Instructions for obtaining calibration values by using 0xAC Command in the 1203 integrated calibration algorithm

1203 integrated calibration algorithm could run after calibration in the 1203 chip which is burned with OTP data successfully has been completed. The calibration data could be got based on 1203 integrated algorithm by using 0xAC Command. It executes the 0xAC command to obtain the calibration value as followings:

1. Issuing The Command

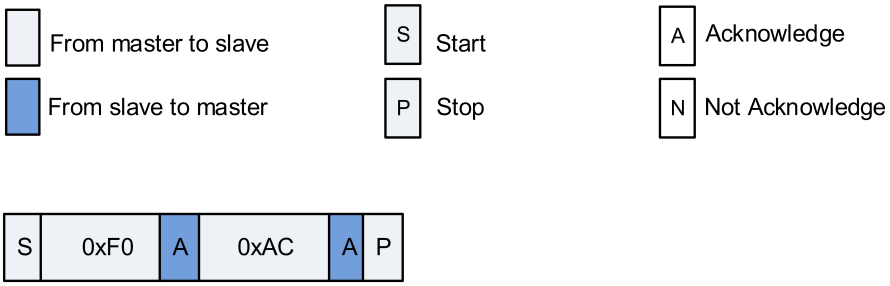


Figure 1: Write Command

0xF0 in the write command indicates that the 7-bit default device address in I2C is 0x78, and 0 in the last bit indicates that the master device is executed by the write operation.

2. Waiting

After issuing Write Command, we should wait for a while before issuing Read Command, because it takes time to complete the entire measurement internally. The waiting time depends on the setting of [13:11] pressure oversampling rate and [15:14] temperature oversampling rate of OTP(Address: 0x14). The Maximum Wait Time is 300ms.

The waiting time need not be calculated. Whether the collection is over or not is specified by continuously reading the IIC status word.

3. Reading

Calibration data can be read only if the interval between Write and Read Commands is longer than the measured time.

The reading format is shown in Figure 2. 0xF1 in the read command indicates that the 7-bit default device address in I2C is 0x78. 1 in the last bit indicates that the master device is executing in the read operation. The read calibration data consist of 6 bytes, including status word with 1 byte, bridge calibration value with 3 bytes and temperature calibration value with 2 bytes.

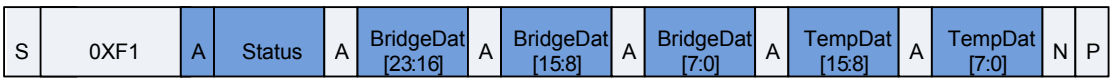


FIG. 2 5-byte calibrated bridge and temperature values in I2C

4. Conversion

After getting the calibration data, the unsigned numbers in the form of AD values need simple conversion.For examples, we assume that calibration data we got are: 0x04 0x9B 0xB0 0xC5 0x56 0xAA

0x04 is the status word. If Bit5 is 1, I2C is busy for present and will execute a new command later. If Bit5 is 0, the device is idle period and can read data. Refer to the appendix for a description of each bit of the status word.

0x9B 0xB0 0xC5 Those three bytes are the bridge calibration values

0x56 0xAA Those two bytes are temperature calibration values

Convert 0x9B, 0xB0, and 0xC5 to a decimal number 10203333. That calculation assumes that the range used in calibration is 20kPA - 120kpa, and the corresponding AD output is 1677722 ~ 15099494 (10%AD ~ 90%AD).

According to the P2 input-output relation calibration formula:

Actual pressure value = (120-20) / (15099494-1677722) X (10203333-1677722) +20 = 83.5208 kPa

Temperature calibration value conversion:

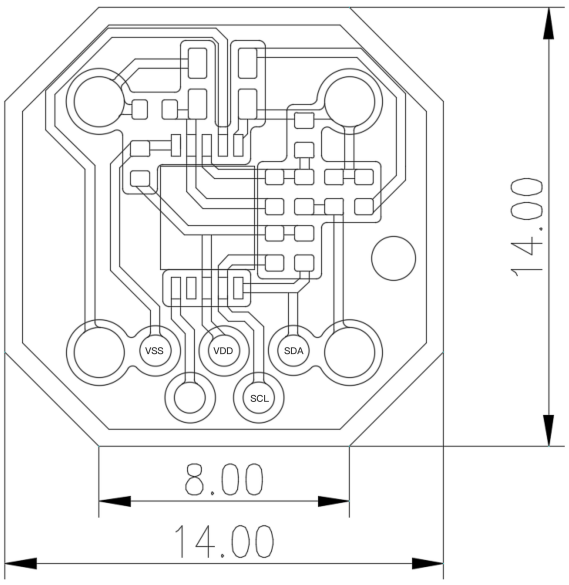
Convert 0x56, 0xAA to a decimal number 22186. Since the read calibration data is presented as a percentage which is numerically equal to the ratio of the decimal number we converted and the maximum 16bits unsigned number (65535), conversion result can be displayed in the percentage: 22186/65536 X 100% = 33.85%

The calibration range of temperature is between - 40°C and 150°C, therefore

calibration value = (150 - (- 40)) X 33.85% - 40 = 24.32°C

It should be noted that a temperature sensor can only be used after calibration, while an non-calibration temperature value is an original value which can't be used.

Size



VSS: S = series; VDD: D = device ; SDA: a two-way data line; SCL: a clock line

Appendix

Table1: Status word description

Bit number	Signification	Description
Bit7	Reserved	Fixed value: 0
Bit6	Power indication	1: Power on（V_{DDB} on)；0:Power off
Bit5	Busy indication	1: Device is too busy to execute a new command. The data read by I^2C command are invalid. 0: The data are ready to read which are required by a latest I^2C command.
Bit4	Reserved	Fixed value: 0
Bit[3]	Mode Status	0: NOR mode 1: CMD mode
Bit2	Memory integrity/error flag	0: The test (CRC) of whether data are integrated in OTP memory has passed. 1: The CRC failed. A new value of CRC can be used after next up because the CRC is just verified once during the Power-up (POR).
Bit1	Reserved	Fixed value: 0
Bit0	Reserved	Fixed value: 0