FAIRCHILD SEMICONDUCTOR®

July 2009

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%
  FOD814A: 50–150%
  FOD817: 50–600%
  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

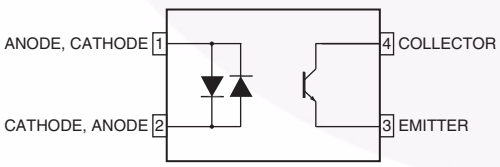
FOD814 Series
- AC line monitor
- Unknown polarity DC sensor
- Telephone line interface

FOD817 Series
- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

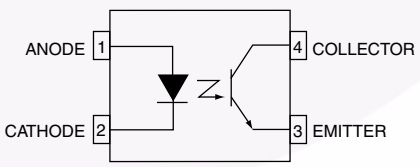
Description

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.

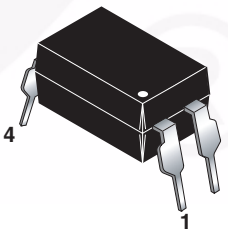
Functional Block Diagram



FOD814



FOD817



Absolute Maximum Ratings (T_A = 25°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_{STG}	Storage Temperature	-55 to +150		°C
T_{OPR}	Operating Temperature	-55 to +105	-55 to +110	°C
T_{SOL}	Lead Solder Temperature	260 for 10 sec		°C
T_J	Junction Temperature	125 Max.		°C
θ_{JC}	Junction-to-Case Thermal Resistance	210		°C/W
P_{TOT}	Total Power Dissipation	200		mW
EMITTER				
I_F	Continuous Forward Current	±50	50	mA
V_R	Reverse Voltage		6	
P_D	Power Dissipation Derate above 100°C	70 1.7		mW mW/°C
DETECTOR				
V_{CEO}	Collector-Emitter Voltage	70		V
V_{ECO}	Emitter-Collector Voltage	6		V
I_C	Continuous Collector Current	50		mA
P_C	Collector Power Dissipation Derate above 90°C	150 2.9		mW mW/°C

Electrical Characteristics (T_A = 25°C Unless otherwise specified.)

Individual Component Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER							
V_F	Forward Voltage	FOD814	I_F = ±20mA		1.2	1.4	V
		FOD817	I_F = 20mA		1.2	1.4	
I_R	Reverse Leakage Current	FOD817	V_R = 4.0V			10	µA
C_t	Terminal Capacitance	FOD814	V = 0, f = 1kHz		50	250	pF
		FOD817	V = 0, f = 1kHz		30	250	
DETECTOR							
I_{CEO}	Collector Dark Current	FOD814	V_{CE} = 20V, I_F = 0			100	nA
		FOD817	V_{CE} = 20V, I_F = 0			100	
BV_{CEO}	Collector-Emitter Breakdown Voltage	FOD814	I_C = 0.1mA, I_F = 0	70			V
		FOD817	I_C = 0.1mA, I_F = 0	70			
BV_{ECO}	Emitter-Collector Breakdown Voltage	FOD814	I_E = 10µA, I_F = 0	6			V
		FOD817	I_E = 10µA, I_F = 0	6			

DC Transfer Characteristics

Symbol	DC Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Unit
CTR	Current Transfer Ratio	FOD814	I_F = ±1mA, V_{CE} = 5V(1)	20		300	%
		FOD814A		50		150	
		FOD817	I_F = 5mA, V_{CE} = 5V(1)	50		600	
		FOD817A		80		160	
		FOD817B		130		260	
		FOD817C		200		400	
		FOD817D		300		600	
$V_{CE\ (sat)}$	Collector-Emitter Saturation Voltage	FOD814	I_F = ±20mA, I_C = 1mA		0.1	0.2	V
		FOD817	I_F = 20mA, I_C = 1mA		0.1	0.2	

AC Transfer Characteristics

Symbol	AC Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Unit
f_C	Cut-Off Frequency	FOD814	V_{CE} = 5V, I_C = 2mA, R_L = 100Ω, -3dB	15	80		kHz
t_r	Response Time (Rise)	FOD814, FOD817	V_{CE} = 2 V, I_C = 2mA, R_L = 100Ω(2)		4	18	µs
t_f	Response Time (Fall)	FOD814, FOD817			3	18	µs

*Typical values at T_A = 25°C

Electrical Characteristics (T_A = 25°C Unless otherwise specified.) (Continued)

Isolation Characteristics

Symbol	Characteristic	Device	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage[3]	FOD814, FOD817	f = 60Hz, t = 1 min, $I_{I-O} \leq 2\mu A$	5000			Vac(rms)
R_{ISO}	Isolation Resistance	FOD814, FOD817	V_{I-O} = 500VDC	$5x10^{10}$	$1x10^{11}$		Ω
C_{ISO}	Isolation Capacitance	FOD814, FOD817	V_{I-O} = 0, f = 1 MHz		0.6	1.0	pf

*Typical values at T_A = 25°C

Notes:

1. Current Transfer Ratio (CTR) = I_C/I_F 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°C Unless otherwise specified.)

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

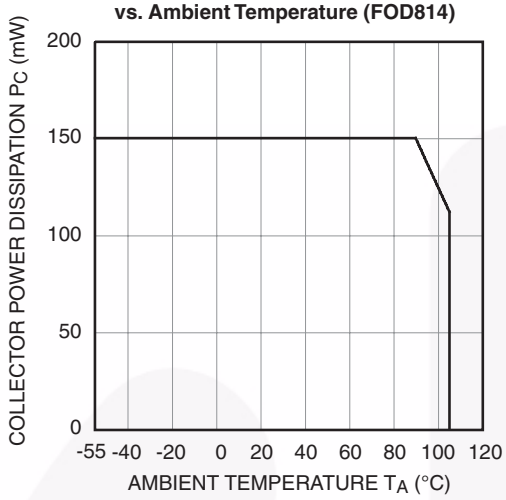


Fig. 2 Collector Power Dissipation vs. Ambient Temperature (FOD817)

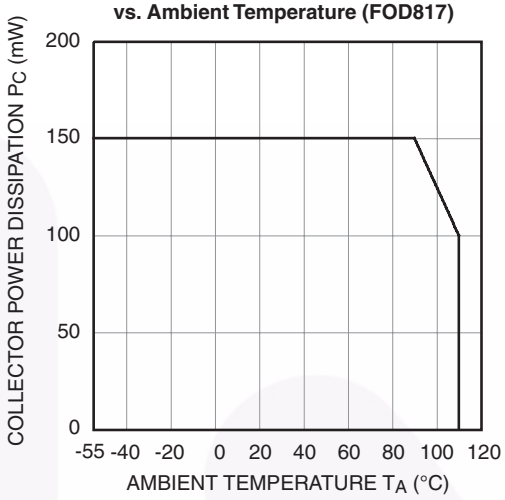


Fig. 3 Collector-Emitter Saturation Voltage vs. Forward Current

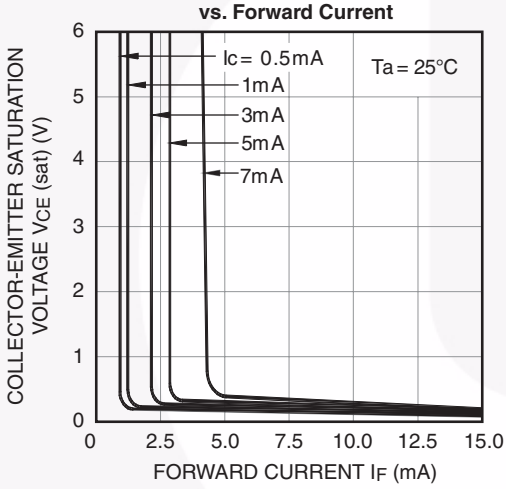


Fig. 4 Forward Current vs. Forward Voltage (FOD814)

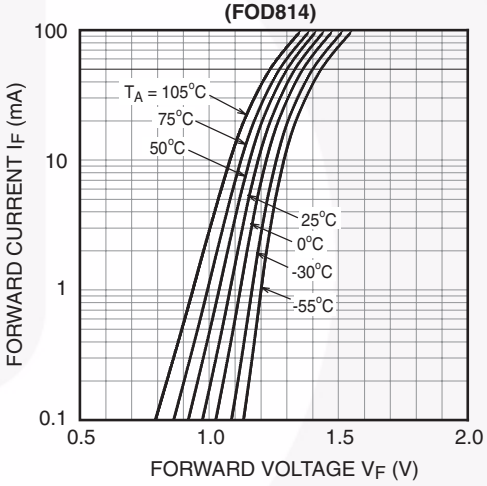


Fig. 5 Forward Current vs. Forward Voltage (FOD817)

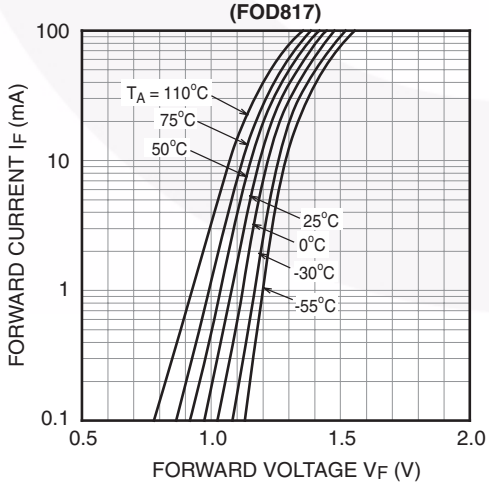
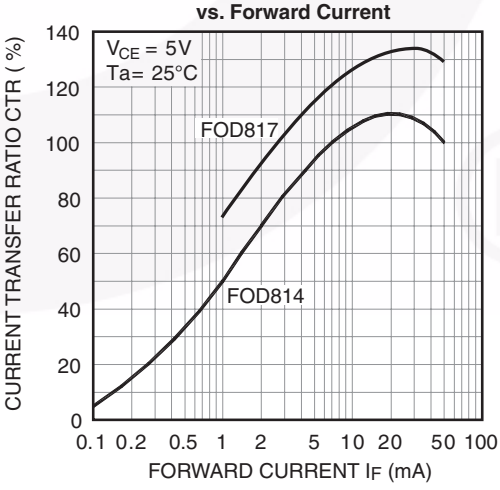


Fig. 6 Current Transfer Ratio vs. Forward Current



Typical Electrical/Optical Characteristics (Continued) (T_A = 25°C Unless otherwise specified.)

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

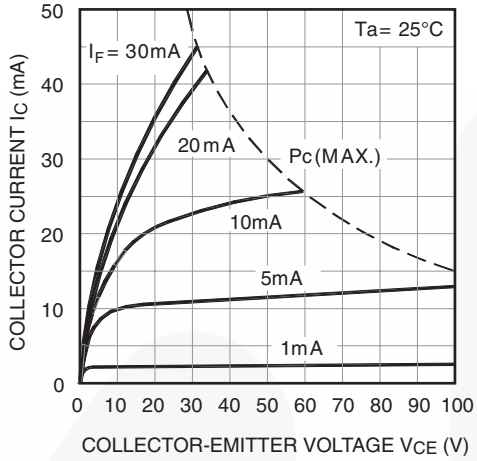


Fig. 8 Collector Current vs. Collector-Emitter Voltage (FOD817)

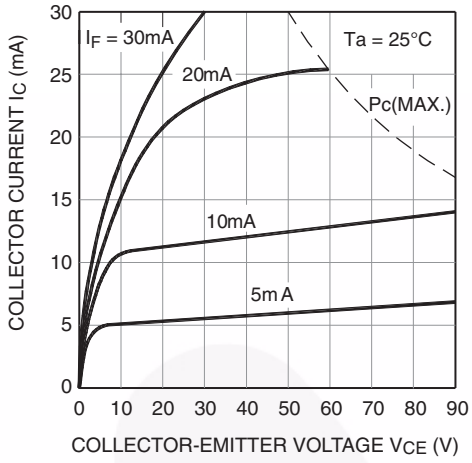


Fig. 9 Relative Current Transfer Ratio vs. Ambient Temperature

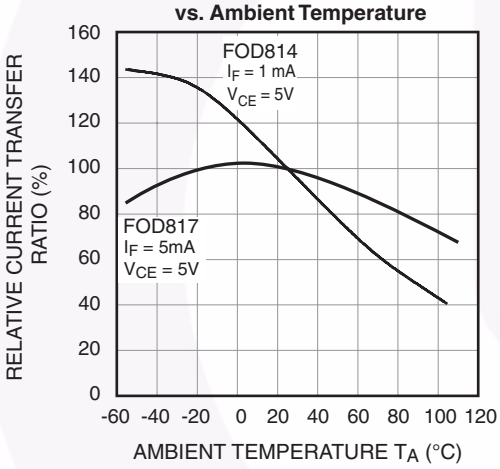


Fig. 10 Collector-Emitter Saturation Voltage vs. Ambient Temperature

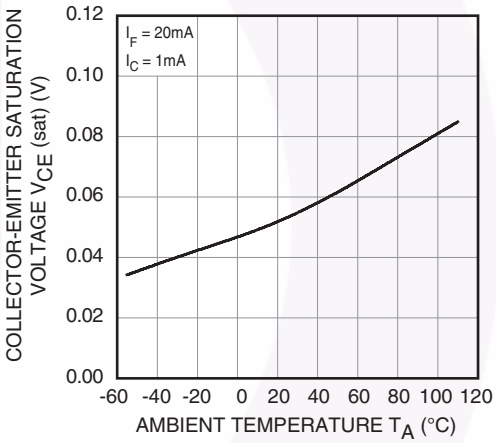


Fig. 11 LED Power Dissipation vs. Ambient Temperature (FOD814)

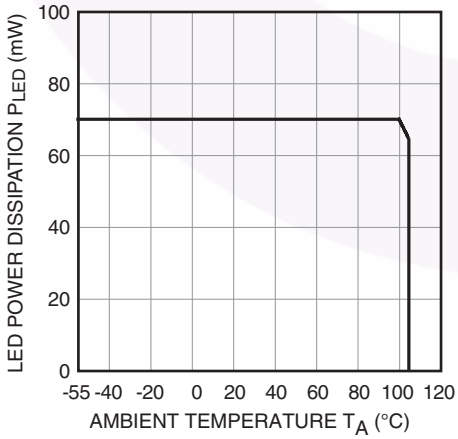
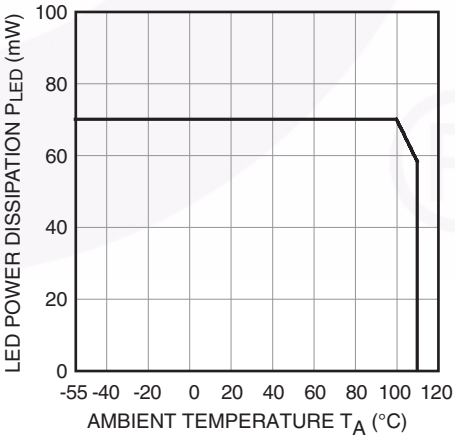


Fig. 12 LED Power Dissipation vs. Ambient Temperature (FOD817)



Typical Electrical/Optical Characteristics (Continued) (T_A = 25°C Unless otherwise specified.)

Fig. 13 Response Time vs. Load Resistance

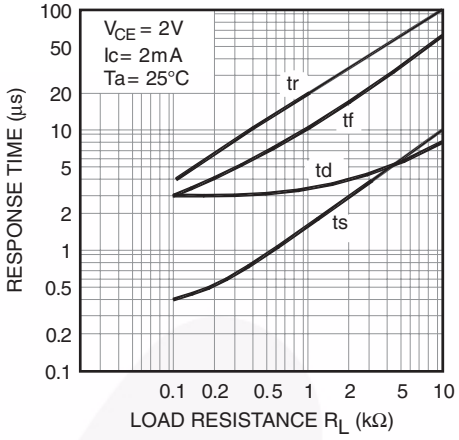


Fig. 14 Frequency Response

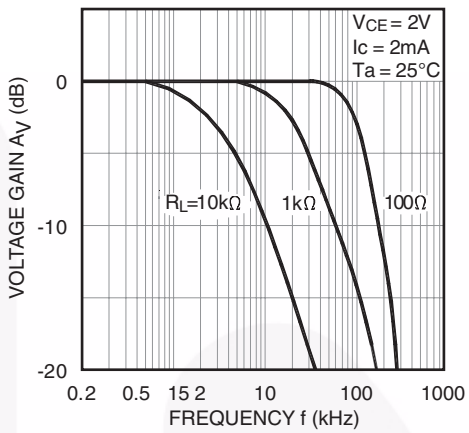
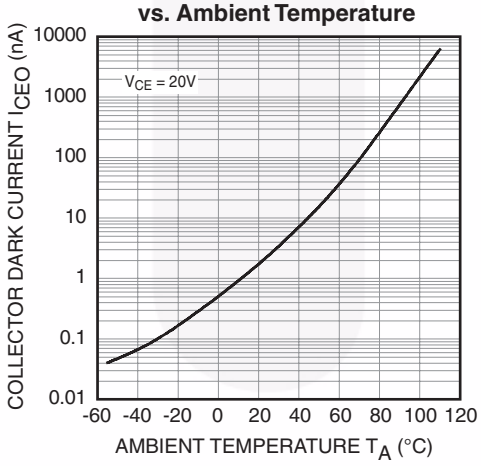
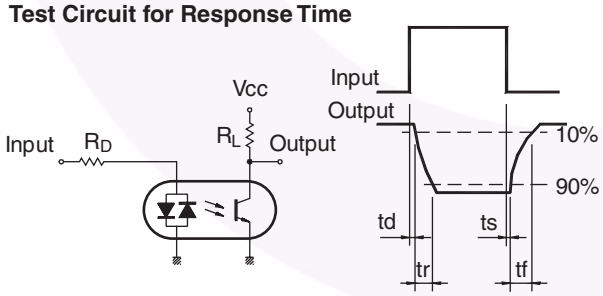


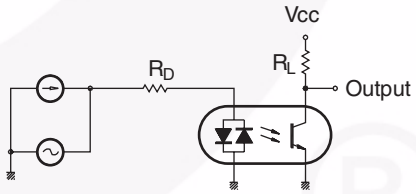
Fig. 15 Collector Dark Current vs. Ambient Temperature



Test Circuit for Response Time

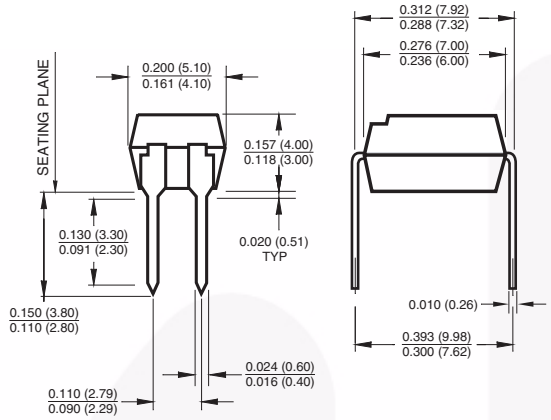


Test Circuit for Frequency Response

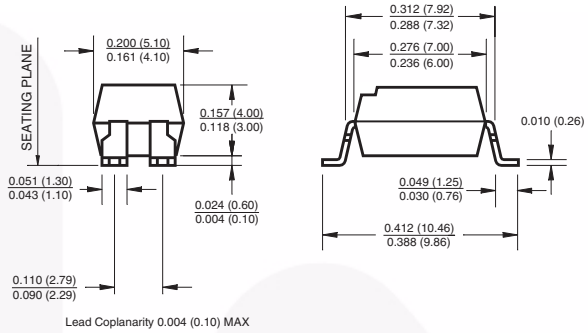


Package Dimensions

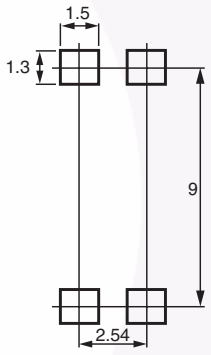
Through Hole



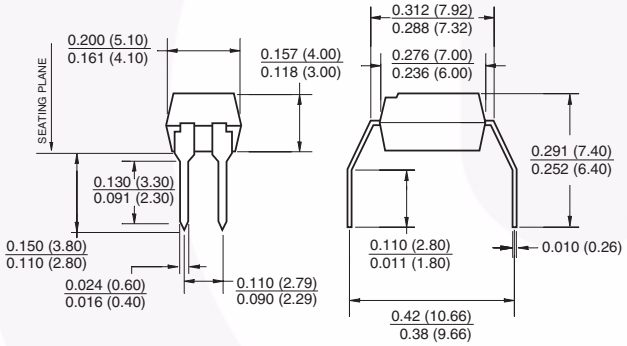
Surface Mount



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.

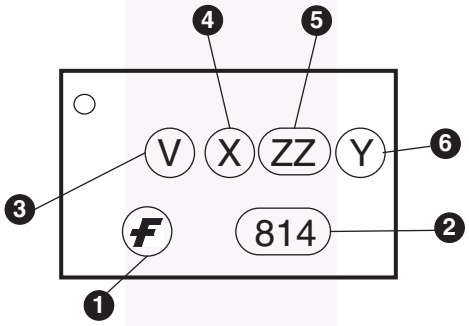
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

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

Ordering Information

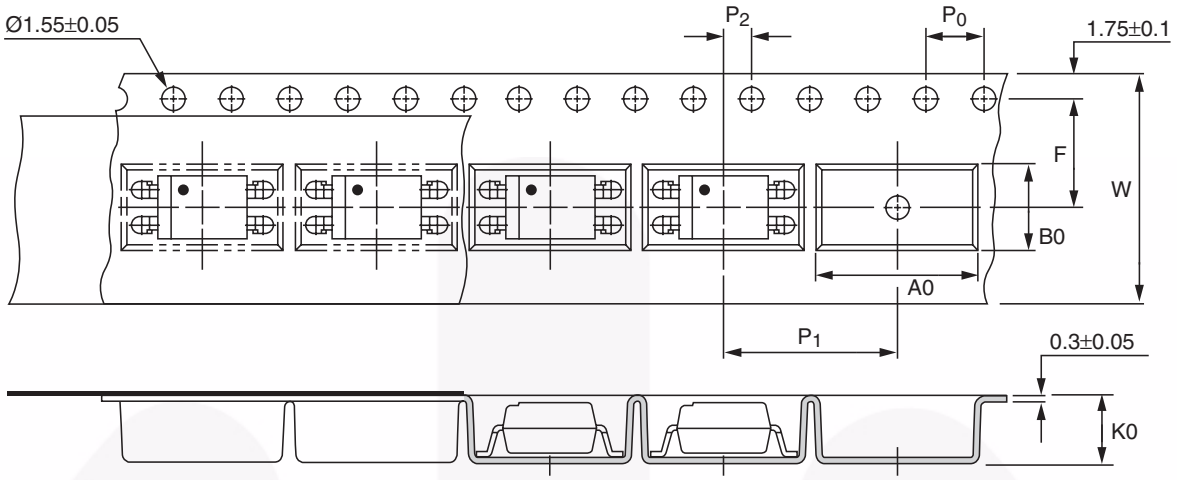
Option	Part Number Example	Description
S	FOD814S	Surface Mount Lead Bend
SD	FOD814SD	Surface Mount; Tape and reel
300	FOD814300	VDE Approved
300W	FOD814300W	VDE Approved, 0.4" Lead Spacing
3S	FOD8143S	VDE Approved, Surface Mount
3SD	FOD8143SD	VDE Approved, Surface Mount, Tape & Reel

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

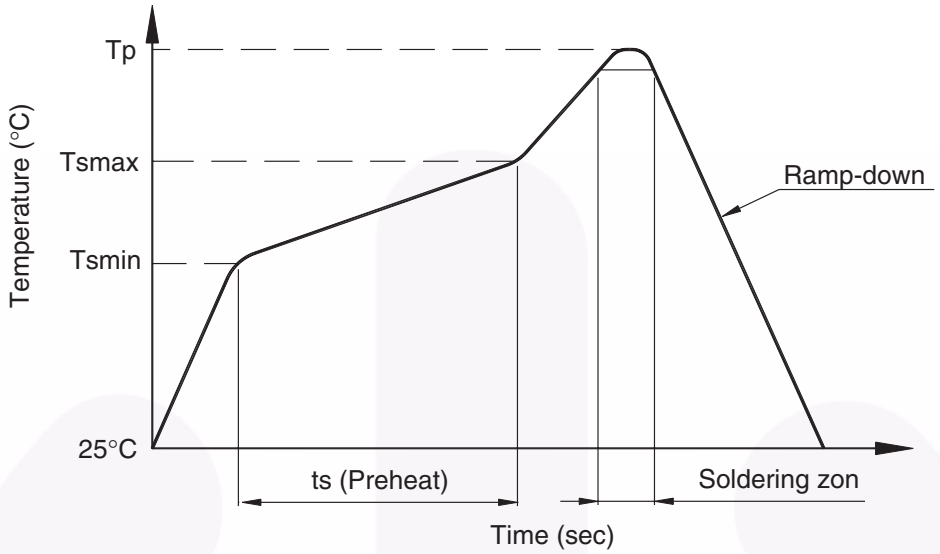
Carrier Tape Specifications



Note:
All dimensions are in millimeters.

Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (.63)
P_0	Pitch of sprocket holes	4 ± 0.1 (.15)
F P_2	Distance of compartment	7.5 ± 0.1 (.295) 2 ± 0.1 (.079)
P_1	Distance of compartment to compartment	12 ± 0.1 (.472)
A0	Compartment	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 (Tsmin-Tsmax / 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

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Green FPS™ e-Series™
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MotionMax™
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SuperSOT™-6
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2. A critical component in 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.

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I40