

FDM6296

Single N-Channel Logic-Level PowerTrench® MOSFET 30V, 11.5A, 10.5mΩ

Features

- Max $r_{DS(on)}$ = 10.5mΩ at $V_{GS} = 10V$, $I_D = 11.5A$
- Max $r_{DS(on)}$ = 15mΩ at $V_{GS} = 4.5V$, $I_D = 10A$
- Low Qg, Qgd and Rg for efficient switching performance
- RoHS Compliant

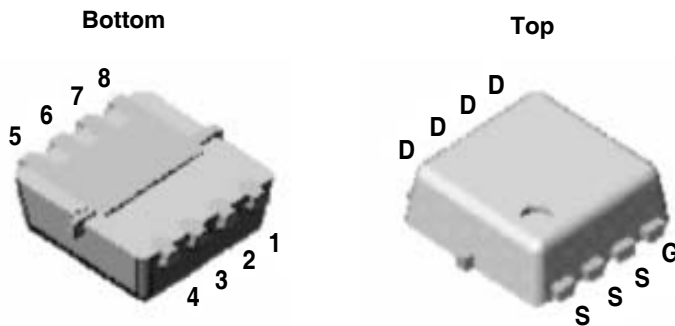


General Description

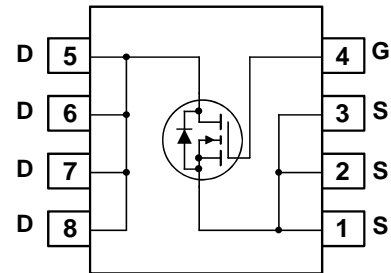
This single N-channel MOSFET in the thermally efficient MicroFET package has been specifically designed to perform well in Point of Load converters. Providing an optimized balance between $r_{DS(on)}$ and gate charge this device can be effectively used as a "high side" control switch or "low side" synchronous rectifier.

Application

- Point of Load Converter
- 1/16 Brick Synchronous Rectifier



Power 33



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous (Note 1a)	11.5	A
	-Pulsed	40	
P_D	Power Dissipation (Note 1a)	2.1	W
	Power Dissipation (Note 1b)	0.9	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	3.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	60	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
6296	FDM6296	Power 33	7"	8mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		29		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 11.5\text{A}$		8.7	10.5	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 10\text{A}$		10.6	15	
		$V_{GS} = 10\text{V}, I_D = 11.5\text{A}, T_J = 125^\circ\text{C}$		13	17	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 11.5\text{A}$		47		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		1507	2005	pF
C_{oss}	Output Capacitance			415	555	pF
C_{rss}	Reverse Transfer Capacitance			128	170	pF
R_g	Gate Resistance	$V_{DS} = 15\text{mV}, f = 1\text{MHz}$		1.1		Ω

Switching Characteristics

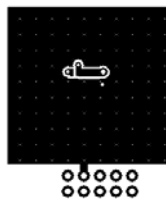
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 1.0\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		10	20	ns
t_r	Rise Time			5	10	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
t_f	Fall Time			13	23	ns
Q_g	Total Gate Charge at 5V	$V_{GS} = 5\text{V}$		12	17	nC
Q_{gs}	Gate to Source Gate Charge	$V_{DD} = 15\text{V}$		4		nC
Q_{gd}	Gate to Drain "Miller" Charge	$I_D = 11.5\text{A}$		3		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2\text{A}$ (Note 2)		0.9	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 11.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		29		ns
Q_{rr}	Reverse Recovery Charge			20		nC

Notes:

- 1: $R_{\theta JA}$ is determined with the device mounted on a 1 in² oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.
 (a) $R_{\theta JA} = 60^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper, 1.5"x1.5"x0.062" thick PCB.
 (b) $R_{\theta JA} = 135^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper.



a. $60^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $135^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

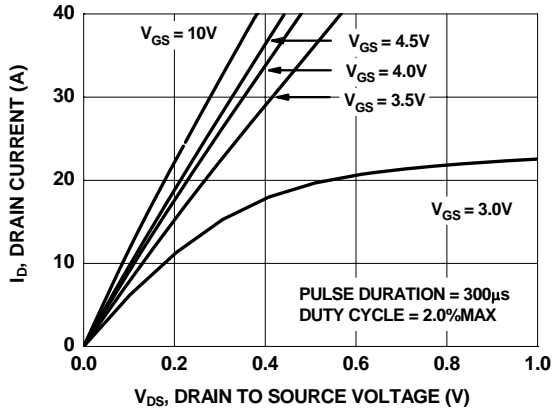


Figure 1. On-Region Characteristics

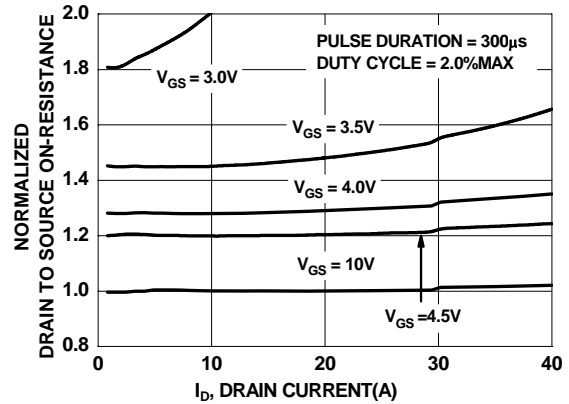


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

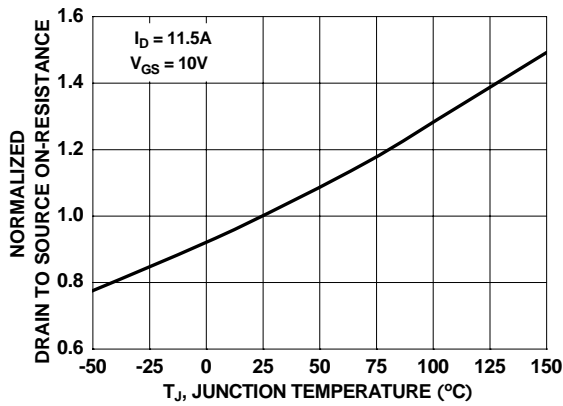


Figure 3. Normalized On-Resistance vs Junction Temperature

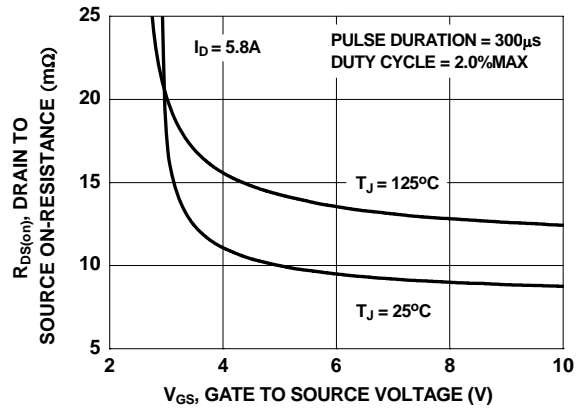


Figure 4. On-Resistance vs Gate to Source Voltage

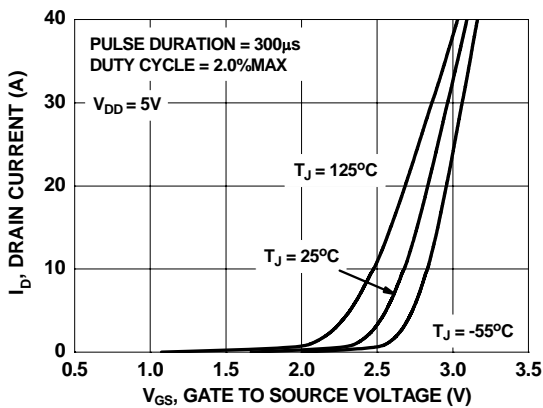


Figure 5. Transfer Characteristics

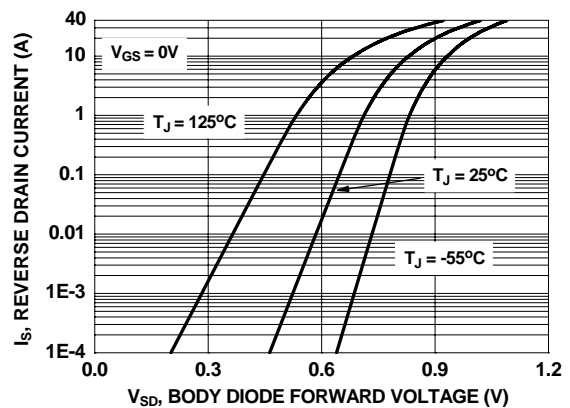


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

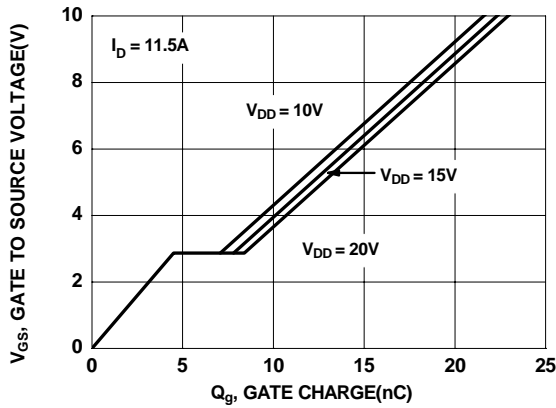


Figure 7. Gate Charge Characteristics

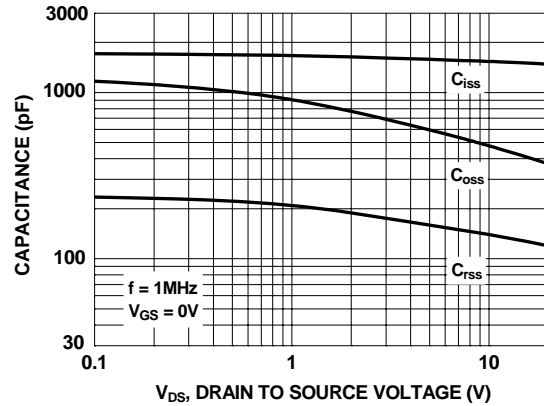


Figure 8. Capacitance vs Drain to Source Voltage

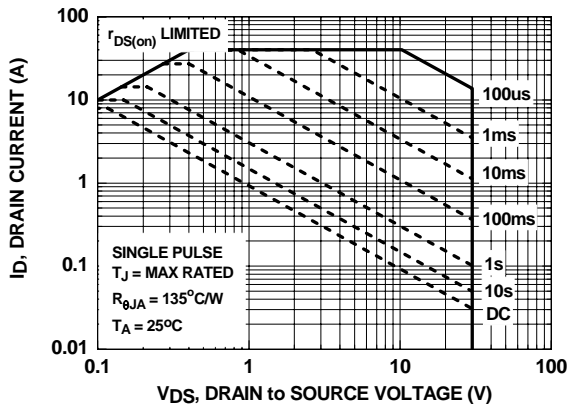


Figure 9. Forward Bias Safe Operating Area

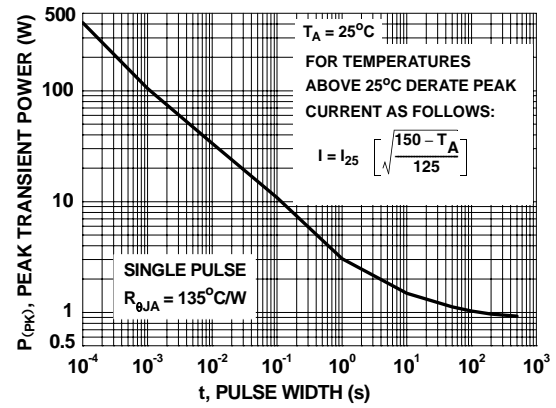


Figure 10. Single Pulse Maximum Power Dissipation

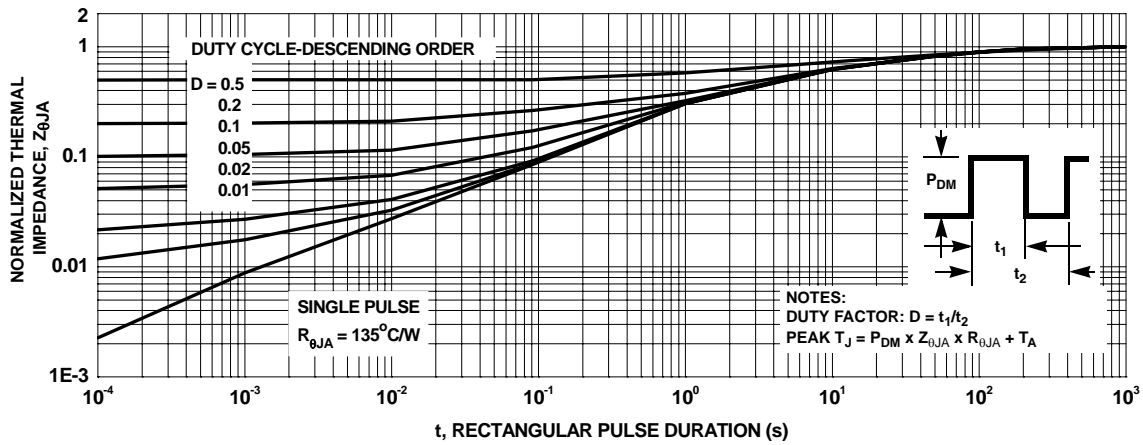
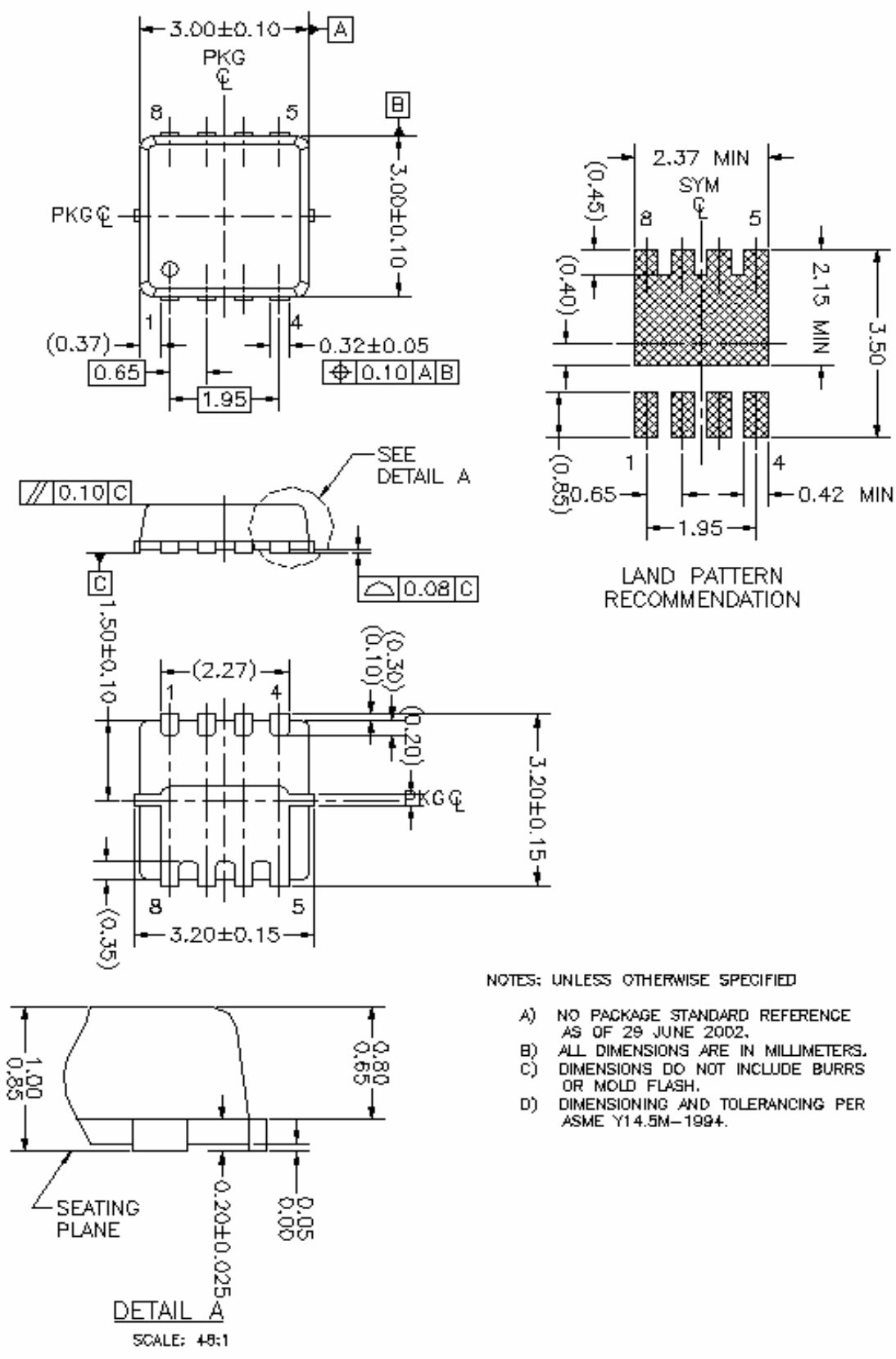


Figure 11. Transient Thermal Response Curve



NOTES: UNLESS OTHERWISE SPECIFIED

- A) NO PACKAGE STANDARD REFERENCE AS OF 29 JUNE 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx™	FACT Quiet Series™	OCX™	SILENT SWITCHER®	UniFET™
ActiveArray™	GlobalOptoisolator™	OCXPro™	SMART START™	VCX™
Bottomless™	GTO™	OPTOLOGIC®	SPM™	Wire™
Build it Now™	HiSeC™	OPTOPLANAR™	Stealth™	
CoolFET™	I ² C™	PACMAN™	SuperFET™	
CROSSVOLT™	i-Lo™	POP™	SuperSOT™-3	
DOME™	ImpliedDisconnect™	Power247™	SuperSOT™-6	
EcoSPARK™	IntelliMAX™	PowerEdge™	SuperSOT™-8	
E ² CMOS™	ISOPLANAR™	PowerSaver™	SyncFET™	
EnSigna™	LittleFET™	PowerTrench®	TCM™	
FACT®	MICROCOUPLER™	QFET®	TinyBoost™	
FAST®	MicroFET™	QS™	TinyBuck™	
FASTr™	MicroPak™	QT Optoelectronics™	TinyPWM™	
FPS™	MICROWIRE™	Quiet Series™	TinyPower™	
FRFET™	MSX™	RapidConfigure™	TinyLogic®	
	MSXPro™	RapidConnect™	TINYOPTO™	
Across the board. Around the world.™		μSerDes™	TruTranslation™	
The Power Franchise®		ScalarPump™	UHC®	
Programmable Active Droop™				

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:

- 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, or (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 significant injury to the user.
- A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

Rev. I22