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ON Semiconductor®

FDMS039N08B

N-Channel PowerTrench® MOSFET

80 V, 100 A, 3.9 mΩ

Features

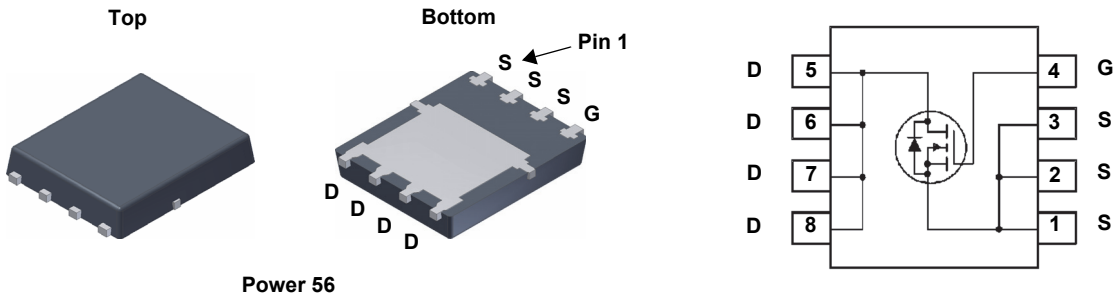
- $R_{DS(on)} = 3.2 \text{ m}\Omega$ (Typ.) @ $V_{GS} = 10 \text{ V}$, $I_D = 50 \text{ A}$
- Low FOM $R_{DS(on)} \cdot Q_G$
- Low Reverse Recovery Charge, $Q_{rr} = 80 \text{ nC}$
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100%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



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ 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 ($T_C = 25^\circ\text{C}$)	100
		- Continuous ($T_A = 25^\circ\text{C}$) (Note 1a)	19.4
I_{DM}	Drain Current	- Pulsed (Note 2)	400
E_{AS}	Single Pulsed Avalanche Energy	(Note 3)	240
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	104
		($T_A = 25^\circ\text{C}$) (Note 1a)	2.5
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

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

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 $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	80	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$, Referenced to 25°C	-	0.04	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	± 100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$	-	3.2	3.9	$\text{m}\Omega$
g_{FS}	Forward Transconductance	$V_{DS} = 10 \text{ V}, I_D = 50 \text{ A}$	-	100	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	5715	7600	pF	
C_{oss}	Output Capacitance		-	881	1170	pF	
C_{rss}	Reverse Transfer Capacitance		-	15	-	pF	
$C_{oss(er)}$	Energy Related Output Capacitance	$V_{DS} = 40 \text{ V}, V_{GS} = 0 \text{ V}$	-	1646	-	pF	
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 40 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 0 \text{ V to } 10 \text{ V}$	-	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		(Note 4)	-	16	-	nC
ESR	Equivalent Series Resistance		$f = 1 \text{ MHz}$	-	1.2	-	Ω

Switching Characteristics

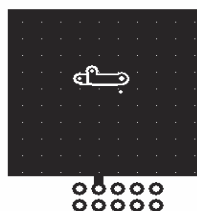
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	42	94	ns	
t_r	Turn-On Rise Time		-	25	60	ns	
$t_{d(off)}$	Turn-Off Delay Time		(Note 4)	-	48	106	ns
t_f	Turn-Off Fall Time		(Note 4)	-	17	44	ns

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	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$	-	-	1.3	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}, V_{DD} = 40 \text{ V}$ $di_F/dt = 100 \text{ A}/\mu\text{s}$	-	68	-	ns
Q_{rr}	Reverse Recovery Charge		-	80	-	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5 \text{ in.}$ 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. $50^\circ\text{C}/\text{W}$ when mounted on a 1 in^2 pad of 2 oz copper.



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.

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

Typical Performance Characteristics

Figure 1. On-Region Characteristics

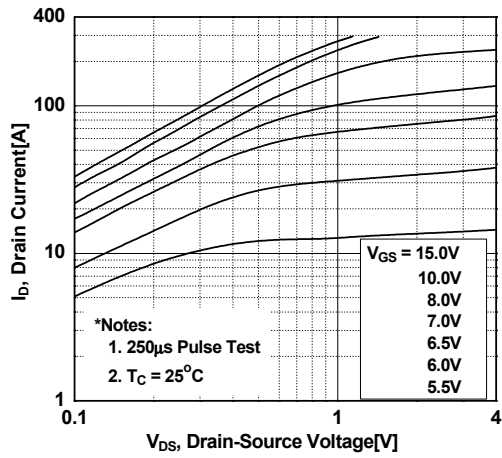


Figure 2. Transfer Characteristics

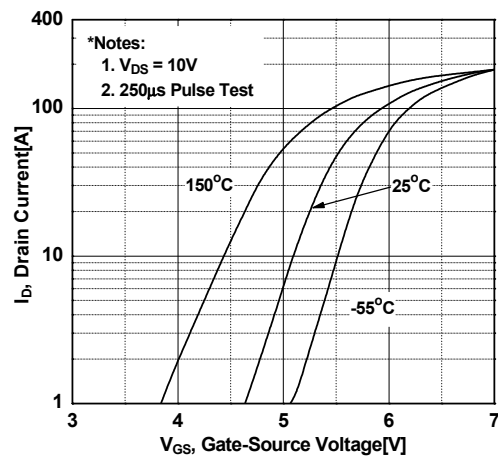


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

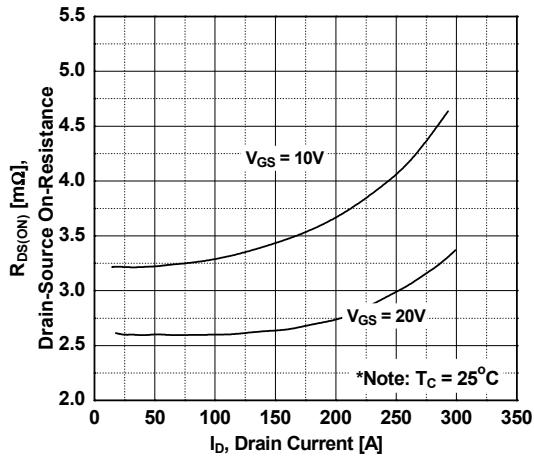


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

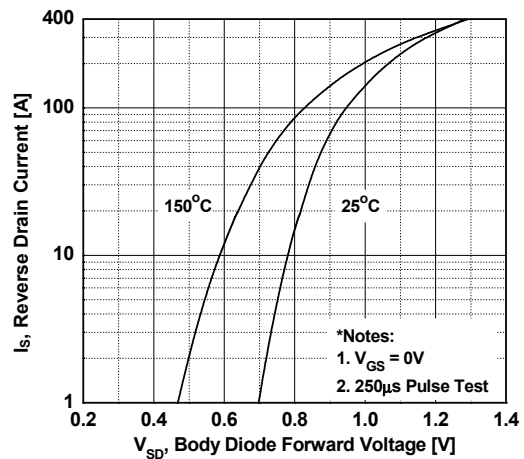


Figure 5. Capacitance Characteristics

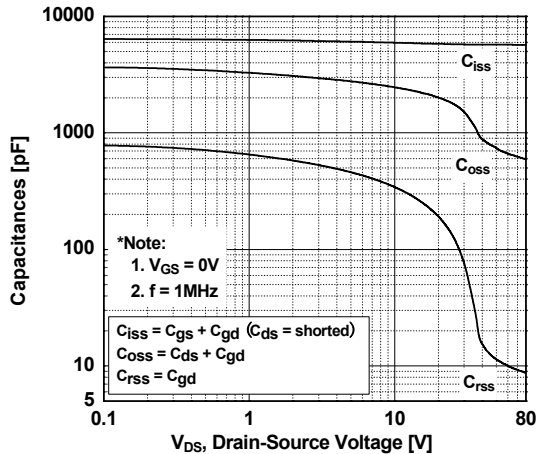
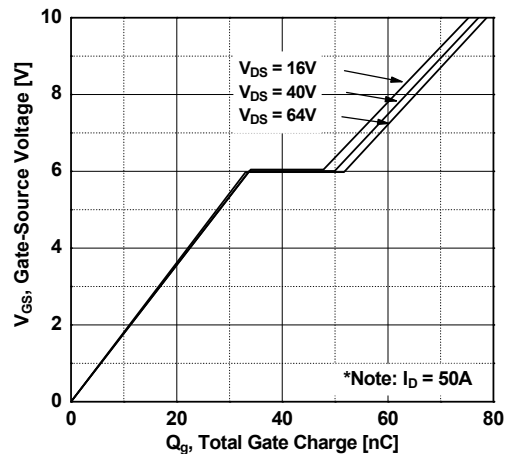


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

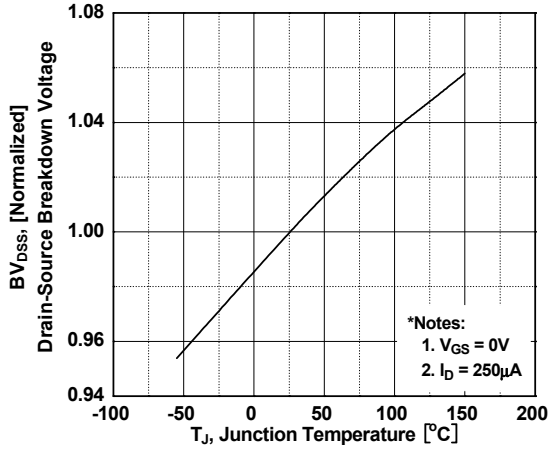


Figure 8. On-Resistance Variation vs. Temperature

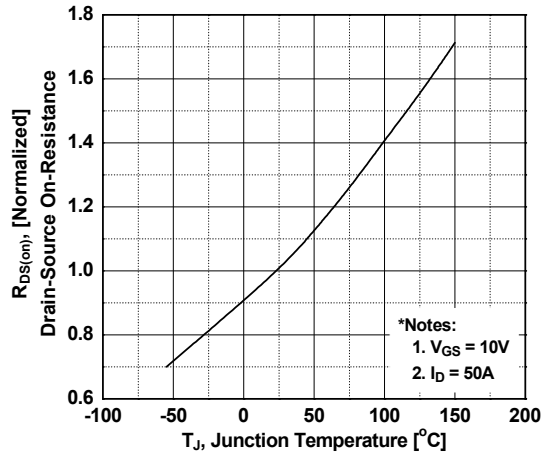


Figure 9. Maximum Safe Operating Area

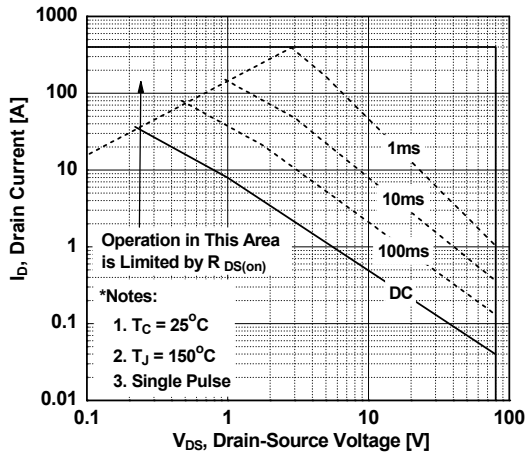


Figure 10. Maximum Drain Current vs. Case Temperature

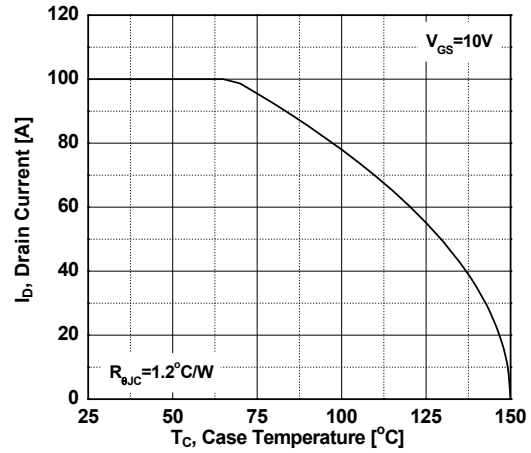


Figure 11. Unclamped Inductive Switching Capability

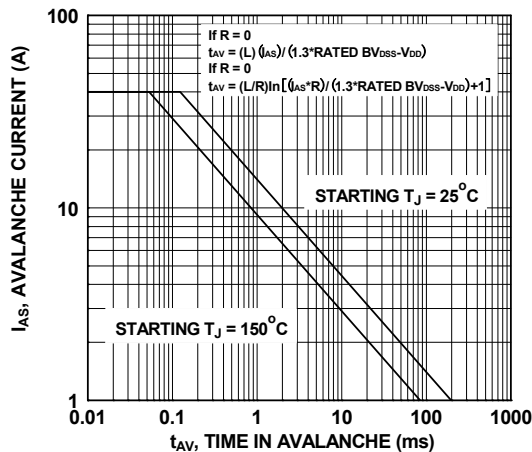
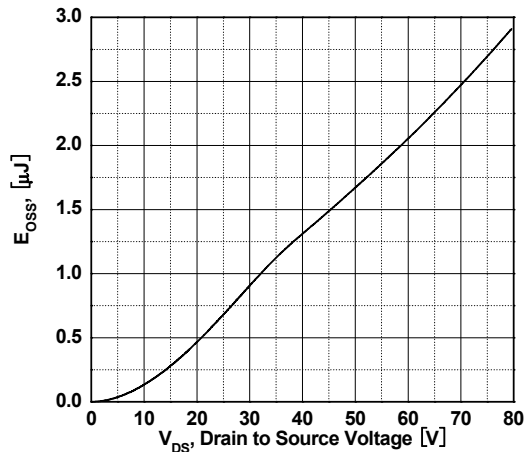


Figure 12. Eoss vs. Drain to Source Voltage



Typical Performance Characteristics (Continued)

Figure 13. Transient Thermal Response Curve

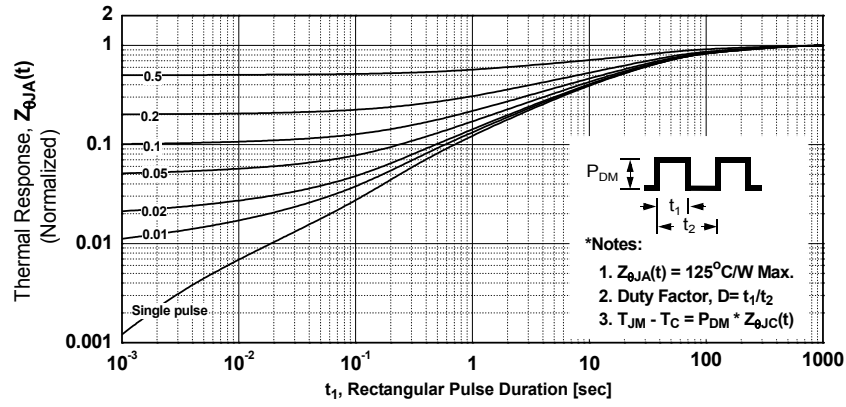


Figure 14. Gate Charge Test Circuit & Waveform

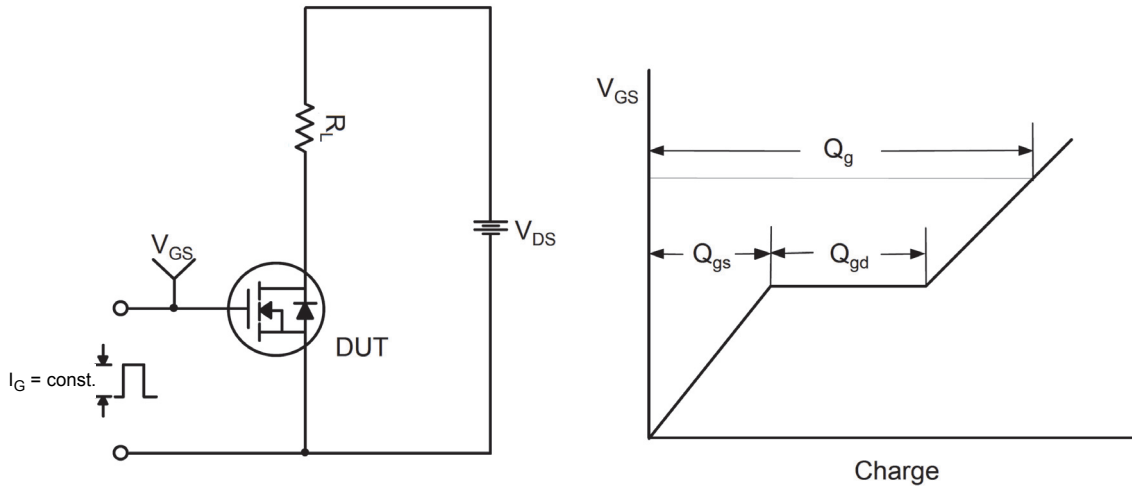


Figure 15. Resistive Switching Test Circuit & Waveforms

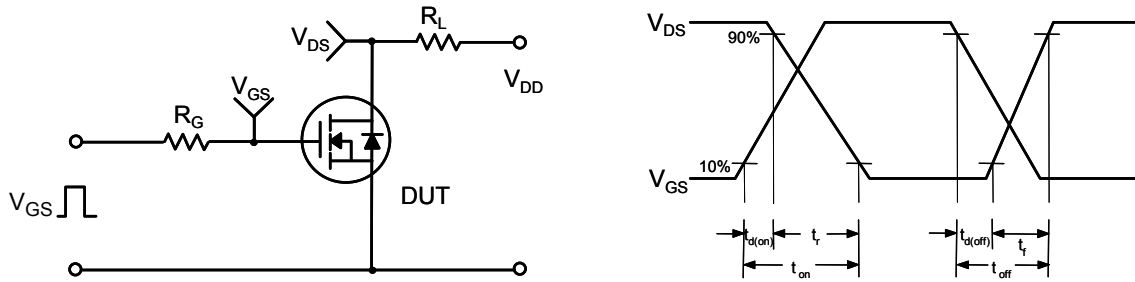


Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms

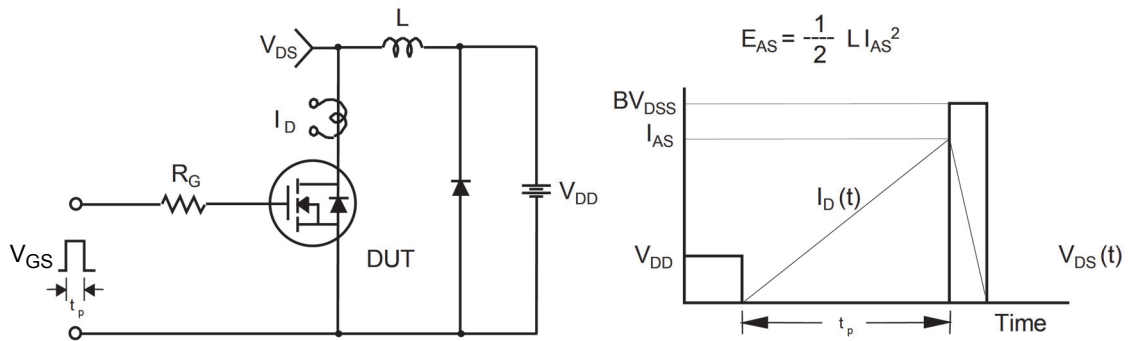
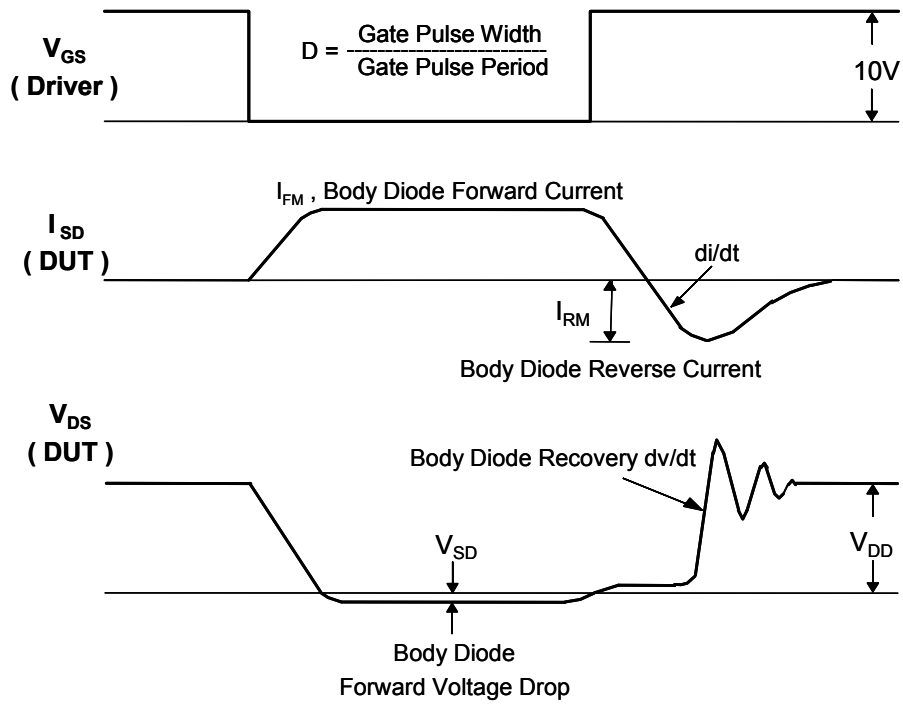
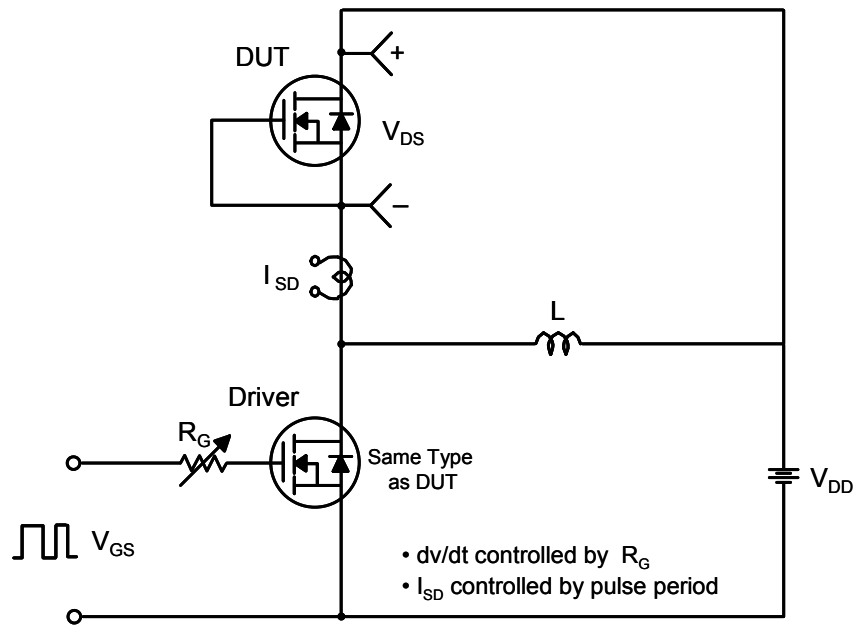


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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