KTH7112 EVB Manual

Technical Support
sales.global@conntek.com.cn

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1 Introduction

The KTH7112_EVB evaluation board is mainly used for performance evaluation and testing of the high-speed and high-precision magnetic encoder chip KTH7112 developed by Conntek. This document provides a detailed description of the specific usage method of this board.

2 Hardware Overview

The hardware circuit of the KTH7112_EVB evaluation board includes: encoder chip, decoupling capacitors, SPI pull-up resistors, indicator LEDs, mode configuration resistors, setting button, and connector.

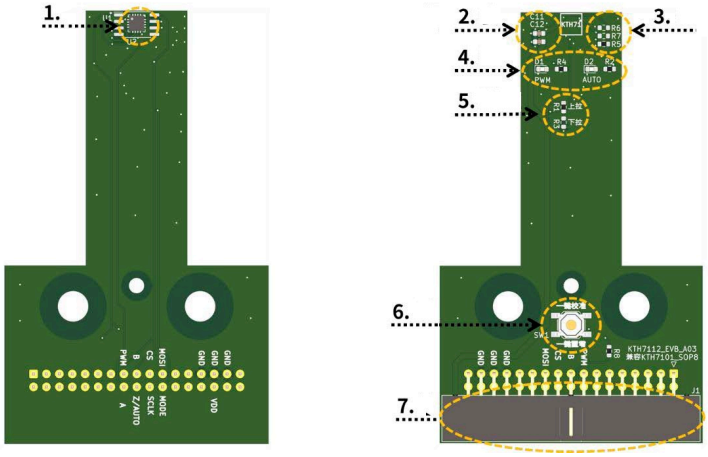

Figure 1: Board Appearance

The corresponding circuit names on the board are described in the table below.

No.	Circuit Name	Description
1	Encoder Chip	KTH7112 encoder chip
2	Decoupling Capacitor	Used for power supply filtering of the encoder chip
3	SPI Pull-up Resistor	Pull-up resistors for SPI signals CS, SCLK, and SDA. By default, only the SCLK signal is pulled up
4	Indicator LED	Connected respectively to U1.Pin9 PWM pin and U1.Pin14 AUTO_CAL pin, used to indicate the signal level of the corresponding pins
5	Mode Configuration Resistor	Connected to U1.Pin7 MODE pin, used to configure the pull-up or pull-down state of the MODE pin. The default is pull-up, which means the MODE pin is high by default
6	Setting Button	The SW1 button is directly connected to U1.Pin14. After the button is pressed, the AUTO_CAL pin of U1.Pin14 will be pulled high
7	Connector	The J1 connector is mainly used to bring out various signals of the encoder chip

Table 1: Board Function Table

3 Schematic

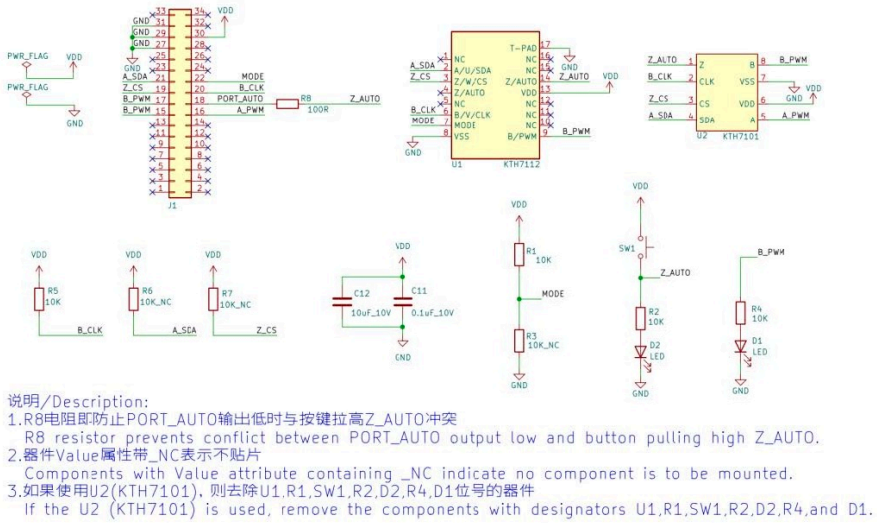

Figure 2: Board Schematic

4 Mechanical Dimensions

The figure below shows the dimension information of the EVB board. The overall size is $52.0\,\text{mm} \times 85.0\,\text{mm}$, and the encoder chip is placed at a distance of $2.49\,\text{mm}$ from the board edge.

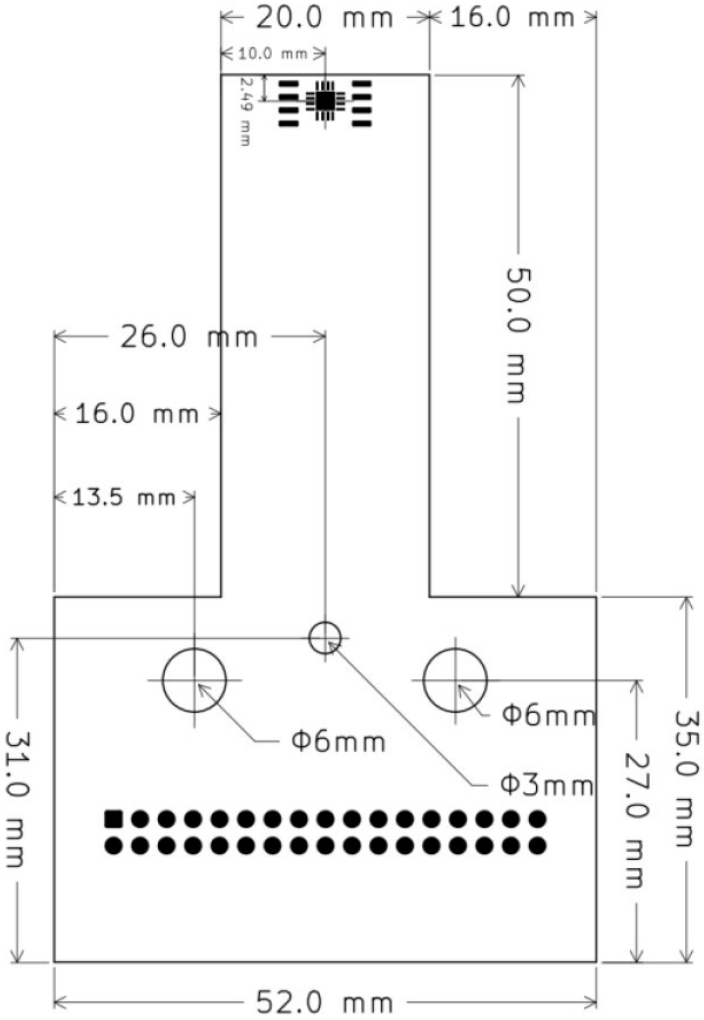

Figure 3: Board Dimensions

5 Connector Interface Definition

Connector J1 is a 34-pin wire-to-board connector with a pin pitch of 2.54 mm. The main signals of the EVB board can be brought out through this connector using a ribbon cable. The signal definitions corresponding to each pin can be referenced from the silkscreen beside the pins.

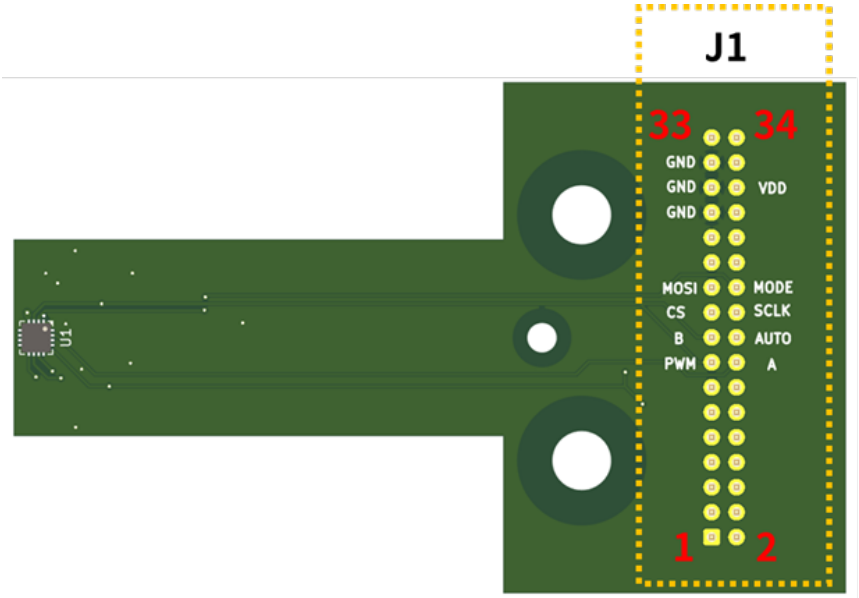

Figure 4: Connector J1 Interface

The main related signals of connector J1 are listed below.

Pin No.	PCB Silkscreen	KTH7112 Pin	Function Description
J1.15	PWM	U1.9(PWM)	Duty cycle output
J1.18	AUTO	U1.14(AUTO_CAL)	External calibration or zero-setting trigger input, active high
J1.19	CS	U1.3(Z/W/CS)	IO function configured by MODE pin and IO_MUX register
J1.20	SCLK	U1.6(B/V/SCLK/SSCK)	IO function configured by MODE pin and IO_MUX register
J1.21	MOSI	U1.2(A/U/SDA/SSD)	IO function configured by MODE pin and IO_MUX register
J1.22	MODE	U1.7(MODE)	Interface output control
J1.30	VDD	U1.13(VDD)	Power supply input for the encoder chip, from 3.3 V to 5 V
J1.27	GND	U1.8(GND)	Ground
J1.29	GND	U1.8(GND)	Ground
J1.31	GND	U1.8(GND)	Ground

Table 2: Connector J1 Pin Description

6 Functional Description

6.1 SPI Data Reading

First, make sure that the mode configuration resistor is in the pull-up state, that is, R1 is soldered. Then connect the VDD and GND pins of connector J1 to the power supply. After the board is powered on, the MODE pin of the KTH7112 chip is at a high level, and U1.2, U1.6, and U1.3

operate in the three-wire SPI mode. At this time, three-wire SPI communication with the KTH7112 chip can be carried out through the CS, SCLK, and MOSI pins on J1, so that angle data and register-related data can be read.

6.2 One-click Calibration and One-click Zero Setting

The SW1 button on the EVB board is connected to the AUTO_CAL pin of the encoder chip. After SW1 is pressed, the AUTO indicator LED on the board will light up, and the AUTO_CAL pin of the encoder chip will be pulled high at the same time. Alternatively, the AUTO_CAL pin can also be pulled high through pin J1.18(AUTO). After this pin is pulled high, the encoder chip will automatically trigger calibration or zero setting according to the current angle variation.

When the pin is kept high continuously, and the signal magnet corresponding to the encoder chip is rotating at a constant speed, the encoder chip will enter calibration mode to perform angle calibration. At this time, the PWM indicator LED on the board will start flashing. After calibration is completed, if calibration is successful, the PWM indicator LED will remain on. If calibration fails, the PWM indicator LED will turn off.

When the pin is pulled high for more than $2\,\mathrm{s}$ while the signal magnet corresponding to the encoder chip is stationary, the encoder chip will enter the zero-setting state, and the current angle value will be reset to the zero point, thus completing the angle zero-setting operation.

6.3 Output Mode Switching

The CS, SCLK, and MOSI pins of connector J1 on the KTH7112_EVB board are directly connected to pins U1.3, U1.6, and U1.2 of the encoder chip. By configuring different combinations of MODE level and IO_MUX register settings, different data output modes can be achieved.

PIN and Register	Status 1	Status 2	Status 3	Status 4
PIN7: MODE	High level	Low level	Low level	Low level
IO_MUX[2:0]	Any	4	1	2
PIN2	SDA	A	U	SSD
PIN6	SCLK	B	V	SSCK
PIN3	CS	Z	W	Z

Table 3: KTH7112 Interface Output Selection Table

The MODE level is switched by changing the pull-up or pull-down configuration using mode configuration resistors R1 and R3 on the board. Together with the IO_MUX register values configured as described in the datasheet, the CS, SCLK, and MOSI pins on J1 can be switched to different output modes such as ABZ, UVW, and SSI.