

FDMB3800N

Dual N-Channel PowerTrench® MOSFET

30V, 4.8A, 40mΩ

Features

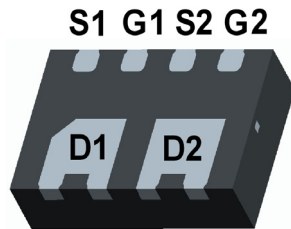
- Max $r_{DS(on)}$ = 40mΩ at $V_{GS} = 10V$, $I_D = 4.8A$
- Max $r_{DS(on)}$ = 51mΩ at $V_{GS} = 4.5V$, $I_D = 4.3A$
- Fast switching speed
- Low gate Charge
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability.
- RoHS Compliant



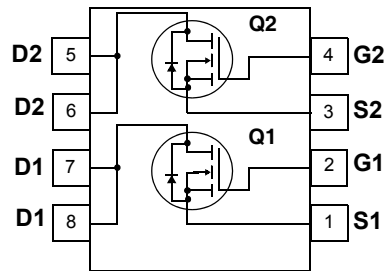
General Description

These N-Channel Logic Level MOSFETs are produced using Fairchild Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

These devices are well suited for low voltage and battery powered applications where low in-line power loss and fast switching are required.



MicroFET 3X1.9



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 $T_A = 25^\circ\text{C}$ (Note 1a) | 4.8 | A |
| | -Pulsed | 9 | |
| P_D | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a) | 1.6 | W |
| | Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b) | 0.75 | |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

Thermal Characteristics

| | | | | |
|-----------------|---|-----------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1a) | 80 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | (Note 1b) | 165 | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|---------------|-----------|------------|------------|
| 3800 | FDMB3800N | MicroFET3X1.9 | 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 | | 24 | | $\text{mV}/^\circ\text{C}$ |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 24\text{V}, V_{GS} = 0\text{V}, T_J = 55^\circ\text{C}$ | | | 1 10 | 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 | | -4 | | $\text{mV}/^\circ\text{C}$ |
| $r_{DS(on)}$ | Drain to Source On Resistance | $V_{GS} = 10\text{V}, I_D = 4.8\text{A}$ | | 32 | 40 | $\text{m}\Omega$ |
| | | $V_{GS} = 4.5\text{V}, I_D = 4.3\text{A}$ | | 41 | 51 | |
| | | $V_{GS} = 10\text{V}, I_D = 4.8\text{A}, T_J = 125^\circ\text{C}$ | | 43 | 61 | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{V}, I_D = 4.8\text{A}$ | | 14 | | S |

Dynamic Characteristics

| | | | | | | |
|-----------|------------------------------|--|--|-----|-----|-------------|
| C_{iss} | Input Capacitance | $V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$ | | 350 | 465 | pF |
| C_{oss} | Output Capacitance | | | 90 | 120 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 40 | 60 | pF |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | | 3 | | Ω |

Switching Characteristics

| | | | | | | |
|--------------|-------------------------------|--|-----------------------|-----|-----|----|
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD} = 15\text{V}, I_D = 1\text{A}, V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$ | | 8 | 16 | ns |
| t_r | Rise Time | | | 5 | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 21 | 34 | ns |
| t_f | Fall Time | | | 2 | 10 | ns |
| $Q_{g(TOT)}$ | Total Gate Charge at 5V | $V_{GS} = 0\text{V to } 5\text{V}$ | $V_{DD} = 15\text{V}$ | 4 | 5.6 | nC |
| Q_{gs} | Gate to Source Gate Charge | | $I_D = 7.5\text{A}$ | 1.0 | | nC |
| Q_{gd} | Gate to Drain "Miller" Charge | | | 1.5 | | nC |

Drain-Source Diode Characteristics

| | | | | | | |
|----------|---|--|--|------|-----|----|
| I_S | Maximum Continuous Drain - Source Diode Forward Current | | | 1.25 | A | |
| V_{SD} | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = 1.25\text{A}$ (Note 2) | | 0.8 | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $I_F = 4.8\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | | 17 | | ns |
| Q_{rr} | Reverse Recovery Charge | | | 7 | | 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. $80^\circ\text{C}/\text{W}$ when mounted on a 1in^2 pad of 2 oz copper



b. $165^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.

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

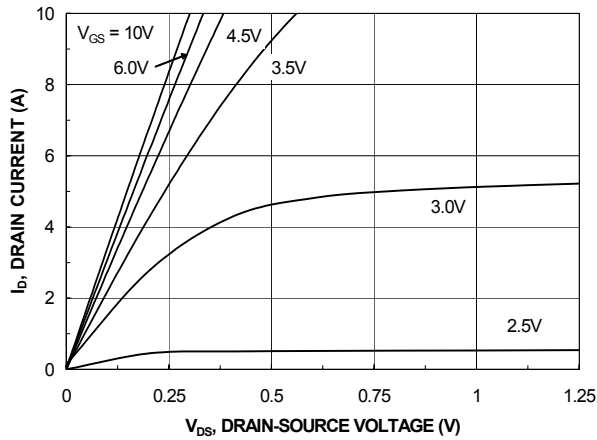


Figure 1. On Region Characteristics

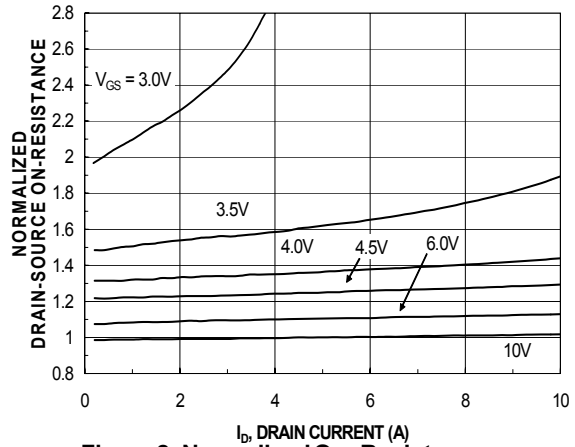


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

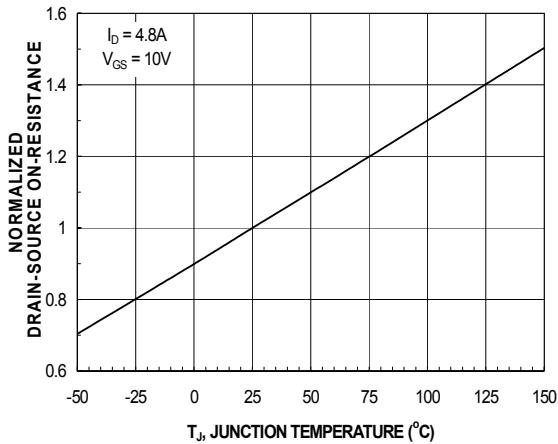


Figure 3. Normalized On-Resistance vs Junction Temperature

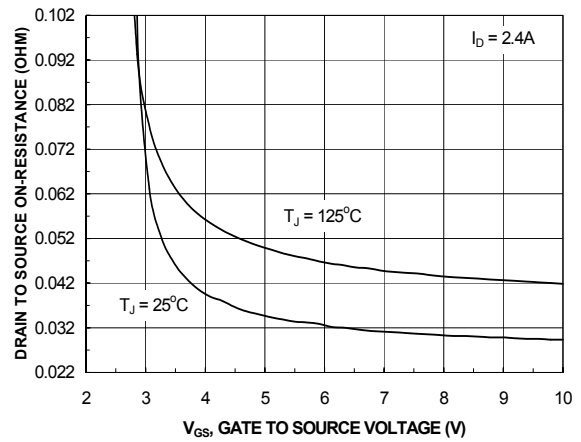


Figure 4. On-Resistance vs Gate to Source Voltage

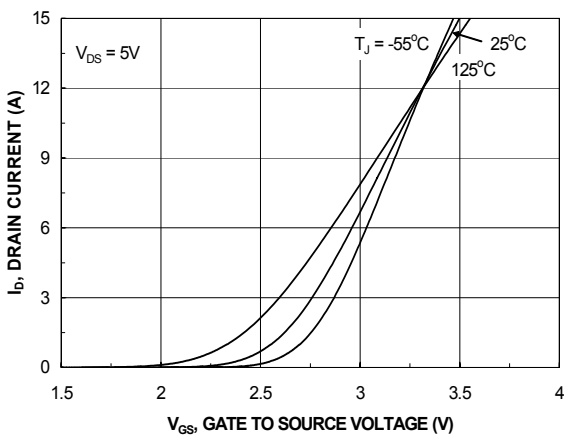


Figure 5. Transfer Characteristics

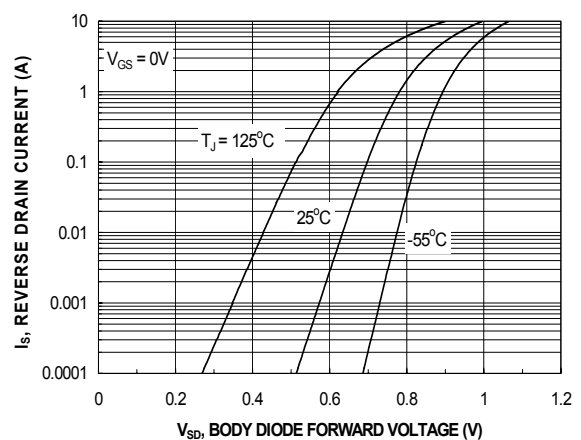


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

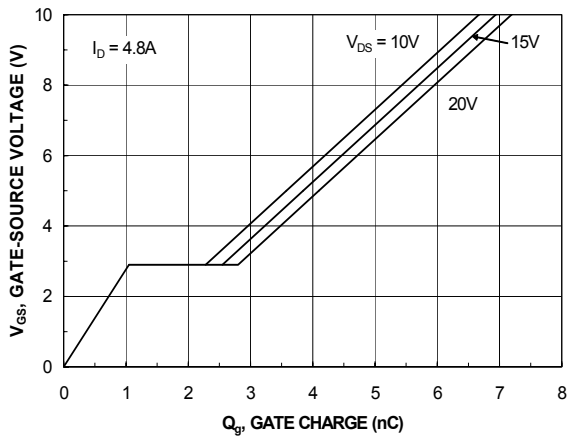


Figure 7. Gate Charge Characteristics

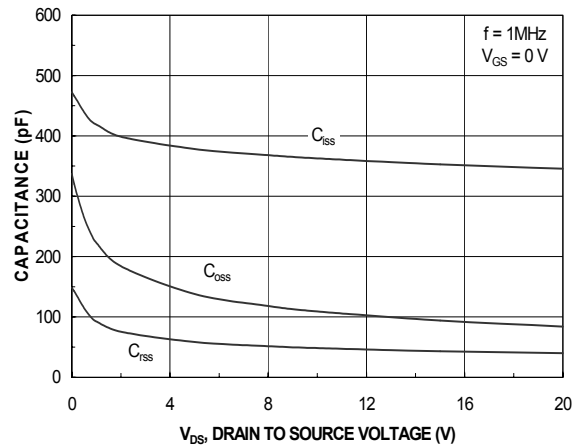


Figure 8. Capacitance vs Drain to Source Voltage

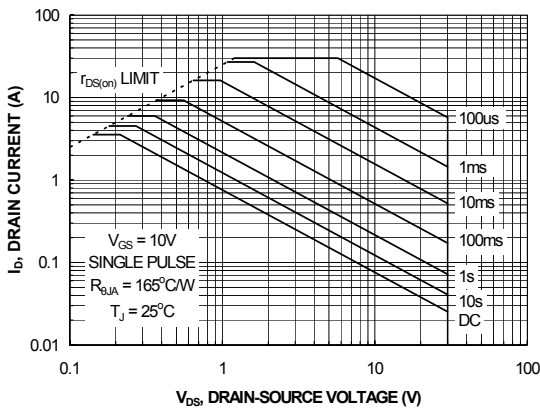


Figure 9. Forward Bias Safe Operating Area

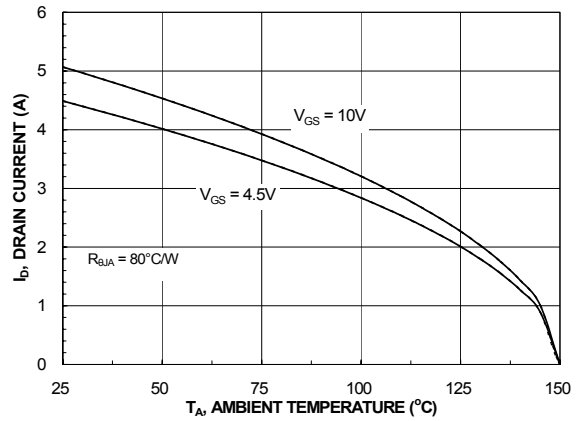


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

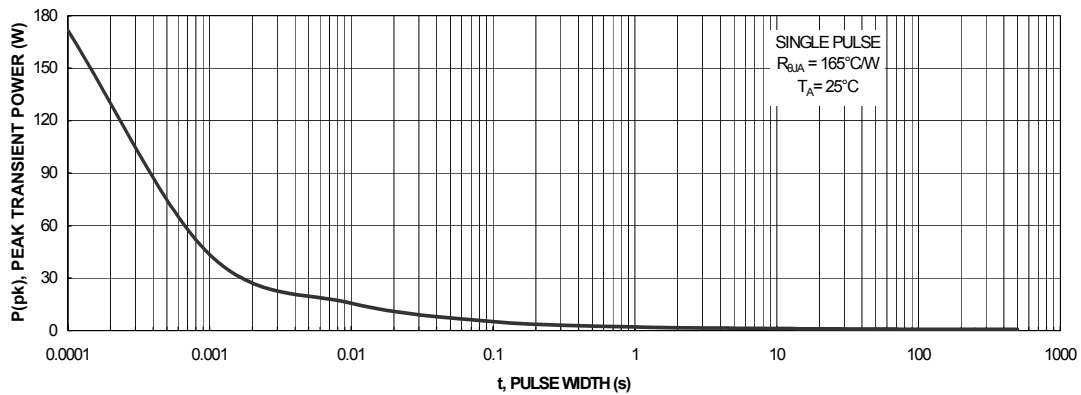


Figure 11. Single Pulse Maximum Power Dissipation

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

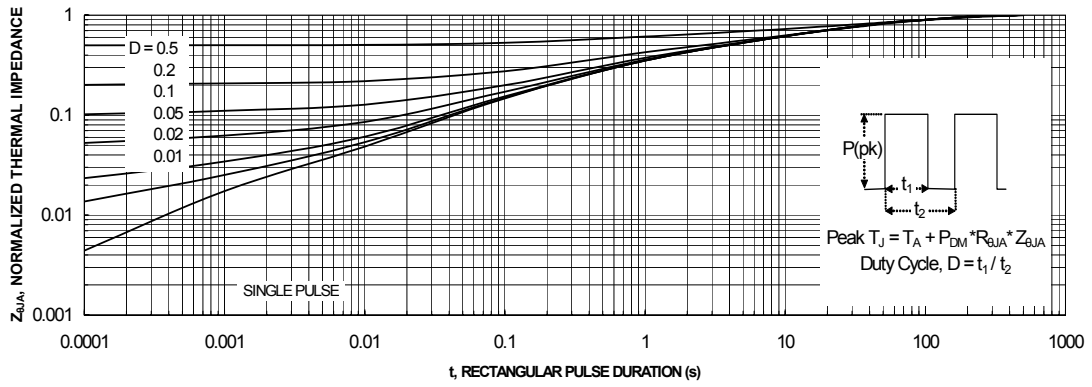
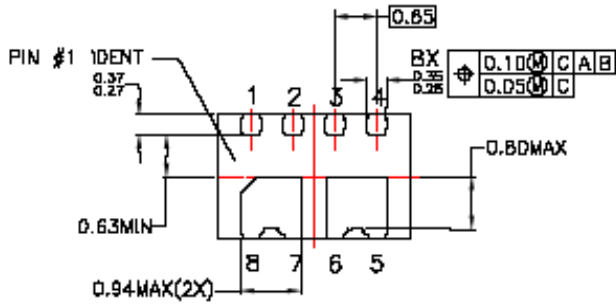
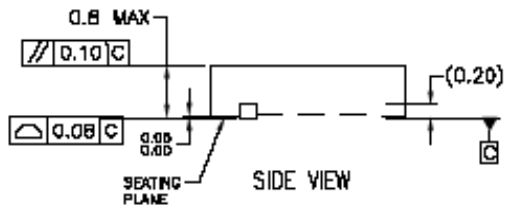
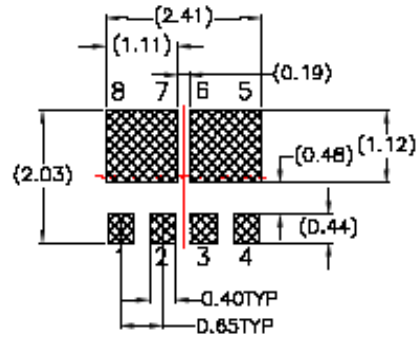
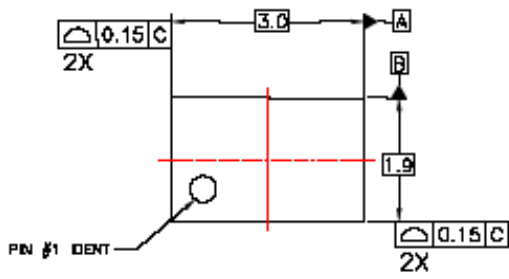


Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



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™ | UltraFET® |
| Bottomless™ | GTO™ | OPTOLOGIC® | SPM™ | VCX™ |
| Build it Now™ | HiSeC™ | OPTOPLANAR™ | Stealth™ | Wire™ |
| 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. 120