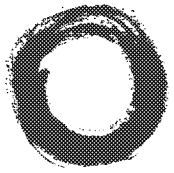
Data Sheet Addendum
August 1998



Lucent Technologies
Bell Labs Innovations

263-Type 0.98 μm Pump Laser Module

Optoelectronics Documentation Update

The Table of Electrical/Optical Characteristics in the 263-Type Laser data sheet (DS98-207LWP) has been amended to reflect the latest device coding scheme. The only parameter affected is Operating Laser Forward Voltage (Table 1, page 3), which requires the addition of the letter N as the last character in the code. The changes are reflected in the isolated table section shown here.

Electrical/Optical Characteristics

Measured at 25 °C laser temperature.

Table 1. Electrical/Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Operating Laser Forward Voltage:	$V_{F, OP}$				
263CN—263HN		—	2.0	2.5	V
263JN		—	—	2.7	V
263KN		—	—	2.8	V
263LN		—	—	2.9	V
263MN		—	—	3.0	V

Also, in the same table on page 4, the unit column representing the thermistor resistance parameter has been changed to kΩ. The symbol was inadvertently presented as Kπ.

Thermistor Resistance @ 25 °C	Rth	9.5	—	10.5	kΩ

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

INTERNET: **http://www.lucent.com/micro**, or for Optoelectronics information, **http://www.lucent.com/micro/opto**
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: OPTOELECTRONICS MARKETING: **(44) 1344 865 900** (Bracknell UK)

August 1998
DA98-020LWP (Must accompany DS98-207LWP)

microelectronics group

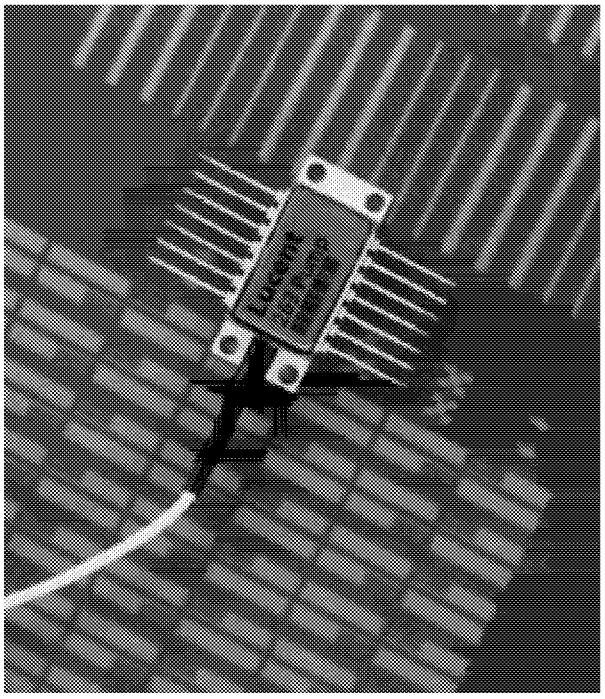
Lucent Technologies
Bell Labs Innovations

Data Sheet
April 1998

microelectronics group

Lucent Technologies
Bell Labs Innovations

263-Type 0.98 μm Pump Laser Module



The 263-Type Laser Modules are designed exclusively as continuous wave (CW) optical pump sources for 1.5 μm erbium-doped fiber amplifier systems.

Features

- High-coupled rated output power (up to 150 mW CW)
- Wide environmental range
- Field-proven packaging technology
- Internally controlled thermal stability
- InGaAs/GaAlAs high-power quantum-well chip design
- Internal thermoelectric cooler
- InGaAs PIN photodetector backface monitor
- Single-mode fiber pigtail
- Compact, 14-pin butterfly package
- Industry-compatible package and pinout

Applications

- Erbium-doped fiber amplifier systems
  - — In-line optical repeaters
  - — Power-booster amplifiers
  - — Optical preamplifiers

Description

The 263-Type Laser represents a family of thermoelectrically cooled, high-power, fiber-amplifier pump laser modules. The devices are designed exclusively as continuous wave (CW) optical pump sources for erbium-doped fiber amplifier (EDFA) systems operating at 1.5 μm wavelengths. They are an essential component of in-line optical repeaters, power-booster amplifiers, and optical preamplifiers. The pump lasers have performed effectively with proven feasibility in laboratory and field trials involving EDFA applications.

Description (continued)

The laser modules feature a high-power, quantum-well laser chip that is designed to match the 1.5 μm erbium-doped fiber absorption band. Thus, the pump laser modules are ideal for high-gain and high-saturation power applications.

The 263-Type modules operate over the wavelength range of 975 nm—985 nm. The devices are available in rated powers from 60 mW to 150 mW. Please contact your Lucent Technologies Microelectronics Group sales representative to discuss optical powers higher than 150 mW.

An integral thermoelectric cooler (TEC) stabilizes the laser at room temperature and, combined with a hermetic environment, allows the device to achieve high-power operation over the extended temperature range of –20 °C to +70 °C. Please contact your Lucent Technologies sales office to discuss wider operating temperature ranges. An internal InGaAs PIN photodiode, mounted directly behind the laser diode, functions as the laser detector and monitors light emissions from the rear facet of the laser.

The 263-Type Pump Laser Module is offered in a 14-pin, hermetic butterfly package. The fiber pigtail is a 125 μm single-mode fiber with a 5 μm core, a cut-off wavelength of 950 nm, and a mode field diameter of 5.9 μm. The fiber is encased in a 900 μm tight buffer jacket. The standard connector is a low-reflection 10° beveled rotary connector.

All semiconductor lasers are susceptible to damage from high-current or high-voltage electrical transients such as electrostatic discharge (ESD) or electrical overstress (EOS). Since pump lasers require a large CW current to generate their high optical powers, they may be more vulnerable to electrical transients during normal operation. Lucent Technologies has incorporated surge protection circuitry within the 263 pump laser package to provide exceptional resistance to electrical overstresses and ESD (see Figure 1).

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 operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Operating Case Temperature Range	T_C	–20	70	°C
Storage Case Temperature Range	T_{stg}	–40	85	°C
Laser Diode Chip Temperature	TLD	—	30	°C
dc Forward Drive Current	I_F	—	450	mA
Optical Output Power	P_O	—	150	mW
Laser Reverse Voltage	V_R	—	2	V
TEC Current	I_{TEC}	—	1.5	A
Monitor Reverse Bias	V_{RMON}	—	10	V
Temperature Sensor Current	I_{TS}	—	5	mA
Laser Diode Chip Temperature	T_{LD}	—	30	°C

Handling Precautions

Electrostatic Discharge

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).

Lucent employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 kΩ, capacitance = 100 pF) is widely used and, therefore, can be used for comparison purposes. The HBM ESD withstand voltage established for the 263-Type Pump Laser Module is ±500 V.

Electrical/Optical Characteristics

Measured at 25 °C laser temperature.

Table 1. Electrical/Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Center Wavelength*	λC	975	980	985	nm
RMS Spectral Width*	Δλ	—	1.0	2.0	nm
Power in Wavelength Band (% between 970 nm and 990 nm)	—	90	99	—	%
Operating Optical Output Power:	P_O				
263CN		60	—	—	mW
263DN		70	—	—	mW
263EN		80	—	—	mW
263FN		90	—	—	mW
263GN		100	—	—	mW
263HN		110	—	—	mW
263JN		120	—	—	mW
263KN		130	—	—	mW
263LN		140	—	—	mW
263MN		150	—	—	mW
Threshold Current	I_{TH}	—	30	45	mA
Operating Laser Forward Current†:	$I_{F, OP}$				
263CN		—	150	225	mA
263DN		—	150	225	mA
263EN		—	170	240	mA
263FN		—	190	250	mA
263GN		—	210	275	mA
263HN		—	230	275	mA
263JN		—	260	350	mA
263KN		—	285	375	mA
263LN		—	310	385	mA
263MN		—	325	400	mA
Operating Laser Forward Voltage:	$V_{F, OP}$				
263C—263H		—	2.0	2.5	V
263J		—	—	2.7	V
263K		—	—	2.8	V
263L		—	—	2.9	V
263M		—	—	3.0	V
Monitor Current at $I_{F, OP}$‡	I_{RMON}	200	—	4000	μA
Monitor Dark Current @ I_F = 0 and V_{RMON} = 5.0 V	I_D	—	0.01	0.1	μA
Kink-free Operation:					
$I_{OP} \leq$ 120 mW	—	1.2 I_{OP}	—	—	mW
I_{OP} > 120 mW	—	1.1 I_{OP}	—	—	mW

* Measurements are performed at I_F, with >50 dB optical return loss from the fiber front end.
† The maximum operating laser forward current at the beginning of life (BOL) is provided with each device. End of life (EOL) is defined as 1.2 times BOL value.
‡ This range is inclusive of all codes. Within a given power level, the ratio of $I_{RMON(MAX)}$ to $I_{RMON(MIN)}$ will be ≤10:1.

Electrical/Optical Characteristics (continued)

Table 1. Electrical/Optical Characteristics (continued)

Parameter	Symbol	Min	Typ	Max	Unit
TEC Capacity*, †	ΔT	45	—	—	°C
TEC Current @ ΔT = 45 °C, $I_{F, OP}$	I_{TEC}	—	0.9	1.2	A
TEC Voltage @ ΔT = 45 °C, $I_{F, OP}$	V_{TEC}	—	2.0	2.5	V
Thermistor Resistance @ 25 °C	Rth	9.5	—	10.5	kπ
Thermistor Constants‡	A	—	1.130	—	10^{-3}
	B	—	2.341	—	10^{-4}
	C	—	0.876	—	10^{-7}
Spectrum Stability (over one minute)	$\Delta\lambda_{PT}$	—	—	0.5	nm
Output Power Stability (over one minute)	ΔP_{OT}	—	—	0.5	% of P_O

* ΔT is defined as the difference between the case temperature and the laser temperature.
† The device is available at a minimum TEC capacity (ΔT) of 45 °C. Please contact your Lucent Technologies sales representative to discuss a higher ΔT.
‡ The relationship between resistance and temperature (degrees Kelvin) is $1/T = A + B (\ln R) + C (\ln R)^3$.

Qualification Testing

The 263-Type Pump Laser has successfully passed the following qualification tests. Along with previous qualification testing done on the package, the device meets the intention of Bellcore TR-NWT-000468.

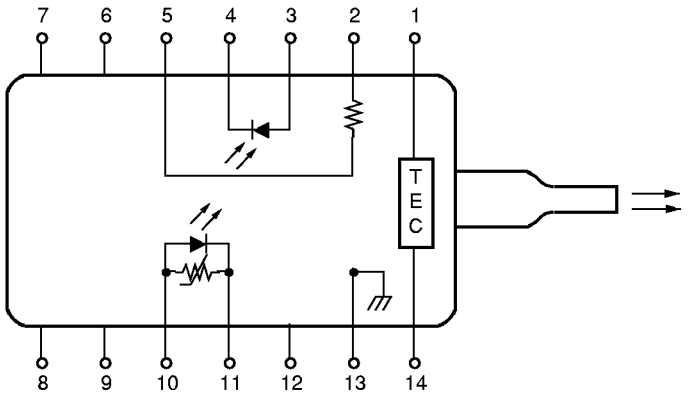
Test	Conditions	Sample Size	# Passed
Vibration	20 Hz—2000 Hz, 20 g	5	5
Shock	1500 g, 0.5 ms, 5 blows each axis	5	5
Temperature Cycling	–40 °C to +85 °C, 100 cycles	5	5
Thermal Shock	–15 °C to +85 °C, 15 cycles	5	5
Fiber Pull	1 kg, 3 cycles	5	5
High-temperature Bake	85 °C, unbiased	10	10

User Information

Pin Number	Connection*
1	TE Cooler (+)
2	Thermistor
3	Monitor Anode (–Bias)
4	Monitor Cathode (+Bias)
5	Thermistor
6	No Connect
7	No Connect
8	No Connect
9	No Connect
10	Laser Anode (+), Surge Protection Varistor
11	Laser Cathode (–), Surge Protection Varistor
12	No Connect
13	Package Ground
14	TEC Cooler (–)

* Other pin configurations available. Contact your local Lucent Sales Office for additional information.

User Information (continued)



1-675.a

Figure 1. Schematic

Mounting and Connections

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Proper precautions should be taken during both handling and testing.

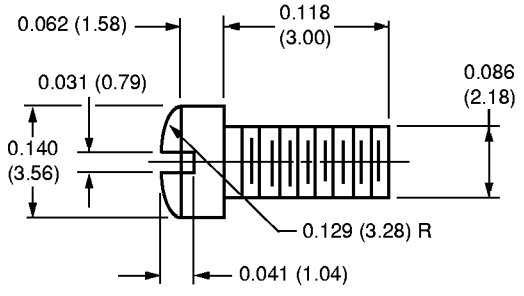
The base of the laser module (see Outline Diagram) should be maintained at or below 70 °C (maximum) during operation. Interfaces between the laser module base and heat sink must be clean, and the use of a thermal filler may be necessary.

Mounting Instructions

The minimum fiber bend radius is 0.5 in.

To avoid degradation in performance, mount the module on the board as follows:

1. Place the bottom flange of the module on a flat heat sink at least 0.5 in. x 1.180 in. (12.7 mm x 30 mm) in size. The surface finish of the heat sink should be better than 32 μin. (0.8 μm), and the surface flatness must be better than 0.001 in. (25.4 μm). Using thermal conductive grease is optional; however, thermal performance may be improved if conductive grease is applied between the bottom flange and the heat sink.
2. Mount four #2-56 screws with Fillister heads (M2-3 mm) at the four screw hole locations (see Outline Diagram). The Fillister head diameter must not exceed 0.140 in. (3.55 mm). Do not apply more than 1 in./lb. of torque to the screws.



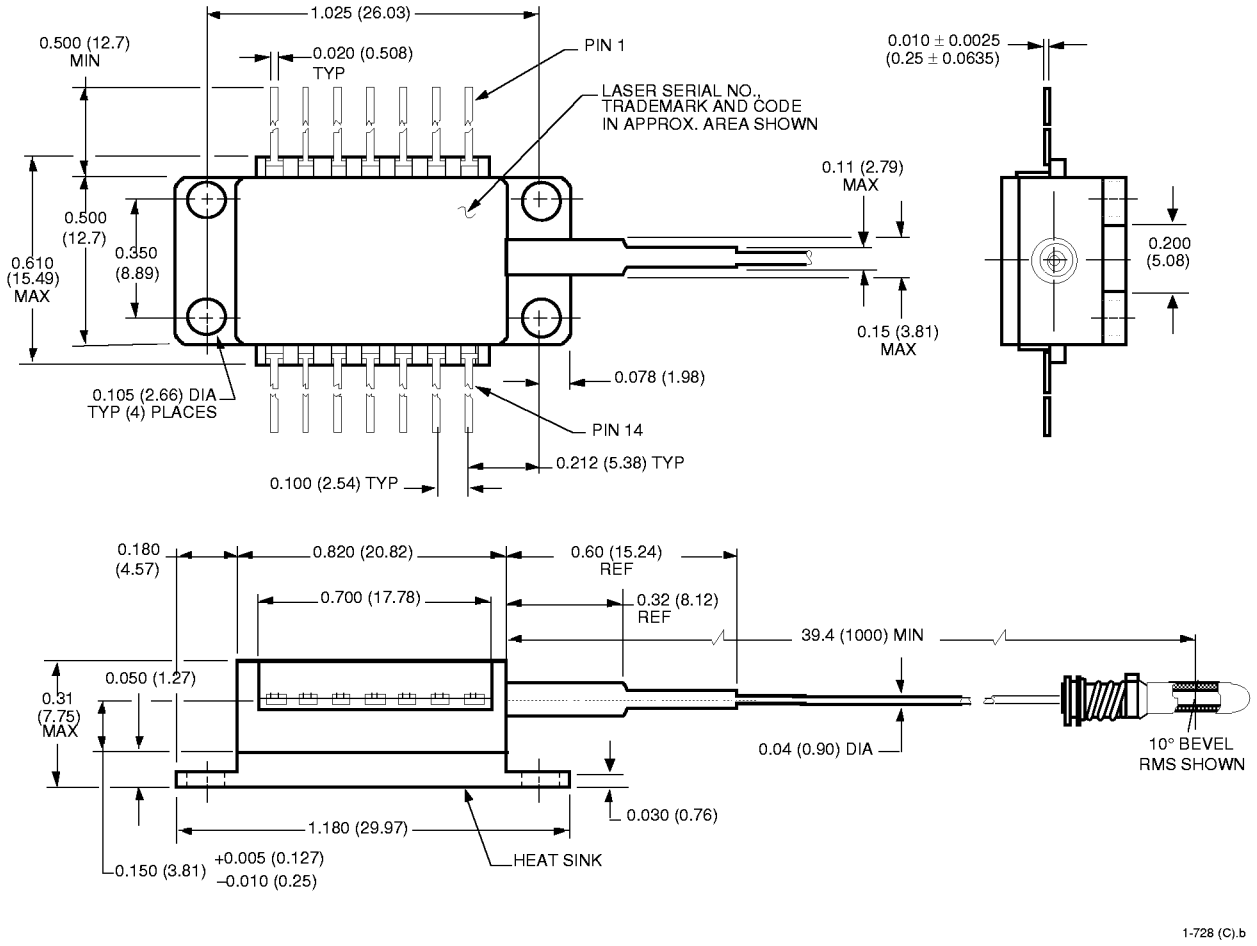
Note: Dimensions are in inches and (millimeters).

1-532

Figure 2. Fillister Head Screw

Outline Diagram

Dimensions are in inches and (millimeters)

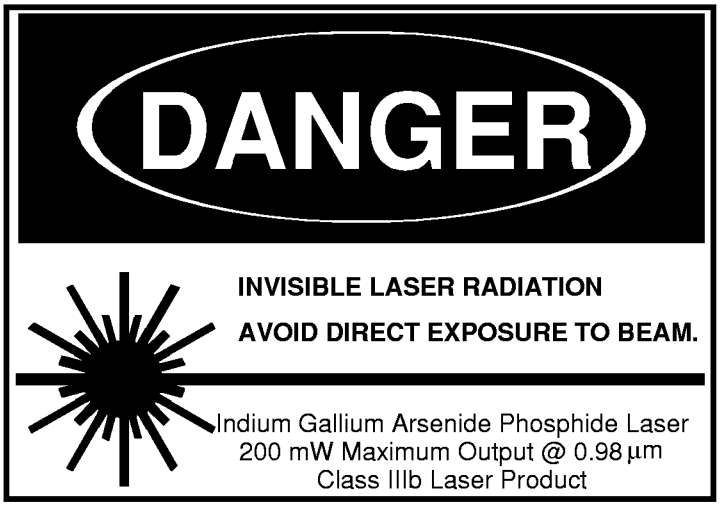


Laser Safety Information

Class IIIb Laser Product

This product complies with 21 CFR 1040.10 and 1040.11.
Single-mode connector
Wavelength = 0.98 μm
Maximum power = 200 mW
Because of size constraints, 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.



DANGER
INVISIBLE RADIATION IS EMITTED FROM THE END OF THE FIBER OR CONNECTOR. AVOID DIRECT EXPOSURE TO THE BEAM. DO NOT VIEW WITH OPTICAL INSTRUMENTS.

Ordering Information

Table 2. Ordering Information

Device Code	Output Power	Comcode
263CN	60 mW	108218769
263DN	70 mW	108027855
263EN	80 mW	108187741
263FN	90 mW	108027863
263GN	100 mW	108179383
263HN	110 mW	108179425
263JN	120 mW	108002239
263KN	130 mW	108027871
263LN	140 mW	108200593
263MN	150 mW	108027848

Note: The standard connector is a low-reflection, 10° beveled rotary connector.

Table 3. Related Product Information

Description	Part Number	Document Number
1.3 μm Digital Isolated DFB Laser Module	D2300-Type	DS97-122LWP
1.5 μm Digital Isolated DFB Laser Module	D2500-Type	DS97-116LWP
Lithium Niobate High-Speed Electro-Optic Modulator	—	DS96-135LWP
1.48 μm Pump Laser Module—Ultrahigh Reliability	248-Type	DS92-212LWP
1.5 μm Erbium-Doped Fiber Amplifier	1712-Type	DS96-086LWP
1.5 μm EDFA (Optional Gain Block)	1718-Type	DS95-233LWP
1.5 μm EDFA Optical Amplifier for Video Applications	1720-Type	DS97-002LWP
1480 nm Erbium-Doped Fiber Amplifier	1713-Type	DS96-134LWP
High-Speed Lightwave Receiver	1319-Type	DS97-106LWP

Table 4. Related Literature

Description	Document Number
Laser Safety and Lucent Technologies Optical-Fiber Communication Systems	TN95-011LWP
Cleaning Fiber-Optic Assemblies	TN95-010LWP

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

INTERNET: **http://www.lucent.com/micro**, or for Optoelectronics information, **http://www.lucent.com/micro/opto**
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: OPTOELECTRONICS MARKETING: **(44) 1344 865 900** (Bracknell UK)

April 1998
DS98-207LWP (Replaces DS97-284LWP)

Printed On
Recycled Paper

microelectronics group
Lucent Technologies
Bell Labs Innovations