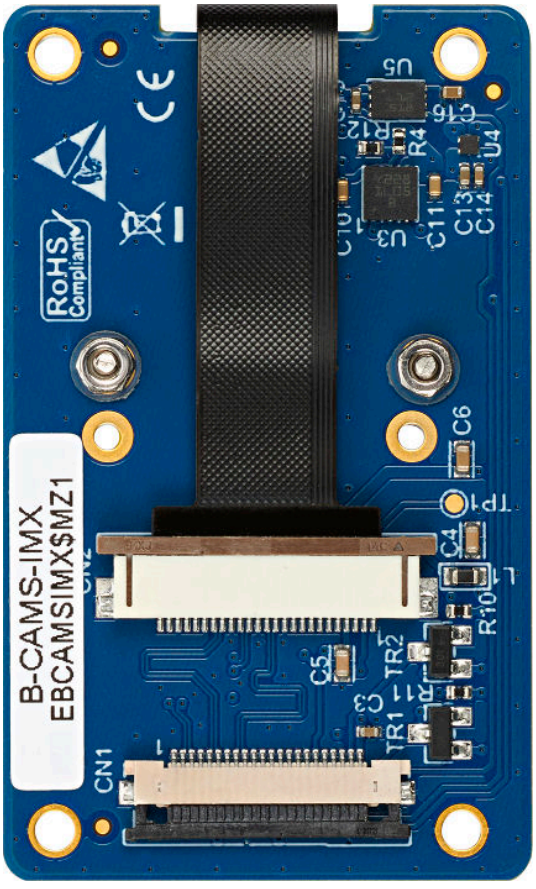
Camera module bundle for STM32 boards

Introduction

The B-CAMS-IMX camera module provides a compelling hardware set to handle multiple computer vision scenarios and use cases. It features a high-resolution 5-Mpx RGB CMOS image sensor, an inertial motion unit, and a Time-of-Flight sensor. It can be used with any STM32 boards featuring a MIPI CSI-2® interface with a 22-pin FFC connector to enable full-featured computer vision on STM32 microcontrollers and microprocessors easily.

Figure 1. B-CAMS-IMX top view without FFC

Figure 2. B-CAMS-IMX bottom view without FFC



Pictures are not contractual.

1 Features

- Camera module accessory board (MB1854) including:
  - Dual-lane MIPI CSI-2® data output supporting Sony 5-Mpx RGB CMOS image sensor
  - M12 × 0.5 lens holder for a variety of commercially available, ready-to-use M12 lenses
  - Supplied M12 lens: Manual focus, 87° FOV
  - Inertial motion unit
  - Multizone direct Time-of-Flight sensor
  - 3.3 V power
  - Board connector:
    - 0.5 mm-pitch, 22-pin flexible flat cable (FFC) connector
  - 22-pin flexible flat cable

2 Ordering information

To order the B-CAMS-IMX camera module, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Content and references	Target STM32 boards
B-CAMS-IMX	• MB1854(1) • FFC(2)	STM32 boards featuring a 22-pin camera FFC connector

1. *Camera module accessory board*
2. *Flexible flat cable.*

The STM32 Discovery kits and Evaluation boards feature STM32 32-bit microcontrollers or microprocessors based on the Arm® Cortex® processor.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

2.1 Codification

The meaning of the codification is explained in Table 2.

Table 2. Codification explanation

B-XXXX-YYY	Description	Example: B-CAMS-IMX
B	Board kind	Accessory board
XXXX	Board type	CAMS: Camera sensor
YYY	Specific features	IMX: Sony CMOS RGB image sensor

3 Development environment

3.1 EDA resources

All board design resources, including schematics, EDA databases, manufacturing files, and the bill of materials, are available from the corresponding product page at *www.st.com*.

4 Safety recommendations

4.1 Targeted audience

This product targets users with at least basic electronics or embedded software development knowledge like engineers, technicians, or students.

This board is not a toy and is not suited for use by children.

4.2 Handling the board

This product contains a bare printed circuit board and like all products of this type, the user must be careful about the following points:

- The connection pins on the board might be sharp. Be careful when handling the board to avoid hurting yourself.
- This board contains static sensitive devices. To avoid damaging it, handle the board in an ESD-proof environment.
- While powered, do not touch the electric connections on the board with your fingers or anything conductive. The board operates at a voltage level that is not dangerous, but components might be damaged when shorted.
- Do not put any liquid on the board and avoid operating it close to water or at a high humidity level.
- Do not operate the board if it is dirty or dusty.
- The pins of the board are exposed and must not come into contact with a metal surface, as this can produce a short circuit and damage the board.

4.3 Delivery recommendations

Before the first use, inspect the board for any damage that may have occurred during shipment. Ensure that all socketed components are securely fixed in their sockets and that nothing is loose in the plastic bag.

4.4 Laser safety consideration

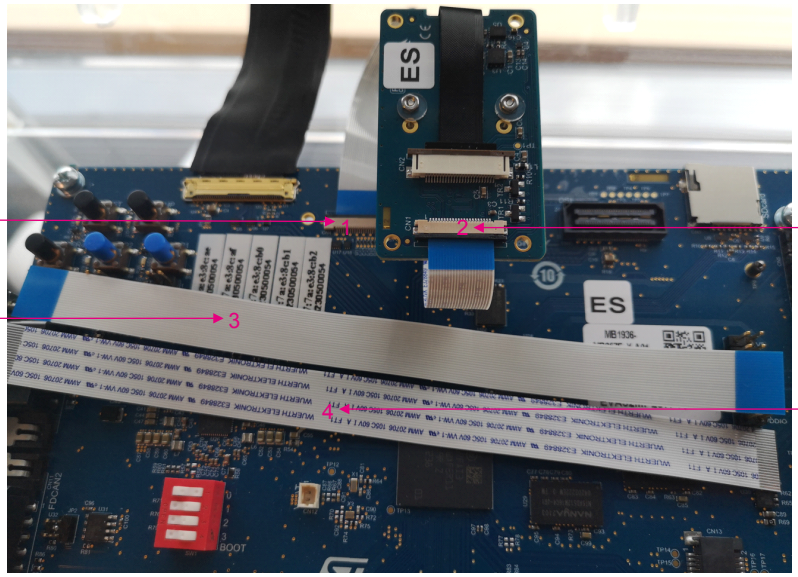
The Time-of-Flight and gesture-detection sensor contains a laser emitter and the corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonably foreseeable conditions including single faults in compliance with IEC 60825-1:2014 (third edition). The laser output remains within Class 1 limits if the recommended STMicroelectronics device settings are used and the operating conditions specified in the data sheet are followed. The laser output power must not be increased and no optics must be used with the intention of focusing the laser beam. Figure 3 shows the warning label for Class 1 laser products.

Figure 3. Class 1 laser product label

5 Quick start guide

This section describes how to start development quickly using the B-CAMS-IMX camera module.

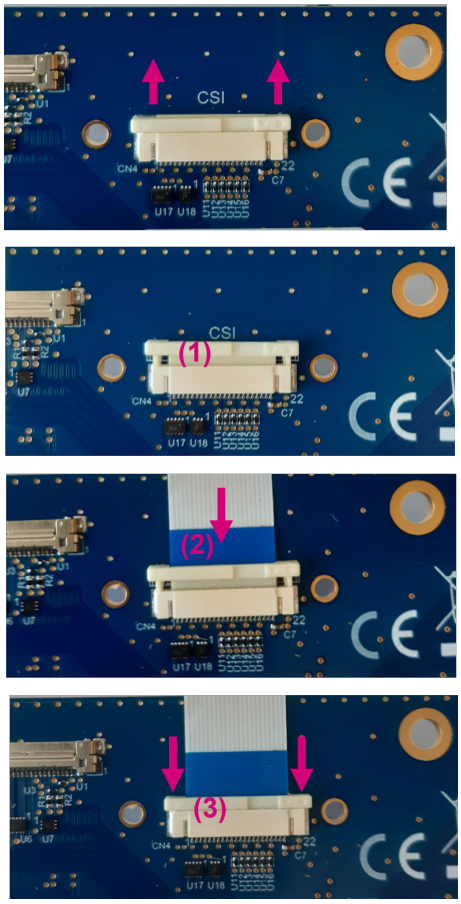
Figure 4. B-CAMS-IMX connected to a target STM32 board



- Make sure that the target STM32 board is not powered.
- Find the camera connector on the target STM32 board (Figure 4.1) and the one on MB1854 (CN1 Figure 4.2).

- On each connector, carefully:

Figure 5. B-CAMS-IMX/target STM32 board connection



  - Lightly pull the black plastic Figure 5 (1) to insert the contact side of the FFC towards the board Figure 5 (2).
  - Push the black plastic to hold the FFC Figure 5 (3).

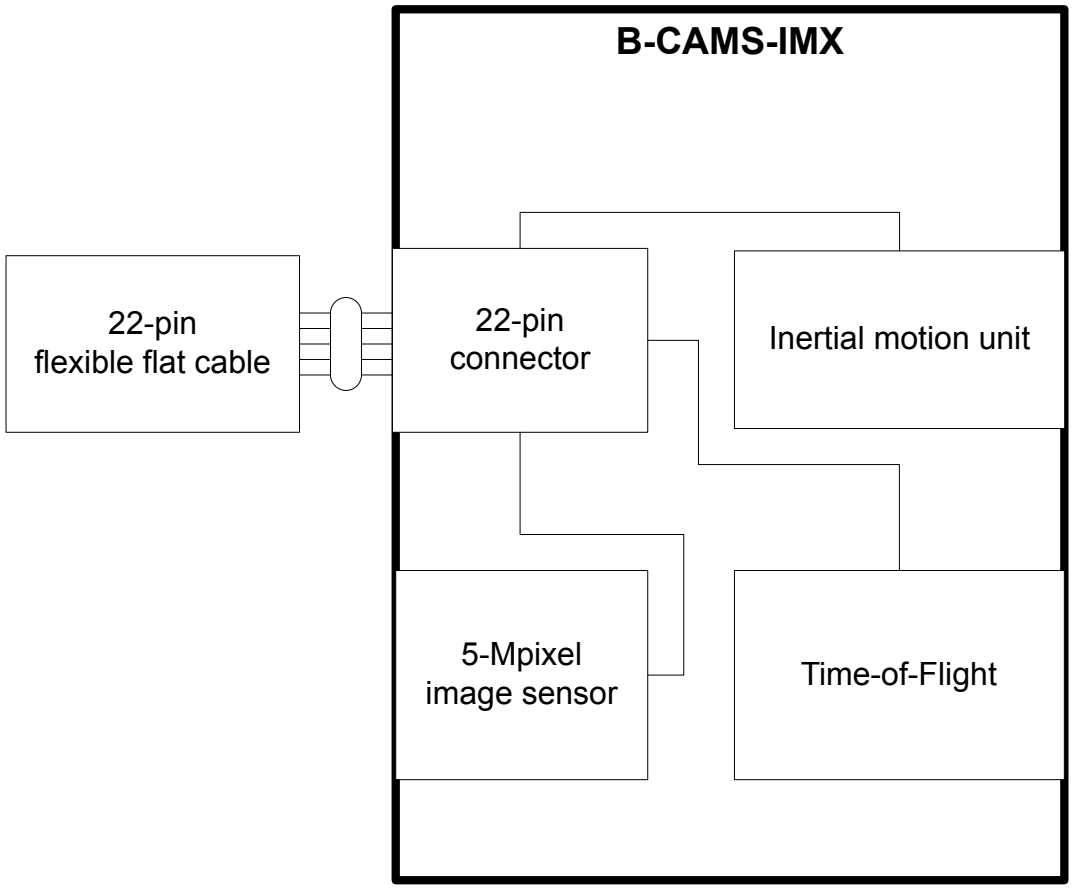
- Download the code example and the full set of documentation from *www.st.com* and program the target STM32 board.
- Evaluate computer vision possibilities on STM32 devices and develop your application.
- The lens is interchangeable. B-CAMS-IMX accepts the various M12-mount lenses available on the market.

6 Hardware layout and configuration

6.1 Hardware block diagram

The B-CAMS-IMX camera module is designed around the 5-Mpx RGB CMOS image sensor, an inertial motion unit (IMU), and a Time-of-Flight (ToF) sensor. The hardware block diagram is illustrated in Figure 6.

Figure 6. B-CAMS-IMX hardware block diagram



6.2 Hardware board layout

Figure 7 and Figure 8 help users locate these features on the B-CAMS-IMX board.

Figure 7. B-CAMS-IMX PCB layout (top view)

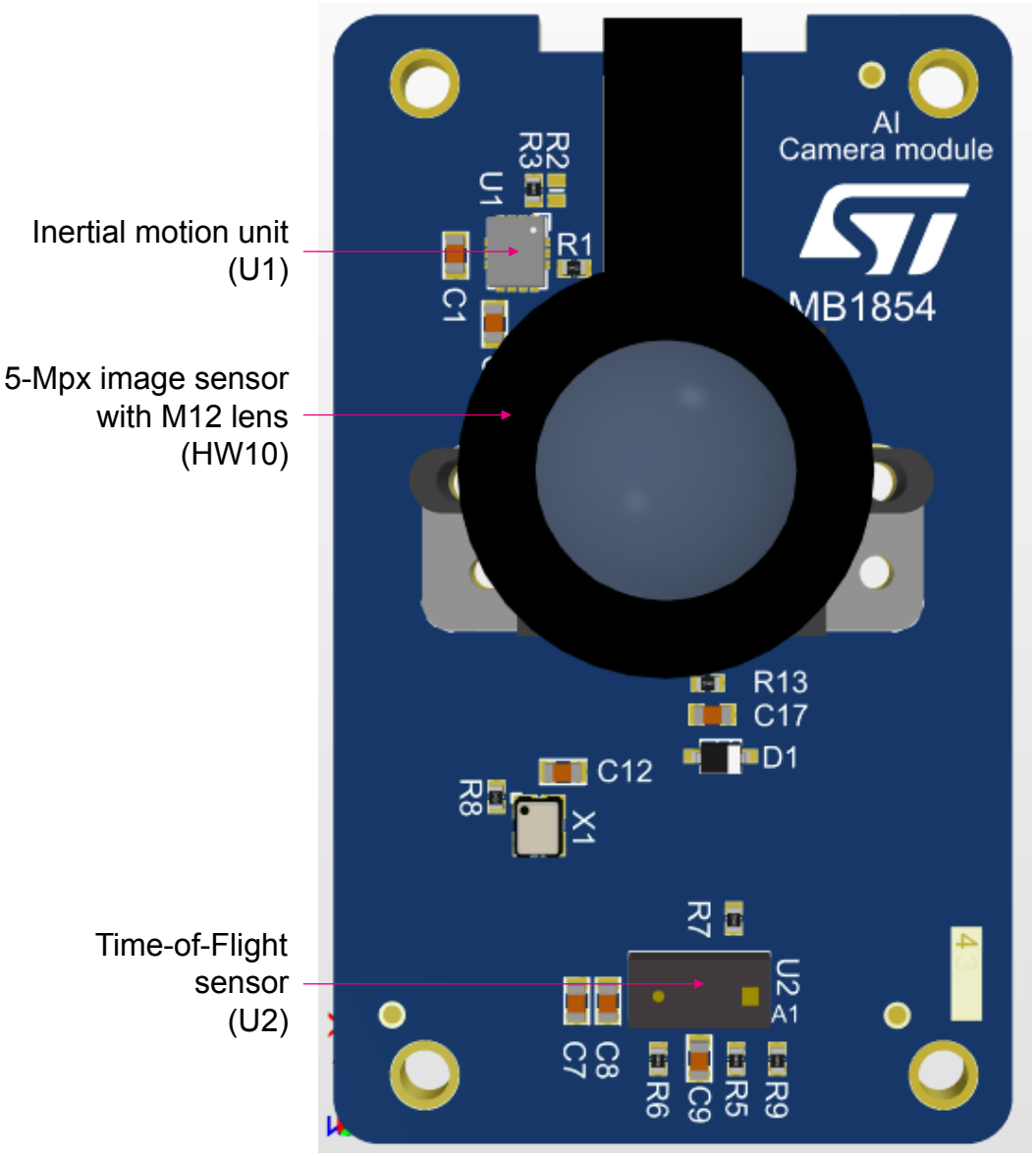
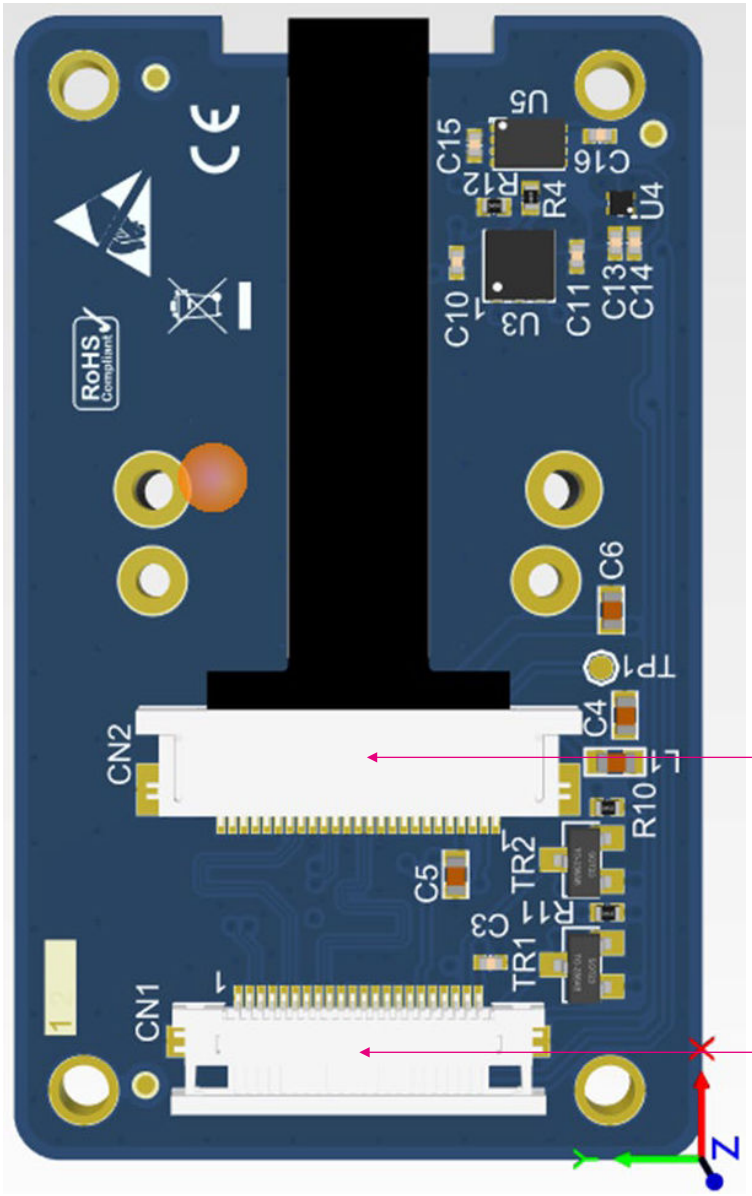


Figure 8. **B-CAMS-IMX PCB layout (bottom view)**



6.3 Mechanical drawing

All measurements are in millimeters.

Figure 9. B-CAMS-IMX board mechanical dimensions (bottom view, in millimeters)

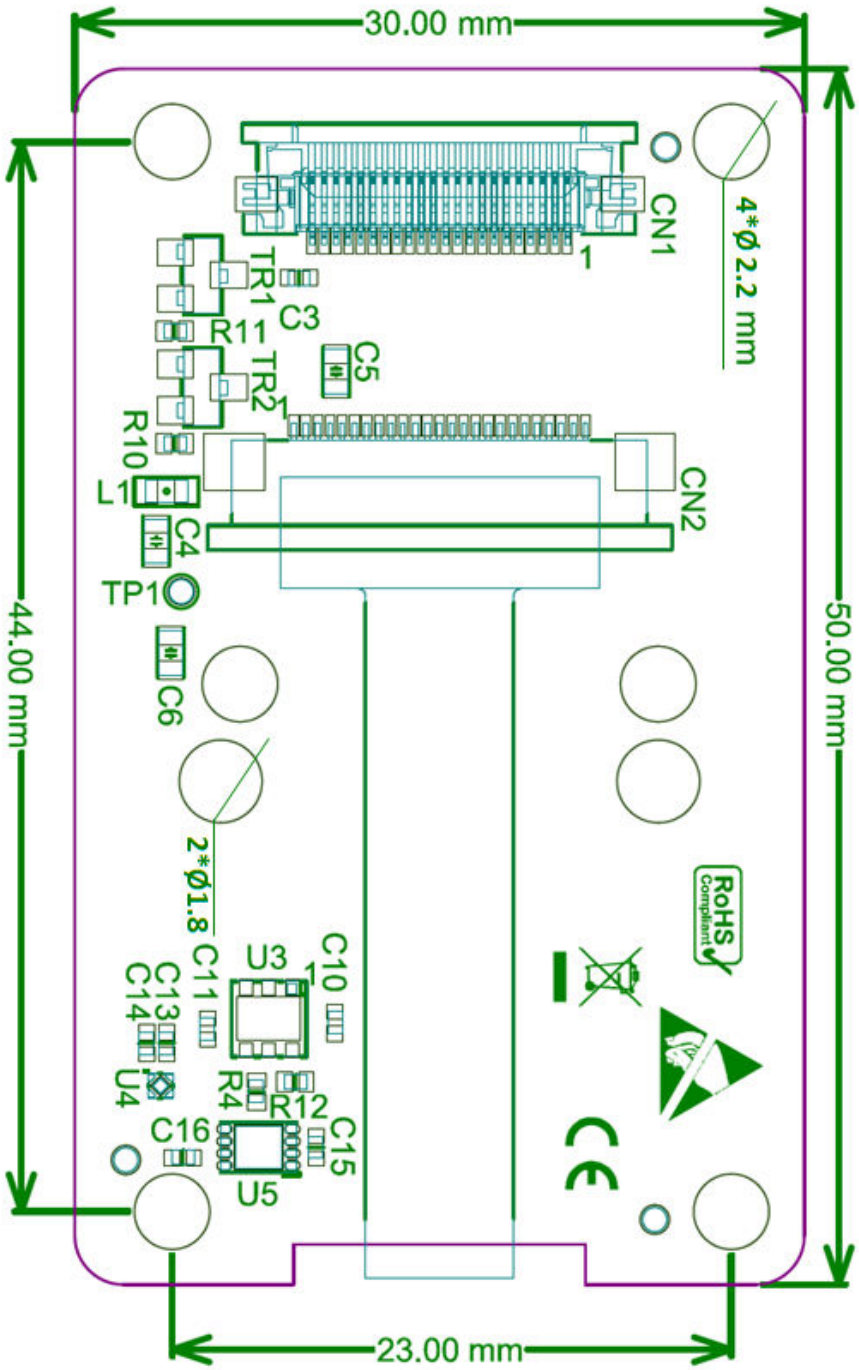
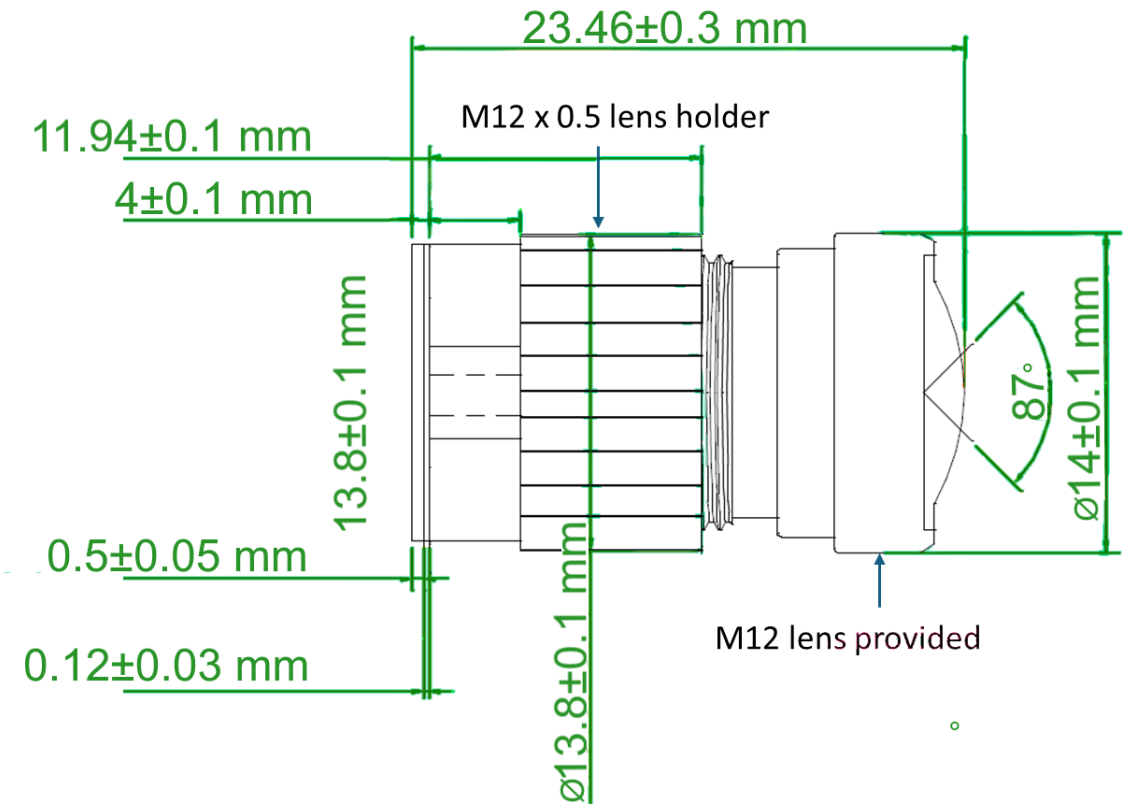


Figure 10. **Dimensions of the M12-mount lens (in millimeters)**



7 FFC connector to the target STM32 board

This is the 22-pin connector supporting the FFC connected to the target STM32 board, 3V3 signaling.

Twenty-two pins are necessary to connect all the needed signals to get the full features of B-CAMS-IMX, as described in Table 3.

Table 3. FFC connector (CN1) assignment

CN1 pin number	Assignment	Description
1	GND	-
2	CSI_D0_N	MIPI CSI-2® data output, first lane
3	CSI_D0_P	MIPI CSI-2® data output, first lane
4	GND	-
5	CSI_D1_N	MIPI CSI-2® data output, second lane
6	CSI_D1_P	MIPI CSI-2® data output, second lane
7	GND	-
8	CSI_CLK_N	MIPI CSI-2® clock output
9	CSI_CLK_P	MIPI CSI-2® clock output
10	GND	-
11	TOF_LPn	ToF I^2C enabled in LP mode, input, active high
12	TOF_INT	ToF interrupt, output, active low
13	GND	-
14	IMU_INT1	IMU, programmable interrupt1, output
15	IMU_INT2	IMU, programmable interrupt2, output
16	GND	-
17	NRST_CAM	Camera module reset, input, active low
18	EN_MODULE	Enable the camera module regulators, input, active high
19	GND	-
20	I2C_SCL	I^2C clock input, shared with the image sensor, IMU, and ToF
21	I2C_SDA	I^2C data I/O, shared with the image sensor, IMU, and ToF
22	3V3	Power supply, input

8 Board functions

This section explains all the functions of the board. Refer to the Hardware board layout in Figure 7 and Figure 8, B-CAMS-IMX top and bottom layout views.

8.1 5-Mpx image sensor

The camera module (HW10) has a high-resolution 5-Mpx (type 1/2.8) CMOS RGB image sensor compatible with a M12-mounted lens. The module is provided with the following M12 lens: 1/2.8”, EFL 3.24 mm, F/NO 2.7, view angle 87°.

HW10 is inserted into the CN2 connector. The needed signals from the STM32 target board to drive the module are available on the main connector (CN1): I^2C, NRST_CAM, EN_MODULE, and a dual-lane MIPI CSI-2® (CLK, D0, D1).

I^2C address: `0x1A`

8.2 Inertial motion unit

U1 is a 6-axis IMU (inertial motion unit), featuring a high-performance 3-axis digital accelerometer and 3-axis digital gyroscope. CN1 controls it via I^2C and two interrupt signals.

I^2C address: `0xD4`

8.3 Time-of-Flight

The Time-of-Flight (ToF) sensor is a laser-ranging sensor. It can be used for gesture control and accurate distance measurements. The ToF sensor (U2) is managed with an I^2C, an LPN control line, and an interrupt line. The I^2C can be accessed only if the LPn is at a high level.

I^2C address: `0x52`

9 B-CAMS-IMX product information

9.1 Product marking

The product and each board composing the product are identified with one or several stickers. The stickers, located on the top or bottom side of each PCB, provide product information:

- Main board featuring the target device: product order code, product identification, serial number, and board reference with revision.

  Single-sticker example:

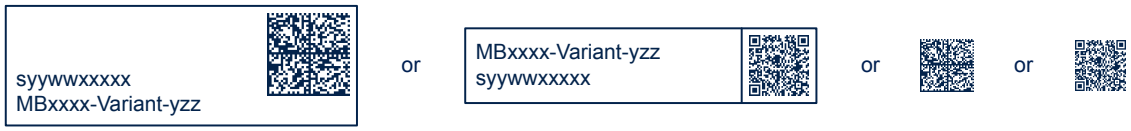
  

  Dual-sticker example:

- Other boards if any: board reference with revision and serial number.

  Examples:

On the main board sticker, the first line provides the product order code, and the second line the product identification.

On all board stickers, the line formatted as *"MBxxxx-Variant-yzz"* shows the board reference *"MBxxxx"*, the mounting variant *"Variant"* when several exist (optional), the PCB revision *"y"*, and the assembly revision *"zz"*, for example B01. The other line shows the board serial number used for traceability.

Products and parts labeled as *"ES"* or *"E"* are not yet qualified or feature devices that are not yet qualified. STMicroelectronics disclaims any responsibility for consequences arising from their use. Under no circumstances will STMicroelectronics be liable for the customer's use of these engineering samples. Before deciding to use these engineering samples for qualification activities, contact STMicroelectronics' quality department.

"ES" or *"E"* marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet *Package information* paragraph at the *www.st.com* website).
- Next to the ordering part number of the evaluation tool that is stuck, or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a *"U"* marking option at the end of the standard part number and is not available for sales.

To use the same commercial stack in their applications, the developers might need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

9.2 B-CAMS-IMX product history

Table 4. Product history

Order code	Product identification	Product details	Product change description	Product limitations
B-CAMS-IMX	BCAMSIMX$MZ1	Board: MB1854-CSI-B01 (camera module accessory board)	Initial revision	No limitation
	BCAMSIMX$CZ1	Board: MB1854-CSI-B02 (camera module accessory board)	• Camera module accessory board revision changed. • Board sticker format changed.	No limitation

9.3 Board revision history

Table 5. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1854 (camera module accessory board)	CSI-B01	Initial revision	No limitation
	CSI-B02	• Updated several components due to obsolescence (such as connectors). • Refer to the bill of materials for further details.	No limitation

10 Compliance statements and conformity declarations

10.1 Federal Communications Commission (FCC) compliance statement

Part 15.19

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

Part 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Note: Use only shielded cables.

Responsible Party - U.S. Contact Information:

Francesco Doddo
STMicroelectronics, Inc.
200 Summit Drive | Suite 405 | Burlington, MA 01803
USA
Telephone: +1 781-472-9634

10.2 Innovation, Science and Economic Development Canada (ISED) compliance statement

This product complies with the ICES-003 standard class A of the ISED regulation.

ISED Canada ICES-003 Compliance Label: CAN ICES (A)/NMB (A).

Note: Use only shielded cables.

Ce produit est conforme à la norme NMB-003 classe A de la ISDE.

Étiquette de conformité à la NMB-003 d'ISDE Canada : CAN ICES (A) / NMB (A).

Note: Utiliser uniquement des câbles blindés.

10.3 UKCA conformity

Simplified UK declaration of conformity

Hereby, the manufacturer STMicroelectronics, declares that the equipment type B-CAMS-IMX is in compliance with the UK Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK SI 2012 No. 3032).

Note: Use only shielded cables.

10.4 CE conformity

10.4.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the equipment type B-CAMS-IMX is in compliance with directives 2011/53/EU and 2015/863/EU (RoHS), and 2014/30/EU (EMC).

Note:
- *RoHS: Restriction of hazardous substances*
- *EMC: Electromagnetic compatibility*

Warning

This device is compliant with Class A of EN55032/CISPR32. In a residential environment, this equipment may cause radio interference.

Note: Use only shielded cables.

10.4.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement électrique du type B-CAMS-IMX est conforme aux directives 2011/53/UE et 2015/863/UE (LdSD), et à la directive 2014/30/UE (CEM).

Note:
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *CEM : compatibilité électromagnétique*

Avertissement

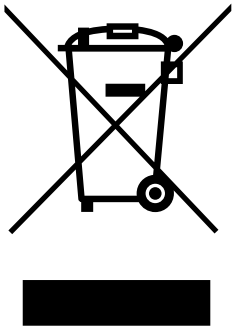
Cet équipement est conforme à la Classe A de la EN55032 / CISPR 32. Dans un environnement résidentiel, cet équipement peut créer des interférences radio.

Note: Utiliser uniquement des câbles blindés.

11 Product disposal

Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)



This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories must not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, separate these items from other types of waste and recycle them responsibly at a designated collection point to promote the sustainable reuse of material resources.

Household users:

Contact the retailer that you purchased the product from or your local authority for details of your nearest designated collection point.

Business users:

Contact your dealer or supplier for further information.

Revision history

Table 6. **Document revision history**

Date	Revision	Changes
25-Jun-2024	1	Initial release.
27-Sep-2024	2	Removed references.
29-Oct-2025	3	Updated: • Section 10: Compliance statements and conformity declarations Added: • Section 3: Development environment • Section 4: Safety recommendations • Section 9: B-CAMS-IMX product information • Section 11: Product disposal

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