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SPT0001 - DIGITAL COMPASS MODULE (Preliminary 1.3)

● DESCRIPTION

SPT0001 is a digital compass module for use in navigation and guidance system. This compass solution can be easily integrated into systems using a digital interface. The SPT0001 consists of a Honeywell HMC1052 two-axis magneto-resistive sensor with integrated 10-bit ADC to provide resolution of 1° and accuracy of $\pm 3^\circ$. All compass calculation and Hard Iron compensation routines are included in the integrated microcontroller.

● FEATURES

- $0^\circ \sim 359^\circ$ range
- $\pm 3^\circ$ accuracy
- 1° resolution
- Hard Iron Compensation
- Integrated MCU for heading calculation and compass calibration
- Low power consumption (STOP mode, $<1\mu\text{A}$)
- Easy to use digital interface
- Wide operating voltage (2.4V to 3.3V)

● APPLICATIONS

- Handheld digital compass
- Digital Navigation System (DNS)
- Vehicle Compass
- PDA Compass
- Mobile Phone Compass

● TECHNICAL SPECIFICATIONS

Parameter	Specification
Range	$0^\circ \sim 359^\circ$
Accuracy	$\pm 3^\circ$
Resolution	1°
Supply voltage	2.4 V to 3.3 V
Current consumption (Stop Mode)	$<1\mu\text{A}$
Current consumption (Operating)	$<500\mu\text{A}$
Current consumption (Calibration)	$<500\mu\text{A}$
Operating temperature	$-20^\circ\text{C} \sim +70^\circ\text{C}$

Table 1: Specification



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● PIN DESCRIPTION

Pin	Name	I/O	Function
1	VDD	Power	Supply voltage, connect to VDD
2	SELECT	O	Active high select for compass
3	READY	I	Compass ready signal
4	DATA	I/O	Input/Output port for command/data
6	CLOCK	O	Clock generated by Master
7	GND	Power	Ground

Table 2: Pin Descriptionm

● TABLE OF COMMANDS

Command	Option	Data	Description
0101	0001	13 bits	Get compass heading (1 bit Error bit, followed by 12 bits BCD values)
0101	0010	/	Calibration

Table 3: Table of Commands

● COMPASS HEADING

The compass module operates as a slave device. On power up, the compass module enters STOP mode which consumes negligible current. To enable the compass, the SELECT pin changes from low to high and the compass module then wakes up from STOP mode. The master should send the command (0101) and the OP CODE (0001) to the slave. Upon reception of the command, the compass module acknowledges by setting high the ready signal. The master should then set the clock to tell the compass the acknowledgement is received. It follows that the compass performs calculation of compass heading. Upon completion of calculation, the READY pin will be set high by the compass module. As this time, the master can clock the slave and read the DATA pin to obtain the compass heading. The first bit indicates whether a successfully heading is calculated. If this bit is zero, it means that there is error occurred such as strong magnetic distortion detected. At last, the master should set the SELECT pin to low to put the compass module into sleep mode to reduce current consumption.

● CALIBRATION

Digital compasses consist of sensing device to detect the earth's magnetic field. This magnetic field is weak and can be distorted by nearby ferrous objects or magnet. Calibration has to be done to compensate the distortion in magnetic field for accurate heading.

The calibration procedure is simple. The compass has to be placed on a horizontal plane and it enters calibration mode. The user is requested to rotate the compass slowly for one circle. After all, the user informs the



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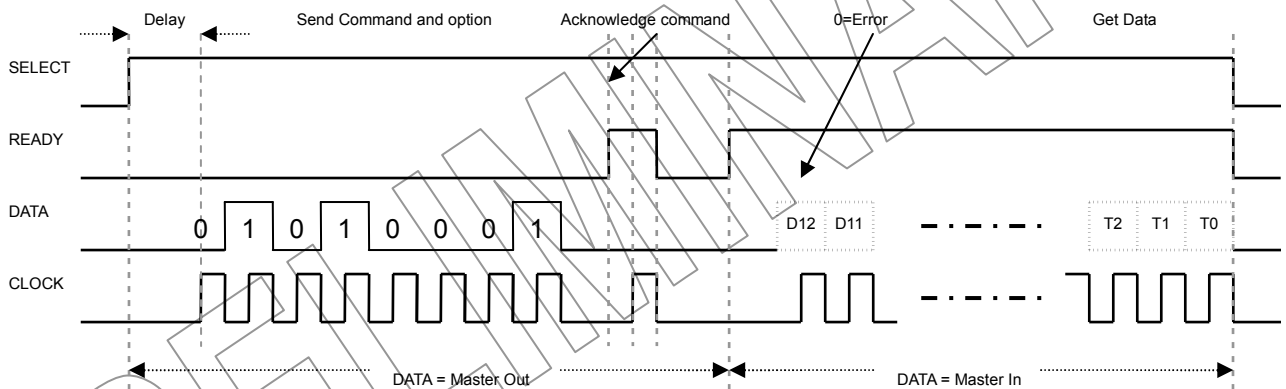
system completion of calibration.

It should be noticed that calibration is necessary whenever the compass is relocated. A good practice is to avoid placing the compass near ferrous objects and strong magnetic field.

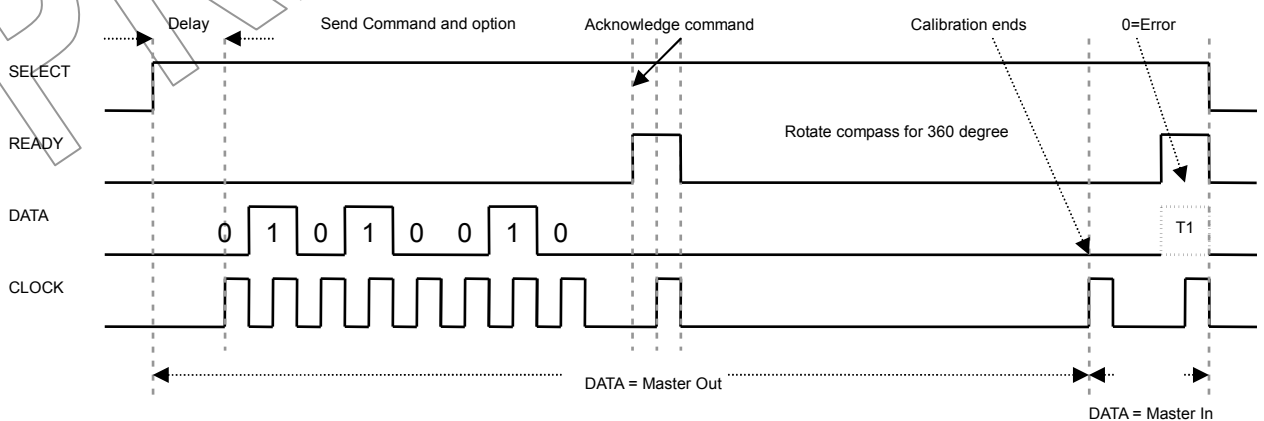
To perform calibration, the master sets the SELECT pin to high to wake up the compass and sends the command (0101) and op code (0010). The compass module then wakes up and performs calibration. The user should rotate the compass slowly for one circle. Upon completion, the master sets the CLOCK pin to high and waits for the READY pin to go high. After all, the master should clock once again and check the DATA pin. If DATA pin is high, then the calibration is completed. Otherwise, the calibration procedure has to be performed once again.

● TIMING DIAGRAMS

■ Compass Heading



■ Calibration

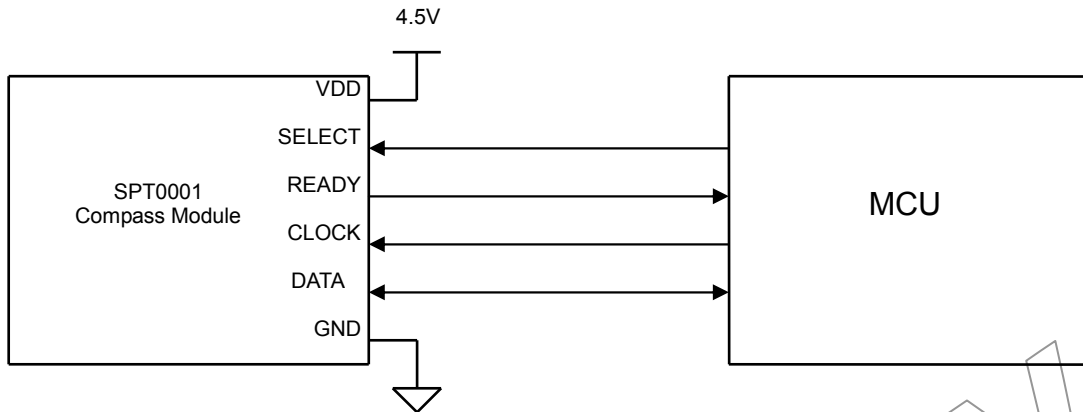




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● APPLICATION CIRCUIT



● CONTACT INFORMATION

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