

# FOD814 Series, FOD817 Series 4-Pin High Operating Temperature Phototransistor Optocouplers

## Features

- AC input response (FOD814 only)
- Applicable to Pb-free IR reflow soldering
- Compact 4-pin package
- Current transfer ratio in selected groups:
 

FOD814: 20–300%	FOD817: 50–600%
FOD814A: 50–150%	FOD817A: 80–160%
	FOD817B: 130–260%
	FOD817C: 200–400%
	FOD817D: 300–600%
- C-UL, UL and VDE approved
- High input-output isolation voltage of 5000Vrms
- Minimum  $BV_{CEO}$  of 70V guaranteed
- Higher operating temperatures (versus H11AXXX counterparts)

## Applications

### FOD814 Series

- AC line monitor
- Unknown polarity DC sensor
- Telephone line interface

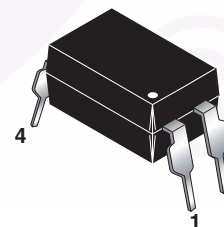
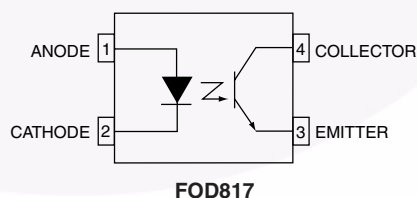
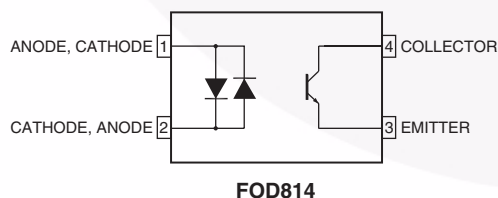
### FOD817 Series

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

## Description

The FOD814 consists of two gallium arsenide infrared emitting diodes, connected in inverse parallel, driving a silicon phototransistor output in a 4-pin dual in-line package. The FOD817 Series consists of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 4-pin dual in-line package.

## Functional Block Diagram



# **Absolute Maximum Ratings** ( $T_A = 25^{\circ}\text{C}$ Unless otherwise specified.)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Value		Units
		FOD814	FOD817	
TOTAL DEVICE				
T <sub>STG</sub>	Storage Temperature	-55 to +150		°C
T <sub>OPR</sub>	Operating Temperature	-55 to +105	-55 to +110	°C
T <sub>SOL</sub>	Lead Solder Temperature	260 for 10 sec		°C
T <sub>J</sub>	Junction Temperature	125 Max.		°C
θ <sub>JC</sub>	Junction-to-Case Thermal Resistance	210		°C/W
P <sub>TOT</sub>	Total Power Dissipation	200		mW
EMITTER				
I <sub>F</sub>	Continuous Forward Current	±50	50	mA
V <sub>R</sub>	Reverse Voltage		6	
P <sub>D</sub>	Power Dissipation Derate above 100°C	70		mW
		1.7		mW/°C
DETECTOR				
V <sub>CEO</sub>	Collector-Emitter Voltage	70		V
V <sub>ECO</sub>	Emitter-Collector Voltage	6		V
I <sub>C</sub>	Continuous Collector Current	50		mA
P <sub>C</sub>	Collector Power Dissipation Derate above 90°C	150		mW
		2.9		mW/°C

## Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified.)

### Individual Component Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER							
V <sub>F</sub>	Forward Voltage	FOD814	I <sub>F</sub> = ±20mA		1.2	1.4	V
		FOD817	I <sub>F</sub> = 20mA		1.2	1.4	
I <sub>R</sub>	Reverse Leakage Current	FOD817	V <sub>R</sub> = 4.0V			10	μA
C <sub>t</sub>	Terminal Capacitance	FOD814	V = 0, f = 1kHz		50	250	pF
		FOD817	V = 0, f = 1kHz		30	250	
DETECTOR							
I <sub>CEO</sub>	Collector Dark Current	FOD814	V <sub>CE</sub> = 20V, I <sub>F</sub> = 0			100	nA
		FOD817	V <sub>CE</sub> = 20V, I <sub>F</sub> = 0			100	
BV <sub>CEO</sub>	Collector-Emitter Breakdown Voltage	FOD814	I <sub>C</sub> = 0.1mA, I <sub>F</sub> = 0	70			V
		FOD817	I <sub>C</sub> = 0.1mA, I <sub>F</sub> = 0	70			
BV <sub>ECO</sub>	Emitter-Collector Breakdown Voltage	FOD814	I <sub>E</sub> = 10μA, I <sub>F</sub> = 0	6			V
		FOD817	I <sub>E</sub> = 10μA, I <sub>F</sub> = 0	6			

### DC Transfer Characteristics

Symbol	DC Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Unit
CTR	Current Transfer Ratio	FOD814	I <sub>F</sub> = ±1mA, V <sub>CE</sub> = 5V <sup>(1)</sup>	20		300	%
		FOD814A		50		150	
		FOD817	I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V <sup>(1)</sup>	50		600	
		FOD817A		80		160	
		FOD817B		130		260	
		FOD817C		200		400	
		FOD817D		300		600	
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	FOD814	I <sub>F</sub> = ±20mA, I <sub>C</sub> = 1mA		0.1	0.2	V
		FOD817	I <sub>F</sub> = 20mA, I <sub>C</sub> = 1mA		0.1	0.2	

### AC Transfer Characteristics

Symbol	AC Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Unit
f <sub>C</sub>	Cut-Off Frequency	FOD814	V <sub>CE</sub> = 5V, I <sub>C</sub> = 2mA, R <sub>L</sub> = 100Ω, -3dB	15	80		kHz
t <sub>r</sub>	Response Time (Rise)	FOD814, FOD817	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 2mA, R <sub>L</sub> = 100Ω <sup>(2)</sup>		4	18	μs
t <sub>f</sub>	Response Time (Fall)	FOD814, FOD817			3	18	μs

\*Typical values at T<sub>A</sub> = 25°C

## Electrical Characteristics (T<sub>A</sub> = 25°C Unless otherwise specified.) (Continued)

### Isolation Characteristics

Symbol	Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Units
V <sub>ISO</sub>	Input-Output Isolation Voltage <sup>(3)</sup>	FOD814, FOD817	f = 60Hz, t = 1 min, I <sub>I-O</sub> ≤ 2μA	5000			Vac(rms)
R <sub>ISO</sub>	Isolation Resistance	FOD814, FOD817	V <sub>I-O</sub> = 500VDC	5x10 <sup>10</sup>	1x10 <sup>11</sup>		Ω
C <sub>ISO</sub>	Isolation Capacitance	FOD814, FOD817	V <sub>I-O</sub> = 0, f = 1 MHz		0.6	1.0	pf

\*Typical values at T<sub>A</sub> = 25°C

#### Notes:

1. Current Transfer Ratio (CTR) = I<sub>C</sub>/I<sub>F</sub> x 100%.
2. For test circuit setup and waveforms, refer to page 7.
3. For this test, Pins 1 and 2 are common, and Pins 3 and 4 are common.

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

Fig. 1 Collector Power Dissipation vs. Ambient Temperature (FOD814)

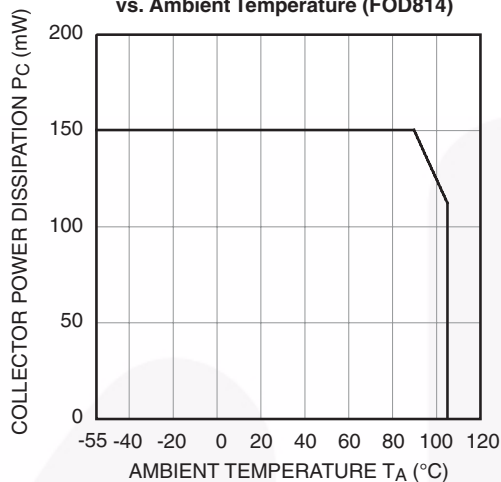


Fig. 2 Collector Power Dissipation vs. Ambient Temperature (FOD817)

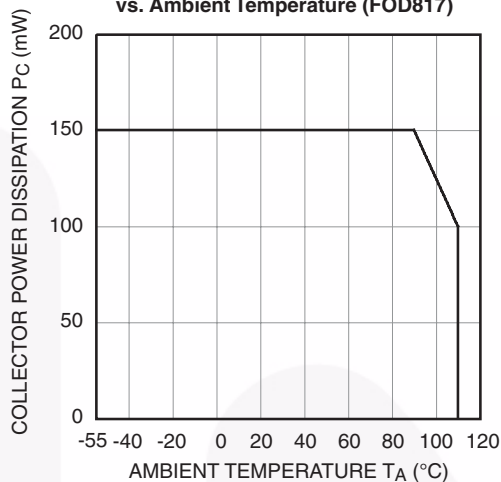


Fig. 3 Collector-Emitter Saturation Voltage vs. Forward Current

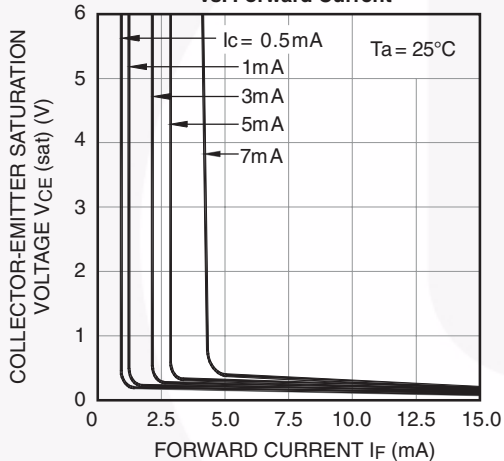


Fig. 4 Forward Current vs. Forward Voltage (FOD814)

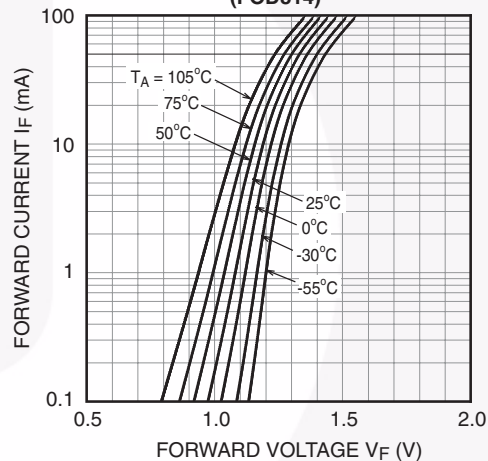


Fig. 5 Forward Current vs. Forward Voltage (FOD817)

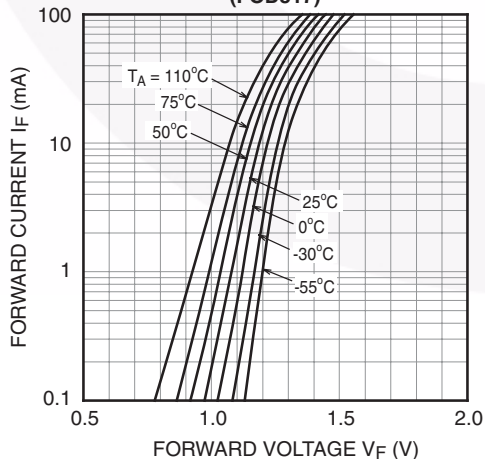
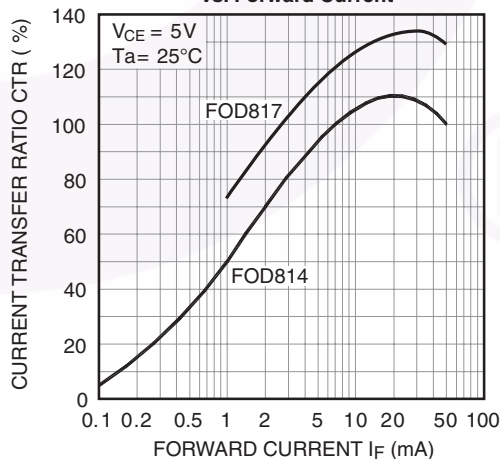
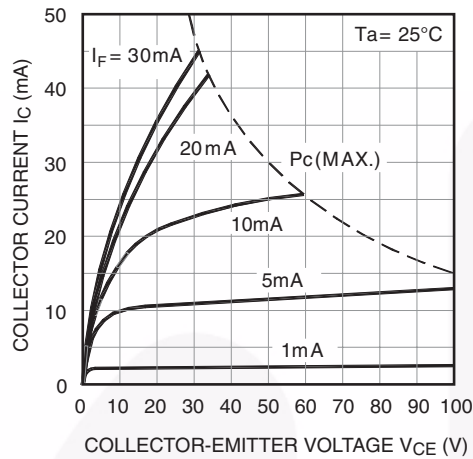


Fig. 6 Current Transfer Ratio vs. Forward Current

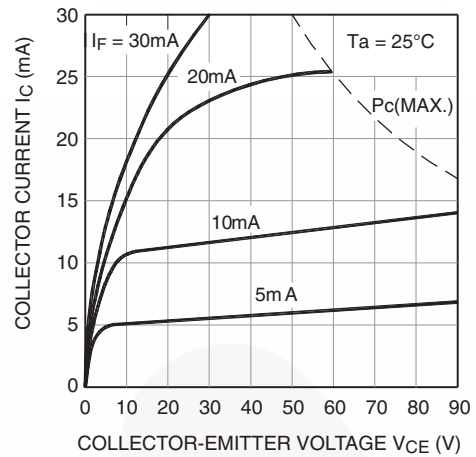


**Typical Electrical/Optical Characteristics** (Continued) ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

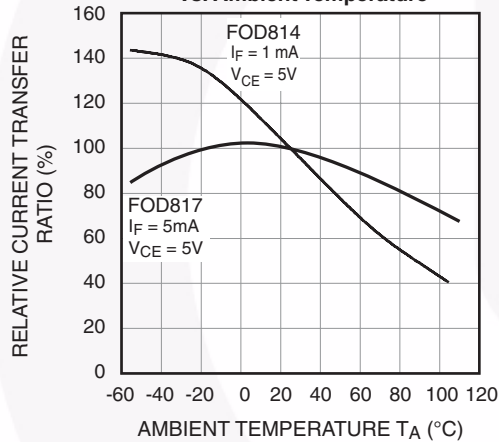
**Fig. 7 Collector Current vs. Collector-Emitter Voltage (FOD814)**



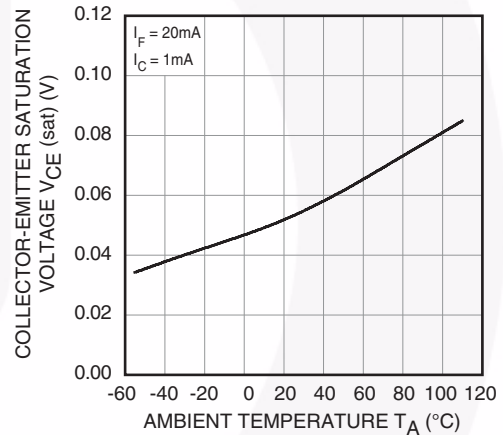
**Fig. 8 Collector Current vs. Collector-Emitter Voltage (FOD817)**



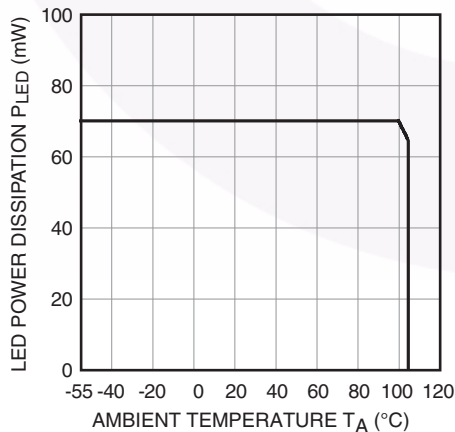
**Fig. 9 Relative Current Transfer Ratio vs. Ambient Temperature**



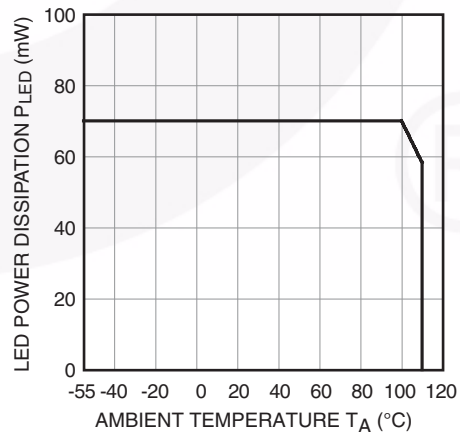
**Fig. 10 Collector-Emitter Saturation Voltage vs. Ambient Temperature**



**Fig. 11 LED Power Dissipation vs. Ambient Temperature (FOD814)**

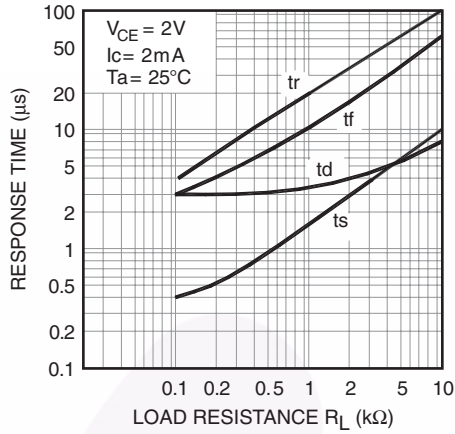


**Fig. 12 LED Power Dissipation vs. Ambient Temperature (FOD817)**

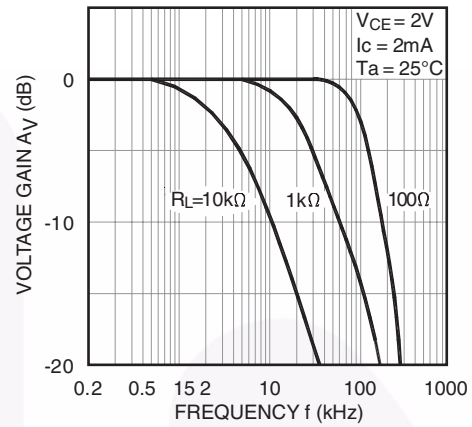


**Typical Electrical/Optical Characteristics** (Continued) ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

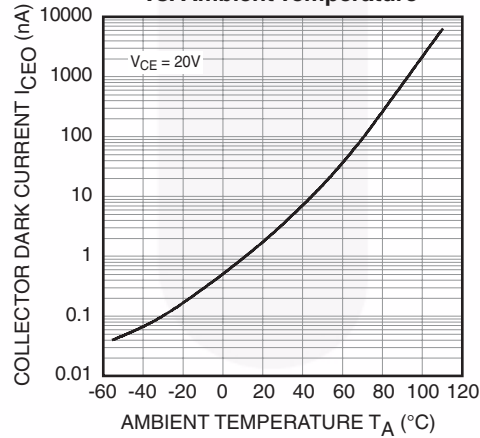
**Fig. 13 Response Time vs. Load Resistance**



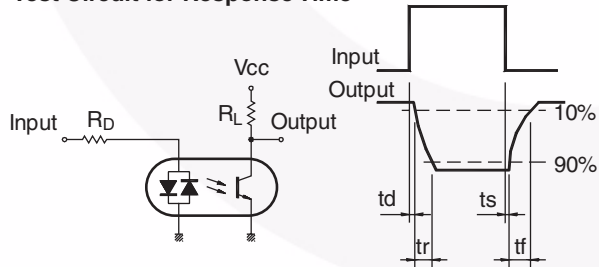
**Fig. 14 Frequency Response**



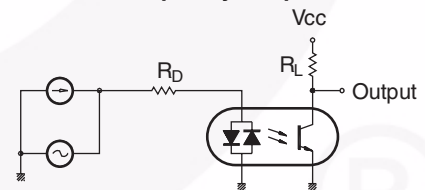
**Fig. 15 Collector Dark Current vs. Ambient Temperature**



**Test Circuit for Response Time**

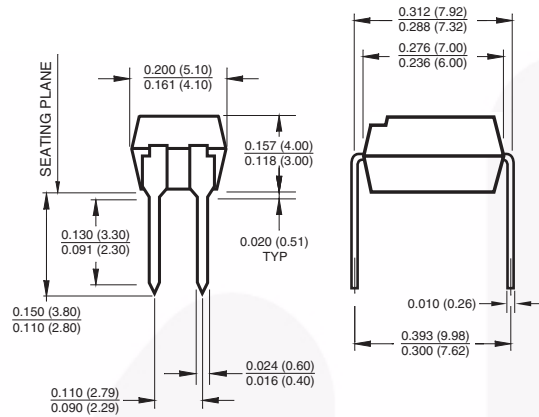


**Test Circuit for Frequency Response**

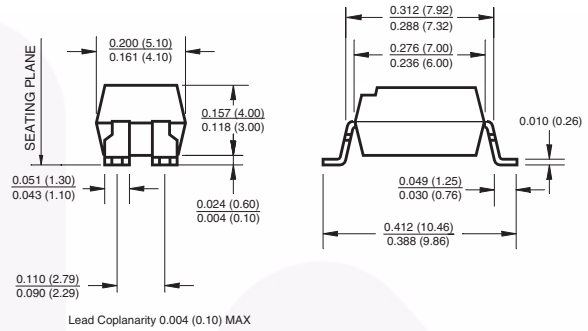


## Package Dimensions

### Through Hole

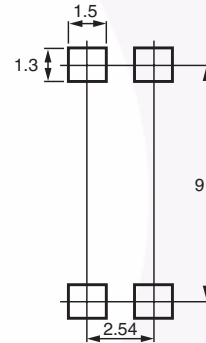
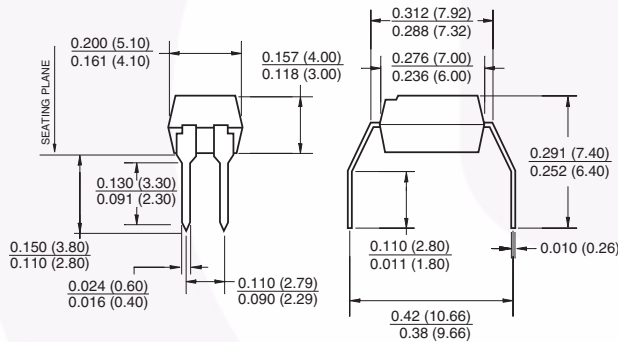


### Surface Mount



### Surface Mount (Footprint Dimensions)

### 0.4" Lead Spacing



### Note:

All dimensions are in inches (millimeters)

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:

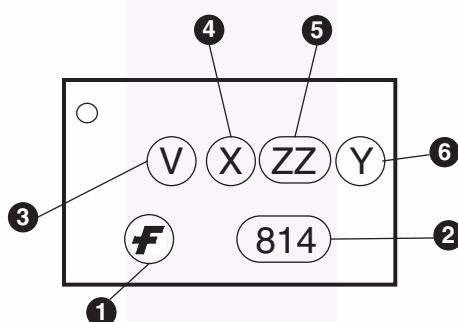
<http://www.fairchildsemi.com/packaging/>



## Ordering Information

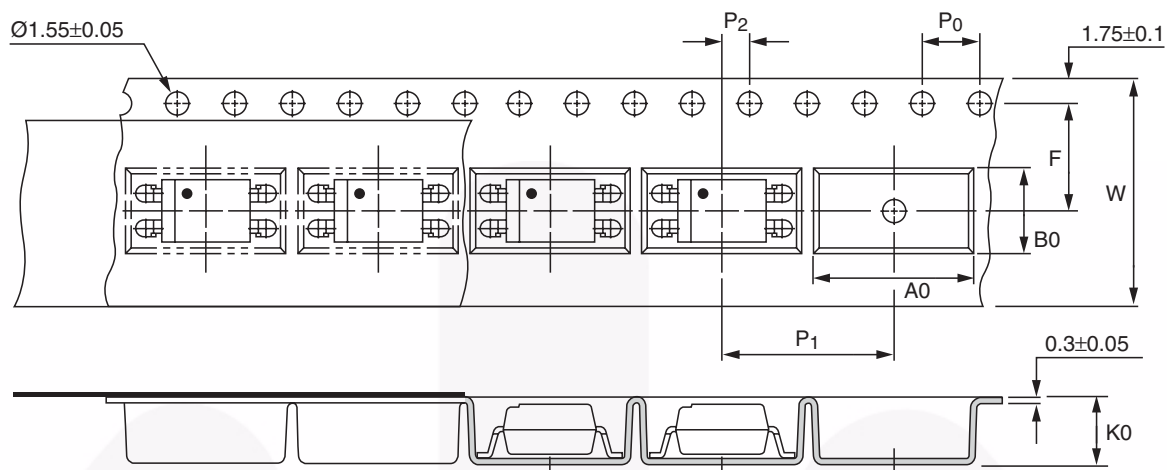
Option	Part Number Example	Description
S	FOD814S	Surface Mount Lead Bend
SD	FOD814SD	Surface Mount; Tape and reel
300	FOD814300	VDE Approved
300W	FOD814300W	VDE Approved, 0.4" Lead Spacing
3S	FOD8143S	VDE Approved, Surface Mount
3SD	FOD8143SD	VDE Approved, Surface Mount, Tape & Reel

## 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 Y = Manufactured in Thailand YA = Manufactured in China

## Carrier Tape Specifications

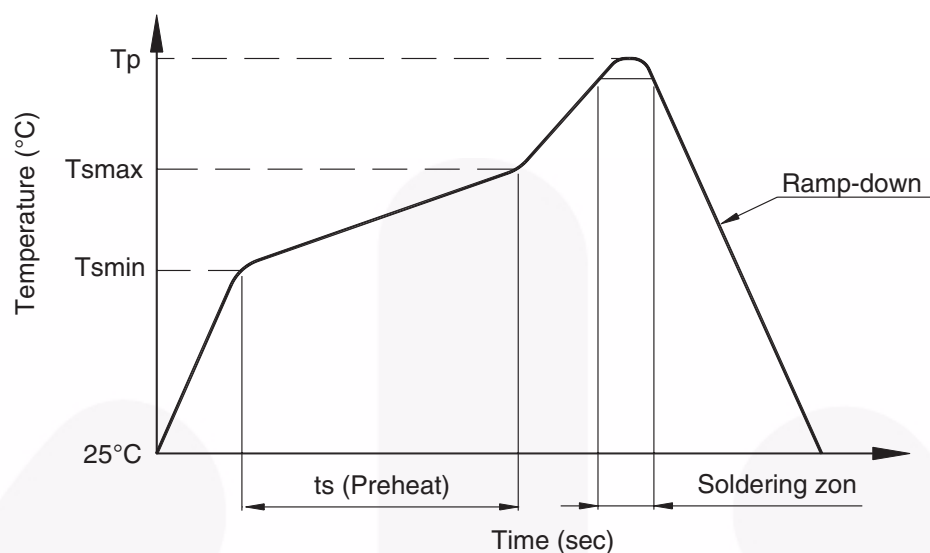


### Note:

All dimensions are in millimeters.

Symbol	Description	Dimensions in mm (inches)
W	Tape wide	$16 \pm 0.3$ (.63)
$P_0$	Pitch of sprocket holes	$4 \pm 0.1$ (.15)
F	Distance of compartment	$7.5 \pm 0.1$ (.295)
$P_2$		$2 \pm 0.1$ (.079)
$P_1$	Distance of compartment to compartment	$12 \pm 0.1$ (.472)
A0	Compartment	$10.45 \pm 0.1$ (.411)
B0		$5.30 \pm 0.1$ (.209)
K0		$4.25 \pm 0.1$ (.167)

## Lead Free Recommended IR Reflow Condition



Profile Feature	Pb-Sn solder assembly	Lead Free assembly
Preheat condition (Tsm-Tsmx / 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	260 +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