FAIRCHILD SEMICONDUCTOR®

October 2013

FDP3651U

N-Channel PowerTrench® MOSFET

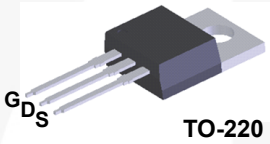
100 V, 80 A, 18 mΩ

Features

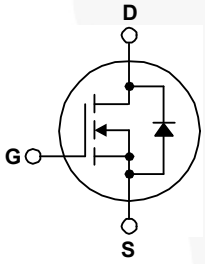
- $R_{DS(on)}$ = 15 mΩ (Typ.) @ V_{GS} = 10 V, I_D = 80 A
- High Performance Trench Technology for Extremely Low $R_{DS(on)}$
- Low Miller Charge
- UIS Capability (Single Pulse and Repetitive Pulse)

Applications

- Consumer Appliances
- Synchronous Rectification
- Battery Protection Circuit
- Motor drives and Uninterruptible Power Supplies
- Micro Solar Inverter



TO-220



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter		FDP3651U	Unit
V_{DSS}	Drain to Source Voltage		100	V
V_{GSS}	Gate to Source Voltage		±20	V
I_D	Drain Current - Continuous		80	A
	- Pulsed	(Note 1)	320	
P_D	Power Dissipation		255	W
E_{AS}	Single Pulsed Avalanche Energy	(Note 2)	266	mJ
T_J, T_{STG}	Operating and Storage Temperature		-55 to 175	°C
T_L	Maximum lead temperature soldering purposes, 1/8" from case for 5 seconds		300	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance , Junction to Ambient, Max.	62	°C/W
$R_{\theta JC}$	Thermal Resistance , Junction to Case, Max.	0.59	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDP3651U	FDP3651U	Tube	N/A	50 units

©2006 Fairchild Semiconductor Corporation

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	100	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80V, V_{GS} = 0V	-	-	1	μA
		V_{DS} = 80V, V_{GS} = 0V, T_C=150°C	-	-	250	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = -250μA	3.5	4.5	5.5	V
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10V , I_D = 80A	-	15	18	mΩ
		V_{GS} = 10V , I_D = 40A	-	13	15	
		V_{GS}=10V, I_D=40A,T_J=175°C	-	32	37	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25V,V_{GS} = 0V f=1MHz	-	4152	5522	pF
C_{oss}	Output Capacitance		-	485	728	pF
C_{rss}	Reverse Transfer Capacitance		-	89	118	pF
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0V to 10V, V_{DD} = 50V, I_D = 80A	-	49	69	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0V to 2V, V_{DD} = 50V, I_D = 80A	-	7	9.8	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 50V, I_D = 80A	-	23	-	nC
Q_{gd}	Gate to Drain Charge	V_{DD} = 50V, I_D = 80A	-	16	-	nC
Resistive Switching Characteristics						
$t_{(on)}$	Turn-On Time	V_{DD} = 50V, I_D = 80A, V_{GS} = 10V, R_{GS} = 5.0Ω	-	-	64	ns
$t_{d(on)}$	Turn-On Delay Time		-	15	27	ns
t_r	Rise Time		-	16	29	ns
$t_{d(off)}$	Turn-Off Delay Time		-	32	52	ns
t_f	Fall Time		-	14	26	ns
$t_{(off)}$	Turn-Off Time		-	-	78	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	I_{SD} = 80A	-	0.99	1.25	V
		I_{SD} = 40A	-	0.88	1.0	V
t_{rr}	Reverse Recovery Time	I_s = 40 A, di/dt = 100A/μs	-	70	105	ns
Q_{rr}	Reverse Recovery Charge		-	202	303	nC

Notes:
1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. L=0.13mH, I_{AS} = 64A, V_{DD}=50V, R_G=25 Ω , Starting T_J=25°C

Typical Characteristics T_C = 25°C unless otherwise noted

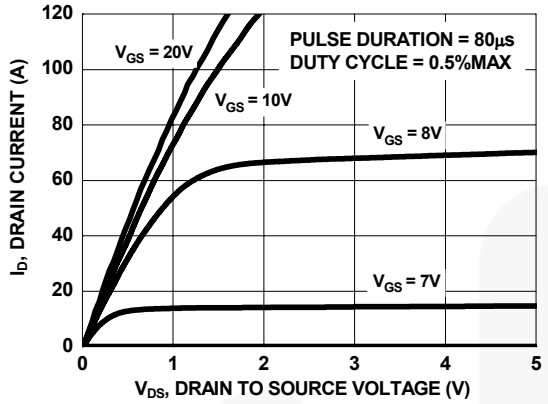


Figure 1. On Region Characteristics

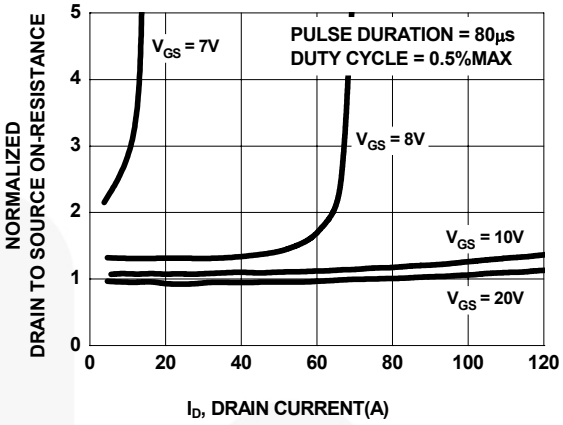


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

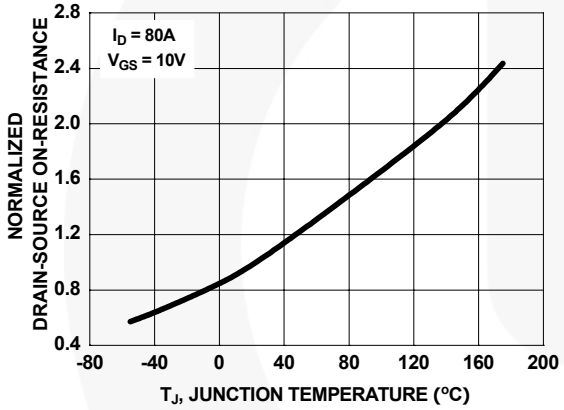


Figure 3. Normalized On Resistance vs Junction Temperature

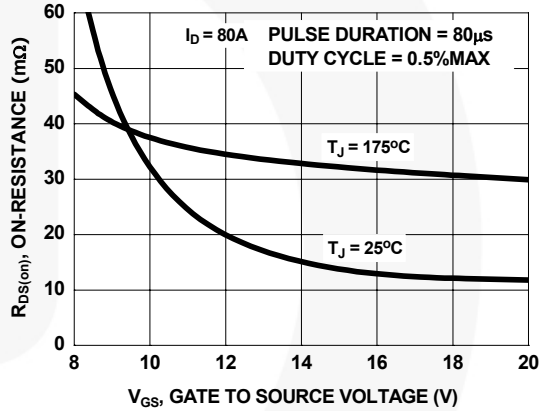


Figure 4. On-Resistance vs Gate to Source Voltage

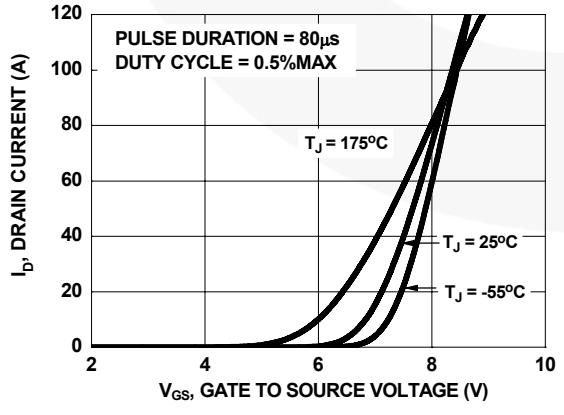


Figure 5. Transfer Characteristics

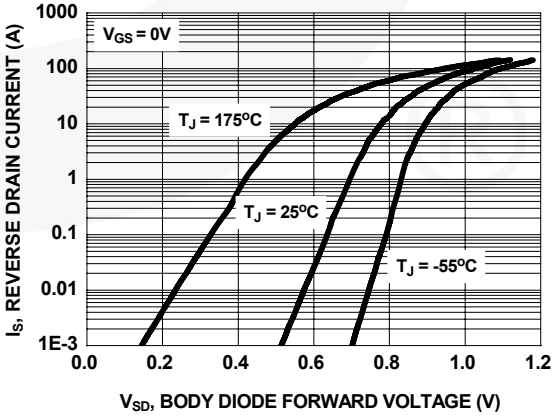


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_C = 25°C unless otherwise noted

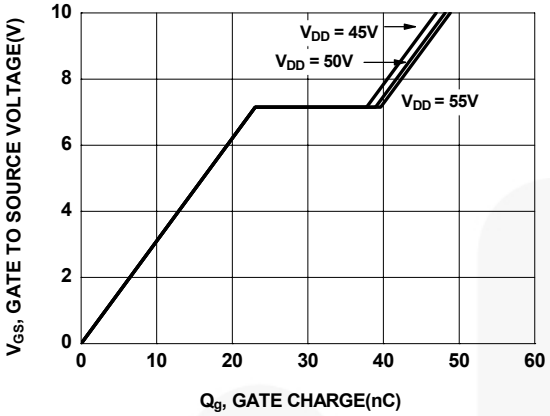


Figure 7. Gate Charge Characteristics

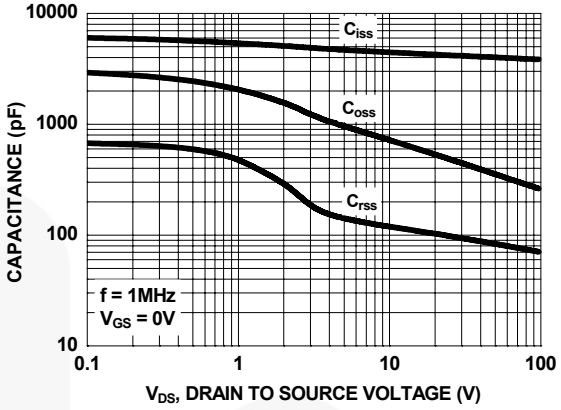


Figure 8. Capacitance vs Drain to Source Voltage

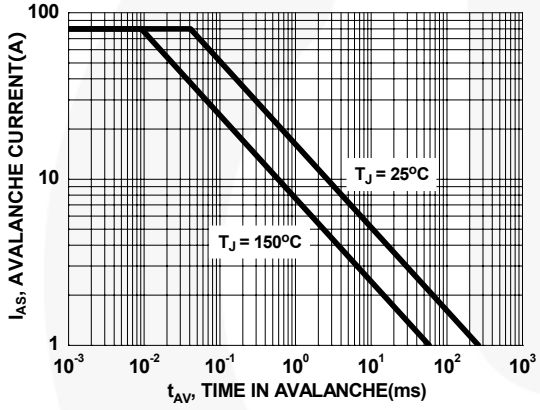


Figure 9. Unclamped Inductive Switching Capability

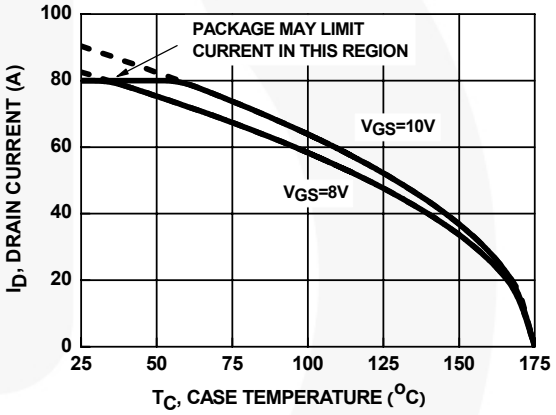


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

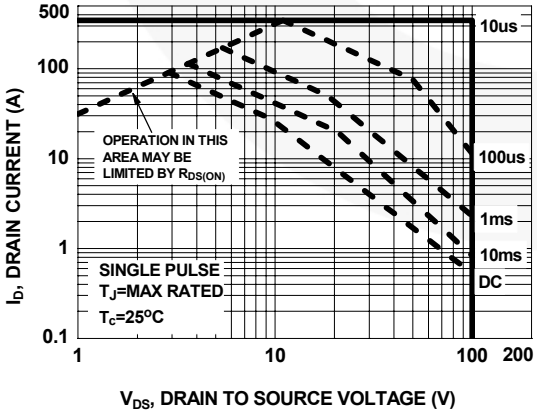


Figure 11. Forward Bias Safe Operating Area

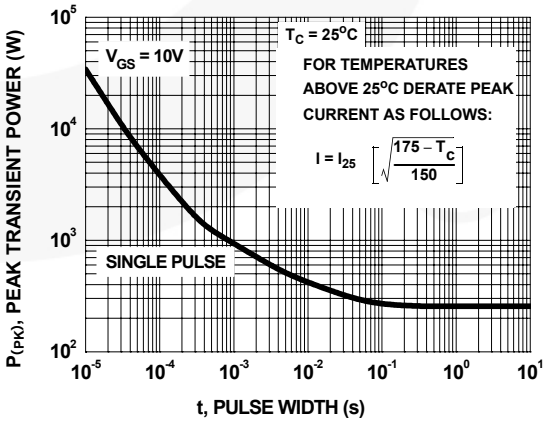


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_C = 25°C unless otherwise noted

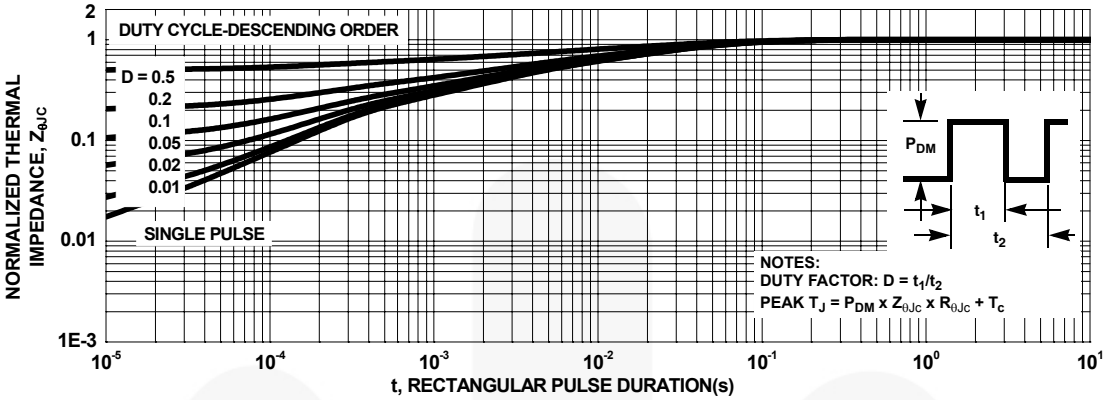


Figure 13. Transient Thermal Response Curve

Mechanical Dimensions

TO-220 3L

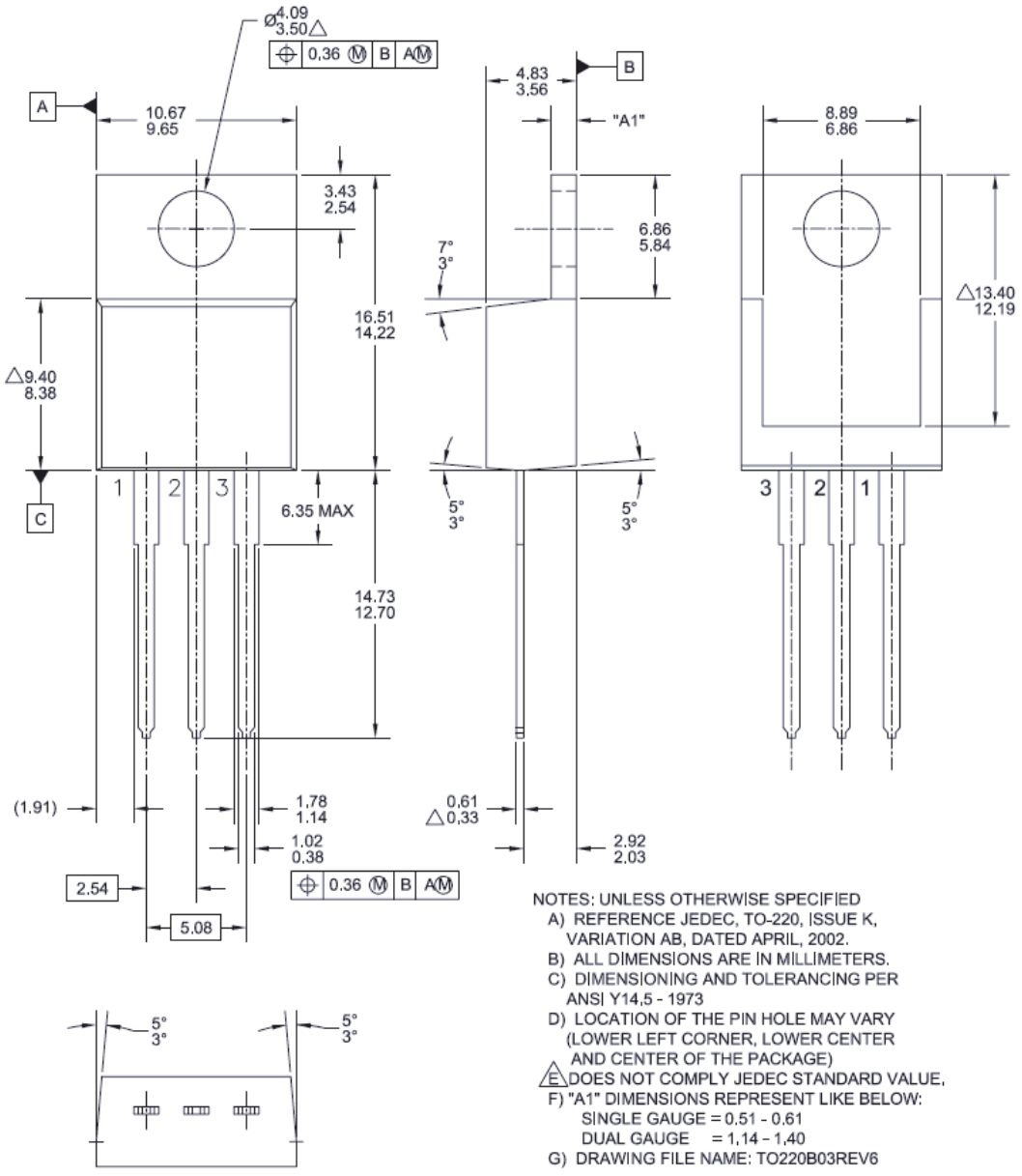


Figure 14. TO-220, Molded, 3Lead, Jedec Variation AB

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

http://www.fairchildsemi.com/package/packageDetails.html?id=PN_TT220-003

Dimension in Millimeters

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™
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℠
GreenBridge™
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™
SerDes™
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. I66

©2006 Fairchild Semiconductor Corporation