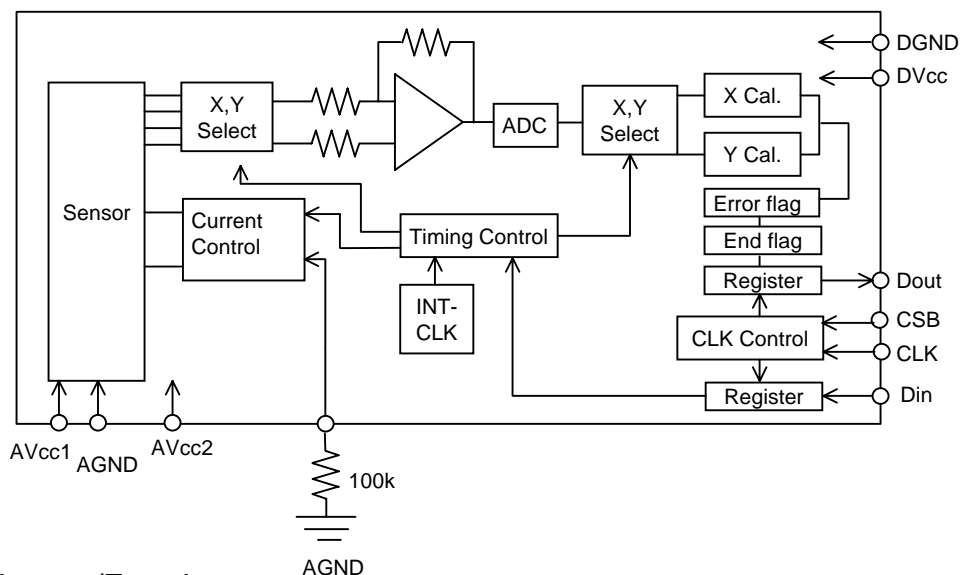


# Magnetic Compass Sensor (11bits)

## Preliminary Data Sheet

## 1. Block Diagram



## 2. Pin Layout/Function

| Pin No. | Name  | I/O    | Function  |
|---------|-------|--------|---|
| 1       | NC    | -----  |   |
| 2       | NC    | -----  |   |
| 3       | R     | I      | Terminal for Internal Driving Current Setup ,Put 100k[Ohm] resistor between pin-3 & AGND. |
| 4       | AGND  | Ground | Analog Ground   |
| 5       | TMC   | I      | This is a Testing terminal, to be Grounded.   |
| 6       | Din   | I      | Serial Command  |
| 7       | Dout  | O      | Serial Data   |
| 8       | DGND  | Ground | Digital Ground  |
| 9       | DVcc  | Power  | Power Supply for Digital Circuit  |
| 10      | CLK   | I      | Shift Clock for Data Transfer(up to 5MHz)   |
| 11      | CSB   | I      | Chip Select Signal  |
| 12      | MON1  | I      | This is a Testing terminal, to be Grounded.   |
| 13      | MON2  | I      | This is a Testing terminal, to be Grounded.   |
| 14      | AVcc2 | Power  | Power Supply for Analog Circuit   |
| 15      | AVcc1 | Power  | Power Supply for Analog Circuit   |
| 16      | NC    | -----  |   |

### 3. Absolute Maximum Rating Over Operating

| No. | Item                 | Symbol    | Limitation           | Unit |
|-----|----------------------|-----------|----------------------|------|
| 1   | Power Supply         | AVcc/DVcc | -0.3_+6.7            | V    |
| 2   | Terminal Voltage     | Vin       | -0.3 _AVcc/DVcc_+0.3 | V    |
| 3   | Operating Temp.      | TOPE      | -20_+85              | degC |
| 4   | Storage Temp.        | TSTG      | -40_+100             | degC |
| 5   | Max. Acceptable Loss | P         | (126)                | mW   |

Note) In case being operated out of the range specified, the sensor/circuit may permanently be destroyed. It is desirable to be used with specified operating condition as shown 4. If it is exceeded, the product(s) may work improperly and/or may be affected to its reliable characteristics.

### 4. The electrical performance

(Vcc:2.7 -- 3.3V, Ta: -20 -- +85degC)

|    | Item                             | Symbol          | Condition for measurement           | Min.      | Typ. | Max.      | Unit   |
|----|----------------------------------|-----------------|-------------------------------------|-----------|------|-----------|--------|
|    | Supply Voltage                   | Vcc             |                                     | 2.7       | 3.0  | 3.3       | V      |
| *1 | Current Consumption (active)     | Icc1            | Measurement operation               | ---       | 9    | 13        | mA     |
|    | Current Consumption (standby)(1) | Iccst(1)        | Ta= -20degC - +60degC, Vcc=3.0V     | ---       | ---  | 1         | uA     |
|    | Current Consumption (standby)(2) | Iccst(2)        | Ta= +60degC - +85degC, Vcc=3.0V     | ---       | ---  | 5         | uA     |
| *1 | Current Consumption(ave)         | Iccave          | Measurement period:100ms            | ---       | 3    | 5         | mA     |
|    | Measuring Time                   | Tmes            |                                     | ---       | 30   | 40        | ms     |
|    | Sensitivity                      | Bse             | Ta= 25degC, Vcc=3.0V                | 1.0       | ---  | 1.6       | LSB/uT |
|    | Magnetic field range             | H               | Ta= 25degC, Vcc=3.0V, F.S.=+/-180uT | -180      | ---  | 180       | uT     |
|    | Linearity                        | linia           | Ta= 25degC, Vcc=3.0V                | -5        | ---  | 5         | % / FS |
|    | Low-Level Input Voltage          | V <sub>IL</sub> |                                     | -0.3      | ---  | Vcc x 0.2 | V      |
|    | High-Level Input Voltage         | V <sub>IH</sub> |                                     | Vcc x 0.8 | ---  | Vcc + 0.3 | V      |
|    | Low-Level Output Voltage         | V <sub>OL</sub> | Vcc=3V, IL=1mA                      | -0.3      | ---  | Vcc x 0.1 | V      |
|    | High-Level Output Voltage        | V <sub>OH</sub> | Vcc=3V, IL= -1mA                    | Vcc x 0.9 | ---  | Vcc + 0.3 | V      |

Note) \*1

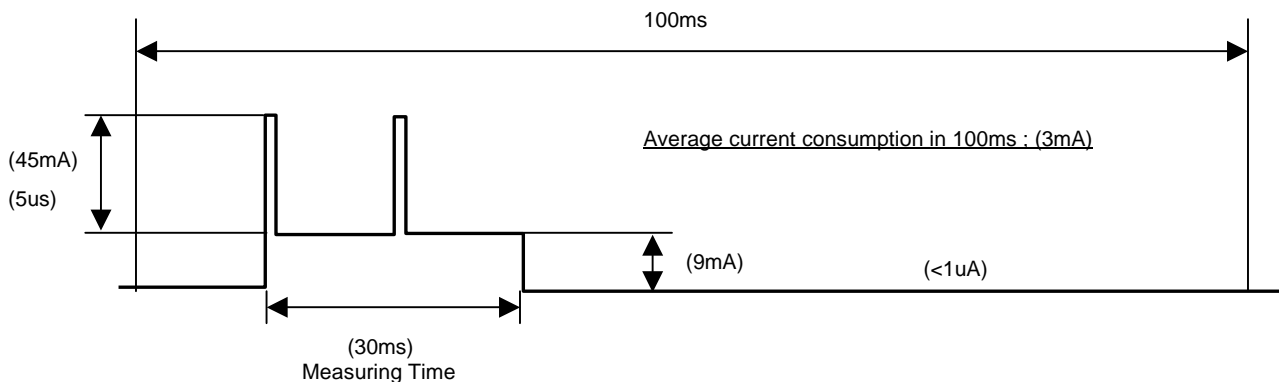


Fig. Average current consumption in measurement

## 5. Interface

### 5 - 1. Command

| 1 | 2 | 3 | 4 | Mode        |
|---|---|---|---|-------------|
| 0 | 0 | 0 | 0 | Reset       |
| 1 | 0 | 0 | 0 | Measurement |
| 1 | 1 | 0 | 0 | Read        |
| 0 | 1 | 0 | 0 | -----       |

### 5 - 2. End flag

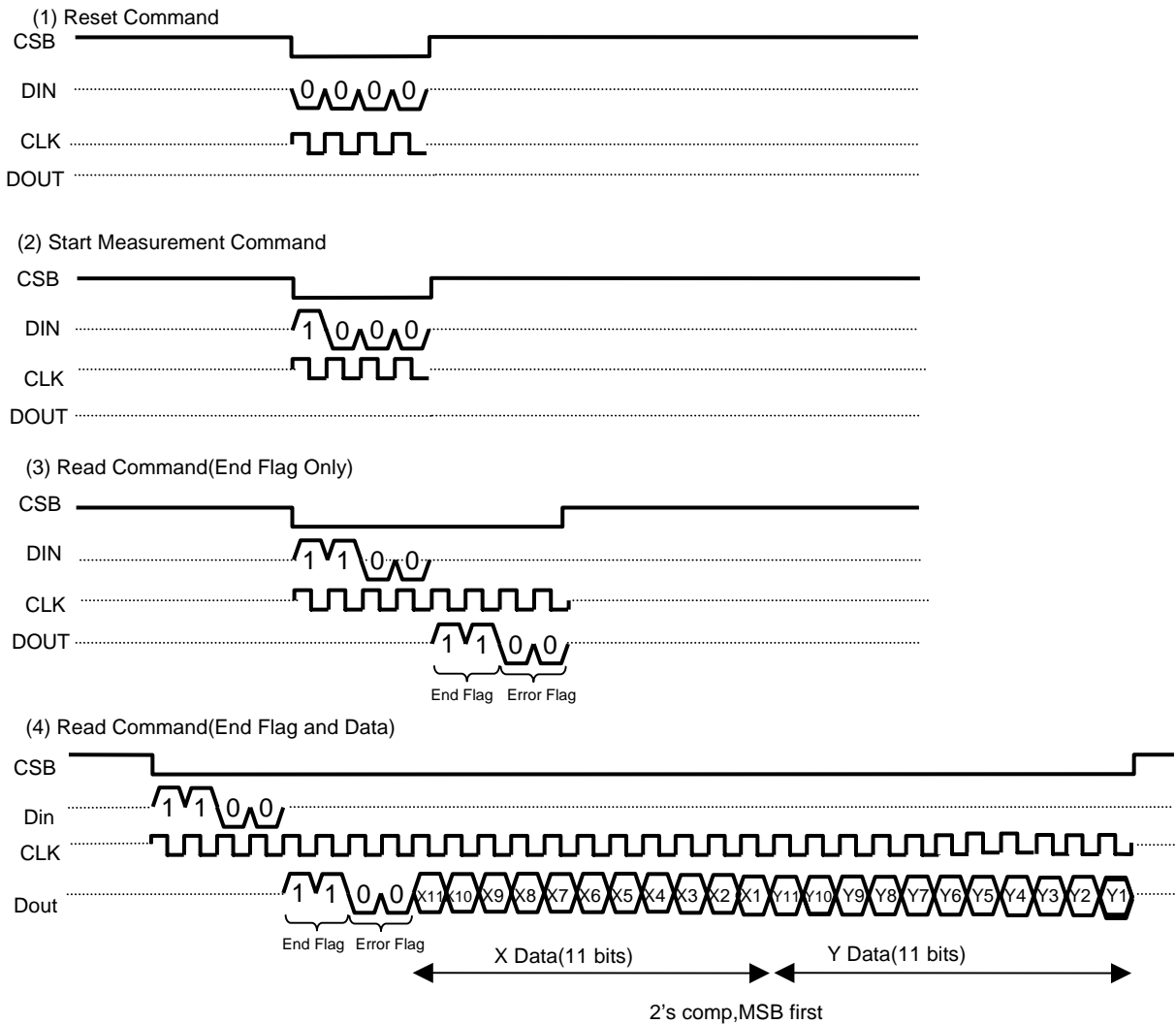
| End flag state | Conditions affecting flags                              |
|----------------|---|
| "00"           | (1) In the middle of measurement<br>(2) RESET operation |
| "11"           | (1) Completion of measurement                           |
| "01" "10"      | Not defined $\triangle 1$                               |

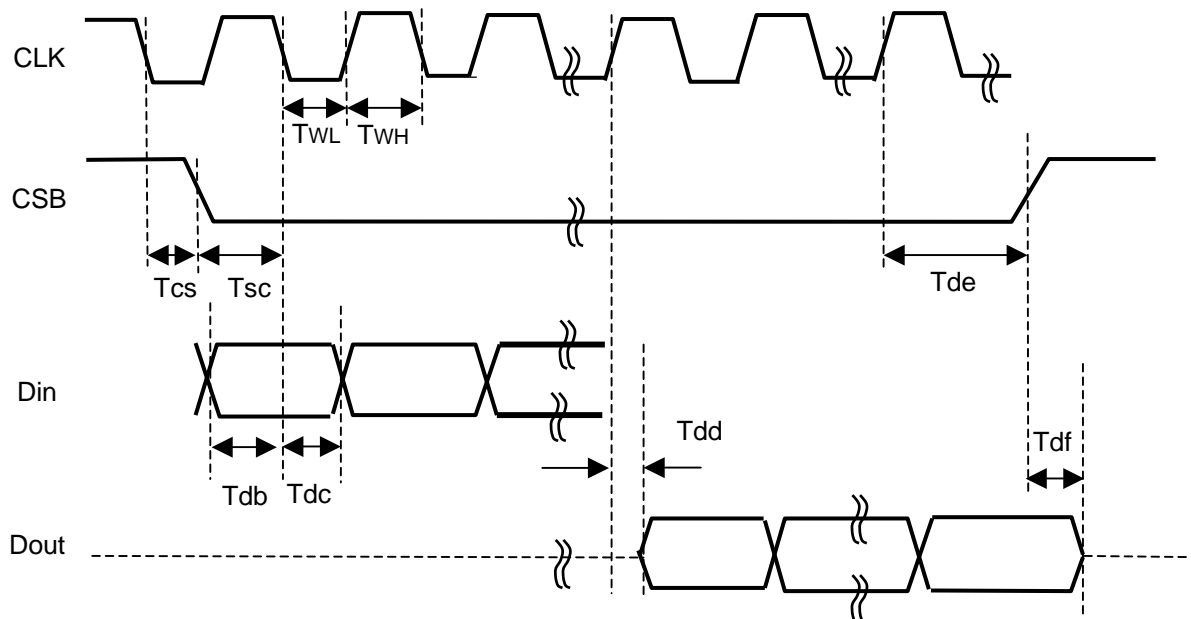
### 5 - 3. Error flag

| Error flag state | Conditions affecting flags                                  |
|------------------|---|
| "00"             | (1) Normal completion of measurement<br>(2) RESET operation |
| "11"             | (1) A/D overflow in measurement                             |
| "01" "10"        | Not defined $\triangle 1$                                   |



### 5 - 4. I/O Timing Chart

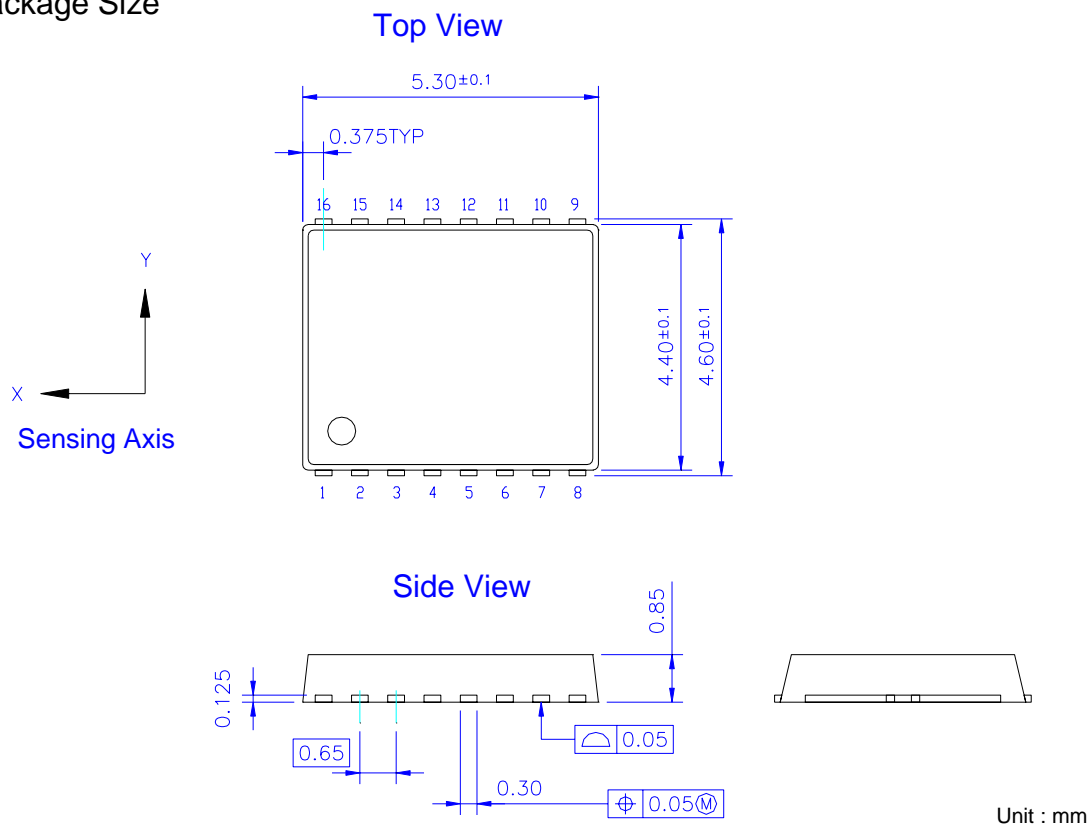



**5 - 5. I/O Timing Chart (Details)**

**AC Timing Spec.**

| Item                | Symbol    | Min. | Typ. | Max. | Unit |
|---------------------|-----------|------|------|------|------|
| CSB-CLK margin(1)   | $T_{cs}$  | 30   | -    | -    | ns   |
| CSB-CLK margin(2)   | $T_{sc}$  | 100  | -    | -    | ns   |
| CLK-Data setup time | $T_{db}$  | 30   | -    | -    | ns   |
| CLK-Data hold time  | $T_{dc}$  | 30   | -    | -    | ns   |
| CLK-Data delay time | $T_{dd}$  | -    | -    | 40   | ns   |
| CSB margin          | $T_{de}$  | 100  | -    | -    | ns   |
| CSB-Data delay time | $T_{df}$  | -    | -    | 30   | ns   |
| CLK high time       | $T_{WH}$  | 100  | -    | -    | ns   |
| CLK low time        | $T_{WL}$  | 100  | -    | -    | ns   |
| CLK frequency       | $f_{CLK}$ | -    | 1    | 5    | MHz  |

**Test Conditions**

- (1)  $T_a=25 \text{ degC}$
- (2)  $V_{cc}=2.7V - 3.3V$
- (3) Load of Output=30 pF
- (4) Input  $V_{iL}=0.2V$   $V_{iH}=V_{cc}-0.2V$   $t_r=10ns$   $t_f=10ns$
- (5) CLK Frequency=1MHz Duty=50%

**6. Package Size**

**7. Recommended Foot Pattern**
