ITW38N30A

N-Channel MOSFET

Lead Free Package and Finish

Applications:

• Power switch circuit of electric welder

V_{DSS}	$R_{DS(on)}$(Typ)	I_D
300V	0.045Ω	38.5A

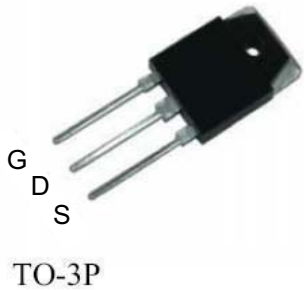
Features:

• RoHS Compliant

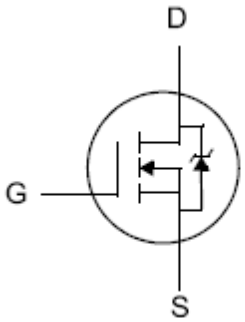
• Low ON Resistance

• Low Gate Charge

• dv/dt Rated



TO-3P
Not to Scale



Ordering Information

Part Number	Package Type	BRAND
ITW38N30A	TO-3P	***IPS***

Absolute Maximum Ratings

Tc= 25℃ unless otherwise specified

Symbol	Parameter	Maximum	Units
V_{DSS}	Drain-to-Source Voltage (NOTE *1)	300	V
I_D	Continuous Drain Current	38.5	A
	Continuous Drain Current@ 100 ℃	25	
I_{DM}	Pulsed Drain Current, V_{GS}@ 10V (NOTE *2)	154	
P_D	Power Dissipation	290	W
	Derating Factor above 25℃	2.33	W/℃
V_{GS}	Gate-to-Source Voltage	±30	V
EAS	Single Pulse Avalanche Engergy;	1500	mJ
dv/dt	Peak Diode Recovery dv/dt (NOTE *3)	5.0	V/ns
T_L T_{PKG}	Maximum Temperature for Soldering Leads at 0.063in(1.6mm) from Case for 10 seconds Package Body for 10 seconds	300 260	℃
T_J and T_{STG}	Operation Decction and Storage Temperature Range	150, -55 to 150	℃

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

Thermal Resistance

Symbol	Parameter	Maximum	Units	Test Condition
$R_{\theta JC}$	Decction-to-Case	0.43	℃/W	Drain lead soldered to water cooled heatsink, PD ad-justed for a peak Decction temperature of +150oC. 1 cubic foot chamber, free air.
$R_{\theta JA}$	Decction-to-Ambient	40		

Electrical Characteristics TJ= 25℃ unless otherwise specified：

OFF Characteristics						
Symbol	Parameter	Rating			Units	Test Conditions
		Min.	Typ.	Max.		
V_{DSS}	Drain-to-Source Breakdown Voltage	300	--	--	V	V_{GS}=0V, I_D=250μA
$\Delta BV_{DSS}/\Delta T_J$	Bvdss Temperature Coefficient	--	0.35	--	V/℃	Reference to 25℃, ID=250uA
$I_{DS(off)}$	Off-State Drain-to-Source Current	--	--	1.0	uA	V_{DS} = 300V, V_{GS}=0V, T_a = 25℃
		--	--	100		V_{DS} =240V, V_{GS}= 0 V, T_a = 125℃
$I_{GSS(F)}$	Gate-to-Source Forward Leakage	--	--	100	nA	V_{GS} =+30V
$I_{GSS(R)}$	Gate-to-Source Reverse Leakage	--	--	-100		V_{GS} =-30V

ON Characteristics						
Symbol	Parameter	Rating			Units	Test Conditions
		Min.	Typ.	Max.		
$R_{DS(ON)}$	Drain-to-Source On-Resistance	--	0.045	0.085	Ω	V_{GS}=10V,I_D=19.2A (NOTE*4)
g_{fs}	Forward Transconductance	--	17	--	S	V_{DS}=15V I_D =19.2A (NOTE*4)
$V_{GS(TH)}$	Gate Threshold Voltage	2.0	--	4.0	V	V_{DS} = V_{GS}, I_D = 250μA

Dynamic Characteristics						
Symbol	Parameter	Rating			Units	Test Conditions
		Min.	Typ.	Max.		
C_{iss}	Input Capacitance	--	5900	--	pF	V_{GS} =0V V_{DS} = 25V f = 1.0MHz
C_{oss}	Output Capacitance	--	726	--		
C_{rss}	Reverse Transfer Capacitance	--	82	--		
Q_g	Total Gate Charge	--	123	--	nC	V_{DD} =150V I_D =38.5A
Q_{gs}	Gate-to-Source Charge	--	25	--		
Q_{gd}	Gate-to-Drain (“Miller”)Charge	--	47	--		

Resistive Switching Characteristics						
Symbol	Parameter	Rating			Units	Test Conditions
		Min.	Typ.	Max.		
$t_{d(ON)}$	Turn-on Delay Time	--	62	--	ns	V_{DD} = 150V I_D =38.5A V_{GS} = 10V R_G =25Ω
trise	Rise Time	--	165	--		
$t_{d(OFF)}$	Turn-Off Delay Time	--	303	--		
t_{fall}	Fall Time	--	144	--		

Source-Drain Diode Characteristics						
Symbol	Parameter	Rating			Units	Test Conditions
		Min.	Typ.	Max.		
I_S	Continuous Source Current (Body Diode)	--	--	38.5	A	Integral pn-diode in MOSFET
I_{SM}	Maximum Pulsed Current (Body Diode)	--	--	154	A	
V_{SD}	Diode Forward Voltage	--	--	1.5	V	I_S=38.5A,V_{GS}=0V
trr	Reverse Recovery Time	--	333	--	ns	I_F=38.5A, T_j = 25°C di/dt=100A/us
Qrr	Reverse Recovery Charge	--	2.5	--	uC	

Notes:

***1.** T_J=+25℃ to +150℃.

***2.** Repetitive rating; pulse width limited by maximum Decction temperature.

***3.** I_{SD}=38.5di/dt≤100A/us, V_{DD}≤BV_{DSS}, T_{Jmax}=+150℃.

***4.** Pulse width≤380us; duty cycle≤2%.

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

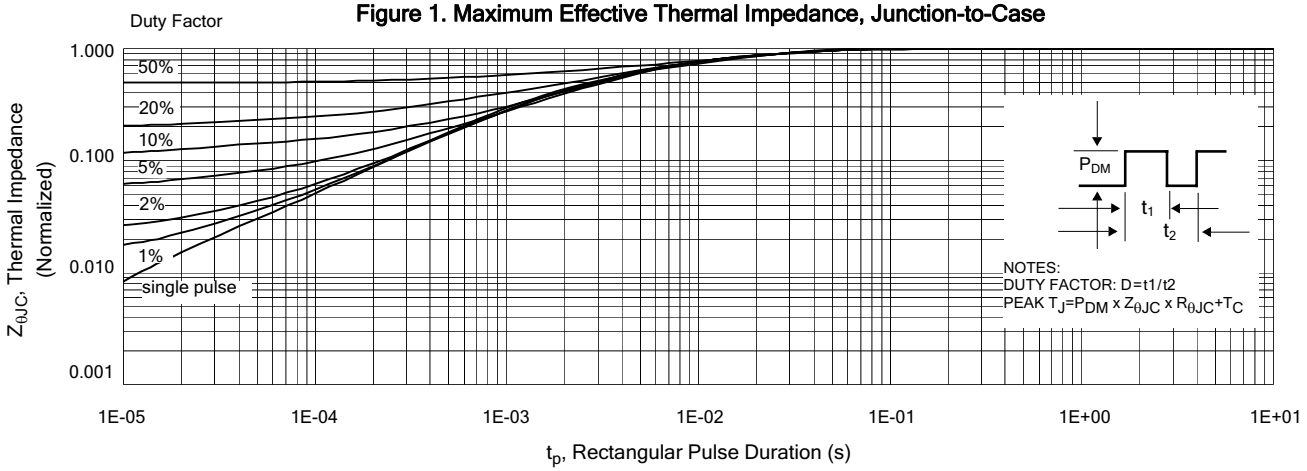


Figure 2. Maximum Power Dissipation vs Case Temperature

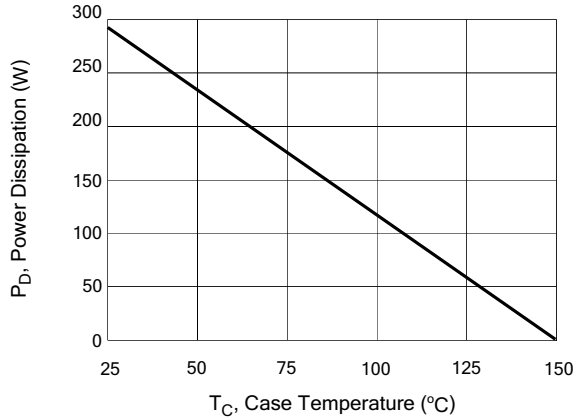


Figure3. Maximum Continuous Drain Current vs Case Temperature

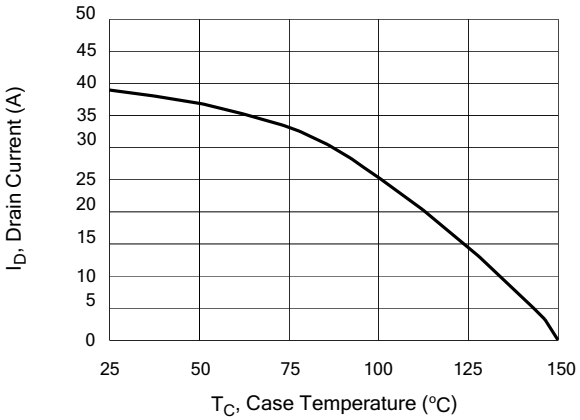


Figure 4. Typical Output Characteristics

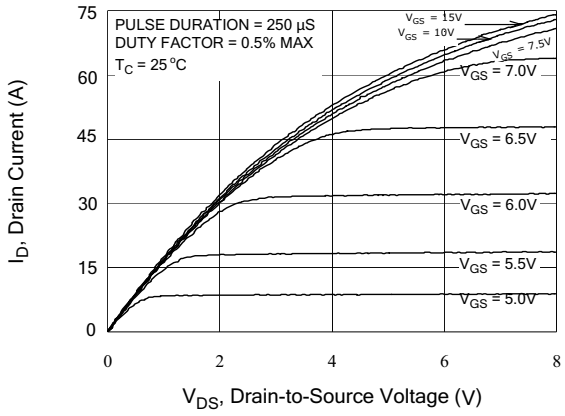


Figure5. Typical Drain-to-Source ON Resistance vs Gate Voltage and Drain Current

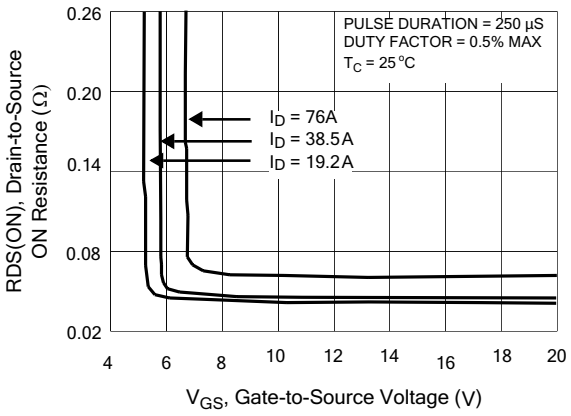


Figure 6. Maximum Peak Current Capability

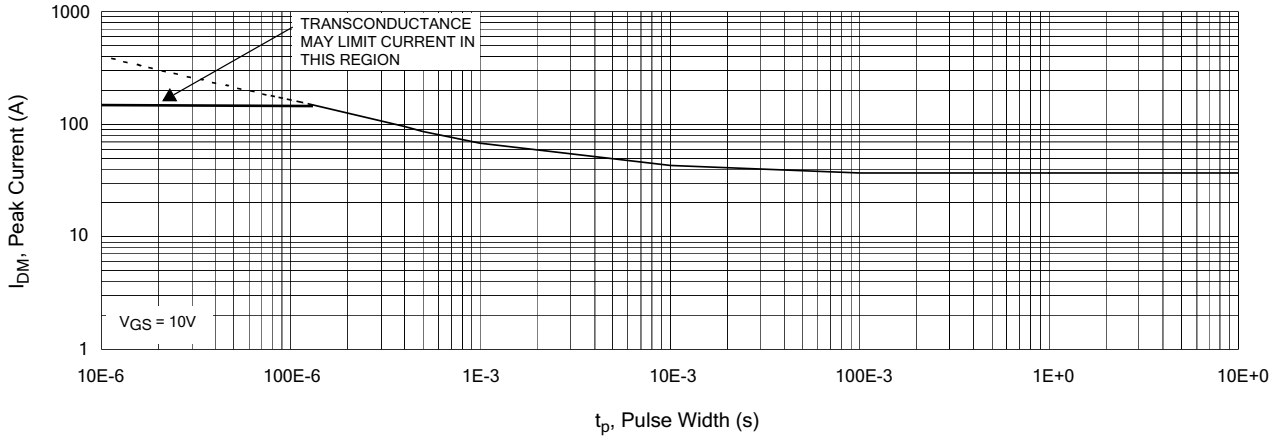


Figure 7. Typical Transfer Characteristics

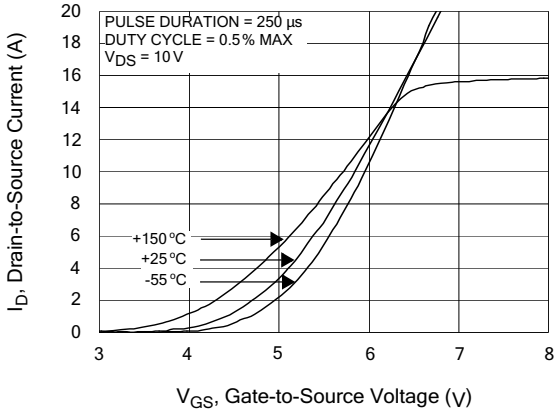


Figure8. Unclamped Inductive Switching Capability

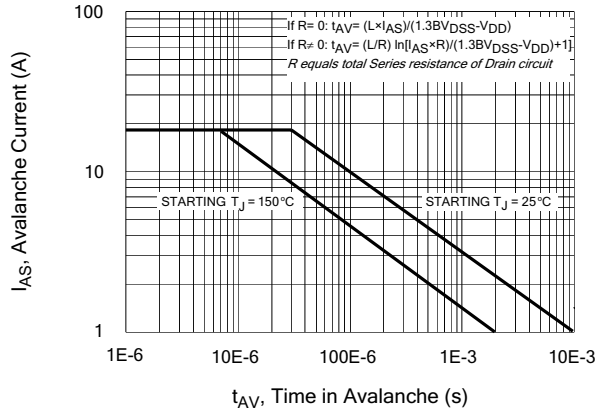


Figure 9. Typical Drain-to-Source ON Resistance vs Drain Current

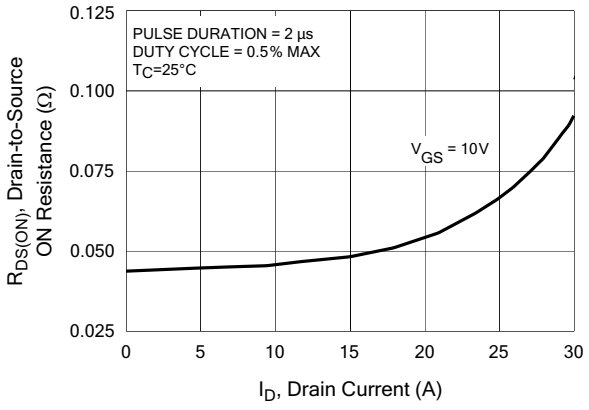


Figure 10. Typical Drain-to-Source ON Resistance vs Junction Temperature

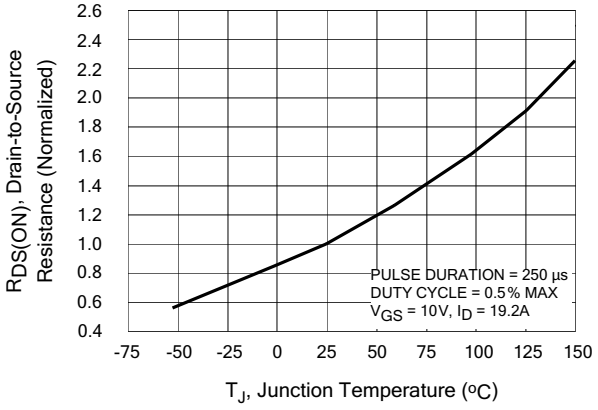


Figure 11. Typical Breakdown Voltage vs Junction Temperature

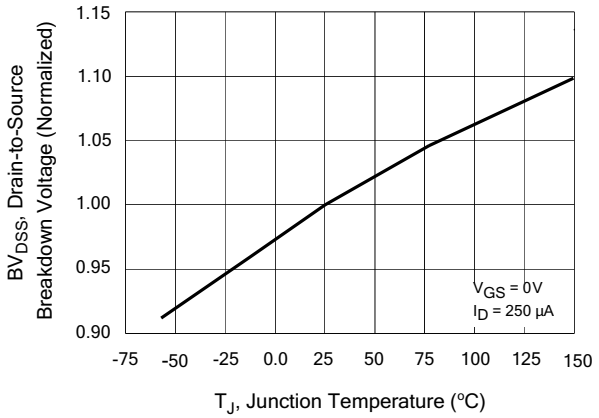


Figure 12. Typical Threshold Voltage vs Junction Temperature

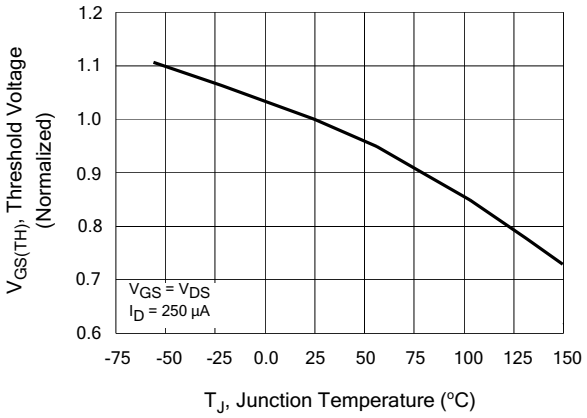


Figure 13. Maximum Forward Bias Safe Operating Area

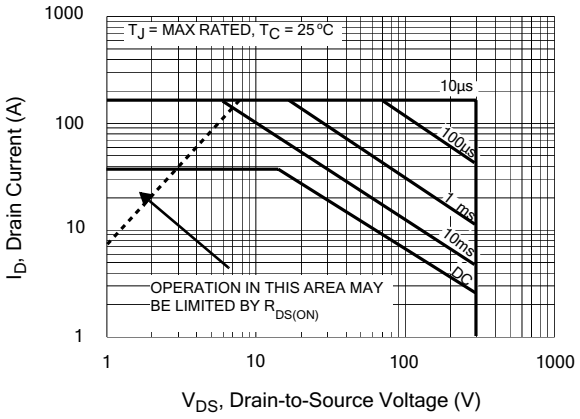


Figure 14. Typical Capacitance vs Drain-to-Source Voltage

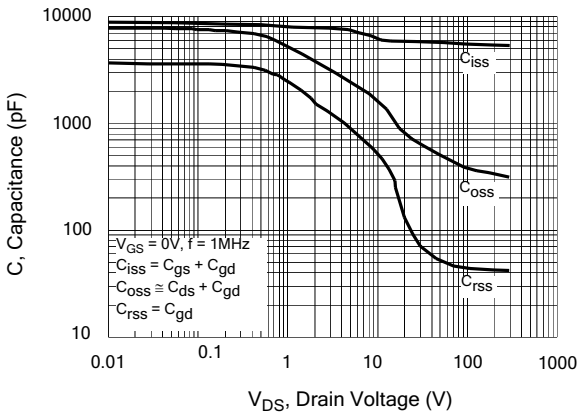


Figure 15. Typical Gate Charge vs Gate-to-Source Voltage

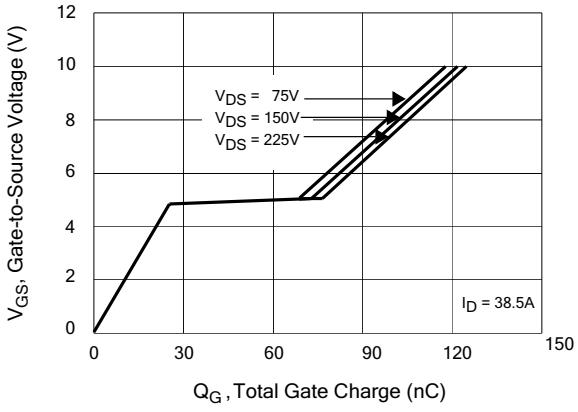
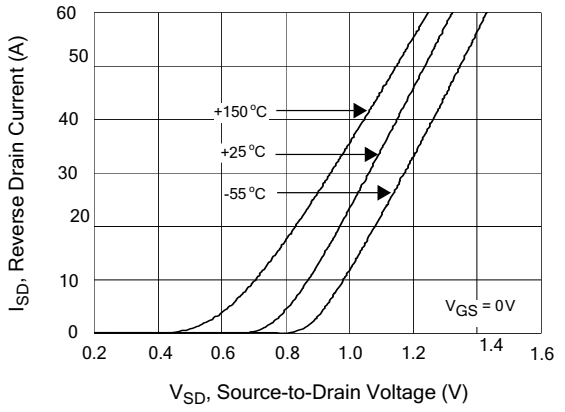


Figure 16. Typical Body Diode Transfer Characteristics



TestCircuitandWaveform

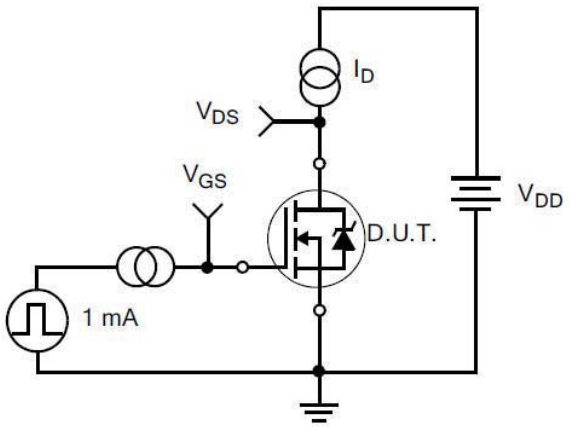


Figure 17. Gate Charge Test Circuit

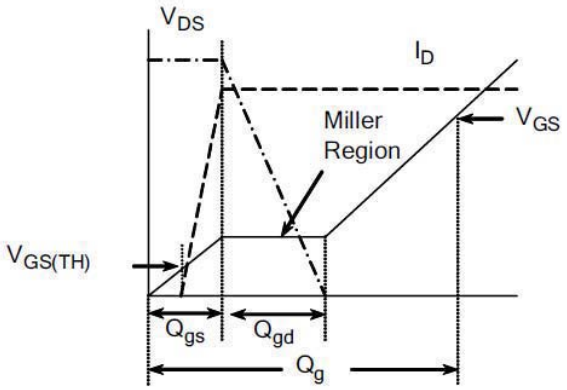


Figure 18. Gate Charge Waveform

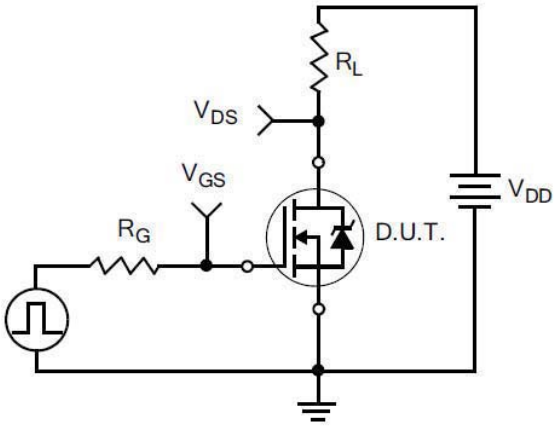


Figure 19. Resistive Switching Test Circuit

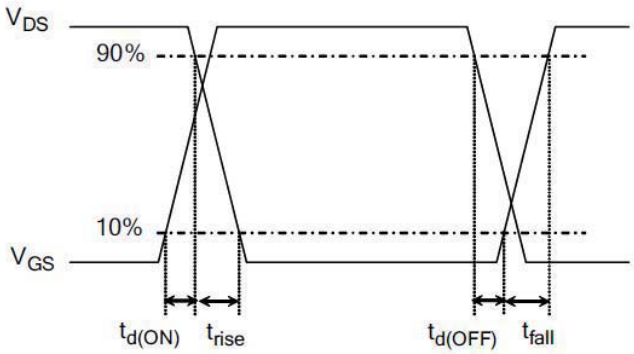


Figure 20. Resistive Switching Waveforms

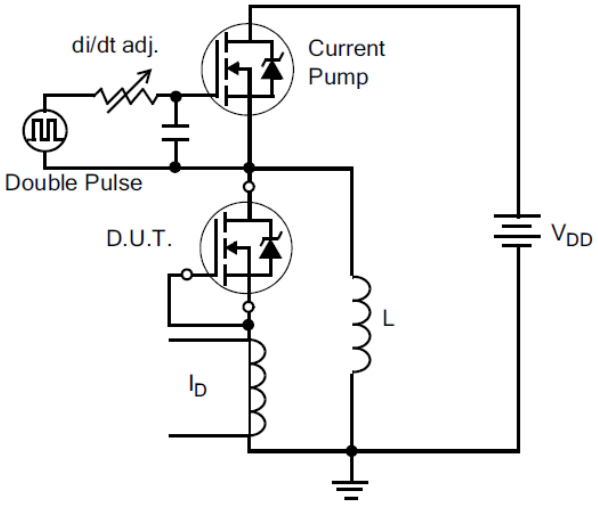


Figure 21. Diode Reverse Recovery Test Circuit

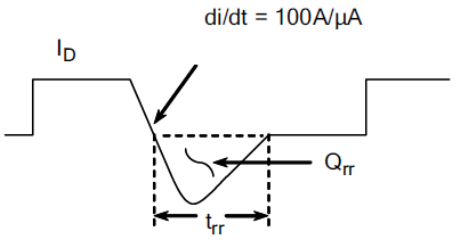


Figure 22. Diode Reverse Recovery Waveform

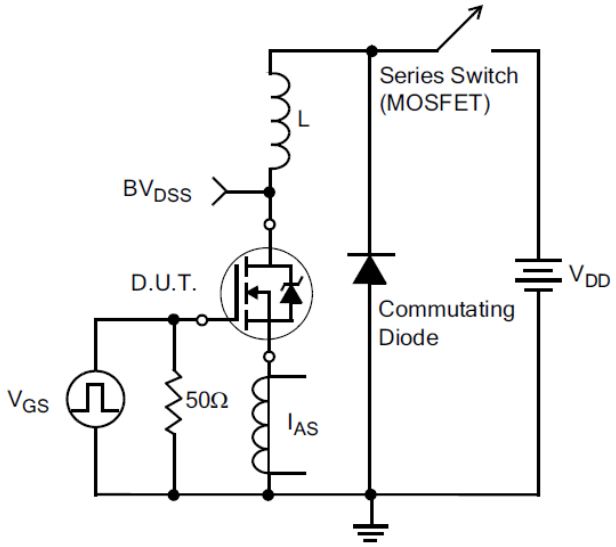
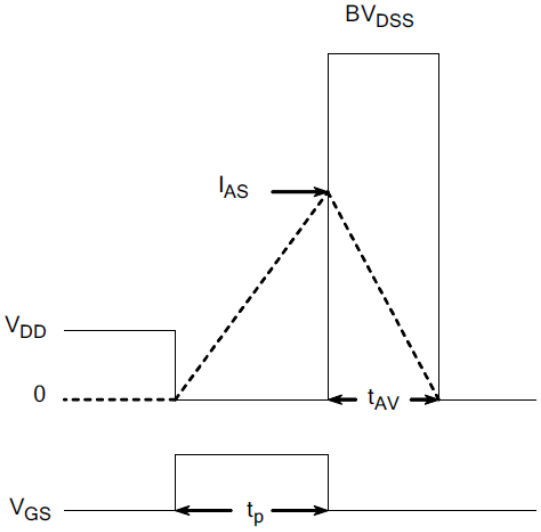


Figure 23. Unclamped Inductive Switching Test Circuit



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

Figure 24. Unclamped Inductive Switching Waveforms

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