

MP3 Trigger User Guide

2009.09.17

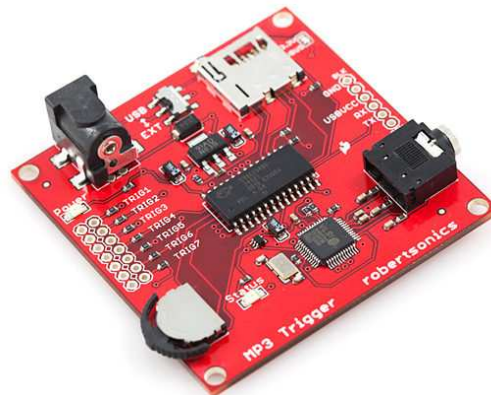
Overview

The MP3 Trigger is a versatile, low-cost, low-power embedded audio unit that plays MP3 tracks directly from a FAT16-formatted microSD flash card to a stereo line-level 1/8" output jack, supporting up to 192Kbps stereo playback. The board has 7 external input pins that will directly trigger pre-selected MP3 tracks, and a full-duplex serial control port that provides full transport control, remote triggering for up to 256 tracks as well as rapid real-time volume control. There is also an on-board navigation switch for local access and playback of all MP3 tracks on the flash card.

Specifications

- Input Voltage Range: 4.5V to 12.0V DC, or regulated 3.3V (jumper selectable).
- Current Consumption: 45mA idle, 85mA playing.
- File system: FAT16.
- Audio output: line-level stereo (1/8" stereo jack).
- Trigger inputs: Logic level 3.3V – 5.0V, active low inputs, w/ internal pull-ups. (Connector provides individual grounds, allowing switches or jumpers to be connected directly to each trigger input).
- Serial: Full duplex, 8-bit, 38.4Kbaud.

Figure 1



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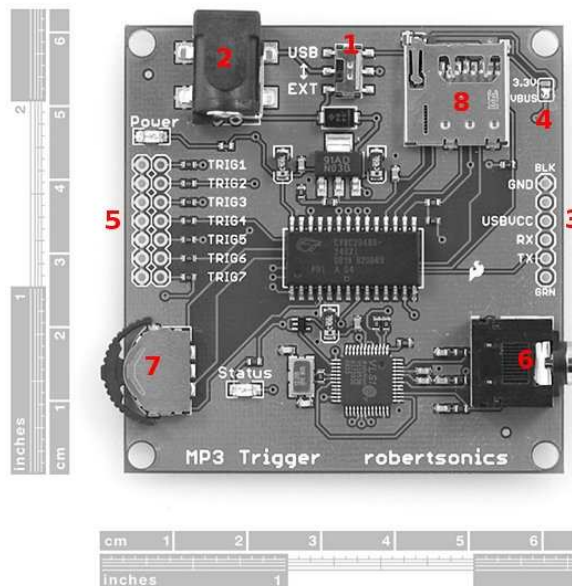
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Component Layout

The layout of the MP3 Trigger can be seen in Figure 2 below.

- 1) Power Select Switch
- 2) External Power Connector (5.5x2.1mm center positive)
- 3) USB Power and UART Interface for the FTDI Basic (DEV-09115)
- 4) USB Power Selection Jumper
- 5) Trigger Pins
- 6) 1/8" Stereo Audio Output Jack
- 7) Navigation Switch
- 8) microSD Socket

Figure 2



Supplying Power

With the Power Select Switch (1) in the EXT position, power is applied through the 2.1mm, center-positive barrel connector (2) and is routed through the on-board regulator. 4.5V to 12V DC is the allowable input voltage range.

With the Power Select Switch in the USB position, power is applied through the USBVCC pin of the serial port connector (3). As shipped, the USB Power selection jumper (4) routes this pin to the on-board voltage regulator so the same voltage range as above should be observed. If the serial interface supplies 5V DC, use this position. If the serial interface instead provides regulated 3.3V DC, then the jumper (4) may be modified so that the USBVCC pin bypasses the on-board regulator and supplies the MP3 Trigger with 3.3V DC directly.

Refer to the MP3 Trigger schematic diagram for further details.

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Basic Operation

Simply transfer desired MP3 files onto a microSD flash card using a PC. The MP3 Trigger currently supports SD media formatted with the FAT16 file structure. Most microSD cards of 2GB or less are pre-formatted with FAT16. Cards larger than 2G, and smaller cards formatted with FAT32, will need to be reformatted to work with the MP3 Trigger.

The MP3 Trigger does not currently support hot-swapping of the microSD Card. While this will not damage anything, the microSD media is only initialized during power up. So whenever the card is changed or updated, be sure to power cycle the MP3 Trigger after installing the card.

When power is applied the MP3 Trigger, the on-board (green) status LED indicates the state of the installed media as follows:

- 1 long blink - No FAT16 microSD media found.
- 1 long blink, followed by 1 short blink - microSD media found, but no MP3 files located.
- Constant short blinks - Problem with MP3 Decoder hardware (diagnostic).
- 3 short blinks – FAT16 microSD media found, and at least one MP3 file located.

As soon as the MP3 Trigger powers up with 3 short blinks, it's ready to go. The on-board navigation switch can be used to play all of the tracks on the card, regardless of the filenames.

- Right - Plays the next MP3 file in the directory
- Left - Plays the previous MP3 file in the directory
- Center - Starts/Stops the current MP3 file

Using the Trigger Inputs

The MP3 Trigger provides 7 input pins (TRIG1 – TRIG7) that can be used to trigger specific MP3 tracks on the microSD card. Use the following file naming convention to associate a particular track with a trigger:

- TRIG1: filename – TRACK001.MP3
- TRIG2: filename – TRACK002.MP3
- ...
- TRIG7: filename – TRACK007.MP3

These inputs are active low and are pulled high internally. Therefore, they can be activated either by digital outputs from another microcontroller (such as an Arduino) or by a simple contact closure (switch) to ground. The inputs support voltage levels of either 5V or 3.3V.

The trigger inputs are made available on the even-numbered pins of a dual row connector, and all the opposing (odd-numbered) pins are ground, making it easy to wire individual switches or contact closures directly to the MP3 Trigger board. Refer to the MP3 Trigger schematic for details. (The ground pins are those closest to the edge of the PCB.)

Activation of a trigger immediately causes the corresponding track to play (if it exists).

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Installing a 14-pin dual-row header allows shunt jumpers to be installed on the trigger inputs to automatically sequence and loop tracks on power-up as follows:

When a triggered track reaches the end, the MP3 Trigger looks to see if any trigger inputs are active, and will automatically start another track if so. If only the same trigger is active, then that track will restart (loop). If other triggers are active, the MP3 Trigger will always start the next higher trigger track, wrapping back to TRIG1 after TRIG7.

This, combined with the fact that the MP3 Trigger will automatically start the lowest numbered active trigger on power up, means that by installing shunt jumpers on the TRIG1 – TRIG7 inputs, the MP3 Trigger can be set to automatically sequence and loop from 1 to 7 tracks on power up with no externally programming or control required.

Serial Control Protocol

The MP3 Trigger comes with a full duplex 3.3-5V serial TTL interface that allows for control of all the MP3 tracks (up to 256) on the microSD card as well as volume. You can use our FTDI Basic (DEV-09115) or connect to any serial interface that uses the format: 38.4Kbps, 8-bits, 1-start, 1-stop, no parity, flow control = none. Note that power can be supplied to the MP3 Trigger by the FTDI Basic by placing the Power Select Switch in the USB Position.

All commands to the MP3 Trigger are 1 or 2 bytes in length.

1-byte commands are upper case ASCII characters.

2-byte commands start with an ASCII character. Those starting with an upper case character use an ASCII value ('0' – '9') as the second byte. (These commands can be typed on a keyboard.) 2-byte commands starting with a lower case character require a binary value (0 – 255) as the second byte.

Bytes sent to the MP3 Trigger are not echoed. If echoing is required, set your terminal program to echo locally.

Command Summary:

Command: Navigation – Start/Stop

Number of bytes: 1

Command byte: 'O'

Data byte: none

Comments: This command performs the same function as pushing the on-board nav switch center position. If the current track is playing, it stops. If the current track is stopped, it will restart from the beginning

Command: Navigation – Forward

Number of bytes: 1

Command byte: 'F'

Data byte: none

Comments: This command performs the same function as pushing the on-board nav switch right position. The next MP3 track in the directory will be started.

Command: Navigation – Reverse

Number of bytes: 1

Command byte: 'R'

Data byte: none

Comments: This command performs the same function as pushing the on-board nav switch left position. The

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previous MP3 track in the directory will be started.

Command: Trigger (ASCII)

Number of bytes: 2

Command byte: 'T'

Data byte: N = ASCII '1' through '9'

Comments: If it exists, the track with the filename "TRACK00N.MP3" will be started, where N is the data byte.

Command: Trigger (binary)

Number of bytes: 2

Command byte: 't'

Data byte: n = 1 to 255

Comments: If it exists, the track with the filename "TRACKNNN.MP3" will be started, where NNN is the ASCII equivalent of the data byte n.

Command: Play (binary)

Number of bytes: 2

Command byte: 'p'

Data byte: n = 0 to 255

Comments: If it exists, the nth track in the directory will be played. The total number of available tracks in the directory can be retrieved using Status Request command below.

Command: Set Volume (binary)

Number of bytes: 2

Command byte: 'v'

Data byte: n = 0 to 255

Comments: The VS1053 volume will be set to the value n. Per the VS1053 datasheet, maximum volume is 0x00, and values much above 0x40 are too low to be audible.

Command: Status Request (ASCII)

Number of bytes: 2

Command byte: 'S'

Data byte: N = ASCII '0' through '1'

Comments: If N = '0', the MP3 Trigger will respond with a version string. If N = '1', the MP3 Trigger will respond with the total number of tracks on the installed microSD card, in ASCII. Both responses will be preceded by the '=' character.

MP3 Trigger Outgoing Message Summary:

The MP3 Trigger sends the following ASCII messages:

'X': When the currently playing track finishes.

'x': When the currently playing track is cancelled by a new command.

'E': When a requested track doesn't exist (error).

In response to a Status Request Command, data byte = '0', the MP3 Trigger sends an 18-byte version string: e.g. "=MP3 Trigger v1.00"

In response to a Status Request Command, data byte = '1', the MP3 Trigger sends the number of MP3 tracks on the currently installed microSD card: e.g. "=14"