

FOD816 Series 4-Pin Phototransistor Optocouplers

Features

- AC input response
- Applicable to Pb-free IR reflow soldering
- Compact 4-pin package
- High current transfer ratio: 600% minimum
- Safety agency approvals pending
- High input-output isolation voltage of 5000Vrms

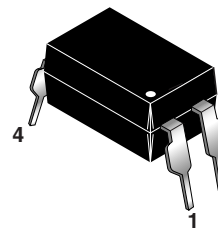
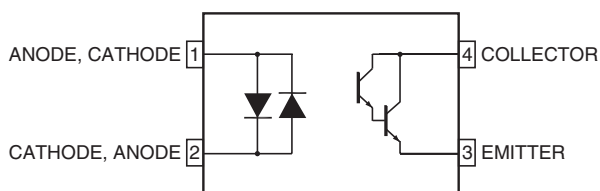
Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

Description

The FOD816 consists of two gallium arsenide infrared emitting diodes, connected in inverse parallel, driving a silicon photodarlington output in a 4-pin dual in-line package.

Functional Block Diagram



Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified.)

| Parameter | Symbol | Value | Units |
|-----------------------------|------------------|----------------|-------|
| TOTAL DEVICE | | | |
| Storage Temperature | T _{STG} | -55 to +125 | °C |
| Operating Temperature | T _{OPR} | -30 to +100 | °C |
| Lead Solder Temperature | T _{SOL} | 260 for 10 sec | °C |
| Total Power Dissipation | P _{TOT} | 200 | mW |
| INPUT | | | |
| Forward Current | I _F | ±50 | mA |
| Power Dissipation | P | 70 | mW |
| OUTPUT | | | |
| Collector-Emitter Voltage | V _{CEO} | 35 | V |
| Emitter-Collector Voltage | V _{ECO} | 6 | V |
| Collector Current | I _C | 80 | mA |
| Collector Power Dissipation | P _C | 150 | mW |

Electrical/Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Individual Component Characteristics

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|-------------------------------------|--------------------------------------|------------|-----|-----|-----|---------------|
| INPUT | | | | | | |
| Forward Voltage | ($I_F = \pm 20 \text{ mA}$) | V_F | — | 1.2 | 1.4 | V |
| Terminal Capacitance | ($V = 0, f = 1 \text{ kHz}$) | C_t | — | 50 | 250 | pF |
| OUTPUT | | | | | | |
| Collector Dark Current | ($V_{CE} = 10 \text{ V}, I_F = 0$) | I_{CEO} | — | — | 1 | μA |
| Collector-Emitter Breakdown Voltage | ($I_C = 0.1 \text{ mA}, I_F = 0$) | BV_{CEO} | 35 | — | — | V |
| Emitter-Collector Breakdown Voltage | ($I_E = 10 \mu\text{A}, I_F = 0$) | BV_{ECO} | 6 | — | — | V |

Transfer Characteristics ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

| DC Characteristic | Test Conditions | Symbol | Min | Typ | Max | Unit |
|--------------------------------------|---|---------------|--------------------|--------------------|-------|---------------|
| Collector Current | ($I_F = \pm 1 \text{ mA}, V_{CE} = 2 \text{ V}$) | I_C | 6 | — | 75 | mA |
| Current Transfer Ratio ¹ | | CTR | 600 | — | 7,500 | % |
| Collector-Emitter Saturation Voltage | ($I_F = \pm 20 \text{ mA}, I_C = 5 \text{ mA}$) | $V_{CE(sat)}$ | — | 0.8 | 1 | V |
| Isolation Resistance | (DC500V 40~60% R.H.) | R_{iso} | 5×10^{10} | 1×10^{11} | — | Ω |
| Floating Capacitance | ($V = 0, f = 1 \text{ MHz}$) | C_f | — | 0.6 | 1 | pF |
| Cut-Off Frequency | ($V_{CE} = 5 \text{ V}, I_C = 2 \text{ mA}, R_L = 100 \Omega, -3\text{dB}$) | f_C | 1 | 6 | — | KHz |
| Response Time (Rise) | ($V_{CE} = 2 \text{ V}, I_C = 10 \text{ mA}, R_L = 100 \Omega$) | t_r | — | 60 | 300 | μs |
| Response Time (Fall) | | t_f | — | 53 | 250 | μs |

Isolation Characteristics

| Characteristic | Test Conditions | Symbol | Min | Typ | Max | Units |
|---|--------------------------------------|-----------|--------------------|-----------|-----|----------|
| Input-Output Isolation Voltage (note 3) | $f = 60\text{Hz}, t = 1 \text{ min}$ | V_{ISO} | 5000 | | | Vac(rms) |
| Isolation Resistance | ($V_{I-O} = 500 \text{ VDC}$) | R_{ISO} | 5×10^{10} | 10^{11} | | Ω |
| Isolation Capacitance | ($V_{I-O} = 0, f = 1 \text{ MHz}$) | C_{ISO} | | 0.6 | 1.0 | pf |

NOTES

- Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.

Typical Electrical/Optical Characteristic Curves ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Fig. 1 Forward Current vs. Ambient Temperature

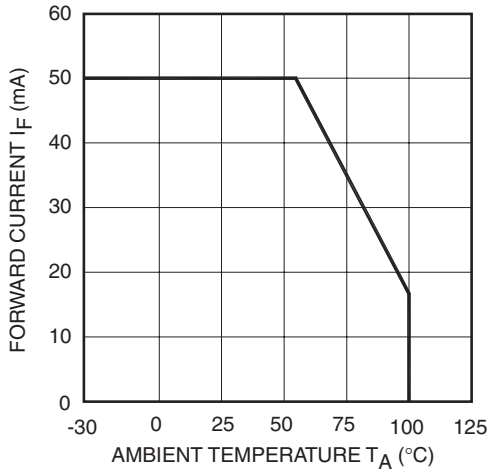


Fig. 2 Collector Power Dissipation vs. Ambient Temperature

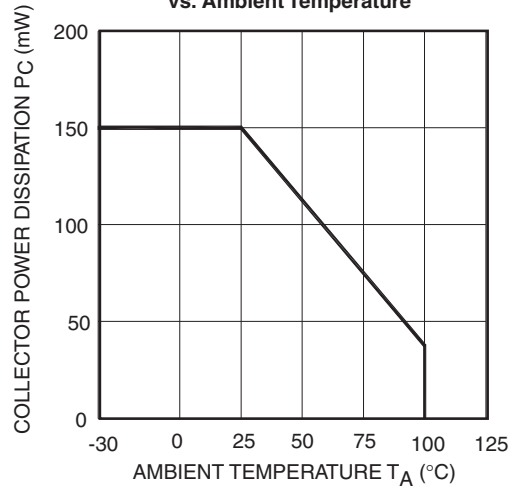


Fig. 3 Collector-Emitter Saturation Voltage vs. Forward Current

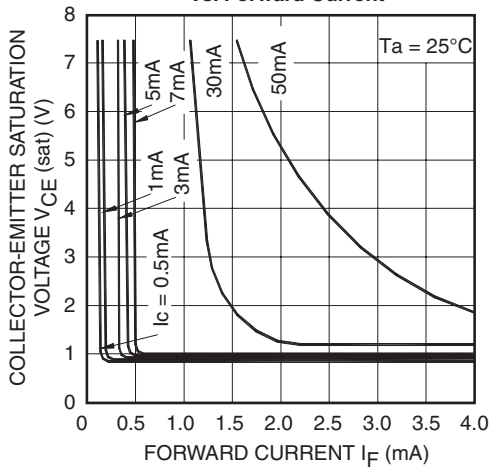


Fig. 4 Forward Current vs. Forward Voltage

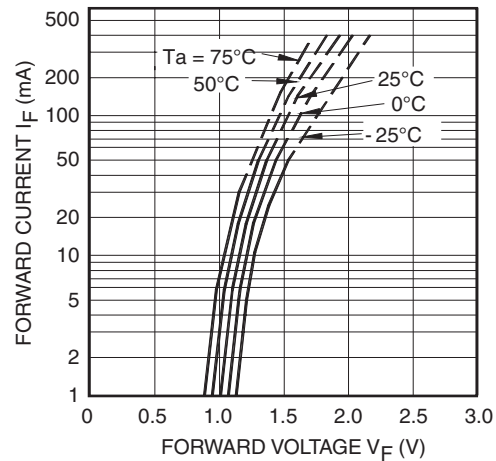


Fig. 5 Current Transfer Ratio vs. Forward Current

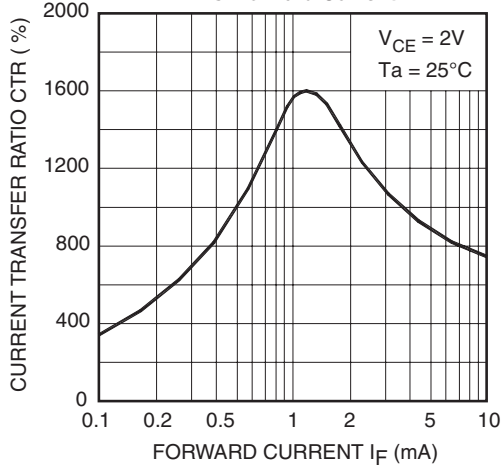
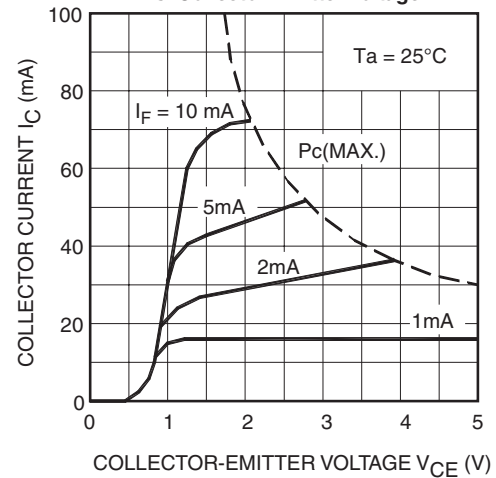


Fig. 6 Collector Current vs. Collector-Emitter Voltage



Typical Electrical/Optical Characteristic Curves ($T_A = 25^\circ\text{C}$ Unless otherwise specified.)

Fig. 7. Relative Current Transfer Ratio vs. Ambient Temperature

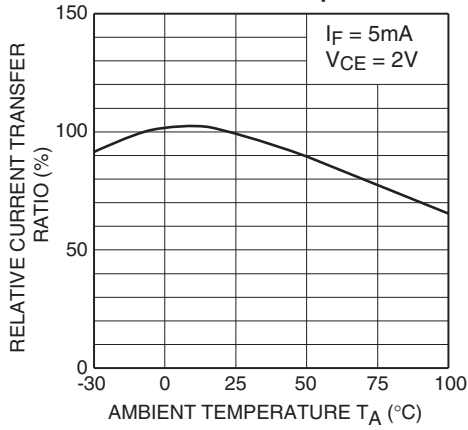


Fig. 8 Collector-Emitter Saturation Voltage vs. Ambient Temperature

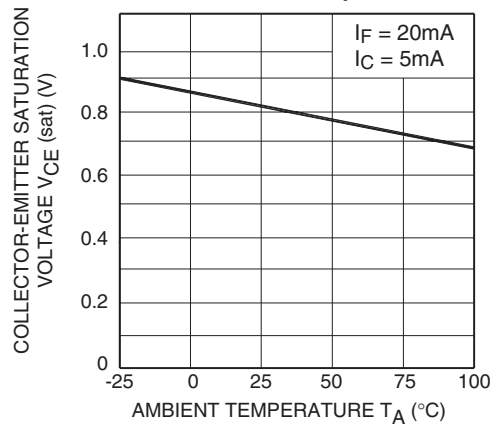


Fig. 9 Collector Dark Current vs. Ambient Temperature

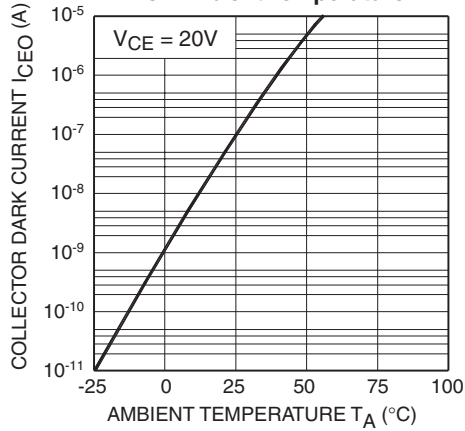


Fig. 10. Response Time vs. Load Resistance

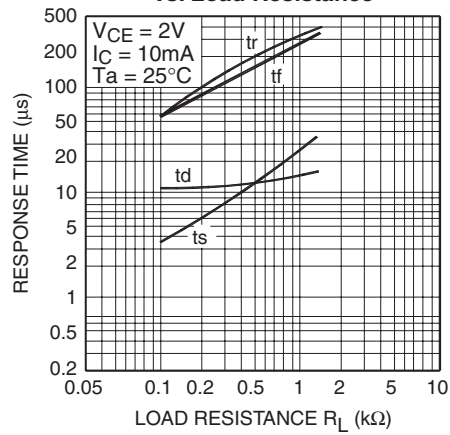
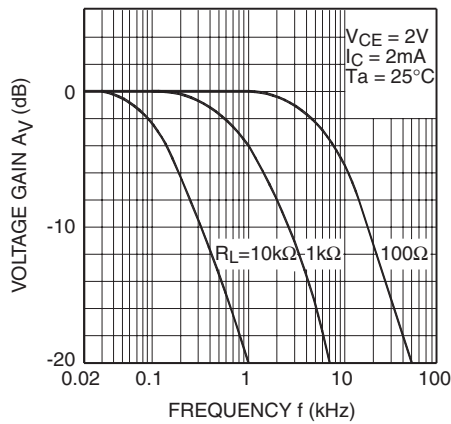
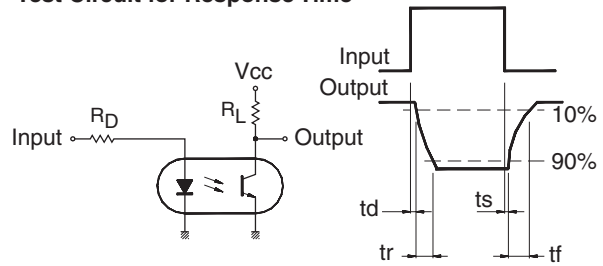


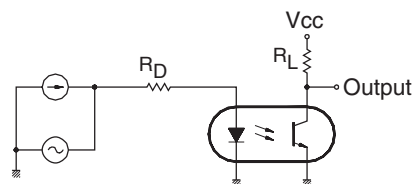
Fig. 11. Frequency Response



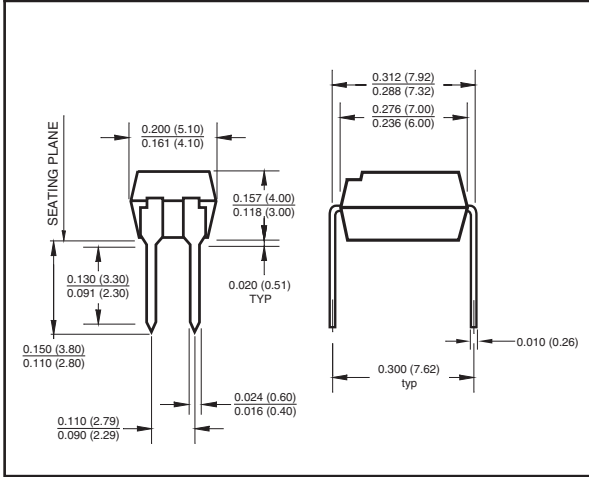
Test Circuit for Response Time



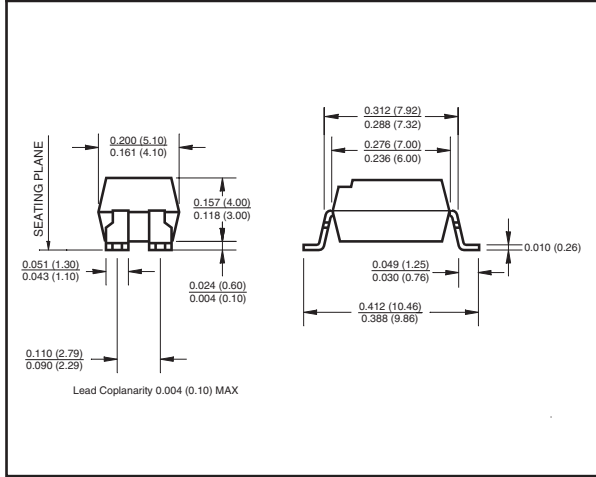
Test Circuit for Frequency Response



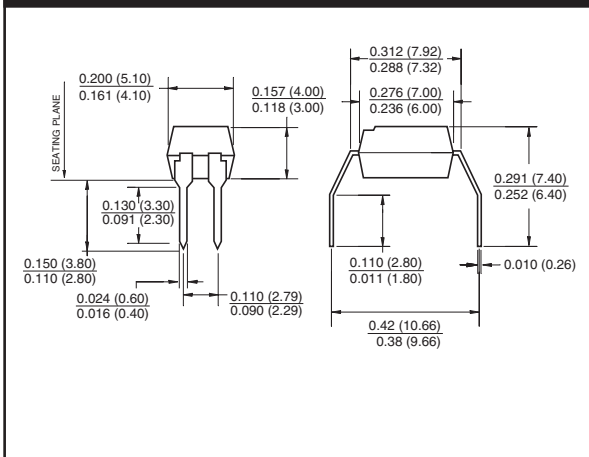
Package Dimensions (Through Hole)



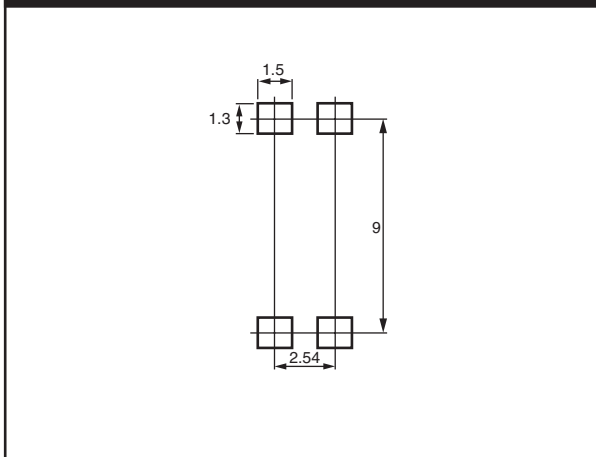
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Footprint Dimensions (Surface Mount)



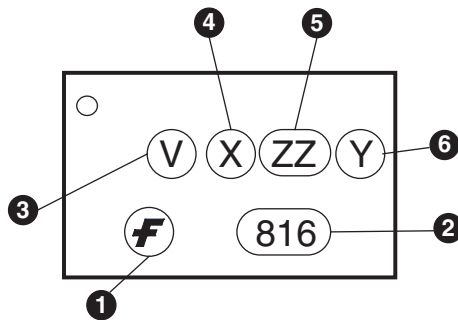
NOTE

All dimensions are in inches (millimeters)

Ordering Information

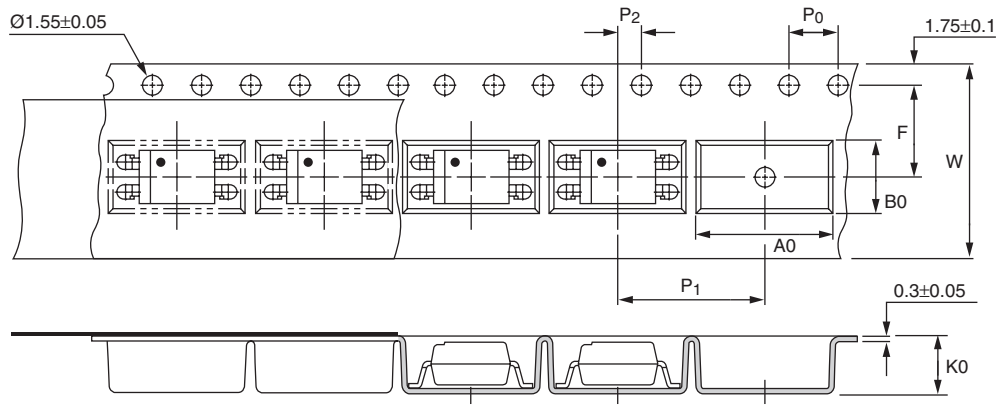
| Option | Order Entry Identifier | Description |
|--------|------------------------|--|
| S | .S | Surface Mount Lead Bend |
| SD | .SD | Surface Mount; Tape and reel |
| W | .W | 0.4" Lead Spacing |
| 300 | .300 | VDE Approved |
| 300W | .300W | VDE Approved, 0.4" Lead Spacing |
| 3S | .3S | VDE Approved, Surface Mount |
| 3SD | .3SD | VDE Approved, Surface Mount, Tape & Reel |

Marking Information



| Definitions | |
|-------------|--|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code |
| 5 | Two digit work week ranging from '01' to '53' |
| 6 | Assembly package code |

Carrier Tape Specifications

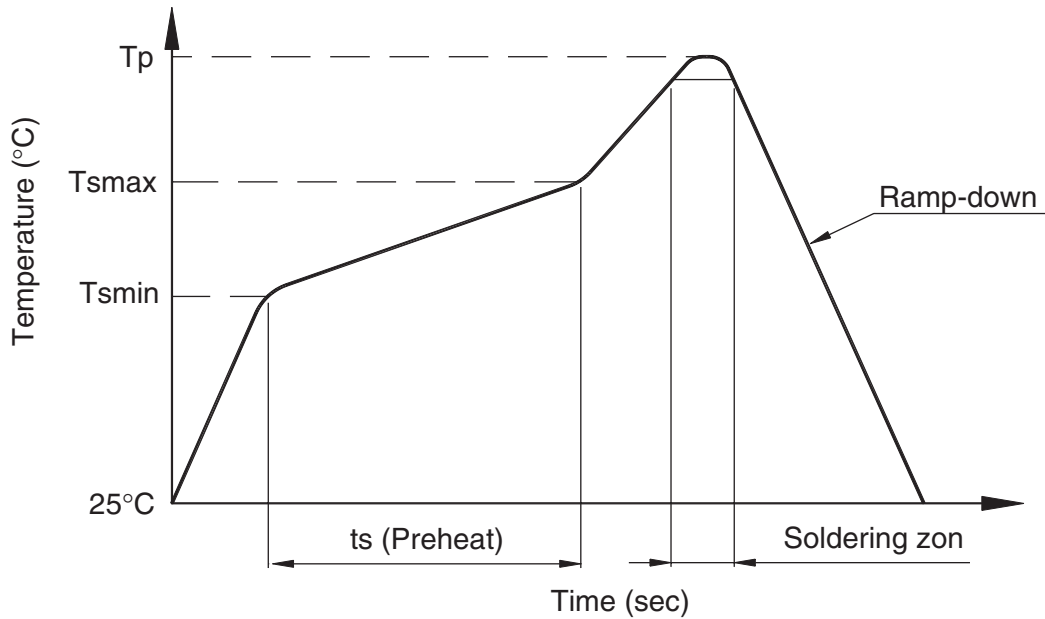


NOTE

All dimensions are in millimeters

| Description | Symbol | Dimensions in mm (inches) |
|--|----------------|---------------------------|
| Tape wide | W | 16 ± 0.3 (.63) |
| Pitch of sprocket holes | P ₀ | 4 ± 0.1 (.15) |
| Distance of compartment | F | 7.5 ± 0.1 (.295) |
| | P ₂ | 2 ± 0.1 (.079) |
| Distance of compartment to compartment | P ₁ | 12 ± 0.1 (.472) |
| Compartment | A ₀ | 10.45 ± 0.1 (.411) |
| | B ₀ | 5.30 ± 0.1 (.209) |
| | K ₀ | 4.25 ± 0.1 (.167) |

Lead Free recommended IR Reflow condition



| Profile Feature | Pb-Sn solder assembly | Lead Free assembly |
|---|-------------------------------|-------------------------------|
| Preheat condition (Tsmmin-Tsmmax / ts) | 100°C ~ 150°C 60 ~ 120 sec | 150°C ~ 200°C 60 ~ 120 sec |
| Melt soldering zone | 183°C 60 ~ 120 sec | 217°C 30 ~ 90 sec |
| Peak temperature (Tp) | 240 +0/-5°C | 250 +0/-5°C |
| Ramp-down rate | 6°C/sec max. | 6°C/sec max. |

Recommended Wave Soldering condition

| Profile Feature | For all solder assembly |
|-----------------------|-------------------------|
| Peak temperature (Tp) | Max 260°C for 10 sec |

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

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.

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:

- | | |
|---|---|
| <p>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, 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.</p> | <p>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.</p> |
|---|---|

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. I16