

N-Channel MOSFET

Lead Free Package and Finish

Applications:

- Adaptor
- Charger
- SMPS

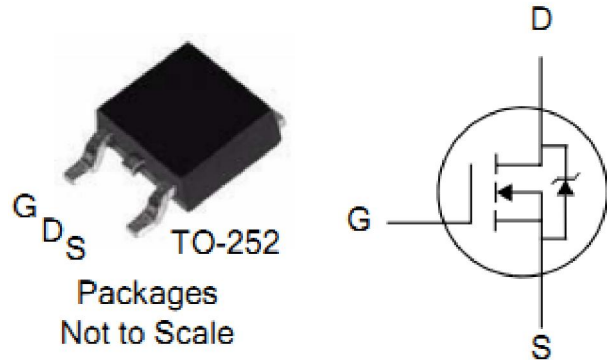
V_{DSS}	$R_{DS(ON)}(Typ.)$	I_D
600V	2.1Ω	4A

Features:

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

Ordering Information

PART NUMBER	PACKAGE	BRAND
ITD04N60R	TO-252	IPS



Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	ITD04N60R	Units
V_{DSS}	Drain-to-Source Voltage	600	V
I_D	Continuous Drain Current	4	A
I_{DM}	Pulsed Drain Current, $V_{GS}@10\text{V}$ (NOTE *1)	16	A
P_D	Power Dissipation	75	W
	Derating Factor above 25°C	0.6	W/ $^\circ\text{C}$
V_{GS}	Gate-to-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy (NOTE *2)	250	mJ
T_L	Maximum Temperature for Soldering	300	$^\circ\text{C}$
T_J and T_{STG}	Operating Junction and Storage Temperature Range	150, -55 to 150	

Thermal Resistance

Symbol	Parameter	Max.	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	1.67	$^\circ\text{C}/\text{W}$	Water cooled heatsink, P_D adjusted for a peak junction temperature of $+150^\circ\text{C}$.
$R_{\theta JA}$	Junction-to-Ambient	100		1 cubic foot chamber, free air.



ITD04N60R

OFF Characteristics $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{DSS}	Drain-to-Source Breakdown Voltage	600	--	--	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Drain-to-Source Leakage Current	--	--	1	μA	$V_{DS}=600V, V_{GS}=0V$ $T_J=25^\circ\text{C}$
		--	--	100		$V_{DS}=480V, V_{GS}=0V$ $T_J=125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	--	--	+100	nA	$V_{GS}=+30V$
	Gate-to-Source Reverse Leakage	--	--	-100		$V_{GS}=-30V$

ON Characteristics $T_J=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	--	2.1	2.5	Ω	$V_{GS}=10V, I_D=2A$
$V_{GS(TH)}$	Gate Threshold Voltage	2	--	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
g_{fs}	Forward Transconductance	--	3.5	--	S	$V_{DS}=15V, I_D=2A$

Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
C_{iss}	Input Capacitance	--	590	--	μF	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$
C_{oss}	Output Capacitance	--	55	--		
C_{rss}	Reverse Transfer Capacitance	--	4	--		
Q_g	Total Gate Charge	--	14.5	--	nC	$I_D=4A, V_{DD}=480V$ $V_{GS}=10V$
Q_{gs}	Gate-to-Source Charge	--	2.6	--		
Q_{gd}	Gate-to-Drain ("Miller") Charge	--	6.5	--		

Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	14		ns	$V_{DD}=300V, I_D=4A,$ $V_G=10V, R_G=10\Omega$
t_{rise}	Rise Time	--	15			
$t_{d(OFF)}$	Turn-Off Delay Time	--	34			
t_{fall}	Fall Time	--	13			



ITD04N60R

Source-Drain Diode Characteristics

T_c=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
I _S	Continuous Source Current (Body Diode)	--	--	4	A	T _C =25°C
I _{SM}	Maximum Pulsed Current (Body Diode)	--	--	16	A	
V _{SD}	Diode Forward Voltage	--	--	1.5	V	I _{SD} =4A, V _{GS} =0V
t _{rr}	Reverse Recovery Time	--	250	--	ns	I _F = I _S di/dt=100A/us
Q _{rr}	Reverse Recovery Charge	--	1	--	uC	

Notes:

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

*2. L=10mH, I_D=7.1A, Start T_J=25°C

Characteristics Curve:

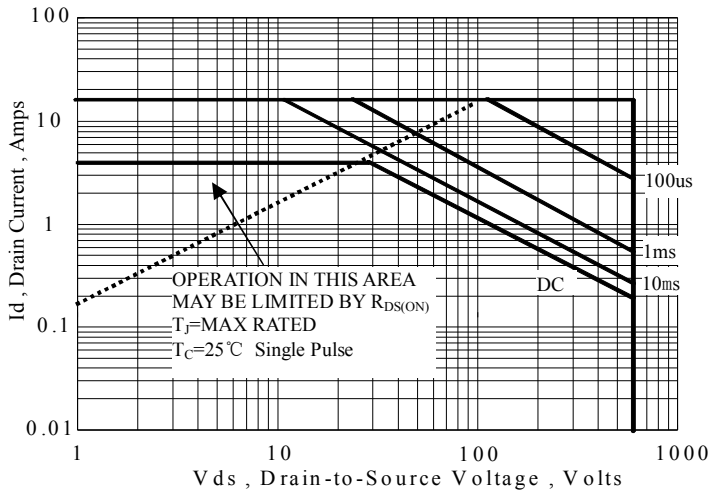


Figure 1 Maximum Forward Bias Safe Operating Area

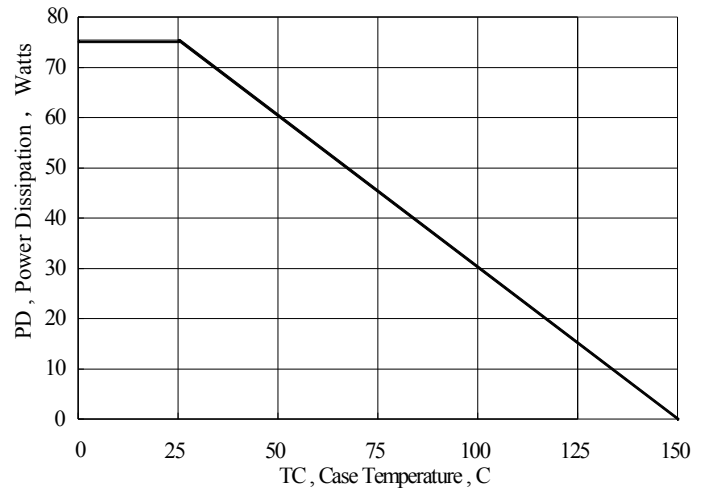


Figure 2 Maximum Power Dissipation vs Case Temperature

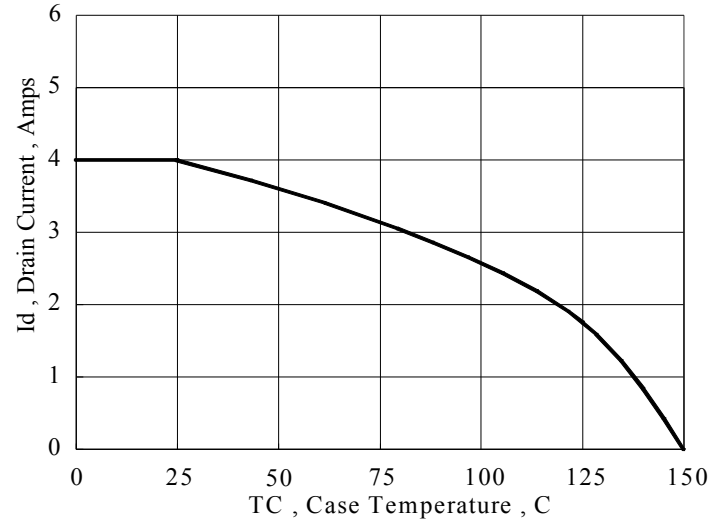


Figure 3 Maximum Continuous Drain Current vs Case Temperature

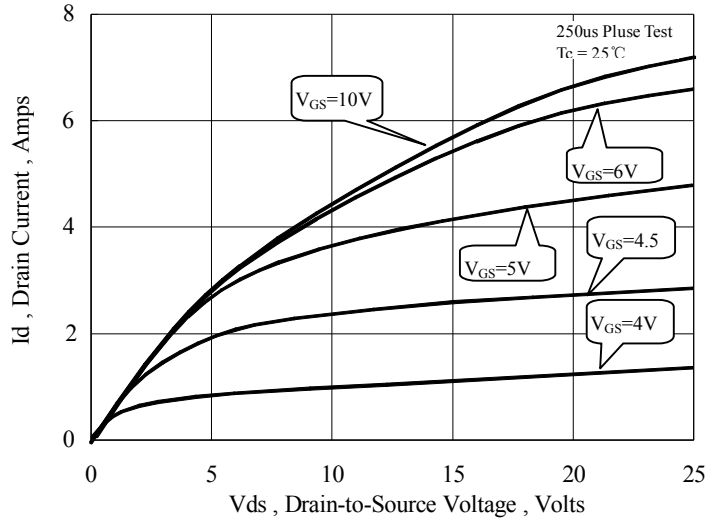


Figure 4 Typical Output Characteristics

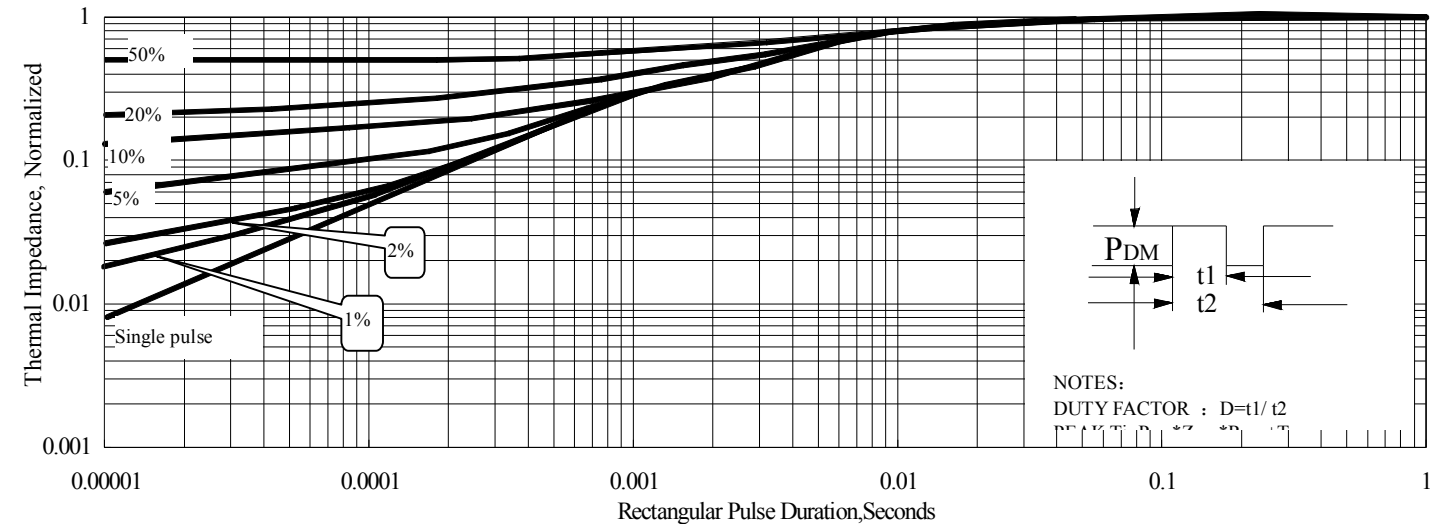


Figure 5 Maximum Effective Thermal Impedance , Junction to Case

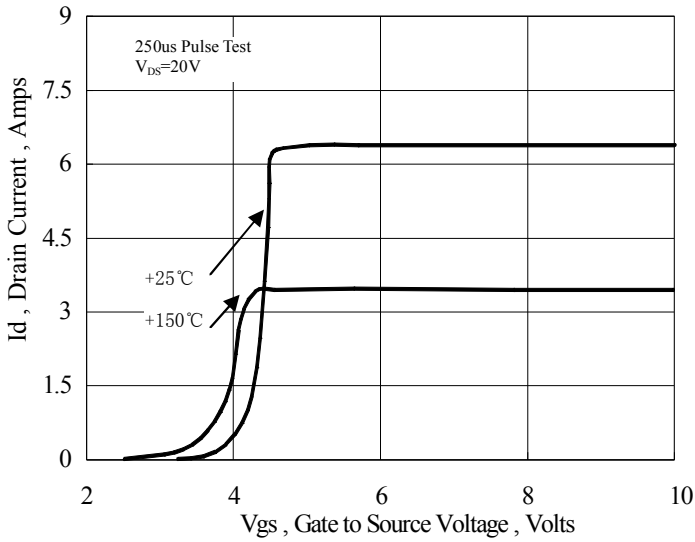


Figure 6 Typical Transfer Characteristics

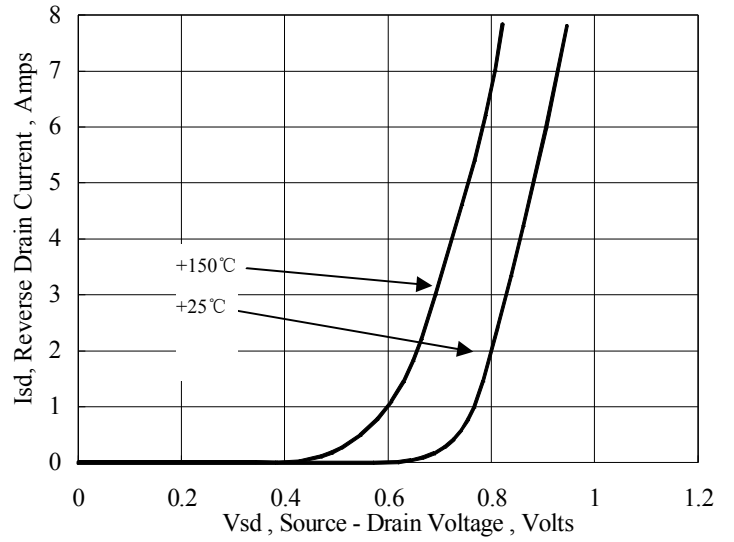


Figure 7 Typical Body Diode Transfer Characteristics

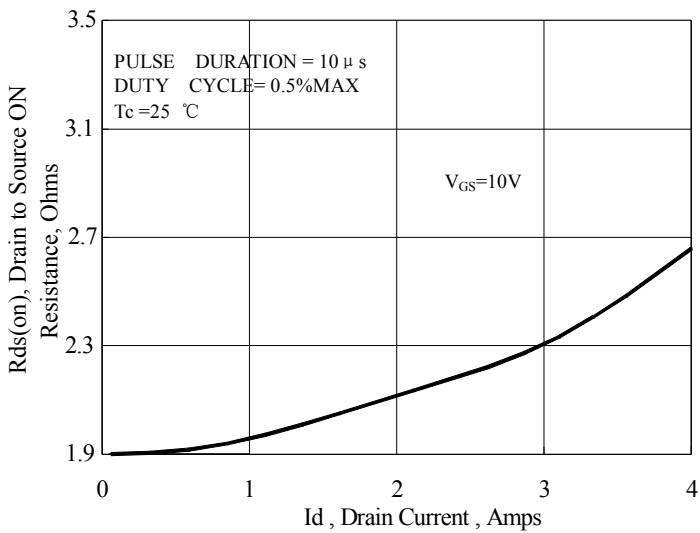


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

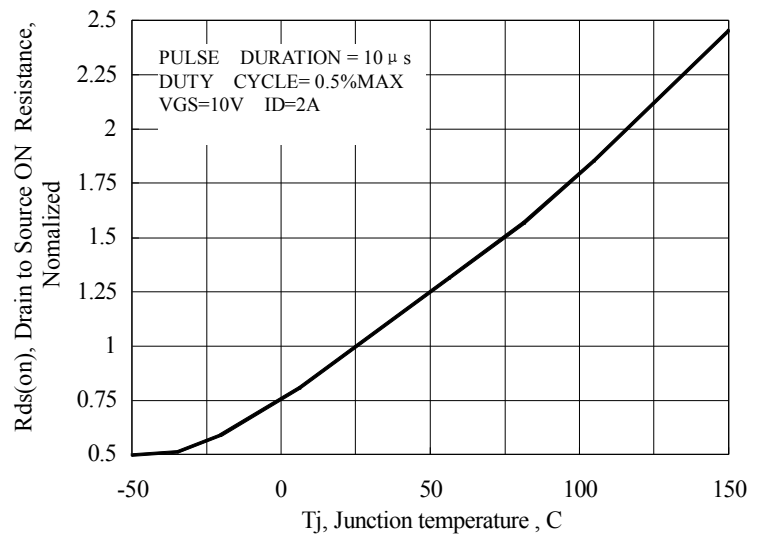


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

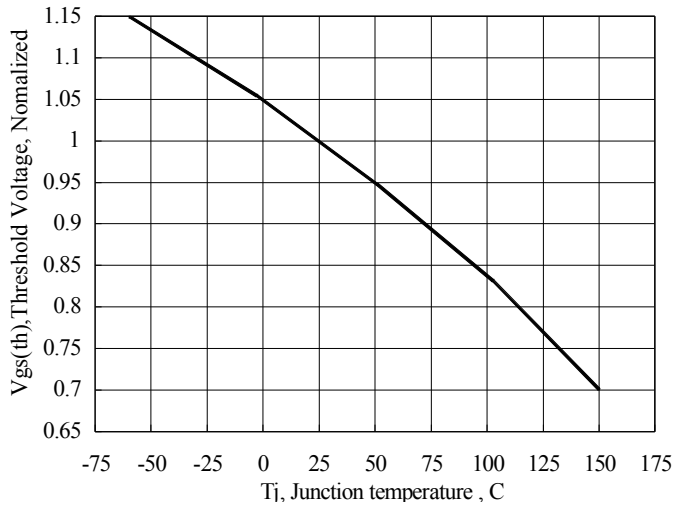


Figure 10 Typical Theshold Voltage vs Junction Temperature

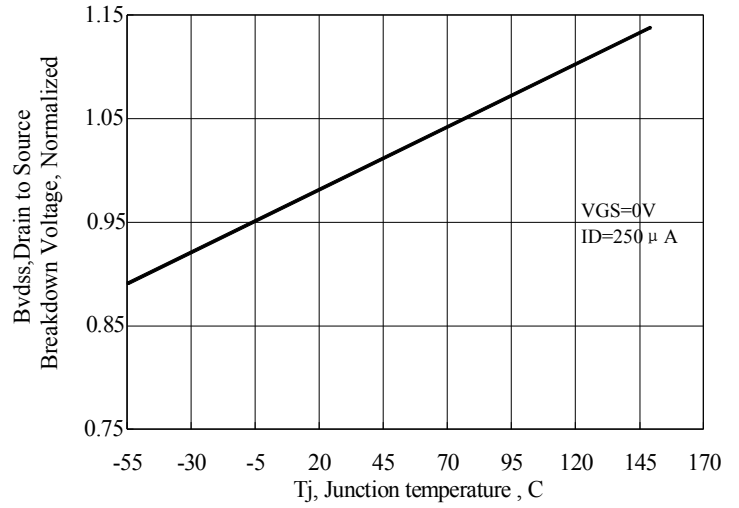


Figure 11 Typical Breakdown Voltage vs Junction Temperature

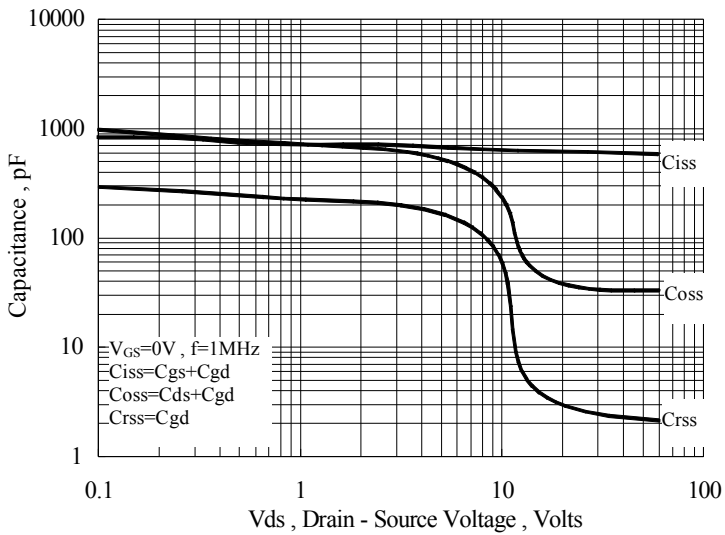


Figure 12 Typical Capacitance vs Drain to Source Voltage

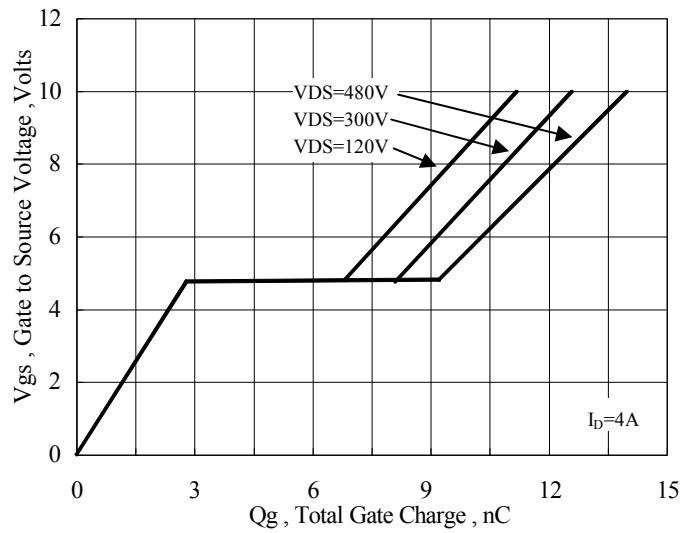


Figure 13 Typical Gate Charge vs Gate to Source Voltage

Test Circuits and Waveforms

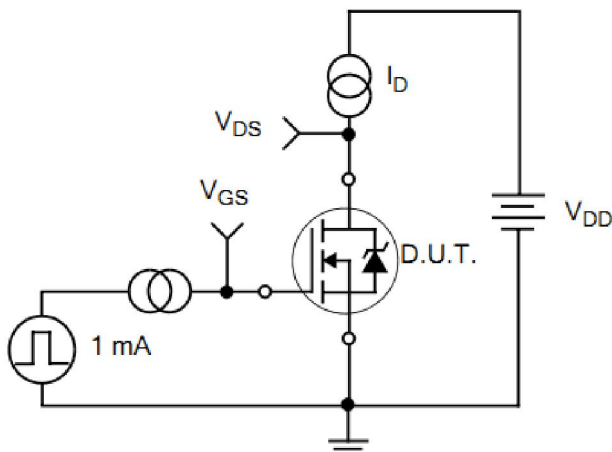


Figure 14. Gate Charge Test Circuit

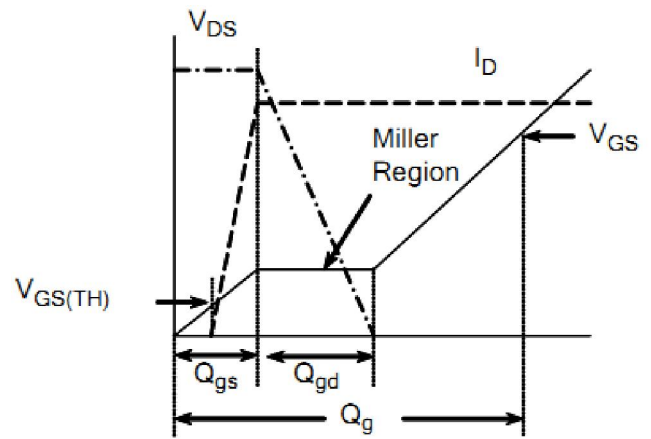


Figure 15. Gate Charge Waveforms

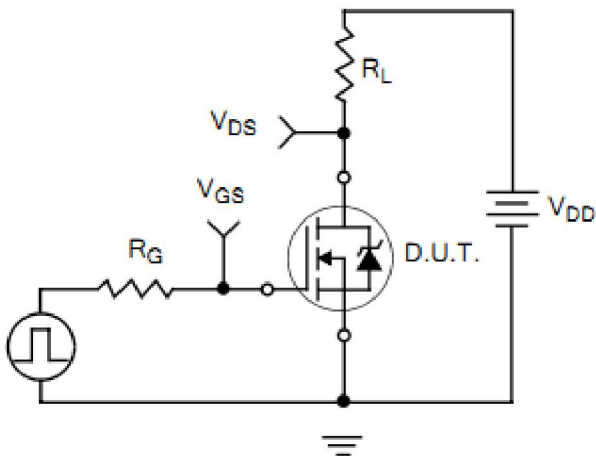


Figure 16. Resistive Switching Test Circuit

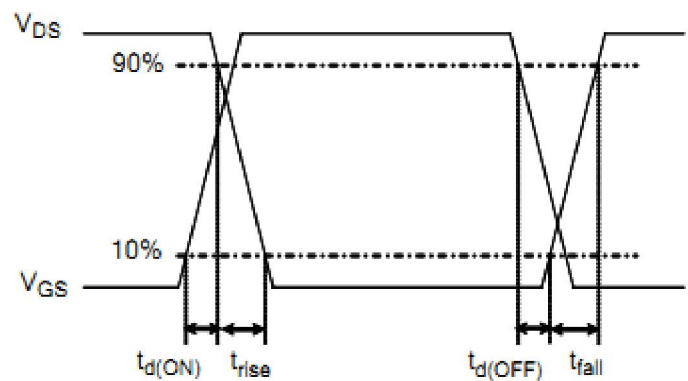


Figure 17. Resistive Switching Waveforms

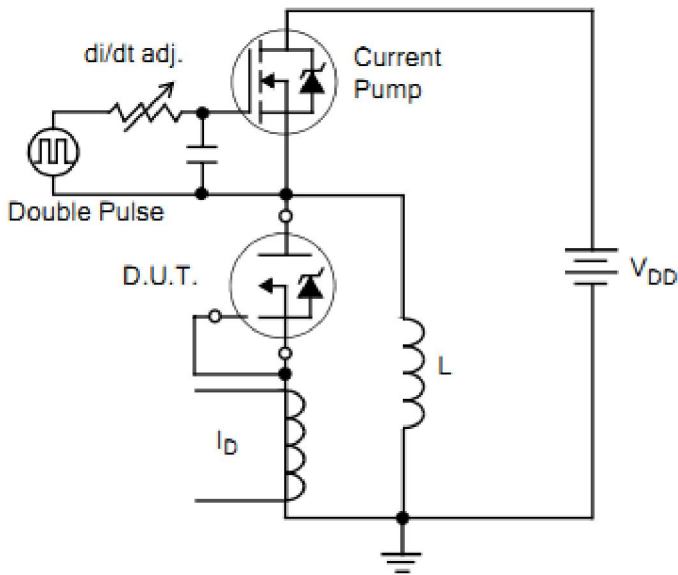


Figure 18. Diode Reverse Recovery Test Circuit

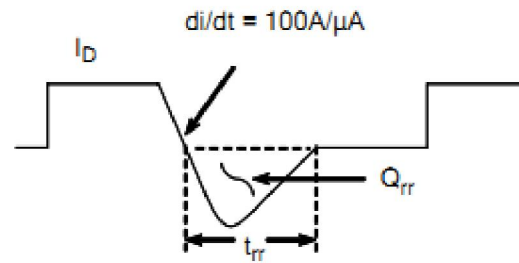


Figure 19. Diode Reverse Recovery Waveform

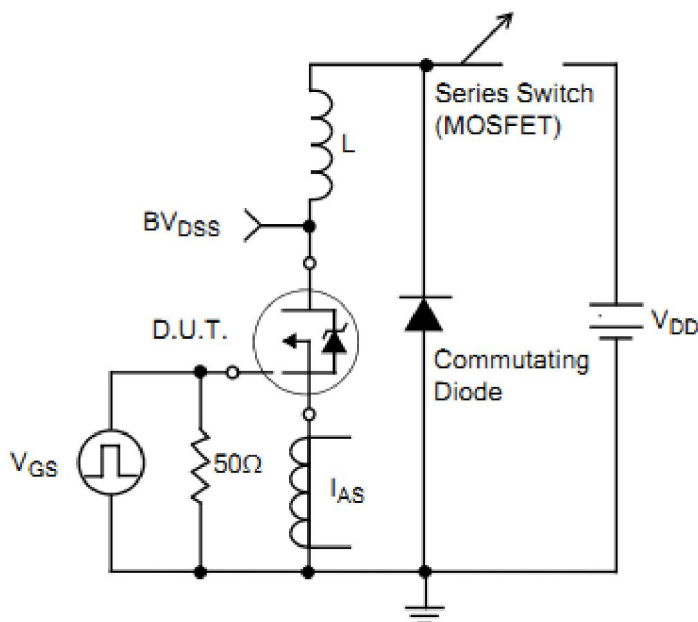


Figure 20. Unclamped Inductive Switching Test Circuit

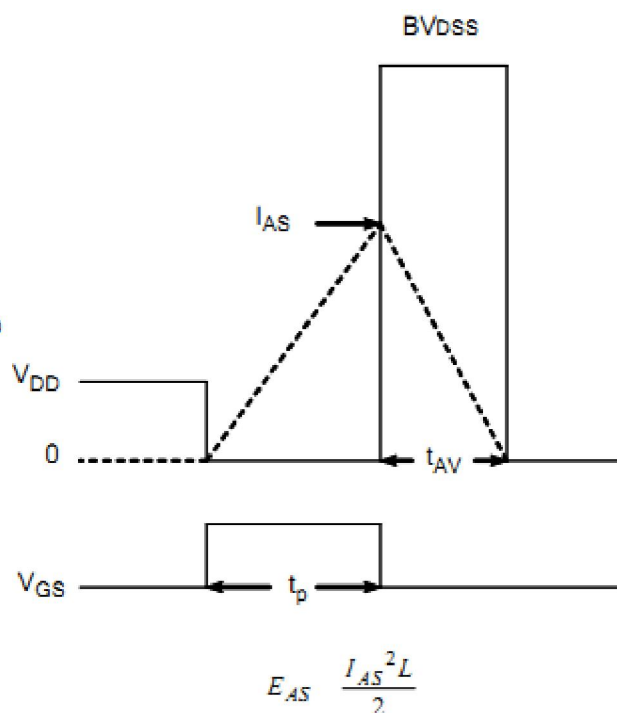


Figure 21. Unclamped Inductive Switching Waveform



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