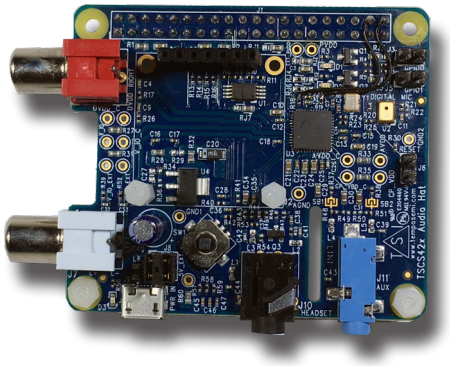
Tempo Semiconductor TSCS42xx Audio HAT Board for Raspberry Pi®

Applications

The TSCS42xx Audio HAT Board enables any Raspberry Pi single-board computer to be transformed into a fully customizable complete audio solution for a wide variety of applications. Here are some of just a few of the possible use-cases for the TSCS42xx Audio Codec HAT when combined with your Raspberry Pi computer:

- Wired or Wireless multi-room streaming audio player / “Smart Speaker” / Voice Activated Assitant
- Mini Soundbar for placement above or below computer monitors
- Arcade table project with high quality, immersive audio
- Internet radio player with high quality stereo audio
- Gaming Headphone Amplifier



Features

- The FIRST and ONLY Audio Codec HAT board for Raspberry Pi with an integrated DSP that is easily adjustable using the TSCS42xx ALSA GUI and flash savable

- Full driver support in Raspbian* / NOOBS* / Linux

- Compatible with VLC / OSMC / RuneAudio / Volumio / Moode / PiCorePlayer / PiMusicBox / OpenELEC / etc.

- Optional support for OLED display panel (shown on following page, in addition to the TSCS42xx Audio HAT Board being mounted to a Raspberry Pi 3B+ board) - enables a completely “plug-and-play” stand-alone operation without a need to connect a monitor, mouse, keyboard, USB flash disk, connect to Bluetooth, Wi-Fi or Ethernet cable

- Stand-alone demo local audio player SD Card image available for download from Temposemi page on GitHub - users can simply modify the include VLC playlist & copy their own MP3 / AAC / FLAC music to the music folder

- One-finger joystick enables control over volume up / volume down / next track / previous track / pause / play / cycle through DSP modes

- Standard terminal screw connects offer a standard method of connecting speakers (Rev A board pictures shown in the document employed RCA connectors - Rev B board pictures are being taken)

- Stereo analog line level input via 3.5mm jack (J11 Aux)

- Integrated Pop & Click-Free Capless, Ground-Center Referenced HP Driver via 3.5mm jack (J10 Headset)

- High-quality digital audio capture, processing and playback supporting up to 96kHz / 32-bit Linear PCM native input via digital audio inputs or via 32-bit stereo ADCs and 32-bit stereo DACs

- Compatible with Raspberry Pi 2B and the new 3B

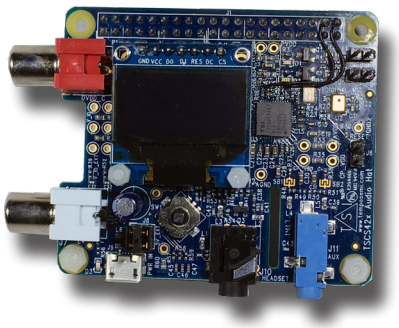
- Raspberry Pi board & TSCS42xx Audio HAT board powered via single Micro USB port (on HAT board)

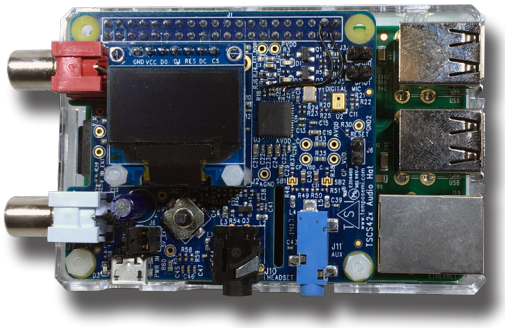
- Hardware and software volume control from your Raspberry Pi or using joystick on HAT board

- Plug-and-play compatibility for ease of use

- Fully HAT Compliant

Raspberry Pi®





Technical Details

● Tempo Semiconductor TSCS42xx - Low-Power Audio Codec - 96kHz / 32-bit with integrated 24-bit signal processing engine

● Speaker Amplifier: Maximum power output of 2 x 3W (RMS) into 4 Ohms at 10% THD+N, 2 x 1.5W (RMS) into 8 Ohms at 10% THD+N

● Fully integrated hardware volume mixing via “ALSAMIX” or any ALSA compatible application

● The additional Hardware-based DSP Audio Processing features inside the TSCS42xx Codec DSP engine can be controlled via the I2C interface from the Broadcom SOC using the Tempo Semiconductor supplied, open-source ALSA compatible application GUI (or via command line controls):

  ● Two independent banks of stereo 6-band Parametric EQs or configurable biquad filters (such as High-Pass, Low-Pass, Band-Pass, All-Pass, etc)

  ● Wideband, Stereo DRC (Dynamic Range Compressor)

  ● Pro-Style, Stereo, 3-band Compressor / Limiter / Expander with independent Time & Frequency Domain adjustments

  ● Configurable Psychoacoustic Bass Enhancement

  ● Configurable High-Frequency Content Restoration Enhancement

  ● 3D Stereo Enhancement for surround encoded 2 channel content

● Integrated EEPROM for automatic Raspberry Pi device-tree driver configuration

● Total harmonic distortion (THD+N) of 0.05% at 1W, 1kHz, into 4 Ohms.

● HP Output signal-to-noise ratio (SNR) of 124 dB A-Wtd (using a digital silence output) / 102dB DNR

● End-to-end, 28-bit digital audio path with 384kHz upsampling prior to signal processing

*Note: * User is required to add the TSC42xx driver module to the rootfs that comes with both the Raspbian and NOOBS SD Card images. Detailed directions can be found on the above link.This board powers both the HAT board as well as the Raspberry Pi from a single power supply with a Micro USB cable. A universal AC/DC adapter with +5VDC output and 3A output current capability (or higher) and a USB Micro cable (like Model: DSM-0530) is required for proper operation. The blue OLED display shown mounted to the TSCS42xx Audio HAT board in the above picture measures 0.96” wide and has a resolution of 128 x 64 pixels. The board shown offers both SPI and IIC (I2C) control. This implementation follows the I2C control protocol. This display can be purchased here, however, it is NOT required for “desktop mode” operation but mearly stand-alone operation that enables a local audio file playback demo with the ability to cycle through the various DSP mode presets, adjust volume and skip tracks using the joystick. Raspberry Pi and the Rapberry Pi logo are trademarks of the Raspberry Pi Foundation. TSI and the TSI logo are trademarks or registered trademarks of Tempo Semiconductor, Inc.*