



## SY56017R Evaluation Board

Low Voltage 1.2V to 2.5V CML Differential  
2:1 MUX with Input Equalization

### General Description

The SY56017R evaluation board is designed for convenient set-up and quick evaluation. It allows the user to evaluate the part 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 50 $\Omega$ -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](http://www.micrel.com).

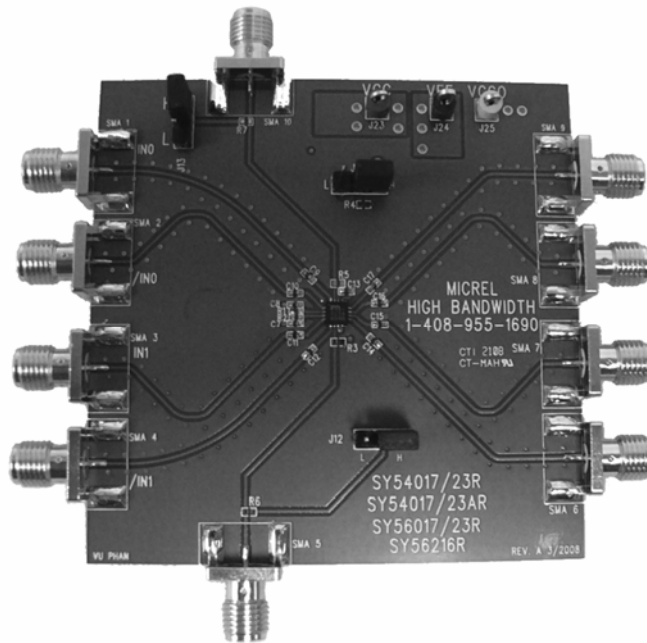
### Features

- SY56017R 1.2V/1.8V/2.5V CML outputs
- 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

- SY56017R Low Voltage 1.2V to 2.5V CML Differential 2:1 MUX with Input Equalization

### Evaluation Board



## Evaluation Board Description

The SY56017R 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 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.

### SY56017R 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 <90mA and 1.2V/1.8V/2.5V supply is <25mA. If using one supply, <115mA.

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 inputs 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 desired attenuation line and then connect to the appropriate input, IN0 or IN1 on the evaluation board. Make sure the length of each attenuation line is matched to each other. The desired input needs to be selected through the SEL pin (Pin 15), which is connected to the J13 jumper. Please refer to Table 1 below for proper selection of input.

SEL/J13	OUTPUT
0	IN0 Input Selected
1	IN1 Input Selected

Table 1. Truth Table

3. The equalization can be selected through the EQ pin (Pin 6), which is connected to the J12 jumper. The EQ setting depends on the length of the attenuation line. Please refer to Table 2 below for the desired equalization selection.

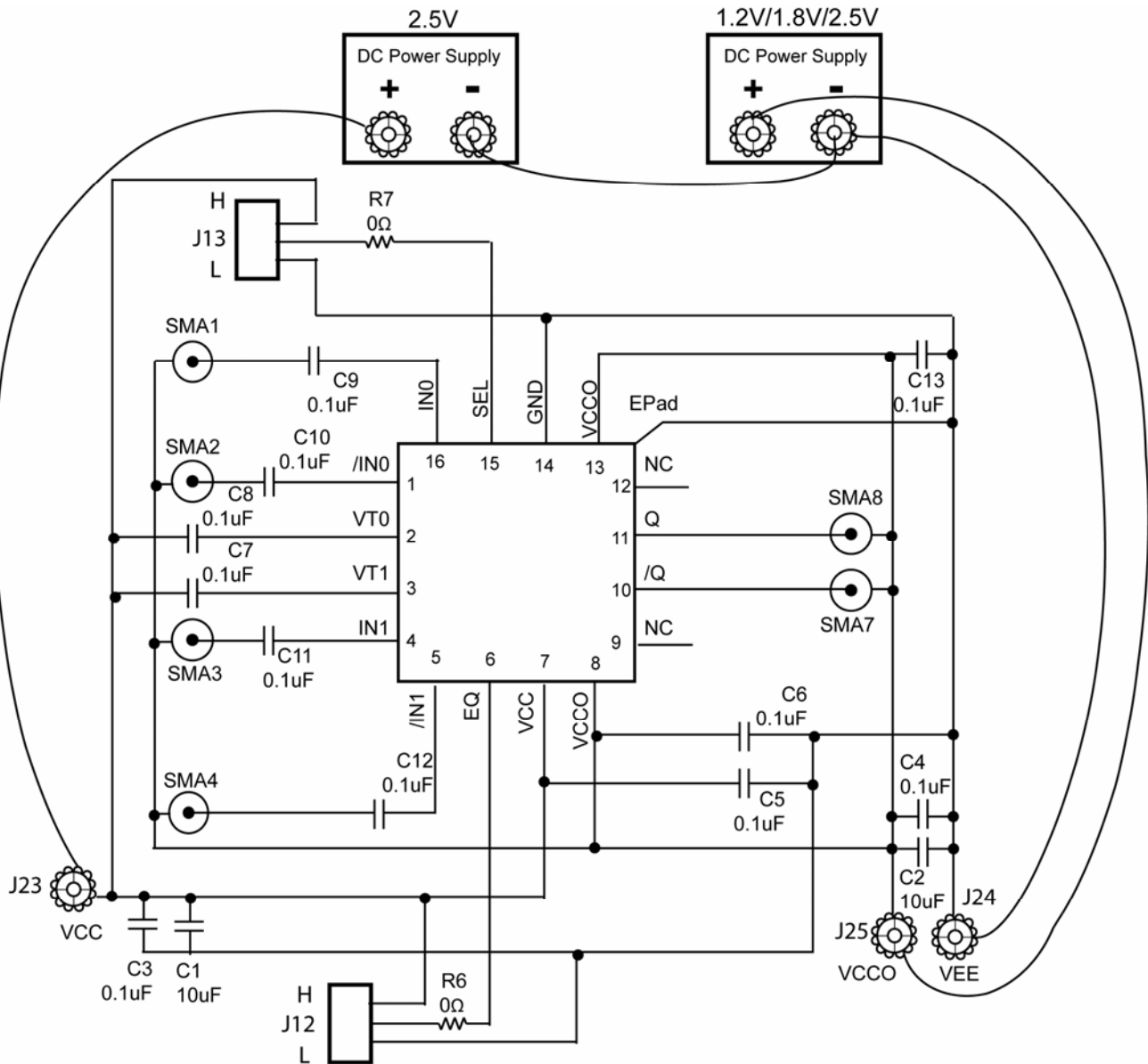
EQ	FRA EQUALIZATION
LOW( L)	27"
FLOAT	18"
HIGH( H)	9"

Table 2. EQ Setting

### Setting up the DC-Coupled Output

1. Using equal length 50Ω impedance coaxial cables connect the SMA outputs of the evaluation board (Pin 10 and Pin 11 for Q) to the oscilloscope or other measurement device that has an internal DC-Coupled 50Ω termination. If only one output is connected to the oscilloscope, the complementary output must still be terminated with a 50Ω termination.
2. Turn on the power supplies and verify that the 2.5V supply current is <90mA and 1.2V/1.8V/2.5V supply is <25mA. And <115mA if using one supply.
3. Enable the signal source and monitor the output.

# Evaluation Board



**SY56017R AC-Coupled Evaluation Board**

Power Supply	V <sub>CC</sub>	V <sub>CCO</sub>	V <sub>EE</sub>	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 3. SY56017R AC-Coupled Evaluation Board Power Supply Connections**

## Bill of Materials

### SY56017R Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C5-C13	VJ0402Y104KXXAT	Vishay <sup>(1)</sup>	0.1 $\mu$ F, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	9
C1,C2	293D106X0010	Vishay <sup>(1)</sup>	10 $\mu$ F, 20V, Tantalum Electrolytic Capacitor, Size C	2
C3, C4	VJ0805Y104KXXAT	Vishay <sup>(1)</sup>	0.1 $\mu$ F, 25V, 10% Ceramic Capacitor, Size 0805	2
R6, R7	CRCW040200R0F	Vishay <sup>(1)</sup>	0 $\Omega$ , 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	2
J23			Red Test Point ( $V_{CC}$ )	1
J24			Black Test Point (GND)	1
J25			Yellow Test Point ( $V_{EE}$ )	1
J12, J13	PZC365FBN	Vishay <sup>(1)</sup>	3-pin Jumper	2
SMA1-SMA4, SMA7, SMA8,	142-0701-851	Johnson Components <sup>(2)</sup>	Jack Assembly End Launch SMA	6
U1	<b>SY56017R</b>	<b>Micrel<sup>(3)</sup></b>	Low Voltage 1.2V to 2.5V CML Differential 2:1 MUX with Input Equalization	1

#### Notes:

1. Vishay: [www.vishay.com](http://www.vishay.com).
2. Johnson Components: [www.johnsoncomponents.com](http://www.johnsoncomponents.com).
3. Micrel, Inc.: [www.micrel.co](http://www.micrel.co)

### Additional Bill of Materials for SY56017R DC-Coupled Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C9-C12	CRCW040200R0F	Vishay <sup>(1)</sup>	Replace with 0 $\Omega$ , 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	4
R1,R2	CRCW040200R0F	Vishay <sup>(1)</sup>	Add 0 $\Omega$ , 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	2

#### Notes:

1. Vishay: [www.vishay.com](http://www.vishay.com)

## PC Board Layout

### Board Layout

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

L1	Signal
L2	V <sub>CCO</sub> Power
L3	V <sub>CC</sub> Power
L4	V <sub>EE</sub> Power
L5	V <sub>CCO</sub> Power
L6	Signal

Table 4. Layer Stack

## Modifying the AC-Coupled Board for DC-Coupled Operation

### When DC-Coupling is Necessary

For applications where AC-coupling of the inputs 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 C9-C12 with 0Ω resistors.
2. Add R1 and R2, 0Ω resistors.

### Setting up the SY56017R 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<sub>CCO</sub> to V<sub>CC</sub> and operating with one supply.
4. Connect the negative terminal of the two power supplies together and connect to the V<sub>EE</sub> 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 <90mA and

1.2V/1.8V/2.5V supply is <25mA. If using one supply, <115mA.

7. Turn off the power supply.

### Setting up the DC-Coupled Input

1. When the inputs are DC-coupled, they are referenced to V<sub>CCO</sub> because the body of the SMA connectors is tied to V<sub>CCO</sub>. Therefore, the device HIGH and LOW input voltage levels will change depending on V<sub>CCO</sub>. To make the input HIGH level 1.8V and LOW level 1.4V, follow Table 5 to program the differential signal source. If the levels are varied, make sure they remain within the datasheet input range.

V <sub>CCO</sub>	HIGH	LOW
1.2	0.6V	0.2V
1.8	0V	-0.4V
2.5	-0.7V	-1.1V

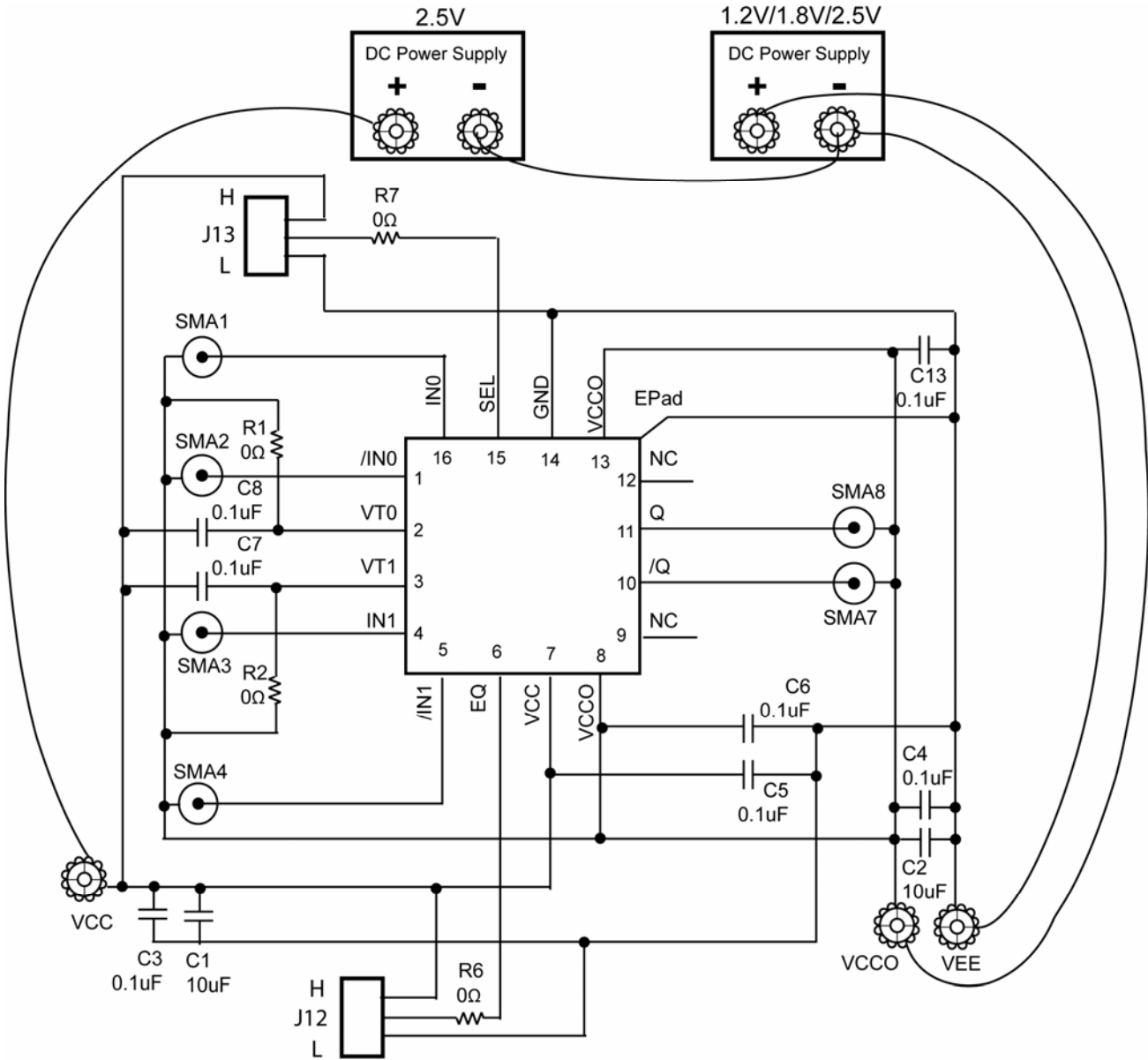
Table 5. Source Levels as a Function of V<sub>CCO</sub>

2. Using equal length 50 Ω impedance coaxial cables, connect the signal source to the desired attenuation line and then connect to the appropriate input IN0 or IN1 on the evaluation board. Make sure the length of each attenuation line is matched to each other. The desired input needs to be selected through the SEL pin (Pin 15), which is connected to the J13 jumper. Please refer to Table 1.
3. The equalization can be selected through the EQ pin (Pin 6), which is connected to the J12 jumper. The EQ setting depends on the length of the attenuation line. Please refer to Table 2 for the desired equalization selection.

### Setting up the DC-Coupled Output

1. Using equal length 50Ω impedance coaxial cables, connect the SMA outputs of the evaluation board (Pin 10 and Pin 11) to the oscilloscope or other measurement device that has an internal DC-coupled 50Ω termination. If only one output is connected to the oscilloscope, the complementary output must still be terminated with a 50Ω termination.
2. Turn on the power supplies and verify that the 2.5V supply current is <90mA and 1.2V/1.8V/2.5V supply is <25mA. And <115mA if using one supply.
3. Enable the signal source and monitor the outputs.

**Evaluation Board**



**SY56017R DC-Coupled Evaluation Board**

Power Supply	V <sub>CC</sub>	V <sub>CCO</sub>	V <sub>EE</sub>	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 6. SY56017R DC-Coupled Evaluation Board Power Supply Connections**

## HBW Support

Hotline: 408-955-1690

Email Support: [HBWHelp@micrel.com](mailto: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 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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