

## A1751A DWDM Analog Forward-Path or Return-Path Laser Modules



### Features

- Higher temperature rating
- Excellent linearity
- Standard ITU wavelengths
- Advanced analog chip design
- Tested for forward and return path applications
- Reduces equipment requirements in the hub
- Exceeds *Telcordia Technologies*\* 468 specification.

### Applications

- Node capability
- Narrow transmitter housing
- Networks with limited fiber
- Architectures using separate optical wavelengths to carry targeted services

### Description

The A1751A laser module is a dense wavelength-division multiplexing (DWDM) laser for analog applications. It features a distributed-feedback (DFB) chip that has been designed specifically for radio frequency (RF) applications. The A1751A laser module has a wide temperature range for reliable performance in harsh node environments and narrow transmitter designs. It also features low adiabatic chirp to maximize signal quality in short and long lengths of fiber. The laser's excellent inherent linearity minimizes degradation of the broadcast signals caused by the quadrature amplitude modulation (QAM) channels.

Wavelength-division multiplexing is being designed into cable television architectures. DWDM, a method for delivering targeted QAM signals to different locations, allows multiple signal sets to be combined onto a single strand of fiber for transmission from a head-end to a hub. At the hub, individual QAM signals can be selected and combined with broadcast analog channels. The versatile A1751A DWDM laser module reduces cable network architecture fiber needs and lessens equipment requirements in the hub.

The A1751A is available in a wide range of standard ITU wavelengths. The lasers are offered as either forward-path (40 MHz—860 MHz) or return-path (5 MHz—210 MHz) modules.

\* *Telcordia Technologies* is a trademark of Telcordia Technologies, Inc.

## 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	Tc	-40	85	°C
Storage Temperature Range	Tstg	-40	85	°C
Monitor Photodiode Reverse Voltage	VMPD	—	10	V
Laser Forward Current	IF	—	150	mA
Reverse Voltage (Laser)	VR	—	2	V
TEC Current	ITEC	—	1.7	A
RF Input Power	PRFIN	—	62	dBm V

\* The device can withstand continuous exposure to the specified limits without damage.

## Characteristics

Table 1. Key Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Frequency Range: <sup>1</sup> Return Path Forward Path	F	—	5 40	— —	210 860	MHz MHz MHz
Frequency Response: <sup>1</sup> 5 MHz—210 MHz 40 MHz—860 MHz	—	IF = 60 mA, TOP = 25 °C	— —	±0.5 ±0.5	— —	dB dB
RF Return Loss: <sup>1</sup> 5 MHz—210 MHz 40 MHz—860 MHz	RLRF	IF = 60 mA,	— —	>16 >16	— —	dB dB
Optical Output Power	PO	IF = IOP	6, 8, or 10	—	—	mW
Laser Relative Intensity Noise	RIN	IF = ITH + 70 mA, T = 25 °C	—	< -155	—	dB/Hz
Composite Second Order <sup>2, 3</sup>	CSO	IF = IOP, OMI = 10%	—	—	-50	dBc
Composite Triple Beat <sup>2, 4</sup>	CTB	IF = IOP, OMI = 10%	—	—	-60	dBc
Available Wavelengths	λ	IP = IOP, T = TOP	1527.94	—	1563.1	nm
Wavelength Drift <sup>5</sup>	λΔ	IF = 60 mA, T = TOP, Tc varied from min—>max	—	—	0.04	nm
Adiabatic Chirp	FM	IF = 60 mA, TOP = 25 °C, measured at 500 MHz	40	—	100	MHz/mA
Operating Case Temperature Range	Tc	IF = IOP	-40	—	85	°C

1. Tested in a 50 Ω resistively matched system.
2. Eight channel loading with 10% OMI and 40 km fiber length.
3. Measured at 42 MHz.
4. Measured at 553.25 MHz, 577.25 MHz, and 595.25 MHz.
5. Change in wavelength as case temperature is changed.

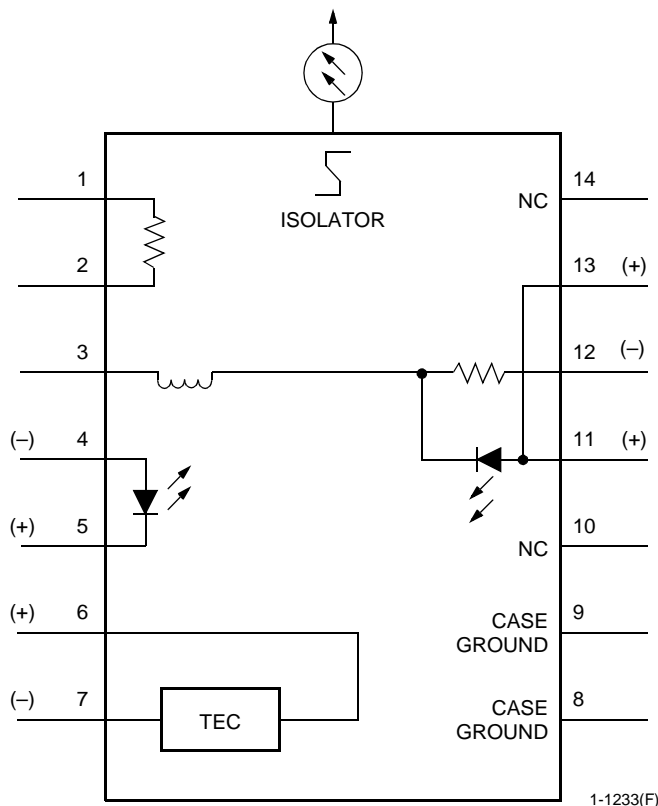
**Characteristics** (continued)

**Table 2. Additional Characteristics**

Parameter	Symbol	Conditions	Min	Max	Unit
Bias Current <sup>1</sup>	I <sub>B</sub>	BOL	—	120	mA
Threshold Current	I <sub>TH</sub>	25 °C, BOL	—	30	mA
Slope Efficiency <sup>2</sup>	η	I <sub>P</sub> = I <sub>TH</sub> + 20 and I <sub>TH</sub> + 60	0.10	—	mW/mA
Monitor Photocurrent	I <sub>MON</sub>	I <sub>OP</sub> = 0 mA, V <sub>RM</sub> = 5 V, T <sub>OP</sub> = 25 °C	10	200	μA/mW
Operating Chip Temperature <sup>3</sup>	T <sub>OP</sub>	I <sub>F</sub> = I <sub>OP</sub>	18	35	°C
TEC Current	I <sub>TEC</sub>	-40 °C < T <sub>C</sub> < 85 °C, T <sub>OP</sub> = 15 °C—35 °C, I <sub>F</sub> = 60 mA	-1.5	1.5	A
TEC Voltage	V <sub>TEC</sub>	T <sub>OP</sub> = 15 °C—35 °C over T <sub>C</sub>	-2.5	3.8	V
Thermistor Resistance	R <sub>TH</sub>	T <sub>OP</sub> = 25 °C	—	10.5	kΩ
Optical Return Loss	RL	T <sub>C</sub>	40	—	dB
Side Mode Suppression Ratio	SMSR	I <sub>F</sub> = I <sub>OP</sub>	30	—	dB

1. Bias point at which all specifications apply.
2. For 10 mW output power. Minimum slope efficiency is lower for lower-power lasers.
3. Chip temperature at which wavelength specification is met. Operating chip temperature is reported for each laser.

**Electrical Schematics**



**Figure 1. A1751A Laser Schematic**

Electrical Schematics (continued)

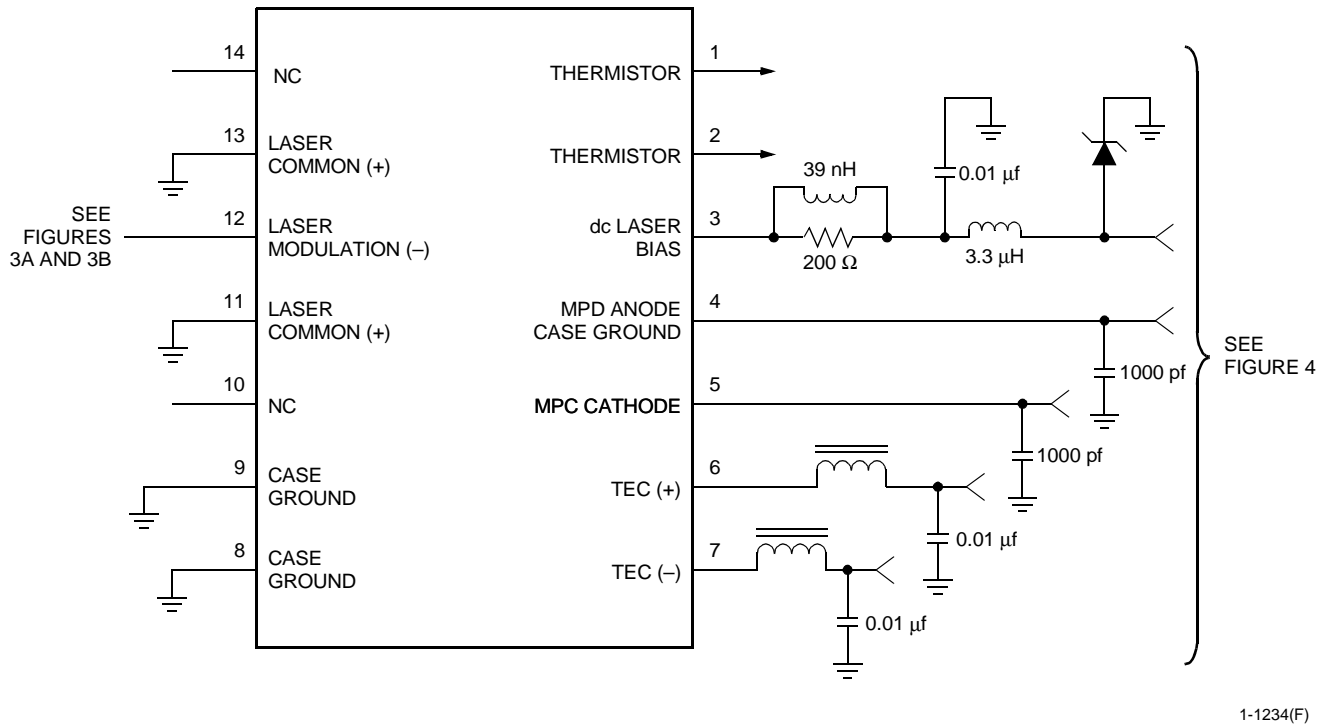
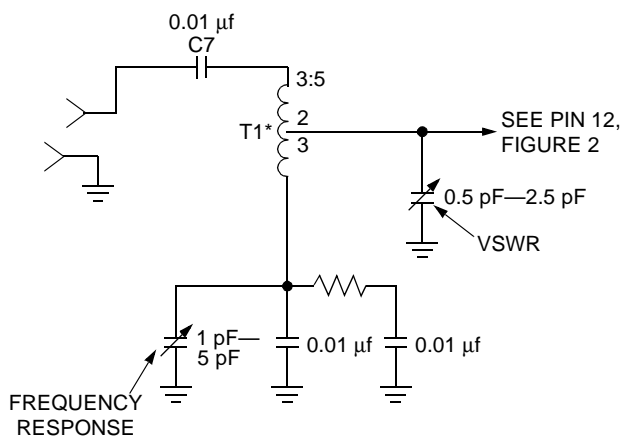


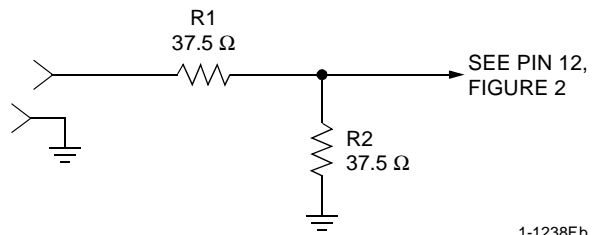
Figure 2. A1751A Circuit Schematic



\*T1 (75 Ω) 3:5.

1-1238Fa

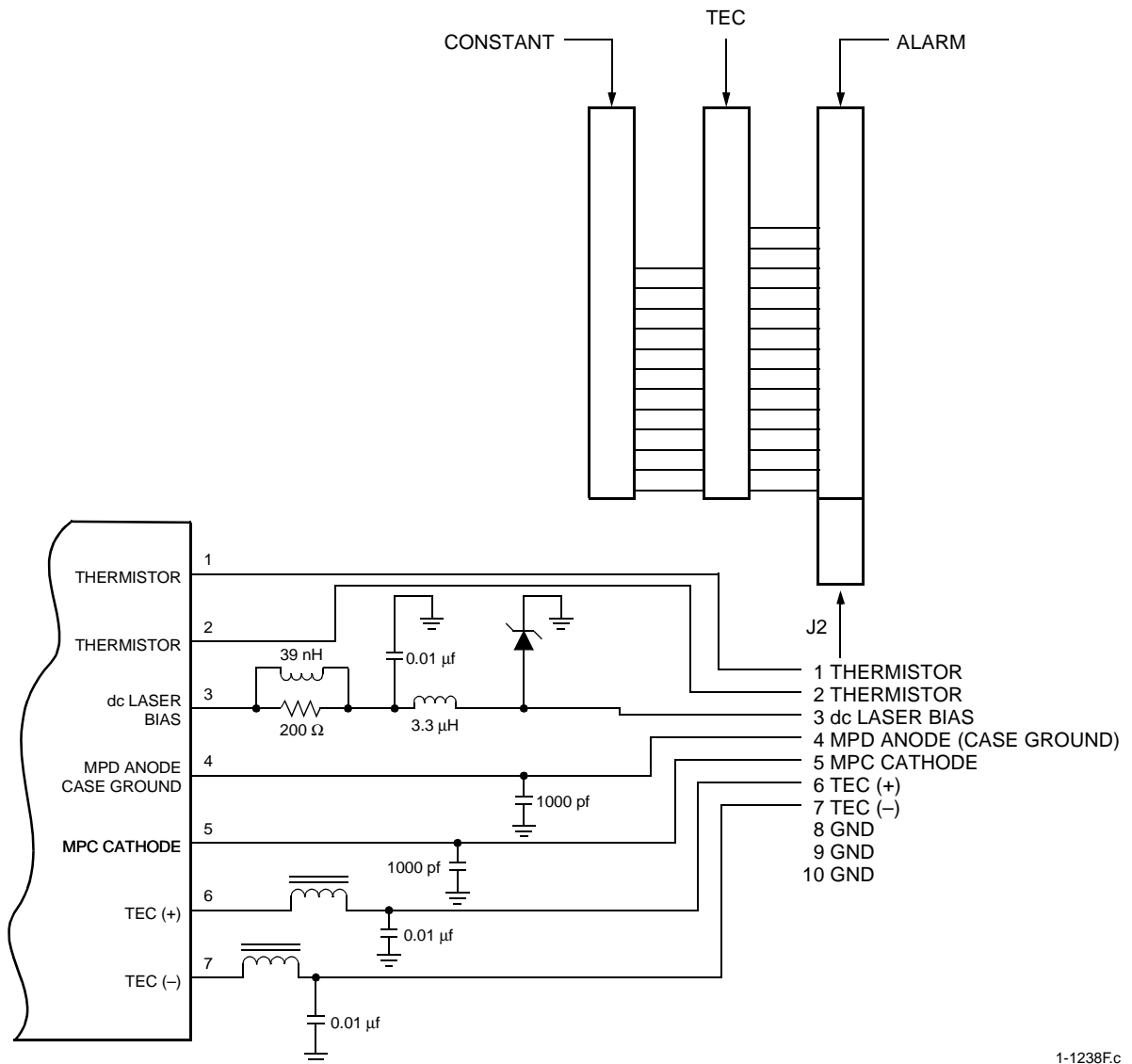
Figure 3a. Impedance-Matched Configuration



1-1238Fb

Figure 3b. Resistive-Matched Configuration

Electrical Schematics (continued)

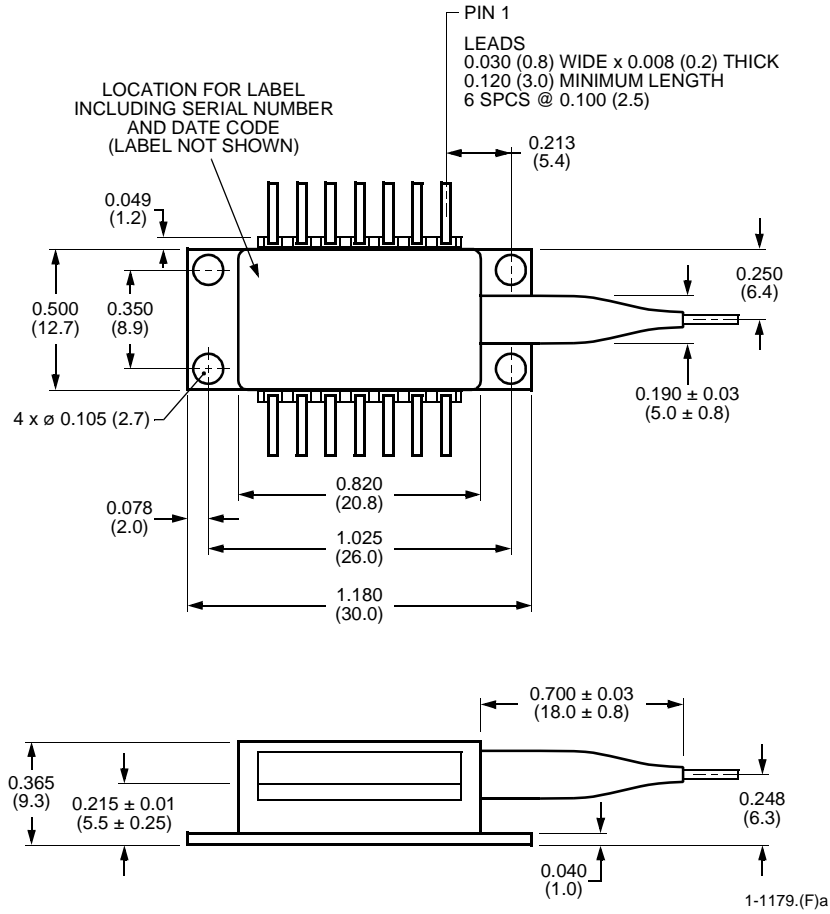


Note: When ordering the dc set, the following boards are included: alarm board, 9108-004; TEC board, 9028-004; constant current, 9383-004.

Figure 4. dc Set (Agere Systems-Supplied Option)

## Outline Diagram

Dimensions are in inches and (millimeters).



## Pin Information

Table 3. Pin Descriptions

Pin No.	Description
1	Thermistor
2	Thermistor
3	dc Laser Bias (-)
4	MPD Anode, Case Ground
5	MPD Cathode
6	Thermoelectric Cooler (+)
7	Thermoelectric Cooler (-)
8	Case Ground
9	Case Ground
10	NC
11	Laser Common (+)
12	Laser Modulation (-)
13	Laser Common (+)
14	NC

## Laser Safety Information

### Class IIIb Laser Product

FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are Class 3B laser products per IEC\* 60825-1:1993. The device has been classified with the FDA under an accession number to be determined.

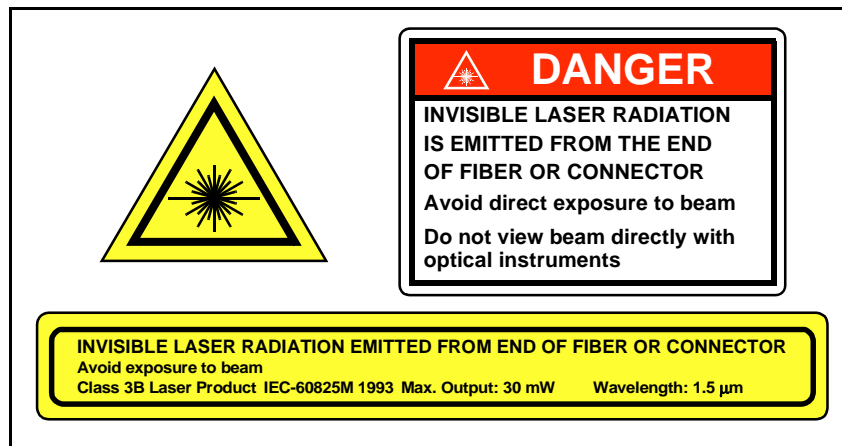
This product complies with 21 CFR 1040.10 and 1040.11.  
Single-mode fiber pigtail with SC/APC connectors (standard)  
Wavelength = 1.5  $\mu\text{m}$   
Maximum power = 30 mW

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) 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.**

\* IEC is a registered trademark of The International Electrotechnical Commission.



## Ordering Information

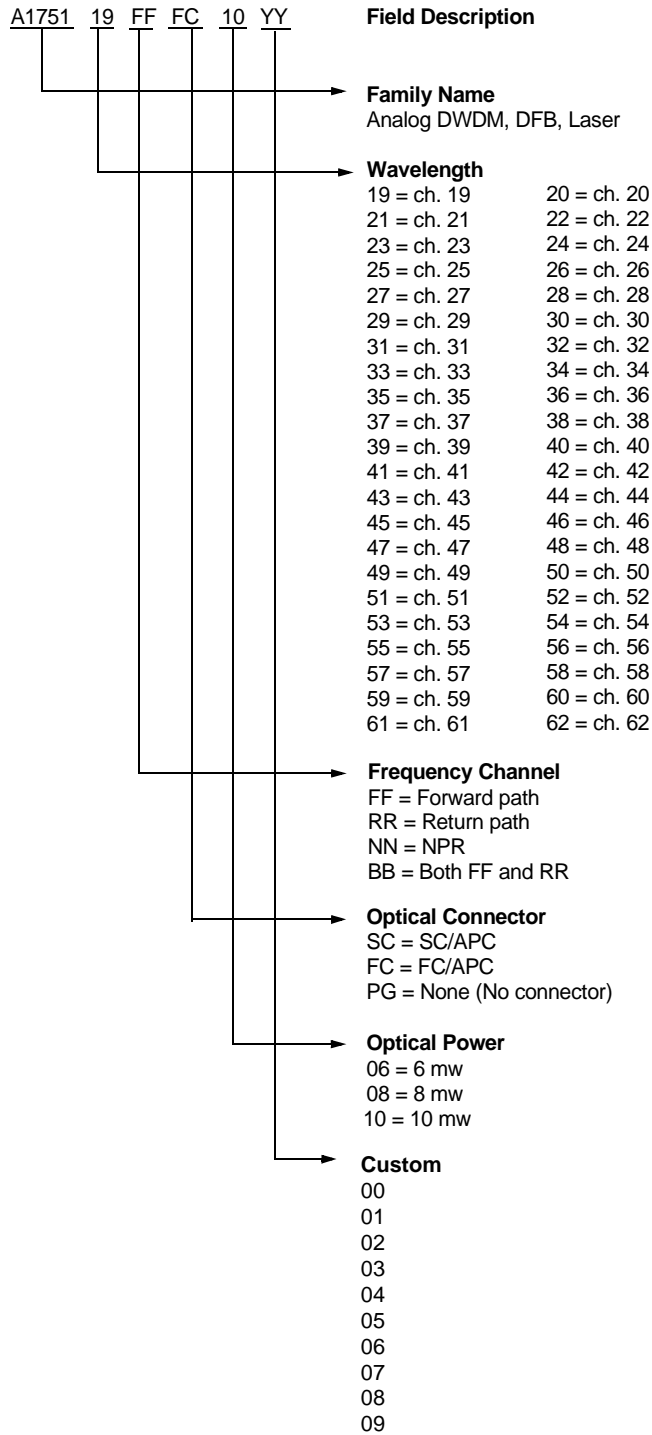
Table 4. Ordering Information\*

Device Code	Description	Connector	Comcode
A1751A (See Ordering Code Definitions, next page)	DWDM Analog Forward or Return Path Laser Module	SC/APC standard; FC/APC available	TBD

\* For additional ordering information, please contact an Agere Systems at Opto West, 1-800-362-3891 (for sales staff, please press option 2).

Ordering Information (continued)

Ordering Code Definitions





**Notes**

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For additional information, contact your Agere Systems Account Manager or the following:

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