



The ModBox-850nm-28Gbaud-PAM4 is the unique Linear Reference Transmitter at 850 nm available on the market allowing to generate very high quality PAM-4 data streams up to 28 Gbaud and NRZ up to 28 Gb/s. The transmitter produces very clean eye diagrams with high SNR and short rise and fall times. It also provides the flexibility of adjusting the extinction ratio for vertical eye closure.

The ModBox-850nm-28Gbaud-PAM4 provides R&D and Production engineers with a user friendly turn-key instrument delivering state of the art performance. It is being used in optical telecommunications laboratories and production test beds.

The equipment incorporates a modulation stage based on a chirp-free LiNbO₃ Mach-Zehnder modulator, coupled with a high performance linear RF driver and an automatic bias control circuitry. It also integrates a DFB laser source.

In addition to the 850 nm, ixblue offers reference transmitters in the O-band, C-band.

FEATURES

- 850 nm Reference Transmitter
- PAM-4 up to 28 Gbaud
- NRZ up to 28 Gb/s
- Reliable & reproducible measurements
- High eye diagram stability
- Variable Extinction Ratio

APPLICATIONS

- Transmission system test
- Components characterization
- Production test
- R&D laboratories

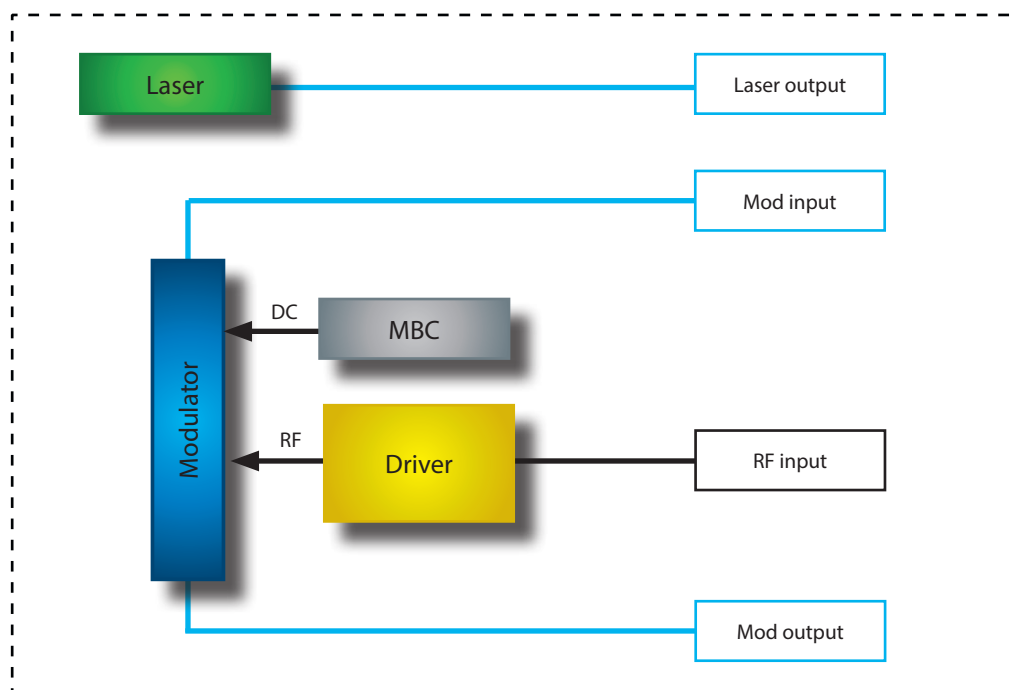
OPTIONS

- Multi-Channel
- O-band, C-band

Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength	-	852 nm	-
Modulation format	PAM-4, NRZ		
Modulation bandwidth	PAM-4 up to 28 Gbaud, NRZ up to 28 Gb/s		
Modulated output power (option HP)	5 dBm	6 dBm	-

Functional Block Diagram



The ModBox-850nm-28Gbaud-PAM4 features:

- A chirp-free X-cut LiNbO₃ (Lithium Niobate) Mach-Zehnder external intensity modulator coming with an unparalleled stability and a superior optical power handling capabilities. This modulator is moreover selected for its high electro-optic bandwidth with flat and low ripple electro-optic response curve.
- A high bandwidth and highly linear RF driver.
- A modulator bias controller. The internal LiNbO₃ modulator is a X-cut device with very low drift. However an automatic bias control circuit is provided to lock the operating point of the modulator at the quadrature point whatever the environmental conditions. The MBC ensures a highly stable optical output signal to provide reliable and reproducible measurements.
- A 852 nm low RIN laser is integrated by default. For convenience, an external patch cord is delivered to connect the laser output to the optical input of the modulation stage. Wavelength and power are tunable through the front panel controls or the ModBox software interface.

The ModBox-850nm-28Gbaud-PAM4 is controlled from the front panel via the Smart interface with a simple rotary knob and keypad. The Smart manual interface allows for bias control circuit, driver gain and laser settings. It comes also with a simple GUI solution, Windows based and implemented through the USB interface of the user PC.

Input Electrical Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Data-rate	-	PAM-4 electrical input signal	0.1	-	28	Gbaud
		NRZ electrical input signal	0.1	-	28	Gb/s
Input voltage	V_{IN}	AC coupled - 50 Ω SE - Linear operation	-	0.200	0.300	Vpp
Jitter	J_{RMS}	-	-	1	1.2	ps
Rise / fall time	t_r / t_f	20 % - 80 %	-	13	18	ps
Corss-point	-	NRZ mode	45	50	55	%

Input Optical Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operation	λ	CW	850	852	854	nm
Polarization	-	-	Linear and controlled			-
Power	OP_{IN}	-	-	10	-	dBm
Side Mode Supression Ratio	SMSR	-	30	-	-	dB
Spectrum linewidth	$\Delta\lambda$	FWHM	-	0.5	1	MHz
Polarization Extinction ratio	PER	-	-	19	-	dB

Output Optical Specifications

Specifications below are given with embedded 852 nm laser.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Embedded Laser	λ	DFB integrated by default	-	852	-	nm
Data format	-	-	PAM-4 & NRZ			-
Data-rate	-	PAM-4 electrical input signal	0.1	-	28	Gbaud
		NRZ electrical input signal	0.1	-	28	Gb/s
Output modulated power	OP _{OUT}	Standard	2	3	-	dBm
		High output power option	5	6	-	dBm
Jitter	J _{RMS}	RMS Jitter, NRZ mode	-	0.8	-	ps
	J _{PP}	Peak-to-Peak Jitter, NRZ mode	-	5	-	ps
Minimum dynamic extinction ratio	DER _{MIN}	By NRZ data input level adjustment	2	-	-	dB
Maximum dynamic extinction ratio	DER _{MAX}	By NRZ data input level adjustment	-	10	13	dB
Dynamic Signal to Noise Ratio	SNR	NRZ mode	-	12	-	dB
Rise / fall time	t _r / t _f	NRZ mode	-	15	-	ps
Crosspoint	-	NRZ mode	45	50	55	%
Optical return loss	ORL	-	-40	-45	-	dB
Side Mode Supression Ratio	SMSR	-	30	-	-	dB
Spectrum linewidth	$\Delta\lambda$	FWHM	-	1	-	MHz

SMART Interface and GUI

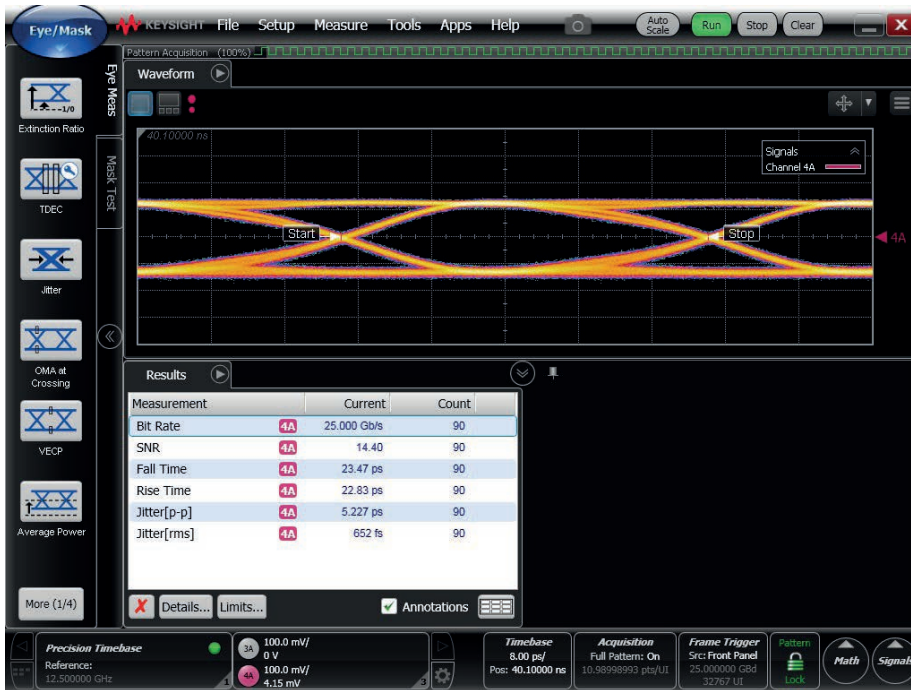
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wavelength laser tuning range	$\delta\lambda$	Diode chip temperature control	-	0.8	1	nm
Optical output power adjustment	δ OP _{OUT}	Diode Injection current control	0	-	100	%
Eye amplitude adjustment	δ ER	-	-	3	-	dB
Eye crosspoint adjustment	-	-	-4	-	4	%

Absolute Maximum Ratings

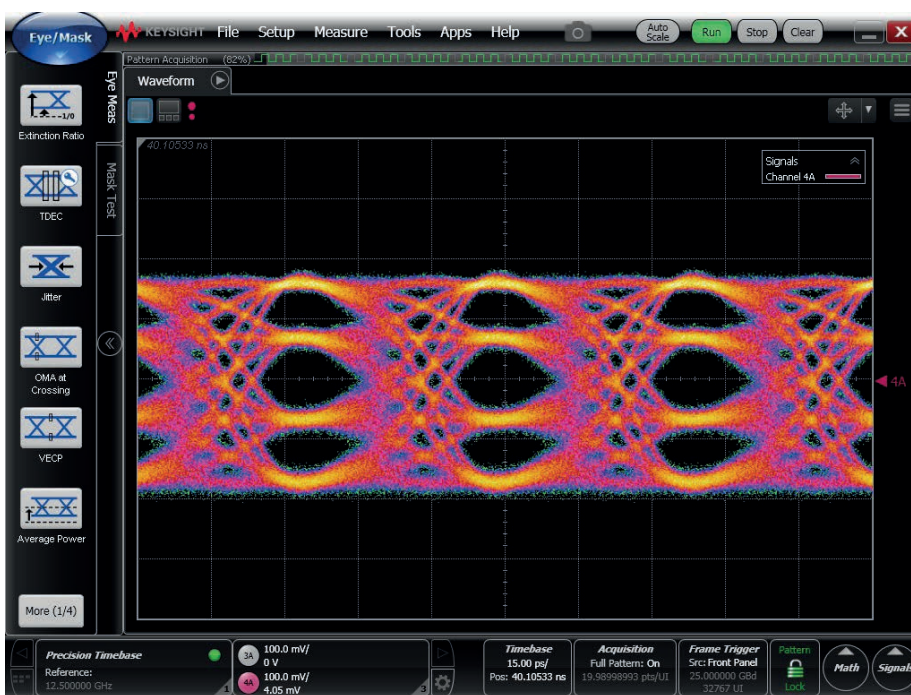
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Input voltage	V _{IN}	-	1	V _{pp}
Optical input power	OP _{in}	-	20	dBm

Eye Diagrams - NRZ 25 Gb/s - 850 nm - From ModBox-850nm-28Gbaud-PAM4

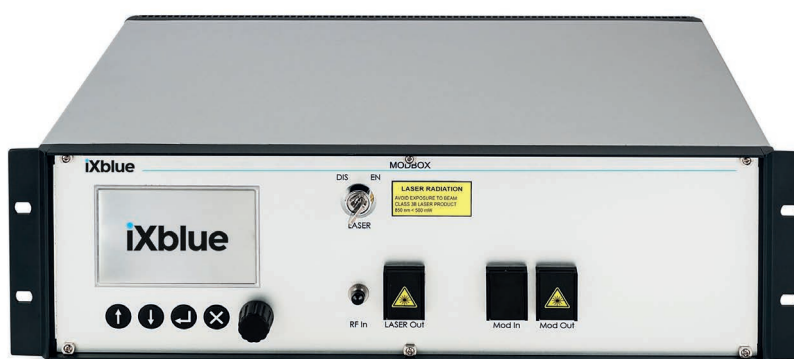


Eye Diagrams - PAM-4 25 Gbaud - 850 nm - From ModBox-850nm-28Gbaud-PAM4



Interfaces, Dimensions and Compliance

Interfaces	
Optical	Polarization maintaining fiber PM85-U25D - FC/APC (by default, other connectors type in option)
RF input	Single 1.85 mm female RF connector - 50 Ω
Control	Smart Interface (front panel), GUI (USB typeB)
Power supply	100-120V/220-240 automatic switch 50-60Hz (Rear panel)
EMC and optical norms	EN61326-1 Ed. 2006 / NF EN 60825-1 & EN 60825-2 Ed.2014
Dimensions / Weight	Rack 19" x 3U, Depth=375mm / 3 kg



ModBox-850nm-28Gbaud-PAM4 - Front panel

Ordering information

ModBox-850nm-28Gbaud-PAM4

850nm = Operating wavelength, embeds laser at 852 nm by default
28Gbaud = Data-rate: NRZ up to 28 Gb/s - PAM-4 up to 28 Gbaud

Opt-YY

YY = Output connectors, FA : FC/APC - SA : SC/APC

About us

ixBlue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and optical modulation solutions based on the company lithium niobate (LiNbO₃) 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.