

MODULATOR

MX1300-LN series

O-Band Intensity Modulators

The MX1300-LN series are lithium niobate (LiNbO₃) intensity modulators specially designed for operation in the 1310 nm wavelength band. Thanks to their O-Band optimized optical waveguides and their 1310 nm selected fibers, the MX1300-LN can be claimed genuine 1310 nm intensity modulators.

The X-cut design of these Mach-Zehnder modulator confers them an unmatched stability in a wide range of operational conditions, as well as a zero chirp performance. ixblue proprietary waveguide design offers a low insertion loss combined with a high contrast. Thanks to their low V_p, the MX1300 series are ideally suited for low to high bit rates optical transmission with NRZ, RZ, DPSK, PAM-4 and are key devices for a large variety of applications.



Features

- O-Band specific waveguides and fibers
- X-cut for high stability
- Low drive voltage
- Low insertion loss

Applications

- Up to NRZ-56 Gb/s - PAM4-32 Gbaud
- General purpose intensity modulation
- Test and measurements

Options

- Analog version
- 1060 nm, 850 nm band versions

Related Equipments

- Choice of RF drivers
- MBC-DG Automatic Bias Controllers
- ModBox-VNA-Oband
- ModBox-PON

MX1300-LN-10 Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---------------------------|------|-----|------|------|
| Operating wavelength | 1270 | - | 1330 | nm |
| Insertion loss | - | 3.5 | - | dB |
| Electro-optical bandwidth | - | 12 | - | GHz |
| V _π RF @50 kHz | - | 4 | - | V |
| Electro-optical bandwidth | 10 | - | - | GHz |

MX1300-LN-20 Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---------------------------|------|-----|------|------|
| Operating wavelength | 1270 | - | 1330 | nm |
| Insertion loss | - | 3.5 | - | dB |
| Electro-optical bandwidth | - | 25 | - | GHz |
| V _π RF @50 kHz | - | 4 | - | V |
| Electro-optical bandwidth | 20 | - | - | GHz |

MX1300-LN-40 Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---------------------------|------|-----|------|------|
| Operating wavelength | 1270 | - | 1330 | nm |
| Insertion loss | - | 3.5 | - | dB |
| Electro-optical bandwidth | - | 30 | - | GHz |
| V _π RF @50 kHz | - | 4 | - | V |
| Electro-optical bandwidth | 28 | - | - | GHz |

MX1300-LN-10

12 GHz Intensity Modulator

Electrical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------|--------------------------|---------------------------------|-----|-----|-----|------------|
| Electro-optical bandwidth | S_{21} | RF electrodes, -3 dB from 2 GHz | 10 | 12 | - | GHz |
| Ripple S_{21} | ΔS_{21} | RF electrodes | - | 0.5 | 1 | dB |
| Electrical return loss | S_{11} | RF electrodes, $f < 10$ GHz | - | -15 | -10 | dB |
| V_{π} RF @50 kHz | $V_{\pi_{RF\ 50\ kHz}}$ | RF electrodes | - | 4 | 5 | V |
| V_{π} RF @10 Gb/s PRBS | $V_{\pi_{RF\ 10\ Gb/s}}$ | RF electrodes | - | 4.7 | 5.7 | V |
| V_{π} DC electrodes | $V_{\pi_{DC}}$ | DC electrodes | - | 5.5 | 6 | V |
| RF input impedance | Z_{in-RF} | - | - | 50 | - | Ω |
| DC input impedance | Z_{in-DC} | - | 1 | - | - | M Ω |

50 Ω RF input

Optical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|-----------|---|------------------------------|------|------|------|
| Crystal | - | - | Lithium Niobate X-Cut Y-Prop | | | |
| Operating wavelength | λ | - | 1270 | 1310 | 1330 | nm |
| Insertion loss | IL | Without optical connectors* | - | 3.5 | 4.5 | 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, 1310 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 |
|-----------------------|------------|-----|-----|------|
| 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 |

MX1300-LN-20

25 GHz Intensity Modulator

Electrical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------------|--------------------------|---------------------------------|-----|-----|-----|------------|
| Electro-optical bandwidth | S_{21} | RF electrodes, -3 dB from 2 GHz | 20 | 25 | - | GHz |
| Ripple S_{21} | ΔS_{21} | RF electrodes | - | 0.5 | 1 | dB |
| Electrical return loss | S_{11} | RF electrodes, $f < 20$ GHz | - | -15 | -10 | dB |
| V_{π} RF @50 kHz | $V_{\pi_{RF\ 50\ kHz}}$ | RF electrodes | - | 4 | 5 | V |
| V_{π} RF @10 Gb/s PRBS | $V_{\pi_{RF\ 10\ Gb/s}}$ | RF electrodes | - | 5.5 | 6 | V |
| V_{π} DC electrodes | $V_{\pi_{DC}}$ | DC electrodes | - | 5.5 | 6 | V |
| RF input impedance | Z_{in-RF} | - | - | 50 | - | Ω |
| DC input impedance | Z_{in-DC} | - | 1 | - | - | M Ω |

50 Ω RF input

Optical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|-----------|---|------------------------------|------|------|------|
| Crystal | - | - | Lithium Niobate X-Cut Y-Prop | | | |
| Operating wavelength | λ | - | 1270 | 1310 | 1330 | nm |
| Insertion loss | IL | Without optical connectors* | - | 3.5 | 4.5 | 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, 1310 nm, unless differently specified.

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

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| 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 |

MX1300-LN-40

40 GHz Intensity Modulator

Electrical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------|-------------------------|---------------------------------|-----|-----|-----|------------|
| Electro-optical bandwidth | S_{21} | RF electrodes, -3 dB from 2 GHz | 28 | 30 | - | GHz |
| Ripple S_{21} | ΔS_{21} | RF electrodes | - | 0.5 | 1 | dB |
| Electrical return loss | S_{11} | RF electrodes, $f < 20$ GHz | - | -15 | -10 | dB |
| V_{π} RF @50 kHz | $V_{\pi_{RF\ 50\ kHz}}$ | RF electrodes | - | 4 | 5 | V |
| V_{π} DC electrodes | $V_{\pi_{DC}}$ | DC electrodes | - | 5.5 | 6 | V |
| RF input impedance | Z_{in-RF} | - | - | 50 | - | Ω |
| DC input impedance | Z_{in-DC} | - | 1 | - | - | M Ω |

50 Ω RF input

Optical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|-----------|---|------------------------------|------|------|------|
| Crystal | - | - | Lithium Niobate X-Cut Y-Prop | | | |
| Operating wavelength | λ | - | 1270 | 1310 | 1330 | nm |
| Insertion loss | IL | Without optical connectors* | - | 3.5 | 4.5 | 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, 1310 nm, unless differently specified.

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

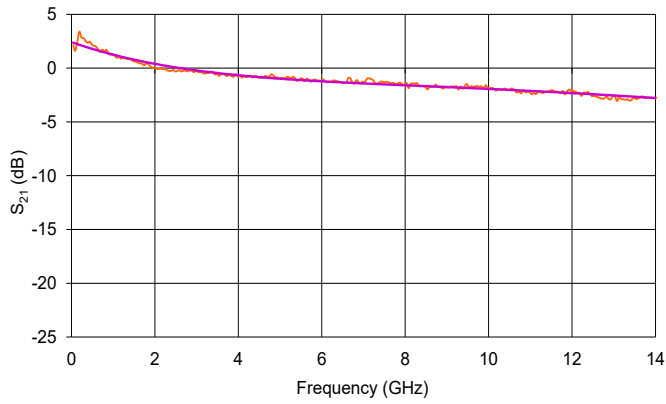
Absolute Maximum Ratings

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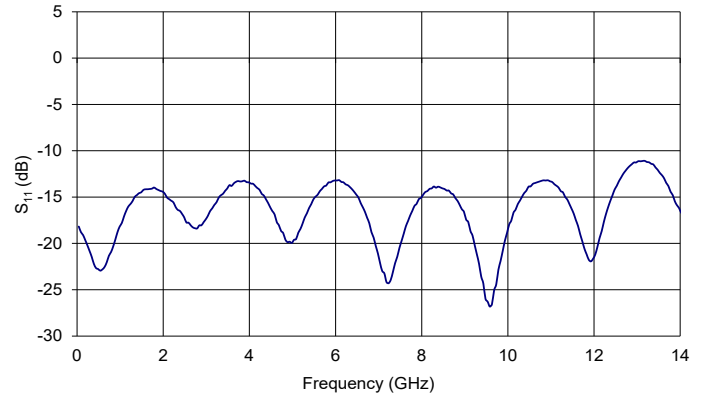
| Parameter | Symbol | Min | Max | Unit |
|-----------------------|------------|-----|-----|------|
| RF input power | EP_{in} | - | +28 | dBm |
| Bias Voltage | V_{bias} | -20 | +20 | V |
| Optical input power | OP_{in} | - | +20 | dBm |
| Operating temperature | OT | 0 | +70 | °C |
| Storage temperature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

MX1300-LN-10, 20 & 40

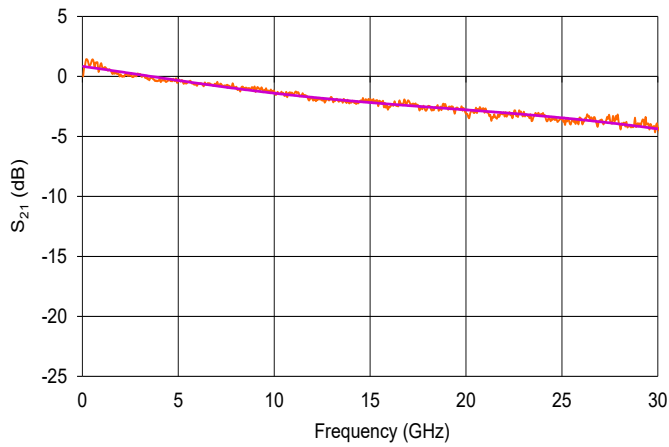
MX1300-LN-10 Typical S_{21} Curve



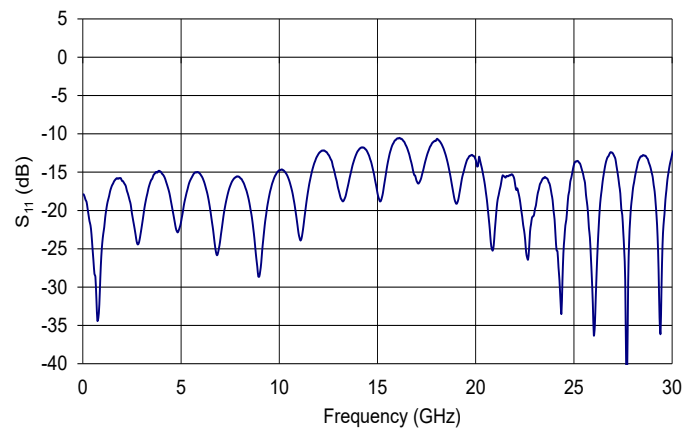
MX1300-LN-10 Typical S_{11} Curve



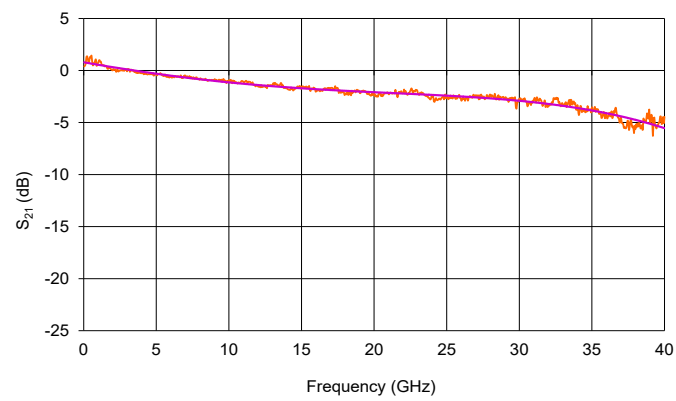
MX1300-LN-20 Typical S_{21} Curve



MX1300-LN-20 Typical S_{11} Curve



MX1300-LN-40 Typical S_{21} Curve



MX1300-LN-40 Typical S_{11} Curve

