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Hardware Reference Designs

Overview

Synthiam publishes open-source hardware reference designs on GitHub to make your own hardware. Save time and development cost by using our source-available reference designs to make your own products!

Here are the reference designs we have available:

EZ-B v4

A fully featured WiFi robot controller with streaming audio and video. Features 24 Digital I/O, 8 ADC, 3 I2C, and 3 UART.

Power Harness

A LiPo battery to EZ-B v4 wiring harness with fuse protection.

EZ-B Camera

Gives the EZ-B v4 and EZ-B IoTiny video capabilities.

GPS

Allows a NEO-6M GPS to be mounted at a 90 degree angle.

Ultrasonic

A 3-wire interface with on-board 5V voltage regulator.

RGB 8x8 Display
An I2C display that can create bright and colorful animations with 64 pixels.

EZ-B IoTiny
A miniature version of the EZ-B v4. Features streaming audio and video, 8 digital I/O, 2 ADC, and 1 I2C.

Neopixel Blaster
Takes commands from a single digital pin and controls 8 channels of multiple WS2812b Neopixel RGB LEDs.

Blaster Bit
A single WS2812b Neopixel RGB LED to connect to the Neopixel Blaster.

Microphone
Converts a sound signal to an analog voltage in real-time.

Temperature Sensor
Converts a temperature value into an analog voltage.

Line Sensor
Converts 3 reflective sensor analog voltages to I2C data.

Humidity Sensor
Takes both the humidity and temperature analog voltages and outputs one sensor analog

voltage at a time.

Voltmeter
Reads a 0 - 17.5VDC input voltage.

Variable Voltage Supply
A variable supply that takes a 4.1 - 37VDC input voltage and outputs 1.2 - 37VDC.

Indoor Positioning System
This system locates the position of a robot in a room and moves it to the desired location. The IPS uses one regular camera and one infrared sensitive camera.

IPS Transmitter
A wide angle infrared LED that is used as a beacon for the IPS.

IMU Sensor
A accelerometer/gyroscope combo sensor that pre-processes the data then transmits it via I2C.

LIDAR
A sensor that provides SLAM data for robot navigation.

RGB Eyes
Gives any robot animated eyes with 18 RGB LEDs.

Roomba Cable
Connects an I/O Controller to a Roomba's serial communication interface (SCI) port.

EZ-B v4

Link:
https://youtu.be/CaTT_VOLmrA

This Roll-out Video includes:

1. Hook-up guide for Power, Digital Sensor, Analog Sensor, I2C, Camera, and Speaker
2. Using related Synthiam ARC software skills
3. Schematic overview
4. Bill of Materials (BOM) overview
5. Custom firmware location

The EZ-Bv4 reference design has the wireless video and audio streaming capabilities of an IoT device paired together with the sensor and servo features of a robot controller. It's the only I/O controller that takes full advantage of all the amazing features in ARC.
This product requires licensing agreement for manufacturing
. Please
Contact Us
to find out more.

Features

3.33MBaud UART data communication to E-15 WiFi board
3.33MBaud UART data communication to E-09 Camera

3 x user available UART ports
1 x I2C port (3 x parallel breakouts on E-15)
1 x E-09 Camera Breakout

24 x Digital I/O breakouts with PWM (GVS style)
8 x 12-bit Analog breakouts (GVS style)
1 x 12-bit DAC for audio output
DAC output breakout pad
Audio Amplifier & Speaker breakouts
SWD programming header (on both Main and WiFi boards)
Over the air updating

Reset button for WiFi module
Integrated Webserver (192.168.1.1)
AP mode (direct) and Client mode (router) available

Energy-efficient 3.3V 3A Switching power supply
Red communication indicator LED

RGB status LED

5V tolerant I/O pins
Reverse polarity protection
10mA protection limit for I/O ports
Resettable fuse protection for ARM microcontroller
Heat sink thermal protection for ARM microcontroller
Blue power LED
Voltage requirement: 4.5-16VDC (7.4V Typical)
Current draw: 80mA (no audio, 7.4V)
Dimensions: 56(W) x 54(L) x 31.5(H) (mm)
Weight: 43g

Major components

LM4902MM Audio amplifier
EMW3165-P MXChip 802.11b/g/n WiFi Module (custom firmware provided)

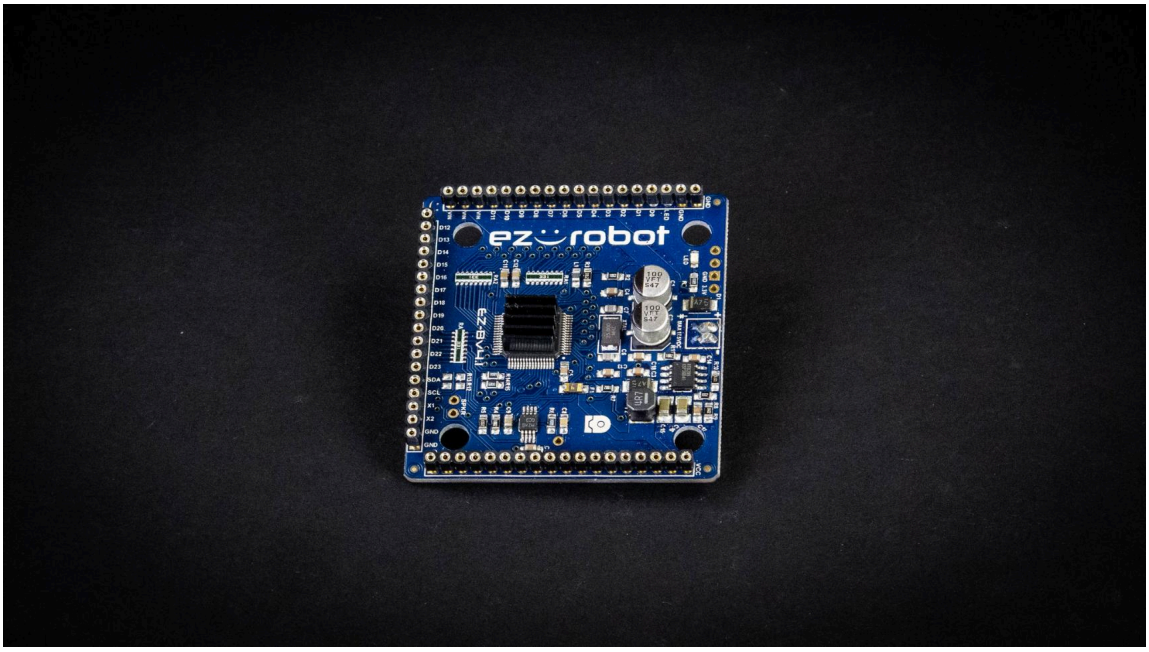
STM32F205RET6 ARM microcontroller (custom firmware provided)
RT8299GSP Switching power supply

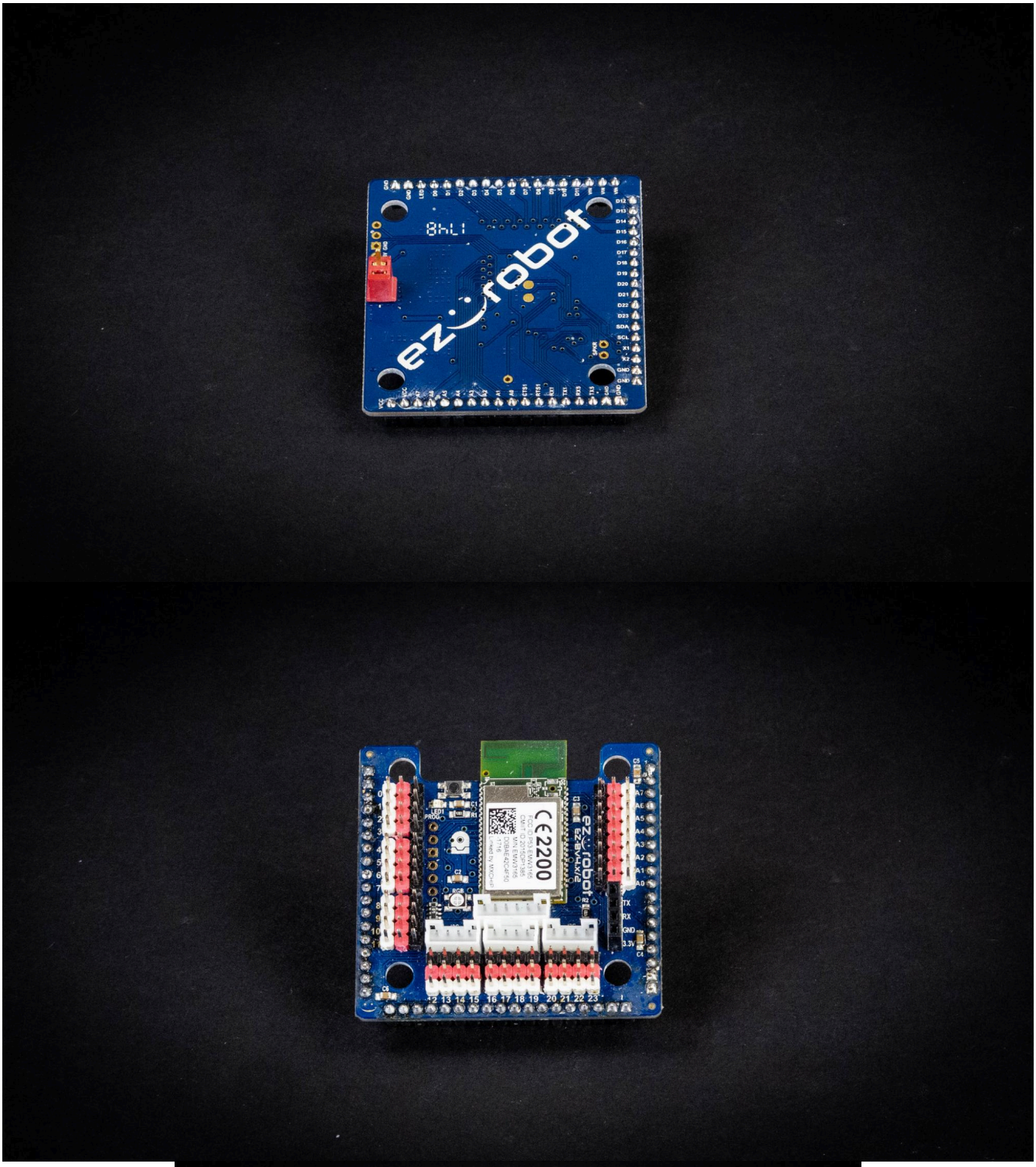
Manufacturing notes

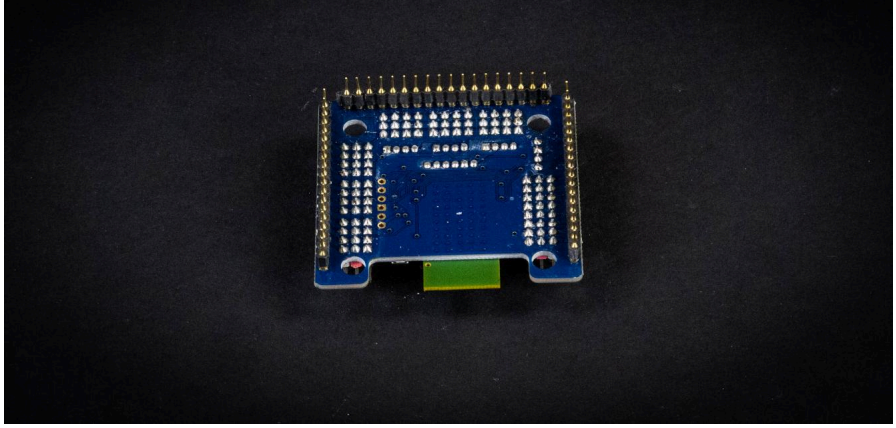
Supplier: programs custom firmware into the STM32F205RET6 and EMW3165-P at their facility before sending to the manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Dual Side soldering of THT components

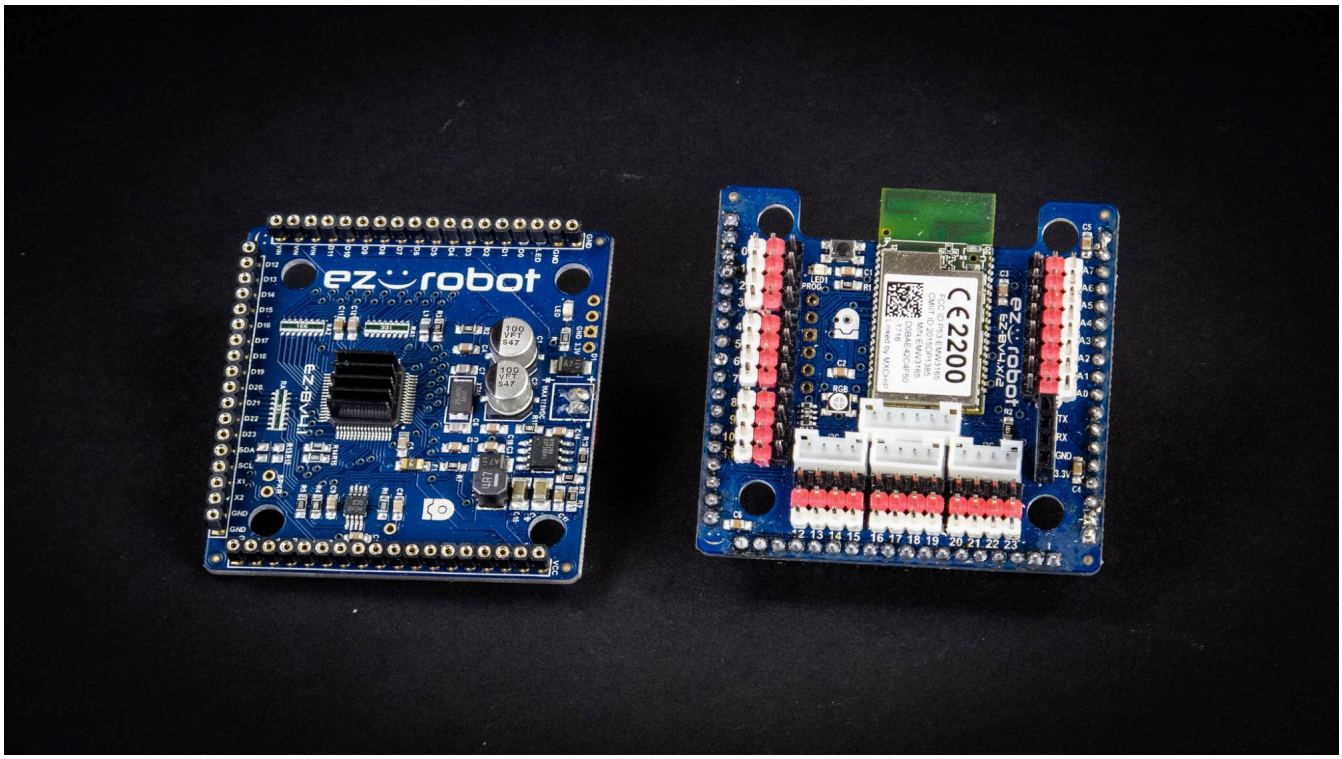
Certification:
Recommended to compliance test (when combined with E-15) in order to check for FCC Part 15 Class B interference with the FCC/CE Certified EMW3165 WiFi module.

Photos




ez-robot
CE2200





Power Harness

Link:
https://youtu.be/7Jo_VavvVQ8

This Roll-out includes:

1. Feature set
2. Hook-up guide
3. Bill of Materials (BOM) overview
4. Assembly instructions

The power harness reference design is designed to deliver 7.4V from an RC LiPo battery (with deans connector) to the EZ-B v4. A unique feature of this harness is that it is designed for high current applications. We want to share these files with you so you can create your own!

Features

Replaceable fuse
Integrated ON/OFF switch
Deans connector input, Micro deans output
High current rated components and wire
Flexible silicone wire
PCB can alternately be used with a Barrel Jack
Voltage requirement: 0-17.5VDC (7.4V Typical)
Current rating: 6A continuous, 20A peak
Fuse protection: 20A ATM mini blade fuse
Wire Length: 6"

Dimensions: 25.9(W) x 40.9(L) x 13.9(H) (mm) PCB+fuse
Weight: 13g

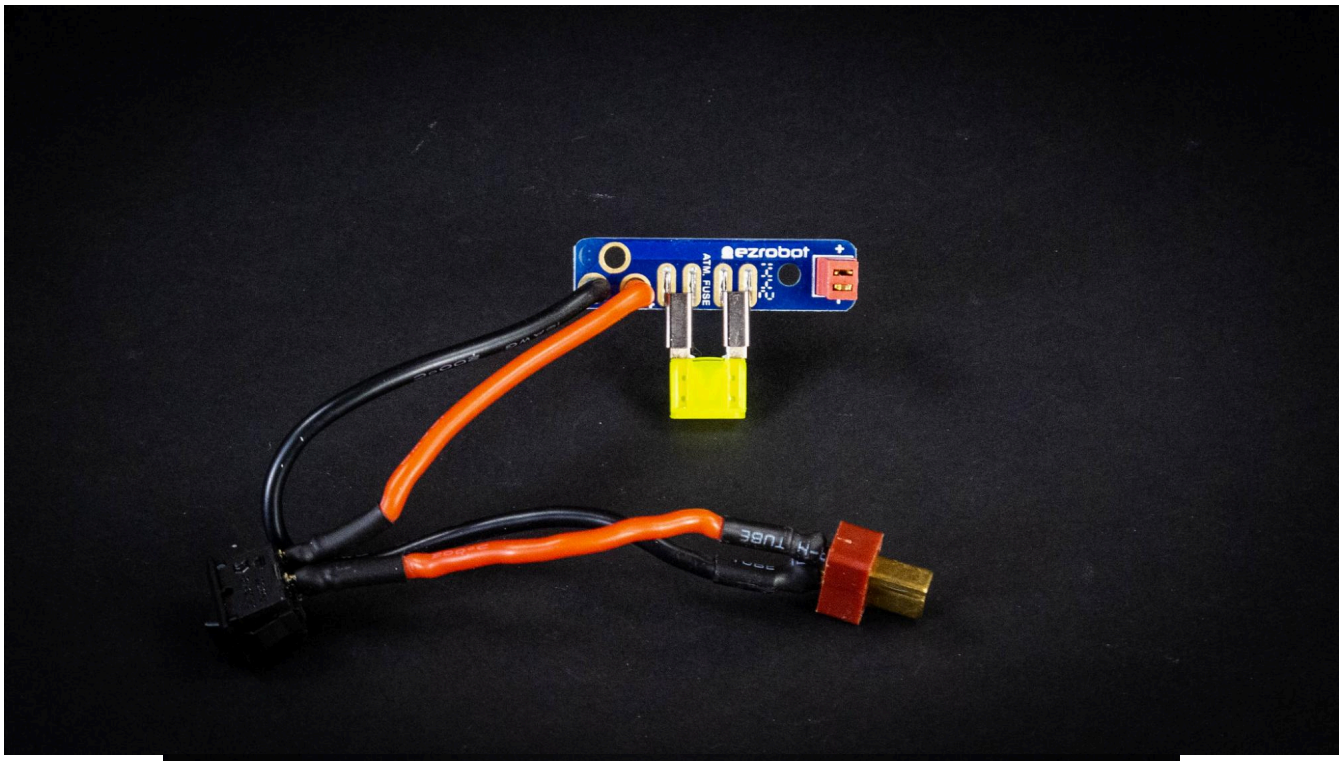
Resources

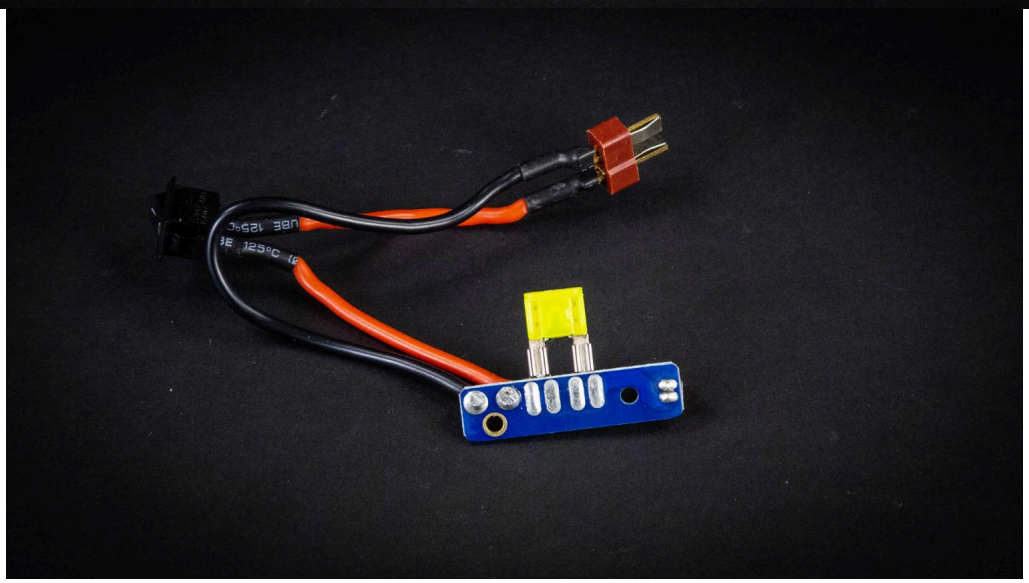
Documentation:
BOM, Assembly Notes, Test Procedures

Hardware: Altium PCB design File, Gerbers

Altium Libraries are also available here

Photos





EZ-B Camera

Link:
https://youtu.be/FZY4v0a6e4Q

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using Synthiam ARC software skills
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Custom firmware location

The EZ-B Camera reference design is capable of color tracking, objection recognition, facial recognition, and more. It also communicates at a very high speed - 3.33MBaud. This product requires a licensing agreement. Please
Contact Us
for more information.

Features

3.33MBaud UART communication
2 Megapixel Camera
Replaceable Camera module
Replaceable Infinity focus lens
Mini SWD programming header
On-board 2.8V and 1.5V regulation for camera module
5V tolerant I/O pins
RGB LED status indicator
ARC behavior control available
Small form factor
Voltage requirement: 3.2-3.4VDC (3.3V Typical)
Current draw: 70mA
Dimensions: 22.3(W) x 24.4(L) x 13.8(H) (mm)
Weight: 4g

Major Components

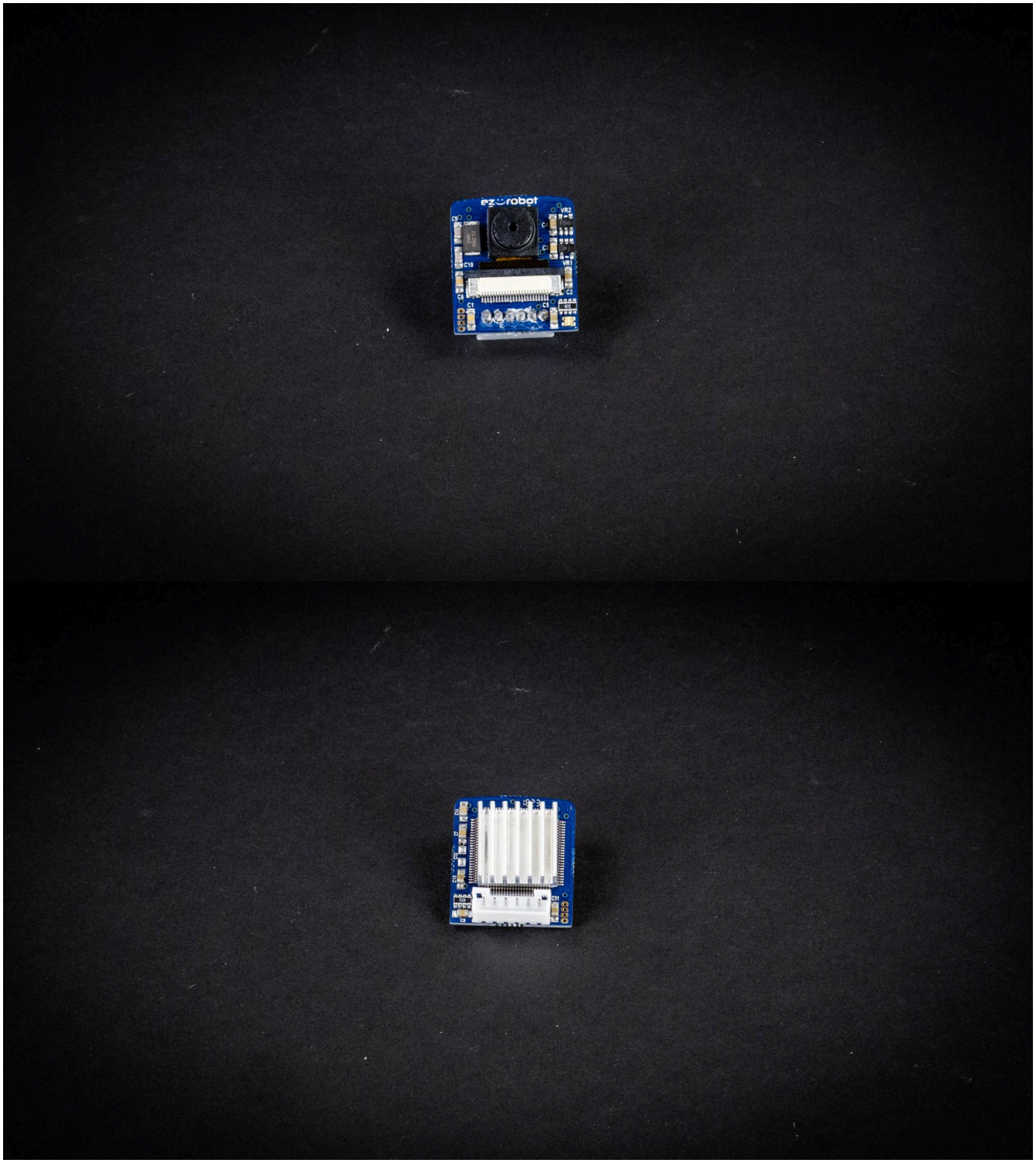
STM32F407VET6 32-bit Cortex-M4 ARM microcontroller (custom firmware provided)
HDF3M-811 OV2640 2 Megapixel Camera

Manufacturing Notes

Supplier: provides pre-built HDF3M-811 OV2640 Camera with custom ribbon length
Supplier: programs custom firmware into the STM32F407VET6 at their facility before sending to the manufacturer
Manufacturer: Dual side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components
Manufacturer: Installs Camera onto PCB

Note:
This camera natively connects to the
 EZ-Bv4 WiFi Board
and
 EZ-B IoTiny

Photos



ARC Skill

The ARC skill is fully featured. Camera detection and recognition can be activated with the simple click of a mouse button or with code.

Link:
https://synthiam.com/Products/Controls/Camera/Camera-Device-16120

GPS

This is a ez-clip mounting option for the Waveshare GPS NEO-7M-C module. A unique feature of this design is that it allows the GPS antenna to keep pointing skyward while the module is mounted onto a vertical connection. We want to share these files with you so you can create your own!

Features

UART communication
On-board GPS antenna
PPS pin broken out
Backup battery and EEPROM
3.3V voltage regulator
Red status LED
Voltage requirements: 3.2-5V (3.3V typical)
Current draw: 78mA
Dimensions: 25.5(W) x 35.3(L) x 37.5(H) (mm)
Weight: 20g

Major Components

NEO-7M-C GPS module

Manufacturing Notes

Manufacturer: Dual side placement and soldering of PCBs

Wiki link for NEO-7M-C module:
https://www.waveshare.com/wiki/UART_GPS_NEO-7M-C

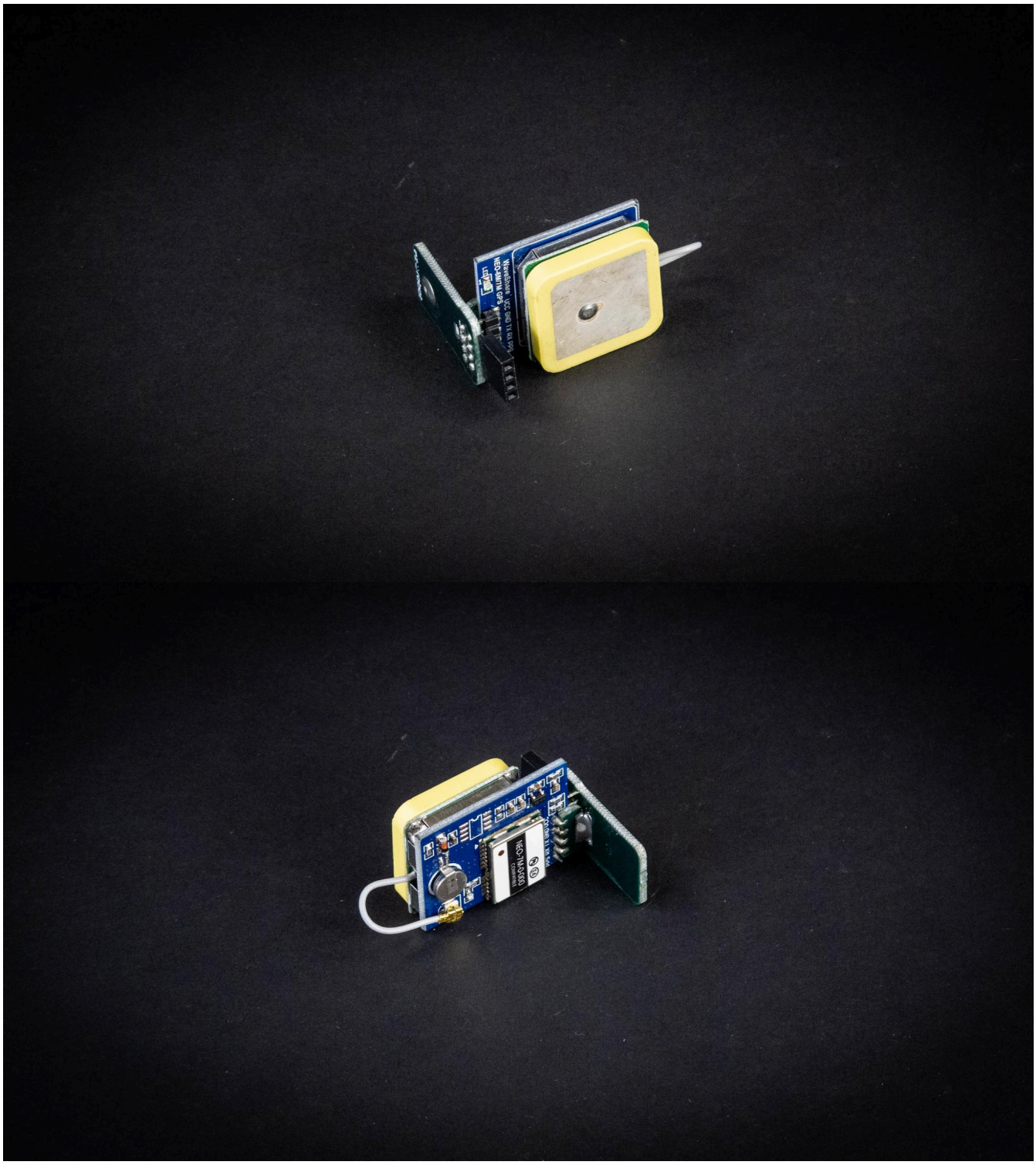
Resources

Documentation:
BOM, Assembly Notes

Hardware: Altium PCB design Files

Altium Libraries are also available here

Photos



ARC Skill

The ARC skill for this reference design is very easy to use! Simply click on the connect button to get GPS Latitude, Longitude, time, speed, altitude, and satellite count.

Link: https://synthiam.com/Docs/Skills/Gps/GPS?id=16145

Ultrasonic

Link:
https://youtu.be/U_xIYUk4qag

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using Synthiam ARC software skills
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Custom firmware location
7. Assembly instructions

The Ultrasonic reference design can be used to determine real world distance, collision detection, or objects detected by simulated radar when combined with ARC. This unique design has an integrated 5V regulator and only uses 3 wires instead of 4. We want to share these files with you so you can create your own!

Features

Only one Digital I/O pin required (+ 2 power pins)
Programming header
On-board 5V regulation for HC-SR04
5V tolerant I/O pins
Red LED status indicator
Multiple ARC Skills available
Voltage input requirement: 6-20VDC
Current draw: 9mA
Dimensions: 45.2(W) x 20.3(L) x 29.7(H) (mm)
Weight: 11g

Major Components

PIC16F1704-I/ST PIC microcontroller (custom firmware provided)
NCP1117ST50T3GOSCT 5V Regulator
HC-SR04 Ultrasonic sensor

Manufacturing Notes

Supplier: provides pre-built HC-SR04 Sensor
Supplier: programs custom firmware into the PIC16F1704-I/ST at their facility before sending to manufacturer

Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Dual Side soldering of THT components

Resources

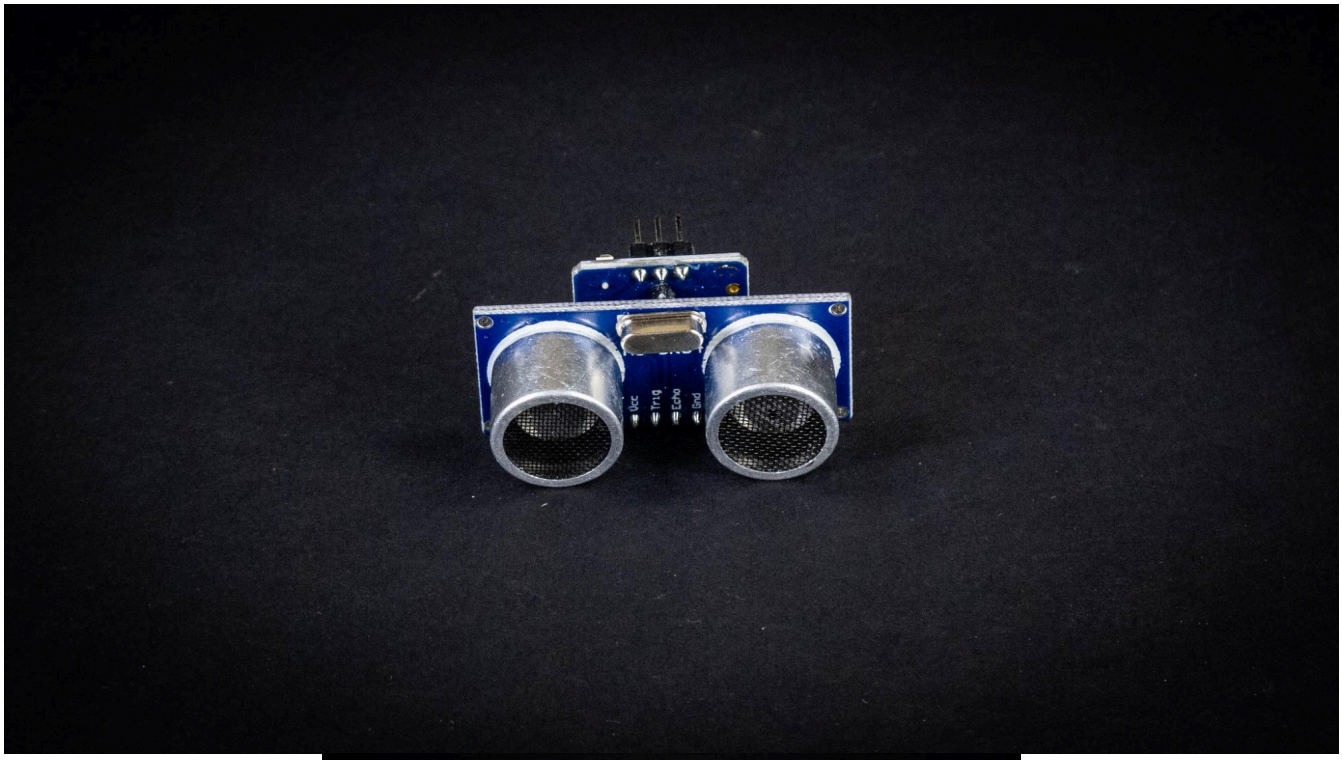
Documentation:
Schematic PDF, Datasheet PDF, BOM, Assembly Notes, Test Procedures

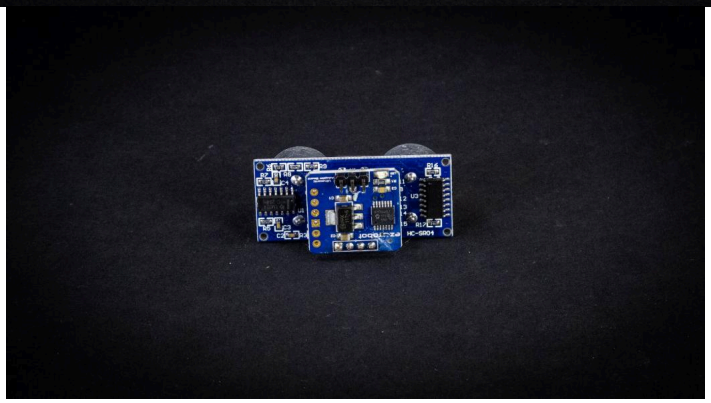
Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Firmware:
Code, Compiled Hex

Altium Libraries are also available
here

Photos





ARC Skills
There are 3 ARC skills that are directly related to the Ultrasonic. The Ultrasonic Distance, Collision Detection, and Radar controls. Grab the values from each of these controls with the click of a mouse button or with code.

Link: https://synthiam.com/Products/Controls/Ultrasonic-Distance

Where to Buy

EZ-Robot has their products on their website store for purchase, as well as many other online and offline retail stores. Here's links to the EZ-B Camera products directly at EZ-Robot's store:

Ultrasonic Distance Sensor

RGB 8x8 Display

Link:
https://youtu.be/Iwhcii0WCHs

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using ARC Skill
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Custom firmware location
7. Assembly instructions

The RGB 8x8 display reference design has a matrix of 64 full color LEDs. Each LED can be individually controlled by ARC to form messages, pictures, games, and more! A unique feature of this display is that it is a smaller form factor (48x48mm) than common RGB matrix displays (60x60mm). We want to share these files with you so you can create your own!

Features

I2C communication
Adjustable I2C address for chaining multiple displays
PIC programming header
5V tolerant I/O pins
Address displayed on boot
ARC skill available
Small form factor RGB display
Vibrant Green color, better than majority of matrix displays
Voltage requirement: 3.2-3.4VDC (3.3V Typical)
Current draw: All LEDs off - 6.6mA, All Blue - 86mA, All Green - 106mA, All Red - 154mA, All White - 273mA

Dimensions: 48(W) x 48(L) x 15.6(H) (mm)
Weight: 32g

Major Components

HS-19088BSRND-GG RGB 8x8 LED Matrix
PIC16F1937 PIC microcontroller (custom firmware provided)

Manufacturing Notes

Supplier: programs custom firmware into the PIC16F1937 at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Dual Side soldering of THT components

Resources

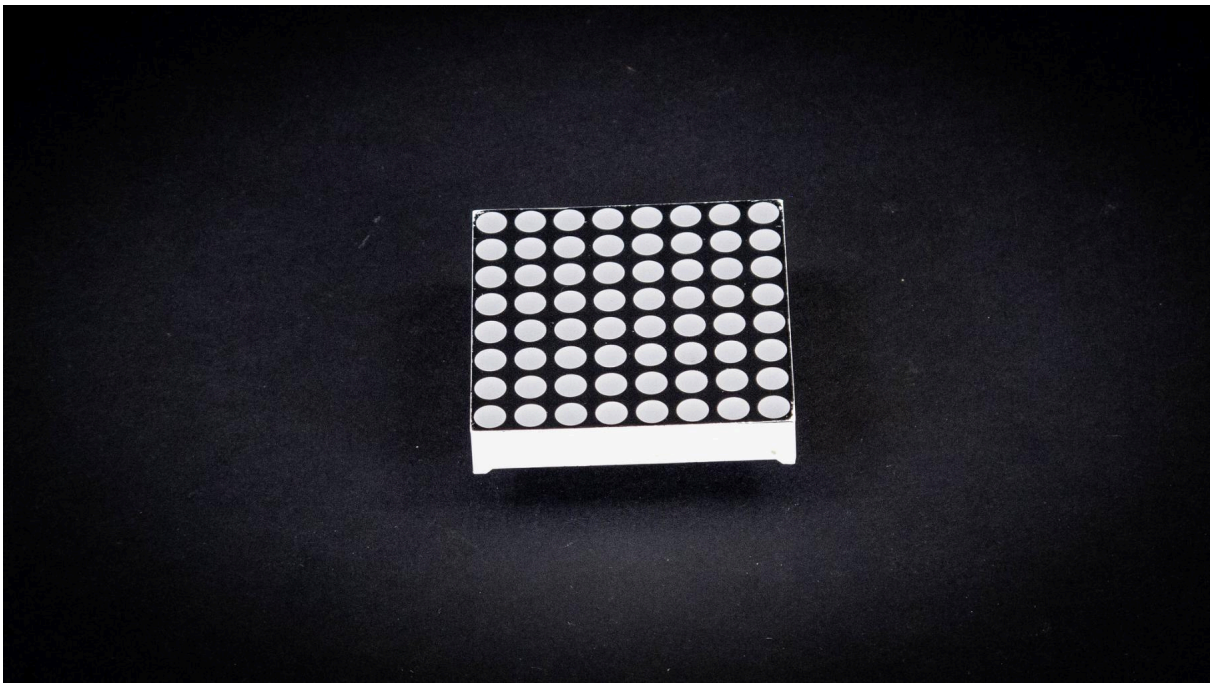
Documentation:
Schematic PDF, Datasheet PDF, BOM, Assembly Notes, Test Procedures

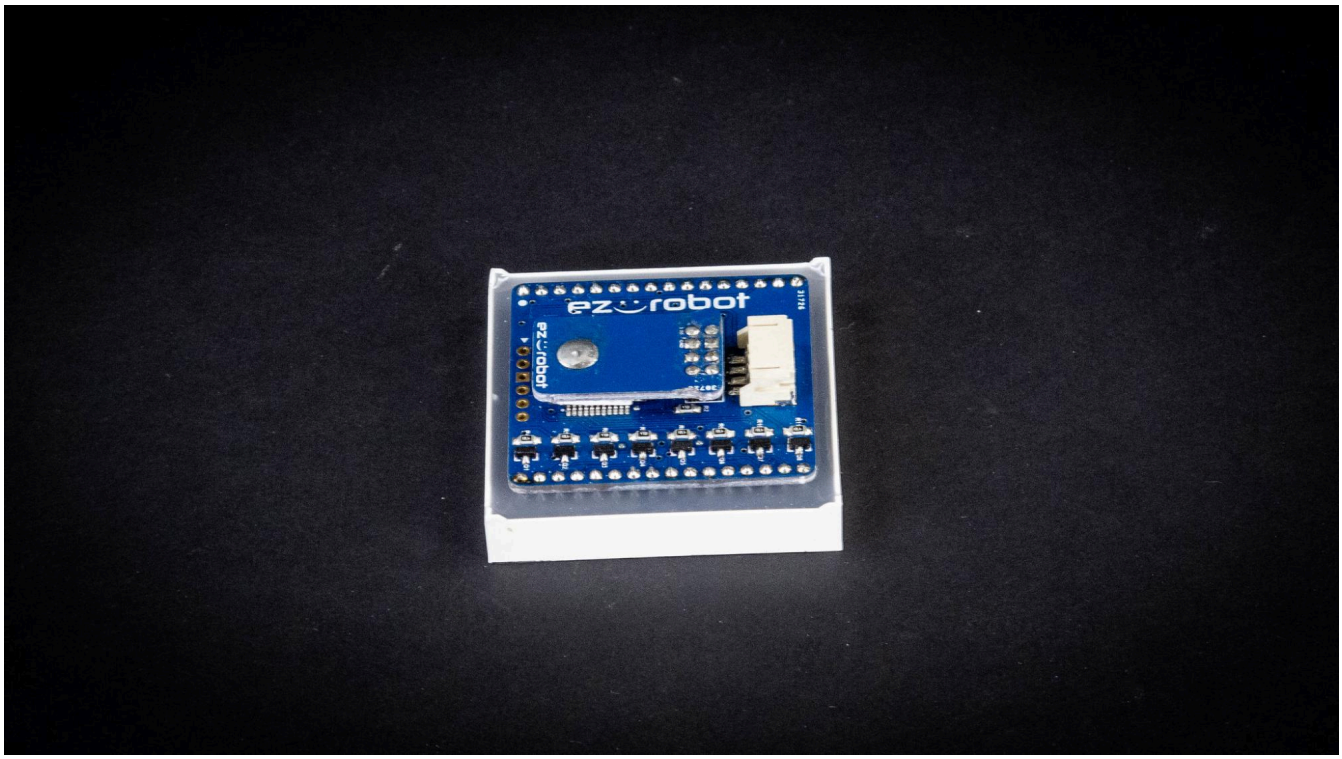
Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Firmware:
Code, Compiled Hex

Altium Libraries are also available here

Photos





ARC Skill

The ARC skill for this reference design is very easy to use! Simply add an animation frame, click on the pixels, choose the color, and repeat! Activate the animations with the click of a mouse button or with code.

Link: https://synthiam.com/Software/Manual/RGB-8x8-Animator-16173

Where to buy

EZ-Robot has their products on their website store for purchase, as well as many other online and offline retail stores. Here's links to the EZ-B v4 products directly at EZ-Robot's store:

RGB 8x8 Display

EZ-B IoTiny

Link:
https://youtu.be/oPMsaccwQWI

This Roll-out Video includes:

1. Feature set
2. Hook-up guide for Power, Servo, ADC, I2C, Camera, and Speaker
3. Using related Synthiam ARC software skills
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Custom firmware location
7. Assembly instructions

The EZ-B IoTiny reference design has the wireless video and audio streaming capabilities of an IoT device paired together with the sensor and servo features of a robot controller. It's 1/4 the size of the EZ-B v4 but it has 1/4 the amount of I/O pins as a result. It's barrel jack for power and upward-facing GVS servo/sensor pins make the IoTiny instantly application ready.

This product requires licensing agreement for manufacturing.
Please
Contact Us
for more information.

Features

3.33MBaud UART data communication to EZ-B Camera
1 x I2C port
8 x Digital I/O ports with PWM
2 x 12-bit analog ports (Not 5V Tolerant)
1 x 12-bit DAC for audio output
Audio Amplifier & Speaker breakouts
PIC programming header
Energy-efficient 3.3V 3A Switching power supply
Reset button for WiFi module
Integrated Webserver (192.168.1.1)
AP mode (direct) and Client mode (router) available
Can connect to phones and tablets with ARC App
Over the air updating
5V tolerant I/O pins
Reverse polarity protection
10mA protection limit for I/O ports
RGB Status LED
Voltage requirement: 4.5-16VDC (7.4V Typical)
Current draw: 75mA (no audio, 7.4V)
Dimensions: 41(W) x 56.5(L) x 13(H) (mm)
Weight: 14g

Major Components

EMW3165-P MXChip WiFi Module (custom firmware provided)
PIC16F1704-I/ST PIC Microcontroller (custom firmware provided)
LM4902MM Audio amplifier
RT8299GSP Switching power supply

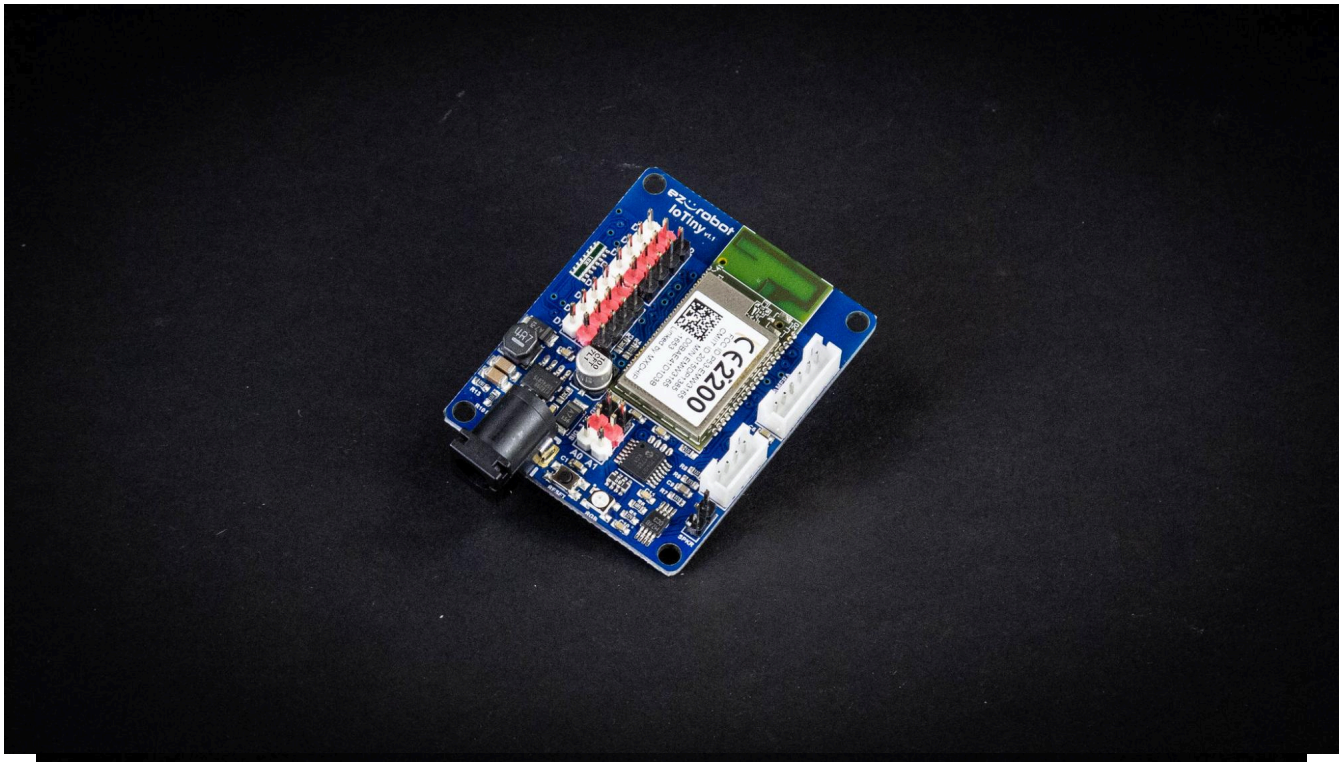
Manufacturing Notes

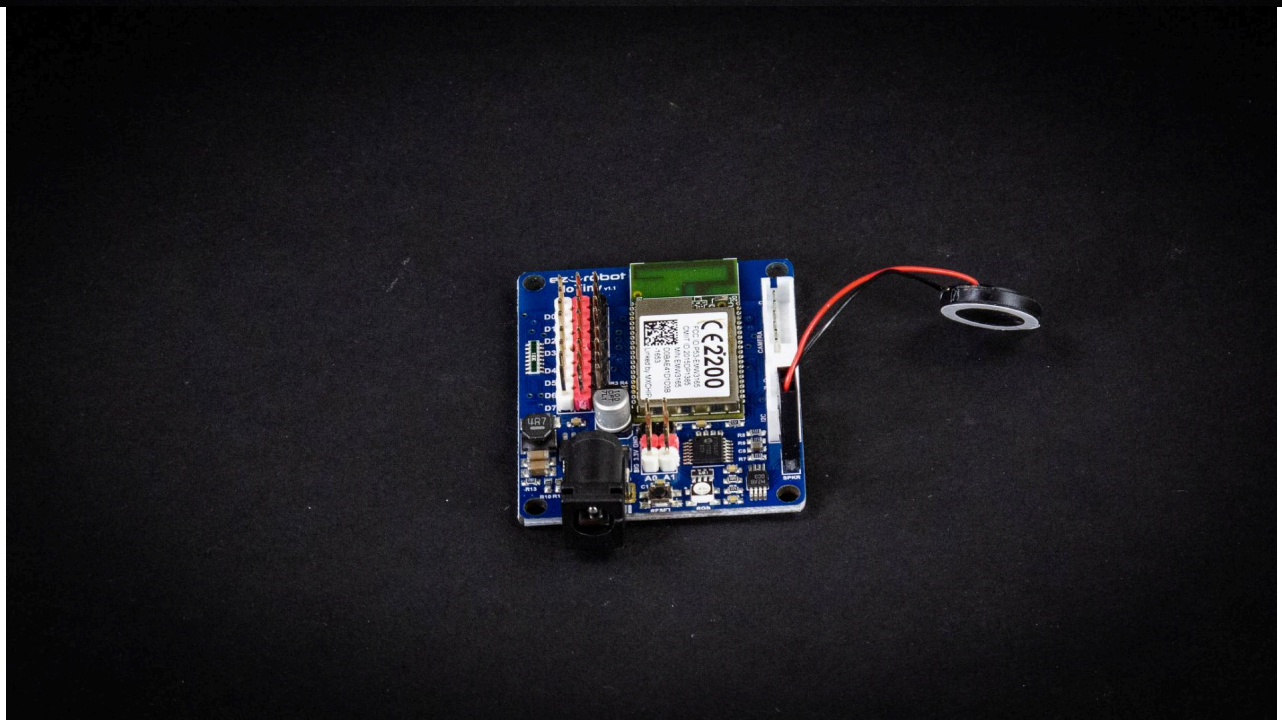
Supplier: programs custom firmware into the EMW3165-P at their facility before sending to

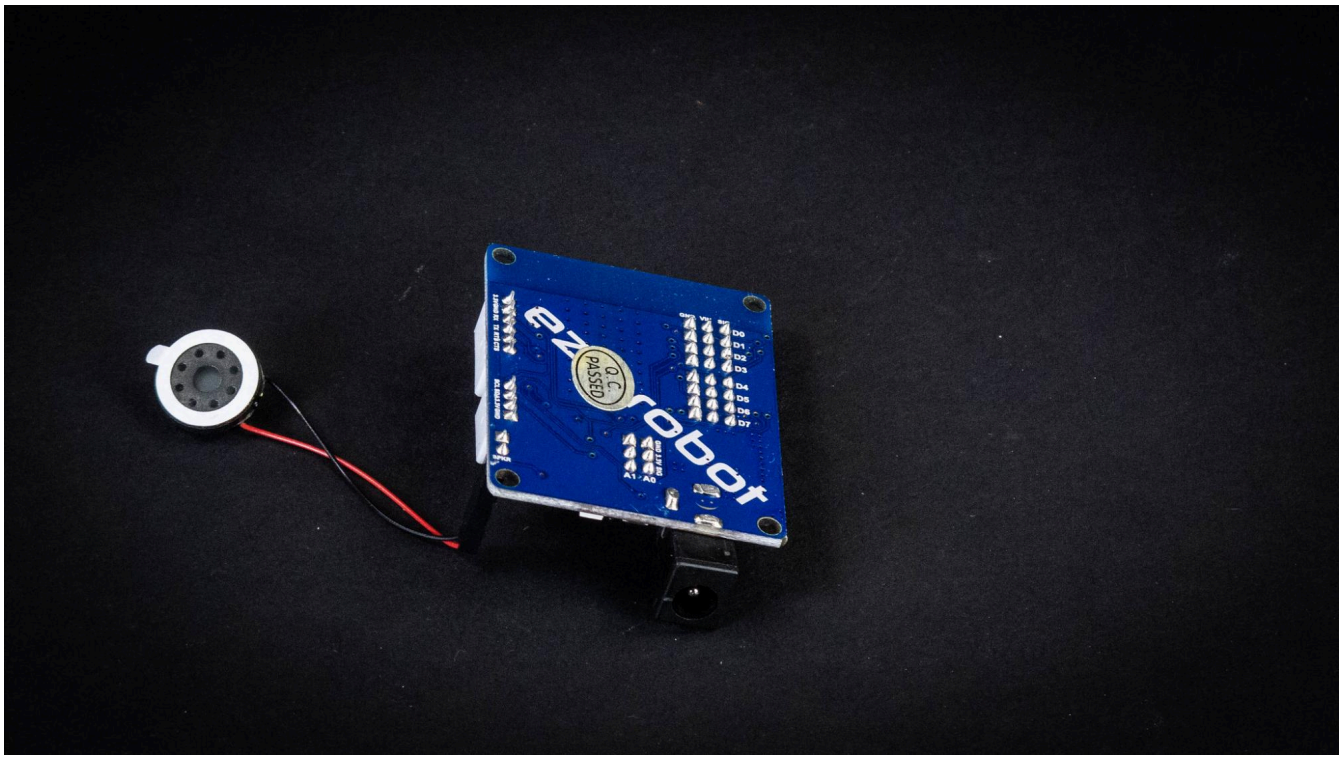
the manufacturer
Supplier: programs custom firmware into the PIC16F1704-I/ST at their facility before sending to the manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

Certification:
Recommended to compliance test in order to check for FCC Part 15 Class B interference with the FCC/CE Certified EMW3165 WiFi module.

Photos







Neopixel Blaster

Link:
https://youtu.be/iWZ4e5sMYgQ

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using Synthiam ARC software skill
4. Custom firmware location
5. Schematic overview
6. Bill of Materials (BOM) overview
7. Assembly instructions

The Neopixel Blaster reference design connects WS2812b addressable RGB LEDs to ARC. By utilizing ARC, the Neopixel Blaster can create animations and display all kinds of colors with WS2812b LEDs. A unique feature of this board is that it allows any ARC compatible board to use Neopixel LEDs, no libraries or precision timing required. We want to share these files with you so you can create your own!

Features

8 channels
Control up to 80 LEDs per channel
Each LED can display 1 of 16 million different colors
Mini programming header
5V tolerant I/O pins

RGB LED status indicator
ARC skill available
Voltage requirement: 6-18VDC (7.4V Typical)
Current draw: WS2812B off - 7mA, WS2812B white - 46mA
Dimensions: 29.7(W) x 35.7(L) x 11.5(H) (mm)
Weight: 5g

Major Components

PIC16F1704-I/ST 8-bit PIC microcontroller (custom firmware provided)
NCP1117ST50T3GOSCT 5V Linear voltage regulator
WS2812B Addressable RGB LED

Manufacturing Notes

Supplier: programs custom firmware into the PIC16F1704-I/ST at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

Note:
This reference design pairs with either a WS2812B NeoPixel LED or a Blaster Bit from here: https://github.com/synthiam/E-22_Blaster_Bit

Resources

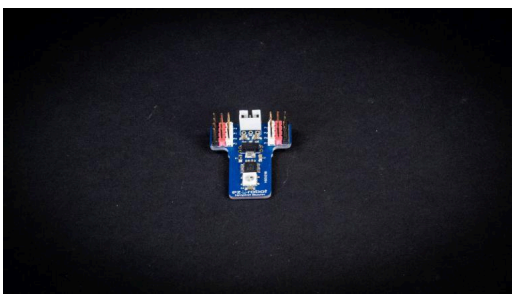
Documentation:
Schematic PDF, Datasheet PDF, BOM, Test Procedures

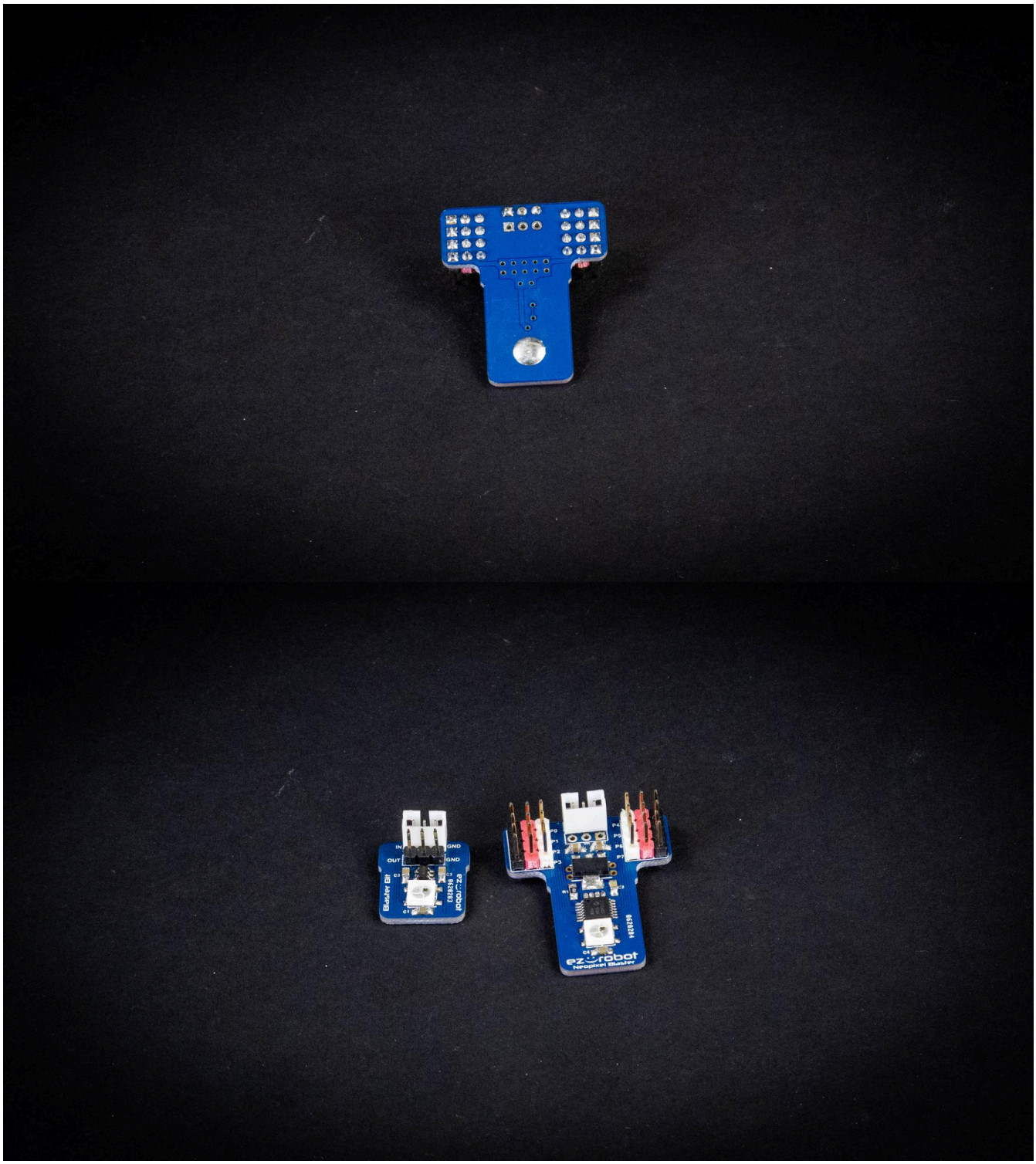
Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Firmware:
Code, Compiled Hex

Altium Libraries are also available here

Photos





ARC Skill

The ARC Neopixel Blaster skill makes it easy to control the Neopixel LEDs. The LED colors can be chained and activated with a simple code segment.

Link:
https://synthiam.com/Software/Manual/Neopixel-Blaster-16172

Where to Buy

EZ-Robot has their products on their website store for purchase, as well as many other online and offline retail stores. Here's links to the EZ-B v4 products directly at EZ-Robot's store:

Neopixel Blaster

Blaster Bit

Link:
https://youtu.be/iWZ4e5sMYgQ

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using Synthiam ARC software skill
4. Custom firmware location
5. Schematic overview
6. Bill of Materials (BOM) overview
7. Assembly instructions

The Blaster Bit reference design connects to the Neopixel Blaster. With ARC you can create colorful Blaster bit animations! A unique feature of the blaster bit is that it has a 5V regulator on-board so that it can be powered by, or protected from, higher voltages. We want to share these files with you so you can create your own!

Features

Output Connector to chain Neopixels using one channel
80 Blaster bits can be used per NeoPixel Blaster channel
5V tolerant data pin
Can display 1 of 16 million different colors
ARC Skill available
Voltage requirement: 6-24VDC (7.4V Typical)
Current draw: WS2812B off - 0.5mA, WS2812B white - 39mA
Dimensions: 16.3(W) x 18.3(L) x 10.4(H) (mm)
Weight: 1g

Major Components

WS2812B Addressable RGB LED
AP2204K-5.0TRG1 5V Linear voltage regulator

Manufacturing Notes

Manufacturer: Single side placement and soldering of SMT components

Manufacturer: Single Side soldering of THT components

Note:
This reference design requires the E-21 NeoPixel Blaster:
https://github.com/synthiam/E-21_Neopixel_Blaster

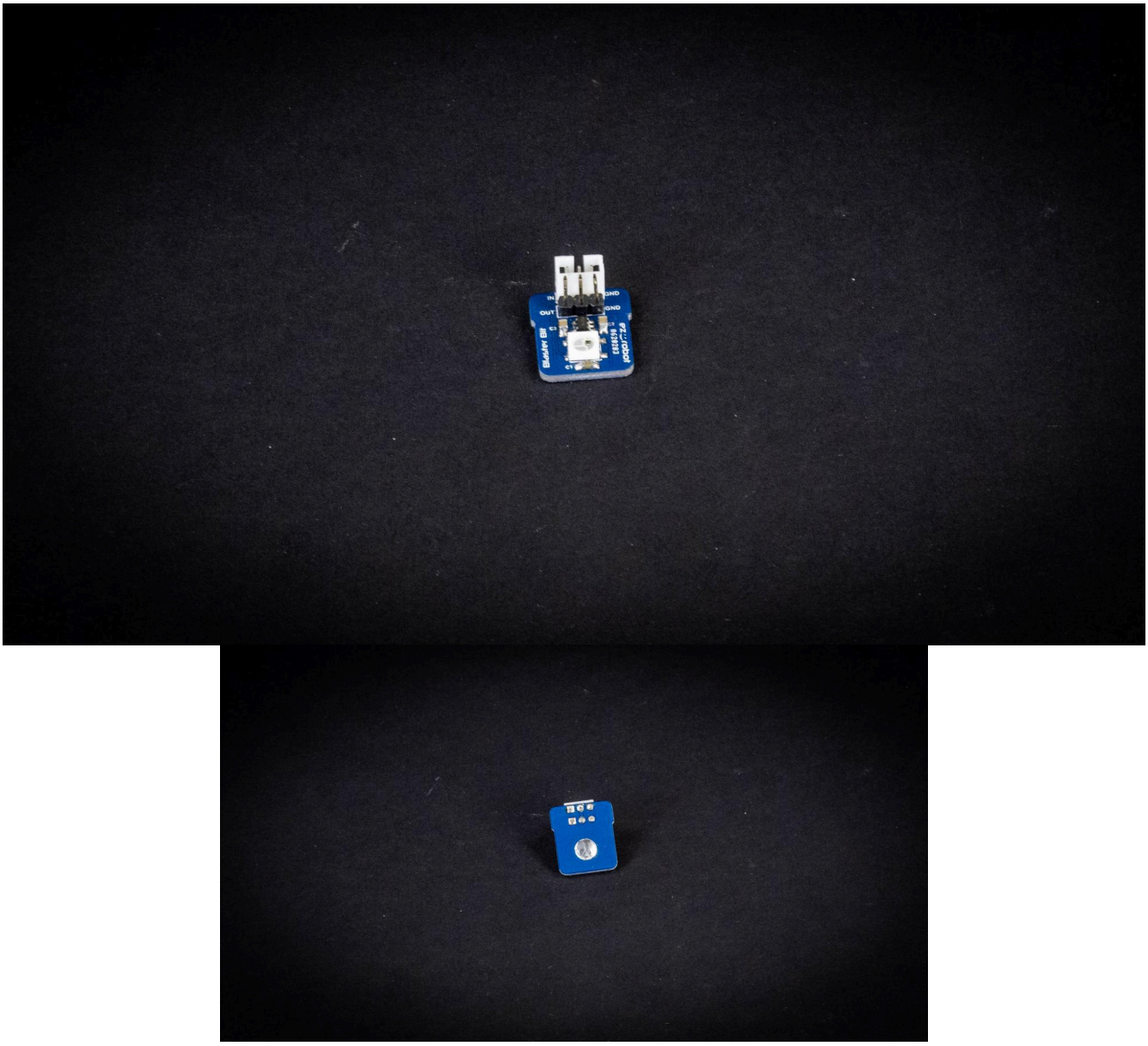
Resources

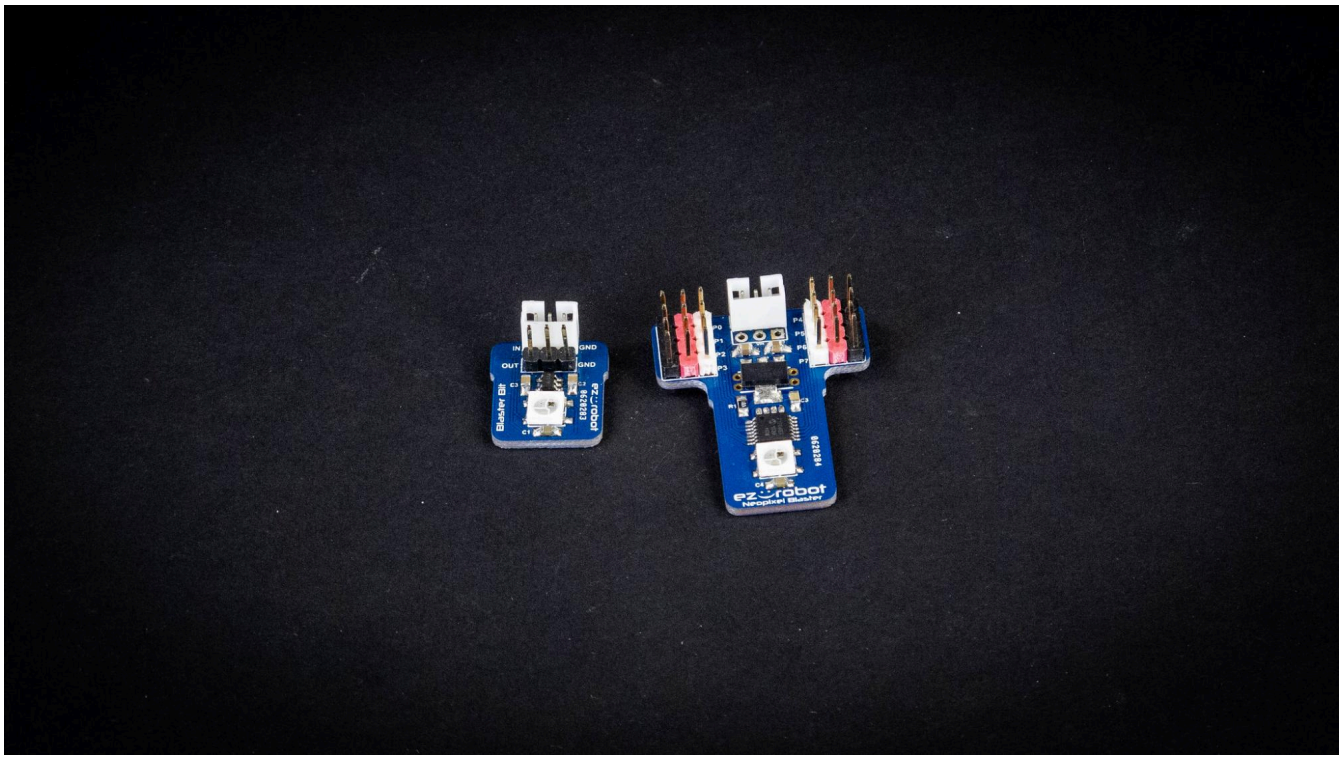
Documentation:
Schematic PDF, Datasheet PDF, BOM, Assembly Instructions, Test Procedures

Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Altium Libraries are also available here

Photos





ARC Skill

The ARC Neopixel Blaster Skill makes it easy to control the Blaster Bit. The LED colors can be chained and activated with a simple code segment.

Link:
https://synthiam.com/Software/Manual/Neopixel-Blaster-16172

Where to Buy

EZ-Robot has their products on their website store for purchase, as well as many other online and offline retail stores. Here's links to the EZ-B v4 products directly at EZ-Robot's store:

Blaster Bit

Microphone

The Microphone reference design connects to an EZ-B ADC port, then ARC converts the voltage levels into sound data. We want to share these files with you so you can create your own!

Features

3.3V voltage regulator on-board
Full human audible range 20Hz-20kHz
Audio input to 2-stage amplified analog voltage output

Single supply amplifier
Green Power LED
Voltage requirements: 3.2-16V (3.3V typical)
Current draw: 1.2mA
Dimensions: 16.2(W) x 39.5(L) x 7.8(H) (mm)
Weight: 4g

Major Components

CMA-4544PF-W Analog condenser microphone (-44dB)
OPA2344UA/2K5 Opamp 1MHz
SPX3819M5-L-3-3/TR 3.3V Regulator

Manufacturing Notes

Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT component

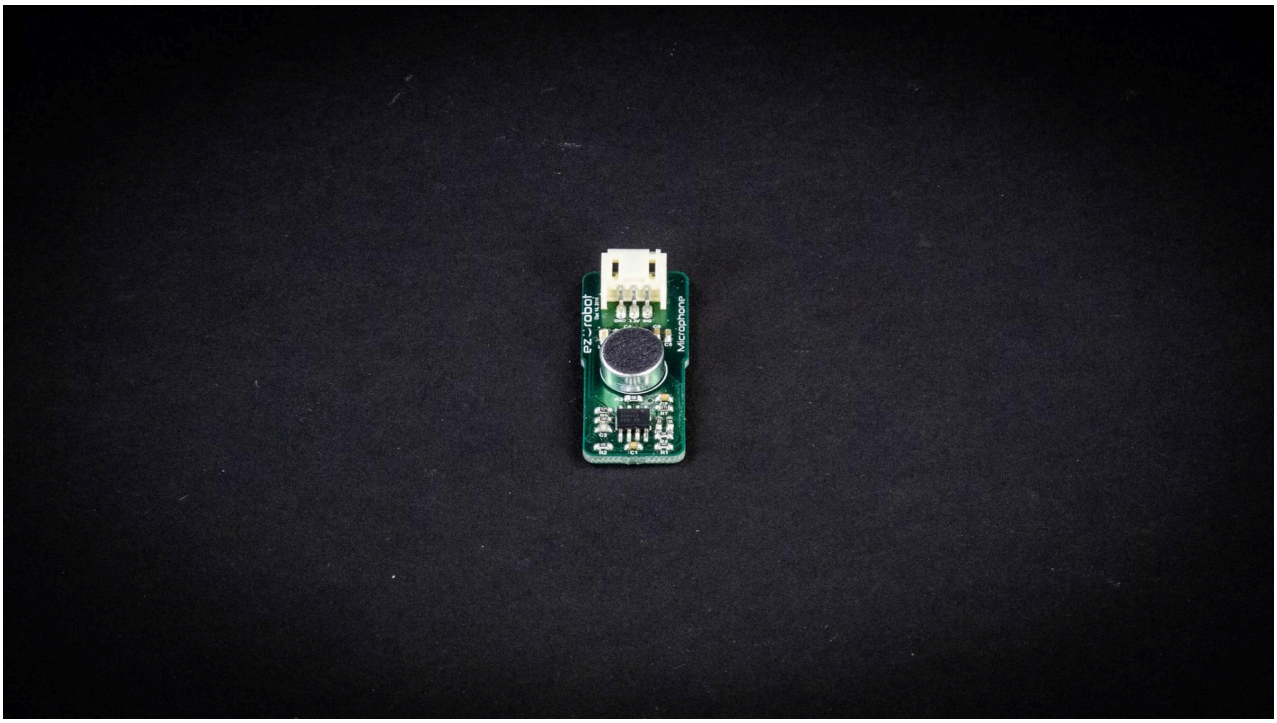
Resources

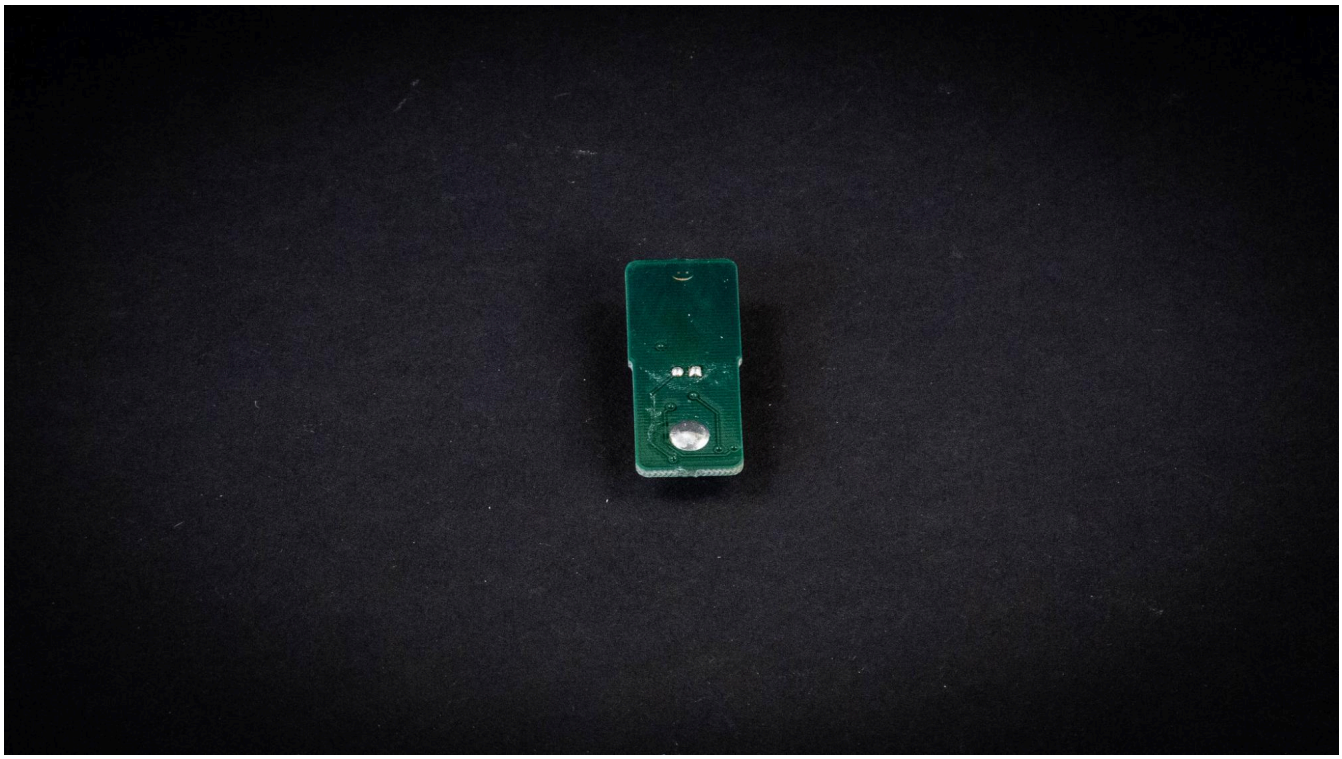
Documentation:
Schematic PDF, Datasheet PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File

Altium Libraries are also available here

Photos





Temperature Sensor

The Temperature sensor reference design measures temperature in degrees Celsius as an analog voltage. The Temperature sensor connects to an I/O controller ADC pin and measures temperature with a scale factor of 10mV/°C. We want to share these files with you so you can create your own!

Features

3.3V voltage regulator on-board
Green Power LED
Small form factor
Temerature range: -40°C to 125°C
Voltage requirements: 3.2-16V (3.3V typical)
Current draw: 1.6mA
Dimensions: 16.2(W) x 23.8(L) x 7.3(H) (mm)
Weight: 2g

Major Components

TMP36GRTZ-REEL7 Analog Temperature Sensor -40°C to 125°C
SPX3819M5-L-3-3/TR 3.3V Regulator

Manufacturing Notes

Manufacturer: Single side placement and soldering of SMT components

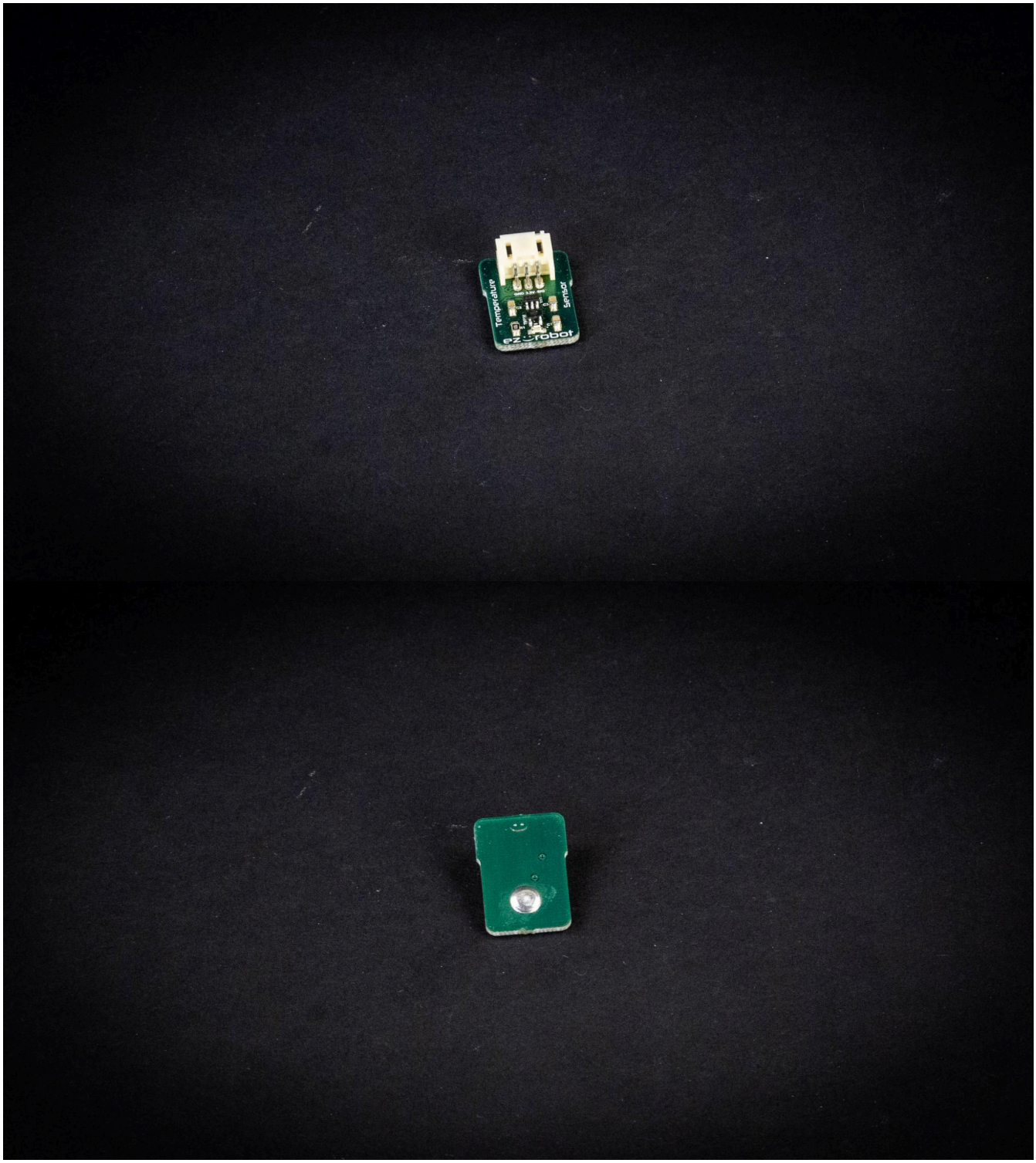
Resources

Documentation:
Schematic PDF, Datasheet PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File

Altium Libraries are also available here

Photos



Line Sensor

The Line sensor reference design can be used for line following, edge detection, gesture control, or any number of other applications that can utilize a reflective infrared sensor. We want to share these files with you so you can create your own!

Features

I2C communication
Green Power LED
Mini PIC programming port
3 x Refective optical sensors 18mm apart for Line sensing
Alternatively use this reference design for Gesture sensing as sensor values are variable
Voltage requirement: 3.2-3.4V (3.3V typical)
Current draw: 35.3mA
Dimensions: 43(W) x 43.5(L) x 10.3(H) (mm)
Weight: 6g

Major Components

PIC16F1704-I/ST PIC Microcontroller (custom firmware provided)
3 x TCRT5000L Reflective Optical Sensor with Transistor Output

Manufacturing Notes

Supplier: programs custom firmware into the PIC16F1704-I/ST at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

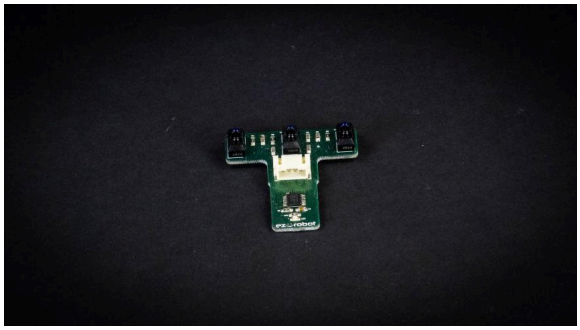
Resources

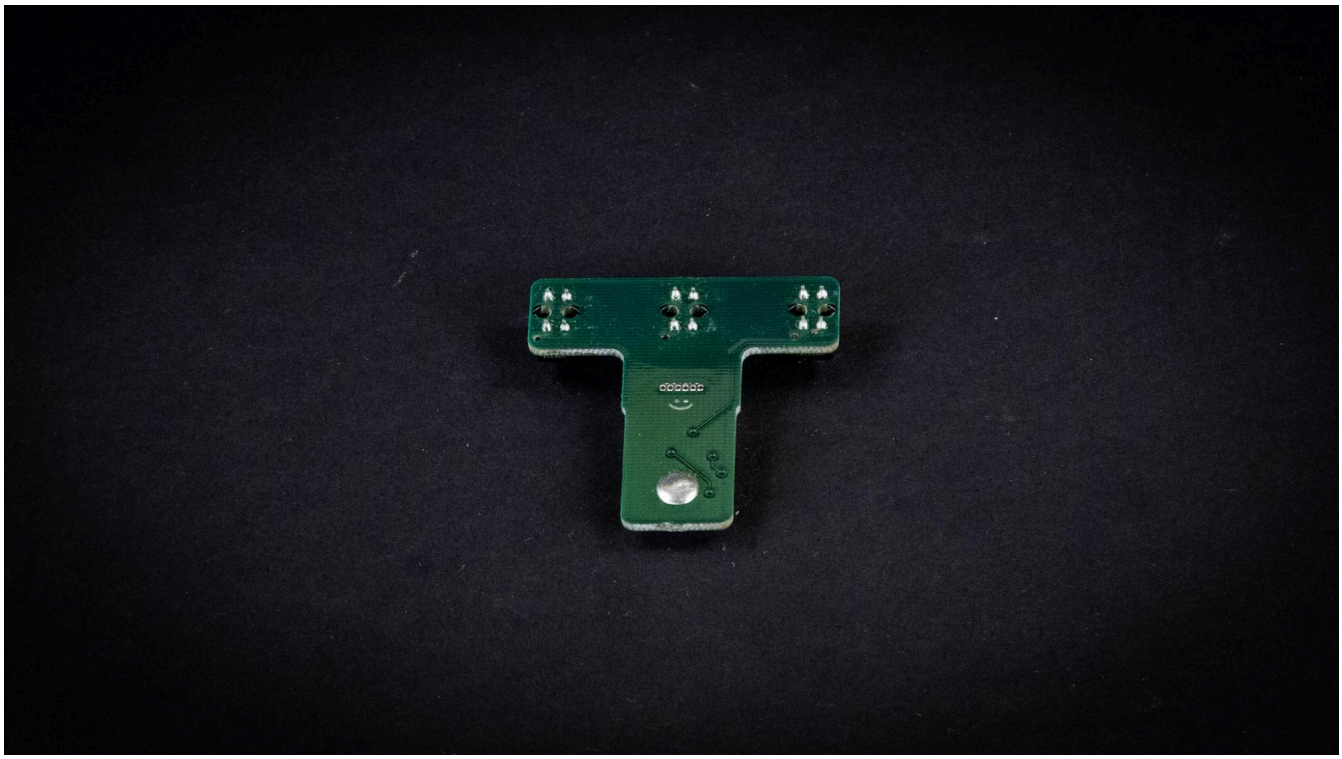
Documentation:
Schematic PDF, Datasheet PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File

Altium Libraries are also available here

Photos





Humidity Sensor

The Humidity sensor reference design is used to accurately measure relative humidity (RH) in percent and it also measures temperature in degrees Celsius. A unique feature of this reference design is that it takes the digital readout from the HDC1080 and converts it to analog so that it can easily be read by a variety of microcontroller boards. It also has an on-board select button, along with RGB LED mode indicator, to allow the output reading for either humidity or temperature to be selected. We want to share these files with you so you can create your own!

Features

Analog output
RGB Status LED
Humidity/Temp Mode Button
PIC programming port
3.3V voltage regulator on-board
Voltage requirement: 3.2-16V (3.3V typical)
Current draw: 0.43mA
Dimensions: 27.3(W) x 39.4(L) x 7.5(H) (mm)
Weight: 3g

Major Components

PIC16F1704-I/ST PIC Microcontroller (custom firmware provided)
HDC1080 Digital Humidity Sensor

SPX3819M5-L-3-3/TR 3.3V Regulator

Manufacturing Notes

Supplier: programs custom firmware into the PIC16F1704-I/ST at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components

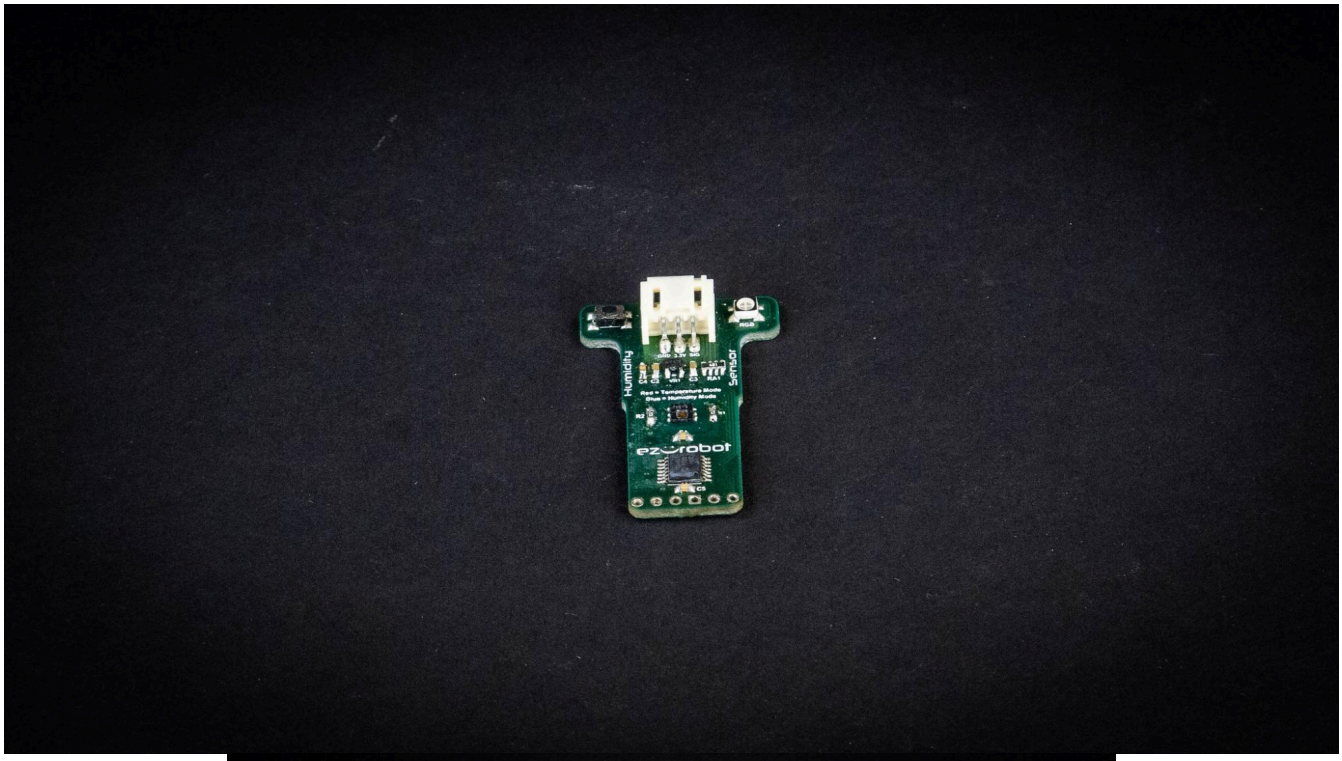
Resources

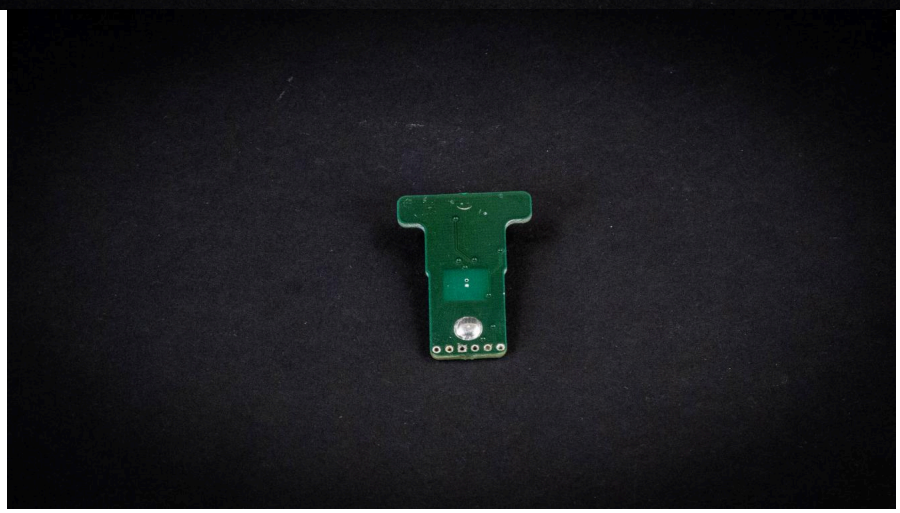
Documentation:
Schematic PDF, Datasheet PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File

Altium Libraries are also available here

Photos





Voltmeter

Link:
https://youtu.be/czC40y7L5Ys

This Roll Out video includes:

1. Feature set
2. Hook-up guide
3. Using ARC Skills
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Assembly instructions

The Voltmeter reference design measures the source voltage of a supply or signal and converts it to a 0 - 3.3VDC voltage that can be read by an I/O controller ADC pin. A unique feature of this design is that it has reverse polarity protection. We want to share these files with you so you can create your own!

Features

Multimeter Lead input with Flexible silicone wire
Reverse polarity protection
PCB can alternately be used with Banana Jacks
Green Power LED
Voltage requirement: 0-17.5VDC input
Wire Length: 34"
Dimensions: 26.3(W) x 30.8(L) x 9.2(H) (mm) PCB
Weight: 58g

Major Components

D2275 Set of Multimeter probes
1N4448W-TP 75V 250mA reverse polarity Diode (low leakage current)

Manufacturing Notes

Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

Resources

Documentation:
Schematic PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Altium Libraries are also available here

Photos



ARC Skill

The ARC ADC skills are very easy to use with the Voltmeter. Read or graph the voltage values with the simple click of a mouse button or with code.

Link:
https://synthiam.com/Products/Controls/Adc

Variable Voltage Supply

Link:
https://youtu.be/hDk28uFZj5k

This Roll Out video includes:

1. Feature set
2. Hook-up guide
3. Bill of Materials (BOM) overview
4. Assembly instructions

The Variable Voltage Supply reference design takes an input voltage and converts it to a lower output voltage, and it's readout can display both voltage values. We've modified the LM2596 voltage display module from China LC Technologies to be more user friendly. We've added a 2 wire dupont input with reverse polarity protection and black & red output wires with Alligator clips. We want to share these files with you so you can create your own!

Features

2-wire voltage input with Dupont connector
Reverse polarity protection
Alligator clip voltage output
2 digital 7-segment Voltage display
Input/Output voltage display select button
Voltage Input requirement: 4.1-37VDC
Voltage Output: 1.2-37VDC
Current Rating: 3A (max)
Wire Length: 1m
Dimensions: 45.7(W) x 42.2(L) x 14.7(H) (mm) PCB
Weight: 42g

Major Components

LM2596 Voltage Display Module
A14050600UX1279 Red & Black cable with 2-pole female connector
1M Alligator clip + Banana plug test cable
SB540 40V 5A Diode

Manufacturing Notes

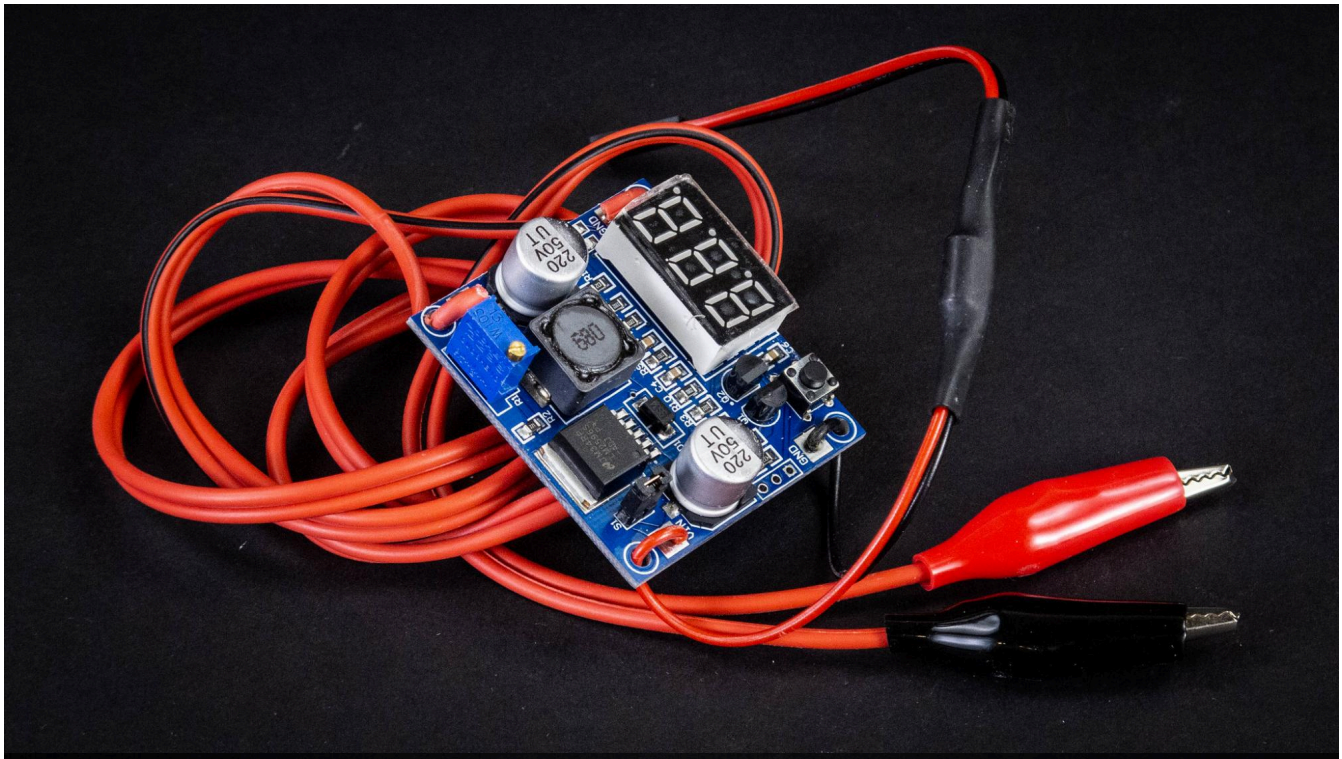
Supplier: Provides LM2596 Voltage Display Module
Manufacturer: Single Side soldering of THT components + Wires + Diode

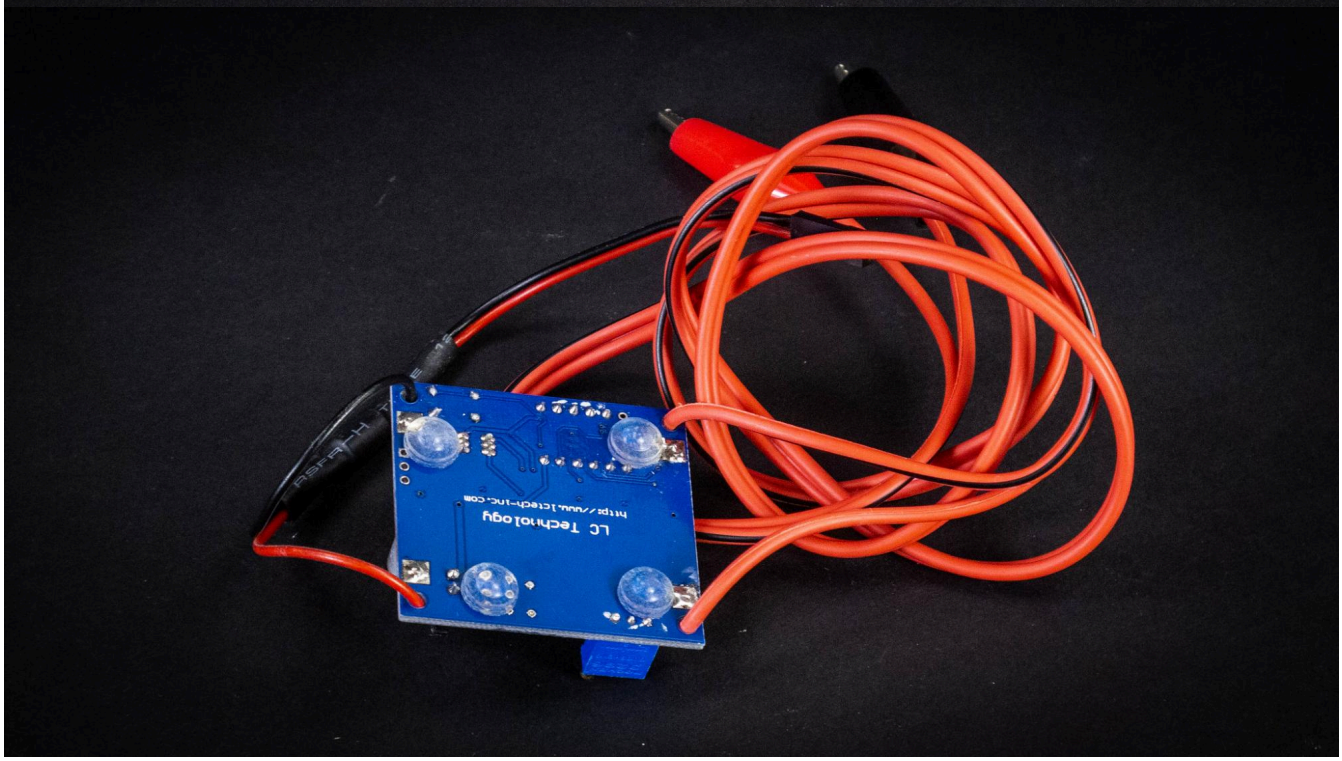
China LC Tech product page:
https://www.chinalctech.com/cpzx/Programmer/Power_Module/167.html

Resources

Documentation:
Assembly Instructions, BOM

Photos





Indoor Positioning System

The Indoor Positioning System (IPS) reference design has two cameras (IR and Visible light) in order to find the location of a robot in a room. One camera has a normal lens with an Infrared blocking filter and the other has an infrared sensitive lens with a daylight blocking filter. A unique feature of this design is that it uses wide angle lenses and can detect the IPS Transmitter across an entire room or warehouse. Due to sunlight having light within the IR spectrum range of the transmitter, this device can only be used indoors.

Features

Combined with the IPS TX, this system can be used for night vision
SWD Programming port
Two types of communication modes: USB or EZ-B camera port
Switch for USB or EZ-B mode
Replaceable Camera modules
Replaceable Wide angle lenses
On-board 3.3V, 2.8V and 1.5V voltage regulation
5V tolerant I/O pins
RGB status indicator
ARC skill available
Voltage requirement: 3.2-16VDC (3.3V (EZ-B) or 5V (USB) Typical)
Current draw: 200mA
Dimensions: 37.7(W) x 51.5(L) x 16(H) (mm)
Weight: 11g

GitHub Repo

Click here to view the github repo of hardware and software

Major Components

STM32F407VET6 32-bit Cortex-M4 ARM microcontroller (custom firmware provided)
2 x HDF3M-811 OV2640 2 Megapixel Camera
TS3DV20812RHHR 1:2 Multiplexer

Manufacturing Notes

Supplier: programs custom firmware into the STM32F407VET6 at their facility before sending to manufacturer
Supplier: provides pre-built HDF3M-811 OV2640 Cameras with custom ribbon length
Supplier: provides HDF3M-811 OV2640 Camera with custom IR filter and Wide angle lens
Supplier: provides HDF3M-811 OV2640 Camera with custom Daylight filter and Wide angle lens
Manufacturer: Dual side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

This project requires the IPS Transmitter:
https://github.com/synthiam/E-44_IPS_Transmitter

Resources

Documentation:

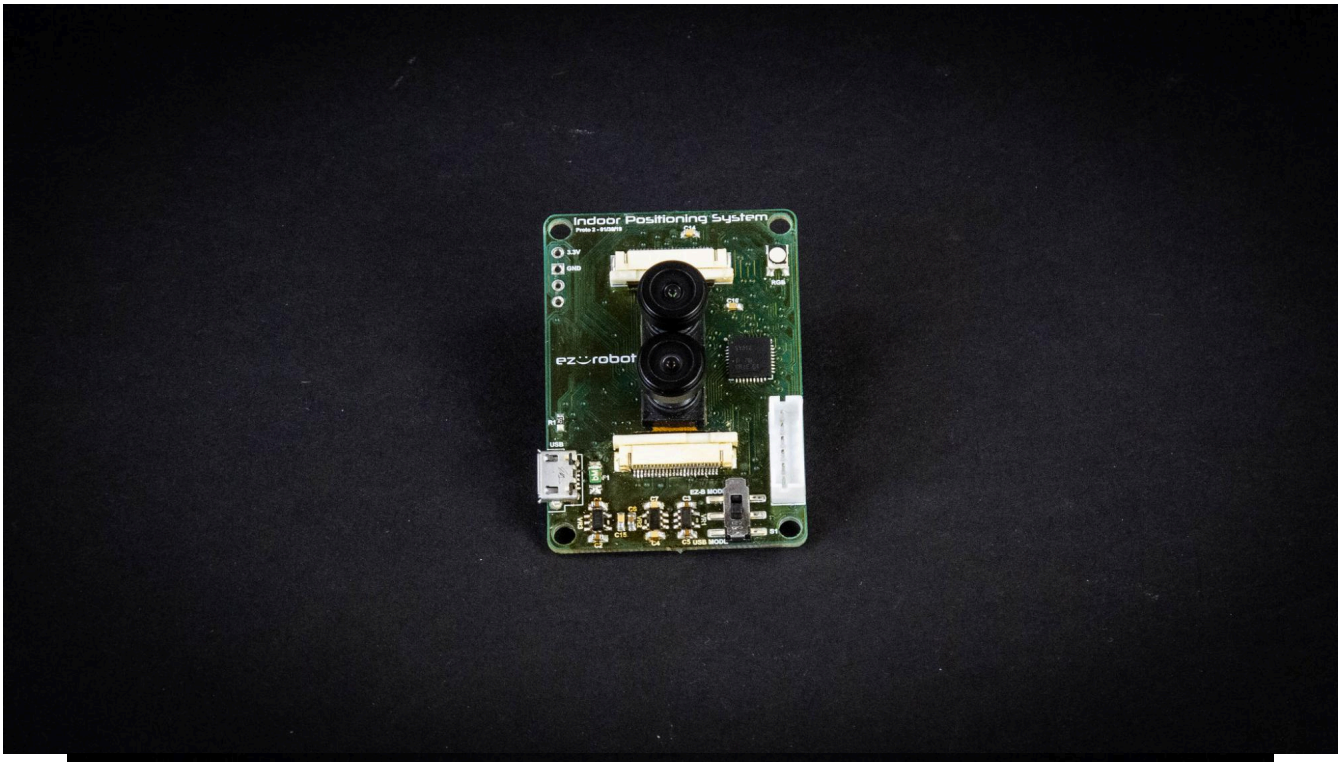
Schematic PDF, Datasheet PDF, BOM, Assembly PDFs

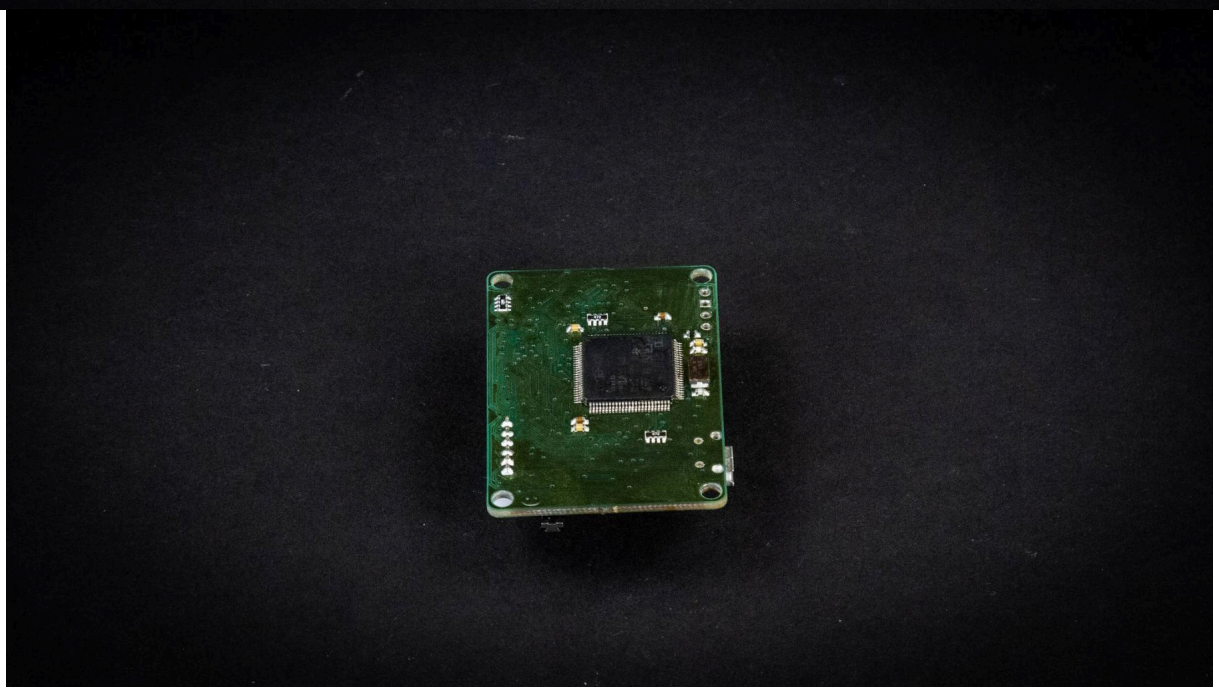
Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

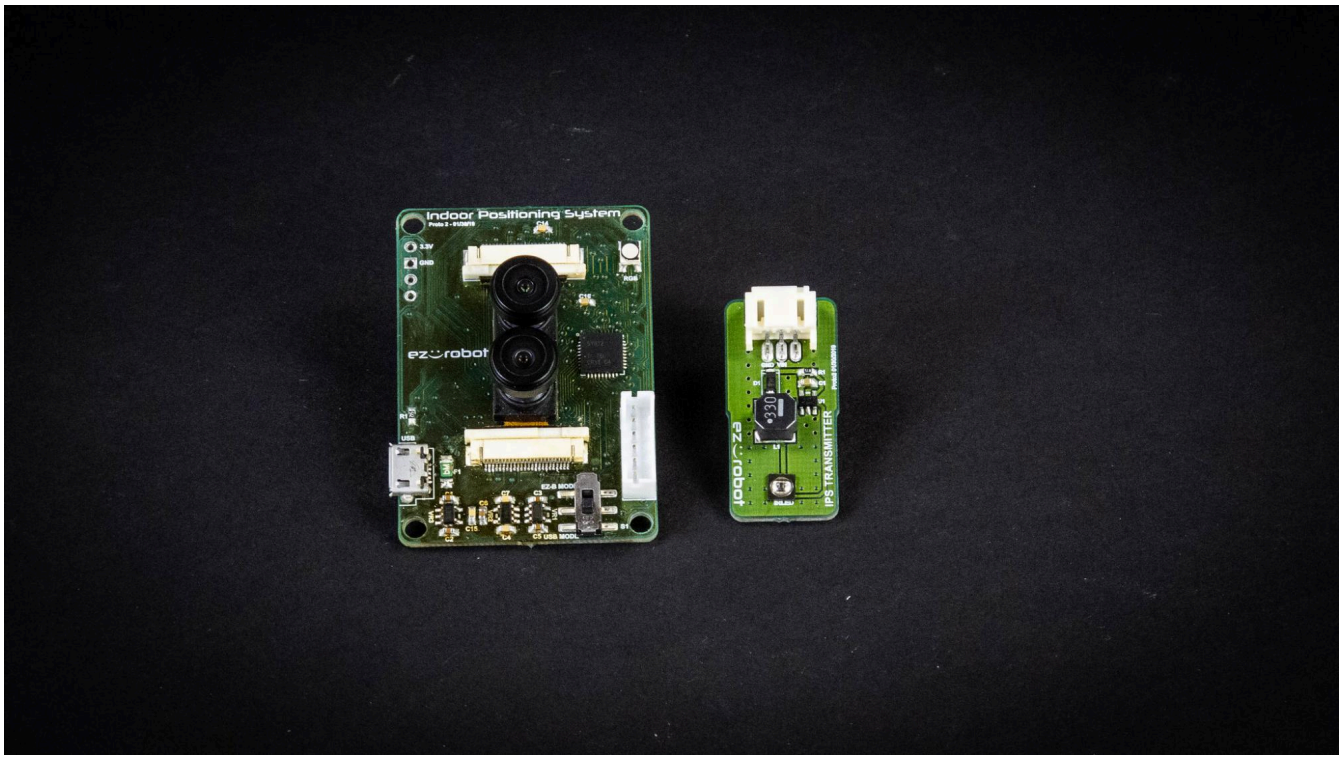
Firmware:
Code, Compiled Binary

Altium Libraries are also available here

Photos







ARC Skill

The ARC skill for this reference design is very easy to use. Simply click on the area you'd like the robot to move to and it moves there!

Link:
https://synthiam.com/Software/Manual/Indoor-Positioning-System-17492

IPS Transmitter

The IPS transmitter shines a 150° invisible infrared light beam that is picked up by the Indoor Positioning System's infrared camera. A unique feature of this IR transmitter is that it has an extremely wide angle of infrared light dispersion that can be picked up even when the IPS is directly perpendicular to the LED. It also has built-in LED driver circuit that consumes less current, and generates less heat than using classic resistor current limiting. We want to share these files with you so you can create your own!

Features

Combined with the IPS, this system can be used for night vision
Switching Power Supply LED driver circuit
150° extremely wide angle infrared Light dispersion
ARC skill available
Wavelength: 850nm
Voltage requirement: 4.5-40VDC (7.4V Typical)

Current draw: 190mA (7.4V), 94mA (16V)
Dimensions: 15.9(W) x 33.4(L) x 7.1(H) (mm)
Weight: 3g

Major Components

AL8861WT-7 LED Driver
LTE-R38386A-ZF-U IR Emitter 850nm 1A 150° Lens

Manufacturing Notes

Manufacturer: Single side placement and soldering of SMT components

This project pairs with the Indoor Positioning System:
https://github.com/synthiam/E-39_Indoor_Positioning_System

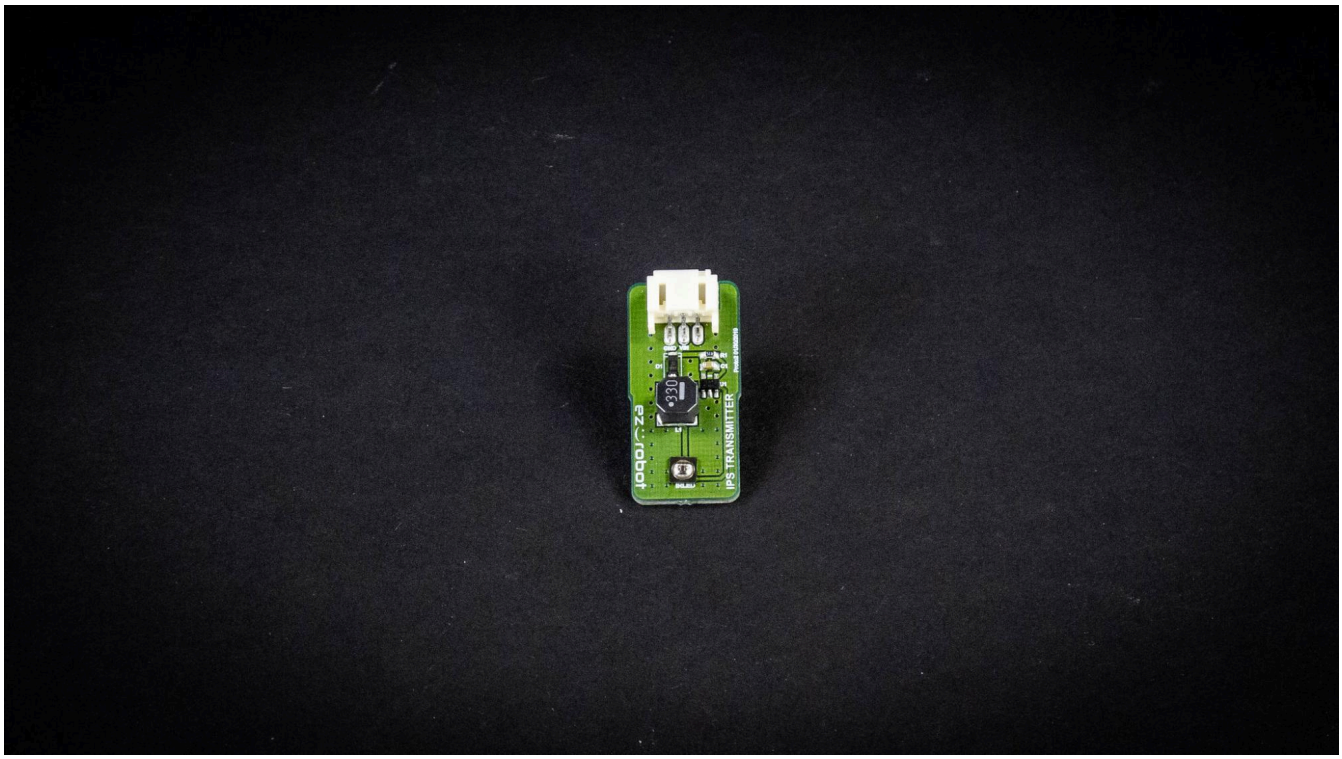
Resources

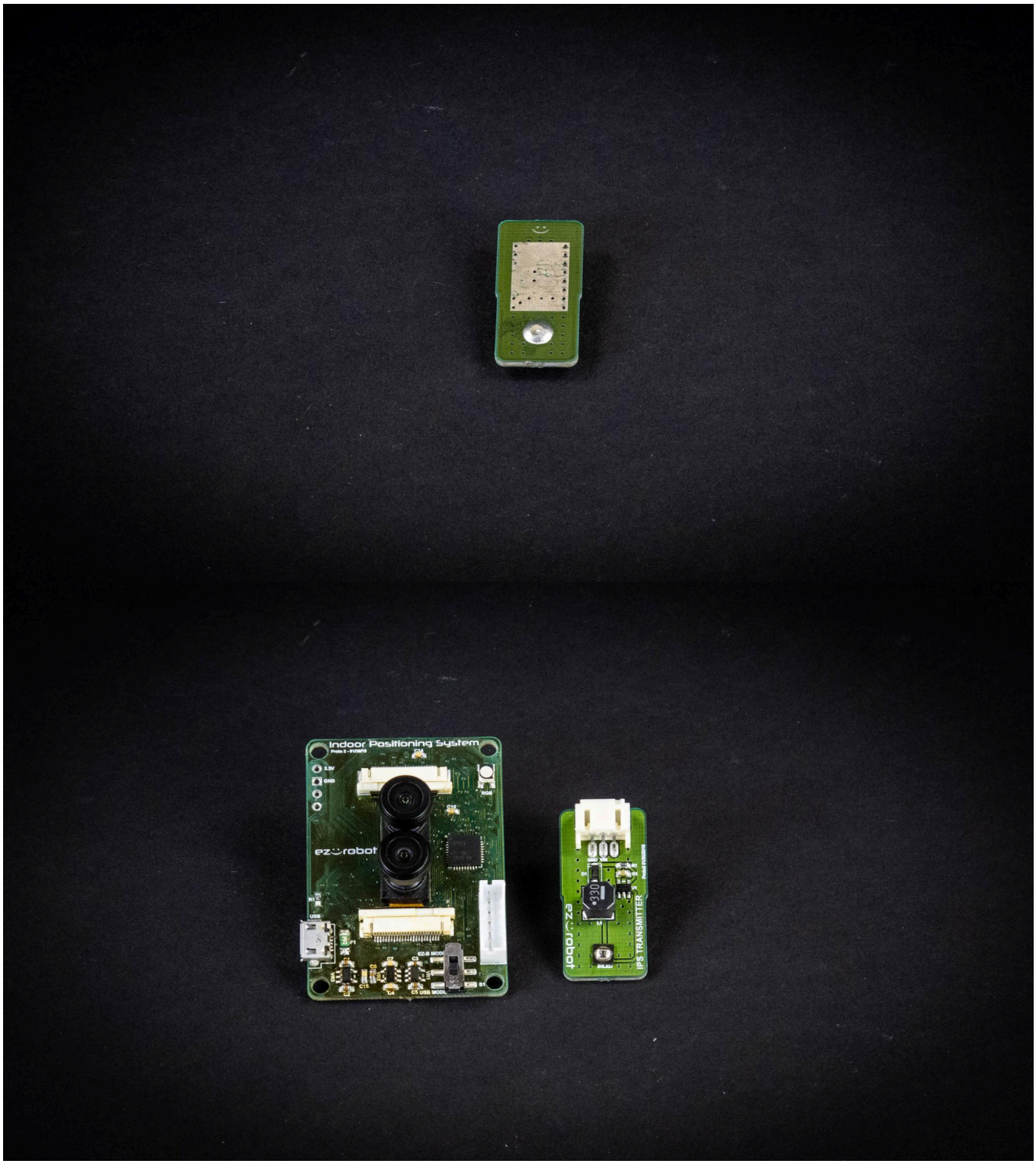
Documentation:
Schematic PDF, Datasheet PDF, BOM, Assembly PDF

Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Altium Libraries are also available here

Photos





ARC Skill

The ARC skill for this reference design is very easy to use. Simply click on the area you'd like the robot to move to and it moves there!

Link: https://synthiam.com/Software/Manual/Indoor-Positioning-System-17492

IMU Sensor

The IMU Sensor reference design is an accelerometer/gyro/temperature combo sensor paired with an STM32 ARM cortex-M0 microcontroller. The microcontroller simplifies the sensor data and makes it compatible with ARC. A unique feature of this design is that it connects directly to a visual interface and automatically outputs pitch and roll angles in ARC. We want to share these files with you so you can create your own!

Features

3-axis Gyroscope/Accelerometer
Temperature sensor
I2C communication
On-board processing
Mini programming header
5V tolerant I/O pins
Blue LED status indicator
ARC skill available
Voltage requirement: 3.2-3.4VDC (3.3V Typical)
Current draw: 10.8mA
Dimensions: 15.8(W) x 38.7(L) x 7.5(H) (mm)
Weight: 3g

Major Components

STM32F030C8T6 32-bit Cortex-M0 ARM microcontroller (custom firmware provided)
LSM6DS3USTR Accelerometer/Gyro Combo

Manufacturing Notes

Supplier: programs custom firmware into the STM32F030C8T6 at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components

Resources

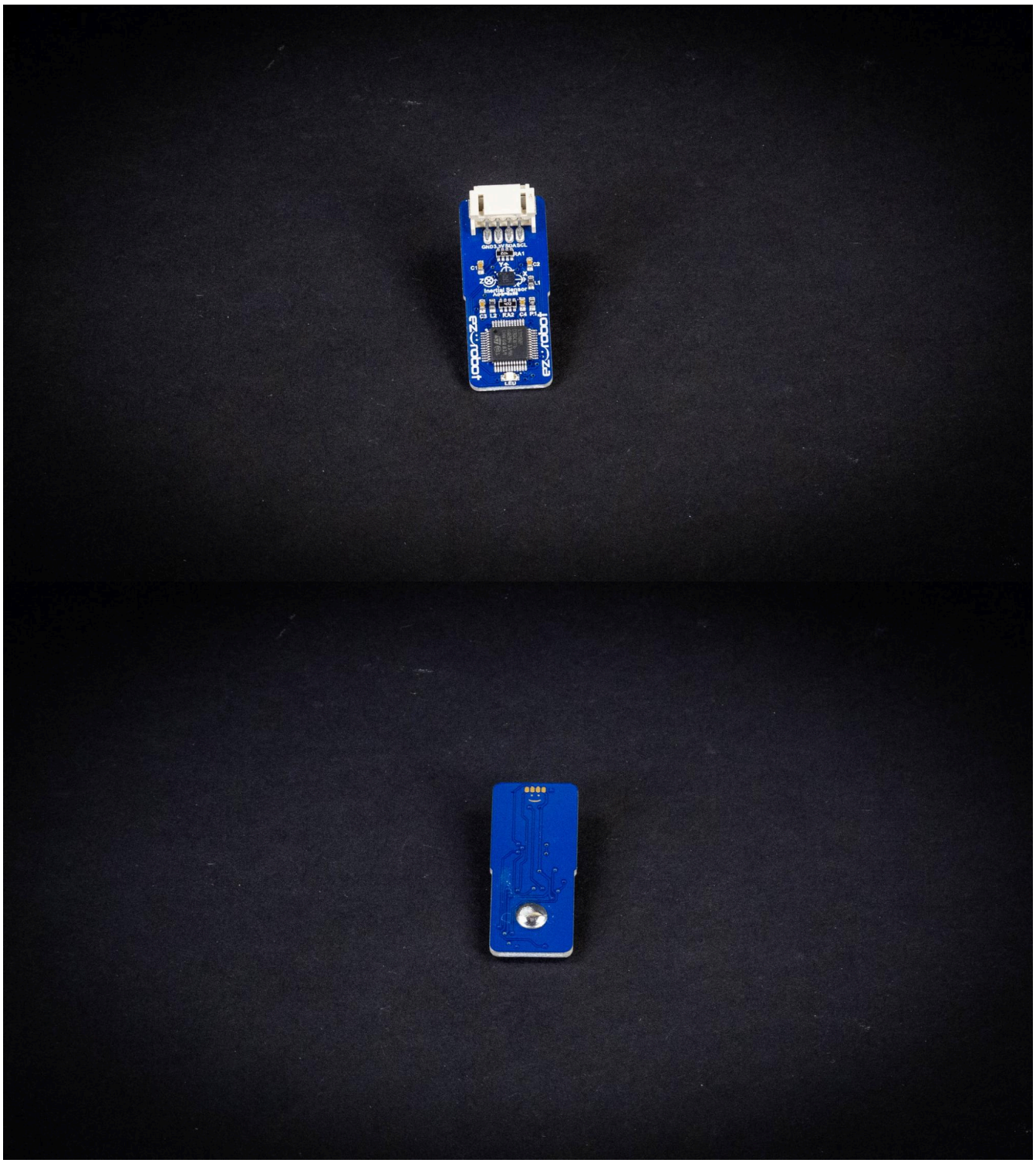
Documentation:
Schematic PDF, Datasheet PDF, BOM, Test Procedures

Hardware:
Altium PCB design File, Altium SCH Design File, Gerbers

Firmware:
Code, Compiled Binary

Altium Libraries are also available here

Photos



Where to Buy

EZ-Robot has their products on their website store for purchase, as well as many other online and offline retail stores. Here's links to the EZ-B v4 products directly at EZ-Robot's store:

IMU Sensor

LIDAR

The LIDAR reference design simplifies the communication from the LIDAR and allows it easily interface to ARC. ARC then gives a visual representation of the data and starts mapping the area. We want to share these files with you so you can create your own!

Features

I2C breakout
EZ-B Camera breakout
LIDAR communication breakout
SWD programming header
5V tolerant I/O pins
Mounting points for LIDAR unit
5V energy efficient switching power supply
ARC skill available
Reverse polarity protection
Bicolor Blue/red indicator LED
Voltage requirement: 5-16VDC (7.4V Typical)
Dimensions: 149.4(W) x 95.3(L) x 39.6(H) (mm)
Weight: 166g

Major Components

STM32F401RBT6 ARM microcontroller (custom firmware provided)
RT8299GSP Switching power supply
HLS-LFCD2 LIDAR unit

Manufacturing Notes

Supplier: programs custom firmware into the STM32F401RBT6 at their facility before sending to manufacturer
Supplier: provides LIDAR unit
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components
Manufacturer: Assembles PCB and LIDAR unit together

Resources

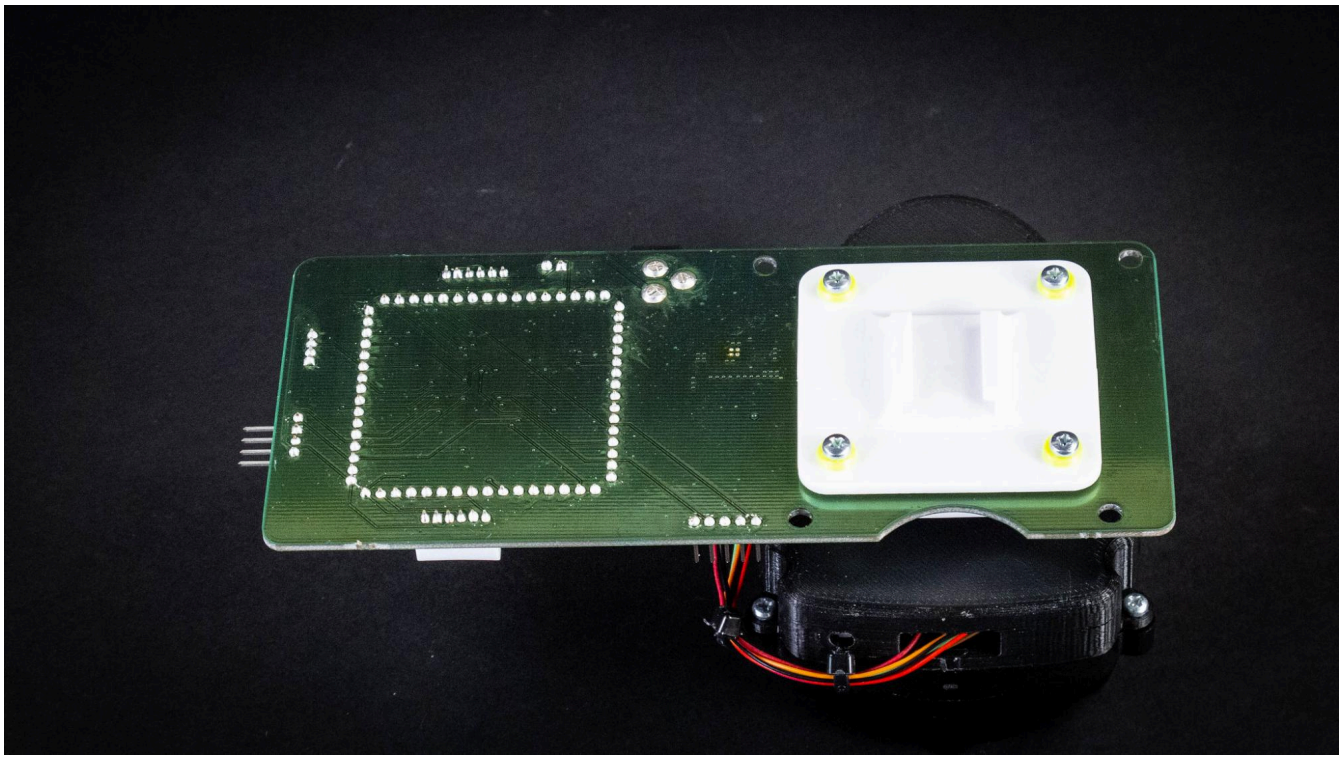
Documentation:
Schematic PDF, Datasheet PDF, BOM

Hardware:
Altium PCB design File, Altium SCH Design File

Altium Libraries are also available here

Photos





ARC Skill

The ARC Skill for this reference design is very easy to use. With a few button clicks you can start mapping your robot's environment!

Link:
https://synthiam.com/Software/Manual/EZ-LIDAR-SLAM-15944

RGB Eyes

Link:
https://youtu.be/wvMHZ1NPT24

This Roll-out Video includes:

1. Feature set
2. Hook-up guide
3. Using ARC Skill
4. Schematic overview
5. Bill of Materials (BOM) overview
6. Custom firmware location
7. Assembly instructions

The RGB Eyes reference design consists of a pair of 3 x 3 RGB LED matrices that can be controlled be easily controlled by ARC to display robot animations and emotions. A unique feature of this display is that it uses an on-board microcontroller to PWM drive all the LEDs which uses a low amount of current. This project requires licensing. Please

Contact Us
for more information.

Features

I2C communication
Adjustable I2C address for chaining multiple displays
Programming header
5V tolerant I/O pins
ARC skill available
Voltage requirement: 3.2-3.4VDC (3.3V Typical)
Current draw: All LEDs off - 6mA, All Blue - 8.4mA, All Green - 8.2mA, All Red - 12mA, All White - 14.6mA
Dimensions: 65.8(W) x 33(L) x 9.4(H) (mm)
Weight: 8g

Major Components

PIC16F1937 8-bit PIC microcontroller (custom firmware provided)
PLCC4RGBCT-CA RGB LED 3528 Common Anode

Manufacturing Notes

Supplier: programs custom firmware into the PIC16F1937 at their facility before sending to manufacturer
Manufacturer: Single side placement and soldering of SMT components
Manufacturer: Single Side soldering of THT components

Photos

ARC Skill

The ARC RGB Animator skill is very easy to use. Create shapes, patterns, emotions, and animations with the simple click of a mouse button or with code!

Link: https://synthiam.com/Software/Manual/RGB-Animator-16079

Roomba Cable

The Roomba cable reference design interfaces the Roomba SCI port to a I/O controller. The

power output from the Roomba's SCI port is limited to 200mA by a PTC fuse internally within the Roomba but is more than enough to power most controllers. A unique feature of this cable is that it has the Roomba SCI wires are broken out to common interface plugs (2.1mm Barrel and Dupont). This gives the Roomba the ability to plug and play right away with I/O controllers with no soldering required. We want to share these files with you so you can create your own!

Features

MD-70 Male 7-pin mini DIN connector to connect to Roomba SCI port
2.1mm Barrel Plug to connect to I/O controller voltage input
3-pin dupont connector to connect to I/O controller UART (TX/RX/GND) port
ARC skill available
Wire length: 15cm
Dimensions (7-pin mini DIN): 13.7(W) x 13.7(L) x 50.5(H) (mm)
Weight: 13g

Major Components

MD-70 Male 7-pin mini DIN connector

Manufacturing Notes

Manufacturer: Soldering of connectors and wires

Resources

Documentation:
Assembly Instructions, Datasheet, BOM

Photos





ARC Skill

The ARC skill for this reference design is very easy to use. Simply click on the control buttons to activate the Roomba!

Link:
https://synthiam.com/Docs/Skills/Movement-Panels/iRobot-Roomba-Movement-Panel?id=19164