

Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Max.) (Ω)	$V_{GS} = 10$ V	1.40
Q_g (Max.) (nC)	24	
Q_{gs} (nC)	6.3	
Q_{gd} (nC)	11	
Configuration	Single	

FEATURES

- Low Gate Charge Q_g Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dV/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective C_{OSS} specified
- Lead (Pb)-free Available



RoHS*
COMPLIANT

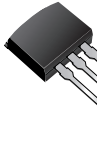
APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High speed power switching

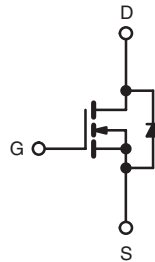
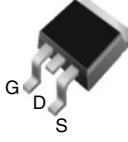
TYPICAL SMPS TOPOLOGIES

- Two Transistor Forward
- Half Bridge and Full Bridge

I²PAK
(TO-262)



D²PAK
(TO-263)



N-Channel MOSFET

ORDERING INFORMATION			
Package	D ² PAK (TO-263)	D ² PAK (TO-263)	I ² PAK (TO-262)
Lead (Pb)-free	IRF830ASPbF	IRF830ASTRLPbF ^a	IRF830ALPbF
	SiHF830AS-E3	SiHF830ASTL-E3 ^a	SiHF830AL-E3
SnPb	IRF830AS	IRF830ASTRL ^a	IRF830AL
	SiHF830AS	SiHF830ASTL ^a	SiHF830AL

Note

a. See device orientation.

ABSOLUTE MAXIMUM RATINGS $T_C = 25$ °C, unless otherwise noted				
PARAMETER	SYMBOL	LIMIT	UNIT	
Drain-Source Voltage	V_{DS}	500	V	
Gate-Source Voltage	V_{GS}	± 30		
Continuous Drain Current	V_{GS} at 10 V	$T_C = 25$ °C	5.0	A
		$T_C = 100$ °C	3.2	
Pulsed Drain Current ^{a, e}	I_{DM}	20		
Linear Derating Factor		0.59	W/°C	
Single Pulse Avalanche Energy ^{b, e}	E_{AS}	230	mJ	
Avalanche Current ^a	I_{AR}	5.0	A	
Repetitive Avalanche Energy ^a	E_{AR}	7.4	mJ	
Maximum Power Dissipation		$T_A = 25$ °C	3.1	W
		$T_C = 25$ °C	74	
Peak Diode Recovery dV/dt ^{c, e}	dV/dt	5.3	V/ns	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	°C	
Soldering Recommendations (Peak Temperature)	for 10 s	300 ^d		

Notes


- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25$ °C, $L = 18$ mH, $R_G = 25$ Ω , $I_{AS} = 5.0$ A (see fig. 12).
- $I_{SD} \leq 5.0$ A, $dI/dt \leq 370$ A/ μ s, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °C.
- 1.6 mm from case.
- Uses SiHF830A data and test conditions.

* Pb containing terminations are not RoHS compliant, exemptions may apply

THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient (PCB Mounted, steady-state) ^a	R_{thJA}	-	40	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.7	

Note

a. When mounted on 1" square PCB (FR-4 or G-10 material).

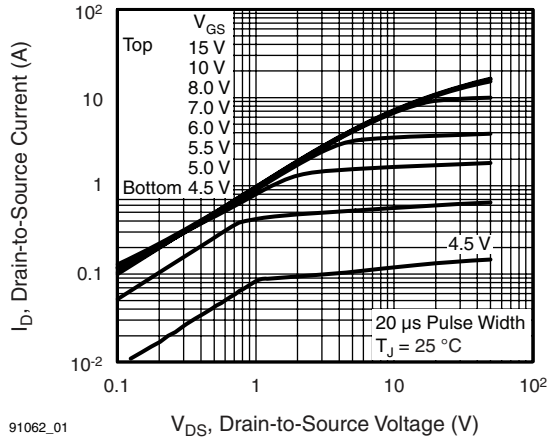
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	500	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}^d$	-	0.60	-	V/°C	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.0	-	4.5	V	
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 30\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$	-	-	25	μA	
		$V_{DS} = 400\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	250		
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ $I_D = 3.0\text{ A}^b$	-	-	1.4	Ω	
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 3.0\text{ A}^d$	2.8	-	-	S	
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5 ^d	-	620	-	μF	
Output Capacitance	C_{oss}		-	93	-		
Reverse Transfer Capacitance	C_{rss}		-	4.3	-		
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 1.0\text{ V}$, $f = 1.0\text{ MHz}$	-	886	-	
Effective Output Capacitance	$C_{oss\text{ eff.}}$		$V_{DS} = 400\text{ V}$, $f = 1.0\text{ MHz}$	-	27	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$V_{DS} = 0\text{ V to } 400\text{ V}^{c, d}$	-	39	-	
Gate-Source Charge	Q_{gs}		$I_D = 5.0\text{ A}$, $V_{DS} = 400\text{ V}$, see fig. 6 and 13 ^{b, d}	-	-	24	nC
Gate-Drain Charge	Q_{gd}			-	-	6.3	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 250\text{ V}$, $I_D = 5.0\text{ A}$, $R_G = 14\text{ }\Omega$, $R_D = 49\text{ }\Omega$, see fig. 10 ^{b, d}	-	10	-	ns	
Rise Time	t_r		-	21	-		
Turn-Off Delay Time	$t_{d(off)}$		-	21	-		
Fall Time	t_f		-	15	-		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	5.0	A	
Pulsed Diode Forward Current ^a	I_{SM}		-	-	20		
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 5.0\text{ A}$, $V_{GS} = 0\text{ V}^b$	-	-	1.5	V	
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = 5.0\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}^{b, d}$	-	430	650	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	2.0	3.0	μC	
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.
- $C_{oss\text{ eff.}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DS} .
- Uses SiHF830A data and test conditions.

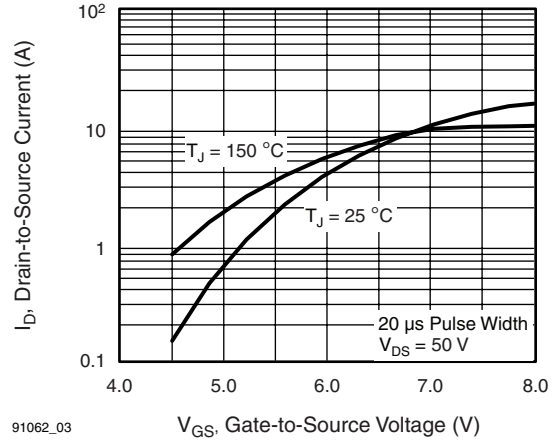


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



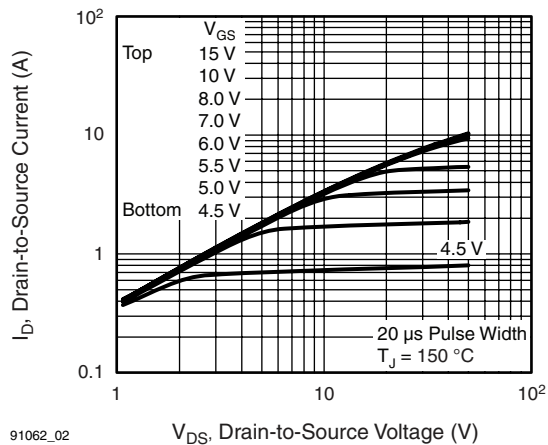
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Fig. 1 - Typical Output Characteristics



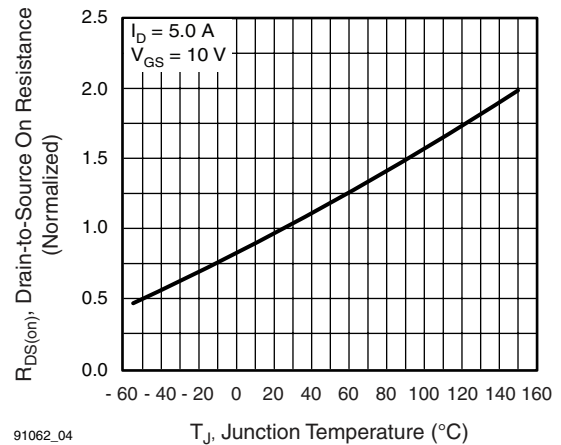
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Fig. 3 - Typical Transfer Characteristics



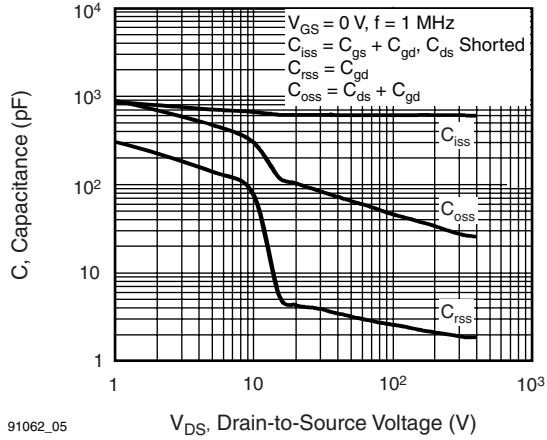
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Fig. 2 - Typical Output Characteristics



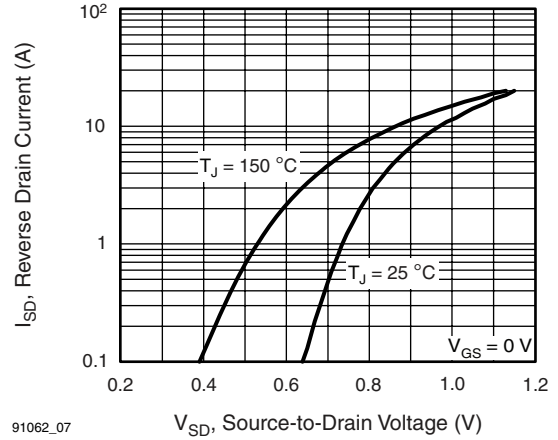
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Fig. 4 - Normalized On-Resistance vs. Temperature



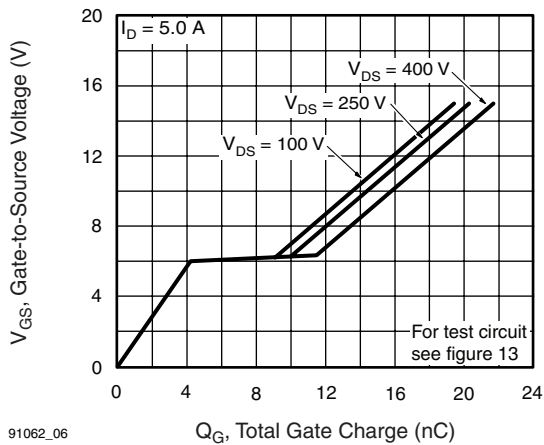
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Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage



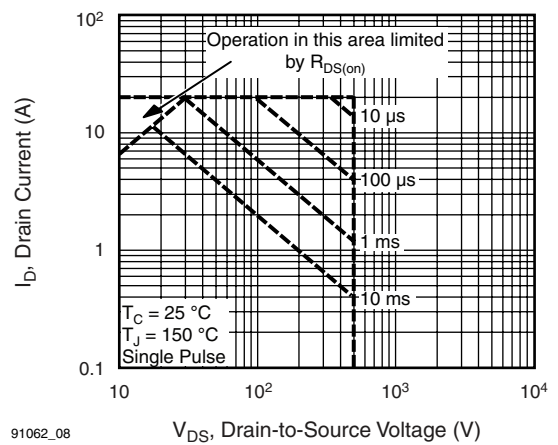
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Fig. 7 - Typical Source-Drain Diode Forward Voltage



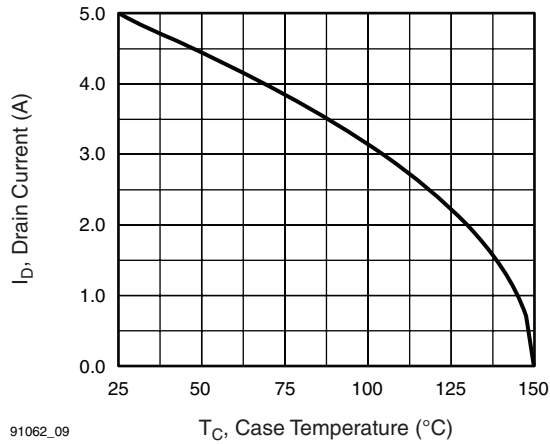
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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage



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Fig. 8 - Maximum Safe Operating Area



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Fig. 9 - Maximum Drain Current vs. Case Temperature

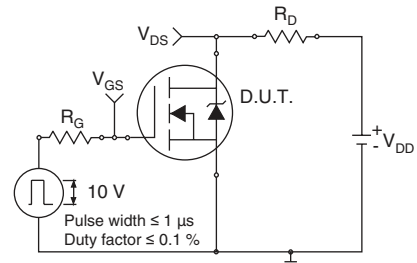


Fig. 10a - Switching Time Test Circuit

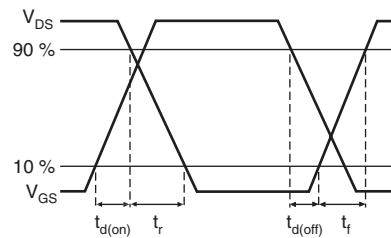
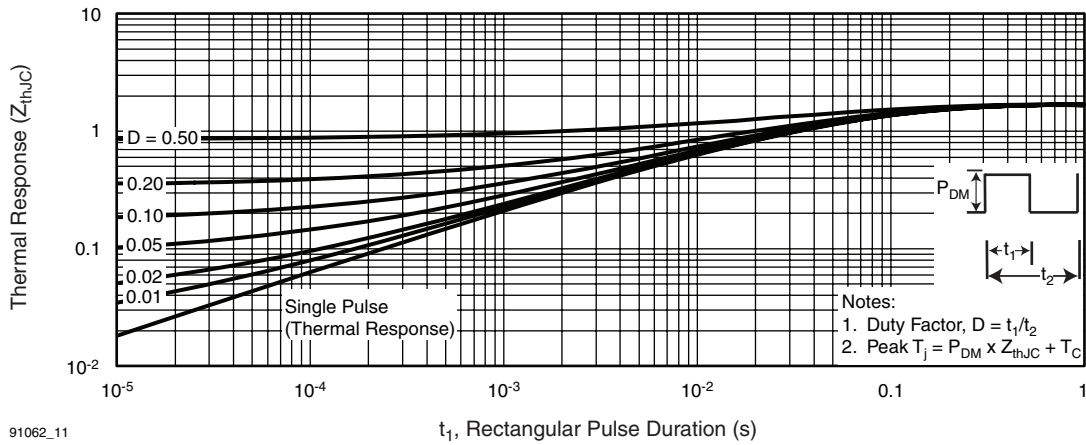


Fig. 10b - Switching Time Waveforms



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

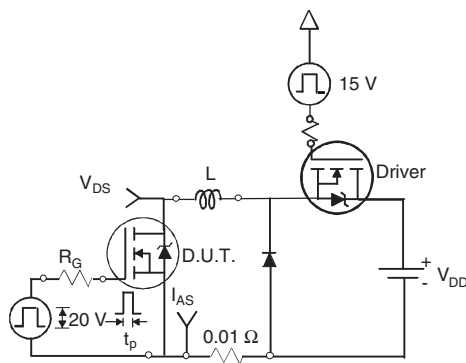


Fig. 12a - Unclamped Inductive Test Circuit

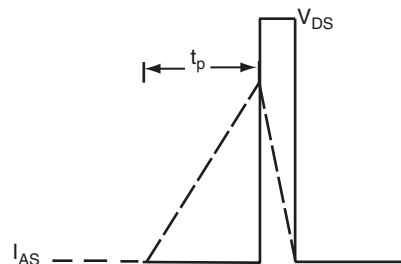
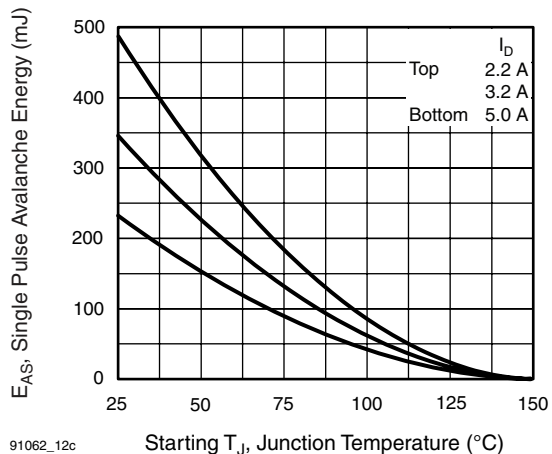
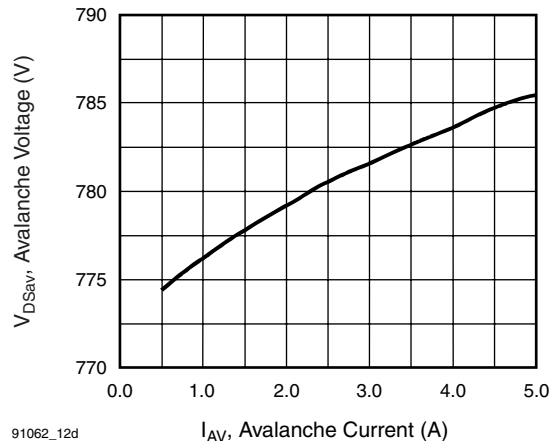


Fig. 12b - Unclamped Inductive Waveforms



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Fig. 12c - Maximum Avalanche Energy vs. Drain Current



91062_12d

Fig. 12d - Basic Gate Charge Waveform

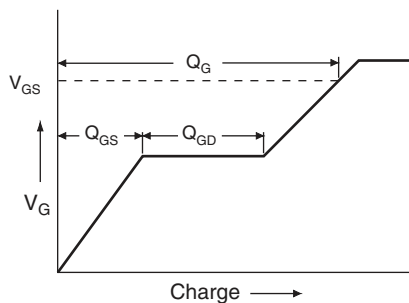


Fig. 13a - Maximum Avalanche Energy vs. Drain Current

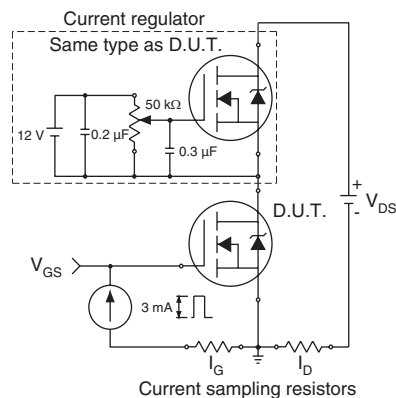


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

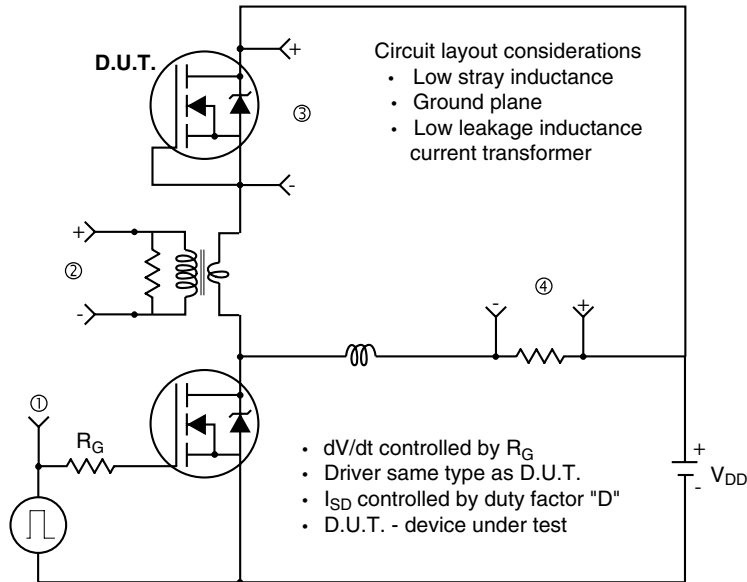


Fig. 14 - For N-Channel

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