iXblue PHOTONICS

The ModBox-AN-Oband-40GHz is an optical transmitter dedicated to analog transmission up to 40 GHz.

The ModBox-AN-Oband-40GHz features an internal laser source. The unit is optimized to generate a high performance and high stability optical analog signal from its internal laser source and a user supplied RF modulation signal.

FEATURES

- Analog modulation up to 40 GHz
- dither-free bias controller
- Low RIN
- High harmonics suppression
- Embedded 1310 nm laser
- Embedded photoreceiver

APPLICATIONS

- Transmission system test
- Components characterization
- Radio Over Fiber
- R&D laboratories

Performance Highlights

| Parameter	Min	Typ	Max
Operating wavelength	Full O band		
Modulation format	Amplitude Analog Modulation, OFDM, …		
Operating modulation bandwidth	100 M	-	40 G
Insertion loss	-	4 dB	5 dB
Output modulated power	-	7 dBm	8 dBm

Ordering Information:

XSoptix

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Guilford, CT 06437
Ph: 203-401-8093

Email orders to: sales@xsoptix.com
Fax orders to: 800-878-7282

Functional Block Diagram
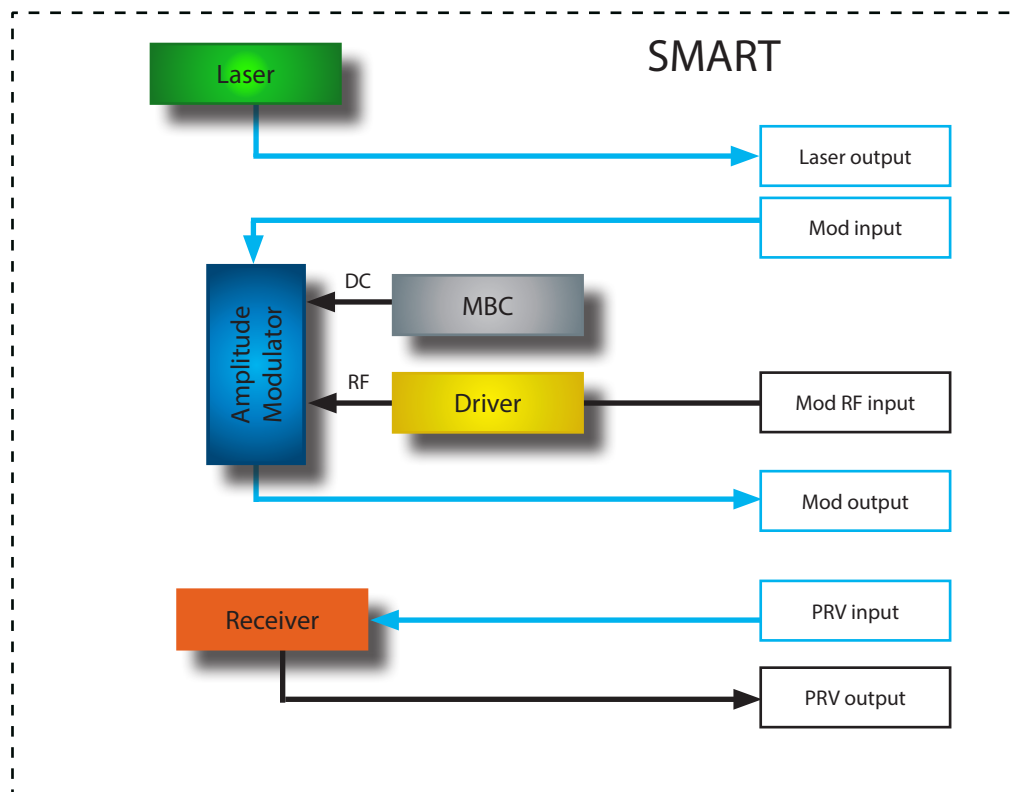
The ModBox-AN-Oband-40GHz features:

- a 1310 nm optical source. it comes with an output power of 40 mW. It is a low RIN DFB laser and assembled with a low noise current driver and temperature controller. A laser output port is available on the front panel of the unit. An optical PM patchcord is supplied.

- a modulation stage optimized for analog modulation. This stage is build around a wide bandwidth, chirp-free and analog intensity modulator and a wide bandwidth linear RF amplifier. The modulator is characterized by its high harmonic suppresssion and flat bandwidth curve. It is a dedicated O-Band modulator to ensure a low pragation loss and high quality modulation. The amplifier is characterised by a flat group delay and gain curves with reduced ripple all over the bandwith. The modulator and the driver are selected to allow a modulation up to 40 GHz. A dither-free automatic bias controller allows to lock the modultor operating point in quadrature so as to operate it in the linear part of its transfer function and to guarantee highly stable performance.

- a photoreceiver module. It is a single ended front-end with a very flexible design. The package contains a waveguide-integrated PIN-photodiode (PD) and a transimpedance amplifier (TIA) with a fixed gain. The amplifier has a typical bandwidth of 30 GHz, is optimized for linearity and for low noise.

The ModBox-AN-Oband-40GHz is controlled from the front panel thanks to the Smart interface with a simple rotary knob and keypad. The Smart manual interface allows for bias control circuit, drivers gain and laser current settings. It comes also with a simple GUI solution, Windows based and implemented through the USB interface of the user PC.

The ModBox integrates a laser. The ModBox Smart Interface allows the user to control laser power and wavelength.

O-Band DFB Laser Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wavelength	λ	By default		1310 nm		
Laser type	-	-		DFB		-
Optical output power	-	CW	-	-	40	mW
Spectrum linewidth	Δλ	FWHM	-	1	-	MHz
Optical return loss	ORL	-	30	35	-	dB
Side mode suppression ratio	SMSR	-	40	-	-	dB
Optical output power adjustment	PCW	Smart	0	-	40	mW
Wavelength laser tuning range	-	Smart	-	0.8	1	nm

Input Optical Specifications   User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Modulators (Amplitude, Phase) Data Input Specifications						
Source type	-	CW		DFB, DBR, tunable laser		
Wavelength	λ	O-Band	1260	-	1350	nm
Input power	P_{CW}	CW	1	-	300	mW
Polarization	P	-		Linear and controlled		

Input Electrical Specifications   User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input electrical termination	-	AC coupled		Single ended		-
Frequency and signal type	F	Amplitude Modulation - Analog	100 M	-	40 G	Hz
Input signal amplitude	V_{IN}	Amplitide Modulation	-	200	250	mVpp
Impedance matching	Z_{IN-RF}	-	-	50	-	Ω

Output Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Analog Modulation						
Modulated operation bandwith	-	-	100 M	-	40 G	Hz
Insertion loss	IL	At maximum transmission	-	5	7	dB
Output power	P_{Out}	With intertnal laser	-	7	8	dBm
Chirp	α	-	-0.1	0	0.1	-
Optical return loss	ORL	-	-45	-50	-	dB
Electrical return loss	ERL	-	-	-12	-10	dB
Static extinction ratio	ER	@1310nm	20	25	-	dB
2nd harmonic suppression ratio	H_1-H_2	By design	-	-60	-	dB
RF gain adjustment	DG	Smart	-	3	-	dB
Bias Control	MBC	Smart	Dither-less - Automatic / Manual			

Photoreceiver Specifications

| Parameter	Symbol	Condition	Min	Typ	Max	Unit
Photodetector type	-	-	Linear PIN / TIA photoreceiver module			
Operating wavelength range	λ	-	1260	-	1620	nm
Average Optical Input Power	P_{opt}	-	-10	-	3	dBm
3dB cut-off frequency	F_{3dB}	-	29	31	-	GHz
Optical return loss	ORL	-	27	-	-	dB
Photodiode DC responsivity	R	1310 nm	-	0.3	-	A/W
		1525 nm - 1575 nm	0.5	-	0.75	A/W
Maximum optical input power	Popt	Average	-10	-	3	dBm
Output Voltage Swing	V_{Out}	-	20	-	300	mV
Conversion gain	-	Typical range	50	-	1 800	V/W
Equivalent Input Noise Density	I_{noise}	At maximum gain	-	20	-	pA/sqrtHz
Total Harmonic Distortion	THD	1-14GHz, Vout<0.2 mVpp, Iin<2.2mApp	-	3	-	%

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
RF input power	EP_{in}	-	4	dBm
Optical input power (modulator)	OP_{in}	-	25	dBm
Optical input power (PRV)	OP_{in}	-	6	dBm

Front Panel

Parameter	
Power	Powers the system and lits green when the switch is set on
LCD	Displays ModBox current status and allows the user to edit parameter in the ModBox menus
Keypad	Allows one to browse through the smart interface menus and edit the system's parameters
System rotary knob	Allows browsing and editing through the ModBox menus
Laser	Polarization maintaining fiber, PM - FC/APC fiber connector
Modulator / driver	Polarization maintaining fiber, PM 13-U25D - FC/APC fiber connector - Single 1.85 mm RF connector
Photoreceiver	SMF28 - FC/APC fiber connector - Single 1.85 mm RF connector

There are monitoring LEDS on the front panel upper right corner: Analog modulation drivers, MBC, Laser green LEDs monitor operation.
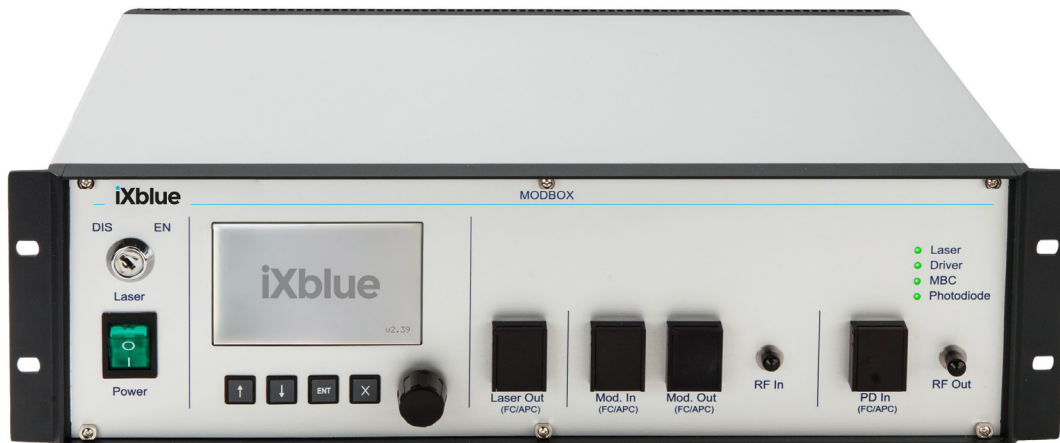
Analog ModBox with opional receiver - Front panel.

Ordering information

ModBox-AN-Oband-40GHz

AN = ANalog modulation unit type up to 40 GHz
Oband = Full O-Band operation and 1310 nm laser embedded

About us

iXblue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate (LiNbO$_3$) modulators and RF electronic modules.
iXblue Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.

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