



# RF OPTICAL PRODUCTS & SUBSYSTEMS UP to 40GHz

“Providing integrated solution for RF/optical links”



## Advanced Surface Mount Technologies & Packaging solutions



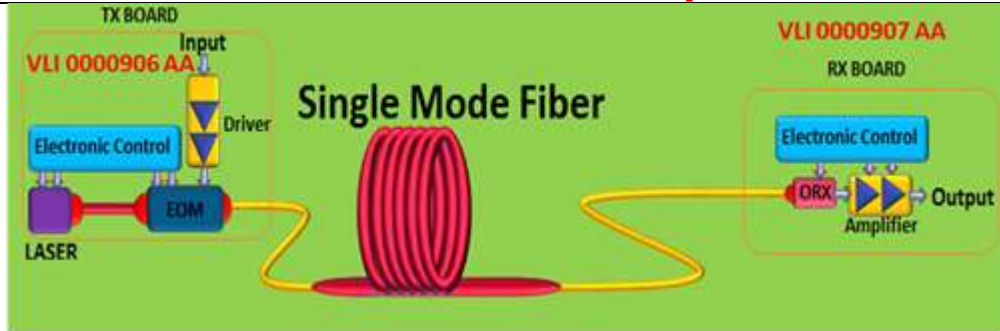
VectraWave is a solution provider for integrated electronic in high frequency microwaves and optoelectronic for telecommunications over radio or optical fibre, in the field of civil, security, military market. VectraWave is an independent company, delivering “OEM” and proprietary Integrated Circuits and System In Package or Multi-Chip-Modules improving performances and costs of communication system equipments, by offering components based on SiGe, GaAs, micro-electronics and packaging advanced technologies.

**Smart Amplifiers, Integrated Circuits, Systems  
for Microwave, RF and Lightwave Equipements**



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**0.5 / 2GHz to 18GHz RF Optical Link**



The OTX is composed by an optical laser source with a constant emitting power level at 1550nm. Then an Electro Optical Modulator (EOM) is used to convert the electrical analog signal into an optical analog signal. A driver is used to ensure the electrical dynamic required for linear operation.

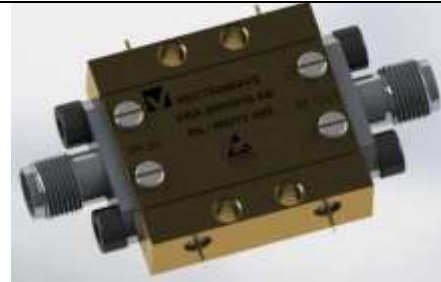
**OTX Subsystem : P/N VLI 0000906 AA (0,5 to 18 GHz)**  
Integrating Laser diode, RF Analog EOM Modulator, RF amplifier with fix gain VWA 0000906 AA & VWA 0000954 AA (2 Stages) or switchable gain P/N VWA 000073 AC.

The ORX includes an optical photo receiver (ORX) allows to convert the optical signal into electrical signal. Then linear Low Noise amplifier is used to ensure a reasonable output signal amplitude level.

**ORX subsystem : P/N VLI 0000907 AA (0,5 to 18 GHz)**  
integrating Optical Photo receiver P/N VLI 0000893 or VLI 0000894, or .., and LNA amplifier type VWA 0000913 AA (3 Stages) or VWA 0000916 AA (2 Stages)

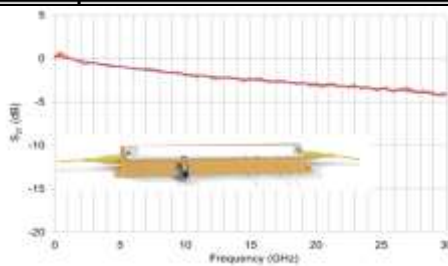


VWA 0000954 AA



VWA 0000916 AA

| Part Number    | Description  | RF In/Out |
|----------------|--|-----------|
| VWA 00052      | 0,5-4 GHz   31dB Gain   18 dBm Psat - 9V/200mA - RF Amplifier                    | SMA (F)   |
| VWA 00073 AC   | 0,5-20 GHz   Switchable 0 - 20 - 40 dB Gain   20 dBm - +12V/-12V - RF Amplifier  | SMA (F)   |
| VWA 0000906 AA | 0,5-20 GHz   15dB Gain   NF 2,5 to 4,5dB / 23 dBm Psat - 9V/200mA - RF Amplifier | SMA (F)   |
| VWA 0000954 AA | 0,5-20 GHz   24dB Gain   NF 2,5 to 5dB / 22 dBm Psat - 8V/290mA -RF Amplier      | SMA (F)   |



DFB + OEM or Direct Laser diode modulation



Optical Photo Receiver

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|  |
|--|
| <b>VWA 00073 AC</b>  |
| <b>MGD20G : 0.5 to 20 GHz<br/>Amplifier with gain management</b> |

### Description

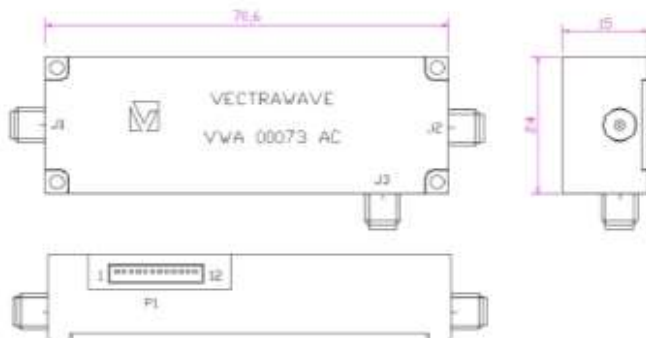
The **VWA 00073 AC** is an amplifier with 3 states of gain, -10dB / +20dB and +40dB, over the full band 0.5 to 20GHz.

The RF components used are pHEMT broadband MMIC amplifiers and PIN diodes switches.

This module integrates :

- all the RF passives and biasing devices into the same package.
- an output power measurement usable to select the gain.
- an 'enable' control to switch off the whole function.

### Mechanical Dimensions :



Size : 70.6 x 24 x 15 mm<sup>3</sup>  
Weight = 50 g

### Features

- MCM amplifier with gain management
- Wide band : 0.5 to 20 GHz
- 3 gain positions : -10 / +20 / +40 dB
- Output power measurement.
- 50Ω, AC coupled RF input and output,
- Power supplies : +12V & -12V
- K connectors

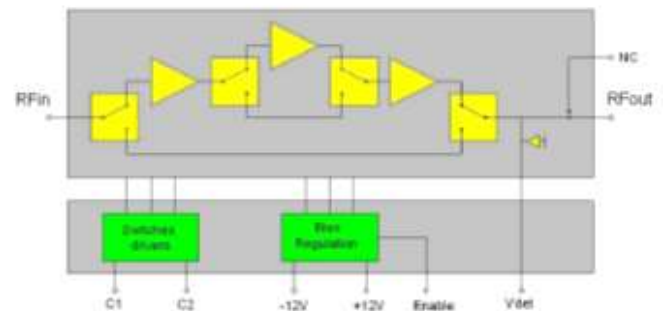
### Applications

- Radar & ECM
- ROF
- Other

### Ordering information

|                     |
|---------------------|
| <b>Product code</b> |
| VWA 00073 AC        |

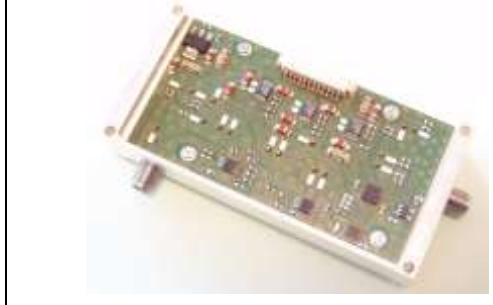
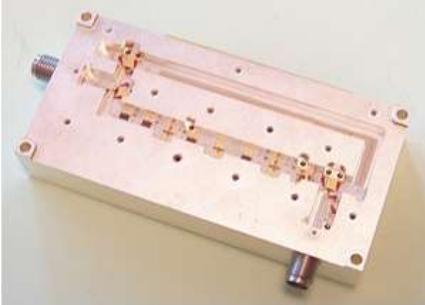
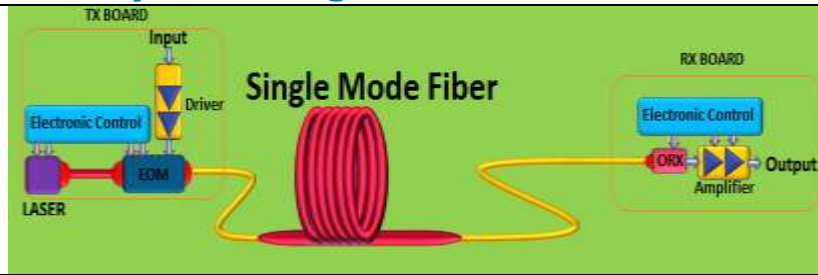
### Functional Block Diagram



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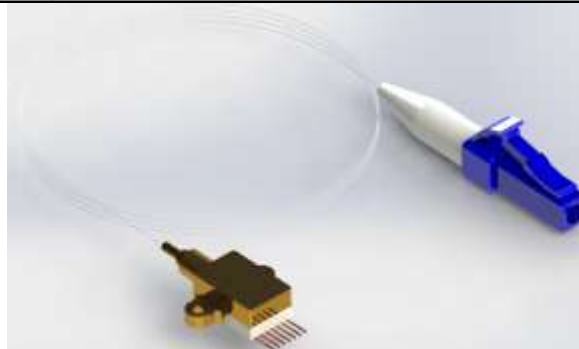


**0,5 to 40 GHz RF Optical Link with Switch Gain Amplifier (0/20/40dB)  
For OTX System integration with EOM & DFB Laser**



**0,5 to 40GHz switch Gain Amplifier with K connector**

| Part Number | Description  | RF In/Out |
|-------------|--|-----------|
| VWA 0000964 | 40KHz-20 GHz   15dB Gain   NF= 2,5 to 4,5dB/ 23 dBm Psat - 8V/180mA - RF, Pulse & Data com | SMA (F)   |
| VWA 0000916 | 40KHz-40 GHz   20dB Gain   NF 5dB / Vout 4Vpp -6V/280mA - RF, Pulsed & Data com Amplifier  | K (F)     |



**Micro strip Pin Optical Receiver**



**Optical Receiver with K connector**



**Optical Receiver with coplanar PIN**

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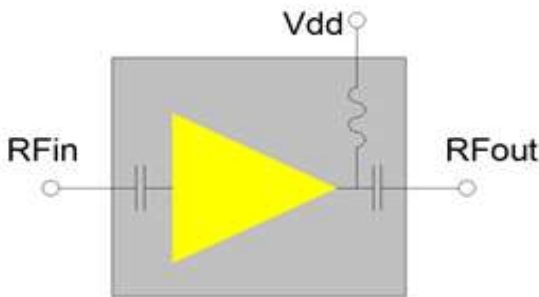


|   |
|---|
| <b>VWA 0000906 AA</b>                   |
| <b>500MHz to 20GHz</b>                  |
| <b>Medium Power</b>                     |
| <b>Broadband Distributed Amplifiers</b> |

**Description**

The VWA 0000906 AA is a single positive biasing distributed amplifier from 500MHz to 20GHz. It consists of 1 distributed MMIC amplifier with bias circuitry into a SMA housing.

**Functional Block Diagram**



Application Note (AN) is available on request

**Features**

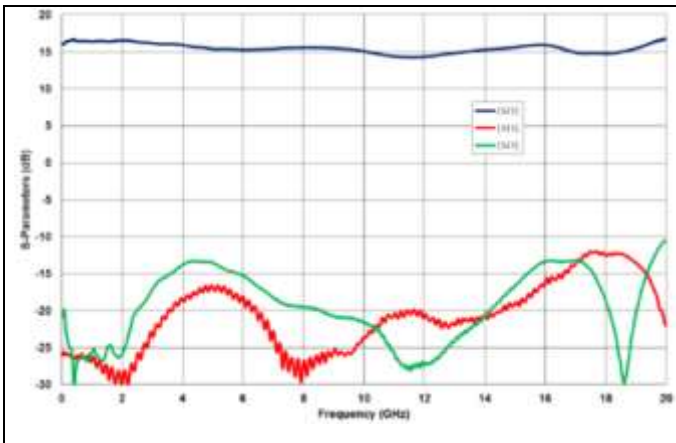
- Distributed pHEMT GaAs MMIC amplifier
- Wide band : 500MHz to 20 GHz
- High Output Psat : +23dBm
- Linear gain : 15dB typical
- 50Ω, AC coupled RF input and output,
- Dimensions : 20.7 x 19.0 x 9.1 mm<sup>3</sup>

**Applications**

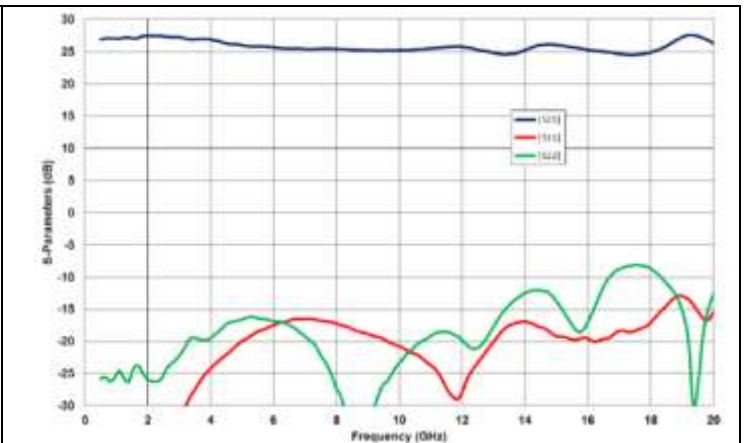
- Wide band medium power amplification
- Broadband communication
- Test and measurement

**Ordering information**

|                       |
|-----------------------|
| <b>Product code</b>   |
| <b>VWA 0000906 AA</b> |



**VWA 0000906AA – Gain/RL (dB)**



**VWA 0000954AA – Gain/RL (dB)**

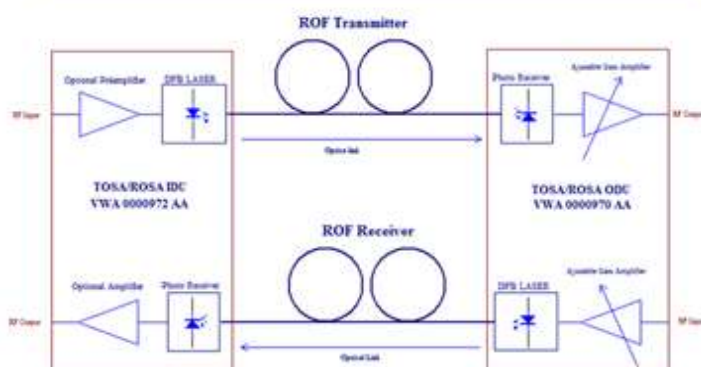
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**VWA 0000970 AA (ODU)**  
**VWA 0000972 AA (IDU)**

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**RF over Fiber Optic Transceiver**  
**5-6GHz Bandwidth**



### Description:

The VWA0000970AA and VWA0000972AA are a 5-6GHz RF over optical Transceiver developed for Point multipoint (PmP) radio communication systems.

It is a Radio on fiber transceiver for uplink and downlink between an Infrastructure Switching Center (Indoor unit) and an outdoor unit (Antenna). This connection is carried out by two modules TX/RX transceivers with a TOSA/ROSA optical link. The first module indoor unit (IDU) contains DFB LASER for the transmitter and photo receiver for receiver. The second one, outdoor unit (ODU) contains also LASER for the transmitter and photo receiver for receiver and RF amplifier with integrate AGC to compensate optical losses. The optical maximum losses can reach 15dB.

They deliver significant characteristics in the transport of RF signals particularly in WIFI LAN format (ISM Band 5-6GHz). For example multiplex OFDM with different modulation order's (BPSK, QPSK, QAM16, QAM64...)

### Main Features:

- Frequency range : 5 – 6 GHz
- Transceiver RF Input /Output power: 0dBm typ.
- Receiver RF Input: -25dBm to -65dBm typ.
- Receiver RF output: -25dBm typ.
- TOSA Optical output power: 4mW typ.
- Automatic Optical Power control
- Optional CWDM Wavelength
- Shielded BOX
- Power Supply typ. 5V
- RF inputs (SMA connector)
- Optical I/O LC/UPC

### Applications:

- Mobile Radio 3G & 4G LTE
- Wi-Fi, WiMAX systems
- LMDS MVDDS...
- Alternative to coaxial cable systems

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|   |
|---|
| <b>Photo receivers</b>                              |
| <b>ORX(DC-50GHz)<br/>&amp;<br/>HPORX (DC-18GHz)</b> |

**Description**

VECTRAWAVE has developed a large panel of optical receiving structure for various applications from DC to 50 GHz in 1550 nm wavelength.

The component consists on a small form factor hermetic package equipped with an electronic coplanar output access; it allows the integration of biasing filter and complementary hyper frequency function.

Depending on the operating frequency, bandwidth requirement, environmental applications, Vectrawave team propose a tradeoff to optimize some photoreceiver parameters.

**ORX on K-EVB**



**Features**

- **Sensitivity VS operating frequency:**



- **Linearity:**

Generally, for a modulation contrast of 100%, the output compression point is observed for an optical input power of +5dBm. The use of HPORX (DC-18GHz) allows shifting this value up to +15dBm.

- **Active/Passive options:**

On Customer Demand, a TIA or a band pass matching network can be integrated for optimizing transimpedance values and frequency bandwidth.

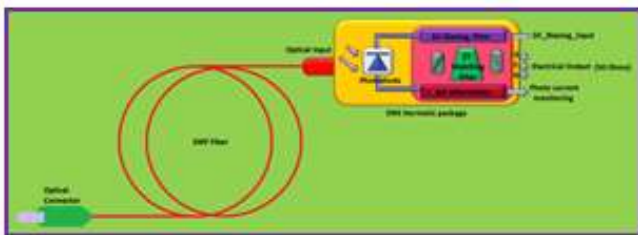
- **Optical return losses:**

Typically up to 30dB.

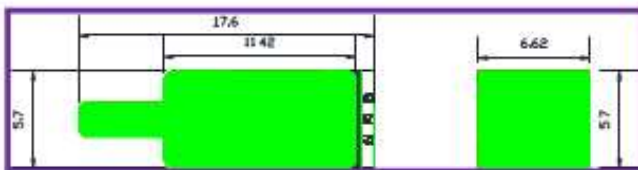
- **HF Output return losses:**

Typically lower than -10dB (DC-30GHz) and lower than -8dB (DC-40GHz).

**ORX Schematic**



**ORX Mechanical drawing (mm)**



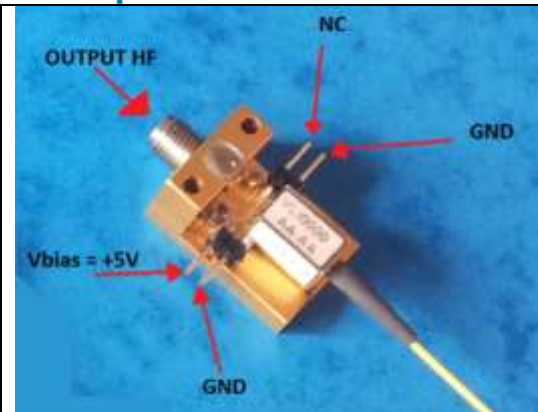
**Ordering information**

|                         |
|-------------------------|
| <b>Product code:</b>    |
| <b>VLI_0000XXX_AAAA</b> |

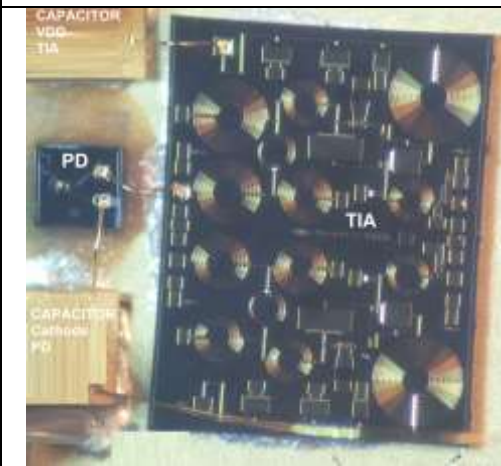
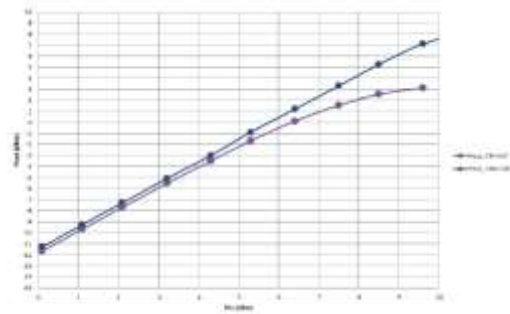
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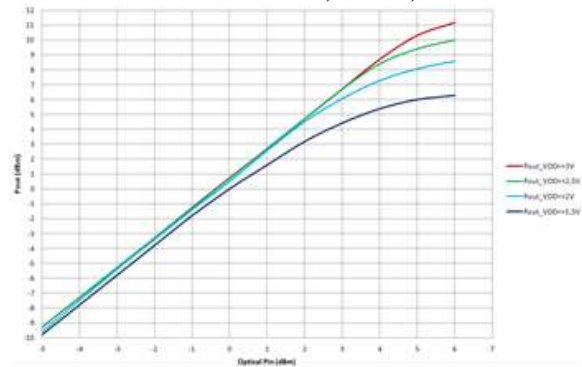
**Optical Receivers: Narrow band versus Wide band (50Ohms)**



X Band RF Optical receiver without TIA  
Pout Vs Pin @ 9,2GHz, m=1, Sr =0,75 A/W  
Vbias=+5V & Vbias =+10V



VLI 0000898 AA : S Band RF Optical receiver with TIA  
Pout Vs Pin @ 4,3GHz, m=1



**Optical Receivers: L, S, C, X, Ku, Ka narrow band versus Wide band solution**

| Frequency | Pin | Iph    | S (A/W) | Pout | Zt (ohms) | GAIN (dB) | Solution                         |
|-----------|-----|--------|---------|------|-----------|-----------|----------------------------------|
| 2-3 GHz   | 6   | 0,003  | 0,75    | -2,5 | 79,05     | 3,98      | Narrow Band Solution<br>300 MHz  |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |
| 13 GHz    | 6   | 0,003  | 0,75    | -2,5 | 79,05     | 3,98      | Narrow Band Solution<br>700 MHz  |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |
| 20 GHz    | 6   | 0,002  | 0,50    | -6   | 79,24     | 4,00      | Narrow Band Solution<br>1000 MHz |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |
| 30 GHz    | 6   | 0,0015 | 0,38    | -10  | 66,67     | 2,50      | Narrow Band Solution<br>1500 MHz |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |
| 40 GHz    | 8   | 0,0025 | 0,40    | -14  | 25,24     | -5,94     | Wide Band Solution<br>DC-40 GHz  |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |
| 15 GHz    | 13  | 0,015  | 0,75    | 1,5  | 25,06     | -6,00     | Wide Band Solution<br>DC-14 GHz  |
|           | dBm | A      | A/W     | dBm  | OHMS      | dB        |                                  |

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