Precision CML/LVPECL/LVDS 1:2 Fanout Buffer with Internal Termination and Fail Safe Input

SY58606/7/8U Evaluation Board

General Description

The SY58606U, SY58607U, and SY58608U evaluation boards are designed for convenient setup and quick evaluation of the respective devices. They allow the user to evaluate the part over the full voltage-range of the part without requiring any modifications to the board. The board is optimized to interface directly to a 50Ω oscilloscope.

The board is designed in multiple layers for better performance and simple signal evaluation. For best AC performance, 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 web site at: www.micrel.com.

Features

- SY58606U CML outputs
- SY58607U LVPECL outputs
- SY58608U LVDS outputs
- +2.5V or 3.3V power supply
- 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

- SY58606U, 4.25Gbps Precision CML 1:2 Fanout Buffer with Internal Termination and Fail-Safe Inputs
- SY58607U, 3.2Gbps Precision LVPECL 1:2 Fanout Buffer with Internal Termination and Fail-Safe Inputs
- SY58608U, 3.2Gbps Precision LVDS 1:2 Fanout Buffer with Internal Termination and Fail-Safe Inputs

Evaluation Board

Evaluation Board Description

The SY58606U, SY58607U, and SY58608U share a common evaluation board. The individual evaluation boards are labeled to identify the specific device and the configuration, for that board. The SY58606U, SY58607U, and SY58608U are CML, LVPECL, and LVDS output evaluation boards respectively.

The default configuration for the boards is the AC-coupled configuration and all boards are shipped with this configuration. The choice between two configurations offers the user flexibility in selecting the board that is right for this 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 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. The user only needs 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

SY58606U DC-Coupled Evaluation Boards

To allow the CML outputs to be used in a DC-coupled configuration with a scope that has a standard 50Ω to GND termination, the power supplies are configured to offset the voltage of the evaluation board to be negative. For a 2.5V configuration the V_{CC} and GND of the board are set to 0V and the V_{EE} is set to -2.5V. For a 3.3V configuration the V_{CC} and GND of the board are set to 0V and the V_{EE} is set to -3.3V. This allows the body of the SMA connectors, which are scope GND, to appear at the same potential as V_{CC} for the CML output drivers.

SY58607U DC-Coupled Evaluation Boards

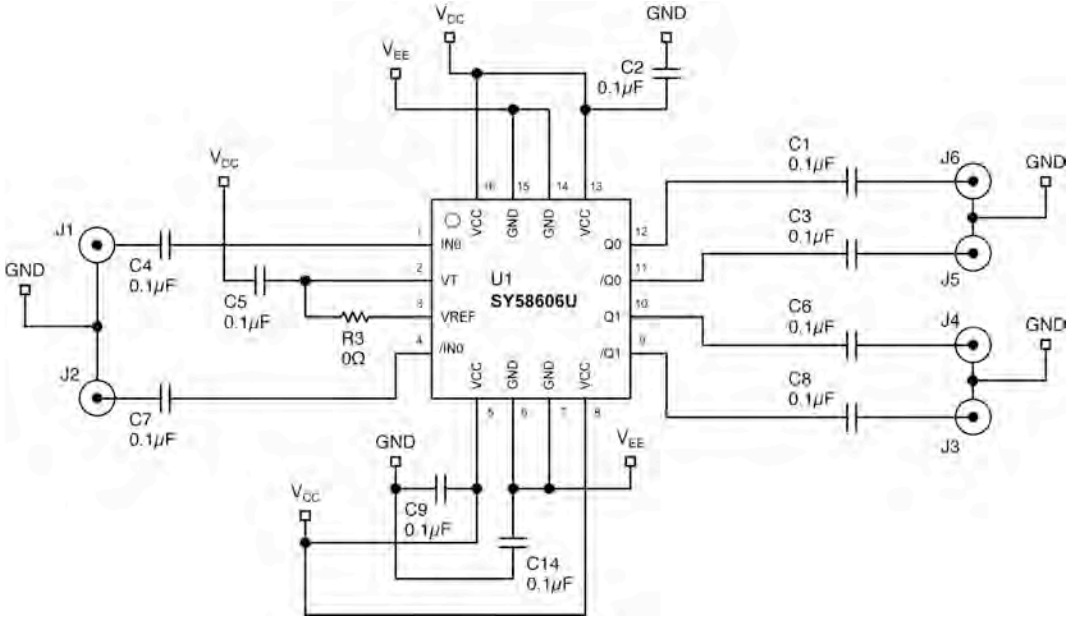
For DC-coupled operation, the boards can be modified to use two power supplies in a “split-supply configuration.” The term split-supply simply means the +3.3V supply is split into a +2V and -1.3V, or for a +2.5V supply it is split into a +2V and -0.5V power supply configuration. This effectively offsets the board by +2V. The +2V offset in this two-power supply configuration then provides the correct terminations of 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 or -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}.

SY58608U DC-Coupled Evaluation Boards

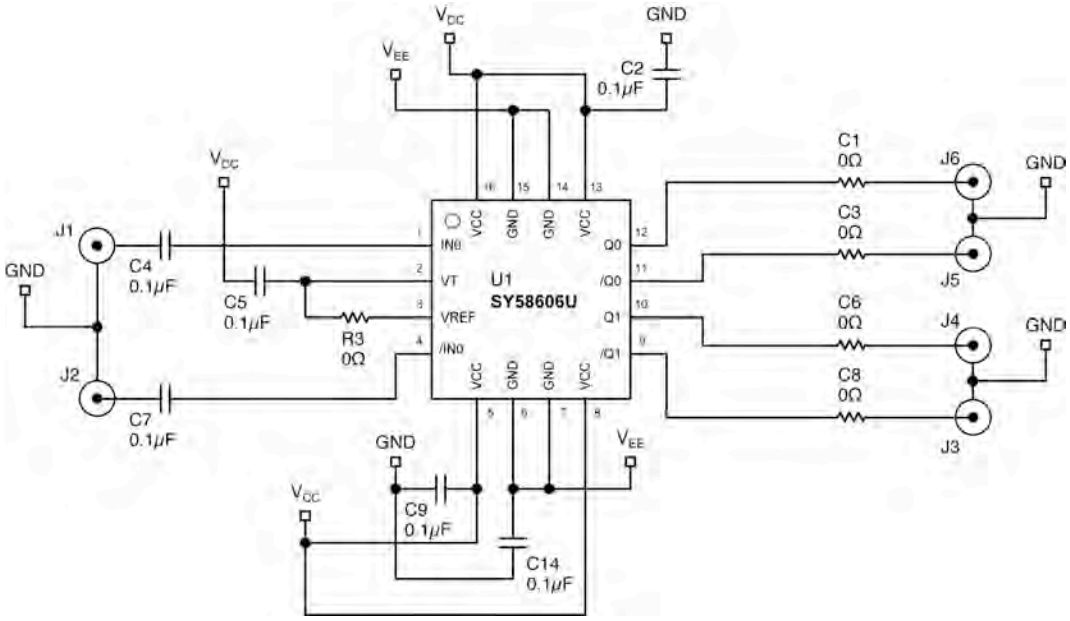
DC-coupled operation can be accomplished by modifying the board to use two power supplies into a “split-supply configuration”. In order to correctly interface LVDS to a 50Ω-(to-ground) scope, V_{CC} must be V_{OCM} above the GND level. Therefore, a 2.5V supply will be split into +1.2V and -1.3V to ensure 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 section “Modifying your AC-coupled Board for DC-Coupled Operation.”

Evaluation Board



SY58606U AC-Coupled Evaluation Board



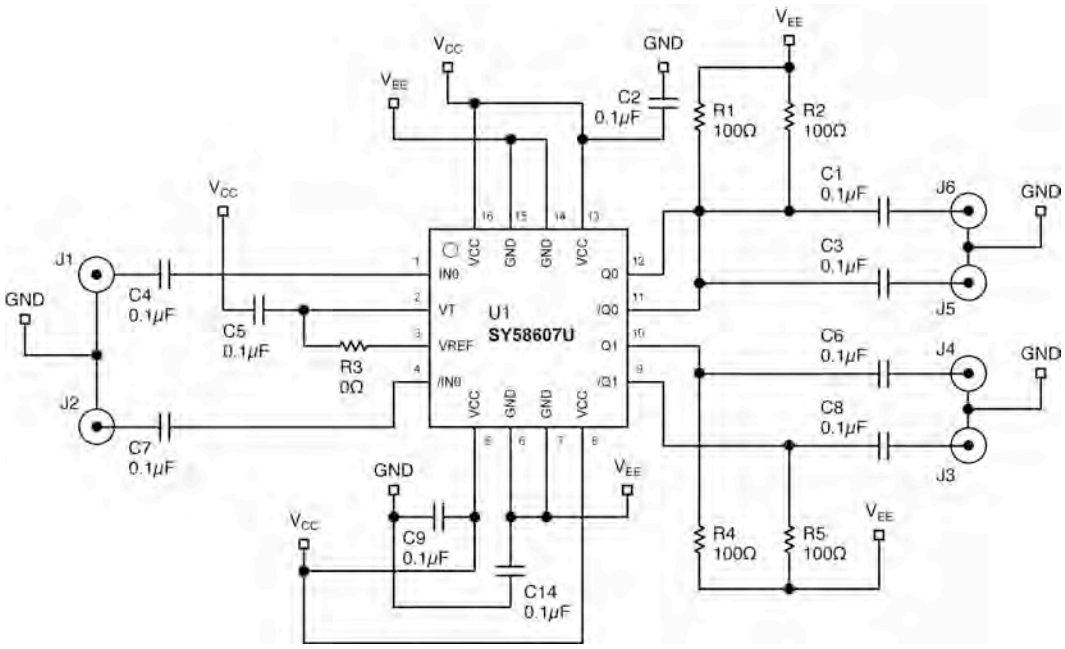
SY58606U DC-Coupled Evaluation Board

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
AC-Coupled Input/DC-Coupled Output	2.5V	0V	0V	-2.5V
AC-Coupled Input/DC-Coupled Output	3.3V	0V	0V	-3.3V

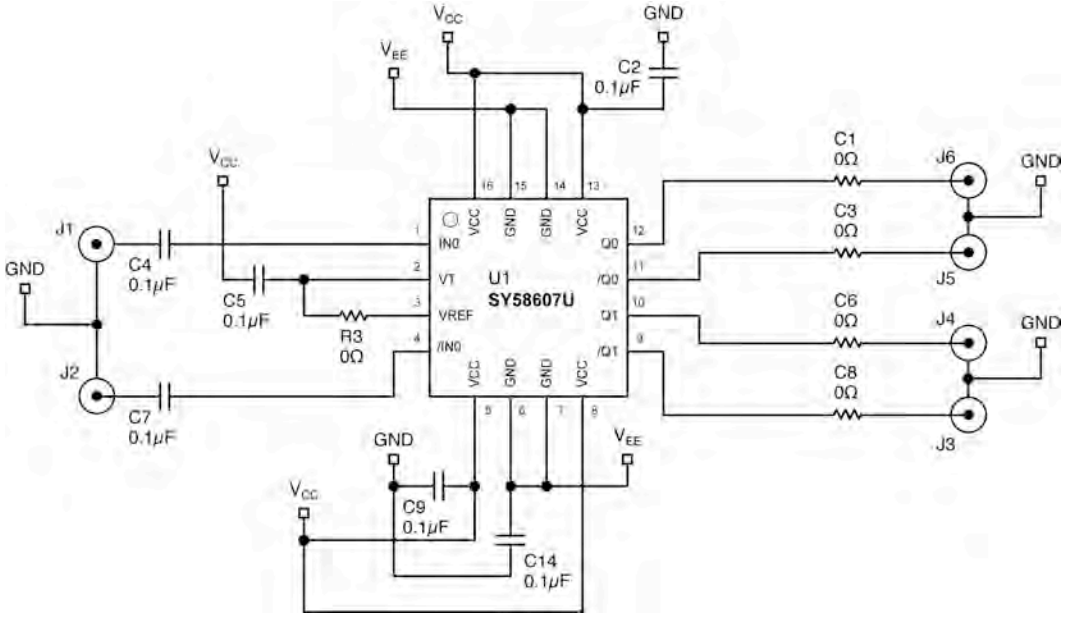
hbwhelp@micrel.com or (408) 955-1690

Table 1. SY58606U AC/DC-Coupled Evaluation Board Power Supply Connection

Evaluation Board



SY58607U AC-Coupled Evaluation Board



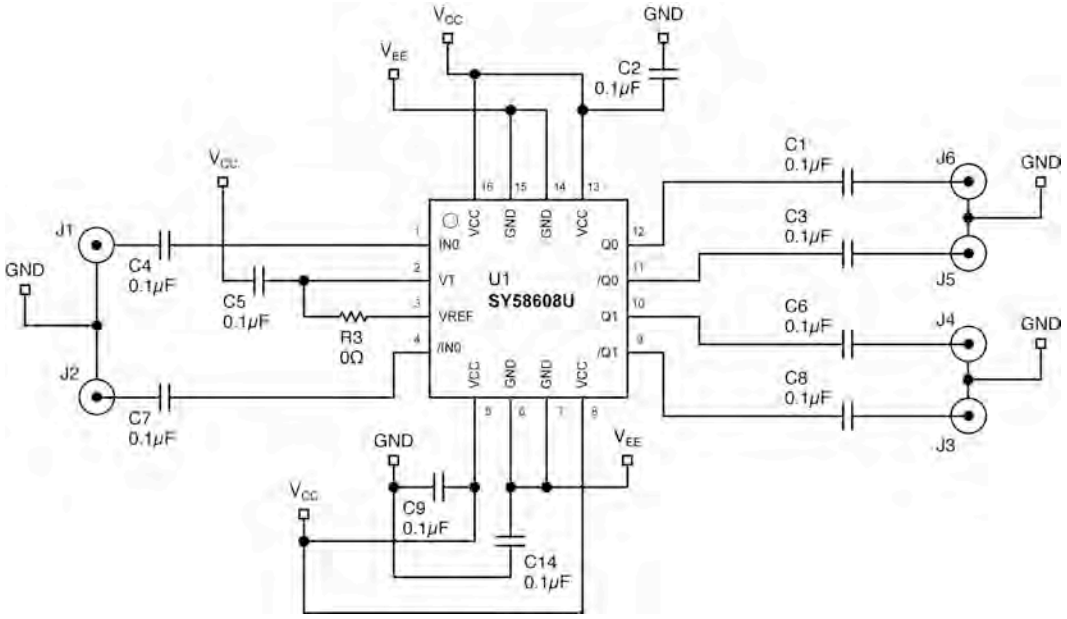
SY58607U DC-Coupled Evaluation Board

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
AC-Coupled Input/DC-Coupled Output	2.5V	2.0V	0V	-0.5V

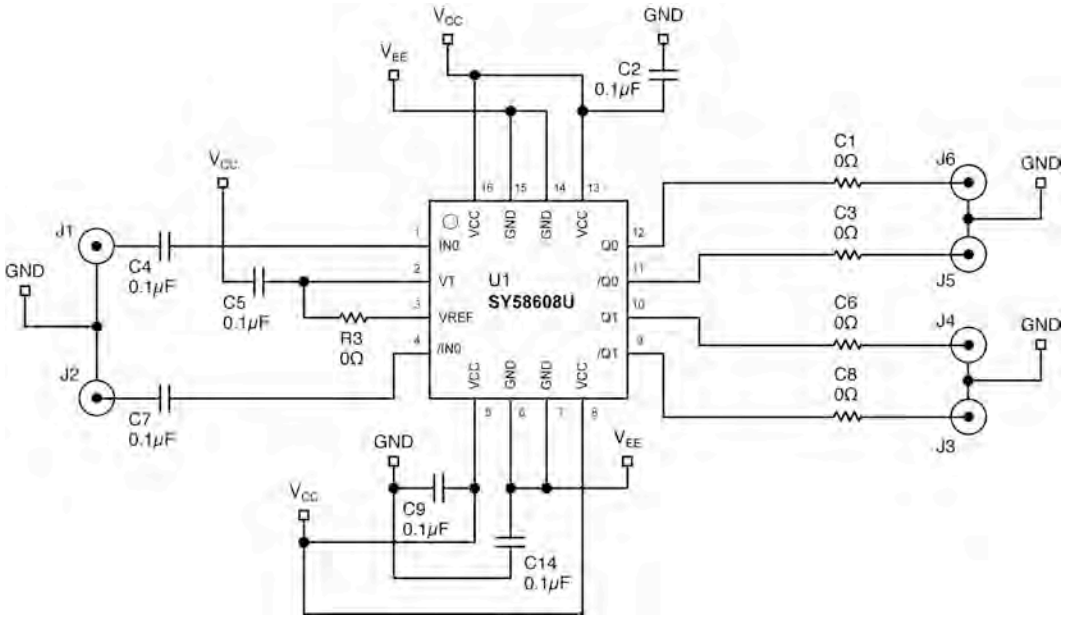
AC-Coupled Input/DC-Coupled Output	3.3V	2.0V	0V	-1.3V

Table 2. SY58607U AC/DC-Coupled Evaluation Board Power Supply Connections

Evaluation Board



SY58608U AC-Coupled Evaluation Board



SY58608U DC-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/DC-Coupled Output	2.5V	1.2V	0V	-1.3V

Table 3. SY58608U AC/DC-Coupled Evaluation Board Power Supply Connections

AC-Coupled Evaluation Board Setup

Setting up the SY58606/7/8U AC-Coupled Evaluation Board

The following steps describe the procedures for setting up the evaluation board:

1. Set the voltage setting for a DC supply to be either 2.5V or 3.3V (2.5V for SY58608U) depending upon your application and turn off the supply.
2. On the evaluation board short the GND terminal to the VEE terminal and connect them to the negative side of the DC power supply.
3. Connect the VCC terminal to the positive side of the DC power supply.
4. Turn on the power supply on verify that the poser supply current is <70mA
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). Turn off or disable the outputs of the signal source.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation board.
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 supply and verify the current is <70mA.
10. Enable the signal source and monitor the outputs.

Modifying AC-Coupled 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.

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:

SY58606U:

1. Replace capacitors C1, C3, C6 and C8 with 0Ω resistors.

SY58607U:

1. Replace capacitors C1, C3, C6 and C8 with 0Ω resistors.
2. Remove R1, R2, R4 and R5.

SY58608U:

1. Replace capacitors C1, C3, C6 and C8 with 0Ω resistors.

DC-Coupled Evaluation Board Setup

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

SY58606U:

1. Set the voltage for DC supply to 3.3V (or 2.5V based on your application).
2. Short GND and V_{CC}
3. Connect the positive side of the power supply to V_{CC}. This is the 0V ground potential for the board.
4. Turn off the power supply and connect the negative side of the power supply to V_{EE}.
5. Using a voltmeter, turn on the power supply and verify that the power supply current is <70mA.
6. Turn off the power supply.
7. Using a differential signal source set the amplitude of each side of the differential pair to be 400mV (800mV 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. Any of these two 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 <80mA.
10. Enable the signal source and monitor the outputs.

SY58607U:

1. Set the voltage for DC supply number 1 to be 2.0V and connect it 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 it to 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. Using a voltmeter, turn on the power supply and verify that the power supply current is <80mA.
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. Any of these two 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 <80mA.
10. Enable the signal source and monitor the outputs.

SY58608U:

1. Set the voltage for DC supply number 1 to be 1.3V and connect it to V_{CC}.
2. Set the voltage for DC supply number 2 to be –1.2V and connect it to 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. Using a voltmeter, turn on the power supply and verify that the power supply current is <80mA.
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. Any of these two 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 <80mA.
10. Enable the signal source and monitor the outputs.

Evaluation Board Layout

PC Board Layout

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

L1	Signal/GND
L2	Impedance GND
L3	VCC Power/VEE Power
L4	Signal/GND

Table 4. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C11, C13	293D685X06R3A	Vishay[1]	6.8µF, 20V, Tantalum Electrolytic Capacitor, Size C	2
C1–C10, C12, C14	VJ0402Y104KXXAT	Vishay[1]	0.1µF, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	12
R1, R2, R4, R5	CRCW04021000F	Vishay[1]	100Ω, 1%, Resistor, Size 0402	4
J1-J3	111-0703-001	Johnson [2]	Banana Jack	3
SMA1-SMA6	142-0701-851	Johnson[2]	Jack Assembly End Launch SMA	6
U1	**SY58606U**	**Micrel, Inc.[3]**	**4.25Gbps Precision CML Buffer with Internal Termination and Fail Safe Input**	1
U1	**SY58607U**	**Micrel, Inc.[3]**	**3.2Gbps Precision LVPECL Buffer with Internal Termination and Fail Safe Input**	1
U1	**SY58608U**	**Micrel, Inc.[3]**	**3.2Gbps Precision LVDS Buffer with Internal Termination and Fail Safe Input**	1

Notes:

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