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Open

MiCOKit-3166 Development Kit Hardware Manual

Abstract

MiCOKit from MXCHIP is one development kit based on MiCO. It could be used for the development of smart devices and the demos. This development kit provides one easy solution for developing smart devices. And it's convenient in achieving the applications of users.

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Version Record

Date	Version	Update content
6-29-2017	V1.0	Initial version.
7-11-2017	V1.1	Add section 3: description of extension board

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1. Overview

MiCOKit from MXCHIP is one development kit based on MiCO. It could be used for the development of smart devices and the demos. This development kit provides one easy solution for developing smart devices. And it's convenient in achieving the applications of users.

MiCOKit features:

- Based on MiCO, high efficiency, safe and easy to use;
- Sufficient peripherals;
- Various Demos and perfect MiCOKit SDK are available;

The kits include hardware, software and community parts with MiCOKit development board and the demos about how to connect to cloud platform to achieve the controlling by mobile phone.

- FogCloud service is prepared;
- Interaction with phone and PC;
- Interface for main third cloud platform: Aliyun, Microsoft, Amazon, IBM, Wechat, AirKiss, Ayla, FogCloud, GizWits, Haier U+, Arrayent and so on;

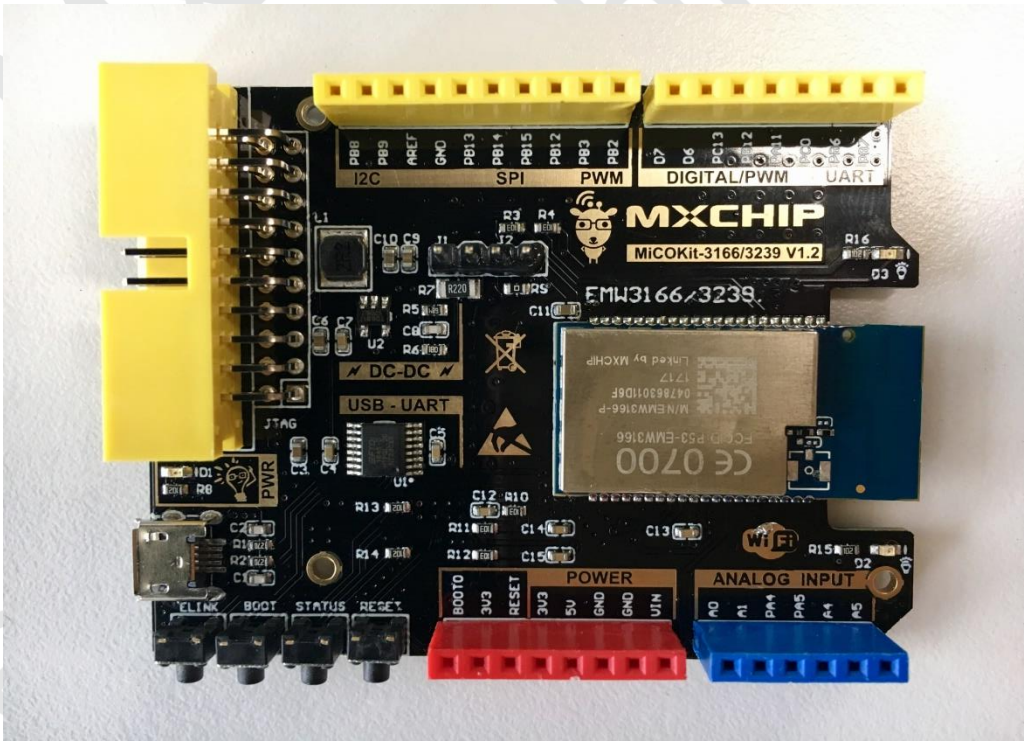

Figure 1 MiCOKit Development Board

1.1 Hardware

Double plate cascade structure is applied in MiCOKit. It includes two parts: one is the standard Arduino board with MCU and wifi core, and the other one is the Arduino extender board. The main board has various types, while the extender board is one standard board which can fit in different main board. The extender board equips with RGB LED, various sensors and some debug .pins which can be used to achieve quick developments.

Part number: MiCOKit-3166 (including both baseboard and extension board)

MiCOKit-base-3166 (baseboard only)

1.2 Software

MiCOKit is based on MiCO. Developers can easily develop their own product by using supplied SDK which takes the features of IoT developing.

One completed cloud platform service is already available. Developers could see the sensor data and control the devices on board by using FogCloud service and APP “MICO enjoy” in order to achieve the interaction between mobile phone and MiCOKit.

1.3 Support for developers

One account of MiCO developers’ community and the privilege for developing support are provided by using MiCOKit. It includes the necessary developing resources, SDK, MiCO community and the information about how to connect to other cloud platforms by using interfaces in software frame provided by MXCHIP.

MiCO developers’ community: www.MiCO.io.

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2. Main board

MiCOKit-3166 applies the Wi-Fi module with Arduino standard, main components:

- EMW3166 from MXCHIP;
- 2Mbyte build-in SPI flash within EMW3166;
- Demos about solution of MiCO-Cloud-APP for secondary development;
- USB to UART serial port for debugging;
- 3 indicator LED of working status;
- Power supply: Micro-USB 5V with one DC-DC onboard 5V-3.3V.
- JTAG/SWD debug connector;
- Pins for Arduino extender board;

The functions of the pins on MiCOKit main board could be distinguished by color. Yellow is for digital signal pins, blue is for analogue signal pins and red is for power supply.

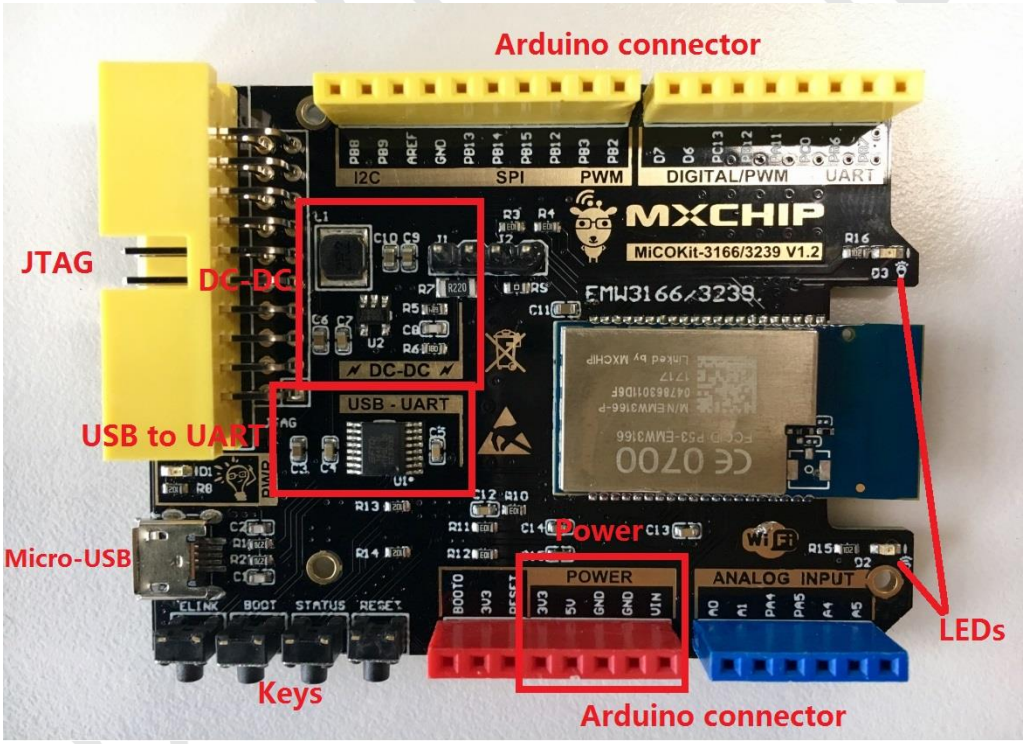

Figure 2 MiCOKit-3166 Main Board

2.1 Power

MiCOKit uses USB as the power supply and serial communication, and one high efficient DC-DC (TD6817). TD6817 is one monolithic synchronous buck regulator with high efficiency (96%) and constant frequency (1.5MHz). The output voltage has three types: changeable, stable 1.5V and 1.8V. The maximum output current is 2A, while the static loss is just 20uA. The output voltage 2.5V-5.5V is suitable for the power supply of single lithium battery. The switch frequency is set as inner 1.5MHz which is convenient for small SMT inductor and capacitor. It has the function of over-temperature protection.

The circuit shows like figure 3. The power light D1 lights when power supply works. R7 and J1 are designed for power consumption testing.

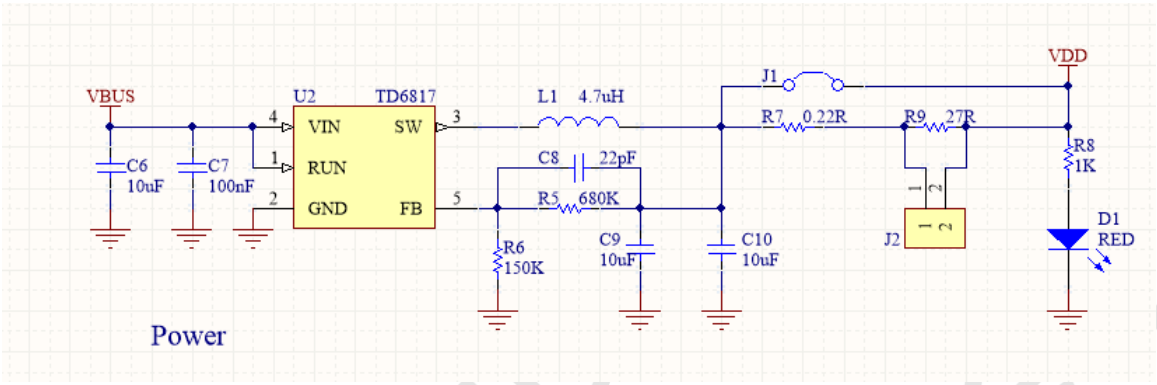

Figure 3 The Circuit of Power Supply

2.2 USB to UART

The part USB to UART with FT230X on MiCOKit board is applied for debugging.

The main function:

- Handshake signal, modem connector signal, hardware and Xon/Xoff data flow control;
- UART: 7/8 Bit data bits, 1/2 stop bits, odd/even parity;
- Rate: 300=>3M(TTL), 512Byte buffer;
- I/O voltage: 3.3V-5V;
- Compatible with USB 2.0;
- Driver: Windows 8 32/64-bit, Windows 7 32/64-bit, Windows Vista/Vista 64-bit, Windows XP/XP 64-bit, Server 2003, XP and Server 2008, Windows XP Embedded, Windows CE 4.2, 5.0 and 6.0, Mac OS-X, Linux 3.2 and greater, Android and so on.
- Packaged as SSOP16 and QFN16 with lead free.

The circuit for this part:

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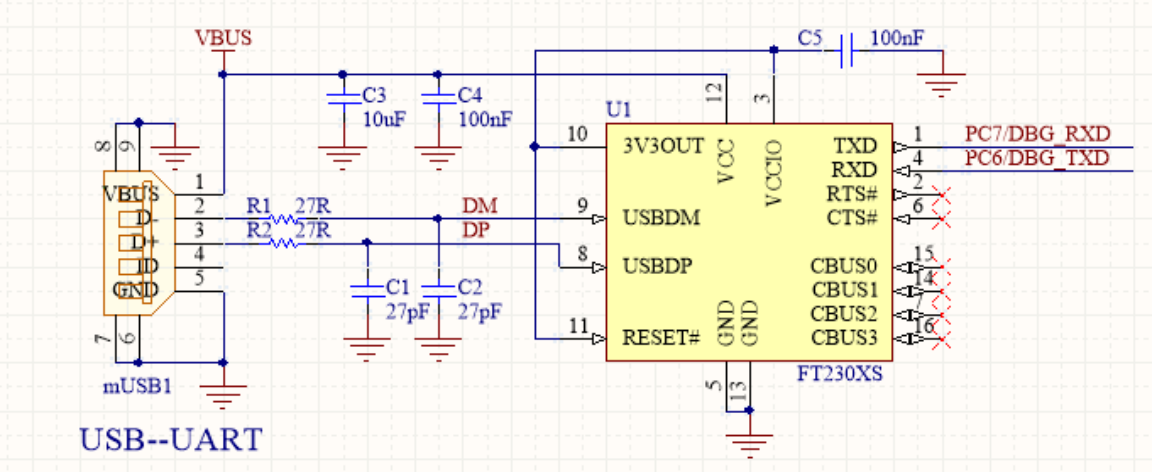


Figure 4 USB to UART Circuit

Connecting the USB to PC, it shows a new serial port after installing the driver:

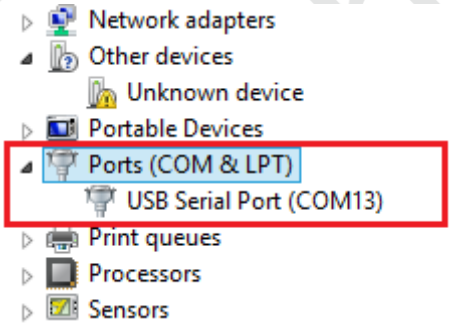


Figure 5 Serial Installing

2.3 Wi-Fi module

This MiCOKit uses EMW3166 as the wifi module. Please refer more information on www.mxchip.com.

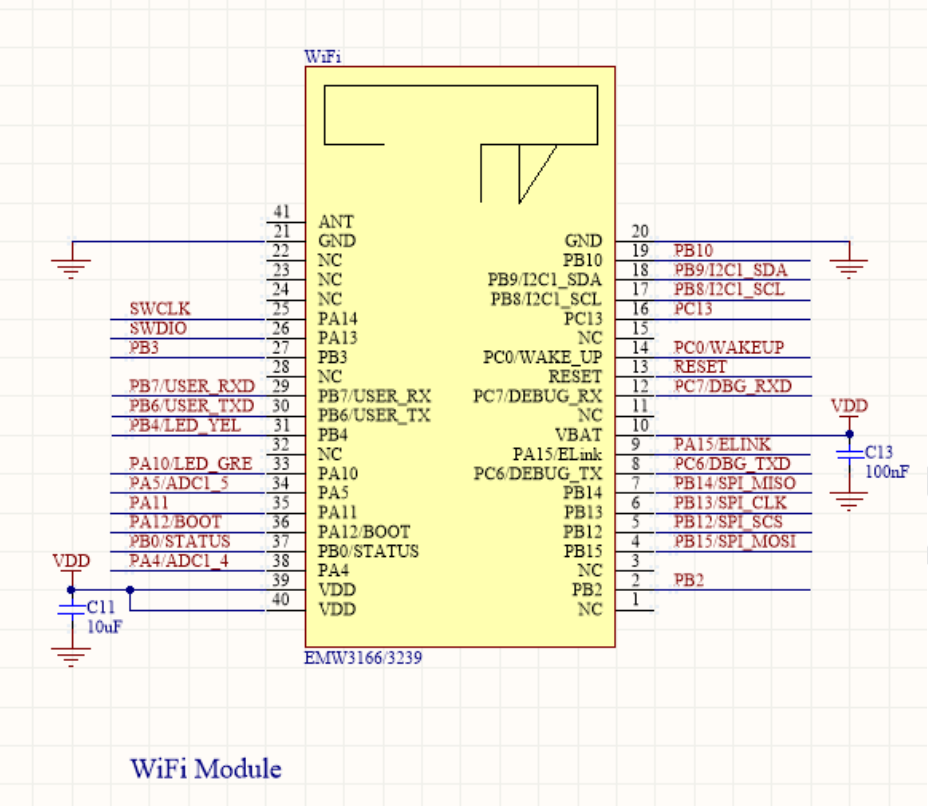


Figure 6 EMW3166

2.4 LED lights

In order to let users know about the working status, there are 3 LED lights D1, D2 and D3 on board.

- D1 is power indicator LED.
- D2 is system status indicator LED.
- D3 is RF status indicator LED.

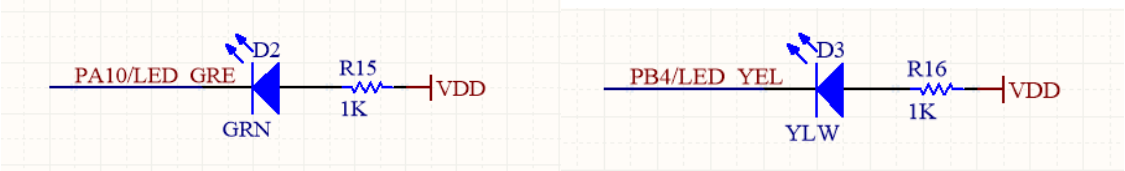


Figure 7 LED Circuit

2.5 Working mode

It designs 3 working mode switches on board for debugging.

Table 1 Working Mode

Boot	STATUS	ELINK	Working Mode
H	/	/	NORMAL WORK
L	H	L	ATE
L	L	H	QC
L	H	H	BOOTLOADER

2.6 Buttons

There are 4 buttons on board:

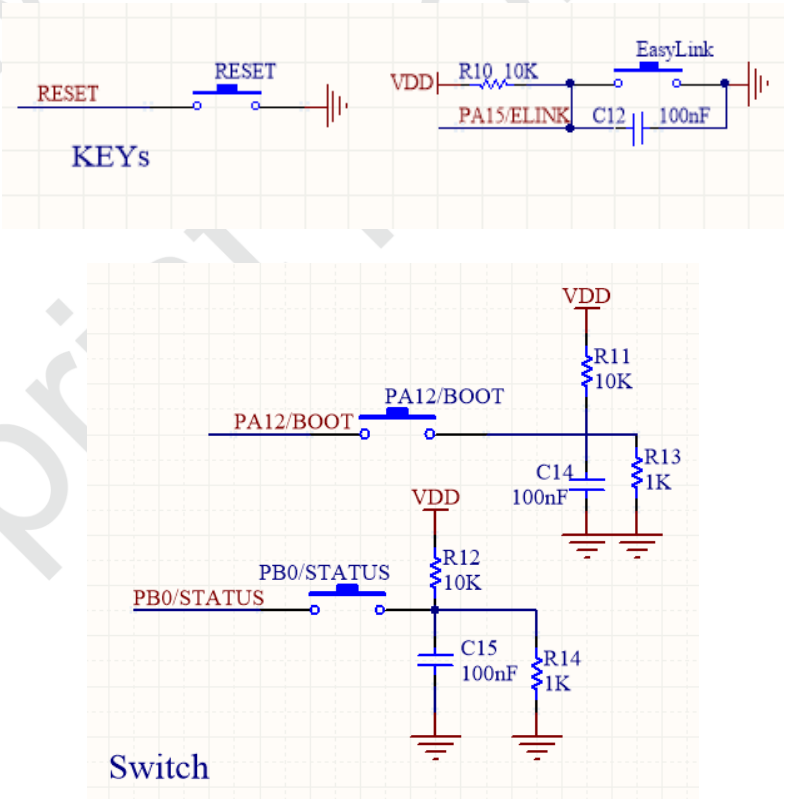


Figure 8 Buttons

2.7 JTAG debug connector

MiCOKit uses standard JTAG debug connector for connecting with J-LINK or U-LINK2.

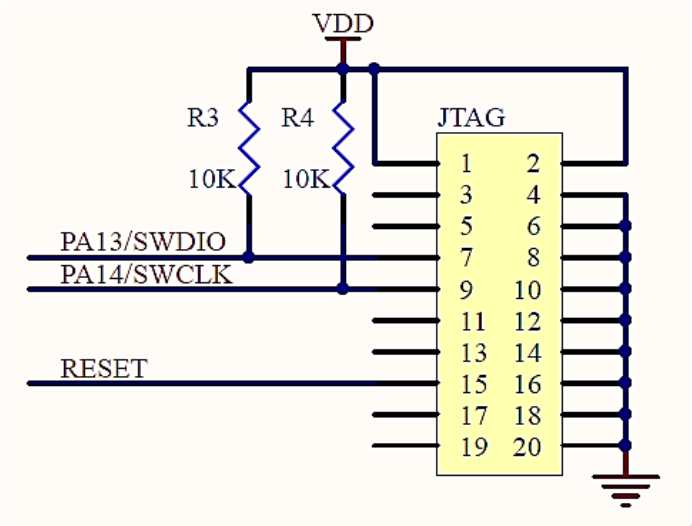


Figure 9 JTAG Connector

Notes:

Limited by the IO of EMW3166, the JTAG interface only supports for SWD debugging mode.

2.8 Arduino connector

MiCOKit uses standard Arduino connector for connecting with extender Arduino board.

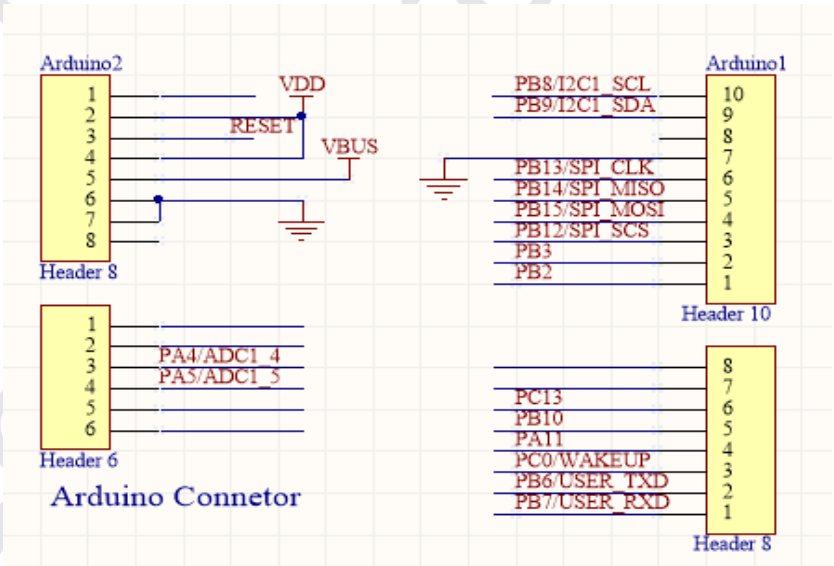
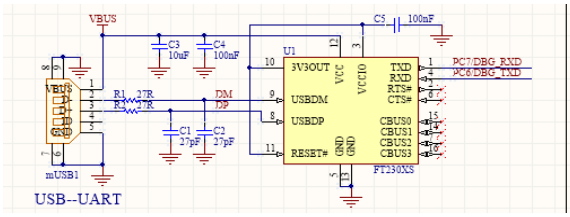
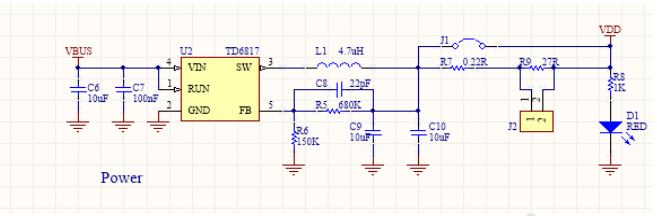
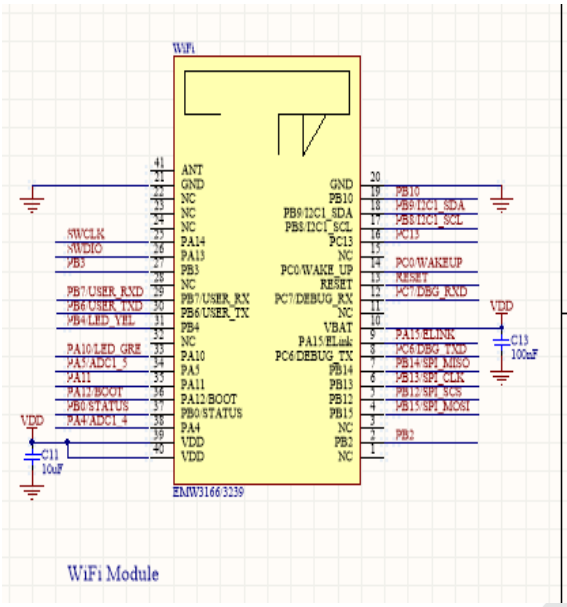


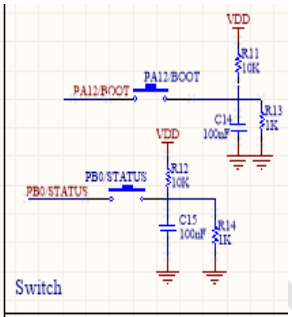
Figure 10 Arduino Connector

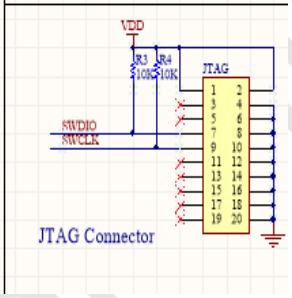
2.9 Schematics

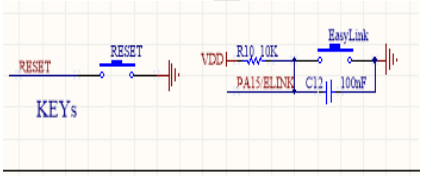


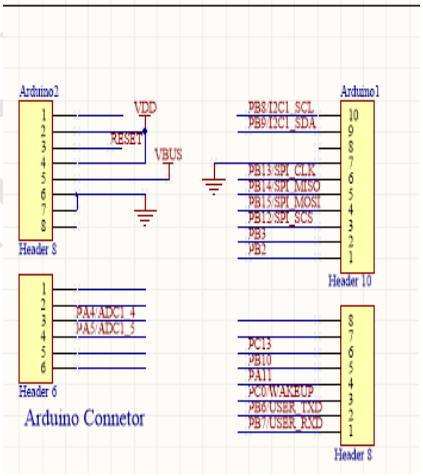












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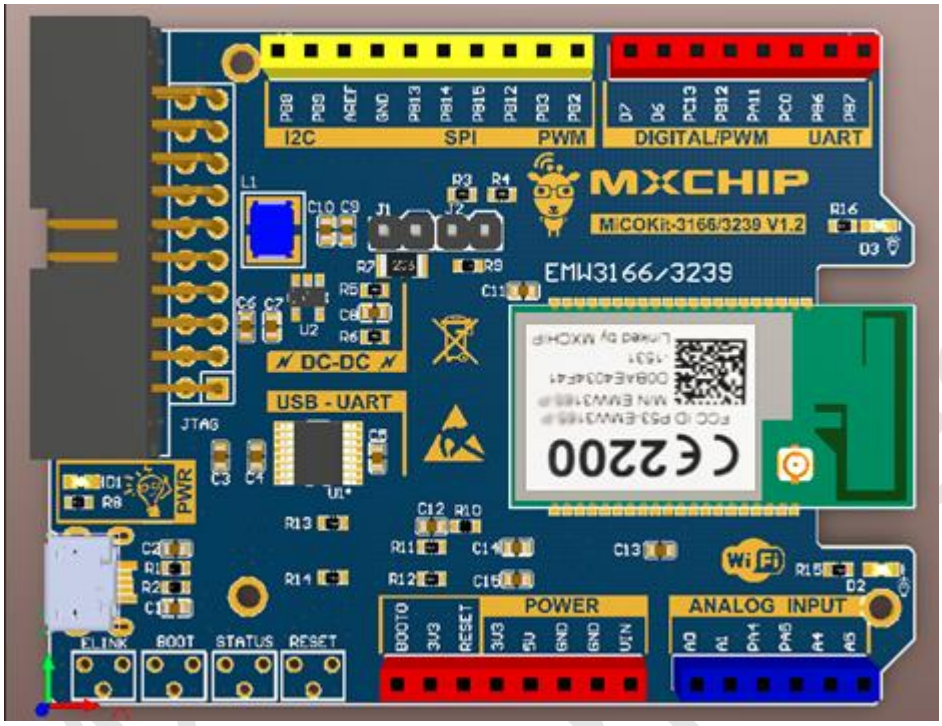
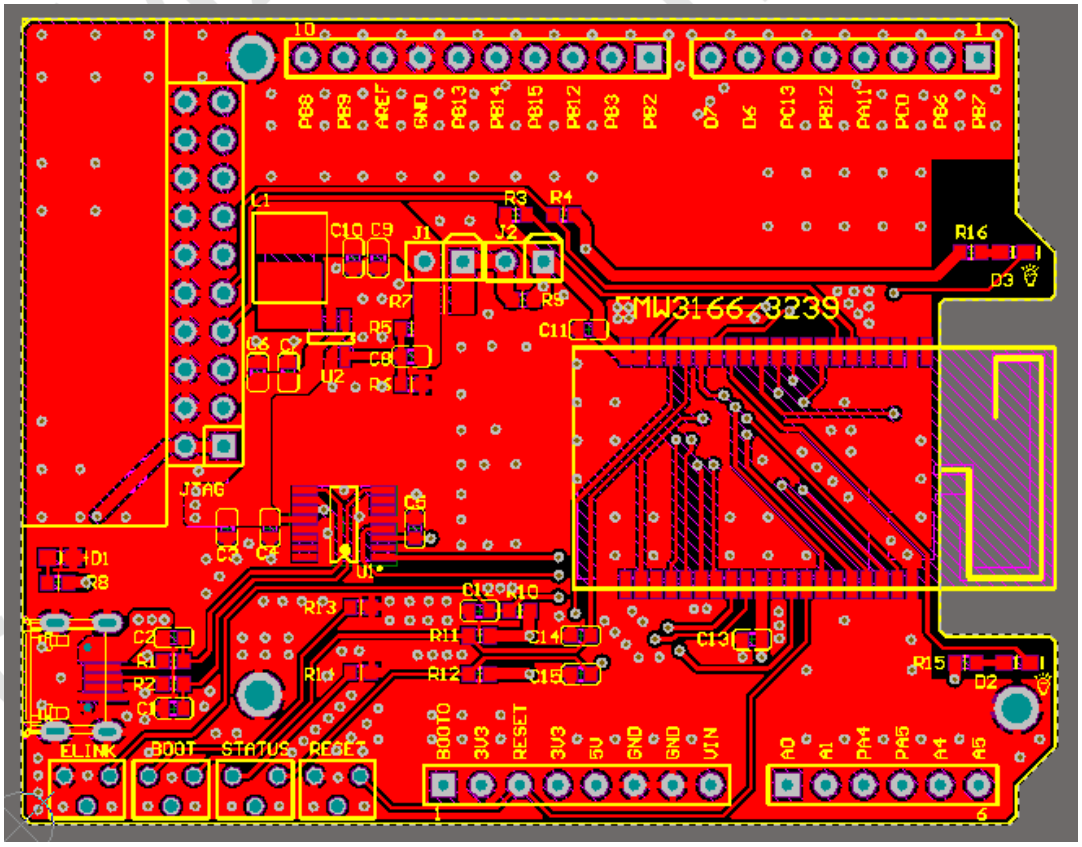
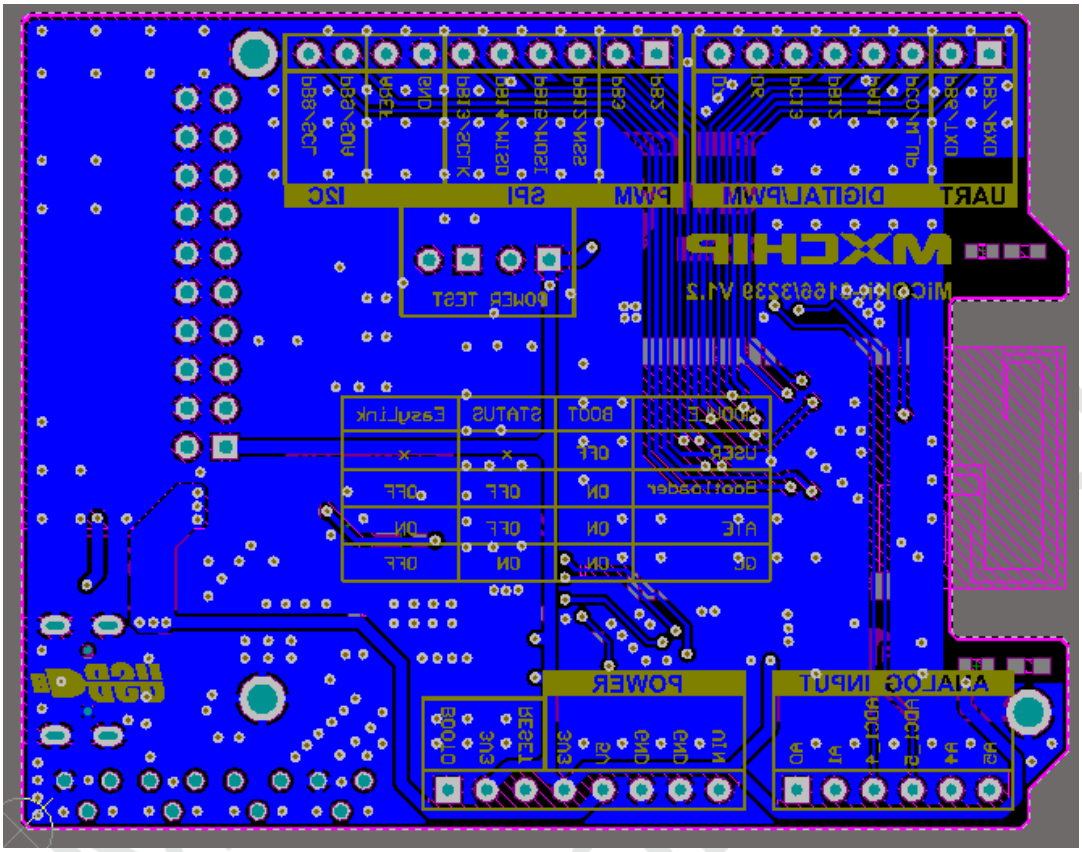
2.10 PCB


I2C
SPI
PWM
DIGITAL/PWM
UART
MXCHIP
MiCOKit-3166/3239 V1.2
EMW3166/3239
DC-DC
USB - UART
JTAG
PWR
POWER
ANALOG INPUT
ELINK
BOOT
STATUS
RESET


EMW3166/3239
JTAG
ELINK
BOOT
STATUS
RESET



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3. Extension board

MiCOKit designs the extender board with standard Arduino connector including various sensors for users to learn about how to use MICO to develop their own applications.

The devices on MiCOKit extender board can be used to simulate the applications in life for sake of the development about these applications.

The peripherals:

- 128x64 OLED double color screen;
- Temperature/humidity sensor, light intensity sensor, range sensor and infrared sensor;
- 8mm RGB LED;
- Speed motor;
- 2 buttons;
- Environment sensor, nine axis motion sensor (optional);
- CP core for APPLE (optional);
- Standard Arduino connector;
- Extender connector for Arduino sensor;
- UART debug connector;

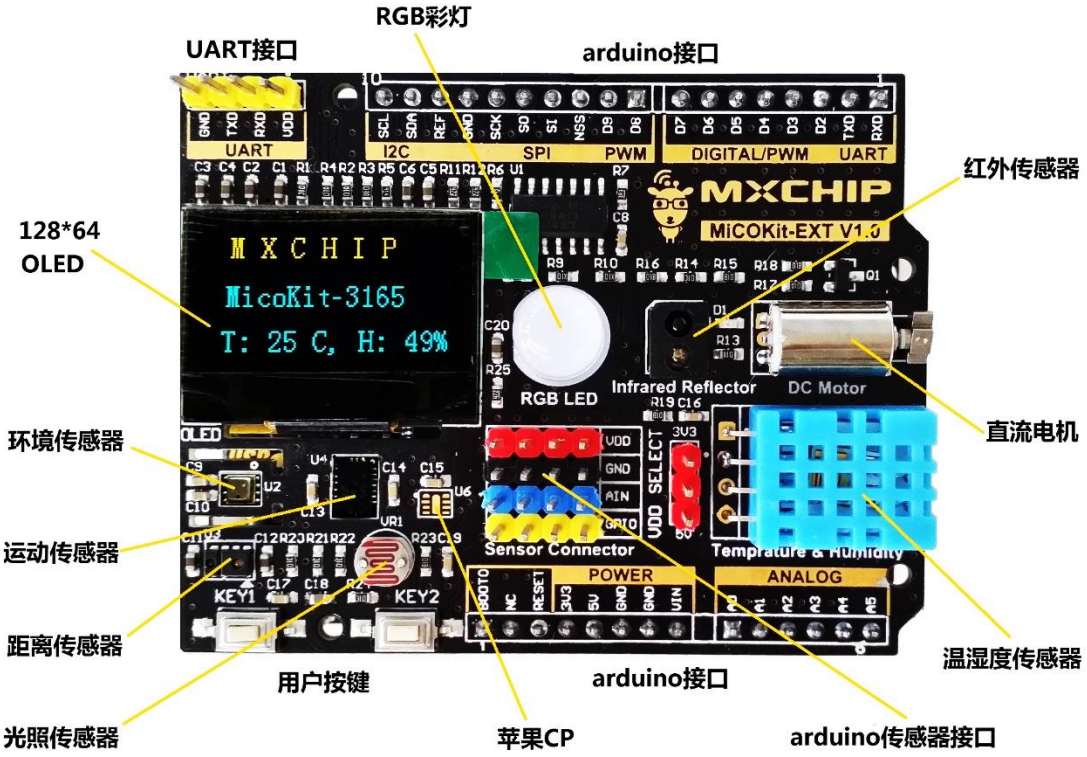

Figure 11 MiCOKit Extender Board

3.1 OLED screen

MiCOKit uses one OLED screen with 32mm square, 128x64 dot-matrix, yellow& blue OLED screen.

The features:

- High resolution: 128x64;
- Wide-angle: >160 °;
- Low power: 0.06W on normal;
- Power range: 3V-5V;
- Working temperature: -30℃~70℃;
- Several communication mode: 8-bit parallel port, 4 line SPI, IIC;
- CS signal carried;
- Compatible with both 3.3V and 5V;
- Light level and contrast ratio are controllable by software;
- Working life is more than 16000 hours;
- OLED screen is cored with SSD1306;

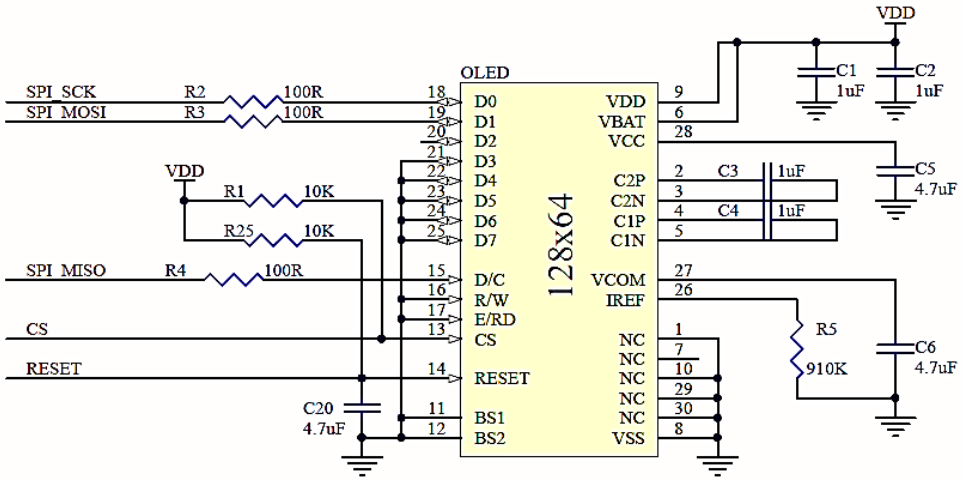

Figure 12 OLED Screen Circuit

3.2 RGB LED

MiCOKit designs one RGB LED of 8mm diameter on extender board. It is driven by P9813 and can be controlled by APP of MXCHIP;

The features:

- IC input voltage: 5V~6.5V, LDO built-in, output voltage: 4.5V;
- Input signal verified;
- 1.2MHz ring oscillator built-in to keep stable FREE-RUN output;
- The maximum serial clock frequency 15MHz;
- With PLL regeneration;
- The tolerance voltage is 17V;

Circuit of this part:

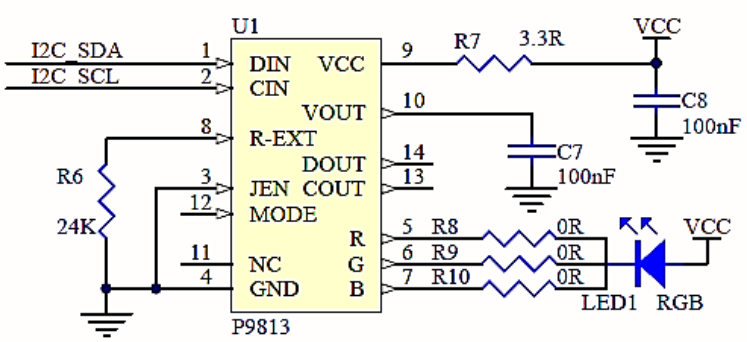

Figure 13 RGB Driver Circuit

P9813 driver timer:

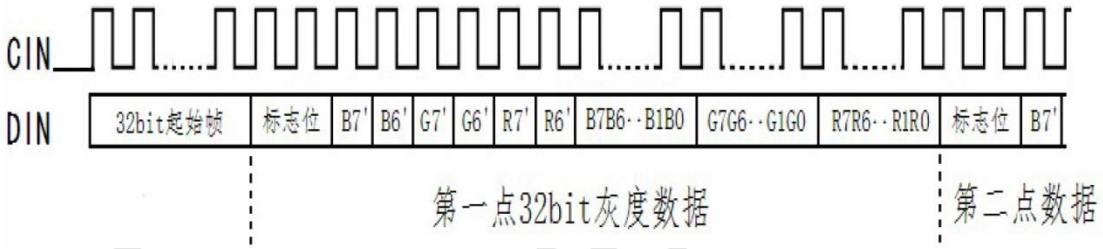

Figure 14 P9813 Driver Timer

3.3 Environment sensor (optional)

MiCOKit designs one environment sensor BME280 which is optional on extender board. It includes digital temperature, humidity and air pressure sensors.

BME280 has standard I2C connector.

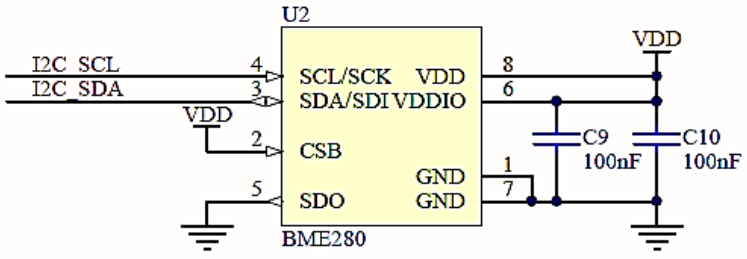

Figure 15 Environment Sensor Circuit

3.4 Nine axis motion sensor (optional)

MiCOKit designs one nine axis motion sensor BMX055 which is optional on extender board. It includes one 12-bit three-axis accelerometer sensor, one 16-bit gyroscope and one fully functional three-axis magnetic sensor.

BMX055 has normal I2C connector.

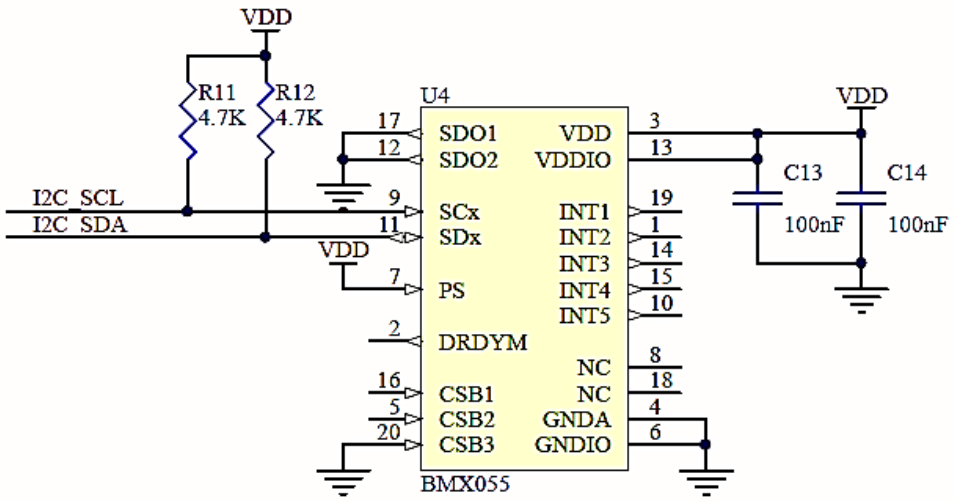

Figure 16 Nine-axis Motion Sensor Circuit

MiCOKit designs the CP which is optional on board for Home Kit development with the APPLE authentication peripherals.

CP uses standard I2C connector:

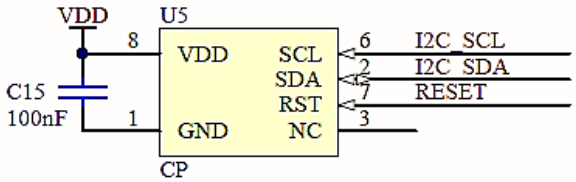

Figure 17 APPLE CP Circuit

3.5 Range& solar sensor

MiCOKit designs one range& solar sensor APDS-9930 on board. This sensor includes one Ambient Light Sensor (ALS) and one infrared LED sensor for range. Adding the micro-optics on chip could reduce the power consumption. Additionally, the inner state machine could make device into low power mode.

The features:

- Including ALS, infrared LED and range detector;
- ALS:
  - Visual sense like human's eyes;

- Programmable interrupt function with upper and lower limited threshold value;
- Resolution ratio: 16-bit;
- High sensitivity under working on dark glass
- Low lumen at 0.01 lux;

- Range detection:
  - Accurate to 100mm detection;
  - Including infrared LED and synchronization LED drivers;
  - Free of factory calibration of range sensor;
- Programmable timer:
  - Power in waiting mode: typical -90uA;
  - Programmable range: 2.7ms~>8ms;
- I2C connector:
  - Up to 400kHz;
  - Specific interrupt pins;
- Power in sleep mode: typical -2.2uA;
- Small package 3.94x2.36x1.35mm.

APDS-9930 has standard I2C connector:

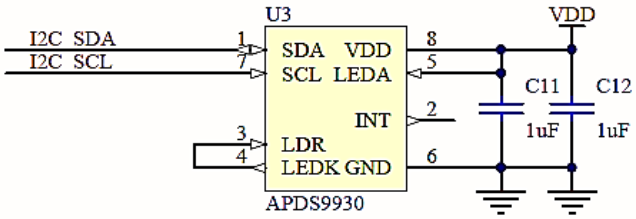

Figure 18 Range& Solar Sensor Circuit

3.6 Temperature& humidity sensor

MiCOKit designs one normal temperature& humidity sensor DHT11 on extender board. DHT11 uses single line serial to transmit data.

Temperature& humidity sensor circuit:

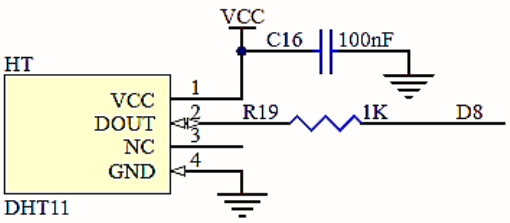

Figure 19 Temperature& Humidity Sensor Circuit

DHT11 timing:

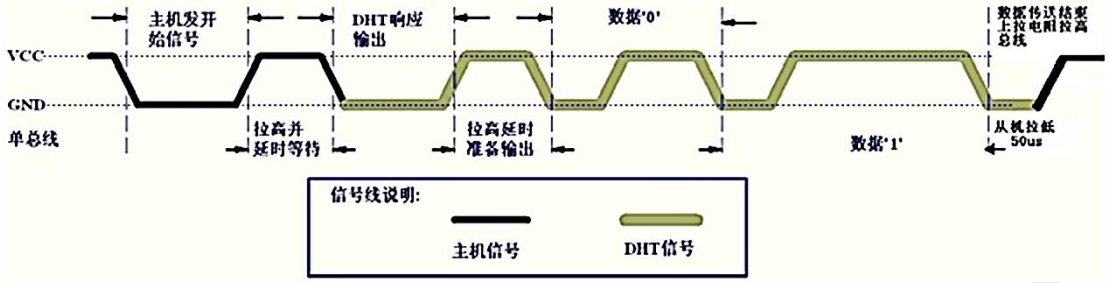

Figure 20 DHT11 Timing

3.7 Infrared reflection switch

MiCOKit designs one infrared reflection switch which is RPR220 photomultiplier tube. RPR220 is one integrative photoelectricity detector of reflection type.

The features:

- Enhance sensitivity by plastic lens;
- Small and compact;
- Simple circuit and working stably;

It is used to find the reflection range by detecting the voltage. At the same time, one LED could be used to watch the range by the change of light level.

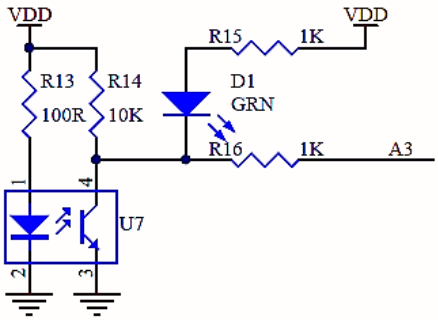

Figure 21 Infrared Reflection Sensor Circuit

3.8 Solar sensor

MiCOKit designs one special solar sensor on extender board. It uses photo resistance. The change of photo resistance could be transformed as the change of voltage. Detecting the voltage change of ADC input could be used to watch the change of light level.

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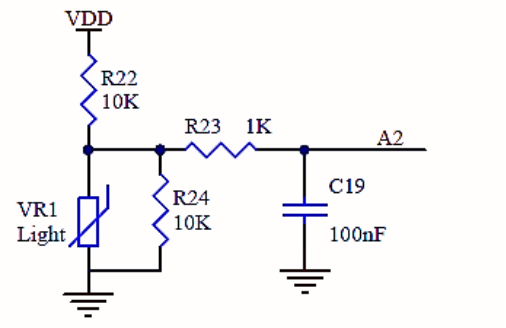

Figure 22 Solar Sensor Circuit

3.9 Mini-type DC motor

MiCOKit designs one coreless DC motor on extender board to simulate field controlling. Its type is LX0610C which is one DC, permanent magnet and servo motor.

The DC motor uses NPN transistor as the driver and PWM to achieve speed control.

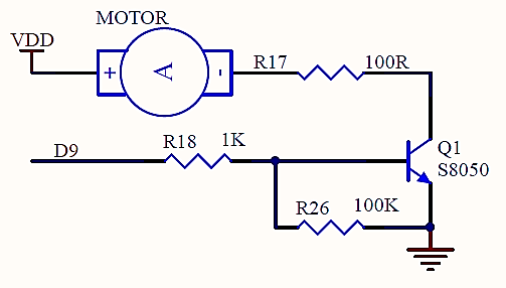

Figure 23 DC Motor Circuit

3.10 Standard Arduino connector

MiCOKit designs standard Arduino connector on extender board. It is compatible with not only the main board but also some other Arduino main boards. It uses color to distinguish the functions. Yellow is for digital signal connector, blue is for analog signal and red is for power connector.

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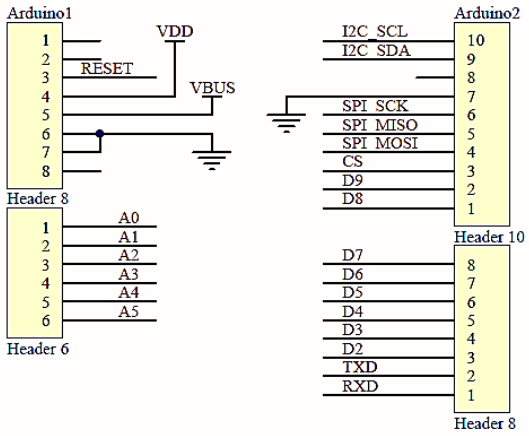

Figure 24 Extender Board Arduino Circuit

3.11 Arduino sensor connector

MiCOKit remains Arduino sensor connector on extender board for various external analog, digital sensors. And the connectors are compatible with both 3.3V and 5V power supply.

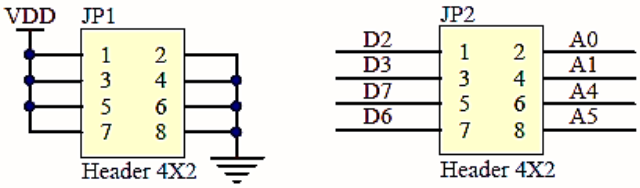

Figure 25 Arduino Sensor Connector Circuit

3.12 UART connector

MiCOKit remains one UART connector on extender board for users debugging.

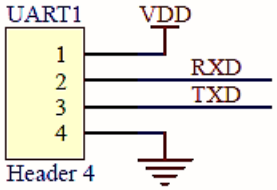

Figure 26 UART Connector Circuit

Mxchip reprint prohibited

3.13 Schematic of extension board

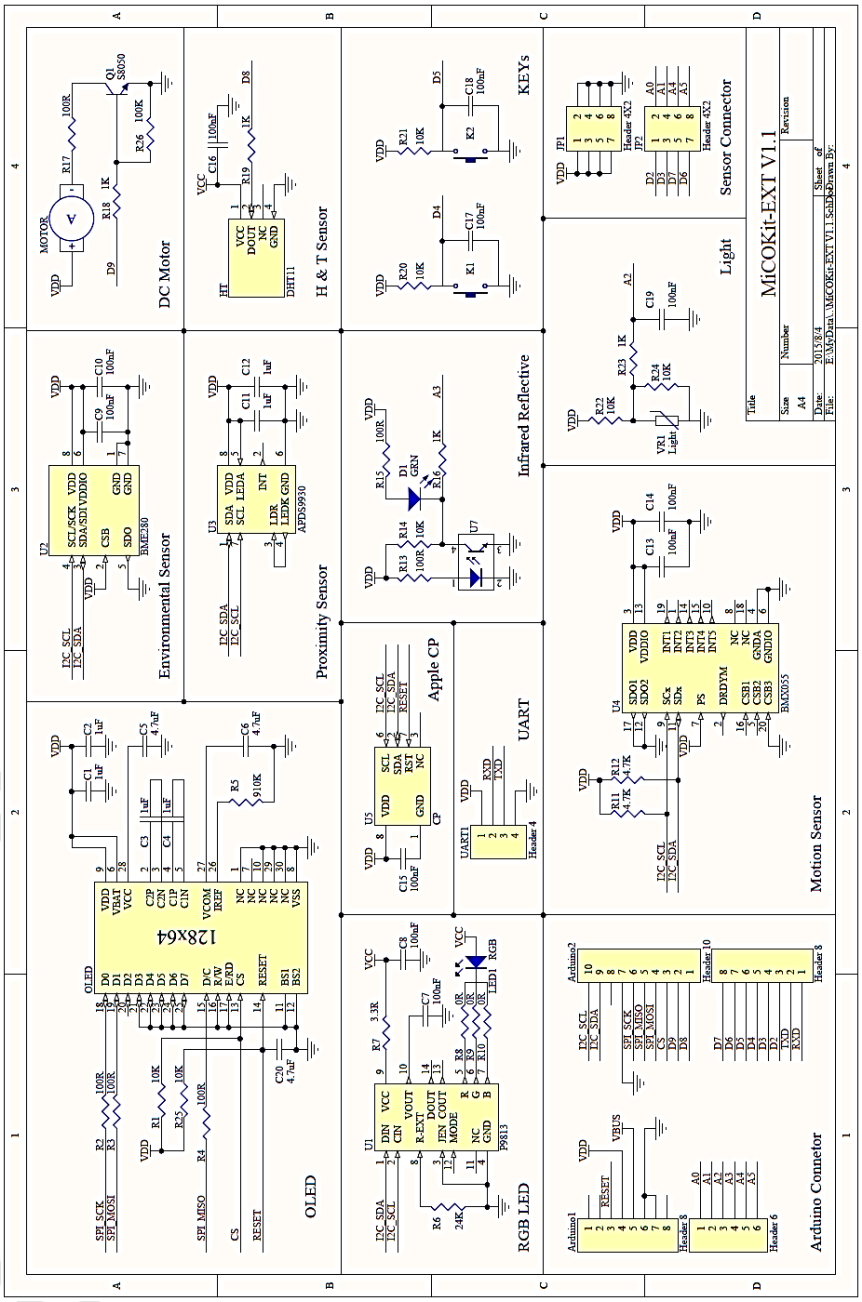

Figure 27 Schematic of extension board