FAIRCHILD SEMICONDUCTOR®

June 2010

FDMC7692S

N-Channel Power Trench® SyncFET™

30 V, 12.5 A, 9.3 mΩ

Features

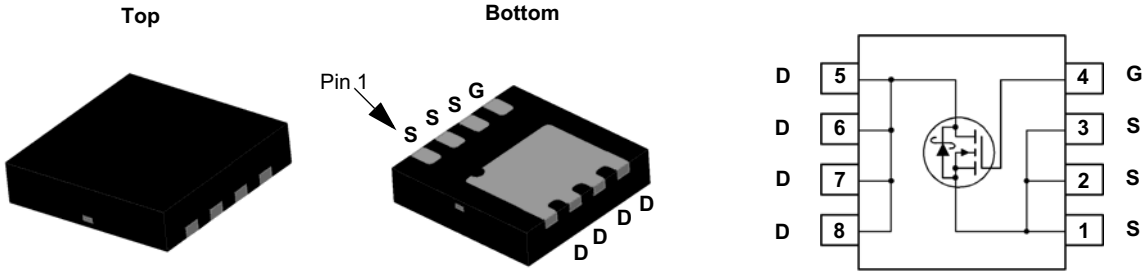
- Max $r_{DS(on)}$ = 9.3 mΩ at V_{GS} = 10 V, I_D = 12.5 A
- Max $r_{DS(on)}$ = 13.6 mΩ at V_{GS} = 4.5 V, I_D = 10.4 A
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant

General Description

This FDMC7692S is produced using Fairchild Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery packs.

Applications

- DC - DC Buck Converters
- Notebook DC - DC application



MLP 3.3x3.3

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25 °C		18	A
	-Continuous	T_A = 25 °C	(Note 1a)	12.5	
	-Pulsed			45	
E_{AS}	Sinlge Pulse Avalanche Energy		(Note 3)	21	mJ
P_D	Power Dissipation	T_C = 25 °C		27	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC7692S	FDMC7692S	MLP 3.3X3.3	13 ”	12 mm	3000 units

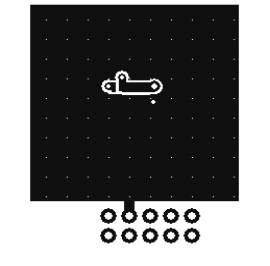
©2010 Fairchild Semiconductor Corporation

Electrical Characteristics T_J = 25 °C unless otherwise noted

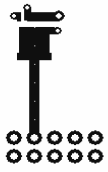
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			500	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 1 mA	1.2	2.0	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 12.5 A		7.8	9.3	mΩ
		V_{GS} = 4.5 V, I_D = 10.4 A		10.8	13.6	
		V_{GS} = 10 V, I_D = 12.5 A, T_J = 125 °C		9.6	13.0	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 12.5 A		62		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		1040	1385	pF
C_{oss}	Output Capacitance			445	590	pF
C_{rss}	Reverse Transfer Capacitance			40	60	pF
R_g	Gate Resistance			1.1	2.9	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 12.5 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		9	17	ns
t_r	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	34	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 15 V, I_D = 12.5 A		16	23	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 15 V, I_D = 12.5 A		8	10	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15 V, I_D = 12.5 A		4		nC
Q_{gd}	Gate to Drain “Miller” Charge			2		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 12.5 A (Note 2)		0.9	1.3	V
		V_{GS} = 0 V, I_S = 0.9 A (Note 2)		0.5	0.7	
t_{rr}	Reverse Recovery Time	I_F = 12.5 A, di/dt = 300 A/μs		21	33	ns
Q_{rr}	Reverse Recovery Charge			16	29	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. 53 °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. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

3. E_{AS} of 21 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 12.0 A, V_{DD} = 27 V, V_{GS} = 10 V. 100% test at L = 3 mH, I_{AS} = 3.2 A .

©2010 Fairchild Semiconductor Corporation

Typical Characteristics T_J = 25 °C unless otherwise noted

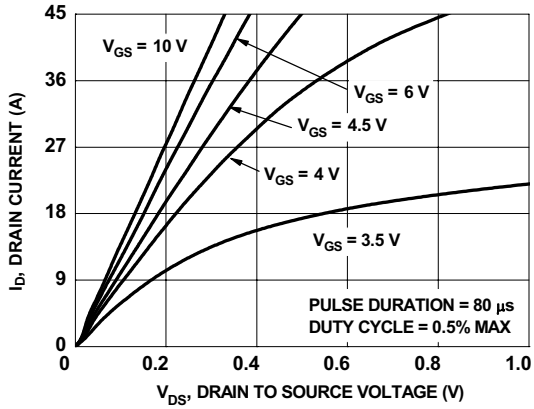


Figure 1. On-Region Characteristics

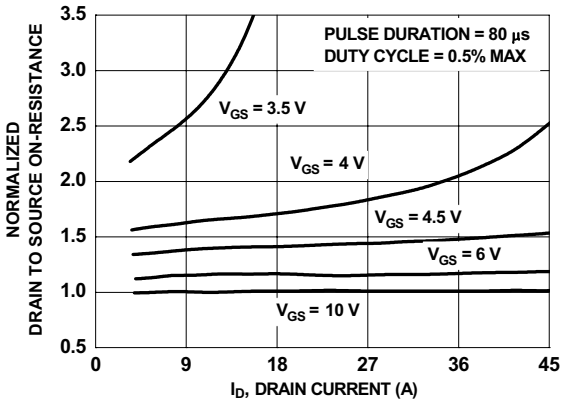


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

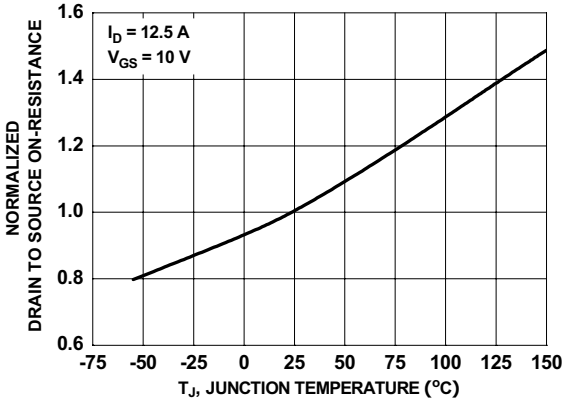


Figure 3. Normalized On-Resistance vs Junction Temperature

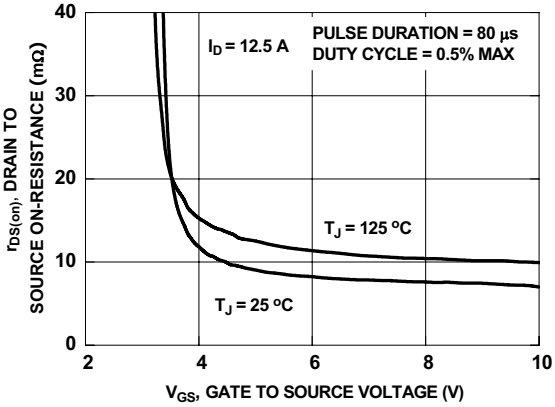


Figure 4. On-Resistance vs Gate to Source Voltage

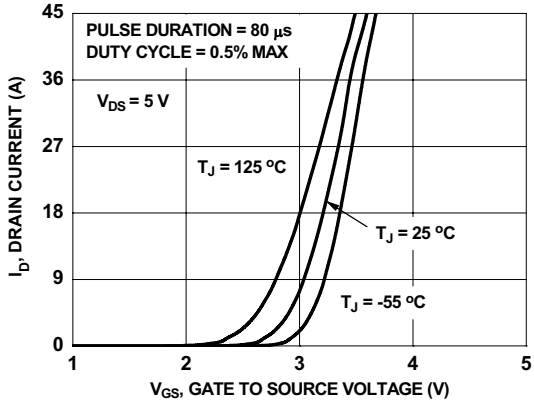


Figure 5. Transfer Characteristics

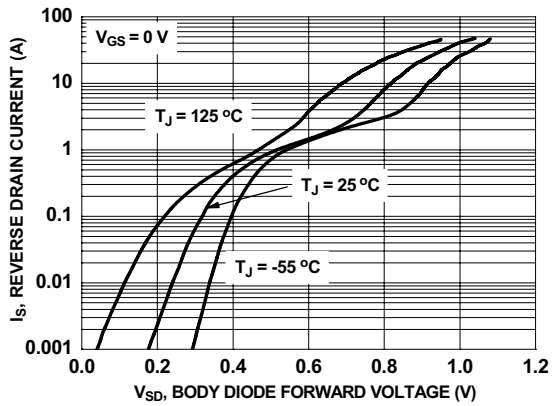


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

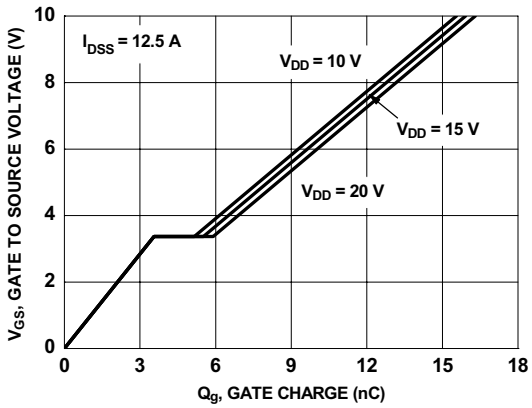


Figure 7. Gate Charge Characteristics

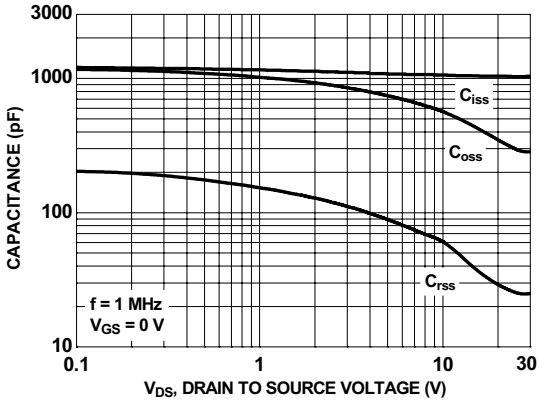


Figure 8. Capacitance vs Drain to Source Voltage

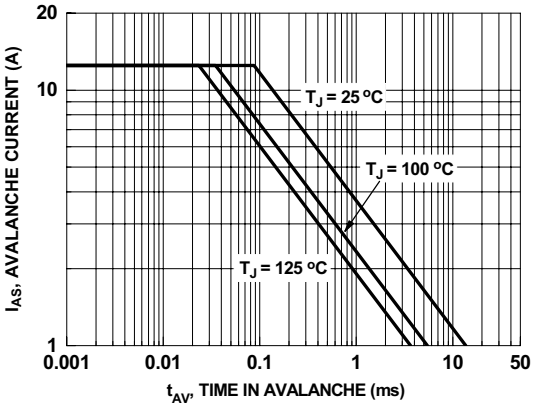


Figure 9. Unclamped Inductive Switching Capability

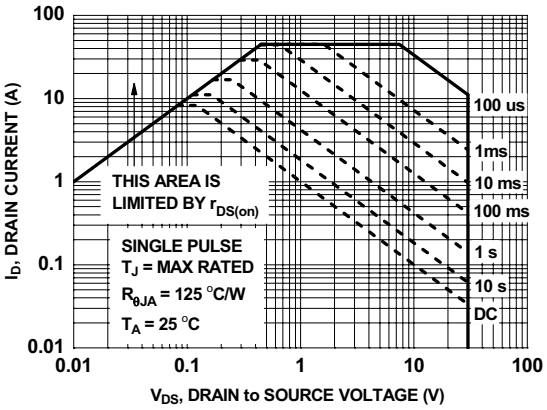


Figure 10. Forward Bias Safe Operating Area

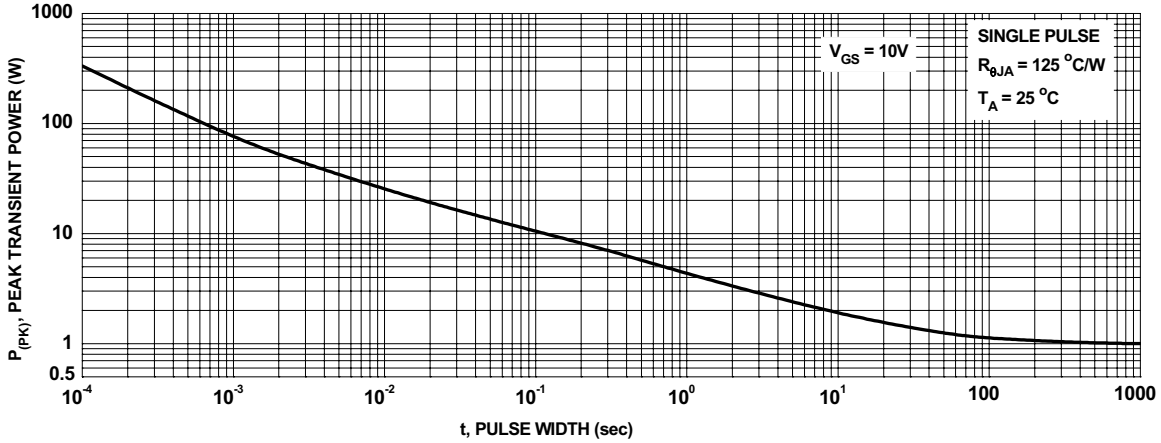


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

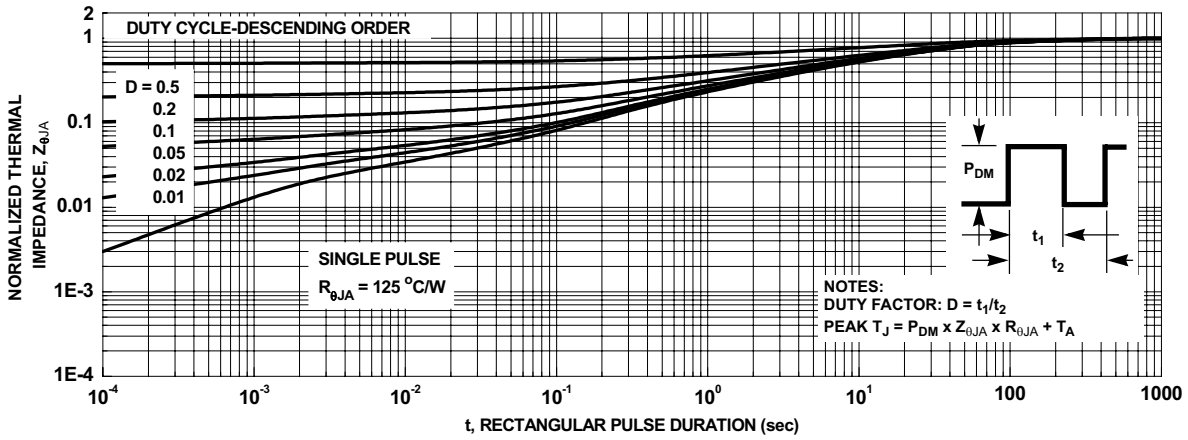


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (continued)

SyncFET Schottky body diode Characteristics

Fairchild's SyncFET process embeds a Schottky diode in parallel with PowerTrench MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 13 shows the reverses recovery characteristic of the FDMC7692S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

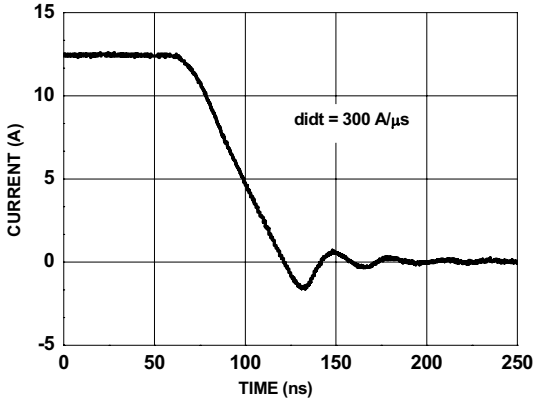


Figure 13. SyncFET body diode reverse recovery characteristic

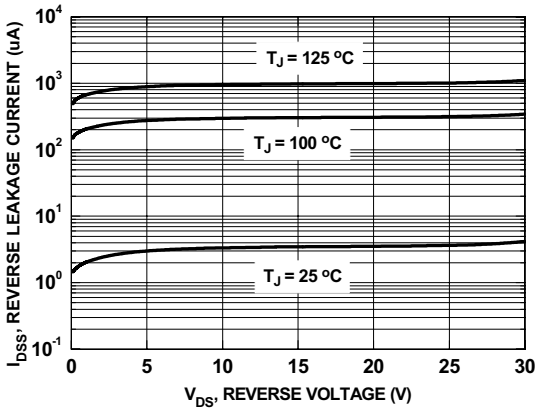
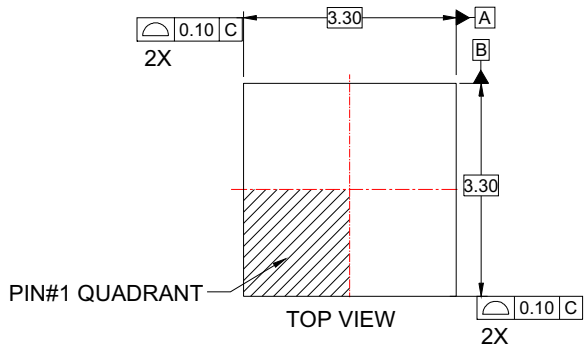
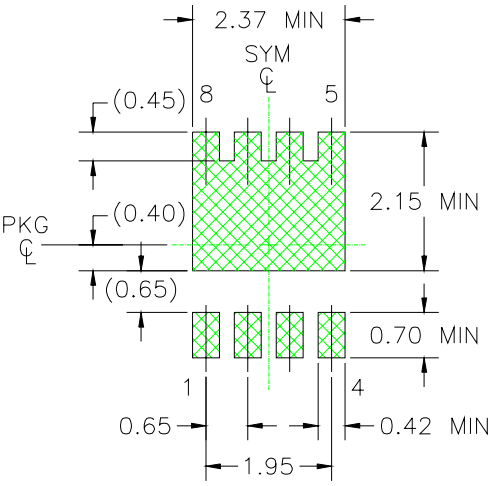


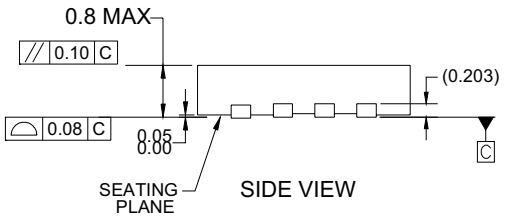
Figure 14. SyncFET body diode reverses leakage versus drain-source voltage

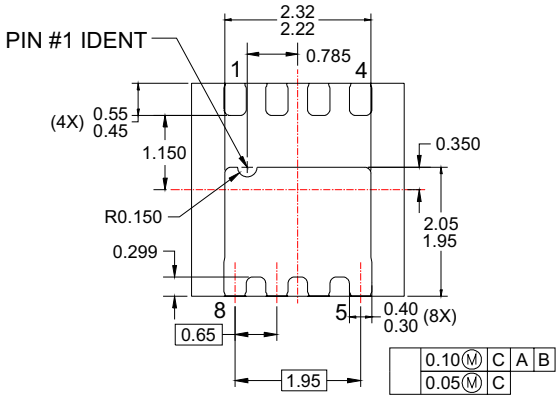
Dimensional Outline and Pad Layout





RECOMMENDED LAND PATTERN





BOTTOM VIEW

NOTES:

A. DOES NOT CONFORM TO JEDEC REGISTRATION MO-229

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

D. DRAWING FILE NAME : MLP08SREVA

E. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY

©2010 Fairchild Semiconductor Corporation

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.

AccuPower
Auto-SPM
Build it Now
CorePLUS
CorePOWER
CROSSVOLT
CTL
Current Transfer Logic
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax
ESBC
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series
FACT®
FAST®
FastvCore
FETBench
FlashWriter®*
FPS
F-PFS
FRFET®
Global Power Resource SM
Green FPS
Green FPS e-Series
G*max*
GTO
IntelliMAX
ISOPLANAR
MegaBuck
MICROCOUPLER
MicroFET
MicroPak
MicroPak2
MillerDrive
MotionMax
Motion-SPM
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM
PowerTrench®
PowerXS™
Programmable Active Droop
QFET®
QS
Quiet Series
RapidConfigure
Saving our world, 1mW/W/kW at a time™
SignalWise
SmartMax
SMART START
SPM®
STEALTH
SuperFET
SuperSOT -3
SuperSOT -6
SuperSOT -8
SupreMOS
SyncFET
Sync-Lock™
SYSTEM GENERAL ®*
The Power Franchise®
the power franchise
TinyBoost
TinyBuck
TinyCalc
TinyLogic®
TINYOPTO
TinyPower
TinyPWM
TinyWire
TriFault Detect
TRUECURRENT *
µSerDes
µSerDes
UHC®
Ultra FRFET
UniFET
VCX
VisualMax
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 herein:

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 manufacturers 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 applications, 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 handling 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 any 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. I48