

# FDMS015N04B

## N-Channel PowerTrench® MOSFET

40 V, 100 A, 1.5 mΩ



### Features

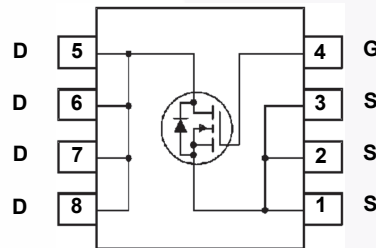
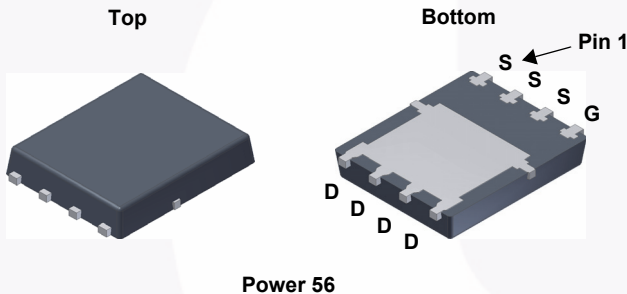
- $R_{DS(on)} = 1.13 \text{ m}\Omega$  (Typ.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 50 \text{ A}$
- Advanced Package and Silicon Combination for Low  $R_{DS(on)}$  and High Efficiency
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

### Description

This N-Channel MOSFET is produced using Fairchild 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
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies



### MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	FDMS015N04B	Unit
$V_{DSS}$	Drain to Source Voltage	40	V
$V_{GSS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current	- Continuous ( $T_C = 25^\circ\text{C}$ )	100
		- Continuous ( $T_A = 25^\circ\text{C}$ ) (Note 1a)	31.3
$I_{DM}$	Drain Current	- Pulsed (Note 2)	400
$E_{AS}$	Single Pulsed Avalanche Energy	(Note 3)	526
$P_D$	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	FDMS015N04B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max. (Note 1a)	50	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS015N04B	FDMS015N04B	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	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	40	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	37	-	$\text{mV}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Body Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 50 \text{ A}$	-	1.13	1.5	$\text{m}\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 5 \text{ V}, I_D = 50 \text{ A}$	-	171	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$ $f = 1 \text{ MHz}$	-	6560	8725	pF
$C_{oss}$	Output Capacitance		-	2795	3720	pF
$C_{rss}$	Reverse Transfer Capacitance		-	162	-	pF
$C_{oss(er)}$	Energy Releated Output Capacitance	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$	-	3896	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 20 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 0 \text{ V to } 10 \text{ V}$	-	91	118	nC
$Q_{gs}$	Gate to Source Gate Charge		-	26	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	9	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		(Note 4)	-	16	-
ESR	Equivalent Series Resistance	$f = 1 \text{ MHz}$	-	1.4	-	$\Omega$

### Switching Characteristics

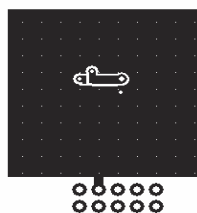
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 20 \text{ V}, I_D = 50 \text{ A}$ $V_{GS} = 10 \text{ V}, R_G = 4.7 \Omega$	-	34	78	ns
$t_r$	Turn-On Rise Time		-	24	58	ns
$t_{d(off)}$	Turn-Off Delay Time		-	71	152	ns
$t_f$	Turn-Off Fall Time		(Note 4)	-	26	62

### 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	$V_{GS} = 0 \text{ V}, I_{SD} = 50 \text{ A}$	-	78	-	ns
$Q_{rr}$	Reverse Recovery Charge	$di_F/dt = 100 \text{ A}/\mu\text{s}$	-	90	-	nC

#### Notes:

1.  $R_{\theta JA}$  is determined with the device mounted on a  $1 \text{ in}^2$  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  $1 \text{ in}^2$  pad of 2 oz copper.

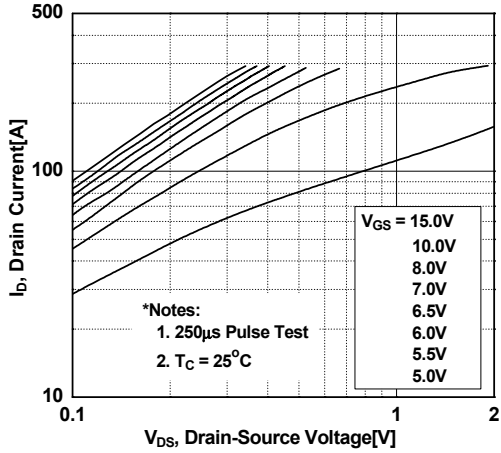


b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

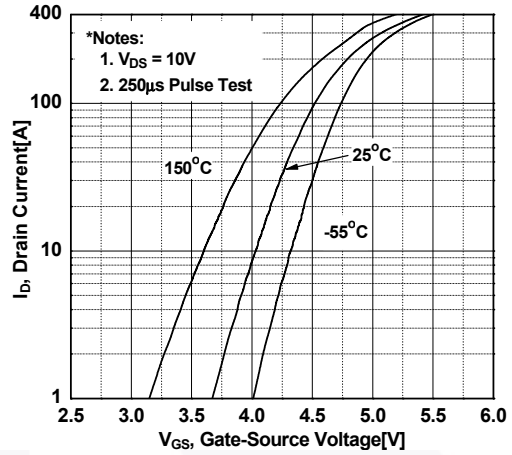
2. Repetitive rating; pulse-width limited by maximum junction temperature.
3.  $L = 3 \text{ mH}, I_{AS} = 18.72 \text{ A}$ , starting  $T_J = 25^\circ\text{C}$ .
4. Essentially independent of operating temperature typical characteristics.

## Typical Performance Characteristics

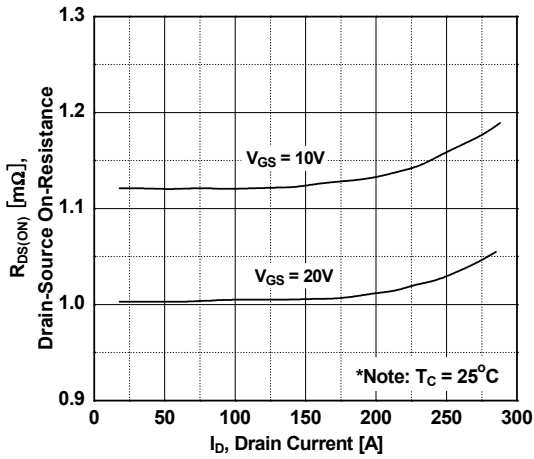
**Figure 1. On-Region Characteristics**



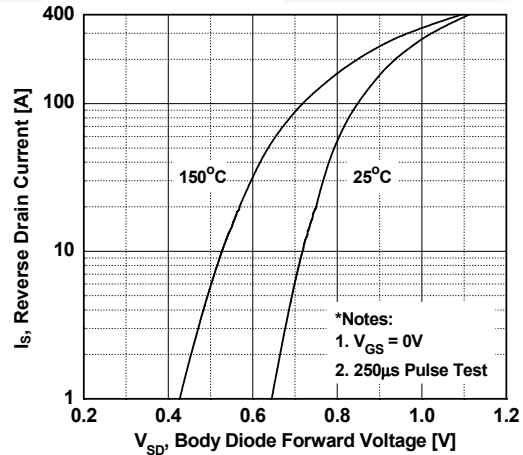
**Figure 2. Transfer Characteristics**



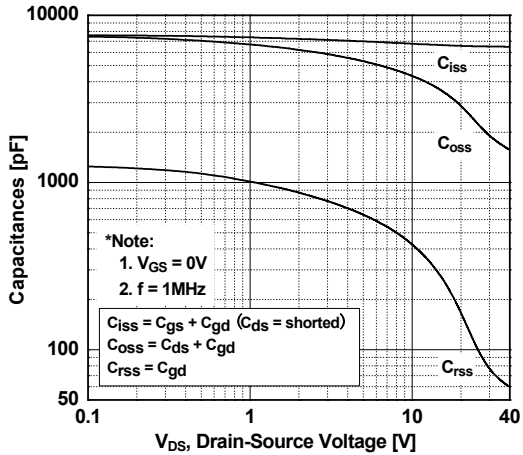
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



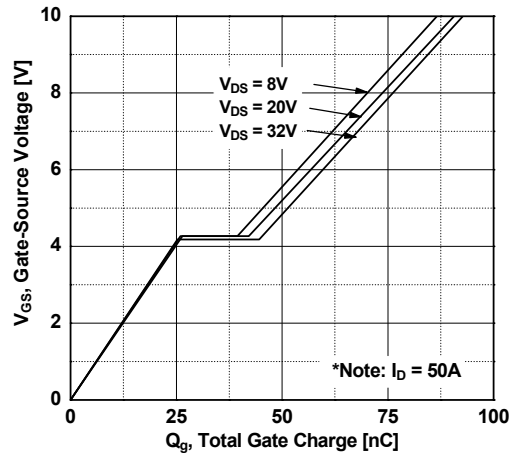
**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**

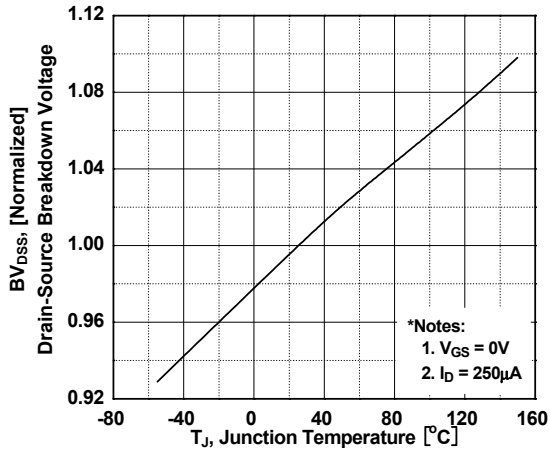


**Figure 6. Gate Charge Characteristics**

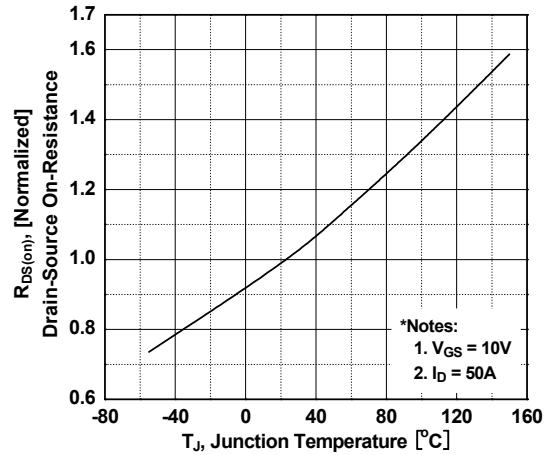


**Typical Performance Characteristics** (Continued)

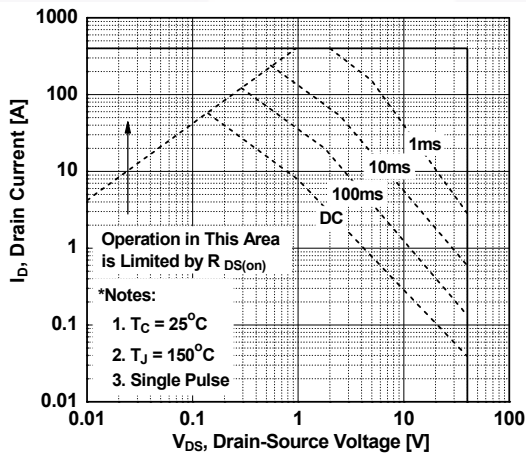
**Figure 7. Breakdown Voltage Variation vs. Temperature**



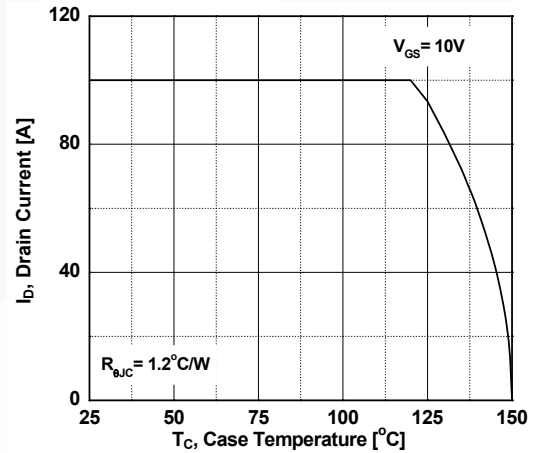
**Figure 8. On-Resistance Variation vs. Temperature**



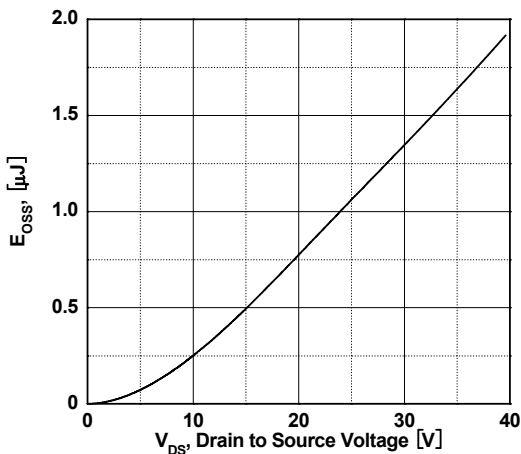
**Figure 9. Maximum Safe Operating Area**



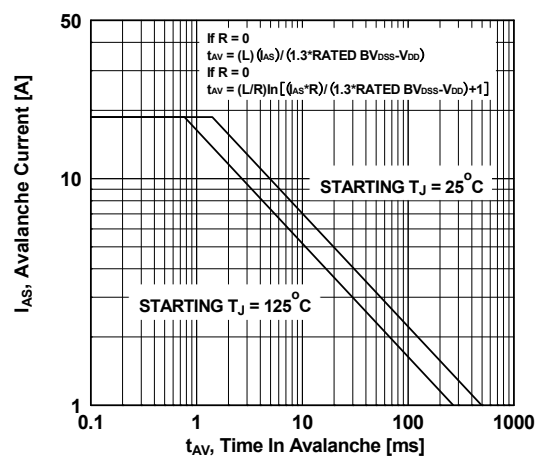
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11. E\_oss vs. Drain to Source Voltage**

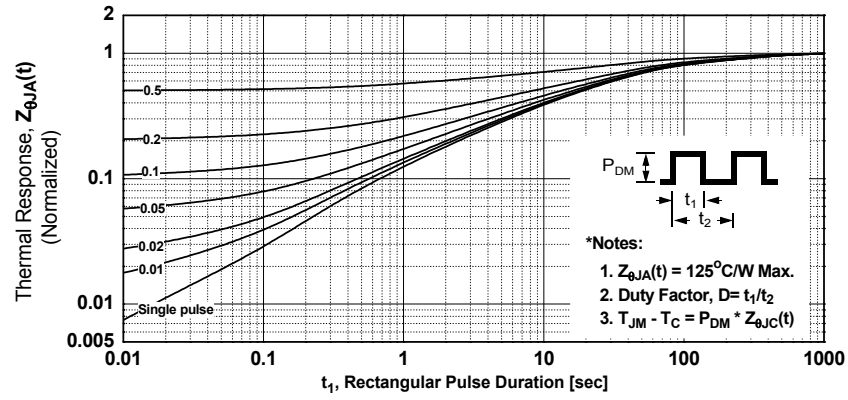


**Figure 12. Unclamped Inductive Switching Capability**

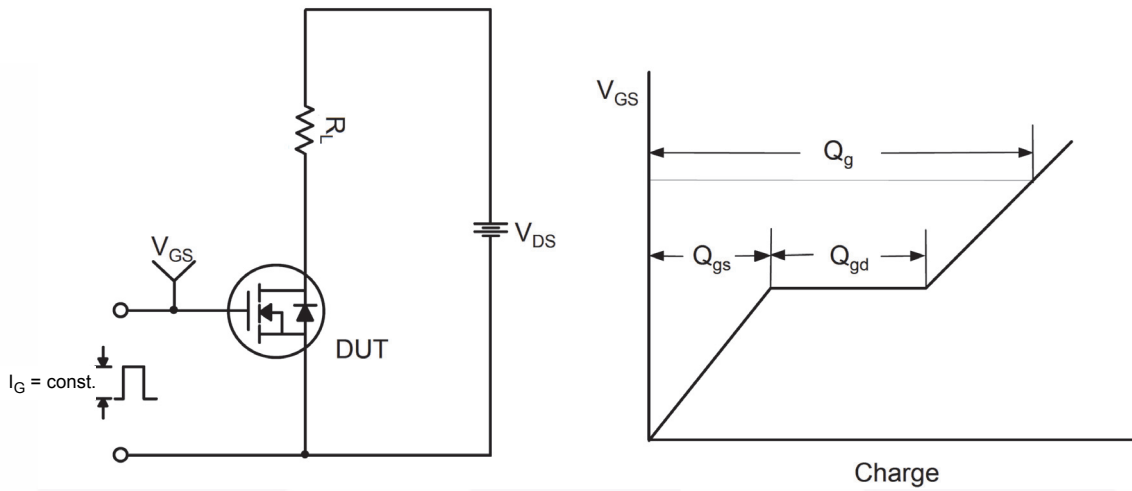


Typical Performance Characteristics (Continued)

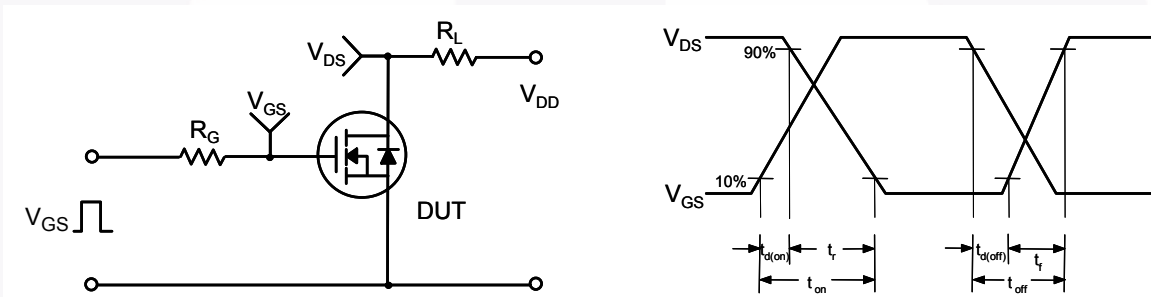
Figure 13. Transient Thermal Response Curve



**Figure 14. Gate Charge Test Circuit & Waveform**



**Figure 15. Resistive Switching Test Circuit & Waveforms**



**Figure 16. Unclamped Inductive Switching Test Circuit & Waveforms**

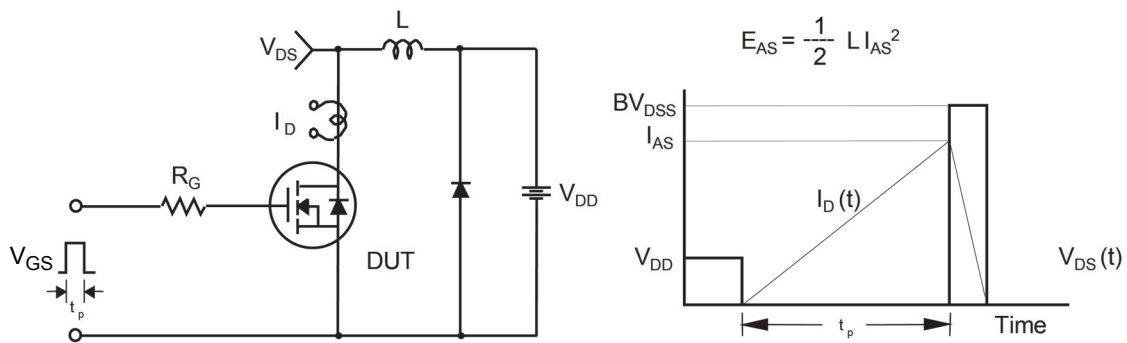
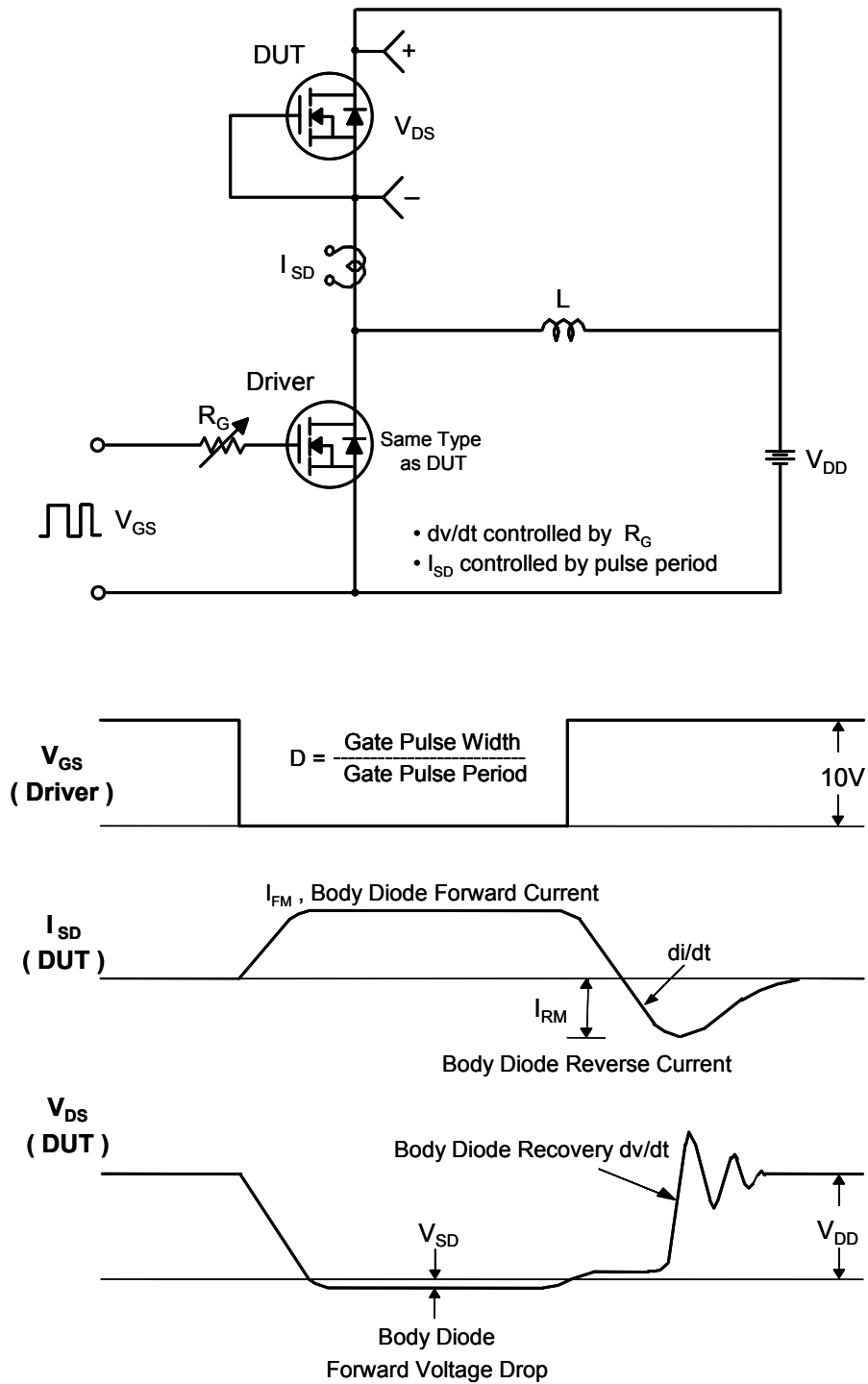


Figure 17. Peak Diode Recovery dv/dt Test Circuit & Waveforms







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Rev. I66

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