

MX2000-LN series

2 μm band 1 GHz & 10 GHz Intensity Modulators

MODULATOR

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 LiNbO₃ 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 series

2 μm band 1 GHz & 10 GHz Intensity Modulators

MODULATOR
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} | ΔS_{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 | - | Ω |
| DC input impedance | Z_{in-DC} | - | - | 1 | - | MΩ |

Optical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|-----------|---|------|------|------|------------------------------|
| Crystal | - | - | | | | Lithium Niobate X-Cut Y-Prop |
| Operating wavelength | λ | - | 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 | α | - | -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 series

2 μm band 1 GHz & 10 GHz Intensity Modulators

MODULATOR

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} | ΔS_{21} | RF electrodes, $f < 2$ GHz | - | 0.5 | 1 | dB |
| Electrical return loss | S_{11} | RF electrodes, $f < 10$ GHz | - | -12 | -10 | dB |
| V/π RF @50 kHz | $V/\pi R F_{50\text{ kHz}}$ | RF electrodes | - | 9.5 | 11 | V |
| V/π DC electrodes | $V/\pi D C$ | DC electrodes | - | 11 | 13 | V |
| Impedance matching | Z_{in-RF} | - | - | 50 | - | Ω |
| 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 | λ | - | 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

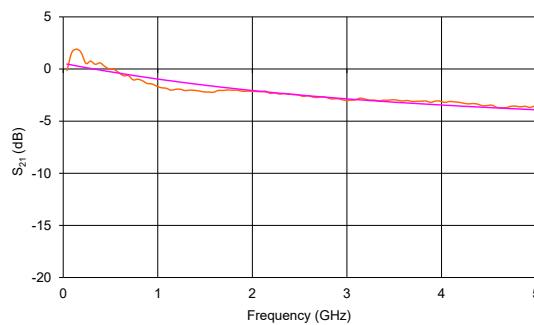
| Parameter | Symbol | Min | Max | Unit |
|-----------------------|------------|-----|-----|------|
| RF input power | $E P_{in}$ | - | 28 | dBm |
| Bias voltage | V_{bias} | -20 | +20 | V |
| Optical input power | $O P_{in}$ | - | 20 | dBm |
| Operating temperature | OT | 0 | +70 | °C |
| Storage temperature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

MX2000-LN series

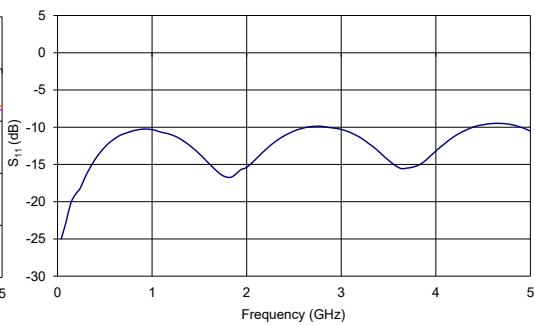
2 μm band 1 GHz & 10 GHz Intensity Modulators

MODULATOR

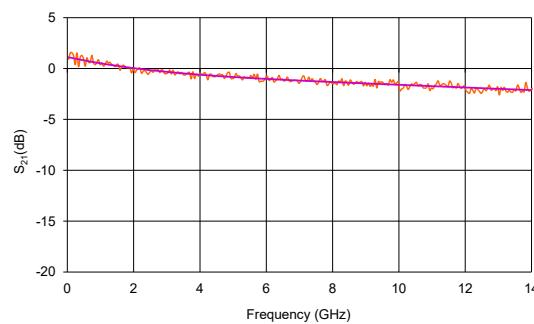
MX2000-LN-01 Typical S_{21} Curve



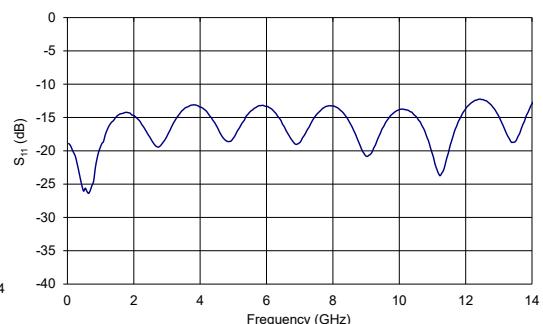
MX2000-LN-01 Typical S_{11} Curve



MX2000-LN-10 Typical S_{21} Curve

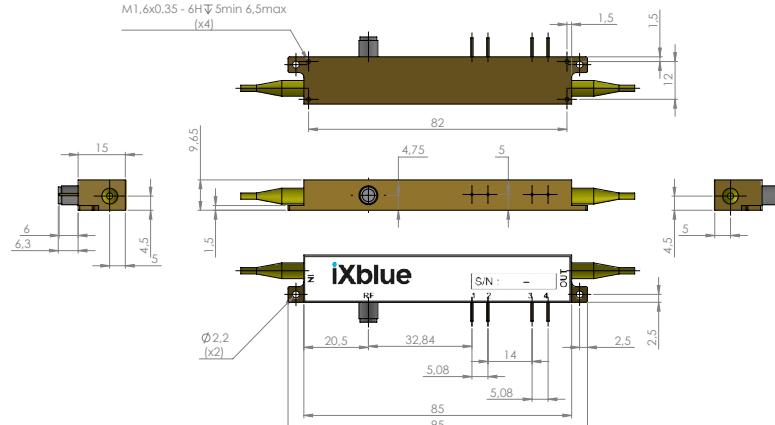


MX2000-LN-10 Typical S_{11} Curve



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_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.

iXblue 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.