

TDK-InvenSense
EV_ICM-459xx-x
(ICM-456xx + ICT-1531X EVB)
Evaluation Board
user guide

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1 OVERVIEW

This document describes the EVB that is part of the system dedicated to the evaluation of TDK-InvenSense's IMU ICM-45608 and ICM-45689 paired with Mag Sensor ICT-15318 and ICT-15312.

The EVB provides 9x motion sensor solution with on board IMU paired with Mag Sensor,

This user guide will be applied for any future new part in the same product line.

It provides information needed for the integration of EVB into a customer's system and explains the functionality of key signals and circuit functions, hardware jumper settings and port connections.

EVB numbers correspond to IMU and Mag sensor are listed in the table below.

Component part number	EVB number
ICM-45608 + ICT-15318	EV_ICM-45908-1
ICM-45608 + ICT-15312	EV_ICM-45908-2
ICM-45689 + ICT-15318	EV_ICM-45989-1
ICM-45689 + ICT-15312	EV_ICM-45989-2

The EVB provides:

- 9-axis (3D Magnetometer, 3D Accelerometer and 3D gyroscope).
- Host interface to access IMU with I2C, I3C or SPI.
- On-board voltage controllers allowing different supply levels to the IMU.
- Access measuring pin for IMU and Mag sensor power consumption test separately.

The EVB can be used as a standalone element, using I2C, I3C or SPI serial communication interface for Customer's MCU, or it may be plugged into TDK-InvenSense Universal DK to allow using TDK-InvenSense GUI for IMU configuration and sensor data streaming to PC.

The EVB is lead-free and RoHS compliant.

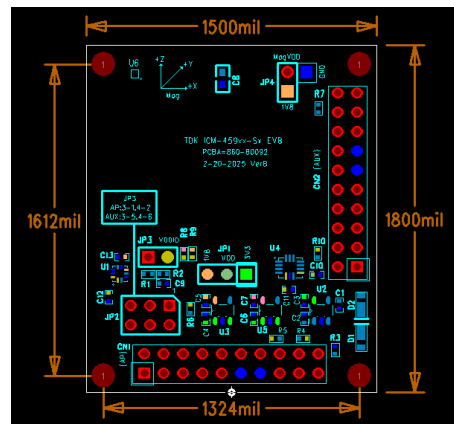


Figure 1. EVB overview

The EVB is a 4-layer FR-4 PCB with dimensions marked in Figure 1.

Figure 2 is for the PCB top/bottom layout and silkscreen print on top layer.

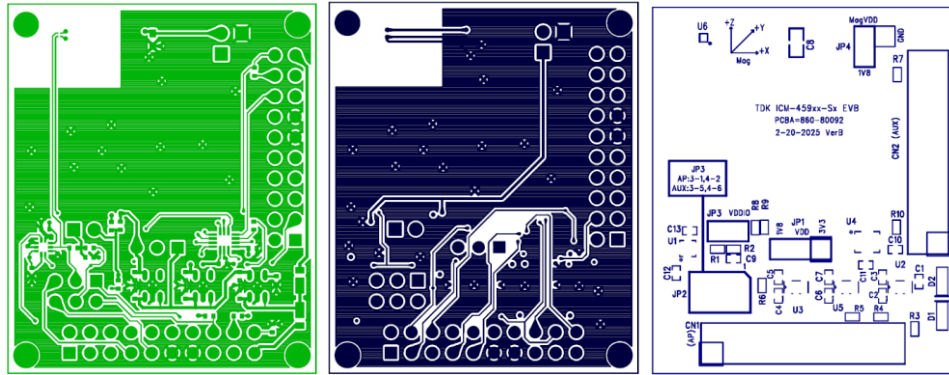


Figure 2. EVB layout: top side, bottom side, silk screen top side

Please refer to the product specification of each IMU for electrical characteristics, pinout, and applications details. Sensor product specifications can be found at www.invensense.tdk.com. For product specifications for unreleased parts, please contact TDK-InvenSense through the website:

<https://invensense.tdk.com/smartautomotive-product-details/#contact>

2 SCHEMATIC AND BILL OF MATERIALS

EV_ICM-459xx-x board is fully assembled and tested. Its schematic is as the below.

TDK's TMR Mag sensor ICT-15318 or ICT-15312 as an I2C slave device can be configured to communicate with IMU built-in I2C master (AUX1) or with user MCU processor I2C/I3C master. Jumper JP2 is designed for the option selections.

When using dual interface IMU ICM-45608 and ICM-45689, their AUX1 is used as I2C master for Mag sensor communication, the CN2 is not used.

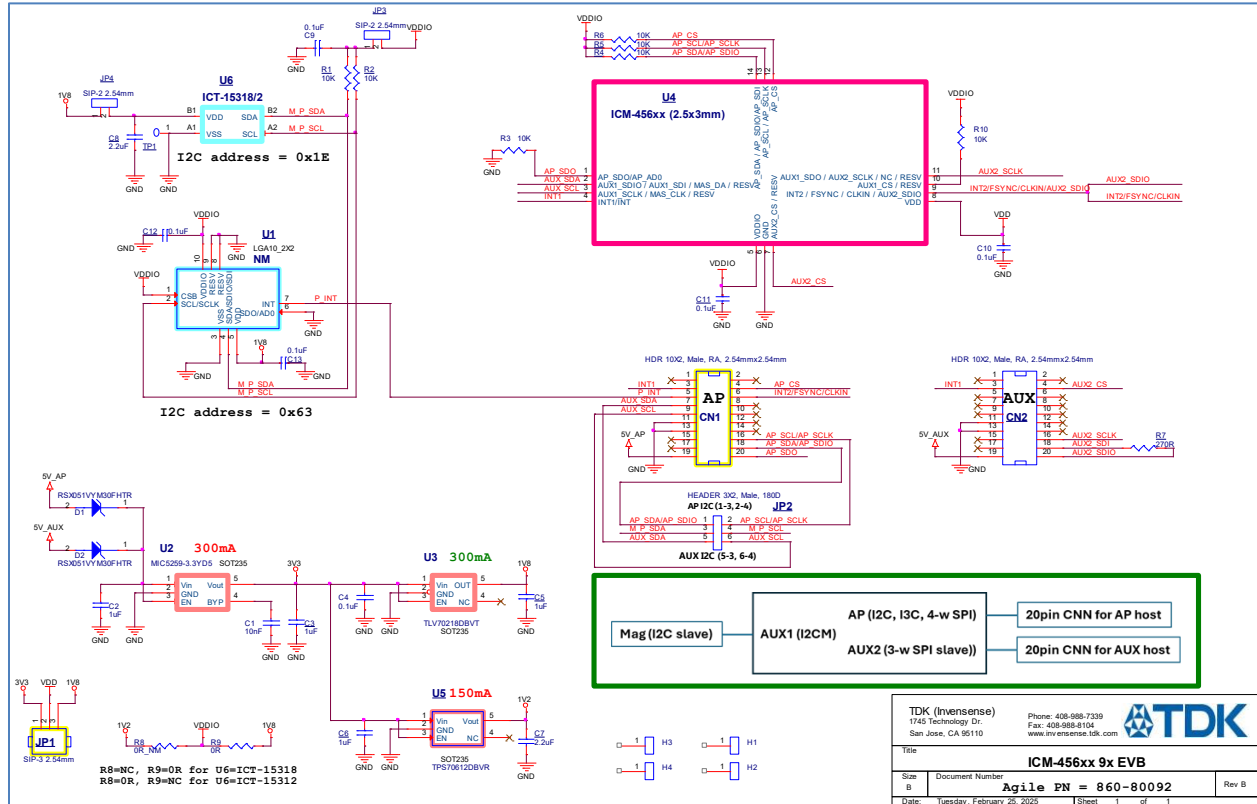


Figure 3. EVB circuit schematic

The EVB bill of material is listed in the below table.

Quantity	Reference	Part	manufacturer	manufacturer's part number
2	CN1,CN2	HDR 10X2, Male, RA, 2.54mmx2.54mm	Wurth	61302021021
1	JP1	SIP-3 2.54mm	FCI	68000-103HLF
1	JP2	HEADER 3X2, Male, 180D	FCI	67997-206HLF
2	JP3,JP4	SIP-2 2.54mm	3M	961102-6404-AR
1	C1	10nF	TDK	CGA2B3X8R1H103K050BE
4	C2,C3,C5,C6	1uF	TDK	CGB2A11B1A105M033BC
6	C4,C9,C10,C11,C12,C13	0.1uF	Yageo	CC0402KRX5R6BB104
1	C7	2.2uF	TDK	C1005X6S0J225K050BC
1	C8	2.2uF	Knowles	0603BW225K160YT
2	D1,D2	RSX051VYM30FHTR	ROHM	RSX051VYM30FHTR

7	R1,R2,R3,R4,R5,R6,R10	10K	Yageo	RC0402JR-0710KL
1	R7	270R	Yageo	RC0402FR-07270RL
1	R9	0R	Yageo	RC0402JR-070RL
1	U2	MIC5259-3.3YD5	Microchip	MIC5259-3.3YD5
1	U3	TLV70218DBVT	TI	TLV70218DBVT
1	U4	ICM-456xx (2.5x3mm)	TDK	ICM-4563x
1	U5	TPS70612DBVR	TI	TPS70612DBVR
1	U6	ICT-15318	TDK	ICT-15318
5		Jumper Shunt for J1 pin2-3 Jumper Shunt for JP2 pin3-5 and pin4-6 Jumper Shunt for J3 and JP4 pin1-2	Sullins	QPC02SXGN-RC

Table 1. EVB Bill of Materials

3 EVB CONNECTOR PINOUT

CN1 PIN NUMBER	CN1 SIGNALS	SIGNAL DESCRIPTION
1,5,7,9,15,17 2,8,10,12,14	N.C.	N.C. Do not connect to these pins
3	INT1	IMU INT1
4	AP_/CS	SPI chip-select
6	FSYNC/INT2	IMU FSYNC/INT2
11, 13	GND	Ground connection
16	AP_SCL/AP_SCLK	I2C SCL, or SPI SCLK
18	AP_SDA/AP_SDIO	I2C SDA, or SPI MOSI
19	VIN	Main power supply line. 5V
20	AP_SDO	SPI MISO

Table 2. User interface connector signals (CN1)

JP2 PIN NUMBER	JP2 SIGNAL NAME	SIGNAL DESCRIPTION
1	AP_SDA	User MCU processor I2C Master SDA
2	AP_SCL	User MCU processor I2C Master SCL
3	Mag SDA	Mag Sensor SDA
4	Mag SCL	Mag Sensor SCL
5	AUX1 SDA	IMU AUX1 I2C Master SDA
6	AUX1 SCL	IMU AUX1 I2C Master SCL

Table 3. Mag I2C Slave Selection (JP2)

JP2 PIN SHUNT	Mag I2C slave is connected to
1-3, 2-4	User MCU processor I2C Master
3-5, 4-6	IMU AUX1 I2C Master

Table 4. Mag I2C Slave Selection Setting (JP2)

JP1 PIN NUMBER	JP1 SIGNAL NAME	SIGNAL DESCRIPTION
1	3V3	3.3V from on board LDO
2	VDD	VDD power supply for IMU
3	1V8	1.8V from on board LDO

Table 5. VDD Power JP1

JP3	VDDIO	Mag Sensor VDDIO. Should closed for normal operation.
JP4	VDD	Mag Sensor VDD. Should be closed for normal operation.

Table 6. Mag Sensor VDD and VDDIO Power Measurement (JP3 and JP4)

4 HOST INTERFACE OPTIONS

For connectivity with a host PC, the EVB is designed to be plugged into the **DK-UNIVERSAL-I** board (through CN1 connector). Figure 4 shows the complete evaluation system.

Alternatively, users may develop their own host processor and software tools to communicate with the EVB.

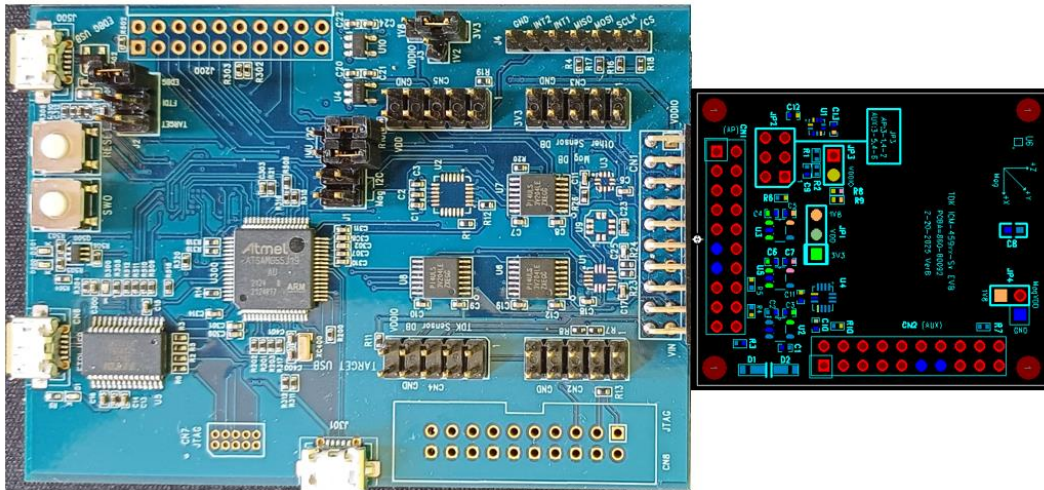


Figure 4. DK-UNIVERSAL-I with EVB

5 SPECIAL INSTRUCTIONS

The motion sensors can be permanently damaged by electrostatic discharge (ESD). ESD precautions for handling and storage must be taken to avoid damage to the devices. For more information on this topic, refer to TDK-InvenSense Application Note *AN-000393 TDK InvenSense IMU PCB Design and MEMS Assembly Guidelines*.

6 REVISION HISTORY

REVISION DATE	REVISION	DESCRIPTION
03/07/2025	1.0	1 st release
05/19/2026	1.1	New title and add EVB part numbers

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