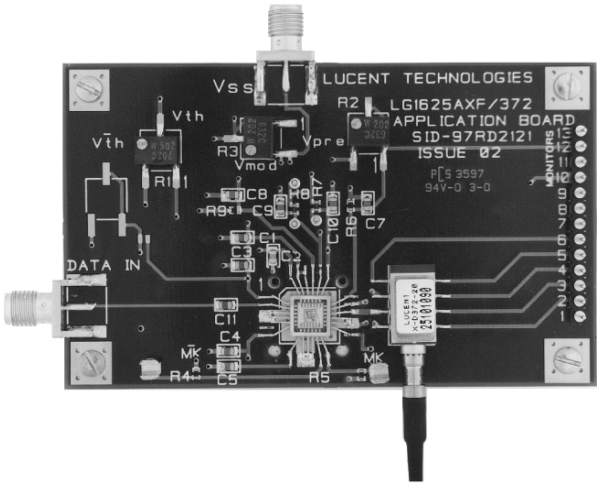
Application Note
August 1998

microelectronics group

Lucent Technologies
Bell Labs Innovations

LG1625AXF/D372 2.5 Gbits/s Transmitter Evaluation Board



Introduction

This application note describes the characteristics and operation of the Lucent Technologies Microelectronics Group LG1625AXF/D372 2.5 Gbits/s Transmitter Evaluation Board. The complete transmitter includes a gallium arsenide laser driver and an isolated distributed feedback (DFB) laser module and is designed to meet SONET requirements for OC-48 system applications.

Description

The intent of the evaluation board is to aid in the performance evaluation of two Lucent Technologies products, the LG1625AXF Laser Driver and the D372 Digital Uncooled DFB Mini 8-Pin Laser Module.

The LG1625AXF Laser Driver is a gallium-arsenide (GaAs) integrated circuit used to modulate a laser diode in Gbits/s lightwave applications. Its modulation output current and laser prebias current are voltage controlled. The LG1625AXF operates up to a data rate of 3 Gbits/s and is available in a 24-pin, hermetic, gull wing package. (See the LG1625AXF preliminary data sheet for more detailed information.)

The LG1625AXF/D372 Evaluation Board is populated with all of the necessary passive components required for device biasing, power supply filtering, and ac coupling of the data input signal. (Figure 1 shows a complete schematic of the board.) Three potentiometers are provided to control the output of the LG1625AXF. Both the LG1625AXF and the D372 can be controlled and monitored using the strategically placed pins located on the board. (Table 1 and Figure 2 provide each pin's function and location.) End launch SMA connectors are provided on the board for the power supply and data input connections.

The printed-circuit board (PCB) is composed of FR-4 glass epoxy. It has four layers that are defined as follows: controlled impedance lines and interconnect are located on layer one; layers two and three are the ground plane; layer four contains the remainder of the interconnect. (Figure 4 shows a picture of the board's stack up.) The board's layout plots and Gerber files are available upon request.

The D372 Digital Uncooled DFB Mini 8-Pin Laser Module consists of a 1310 nm laser diode coupled to a single-mode fiber pigtail. The module includes a narrow linewidth (<1 nm) DFB-multiquantum well (MQW) single-mode laser and an InGaAs PIN photodiode backface monitor in a hermetically sealed package. This device nominally has an output power of 2 mW. (See the D372 advance data sheet for more detailed information.)

Operation

The following equipment is required to operate the LG1625AXF/D372 Evaluation Board:

1. One dc power supply
2. Digital oscilloscope with optical input
3. Pattern generator
4. Two digital multimeters

Figure 3 shows the typical test configuration for the evaluation board. First, connect the power supply V_{SS} with the voltage set at –5.2 V and the current limit set to 200 mA. The board will typically sink approximately 110 mA when the modulation and prebias currents are set to 0 mA. Next, connect data input, set the amplitude of the data signal to 500 mV (p-p), set the clock frequency to 2.48832 GHz, and select the desired data pattern (i.e., $2^{23} – 1$ pseudorandom binary sequence).

LG1625AXF Laser Driver Control

Three characteristics of the LG1625AXF output are controlled using the three onboard potentiometers as follows:

V_{TH}: The eye crossing point is controlled by varying the voltage on pin 24 of the LG1625AXF. This is accomplished by adjusting the potentiometer labeled V_{TH} while viewing the output data eye on the oscilloscope. The voltage V_{TH} can be monitored directly at pin 24 of the laser driver. A voltage of approximately –1.25 V (reference from GND) centers the eye crossing point.

I_{MOD}: The output modulation current is controlled by setting the voltage V_{MOD} on pin 21 of the LG1625AXF. V_{MOD} is varied using the potentiometer labeled V_{MOD}. To monitor the amount of output modulation current, place a multimeter across board pins 16 and 17 and measure the voltage. This measures the voltage across a 1 Ω resistor. The V_{MOD} voltage is monitored at board pin 13.

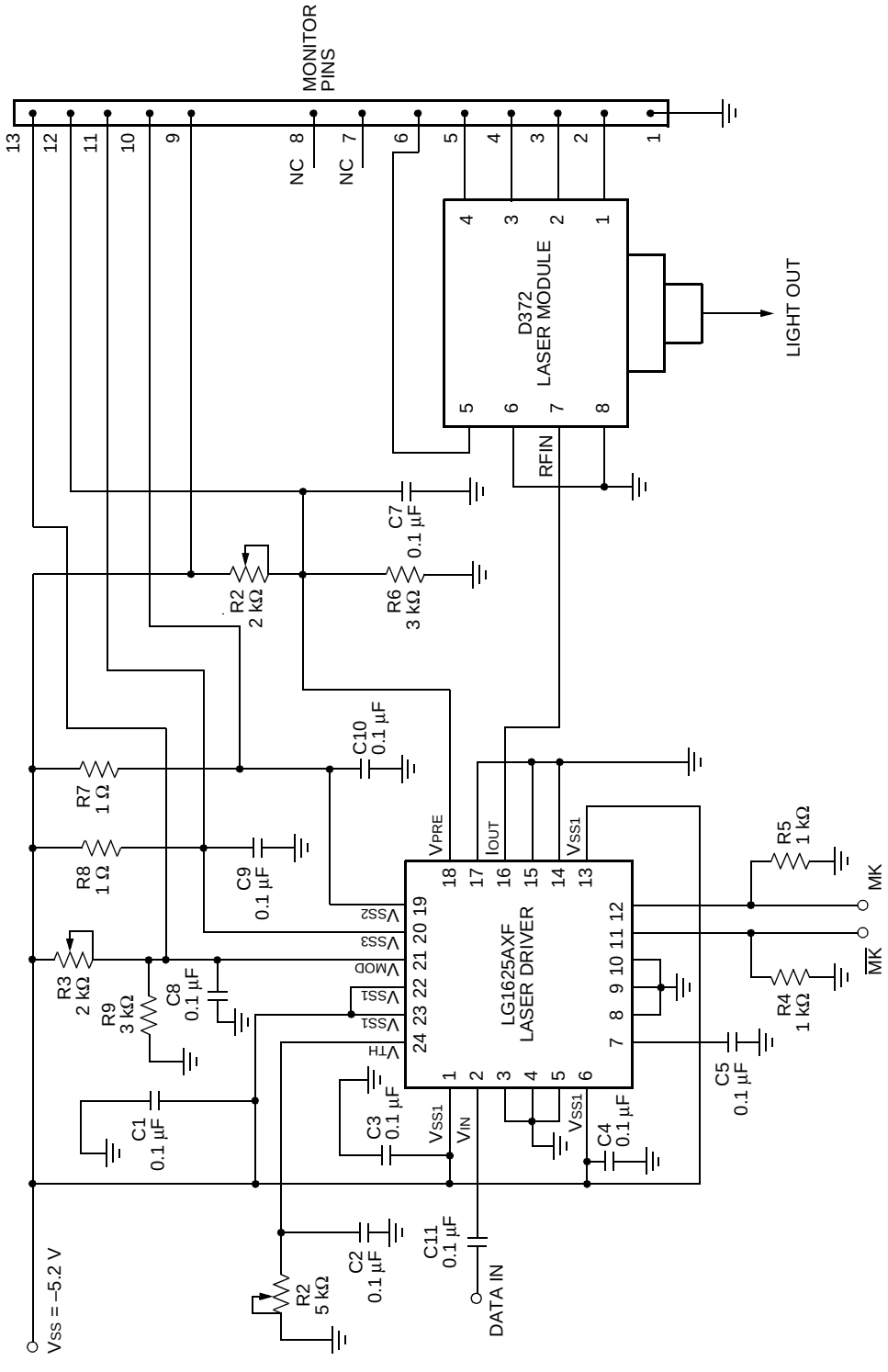
I_{PRE}: The prebias current required by the D372 Laser is controlled by setting the voltage V_{PRE} on pin 18 of the LG1625AXF. This is accomplished by adjusting the potentiometer labeled V_{PRE}. To monitor the amount of prebias current, place a multimeter across board pins 16 and 18 and measure the voltage. This measures the voltage across a 1 Ω resistor. A typical prebias current is 10 mA. Consult the D372 Laser Module test data to determine the exact prebias current. The V_{PRE} voltage can be monitored at board pin 12.

In addition, the mark density of the data can be monitored at board pins 14 and 15.

D372 Laser Module Control

The D372 Laser can be controlled and monitored using pins 2 through 6 located on the right side of the evaluation board. The D372 Laser Module includes a thermistor for feedback to (user-added) board-level circuitry, if needed. The thermistor is accessible through board pins 2 and 3. dc biasing of the laser cathode can be done using pin 4 of the board. Also, the photodiode backface monitor cathode and anode are accessible through board pins 5 and 6, respectively.

Operation (continued)



5-6556(F)r.3

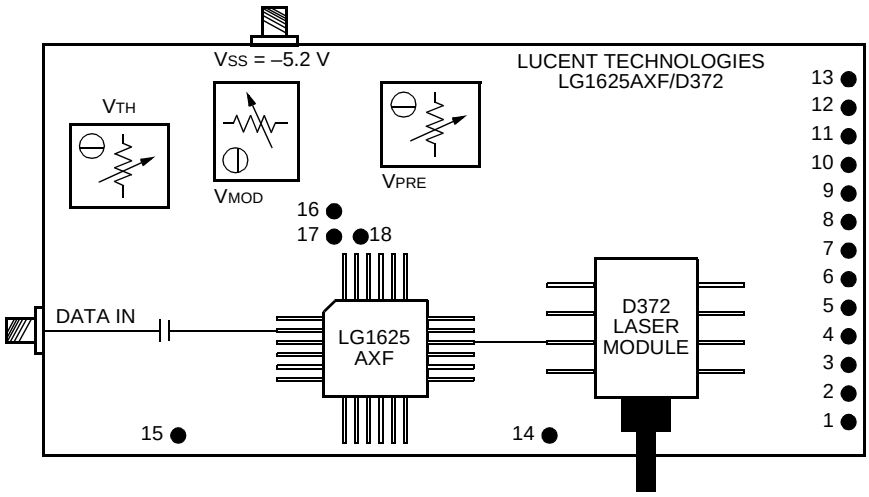
Figure 1. Evaluation Board Schematic

Operation (continued)

Table 1. Board Pin Descriptions

Pin	Description
1	Ground
2	Thermistor
3	Thermistor
4	Laser dc bias cathode (–)
5	Backface monitor cathode (–)
6	Backface monitor anode (+)
7	Not connected
8	Not connected
9	V_{SS}: Power supply (–5.2 V)
10	V_{SS2}: Supply (–5.2 V) for output prebias current
11	V_{SS3}: Supply (–5.2 V) for output modulation current
12	V_{PRE}: Prebias current control input
13	V_{MOD}: Modulation current control input
14	MK: Mark density output
15	$\overline{MK}$: $\overline{\text{Mark density}}$ output
16	V_{SS} side of 1 Ω sense resistors
17	V_{SS3} side of 1 Ω I_{MOD} sense resistor
18	V_{SS2} side of 1 Ω I_{PRE} sense resistor

Note: Pins 2 through 6 control/monitor the D372 Laser while pins 9 through 18 control/monitor the LG1625AXF Laser Driver.



5-6557 (F)

Note: Figure not to scale.

Figure 2. Pin Connections on the Evaluation Board

Operation (continued)

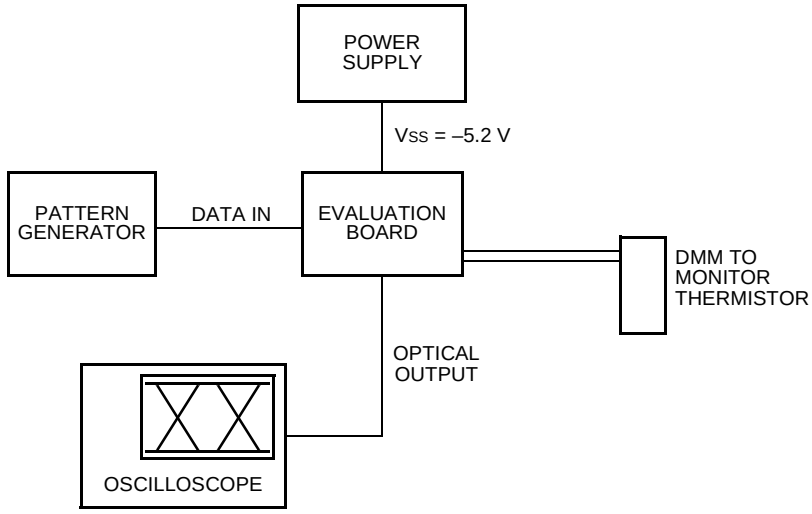
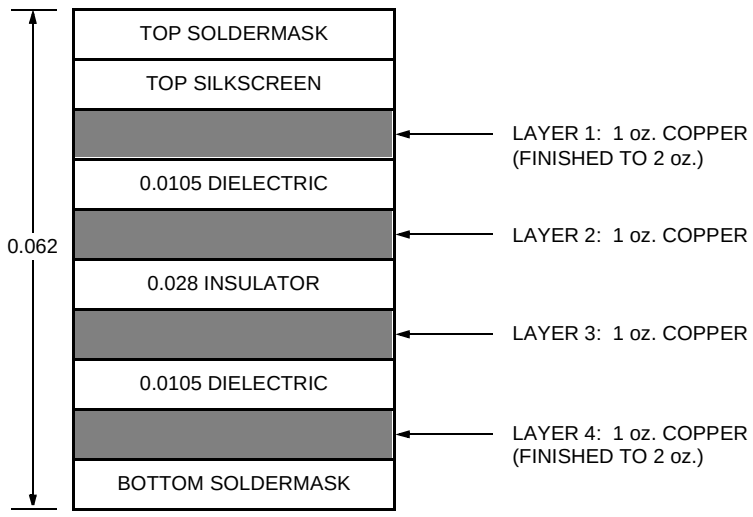


Figure 3. Typical Test Configuration



Note: Dimensions are in inches.

Figure 4. Stack Up of FR4 Board

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

INTERNET: **http://www.lucent.com/micro**
E-MAIL: **docmaster@micro.lucent.com**
N. AMERICA: Microelectronics Group, Lucent Technologies Inc., 555 Union Boulevard, Room 30L-15P-BA, Allentown, PA 18103
1-800-372-2447, FAX 610-712-4106 (In CANADA: **1-800-553-2448**, FAX 610-712-4106)
ASIA PACIFIC: Microelectronics Group, Lucent Technologies Singapore Pte. Ltd., 77 Science Park Drive, #03-18 Cintech III, Singapore 118256
Tel. (65) 778 8833, FAX (65) 777 7495
CHINA: Microelectronics Group, Lucent Technologies (China) Co., Ltd., A-F2, 23/F, Zao Fong Universe Building, 1800 Zhong Shan Xi Road, Shanghai 200233 P. R. China **Tel. (86) 21 6440 0468**, **ext. 316**, FAX (86) 21 6440 0652
JAPAN: Microelectronics Group, Lucent Technologies Japan Ltd., 7-18, Higashi-Gotanda 2-chome, Shinagawa-ku, Tokyo 141, Japan
Tel. (81) 3 5421 1600, FAX (81) 3 5421 1700
EUROPE: Data Requests: MICROELECTRONICS GROUP DATALINE: **Tel. (44) 1189 324 299**, FAX (44) 1189 328 148
Technical Inquiries: GERMANY: **(49) 89 95086 0** (Munich), UNITED KINGDOM: **(44) 1344 865 900** (Bracknell),
FRANCE: **(33) 1 48 83 68 00** (Paris), SWEDEN: **(46) 8 600 7070** (Stockholm), FINLAND: **(358) 9 4354 2800** (Helsinki),
ITALY: **(39) 2 6608131** (Milan), SPAIN: **(34) 1 807 1441** (Madrid)

August 1998
AP98-057FCE

microelectronics group

Lucent Technologies
Bell Labs Innovations