

# FINISAR®

## Key Features

- ▶ Integrated Raman and EDFA design with unified gain control
- ▶ Supports up to three 14xx nm Raman and 980 nm EDFA pumps, in various configurations
- ▶ Variable gain operation with dynamic range of up to 17 dB
- ▶ Exceptionally low effective noise figure for all gain values
- ▶ Superior gain flatness <0.7 dB typical, for all fiber types, and not dependent on fiber losses.
- ▶ Class 1M\* laser eye safety according to IEC 60825, and CDRH 21 CFR §1040.10
- ▶ Automatic restart and shut-down mechanisms
- ▶ Standard RS232 or I<sup>2</sup>C communication protocols

## Applications

- ▶ Extending metro, regional, LH and ULH WDM links (3000 km and beyond)
- ▶ System upgrade to 40 Gb/s, 100 Gb/s, and coherent detection
- ▶ Link extension beyond 1000 km without adding 3R O-E-O sites
- ▶ OSNR-sensitive applications
- ▶ Dynamic ROADM networks

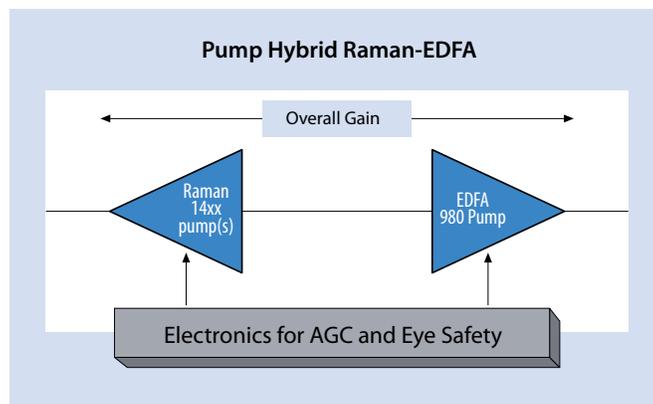
# Hybrid Raman-EDFA Module

## Overview

Finisar's Hybrid Raman-EDFA module enables cost-effective deployment of ultra-long haul networks as well as the extension of existing long-haul, regional and metro networks, without the need for 3R O-E-O regeneration. The Hybrid module consists of a counter-propagating Raman pump unit and a variable gain (VG) EDFA. These two elements are integrated to provide exceptionally low noise figure and excellent gain flatness - two imperative parameters for ultra-long haul systems. The module can support up to three Raman/EDFA pumps in various configurations.

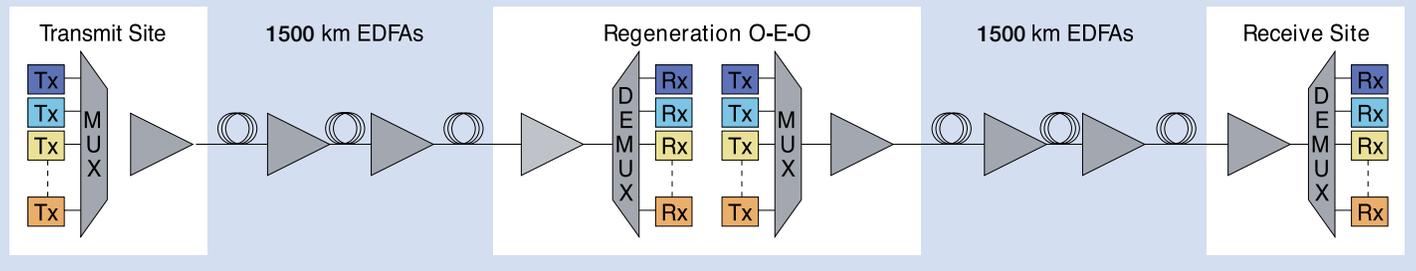
Since the module's first stage is a Raman pre-amplifier which has a negative effective noise figure, the overall combination of the Raman pre-amplifier and VG EDFA has a very low effective noise figure. This allows the link reach to be extended 3 to 4 times in comparison to a system based on traditional EDFAs. The Hybrid control circuitry operates in advanced automatic gain control (AGC) mode, in which the actual Raman gain is automatically measured and then complemented using the EDFA gain. The required total gain is therefore constantly maintained. This fast AGC circuitry provides excellent transient suppression, allowing the amplifier to keep the gain constant particularly in cases where there are fast and large changes in the input power (regardless of ASE produced by the Raman pump).

The module incorporates laser safety mechanisms, ensuring that both the Hybrid Raman-EDFA module itself and the network in which it is installed can be classified as Class 1M\* with respect to laser safety.

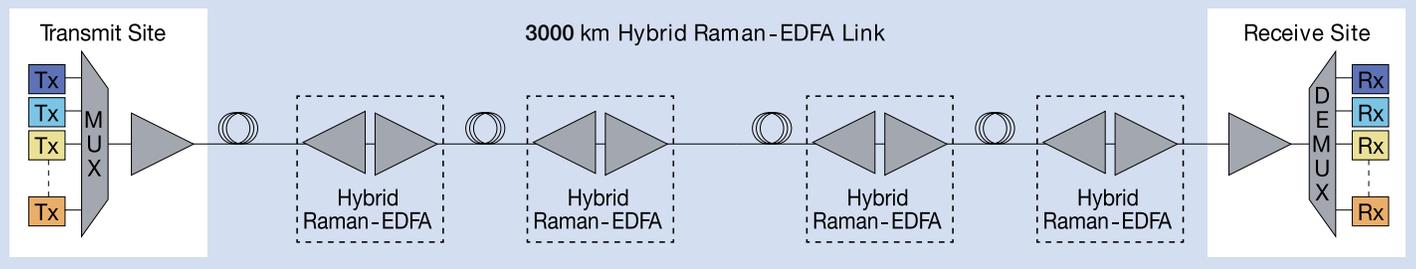


# Hybrid Raman-EDFA Module

## O-E-O Option



## Hybrid Option



## Specifications

Parameter	Specifications			Remarks
	Min.	Max.	Unit	
Wavelength Range	1528	1567	nm	
Input Power Range	-35	+11	dBm	Other input power ranges can be specified
Saturated Output Power	21		dBm	
Gain Range	15	40	dB	Any 17 dB dynamic range can be selected for 3-pump design
Noise Figure	2-pumps	$G \geq 24$	1	For G.652 fiber, depends on dynamic gain range
	3-pumps	$G \geq 28$	0	
Gain Flatness Peak-Peak		0.7	dB	Including Raman gain
Gain Setting Accuracy	-0.5	+0.5	dB	
Transient Overshoot/Undershoot		$\pm 1$	dB	Up to 19 dB add/drop
Transient Setting Time		400	ms	
PDG + PDL		0.35	dB	
Mechanical Dimensions	160x220x26mm		mm	Without heat sink
Power Consumption		42	W	

\* Class 1M products are not hazardous under normal circumstances, but may pose an eye hazard when the laser output is viewed with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm

Specifications above do not refer to any specific part number in production. Please contact Finisar for datasheets of production units.

**FINISAR**

1389 Moffett Park Drive  
Sunnyvale, CA 94089-1133  
www.finisar.com

Phone: +1-408-548-1000  
Sales: +1-408-541-5690  
Email: sales@finisar.com



Visit Our Website