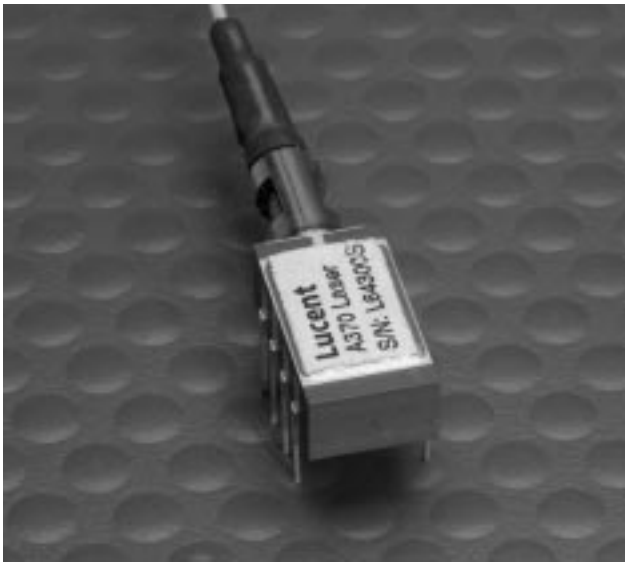
Data Sheet
March 2001

microelectronics group

Lucent Technologies
Bell Labs Innovations

A370-Type Analog Uncooled Laser Module



The low-profile A370-Type Analog Laser Module is ideally suited for CATV applications, particularly in systems where long spans and superior reliability are the critical considerations.

Features

- Eight-pin package suitable for CATV applications
- Frequency range up to 1.0 GHz
- MQW F-P 1.3 µm laser with single-mode fiber pigtail
- Wide operating temperature range: –40 °C to +85 °C
- No TEC required
- High output power: typically 1.0 mW power coupled into single-mode fiber
- Hermetically sealed active components
- Internal back-facet monitor
- Qualification program: *Telcordia Technologies** TA-983

Applications

- Narrowband video
- Downstream telephony and data
- Return path systems
- Analog and digital modulation systems
- Telecommunications

Benefits

- Easily board mounted
- Requires no lead bending
- No additional heat sinks required
- Pin compatible with industry-standard, 14-pin laser module
- High output power allows for longer system spans, more fiber splits, and greater tolerance of fiber and connector quality

* *Telcordia Technologies* is a trademark of Telcordia Technologies, Inc.

Description

The A370-Type Uncooled Laser Module consists of a laser diode coupled to a single-mode fiber pigtail. The device is available in a standard, 8-pin configuration (see Figure 1 and/or Table 1) and is ideal for CATV applications.

The module includes a multiquantum-well Fabry-Perot (MQW F-P) laser and an InGaAs PIN photodiode back-facet monitor in an epoxy-free, hermetically sealed package.

The device characteristics listed in this document are met at 1.0 mW output power. Higher- or lower-power operation is possible. Under conditions of a fixed photodiode current, the change in optical output is typically ±0.5 dB over an operating temperature range of –40 °C to +85 °C.

This device incorporates the new Laser 2000 manufacturing process from the Optoelectronics 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 the Optoelectronic unit's highly automated production lines. The Laser 2000 platform is qualified for the central office and uncontrolled environments, and can be used for applications requiring high performance and low cost.

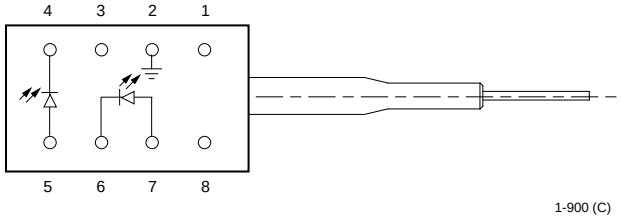


Figure 1. A370-Type Analog Uncooled Laser Module Schematic, Top View

Table 1. Pin Descriptions

Pin Number	Connection
1	NC
2	Case ground
3	NC
4	Photodiode cathode
5	Photodiode anode
6	Laser diode cathode
7	Laser diode anode
8	NC

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 operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Maximum Peak Laser Drive Current or Maximum Fiber Power*	I_{OP} P_{MAX}	— —	150 10	mA mW
Peak Reverse Laser Voltage: Laser Monitor	 V_{RL} V_{RD}	 — —	 2 20	 V V
Monitor Forward Current	I_{FD}	—	2	mA
Operating Case Temperature Range	T_C	–40	85	°C
Storage Case Temperature Range	T_{stg}	–40	85	°C
Lead Soldering Temperature/Time	—	—	260/10	°C/s
Relative Humidity (noncondensing)	RH	—	85	%

* Rating varies with temperature.

Handling Precautions

Caution: This device is susceptible to damage as a result of electrostatic discharge (ESD). 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.

Electro/Optical Characteristics

Table 2. Electro/Optical Characteristics (over operating temperature range unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Operating Temperature Range	T	—	–40	—	85	°C
Optical Output Power*	P_F	CW, nominal	—	1	—	mW
Threshold Current	I_{TH}	T = 25 °C T = full range	4.5 1	9 —	15 45	mA mA
Drive Current Above Threshold	I_{MOD}	CW, P_F = 1.0 mW, T = 25 °C CW, I_{MON} = constant, T = full range	20 15	30 —	40 70	mA mA
Slope Efficiency	SE	CW, P_F = 1.0 mW, T = 25 °C	25	—	50	µW/mA
Center Wavelength	λ_C	P_F = 1.0 mW, CW	1270	—	1350	nm
RMS Spectral Width	$\Delta\lambda$	P_F = 1.0 mW	—	2	3	nm
Tracking Error	TE	I_{MON} = constant, CW	—	0.5	±1	dB
Forward Voltage	V_F	CW	—	1.1	1.6	V
Input Impedance	R	—	3	—	8	Ω
Monitor Current	I_{MON}	V_R† = 5 V	400	—	1200	µA
Monitor Dark Current	I_D	V_R† = 5 V	—	10	200	nA
Wavelength Temperature Coefficient	—	—	—	0.4	0.5	nm/°C

* See Table 5 for more information.
† V_R = reverse voltage.

Electro/Optical Characteristics (continued)

Analog Operation

The A370 Series Laser Module has the capability of being used in a wide variety of analog operations. These may include several channels of pure video signals, or a mix of video signals with digital data channels riding on analog carriers. It is difficult to prepare a single battery of testing conditions that will satisfy all applications. The following table contains a set of testing conditions that Lucent believes will give a broad indication of the performance of the A370 Series Laser Module. Please contact your local Field Application Engineer if different testing conditions and parametric limits are required.

The distortion characteristics are measured using a two-tone test. The frequencies are 13 MHz and 19 MHz. The second-order distortion components are measured at f1 + f2 = 32 MHz and f1 – f2 = 6 MHz. All third-order distortion components are measured in the frequency range of 5 MHz—200 MHz, and they meet the required level. All measurements are made with SC-SPC connectors on the laser module pigtails.

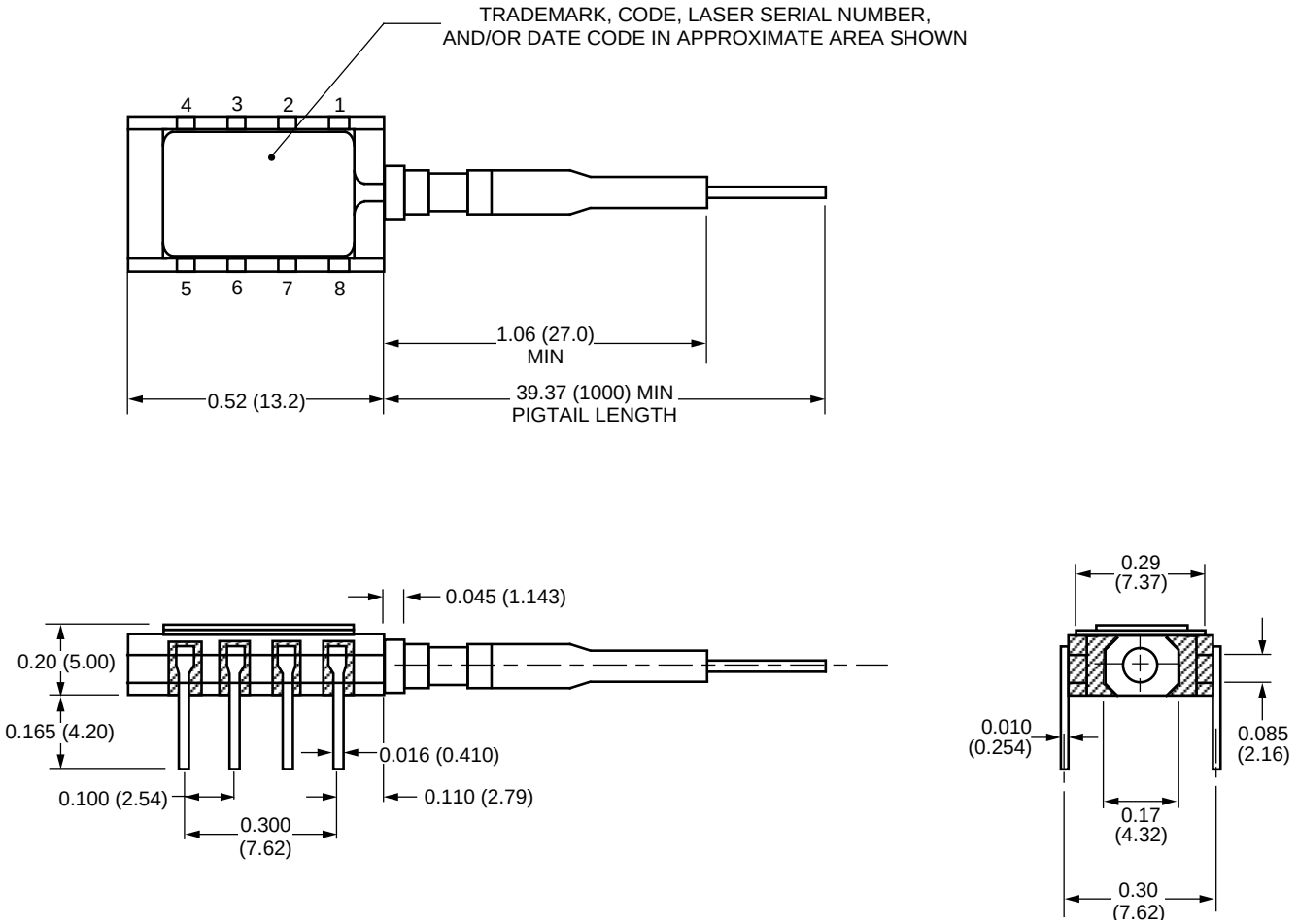
Table 3. Analog Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Power*	P_O	CW, T = –40 °C to +85 °C	—	1.0	—	mW
Relative Intensity Noise	RIN	CW, Freq. = 5 MHz to 300 MHz; no fiber loss, T = –40 °C to +85 °C	—	–140	–130	dB/Hz
Modulation Bandwidth	BW	–3 dB, T = –40 °C to +85 °C	1.0	—	—	GHz
Second-order Distortions	—	T = 25 °C, OMI = 0.2; Two-tone test: f1 = 13 MHz, f2 = 19 MHz; 20 km of fiber, (7 dB loss) plus connector loss, f1 ± f2	—	–48 –50†	–40 –45†	dBc dBc
Third-order Distortions	—	T = 25 °C, OMI = 0.2; Two-tone test: f1 = 13 MHz, f2 = 19 MHz; 20 km of fiber (7 dB loss), plus connector loss, all peaks from 5 MHz—50 MHz meet this level	—	–60 –60†	–50 –50†	dBc dBc
RF Bandpass Flatness	B_PF	Peak to valley: 5 MHz to 200 MHz	—	—	1.0	dB
Spurious Noise	N_{SP}	T = 25 °C, OMI = 0.2; ref. to one-tone: 5 MHz to 50 MHz, 20 km of fiber, (7 dB loss) plus connector loss	—	–58 –58†	–54 –54†	dBc dBc
Spurious Noise (carrier off)	N'_{SP}	T = 25 °C	—	–45 –45†	–37 –40†	dBc dBc

* See Table 5 for more information.
† Premium performance.

Outline Diagram

Dimensions are in inches and (millimeters).



Qualification Information

The A370-Type Laser Module has passed the following qualification tests and meets the intent of *Telcordia Technologies* TR-NWT-000468 for interoffice environments and TA-TSY-000983 for outside plant environments.

Table 4. A371-Type Laser Module Qualification Test Plan

Qualification Test	Conditions	Sample Size	Reference
Mechanical Shock	500 G	11	MIL-STD-883 Method 2002
Vibration	20 g, 20 Hz—2,000 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	*Telcordia Technologies* 983
Accelerated (Biased) Aging	85 °C, 5,000 hrs.	25	*Telcordia Technologies* 983 Section 5.18
High-temperature Storage	85 °C, 2,000 hrs.	11	*Telcordia Technologies* 983
Temperature Cycling	500 cycles	11	*Telcordia Technologies* 983 Section 5.20
Cyclic Moisture Resistance	10 cycles	11	*Telcordia Technologies* 983 Section 5.23
Damp Heat	40 °C, 95% RH, 1,344 hrs.	11	MIL-STD-202 Method 103
Internal Moisture	<5,000 ppm water vapor	11	MIL-STD-883 Method 1018
Flammability	—	—	TR357 Sec. 4.4.2.5
ESD Threshold	—	6	*Telcordia Technologies* 983 Section 5.22

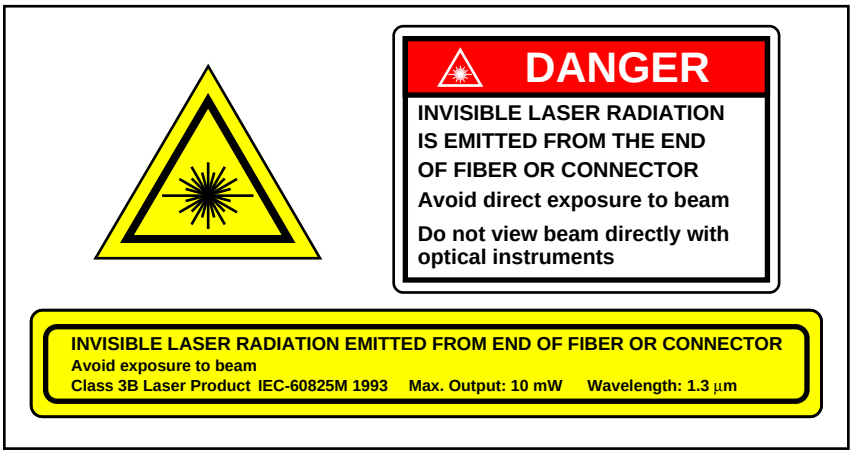
Laser Safety Information

Class IIIb Laser Product

FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are Class 3B laser products per *IEC** 60825-1:1993. The device has been classified with the FDA under accession number 8720010.

This product complies with 21 CFR 1040.10 and 1040.11.
8.3 µm single-mode pigtail or connector
Wavelength = 1.3 µm
Maximum power = 10 mW
Because of size constraints, laser safety labeling is not affixed to the module but attached to the outside of the shipping carton.
Product is not shipped with power supply.

Caution: Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.



* *IEC* is a registered trademark of The International Electrotechnical Commission.

Ordering Information

Table 5. Ordering Information

Code	Comcode	Pfiber	Connector	Performance Option
A370-10A	108009150	1.0 mW	SC-PC	Standard
A370-10F	108013954	1.0 mW	FC-PC	Standard
A370-10B	108024183	1.0 mW	SC-APC	Standard
A370-10G	108061839	1.0 mW	FC-APC	Standard
A370-10N	108013962	1.0 mW	none	Standard
A370-11A	108225384	1.0 mW	SC-PC	Premium
A370-11F	108225392	1.0 mW	FC-PC	Premium

For additional information, contact your Microelectronics Group Account Manager or the following:

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