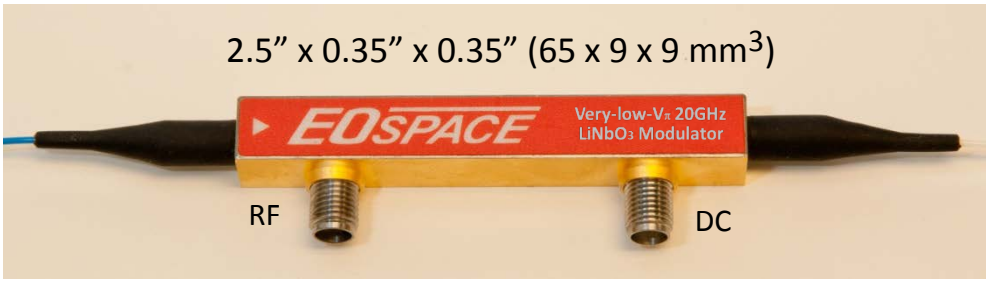
High-Performance, Low-V_π, 20GHz Small-Form-Factor Lithium Niobate Optical Modulator



EOSPACE has a line of small-form-factor (SFF) modulators designed for use in demanding high-performance digital and analog applications requiring operation from 0-20GHz. 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 (~3.7V @ 1 GHz, <4V max)
- Low insertion loss (< 4dB)
- Large bandwidth (~20GHz)
- 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-20GHz operation
- Optional extended operation DC-40GHz
- 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 (> 40GHz)
- 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
- GPO or GPPO connector version with thinner housing (65 x 8.9 x 5 mm^3)

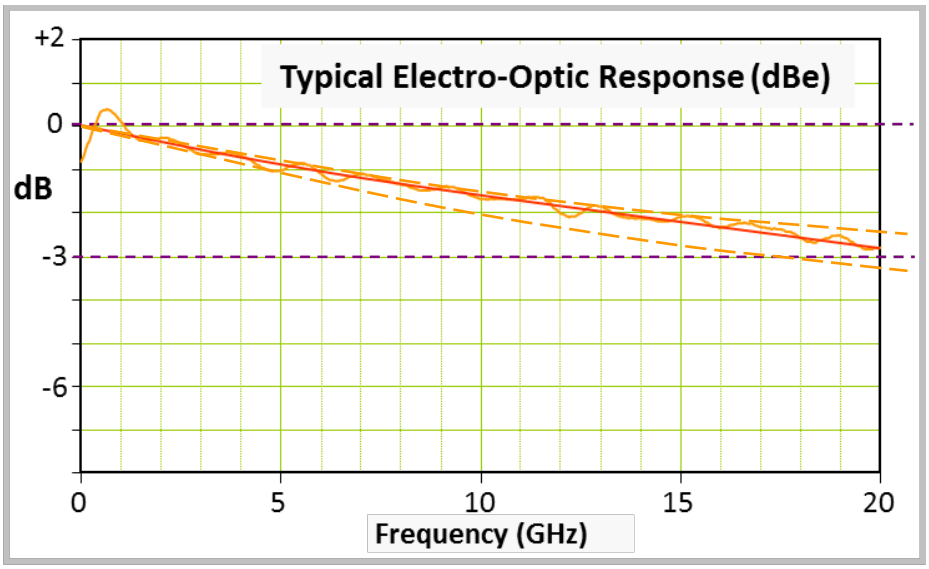
- Other options --- Please call

Standard Specifications*

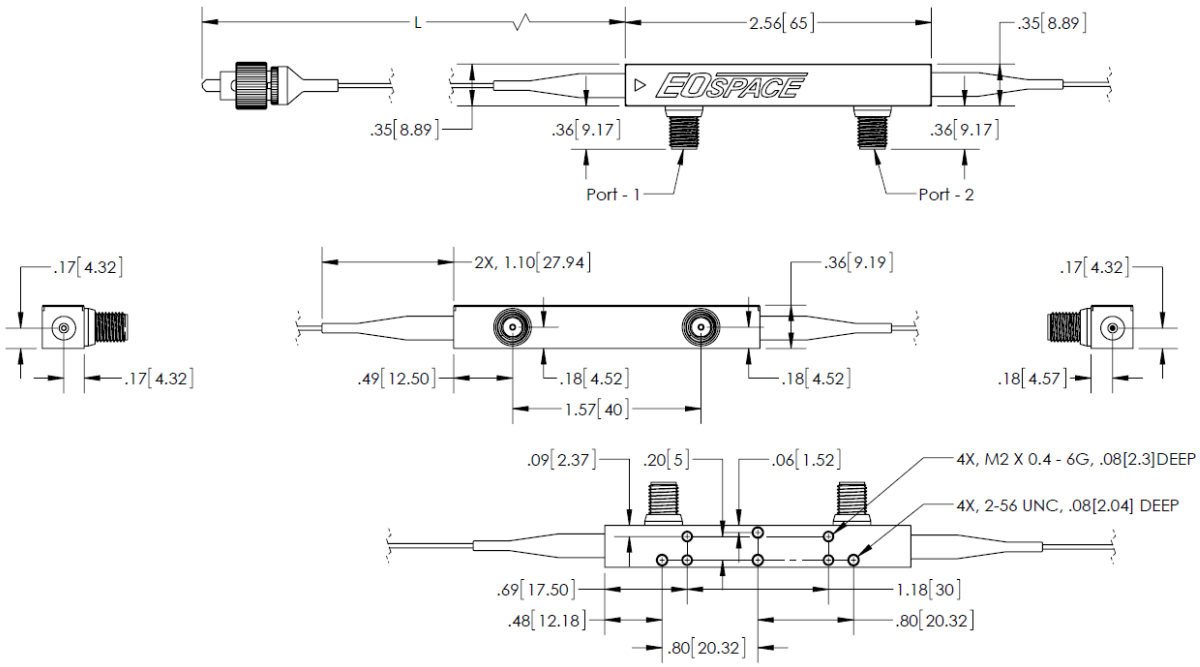
Parameter	AX-0MSS-20-LV			Unit
	Min	Typical	Max	
General				
Material		$LiNbO_3$		
Crystal orientation		x-cut		
Electrical/Optical[1]				
Operating wavelength	1530		1565	nm
Optical insertion loss[2]		3.5	4.0	dB
Modulation Port				
Vpi (@ 1 GHz)		3.7	4.0	volts
3 dB Bandwidth	18	20		GHz
|S11| (0 – 20 GHz)		-12	-10	dB
DC Bias Port V_π		7	10	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/UPC 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, extended modulation response to 40GHz, 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 20GHz
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 a automatic bias controller

Ordering Information: Low-V_π (LV) Version

AX-0MSS-20-PFA-SFU-LV- .... - S..... (for a standard single input/output 20GHz intensity modulator)

- S..... — 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
- SFU — 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
- PFA — Input fiber: P (PM fiber) followed by the connector code such as FU=FC/UPC, FA=FC/APC – Please call for others
- SS — Electrical connectors: Port 1, Port 2
  SS = Dual SMA standard
  for 2.92mm, 1.85mm, GPO, etc. – Please call

Optional Dual-Fiber Configurations:

AX-1x2-0MSS-20-PFA-SFU-LV- .... - S..... (for a dual-complementary output fibers)

AX-2x2-0MSS-20-PFA-SFU-LV- .... - S..... (for a dual inputs & dual-complementary outputs fibers)

Contact Information

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