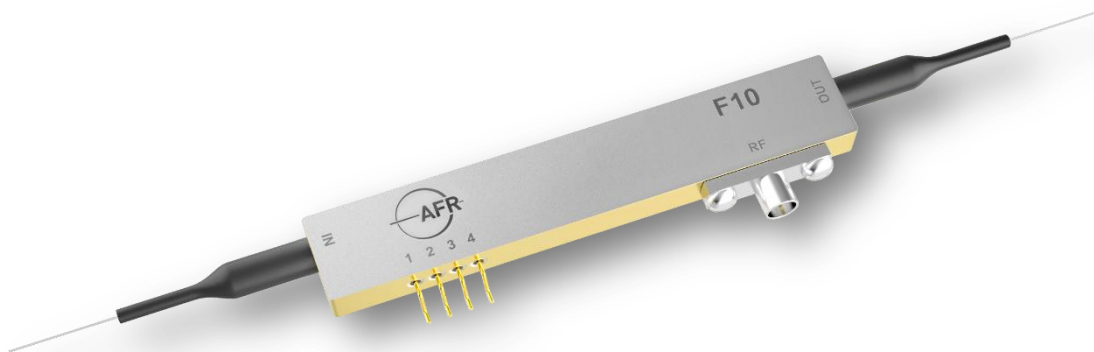


C-Band 10 GHz High Bandwidth Zero-Chirp LiNbO₃ Intensity Modulator F10



AFR high bandwidth Zero-Chirp modulators are based on the Mach-Zehnder Interferometer (MZI) architecture. They are manufactured using the highly reliable titanium indiffusion technology in X-Cut, Y-Propagating lithium-Niobate substrates.

The F10 is a Zero-Chirped, X-Cut single drive modulator designed for high bit rate advanced metro to long haul communication systems that requires the superior performance of X-Cut lithium niobite.

The F10 modulator contains an integrated photo detector that may be used to set and lock the DC bias on the modulator as well as provide an estimate of the modulator output optical power.

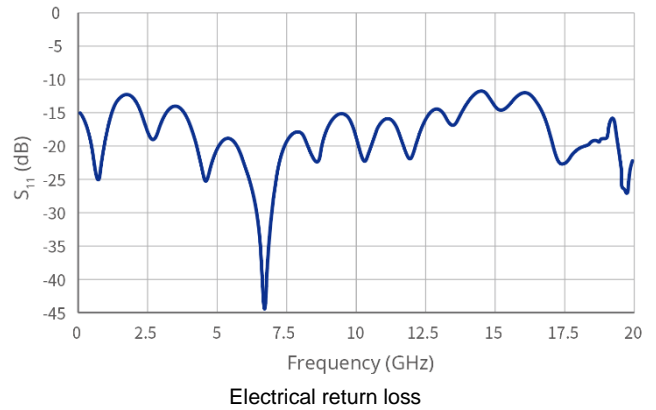
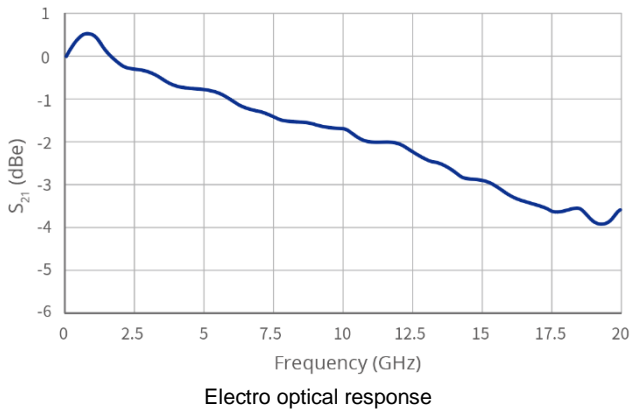
Key Features

- Titanium-Indiffused Waveguide
- X-cut LiNbO₃ Intensity Modulator
- C-Band Operation
- Enhances E/O Bandwidth for up to 12.5 Gb/s Modulation Speed
- Zero-Chirped Modulator
- Integrated Monitor Photodiode
- Integrated Polarizer
- Compliance with Telcordia GR-468-Core
- Hermatic Package

Applications

- External Intensity Modulation from 10 to 12.5 Gb/s NRZ and Electrical RZ
- High Frequency Fiber Optic Links
- Instrumentation

Performance Characteristics F10



Absolute Maximum Ratings

Parameters	Conditions	Min.	Max.	Unit
Maximum RF Input Power	AC coupled	-	25	dBm
Maximum Optical Input Power	CW	-	20	dBm
Operating Case Temperature	-	- 5	+ 75	°C
Storage Temperature	-	- 40	+ 85	°C
Maximum Operating Temperature Variation Rate	-	-	1	°C/min
Operating Humidity	-	5	85	%
Leads Soldering Temperature	-	-	250	°C
Leads Soldering Time	-	-	10	s

Optical and Electrical Specifications

Parameter	Conditions ¹	Min.	Typical	Max.	Unit
Optical					
Operating Wavelength	-	1525	-	1570	nm
Insertion Loss	BOL ²	-	-	4.5 ⁽³⁾ 5.0 ⁽⁴⁾	dB
Extinction Ratio	@ DC	20	24	-	dB
PRBS Eye Extinction Ratio	10.7 Gb/s PRBS 2 ³¹ -1	13	-	-	dB
Chirp, Alpha Parameter	-	- 0.1	0	0.1	nominal
Optical Return Loss	w/o connectors	45	-	-	dB
Electrical – RF Port					
PRBS Electrical Drive Voltage	10.7 Gb/s PRBS 2 ³¹ -1	-	4.5	6.0	V _{pp}
S ₂₁ Electro-Optic Bandwidth	- 3 dB, wrt 130 MHz	11	-	-	GHz
Bandwidth Ripple	130 MHz-12.5 GHz wrt 5° order polynomial approximation	- 1	-	1	dB
S ₁₁ Electrical Return Loss	130 MHz - 12.5 GHz	10	11	-	dB
RF V _π Voltage	@ 1 kHz	-	5	6.5	V
Electrical – Bias Port					
Bias V _π Voltage	@ 1 kHz	-	5.5	6.0	V
Quadrature Voltage Range	EOL operating temperature	- 15	-	15	V
Bias Port Impedance	@ DC	1	-	-	MΩ
Photodiode Characteristic					
Monitor PD Reverse Current	-	-	-	2	mA
Monitor PD Forward Current	-	-	-	10	mA
Monitor PD Reverse Voltage	-	-	-	15	V
Photodiode Responsivity	Bias at quadrature voltage	20	-	130	mA/W
Linearity	-	- 10	-	+ 10	%
Tracking Error	-	- 3	-	+ 3	°
Extinction Ratio	-	6	-	-	dB

¹ T_{op} = 25°C, BOL, wavelength at 1550 nm, unless otherwise specified.

² Insertion loss at the maximum of the modulator's transfer function and does not include the 3 dB loss when operating in quadrature.

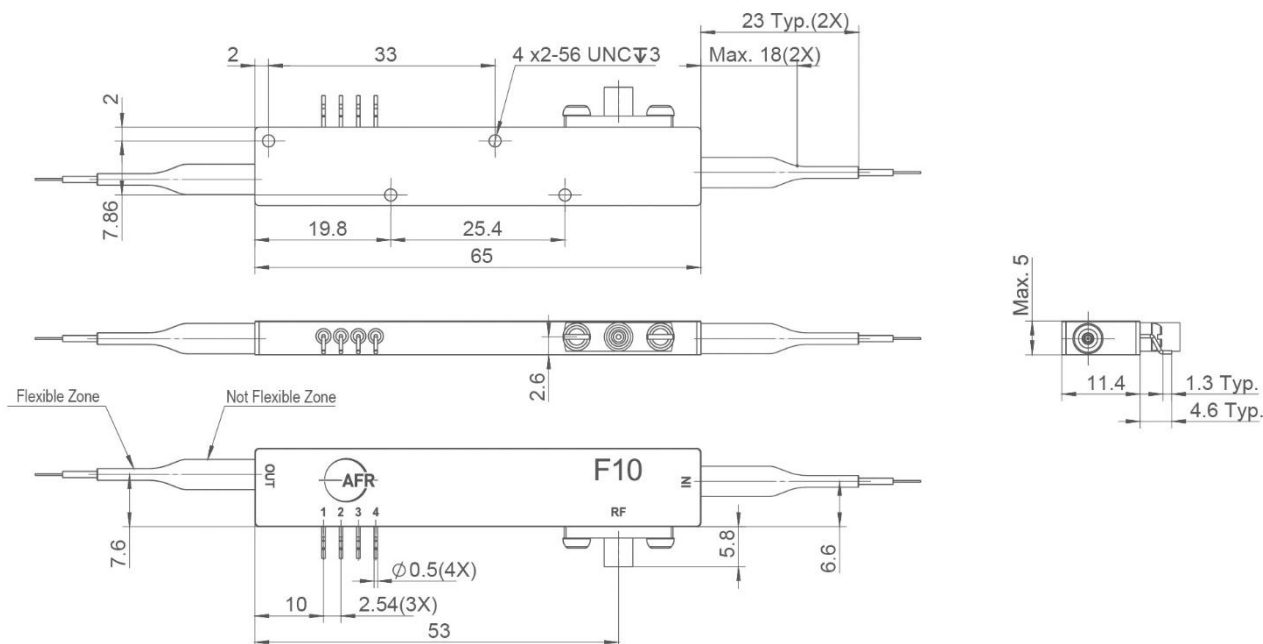
³ The maximum insertion loss is testing without any connector.

⁴ The maximum insertion loss is testing with connectors at both fiber end.

Pinout and Fiber Specifications

RF Connector	GPO male
Bias and PD connector	LEAD pins
Input Fiber	Corning PM15-U25D or PM15-U40D (Panda fiber), L1 (900 μm loose tube fiber without connector) > 1.0 m & L2 (bare fiber) ≥ 5 cm, or >1.0 m 900 μm loose tube fiber with connectors
Output Fiber	Corning SMF-28™ or PM15-U25D (Panda fiber) or PM15-U40D (Panda fiber) L1 (900 μm loose tube fiber without connector) > 1.0 m & L2 (bare fiber) ≥ 5 cm, or > 1.0 m 900 μm loose tube fiber with connectors
Minimum Bending Radius	15 mm

Mechanical Outline



* All dimension measured in mm. L1 is fiber length with 900 μm loose tube. L2 is length of bare fiber.

Pinout Information

Pin	Name	Description
1	PD-C	Photodiode Cathode (-)
2	PD-A	Photodiode Anode (+)
3	Bias	MZ DC Bias Voltage
4	GND	Ground
5	RF	RF Input (GPO male)

Electrostatic Discharge (ESD)

Caution : Use of controls or adjustments or performance of procedures other than those specified herein may result in electrical component failure.



RoHS Compliance

This series of modulators are RoHS compliant with exemption 6c.

Reliability Requirements

This series of modulators are designed to meet Telcordia GR-468-Core requirements.

Ordering Information:

For more information on this product and its availability, please contact your local AFR account manager or directly at sales@fiber-resources.com.

Product Description	Part Number
F10, C-band 10 GHz High Bandwidth Zero-Chirp LiNbO ₃ Intensity Modulator Input fiber : (Black) Corning PM15-U40D (Panda fiber), L1 (900 μm loose tube fiber) > 1.0 m & L2 (bare fiber) ≥ 5 cm, no connector Output fiber : (Blue) Corning SMF-28™, L1 (900 μm loose tube fiber) > 1.0 m & L2 (bare fiber) ≥ 5 cm, no connector	792000770
F10, C-band 10 GHz High Bandwidth Zero-Chirp LiNbO ₃ Intensity Modulator Input fiber : (Black) Corning PM15-U40D (Panda fiber), L1 (900 μm loose tube fiber) > 1.0 m, FC/PC connector Output fiber : (Blue) Corning SMF-28™, L1 (900 μm loose tube fiber) > 1.0 m, FC/PC connector	792000771
F10, C-band 10 GHz High Bandwidth Zero-Chirp LiNbO ₃ Intensity Modulator Input fiber : (Black) Corning PM15-U25D (Panda fiber), L1 (900 μm loose tube fiber) > 1.0 m, no connector Output fiber : (Black) Corning PM15-U25D (Panda fiber), L1 (900 μm loose tube fiber without connector) > 1.0 m, no connector	792000965



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