

MODULATOR

MPX and MPZ series

Low frequencies to 40 GHz Phase Modulators

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 wide bandwidth operation to 40 GHz. Dedicated modulators bandwidths are proposed for an efficient electrical to optical conversion.
- The MPX-LN-0.1 has a high impedance input optimized for modulation frequencies up to 300 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. These modulators come with a comprehensive range of options (DC Coupled, Low Insertion Loss, POLarizer, High Electrical Power) to offer the highest performance for a wide range of applications from laboratory experiments to demanding industrial systems..



Features

- Low and wide EO bandwidth
- C & L bands
- Low V_{π}
- Low insertion loss

Applications

- Side bands generation
- Laser Combining
- Interferometric sensing
- Frequency shifting / broadening
- Quantum Key Distribution (QKD)
- Pound-Drever-Hall locking (PDH)
- High data rate telecommunications

Options

- DC coupled
- Low residual intensity modulation
- Low insertion loss
- High electrical input power capability

Related Equipments

- Matched RF amplifiers
- MX, MXAN, MXER intensity modulators
- Short optical pulse ModBox

Low and Medium Bandwidth Phase Modulators Highlights*

Parameter	MPX-LN-0.1	MPZ-LN-01
Operating wavelength		1530 nm - 1625 nm
Usable Electro-optical bandwidth	300 MHz	3 GHz
V_{π} RF @50 kHz	3.5 V	3 V
Insertion loss	2.7 dB	2.5 dB

*Specifications given at 25 °C, 1550 nm

Wide Bandwidth Phase Modulators Highlights*

Parameter	MPZ-LN-10	MPZ-LN-20	MPZ-LN-40
Operating wavelength			1530 nm - 1625 nm
Usable electro-optical bandwidth	16 GHz	30 GHz	40 GHz
V_{π} RF @50 kHz	4 V	4.5 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

Up to 300 MHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-	-	150	-	MHz
Usabe electro-optical bandwidth	S_{21}	-	-	300	-	MHz
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	3.5	4	V
RF Input Impedance	Z_{in-RF}	-	-	10 000	-	Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1625	nm
Insertion loss	IL	Without optical 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.

(*) 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
Modulation voltage range	$E_{V_{in}}$	-20	20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MPZ-LN-01

Up to 3 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-	1	1.5	-	GHz
Usable electro-optical bandwidth	S_{21}	-	-	3	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	-	dB
Electrical return loss	S_{11}	-	-	-15	-12	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	3	3.5	V
V_{π} RF @1 GHz / 3 GHz	$V_{\pi_{RF\ 1\ GHz}}$	-	-	3.1 / 4.5	-	V
RF port impedance matching	Z_{in-RF}	-	-	50	-	Ω
V_{π} DC electrodes	$V_{\pi_{DC}}$	DCC option, housing #B	-	3	6	V
DC port impedance matching	Z_{in-DC}	DCC option, housing #B	1	-	-	M Ω

Optical Characteristics

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

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

(*1) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector.

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Parameter	Symbol	Condition	Min	Max	Unit
RF input power	EP_{in}	-	-	28	dBm
High electrical input power option	HEP_{in}	-	-	33	dBm
Optical input power	OP_{in}	-	-	20	dBm
Bias Voltage	V_{DCC}	DCC option, housing #B	-15	+15	V
Operating temperature	OT	-	0	+70	°C
Storage temperature	ST	-	-40	+85	°C

MPZ-LN-10

Up to 16 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	-	10	12	-	GHz
Usable electro-optical bandwidth	S_{21}	-	-	16	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-17	-14	dB
		HEP option	-	-14	-10	dB
V π RF @50 kHz	V π_{RF} 50 kHz	-	-	4	5	V
V π RF @10 GHz / 16 GHz	V π_{RF} 10 GHz / 16 GHz	-	-	6 / 9	-	V
RF impedance matching	Z_{in-RF}	-	-	50	-	Ω
V π DC electrodes	V π_{DC}	DCC option, housing #B	-	4	7	V
DC port impedance matching	Z_{in-DC}	DCC option, housing #B	1	-	-	M Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	2.5	3.5	dB
Low insertion loss option	LIL	Without optical connectors*	-	2	2.5	dB
Optical return loss	ORL	-	-40	-45	-	dB

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(*) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

Absolute Maximum Ratings

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Parameter	Symbol	Condition	Min	Max	Unit
RF input power	EP _{in}		-	28	dBm
High electrical input power option	HEP _{in}		-	33	dBm
Optical input power	OP _{in}		-	20	dBm
Bias Voltage	V _{DCC}	DCC option, housing #B	-15	+15	V
Operating temperature	OT		0	+70	°C
Storage temperature	ST		-40	+85	°C

MPZ-LN-20

Up to 30 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	20	25	-	GHz
Usable electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	-	30	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	4.5	5.5	V
V_{π} RF @20 GHz / 30 GHz	$V_{\pi_{RF\ 20\ GHz / 30\ GHz}}$	-	-	6.5 / 10	-	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω

Optical Characteristics

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

All specifications given at 25 °C, 1550 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
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MPZ-LN-40

Up to 40 GHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	30	33	-	GHz
Usable electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	-	40	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-12	-9	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	6	7	V
V_{π} RF @30 GHz	$V_{\pi_{RF\ 30\ GHz}}$	-	-	8.5	-	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω

Optical Characteristics

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

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

(*1) Consider an extra-loss up to 0.25 dB for each FC/APC optical connector

Absolute Maximum Ratings

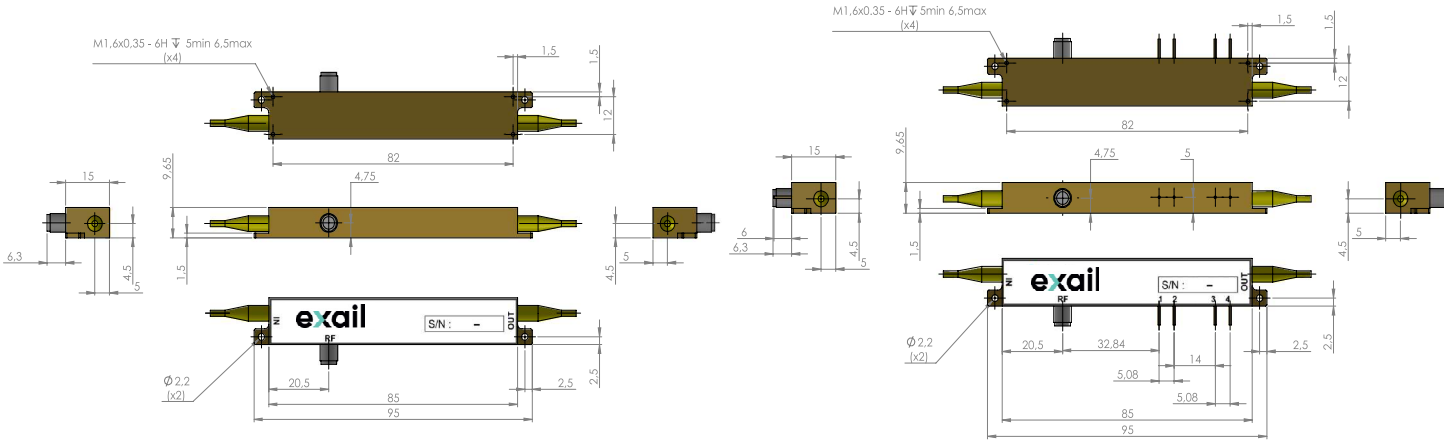
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Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	28	dBm
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

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Mechanical Diagram and Pinout

All measurements in mm



Housing #A: Standard Modulator housing

Housing #B: Modulator housing with DCC

Port	Function	Note
IN	Optical input port	Polarization maintaining fiber 1550 nm Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 μm
OUT	Optical output port	Polarization maintaining fiber 1550 nm, Corning PM 15-U25D Length: 1.5 meter, Buffer diameter: 900 μm
RF	RF input port	Female K (SMA compatible) MPZ-LN-40: female 2.4 mm, compatible to mate with V / 1.85mm
PINS 1 / 2	Ground / DC	Pin feed through diameter 1.0 mm
PINS 3 / 4	Not connected / Not connected	Pin feed through diameter 1.0 mm

Ordering Information

MPX/MPZ-LN-□-00-□-□-□-□-□

- Bandwidth : **X-cut: 0.1** (150 MHz),
Z-cut: 01 (1 GHz), **10** (10 GHz), **20** (20 GHz), **40** (40 GHz)
- Input fiber : Polarisation maintaining Fiber
- Output fiber : Single Mode and Polarisation maintaining Fiber
- Input connector : **00** (bare fiber), **FA** (FC/APC)
- Output connector : **00** (bare fiber), **FA** (FC/APC)
- POL (Embedded in-line Polarizer)
- HEP (High Electrical Power) for MPZ-LN-01 and LN-10 only
- LIL (Low Insertion Loss) for MPZ-LN-10 only
- DCC: DC Coupled for MPZ-LN-01 and MPZ-LN-10 only.

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 (LiNbO₃) 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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