MASARYK
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PV198 – One-chip Controllers

I2C

Content

1. What is I2C
2. What is it used for
3. How does it work
4. FRDM-K66F I2C
5. Accelerometer & Magnetometer
6. Application

What is I2C

- **I2C** – **I**nter-**I**ntegrated **C**ircuit
- Invented in 1982 by Philips Semiconductor (now NXP Semiconductors)

What is it used for

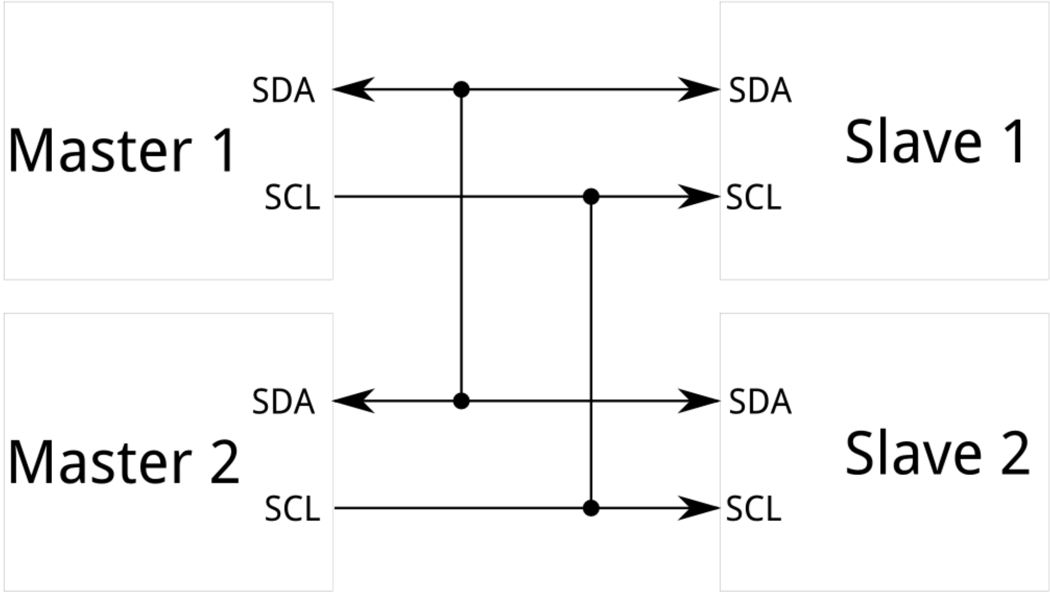
- Intra-board communication

- Peripherals
- Sensors

How does it work

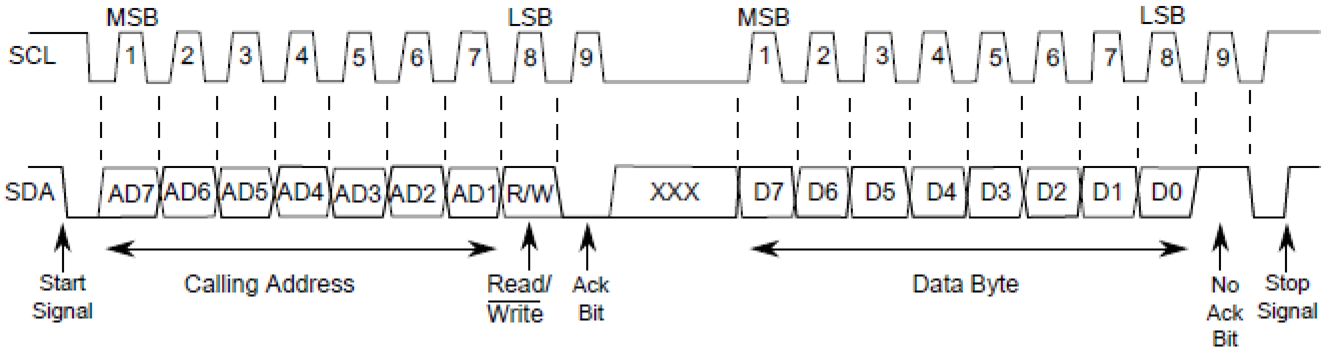
- 2 wires (Clock – SCL, Data – SDA) – pulled high
- Multi-master & multi-slave
- 100 kbit/s – 5 Mbit/s
- 7-bit addressing / 10-bit addressing
- Synchronous
- Half-duplex

How does it work – Scheme



https://learn.sparkfun.com/tutorials/i2c/all

How does it work – Message



K66 Sub-Family Reference Manual, Figure 58-2.

FRDM-K66F I2C

- 4 I2C modules
- Address match wakeup in low power modes
- SMBus support
- DMA support
- Methods to use:
  - BOARD_I2C_Receive
  - BOARD_I2C_Send

Accelerometer & Magnetometer

- FXOS8700CQ – link
- 3-axis, linear accelerometer + 3-axis, magnetometer combined into a single package

Accelerometer & Magnetometer

- Connected to I2C bus and 2 GPIO signals

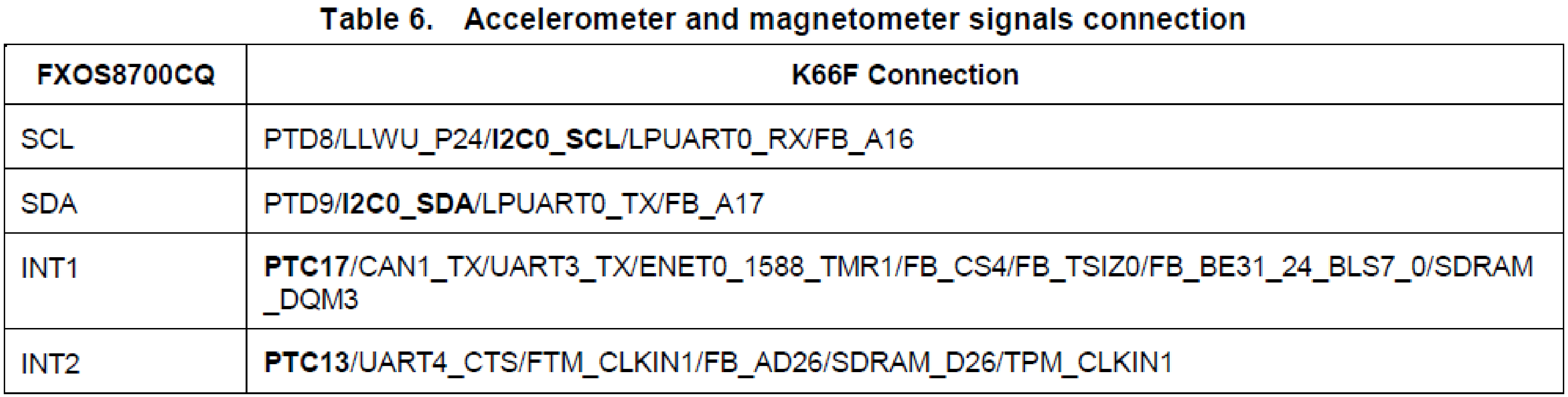


Table 6. Accelerometer and magnetometer signals connection

FXOS8700CQ	K66F Connection
SCL	PTD8/LLWU_P24/**I2C0_SCL**/LPUART0_RX/FB_A16
SDA	PTD9/**I2C0_SDA**/LPUART0_TX/FB_A17
INT1	**PTC17**/CAN1_TX/UART3_TX/ENET0_1588_TMR1/FB_CS4/FB_TSIZ0/FB_BE31_24_BLS7_0/SDRAM_DQM3
INT2	**PTC13**/UART4_CTS/FTM_CLKIN1/FB_AD26/SDRAM_D26/TPM_CLKIN1

Freedom FRDM-K66F Development Platform User’s Guide, Table 6.

Application – Template

- *startInitialization* (check sensor ID, wake-up)
- *setupOrientationDetection* (enable detection, interrupts, etc.) – Homework
- *finishInitialization* (setup frequency, activate sensor)

Application

- Create an application that reads accelerometer output data registers
- Print register values into console

Bonus:

- Calculate tilt angle from received values

Homework

- Create an application that detects orientation of the board (the same way as mobile phones do)
- Use the feature of the sensor – do not calculate it in the MCU from XYZ register values
- Use interrupt from sensor
- Print current orientation into console when orientation of the board changes

Homework

- Write your code into method ***setupOrientationDetection()***

- Link to Application note: AN4068