onsemi

FOD814, FOD817

Introduction or 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.

Features

- AC Input Response (FOD814)
- 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%
- Minimum BV_{CEO} of 70 V Guaranteed
- Safety and Regulatory Approvals
 - UL1577, 5,000 VAC_{RMS} for 1 Minute
 - ◆ DIN EN/IEC60747-5-5
- This Device is Pb-Free

Typical Applications

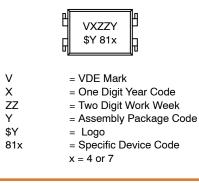
- FOD814 Series
 - AC Line Monitor
 - Unknown Polarity DC Sensor
 - Telephone Line Interface
- FOD817 Series
 - Power Supply Regulators
 - Digital Logic Inputs
 - Microprocessor Inputs





PDIP4 CASE 646CD CASE 646CA PDIP4 GW CASE 709AH

MARKING DIAGRAM



ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

1

FUNCTIONAL BLOCK DIAGRAM

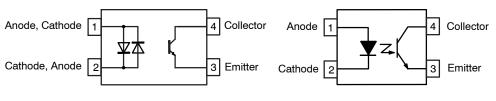


Figure 1. Schematic – FOD814

Figure 2. Schematic – FOD817

SAFETY AND INSULATION RATINGS

Para	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	Climatic Classification		
Pollution Degree (DIN VDE 0110/1.89)	2		
Comparative Tracking Index	175		

Symbol	Parameter	Value	Unit
V _{PR}	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}
	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	1594	
V _{IORM}	Maximum Working Insulation Voltage	850	
V _{IOTM}	Highest Allowable Over-Voltage	8000	
	External Creepage	≥7	mm
	External Clearance	≥7	
	External Clearance (for Option W, 0.4" Lead Spacing)	≥ 10	
DTI	Distance Through Insulation (Insulation Thickness)	≥0.4	
Τ _S	Case Temperature (Note 1)	175	°C
I _{S,INPUT}	Input Current (Note 1)	400	mA
P _{S,OUTPUT}	Output Power (Note 1)	700	mW
R _{IO}	Insulation Resistance at T _S , V _{IO} = 500 V (Note 1)	> 10 ¹¹	Ω

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.

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

ABSOLUTE MAXIMUM RATINGS $T_A = 25^{\circ}C$ unless otherwise specified.

		Value		
Symbol	Parameter	FOD814	FOD817	Unit

T _{STG}	Storage Temperature	–55 to	°C	
T _{OPR}	Operating Temperature	–55 to +105	–55 to +110	
TJ	Junction Temperature	–55 to		
T _{SOL}	Lead Solder Temperature 260 for 10 s		or 10 s	
θJC	Junction-to-Case Thermal Resistance	2.	°C/W	
P _{TOT}	Total Device Power Dissipation	20	mW	

ABSOLUTE MAXIMUM RATINGS $T_A = 25^{\circ}C$ unless otherwise specified. (continued)

		Va	Value		
Symbol	Parameter	FOD814	FOD817	Unit	
EMITTER			-		
١ _F	Continuous Forward Current	±50	50	mA	
V _R	Reverse Voltage		6	V	
PD	Power Dissipation	7	70	mW	
	Derate Above 100°C	1	.7	mW/°C	
DETECTOF	ł			•	
V _{CEO}	Collector-Emitter Voltage	7	70	V	
V_{ECO}	Emitter-Collector Voltage		6		
Ι _C	Continuous Collector Current	Ę	50	mA	
P _C	Collector Power Dissipation	1	50	mW	
	Derate Above 90°C	2	2.9	mW/°C	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS $T_A = 25^{\circ}C$ unless otherwise specified.

INDIVIDUAL COMPONENT CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Тур	Max	Unit
Emmiter							
V _F	Forward Voltage	FOD814	I _F = ±20 mA	-	1.2	1.4	V
		FOD817	I _F = 20 mA	-	1.2	1.4	
I _R	Reverse Current	FOD817	V _R = 4.0 V	-	-	10	μΑ
Ct	Terminal Capacitance	FOD814	V = 0, f = 1 kHz	-	50	250	pF
		FOD817		-	30	250	

Detector

I _{CEO}	Collector Dark Current	FOD814	$V_{CE} = 20 \text{ V}, \text{ I}_{F} = 0$	-	-	100	nA
		FOD817		-	-	100	
BV _{CEO}	Collector-Emitter Breakdown	FOD814	l _C = 0.1 mA, l _F = 0	70	_	-	V
	Voltage	FOD817		70	_	-	
BV _{ECO}	Emitter-Collector Breakdown	FOD814	I _E = 10 μA, I _F = 0	6	-	-	
	Voltage	FOD817		6	-	_	

DC TRANSFER CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS $T_A = 25^{\circ}C$ unless otherwise specified. (continued)

AC TRANSFER CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Тур	Мах	Unit
f _C	Cut–Off Frequency	FOD814		15	80	-	kHz
t _r	Response Time (Rise)	FOD814, FOD817	$V_{CE} = 2 V, I_{C} = 2 mA,$	-	4	18	μs
t _f	Response Time (Fall)	FOD814, FOD817	R _L = 100 Ω (Note 3)	-	3	18	

ISOLATION CHARACTERISTICS

Symbol	Parameter	Device	Test Conditions	Min	Тур	Max	Unit
V _{ISO}	Input–Output Isolation Voltage (Note 4)	FOD814, FOD817	$\begin{array}{l} f=60 \text{ Hz}, t=1 \text{ min}, \\ I_{I-O} \leq 2 \ \mu A \end{array}$	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

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

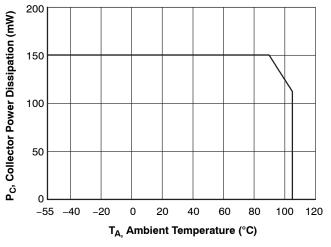
2. Current Transfer Ratio (CTR) = I_C / I_F x 100%

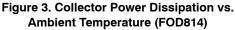
3. For test circuit setup and waveforms, refer to page 5.

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

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTICS CURVES

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





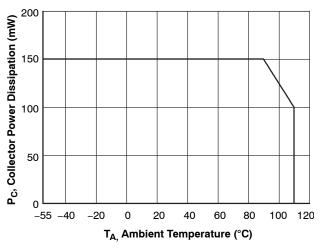
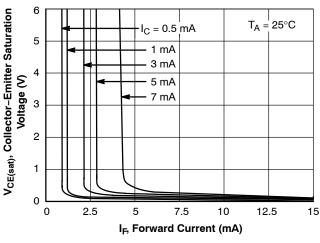
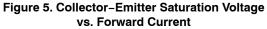


Figure 4. Collector Power Dissipation vs. Ambient Temperature (FOD817)

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTICS CURVES

 $T_A = 25^{\circ}C$ unless otherwise specified. (continued)





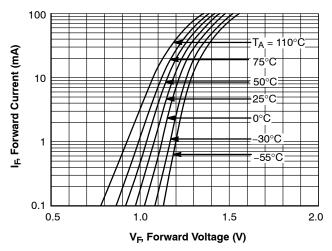
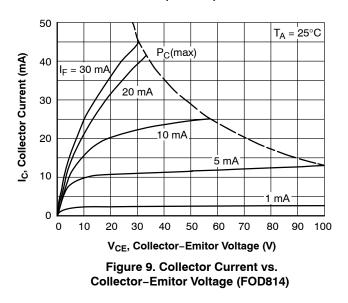


Figure 7. Forward Current vs. Forward Voltage (FOD817)



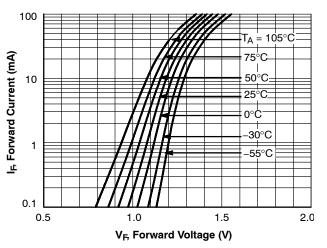


Figure 6. Forward Current vs. Forward Voltage (FOD814)

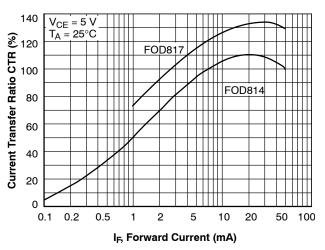
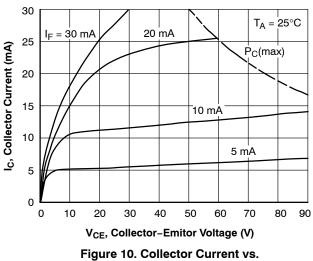


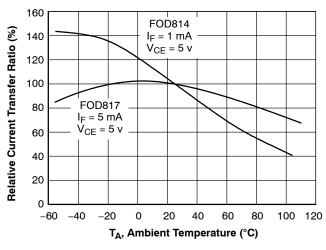
Figure 8. Current Transfer Ratio vs. Forward Current



Collector-Emitor Voltage (FOD817)

TYPICAL ELECTRICAL/OPTICAL CHARACTERISTICS CURVES

 $T_A = 25^{\circ}C$ unless otherwise specified. (continued)





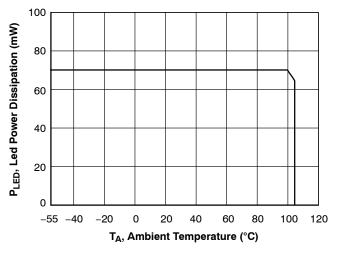
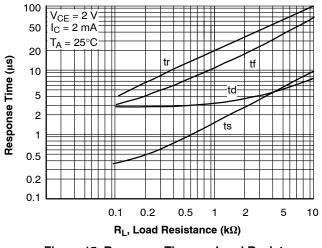
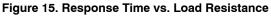


Figure 13. Led Power Dissipation vs. Ambient Temperature (FOD814)





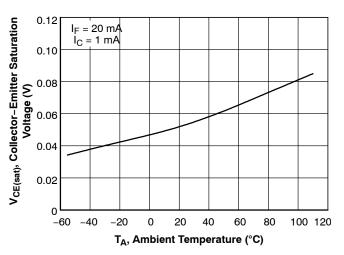


Figure 12. Collector–Emitter Saturation Voltage vs. Ambient Temperature

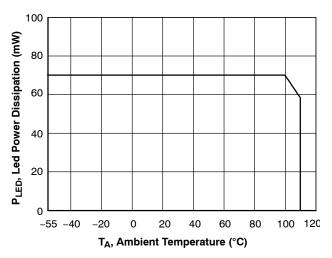
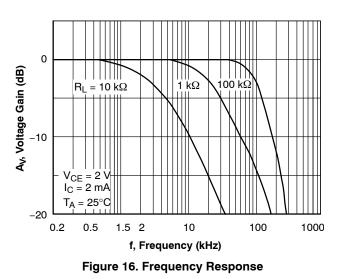
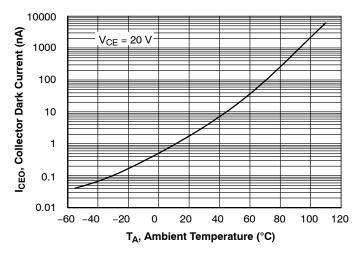


Figure 14. Led Power Dissipation vs. Ambient Temperature (FOD817)



TYPICAL ELECTRICAL/OPTICAL CHARACTERISTICS CURVES

 $T_A = 25^{\circ}C$ unless otherwise specified. (continued)





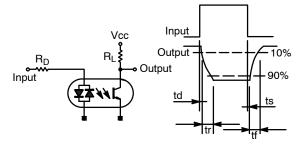


Figure 18. Test Circuit for Response Time

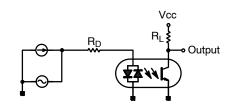


Figure 19. Test Circuit for Frequency Response

REFLOW PROFILE

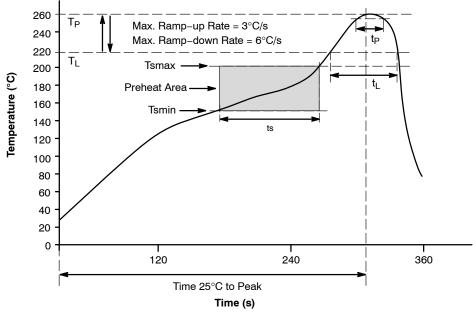


Figure 20. Reflow Profile

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 s
Ramp-up Rate (t _L to t _P)	3°C/s max.
Liquidous Temperature (T _L)	217°C
Time (t _L) Maintained Above (T _L)	60–150 s
Peak Body Package Temperature	260°C +0°C / -5°C
Time (t _P) within 5°C of 260°C	30 s
Ramp-down Rate (T _P to T _L)	6°C/s max.
Time 25°C to Peak Temperature	8 min max.

ORDERING INFORMATION

Part Number	Package	Shipping [†]	
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	Tape and Reel (1,000 units per reel)	

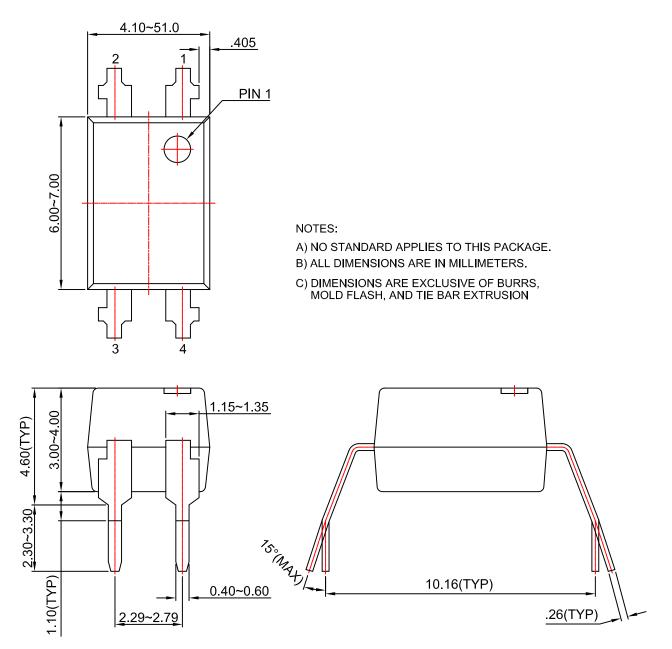
+For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

NOTE: The product orderable part number system listed in this table also applies to the FOD814 products. "X" denotes the Current Transfer Ratio (CTR) options.



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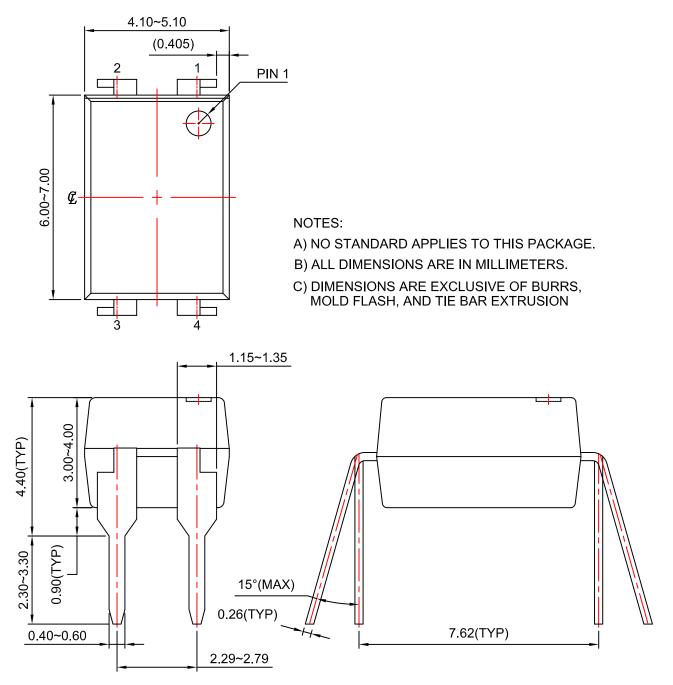
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