LUMENTUM

WaveReady®

Multichannel Erbium-Doped Fiber Amplifiers (EDFA)
WRA-217C0001B, WRA-217L0001B, WRA-217C0002B, WRA-217CSC01B, WRA-217CSC02B, WRA-219C0001B, WRA-219C0002B, WRA-219CSC01B, WRA- 219CSC02B, WRA-220C0002B, WRA-220CSC02B

The WaveReady WRA-217 series, WRA-219 series and WRA-220 modules are dense wavelength division multiplexing (DWDM) optical amplifiers that are fully user-configurable. These multichannel amplifiers provide a simple, economical optical amplification solution in a flexible, ready-to-use package. The WRA-2xx series amplifiers include an advanced gain control circuit, an efficient pump laser, and a mid-stage variable attenuator.

The WRA-2xx series amplifiers can be configured as a booster or as pre- or inline amplifiers. The modules work by default in constant signal gain mode but can be configured to constant total output power mode. Their ease-of-use and performance make the WRA-2xx amplifiers the ideal solution for high-density metro applications. Some models include tilt support and Optical Services Channel (OSC) capability. Front panel light emitting diodes (LEDs) indicate module status, while integrated electronics provide alarm and control functionality.

Deployed with a WaveReady communications module (COM-300), these units offer remote management and configuration through TL1, SNMP, or using the WaveReady Multi-Node Manager. Local and remote management are performed through a serial or Ethernet port on the communications module.

The modules are installed in a WaveReady 3500F or 3100 shelf mounted in 19-inch, 23-inch or ETSI telecommunications racks.

The WRA-2xx amplifiers use advanced transient suppression techniques to dynamically respond to changes in the number of wavelengths or signal power. As a result, they preserve gain flatness and output power over a wide range of input conditions to meet the needs of reconfigurable optical networks.

Key Features

- Support protocol and data-rate independent applications, including 100G/OC-768
- Easily configurable as a booster or as pre/inline amplifier
- Easily configurable from 13 to 23 dB in constant signal gain mode
- Easily configurable from -6 to +20 dBm in constant output power mode
- Support an optical output monitor port
- Offer a low-power consumption noise figure
- Remote management with OSC through dedicated optical ports on OSC-enabled models
- Compensate for system-induced tilt on tilt-enabled models

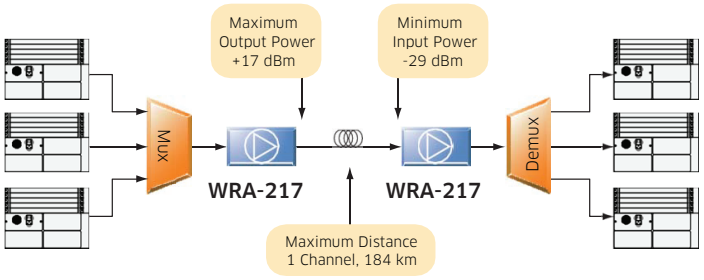
Applications

- Offer DWDM booster or pre/inline amplification
- Enable access and metro optical networks
- Support DWDM point-to-point applications and DWDM optical add-drop or X-C nodes

Compliance

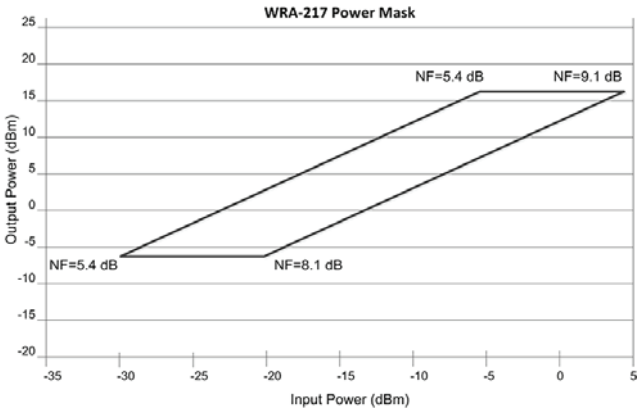
- Telcordia NEBS Level 3
- FDA Class 1M laser device
- FCC Class A device
- UL 60950-1 First Edition
- CAN/CSA C22.2 No. 60950 01
- CE
- IEC 60825-2
- RoHS (exemptions 7b, 8a) for WRA-219xxxxxx
- RoHS 6/6 for WRA-217xxxxxx and WRA-220xxxxxx

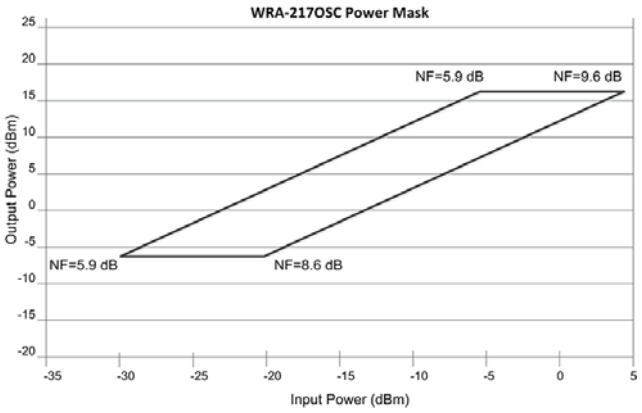
Amplification for Extended-Reach and Pre-Amp Application

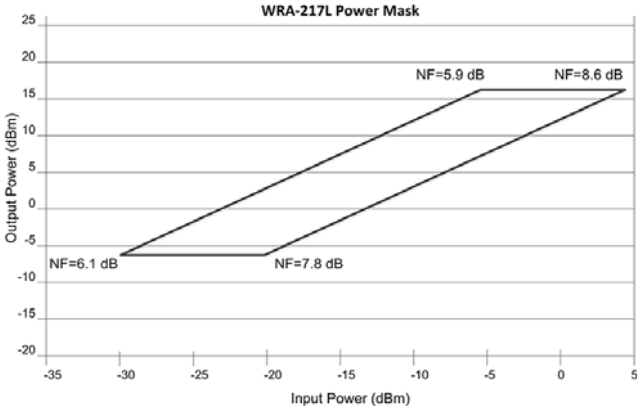


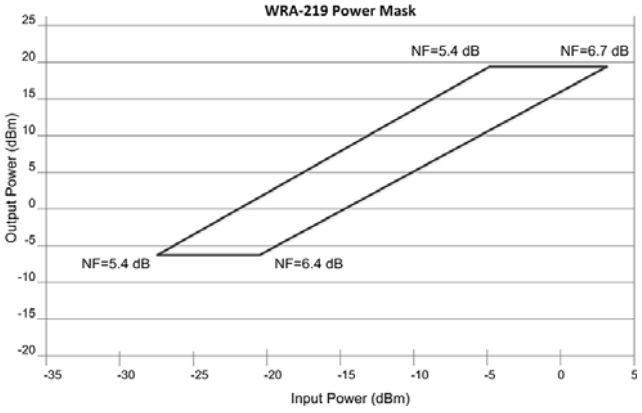
Typical Link Budget: WRA-217C0001B

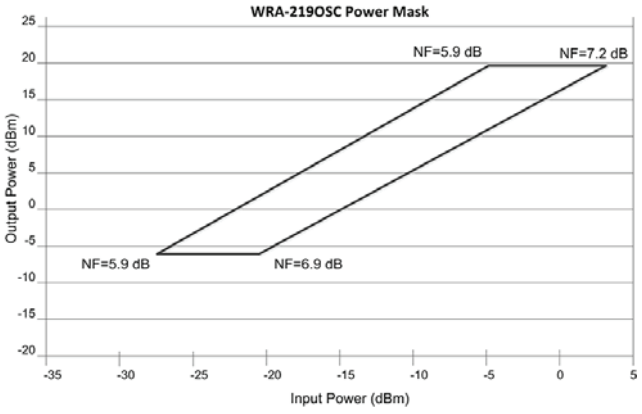
Number of wavelengths	Total Output Power (dBm)	Power Per-Channel (dBm)	Per-Channel Power Budget[1] (dB)	Maximum Distance (km)
1	+17	+17	46	184
2	+17	+14	43	172
4	+17	+11	40	160
8	+17	+8	37	148
16	+17	+5	34	136

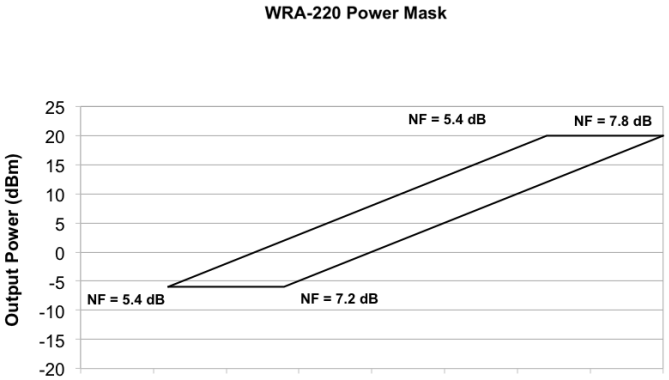


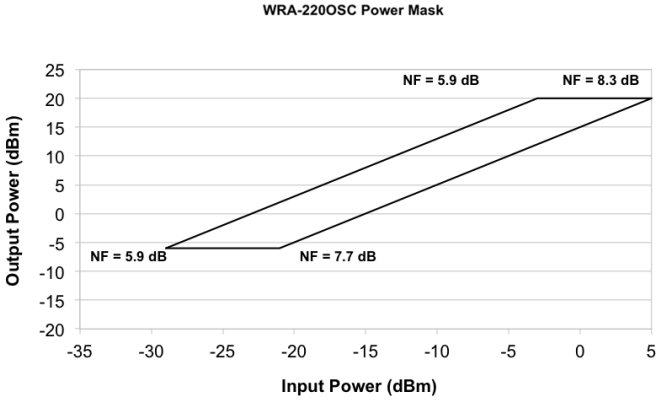












Optical Performance

Specification		Minimum	Maximum
Operating wavelength	WRA-217 WRA-219 WRA-220	1528.77 nm	1563.04 nm
	WRA-217 OSC WRA-219 OSC WRA-220 OSC	1528.77 nm	1563.04 nm
	WRA-217L	1570.42 nm	1606.60 nm
Input power range	WRA-217 WRA-217 OSC	-29 dBm	+4 dBm
	WRA-217L	-29 dBm	+4 dBm
	WRA-219 WRA-219 OSC	-29 dBm	+2 dBm
	WRA-220 WRA-220 OSC	-29 dBm	+5 dBm
Total output power (user-configurable in constant power out mode 0.1 dB set resolution)	WRA-217 WRA-217 OSC	-6 dBm	+17 dBm
	WRA-217L	-6 dBm	+17 dBm
	WRA-219 WRA-219 OSC	-6 dBm	+19 dBm
	WRA-220 WRA-220 OSC	-6 dBm	+20 dBm
Input LOS threshold configurable range	User configurable; 1.0 dB set resolution	-38 dBm	0 dBm
Power measurement accuracy (all detectors)	P>=-29 dBm	-0.7 dB	+0.7 dB
	-29<P<=-38	-1.5 dB	+1.5 dB

Optical Specifications (continued)

Specification				Minimum	Maximum
Gain 0.1 dB set resolution	WRA-217 WRA-217 OSC			13 dB	23 dB
	WRA-217L			13 dB	23 dB
	WRA-219 WRA-219 OSC			17 dB	23 dB
	WRA-220 WRA-220 OSC			15 dB	23 dB
Polarization dependent gain				–	0.5 dB
Gain flatness (over all operating wavelengths)	15 to 45° C ambient to the shelf			–	1.5 dB
	-5 to 55° C ambient to the shelf			–	2 dB
Gain accuracy (relative to gain target in constant gain mode)				-1.0 dB	+1.0 dB
Gain stability (peak-to-peak in constant gain mode)				-0.1 dB	+0.1 dB
Noise figure: WRA-217	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-6 dBm	23 dB	0 dB	–	5.4 dB
	-6 dBm	23 dB	-3 dB	–	6.5 dB
	+4 dBm	13 dB	0 dB	–	9.1 dB
	+4 dBm	13 dB	-3 dB	–	12.3 dB
	-19 dBm	13 dB	0 dB	–	8.1 dB
	-9 dBm	23 dB	0 dB	–	5.2 dB
	-9 dBm	13 dB	0 dB	–	8.8 dB
	-29 dBm	23 dB	0 dB	–	5.4 dB
Noise figure: WRA-217 OSC	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-6 dBm	23 dB	0 dB	–	5.9 dB
	-6 dBm	23 dB	-3 dB	–	7.0 dB
	+4 dBm	13 dB	0 dB	–	9.6 dB
	+4 dBm	13 dB	-3 dB	–	12.7 dB
	-19 dBm	13 dB	0 dB	–	8.6 dB
	-9 dBm	23 dB	0 dB	–	5.7 dB
	-9 dBm	13 dB	0 dB	–	9.3 dB
	-29 dBm	23 dB	0 dB	–	5.9 dB
Noise figure: WRA-217L	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-6 dBm	23 dB	0 dB	–	5.9 dB
	+4 dBm	13 dB	0 dB	–	8.6 dB
	-19 dBm	13 dB	0 dB	–	7.8 dB
	-9 dBm	23 dB	0 dB	–	5.9 dB
	-9 dBm	13 dB	0 dB	–	8.1 dB
	-29 dBm	23 dB	0 dB	–	6.1 dB
Noise figure: WRA-219	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-4 dBm	23 dB	0 dB	–	5.4 dB
	-4 dBm	23 dB	-3 dB	–	6.5 dB
	2 dBm	17 dB	0 dB	–	6.7 dB
	2 dBm	17 dB	-3 dB	–	8.8 dB
	-23 dBm	17 dB	0 dB	–	6.4 dB
	-29 dBm	23 dB	0 dB	–	5.4 dB
Noise figure: WRA-219 OSC	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-4 dBm	23 dB	0 dB	–	5.9 dB
	-4 dBm	23 dB	-3 dB	–	7.0 dB
	2 dBm	17 dB	0 dB	–	7.2 dB
	2 dBm	17 dB,	-3 dB	–	9.3 dB
	-23 dBm	17 dB	0 dB	–	6.9 dB
	-29 dBm	23 dB	0 dB	–	5.9 dB

Optical Specifications (continued)

Specification				Minimum	Maximum
Noise figure: WRA-220[1]	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-3 dBm	23 dB	0 dB	–	5.4 dB
	-3 dBm	23 dB	-3 dB	–	6.5 dB
	3 dBm	17 dB	0 dB	–	6.7 dB
	3 dBm	17 dB	-3 dB	–	8.8 dB
	-29 dBm	23 dB	0 dB	–	5.4 dB
	5 dBm	15 dB	0 dB	–	7.8 dB
	-21 dBm	15 dB	0 dB	–	7.2 dB
Noise figure: WRA-220 OSC[2]	***Pin***	***Gain***	***Tilt***	***Minimum***	***Maximum***
	-3 dBm	23 dB	0 dB	–	5.9 dB
	-3 dBm	23 dB	-3 dB	–	7.0 dB
	3 dBm	17 dB	0 dB	–	7.2 dB
	3 dBm	17 dB	-3 dB	–	9.3 dB
	-29 dBm	23 dB	0 dB		5.9 dB
	5 dBm	15 dB	0 dB	–	8.3 dB
	-21 dBm	15 dB	0 dB	–	7.7 dB
Monitor tap ratio				21.5 dB	18.5 dB
Polarization mode dispersion				–	0.5 ps
Backward ASE at input				–	-30 dBm
Remnant 980 to input				–	-20 dBm
Remnant 980 to output				–	-20 dBm
Return loss				-40 dB	
OSC wavelength range	WRA-217 OSC			1500 nm	1520 nm
	WRA-219 OSC				
	WRA-220 OSC				
OSC insertion loss	Amplifier Rx -> OSC Tx; OSC Rx -> Amplifier Tx. Not including connectors			–	1.0 dB
OSC isolation	OSC band from amplifier band, measured at OSC output port			30 dB	–
	Amplifier band from OSC band, measured at EDFA input			12 dB	–
OSC Flatness	Across OSC wavelength range			–	0.3 dB

1. Non-zero tilt is only supported by the WRA-220 and WRA-220OSC when the gain is provisioned to 17 dB or greater. Performance is not guaranteed when tilt is applied to gain settings below 17 dB

2. Non-zero tilt is only supported by the WRA-220 and WRA-220OSC when the gain is provisioned to 17 dB or greater. Performance is not guaranteed when tilt is applied to gain settings below 17 dB

Physical Specifications

Parameter	Minimum	Typical	Maximum
Size (H x W x D)	–	6.8 x 1.0 x 8.8 inches (17.27 x 2.54 x 22.35 cm)	–
Weight (approximate)	–	2.5 lbs (1.1 kg)	–

Environmental Specifications

Parameter	Minimum	Typical	Maximum
Normal operating temperature	5°C	–	40°C
Extended operating temperature	–5°C	–	55°C
Storage temperature	–40°C	–	85°C
Relative humidity (non-condensing)	5%	–	90%

Interface Specifications

Interface	Description
Optical	LC/UPC bulkheads, angled downward in accordance with other WaveReady modules
Craft	Requires a WaveReady 3100 or 3500F series shelf and a WaveReady system controller.
TL1/SNMP	Requires a WaveReady 3100 or 3500F series shelf and a WaveReady system controller.
Front panel	CARD (module) MAJ/CRIT (major/critical alarm) MIN (minor alarm) Rx Port Tx Port Laser On

Odering Information

For more information on this or other products and their availability, please contact your local Lumentum account manager or Lumentum directly at customer.service@lumentum.com.

Product Code	Description
Multi-Channel Amplifiers	
WRA-217C0001B	Multi-channel C-band amplifier 17 dBm output power
WRA-217L0001B	Multi-channel L-band amplifier 17 dBm output power
WRA-219C0001B	Multi-channel C-band amplifier 19 dBm output power
Amplifiers with Tilt Support	
WRA-217C0002B	Multi-channel C-band amplifier 17 dBm output power with tilt control
WRA-219C0002B	Multi-channel C-band amplifier 19 dBm output power with tilt control
WRA-220C0012B	Multi-channel C-band WDM amplifier 20 dBm output power with tilt control
Amplifiers with OSC Filters	
WRA-217CSC01B	Multi-channel C-band WDM amplifier 17 dBm output power with OSC filters
WRA-219CSC01B	Multi-channel C-band WDM amplifier 19 dBm output power with OSC filters
Amplifiers with OSC Filters and Tilt Support	
WRA-217CSC02B	Multi-channel C-band WDM amplifier 17 dBm output power with OSC filters and tilt control
WRA- 219CSC02B	Multi-channel C-band WDM amplifier 19 dBm output power with OSC filters and tilt control
WRA-220CSC12B	Multi-channel C-band WDM amplifier 20 dBm output power with OSC filters and tilt control
Associated Parts	
DMS-3100DC004	WR3100 1U Shelf
DMS3500FSE04	WaveReady Shelf, 7U, 630 W Cooling Capacity
DMS3500FSE05	WaveReady Shelf, 8U, 700 W Cooling Capacity
COM300ET003YMx.x	WaveReady System Controller 300 (COM-300) with WaveReady system release x.x and one Multi-Node Manager license. See the COM-300 data sheet for the currently supported system release.
WRT-882DT00OB	WaveReady Transponder 882 (WRT-882), 10G Dual Transponder
MDX-40MD101CB	40 Channel DWDM Mux/Demux, ITU Channels 20-59

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