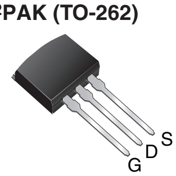
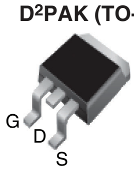
Power MOSFET

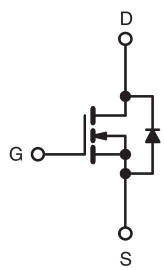
PRODUCT SUMMARY		
V_{DS} (V)	600	
$R_{DS(on)}$ (Ω)	V_{GS} = 10 V	4.4
Q_g (Max.) (nC)	18	
Q_{gs} (nC)	3.0	
Q_{gd} (nC)	8.9	
Configuration	Single	

I[2]PAK (TO-262)



D[2]PAK (TO-263)





N-Channel MOSFET

FEATURES

- **Halogen-free According to IEC 61249-2-21 Definition**
- Surface Mount (IRFBC20S, SiHFBC20S)
- Low-Profile Through-Hole (IRFBC20L, SiHFBC20L)
- Available in Tape and Reel (IRFBC20, SiiHFBC20S)
- Dynamic dV/dt Rating
- 150 °C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Compliant to RoHS Directive 2002/95/EC

Pb Available
RoHS* COMPLIANT
HALOGEN FREE Available

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 D[2]PAK is a surface mount power package capable of the accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D[2]PAK is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0 W in a typical surface mount application. The through-hole version (IRFBC20L, SiHFBC20L) is a available for low-profile applications.

ORDERING INFORMATION			
Package	D[2]PAK (TO-263)	D[2]PAK (TO-263)	I[2]PAK (TO-262)
Lead (Pb)-free and Halogen-free	SiHFBC20S-GE3	SiHFBC20STRL-GE3[a]	SiHFBC20L-GE3
Lead (Pb)-free	IRFBC20SPbF	IRFBC20STRLPbF[a]	IRFBC20LPbF
	SiHFBC20S-E3	SiHFBC20STL-E3[a]	SiHFBC20L-E3
SnPb	IRFBC20S	IRFBC20STRL[a]	IRFBC20L
	SiHFBC20S	SiHFBC20STL[a]	SiHFBC20L

Note
a. See device orientation.

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[e]	V_{GS} at 10 V	T_C = 25 °C	I_D	2.2	A
		T_C = 100 °C		1.4	
Pulsed Drain Current[a, e]			I_{DM}	8.0	
Linear Derating Factor				0.40	W/°C
Single Pulse Avalanche Energy[b, e]			E_{AS}	84	mJ
Avalanche Current[a]			I_{AR}	2.2	A
Repetiitive Avalanche Energy[a]			E_{AR}	5.0	mJ
Maximum Power Dissipation	T_A = 25 °C		P_D	3.1	W
	T_C = 25 °C			50	
Peak Diode Recovery dV/dt[c, e]			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]	

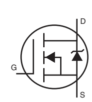
Notes
a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. V_{DD} = 50 V, starting T_J = 25 °C, L = 31 mH, R_g = 25 Ω, I_{AS} = 2.2 A (see fig. 12).
c. $I_{SD} \leq$ 2.2 A, dI/dt $\leq$ 40 A/μs, $V_{DD} \leq V_{DS}$, $T_J \leq$ 150 °C.
d. 1.6 mm from case.
e. Uses IRFBC20, SiHFBC20 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}	-	2.5	

Note

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

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[c]	-	0.88	-	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 = 1.3 A[b]	-	-	4.4	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 1.3 A[c]	1.4	-	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5[c]	-	350	-	pF
Output Capacitance	C_{oss}		-	48	-	
Reverse Transfer Capacitance	C_{rss}		-	8.6	-	
Total Gate Charge	Q_g	V_{GS} = 10 V, I_D = 2.0 A, V_{DS} = 360 V, see fig. 6 and 13[b, c]	-	-	18	nC
Gate-Source Charge	Q_{gs}		-	-	3.0	
Gate-Drain Charge	Q_{gd}		-	-	8.9	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 300 V, I_D = 2.0 A, R_g = 18 Ω, R_D = 150 Ω, see fig. 10[b, c]	-	10	-	ns
Rise Time	t_r		-	23	-	
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	
Fall Time	t_f		-	25	-	
Internal Source Inductance	L_S	Between lead, and center of die contact	-	7.5	-	nH
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	2.2	A
Pulsed Diode Forward Current[a]	I_{SM}		-	-	8.0	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 2.2 A, V_{GS} = 0 V[b]	-	-	1.6	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 2.0 A, dI/dt = 100 A/μs[b, c]	-	290	580	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	0.67	1.3	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 ≤ 300 μs; duty cycle ≤ 2 %.

c. Uses IRFBC20, SiHFBC20 data and test conditions.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

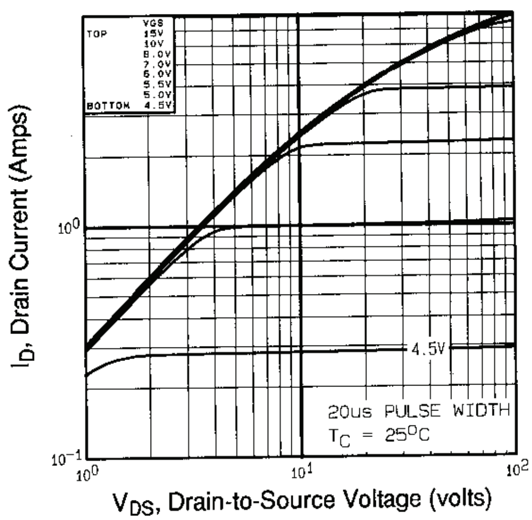


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

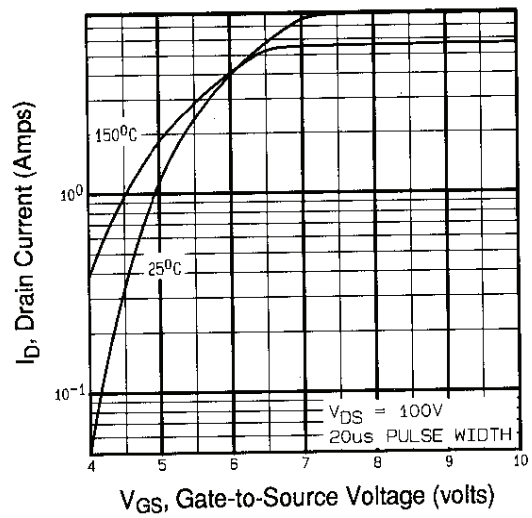


Fig. 3 - Typical Transfer Characteristics

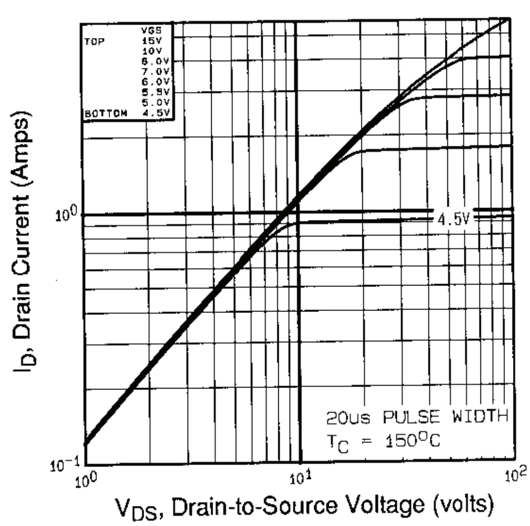


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

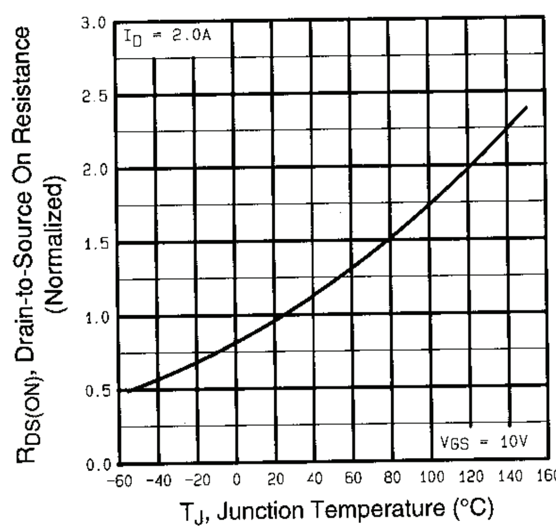


Fig. 4 - Normalized On-Resistance vs. Temperature

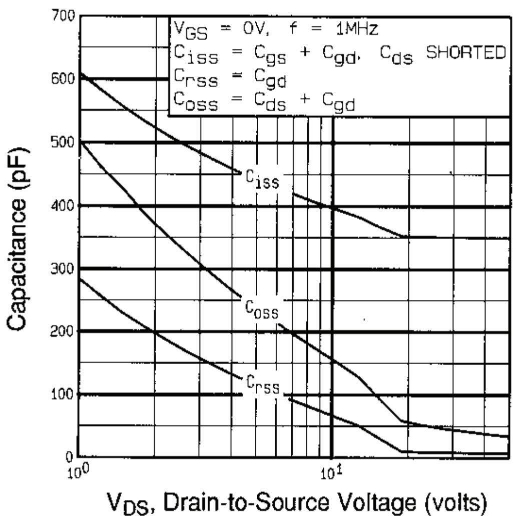


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

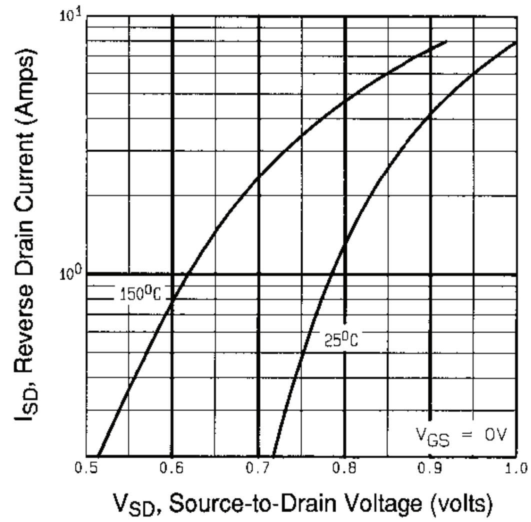


Fig. 7 - Typical Source-Drain Diode Forward Voltage

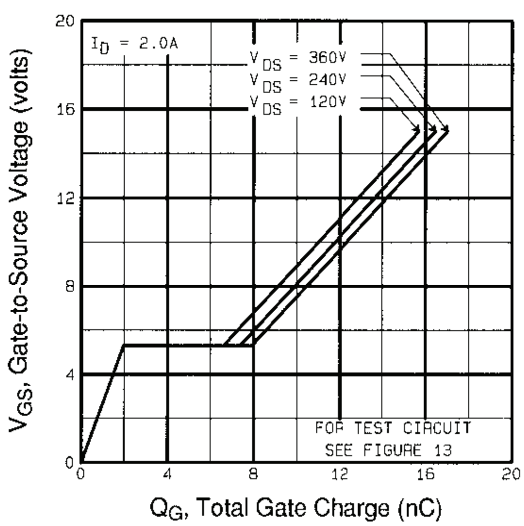


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

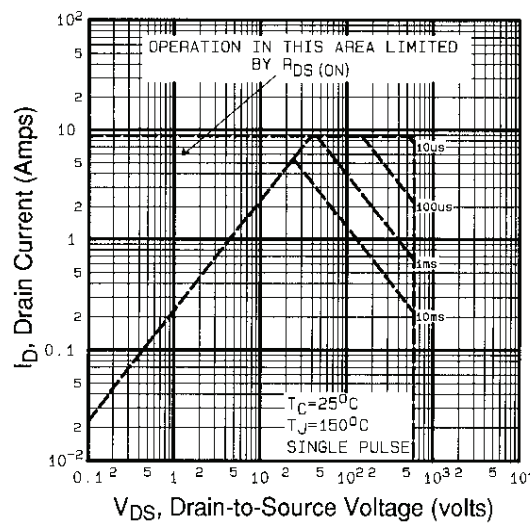


Fig. 8 - Maximum Safe Operating Area

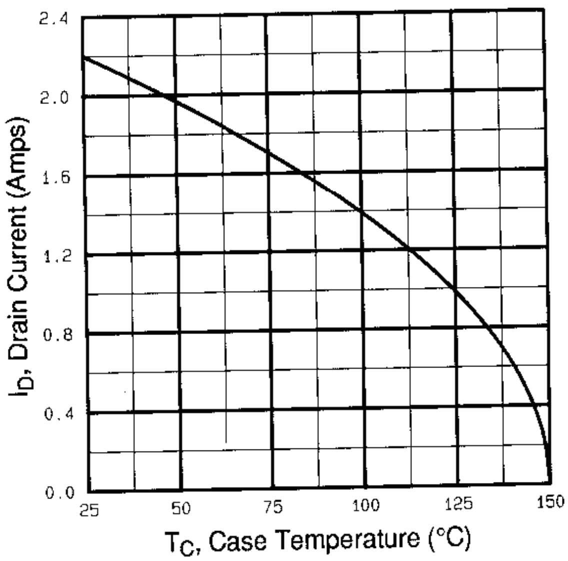


Fig. 9 - Maximum Drain Current vs. Case Temperature

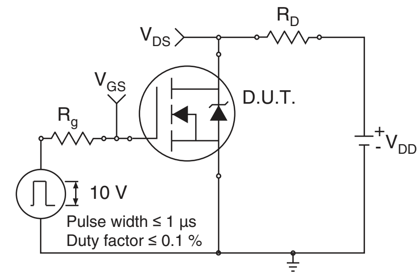


Fig. 10a - Switching Time Test Circuit

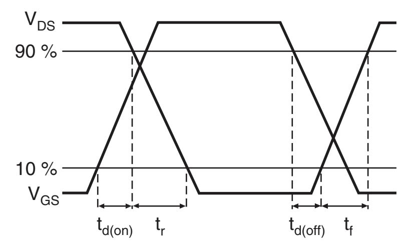


Fig. 10b - Switching Time Waveforms

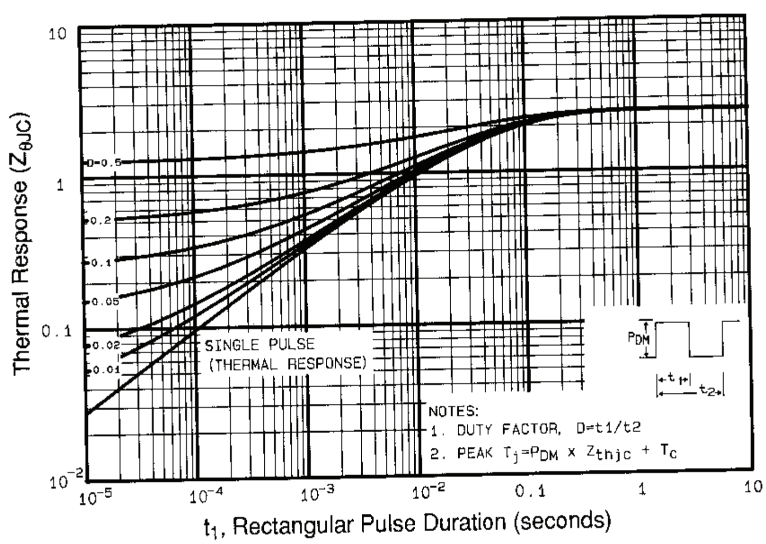


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

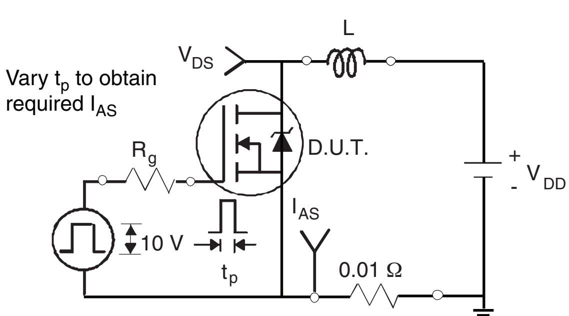


Fig. 12a - Unclamped Inductive Test Circuit

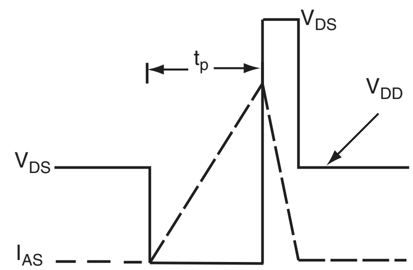


Fig. 12b - Unclamped Inductive Waveforms

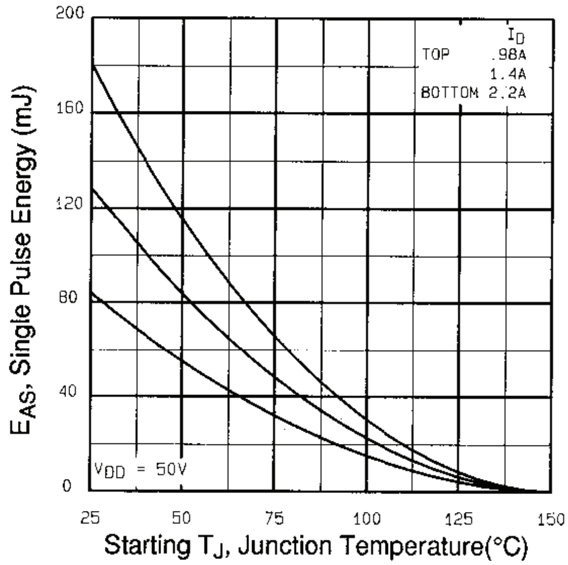


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

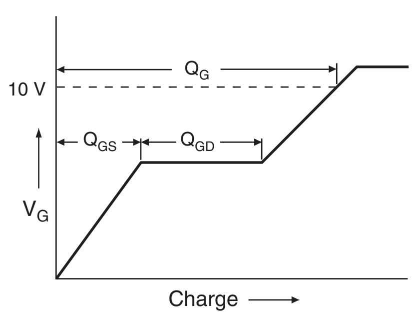


Fig. 13a - Maximum Avalanche Energy vs. Drain Current

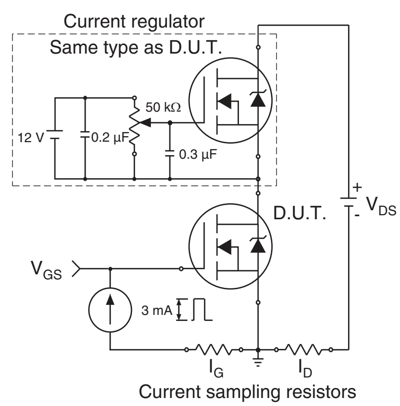
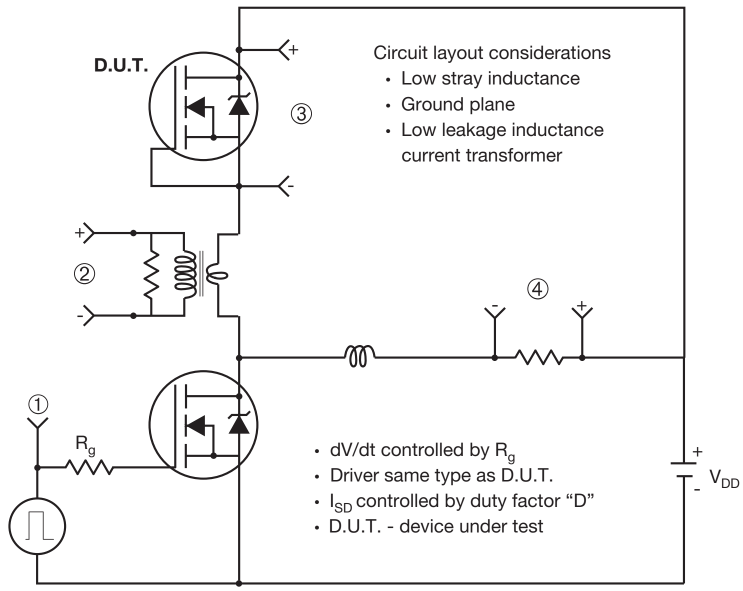
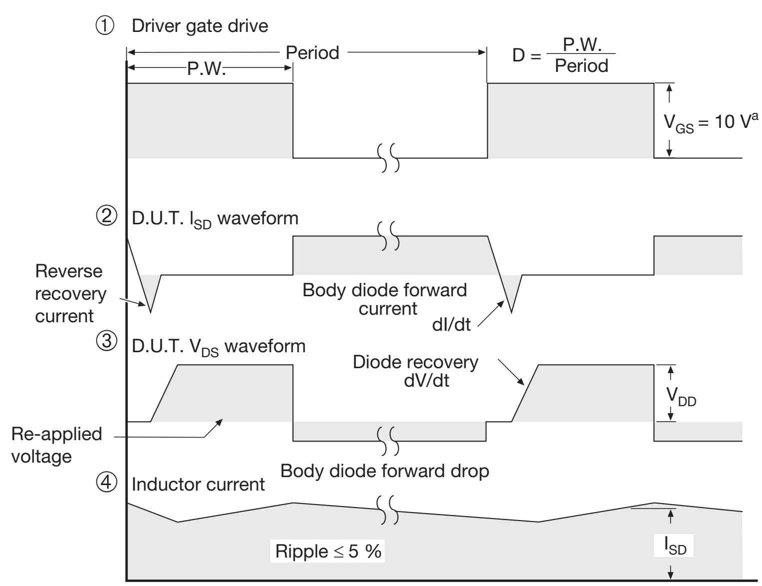


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit





Note

a. V_{GS} = 5 V for logic level devices

Fig. 14 - For N-Channel

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