

AN-1776 LMH2180 Evaluation Board in WSON

1 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.

2 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 chips. 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/ μ s internal slew rate at a supply current of only 1.3 mA for one enabled channel 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 1 V. 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.

3 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. For the required control logic, see [Table 1](#).

Table 1. States of LMH2180

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

4 Layout Considerations

Careful consideration for circuitry design and PCB layout eliminates problems and optimizes 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, 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 values 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.

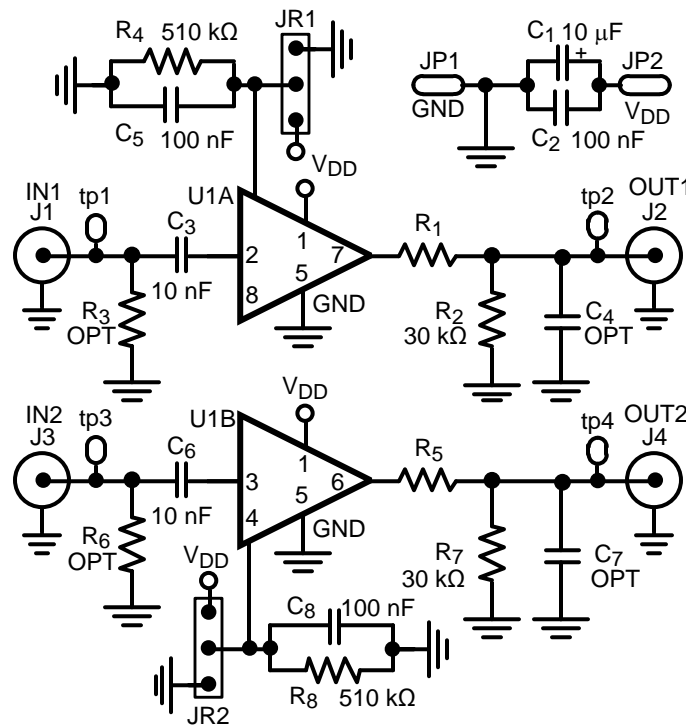


Figure 1. Schematic of the Evaluation Board

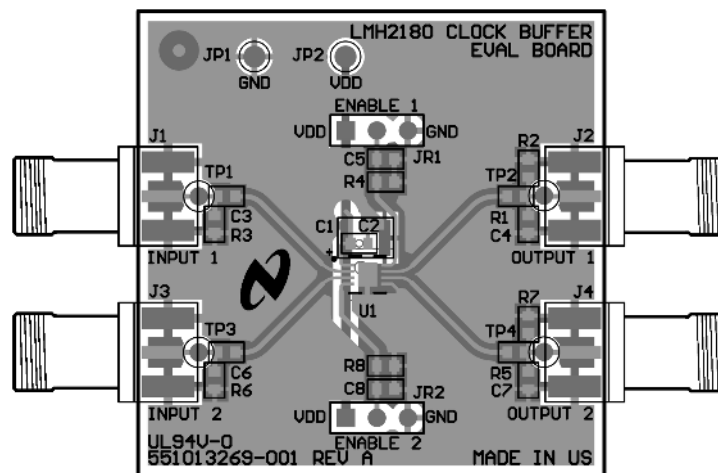


Figure 2. Layout of the Evaluation Board

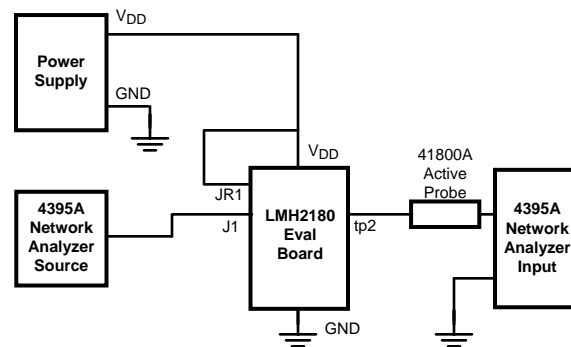
The Bill of Material (BOM) of the evaluation board is given in [Table 2](#).

Table 2. Bill of Material

| 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 | WSO8-8 | LMH2180 |

5 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 2.5 V to 5.0 V 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 that 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.

6 Measurement Results

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

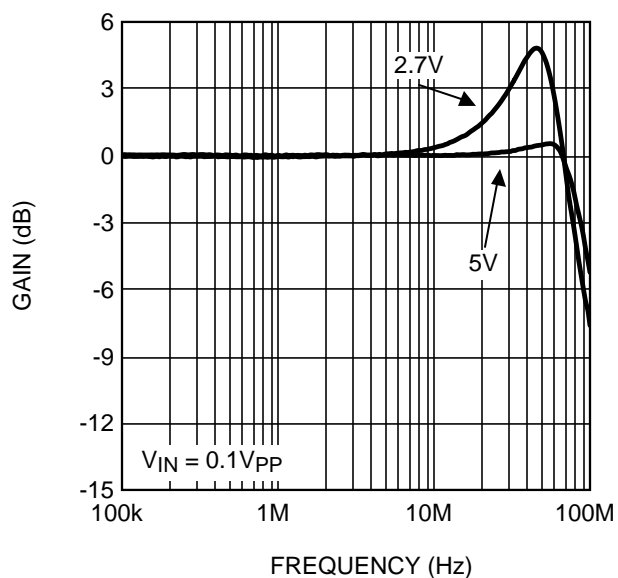


Figure 4. Frequency Response

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