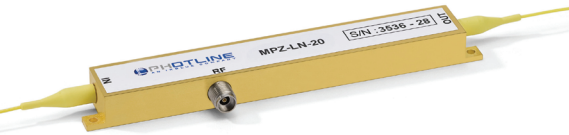


## MPX and MPZ series

Low frequencies to 40 GHz Phase Modulators

### PHOTLINE MODULATOR



#### FEATURES

- High Bandwidth
- C & L bands
- Low insertion loss
- Low  $V_{\pi}$

#### APPLICATIONS

- Side bands generation
- Interferometric sensing
- Frequency shifting / broadening
- Quantum key distribution
- High data rate telecommunications

#### OPTIONS

- 1310 nm versions
- 800 nm, 1000 nm, 2.0  $\mu\text{m}$  versions
- Low residual intensity modulation

#### RELATED EQUIPMENTS

- Matched RF amplifiers

The Photline 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.
- The MPX-LN-0.1 has a high impedance input optimized for modulation 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 the highest performance for a wide range of applications from laboratory experiments to demanding industrial systems.

#### MPX-LN-0.1 Performance Highlights

Parameter	MPX-LN-0.1
Operating wavelength	1530 nm - 1625 nm
Electro-optical bandwidth	150 MHz
$V_{\pi}$ RF @50 kHz	3.5 V
Insertion loss	2.7 dB

Specifications given at 25 °C, 1550 nm.

#### MPZ-LN series Performance Highlights

Parameter	MPZ-LN-10	MPZ-LN-20	MPZ-LN-40
Operating wavelength	1530 nm - 1625 nm		
Electro-optical bandwidth	12 GHz	25 GHz	33 GHz
$V_{\pi}$ RF @50 kHz	4 V	6 V	6 V
Insertion loss	2.5 dB	2.5 dB	2.5 dB

Specifications given at 25 °C, 1550 nm.

### MPX-LN-0.1

150 MHz Phase Modulator

#### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	$S_{21}$	RF electrodes	-	150	-	MHz
$V_{\pi}$ RF @50 kHz	$V_{\pi}$ RF <sub>50 kHz</sub>	RF electrodes	-	3.5	4	V
RF input impedance	$Z_{in-RF}$	-	-	10 000	-	$\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1530	1550	1625	nm
Insertion loss	IL	Without connectors	-	2.7	3.5	dB
Polarization dependent loss	PDL	-	-	5	8	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1550 nm, unless differently specified.

#### 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
Modulation voltage range	$EV_{in}$	-20	20	V
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

### MPZ-LN-10

10 GHz Phase Modulator

#### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	$S_{21}$	RF electrodes, from 2 GHz	10	12	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	$S_{11}$	RF electrodes	-	-17	-13	dB
$V\pi$ RF @50 kHz	$V\pi_{RF_{50\text{ kHz}}}$	RF electrodes, @1550 nm	-	4	5	V
$V\pi$ RF @10 GHz	$V\pi_{RF_{10\text{ GHz}}}$	RF electrodes, @1550 nm	-	6	7	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1530	1550	1625	nm
Insertion loss	IL	Without connectors	-	2.5	3.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1550 nm, unless differently specified.

#### 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
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

### MPZ-LN-20

20 GHz Phase Modulator

#### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	$S_{21}$	RF electrodes, from 2 GHz	20	25	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	$S_{11}$	RF electrodes	-	-12	-10	dB
$V\pi$ RF @50 kHz	$V\pi$ RF <sub>50 kHz</sub>	RF electrodes, @1550 nm	-	6	7	V
$V\pi$ RF @20 GHz	$V\pi$ RF <sub>20 GHz</sub>	RF electrodes, @1550 nm	-	8	9	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1530	1550	1625	nm
Insertion loss	IL	Without connectors	2	2.5	3	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1550 nm, unless differently specified.

#### 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
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

### MPZ-LN-40

40 GHz Phase Modulator

#### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	$S_{21}$	RF electrodes, from 2 GHz	30	33	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	RF electrodes	-	0.5	1	dB
Electrical return loss	$S_{11}$	RF electrodes, 0 - 30 GHz	-	-12	-10	dB
$V_{\pi}$ RF @50 kHz	$V_{\pi}$ RF <sub>50 kHz</sub>	RF electrodes, @1550 nm	-	6	7	V
$V_{\pi}$ RF @30 GHz	$V_{\pi}$ RF <sub>30 GHz</sub>	RF electrodes, @1550 nm	-	8.5	10	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	$\lambda$	-	1530	1550	1625	nm
Insertion loss	IL	Without connectors	2	2.5	3	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 1550 nm, unless differently specified.

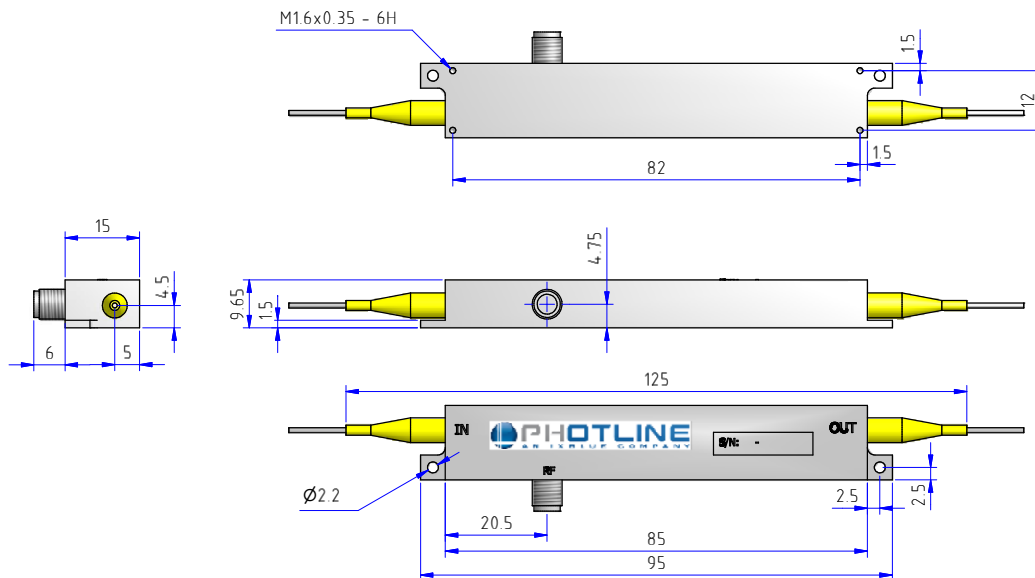
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Parameter	Symbol	Min	Max	Unit
RF input power	$EP_{in}$	-	28	dBm
Optical input power	$OP_{in}$	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

### Mechanical Diagram and Pinout

All measurements in mm



Port	Function	Note
IN	Optical input port	Polarization maintaining 1550 nm Corning PM 15-U25D length : 1.5 meter, buffer diameter : 900 um
OUT	Optical output port	Polarization maintaining 1550 nm Corning PM 15-U25D length : 1.5 meter, buffer diameter : 900 um
RF	RF input port	Wiltron female K (V type for MPZ-LN-40)

### Ordering information

## MPX-LN-0.1-Y-Z-AB-CD / MPZ-LN-WW-Y-Z-AB-CD

**XX = X-cut Bandwidth : 0.1 150 MHz**

**WW = Z-cut Bandwidth : 10 10 GHz 20 20 GHz 40 40 GHz**

**Y = Input fiber : P** Polarization maintaining **S** Standard single mode

**Z = Output fiber : P** Polarization maintaining **S** Standard single mode

**AB = Input connector : 00** bare fiber **FA** FC/APC **FC** FC/SPC

**CD = Output connector : 00** bare fiber **FA** FC/APC **FC** FC/SPC

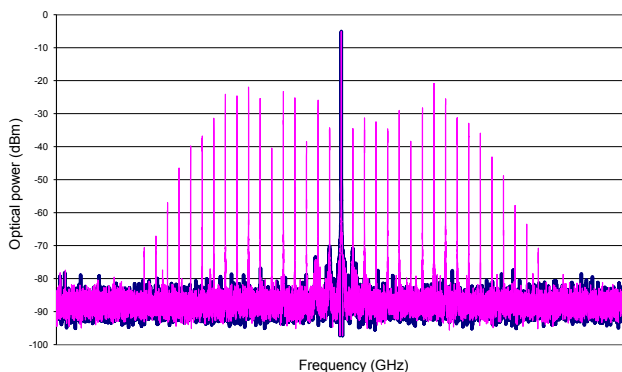
Note : optical connectors are Senko with narrow key or equivalent

### Related equipments : Spectral Broadening ModBoxes

The spectral broadening of optical signals is a solution to suppress the Stimulated Brillouin Scattering (SBS) caused in optical fibers by high fluxes of highly coherent light.

The SBS degrades the signal integrity and prevents the proper transmission through the fiber. Under certain conditions, when amplification occurs for instance, the SBS can lead to the destruction of the fiber and the optical components along or forward the fiber. When the temporal coherence of the signal is destroyed, the SBS power threshold is significantly increased and thus its effects can be eliminated.

The Spectral Broadening ModBoxes achieve the spectral broadening of the optical signal by modulating its phase via the mean of a very efficient  $\text{LiNbO}_3$  phase modulator and creating a number of lines over a spectral width that can reach several hundreds GHz.



The spectrally broadened optical signal



The spectral broadening ModBox

### About us

iXBlue Photonics includes iXBlue iXFiber brand that produces specialty optical fibers and Bragg gratings based fiber optics components and iXBlue Photline brand that provides optical modulation solutions based on the company lithium niobate ( $\text{LiNbO}_3$ ) 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.

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