11.3 Gbps Rate-Selectable Limiting Amplifier Evaluation Board

FEATURES

- **Easy to use Evaluation Board for 11.3Gbps Limiting Amplifier ONET8501P**
- **Easy Device Programming with USB to I2C Interface**
- **GUI to Control Functionality**
- **Includes Calibration Path**
- **Fully Assembled and Tested**

GENERAL DESCRIPTION

The ONET8501P-EV evaluation board is designed for easy quick-test as well as comprehensive evaluation of the ONET8501P 11.3Gbps rate-selectable limiting amplifier.

This fully assembled and factory tested evaluation board allows complete validation of all device functions.

For optimum performance, the board is equipped with 50Ω SMA connectors and well-controlled 50Ω impedance microstrip transmission lines.

In order to account for measurement inaccuracies caused by inevitable line loss, calibration lines are provided, consisting of the same type of SMA connectors and microstrip transmission line layout.

Using the GUI, the bandwidth, output amplitude, output pre-emphasis, input threshold voltage (slice level) and the loss of signal assert level can be adjusted.

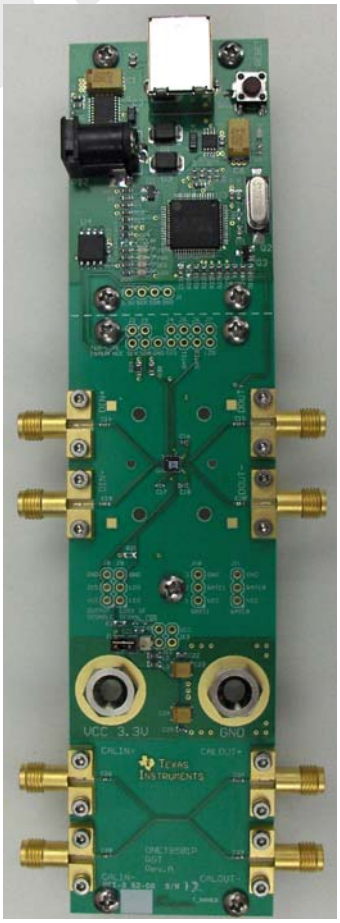
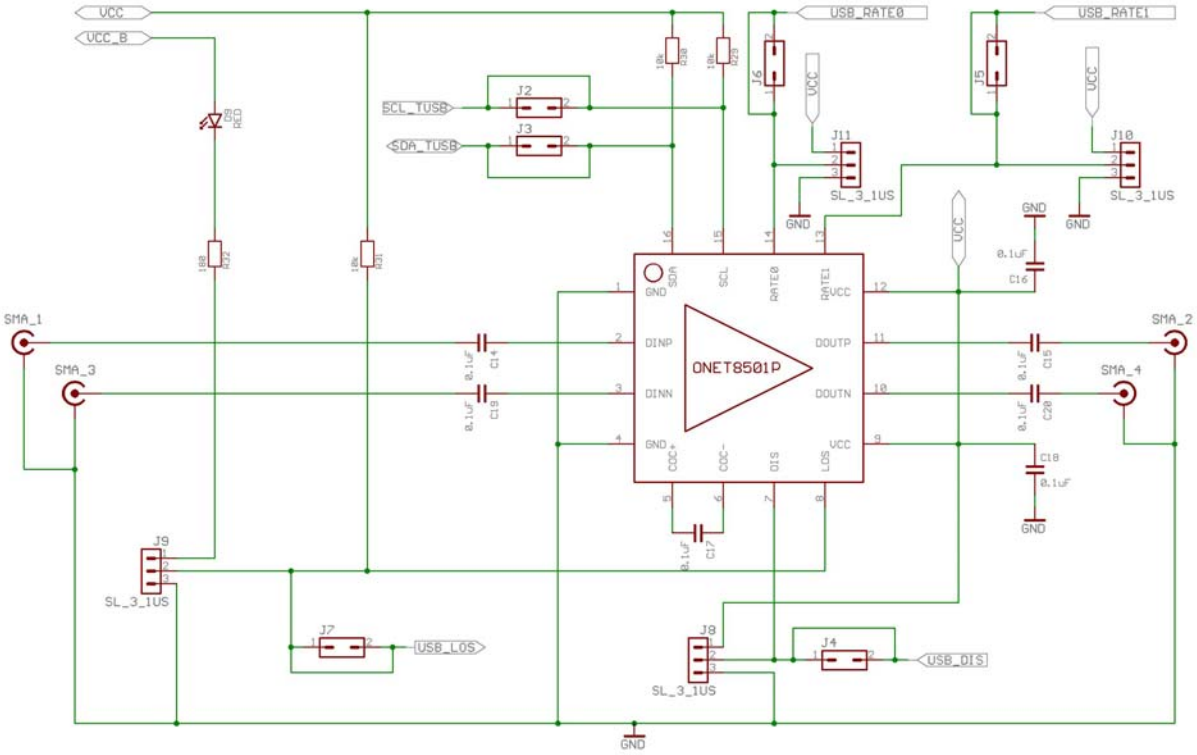


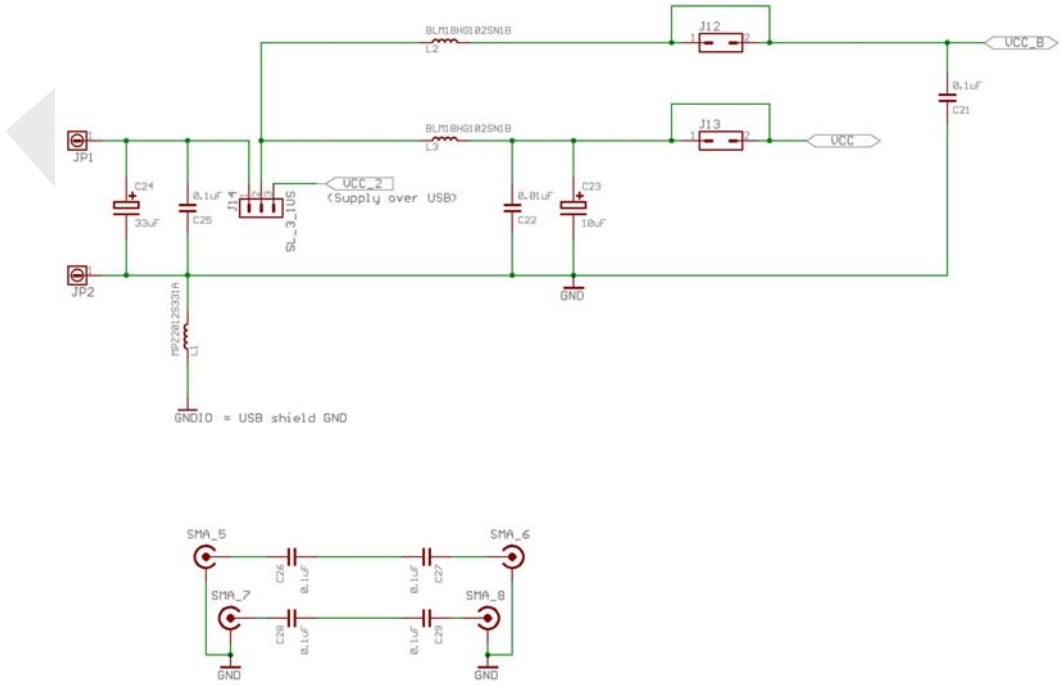
Figure 1: ONET8501P-EV Evaluation Board.

EV BOARD SCHEMATIC DIAGRAM

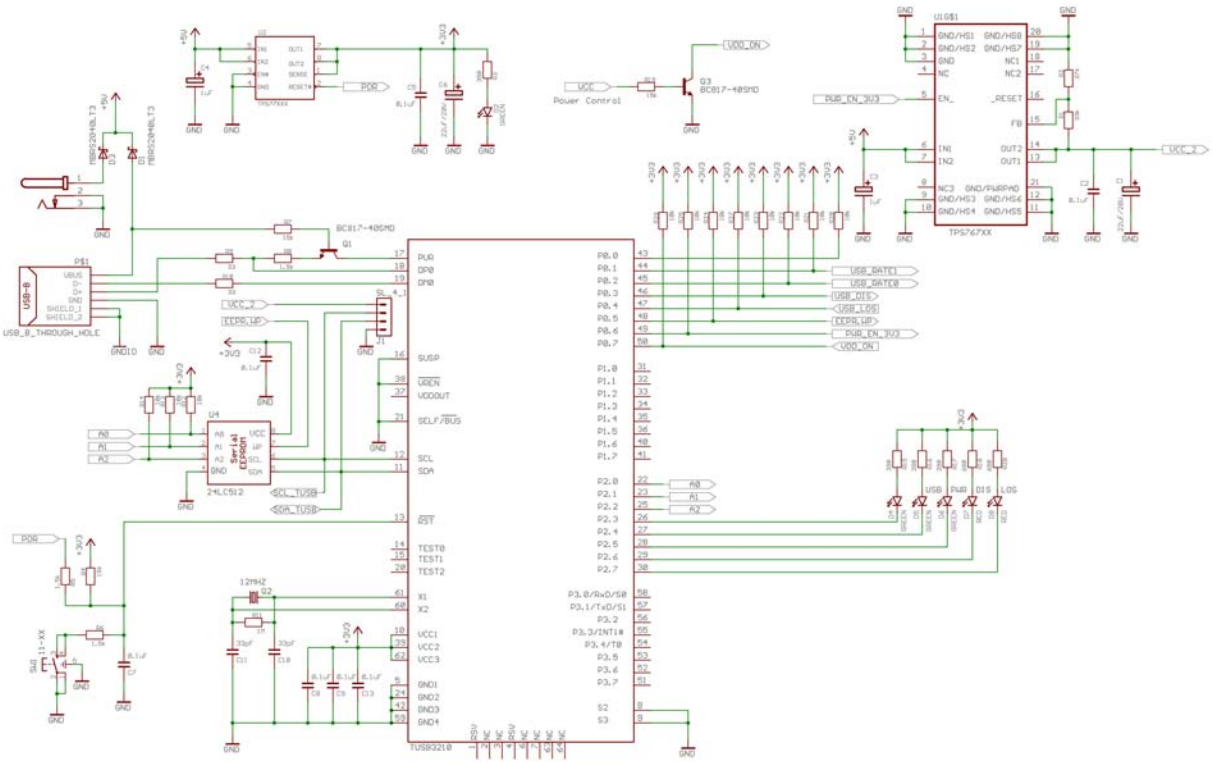
The EV board schematic diagram is given in Figure 2



Signal Path and Control Circuitry



Supply Filtering and Calibration Lines



USB Interface

Figure 2: ONET8501P-EV Evaluation Board Schematic

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CALIBRATION LINE

For optimum performance, the EV board is equipped with 50Ω SMA connectors and well-controlled 50Ω impedance microstrip transmission lines in the high-speed data-signal path. However, inevitable line loss occurs at high frequencies.

In order to account for the resulting measurement inaccuracies, calibration lines are provided consisting of the same type of SMA connectors and microstrip transmission line layout as used in the high-speed data-signal path.

The microstrip lines are designed as 50Ω microstrip lines close to the SMA connectors. Close to the chip, the gap between the two lines of the differential pair narrows resulting in reduced common mode matching. The differential line impedance however is kept constant at 100Ω on the entire board.

The calibration line is intended to be used for S21 and S12 calibration purposes. Furthermore, in the time domain it helps to determine the impact of the EV board on signal edge speed as well as deterministic jitter.

SIGNAL PATH AND CONTROL CIRCUITRY

The signal path consists of the input port SMA connectors DIN+ and DIN-, the coupling capacitors C14 and C19, the 50Ω single ended / 100Ω differential input transmission lines, the ONET8501P, the 50Ω single ended / 100Ω differential output transmission lines, the coupling capacitors C15 and C20, and the output port SMA connectors DOUT+ and DOUT-.

The ONET8501P uses a two-wire serial interface for digital control of the bandwidth, output amplitude, output pre-emphasis, input threshold voltage (slice level) and the loss of signal assert level. Predetermined settings for bandwidth and LOS assert levels can also be selected with the external rate selection pins (RATE1 and RATE0). For more information on the use of the two-wire interface, please refer to the ONET8501P data sheet.

The ONET8501P-EV is set-up for full control and monitoring through the two-wire interface. Manual control of such features as external rate selection and output disable can be done by cutting traces at the appropriate points and using jumpers.

JUMPER AND CONNECTOR LOCATION AND DESCRIPTION

The location of all connectors and jumpers are shown in Figure 3 below.

A description of the jumpers and connectors is given in Table 1.

Follow the guidelines in the measurement setup section to quickly get started.

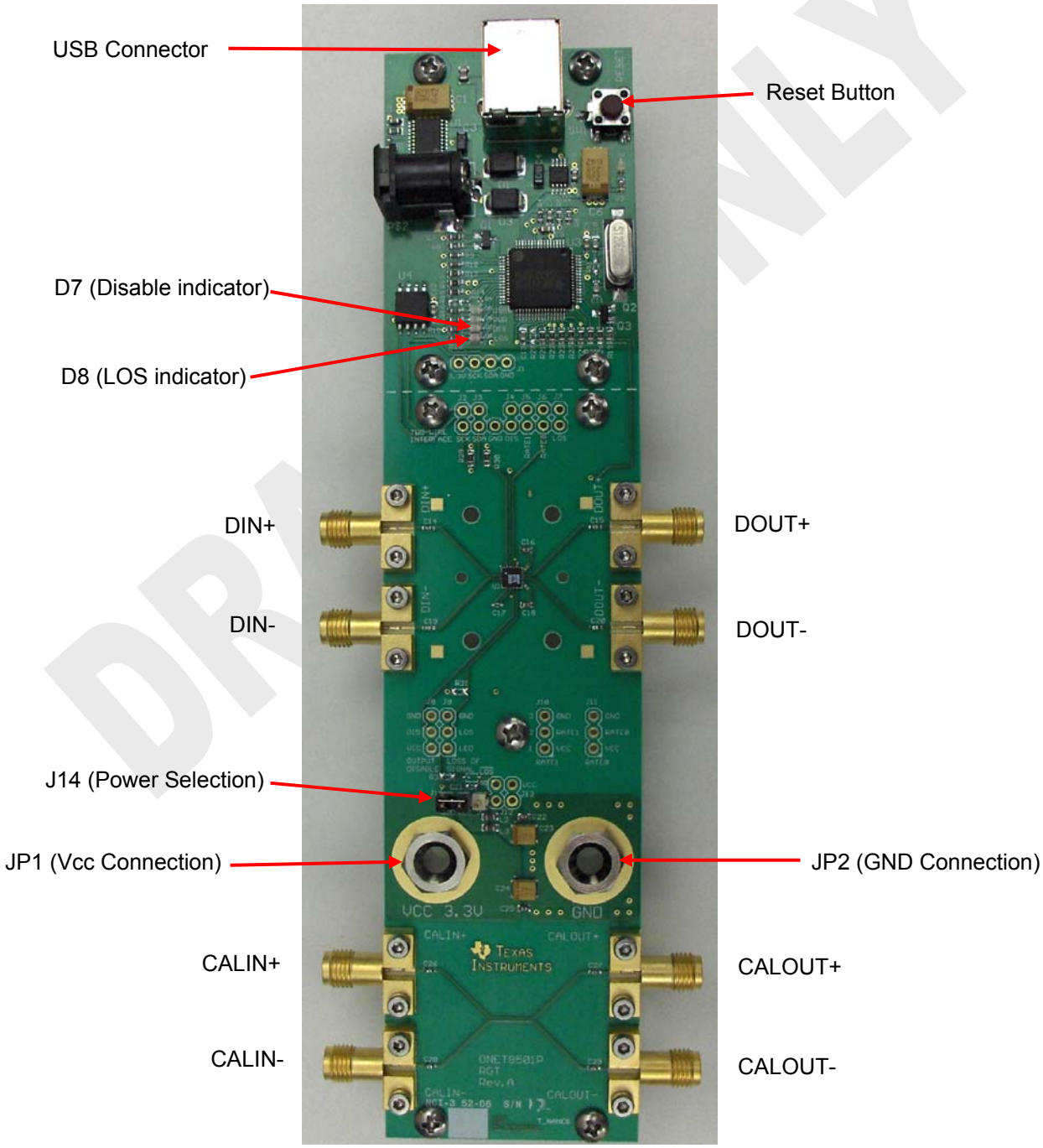

Figure 3: ONET8501-EV Evaluation Board Jumper and Connector Locations

Symbol	Connector / Jumper	Function
DIN+	Non-inverted data input signal	SMA connector for non-inverted input data signal. On board AC coupled and on-chip differentially 100Ω terminated to DIN-.
DIN–	Inverted data input signal	SMA connector for inverted input data signal. On board AC coupled and on-chip differentially 100Ω terminated to DIN+.
DOUT+	Non-inverted data output signal	SMA connector for non-inverted output data signal. On board AC coupled and on-chip 50Ω back-terminated to VCC.
DOUT –	Inverted data output signal	SMA connector for inverted output data signal. On board AC coupled and on-chip 50Ω back-terminated to VCC.
CALIN+	Non-inverted calibration line input	SMA connector for non-inverted calibration line input.
CALIN–	Inverted calibration line input	SMA connector for inverted calibration line input.
CALOUT+	Non-inverted calibration line output	SMA connector for non-inverted calibration line output.
CALOUT–	Inverted calibration line output	SMA connector for inverted calibration line output.
J14	Power supply selection	Place a jumper on pins 1 and 2 to select an external power supply through JP1 and JP2. Place a jumper on pins 2 and 3 to use supply through the USB cable.
D7	DIS	LED is turned on if the output is disabled.
D8	LOS indicator	LED is turned on if the applied input signal level is below the programmed threshold level.

Table 1: Jumper and Connector Description

MEASUREMENT SETUP

Follow this procedure to quickly setup for measurements. The board is pre-set for open loop operation.

1. Install the ONET8501_gui_install_v0.7.msi or higher revision file and follow the instructions. Use the default directory for the installation.
2. Attach the interface cable from the USB port of the computer to the USB port of the evaluation board. The interface circuitry is powered through the USB cable.
3. The driver for the USB port will need to be installed. Follow the instructions for installing a new driver. The driver is located at C:\Program Files\Texas Instruments\TI (ONET8501V-ONET8501P) Eval Board\ Driver. Once a particular USB port has been configured, this same port must always be used to control the interface board.
4. All control and monitoring functions are done through the GUI so no jumpers have been installed except J14 which is set to select an external power supply.
5. Connect a differential data input signal source to the SMA connectors DIN+/DIN–. Set the data rate up to 11.3Gbps. Set the amplitude between $5mV_{p-p}$ differential and $2000mV_{p-p}$ differential. For small input signals, attenuators may be required.
6. Connect the output SMA connectors DOUT+/DOUT– through 50Ω matched impedance cables to a 50Ω oscilloscope with a bandwidth of at least 12GHz. Ensure that the maximum input voltage of the oscilloscope is not exceeded. Use appropriate attenuators if needed.
7. Apply a +3.3V supply to the +3.3V banana jack and the supply ground to the GND banana jack. The typical current consumption in default mode will be about 36mA.
8. Run the GUI by clicking the ONET8501 GUI shortcut icon on the desktop. Choose the ONET8501P tab. The interface will be as shown in Figure 4. The USB communication error indicator and I2C communication indicator should both be green as shown in Figure 5. If the I2C indicator is red, then press the reset button on the interface board.
9. The device will power up in a default state with an output amplitude of 300mVpp. The features of the device are controlled through the corresponding sliders or selection buttons. To use the input threshold control to its full range, the DC offset cancellation should be disabled. Please refer to the data sheet for the register functionality.
10. Typical eye diagrams at 10.3125Gbps are shown in Figures 6 and 7.
11. The ONET8501P can also be controlled through the I2C Diag page by typing in the HEX values for the appropriate registers and clicking on the Write Bytes box. The register values can be read by clicking on the Read Bytes box.

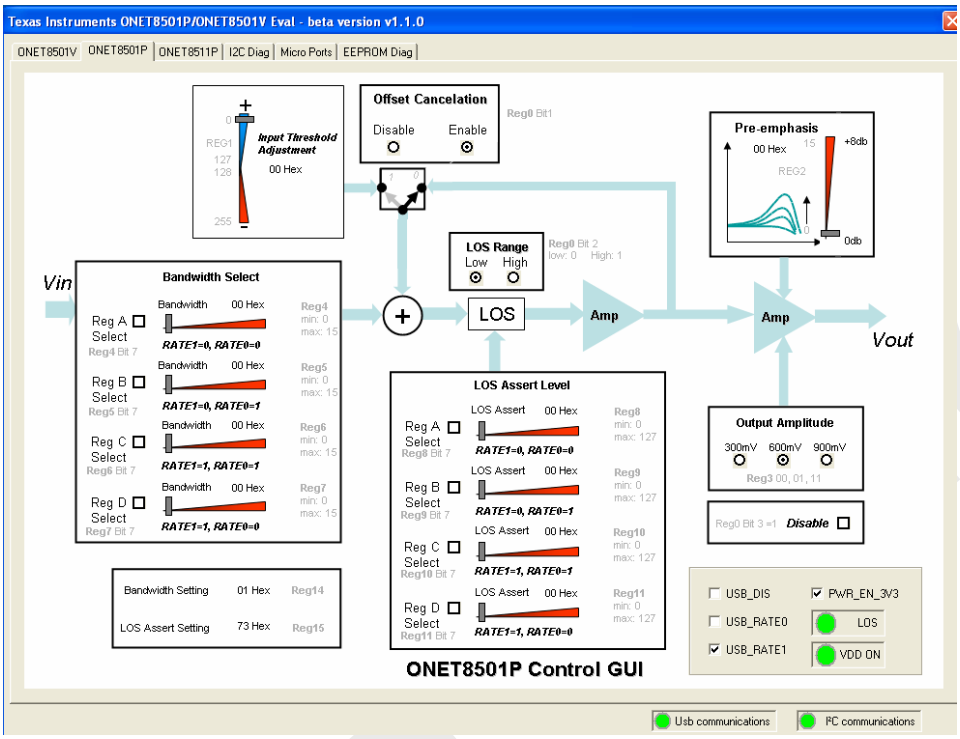

Figure 4: ONET8501P GUI

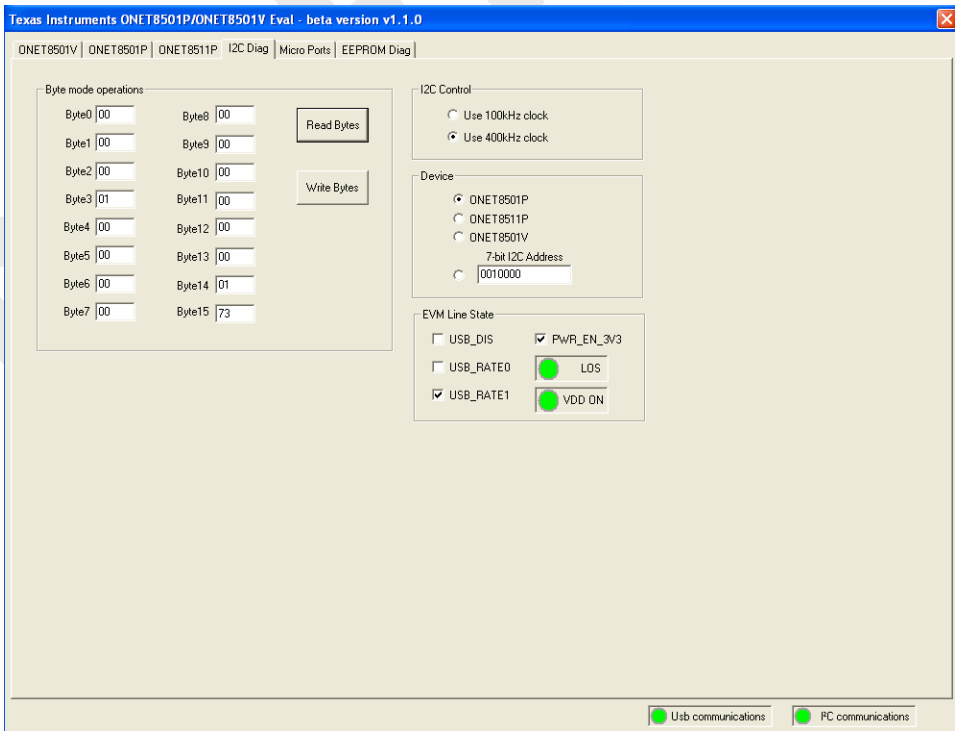

Figure 5: ONET8501P I2C Diag Page

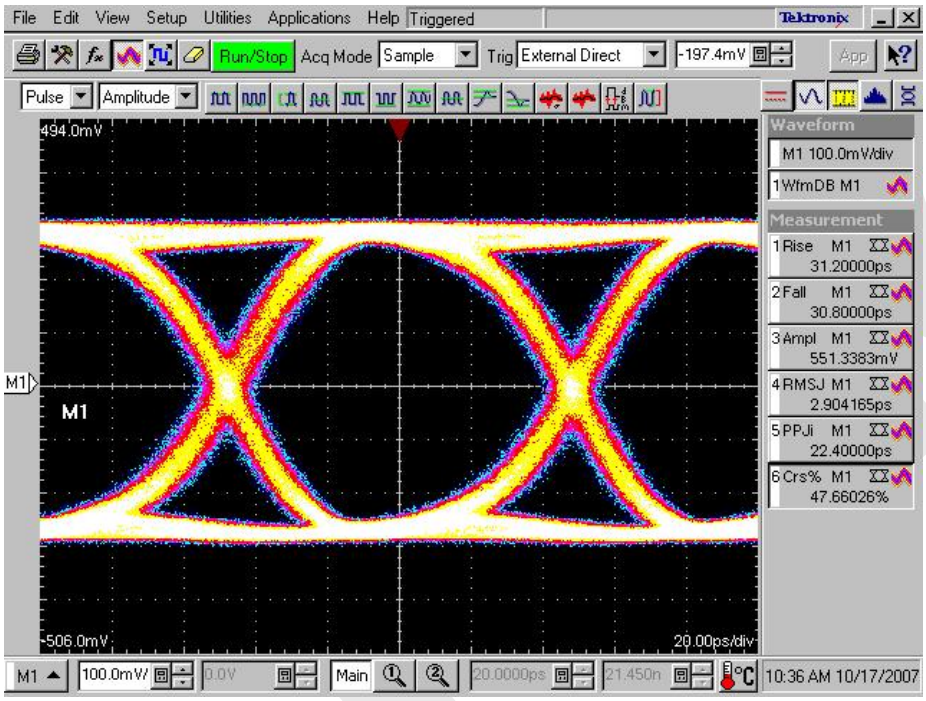

Figure 6: Output Eye-Diagram at 10.3125Gbps, Highest Bandwidth Setting and 600mVpp Output Setting with 10mVpp, 2^{31}-1 PRBS Input

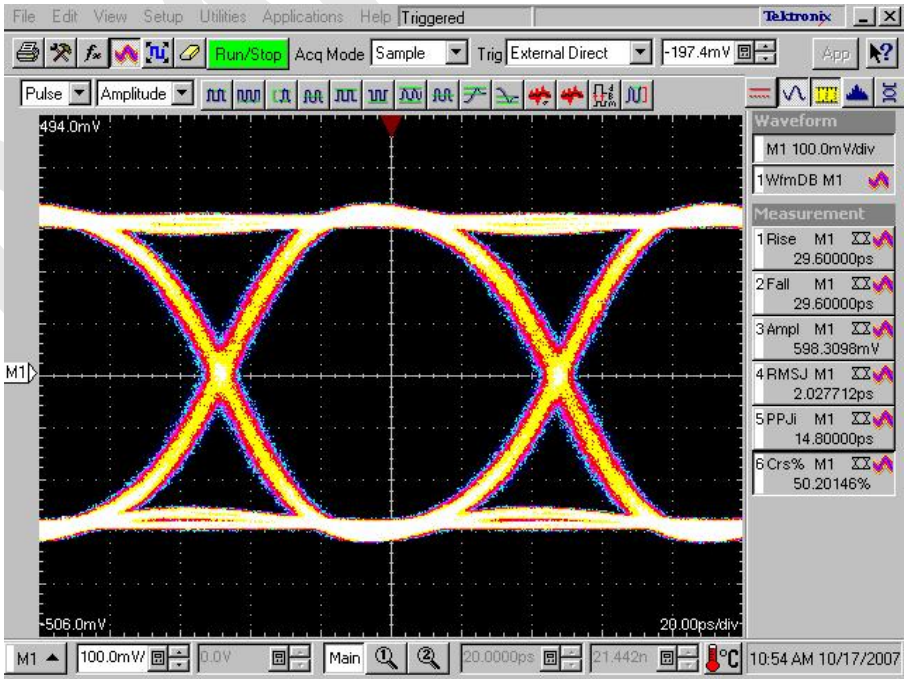

Figure 7: Output Eye-Diagram at 10.3125Gbps, Highest Bandwidth Setting and 600mVpp Output Setting with 1000mVpp, 2^{31}-1 PRBS Input

REVISION HISTORY

Rev #	Date	Description	Author
0.1	02/22/2007	Initial Draft.	Alex Davidson
0.2	02/26/2007	Added GUI interface Fig. 4 and changed Fig. 5	A. Davidson
0.3	02/28/2007	Updated Figures 4 and 5	A. Davidson
0.4	10/17/07	Updated Figures 6 and 7	a. Davidson

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