Application Note
February 1999

microelectronics group

Lucent Technologies
Bell Labs Innovations

2.5 Gbits/s Fiber-Optic Receiver Evaluation Board

Introduction

The SID-95RD2193 evaluation board is designed for evaluation of the LG1600FXH2488 clock and data regenerator, the LG1605DXB limiting amplifier, and the 1319 lightwave receiver in a typical OC-48 receiver configuration to provide recovered clock and retimed electrical data from input light pulses at 2.5 Gbits/s.

Description

The three Lucent Technologies Microelectronics Group ICs used on the receiver board are the LG1600FXH2488 clock and data regenerator, LG1605DXB limiting amplifier, and the 1319 lightwave receiver. The APD bias voltage is provided by a dc-to-dc converter, the Lucent 700B power module.

The LG1600FXH2488 clock and data regenerator (CDR) is a compact, single device solution to clock recovery and data retiming, which does not need an external reference crystal for proper operation. The device regenerates clean clock and error-free data signals from NRZ data input. It is supplied in a surface-mount package, with complimentary 50 Ω I/Os and operates on a single –5.2 V supply.

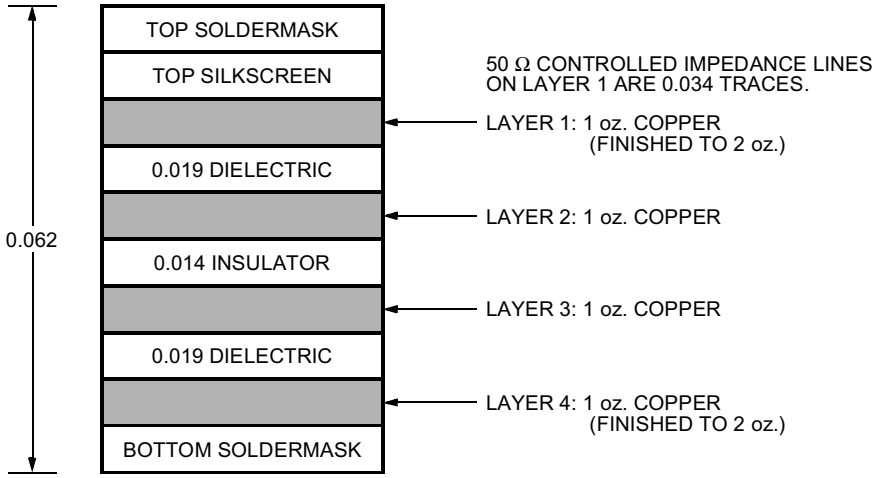
The LG1605DXB is a wideband limiting amplifier with differential inputs and outputs that provide at least 28 dB of gain single-ended, 34 dB differential, with a typical bandwidth of 3 GHz. Similar to the CDR, it is supplied in a surface-mount package, with complimentary 50 Ω I/Os and operates on a single –5.2 V supply.

The 1319 high-speed lightwave receiver is a wideband, linear device designed for use in single-mode, high-speed applications. The receiver contains both a high-performance APD and GaAs preamplifier. The receiver operates in the 1.3 µm to 1.55 µm wavelength range, with a typical sensitivity of –34 dBm at 2.5 Gbits/s.

The 700B power module is an application specific module designed to boost a nominal 5 V input into an output voltage adjustable from 24 V to 97 V. The voltage output is temperature compensating using either the 0.1%/°C or 0.2%/°C pins.

The board material used is FR-4 glass epoxy. This popular material is readily available and less expensive than other materials. The board layout consists of four layers. The top layer is reserved for high-speed signal leads. This consists of the signal interconnects between the ICs, along with the high-speed I/Os which launch into edge-type SMAs on the perimeter of the board. The second layer is the ground plane, while the third and fourth layers are power supply and interconnect, respectively. Microwave techniques were incorporated in laying out the PCB board to ensure controlled 50 Ω impedance lines for the signal leads. Figure 1 shows the stack up of the FR-4 board.

Description (continued)



Note: Dimensions are inches.

Figure 1. FR-4 Layer Stack Up

Power

Two separate dc supplies are required to drive the evaluation board. A –5.2 V supply is used to drive the optical receiver, limiting amplifier, and CDR while a +5 V supply is required for the 700B, dc-to-dc module.

Board Description

Figure 2 shows the IC layout on the evaluation board along with a description of each of the end launch SMA connectors. The board configuration is a single-ended design from the 1319 lightwave receiver through the limiting amplifier to the CDR. An unused input and output of the limiting amplifier is also available for additional evaluation. For proper operation, all unused I/Os should be terminated through 50 Ω to ground. Test points are available to monitor the photo detector current of the 1319 and the loss of signal indicator on the CDR.

Description (continued)

Board Description (continued)

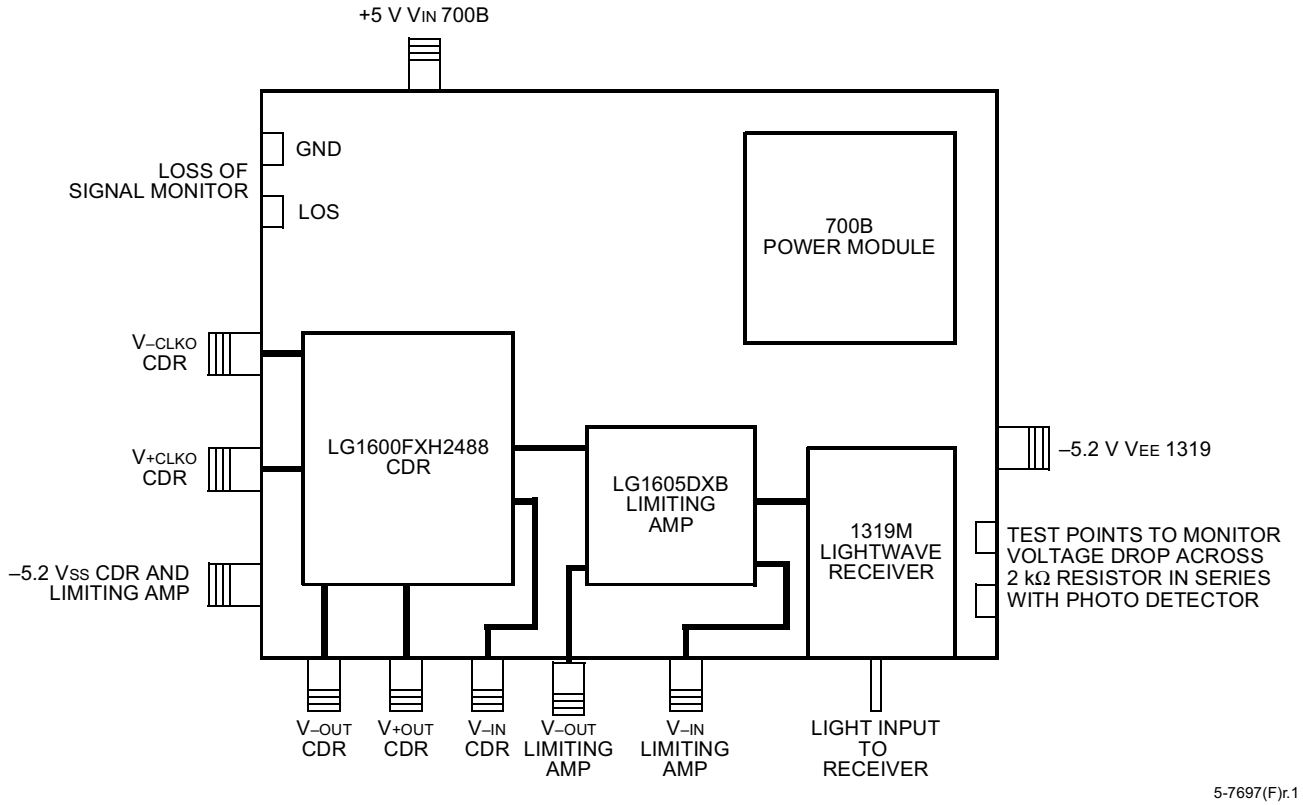


Figure 2. IC Layout and SMA Description

Description (continued)

Board Description (continued)

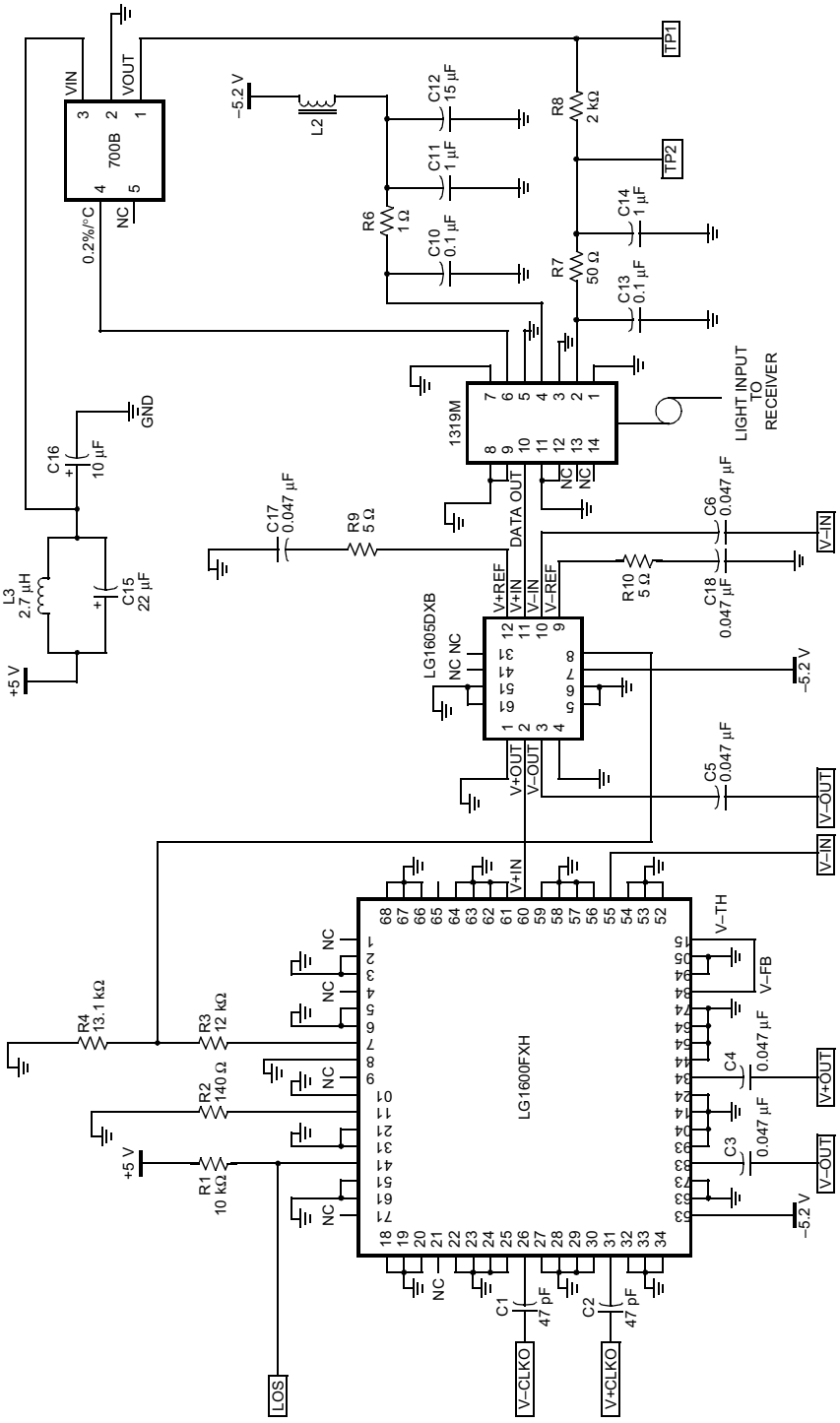


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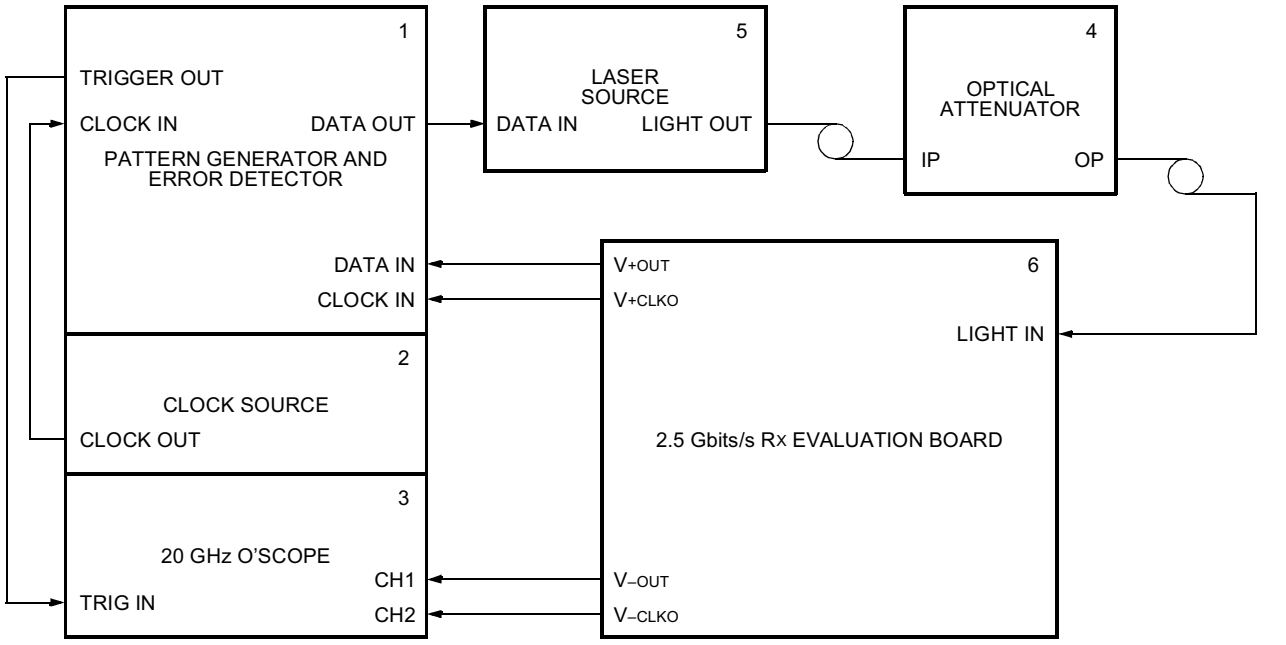
Figure 3. SID-95RD2193 Circuit Schematic

Test Configurations



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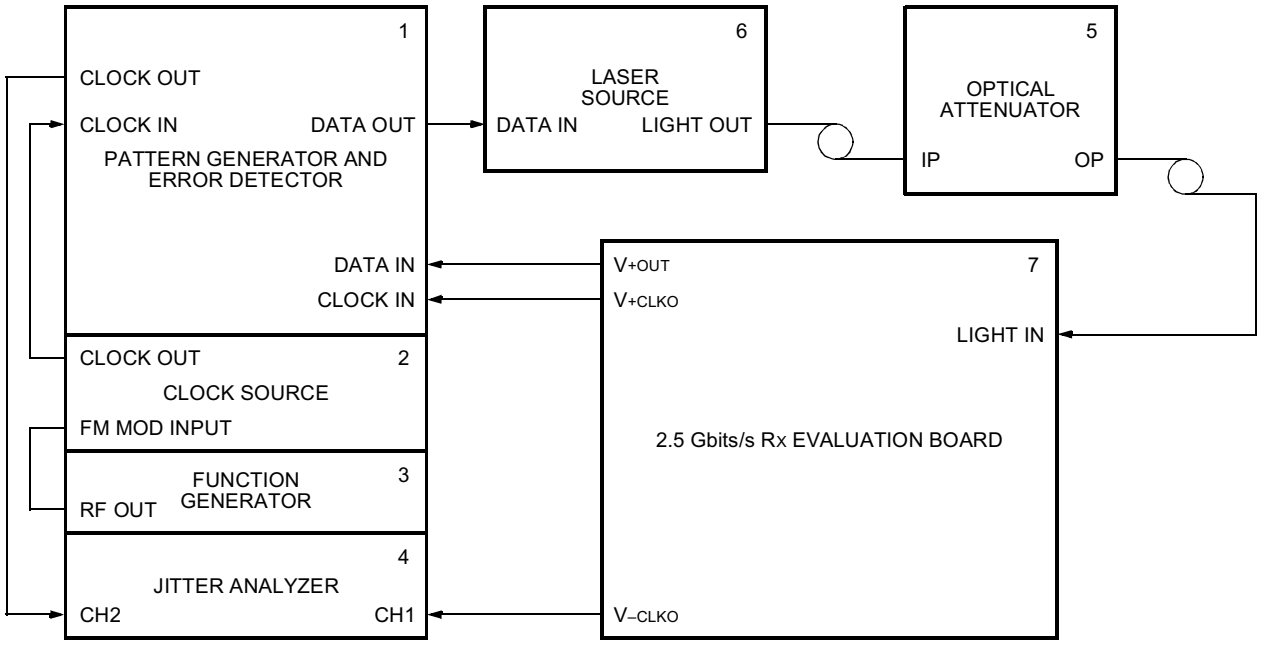
Note: Test equipment (1)—(4) *Hewlett-Packard** HP70843A, HP83752A, HP83480A, and HP8158B, (5) Lucent 2.5 Gbits/s transmitter board 96RD2179, and (6) Lucent 2.5 Gbits/s receiver board 95RD2193.

* *Hewlett-Packard* is a registered trademark of Hewlett-Packard Company.

Figure 4. Typical Test Configuration to Measure Sensitivity



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Note: Test equipment (1)—(5) *Hewlett-Packard* HP70843A, HP83752A, HP3325B, HP70820A, and HP8158B, (6) Lucent 2.5 Gbits/s transmitter board 96RD2179, and (7) Lucent 2.5 Gbits/s receiver board 95RD2193.

Figure 5. Typical Test Configuration for Measuring Jitter Tolerance and Jitter Transfer

Typical Test Results

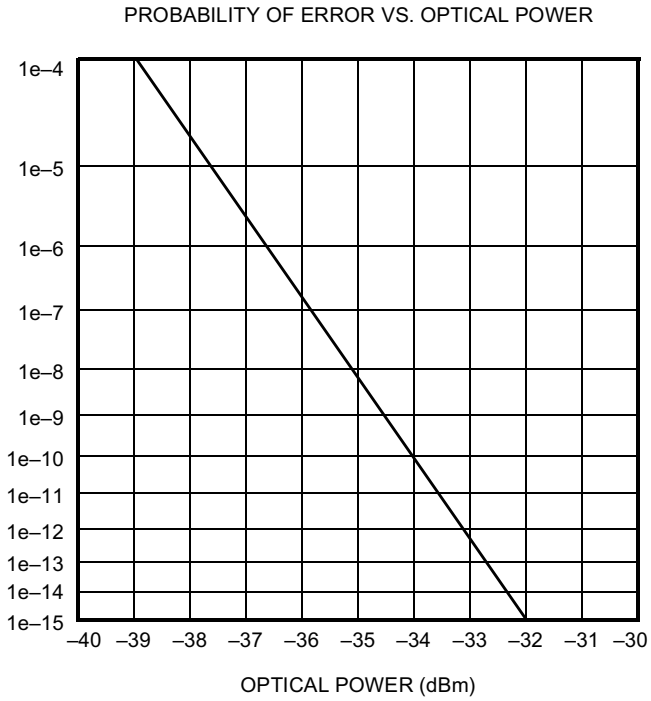

Figure 6. 2.5 Gbits/s Receiver Board Sensitivity: –34 dBm @ BER of 1e–10

Typical Test Results (continued)

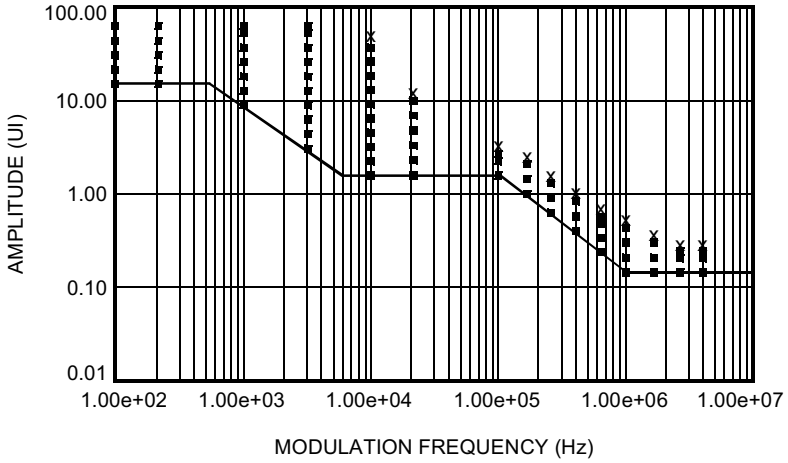

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Figure 7. Jitter Tolerance for a 2.5 Gbits/s Receiver Board

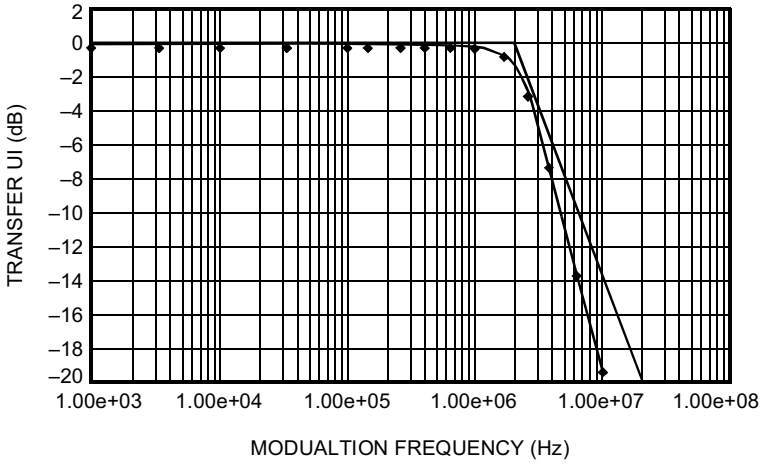

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Figure 8. Jitter Transfer for a 2.5 Gbits/s Receiver Board

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** (Ascot),
FRANCE: **(33) 1 40 83 68 00** (Paris), SWEDEN: **(46) 8 594 607 00** (Stockholm), FINLAND: **(358) 9 4354 2800** (Helsinki),
ITALY: **(39) 02 6608131** (Milan), SPAIN: **(34) 1 807 1441** (Madrid)

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