

AN-1776 LMH2180 Evaluation Board in LLP

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 too heavily.

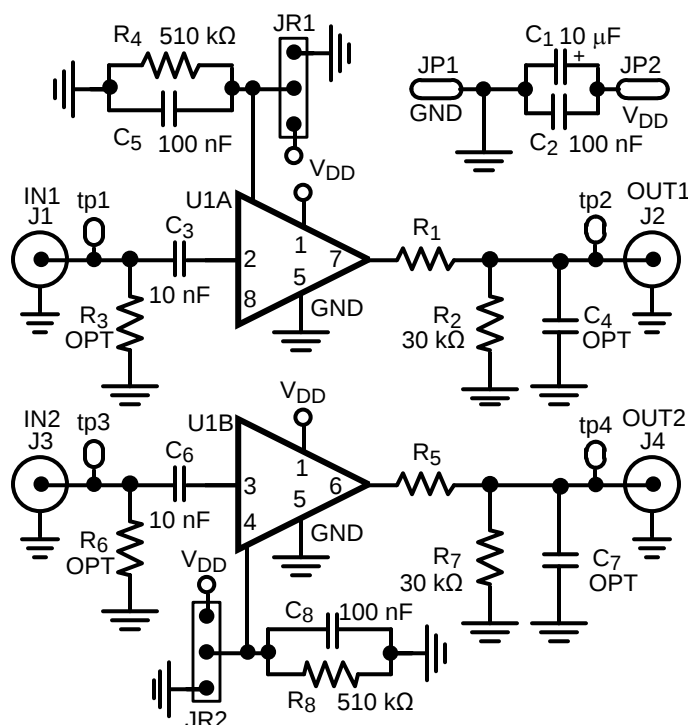


Figure 1. Schematic of the Evaluation Board

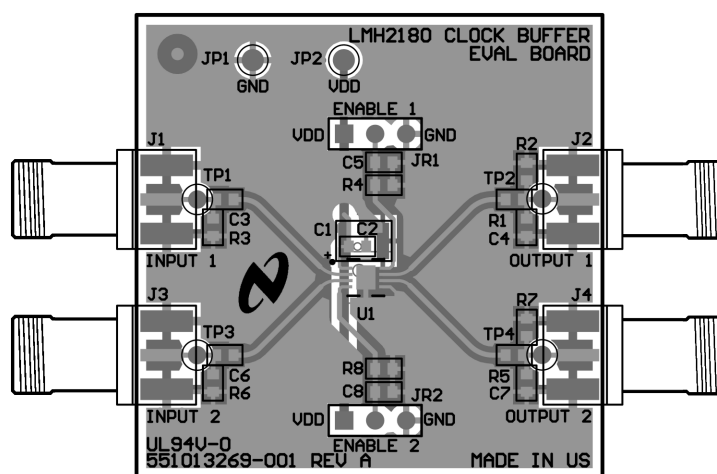


Figure 2. Layout of the Evaluation Board

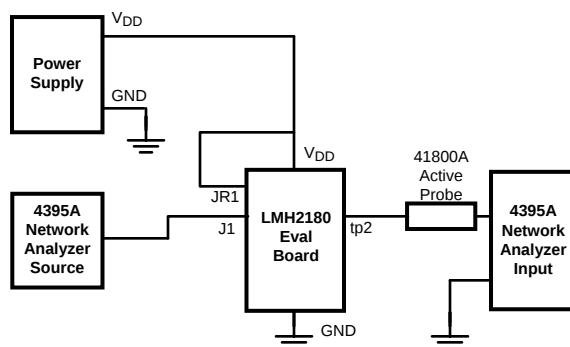
The Bill of Material (BOM) of the evaluation board is given in [Table 2](#).

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	LLP-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).

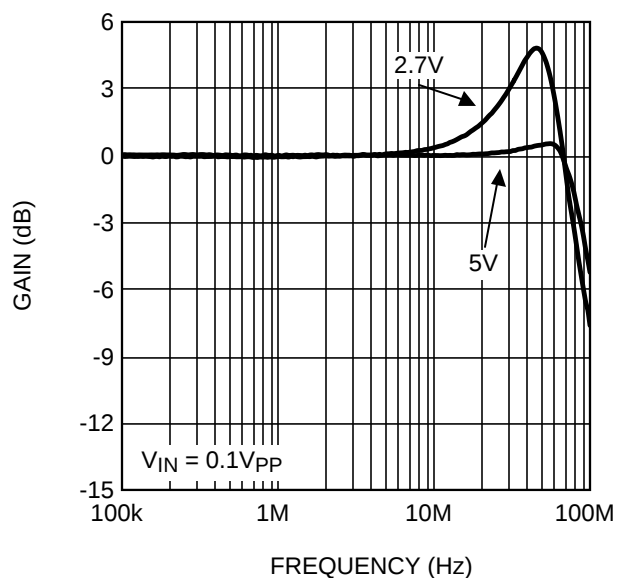


Figure 4. Frequency Response

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com