FAIRCHILD SEMICONDUCTOR®

September

FDMS039N08B

N-Channel PowerTrench® MOSFET

80V, 100A, 3.9mΩ

Features

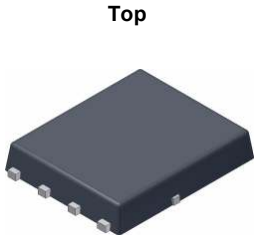
- $R_{DS(on)}$ = 3.2mΩ (Typ.)@ V_{GS} = 10V, I_D = 50A
- Low FOM $R_{DS(on)}$ *Q_G
- Low reverse recovery charge, Q_{rr}
- Soft reverse recovery body diode
- Enables highly efficiency in synchronous rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

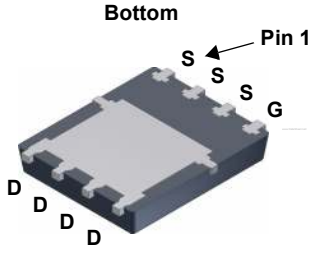
Description

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.

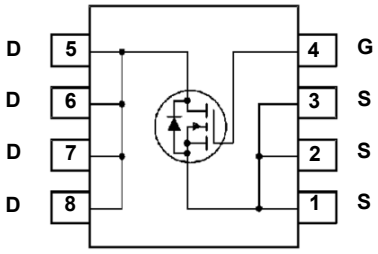
Application

- Synchronous Rectification for Server / Telecom PSU
- Battery Charger and Battery Protection circuit
- DC motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter





Power 56



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted*

Symbol	Parameter			Ratings	Units
V_{DSS}	Drain to Source Voltage			80	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		100	A
		- Continuous (T_A = 25°C)	(Note 1)	19.4	
I_{DM}	Drain Current	- Pulsed	(Note 2)	400	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 3)	240	mJ
P_D	Power Dissipation	(T_C = 25°C)		104	W
		(T_A = 25°C)	(Note 1)	2.5	W
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1)	50	

Package Marking and Ordering Information

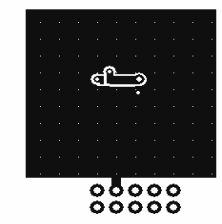
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS039N08B	FDMS039N08B	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_C = 25°C unless otherwise noted

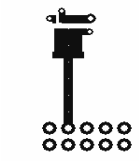
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	80	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	0.04	-	V/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 64V, V_{GS} = 0V	-	-	1	μA
I_{GSS}	Gate to Body Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	2.5	-	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10V, I_D = 50A	-	3.2	3.9	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 50A (Note 4)	-	100	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 40V, V_{GS} = 0V, f = 1MHz	-	5715	7600	pF
C_{oss}	Output Capacitance		-	881	1170	pF
C_{rss}	Reverse Transfer Capacitance		-	15	-	pF
C_{oss}(er)	Engry Releted Output Capacitance	V_{DS} = 40V, V_{GS} = 0V	-	1646	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 40V, I_D = 50A, V_{GS} = 0V to 10V (Note 4,5)	-	77	100	nC
Q_{gs}	Gate to Source Gate Charge		-	34	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	13	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	16	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 40V, I_D = 50A, V_{GS} = 10V, R_{GEN} = 4.7Ω (Note 4,5)	-	42	94	ns
t_r	Turn-On Rise Time		-	25	60	ns
$t_{d(off)}$	Turn-Off Delay Time		-	48	106	ns
t_f	Turn-Off Fall Time		-	17	44	ns
ESR	Equivalent Series Resistance	Drain Open, f = 1MHZ	-	1.2	-	Ω
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} = 0V, I_{SD} = 50A	-	-	1.3	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0V, I_{SD} = 50A, V_{DD} = 40V, dI_F/dt = 100A/μs (Note 4)	-	68	-	ns
Q_{rr}	Reverse Recovery Charge		-	80	-	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a 1.5 x 1.5 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 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L = 0.3mH, I_{AS} = 40A, Starting T_J = 25°C
4. Pulse Test: Pulse Width ≤ 300 μs, Duty cycle ≤ 2.0%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Performance Characteristics

Figure 1. On-Region Characteristics

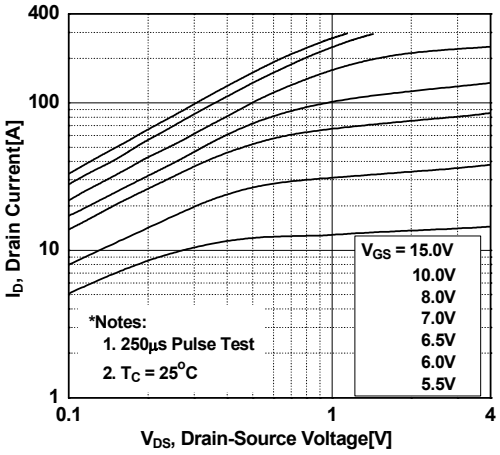


Figure 2. Transfer Characteristics

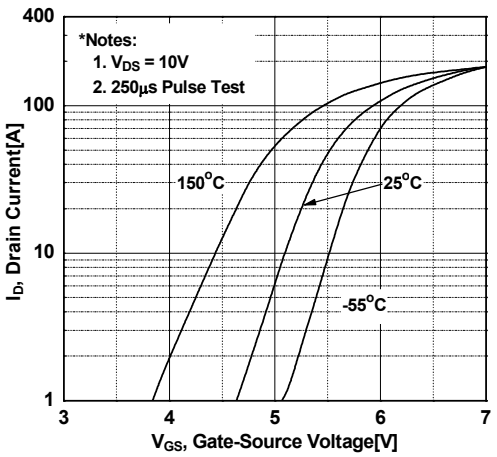


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

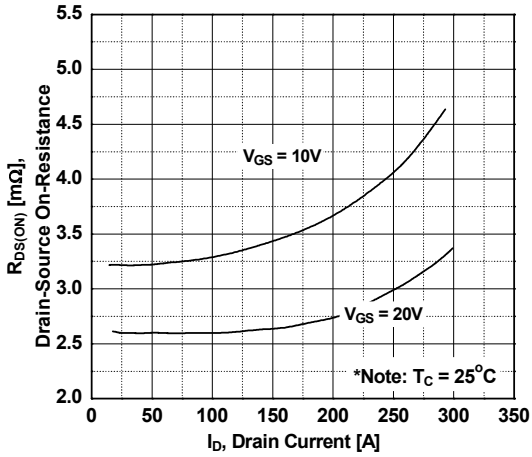


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

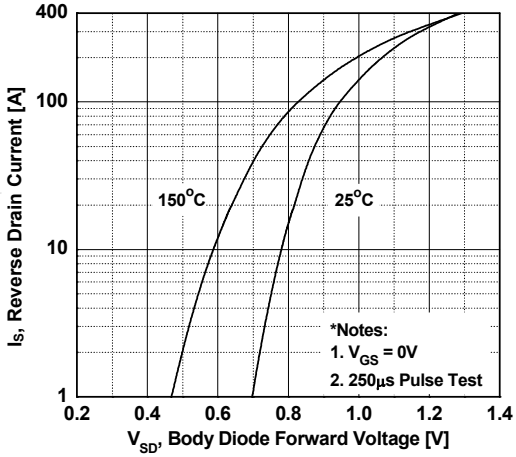


Figure 5. Capacitance Characteristics

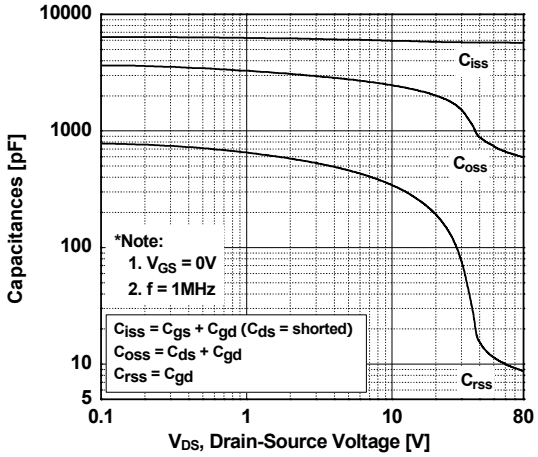
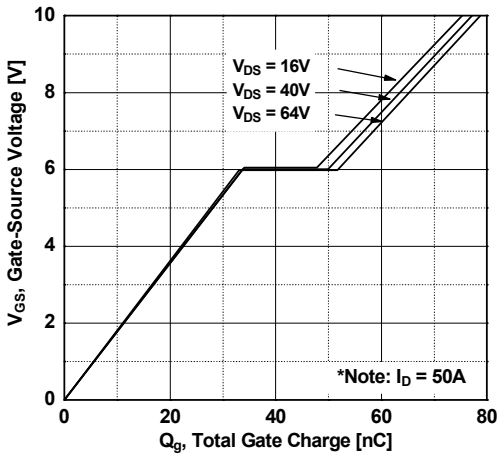


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

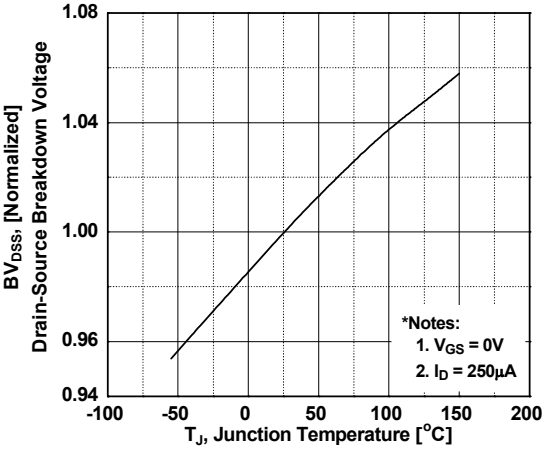


Figure 8. On-Resistance Variation vs. Temperature

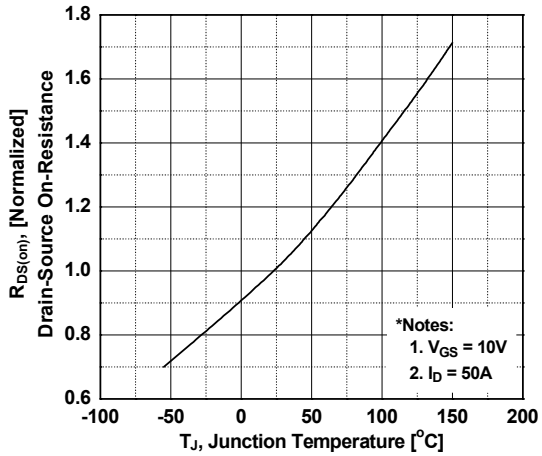


Figure 9. Maximum Safe Operating Area vs. Ambient Temperature

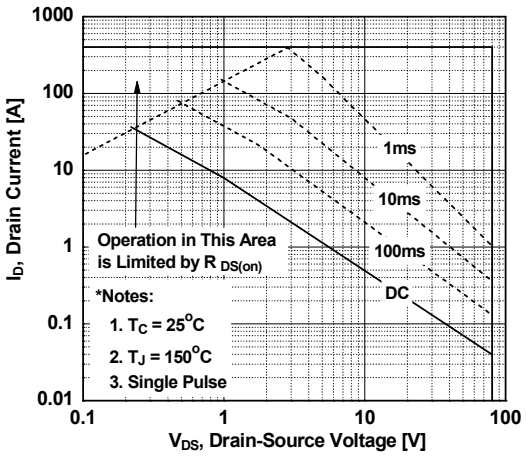


Figure 10. Maximum Drain Current

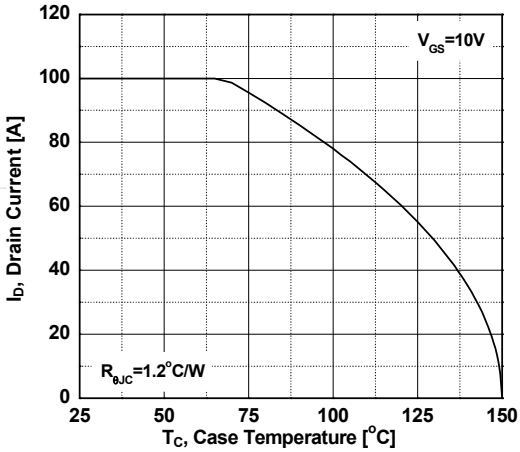


Figure 11. Unclamped Inductive Switching Capability

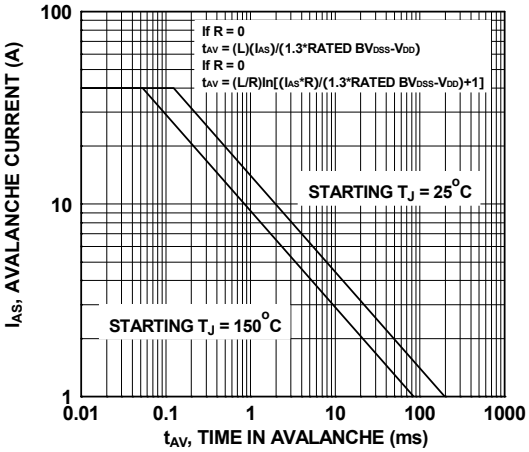
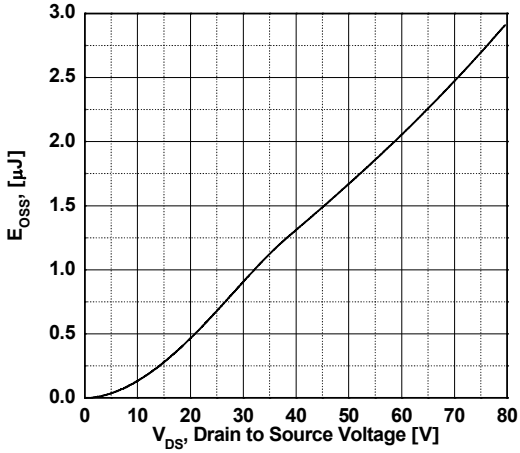
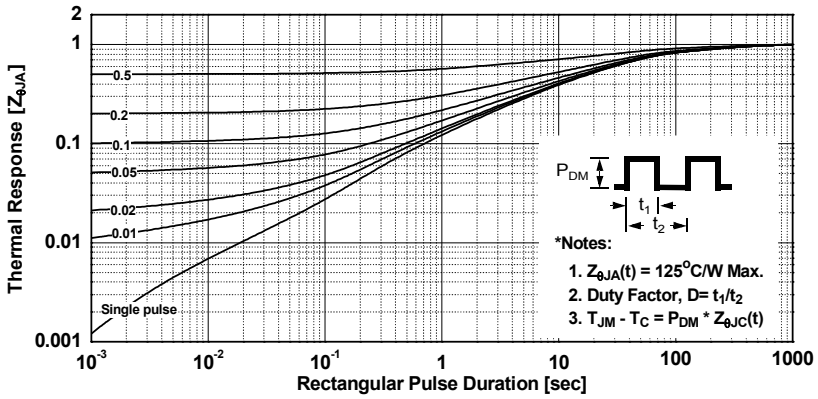


Figure 12. Eoss vs. Drain to Source Voltage

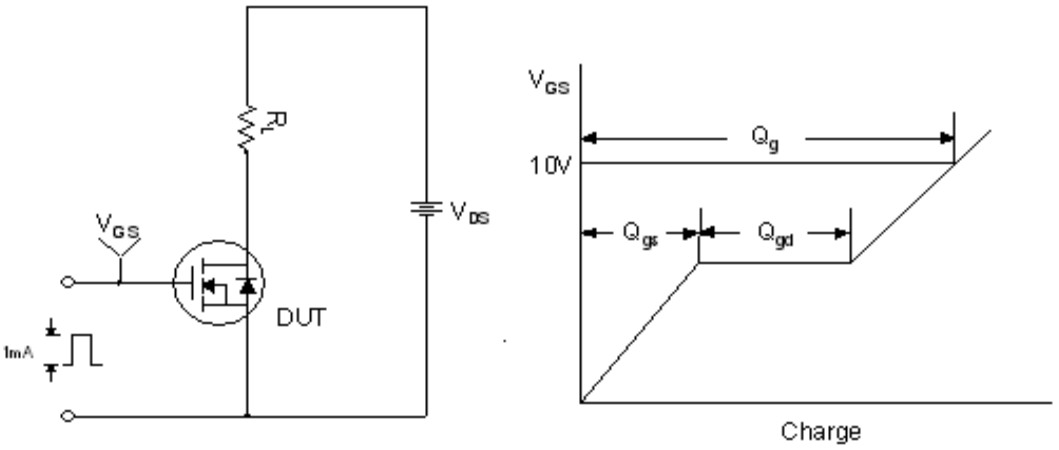


Typical Performance Characteristics (Continued)

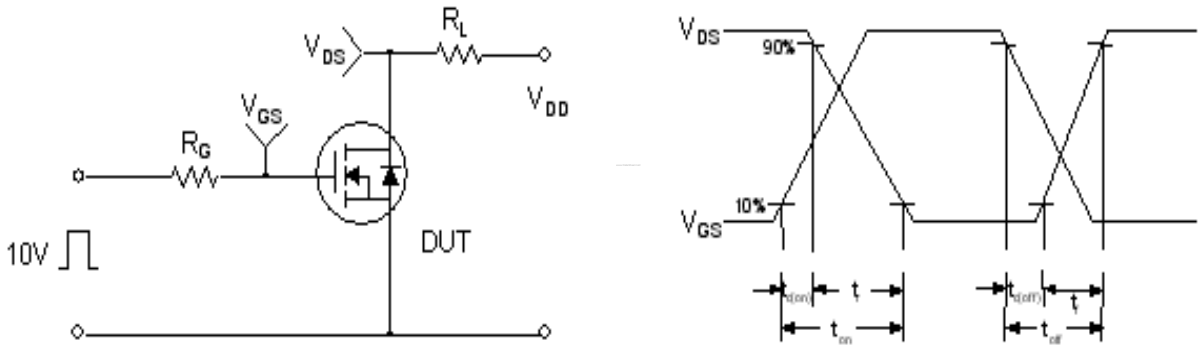
Figure 13. Transient Thermal Response Curve



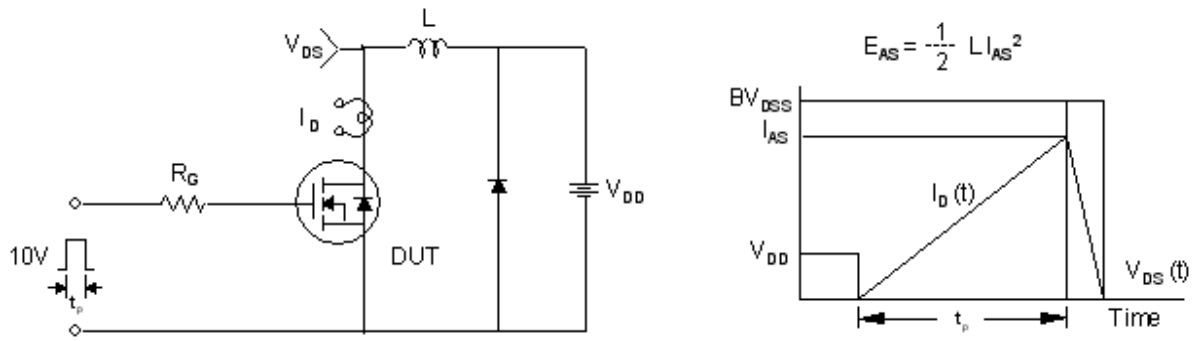
Gate Charge Test Circuit & Waveform



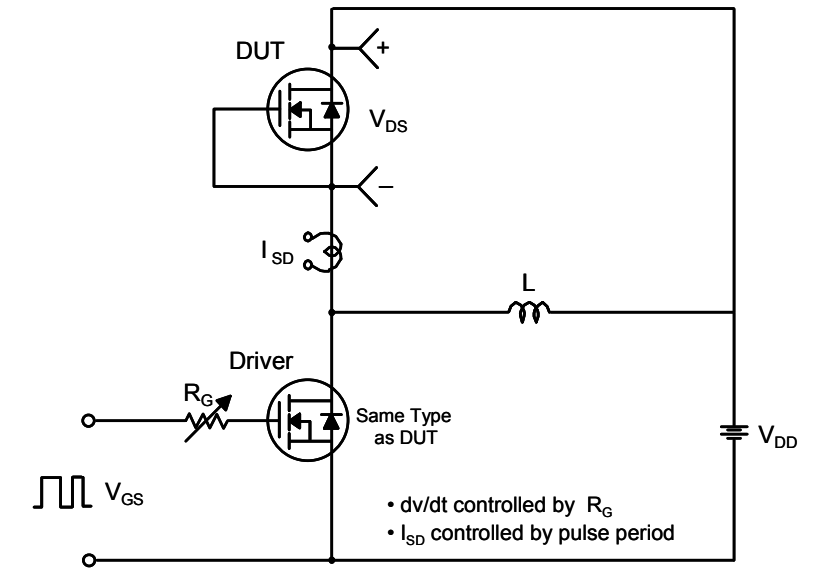
Resistive Switching Test Circuit & Waveforms

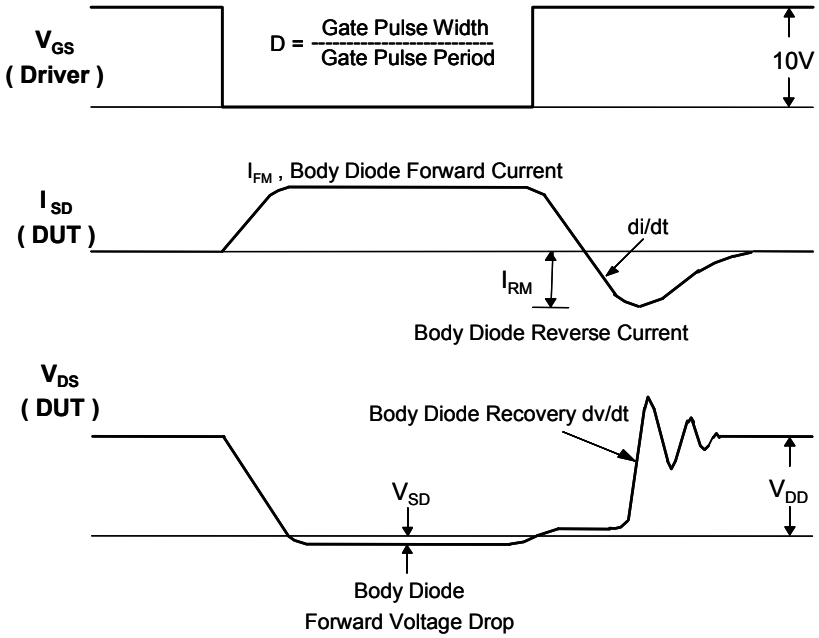


Unclamped Inductive Switching Test Circuit & Waveforms

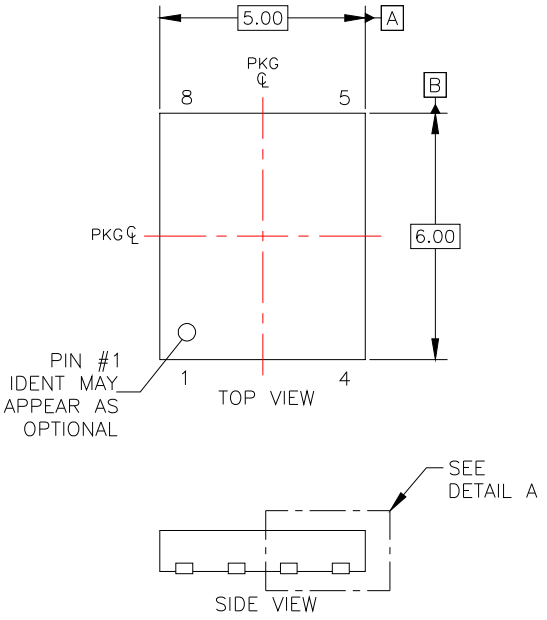


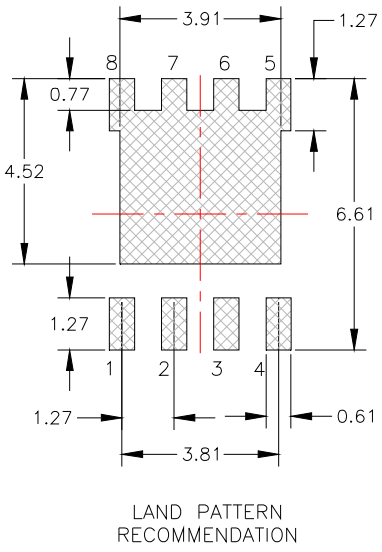
Peak Diode Recovery dv/dt Test Circuit & Waveforms

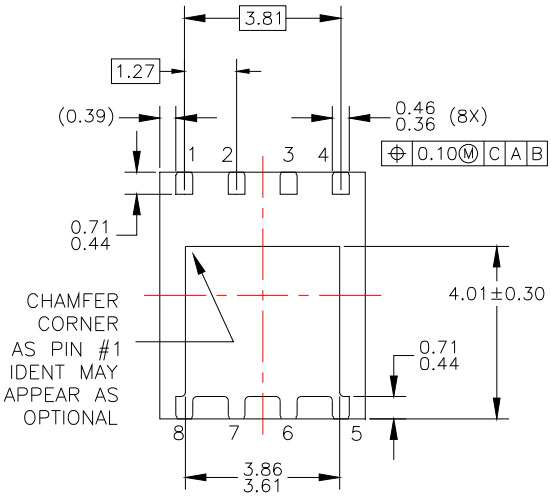


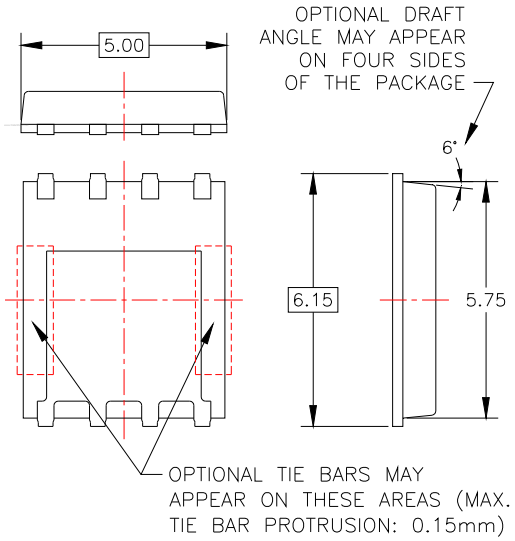


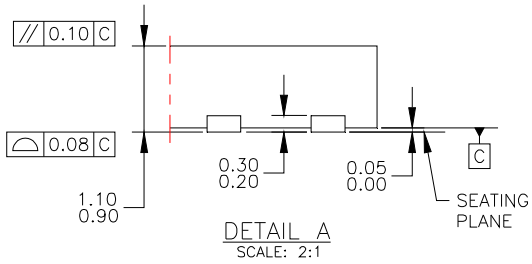
Dimensional Outline and Pad Layout











NOTES: UNLESS OTHERWISE SPECIFIED

A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
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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.

Rev. I55