

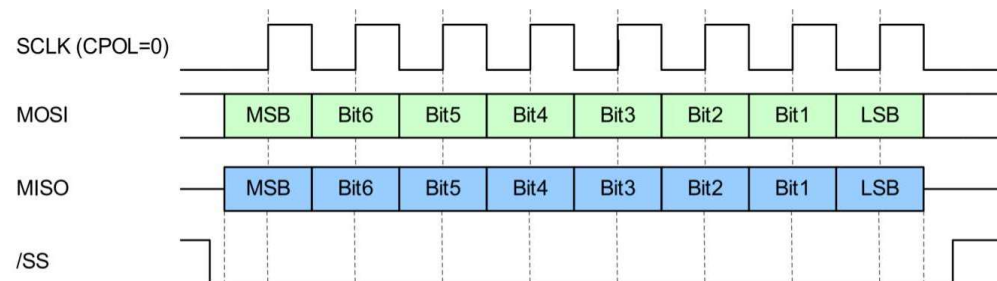
Application Note AN-15.2

SPI Protocol

Version 1.0
1-Sep-2020

Parameters	Min	Typical	Max	Unit	Remarks
SCLK Clock Frequency	0.05	1	12	MHz	f_{SCL}
SS drop to first clock edge	1	50	-	ns	t_{HDSS}
Minimum SCLK clock Low width	1	25	-	ns	t_{LOW}
Minimum SCLK clock HIGH width	1	25	-	ns	t_{HIGH}
Input High Level Voltage	0.7	-	1	VDD	V_{HIGH}
Input Low Level Voltage	0	-	0.3	VDD	V_{LOW}
Driving current of SPI output (peak)	-	40	180	mA	I_{MISO}

SPI MODE : 0 (CPHA=0, CPOL=0)



- Start Command Mode(Exit Sleep Mode):

Byte#	0	1	2
MOSI	0xA9	0x00	0x00
MISO	0x00	0x00	0x00

- Enter Sleep Mode:

Byte#	0	1	2
MOSI	0xA8	0x00	0x00
MISO	0x00	0x00	0x00

- Measure:

Byte#	0	1	2
MOSI	0xAA	0x00	0x00
MISO	0x00	0x00	0x00

- Read Example(after the completion of a Measure command ,AA_{HEX}):

Byte#	0	1	2	3	4	5	6
MOSI	0xF0	0x00	0x00	0x00	0x00	0x00	0x00
MISO	Status	Pressure data			Temperature data		
		[23:16]	[15:8]	[7:0]	[23:16]	[15:8]	[7:0]

Status:

Bit #	7	6	5	4	3	2	1	0
Meaning	0	Power?	Busy?	Mode		Memory Error?	Connection Check Fault?	Math Saturation?

Example Code:

```

/**
This example shows how to communicate to sensor
via SPI using an Arduino Uno.

Required electrical connections
Arduino UNO <-> sensor   Comment
SV      VDD
GND     VSS
PIN13   SCK/SCL
PIN12   MISO/SDA
PIN11   MOSI
PIN10   NCS/SAO

*/

//! [Example Code]
#include <SPI.h>

const int chipSelectPin = 10;
/**
This function is automatically called upon startup.
Initializes Serial communication, SPI, and the chip-select pin
which is pulled high as default.
*/
void setup()
{
  Serial.begin(9600); //Serial communications at 9600 bps
  SPI.begin();
  SPI.setClockDivider(SPI_CLOCK_DIV128);
  SPI.setBitOrder(MSBFIRST);
  SPI.setDataMode(SPI_MODE0); //CPHA=0, CPOL=0
  pinMode(chipSelectPin, OUTPUT);
  digitalWrite(chipSelectPin, HIGH); //Chip Select is low-active
}

void loop()
{
  byte buffer[7] = {0xF0, 0, 0, 0, 0, 0, 0}; // buffer initialized
  readRegisters( 7, buffer); //read dsp_t_sync, dsp_s_sync, Status
  for (int i = 0; i < 7; i++) {
    Serial.print(buffer[i], HEX);
    Serial.print(" ");
  }
  Serial.println();
  unsigned int STATUS = 0;
  unsigned int pressure = 0;
  unsigned int temperature = 0;
  double temperature_d = 0;
  STATUS = (unsigned int)buffer[0];
  //
  // pressure = (unsigned int)buffer[1];
  pressure = pressure << 8;
  pressure = pressure + (unsigned int)buffer[2];
  //
  temperature = (unsigned int)buffer[4];
  temperature = temperature << 8;
  temperature = temperature + (unsigned int)buffer[5];
  Serial.print(" Status: ");
  Serial.println(STATUS);
  Serial.print(" Pressure(16 bit): ");
  Serial.println(pressure);
  Serial.print(" Temperature(16 bit): ");
  Serial.println(temperature);
  delay(1000);
}

/*
Reads multiple registers
- number:   Number of byte to be read from
- buffer:   Buffer to write the register-values to.
*/
void readRegisters( unsigned int number, byte *buffer)
{
  digitalWrite(chipSelectPin, LOW);
  SPI.transfer(0xAA); //Send register address, read/write-bit
  SPI.transfer(0); //Send crc_enable=0, length in words - 1, 0
  SPI.transfer(0); //Send crc_enable=0, length in words - 1, 0
  // take the chip select high to de-select:
  digitalWrite(chipSelectPin, HIGH);
  //
  unsigned char high;
  unsigned char low;
  // take the chip select low to select the device:
  digitalWrite(chipSelectPin, LOW);
  for (int i = 0; i < number; i++)
  {
    buffer[i] = SPI.transfer(buffer[i]);
  }
  // take the chip select high to de-select:
  digitalWrite(chipSelectPin, HIGH);
}

```

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