LMH2180 Evaluation Board in micro SMD

National Semiconductor
Application Note 1863
Gerrit de Wagt
August 21, 2008

General Description

This evaluation board is designed to aid in the characterization of National Semiconductors LMH2180 75 MHz Dual Clock Buffer in micro SMD package. 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 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.

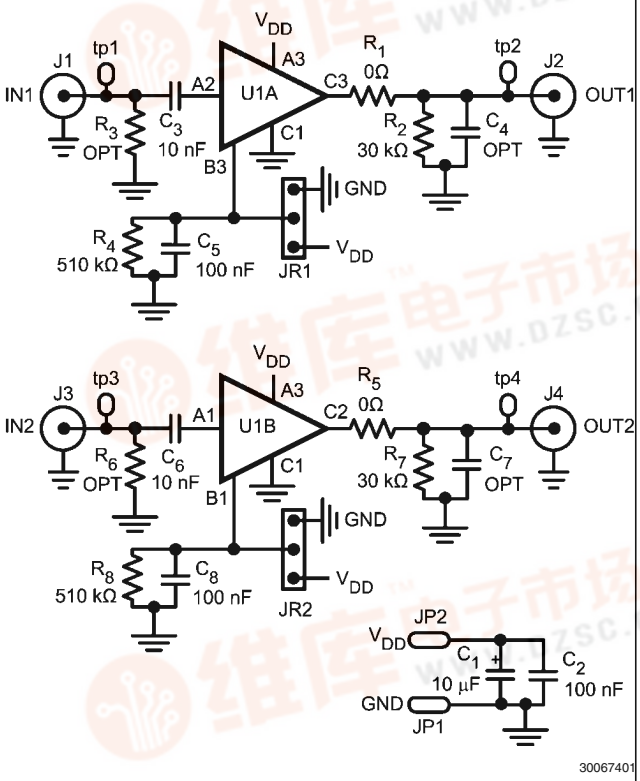

FIGURE 1. Schematic of the Evaluation Board

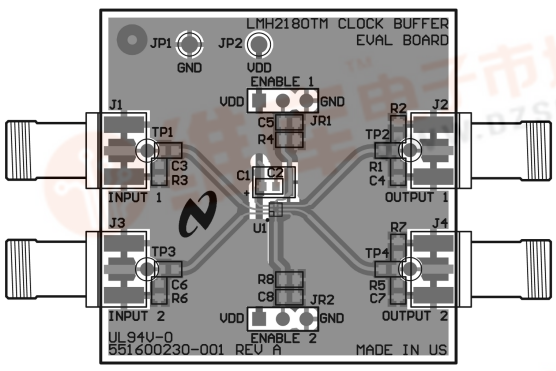

FIGURE 2. Layout of the Evaluation Board

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

Designator	Description	Comment
R1, R5	0603 Resistor	0Ω
R2, R7	0603 Resistor	30 kΩ
R3, R6	0603 Resistor	Optional
R4, R8	0603 Resistor	510 kΩ
C1	Case B, Tantalum Capacitor	10 µF 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	micro SMD	LMH2180TM

Measurement Procedure

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

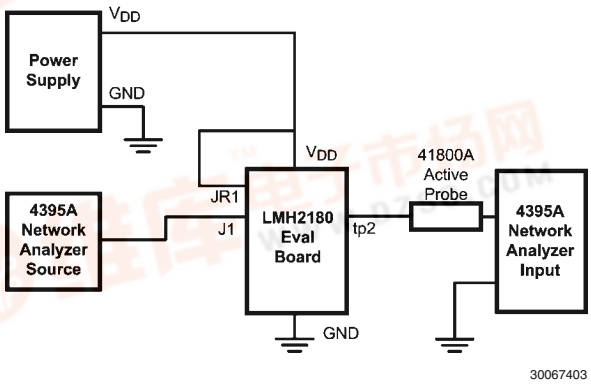

FIGURE 3. Measurement Setup

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 it's 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 @ 50Ω).

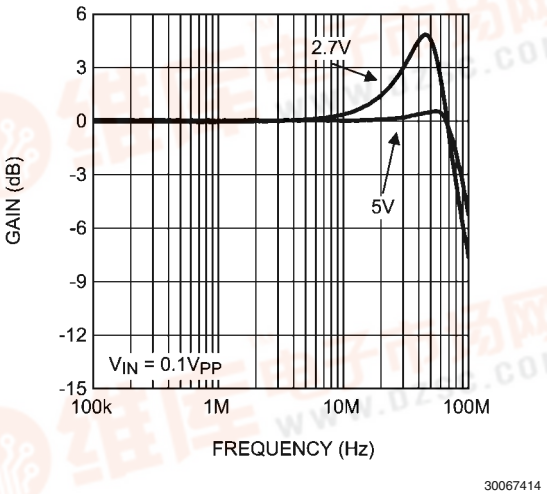

FIGURE 4. Frequency Response

Notes

Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	www.national.com/amplifiers	WEBENCH	www.national.com/webench
Audio	www.national.com/audio	Analog University	www.national.com/AU
Clock Conditioners	www.national.com/timing	App Notes	www.national.com/appnotes
Data Converters	www.national.com/adc	Distributors	www.national.com/contacts
Displays	www.national.com/displays	Green Compliance	www.national.com/quality/green
Ethernet	www.national.com/ethernet	Packaging	www.national.com/packaging
Interface	www.national.com/interface	Quality and Reliability	www.national.com/quality
LVDS	www.national.com/lvds	Reference Designs	www.national.com/refdesigns
Power Management	www.national.com/power	Feedback	www.national.com/feedback
Switching Regulators	www.national.com/switchers		
LDOs	www.national.com/ldo		
LED Lighting	www.national.com/led		
PowerWise	www.national.com/powerwise		
Serial Digital Interface (SDI)	www.national.com/sdi		
Temperature Sensors	www.national.com/tempsensors		
Wireless (PLL/VCO)	www.national.com/wireless		

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

Life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

For the most current product information visit us at www.national.com

National Semiconductor Americas Technical Support Center
Email: support@nsc.com
Tel: 1-800-272-9959

National Semiconductor Europe Technical Support Center
Email: europe.support@nsc.com
German Tel: +49 (0) 180 5010 771
English Tel: +44 (0) 870 850 4288

National Semiconductor Asia Pacific Technical Support Center
Email: ap.support@nsc.com

National Semiconductor Japan Technical Support Center
Email: jpn.feedback@nsc.com