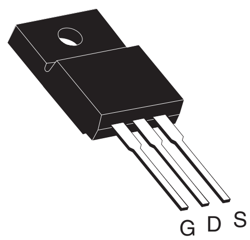
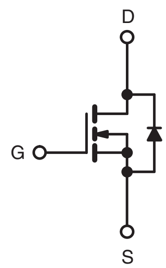
Power MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	600	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	1.2
Q_g (Max.) (nC)	60	
Q_{gs} (nC)	8.3	
Q_{gd} (nC)	30	
Configuration	Single	

TO-220 FULLPAK





N-Channel MOSFET

FEATURES

- Isolated Package
- Low Thermal Resistance
- Sink to Lead Creepage Dist. = 4.8 mm
- High Voltage Isolation = 2.5 kV_{RMS} (t = 60 s, f = 60 Hz)
- Dynamic dV/dt Rating
- Lead (Pb)-free Available

Pb Available
RoHS* COMPLIANT

DESCRIPTION

Third generation Power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.
The TO-220 FULLPAK eliminates the need for additional insulating hardware in commercial-industrial applications. The molding compound used provides a high isolation capability and a low thermal resistance between the tab and external heatsink. This isolation is equivalent to using a 100 micron mica barrier with standard TO-220 product. The FULLPAK is mounted to a heatsink using a single clip or by a single screw fixing.

ORDERING INFORMATION	
Package	TO-220 FULLPAK
Lead (Pb)-free	IRFIBC40GPbF
	SiHFIBC40G-E3
SnPb	IRFIBC40G
	SiHFIBC40G

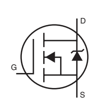
ABSOLUTE MAXIMUM RATINGS T_C = 25 °C, unless otherwise noted

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-Source Voltage			V_{DS}	600	V
Gate-Source Voltage			V_{GS}	± 20	
Continuous Drain Current	V_{GS} at 10 V	T_C = 25 °C	I_D	3.5	A
		T_C = 100 °C		2.2	
Pulsed Drain Current[a]			I_{DM}	14	
Linear Derating Factor				0.32	W/°C
Single Pulse Avalanche Energy[b]			E_{AS}	500	mJ
Repetitive Avalanche Current[a]			I_{AR}	3.5	A
Repetitive Avalanche Energy[a]			E_{AR}	4.0	mJ
Maximum Power Dissipation	T_C = 25 °C		P_D	40	W
Peak Diode Recovery dV/dt[c]			dV/dt	3.0	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. V_{DD}= 50 V, starting T_J = 25 °C, L = 74 mH, R_G = 25 Ω, I_{AS} = 3.5 A (see fig. 12).
c. $I_{SD} \leq 6.2$ A, dI/dt ≤ 80 A/µs, $V_{DD} \leq V_{DS}$, $T_J \leq 150$ °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}	-	65	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	-	3.1	

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		600	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA		-	0.70	-	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} = ± 20 V		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 600 V, V_{GS} = 0 V		-	-	100	µA
		V_{DS} = 480 V, V_{GS} = 0 V, T_J = 125 °C		-	-	500	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 2.1 A[b]	-	-	1.2	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 2.1 A		4.9	-	-	S
Dynamic							
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5		-	1300	-	pF
Output Capacitance	C_{oss}			-	160	-	
Reverse Transfer Capacitance	C_{rss}			-	30	-	
Drain to Sink Capacitance	C	f = 1.0 MHz		-	12	-	
Total Gate Charge	Q_g	V_{GS} = 10 V	I_D = 6.2 A, V_{DS} = 360 V, see fig. 6 and 13[b]	-	-	60	nC
Gate-Source Charge	Q_{gs}			-	-	8.3	
Gate-Drain Charge	Q_{gd}			-	-	30	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 300 V, I_D = 6.2 A, R_G = 9.1 Ω, R_D = 47 Ω, see fig. 10[b]		-	13	-	ns
Rise Time	t_r			-	18	-	
Turn-Off Delay Time	$t_{d(off)}$			-	55	-	
Fall Time	t_f			-	20	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	3.5	A
Pulsed Diode Forward Current[a]	I_{SM}			-	-	14	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 3.5 A, V_{GS} = 0 V[b]		-	-	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 6.2 A, dI/dt = 100 A/µs[b]		-	470	940	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	4.0	7.9	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 ≤ 300 µs; duty cycle ≤ 2 %.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

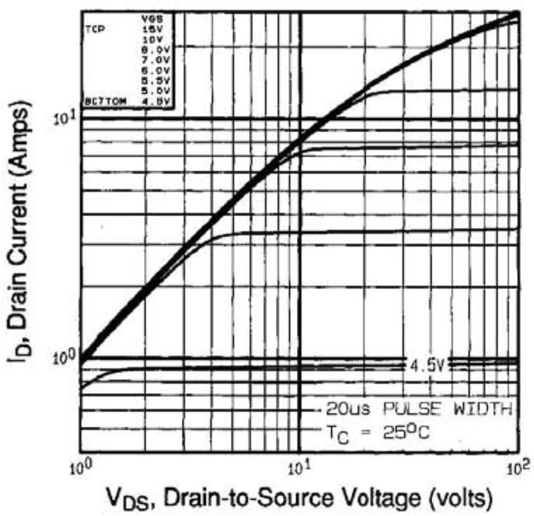


Fig. 1 - Typical Output Characteristics, $T_C = 25\ °C$

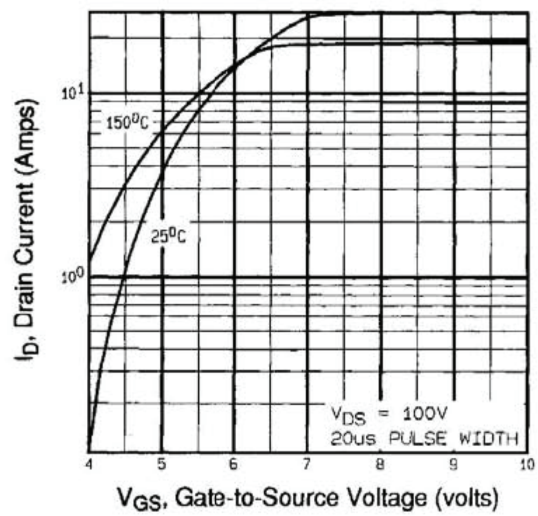


Fig. 3 - Typical Transfer Characteristics

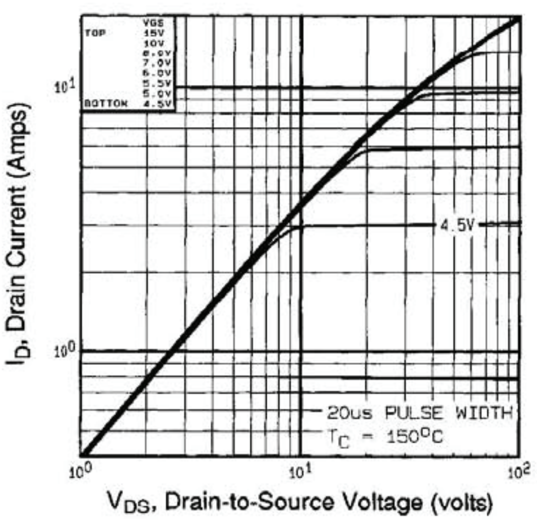


Fig. 2 - Typical Output Characteristics, $T_C = 150\ °C$

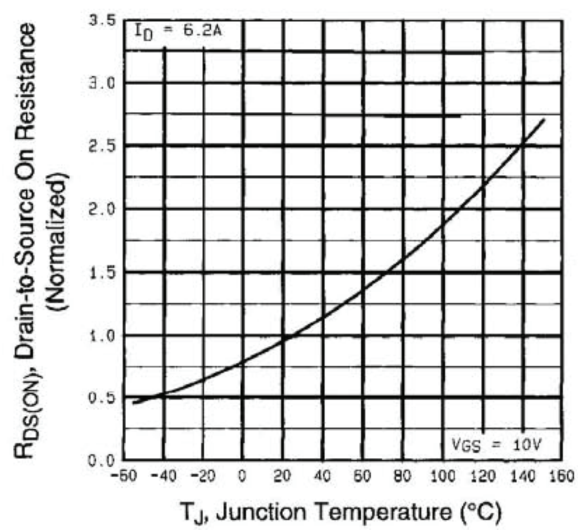


Fig. 4 - Normalized On-Resistance vs. Temperature

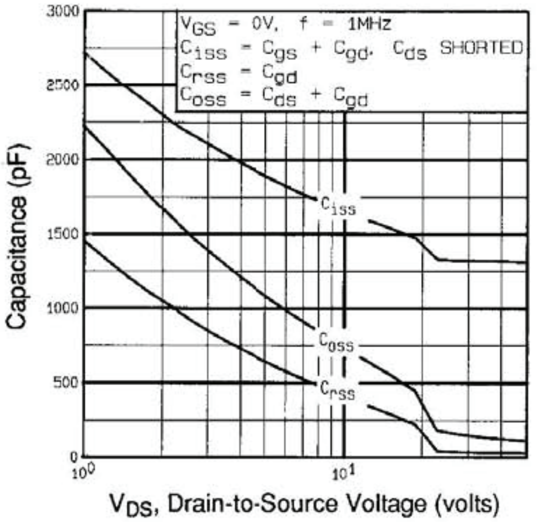


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

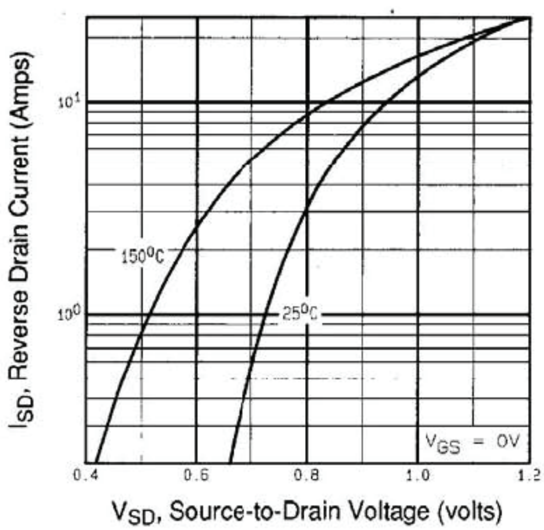


Fig. 7 - Typical Source-Drain Diode Forward Voltage

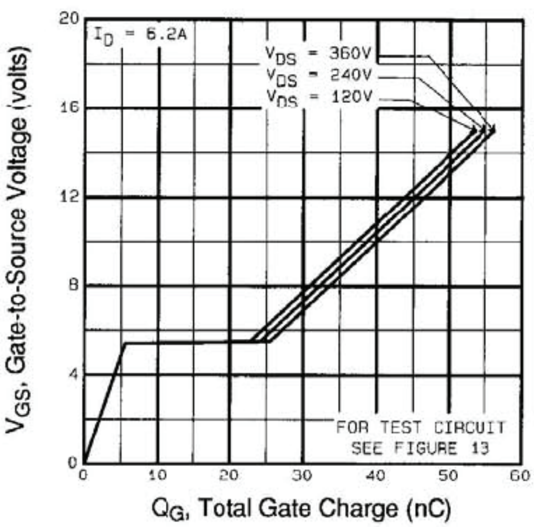


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

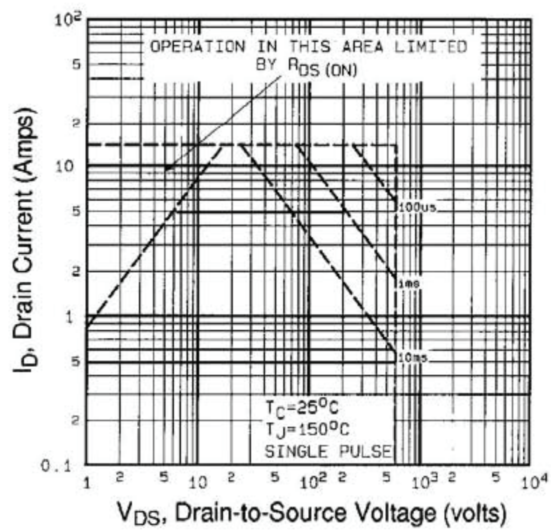


Fig. 8 - Maximum Safe Operating Area

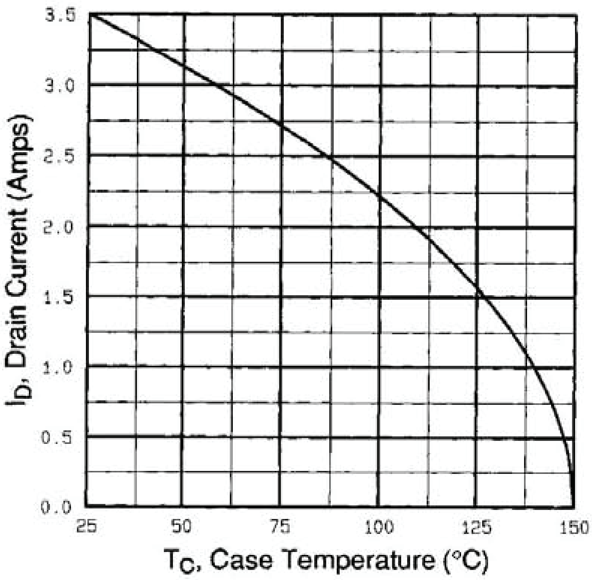


Fig. 9 - Maximum Drain Current vs. Case Temperature

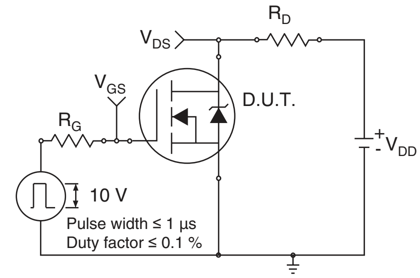


Fig. 10a - Switching Time Test Circuit

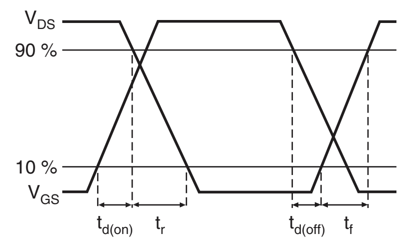


Fig. 10b - Switching Time Waveforms

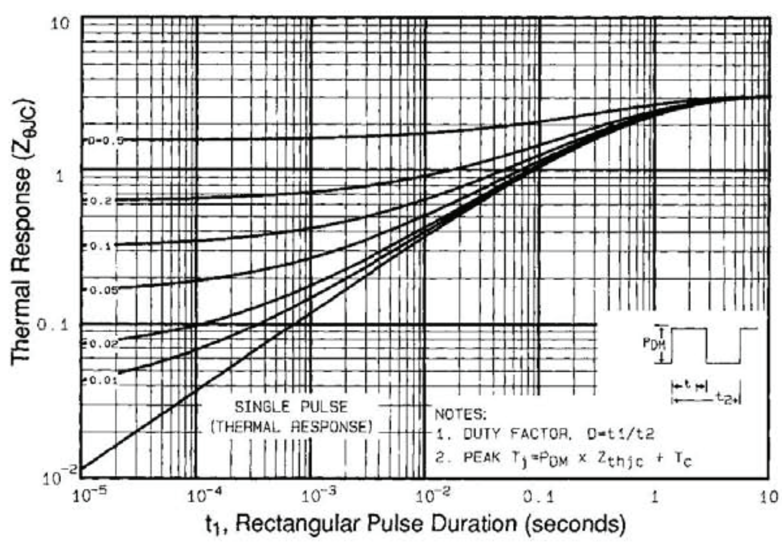


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

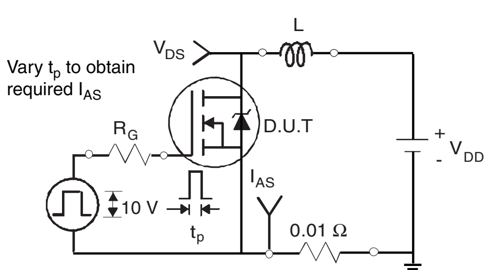


Fig. 12a - Unclamped Inductive Test Circuit

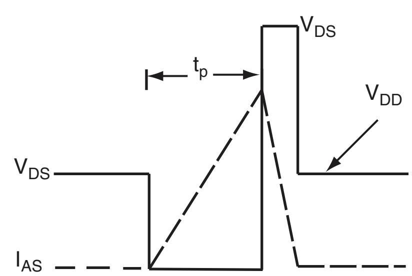


Fig. 12b - Unclamped Inductive Waveforms

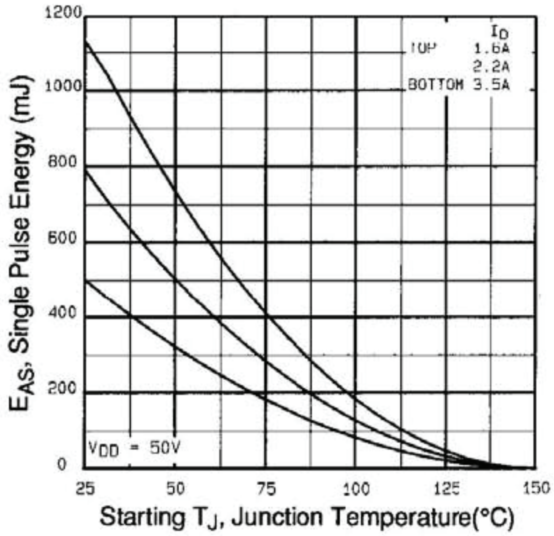


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

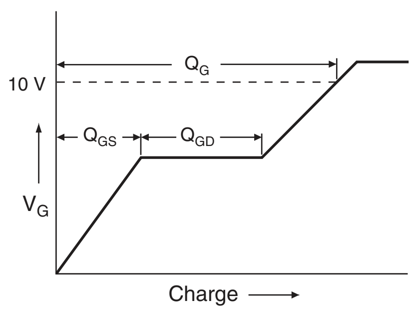


Fig. 13a - Basic Gate Charge Waveform

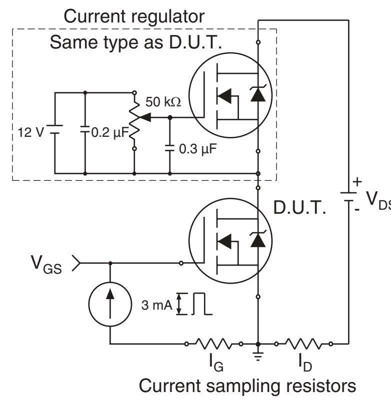


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit

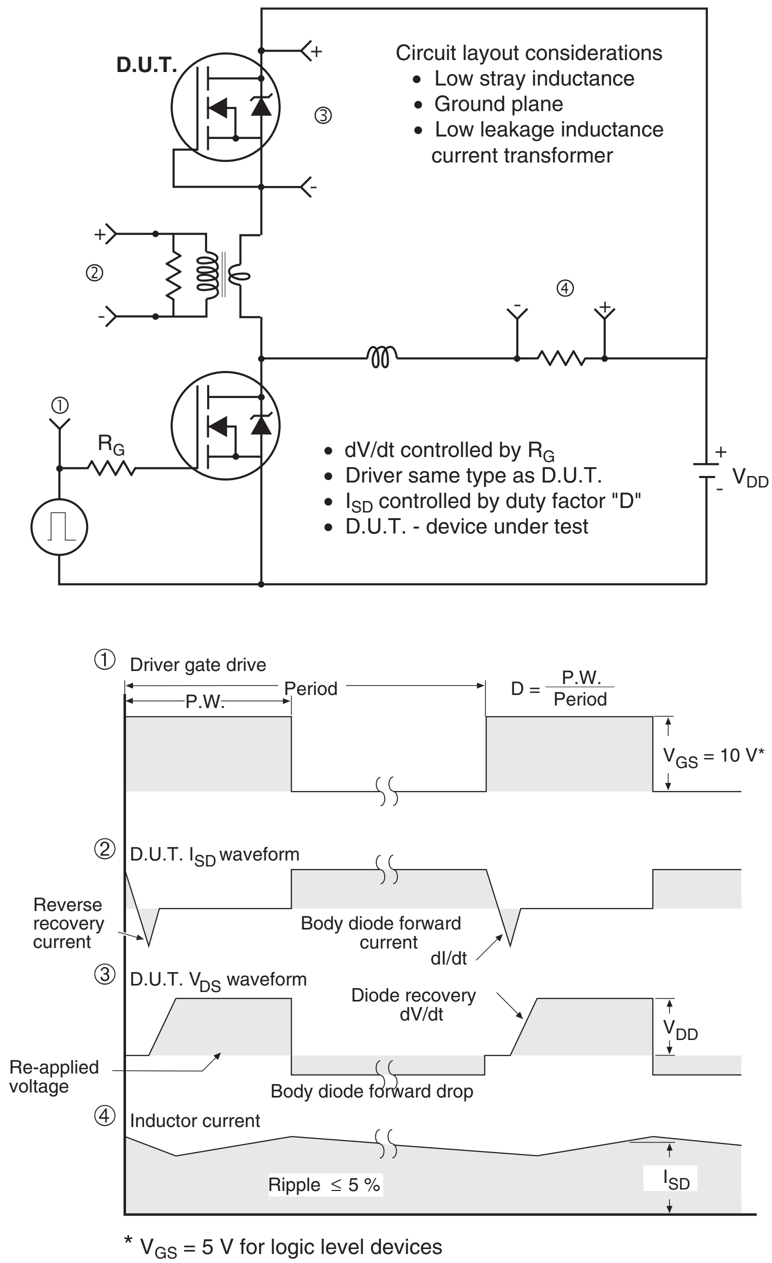


Fig. 14 - For N-Channel

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