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FOD819 Series

FOD819 4-Pin DIP High Speed Phototransistor Optocouplers

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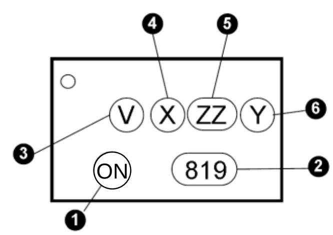
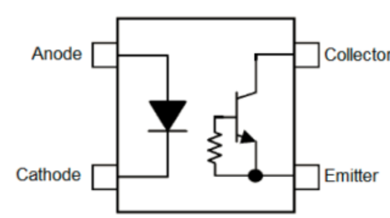
DIP 4 PINS

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.

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

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
V_{PR}	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	V_{peak}
	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	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 (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

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, $I_{I-O} \leq 2$ µA	5000			VAC_{RMS}
R_{ISO}	Isolation Resistance	V_{I-O} = 500 V_{DC}		1 x 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

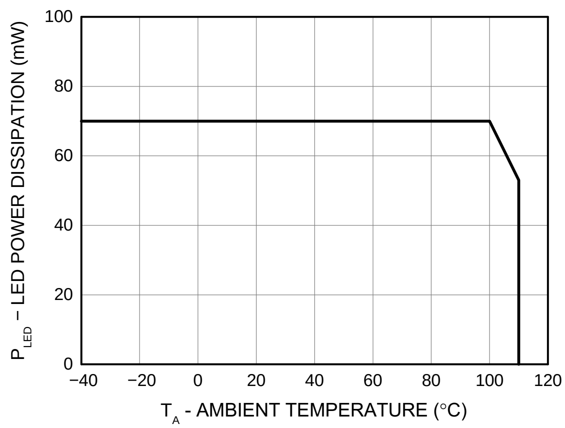


Figure 1. LED Power Dissipation vs. Ambient Temperature

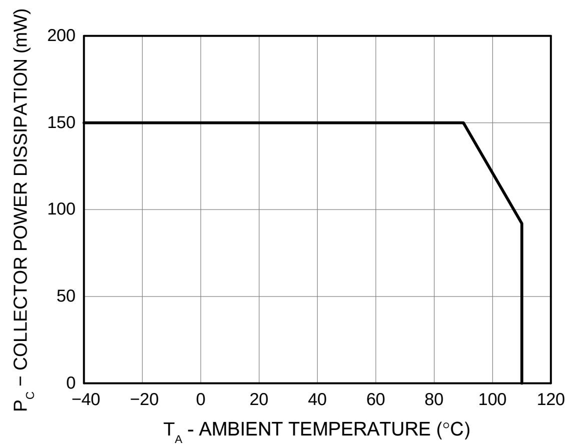


Figure 2. Collector Power Dissipation vs. Ambient Temperature

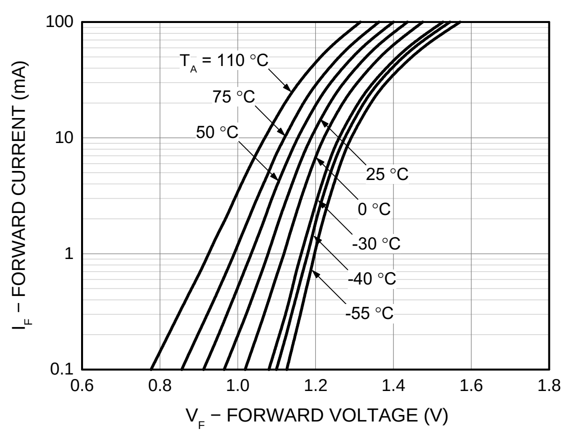


Figure 3. Forward Current vs. Forward Voltage

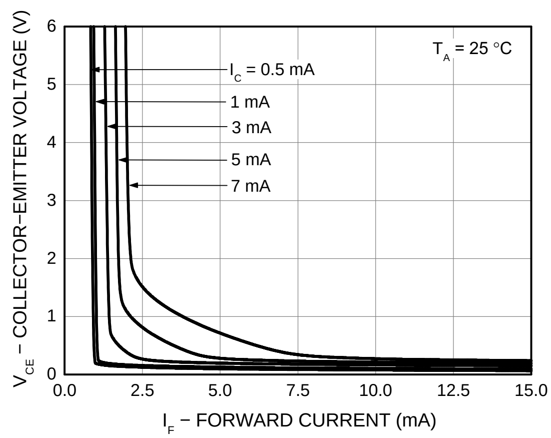


Figure 4. Collector-Emitter Voltage vs. Forward Current

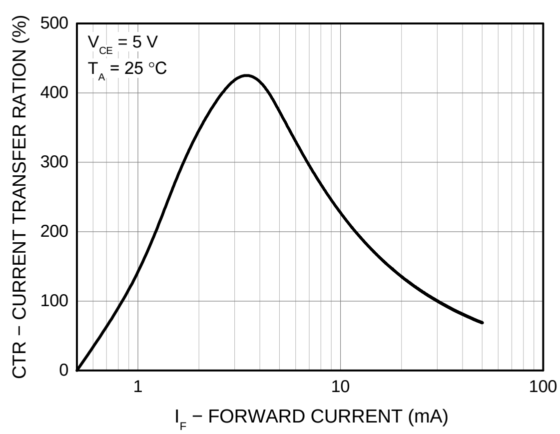


Figure 5. Current Transfer Ratio vs. Forward Current

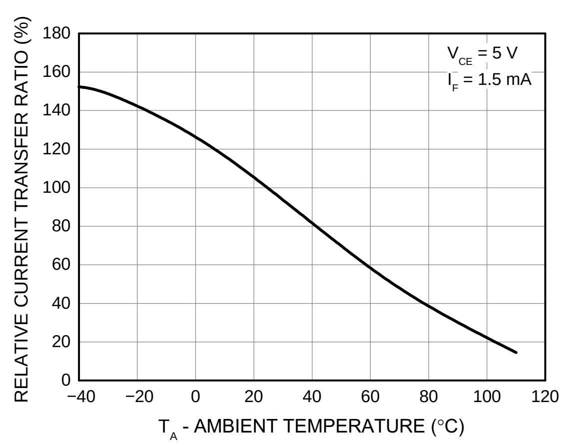


Figure 6. Relative Current Transfer Ratio vs. Ambient Temperature

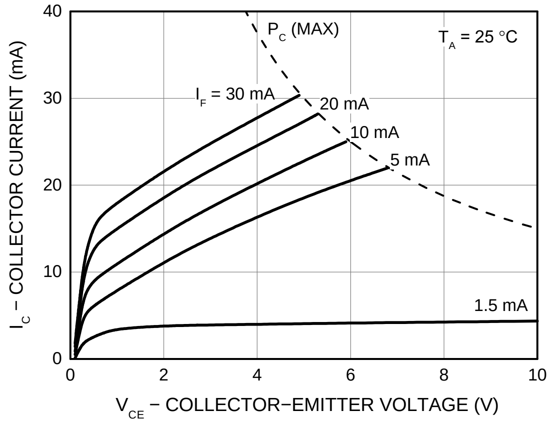


Figure 7. Collector Current vs. Collector-Emitter Voltage

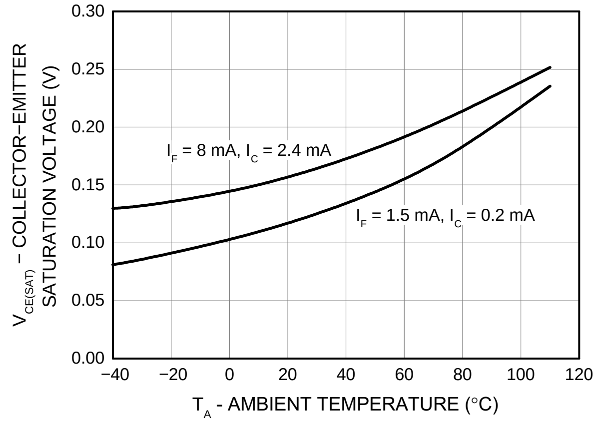


Figure 8. Collector-Emitter Saturation Voltage vs. Ambient Temperature

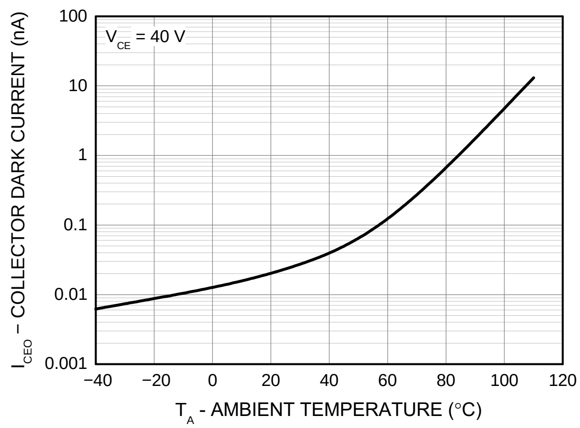


Figure 9. Collector Dark Current vs. Ambient Temperature

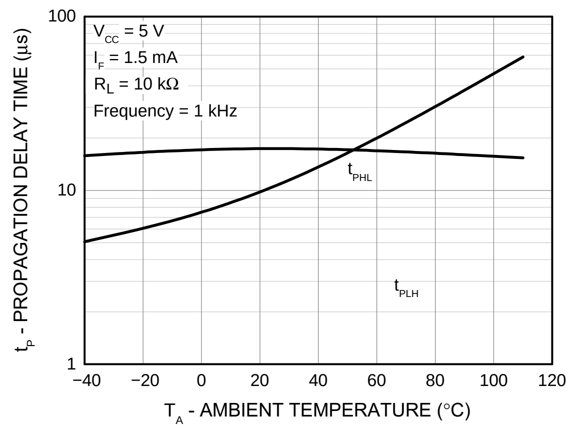


Figure 10. Propagation Delay vs. Ambient Temperature

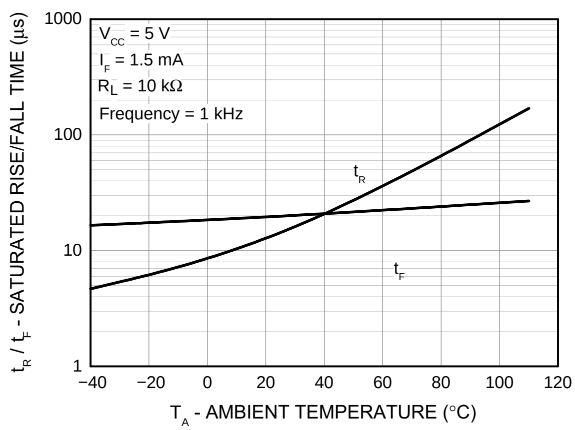


Figure 11. Saturated Rise / Fall Time vs. Ambient Temperature

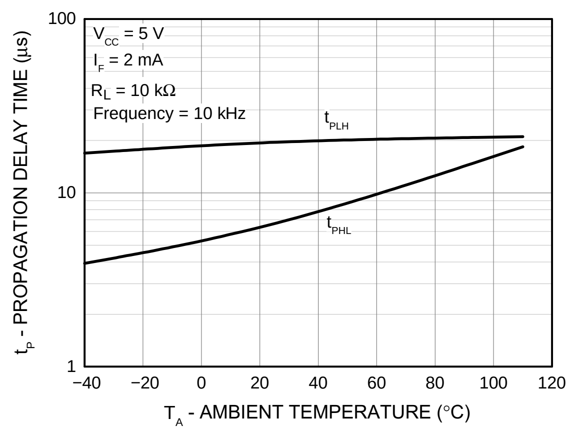


Figure 12. Propagation Delay vs. Ambient Temperature

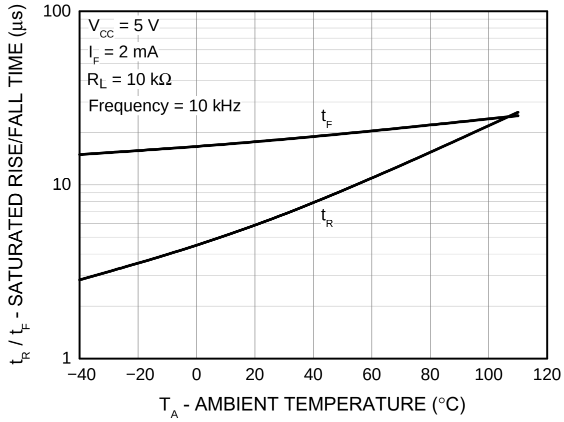


Figure 13. Collector Dark Current vs. Ambient Temperature

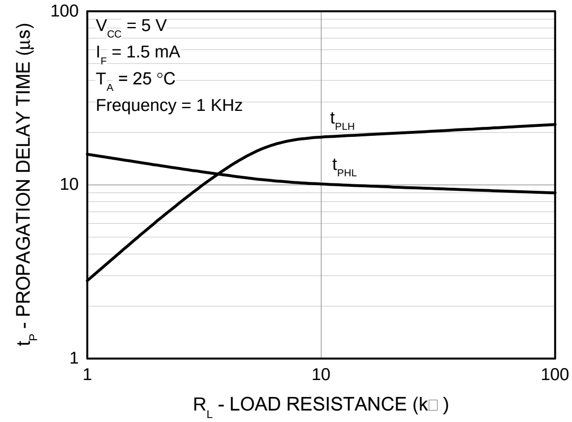


Figure 14. Propagation Delay vs. Ambient Temperature

Test Circuit

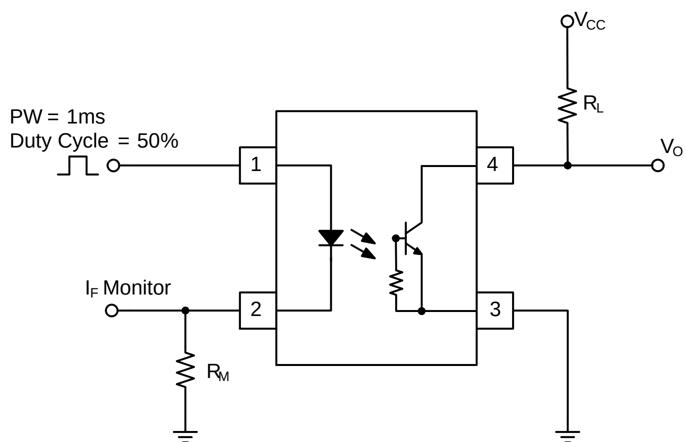


Figure 15. Test Circuit for Response Time

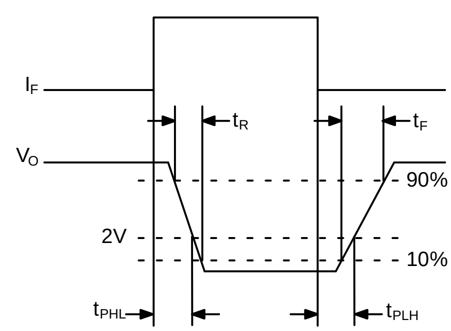


Figure 16. Timing Diagram

Reflow Profile

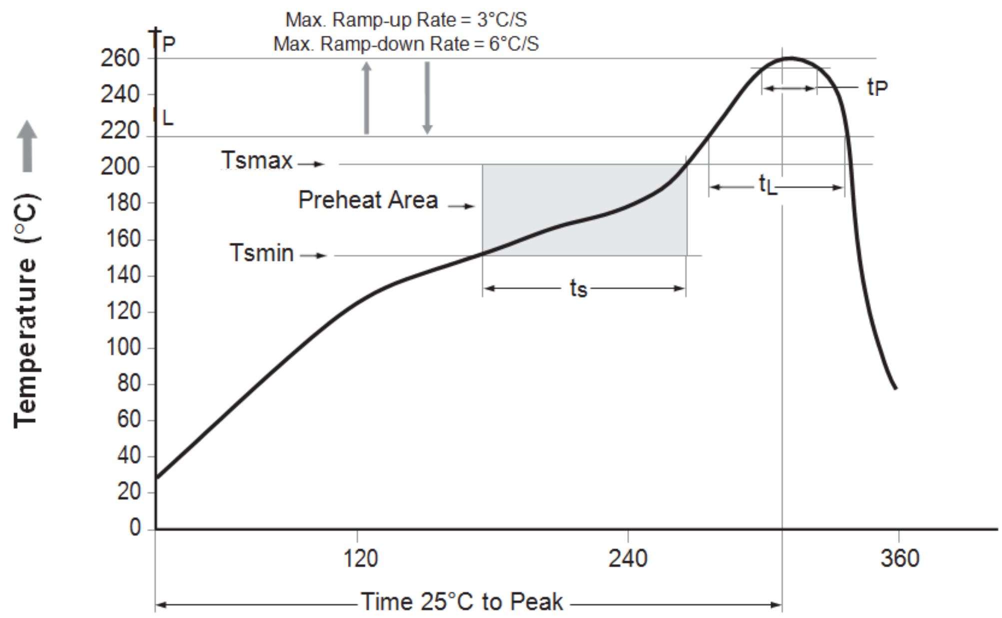


Figure 17. Reflow Profile

Table 6.

Profile Freature	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.

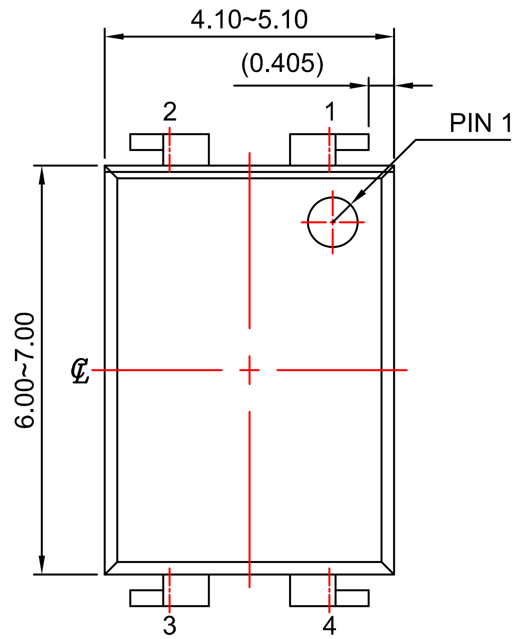
Table 7. ORDERING INFORMATION

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

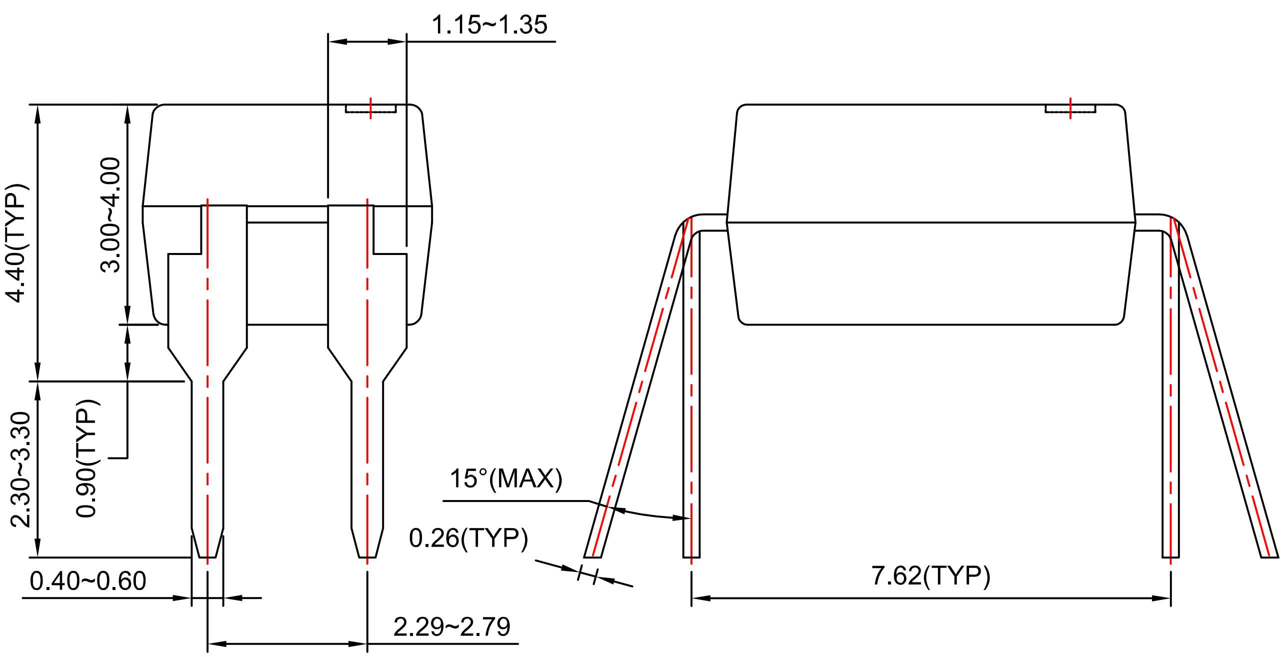


NOTES:

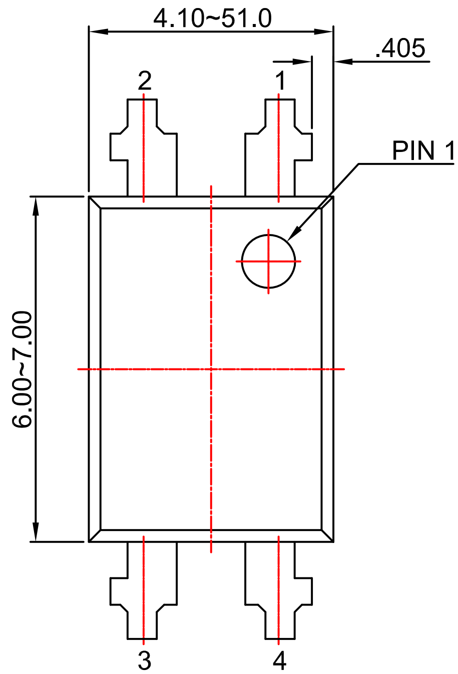
A) NO STANDARD APPLIES TO THIS PACKAGE.

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



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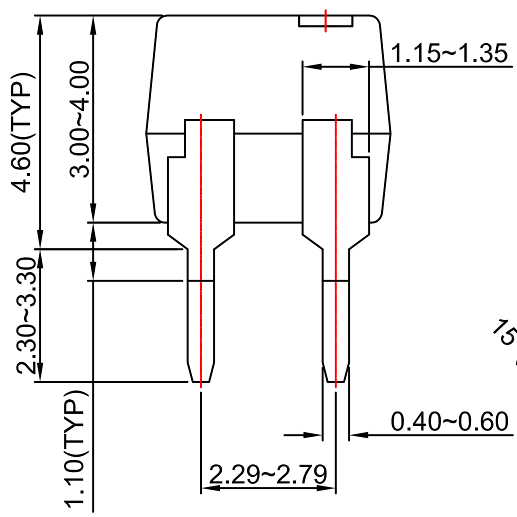
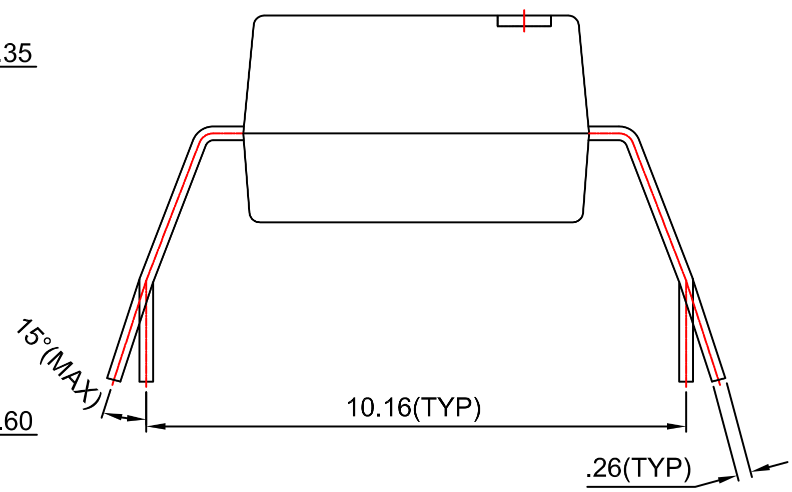
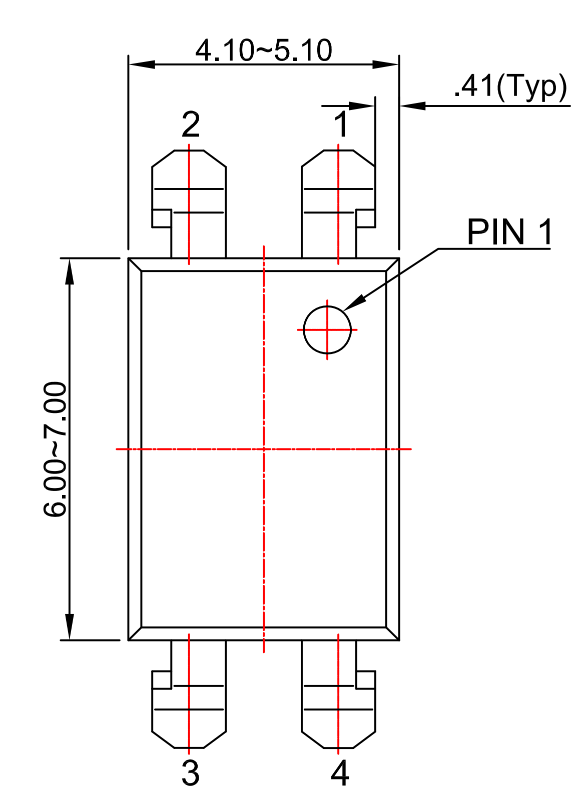
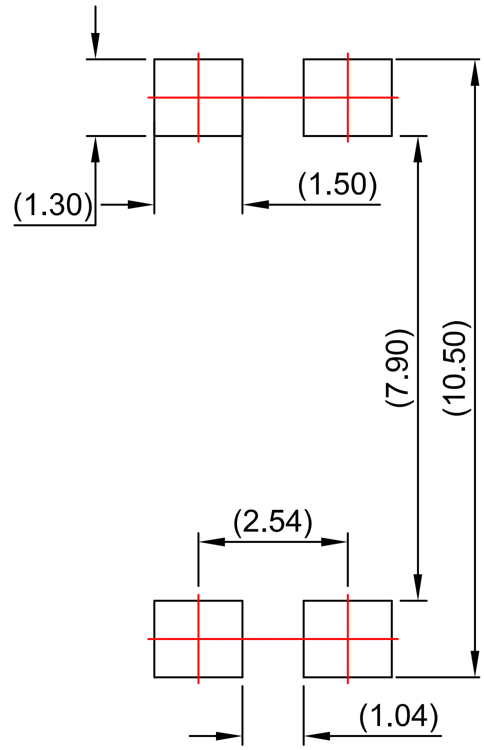


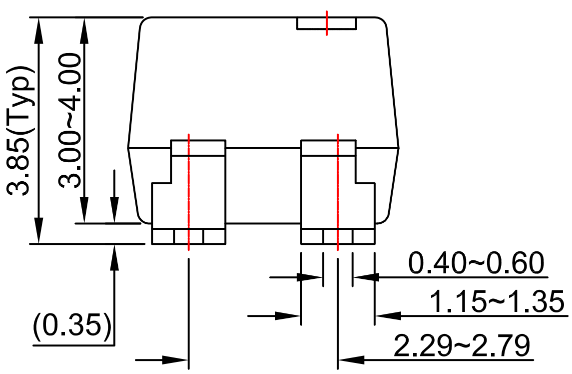


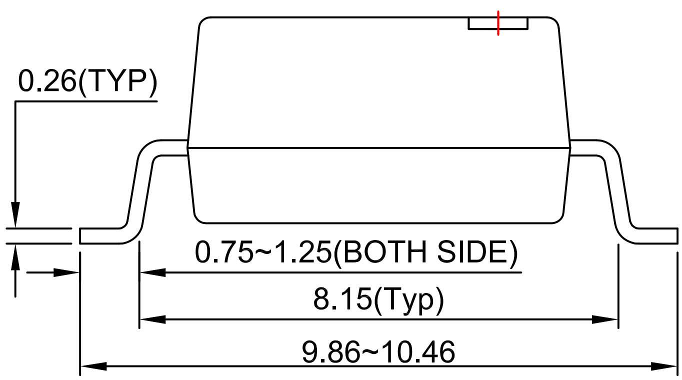
PDIP4 GW
CASE 709AH
ISSUE A





LAND PATTERN RECOMMENDATION





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