

ECE 511 Project Group 11:  
MP3 Boombox  
Progress Report 1  
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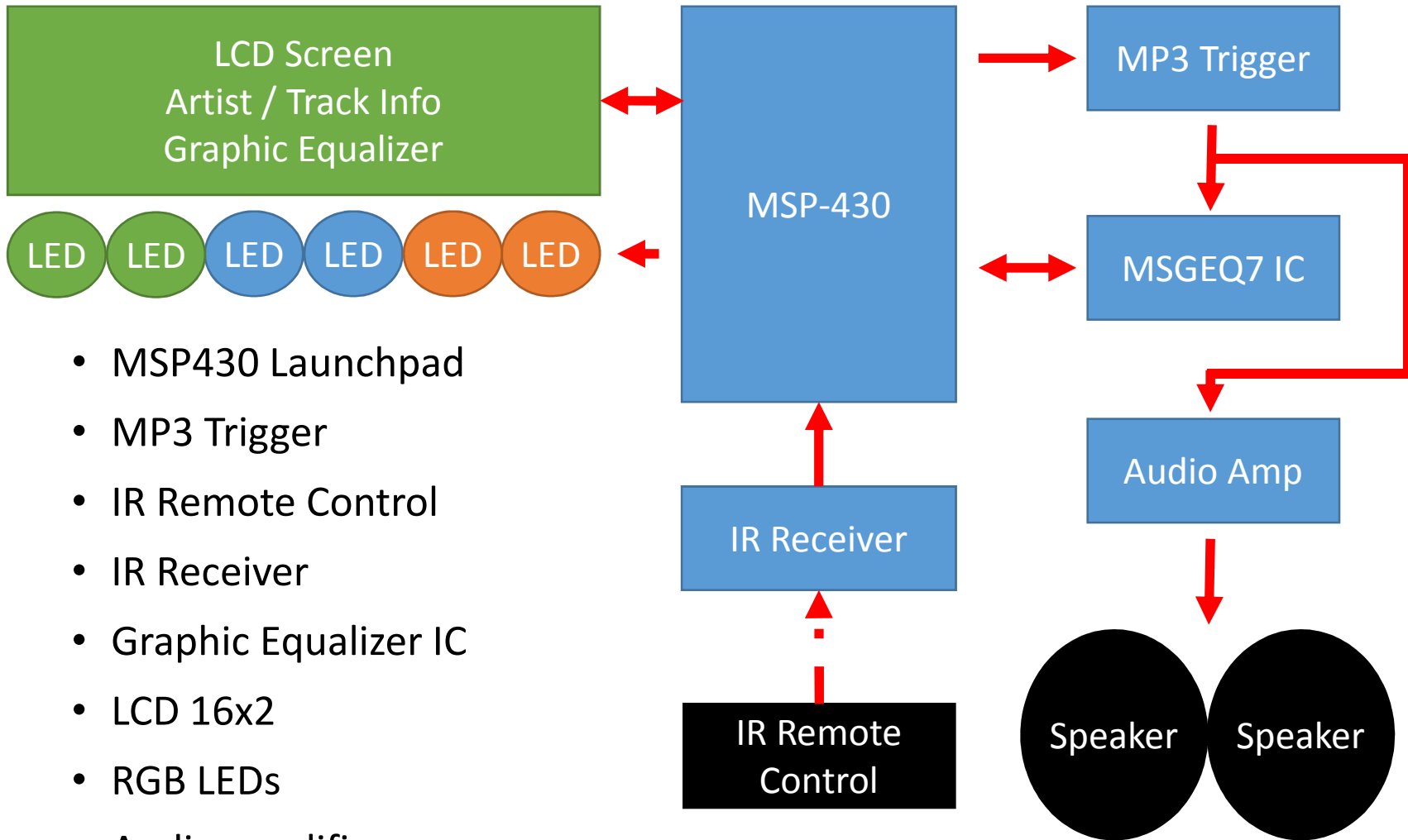
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# Project: MP3 Boombox

- Major Features:
  - Ability to decode MP3 files stored on an SD card
  - Ability to pause, play, stop, and fast forward tracks with IR remote control.
  - Ability to analyze music being played and display frequency spectrum on LCD
  - Ability to show name of current artist and song title on LCD
  - Produce light patterns using arrays of LEDs
  - Ability to amplify audio output and play through speakers

# Major Components:



- MSP430 Launchpad
- MP3 Trigger
- IR Remote Control
- IR Receiver
- Graphic Equalizer IC
- LCD 16x2
- RGB LEDs
- Audio amplifier

# Tasks to be Performed:

- LCD
  - Write functions to control LCD in 4bit format
  - Functions : Print, clear, move cursor to x,y position
  - Create custom bitmap to show EQ level on lower screen row
- MP3 Trigger
  - Write UART communication functions
  - Link MP3 Trigger to array list data structure
  - Call LCD functions to display song information
- Interface the EQ IC
  - Provide two control lines to control EQ IC
  - Read input level using ADC input pin
- Interface the IR receiver
  - Using interrupt routine to read IR remote
  - Write functions for Play/Stop, Next Track, Previous Track, volume up/down

# Tasks to be Performed:

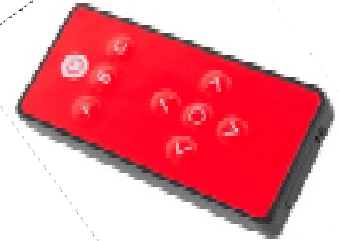
- Interface the RGB LEDs
- Bring it all together for prototype, debug and test
- Create PCB for final device assembly

# MP3 Trigger

- Embedded audio unit
- VS1063 MP3 audio codec IC
- Device Control
  - 18 Active low input
  - Full Duplex serial TTL Communication
- Available Commands
  - Play/stop, next track, previous track
  - Volume Up/Down
- uSD card (SPI)
  - File System: Fat16/Fat32



# IR Remote and IR Receiver(TSOP85338)



**Addressing the interface:** Triggers an interrupt routine to MSP430.

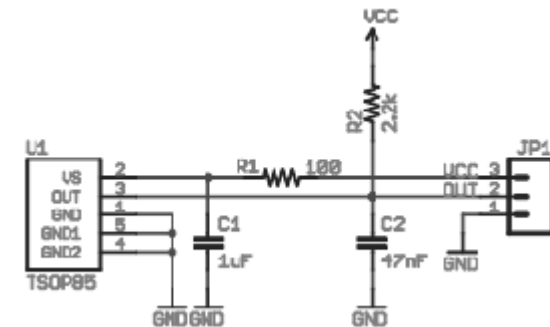
**Functions to be operated :** Play/Stop, Next Track, Previous Track, volume up/down.

## IR remote :

- Infrared LED emits a wavelength of 950nm.
- O/P is modulated at 38kHz.
- 9 buttons-each emits 32 bit codes. Uses NEC protocol.

## IR receiver breakout :

- Consists of IR demodulator (TSOP85338 ) and a 38kHz filter on board.
- TSOP85338 : PIN diode and a preamplifier.
- 2 lenses for high sensitivity
- Supply V : 2.5-5V.

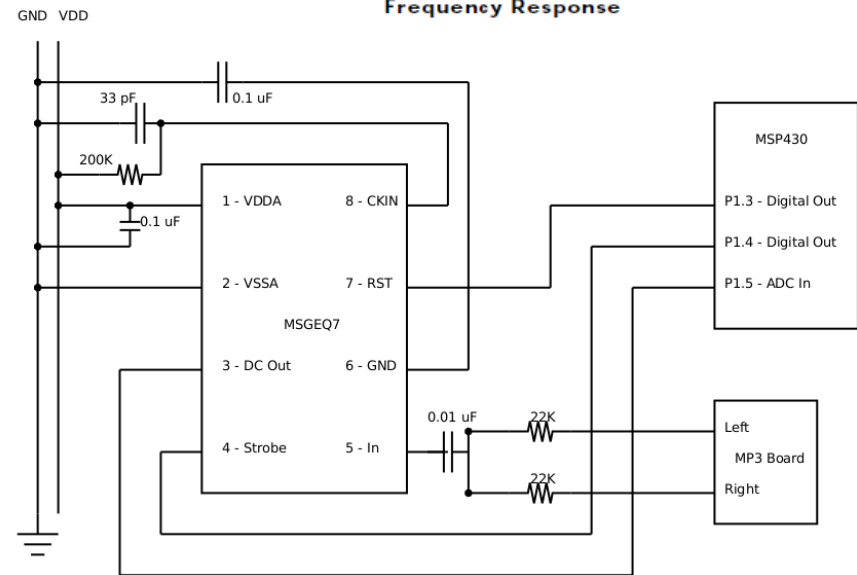
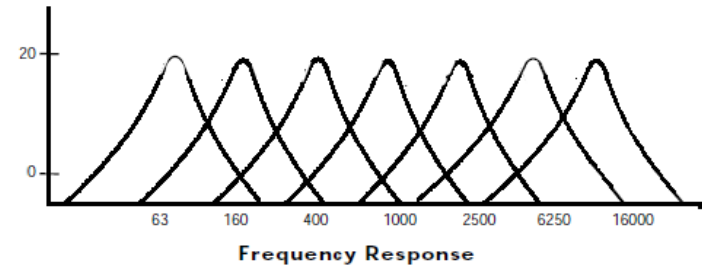


**MSP430 launchpad is programmed to receive these demodulated codes and match to call the appropriate function.**

# Graphic Equalizer – MSGEQ7



- Measures frequency content in 7 bands
- Provides levels to LCD for digital VU Meter
- Controlled by two Digital IO pins from MSP430
  - Reset and Strobe
- Multiplexed level output received on one input pin of MSP430
  - ADC10 module used to convert DC voltage level to digital value

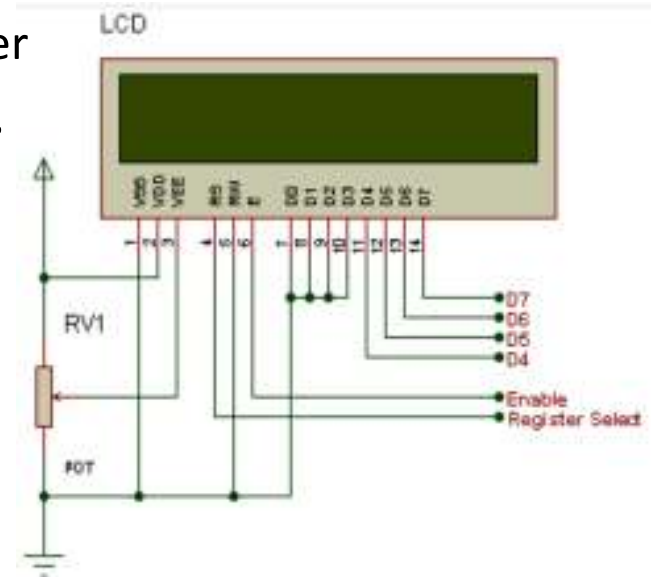




# 16 × 2 LCD

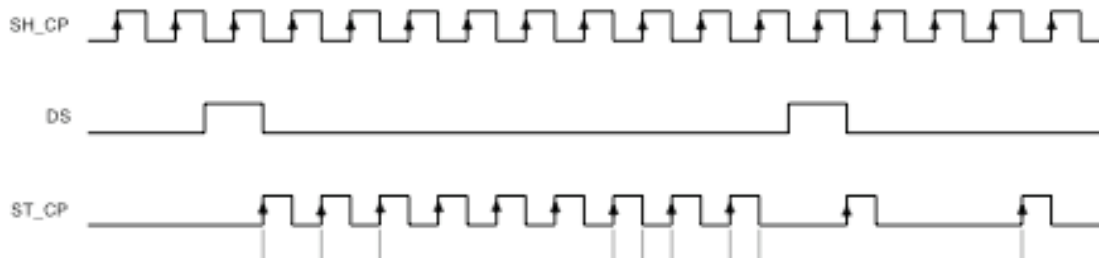
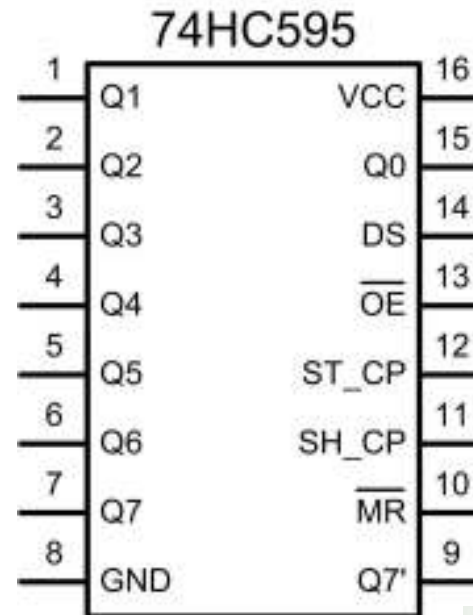
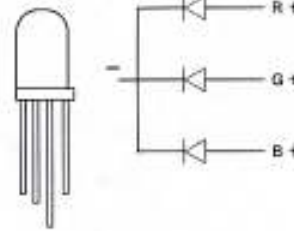


- Display the song title and the artist on the top row.
- Display the Equalizer bands on the bottom row.
  - Takes the output from the equalizer (7 bands).
  - Display the output as levels (8×5) for each band.
- Software:
  - Functions: Print String, Print band, clear, move cursor to x, y position
- Hardware:
  - 16 × 2 LCD with Hitachi HD44780 controller
  - Potentiometer: to adjust the contrast of the LCD.
- Progress:
  - Components : acquired.
  - Software : almost done, just bands to display.
  - Hardware : done!



# RGB LEDs

- (8) RGB LED Housings
  - Contains 24 unique LEDs
- (3) 74HC595 Shift Registers
  - Each drives 8 LEDs
  - Cascaded
- Controlled by three digital output pins
  - DATA, CLOCK, and LATCH
- Three distinct light patterns based on user input and MP3 trigger status



# SCHEMATIC

