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CATALOG - 2020
COMPONENTS FOR OPTICAL NETWORK
Advanced Fiber Resources (AFR), established in 2000, is one of the industry's leading suppliers of optical passive components. With its strong R&D and design capabilities, high efficient manufacturing process and strict quality control, AFR designs and manufactures both standard and custom components, and provide contract manufacturing solutions to our customers. Our customer base includes fiber laser, telecom, data center, fiber sensing, autonomy, biomedical equipment manufacturers, as well as research institutes and universities around the globe. AFR's products have been sold to customers in more than 40 countries and regions worldwide.
QUALITY

At AFR, quality is our top priority and an integral part of everything we do. The product quality management covers from product development, supply chain management, manufacturing to after-sales. AFR’s quality management system fulfills the requirements of ISO9001: 2015, and most products are certified with Telcordia GR-1221-CORE reliability test.

The company currently has 7 professional laboratories and equipped with many high precision instruments, to ensure excellent reliability of our products. We have built an optical surface processing center and a machining center, producing crystals, mirrors, PBS, other flat surface optics and mechanical components in-house, the key material production capability makes us more competitive.

We strive to continuously improve our products with proactive, data driven, quality first systems and processes.

PRODUCT PORTFOLIO

Flagship Products
- LiNbO3 Modulator Series
- Micro-Connectivity
- Hybrid Components

One-Stop Fiber Assembly Service
- Lensed Fiber
- Fiber Metallization
- Fiber Feedthrough
- Laser Packaging

Product Capabilities
- High-Reliability Series
- Polarization Maintaining Series
- High Power Series
- Electric Driven
Coherent Modulator 400-600G PM-QMZ

AFR Coherent Modulator 400/600Gb/s PM-QMZ is explicitly designed to enable 400GE and beyond speeds on a single wavelength or carrier. This modulator is a high electro-optic bandwidth polarization multiplexed quad parallel Mach-Zehnder (PM-QMZ) that integrates into a hermetic package an input beam splitter, four parallel Mach-Zehnder modulators configured for I-Q modulation, a polarization combiner, and monitoring photodiodes for power and bias control.

Features
- 400Gb/s Generated from Four 64 Gbaud Signals (Polarization Multiplexed 2 x 200Gb/s QPSK, Plus FEC)
- Single Ended
- 3dB Electro-optic Bandwidth Exceeding 35 GHz
- Extinction Ratio Above 25 dB to Enable Complex Modulation Formats
- Insertion Loss Below 13 dB for High Efficiency
- Package Dimensions: 90.5 (L) mm x 11.5 (W) mm x 6.1 (H) mm

Applications
- Coherent Links at 400Gb/s on a Single Carrier
- DWDM over 10Gb/s infrastructure (with Coherent Detection)

Coherent Modulator 100-200G PM-QMZ

AFR Coherent Modulator 100/200Gb/s PM-QMZ is designed according to the widely accepted OIF 100GE Tx implementation agreement, It supports the dual polarization-QPSK modulation scheme, with each of four parallel MZI’s running at speeds of up to 32Gbaud. The ship design features low insertion loss (with very small polarization dependent loss) as well as high bandwidth with quasi-linear electro-optics roll-off.

Features
- 100Gb/s Generated from Four 25 Gbaud Signals (Polarization Multiplexed 2 x 50Gb/s QPSK, Plus FEC)
- Single Ended
- Low Insertion Loss
- Fully Integrated with Polarization Combiner
- Designed to OIF Implementation Agreement
- Leading Transmission Performance
- Low Drive Voltage
- Low Skew
- Package Dimensions: 90.5(L)mmx13.2(W)mmx6.5(H)mm

Applications
- 100Gb/s Metro to Ultra-long Haul Transmission with Highest Spectral Efficiency
- DWDM over 10Gb/s Infrastructure (with Coherent Detection)
- 100G Transponders and Linecards
- Other Modulation Formats

Dual Output Analog Modulator (AM-1)

AFR Dual Output Analog Modulator is designed according to the widely accepted for use in externally modulated 1550nm CATV transmitters. A polarizer is integrated for optimum CSO suppression. The modulator can be actively controlled by electronic to provide high levels of CSO and CTB suppression, as needed for CATV application.

Features
- Titanium Indiffused Waveguides
- X-cut, Y-propagating LiNbO3 Substrates
- 1550nm Window
- Travelling Wave Electrode Design
- Separate Bias Electrode
- Dual Output Port, 180° Phase Difference
- Enables Low CSO on Both Outputs
- Low Drive Voltage
- Low Insertion Loss
- High Efficiency Phase Modulator Electrode
- Package Dimensions: 117.6 (L) mm x 17.5 (W) mm x 10.1 (H) mm

Applications
- Externally Intensity Modulation in Analogue Transmission Systems for CATV

Performance Characteristics
AFR Broadband Analog Intensity Modulators combine high linearity with low driving voltage and small footprint, covering all the frequency range from 20 GHz to beyond 40 GHz (AM20: 20 – 30 GHz; AM40: >30 GHz). The increasing demand to shift the transmission frequency in microwave fiber optic links towards higher frequency finds in AFR analog modulators the most advanced and suitable answer. The experience and know-how of AFR engineers is available to customize our products to the customer's specific requirements.

**Features**
- Titanium Indiffused Waveguides
- X-cut LiNbO$_3$
- Low Drive Voltage Compatible with Commercially Available Drivers
- Low Optical Insertion Loss
- Operating up to 60 GHz
- Smooth Frequency Response up to >60 GHz
- Integrated Photodiode
- Integrated Polarizer
- Package Dimensions: 87.05 (L) mm x 14.5 (W) mm x 10.4 (H) mm

**Applications**
- Antenna Remoting
- High Frequency Fiber Optic Links
- Analog Microwave over Fiber (RoF)
- Delay Lines Telemetry Systems
- Instrumentation (Optical Network Analyzers)

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**LiNbO$_3$ MODULATOR SERIES**

**20&40 GHz Intensity Modulator (AM20, AM40)**

AFR Broadband Analog Intensity Modulators combine high linearity with low driving voltage and small footprint, covering all the frequency range from 20 GHz to beyond 40 GHz (AM20: 20 – 30 GHz; AM40: >30 GHz). The increasing demand to shift the transmission frequency in microwave fiber optic links towards higher frequency finds in AFR analog modulators the most advanced and suitable answer. The experience and know-how of AFR engineers is available to customize our products to the customer's specific requirements.

**Features**
- Titanium Indiffused Waveguides
- X-cut LiNbO$_3$
- Low Drive Voltage Compatible with Commercially Available Drivers
- Low Optical Insertion Loss
- Operating up to 60 GHz
- Smooth Frequency Response up to >60 GHz
- Integrated Photodiode
- Integrated Polarizer
- Package Dimensions: 87.05 (L) mm x 14.5 (W) mm x 10.4 (H) mm

**Applications**
- Antenna Remoting
- High Frequency Fiber Optic Links
- Analog Microwave over Fiber (RoF)
- Delay Lines Telemetry Systems
- Instrumentation (Optical Network Analyzers)

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**High Bandwidth Zero-Chirp 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 F10-0 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 F10-0 modulator contains an integrated photodetector 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.

**Features**
- Very Low Drive Voltage
- GPO (male) RF Input
- C- and L-band Operation
- Enhances E/O Bandwidth up to 12.5Gb/s Modulation Speed
- Low Insertion Loss
- High Extinction Ratio
- Integrated Monitor Shotodiode
- F10-0 Zero-chirped Modulator
- Integrated Polarizer
- Surface Mountable with Gull-wing DC Pins
- RoHS Compliant
- Package Dimensions: 65 (L) mm x 9.86 (W) mm x 5 (H) mm

**Applications**
- External Intensity Modulation from 10 to 12.5Gb/s NRZ and Electrical RZ
- High Frequency Fiber Optic Links
- Analog Microwave over Fiber (RoF)
- Instrumentation
With robust process and mass production experience, VLINK provides customer all types of Short Reach jumper used on SR4/SR8 modules. Customer can choose between MT Polishing and laser cleaving process based on different structures. Fiber length tolerance of ±0.1mm is available.

90° Fiber Array
Vlink’s 90 Degree Bending Fiber Arrays are fabricated with high precision V-Groove substrate via VLINK special bend, assembly and polish process to get low insertion loss, high accuracy of fiber core pitch and excellent quality of polished surface. The compact dimensions with height less than 3.8mm is ideal for connection on high speed Silicon Photonics transceiver modules.

Features
- High Coupling Efficiency used on Silicon Photonics Assembly
- Patented VLINK Technology for Low Stress and High Reliability
- 8-Channel, 12-Channel or on Request
- Fiber Height 3.5mm or less
- Low Bending Loss <0.1dB
- Low Coupling Loss <0.35dB

Applications
- Grating Coupling on Silicon Photonics Connection

400G Multi-Mode SR8
With robust process and mass production experience, VLINK provides customer all types of Short Reach jumper used on SR4/SR8 modules. Customer can choose between MT Polishing and laser cleaving process based on different structures. Fiber length tolerance of ±0.1mm is available.

Features
- 24-24 Channel or 24-16 Channel
- Accurately Control the Length

Applications
100G/400G Short Reach Solution (SR4/SR8)

400G DR4 Assembly
400G DR4 jumper consists of 1pc MT, 1pc RX FAU with 45deg fiber protrusion polishing, and 1pc TX FAU with 4 isolators attached. Fiber length is accurately controlled by special fixture. Isolators attachment and isolation testing is accomplished by automatic machines. The products are compliant with GR-468-Core requirements.

Features
- High Accuracy of Fiber Length Control
- Automatic Isolator Attaching Process
- Auto Performance Testing System

Applications
- 400G Parallel Single Mode Solution

AWG FA Subassembly
Vlink’s 4ch/5ch FA Subassembly with LC stubs and LC receptacle is ideal for AWG alignment. High FA pitch accuracy and polishing angle can make alignment easy. Completed by auto-assembly process, Vlink’s receptacle is able to comply with wiggle requirements.

Features
- Automatic Alignment
- Automatic Test System
- Suited for Both Silicon and Quartz Glass Based AWG Chip

Applications
CWDM4/LAN WDM4 Modules

TFF CWDM/LAN-WDM Module
Vlink’s Thin Film Filter CWDM and LAN WDM Block is with compact size, high effective aperture, accurate pointing angle, and suited for QSFP28 transceiver modules. Filters attachment is accomplished by automatic machine.

Features
- Mass Production, Cost Effective
- Automatic Manufacturing Process
- Typical Output Light Parallelism <0.1deg

Applications
CWDM4/LAN WDM4 Module
**PM Fiber Array and Fiber Pigtail**

Vlink’s PM Fiber Pigtail and Fiber Array is ideally suitable for Coherent application, Fiber Sensor systems. With our professional design and manufacturing capability, Vlink can provide customer various types of PM pigtails. Our products are of high quality, cost effective, GR-1221/1209 and RoHS compliance.

**Features**
- High PER up to 30dB
- Low Stress on PM Fiber with VLINK Packing Process
- Low PER Degradation After Laser Welding/Soldering

**Applications**
- ICR/TLA Module
- Lidar Devices

**High Density Fiber Array**

Vlink’s High Density Fiber Array are widely used on DWDM modules and ROADM WSS modules. High pitch accuracy is controlled by V-Groove material, assembly process, and finished goods. Pitch in X or Y direction can be customized and asymmetrical. With AR coating and Feed-through assembly capability, Vlink can provide customer one-stop solution.

**Features**
- Multi-Channel Fiber Array up to 256F
- Fiber Core Pitch 250um, 127um, 84um or Special
- Typical Pitch Error 0.5um
- 2D FAU is Available

**Applications**
- Application for DWDM AWG, WSS

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**Hybrid Components**

**Main Advantages of EDFA**

- In Line with the Low Loss Band, Widely Used in Optical Fiber Communication
- High Coupling Efficiency
- High Energy Conversion Efficiency
- High Gain, Low Noise
- Insensitive Gain Characteristics
- Transparent Transmission of Signal is Achievable

**AFR’s Components for EDFA**

- Tap Coupler
- WDM + Isolator
- Isolator + WDM + GFF
- Photodiode + VOA + Tap PD
- WDM + SDI + GFF
- Isolator + Tap PD

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**HYBRID COMPONENTS**

**MICRO-CONNECTIVITY**

- Tap + Isolator + WDM
- Tap + Isolator + GFF
- Tap + Isolator + PD
- Tap + PD
- WDM + Isolator
- WDM + Isolator + GFF
- WDM + Isolator + PD
With strong capabilities and rich experience, AFR can provide One-Stop Fiber Assembly Service according to the requirements of customers. Our products and service include Lensed Fiber, Fiber Metallization, Fiber Feedthrough, Fiber Coating, Fiber End Face Polishing, Fiber Array, Fiber Connector, Fiber Bragg Grating, etc.

**Lensed Fiber**

**Features**
- Wedge or Conical Lens Available
- Special Lens Customized
- High Coupling Efficiency
- High Reliability in Hermetic Packaging
- SMF, PMF, MMF, Special Fiber

**Applications**
- Assembly for Pump Lasers, SLEDs, etc.
- DFB Laser Packaging
- Optical Direct Coupling to Optical Waveguide

**Fiber Metallization**

**Products**
- Metalized Fiber Cable
- DFB, Pump Laser, etc
- PM Metalized Fiber Cable

**Features**
- Sputtering Process
- Excellent Adhesion and Solderability
- Eco-Friendly Solution
- In-House Coating
- Multi-channels: 4/8/32+ Channels

**Fiber Feedthrough**

**Features**
- Hermetic Sealing Guaranteed
- Glass Solder and Metal Solder Both Available
- Single Fiber and Ribbon Fiber Both Available

**Laser Packaging**

**Products**
- H8/14 Pin Butterfly Packaging
- TO-CAN Packaging

**Features**
- Hermetic Sealing
- High Reliability
- Custom Design Available
- For DFB, SLED, and Pump LD Packaging

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**FAST RESPONSE, CUSTOM DESIGN**
High-Reliability Series

Products
- Filter WDM
- Isolator
- GFF
- GFF + Isolator
- PBC/S

Features
- Volume Shipment Since 2013
- Shipped 20,000+ pcs to the US & Japan
- FIT < 0.1
- 5000+ Hours Reliability Test

Polarization Maintaining Series

Products
- PM Coupler
- PM Isolator
- Polarization Beam Combiner/Splitter
- PM Circulator
- PM WDM (Fused/Filter)
- In-line Polarizer
- Faraday Mirror

Applications
- Fiber Amplifiers
- ACO/DCO
- ICR/ICT
- Coherent Module and Transponder
- ER > 25dB

20 Years Experience of Design & Manufacturing of PM Components
6 Million + Components Shipped

High Power Series

Products
- Isolator
- Isolator+WDM
- Circulator
- MFA
- FBG

Features
- Cleanness
- Coating Processing
- High Damage Threshold Optical Material Selection
- Product Design and High Simulation Ability
- Strict Management on Production Process
- One by One Testing
- Max. Optical Power (CW): 10W
- Max. Optical Power (Pulsed): 10kW

Applications
- HP Fiber Amplifiers
- HP EDFA

Electric Driven

Products
- Low WDL MEMS VOA and Array
- PM MEMS Switch 1x2/2x2/1xN
- Unidirectional Tap PD and Array
- Fiber Pigtailed PD and Array
- TAP+Isolator+PD Hybrid

Features
- Low WDL: < 0.5dB (VOA)
- Low IL: < 0.7dB (VOA/Switch)
- Fast Response: < 2ms (VOA), < 10ms (Switch)
- Low Dark Current: < 2nA (PD)
- High Directivity: > 35dB (PD)
- Compact Size

Applications
- Fiber Amplifiers
- WSS
- V-MUX
- MUXs
- Optical Transponder
- Optical Line Protection
- Optical Channel Monitoring