ModBox



The ModBox-850nm-NRZ series is a family of Reference Transmitters that generate excellent quality NRZ optical data streams up to 28 Gb/s, 44 Gb/s, 50 Gb/s at 850 nm. These transmitters produce very clean eye diagrams with high SNR and short rise and fall times. They also provide the flexibility of adjusting the extinction ratio for vertical eye closure (VER option).

The ModBox-850nm-NRZ series 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 $LiNb0_3$ Mach-Zehnder modulator, coupled with a high performance 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, 1 μ m region.

FEATURES

- · 850 nm Reference Transmitter
- Up to 28 Gb/s, 44 Gb/s, 50 Gb/s
- Reliable & reproducible measurements
- · High eye diagram stability
- Variable Extinction Ratio

APPLICATIONS

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

OPTIONS

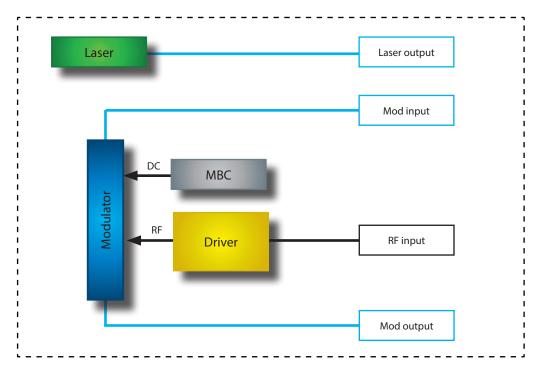
- Variable Extinction Ratio
- Multi-Channel
- O-band, C-band, 1310 nm & 1550 nm

Performance Highlights

| Parameter | Min | Max | | | |
|------------------------------------|---------------------------|-------|---|--|--|
| Operating wavelength | - 852 nm - | | | | |
| Modulation format | NRZ | | | | |
| Modulation bandwidth | 28 Gb/s, 44 Gb/s, 50 Gb/s | | | | |
| Modulated output power (option HP) | 5 dBm | 6 dBm | - | | |

ModBox

Functional Block Diagram



The ModBox-850nm-NRZ series feature:

- A chirp-free X-cut LiNb0₃ (Lithium Niobate) Mach-Zehnder Intensity modulator. It is selected for its high electro-optic bandwidth and flat, low ripple, electro-optic response curve.
 - A high bandwidth limiting RF driver with gain and crossing levels adjustment for eye diagram optimization.
- 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-NRZ 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.



ModBox

Input Electrical Specifications User supplied, not a ModBox specification

| Parameter | Symbol | Conc | lition | Min | Тур | Max | Unit |
|----------------------------|---|-------------------------|-------------------------|-------|-------|-------|------|
| | PRBS | ModBox-850ni | m-NRZ-28Gb/s | 0.1 | - | 28 | Gb/s |
| Data-rate | | ModBox-850ni | m-NRZ-44Gb/s | 0.1 | - | 44 | Gb/s |
| | | ModBox-850nm-NRZ-50Gb/s | | 0.1 | - | 50 | Gb/s |
| Input voltage | V _{IN} | AC coupled - 50 | Ω - Single ended | 0.400 | 0.450 | 0.500 | Vpp |
| Jitter | J _{RMS} | - | - | - | 1 | -1.2 | ps |
| Rise / fall time t_r/t_f | | | 28Gb/s | - | 13 | 18 | ps |
| | t _r / t _f 20 % - 80 % | 20 % - 80 % | 44 Gb/s | - | 8 | 10 | ps |
| | | 50 Gb/s | - | 7 | 8 | ps | |

Input Optical Specifications User supplied, not a ModBox specification

| Parameter | Symbol | Condition | Min | Тур | Max | Unit |
|----------------------------|--------|-----------|-----|-----------------|-----|------|
| Operation | λ | CW | 850 | 852 | 854 | nm |
| Polarization | - | - | Lin | ear and control | led | - |
| Power | Р | - | - | - | 40 | mW |
| Side Mode Supression Ratio | SMSR | - | 30 | - | - | dB |
| Spectrum linewidth | Δλ | FWHM | - | 1 | - | MHz |

Output Optical Specifications Specifications below are given with embedded 852 nm laser.

| Parameter | Symbol | Condition | Min | Тур | Max | Unit |
|-------------------------------|-------------------|---|-----|-----|-----|------|
| | | ModBox-850nm-28Gb/s-NRZ | 0.1 | - | 28 | Gb/s |
| Data-rate | PRBS | ModBox-850nm-44Gb/s-NRZ | 0.1 | - | 44 | Gb/s |
| | | ModBox-850nm-50Gb/s-NRZ | 0.1 | - | 50 | Gb/s |
| Added RMS jitter | J _{RMS} | $\sqrt{J_{RMS} = J_{RMS-total}^2 - J_{RMS-source}^2}$ | - | 0.8 | 1.2 | ps |
| Dynamic Extinction Ratio | DER | - | - | 12 | - | dB |
| Dynamic Signal to Noise Ratio | SNR | ModBox-850nm-28Gb/s-NRZ | - | 25 | - | - |
| Rise / fall time | t, / t, | ModBox-850nm-28Gb/s-NRZ | - | 15 | 18 | ps |
| | | ModBox-850nm-44Gb/s-NRZ | - | 8 | 10 | ps |
| | | ModBox-850nm-50Gb/s-NRZ | - | 8 | 10 | ps |
| Cross point | - | - | 45 | 50 | 55 | % |
| Eye cross point variation | - | - | -5 | - | 5 | % |
| Electrical Return loss | ERL | - | - | -10 | - | dB |
| Average output power | | Standard | 2 | 3 | - | dBm |
| | OP _{Out} | High output power option | 5 | 6 | - | dBm |

ModBox

852 nm DFB Laser Specifications and Other Lasers Option The laser 852 nm laser is embedded by default.

| • | | · · | | | • | |
|---------------------------------|--------|---------------------------------|-----|-----|-----|------|
| Parameter | Symbol | Condition | Min | Тур | Max | Unit |
| Laser type | - | - | | DFB | | - |
| Wavelength | λ | Embedded by default | - | 852 | - | nm |
| Wavelength laser tuning range | - | Diode chip temperature control | - | 0.8 | 1 | nm |
| Optical output power | - | CW | - | 40 | 50 | mW |
| Optical output power adjustment | - | Diode Injection current control | 0 | - | 100 | % |
| Spectrum linewidth | Δλ | FWHM | 0.5 | 1 | - | MHz |
| Side Mode Suppression Ratio | SMSR | - | 30 | - | - | dB |
| Optical Return Loss | ORL | - | 45 | - | - | dB |

Variable Extinction Ratio Specifications Option

| Parameter | Symbol | Condition | Min | Тур | Max | Unit |
|---------------------------|--------|------------------------------|-------------------------|-----|-----|------|
| Data-rate | PRBS | ModBox-850nm-28Gb/s-NRZ | 0.1 | - | 28 | Gb/s |
| Variable Extinction Ratio | VER | - | 3 | - | 12 | dB |
| Pre-set VER values | VER | Available from Smart and GUI | 3 dB, 6 dB, 9 dB, 12 dB | | - | |

Absolute Maximum Ratings

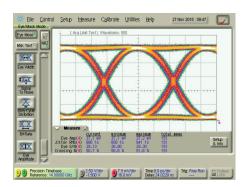
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute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

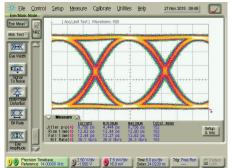
| Parameter | Symbol | Min | Max | Unit |
|---------------------|------------------|-----|-----|------|
| Input voltage | V _{IN} | - | 1 | Vpp |
| Optical input power | OP _{in} | - | 20 | dBm |

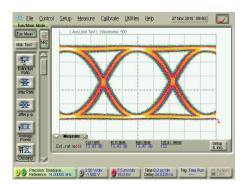


ModBox

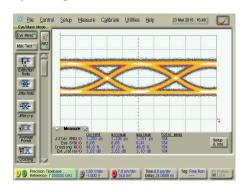
Eye Diagrams - 28 Gb/s - 850 nm - From ModBox-850nm-28Gb/s-NRZ

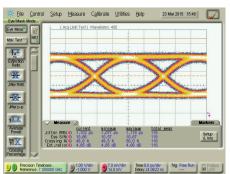


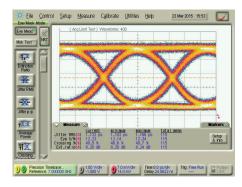




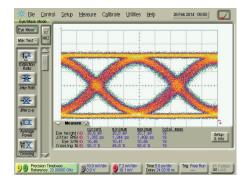
Eye Diagrams - 28 Gb/s - 850 nmn with Variable ER option - From ModBox-850nm-28Gb/s-NRZ with VER option

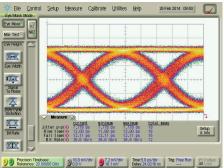


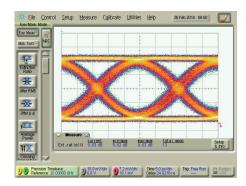




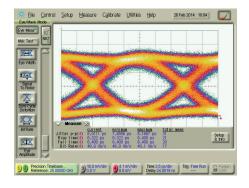
Eye Diagrams - 44 Gb/s - 850 nm - From ModBox-850nm-44Gb/s-NRZ

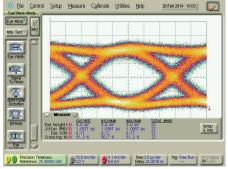


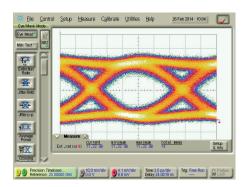




Eye Diagrams - 50 Gb/s - 850 nm - From ModBox-850nm-50Gb/s-NRZ









ModBox

Interfaces, Dimensions and Compliance

| Interfaces | |
|-----------------------|--|
| Optical | Polarization maintaining fiber PM7800 - 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 |



Ordering information

ModBox-850nm-XXGbps-NRZ

850 nm = Operating wavelength, embeds laser at 850 nm by default XX = Data-rate: 28Gb/s up to 28 Gb/s - 44 Gb/s up to 44 Gb/s - 50 Gb/s up to 50 Gb/s

Opt-VER

Variable Extinction Ratio option

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 provides 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.

3, rue Sophie Germain 25 000 Besançon - FRANCE

Tel.: +33 (0) 381 853 180 - Fax: +33 (0) 381 811 557

Ixblue reserves the right to change, at any time and without notice, the specifications, design, function or form of its products described herein. All statements, specification, technical information related to the products herein are given in good faith and based upon information believed to be reliable and accurate at the moment of printing. However the accuracy and completeness thereof is not guaranteed. No liability is assumed for any inaccuracies and as a result of use of the products. The user must validate all parameters for each application before use and he assumes all risks in connection with the use of the products