MODULATOR

MX1300-LN series

O-Band Intensity Modulators

The MX1300-LN series are lithium niobate (LiNbO3) intensity modulators specially designed for operation in the 1310 nm wavelength band. Thanks to their O-Band optimized optical waveguides and their 1310 nm selected fibers, the MX1300-LN can be claimed genuine 1310 nm intensity modulators.

The X-cut design of these Mach-Zehnder modulator confers them an unmatched stability in a wide range of operational conditions, as well as a zero chirp performance. iXblue proprietary waveguide design offers a low insertion loss combined with a high contrast. Thanks to their low Vp, the MX1300 series are ideally suited for low to high bit rates optical transmission with NRZ, RZ, DPSK, PAM-4 and are key devices for a large variety of applications.

Features

- O-Band specific waveguides and fibers
- X-cut for high stability
- Low drive voltage
- Low insertion loss

Applications

- Up to NRZ-56 Gb/s - PAM4-32 Gbaud
- General purpose intensity modulation
- Test and measurements

Options

- Analog version
- 1060 nm, 850 nm band versions

Related Equipments

- Choice of RF drivers
- MBC-DG Automatic Bias Controllers
- ModBox-VNA-Oband
- ModBox-PON

MX1300-LN-10 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1270	-	1330	nm
Insertion loss	-	3.5	-	dB
Electro-optical bandwidth	-	12	-	GHz
Vπ RF @50 kHz	-	4	-	V
Electro-optical bandwidth	10	-	-	GHz

MX1300-LN-20 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1270	-	1330	nm
Insertion loss	-	3.5	-	dB
Electro-optical bandwidth	-	25	-	GHz
Vπ RF @50 kHz	-	4	-	V
Electro-optical bandwidth	10	-	-	GHz

MX1300-LN-40 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1270	-	1330	nm
Insertion loss	-	3.5	-	dB
Electro-optical bandwidth	-	30	-	GHz
Vπ RF @50 kHz	-	4	-	V
Electro-optical bandwidth	10	-	-	GHz

MX1300-LN-10

12 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, -3 dB from 2 GHz	10	12	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, f < 10 GHz	-	-15	-10	dB
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	RF electrodes	-	4	5	V
Vπ RF @10 Gb/s PRBS	$V\pi_{RF\ 10\ Gb/s}$	RF electrodes	-	4.7	5.7	V
Vπ DC electrodes	$V\pi_{DC}$	DC electrodes	-	5.5	6	V
RF input impedance	Z_{in-RF}	-	-	50	-	Ω
DC input impedance	Z_{in-DC}	-	1	-	-	MΩ

50 Ω RF input

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1270	1310	1330	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	22	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	+0.1	-

All specifications given at 25 °C, 1310 nm, unless differently specified.
(*) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

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}	-	+28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	+20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MX1300-LN-20

25 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, -3 dB from 2 GHz	20	25	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, f < 20 GHz	-	-15	-10	dB
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	RF electrodes	-	4	5	V
Vπ RF @10 Gb/s PRBS	$V\pi_{RF\ 10\ Gb/s}$	RF electrodes	-	5.5	6	V
Vπ DC electrodes	$V\pi_{DC}$	DC electrodes	-	5.5	6	V
RF input impedance	Z_{in-RF}	-	-	50	-	Ω
DC input impedance	Z_{in-DC}	-	1	-	-	MΩ

50 Ω RF input

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1270	1310	1330	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	22	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	+0.1	-

All specifications given at 25 °C, 1310 nm, unless differently specified.
(*) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

Absolute Maximum Ratings

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Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	+28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	+20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MX1300-LN-40

40 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, -3 dB from 2 GHz	28	30	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, f < 20 GHz	-	-15	-10	dB
Vπ RF @50 kHz	$V\pi_{RF\ 50\ kHz}$	RF electrodes	-	4	5	V
Vπ DC electrodes	$V\pi_{DC}$	DC electrodes	-	5.5	6	V
RF input impedance	Z_{in-RF}	-	-	50	-	Ω
DC input impedance	Z_{in-DC}	-	1	-	-	MΩ

50 Ω RF input

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1270	1310	1330	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	22	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	+0.1	-

All specifications given at 25 °C, 1310 nm, unless differently specified.
(*) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

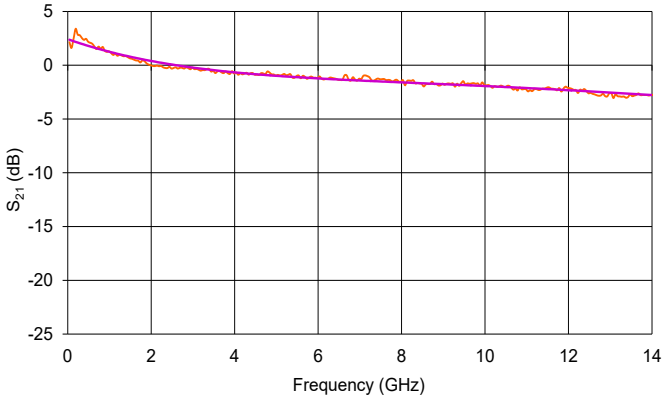
Absolute Maximum Ratings

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.

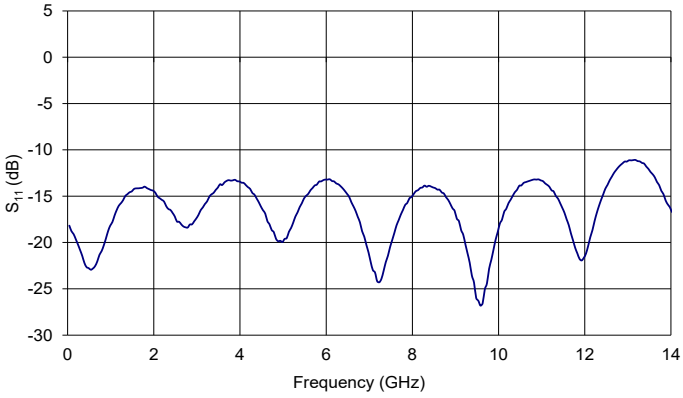
Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	+28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	+20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MX1300-LN-10, 20 & 40

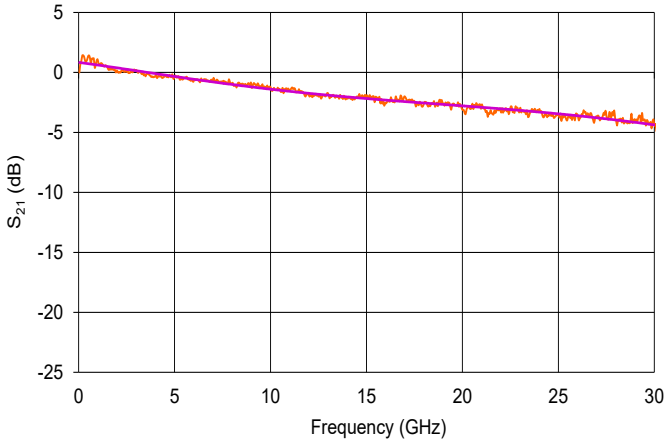
MX1300-LN-10 Typical S_{21} Curve



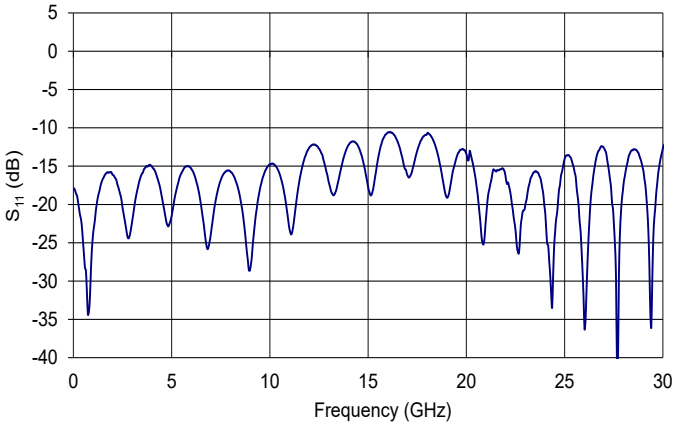
MX1300-LN-10 Typical S_{11} Curve



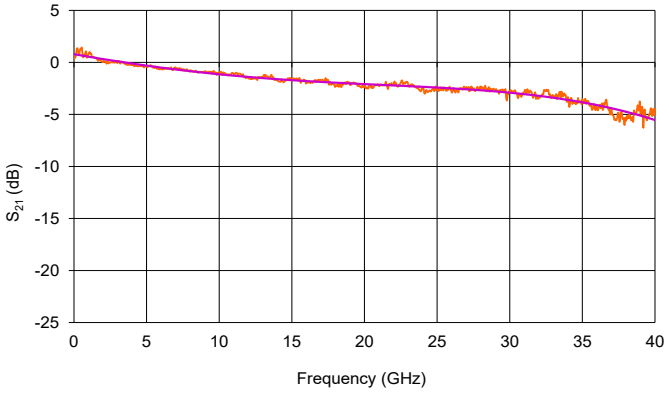
MX1300-LN-20 Typical S_{21} Curve



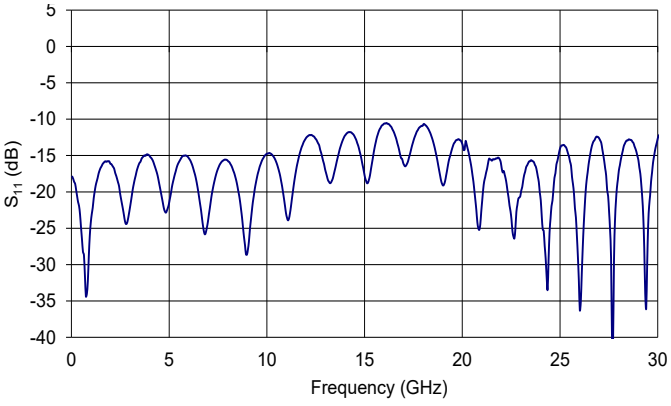
MX1300-LN-20 Typical S_{11} Curve



MX1300-LN-40 Typical S_{21} Curve

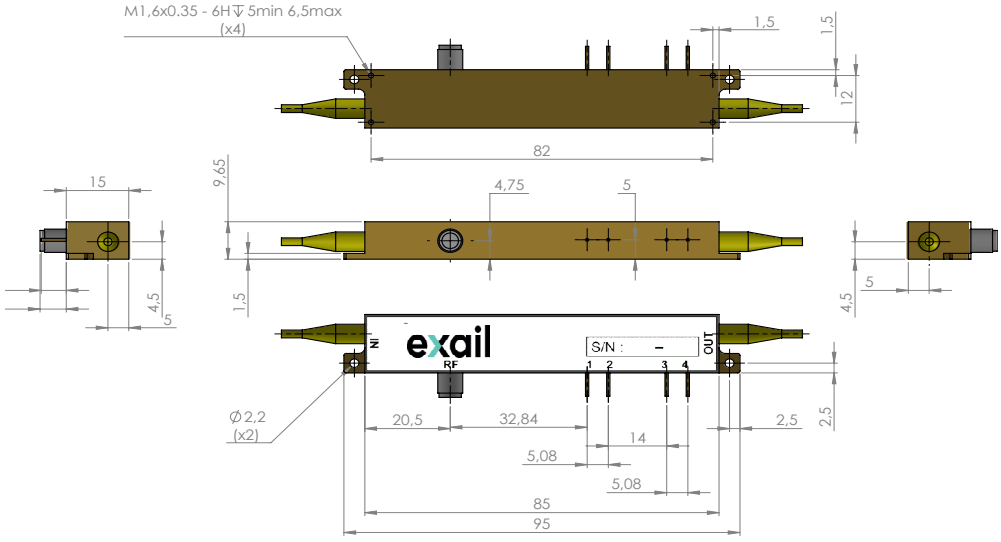


MX1300-LN-40 Typical S_{11} Curve



Mechanical Diagram and Pinout

All measurements in mm



Port	Function	Note
IN	Optical input port	Polarization maintaining 1310 nm Corning PM 13-U25D Length: 1.5 meter, buffer diameter: 900 µm
OUT	Optical output port	Polarization maintaining 1310 nm Corning PM 13-U25D Length: 1.5 meter, buffer diameter: 900 µm
RF	RF input port	MX1300-LN-10: Female K (SMA comptatible) MX1300-LN-20: Female K or 2.4 mm (optional) MX1300-LN-40: 2.4 mm, female, compatible to mate with V / 1.85 mm connectors (K option)
1	Ground	Pin feed through diameter 1.0 mm
2	DC	Pin feed through diameter 1.0 mm
3, 4	Photodiode cathode, anode	Pin feed through diameter 1.0 mm

Ordering information

Bandwidth : **10** (10 GHz), **20** (20 GHz), **40** (40 GHz)

Internal photodiode: "PD": integrated,"00": not integrated (by default)

Input fiber: P Polarization maintaining

Output fiber: P Polarization maintaining, S Standard single mode

Input connector: **00** (bare fiber), **FA** (FC/APC)

Output connector: **00** (bare fiber), **FA** (FC/APC)

MX1300-LN -□-□-□-□-□-□

About us

Exail 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.
Exail 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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01_2023_ED8 / 00023431-A / 00023623-A / 00023621-A