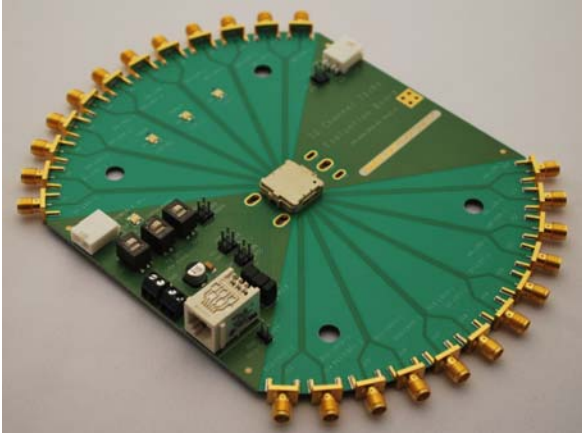


## InterBOARD™ 12 Channel Transmitter and Receiver Evaluation Board User Guide

### SN-E12-X00501 Evaluation Board



#### Summary:

The Reflex Photonics SN-E12-X00501 Evaluation Board is the perfect vehicle for testing and evaluating *InterBoard™* Transmitter and Receiver modules capable of high-speed transmission over 12 parallel optical channels.

Each evaluation board consists of a 10X10 MEG-Array receptacle connector located in the center of the board and capable of accepting either the transmitter and receiver modules. The receptacle connector is used to achieve the electrical connection to the transmitter and receiver modules. 24 straight jack SMA connectors are available on the periphery of the board for either inputting or outputting all 12 high-speed differential signals.

Dip switches and headers are available to enable and disable functions within the modules. Status LED indicators are also present for control signal monitoring. The power supply to each evaluation board is delivered either through test points or an SMA connector. In order to build a full optical link a 2 m long MTP/MPO fiber ribbon with 2 adapters is also included with the evaluation kit.

Since the module features offer very high functionality and feature integration, pin headers provide a connection for communication via a two-wire serial interface.

#### Features:

- Single Board compatible with Transmitter and Receiver
- Designed to operate up to 3.5 Gb/s per test channel
- Independent connection to all channels
- All high-speed signal accessible through SMA connectors
- DC coupled high-speed signals
- Control Pins for all I/O
- Built with standard 4 Layer FR-4 material
- Connectors for single +3.3V Power Supply

#### InterBoard™ Optical Modules (sold separately):

Part Number	Description
SN-T12-P00501	12 X 3.5 Gb/s, 850nm Mid-Board Transmitter module
SN-R12-P00501	12 X 3.5 Gb/s 850 nm Mid-Board Receiver module
SN-T12-C00501	12 X 3.5 Gb/s 850nm Board-Edge Transmitter module
SN-R12-C00501	12 X 3.5 Gb/s 850nm Board-Edge Receiver module

#### Evaluation Kit Content:

- 2 - Reflex Photonics SN-E12-X00501 Evaluation boards
- 1 - MTP/MPO fiber ribbon cable (2m)
- 2 - MTP/MPO adapters
- 1 - User Guide



Board to board optical link example

### Introduction

The Reflex Photonics SN-E12-X00501 Evaluation Board enables the user to effectively evaluate the Reflex Photonics 12 channel optical transmitter and receiver modules. The kit comes with all the necessary hardware and software. The board has been designed to accommodate 12 independent signals, measures approximately 17 x 14 cm and was built with a standard 4 layer FR-4 PCB stack-up.

This user guide gives general guidelines for setting up and using the evaluation boards to manually characterize *InterBOARD™* Transmitter and Receivers.

### Safety and Handling

Industry standard ESD procedures should be practiced when handling the Reflex Photonics SN-E12-X00501 Evaluation Board as well as Transmitter and Receiver modules. Avoid direct contact without proper grounding. A grounded wrist strap should be worn at all times, floor mats and proper work benches are highly recommended.

The Reflex Photonics SN-E12-X00501 Evaluation Board containing a Transmitter module will emit invisible radiation. Users are cautioned not to stare into the open apertures when the Evaluation Board is powered up. The transmitter module power is adjusted for Class 1M laser compliance.

Always handle modules with care to prevent damages to the electrical or optical connector, only remove the electrical connector process plug before insertion. Align both connectors by feel and when the receptacle keys start into the plug slots, push down on the module and move force forward until the receptacle cover flange bottoms on the front face of the plug. Like mating, the connector pair can be unmated by pulling them straight apart. However, it requires less effort to un-mate if the force is originated from one of the slot/key ends of the assembly. Mating or un-mating of the connector by rolling in a direction perpendicular to alignment slot/keys may cause damage to the terminal contacts and is must be avoided.



Figure 1. Illustration of proper mating and un-mating procedure.

Once mated, each module should be secured with the three provided mounting screws. The high-density MEG-Array connector allows for easy interchange of the modules and enables the testing of many devices using with the same Evaluation Board. The connector is specified to handle 50 plugging and unplugging steps without degradation.

The transmitter and receiver modules are designed for 0 to 80 °C operation and cooling is not required. However a minimum airflow should be maintained if the modules are purposely raised in temperature during testing. Consult modules data sheets for minimum airflow requirements.

### Link Overview

Reflex Photonics transmitter and receiver modules offer twelve asynchronous channels operating at up to 3.5-Gbps per channel. These modules are designed for very short reach application (1m to 300m) with support on both 62.5/125 micron multimode fiber and 50/125 micron multimode fiber.

As shown in Figure 2, a complete 12 channel parallel point-to-point optical link consists of a transmitter module, a 12-channel fiber optic cable, and a receiver module. The transmitter module consists of an array of 12 VCSELs (Vertical Cavity Surface Emitting Lasers) and associated circuitry, which converts 12 parallel electrical data inputs to 12 parallel optical data output signals. Conversely, the receiver module inputs 12 parallel optical signals and converts them into 12 parallel electrical signals through an array of 12 PIN photodiodes and associated circuitry.

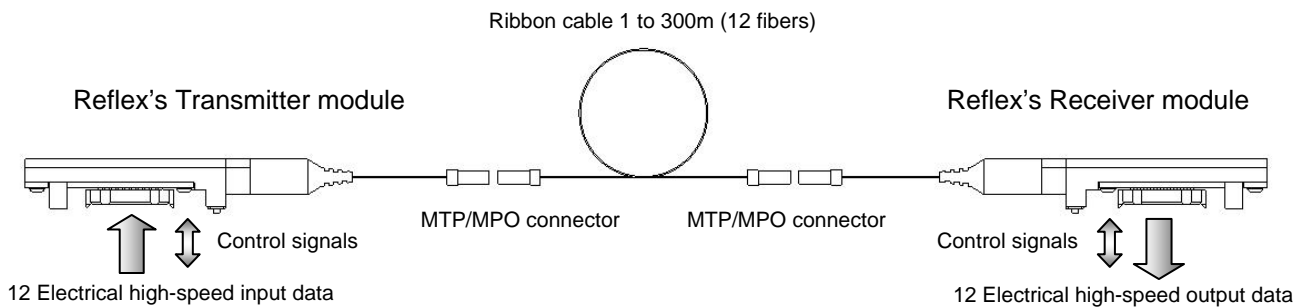


Figure 2. Complete point-to-point 12 channel parallel optical link.

The optical fiber ribbon cable has MPO/MTP connectors at both ends. The orientation of the ribbon cable is "keyed" and guide pins are used to ensure proper alignment. The cable usually has 180 degree rotation i.e. Reverse Fiber Positioning (RFP) to ensure proper channel to channel matching. When connecting MTP/MPO cables and connectors special care must be taken to ensure guide pins are present on only one side of the connection. Cables or MTP/MPO components such as adapter, connectors which are meant to be handled by technicians typically do not contain guide pins to facilitate cleaning when required. Figure 3, illustrates a typical *InterBOARD™* implementation and demonstrates that the guide pins will be located at the interface of a system in this example at the face plate.

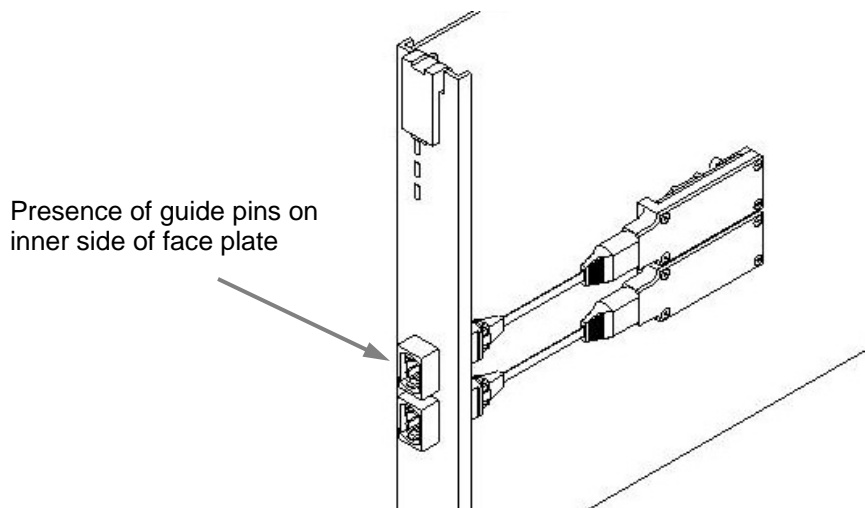


Figure 3. Mid-board application example.

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by email at [sales@reflexphotonics.com](mailto:sales@reflexphotonics.com)

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## Recommended Testing Equipment

A wide variety of electrical and optical measurements can be performed on the transmitter and receiver modules. As a general guideline, we recommend the following test equipment:

- BERT (Bit Error Rate Tester) consisting of a Pulse Generator and Signal Analyzer for error detection will provide both signal patterns and BER (Bit Error Rate) measurements. A multi-channel or parallel BERT is highly recommended.
- Sampling Oscilloscope with 12 GHz Electrical and Optical plug-in modules can be used for eye mask diagrams and jitter measurements.
- DC Blocks should be used for AC coupling of high-speed signals as CML type formats require 50 Ohm to VCC type terminations and are often not available on standard test equipment such as oscilloscopes and analyzers.
- A single +3.3V / 1 Amp Power Supply.
- SMA Cables with a bandwidth in excess of 10 GHz are preferred. Special care should be taken to ensure that each pair of cable carrying differential signals is closely matched in length.
- MTP/MPO cable fan-outs for easier access to optical signals of individual channels are recommended.

Other equipment such as an optical power meter, an optical spectrum analyzer, optical attenuators and an optical reference source are also valuable for common measurements.

## Evaluation Kit Overview

The SN-K12-X00501 Evaluation Kit includes two identical SN-E12-X00501 Evaluation Boards (a selector switch is available to select between Transmitter and Receiver), one 2m MTP/MPO ribbon cable and two MTP/MPO adapters.

The Evaluation Kit has been designed to enable the individual testing of the Transmitter and Receiver modules. The Evaluation Kit also enables to test a complete transmitter to receiver link while maintaining proper channel to channel orientation. In order to maintain proper channel orientation, all supplied components use a RFP configuration i.e. key-up to key-down. A single +3.3V power supply is required. A global selector switch is used to select between transmitter and receiver.

As shown in figure 4, the evaluation board contains multiple connectors and switches which are designed to assist in the manual testing process. Table 1 describes the functionality and characteristics of the components on the Evaluation Board.

## General Setup

*InterBOARD*<sup>™</sup> Transmitter and Receiver modules should always be well connected to the Evaluation boards by using the fastening screws from the underside of the Evaluation Board. Once a Transmitter or Receiver module has been installed the TX/RX Selector switch (S1) should be positioned in the proper orientation depending if a Transmitter or Receiver is present. Failure to position the will result in improper function of LED indicators. The Transmitter or Receiver modules will not be damaged if the Selector switch is incorrectly positioned.

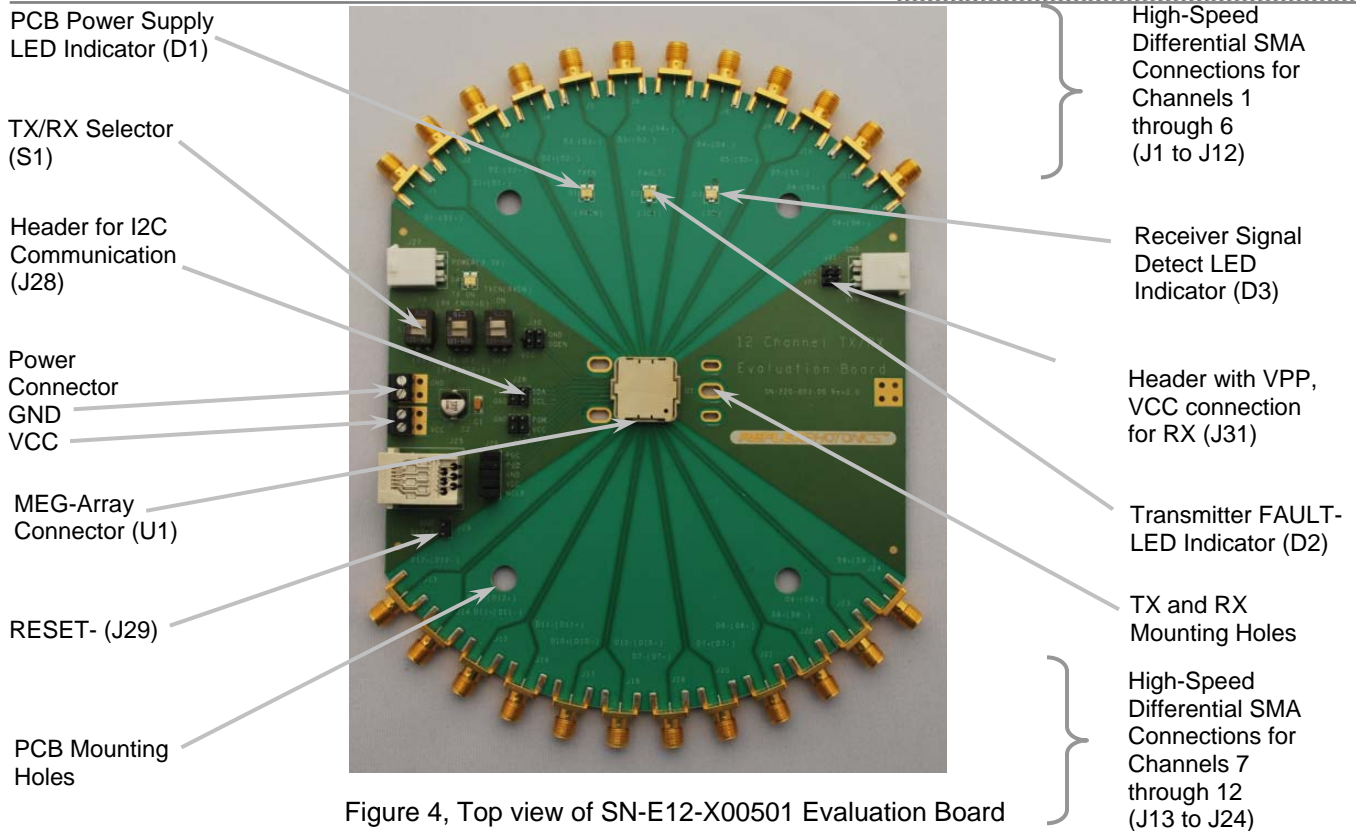


Figure 4, Top view of SN-E12-X00501 Evaluation Board

Designator	Label	Description
J1 to J24	D1+/- to D12+/-	High-speed differential 50 ohm SMA electrical input and output connections. Outer labels refer to Transmitter pin assignment and (inner) labels refer to the Receiver.
S1	TX (RX)	Selector switch between Transmitter and Receiver. If incorrectly set, damage will not occur to Reflex Photonics modules under test but indicators will not function properly.
S2	TX ON / TX OFF	Enables or disables module, only used for TX modules.
S3	TXEN (RXEN)	Enables or disables module, used for both TX and RX modules.
D1	TXEN (RXEN)	LED indicator for power supply.
D2	FAULT-	LED indicator for detection of a fault on the transmitter. Light turns on if fault occurs.
D3	SD	LED indicator for the detection of sufficient optical power on all 12 receiver channels.
J28	VCC, GND, SCL, SDA	Clock, Data, and power lines for I2C communication.
J29	RESET-, GND	Resets the module if jumper connected between RESET- and GND, only used for TX.
J31	VPP, VCC	VPP connection. Used for RX only. Connect jumper between VPP and VCC.
U1		MEG-Array connector for <i>InterBoard</i> <sup>TM</sup> Transmitter and Receiver Modules
VCC		+3.3 V terminal for power supply.
GND		Ground terminal for power supply, connected to signal ground plane.

Table 1, Evaluation Board Reference designators and description

A single power supply of +3.3 V should be used and can be connected through the power connector. 24 SMA connectors are provided at the periphery of the Evaluation Board to enable the transmission of high-speed electrical data signals to the Transmitter or from the Receiver modules. Two sets of SMA connectors are provided for each data channel to enable differential signaling. Data channels are labeled by their respective numbers and in order to preserve proper channel assignment, Receiver channels are referred with parentheses (). Cable lengths for inverting and non-inverting differential channels should be matched in length to minimize electrical skew. We strongly recommend the use of DC blocks to prevent improper voltage offsets and to prevent possible damage to measurement equipment.

Basic control and diagnostic pins are available through switches and jumpers and three LED indicators. A green LED indicator labeled TX/RX ON lights up when a module is enabled. A RESET- jumper is available to reset the Transmitter module if required. A red LED indicator labeled FAULT- lights up if a fault is detected at the Transmitter. Similarly a green LED labeled SD for Signal Detect lights up when signals are present on all receiver channels.

Several dual row headers are also present on the Evaluation Board. Most of those header pins are reserved or have been designed for troubleshooting by a Reflex Photonics technician. However, if desired, several pins marked with known labels can be used to probe control and diagnostic signals.

### Document revision history

Revision	Page	Description
1.1	1, 5	Pictures updated to account for new version of Evaluation Printed Circuit Board.
	6	VPP pin and description removed.
	1-6	Minor editorial changes.
1.2	1,5	Update to pictures and labels.
	6	Updated text for new revision of board.

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