



The MXDO-LN-20 is a lithium niobate (LiNbO₃) intensity modulator with dual fiber outputs designed for analog applications at frequencies up to 20 GHz. The MXDO-LN-20 specific design offers an excellent balance of the two complementary fiber outputs.

The X-cut of this Mach-Zehnder modulator confers it an unmatched stability in a wide range of operational conditions, as well as a zero chirp performance. The MXDO-LN-20 is ideally suited for 20 GHz analog communications such as RF over fiber and microwave photonics using differential detection.

FEATURES

- Dual complementary optical outputs
- High EO bandwidth
- High stability

APPLICATIONS

- Antenna remoting
- Radar / Satcom
- Test and measurement
- Up to 20 GHz high frequency links

OPTIONS

- Hermetic sealing
- External monitoring photodiode

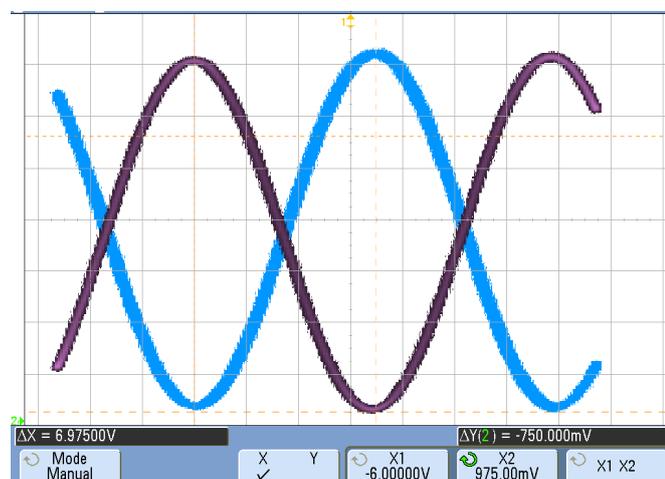
RELATED EQUIPMENTS

- DR-AN analog RF amplifiers
- MBC ditherless Bias Controllers

Performance Highlights

Parameter	Min	Typ	Max	Unit
Operating wavelength	1530	-	1580	nm
Insertion loss	-	4	-	dB
Electro-optical bandwidth	18	20	-	GHz
V _π RF @50 kHz	-	5.5	-	V
Output coupling rate	-	50	-	%
2nd harmonic suppression ratio	-	70	-	dB
Input 3rd order intercept	-	30	-	dB

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



Electrical Characteristics 50 Ω RF input

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Electro-optic bandwidth	S_{21}	RF electrodes, from 2 GHz	18	20	-	GHz
Ripple S21	ΔS_{21}	RF electrodes, $f < 20$ GHz	-	0.5	1	dB
Electrical return loss	ES_{11}	RF electrodes, $f < 20$ GHz	-	-12	-10	dB
V_{π} RF @50 kHz	$V_{\pi RF_{50\text{ kHz}}}$	RF electrodes	-	5.5	6	V
V_{π} DC electrodes	$V_{\pi DC}$	DC electrodes	-	7	7.5	V
RF input impedance	Z_{in-RF}	-	-	40	-	Ω
DC input impedance	Z_{in-DC}	-	-	1	-	M Ω

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

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 connectors	-	4	5	dB
DC extinction ratio	ER	Measured with narrow source linewidth < 200 MHz	20	22	-	dB
Output coupling rate	C	Per channel, @Quad, $P_{i=1,2} / (P_1 + P_2)$ *	-	50	-	%
Balance coupling rate	ΔC	Over 1530 nm - 1560 nm	-	5	-	%
Optical return loss	ORL	-	-40	-45	-	dB
Chirp	α	-	-0.1	0	0.1	-

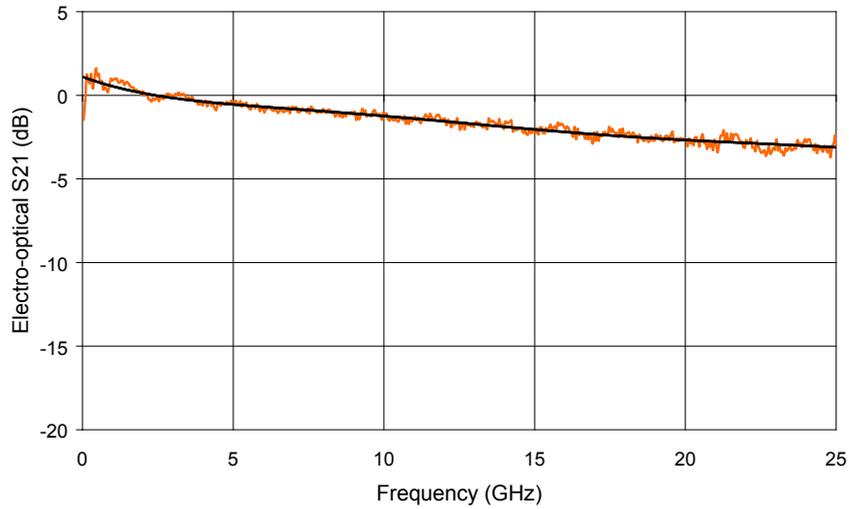
* P_1 and P_2 are defined as the modulator outputs

Absolute Maximum Ratings

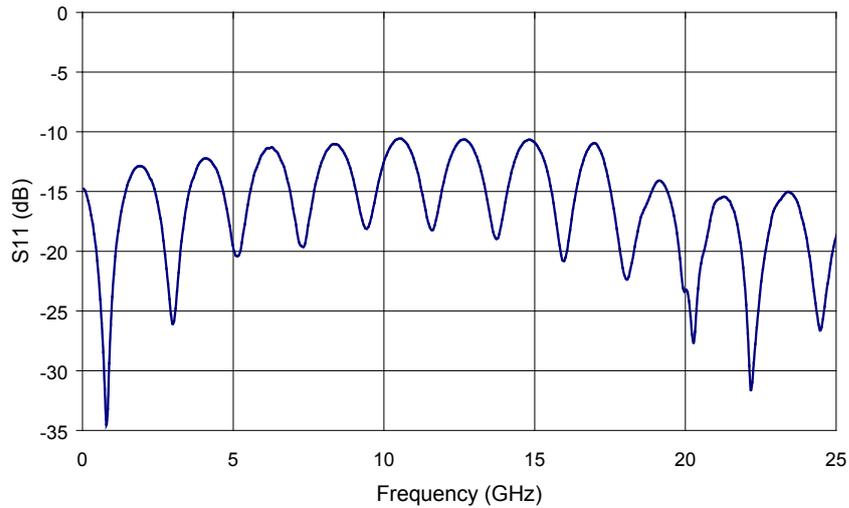
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute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

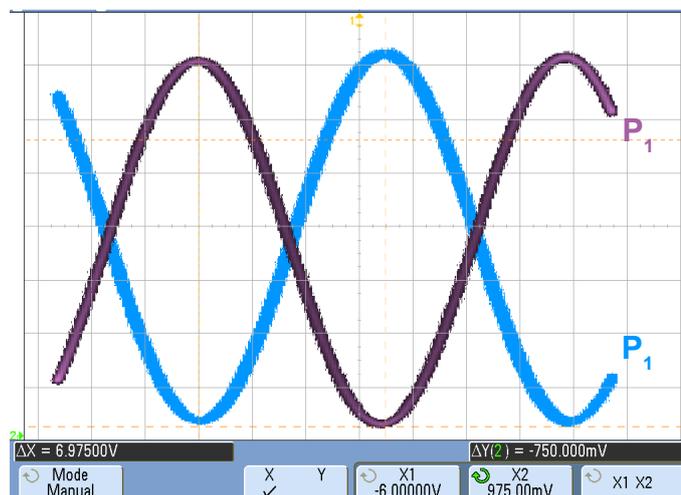
MXDO-LN-20 Typical S21 Curve

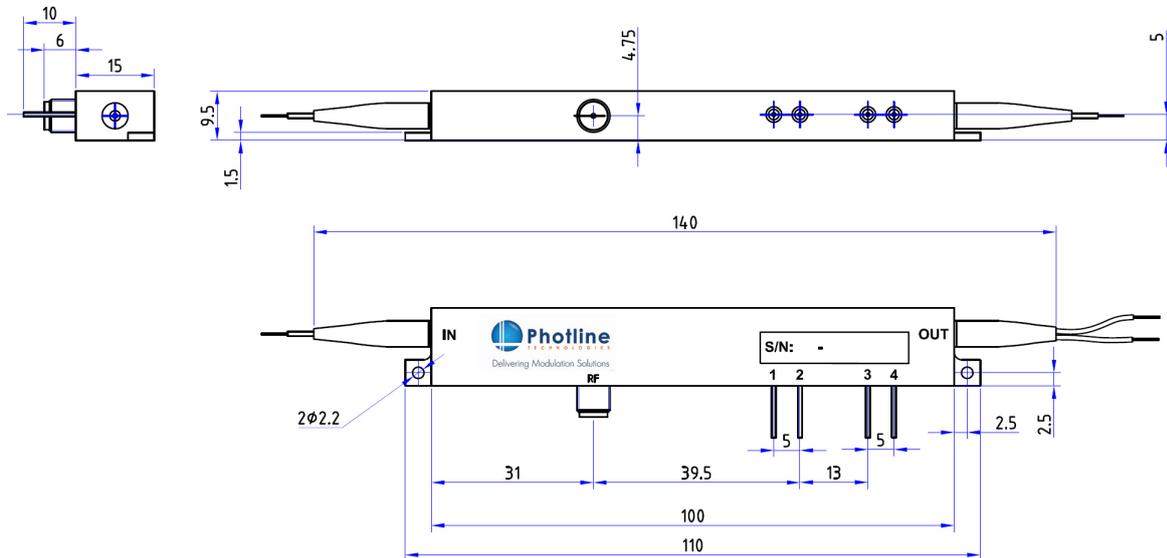


MXDO-LN-20 Typical S11 Curve



Modulator P₁ and P₂ Optical Outputs versus V_{RF}



Mechanical Diagram and pinout All measurements in mm


Port	Function	Note
IN	Optical input port	Polarization maintaining fiber, Corning PM 98-U25A, Length 1.5 meter. Buffer diameter 900 μm
OUT	Optical output port	Polarization maintaining fiber, Corning PM 98-U25A, Length 1.5 meter. Buffer diameter 900 μm
RF	RF input port	Wiltron female K (SMA compatible)
1	Ground	Pin feed through diameter 1.0 mm
2	DC	Pin feed through diameter 1.0 mm
3, 4	Not connected	-

Ordering information
MXDO-LN-20-XX-Y-Z-AB-CD

XX = External monitoring PD : 00 No photodiode PD with photodiode

Y = Input fiber : P Polarisation maintaining S Standard single mode

Z = Input fiber : P Polarisation maintaining S Standard single mode

AB = Output connector : 00 bare fiber FA FC/APC FC FC/SPC

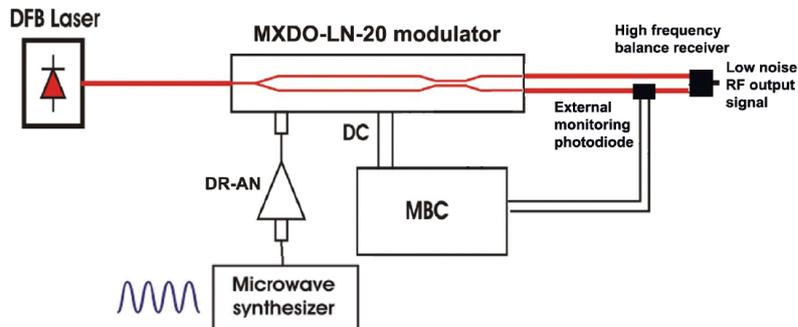
CD = Output connector : 00 bare fiber FA FC/APC FC FC/SPC

Note : optical connectors are Seikoh-Giken with narrow key or equivalent

Optional external monitoring PD

Parameter	Condition	Min	Typ	Max	Unit
Tap	-	-	5	-	%
Photodiode responsivity	Relative to optical power in fiber	-	9	-	mA/W
Cut off frequency	@ -3 dB	-	35	-	MHz
Photodiode reverse voltage	-	-	5	-	V

Related equipments & Examples of application



Analog transmission

The DR-AN is a family of wideband RF amplifier modules designed for analog applications at frequencies up to 36 GHz. They are characterized by a low Noise Figure and a linear transfer function and they match with MXDO-LN-20 type modulator.



The MBC-DG-BT is a bench top automatic bias controller specially designed to lock the operating point of LiNbO₃ Mach-Zehnder modulators and ensure a stable operation over time and environmental conditions.



Modbox-AN-Tx and ModBox-AN-Rx are a family of turnkey optical transmitters and receivers for analog applications.

Analog ModBoxes operate and receive from low frequencies up to 40 GHz and from 780 nm up to 1580 nm for high performances transmission.

About us

Photline Technologies is a provider of Fiber Optics Modulation Solutions based on the company LiNbO₃ modulators and high-speed electronics modules. Photline Technologies offers high speed and high data rate modulation solutions for the telecommunication industry and the defense, aerospace, instruments and sensors markets. The products offered by the company include : comprehensive range of intensity and phase modulators (800 nm, 1060 nm, 1300 nm, 1550 nm), RF drivers and modules, transmitters and modulation units.