

Fiber Optic Bi-Directional SFF 2x5 Transceiver For 155 Mb/s and Tx 1550 FP / Rx 1310 PIN

Data Sheet

OBF2154



Features

- Data rate of up to 155 Mb/s
- Single fiber solution with WDM
- Singlemode fiber with SC connector
- FP laser diode with wavelength 1550 nm
- 2x5 Footprint compliant with Small Form Factor (SFF)
- Single power supply (+3.3V)
- Differential PECL inputs and outputs
- Class 1 laser product
- 20 km link distance

Applications

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

Description

The OBF2154 is a bi-directional WDM single fiber transceiver 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 μm singlemode fiber through an SC connector.

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 module is also compatible with industry standard hand and wave soldering processes.

Safety

Laser Compliance Statement

The OBF2154 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 _{stg} | -40 to +85 | °C |
| Operating Temperature | T _{op} | -20 to +70 | °C |
| Soldering Temperature | S _{temp} | 240 | °C |
| Soldering Time | S _{time} | 10 | sec |
| Continuous Forward Current | | 150 | mA |

Recommended Operating Transmitter Conditions

| Parameter | Symbol | Value | Unit |
|-------------------|----------------------------------|-------|------|
| Supply Voltage | V _{cc} -V _{ee} | 3.3 | V |
| Operating Current | | 55 | mA |

Transmitter Electro-Optical Characteristics (T_A=25°C)

| Parameter | Symbol | Minimum | Typical | Maximum | Unit |
|---|----------------------------------|---|---------|---------|------|
| Averaged Launched Power into 9/125 μm fiber | P _{OUT} | -14 | | -8 | dBm |
| Emission Center Wavelength | λ | 1480 | 1550 | 1580 | nm |
| Spectral Bandwidth (RMS) | Δλ | | | 4 | nm |
| Extinction Ratio | E _r | 9 | | | dB |
| Rise/Fall Time (10%-90%) | t _R / t _F | | 1 | 2 | ns |
| Eye Diagram | | Compliant with ITU-T Recommendation G.957 | | | |
| Data Input Current - LOW | I _{IL} | -350 | | | μA |
| Data Input Current - HIGH | I _{IH} | | | 350 | μA |
| Tx Data Input Voltage - HIGH | V _{IH} -V _{CC} | -1.1 | | -0.74 | V |
| Tx Data Input Voltage - LOW | V _{IL} -V _{CC} | -2.0 | | -1.58 | V |
| Tx Data Input Differential Voltage | V _{DIFF} | 0.3 | | 1.6 | V |

Absolute Maximum Receiver 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 _{stg} | -40 to +85 | °C |
| Operating Temperature | T _{op} | -20 to +70 | °C |
| Soldering Temperature | S _{temp} | 240 | °C |
| Soldering Time | S _{time} | 10 | sec |
| Supply Voltage (V _{CC} -V _{EE}) | | 3.6 | V |

Recommended Operating Receiver Conditions

| Parameter | Symbol | Value | Unit |
|-------------------|----------------------------------|-------|------|
| Supply Voltage | V _{CC} -V _{EE} | 3.3 | V |
| Operating Current | | 65 | mA |

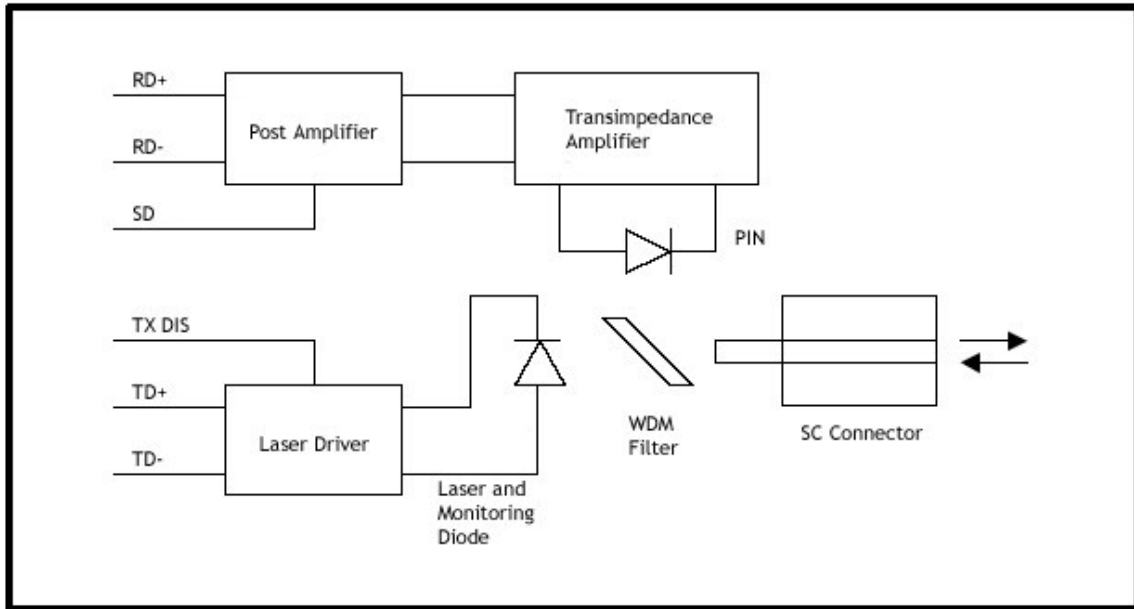
Receiver Electro-Optical Characteristics (T_A=25°C, V_{CC}=3.3V)

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

Notes:

1. Minimum average optical power @ BER = 1x10⁻¹⁰. Measured with a 2²³-1 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 is deasserted, 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 μm 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.

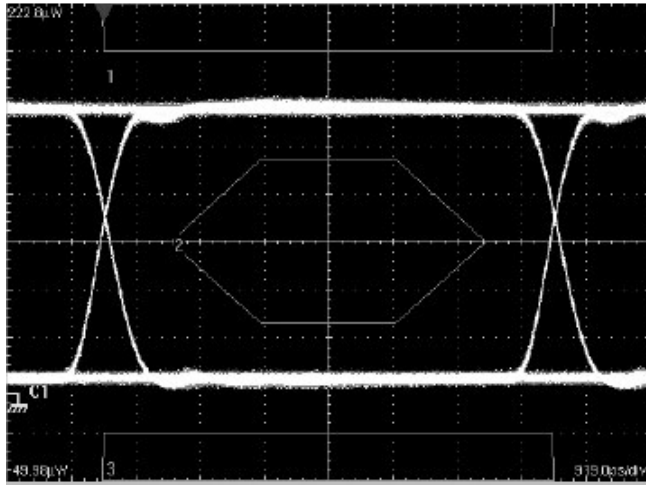
Transmitter

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 Ω terminated. The laser can be disabled by TX DIS input.

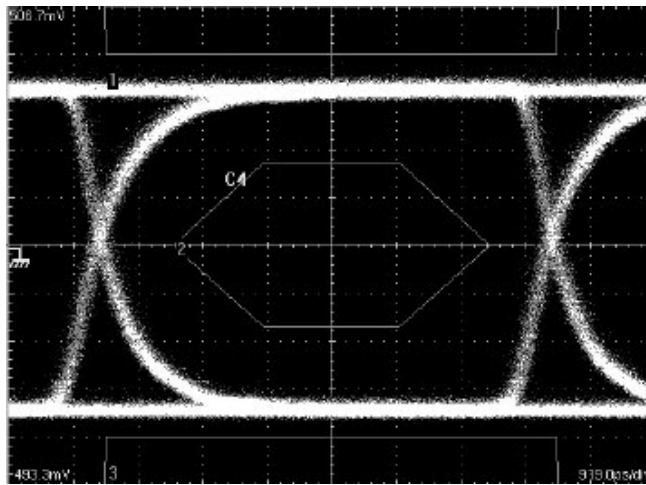
Receiver

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.

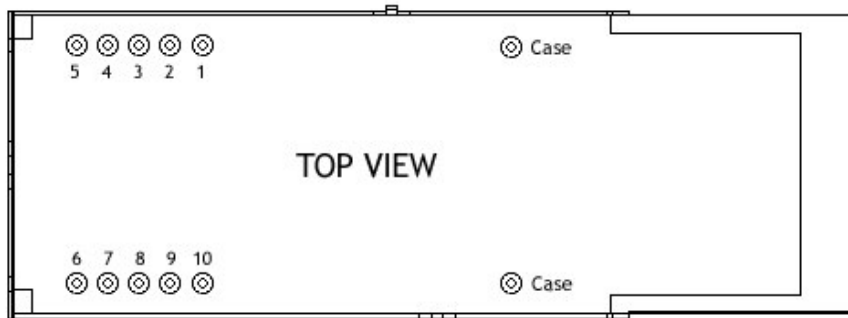
Typical Tx Eye Diagram



Typical Rx Eye Diagram



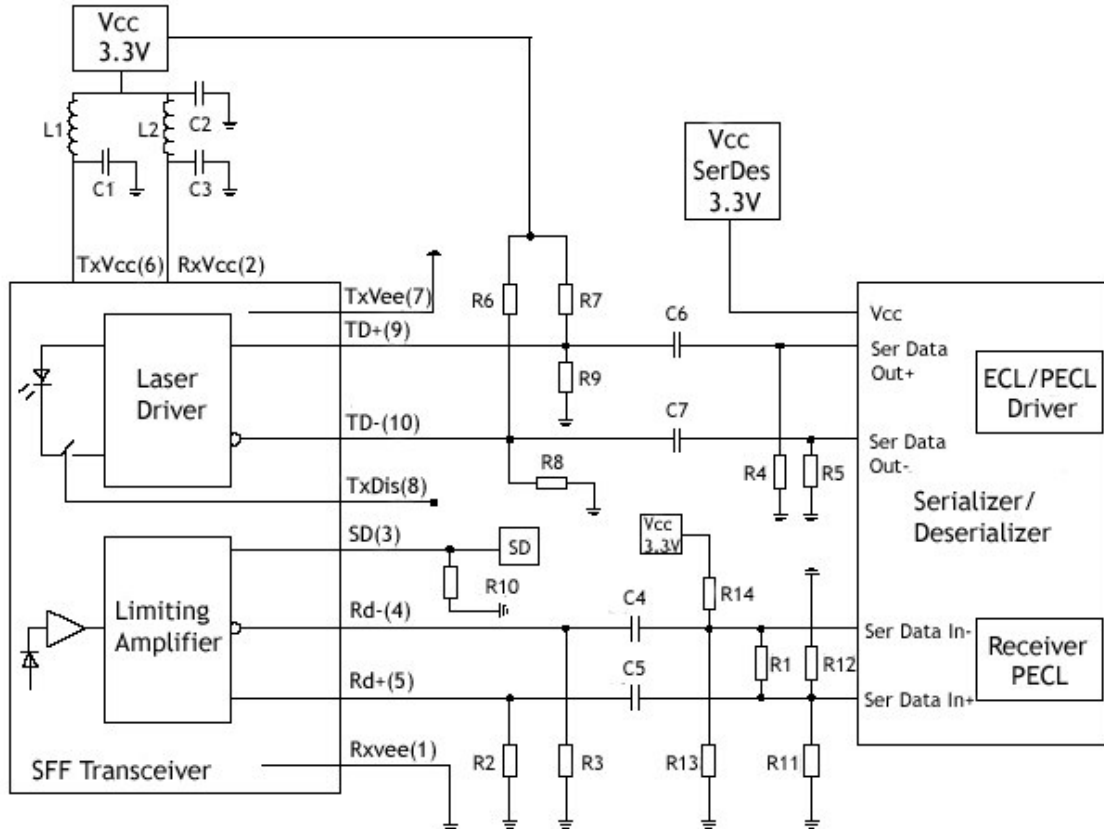
Connection Diagram



Pin Assignment and Description

| PIN | Symbol | Name | Level/Logic | Description |
|-----|--------|----------------------------|-------------|---|
| 1 | RX GND | Receiver Signal Ground | N/A | |
| 2 | VccR | Receiver Power Supply | N/A | |
| 3 | SD | Signal Detect | PECL | Logic "1" output represents that light is present at receiver input. Logic "0" output represents no optical signal is detected. |
| 4 | RD- | Received Data Out Not | PECL | |
| 5 | RD+ | Received Data Out | PECL | |
| 6 | VccT | Transmitter Power Supply | N/A | |
| 7 | TX GND | Transmitter Signal Ground | N/A | |
| 8 | TX DIS | Transmitter Disable/Enable | TTL-Input | A low/open signal switches the laser ON. A high signal switches the laser OFF. |
| 9 | TD+ | Transmitter Data In | PECL | |
| 10 | TD- | Transmitter Data In Not | PECL | |

Recommended Circuit Schematic



Recommended Components Values

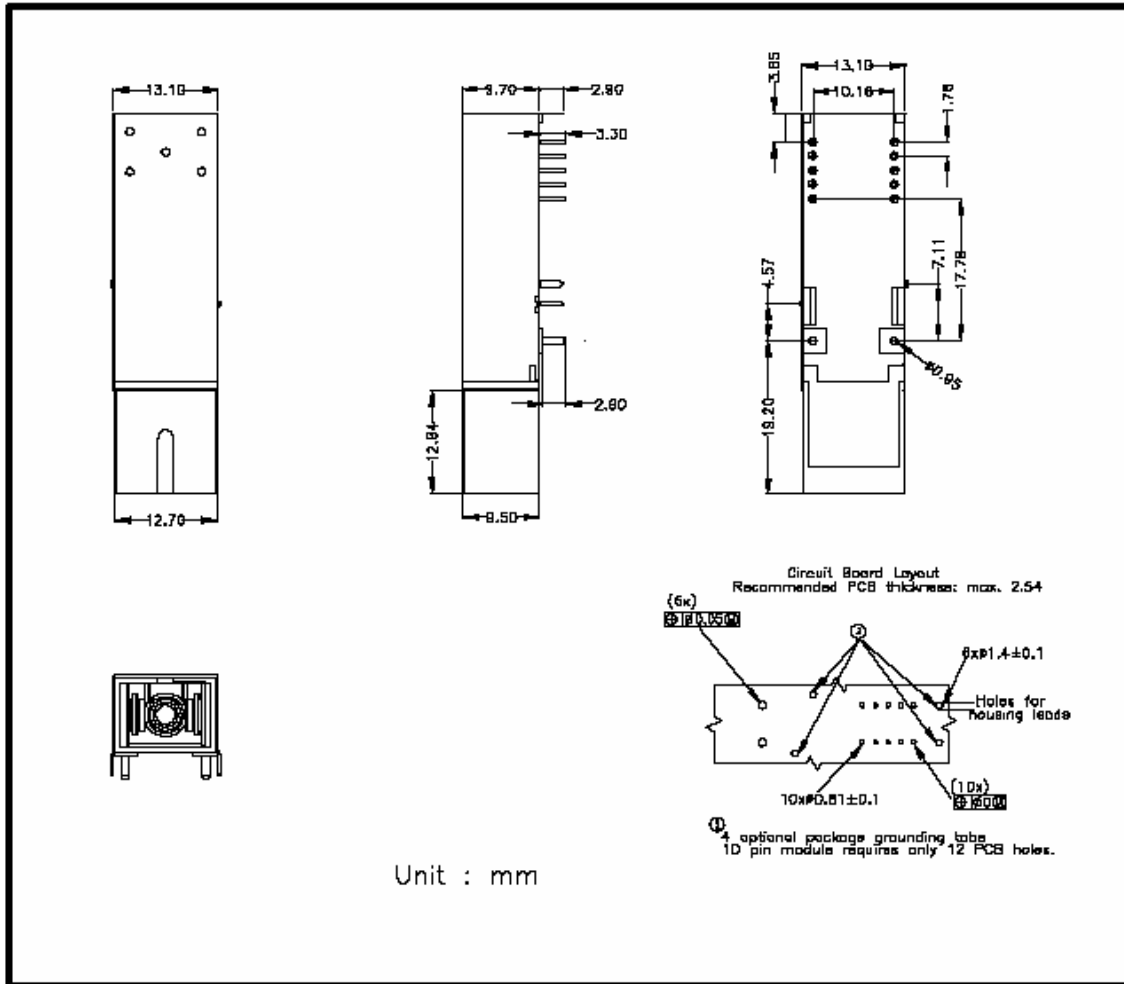
- L1, L2: 1 to 4.7 μ H
- C1, C2, C3: 4.7 to 10 μ F
- C4, C5, C6, C7: 100 nF
- R1: 100 ohm
- R2, R3: 150 ohm
- R4, R5: biasing of outputs depending on Serializer
- R6, R7: 127 ohms
- R8, R9: 80 ohms
- R10: 2200 ohms
- R11, R13: 4300 ohms
- R12, R14: 2700 ohms

Notes:

1. Place R1/R4/R5 as close to Ser/Des as possible.
2. Place R2/R3 as close to transceiver as possible.

Package Outline Diagram

Dimensions for the device package are given in millimeters.



Notes:

1. Dimensions refer to SC connector.
2. Refer to package outline of the Small Form Factor (SFF) Multi-Source Agreement (MSA) for dimensions not shown.

Additional Information

Contact

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