



Precision 1GHz and 3.2GHz LVPECL and LVDS $\div 3$, $\div 5$ Clock Dividers

SY89228/229/230/231U Evaluation Board

General Description

The SY89228/229/230/231U evaluation board is designed for convenient setup and quick evaluation with SMA connectors on each I/O. The board is optimized to interface directly to a 50 Ω oscilloscope.

For ease of evaluation, 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.

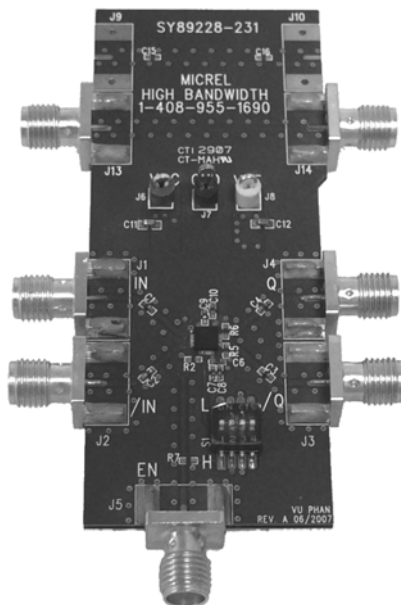
Features

- SY89228/230U LVPECL output
- SY89229/231U LVDS output
- SMA I/O connectors
- SY89228/230U :+2.5V or +3.3V power supply
- SY89229/231U :+2.5V power supply
- 1 output accessible board design
- 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

- SY89228/229U, 1GHz Precision, LVPECL and LVDS $\div 3$, $\div 5$ Clock Dividers with Fail-Safe Input and Internal Termination
- SY89230/231U, 3.2GHz Precision, LVPECL and LVDS $\div 3$, $\div 5$ Clock Dividers

Evaluation Board



Evaluation Board Description

The SY89228/229/230/231U share a common evaluation board. The SY89229U and the SY89231U have an LVDS output structure while the SY89228U and the SY89230 have an LVPECL output structure; hence, the evaluation board is designed to accommodate both output structures.

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.

DC-Coupled Evaluation Board

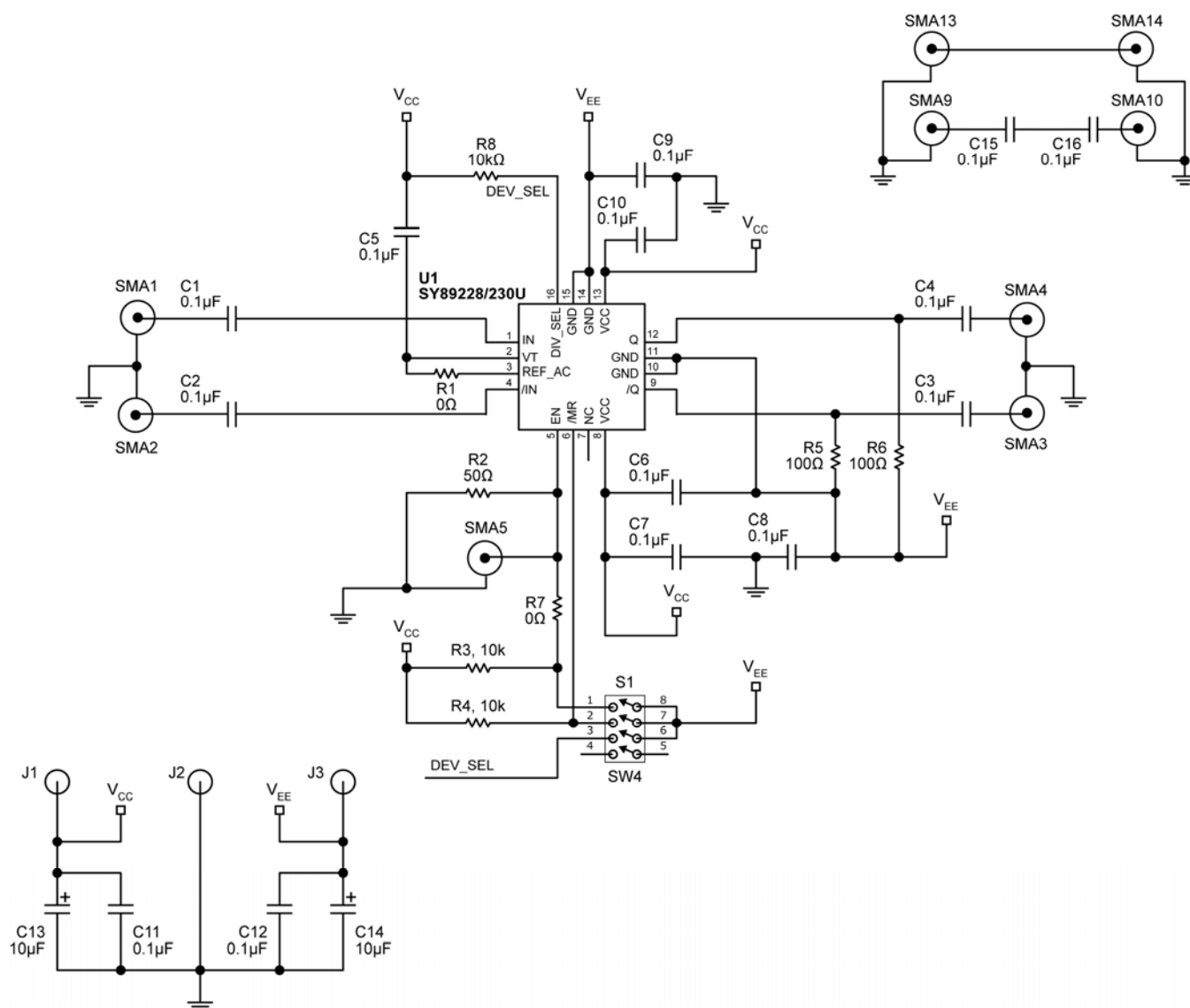
SY89228/230U (LVPECL output)

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 termination 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 and –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.”

SY89229/231U (LVDS output)

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

Evaluation Board

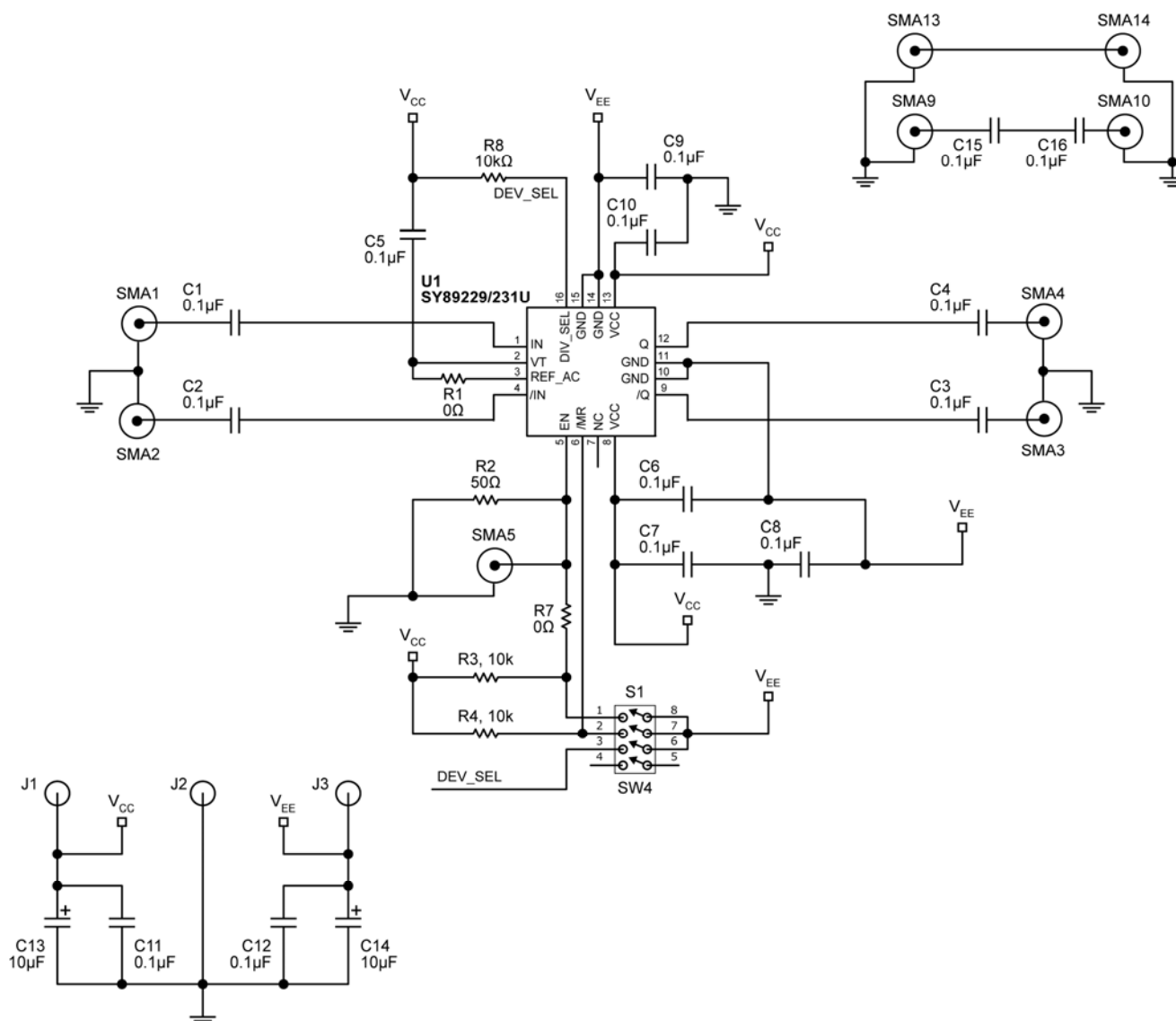


SY89228/230U AC-Coupled Evaluation Board (LVPECL output))

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. SY89228/230U AC/DC-Coupled Evaluation Board Power Supply Connections

Evaluation Board



SY89229/231U AC-Coupled Evaluation Board (LVDS output)

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	1.3V	0V	-1.2V

Table 2. SY89229/231U AC/DC-Coupled Evaluation Board Power Supply Connections

AC-Coupled Evaluation Board Setup

Setting up the SY89228/229/230/231U 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 SY89229/231) and turn off the supply.
2. For the SY89228/230 products, if operating voltage is 3.3V, R5 and R6 need to be 100Ω. If operating voltage is 2.5V, R5 and R6 need to be 50Ω.
3. 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.
4. Connect the V_{CC} terminal to the positive side of the DC power supply.
5. Turn on the power supply and verify that the power supply current is <150mA.
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). Turn off, or disable the outputs of the signal source.
8. Using equal length 50Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation.
9. 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.
10. Turn on the power and verify the current is <200mA.
11. Input to the EN pin can be provided by the dip-switch S1 or a signal from SMA5. If SMA5 is used, add R2 and remove R7. If S1 is used, add R7 and remove R2.
12. Enable the signal source and monitor the output.

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 input remains AC-Coupled.

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

SY89228/230U (LVPECL output)

1. Replace capacitors C3 and C4 with 0Ω resistors.
2. Remove R5 and R6.

SY89229/231U (LVDS output)

1. Replace capacitors C3 and C4 with 0Ω resistors.

DC-Coupled Evaluation Board Setup

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

SY89228/230U

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.
4. Turn off the power supplies and connect the GND terminal on the board to the negative side of DC power supply 1. The board ground is now 2V below V_{CC} .
5. Turn on the power supply and verify that the power supply current is <150mA.
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..
9. Turn on the power and verify the current is <200mA.

10. Input to the EN pin can be provided by the dip-switch S1 or a signal from SMA5. If SMA5 is used, add R2 and remove R7. If S1 is used, add R7 and remove R2.

11. Enable the signal source and monitor the output.

SY89229/231U

1. Set the voltage for DC supply number 1 to be 1.3V and connect the positive side to V_{CC} .
2. Set the voltage for DC supply number 2 to be 1.2V 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.
4. Turn off the power supplies and connect the GND terminal on the board to the negative side of DC power supply 1. The board ground is now 1.2V above V_{EE} .
5. Verify that the power supply current is <150mA.
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.
9. Turn on the power and verify the current is <200mA.
10. Input to the EN pin can be provided by the dip-switch S1 or a signal from SMA5. If SMA5 is used, add R2 and remove R7. If S1 is used, add R7 and remove R2.
11. Enable the signal source and monitor the output.

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
L2	GND
L3	V _{CC}
L4	V _{EE}
L5	GND
Bottom	Signal and GND

Table 3. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1-12,C15,C16	VJ0402Y104KXXAT	Vishay ⁽¹⁾	0.1μF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	14
C13, C14	293D685X9025C2T	Vishay ⁽¹⁾	10uF, 25 V, 10%, Tantalum Electrolytic Capacitor, Size 293D	2
R3, R4, R8	CRCW0401002F	Vishay ⁽¹⁾	10kΩ, 1/16W, 5%, Resistor SMD, Size 0402	3
R1, R7	CRCW040200R0F	Vishay ⁽¹⁾	0Ω, 1/16W, 5% Thick-film Resistor, Size 0402	2
R2	CRCW04020500F	Vishay ⁽¹⁾	50Ω, 1%, Resistor, Size 0402	1
R5, R6	CRCW0402820F	Vishay ⁽¹⁾	100Ω, 1/16W, 5% Thick-film Resistor, Size 0402	2
SMA1-SMA5, SMA9-SMA10, SMA13-SMA14	142-0701-851	Johnson Components ⁽²⁾	Jack Assembly End Launch SMA	9
J6	5005K-ND	Digi-Key ⁽³⁾	Red Test Point	1
J7	5006K-ND	Digi-Key ⁽³⁾	Black Test Point	1
J8	5007K-ND	Digi-Key ⁽³⁾	Yellow Test Point	1
S1	CKN1362-ND	Digi-Key ⁽³⁾	Dip Switch	1
U1	SY89228U	Micrel, Inc. ⁽⁴⁾	1GHz Precision, LVPECL ÷3, ÷5 Clock Divider with Fail-Safe Input and Internal Termination	1
U1	SY89229U	Micrel, Inc. ⁽⁴⁾	1GHz Precision, LVDS ÷3, ÷5 Clock Divider with Fail-Safe Input and Internal Termination	1
U1	SY89230U	Micrel, Inc. ⁽⁴⁾	3.2GHz Precision, LVPECL ÷3, ÷5 Clock Divider	1
U1	SY89231U	Micrel, Inc. ⁽⁴⁾	3.2GHz Precision, LVDS ÷3, ÷5 Clock Divider	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 PECL and LVPECL, clock synthesizer, 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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