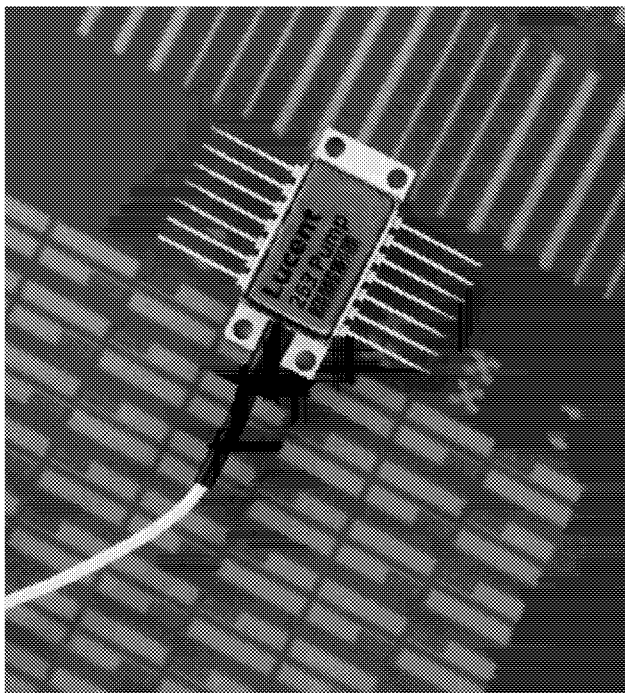


263-Type 0.98 μm Pump Laser Module with Fiber Grating



Offering superior wavelength stability, the 263-Type Laser Modules with Fiber Grating 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)
- Fiber grating for wavelength stability
- 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 Pump Laser Module with Fiber Grating is a family of thermoelectrically cooled, high-power laser modules for erbium-doped fiber amplifier (EDFA) fiber-amplifier applications. The devices incorporate a fiber Bragg grating to achieve a stable wavelength performance between 975 nm and 985 nm over the full operating temperature range. They are designed exclusively as continuous wave (CW) optical pump sources for dense wavelength-division multiplexing (DWDM) EDFA systems operating at 1.5 μm wavelengths. The 263-Type grating-stabilized pump laser modules are also particularly suitable for use in EDFA designs requiring double pumping at slightly different wavelengths.

The 263-Type Pump Laser Module with Fiber Grating is physically and electrically identical to the standard 263-Pump Laser Module, differing only in the use of an external fiber Bragg grating to stabilize the operating wavelength. The laser optical spectrum is locked by the fiber grating and thereby occurs in the center of the absorption region of erbium-doped fiber. The center wavelength peak of the optical spectrum is very narrow and insensitive to temperature variations and back reflections.

The laser modules feature a high-power, quantum-well laser chip that exhibits grating-stabilized optical powers ranging from 70 mW to 150 mW.

Please contact your Lucent Technologies Microelectronics Group sales representative to discuss optical powers higher than 150 mW.

Description (continued)

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 $-20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$. 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 Module with Fiber Grating is offered in a 14-pin, hermetic butterfly package. The fiber pigtail is a *Flexcor** 1060-type 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 out to the point where the fiber grating is spliced onto the pigtail. The fiber with the grating is spliced onto the pigtail and the spliced area is recoated with acrylite to provide strength and

protection. The recoated splice and remaining fiber is enclosed in a 900 μm loose-tube PVC jacket. The standard connector is a low-reflection, 10-degree beveled, 2.5 mm ceramic ferrule.

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).

* *Flexcor* is a registered trademark of Corning Incorporated.

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	$^{\circ}\text{C}$
Storage Case Temperature Range	T_{stg}	-40	85	$^{\circ}\text{C}$
Laser Diode Chip Temperature	TLD	—	30	$^{\circ}\text{C}$
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	TLD	—	30	$^{\circ}\text{C}$

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 k Ω , 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 $\pm 500\text{ V}$.

Electrical/Optical Characteristics

Measured at 25 °C laser temperature.

Table 1. Electrical/Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Center Wavelength ^{1, 2, 3}	λ_c	975	979	985	nm
RMS Spectral Width ¹	$\Delta\lambda$	—	—	1.0	nm
Power in Wavelength Band (% between 970 nm and 990 nm)	—	90	99	—	%
Operating Optical Output Power:	P_o				
263CNG		60	—	—	mW
263DNG		70	—	—	mW
263ENG		80	—	—	mW
263FNG		90	—	—	mW
263GNG		100	—	—	mW
263HNG		110	—	—	mW
263JNG		120	—	—	mW
263KNG		130	—	—	mW
263LNG		140	—	—	mW
263MNG		150	—	—	mW
Threshold Current	I_{TH}	—	30	45	mA
Operating Laser Forward Current ⁴ :	$I_{F, OP}$				
263CNG		—	150	210	mA
263DNG		—	150	225	mA
263ENG		—	170	225	mA
263FNG		—	190	250	mA
263GNG		—	210	275	mA
263HNG		—	230	275	mA
263JNG		—	260	350	mA
263KNG		—	285	375	mA
263LNG		—	310	385	mA
263MNG		—	325	400	mA
Operating Laser Forward Voltage:	$V_{F, OP}$				
263CNG—263HNG		—	2.0	2.5	V
263JNG		—	—	2.7	V
263KNG		—	—	2.8	V
263LNG		—	—	2.9	V
263MNG		—	—	3.0	V
Monitor Current at $I_{F, OP}$ ⁵	I_{RMON}	200	—	5000	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

1. Measurements are performed at I_F with >50 dB optical return loss from the fiber front end.

2. With grating at 25 °C. $\Delta\lambda_{C(MAX)}$ vs. T (°C) = 0.020 nm/°C.

3. Other wavelengths are available on special order. Contact your Lucent Technologies account manager for more information.

4. 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.

5. This range is inclusive of all codes. Within a given power level, the ratio of $I_{RMON(MAX)}$ to $I_{RMON(MIN)}$ will be $\leq 10:1$.

Electrical/Optical Characteristics (continued)

Table 1. Electrical/Optical Characteristics (continued)

Parameter	Symbol	Min	Typ	Max	Unit
TEC Capacity ^{*, †}	ΔT	45	—	—	$^{\circ}\text{C}$
TEC Current @ $\Delta T = 45\text{ }^{\circ}\text{C}$, $I_{F,OP}$	I_{TEC}	—	0.9	1.2	A
TEC Voltage @ $\Delta T = 45\text{ }^{\circ}\text{C}$, $I_{F,OP}$	V_{TEC}	—	2.0	2.5	V
Thermistor Resistance @ $25\text{ }^{\circ}\text{C}$	R_{th}	9.5	—	10.5	$\text{k}\Omega$
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 $45\text{ }^{\circ}\text{C}$. 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.

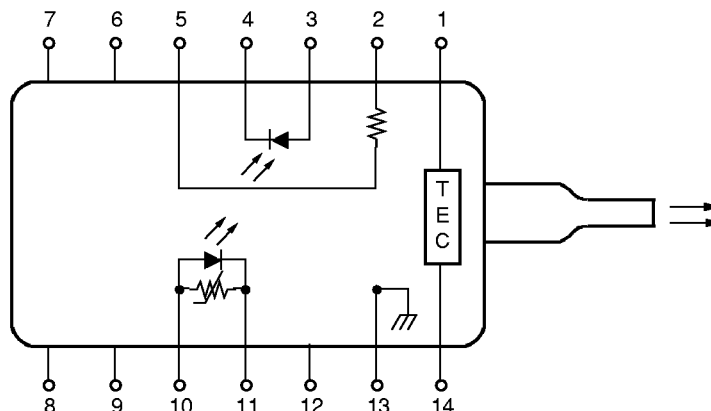
Test	Conditions	Sample Size	# Passed
Vibration	20 Hz—2000 Hz, 20 g	5	5
Shock	1500 g, 0.5 ms, 5 blows each axis	5	5
Temperature Cycling	$-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$, 100 cycles	5	5
Thermal Shock	$-15\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$, 15 cycles	5	5
Fiber Pull	1 kg, 3 cycles	5	5
High-temperature Bake	$85\text{ }^{\circ}\text{C}$, 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.

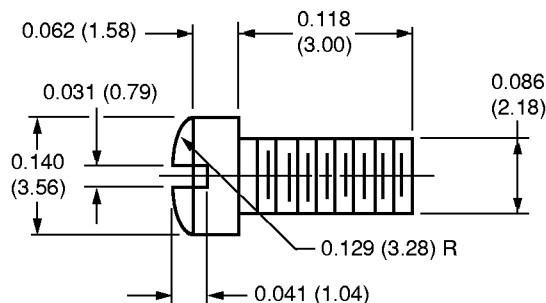
The base of the laser module (see Outline Diagram) should be maintained at or below 70 °C (maximum) during operation. Interfaces between the laser module base and heat sink must be clean, and the use of a thermal filler may be necessary.

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 μm . (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

Laser Safety Information

Class IIIb Laser Product

This product complies with 21 CFR 1040.10 and 1040.11.

Single-mode connector

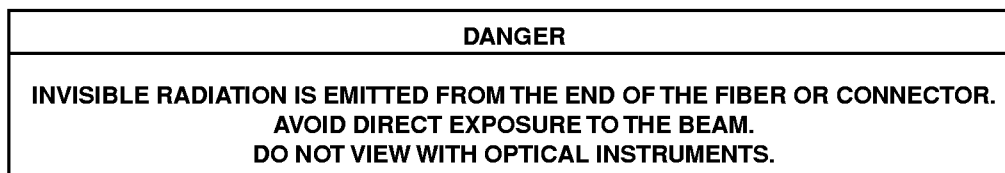
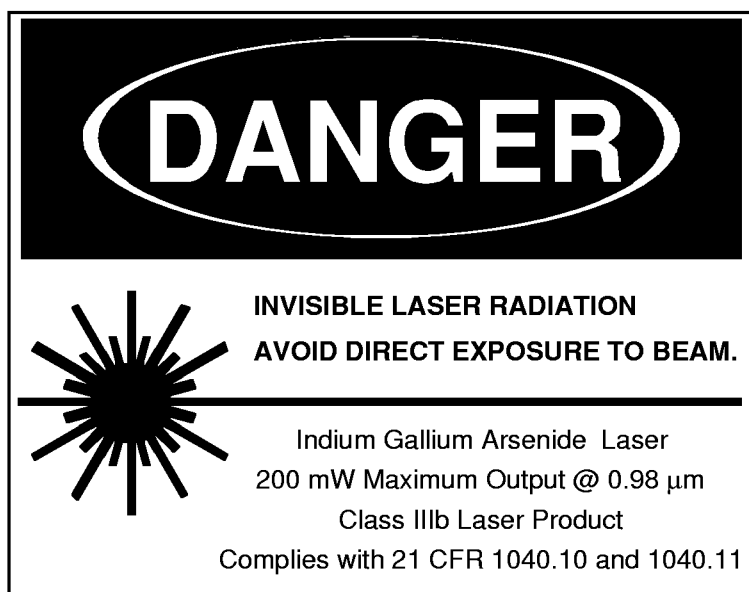
Wavelength = 0.98 μm

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.



Ordering Information

Table 2. Ordering Information

Device Code	Output Power	Comcode
263DNG	70 mW	108368911
263ENG	80 mW	108368929
263FNG	90 mW	108368937
263GNG	100 mW	108368945
263HNG	110 mW	108368952
263JNG	120 mW	108368960
263KNG	130 mW	108368978
263LNG	140 mW	108368986
263MNG	150 mW	108368994

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
10 Gbits/s and 20 Gbits/s Lithium Niobate SLIM-PAC Electro-Optic Modulator	—	DS98-110LWP
1.48 μm Pump Laser Module—Ultrahigh Reliability	248-Type	DS92-212LWP
Optical Amplifier Platform—Erbium-Doped Fiber Amplifier	1724-Type	DS98-412LWP
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:

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