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May 2017

FOD814 Series, FOD817 Series 4-Pin DIP Phototransistor Optocouplers

Features

- AC Input Response (FOD814)
- 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%

- Minimum BV_{CEO} of 70 V Guaranteed
- · Safety and Regulatory Approvals
 - UL1577, 5,000 VAC_{RMS} for 1 Minute
 - DIN EN/IEC60747-5-5

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

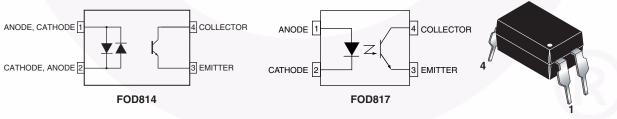


Figure 1. Schematic

Figure 2. Package Outlines

Safety and Insulation Ratings

As per DIN EN/IEC 60747-5-5, this optocoupler is suitable for "safe electrical insulation" only within the safety limit data. Compliance with the safety ratings shall be ensured by means of protective circuits.

Parameter	Characteristics	
Installation Classifications per DIN VDE	< 150 V _{RMS}	I–IV
0110/1.89 Table 1, For Rated Mains Voltage	< 300 V _{RMS}	I–III
Climatic Classification		30/110/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Symbol	Parameter	Value	Unit
V	Input-to-Output Test Voltage, Method A, $V_{IORM} \times 1.6 = V_{PR}$, Type and Sample Test with $t_m = 10$ s, Partial Discharge < 5 pC	1360	V _{peak}
V _{PR}	Input-to-Output Test Voltage, Method B, $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m = 1$ s, Partial Discharge < 5 pC	1560	V _{peak}
V_{IORM}	Maximum Working Insulation Voltage	850	V _{peak}
V_{IOTM}	Highest Allowable Over-Voltage	8000	V _{peak}
	External Creepage	≥ 7	mm
	External Clearance	≥ 7	mm
	External Clearance (for Option W, 0.4" Lead Spacing)	≥ 10	mm
DTI	Distance Through Insulation (Insulation Thickness)	≥ 0.4	mm
T _S	Case Temperature ⁽¹⁾	175	°C
I _{S,INPUT}	Input Current ⁽¹⁾	400	mA
P _{S,OUTPUT}	Output Power ⁽¹⁾	700	mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V ⁽¹⁾	> 10 ¹¹	Ω

Note

1. Safety limit values – maximum values allowed in the event of a failure.

Absolute Maximum Ratings

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. $T_A = 25^{\circ}C$ Unless otherwise specified.

Comple at	Damamatan	Va	lue	
Symbol	Parameter	FOD814	FOD817	Unit
Total Device				
T _{STG}	Storage Temperature	-55 to	+150	°C
T _{OPR}	Operating Temperature	-55 to +105	-55 to +110	°C
T _J	Junction Temperature	-55 to	+125	°C
T _{SOL}	Lead Solder Temperature	260 for 10) seconds	°C
$\theta_{\sf JC}$	Junction-to-Case Thermal Resistance	2.	10	°C/W
P _{TOT}	Total Device Power Dissipation	200		mW
EMITTER				
I _F	Continuous Forward Current	±50	50	mA
V_{R}	Reverse Voltage		6	V
	Power Dissipation	7	0	mW
P_{D}	Derate Above 100°C	1.7		mW/°C
DETECTOR				
V _{CEO}	Collector-Emitter Voltage	70		V
V _{ECO}	Emitter-Collector Voltage	6		V
I _C	Continuous Collector Current	50		mA
Б	Collector Power Dissipation	1:	50	mW
P_{C}	Derate Above 90°C	2	.9	mW/°C

Electrical Characteristics

 $T_A = 25$ °C unless otherwise specified.

Individual Component Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Тур.	Max.	Unit	
EMITTER		<u></u>		1			.1	
\/	Converd Voltage	FOD814	I _F = ±20 mA		1.2	1.4	V	
V_{F}	Forward Voltage	FOD817	I _F = 20 mA		1.2	1.4	V	
I _R	Reverse Current	FOD817	V _R = 4.0 V			10	μΑ	
	Terminal Canacitanes	FOD814	V = 0, f = 1 kHz		50	250	250	
C _t Terminal Capacitance		FOD817	V = 0, f = 1 kHz		30	250	pF	
DETECTO	OR .						•	
	Collector Dark Current	FOD814	$V_{CE} = 20 \text{ V}, I_F = 0$			100	~ Λ	
I _{CEO}	Collector Dark Current	FOD817	$V_{CE} = 20 \text{ V}, I_F = 0$			100	- nA	
D\/	Collector-Emitter Breakdown	FOD814	$I_C = 0.1 \text{ mA}, I_F = 0$	70				
BV _{CEO}	Voltage FOD817 $I_C = 0.1 \text{ mA}, I_F = 0$		70			- V		
Emitter-C	Emitter-Collector Breakdown	FOD814	$I_E = 10 \mu A, I_F = 0$	6			V	
BV _{ECO}	Voltage	FOD817	$I_E = 10 \mu A, I_F = 0$	6			V	

DC Transfer Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Тур.	Max.	Unit
		FOD814	I _F = ±1 mA, V _{CE} = 5 V	20		300	
		FOD814A	IF = ±1 IIIA, VCE = 5 V	50		150	
		FOD817		50		600	
CTR	Current Transfer Ratio ⁽²⁾	FOD817A		80		160	%
	F	FOD817B	$I_F = 5 \text{ mA}, V_{CE} = 5 \text{ V}$	130		260	
		FOD817C		200		400	
		FOD817D		300		600	
V	Collector-Emitter Saturation	FOD814	$I_F = \pm 20 \text{ mA}, I_C = 1 \text{ mA}$		0.1	0.2	V
V _{CE(SAT)}	Voltage	FOD817	$I_F = 20 \text{ mA}, I_C = 1 \text{ mA}$		0.1	0.2	V

AC Transfer Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Тур.	Max.	Unit
f _C	Cut-Off Frequency	FOD814	$V_{CE} = 5 \text{ V}, I_{C} = 2 \text{ mA},$ $R_{L} = 100 \Omega, -3 \text{ dB}$	15	80		kHz
t _r	Response Time (Rise)	FOD814, FOD817	$V_{CE} = 2 \text{ V, } I_{C} = 2 \text{ mA,}$ $R_{1} = 100 \ \Omega^{(3)}$		4	18	μs
t _f	Response Time (Fall)	FOD814, FOD817	$R_L = 100 \Omega^{(3)}$		3	18	μs

Notes

- 2. Current Transfer Ratio (CTR) = $I_C / I_F x 100\%$.
- 3. For test circuit setup and waveforms, refer to page 7.

Electrical Characteristics (Continued)

 $T_A = 25$ °C unless otherwise specified.

Isolation Characteristics

Symbol	Parameter	Device	Test Conditions	Min.	Тур.	Max.	Unit
V _{ISO}	Input-Output Isolation Voltage ⁽⁴⁾	FOD814, FOD817	f = 60 Hz, t = 1 minute, $I_{I-O} \le 2 \mu A$	5000			VAC _{RMS}
R _{ISO}	Isolation Resistance	FOD814, FOD817	V _{I-O} = 500 V _{DC}	5x10 ¹⁰	1x10 ¹¹		Ω
C _{ISO}	Isolation Capacitance	FOD814, FOD817	V _{I-O} = 0, f = 1 MHz		0.6	1.0	pf

Note:

4. For this test, Pins 1 and 2 are common, and Pins 3 and 4 are common.

Typical Electrical/Optical Characteristic Curves

 $T_A = 25$ °C unless otherwise specified.

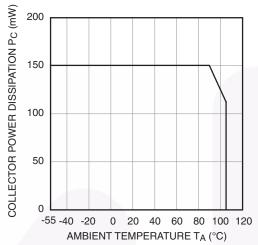


Fig. 3 Collector Power Dissipation vs. Ambient Temperature (FOD814)

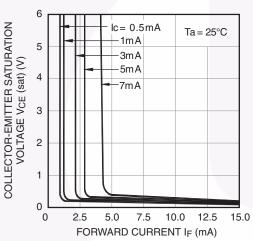


Fig. 5 Collector-Emitter Saturation Voltage vs. Forward Current

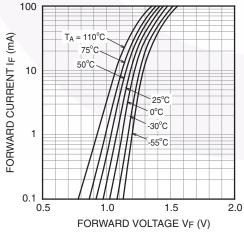


Fig. 7 Forward Current vs. Forward Voltage (FOD817)

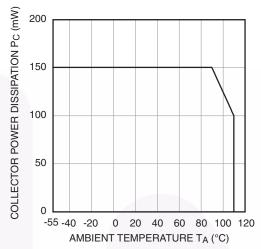


Fig. 4 Collector Power Dissipation vs. Ambient Temperature (FOD817)

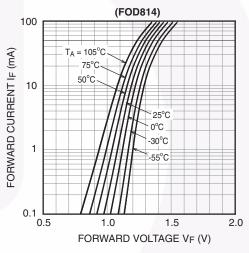


Fig. 6 Forward Current vs. Forward Voltage

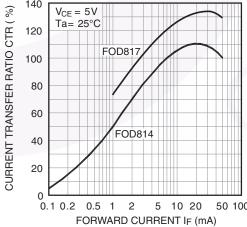


Fig. 8 Current Transfer Ratio vs. Forward Current

Typical Electrical/Optical Characteristic Curves (Continued)

 $T_A = 25$ °C unless otherwise specified.

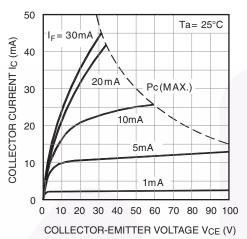


Fig. 9 Collector Current vs. Collector-Emitter Voltage (FOD814)

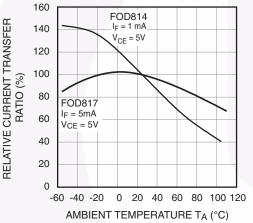
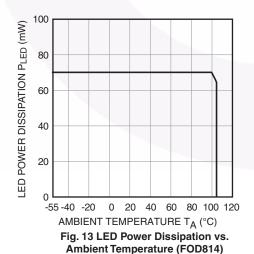


Fig. 11 Relative Current Transfer Ratio vs. Ambient Temperature



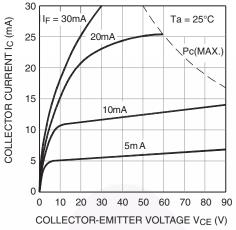


Fig. 10 Collector Current vs. Collector-Emitter Voltage (FOD817)

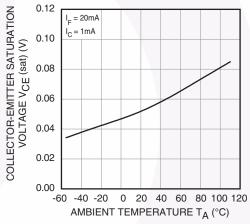


Fig. 12 Collector-Emitter Saturation Voltage vs. Ambient Temperature

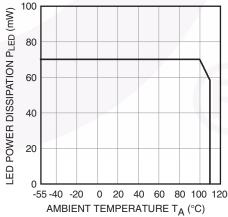


Fig. 14 LED Power Dissipation vs. Ambient Temperature (FOD817)

Typical Electrical/Optical Characteristic Curves (Continued)

 $T_A = 25$ °C unless otherwise specified.

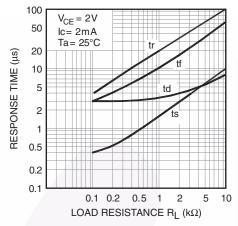


Fig. 15 Response Time vs. Load Resistance

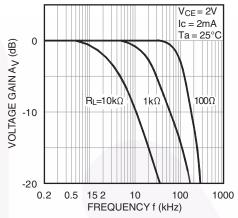


Fig. 16 Frequency Response

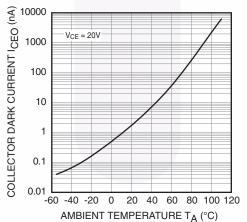
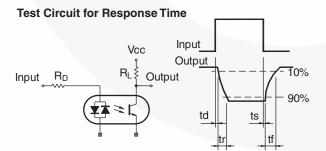
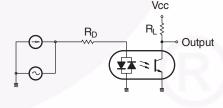


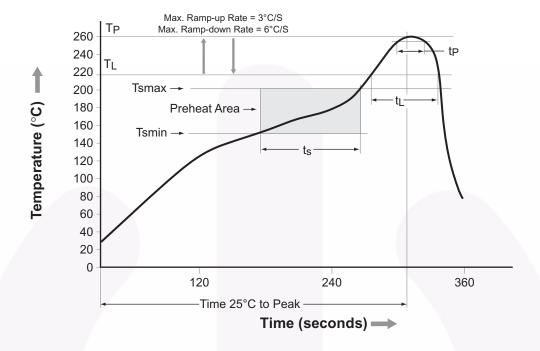
Fig. 17 Collector Dark Current vs. Ambient Temperature







Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmin)	150°C
Temperature Max. (Tsmax)	200°C
Time (t _S) from (Tsmin to Tsmax)	60-120 seconds
Ramp-up Rate (t _L to t _P)	3°C/second max.
Liquidous Temperature (T _L)	217°C
Time (t _L) Maintained Above (T _L)	60-150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	30 seconds
Ramp-down Rate (T _P to T _L)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Figure 20. Reflow Profile

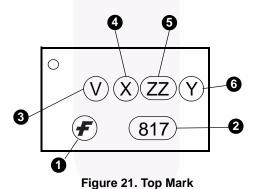
Ordering Information

Part Number	Package	Packing Method
FOD817X	DIP 4-Pin	Tube (100 units per tube)
FOD817XS	SMT 4-Pin (Lead Bend)	Tube (100 units per tube)
FOD817XSD	SMT 4-Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
FOD817X300	DIP 4-Pin, DIN EN/IEC60747-5-5 option	Tube (100 units per tube)
FOD817X3S	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option	Tube (100 units per tube)
FOD817X3SD	SMT 4-Pin (Lead Bend), DIN EN/IEC60747-5-5 option	Tape and Reel (1,000 units per reel)
FOD817X300W	DIP 4-Pin, 0.4" Lead Spacing, DIN EN/IEC60747-5-5 option	Tube (100 units per tube)

Note:

The product orderable part number system listed in this table also applies to the FOD814 products.

Marking Information



Definiti	ons
1	Fairchild Logo
2	Device Number
3	DIN EN/IEC60747-5-5 Option (only appears on parts ordered with this option)
4	One-Digit Year Code, e.g., '5'
5	Two-Digit Work Week, Ranging from '01' to '53'
6	Assembly Package Code Y = Manufactured in Thailand YA = Manufactured in China

[&]quot;X" denotes the Current Transfer Ratio (CTR) options

Carrier Tape Specifications

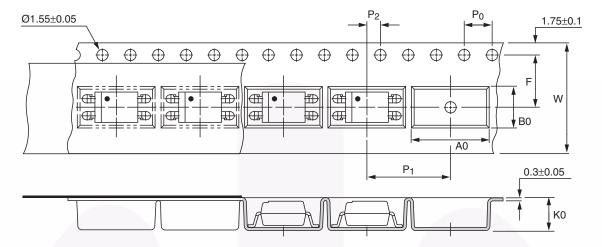
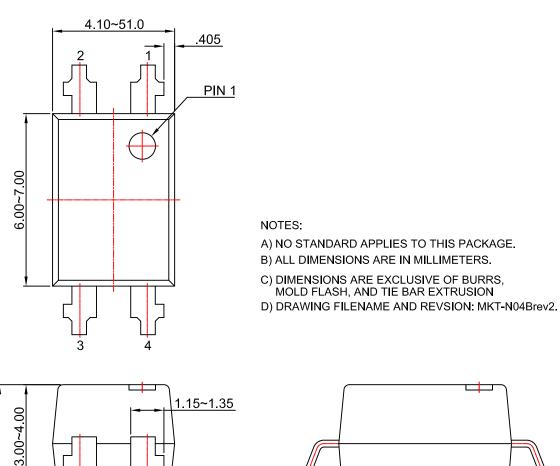
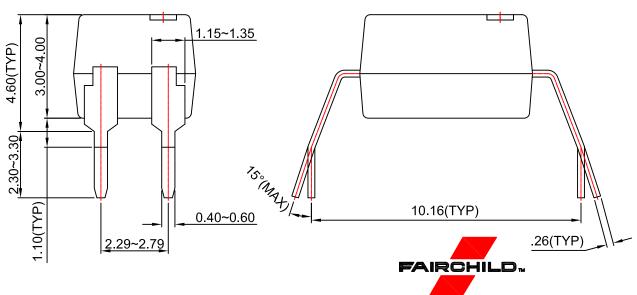
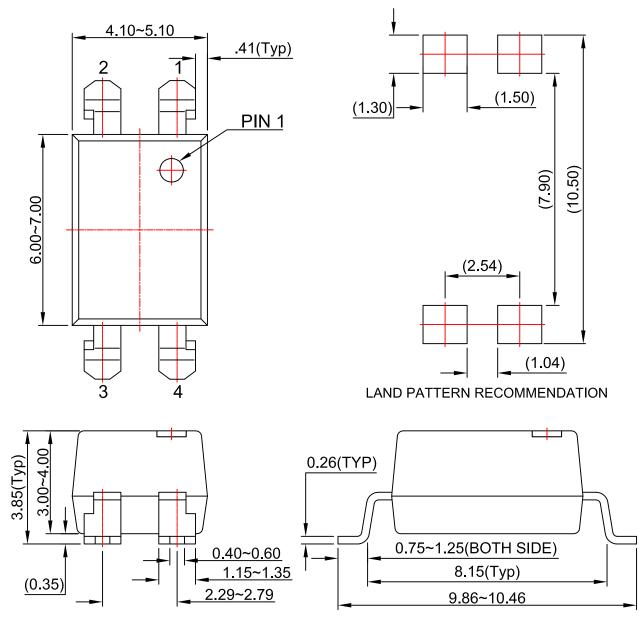


Figure 22. Carrier Tape Specification

Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (0.63)
P ₀	Pitch of sprocket holes	4 ± 0.1 (0.15)
F P ₂	Distance of compartment	7.5 ± 0.1 (0.295) 2 ± 0.1 (0.079)
P ₁	Distance of compartment to compartment	12 ± 0.1 (0.472)
A0	Compartment	10.45 ± 0.1 (0.411)
В0		5.30 ± 0.1 (0.209)
K0		4.25 ± 0.1 (0.167)



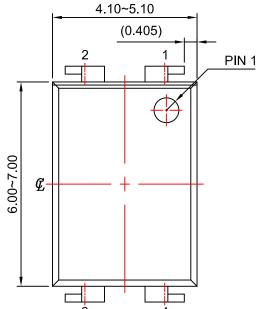




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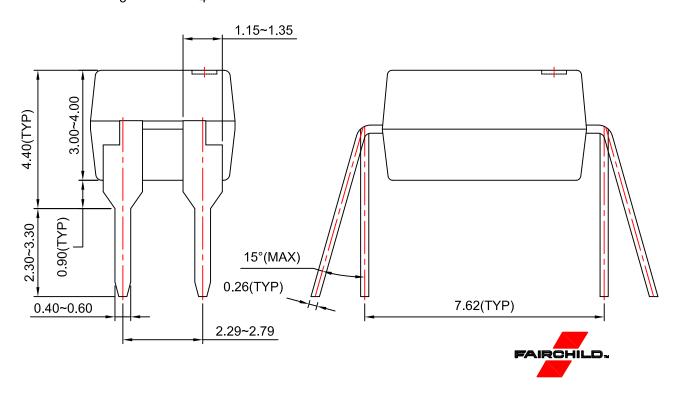
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