

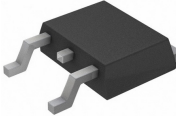
## Description

Features		
$V_{DSS}$	$R_{DS(ON)}$ @ 10V(Typ)	$I_D$
200V	0.49 $\Omega$	5A


- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

**Application**

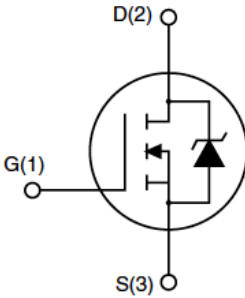
- DC Motor Control and Class D Amplifier
- Uninterruptible Power Supply (UPS)
- Automotive



TO-252



TO-251



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

Symbol	Parameter		Max.	Units
			TO-251/TO-252	
$V_{DSS}$	Drain-Source Voltage		200	V
$V_{GSS}$	Gate-Source Voltage		$\pm 30$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	5	A
		$T_C = 100^\circ\text{C}$	3.24	A
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>		20	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note2</sup>		125	mJ
dv/dt	Peak Diode Recovery Energy <sup>note3</sup>		5	V/ns
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	78	W
	Linear Derating Factor	$T_C > 25^\circ\text{C}$	0.625	W/ $^\circ\text{C}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.6	$^\circ\text{C}/\text{W}$
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$

\*Drain current limited by maximum junction temperature

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

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	200	-	-	V
$\Delta V_{(BR)DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D = 250\mu A$	-	0.25	-	$V/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 200V, V_{GS} = 0V$	-	-	1	$\mu A$
		$V_{DS} = 160V, T_C = 125^\circ\text{C}$	-	-	10	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage <sup>note4</sup>	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.9	3	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10V, I_D = 2.5A$	-	0.49	0.58	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 30V, I_D = 2.5A$	-	5.2	-	S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	-	255	-	pF
$C_{oss}$	Output Capacitance		-	30.2	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	2.3	-	pF
$Q_g$	Total Gate Charge	$V_{DD} = 160V, I_D = 5A,$ $V_{GS} = 10V$	-	10.8	-	nC
$Q_{gs}$	Gate-Source Charge		-	1.7	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	3.1	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100V, I_D = 5A,$ $R_G = 10\Omega, V_{GS} = 10V$	-	7.33	-	ns
$t_r$	Turn-On Rise Time		-	10.7	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	18.2	-	ns
$t_f$	Turn-Off Fall Time		-	11.9	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current	-	-	5	-	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current	-	-	20	-	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 5A$	-	-	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0V, I_F = 5A,$ $di/dt = 100A/\mu s$	-	125.5	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	357	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 10\text{mH}, I_{AS} = 5A, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 5A, di/dt \leq 200A/\mu s, V_{DD} \leq B_{VDSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

Typical Performance Characteristics

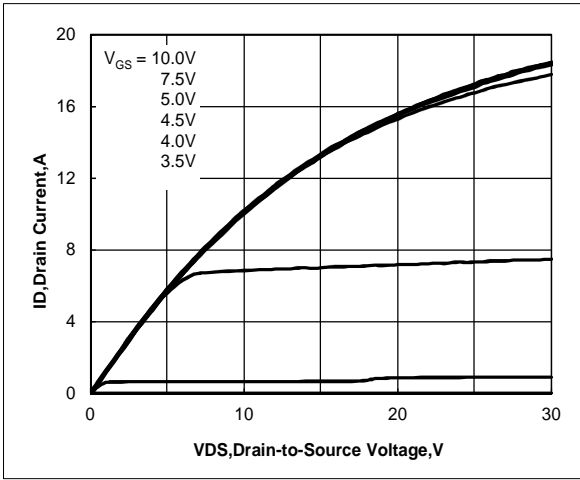


Figure 1. Output Characteristics

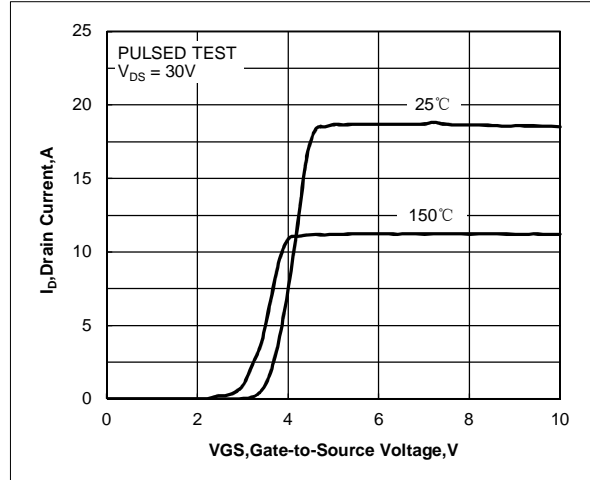


Figure 2. Transfer Characteristics

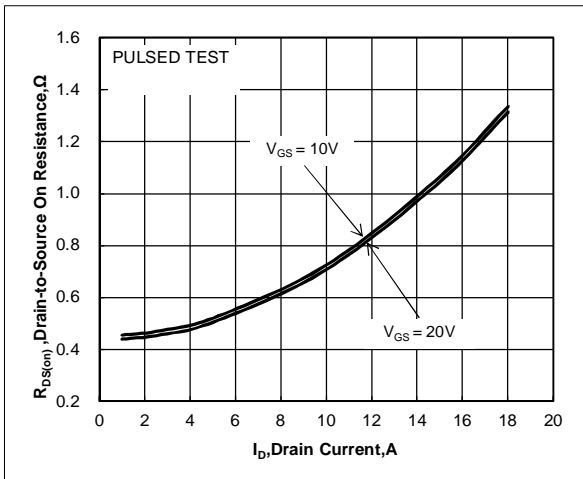


Figure 3. Drain-to-Source On Resistance vs. Drain Current and Gate Voltage

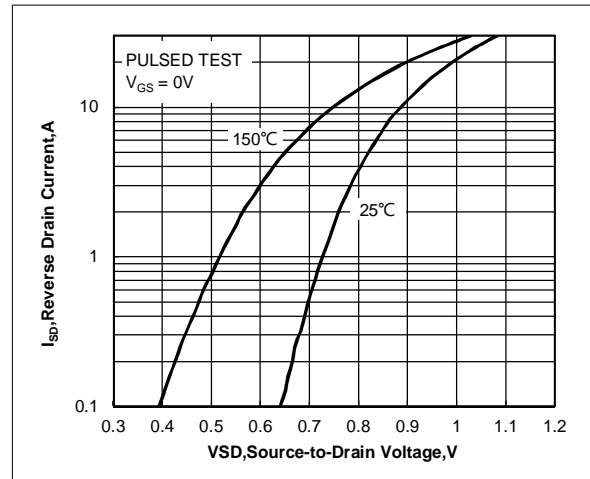


Figure 4. Body Diode Forward Voltage vs. Source Current and Temperature

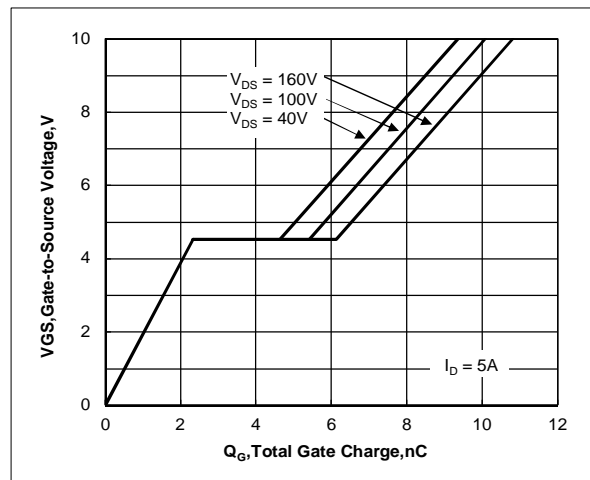
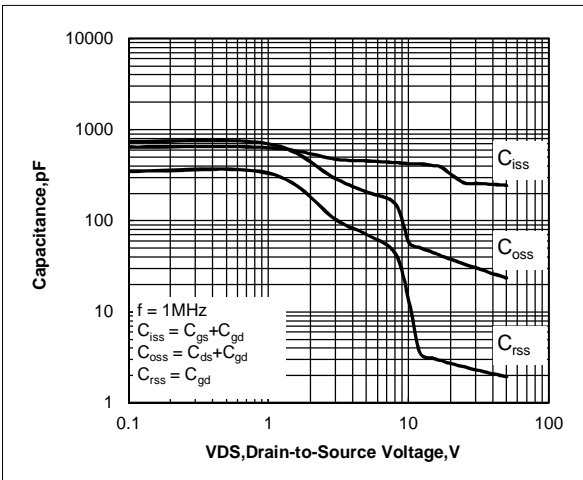


Figure 5. Capacitance Characteristics

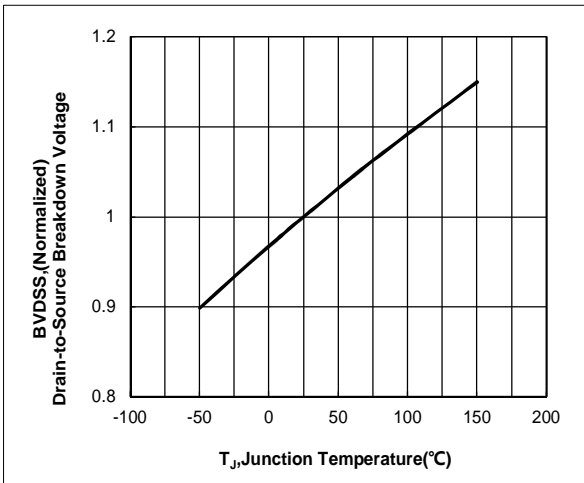


Figure 7. Normalized Breakdown Voltage vs. Junction Temperature

Figure 6. Gate Charge Characteristics

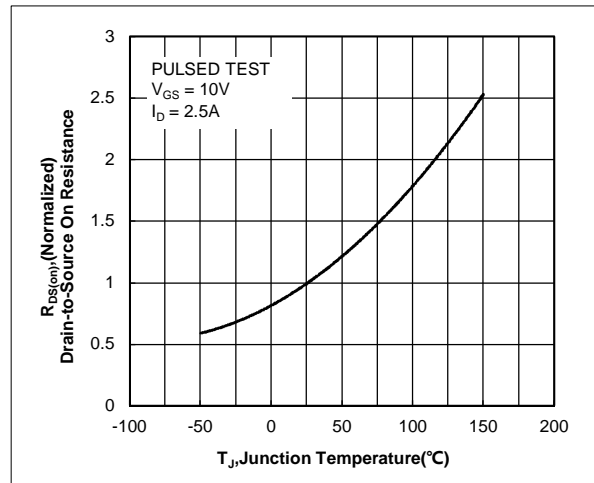


Figure 8. Normalized On Resistance vs. Junction Temperature

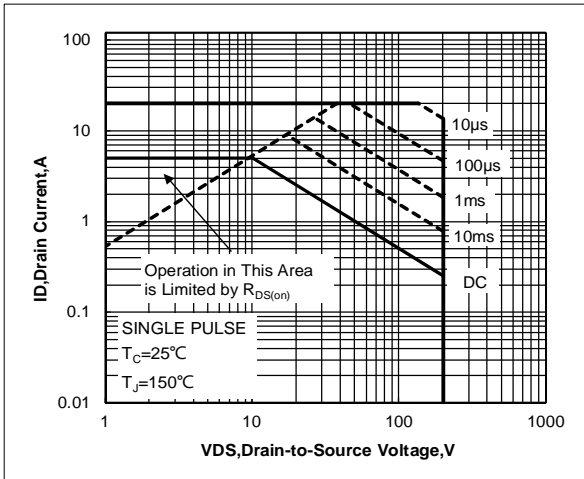


Figure 9. Maximum Safe Operating Area for RU5N20A

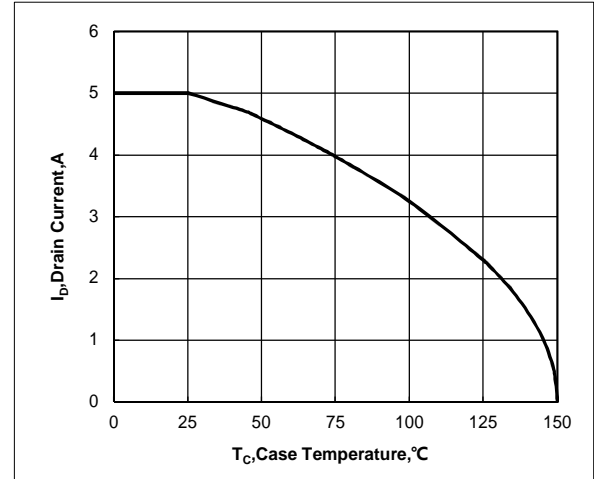


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

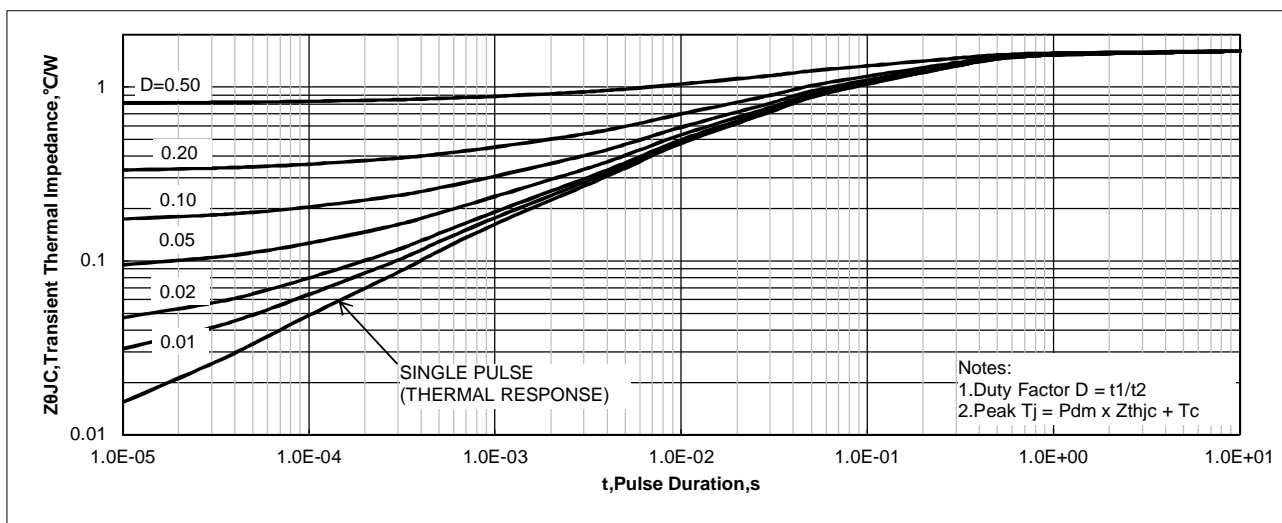


Figure 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case for RU5N20A

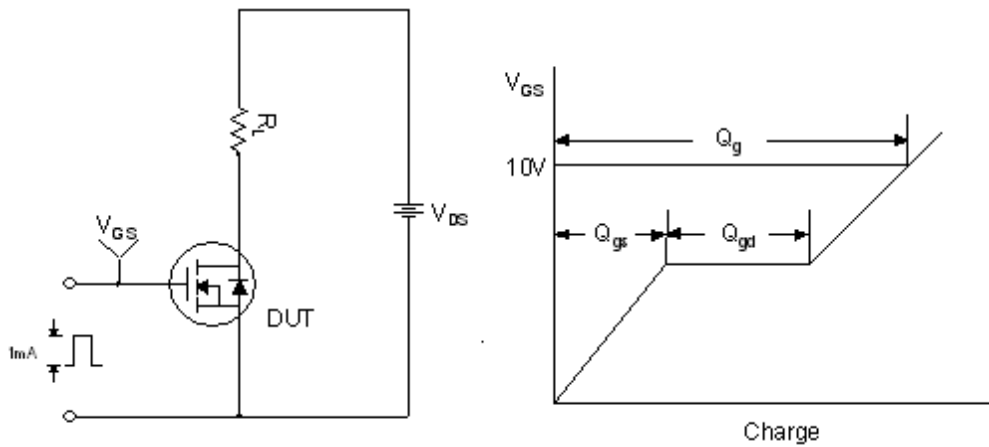


Figure 12. Gate Charge Test Circuit & Waveform

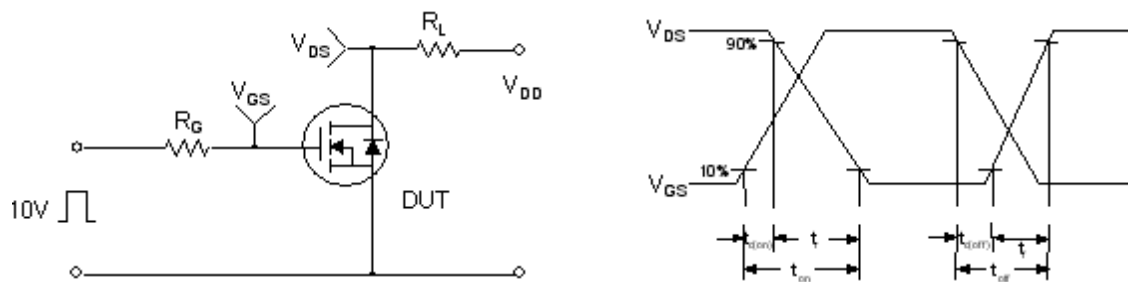


Figure 13. Resistive Switching Test Circuit & Waveforms

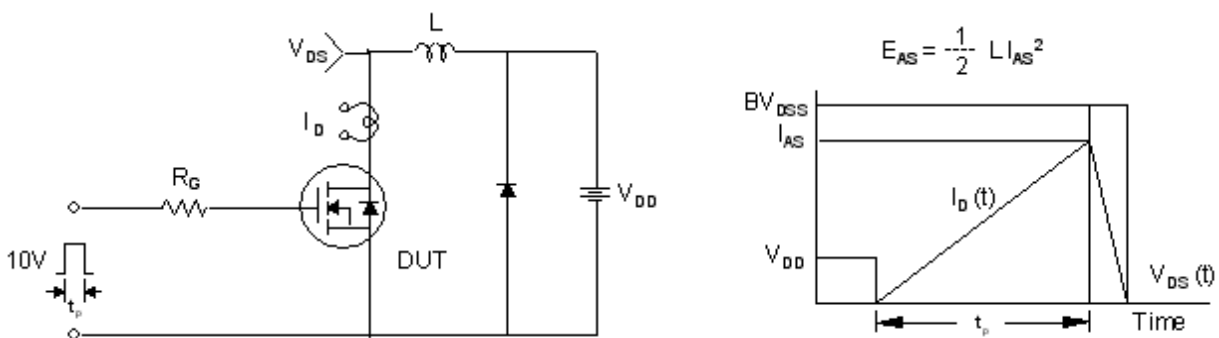


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

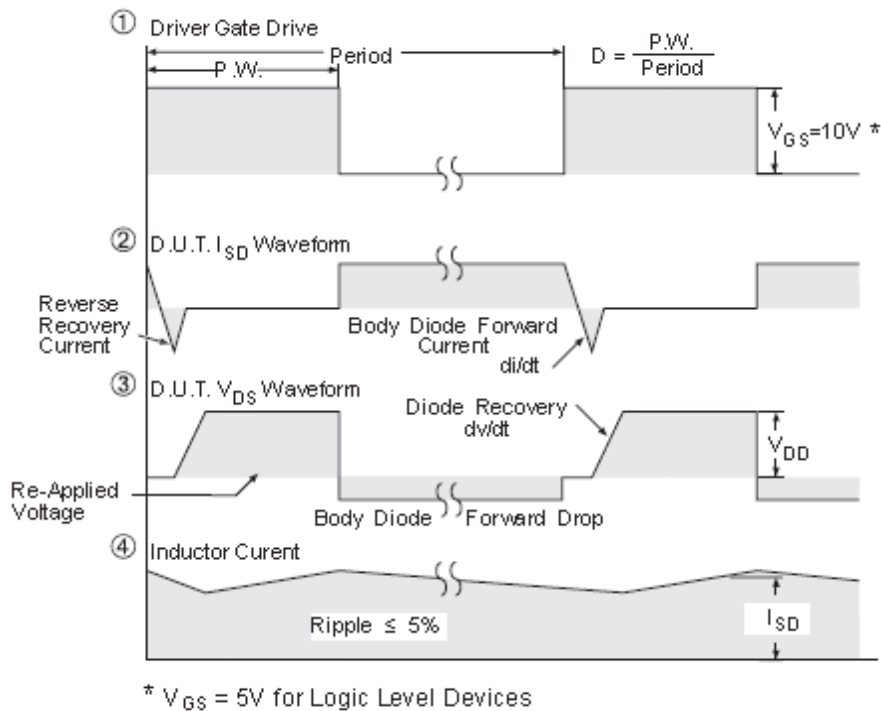
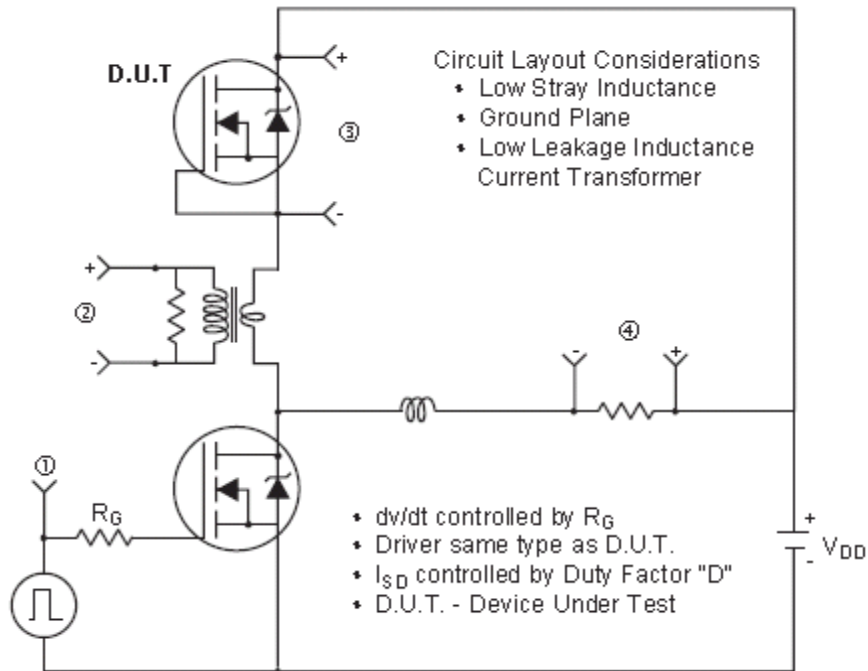


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms (For N-channel)

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