

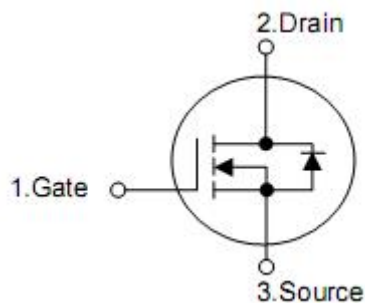
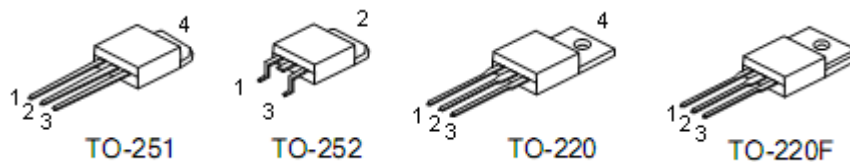
1. Features

- n $R_{DS(ON)} = 1.9\Omega$ (typ.) @ $V_{GS} = 10V$, $I_D = 2A$
- n Fast switching
- n 100% avalanche tested
- n Improved dv/dt capability

2. Application

- n High frequency switching mode power supply
- n Uninterruptible Power Supply(UPS)
- n Electronic ballast

3. Pin configuration



Pin	Function
1	Gate
2	Drain
3	Source
4	Drain

4. Ordering Information

Part Number	Package	Brand
KND4360A	TO-252	KIA
KNU4360A	TO-251	KIA
KNP4360A	TO-220	KIA
KNF4360A	TO-220F	KIA

5. Absolute maximum ratings

(T_C= 25°C , unless otherwise specified)

Parameter	Symbol	Rating				Units
		TO220	TO220F	TO251	TO252	
Drain-source voltage	V _{DSS}	600				V
Gate-source voltage	V _{GSS}	± 30				V
Drain current continuous	I _D	T _C =25°C	4.0	4.0*	4 *	A
		T _C =100°C	2.78	2.78*	2.78*	A
Drain current pulsed (note1)	I _{DM}	16	16*	16*	A	
Avalanche energy	E _{AS}	180				mJ
Peak diode recovery dv/dt (note3)	dv/dt	4.8				V/ns
Total power dissipation	P _D	T _C =25°C	100	44.6	44.6	W
		Derate above 25°C	0.8	0.357	0.357	W/°C
Thermal Resistance Junction to Case	R _{θJC}	1.25	3.75	2.8	°C/W	
Storage temperature	T _{STG}	-55~+150				°C

*Drain current limited by maximum junction temperature.

6. Electrical characteristics

($T_J=25^{\circ}\text{C}$, unless otherwise notes)

Parameter		Symbol	Conditions	Min	Typ	Max	Unit
Off characteristics							
Drain-source breakdown voltage		BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
Zero gate voltage drain current		I_{DSS}	$V_{DS}=600V, V_{GS}=0V$	-	-	1	μA
			$V_{DS}=480V, T_C=125^{\circ}\text{C}$	-	-	10	μA
Gate-body leakage Current	Forward	I_{GSS}	$V_{GS}=30V, V_{DS}=0V$	-	-	100	nA
	Reverse		$V_{GS}=-30V, V_{DS}=0V$	-	-	-100	nA
Breakdown voltage temperature coefficient		$\Delta BV_{DSS}/\Delta T_J$	Reference to 25°C $I_D=250\mu A$	-	0.65	-	$V/^{\circ}\text{C}$
On characteristics							
Gate threshold voltage (note4)		$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
Static drain-source on-resistance		$R_{DS(ON)}$	$V_{GS}=10V, I_D=2.0A$	-	1.9	2.3	Ω
Forward Transconductance		G_{FS}	$V_{DS}=30V, I_D=2.0A$	-	5.5	-	S
Dynamic characteristics							
Input capacitance		C_{ISS}	$V_{DS}=25V, V_{GS}=0V,$ $f=1\text{MHz}$	-	511	-	pF
Output capacitance		C_{OSS}		-	56.6	-	pF
Reverse transfer capacitance		C_{RSS}		-	5.55	-	pF
Switching characteristics							
Turn-on delay time		$t_{D(ON)}$	$V_{DD}=300V, I_D=4.0A,$ $R_G=10\Omega, V_{GS}=10V$	-	11.3	-	ns
Rise time		t_R		-	14.7	-	ns
Turn-off delay time		$t_{D(OFF)}$		-	37.6	-	ns
Fall time		t_F		-	10.4	-	ns
Total gate charge		Q_G	$V_{DD}=480V,$ $I_D=4.0A$ $V_{GS}=10V$	-	15.3	-	nC
Gate-source charge		Q_{GS}		-	2.45	-	nC
Gate-drain charge		Q_{GD}		-	6.56	-	nC
Drain-source diode characteristics							
Drain-source diode forward voltage		V_{SD}	$V_{GS}=0V, I_{SD}=4.0A$	-	-	1.4	V
Continuous drain-source current		I_{SD}		-	-	4	A
Pulsed drain-source current		I_{SM}		-	-	16	A
Reverse recovery time		t_{RR}	$V_{GS}=0V, I_F=4A$ $di/dt=100A/\mu s$	-	315	-	ns
Reverse recovery charge		Q_{RR}		-	1.83	-	μC

Notes: 1. Repetitive rating : pulse width limited by maximum junction temperature

2. $L=10\text{mH}, I_{AS}=6.0A, V_{DD}=50V, R_G=25\Omega$, starting $T_J=25^{\circ}\text{C}$

3. $I_{SD}\leq 4.0A, di/dt\leq 200A/\mu s, V_{DD}\leq BV_{DSS}$, starting $T_J=25^{\circ}\text{C}$

4. Pulse test : pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

7. Test circuits and waveforms

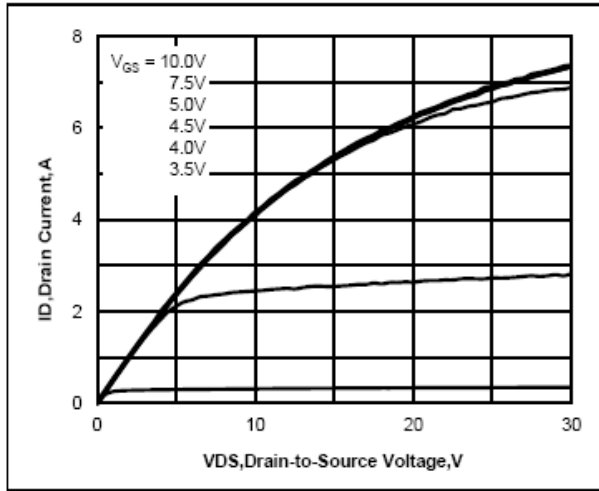


Figure 1. Output Characteristics

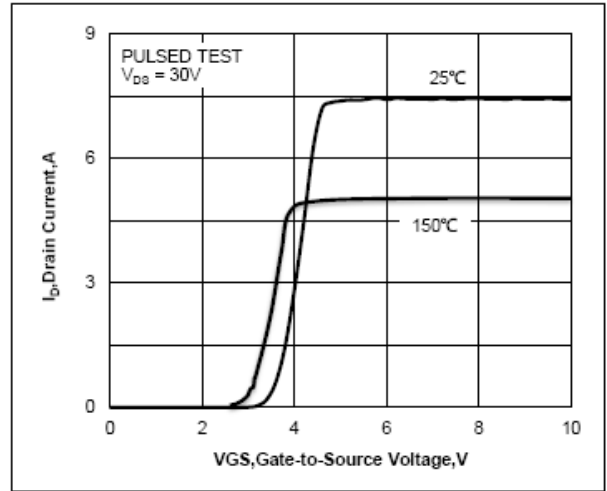


Figure 2. Transfer Characteristics

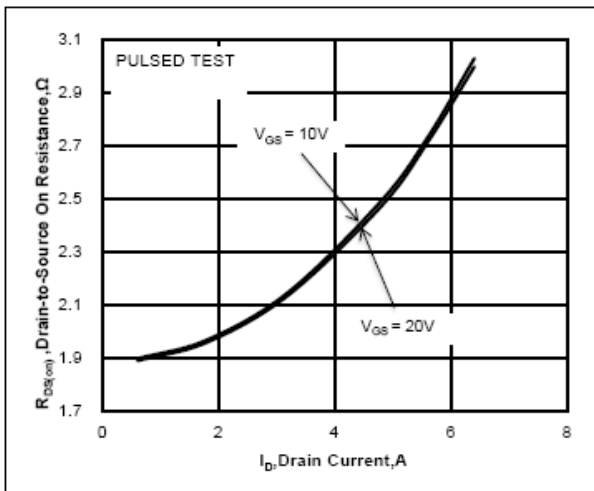


Figure 3. Drain-to-Source On Resistance vs. Drain Current and Gate Voltage

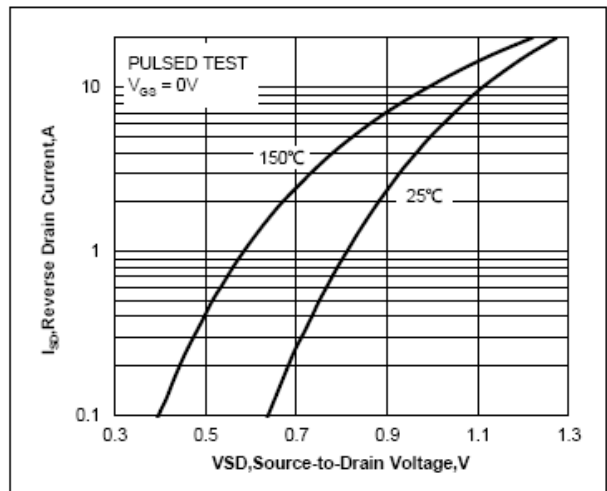


Figure 4. Body Diode Forward Voltage vs. Source Current and Temperature

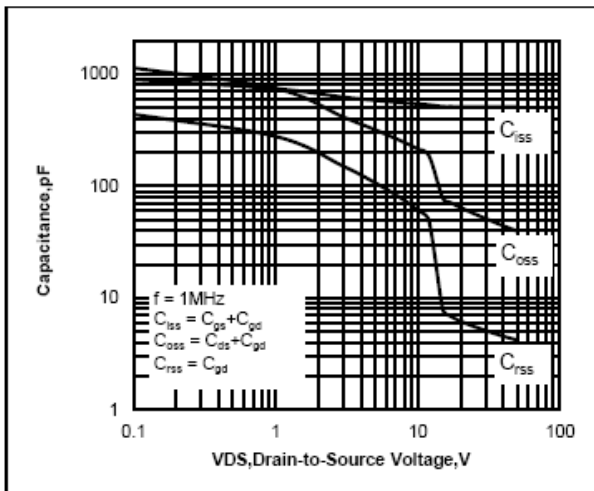


Figure 5. Capacitance Characteristics

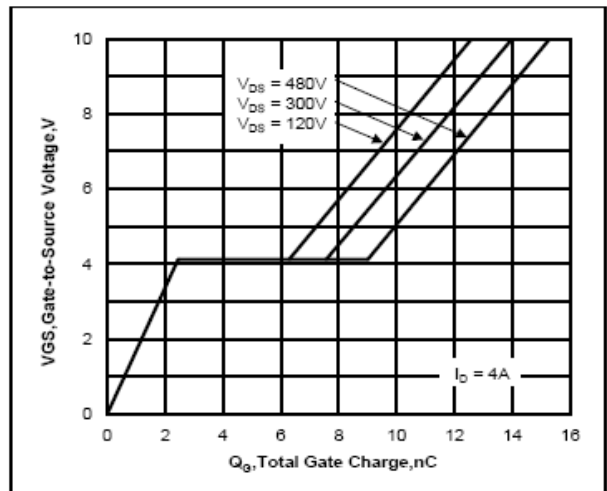


Figure 6. Gate Charge Characteristics

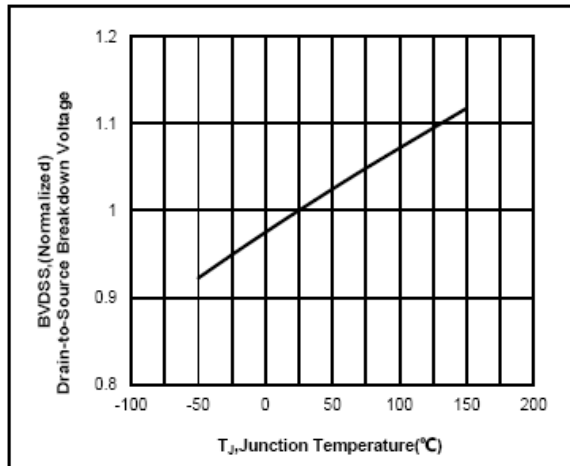


Figure 7. Normalized Breakdown Voltage vs. Junction Temperature

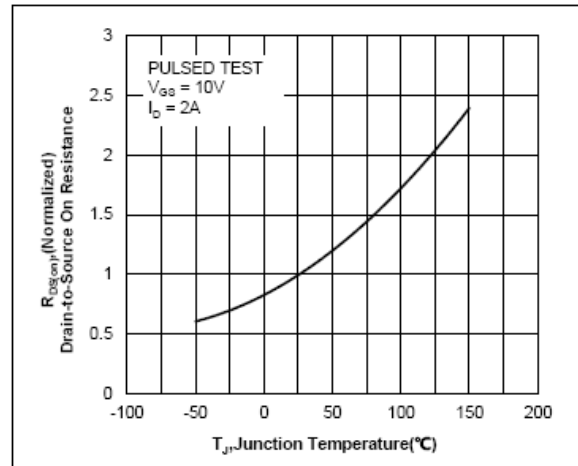


Figure 8. Normalized On Resistance vs. Junction Temperature

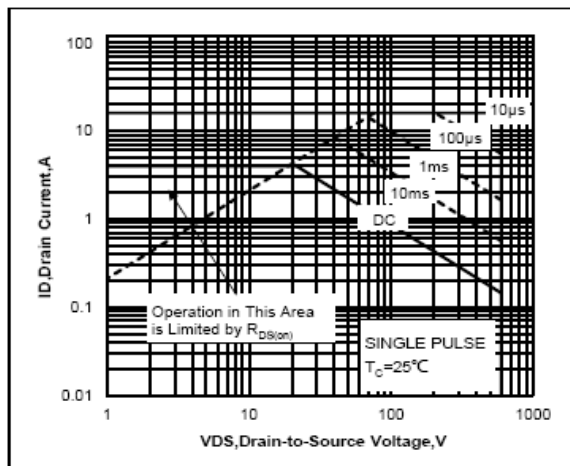


Figure 9. Maximum Safe Operating Area

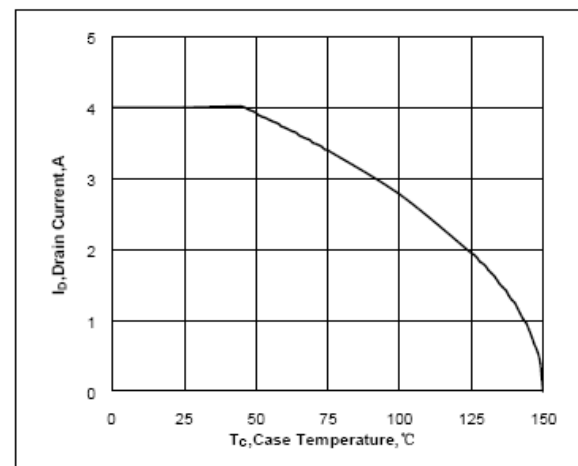


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

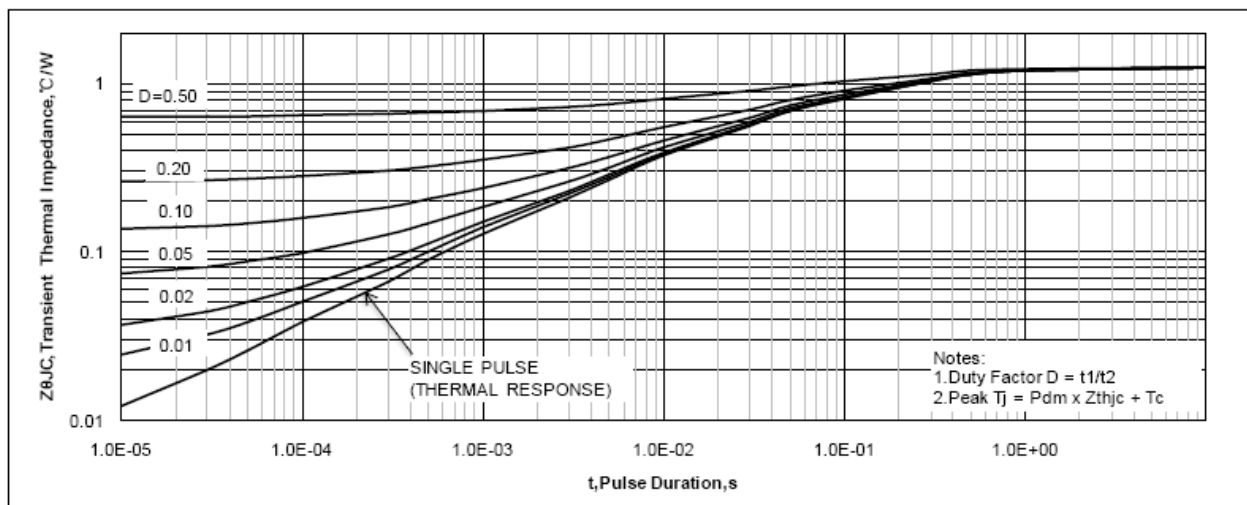


Figure 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

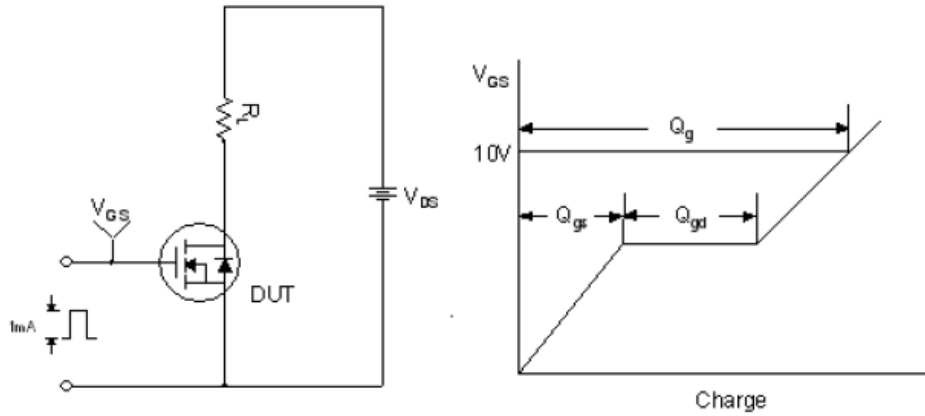


Figure 12. Gate Charge Test Circuit & Waveform

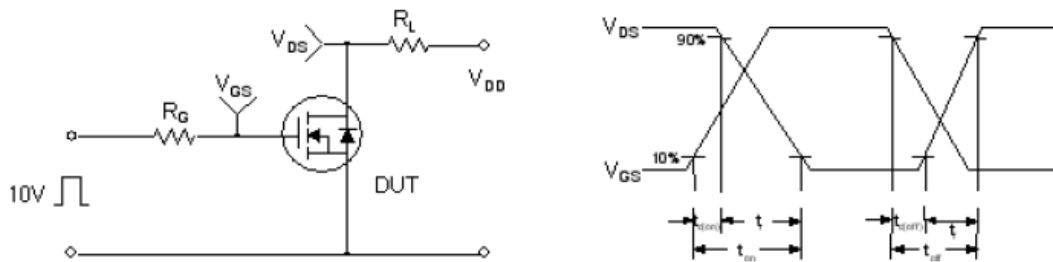


Figure 13. Resistive Switching Test Circuit & Waveforms

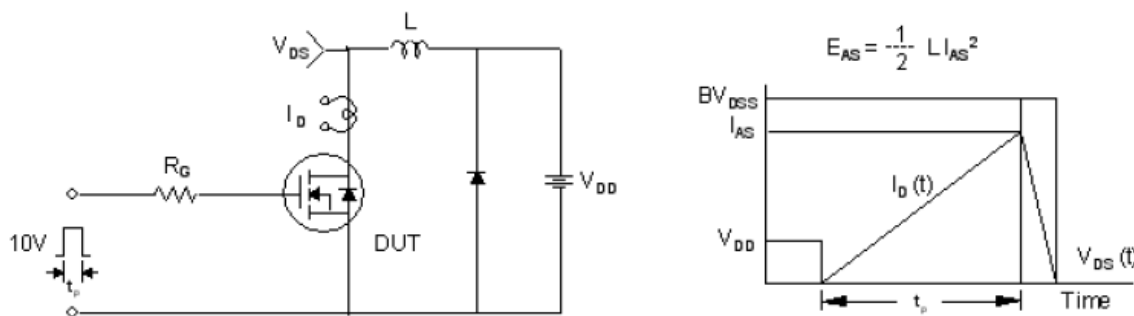


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

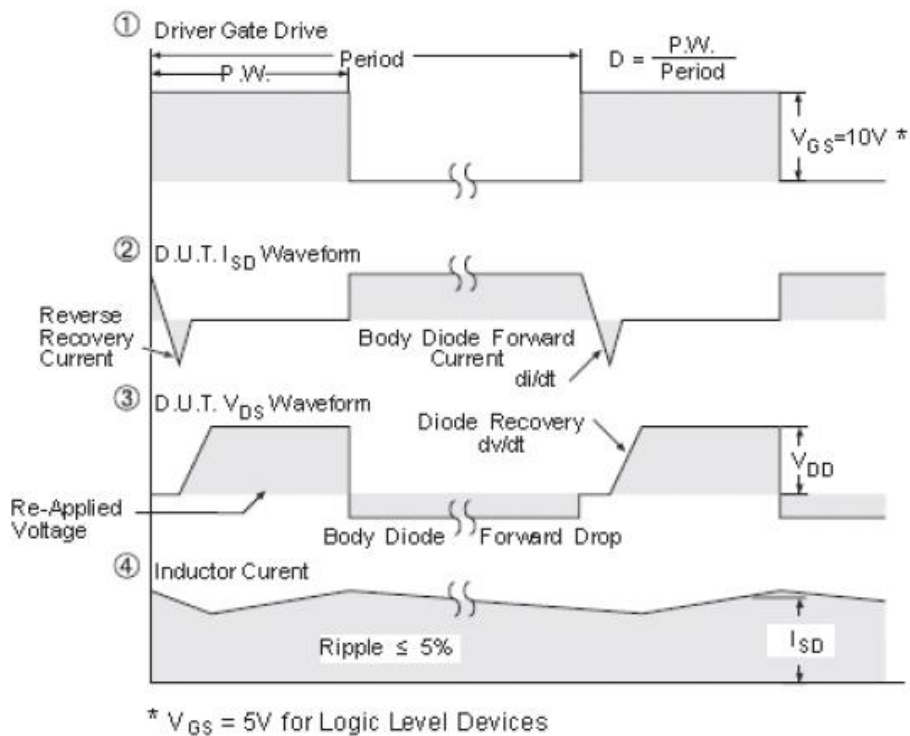
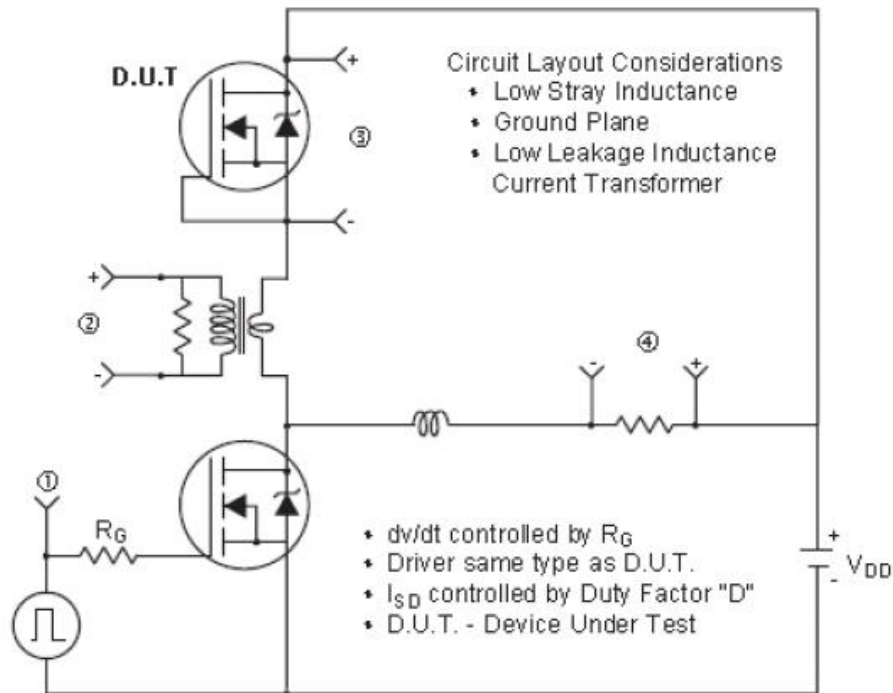


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms (For N-channel)