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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

November 2013

FDD850N10LD

BoostPak (N-Channel PowerTrench® MOSFET + Diode)

100 V, 15.3 A, 75 mΩ

Features

- $R_{DS(on)}$ = 61 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 12 A
- $R_{DS(on)}$ = 64 mΩ (Typ.) @ V_{GS} = 5.0 V, I_D = 12 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

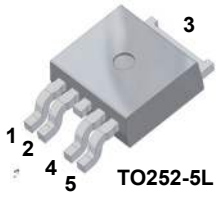
Description

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.

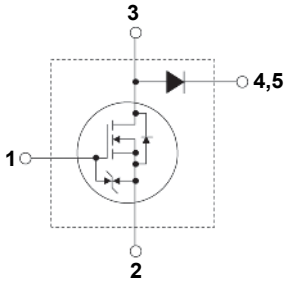
Applications

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



TO252-5L

1. Gate
2. Source
3. Drain / Anode
4. Cathode
5. Cathode



Maximum Ratings T_C = 25°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°C)		15.3	A
		- Continuous (T_C = 100°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°C)		42	W
		- Derate Above 25°C		0.33	W/°C
I_F(AV)	Diode Average Rectified Forward Current (T_C = 138°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	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds			300	°C

Thermal Characteristics

Symbol	Parameter	FDD850N10LD	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case for MOSFET, Max.	3.0	°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 $T_C = 25^oC$ 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	100	-	-	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced to 25°C	-	0.1	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	-	-	1	μA
		V_{DS} = 80 V, T_C = 125°C	-	-	500	
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	1.0	-	2.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 12 A	-	61	75	mΩ
		V_{GS} = 5 V, I_D =12 A	-	64	96	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 15.3 A	-	31	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 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 V, I_D = 15.3 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)	f = 1 MHz	-	1.75	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 50 V, I_D = 15.3 A, V_{GS} = 5 V, R_G = 4.7 Ω (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 mH, I_{AS} = 9.1 A, R_G = 25 Ω, starting T_J = 25°C.
3. I_{SD} ≤ 15.3 A, di/dt ≤ 200 A/μs, V_{DD} ≤ BV_{DSS}, starting T_J = 25°C.
4. Essentially independent of operating temperature typical characteristics.

Electrical Characteristics of the Diode $T_C = 25^oC$ unless otherwise noted.

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

Typical Performance Characteristics - MOSFET

Figure 1. On-Region Characteristics

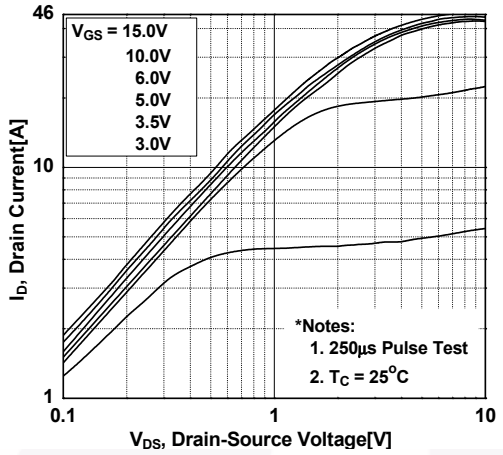


Figure 2. Transfer Characteristics

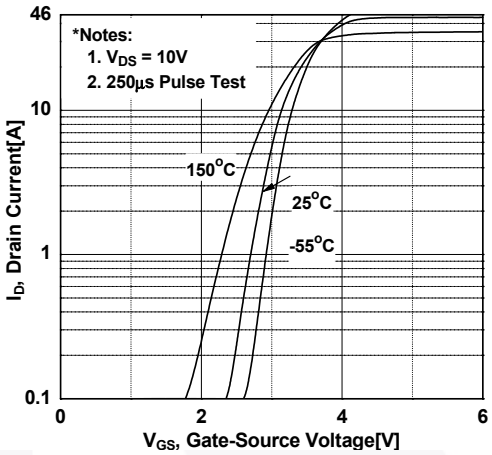


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

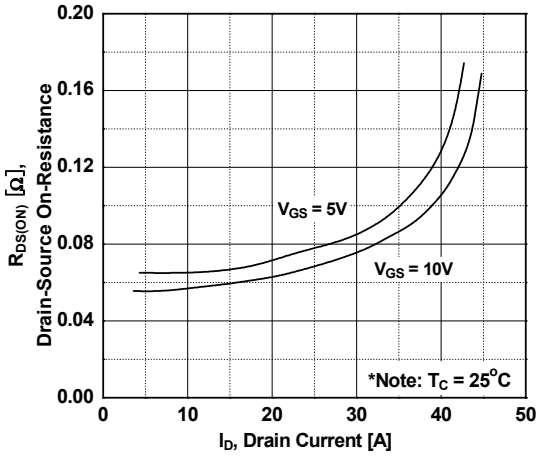


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

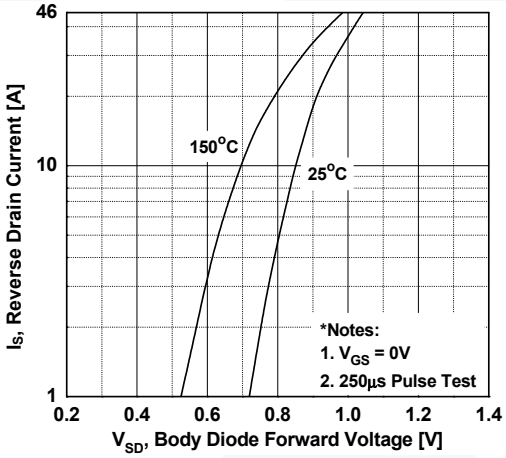


Figure 5. Capacitance Characteristics

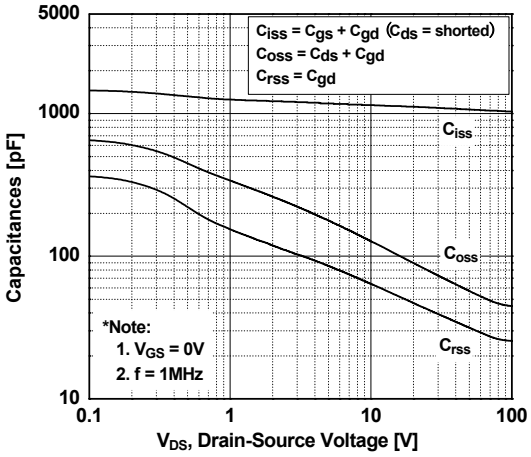
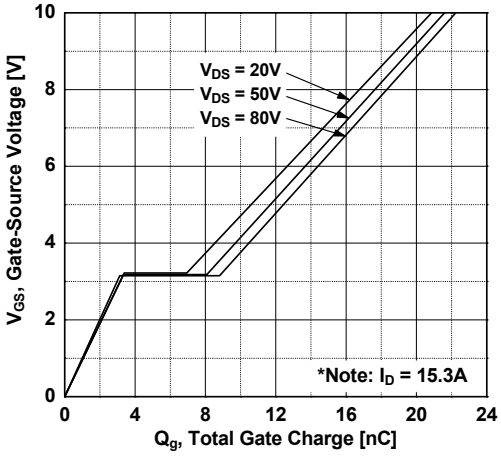


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics - MOSFET (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

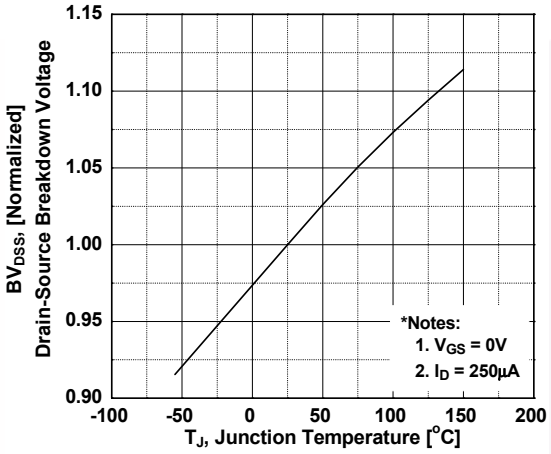


Figure 8. On-Resistance Variation vs. Temperature

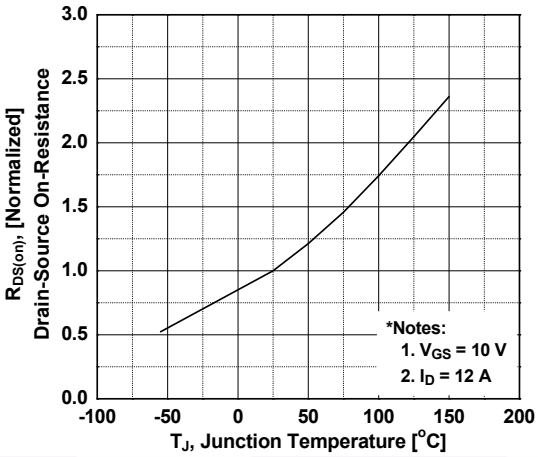


Figure 9. Maximum Safe Operating Area

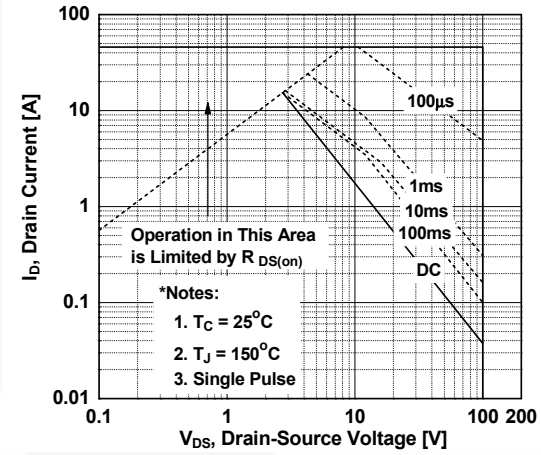
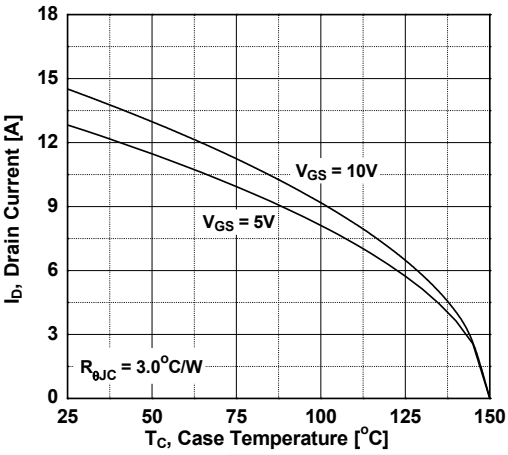


Figure 10. Maximum Drain Current vs. Case Temperature



Typical Performance Characteristics - Diode (Continued)

Figure 11. Diode Forward Voltage Drop vs. Forward Current

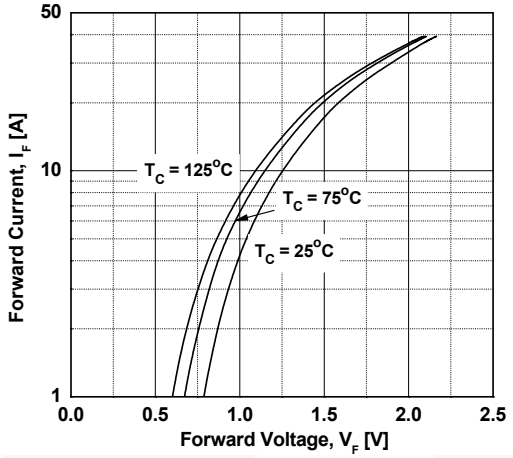


Figure 12. Diode Reverse Current vs. Reverse Voltage

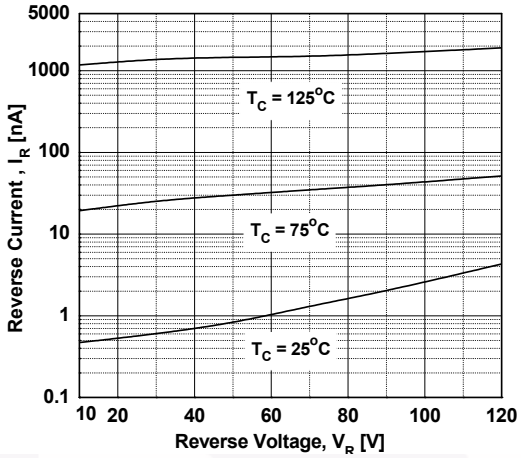


Figure 13. Diode Junction Capacitance

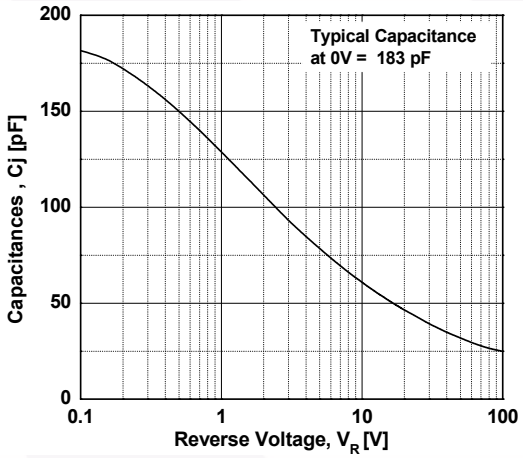


Figure 14. Diode Reverse Recovery Time vs. di/dt

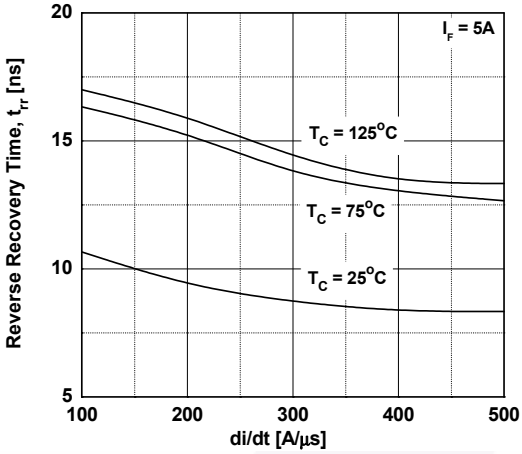


Figure 15. Diode Reverse Recovery Current vs. di/dt

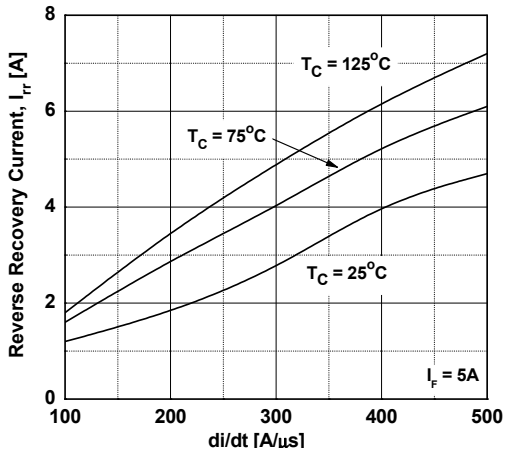
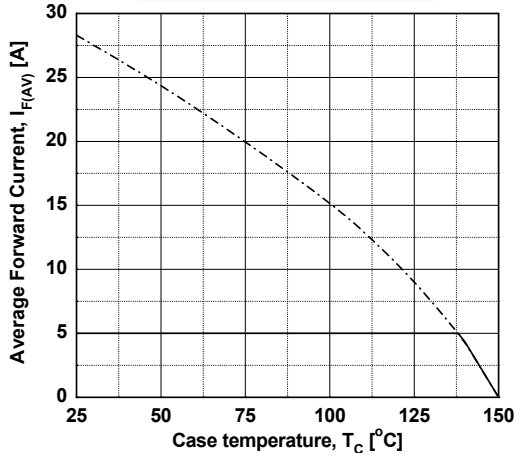


Figure 16. Diode Forward Current Derating Curve



Typical Performance Characteristics (Continued)

Figure 17. Transient Thermal Response Curve of MOSFET

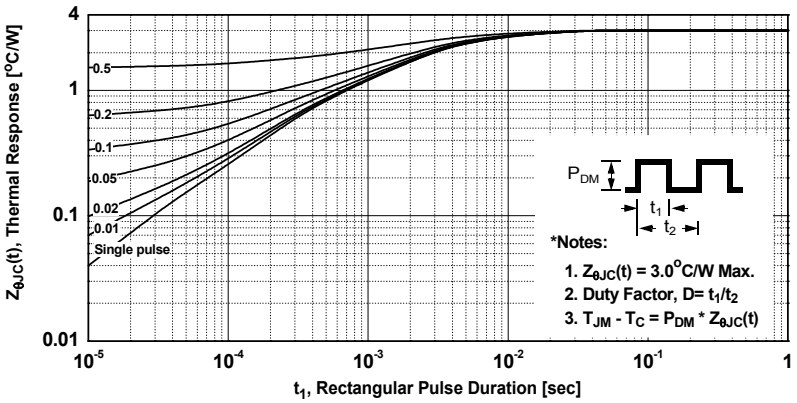
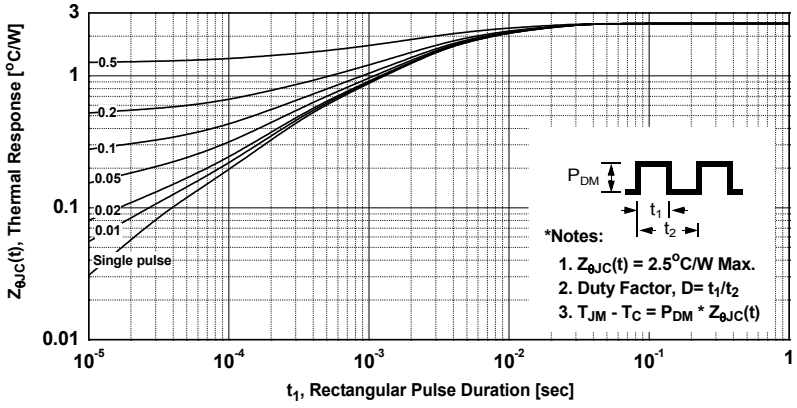


Figure 18. Transient Thermal Response Curve of Diode



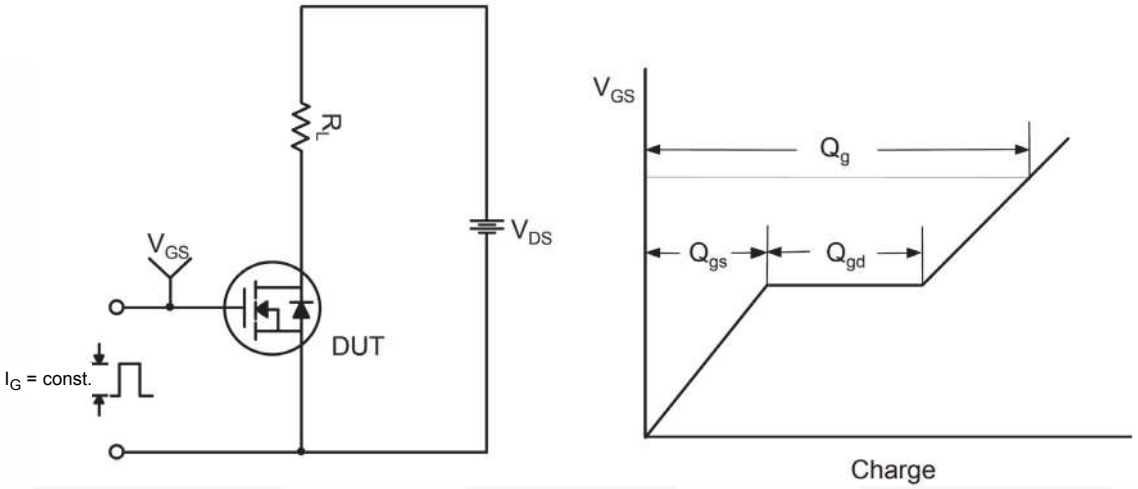


Figure 19. Gate Charge Test Circuit & Waveform

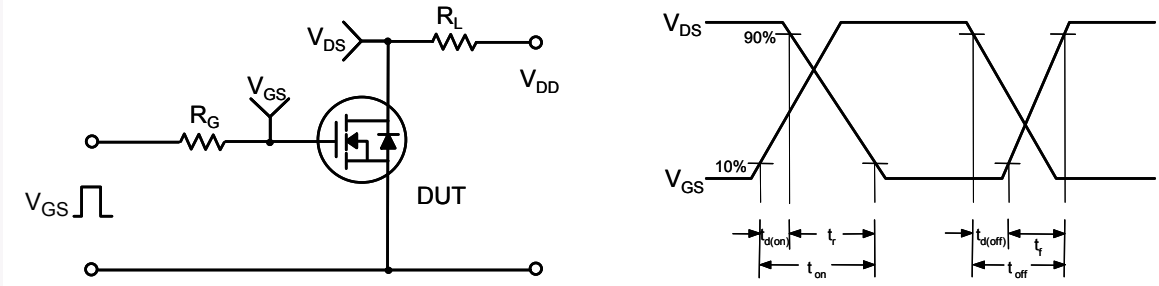


Figure 20. Resistive Switching Test Circuit & Waveforms

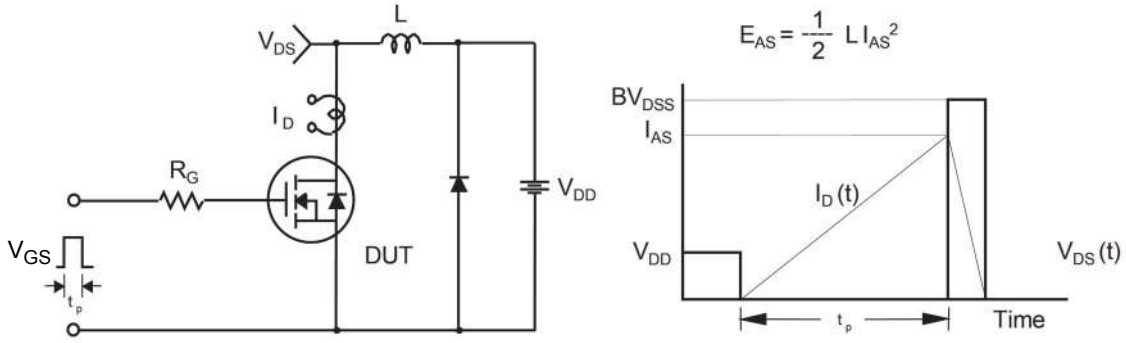


Figure 21. Unclamped Inductive Switching Test Circuit & Waveforms

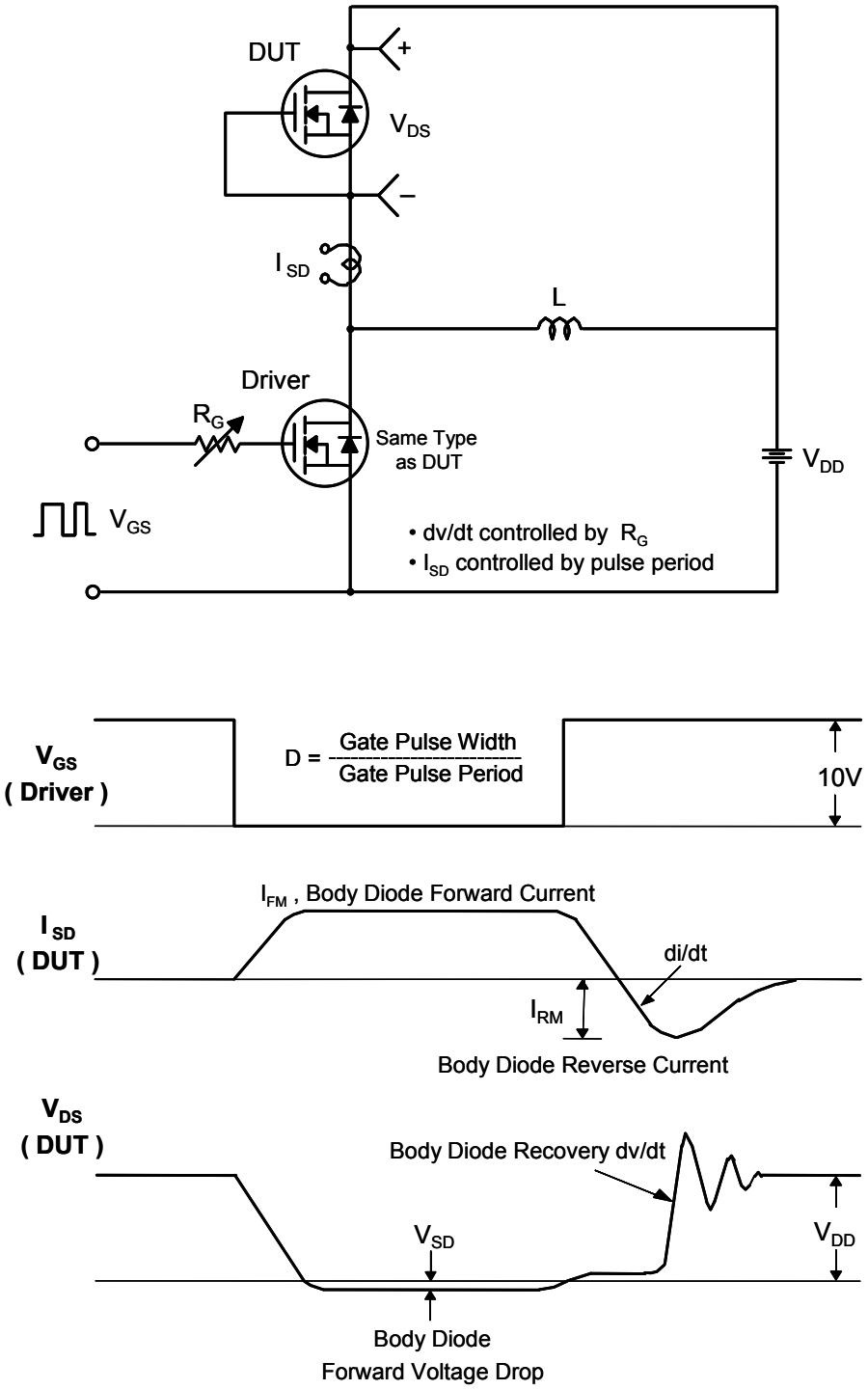


Figure 22. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

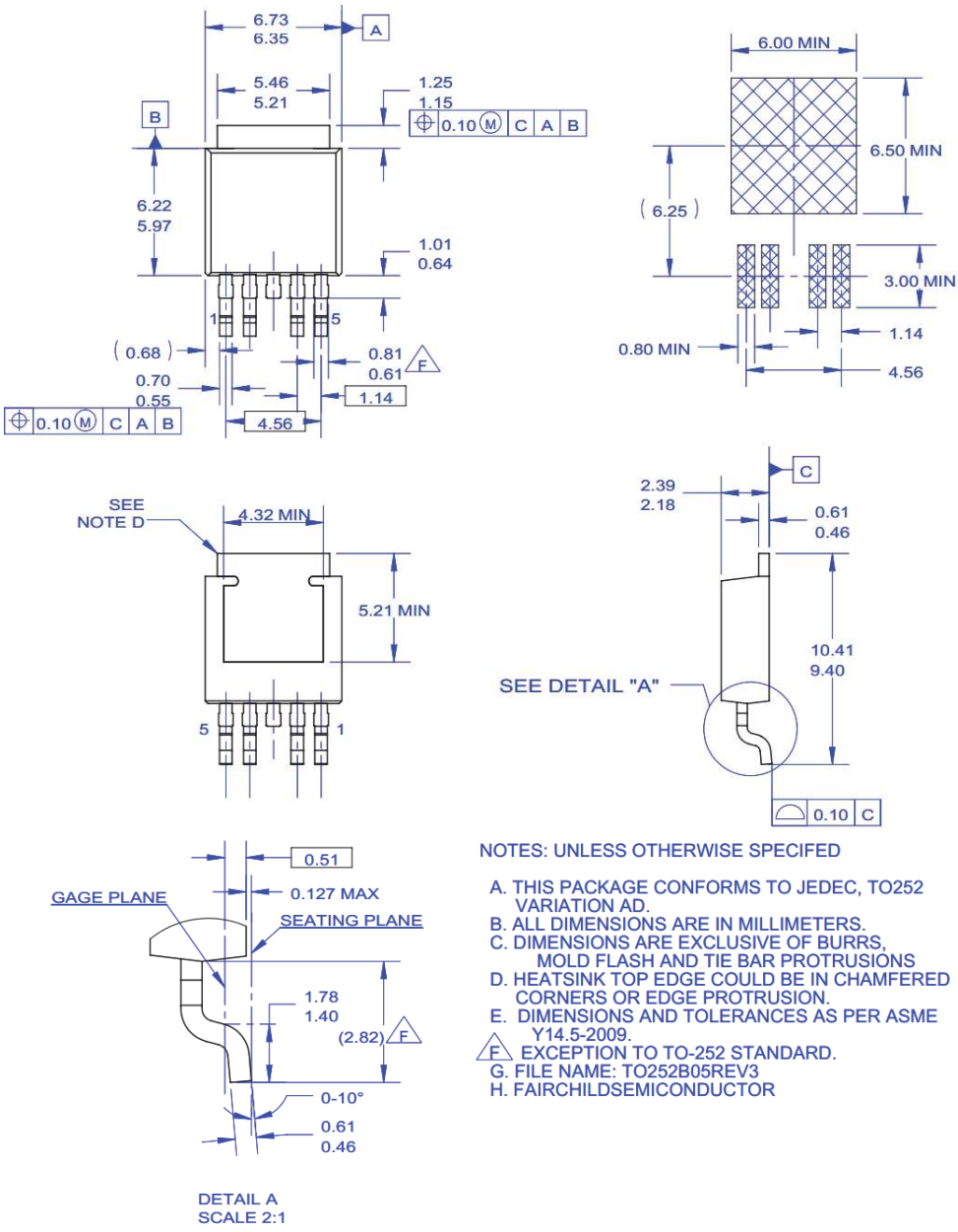


Figure 23. TO252 (D-PAK), Molded, 5-Lead, Option AD

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I66

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