

1. Description of the main component and the functions realized by the circuitry
 - a. ARM Cortex 32b MCU+FPU (IC32A)
 - i. The heart and soul component of the music system, it can control all the modules connected to the ARM Cortex. This ARM Cortex has an internal flash where the main firmware, boot loader, and other configurations can be loaded.
 - ii. Modules below are some of the modules that can be controlled or programmed by the ARM Cortex.
 - iii. It also has a vbat feature that allows to power the device from an external battery when the vdd is not present.
 - b. USB OTG (X8)
 - i. The ARM Cortex has a built-in USB OTG which can be used for:
 1. For data collection or interface to the computer for some application
 2. And the other one is to interface with another USB device.
 - c. FAN L (X15) and FAN R (X17)
 - i. Other main components are the fan Left and Right Control, it is connected to the ARM Cortex and controls the fan speed using a PWM signal.
 - d. Sustain Pedal
 - i. Another main component is the sustain pedal, I think this is for a musical instrument that makes musical effects when the pedal is being controlled.
 - e. LCD (X12)
 - i. As we are working in a small embedded design, our UI would be like the LCD, ARM Cortex has an LCD controller using a parallel interface. LCD interface in the circuit is just connected to the "Surface R" where the actual LCD device is being connected.
 - f. 74HC244 (Octal Buffer, IC37A, IC37B)
 - i. A minor component of the circuit is the 74HC244, this component buffers or boosts the signal out from the ARM Cortex.
 - g. TL064 (Op Amp)
 - i. This low-power JFET input component is used to improve the DAC signal for DAC1_5v, DAC1_10v, and DAC_75v out from ARM Cortex pins PA2 and PA5.
 - h. SWD (X10)
 - i. One of the major components of the system is this SWD, with this; the system can be debugged during the initial stage of the development.

- ii. Debugging meaning we can monitor what is happening in the system firmware after boot-up, like stepping by line the code, changing data, place a breakpoint, etc.
 - iii. One way to download also the firmware is thru SWD.
 - iv. Normally after development and production, this SWD connection will be removed and use other method like using UART or USB to download the firmware and other application.
 - i. CAT25M01 (X10, Serial EEPROM)
 - i. Another main component is the EEPROM Serial 1Mb SPI, this non-volatile memory is organized as 128Kx8, it features 256B page write buffer and support the Serial Peripheral Interface (SPI)
 - ii. Normally, the usage of EEPROM is for configuration location, most of the configuration is being loaded here and fetch once the user want to access or change the configuration.
 - j. MIDI Signals (X11, X13, X16)
 - i. Other components are the MIDI signals. It has signal for MIDI thru, MIDI out, and MIDI in. These signals are connected to the ARM Cortex UART4_RX and UART4_TX and is being buffer by 74HCT244
2. Minor comment in the circuitry
- a. Some of the direction of the connection is confusing like NRST should be out direction in x10. Other confusing direction is SEL_A_E (out direction in ARM Cortex) but the x12 is also in OUT direction. This is just a minor typo error and the connectivity and the functionality is still there, it's just the orientation.
 - b. STM32F466VCT6 should be STM32F446VCT6
3. Suggestion for improvement
- a. Minor improvement by using proper orientation regarding the correctness of using the right arrow direction.
 - b. We can improve by adding test point FAN control.