



### FEATURES

- Low insertion loss
- Low  $V_{\pi}$
- 2 μm specific design

### APPLICATIONS

- LIDAR
- Gas sensing
- Mid-IR wavelength generation
- Spectroscopy
- Seed source
- Research & development

### OPTIONS

- 20 GHz version
- Hermetic sealing

### RELATED EQUIPMENTS

- Choice of RF drivers
- 2.0 μm band Phase Modulators
- MBC-DG Automatic Bias Controllers

The MX2000-LN series are intensity modulators especially designed for operation in the 2.0 μm wavelength band at frequencies up to 10 GHz and above.

These Mach-Zehnder modulators offer engineers working at 2.0 μm the intrinsic and unparalleled benefits of LiNbO<sub>3</sub> external modulation: high bandwidth, high contrast, ease of use.

The MX2000-LN series are based on a X-cut design that confers them an unparalleled stability. They incorporate 2.0 μm specific waveguide and are pigtailed with 2.0 μm polarization maintaining fibers.

### MX2000-LN-01 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	-	2200	nm
Insertion loss	-	4	-	dB
Electro-optical bandwidth	1	2	-	GHz
$V_{\pi}$ RF @50 kHz	-	5.5	-	V

Specifications given at 25 °C, 50 Ω, 2050 nm

### MX2000-LN-10 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1900	-	2200	nm
Insertion loss	-	4	-	dB
Electro-optical bandwidth	10	12	-	GHz
$V_{\pi}$ RF @50 kHz	-	9.5	-	V

Specifications given at 25 °C, 50 Ω, 2050 nm

## MX2000-LN-01

### 1 GHz Intensity Modulator

#### Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	$S_{21}$	RF electrodes, from 500 MHz	1	2	-	GHz
Ripple $S_{21}$	$\Delta S_{21}$	RF electrodes, $f < 2$ GHz	-	0.5	1	dB
Electrical return loss	$S_{11}$	RF electrodes, $f < 2$ GHz	-	-12	-10	dB
$V\pi$ RF @50 kHz	$V\pi_{RF_{50\text{ kHz}}}$	RF electrodes	-	5.5	6.5	V
$V\pi$ DC electrodes	$V\pi_{DC}$	DC electrodes	-	11.5	13	V
Impedance matching	$Z_{in-RF}$	-	-	50	-	$\Omega$
DC input impedance	$Z_{in-DC}$	-	-	1	-	M $\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	$\lambda$	-	1900	2050	2200	nm
Insertion loss	IL	Without connectors	-	4	5.5	dB
DC extinction ratio	ER	Measured with narrow source linewidth $< 200$ MHz	20	22	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	$\alpha$	-	-0.1	0	0.1	-

All specifications given at 25°C, 2050 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
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

## MX2000-LN-10

### 10 GHz Intensity 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, $f < 2$ GHz	-	0.5	1	dB
Electrical return loss	$S_{11}$	RF electrodes, $f < 10$ GHz	-	-12	-10	dB
$V_{\pi}$ RF @50 kHz	$V_{\pi\text{RF}_{50\text{kHz}}}$	RF electrodes	-	9.5	11	V
$V_{\pi}$ DC electrodes	$V_{\pi\text{DC}}$	DC electrodes	-	11	13	V
Impedance matching	$Z_{\text{in-RF}}$	-	-	50	-	$\Omega$
DC input impedance	$Z_{\text{in-DC}}$	-	-	1	-	M $\Omega$

#### Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	$\lambda$	-	1900	2050	2200	nm
Insertion loss	IL	Without connectors	-	4	5.5	dB
DC extinction ratio	ER	Measured with narrow source linewidth $< 200$ MHz	20	22	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	a	-	-0.1	0	0.1	-

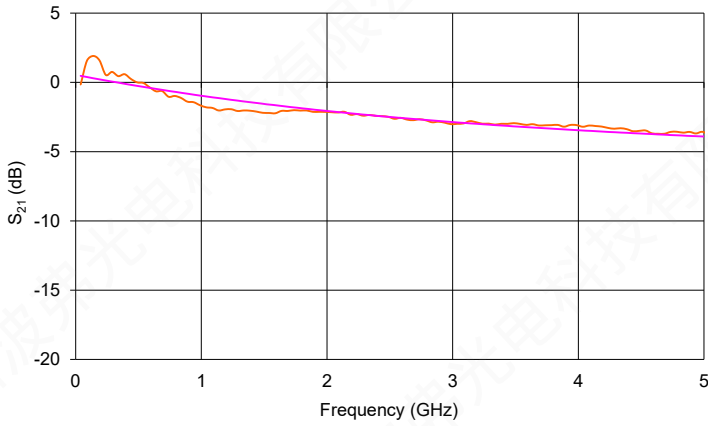
All specifications given at 25°C, 2050 nm, unless differently specified

#### Absolute Maximum Ratings

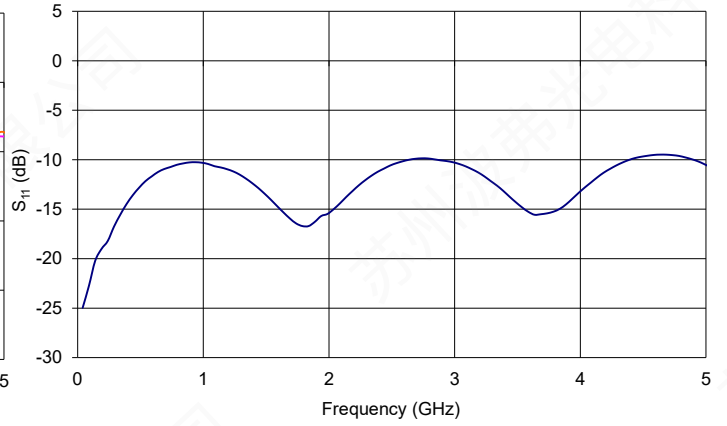
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure

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

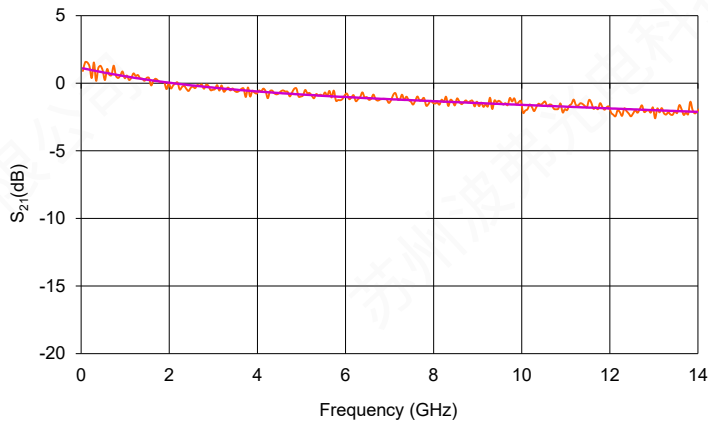
MX2000-LN-01 Typical  $S_{21}$  Curve



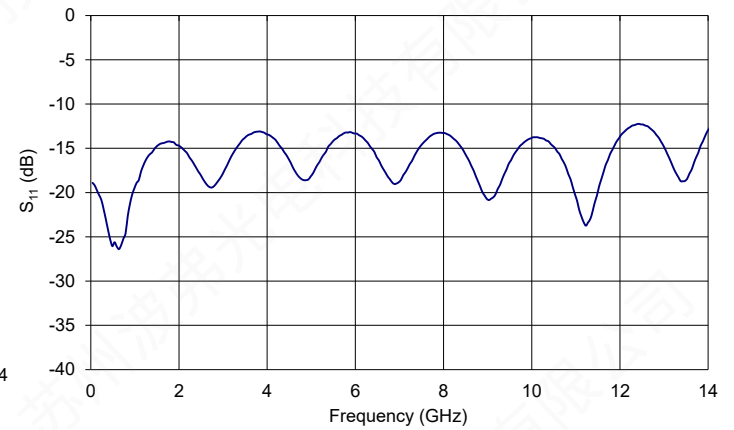
MX2000-LN-01 Typical  $S_{11}$  Curve



MX2000-LN-10 Typical  $S_{21}$  Curve

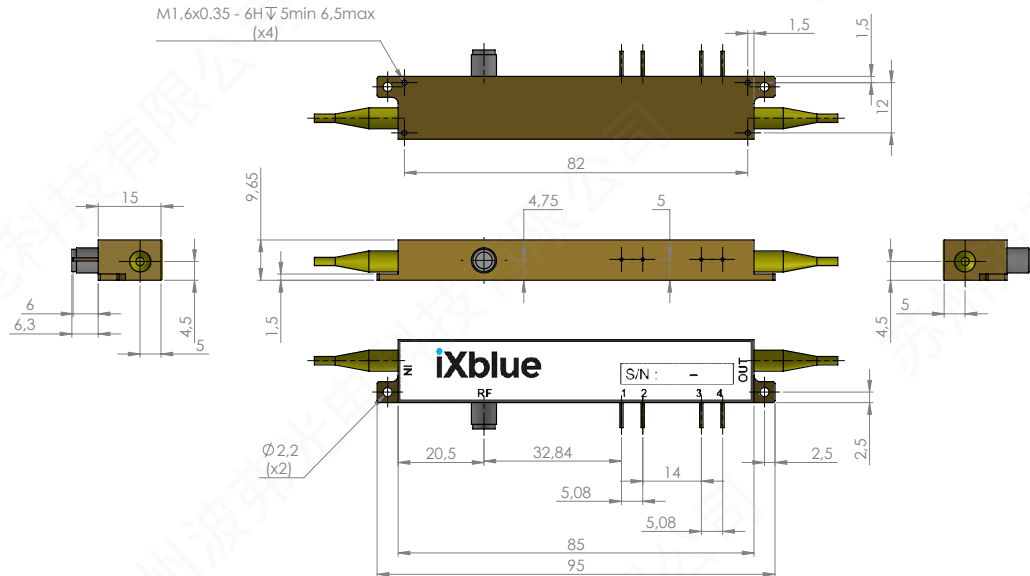


MX2000-LN-10 Typical  $S_{11}$  Curve



**Mechanical Diagram and Pinout**

All measurements in mm



Port	Function	Note
IN	Optical input port	2000 nm Polarization maintaining fiber, Nufern PM1950, length : 1.5 meter
OUT	Optical output port	2000 nm Polarization maintaining fiber, Nufern PM1950, length : 1.5 meter
RF	RF input port	Female K (SMA compatible)
1	Ground	Pin feed through diameter 1.0 mm
2	DC	Pin feed through diameter 1.0 mm
3	Photodiode cathode	Pin feed through diameter 1.0 mm
4	Photodiode anode	Pin feed through diameter 1.0 mm

**Ordering information**

**MX2000-LN-BW-Y-Z-AB-CD**

- BW = Bandwidth : 01 1 GHz 10 10 GHz
- Y = Input fiber : P Polarization maintaining
- Z = Output fiber : P Polarization maintaining
- 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

**About us**

ixblue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate (LiNbO<sub>3</sub>) 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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