Precision 1:8 LVPECL Fanout Buffer with Internal Termination

SY89858U Evaluation Board

General Description

The SY89858U evaluation board is designed for convenient setup and quick evaluation of the SY89858U. The boards are optimized to interface directly to a 50Ω oscilloscope.

For best AC performance, the boards are configured in AC-coupled in/AC-coupled out configuration. For applications that require a DC-coupled configuration, step-by-step instructions for modifying the board are included.

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

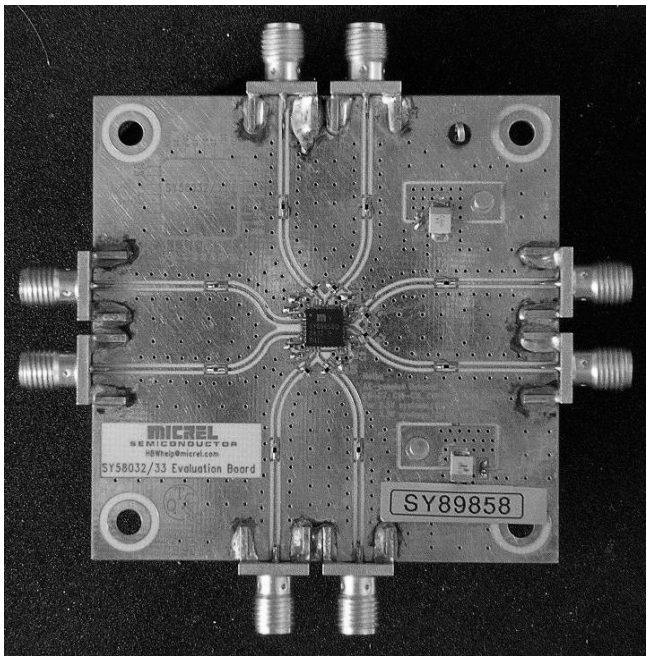
Features

- Fully assembled and tested SY89858U
- +2.5V or +3.3V power supply
- AC-coupled configuration for ease-of-use
- I/O interface includes on-board termination
- Fully assembled and tested
- Can be reconfigured for DC-coupling operation

Related Documentation

- SY89858U Precision 1:8 LVPECL Fanout Buffer with Internal Termination

Evaluation Board



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Evaluation Board Description

The default configuration for the SY89858U board is the AC-coupled. The choice between AC-coupled and DC-coupled configurations offers the user flexibility for specific applications.

AC-Coupled Evaluation Board

The AC-coupled configuration is suited to most customer applications and is preferred by the majority of users because of its ease-of-use. It requires only a single power supply and offers the most flexibility in interfacing to a variety of signal sources.

The DC-bias levels and AC-coupling capacitors are supplied on-board for each input, making it unnecessary to vary the offset voltage or change any components on the board as the power supply voltage varies over the +2.5V ±5% and +3.3V ±10% operating range. The user needs only to supply a minimum input voltage swing and the bias voltage will automatically adjust the input to the correct level as the power supply voltage varies.

DC-Coupled Evaluation Board

For applications that are not suited to AC-coupling, such as clock that can be turned off for extended periods of time, the board can be user-configured for DC-coupled operation.

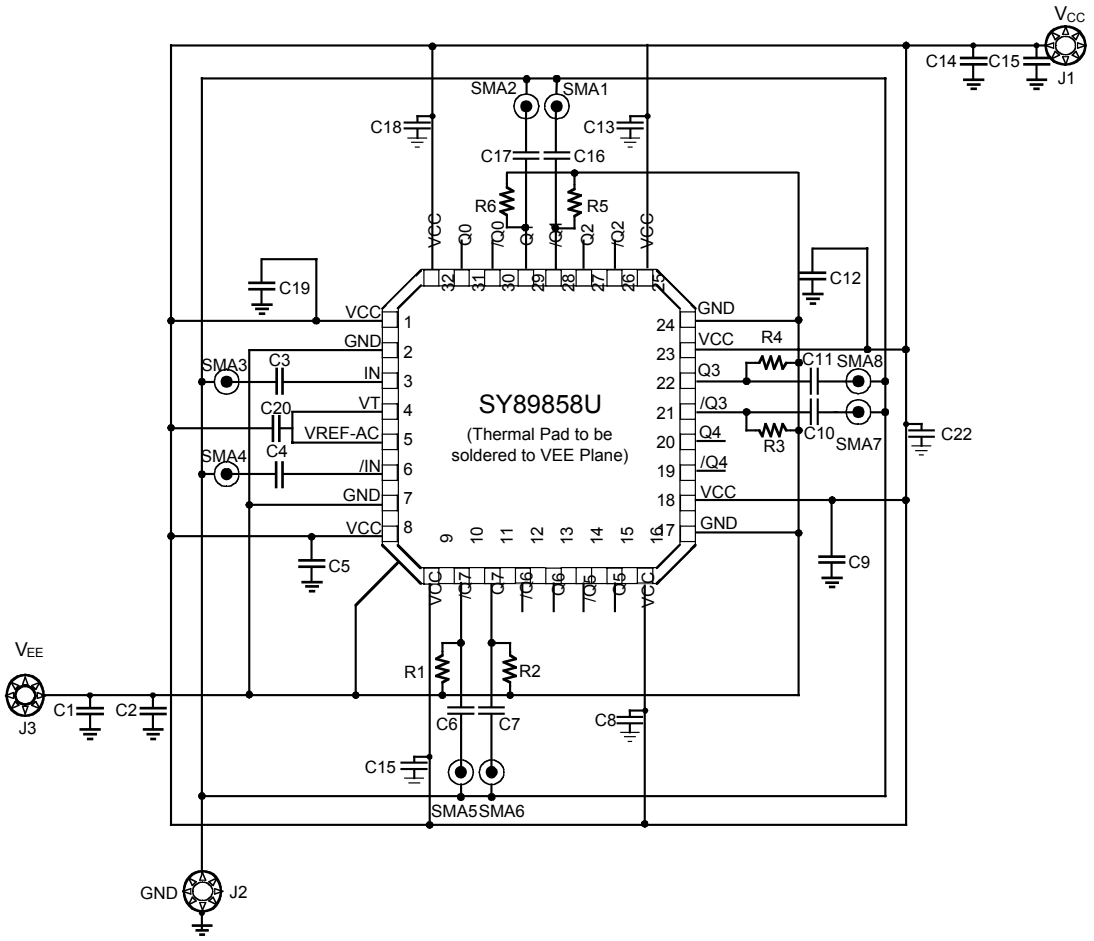
This can be accomplished by modifying the board to use two power supplies into a “split-supply configuration.” Since LVPECL is referenced to V_{CC}, and standard PECL termination is 50W to V_{CC}-2V. Split-supply is an easy method to interface to a 50W (to ground) scope. Therefore, a 3.3V supply will be split into +2V and -1.3V, and a 2.5V supply will be split into a +2V and -0.5V.

The +2V offset in this two-power supply configuration then provides the correct terminations for the device by setting the Ground potential on the board to be exactly 2 volts below the V_{CC} supply. The V_{EE} voltage is then set to –1.3V for 3.3V devices, or –0.5V for 2.5V devices to ensure proper V_{CC} to V_{EE} voltage difference.

Any-Input Interface

The unique internal input termination sets the input common mode voltage. This enables the input to interface with any differential signal over the supply voltage without modifying the board.

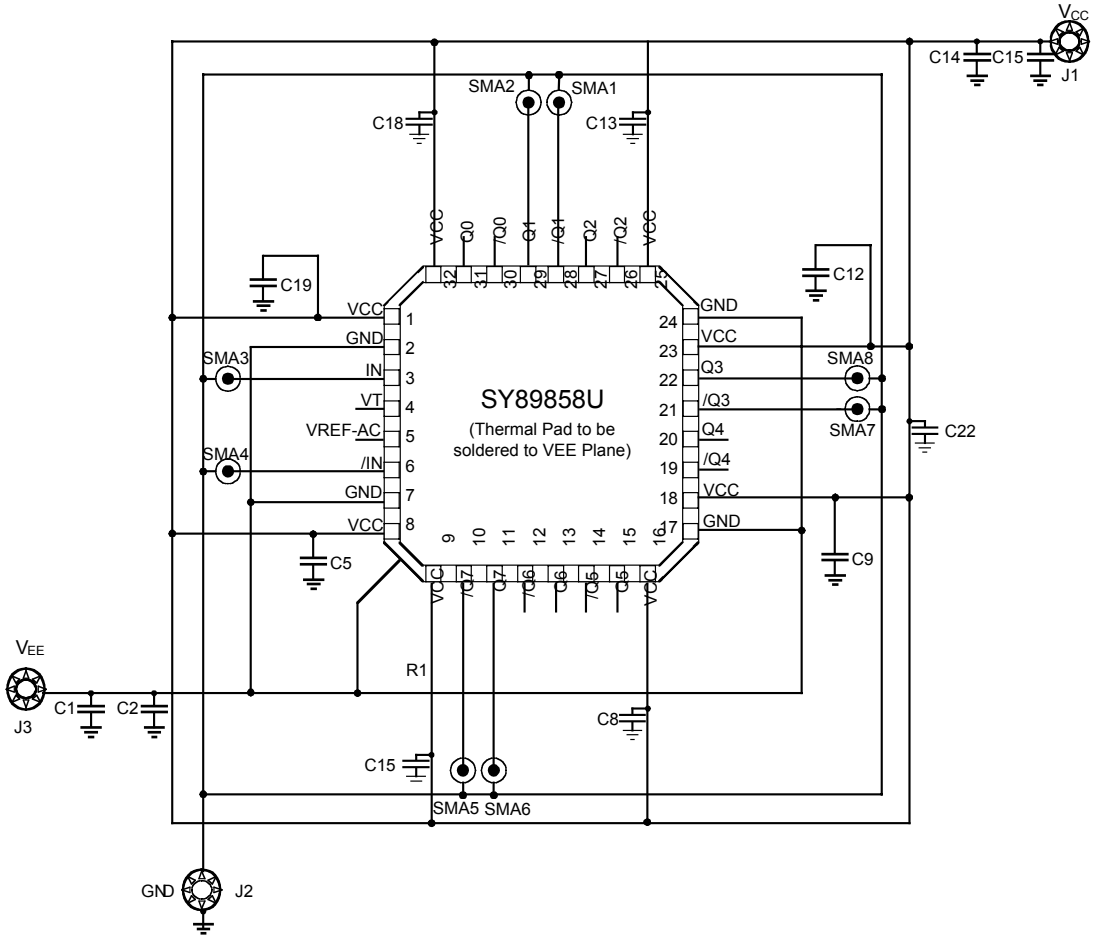
Evaluation Board



AC-Coupled Evaluation Board

I/O	Power Supply	V_{CC}	GND	V_{EE}
AC-Coupled Input/AC-Coupled Output	2.5V	+2.5V	0V	0V
AC-Coupled Input/AC-Coupled Output	3.3V	+3.3V	0V	0V

Table 1. AC-Coupled Evaluation Board Power Supply Connections



DC-Coupled Evaluation Board

I/O	Power Supply	V_{CC}	GND	V_{EE}
DC-Coupled Input/DC-Coupled Output	2.5V	+2V	0V	-0.5V
DC-Coupled Input/DC-Coupled Output	3.3V	+2V	0V	-1.3V

Table 2. DC-Coupled Evaluation Board Power Supply Connections

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AC-Coupled Evaluation Board Setup

Setting up the SY89858U AC-coupled Evaluation Board

The following steps describe the procedure for setting up the evaluation board:

1. Set the voltage setting for a DC-supply to be either 2.5V or 3.3V, depending upon your application, and turn off the supply.
2. Connect the GND and V_{EE} terminal to the negative side of a DC power supply. This is the 0V ground potential.
3. Connect the V_{CC} terminal to the positive side of a DC power supply.
4. Turn on the power supply and verify the power supply current is < 160mA.
5. Turn off the power supply.
6. Using a differential signal source set the amplitude of each side of the differential pair to be 800mV (1600mV measured differentially). Set the offset to be a positive value, the value of this offset is not critical, as the AC-coupled inputs will be automatically biased to the correct offset. Turn off or disable the outputs of the signal source.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the inputs on the evaluation board (SMA3 and SMA4).
8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA1 and SMA2 or SMA5 and SMA6 or SMA 7 and SMA 8) to the oscilloscope or other measurement device that has an internal 50Ω termination. Any of these 6 outputs that are not connected to a scope or other instrument should be terminated with a 50Ω-to-ground at the SMA on the board.
9. Turn on the power supply and verify the current is <200mA.
10. Enable the signal source and monitor the outputs.

Modifying AC-Coupled Outputs for DC-Coupled Operation

When DC-Coupling is Necessary

For applications where AC-coupling is not appropriate, the board can be reconfigured for DC-coupled operation. An example where DC-coupling is required is if the input data or clock can be disabled. This would result in a DC-signal at the inputs and the on-board biasing resistors (R1 and R2) would apply the same level to both the true and complement inputs. Since these inputs are differential, this would result in an intermediate non-differential state at the inputs and the outputs would be in an indeterminate condition. This condition can be avoided by reconfiguring the board for DC-coupled operation and using two power supplies.

Reconfiguring an AC-coupled Board into a DC-coupled Board

The following procedure details the steps for converting an AC-coupled board to a DC-coupled board:

1. Disconnect V_{REF-AC} and V_T
2. Remove resistors R1-R6
3. Replace capacitors C3–C4, C6-C7, C10-C11, and C16–C17 with 0Ω resistors.

Setting up the DC-Coupled Evaluation Board

The following steps describe the procedure for setting up the DC-coupled evaluation board:

1. Set the voltage for DC supply number 1 to be 2.0V and connect it to J1 (V_{CC}).
2. Set the voltage for DC supply number 2 to be –1.3V (for 3.3V operation) or –0.5V (for 2.5V operation) and connect it to J3 (V_{EE}).
3. Connect the negative side of power supply 1 to the positive side of power supply 2. This is the 0V ground potential for the board.
4. Turn off the power supplies and connect the GND terminal on the board, J2, to the negative side of a DC power supply 1 and the positive side of DC power supply 2
5. Turn on the power supply and verify that the power supply current is <160mA. Using a voltmeter, turn off the power supply.
6. Disable the outputs of the differential signal source and set the $V_{OH} = V_{CC}$-1.0V and the $V_{OL} = V_{CC}$-1.75V) as shown in the following table.

I/O Voltage Level	+3.3V Supply	+2.5V Supply
$V_{OH} = V_{CC}$-1.0V	+2.3V	+1.5V
$V_{OL} = V_{CC}$-1.75V	+1.55V	+0.75V

Table 3. DC-Coupled Output Voltage Levels

7. Using (2) equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA1 and SMA2 or SMA5 and SMA6 or SMA 7 and SMA 8) to the oscilloscope or other measurement device that has an internal 50Ω termination. Any of these 6 outputs that are not connected to a scope or other instrument should be terminated with a 50Ω termination-to-ground at the SMA on the board.
8. Turn on the power and verify the current is <200mA.
9. Enable the signal source and monitor the outputs.

Evaluation Board Layout

PC Board Layout

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

L1	GND and Signal
L2	GND
L3	VCC
L4	GND

Table 4. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C2, C14	293D685X0025C2T	Vishay[1]	6.8μF, 20V, Tantalum Electrolytic Capacitor, Size C	2
C3-C13, C16-C19	VJ0402Y104KXXAT	Vishay[1]	0.1μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	9
C6-C7, C10-C11, C16-C17	CRCW0402000Z	Vishay[1]	0.47μF, 20V, Tantalum Electrolytic Capacitor, Size 0603	1
R1-R6	CRCW080582R5F	Vishay[1]	82Ω, 1/10W, 5% Thick-film Resistor, Size 0805	2
SMA1-SMA8	142-0701-851	Johnson Components[2]	Jack Assembly End Launch SMA	13
J1	111-0702-001	Johnson Components[2]	Red Banana Jack	1
J2	111-0703-001	Johnson Components[2]	Black Banana Jack	1
J3	111-0701-001	Johnson Components[2]	Green Banana Jack	1
U1	**SY89858U**	**Micrel[3]**	**Precision 1:8 LVPECL Fanout Buffer with Internal Termination**	1

Additional Components

Item	Part Number	Manufacturer	Description	Qty.
C6-C7, C10-11, C16-C17	CRCW040200R0F	Vishay[1]	Replace Capacitors with Resistors: 0 Ω, 1/16W, 5% Thick-film Resistor, Size 0402	6

Notes:

1. Vishay: www.vishay.com.
2. Johnson Components: www.johnsoncomponents.com
3. Micrel, Inc.: www.micrel.com.

Micrel Cross Reference

To find an equivalent Micrel part, go to Micrel's website at: http://www.micrel.com and follow the steps below:

1. Click on Dynamic Cross Reference.
2. Enter competitor's part number in the Dynamic Cross Reference field.
3. To download a PDF version of this information, click on the Cross Reference PDF tab.

HBW Support

Hotline: 408-955-1690

Email Support: HBWHelp@micrel.com

Application Hints and Notes

For application notes on high speed termination on PECL and LVPECL products, clock synthesizer products, SONET jitter measurement, and other High Bandwidth product go to Micrel's website at http://www.micrel.com/. Once in Micrel's website, follow the steps below:

1. Click on "Product Info".
2. In the Applications Information Box, choose "Application Hints and Application Notes."

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