PECL & ECL ÷2/÷4 Clock Generator

SY89312/3V Evaluation Board

General Description

The SY89312V and SY89313V evaluation boards are designed for convenient setup and quick evaluation of these devices. The boards are optimized to interface directly to a 50Ω oscilloscope.

The default evaluation board I/O configuration is AC-coupled inputs and outputs. 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 website at www.micrel.com.

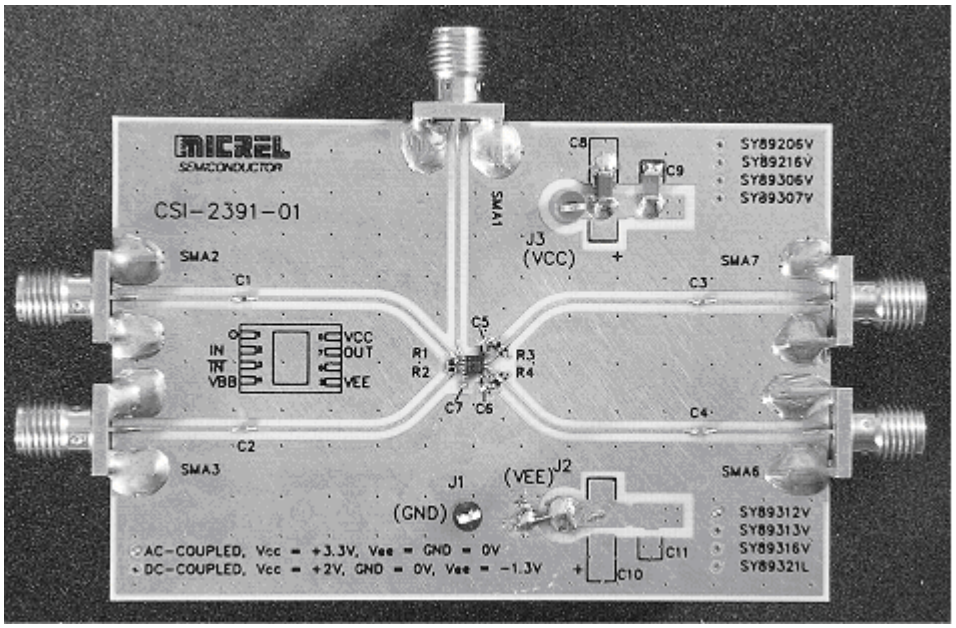
Features

- SY89312V: ÷2 Clock Generator
- SY89313V: ÷4 Clock Generator
- Single +3.3V or +5V power supply
- AC-coupled configuration for ease-of-use
- I/O interface includes on-board termination
- Fully assembled and tested
- Reconfigurable for DC-coupled operation

Related Documentation

- SY89312V, 3.3V/5V 4GHz PECL/ECL ÷2 Clock Generator Data Sheet
- SY89313V, 3.3V/5V 4GHz PECL/ECL ÷4 Clock Generator Data Sheet

Evaluation Board



Evaluation Board Description

The SY89312V and SY89313V evaluation boards can be configured for either AC-coupled or DC-coupled operation.

The default configuration for the boards is AC-coupled inputs and AC-coupled outputs. The choice between two configurations offers the user flexibility in selecting the board that is right for his particular application.

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 of either 3.3V ±10% or 5.0V ±10% 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. 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 DC-coupled operation, the board can be modified to use two power supplies in a “split-supply configuration”. Split-supply is an easy method to interface to a 50Ω (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 +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 to ensure proper V_{CC} to V_{EE} voltage difference.

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

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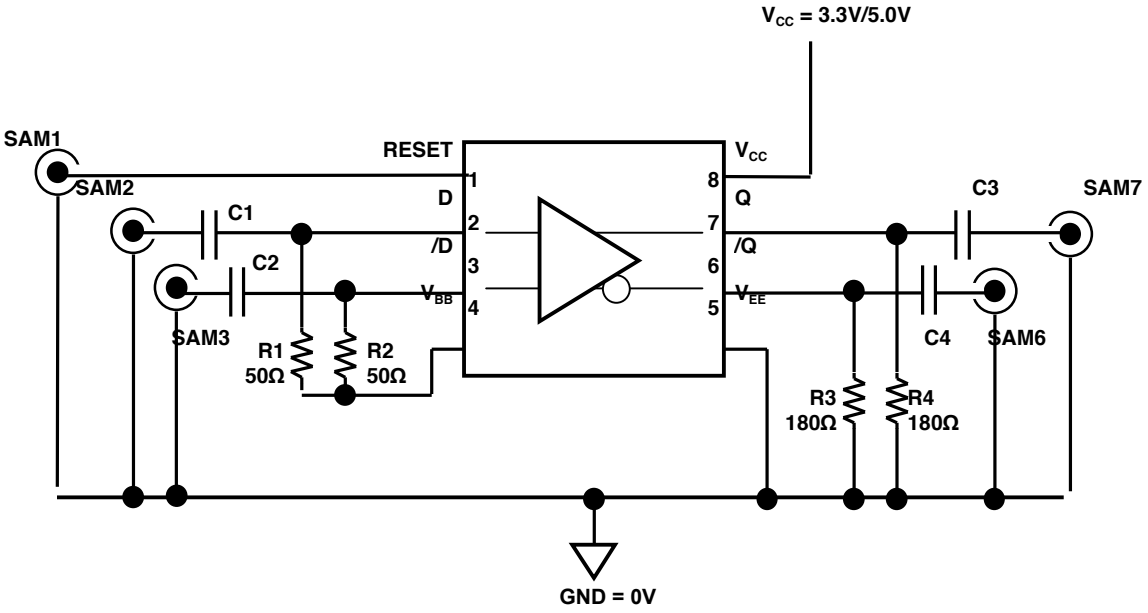
Evaluation Board



SY89312/3V AC-Coupled Evaluation Board

AC-Coupled Evaluation Board Power Supply Connections				
Power Supply	**V_{CC}**	**GND**	**V_{EE}**	**I/O**
3.3 Volt System	+3.3V	0V	0V	AC-Coupled Input/AC-Coupled Output
5 Volt System	+5V	0V	0V	AC-Coupled Input/AC-Coupled Output

Table 1. SY89312/3V AC-Coupled Configuration

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AC-Coupled Evaluation Board Setup

Setting up the 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 3.3V or 5.0V depending on your application and turn off the supply.
2. Connect the GND 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 that the power supply current is <100mA.
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 (SMA2 and SMA3).
8. Connect a variable DC power supply to the input on the evaluation board (SMA1). This is the control voltage and should be between V_{CC} and V_{CC}-1.3V.
9. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA6 and SMA7) to the oscilloscope or other measurement device that has an internal 50Ω termination.
10. Turn on the power and verify the current is <100mA.
11. Enable the signal source and monitor the outputs.

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1, C2, C3, C4, C7	VJ0402Y104KXXAT	Vishay[1]	0.1μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	5
C5, C6	VJ0402Y103KXXAT	Vishay[1]	0.01μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	2
C8	293D685X0025B2T	Vishay[1]	6.8μF, 20V, Tantalum Electrolytic Capacitor, Size C	1
C9	VJ0805Y103KXXAT	Vishay[1]	0.01μF, 25V, 10% Ceramic Capacitor, Size 0805	1
R1, R2	CRCW0402500F	Vishay[1]	50Ω, 1/16W, 5% Thick-film Resistor, Size 0402	2
R3, R4	CRCW04021800F	Vishay[1]	180Ω, 1/16W, 5% Thick-film Resistor, Size 0402	2
J1	111-0703-001	Johnson Components[2]	Black Banana Jack	1
J3	111-0702-001	Johnson Components[2]	Red Banana Jack	1
SMA1, SMA2, SMA3, SMA6, SMA7	142-0701-851	Johnson Components[2]	Jack Assembly End Launch SMA	5
U1	**SY89312/3V**	**Micrel[3]**	PECL/ECL ÷2/÷4	1

Notes:

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

Evaluation Board Layout

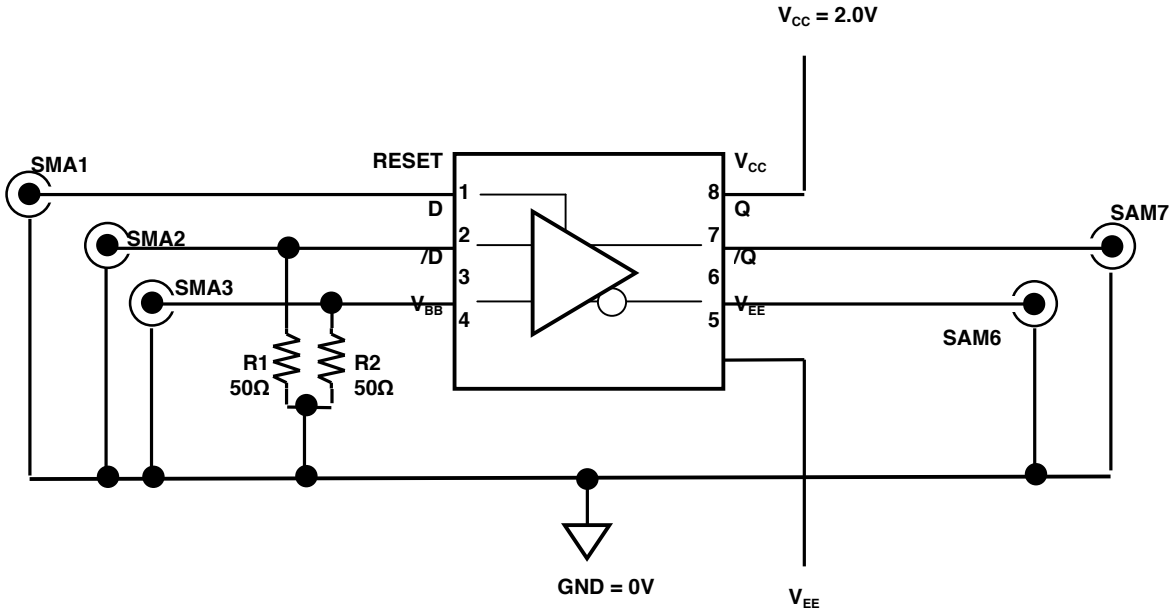
PC Board Layout

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

Layer	SY89312/3V
L1	GND and Signal
L2	Impedance GND
L3	V_{CC} and V_{EE}
L4	GND and Signal

Table 2. Layer Stack

Evaluation Board

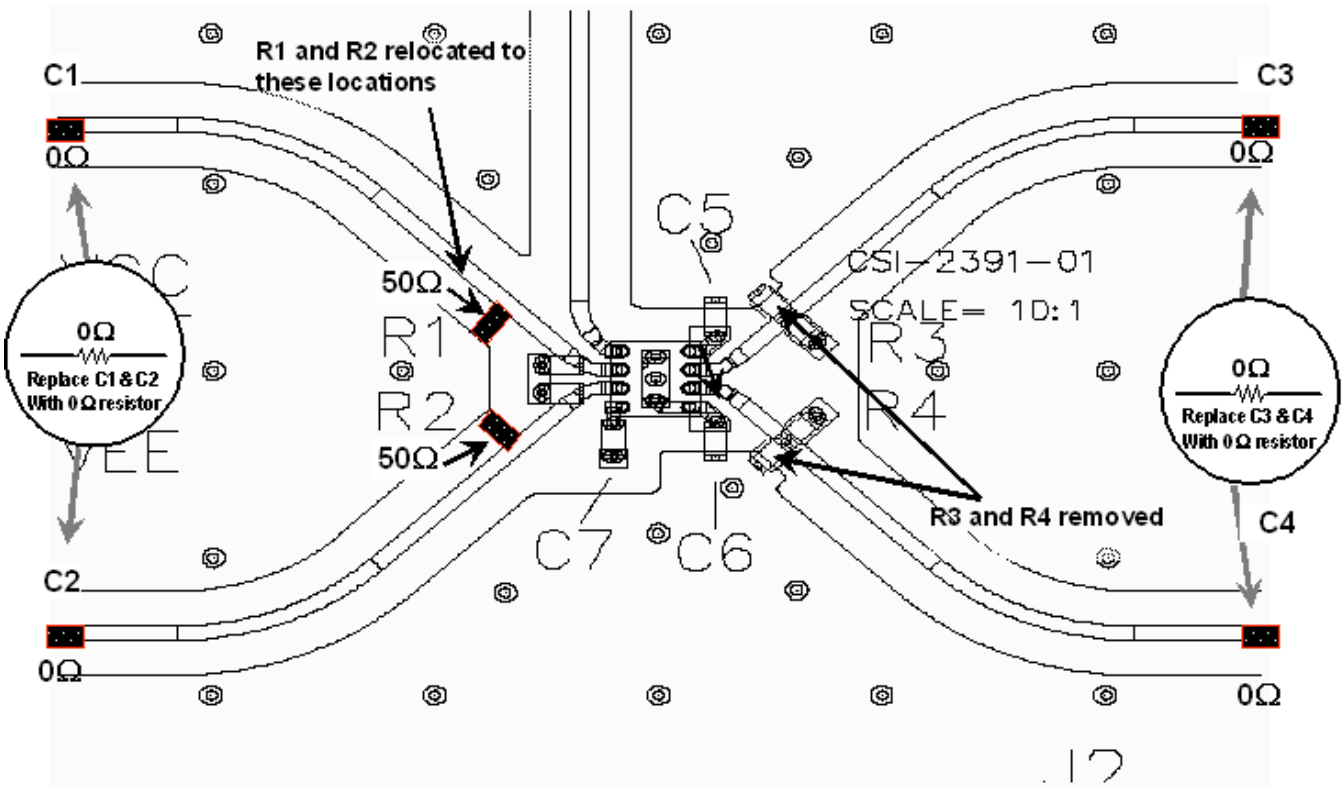


SY89312/3V DC-Coupled Evaluation Board

DC-Coupled Evaluation Board Power Supply Connections				
Power Supply	**V_{CC}**	**GND**	**V_{EE}**	**I/O**
3.3 Volt System	+2V	0V	-1.3V	AC-Coupled Input/DC-Coupled Output
5 Volt System	+2V	0V	-3.0V	AC-Coupled Input/DC-Coupled Output

Table 3. SY89312/3V DC-Coupled Configuration

Evaluation Board



SY89312/3V DC-Coupled Loading Diagram

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. Remove resistors R3 and R4.
2. Remove resistors R1 and R2 and reposition them as shown in the loading diagram.
3. Replace capacitors C1, C2, C3 and C4 with 0Ω resistors.
4. Remove the soldered-wire shorting bar between J2 (V_{EE}) and the ground plane.
5. Install components J2, C10 and C11. These locations should look like the components in J3, C8 and C9.
6. For easy identification, remove the solder dot from the via adjacent to the AC-coupled silkscreen label on the front of the board and add a solder dot to the DC-coupled via.

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 J3 (V_{CC}).
2. Set the voltage for DC supply number 2 to be –1.3V (for 3.3V operation) or –3.0V (for 5.0V 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 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 <100mA. 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	+5.0V Supply
$V_{OH} = V_{CC}$-1.0V	+2.3V	+4.0V
$V_{OL} = V_{CC}$-1.75V	+1.55V	+3.25V

8. Using equal length 50Ω impedance coaxial cables, connect the signal source to the inputs on the evaluation board (SMA2 and SMA3).
9. Using a 50Ω impedance coaxial cable, connect a signal source to the input on the evaluation board (SMA1).
10. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (SMA6 and SMA7) to the oscilloscope or other measurement device that has an internal 50Ω termination.
11. Turn on the power and verify the current is <100mA.
12. Enable the signal source and monitor the outputs.

Bill of Materials

Additional Bill of Materials for DC-Coupled Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C1, C2, C3, C4	CRCW0402000Z	Vishay[1]	Replace capacitors with resistors: 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402	4
C10	293D685X0025B2T	Vishay[1]	6.8μF, 20V, Tantalum Electrolytic Capacitor, Size C	1
C11	VJ0805Y103KXXAT	Vishay[1]	0.01μF, 25V, 10% Ceramic Capacitor, Size 0805	1
J2	111-0702-001	Johnson Components[2]	Red Banana Jack	1

Notes:

1. Vishay: www.vishay.com
2. Johnson Components: www.johnsoncomponents.com
3.

Micrel Cross Reference

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