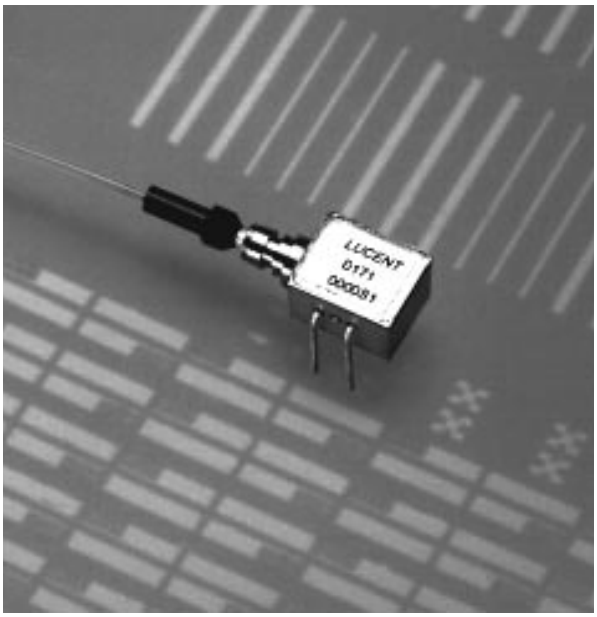
Advance Data Sheet
March 1999

microelectronics group

Lucent Technologies
Bell Labs Innovations

D171-Type *FastLight*™ PIN Photodetectors



The D171-Type PIN Photodetectors feature a rear-illuminated planar diode structure with a low-capacitance 4-mil active area for maximum responsivity and speed.

Features

- Low-profile, 4-lead mini-DIL package
  — Suitable for SONET applications
- High performance
  — High speed (<0.5 ns typical rise and fall time)
  — High responsivity (0.85 A/W typical)
  — Low dark current
- Planar structure for high reliability
- Wavelength : 1.1µm—1.6 µm
- 50 µm core multimode fiber
- Wide operating temperature range : –40 °C to +85 °C
- Wide bandwidth
- Qualification program : Bellcore TA-NWT-983

Applications

- Long-reach SONET OC-3/OC-12 systems and SDH STM-1/STM-4 systems
- Secure digital data systems

Benefits

- Compact size
- Easily board mounted

Description

The D171-Type Photodetector consists of a PIN coupled to a multimode fiber pigail. The device is available in a 4-pin mini-DIL configuration (see Figure 3 and/or Table 1) and is ideal for long-reach (SONET) and other high-speed digital applications.

The D171-Type PIN Photodetector is a rear-illuminated planar diode structure with a low-capacitance active area for maximum responsivity and speed.

This device incorporates the new Laser 2000 manufacturing process from the Optoelectronics Products unit of Lucent Technologies Microelectronics Group. Laser 2000 is a low-cost platform that targets high-volume manufacturing and tight product distributions on all optical subassemblies. This platform incorporates an advanced optical design that is produced on Opto's highly automated production lines. The Laser 2000 platform is qualified for central office and uncontrolled environments, and can be used for applications requiring high perfomance and low cost.

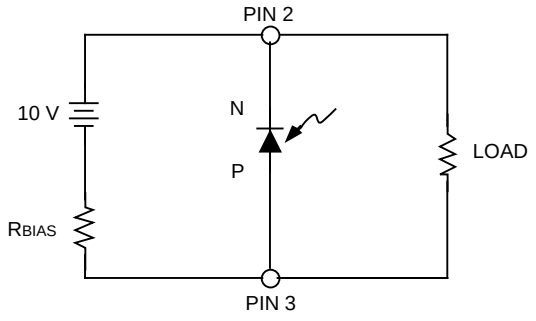
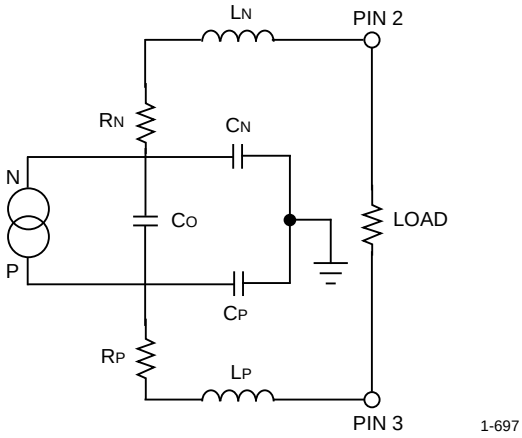


Figure 1. Typical Bias Connection



Notes:
This equivalent circuit is intended for modeling the package capacitance. Minimum capacitance is achieved by connecting the N-side to ground, applying a negative voltage to the P-side, and allowing the package to float (i.e., not connected to ground).

Typical values are as follows:
C_O = 0.3 pF to 0.5 pF.
L_N, L_P = 3.0 nH.
R_N, R_P = 5 Ω.
C_N = 0.4 pF.
C_P = 0.1 pF.

Figure 2. Equivalent ac Circuit for Digital Applications

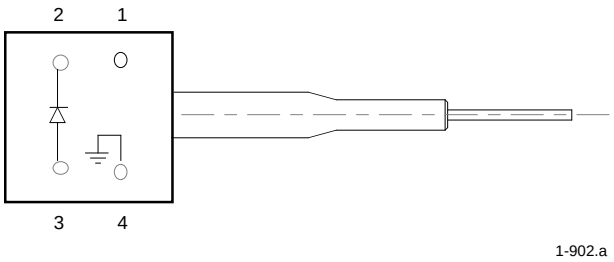


Figure 3. D171-Type PIN Photodetector Schematic (Top View)

Table 1. Pin Descriptions

Pin Number	Description
1	NC
2	Photodiode Cathode
3	Photodiode Anode
4	Case Ground

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Operating Temperature Range	T_A	–40	85	°C
Storage Temperature Range	T_{stg}	–40	90	°C
Forward Voltage	V_F	—	0	V
Reverse Voltage*	V_R	—	30	V
Photocurrent	—	—	4	mA
Humidity	—	—	95	%

* The recommended reverse bias voltage is 5 V to 15 V.

Handling Precautions

Electrostatic Discharge

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

Although protection circuitry is designed into the device, take proper precautions to avoid exposure to ESD.

Electrical Characteristics

T_C = 25 °C. Determined with a 50 Ω load.

Parameter	Symbol	Min	Typ	Max	Unit
Capacitance (f < 900 MHz)*	—	—	0.65	0.70	pF
Rise/Fall Time	t_R/t_F	—	<0.5	—	ns
Dark Current	I_D	—	1	5	nA
Reverse Voltage	V_R	2	5	30	V

* The minimum capacitance configuration occurs when the N-side of the PIN is grounded and a negative voltage is applied to the P-side, with the package floating, not grounded (value reference only; not tested in manufacture).

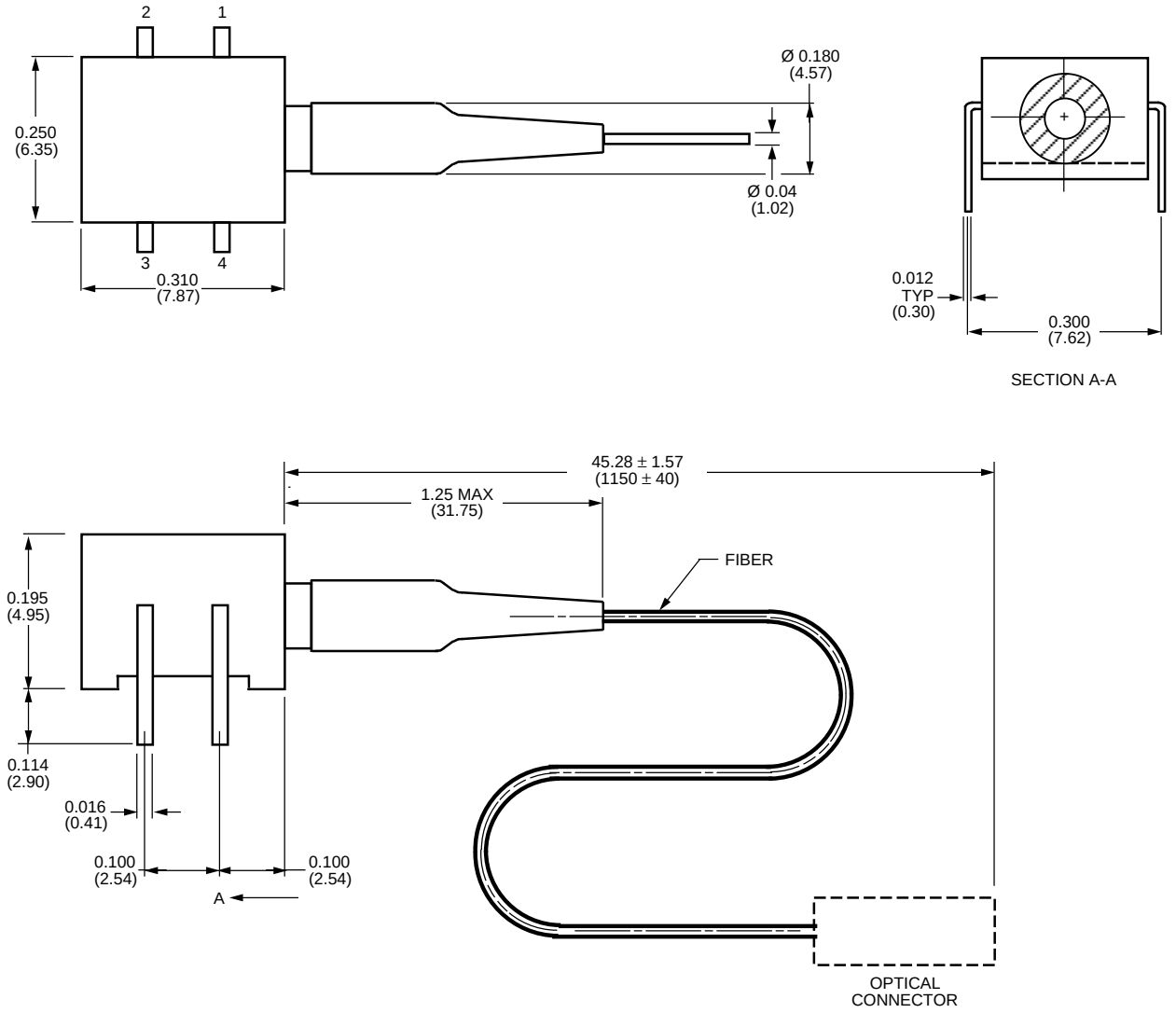
Optical Characteristics

T_C = 25 °C.

Parameter	Symbol	Min	Typ	Max	Unit
Responsivity	R	0.75	0.85	—	A/W
Wavelength Range	—	1.1	—	1.6	µm

Outline Diagram

Dimensions are in inches and (millimeters).



1-933

Qualification Information

The D171-Type PIN Photodetector has completed the following qualification tests and meets the intent of Bellcore TR-NWT-000468 for interoffice environments and TA-NWT-000983 for outside plant environments.

Table 2. D171-Type PIN Photodetector Qualification Test Plan

Test	Conditions	Sample Size	Reference
Mechanical Shock	500 G	11	MIL-STD-883 Method 2002
Vibration	20 g, 20 Hz—2000 Hz	11	MIL-STD-883 Method 2007
Solderability	—	11	MIL-STD-883 Method 2007
Thermal Shock	Delta T = 100 °C	11	MIL-STD-883 Method 2003
Fiber Pull	1 kg; 3 times	11	Bellcore 983
Accelerated (biased) Aging	85 °C, 5000 hrs.	25	Bellcore 983 Section 5.18
High-temperature Storage	85 °C, 2000 hrs.	11	Bellcore 983
Temperature Cycling	500 cycles	11	Bellcore 983 Section 5.20
Cyclic Moisture Resistance	10 cycles	11	Bellcore 983 Section 5.23
Damp Heat	40 °C, 95% RH, 1344 hrs.	11	MIL-STD-202 Method 103
Internal Moisture	<5000 ppm water vapor	11	MIL-STD-883 Method 1018
Flammability	—	—	TR357 Sec. 4.4.2.5
ESD Threshold	—	6	Bellcore 983 Section 5.22

Ordering Information

Device Code	Description	Comcode
D171C004BAA	PIN 4-Lead Package, 50 µm, MM Fiber, SC Connector	108156654
D171C004BAF	PIN 4-Lead Package, 50 µm, MM Fiber, FC Connector	108156662
D171C004CAN	PIN 4-Lead Package, SM Fiber, No Connector	108271699

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