

## N-Channel MOSFET

**Lead Free Package and Finish**

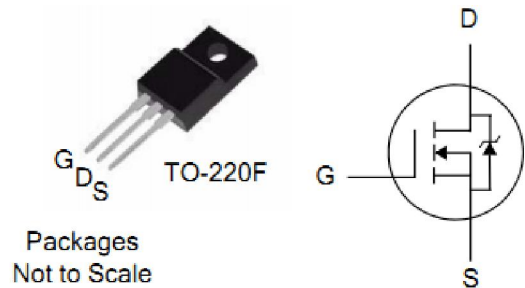
### Applications:

- Adaptor
- Charger
- SMPS

$V_{DSS}$	$R_{DS(ON)}(Typ.)$	$I_D$
600V	0.57Ω	12A

### Features:

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



### Ordering Information

PART NUMBER	PACKAGE	BRAND
ITA12N60R	TO-220F	<b>IPS</b>

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

Symbol	Parameter	ITA12N60R	Units
$V_{DSS}$	Drain-to-Source Voltage	600	V
$I_D$	Continuous Drain Current	12	A
$I_{DM}$	Pulsed Drain Current, $V_{GS}@10V$ (NOTE *1)	48	A
$P_D$	Power Dissipation	42	W
	Derating Factor above $25^\circ\text{C}$	0.34	W/ $^\circ\text{C}$
$V_{GS}$	Gate-to-Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulse Avalanche Energy (NOTE *2)	670	mJ
$T_L$	Maximum Temperature for Soldering	300	$^\circ\text{C}$
$T_J$ and $T_{STG}$	Operating Junction and Storage Temperature Range (NOTE *1)	150, -55 to 150	

### Thermal Resistance

Symbol	Parameter	Max.	Units	Test Conditions
$R_{\theta JC}$	Junction-to-Case	2.98	$^\circ\text{C}/\text{W}$	Water cooled heatsink, $P_D$ adjusted for a peak junction temperature of $+150^\circ\text{C}$ .
$R_{\theta JA}$	Junction-to-Ambient	62.5		1 cubic foot chamber, free air.

## 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	$\mu A$	$V_{DS}=600V, V_{GS}=0V$ $T_J=25^\circ\text{C}$
		--	--	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	--	0.57	0.75	$\Omega$	$V_{GS}=10V, I_D=6A$
$V_{GS(TH)}$	Gate Threshold Voltage	2	--	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
$g_{fs}$	Forward Transconductance	--	12	--	S	$V_{DS}=15V, I_D=6A$

## Dynamic Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$C_{iss}$	Input Capacitance	--	1980	--	$\mu F$	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$
$C_{oss}$	Output Capacitance	--	170	--		
$C_{rss}$	Reverse Transfer Capacitance	--	10	--		
$Q_g$	Total Gate Charge	--	40	--	$nC$	$I_D=12A, V_{DD}=480V$ $V_{GS}=10V$
$Q_{gs}$	Gate-to-Source Charge	--	9.8	--		
$Q_{gd}$	Gate-to-Drain ("Miller") Charge	--	14.5	--		

## Resistive Switching Characteristics Essentially independent of operating temperature

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$t_{d(ON)}$	Turn-on Delay Time	--	27		$ns$	$V_{DD}=300V, I_D=12A,$ $V_G=10V, R_G=10\Omega$
$t_{rise}$	Rise Time	--	25			
$t_{d(OFF)}$	Turn-Off Delay Time	--	63			
$t_{fall}$	Fall Time	--	39			



# ITA12N60R

## Source-Drain Diode Characteristics

$T_c=25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_S$	Continuous Source Current (Body Diode)	--	--	12	A	$T_c=25^{\circ}\text{C}$
$I_{SM}$	Maximum Pulsed Current (Body Diode)	--	--	48	A	
$V_{SD}$	Diode Forward Voltage	--	--	1.5	V	$I_{SD}=12\text{A}, V_{GS}=0\text{V}$
$t_{rr}$	Reverse Recovery Time	--	581	--	ns	$I_F=I_S$ $di/dt=100\text{A}/\mu\text{s}$
$Q_{rr}$	Reverse Recovery Charge	--	4	--	$\mu\text{C}$	

### Notes:

- \*1. Repetitive rating; pulse width limited by maximum junction temperature.
- \*2.  $L=10\text{mH}$ ,  $I_D=11.6\text{A}$ , Start  $T_J=25^{\circ}\text{C}$

## Characteristics Curve:

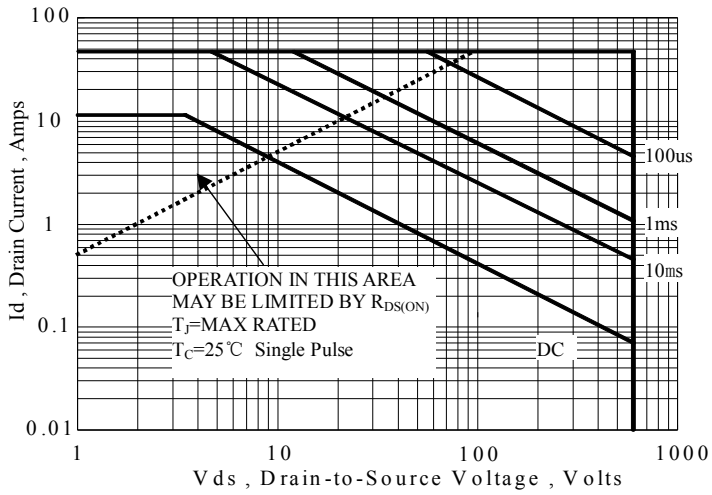


Figure 1 Maximum Forward Bias Safe Operating Area

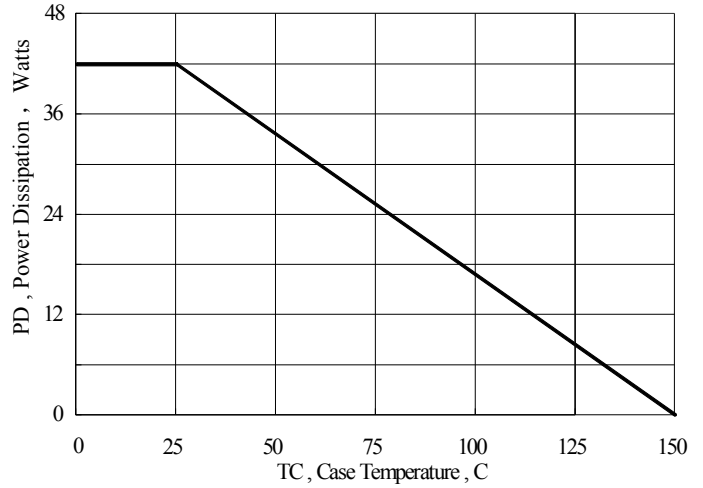


Figure 2 Maximum Power Dissipation vs Case Temperature

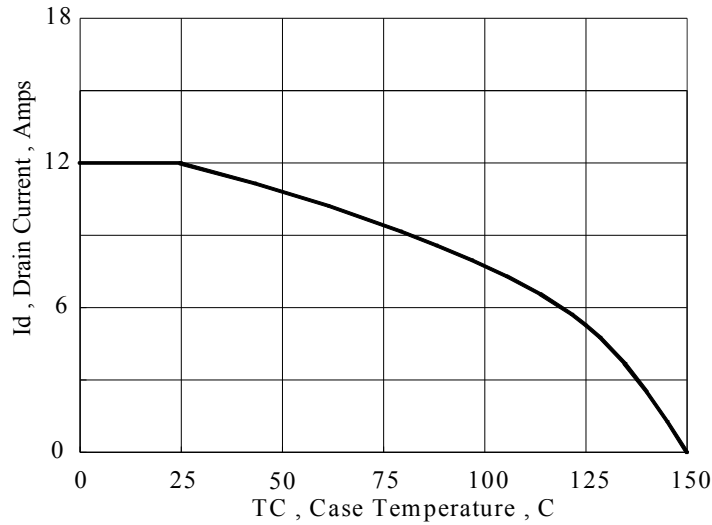


Figure 3 Maximum Continuous Drain Current vs Case Temperature

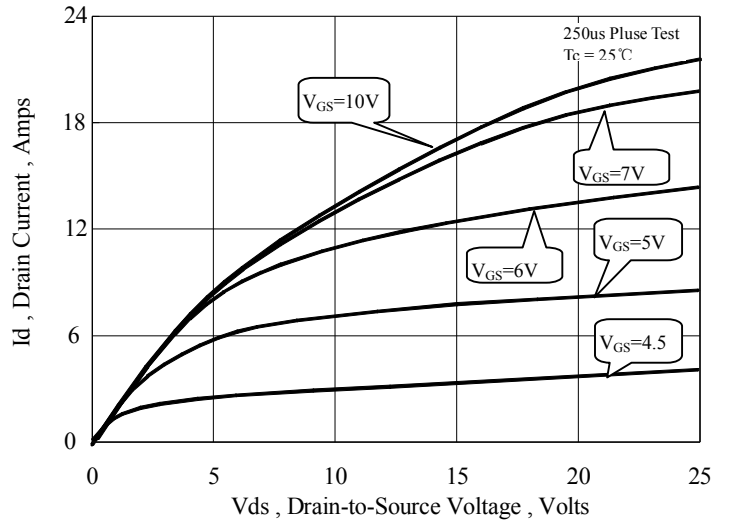


Figure 4 Typical Output Characteristics

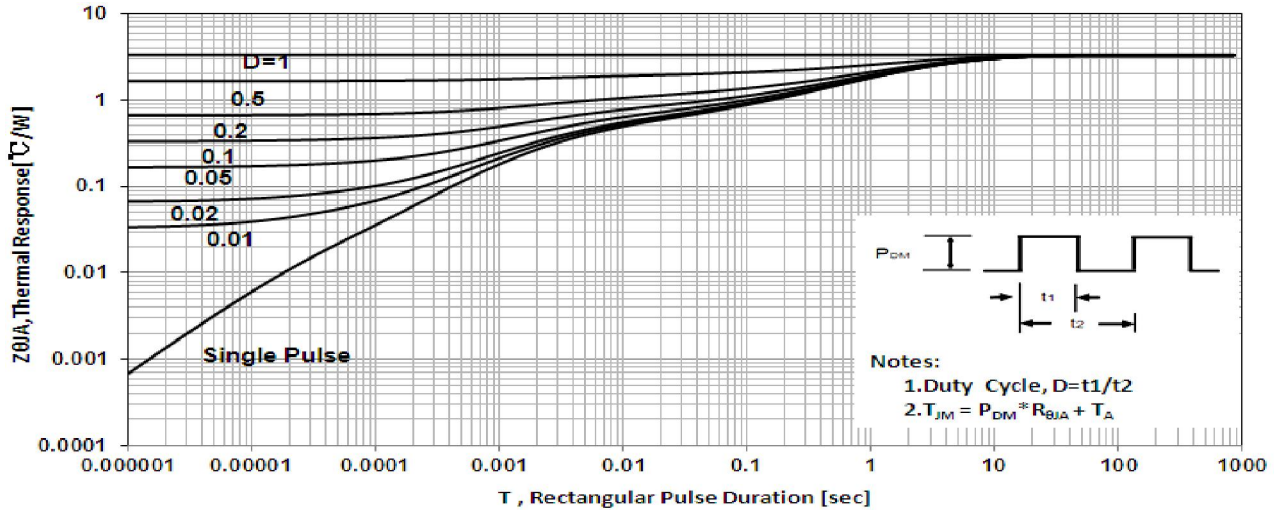


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

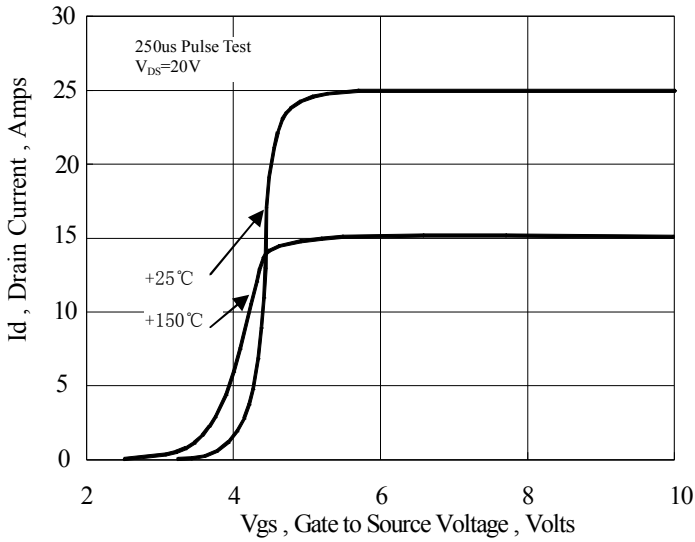


Figure 6 Typical Transfer Characteristics

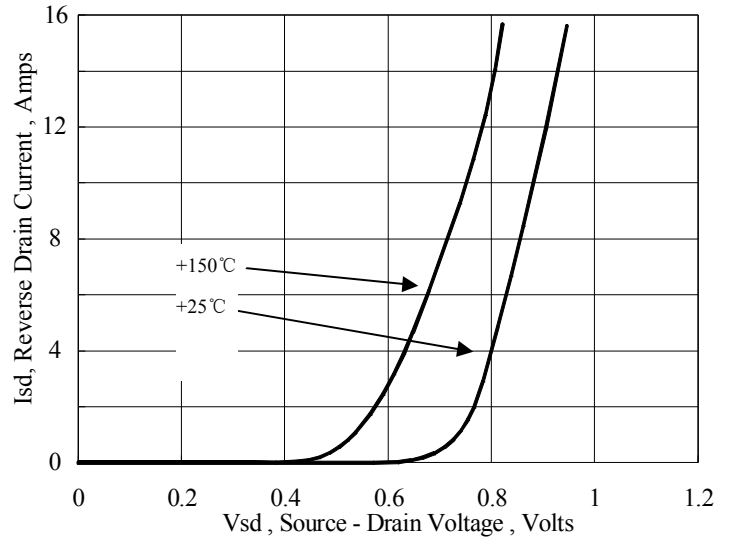


Figure 7 Typical Body Diode Transfer Characteristics

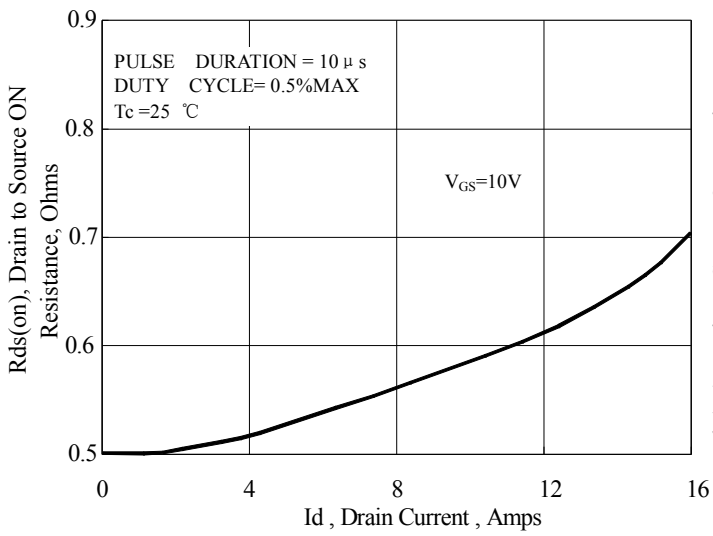


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

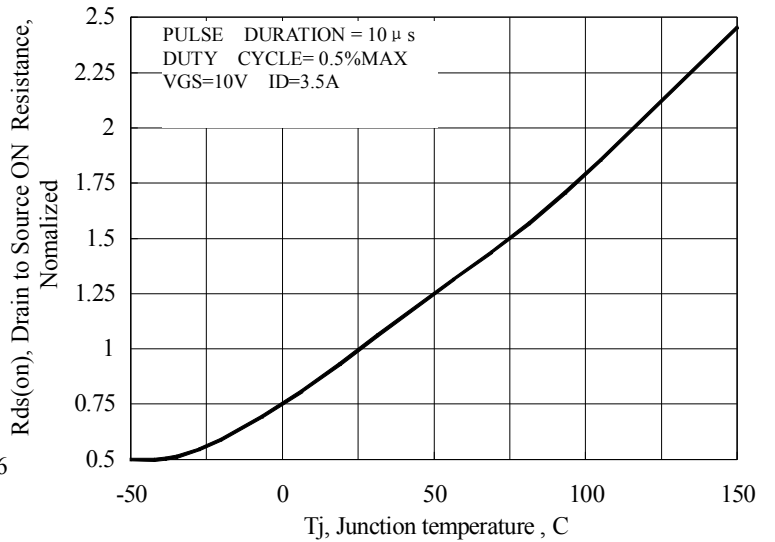


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

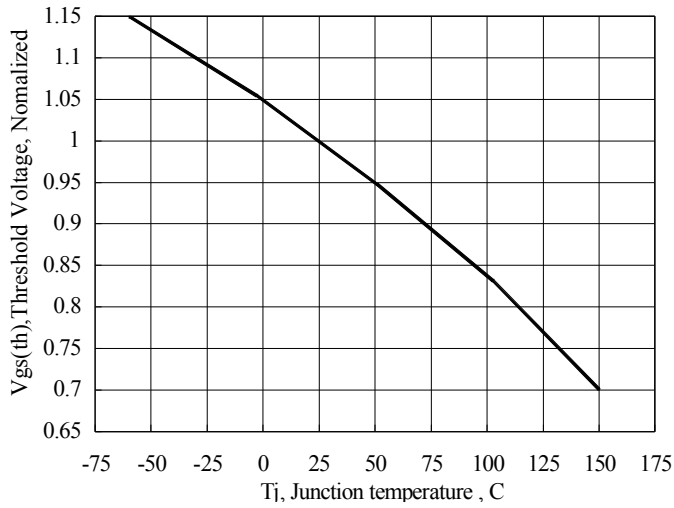


Figure 10 Typical Theshold Voltage vs Junction Temperature

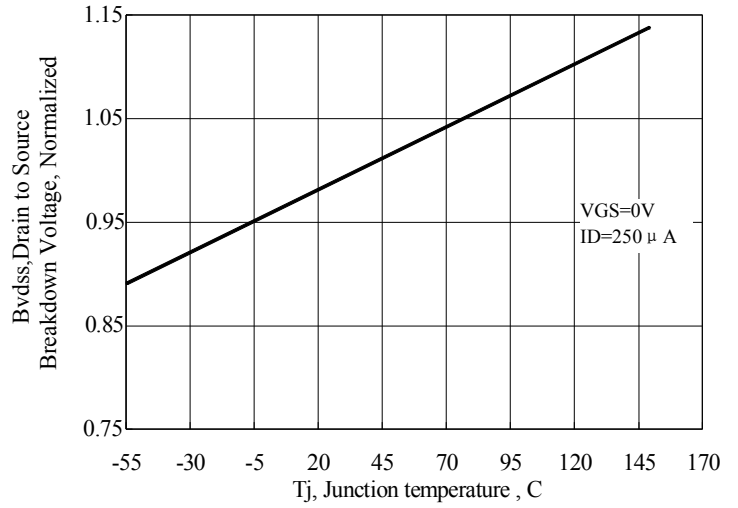


Figure 11 Typical Breakdown Voltage vs Junction Temperature

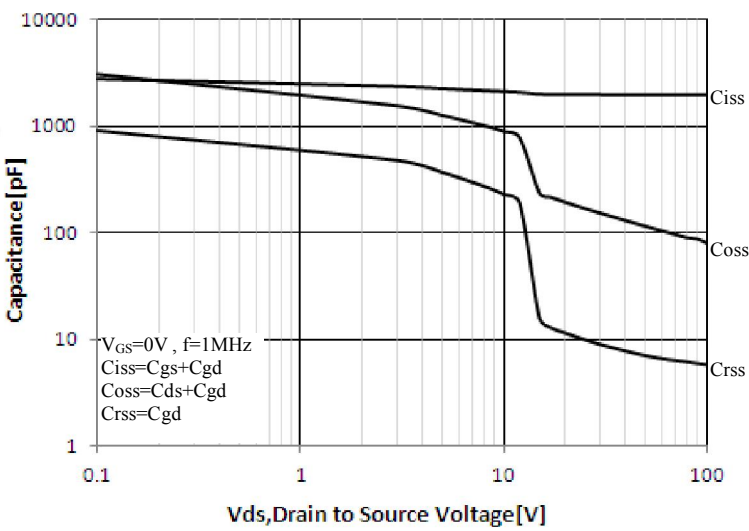


Figure 12 Typical Capacitance vs Drain to Source Voltage

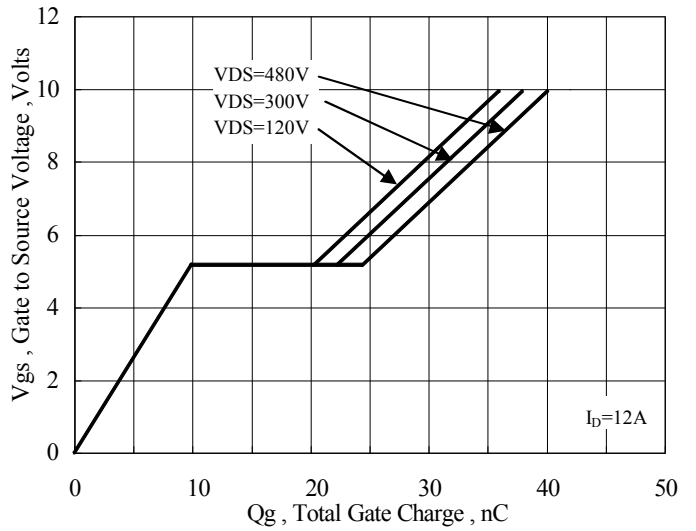


Figure 13 Typical Gate Charge vs Gate to Source Voltage

## Test Circuits and Waveforms

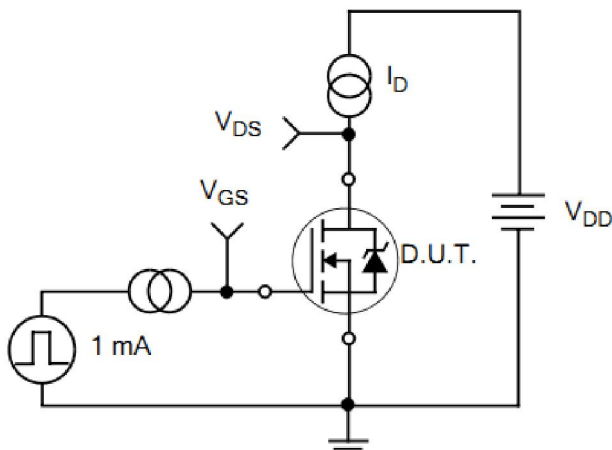


Figure 14. Gate Charge Test Circuit

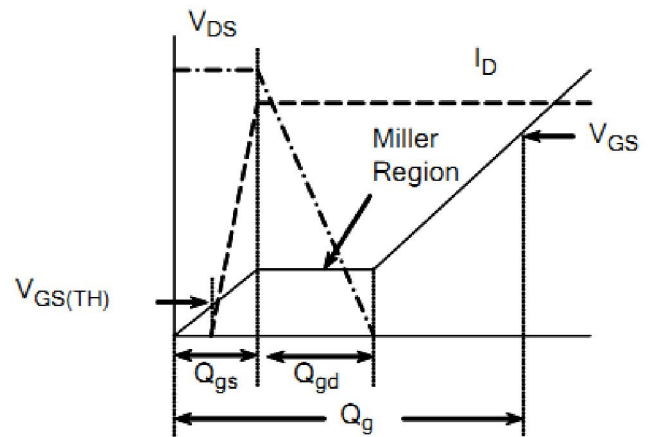


Figure 15. Gate Charge Waveforms

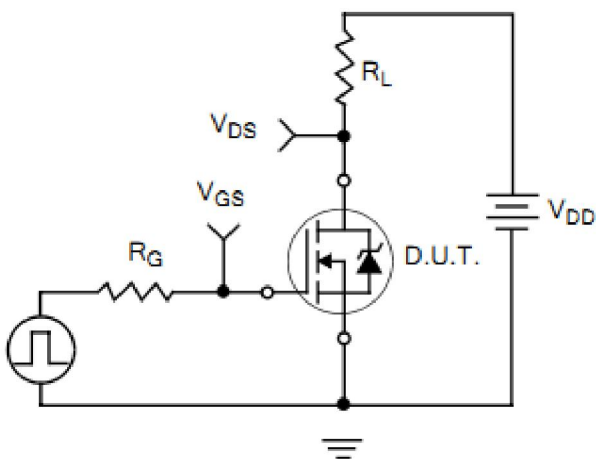


Figure 16. Resistive Switching Test Circuit

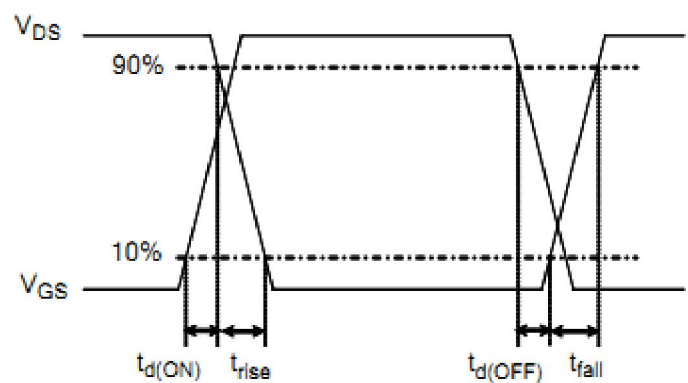


Figure 17. Resistive Switching Waveforms

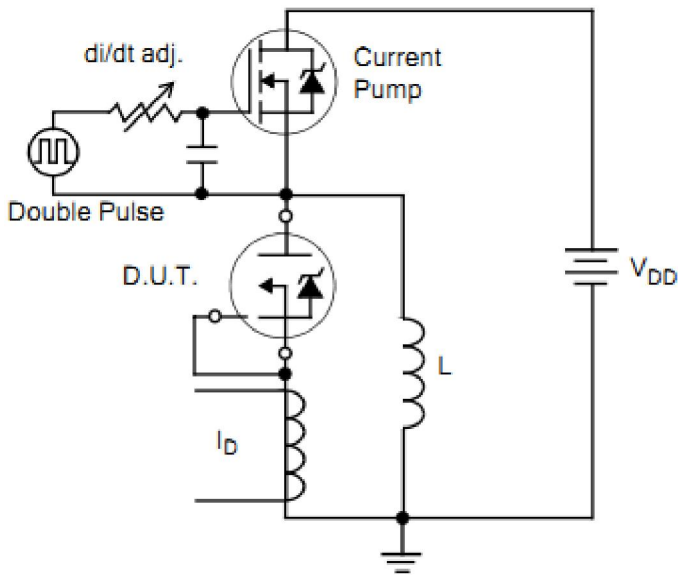


Figure 18. Diode Reverse Recovery Test Circuit

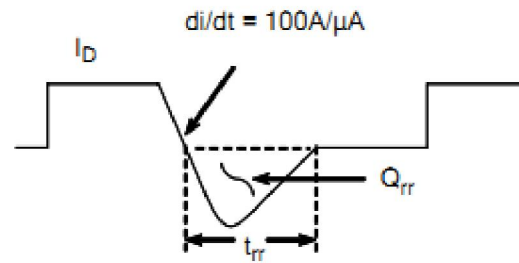


Figure 19. Diode Reverse Recovery Waveform

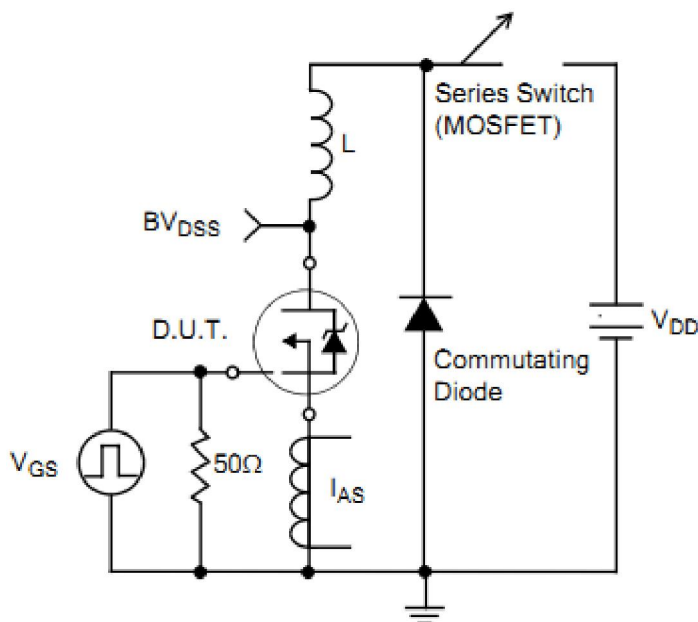


Figure 20. Unclamped Inductive Switching Test Circuit

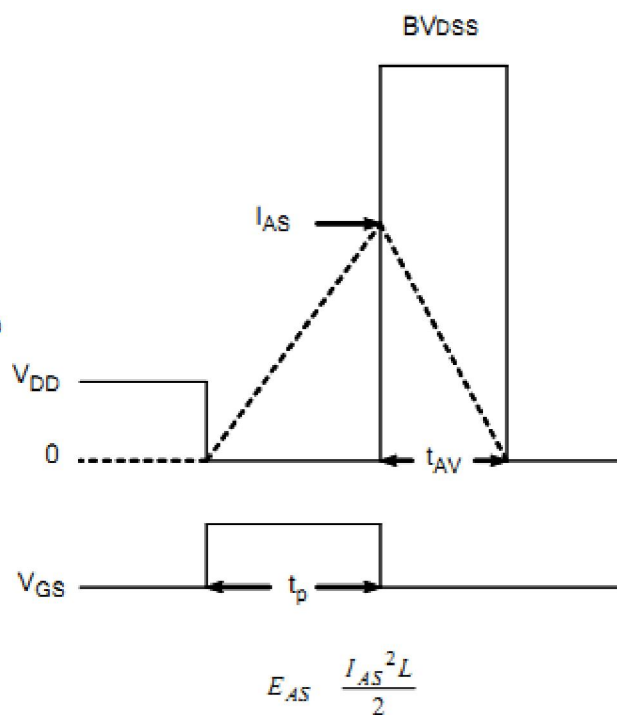


Figure 21. Unclamped Inductive Switching Waveform





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