FAIRCHILD SEMICONDUCTOR®

March 2010

FDD050N03B

N-Channel PowerTrench® MOSFET

30V, 90A, 5mΩ

Features

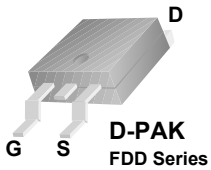
- $R_{DS(on)}$ = 3.7mΩ (Typ.)@ V_{GS} = 10V, I_D = 25A
- Fast Switching Speed
- Low gate charge
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

Description

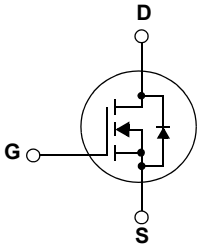
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

- DC to DC Convertors / Synchronous Rectification



D-PAK
FDD Series



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FDD050N03B	Units
V_{DSS}	Drain to Source Voltage		30	V
V_{GSS}	Gate to Source Voltage		±16	V
I_D	Drain Current	- Continuous (T_C = 25°C, Silicon Limited)	90*	A
		- Continuous (T_C = 100°C, Silicon Limited)	63*	
		- Continuous (T_C = 25°C, Package Limited)	50	
I_{DM}	Drain Current	- Pulsed (Note 1)	360	A
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	72	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	2	V/ns
P_D	Power Dissipation	(T_C = 25°C)	65	W
		- Derate above 25°C	0.43	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
T_L	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds		300	°C

*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 50A.

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case		2.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 6)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD050N03B	FDD050N03B	D-PAK	330mm	16mm	2500

Electrical Characteristics $T_C = 25^oC$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V, T_C = 25°C	30	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	13	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V, V_{GS} = 0V	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±16V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1.25	2.0	3.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 25A	-	3.7	5.0	mΩ
		V_{GS} = 4.5V, I_D = 15A	-	5.2	8.1	
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 50A (Note 4)	-	169	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz	-	2160	2875	pF
C_{oss}	Output Capacitance		-	805	1070	pF
C_{rss}	Reverse Transfer Capacitance		-	85	130	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DD} = 15V, I_D = 50A, V_{GS} = 10V (Note 4,5)	-	33	43	nC
Q_{gs}	Gate to Source Gate Charge		-	7.8	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	3.8	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	4.6	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 50A, V_{GS} = 10V, R_{GEN} = 4.7Ω (Note 4,5)	-	14.5	39	ns
t_r	Turn-On Rise Time		-	4.5	18	ns
$t_{d(off)}$	Turn-Off Delay Time		-	30	70	ns
t_f	Turn-Off Fall Time		-	4.5	19	ns
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	90*	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	360	A
V_{SD}	Drain to Source Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 50A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 50A, dI_F/dt = 100A/μs (Note 4)	-	33	-	ns
Q_{rr}	Reverse Recovery Charge		-	19	-	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L = 1mH, I_{AS} = 12A, V_{DD} = 27V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 50A, di/dt ≤ 200A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J = 25°C
4. Pulse Test: Pulse width ≤ 300μs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics
6. When mounted on a 1 in^2 pad of 2 oz copper

Typical Performance Characteristics

Figure 1. On-Region Characteristics

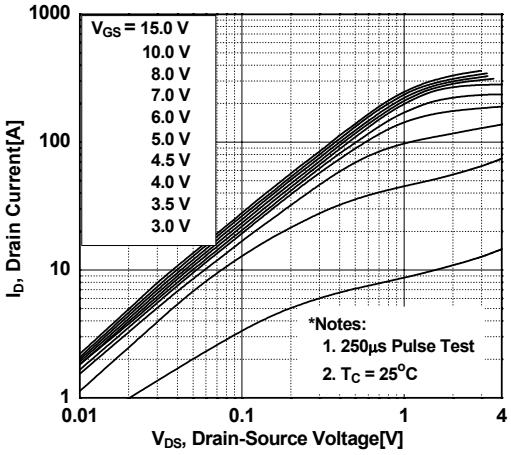


Figure 2. Transfer Characteristics

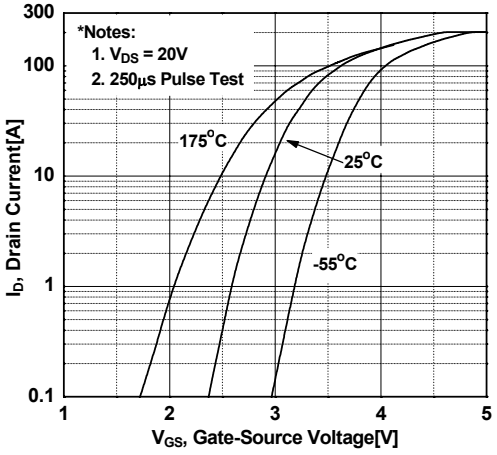


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

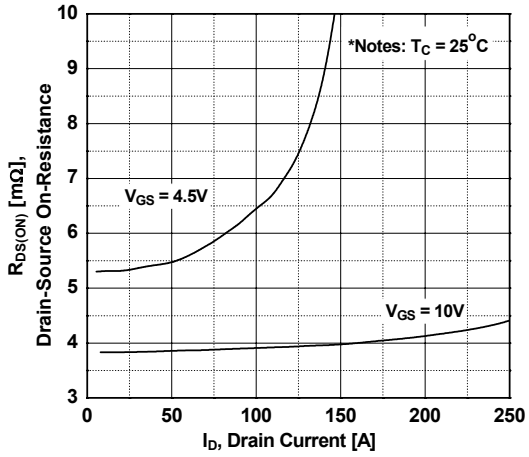


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

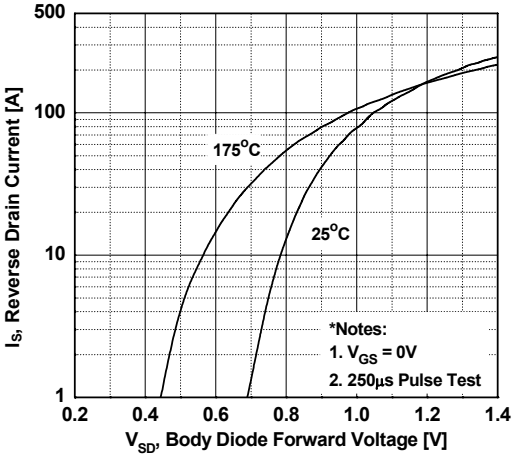


Figure 5. Capacitance Characteristics

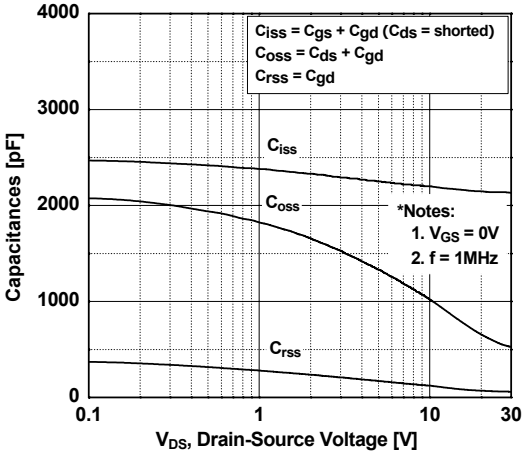
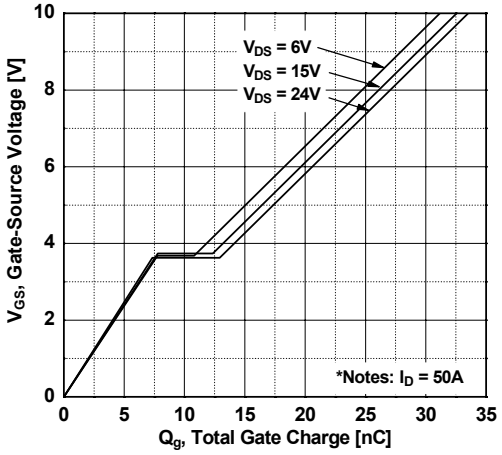


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

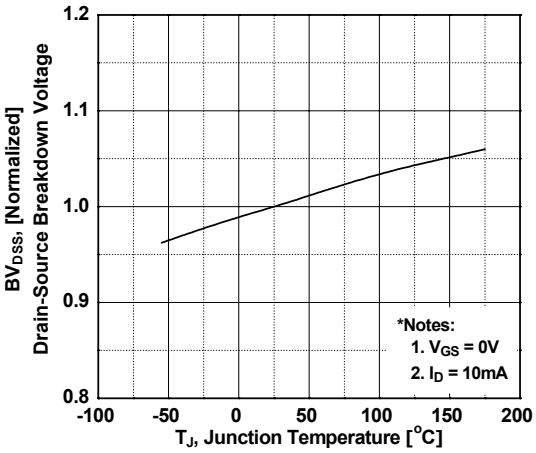


Figure 8. On-Resistance Variation vs. Temperature

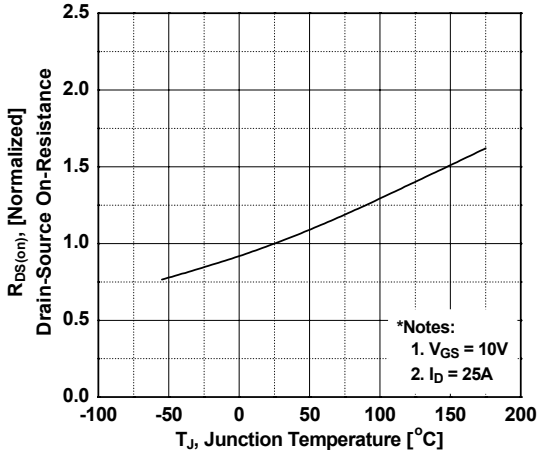


Figure 9. Maximum Safe Operating Area

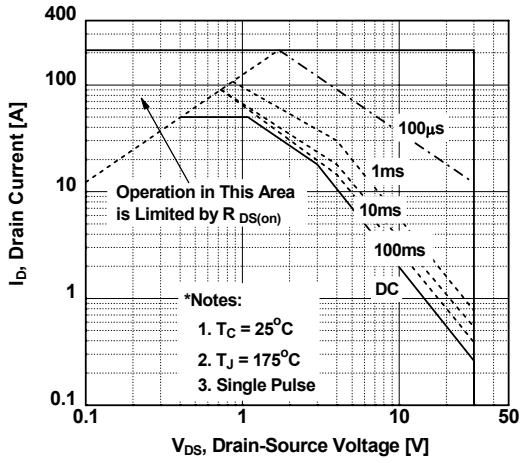


Figure 10. Maximum Drain Current vs. Case Temperature

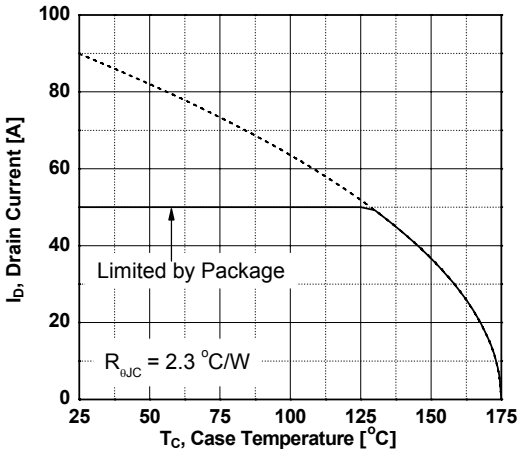
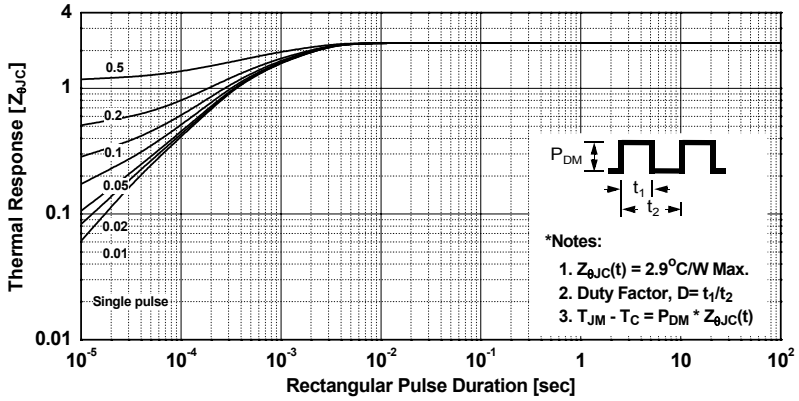
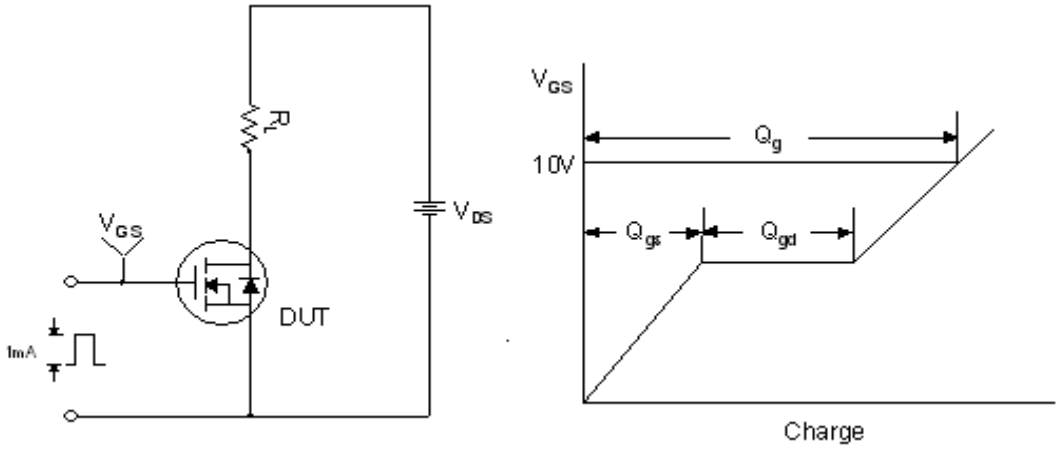


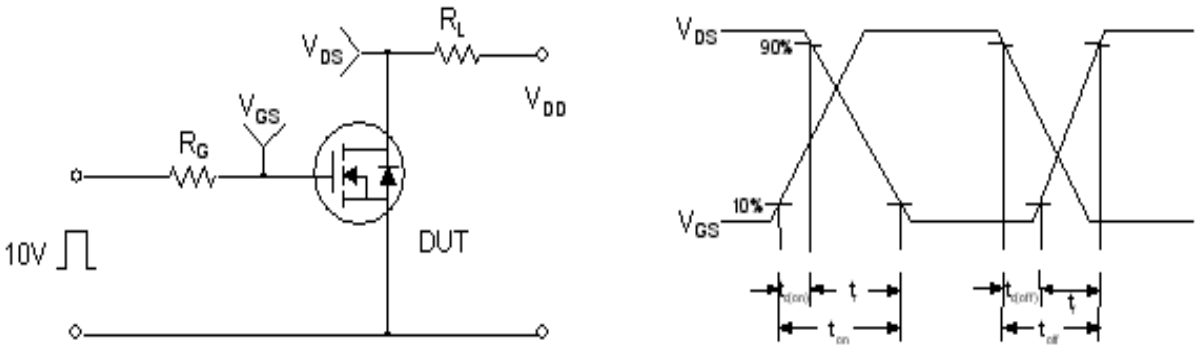
Figure 11. Transient Thermal Response Curve



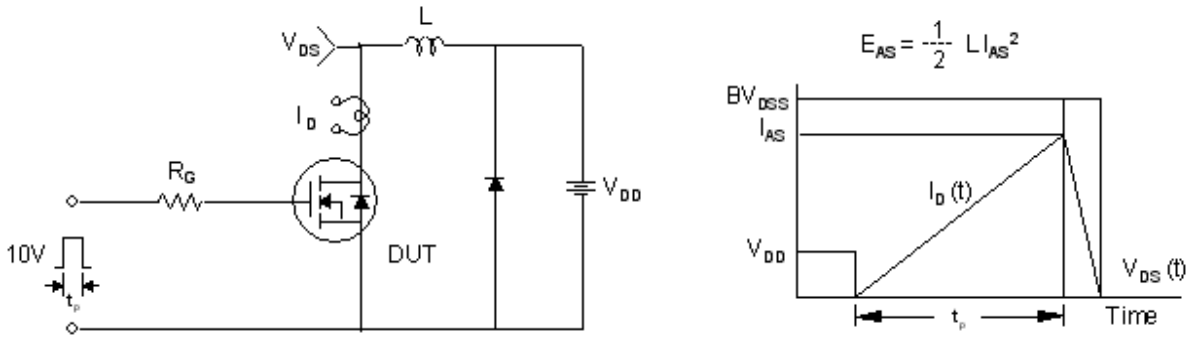
Gate Charge Test Circuit & Waveform



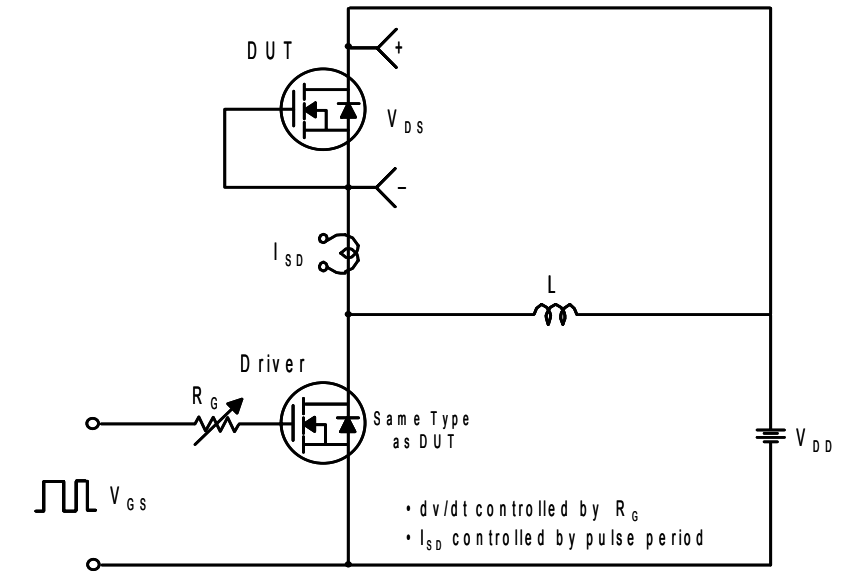
Resistive Switching Test Circuit & Waveforms

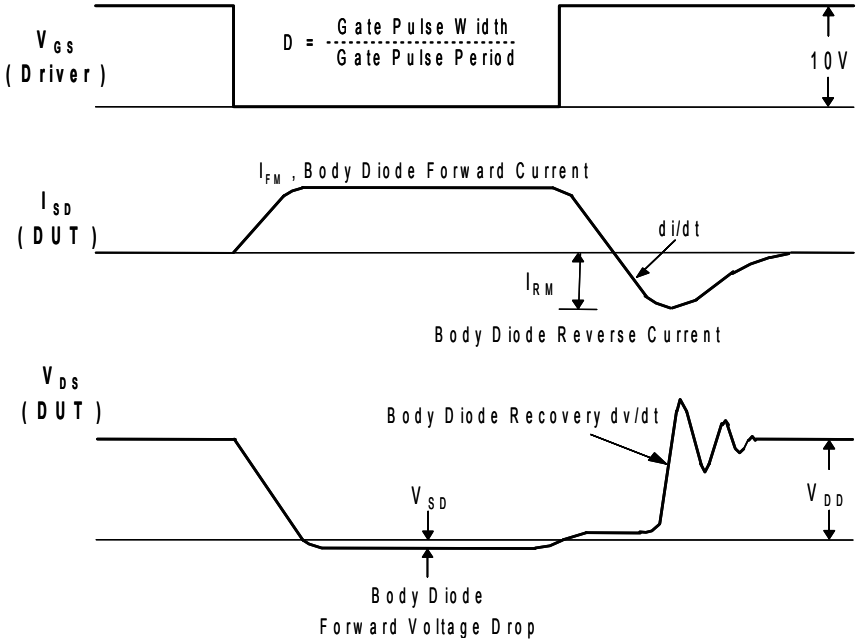


Unclamped Inductive Switching Test Circuit & Waveforms



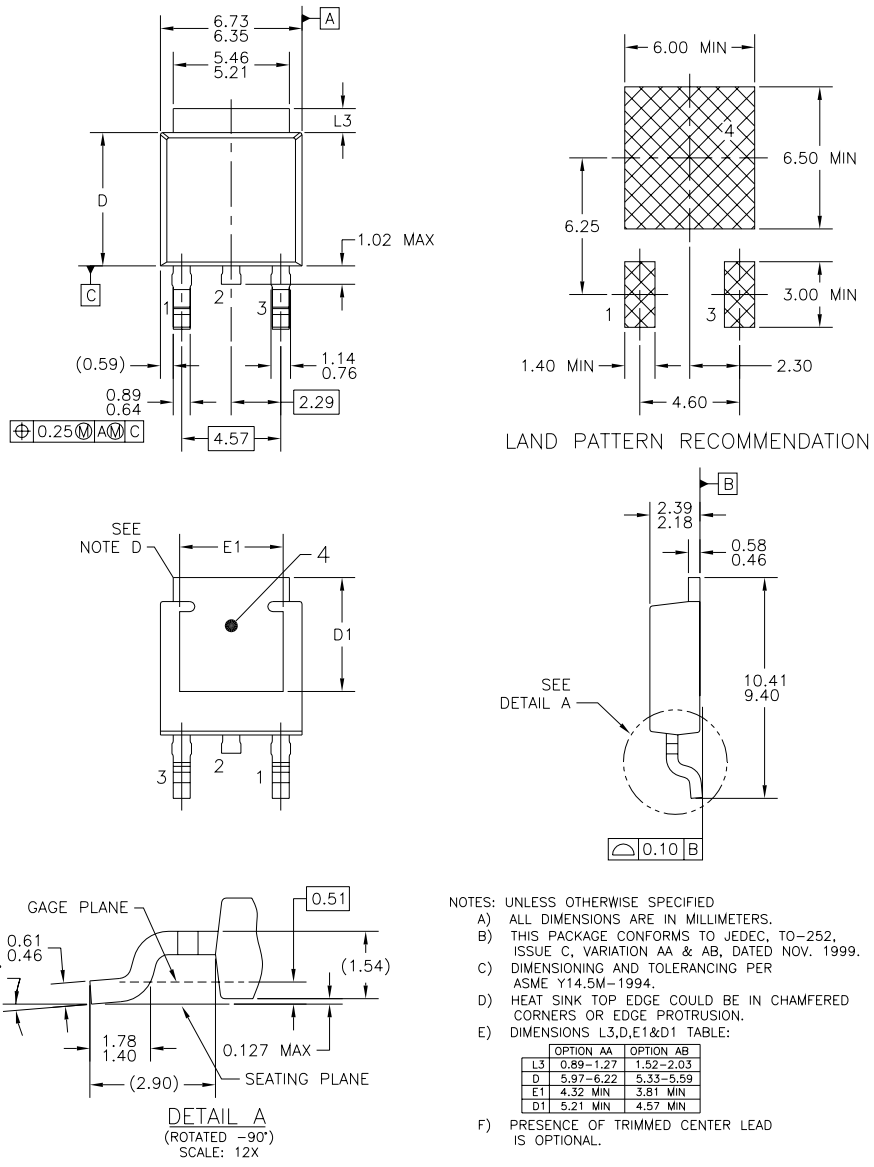
Peak Diode Recovery dv/dt Test Circuit & Waveforms





Mechanical Dimensions

D-PAK



NOTES: UNLESS OTHERWISE SPECIFIED

A) ALL DIMENSIONS ARE IN MILLIMETERS.

B) THIS PACKAGE CONFORMS TO JEDEC, TO−252, ISSUE C, VARIATION AA & AB, DATED NOV. 1999.

C) DIMENSIONING AND TOLERANCING PER ASME Y14.5M−1994.

D) HEAT SINK TOP EDGE COULD BE IN CHAMFERED CORNERS OR EDGE PROTRUSION.

E) DIMENSIONS L3,D,E1&D1 TABLE:

	OPTION AA	OPTION AB
L3	0.89−1.27	1.52−2.03
D	5.97−6.22	5.33−5.59
E1	4.32 MIN	3.81 MIN
D1	5.21 MIN	4.57 MIN

F) PRESENCE OF TRIMMED CENTER LEAD IS OPTIONAL.

Dimensions in Millimeters

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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.

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