### MPX / MPZ series Low frequencies to 32 GHz Phase Modulators



Delivering Modulation Solutions

#### Modulator

Pholine NFZLH-10 (Sini 2000-24) **Features** High Bandwidth > 32 GHz C & L bands Low insertion loss Low Vπ Applications Chirping Interferometric sensing Frequency shifting / broadening Quantum key distribution High data rate telecommunication Options Hermetic sealing 800 nm, 1000 nm, 2.0 μm versions Low residual intensity modulation **Related equipments** 



The MPX-LN and MPZ-LN series make up the most comprehensive range of electro-optic phase modulators available on the market for the 1550 nm wavelength band.

- The MPZ-LN series are ideally suited for high bandwidth operation at 10 GHz, 20 GHz and up to 40 GHz.
- For lower frequencies up to 05 GHz, the MPX-LN series offers the unparalleled stability of x-cut devices.
- Finally, the MPX-LN-0.1 has a high impedance input optimized for frequencies below 150 MHz.

Designed using state-of-the-art and proven lithium niobate technology, MPX-LN and MPZ-LN phase modulators are easy to operate and to integrate. They offer high performance for all state of the art applications.

#### MPX-LN series Performance Highlights

Parameter	MPX-LN-0.1	MPX-LN-05		
Operating wavelength	1530 nm - 1580 nm			
Electro-optical bandwidth	150 MHz	4 GHz		
Vπ RF @50 kHz	3.5	6 V		
Insertion loss	3 dB	3.5 dB		

Specifications given at 25 °C, 1550 nm

#### MPZ-LN series Performance Highlights

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Parameter	MPZ-LN-10	MPZ-LN-40				
Operating wavelength	1530 nm - 1580 nm					
Electro-optical bandwidth	12 GHz	32 GHz				
Vπ RF @50 kHz	5 V	7 V				
Insertion loss	2.5 dB	2.5 dB	2.5 dB			

Specifications given at 25 °C, 1550 nm



#### Modulator

## MPX-LN-0.1 150 MHz Phase modulator

### **Electrical Characteristics**

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Electro-optic bandwidth	S <sub>21</sub>	RF electrodes	-	150	-	MHz
Vπ RF @50 kHz	Vπ RF <sub>50 kHz</sub>	RF electrodes	-	3.5	4	V
RF input impedance	Z <sub>in-RF</sub>	-	-	10 000	-	Ω

### Optical Characteristics All specifications given at 25 °C, 1550 nm, unless differently specified

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1580	nm
Insertion loss	IL	Without connectors	-	3	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

## Absolute Maximum Ratings

Parameter	Symbol	Min	Мах	Unit
Modulation voltage range	EV <sub>in</sub>	-20	20	V
Optical input power	OP <sub>in</sub>	-	20	dBm
Operating temperature	ОТ	0	+70	°C
Storage temperature	ST	-40	+85	°C



#### Modulator

## MPX-LN-05 5 GHz Phase modulator

### **Electrical Characteristics**

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Electro-optic bandwidth	S <sub>21</sub>	RF electrodes, from 2 GHz	4	5	-	GHz
Ripple S <sub>21</sub>	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	ES <sub>11</sub>	RF electrodes	-	-12	-10	dB
Vπ RF @50 kHz	Vπ RF <sub>50 kHz</sub>	RF electrodes	-	6	7	V
Vπ RF @5 GHz	$V\pi RF_{5 GHz}$	RF electrodes	-	9	10	V
RF input impedance	Z <sub>in-RF</sub>	-	-	40	-	Ω

#### Optical Characteristics All specifications given at 25 °C, 1550 nm, unless differently specified

Parameter	Symbol	Condition	Min	Тур	Max	Unit	
Crystal	-	-	Lithium Niobate X-Cut Y-Prop				
Waveguide process	-	-	Ti diffusion				
Operating wavelength	λ	-	1530	1550	1580	nm	
Insertion loss	IL	Without connectors	-	3.5	4.5	dB	
Optical return loss	ORL	-	-40	-45	-	dB	

## Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
RF input power	EP <sub>in</sub>	-	28	dBm
Optical input power	OP <sub>in</sub>	-	20	dBm
Operating temperature	ОТ	0	+70	°C
Storage temperature	ST	-40	+85	°C



#### Modulator

### MPZ-LN-10 10 GHz Phase modulator

### **Electrical Characteristics**

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Electro-optic bandwidth	S <sub>21</sub>	RF electrodes, from 2 GHz	10	12	-	GHz
Ripple S <sub>21</sub>	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	ES <sub>11</sub>	RF electrodes	-	-12	-10	dB
Vπ RF @50 kHz	Vπ RF <sub>50 kHz</sub>	RF electrodes	-	5	6	V
Vπ RF @10 GHz	$V\pi RF_{10 GHz}$	RF electrodes	-	7	8	V
RF input impedance	Z <sub>in-RF</sub>	-	-	40	-	Ω

### Optical Characteristics All specifications given at 25 °C, 1550 nm, unless differently specified

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1580	nm
Insertion loss	IL	Without connectors	-	2.5	3.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

## Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
RF input power	EP <sub>in</sub>	-	28	dBm
Optical input power	OP <sub>in</sub>	-	20	dBm
Operating temperature	ОТ	0	+70	°C
Storage temperature	ST	-40	+85	°C



#### Modulator

## MPZ-LN-20 20 GHz Phase modulator

## **Electrical Characteristics**

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Electro-optic bandwidth	S <sub>21</sub>	RF electrodes, from 2 GHz	18	20	-	GHz
Ripple S <sub>21</sub>	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	ES <sub>11</sub>	RF electrodes	-	-12	-10	dB
Vπ RF @50 kHz	$V\pi RF_{50 \text{ kHz}}$	RF electrodes	-	7	8	V
Vπ RF @20 GHz	Vπ RF <sub>20 GHz</sub>	RF electrodes	-	9	10	V
RF input impedance	Z <sub>in-RF</sub>	-	-	40	-	Ω

#### Optical Characteristics All specifications given at 25 °C, 1550 nm, unless differently specified

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1580	nm
Insertion loss	IL	Without connectors	-	2.5	3.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

# Absolute Maximum Ratings

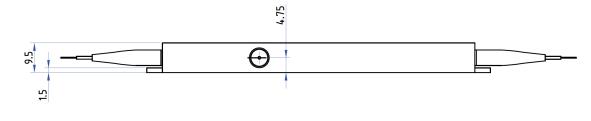
Parameter	Symbol	Min	Max	Unit
RF input power	EP <sub>in</sub>	-	28	dBm
Optical input power	OP <sub>in</sub>	-	20	dBm
Operating temperature	ОТ	0	+70	°C
Storage temperature	ST	-40	+85	°C

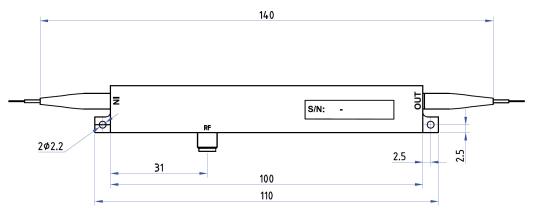


#### Modulator

### Mechanical Diagram and Pinout All measurements in mm







Port	Function	Note
IN	Optical input port	Polarization maintaining fiber 1550 nm, SM-15-P-8/125UV/UV400, Length 1.5 meter. Buffer diameter 900 $\mu m$
OUT	Optical output port	Polarization maintaining fiber 1550 nm, SM-15-P-8/125UV/UV400, Length 1.5 meter. Buffer diameter 900 μm
RF	RF input port	Wiltron female K

### Ordering information

# MPX-LN-XX-Y-Z-AB-CD MPZ-LN-WW-Y-Z-AB-CD

- **XX = X-cut Bandwidth : 0.1** 150 MHz **05** 5 GHz
- WW = Z-cut Bandwidth : 10 10 GHz 20 20 GHz
- Y = Input fiber : P Polarisation maintaining S Standard single mode
- Z = Input fiber : P Polarisation maintaining S Standard single mode
- AB = Output connector : 00 bare fiber FA FC/APC FC FC/SPC
- CD = Output connector : 00 bare fiber FA FC/APC FC FC/SPC

Note : optical connectors are Seikoh-Giken with narrow key or equivalent



#### Modulator

### MPZ-LN-40 40 GHz Phase modulator

## **Electrical Characteristics**

Parameter	Symbol	Condition	Min	Тур	Max	Unit
Electro-optic bandwidth	S <sub>21</sub>	RF electrodes, from 2 GHz	30	32	-	GHz
Ripple S <sub>21</sub>	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	ES <sub>11</sub>	RF electrodes	-	-12	-10	dB
Vπ RF @50 kHz	$V\pi RF_{50 \text{ kHz}}$	RF electrodes	-	7	8	V
Vπ RF @30 GHz	Vπ RF <sub>30 GHz</sub>	RF electrodes	-	10	11	V
RF input impedance	Z <sub>in-RF</sub>	-	-	35	-	Ω

#### Optical Characteristics All specifications given at 25 °C, 1550 nm, unless differently specified

Parameter	Symbol	Condition Min Typ M		Max	Unit	
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1580	nm
Insertion loss	IL	Without connectors	-	2.5	3.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

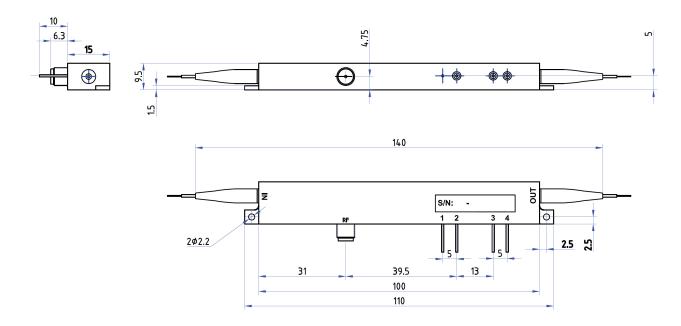
# Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
RF input power	EP <sub>in</sub>	-	28	dBm
Optical input power	OP <sub>in</sub>	-	20	dBm
Operating temperature	ОТ	0	+70	°C
Storage temperature	ST	-40	+85	°C



#### Modulator

### MPZ-LN-40 Mechanical Diagram and Pinout All measurements in mm



Port	Function	Note		
IN	Optical input port	Polarization maintaining fiber 1550 nm, SM-15-P-8/125UV/UV400, Length 1.5 meter. Buffer diameter 900 μm		
OUT	Optical output port	Polarization maintaining fiber 1550 nm, SM-15-P-8/125UV/UV400, Length 1.5 meter. Buffer diameter 900 $\mu m$		
RF	RF input port	Wiltron female V (K in option)		
1	Not connected	Not applicable		
2	Not used	Not applicable		
3	Not used	Not applicable		
4	Not used	Not applicable		

### Ordering information

# MPZ-LN-40-Y-Z-AB-CD

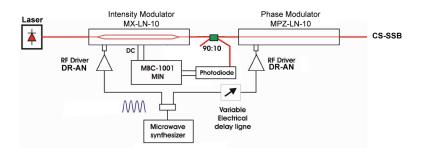
Y = Input fiber : P Polarisation maintaining S Standard single mode
Z = Input fiber : P Polarisation maintaining S Standard single mode
AB = Output connector : 00 bare fiber FA FC/APC FC FC/SPC
CD = Output connector : 00 bare fiber FA FC/APC FC FC/SPC
Note : optical connectors are Seikoh-Giken with narrow key or equivalent



#### Modulator

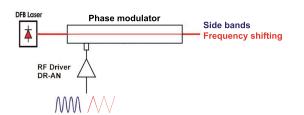
### Related equipments & Examples of application

#### Single Side Band with Carrier Supressed



Efficient Single Side Band modulation and Carrier Suppression can be achieved by using a combination of Intensity and Phase modulators properly driven with DR-AN analog RF amplifiers.

#### Side Bands Generation / Frequency Shifting





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DR-AN series amplifiers are high performance analog drivers for MPX-LN and MPZ-LN modulators.



1550 nm ModBoxes are custom designed Modulation Units and Transmitters. They incorporate a complete and dedicated modulation stage with power supply and control electronics and optional laser source and receiver. ModBoxes can be taylored to accomodate a broad variety of applications : pulse generation, pulse picking, spectral broadening, analog modulation, digital communication....

## ABOUT US

Photline Technologies is a provider of Fiber Optics Modulation Solutions based on the company LiNb03 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), RF drivers and modules, transmitters and modulation units.

Photline Technologies phone : +33 (0) 381 853 180 fax : +33 (0) 381 811 557 16, rue Auguste Jouchoux F-25 000 Besançon Photline Technologies 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.