

## Fiber Optic Bi-Directional 1x9 Transceiver For 155 Mb/s and Tx 1550 FP / Rx 1310 PIN

Data Sheet

OBN2156



### Features

- Data rate of up to 155 Mb/s
- Single fiber solution with WDM
- Singlemode fiber with SC connector
- FP laser diode with 1550 nm wavelength
- Industry standard 1x9 footprint
- Single power supply (+3.3V)
- Differential PECL inputs and outputs
- Class 1 laser product
- 22 dB Power budget for 40 km link distance

### Applications

- Fast Ethernet
- Fiber Channel
- ATM/SONET OC-3/SDH STM-1
- FDDI
- FTTx with 100 Mb/s Ethernet First Mile (EFM) standard

### Description

The OBN2156 is a bi-directional WDM single fiber transceiver and is specially designed to handle data rates of up to 155 Mb/s from a single power supply (+3.3V). The module uses a WDM filter to couple the optic transmitter and receiver signals into a single 9/125  $\mu\text{m}$  singlemode fiber through an SC connector. This transceiver is developed for distances of up to 40 km. The full differential data inputs and outputs are PECL compatible.

The transmitter consists of a high reliability InGaAsP 1550 nm Fabry-Perot (FP) laser diode coupled to a singlemode fiber through the SC connector.

The hybrid bipolar fiber optic receiver consists of an InGaAs PIN (P-type/ Intrinsic/ N-type detector) photodiode for high-speed operation and a transimpedance preamplifier for excellent noise immunity.

The transceiver module has a standard 1x9 footprint, and is compatible with industry standard hand and wave soldering processes.

**Safety**

**Laser Compliance Statement**

The OBN2156 is classified as a Class I Laser Product and complies with IEC 60825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under recommended operating conditions. Because the transceiver is designed to be inherently eye safe, it does not require open fiber control thus eliminating complex electronics or mechanics.

Caution - use of device other than those specified herein may result in hazardous laser radiation exposure or other damage. Please embrace all customary precautions and discretion while handling this device.

**Performance Specifications**

**Absolute Maximum Transmitter Ratings**

Stresses in excess of the absolute maximum ratings can cause damage to the optical device. Operations of the optical device are suggested to remain within the recommended operating conditions. Exposure to the absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Value	Unit
Storage Temperature	T <sub>stg</sub>	-40 to +85	°C
Operating Temperature	T <sub>op</sub>	0 to +70	°C
Soldering Temperature	S <sub>temp</sub>	240	°C
Soldering Time	S <sub>time</sub>	10	sec
Continuous Forward Current		150	mA

**Recommended Operating Transmitter Conditions**

Parameter	Symbol	Value	Unit
Supply Voltage	V <sub>cc</sub> -V <sub>ee</sub>	3.3	V
Operating Current		55	mA

**Transmitter Electro-Optical Characteristics (T<sub>A</sub>=25°C)**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Averaged Launched Power into 9/125 μm fiber	P <sub>OUT</sub>	-9		-3	dBm
Emission Center Wavelength	λ	1480	1550	1580	nm
Spectral Bandwidth (RMS)	Δλ			4	nm
Extinction Ratio	E <sub>r</sub>	9			dB
Rise/Fall Time (10%-90%)	t <sub>R</sub> /t <sub>F</sub>		1	2	ns
Eye Diagram		Compliant with ITU-T Recommendation G.957			
Data Input Current - LOW	I <sub>IL</sub>	-350			μA
Data Input Current - HIGH	I <sub>IH</sub>			350	μA
Tx Data Input Voltage - HIGH	V <sub>IH</sub> -V <sub>CC</sub>	-1.1		-0.74	V
Tx Data Input Voltage - LOW	V <sub>IL</sub> -V <sub>CC</sub>	-2.0		-1.58	V
Tx Data Input Differential Voltage	V <sub>DIFF</sub>	0.3		1.6	V

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Soldering Temperature	S <sub>temp</sub>	240	°C
Soldering Time	S <sub>time</sub>	10	sec
Supply Voltage (V <sub>CC</sub> -V <sub>EE</sub> )		3.6	V

### Recommended Operating Receiver Conditions

Parameter	Symbol	Value	Unit
Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	3.3	V
Operating Current		65	mA

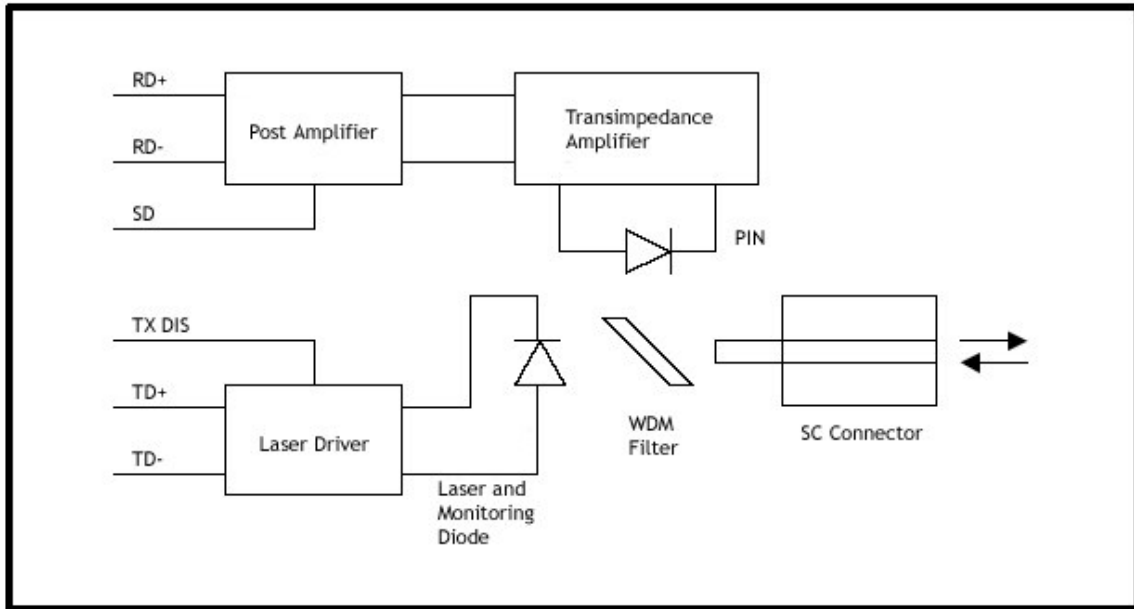
### Receiver Electro-Optical Characteristics (T<sub>A</sub>=25°C, V<sub>CC</sub>=3.3V)

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Receiving Wavelength Center of Range	λ <sub>R</sub>	1260	1310	1360	nm
Sensitivity (Average Power) <sup>1</sup>	P <sub>SEN</sub>			-31	dBm
Saturation (Average Power)	P <sub>SAT</sub>	0			dBm
Rise/Fall Time (10%-90%)	t <sub>R</sub> / t <sub>F</sub>		1	2	ns
Signal Detect Assert Level	P <sub>SDA</sub>			-31	dBm
Signal Detect Deassert Level	P <sub>SDD</sub>	-45			dBm
Signal Detect Hysteresis	P <sub>SDA</sub> - P <sub>SDD</sub>	1.0			dBm
Signal Detect Assert Time	t <sub>SDA</sub>			100	µs
Signal Detect Deassert Time	t <sub>SDD</sub>			100	µs
Signal Detect Output Voltage - HIGH <sup>2,3</sup>	V <sub>SDH</sub> -V <sub>CC</sub>	-1.1		-0.74	V
Signal Detect Output Voltage - LOW <sup>2,3</sup>	V <sub>SDL</sub> -V <sub>CC</sub>	-2.0		-1.58	V
Data Output Voltage - HIGH <sup>2,3</sup>	V <sub>OH</sub> -V <sub>CC</sub>	-1.1		-0.74	V
Data Output Voltage - LOW <sup>2,3</sup>	V <sub>OL</sub> -V <sub>CC</sub>	-2.0		-1.58	V
Optical Crosstalk	OCT			-45	dB

Notes:

1. Minimum average optical power @ BER = 1x10<sup>-10</sup>. Measured with a 2<sup>23</sup>-1 NRZ PBRS with 72 "1"s and 72 "0"s inserted per the ITU-T recommendation G.958.
2. These output levels are compatible with 10K, 20KH, and 100K ECL and PECL inputs. When SD desasserted, the data at output is fixed at the ZERO level (i.e. RD+ at Low level and RD- at High level).
3. Voltage levels when the recommended circuit schematic is applied.

**Block Diagram**



**Optical Subassembly**

An InGaAsP laser with monitoring diode, an InGaAs PIN photodiode, a transimpedance amplifier, and a wavelength division multiplexing (WDM) filter are integrated to form the bi-directional single fiber optical subassembly (OSA). Light signals over wavelengths of 1550 nm and 1310 nm are respectively transmitted and received through a 9/125  $\mu\text{m}$  singlemode fiber via an SC connector. The WDM filter is designed to pass transmitting signals at 1550 nm but also reflects receiving 1310 nm signals to suppress extensive optical cross talk. The PIN photodiode together with the transimpedance amplifier converts the received optical serial data into an electrical signal.

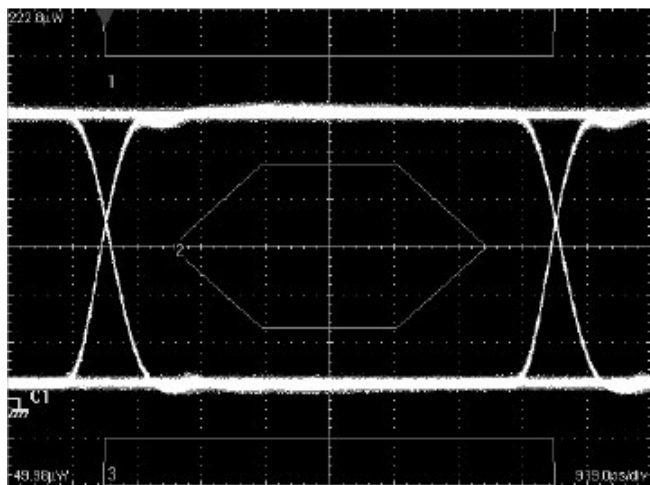
**Transmitter**

The transmitter contains a laser circuit that drives the modulation and bias current of the laser diode. A power control circuit controls the currents while the output from the monitoring diode acts as the controlling signal. The transmitter converts PECL compatible electrical serial data (TD+ and TD-) into optical serial data. Data lines are 100  $\Omega$  terminated. The laser can be disabled by TX DIS input.

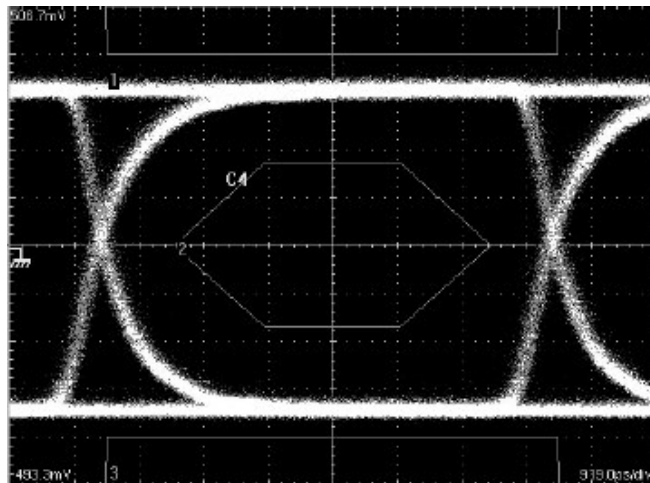
**Receiver**

The post amplifier converts the serial data from transimpedance amplifier into PECL compatible data (RD+ and RD-). The Signal Detect (SD, active high) shows whether an optical signal is present.

Typical Tx Eye Diagram



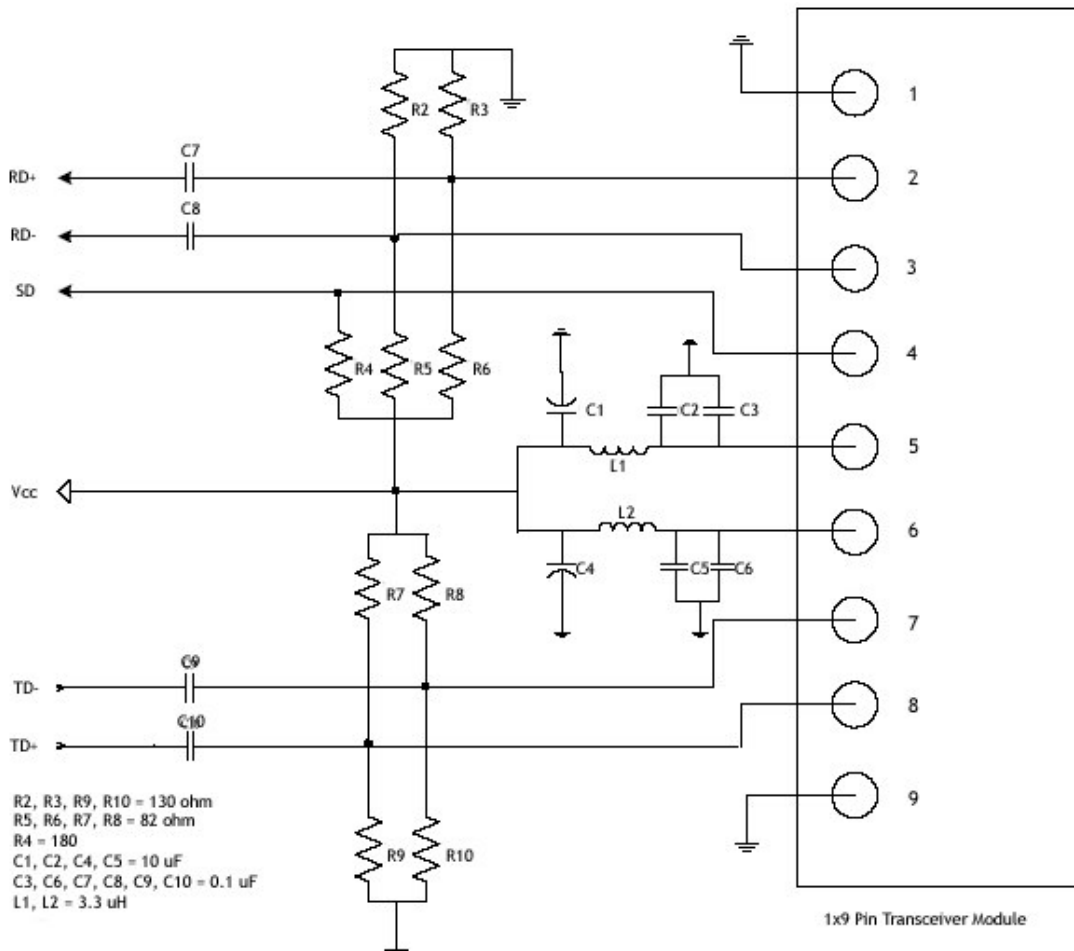
Typical Rx Eye Diagram



Pin Assignment and Description

PIN	Symbol	Description
1	RX_GND	Receiver Ground
2	RD+	Receiver Data Out
3	RD-	Receiver Data Out Bar
4	SD	Receiver Signal Detect Output
5	Rx_Vcc	Receiver Power Supply
6	Tx_Vcc	Transmitter Power Supply
7	TD-	Transmitter Data In Bar
8	TD+	Transmitter Data In
9	Tx_GND	Transmitter Ground

Recommended Interface Diagram



Additional Information

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