

# ARM® Cortex®-M 32-bit Microcontroller

## NuMicro® Family NuMaker Uni User Manual

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## 1 OVERVIEW

NuMaker Uni is an IoT or wearable application development board based on NuMicro® NANO100NE3BN. The start kit enables quick development, prototype evaluation, and creation of innovative designs for users. The kit also includes complete source-code examples, which helps users to build target C code applications quickly.

The NuMaker Uni has built in many components such as a Gyro sensor, a Wi-Fi Module, and a Bluetooth Module. By these components, developers can create new applications and working prototypes easily. It also allows users to extend its hardware, like servo motor, LED and EEPROM. The NuMaker Uni is suitable for a variety of IoT or wearable applications. Developers can implement applications for IoT such as home security, gas leak warning, smart remote controller, humidity and temperature monitor, and self-balancing scooter, multicopter. Developers can also implement applications for wearables such as pedometer, oximeter, heart rate monitor, electrocardiography (ECG), and smartband.

The NANO100NE3BN is an ultra-low power 32-bit microcontroller embedded with ARM® Cortex®-M0 core operated at a wide voltage range from 1.8V to 3.6V and runs up to 42 MHz frequency.

### 1.1 Features

The NuMaker Uni offers the following features:

- IR Transmitter
- IR Receiver
- 3-axis accelerometer and 3-axis Gyro sensor (MPU6500)
- Temperature-Humidity sensor (HTU21D)
- ESP-03 – 802.11b/g/n Wi-Fi Module
- BB2710-29 – Dual Mode Bluetooth Module
- R/G/B LED
- Extension pins provide SPI, I<sup>2</sup>C, PWM, and ADC interfaces

## 2 INTRODUCTION TO NUMAKER UNI

The NuMaker Uni uses the NANO100NE3BN as the target microcontroller. Figure 2-1 shows the NuMaker Uni board.

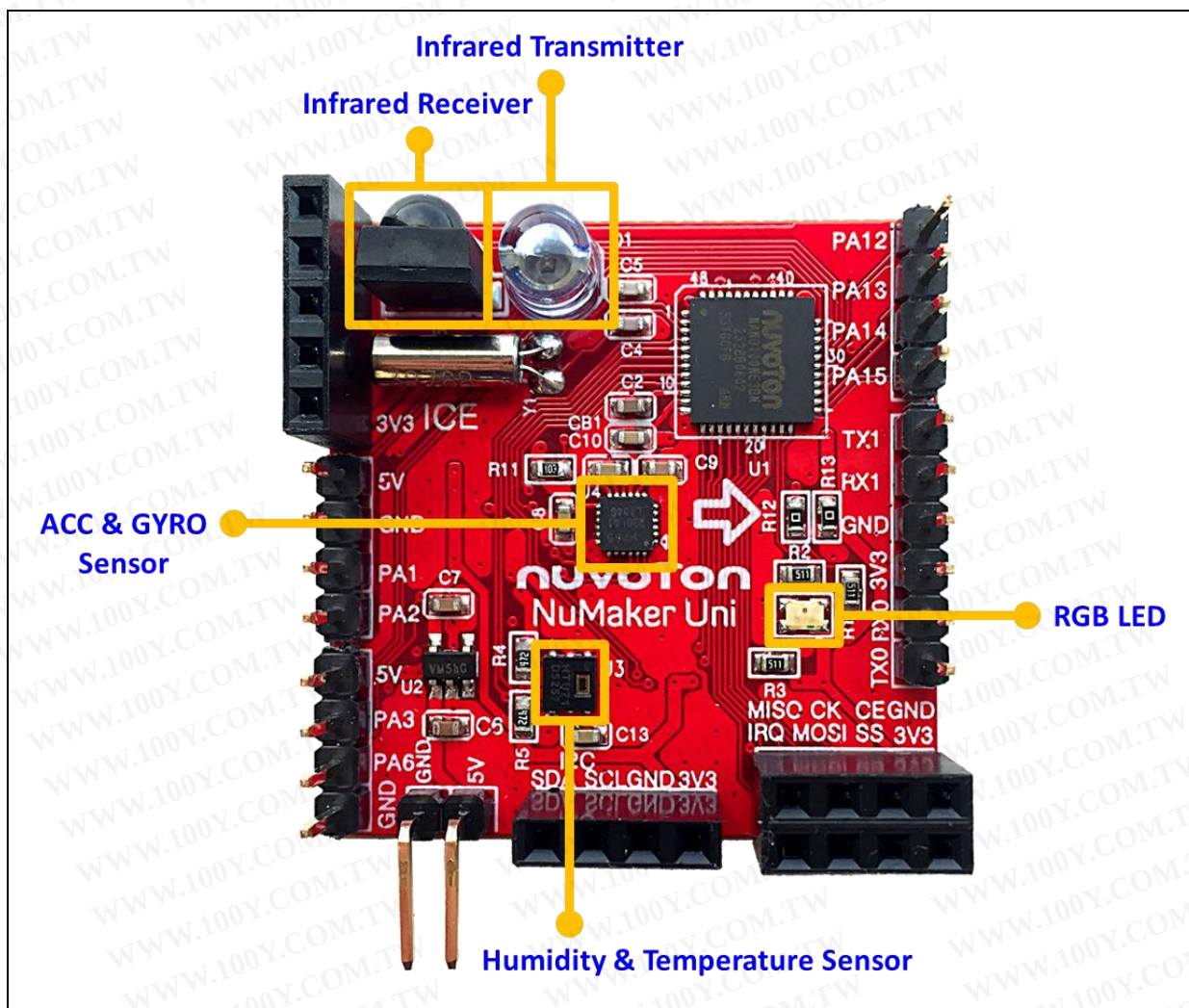


Figure 2-1 NuMaker Uni Board

The NuMaker Uni supports the Nu-Link ICE Adaptor, and uses In-Circuit Programming (ICP) mode based on the SWD interface. The NuMicro® ICP Programming Tool can be used for developers to develop their software and program the MCU. The NuMaker Uni also supports third party development tools, such as Keil RVMDK, and IAR EWARM.

The NANO100NE3BN used by the NuMaker Uni can run up to 42MHz, and support 3.7V to 5V DC connector for 3.7V Lithium battery or 5V power supply. It includes Red/Green/Blue LED, an Infrared transmitter and infrared receiver, 3-axis accelerometer & 3-axis gyroscope (MPU6500), a temperature & humidity sensor (HTU21D), a 802.11b/g/n Wi-Fi module (ESP-03) which supports TCP, UDP server & client, AP or Station mode, and AT command, and a dual mode Bluetooth 3.0 module (BB2710-29) which supports SPP and GATT profile, and AT command.

### 3 INTRODUCTION TO NU-LINK MINI

The Nu-Link Mini 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. To use the Nu-Link Mini Debug adaptor with Keil or IAR, please refer to “Nuvoton NuMicro® IAR ICE Driver User Manual” or Nuvoton NuMicro® Keil ICE Driver User Manual” for details. Figure 3-1 shows the Nu-Link Mini board.

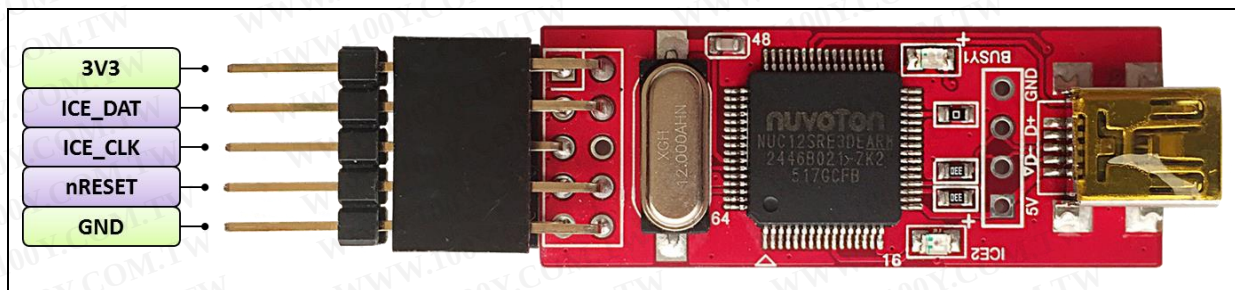


Figure 3-1 Nu-Link Mini Board

## 4 HARDWARE INTRODUCTION

- MCU
  - Cortex®-M0 NANO100NE3BN - 32-bit MCU
  - Max speed of 42 MHz
  - 128 KB Flash and 16 KB SRAM
  - Power-down current <1uA
  - Support SPI, I<sup>2</sup>C, UART, ADC, PWM, GPIO
- Sensor
  - IR Transmitter
  - IR Receiver
  - 3-axis accelerometer and 3-axis Gyro sensor (MPU6500)
  - Temperature-Humidity sensor (HTU21D)
- Wireless Module
  - ESP-03 – 802.11b/g/n Wi-Fi Module
    - ◆ Support TCP, UDP Server & Client
    - ◆ Support AP, Station mode
    - ◆ Support AT Command
  - BB2710-29 – Dual Mode Bluetooth Module
    - ◆ Support SPP and GATT profile
    - ◆ Support UART AT Command

### 4.1 On-Board Devices Interface

| Device Name               | Component Name | MCU Interface Name                                                         |
|---------------------------|----------------|----------------------------------------------------------------------------|
| Infrared Receiver         | FM-9038        | PWM capture: PA13/PWM0_CH1                                                 |
| Infrared Transmitter      | IR diode       | PWM output : PA12/PWM0_CH0                                                 |
| Inertial Measurement Unit | MPU6500        | I <sup>2</sup> C1: PA11/I <sup>2</sup> C1-SCL & PA10/I <sup>2</sup> C1-SDA |
| Temperature & Humidity    | HTU21D         | I <sup>2</sup> C1: PA11/I <sup>2</sup> C1-SCL & PA10/I <sup>2</sup> C1-SDA |
| Wi-Fi module              | ESP-03         | UART1: UART1_TX / PB5, UART1_RX / PB4                                      |
| Bluetooth module          | BB2710-29      | UART0 : UART0_TX / PB1, UART0_RX / PB0                                     |

## 4.2 Board Extension Interfaces

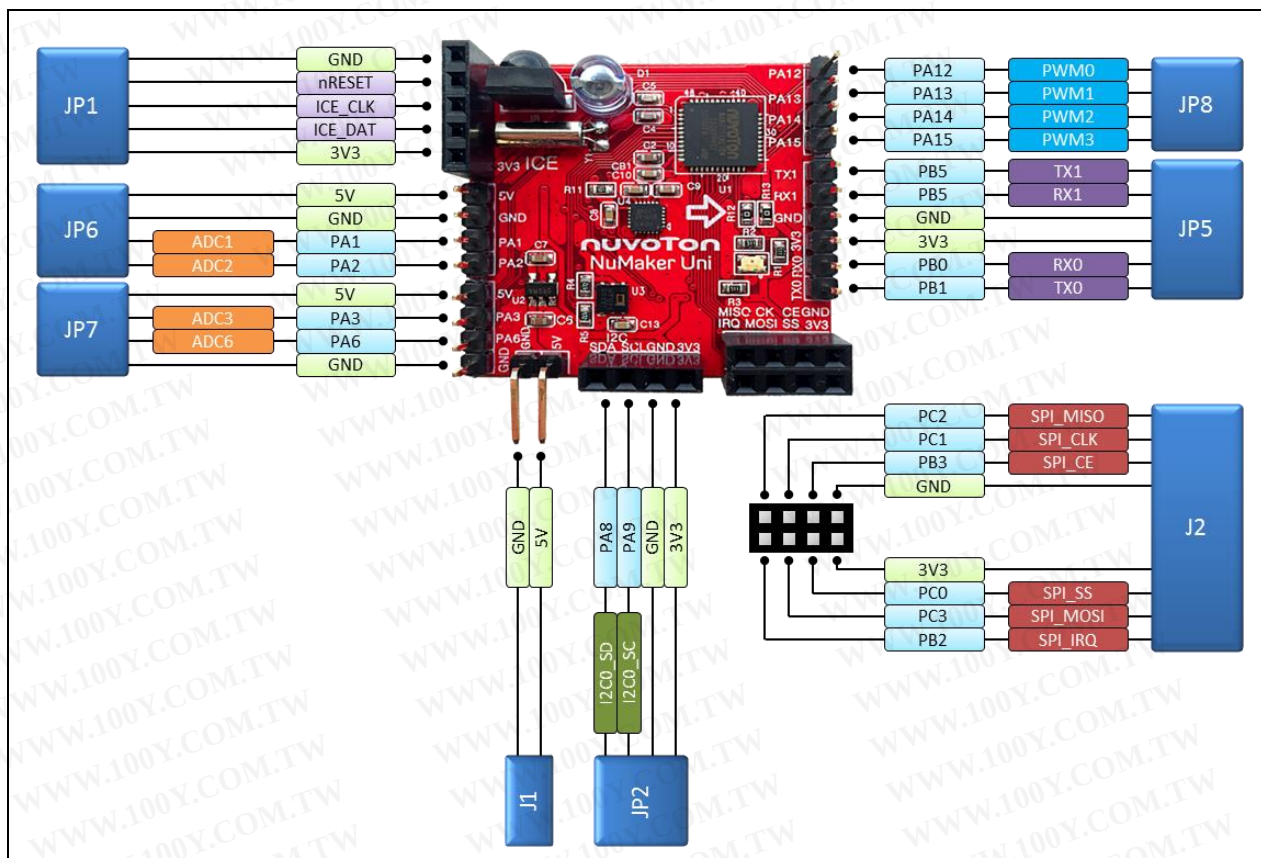


Figure 4-1 NuMaker Uni Pin Diagram

- JP1 – ICE interface for Nu-Link Mini

| JP1   | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | VCC                   | VCC3               |
| Pin 2 | ICE_DAT               | ICE_DAT            |
| Pin 3 | ICE_CLK               | ICE_CK             |
| Pin 4 | RESET                 | nRESET             |
| Pin 5 | GND                   | GND                |

- JP2 – I<sup>2</sup>C interface (pin assignment matched with the 0.96" I<sup>2</sup>C OLED module)

| JP2   | Interface Signal Name | MCU Pin Assignment          |
|-------|-----------------------|-----------------------------|
| Pin 1 | VCC                   | VCC                         |
| Pin 2 | GND                   | GND                         |
| Pin 3 | SCL                   | I <sup>2</sup> C0_SCL / PA9 |
| Pin 4 | SDA                   | I <sup>2</sup> C0_SDA / PA8 |

- JP5 – UART interface

| JP5   | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | UART0_TX              | UART0_TX / PB1     |
| Pin 2 | UART0_RX              | UART0_RX / PB0     |
| Pin 3 | VCC3                  | VCC3               |
| Pin 4 | GND                   | GND                |
| Pin 5 | UART1_RX              | UART1_RX / PB4     |
| Pin 6 | UART1_TX              | UART1_TX / PB5     |

- JP6 – ADC interface (pin assignment match gas sensor module MQ-2)

| JP6   | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | ADC_MQ                | PA2 / ADC2         |
| Pin 2 | ADC_DO                | PA1 / ADC1         |
| Pin 3 | GND                   | GND                |
| Pin 4 | +5V                   | +5V                |

- JP7 – TimerCapture interface (pin assignment matched with the ultrasonic sensor module HC-SR04)

| JP7   | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | GND                   | GND                |
| Pin 2 | ECHO                  | PA6 / TC3          |
| Pin 3 | TRIG                  | PA3                |
| Pin 4 | +5V                   | +5V                |

- JP8 – PWM interface

| JP8   | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | PA15                  | PA15 / PWM0_CH3    |
| Pin 2 | PA14                  | PA14 / PWM0_CH2    |
| Pin 3 | PA13                  | PA13 / PWM0_CH1    |
| Pin 4 | PA12                  | PA12 / PWM0_CH0    |

- J2 – SPI interface (pin assignment matched with the RF module nRF24L01)

| J2    | Interface Signal Name | MCU Pin Assignment |
|-------|-----------------------|--------------------|
| Pin 1 | GND                   | GND                |
| Pin 2 | VCC3                  | VCC3               |

|       |          |                  |
|-------|----------|------------------|
| Pin 3 | SPI_CE   | PB3              |
| Pin 4 | SPI_CS   | PC0 / SPI0_SS0   |
| Pin 5 | SPI_CLK  | PC1 / SPI0_CLK   |
| Pin 6 | SPI_MOSI | PC3 / SPI0_MOSI0 |
| Pin 7 | SPI_MISO | PC2 / SPI0_MISO0 |
| Pin 8 | SPI_IRQ  | PB2              |

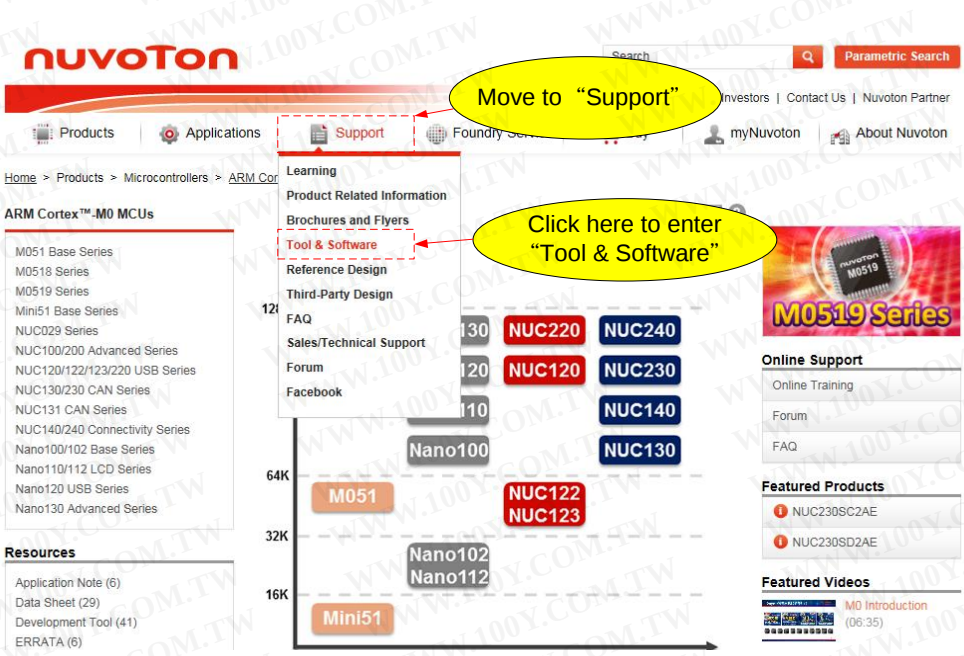
## 5 HOW TO START NUMAKER UNI ON IDE

### 5.1 Supported IDE Software

- IAR Embedded Workbench
- Keil uVision® IDE

### 5.2 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: <a href="http://www.nuvoton.com/NUMICRO">HTTP://WWW.NUVOTON.COM/NUMICRO</a> . |
| Step2 |                                |

**Step3**

Click here to enter Software download page

**Step4**

**Programmer Software Tools Package**

| File name                                                                               | Description                                | Version    | Date       |
|-----------------------------------------------------------------------------------------|--------------------------------------------|------------|------------|
| <a href="#">ICP Programming Tool V1.31.6535.zip</a><br><a href="#">Revision History</a> | NuMicro ICP tool & user manual             | V1.31.6535 | 2016-2-24  |
| <a href="#">ISP Programming Tool V1.47.zip</a><br><a href="#">Revision History</a>      | NuMicro ISP Programming Tool & user manual | V1.47      | 2015-7-28  |
| <a href="#">NuGang Programmer V7.02.zip</a><br><a href="#">Revision History</a>         | NuMicro Gang Programmer & user manual      | V7.02      | 2015-11-27 |

**Nu-Link Driver**

| File name                                                                                        | Description                                                                                                        | Version    | Date      |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------|-----------|
| <a href="#">Nu-Link Driver for Keil RVMDK V1.31.6535.zip</a><br><a href="#">Revision History</a> | 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 |
| <a href="#">Nu-Link Driver for IAR EWARM V1.31.6535.zip</a><br><a href="#">Revision History</a>  | 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 |

Click here to download the file.

**Step5**

Download the NuMicro®  $\mu$ Vision® IDE driver or NuMicro® IAR Embedded Workbench driver.

### 5.3 Hardware Setup

The hardware setup is shown as Figure 5-1.

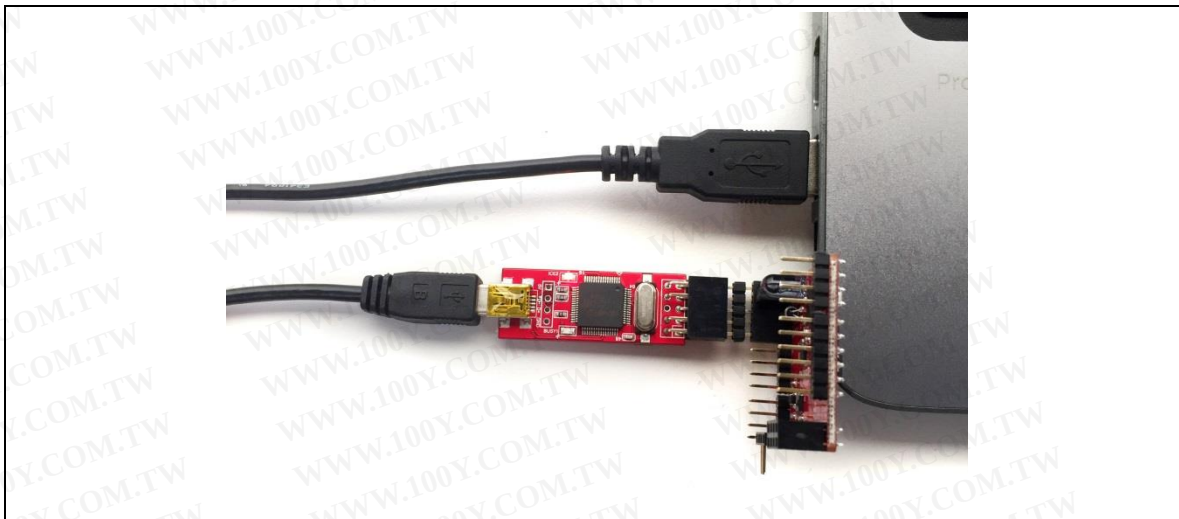


Figure 5-1 NuMaker Uni Hardware Setup

### 5.4 Starting to Use NuMaker Uni

1. Connect Nu-Link Mini to NuMaker Uni on its ICE port (J2) as shown in Figure 5-2.

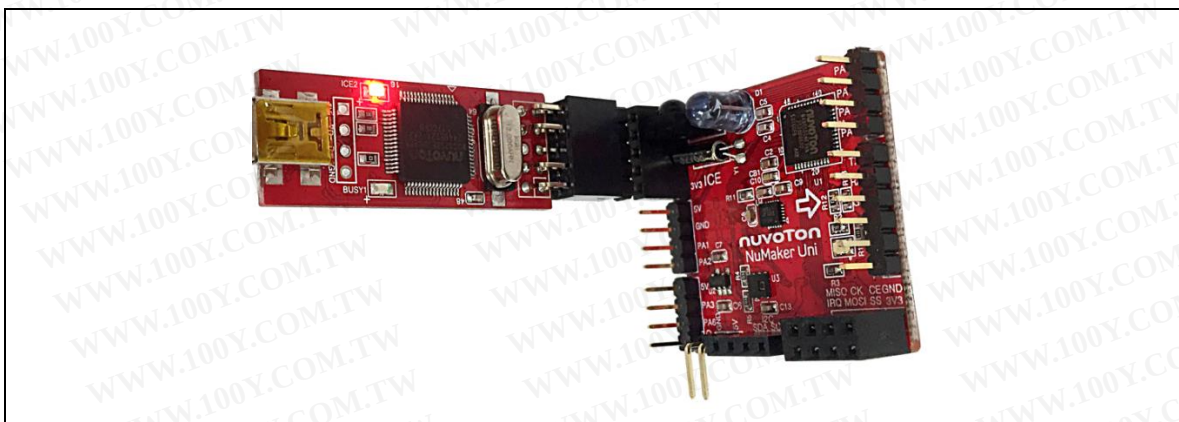


Figure 5-2 NuMaker Uni and Nu-Link Mini Connection

2. Connect Nu-Link Mini to PC through the USB cable as shown in Figure 5-3.

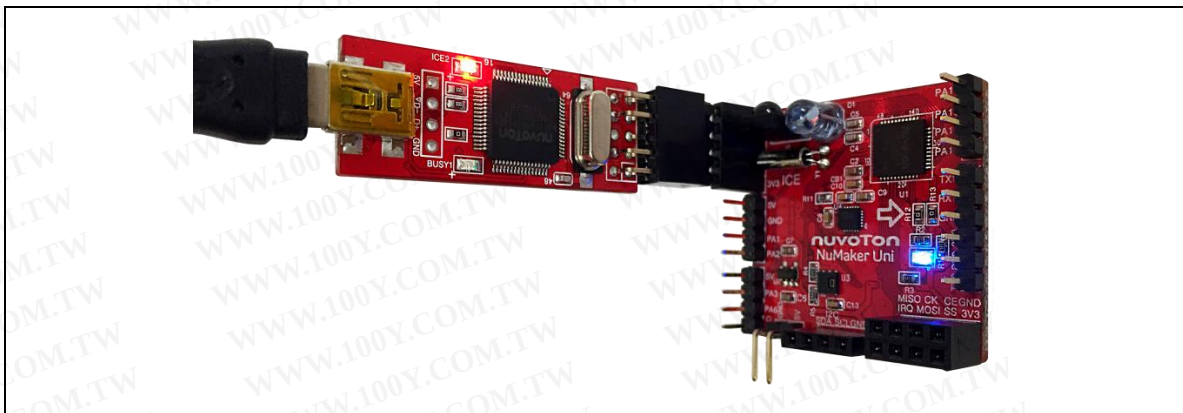


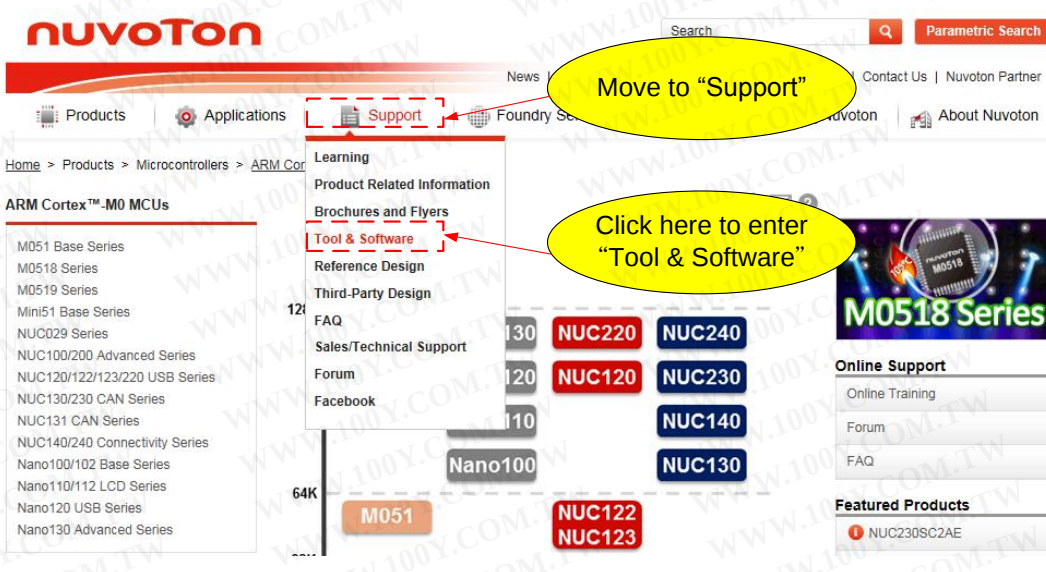
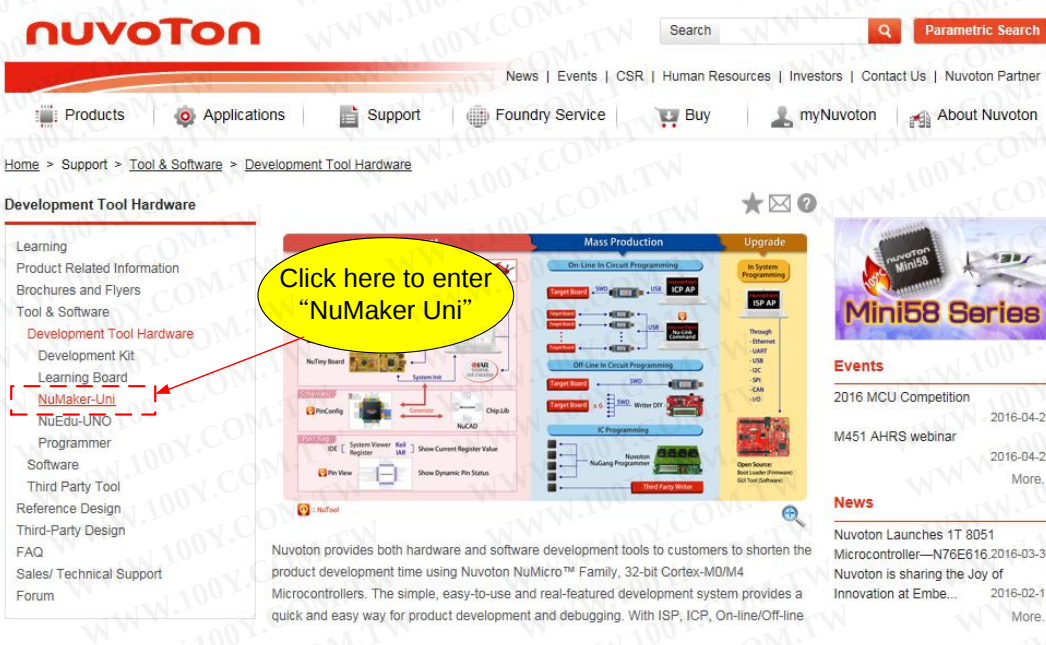
Figure 5-3 Blue LED Turns On

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 Mini LED will turn on to indicate the power is supplied from PC.

The Blue LED turns on as shown in Figure 5-3 after the connection from NuMaker Uni to PC through Nu-Link Mini. It means the R/G/B LED, the Bluetooth Module, the Wi-Fi Module, and the I<sup>2</sup>C module are ready for use. For more details, please refer to section 6.1.1.

## 5.5 Software Download

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

|       |                                                                                                                   |
|-------|-------------------------------------------------------------------------------------------------------------------|
| Step1 | Visit The Nuvoton NuMicro® Website: <a href="http://www.nuvoton.com/NUMICRO">HTTP://WWW.NUVOTON.COM/NUMICRO</a> . |
| Step2 |                                |
| Step3 |                               |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Step4</b></p> | <p><b>Features:</b></p> <ul style="list-style-type: none"> <li>• The NuMaker Uni offers the following features:</li> <li>• IR Transmitter</li> <li>• IR Receiver</li> <li>• 3-axis accelerometer and 3-axis Gyro sensor (MPU6500)</li> <li>• Temperature-Humidity sensor (HTU21D)</li> <li>• ESP-03 – 802.11b/g/n Wi-Fi Module</li> <li>• BB2710-29 – Dual Mode Bluetooth Module</li> <li>• R/G/B LED</li> <li>• Extension pins provide SPI, I2C, PWM, and ADC interfaces</li> </ul> <p><b>Resource:</b></p> <div>  <b>NuMaker Uni User Manual</b> </div> <div>  <b>NuMaker Uni Software</b> </div> <div> <p>Click here to download "NuMaker Uni Software"</p>  </div> |
| <p><b>Step5</b></p> | <p>Download the SW_MuMaker_Uni_V1.0 Software.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## 5.6 Folder Structure

The example demonstrates compiling, downloading and executing sample code on a NuMaker Uni board. Figure 5-4 lists the NuMaker Uni software (SW\_NuMaker\_Uni\_v1.0.zip) downloaded from Nuvoton NuMicro® website.

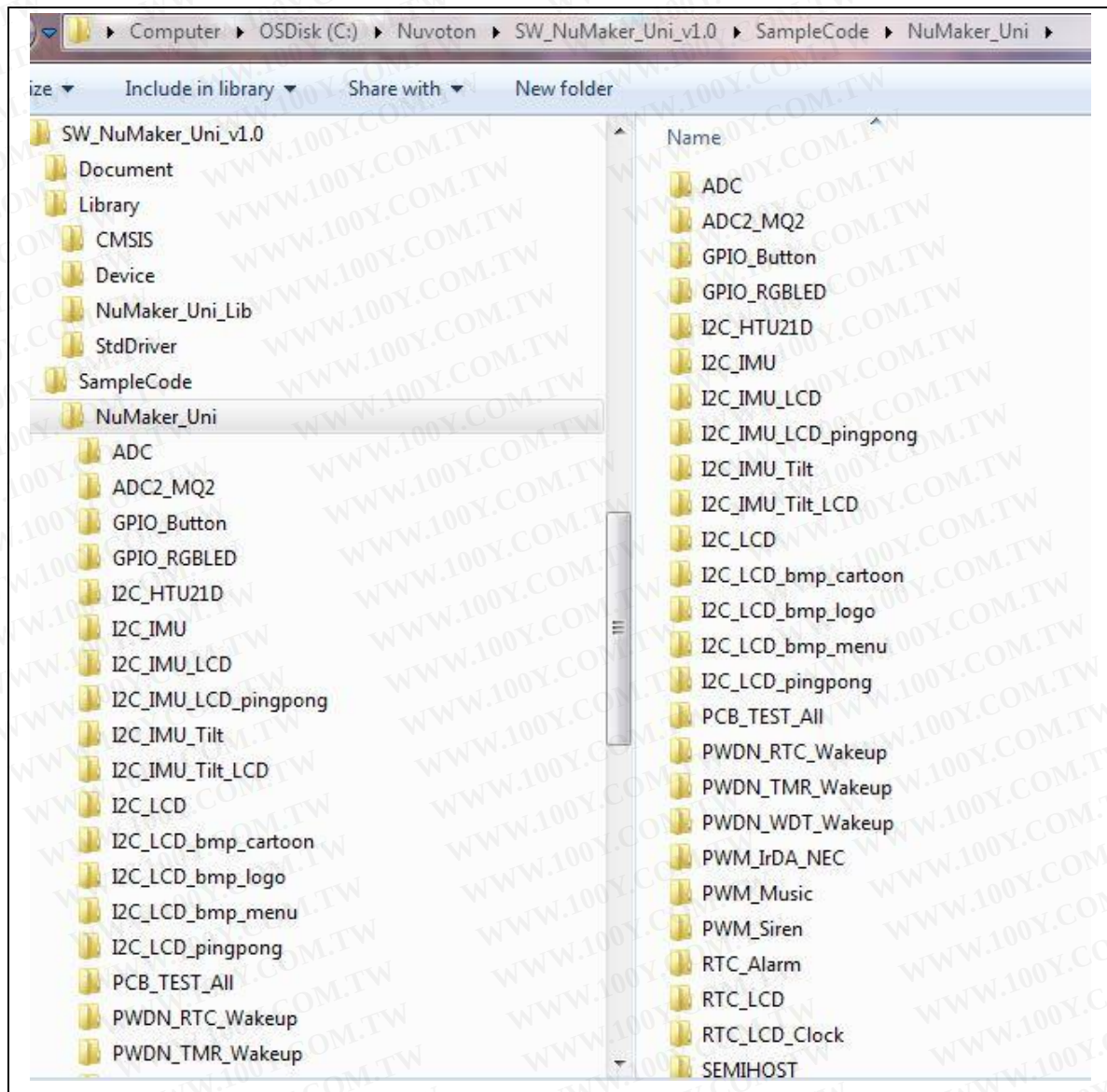


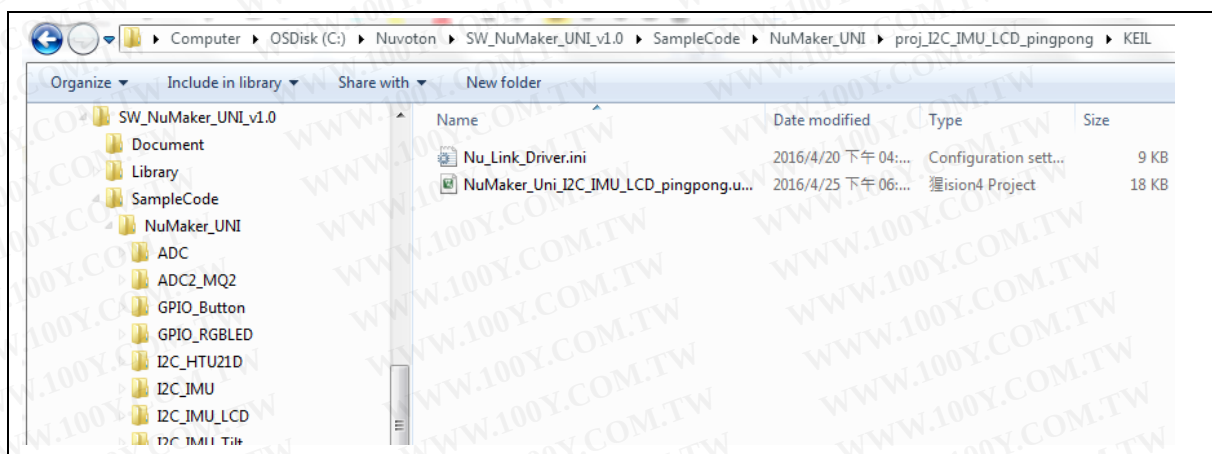
Figure 5-4 Sample Code Directory

### 5.6.1 Using Keil uVision® IDE to Program

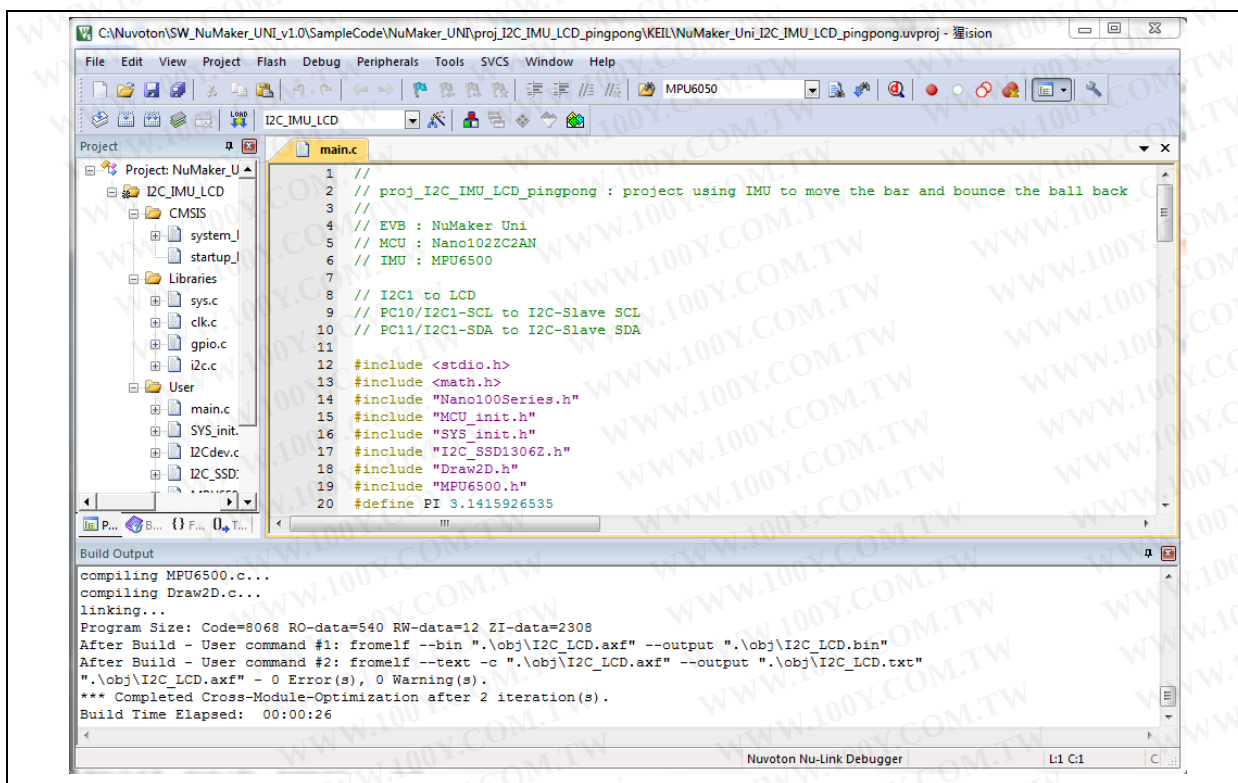
The example demonstrates how to download and debug an application on NuMaker Uni board.

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

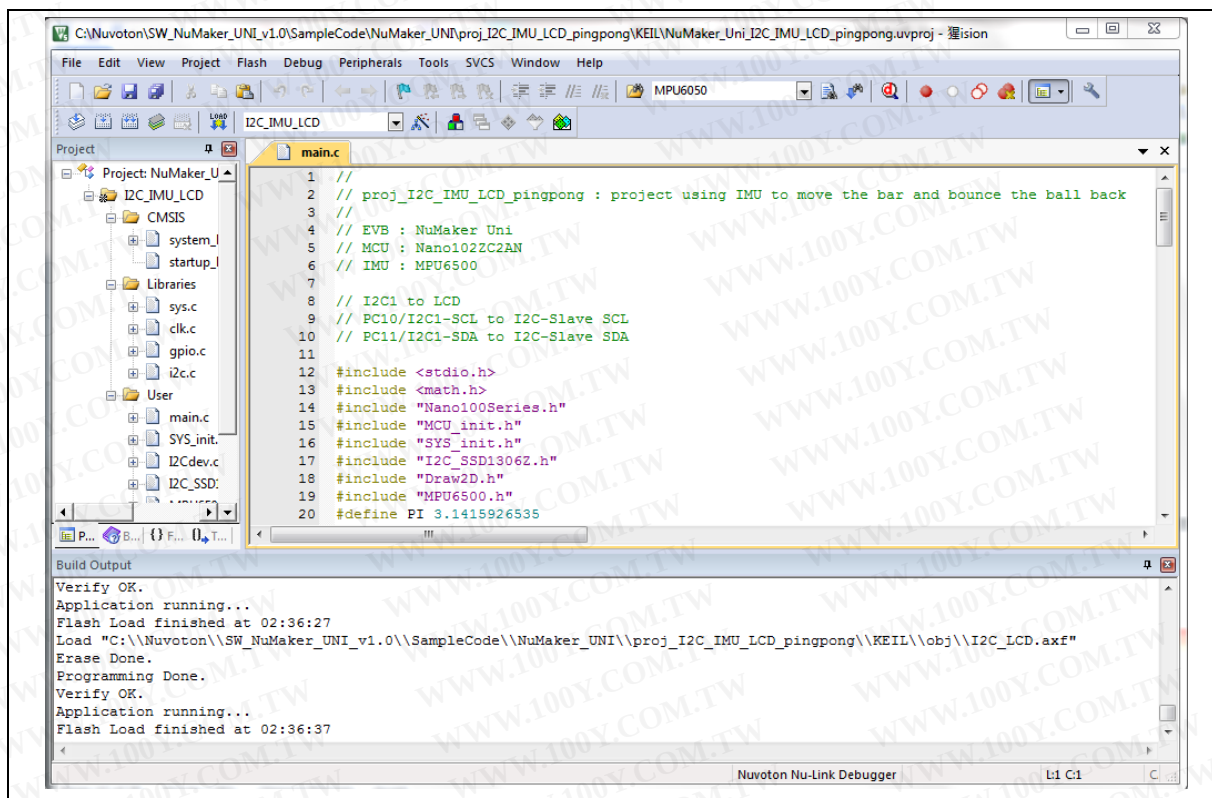
(Default: SW\_NuMaker\_Uni\_v1.0\SampleCode\NuMaker\_Uni\proj\_IMU\_LCD\_pingpong\Keil)



2. Click  "Build" to compile the sample code.



- Click  "Download" to download binary code to NuMaker Uni.



- After download, MCU should be up and running. If not, please reconnect USB cable to power it up again. In this sample code, it is using IMU to detect motion for controlling the bar to bounce the ball back, as shown in Figure 5-5.

Note that the start kit does not include the Li-battery and the LCD module.



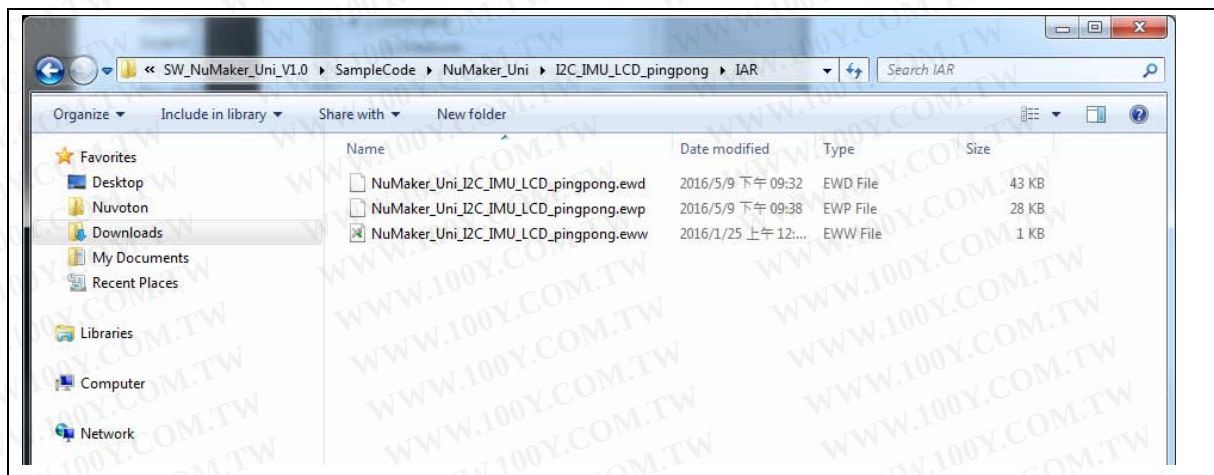
Figure 5-5 NuMaker Uni Sample Code Running

## 5.6.2 Using IAR Embedded Workbench to Program

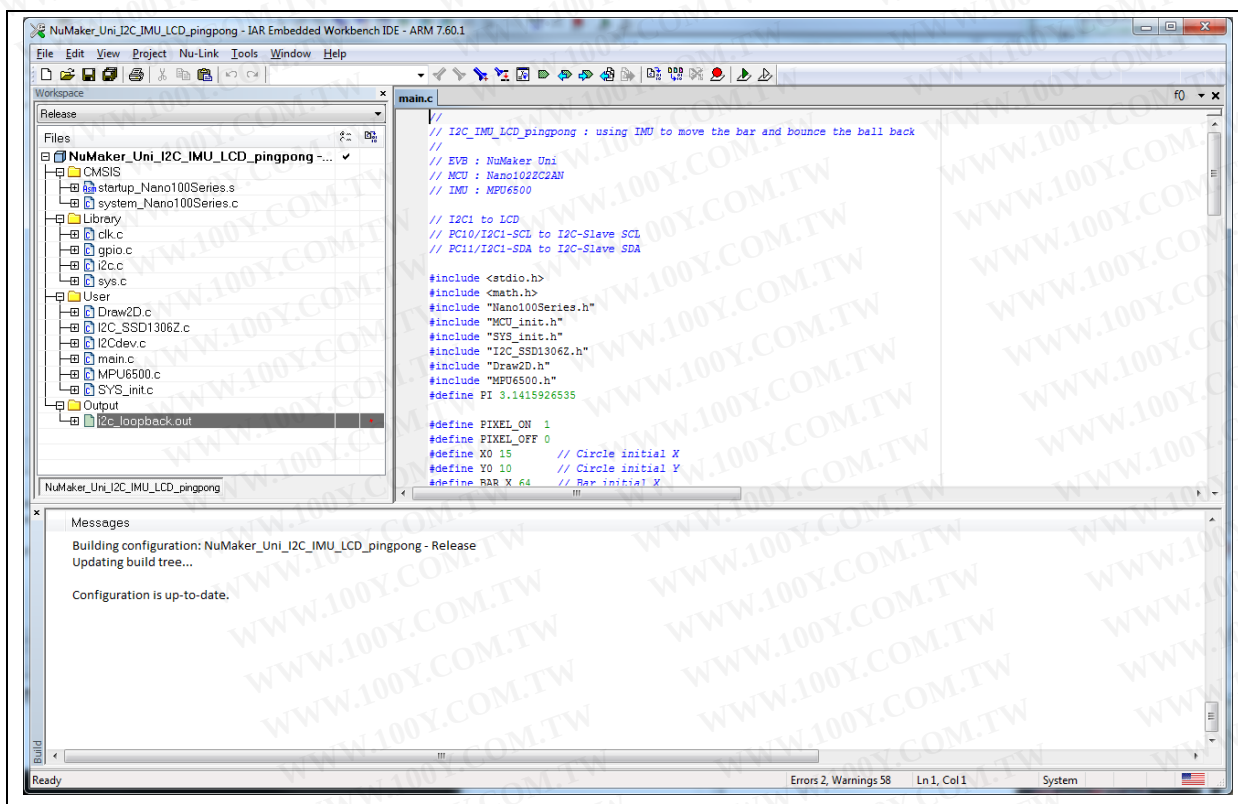
The example demonstrates how to download and debug an application on NuMaker Uni board.

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

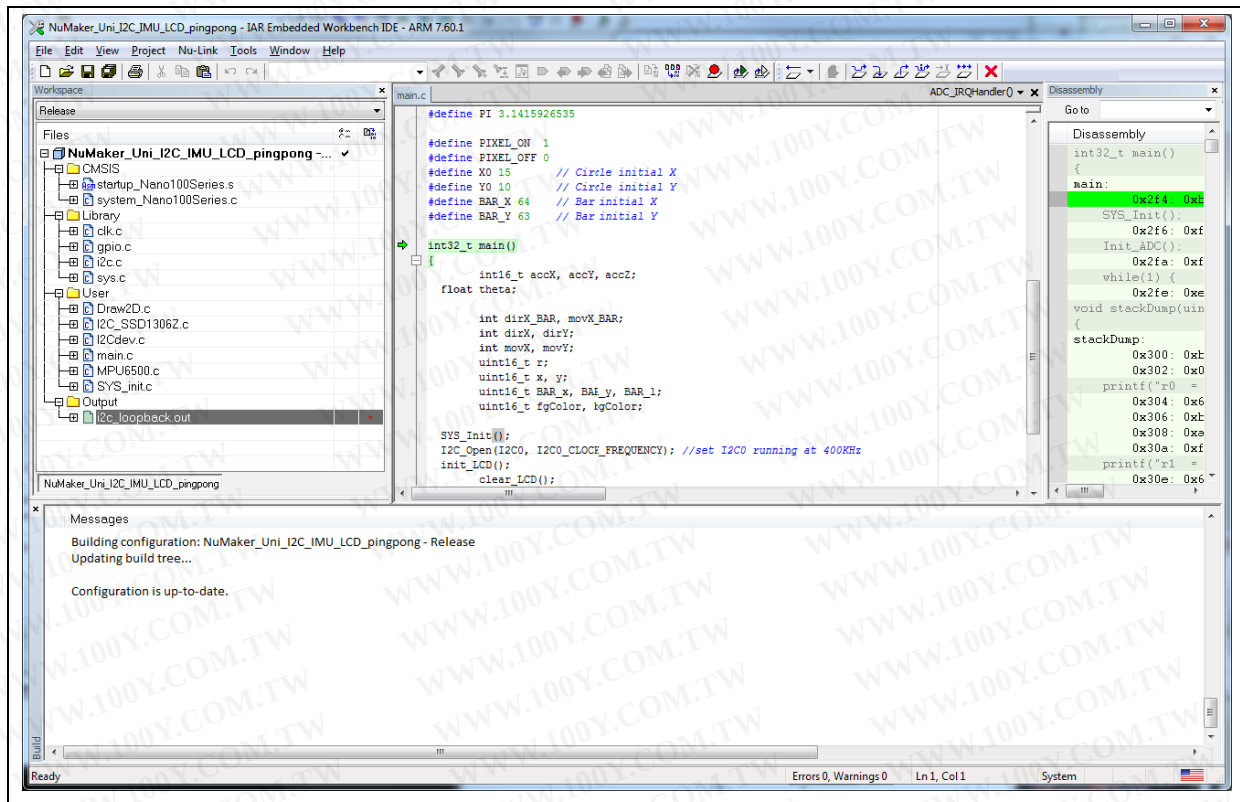
(Default: SW\_NuMaker\_Uni\_v1.0\SampleCode\NuMaker\_Uni\proj\_IMU\_LCD\_pingpong\IAR\)



2. Click  "Make" to compile the sample code.



3. Click  "Download and Debug" to download binary code to NuMaker Uni.



4. After download, MCU should be up and running. If not, please reconnect the USB cable to power it up again. In this sample code, it is using IMU to detect motion for controlling the bar to bounce the ball back, as shown in Figure 5-5.

## 6 SAMPLE CODE DESCRIPTION

File path: \SW\_NuMaker\_Uni\_V1.0\SampleCode\NuMaker\_Uni

| Category | Sample Code Name      | Description                                                                         |
|----------|-----------------------|-------------------------------------------------------------------------------------|
| Project  | proj_IMU_LCD_pingpong | Using IMU to move the bar and bounce the ball back                                  |
| Project  | proj_BT_Humidity      | Using Bluetooth to report humidity to Smartphone                                    |
| Project  | proj_BT_Remote        | Using Smartphone to control MCU to output IR code                                   |
| ADC      | ADC                   | Using Analog-to-Digital Converter to read sensor                                    |
| ADC      | ADC2_MQ2              | Using Analog-to-Digital Converter to read Gas sensor                                |
| GPIO     | GPIO_IRQ              | GPIO interrupt triggered by buttons                                                 |
| GPIO     | GPIO_RGBLED           | GPIOs control R/G/B LEDs                                                            |
| I2C      | I2C_HTU21D            | Using I <sup>2</sup> C to read humidity and transparency                            |
| IMU      | I2C_IMU               | Using I <sup>2</sup> C to read IMU and display on Debug Session of Keil MDK         |
| IMU      | I2C_IMU_LCD           | Using I <sup>2</sup> C to read IMU and display on LCD                               |
| IMU      | IMU_Tilt              | Read Accelerometer to calculate title angles and print on Debug Session of Keil MDK |
| IMU      | IMU_Tilt_LCD          | Read Accelerometer to calculate title angles and print on LCD                       |
| LCD      | I2C_LCD               | Display 4 lines of text on LCD                                                      |
| LCD      | I2C_LCD_bmp_cartoon   | Draw and display multiple cartoons' bitmap on LCD                                   |
| LCD      | I2C_LCD_bmp_logo      | Draw a bitmap of logo on LCD                                                        |
| LCD      | I2C_LCD_bmp_menu      | Display a menu bitmap on LCD                                                        |
| LCD      | I2C_LCD_pingpong      | Draw a bar and ball to emulate pingpong on LCD                                      |
| PCB Test | PCB_All_Test          | Testing All components and pins on PCB and display pass/fail status on LED          |
| PWDN     | PWDN_RTC_Wakeup       | RTC time-out to wake up MCU from Power-down mode                                    |
| PWDN     | PWDN_TMR_Wakeup       | Timer time-out to wake up MCU from Power-down mode                                  |
| PWDN     | PWDN_WDT_Wakeup       | Watchdog Timer time-out to wake up MCU from Power-down mode                         |
| PWM      | PWM_IrDA_NEC          | IR emitter to transmit and IR receiver to receive NEC code                          |
| PWM      | PWM_Music             | PWM output tone to Buzzer to play music "Fur Elise"                                 |
| PWM      | PWM_Siren             | PWM output dual frequency to buzzer                                                 |
| RTC      | RTC_Alarm             | RTC alarm in 5 seconds (printf onto display)                                        |
| RTC      | RTC_LCD               | Display RTC Date & Time on LCD (without Power-down mode)                            |
| RTC      | RTC_LCD_Clock         | Draw a Clock & draw clock pointer every RTC tick                                    |
| ICE      | SEMIHOST              | Using Keil MDK Debug Session                                                        |
| SPI      | SPI_Loopback          | SPI MOSI connected to MISO                                                          |
| SPI      | SPI_NRF24L01          | nRF24L01 Transmitter & Receiver Testing                                             |

|       |                      |                                              |
|-------|----------------------|----------------------------------------------|
| SPI   | SPI_RFID_RC522       | RFID Reader RC522 reading RFID Tag           |
| TMR   | TMR1                 | Timer1 counting                              |
| TMR   | TMR1_LED             | Timer1 controlled (no water) to target board |
| TMR   | TMR3_Capture_SR04    | Timer3 capture Ultrasonic sensor ranger      |
| UART0 | UART0_BT_RX_LCD      | Bluetooth Receive & display on LCD           |
| UART0 | UART0_BT_TEST_LCD    | Returning Universal donative contract        |
| UART1 | UART1_WiFi_TCPclient | ESP8266 run as TCP client                    |
| UART1 | UART1_WiFi_TCPserver | ESP8266 run as TCP server                    |
| UART1 | UART1_WiFi_LCD       | ESP8266 run as a TCP with LCD display        |
| UART1 | UART1_WiFi_Test_LCD  | Test ESP8266 AT Command OK                   |
| WDT   | WDT_Interrupt        | Watchdog Timer time-out to interrupt MCU     |
| WDT   | WDT_Reset            | Watchdog Timer time-out to reset MCU         |

## 6.1 Application Project Examples

### 6.1.1 NuMaker Uni Components and Socket Pins Test

| File Name                       | Default Directory                                                  |
|---------------------------------|--------------------------------------------------------------------|
| NuMaker_Uni_PCB_Test_All.uvproj | \\SW_NuMaker_Uni_v1.0\\SampleCode\\NuMaker_Uni\\PCB_TEST_All\\KEIL |

NuMaker\_Uni\_PCB\_Test\_All.uvproj allows users to check all components and socket pins on NuMaker Uni. This project is already downloaded into NuMaker Uni. The NuMaker Uni has passed this test before product delivery. Here is the list of all tests:

1. R/G/B LED
2. Bluetooth module
3. Wi-Fi module
4. GPIO
5. Temperature-Humidity sensor
6. Extension pins provide SPI, I<sup>2</sup>C, PWM, and ADC interfaces

Please follow the steps below to download and execute the sample project.

1. To execute this sample project, some extension pins need to be short on NuMaker Uni. The hardware setting is shown in Figure 6-1.

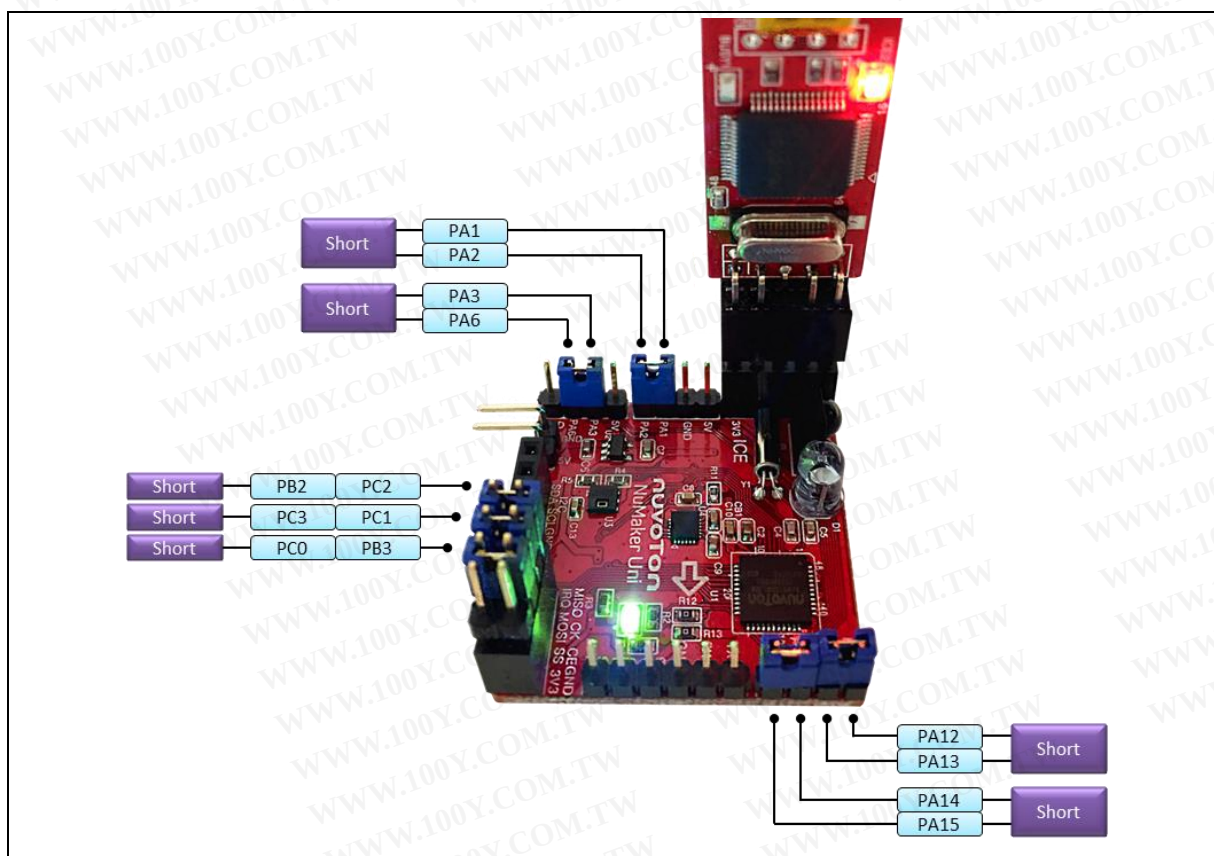


Figure 6-1 NuMaker Uni Hardware Setup

2. Download the demo firmware to NuMaker Uni, click  "Start Debug Session", and click  "Run".
3. The Blue LED light indicates the R/G/B LED, the Bluetooth Module, the Wi-Fi Module, and the I<sup>2</sup>C module are ready for use.
4. After finishing all the tests, LED will turn on according to the tests result. The Green LED light indicates all tests pass, as shown in Figure 6-2. The Red LED light indicates at least one test fails.

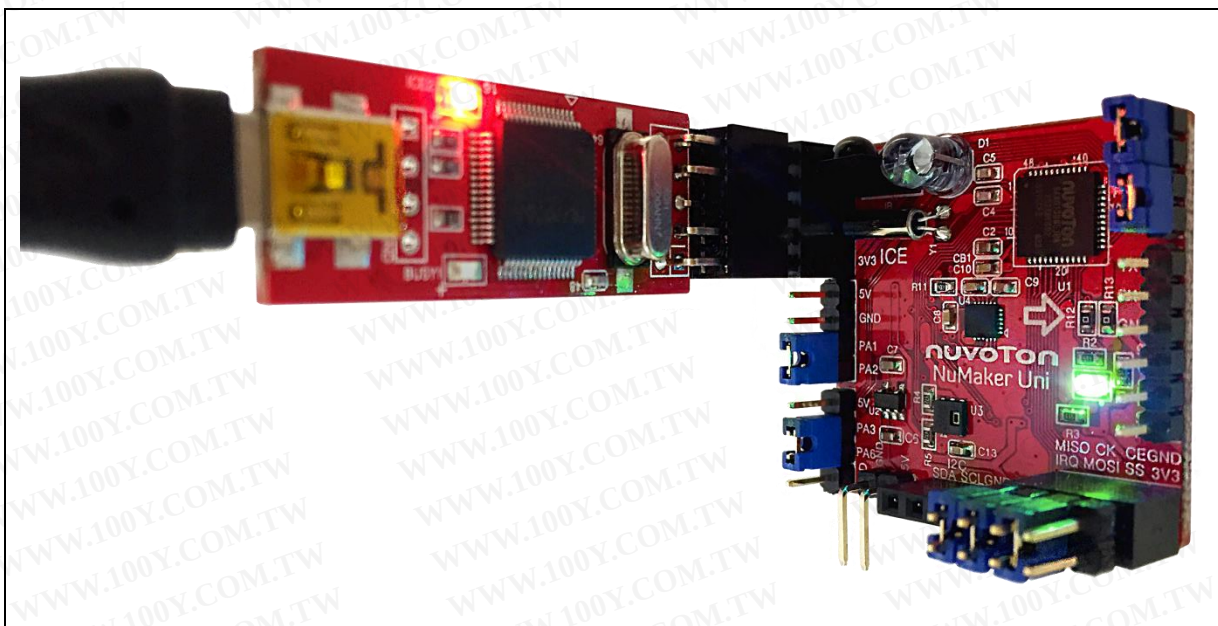


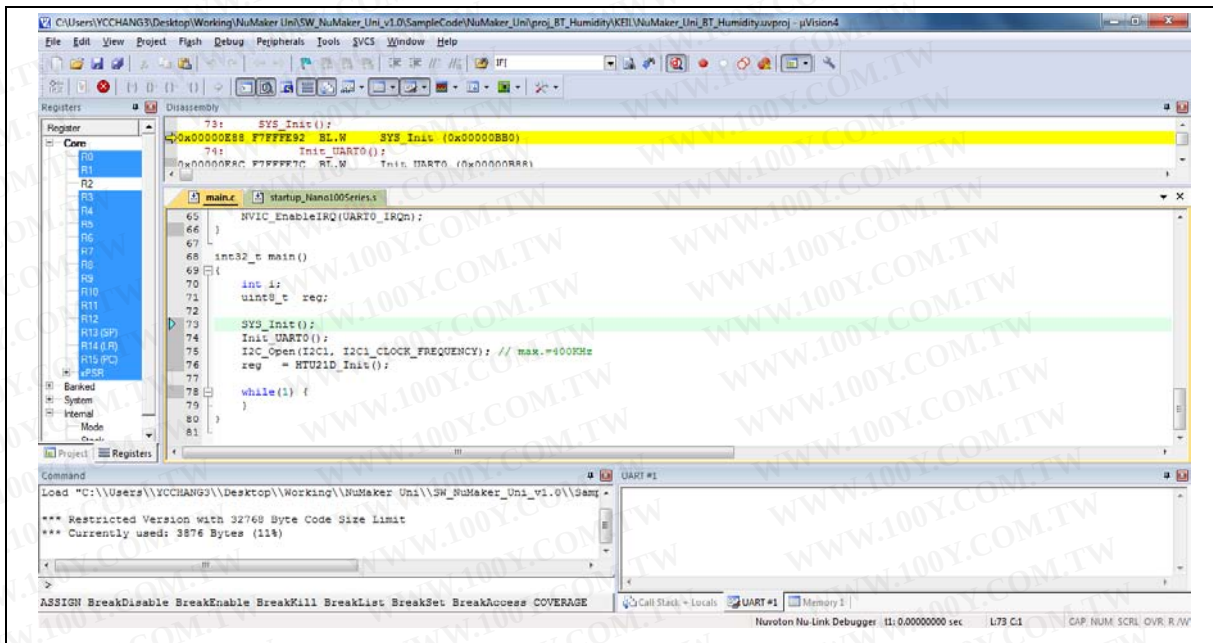
Figure 6-2 Green LED Turns On

### 6.1.2 Using NuMaker Uni to Detect Temperature and Humidity

| File Name                      | Default Directory                                                 |
|--------------------------------|-------------------------------------------------------------------|
| NuMaker_Uni_BT_Humidity.uvproj | ISW_NuMaker_Uni_v1.0\SampleCode\NuMaker_Uni\proj_BT_Humidity\Keil |
| NuMaker_Uni_BT_Humidity.apk    | ISW_NuMaker_Uni_v1.0\SampleCode\NuMaker_Uni\proj_BT_Humidity      |

The NuMaker Uni BT Humidity APP allows the android phone or tablet to connect with NuMaker Uni. The proj\_BT\_Humidity project allows NuMaker Uni to detect environment temperature and humidity and send these information to the android phone or tablet. Please follow the below steps to install and execute the application project.

1. Connect the NuMaker Uni board to a computer through a Mini USB cable, and place the NuMaker Uni board on a flat surface.
2. Download the demo firmware to NuMaker Uni, click  "Start Debug Session", and click  "Run".



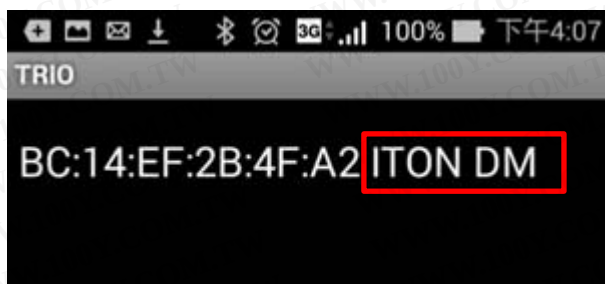
3. Install NuMaker\_Uni\_BT\_Humidity.apk on an android phone or tablet.
4. Set up your phone with Bluetooth on. Search for Bluetooth device "ITON DM" and pair with your phone.



5. Open NuMaker Uni BT Humidity APP.



6. Tap "Connect" and select the Bluetooth device "ITOM DM".



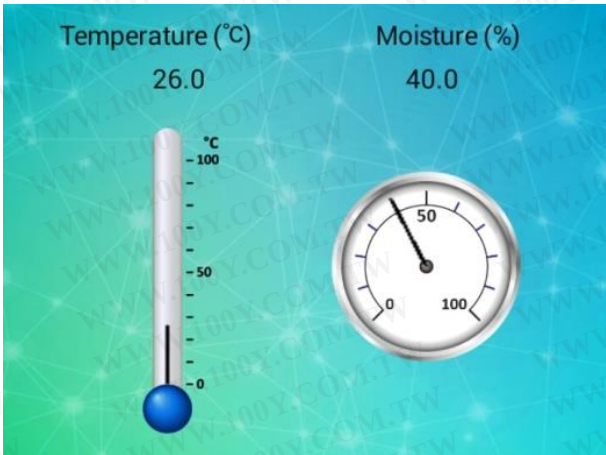
7. After connected, a new page will appear on NuMaker Uni BT Humidity APP.



8. Select Temperature/Humidity Meter.



9. Temperature and humidity visual indicators show.



6.1.3 Using NuMaker Uni to Receive Information from NuMaker Uni APP

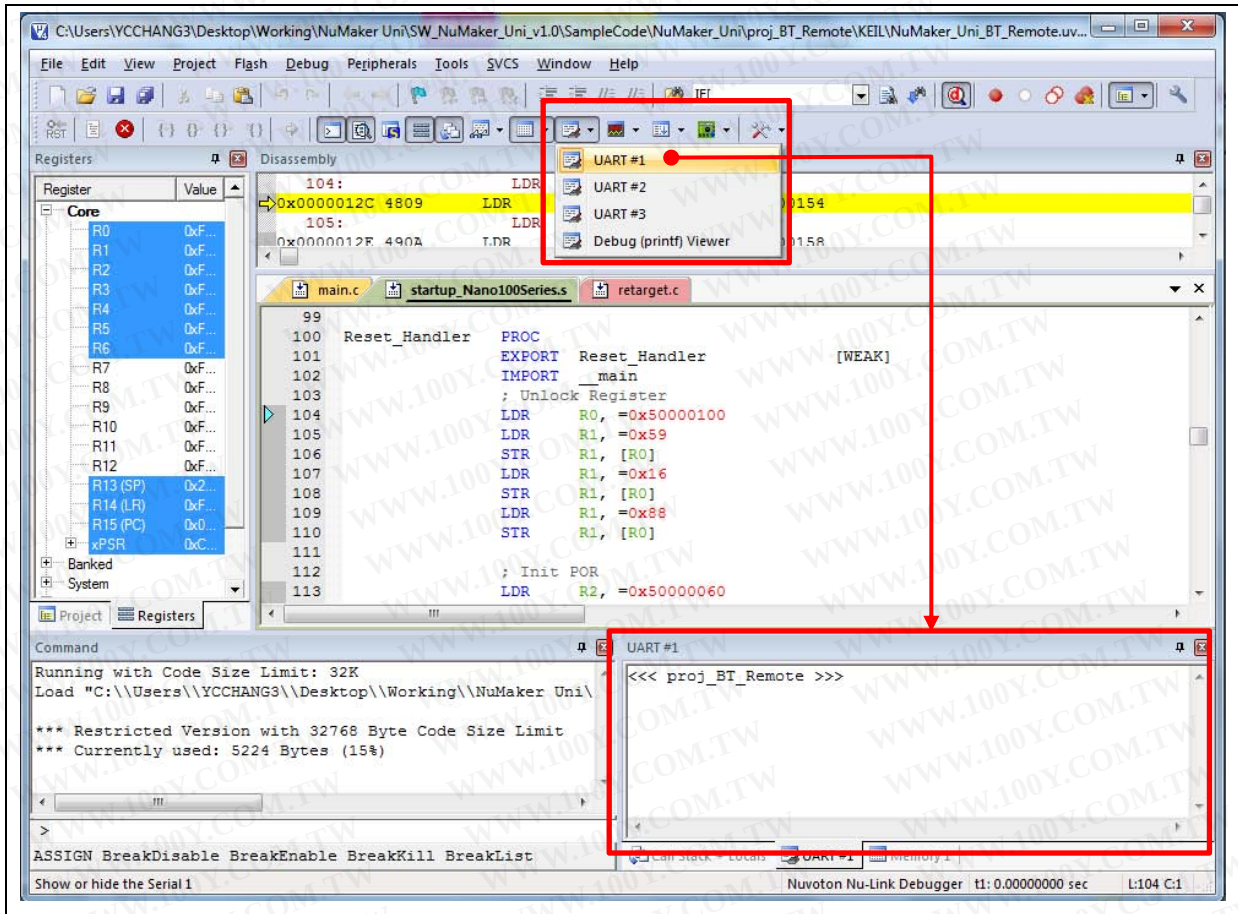
| File Name                    | Default Directory                                               |
|------------------------------|-----------------------------------------------------------------|
| NuMaker_Uni_BT_Remote.uvproj | \SW_NuMaker_Uni_v1.0\SampleCode\NuMaker_Uni\proj_BT_Remote\Keil |
| NuMaker_Uni_BT_Remote.apk    | \SW_NuMaker_Uni_v1.0\SampleCode\NuMaker_Uni\proj_BT_Remote      |

The NuMaker Uni BT Remote APP allows users to use the android phone or tablet as remote control. The proj\_BT\_Remote project allows NuMaker Uni to work as a receiver. Please follow the steps below to install and execute the application project.

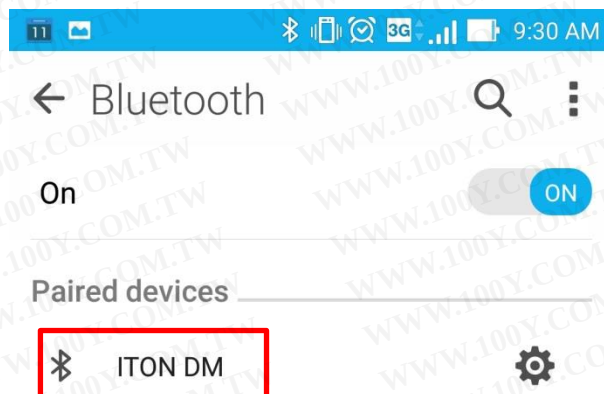
1. Connect the NuMaker Uni board to a computer through a Mini USB cable, and place the NuMaker Uni board on a flat surface.

2. Download the demo firmware to NuMaker Uni, click  “Start Debug Session”, and click  “Run”.

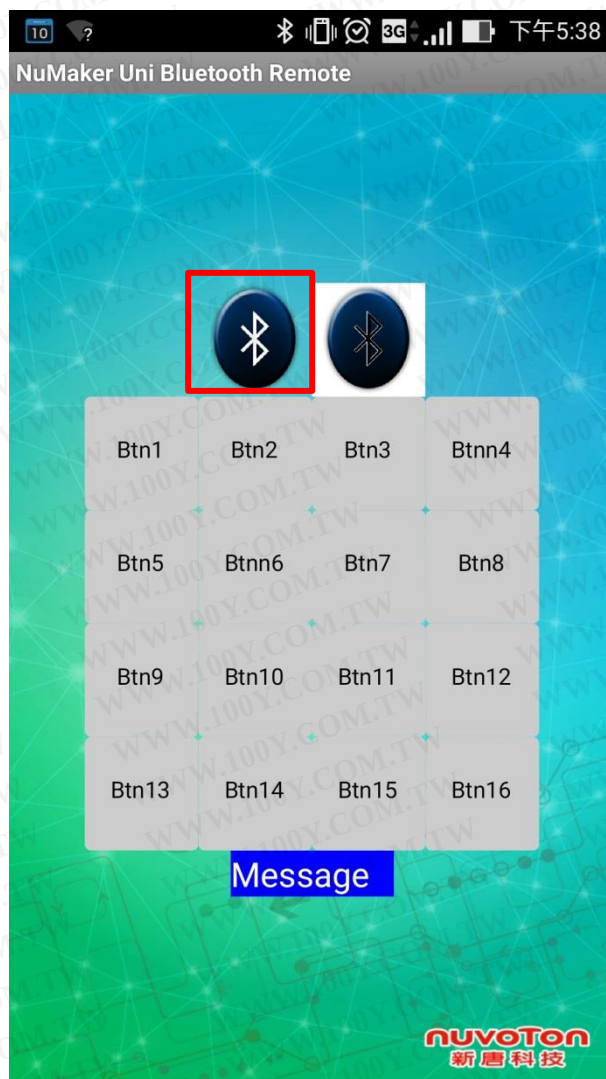
- Click "Serial Windows" and select "UART #1". The UART #1 windows will appear.



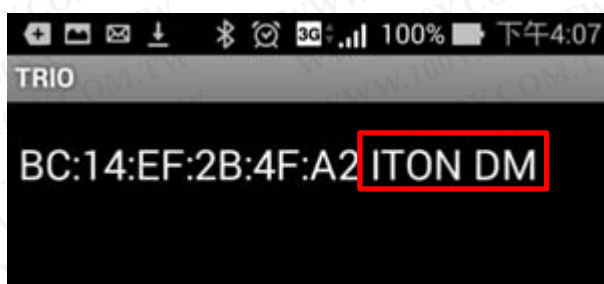
- Install NuMaker\_Uni\_BT\_Remote.apk on an android phone or tablet.
- Set up your phone with Bluetooth on. Search for Bluetooth device "ITON DM" and pair with your phone.



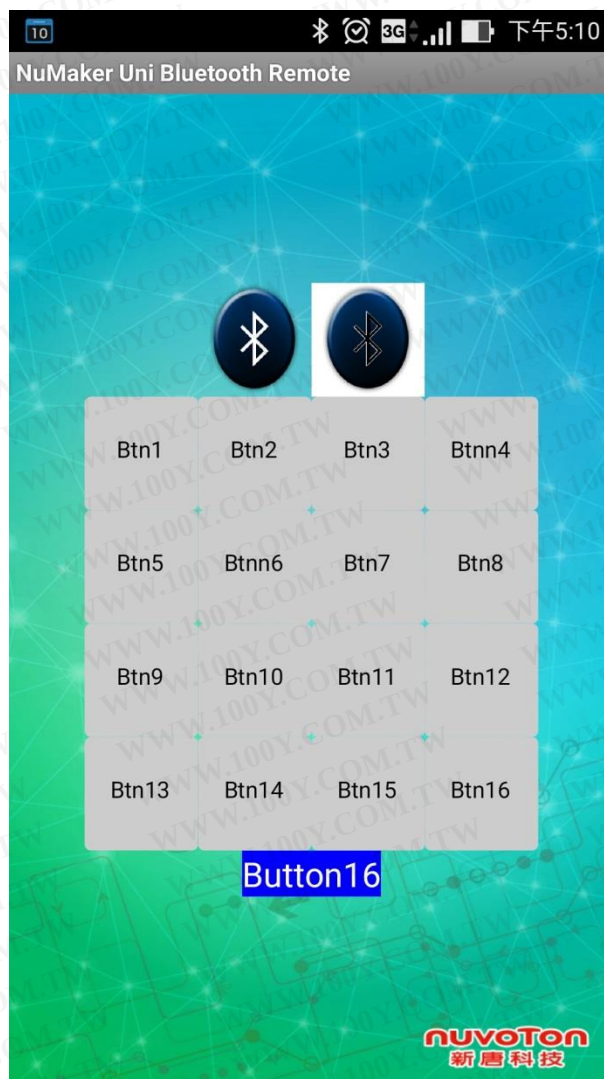
- Open NuMaker Uni BT Remote APP and tap the left Bluetooth icon.



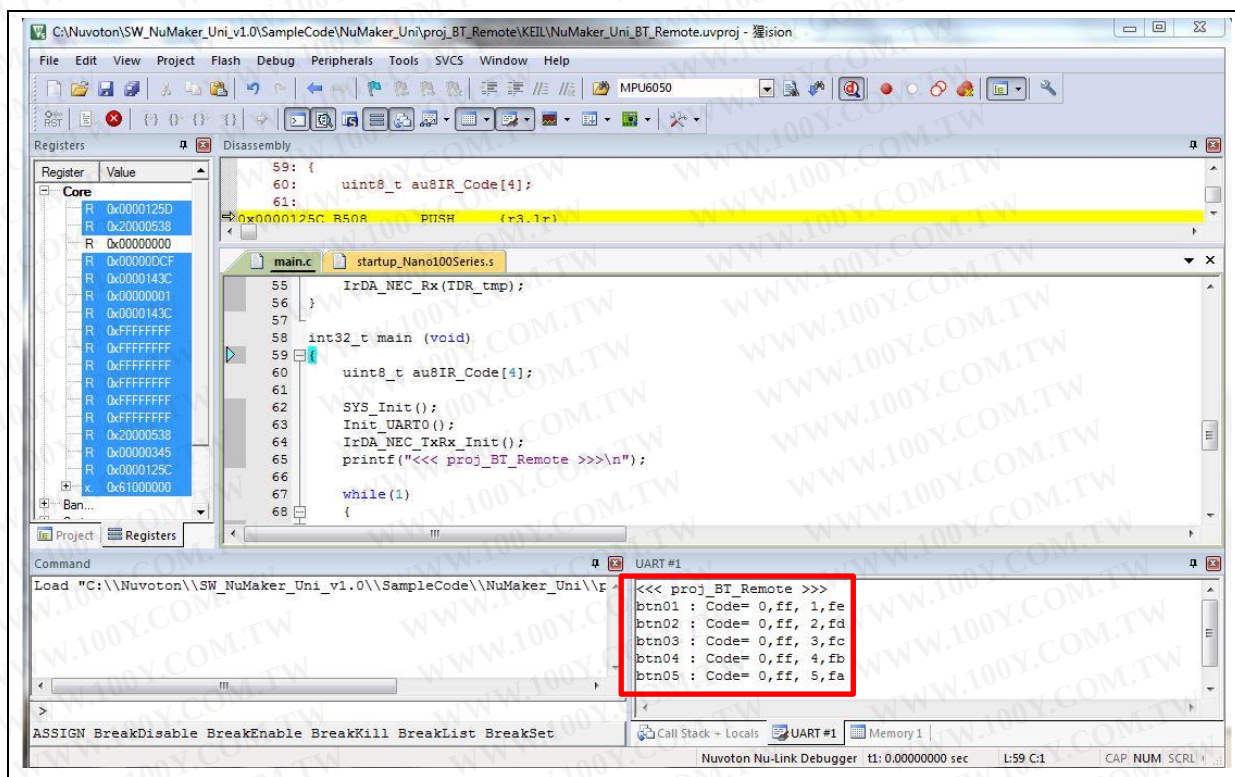
- Select the Bluetooth device "ITOM DM".



8. After connected, buttons Btn1 ~ Btn16 will be shown on NuMaker Uni BT Remote APP.



9. Randomly click the button. The result will be sent to the NuMaker Uni through Bluetooth, and shown immediately in the UART #1 windows.



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