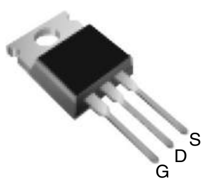
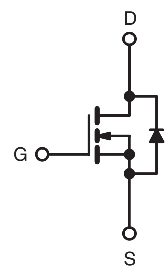
Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	500	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	0.28
Q_g (Max.) (nC)	130	
Q_{gs} (nC)	33	
Q_{gd} (nC)	59	
Configuration	Single	

TO-220





N-Channel MOSFET

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
- Low T_{rr} and Soft Diode Recovery
- Lead (Pb)-free Available

Available
RoHS*
COMPLIANT

APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching
- ZVS and High Frequency Circuit
- PWM Inverters

ORDERING INFORMATION	
Package	TO-220
Lead (Pb)-free	IRFB17N50LPbF
	SiHFB17N50L-E3
SnPb	IRFB17N50L
	SiHFB17N50L

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	I_D	16	A
		T_C = 100 °C		11	
Pulsed Drain Current[a]			I_{DM}	64	
Linear Derating Factor				1.8	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	390	mJ
Repetitive Avalanche Current[a]			I_{AR}	16	A
Repetitive Avalanche Energy[a]			E_{AR}	22	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	220	W
Peak Diode Recovery dV/dt[c]			dV/dt	13	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

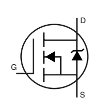
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. Starting T_J = 25 °C, L = 3.0 mH, R_G = 25 Ω, I_{AS} = 16 A (see fig. 12).
c. $I_{SD} \le 16$ A, dI/dt ≤ 347 A/µs, $V_{DD} \le V_{DS}$, $T_J \le 150$ °C.
d. 1.6 mm from case.

* 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	-	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	0.56	°C/W

SPECIFICATIONS T_J = 25 °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		500	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-	0.6	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA		3.0	-	5.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 30 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V		-	-	50	µA
		V_{DS} = 400 V, V_{GS} = 0 V, T_J = 125 °C		-	-	2.0	mA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 9.9 A[b]	-	0.28	0.32	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 9.9 A[b]		11	-	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	2760	-	pF
Output Capacitance	C_{oss}			-	325	-	
Reverse Transfer Capacitance	C_{rss}			-	37	-	
Output Capacitance	C_{oss}	V_{GS} = 0 V	V_{DS} = 1.0 V , f = 1.0 MHz	-	3690	-	
		V_{GS} = 0 V	V_{DS} = 400 V , f = 1.0 MHz	-	84	-	
Effective Output Capacitance	C_{oss} eff.	V_{GS} = 0 V	V_{DS} = 0 V to 400 V[c]	-	159	-	
Total Gate Charge	Q_g	V_{GS} = 10 V	I_D = 16 A, V_{DS} = 400 V, see fig. 6 and 13[b]	-	-	130	nC
Gate-Source Charge	Q_{gs}			-	-	33	
Gate-Drain Charge	Q_{gd}			-	-	59	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 250 V, I_D = 16 A, R_G = 7.5 Ω, see fig. 10[b]		-	21	-	ns
Rise Time	t_r			-	51	-	
Turn-Off Delay Time	$t_{d(off)}$			-	50	-	
Fall Time	t_f			-	28	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	16	A
Pulsed Diode Forward Current[a]	I_{SM}			-	-	64	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 16 A, V_{GS} = 0 V[b]		-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C	I_F = 16 A, dI/dt = 100 A/µs[b]	-	170	250	ns
		T_J = 125 °C		-	220	330	
Body Diode Reverse Recovery Charge	Q_{rr}	T_J = 25 °C		-	470	710	nC
		T_J = 125 °C		-	810	1210	
Reverse Recovery Current	I_{RRM}			-	7.3	11	A
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 ≤ 300 µs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

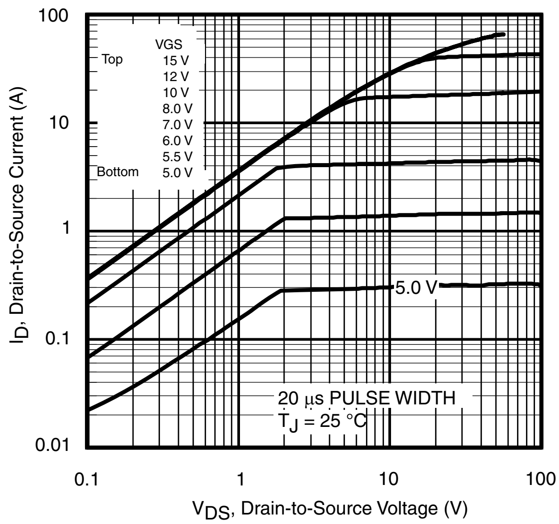


Fig. 1 - Typical Output Characteristics

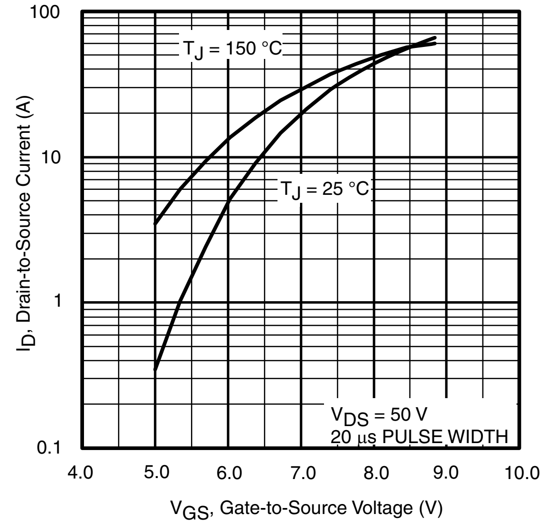


Fig. 3 - Typical Transfer Characteristics

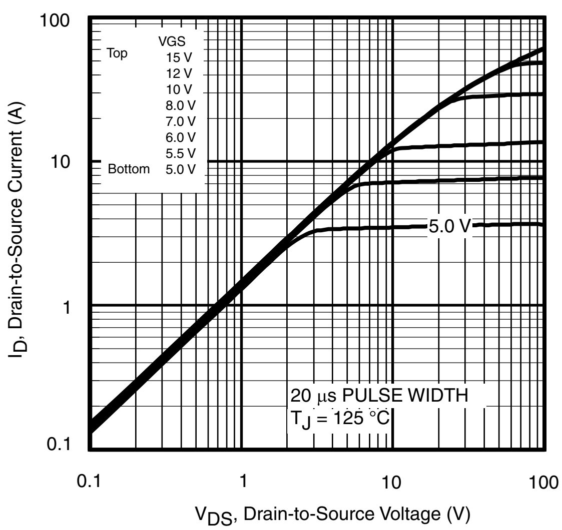


Fig. 2 - Typical Output Characteristics

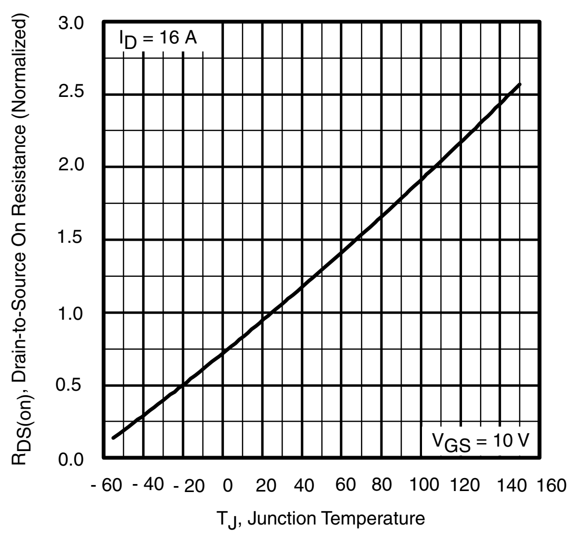


Fig. 4 - Normalized On-Resistance vs. Temperature

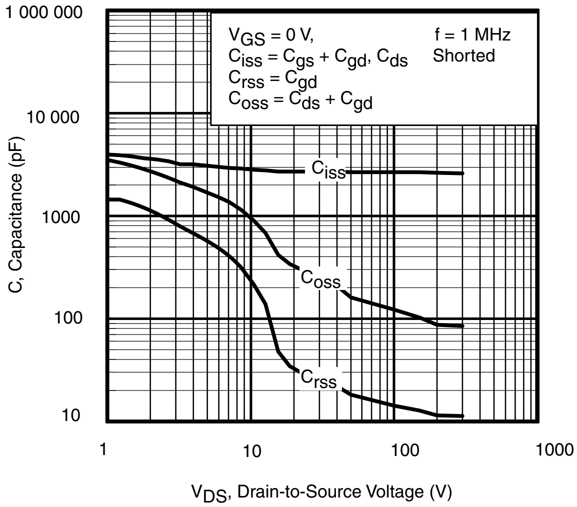


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

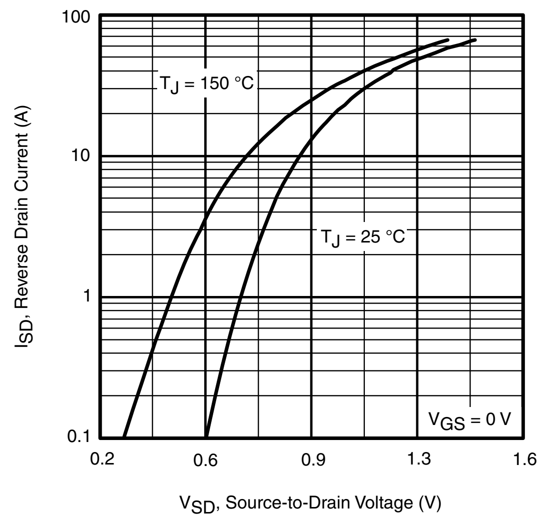


Fig. 7 - Typical Source-Drain Diode Forward Voltage

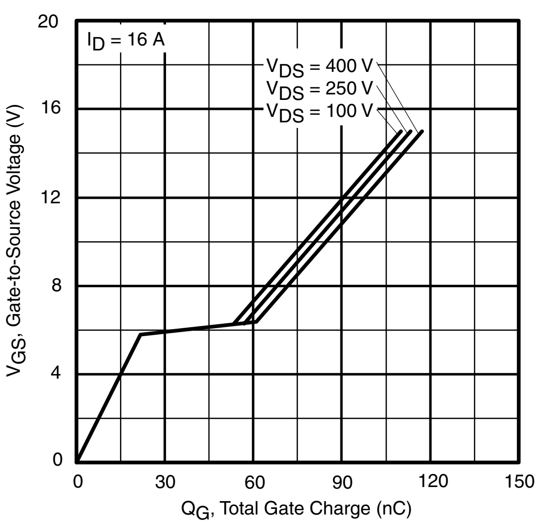


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

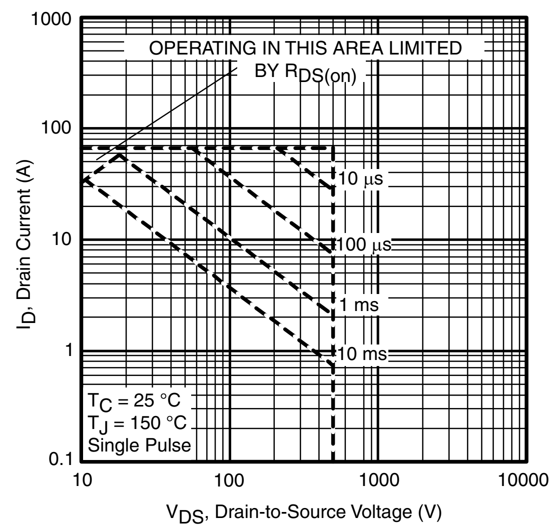


Fig. 8 - Maximum Safe Operating Area

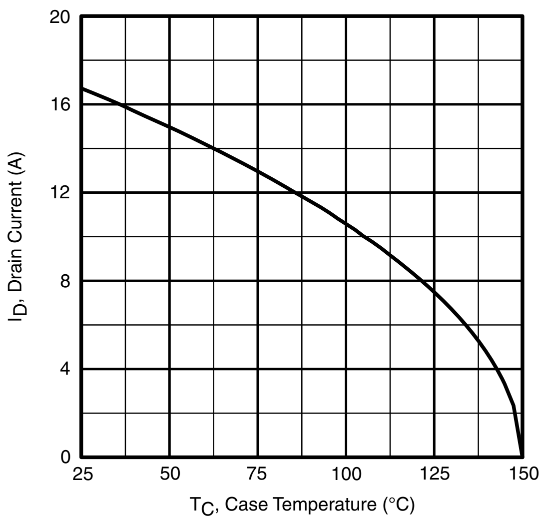


Fig. 9 - Maximum Drain Current vs. Case Temperature

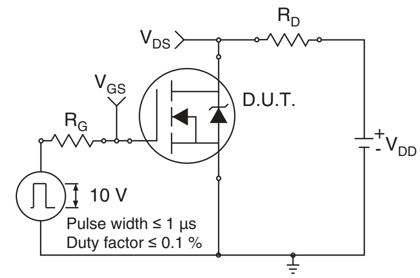


Fig. 10a - Switching Time Test Circuit

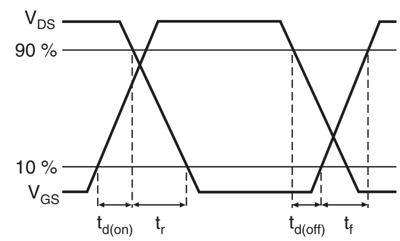


Fig. 10b - Switching Time Waveforms

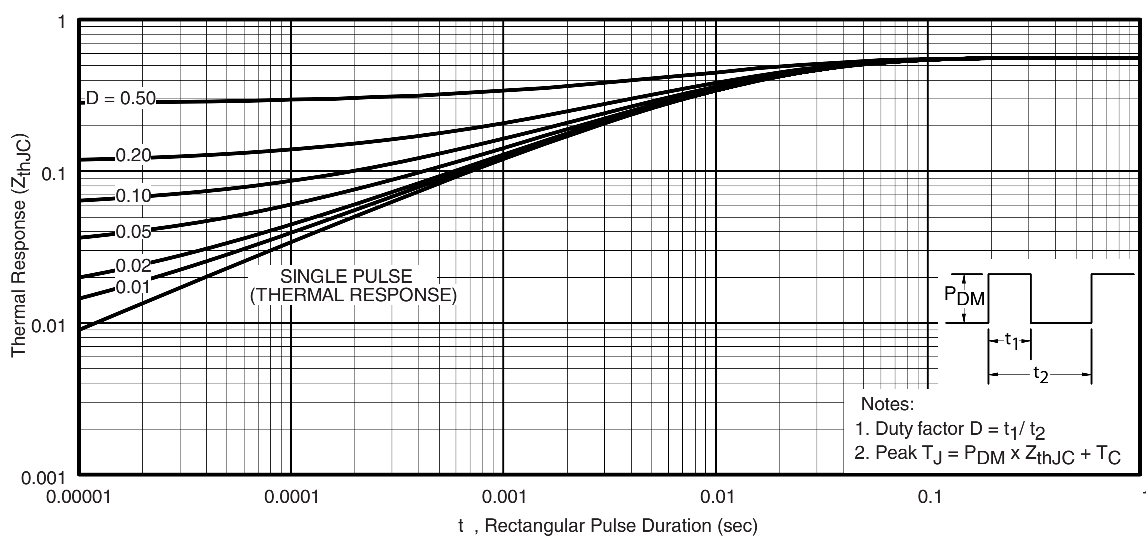


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

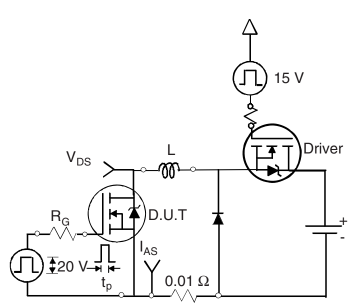


Fig. 12a - Unclamped Inductive Test Circuit

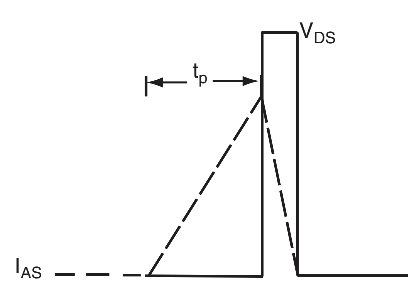


Fig. 12b - Unclamped Inductive Waveforms

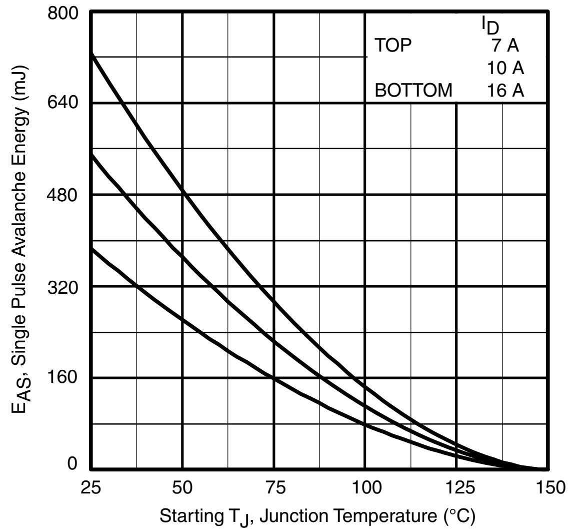


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

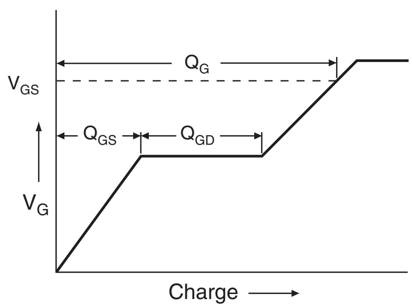


Fig. 13a - Basic Gate Charge Waveform

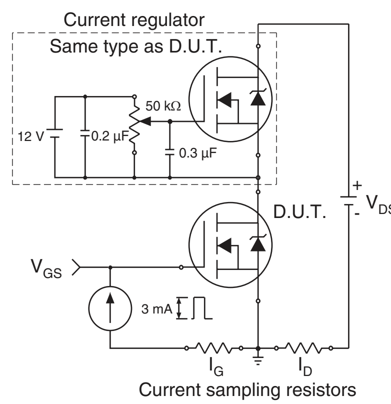
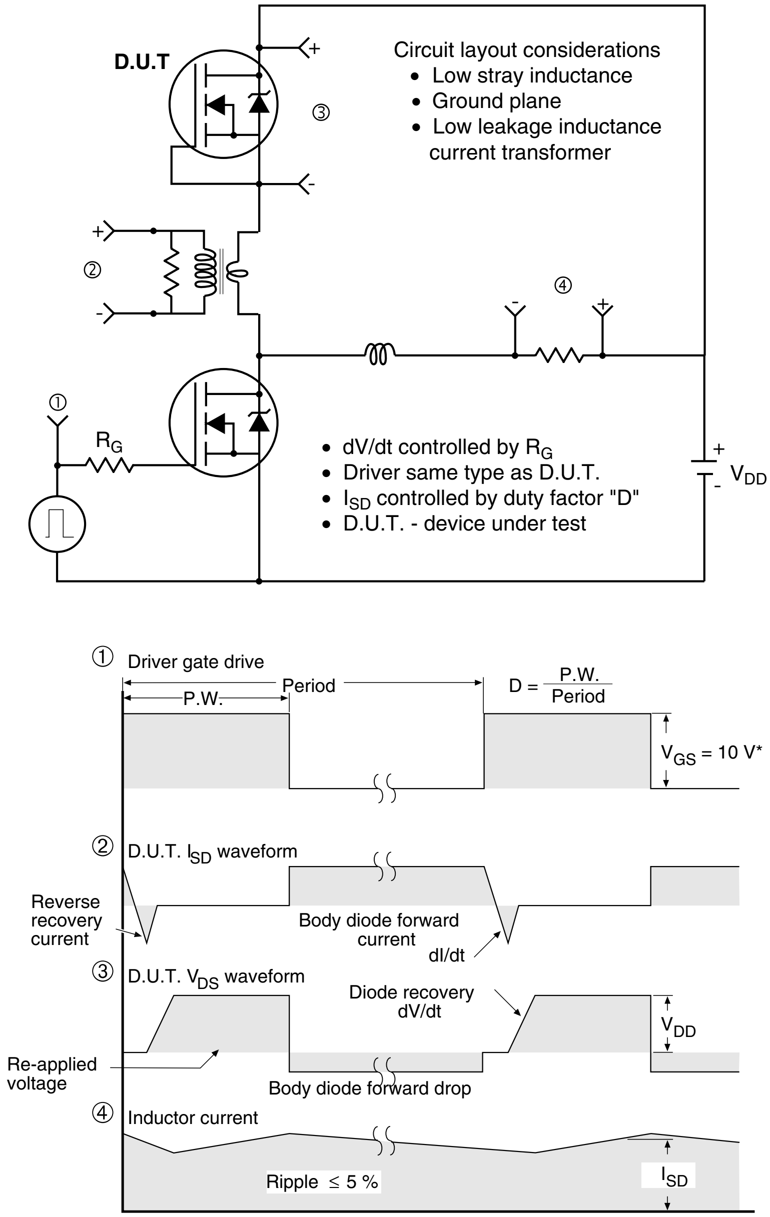


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



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

Fig. 14 - For N-Channel

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