Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

FAIRCHILD SEMICONDUCTOR®

February 2007

FDMS8690
N-Channel Power Trench® MOSFET
30V, 27A, 9.0mΩ

Features

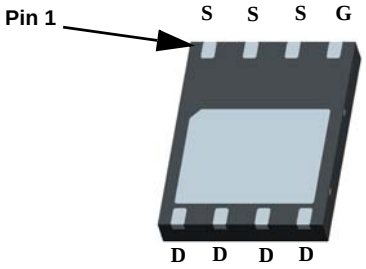
- Max $r_{DS(on)}$ = 9.0mΩ at V_{GS} = 10V, I_D = 14.0A
- Max $r_{DS(on)}$ = 12.5mΩ at V_{GS} = 4.5V, I_D = 11.5A
- High performance trench technology for extremely low $r_{DS(on)}$ and gate charge
- Minimal Qgd (2.9nC typical)
- RoHS Compliant

General Description

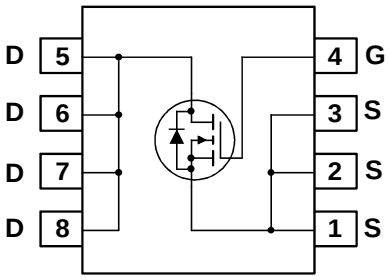
This device has been designed specifically to improve the efficiency of DC/DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low $r_{DS(on)}$ has been maintained to provide an extremely versatile device.

Application

- High Efficiency DC-DC converters.
- Notebook CPU power supply
- Multi purpose Point of Load



Power 56 (Bottom view)



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		27	A
	-Continuous (Silicon limited)	T_C = 25°C		52	
	-Continuous	T_A = 25°C	(Note 1a)	14	
	-Pulsed			100	
P_D	Power Dissipation	T_C = 25°C		37.8	W
	Power Dissipation	T_A = 25°C	(Note 1a)	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

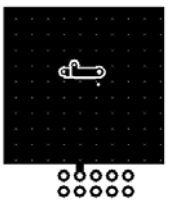
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS8690	FDMS8690	Power 56	13”	12mm	3000 units

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 = 250μA, V_{GS} = 0V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		34		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V , V_{GS} = 0V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V, V_{DS} = 0V			±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250μA	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250μA, referenced to 25°C		-4.5		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V, I_D = 14.0A		7.4	9.0	mΩ
		V_{GS} = 4.5V, I_D = 11.5A		9.9	12.5	
		V_{GS} = 10V, I_D = 14.0A, T_J = 125°C		10.6	13.3	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz		1260	1680	pF
C_{oss}	Output Capacitance			535	715	pF
C_{rss}	Reverse Transfer Capacitance			80	120	pF
R_g	Gate Resistance	f = 1MHz		1.1	5.0	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15V, I_D = 1.0A, V_{GS} = 10V, R_{GEN} = 6Ω		8	16	ns
t_r	Rise Time			1.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			26	42	ns
t_f	Fall Time			19	35	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V; V_{DD} = 15V, I_D = 14.0A		18.8	27	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V; V_{DD} = 15V, I_D = 14.0A		10	14	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15V, I_D = 14.0A		3.5		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 15V, I_D = 14.0A		2.9		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0V, I_S = 2.1A (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 14.0 A, di/dt = 100A/μs			45	ns
Q_{rr}	Reverse Recovery Charge				33	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: Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

Typical Characteristics T_J = 25°C unless otherwise noted

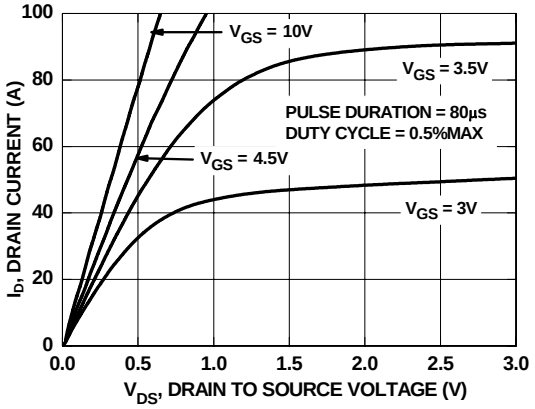


Figure 1. On-Region Characteristics

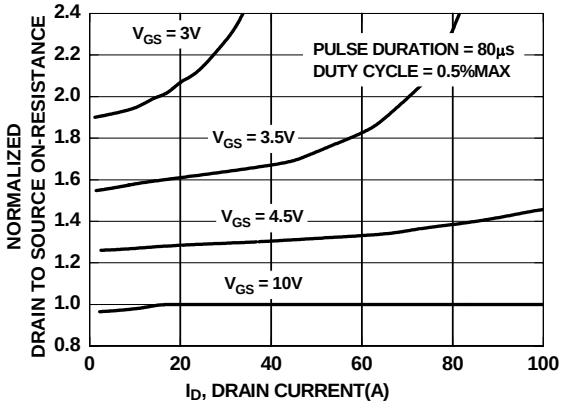


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

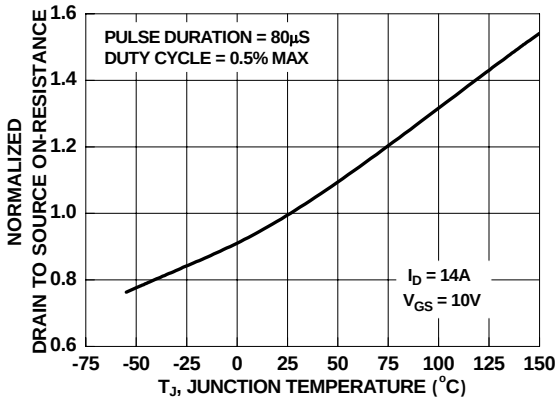


Figure 3. Normalized On-Resistance vs Junction Temperature

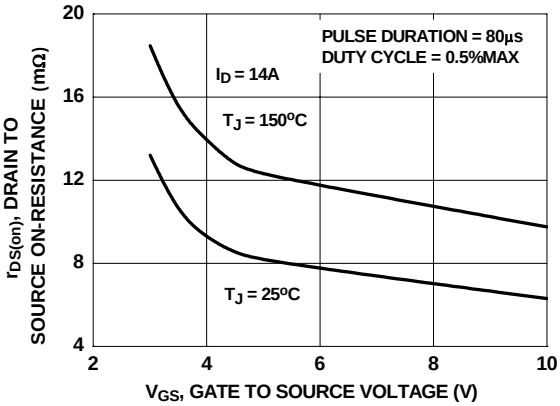


Figure 4. On-Resistance vs Gate to Source Voltage

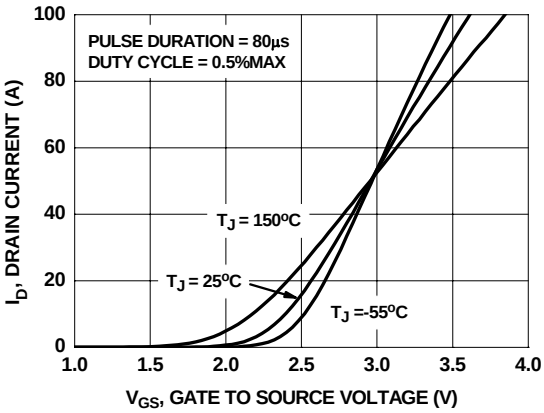


Figure 5. Transfer Characteristics

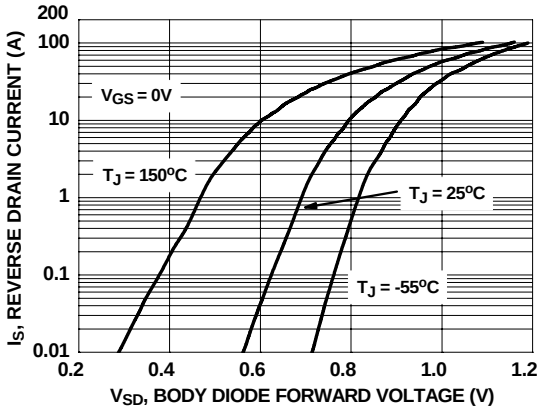


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

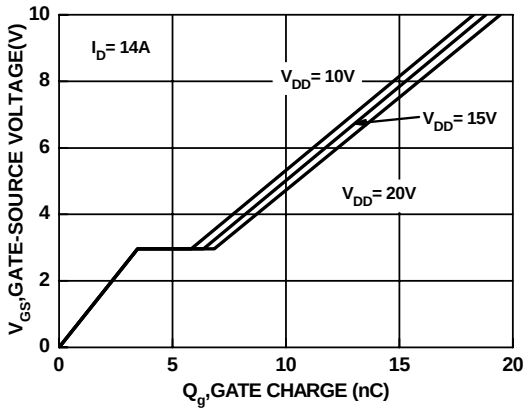


Figure 7. Gate Charge Characteristics

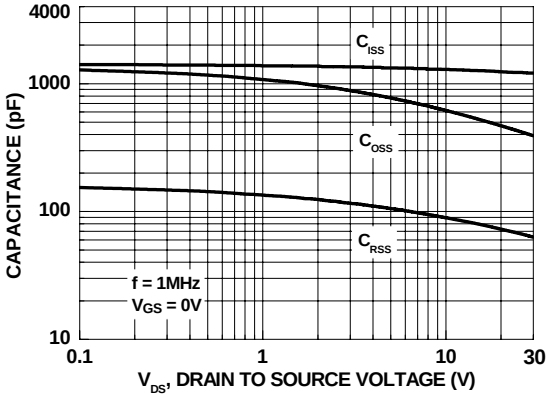


Figure 8. Capacitance vs Drain to Source Voltage

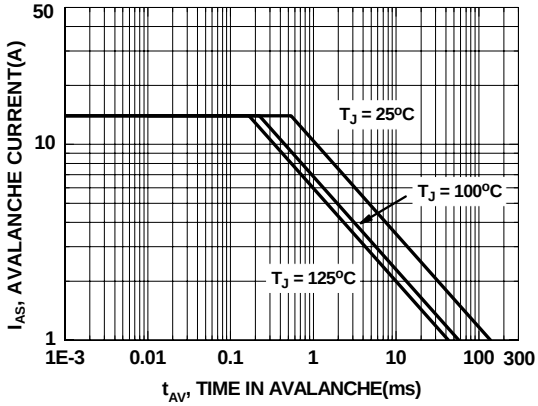


Figure 9. Unclamped Inductive Switching Capability

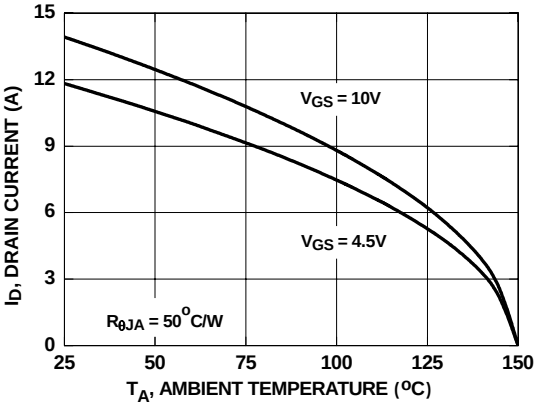


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

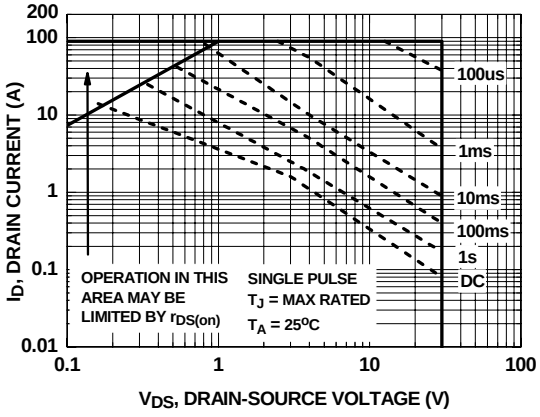


Figure 11. Forward Bias Safe Operating Area

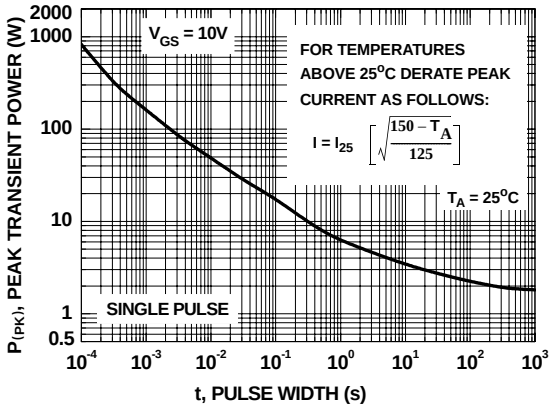


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

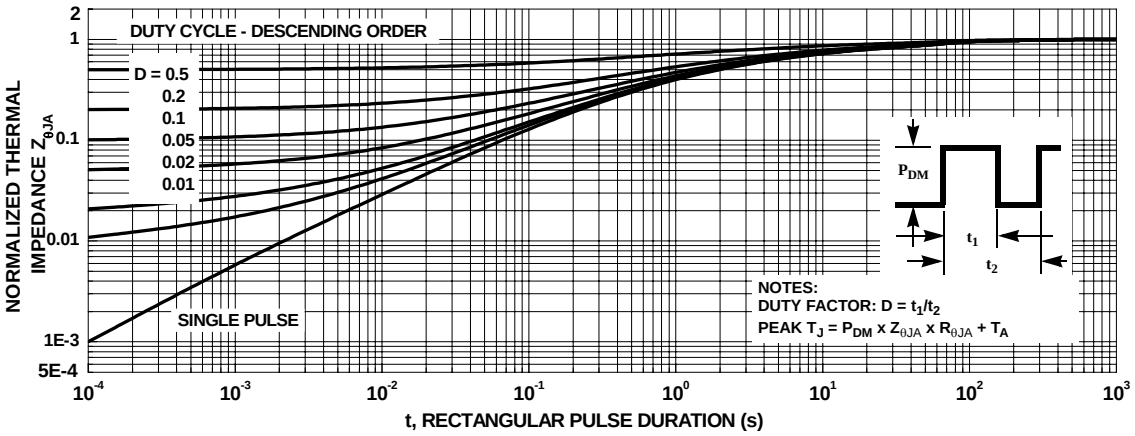
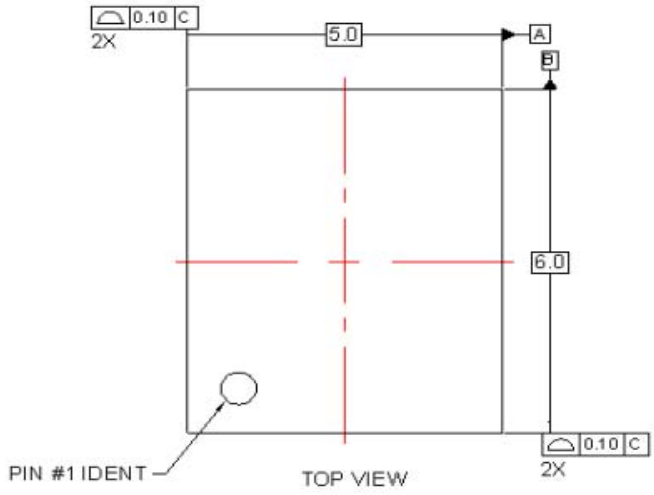
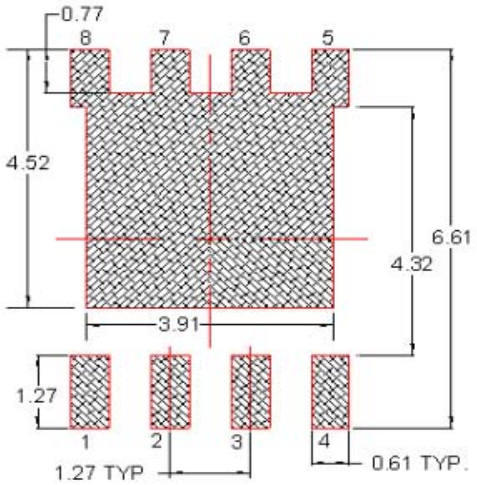
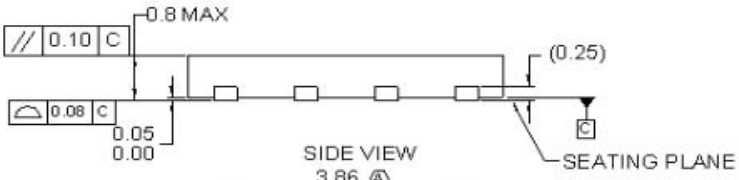


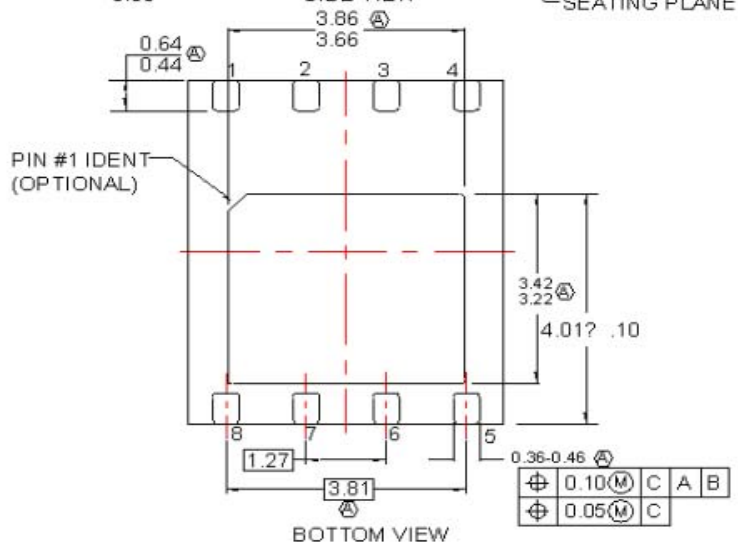
Figure 13. Transient Thermal Response Curve





RECOMMENDED LAND PATTERN





NOTES:

A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229, DATED 11/2001.

B. DIMENSIONS ARE IN MILLIMETERS.

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

D. TERMINALS 5,6,7 AND 8 ARE TIED TO THE EXPOSED PADDLE

MLP08GrevD

FAIRCHILD SEMICONDUCTOR®

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®
Across the board. Around the world.™
ActiveArray™
Bottomless™
Build it Now™
CoolFET™
CROSSVOLT™
CTL™
Current Transfer Logic™
DOME™
E^2CMOS™
EcoSPARK®
EnSigna™
FACT Quiet Series™
FACT®
FAST®
FASTr™
FPS™
FRFET®
GlobalOptoisolator™
GTO™
HiSeC™
i-Lo™
ImpliedDisconnect™
IntelliMAX™
ISOPLANAR™
MICROCOUPLER™
MicroPak™
MICROWIRE™
MSX™
MSXPro™
OCX™
OCXPro™
OPTOLOGIC®
OPTOPLANAR®
PACMAN™
POP™
Power220®
Power247®
PowerEdge™
PowerSaver™
PowerTrench®
Programmable Active Droop™
QFET®
QS™
QT Optoelectronics™
Quiet Series™
RapidConfigure™
RapidConnect™
ScalarPump™
SMART START™
SPM®
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
TCM™
The Power Franchise®
TinyBoost™
TinyBuck™
TinyLogic®
TINYOPTO™
TinyPower™
TinyWire™
TruTranslation™
µSerDes™
UHC®
UniFET™
VCX™
Wire™

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.

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; 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	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice 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. I23

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative