Ultra-Precision Differential CML and LVPECL Line Driver/Receiver w/Internal Termination

SY58600/601/602U Evaluation Board

General Description

The SY58600U, SY58601U and SY58602U evaluation boards are designed for convenient set-up and quick evaluation of the respective devices. They allow the user to evaluate the part over the full voltage-range of the parts without requiring any modifications to the board.

The evaluation board standard configuration is AC-coupled for direct interface to a 50Ω compatible oscilloscope without split supplies. For applications that require a DC-coupled configuration, step-by-step instructions for modifying the board are included.

All data sheets and support documentation can be found at Micrel's web site at www.micrel.com.

.

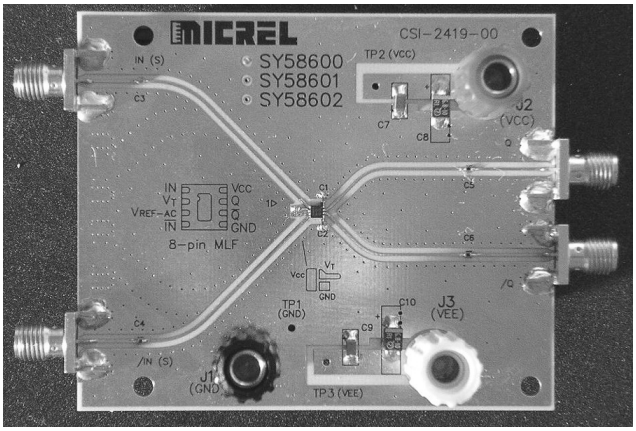
Features

- SY58600U CML outputs
- SY58601U and SY58602U LVPECL outputs
- Single +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
- Reconfigurable for DC-coupled operation

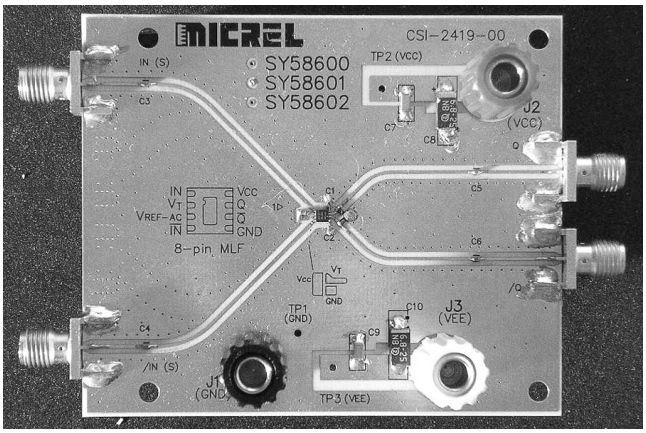
Related Documentation

- SY58600U Ultra-Precision Differential 400mV CML Line Driver/Receiver with Internal Termination Data Sheet
- SY58601U Ultra-Precision Differential 800mV LVPECL Line Driver/Receiver with Internal Termination Data Sheet
- SY58602U Ultra-Precision Differential 400mV LVPECL Line Driver/Receiver with Internal Termination Data Sheet

Evaluation Board



SY58600U AC-Coupled Evaluation Board



SY58601U/602U AC-Coupled Evaluation Board

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

Evaluation Board Description

The SY58600U, SY58601U and SY58602U share a common evaluation board. The individual evaluation boards are labeled to identify the specific device and the configuration, either AC-coupled or DC-coupled configuration, for that board. The SY58600U is a CML-output evaluation board and the SY58601U and SY58602U are identical LVPECL-output evaluation boards.

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 his 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 of either +2.5V ±5% or +3.3V ±10% and offers the most flexibility in interfacing to a variety of signal sources.

The AC-coupling capacitors are supplied on-board for each input, making it unnecessary to vary the offset voltage or change any components on the board as the power supply voltage varies. The user needs only 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 Boards

SY58600U DC-Coupled Evaluation Boards

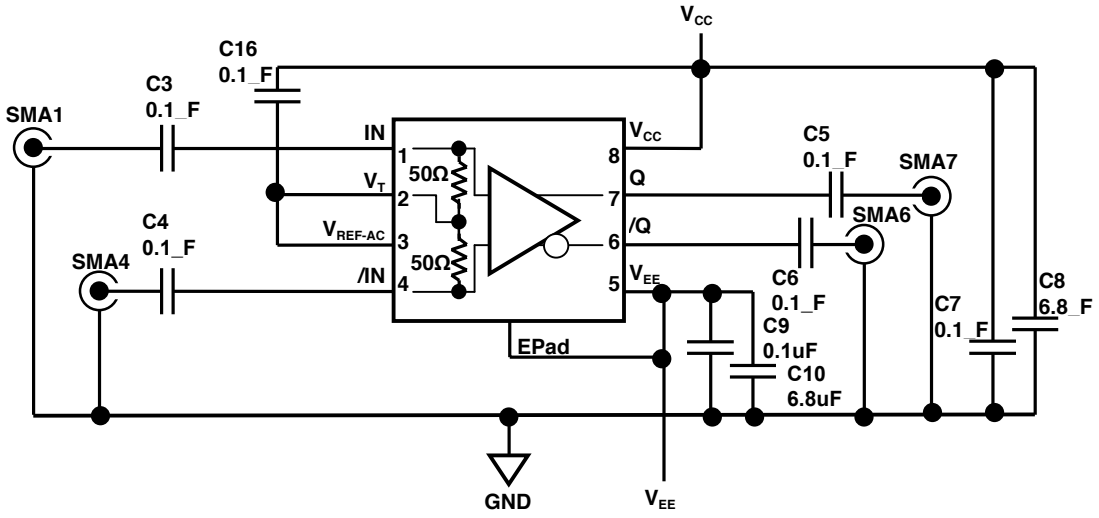
To allow the CML outputs to be used in a DC-coupled configuration with a scope that has a standard 50Ω to GND termination, the power supplies are configured to offset the voltage of the evaluation board to be negative. For a 2.5V configuration the V_{CC} and GND of the board are set to 0V and the V_{EE} 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.

SY58601U/SY58602U DC-Coupled 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 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 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}.

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

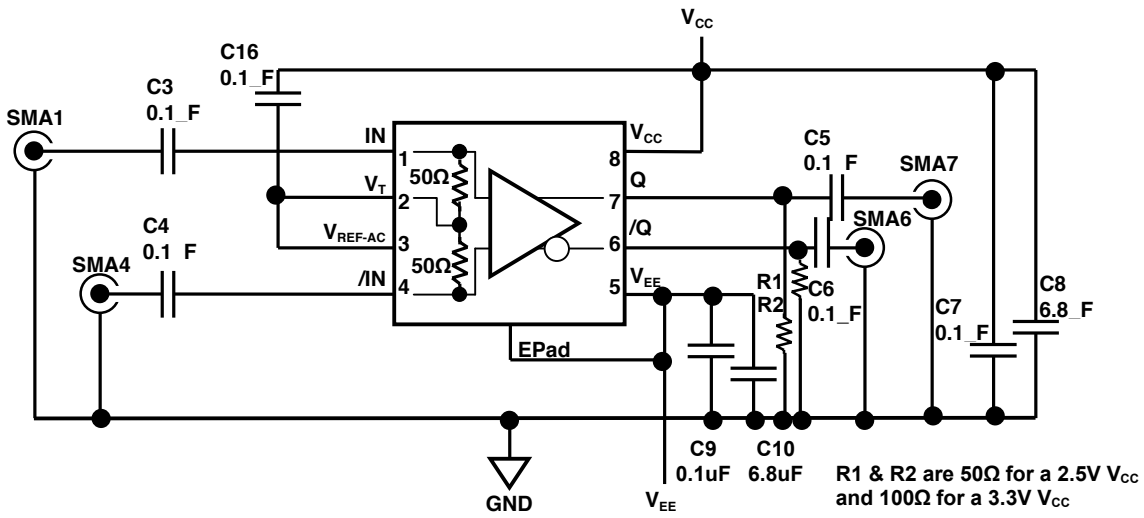


SY58600U AC-Coupled Evaluation Board

Power Supply	V_{CC}	GND	V_{EE}	I/O
2.5 Volt System	+2.5V	0V	0V	AC-Coupled Input/AC-Coupled Output
3.3 Volt System	+3.3V	0V	0V	AC-Coupled Input/AC-Coupled Output

Table 1. SY58600U AC-Coupled Evaluation Board Power Supply Connections

Evaluation Board



SY58601/602U AC-Coupled Evaluation Board

Power Supply	V_{CC}	GND	V_{EE}	I/O
2.5 Volt System	+2.5V	0V	0V	AC-Coupled Input/AC-Coupled Output
3.3 Volt System	+3.3V	0V	0V	AC-Coupled Input/AC-Coupled Output

Table 2. SY58601/602U AC-Coupled Evaluation Board Power Supply Connections

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

AC-Coupled Evaluation Board Set-Up

Setting up the SY58600U AC-Coupled Evaluation Board

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

1. Set the voltage setting for a DC supply to be either 2.5V or 3.3V depending on your application and turn off the supply.
2. 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.
3. Connect the V_{CC} terminal to the positive side of the DC power supply
4. Turn on the power supply 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). Set the offset to be a negative value, the value of this 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.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation board (Pin 1 and Pin 4).
8. Using equal length 50Ω impedance coaxial cables, connect the SMA outputs of the evaluation board (Pin 7 and Pin 6) to the oscilloscope or other measurement device that has an internal 50Ω termination.
9. Turn on the power and verify the current is <70mA.
10. Enable the signal source and monitor the outputs.

Setting up the SY58601U or SY58602U AC-Coupled Evaluation Board

The following steps describe the procedure for setting up the LVPECL-output evaluation boards:

1. Set the voltage setting for a DC supply to be either 2.5V or 3.3V depending on your application and turn off the supply.
2. 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.
3. Connect the V_{CC} terminal to the positive side of the DC power supply
4. Turn on the power supply 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). Set the offset to be a negative value, the value of this 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.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the SMA inputs on the evaluation board (Pin 1 and Pin 4).
8. Using equal length 50Ω impedance coaxial cables, connect the SMA outputs of the evaluation board (Pin 7 and Pin 6) to the oscilloscope or other measurement device that has an internal 50Ω termination.
9. Turn on the power and verify the current is <70mA.
10. Enable the signal source and monitor the outputs

Bill of Materials

SY58600U Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C1, C2, C3, C4, C5, C6, C16	VJ0402Y104KXXAT	Vishay[1]	0.1_F, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	7
C8, C10	293D685X0010	Vishay[1]	6.8_F, 20V, Tantalum Electrolytic Capacitor, Size C	2
C9, C11	VJ0805Y104KXXAT	Vishay[1]	0.1_F, 25V, 10% Ceramic Capacitor, Size 0805	2
J1			Banana Post	1
J2			Banana Post	1
J3			Banana Post	1
SMA1, SMA4, SMA6, SMA7	142-0701-851	Johnson Components [2]	Jack Assembly End Launch SMA	4
U1	**SY58600U**	**Micrel [3]**	Ultra-Precision Differential CML Line Driver/Receiver with Internal Termination	1

SY58601/602U Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C1, C2, C3, C4, C5, C6, C16	VJ0402Y104KXXAT	Vishay[1]	0.1_F, 25V, 10% Ceramic Capacitor, Size 0402, X7R Dielectric	7
C8, C10	293D685X0010	Vishay[1]	6.8_F, 20V, Tantalum Electrolytic Capacitor, Size C	2
C9, C11	VJ0805Y104KXXAT	Vishay[1]	0.1_F, 25V, 10% Ceramic Capacitor, Size 0805	2
R1, R2[4]	CRCW040249R9F	Vishay[1]	50Ω, 1/16W, 5% Thick-film Resistor, Size 0402	2
J1			Banana Post	1
J2			Banana Post	1
J3			Banana Post	1
SMA1, SMA4, SMA6, SMA7	142-0701-851	Johnson Components[2]	Jack Assembly End Launch SMA	4
U1	**SY58601/602U**	**Micrel[3]**	Ultra-Precision Differential LVPECL Line Driver/Receiver with Internal Termination	1

Notes:

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

PC Board Layout

Board Layout

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

L1	Signal/GND
L2	Impedance GND
L3	V_{CC} Power/V_{EE} Power
L4	Signal/GND

Table 3. Layer Stack

Modifying The AC-Coupled Board 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 output operation. This configuration allows the CML output to be connected directly to a scope with the standard termination of 50Ω to ground.

SY58600U

Reconfiguring an AC-Coupled SY58600U Board into a DC-Coupled Board

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

1. Replace capacitors C5 and C6 with 0Ω resistors.

Setting up the SY58600U DC-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 either 3.3V or 2.5V depending on your application and turn off the supply.
2. Connect the GND terminal and the V_{CC} terminal to the positive side of a DC power supply.
3. Connect the V_{EE} terminal to the negative side of a DC power supply. This allows the SY58600U to see either +3.3V or +2.5V at V_{CC} with respect to V_{EE} while setting the V_{CC} to be at the same voltage potential as the GND of the scope. By doing this the 50Ω termination to GND of the scope appears as a 50Ω termination to V_{CC} for the device, which is the desired termination for a CML output.
4. Turn on the power supply 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). Set the offset to be zero, the value of this 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.
7. Using equal length 50Ω impedance coaxial cables, connect the signal source to the inputs on the evaluation board (IN and /IN).
8. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (Q and /Q) to the oscilloscope or other measurement device that has an internal 50Ω termination.
9. Turn on the power and verify the current is <70mA.
10. Enable the signal source and monitor the outputs.

SY58601U/SY58602U

Reconfiguring an AC-Coupled SY58601U or SY58602U Board into a DC-Coupled Board

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

1. Remove resistors R1 and R2
2. Remove the solder bridge between device pins 2 and 3 at the SY58601U or SY58602U.
3. Remove capacitor C16.
4. Short the VT (pin 2) to the GND pad near it shown on the silkscreen on the back of the board.
5. Replace capacitors C3, C4, C5 and C6 with 0Ω resistors.

Setting up the SY58601U or SY58602U DC-coupled Evaluation Board

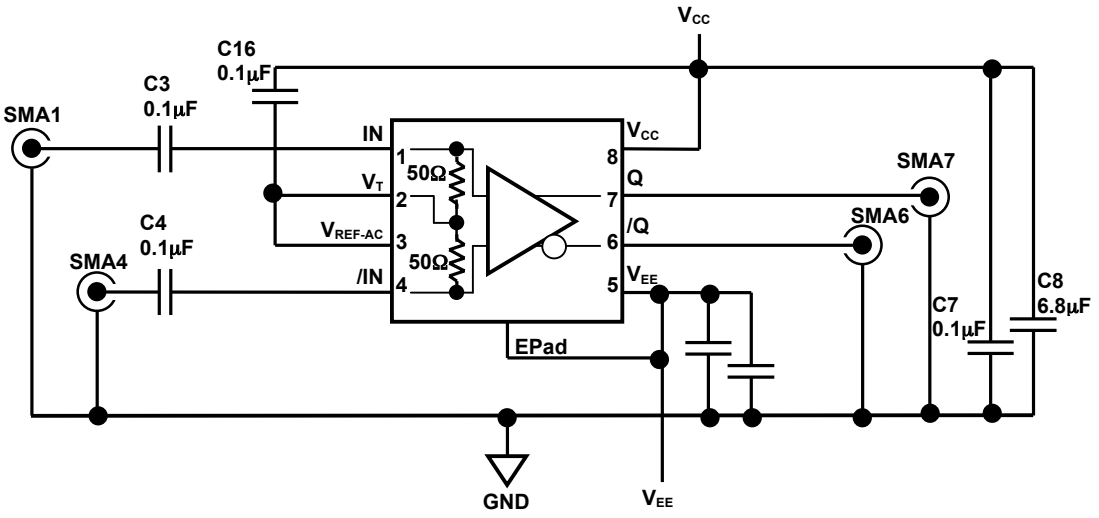
The following steps describe the procedure for setting up the DC-coupled evaluation board:

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 (for 3.3V operation) or –0.5V (for 2.5V operation) 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. Turn on the power supply and verify that the power supply current is <70mA. Using a voltmeter.
6. Turn off the power supply.
7. Disable the outputs of the differential signal source and set the $V_{OH} = V_{CC}–1.0V$ and the $V_{OL} = V_{CC}–1.75V$) as shown in the following table:

I/O Voltage Level	+3.3V Supply	+2.5V Supply
$V_{OH} = V_{CC} –1.0V$	+1.0V	+1.0V
$V_{OL} = V_{CC} –1.75V$	+0.25V	+0.25V

8. Using equal length 50Ω impedance coaxial cables, connect the signal source to the inputs on the evaluation board (IN and /IN).
9. Using equal length 50Ω impedance coaxial cables, connect the outputs of the evaluation board (Q and /Q) to the oscilloscope or other measurement device that has an internal 50Ω termination.
10. Turn on the power and verify the current is <70mA.
11. Enable the signal source and monitor the outputs.

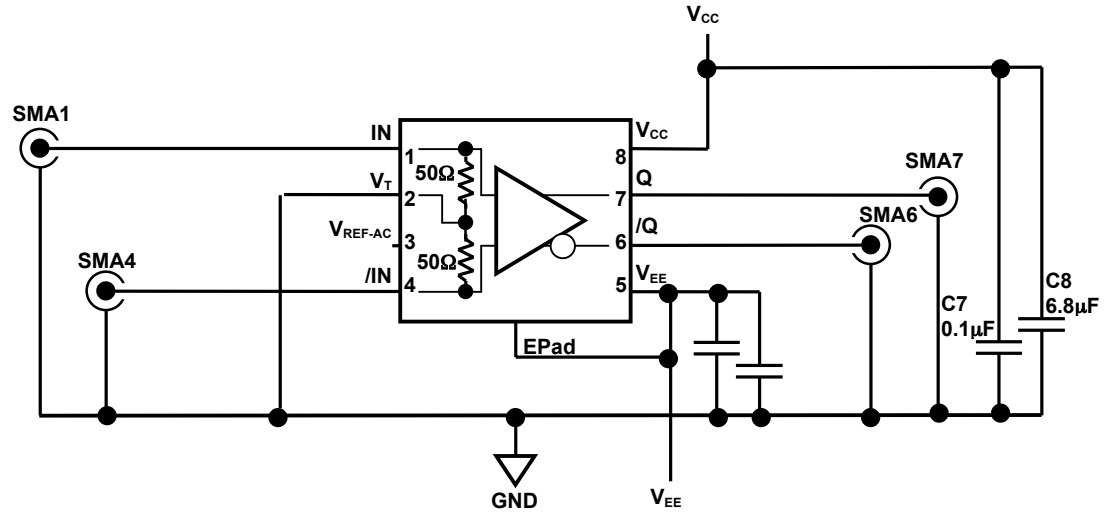
hbwhelp@micrel.com or (408) 955-1690



SY58600U DC-Coupled Evaluation Board

Power Supply	V_{CC}	GND	V_{EE}	I/O
2.5 Volt System	+2V	0V	–0.5V	AC-Coupled Input/DC-Coupled Output
3.3 Volt System	+2V	0V	–1.3V	AC-Coupled Input/DC-Coupled Output

Table 4. DC-Coupled Evaluation Board Power Supply Connections



SY58601U/SY58602U DC-Coupled Evaluation Board

Power Supply	V_{CC}	GND	V_{EE}	I/O
2.5 Volt System	0V	0V	-2.5V	AC-Coupled Input/DC-Coupled Output
3.3 Volt System	0V	0V	-3.3V	AC-Coupled Input/DC-Coupled Output

Table 5. DC-Coupled Evaluation Board Power Supply Connections

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

Additional Bill of Materials for SY58600U DC-Coupled Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C5, C6	CRCW040200R0F	Vishay	Replace with 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	2

Additional Bill of Materials for SY58601U/SY58602U DC-Coupled Evaluation Board

Item	Part Number	Manufacturer	Description	Qty.
C3, C4, C5, C6	CRCW040200R0F	Vishay	Replace with 0Ω, 1/16W, 5% Thick-film Resistor, Size 0402, X7R Dielectric	4

Notes:

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

Micrel Cross Reference

To find an equivalent Micrel part, go to Micrel's website at http://www.micrel.com and follow the steps below:

1. Click on Dynamic Cross Reference
2. Enter competitor's part number in the Dynamic Cross Reference field
3. To download a PDF version of this information, click on the Cross Reference PDF tab

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. 2150 FORTUNE DRIVE SAN JOSE, CA 95131 USA
TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB http:/www.micrel.com