



## Features

- 30 MHz to 3 GHz RF Bandwidth (optional 6 GHz)
- -40°C to +70°C Operating Case Temperature Range (1310 nm)
- Small Size, 0.7" x 1.6" x 0.3"
- Weighs 18.7 Grams
- 1310 nm, 1550 nm, CWDM Wavelengths
- High SFDR
- +5V Supply Voltage
- Automatic Optical Power Control
- Local LED Alarm Indicator
- Uncooled Isolated DFB Lasers
- Lasers Conform to Class 1 Emission Level Per CDRH and IEC-825 (EN 60825) Standards

## Options

- Integrated +20 dB Transmitter LNA
- Extended High Frequency, 6 GHz
- Extended Low Frequency, 1 MHz
- +3.7V Power Supply Option
- I2C Status and Control
- Multimode Fiber Capability

## Applications

- Radiation Pattern Measurements
- High Density Deployments
- In-Building DAS Solutions
- Avionics
- Low Voltage Battery Powered
- 4G LTE 5G CBRS
- Optical Delay Line
- Remote Antenna Location
- Satcom

# OZ10x

## Description

The OZ10x OEM fiber optic transmitter and receiver modules are broadband RF over Fiber standalone enclosed board level assemblies that are well-suited for low size/weight/power applications. The OZ10x has a wide dynamic range and supports RF transport in situations where transport distance or flexibility of cabling may prohibit the use of coaxial cable. The modules provide high Spurious Free Dynamic Range (SFDR) transport for RF signals in the frequency range 30 MHz to 3 GHz. Optional extended bandwidths of 1 MHz (for lower rolloff) and/or 6 GHz (for upper rolloff) are also available. The OZ10x features a linear optically isolated DFB laser diode operating at 1310 nm or 1550 nm or a high performance InGaAs photodiode. CWDM wavelengths are also available. Standard transport is over 9/125  $\mu\text{m}$  Single Mode Fiber, however Multimode fiber transport is also an option (contact Optical Zonu for details). The standard RF interface is 50 Ohm SMA and the standard optical interface is a SC/APC (FC/APC is also available) fiber pigtail. Built-in RF shielding supports low EMI/RF interference. Average Automatic Power Control (AAPC) provides closed loop control of the transmitter optical output power over the full operating temperature range. Alarm and monitoring functions are available through the optional I2C serial data interface. An LED provides status of laser bias current (transmitter) or received optical power (receiver). The OZ10x module is powered from +5 VDC. For the optional +3.7V powered version, please contact Optical Zonu.

A primary application for the small OZ10x OEM module is to facilitate antenna radiation pattern measurements. The optical modules enable the measurement of radiation patterns of small antennas without the EM interference of coaxial cables.

OZ10x transmitter and receiver modules may be integrated into 19" rack mounted architectures to provide very dense RF over fiber transport. Up to 36 transmitter and/or receiver modules can be fit into a 19" 1RU J-Chassis by utilizing the J1 form factor (see [J1/J84 Datasheet](#))

## Absolute Maximum Ratings

| Parameter                                                              | Symbol   | Min  | Max   | Units |
|------------------------------------------------------------------------|----------|------|-------|-------|
| Storage Temperature (Case)                                             | $T_s$    | -40  | +85   | °C    |
| Operating Temperature (Case) 1310nm DFB Laser, -20°C for 1550 nm Laser | $T_o$    | -40  | +70   | °C    |
| DC Supply Voltage 5V version                                           | $V_{CC}$ | 4.75 | 5.5   | Volts |
| DC Supply Voltage 3.7V version                                         | $V_{CC}$ | 3.5  | +5.25 | Volts |
| Maximum RF Input into Transmitter (with LNA)                           | -        | -    | 0     | dBm   |
| Maximum RF Input into Transmitter (No LNA)                             | -        | -    | +15   | dBm   |
| Maximum Optical Input into Receiver                                    | -        | -    | 10    | dBm   |
| Unpackaged Weight                                                      | -        | -    | 19    | g     |

## DC Characteristics of OZ10X (+5V Version)

| Parameter                               | Symbol      | Min  | Typical   | Max   | Units | Notes |
|-----------------------------------------|-------------|------|-----------|-------|-------|-------|
| Power Supply Voltage (+5V Version)      | $V_{CC}$    | -    | +5        | +5.25 | Volts | -     |
| Power Supply Current, Transmitter       |             |      |           |       |       |       |
| High Gain LNA option                    | $I_{CC,Tx}$ | -    | 140       | 170   | mA    | -     |
| Unity Gain No LNA                       | $I_{CC,Tx}$ | -    | 85        | 105   | mA    | -     |
| Power Supply Current, Receiver          |             |      |           |       |       |       |
| High Gain LNA option                    | $I_{CC,Rx}$ | -    | 160       | 170   | mA    | -     |
| Unity Gain No LNA                       | $I_{CC,Rx}$ | -    | 80        | 95    | mA    | -     |
| Laser Optical Output Power, Transmitter | -           | -    | 2         | 3.5   | mW    | -     |
| Transmitter Operating Wavelength        | $\lambda$   | 1270 | 1550/1310 | 1610  | nm    | -     |

### Characteristics of OZ101 (+5V Version)

| Parameter                          | Symbol | Min  | Typical   | Max   | Units                | Notes |
|------------------------------------|--------|------|-----------|-------|----------------------|-------|
| High Frequency Cutoff              | HFC    | 2700 | 3000      | -     | MHz                  |       |
| Low Frequency Cutoff               | LFC    | -    | 30        | -     | MHz                  | 1     |
| Frequency Response (30 - 3000 MHz) | S21    | -    | +/- 1.5   | -     | dB                   |       |
| Input Impedance                    | Z      | -    | 50        | -     | Ohms                 |       |
| Input VSWR (30 - 3000 MHz)         | -      | -    | 1.7:1     | 1.9:1 | -                    |       |
| Spur Free Dynamic Range            |        |      |           |       |                      |       |
| With LNA (1 GHz / 3 GHz)           | SFDR   | -    | 108/104   | -     | dB/Hz <sup>2/3</sup> | 2     |
| No LNA (1 GHz / 3 GHz)             | SFDR   | -    | 109/104   | -     | dB/Hz <sup>2/3</sup> | 2     |
| RF Link Gain (30 - 3000 MHz)       |        |      |           |       |                      |       |
| With LNA                           | G      | +19  | +20       | +22   | dB                   | 2     |
| No LNA                             | G      | -1   | 0         | +2    | dB                   | 2     |
| Equivalent Input Noise             |        |      |           |       |                      |       |
| With LNA (1 GHz / 3 GHz)           | EIN    | -    | -153/-149 | -     | dBm-Hz               | 2, 3  |
| No LNA (1 GHz / 3 GHz)             | EIN    | -    | -133/-129 | -     | dBm-Hz               | 2, 3  |
| Input Third Order Intercept        |        |      |           |       |                      |       |
| With LNA (1 GHz / 3 GHz)           | IIP3   | -    | 10/8      | -     | dBm                  | 2     |
| No LNA (1 GHz / 3 GHz)             | IIP3   | -    | 28/25     | -     | dBm                  | 2     |

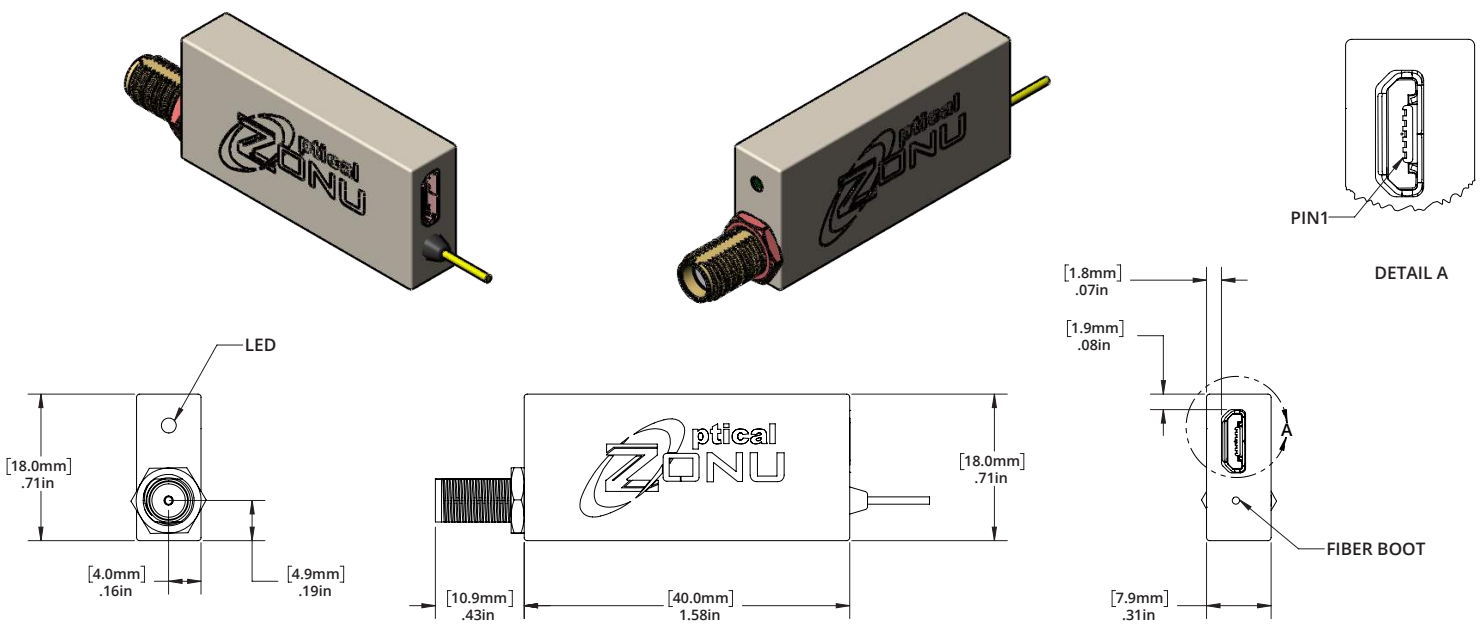
### Characteristics of OZ104 (+5V Version)

| Parameter                          | Symbol | Min  | Typical   | Max   | Units                | Notes |
|------------------------------------|--------|------|-----------|-------|----------------------|-------|
| High Frequency Cutoff              | HFC    | 3700 | 4000      | -     | MHz                  |       |
| Low Frequency Cutoff               | LFC    | -    | 30        | -     | MHz                  | 1     |
| Frequency Response (30 - 4000 Mhz) | S21    | -    | +/- 1.5   | -     | dB                   |       |
| Input Impedance                    | Z      | -    | 50        | -     | Ohms                 |       |
| Input VSWR (30 - 4000 MHz)         | -      | -    | 1.7:1     | 1.9:1 | -                    |       |
| Spur Free Dynamic Range            |        |      |           |       |                      |       |
| With LNA (1 GHz / 4 GHz)           | SFDR   | -    | 105/104   | -     | dB/Hz <sup>2/3</sup> | 2     |
| No LNA (1 GHz / 4 GHz)             | SFDR   | -    | 107/102   | -     | dB/Hz <sup>2/3</sup> | 2     |
| RF Link Gain (30 - 4000 MHz)       |        |      |           |       |                      |       |
| With LNA                           | G      | +15  | +17       | +20   | dB                   | 2     |
| No LNA                             | G      | -1   | 0         | +2    | dB                   | 2     |
| Equivalent Input Noise             |        |      |           |       |                      |       |
| With LNA (1 GHz / 4 GHz)           | EIN    | -    | -150/148  | -     | dBm-Hz               | 2, 3  |
| No LNA (1 GHz / 4 GHz)             | EIN    | -    | -133/-128 | -     | dBm-Hz               | 2, 3  |
| Input Third Order Intercept        |        |      |           |       |                      |       |
| With LNA (1 GHz / 4 GHz)           | IIP3   | -    | 8/8       | -     | dBm                  | 2     |
| No LNA (1 GHz / 4 GHz)             | IIP3   | -    | 27/25     | -     | dBm                  | 2     |

### Characteristics of OZ106 (+5V Version)

| Parameter                          | Symbol | Min  | Typical   | Max   | Units                | Notes |
|------------------------------------|--------|------|-----------|-------|----------------------|-------|
| High Frequency Cutoff              | HFC    | 5700 | 6000      |       | MHz                  |       |
| Low Frequency Cutoff               | LFC    |      | 30        |       | MHz                  | 1     |
| Frequency Response (30 - 6000 Mhz) | S21    |      | +/- 1.5   |       | dB                   |       |
| Input Impedance                    | Z      |      | 50        |       | Ohms                 |       |
| Input VSWR (30 - 6000 MHz)         |        |      | 1.7:1     | 1.9:1 |                      |       |
| Spur Free Dynamic Range            |        |      |           |       |                      |       |
| With LNA (1 GHz / 6 GHz)           | SFDR   |      | 105/101   |       | dB/Hz <sup>2/3</sup> | 2     |
| No LNA (1 GHz / 6 GHz)             | SFDR   |      | 107/100   |       | dB/Hz <sup>2/3</sup> | 2     |
| RF Link Gain (30 - 6000 MHz)       |        |      |           |       |                      |       |
| With LNA                           | G      | +15  | +17       | +20   | dB                   | 2     |
| No LNA                             | G      | -1   | 0         | +2    | dB                   | 2     |
| Equivalent Input Noise             |        |      |           |       |                      |       |
| With LNA (1 GHz / 6 GHz)           | EIN    |      | -150/-146 |       | dBm-Hz               | 2, 3  |
| No LNA (1 GHz / 6 GHz)             | EIN    |      | -133/-126 |       | dBm-Hz               | 2, 3  |
| Input Third Order Intercept        |        |      |           |       |                      |       |
| With LNA (1 GHz / 6 GHz)           | IIP3   |      | 8/6       |       | dBm                  | 2     |
| No LNA (1 GHz / 6 GHz)             | IIP3   |      | 26/24     |       | dBm                  | 2     |

### Mechanical Outline



## Characteristics of OZ101 (+3.7V Version)

| Parameter                                      | Symbol      | Min  | Typical  | Max | Units                | Notes |
|------------------------------------------------|-------------|------|----------|-----|----------------------|-------|
| Power Supply Voltage                           | $V_{CC}$    | +3.4 | +3.7     |     | Volts                |       |
| Power Supply Current, Transmitter              | $I_{CC,Tx}$ |      | 55       | 75  | mA                   |       |
| Power Supply Current, Transmitter (with LNA)   | $I_{CC,Tx}$ |      | 90       | 100 | mA                   |       |
| Power Supply Current, Receiver                 | $I_{CC,Rx}$ |      | 95       | 105 | mA                   |       |
| Power Supply Current, Receiver (with LNA)      | $I_{CC,Rx}$ |      | 95       | 115 | mA                   |       |
| Frequency Response (30 - 3000 MHz)             | S21         |      | +/- 1.75 |     | dB                   |       |
| Spur Free Dynamic Range @ 1GHz                 | SFDR        |      | 104      |     | dB/Hz <sup>2/3</sup> | 2     |
| Spur Free Dynamic Range @ 1 GHz (with LNA)     | SFDR        |      | 102      |     | dB/Hz <sup>2/3</sup> | 2     |
| RF Link Gain (30 - 3000 MHz)                   | G           | -1   | 0        | +1  | dB                   | 2     |
| RF Link Gain (30 - 3000 MHz) (with LNA)        | G           | +15  | +16      | +17 | dB                   | 2     |
| Equivalent Input Noise @ 1 GHz                 | EIN         |      | -133     |     | dBm-Hz               | 2, 3  |
| Equivalent Input Noise @ 1 GHz (with LNA)      | EIN         |      | -150     |     | dBm-Hz               | 2, 3  |
| Input Third Order Intercept @ 1 GHz            | IIP3        |      | +23      |     | dBm                  | 2     |
| Input Third Order Intercept @ 1 GHz (with LNA) | IIP3        |      | +3       |     | dBm                  | 2     |

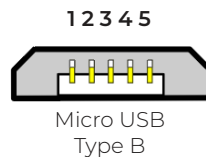
<sup>1</sup> Typical Low Frequency Cutoff (LFC) is 30 MHz; for lower LFC - contact Optical Zonu

<sup>2</sup> Measured with 1 meter of optical fiber. For +3.7 Volts operation the IMD is measured using 2-tone each at -5 dBm. Other variations of Gain, NF and IIP3 are available upon request. Contact Optical Zonu for more details. On this model higher Gain, up to 6 dB available. All measurements taken at 25°C

<sup>3</sup> NF (dB) = EIN (dBm-Hz) + 174 (dBm/Hz)

## Pin Assignments

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



In addition to supplying the DC power input to the OZ10X modules, the micro-USB (type B) connector also provides an optional I<sup>2</sup>C interface to module Read Only Memory (ROM). Select alarms, warnings, and critical parameters are made available. Note that in order to implement proper logic levels, customer side interface must supply a 10K Ohm pull-up resistor. Please contact Optical Zonu for option information and details.

## Rack Mounted Integration

OZ101 modules may be used in 19" rack mounted chassis by integrating them into higher level assemblies.

The J1 module (below on left) is an assembly that integrates the OZ101 into a small enclosure which makes available the 50 $\Omega$  SMA RF connector and LC/APC optical bulkhead connector on the front of the assembly. The back of the assembly consists of a blind mate connector which provides 5V from a backplane and a management and control interface.

The J1 is not a stand alone assembly. Up to four J1 transmitters and/or receivers may be inserted into a J84 plug-in module (below on right) for use in either a 1RU J-Chassis or a 3RU J3U Chassis. For more detail, [see the J1/J84 Datasheet](#).



**J1 MODULE**



**J84 PLUG-IN MODULE**



### Ordering Information

TRANSMITTER PART NOS

## A13 - Z10X - DXX - AX - XX

|                  |                             |                   |                             |                           |
|------------------|-----------------------------|-------------------|-----------------------------|---------------------------|
| <b>1</b> - 3 GHz | <b>31</b> - 1310 nm         | <b>S</b> - SC/APC | <b>S</b> - Single Mode      | <b>(blank)</b> - No LNA   |
| <b>4</b> - 4 GHz | <b>55</b> - 1550 nm         | <b>F</b> - FC/APC | <b>M</b> - 62.5µm Multimode | <b>L</b> - Integrated LNA |
| <b>6</b> - 6 GHz | <b>yy</b> - CWDM<br>1yy0 nm |                   | <b>M50</b> - 50µm Multimode |                           |

RECEIVER PART NOS

## A23 - Z10X - 00 - AX - X

|                  |                   |                             |
|------------------|-------------------|-----------------------------|
| <b>1</b> - 3 GHz | <b>S</b> - SC/APC | <b>S</b> - Single Mode      |
| <b>4</b> - 4 GHz | <b>F</b> - FC/APC | <b>M</b> - 62.5µm Multimode |
| <b>6</b> - 6 GHz |                   | <b>M50</b> - 50µm Multimode |

Note: For multimode Fiber option, receiver optical connector is SC/UPC or FC/UPC.

FIBER LINK (TRANSMITTER + RECEIVER) PART NOS

## A03 - Z10X - DXX - AX - XX

|                  |                             |                   |                             |                           |
|------------------|-----------------------------|-------------------|-----------------------------|---------------------------|
| <b>1</b> - 3 GHz | <b>31</b> - 1310 nm         | <b>S</b> - SC/APC | <b>S</b> - Single Mode      | <b>(blank)</b> - No LNA   |
| <b>4</b> - 4 GHz | <b>55</b> - 1550 nm         | <b>F</b> - FC/APC | <b>M</b> - 62.5µm Multimode | <b>L</b> - Integrated LNA |
| <b>6</b> - 6 GHz | <b>yy</b> - CWDM<br>1yy0 nm |                   | <b>M50</b> - 50µm Multimode |                           |

Note: For 3.7V configurations, contact Optical Zonu

### Accessories

PART NO. (AC to +5V Power Supply, 1A, 5W, Micro USB)

## ZA1 - 1 - 05 - 10 - USB

### Contacts

#### HEADQUARTERS

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sales@opticalzonu.com

#### CUSTOMER SUPPORT

818-780-9701 x276 ;  
818-452-5131  
support@opticalzonu.com

#### SALES - RF

818-780-9701 x122 ;  
818-579-9630  
sales@opticalzonu.com

#### SALES - RF EAST

818-780-9701 x140 ;  
818-579-9594  
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#### SALES - SATCOM

818-780-9701 x242 ;  
818-452-5896  
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#### SALES - DIGITAL

818-780-9701 x131 ;  
818-579-9592  
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#### TECHNICAL SUPPORT

818-780-9701 x134 ;  
818-579-2359  
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### Related Products

[OZ5xx OEM Transmitter/Receiver Modules \(30 - 6000 MHz\), optional Tunable RF Gain, CWDM, I2C Serial Interface](#)

[Low Phase Noise Transmitter/Receiver Modules \(10 - 200 MHz\), Multiple Form Factors, optional CWDM](#)

[OZ600 Transmitter/Receiver Standalone Modules \(30 - 3000 MHz\), optional CWDM](#)

[OZ81x Transmitter/Receiver Standalone Modules \(30 - 6000 MHz\), optional AGC, CWDM, RS232 Transport, I2C Serial Interface](#)

[J1/J84 Transmitter/Receiver High Density Plug-in Modules \(30 - 6000 MHz\), Remote Access via HTTP, GUI, SNMP v2 and v3](#)

### Additional Resources

[Standalone RF Over Fiber Modules](#)

[RF Over Fiber Rack Mount Integrated Subsystems](#)

[RF Over Fiber Rack Mount Modular Subsystems](#)

[RF Over Fiber Applications](#)

[19" 1RU J-Chassis](#)

[19" 3RU J3U Chassis](#)

[19" 1RU OZC9500 Chassis](#)

