

MODULATOR

MPX2000 / MPZ2000 series

2 μm band low frequencies to 20 GHz Phase Modulators

The MPX2000 and MPZ2000 are phase modulators especially designed for phase modulation in the 2.0 μm wavelength band from low frequencies to 20 GHz and above. The MPX2000/MPZ2000 incorporate 2.0 μm specific waveguides and are pigtailed with 2.0 μm polarization maintaining fibers.

The MPZ2000-LN-10 comes with Low V_{π} (LVP) and High Electrical Power (HEP) options.



Features

- Low insertion loss
- Low V_{π} (LV π)
- 2.0 μm specific design

Applications

- LIDAR
- Gas sensing
- Side bands generation
- Spectral Beam Combining (SBC)
- Coherent Beam Combining (CBC)
- Optical Frequency Combs
- Interferometric sensing
- Frequency shifting / broadening
- Quantum Key Distribution (QKD)
- Pound-Drever-Hall locking (PDH)
- High data rate telecommunications

Options

- Low V_{π} (LVP)
- Low Residual Amplitude modulation
- High electrical input power (HEP)
- Space grade version

Related Equipements

- Matched RF amplifiers
- Coherent Beam Combining ModBox

MPX2000-LN-0.1 - Performance Highlights ⁽¹⁾

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2000	2200	nm
Usable electro-optical bandwidth	-	300	-	MHz
V_{π} RF @50 kHz	-	4.5	-	V
Insertion loss	-	3	-	dB

⁽¹⁾ Specifications given at 25 °C, 2050 nm

MPZ2000-LN-10 - Performance Highlights ⁽¹⁾

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2000	2200	nm
Usable electro-optical bandwidth	-	16	-	GHz
V_{π} RF @50 kHz	-	6.5	-	V
Insertion loss	-	3	-	dB

⁽¹⁾ Specifications given at 25 °C, 2050 nm

MPZ2000-LN-10-LVP - Performance Highlights ⁽¹⁾

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	2050	2200	nm
Usable electro-optical bandwidth	-	20	-	GHz
V_{π} RF @50 kHz	-	4.5	-	V
Insertion loss	-	2.5	-	dB

⁽¹⁾ Specifications given at 25 °C, 2050 nm

MPX2000-LN-0.1

300 MHz Phase Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes	100	150	-	MHz
Usable electro-optical bandwidth	S_{21}	RF electrodes	-	300	-	MHz
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes	-	4.5	6	V
RF input impedance	Z_{in-RF}	-	-	10	-	k Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1900	2000	2200	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	3	5	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 2050 nm, unless differently specified.

⁽¹⁾ 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	EV_{in}	-20	20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MPZ2000-LN-10

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}	-	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	6.5	7.5	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut X-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1900	2000	2200	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	3	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

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⁽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
High electrical input power option	HEP_{in}	-	33	dBm
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MPZ2000-LN-10-LVP

20 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}	-	-	20	-	GHz
Ripple S_{21}	ΔS_{21}	-	-	0.5	1	dB
Electrical return loss	S_{11}	-	-	-13	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	-	-	4.5	5	V
V_{π} RF @10 GHz	$V_{\pi_{RF\ 10\ GHz}}$	-	-	5.5	-	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate Z-Cut X-Prop			
Waveguide process	-	-	Ti diffusion			
Operating wavelength	λ	-	1900	2050	2200	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	2.5	4	dB
Optical return loss	ORL	-	-40	-45	-	dB

All specifications given at 25 °C, 2050 nm, unless differently specified.

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

Absolute Maximum Ratings

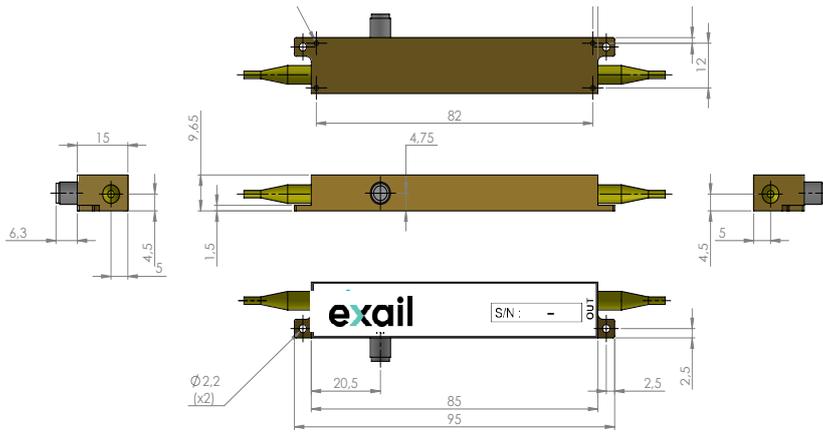
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Parameter	Symbol	Condition	Min	Max	Unit
RF input power	EP_{in}	-	-	33	dBm
Optical input power	OP_{in}	-	-	20	dBm
Operating temperature	OT	-	0	+70	°C
Storage temperature	ST	-	-40	+85	°C

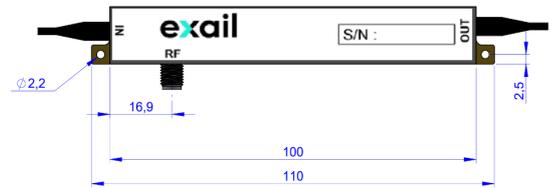
MODULATOR | MPX2000 / MPZ2000 SERIES | 5/5

Mechanical Diagram and Pinout

All measurements in mm



Housing #A: Standard Modulator housing



Housing #B: Modulator housing with LVP (MPZ2000-LN-10-LVP)

Port	Function	Note
IN	Optical input port	2000 nm Polarization maintaining fiber EXAIL IXF-PMF-1950-125-P-021
OUT	Optical output port	2000 nm Polarization maintaining fiber EXAIL IXF-PMF-1950-125-P-021
RF	RF input port	Female K (SMA compatible)

Ordering Information

MPX2000/MPZ2000-LN-□-□-□-□-□-□-□

- Bandwidth: **01** (300 MHz), **10** (up to 20 GHz with LVP)
- Input fiber: **P** Polarization maintaining
- Output fiber: **P** Polarization maintaining
- Input connector: **00** (bare fiber), **FA** (FC/APC)
- Output connector: **00** (bare fiber), **FA** (FC/APC)
- Low V_π option: **LVP**
- High Electrical Power: **HEP** (for MPZ2000-LN-10)