



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

SY58609/10/11U Evaluation Board

General Description

The SY58609U, SY58610U, and SY58611U evaluation boards are designed for convenient setup and quick evaluation with SMA connectors on each I/O. 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.

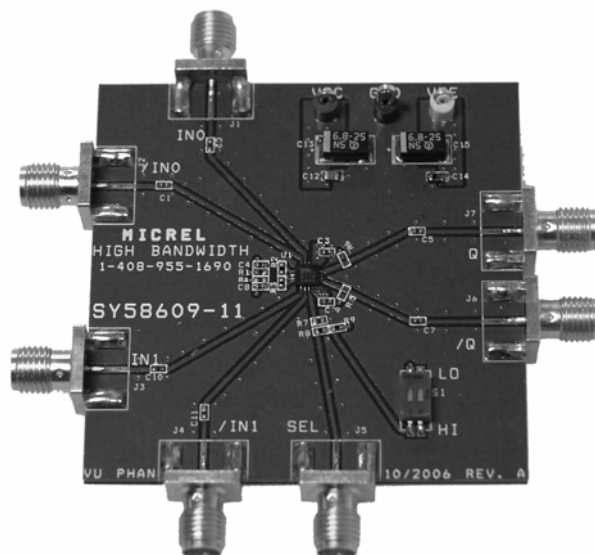
Features

- SY58609U CML outputs
- SY58610U LVPECL outputs
- SY58611U LVDS outputs
- SMA I/O connectors
- +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

- SY58609U, 4.25Gbps Precision CML 2:1 MUX with Internal Termination and Fail-Safe Inputs
- SY58610U, 3.2Gbps Precision LVPECL 2:1 MUX with Internal Termination and Fail-Safe Inputs
- SY58611U, 3.2Gbps Precision LVDS 2:1 MUX with Internal Termination and Fail-Safe Inputs

Evaluation Board



Evaluation Board Description

The SY58609U, SY58610U, and SY58611U share a common evaluation board. The individual evaluation boards are labeled to identify the specific device and the configuration. The SY58609U, SY58610U, and SY58611U are CML, LVPECL, and LVDS output evaluation board respectively.

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 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 when 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

SY58609U 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.

SY58610U DC-Coupled Evaluation Boards

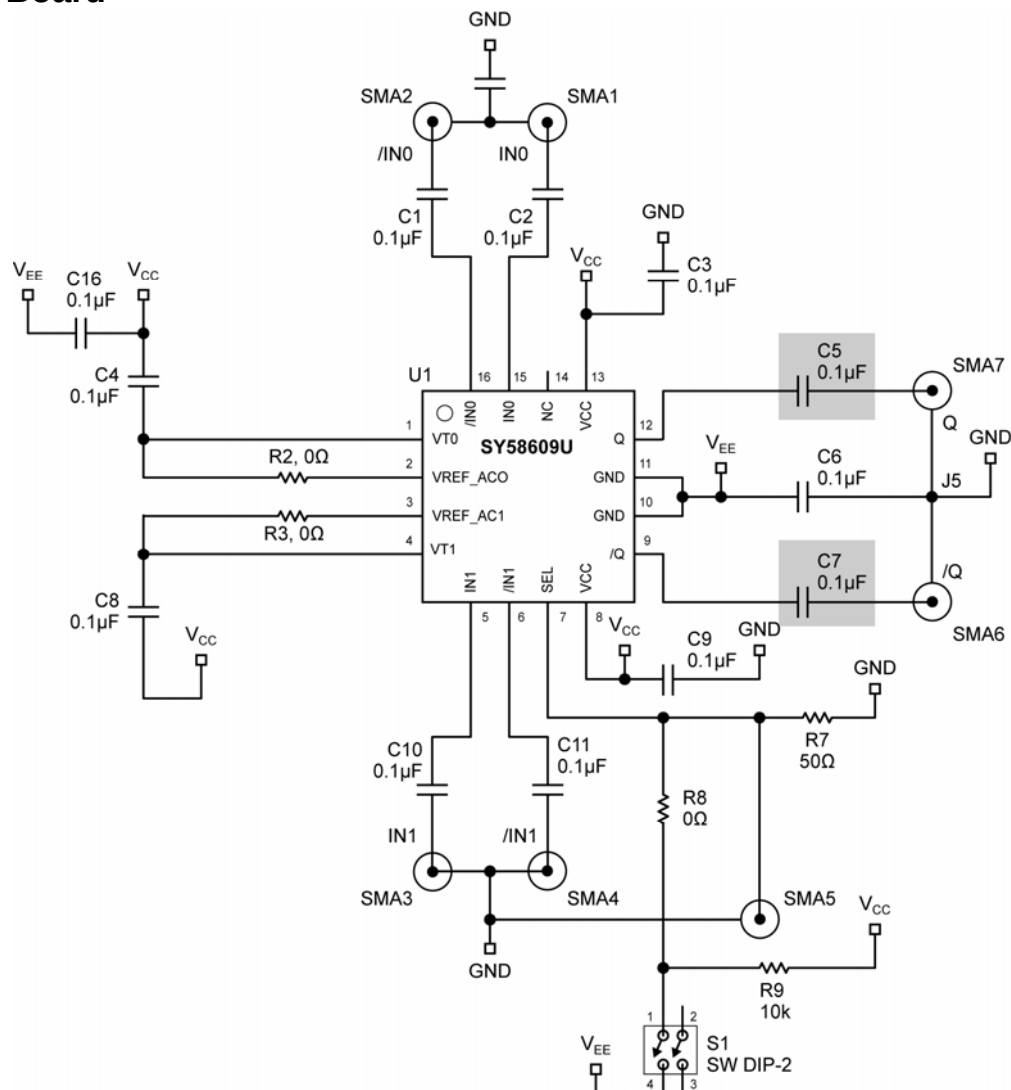
For DC-coupled operation, the boards can be modified to use two power supplies in a “split-supply configuration.” The term split-supply simply means the +3.3V supply is split into a +2V and -1.3V, or for a +2.5V supply it is split into a +2V and -0.5V power supply configuration. This effectively offsets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

SY58611U 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

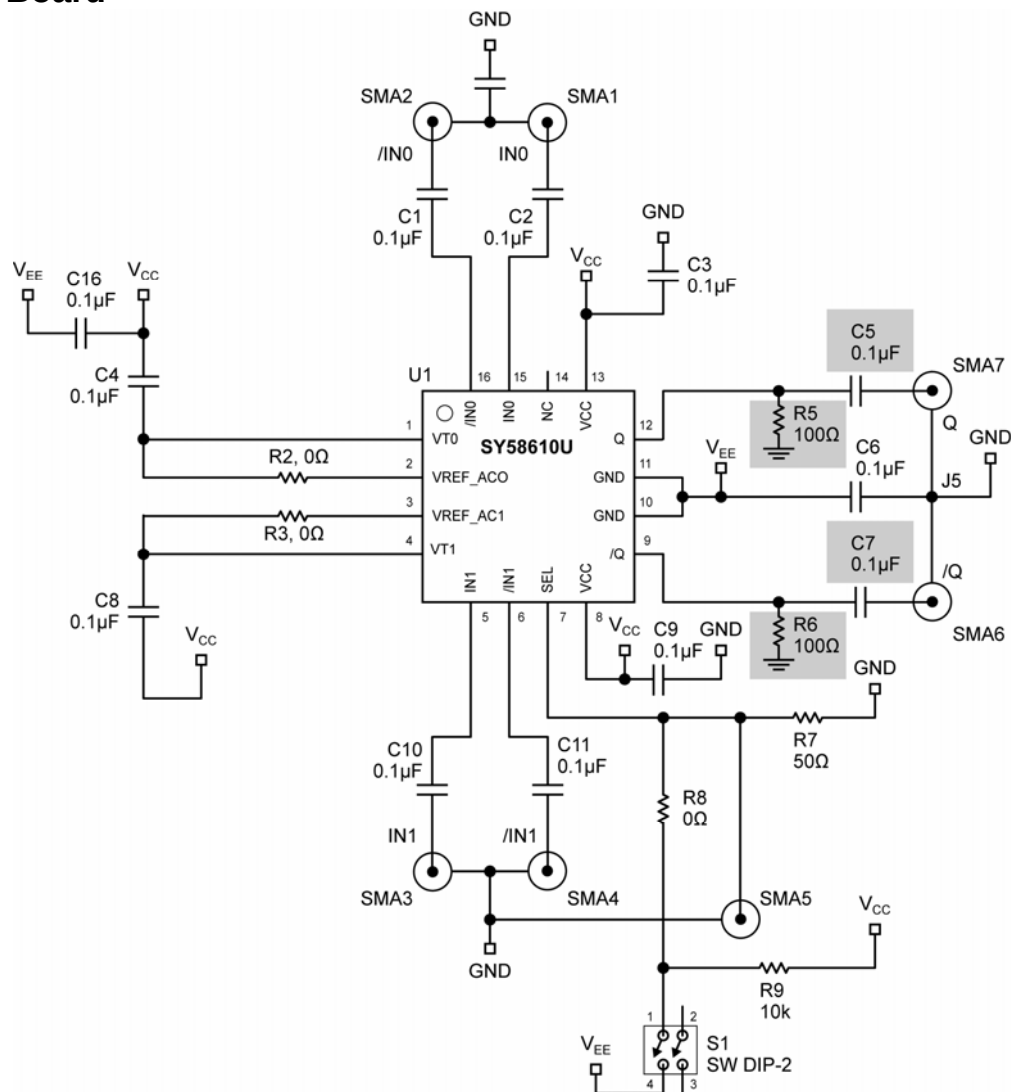


SY58609U AC-Coupled Evaluation Board

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

Table 1. SY58609U AC/DC-Coupled Evaluation Board Power Supply Connection

Evaluation Board

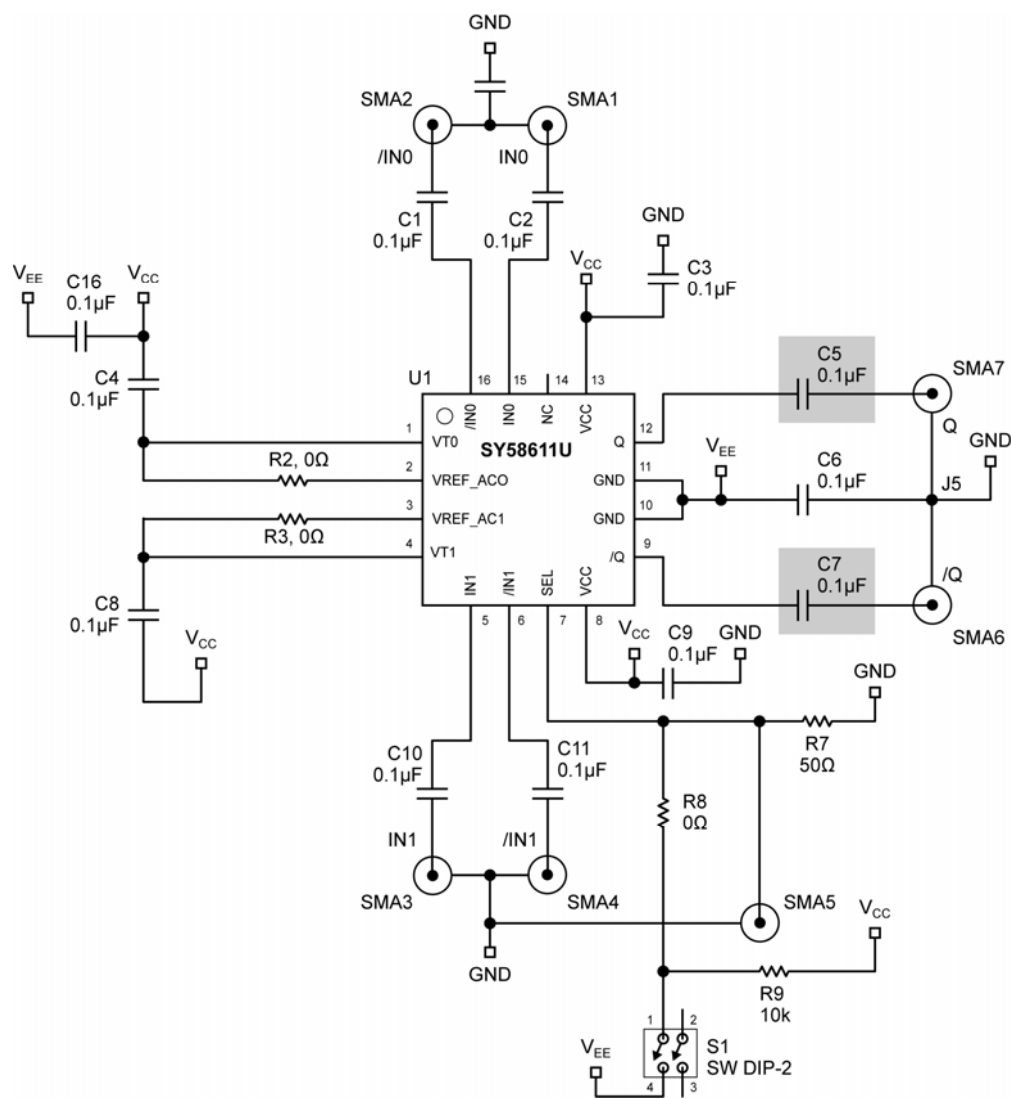


SY58610U AC-Coupled Evaluation Board

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. SY58610U AC/DC-Coupled Evaluation Board Power Supply Connections

Evaluation Board



SY58611U AC-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. SY58611U AC/DC-Coupled Evaluation Board Power Supply Connections

AC-Coupled Evaluation Board Setup

Setting up the SY58609/10/11U 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 only for SY58611U) and then 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, and verify that the power 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 50 Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation board.
8. Using equal length 50 Ω impedance coaxial cables, connect the outputs of the evaluation board to the oscilloscope or other measurement device that has an internal 50 Ω -termination.
9. Turn on the power supply and verify the current is <70mA.
10. Input to the SEL pin can be provided by the dip-switch or a signal from the SMA connector. Remove R7 if dip-switch is used and remove R8 if SMA connector is used.
11. Enable the signal source and monitor the outputs.

Modifying an AC-Coupled Board for DC-Coupled Operation

When DC-Coupling Output is Necessary

For applications where AC-coupling the output is not appropriate, the board can be reconfigured for DC-coupled operation. The inputs remain AC-coupled.

Following procedure details the steps for converting an AC-coupled board to a DC-coupled board:

SY58609U:

1. Replace capacitors C5 and C7 with 0Ω resistors.

SY58610U:

1. Replace capacitors C5 and C7 with 0Ω resistors.
2. Remove R5 and R6.

SY58611U:

1. Replace capacitors C5 and C7 with 0Ω resistors.

DC-Coupled Evaluation Board Setup

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

SY58609U:

1. Set the voltage for DC supply to 3.3V (or 2.5V based on your application) and turn on the power supply.
2. On the board, 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. Connect the negative side of the power supply to V_{EE} .
5. 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 output.

SY58610U:

1. Set the voltage for DC supply number 1 to be 2.0V 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. 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 DC power supply 1 and the positive side of DC power supply 2.
5. 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 output.

SY58611U:

1. Set the voltage for DC supply number 1 to be 1.2V and connect the positive side to V_{CC} .
2. Set the voltage for DC supply number 2 to be -1.3V 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. 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 DC power supply 1 and the positive side of DC power supply 2.
5. 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 50 Ω impedance coaxial cables, connect the outputs of the evaluation board to the oscilloscope or other measurement device that has an internal 50 Ω -termination. Any of these two outputs that are not connected to a scope, or other instrument should be terminated with a 50 Ω 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 output.

Evaluation Board Layout

PC Board Layout

The evaluation board is constructed with Rogers 4003 material and is coplanar in design to minimize noise, achieve high bandwidth and minimize crosstalk. I/O signal traces are micro-strip.

L1	Signal/GND
L2	GND
L3	V _{CC}
L4	V _{EE}
L5	GND
L6	Signal/GND

Table 4. Layer Stack

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C13, C15	293D106X004B	Vishay ⁽¹⁾	10 μ F, 20V, Tantalum Electrolytic Capacitor, Size C	2
C1–C14	VJ0402Y104KXXAT	Vishay ⁽¹⁾	0.1 μ F, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	14
R1, R4, R7	CRCW0402250R0F	Vishay ⁽¹⁾	50 Ω , 1%, Resistor, Size 0402	3
R2, R3, R8	CRCW04020R00F	Vishay ⁽¹⁾	0 Ω , 1%, Resistor, Size 0402	3
R5, R6	CRCW04021000F	Vishay ⁽¹⁾	100 Ω , 1%, Resistor, Size 0402	2
R9	CRCW04020R00F	Vishay ⁽¹⁾	10K Ω , 1%, Resistor, Size 0402	1
J1-J3	111-0703-001	Johnson ⁽²⁾	Banana Jack	3
SMA1-SMA7	142-0701-851	Johnson ⁽²⁾	Jack Assembly End Launch SMA	7
U1	SY58609U	Micrel, Inc.⁽³⁾	4.25Gbps Precision CML 2:1 MUX with Internal Termination and Fail Safe Input	1
U1	SY58610U	Micrel, Inc.⁽³⁾	3.2Gbps Precision LVPECL 2:1 MUX with Internal Termination and Fail Safe Input	1
U1	SY58611U	Micrel, Inc.⁽³⁾	3.2Gbps Precision LVDS 2:1 MUX 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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