Bluetooth Audio Rejiggering Instrument (BARI)

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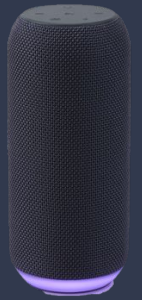
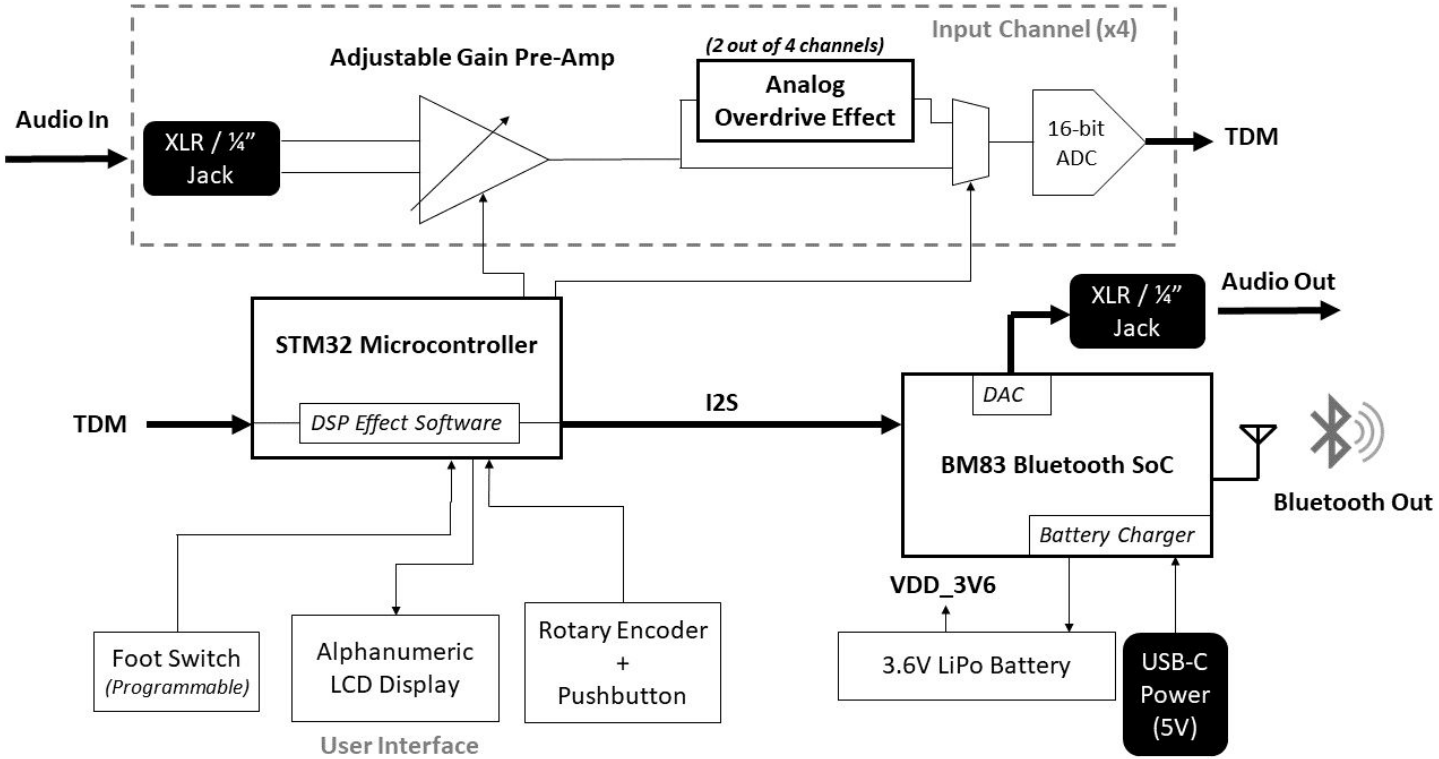
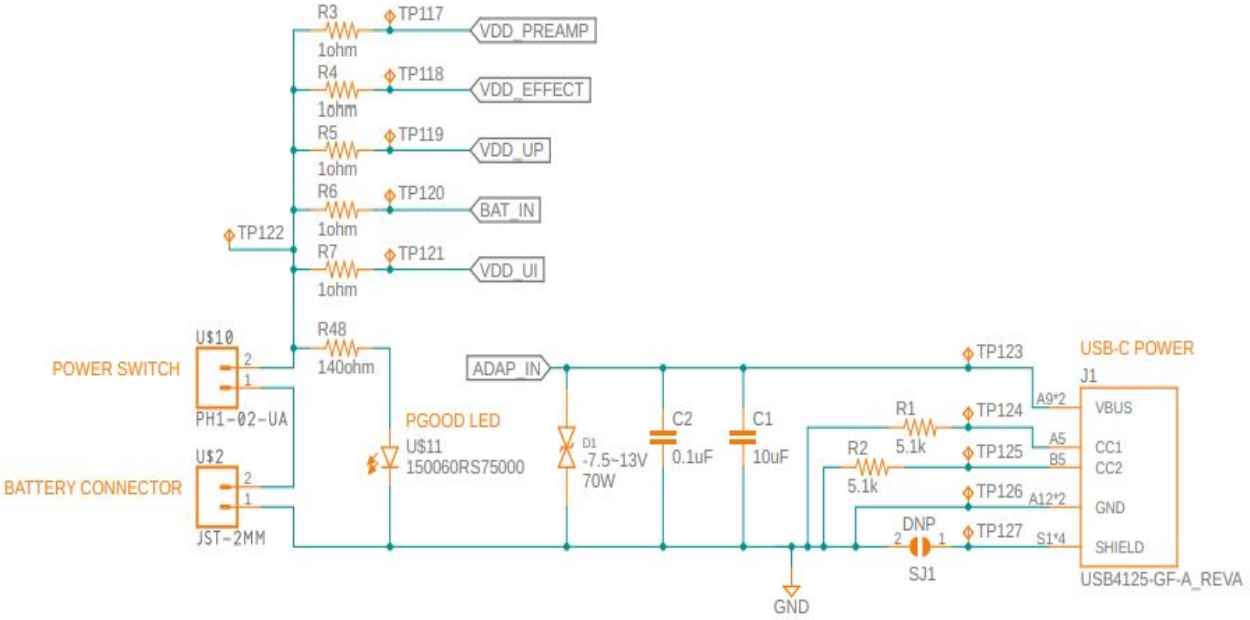
(Group D0)

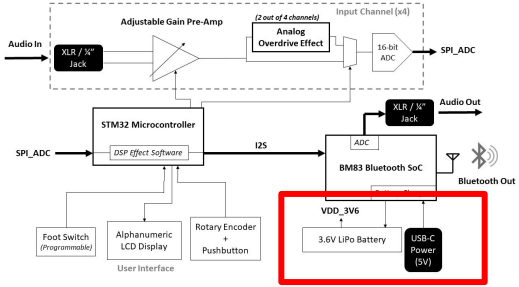


Block Diagram



Power Module



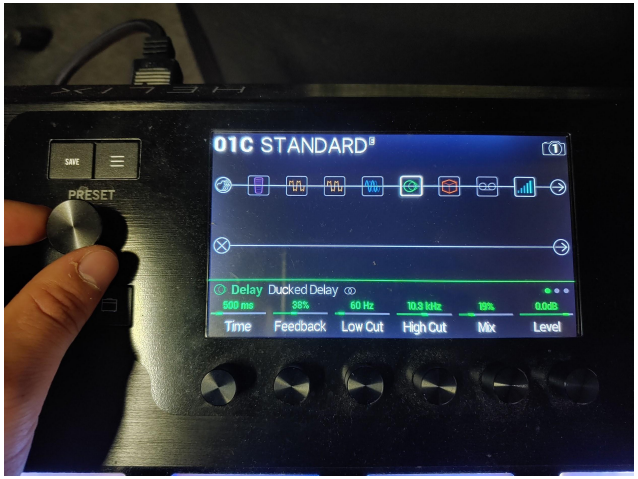


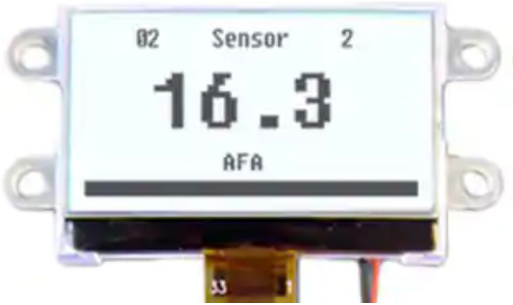
INTERFACES
VDD out to all five modules.
Battery, USB-C Connector

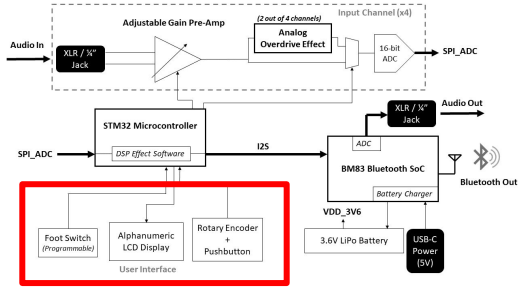
IMPLEMENTATION
Full custom design

TESTING
Battery Lifecycle Test
System Power Consumption Test

User Interface Module





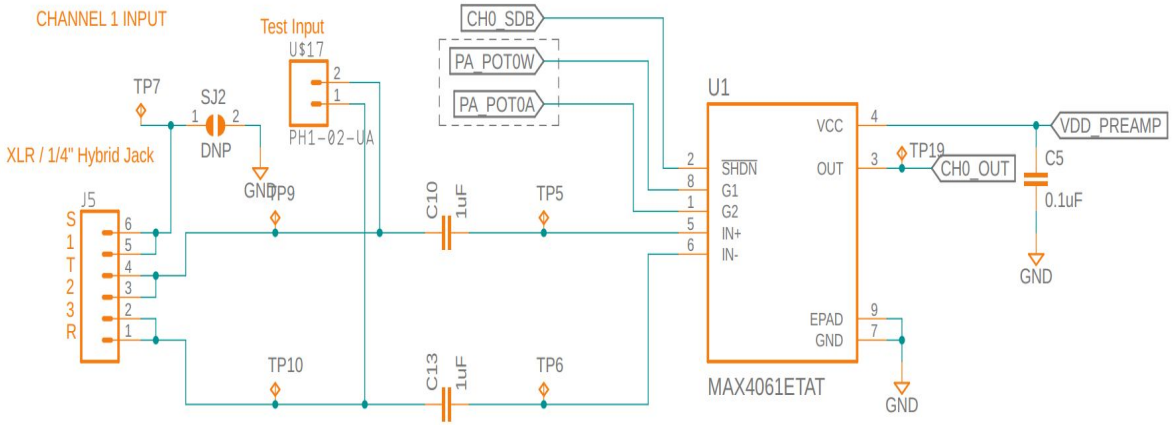


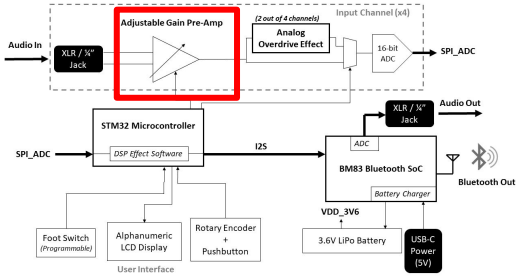
INTERFACES
Control to and from Microcontroller

IMPLEMENTATION
PEC12R Rotary Encoder + Button
NHD 128x64 LCD
Lovermusic SPDT Footswitch

TESTING
User Interface Latency Test
Ease-of-Use Test

Pre-Amplifier



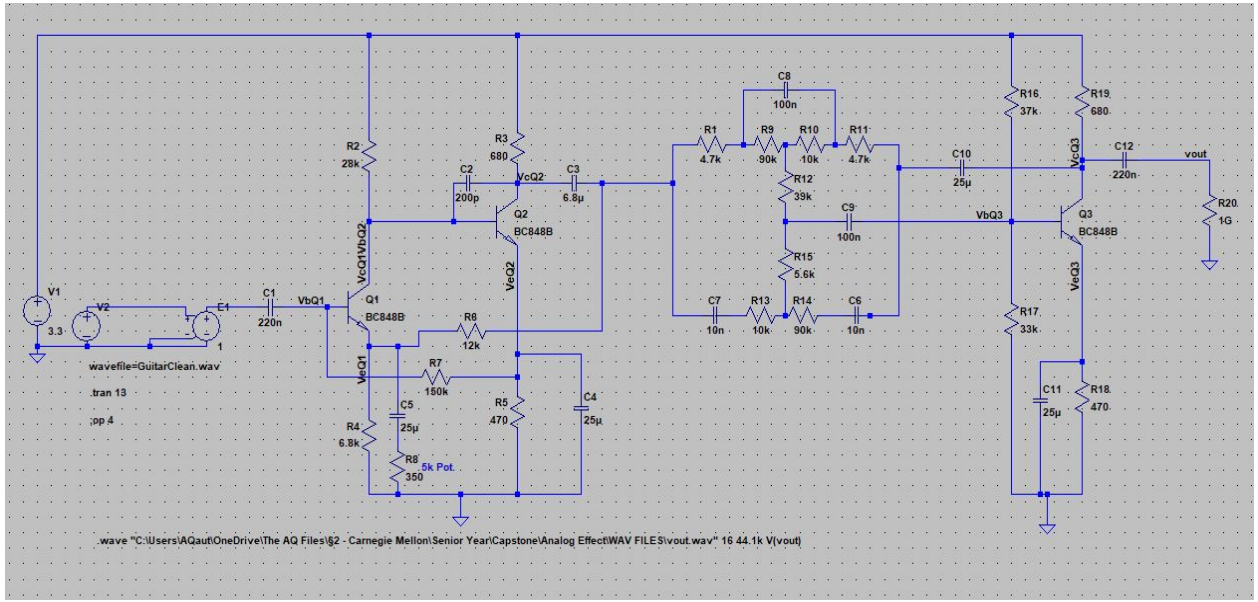


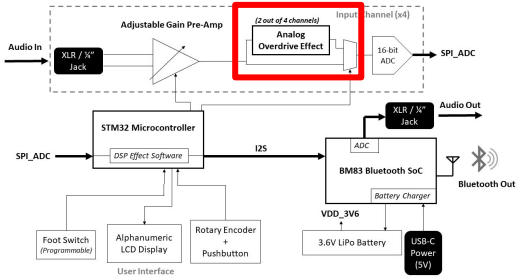
INTERFACES:
Audio in from XLR/ ¼” Jack
Audio out to Analog Effect
Control from Microcontroller

IMPLEMENTATION
MAX4061

TESTING
Pre-Amplifier Functional Test
(Input, Output, Gain Flatness, Distortion)

Analog Overdrive Effect



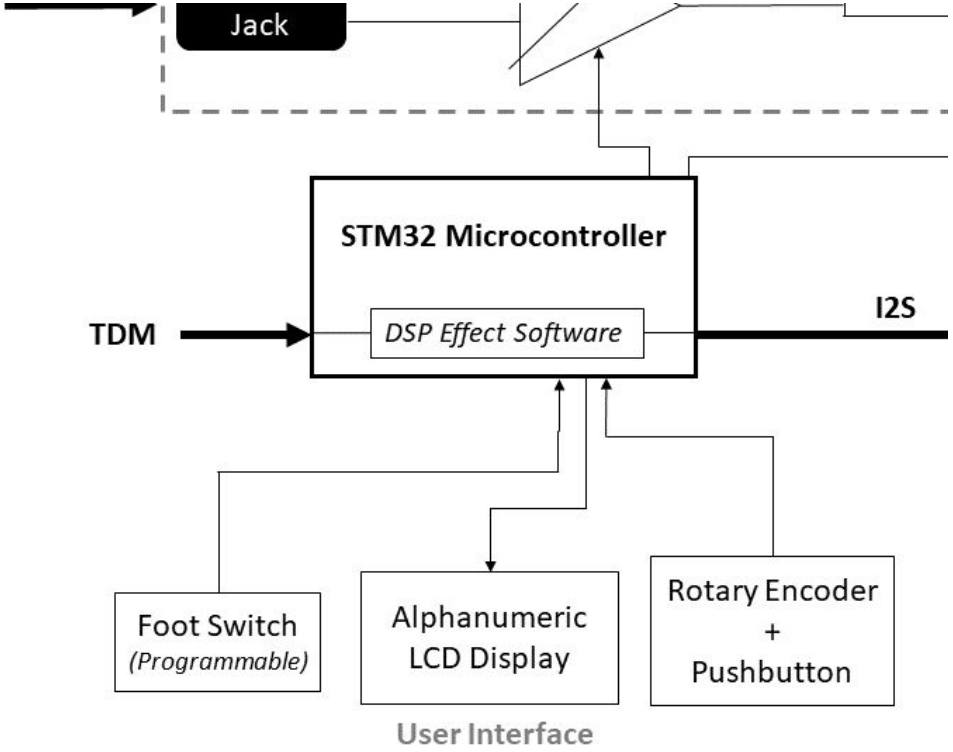


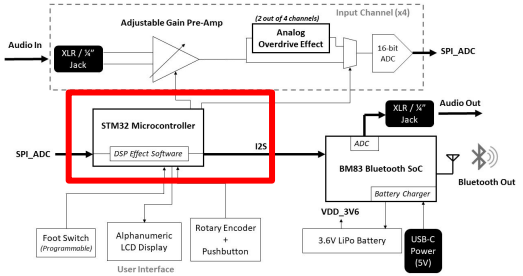
INTERFACES:
Audio in from Pre-Amp
Audio out to ADC
Control from Microcontroller

IMPLEMENTATION
Based on Colorsound Overdriver factory schematic, redesigned for 3V3.

TESTING
Analog Effect SPICE Verification Test

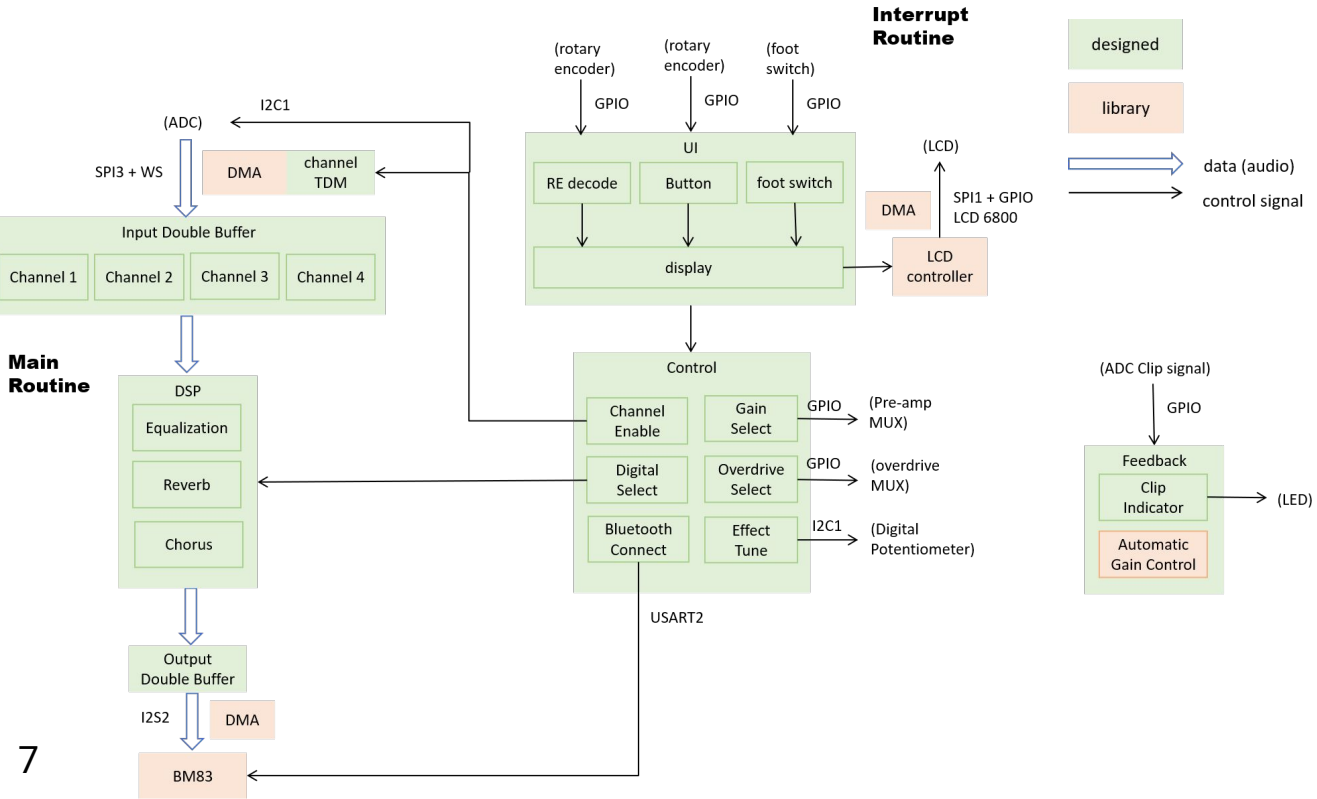
Microcontroller





INTERFACES:
16-bit 4-channel ADC input through SPI (with Time-division Multiplexing)
Single channel output through I2S
GPIO for UI & channel select
I2C for Digipot and ADC control
LCD control via SPI
UART for Bluetooth control
IMPLEMENTATION
Separate data flow from control flow

Microcontroller Kernel

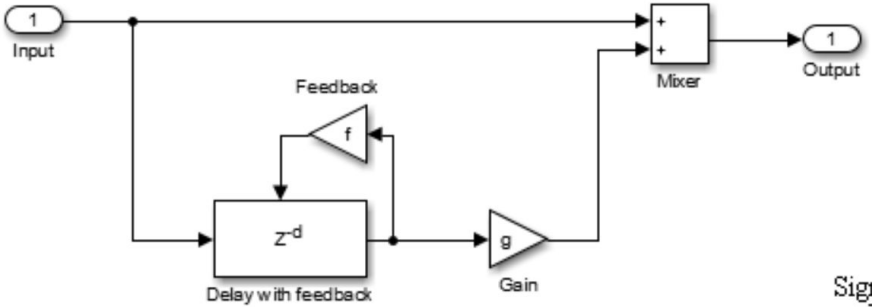


IMPLEMENTATION:
Kernel & Interrupt routines
+ Library code for common interfaces

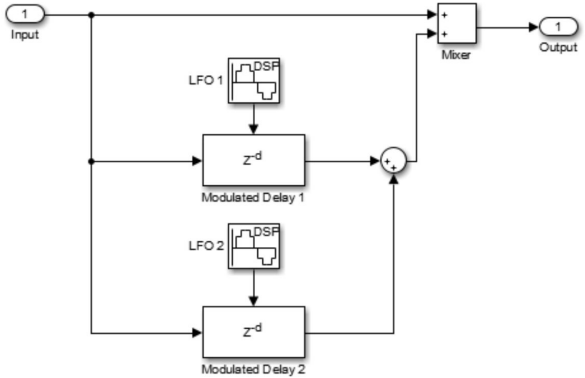
TESTING:
Comm Protocol Bringup Procedure
Per-Peripheral Unit Test
Integrated w/ other system functional tests

DSP Algorithms

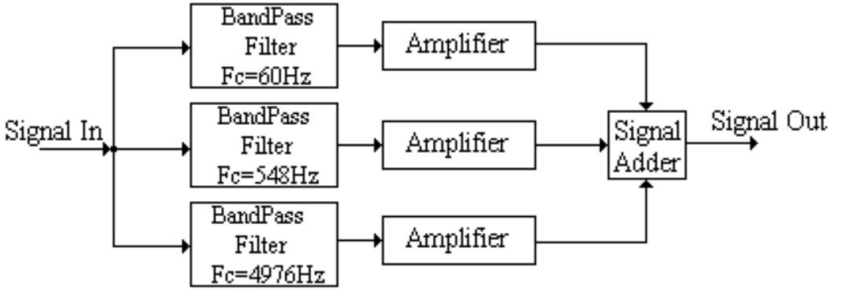
Delay



Chorus



3-Band EQ



TESTING

Digital Effect MATLAB Verification Test

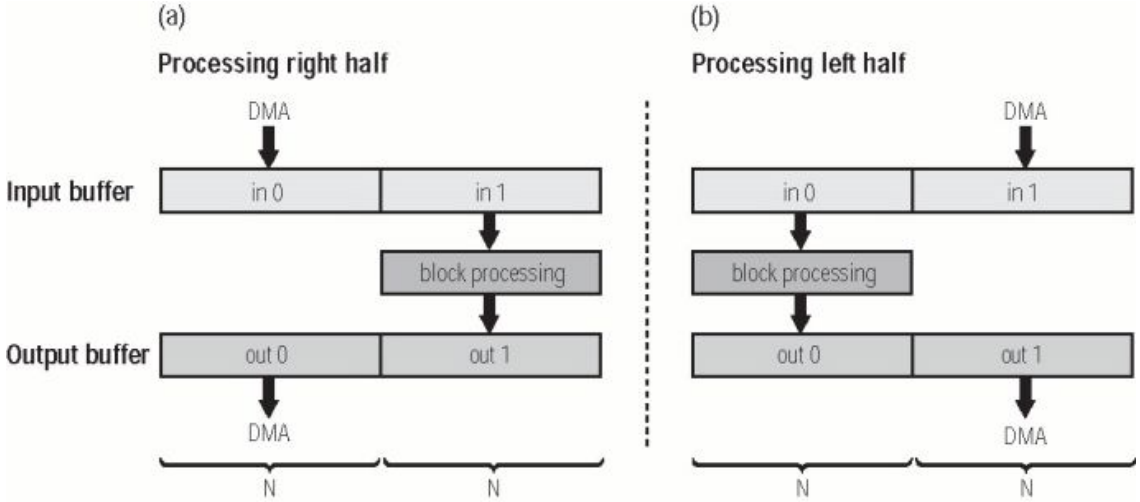
DSP Implementation

Specs: 16-bit depth, 44.1kHz sampling rate, mono

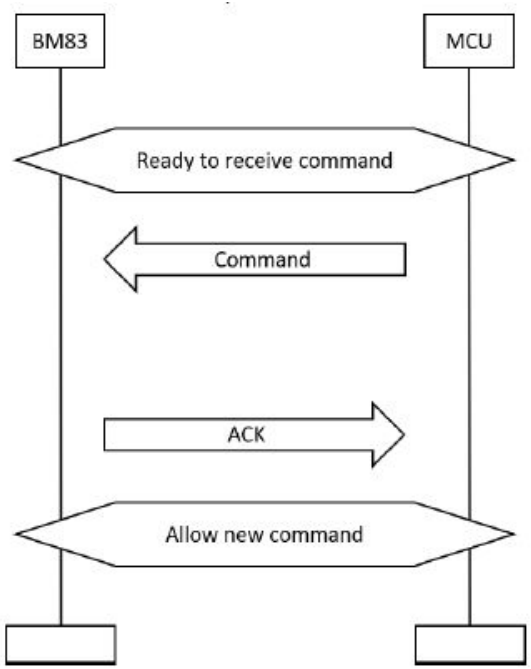
Total SRAM: 190.7KB of 192KB
Double Input Buffer (4 inputs): 4KB total
Processing Space: 1.5KB
Previous Input Storage: 17.2KB
Previous Output Storage: 1.6KB
Wet Delay Line Storage: 165.4KB
Double Output Buffer (1 output): 1KB

Total Flash: 43.1KB of 1MB
Filter Coefficients (Flash): 39.1KB
Wavetable (Flash): 4KB

Minimum Latency: 2.9ms to 11.6ms



Bluetooth Module (BM83)

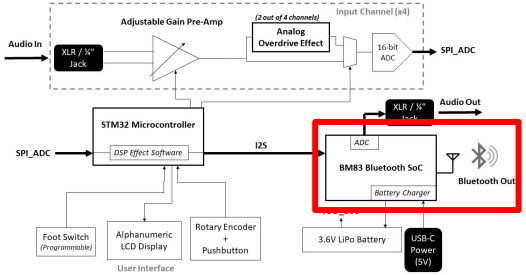


Command	Op Code	Command Parameters
MMI_Action	0x02	data_base_index, action

Description:

MCU can send proper command to complete different kinds of action.

0x56	Reset some EEPROM setting to default setting
0x57	Force speaker gain toggle
0x58	Toggle button indication
0x5D	Fast enter pairing mode (from non-off mode)
0x5E	Switch power OFF
0x5F	Disable LED



INTERFACES:

I2S audio input, BLE output

UART command input

IMPLEMENTATION

Based on supplied library code and UART command set

TESTING

Bluetooth Range Test

Schedule and Task Breakdown