

FDD850N10LD

BoostPak (N-Channel PowerTrench® MOSFET + Diode)

100 V, 15.3 A, 75 mΩ

Features

- $R_{DS(on)} = 61\text{ m}\Omega$ (Typ.) @ $V_{GS} = 10\text{ V}$, $I_D = 12\text{ A}$
- $R_{DS(on)} = 64\text{ m}\Omega$ (Typ.) @ $V_{GS} = 5.0\text{ V}$, $I_D = 12\text{ A}$
- Low Gate Charge (Typ. 22.2 nC)
- Low C_{RSS} (Typ. 42 pF)
- Fast Switching
- 100% Avalanche Tested
- Improved dv/dt Capability
- RoHS Compliant

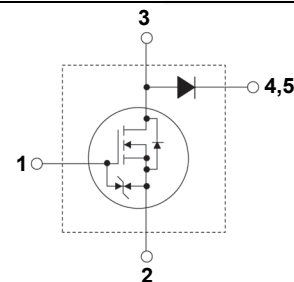
Description

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

The NP diode is hyperfast rectifier with low forward voltage drop and excellent switching performance.

Applications

- LED Monitor Backlight
- LED TV Backlight
- LED Lighting
- Consumer Appliances, DC-DC converter (Step up & Step down)



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

Symbol	Parameter		FDD850N10LD	Unit
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		± 20	V
I_D	Drain Current	- Continuous ($T_C = 25^\circ\text{C}$)	15.3	A
		- Continuous ($T_C = 100^\circ\text{C}$)	9.7	
I_{DM}	Drain Current	- Pulsed (Note 1)	46	A
E_{AS}	Single Pulsed Avalanche Energy (Note 2)		41	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		6.0	V/ns
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	42	W
		- Derate Above 25°C	0.33	
$I_F(AV)$	Diode Average Rectified Forward Current ($T_C = 138^\circ\text{C}$)		5	A
I_{FSM}	Diode Non-repetitive Peak Surge Current 60 Hz Single Half-Sine Wave		50	A
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FDD850N10LD	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for MOSFET, Max.	3.0	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case for Diode, Max.	2.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	87	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FDD850N10LD	850N10LD	TO-252 5L	Tape and Reel	13"	16 mm	2500 units

Electrical Characteristics of the MOSFET $T_C = 25^\circ\text{C}$ unless otherwise noted.

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

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	100	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C	-	0.1	-	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\ \text{V}$, $V_{GS} = 0\ \text{V}$	-	-	1	μA
		$V_{DS} = 80\ \text{V}$, $T_C = 125^\circ\text{C}$	-	-	500	
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	$V_{GS} = V_{DS}$, $I_D = 250\ \mu\text{A}$	1.0	-	2.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}$, $I_D = 12\ \text{A}$	-	61	75	$\text{m}\Omega$
		$V_{GS} = 5\ \text{V}$, $I_D = 12\ \text{A}$	-	64	96	
g_{FS}	Forward Transconductance	$V_{DS} = 10\ \text{V}$, $I_D = 15.3\ \text{A}$	-	31	-	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\ \text{V}$, $V_{GS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	-	1100	1465	pF
C_{oss}	Output Capacitance		-	80	105	pF
C_{rss}	Reverse Transfer Capacitance		-	42	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	$V_{DS} = 80\ \text{V}$, $I_D = 15.3\ \text{A}$ (Note 4)	-	22.2	28.9	nC
$Q_{g(tot)}$	Total Gate Charge at 5V		-	12.3	16.0	nC
Q_{gs}	Gate to Source Gate Charge		-	3.0	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	5.7	-	nC
ESR	Equivalent Series Resistance (G-S)		-	1.75	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\ \text{V}$, $I_D = 15.3\ \text{A}$, $V_{GS} = 5\ \text{V}$, $R_G = 4.7\ \Omega$ (Note 4)	-	17	44	ns
t_r	Turn-On Rise Time		-	21	52	ns
$t_{d(off)}$	Turn-Off Delay Time		-	27	64	ns
t_f	Turn-Off Fall Time		-	8	26	ns

Drain-Source Diode Characteristics

I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	15.3	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	46	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} = 0 V, I _{SD} = 12 A	-	-	1.3	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _{SD} = 15.3 A, V _{DS} = 80 V, dI _F /dt = 100 A/μs	-	38	-	ns
Q _{rr}	Reverse Recovery Charge		-	50	-	nC

Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2. $L = 1\ \text{mH}$, $I_{AS} = 9.1\ \text{A}$, $R_G = 25\ \Omega$, starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq 15.3\ \text{A}$, $di/dt \leq 200\ \text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature typical characteristics.

Electrical Characteristics of the Diode $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_R	DC Blocking Voltage	$I_R = 250\ \mu\text{A}$	150	-	-	V
V_{FM}	Maximum Instantaneous Forward Voltage	$I_F = 5\ \text{A}$	$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ 2.5	$T_C = 25^\circ\text{C}$ V
			$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ 0.9	$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ V
I_{RM}	Maximum Instantaneous Reverse Current @ rated V_R		$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ 50	$T_C = 25^\circ\text{C}$ uA
			$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ 1000	$T_C = 125^\circ\text{C}$ uA
t_{rr}	Diode Reverse Recovery Time	$I_F = 5\ \text{A}$, $di/dt = 200\ \text{A}/\mu\text{s}$	$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ 10.7	$T_C = 25^\circ\text{C}$ 22	$T_C = 25^\circ\text{C}$ ns
			$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ 14.5	$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ ns
I_{rr}	Diode Peak Reverse Recovery Current		$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ 2.2	$T_C = 25^\circ\text{C}$ 5	$T_C = 25^\circ\text{C}$ A
			$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ 3.4	$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ A
			$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ 11.7	$T_C = 25^\circ\text{C}$ -	$T_C = 25^\circ\text{C}$ nC
Q_{rr}	Diode Reverse Recovery Charge		$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ 24.7	$T_C = 125^\circ\text{C}$ -	$T_C = 125^\circ\text{C}$ nC
W_{AVL}	Avalanche Energy ($L = 40\ \text{mH}$)		10	-	-	mJ

Typical Performance Characteristics - MOSFET

Figure 1. On-Region Characteristics

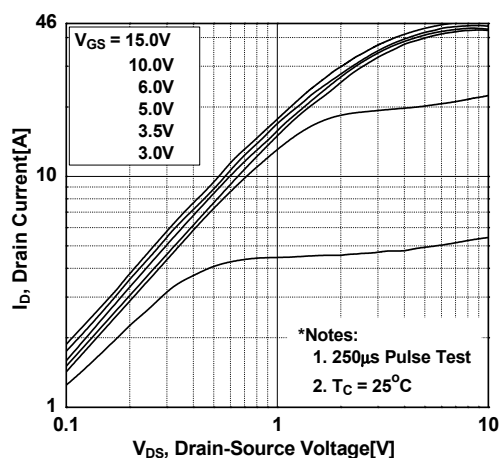


Figure 2. Transfer Characteristics

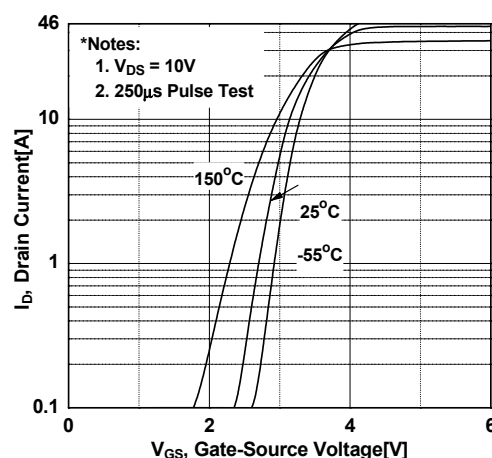


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

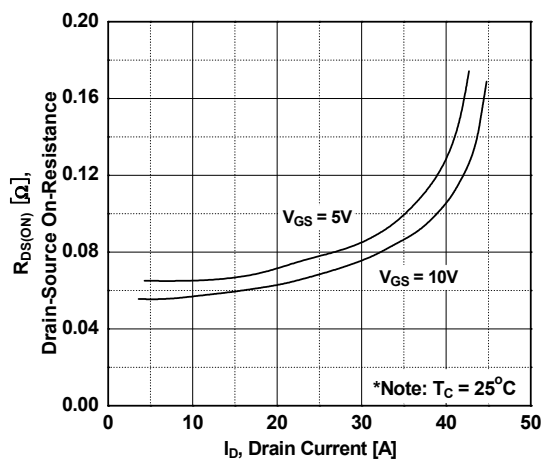


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

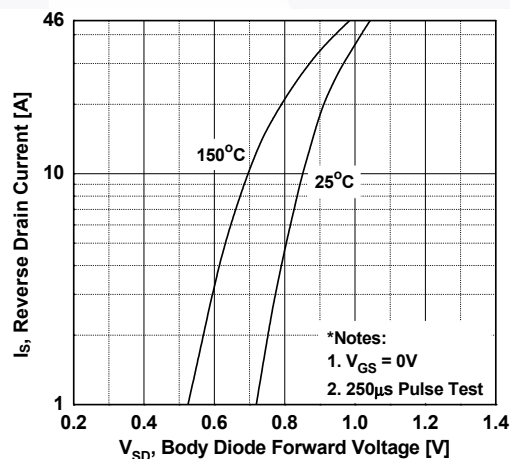


Figure 5. Capacitance Characteristics

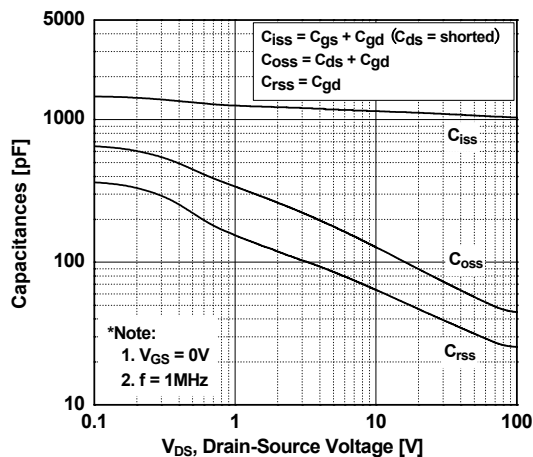
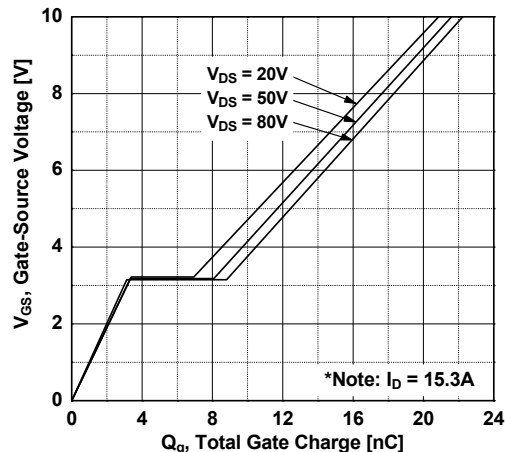


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics - MOSFET (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

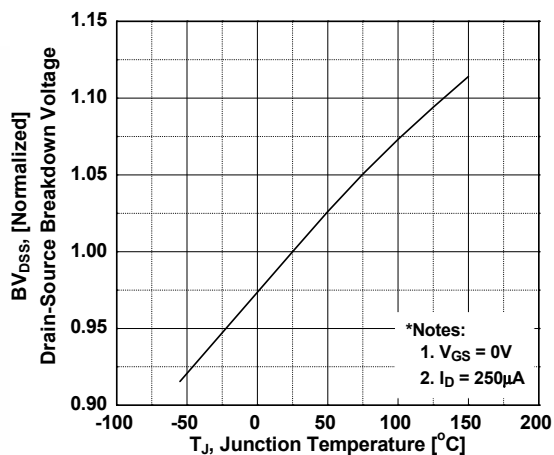


Figure 8. On-Resistance Variation vs. Temperature

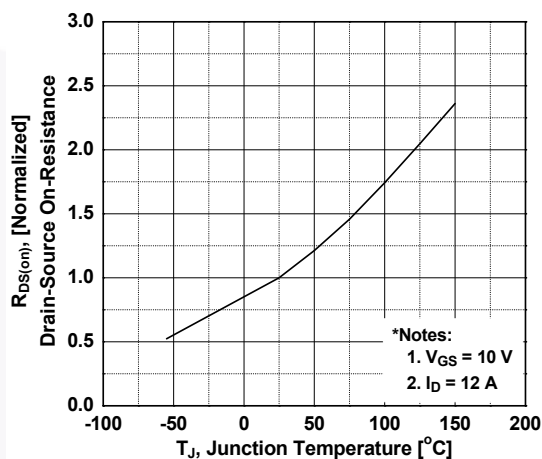


Figure 9. Maximum Safe Operating Area

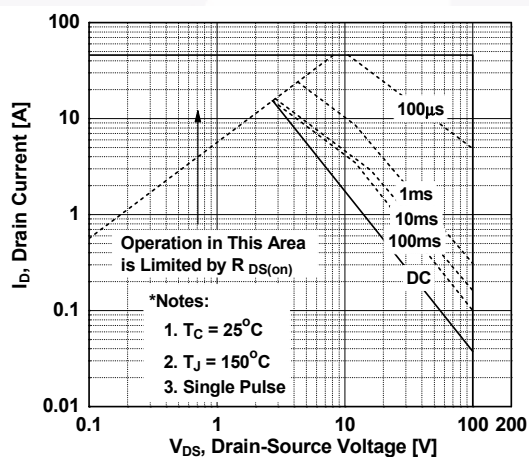
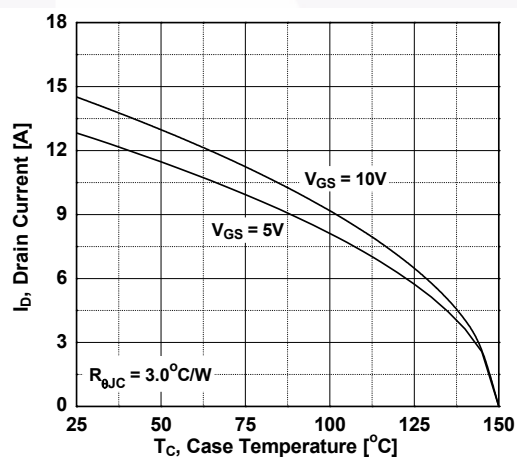


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics - Diode (Continued)

Figure 11. Diode Forward Voltage Drop vs. Forward Current

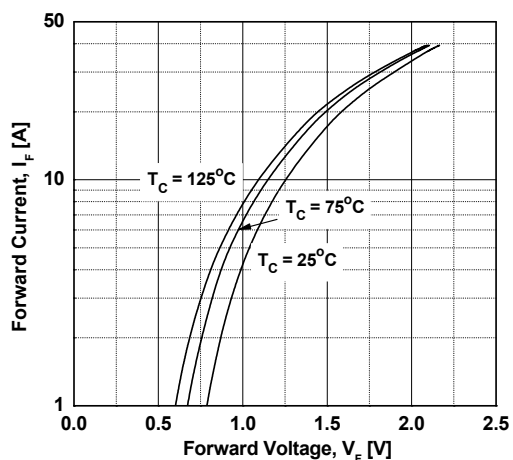


Figure 12. Diode Reverse Current vs. Reverse Voltage

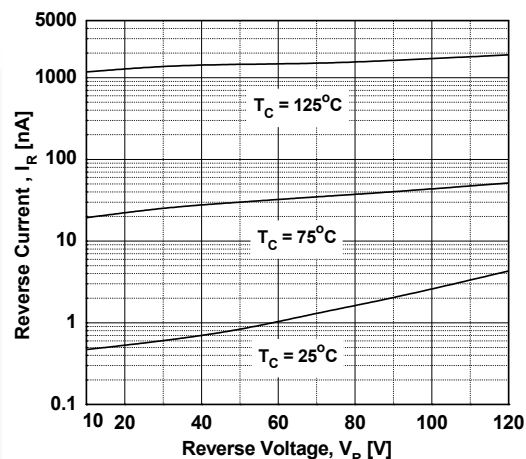


Figure 13. Diode Junction Capacitance

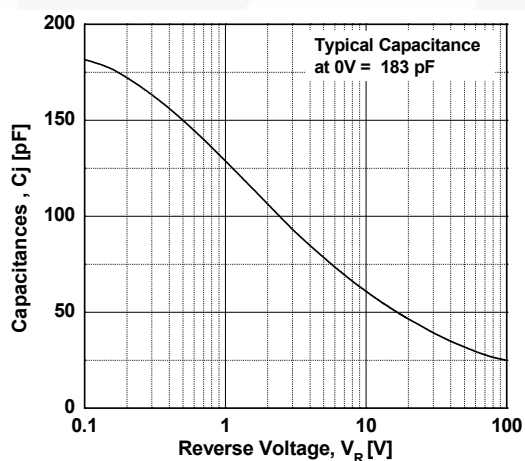


Figure 14. Diode Reverse Recovery Time vs. di/dt

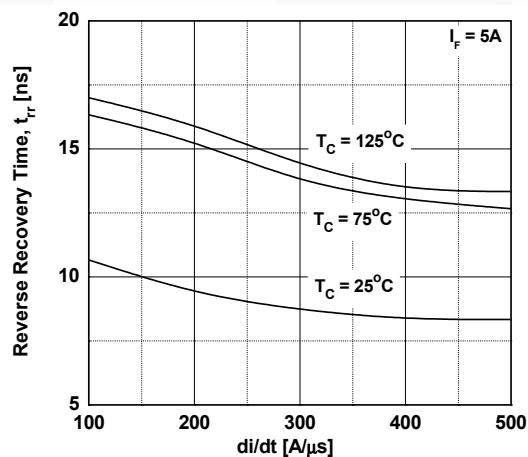


Figure 15. Diode Reverse Recovery Current vs. di/dt

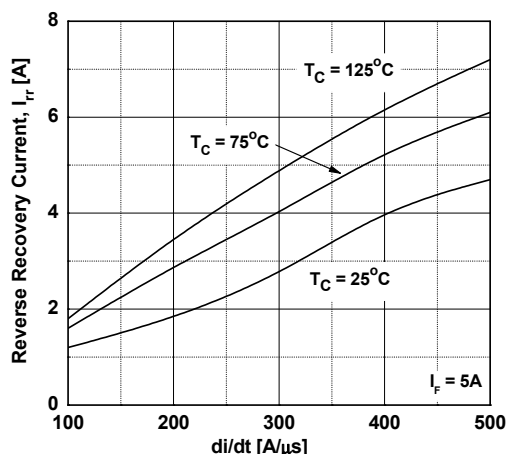
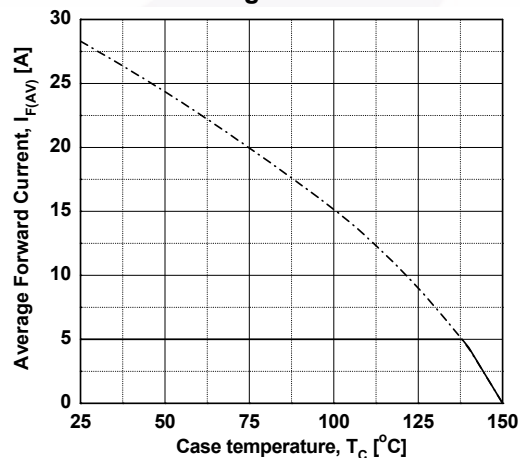


Figure 16. Diode Forward Current Derating Curve



Typical Performance Characteristics (Continued)

Figure 17. Transient Thermal Response Curve of MOSFET

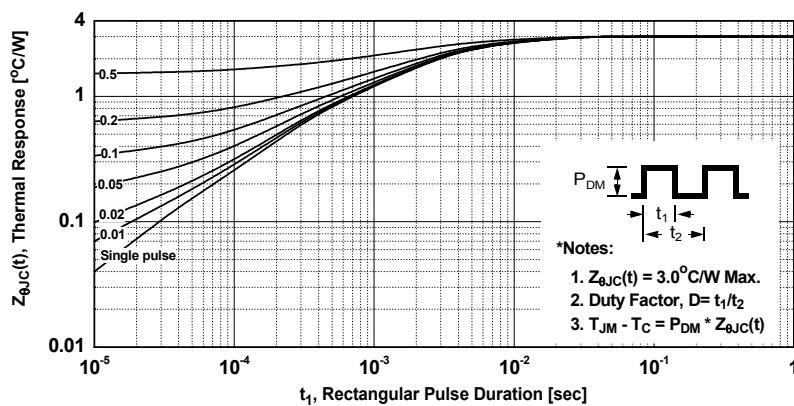
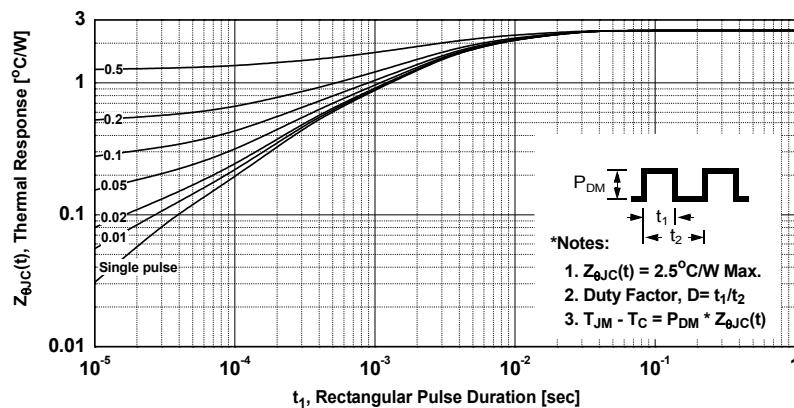


Figure 18. Transient Thermal Response Curve of Diode



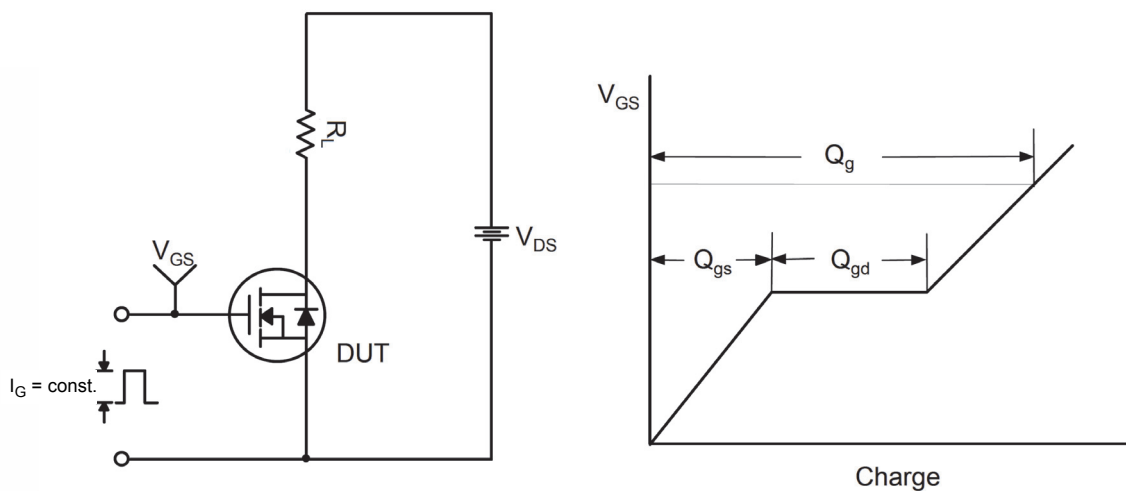


Figure 19. Gate Charge Test Circuit & Waveform

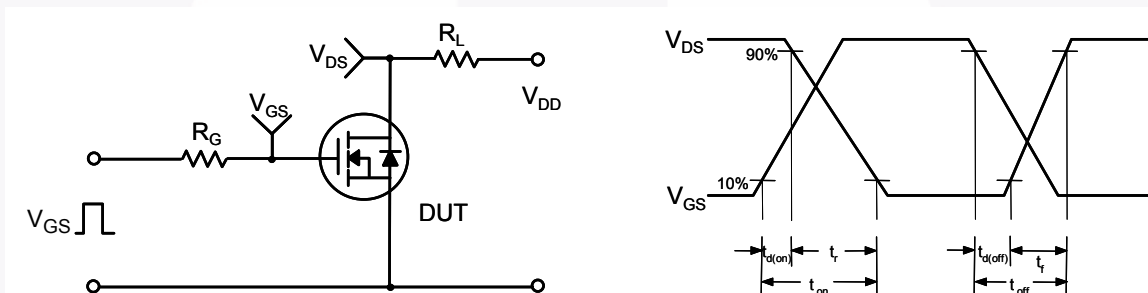


Figure 20. Resistive Switching Test Circuit & Waveforms

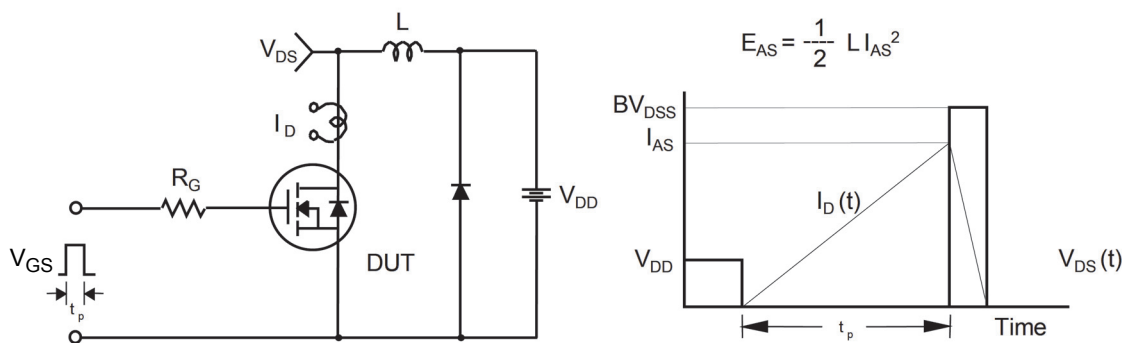


Figure 21. Unclamped Inductive Switching Test Circuit & Waveforms

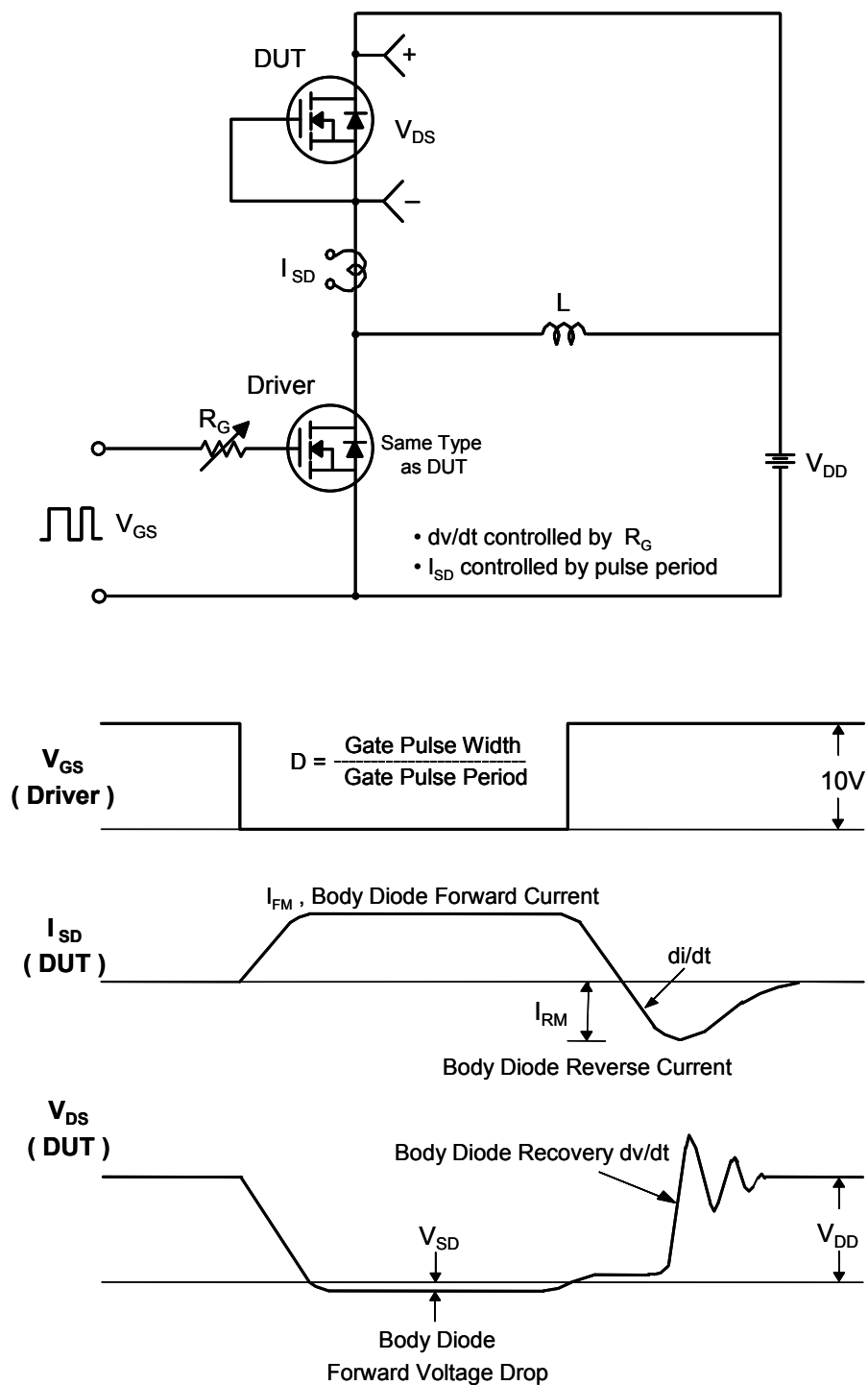


Figure 22. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

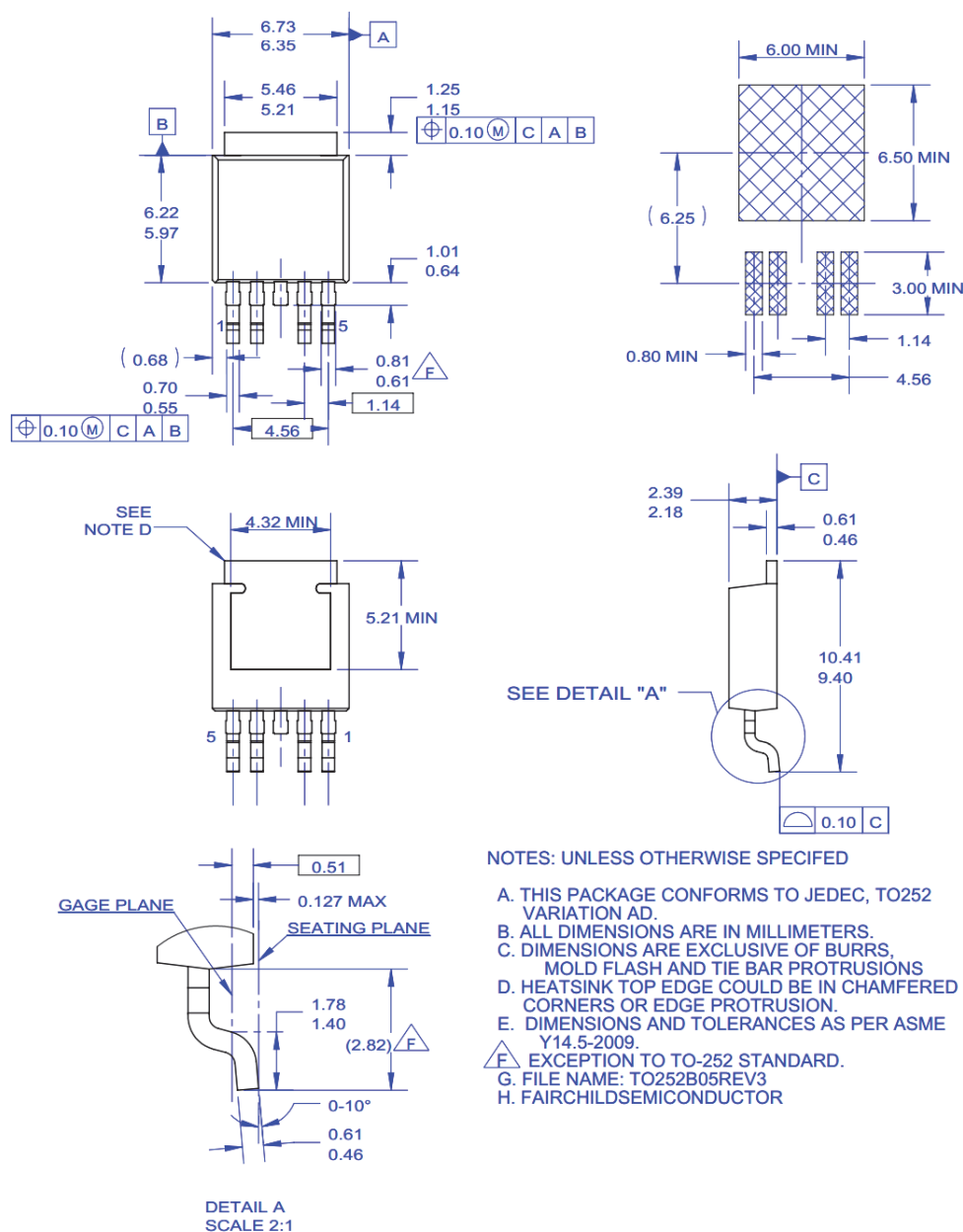


Figure 23. TO252 (D-PAK), Molded, 5-Lead, Option AD

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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
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