NUC240 Driver GP2Y1010AU0F

Example Code Introduction for 32-bit NuMicro®Family

Information

Application	This sample code uses NUC240 to drive GP2Y1010AU0F to get PM2.5 value through ADC interface.
BSP Version	NUC230_240 Series BSP CMSIS v3.01.001
Hardware	NuTiny-SDK-NUC240V

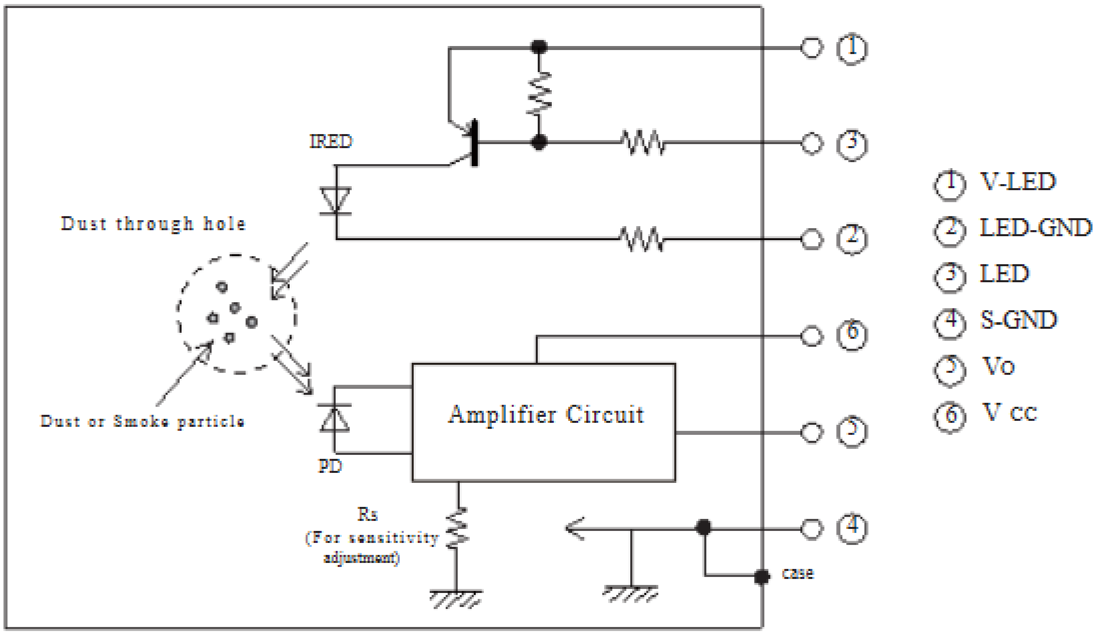
1 Function Description

1.1 Introduction

This sample code uses NUC240 to drive GP2Y1010AU0F to get Vo value (GP2Y1010AU0F output voltage) to calculate PM2.5 through ADC interface.

1.2 Principal

GP2Y1010AU0F is a dust sensor by optical sensing system. An infrared emitting diode (IRED) and a phototransistor are diagonally arranged into this device. It detects the reflected light of dust in air. Especially, it is effective to detect very fine particle like the cigarette smoke. In addition it can distinguish smoke from house dust In addition it can distinguish smoke from house dust by pulse pattern of output voltage.



2 Code Description

Calculate PM2.5

```
    void ADC_IRQHandler(void)
    {
        g_u32AdcIntFlag = 1;
        ADC_CLR_INT_FLAG(ADC, ADC_ADF_INT); /* clear the A/D conversion flag */
    }
    int main(void)
    {
        int32_t  i32ConversionData;
        float calcVoltage, dustDensity;
        /* Unlock protected registers */
        SYS_UnlockReg();
        /* Enable ADC module clock */
        CLK_EnableModuleClock(ADC_MODULE);
        SystemCoreClockUpdate();

        /*ADC clock source is 22.1184MHz, set divider to 10, ADC clock is 22.1184/10 MHz */
        CLK_SetModuleClock(ADC_MODULE, CLK_CLKSEL1_ADC_S_HIRC, CLK_CLKDIV_ADC(11));

        /* Disable the GPA0 - GPA3 digital input path to avoid the leakage current. */
        GPIO_DISABLE_DIGITAL_PATH(PA, 0x1);

        /* Configure the GPA0 ADC analog input pins */
        SYS->GPA_MFP &= ~(SYS_GPA_MFP_PA0_Msk);
        SYS->GPA_MFP |= SYS_GPA_MFP_PA0_ADC0;
        SYS->ALT_MFP1 = 0;

        /* Set the ADC operation mode as single, input mode as single-end and enable the
analog input channel 2 */
        ADC_Open(ADC, ADC_ADCR_DIFFEN_SINGLE_END, ADC_ADCR_ADMD_SINGLE, 0x1 << 0);

        /* Power on ADC module */
        ADC_POWER_ON(ADC);

        /* Clear the A/D interrupt flag for safe */
        ADC_CLR_INT_FLAG(ADC, ADC_ADF_INT);

        /* Enable the ADC interrupt */
        ADC_EnableInt(ADC, ADC_ADF_INT);
        NVIC_EnableIRQ(ADC_IRQn);

        /* Configure PA.1 as Output mode*/
        GPIO_SetMode(PA, BIT1, GPIO_PMD_OUTPUT);
        LED_POWER_PIN = 1;

        while (1)
        {
            LED_POWER_PIN = 0; // power on the LED
            g_u32AdcIntFlag = 0;
            CLK_SysTickDelay(250); /* Reset the ADC interrupt indicator and Start A/D 
conversion */
            ADC_START_CONV(ADC);
            CLK_SysTickDelay(3200);  //delay 3.2ms

            /* Wait ADC interrupt (g_u32AdcIntFlag will be set at IRQ_Handler function)*/
            while (g_u32AdcIntFlag == 0);

            /* Get the conversion result of the ADC channel 0 */
            i32ConversionData = ADC_GET_CONVERSION_DATA(ADC, 0);
            LED_POWER_PIN = 1;
            // 0 - 5V mapped to 0 - 1023 integer values
            // recover voltage
            calcVoltage = (float)i32ConversionData * (5.0 / 1024.0);
            // linear eqaution taken from http://www.howmuchsnow.com/arduino/airquality/
            dustDensity = 0.17 * calcVoltage - 0.1;
            printf("Dust Density: ");
            printf("%.2f", dustDensity * 1000);
            printf(" ug/m3 \n\r");
            CLK_SysTickDelay(100000);  //delay 100ms
        }

    }
```

Reference material:

http://www.howmuchsnow.com/arduino/airquality/

3 Software and Hardware Environment

- **Software Environment**
  - BSP Version
    - NUC230_240 Series BSP CMSIS v3.01.001
  - IDE Version
    - Keil uVersion4.74
- **Hardware Environment**
  - Circuit Components
    - NuTiny-SDK-NUC240V
    - GP2Y1010AU0F
  - Diagram

NUC240 use ADC(PA0) get Vo value of GP2Y1010AU0F to calculate PM2.5.

5V	↔	V-LED
GND	↔	LED-GND
PA1	↔	LED
GND	↔	S-GND
PA0	↔	Vo
5V	↔	VDD
NUC240		GP2Y1010AU0F

4 Directory Information

🗁 EC_ NUC240_ADC_GP2Y1010AU0F_PM2.5_V1.00	
🗁 Library	Sample code header and source files
🗁 CMSIS	Cortex®Microcontroller Software Interface Standard (CMSIS) V4.5.0 definitions by ARM® Corp.
🗁 Device	CMSIS compliant device header file
🗁 StdDriver	All peripheral driver header and source files
🗁 SampleCode	
🗁 ExampleCode	Source file of example code

5 How to Execute Example Code

1. According to Directory Information, enter the KEIL folder in path ExampleCode and double click “NUC240_ADC_GP2Y1010AU0F_PM2.5.uvproj”
2. Enter the compilation mode interface
   a. Compilation
   b. Download code to Flash
   c. Enter/leave debugging mode
3. Enter the debugging mode interface
   a. Execution code

6 Revision History

Date	Revision	Description
Apr. 24, 2019	1.00	1. Initially issued.

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