FOD819 Series

FOD819 4-Pin DIP High Speed Phototransistor Optocouplers

Description

The FOD819 consists of a gallium arsenide (GaAs) infra− red emitting diode, driving a high speed photo detector with integrated base−to−emitter resistor, R_{BE}, in a 4−pin dual−in−line package. It is designed to be an improved replacement to the popular FOD817 Series when higher speed performance is required in isolated data signal transmission.

Features

- High Speed Performance ~ 30 kHz
- Current Transfer Ratio: 100% to 600%
- Minimum BV_{CEO} of 80 V Guaranteed
- Safety and Regulatory Approvals:
- UL1577, 5,000 VAC_{RMS} for 1 Minute
- DIN EN/IEC60747−5−5, 850 V Peak Working Insulation Voltage

Typical Applications

- Digital Logic Inputs
- Microprocessor Inputs
- Power Supply Monitor
- Twisted Pair Line Receiver
- Telephone Line Receiver

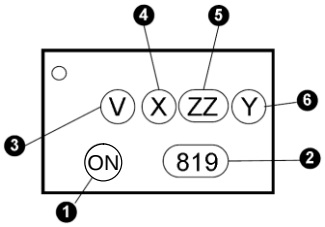
ON Semiconductor®

www.onsemi.com



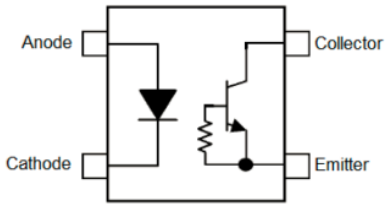
DIP 4 PINS

MARKING DIAGRAM



1. ON = Company Logo
2. 819 = Device Number
3. V = DIN EN/IEC60747−5−5 Option
4 X = One−Digit Year Code
5. ZZ = Digit Work Week
6. Y = Assembly Package Code

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

© Semiconductor Components Industries, LLC, 2017

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.

Table 1. SAFETY AND INSULATION RATINGS

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		55/115/21
Pollution Degree (DIN VDE 0110/1.89)		2
Comparative Tracking Index		175

Table 2.

Symbol	Parameter	Value	Unit
VPR	Input−to−Output Test Voltage, Method A, V_{IORM} x 1.6 = V_{PR}, Type and Sample Test with t_m = 10 s, Partial Discharge < 5 pC	1360	Vpeak
	Input−to−Output Test Voltage, Method B, V_{IORM} x 1.875 = V_{PR}, 100% Production Test with t_m = 1 s, Partial Discharge < 5 pC	1594	Vpeak
VIORM	Maximum Working Insulation Voltage	850	Vpeak
VIOTM	Highest Allowable Over−Voltage	8000	Vpeak
	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 (Note 1)	175	°C
IS,INPUT	Input Current (Note 1)	400	mA
PS,OUTPUT	Output Power (Note 1)	700	mW
RIO	Insulation Resistance at T_S, V_{IO} = 500 V (Note 1)	> 10^{11}	Ω

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

Table 3. ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
TOTAL PACKAGE			
T_{STG}	Storage Temperature	−55 to +125	°C
T_{OPR}	Operating Temperature	−55 to +110	°C
T_J	Junction Temperature	−55 to +125	°C
T_{SOL}	Lead Solder Temperature	260 for 10 seconds	°C
θ_{JC}	Junction−to−Case Thermal Resistance	210	°C/W
P_{TOT}	Total Device Power Dissipation	200	mW
EMITTER			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	6	V
P_D	Power Dissipation	70	mW
	Derate Above 100°C	1.7	mW/°C

Table 3. ABSOLUTE MAXIMUM RATINGS (continued)

Symbol	Parameter	Value	Unit
DETECTOR			
V_{CEO}	Collector−Emitter Voltage	80	V
V_{ECO}	Emitter−Collector Voltage	2	V
I_C	Continuous Collector Current	30	mA
P_C	Collector Power Dissipation	150	mW
	Derate Above 90°C	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

Table 4. INDIVIDUAL COMPONENT CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
EMITTER						
V_F	Forward Voltage	I_F = 1.5 mA		1.2	1.4	V
I_R	Reverse Current	V_R = 4.0 V			10	μA
C_t	Terminal Capacitance	V = 0, f = 1 kHz		30		pF
DETECTOR						
I_{CEO}	Collector Dark Current	V_{CE} = 40 V, I_F = 0			100	nA
BV_{CEO}	Collector−Emitter Breakdown Voltage	I_C = 0.1 mA, I_F = 0	80	150		V
BV_{ECO}	Emitter−Collector Breakdown Voltage	I_E = 0.1 mA, I_F = 0	2	7		V
DC TRANSFER CHARACTERISTICS						
CTR	Current Transfer Ratio (Note 2)	I_F = 1.5 mA, V_{CE} = 5 V	100		600	%
$V_{CE(SAT)}$	Saturation Voltage	I_F = 1.5 mA, I_C = 0.2 mA			0.3	V
$I_{C(OFF)}$	OFF−state collector current	V_F = 0.7 V, V_{CE} = 40 V			10	μA
AC TRANSFER CHARACTERISTICS						
t_R	Rise Time (Saturated)	I_F = 1.5 mA, V_{CC} = 5 V, R_L = 10 kΩ (Note 3)		12		μs
t_F	Fall Time (Saturated)			20		μs
t_{PHL}	Propagation Delay Time High−to−Low	I_F = 1.5 mA, V_{CC} = 5 V, R_L = 10 kΩ (Note 3)		9	30	μs
t_{PLH}	Propagation Delay Time Low−to−High			18	30	μs

2. Current Transfer Ratio (CTR) = I_C / I_F x 100%.
3. Refer to test circuit setup.

Table 5. ISOLATION CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{ISO}	Input−Output Isolation Voltage (Note 4)	f = 60 Hz, t = 1 minutes, $I_{I-O} \le 2$ μA	5000			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V_{DC}		1×10^{11}		Ω
C_{ISO}	Isolation Capacitance	V_{I-O} = 0, f = 1 MHz		0.6	1.0	pf

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

Typical Performance Curves

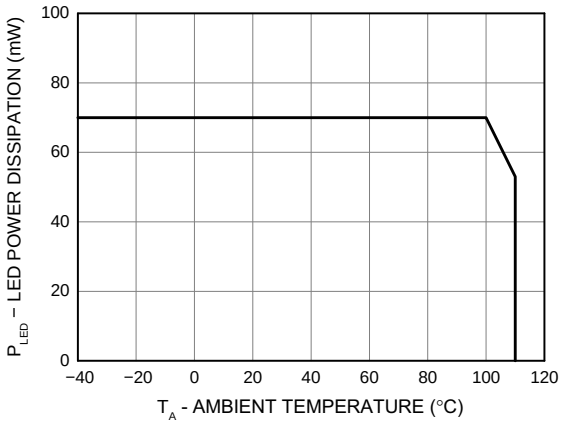


Figure 1. LED Power Dissipation vs. Ambient Temperature

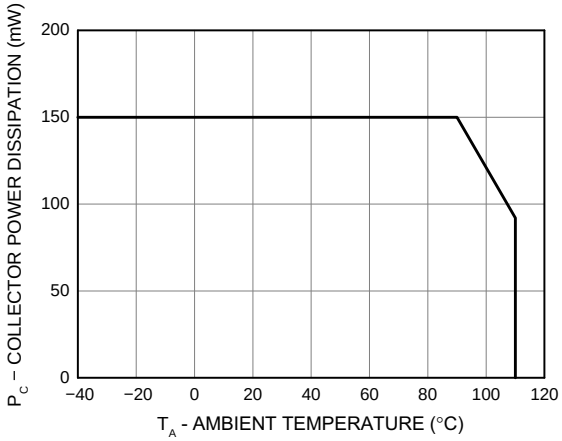


Figure 2. Collector Power Dissipation vs. Ambient Temperature

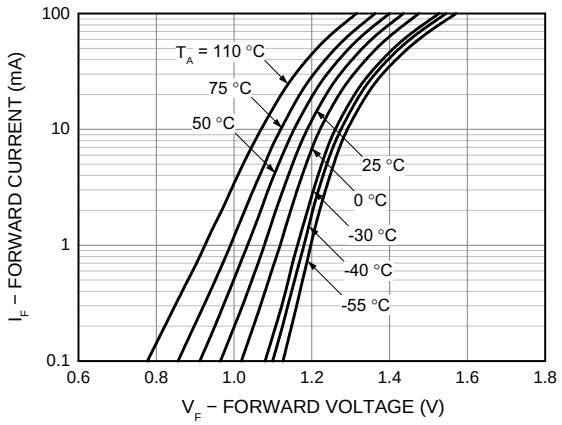


Figure 3. Forward Current vs. Forward Voltage

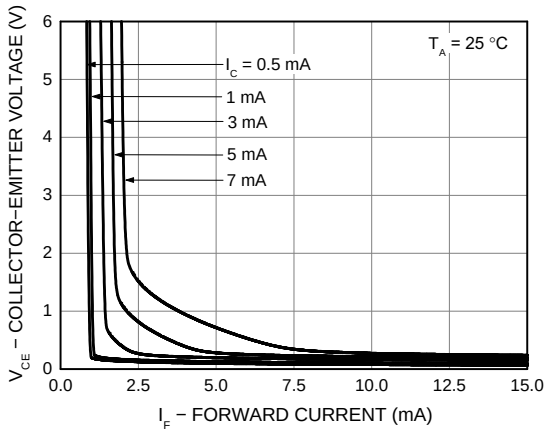


Figure 4. Collector-Emitter Voltage vs. Forward Current

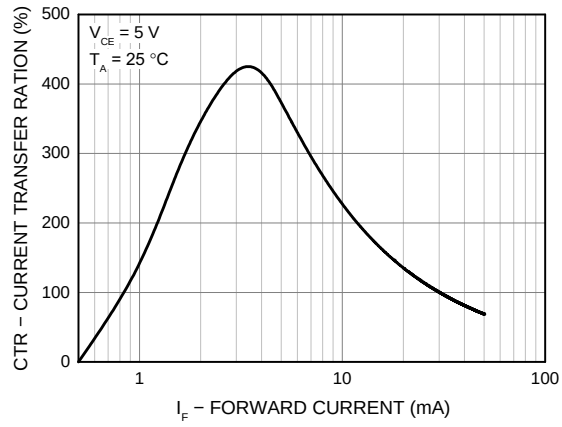


Figure 5. Current Transfer Ratio vs. Forward Current

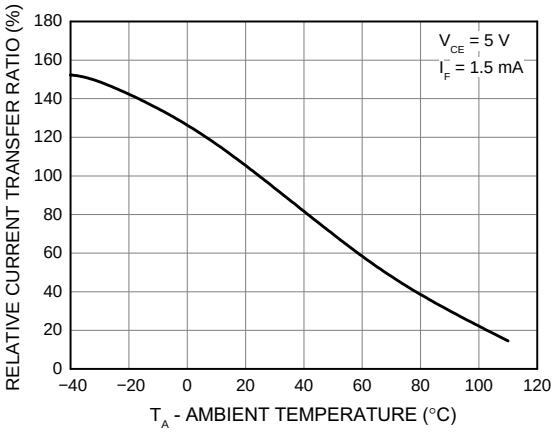


Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

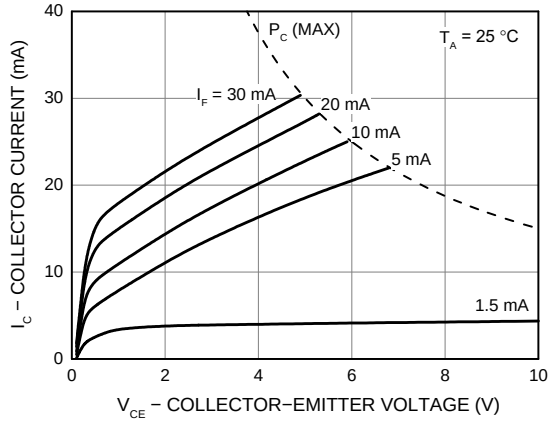


Figure 7. Collector Current vs. Collector-Emitter Voltage

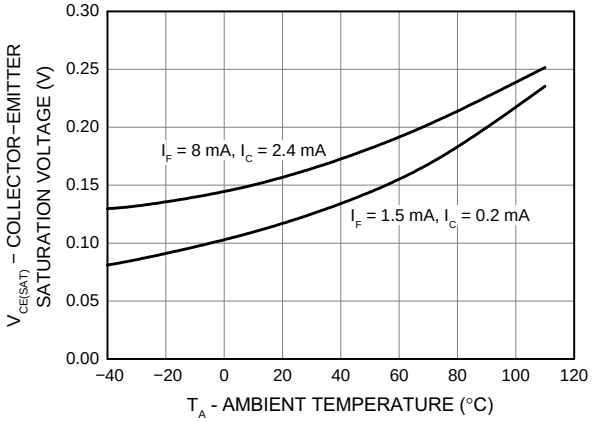


Figure 8. Collector-Emitter Saturation Voltage vs. Ambient Temperature

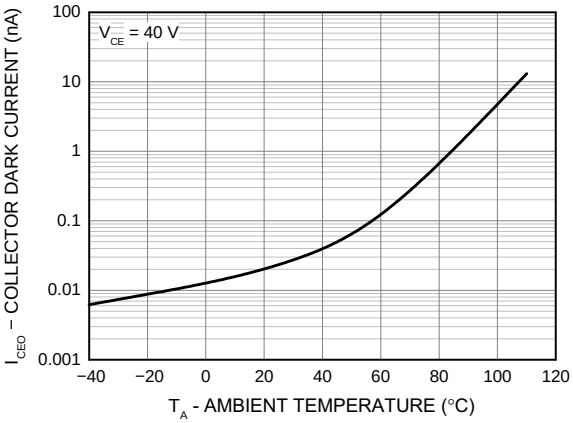


Figure 9. Collector Dark Current vs. Ambient Temperature

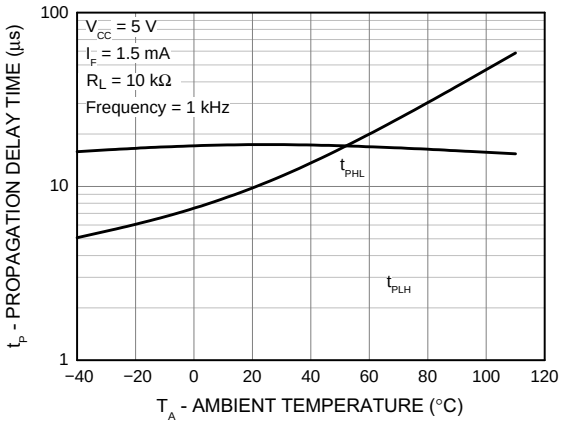


Figure 10. Propagation Delay vs. Ambient Temperature

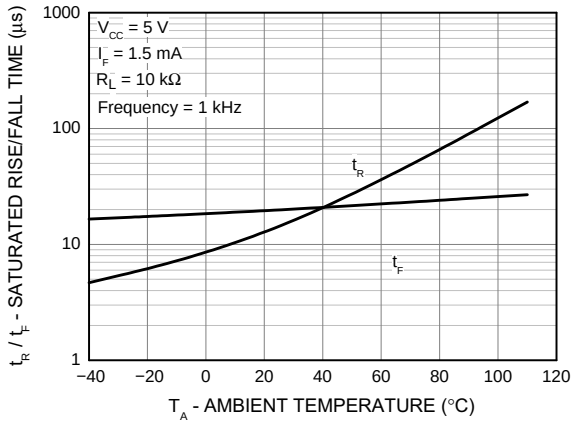


Figure 11. Saturated Rise / Fall Time vs. Ambient Temperature

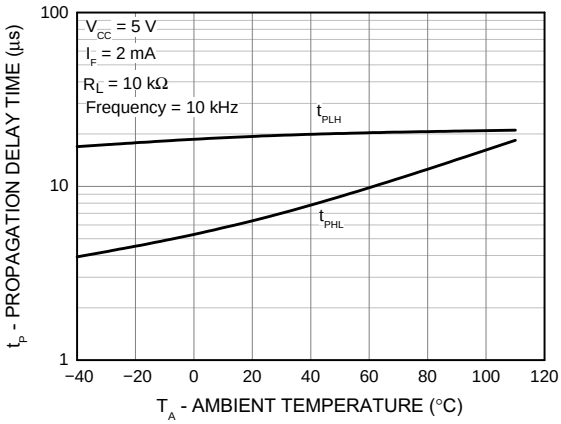


Figure 12. Propagation Delay vs. Ambient Temperature

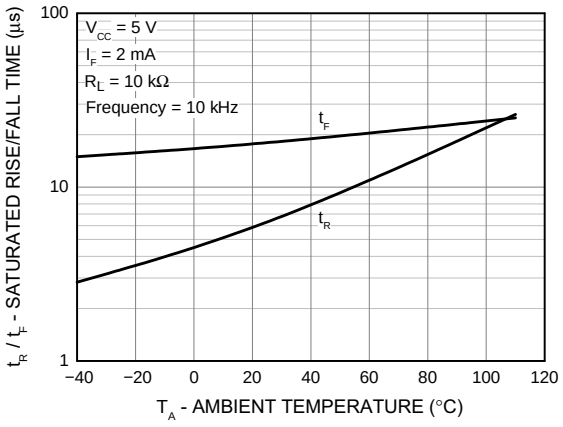


Figure 13. Collector Dark Current vs. Ambient Temperature

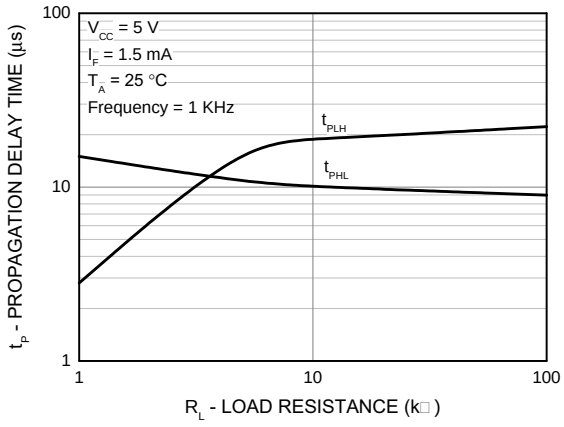


Figure 14. Propagation Delay vs. Ambient Temperature

Test Circuit

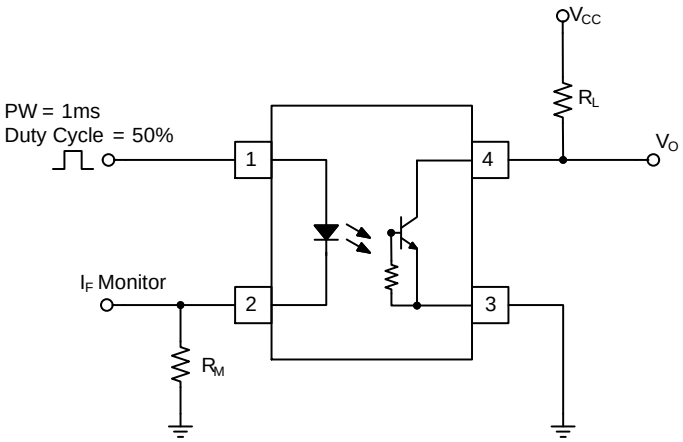


Figure 15. Test Circuit for Response Time

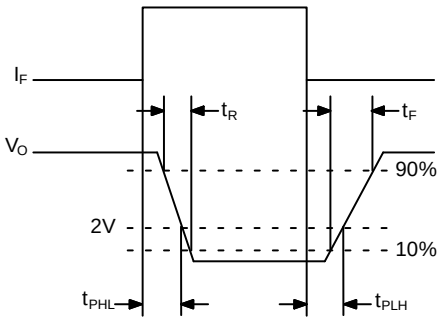


Figure 16. Timing Diagram

Reflow Profile

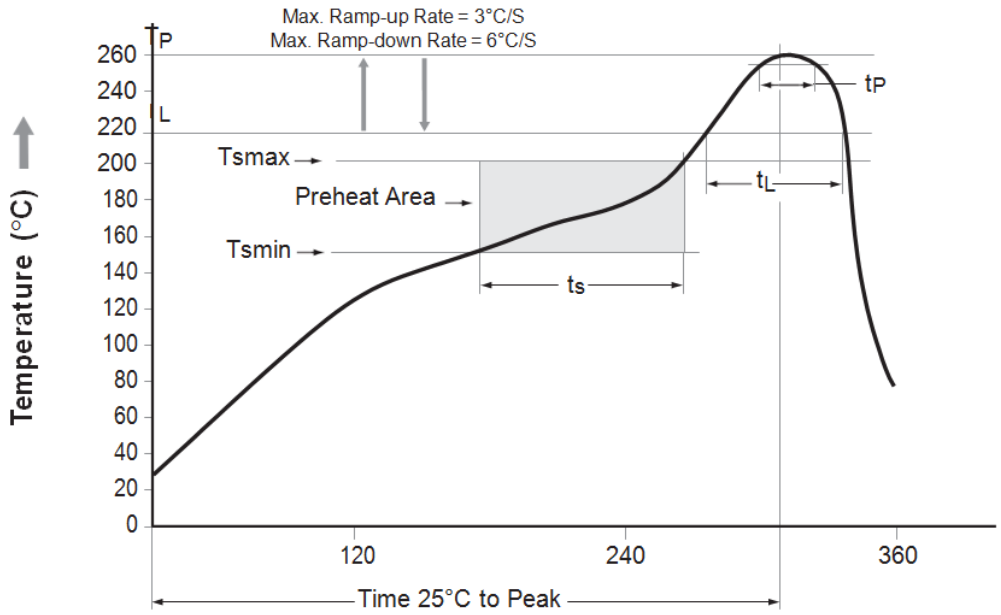


Figure 17. Reflow Profile

Table 6.

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.

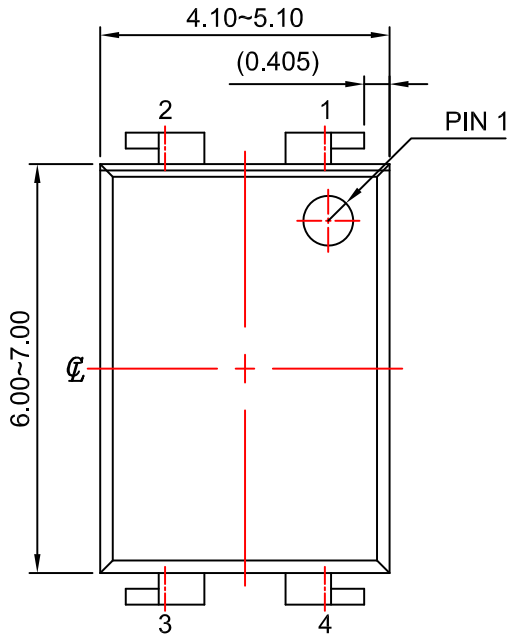
Table 7. ORDERING INFORMATION

Part Number	Package	Packing Method †
FOD819	DIP 4−Pin	Tube (100 units per tube)
FOD819S	SMT 4−Pin (Lead Bend)	Tube (100 units per tube)
FOD819SD	SMT 4−Pin (Lead Bend)	Tape and Reel (1,000 units per reel)
FOD819300	DIP 4−Pin, DIN EN/IEC60747−5−5 option	Tube (100 units per tube)
FOD8193S	SMT 4−Pin (Lead Bend), DIN EN/IEC60747−5−5 option	Tube (100 units per tube)
FOD8193SD	SMT 4−Pin (Lead Bend), DIN EN/IEC60747−5−5 option	Tape and Reel (1,000 units per reel)
FOD819300W	DIP 4−Pin, 0.4” Lead Spacing, DIN EN/IEC60747−5−5 option	Tube (100 units per tube)

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

PACKAGE DIMENSIONS

PDIP4 4.6 x 6.5, 2.54P
CASE 646CD
ISSUE O

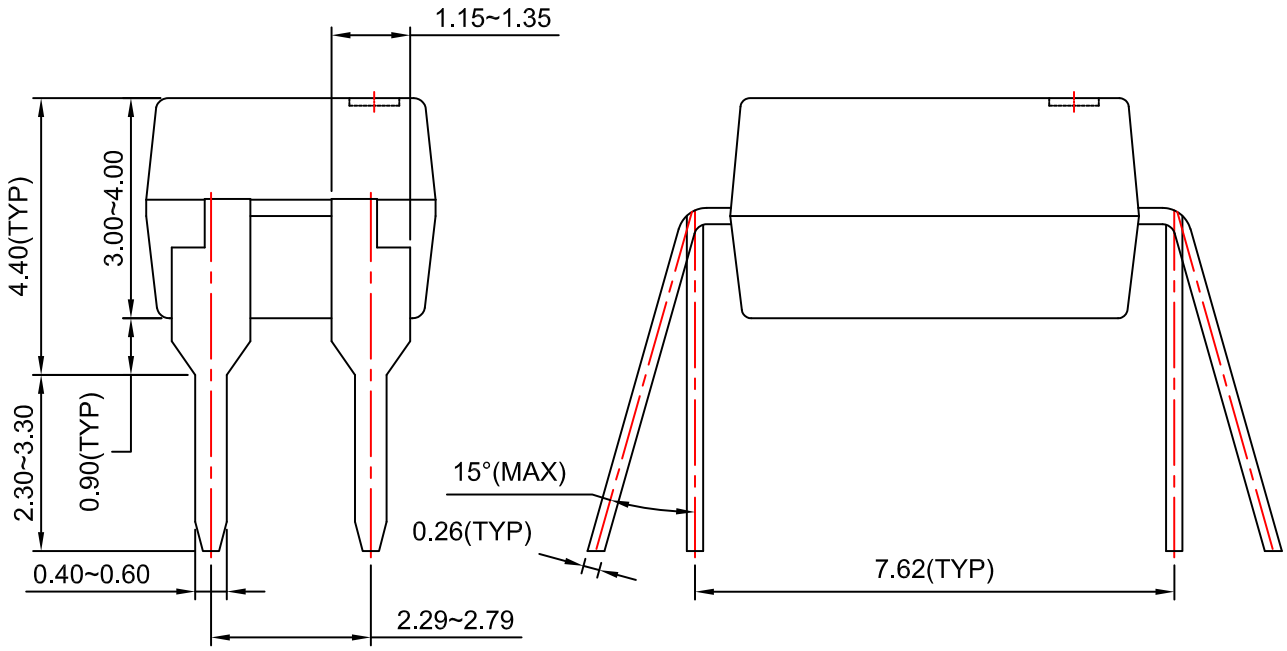


NOTES:

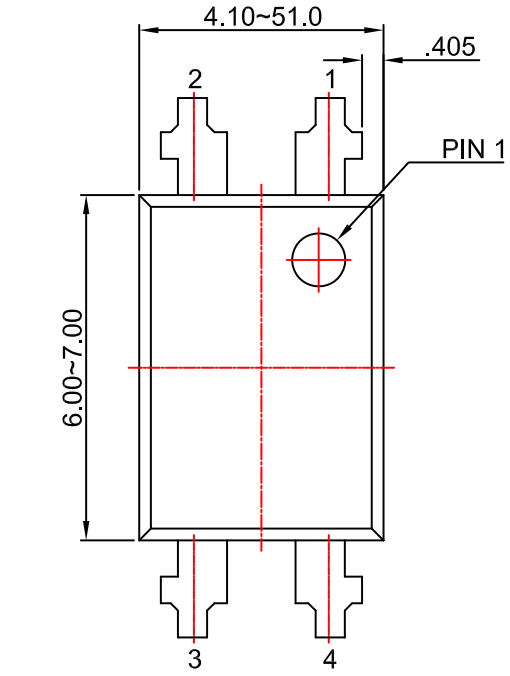
A) NO STANDARD APPLIES TO THIS PACKAGE.

B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION



PDIP4 4.6 x 6.5, 2.54P
CASE 646CA
ISSUE O

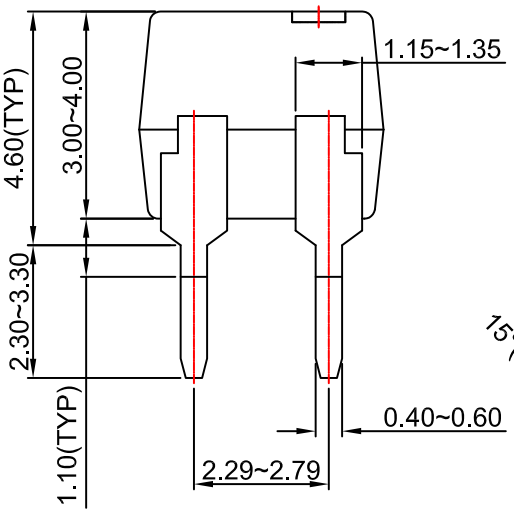


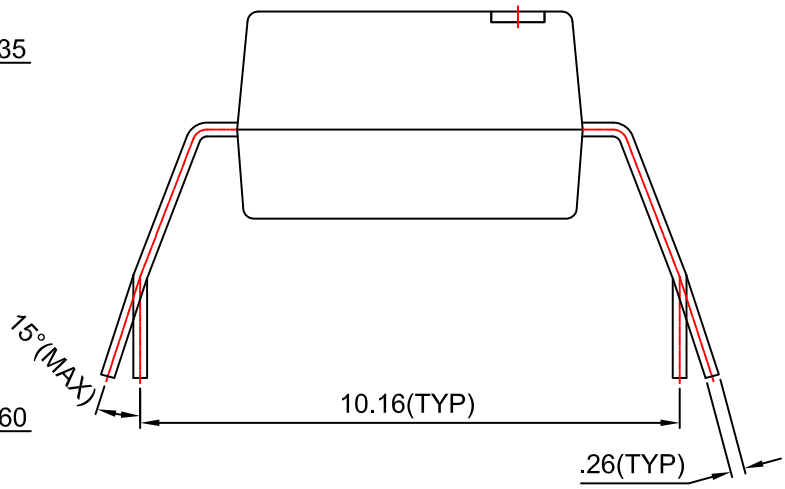
NOTES:

A) NO STANDARD APPLIES TO THIS PACKAGE.

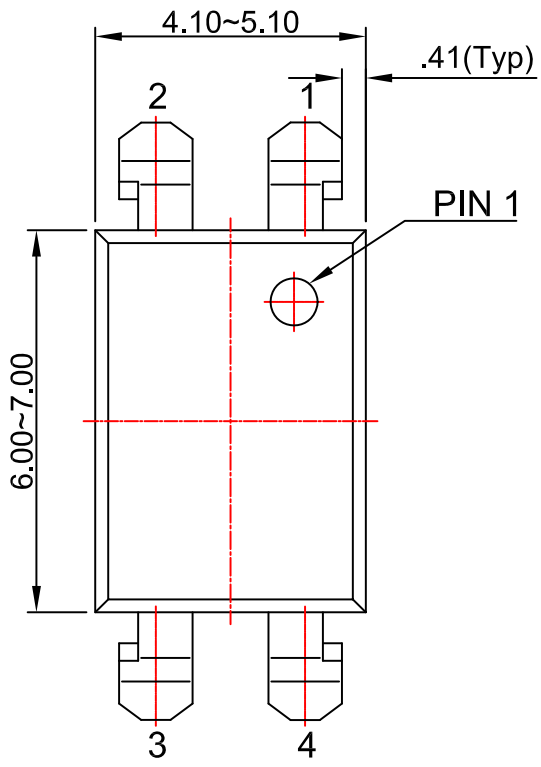
B) ALL DIMENSIONS ARE IN MILLIMETERS.

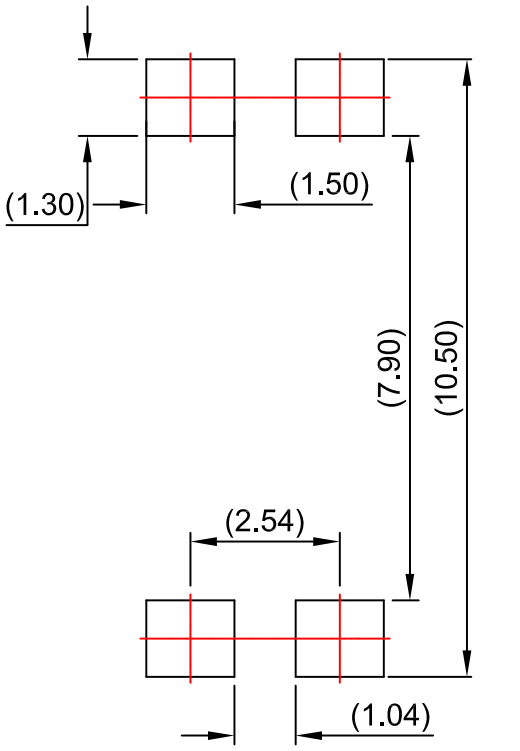
C) DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSION



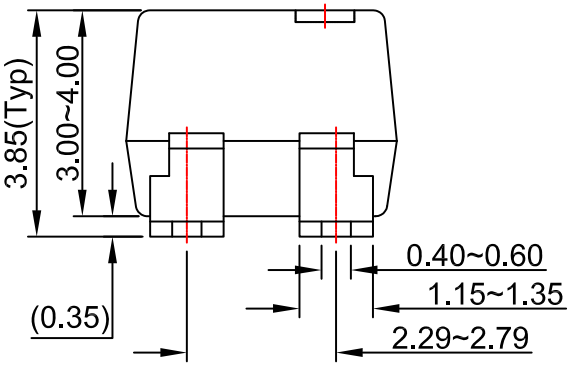


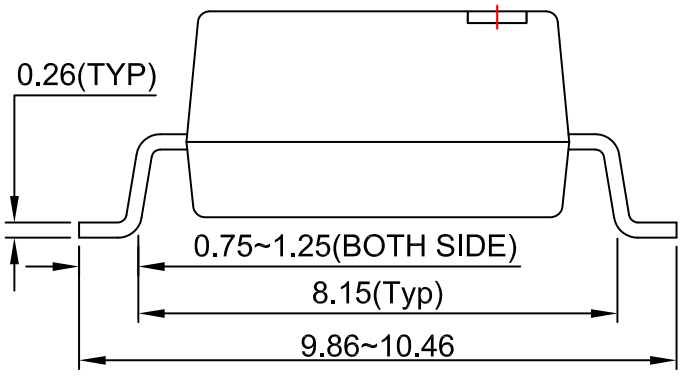
PDIP4 GW
CASE 709AH
ISSUE A





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

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative