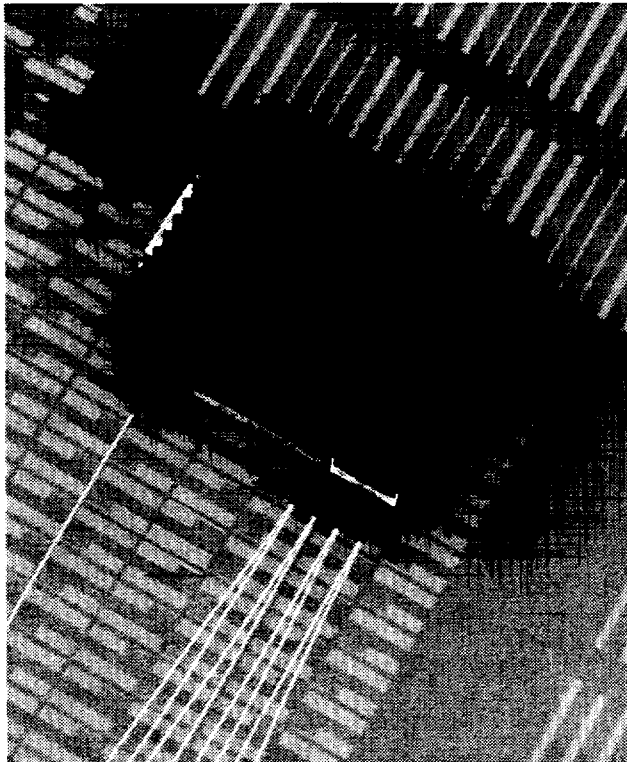




Optical Amplifier for Video Applications 1724-Type Erbium-Doped Fiber Amplifier



The 1724-Type EDFA incorporates a standard DB-25 electrical connector, an integral heat sink, and SC/APC optical connectors.

Features

- High saturation output power (up to 22 dBm)
- Low power consumption
- Low noise (<5.5 dB maximum)
- Single +5 V operation
- Wide input-signal bandwidth
- Wide operating temperature range:
0 °C to 65 °C
- Optical input and output taps
- Isolated input and output

- TTL-compatible alarm outputs:
 - Loss of input power
 - Loss of output power
 - Pump bias alarm
 - Pump temperature alarm
- Connectorized SM fiber pigtail
- Standard serial communication channel
- Gain flattened models available for WDM digital applications over the range of 1530 nm—1560 nm

Applications

- CATV and analog communication systems
- Power booster
- Line amplifier

Description

The 1724-Type Erbium-Doped Fiber Amplifier (EDFA) has been designed for use in analog applications. It operates over a wide temperature range, exhibits extremely low power dissipation, and offers a variety of alarms and monitors. The module is available with a standard DB-25 electrical connector, integral heat sink, and SC/APC optical connectors. Optimum performance and system stability are aided through the use of optical isolation at the input and output. Reflections from unmatched optical connections in the system do not affect the performance of the amplifier. Optical input and output are through single-mode fiber pigtails terminated with optical connectors.

The EDFA incorporates optical input and output taps that are monitored via an integral microcontroller. The microcontroller stabilizes the temperature of the pumps and maintains constant optical output power.

Description (continued)

Contact your Lucent Technologies Microelectronics Group Account Manager to discuss electrical or optical connector options not listed in the Ordering Information section.

TTL-Compatible Alarm Outputs

Loss of Input Power Alarm

If the input decreases to less than -2 dBm, the loss of input power alarm (pin 19) output will activate (TTL-logic 1).

Loss of Output Power Alarm

If the output power decreases by more than 2 dB from its beginning-of-life value, the loss of output power alarm (pin 8) will activate (TTL-logic 1).

Pumps Temperature Alarm

If the laser temperature for the pumps exceeds 35 °C, the pump temperature alarm (pin 10) output will activate (TTL-logic 1).

Pumps Bias Alarm

If the bias current for the pumps exceeds 95% of its EOL value, the pump bias alarm (pin 9) output will activate (TTL-logic 1).

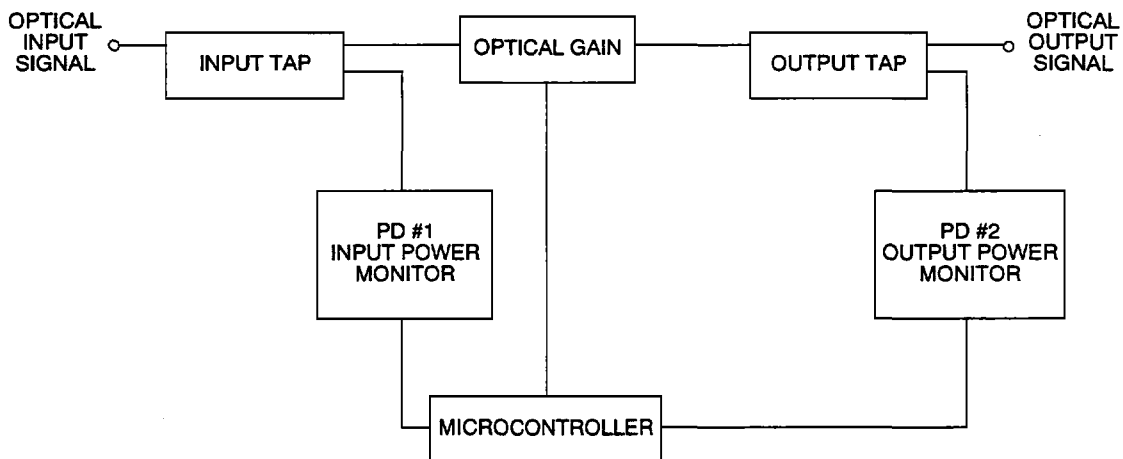
EDFA Temperature Alarm

If the case temperature exceeds 60 °C, then the EDFA temperature alarm (pin 7) output will activate (TTL-logic 1).

Standard Features

The standard 1724-Type EDFA incorporates the optical architecture illustrated in Figure 1. The standard features include:

- Integral heat sink and DB-25 electrical connector
- Optical input tap
- Optical output tap
- SC/APC optical connector
- Alarms:
 - Loss of input power alarm ($P_{IN} < -2$ dBm)
 - Loss of output power alarm ($P_O < P_{O, BOL} - 2$ dB)
 - Pump bias alarm ($>95\%$ of EOL value)
 - Pump temperature alarm ($T_L > 35$ °C)
 - EDFA temperature alarm ($T_C > 60$ °C)



1-904 (C)

Figure 1. Block Diagram for 1724-Type EDFA

Optional Features

Other feature and package options for the 1724-Type EDFA include:

- Multiple optical outputs available:
 - 4x + 16 dBm
 - 8x + 13 dBm

- Loss of input signal shutdown (disables bias current to the pump(s) when the input signal falls below a predesignated value)
- Alternative pin designations
- Without integral heat sink and with DB-25 electrical connector

Pin Information

Table 1. Pin Descriptions

Pin	Description	Pin	Description
1	+5.0 V	14	GND
2	+5.0 V	15	GND
3	+5.0 V	16	GND
4	+5.0 V	17	GND
5	Reserved	18	RS-232 OUT (TTL)
6	Reserved	19	Loss of Input Power Alarm*†
7	EDFA Temperature Alarm*†	20	Reserved
8	Loss of Output Power Alarm*†	21	Amplifier Disable Input‡
9	Pumps Bias Alarm*†	22	RS-232 IN (TTL)
10	Pumps Temperature Alarm*†	23	Reserved
11	Reserved	24	+5.0 V
12	+5.0 V	25	GND
13	GND	—	—

* Custom alarms available upon request. Contact your Microelectronics Group Account Manager to discuss your requirements.

† The alarms operation TTL logic (see Electrical Characteristics). TTL LOW = normal operation, TTL HIGH = alarm condition.

‡ The disable feature operates on TTL logic (see Electrical Characteristics). TTL LOW = normal operation, TTL HIGH = pump(s) disabled.

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	Typ	Max	Unit
Storage Temperature	T _{stg}	-40	20	70	°C
Operating Case Temperature	T _c	0	35	65	°C
Absolute Humidity	—	—	—	0.024	lbs. H ₂ O/lbs. dry air

Electrical Characteristics

Table 2. Power Supply

Parameter	Symbol	Min	Typ*	Max	Unit
dc Power Supply Voltage	V _{PS1}	4.75	5.0	5.25	V
Power Supply Current (beginning of life):					
1724FBC	I _{PS1}	—	1.9	—	A
1724GBC	I _{PS1}	—	2.3	—	A
Power Supply Current (end of life):					
1724FBC	I _{PS1}	—	—	3.0	A
1724GBC	I _{PS1}	—	—	3.6	A
Electrical Power Consumption (beginning of life):					
1724FBC	—	—	9.3	—	W
1724GBC	—	—	11.4	—	W
Electrical Power Consumption (end of life):					
1724FBC	—	—	—	15.5	W
1724GBC	—	—	—	19.0	W

* Typical operating characteristics: V_{PS1} = 5.0 V, T_c = 35 °C.

Table 3. TTL Inputs/Outputs

Under normal operating conditions, the various alarm outputs will be TTL level, voltage output low. If the corresponding parameter is outside a predesignated range, the associated alarms will become TTL level, voltage output high.

Parameter	Symbol	Min	Typ	Max	Unit
Input Voltage:					
High	V _{IH}	2	—	—	V
Low	V _{IL}	—	—	0.8	V
Output Voltage:					
High	V _{OH}	2.4	—	—	V
Low	V _{OL}	0	0.1	0.4	V
Input Current:					
High	I _{IH}	—	—	-1	μA
Low	I _{IL}	—	—	1	μA
Output Current:					
High	I _{OH}	—	—	-4	mA
Low	I _{OL}	—	—	20	μA

Optical Characteristics

Table 4. Performance Specifications

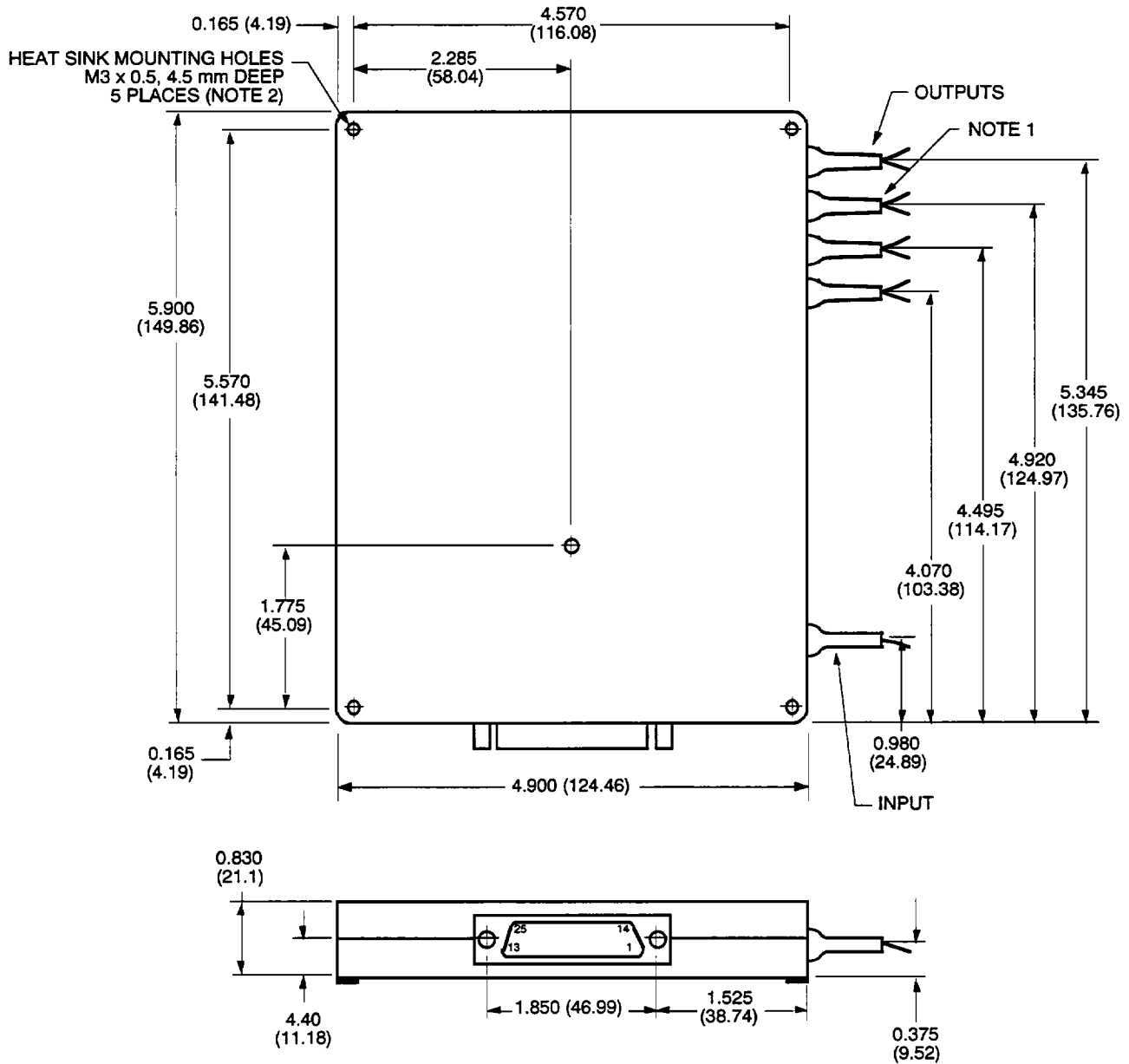
Parameter	Symbol	Min	Typ	Max	Unit
Signal Wavelength Range	λ_L	1540	—	1560	nm
Measurement Wavelength	λ_M	—	1550	—	nm
Input Signal Power	P_{IL}	0	—	10	dBm
Peak Output Power (at λ_M and $T_c = 35^\circ\text{C}$):					
1724FBC	P_o	21	—	—	dBm
1724GBC	P_o	22	—	—	dBm
Noise Figure at $P_{IL} = 0$ dBm	NF	—	—	5.5	dB
CSO	—	—	—	-70	dBc
CTB	—	—	—	-70	dBc
Return Loss	RL	40	—	—	dB
Relative Intensity Noise at $P_{IL} = +6$ dBm	RIN	—	—	-155	dB/Hz
Output Power Stability (over temperature, wavelength, and input power variations)	ΔP_o	—	± 0.5	—	dB

Note: Gain-flattened amplifiers available for WDM digital applications. Contact your local Lucent Field Applications Engineer for more information.

Outline Diagrams (continued)

1724 EDFA Without Integral Heat Sink and with DB-25 Electrical Connector

Dimensions are in inches and (millimeters).



1. Port used for single output.
2. 4-40 x 0.300 "special order."

Note: Laser safety information is on the side and bottom of unit.

1-794.e

Laser Safety Information

Class IIIb Laser Product

This product complies with 21 CFR 1040.10 and 1040.11.

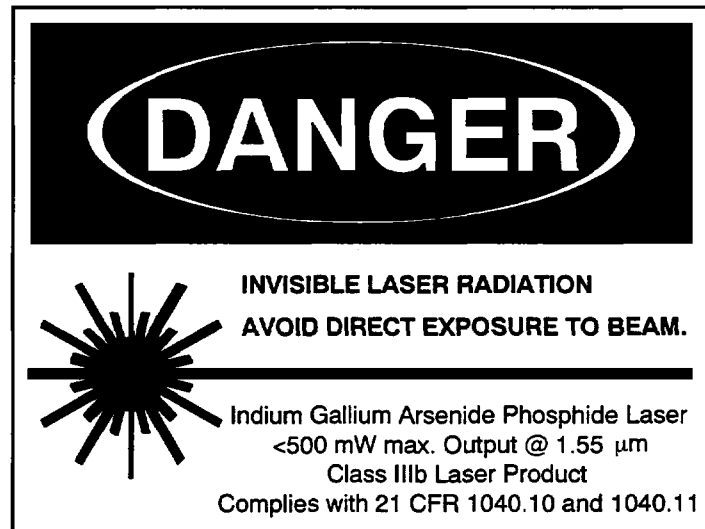
Single-mode connector

Wavelength = 1.55 μm

Maximum power <500 mW

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 laser radiation is emitted from
the end of the fiber or connector.
AVOID DIRECT EXPOSURE TO BEAM.
Do not view with optical instruments.**

Ordering Information

Table 5. Ordering Information*

Device Code	Connector	Po	Comcode
X1724FBC	SC/APC	+21.0	107954075
X1724GBC	SC/APC	+22.0	107954067

* The 1724-Type EDFA is also available:

- With multiple optical outputs.
- Without integral heat sink and with DB-25 electrical connector.

Note: Contact your Account Manager to discuss your requirements. (If you do not know your Account Manager, please call Microelectronics Group, Optoelectronics Unit, directly at (610) 391-2520.)

Table 6. Coding Information

Example: X1724XXX

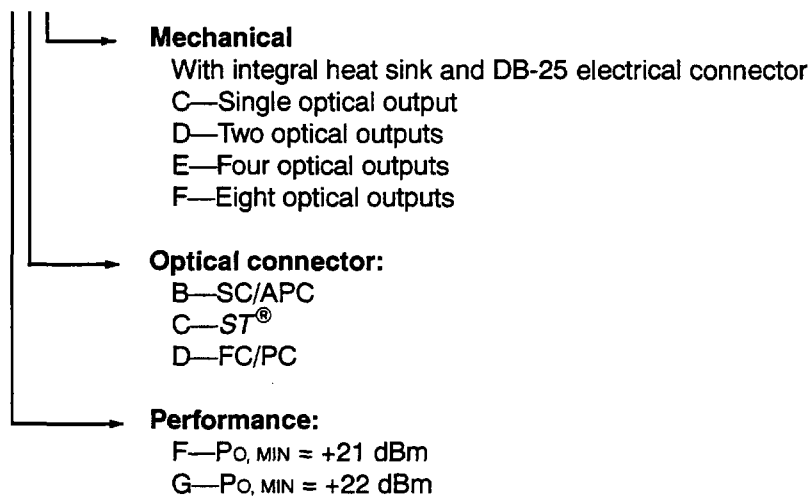


Table 7. Related Product Information

Description	Part Number	Document Number
High-Speed Lightwave Receiver	1319-Type	DS97-106LWP
1.5 μ m EDFA (980 nm pump(s))	1712-Type	DS96-086LWP
1.5 μ m EDFA (1480 nm pump(s))	1713-Type	DS96-134LWP
1.5 μ m EDFA (Optical Gain Block)	1718-Type	DS95-233LWP
1.5 μ m EDFA Optical Amplifier for Video Applications	1720-Type	DS97-002LWP
Lithium Niobate Modulator	—	DS96-135LWP
1.5 μ m Isolated DFB Laser Module	DS2500-Type	DS97-114LWP
1.3 μ m Isolated DFB Laser Module	DS2300-Type	DS97-122LWP
0.98 μ m Pump Laser Module	263-Type	DS98-207LWP
Long-Wavelength PIN Photodetectors	131-Type	DS98-206LWP

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

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