

BONE CONDUCTION PERSONAL SOUND AMPLIFIER HARDWARE

DO NOT USE AS HEARING AID.

APPLICATION NOTE

7/2020-BC-HARDWARE



HARDWARE BLOCK DIAGRAM:

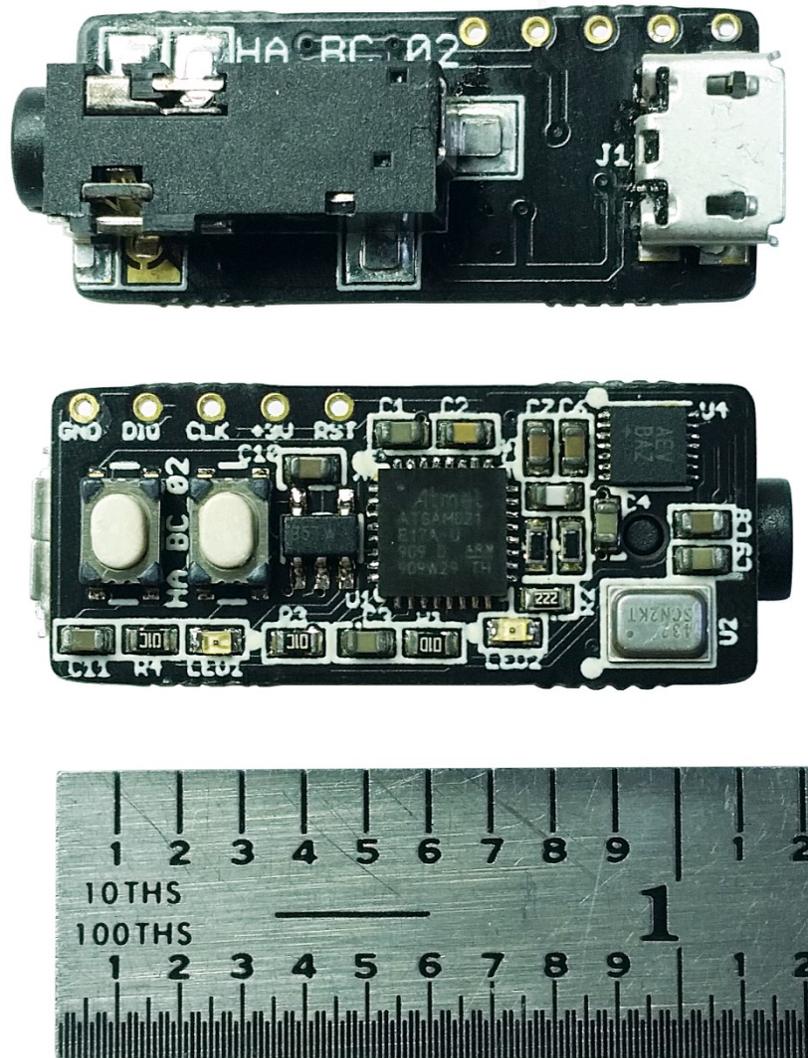


HARDWARE DESIGN DETAILS:

The Bone Conduction (BC) hardware is powered by a USB battery pack through a USB Micro-B Receptacle and is connected to a bone conduction headset via a 3.5mm jack (such as shown in the configuration on the first page). The BC hardware includes 2 buttons for volume up/down control and a green LED light for visual indications. The device powers on by momentarily pressing the volume up button. The device turns off by pressing down either button for more than 2 seconds.

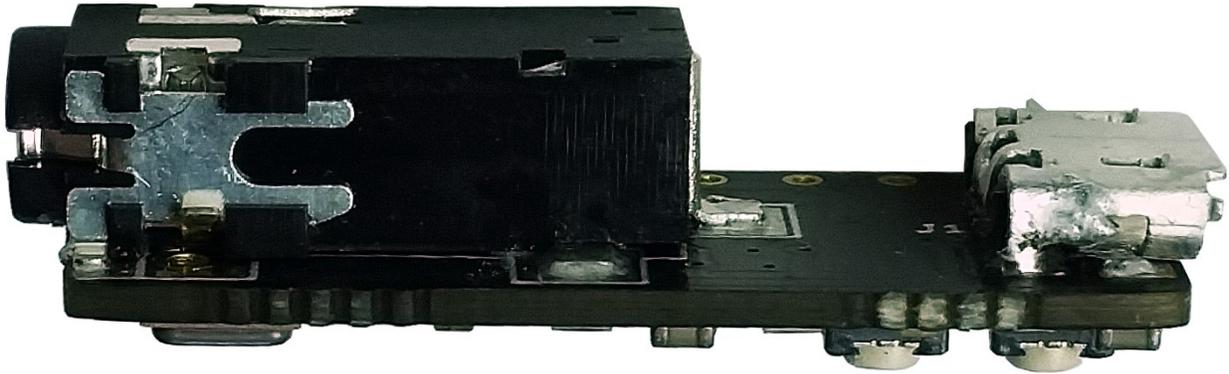
The BC hardware includes provisions for firmware development through a serial wire debug interface (RESET, SWCLK, SWDIO, POWER, and GROUND). The design includes 5 pogo pin receptors spaced on 1/10 inch centers for interface to a programmer/debugger.

The 2-layer printed circuit board (PCB) measures: 28 millimeters (mm) by 12 mm. Components are mounted to both sides of the PCB. Programming receptors for firmware development are pictured on the top edge of the PCB.

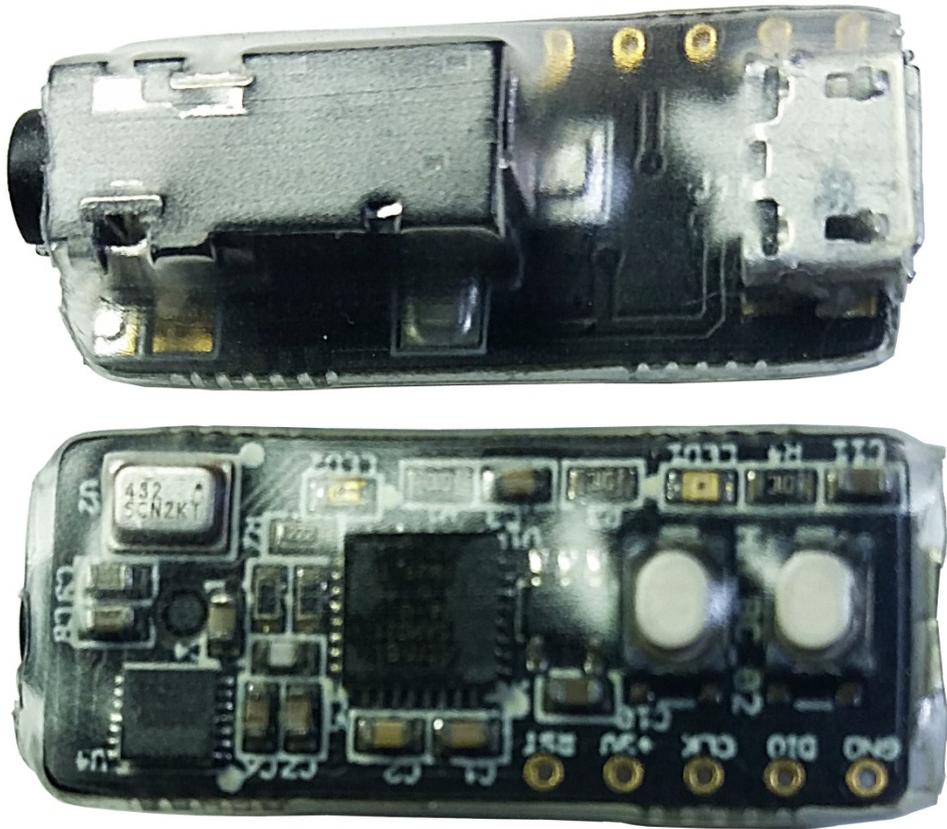


PIXATION DSP

Pin 4 of the audio jack is not soldered and is bent up to allow sound passage to the MEMS microphone.



Polyolefin 2:1 Clear Transparent Heat Shrink Tubing (thin walled, 12-13 mm pre-shrink diameter) was used to encase the PC hardware. Note that flexible polyolefin allows the buttons to be pressed.



PIXATION DSP

In the second configuration below, the Bone Conduction (BC) hardware is connected to a flat USB battery pack and a bone conduction transducer (Digi-Key Part Number: 1528-1948-ND/Adafruit Part Number: 1674). The bone conduction transducer is connected via an audio cable and 3.5mm plug and is encased with Polyolefin 2:1 Clear Transparent Heat Shrink Tubing (thin walled, 30 mm pre-shrink diameter).



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HARDWARE WARNINGS: (1) Small parts choking hazard. (2) Cords strangulation hazard.

Safety guidance provided for the use of Pixation Corp. firmware follows:

1. DO NOT USE AS A HEARING AID. MAY PRODUCE SOUND LEVELS WHICH CAUSE HEARING LOSS.
2. Instructions to the end user shall include recommendations to avoid sound environments where sound levels exceed 85 decibels, A-weighted, as an 8-hour time-weighted average (85 dBA as an 8-hr TWA) using a 3-dB exchange rate (see: <https://www.cdc.gov/niosh/topics/noise/default.html>).
3. Instructions to the end user shall include recommendations to limit device usage to 8 hours/day.
4. Instructions to the end user shall include recommendations to limit device usage to no more than 40 hours/week.

Contact: Pixation@Pixation.com for firmware or printed circuit board (PCB) files.

See additional Application Notes at www.Pixation.com

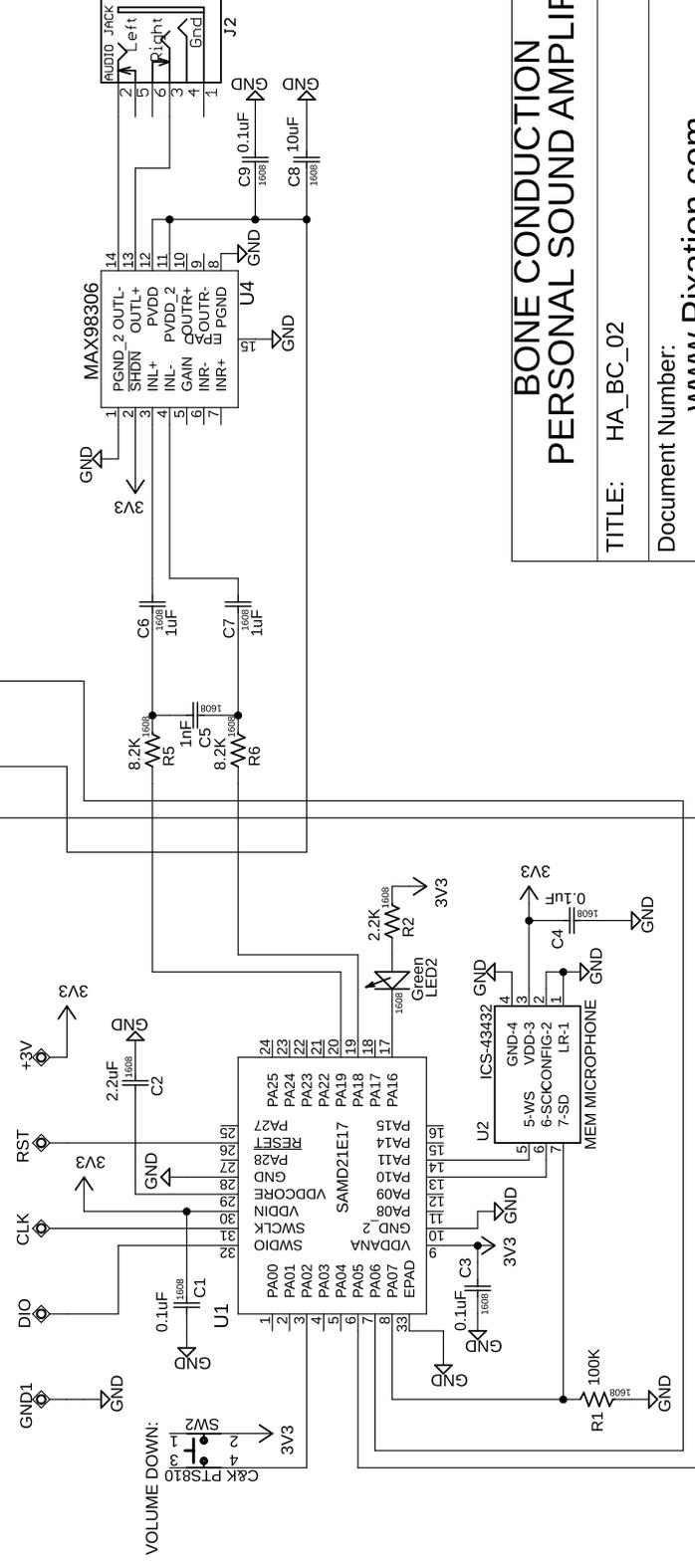
Schematic and Bill of Materials (BOM) attached.

BILL OF MATERIALS:

- 1ea. U1 Microchip Tech. ATSAM21E17A-MUT MCU 32BIT 128KB FLASH 32QFN
- 1ea. U2 InvenSense ICS-43432 MIC MEMS DIGITAL I2S OMNI -26DB
- 1ea. U3 Microchip Tech. TC1015-3.3VCT13 IC REG LINEAR 3.3V 100MA SOT23-5
- 1ea. U4 Maxim Integrated MAX98306ETD+T IC AMP CLASS D STER 3.7W 14TDFN
- 2ea. LED1 LED2 C&K PT5810 Life-On Inc. LTST-C191KGGT LED GREEN 0603
- 2ea. SW1,SW2 C&K PT5810 SJK 250 SMTR LFS SWITCH TACTILE SPST-NO 0.05A 16V
- 1ea. J1 Amphenol FCI 10118192-0001LF CONN USB MICRO B RECP T SMT R/A
- 1ea. J2 CUI Inc. SJ-43516-SMT-TR CONN JACK 4COND 3.5MM SMD R/A
- 1ea. C1 SMD Capacitor Ceramic 10uF 0603
- 1ea. C2 SMD Capacitor Ceramic 2.2uF 0603
- 1ea. C6, C7 SMD Capacitor Ceramic 1uF 0603
- 4ea. C1, C3, C4, C9 SMD Capacitor Ceramic 0.1uF 0603
- 1ea. C5 SMD Capacitor Ceramic 1000pF (1nF) 5% 0603
- 1ea. R1 SMD Resistor 100K Ohm 0603
- 2ea. R3, R4 SMD Resistor 10K Ohm 0603
- 2ea. R5, R6 SMD Resistor 8.2K Ohm 0603
- 1ea. R2 SMD Resistor 2.2K Ohm 0603

NOTE: Connect 5 Volt USB power to J1 and press down "Volume Up" button when programming microcontroller to provide power to Atmel Ice module.

SERIAL WIRE DEBUG RECEPTORS:



**BONE CONDUCTION
PERSONAL SOUND AMPLIFIER**

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