NANO100通过I2C驱动QMC5883L

NuMicro® 32 位系列微控制器范例代码介绍

文件信息

代码简述	本范例代码使用 NANO100 的 I2C 接口驱动 QMC5883L
BSP 版本	Nano100B_Series_BSP_CMSIS_v3.03.000
开发平台	NuTiny-EVB-Nano130-LQFP128 V1.0

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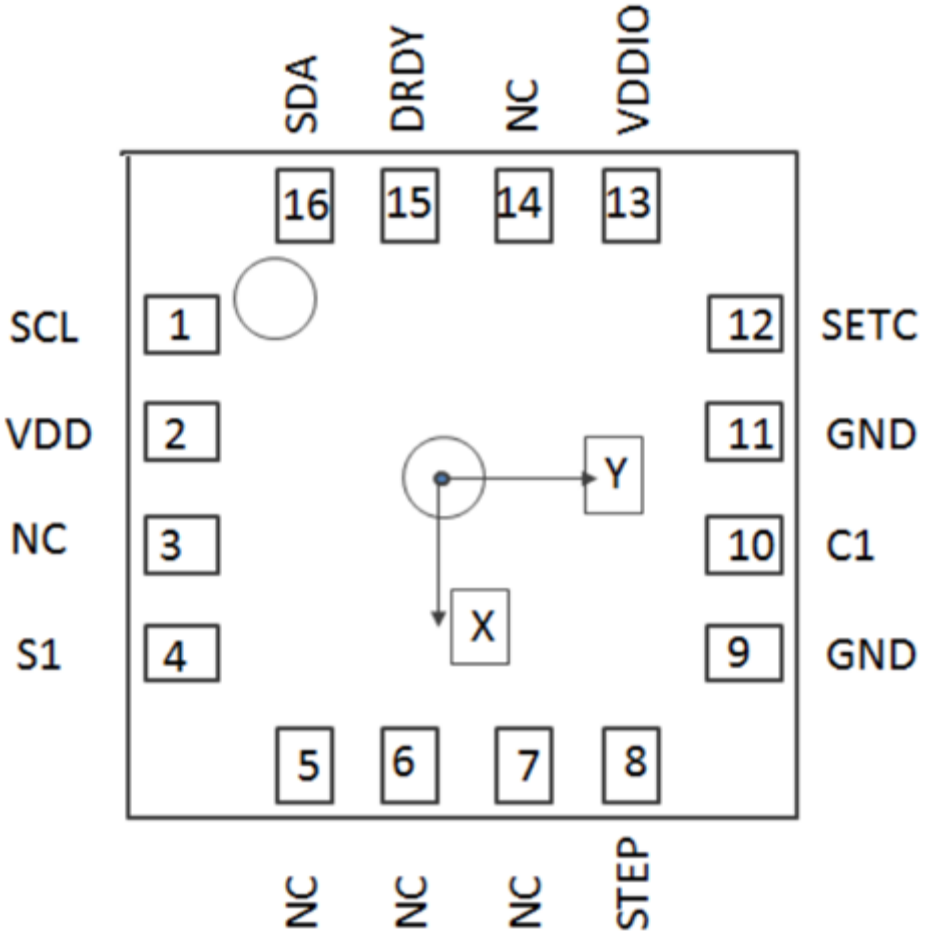
1 功能介绍

1.1 简介

QMC5883L是一款3轴磁传感器，可通过I2C接口进行控制。

1.1.1 引脚配置

QMC5883L引脚图如下：



引脚功能描述如下：

引脚号	引脚名	功能
1	SCL	串行时钟 – I2C主机/从机时钟
2	VDD	电源 （2.16V~ 3.6V）
3	NC	不连接
4	S1	连接到VDDIO

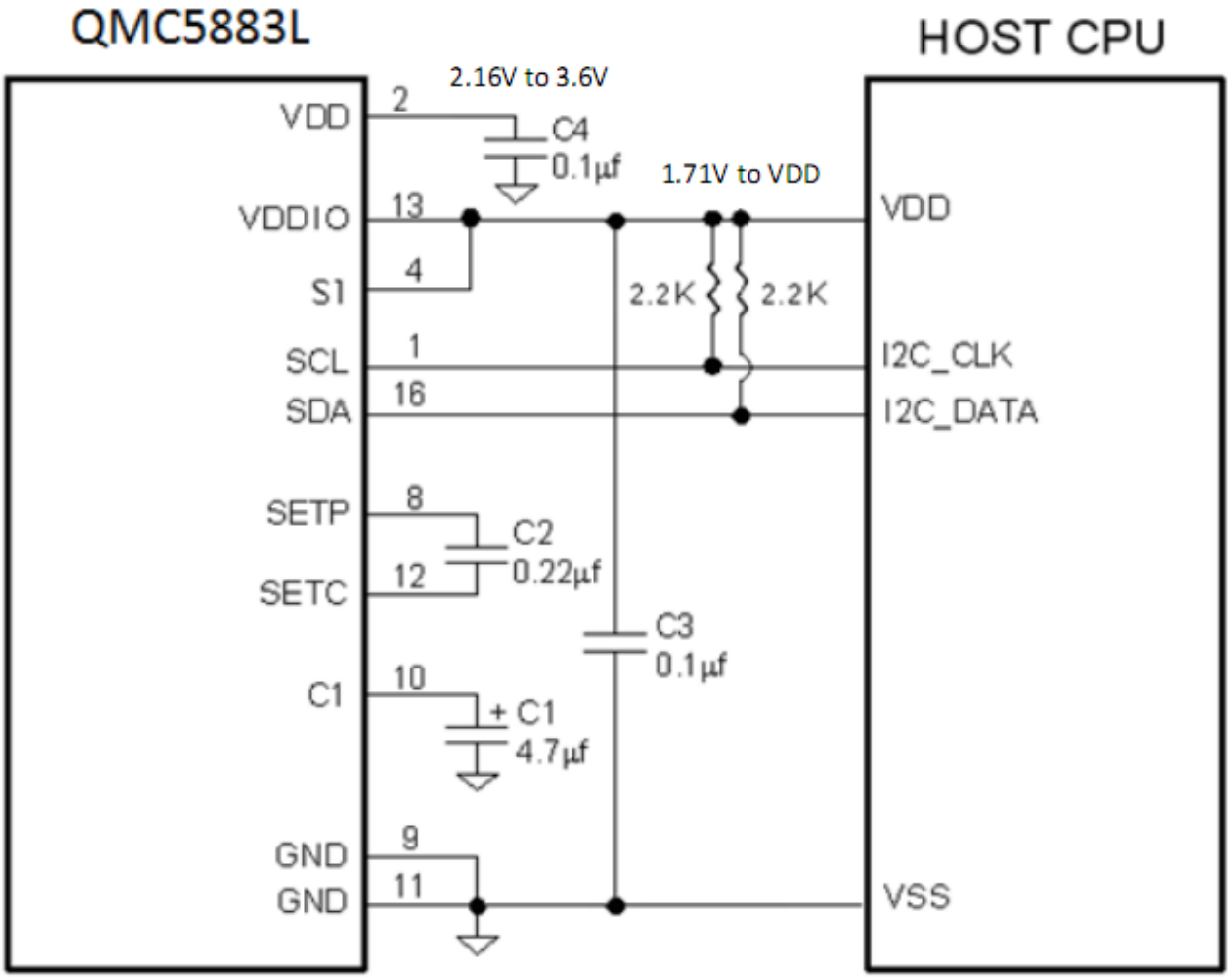
5	NC	不连接
6	NC	不连接
7	NC	不连接
8	SETP	S/R电容（C2）连接
9	GND	地
10	C1	充电电容（C1）连接
11	GND	地
12	SETC	S/R电容（C2）连接
13	VDDIO	IO电源（1.71V~VDD）
14	NC	不连接
15	DRDY	数据准备好中断引脚，默认为低，数据准备好为高，直到数据寄存器被读。
16	SDA	串行数据 – I2C主机/从机数据

1.1.2 寄存器映射

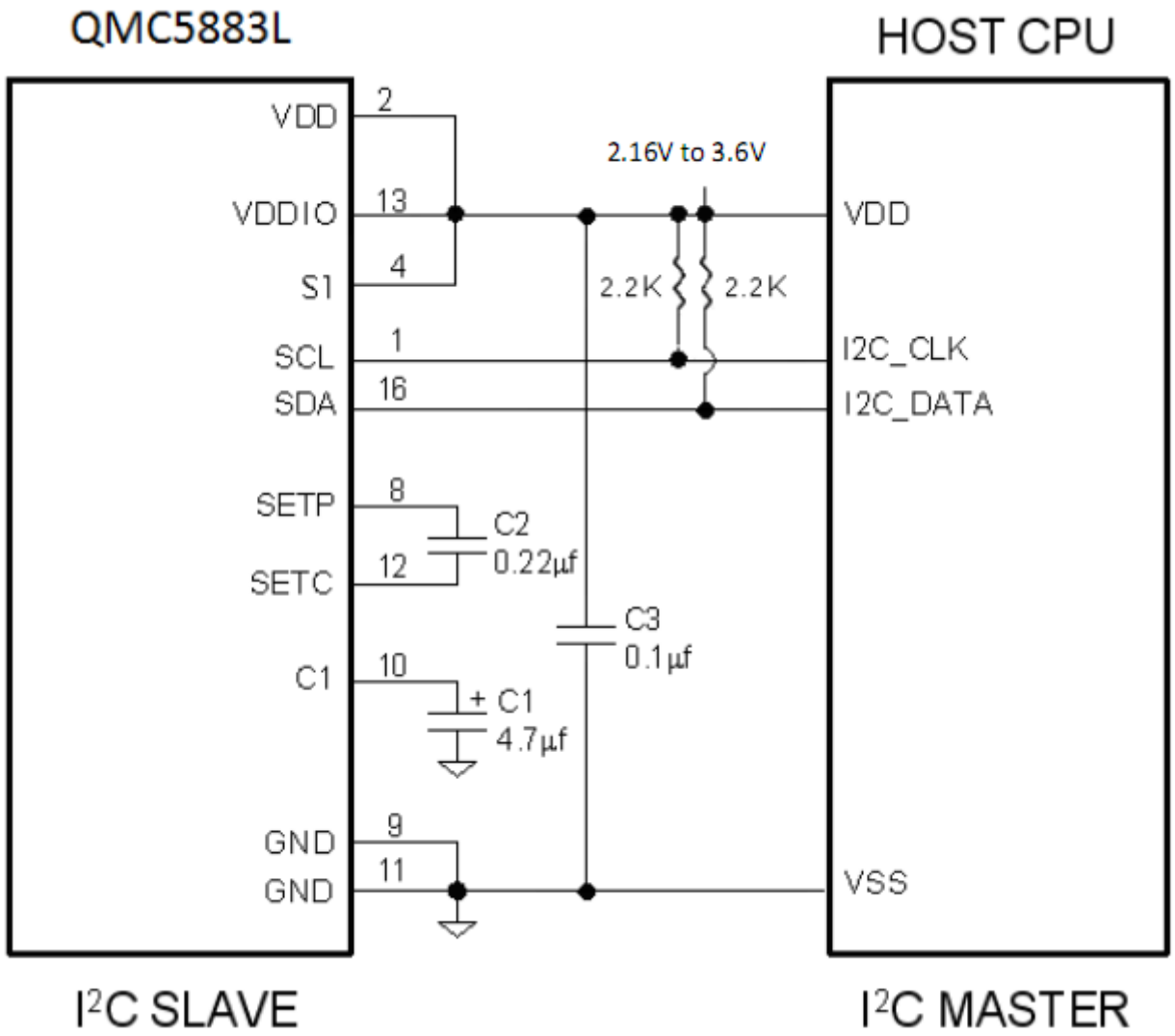
地址	7	6	5	4	3	2	1	0	访问
00H	X轴数据输出LSB寄存器XOUT[7:0]								只读
01H	X轴数据输出MSB寄存器XOUT[15:8]								只读
02H	Y轴数据输出LSB寄存器YOUT[7:0]								只读
03H	Y轴数据输出MSB寄存器YOUT[15:8]								只读
04H	Z轴数据输出LSB寄存器ZOUT[7:0]								只读
05H	Z轴数据输出MSB寄存器ZOUT[15:8]								只读
06H						DOR	OVL	DRDY	只读
07H	TOUT[7:0]								只读
08H	TOUT[15:8]								只读
09H	OSR[1:0]		RNG[1:0]		ODR[1:0]		MODE[1:0]		读/写
0AH	SOFT_RST	ROL_PNT						INT_ENB	读/写，只有在空闲时可读
0BH	SET/RESET周期FBR [7:0]								读/写
0CH	保留								只读
0DH	芯片ID								只读

1.1.3 应用电路

1.1.3.1 双电源连接



1.1.3.2 单电源连接



关于QMC5883L的详细信息，请参考QMC5883L的数据手册。

1.2 原理

本范例代码使用NANO100系列通过I2C接口实现对QMC5883L的读写，获取3轴磁传感器值。

1.2.1 I2C 写

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 读

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		

详细信息，请参考QMC5883L的数据手册。

1.3 执行结果

执行结果，打印数据如下：

```
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 代码介绍

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);
}
```

读取 3 轴磁传感器值：

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

3 软件与硬件环境

- 软件环境
  - BSP 版本
    - Nano100B_Series_BSP_CMSIS_v3.03.000
  - IDE 版本
    - Keil uVersion4.74
- 硬件环境
  - 电路组件
    - NuTiny-EVB-Nano130-LQFP128 V1.0
    - QMC5883L
  - 示意图

NANO100 使用 I2C 接口对 QMC5883L 进行初始化，获取 3 轴磁传感器值。

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

4 目录信息

- 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 如何执行范例程序

1. 根据目录信息章节进入 ExampleCode 路径中的 KEIL 文件夹，双击 I2C_QMC5883L.uvproj。
2. 进入编译模式接口
   a. 编译
   b. 下载代码至内存
   c. 进入 / 离开除错模式
3. 进入除错模式接口
   a. 执行代码

6 修订纪录

Date	Revision	Description
Dec.16, 2019	1.00	1. 初始发布.

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