ON Semiconductor®

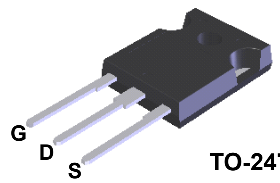
FCH041N60F-F085

N-Channel SuperFET II FRFET MOSFET

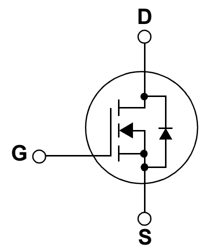
600 V, 76 A, 41 mΩ

Features

- Typical $R_{DS(on)}$ = 36 mΩ at V_{GS} = 10 V, I_D = 38 A
- Typical $Q_{g(tot)}$ = 267 nC at V_{GS} = 10V, I_D = 38 A
- Low Effective Output Capacitance (Typical $C_{oss(eff.)}$ = 720 nF)
- 100% Avalanche Tested
- Qualified to AEC Q101
- RoHS Compliant



TO-247



Description

SuperFET® II MOSFET is ON Semiconductor's brand-new high voltage super-junction (SJ) MOSFET family that is utilizing charge balance technology for outstanding low on-resistance and lower gate charge performance. This technology is tailored to minimize conduction loss, provide superior switching performance, dv/dt rate and higher avalanche energy. Consequently SuperFETII is very well suited for the Soft switching and Hard Switching topologies like High Voltage Full Bridge and Half Bridge DC-DC, Interleaved Boost PFC, Boost PFC for HEV-EV automotive.
SuperFET II FRFET® MOSFET's optimized body diode reverse recovery performance can remove additional component and improve system reliability.

Application

- Automotive On Board Charger
- Automotive DC/DC converter for HEV

Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain to Source Voltage		600	V
V_{GS}	Gate to Source Voltage		±20	V
I_D	Drain Current - Continuous (V_{GS}=10)	T_C = 25°C	76	A
	Pulsed Drain Current		See Fig 4	A
E_{AS}	Single Pulse Avalanche Rating	(Note 1)	2025	mJ
dv/dt	MOSFET dv/dt		100	V/ns
	Peak Diode Recovery dv/dt	(Note 2)	50	
P_D	Power Dissipation		595	W
	Derate Above 25°C		4.76	W/°C
T_J, T_{STG}	Operating and Storage Temperature		-55 to + 150	°C
$R_{\theta JC}$	Maximum Thermal Resistance Junction to Case		0.21	°C/W
$R_{\theta JA}$	Maximum Thermal Resistance Junction to Ambient	(Note 3)	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FCH041N60F	FCH041N60F-F085	TO-247	-	-	30

Notes:
1: Starting T_J = 25°C, L = 18mH, I_{AS} = 15A, V_{DD} = 100V during inductor charging and V_{DD} = 0V during time in avalanche.
2: I_{SD} ≤ 38A, di/dt ≤ 200 A/us, V_{DD} ≤ 380V, starting T_J = 25°C.
3: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance, where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design, while $R_{\theta JA}$is determined by the board design. The maximum rating presented here is based on mounting on a 1 in^2 pad of 2oz copper.

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
Off Characteristics							
B_{VDSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V		600	-	-	V
I_{DSS}	Drain to Source Leakage Current	V_{DS}=600V, V_{GS} = 0V	T_J = 25°C	-	-	10	μA
			T_J = 150°C(Note 4)	-	-	1	mA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V		-	-	±100	nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA		3	4	5	V
$r_{DS(on)}$	Drain to Source On Resistance	I_D = 38A, V_{GS} = 10V	T_J = 25°C	-	36	41	mΩ
			T_J = 150°C(Note 5)	-	89	98	mΩ
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{DS} = 100V, V_{GS} = 0V, f = 1MHz		-	10900	-	pF
C_{oss}	Output Capacitance			-	360	-	pF
C_{rss}	Reverse Transfer Capacitance			-	4.4	-	pF
$C_{oss(eff)}$	Effective Output Capacitance	V_{DS} = 0V to 480V, V_{GS} = 0V		-	720	-	pF
R_g	Gate Resistance	f = 1MHz		-	0.7	-	Ω
$Q_{g(ToT)}$	Total Gate Charge	V_{DD} = 380V, I_D = 38A, V_{GS} = 10V		-	267	347	nC
$Q_{g(th)}$	Threshold Gate Charge			-	20	26	nC
Q_{gs}	Gate to Source Gate Charge			-	59	-	nC
Q_{gd}	Gate to Drain “Miller“ Charge			-	106	-	nC

Switching Characteristics

t_{on}	Turn-On Time	V_{DD} = 380V, I_D = 38A, V_{GS} = 10V, R_G = 4.7Ω	-		242	ns
$t_{d(on)}$	Turn-On Delay Time		-	63	-	ns
t_r	Rise Time		-	48	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	214	-	ns
t_f	Fall Time		-	33	-	ns
t_{off}	Turn-Off Time		-	-	514	ns

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Voltage	I_{SD} = 38A, V_{GS} = 0V	-	-	1.2	V
T_{rr}	Reverse Recovery Time	I_F = 38A, dI_{SD}/dt = 100A/μs, V_{DD} = 480V	-	219	-	ns
Q_{rr}	Reverse Recovery Charge		-	1.9	-	μC

Notes:

4: The maximum value is specified by design at T_J = 150°C. Product is not tested to this condition in production.

Typical Characteristics

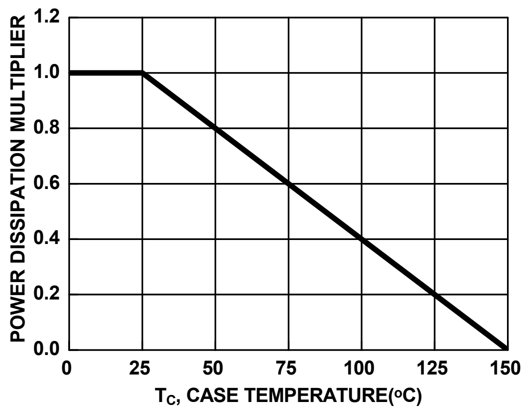


Figure 1. Normalized Power Dissipation vs. Case Temperature

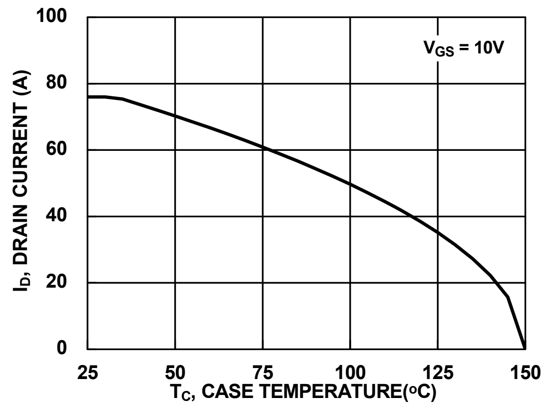


Figure 2. Maximum Continuous Drain Current vs. Case Temperature

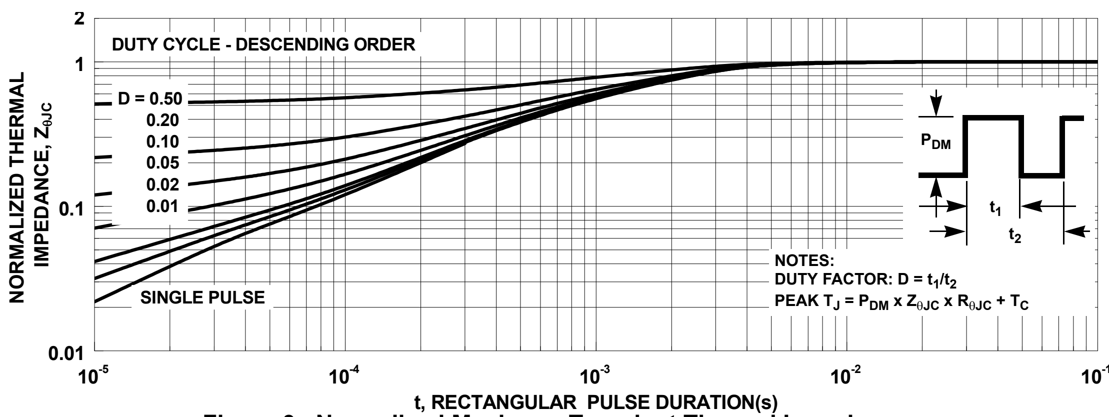


Figure 3. Normalized Maximum Transient Thermal Impedance

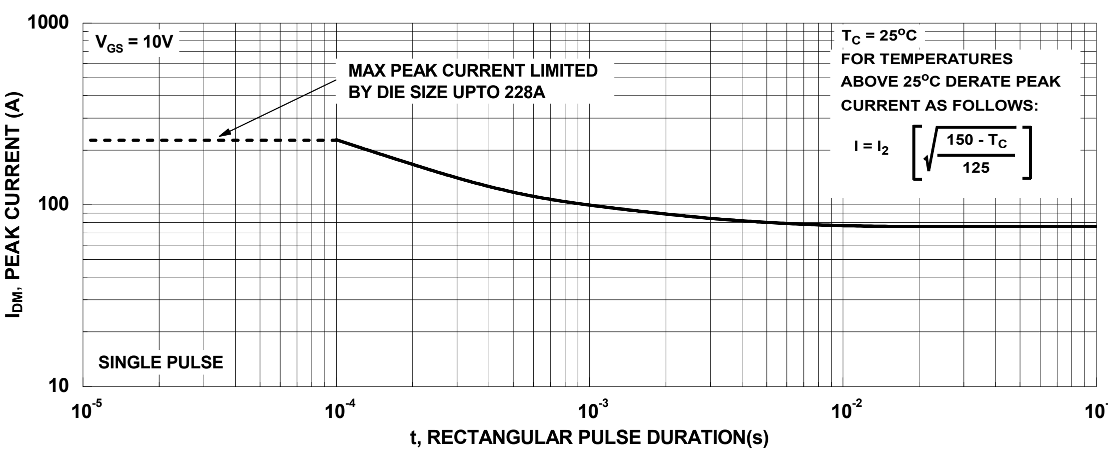


Figure 4. Peak Current Capability

Typical Characteristics

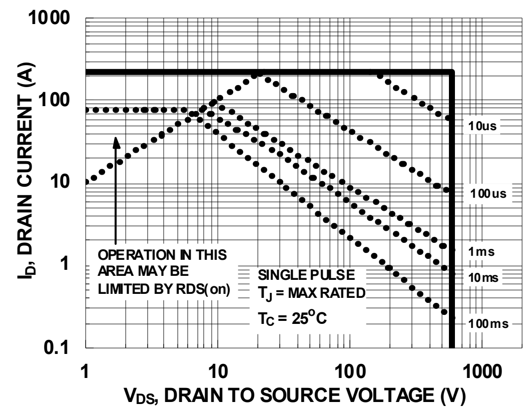


Figure 5. Forward Bias Safe Operating Area

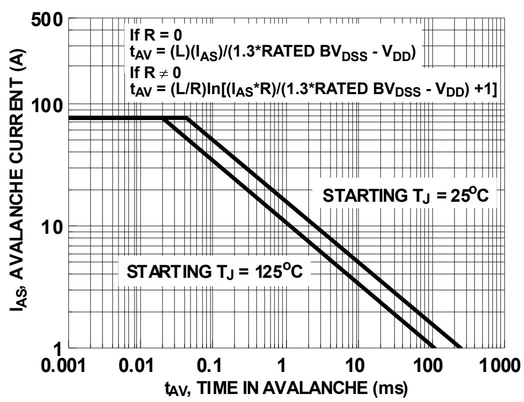


Figure 6. Unclamped Inductive Switching Capability

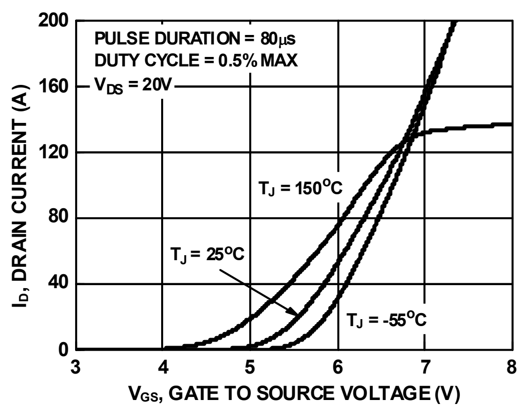


Figure 7. Transfer Characteristics

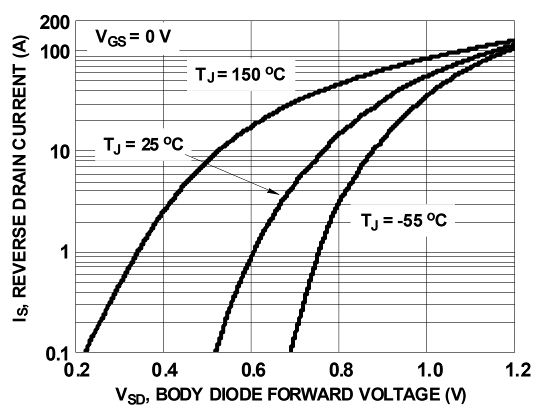


Figure 8. Forward Diode Characteristics

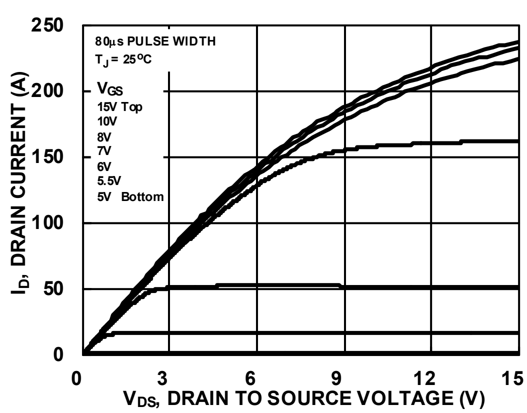


Figure 9. Saturation Characteristics

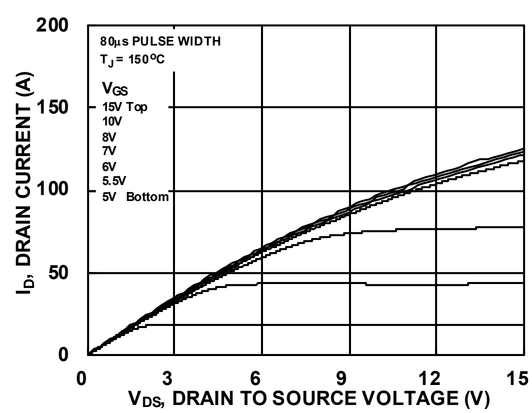


Figure 10. Saturation Characteristics

Typical Characteristics

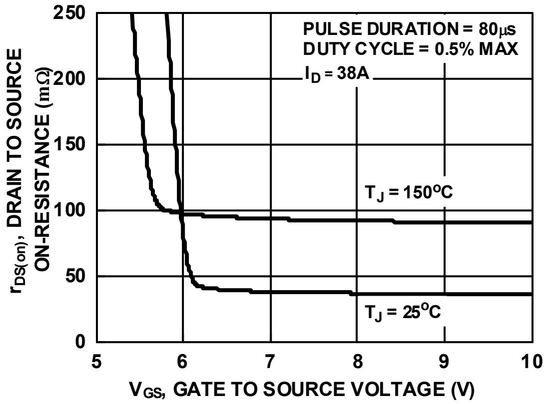


Figure 11. R_{DSON} vs. Gate Voltage

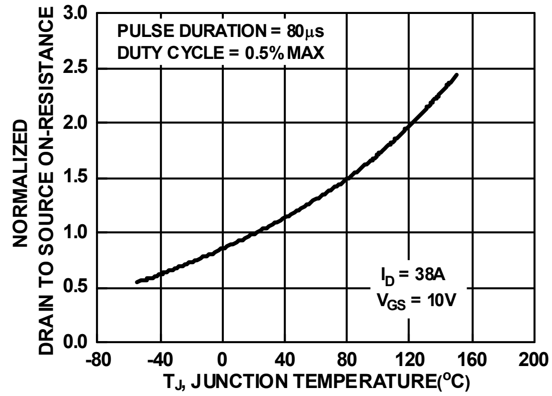


Figure 12. Normalized R_{DSON} vs. Junction Temperature

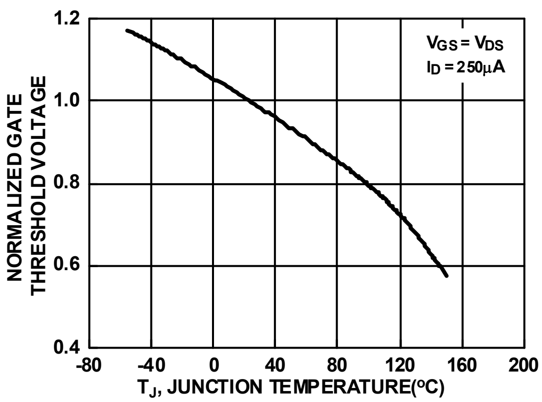


Figure 13. Normalized Gate Threshold Voltage vs. Temperature

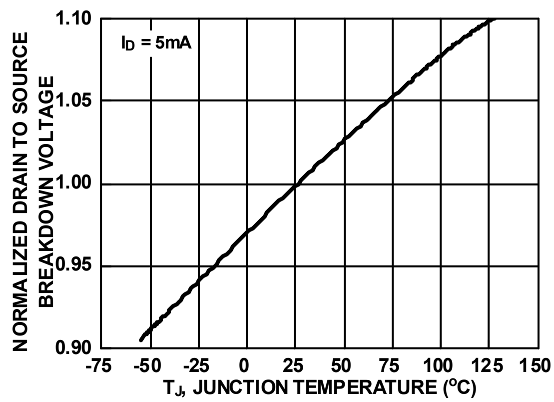


Figure 14. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature

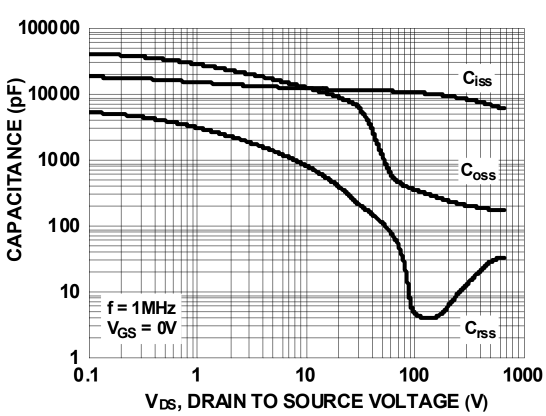


Figure 15. Capacitance vs. Drain to Source Voltage

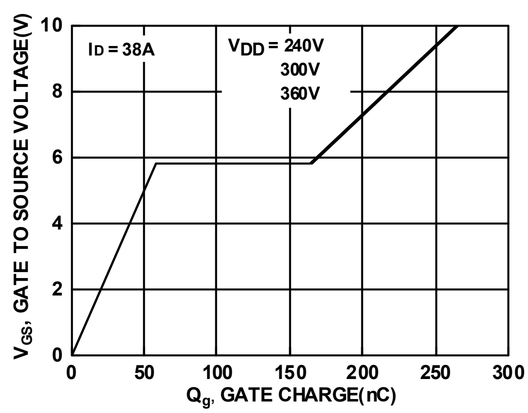


Figure 16. Gate Charge vs. Gate to Source Voltage

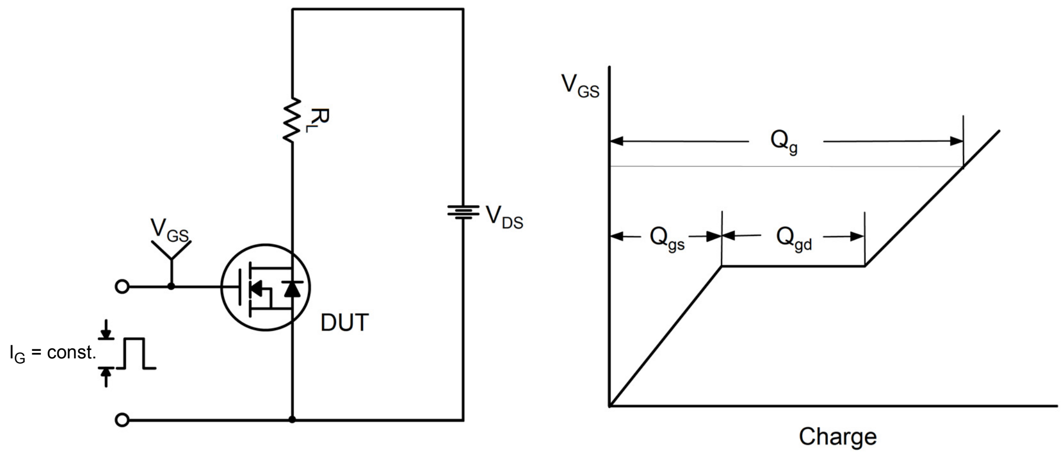


Figure 17. Gate Charge Test Circuit & Waveform

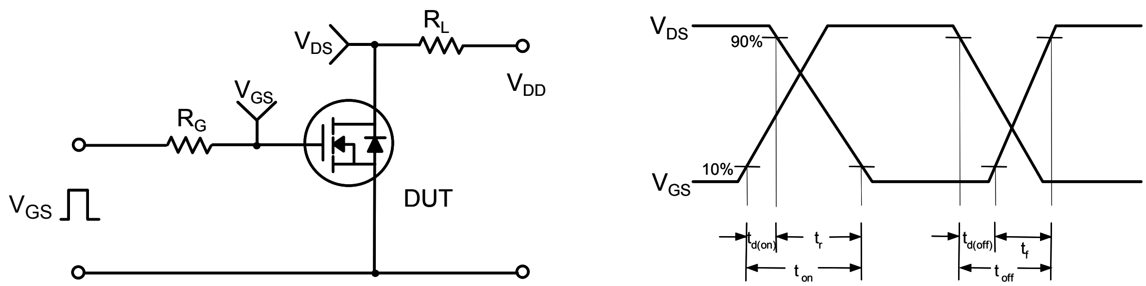


Figure 18. Resistive Switching Test Circuit & Waveforms

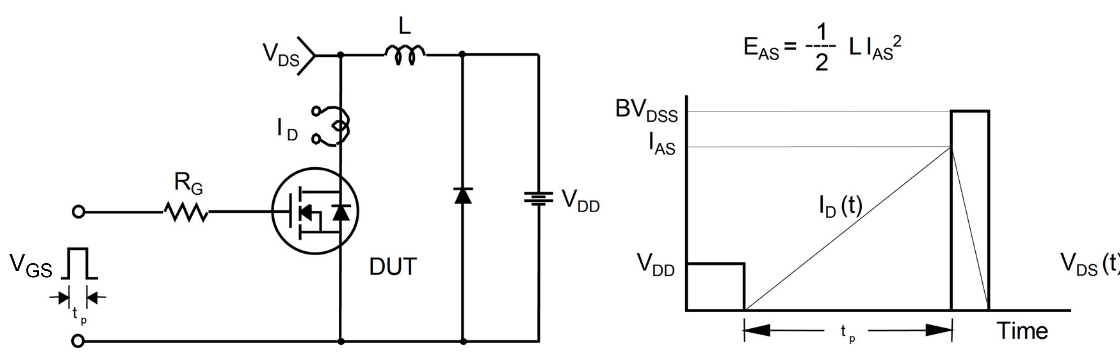


Figure 19. Unclamped Inductive Switching Test Circuit & Waveforms

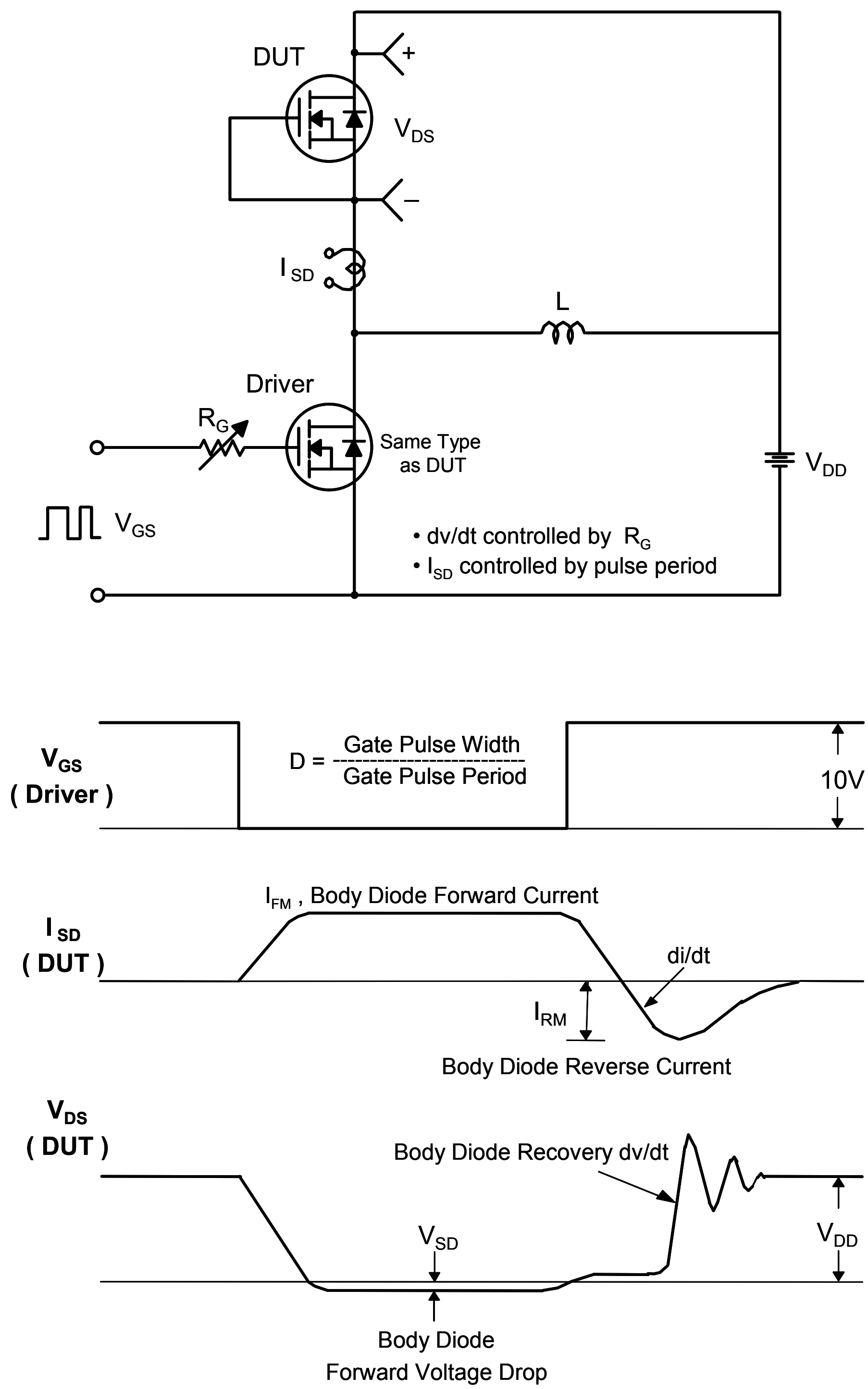


Figure 20. Peak Diode Recovery dv/dt Test Circuit & Waveforms

PUBLICATION ORDERING INFORMATION

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