

PmodAMP1™ Speaker/Headphone Amplifier Reference Manual

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Note: This document applies to REV B of the board.



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Overview

The PmodAMP1 Speaker/Headphone Amplifier (PmodAMP1) amplifies low power audio signals to drive either stereo headphones or a monophonic speaker. The speaker is driven from the left stereo input.

The audio inputs to the module are provided through a Digilent 6-pin Pmod connector. A 1/8-inch stereo audio jack is used for the headphone output and a 1/8-inch mono audio jack is used for the speaker output. An inexpensive speaker and enclosure suitable for use with the PmodAMP1 is available from Digilent.

Unlike most Digilent Pmod modules, which accept only digital inputs, the PmodAMP1 accepts analog inputs as well as pulse width modulated digital inputs.

Features include:

- National Semiconductor LM4838 audio amplifier IC
- 1/8-inch stereo headphone jack
- 1/8-inch mono speaker jack
- a 6-pin header for inputs
- 3V-5V operating voltage
- small form factor (0.80" x 1.15").

Functional Description

The PmodAMP1 accepts either digital or analog inputs. The input voltage range is 0-Vcc. Typically the module will use power supplied by a Digilent system board and will be

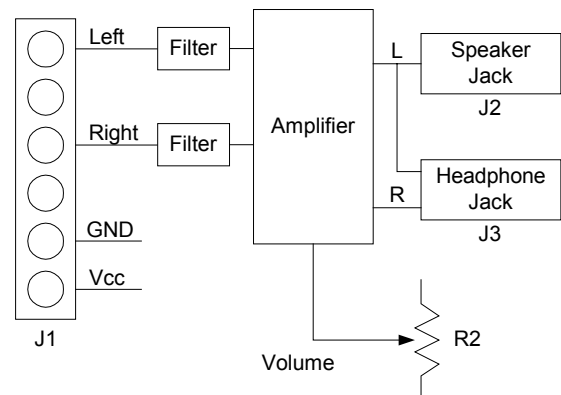
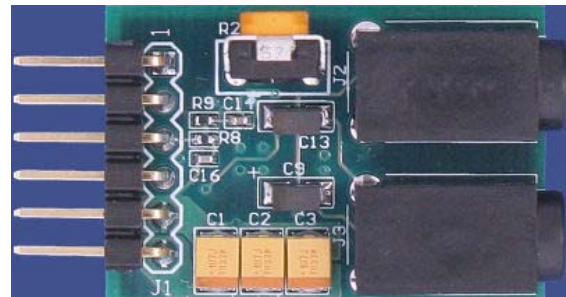


Figure 1 PmodAMP1 Block Diagram

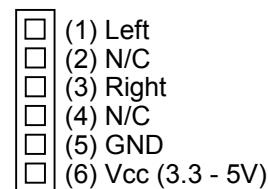


Figure 2 PmodAMP1 Input Connector, J1

operated at 3.3V. The maximum power supply voltage is 5.0V. The inputs for the amplifier and the power to the module are provided on connector J1.

The PmodAMP1 provides a band-pass filter on the input with a high pass cutoff frequency of

approximately 150Hz and a low pass cutoff frequency of approximately 8KHz.

A digital input will typically be a pulse width modulated (PWM) signal produced by a digital output from a Digilent programmable logic system board. The low pass filter on the input will act as a reconstruction filter to convert the pulse width modulated digital signal into an analog voltage on the amplifier input.

The PmodAMP1 also accepts analog inputs with an input voltage range of 0-Vcc. These inputs will typically be the output of an analog to digital converter module, like the Digilent PmodDA1 or PmodDA2, but could also be a line level signal from some other audio source.

The output of a digital to analog converter module will typically have a voltage range of 0-3.3V and should have a sample rate of at least 16Khz. The low pass filter on the input will again act as a reconstruction filter and remove the high frequency artifacts introduced by the sampling process.

A line level input, like the output of a portable CD player or MP3 player, will typically be a 1V peak-to-peak analog voltage.

The input voltage, from whatever signal source is used, is filtered by the input band-pass filter, amplified and then sent to the output jacks to

drive either a speaker or headphones.

Connector J2 is the speaker output. Connector J3 is the headphone output. Both headphones and a speaker can be connected and driven simultaneously. The potentiometer, R2, is a volume control and can be used to adjust the output level.

The PmodAMP1 module will typically be used with a Digilent programmable logic system board producing pulse width modulated digital outputs or producing analog output via a digital to analog converter module. Most Digilent system boards, like the Basys and Nexys, have 6-pin connectors that allow the PmodAMP1 to plug directly into the system board or to connect via a Digilent 6-pin cable.

Some older Digilent boards may need a Digilent Module Interface Board (MIB) and a 6-pin cable to connect to the PmodAMP1. The MIB plugs into the system board and the cable is used to connect the PmodAMP1 to the module interface board.

For more information about the operation and features of the LM4838 audio amplifier IC, refer to the data sheet available at www.national.com.

For more information, the PmodAMP1 schematic is available at www.digilentinc.com.