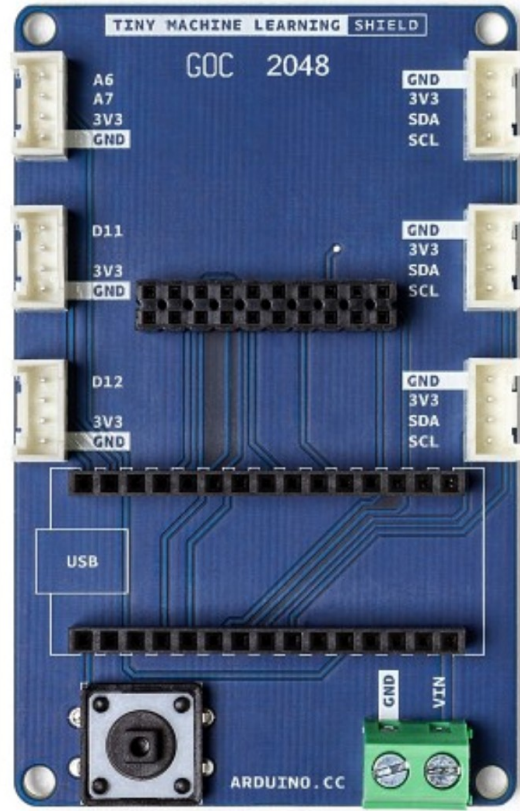
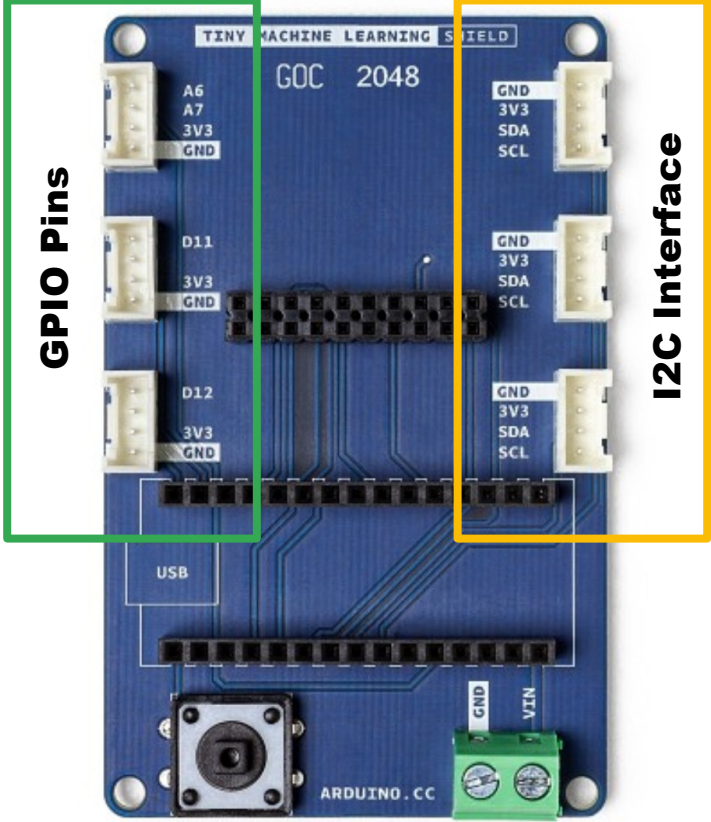


Embedded I/O

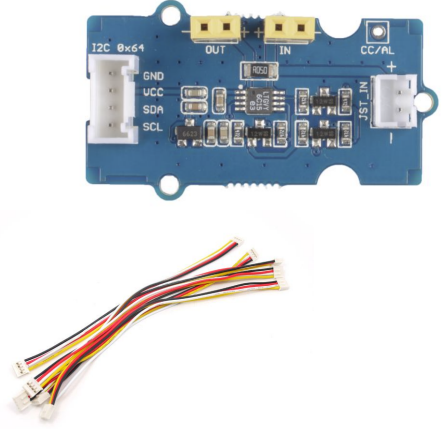
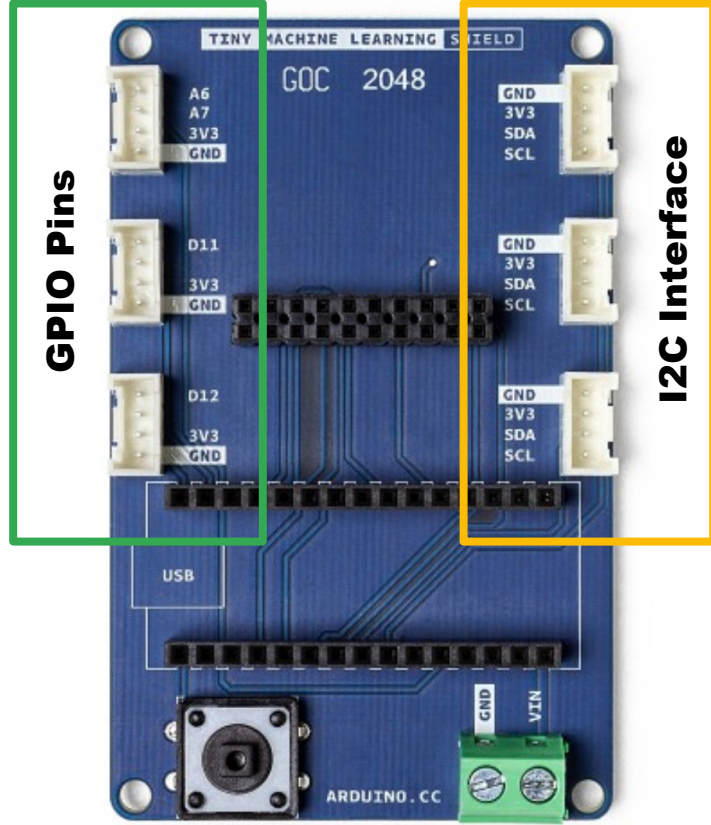




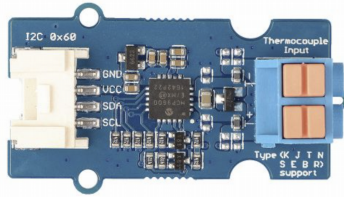


GPIO Pins

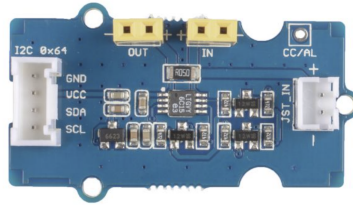
I2C Interface



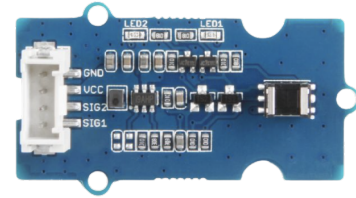
Systems Engineering—Module Integration



Thermocouple Amp



Coulomb Counter



Rotary Encoder

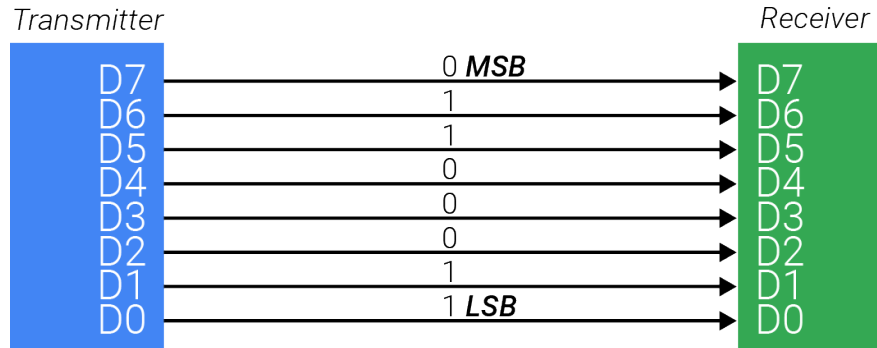
Grove Sensors

Large catalog of sensors, actuators available at [seeedstudio.com](https://www.seeedstudio.com)

Method of Communication

MSB → most significant bit
LSB → least significant bit

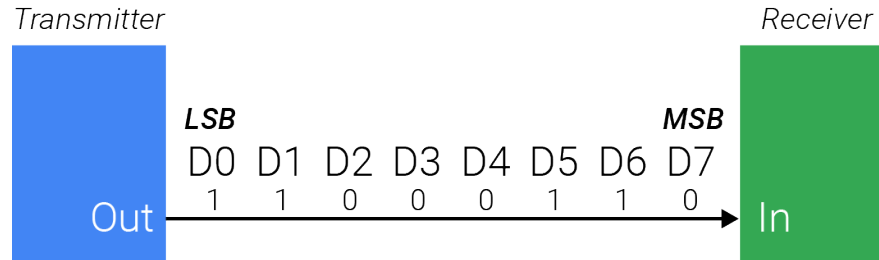
Option 1: use *parallel* interface to connect elements



Method of Communication

MSB → most significant bit
LSB → least significant bit

Option 2: use *serial* interface to transmit binary data in sequence



This approach **reduces number of wires**

Serial Communication Protocols

UART

*universal asynchronous
receive-transmit*

no shared clock
for synchronicity

slower

simple wiring

I2C

inter-integrated circuit

shared clock
intermediate speed

bi-directional
but one-at-a-time

simple wiring

SPI

serial peripheral interface

shared clock
high transfer speed

simultaneous
full duplex

complex wiring

Serial Communication Protocols

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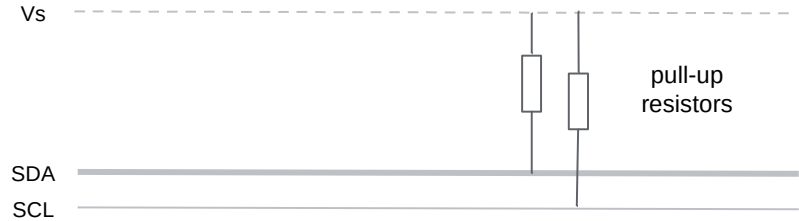
simultaneous
full duplex

complex wiring

Inter-Integrated Circuit (I2C)

SDA is the serial data channel

SCL is the serial clock channel

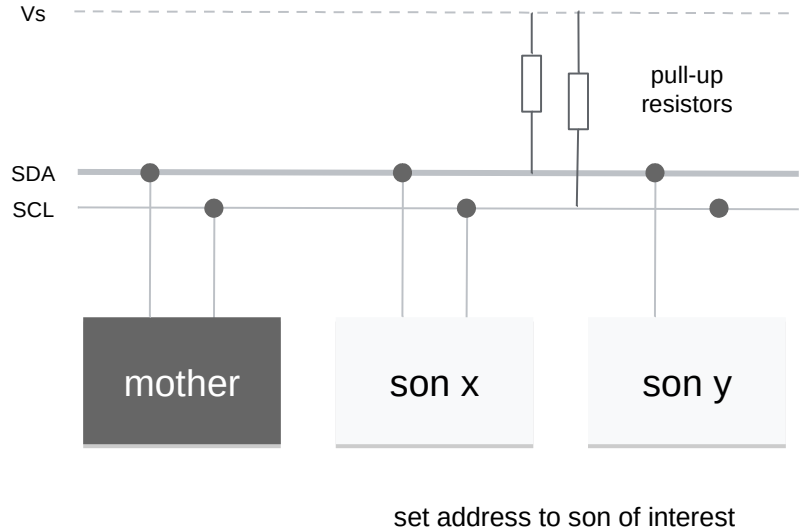


Inter-Integrated Circuit (I2C)

SDA is the serial data channel

SCL is the serial clock channel

Bus permits addressing of **'sons'**



Inter-Integrated Circuit (I2C)

SDA is the serial data channel

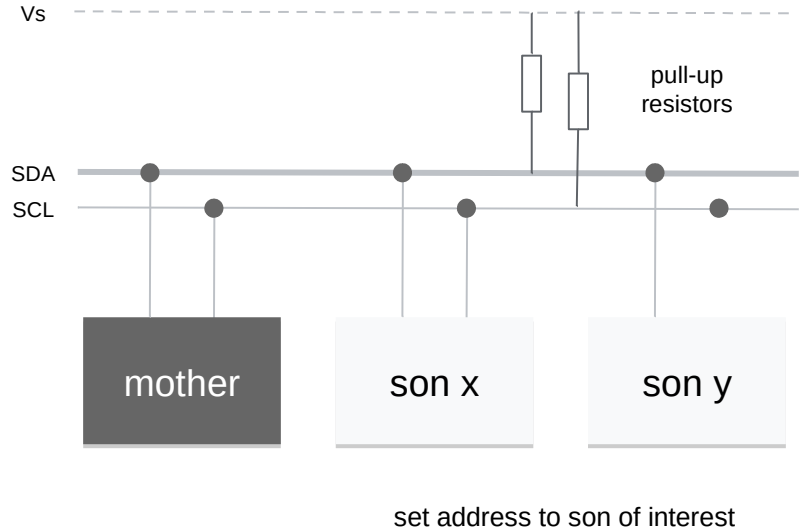
SCL is the serial clock channel

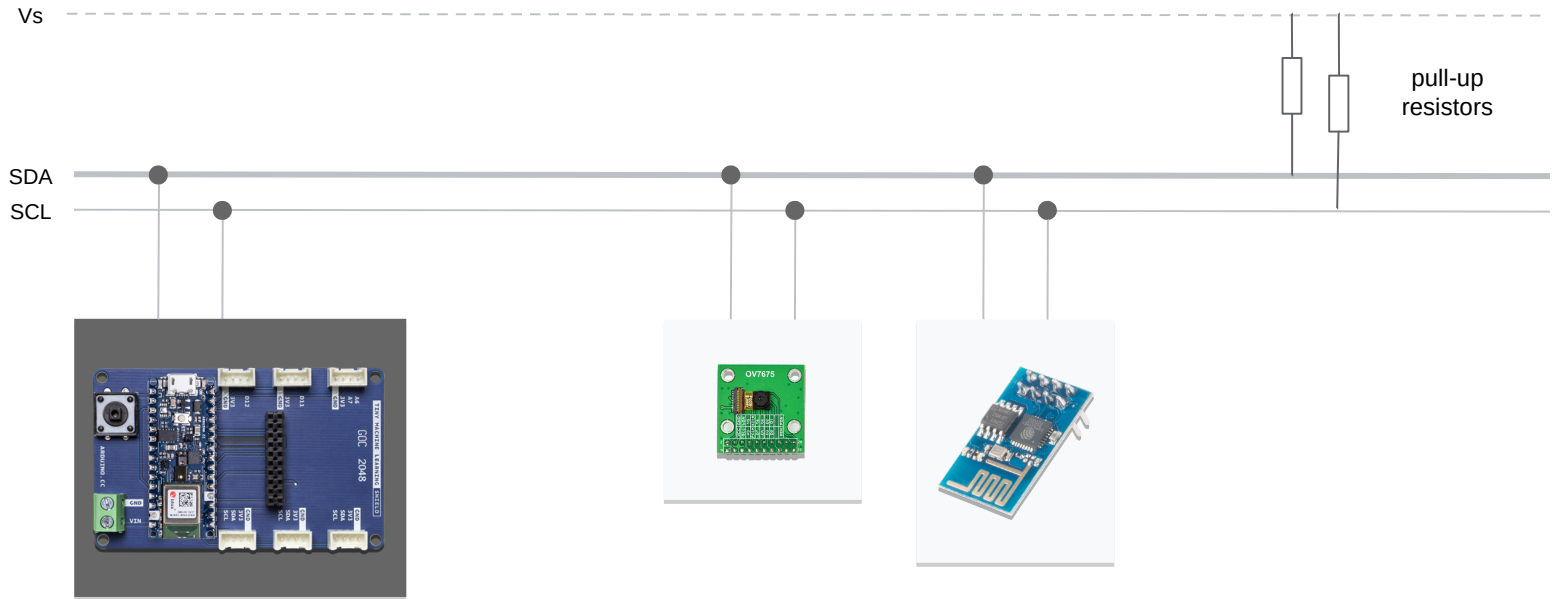
Bus permits addressing of **'sons'**

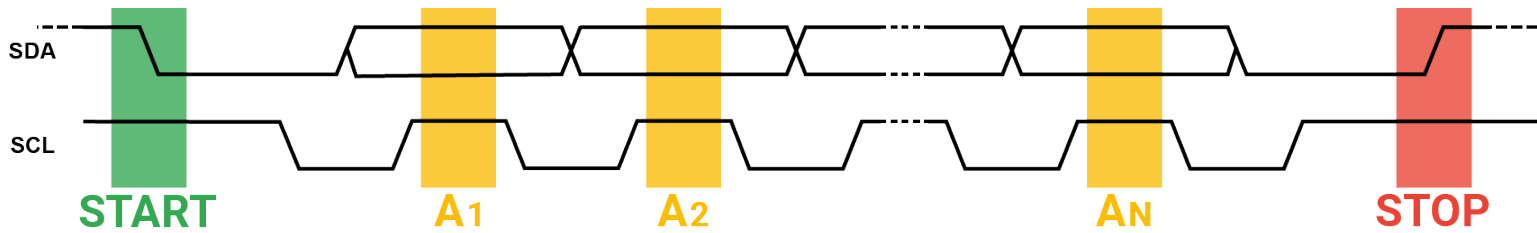
Two modes of operation

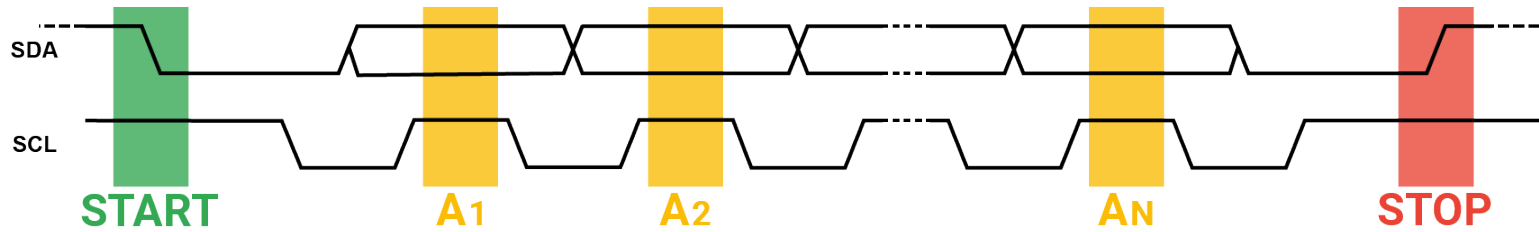
Mother-transmitter, son-receiver

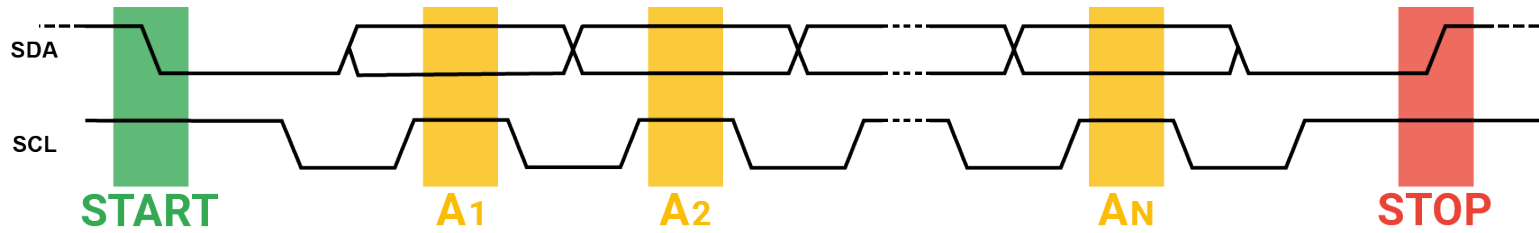
Son-transmitter, mother-receiver

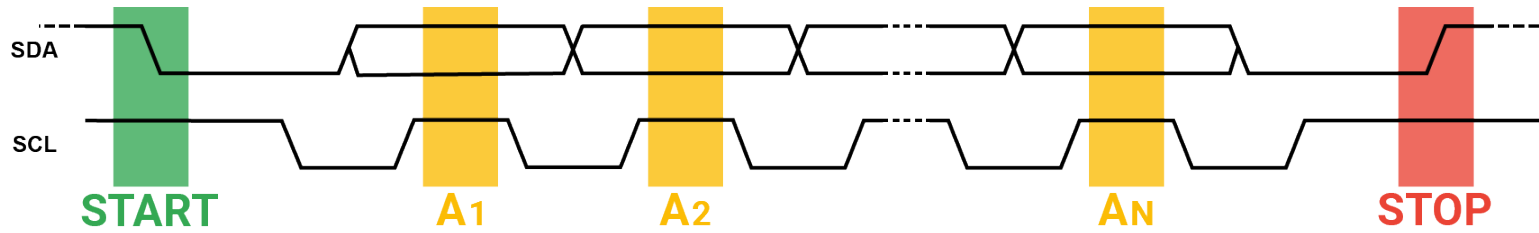


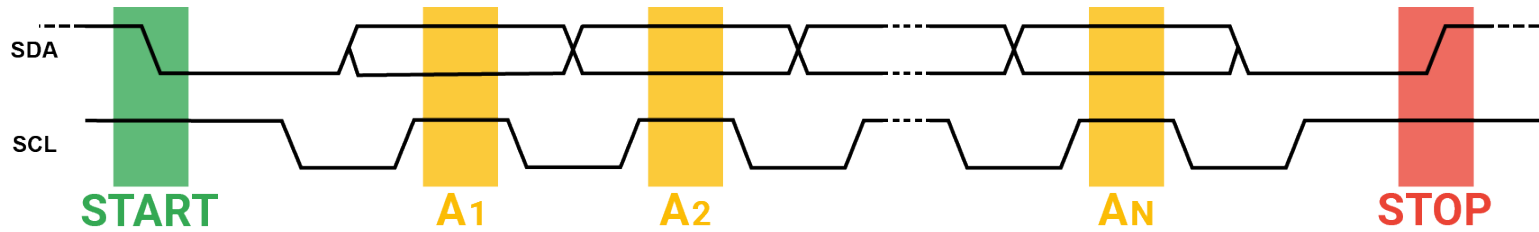


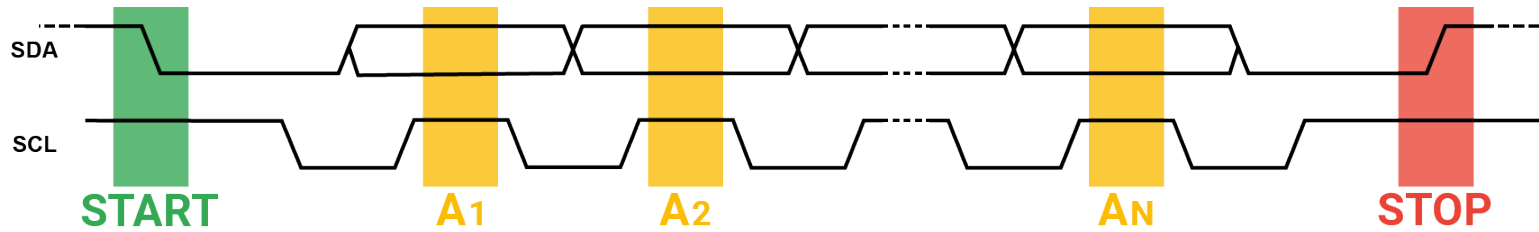


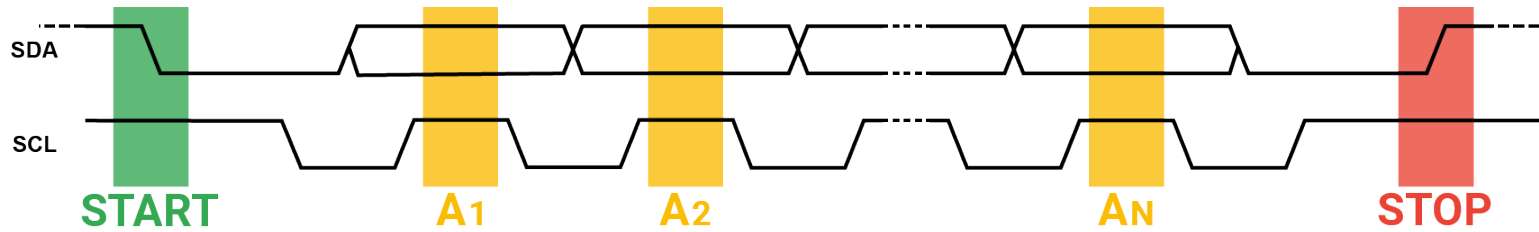


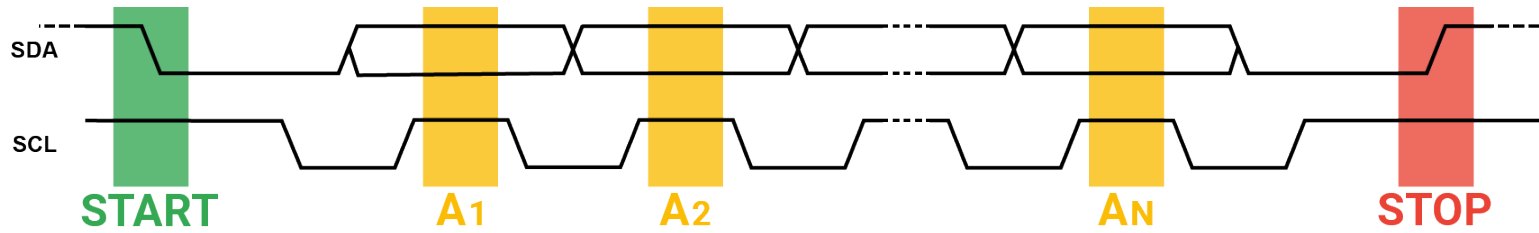


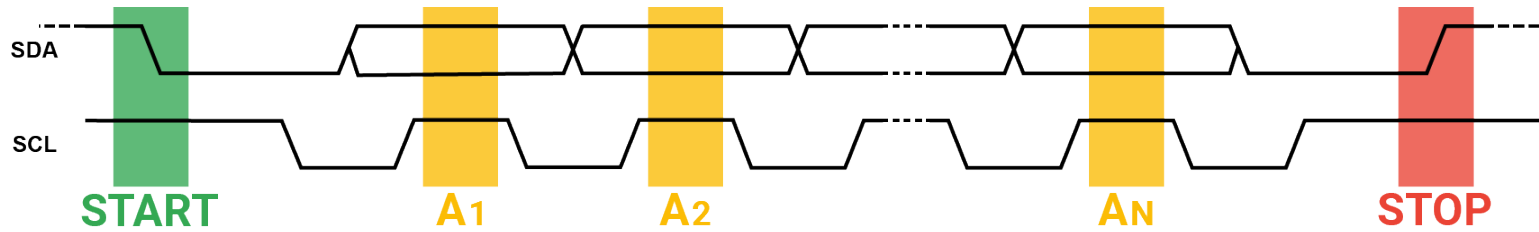


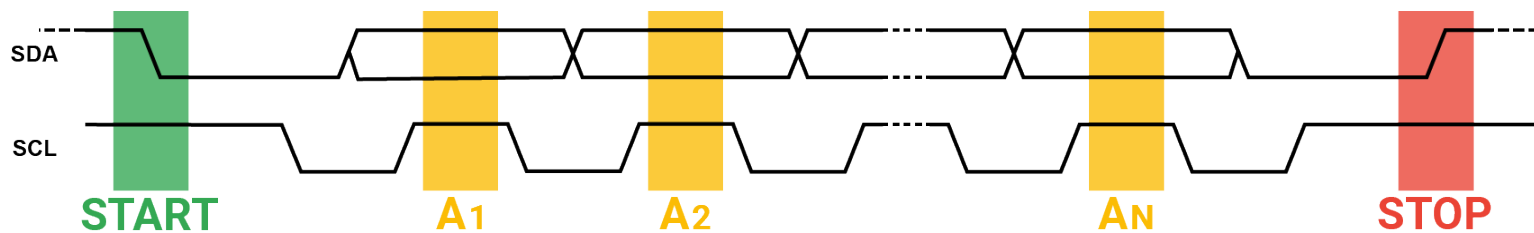












I²C in action



I²C in action



I²C in action





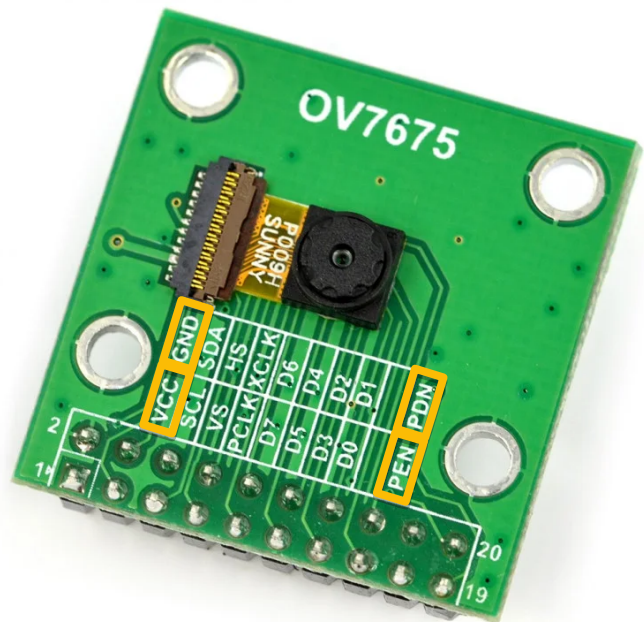
OV7675

P009H
SUNN
H600P

VCC	GND
SCL	SDA
VS	HS
PCLK	XCLK
D7	D6
D5	D4
D3	D2
D1	
PEN	PDM

1
2

20
19



OV7675

P009H
SUNN
H600P

VCC GND

SCL SDA

VS HS

PCLKXCLK

D7 D6

D5 D4

D3 D2

D0 D1

PEN PDM

1

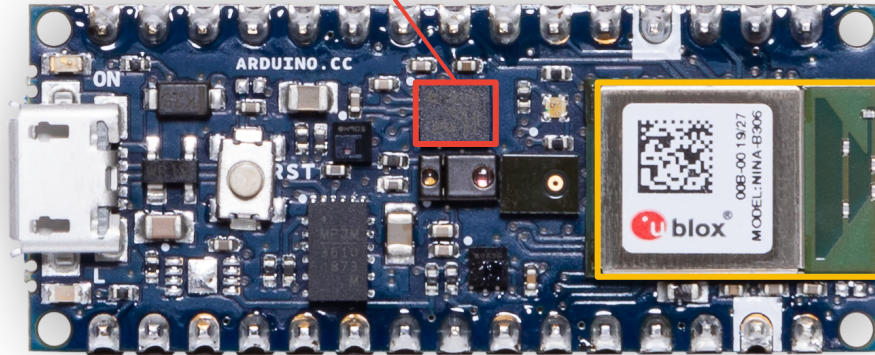
2

20

19

I²C in action

IMU



Processor
+ Bluetooth

