NANO100通過I2C驅動QMC5883L

NuMicro® 32 位系列微控制器範例代碼介紹

文件資訊

代碼簡述	本範例代碼使用 NANO100 的 I2C 接口驅動 QMC5883L
BSP 版本	Nano100B_Series_BSP_CMSIS_v3.03.000
開發平台	NuTiny-EVB-Nano130-LQFP128 V1.0

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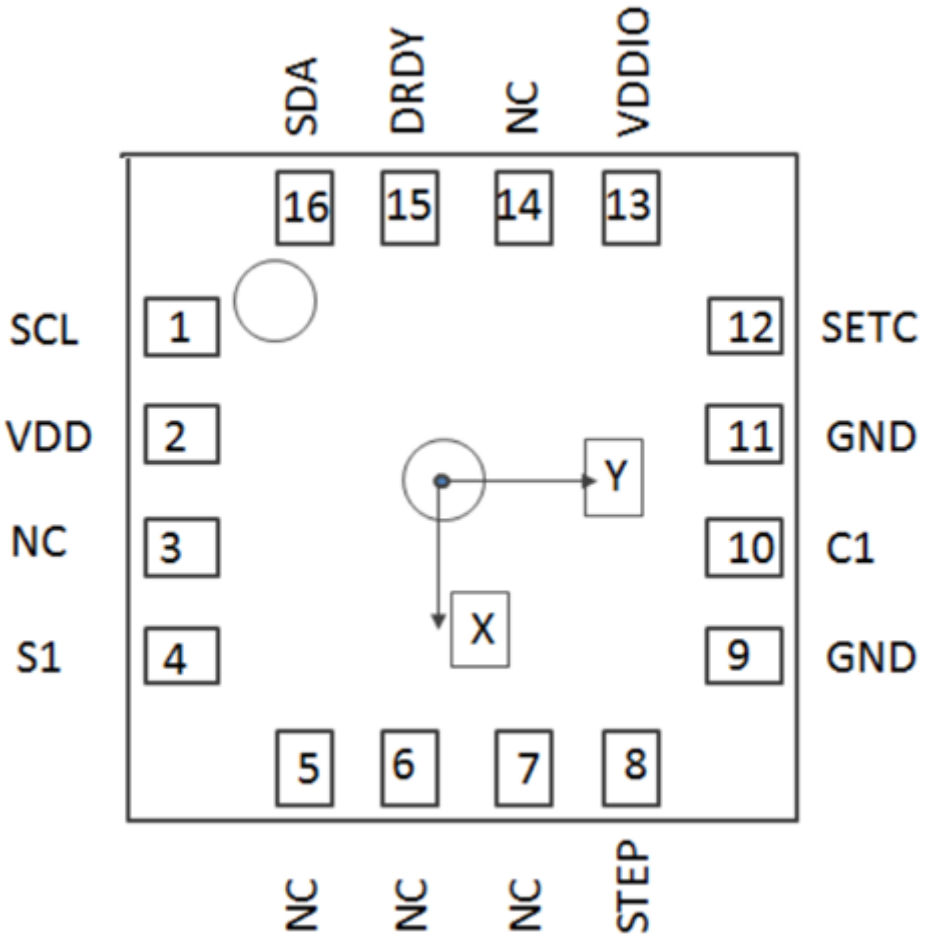
1 功能介紹

1.1 簡介

QMC5883L是一款3軸磁傳感器，可通過I2C接口進行控制。

1.1.1 引腳配置

QMC5883L引腳圖如下：



引腳功能描述如下：

引腳號	引腳名	功能
1	SCL	串行時鐘 – I2C主機/從機時鐘

2	VDD	電源（2.16V~ 3.6V）
3	NC	不連接
4	S1	連接到VDDIO
5	NC	不連接
6	NC	不連接
7	NC	不連接
8	SETP	S/R電容（C2）連接
9	GND	地
10	C1	充電電容（C1）連接
11	GND	地
12	SETC	S/R電容（C2）連接
13	VDDIO	IO電源（1.71V~VDD）
14	NC	不連接
15	DRDY	數據準備好中斷引腳，默認為低，數據準備好為高，直到數據寄存器被讀。
16	SDA	串行數據 – I2C主機/從機數據

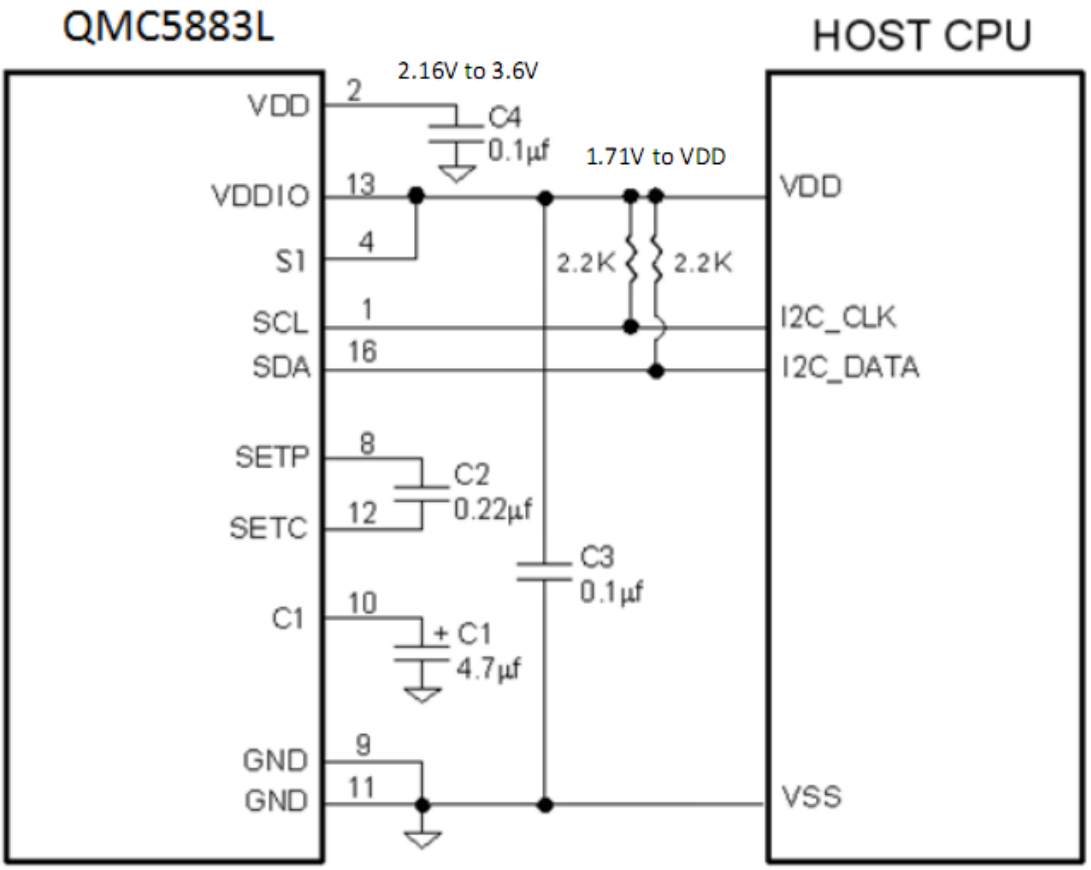
1.1.2 寄存器映射

地址	7	6	5	4	3	2	1	0	訪問
00H	X軸數據輸出LSB寄存器XOUT[7:0]								只讀
01H	X軸數據輸出MSB寄存器XOUT[15:8]								只讀
02H	Y軸數據輸出LSB寄存器YOUT[7:0]								只讀
03H	Y軸數據輸出MSB寄存器YOUT[15:8]								只讀
04H	Z軸數據輸出LSB寄存器ZOUT[7:0]								只讀
05H	Z軸數據輸出MSB寄存器ZOUT[15:8]								只讀

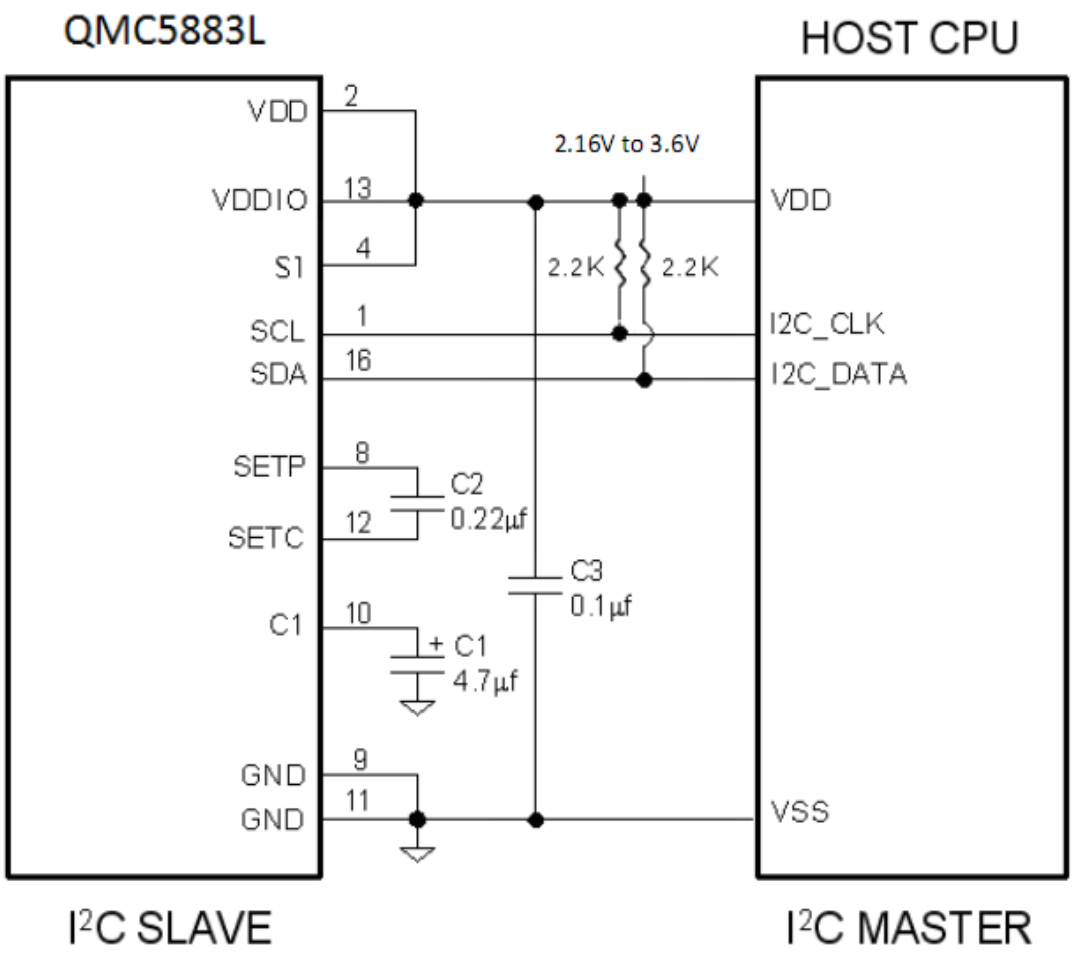
06H						DOR	OVL	DRDY	只讀
07H	TOUT[7:0]								只讀
08H	TOUT[15:8]								只讀
09H	OSR[1:0]		RNG[1:0]		ODR[1:0]		MODE[1:0]		讀/寫
0AH	SOFT_RST	ROL_PNT						INT_ENB	讀/寫，只有在空閒時可讀
0BH	SET/RESET週期FBR [7:0]								讀/寫
0CH	保留								只讀
0DH	芯片ID								只讀

1.1.3 應用電路

1.1.3.1 雙電源連接



1.1.3.2 單電源連接



關於QMC5883L的詳細信息，請參考QMC5883L的數據手冊。

1.2 原理

本範例代碼使用NANO100系列通過I2C接口實現對QMC5883L的讀寫，獲取3軸磁傳感器值。

1.2.1 I2C 寫

START	Slave Address (0x0D)							R W	SACK	Register Address (0x09)								SACK	Data (0x01)								SACK	STOP
	0	0	0	1	1	0	1	0		0	0	0	0	1	0	0	1		0	0	0	0	0	0	0	1		

1.2.2 I2C 讀

START	Slave Address (0x0D)							R W	SACK	Register Addres (0x00)								SACK	
	0	0	0	1	1	0	1	0		0	0	0	0	0	0	0	0		
START	Slave Address (0x0D)							R W	SACK	Data (0x00)								MACK	Data (0x01)
	0	0	0	1	1	0	1	1		0	0	0	0	0	0	0	0		0 0 0 0 0 0 0 1
MACK	Data (0x02)								MACK	……								MACK	Data (0x07)								NACK	STOP
	0	0	0	0	0	0	1	0		……									0 0 0 0 0 1 1 1									

詳細信息，請參考QMC5883L的數據手冊。

1.3 執行結果

執行結果，打印數據如下：

```
Core Clock = 42000000 Hz

+------------------------------------------------------+
|   Nano100 Series I2C Sample Code with QMC5883L       |
+------------------------------------------------------+
Data:  X: 8575  Y: 60021  Z: 4347
Data:  X: 8680  Y: 60121  Z: 4280
Data:  X: 8760  Y: 60176  Z: 4155
Data:  X: 8735  Y: 61841  Z: 4437
Data:  X: 5780  Y: 59916  Z: 6320
Data:  X: 8735  Y: 62291  Z: 3587
Data:  X: 8395  Y: 63026  Z: 2622
Data:  X: 8430  Y: 63056  Z: 2612
Data:  X: 8430  Y: 63001  Z: 2642
```

2 代碼介紹

初始化 QMC5883L：

```
void QMC5883L_Init(void)
{
    I2C0_Init();

    I2C0_Write(QMC5883L_ADDR, QMC5883L_REG_PERIOD, 0x01);
    I2C0_Write(QMC5883L_ADDR, QMC5883L_REG_CONTROL1, 0x0D);
}
```

獲取 3 軸磁傳感器值：

```
void QMC5883L_ReadData(uint8_t au8Data[6])
{
    I2C0_Read(QMC5883L_ADDR, QMC5883L_REG_DATAX_LSB, 6, au8Data);
}
```

3 軟體與硬體環境

● 軟體環境

- ■ BSP 版本
  - ◆ Nano100B_Series_BSP_CMSIS_v3.03.000
- ■ IDE 版本
  - ◆ Keil uVersion4.74

● 硬體環境

- ■ 電路元件
  - ◆ NuTiny-EVB-Nano130-LQFP128 V1.0
  - ◆ QMC5883L
- ■ 示意圖

NANO100 使用 I2C 接口對 QMC5883L 進行初始化，獲取 3 軸磁傳感器值。

NANO100		QMC5883L
VDD	↔	VDD
VDD	↔	VDDIO
VDD	↔	S1
I2C0_SCL (PA.9)	↔	SCL
I2C0_SDA (PA8)	↔	SDA
GND	↔	GND

4 目錄資訊

- EC_NANO100_I2C_ QMC5883L _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 資料夾，雙擊 I2C_QMC5883L.uvproj。
2. 進入編譯模式介面
   a. 編譯
   b. 下載代碼至記憶體
   c. 進入 / 離開除錯模式
3. 進入除錯模式介面
   a. 執行代碼

6 修訂紀錄

Date	Revision	Description
Dec.16, 2019	1.00	1. 初始發布.

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