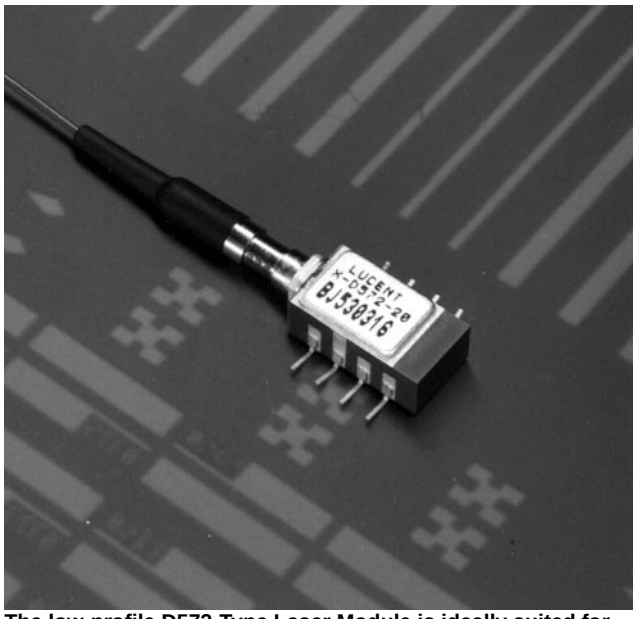
Advance Data Sheet
February 2000

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 (+)

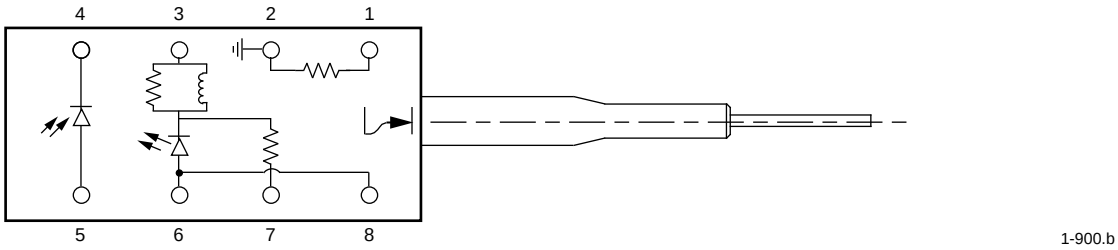


Figure 1. D572-Type Uncooled DFB Mini 8-Pin Laser Module Schematic, Top View

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 Maximum Fiber Power*	I_{OP} P_{MAX}	— —	150 10	mA mW
Peak Reverse Laser Voltage: Laser Monitor	 V_{RL} V_{RM}	 — —	 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 *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 T = full range	5 2	11 —	15 60	mA mA
Modulation Current	I_{MOD}	CW, P_F = 2.0 mW, T = 25 °C CW, I_{MON} = constant, T = full range	15 7.5	25 —	35 60[1]	mA mA
Slope Efficiency[2]	SE	CW, P_F = 2.0 mW, T = 25 °C	57	—	133	μW/mA
Center Wavelength[3]	λ_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

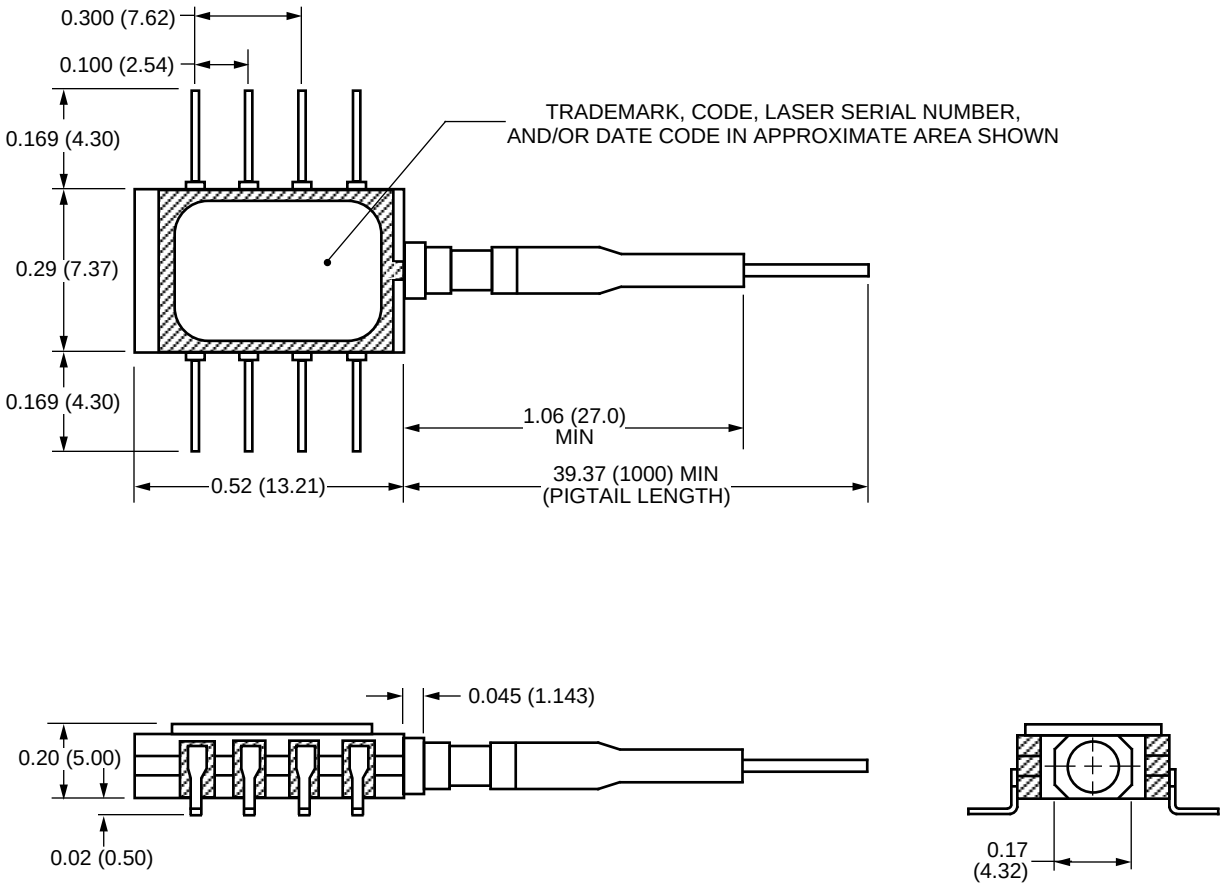
The D572-Type Laser Module is scheduled to complete the following qualification tests and meets the intent of *Telcordia Technologies* TR-NWT-000468 for interoffice environments and TA-TSY-000983 for outside plant environments.

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).



Laser Safety Information

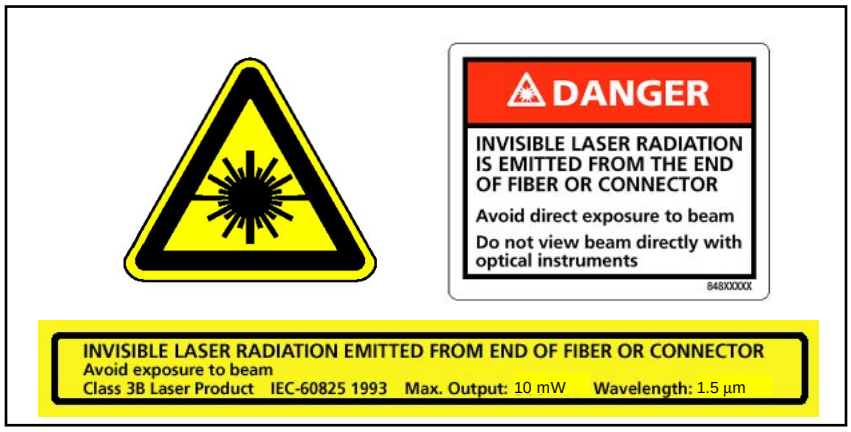
Class IIIb Laser Product

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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Lucent Technologies
Bell Labs Innovations

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