Second Block Checkoff

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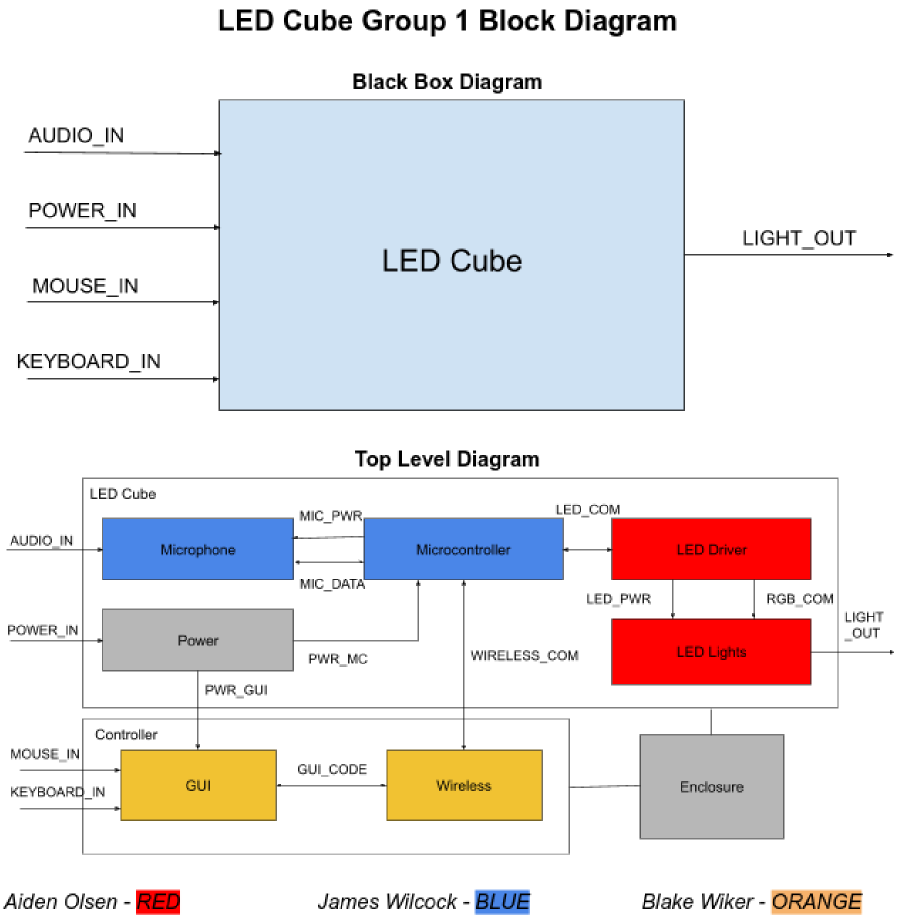
Description of Block

This block takes in audio input from a microphone and outputs it onto the led cube. It represents the volume of the audio by expanding outwards all along the cube. For example, on no or very quiet volume it has no light. If there is some volume then there is the led at the middle is lit thorugh all layers. If there is more volume than that a 3x3 square in the middle of the leds is lit on all layers. At the max volume all leds on all layers will be lit up.

Electrical Characteristics

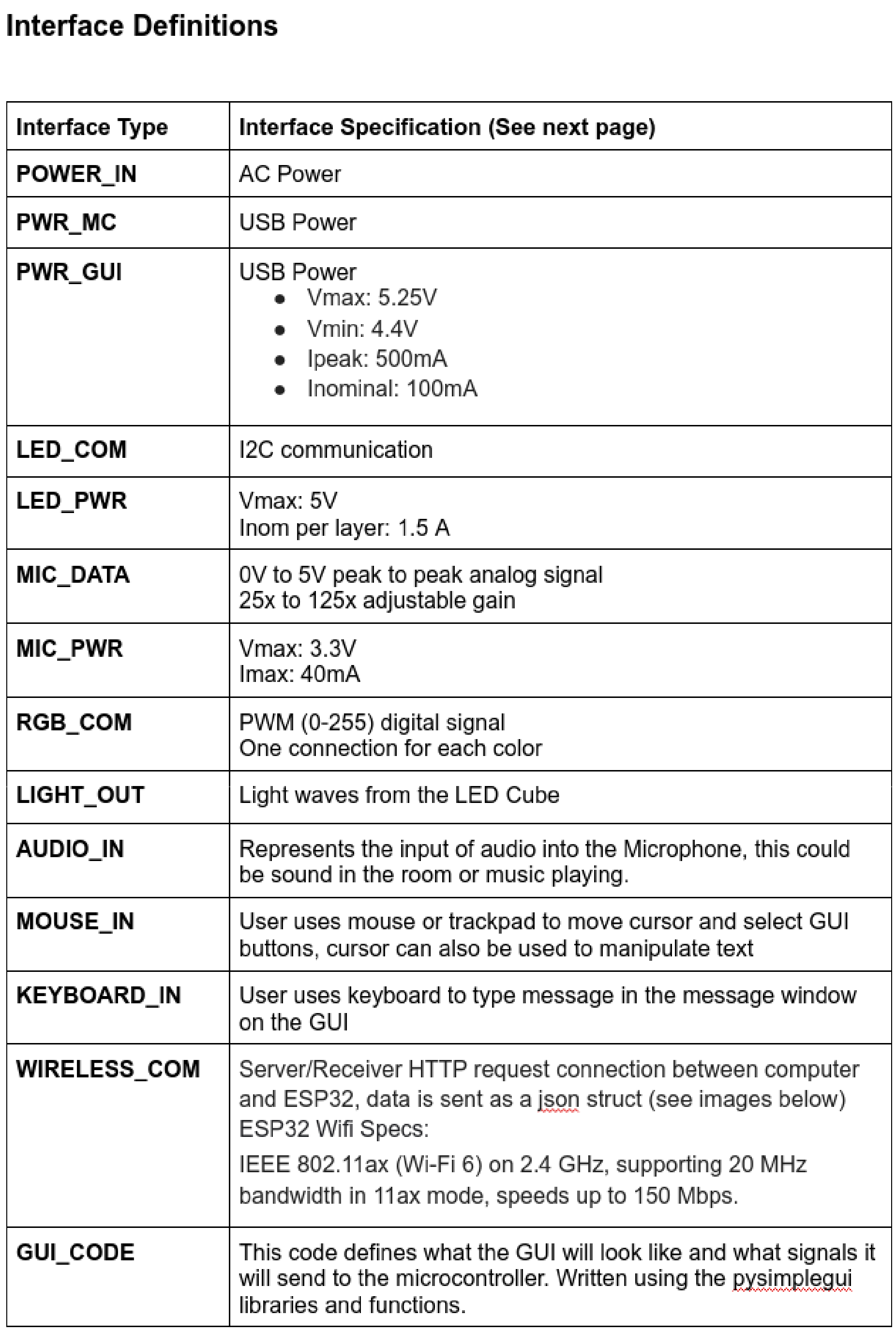
Characteristic	Min	Max
Current	24uA	60uA
Supplied Voltage		3.3v
Output Voltage		3.3v/2 = 1.65V

Top Level Block Diagram



LED Cube Group 1 Block Diagram

Aiden Olsen - RED *James Wilcock - BLUE* *Blake Wiker - ORANGE*

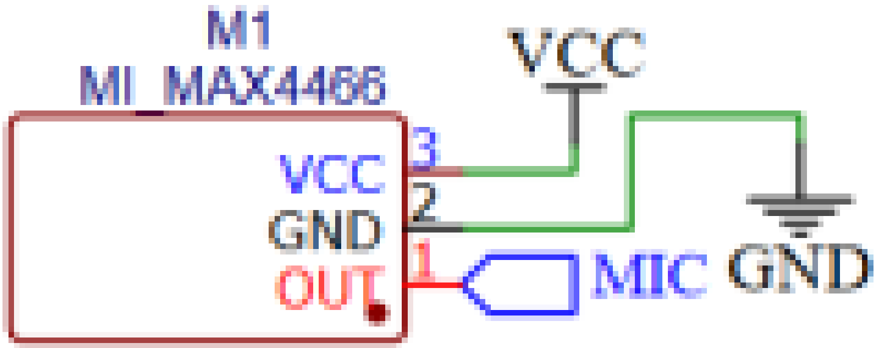


Interface Definitions

Interface Type	Interface Specification (See next page)
POWER_IN	AC Power
PWR_MC	USB Power
PWR_GUI	USB Power ● Vmax: 5.25V ● Vmin: 4.4V ● Ipeak: 500mA ● Inominal: 100mA
LED_COM	I2C communication
LED_PWR	Vmax: 5V Inom per layer: 1.5 A
MIC_DATA	0V to 5V peak to peak analog signal 25x to 125x adjustable gain
MIC_PWR	Vmax: 3.3V Imax: 40mA
RGB_COM	PWM (0-255) digital signal One connection for each color
LIGHT_OUT	Light waves from the LED Cube
AUDIO_IN	Represents the input of audio into the Microphone, this could be sound in the room or music playing.
MOUSE_IN	User uses mouse or trackpad to move cursor and select GUI buttons, cursor can also be used to manipulate text
KEYBOARD_IN	User uses keyboard to type message in the message window on the GUI
WIRELESS_COM	Server/Receiver HTTP request connection between computer and ESP32, data is sent as a json struct (see images below) ESP32 Wifi Specs: IEEE 802.11ax (Wi-Fi 6) on 2.4 GHz, supporting 20 MHz bandwidth in 11ax mode, speeds up to 150 Mbps.
GUI_CODE	This code defines what the GUI will look like and what signals it will send to the microcontroller. Written using the pysimplegui libraries and functions.

#Interface definitions

Schematic



Audio sampling code

```
#include "audiomode.h"
int getvolume()
{
    float normalized = 0;
    int count = 0;
    int sum = 0;
    int time = millis();
    int sensorValue;
    while (millis() - time < 20)
    {
        sensorValue = analogRead(sensorPin);
        if (sensorValue > 1900)
        {
            sum += abs(sensorValue);
            count++;
        }
    }
    if (count == 0)
    {
        count = 1;
    }
    // Serial.println(count);
    // Serial.println(sum);
    normalized = abs((float(sum / count) - 1950) / (4096 - 1950));
    int volume = int(normalized * 100); // 0-100 volume
    int level = 0;
    if (volume < 15)
    {
        level = 0;
    }
    else if (volume < 30)
    {
        level = 1;
        // turn on [2][2]
    }
    else if (volume < 50)
    {
        level = 2;
        // turn on [1-3][1-3]
    }
    else
    {
        level = 3;
        // turn all on
    }
    return level;
}
```

Audio header file

```
#ifndef AUDIOMODE_H
#define AUDIOMODE_H
#include <Arduino.h>
// TODO CHANGE pin for pcb to 34
#define sensorPin 35
int getvolume();
#endif
```

Code for manipulating the ledarray based on volume

```
int handlevolume(int volume, int color[3], int (*ledarray)[5][5][7][3])
{
  if (volume == 0)
  {
    // turn all off
    for (int x = 0; x < 5; x++)
    {
      for (int y = 0; y < 5; y++)
      {
        for (int z = 0; z < 7; z++)
        {
          (*ledarray)[x][y][z][0] = 0;
          (*ledarray)[x][y][z][1] = 0;
          (*ledarray)[x][y][z][2] = 0;
        }
      }
    }
  }
  else if (volume == 1)
  {
    // turn middle on
    for (int x = 0; x < 5; x++)
    {
      for (int y = 0; y < 5; y++)
      {
        for (int z = 0; z < 7; z++)
        {
          if (x == 2 && y == 2)
          {
            (*ledarray)[x][y][z][0] = color[0];
            (*ledarray)[x][y][z][1] = color[1];
            (*ledarray)[x][y][z][2] = color[2];
          }
          else
          {
            (*ledarray)[x][y][z][0] = 0;
            (*ledarray)[x][y][z][1] = 0;
            (*ledarray)[x][y][z][2] = 0;
          }
        }
      }
    }
  }
  else if (volume == 2)
  {
    // turn 3x3 middle on
    for (int x = 0; x < 5; x++)
    {
      for (int y = 0; y < 5; y++)
      {
        for (int z = 0; z < 7; z++)
        {
          if ((x >= 1 && x <= 3) && (y >= 1 && y <= 3))
          {
            (*ledarray)[x][y][z][0] = color[0];
            (*ledarray)[x][y][z][1] = color[1];
            (*ledarray)[x][y][z][2] = color[2];
          }
          else
          {
            (*ledarray)[x][y][z][0] = 0;
            (*ledarray)[x][y][z][1] = 0;
            (*ledarray)[x][y][z][2] = 0;
          }
        }
      }
    }
  }
  else if (volume == 3)
  {
    // all on
    for (int x = 0; x < 5; x++)
    {
      for (int y = 0; y < 5; y++)
      {
        for (int z = 0; z < 7; z++)
        {
          (*ledarray)[x][y][z][0] = color[0];
          (*ledarray)[x][y][z][1] = color[1];
          (*ledarray)[x][y][z][2] = color[2];
        }
      }
    }
  }
  return volume;
}
```