Subsystem Design

Subsystem Reading From Sensors Through I2C

1 Description

This subsystem example demonstrates collecting ambient light, humidity and temperature data using MSPM0C1104 MCU and TI digital I2C sensors HDC2010/80 and OPT3001. This design can be a cost-optimized proposal for building automation projects. Figure 1-1 demonstrates system elements connections. Code for this example is found in the MSPM0 SDK.

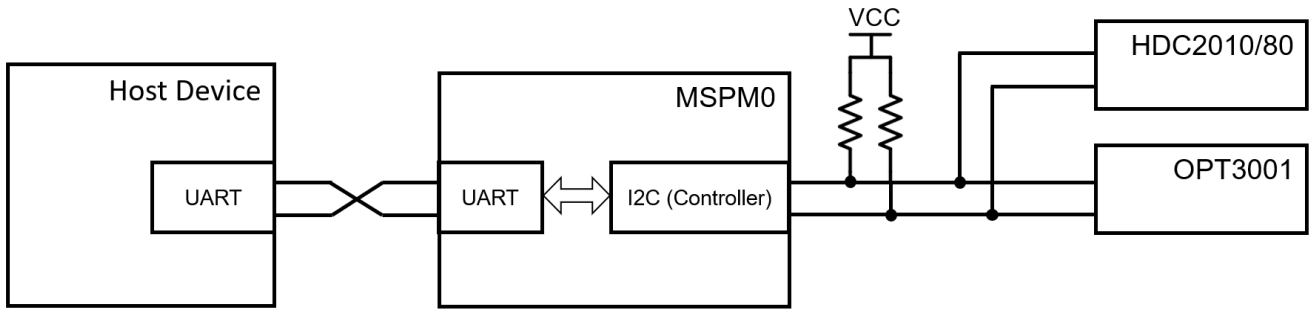

Figure 1-1. Subsystem Functional Block Diagram

2 Required Peripherals

This application requires 1 UART and 1 I2C peripherals. The application uses one GPIO to toggle LED and signalize transfer status.

Table 2-1. Required Peripherals

Sub-block Functionality	Peripheral Use	Notes
I2C Controller	I2C	Called I2C_0_INST in code. Default 100000Hz bus speed.
UART output	UART	Called UART_0_INST in code. Default 9600 baud rate.
IO input	GPIO	Called USER_LED_1 in code.

3 Sensor Evaluation Modules

This code example can be run using OPT3001 and HDC2010/80 sensors. The corresponding EVM can be used for prototyping.

Table 3-1. Compatible Devices

Compatible devices	EVM
HDC2080	BP-BASSENSORSMKII
HDC2010	BOOSTXL-BASSENSORS
OPT3001	BP-BASSENSORSMKII, BOOSTXL-BASSENSORS

4 Design Considerations

In this code example, Auto Measurement Mode with 2Hz frequency is set for HDC sensor and continuous conversions with 100ms conversion time for OPT. To change these, follow sensors data sheets and modify *gTxPacketConfigurationHDC* and *gTxPacketConfigurationOPT* in code.

LED1 on LP-MSPM0C1104 board toggles if transmission is successful. If an error occurs, LED1 stays set. Check pin connections and press NRST button.

In default, PA11 pin on LP-MSPM0C1104 board is set as I2C SCL and PA0 pin as SDA. To enable OPT3001 on BP-BASSENSORSMKII or BOOSTXL-BASSENSORS pack, connect O_V+ pin to 1.6V to 3.6V supply.

5 Software Flowchart

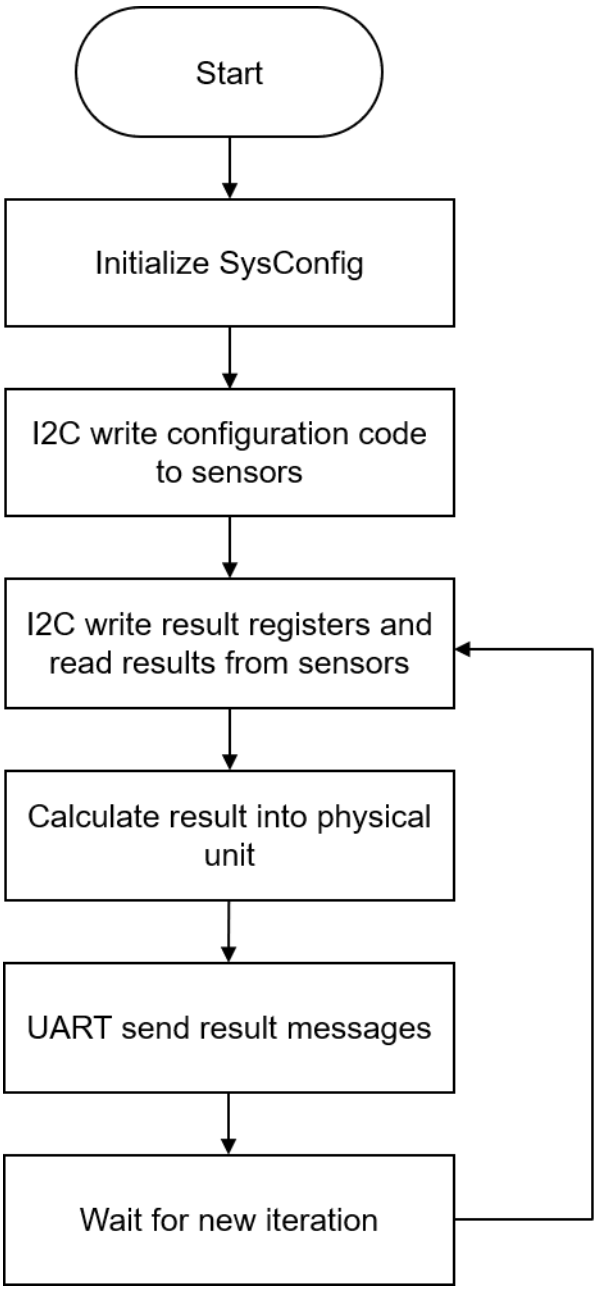

Figure 5-1. Software Flow Diagram

6 Application Code

```
int main(void)
{
  SYSCFG_DL_init();
  /* Set LED to indicate start of transfer */
  DL_GPIO_clearPins(GPIO_LEDS_PORT, GPIO_LEDS_USER_LED_1_PIN);

  setMeasurementConfigurationsForSensors();

  while (1)
  {
    takeMeasurements();

    /* Interpret values */
    gHumidityRH = HDC2010_humToIntRelative(gHumidity);
    gTemperatureCelsius = HDC2010_tempToFloatCelsius(gTemperature);
    gLightLux = 0.01 * pow(2, gExponent) * gResult;
    delay_cycles(24000);

    sendToUARTReceiver();

    /* If write and read were successful, toggle LED every second till next measurement */
    for (uint8_t i = 0; i < gSecDelay; i++) {
      DL_GPIO_togglePins(GPIO_LEDS_PORT,
      GPIO_LEDS_USER_LED_1_PIN);
      delay_cycles(24000000);
    }
  }
}
```

7 Results

To observe measurement results, connect LP-MSPM0C1104 through USB-C to your PC and run serial monitor with speed set to 9600, data bits 8, stop bits 1, parity *None*, flow control *None*. In this example results are presented with 1 RH%, 0.1°C and 1lx accuracy. To adjust message sending frequency modify gSecDelay parameter in the code (default 30s-time delay).

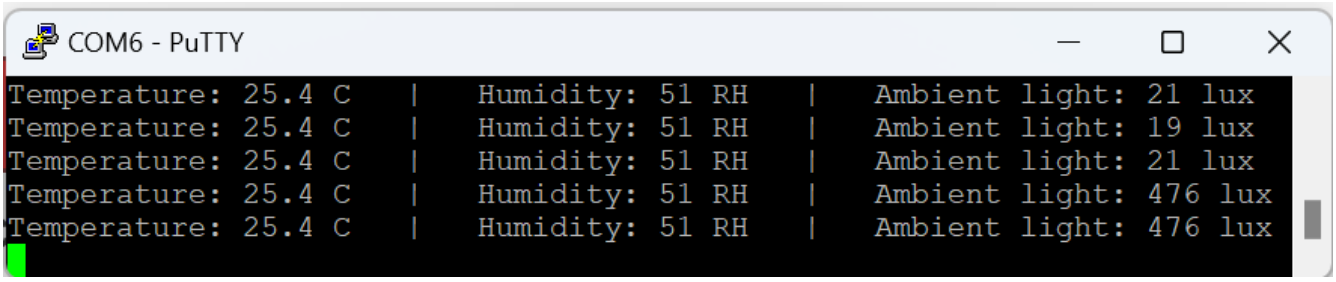

Figure 7-1. Serial Monitor Output - PuTTY

8 Additional Resources

- MSPM0 Software Development Kit (SDK)
- Learn more about SysConfig
- MSPM0C Technical Reference Manual
- MSPM0 Academy - I2C Introduction Lab

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