Precision 1:5 LVDS and LVPECL Fanout Buffer with 2:1 MUX and Fail-Safe Input with Internal Termination

SY89846/847U Evaluation Board

General Description

The SY89846U and SY89847U evaluation boards are designed for convenient setup and quick evaluation with SMA connectors on each I/O. The board is optimized to interface directly to a 50Ω oscilloscope.

The board is designed in multiple layers for better performance and simple signal evaluation. For best AC performance, the board is configured in AC-coupled In and AC-coupled Out configuration. For applications that require a DC-coupled configuration, step-by-step instructions for modifying the board are included.

All datasheets and support documentation can be found on Micrel's website at: www.micrel.com.

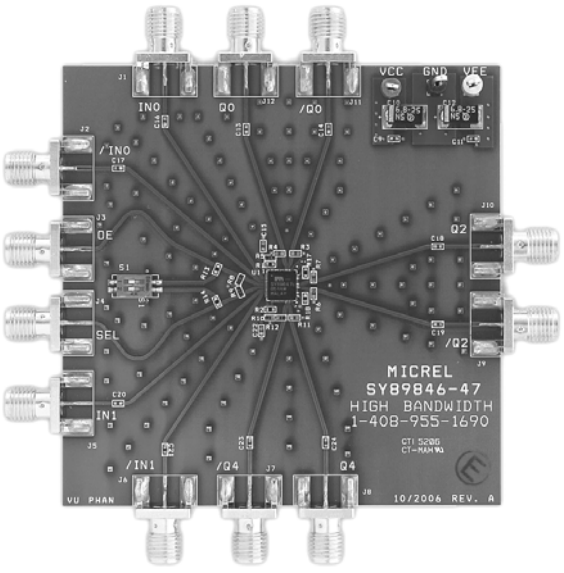
Features

- SY89846U LVPECL outputs
- SY89847U LVDS outputs
- SMA I/O connectors
- +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-coupled operation

Related Documentation

- SY89846U, Precision 1:5 LVPECL Fanout with 2:1 MUX and Fail-Safe Input with Internal Termination Datasheet
- SY89847U, Precision 1:5 LVDS Fanout with 2:1 MUX and Fail-Safe Input with Internal Termination Datasheet

Evaluation Board



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Evaluation Board Description

The SY89846U and SY89847U share a common evaluation board. The individual evaluation boards are labeled to identify the specific device on that board. The SY89847U is an LVDS-output evaluation board and the SY89846U is an LVPECL-output evaluation board.

The default configuration for the boards is the AC-coupled configuration. The choice between two configurations offers flexibility for different applications.

AC-Coupled Evaluation Board

The AC-coupled configuration is suited for 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 when interfacing to a variety of signal sources.

The DC-bias levels and AC-coupling capacitors are supplied on-board for each input. The user only needs 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

SY89846U

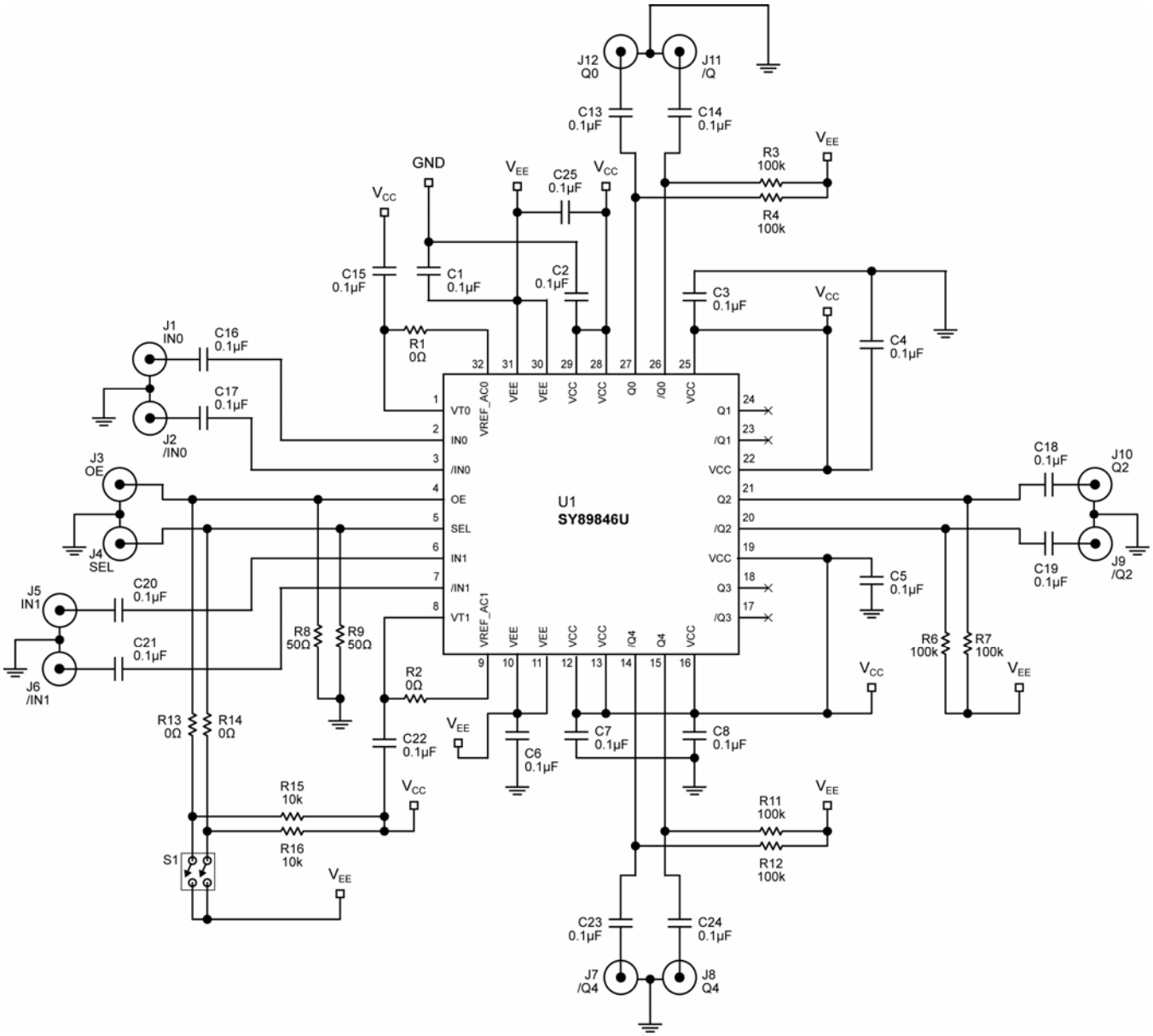
For DC-coupled operation, the boards can be modified to use two power supplies in a "split-supply configuration". The term split-supply simply means the +3.3V supply is split into a +2V and –1.3V, or for a +2.5V supply it is split into a +2V and –0.5V power supply configuration. This effectively offsets the board by +2V. 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 so the device power pins still see a full 3.3V or 2.5V potential between V_{CC} and V_{EE}.

Step-by-step instructions for modifying an AC-coupled evaluation board for DC-coupled operation are supplied in the sub-section, "Modifying your AC-Coupled Board for DC-Coupled Operation."

SY89847U

DC-coupled operation can be accomplished by modifying the board to use two power supplies into a "split-supply configuration". In order to correctly interface LVDS to a 50Ω-(to-ground) scope, V_{CC} must be V_{OCM} above the ground level. Therefore, a 2.5V supply will be split into +1.2V and -1.3V to ensure a proper V_{CC} to V_{EE} voltage difference.

Evaluation Board



SY89846U 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
AC-Coupled Input/DC-Coupled Output	2.5V	2.0V	0V	-0.5V
AC-Coupled Input/DC-Coupled Output	3.3V	2.0V	0V	-1.3V

Table 1. SY89846U AC/DC-Coupled Evaluation Board Power Supply Connections

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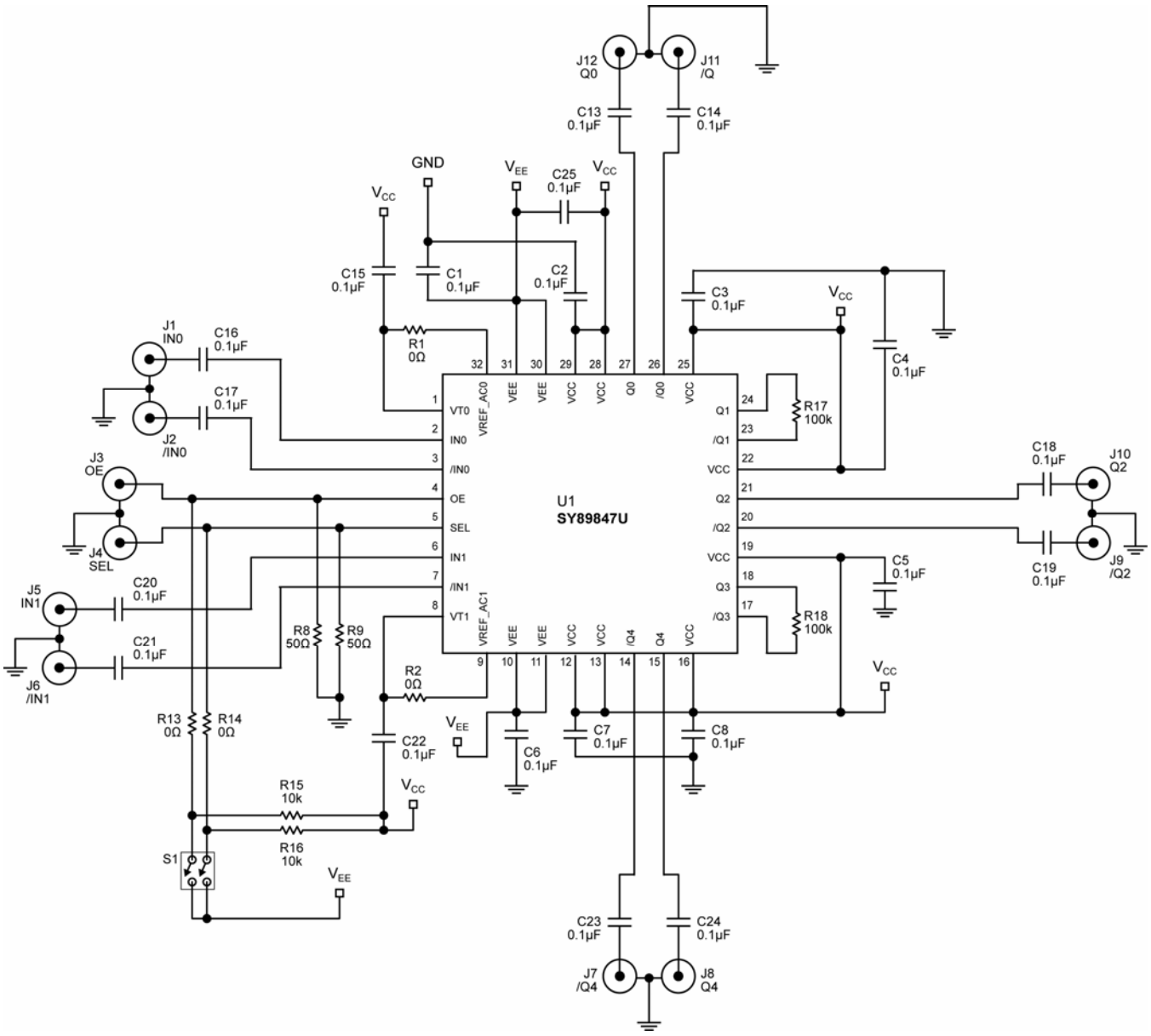
Evaluation Board



SY89847U 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/DC-Coupled Output	2.5V	1.2V	0V	-1.3V

Table 2. SY89847U AC/DC-Coupled Evaluation Board Power Supply Connections

AC-Coupled Evaluation Board Setup

Setting up the SY89846/47U 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 2.5V or 3.3V (2.5V for SY89847U) and turn off the supply.
2. On the evaluation board, short the GND terminal to the V_{EE} terminal and connect them to the negative side of the DC power supply.
3. Connect the V_{CC} terminal to the positive side of the DC power supply.
4. Turn on the power supply and verify that the power supply current is <420mA.
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). Turn off, or disable the outputs of the signal source.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation.
8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board to the oscilloscope or other measurement device that has an internal 50Ω termination.
9. Turn on the power and verify the current is <500mA.
10. Input to the SEL or OE pin can be provided by the dip-switch or a signal from the SMA connector. If SMA connector is used, add a 50Ω resistor close to the SEL and OE input in order to terminate the transmission line and remove R14 and R13.
11. Enable the signal source and monitor the outputs.

Modifying an AC-Coupled Board for DC-Coupling Operation

When DC-coupling the Output is Necessary

For applications where AC-coupling the output is not appropriate, the board can be reconfigured for DC-coupled output operation. The inputs remain AC-coupled.

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

SY89846U

1. Replace capacitors C13, C14, C18, C19, C23, and C24 with 0Ω resistors.
2. Remove R3, R4, R6, R7, R11, and R12.

SY89847U:

1. Replace capacitors C13, C14, C18, C19, C23, and C24 with 0Ω resistors.

DC-Coupled Evaluation Board Setup

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

SY89846U

1. Set the voltage for DC supply number 1 to be 2V and connect the positive side to V_{CC}
2. Set the voltage for DC supply number 2 to be -1.3V (or -0.5V for a 2.5V application) and connect the negative side to 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 to the negative side of DC power supply 1 and the positive side of DC power supply 2.
5. Verify that the power supply current is <420mA.
6. Turn off the power supply.
7. Using a differential signal source, set the amplitude of each side of the differential pair to be 800mV (1600mV measured differentially). The 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.
8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board to the oscilloscope or other measurement device that has an internal 50Ω termination. Any outputs that are not connected to a scope or any other instrument should be terminated with a 50Ω termination-to-ground at the SMA on the board.
9. Turn on the power and verify the current is <500mA.
10. Enable the signal source and monitor the outputs.

SY89847U:

1. Set the voltage for DC supply number 1 to be 1.2V and connect the positive side to V_{CC}
2. Set the voltage for DC supply number 2 to be -1.3V and connect the negative side to 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 to the negative side of DC power supply 1 and the positive side of DC power supply 2.
5. Verify that the power supply current is <420mA.
6. Turn off the power supply.
7. Using a differential signal source, set the amplitude of each side of the differential pair to be 325mV (650mV measured differentially). The 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.
8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board to the oscilloscope or other measurement device that has an internal 50Ω termination. Any outputs that are not connected to a scope or any other instrument should be terminated with a 50Ω termination-to-ground at the SMA on the board.
9. Turn on the power and verify the current is <500mA.
10. Enable the signal source and monitor the outputs.

Evaluation Board Layout

PC Board Layout

The evaluation boards are constructed with Rogers 4003 material, and are coplanar in design to minimize noise, achieve high bandwidth, and minimize crosstalk. I/O strips signal traces are micro-strip.

Top	Signal
L1	GND
L2	V_{CC}
L3	V_{EE}
L4	GND
Bottom	Signal and GND

Table 3. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1-C9, C11, C13-C25	VJ0402Y104KXXAT	Vishay[1]	0.1µF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	23
C10, C12	293D685X9025C2T	Vishay[1]	6.8uF, 25 V, 10%, Tantalum Electrolytic Capacitor, Size 293D	2
R15, R16	CRCW0401002F	Vishay[1]	10kΩ, 1/16W, 5%, Resistor SMD, Size 0402	2
R1, R2, R13, R14	CRCW040200R0F	Vishay[1]	0Ω, 1/16W, 5% Thick-film Resistor, Size 0402	4
R3, R4, R6, R7, R11, R12, R17, R18	CRCW0402820F	Vishay[1]	100Ω, 1/16W, 5% Thick-film Resistor, Size 0402	8
J1-J12	142-0701-851	Johnson Components[2]	Jack Assembly End Launch SMA	12
P1	5005K-ND	Digi-Key.[3]	Red Test Point	1
P2	5006K-ND	Digi-Key.[3]	Black Test Point	1
P3	5007K-ND	Digi-Key.[3]	Yellow Test Point	1
S1	CKN1362-ND	Digi-Key.[3]	Dip Switch	1
U1	**SY89846U**	**Micrel, Inc.[4]**	**Ultra-Precision 1:5 LVPECL Divider/Fanout Buffer**	1
U1	**SY89847U**	**Micrel, Inc.[4]**	**Ultra-Precision 1:5 LVDS Divider/Fanout Buffer**	1

Notes:

1. Vishay: www.vishay.com.
2. Johnson Components: www.johnsoncomponents.com.
3. Digi-Key: www.digikey.com
4. **Micrel, Inc.: www.micrel.com.**

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 Bandwidth products go to Micrel Inc., 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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