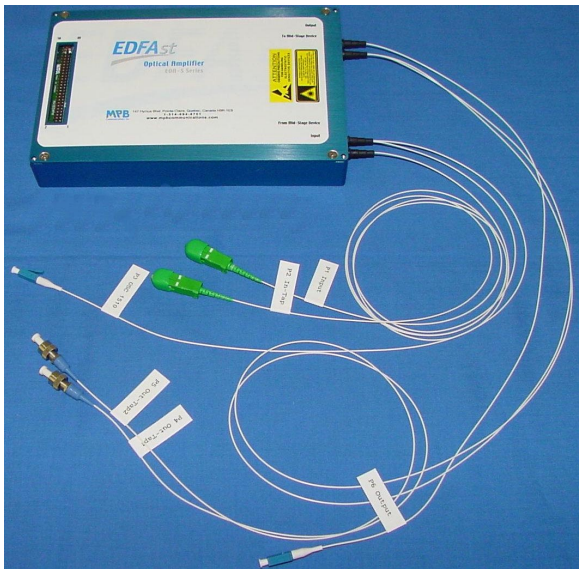
MPB Communications Inc.

EDFAst Optical Amplifier

EOA-SI04-C34-C

Variable-Gain ED*FAst*™ DWDM Optical Amplifier



MPB Communications' ED*FAst*™ brand comprises advanced optical amplifiers made plug and play to their system environment to ensure rapid system integration and deployment.

Features

- Leading-edge optics
- Variable gain
- Mid-stage access capability with 0-10dB dynamic loss range
- 20 dBm output power
- Built-in Optical-Supervisory-Channel multiplexer
- Input, Midstage and Output power monitors
- Optical output power tap
- Embedded electronics
- Fast-transient suppression
- Flexible operation supporting user-selectable AGC, APC and ACC modes of operation
- Graphical User Interface
- Wide operational temperature range
- Telcordia compliant

Applications

- Metropolitan and Regional DWDM networks
- Dynamic optical amplification with fast transient control
- Receiver, line, mesh or ring amplifier with midstage access
- Wide range of span length links with variable gain

Description

The EOA-SI04-C34-C ED*FAst*™ DWDM Optical Amplifier fits the stringent requirements of the dynamically reconfigurable DWDM Metro rings and meshes. It delivers 20 dBm of output power and features adjustable gain to suit a variety of span lengths, midstage access for incorporation of dispersion compensation, optical-cross connects or optical-add/drop multiplexers and fast-transient suppression for network self-healing.

ED*FAst*™ Optical Amplifiers come with a Graphical-User-Interface software for headache-free, flexible integration in network systems. Internally, a microcontroller unit allows the user to operate the module either in automatic-gain-control mode with fast transient suppression, automatic-output-power-control mode or automatic-current-control mode. It also controls the amplifier, the alarms and communication. Electronics control relies on wideband, high-drive-current laser-diode drivers and on a fast digital signal processor for wide-dynamic-range channel add/drops with fast-gain-transient suppression as well as on a VOA driver for gain adjustment.

MPB Communications is dedicated to close customer collaboration: our standard amplifier designs can readily be modified to optimize amplifier performance to specific operational regimes.

General Specifications

Parameter	Value
Storage Case Temperature Range	–40 to +70°C
Operating Case Temperature Range	0 to 70°C
Maximum Power Supply Voltage	+6.0 V

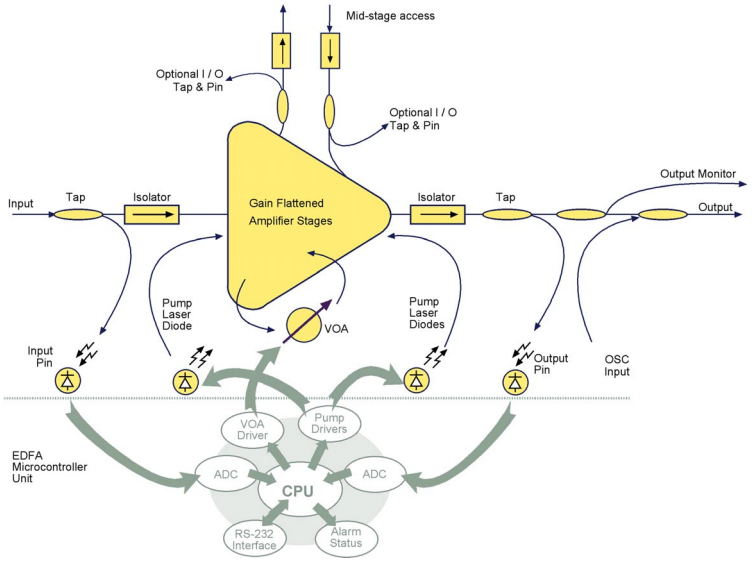
Optical Specifications

Optical Parameter	Units	Minimum	Typical	Maximum	Conditions
Wavelength Range	nm	1529		1563	
Total Input Power	dBm	-15		+5	
Saturated Output Power	dBm	20			
Adjustable Gain Range	dB	14		19	@ 20-dBm output power
Mid-Stage Loss	dB	0		10	
Gain Flatness	dB		+/- 0.3	+/- 0.5	0 to 70C case temperature
Noise Figure	dB		6.5 dB 10.0 dB	8.0 dB 11.0 dB	@ 19-dB gain @ 14-dB gain
Polarization Mode Dispersion	ps		0.5	1.0	
Polarization Dependent Gain	dB		0.1	0.3	
Transient Suppression Time	µsec		40	100	3 dB add/drop
Gain Excursion	dB		0.5	1	3 dB add/drop
Steady-State Gain Error	dB		0.2	0.5	
Input/Output Optical Isolation	dB	30			Over bandwidth
Input/Output Optical Return Loss	dB	60			FC/APC connectors
Input/Output Residual Pump Power	dBm			-30	
Backward ASE Power @ Input Port	dBm			-30	
C-band Supervisory Channel Wavelength Range	nm	1500		1520	

Electrical Specifications

Electrical Parameters	Minimum	Typical	Maximum
Operating Voltage (Vcc)	4.75 V	5.0 V	5.25 V
Power Consumption (Beginning of Life @ 25°C)	-	6.5 W	8 W
Digital alarm-output-voltage High (TTL)	2.4 V	-	Vcc
Digital alarm-output-voltage Low (TTL)	0 V	-	0.4 V
Disable and Mute-input-voltage High (TTL)	2.0 V	-	Vcc
Disable and Mute-input-voltage Low (TTL)	0 V	-	0.8 V
ESD	EN61000-4-2; GR-1089-CORE section 2		
Radiated Immunity	EN61000-4-3; GR-1089 section 3.3		
Radiated Emissions	EN55022 Class A; GR-1089 section 3.2		

Block Diagram



PIN Configuration

Electrical connection is through a 50-pin 0.1“ spacing dual-row 0.025” sq. connector.

I/O	Pin #	Description
I	1-6, 45-50	Power supply, +5VDC.
I	7-10, 13, 19, 20, 25, 31, 32, 41-44	Power ground, return path for +5V.
I	22, 24, 26, 28, 30	Analog ground, return path for PHD1 to 4.
-	11, 12, 35, 39, 40	N/C
I	14	Reset MCU and DSP, active low.
I	15	Serial communications receive line.
O	16	Serial communications transmit line.
O	17	Pump current alarm, alarm is active high.
O	18	Loss of optical input signal, alarm is active high.
O	21	Photo-detector 1 EDFA input signal
O	23	Photo-detector 2, EDFA output signal
O	27	Photo-detector 3, midstage-in signal (optional)
O	29	Photo-detector 4, midstage-out signal (optional)
O	33	Pump temperature alarm, alarm is active high.
O	34	Case temperature alarm, alarm is active high.
O	36	Loss of optical output signal, alarm is active high.
I	37	Disable EDFA, all pumps turn off. Disable state is active high.
I	38	Mute EDFA, EDFA output is less than 5 mW. Mute state is active high

External Interface

TTL Outputs

Active high logic TTL-compatible alarm outputs: TTL LOW = normal operation, TTL HIGH = alarm. Hysteresis is implemented on all alarms to prevent alarm oscillating.

1. **Pump Current Alarm:** This alarm is activated if any of the pumps is driven at greater than 95% of its end-of-life value.
2. **Loss of Optical Input Signal Alarm:** This alarm is activated if the total input power drops more than 6 dB below minimum operating point.
3. **Pump Temperature Alarm:** This alarm is activated if any of the pumps’ sub-mount temperature is higher or lower than the set temperature by more than 10 °C.

4. **Case Temperature Alarm:** This alarm is activated if the case temperature exceeds 70°C or is below 0°C.
5. **Loss of Optical Output Signal Alarm:** This alarm is activated if the output power degrades by more than 2 dB from its beginning of life value in APC mode, or if the gain cannot be maintained within 2 dB of its set point in AGC mode.

TTL Inputs

1. **Disable EDFA:** This input will turn the pump-laser drivers off. The pump thermoelectric coolers and other module electronics are unaffected by this input. TTL HIGH = pump drive disabled.
2. **Output-Power Mute:** This input will clamp the output power to a nominal value of 5 mW. This may be used when servicing a "live" system to improve eye safety. TTL HIGH = reduced output power.

Serial Communication Port

Management and status reporting are available through the RS-232 serial port. This is a TTL interface that communicates with a standard baud rate of 9600 baud.

Monitors

1. **Power monitors:** input, output, midstage input and midstage output
2. **Pump monitors**
3. **Temperature:** pump, fiber, case

Software

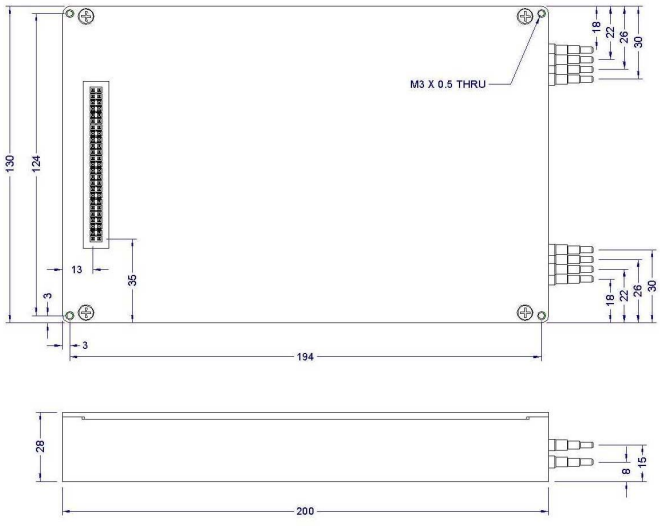
For easy communication, the EOA-SI04-C34-C ED*FAst*™ DWDM Optical Amplifier comes with the Craft-Terminal Software (a Graphical User Interface) CD-ROM, model SW-01841-1.

Software Functions

1. **Set Amplifier mode:** AGC, APC or ACC
2. **Set Gain:** in AGC mode
3. **Set Power:** in APC mode
4. **Set Current:** in ACC mode
5. **Set Midstage Attenuation:** Provides dynamic mid-stage attenuation.
6. **VOA Offset:** Provides tilt control.
7. **Set Optical Delay:** Adjusts midstage optical delay for optimal fast-transient suppression.

Mechanical Drawing

Optical connections are made through singlemode fiber pigtails terminated with FC/APC connectors as standard. The units are housed within a package allowing a heatsink to be attached onto the base. Tapped holes are also provided for easy board mounting.



MPB Communications Inc.

Safety Specifications

The EOA-SI04-C34-C ED*FAst*™ DWDM Optical Amplifiers delivers invisible laser radiation with fiber-coupled output power of up to 250 mW and as such are Class 3B sources of optical radiation. They are intended as OEM products for incorporation into fiber-optic-telecommunications systems and as such require additional features for full compliance with FDA/CRDH 21 CFR 1040.10 and 1040.11 and IEC 60825-1: 1993 radiation performance standards. Internally, an optical amplifier contains one 980-nm and one 1480-nm pump.

Ordering Information

EOA – S	I04 -	C34-	C-	_	_	_

Amplifier Type
I : Inline Amplifier

Flattened Bandwidth
C34: 1529 to 1563 nm

Built-in Electronics
C: Pump drivers & AGC

Connector Type
1: FC/APC (standard)
2: FC-UPC
3: E2000-APC
4: SC-UPC
5: SC-APC
6: Other (specify)

Pigtail Length
1: 50 cm (standard)
2: Other (specify)

Pigtail Jacket
1: 900-µm tight buffer (standard)
2: 3 mm buffer

Accessories

For easy setup, MPB Communications offers as an option an Adapter Kit for ED*FAst*™ Optical Amplifier to computer connection, model A-01921-0.