FAIRCHILD SEMICONDUCTOR®

September 2012

FDMS037N08B

N-Channel PowerTrench® MOSFET

75 V, 100 A, 3.7 mΩ

Features

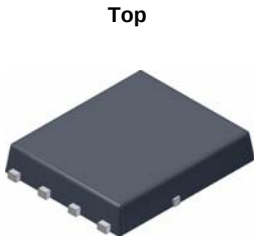
- $R_{DS(on)}$ = 3.01mΩ (Typ.)@ V_{GS} = 10 V, I_D = 50 A
- Low FOM $R_{DS(on)}$*Q_G
- Low Reverse Recovery Charge, Q_{rr} = 80 nC
- Soft Reverse Recovery Body Diode
- Enables Highly Efficiency in Synchronous Rectification
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

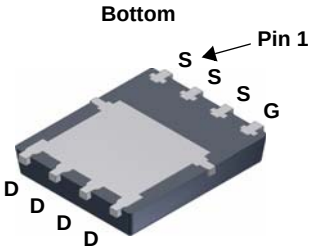
Description

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

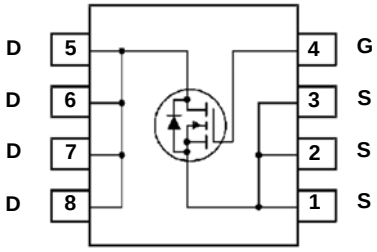
Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection circuit
- DC Motor Drives and Uninterruptible Power Supplies





Power 56



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

Symbol	Parameter			FDMS037N08B	Unit
V_{DSS}	Drain to Source Voltage			75	V
V_{GSS}	Gate to Source Voltage			±20	V
I_D	Drain Current	- Continuous (T_C = 25°C)		100	A
		- Continuous (T_C = 25°C, Silicon Limited)		128	
		- Continuous (T_A = 25°C)	(Note 1)	19.9	
I_{DM}	Drain Current	- Pulsed	(Note 2)	400	A
E_{AS}	Single Pulsed Avalanche Energy		(Note 3)	180.6	mJ
P_D	Power Dissipation	(T_C = 25°C)		104.2	W
		(T_A = 25°C)	(Note 1)	0.83	W
T_J, T_{STG}	Operating and Storage Temperature Range			-55 to +150	°C

Thermal Characteristics

Symbol	Parameter		FDMS037N08B	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.		1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	(Note 1)	50	

Package Marking and Ordering Information

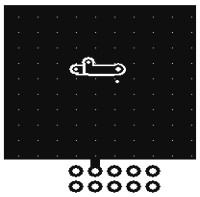
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS037N08B	FDMS037N08B	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_J= 25°C unless otherwise noted

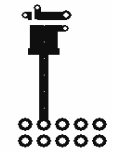
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250μA, V_{GS} = 0V	75	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, Referenced to 25°C	-	39	-	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 60V, 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	-	3.01	3.7	mΩ
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 50A	-	108	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 37.5V, V_{GS} = 0V f = 1MHz	-	4550	5915	pF
C_{oss}	Output Capacitance		-	1060	1380	pF
C_{rss}	Reverse Transfer Capacitance		-	30.2	45	pF
C_{oss}(er)	Energy Releted Output Capacitance	V_{DS} = 37.5V, V_{GS} = 0V	-	1702	-	pF
$Q_{g(tot)}$	Total Gate Charge at 10V	V_{DS} = 37.5V, I_D = 50A V_{GS} = 0V to 10V	-	76.8	100	nC
Q_{gs}	Gate to Source Gate Charge		-	27.5	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	17.4	-	nC
$V_{plateau}$	Gate Plateau Volatge	(Note 4)	-	5.1	-	V
Q_{sync}	Total Gate Charge Sync.	V_{DS} = 0V, I_D = 50A (Note 5)	-	66.3	-	nC
Q_{oss}	Output Charge	V_{DS} = 37.5V, V_{GS} = 0V	-	74.6	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 37.5V, I_D = 50A V_{GS} = 10V, R_{GEN} = 4.7Ω	-	34.9	80	ns
t_r	Turn-On Rise Time		-	20.1	50	ns
$t_{d(off)}$	Turn-Off Delay Time		-	55.3	120	ns
t_f	Turn-Off Fall Time	(Note 4)	-	19.4	49	ns
ESR	Equivalent Series Resistance	f = 1MHz	-	1.28	-	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 dI_F/dt = 100A/μs	-	66.8	-	ns
Q_{rr}	Reverse Recovery Charge		-	84	-	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} = 34.7A, Starting T_J = 25°C

4. Essentially Independent of Operating Temperature Typical Characteristics

5. See the test circuit in page 8

Typical Performance Characteristics

Figure 1. On-Region Characteristics

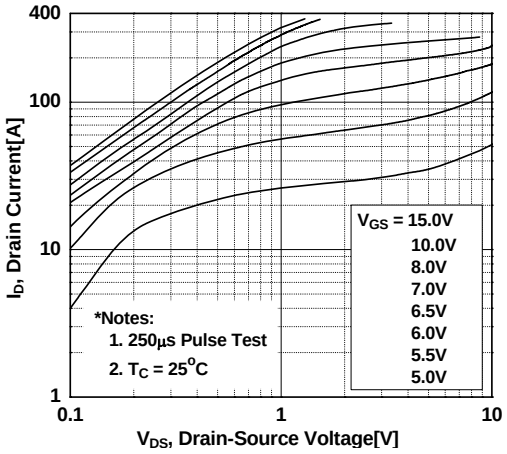


Figure 2. Transfer Characteristics

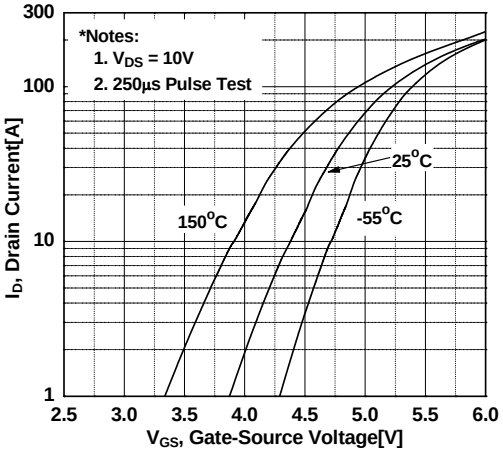


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

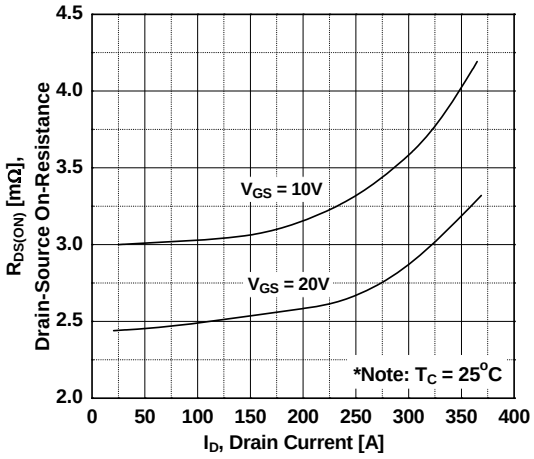


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

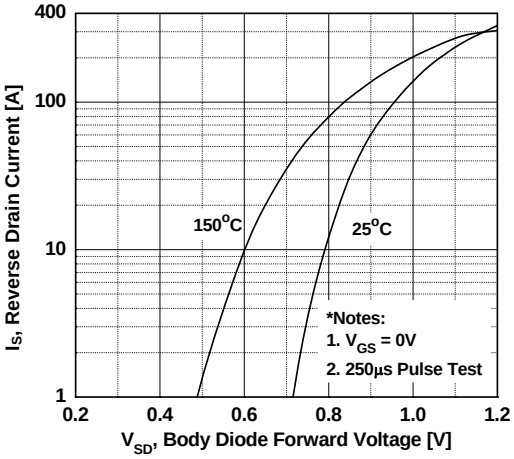


Figure 5. Capacitance Characteristics

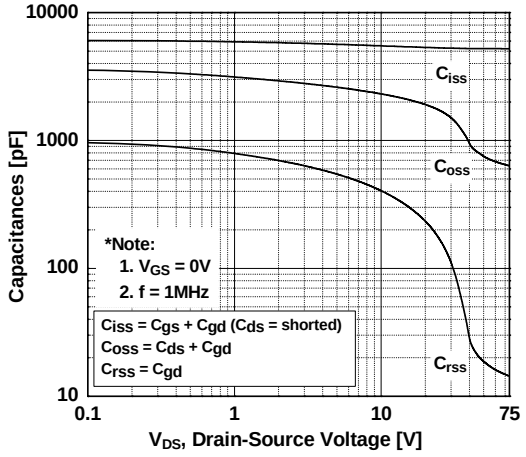
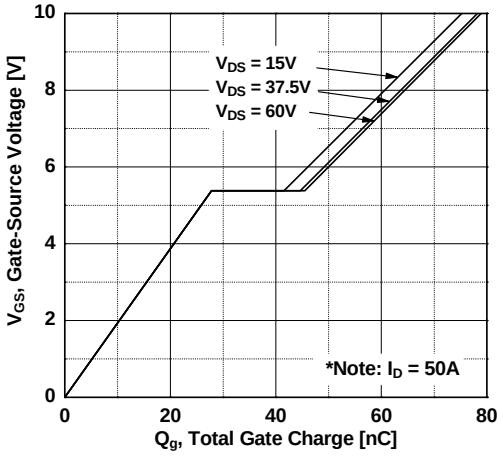


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

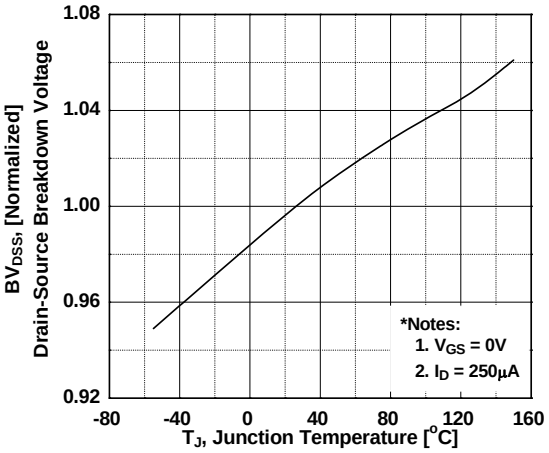


Figure 8. On-Resistance Variation vs. Temperature

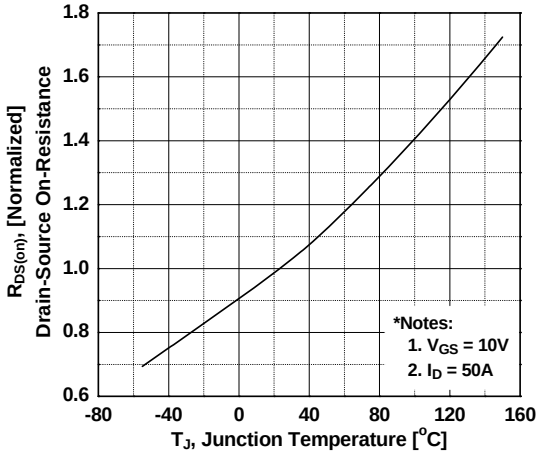


Figure 9. Maximum Safe Operating Area vs. Ambient Temperature

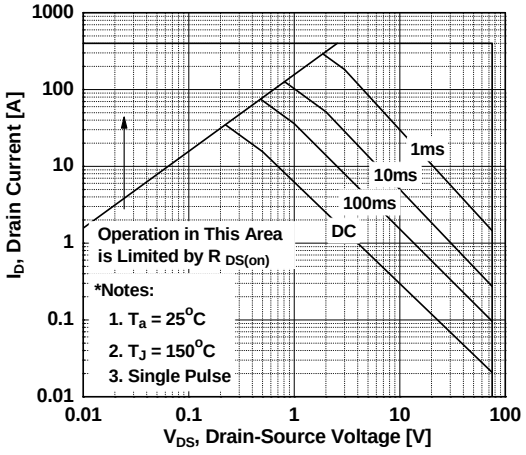


Figure 10. Maximum Drain Current

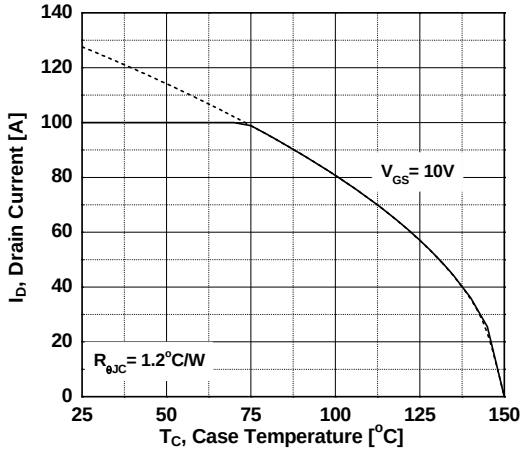


Figure 11. Eoss vs. Drain to Source Voltage

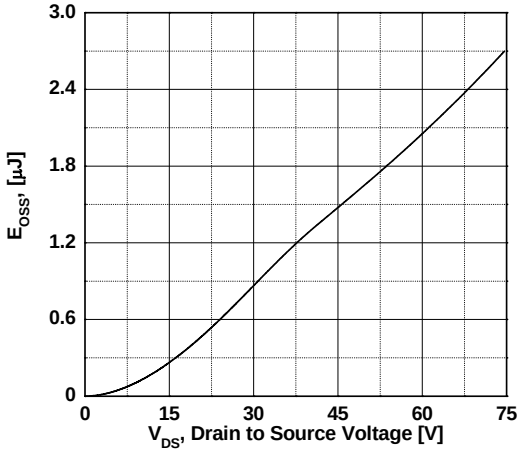
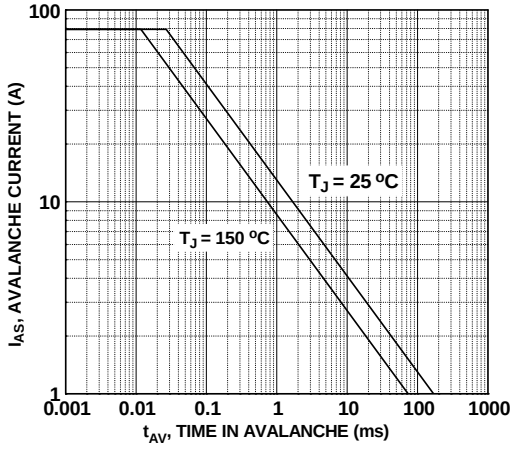
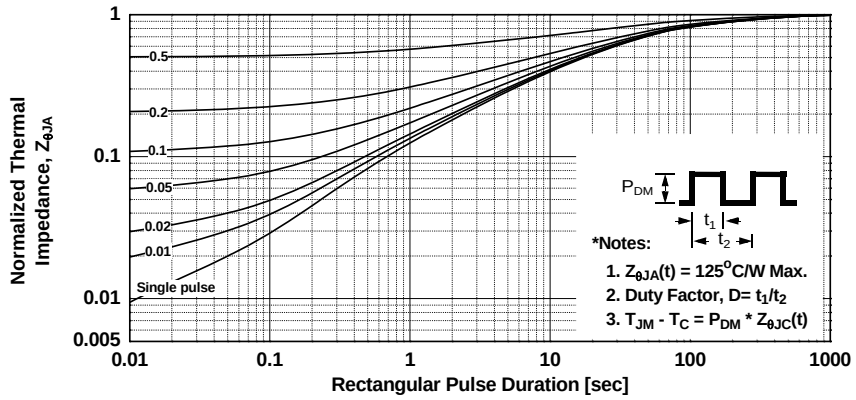


Figure 12. Unclamped Inductive Switching Capability

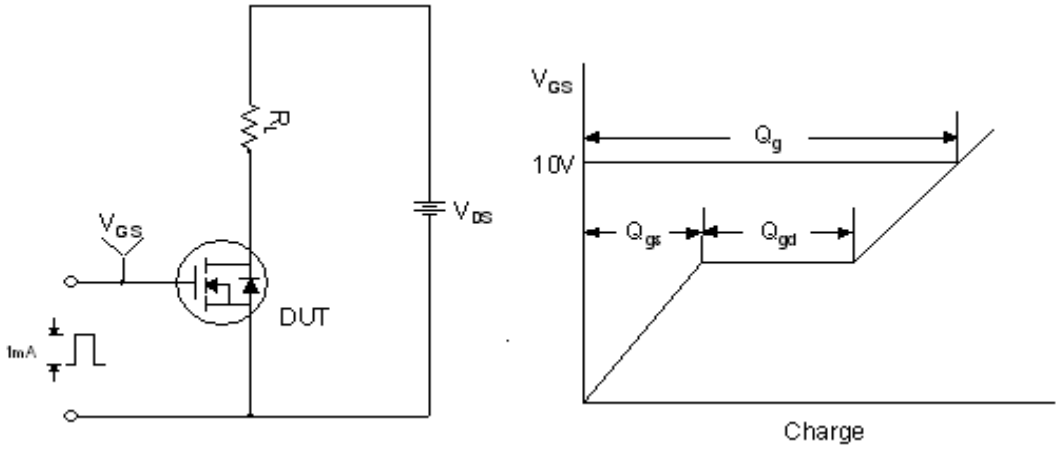


Typical Performance Characteristics (Continued)

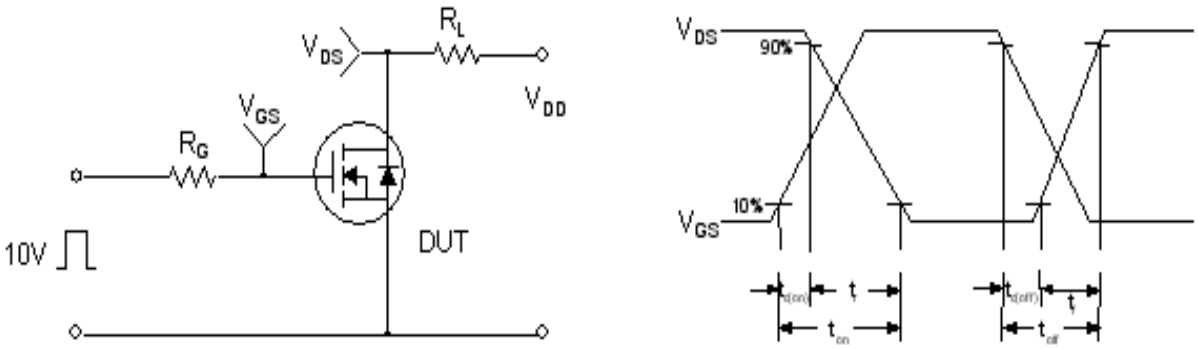
Figure 13. Transient Thermal Response Curve



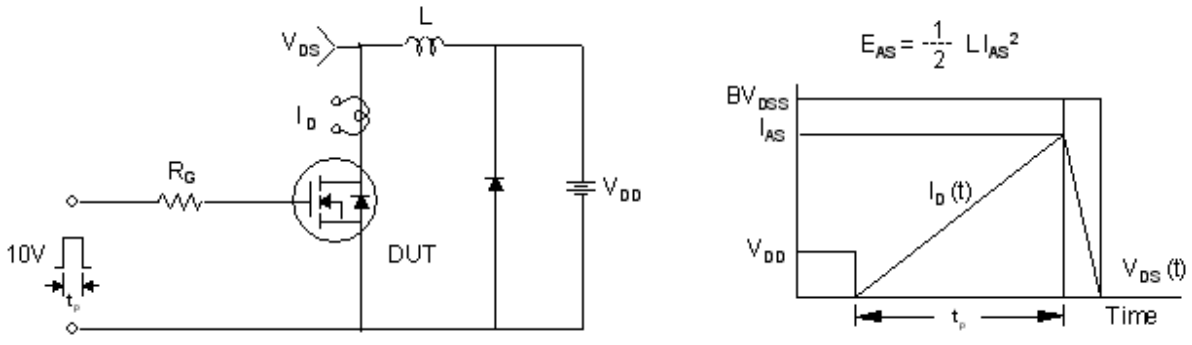
Gate Charge Test Circuit & Waveform



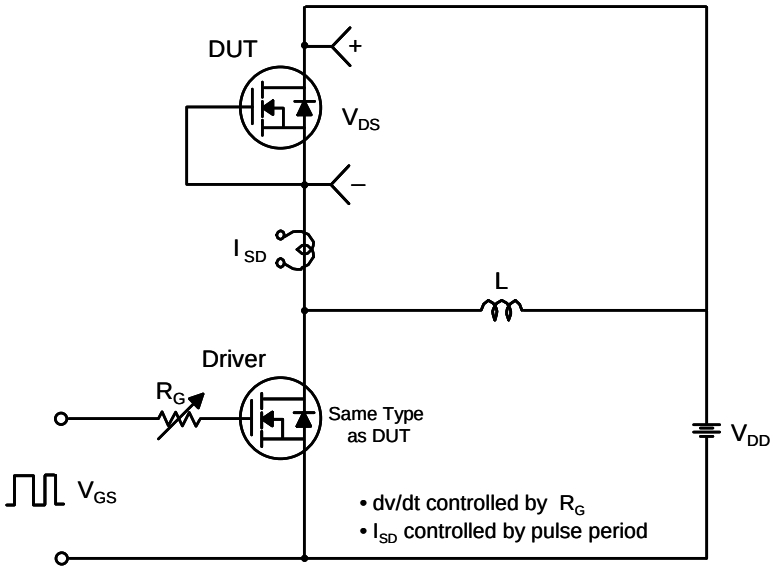
Resistive Switching Test Circuit & Waveforms

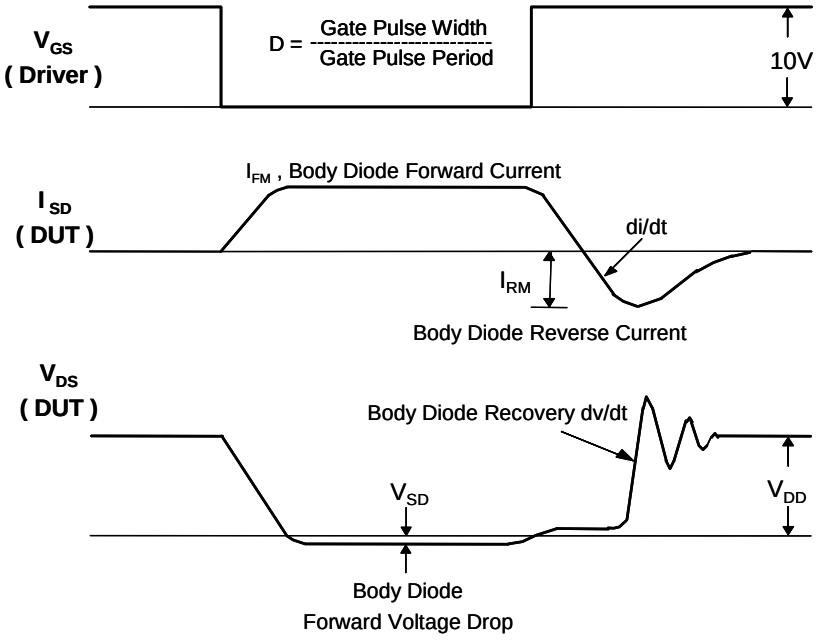


Unclamped Inductive Switching Test Circuit & Waveforms

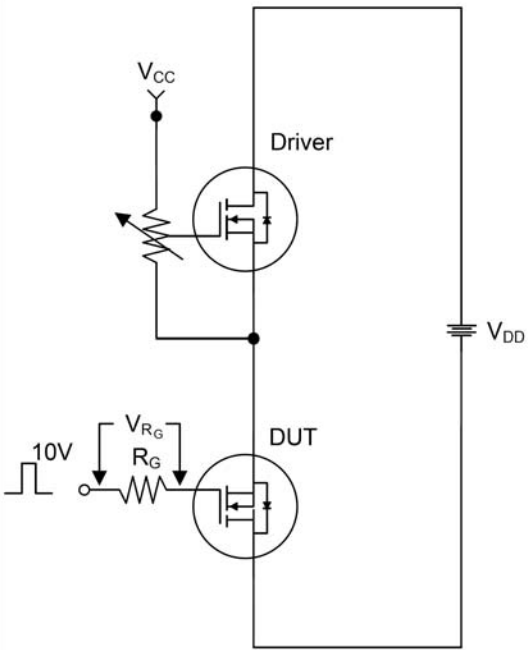


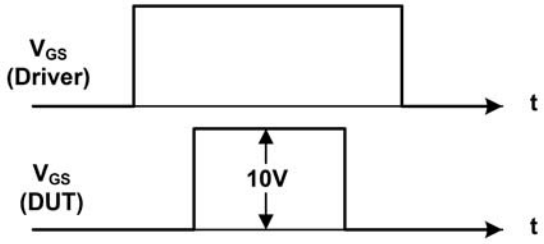
Peak Diode Recovery dv/dt Test Circuit & Waveforms





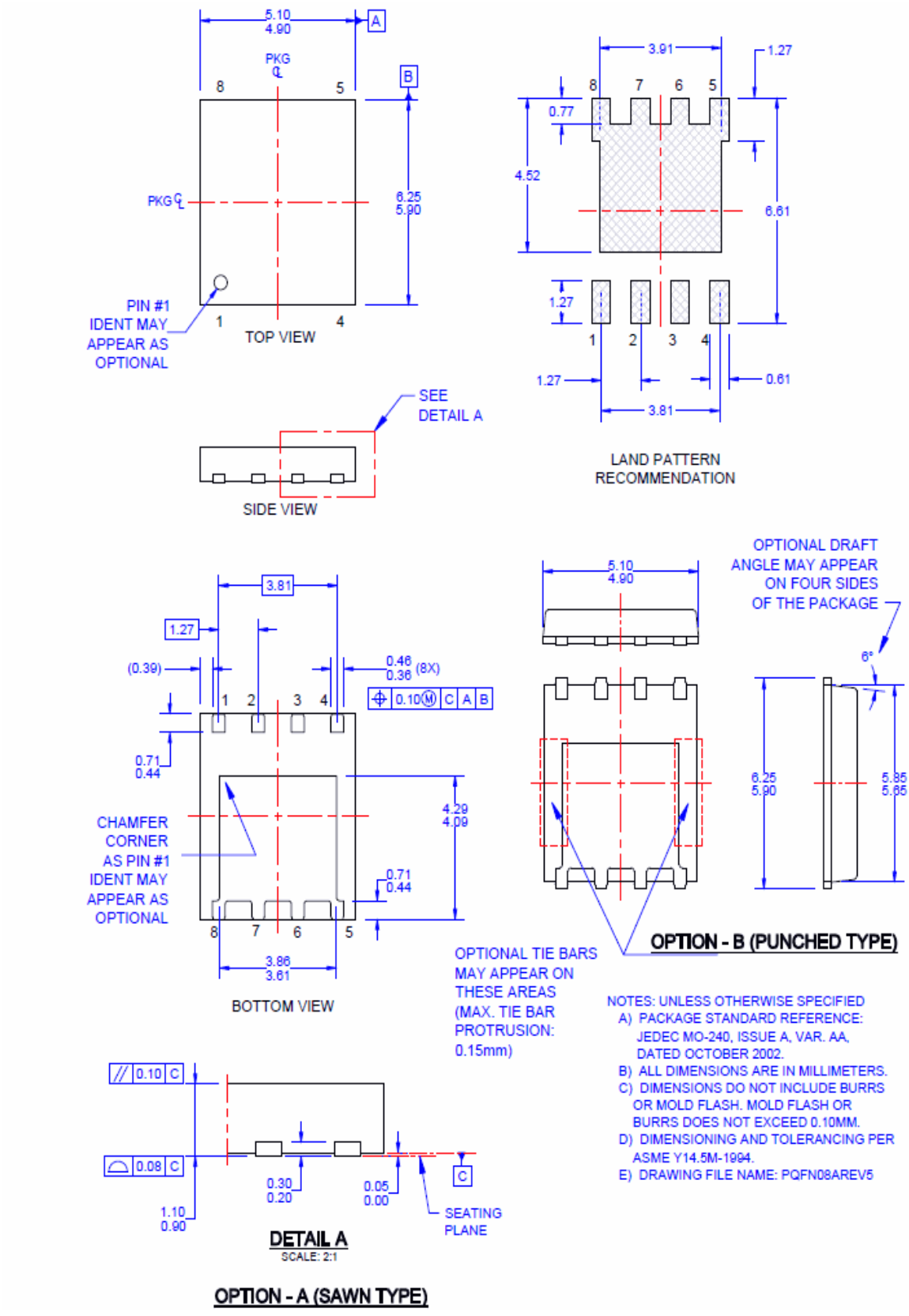
Total Gate Charge Qsync. Test Circuit & Waveforms





$$Qsync = \frac{1}{R_G} \cdot \int V_{R_G}(t)\ dt$$

Dimensional Outline and Pad Layout



FAIRCHILD SEMICONDUCTOR®

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

2Cool™
AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficentMax™
ESBC™
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
Green Bridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Marking Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver™
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL ®*
TinyBoost™
TinyBuck™
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC®
TriFault Detect™
TRUECURRENT®*
µSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufactures of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handing and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

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. I64