



Precision LVPECL/LVDS/CML Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination

SY89843/4/5U Evaluation Board

General Description

The SY89843/4/5U evaluation board is designed for convenient setup and quick evaluation of the SY89843U, SY89844U, and SY89845U. The boards are optimized to interface directly to a 50 Ω oscilloscope.

For best AC performance, the boards are 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 data sheets and support documentation can be found on Micrel's web site at: www.micrel.com.

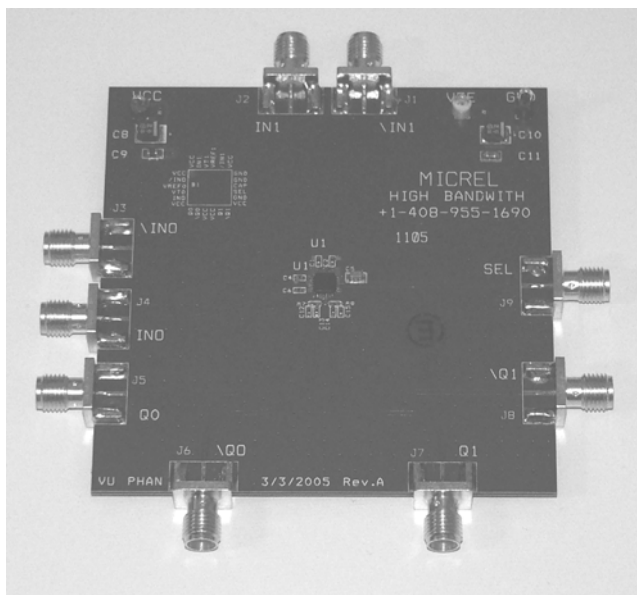
Features

- +2.5V or +3.3V power supply for the SY89843/5U
- +2.5V power supply for the SY89844U
- 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

- SY89843U, Precision LVPECL Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination Data Sheet
- SY89844U, Precision LVDS Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination Data Sheet
- SY89845U, Precision CML Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination Data Sheet

Evaluation Board



Evaluation Board Description

The default configurations for the SY89843/4/5U boards are 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 $\pm 5\%$ and +3.3V $\pm 10\%$ 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.

SY89843U

DC-coupled operation can be accomplished by modifying the board to use two power supplies in a "split-supply configuration." Since LVPECL is referenced to V_{CC} , and standard PECL termination is 50 Ω to $V_{CC}-2V$, split-supply is an easy method to interface to a 50 Ω (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 GND potential on the board to 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.

SY89844U

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 50 Ω (to ground) scope, V_{CC} must be V_{OCM} above the GND level. Therefore, a 2.5V supply will be split into +1.2V and -1.3V to ensure proper V_{CC} to V_{EE} voltage difference.

SY89845U

In order to correctly interface CML to a 50 Ω (to ground) scope in a DC-coupled environment, V_{CC} must be tied to the same voltage as GND. This can be accomplished by setting V_{CC} and GND to the supply level and set V_{EE} to 0V.

Runt Pulse Eliminator

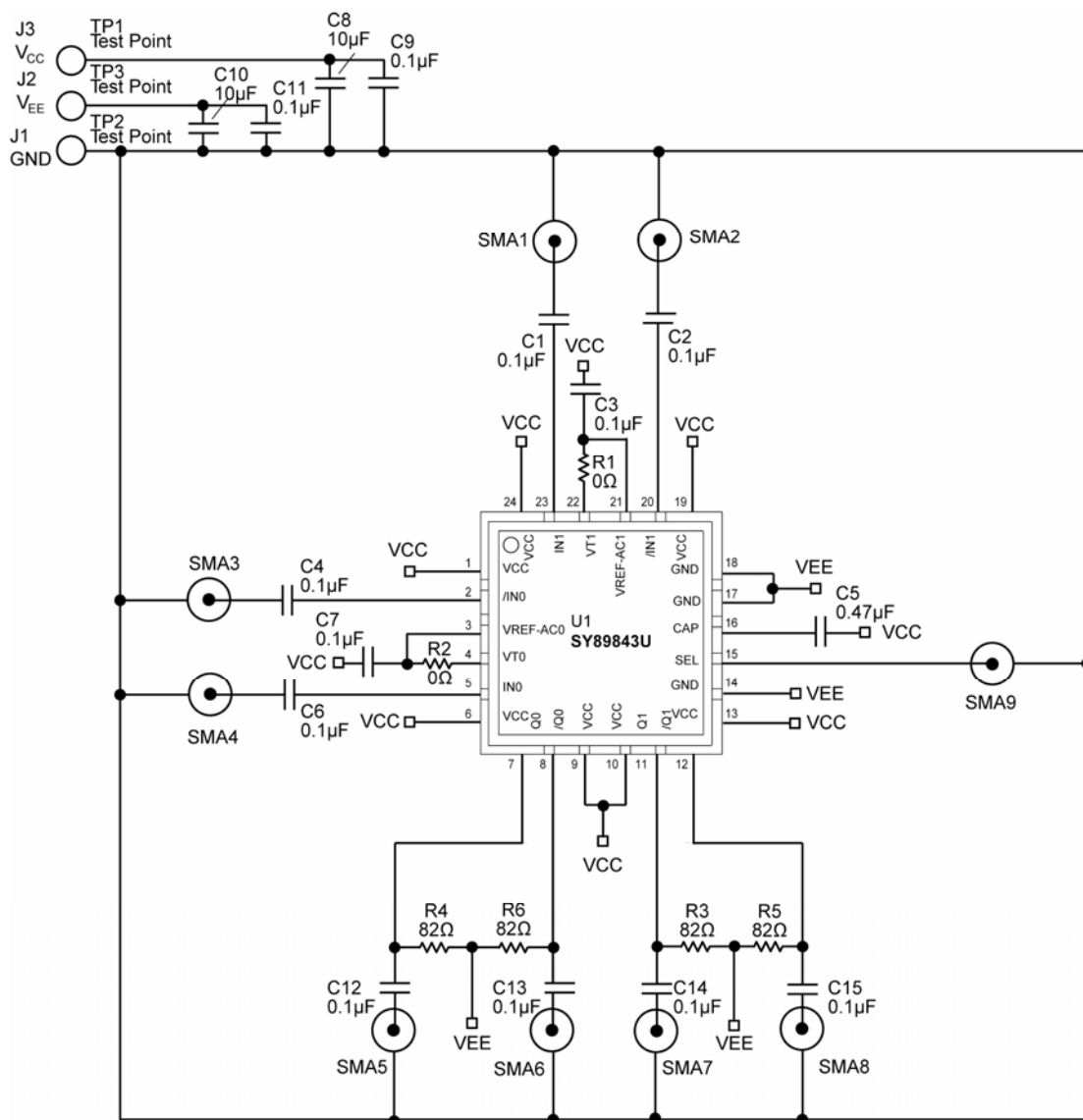
The SY89843/4/5U evaluation board allows the user to test the runt pulse eliminator function. The runt pulse eliminator function prevents any short cycles or "runt" pulses during switchover.

To see the effects of the runt pulse eliminator function, disable it by replacing C5 with a 0 Ω resistor. Sweep the frequency of the function generator to see runt pulses develop. Enable the runt pulse eliminator function by restoring C5, and perform the same frequency sweep.

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



SY89843U AC-Coupled Evaluation Board

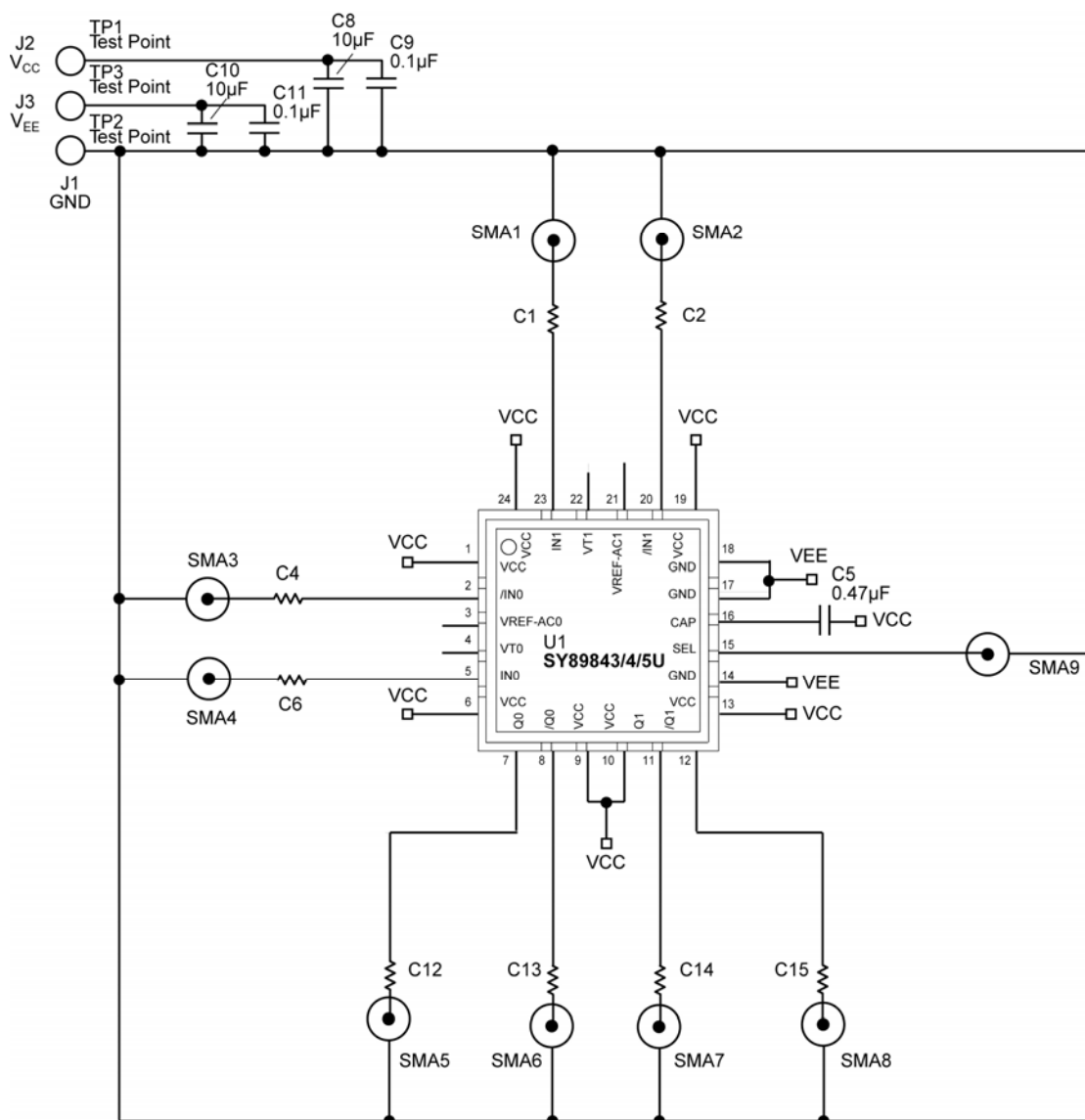
I/O	Power Supply	V _{CC}	GND	V _{EE}
AC-Coupled Input/AC-Coupled Output	2.5V	+2.5V	0V	0V
AC-Coupled Input/AC-Coupled Output	3.3V	+3.3V	0V	0V

Table 1. SY89843U AC-Coupled Evaluation Board Power Supply Connections



Table 2. SY89844/5U AC-Coupled Evaluation Board Power Supply Connections

Evaluation Board



DC-Coupled Evaluation Board

Note:

When reconfiguring an AC-coupled board into a DC-coupled board, replace capacitors C1, C2, C4, C6, C12, C13, C14, and C15 with a 0Ω resistor.

I/O	Power Supply	V _{CC}	GND	V _{EE}
SY89843U DC-Coupled Input/DC-Coupled Output	2.5V	+2.0V	0V	-0.5V
SY89843U DC-Coupled Input/DC-Coupled Output	3.3V	+2.0V	0V	-1.3V
SY89844U DC-Coupled Input/DC-Coupled Output	2.5V	+1.2V	0V	-1.3V
SY89845U DC-Coupled Input/DC-Coupled Output	2.5V	+2.5 V	2.5V	0V
SY89845U DC-Coupled Input/DC-Coupled Output	3.3V	+3.3V	3.3V	0V

Table 3. DC-Coupled Evaluation Board Power Supply Connections

AC-Coupled Evaluation Board Setup

Setting up the SY89843/4/5U 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 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 the 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 400mV (800mV 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 50 Ω impedance coaxial cables, connect the signal source to the inputs on the evaluation board (SMA1 and SMA2 or SMA3 and SMA4).
8. Using equal length 50 Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA5 and SMA6 or SMA7 and SMA8) to the oscilloscope or other measurement device that has an internal 50 Ω termination. Any of these four outputs that are not connected to a scope or other instrument should be terminated with a 50 Ω -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. Reconfiguring the board for DC-coupled operation, and using two power supplies, can avoid this condition.

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

SY89843U

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

1. Remove resistors R1-R6.
2. Remove capacitors C3 and C7.
3. Replace capacitors C1, C2, C4, C6, C12, C13, C14 and C15 with 0Ω resistors.

SY89844/5U

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

4. Remove resistors R1, R2.
5. Remove capacitors C3 and C7.
6. Replace capacitors C1, C2, C4, C6, C12, C13, C14 and C15 with 0Ω resistors.

Setting up the DC-Coupled Evaluation Board

SY89843U

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.
6. Turn off the power supply.
7. 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
$V_{OH} = V_{CC} - 1.0V$	+1.0V	+1.0V
$V_{OL} = V_{CC} - 1.75V$	+0.25V	+0.25V

Table 4. LVPECL I/O Levels

8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA5 and SMA6 or SMA7 and SMA8) to the oscilloscope or other measurement device that has an internal 50Ω termination. Any of these four 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.
9. Turn on the power and verify the current is <200mA.
10. Enable the signal source and monitor the outputs.

SY89844U

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 1.20V and connect it to J1 (V_{CC}).
2. Set the voltage for DC supply number 2 to be – 1.3V 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.
6. Turn off the power supply.
7. Disable the outputs of the differential signal source and set the $V_{OH} = 350mV$ and the $V_{OL} = 0V$.
8. Using equal length 50Ω impedance coaxial cables connect the outputs of the evaluation board (SMA5 and SMA6 or SMA7 and SMA8) to

the oscilloscope or other measurement device that has an internal 50Ω termination. Any of these four 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.

9. Turn on the power and verify the current is <200mA.
10. Enable the signal source and monitor the outputs.

SY89845U

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

1. Set the voltage for the positive side of the power supply to be 2.5V or 3.3V, depending upon your application, and connect it to J1 (V_{CC}) and J3 (GND).
2. Set the voltage for the negative side of the power supply to be 0V and connect it to J3 (V_{EE}).
3. Turn on the power supply and verify that the power supply current is <160mA using a voltmeter.
4. Turn off the power supply.
5. Disable the outputs of the differential signal source and set the $V_{OH} = V_{CC}$ and the $V_{OL} = V_{CC}-0.40V$ as shown in the following table:

I/O Voltage Level	+3.3V Supply	+2.5V Supply
$V_{OH} = V_{CC}$	+3.3V	+2.5V
$V_{OL} = V_{CC}-0.40V$	+2.9V	+2.1V

Table 5. CML I/O Levels

6. Using equal length, 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA5 and SMA6 or SMA7 and SMA8) to the oscilloscope or other measurement device that has an internal 50Ω termination. Any of these four 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.
7. Turn on the power and verify the current is <200mA.
8. Enable the signal source and monitor the outputs.

Evaluation Board Layout

PC Board Layout

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

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

Table 6. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1-C4, C6-C7, C9, C11, C12-C15	VJ0402Y104KXXAT	Vishay ⁽¹⁾	0.1μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	12
C5	VJ0402Y474KXXAT	Vishay ⁽¹⁾	0.47μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	1
C8, C10	293D106X0025C2T	Vishay ⁽¹⁾	10μF, 20V, Tantalum Electrolytic Capacitor, Size C	2
R1, R2	CRCW0402000F	Vishay ⁽¹⁾	0Ω, 1/16W, Resistor SMD, Size 0402	2
R3, R4, R5, R6	CRCW04028250F	Vishay ⁽¹⁾	82Ω, 1/10W, 5% Thick-film Resistor, Size 0402	2
J1	5006K-ND	Keystone Electronics ⁽²⁾	Black Test Point	1
J2	5009K-ND	Keystone Electronics ⁽²⁾	Yellow Test Point	1
J3	5005K-ND	Keystone Electronics ⁽²⁾	Red Test Point	1
SMA1-SMA9	142-0701-851	Johnson ⁽³⁾	Jack Assembly End Launch SMA	9
U1	SY89843U	Micrel ⁽⁴⁾	Precision LVPECL Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination	1
U1	SY89844U	Micrel ⁽⁴⁾	Precision LVDS Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination	1
U1	SY89845U	Micrel ⁽⁴⁾	Precision CML Runt Pulse Eliminator 2:1 MUX with 1:2 Fanout Buffer and Internal Termination	1

Additional Components for DC-Coupled Boards

Item	Part Number	Manufacturer	Description	Qty.
C1-C2, C4, C6, C12-C15	CRCW0402000F	Vishay ⁽¹⁾	0Ω, 1/16W, Resistor SMD, Size 0402	8

Notes:

1. Vishay: www.vishay.com.
2. Keystone Electronics: www.kevelco.com.
3. Johnson: www.johnsoncomponents.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 High Bandwidth products 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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