Device: MOD-1007

This document Version: 1.0

Matches module version: v4

Date: 2 July 2011

Description: SoundOut Audio Module

Contents

Introduction

The MOD-1007 is an WTV020-SD based audio playback module and is compatible with the SOMO14D.

Features

The MOD-1007 comes with a 1Gb card to stash your sound samples on. It can be controlled through a simple serial connection from a microcontroller, or alternatively by simply pulling one of the playback control inputs to ground.

The MOD-1007 plays back .AD4 files, which are a compressed form of audio file known as ADCPM. A utility is provided that can create .AD4 files from .MP3 and .WAV files.

The module can drive a speaker directly.

Hackability

The MOD-1007 is 100% hackable.

At Embedded Adventures, we believe you have the most fun when you have the most control over your hardware. For the MOD-1007 we provide a datasheet, complete schematic and complete source code. After that, it's all up to you. We'd love to hear about the projects you're using it for – send us information and photos to myproject@embeddedadventures.com

Construction

It's all pre-built! Just add female or male header pins, or solder directly to the board, and away you go.

Connections

The MOD-1007 has two connection ports on either side of the board.

RST	Reset – pull low to reset the module
NC	Not connected
SPK	Speaker connection
SPK	Speaker connection
GND	Ground (Vss) connection.
VCC	Positive supply (3.3V)

|	
PLAY	Play – pull to ground to start/stop playback
BSY	High – busy (playing back) Low - ready
SIN	Serial in
CLK	Clock in
PRV	Previous track – pull to ground to go to previous track
NXT	Next track – pull to ground to go to next track

Power

The MOD-1007 requires power at 3.3V. If your microcontroller is using 5V, consider using a bidirectional level converter such as the MOD-1003 from Embedded Adventures (that's us!).

Pull up resistors

Pull up resistors are not required.

Usage – microcontroller mode

To control the MOD-1007, you can clock in commands over the serial connection.
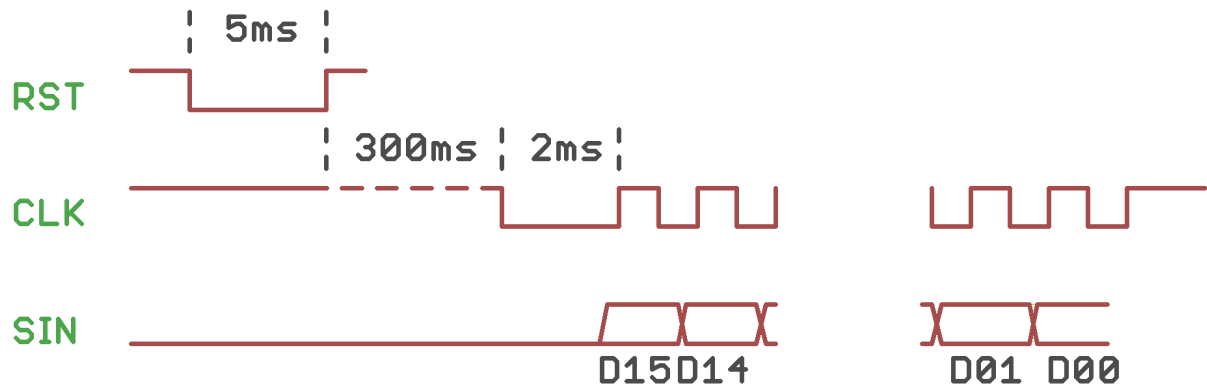
To reset the device, hold the RST pin low for at least 5ms. Then, wait 300ms for the module to read the SD card, calculate the phase of the moon, and prepare for playback.

At the start of each command, pull the CLK line low for 2ms, then clock in the 16 bit command, most significant bit (MSB) first. For each bit, change the data line while the CLK line is low, then pulse the CLK line high to load the bit into the MOD-1007. Each CLK pulse should be at least 50µS long.

It is not necessary to reset the device every time you want to send a command. It's a good idea to do it the first time you start communicating with the module though.

BSY will be high while playback is occurring and low otherwise. You can tell when a file has finished playing back by waiting for the BSY line to return low.

Commands

Commands are 16 bit words.

0x0000 to 0x01FF	Start playback 0000.ad4 to start playback 0511.adf
0xFFFx	Set volume: 0xfff0 mute to 0xfff7 loud (default)
0xFFFE	Play (or pause if already playing)
0xFFFF	Stop playback

So, to playback 0000.ad4, send 0x0000. To start playback of 0001.ad4, send 0x0001 and so on. You can send volume commands whether playback is occurring or not.

The PicPack library includes a queued voice playback system, allowing you to build up sentences from individual words, where each word (or phrase) is an individual .ad4 file. This makes it programmatically easy to do things like:

```
audio_queue_add(PH_IF_YOUR_NAME);
audio_queue_add(player_a_phrase);
audio_queue_add(PH_PRESS_THE);
audio_queue_add(PH_RED);
audio_queue_add(PH_BUTTON);
```

Usage – key mode

Either using buttons tied to ground, or using microcontroller I/O, you can use the key mode of the MOD-1007. This is an easy way to test the module as well. Simply pulse the NXT/PRV inputs to ground to go to the next or previous track, and pulse PLAY to play or pause the current track.

PLAY	Play – pull to ground to start playback, or stop playback
PRV	Previous track – pull to ground to go to previous track
NXT	Next track – pull to ground to go to next track

Filesystem

The module can playback using micro-SD cards up to 2Gb in size. They need to be formatted in "FAT" file system format.

Simply put your files in the root directory, naming them 0000.ad4 and so on.

Note that some micro-SD cards simply won't work with the module, it's a little finicky about which cards it chooses to play with. That's one of the reasons we supply one that we know works.

Creating .ad4 files

Waytronic provide a utility to convert from .wav and .mp3 files to .ad4. You can find it here:

http://www.embeddedadventures.com/datasheets/USBRecorder1.3Setup.zip

Run the installation program. Once you have installed the main program, it will ask if you want to install a driver – just click on the X close button in the top right hand corner, you don't need the driver for just converting files.

You'll have installed a program called "USBRecorder". When you run it, click on the "Local File" tab down the bottom, then the [...] button at the top.
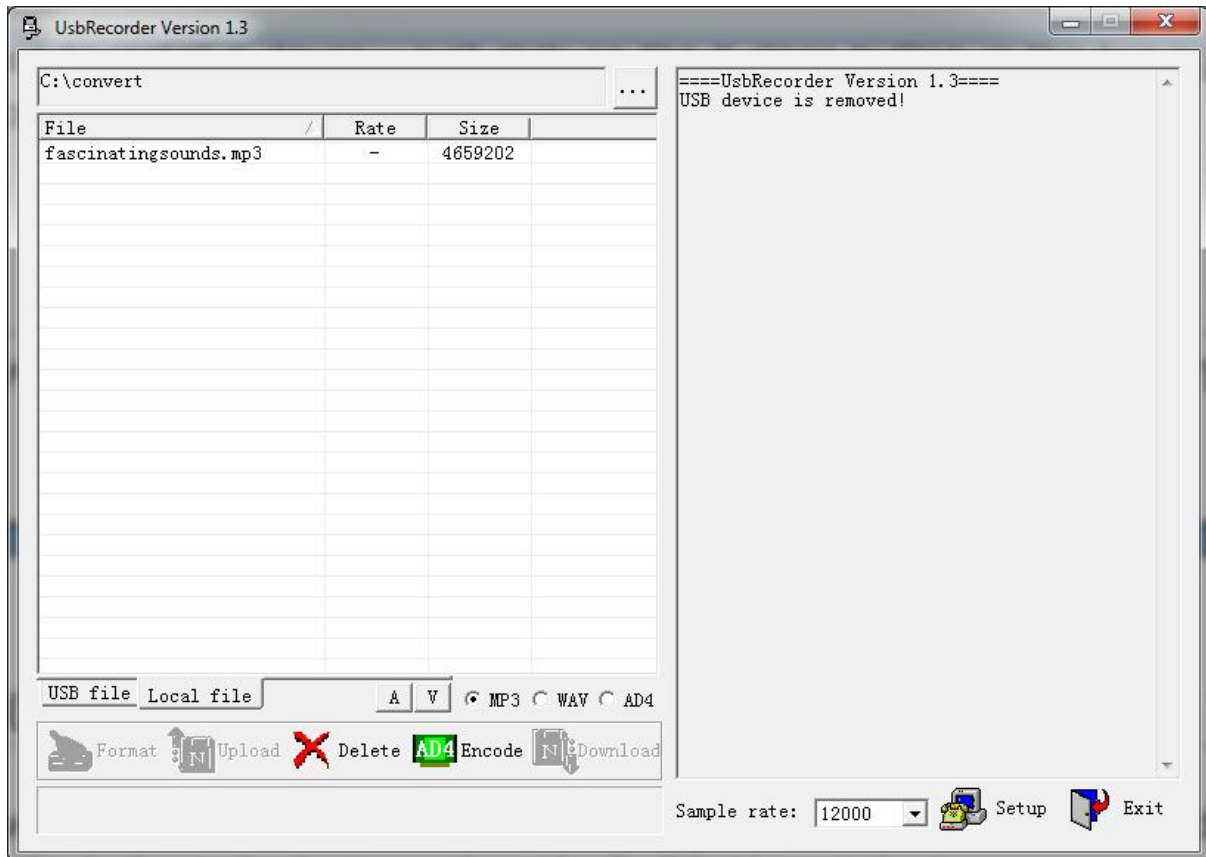

From there you can select a folder where your original .mp3 or .wav file can be found. To show mp3 files, click on the "MP3" radio button down the bottom of the window. To show .wav files, likewise click on the "WAV" radio button.

Chnage the Sample Rate to "Original". Depending on your audio file, you may wish to play around to balance between file size and audio quality. Now click on the file you wish to convert. It will be highlighted in blue. Click on the green AD4 Encode button. After converting, it will place a file in the same directory with the extension .ad4. You can see it by clicking the AD4 radio button.

Now rename your files to start numerically at 0000. For example, rename your files to 0000.ad4, 0001.ad4 and so on.

Copy to the micro-SD card, pop it in the module and you'll be all set to play all sorts of sounds!
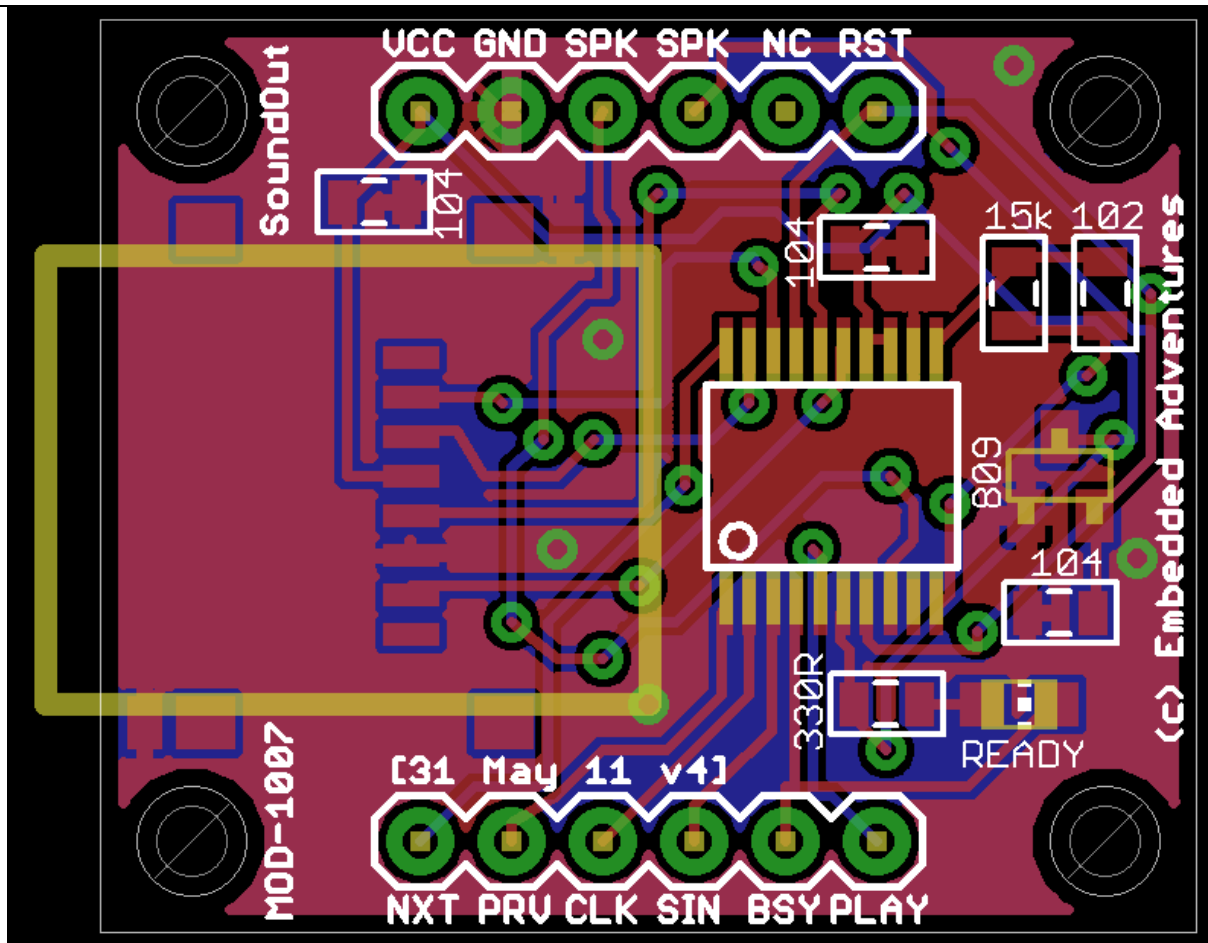
Schematic
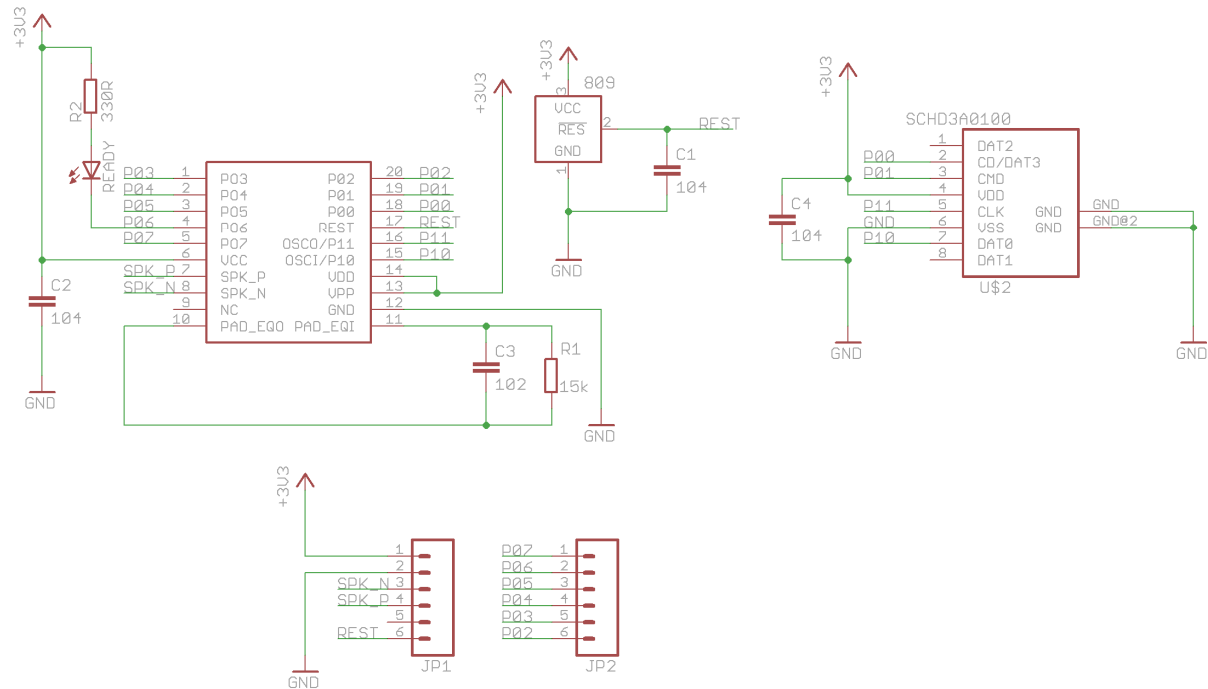
The MOD-1007 includes an 809-based reset chip to ensure the WTV020-SD is reset correctly.

Programming

See ms5611.c and ms5611.h available in the PicPack library. These rely on the i2c.c and i2c.h software i2c libraries. The PicPack library can be downloaded from the Tutorials | Downloads section of www.embeddedadventures.com

PCB

Versions

Version	Date	Comments
Version 1.0	2 July 2011	Initial Version for board v4