OpenADSP: An Open Source Audio Signal Processing Device Based on STM32L432

Power & USB

Power Input and Distribution Unit

- Power Input
- Voltage regulators & DC-DC conversion.
- Current limiting & Protection
- USB Bus management & ESD Protection
- Power mode selection
- Battery Power management & Charging Circuitry

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Audio Codec

Audio Codec: ADC/DAC

- MCU Communication via I2C
- ADC and DAC converison
- Taking Signal from Analog Mice & Sending to MCU after ADC conversion.
- Read data from MCU
- Output using Analog Speaker (After DAC)
- DMA request access

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STM32 MCU

MCU: STM32L432KBU

- 32 Bit ARM Microcontroller
- 3.3V VDD bus In
- Interfaces Used
  - . USB
  - . SWD
  - . I2C
  - . SPI
- 2x Status LEDs (GPIO Powered)

File: STM32 MCU.kicad_sch

Wireless Tranceiver

Wireless Tranceiver

- nRF24L01 Bluetooth Tranceiver
- Embedded NFC antenna
- Interfaced to MCU Via SPI
- Max Op Freq = 2.4GHz
- LC filtered LNA (Single-Ended Antenna Interface)
- SMA connector For Bluetooth Antenna

File: Wireless Tranceiver.kicad_sch

Application Notes

POWER:

- Max Vin = 8V
- Max Vbus = 6V
- ESD Vref = Vbus-0.5V (Typical 4.6-5.2V)
- Vbus is preferred Over VIN (Vbus triggers the P-Channel MOSFET to cut of Backup Supply).
- SBD Reverse Voltage Protection for VUSB/VBUS.
- Max Input Isys = 800mA (Limited by a PTC Resettable Fuse).
- Max Battery supply current = 500mA
- Battery Capacity range (700mAh-4Ah)
- Battery Type (Lithium-polymer 3.7V-4.2V).

MCU: STM32L432KBU

- SWD Programming Interface
- USB Boot mode(SW Enabled)
- 1uF/0.1uF Decoupling Cap (See STM32F datasheet).
- No external termination series resistors are required on USB_DP (D+) and USB_DM (D-)
- Internal USB pull-up resistors are used (AN4879)
- Using Internal Crystal clock source (16MHz)

Bluetooth Tranceiver: nRF24L01

- Reference Design (NRF24L01 Datasheet)
- Route as 50 Ohm controlled impedance traces. Follow datasheet regarding layout.
- Passive antenna (Embedded NFC)

- Reference Design (NRF24L01 Datasheet)
- Decoupling Capacitors are dedicated for VDD Pins
- Communication with MCU over SPI
- Dedicated External Crystal 16MHz (External)
- Crystal Osc. Loading caps: C = 2 * (Cload - Cstray)

Audio Codec: ADC/DAC + Analog frontend

- Reference Design (Datasheet)
- Decoupling Capacitors are dedicated for VDD Pins
- Communication with MCU over I2C
- Direct Memory Access for better performance(DMA Interface) (For more details STM32F4 reference datasheet)
- Condenser microphone (Over LPF-4.5kHz)

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Muhammad Aitesam

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Title: STM32 Audio Processing Kit

Size: A4	Date: 2022-02-07	**Rev: V1.0**
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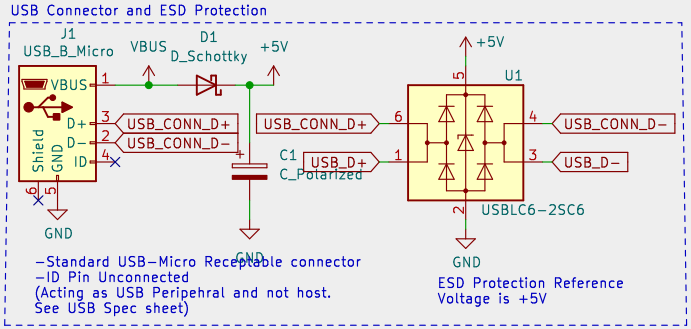
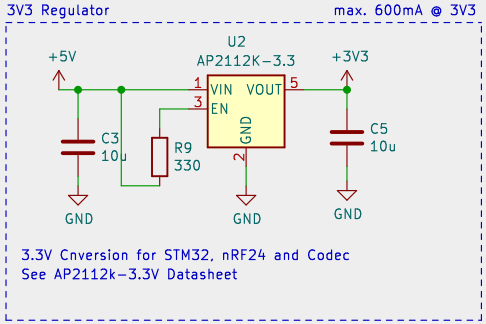
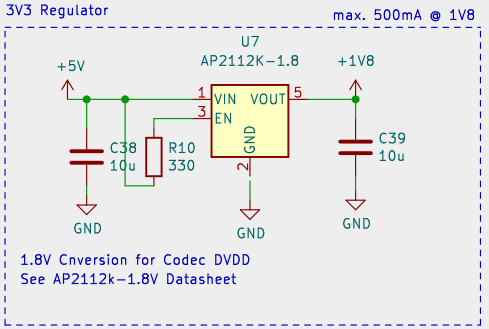
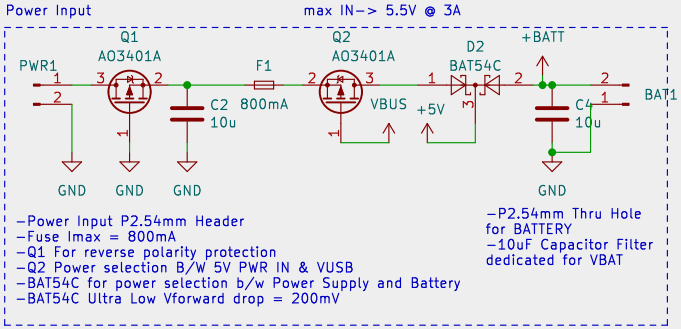
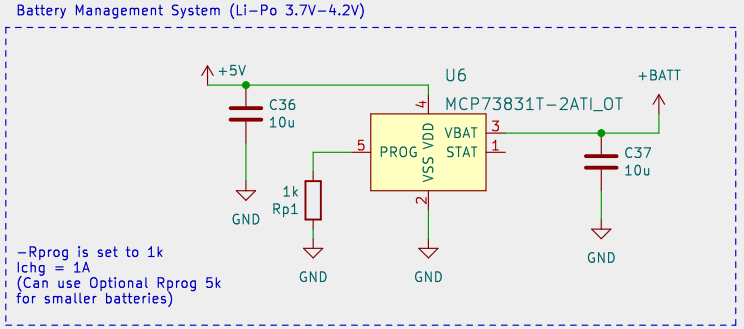
Power & USB

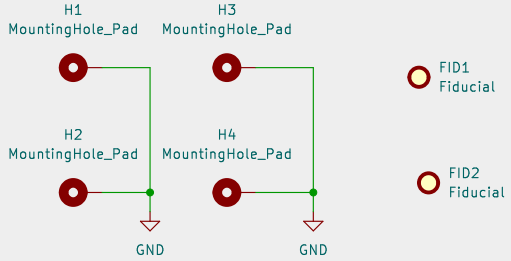












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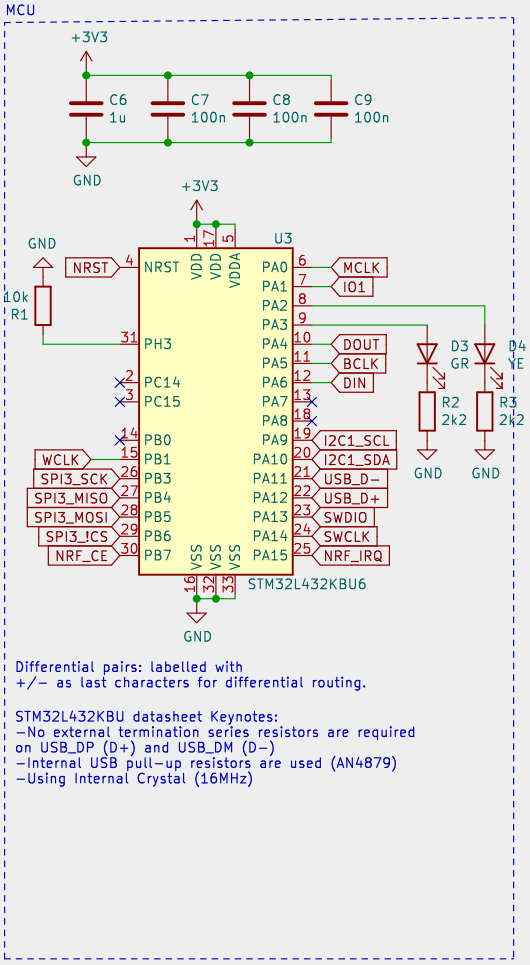
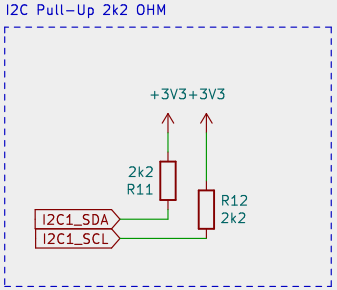
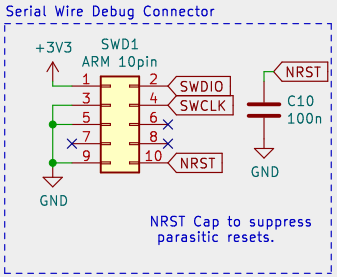
STM32L432KB Microcontroller







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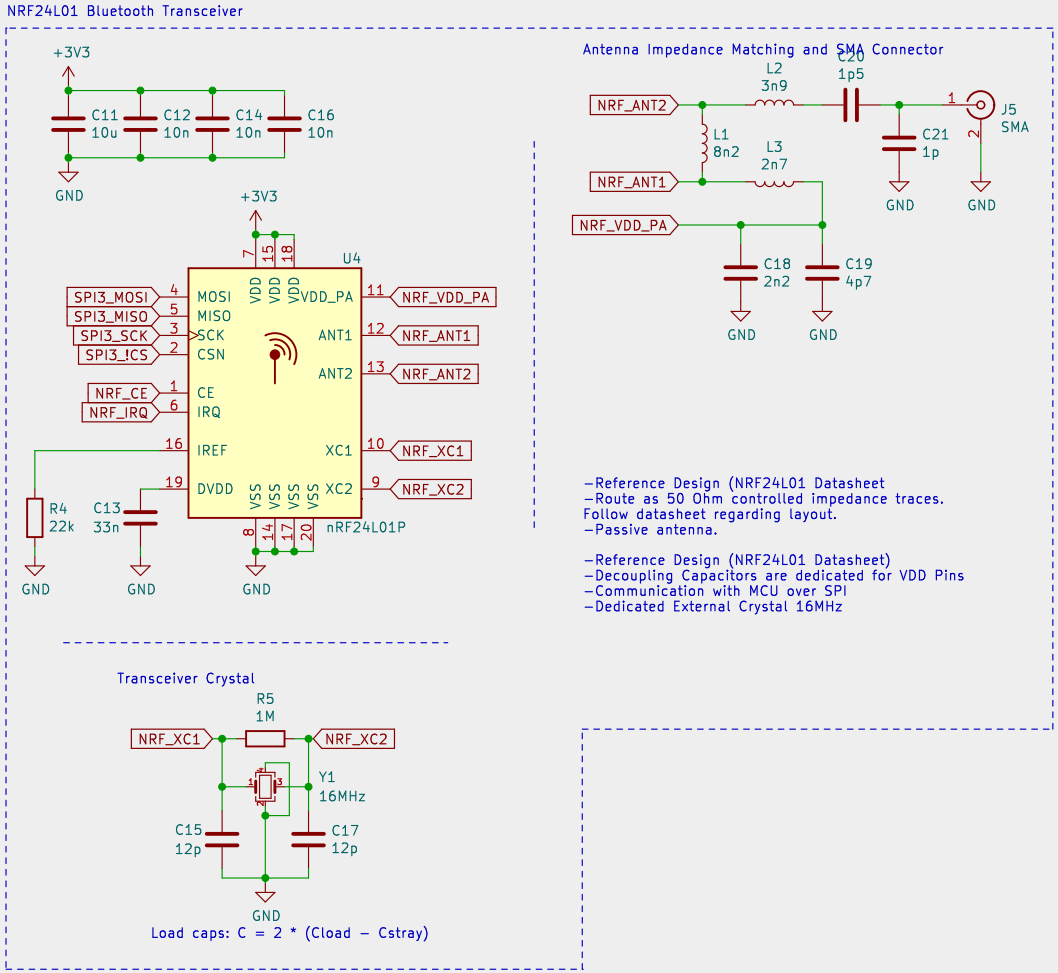
Wireless Tranceiver: nRF24L01 Bluetooth 2.4GHz



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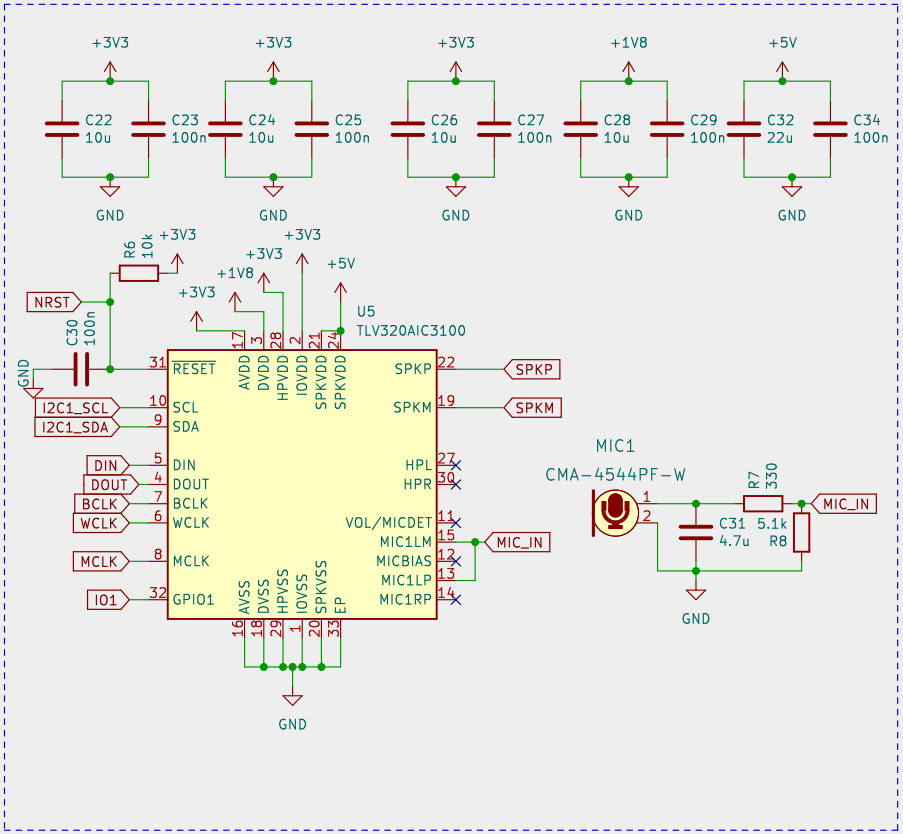
Audio Codec: ADC/DAC + Analog frontend



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