NUC240 Driver GP2Y1010AU0F

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

代碼簡述	本範例代碼為 NUC240 驅動 GP2Y1010AU0F 來計算 PM2.5 值。
BSP 版本	NUC230_240 Series BSP CMSIS v3.01.001
開發平台	NuTiny-SDK-NUC240V

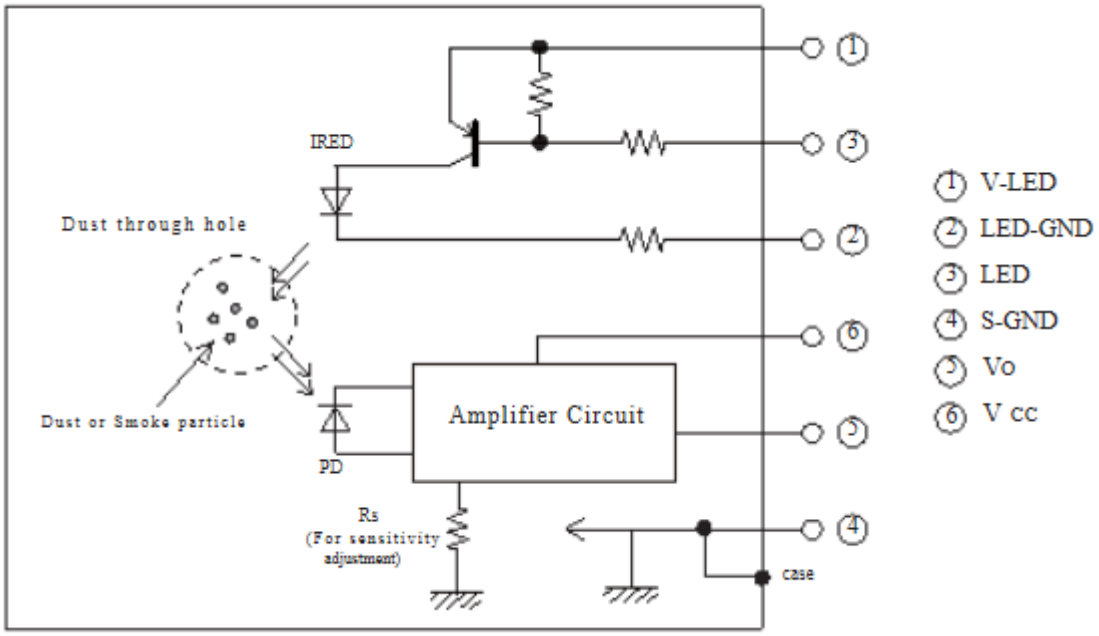
1 功能介紹

1.1 簡介

本範例代碼為 NUC240 系列通過 ADC 接口來讀取 GP2Y1010AU0F 的输出 Vo 值，用於計算 PM2.5 數值。

1.2 原理

GP2Y1010AU0F是一種由光學傳感系統構成的塵埃傳感器。一個紅外發光二極管(IRED)和一個光敏電阻器斜佈置在這個裝置。它能探測到空氣中灰塵的反射光。特別是對香菸煙霧等非常細小的顆粒的檢測是有效的。此外，它還可以通過輸出電壓的脈衝模式來區分煙霧和家居灰塵。



2 代碼介紹

計算 PM2.5 值：

```
    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
        }

    }
```

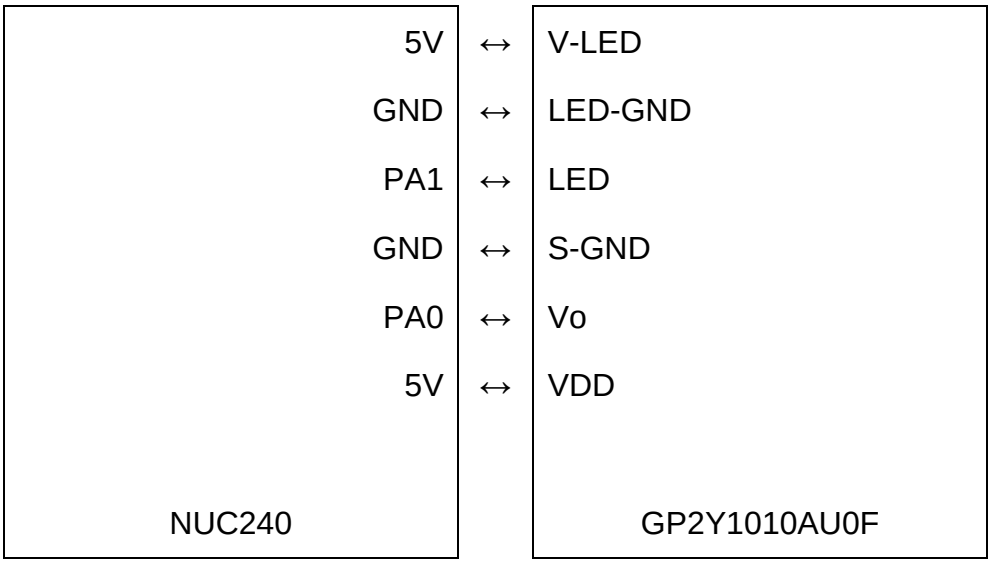
參考資料：

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

3 軟體與硬體環境

- 軟件環境
  - BSP 版本
    - NUC230_240 Series BSP CMSIS v3.01.001
  - IDE 版本
    - Keil uVersion4.74
- 硬件環境
  - 電路元件
    - NuTiny-SDK-NUC240V
    - GP2Y1010AU0F 模塊
  - 示意圖

NUC240 使用 ADC（PA0）讀取 GP2Y1010AU0F 的 Vo 值進行計算得到 PM2.5 值。



4 目錄資訊

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 如何執行範例程式

1. 根據目錄資訊章節進入 ExampleCode 路徑中的 KEIL 文件夾，雙擊 NUC240_ADC_GP2Y1010AU0F_PM2.5.uvproj
2. 進入編譯模式
   a. 編譯
   b. 下載代碼到內存
   c. 進入/離開仿真模式
3. 進入仿真模式接口
   a. 執行代碼

6 修訂紀錄

Date	Revision	Description
Apr. 24, 2019	1.00	1. 初始發布.

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