SY88353BL Evaluation Board

3.3V, 3.2Gbps Limiting Post Amplifier with Programmable Decision Threshold

General Description

The SY88353BL evaluation board enables fast and thorough evaluation of the SY88353BL post amplifier. It provides a unique pin (VTHP) at which a variable DC signal can be applied to adjust the output signal crossing from 20 to 80%. This feature eliminates input DC offsets in DC-coupled applications, minimizes jitter caused by duty cycle distortion, and ultimately optimizes bit error rate (BER) performance. The board is an easy-to-use, single-supply design, designed to be driven by a high-speed, pattern generator.

The SY88353BL evaluation board is intended to terminate to a 50Ω scope and provides for simple user adjustability of the LOS threshold through the adjustment of an on-board potentiometer as well as simple evaluation of the output signal crossings.

All data sheets and support documentation can be found on Micrel's web site at: www.micrel.com.

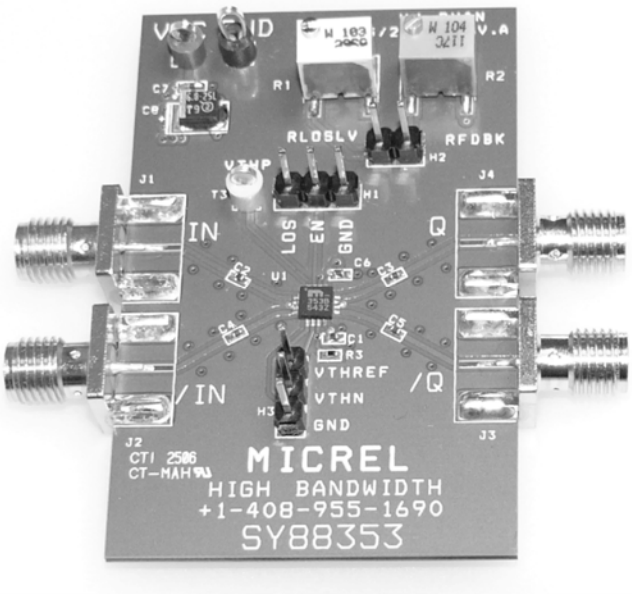
Features

- SY88353BL CML Low-Power Limiting Post Amplifier with TTL LOS
- Single +3.3V power supply
- AC-coupled configuration for direct interface with 50Ω test equipment and easy evaluation of device.
- On-board LOS sensitivity adjustment
- On-board LOS-feedback variable resistor for higher hysteresis adjustment.
- On-board output crossing adjustment

Related Documentation

SY88353BL: 3.3V, 3.2Gbps Limiting Post Amplifier with Programmable Decision Threshold

Evaluation Board



Evaluation Board Description

The SY88353BL evaluation board is designed to operate with a single 3.3V ±10% power supply and is configured with AC-coupled inputs and outputs. The high-speed input and output channels are brought out to SMA connectors through matched-length AC-coupled differential strip-line traces.

AC-Coupled Input

The AC-Coupled inputs bias the input levels to a DC-operating point that is either set to a fixed voltage, which is a diode-drop below Vcc, to get 50% output crossing or is varied by applying a DC voltage between 0V-2.5V at VTHP pin to adjust output crossings. Inputs can be driven by a differential signal with amplitude typically between $10mV_{PP}$-1800mVpp.

AC-Coupled Output

The SY88353BL is configured with AC-coupled outputs allowing the board to interface directly with 50Ω equipment. If only one output is being used, the unused complimentary output should be terminated into 50Ω-to-ground.

The following sections explain how to connect and setup the SY88353BL evaluation board per Figure 1. Ensure proper ESD precautionary measures are taken before handling sensitive electronic equipment, including the SY88353BL evaluation board.

Measurements

Evaluating DOUT & /DOUT

1. Set a DC power supply to +3.3V and turn it off. Connect the positive lead to V_{CC} post and the negative lead to GND post.
2. Set the desired frequency on a pattern generator with an amplitude between $10mV_{PP}$ and $1800mV_{PP}$. Typical data patterns are 2^7-1 or 2^{23}-1 PRBS patterns depending upon the application. Since the inputs to the board are AC-Coupled, the voltage offset of the pattern generator is not significant so it can be set between GND and V_{CC}.
3. Connect the pattern generator with differential outputs as a data source to the DIN and /DIN inputs on the SY88353BL evaluation board. Use matched-length differential cables.
4. For normal output (output crossing adjustment not need), connect VTHN and VTHP to ground.
5. For crossing adjustment, place a jumper across VTHN and VREF and apply a DC signal between 0-2.5V at VTHP. Crossings can be varied from 20% to 80%, reaching 50% when VTHP centers at around 1.25V.
6. Place jumper across EN/ and GND to enable the outputs.
7. Turn the power supply on.
8. Observe the DOUT and /DOUT outputs with a 50Ω scope. The output rise and fall times should be less than 100ps, with an amplitude around 400mV ($800mV_{PP}$ differential).

LOS Hysteresis Measurements

The SY88353BL evaluation board provides a potentiometer to allow for convenient adjustment of LOS_{LVL} without the need for an extra power supply. LOS_{LVL} taps off a potentiometer connected between V_{CC} and V_{CC} –1.3V. Hence, LOSLVL can be set to any voltage between V_{CC} and V_{CC} –1.3, as specified in the SY88353BL data sheet. The potentiometer R1 between Vcc and LOSLVL creates a voltage divider. Thus,

$$V\,LOS_{LVL} = \left[Vcc - \frac{1.3 \times R(k\Omega)}{(R(k\Omega) + 2.8k\Omega)} \right]$$

The steps below show how to measure the LOS hysteresis as a function of the input voltage swing at the DIN and /DIN inputs:

Minimum Input Swing Hysteresis Measurement

The minimum acceptable input swing for the SY88353BL is around $10mV_{PP}$.

1. Set a DC power supply to +3.3V and turn it off. Connect the positive lead to V_{CC} post and the negative lead to GND post.
2. Connect a DMM or similar voltage measurement device between the LOS_{LVL} pin and V_{CC}.
3. Connect a second DMM or similar voltage measurement device between the LOS output and GND. For the remainder of this document, this DMM will be referred to as the LOS DMM.
4. Connect the pattern generator with differential outputs as a data source to the DIN and /DIN inputs on the SY88353BL evaluation board. Use matched-length differential cables.
5. Turn the power supply on.
6. Adjust the trimpot R1 so the voltage at the LOS_{LVL} pin is around 1.3V below V_{CC}. This sets the LOS for maximum sensitivity. At this level the LOS output should go HIGH or LOW (measured with the LOS DMM set up in step 3) as the input voltage swing at DIN and /DIN is varied around or below $10mV_{PP}$. The input level at which the LOS output goes HIGH or LOW is the LOS Assert voltage or LOS de-assert voltage, respectively.
7. Now adjust the trimpot R1 to vary the voltage so it is closer to V_{CC}. Note that as the voltage at the LOS_{LVL} pin approaches V_{CC}, a larger input voltage swing is required to trigger assert and de-assert levels. A smaller input voltage swing is required to trigger assert and de-assert levels.
8. The hysteresis between the assert and de-assert levels can be calculated with the following equation: Hysteresis (dB) = 20log (LOS De-assert voltage/LOS Assert voltage). This hysteresis should be >2dB.

Using Squelching Function

To evaluate the squelching function, place a jumper between LOS and EN/, and observe the outputs as input signals are varied. This ensures output stability under loss-of-signal condition. The EN/ de-asserts the true output signals low without removing the inputs.

Need Higher Hysteresis?

The board provides an additional potentiometer R2 between LOS and LOSLVL. This feedback resistor can be adjusted to increase the hysteresis needed, especially for high-sensitivity LOS requirement. For more details, refer to Applications Note 45.

Evaluation Board Layout

The evaluation boards are constructed with Rogers 4003 material and are coplanar in design fabricated to minimize noise, achieve high bandwidth and minimize crosstalk.

L1	GND and Signal
L2	GND
L3	VCC
L4	GND

Table 1. Layer Stack

Evaluation Board Schematic

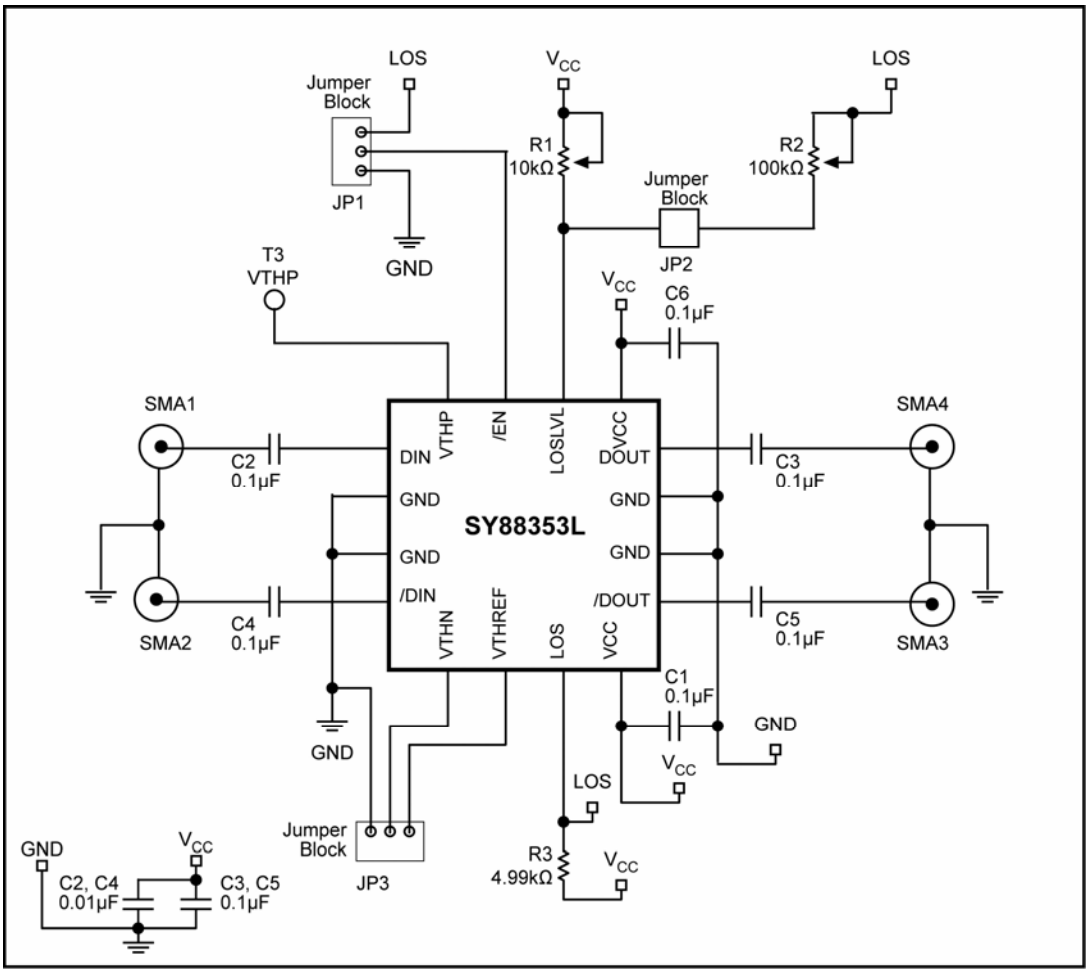


Figure 1. Setup for Measurement

Bill of Materials (MLF®)

Item	Part Number	Manufacturer	Description	Qty.
C1, C2, C3, C4, C5, C6, C7	VJ0402Y104KXXAT	Vishay[1]	0.1µF, 25V, 10% Ceramic Capacitor, Size 0402, X5R, Dielectric	7
C8	293D106X0025CT	Vishay[1]	10µF, Surface Mount Capacitor, Size C	1
R3	CRCW04024991F	Vishay[1]	4.99kΩ SMD resistor, 1%, 1/16W, size 0402	1
R1 (POT)	3269-103	Bourns[2]	10kΩ potentiometer	1
R2 (POT)	3269-104	Bourns[2]	100 kΩ potentiometer	1
JP1,JP2,JP3	TSW-103-07-S-S	Samtec[3]	0.1mil Center through hole terminal strip	3
J1–J4	142-0701-851	Johnson Components[4]	Jack Assembly End Launch SMA	4
U1	**SY88353BL**	**Micrel, Inc.[5]**	**Post Amplifier**	1

Notes:

1. Vishay: www.vishay.com.
2. Bourns: www.bourns.com.
3. Samtec: www.samtec.com.
4. Johnson Components: www.johnsoncomponents.com.
5. **Micrel, Inc.: www.micrel.com.**

HBW Support

Hotline: 408-955-1690
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Application Hints and Notes

Application Hints

The SY88353BL give the user the ability to add an offset to the input signal via the VTHP pin. The V_{thp} offset will allow the user to shift the eye-crossing point from the nominal 50% to a range between 20% and 80%. (See Figures on page 7). Typically, the user alters VTHP to change the decision threshold and the range with the best bit error rate.

In order to set the VTHP offset correctly, follow the steps below:

1. Determine the typical input signal strengths. The VTHP setting will vary depending upon the levels of input.
2. Adjust the R_{LOSLVL} to correspond to the input signal strengths. Refer to Figure 3 on page 6 for R_{LOSLVL} setting.
3. Connect VTHN to VTHREF.
4. Apply a DC signal to VTHP, 1.25V initially, to view the current eye-diagram and determine which direction to move the eye-crossing. The user would want to shift the eye-crossing to eliminate the effects of external noise on the input signal.
5. Increase or decrease VTHP to establish an eye-crossing point where the external noise is compensated to give the best BER. This is the VTHP offset.

Micrel's SY88353BL supports offset levels between 20% and 80% when the input is between $20mV_{PP}$ and $100mV_{PP}$. The hysteresis of the part performs as listed in the specifications within the specified range.

For application notes on Micrel post amplifiers, and hysteresis go to Micrel's website at: http://www.micrel.com/. Once in Micrel's website, follow the steps below:

1. Click on Products.
2. Under Additional Information on the bottom of the page, click on "Product Information"
3. In the Applications Information Box, choose "Application Hints and Application Notes."
4. Jump to "High Bandwidth" section and locate Application-Note 45.

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