Open Acoustic Devices

AudioMoth USB Microphone 1.0.1 Datasheet

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This datasheet describes the AudioMoth USB Microphone hardware, a USB microphone version of the acoustic monitoring device AudioMoth®.

Contents

1 AudioMoth USB Microphone overview

AudioMoth USB Microphone is a low-cost, full-spectrum USB microphone, based on the Gecko processor range from Silicon Labs.

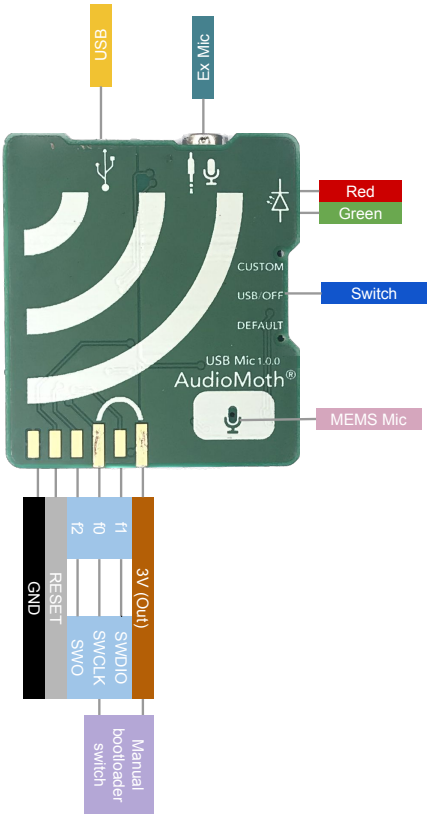

Figure 1: *Front of the AudioMoth USB Microphone*

AudioMoth USB Microphone has the following features:

- Silicon Labs Wonder Gecko microcontroller
  - 48MHz 32-bit processor
  - DSP instruction support and floating-point unit
  - 256kB Flash
  - For full details of the Wonder Gecko microcontroller please see the Wonder Gecko reference manual.
- On-board analog MEMS microphone (SPU0410LR5H-QB), Sensitivity -38 dBV/Pa, 63 dBA SNR, 10Hz to 192kHz
- Sample rates up to 384kHz
- 3.5 mm jack socket for external electret condenser microphones
- Micro-USB B port for power, configuration and for reprogramming
- 6-pin serial wire debug port

AudioMoth USB Microphone is powered by an ultra low power (ULP) Silicon Labs EFM32WG332F256 ARM Cortex-M4F 32-bit micro-controller, a smaller version of the AudioMoth microcontroller. The overall hardware utilises features such as cascaded operational amplifiers for microphone pre-amplification, 12-bit ADC with 16-bit oversampling, DMA for data routing in low energy modes and USB for device configuration.
AudioMoth USB Microphone can be configured to record at many sample rates, making it suitable for monitoring sounds from different source types. These include: anthropogenic noise, such as gunshots, chainsaws or engine

noise (8 kHz sample rate); audible wildlife, such as bird, insect or frog vocalisation (48 kHz sample rate); and ultrasonic wildlife, such as bat or amphibian calls (384 kHz sample rate). The device can be used in multiple scenarios, such as a portable bat detector when plugged into an android phone or tablet; live streaming sound through the internal and external microphone, including underwater sound using an external hydrophone; and as a USB microphone extension to single board computers.

For debug and trace, six pads are exposed and configured to standard J-Link serial wire output (SWO). Serial debug and trace use the standard Silicon Labs tool, Simplicity Studio.

Configuring and reprogramming AudioMoth USB Microphone can be done using USB and the AudioMoth USB Microphone App and AudioMoth Flash App desktop apps, respectively. Once configured settings are persistent. To visualise AudioMoth USB Microphone audio output on desktop download the AudioMoth Live App.

2 Maximum Ratings

Maximum operating conditions for the AudioMoth USB Microphone are:

- Operating Temp Max 85°C
- Operating Temp Min -40°C
- 3.6V minimum input voltage
- 6V maximum input voltage

3 Electrical Specification

TEST CONDITIONS: temperature 23±2°C, running AudioMoth USB Microphone Firmware version 1.2.1.

Parameter	Notes	Min	Typ	Max	Units
Supply voltage		3.3	4.1	6	V
Supply current	Average current, min @8kHz, max @384kHz	18	20	22	mA
Internal microphone	Knowles SPU0410LR5H-QB				
Sensitivity	94 dB SPL @ 1 kHz	-41	-38	-35	dBV/Pa
Signal to Noise Ratio	94 dB SPL @ 1 kHz, A-weighted	-	63	-	dB(A)
External mic socket	Electret condenser mics only				
Supply voltage	2.7kΩ bias resistance	-	3	-	V
Pre-amplification					
Standard gain range	AudioMoth USB Microphone App low, mid and high gain	4.33	15.00	30.00	A_V
Low gain range	AudioMoth USB Microphone App low, mid and high gain with low gain range selected	0.33	1.00	2.00	A_V

4 Applications Information

4.1 External microphone Compatibility

AudioMoth USB Microphone is compatible with plug-in power electret condenser mics. For a detailed guide see the 'Using AudioMoth with External Electret Condenser Microphones' application note.

5 Hardware version changes

Version 1.0.1 (Current)

- Replaced 3.5mm socket component

Version 1.0.0

- Initial version