ON Semiconductor®

FDMS039N08B

N-Channel PowerTrench® MOSFET

80 V, 100 A, 3.9 mΩ

Features

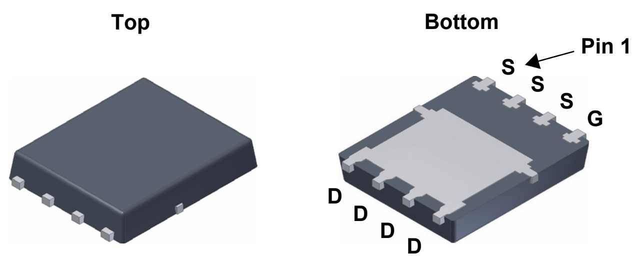
- $R_{DS(on)}$ = 3.2 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 50 A
- Low FOM $R_{DS(on)} {*} Q_G$
- Low Reverse Recovery Charge, Q_{rr} = 80 nC
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

Description

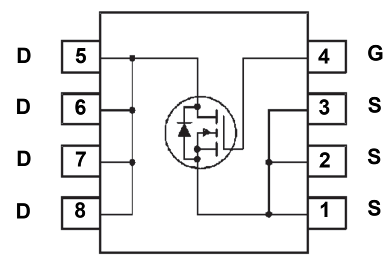
This N-Channel MOSFET is produced using ON Semiconductor's advance PowerTrench® process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies



Power 56



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter		FDMS039N08B	Unit
V_{DSS}	Drain to Source Voltage		80	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)	100	A
		- Continuous (T_A = 25°C) (Note 1a)	19.4	
I_{DM}	Drain Current	- Pulsed (Note 2)	400	A
E_{AS}	Single Pulsed Avalanche Energy (Note 3)		240	mJ
P_D	Power Dissipation	(T_C = 25°C)	104	W
		(T_A = 25°C) (Note 1a)	2.5	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	°C

Thermal Characteristics

Symbol	Parameter	FDMS039N08B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 1a)	50	

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Package Marking and Ordering Information

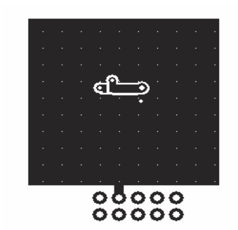
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS039N08B	FDMS039N08B	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_C = 25°C unless otherwise noted.

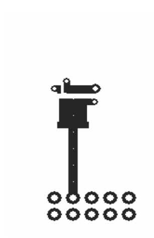
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	80	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.04	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 64 V, V_{GS} = 0 V	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 50 A	-	3.2	3.9	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 50 A	-	100	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 40 V, V_{GS} = 0 V f = 1 MHz	-	5715	7600	pF
C_{oss}	Output Capacitance		-	881	1170	pF
C_{rss}	Reverse Transfer Capacitance		-	15	-	pF
C_{oss}(er)	Engry Releted Output Capacitance	V_{DS} = 40 V, V_{GS} = 0 V	-	1646	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 40 V, I_D = 50 A V_{GS} = 0 V to 10 V (Note 4)	-	77	100	nC
Q_{gs}	Gate to Source Gate Charge		-	34	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	13	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	16	-	nC
ESR	Equivalent Series Resistance	f = 1 MHz	-	1.2	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 40 V, I_D = 50 A V_{GS} = 10 V, R_G = 4.7 Ω (Note 4)	-	42	94	ns
t_r	Turn-On Rise Time		-	25	60	ns
$t_{d(off)}$	Turn-Off Delay Time		-	48	106	ns
t_f	Turn-Off Fall Time		-	17	44	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	100	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	400	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 50 A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_{SD} = 50 A, V_{DD} = 40 V dI_F/dt = 100 A/μs	-	68	-	ns
Q_{rr}	Reverse Recovery Charge		-	80	-	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 50 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Repetitive rating: pulse-width limited by maximum junction temperature.
3. L = 0.3 mH, I_{AS} = 40 A, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Typical Performance Characteristics

Figure 1. On-Region Characteristics

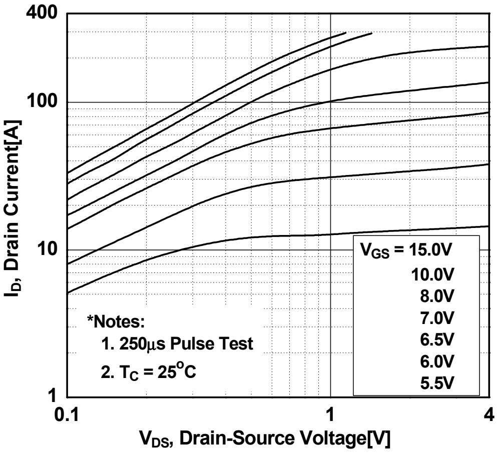


Figure 2. Transfer Characteristics

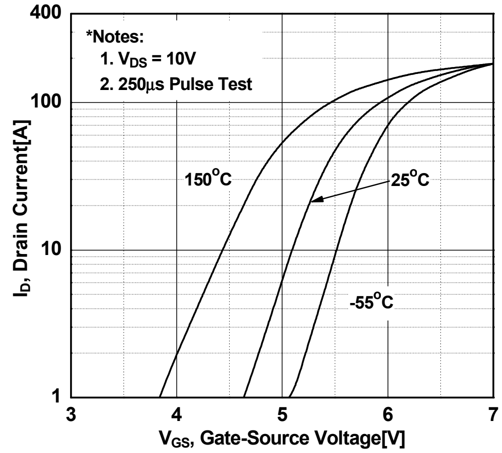


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

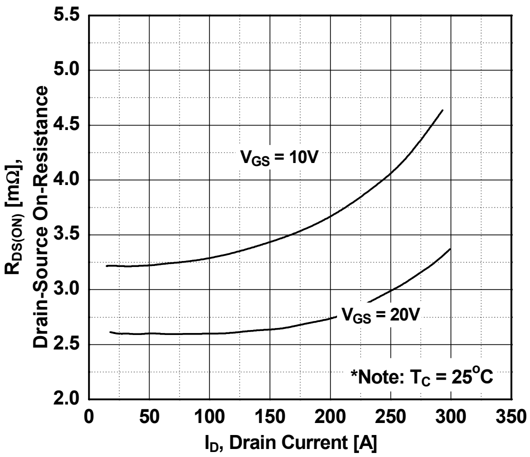


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

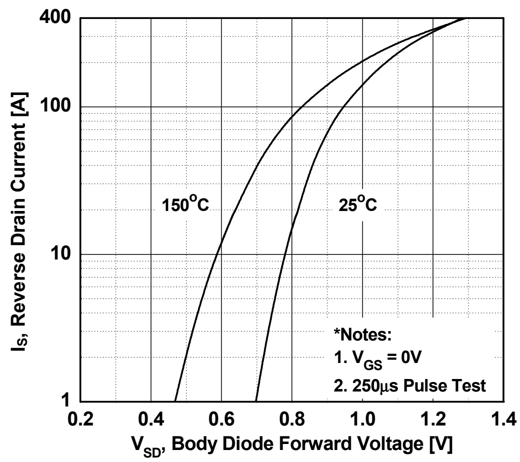


Figure 5. Capacitance Characteristics

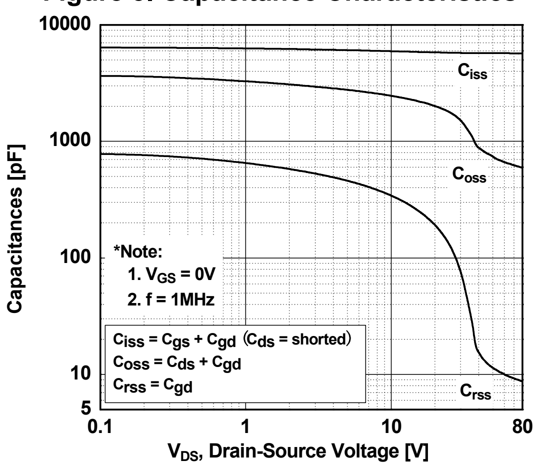
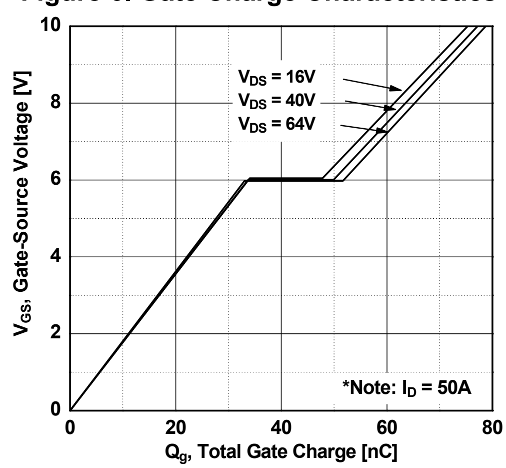


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

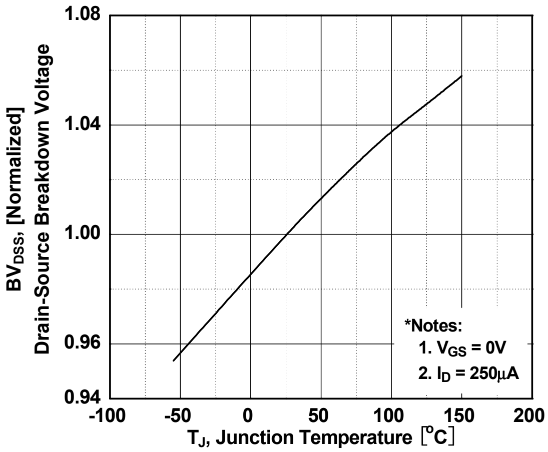


Figure 8. On-Resistance Variation vs. Temperature

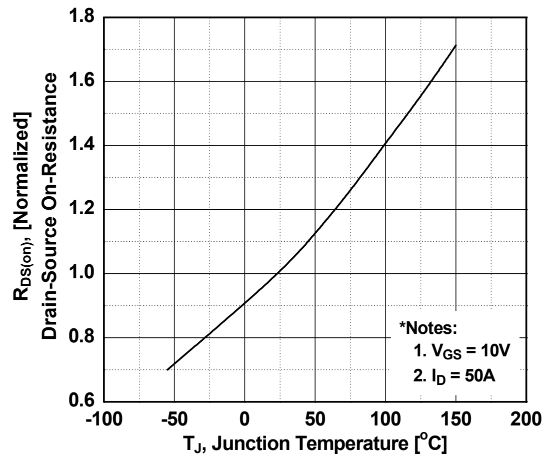


Figure 9. Maximum Safe Operating Area

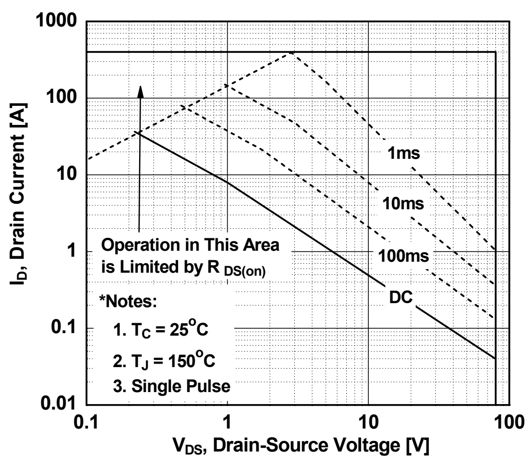


Figure 10. Maximum Drain Current vs. Case Temperature

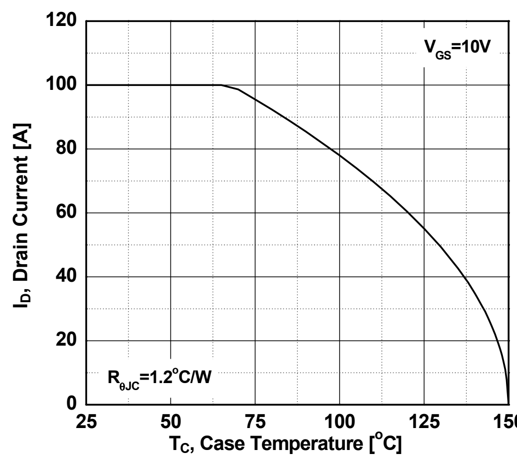


Figure 11. Unclamped Inductive Switching Capability

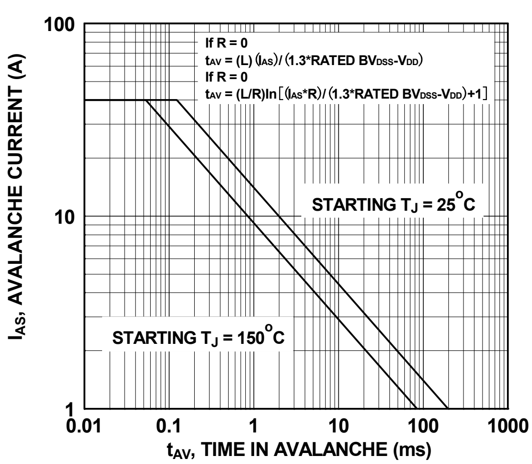
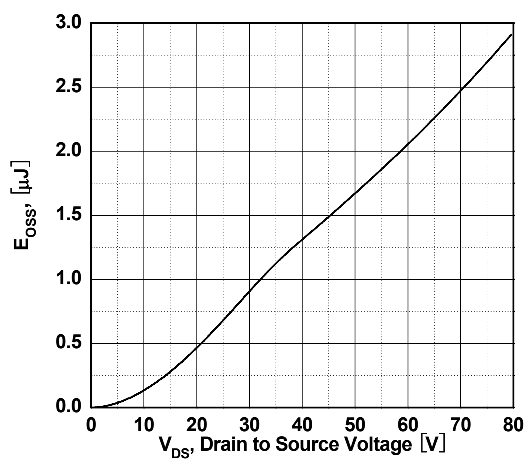
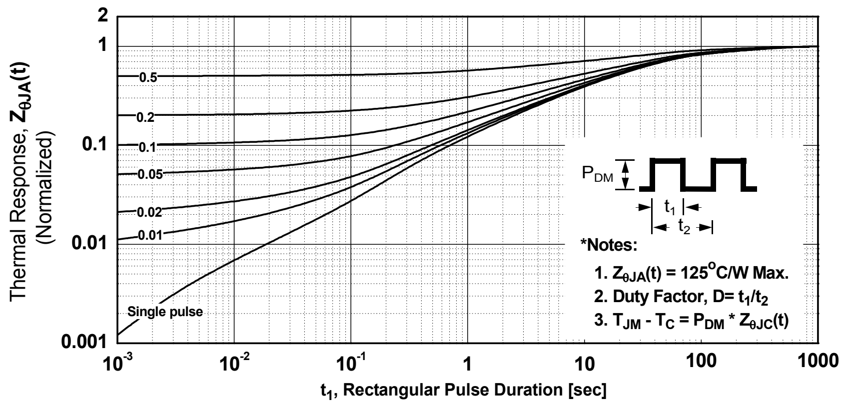


Figure 12. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve



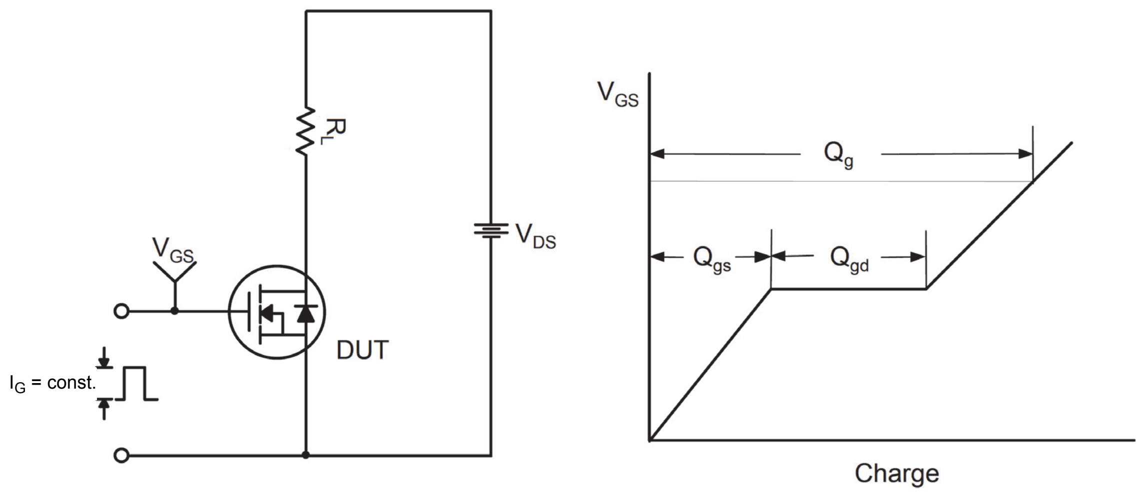


Figure 14. Gate Charge Test Circuit & Waveform

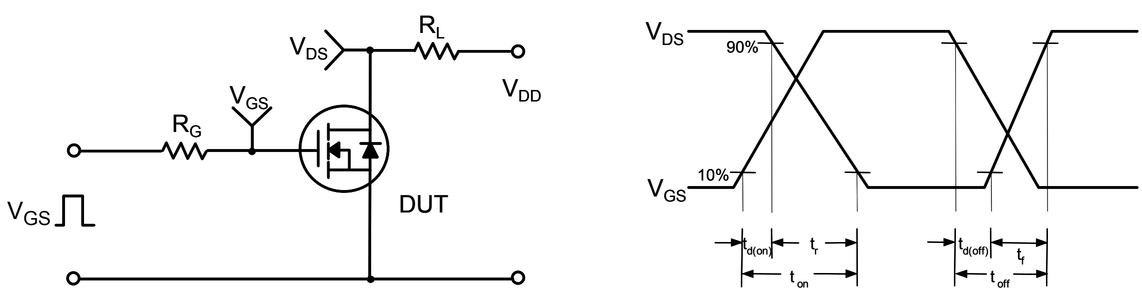


Figure 15. Resistive Switching Test Circuit & Waveforms

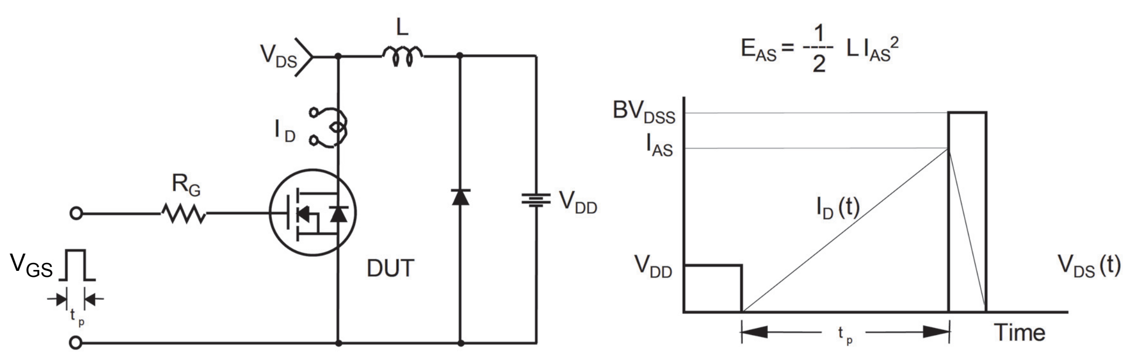
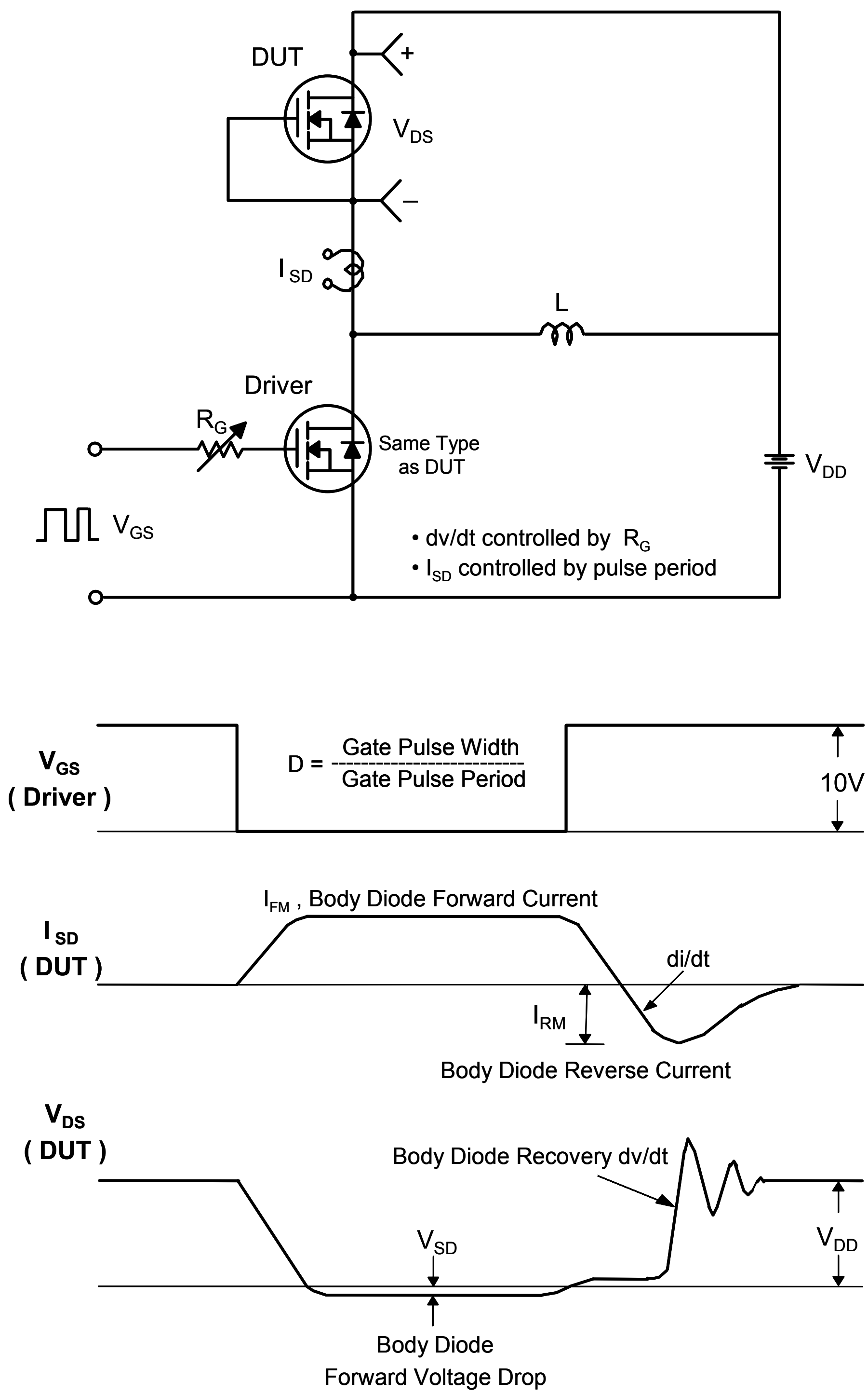


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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