



FEATURES

- 100 Mb/s up to 44 Gb/s
- Short rise and fall time
- High Q factor
- Automatic bias control

APPLICATIONS

- Telecom laboratories
- Components characterization
- Transmission system test
- Production test

OPTIONS

- DFB laser
- Photodetector
- Multi-channels version
- NRZ 12.5 Gb/s version
- 1550 nm, 1310 nm, 1060 nm
- Stressed eye 100 GbE version
- Alternative modulation formats RZ, QPSK, DPSK,...

The ModBox-850nm-28Gbps-NRZ is an optical modulation unit that generates high performance NRZ optical data streams at 850 nm. The equipment incorporates a modulation stage based on a specially design high data rate LiNbO₃ Mach-Zehnder modulator, coupled with a high performance RF driver and an automatic bias control circuitry. It can also receive an internal laser source (DFB) and a photodetection stage.

The ModBox-850nm-28Gbps-NRZ provides R&D and production engineers with the peace of mind of a turn-key instrument and state of the art performance, equivalent to its classical 1550 nm counterpart. It can be used as a reference transmitter in optical telecommunications laboratories, or in production test beds, and is especially useful for 100 GbEthernet related applications.

Although labelled "28 Gb/s" because of the current bandwidth limitation of 850 nm telecom receivers, the ModBox-850nm-28Gbps-NRZ is designed and dimensioned for 44 Gb/s.

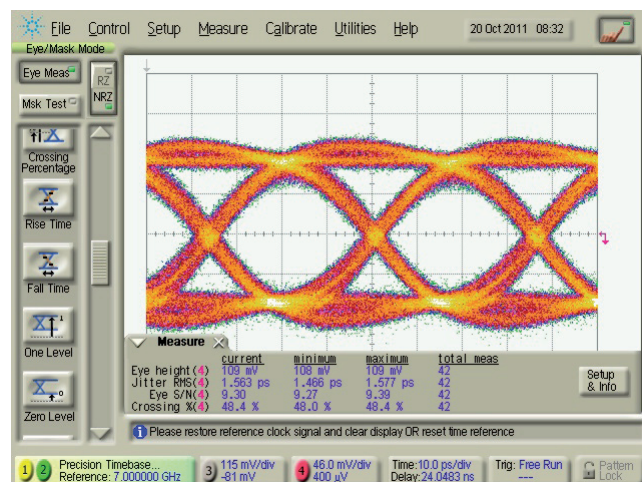
The ModBox 28 - 44 Gb/s are also available at 1550 nm, 1310 nm and 1060 nm.

Performance Highlights

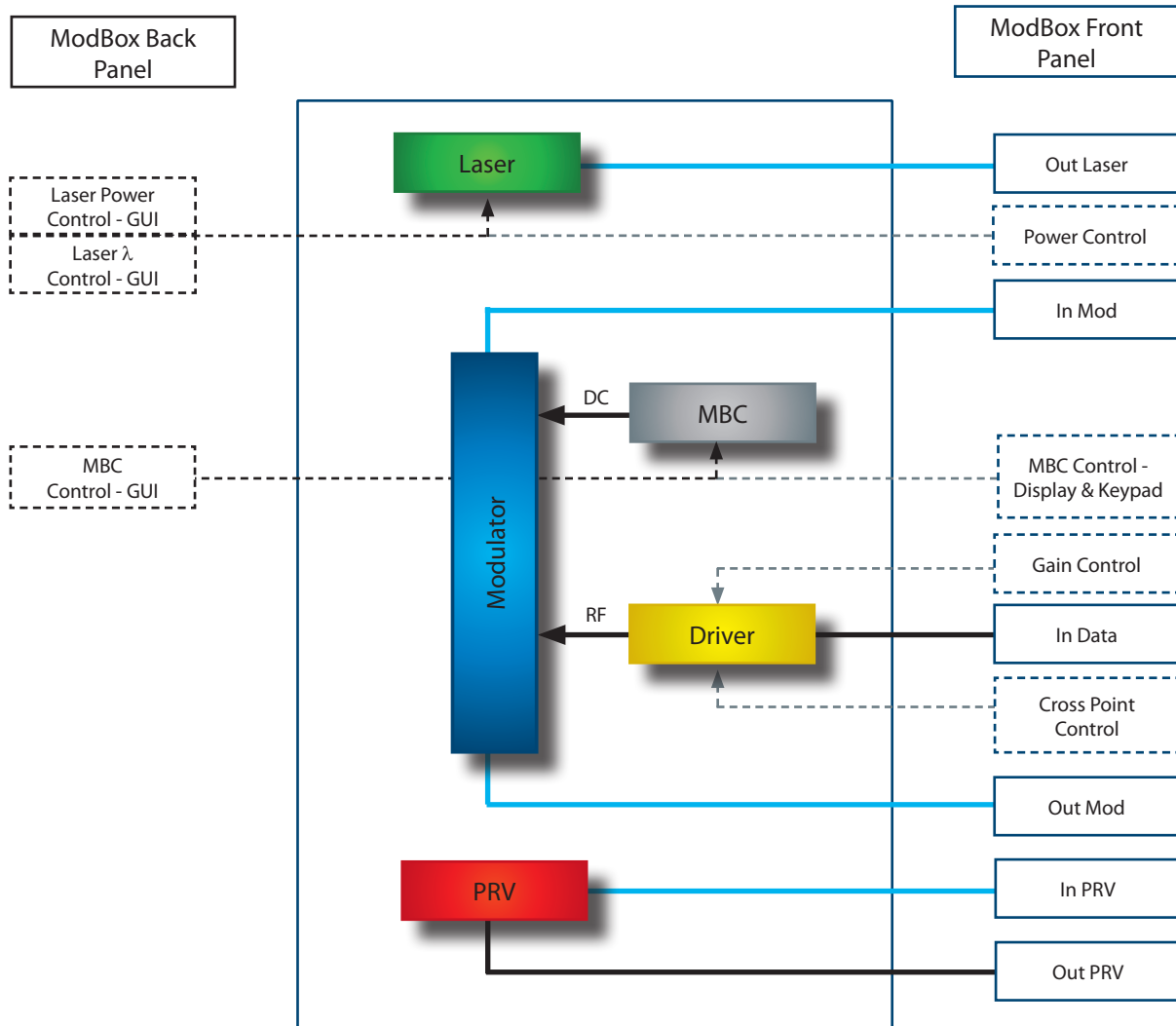
Parameter	Min	Typ	Max	Unit
Optical wavelength range	850 nm band			
Modulation format	NRZ			
Rise / fall time	-	15*	-	ps
RMS added jitter	-	1.5	-	ps
Q-factor	-	13	-	-

* measurement limited by photodetector bandwidth.

28 Gb/s Eye diagram



Functional Block Diagram



The ModBox-850nm-28Gbps-NRZ integrates :

- a high bandwidth, chirp-free, X-cut LiNbO₃ Mach-Zehnder modulator,
- a high bandwidth NRZ RF driver with gain and crossing level adjustment for eye diagram optimization,
- a bias control circuit to lock the Mach-Zehnder modulator in quadrature mode and ensure a highly stable output optical signal,
- an optional laser source, DFB, with its high precision driver that allows control of output power and wavelength,
- an optional high bandwidth photo-receiver (PRV).

Input Electrical Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input electrical data-rate	-	Single ended	0.1	-	28	Gb/s
Modulation format	-	Single ended	NRZ			-
Rise / fall time	t_r / t_f	20 % - 80 %	-	15	18	ps
Impedance matching	Z_{IN}	-	-	50	-	Ω
Input signal amplitude	V_{IN}	Single ended	-	0.5	-	V_{pp}

Input Optical Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Laser type	-	CW	DFB			-
Optical wavelength range	-	-	780	850	900	nm
Polarization	-	-	Linear and controlled			-
Power	P_{IN}	CW	1	20	50	mW

Output Optical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Insertion loss	IL	At maximum modulator transmission	-	6	8	dB
DC extinction ratio	ER_{DC}	-	20	23	-	dB
Return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	0.1	-

Output Modulated Signal - Measured with Photoreceiver

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output data-rate	-	Single ended	0.1*	-	28	Gb/s
Driver gain range	G	Adjustable	-	3	-	dB
Driver cross point	-	Adjustable	45	50	55	%
Rise / fall time	t_r / t_f	20 % - 80 %	-	15	18	ps
Added jitter	J_{RMS}	$\sqrt{J_{RMS}^2 = J_{RMS-total}^2 - J_{RMS-source}^2}$	-	1.5	2	ps
Dynamic extinction ratio	D_{ER}	-	10	13	-	dB
Electrical return loss	S_{11}	-	-	-10	-	dB

* Automatic Bias Control is warranted from 5 Gb/s up to 44 Gb/s.

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
Optical input power	OP_{in}	-	17	dBm
RF input power	EP_{in}	-	5	dBm

Optional 850 nm DFB Laser Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wavelength	λ	Other wavelength on request	845	852	855	nm
Laser type	-	-	DFB			-
Optical output power	-	CW	-	40	50	mW
Spectrum linewidth	$\Delta\lambda$	FWHM	-	2	-	MHz
Optical return loss	ORL	-	30	35	-	dB
Side mode suppression ratio	SMSR	-	30	-	-	dB
Optical output power adjustment	P_{CW}	Front & back panels with GUI	1	-	40	mW
Wavelength laser tuning range	-	Back panel with GUI	-	0.8	1	nm

Optional Photo-receiver Specifications

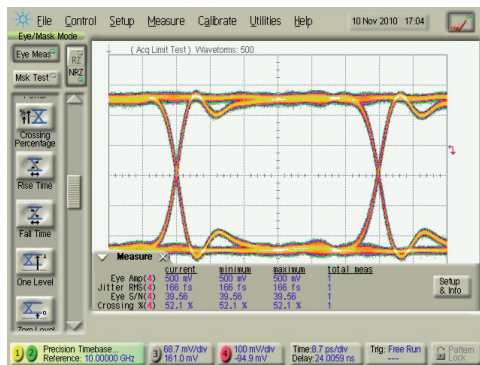
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Photodetector type	-	AC Coupled	PIN with TIA			-
Input fiber type	-	-	Multimode fiber			-
Operating wavelength range	λ	-	800	850	900	nm
Detector bandwidth	f_{3dB}	From 100 kHz	-	20	-	GHz
Responsivity	S	@850 nm	-	0.3	-	A/W
Optical sensitivity	-	@850 nm, 25 Gb/s, 2 ³¹ -1 PRBS	-	-6.5	-	dBm
Overload	-	50 % duty cycle	-	4	-	dBm
Conversion gain	-	@850nm, Single ended	-	75	-	V/W
Detector output impedance	-	-	-	50	-	Ω

Eye Diagrams

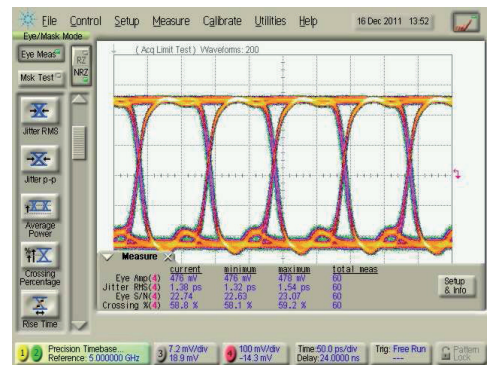
The following equipment was used in obtaining these results :

- Pulse Pattern Generator : Anritsu MP1758A with Mux Centellax MS451V2M
- Oscilloscope Agilent 86100B with time base precision 86107A
- Photo-receiver 850nm

10 Gb/s data rate

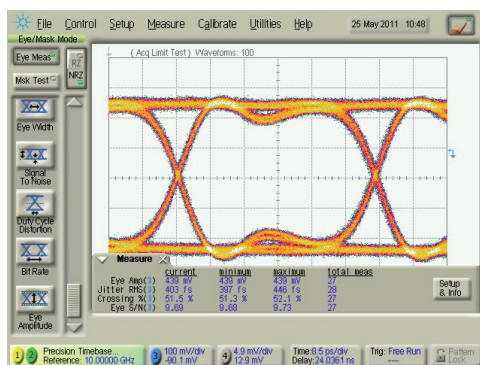


Input signal

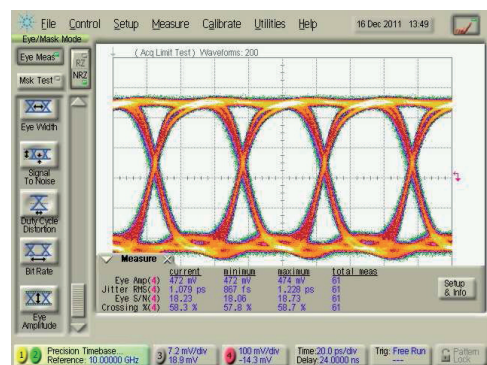


Output response

20 Gb/s data rate

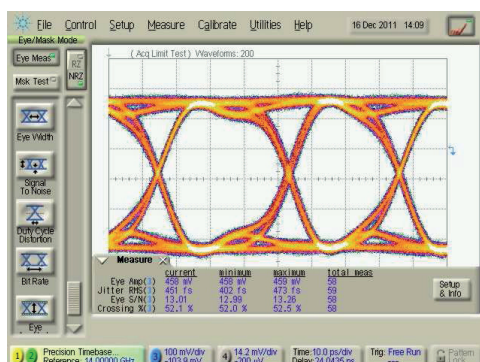


Input signal

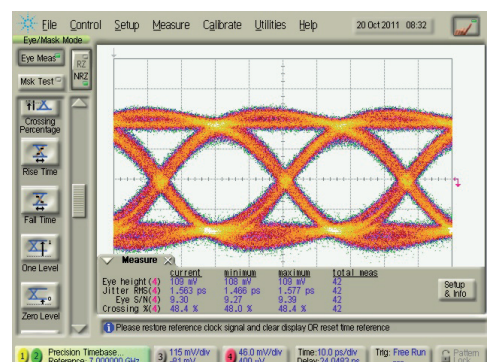


Output response

28 Gb/s data rate



Input signal



Output response

Dimensions - Interfaces - Compliance

Dimensions	
Dimensions	19 inches x 3U
Weight	3 kg - 6.6 pounds
Power supply (rear panel)	100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz
Interfaces	
Optical connectors	FC/UPC - FC/APC - SC/UPC
RF connector	50 Ω - V female
Fiber	Polarization maintaining fiber, PM1550
Remote type	MBC - Laser - USB type B with Labview driver
Compliance	
Safety	EN 60625-1
Marking	CE

Ordering Information

ModBox-W-DR-OL-ORx-XX

W = Wavelength range : 1550nm, 1310nm, 1060nm, 850nm
 DR = maximum output Data-Rate : 12.5Gbps, 28Gbps, 44Gbps
 OL = Laser Option, omit if no laser : wavelength in nm
 ORx = Photo-receiver Option, omit if no photo-receiver- Rx : Photo-receiver
 XX = Input / Output connectors, FA : FC/APC - FC : FC/UPC - SC : SC/UPC

Example : ModBox-850nm-28Gbps-850nm-Rx-FA is a modulation unit for 850 nm, 100 Mb/s - 28Gb/s NRZ optical modulated signal, with DFB laser at 850 nm and photo-receiver, FC-APC connectors.

About us

Photline Technologies is a provider of Fiber Optics Modulation Solutions based on the company LiNbO_3 modulators and high-speed electronics modules. Photline Technologies offers high speed and high data rate modulation solutions for the telecommunication industry and the defense, aerospace, instruments and sensors markets. The products offered by the company include : comprehensive range of intensity and phase modulators (800 nm, 1060 nm, 1300 nm, 1550 nm, 2000 nm), RF drivers and modules, transmitters and modulation units.

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