

# Thin Film Lithium Niobate Fiber Optical Modulator



(20/40 GHz, 3.5V, bias control option)

DATASHEET

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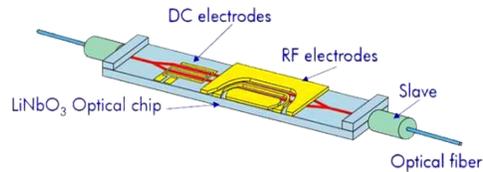
## Features

- Low Voltage ~3.5V
- Up to 40GHz Speed
- Bias Control

## Applications

- Radar
- RoF
- Laboratory Uses
- Concept Proving
- Instrumentation

The Thin Film Lithium Niobate Fiberoptic Modulators (TLNM) series offers advantageous features of a low driving voltage of 3.5V and broadband high speed of up to 60GHz. These improvements over the traditional Lithium Niobate Fiberoptic Modulators are achieved by more efficient smaller and shorter waveguides made possible by thin film LiNbO<sub>3</sub>. Its low operating voltage makes it more efficient to convert RF signal into optical and convenient to use a function generator as the driver for laboratory applications. It has a bias control section that integrates with a micron heater, a photodetector for feedback control that maintains a constant optical bias point. The high-speed modulation control is through an SMA connector, and the bias control is through pins. An automatic bias control module is also available that maintains the bias point and V<sub>p</sub> via a slow-speed feedback circuitry. Custom special design is also available.



## Specifications

Parameter	Min	Typical	Max	Unit
Operation Wavelength	1520		1567	nm
Insertion Loss		3.5	4.5	dB
Return Loss	30		40	dB
Extinction Ratio	15 (H frequency)		20 (L frequency)	dB
Optical Input Power			5	mW
RF Driving Voltage	3.3 (1kHz)	4 (1GHz)		V
V <sub>p</sub> at 40kHz	2.5 (Z-cut)			V
Bandwidth	DC	20	40	GHz
S11 (130MHz to 10 GHz)			10	dB
RF Port Resistance (DC)			50	Ω
RF Input Power			30	dBm
Bias Port Resistance (DC)			1	MΩ
Bias Voltage Range	-15		15	V
Photodetector Responsivity			20	mA/W
Photodetector Extinction Ratio			6	dB
Photodetector Bandwidth		100		kHz
Operating Temperature	-1		60	°C
Storage Temperature	-45		85	°C

### Notes:

Over the maximum power input will burn the device over time

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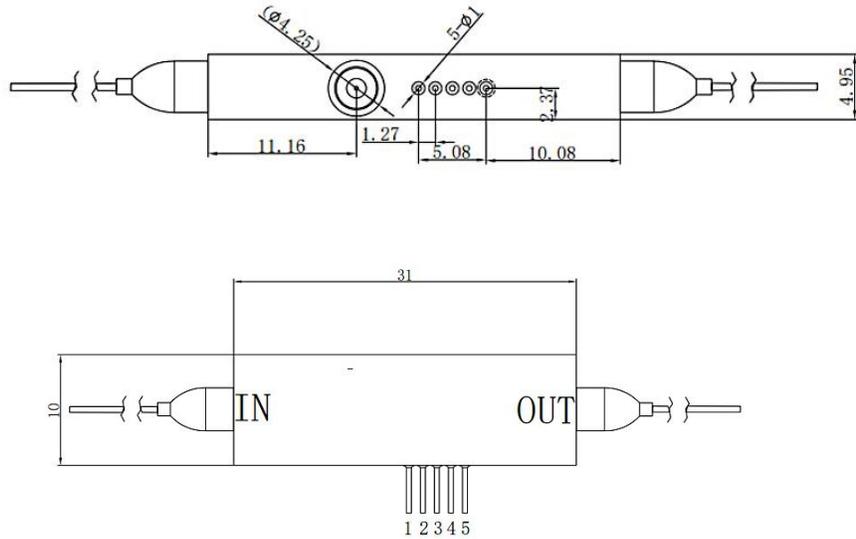
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### Dimensions (mm)



\*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

### Electrical Connection

Pin	Description
1	RF input
2	DND
3	DC bias
4	PD anode
5	PD cathode

### Ordering Information

Prefix	Configuration	Auto Bias Controller	Wavelength	Frequency	Input Fiber	Output Fiber	Cable	Fiber Length	Connector
TLNM-	Amplitude = 1	No = 1 Yes = 2 Special = 3	1520-1570nm = 2	20GHz = 2 40GHz = 4 50GHz = 5 60GHz = 6	PM1550 = 5	PM1550 = 5 SMF28e = 1	0.9mm tube = 1 Special = 0	0.5m = 1 Special = 0	None = 1 FC/PC = 2 FC/APC = 3 Special = 0

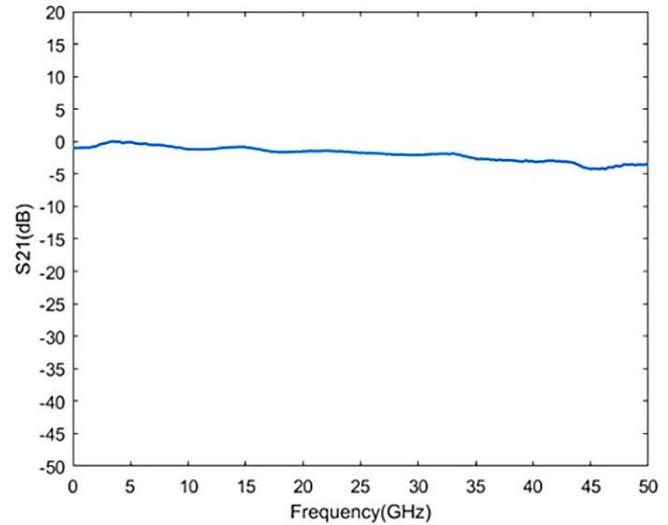
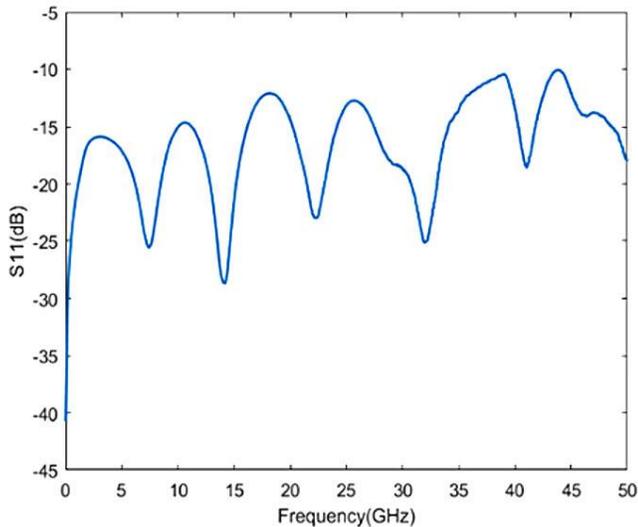
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## Typical RF Performance



## Application Notes

### Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

### Fiber Cleanliness

Fibers with smaller core diameters (<5  $\mu\text{m}$ ) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

### Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the handling by expanding the core side at the fiber ends.