ARM® Cortex®-M

32-bit Microcontroller

NuMicro® Family
NuMaker Brick
User Manual

For additional information or questions, please contact: Nuvoton Technology Corporation.

www.nuvoton.com

Catalog

Figure Catalog

Table catalog

1 OVERVIEW

The NuMaker Brick is an open source IoT platform including a combination of sensors and module which can work independently or be arranged in any order. Monitoring and the adjustment of parameter settings can be done via the NuBrick App on Android based mobile devices or tablet computers. The NuMaker Brick's main control board is equipped with Bluetooth function, which controls and coordinates data transfer. By setting the parameters of various modules via the NuMaker Brick app, the basic applications of an IoT system can be quickly structured. Onboard modules include the temperature and humidity sensor, gas detection module, infrared module, gyroscopes, accelerator, sonar, LED and buzzer.

Full open source development strategies were employed for all firmware, hardware, and application software needed by the NuMaker Brick open platform. This has resulted in an extremely developer-friendly end product that includes a main controller terminal and several sub-modules. The main controller terminal and sensor modules utilizes the NuMicro® M451 series MCU. The NuMaker Brick platform modules are also equipped with powerful computational capabilities to be able to rapidly process data while reducing data transfer time for IoT applications. Every module in the NuMaker Brick platform is capable of simultaneous data processing, providing the advantages of distributed computing. The platform is also capable of timely and quick responses to data collected from the sensors.

In addition to powerful computing capabilities, the NuMaker Brick platform is also designed to provide great flexibility. Each module is already designed to include a specific function. Users can start using the NuMaker Brick platform without the need to rewrite any program. Mobile phones and Tablets can be linked to the platform via Apps to set platform functions. Module connections can also be built or modified like stacking bricks according to the users' preferences. In addition to existing modules, the development module of the NuMaker Brick platform also includes an extension board where developers can create their own modules. Users only need to make sure that the features of the newly added modules are compliant with the NuMaker Brick protocols to start using them, build communication links with existing modules, and achieve plug-and-play functions.

1.1 Features

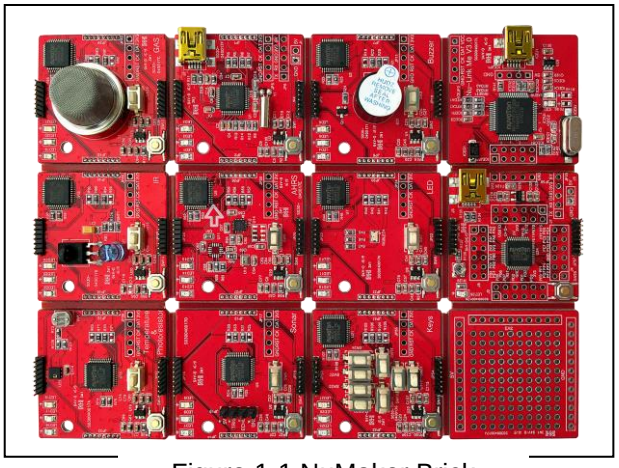


Figure 1-1 NuMaker Brick

- High performance distributed computing
- Highly extensible open source IoT platform
- Adjustment of parameter settings can be done via the NuBrick App on Android based mobile devices or tablet computers
- Each module is already designed to include a specific function and support to stack modules in any order with maximum flexibility
- All modules can be independently utilized
- Wireless Bluetooth communication
- Diverse selection of sensors to satisfy various developer requirements
- Include extension modules, allowing convenient addition of new user-defined functions
- On-board development tool: The Nu-Link-Me ICE adapter

2 NUMAKER BRICK HARDWARE INTRODUCTION

NuMaker Brick development platform equipped NuMicro® M451 series with ARM® Cortex®-M4 core and runs up to 72 MHz frequency. Master controller communicates to phone or tablet with Bluetooth chip, and sub-modules are divided to input class and output class. The input class has six modules: vibration, temperature and humidity, gas, sonar, infrared transmitter and receiver, key modules. The output class has two modules: the buzzer and LED modules. The master controller can develop a variety of IoT applications through communicate with the various input and output modules. Besides, an extension module supports to add a variety of electronic components, and NuMaker Brick has a debugging and programming tool, Nu -Link Me, for user to develop application quickly.

As an open source IoT platform, the system architecture of NuMaker Brick is a master controller that connects with several sub-modules and use divider voltage resistors to identify each module. The Master controller is responsible for the control process of the entire communication and requests for information of sub-modules. If user needs to add a new sub-module, the master controller can identify new sub-module by setting a new parameter for it. The based sub-modules do not need to make any changes. In addition, NuMaker Brick has plug and play function so user can add new sub-module and define the parameters of sub-modules variously. When the sub-module is connected, the master controller will be able to recognize this module and know what type of functions it has after communicates with sub-modules.

NuMaker Brick connect with the sub-modules by I^2C interface. The each module is designed I^2C port around the board for the user to stack modules. Connected ports do not have directivity, and it can connect as shown in Figure 2-1. The respective module has a divider voltage resistor to set identification ID and master controller recognizes each module by the ID setting.

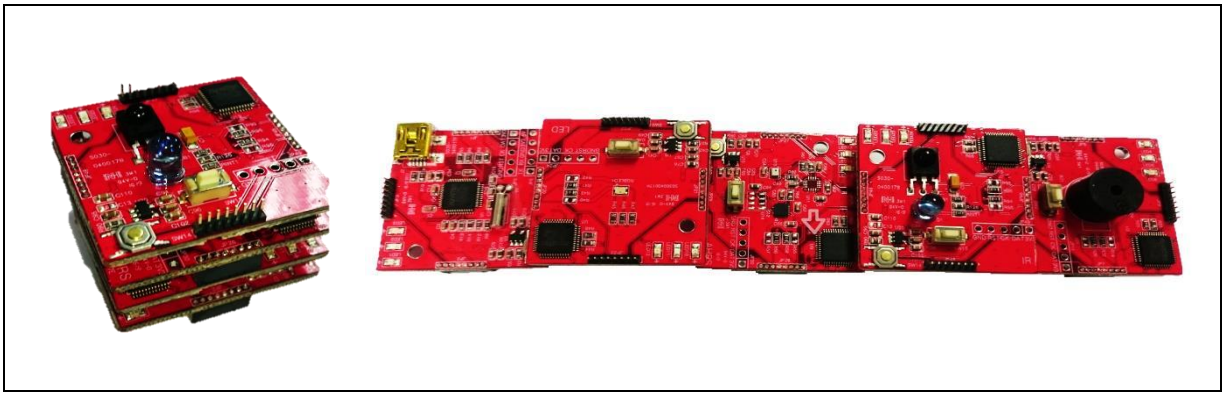


Figure 2-1 NuMaker Brick assembly methods

2.1 MODULE CLASSIFICATION

NuMaker Brick open source development platform is composed of ten different modules, each module can operate independently or arrange to be stacked on each module. According to the features and functionality of each module, the modules are classified into four categories: master controller, input modules, output modules, extension modules, as shown in Figure 2-2.

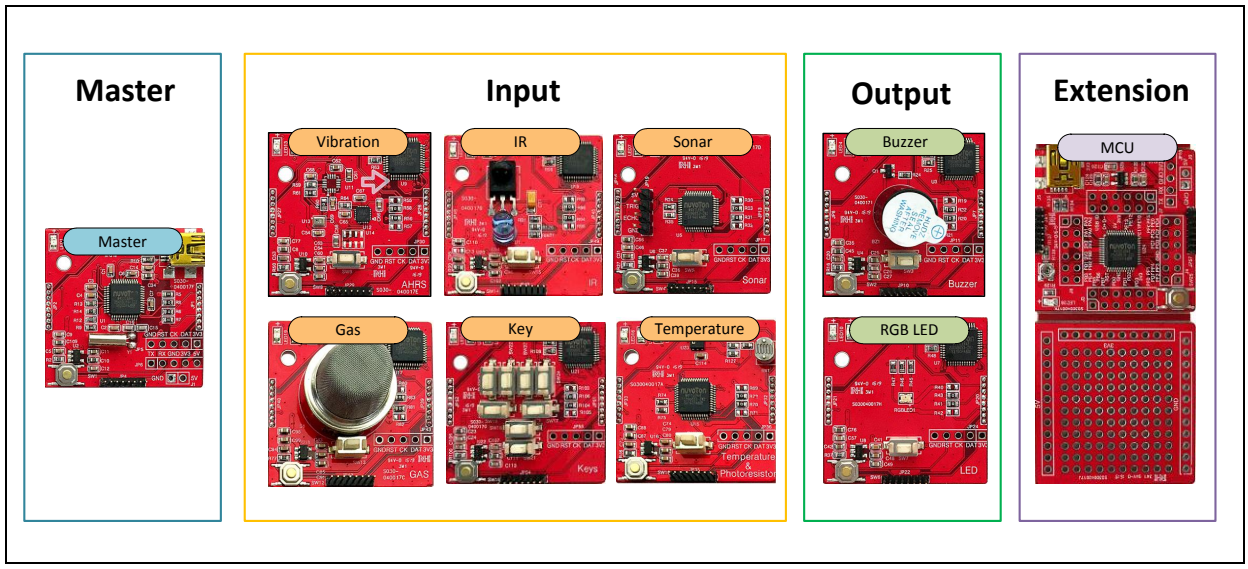


Figure 2-2 NuMaker Brick modules

- **Master Controler**

  Master controller contains USB connector as a power source of the entire system, and it can request information on each module. It euipped a NuMicro® M451 series MCU and a Bluetooth module for connecting phones and tablets. Users can monitor data and set the parameter of each module by your phone or tablet.

- **Input Module**

  This input module is used to collect information on the environment, and upload data to the master controller through the I^2C interfac so these modules almost consist by sensors including vibration, gas, sonar, temperature and humidity sensor. Besides, it has a key module with seven keys as a user interface. Finally, the infrared transmitter/receiver module is a special module, and this module has both input and output functions.

- **Output Module**

  This output module alert notifications by stimulating the user's senses, so it is the output module.

  The output modules contain an buzzer module and a RGB LED module.

- **Extension Module**

  Extension module is composed of NuMicro® M451 development boards, soldering electronic components universal board, and Nu-Link Me programming board. It is a complete set of hardware development environment, and users can develop application quickly by the additional electronic components.

2.1.1 Master Controller

Master controller is as shown in Figure 2-3. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, and a power supply of USB connector with a power detection pin connected to the MCU. It also has a Bluetooth module to connect with your phone or tablet, as shown in Figure 2-4.

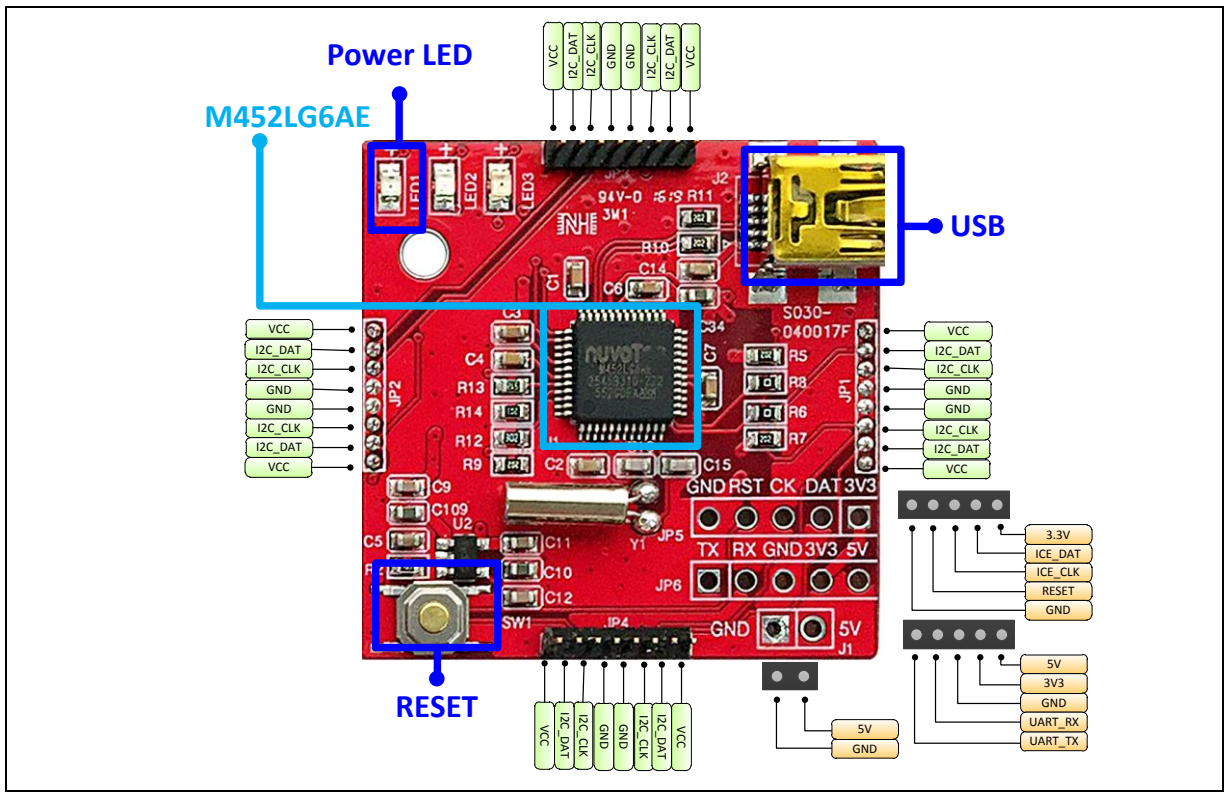


Figure 2-3 Master controller front side

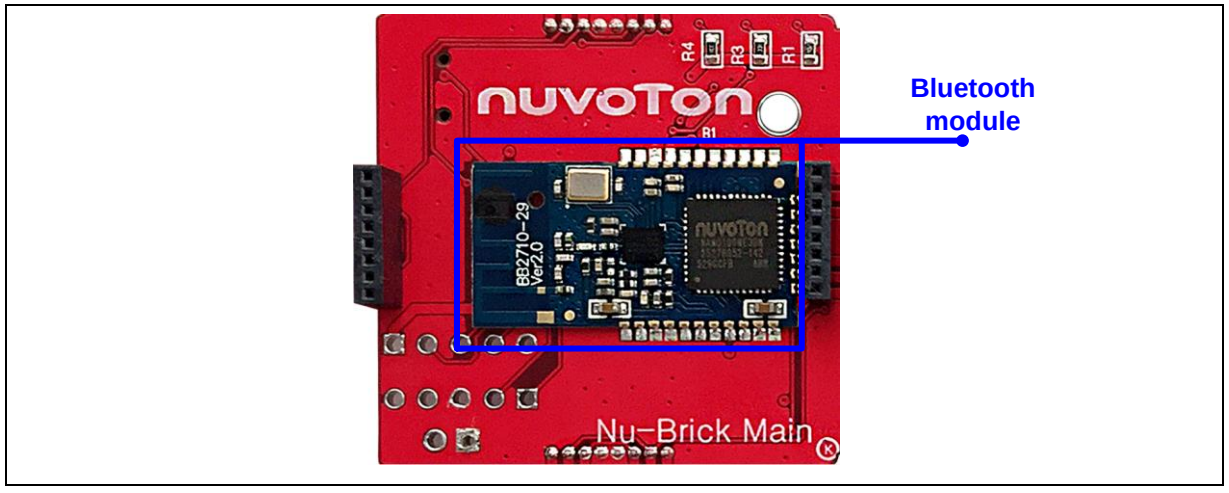


Figure 2-4 Master controller back side

- JP1,JP2,JP3,JP4 – I²C interface for NuMaker Brick module

JP1,JP2,JP3,JP4	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP5 - ICE interface for Nu-Link Mini

JP5	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD33	VDD33
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- JP6 – UART Interface

JP6	Interface Signal Name	MCU Pin Assignment
Pin 1	UART_TX	UART0_TX / PD.0
Pin 2	UART_RX	UART0_RX / PD.1
Pin 3	VSS	VSS
Pin 4	VDD33	VDD33
Pin 5	VDD	VDD

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according to R9 and R12

- BT Module

BT Module	MCU Pin Assignment	Description
BT_TX	UART0_TX / PD.0	BT module transmit pin
BT_RX	UART0_RX / PD.1	BT module receive pin

- LED

LED	MCU Pin Assignment	Description
LED1	VDD33	Power LED
LED2	PWM1_CH0 / PA.3	LED for user defined
LED3	PWM1_CH1 / PA.2	LED for module status

- Battery Power Detect

Battery Detect	MCU Pin Assignment	Description
BAT_DT	EADC_CH1 / PB.1	Pin for battery power detect

2.1.2 Buzzer Module

Buzzer module is as shown in Figure 2-5. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a buzzer for notification, and a user-defined button.

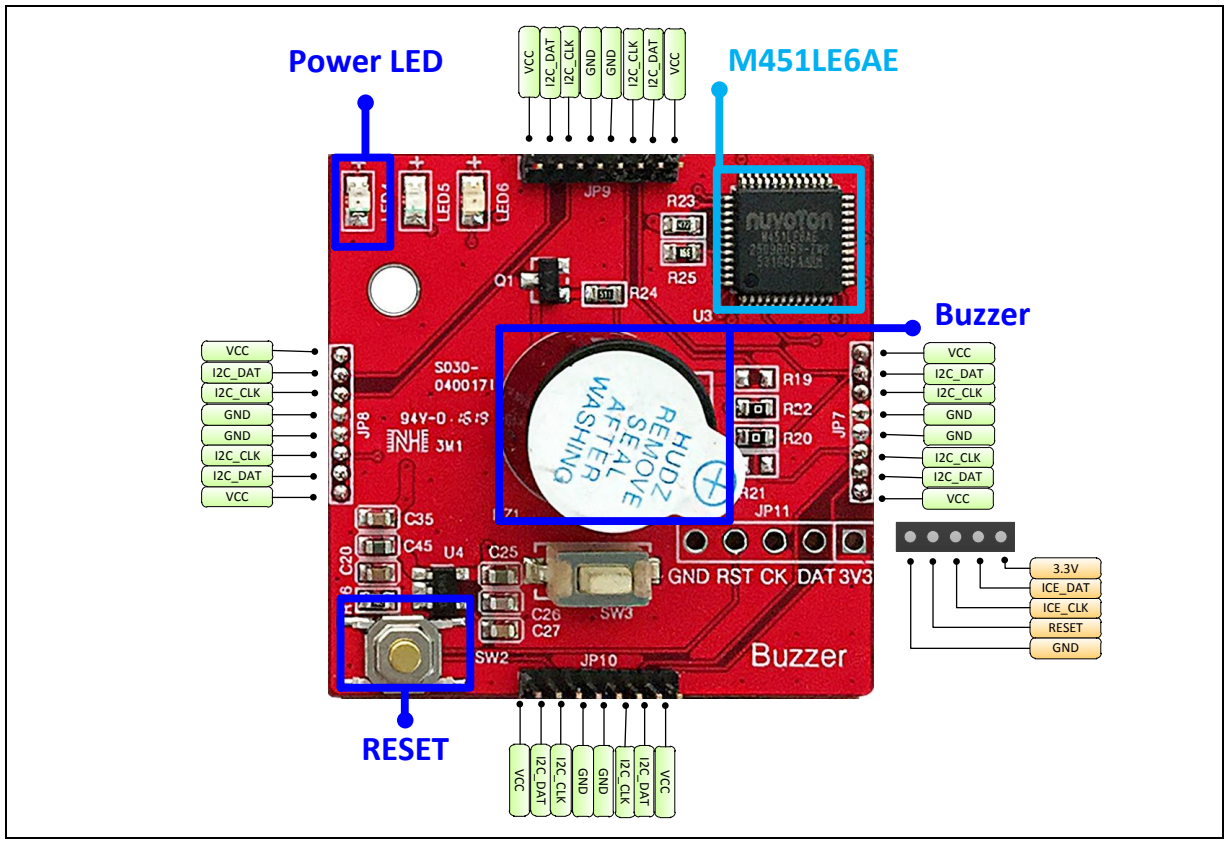


Figure 2-5 Buzzer module

- JP7,JP8,JP9,JP10 – I²C interface for NuMaker Brick module

JP7,JP8,JP9,JP10	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP11 - ICE interface for Nu-Link Me

JP11	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD33	VDD33
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according to R23 and R25

- LED

LED	MCU Pin Assignment	Description
LED4	VDD33	Power LED
LED5	PWM1_CH0 / PA.3	LED for user defined
LED6	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- Buzzer

Buzzer	MCU Pin Assignment	Description
BUZZER	PWM0_CH0 / PC.0	Pin to control buzzer

2.1.3 Sonar module

Sonar module is as shown in Figure 2-6. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a connector for sonar sensors (HC-SR04), and a user-defined button.

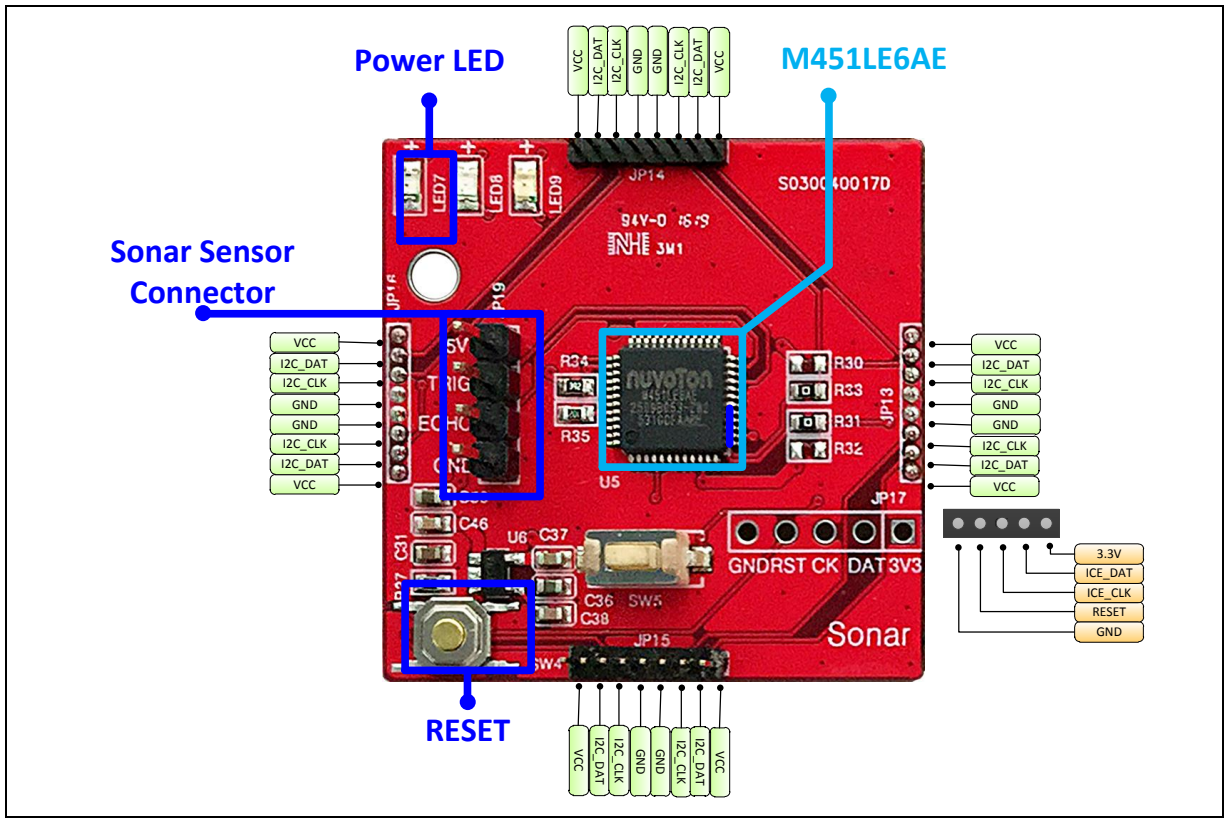


Figure 2-6 Sonar module

- JP13,JP14,JP15,JP16 – I²C interface for NuMaker Brick module

JP13,JP14,JP15,JP16	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP17 – ICE interface for Nu-Link Me

JP17	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD33	VDD33
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- JP19 – Sonar interface

JP19	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	SONAR_ECHO	PWM0_CH2 / PC.2
Pin 3	SONAR_TRIG	PWM0_CH4 / PC.4
Pin 4	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according to R34 and R35

- LED

LED	MCU Pin Assignment	Description
LED7	VDD33	Power LED
LED8	PWM1_CH0 / PA.3	LED for user defined
LED9	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

2.1.4 RGB LED Module

RGB LED module is as shown in Figure 2-7. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a RGB LED, and a user-defined button.

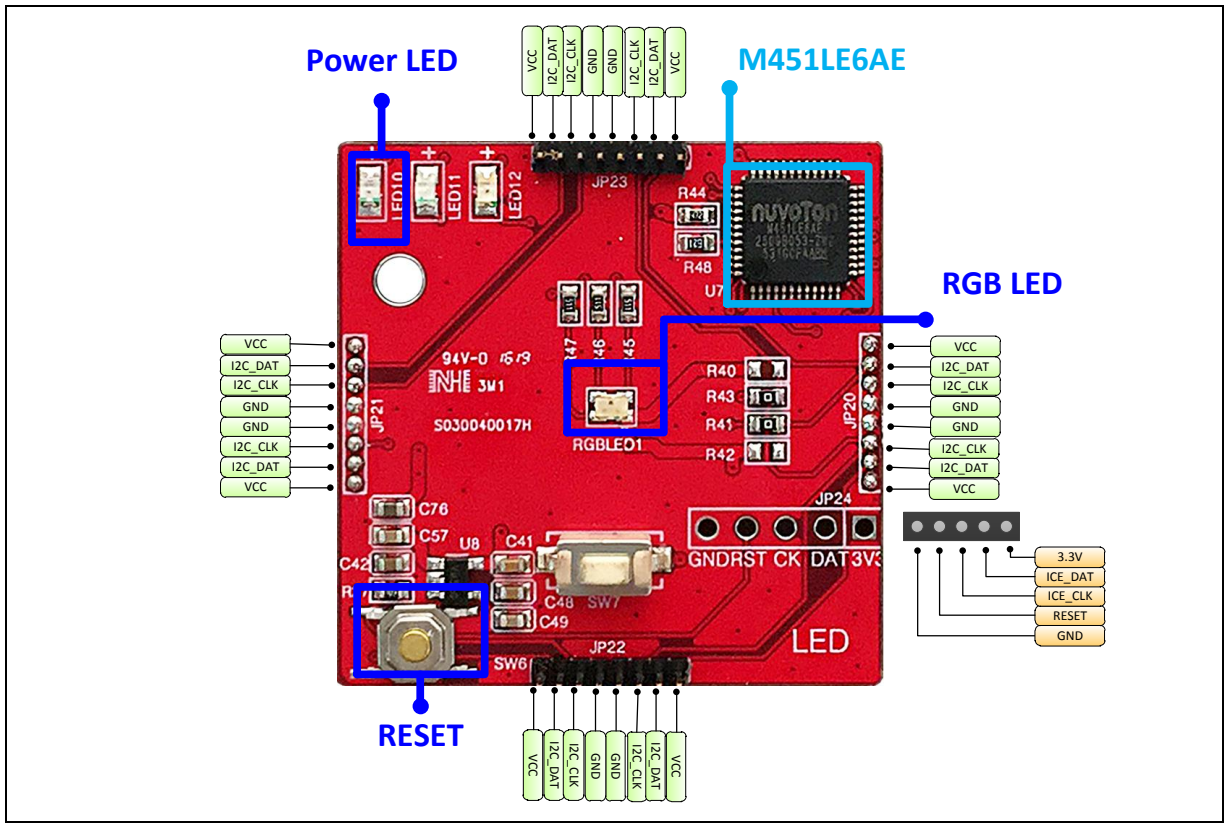


Figure 2-7 RGB LED module

- JP20,JP21,JP22,JP23 – I²C interface for NuMaker Brick module

JP20,JP21,JP22,JP23	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP24 – ICE interface for Nu-Link Mini

JP24	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD33	VDD33
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	PB.0 / EADC_CH0	Pin for ID identify, according to R44 and R48

- LED

LED	MCU Pin Assignment	Description
LED10	VDD	Power LED
LED11	PWM1_CH0 / PA.3	LED for user defined
LED12	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- RGB LED

LED	MCU Pin Assignment	Description
LED_R	PWM0_CH1 / PC.1	Pin to control red channel
LED_G	PWM0_CH0 / PC.0	Pin to control green channel
LED_B	PWM0_CH2 / PC.2	Pin to control blue channel

2.1.5 Vibration Sensor Module

Vibration sensor module is as shown in Figure 2-8. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a user-defined button, a six-axis accelerometer and gyroscope (MPU6500), which communicate with MCU by another I²C interface.

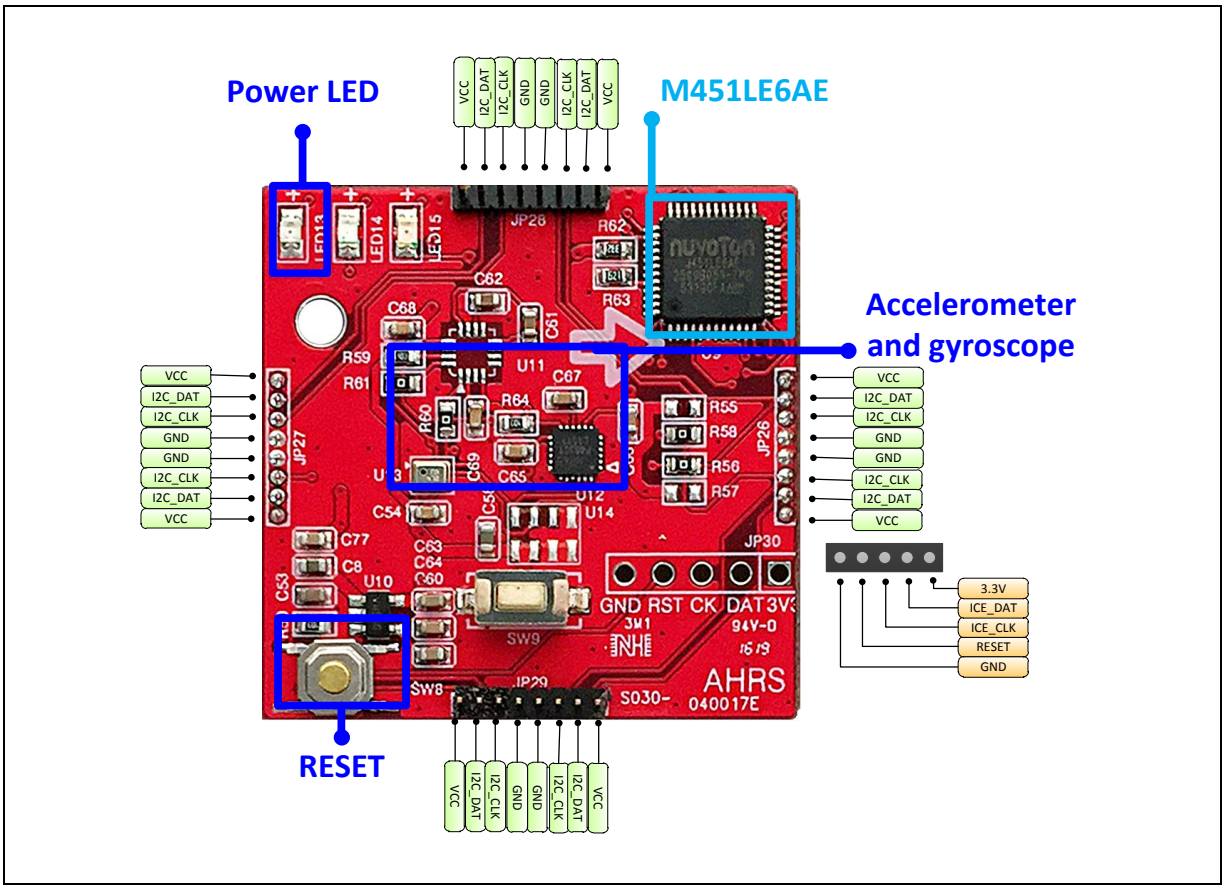


Figure 2-8 Vibration sensor module

- JP26,JP27,JP28,JP29 – I²C interface for NuMaker Brick module

JP26,JP27,JP28,JP29	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP30 – ICE interface for Nu-Link Me

JP30	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD33	VDD33
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according R62 and R63

- LED

LED	MCU Pin Assignment	Description
LED13	VDD	Power LED
LED14	PWM1_CH0 / PA.3	LED for user defined
LED15	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- MPU6500 – 3-axis accelerometer and 3-axis gyroscope

MPU6500	MCU Pin Assignment	Description
MPU6500_SDA	I2C1_SDA / PE.0	I^2C serial data
MPU6500_SCL	I2C1_SCL / PC.4	I^2C serial clock
MPU6500_INT	PF.0	Interrupt pin for digital output

2.1.6 Temperature and Humidity Sensor Module

Temperature and humidity sensor module is as shown in Figure 2-9. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a user-defined button, a temperature and humidity sensor (HTU21D), which communicate with MCU by another I2C interface, and a photoresistor for sensing different levels of light.

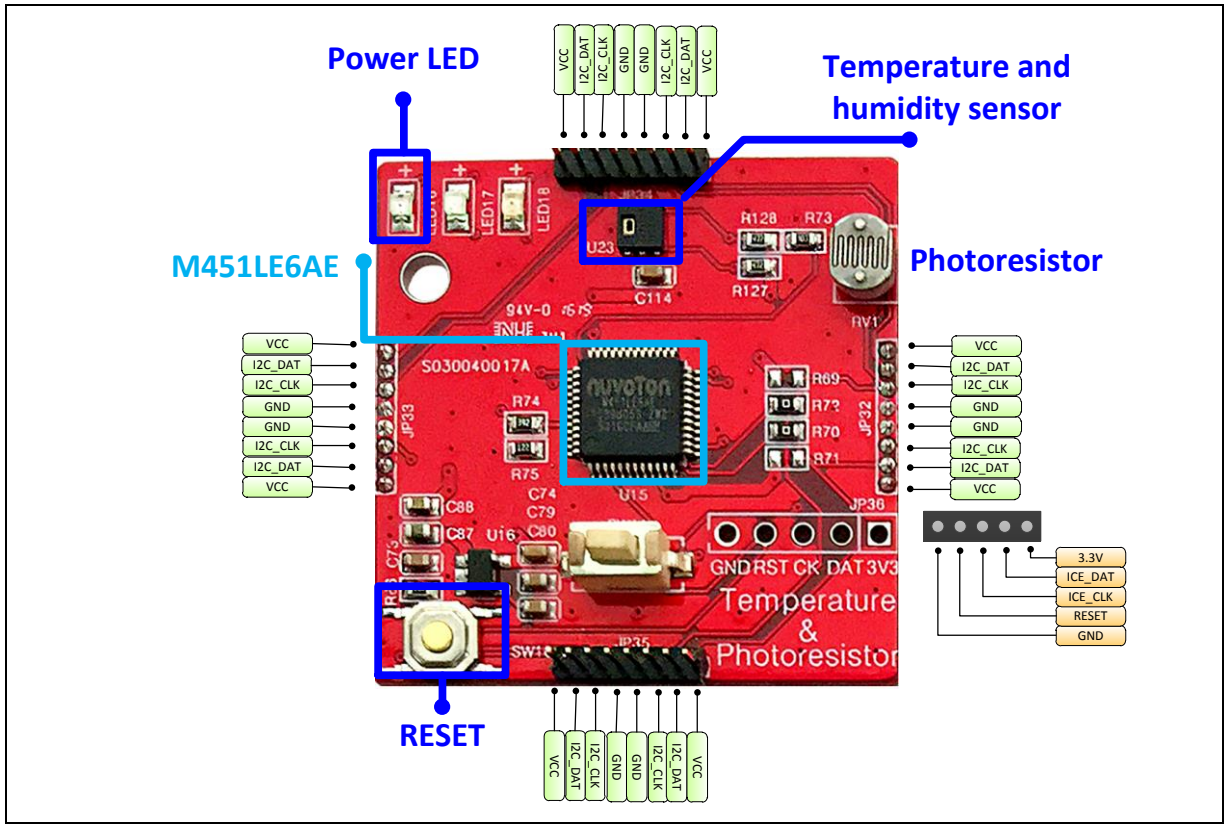


Figure 2-9 Temperature and humidity sensor module

- JP32,JP33,JP34,JP35 – I²C interface for NuMaker Brick module

JP32,JP33,JP34,JP35	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP36 – ICE interface for Nu-Link Me

JP36	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	PB.0 / EADC_CH0	Pin for ID identify, according to R74 and R75

- LED

LED	MCU Pin Assignment	Description
LED16	VDD	Power LED
LED17	PWM1_CH0 / PA.3	LED for user defined
LED18	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- HTU21D – Temperature & Humitlty Sensor

HTU21D	MCU Pin Assignment	Description
HTU21D_SDA	I2C1_SDA / PE.0	I^2C serial data
HTU21D _SCL	I2C1_SCL / PC.4	I^2C serial clock

- Photoresistor

Battery Detect	MCU Pin Assignment	Description
PHOTO_DET	EADC_CH1 / PB.1	Pin to convert photoresistor voltage

2.1.7 Gas Sensor Module

Gas sensor module is as shown in Figure 2-10. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a gas sensor, and a user-defined button.

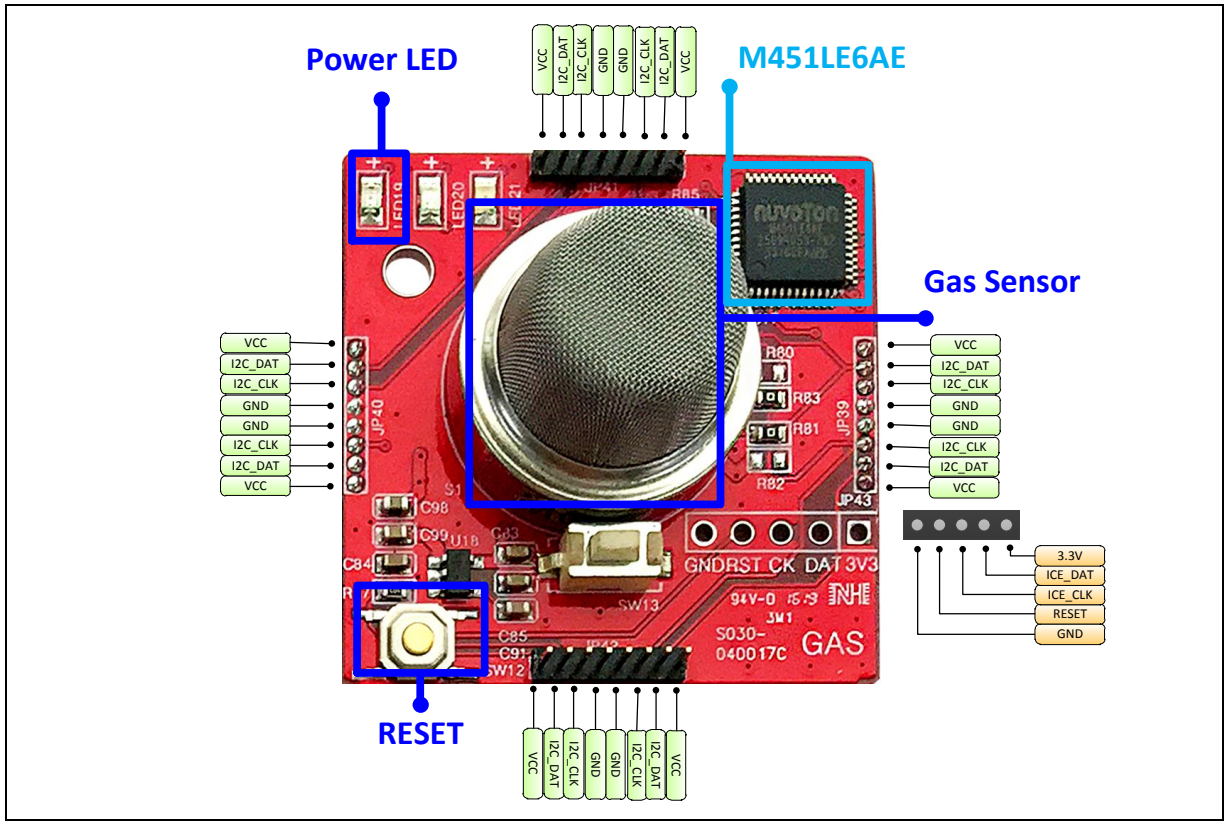


Figure 2-10 Gas sensor module

- JP39,JP40,JP41,JP42 – I²C interface for NuMaker Brick module

JP39,JP40,JP41,JP42	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP43 – ICE interface for Nu-Link Me

JP43	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according R85 and R87

- LED

LED	MCU Pin Assignment	Description
LED19	VDD	Power LED
LED20	PWM1_CH0 / PA.3	LED for user defined
LED21	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- Gas Sensor

Battery Detect	MCU Pin Assignment	Description
GAS_EN	PC.5	Pin to enable gas sensor
GAS_ADC	EADC_CH1 / PB.1	Pin to convert gas sensor to digital value

2.1.8 Infrared Transmitter/Receiver Module

Infrared transmitter/receiver module is as shown in Figure 2-11. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, a infrared transmitter, a infrared receiver, and a user-defined button.

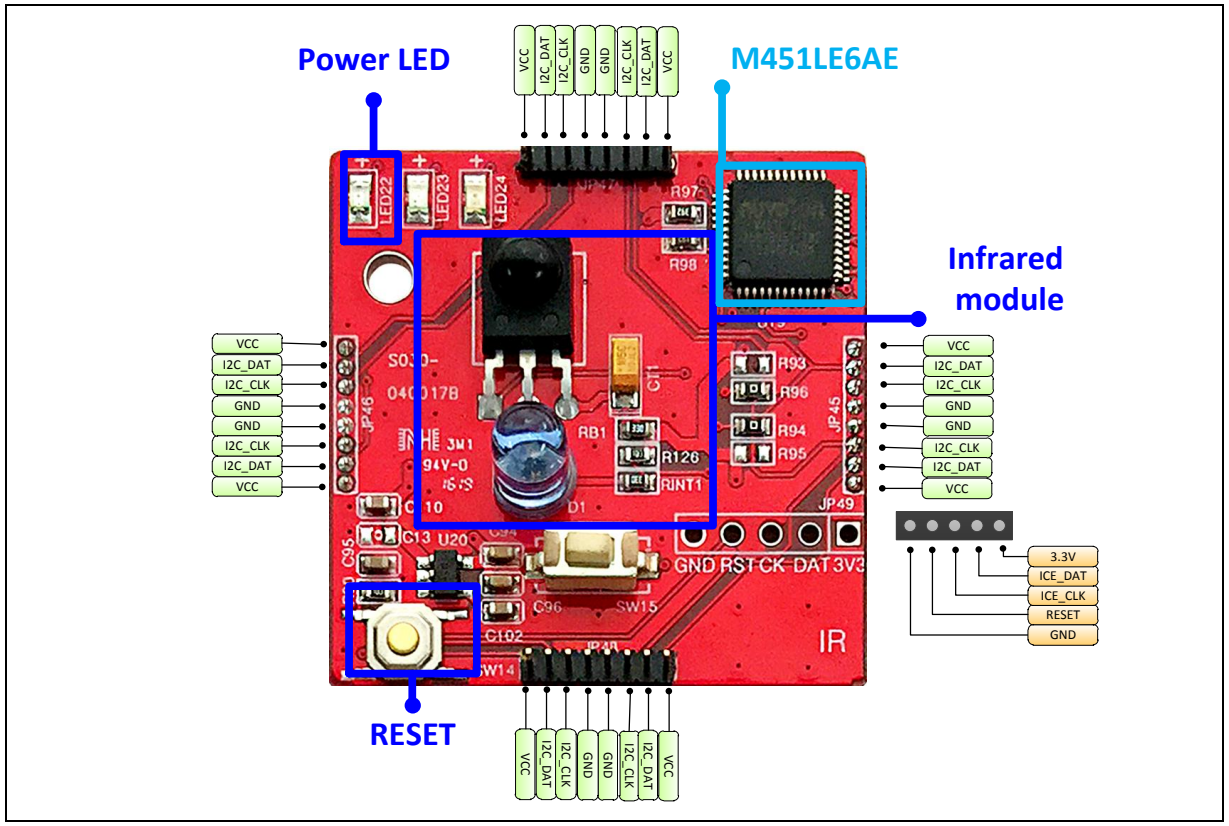


Figure 2-11 Infrared transmitter/receiver module

- JP45,JP46,JP47,JP48 – I²C interface for NuMaker Brick module

JP45,JP46,JP47,JP48	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE13
Pin 3	I2C_CLK	I2C0_SCL / PE12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE12
Pin 7	I2C_DAT	I2C0_SDA / PE13
Pin 8	VDD	VDD

- JP49 – ICE interface for Nu-Link Me

JP49	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according R97 and R98

- LED

LED	MCU Pin Assignment	Description
LED22	VDD	Power LED
LED23	PWM1_CH0 / PA.3	LED for user defined
LED24	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- IR

Battery Detect	MCU Pin Assignment	Description
IR_OUT	PWM0_CH3 / PC.3	Pin to transmit IR signal
IR_IN	PWM0_CH5 / PC.5	Pin to receive IR signal

2.1.9 Key Module

Key module is as shown in Figure 2-12. It euipped with a NuMicro® M452LG6AE MCU and I²C connector ports around the board to connect with other modules. It contains three LED, which is a power LED, module status LED, and a user-defined LED. Other components are included a reset button, a connector for Nu-Link Me programmer, and eight user-defined buttons.

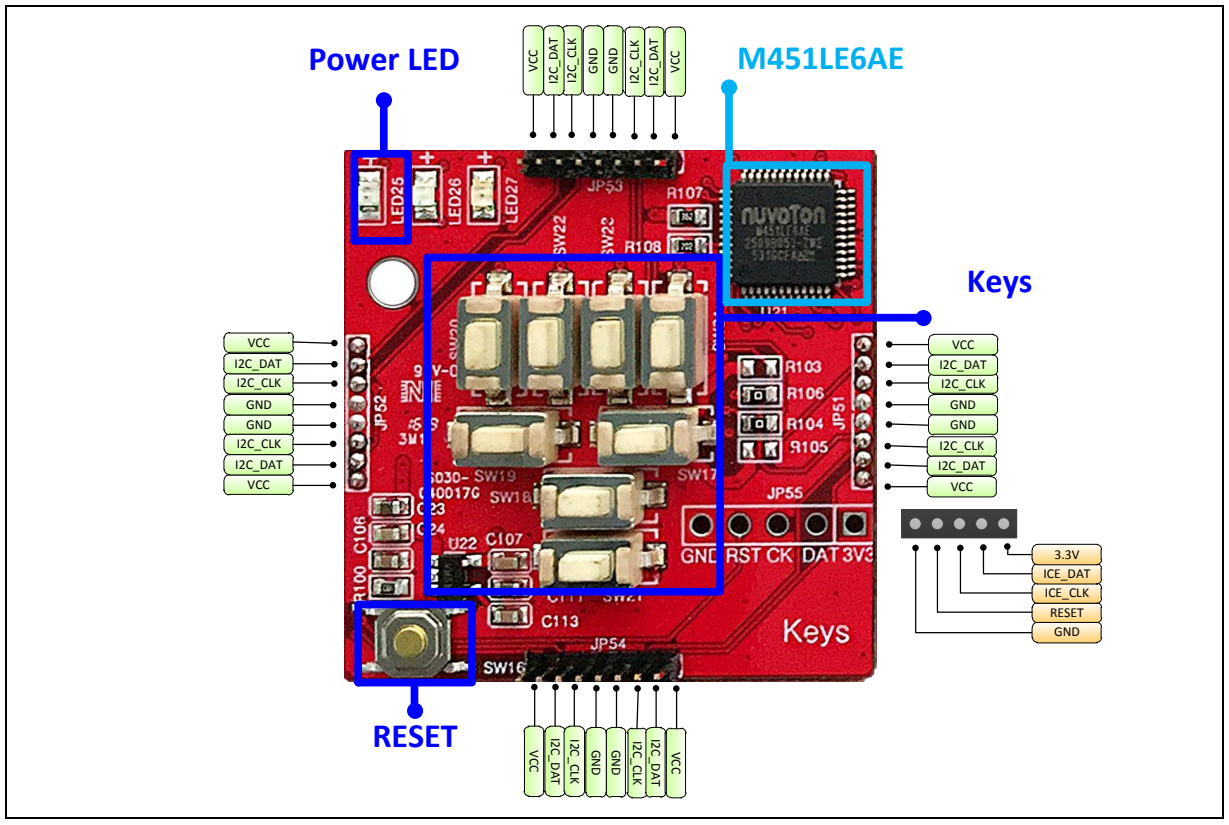


Figure 2-12 Key Module

- JP51,JP52,JP53,JP54 – I²C interface for NuMaker Brick module

JP51,JP52,JP53,JP54	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP55 – ICE interface for Nu-Link Me

JP55	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	GND	GND

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according to R107 and R108

- LED

LED	MCU Pin Assignment	Description
LED25	VDD	Power LED
LED26	PWM1_CH0 / PA.3	LED for user defined
LED27	PWM1_CH1 / PA.2	LED for module status

- Button

Button	MCU Pin Assignment	Description
BTN	PD.7	Button for user defined

- Key

Battery Detect	MCU Pin Assignment	Description
KEY1	PC.0	Pin for KEY1
KEY2	PC.1	Pin for KEY2
KEY3	PC.2	Pin for KEY3
KEY4	PC.3	Pin for KEY4
KEY5	PC.4	Pin for KEY5
KEY6	PC.5	Pin for KEY6
KEY7	PC.6	Pin for KEY7

2.1.10 Extension Module

Extension module is as shown in Figure 2-13. It is composed of two daughter boards, one is MCU board, the other is a universal board. MCU board is euipped with a NuMicro® M452LG6AE MCU and I^{2}C connector ports around the board to connect with other modules. It contains a power LED, a power supply of USB connector, a reset button, and a connector for Nu-Link Me programmer.

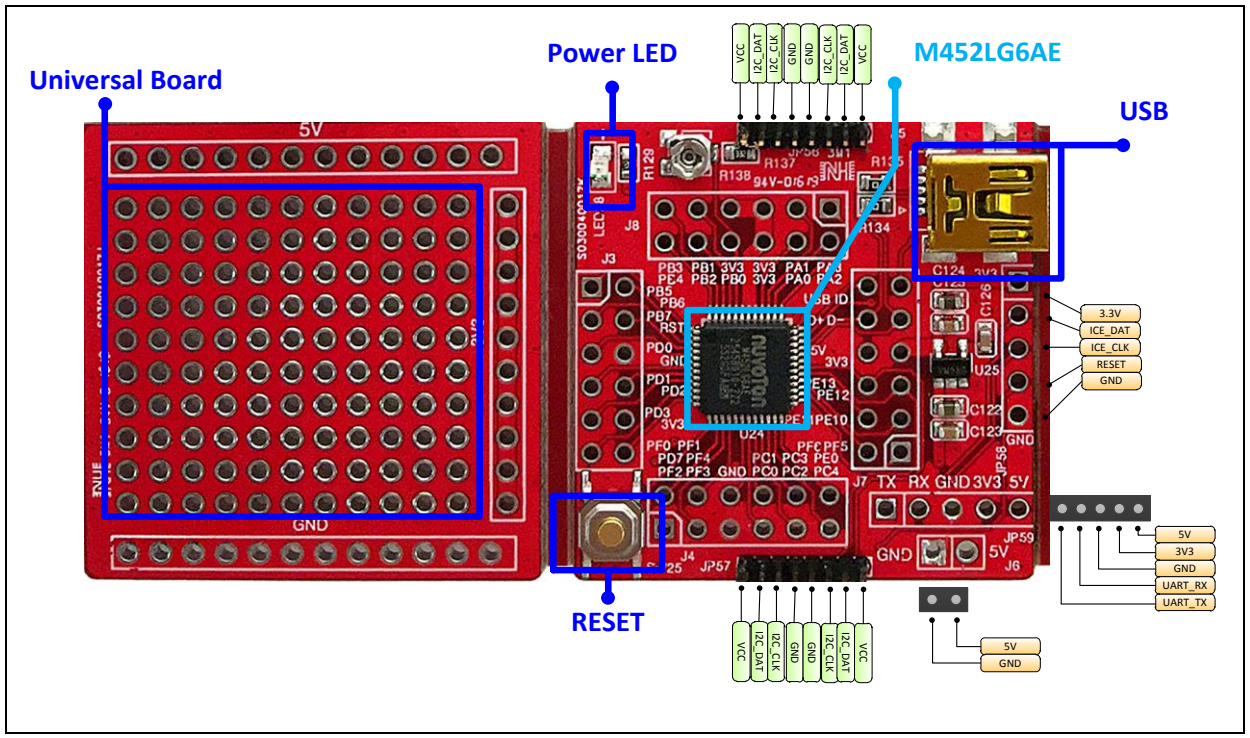


Figure 2-13 Extension module

- JP56,JP57 – I^{2}C interface for NuMaker Brick module

JP56,JP57	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	I2C_DAT	I2C0_SDA / PE.13
Pin 3	I2C_CLK	I2C0_SCL / PE.12
Pin 4	VSS	VSS
Pin 5	VSS	VSS
Pin 6	I2C_CLK	I2C0_SCL / PE.12
Pin 7	I2C_DAT	I2C0_SDA / PE.13
Pin 8	VDD	VDD

- JP58 – ICE interface for Nu-Link Me

JP58	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	ICE_DAT	ICE_DAT
Pin 3	ICE_CLK	ICE_CLK
Pin 4	ICE_RST	nRESET
Pin 5	VSS	VSS

- JP59 – UART interface

JP59	Interface Signal Name	MCU Pin Assignment
Pin 1	UART_TX	UART0_TX / PD.0
Pin 2	UART_RX	UART0_RX / PD.1
Pin 3	VSS	VSS
Pin 4	VDD33	VDD33
Pin 5	VDD	VDD

- JP6 – Power connector

JP6	Interface Signal Name	MCU Pin Assignment
Pin 1	VDD	VDD
Pin 2	VSS	VSS

- ID

ID	MCU Pin Assignment	Description
ID_CHECK	EADC_CH0 / PB.0	Pin for ID identify, according to R138

- Battery Power Detect

Battery Detect	MCU Pin Assignment	Description
BAT_DET	EADC_CH1 / PB.1	Pin for battery power detect

- J3 - Pin assignment for extended connectors

Pin Number	MCU Pin Assignment	Pin Number	MCU Pin Assignment
Pin 1	SPI0_MOSI0 / PB.5	Pin 2	SPI0_MISO0 / PB.6
Pin 3	SPI0_CLK / PB.7	Pin 4	nRESET
Pin 5	UART0_RXD / PD.0	Pin 6	VSS
Pin 7	UART0_TXD / PD.1	Pin 8	INT0 / PD.2

Pin 9	INT1 / PD.3	Pin 10	VDD33
Pin 11	X32_OUT / PF.0	Pin 12	X32_IN / PF.1

- J4 - Pin assignment for extended connectors

Pin Number	MCU Pin Assignment	Pin Number	MCU Pin Assignment
Pin 1	PF.2	Pin 2	PD.7
Pin 3	PF.3	Pin 4	PF.4
Pin 5	VSS	Pin 6	LDO_CAP
Pin 7	PWM0_CH0 / PC.0	Pin 8	PWM0_CH1 / PC.1
Pin 9	PWM0_CH2 / PC.2	Pin 10	PWM0_CH3 / PC.2
Pin 11	I2C1_SCL / PC.4	Pin 12	I2C1_SDA / PE.0

- J7 - Pin assignment for extended connectors

Pin Number	MCU Pin Assignment	Pin Number	MCU Pin Assignment
Pin 1	ICE_CLK	Pin 2	ICE_DAT
Pin 3	PF.10	Pin 4	PE.11
Pin 5	I2C0_SCL / PE12	Pin 6	I2C0_SDA / PE.13
Pin 7	VDD33	Pin 8	VDD
Pin 9	D-	Pin 10	D+
Pin 11	USB_ID	Pin 12	USB_CAP

- J8 - Pin assignment for extended connectors

Pin Number	MCU Pin Assignment	Pin Number	MCU Pin Assignment
Pin 1	PWM1_CH0 / PA.3	Pin 2	PWM1_CH1 / PA.2
Pin 3	UART1_RXD / PA.1	Pin 4	UART1_TXD / PA.0
Pin 5	VDD33	Pin 6	VDD33
Pin 7	VDD33	Pin 8	EADC_CH0 / PB.0
Pin 9	EADC_CH1 / PB.1	Pin 10	EADC_CH2 / PB.2
Pin 11	EADC_CH3 / PB.3	Pin 12	SPI0_SS / PB.4

NOTE:

VDD - 5V, VDD33 - 3.3V

2.2 Nu-Link Me Programmer

The Nu-Link Me Programmer is a Debug Adaptor which connects the USB port of your PC to your target system (via Serial Wired Debug Port) and allows you to program and debug embedded programs on the target hardware.

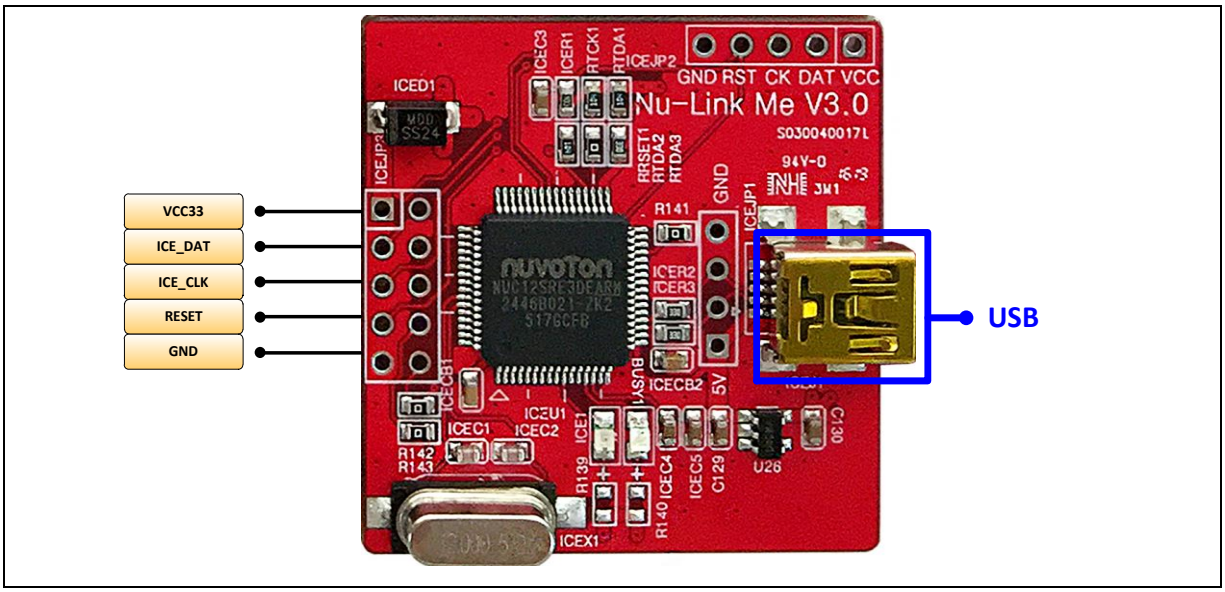


Figure 2-14 Nu-Link Me

2.3 Identification Method

NuMaker Brick uses the I^2C interface to connect to other modules, and the master controller decides o request what information by each module. Every module has a unique ID so master controller can communicate with the sub-modules by the ID. However, we use a voltage divider resistor to generate different voltage value by adjusting the voltage divider resistors to determine the ID. Table 2-1 lists each voltage divider resistor and ID of modules.

Table 2-1 Divider voltage resistor and ID table

Voltage (V)	Re (Ω)	Rs (Ω)	ID (HEX)	Usage
0.1 ~0.25	5.1K	200	0x00	master controller
0.3 ~ 0.45	4.7K	390	0x01	Buzzer module
0.5 ~ 0.65	4.7K	620	0x02	RGB LED module
0.7 ~ 0.85	3.3K	620	0x03	Vibration sensor module
0.9 ~ 1.05	3.9K	1K	0x04	sonar module
1.1 ~ 1.25	3.9K	1.2K	0x05	Temperature and humidity sensor module
1.3 ~ 1.45	5.1K	2K	0x06	Gas sensor module
1.5 ~ 1.65	3.9K	1.8K	0x07	Infrared module
1.7 ~ 1.85	3.6K	2K	0x08	key Module
1.9 ~ 2.05	3.3K	5.1K	0x09	user-defined
2.1 ~ 2.25	3.3K	6.8K	0x0A	user-defined
2.3 ~ 2.45	3.3K	9.1K	0x0B	user-defined
2.5 ~ 2.65	3.3K	12K	0x0C	user-defined
2.7 ~ 2.85	3.3K	18K	0x0D	user-defined
2.9 ~ 3.05	3.3K	33K	0x0E	user-defined

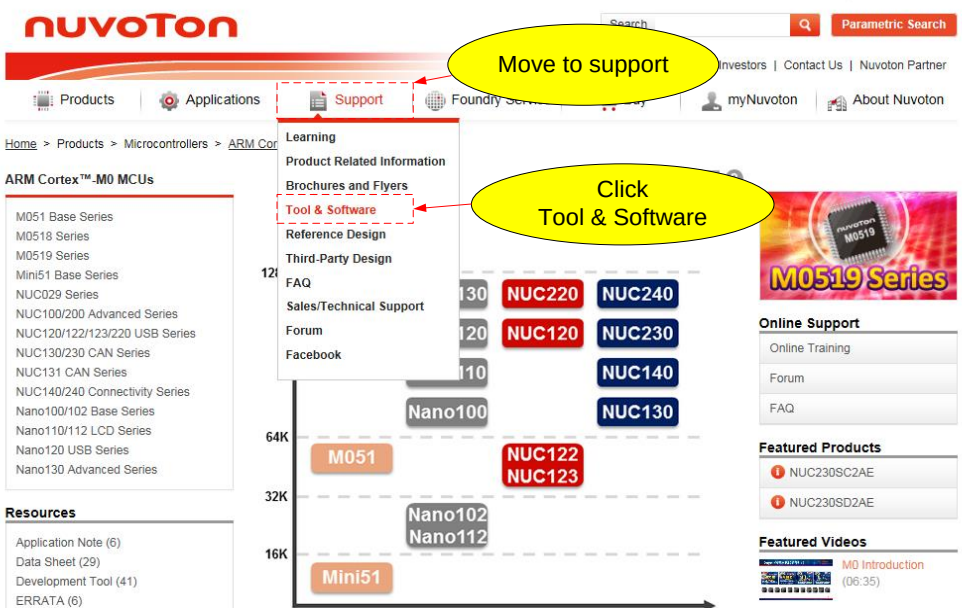
3 HOW TO START NUMAKER BRICK

3.1.1 Supported IDE Software

- IAR Embedded Workbench
- Keil uVision® IDE

3.1.2 Nuvoton Nu-Link Driver Download and Installation

Please visit the Nuvoton company NuMicro® website (http://www.nuvoton.com/NuMicro) to download "NuMicro® Keil µVision® IDE driver" or "NuMicro® IAR Embedded Workbench driver" file. When the Nu-Link driver has been downloaded, please unzip the file and execute the "Nu- Link_Keil_Driver.exe" or "Nu-Link_IAR_Driver.exe" to install the driver.

Step1	**Visit The Nuvoton NuMicro® Website：** HTTP://WWW.NUVOTON.COM/NUMICRO
Step2	

Step3

Step4

Programmer Software Tools Package

File name	Description	Version	Date
ICP Programming Tool V1.31.6535.zip Revision History	NuMicro ICP tool & user manual	V1.31.6535	2016-2-24
ISP Programming Tool V1.47.zip Revision History	NuMicro ISP Programming Tool & user manual	V1.47	2015-7-28
NuGang Programmer V7.02.zip Revision History	ser manual	V7.02	2015-11-27

Download files depend on user development environment

Nu-Link Driver

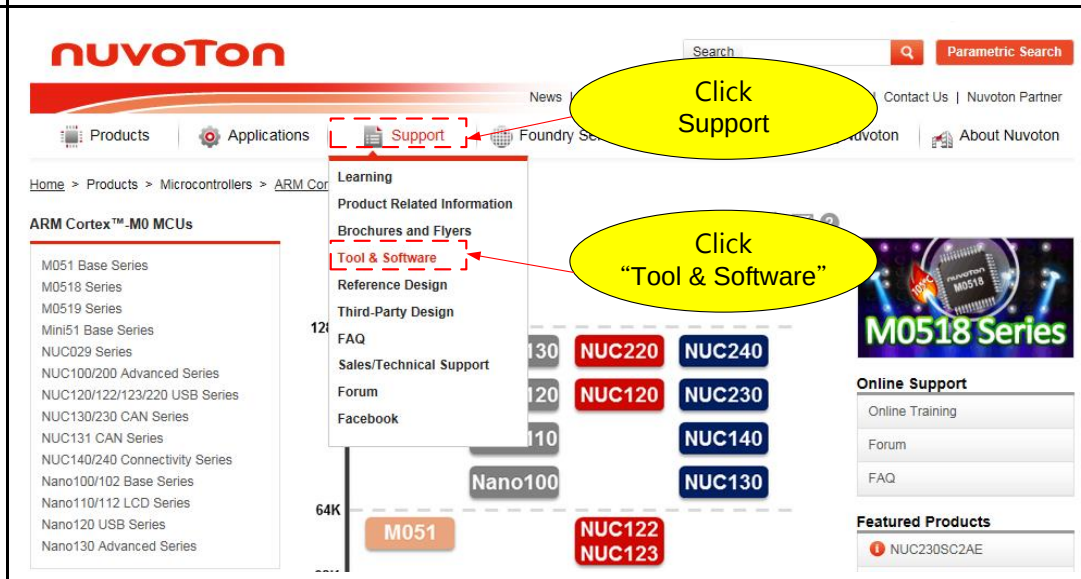
File name	Description	Version	Date
Nu-Link Driver for Keil RVMDK V1.31.6535.zip Revision History	This driver is to support Nu-Link to work under Keil RVMDK Development Environment for all NuMicro Family Devices.	V1.31.6535	2016-2-24
Nu-Link Driver for IAR EWARM V1.31.6535.zip Revision History	This driver is to support Nu-Link to work under IAR EWARM Development Environment for all NuMicro Family Devices.	V1.31.6535	2016-2-24

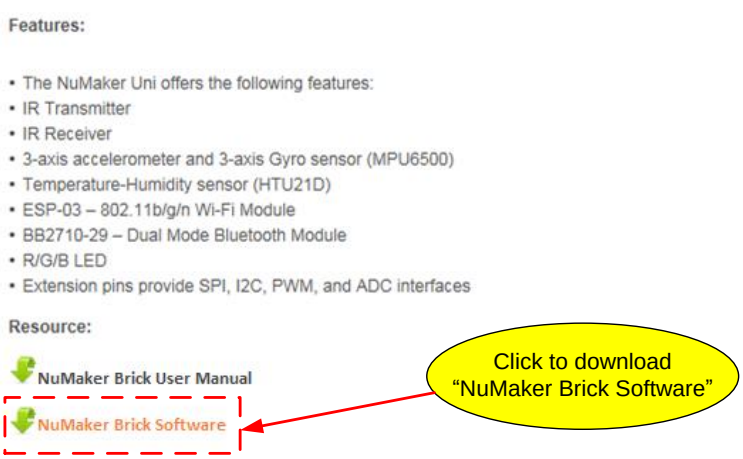
Step5

Download the NuMicro® µVision® IDE driver or NuMicro® IAR Embedded Workbench driver.

3.1.3 NuMaker Brick Source Code Download

Please visit the Nuvoton NuMicro® website (http://www.nuvoton.com/NuMicro) to download NuMaker Brick sample code. The following steps demonstrate how to download sample code of NuMaker Brick.

Step1	**Visit The Nuvoton NuMicro® Website:** HTTP://WWW.NUVOTON.COM/NUMICRO.
Step2	
Step3	

Step4	
Step5	Download the SW_MuMaker_Brick_V1.0 software

3.1.4 Connected to Nu-Link Me

Connect Nu-Link Me to NuMaker Brick on it ICE port, and connect Nu-Link Me to PC trought the USB cable. After the Nu-Link Mini is connected to PC, PC will start searching for a USB device, and it will be recognized as USB ICE shown in the peripheral device window of control panel. Also, the Nu-Link Me and NuMaker Brick LED will turn on to indicate the power is supplied from PC as shown in Figure 3-1.

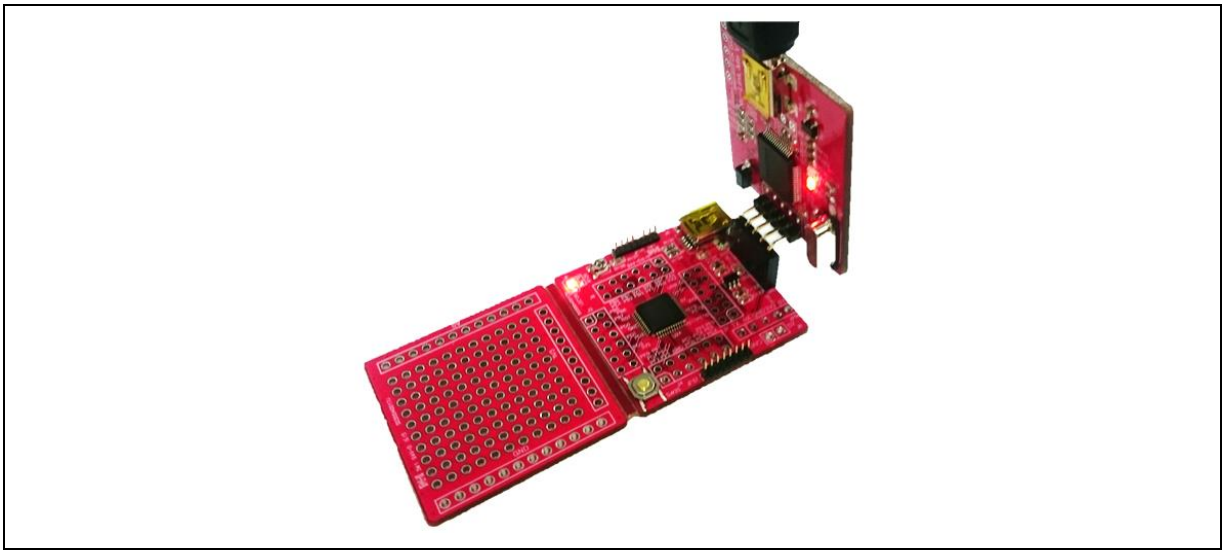
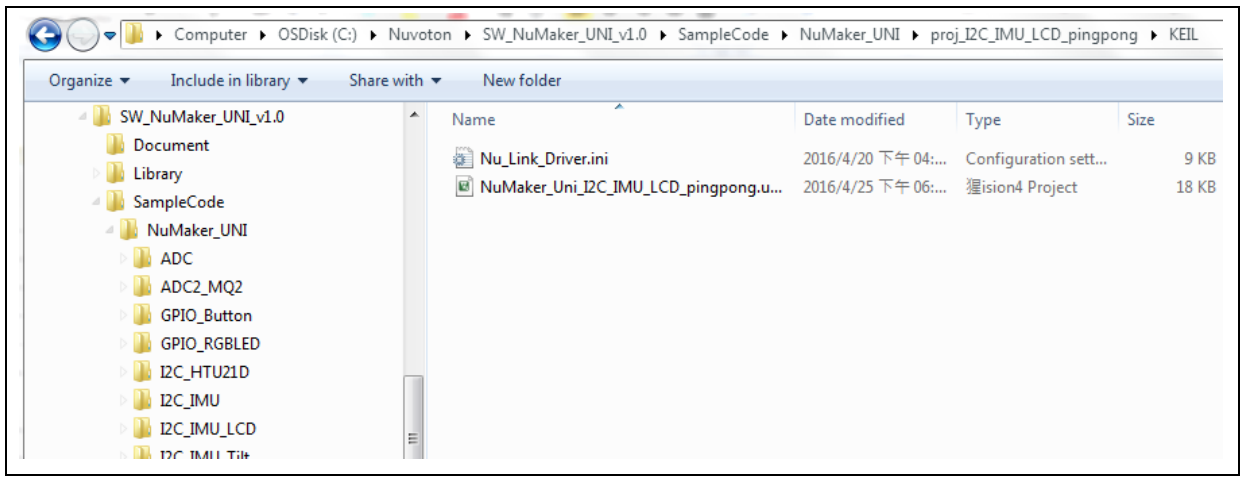


Figure 3-1 Nu-Link Me and NuMaker Brick Connection

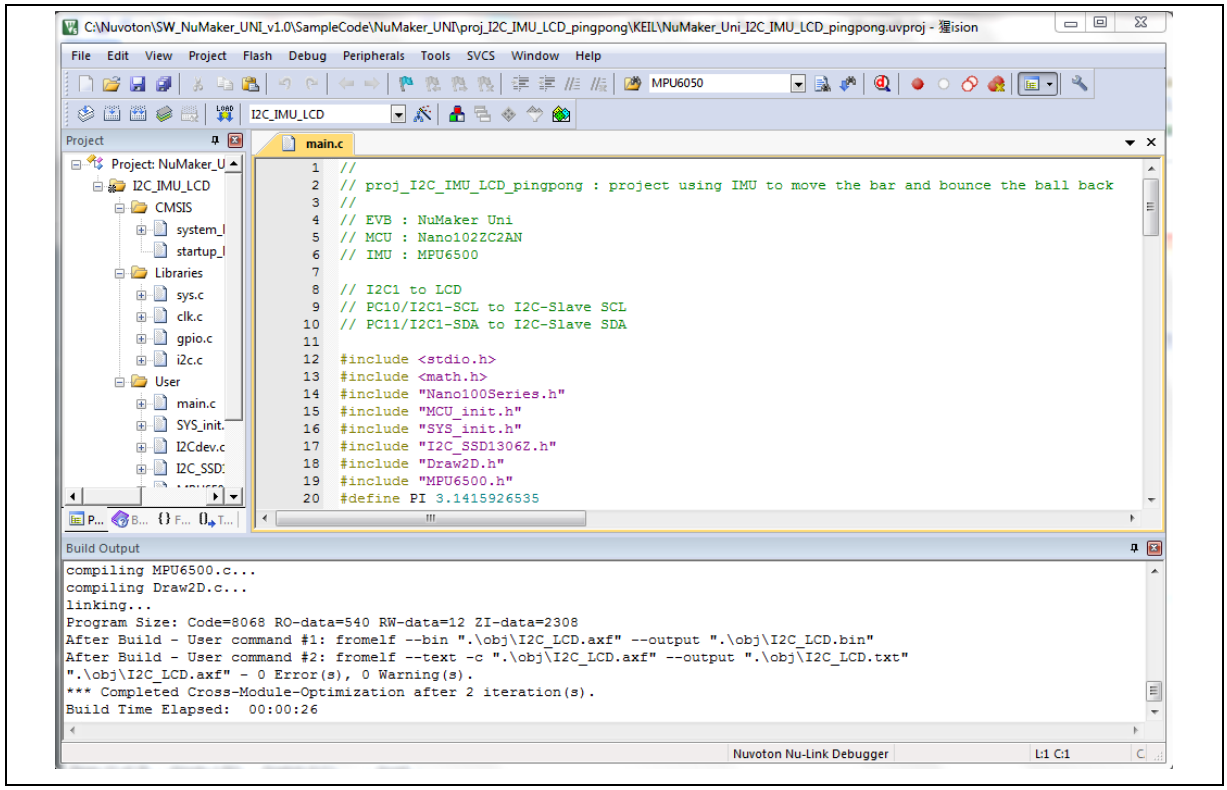
3.1.5 Using Keil uVision® IDE to Program Nu-Link Me

1. The NuMaker Brick example file can be found in the directory list shown in the following figure：

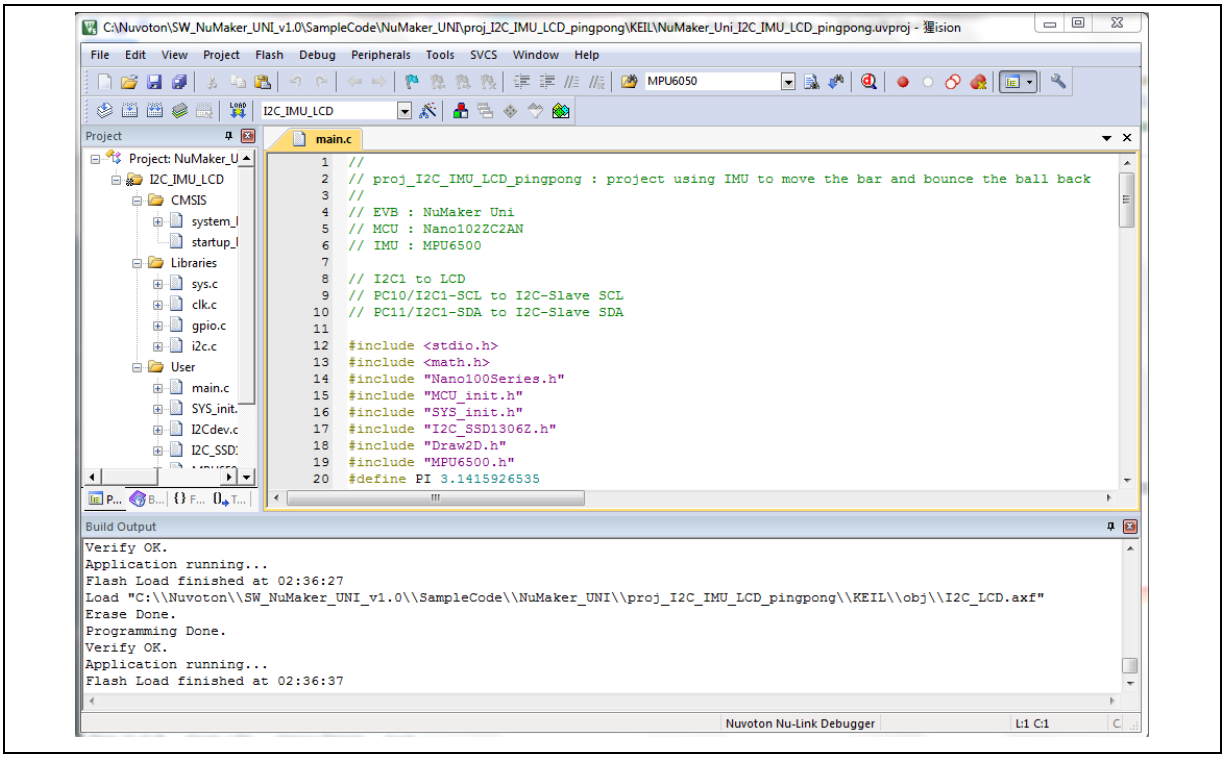
   NuMaker Brick\Firmware\M451SeriesBSP_CMSIS_v3.00.005\SampleCode\StdDriver\NuMaker Brick



2. Click  “Build” to compile the sample code.



3. Click  “Download” to download binary to NuMaker Brick.



4 NUBRICK APP

Users can use phone or tablet through Nubrick APP to monitor the status of each NuMaker Brick module, it can also be used to establish the Nubrick APP relationship between modules or configure individual modules parameter. Nubrick APP without complicated operation, user need only drag the control bar and click button on the graphic interface on the screen to complete the setting.

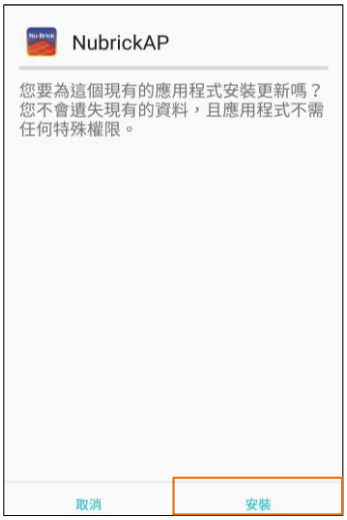
4.1 Supported version

Android version 4.12 or above

4.2 Installation Instructions

- Install Nubrick APP to phone or tablet。
- Enter your phone or tablet's settings page, according to the following settings.

- Use your phone or tablet's file manager to open Nubrick APP and click Install.

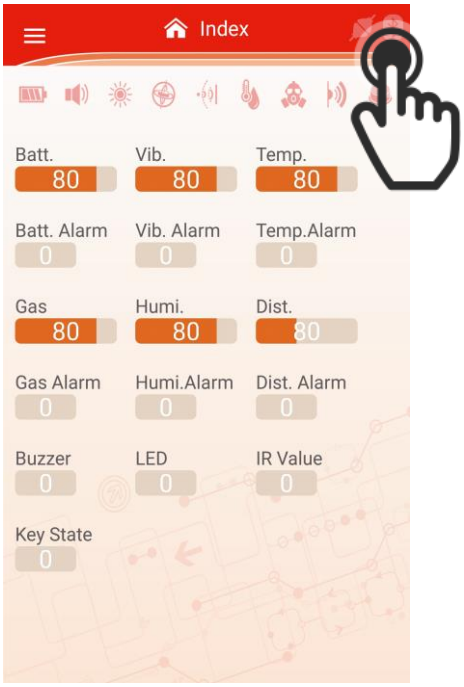


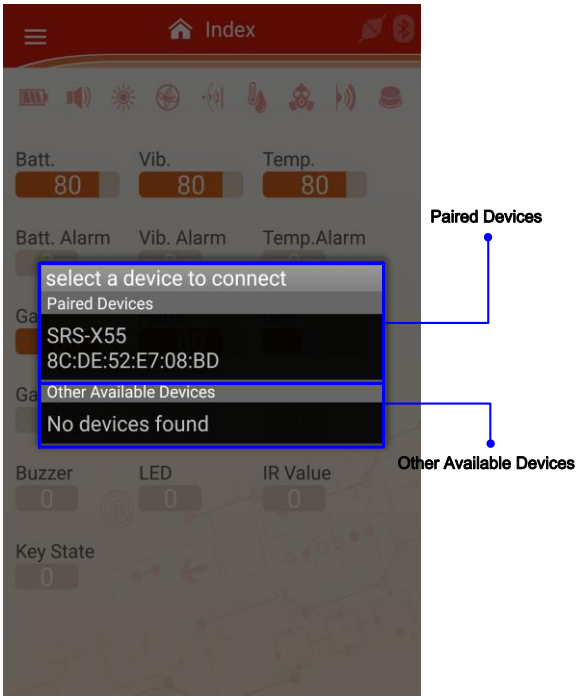
4.3 Operation

- Device connection

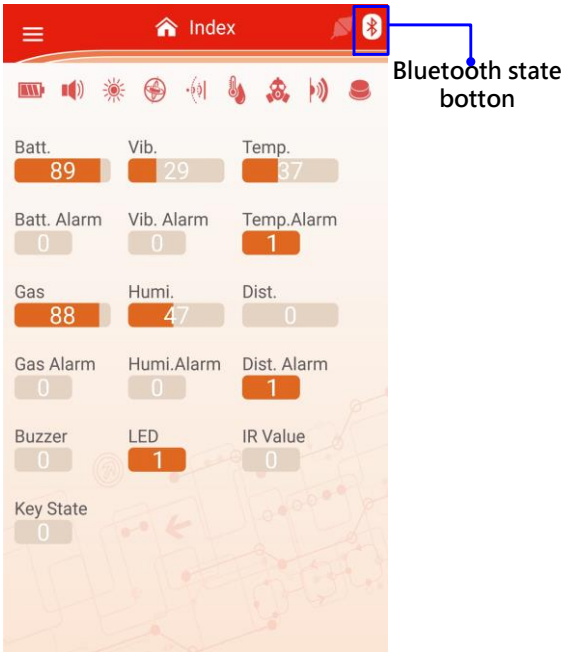
Click Bluetooth icon on any pages a list of Bluetooth devices will appear. Over the top of the paired

Bluetooth device, below the available Bluetooth devices. NuMaker Brick default Bluetooth name was [ITOM DM].



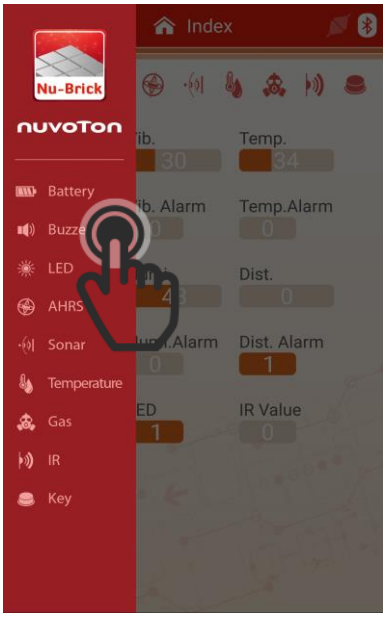


After click Bluetooth icon you want to connect, if it can establish connection between NuMaker Brick and NuBrick APP, Bluetooth icon will light up and update NuMaker Brick information on the page.



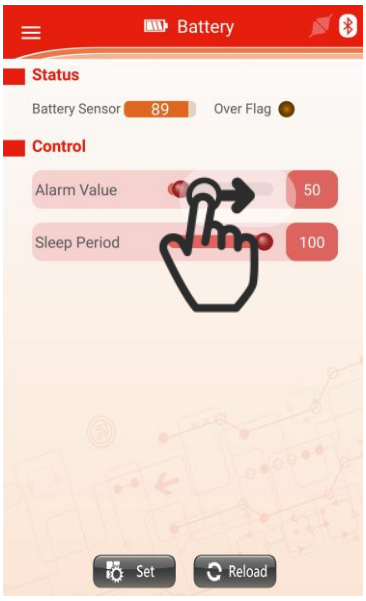
- Switch pages

Click the top left button to pull out the drop down menu, select the heading for the page, you can go directly to that page.

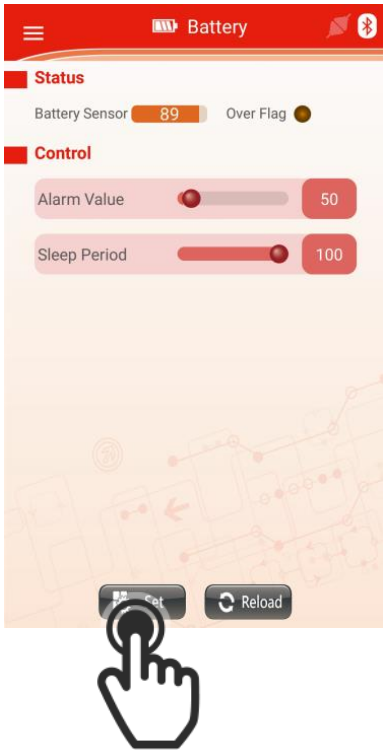


- Setting parameters

User can by sliding through gesture to change the value of each parameter module. Slide to the right to increase the parameter values on the control bar, slide to the left parameter value is reduced.



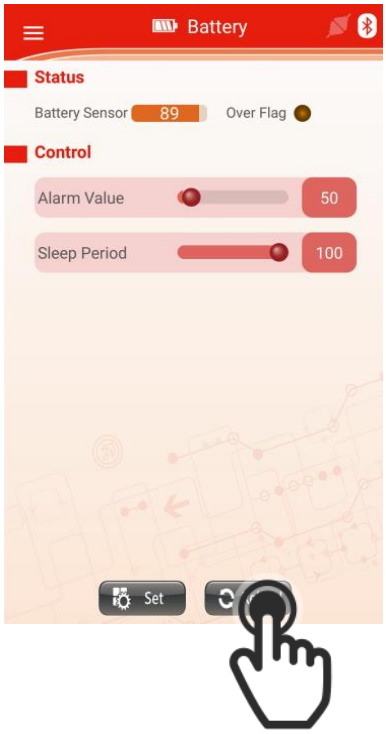
To avoid inadvertently touch control bar during operation, when the user slide control bar does not immediately make changes to the parameter values of the module. User must click the [Set] button on the screen that Nubrick APP all parameter values of the current page will be transmitted via Bluetooth to NuMaker Brick.



- Read parameters

User can read each module parameters thought Nubrick APP, only needs to click the [Reload] button

and it will update current module parameters on the page.



4.4 Page Description

4.4.1 Home

When a user opens Nubrick APP is the first to enter the home page. Home consists of two parts: the module connector and module information and status table, as shown in Figure 4-1.

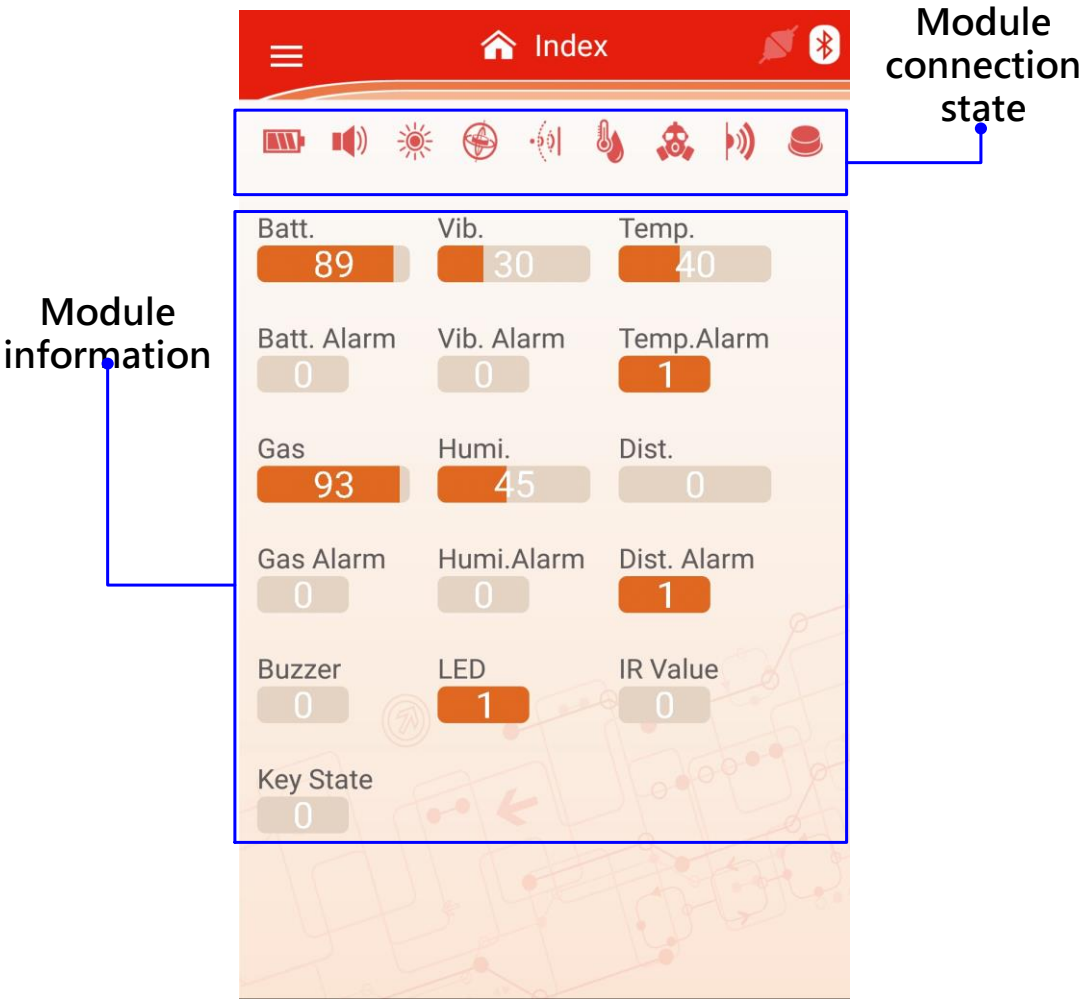


Figure 4-1 Page

- Module connection status table

This table indicates the NuMaker Brick current connection status, each icon represents modules refer to Table 4-1. When the module connected, module's icon will appear blue to indicate that the module is currently the state of the connection. When the module is offline icon is gray as shown in Figure 4-2. User can immediately know the current connection status of each module thought this table.

Table 4-1 Module icon table

Icon	Module
	Master (Battery)
	Buzzer
	RGB LED

	AHRS
	Sonar
	Temperature and humidity
	Gas
	IR
	Key

Figure 4-2 Module connection status diagram

- Module information table

This table contains all module current information, including battery, temperature, etc…, user can immediately know current status of each module, details can be refer to Table 4-2.

Table 4-2 Module information table

Name	Description
Batt.	Battey power
Batt. Alarm	Alarm status of battery power 0: No alarm occurs 1:Alarm occurs
Vib.	Vibration module currently measured value
Vib. Alarm	Alarm status of vibration 0: No alarm occurs 1: Alarm occurs
Temp.	Temperature and humidity module currently measured value
Temp. Alarm	Alarm status of temperature 0: No alarm occurs 1: Alarm occurs
Gas	Gas module currently measured value
Gas. Alarm	Alarm status of gas 0: No alarm occurs 1: Alarm occurs

Humi.	Humidity module currently measured value
Humi. Alarm	Alarm status of humidity 0: No alarm occurs 1: Alarm occurs
Dist.	Sonar module currently measured distance
Dist. Alarm	Alarm status of distance 0: No alarm occurs 1: Alarm occurs
Buzzer	Buzzer module current status
LED	RGB LED module current status
IR Value	IR module currently measured value
Key State	Key module current status

4.4.2 Module Related Page

Module related page is used to set input output relationship between each modules. NuMaker Brick contains two output modules (buzzer, RGB LED) and seven input modules(battery, temperature, etc…). Module related page can be divided to two column, one for buzzer module used to set relationship with each input module, the second is RGB LED module used to set relationship with each input module. This configuration page as shown in Figure 4-3. User only needs to click the module relationship you want and click [Set] button to compete the setting

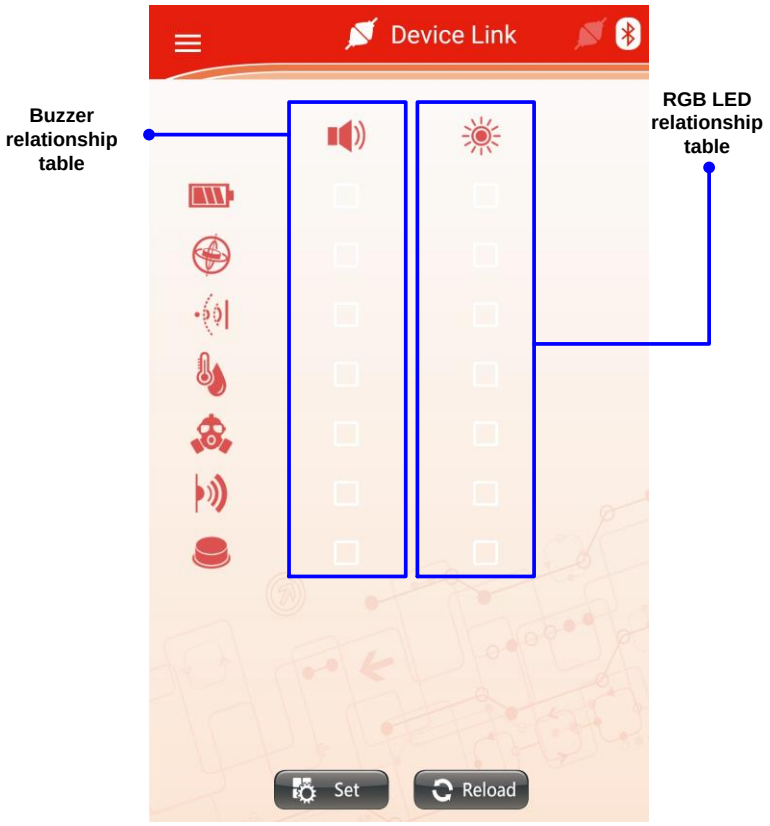


Figure 4-3 Module Related Page

4.4.3 Battery module page

Battery page as shown in Figure 4-4. This page shows the current status of the battery module consists of two parts: battery module status and control table.

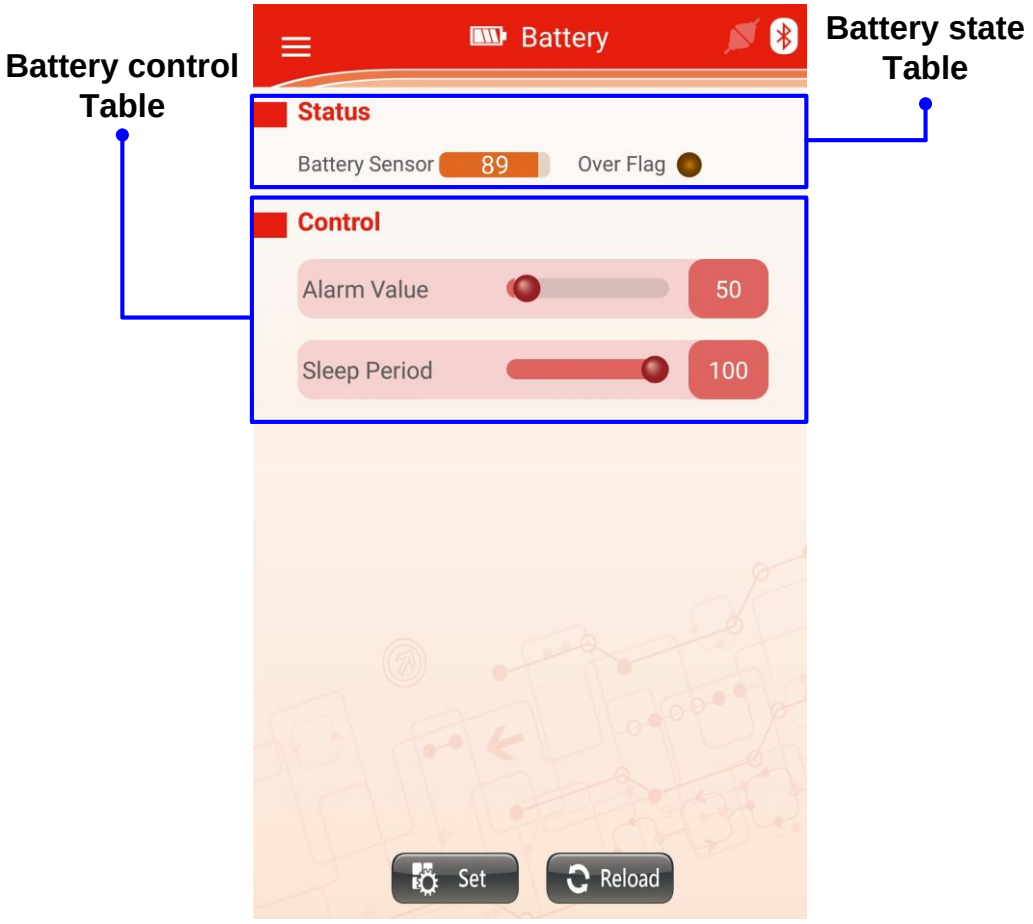


Figure 4-4 Battery module page

- Battery module status table

This table display the current status of battery module, the meaning of each value refer to Table 4-3.

Table 4-3 Battery module status table

Name	Description
Battery Sensor	Currently battery power(%)
Over flag	Low power alarm 0: Currently battery power higher than setting value 1: Currently battery power lower than setting value

- Battery module control table

This table is used to control battery module, the meaning of each parameter refer to Table 4-4.

Table 4-4 Battery module control parameters table

Name	Description
Battery Alarm Value	Low battery alarm value(%). When the current detection power lower than setting value will trigger a low battery alarm
Sleep Periold	Module sleep cycle (ms), lower the setting, the fastermodule reflash

4.4.4 Buzzer module page

Buzzer page as shown in Figure 4-5. This page shows the current status of the buzzer module consists of three parts: buzzer module status, control table and command table.

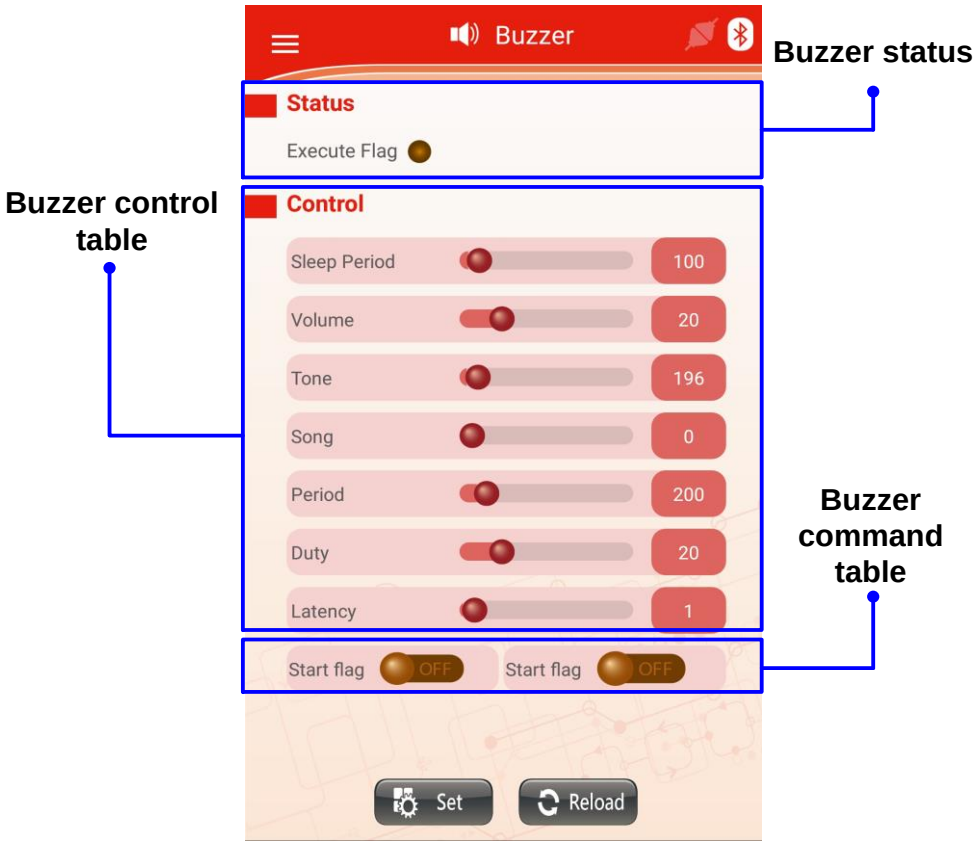


Figure 4-5 Buzzer module page

- Buzzer module status table

This table display the current status of buzzer module, the meaning of each value refer to Table 4-5.

Table 4-5 Buzzer module status table

Name	Description
Execute flag	Display buzzer whether operation 0:Current no operation 1:Current operation

- Buzzer module control table

This table is used to control buzzer module, meaning of each parameter refer to Table 4-6.

Table 4-6 Buzzer module control parameters table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Volume	Volume(%)
Tone	Tone(Hz)
Song	Setting which music played when buzzer action 0:Single tone 1:Default song
Period	Single tone play period(ms)
Duty	Single tone play duty, the higher, the value the faster sound
Latency	Buzzer alarm operation time(sec),the higher number, the longer buzzer alarm

- Buzzer module command table

This table can command buzzer module operation, the meaning of each parameter refer to Table 4-7.

Table 4-7 Buzzer module parameters command table

Name	Description
Start flag	Force buzzer start
Stop flag	Force buzzer stop

4.4.5 RGB LED module page

RGB LED module page as shown in Figure 4-6. This page shows the current status of the RGB LDE module consists of three parts: RGB LED module status, control table and command table.

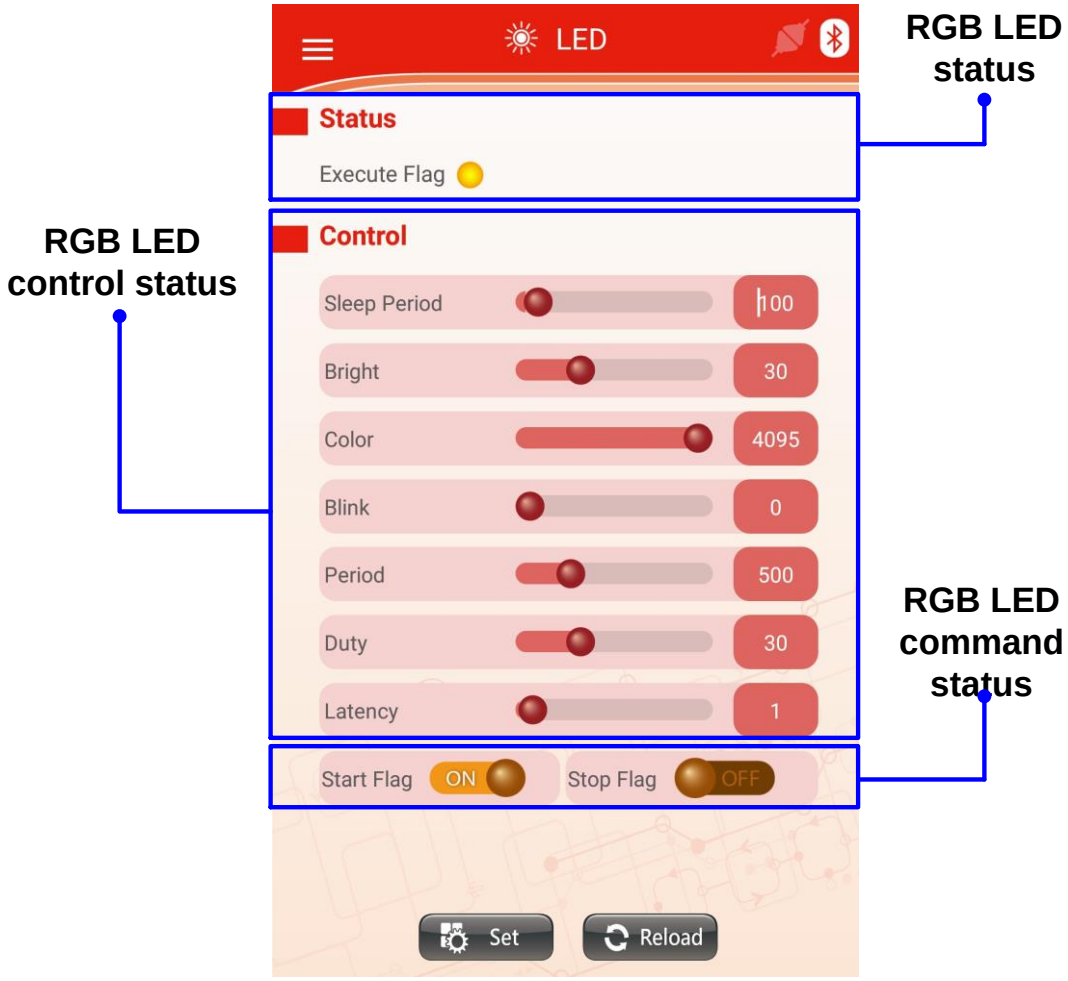


Figure 4-6 RGB LED module page

- RGB LED module status table

This table display the current status of RGB LED module, the meaning of each value refer to Table 4-8.

Table 4-8 RGB LED module state table

Name	Description
Execute flag	Display buzzer whether operation 0:Current no operation 1:Current operation

- RGB LED module control table

This table is used to control RGB LED module, the meaning of each parameter refer to Table 4-9.

Table 4-9 RGB LED module control parameters table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Bright	LED bright(%), the higher value, the brighter LED.
Color	LED color(Max:FFF, max blue is xxF, max green is xFx, max red is Fxx)
Blink	LED flashing mode 0:According setting value flash 1:According to default music frequency flash 2:User defined
Period	LED flash period(ms)
Duty	LED blinking period in light of the duty cycle in ms (%)
Latency	LED alarm time(sec), the higher number, the longer LED alarm

- RGB LED module command table

This table can command RGB LED module operation, the meaning of each parameter refer to Table 4-10.

Table 4-10 RGB LED module parameters command table

Name	Description
Start flag	Force RGB LED start
Stop flag	Force RGB LED stop

4.4.6 Vibration module page

Vibration module page as shown in Figure 4-7. This page shows the current status of the vibration module consists of two parts: vibration module status and control table.

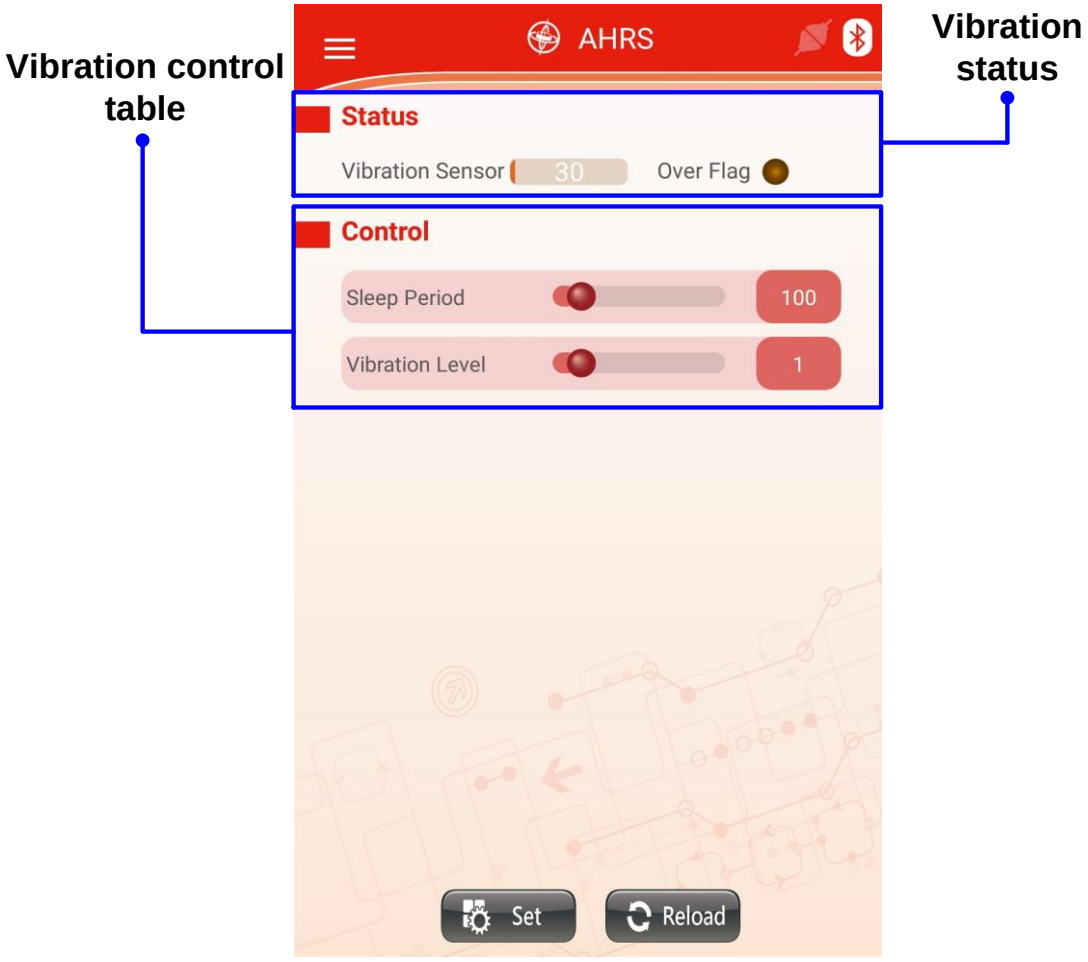


Figure 4-7 Vibration module page

- Vibration module status table

This table display the current status of vibration module, the meaning of each value refer to Table 4-11.

Table 4-11 Vibration module status table

Name	Description
Vibration sensor	Currently detected vibration value
Over flag	Vibration alarm 0:Current vibration value lower than setting value 1:Current vibration value higher than setting value

- Vibration module control table

This table is used to control vibration module, the meaning of each parameter refer to Table 4-12.

Table 4-12 Vibration module control parameters table

Name	Description
Sleep period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Vibration Level	Vibration alarm level(%), the lower number, the more sensitive

4.4.7 Sonar module page

Sonar module page as shown in Figure 4-8. This page shows the current status of the sonar module consists of two parts: vibration module status and control table.

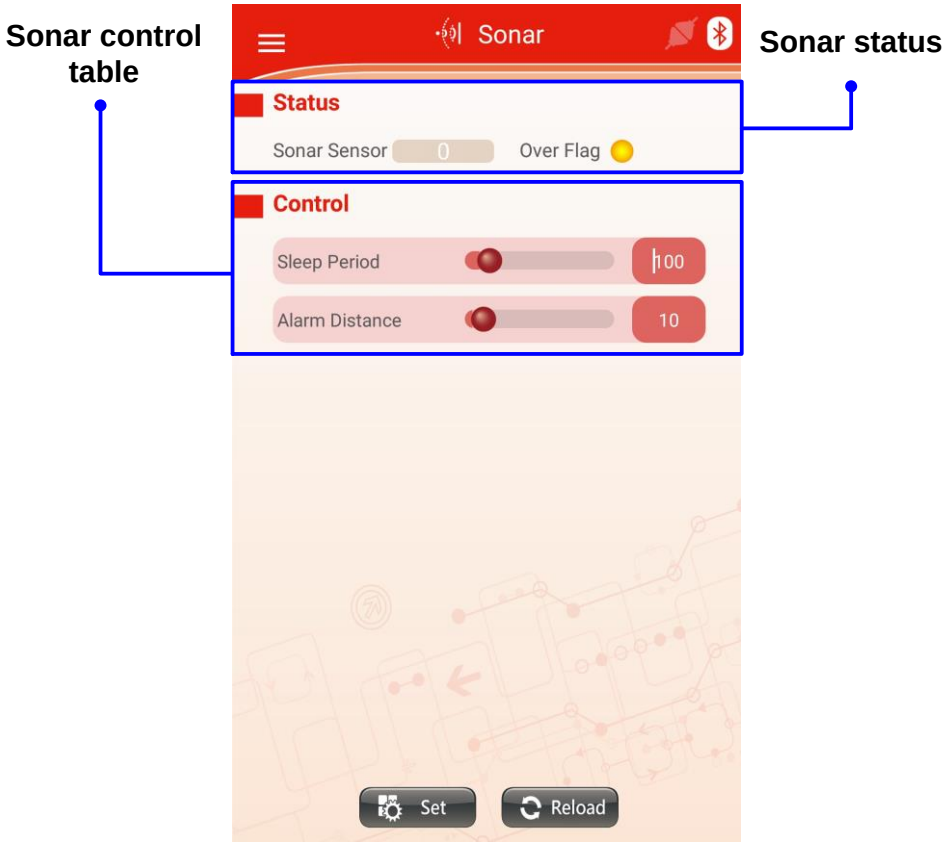


Figure 4-8 Sonar module page

- Sonar module status table

This table display the current status of sonar module, the meaning of each value refer to Table 4-13.

Table 4-13 Sonar module status table

Name	Description
Sonar sensor	Current sonar detected distance(cm)
Over flag	Distance alarm 0:Current distance lower than setting value 1:Current distance higher than setting value

- Sonar module control table

This table is used to control sonar module, meaning of each parameter refer to Table 4-14.

Table 4-14 Sonar module control parameters table

Name	Description
Sleep period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Alarm distance	Sonar alarm distance(cm)

4.4.8 Temperature and humidity module page

Temperature and humidity module page as shown in Figure 4-9. This page shows the current status of the temperature and humidity module consists of two parts:temperature and humidity module status and control table.

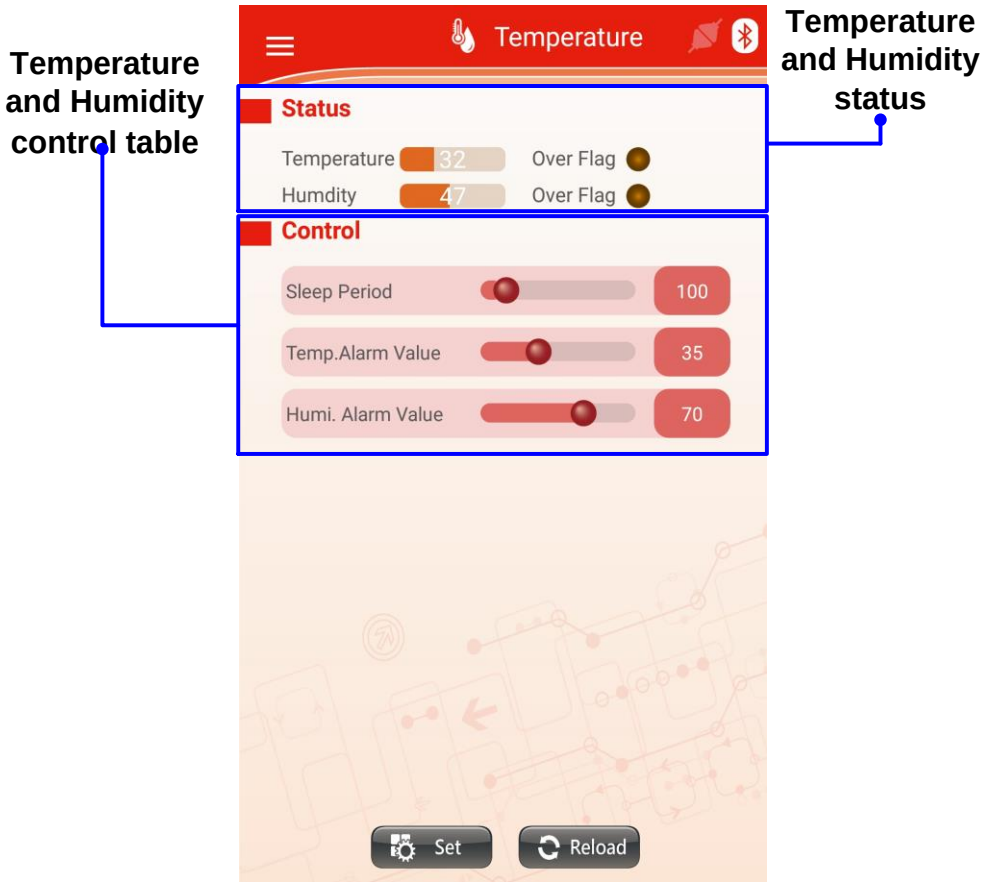


Figure 4-9 temperature and humidity module page

- Temperature and humidity module status table

This table display the current status of temperature and humidity module, the meaning of each value refer to Table 4-15.

Table 4-15 Temperature and humidity module status table

Name	Description
Temperature sensor	Current detected temperature (℃)
Temperature over flag	Temperatur alarm 0:Current temperature lower than setting value 1:Current temperature higher than setting value
Humdity sensor	Current detected humidity (%)
Humdity over flag	Humidity alarm 0: Current humidity lower than setting value 1: Current humidity higher than setting value

- Temperature and humidity module control table

This table is used to control temperature and humidity module, the meaning of each parameter refer to Table 4-16.

Table 4-16 Temperature and humidity module parameters control table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Temp. alarm value	Temperature alarm value(℃)
Humi. alarm value	Humidity alarm value(%)

4.4.9 Gas module page

Gas module page as shown in Figure 4-7Figure 4-10. This page shows the current status of the gas module consists of two parts:gas module status and control table.

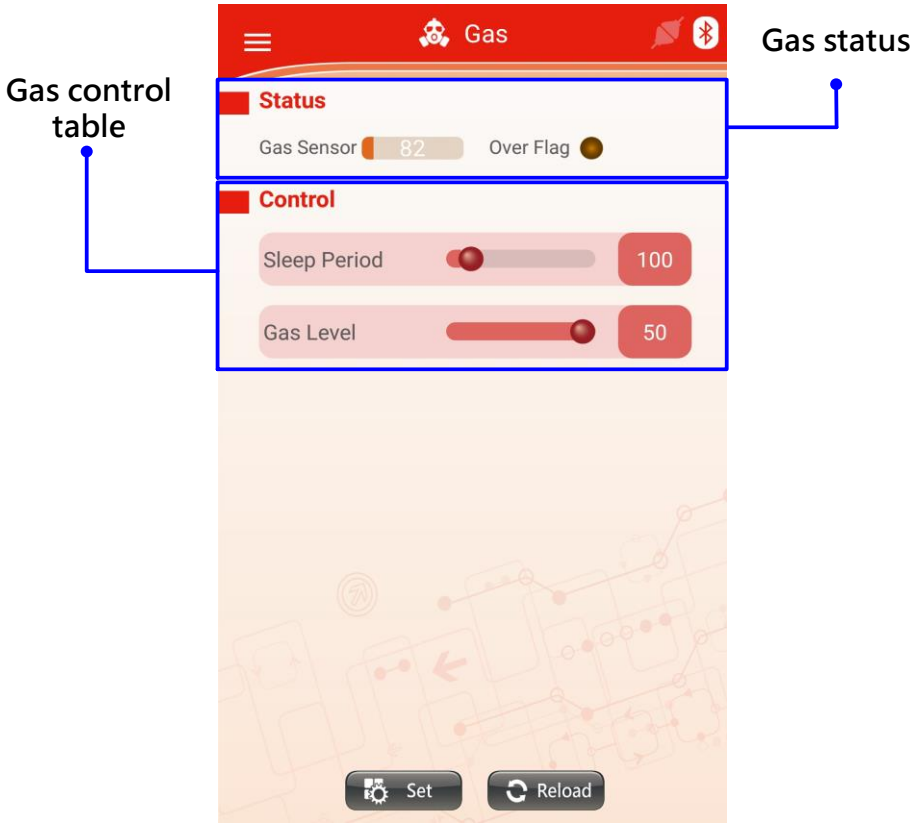


Figure 4-10 Gas module page

- Gas sensor module status table

This table display the current status of gas sensor module, the meaning of each value refer to Table 4-17.

Table 4-17 Gas module status table

Name	Description
Gas sensor	Current detected gas concentration (%), the lower number, the higher gas concentration. The normal range is 80 or more
Over flag	0:Current gas concentration lower than setting value 1:Current gas concentration lower than setting value

- Gas module control table

This table is used to control gas sensor module, the meaning of each parameter refer to Table 4-18.

Table 4-18 Gas module parameters control table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Gas Level	Gas detection sensitivity set value, the higher value, the more sensitive and more likely to trigger alarm

4.4.10 IR module page

IR module page as shown in Figure 4-11. This page shows the current status of the IR module consists of two parts:IR module status, control table and command table.

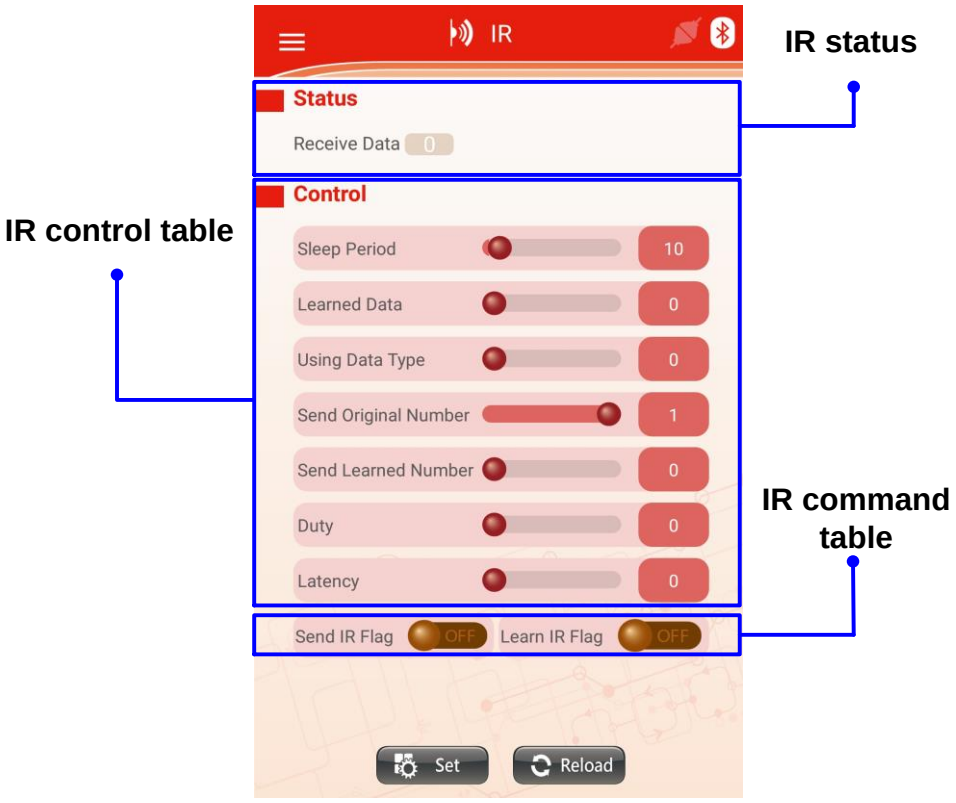


Figure 4-11 IR module page

- IR module status table

This table display the current status of IR module, the meaning of each value refer to Table 4-19.

Table 4-19 IR module status table

Name	Description
Receive Data	Displays the current IR whether the received data

- IR module control table

This table is used to control IR module, the meaning of each parameter refer to Table 4-20.

Table 4-20 IR module parameters control table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash
Learned Data	Display how many data IR module learned
Using Data Type	Use which IR data 0:Use defaule IR data 1:Use learned IR data
Send Original number	Send which default IR data
Send Learned number	Send which learned data

- IR module command table

This table can command IR module operation, the meaning of each parameter refer to Table 4-21.

Table 4-21 IR module parameters command table

Name	Description
Send IR flag	Command IR module send data
Learn IR flag	Command IR module learn data

4.4.11 Buttons module

Buttons module page as shown in Figure 4-12. This page shows the current status of the Buttons module consists of two parts: Buttons module status and control table.

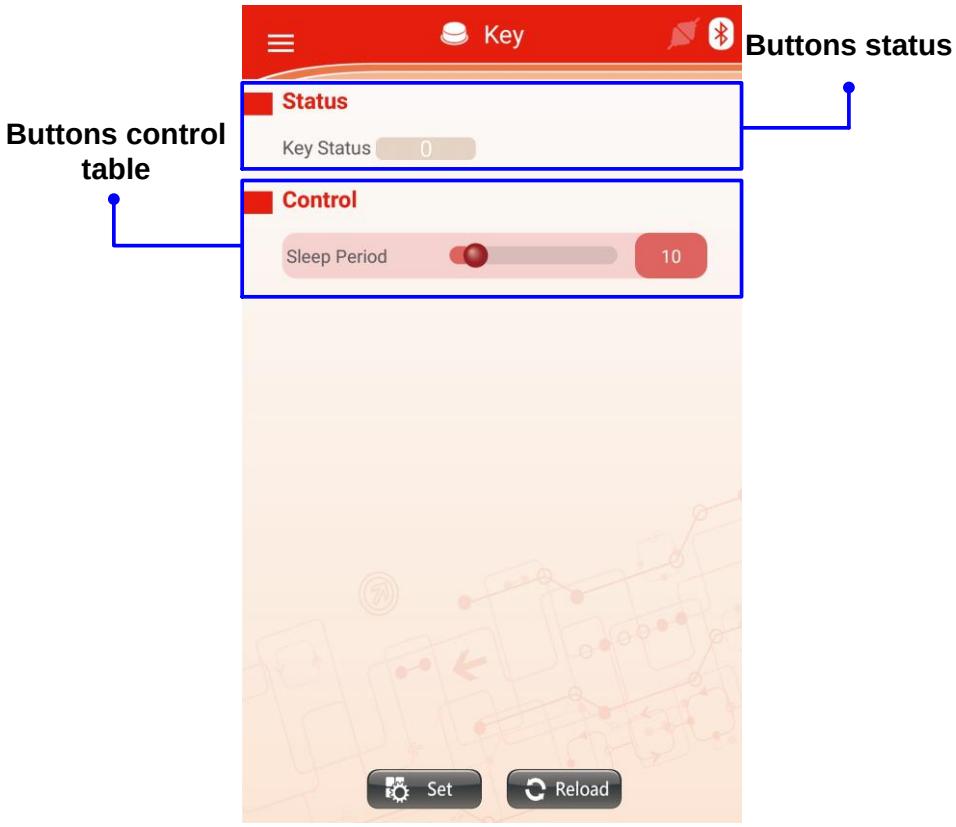


Figure 4-12 Key module

- Buttons module status table

This table display the current status of Buttons module, the meaning of each value refer to Table 4-22.

Table 4-22 Buttons module status table

Name	Description
Buttons Status	Current Buttons status

- Buttons module control table

This table is used to control Buttons module, meaning of each parameter refer to Table 4-23.

Table 4-23 Buttons module parameters control table

Name	Description
Sleep Period	Module sleep cycle (ms), lower the setting, the fastermodule reflash

5 NUBRICK REFERENCE DESIGN

NuMaker Brick is an IoT open development platform. User can stack each module in any order. Without modified any program, user can connect NuMaker Brick to smartphone and sets parameter at each module. The possibility of application is depended on the user's imagination. Such highly flexibility is the most significant thing that NuMaker Brick has. Following we provide some application solution for user reference.

5.1 Home security

Home security application uses the vibration, sonar, buzzer and LED module on Numaker Brick. Put those module on the door or window. When the door are opened, it will trigger buzzer to ring. Inform user that the door is opened.

5.1.1 Home security module connection

Home security application uses the vibration and sonar to sensing doors state. Connecting buzzer module to inform user door state. Following Figure 5-1 is the connection diagram.

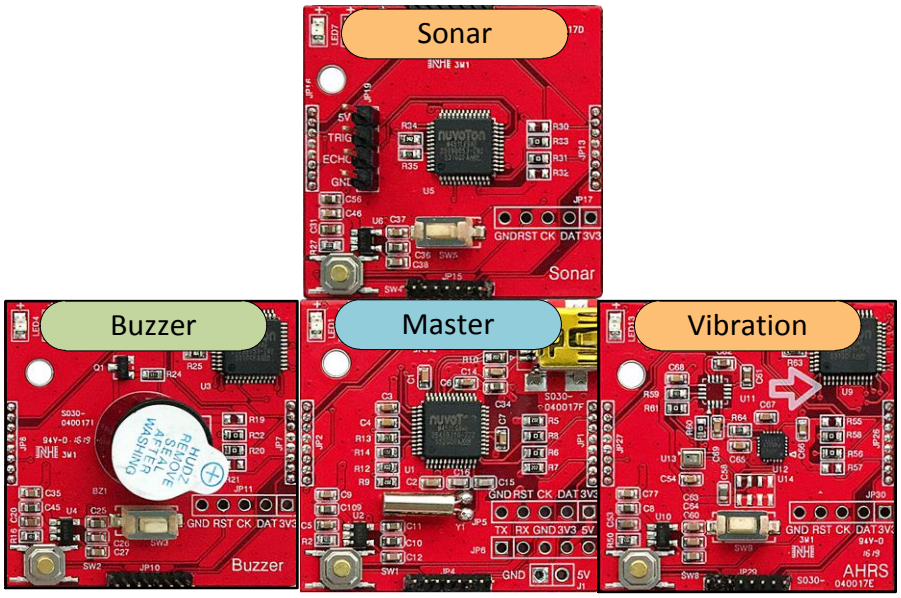


Figure 5-1 Home security module connection diagram

5.1.2 Home security module setting

- Module connection page

  Set the relationship between Vibration, sonar, and buzzer. In case the door is in abnormal state, trigger buzzer to make noise. Following Figure 5-2 represent the setting diagram.

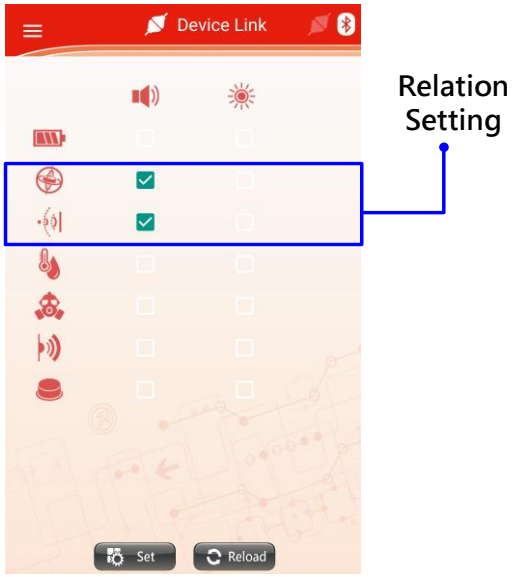


Figure 5-2 Module connection page

- Buzzer page

  To inform user that the door is abnormal sets volume to maximum. Figure 5-3 shown buzzer page.

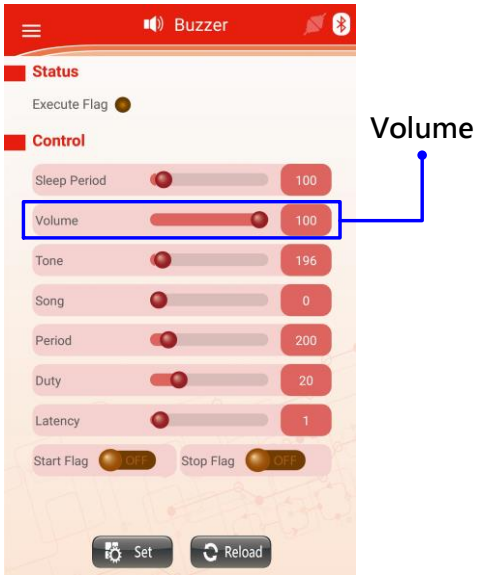


Figure 5-3 Buzzer page

- Vibration page

  To avoid Malfunction, sets vibration level to the third level. User can adjust according to the actual application situation. Figure 5-4 shown vibration page.

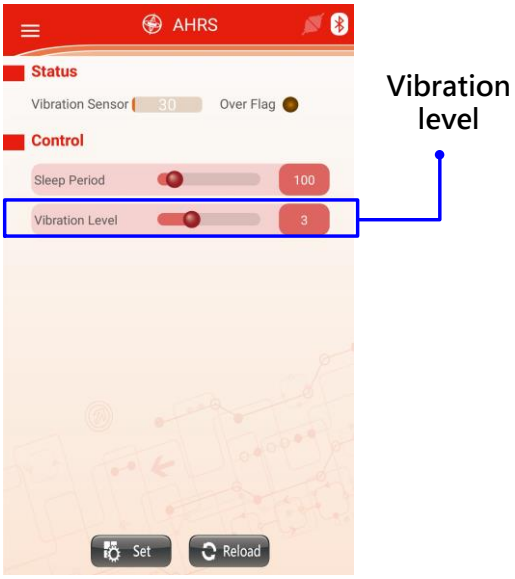


Figure 5-4 Vibration page

- Sonar page

  It will trigger alarm when the distance value of sonar module is less than 90 cm. the user will be warming that the door is opened. User can adjust setting according to the application situation. Figure 5-5 shown Sonar page.

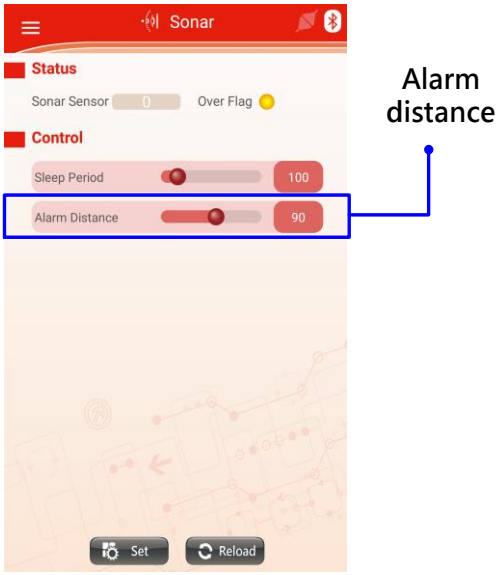


Figure 5-5 Sonar page

5.2 Kitchen security

Kitchen security application uses the temperature, gas, IR, buzzer and LED module on Numaker Brick. When the temperature are too high or gas concentration is too high, it will inform user.

5.2.1 Kitchen security module connection

Kitchen security application uses the gas and temperature to sensing kitchen state. Connecting buzzer and LEDmodule to inform user door state. Following Figure 5-6 is the connection diagram.

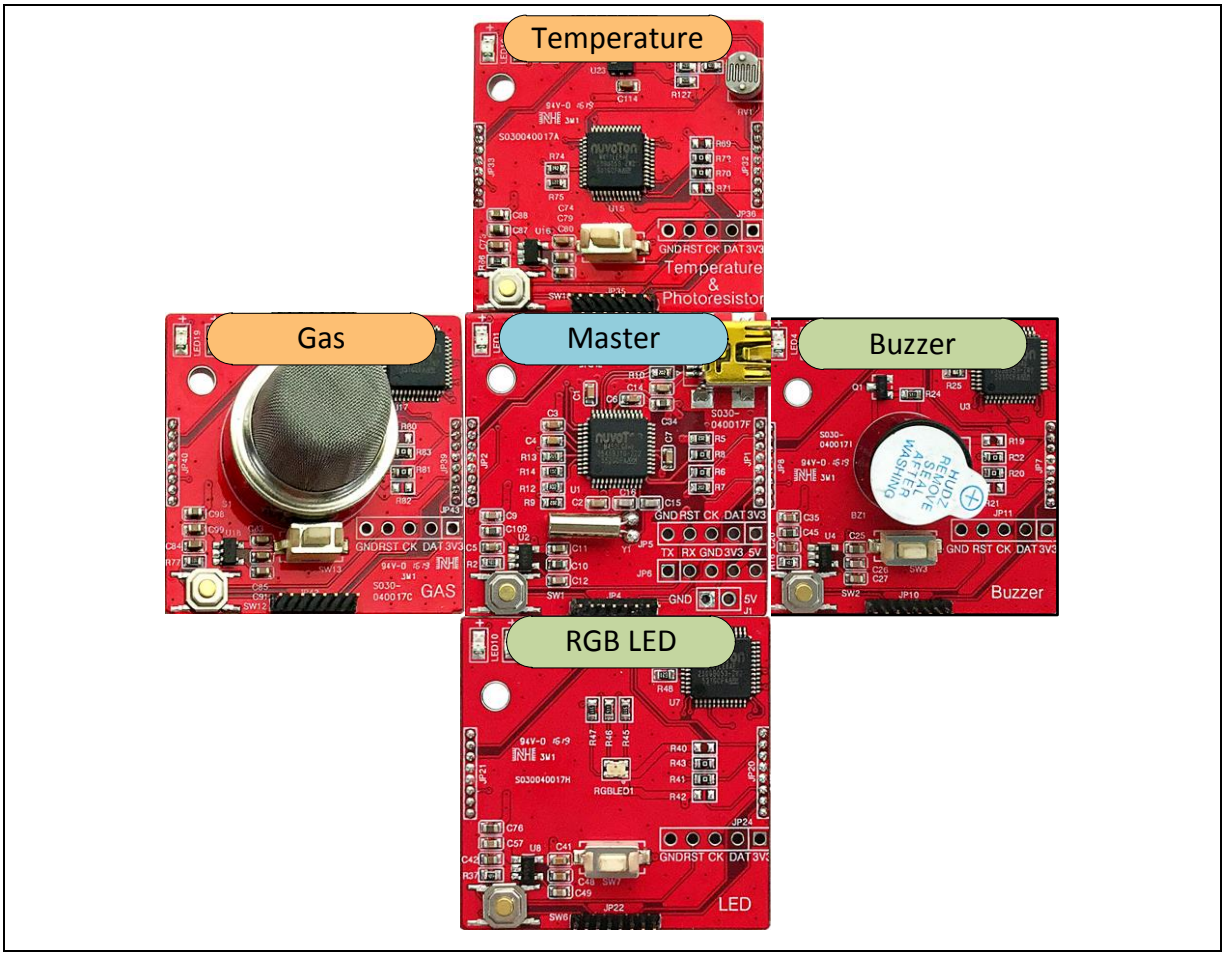


Figure 5-6 Kitchen security module connection diagram

5.2.2 Kitchen security module connection diagram

- Module connection page

  Set the relationship between temperature, gas, buzzer and LED. In case when there are abnormal states in kitchen, trigger buzzer to make noise. Following Figure 5-7 represent the setting diagram.

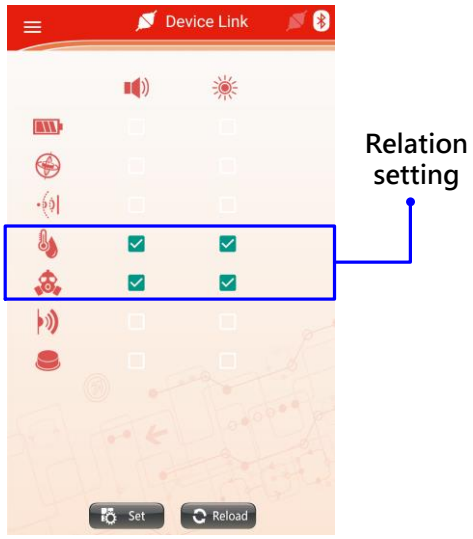


Figure 5-7 Module connection page

- Buzzer page

  To inform user that there are abnormal states, user sets volume to maximum. Figure 5-8 shown buzzer page.

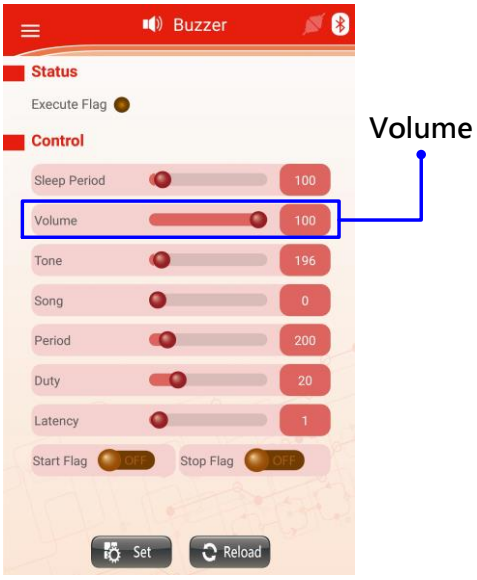


Figure 5-8 Buzzer page

- LED page

  To inform user that there are abnormal states, user sets brightness to maximum. **Error! Reference source not found.**shown LED page.

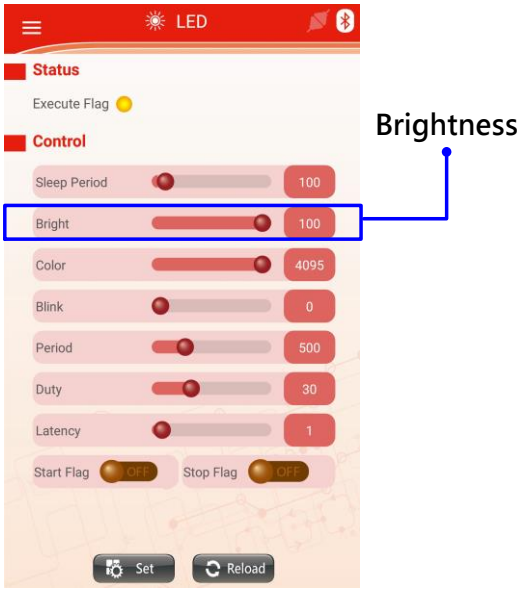


Figure 5-9 LED page

- Temperature and humidity page

  To inform user that the temperature or humidity is not normal, sets temperature alarm value to 40 ℃, humidity alarm value to 70%. When the temperature or humidity is not normal, trigger buzzer and LED module to inform user. Figure 5-10 shown temperature and humidity page.

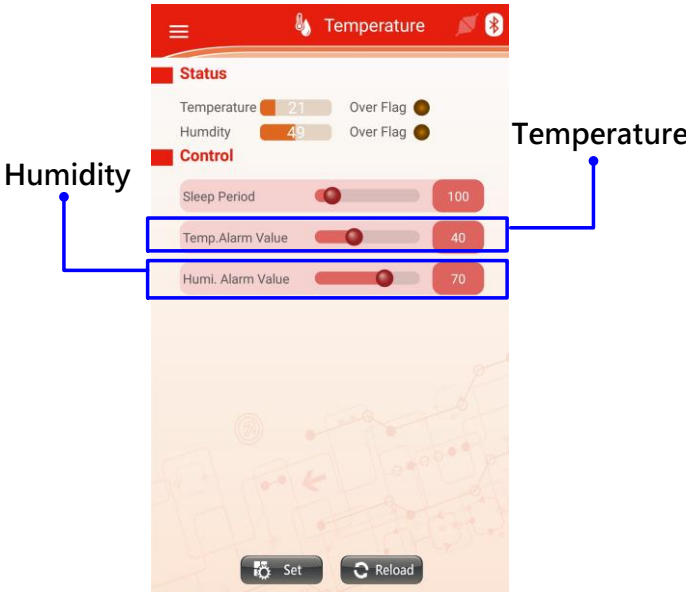


Figure 5-10 Temperature and humidity page

- Gas page

  To avoid gas leakage, we set the gas sensitivity to the highest level. When gas concentration is too high, trigger buzzer and LED module to inform user. Figure 5-11 shown gas page.

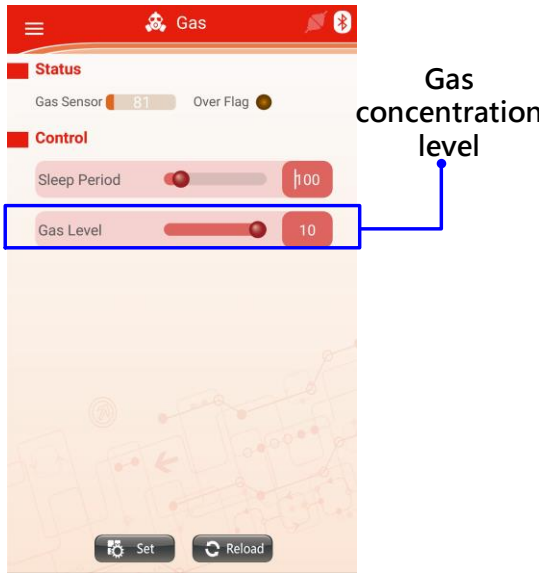


Figure 5-11 Gas page

6 NUMAKER BRICK MODULE SCHEMATIC

6.1 Master schematic

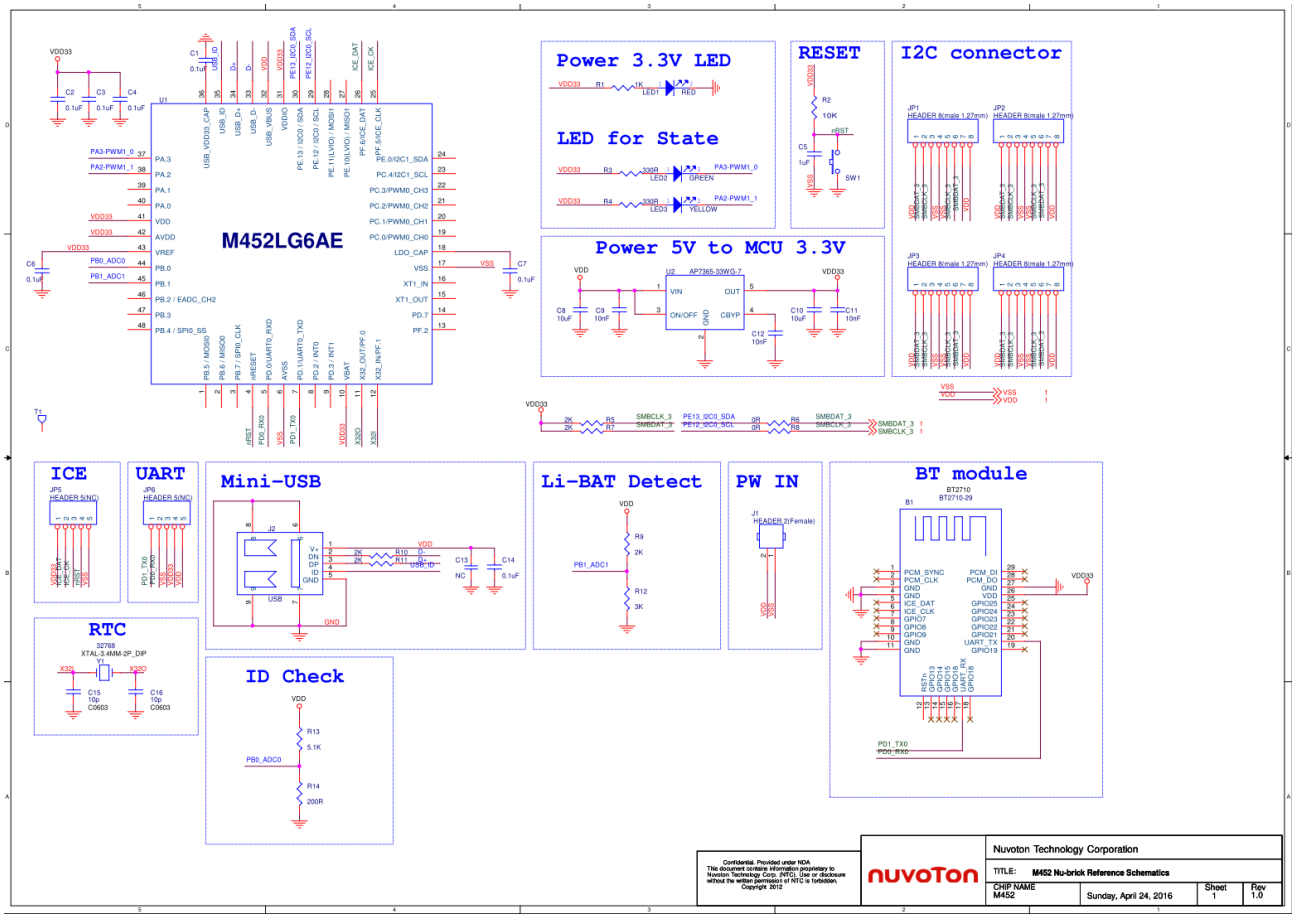


Figure 6-1 Master schematic

6.2 Buzzer module schematic

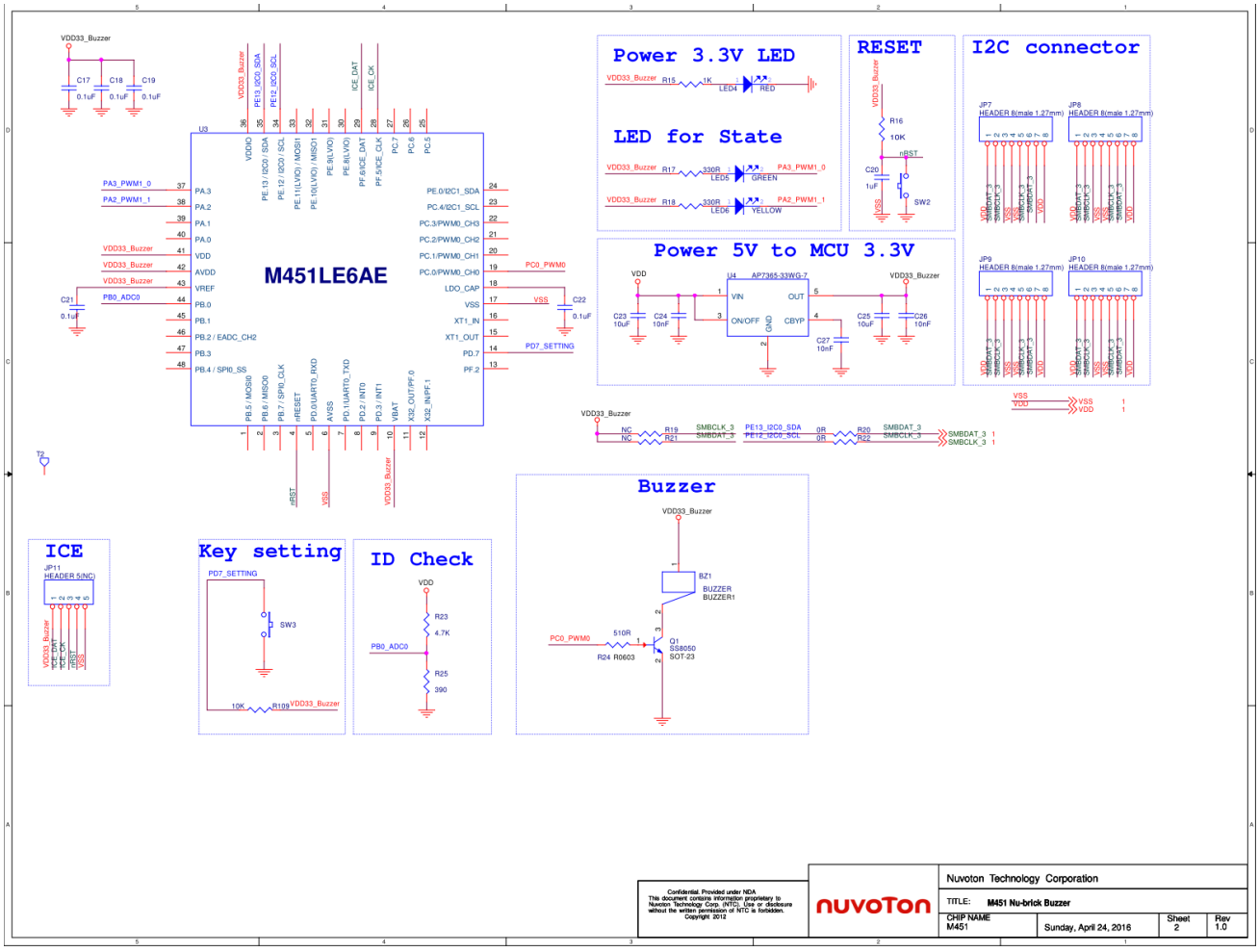


Figure 6-2 Buzzer module schematic

6.3 Sonar module schematic

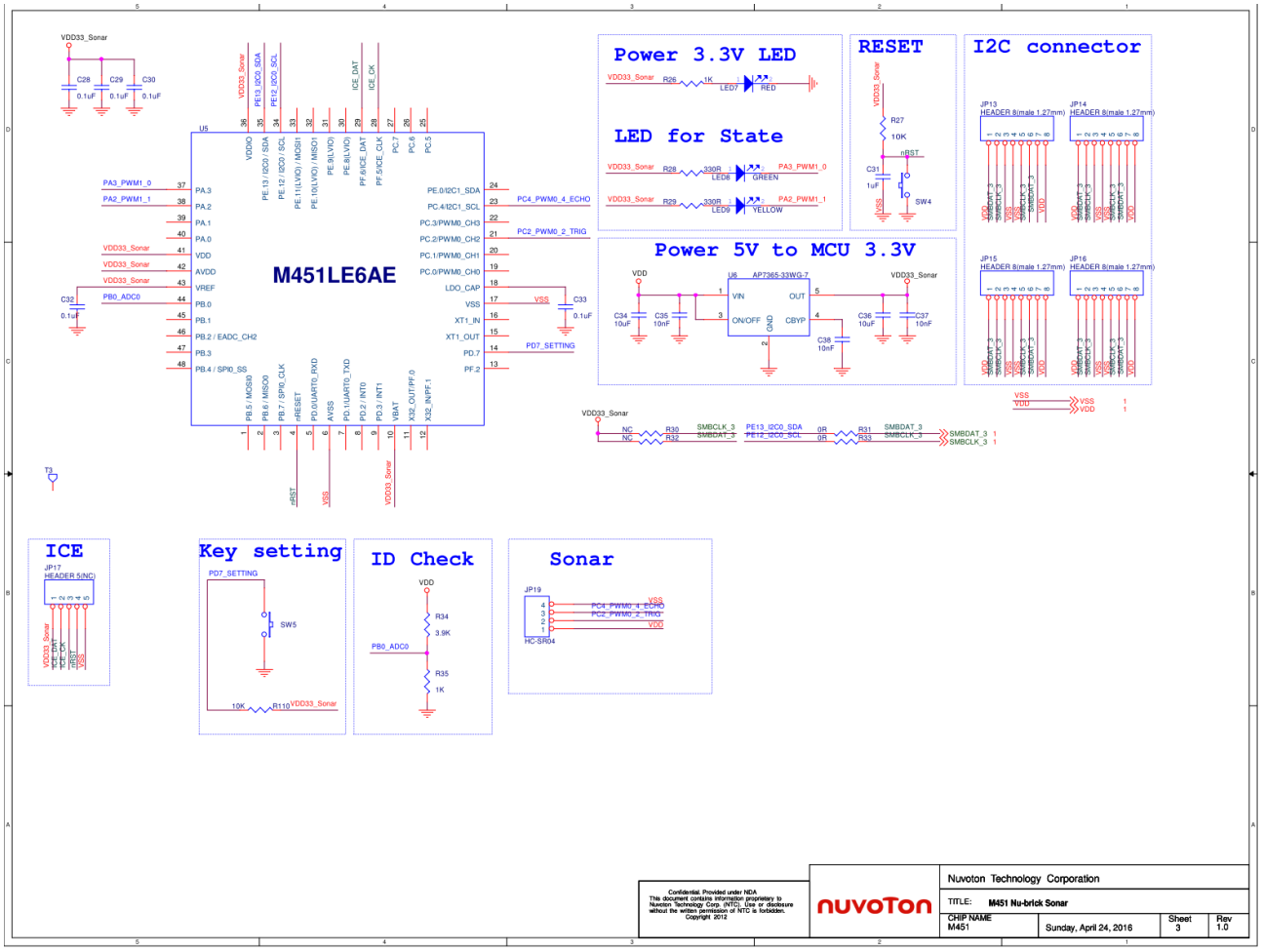


Figure 6-3 Sonar module schematic

6.4 RGB LED module schematic

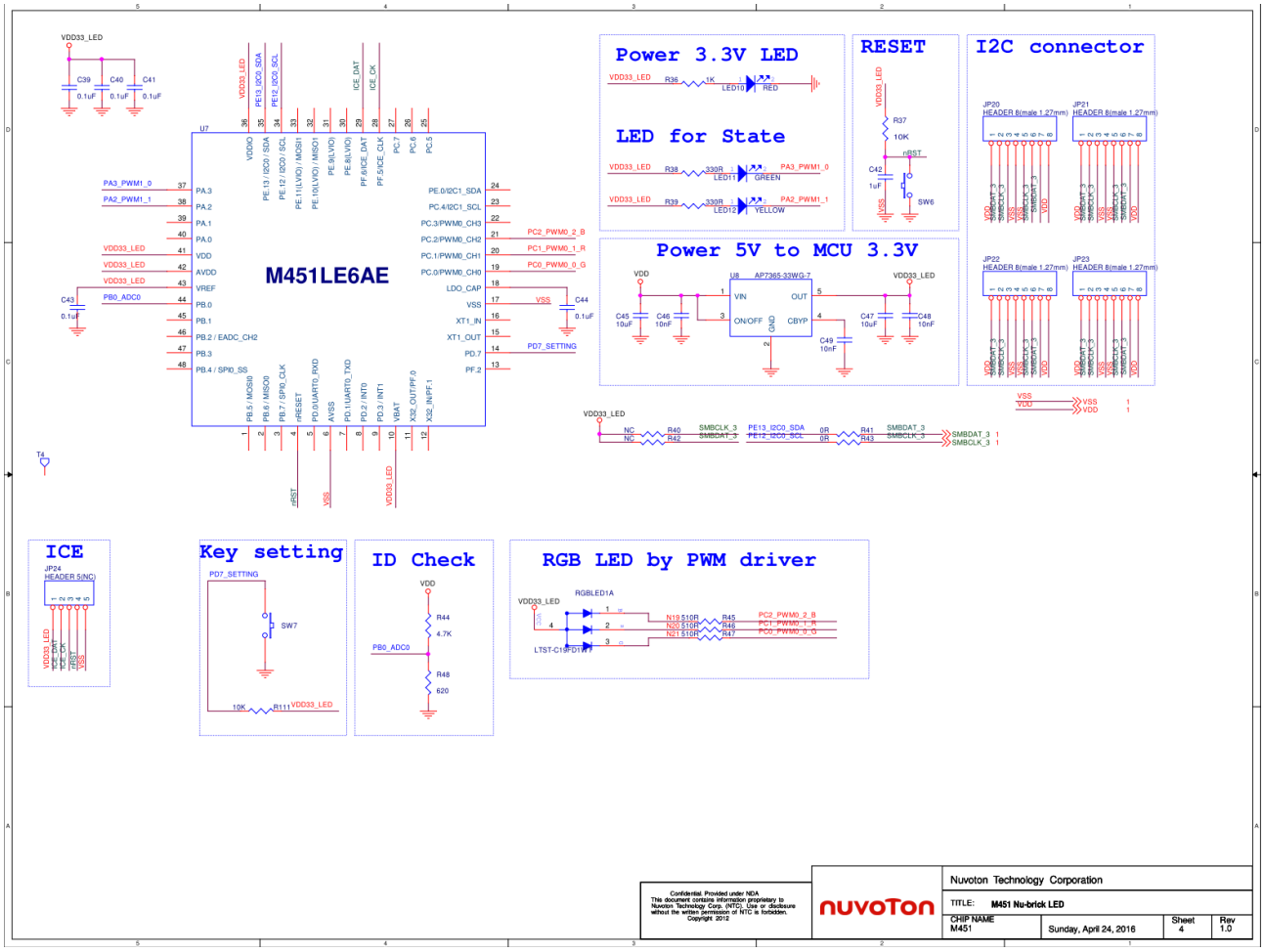


Figure 6-4 RGB LED module schematic

6.5 Vibration module schematic

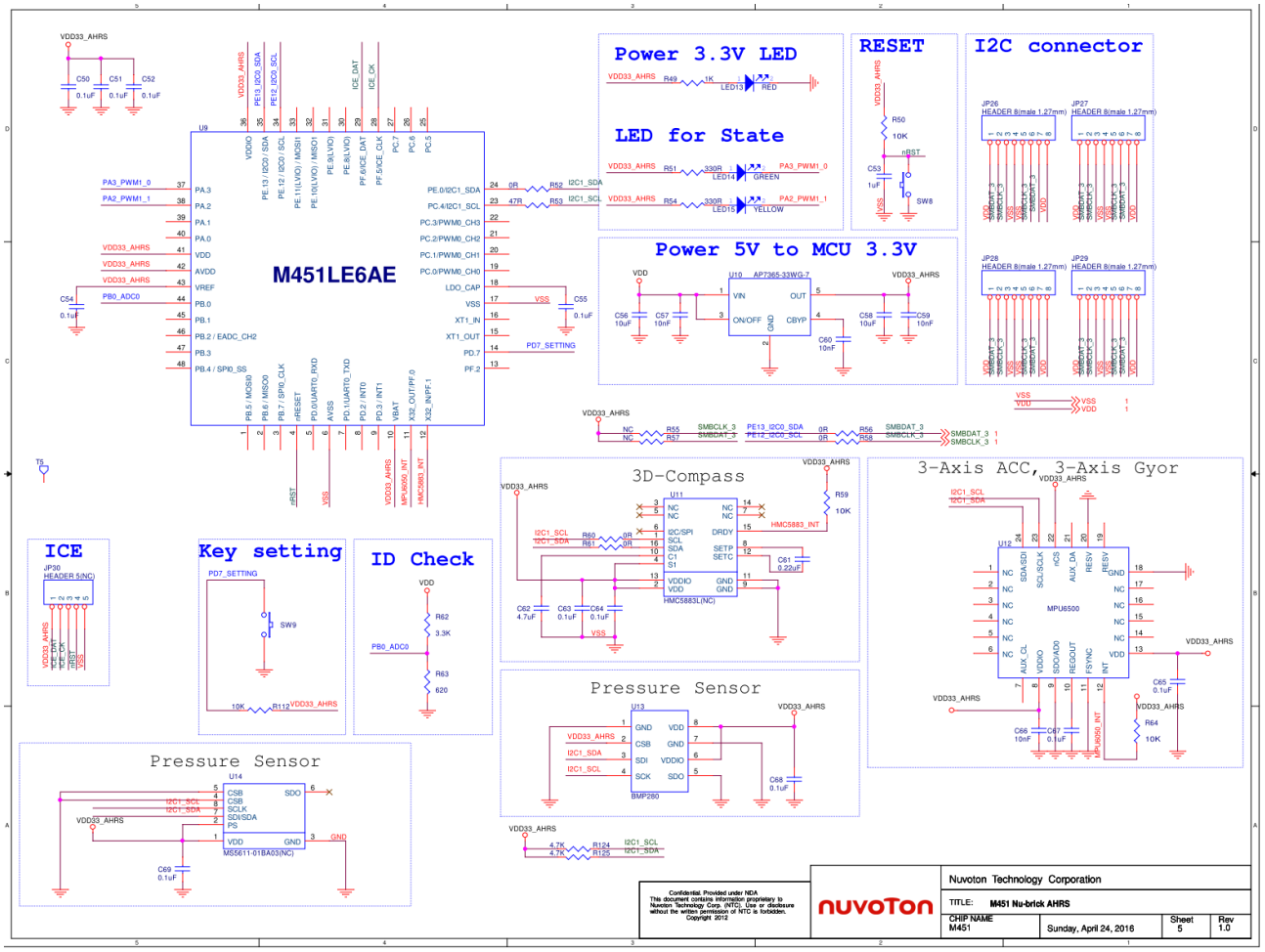


Figure 6-5 Vibration module schematic

6.6 Temperature and humidity module schematic

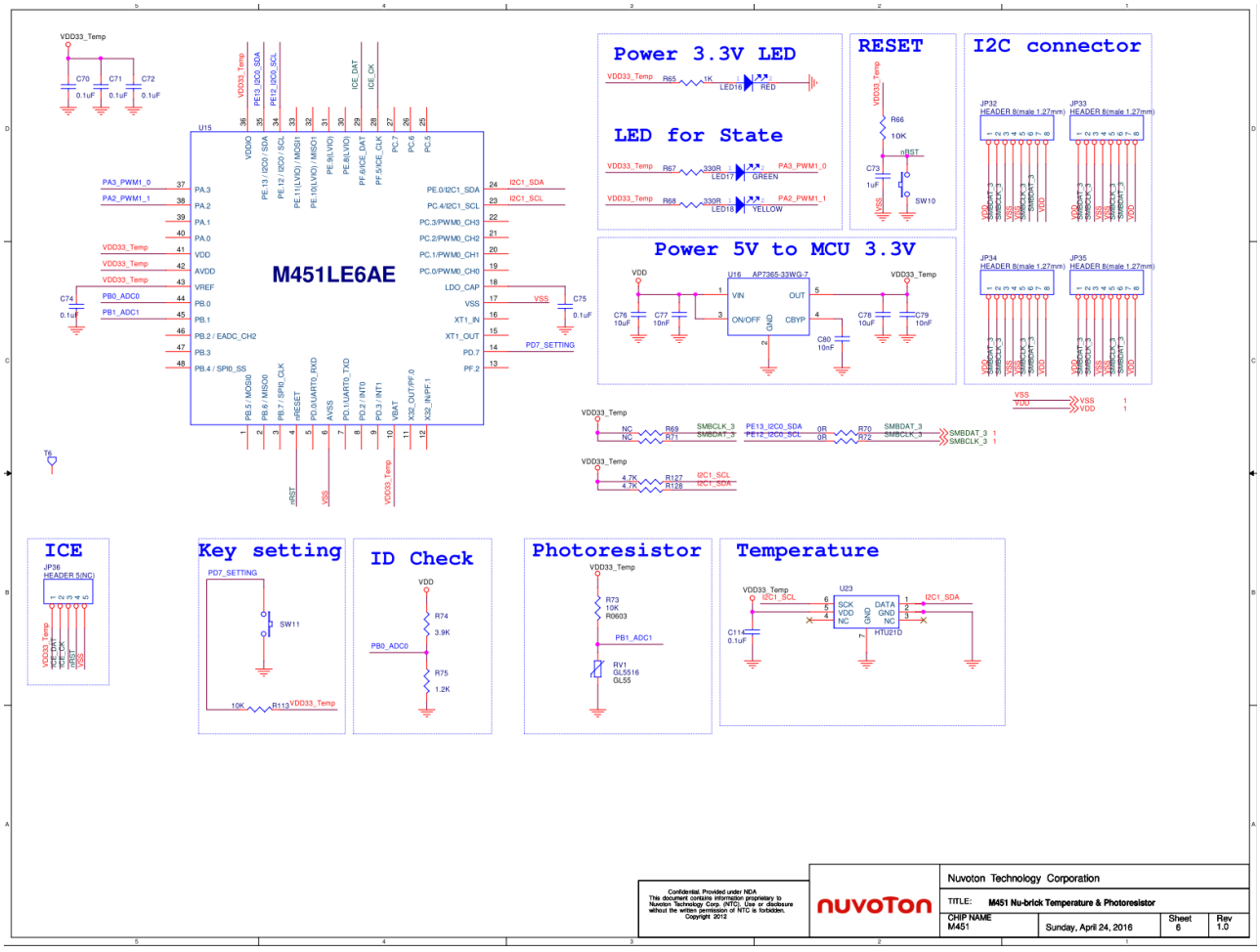


Figure 6-6 Temperature and humidity module schematic

6.7 Gas module schematic

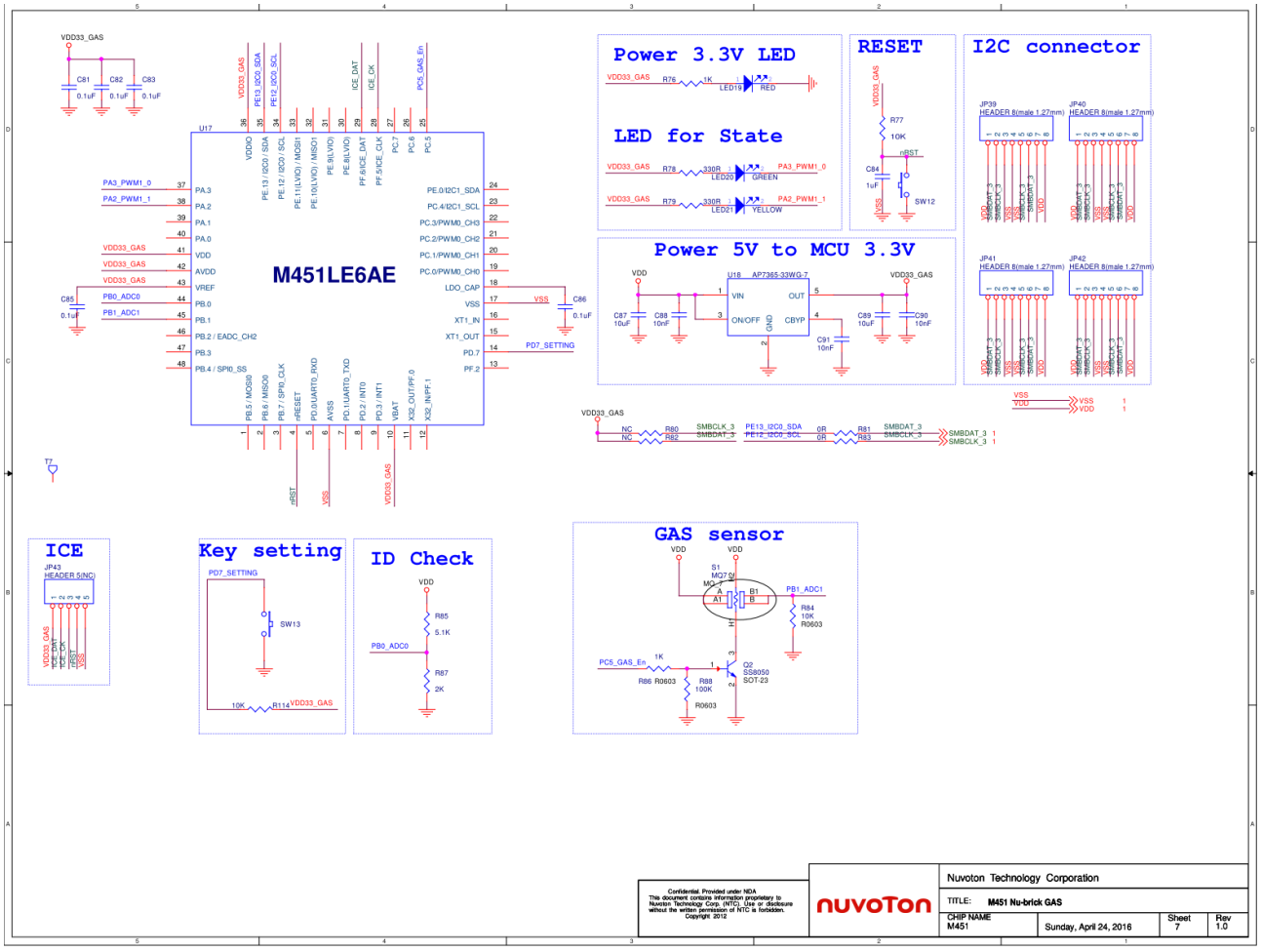


Figure 6-7 Gas module schematic

6.8 Infrared module schematic

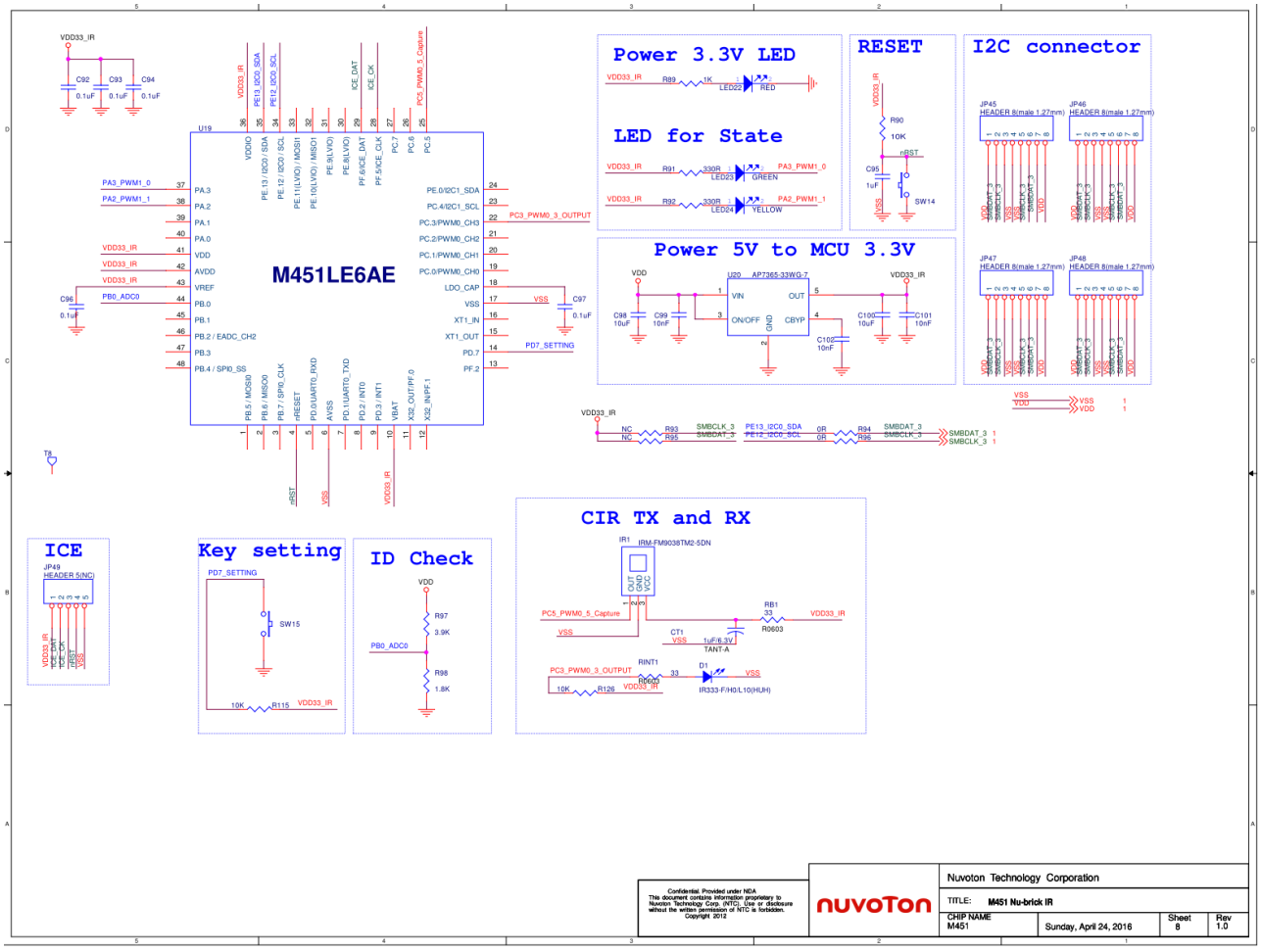


Figure 6-8 Infrared module schematic

6.9 Key module schematic

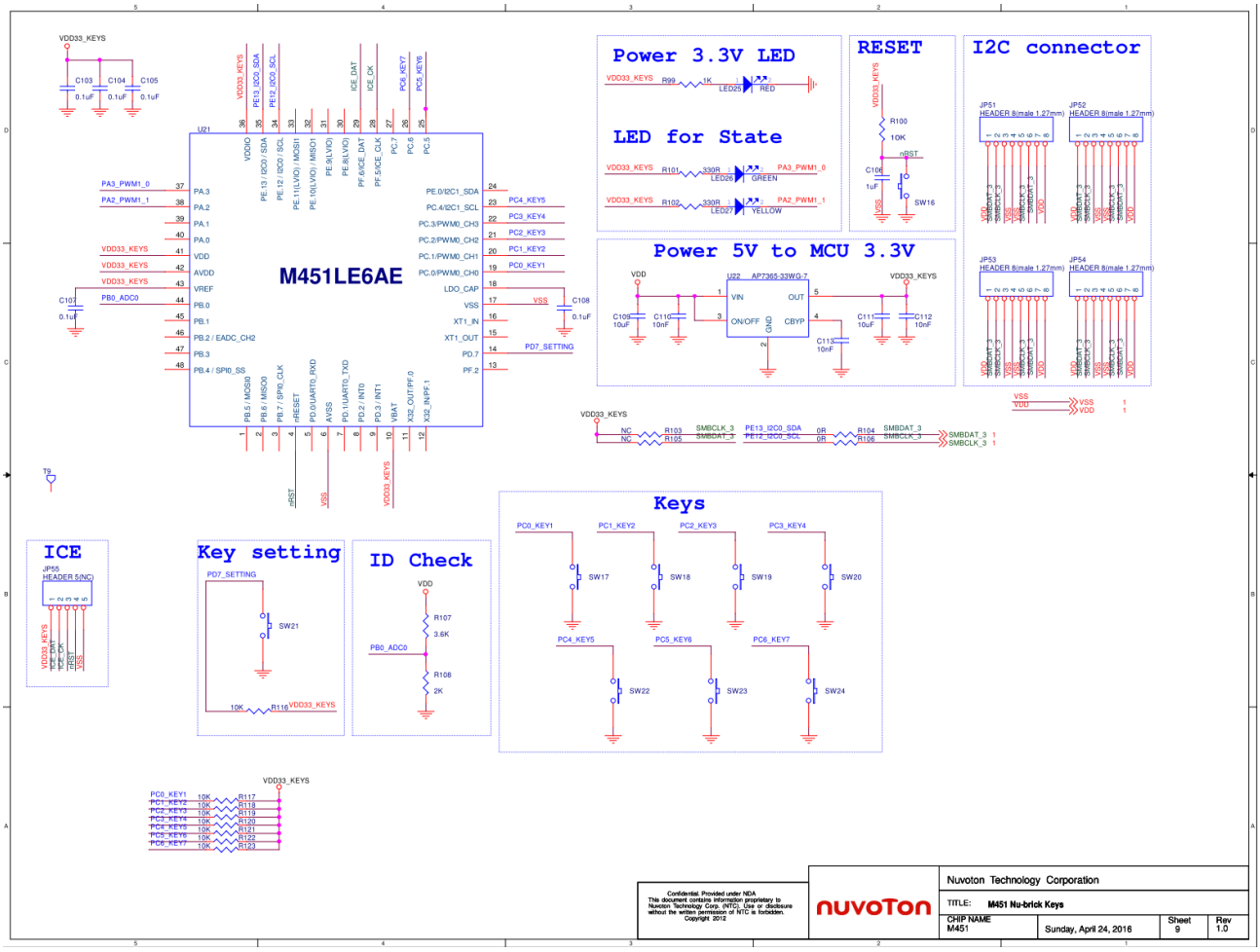


Figure 6-9 Key module schematic

6.10 Extension module schematic

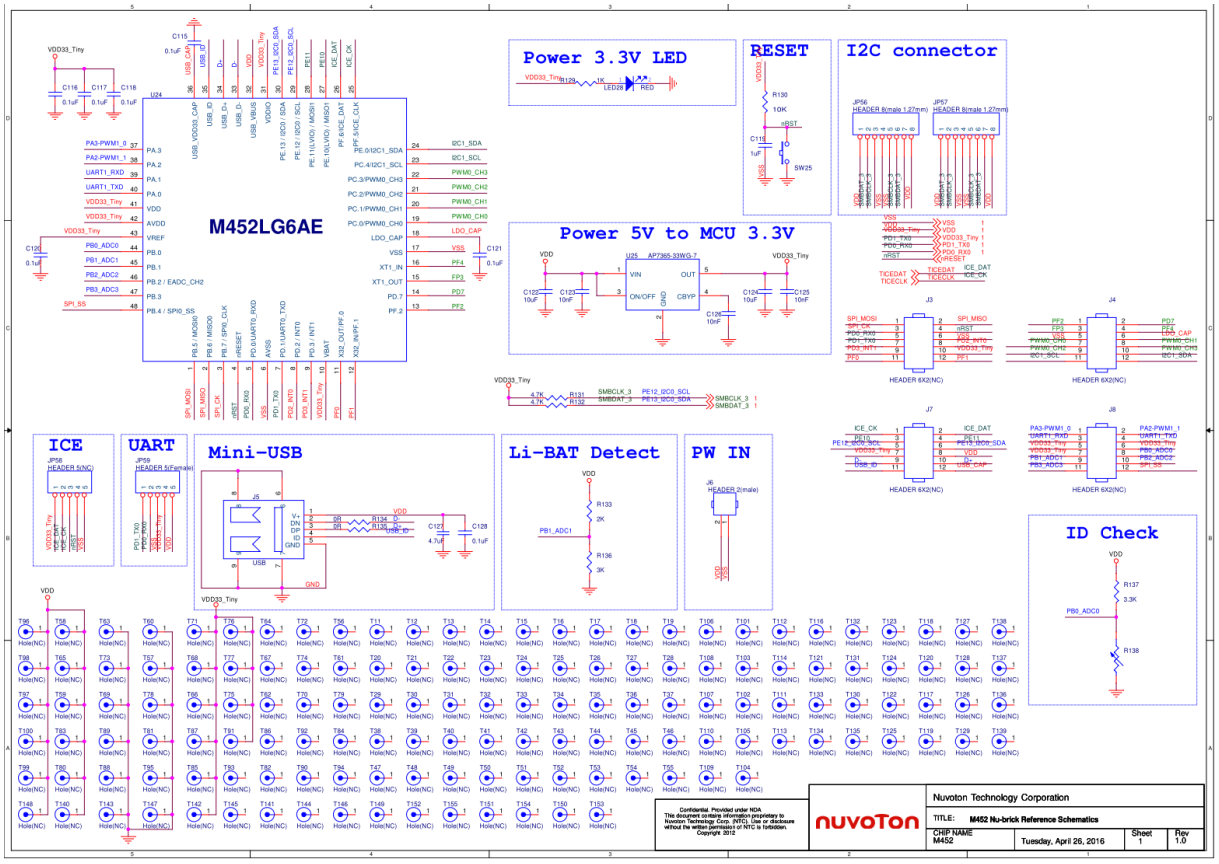


Figure 6-10 Extension module schematic

6.11 Nu-Link Me schematic

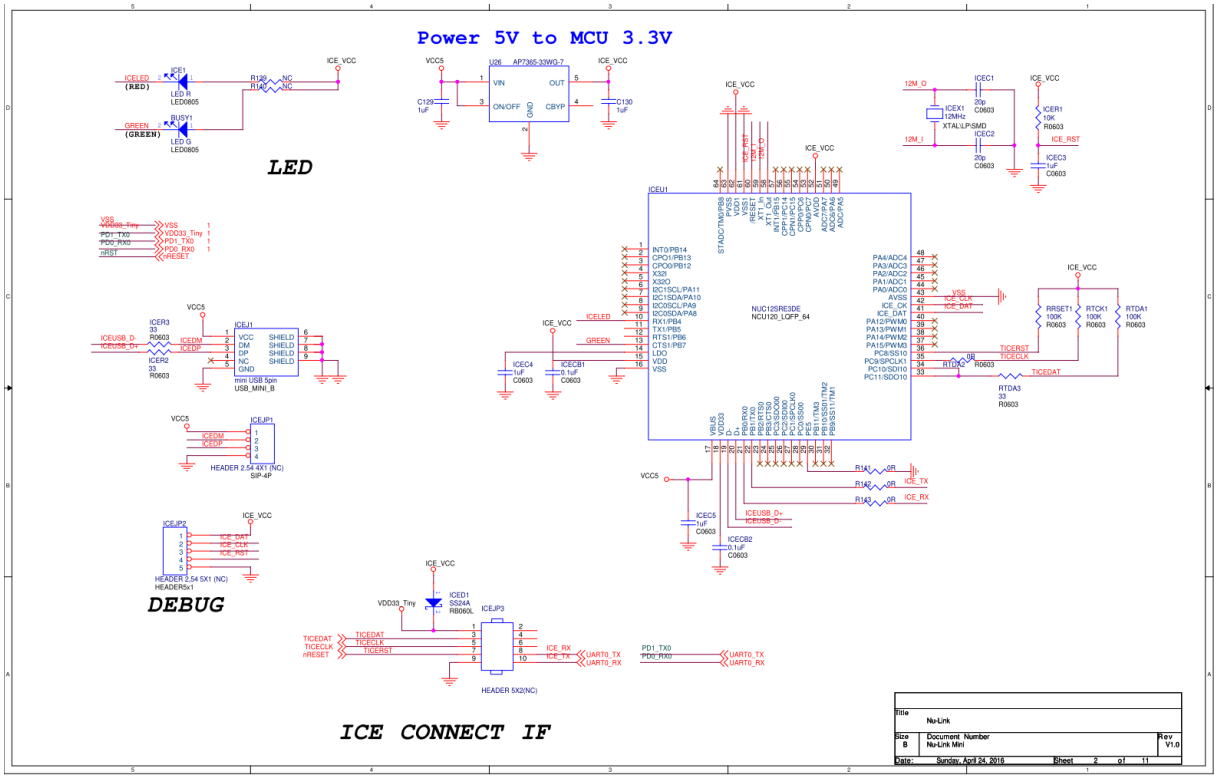


Figure 6-11 Nu-Link Me schematic

6.12 NuMaker Brick PCB layout

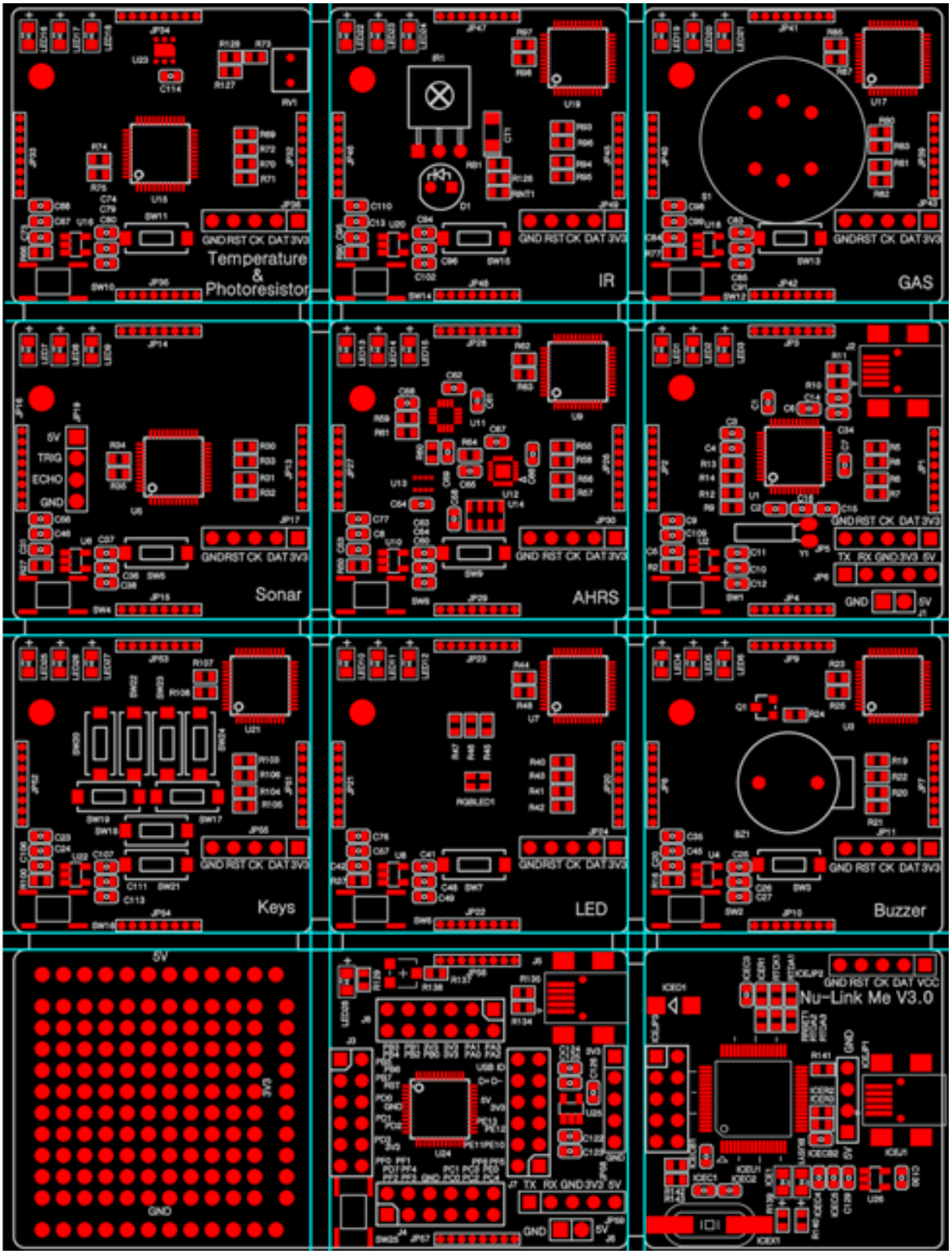


Figure 6-12 NuMaker Brick PCB layout (front)

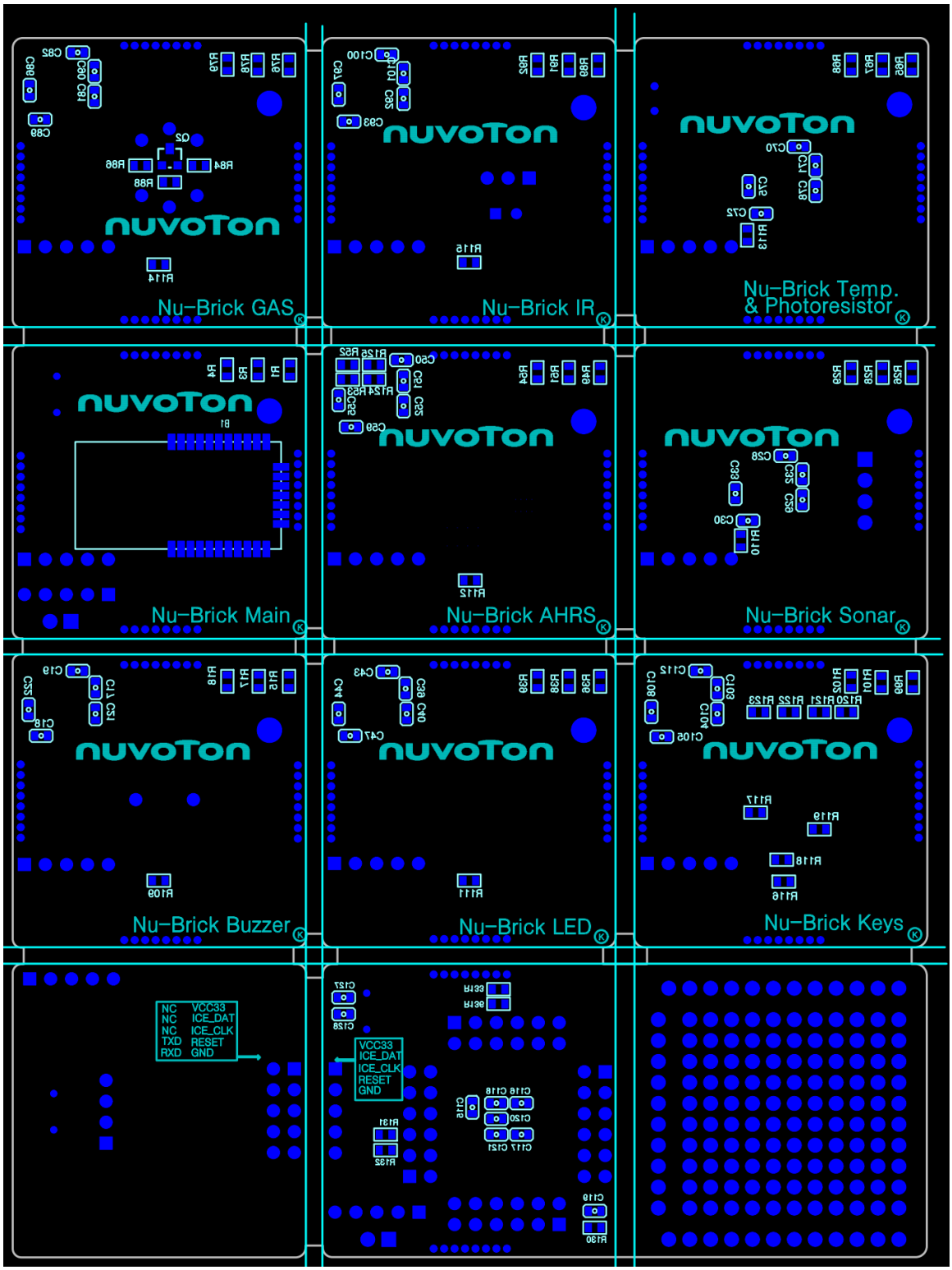


Figure 6-13 NuMaker Brick PCB layout (back)

7 REVISION HISTORY

Date	Revision	Description
2016.08.22	1.01	1. Initially issued.

Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.