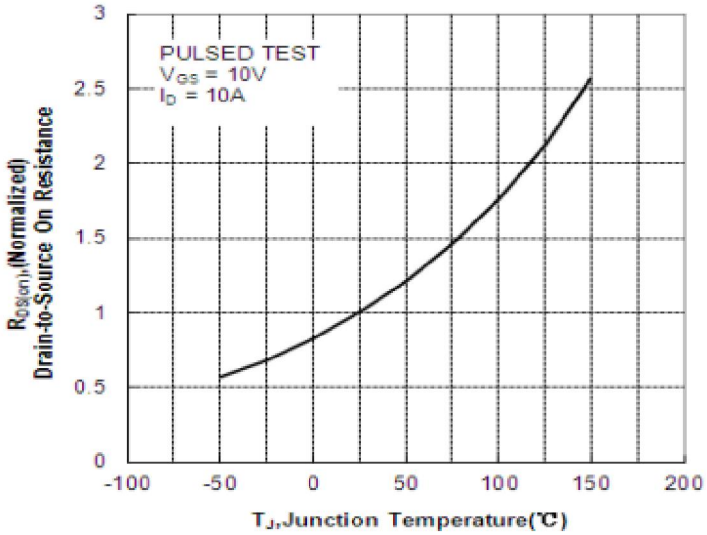


Figure 12 Theshold Voltage vs Junction Temperature

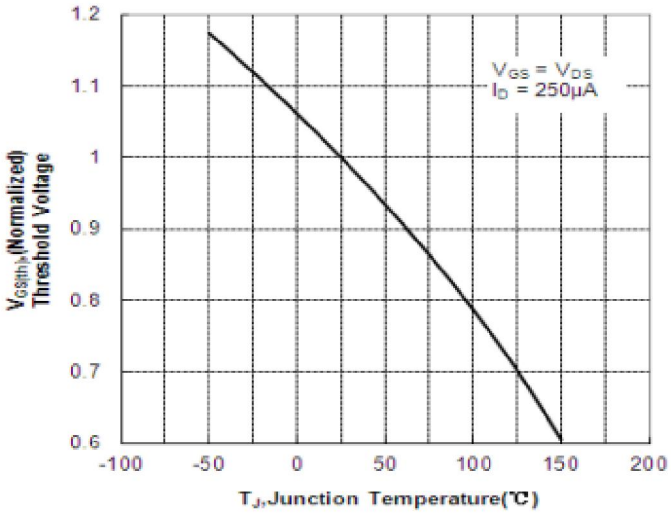
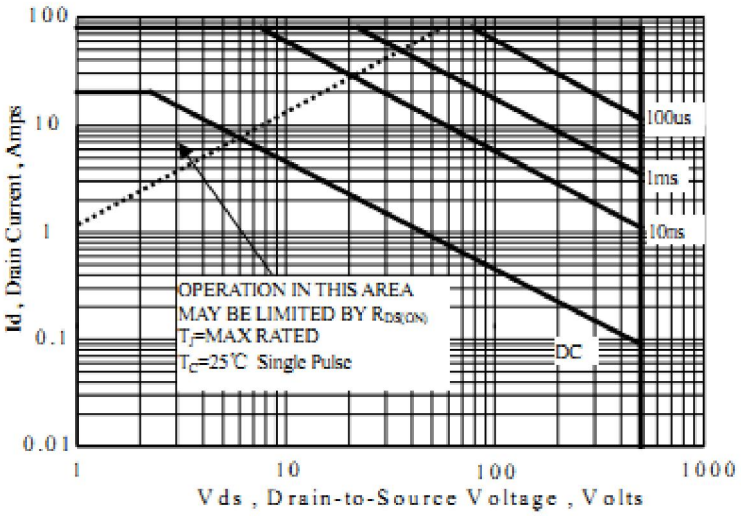


Figure 13. Safe Operating Area



Test Circuits and Waveforms

Figure 14. Gate Charge Test Circuit

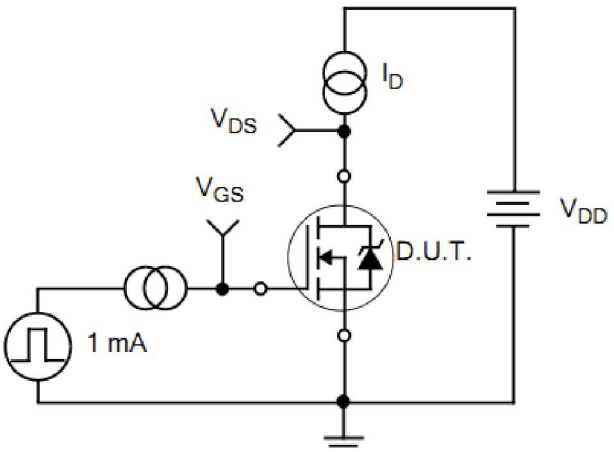


Figure 15. Gate Charge Waveforms

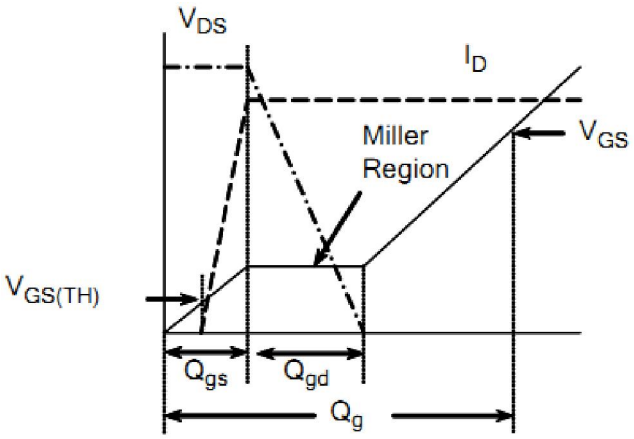


Figure 16. Resistive Switching Test Circuit

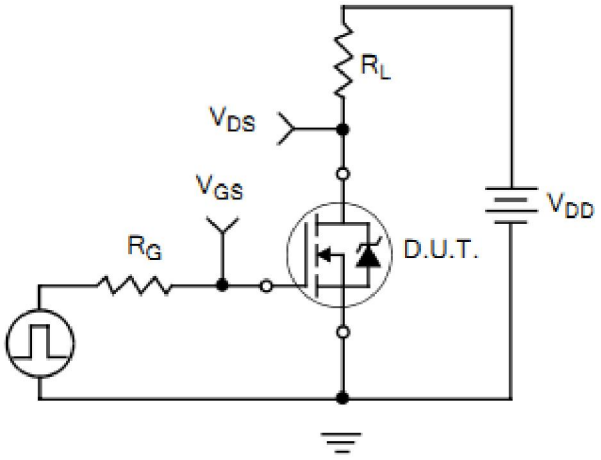


Figure 17. Resistive Switching Waveforms

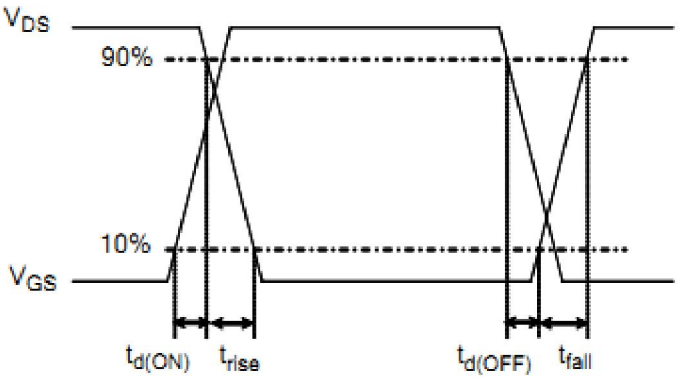


Figure 18. Diode Reverse Recovery Test Circuit

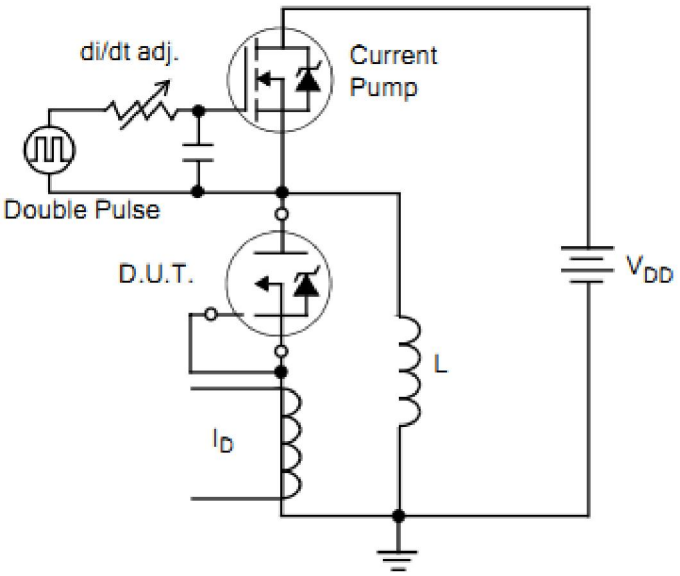


Figure 19. Diode Reverse Recovery Waveform

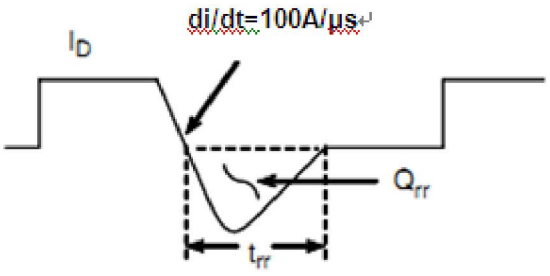


Figure20.Unclamped Inductive Switching Test Circuit

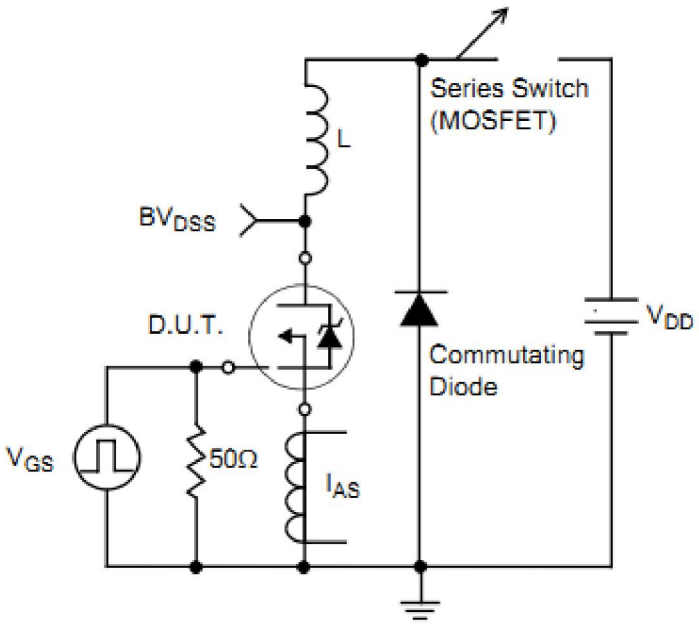
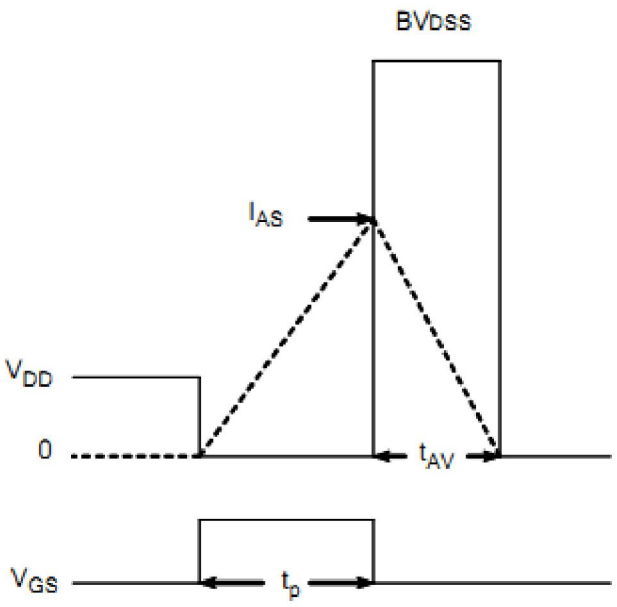


Figure21.Unclamped Inductive Switching Waveform



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

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