

# Infrared Avoid Sensor

## Infrared Avoid Sensor

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This tutorial demonstrates: displaying the distance of infrared sensors through OLED.

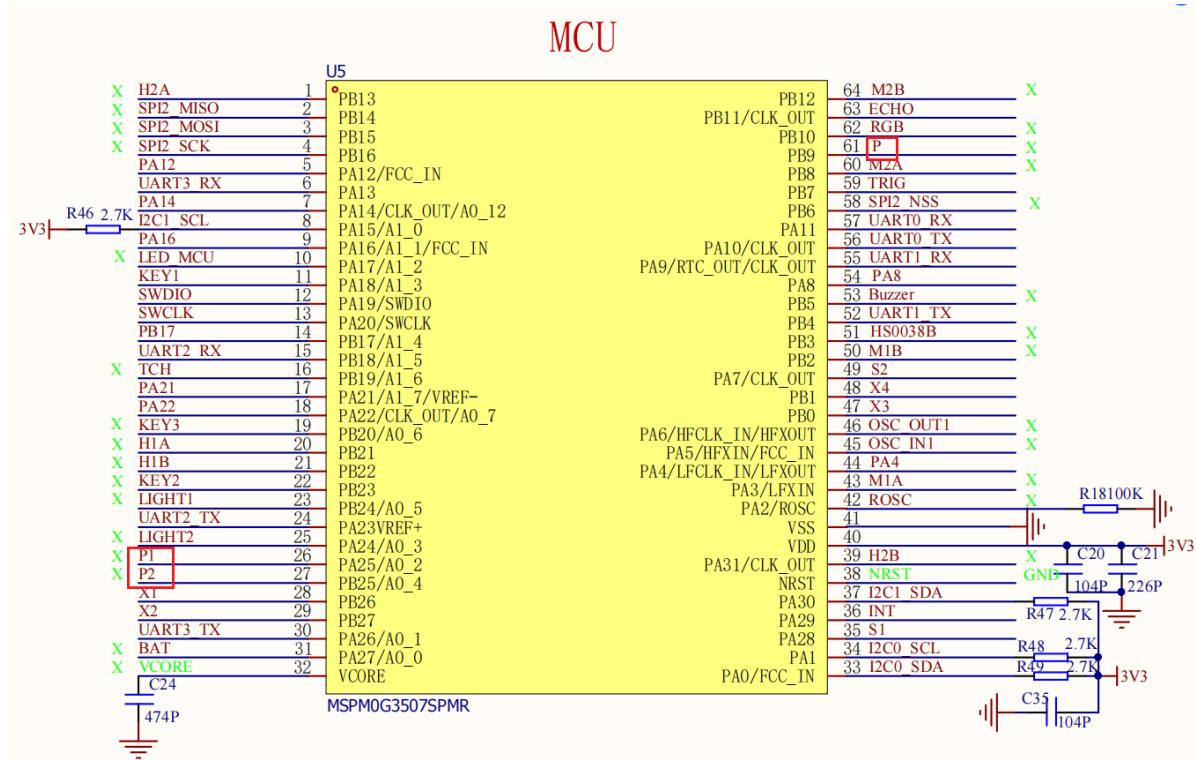
## 1. Software and Hardware

- KEIL
- MSPM0G3507 Development Board
- Type-C data cable or DAP-Link

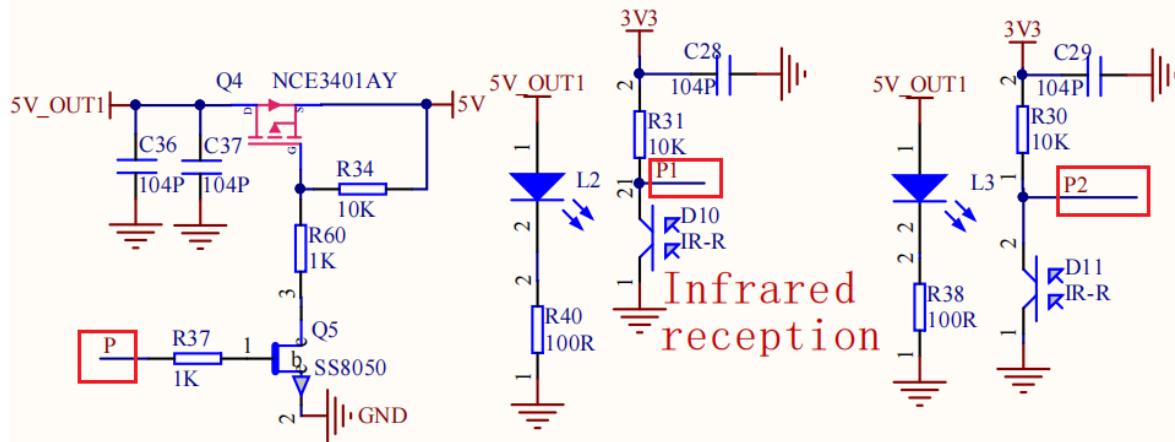
For programming download or simulation to the development board

## 2. Basic Principles

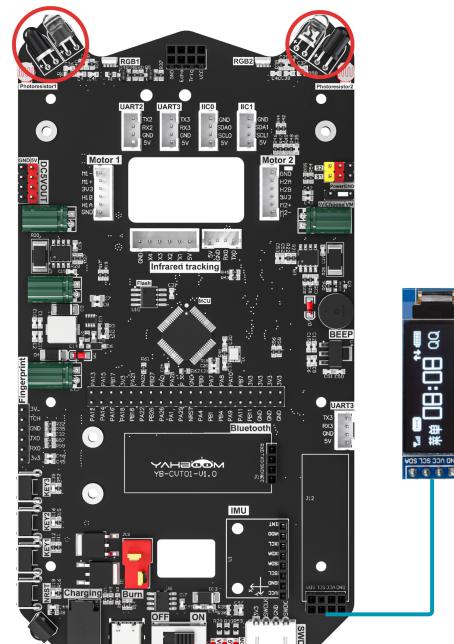
### 2.1 Hardware Schematic



## Dual-channel infrared obstacle avoidance



## 2.2 Physical Connection Diagram



## 2.3 Control Principle

Through two-channel ADC conversion, the analog voltage output by the infrared obstacle avoidance module can be converted into digital values; the value range is 0 to  $2^{12}-1$  (i.e., 0 to 4095).

Infrared Avoidance (Development Board Integrated)	Corresponding Pin
P1	PA25 (controls left obstacle avoidance module switch)
P2	PB25 (controls right obstacle avoidance module switch)
P	PB9 (AD collection)

# 3. Project Configuration

## 3.1 Description

You can refer to the basic tutorial to complete the development environment setup.

## 3.2 Pin Configuration

The screenshot shows the TI LaunchPad Pin Configuration tool interface. The left sidebar lists various hardware components and their configurations:

- PROJECT CONFIGURATION:** Project Config... 1/1 (checked)
- MSP430 DRIVER LIBRARY ...**
- SYSTEM (9):** Board 1/1 (checked), Configuration NVM, DMA, GPIO 7 (checked)
- ANALOG (6):** ADC12 1/2 (checked), COMP, DAC12, GPAMP, OPA, VREF
- COMMUNICATIONS (6):** I2C, I2C - SMBUS, MCAN, SPI, UART 1/4 (checked), UART - LIN
- TIMERS (6):** TIMER 1/7 (checked), TIMER - CAPTURE, TIMER - COMPARE, TIMER - PWM, TIMER - QEI, Timer Fault

The main configuration area is for the **GPIO** section, specifically for the **OLED** component. The configuration details are as follows:

- Name:** OLED
- Port:** PORTA
- Port Segment:** Any
- Group Pins:** SCL1, SDA1
- Digital IOMUX Features:** Assigned Port: PORTA, Assigned Port Segment: Any, Assigned Pin: 15
- Interrupts/Events:** LaunchPad-Specific Pin: No Shortcut Used

At the bottom right, there are two buttons: **+ ADD** and **= REMOVE ALL**.

FILE ABOUT

Type Filter Text... X

PROJECT CONFIGURATION... Project Config... 1/1 ✓ +

MSPM0 DRIVER LIBRARY ... SYSTEM (9)

- Board 1/1 ✓ +
- Configuration NVM +
- DMA +
- GPIO 7 ✓ +
- MATHACL +
- RTC +
- SYSCTL 1/1 ✓ +
- SYSTICK 1/1 ✓ +
- WWDT +

ANALOG (6)

- ADC12 1/2 ✓ +
- COMP +
- DAC12 +
- GPAMP +
- OPA +
- VREF +

COMMUNICATIONS (6)

- I2C +
- I2C - SMBUS +
- MCAN +
- SPI +
- UART 1/4 ✓ +
- UART - LIN +

TIMERS (6)

- TIMER 1/7 ✓ +
- TIMER - CAPTURE +
- TIMER - COMPARE +
- TIMER - PWM +
- TIMER - QEI +
- Timer Fault +

Software ▶ ADC12

ADC12 (1 of 2 Added) ②

+ ADD REMOVE ALL

✓ ADC\_Senor

Name	ADC_Senor
Selected Peripheral	ADC0
Quick Profiles	
ADC12 Profiles	Custom

Basic Configuration

Sample Clock Configuration

ADC Clock Source	SYSOSC
ADC Clock Frequency	32.00 MHz
Force SYSOSC Base Freq In STOP...	<input type="checkbox"/>
Force SYSOSC Base Freq In RUN	<input type="checkbox"/>
Sample Clock Divider	Divide by 8
Calculated Sample Clock Frequen...	4.00 MHz

Sampling Mode Configuration

Conversion Mode	Sequence
Conversion Starting Address	0
Conversion End Address (Sequenc...	4
Enable Repeat Mode	<input type="checkbox"/>
Sampling Mode	Auto
Trigger Source	Software
Conversion Data Format	Binary unsigned, right aligned

ADC Conversion Memory Configurations

SysConfig - C:\ti\mspm0\_sdk\_2\_02\_00\_05\MSPM0G\_CAR\_IR\_Sensor\empty.syscfg

FILE ABOUT

Type Filter Text... X ← → Software > ADC12

PROJECT CONFIGURATION ... Project Config... 1/1 ✓ +

MSPM0 DRIVER LIBRARY ...

SYSTEM (9)

- Board 1/1 ✓ +
- Configuration NVM +
- DMA +
- GPIO 7 ✓ +
- MATHACL +
- RTC +
- SYSCTL 1/1 ✓ +
- SYSTICK 1/1 ✓ +
- WWDT +

ANALOG (6)

- ADC12 1/2 ✓ +
- COMP +
- DAC12 +
- GPAMP +
- OPA +
- VREF +

COMMUNICATIONS (6)

- I2C +
- I2C - SMBUS +
- MCAN +
- SPI +
- UART 1/4 ✓ +
- UART - LIN +

TIMERS (6)

- TIMER 1/7 ✓ +
- TIMER - CAPTURE +
- TIMER - COMPARE +
- TIMER - PWM +
- TIMER - QEI +

Conversion End Address (Sequence...) 4

Enable Repeat Mode

Sampling Mode Auto

Trigger Source Software

Conversion Data Format Binary unsigned, right aligned

ADC Conversion Memory Configurations

Advanced Configuration

Interrupt Configuration

DMA Configuration

Event Configuration

Pin Configuration

Disable Channel 12 Pin

PinMux Peripheral and Pin Configuration

ADC12 Peripheral	Any(ADC0)
ADC12 Channel 2 Pin	PA25/26
ADC12 Channel 4 Pin	PB25/27
ADC12 Channel 5 Pin	PB24/23
ADC12 Channel 3 Pin	PA24/25
ADC12 Channel 0 Pin	PA27/31

Other Dependencies

SysConfig - C:\Users\mihai\Documents\msp430\empty\sysconfig

FILE ABOUT

Type Filter Text... X ← → Software ▶ UART

PROJECT CONFIGURATION... Project Config... 1/1 ✓ +

MSPM0 DRIVER LIBRARY ... SYSTEM (9)

- Board 1/1 ✓ +
- Configuration NVM +
- DMA +
- GPIO 7 ✓ +
- MATHACL +
- RTC +
- SYSCTL 1/1 ✓ +
- SYSTICK 1/1 ✓ +
- WWDT +

ANALOG (6)

- ADC12 1/2 ✓ +
- COMP +
- DAC12 +
- GPAMP +
- OPA +
- VREF +

COMMUNICATIONS (6)

- I2C +
- I2C - SMBUS +
- MCAN +
- SPI +
- UART 1/4 ✓ +
- UART - LIN +

TIMERS (6)

- TIMER 1/7 ✓ +
- TIMER - CAPTURE +
- TIMER - COMPARE +
- TIMER - PWM +
- TIMER - QEI +
- Timer Fault +

UART (1 of 4 Added) ⓘ

+ ADD REMOVE ALL

UART\_0

Name: UART\_0  
Selected Peripheral: UART0

Quick Profiles: Custom

Basic Configuration

UART Initialization Configuration

Clock Source	MFCLK
Clock Divider	Divide by 1
Calculated Clock Source	4.00 MHz
Target Baud Rate	115200
Calculated Baud Rate	115107.91
Calculated Error (%)	0.0799
Word Length	8 bits
Parity	None
Stop Bits	One
HW Flow Control	Disable HW flow control

Advanced Configuration

Extend Configuration

The screenshot shows the SystemConfig software interface for an MSP430 LaunchPad. The left sidebar lists various hardware components and their configurations. The main panel shows the configuration for the GPIO module. Under 'GPIO' (7 pins), 'IRContorl' is selected. A group pin named 'IR\_switch' is defined with the following settings:

- Name: IR\_switch
- Direction: Output
- Initial Value: Cleared
- IO Structure: Any
- Digital IOMUX Features:
  - Assigned Port: Any
  - Assigned Port Segment: Any
  - Assigned Pin: 9
- Interrupts/Events: No Shortcut Used
- PinMux: Peripheral and Pin Configuration
- Other Dependencies: None

## 4. Main Functions

Mainly introduces the functional code written by users. **For detailed code, you can open the project files we provide and view the source code in the Bsp folder.**

### 4.1 User Functions

Function: void Open\_IR\_Switch(void)

<b>Function Prototype</b>	<b>void Open_IR_Switch(void)</b>
Function Description	Open infrared obstacle avoidance output
Input Parameters	None
Output Parameters	None

Function: void Close\_IR\_Switch(void)

<b>Function Prototype</b>	<b>void Close_IR_Switch(void)</b>
Function Description	Close infrared obstacle avoidance output
Input Parameters	None
Output Parameters	None

## 5. Experimental Phenomenon

### Phenomenon:

OLED displays the values after ADC conversion of two-channel infrared sensors.

