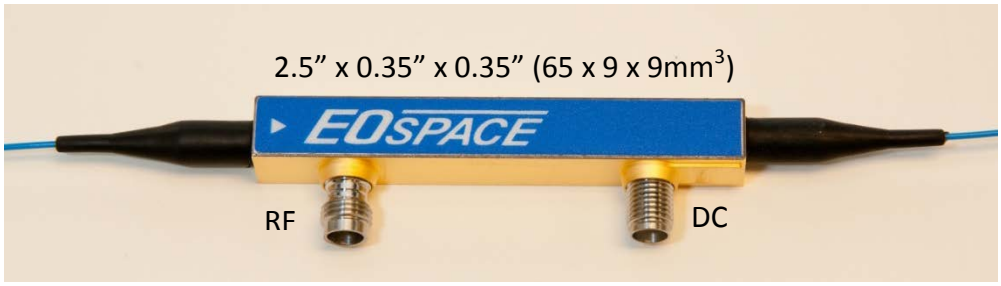
High-Performance Broadband 65GHz Small-Form-Factor Lithium Niobate Optical Modulator



EOSPACE’s line of small-form-factor (SFF) modulators is designed for use in demanding high-performance digital and analog applications requiring operation from DC-65GHz. The small footprint of this modulator allows it to be easily integrated into transceivers, and is achieved while maintaining industry-leading specifications for optical insertion loss and drive voltage. These specifications are maintained over the entire optical C band making these devices very attractive for use with tunable lasers.

EOSPACE’s modulators are based on our proprietary exceptionally-high performance lithium niobate technology developed over the last 30 years for demanding aerospace applications.

Key Features

- Broadband electro-optic traveling-wave modulator
- Zero chirp, X-cut $LiNbO_3$ intensity modulator
- Low drive voltage 5 V @ 1 GHz

- Insertion loss(< 4dB)
- Large bandwidth (>35GHz)
- High optical power handling (400mW)
- Small form factor
  - 2.5” x 0.35” x 0.35” (65 x 9 x 9 mm^3)

Applications

- Digital and analog links
- High-performance aerospace fiber optic links
- DC-65^+GHz operation
- DC-20GHz with <1.5dB drop at 20GHz
- Harsh environments

Options (other specs may change)

- Other wavelengths
  - 1.3µm version
  - Dual-band 1.3/1.55µm version
  - L-band
- Lower insertion loss < 3dB
- Optical ER > 30dB
- Extended modulation range (~65GHz)
- Extended operating temperature range
  - -40 to +85C
  - -55 to +95C
  - -55 to +125C (custom)
- RF input power up to +30dBm
- Optical input power up to 1W
- 1.85mm or 2.92mm RF connectors
- 1x2 and 2x2 dual-input and dual-output fiber configurations for balanced receivers
- GPPO connector version with thinner housing (65 x 8.9 x 5 mm^3)

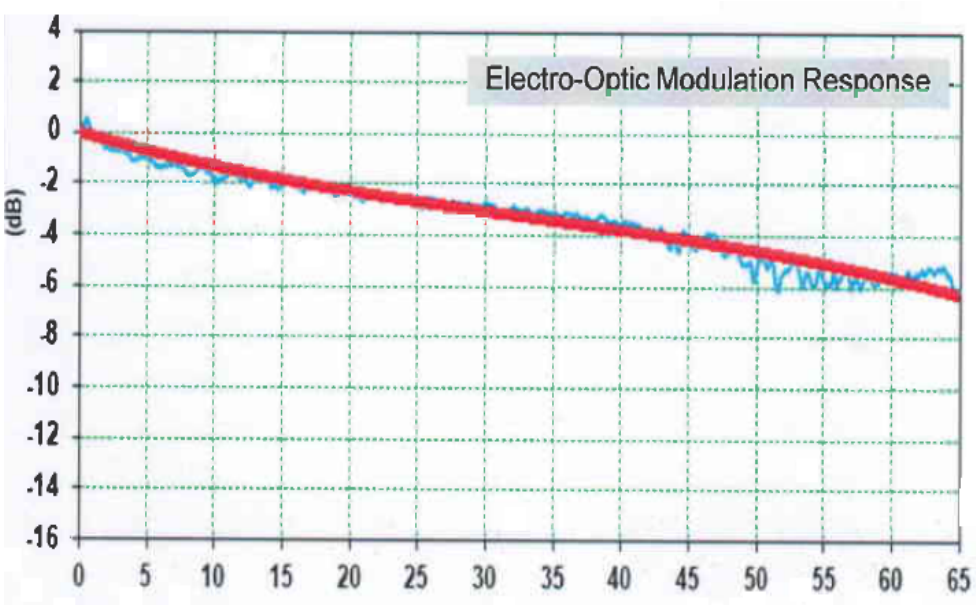
- Other options --- Please call

Standard Specifications*

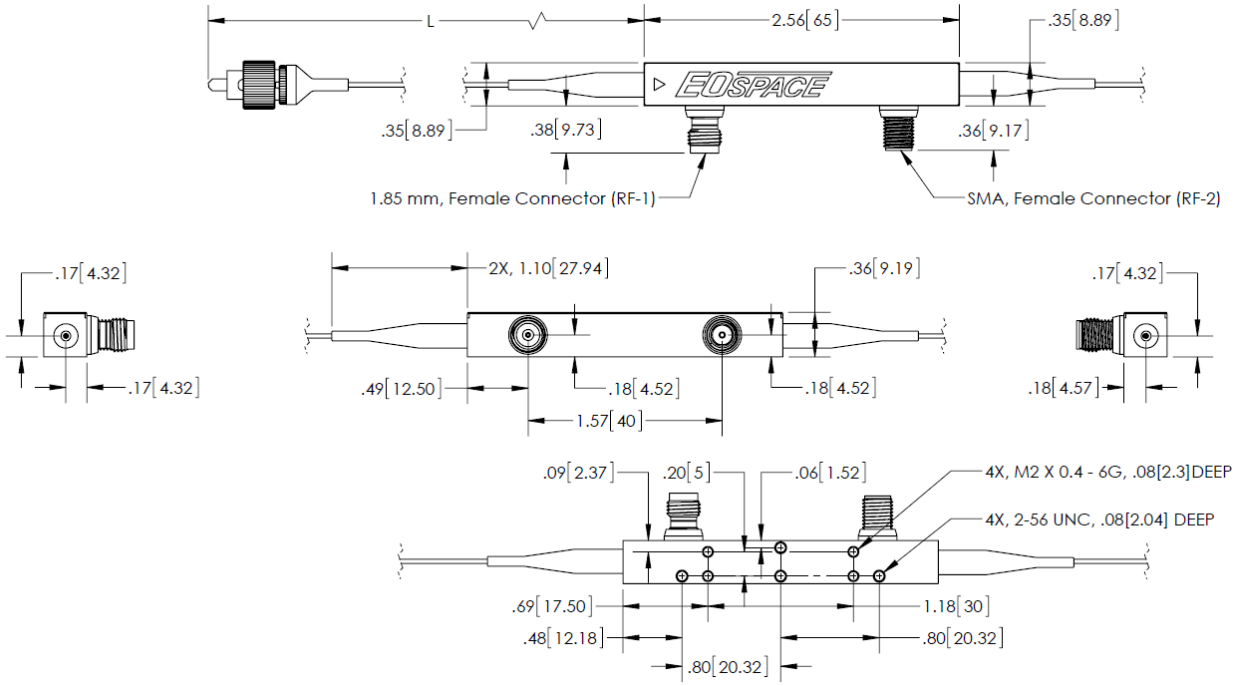
Parameter	AX-0MVS-65			Unit
	Min	Typical	Max	
General				
Material		$LiNbO_3$		
Crystal orientation		x-cut		
Electrical/Optical[1]				
Operating wavelength	1530		1565	nm
Optical insertion loss[2]		4.5	5.0	dB
Vpi (@ 1 GHz)		5.0		volts
3 dB Bandwidth	32	35		GHz
-6dB Bandwidth	60	65		GHz
|S11| (0 – 20 GHz)			-10	dB
DC Bias Port V_π		8	12	volts
Optical null depth (@ DC)	18	20		dB
Alpha chirp factor		0.0		
Optical return loss	45			dB
Mechanical				
Input fiber pigtail	Polarization Maintaining			
Output fiber pigtail	Single Mode or Polarization Maintaining			
Fiber core/clad	9/125			microns
Fiber jacket material	900 µm Hytrel® polyester loose tube			
Fiber length	1			m
Fiber connector	FC/APC standard, others available			
Package	Designed to pass Telcordia GR-468			
Absolute Max				
Optical input power			400	mW
RF input power			+27	dBm
Applied voltage (RF and DC ports)	-15		15	V
Operating temperature	0		70	deg C
Storage temperature	-40		85	deg C

*Higher performance and/or custom specifications may be available upon request (for example, lower insertion loss < 3dB, higher extinction ratio >30dB, other wavelengths such as 1.3µm or dual 1.3/1.55µm, 1x2 and 2x2 input/output fiber configurations, etc.)

[1] All parameters specified at 1550 nm
[2] Includes FC/UPC connector losses. Add 0.5 dB for FC/APC. Losses are lower when fusion spliced.



Package Drawing



Electrical Connections

Connection	Name	Description
Port 1	RF Input	50-ohm input used for high speed modulation up to 65GHz
Port 2	DC Bias Input	high-impedance input used to set the modulator operating point to quadrature, peak, null, etc. by applying a DC voltage and possibly a dither signal from an automatic bias controller

Ordering Information: Broadband 65GHz Version

AX-0MVS-65-PFA-PFA- .... - (for a standard single input/output 40GHz intensity modulator)

- Special configurations or instructions
- Various non-standard options: e.g. lower insertion loss, external RF output port, integrated polarizer, higher optical or RF power handling, etc. – Please call
- Output fiber: P or S (PM or SM fiber) followed by the connector code such as FU=FC/UPC, FA=FC/APC – Please call for others
- Input fiber: P (PM fiber) followed by the connector code such as FU=FC/UPC, FA=FC/APC – Please call for others
- Electrical connectors: Port 1, Port 2
  VS = 1.85mm RF port and SMA DC port - standard
  for 2.92mm, GPPO, etc. – Please call