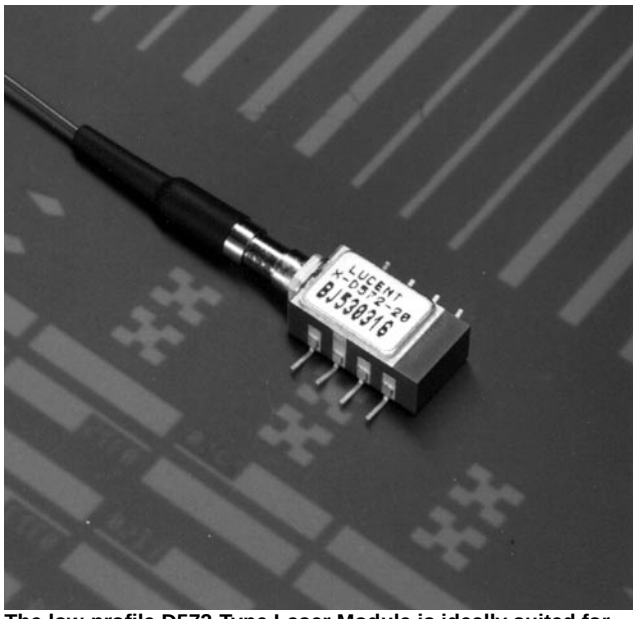
**Advance Data Sheet**
**February 2000**

microelectronics group

Lucent Technologies
Bell Labs Innovations

# D572-Type 1.5 μm Uncooled DFB *FastLight*™ Laser Module for 2.5 Gbits/s and High Bandwidth Applications




**The low-profile D572-Type Laser Module is ideally suited for OC-48 SONET and other high-speed digital applications.**

## Features

- 8-pin package suitable for SONET applications
- Narrow linewidth, distributed feedback, multiquantum-well (DFB-MQW) 1510 nm or 1550 nm laser with single-mode fiber pigtail
- Operating temperature range: –25 °C to +70 °C (–25 °C to +85 °C versions under development)
- 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
- Built-in thermistor and Bias T
- 25 Ω input impedance
- Internal isolator
- *Telcordia Technologies** TA-983 qualification program
- Bandwidth > 3 GHz

## Applications

- SONET OC-48/STM-16 systems
- Telecommunications
- Secure digital data systems

## Benefits

- Easily board mounted
- Gull-wing leads
- No additional heat sinks required
- Low-cost alternative to industry-standard, 14-pin isolated laser module (ILM)
- Highly efficient DFB-MQW laser structure allows for lower threshold and drive currents, and reduced power consumption

## Description

The D572-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 module includes a narrow linewidth (<1 nm) DFB-MQW single-mode laser and an InGaAs PIN photodiode back-facet monitor in a hermetically sealed package.

This package is optimized for a 25 Ω input impedance and allows for dc biasing through an internal bias tee. A thermistor has been included for feedback to board-level bias circuitry, if needed.

* *Telcordia Technologies* is a trademark of Bell Communications Research, Inc.

## 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 ±0.5 dB over an operating temperature range of –25 °C to +70 °C.

This device incorporates the new Laser 2000 manufacturing process from the Optoelectronic Products unit of Lucent Technologies Microelectronics Group. Laser 2000 is a low-cost platform that targets high-volume manufacturing and tighter product distributions on all optical subassemblies. This platform incorporates an advanced optical design that is produced on one of the highly automated production lines at the Opotelectronic manufacturing facility. 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 | Thermistor |
| 2 | Thermistor, package GND |
| 3 | Laser dc bias cathode (–) choke |
| 4 | Photodiode cathode |
| 5 | Photodiode anode |
| 6 | Laser diode anode (+) |
| 7 | Laser RF input cathode (–) 25 Ω |
| 8 | Laser diode anode (+) |

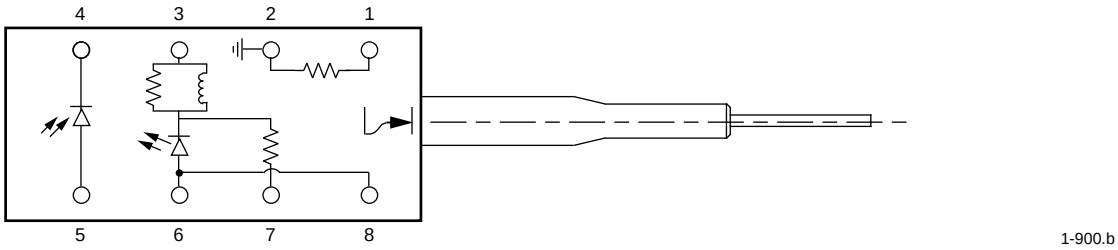



**Figure 1. D572-Type Uncooled DFB Mini 8-Pin Laser Module Schematic, Top View**

## 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:<br>Laser<br>Monitor | <br>$V_{RL}$<br>$V_{RM}$ | <br>—<br>— | <br>2<br>20 | <br>V<br>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 *EIA** Standard *EIA*-625.**

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

* *EIA* is a registered trademark of Electronic Industries Association.

## 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 | — | –25 | — | 70 | °C |
| Optical Output Power | $P_F$ | CW, peak | — | 2 | — | mW |
| Threshold Current | $I_{TH}$ | T = 25 °C<br>T = full range | 5<br>2 | 11<br>— | 15<br>60 | mA<br>mA |
| Modulation Current | $I_{MOD}$ | CW, $P_F$ = 2.0 mW, T = 25 °C<br>CW, $I_{MON}$ = constant, T = full range | 15<br>7.5 | 25<br>— | 35<br>60[1] | mA<br>mA |
| Slope Efficiency[2] | SE | CW, $P_F$ = 2.0 mW, T = 25 °C | 57 | — | 133 | μW/mA |
| Center Wavelength[3] | $\lambda_C$ | $P_F$ = 2.0 mW, CW | 1530 | 1550 | 1570 | nm |
| Spectral Width (–20 dB) | $\Delta\lambda$ | $P_F$ = 2.0 mW | — | — | 1 | nm |
| Side-mode Suppression Ratio | SMSR | CW, $P_F$ = 2.0 mW | 30 | 40 | — | dB |
| Tracking Error | TE | $I_{MON}$ = constant, CW | — | — | 1.5 | dB |
| Spontaneous Emission | $P_{TH}$ | I = (0.9) $I_{TH}$ | — | — | 100 | μW |
| Rise/Fall Times | $t_R$, $t_F$ | 10%—90% pulse[4], T = 25 °C | — | 0.125 | 0.175 | ns |
| Dispersion Penalty | $D_P$ | 1200 ps/nm—1600 ps/nm; typical, 1350 ps/nm | — | — | 2.0 | dB |
| Optical Return Loss | ORL | CW | 18 | — | — | dB |
| Forward Voltage | $V_F$ | At bias coil | — | 1.0 | 1.6 | V |
| Input Impedance | R | — | — | 25 | — | Ω |
| Monitor Current | $I_{MON}$ | $V_R$[5] = 5 V | 100 | — | 1000 | μA |
| Monitor Dark Current | $I_D$ | $V_R$[5]= 5 V | — | 10 | 200 | nA |
| Wavelength Temperature Coefficient | — | — | — | 0.09 | 0.12 | nm/°C |

1. BOL value; EOL = 80 mA.
2. 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.
3 1510 nm wavelength also available.
4. Corrected for electrical pulse fall time.
5. $V_R$ = reverse voltage.

## Qualification Information

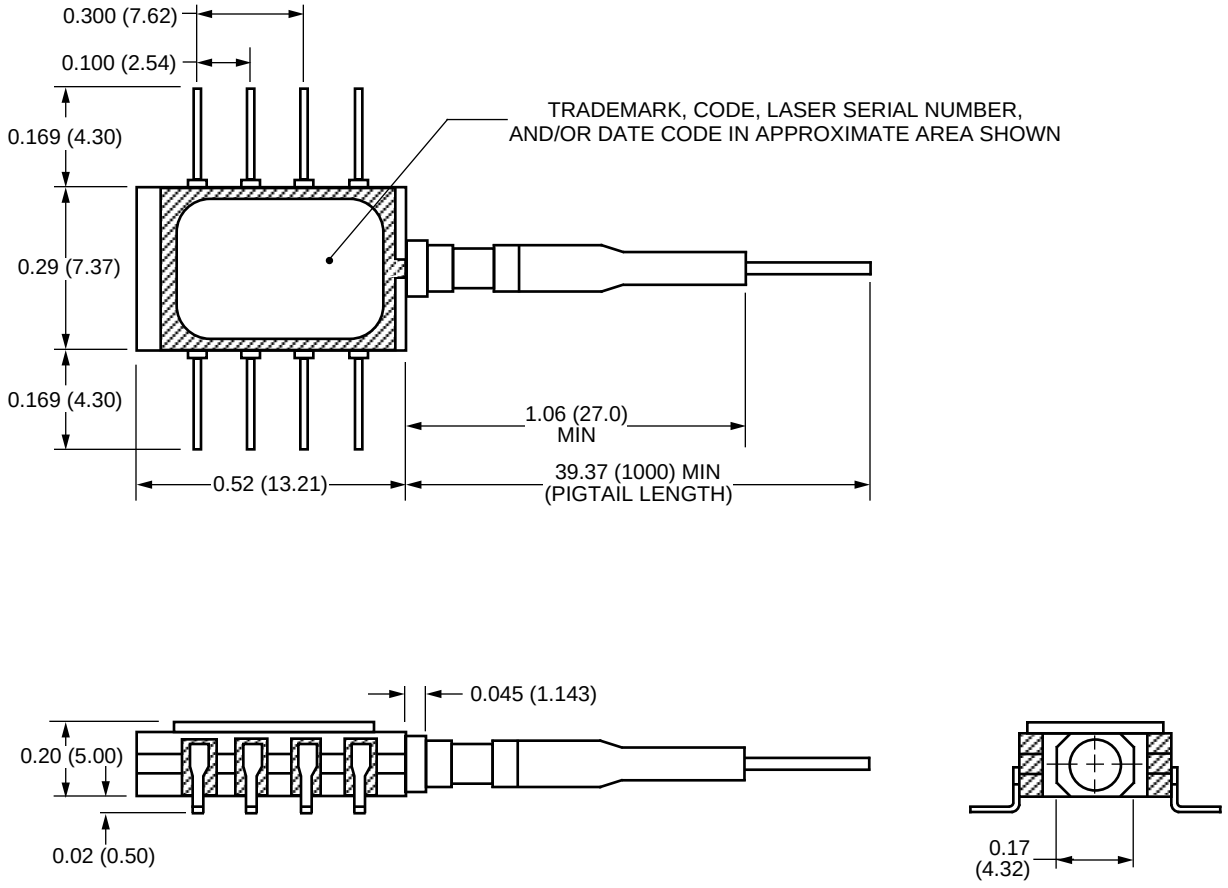
The D572-Type Laser Module is scheduled to complete the following qualification tests and meets the intent of *Telcordia Technologies* TR-NWT-000468 for interoffice environments and TA-TSY-000983 for outside plant environments.

**Table 3. D572-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 | Bellcore 983 |
| Accelerated (Biased) Aging | 85 °C, 5,000 hrs. | 25 | Bellcore 983 Section 5.18 |
| High-temperature Storage | 85 °C, 2,000 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 | <5,000 ppm water vapor | 11 | MIL-STD-883 Method 1018 |
| Flammability | — | — | TR357 Section 4.4.2.5 |
| ESD Threshold | — | 6 | Bellcore 983 Section 5.22 |

## Outline Diagram

Dimensions are in inches and (millimeters).




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## Laser Safety Information

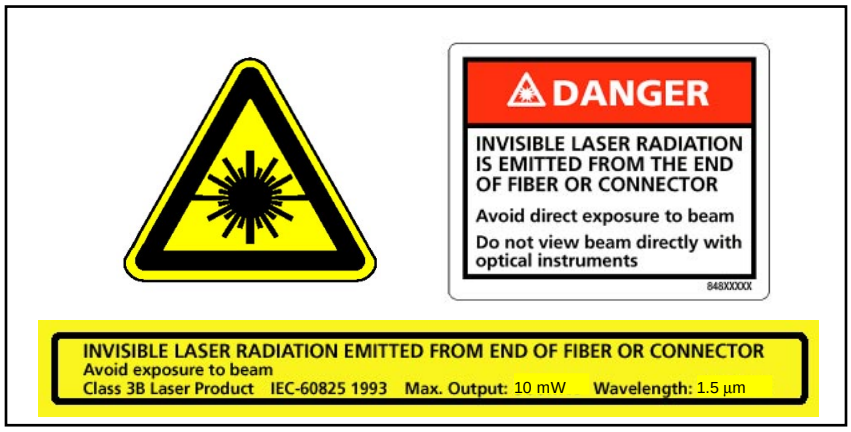
### Class IIIb Laser Product

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 IIIb laser products per *IEC** 60825-1:1993. The device has been certified 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 = 1.5 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

| Device Code* | Comcode | Pfiber | Wavelength | Connector† | Operating Case Temperature Range (°C) |
|---|---|---|---|---|---|
| D572-20AS | 108401290 | 2.0 mW | 1550 nm | SC-PC | –25 to +70 |
| D572-20BS | 108401308 | 2.0 mW | 1550 nm | SC-APC | –25 to +70 |
| D572-20FS | 108401316 | 2.0 mW | 1550 nm | FC-PC | –25 to +70 |
| D572-20GS | 108401324 | 2.0 mW | 1550 nm | FC-APC | –25 to +70 |
| D572-20NS | 108401332 | 2.0 mW | 1550 nm | none | –25 to +70 |
| D572-20SS | 108669565 | 2.0 mW | 1550 nm | LC | –25 to +70 |
| D572-22AS | 108401340 | 2.0 mW | 1550 nm | SC-PC | –5 to +70 |
| D572-22BS | 108401357 | 2.0 mW | 1550 nm | SC-APC | –5 to +70 |
| D572-22FS | 108401365 | 2.0 mW | 1550 nm | FC-PC | –5 to +70 |
| D572-22GS | 108401373 | 2.0 mW | 1550 nm | FC-APC | –5 to +70 |
| D572-22NS | 108401381 | 2.0 mW | 1550 nm | none | –5 to +70 |
| D572C20AS | 108469842 | 2.0 mW | 1510 nm | SC | –25 to +70 |
| D572C20BS | 108469859 | 2.0 mW | 1510 nm | SC-APC | –25 to +70 |
| D572C20FS | 108469867 | 2.0 mW | 1510 nm | FC-PC | –25 to +70 |
| D572C20GS | 108469875 | 2.0 mW | 1510 nm | FC-APC | –25 to +70 |
| D572C20NS | 108469883 | 2.0 mW | 1510 nm | none | –25 to +70 |
| D572C20SS | — | 2.0 mW | 1510 nm | LC | –25 to +70 |
| D572C22AS | 108469891 | 2.0 mW | 1510 nm | SC | –5 to +70 |
| D572C22BS | 108469909 | 2.0 mW | 1510 nm | SC-APC | –5 to +70 |
| D572C22FS | 108469917 | 2.0 mW | 1510 nm | FC-PC | –5 to +70 |
| D572C22GS | 108469925 | 2.0 mW | 1510 nm | FC-APC | –5 to +70 |
| D572C22NS | 108469933 | 2.0 mW | 1510 nm | none | –5 to +70 |
| D572C22SS | — | 2.0 mW | 1510 nm | LC | –5 to +70 |

* Trailing S in code indicates the module contains an isolator.
† Connectors will meet *Telcordia Technologies* GR-326-CORE.

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