

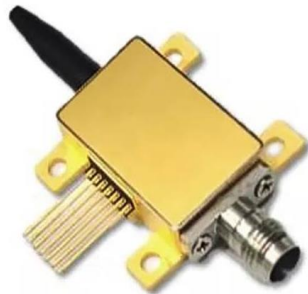
# High Speed Fiber Optical Intensity Modulators Low Voltage Thin Film Lithium Niobate



(60/110 GHz, 3.5V, bias control option)

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The Thin Film Lithium Niobate Fiber optic Modulators (TLNM) series offers a low driving voltage of 3.5V and broadband operation up to 110 GHz, delivering exceptional efficiency and performance over traditional Lithium Niobate modulators. Leveraging thin-film LiNbO<sub>3</sub> technology, its reduce size waveguides optimize RF-to-optical conversion, making it ideal for ultra-high-frequency electrical-to-optical applications. A built-in bias control section with a micro-heater and photodetector ensures stable optical biasing via advanced feedback circuitry. High-speed modulation is facilitated through an SMA connector, with bias control applied via pins, while an optional automatic bias controller provides enhanced stability. Custom designs are available to meet specific application needs.

## Features

- Low Voltage ~3.5V
- Up to 110GHz Speed
- Bias Control
- Small Format

## Applications

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



## Specifications

Parameter	Min	Typical	Max	Unit
Operation Wavelength	1520		1567	nm
Insertion Loss		3.5	4.5	dB
Return Loss	27		40	dB
Extinction Ratio	15 (H frequency)		20 (L frequency)	dB
3 dB Bandwidth(S21 start 2 GHz)	A	63	110	GHz
	B	103	110	
RF Return Loss (S11 2-6GHz)	-10			dB
Optical Input Power			20	dBm
Vp at 50kHz		3	3.5	V
Bandwidth	DC	60	100	GHz
RF Port Resistance (DC)			50	Ω
RF Input Power		12	18	dBm
RF Input Voltage (Vpp)	-3.5		3.5	V
RF Input Root Mean Square Voltage (Vrms)				
Bias Port Resistance (DC)			1	MΩ
Bias Voltage Range			4.5	V
Bias Current			50	mA
Photodetector Responsivity			20	mA/W
Photodetector Extinction Ratio			6	dB
Photodetector Bandwidth		100		kHz
Operating Temperature	-20		70	°C
Storage Temperature	-45		85	°C

### Notes:

Over the maximum optical or RF power input will burn the device over time

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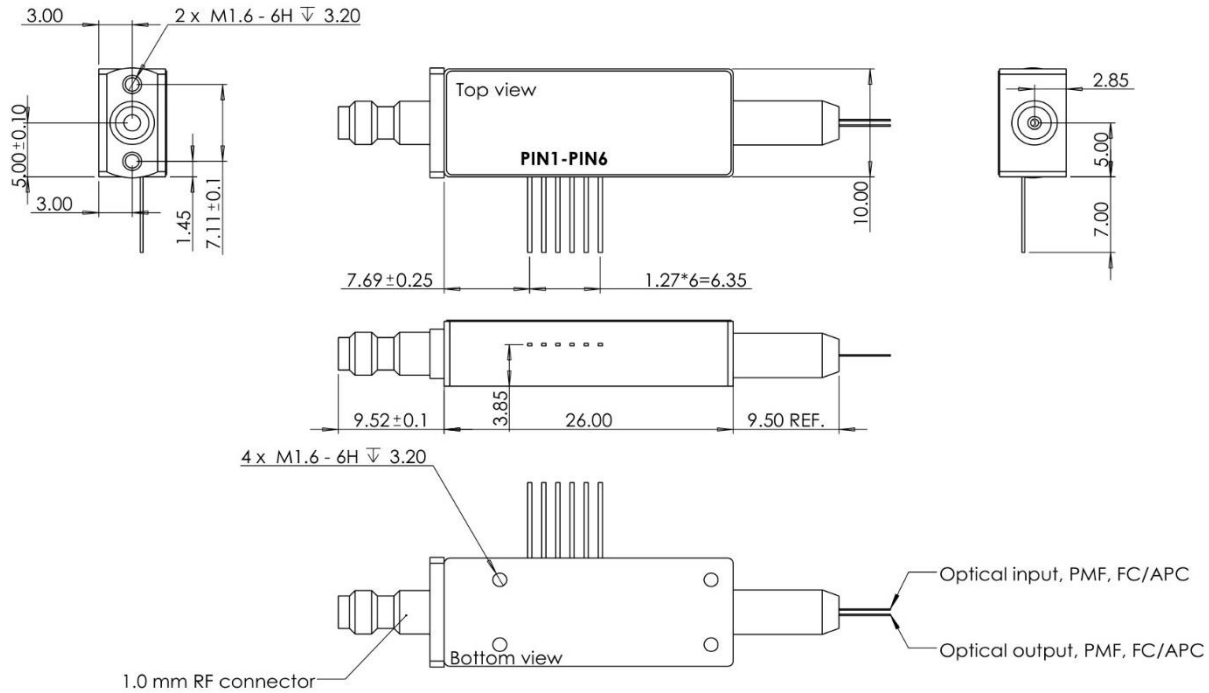
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### Dimensions (mm)



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

### Electrical Connection

Pin	Symbol	Description
1	-	N/A
2	-	N/A
3	Heater	Electrode
4	Heater	Electrode
5	PD	Anode (+)
6	PD	Cathode (-)
RF	RF connector	1 mm K
In	Input Fiber	FC/APC, PMF
Out	Output Fiber	FC/APC, PMF

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### 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	60GHz = 6 110GHz = 1	PM1550 = 5	PM1550 = 5 SMF28e = 1	0.9mm tube = 1 Special = 0	1m = 1 Special = 0	FC/APC= 1 Special = 0

### 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 μm) 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.

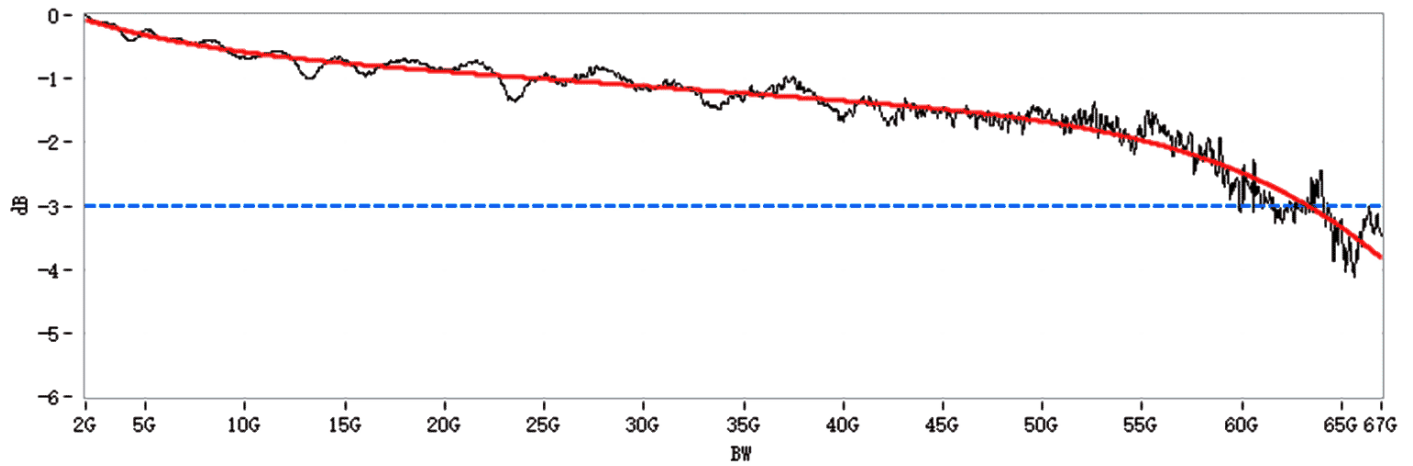
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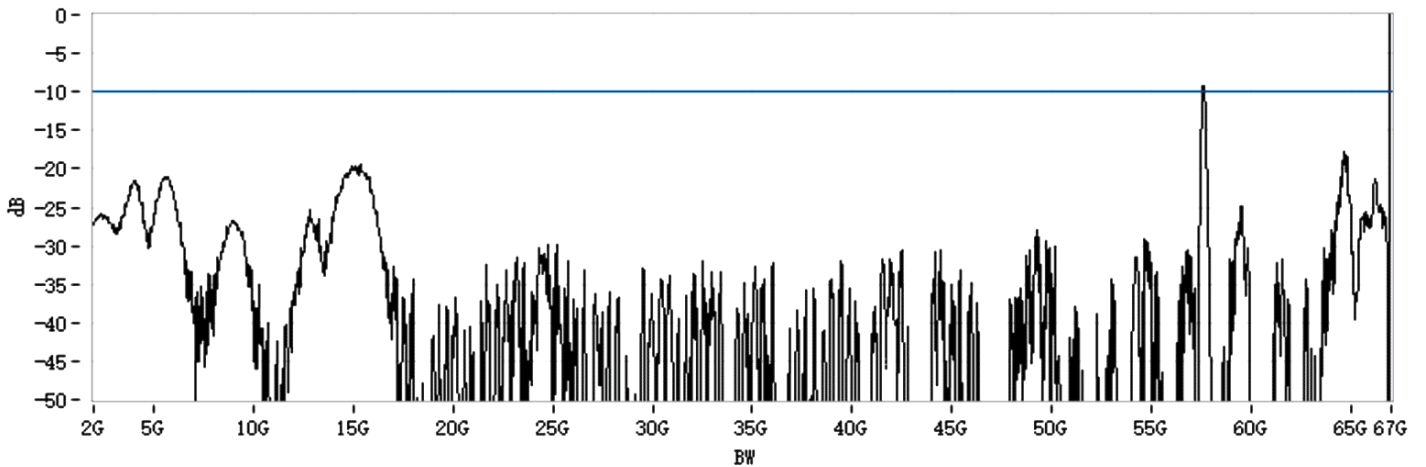
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### S21 & S11 (70 GHz)



**S21**



**S11**

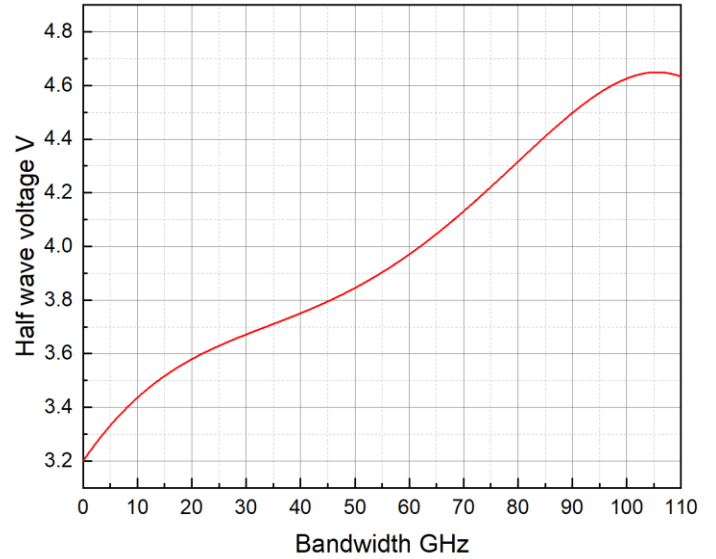
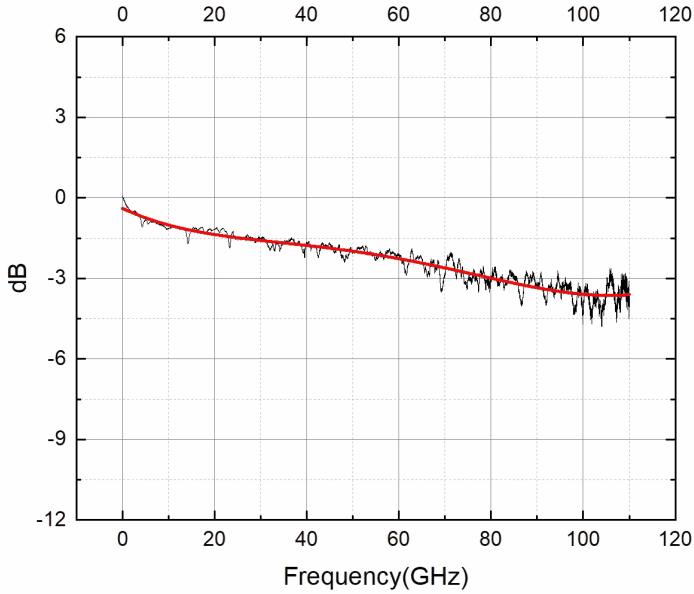
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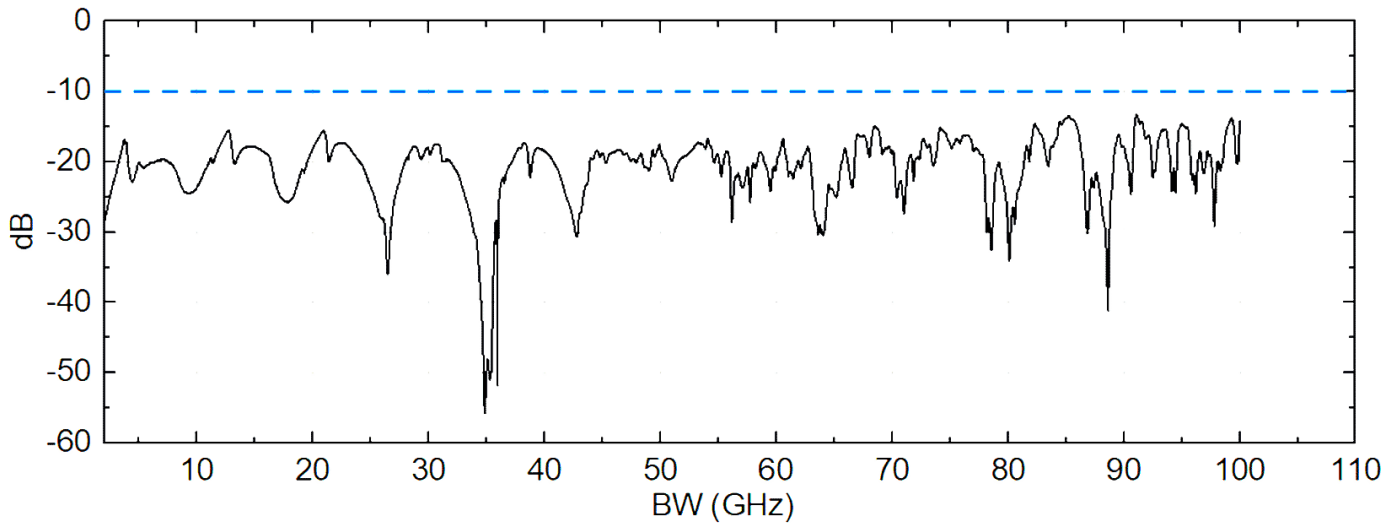
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### S21 & S11 (100 GHz)



### S21



### S11

# High Speed Fiber Optical Intensity Modulators Low Voltage Thin Film Lithium Niobate

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## Typical RF Performance

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# 60/110 GHz Fiber Optical Transmitter/Converter

(0.01 to 60/110 GHz, analog/digital, auto bias)



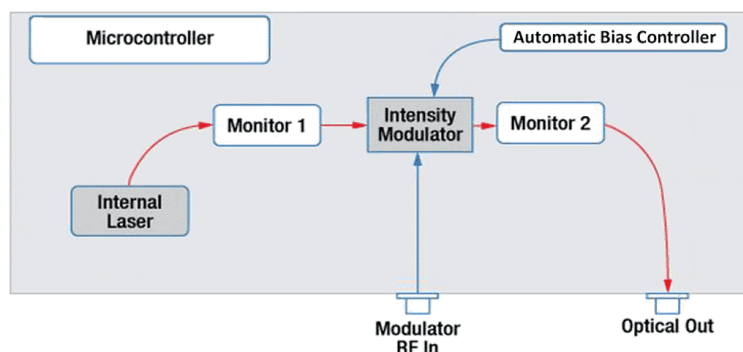
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### Fiber Optical Transmitters (Electrical-to-Optical Converters)



The EOCV series Fiber Optical Transmitters (Electrical-to-Optical Converters) provide high-fidelity analog and digital optical signals from electrical inputs, supporting a wide frequency range of DC to 20 and 40 GHz. These user-friendly turnkey modules feature a corresponding Thin Film Lithium Niobate Fiberoptic Modulator (TLNM), a DFB laser with driver, an automatic bias controller, high-performance control circuits, and a DC power supply, all integrated into a convenient plug-and-play benchtop unit. The TLNM modulators employed in the EOCV series use smaller and shorter waveguides compared to conventional LiNbO<sub>3</sub> modulators, offering greater efficiency in converting RF signals into optical signals. Their low RF driving voltage eliminates the need for an external RF amplifier, making the system compatible with standard function generators for laboratory applications.

The benchtop unit features a front switch to select between three modulator bias modes: Peak and Null for high on/off contrast, and Quadrature for superior linearity in E-O conversion. The laser output power is also adjustable via a front rotating knob, allowing users to fine-tune output settings. Designed for RF-over-Fiber applications, as well as the testing and characterization of optical-to-electrical (O-E) devices, the EOCV series offers a versatile and reliable solution for advanced optical communication and signal processing needs.



### Ordering Information

Prefix	RF Frequency	Laser Wavelength*	Tunable Laser	Package	Configuration	Fiber Connector
EOCV-	60GHz = 6 110GHz = 1	1550 nm = 15500 1551.11 nm = 55111 1562.22 nm = 56222 Special = 00000	None = 1	Benchtop = 3 Rack = 2 Special = 0		FC/APC = 2 Special = 0

**Note:**

\*Laser on the ITU grid can be selected