

MODULATOR

MX-LN series

1550 nm band intensity Modulators

The MX-LN series are lithium niobate (LiNbO₃) intensity modulators designed for optical communications at data rates up to 56 Gb/s.

The X-cut design of these Mach-Zehnder modulators confer them an unmatched stability in a wide range of operational conditions, as well as a zero chirp performance. Exail proprietary waveguide design offers a low insertion loss combined with a high contrast. The MX-LN series are ideally suited for few kb/s up to 56 Gb/s optical transmission with NRZ, RZ, DPSK, Duo Binary modulation formats and are key device for a large variety of high bandwidth applications.



Features

- High bandwidth
- X-cut for high stability
- Low drive voltage
- Low insertion loss

Applications

- Digital communications
- General purpose intensity modulation
- Test and measurement

Options

- High extinction ratio versions
- 2000 nm, 1300 nm, 1060 nm, 850 nm
- Low insertion loss
- Space grade version

Related Equipments

- RF amplifiers
- MBC-DG Automatic Bias Controllers
- Modbox-CBand-VNA

MX-LN-0.1 Performance Highlights*

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	1550	1580	nm
Electro-optical bandwidth	100	400	-	GHz

MX-LN-05 Performance Highlights*

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	1550	1580	nm
Electro-optical bandwidth	3	4	-	GHz

MX-LN-10 Performance Highlights*

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	1550	1625	nm
Electro-optical bandwidth	10	12	-	GHz

MX-LN-20 Performance Highlights*

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	1550	1625	nm
Electro-optical bandwidth	20	25	-	GHz

MX-LN-40 Performance Highlights*

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	1550	1625	nm
Electro-optical bandwidth	28	30	-	GHz

*Specifications given at 25 °C, 1550 nm

MX-LN-0.1

100 MHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth ⁽¹⁾	S_{21}	RF electrodes	100	400	-	MHz
Ripple S_{21} ⁽¹⁾	ΔS_{21}	RF electrodes	-	0.5	1	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	3.5	4	V
V_{π} RF @200 Mb/s PRBS	$V_{\pi_{RF\ 200\ Mb/s}}$	RF electrodes, @ 1550 nm	-	1.5	-	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
RF input impedance	Z_{in-RF}	From DC to 400 MHz	High impedance			-
DC input impedance	Z_{in-DC}	-	1	-	-	M Ω

⁽¹⁾ DC coupled amplitude modulator. RF modulation applies from DC to 400 MHz

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1530	1550	1580	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	30	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	-	0.1	-

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

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}	-	N/A	-
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

MX-LN-05

5 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes	3	4	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes	-	0.5	1	dB
Electrical return loss, 0-5 GHz	S_{11}	RF electrodes	-	-13	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	3.5	4	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	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	-	1530	1550	1580	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	25	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	-	0.1	-

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	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

MX-LN-10

10 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes	10	12	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	5.5	6.5	V
V_{π} RF @10 Gb/s PRBS	$V_{\pi_{RF\ 10\ Gb/s}}$	RF electrodes, @ 1550 nm	-	6.5	7	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	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	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors ⁽¹⁾	-	3.5	-	dB
Insertion loss (with low IL option)	LIL	Without optical connector ⁽¹⁾	-	2.7	3	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, 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	Min	Max	Unit
RF input power	EP_{in}	-	28	
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C

MX-LN-20

20 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	20	25	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 20$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	5	5.5	V
V_{π} RF @20 Gb/s PRBS	$V_{\pi_{RF\ 20\ Gb/s}}$	RF electrodes, @ 1550 nm	-	5.5	6	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	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	-	1530	1550	1625	nm
Insertion loss	IL	Without connector ⁽¹⁾	-	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, 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	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

MX-LN-40

40 GHz Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	28	30	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 30$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	5	6	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes, @ 1550 nm	-	6.5	7	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	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors ¹⁾	-	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, 1550 nm, unless differently specified.

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

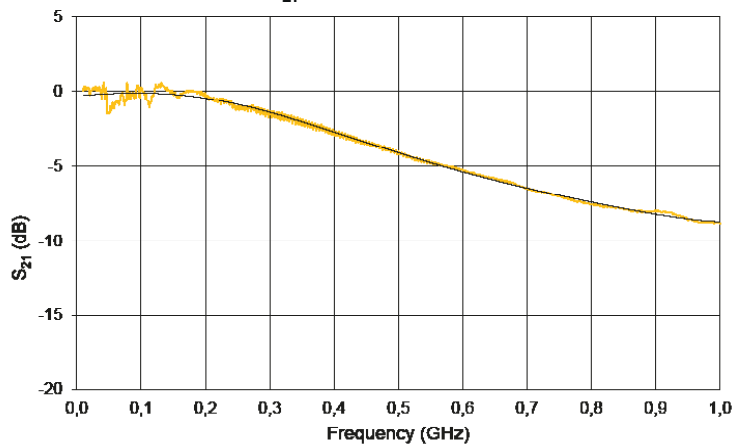
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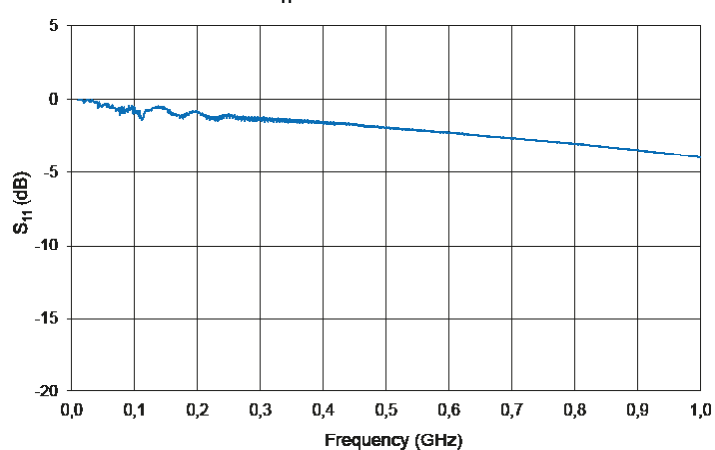
Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MX-LN-0.1 & 05

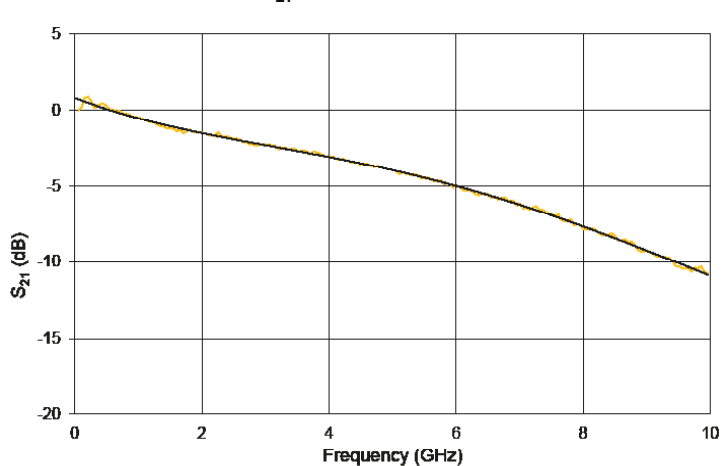
MX-LN-0.1 Typical S_{21} Curve



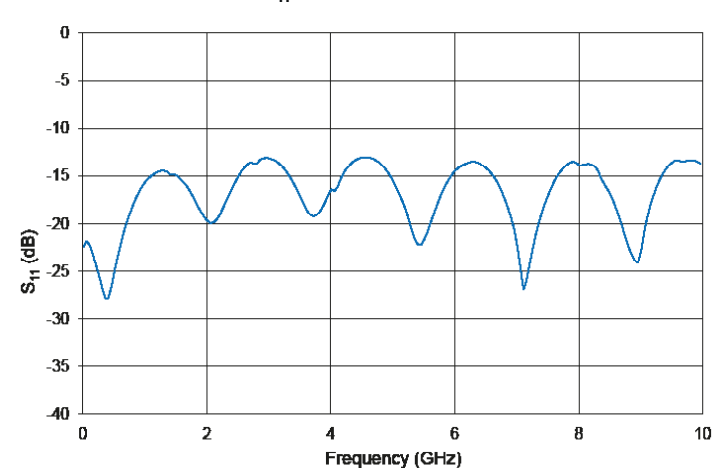
MX-LN-0.1 Typical S_{11} Curve



MX-LN-05 Typical S_{21} Curve

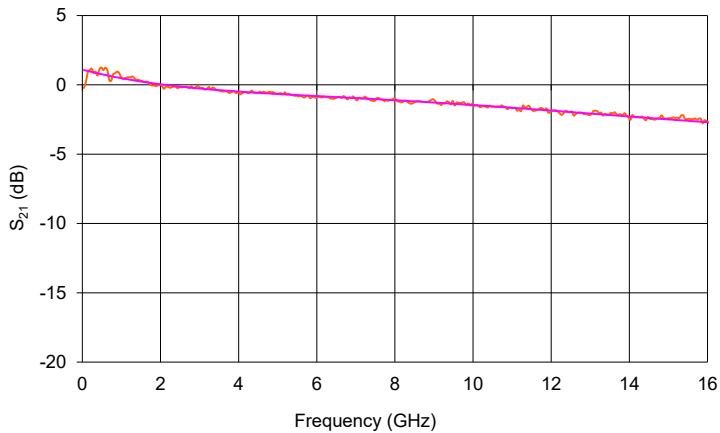


MX-LN-05 Typical S_{11} Curve

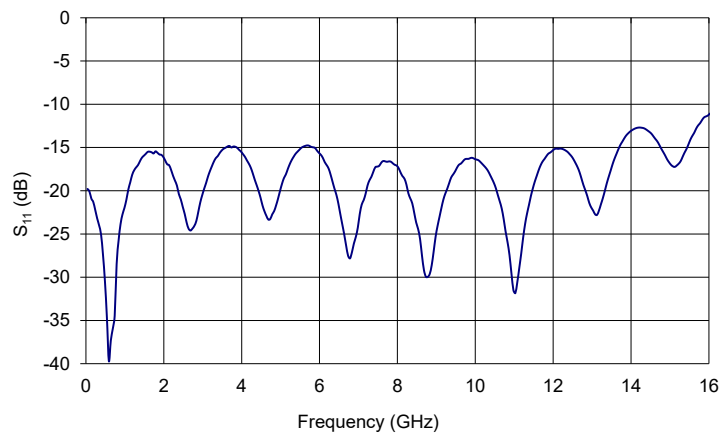


MX-LN-10, 20 & 40

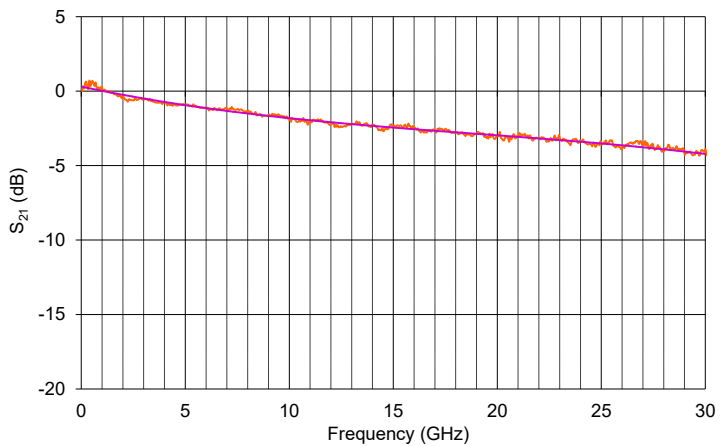
MX-LN-10 Typical S_{21} Curve



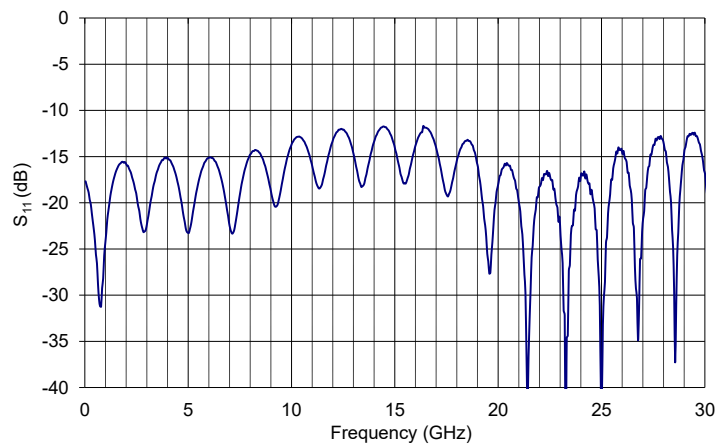
MX-LN-10 Typical S_{11} Curve



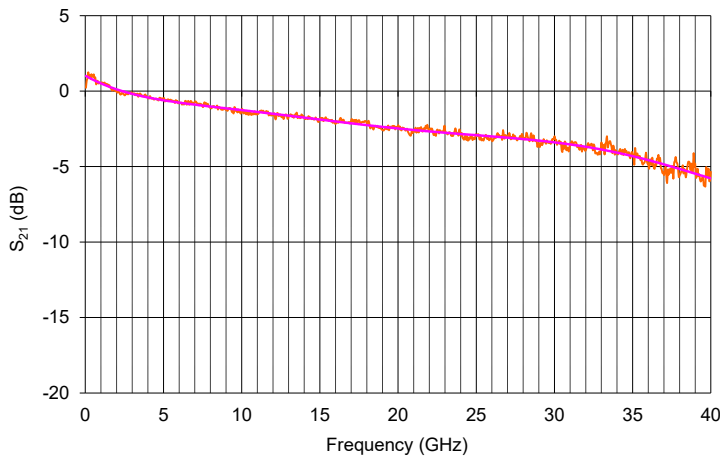
MX-LN-20 Typical S_{21} Curve



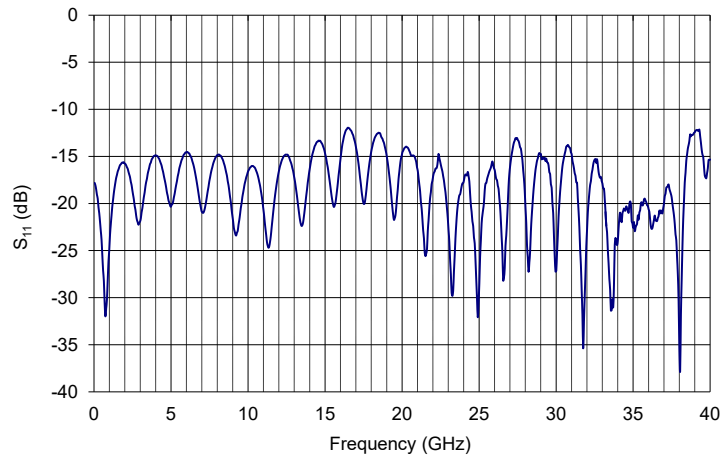
MX-LN-20 Typical S_{11} Curve



MX-LN-40 Typical S_{21} Curve



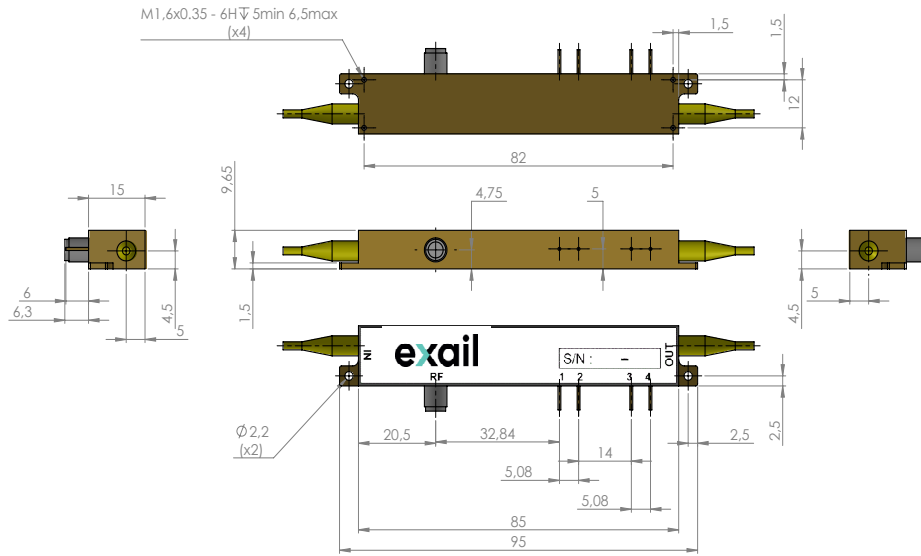
MX-LN-40 Typical S_{11} Curve



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Mechanical Diagram and Pinout

All measurements in mm



Port	Function	Note
IN	Optical input port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 µm
OUT	Optical output port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 µm
RF	RF input port	MX-LN-0.1, 05, 10: Female K (SMA compatible) MX-LN-20: Female K or 2.4 mm (optional) MX-LN-40: 2.4 mm, female, compatible to mate with V / 1.85 mm connectors (K option)
1	Ground	Pin feed through diameter 1.0 mm
2	DC	Pin feed through diameter 1.0 mm
3, 4	Photodiode cathode, anode	Pin feed through diameter 1.0 mm

Ordering information

MX-LN-□-□-□-□-□-□-□

- Bandwidth: **0.1** (400 MHz), **05** (5 GHz), **10** (10 GHz), **20** (20 GHz), **40** (40 GHz)
- Internal photodiode: "**PD**": integrated, "**00**": not integrated (by default)
- Input fiber: **P** Polarization maintaining
- Output fiber: **P** Polarization maintaining, **S** Standard single mode fiber
- Input connector: **00** (bare fiber), **FA** (FC/APC)
- Output connector: **00** (bare fiber), **FA** (FC/APC)
- LIL**: Low Insertion Loss option

About us

Exail reserves the right to change, at any time and without notice, the specifications, design, function or form of its products described herein.

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MODULATOR

MXAN-LN series

1550 nm band Analog Intensity Modulators

The MXAN-LN series are high bandwidth intensity modulators specially designed for the transmission of analog signals over optical fibers.

The MXAN-LN's performance parameters meet the requirement of the most demanding analog transmission links for military and civil applications: the x-cut design offers an unmatched stability, the low insertion loss optimizes links gain and the high linearity preserves the signal quality. They are specially suitable for microwave links and remoted antennas.



Features

- High linearity
- Bandwidth 10 GHz, 20 GHz, 40 GHz
- High stability
- Low insertion loss
- Operation in C and L bands

Applications

- RoF
- Antenna remoting
- Microwave and radar links
- Space and defence systems

Options

- 1300 nm, 1000 nm, 800 nm versions
- Hermetic sealing
- Space qualified

Related Equipments

- DR-AN RF amplifiers
- MBC ditherless Bias Controllers
- Turn-key ModBox systems

MXAN-LN-10 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1625	nm
Insertion loss	-	3.5	-	dB
Insertion loss (with low IL option)	-	2.7	3	dB
Electro-optical bandwidth	10	12	-	GHz
V_{π} RF @50 kHz	-	5.5	-	V

Specifications given at 25 °C, 50 Ω , 1550 nm

MXAN-LN-20 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1625	nm
Insertion loss	-	3.5	-	dB
Electro-optical bandwidth	20	25	-	GHz
V_{π} RF @50 kHz	-	5	-	V
2nd Harmonic suppression ratio	-	60	-	dB

Specifications given at 25 °C, 50 Ω , 1550 nm

MXAN-LN-40 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1625	nm
Insertion loss	-	3.5	-	dB
Usable EO bandwidth	-	40	50	GHz
V_{π} RF @50 kHz	-	5	-	V
2nd Harmonic suppression ratio	-	60	-	dB

Specifications given at 25 °C, 50 Ω , 1550 nm

MXAN-LN-10

10 GHz Analog Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	10	12	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 10$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, $f < 10$ GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes	-	5.5	6	V
V_{π} RF @10 GHz	$V_{\pi_{RF\ 10\ GHz}}$	RF electrodes	-	6.5	7	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
2nd Harmonic suppression ratio	$H_1 - H_2$	Measured @5 GHz	-	70	-	dB
Input 3rd order intercept	IIP3	Measured @5 GHz	28	30	-	dBm
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	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
Insertion loss (with low IL option)	LIL	Without optical connectors*	-	2.7	3	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, 1550 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

MXAN-LN-20

20 GHz Analog Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	20	25	-	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 20$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, $f < 20$ GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes	-	5	5.5	V
V_{π} RF @20 GHz	$V_{\pi_{RF\ 20\ GHz}}$	RF electrodes	-	7	8	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
2nd Harmonic suppression ratio	$H_1 - H_2$	Measured @5 GHz, $RF_{IN} = 0$ dBm	-	60	-	dB
Input 3rd order intercept	IIP3	Measured @5 GHz	28	30	-	dBm
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	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	25	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	0.1	-

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

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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

MXAN-LN-40

40 GHz Analog Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	28	30	-	GHz
Usable EO bandwidth	S_{21}	RF electrodes, from 2 GHz	-	40	50	GHz
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 30$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, $f < 30$ GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes	-	5	6	V
V_{π} RF @20 GHz	$V_{\pi_{RF\ 20\ GHz}}$	RF electrodes	-	7	8	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
2nd Harmonic suppression ratio	$H_1 - H_2$	Measured @5 GHz, $RF_{IN} = 0$ dBm	-	60	-	dB
Input 3rd order intercept	IIP3	Measured @5 GHz	28	30	-	dBm
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	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	3.5	4.5	dB
DC Extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	25	-	dB
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	0.1	-

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Absolute Maximum Ratings

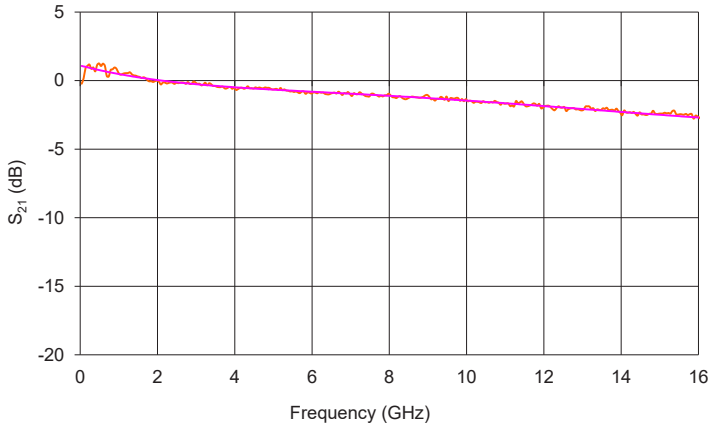
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Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

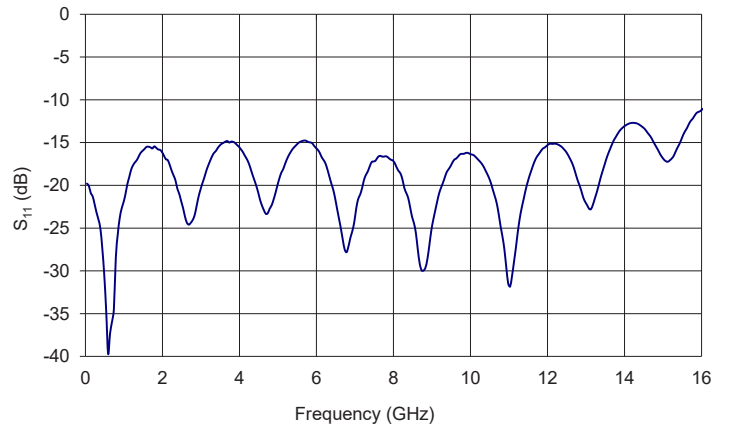
MODULATOR | MXAN-LN SERIES | 5/6

MXAN-LN-10, 20 & 40

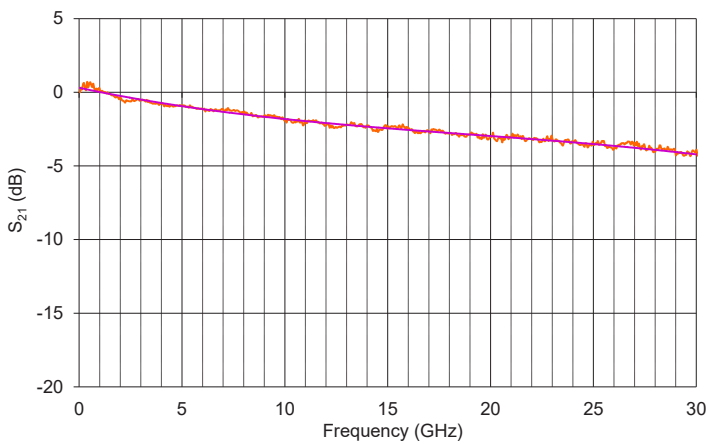
MXAN-LN-10 Typical S_{21} Curve



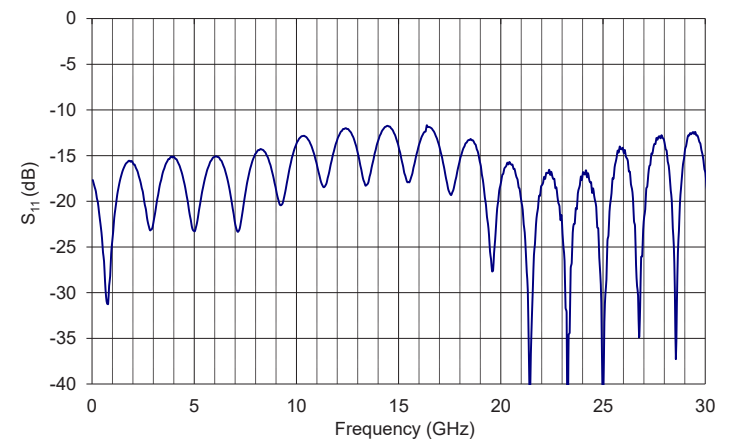
MXAN-LN-10 Typical S_{11} Curve



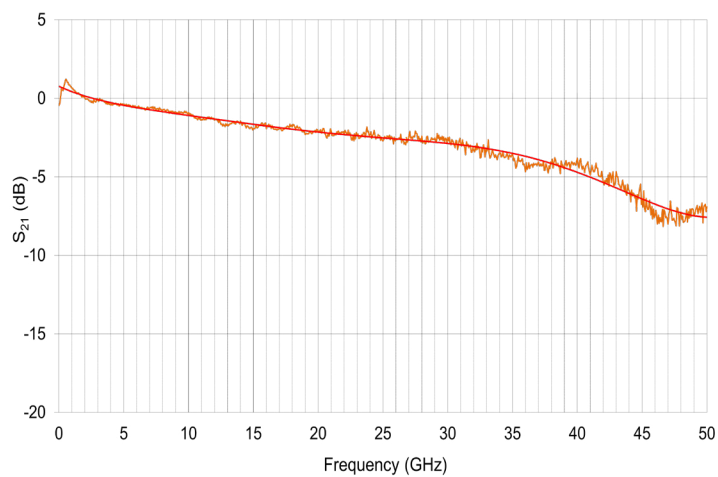
MXAN-LN-20 Typical S_{21} Curve



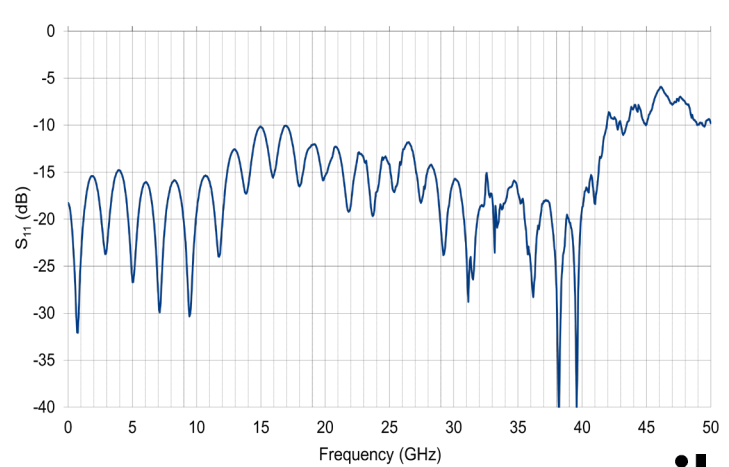
MXAN-LN-20 Typical S_{11} Curve



MXAN-LN-40 Typical S_{21} Curve



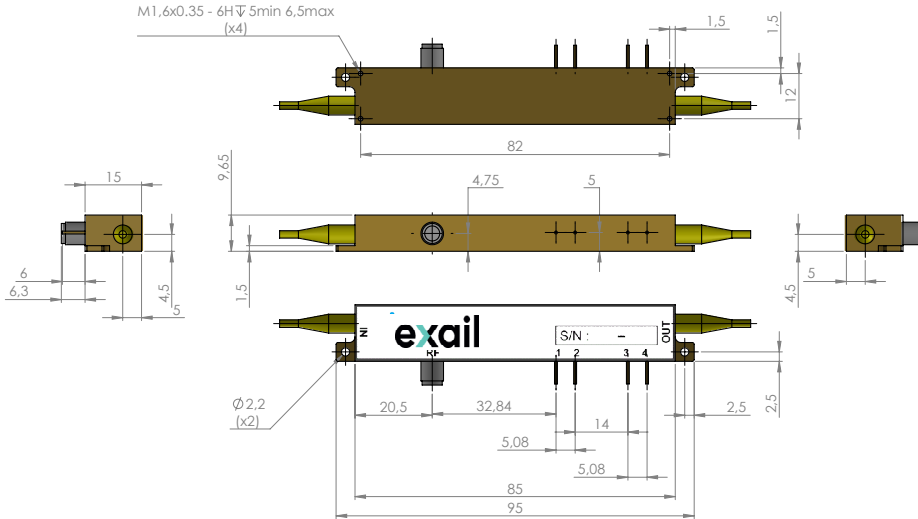
MXAN-LN-40 Typical S_{11} Curve



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Mechanical Diagram and Pinout

All measurements in mm



Port	Function	Note
IN	Optical input port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 μm
OUT	Optical output port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 μm
RF	RF input port	MXAN-LN-10: Female K (SMA compatible) MXAN-LN-20: Female K or 2.4 mm (optional) MXAN-LN-40: 2.4 mm, female, compatible to mate with V / 1.85 mm connectors (K option)
1	Ground	Pin feed through diameter 1.0 mm
2	DC	Pin feed through diameter 1.0 mm
3, 4	Photodiode cathode, anode	Pin feed through diameter 1.0 mm

Ordering information

	Bandwidth : 10 (10 GHz), 20 (20 GHz), 40 (40 GHz)
	Internal photodiode: "PD": integrated, "00": not integrated (by default)
	Input fiber: P Polarization maintaining
	Output fiber: P Polarization maintaining, S Standard single mode
	Input connector: 00 (bare fiber), FA (FC/APC), FC (FC/SPC)
	Output connector: 00 (bare fiber), FA (FC/APC), FC (FC/SPC)
	LIL: Low Insertion Loss option
	Note: optical connectors are Seikoh-Giken with narrow key or equivalent

MXAN-LN-□-□-□-□-□-□-□

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.

Exail 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, Exail provides no warranty (whether express or implied or statutory) as to the description, sufficiency, accuracy or completeness, merchantability or fitness for a particular purpose of any information or specification detailed herein.** No liability is assumed for any inaccuracies and/or as a result of use of the products. The user must validate all parameters for each application before any use and he shall assume all risks and responsibilities in connection with the use of the products.

MODULATOR

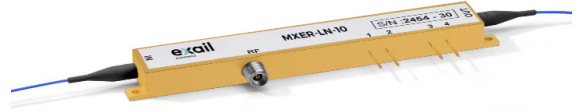
MXER-LN series

1550 nm band Very High Extinction Ratio Intensity Modulators

The MXER-LN series of intensity modulators is a family of high performance modulators exhibiting superior Extinction Ratio.

Their specific design relies on ixblue "Magic Junction" (patent n° US2008193077).

MXER-LN series intensity modulators are key devices in all applications where a combination of high extinction and high bandwidth is required: laser pulse picking prior optical amplification, pulse generation or lidar based sensing systems are a few examples, as well as fiber optics sensors.



Features

- Superior extinction ratio: 40 dB
- High bandwidth
- X-cut for high stability
- Low drive voltage
- Low insertion loss

Applications

- Pulse generation / picking
- Carrier suppression
- Fiber optics sensors
- Pulse applications

Options

- 20 GHz version
- 1060 nm, 1300 nm band versions

Related Equipments

- Pulsed driver DR-PL
- MBC Automatic Bias Controllers

MXER-LN-10 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1625	nm
Insertion loss	-	3.5	-	dB
Extinction ratio	-	30, 35, 40	-	dB
Electro-optical bandwidth	10	-	-	GHz

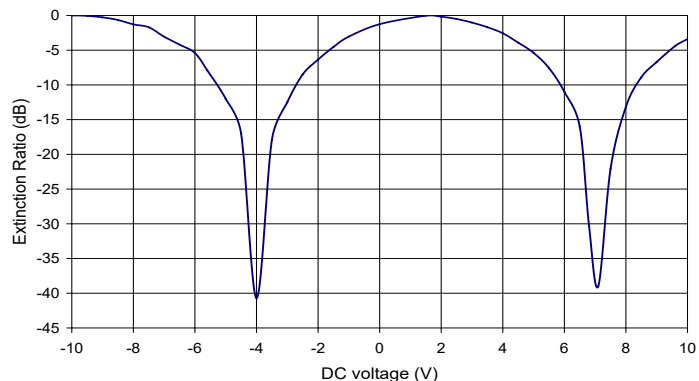
Specifications given at 25 °C, 1550 nm

MXER-LN-20 Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1625	nm
Insertion loss	-	3.5	-	dB
Extinction ratio	-	30, 35, 40	-	dB
Electro-optical bandwidth	18	-	-	GHz

Specifications given at 25 °C, 1550 nm

Extinction Ratio Response



MXER-LN-10

10 GHz Very High Extinction Ratio Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	10	12	-	GHz
Rise / fall times	tr / tr	Optical pulse, using DR-VE-10-MO	-	30	35	ps
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 12$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, 0 - 12 GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	5.5	6	V
V_{π} RF @10 GHz	$V_{\pi_{RF\ 10\ GHz}}$	RF electrodes, @ 1550 nm	-	6.5	7	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω
DC input impedance	Z_{in-DC}	-	1	-	-	M Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	3.5	5	dB
DC Extinction ratio	ER > 30	Measured at 1550 nm by default, for other λ contact us	30	-	-	dB
	ER > 35		35	-	-	dB
	ER > 40		40	-	-	dB
Optical return loss	ORL	-	-40	-45	-40	dB
Chirp	α	-	-0.1	0	-0.1	-

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

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

MXER-LN-20

20 GHz Very High Extinction Ratio Intensity Modulator

Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optical bandwidth	S_{21}	RF electrodes, from 2 GHz	18	20	-	GHz
Rise / fall times	t_r / t_f	Optical pulse	-	20	25	ps
Ripple S_{21}	ΔS_{21}	RF electrodes, $f < 18$ GHz	-	0.5	1	dB
Electrical return loss	S_{11}	RF electrodes, 0 - 18 GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi_{RF\ 50\ kHz}}$	RF electrodes, @ 1550 nm	-	5.5	6	V
V_{π} DC electrodes	$V_{\pi_{DC}}$	DC electrodes	-	6.5	7	V
Impedance matching	Z_{in-RF}	-	-	50	-	Ω
DC input impedance	Z_{in-DC}	-	1	-	-	M Ω

Optical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Crystal	-	-	Lithium Niobate X-Cut Y-Prop			
Operating wavelength	λ	-	1530	1550	1625	nm
Insertion loss	IL	Without optical connectors*	-	3.5	5	dB
DC Extinction ratio	ER > 30	Measured at 1550 nm by default, for other λ contact us	30	-	-	dB
	ER > 35		35	-	-	dB
	ER > 40		40	-	-	dB
Optical return loss	ORL	-	-40	-45	-40	dB
Chirp	α	-	-0.1	0	-0.1	-

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

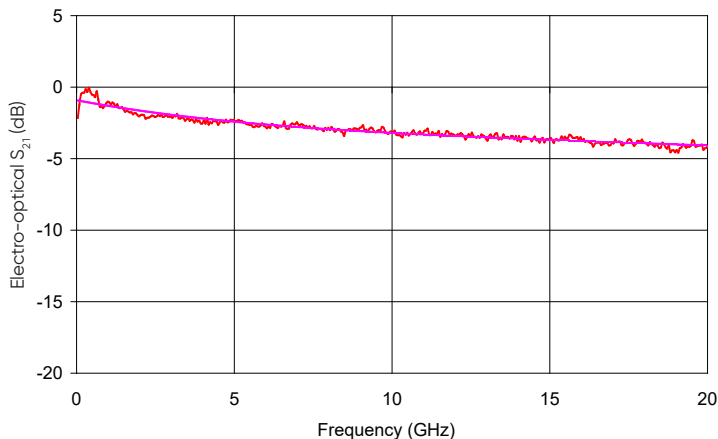
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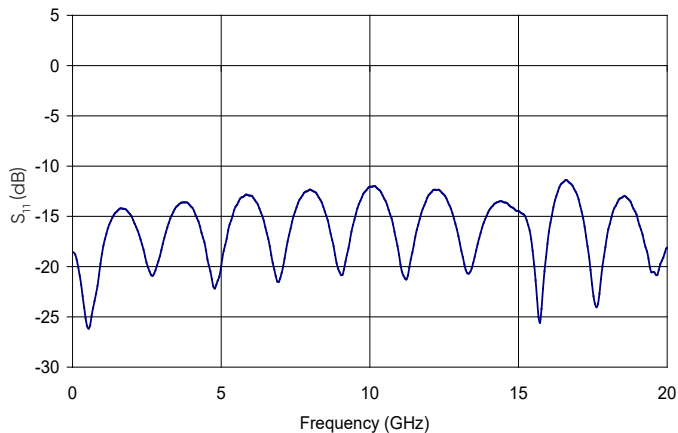
Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	28	dBm
Bias Voltage	V_{bias}	-20	+20	V
Optical input power	OP_{in}	-	20	dBm
Operating temperature	OT	0	+70	°C
Storage temperature	ST	-40	+85	°C

MXER-LN-10 & 20

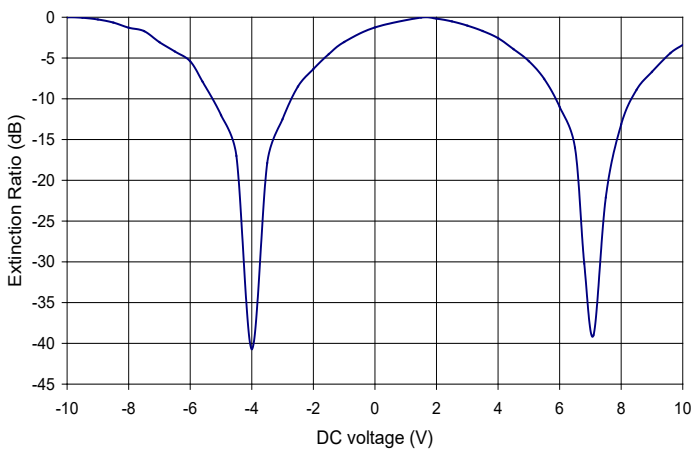
Typical S_{21} Curve



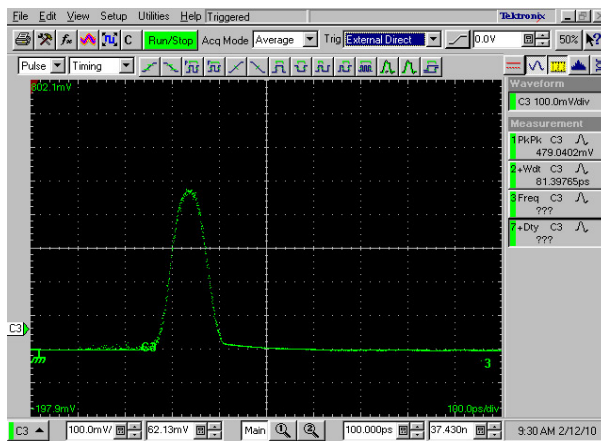
Typical S_{11} Curve



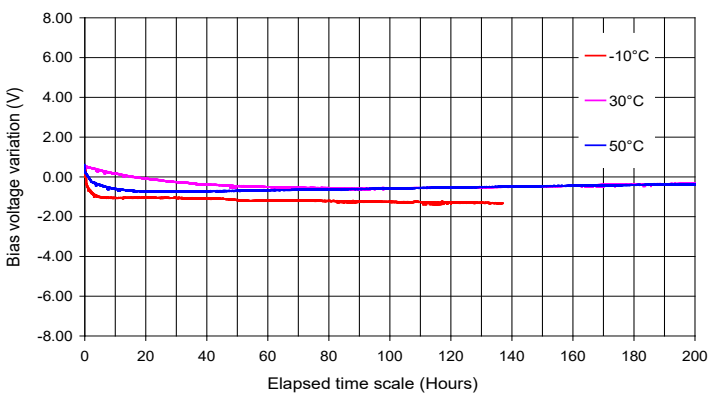
Extinction Ratio



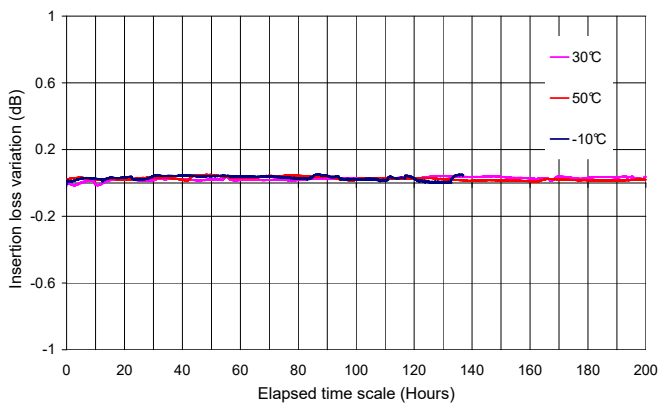
Generated 80 ps Optical Pulse



Stability with Time and Temperature



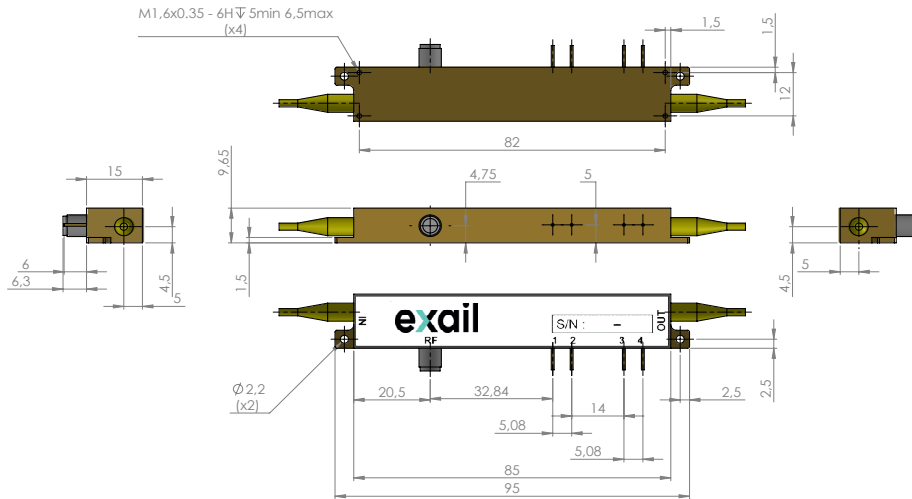
Insertion Loss with Time and Temperature



MODULATOR | MXER-LN SERIES | 5/5

Mechanical Diagram and Pinout

All measurements in mm



Port	Function	Note
IN	Optical input port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 µm
OUT	Optical output port	Polarization maintaining fiber Corning PM 15-U25D Length: 1.5 meter, buffer diameter: 900 µm
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, 4	Photodiode cathode, anode	Pin feed through diameter 1.0 mm

Ordering information

	Bandwidth : 10 (10 GHz), 20 (20 GHz)
	Internal photodiode: "PD": integrated, "00": not integrated (by default)
	Input fiber: P Polarization maintaining
	Output fiber: P Polarization maintaining
	Input connector: 00 (bare fiber), FA (FC/APC), FC (FC/SPC)
	Output connector: 00 (bare fiber), FA (FC/APC), FC (FC/SPC)
	Extinction ratio: 30 (30 dB), 35 (35 dB), 40 (40 dB)
MXER-LN-□-□-□-□-□-□-□	Note: optical connectors are Senko with narrow key or equivalent

About us

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