

# 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

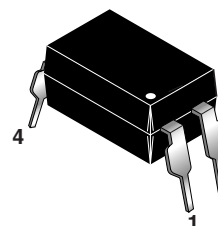
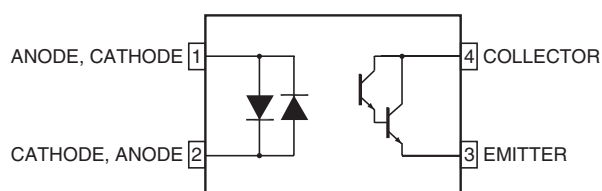
### Applications

- 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<sub>A</sub> = 25°C Unless otherwise specified.)

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

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

| Parameter                           | Test Conditions                            | Symbol     | Min | Typ | Max | Unit          |
|-------------------------------------|--------------------------------------------|------------|-----|-----|-----|---------------|
| <b>INPUT</b>                        |                                            |            |     |     |     |               |
| 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            |
| <b>OUTPUT</b>                       |                                            |            |     |     |     |               |
| Collector Dark Current              | ( $V_{CE} = 10\text{ V}, I_F = 0$ )        | $I_{CEO}$  | —   | —   | 1   | $\mu\text{A}$ |
| Collector-Emitter Breakdown Voltage | ( $I_C = 0.1\text{ mA}, I_F = 0$ )         | $BV_{CEO}$ | 35  | —   | —   | V             |
| Emitter-Collector Breakdown Voltage | ( $I_E = 10\text{ }\mu\text{A}, I_F = 0$ ) | $BV_{ECO}$ | 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 <sup>1</sup>  |                                                                                     | 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.)                                                                | $R_{iso}$     | $5 \times 10^{10}$ | $1 \times 10^{11}$ | —     | $\Omega$      |
| Floating Capacitance                 | ( $V = 0, f = 1\text{ MHz}$ )                                                       | $C_f$         | —                  | 0.6                | 1     | pF            |
| Cut-Off Frequency                    | ( $V_{CE} = 5\text{ V}, I_C = 2\text{ mA}, R_L = 100\text{ }\Omega, -3\text{ dB}$ ) | $f_C$         | 1                  | 6                  | —     | KHz           |
| Response Time (Rise)                 | ( $V_{CE} = 2\text{ V}, I_C = 10\text{ mA}, R_L = 100\text{ }\Omega$ )              | $t_r$         | —                  | 60                 | 300   | $\mu\text{s}$ |
| Response Time (Fall)                 |                                                                                     | $t_f$         | —                  | 53                 | 250   | $\mu\text{s}$ |

**Isolation Characteristics**

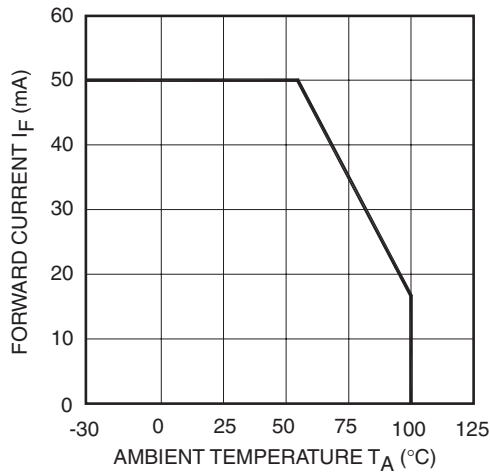
| Characteristic                          | Test Conditions                      | Symbol    | Min                | Typ       | Max | Units    |
|-----------------------------------------|--------------------------------------|-----------|--------------------|-----------|-----|----------|
| Input-Output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

**NOTES**

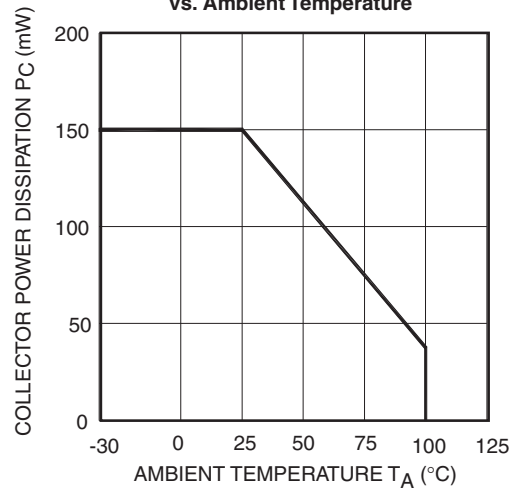
- Current Transfer Ratio (CTR) =  $I_C/I_F \times 100\%$ .

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

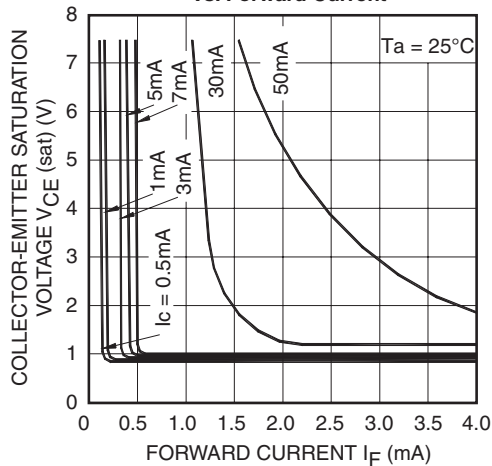
**Fig. 1 Forward Current vs. Ambient Temperature**



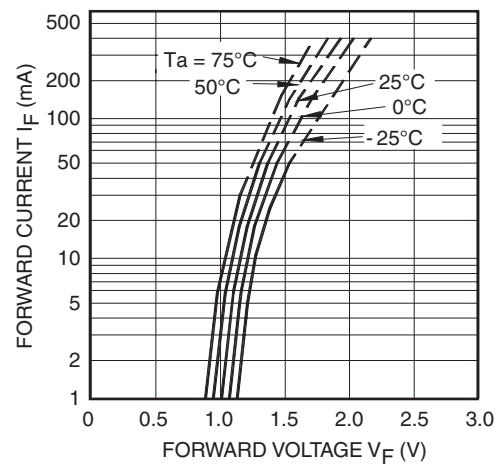
**Fig. 2 Collector Power Dissipation vs. Ambient Temperature**



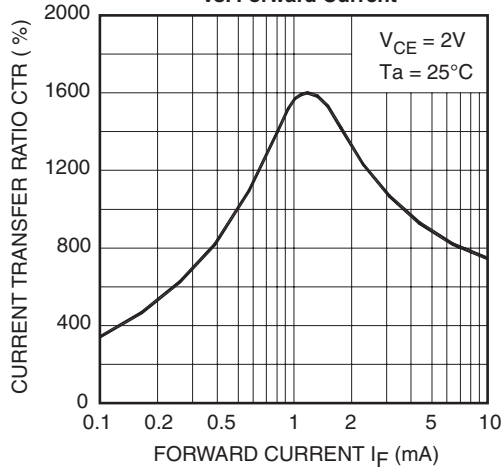
**Fig. 3 Collector-Emitter Saturation Voltage vs. Forward Current**



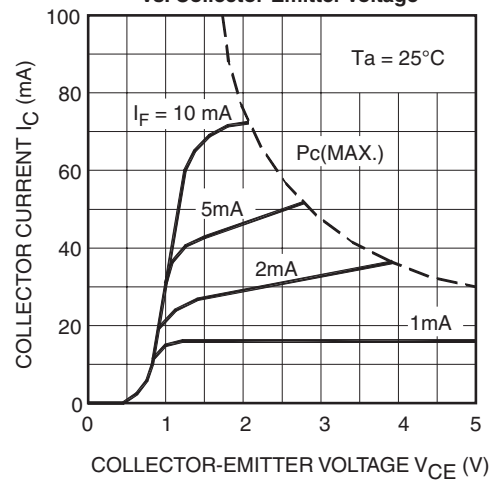
**Fig. 4 Forward Current vs. Forward Voltage**



**Fig. 5 Current Transfer Ratio vs. Forward Current**

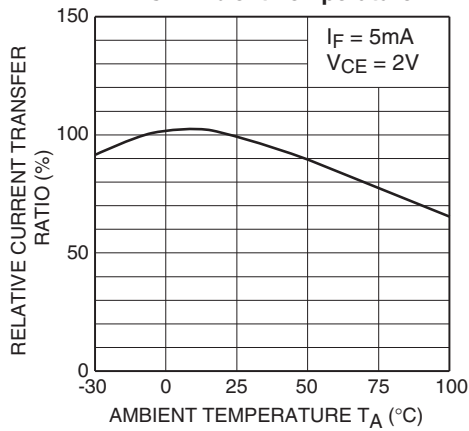


**Fig. 6 Collector Current vs. Collector-Emitter Voltage**

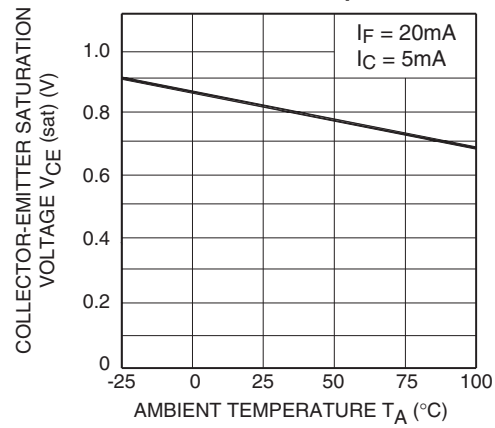


## Typical Electrical/Optical Characteristic Curves ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.)

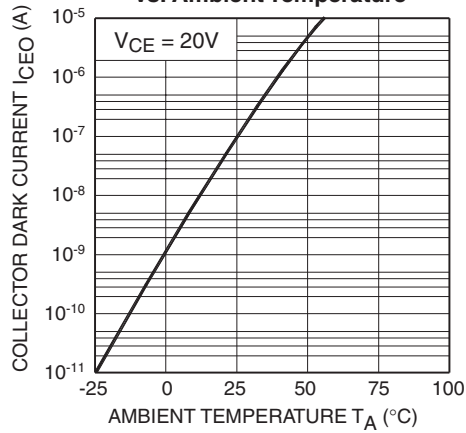
**Fig. 7. Relative Current Transfer Ratio vs. Ambient Temperature**



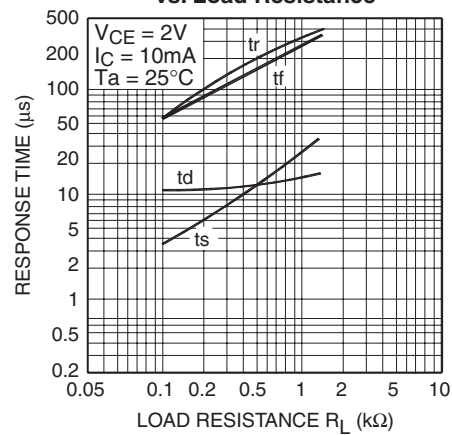
**Fig. 8 Collector-Emitter Saturation Voltage vs. Ambient Temperature**



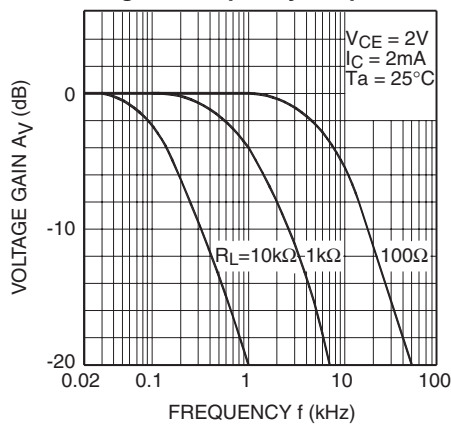
**Fig. 9 Collector Dark Current vs. Ambient Temperature**



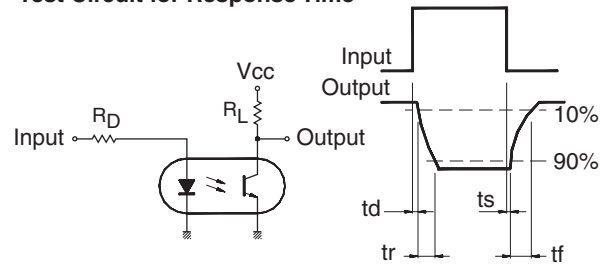
**Fig. 10. Response Time vs. Load Resistance**



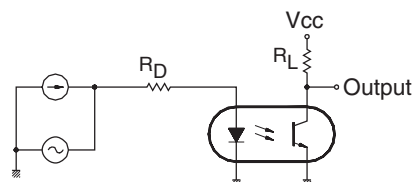
**Fig. 11. Frequency Response**



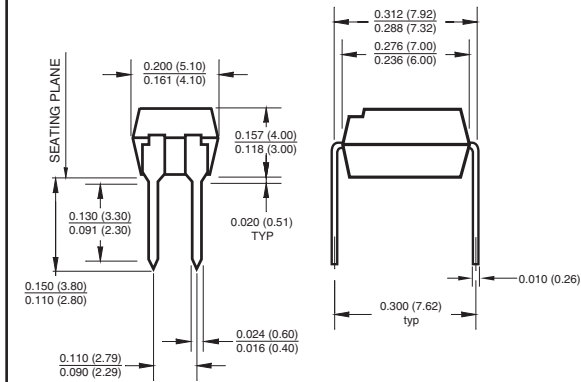
**Test Circuit for Response Time**



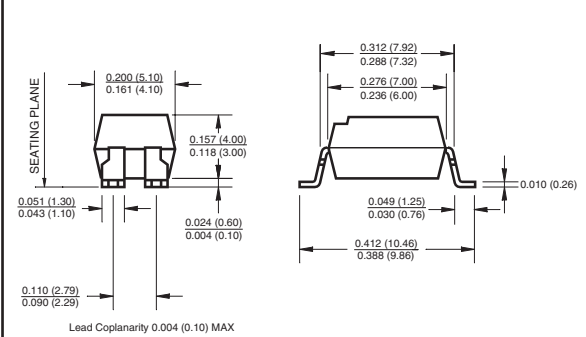
**Test Circuit for Frequency Response**



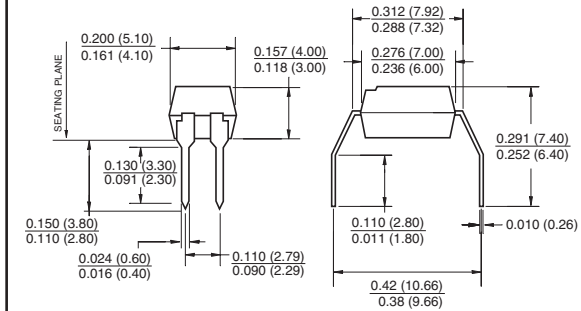
### Package Dimensions (Through Hole)



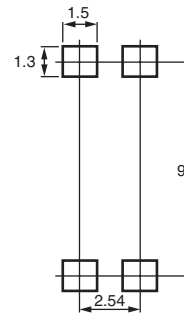
### Package Dimensions (Surface Mount)



### Package Dimensions (0.4" Lead Spacing)



### Footprint Dimensions (Surface Mount)



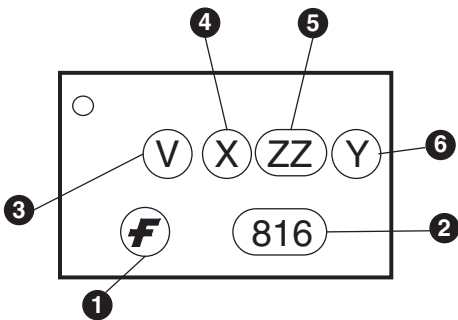
#### NOTE

All dimensions are in inches (millimeters)

Ordering Information

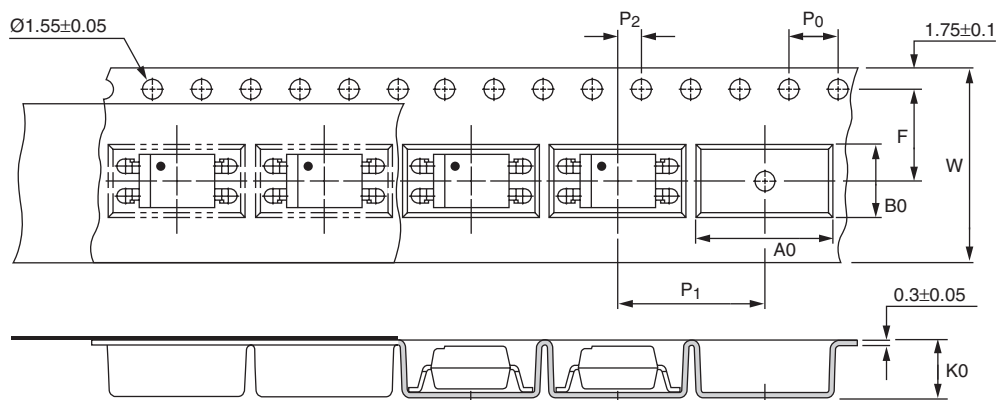
| Option | Order Entry Identifier | Description                              |
|--------|------------------------|------------------------------------------|
| S      | .S                     | Surface Mount Lead Bend                  |
| SD     | .SD                    | Surface Mount; Tape and reel             |
| 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

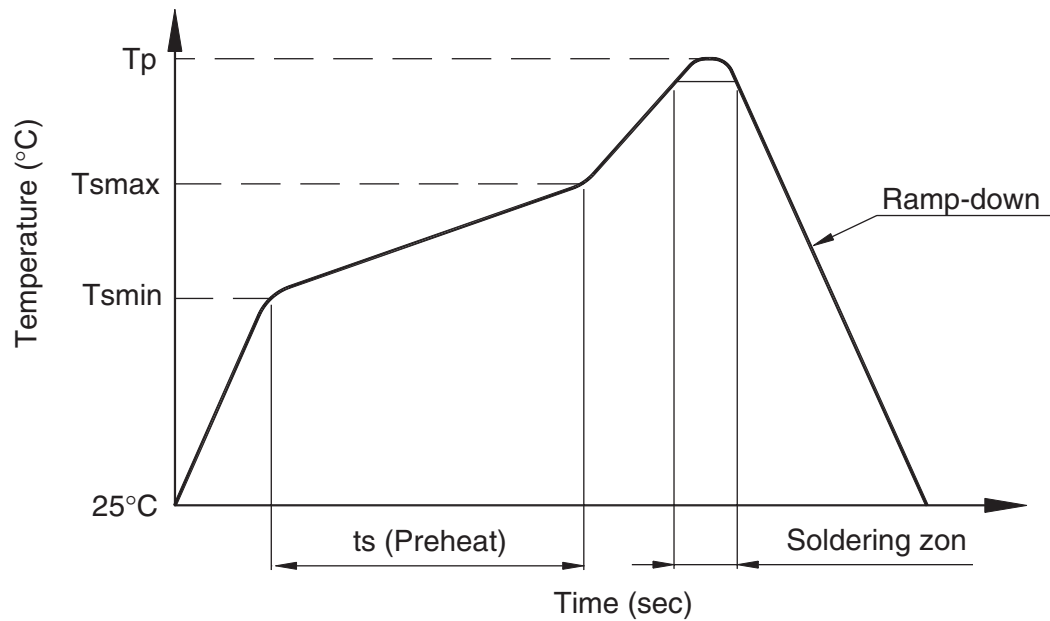


### NOTE

All dimensions are in millimeters

| Description                            | Symbol              | Dimensions in mm (inches)          |
|----------------------------------------|---------------------|------------------------------------|
| Tape wide                              | W                   | 16 ± 0.3 (.63)                     |
| Pitch of sprocket holes                | P <sub>0</sub>      | 4 ± 0.1 (.15)                      |
| Distance of compartment                | F<br>P <sub>2</sub> | 7.5 ± 0.1 (.295)<br>2 ± 0.1 (.079) |
| Distance of compartment to compartment | P <sub>1</sub>      | 12 ± 0.1 (.472)                    |
| Compartment                            | A0                  | 10.45 ± 0.1 (.411)                 |
|                                        | B0                  | 5.30 ± 0.1 (.209)                  |
|                                        | K0                  | 4.25 ± 0.1 (.167)                  |

### Lead Free recommended IR Reflow condition



| Profile Feature                      | Pb-Sn solder assembly         | Lead Free assembly            |
|--------------------------------------|-------------------------------|-------------------------------|
| Preheat condition<br>(Tsm-Tsmx / ts) | 100°C ~ 150°C<br>60 ~ 120 sec | 150°C ~ 200°C<br>60 ~ 120 sec |
| Melt soldering zone                  | 183°C<br>60 ~ 120 sec         | 217°C<br>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    |

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|--------------------------------------------------|---------------------------------|---------------------------|---------------------------------|-----------------------------|
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| ActiveArray <sup>™</sup>                         | FAST <sup>™</sup>               | LittleFET <sup>™</sup>    | PowerTrench <sup>®</sup>        | SyncFET <sup>™</sup>        |
| Bottomless <sup>™</sup>                          | FPS <sup>™</sup>                | MICROCOUPLER <sup>™</sup> | QFET <sup>®</sup>               | TinyLogic <sup>®</sup>      |
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| DOMET <sup>™</sup>                               | HiSeC <sup>™</sup>              | MSX <sup>™</sup>          | RapidConfigure <sup>™</sup>     | UltraFET <sup>®</sup>       |
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| Across the board. Around the world. <sup>™</sup> |                                 | POP <sup>™</sup>          | SuperFET <sup>™</sup>           |                             |
| The Power Franchise <sup>®</sup>                 |                                 | Power247 <sup>™</sup>     | SuperSOT <sup>™</sup> -3        |                             |
| Programmable Active Droop <sup>™</sup>           |                                 | PowerEdge <sup>™</sup>    | SuperSOT <sup>™</sup> -6        |                             |

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#### 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. |
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Rev. I16