DK-10125 SmartMotion Platform Hardware User Guide

Revision 1.0

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1. Revision History

Date	Revision	Description
4/13/2021	1.0	Initial release

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2. Introduction

The DK-10125 TDK SmartMotion Platform is a comprehensive development system for TDK InvenSense Motion and Pressure Sensor devices. The platform designed around the Microchip SAMG55 MCU can be used by customers for rapid evaluation and development of InvenSense sensor-based solutions. The platform integrates an on-board Embedded Debugger so external tools are not required to program or debug with the SAMG55 MCU. Each InvenSense motion and pressure sensor has its own unique development kit.

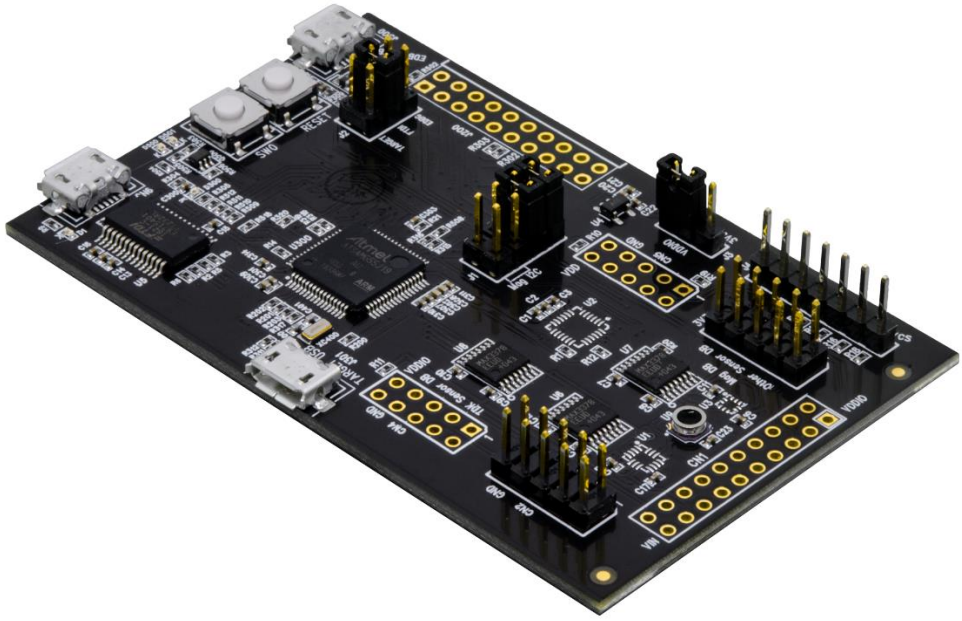
The DK-10125 SmartMotion platform comes with the necessary software including InvenSense Motion Link, a GUI based development tool and embedded Motion Drivers (eMD) for InvenSense motion and Pressure sensors.

Embedded Motion Drivers (eMD) consists of a set of APIs to configure various aspects of the platform including pressure sensor parameters such as output data rate (ODR), low-power or low-noise mode, and sensor interface to host (I2C, SPI).

Motion Link is a GUI based development tool included with the platform. It can be used to capture and visualize the sensor data from the motion sensor.

The platform supports Atmel Studio and is compatible with Microchip Xplained Pro Extension boards. Xplained Pro extension series evaluation kits offer additional peripherals to extend the features of the board and ease the development of customer designs.

DK-10125 SmartMotion Development Kit



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3. Overview

1) Features

- Integrated TDK InvenSense pressure sensor
- Microchip SAMG55 microcontroller with 512KB Flash
- On-board Embedded debugger (EDBG) for Programming and debugging
- Built in FTDI USB to UART interface for fast sensor data transfer.
- USB Connectors for host interface to software debug and data logging
- Board Power Supply through USB

2) Platform Overview

DK-10125 SmartMotion Platform is a hardware unit for TDK sensor product evaluation and algorithm software development. The platform offers flexibilities for many different application developments.

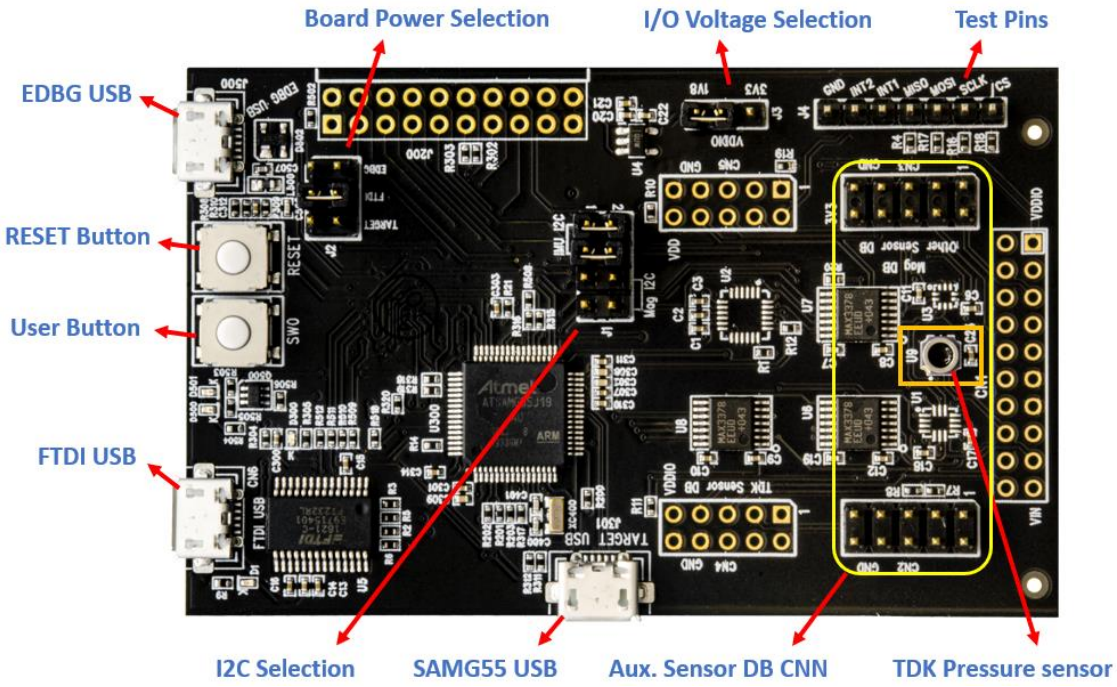

Figure 1. Platform Overview

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4. Hardware User Guide

DK-10125 SmartMotion Platform is compatible with Microchip's SAM G55 Xplained Pro. The link to the Atmel Xplained-Pro user guide is here:

http://www.atmel.com/Images/Atmel-42389-SAM-G55-Xplained-Pro_User-Guide.pdf

1) System Block Diagram

On board EDBG MCU AT32UC3A4256HHB-C1UR allows user to do main MCU SAMG55 debug, trace and programming without using external tools. The Figure 2 shows system block diagram.

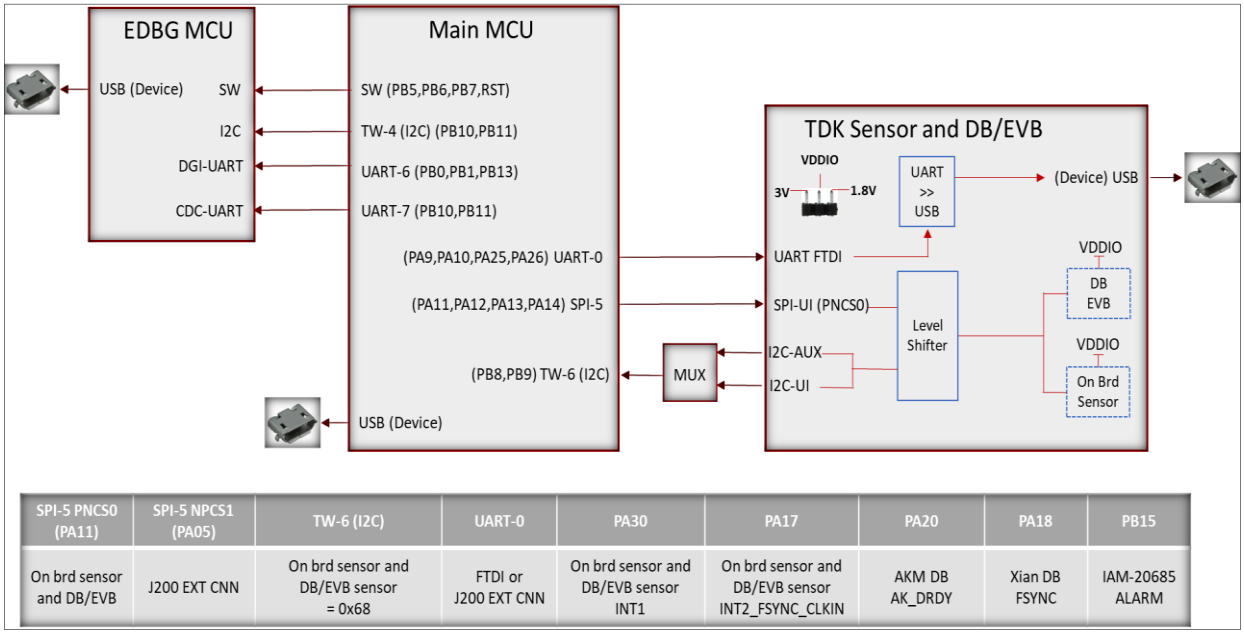

Figure 2 System Block Diagram

2) Main MCU SAMG55 resource allocation

Table 1 SAMG55 Resource Allocation

SAMG55 resource	Usage
UART 0 (PA9/10/25/26)	The UART0 is connected to FTDI input by default. In the use case of Extension-1 on J200, the UART0 to FTDI connection can be disconnected through jumper J3.

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TW6 (I2C) (PB8/9)	TDK sensor is connected to this master I2C. On board sensor slave address = 0x69. Sensors on DB and EVB have slave address = 0x68.
SPI5 (PA11/12/13/14)	The SPI5 master is connected to TDK IMU sensor. On board IMU sensor /CS = PNCS0
GPIO (INTs) PA17/18/20/30 and PB15	The GPIOs are used for sensor interrupt inputs and other intelligent functions. Referring to the table in Figure 2.
TW4 (I2C)	The master I2C communicates with EDBG MCU slave I2C.
UART6	The UART6 is used for EDBG DGI-UART interface.
UART7	The UART7 is used for EDBG CDC-UART interface.

3) **Connectors**

Table 2 details the DK-10125 SmartMotion Platform connector and header reference names and descriptions.

Table 2 Connectors

Connector Ref Name	Connector Function descriptions
CN1 (Not loaded)	External TDK sensor EVB connector
CN2/CN3	Daughter board connector for Aux. sensor. I2C interface only.
CN4/CN5 (Not loaded)	Daughter board connector for TDK sensor. I2C and SPI interfaces.
CN6	USB connector for FTDI USB to serial UART interface
J1	Select host I2C connections, for IMU / Pressure sensor and Auxiliary mag. sensor, or Auxiliary mag. Sensor only.
J2	Board power source selection.
J3	Select VDDIO voltage level, 3V0 or 1V8.
J4	Digital signal test pins

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J200 (Not loaded)	Extension header 1. Has same function as J200 on Microchip's Xplained-Pro board.
J301	MCU SAMG55 USB connector
J500	EDBG MCU USB connector
SW300	User button
SW301	RESET button.

4) **TDK Sensor to SAMG55 MCU connection**

TDK ICP-10125 sensor is connected to SAMG55 MCU I2C only.
The sensor I2C slave address is 0x63.

5) **Auxiliary sensors connection**

3rd party sensors can be connected to the same SAMG55 MCU I2C bus with TDK Pressure sensor through DB, assuming it has a different slave address.
CN2/3 are designed for the auxiliary sensor DB plug in. It supports I2C only.

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6) **Jumper settings**

Table 3 Jumper setting

Jumper	Description
J1	J1 is used to select input source for SAMG55 master I2C. Only two jumper shunts are allowed. Jumper shunts on pin-1/2 and 3/4: ICP-10125 Pressure Sensor primary I2C is connected to SAMG55 I2C master Jumper shunts on pin-5/6 and 7/8: Auxiliary Sensor I2C is connected to SAMG55 I2C master.
J2	The J2 is for board power source selection. Only one jumper shunt is allowed. Jumper shunt on pin-1/2: board power is from EDBG USB on J500. Jumper shunt on pin-3/4: board power is from FTDI USB on CN6 Jumper shunt on pin-5/6: board power is from SAMG55 USB on J301
J3	J3 is for system VDDIO level selection. Jumper shunts on pin-1/2: VDDIO=3V0 Jumper shunts on pin-3/2: VDDIO=1V8 (Use only this for ICP-1025)
J4	J4 have digital signals as test points. Pin-1: SPI /CS Pin-2: SPI SCLK, I2C SCL Pin-3: SPI MOSI, I2C SDA Pin-4: SPI MISO, I2C AD0 Pin-5: INT1 Pin-6: INT2 Pin-7: GND

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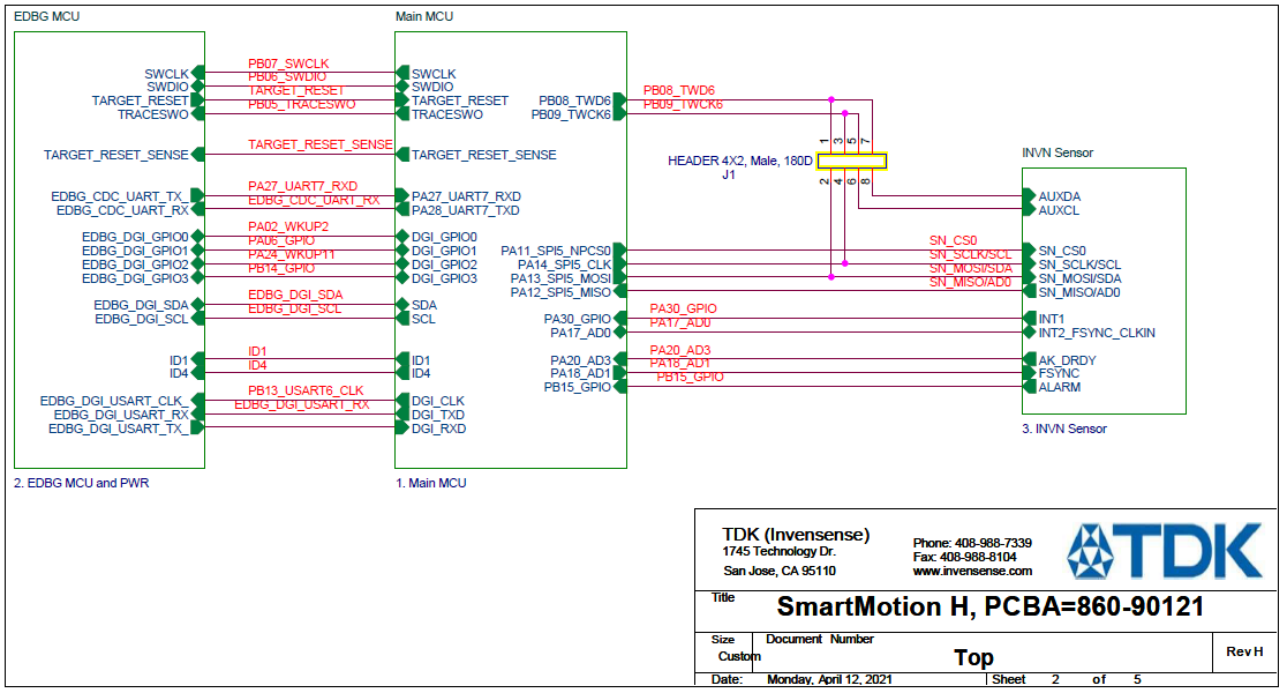
5. Schematics and PCB

1) The schematics version is Ver-H.



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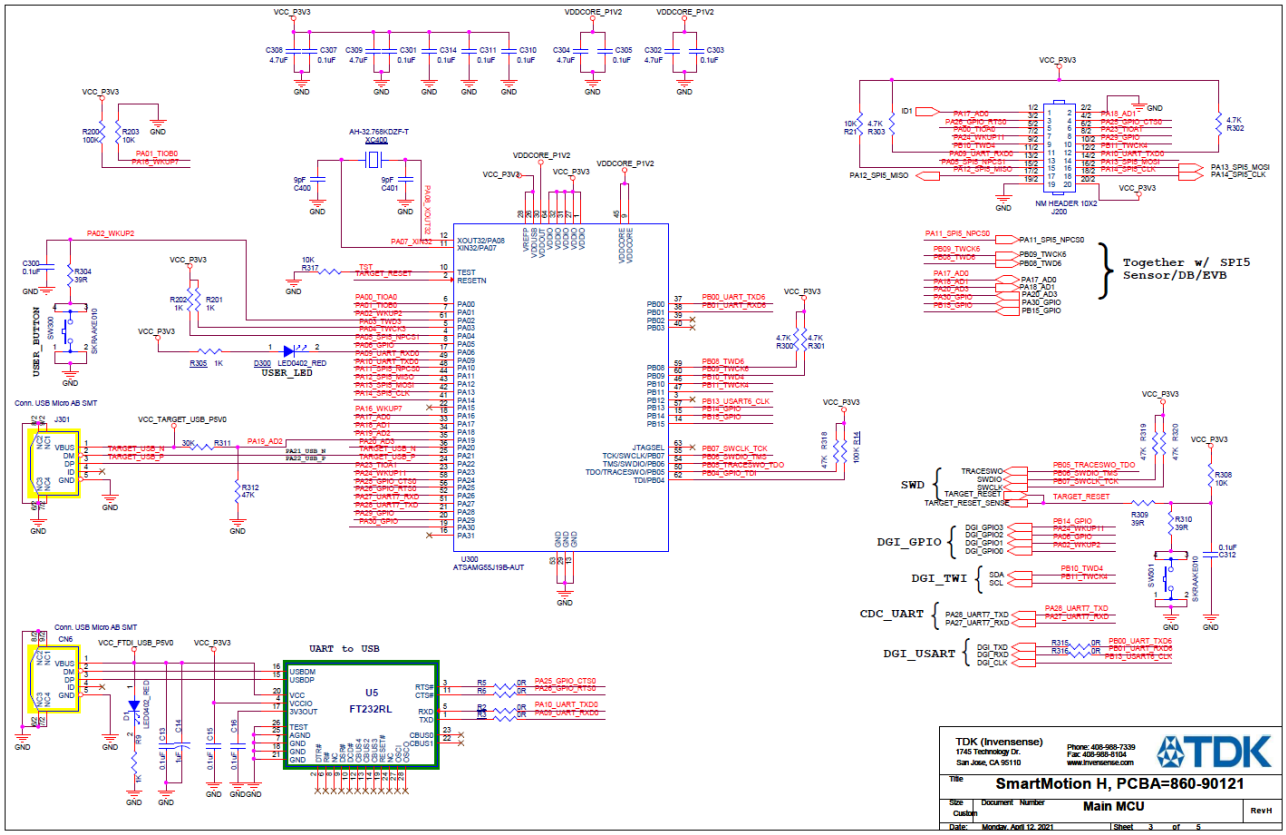

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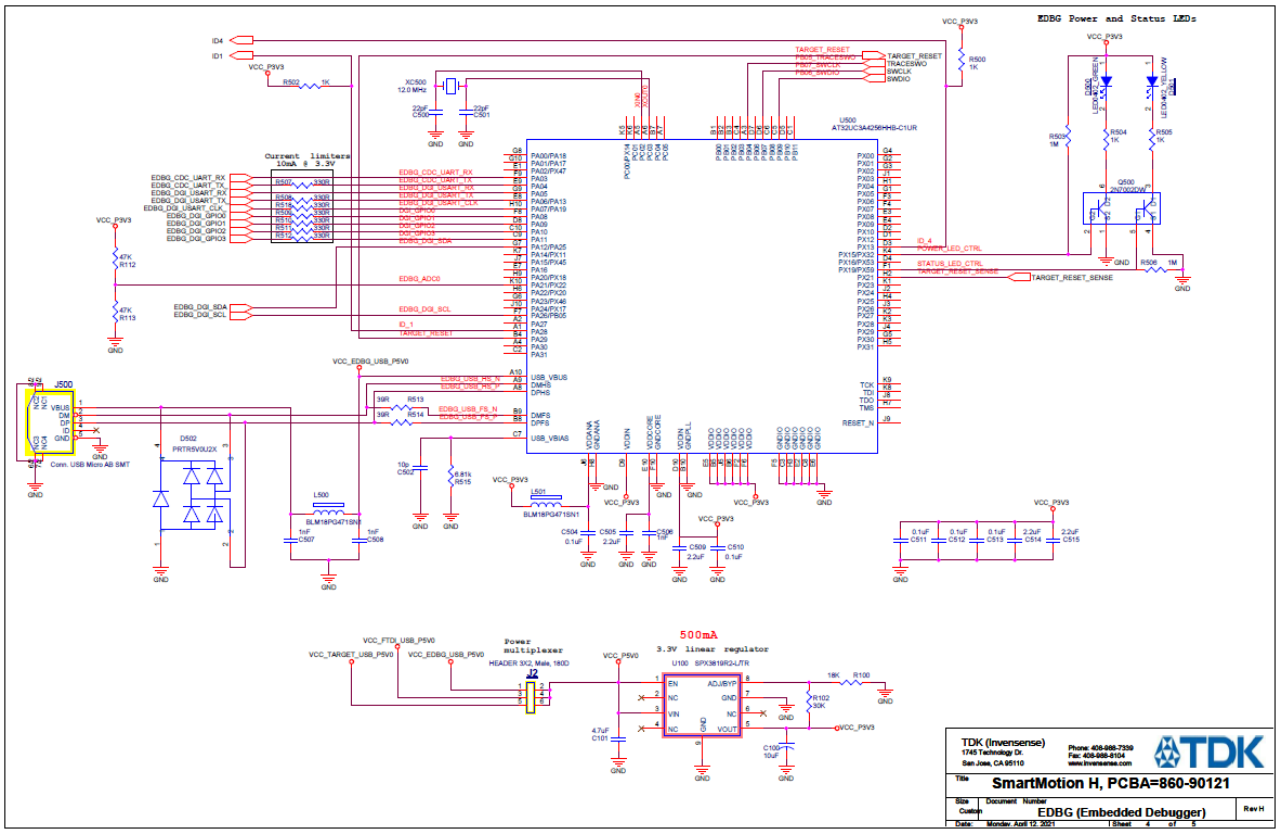

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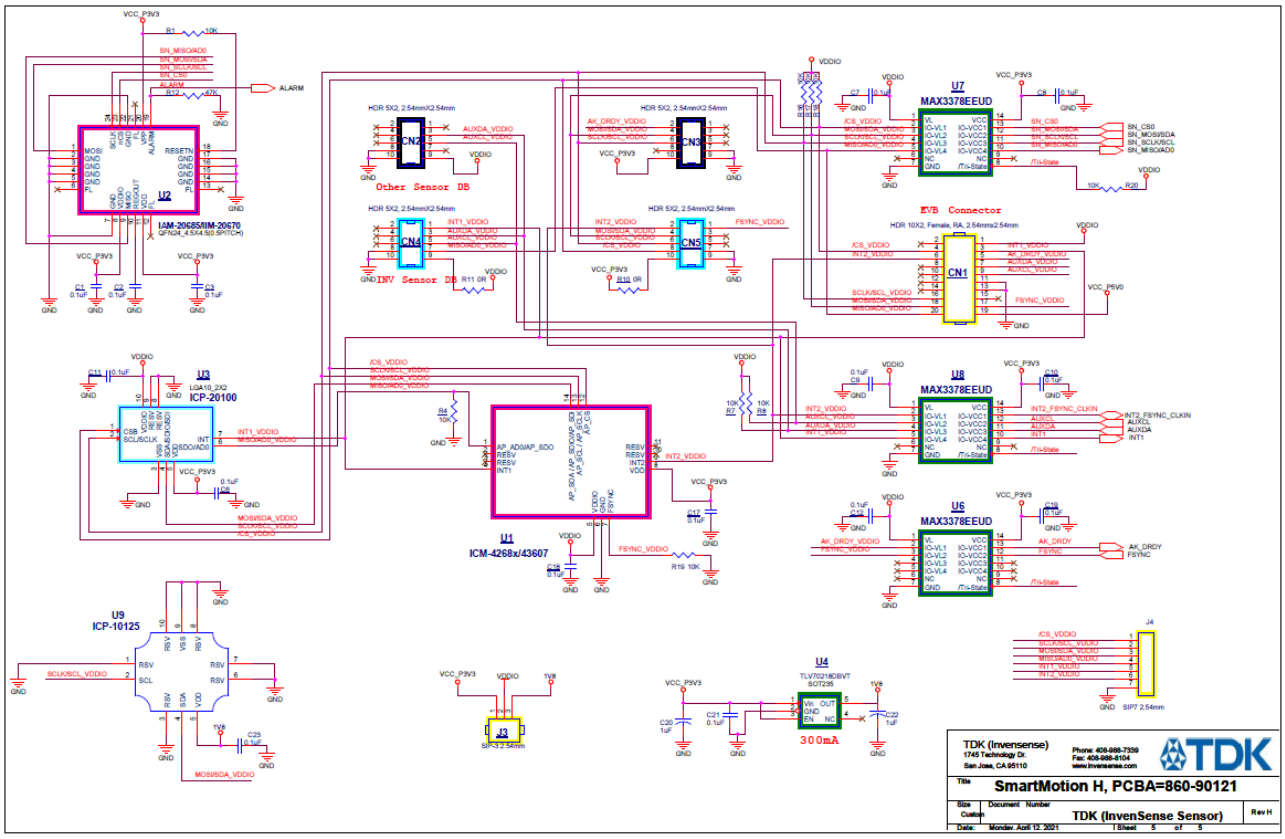

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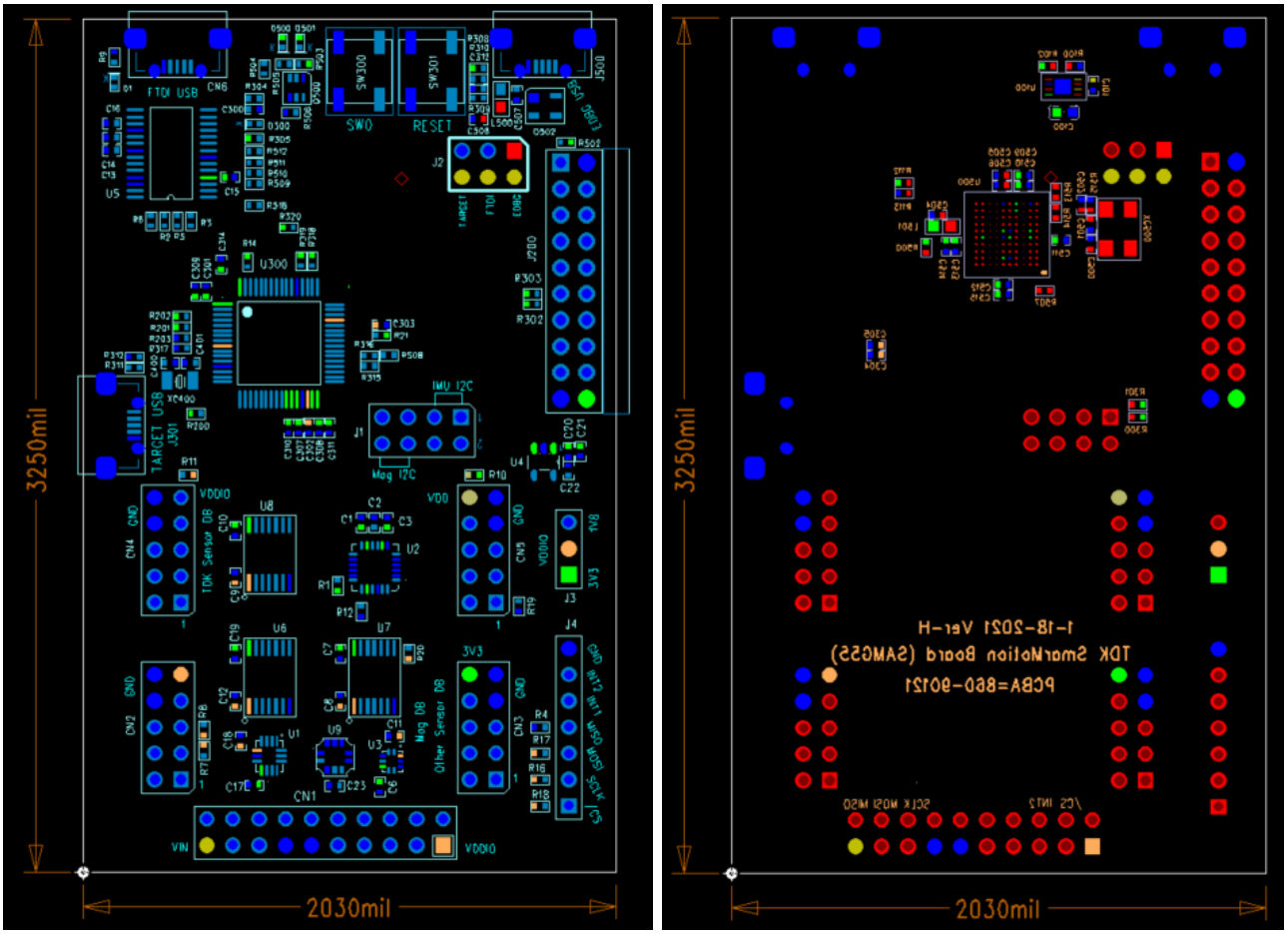
2) Ver-H Board PCB



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