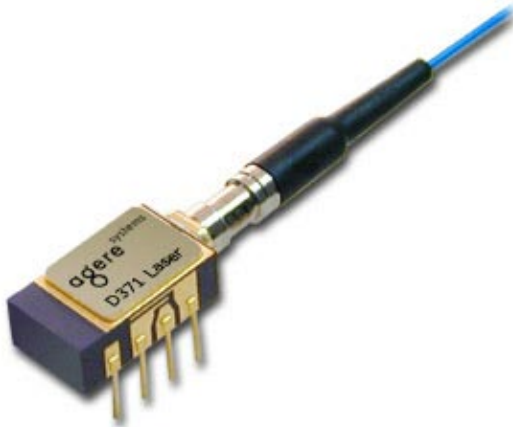


## D371-Type Digital Uncooled DFB Laser Module



The low-profile D371-Type Laser Module is ideally suited for short- and long-haul SONET and other high-speed digital applications.

### Features

- Eight-pin package suitable for SONET applications
- Narrow linewidth, distributed-feedback, multi-quantum-well (DFB-MQW) 1.3  $\mu\text{m}$  laser with single-mode fiber pigtail
- Wide operating temperature range:  
–40 °C to +85 °C
- No TEC required
- High output power: typical 2.0 mW peak power coupled into single-mode fiber
- Hermetically sealed active components
- Internal back-facet monitor
- Qualification program: *Telcordia Technologies*\* TA-983

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

### Applications

- Long-reach SONET OC-3/OC-12 systems
- Telecommunications
- Secure digital data systems

### Benefits

- Easily board mounted
- Requires no lead bending
- No additional heat sinks required
- Pin compatible with industry-standard, 14-pin laser module
- Highly efficient DFB-MQW laser structure allows for lower threshold and drive currents, and reduced power consumption

### Description

The D371-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 long-reach (SONET) and other high-speed digital applications.

The laser diode is a narrow linewidth (<1 nm) DFB-MQW single-mode laser and an InGaAs PIN photodiode back-facet monitor in an epoxy-free, hermetically sealed package.

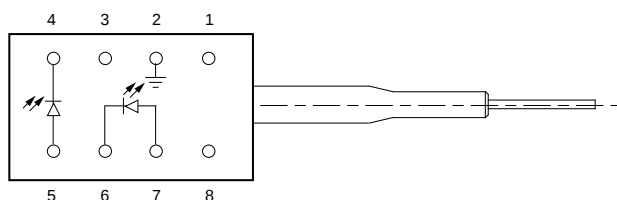
**Description** (continued)

The device characteristics listed in this document are met at 2.0 mW output power. Higher- or lower-power operation is possible. Under conditions of a fixed photodiode current, the change in optical output is typically  $\pm 0.5$  dB over an operating temperature range of  $-40$  °C to  $+85$  °C.

This device incorporates the new Laser 2000 manufacturing process developed by the Optoelectronic unit of Agere Systems Inc. Laser 2000 is a low-cost platform that targets high-volume manufacturing and tighter product distributions on all optical subassemblies. The platform incorporates an advanced optical design that is produced on a highly automated production line. 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.

**Table 1. Pin Descriptions**

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



1-900 (C)

**Figure 1. D371-Type Digital Uncooled DFB Laser Module Schematic, Top View****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<br>Maximum Fiber Power* | $I_{OP}$<br>$P_{MAX}$ | —<br>— | 150<br>10 | mA<br>mW |
| Peak Reverse Laser Voltage:                                 |                       |        |           |          |
| Laser                                                       | $V_{RL}$              | —      | 2         | V        |
| Monitor                                                     | $V_{RD}$              | —      | 20        | 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 <sub>F</sub>                  | CW, nominal                                                                            | —         | 2       | —        | mW       |
| Threshold Current                  | I <sub>TH</sub>                 | T = 25 °C<br>T = full range                                                            | 4<br>2    | 11<br>— | 15<br>50 | mA<br>mA |
| Modulation Current                 | I <sub>MOD</sub>                | CW, P <sub>F</sub> = 2.0 mW, T = 25 °C<br>CW, I <sub>MON</sub> = const. T = full range | 10<br>7.5 | 20<br>— | 30<br>55 | mA       |
| Slope Efficiency <sup>†</sup>      | SE                              | CW, P <sub>F</sub> = 2.0 mW, T = 25 °C                                                 | 67        | —       | 200      | μW/mA    |
| Center Wavelength                  | λ <sub>c</sub>                  | P <sub>F</sub> = 2.0 mW, CW                                                            | 1280      | —       | 1335     | nm       |
| Spectral Width (−20 dB)            | Δλ                              | P <sub>F</sub> = 2.0 mW, 622 Mbits/s                                                   | —         | —       | 1        | nm       |
| Side-mode Suppression Ratio        | SMSR                            | CW, P <sub>F</sub> = 2.0 mW                                                            | 30        | 40      | —        | dB       |
| Tracking Error                     | TE                              | I <sub>MON</sub> = constant, CW                                                        | —         | 0.5     | —        | dB       |
| Spontaneous Emission               | P <sub>TH</sub>                 | I = (0.9) I <sub>TH</sub>                                                              | —         | —       | 50       | μW       |
| Rise/Fall Times                    | t <sub>R</sub> , t <sub>F</sub> | 10%—90% pulse<br>T = 25 °C                                                             | —         | 0.25    | 0.5      | ns       |
| Forward Voltage                    | V <sub>F</sub>                  | CW                                                                                     | —         | 1.1     | 1.6      | V        |
| Input Impedance                    | R                               | —                                                                                      | 3         | —       | 8        | Ω        |
| Monitor Current                    | I <sub>MON</sub>                | V <sub>R</sub> <sup>‡</sup> = 5 V                                                      | 50        | —       | 1000     | μA       |
| Monitor Dark Current               | I <sub>D</sub>                  | V <sub>R</sub> <sup>‡</sup> = 5 V                                                      | —         | 10      | 200      | nA       |
| Wavelength Temperature Coefficient | —                               | —                                                                                      | —         | 0.09    | 0.1      | nm/°C    |

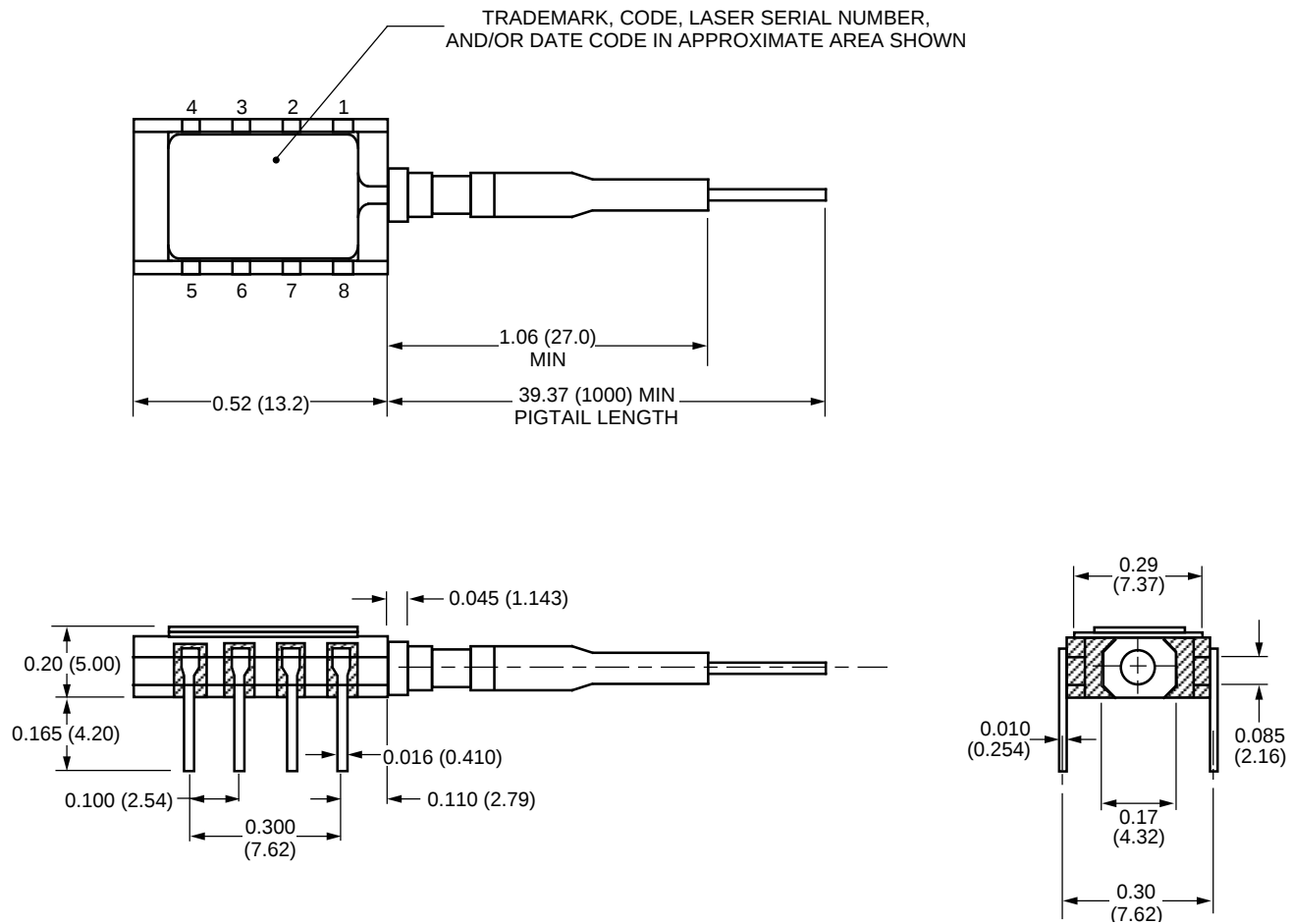
\* 1 mW power option also available. See Table 4 for more information.

† The slope efficiency is used to calculate the modulation current for a desired output power. This modulation current plus the threshold current comprise the total operating current for the device.

‡ V<sub>R</sub> = reverse voltage.

## Outline Diagram

Dimensions are in inches and (millimeters).



1-899 (C).f

## Qualification Information

The D371-Type Laser Module has completed and passed the following qualification tests and meets the intent of Bellcore TR-NWT-000468 for interoffice environments and TA-TSY-000983 for outside plant environments.

**Table 3. D371-Type Laser Module Qualification Test Plan**

| Qualification Test         | Conditions                                                                           | Sample Size | Reference                                            |
|----------------------------|--------------------------------------------------------------------------------------|-------------|------------------------------------------------------|
| Mechanical Shock           | 500 G for P/F<br>1,500 G for information                                             | 11          | MIL-STD-883<br>Method 2002                           |
| Vibration                  | 20 g, 20 Hz—2,000 Hz                                                                 | 11          | MIL-STD-883<br>Method 2007                           |
| Solderability              | —                                                                                    | 11          | MIL-STD-883<br>Method 2007                           |
| Thermal Shock              | Delta T = 100 °C                                                                     | 11          | MIL-STD-883<br>Method 2003                           |
| Fiber Pull                 | 1 kg; 3 times for P/F<br>2 kg; 3 times for information                               | 11          | <i>Telcordia Technologies</i><br>983                 |
| Accelerated (Biased) Aging | 85 °C, 5,000 hrs.                                                                    | 25          | <i>Telcordia Technologies</i><br>983<br>Section 5.18 |
| 85 °C Storage              | 1,000 hrs. for provisional qual.<br>2,000 hrs. for P/F<br>5,000 hrs. for information | 11          | <i>Telcordia Technologies</i><br>983                 |
| Temperature Cycling        | 500 cycles for P/F<br>1,000 cycles for information                                   | 11          | <i>Telcordia Technologies</i><br>983<br>Section 5.20 |
| Cyclic Moisture Resistance | 10 cycles for P/F<br>20 cycles for information                                       | 11          | <i>Telcordia Technologies</i><br>983<br>Section 5.23 |
| Damp Heat                  | 40 °C, 95% RH<br>1,000 hrs. for provisional qual.<br>1,344 hrs. for P/F              | 11          | MIL-STD-202<br>Method 103                            |
| Internal Moisture          | <5,000 ppm water vapor                                                               | 11          | MIL-STD-883<br>Method 1018                           |
| Flammability               | —                                                                                    | —           | TR357<br>Sec. 4.4.2.5                                |
| ESD Threshold              | —                                                                                    | 6           | <i>Telcordia Technologies</i><br>983<br>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  $\mu\text{m}$  single-mode pigtail with optional connector.

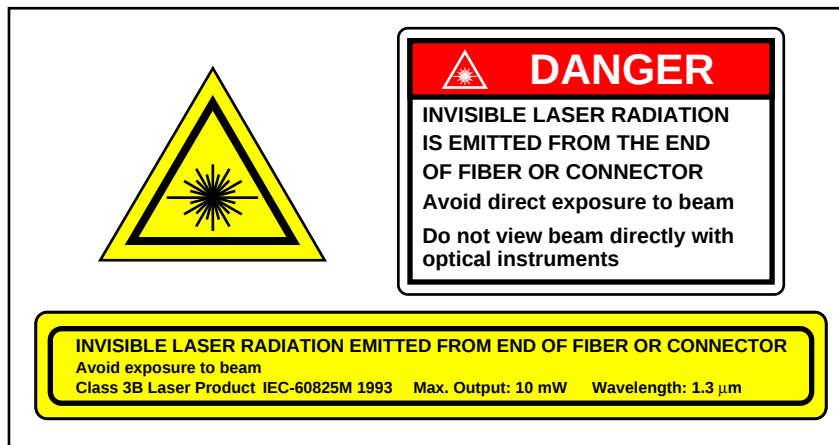
Wavelength = 1.3  $\mu\text{m}$ .

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 4. Ordering Information

| Device Code | Comcode   | Operating Case<br>Temperature Range (°C) | Pfiber | Connector |
|-------------|-----------|------------------------------------------|--------|-----------|
| D371-10A    | 107950941 | –40 to +85                               | 1.0 mW | SC-PC     |
| D371-20A    | 107950958 | –40 to +85                               | 2.0 mW | SC-PC     |
| D371-22A    | 108286527 | 0 to 65                                  | 2.0 mW | SC-PC     |
| D371-20B    | 108225376 | –40 to +85                               | 2.0 mW | SC-APC    |
| D371-10F    | 107950982 | –40 to +85                               | 1.0 mW | FC-PC     |
| D371-20F    | 107950990 | –40 to +85                               | 2.0 mW | FC-PC     |
| D371-22F    | 108286535 | 0 to 65                                  | 2.0 mW | FC-PC     |
| D371-10N    | 107951006 | –40 to +85                               | 1.0 mW | none      |
| D371-20N    | 107951014 | –40 to +85                               | 2.0 mW | none      |
| D371-22N    | 108288382 | 0 to 65                                  | 2.0 mW | none      |

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