Integrated RF Analog/Digital Transceiver

10GHz, 12GHz, SM28 Fiber, MM Fiber

DATASHEET

Return to the Webpage

The TxRx is a plug-and-play module designed to establish an RF link between two points using fiber optic cable or free-space transmission. It uniquely features a compact design that integrates both transmitter and receiver functions, along with >17 dB gain ultra-broadband RF amplifier on the transmitter side or on both transmitter and receiver to reduce noise floor. The system offers strong immunity to interference, high bandwidth, low signal loss over long distances, low distortion, low power consumption, and high reliability, making it easy to deploy in a wide range of applications. The module operates by converting an input RF electrical signal into an optical signal using an electro-optical modulator coupled with a DFB laser in the transmitter. At the receiving end, the optical signal is converted back into an RF signal through a high-linearity photodiode integrated with a low-noise amplifier. Together, the transmitter and receiver form a transceiver that provides a transparent data transmission channel. Bidirectional RF communication over a single fiber link can be achieved using a pair of cable adapters incorporating fiber optic circulators. A wall-pluggable power supply is included for ease of use. The unit requires mounting on a heat sink base.

The TxRx modules are well suited for applications such as telecommunications, satellite communications, radio telescopes, distributed antenna systems, audio/video broadcasting, and timing synchronization. For example, point-to-point antennas can be connected over distances ranging from several meters to many kilometers via fiber; base stations can link to remote sector antennas; and satellite antennas can be connected to remote sites using RF-over-fiber solutions.

Features

- Up to 12GHz
- SM28 Fiber
- Low Loss
- Low Cost
- Stable

Applications

- GSM Repeater
- CDMA Repeater
- WCDMA Repeater
- PHS Repeater
- Digital TV Repeater
- Broadcast Repeater

Specifications

Parameter	Min	Typical	Max	Unit
Optical Wavelength	1520		1580	nm
Optical Output Power		3		mW
Optical Input Power	-16		-6	dBm
RF Frequency Range	0.01		12	GHz
Gain Flatness (p-p)			± 3	dB
RF Output Power	-30		-10	dBm
Input RF Return Loss		18		dB
RF Transmitter Input Power	-10		+10	dBm
Spurious Free Dynamic Range	100			$dBm/H^{2/3}$
Noise Floor			-120	dBm/Hz
Transmit Gain Control (AGC)				
Receive Gain Control (AGC)				
Link Gain	0	5		dB
CNR	35			dB
Fiber Type		SM28		
Fiber Connector Type		SC/APC		
RF Impedance		50		Ω
RF Connector		SMA		
Power Consumption	3			W
Weight	0.5			kg
Operating Temperature	-20		50	°C
Storage Temperature	-45		85	°C

RoHS COMPLIANT

Note: The specifications provided are for general applications with a cost-effective approach. If you need to narrow or expand the tolerance, coverage, limit, or qualifications, please [click this link]:

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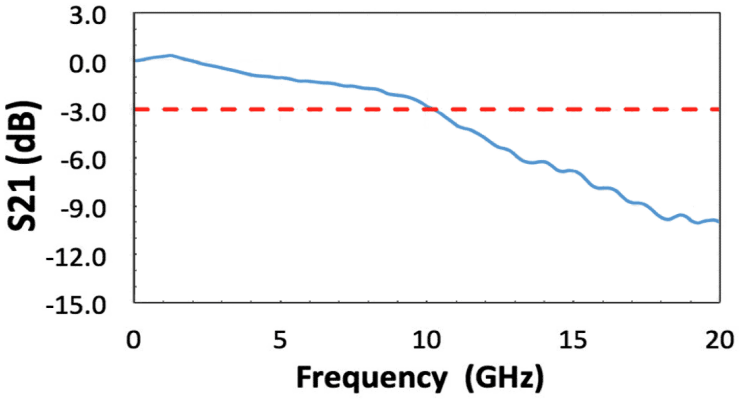
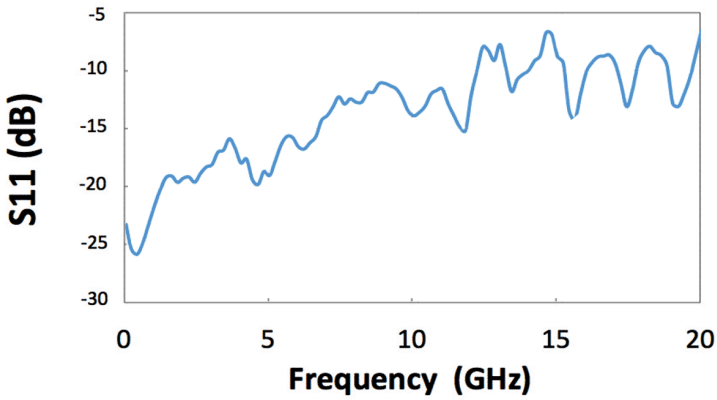
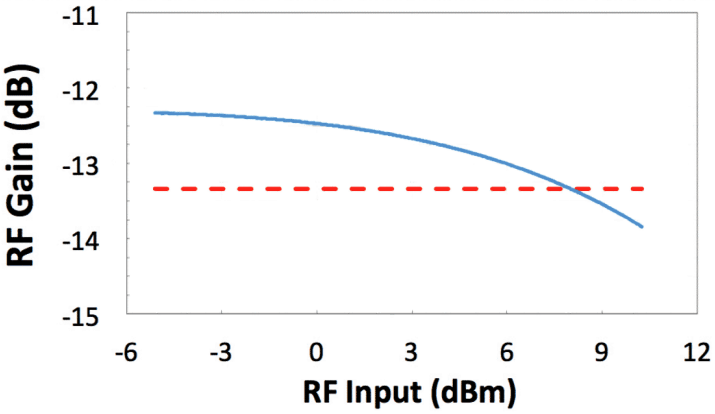
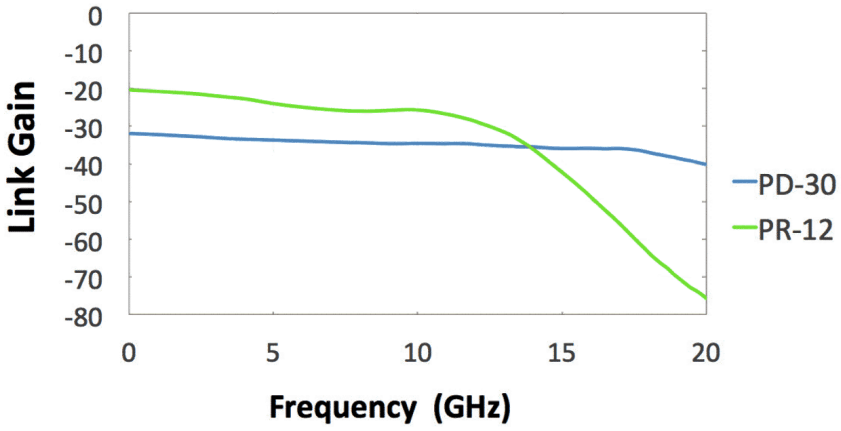
Typical S21 and S11 Response





1 dB Compression and Link Gain Comparison



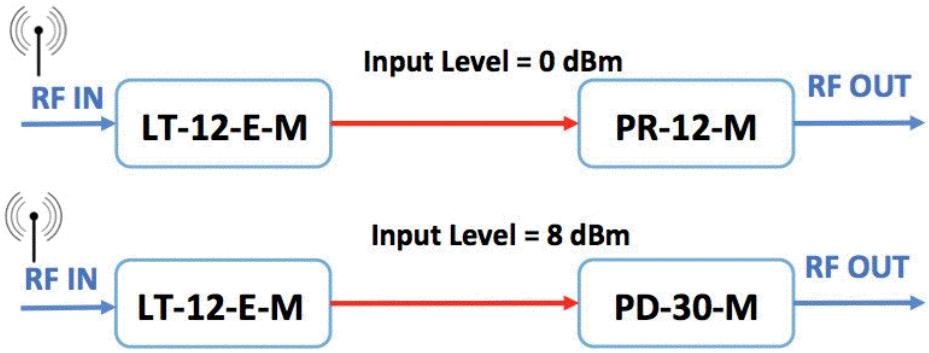


Test Conditions & Link Gain Measurements

LT-12-E-M Output = 3.5 dBm

Link Gain w/PR-12 = -20 dB @ 1 GHz

Link Gain w/PD-30 = -32 dB @ 1 GHz



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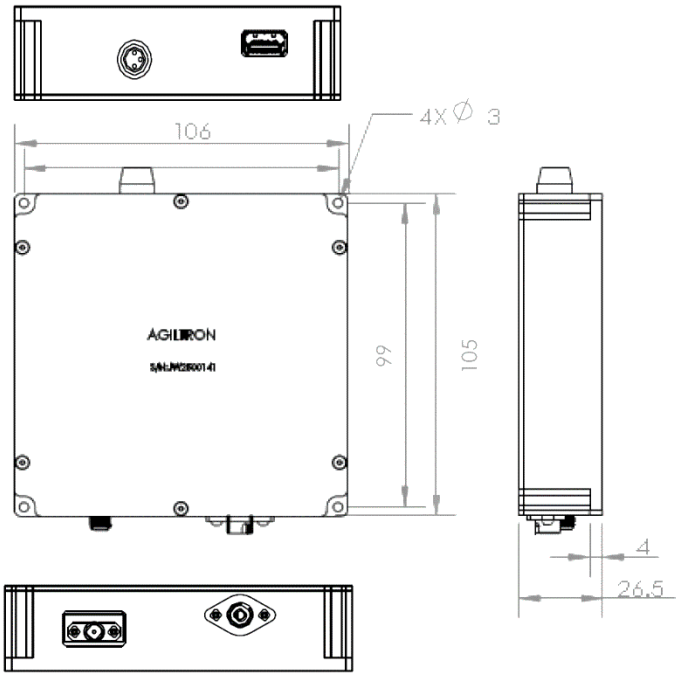
Dimensions Module (Unit: mm)



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

Ordering Information (Part Number)

	☐☐	☐	☐	☐	☐	☐	☐
Prefix	**RF Frequency**	**Wavelength**	**Tx RF Amplifier**	**Rx RF Amplifier**	**Bidirectional [1]**	**Power Supply**	**Fiber Connector [2]**
TXRX-	10GHz SM = 1G 10GHz MM = 1M 12GHz SM = 2G 12GHz MM = 2M	1550 nm = 1 Special = 0 ITU Channel = 2	None = 1 >17dB = 2 Special = 0	None = 1 >17dB = 2 Special = 0	None = 1 Yes = 2 Special = 0	Yes = 1 None = 2	LC/PC = 1 LC/APC = 2 Special = 0

Note:

[1]. Bidirectional means two-way communications via a single fiber link. It includes a circulator cable combiner.

[2]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

Red marked -- Special order

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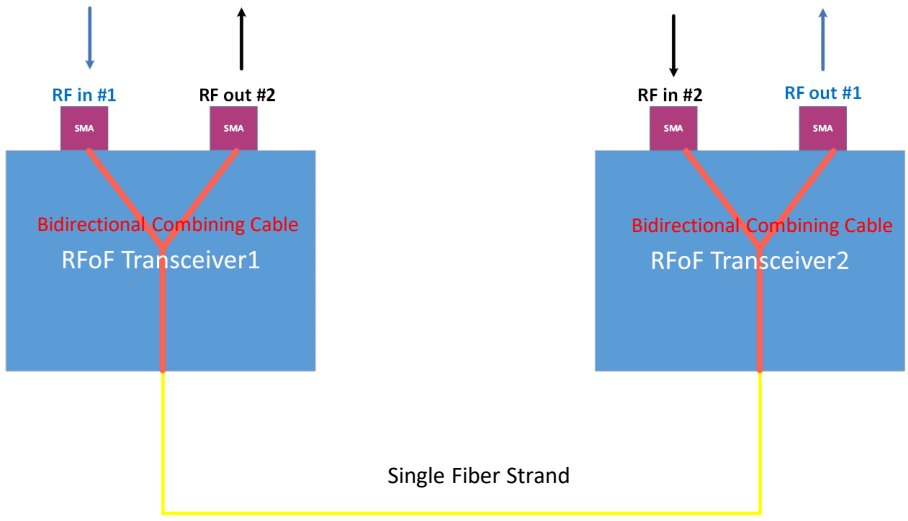
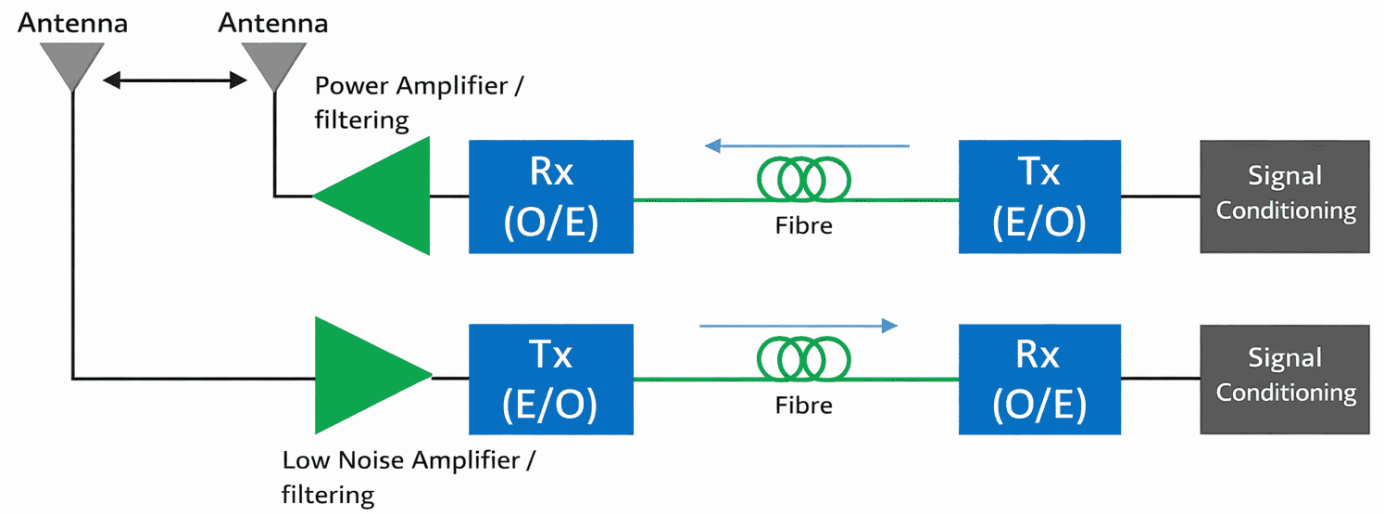
Application Example 1 – Bidirectional RF Link via a Single Fiber



Bidirectional Combining Cable is based on fiber circulator $650 ea

Application Example – Satellite RF over Fiber Link



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Operation Instructions

1. Connect the optical fiber input port on the receiver to the signal source.
2. Connect the RF output port on the receiver to the RF input port of the transmitter.
3. Connect the RF output port of the transmitter to the readout instrument.
4. Plug in the provided power supply to power the device. The LED will turn on (CW for the receiver, blinking for the transmitter).
5. The unit will operate with the performance specified in the test report.
6. If the device does not function as expected, contact us via the sales email. **Do not open the enclosure — doing so will invalidate the one-year warranty.**

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 how handling by expanding the core side at the fiber ends.

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Caution Electrostatic Sensitivity

- Never touch laser diode and the module using hands
- Always use protections when handle a laser diode
- Recommend mounting the laser diode using an ionic gun and ESD finger cots

Laser Safety

This product meets the appropriate standard in Title 21 of the Code of Federal Regulations (CFR). FDA/CDRH Class 1M laser product. This device has been classified with the FDA/CDRH under accession number 0220191. All versions of this laser are Class 1M laser products, tested according to IEC 60825-1:2007 / EN 60825-1:2007. An additional warning for Class 1M laser products. For diverging beams, this warning shall state that viewing the laser output with certain optical instruments (for example eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. For collimated beams, this warning shall state that viewing the laser output with certain instruments designed for use at a distance (for example telescopes and binoculars) may pose an eye hazard.

Wavelength = 1.3/1.5 µm.

Maximum power = 30 mW.

*Caution - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
*IEC is a registered trademark of the International Electrotechnical Commission.

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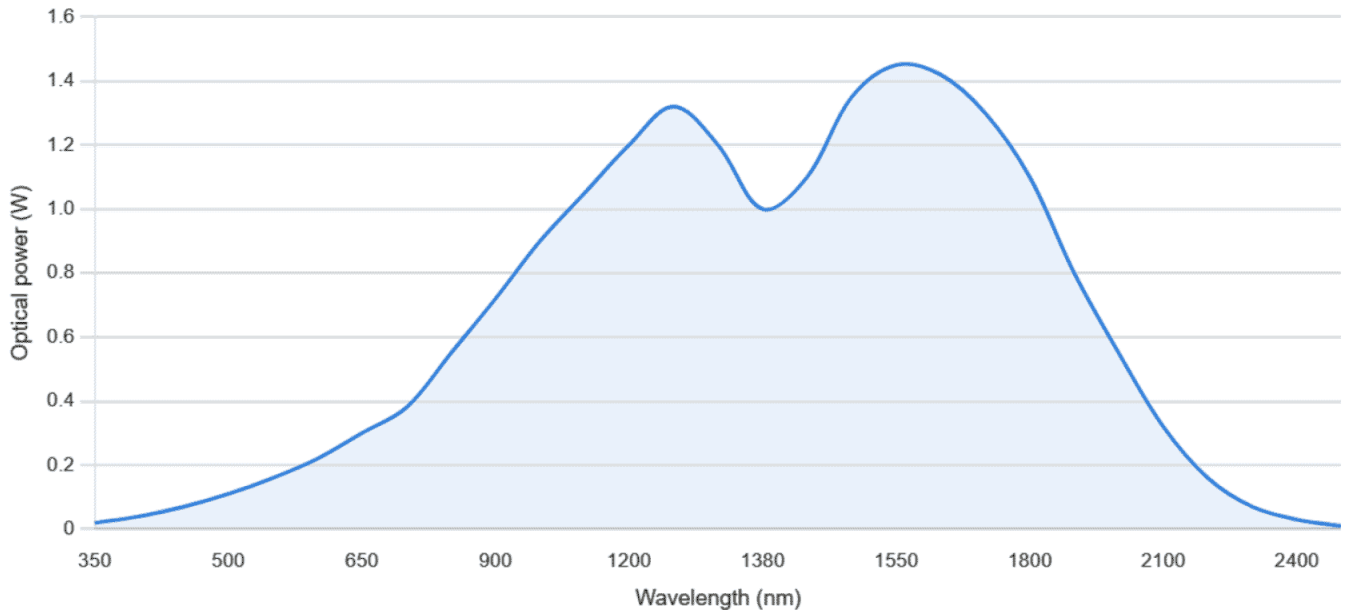
Regular Single Mode / Polarization Maintaining Fiber Optical Power Handing vs Wavelength



Single mode fiber optical power is limited by nonlinear effects in addition to absorption that increase loss and generate heat. The curve shows the approximate safe CW power envelope for standard single-mode fiber. Actual limits depend on fiber design, core size, length, and laser characteristics. Specialty fibers can significantly increase the power limit.

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