



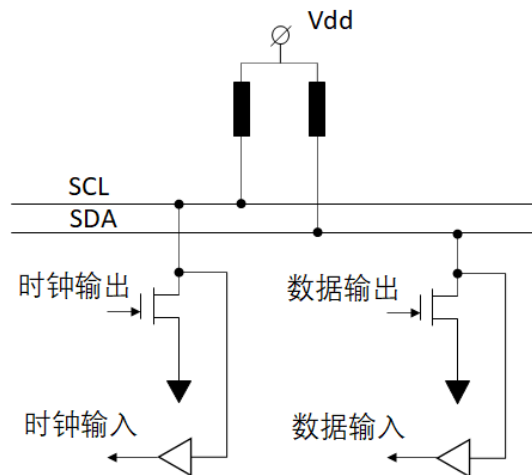
I2C 接口的 NPI-19 中低压硅油压力芯体接口说明

AN-NOVA-008

NPI-19 系列的中低压硅油不锈钢压力传感器中，增加了一款 I2C 接口的系列产品。本文是作为该产品的接口应用准备的。文中简单描述了 I2C 接口的通信 接口定义和数据协议格式，并在相应段落中提供了 C 语言的测试代码，以便用户设备作为 I2C 的主机进行参考测试。

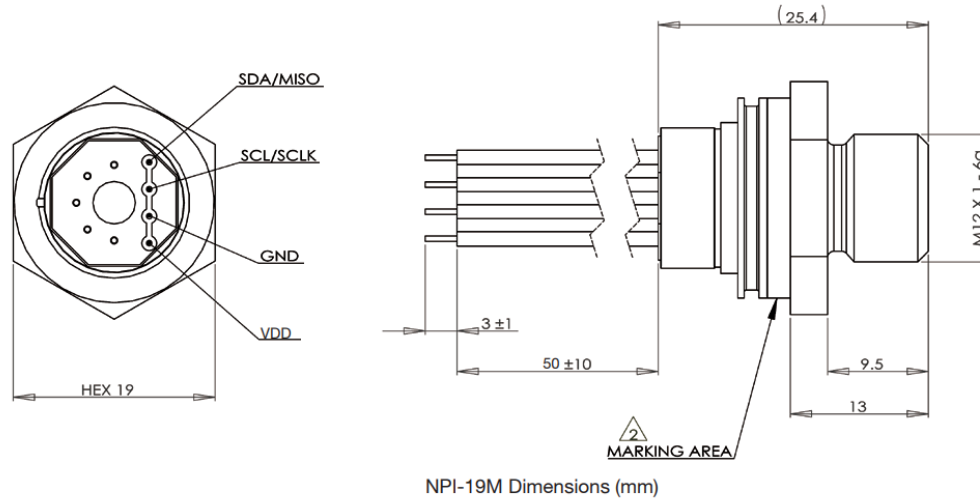


• I2C 接口定义



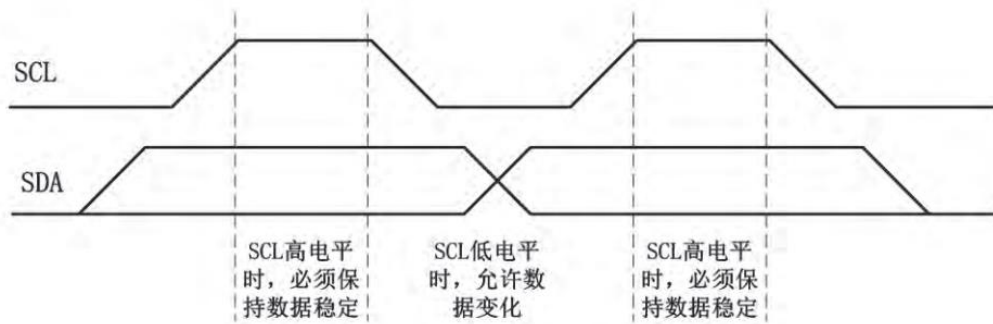
I2C 在硬件上基本都是 OC 门（集电极开路）或者 OD 门（漏极开路），然后在 SCL 时钟线和 SDA 数据线上分别通过一个上拉电阻连接到适当的供电电平，然后主、从设备直接将各自的 SCL 和 SDA 接口连接到同样的连线即可完成电路的配置。由于 I2C 支持多主机模式，所以如果将有效信号 0 作为低电平，1 作为高电平，那么这种硬件配置可以在每条线上形成逻辑“与”的操作结果（ $1\&0=0$ ， $1\&1=1$ ， $0\&0=0$ ），并且具有自我电气保护的电平操作，避免了多机在仲裁和数据收发冲突过程中对总线物理性的破坏。所以，实际应用中，我们对于使用通用 IO 口来模拟 I2C 主机接口的配置过程中，避免将两个端口配置为推挽式（push-pull）的，而尽量设置为 OD（当前 MCU 制程多为基于 MOS 工艺的）。

• NPI-19-I2C 接口数据格式定义

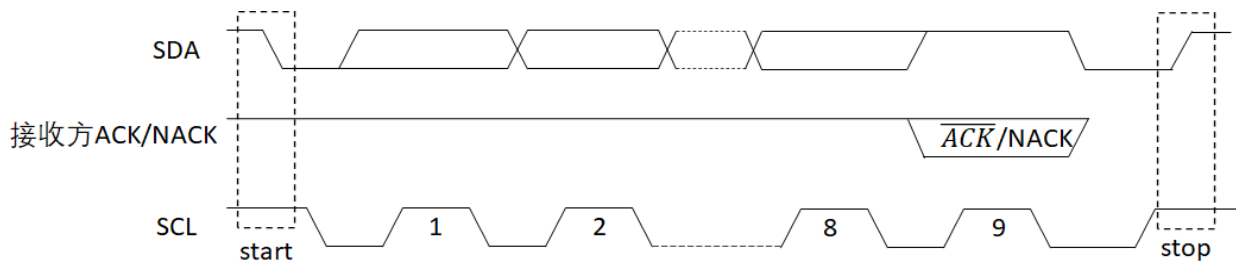


产品的实际接口顺序

• I2C 时序图



总线上数据 SDA 的对应时钟 SCL 的时序图



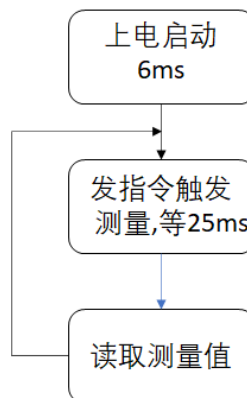
总线上起始和应答时序图

Parameter	Symbol	Min.	Max.	Units
SCL clock frequency	f_{FCL}	100	400	kHz
Start condition hold time relative to SCL edge	t_{HDSTA}	0.1		μS
Minimum SCL clock low width ¹⁾	t_{LOW}	0.6		μS
Minimum SCL clock high width ¹⁾	t_{HIGH}	0.6		μS
Start condition setup time relative to SCL edge	t_{SUSTA}	0.1		μS
Data hold time on SDA relative to SCL edge	t_{HDDAT}	0		μS
Data setup time on SDA relative to SCL edge	t_{SUDAT}	0.1		μS
Stop condition setup time on SCL	t_{SUSTO}	0.1		μS
Bus free time between stop condition and start condition	t_{BUS}	2		μS
¹⁾ Combined low and high widths must equal or exceed minimum SCLK period.				

产品总线时序参数

其中 ACK 部分如果是高电平，在这里是接收方要求结束数据传输。

• 读取压力值 I2C 指令步骤



测量压力读取流程示意图

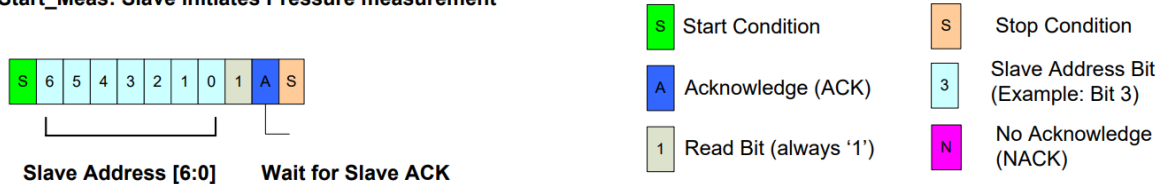
每个字节的数据发送时从最高位开始。器件上电后前 6ms 是自检，随后进入节电睡眠状态，直到接收到总线 Start 信号。主机先发“测量压力”指令，然后新的测量在 25ms 之后可以读取。如果在发“测量压力”指令后没有延时 25ms 即开启读取步骤，则读取的数值仍然是上次测量所得。

- 默认 I2C 从机地址: 0x28H

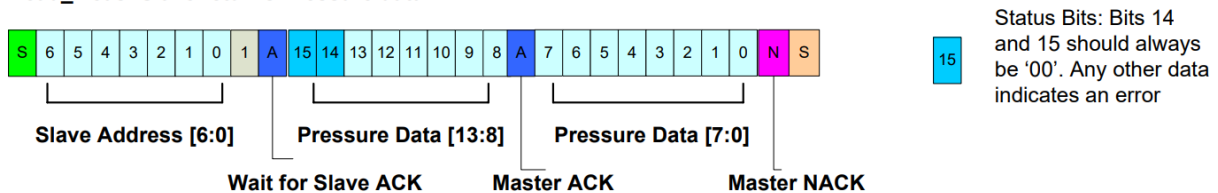
0	1	0	1	0	0	0	0/1
0x28							$\bar{W}/R$
0x50 (写, bit0=0) / 0x51 (读, bit0=1)							

由于在 7 位地址的 I2C 中, 左移一位后, 将读/写操作是放在该字节的最低位, 所以拼接之后的第一个字节就根据读、写要求选择相应的数值。

Start_Meas: Slave initiates Pressure measurement



Read_Meas: Slave returns Pressure data



触发测量和读取两组指令格式

- 读取压力值 I2C 主机测试代码

相关测试代码, 可以从公司产品页面中下载。由于测试代码无法应对所有的 MCU, 使用者需根据自己所使用的芯片进行相应的配置, 然后再测试调试。

NPI-19-i2C 这系列的产品, 用户还可以根据实际情况对产品的从地址进行修改。相关的指令和执行过程, 请与安费诺传感器直接联系。

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