SY54020AR/R Evaluation Board

Low Voltage 1.2V/1.8V/2.5V CML Differential 1:4 Fanout Buffer with /Enable

General Description

The SY54020AR/R evaluation board is designed for convenient set-up and quick evaluation. It allows the user to evaluate the device over the full voltage range of the part without requiring any modification to the board.

The evaluation board standard configuration is AC-coupled inputs with DC-coupled outputs for direct interface to a 50Ω-compatible oscilloscope. 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 at Micrel's web site at: www.micrel.com.

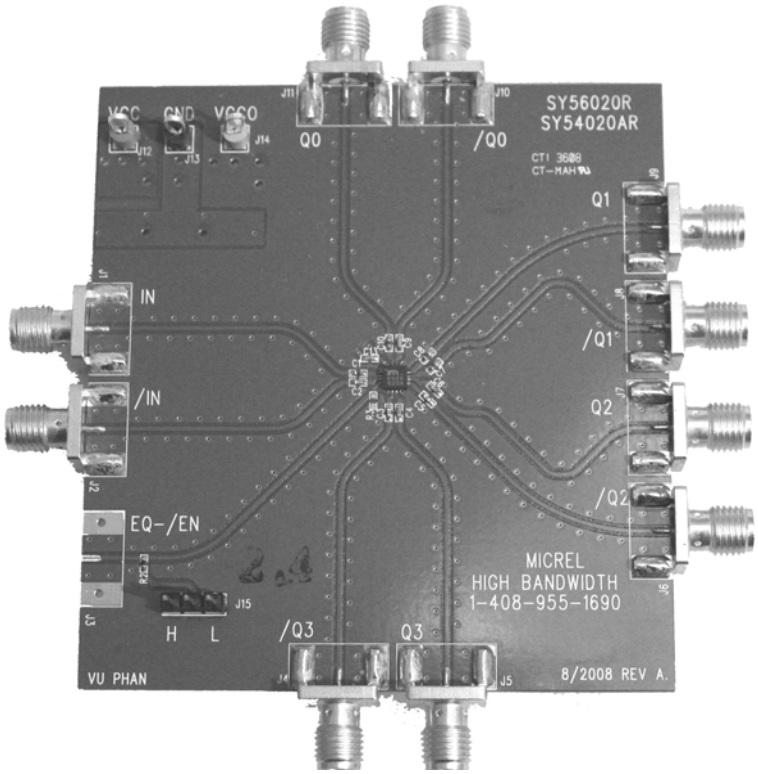
Features

- SY54020AR/R 1.2V/1.8V/2.5V CML outputs
- Synchronous output enable (/EN)
- SY54020R also has fail-safe input
- Single 2.5V VCC with 1.2V/1.8V/2.5V VCCO supply
- AC-coupled configuration for ease-of-use
- I/O interface includes on-board termination
- Fully assembled and tested
- Reconfigurable for DC-coupled operation

Applications

- Clock and data distribution

Evaluation Board



Evaluation Board Description

The SY54020AR/R evaluation board is designed to accept either AC-coupled or DC-coupled inputs; however, all boards are shipped with DC-coupled outputs. The DC-coupled outputs allow the CML output to be connected directly to a scope with the standard termination of 50Ω-to-ground. This is accomplished by tying the body of the SMA connectors to the V_{CCO} supply on the evaluation board so that the scope termination appears as 50Ω-to-V_{CCO} on the board. This allows the body of the SMA connectors, which are scope GND, to appear at the same potential as V_{CCO} for the CML output drivers.

The default configuration for the boards is AC-coupled inputs and DC-coupled outputs and all boards are shipped with this configuration. The choice between the two configurations, AC-coupled or DC-coupled inputs, offers the user flexibility in selecting the board that is right for the given application.

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

If the output is connected to an AC-coupled 50Ω termination, the 1.2V operation may not work due to a 200mV output level shift from the output coupling capacitors.

SY54020AR/R AC-Coupled Evaluation Board (AC-Coupled Input, DC-Coupled Output)

For a 1.2V output configuration, the V_{CC} of the board is set to 2.5V and the V_{CCO} is set to 1.2V. For a 1.8V output configuration, the V_{CCO} is set to 1.8V. For a full 2.5V operation, short V_{CCO} to V_{CC}. For all configurations, the V_{EE} is set to 0V.

Setting up the AC-Coupled Evaluation Board (AC-Coupled Input, DC-Coupled Output)

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

Setting up the Power Supplies:

1. Set the voltage setting of a DC supply to 2.5V and turn off the supply.
2. Set the voltage setting for a second DC supply to be 1.2V, 1.8V or 2.5V and turn off the supply.
3. 2.5V output operation can also be achieved by shorting V_{CCO} to V_{CC} and operating with one supply.
4. Connect the negative terminal of the two power supplies together and connect to the V_{EE} terminal of the evaluation board.
5. Do not earth ground either supply.
6. Turn on the power supplies and verify that the 2.5V supply current is <70mA and 1.2V/1.8V/2.5V supply is <90mA. If using one supply, <160mA.
7. Turn off the power supplies.

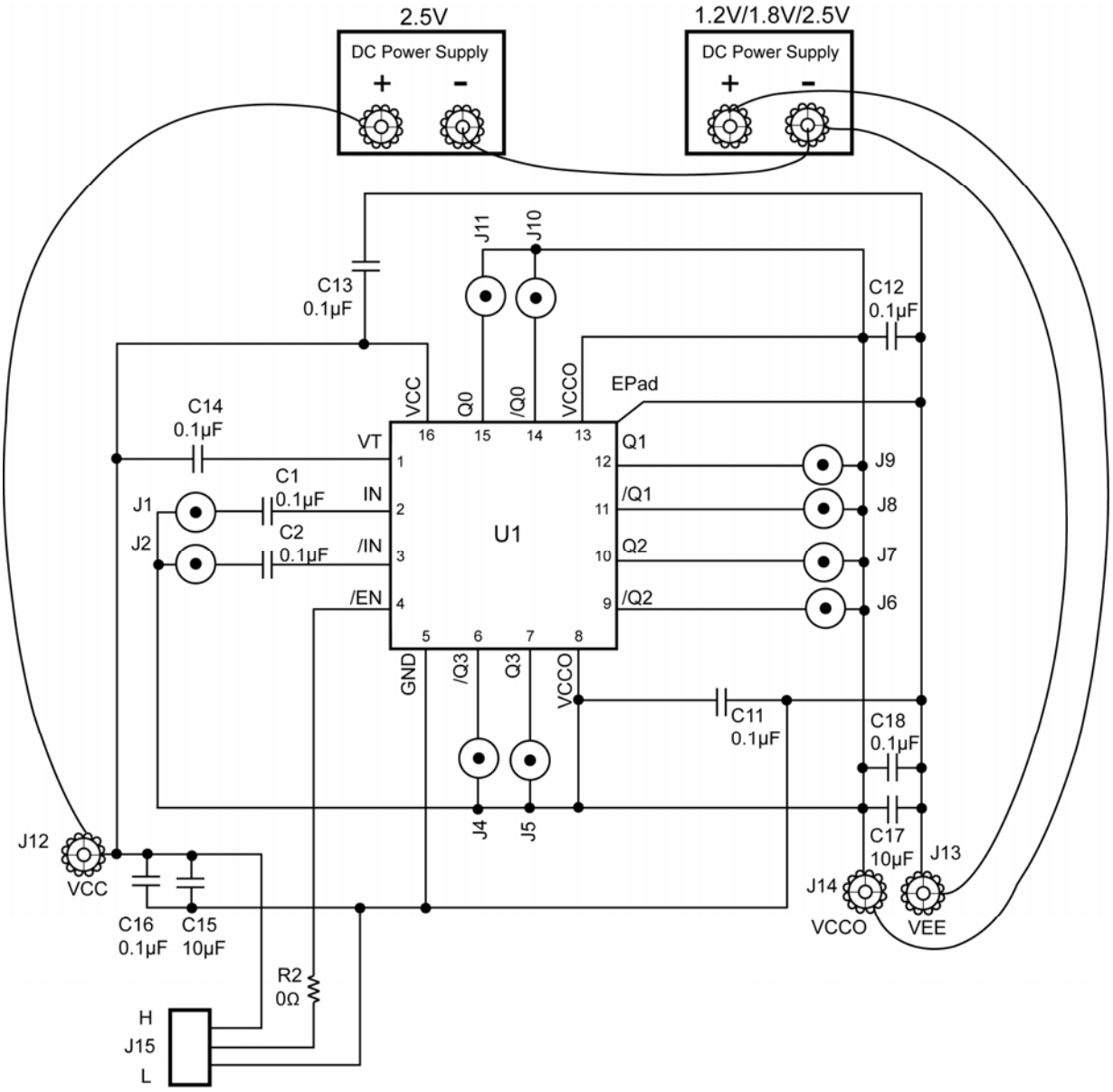
Setting up the AC-Coupled Input

1. Using a differential signal source set the HIGH level of each side of the differential pair to be 0.4V and the LOW level to be 0V. Note that for AC-coupled inputs, only the signal swing is significant, since the input will be re-biased after the series capacitor. The amplitude of the input swing can be any value between 200mV and 1.0V.
2. Using equal length 50Ω impedance coaxial cables, connect the signal source to the input, IN and /IN, on the evaluation board. Make sure the length of each line is matched to each other.
3. The /Enable input (Pin 4) is LOW by default and can be left floating for normal operation. To disable the output, this pin can be tied HIGH.

Setting up the DC-Coupled Output

1. Using equal length 50Ω impedance coaxial cables, connect one of the SMA output pairs of the evaluation board to the oscilloscope or other measurement device that has an internal DC-coupled 50Ω termination. If only one true output is connected to the oscilloscope, the complementary output must still be terminated with a 50Ω termination. Terminate all unused outputs into 50Ω. Otherwise, reflections will distort the waveform being monitored.
2. Turn on the power supplies and verify that the 2.5V supply current is <70mA and 1.2V/1.8V/2.5V supply is <90mA. And <160mA if using one supply.
3. Enable the signal source and monitor the output

Evaluation Board



SY54020AR/R AC-Coupled Evaluation Board

Power Supply	V_{CC}	V_{CCO}	V_{EE}	I/O
1.2V Output	2.5V	1.2V	0V	AC-Coupled Input/DC-Coupled Output
1.8V Output	2.5V	1.8V	0V	AC-Coupled Input/DC-Coupled Output
2.5V Output	2.5V	2.5V	0V	AC-Coupled Input/DC-Coupled Output

Table 2. SY54020AR/R AC-Coupled Evaluation Board Power Supply Connections

Bill of Materials

SY54020AR/R Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C1-C2 C11-C14	VJ0402Y104KXXAT	Vishay[1]	0.1µF, 25V, 10% Ceramic Capacitor, Size 0402,	6
C15,C17	293D106X0010	Vishay[1]	10µF, 20V, Tantalum Electrolytic Capacitor, Size C	2
C16, C18	VJ0805Y104KXXAT	Vishay[1]	0.1µF, 25V, 10% Ceramic Capacitor, Size 0805	2
R2	CRCW040200R0F	Vishay[1]	Add 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402	1
J12			Red Test Point (V_{CC})	1
J13			Black Test Point (V_{EE})	1
J14			Yellow Test Point (V_{CCO})	1
J15	PZC365FBN	Vishay[1]	3-pin Jumper	1
J1-J2 J4-J11	142-0701-851	Johnson Components[2]	Jack Assembly End Launch SMA	10
U1	**SY54020AR/R**	**Micrel [3]**	Low Voltage 1.2V to 2.5V CML Differential 1:4 Fanout Buffer with /Enable	1

Additional Bill of Materials for SY54020AR/R DC-Coupled Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C1-C2	CRCW040200R0F	Vishay[1]	Replace with 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	2
R1	CRCW040200R0F	Vishay[1]	Add 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402	1

Notes:

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

PC Board Layout

Board Layout

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

L1	Signal
L2	V_{CCO} Power
L3	V_{CC} Power
L4	V_{EE} Power
L5	V_{CCO} Power
L6	Signal

Table 3. Layer Stack

Modifying the AC-Coupled Board for DC-Coupled Operation

When DC-Coupling is Necessary

For applications where AC-coupling of the input is not appropriate, the board can be reconfigured for DC-coupled input operation.

Reconfiguring AC-Coupled Inputs to be DC-Coupled Inputs

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

1. Replace capacitors C1-C2 with 0Ω resistors.
2. Install a 0Ω resistor at R1.

Setting up the SY54020AR/R DC-Coupled Evaluation Board (DC-Coupled Input, DC-Coupled Output)

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

Setting up the Power Supplies

1. Set the voltage setting for a DC supply to be 2.5V and turn off the supply.
2. Set the voltage setting for a second DC supply to be 1.2V, 1.8V or 2.5V and turn off the supply.
3. 2.5V output operation can also be achieved by shorting V_{CCO} to V_{CC} and operating with one supply.
4. Connect the negative terminal of the two power supplies together and connect to the V_{EE} terminal of the evaluation board.
5. Do not earth ground either supply.
6. Turn on the power supplies and verify that the 2.5V supply current is <70mA and 1.2V/1.8V/2.5V supply is <90mA. If using one supply, <160mA.
7. Turn off the power supply.

Setting up the DC-Coupled Input

1. When the input is DC-coupled, they are referenced to V_{CCO} because the body of the SMA connectors is tied to V_{CCO}. Therefore, the device HIGH and LOW input voltage levels will change depending on V_{CCO}. To make the input HIGH level 1.8V and LOW level 1.4V, follow Table 4 to program the differential signal source. If the levels are varied, make sure they remain within the datasheet input range, as specified by V_{IH} and V_{IL}.

V_{CCO}	HIGH	LOW
1.2	0.6V	0.2V
1.8	0V	-0.4V
2.5	-0.7V	-1.1V

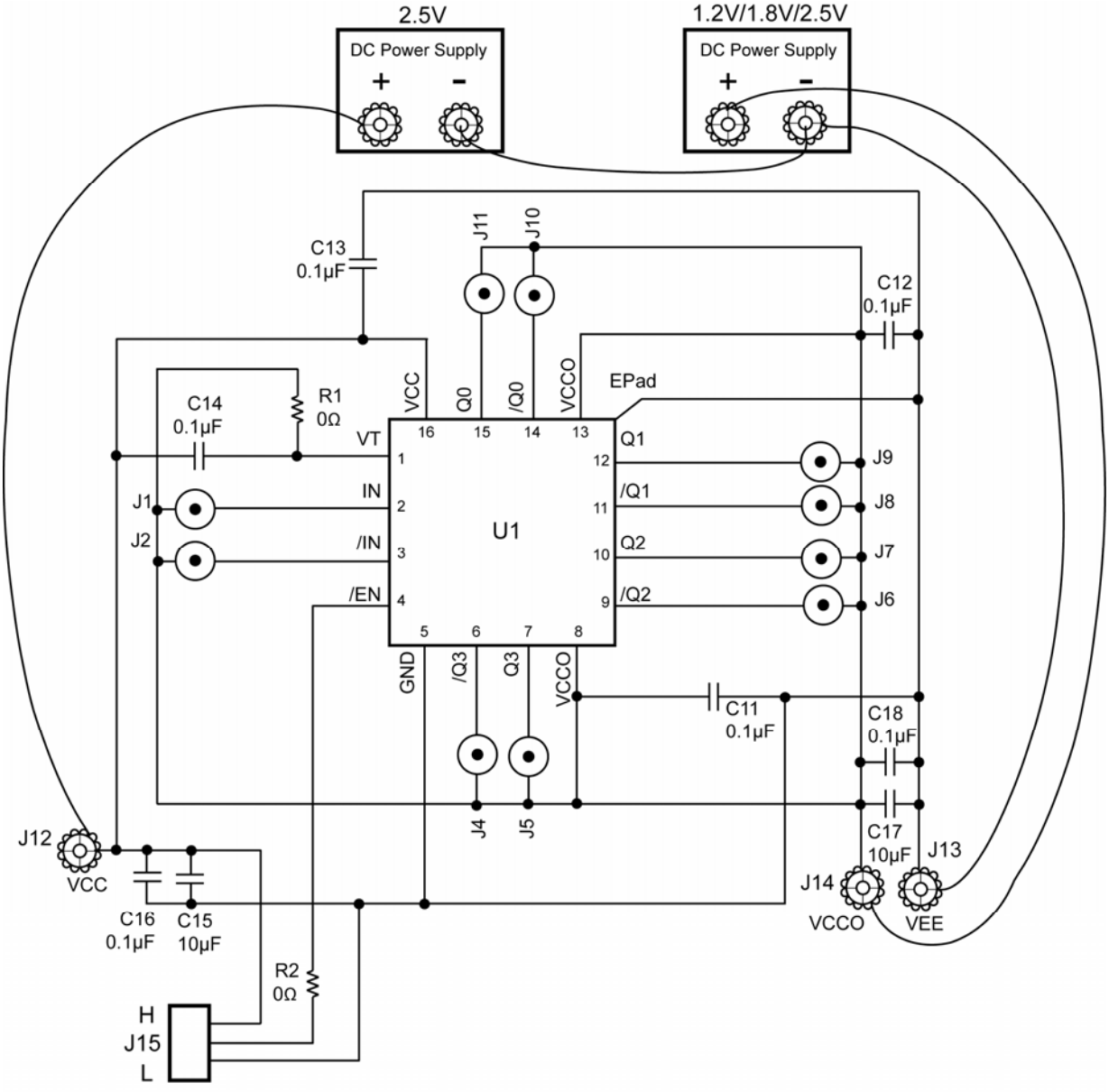
Table 4. Source Levels as a Function of V_{CCO}

2. Using equal length 50Ω impedance coaxial cables, connect the signal source to the input, IN and /IN, on the evaluation board. Make sure the length of each attenuation line is matched to each other.
3. The /Enable input (Pin 4) is LOW by default and can be left floating for normal operation. To disable the output, this pin can be tied HIGH.

Setting up the DC-Coupled Output

1. Using equal length 50Ω impedance coaxial cables connect one of the SMA output pairs of the evaluation board (Pin 15 and Pin 14 for Q0, Pin12 and Pin 11 for Q1, Pin 10 and Pin 9 for Q2, Pin 7 and Pin 6 for Q3) to the oscilloscope or other measurement device that has an internal DC-Coupled 50Ω termination. If only one true output is connected to the oscilloscope, the complementary output must still be terminated with a 50Ω termination. Terminate all unused outputs into 50Ω. Otherwise, reflections will distort the waveform being monitored.
2. Turn on the power supplies and verify that the 2.5V supply current is <70mA and 1.2V/1.8V/2.5V supply is <90mA. And <160mA if using one supply.
3. Enable the signal source and monitor the output

Evaluation Board



SY54020AR/R DC-Coupled Evaluation Board

Power Supply	V_{CC}	V_{CCO}	V_{EE}	I/O
1.2V Output	2.5V	1.2V	0V	DC-Coupled Input/DC-Coupled Output
1.8V Output	2.5V	1.8V	0V	DC-Coupled Input/DC-Coupled Output
2.5V Output	2.5V	2.5V	0V	DC-Coupled Input/DC-Coupled Output

Table 5. SY54020AR/R DC-Coupled Evaluation Board Power Supply Connections

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 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."

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA

TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB http://www.micrel.com