

## Optical Amplifier Platform, 1724-Type Erbium-Doped Fiber Amplifier (W Series)

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Designed for use in DWDM applications, the standard W1724-Type EDFA incorporates a DB-25 connector and a microcontroller with TTL compatible alarm monitoring.

### Features

- Gain-flattened spectral response
- High saturation output power, > 22 dBm
- Low power consumption, < 12 W @ 45 °C
- Low noise
- 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
- Programmable input and output monitors
- Connectorized single-mode fiber pigtail
- Standard serial communication channels

### Applications

- Designed specifically for DWDM applications
- Booster/power amplifier
- Line amplifier

### Description

The W1724-Type Erbium-Doped Fiber Amplifier (EDFA) has been designed for use in DWDM applications and offers the following performance features:

- Flat gain profile over a wide temperature range
- Low noise figure
- High output power
- Automatic gain lock

The versatile W1724-Type EDFA operates over a wide temperature range, exhibits extremely low power dissipation, and offers a variety of alarms and monitors. Optimum performance and system stability are supported through the use of optical isolation at the input and output. Optical input and output are through single-mode fiber pigtailed terminated with optical connectors.

The EDFA incorporates optical input and output taps that are monitored via an integral microcontroller. Significant performance benefits are achieved with the microcontroller, which stabilizes the temperature of the pumps and maintains constant gain of the amplifier.

Contact your Account Manager at Agere Systems Inc. to discuss electrical or optical connector options not listed in the Ordering Information section.

## Standard Features

The standard W1724-Type EDFA incorporates the optical architecture illustrated in Figure 1. The standard features include:

- Exceptional performance benefits with the integral microcontroller, which precisely controls the gain to maintain a flat spectral response over various input powers.
- Single 5 V power supply eliminates the need for dual voltage source circuits.
- DB-25 electrical connector allows for easy electrical connectivity.
- Optical input tap enables input monitoring and control.
- SC/PC optical connector.
- Low power dissipation.
- Alarms:
  - Loss of input power alarm.
  - Loss of output power alarm.
  - Pump bias alarm (>95% of EOL value).
  - Pump temperature alarm ( $T_L > 35\text{ }^\circ\text{C}$ ).
  - EDFA temperature alarm ( $T_C > 60\text{ }^\circ\text{C}$ ).
- Advanced microprocessor design requires minimal engineering for a shelf-level product.
- Standard mechanical outline includes metric screws and fiber outputs (using SC/PC optical connectors) at 180 degrees relative to a DB25 electrical connector. The standard product does not include a heat sink.

## TTL-Compatible Alarm Outputs

### Loss of Input Power Alarm

If the input power is more than 2 dBm below the minimum  $P_{IN}$ , the loss of input power alarm (pin 19) 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 pump(s) exceeds  $35\text{ }^\circ\text{C}$ , the pump temperature alarm (pin 10) will activate (TTL-logic 1).

### Pumps Bias Alarm

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

### EDFA Temperature Alarm

If the case temperature exceeds  $60\text{ }^\circ\text{C}$ , then the EDFA temperature alarm (pin 7) will activate (TTL-logic 1).

## Optional Features

Other feature and package options for the W1724-Type EDFA include:

- Alternative optical connectors
- Integral heat sink

## Block Diagram

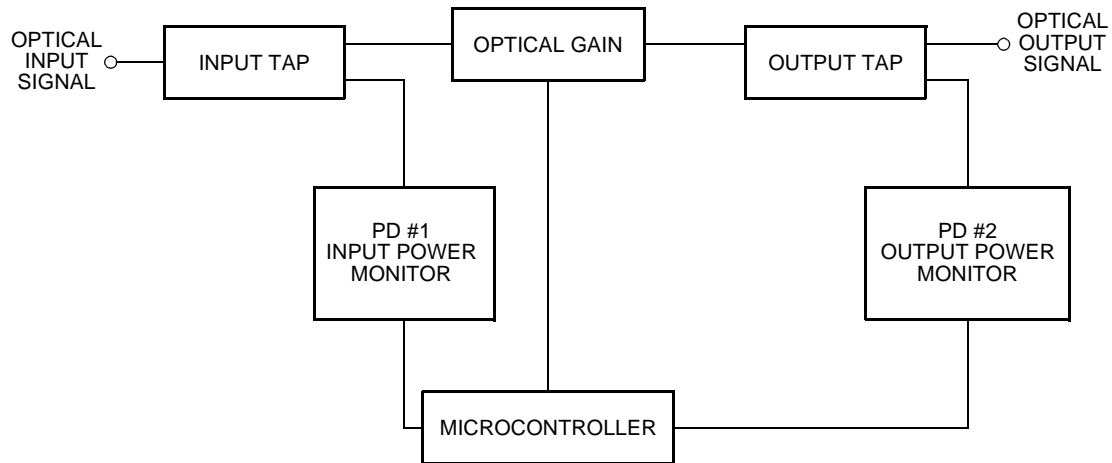


Figure 1. W1724-Type EDFA Block Diagram

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## Pin Information

Table 1. Pin Descriptions for a Microcontrolled (Full) Amplifier

Pin	Description	Pin	Description
1	5.0 V ( $\pm 0.25$ V)	14	GND
2	5.0 V ( $\pm 0.25$ V)	15	GND
3	5.0 V ( $\pm 0.25$ V)	16	GND
4	5.0 V ( $\pm 0.25$ V)	17	GND
5	Reserved <sup>1</sup>	18	RS-232 OUT (TTL)
6	Reserved <sup>1</sup>	19	Loss of Input Power Alarm <sup>6</sup>
7	EDFA Temperature Alarm	20	Reserved <sup>1</sup>
8	Loss of Output Power Alarm <sup>2</sup>	21	Amplifier Disable Input <sup>7</sup>
9	Pumps Bias Alarm <sup>3</sup>	22	RS-232 IN (TTL)
10	Pumps Temperature Alarm <sup>4</sup>	23	Reserved <sup>1</sup>
11	EDFA Shutdown Override <sup>5</sup>	24	5.0 V ( $\pm 0.25$ V)
12	5.0 V ( $\pm 0.25$ V)	25	GND
13	GND	—	—

1. Do not connect to reserved pins.

2. Normal = TTL low, alarm = TTL high if the output power falls 2 dB below the minimum value.

3. Normal = TTL low, alarm = TTL high if pump bias exceeds 95% of its end-of-life value.

4. Normal = TTL low, alarm = TTL high if pump temperature exceeds 35 °C.

5. The EDFA is equipped with an optical transient suppression feature when this pin is tied to GND. The EDFA will turn all pumps off, if the input power is too low. Tying this pin to 5 V will disable this feature; however, damage to the optical connectors and components may occur if the amplifier is turned on without the presence of an optical signal.

6. Normal = TTL low, alarm = TTL high if input power is less than 2 dB below minimum PIN.

7. Amplifier enable (all pumps are on) = TTL low, amplifier disable (all pumps are off) = TTL high.

## 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 <sub>stg</sub>	-40	20	70	°C
Operating Case Temperature	T <sub>C</sub>	0	35	65	°C
Absolute Humidity	—	—	—	0.024	lbs. H <sub>2</sub> O/lbs. dry air

## Electrical Characteristics

Table 2. Power Supply

Parameter	Symbol	Min	Typ*	Max	Unit
dc Power Supply Voltage	V <sub>PS1</sub>	4.75	5.0	5.25	V
Power Supply Current (beginning of life)	I <sub>PS1</sub>	—	1.0	—	A
Power Supply Current (end of life)	I <sub>PS1</sub>	—	—	1.9	A
Electrical Power Consumption (beginning of life)	—	—	5.0	—	W
Electrical Power Consumption (end of life)	—	—	—	10.0	W

\* Typical operating characteristics: V<sub>PS1</sub> = 5.0 V, T<sub>C</sub> = 35 °C.

Table 3. TTL Inputs/Outputs

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

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

## Optical Characteristics

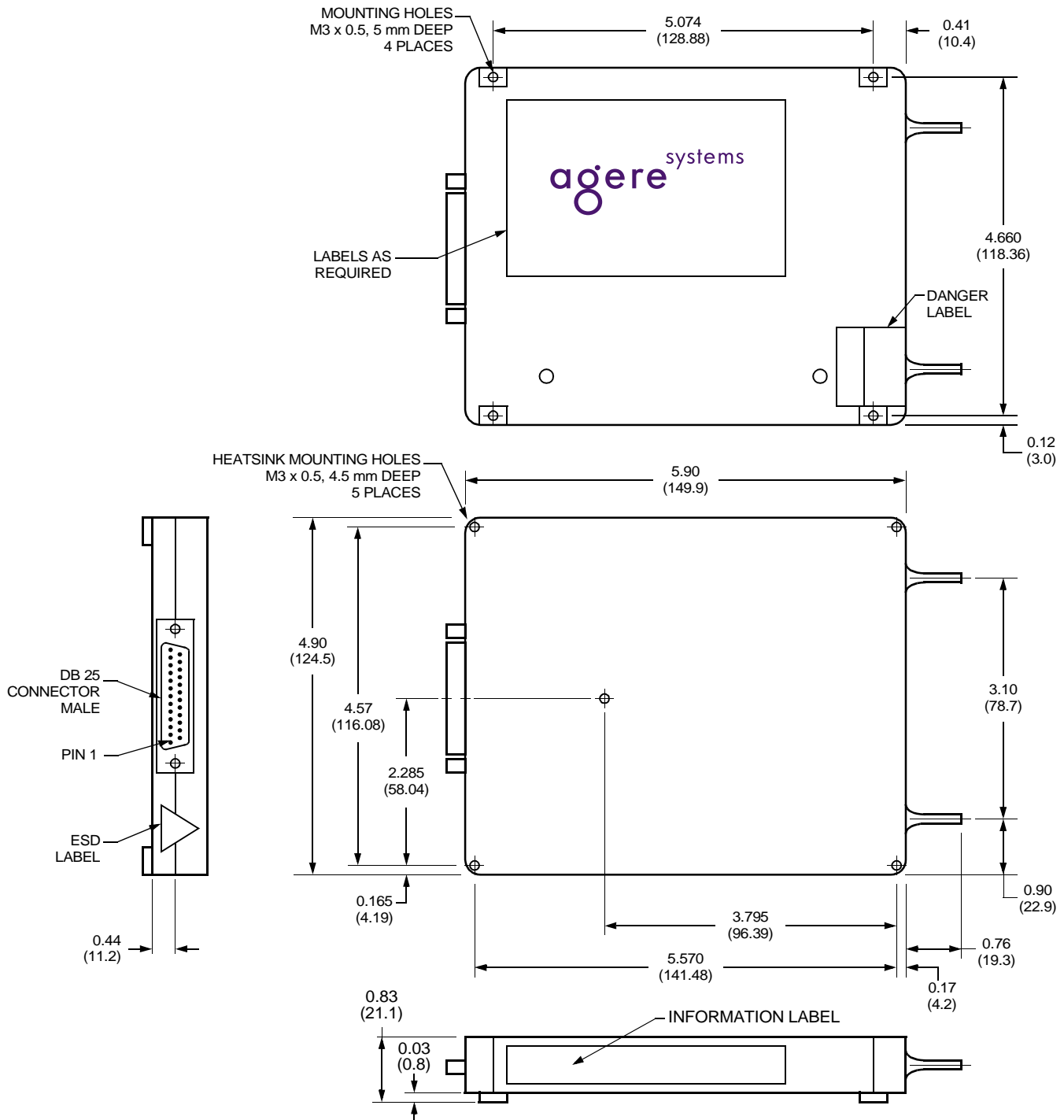
Table 4. Performance Specifications for W Series

Parameter	Symbol	Min	Typ	Max	Unit
Signal Wavelength Range: W1724CDDAD W1724CBBAD W1724CBBAH	$\lambda_L$	1530 1549.32 1549.32	— — —	1560 1560.61 1560.61	nm nm nm
Gain Flatness: W1724CDDAD W1724CBBAD W1724CBBAH	GF	— — —	1.3 — —	2.0 1.5 1.5	dB dB dB
Input Power: W1724CDDAD W1724CBBAD W1724CBBAH	P <sub>IL</sub>	-17 -20 -28	— — —	-8 -8 -16	dBm dBm dBm
Output Power: W1724CDDAD W1724CBBAD W1724CBBAH	P <sub>OUT</sub>	8 4.5 4.5	— — —	17 17.8 17.8	dBm dBm dBm
Noise Figure: W1724CDDAD W1724CBBAD W1724CBBAH	NF	— — —	5.0 — —	6.0 5.5 5.5	dB dB dB
Optical Isolation	—	25	—	—	dB
Return Loss	RL	—	—	-40	dB
Reverse ASE Power Level	P <sub>ASE,R</sub>	—	—	-20	dBm
Polarization-mode Dispersion	PMD	—	—	1.0	ps
Polarization-dependent Gain	PDG	—	—	0.5	dB

## Outline Drawings

### W1724-Type EDFA Package

Dimensions are in inches and (millimeters).

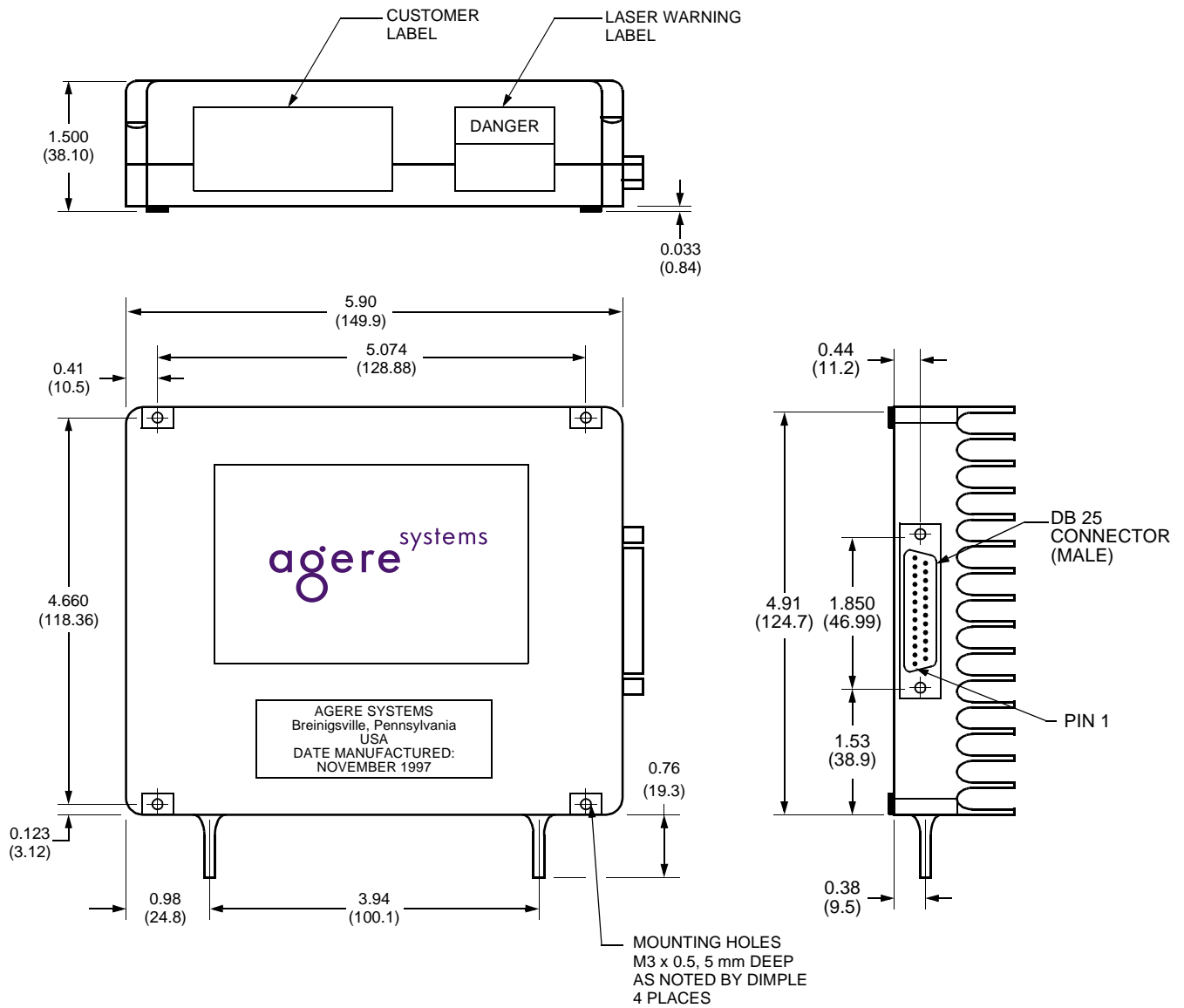


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**Outline Drawings** (continued)

**Optional Package Configuration: W1724-Type EDFA Package with Integral Heat Sink**

Dimensions are in inches and (millimeters).



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## Ordering Information

Table 5. Ordering Information\*

Device Code	Po	Connector	Heat Sink	Comcode
W1724CDDAD	17.0 dBm	FC/PC	Yes	108358433
W1724CBBAD	17.0 dBm	SC/PC	No	108338674
W1724CBBAH	17.0 dBm	SC/PC	No	108396102

\* Contact your Account Manager to discuss your requirements. (If you do not know your Account Manager, please call the Optoelectronics unit at Agere Systems directly at (610) 391-2520.)

## Related Product Information

Table 6. Related Product Information

Description	Part Number	Document Number
High-Speed Lightwave Receiver	1319-Type	DS97-106LWP
Lithium Niobate Modulator	—	DS98-110LWP
Electroabsorption Modulated Isolated Laser Module	E2500-Type	DS98-368LWP
1.5 $\mu\text{m}$ Isolated DFB Laser Module	D2500-Type	DS98-339LWP
1.3 $\mu\text{m}$ Isolated DFB Laser Module	D2300-Type	DS97-122LWP
0.98 $\mu\text{m}$ Pump Laser Module	263-Type	DS99-199LWP
Long-Wavelength PIN Photodetectors	131-Type	DS98-206LWP
Interfacing the 1724-Type Microprocessor-Controlled Erbium-Doped Fiber Amplifier via a Serial Communication Port	1724-Type	AP99-020LWP
1725-Type Gain Block Erbium-Doped Fiber Amplifier	1725	DS00-271LWP
Optical Amplifier Platform, 1730-Type Erbium-Doped Fiber Amplifier	S1730-Type	DS99-353LWP
Extended Band (L-Band) 1735-Type Gain Block Erbium-Doped Fiber Amplifier	1735-Type	DS00-113OPTO



## Laser Safety Information

FDA/CDRH Class IIIb and IEC® 60825 Class 3B laser product.

All versions of the product are FDA/CDRH Class IIIb laser products. The product complies with the U.S. Code of Federal Regulations (CFR), Title 21, Part 1040.10 and 1040.11 laser product regulations. The product is registered/certified with the FDA under accession number 9320325.

All versions are Class 3B laser products per IEC 60825-1:1993.

## Optical Specifications

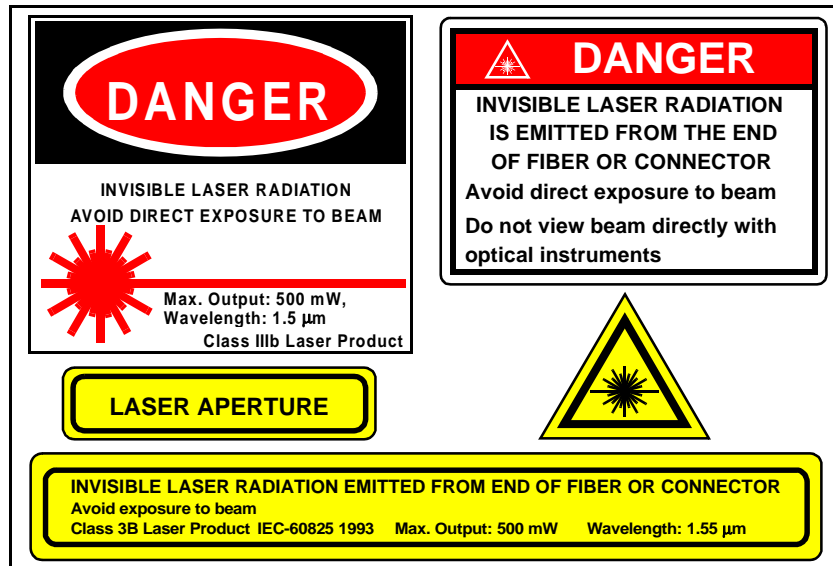
Optical fiber: single-mode, 8.8  $\mu\text{m}$ /125  $\mu\text{m}$  (mode field/cladding diameter) pigtail with connector.

Nominal wavelength: 1550 nm.

Absolute maximum output 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.**



*IEC* is a registered trademark of the International Electrotechnical Commission.

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