



November 2015

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

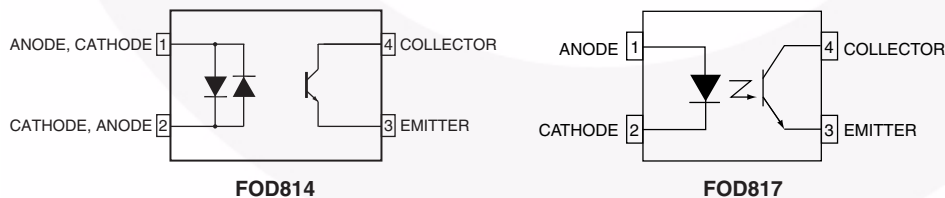


Figure 1. Schematic

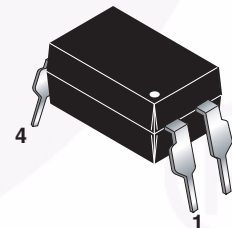


Figure 2. Package Outlines

FOD814 Series, FOD817 Series — 4-Pin DIP Phototransistor Optocouplers

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 0110/1.89 Table 1, For Rated Mains Voltage	< 150 V _{RMS}	I–IV
	< 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 _{PR}	Input-to-Output Test Voltage, Method A, V _{IORM} × 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} × 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. $T_A = 25^\circ\text{C}$ Unless otherwise specified.

Symbol	Parameter	Value		Unit
		FOD814	FOD817	
Total Device				
T_{STG}	Storage Temperature	-55 to +150		$^\circ\text{C}$
T_{OPR}	Operating Temperature	-55 to +105	-55 to +110	$^\circ\text{C}$
T_J	Junction Temperature	-55 to +125		$^\circ\text{C}$
T_{SOL}	Lead Solder Temperature	260 for 10 seconds		$^\circ\text{C}$
θ_{JC}	Junction-to-Case Thermal Resistance	210		$^\circ\text{C}/\text{W}$
P_{TOT}	Total Device Power Dissipation	200		mW
EMITTER				
I_F	Continuous Forward Current	± 50	50	mA
V_R	Reverse Voltage		6	V
P_D	Power Dissipation	70		mW
	Derate Above 100°C	1.7		mW/ $^\circ\text{C}$
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	150		mW
	Derate Above 90°C	2.9		mW/ $^\circ\text{C}$

Electrical Characteristics

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

Individual Component Characteristics

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

DC Transfer Characteristics

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

AC Transfer Characteristics

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

Notes:

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

Electrical Characteristics (Continued) $T_A = 25^\circ\text{C}$ unless otherwise specified.**Isolation Characteristics**

Symbol	Parameter	Device	Test Conditions	Min.	Typ.	Max.	Unit
V_{ISO}	Input-Output Isolation Voltage ⁽⁴⁾	FOD814, FOD817	$f = 60 \text{ Hz}$, $t = 1 \text{ minute}$, $I_{\text{I-O}} \leq 2 \mu\text{A}$	5000			VAC_{RMS}
R_{ISO}	Isolation Resistance	FOD814, FOD817	$V_{\text{I-O}} = 500 \text{ V}_{\text{DC}}$	5×10^{10}	1×10^{11}		Ω
C_{ISO}	Isolation Capacitance	FOD814, FOD817	$V_{\text{I-O}} = 0$, $f = 1 \text{ MHz}$		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

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

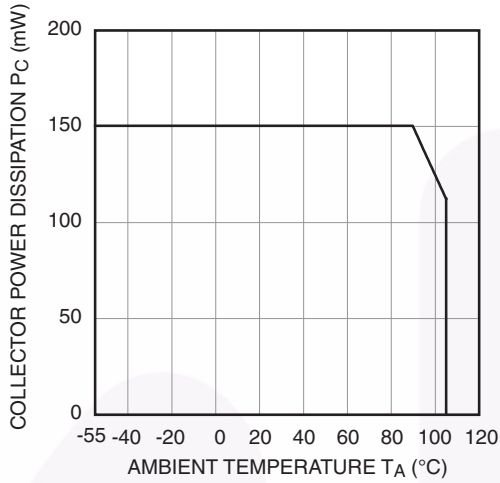


Fig. 3 Collector Power Dissipation vs. Ambient Temperature (FOD814)

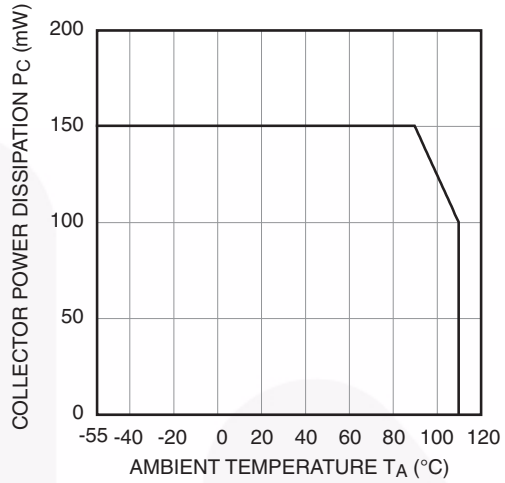


Fig. 4 Collector Power Dissipation vs. Ambient Temperature (FOD817)

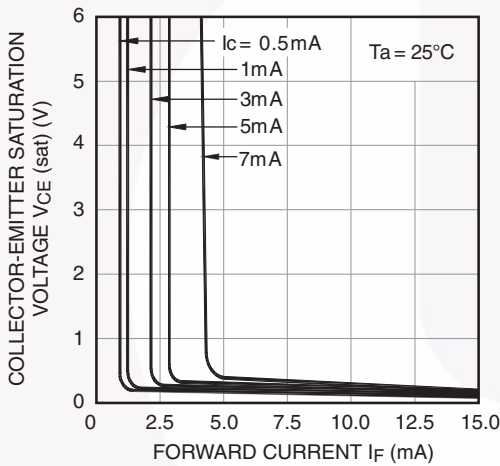


Fig. 5 Collector-Emitter Saturation Voltage vs. Forward Current

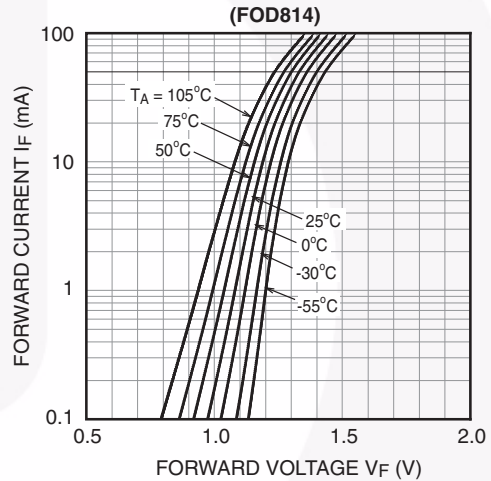


Fig. 6 Forward Current vs. Forward Voltage

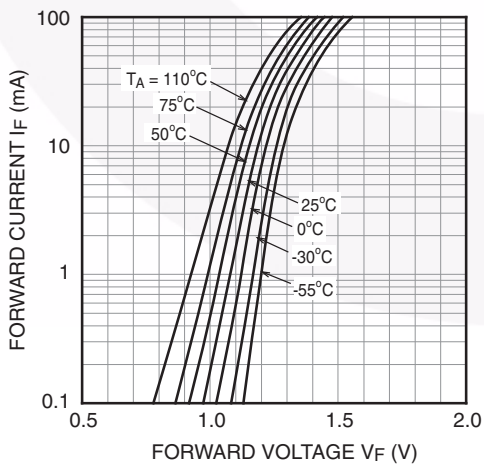


Fig. 7 Forward Current vs. Forward Voltage (FOD817)

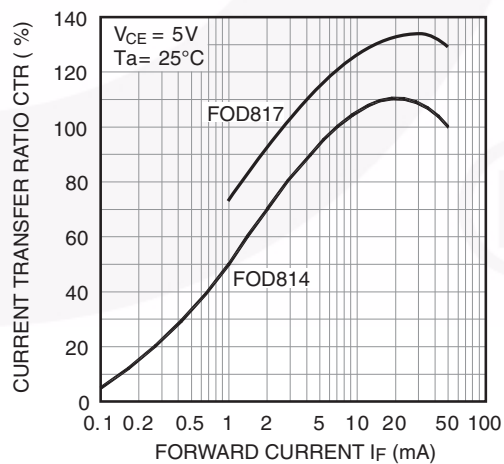


Fig. 8 Current Transfer Ratio vs. Forward Current

Typical Electrical/Optical Characteristic Curves (Continued)

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

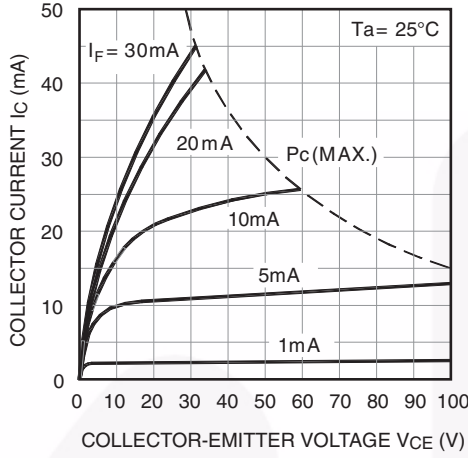


Fig. 9 Collector Current vs. Collector-Emitter Voltage (FOD814)

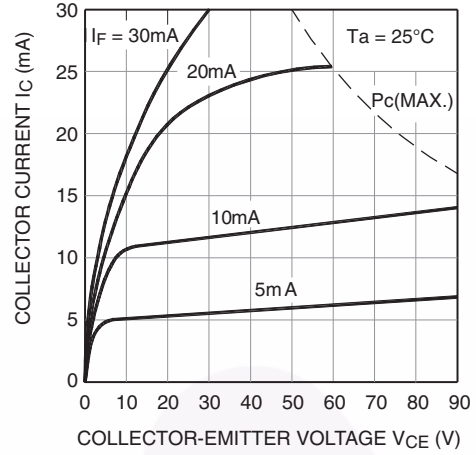


Fig. 10 Collector Current vs. Collector-Emitter Voltage (FOD817)

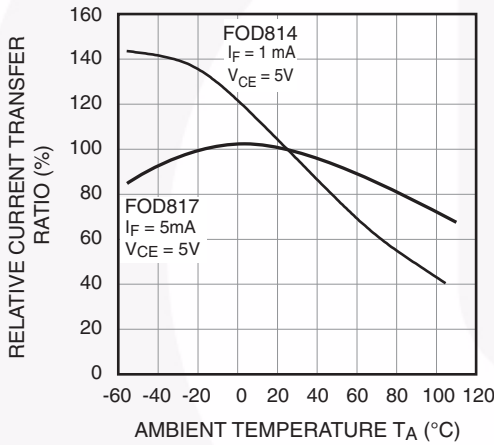


Fig. 11 Relative Current Transfer Ratio vs. Ambient Temperature

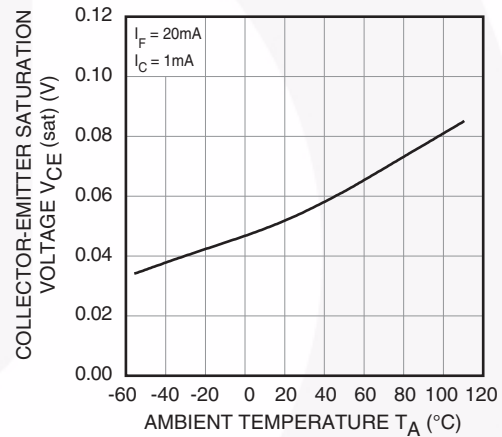


Fig. 12 Collector-Emitter Saturation Voltage vs. Ambient Temperature

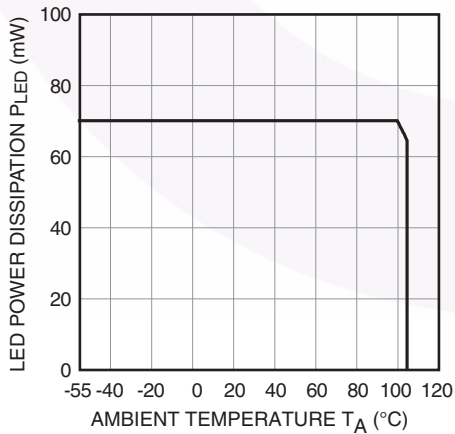


Fig. 13 LED Power Dissipation vs. Ambient Temperature (FOD814)

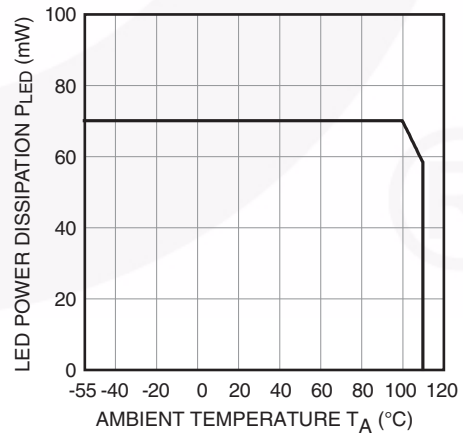


Fig. 14 LED Power Dissipation vs. Ambient Temperature (FOD817)

Typical Electrical/Optical Characteristic Curves (Continued)

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

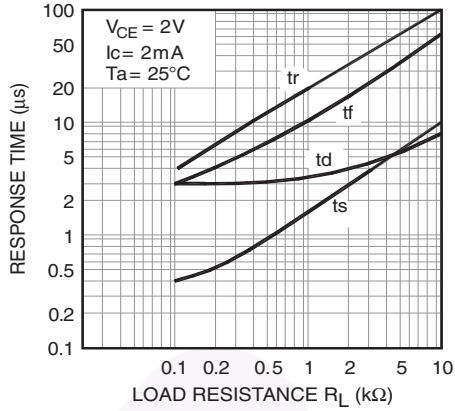


Fig. 15 Response Time vs. Load Resistance

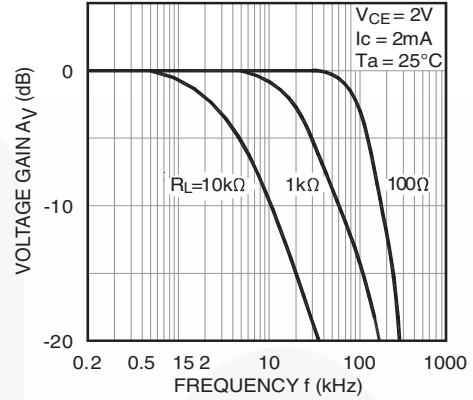


Fig. 16 Frequency Response

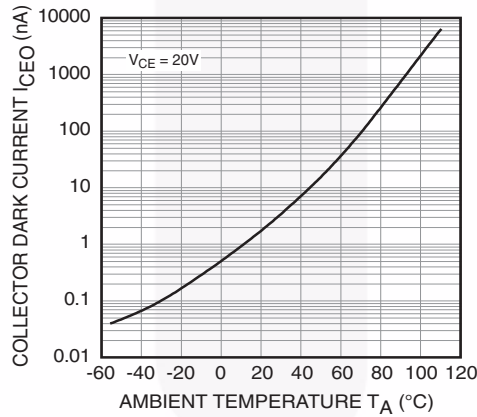


Fig. 17 Collector Dark Current vs. Ambient Temperature

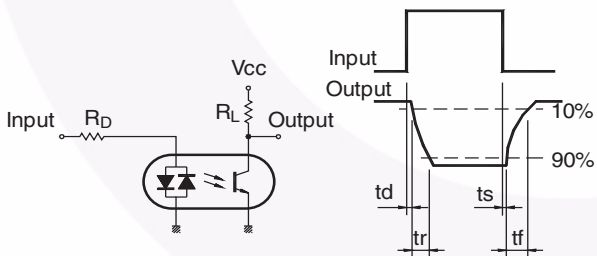


Fig. 18 Test Circuit for Response Time

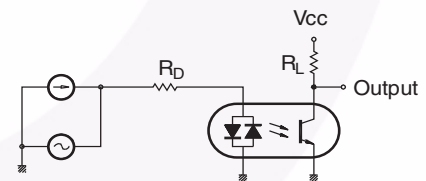
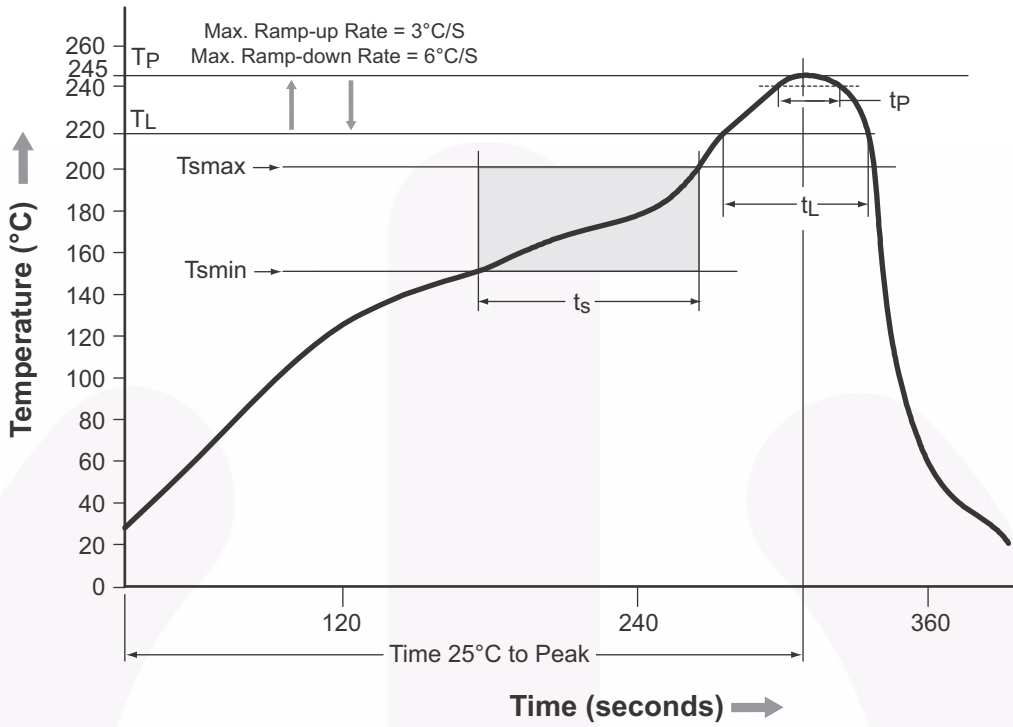


Fig. 19 Test Circuit for Frequency Response

Reflow Profile



Profile Feature	Pb-Free Assembly Profile
Temperature Min. (T _{smin})	150°C
Temperature Max. (T _{smax})	200°C
Time (t _s) from (T _{smin} to T _{smax})	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	245°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.

"X" denotes the Current Transfer Ratio (CTR) options

Marking Information

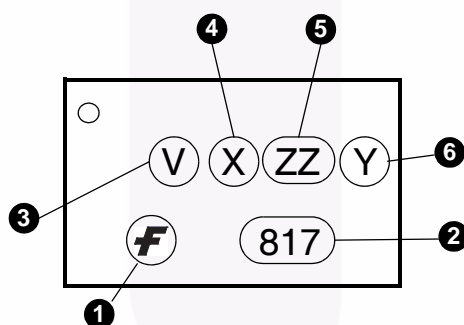


Figure 21. Top Mark

Definitions	
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

Carrier Tape Specifications

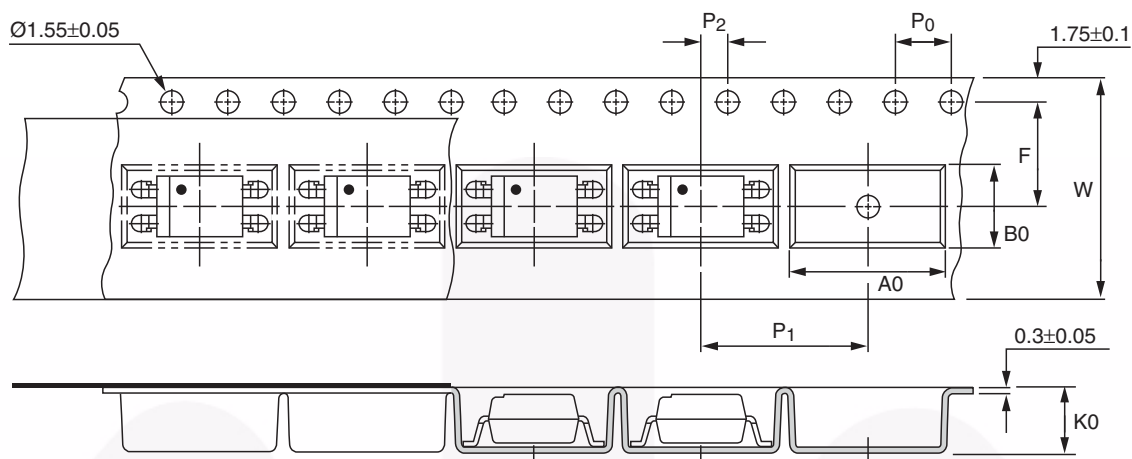


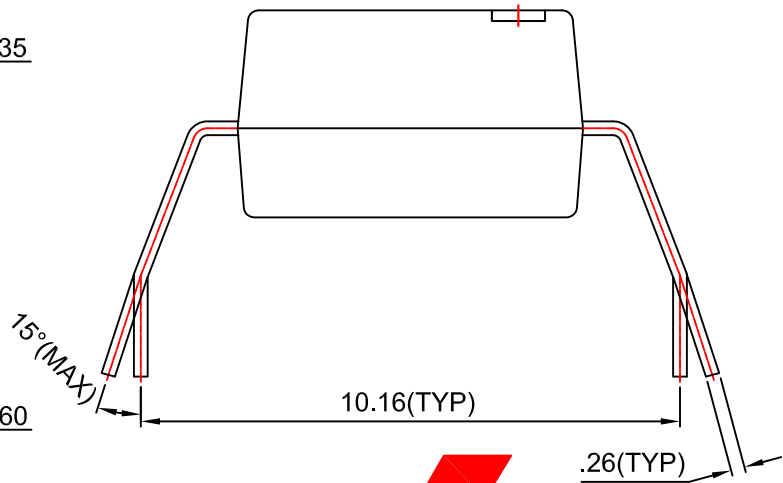
Figure 22. Carrier Tape Specification

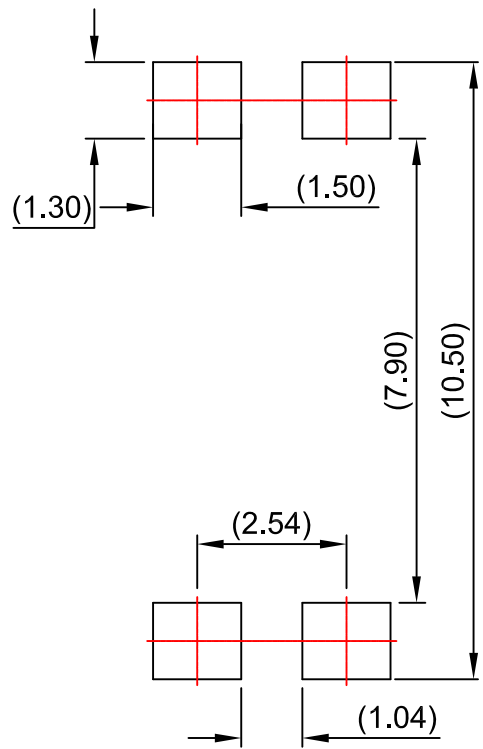
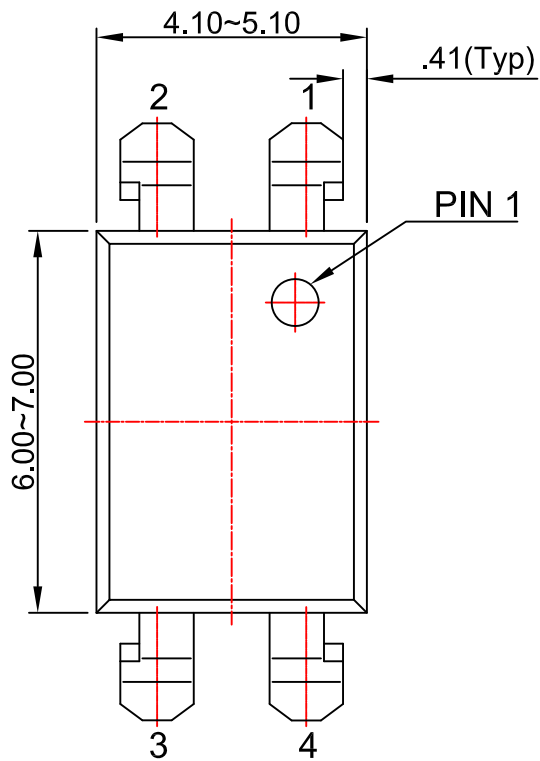
Symbol	Description	Dimensions in mm (inches)
W	Tape wide	16 ± 0.3 (0.63)
P ₀	Pitch of sprocket holes	4 ± 0.1 (0.15)
F	Distance of compartment	7.5 ± 0.1 (0.295)
P ₂		2 ± 0.1 (0.079)
P ₁	Distance of compartment to compartment	12 ± 0.1 (0.472)
A ₀	Compartment	10.45 ± 0.1 (0.411)
B ₀		5.30 ± 0.1 (0.209)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



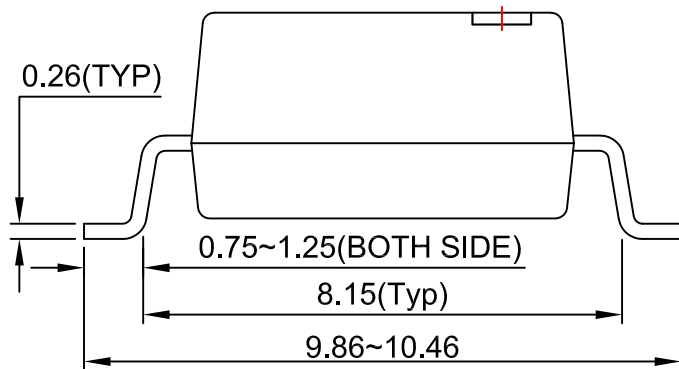
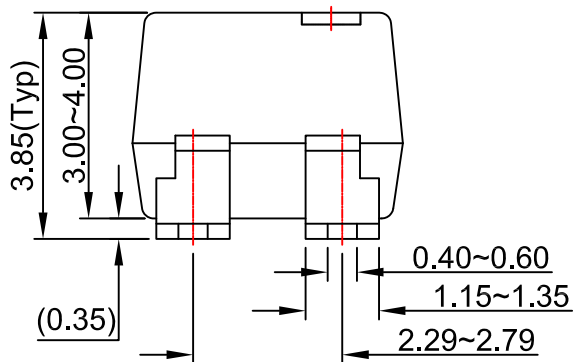
NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N04Brev2.





LAND PATTERN RECOMMENDATION



NOTES:

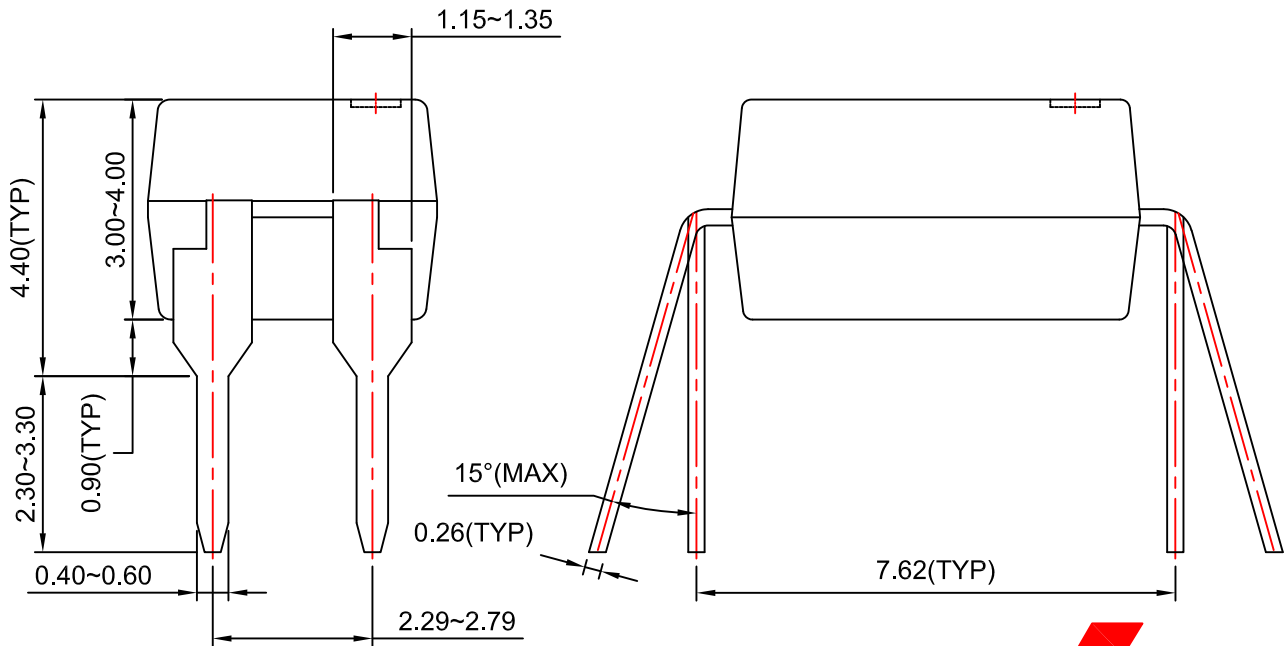
- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N04Crev2.





NOTES:

- A) NO STANDARD APPLIES TO THIS PACKAGE.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION
- D) DRAWING FILENAME AND REVISION: MKT-N04Arev2.





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

- | | | | |
|--------------------------|--|---------------------------------------|------------------|
| AccuPower™ | F-PFS™ | OPTOPLANAR® | SYSTEM GENERAL® |
| AttitudeEngine™ | FRFET® | Power Supply WebDesigner™ | TinyBoost® |
| Awinda® | Global Power Resource SM | PowerTrench® | TinyBuck® |
| AX-CAP®* | GreenBridge™ | PowerXS™ | TinyCalc™ |
| BitSiC™ | Green FPS™ | Programmable Active Droop™ | TinyLogic® |
| Build it Now™ | Green FPS™ e-Series™ | QFET® | TINYOPTO™ |
| CorePLUS™ | Gmax™ | QS™ | TinyPower™ |
| CorePOWER™ | GTO™ | Quiet Series™ | TinyPWM™ |
| CROSSVOL™ | IntelliMAX™ | RapidConfigure™ | TinyWire™ |
| CTL™ | ISOPLANAR™ | Saving our world, 1mW/W/kW at a time™ | TranSiC™ |
| Current Transfer Logic™ | Making Small Speakers Sound Louder and Better™ | SignalWise™ | TriFault Detect™ |
| DEUXPEED® | MegaBuck™ | SmartMax™ | TRUECURRENT®* |
| Dual Cool™ | MICROCOUPLER™ | SMART START™ | μSerDes™ |
| EcoSPARK® | MicroFET™ | Solutions for Your Success™ | UHC® |
| EfficientMax™ | MicroPak™ | SPM® | Ultra FRFET™ |
| ESBC™ | MicroPak2™ | STEALTH™ | UniFET™ |
| F [®] | MillerDrive™ | SuperFET® | Vcx™ |
| Fairchild® | MotionMax™ | SuperSOT™-3 | VisualMax™ |
| Fairchild Semiconductor® | MotionGrid® | SuperSOT™-6 | VoltagePlus™ |
| FACT Quiet Series™ | MTi® | SuperSOT™-8 | XST™ |
| FACT® | MTx® | SupreMOS® | Xsens™ |
| FastvCore™ | MVN® | SyncFET™ | 仙童® |
| FETBench™ | mWSaver® | Sync-Lock™ | |
| FPS™ | OptoHiT™ | | |
| | OPTOLOGIC® | | |

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT [HTTP://WWW.FAIRCHILDSEMI.COM](http://www.fairchildsemi.com). FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

AUTHORIZED USE

Unless otherwise specified in this data sheet, this product is a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability. This product may not be used in the following applications, unless specifically approved in writing by a Fairchild officer: (1) automotive or other transportation, (2) military/aerospace, (3) any safety critical application – including life critical medical equipment – where the failure of the Fairchild product reasonably would be expected to result in personal injury, death or property damage. Customer's use of this product is subject to agreement of this Authorized Use policy. In the event of an unauthorized use of Fairchild's product, Fairchild accepts no liability in the event of product failure. In other respects, this product shall be subject to Fairchild's Worldwide Terms and Conditions of Sale, unless a separate agreement has been signed by both Parties.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Terms of Use

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

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. I77