

LMH2180 Evaluation Board in LLP

National Semiconductor
Application Note 1776
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General Description

This evaluation board is designed to aid in the characterization of National Semiconductors LMH2180 75 MHz Dual Clock Buffer. This board simplifies the connection and ease of use of any oscillating input device. Use this evaluation board as a guide for high frequency layout and as a tool to aid in device testing and characterization.

Basic Operation

The LMH2180 is a device that contains two 75 MHz Clock Buffer amplifiers. These amplifiers are specially designed to minimize the effects of spurious signals from the digital chip to other analog or mixed-signal chip. The LMH2180 also minimizes the influence of varying load resistance and capacitance to the oscillator and increases the drive capability. The buffers have a 106 V/μs internal slew rate at a supply current of only 1.3 mA for one channel enabled and 2.3 mA for two enabled channels. Each amplifier in the LMH2180 is capable of driving loads up to 20 pF. The input of each buffer is internally biased at 1V. This allows AC coupling on the input. Each buffer offers an enable pin that can be used to disable the corresponding channel and to optimize consumption.

Channel Activation

Either channel can be independently enabled or shut down. The enable logic can be provided to the evaluation board by shunting a jumper on JR1 and JR2. Refer to *States of LMH2180* for the required control logic.

States of LMH2180

Channel On	Enable1	Enable2
IN1 to OUT1	High	Don't Care
IN2 to OUT2	Don't Care	High

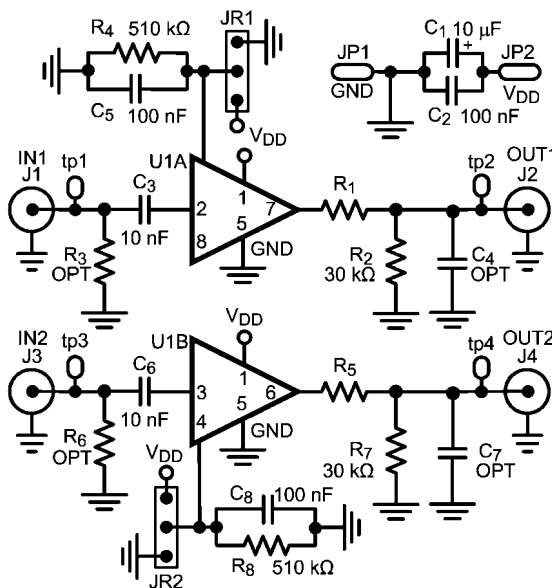
Layout Considerations

Careful consideration for circuitry design and PCB layout will eliminate problems and will optimize the performance of the LMH2180. It is best to have the same ground plane on the PCB for all decoupling and other ground connections.

To ensure a clean supply voltage it is best to place decoupling capacitors close to the LMH2180, between V_{DD} and V_{SS}. On the Evaluation Board this capacitor C1 is placed on the bottom side.

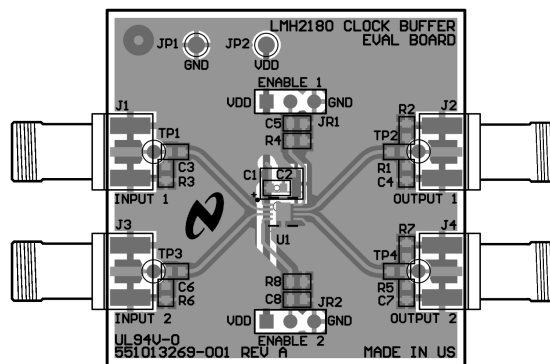
Another important issue is the value of the components, which also determines the sensitivity to disturbances. Resistor val-

ues have to be low enough to prevent noise coupling and large enough to avoid a significant increase in power consumption while loading inputs or outputs to heavily.



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FIGURE 1. Schematic of the Evaluation Board



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FIGURE 2. Layout of the Evaluation Board

The Bill of Material (BOM) of the evaluation board is given in the table below.

Designator	Description	Comment
R1, R5	0603 Resistor	0 Ω
R2, R7	0603 Resistor	30 k Ω
R3, R6	0603 Resistor	Optional
R4, R8	0603 Resistor	510 k Ω
C1	Case B, Tantalum Capacitor	10 μ F 16V
C2, C5, C8	0603 Capacitor	100 nF
C3, C6	0603 Capacitor	10 nF
C4, C7	0603 Capacitor	Optional
JR1, JR2	Jumper	Header 1x3
J1, J2, J3, J4	Connector	SMA
JP1	Power Connector	pin 1.5 mm, Black
JP2	Power Connector	pin 1.5 mm, Red
U1	LLP-8	LMH2180

Measurement Procedure

The performance of the LMH2180 can be measured with the setup given in *Figure 3*.

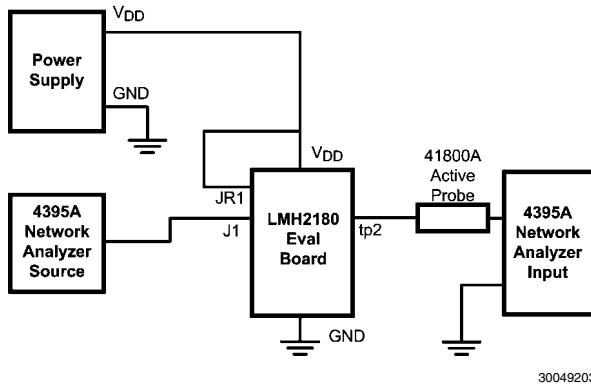


FIGURE 3. Measurement Setup

A supply voltage between 2.5V to 5.0V can be set by an external power supply connected to the JP2 (Red) V_{DD} pin and JP1 (Black) GND pin. In order to test its functionality the buffer is tested by looking at the frequency response. Make sure to enable the buffer which has to be evaluated. The frequency response is tested by using a network analyzer (4395A). For small signal bandwidth evaluation the source input should be set at -16 dBm. Be aware to measure the output of the buffer with the probe directly connected to TP2 or TP4 to measure the highest available bandwidth.

Measurement Results

Figure 4 shows the frequency response of the LMH2180 at 2.7V and 5.0V Power Supply and a source input of $V_{IN} = 0.1V_{PP}$ (-16 dBm @ 50 Ω).

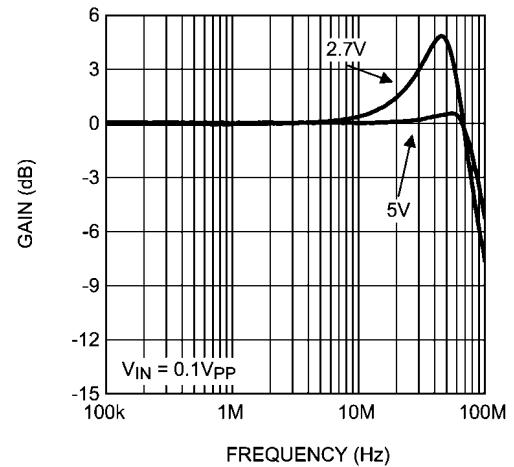


FIGURE 4. Frequency Response

Notes

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