



FDS8672S

N-Channel PowerTrench[®] SyncFET[™] 30V, 18A, 4.8mΩ

Features

- Max $r_{DS(on)}$ = 4.8mΩ at $V_{GS} = 10V$, $I_D = 18A$
- Max $r_{DS(on)}$ = 7.0mΩ at $V_{GS} = 4.5V$, $I_D = 15A$
- Includes SyncFET Schottky body diode
- High performance trench technology for extremely low $r_{DS(on)}$ and fast switching
- High power and current handling capability
- 100% R_g (Gate Resistance) tested
- Termination is Lead-free and RoHS Compliant

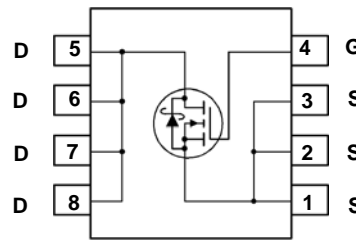
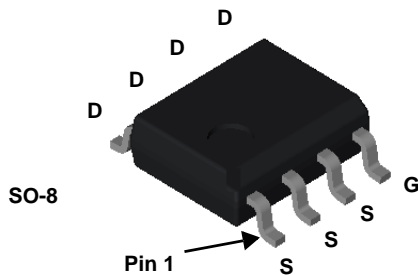


General Description

The FDS8672S is designed to replace a single MOSFET and Schottky diode in synchronous DC/DC power supplies. This 30V MOSFET is designed to maximize power conversion efficiency, providing a low $r_{DS(on)}$ and low gate charge. The FDS8672S includes a patented combination of a MOSFET monolithically integrated with a Schottky diode using Fairchild's monolithic SyncFET technology.

Application

- Synchronous Rectifier for DC/DC Converters
- Notebook Vcore low side switch
- Point of load low side switch



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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 | 18 | A |
| | -Pulsed | 80 | |
| E_{AS} | Single Pulse Avalanche Energy (Note 3) | 216 | mJ |
| P_D | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a) | 2.5 | W |
| | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b) | 1.0 | |
| 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) | 25 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 50 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|----------|---------|-----------|------------|------------|
| FDS8672S | FDS8672S | SO8 | 13" | 12mm | 2500 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 | $I_D = 1\text{mA}, V_{GS} = 0\text{V}$ | 30 | | | V |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = 10\text{mA}$, referenced to 25°C | | 33 | | mV/°C |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$ | | | 500 | 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 | $V_{GS} = V_{DS}, I_D = 1\text{mA}$ | 1.0 | 2.1 | 3.0 | V |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = 10\text{mA}$, referenced to 25°C | | -5 | | mV/°C |
| $r_{DS(on)}$ | Static Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 18\text{A}$ | | 3.8 | 4.8 | m Ω |
| | | $V_{GS} = 4.5\text{V}, I_D = 15\text{A}$ | | 5.3 | 7.0 | |
| | | $V_{GS} = 10\text{V}, I_D = 18\text{A}, T_J = 125^\circ\text{C}$ | | 5.3 | 7.8 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{V}, I_D = 18\text{A}$ | | 78 | | S |

Dynamic Characteristics

| | | | | | | |
|------------|------------------------------|---|--|------|------|----------|
| C_{iss} | Input Capacitance | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$ | | 2005 | 2670 | pF |
| C_{oss} | Output Capacitance | | | 985 | 1310 | pF |
| C_{riss} | Reverse Transfer Capacitance | | | 135 | 205 | pF |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | | 0.6 | 2.0 | Ω |

Switching Characteristics

| | | | | | | |
|--------------|-------------------------------|--|-------------------------------------|--|----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 15\text{V}, I_D = 18\text{A},$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ | | 12 | 22 | ns |
| t_r | Rise Time | | | 4 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 26 | 42 | ns |
| t_f | Fall Time | | | 3 | 10 | ns |
| Q_g | Total Gate Charge | | $V_{GS} = 0\text{V to } 10\text{V}$ | $V_{DD} = 15\text{V},$ $I_D = 18\text{A}$ | 29 | 41 |
| Q_g | Total Gate Charge | $V_{GS} = 0\text{V to } 5\text{V}$ | 15 | | 21 | nC |
| Q_{gs} | Gate to Source Charge | | 5.5 | | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | 3.7 | | | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|---------------------------------------|---|--|-----|-----|----|
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 18\text{A}$ | | 0.8 | 1.2 | V |
| | | $V_{GS} = 0\text{V}, I_S = 1.8\text{A}$ | | 0.4 | 0.7 | |
| t_{rr} | Reverse Recovery Time | $I_F = 18\text{A}, di/dt = 300\text{A}/\mu\text{s}$ | | 27 | 43 | ns |
| Q_{rr} | Reverse Recovery Charge | | | 31 | 50 | nC |

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{in.}$ 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 1in^2 pad of 2 oz copper.



b) 125°C/W when mounted on a minimum pad.

2. Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.
3. Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 12\text{A}$, $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$.

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

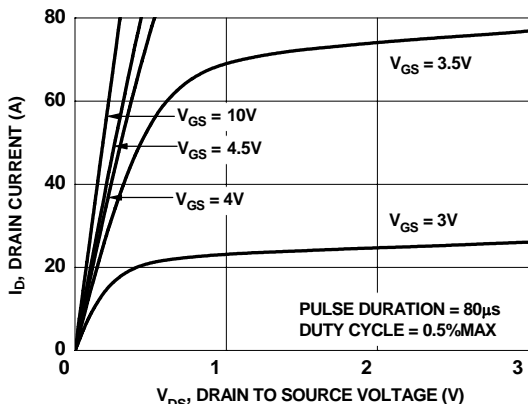


Figure 1. On-Region Characteristics

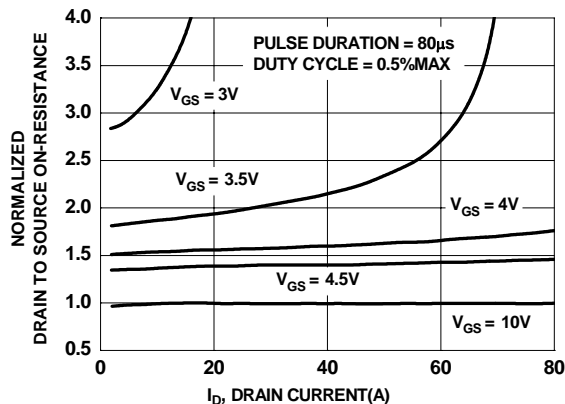


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

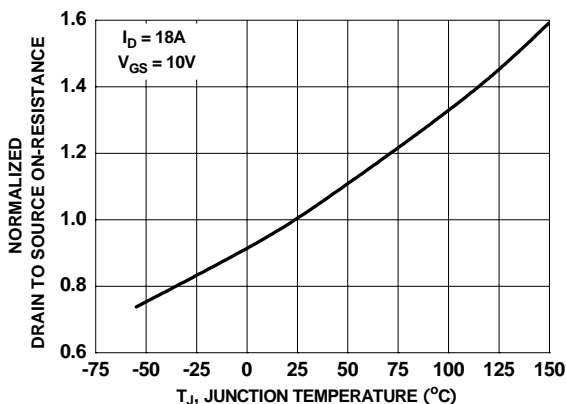


Figure 3. Normalized On-Resistance vs Junction Temperature

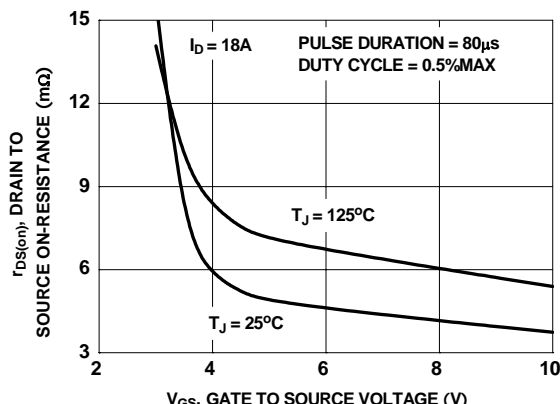


Figure 4. On-Resistance vs Gate to Source Voltage

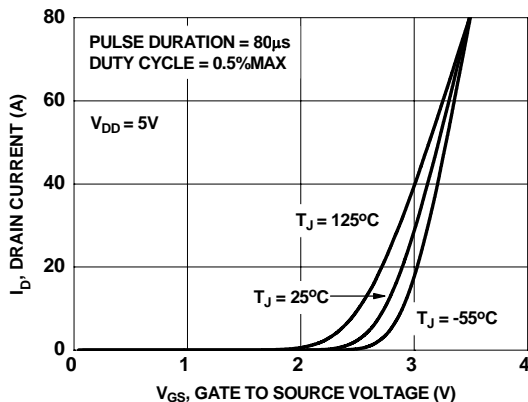


Figure 5. Transfer Characteristics

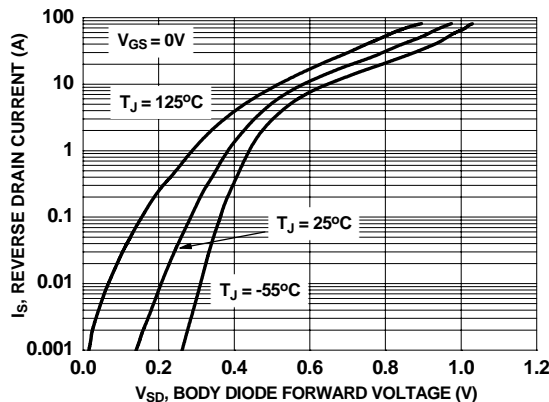


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

www.DataSheet4U.com

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

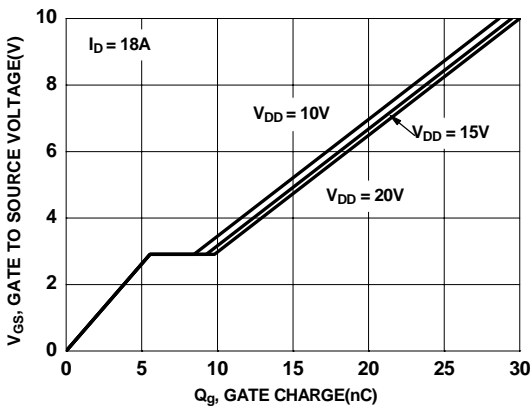


Figure 7. Gate Charge Characteristics

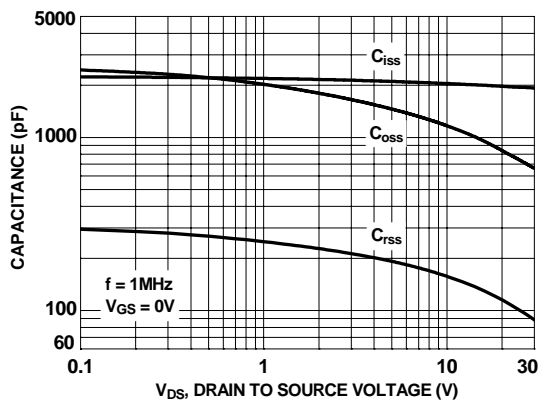


Figure 8. Capacitance vs Drain to Source Voltage

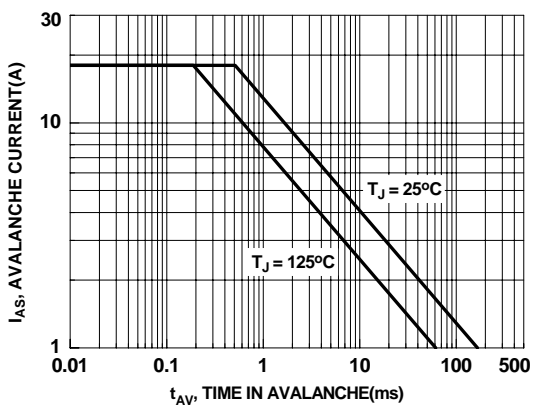


Figure 9. Unclamped Inductive Switching Capability

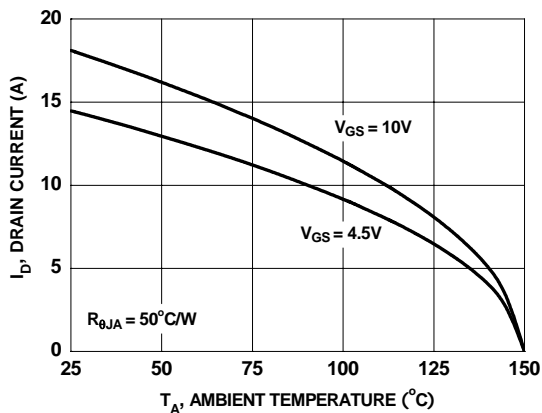


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

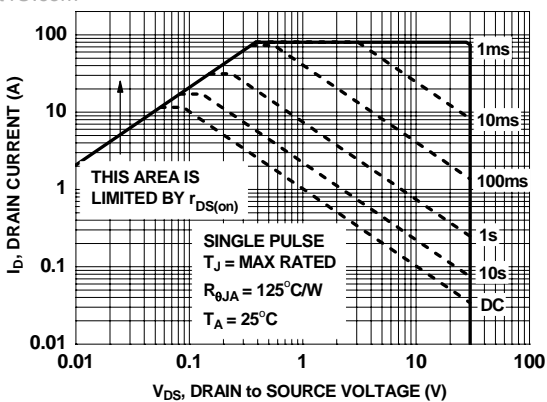


Figure 11. Forward Bias Safe Operating Area

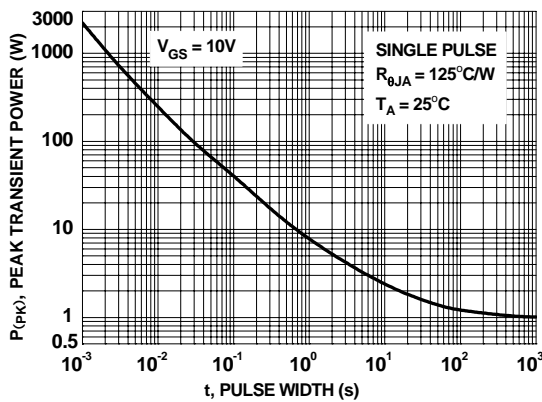


Figure 12. Single Pulse Maximum Power Dissipation

www.DataSheet4U.com

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

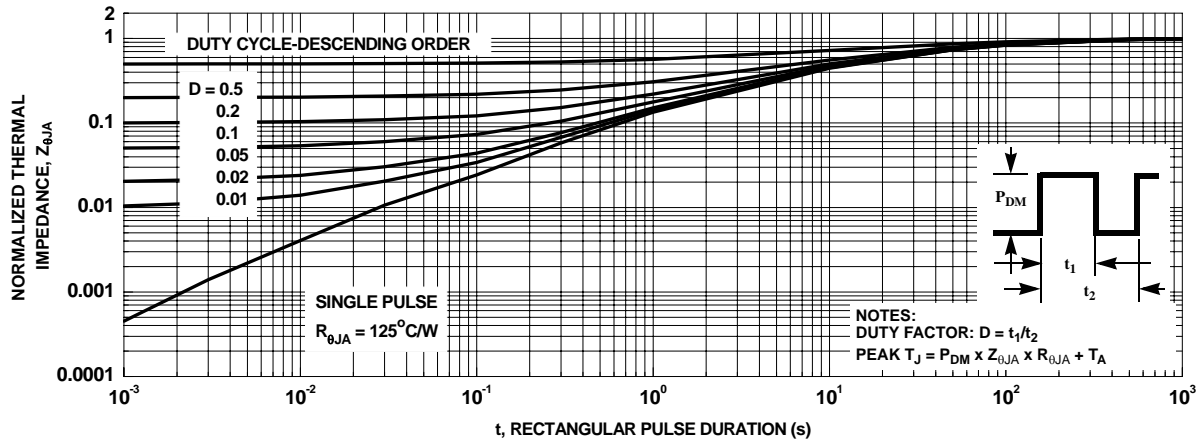


Figure 13. Transient Thermal Response Curve

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

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 14 shows the reverse recovery characteristic of the FDS8672S.

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

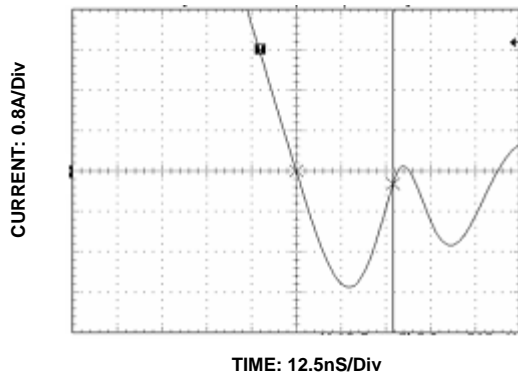


Figure 14. FDS8672S SyncFET Body Diode Reverse Recovery Characteristics

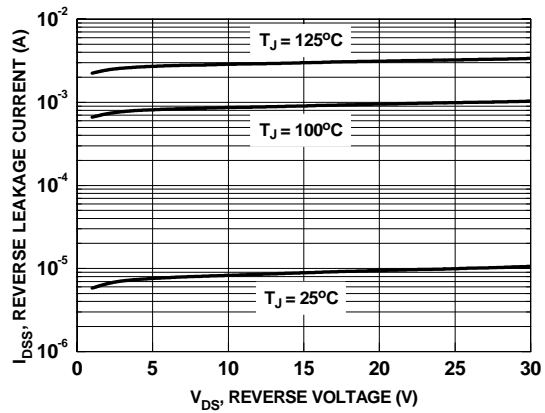
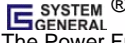





Figure 15. SyncFET Body Diode Reverse Leakage vs Drain to Source Voltage



TRADEMARKS

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

| | | | |
|--|--|--|---|
| ACEx [®] | FPS [™] | PDP-SPM [™] | SyncFET [™] |
| Build it Now [™] | FRFET [®] | Power220 [®] |  SYSTEM [®] |
| CorePLUS [™] | Global Power Resource SM | Power247 [®] | The Power Franchise [®] |
| CROSSVOLT [™] | Green FPS [™] | POWEREDGE [®] | the power |
| CTL [™] | Green FPS [™] e-Series [™] | Power-SPM [™] | franchise |
| Current Transfer Logic [™] | GTO [™] | PowerTrench [®] | TinyBoost [™] |
| EcoSPARK [®] | <i>i-Lo</i> [™] | Programmable Active Droop [™] | TinyBuck [™] |
| EZSWITCH [™] * | IntelliMAX [™] | QFET [®] | TinyLogic [®] |
|  [™] | ISOPLANAR [™] | QS [™] | TINYOPTO [™] |
|  [®] | MegaBuck [™] | QT Optoelectronics [™] | TinyPower [™] |
| Fairchild [®] | MICROCOUPLER [™] | Quiet Series [™] | TinyPWM [™] |
| Fairchild Semiconductor [®] | MicroFET [™] | RapidConfigure [™] | TinyWire [™] |
| FACT Quiet Series [™] | MicroPak [™] | SMART START [™] | μSerDes [™] |
| FACT [®] | MillerDrive [™] | SPM [®] | UHC [®] |
| FAST [®] | Motion-SPM [™] | STEALTH [™] | Ultra FRFET [™] |
| FastvCore [™] | OPTOLOGIC [®] | SuperFET [™] | UniFET [™] |
| FlashWriter [®] * | OPTOPLANAR [®] | SuperSOT [™] -3 | VCX [™] |
| |  [®] | SuperSOT [™] -6 | |
| | | SuperSOT [™] -8 | |

* EZSWITCH[™] and FlashWriter[®] are trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT 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 significant injury to the user.
2. 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; 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. I32