



# Miniature Broadband RF over Fiber Optic Link

## OZ101 Series



### DESCRIPTION

The OZ101 Series of Miniature, Broadband RFoF Links are used for a variety of RF over Fiber (RFoF) Applications. The OZ101 Series are small, light-weight, cost-effective modular components. The Link delivers high Spurious Free Dynamic Range (SFDR) with operational frequencies from 30 MHz to 3.0 GHz, or more.

The OZ101 Series Link consists of individual Tx and Rx Modules, connected via optical fiber (usually Single Mode Fiber), which offer an excellent alternative to using coaxial cable systems. It provides significant improvement in the transport of high frequency RF signals in their native format reliably across a broad range of frequencies.

One of the key uses of these miniaturized RFoF Modules is in antenna radiation pattern measurements. Optical Zonu's Fiber Optic Links enable the measurement of the radiation pattern of small antennas without any coaxial cable interference effects. The product family was designed to enable the testing of hand-held cellular telephones and emerging LTE (employing Antenna Diversity) devices, operating from the low voltage battery supply of the phone itself (down to +3.7 Volts). Experimental results have demonstrated that the use of legacy RF coaxial cable strongly disturbs the antenna gain and radiation patterns for both polarization components. With very simple integration at low cost, our OZ101 Series Links can characterize radiation patterns of both narrow and UWB compact antennas. Studies which compared both measured and simulated results, demonstrated excellent agreement ( $\pm 1$  dB) for co-polarization in the different cut-planes. At very low power level measurements, and at high frequencies, standard RFoF products, which are typically 3 inches by 5 inches, or larger, are considered too big to be used because they affect the antenna radiation pattern. It is "best practice" to use miniaturized optoelectronic components, whose size does not materially impact the outline of the product under test.

The standard optical connector supplied is SC/APC (FC/APC or LC/APC are available). All optical connectors are Angle-Polished (APC) for low back reflection operation. The Receiver features a high performance InGaAs photodiode and the Transmitter is based upon a linear Isolated DFB Laser operating at 1.3 or 1.5  $\mu\text{m}$  (A) over 9/125  $\mu\text{m}$  Single Mode Fiber. Average Automatic Power Control (AAPC) is incorporated for optimal optical power stability over the full temperature range. The RF interface is a 50 Ohm SMA connector.

DC connector (incl. I<sup>2</sup>C link for internal control and Alarms) – Micro USB (B Type)

### FEATURES

- Very Small Package Outline
- Approx Size: 0.7" x 1.6" x 0.3"
- 30 MHz to 3 GHz Bandwidth.
- Direct Modulation FO Link
- 1.5 or 1.3  $\mu\text{m}$  Isolated DFB Lasers
- -20°C to +75°C Operating Temperature
- High Spurious Free Dynamic Range
- LED Front Status Indicator
- Automatic Optical Power Control
- Laser Conforms to Class 1 Emission Level per CDRH and IEC-825 (EN 60825) Standards

### OPTIONS

- Low Noise Amplifier (LNA)
- CWDM Wavelengths
- Extended Bandwidth 1 MHz to 3.0 GHz
- Multimode Fiber Compatibility
- I<sup>2</sup>C Monitoring/Control

### APPLICATIONS

- Radiation Pattern Measurements
- High Density Deployments
- In-Building DAS Solutions
- Avionics
- Low Voltage Battery Powered
- Wi-Max
- 4G LTE
- Cellular Backhaul
- MMDS
- Remote Antenna Location
- Satcom
- GPS Distribution
- Timing Delay

### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Units
Storage Temperature (Case)	T <sub>s</sub>	-40	+85	°C
Operating Temperature (Case)	T <sub>o</sub>	-20	+75	°C
DC Supply Voltage	V <sub>PD</sub>	3.7	5.5	Volts
Maximum RF Input into Tx (No LNA)			+15	dBm
Maximum Optical Input into Rx			4	mW

### CHARACTERISTICS OF TX/RX (+5 Volt Power Supply)

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Supply Voltage	VCC		+5	+5.25	Volts	
Power Supply Current TX	ICctx		60	80	mA	1
Power Supply Current RX	ICCrX		160	170	mA	1
Laser Optical Output Power TX			2	3.5	mW	
Transmitter Operating Wavelength A/B	$\lambda$	1310	1550	1590	nm	
High Frequency Cutoff	HFC		2700	3000	MHz	2
Low Frequency Cutoff	LFC		30		MHz	3
Frequency Response (30 – 2700 MHz)			+/- 1.5		dB	
Input Impedance	Z		50		Ohms	
Input VSWR (30 - 2700 MHz)			1.7:1	1.9:1		
Spur Free Dynamic Range @ 1 GHz	SFDR		108		(dB/Hz) <sup>2/3</sup>	4
RF Link Gain (30 - 2700 MHz)		-1	0	+1	dB	4
Input Noise Floor Density @ 1 GHz	EIN		-133		dBm-Hz	4
Input Third Order Intercept @ 1 GHz	IIP3		30		dBm	4

### CHARACTERISTICS OF TX/RX with LNA (+5 Volt Power Supply) HIGH GAIN LINK

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Supply Voltage	VCC		+5	+5.25	Volts	
Power Supply Current TX	ICctx		85	105	mA	1
Power Supply Current RX	ICCrX		160	170	mA	1
Spur Free Dynamic Range @ 1 GHz	SFDR		106		(dB/Hz) <sup>2/3</sup>	4
RF Link Gain (30 - 2700 MHz)		-1	20	+1	dB	4
Input Noise Floor Density @ 1 GHz	EIN		-156		dBm-Hz	4
Input Third Order Intercept @ 1 GHz	IIP3		8		dBm	4

### CHARACTERISTICS OF TX/RX with LNA (+5 Volt Power Supply) UNITY GAIN LINK

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Supply Voltage	VCC		+5	+5.25	Volts	
Power Supply Current TX	ICctx		85	105	mA	1
Power Supply Current RX	ICCrX		80	95	mA	1
Spur Free Dynamic Range @ 1 GHz	SFDR		106		(dB/Hz) <sup>2/3</sup>	4
RF Link Gain (30 - 2700 MHz)		-1	0	+1	dB	4,6
Input Noise Floor Density @ 1 GHz	EIN		-156		dBm-Hz	4
Input Third Order Intercept @ 1 GHz	IIP3		8		dBm	4

1. Total Power Consumption for both Tx and Rx Modules,.
2. Typical High Frequency Cutoff (HFC) is 2700 MHz. For higher HFC contact Factory.
3. Typical Low Frequency Cutoff (LFC) is 48 MHz. For lower LFC contact Factory.
4. Measured with 1 meter of optical fiber. For +3.7 Volts operation the IMD is measured using 2-tone each at -5 dBm.
5. Other variations of Gain, NF and IIP3 are available upon request. Contact factory for more details.
6. on this model higher Gain, up to 6 dB available

All measurements taken at @ 25°C.

### Battery Operation as low as 3.7 Volts

#### CHARACTERISTICS OF TX/RX (Battery Operation)

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Supply Voltage	VCC	+3.4	+3.7		Volts	
Power Supply Current TX	ICCtx		55	75	mA	1
Power Supply Current RX	ICCrX		95	105	mA	1
Frequency Response (30 – 2700 MHz)			+/- 1.75		dB	
Spur Free Dynamic Range @ 1 GHz	SFDR		104		(dB/Hz) <sup>2/3</sup>	4
RF Link Gain (30 - 2700 MHz)		-1	0	+1	dB	4
Input Noise Floor Density @ 1 GHz	EIN		-133		dBm-Hz	4
Input Third Order Intercept @ 1 GHz	IIP3		23		dBm	4

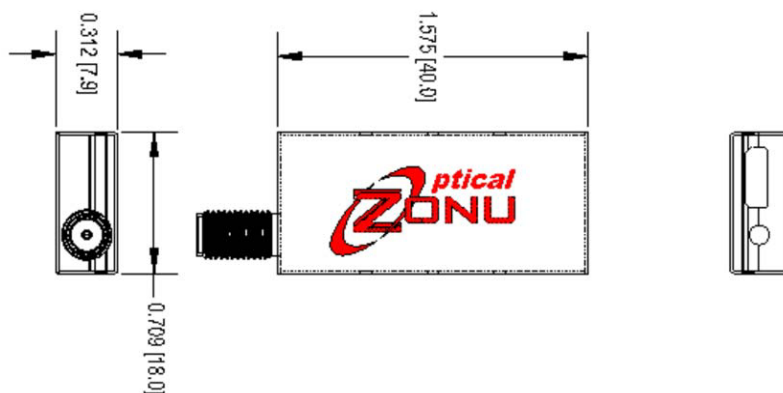
#### CHARACTERISTICS OF TX/RX with LNA (Battery Operation)

Parameter	Symbol	Min	Typical	Max	Units	Notes
Power Supply Voltage	VCC	+3.4	+3.7		Volts	
Power Supply Current TX	ICCtx		80	100	mA	1
Power Supply Current RX	ICCrX		95	105	mA	1
Frequency Response (30 – 2700 MHz)			+/- 1.75		dB	
Spur Free Dynamic Range @ 1 GHz	SFDR		102		(dB/Hz) <sup>2/3</sup>	4
RF Link Gain (30 - 2700 MHz)		-1	16	+1	dB	4
Input Noise Floor Density @ 1 GHz	EIN		-150		dBm-Hz	4
Input Third Order Intercept @ 1 GHz	IIP3		3		dBm	4

7. Total Power Consumption for both Tx and Rx Modules.
8. Typical High Frequency Cutoff (HFC) is 2700 MHz. For higher HFC contact Factory.
9. Typical Low Frequency Cutoff (LFC) is 48 MHz. For lower LFC contact Factory.
10. Measured with 1 meter of optical fiber. For +3.7 Volts operation the IMD is measured using 2-tone each at -5 dBm.
11. Other variations of Gain, NF and IIP3 are available upon request. Contact factory for more details.
12. on this model higher Gain, up to 6 dB available

All measurements taken at @ 25°C.

### MECHANICAL OUTLINE



### PIN ASSIGNMENTS

Pin	Tx/Rx
1	Power Supply (+5V )
2	SDA, IIC (optional)
3	SCA, IIC (optional)
4	NO CONNECT
5	Ground

### ORDERING INFORMATION

PART NO. **AX3-Z101 - X XX - AX - XX**

L - LNA  
0 - No LNA

0 - Unidirectional Link with Tx & Rx  
1 - Transmitter Only (Tx)  
2 - Receiver Only (Rx)

S - Single Mode Fiber Compatible  
M - Multimode Fiber Compatible

D - DFB Laser  
F - Fabry-Perot Laser

S - SC/APC  
F - FC/APC

31 - 1310 nm  
55 - 1550 nm  
  
49 - 1490 nm  
51 - 1510 m  
53 - 1530 nm  
57 - 1570 nm  
59 - 1590 nm  
61 - 1610 nm

MADE IN  
  
U. S. A.