

Reader's Digest for various Sensors

BME680, BME280, TI-ADS1231

ADS1231

24 bit AD converter for bridge sensors

- Startup time: ?? ms
- Wakeup from Power Down mode: 7.95 μ s
 - BUT: (first??) data ready after Standby or wakeup are inconclusive [ADS-1, page 14, 15]
- Data rate with internal oscillator [ADS-1, page 3]
 - 10 or 80 samples per second (select via PIN 4)
 - (digital filtering: 4 conversions for full settling)
- Read-out time for 1 conversion result [ADS-1, page 13]:
 - 100 ms (10 Hz) or 12.5 ms (80 Hz)
- Current consumption?? [ADS-1, page 4]
 - Analog supply current @ 5V: 900 μ A
 - Question: what about the bridge current?
 - Digital supply current @5V: 95 μ A
- Utilize Standby Mode to reduce power consumption? [ADS-1, page 14]
- Interesting table about noise performance. [ADS-1, page 6].
- We also should be clear about reference voltage, Vcm, what is Vcm??? Vref. Remember the discrepancy we had with the Chinese scale unit (2.5V vs. 5V)... See also Table 3 on page 12.

BME280

temperature, humidity, barometric pressure

- **Startup time: 2ms** [BME280-2, page 8]
- Typical **measurement time: 11.5 ms**
- For low current applications @ 1Hz [BME280-1, page 1]:
 - Sleep mode: 0.1 μA
 - (H, T) 1.8 μA
 - (P, T) 2.8 μA
 - (H, P, T) 3.6 μA
- Three modes of operation: Sleep, Normal, Forced → Different power and measurement times [BME280-1, page 2], [BME280-2, page 14]. **Use forced mode!** → Measure once then return to sleep mode. [BME280-2, page 15+16]
- Current during measurement [BME280-2, page 8]:
 - H: 340 μA
 - P: 714 μA
 - T: 350 μA
- See chapter 9 [BME280-2, page 51] for measurement time and current consumption formulas 😊
- There are two **separate power supplies: Vdd and Vddio**. **Be careful with supplying power via I2C while not powered up with Vdd!!** [BME280-2, page 14]
- They keep talking about the recommended use of the Bosch Sensortec API for readout and compensation. Is this the one they are talking about: [BME280-3]?

BME680

temperature, humidity, barometric pressure and VOC gas

- **Please note, this sensor, like all VOC/gas sensors, has variability and to get precise measurements you will want to calibrate it against known sources!** That said, for general environmental sensors, it will give you a good idea of trends and comparisons. We recommend that you run this sensor for 48 hours when you first receive it to "burn it in", and then 30 minutes in the desired mode every time the sensor is in use. This is because the sensitivity levels of the sensor will change during early use and the resistance will slowly rise over time as the MOX warms up to its baseline reading. [BME680-1]
- *The gas measurement requires a heater to be turned on. If we can't disable this measurement that sensor is not good. It seems as if P, H, T measurements can be skipped, but G cannot 😞.*
- The temp. sensor output is used for temp compensation of the humidity, pressure and gas sensors and can also be used as well for estimation of the ambient temperature [BME680-2, page 3]. *Maybe not so accurate for our temp sensing??*
- For the P,H, T plausibility check, the BME680 has to be operated in clean air. An **operation time of at least 10 seconds** is recommended to ensure stable signals [BME680-2, page 8]. *Is this only needed for the plausibility check??*
- I²C up to 3.4 MHz [BME680-3, page 3]
- Current consumption [BME680-3, page 3]:
 - 2.1 – 3.7 μ A @ 1Hz
- Current during measurement, consumption details [BME680-3, page 7]:
 - Temp measurement: 350 μ A
 - Humidity measurement: 340 μ A
 - Pressure measurement: 714 μ A
- Sensor **startup time: 2ms** [BME680-3, page 7]
- Supply currents **@ 1Hz** forced mode [BME680-3, pages 10, xx, xx]
 - Humidity: 2.1 μ A
 - Pressure & Temperature: 3.1 μ A
 - Pressure oversampling rate: 182 Hz
 - Temperature only: 1.0 μ A

I have found no evidence that the gas measurement can be turned off. But since we don't use the gas measurement, I have stopped reading this data sheet for now.

References

[BME680-1] <https://learn.adafruit.com/adafruit-bme680-humidity-temperature-barometric-pressure-voc-gas>

[BME680-2] https://ae-bst.resource.bosch.com/media/_tech/media/application_notes/BST-BME680-AN014.pdf

[BME680-3] https://ae-bst.resource.bosch.com/media/_tech/media/datasheets/BST-BME680-DS001.pdf

[BME280-1] https://ae-bst.resource.bosch.com/media/_tech/media/product_flyer/BST-BME280-FL000.pdf

[BME280-2] https://ae-bst.resource.bosch.com/media/_tech/media/datasheets/BST-BME280-DS002.pdf

[BME280-3] https://github.com/BoschSensortec/BME280_driver

[ADS-1] <http://www.ti.com/lit/ds/symmlink/ads1231.pdf>