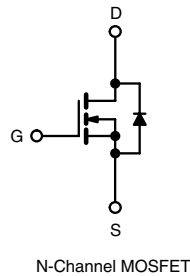
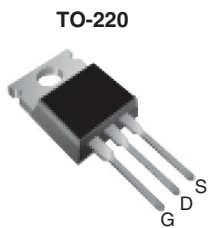


Power MOSFET

PRODUCT SUMMARY

V_{DS} (V)	300	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.45
Q_g (Max.) (nC)	33	
Q_{gs} (nC)	6.9	
Q_{gd} (nC)	12	
Configuration	Single	



FEATURES

- Dynamic dv/dt Rating
- Repetitive Avalanche Rated
- Fast Switching
- Ease of Paralleling
- Simple Drive Requirements
- Lead (Pb)-free Available



RoHS*
COMPLIANT

DESCRIPTION

Third Generation Power MOSFETs from Vishay provides the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.

The TO-220 package is universally preferred for all commercial-industrial applications at lower dissipation levels to approximately 50 watts. The low thermal resistance and low package cost of the TO-220 contribute to its wide acceptance throughout the industry.

ORDERING INFORMATION

Package	TO-220
Lead (Pb)-free	IRFB9N30APbF SiHFB9N30A-E3
SnPb	IRFB9N30A SiHFB9N30A

ABSOLUTE MAXIMUM RATINGS $T_C = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

PARAMETER			SYMBOL	LIMIT	UNIT
Gate-Source Voltage			V _{GS}	± 30	V
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	I _D	9.3	A
		T _C = 100 °C		5.9	
Pulsed Drain Current ^a			I _{DM}	37	
Linear Derating Factor				0.77	W/°C
Single Pulse Avalanche Energy ^b			E _{AS}	160	mJ
Repetitive Avalanche Current ^a			I _{AR}	9.3	A
Repetitive Avalanche Energy ^a			E _{AR}	9.6	mJ
Maximum Power Dissipation	T _C = 25 °C		P _D	96	W
Peak Diode Recovery dV/dt ^c			dV/dt	4.6	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	
Mounting Torque	6-32 or M3 screw			10	lbf · in
				1.1	N · m

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- Starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 3.7\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AS} = 9.3\text{ A}$ (see fig. 12).
- $I_{SD} \leq 9.3\text{ A}$, $dI/dt \leq 270\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^{\circ}\text{C}$.
- 1.6 mm from case.

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

THERMAL RESISTANCE RATINGS

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Case-to-Sink, Flat, Greased Surface	R_{thCS}	0.50	-	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.3	

SPECIFICATIONS $T_J = 25\text{ °C}$, unless otherwise noted

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA		300	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	Reference to 25 °C, I _D = 1 mA		-	0.38	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA		2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}	V _{GS} = ± 30		-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 300 V, V _{GS} = 0 V		-	-	25	μA
		V _{DS} = 240 V, V _{GS} = 0 V, T _J = 125 °C		-	-	250	
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 5.6 A ^b	-	-	0.45	Ω
Forward Transconductance	g _{fs}	V _{DS} = 50 V, I _D = 5.6 A ^b		6.6	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V, V _{DS} = 25 V f = 1.0 MHz, see fig. 5		-	920	-	pF
Output Capacitance	C _{oss}			-	160	-	
Reverse Transfer Capacitance	C _{rss}			-	8.7	-	
Output Capacitance	C _{oss}	V _{GS} = 0 V, V _{DS} = 1.0 V, f = 1.0 MHz		-	1200	-	
		V _{GS} = 0 V, V _{DS} = 240 V, f = 1.0 MHz		-	52	-	
Effective Output Capacitance	C _{oss eff.}	V _{GS} = 0 V, V _{DS} = 0 V to 240 V		-	102	-	
Total Gate Charge	Q _g	V _{GS} = 10 V	I _D = 9.3 A, V _{DS} = 240 V, see fig. 6 and 13 ^b	-	-	33	nC
Gate-Source Charge	Q _{gs}			-	-	6.9	
Gate-Drain Charge	Q _{gd}			-	-	12	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 150 V, I _D = 9.3 A R _G = 12 Ω, R _D = 16 Ω, see fig. 10 ^b		-	10	-	ns
Rise Time	t _r			-	25	-	
Turn-Off Delay Time	t _{d(off)}			-	35	-	
Fall Time	t _f			-	29	-	
Internal Drain Inductance	L _D	Between lead, 6 mm (0.25") from package and center of		-	4.5	-	nH
Internal Source Inductance	L _S			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	9.3	A
Pulsed Diode Forward Current ^a	I _{SM}			-	-	37	
Body Diode Voltage	V _{SD}	T _J = 25 °C, I _S = 9.3 A, V _{GS} = 0 V ^b		-	-	1.5	V
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25 °C, I _F = 9.3 A, di/dt = 100 A/μs ^b		-	280	420	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	1.5	2.3	μC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L _S and L _D)					

Notes

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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

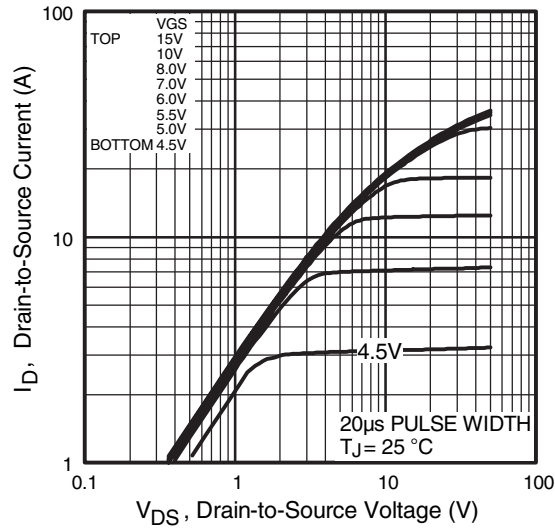


Fig. 1 - Typical Output Characteristics

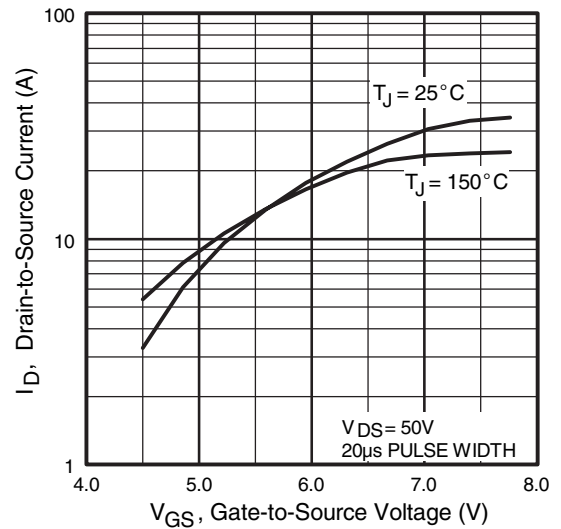


Fig. 3 - Typical Transfer Characteristics

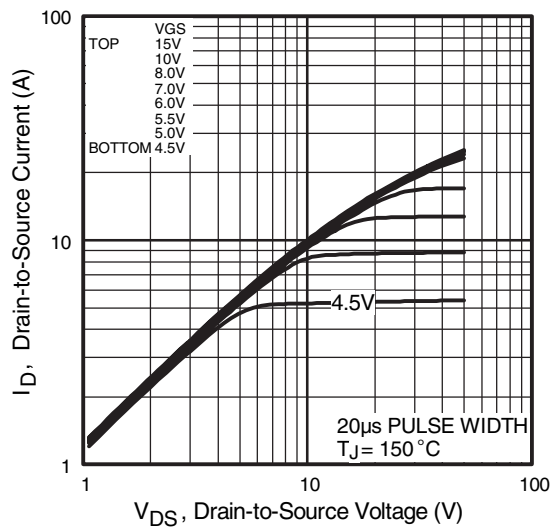


Fig. 2 - Typical Output Characteristics

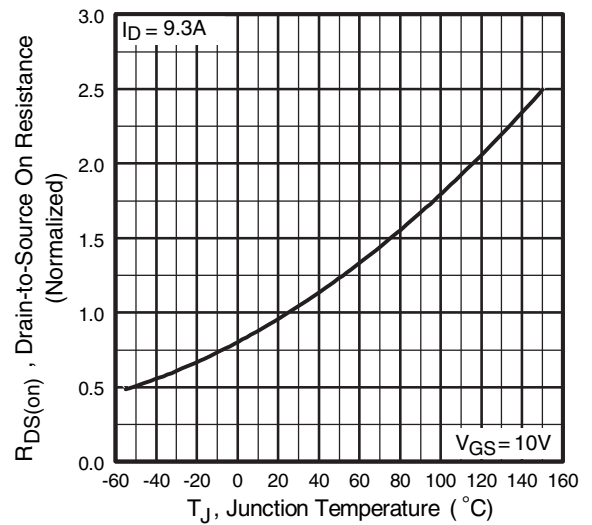
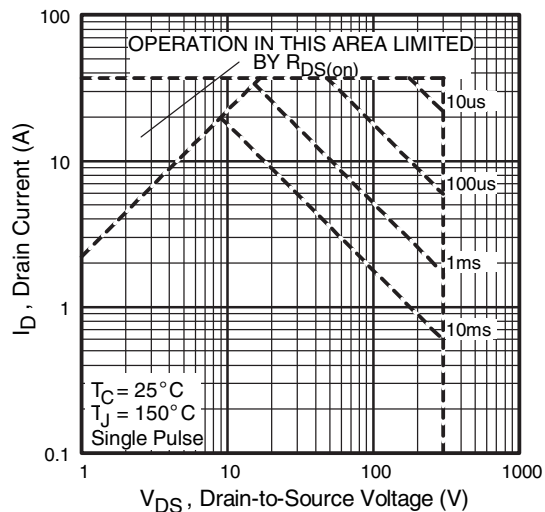
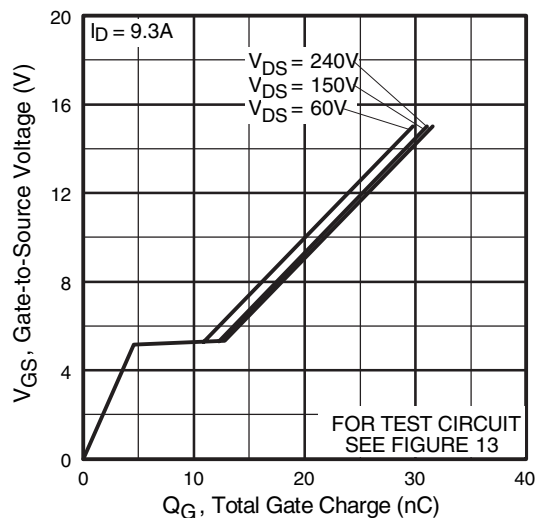
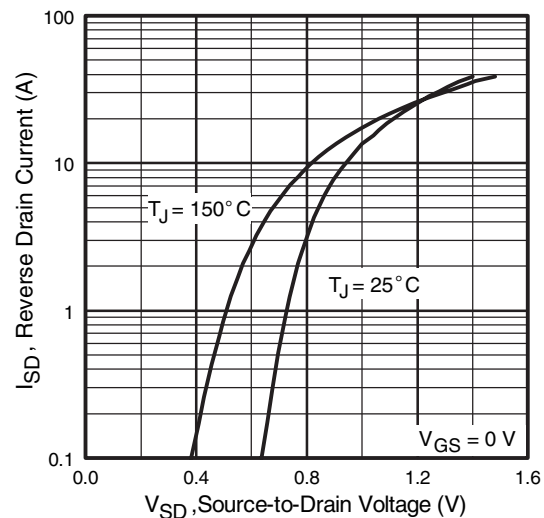
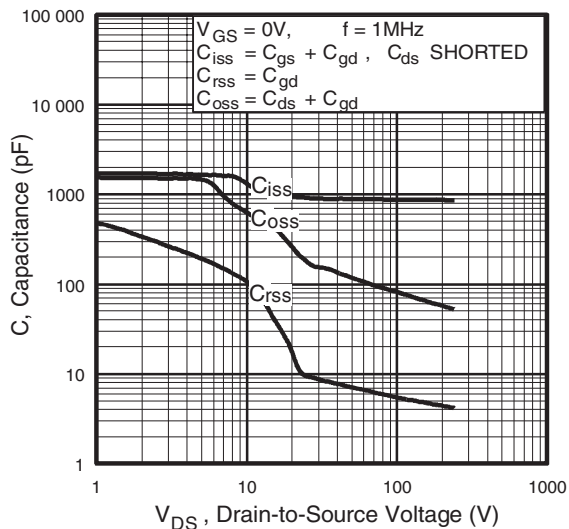


Fig. 4 - Normalized On-Resistance vs. Temperature



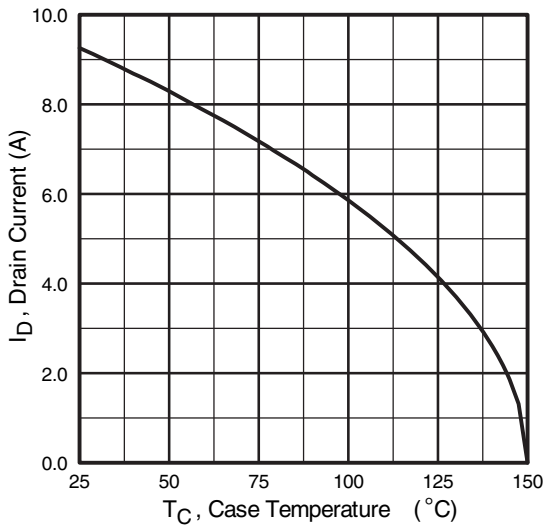


Fig. 9 - Maximum Drain Current vs. Case Temperature

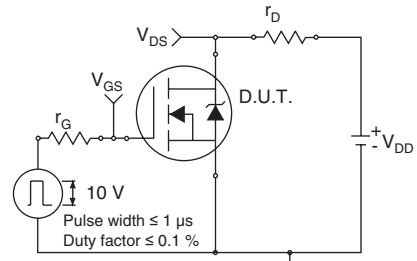


Fig. 10a - Switching Time Test Circuit

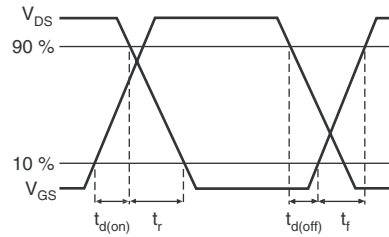


Fig. 10b - Switching Time Waveforms

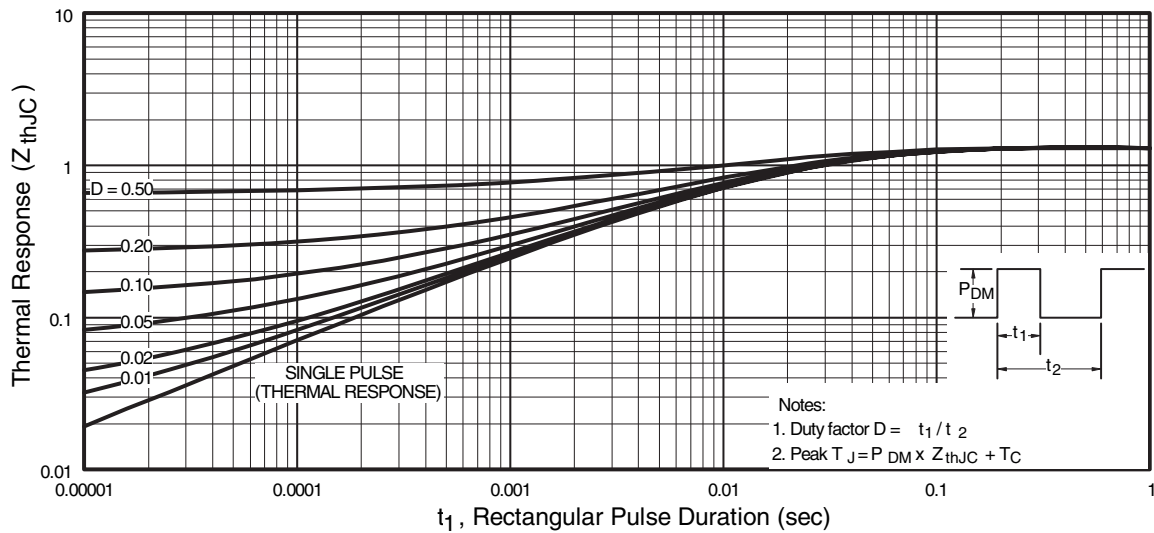


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

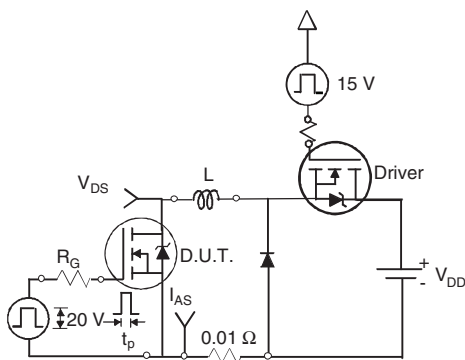


Fig. 12a - Unclamped Inductive Test Circuit

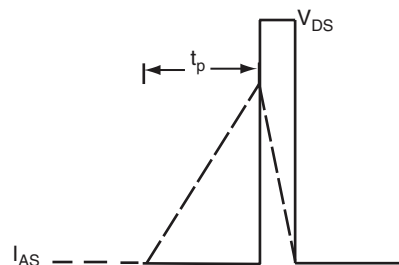


Fig. 12b - Unclamped Inductive Waveforms

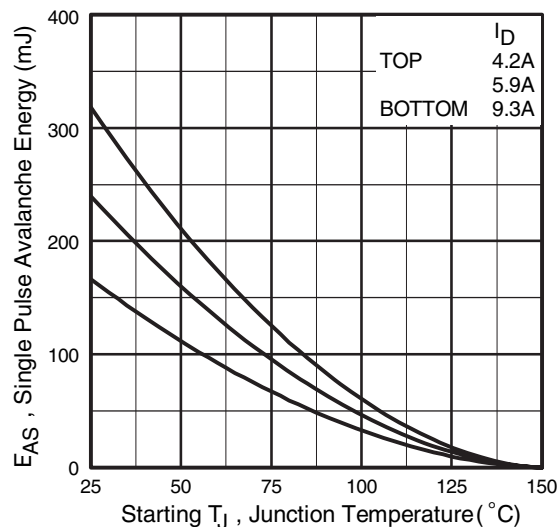


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

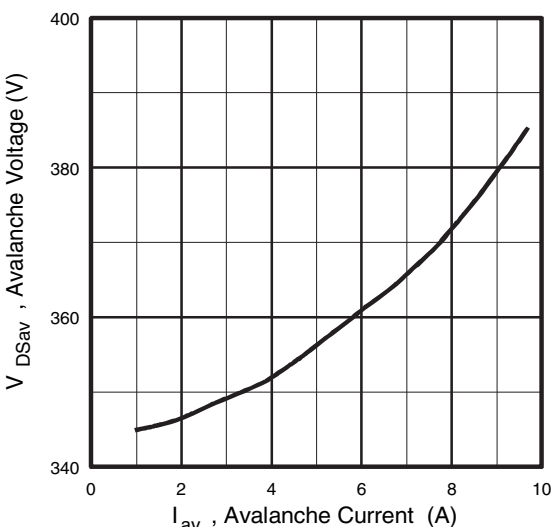


Fig. 12d - Typical Drain-to-Source Voltage vs. Avalanche Current

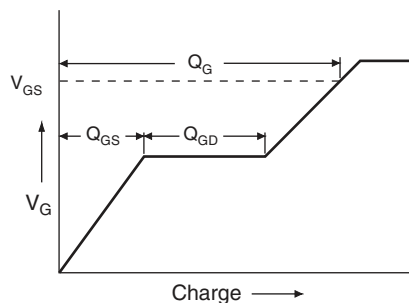


Fig. 13a - Basic Gate Charge Waveform

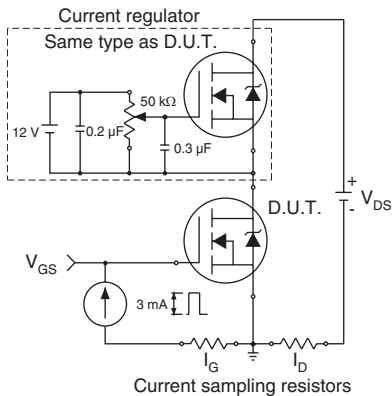
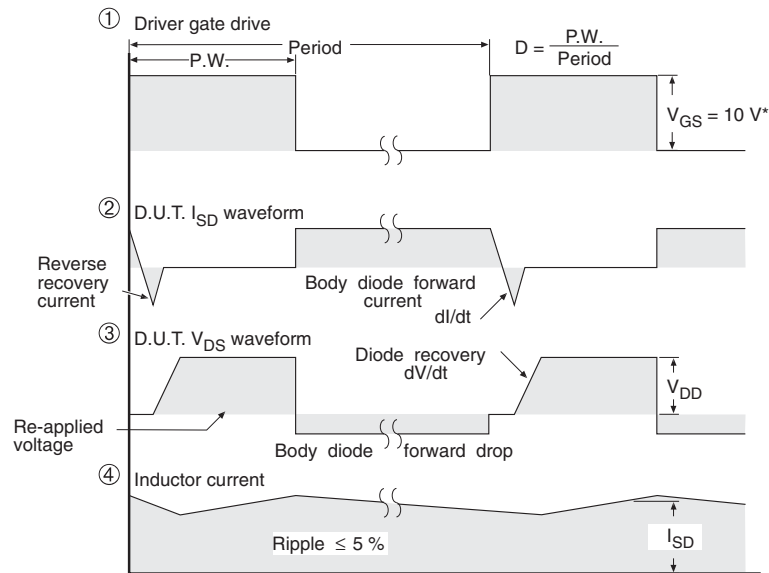
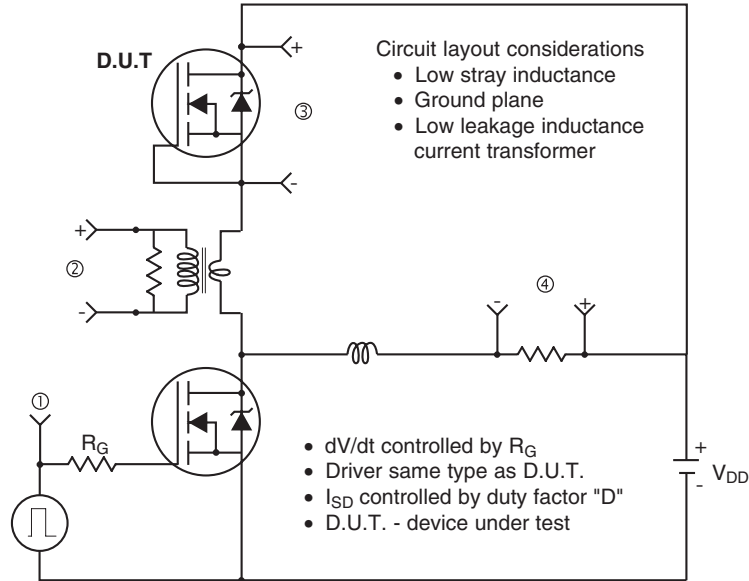


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



* $V_{GS} = 5\text{ V}$ for logic level devices

Fig. 14 - For N-Channel

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