Camera module bundle for STM32 boards

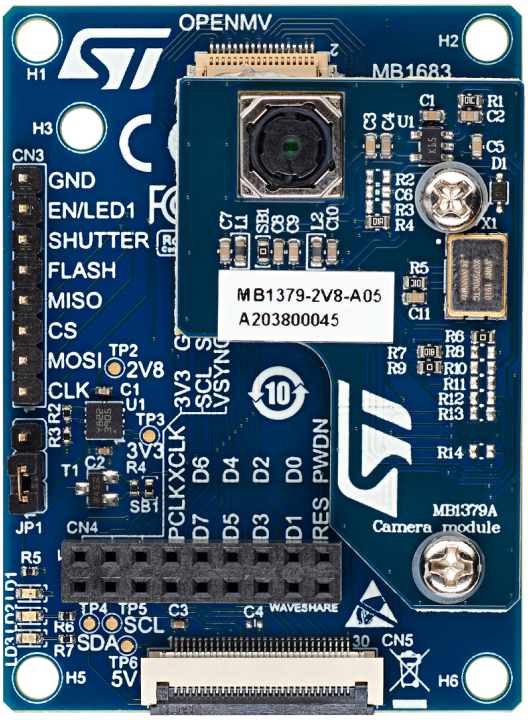
Introduction

The camera module bundle (B-CAMS-OMV) provides extension connectors for the MB1379 STMicroelectronics camera module daughterboard or third-party modules like OpenMV and Waveshare modules. It can be used with the STM32 boards featuring a 1 × 30 pin ZIF connector for the connection of multiple cameras to implement computer vision on STM32 microcontrollers easily.

The camera module bundle feature:

- Camera module adapter board (MB1683)
  - 1 × 30 pin ZIF connector and extended GPIO connector for easy connection to compatible STM32 boards
  - STMicroelectronics camera module (MB1379) connector
  - OpenMV camera module connector
  - Waveshare camera board connector
  - 3.3 V power
- STMicroelectronics camera module (MB1379)
  - Based on the OV5640 image sensor offering a 5-Mpixel resolution with 8-bit color
- Flexible flat cable (FFC)

Figure 1. Camera module bundle (B-CAMS-OMV) top view without FFC



Picture is not contractual.

The camera module bundle is compatible with all STM32 Discovery kits and Evaluation boards featuring a ZIF connector, such as the STM32H747I-DISCO and 32L4R9IDISCOVERY Discovery kits.

1 Ordering information

To order the B-CAMS-OMV camera module bundle, refer to Table 1.

Table 1. Ordering information

Order code	Content and references	Target STM32 boards
B-CAMS-OMV	• MB1683(1) • MB1379(2) • FFC(3)	• STM32H747I-DISCO • 32L4R9IDISCOVERY • STM32 boards featuring a 1 × 30 pin ZIF connector

1. *Camera module adapter board.*
2. *STMicroelectronics camera module mounted on MB1683.*
3. *Flexible flat cable.*

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

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

2 Getting started

Step 1. Make sure that the STM32 board is not powered.

Step 2. Plug and screw the MB1379 STMicroelectronics camera module daughterboard onto the MB1683 camera module adapter board, or connect the third-party camera module to its dedicated connector.

Step 3. Connect the flexible flat cable to the STM32 board and to the MB1683 camera module adapter board.

Step 4. Download code example and the full set of documentation from the FP-AI-VISION1 web page, and program the STM32 board.

Step 5. Evaluate computer vision possibilities on STM32 devices and develop an own applicartion.

3 Hardware layout and configuration

The design of the B-CAMS-OMV camera module adapter board (MB1683) is based on the STMicroelectronics-defined 1 x 30 pin ZIF connector for STMicroelectronics cameras.

Figure 2 illustrates how the camera module bundle extends the STM32 Discovery boards and Evaluation boards connections to camera modules. Figure 3 helps to locate the various connectors on the camera module adapter board (MB1683).

Figure 2. B-CAMS-OMV hardware block diagram

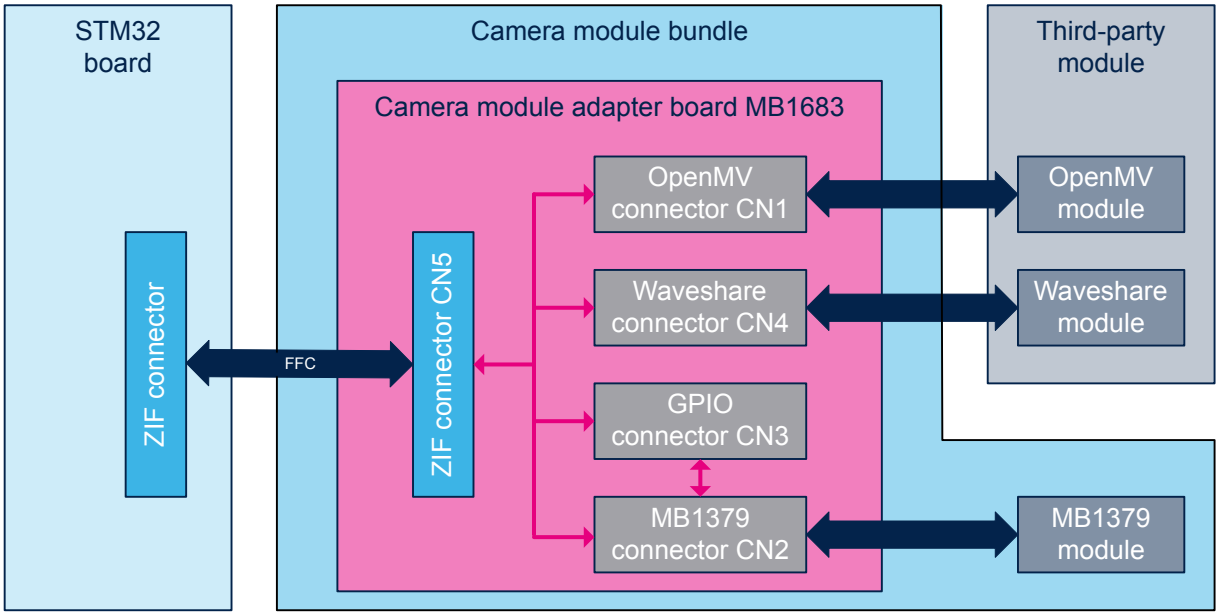


Figure 3. **Camera module adapter board (MB1683) layout**

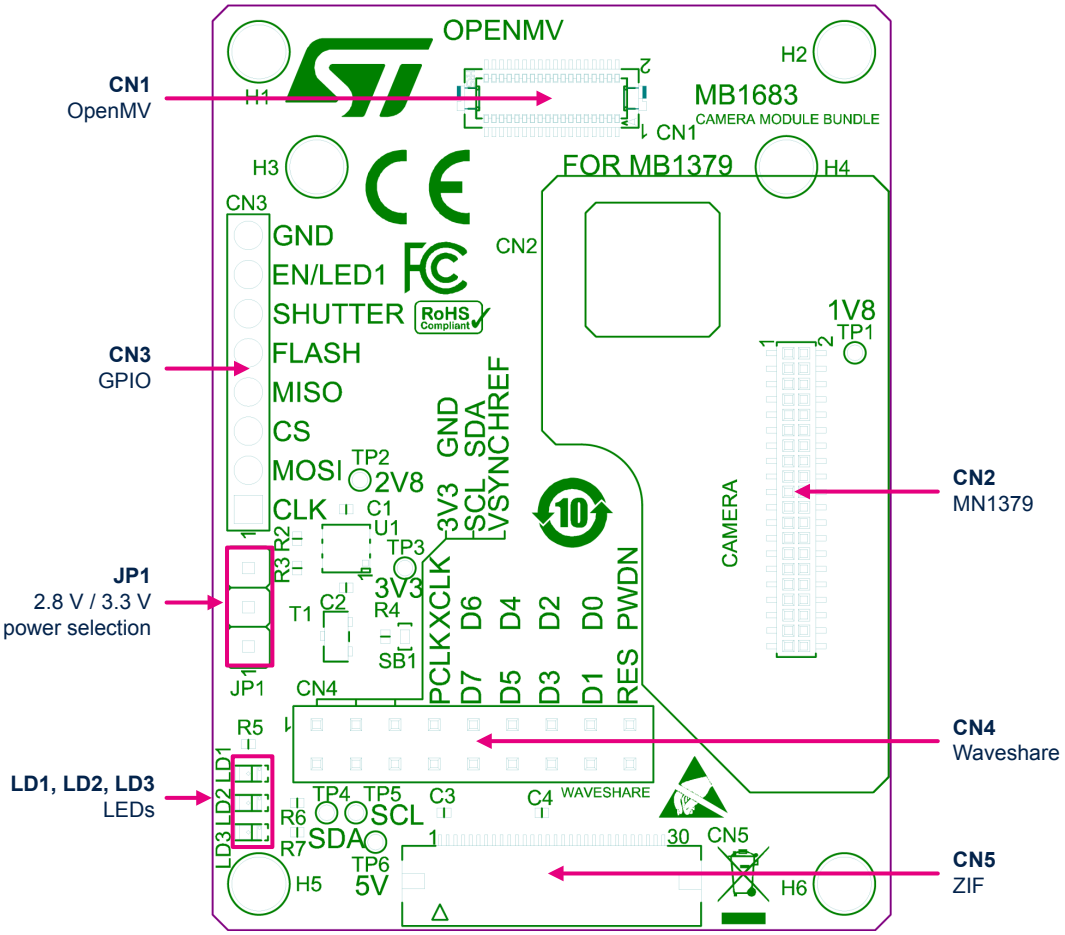
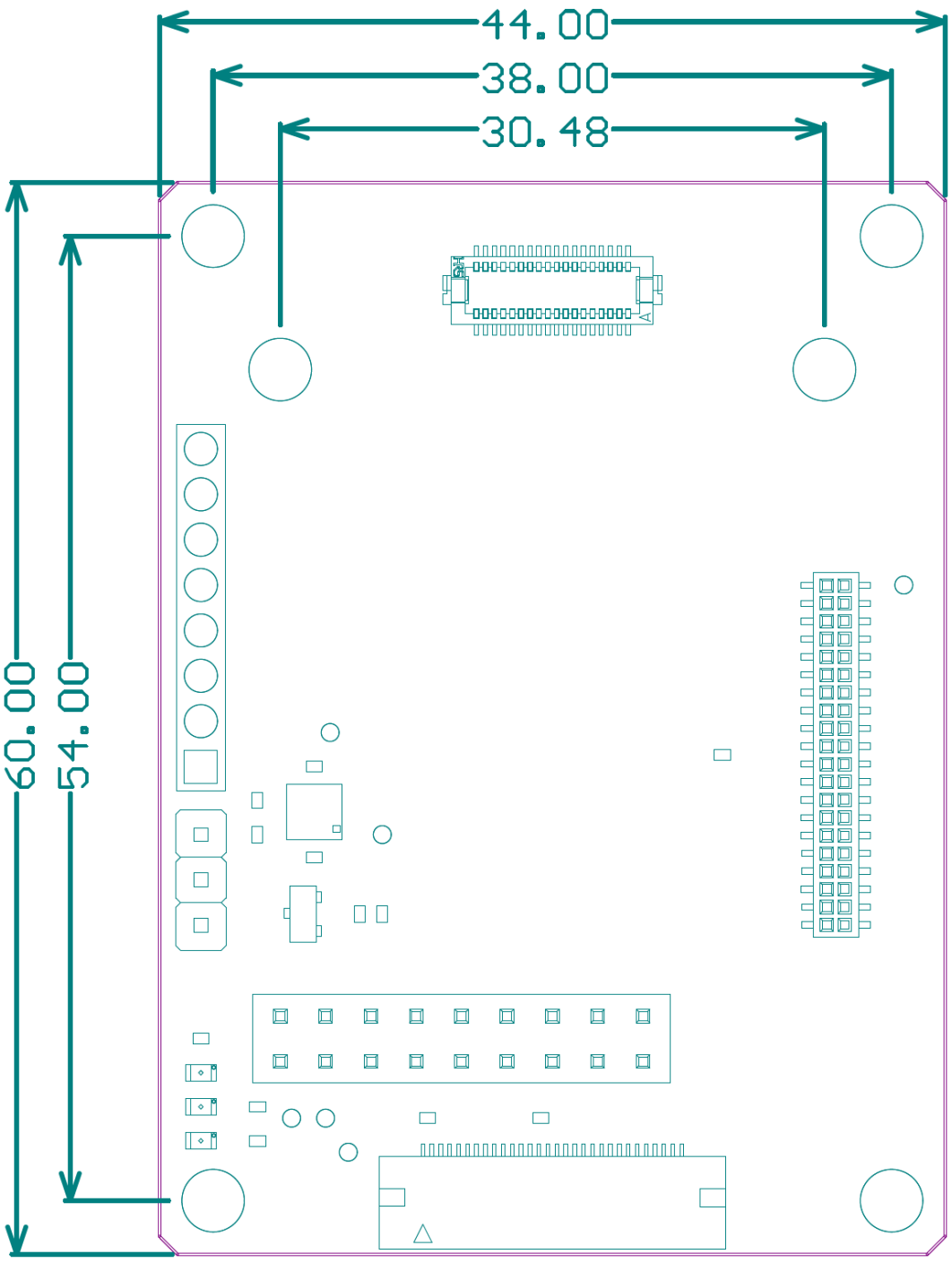


Figure 4 provides the mechanical dimensions of the MB1683 camera module adapter board.

Figure 4. MB1683 mechanical dimensions in millimeters (top view)



3.1 User LEDs

Two general-purpose color LEDs (LD1, LD2) are available as light indicators. Each LED is in the light-emitting state when the the corresponding port of the MCU is in the low-level state. The LD1 and LD2 usage is not reserved to camera features. LD1 is shared with signal PWR_EN. LD2, is shared with signal PULLDOWN.

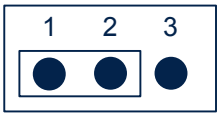
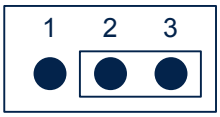
3.2 MB1379 camera module

MB1379 is a 5-Mpixel, 8-bit color STMicroelectronics camera module based on the OV5640 image sensor, clocked from a 24 MHz crystal (MB1379/X1).

3.3 Power selection jumper JP1

JP1 is a 3-pin jumper selector for 3.3 V or 2.8 V power switch. Table 2 shows the definition of the power selection.

Table 2. Description of the power selection

JP1 position	VCAM connection
	VCAM is connected to 3.3 V.
	VCAM is connected to 2.8 V.

The JP1 VCAM power is used only for the CN4 Waveshare connector.

4 Connectors

4.1 OpenMV camera module connector CN1

The OpenMV camera module connector CN1 is based on the OpenMV Cam H7 Plus board. Users can mount the OpenMV Cam H7 Plus camera daughterboard or another OpenMV camera module on the CN1 connector of the camera module bundle for their application.

The OpenMV connector CN1 is a HIROSE 18 × 2 pin receptacle connector with 0.5 mm pitch. Its part number is DF12(3.0)-36DS-0.5V(86).

Figure 5. OpenMV module connector CN1

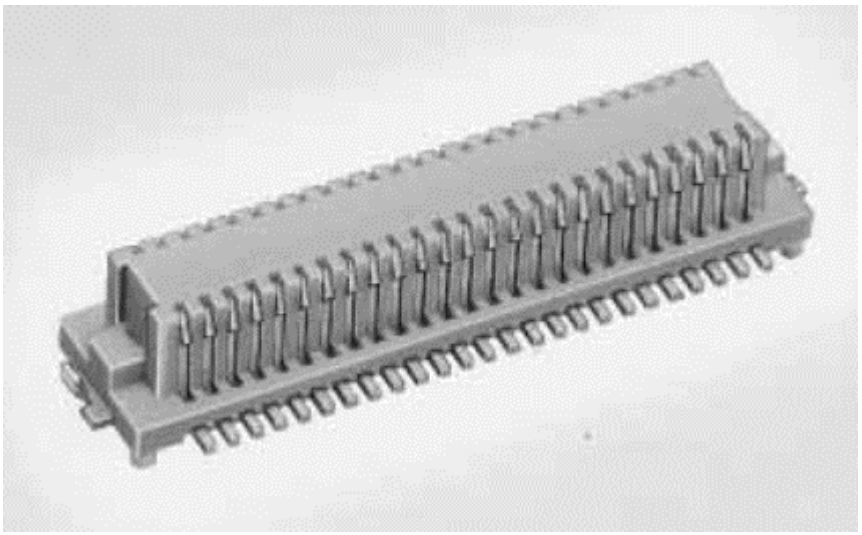


Table 3. OpenMV module connector CN1

Pin number	Description	Pin number	Description
1	-	2	3V3
3	-	4	3V3
5	GND	6	-
7	-	8	-
9	-	10	3V3
11	SPI_CS	12	Camera_CLK
13	SPI_CLK	14	DCMI_PIXCLK
15	SPI_MISO	16	DCMI_VSYNC
17	SPI_MOSI	18	DCMI_HSYNC
19	GND	20	3V3
21	RESET#	22	DCMI_D7
23	SHUTTER	24	DCMI_D6
25	PWR_EN / LED1	26	DCMI_D4
27	GND	28	DCMI_D3
29	DCMI_D1	30	3V3
31	DCMI_D0	32	I2C_SCL

Pin number	Description	Pin number	Description
33	DCMI_D5	34	I2C_SDA
35	DCMI_D2	36	3V3

4.2 MB1379 camera module connector CN2

The connector CN2 for 8-bit DCMI signals supports the MB1379 STMicroelectronics camera module daughterboard.

Figure 6. MB1379 camera module connector CN2 (top view)

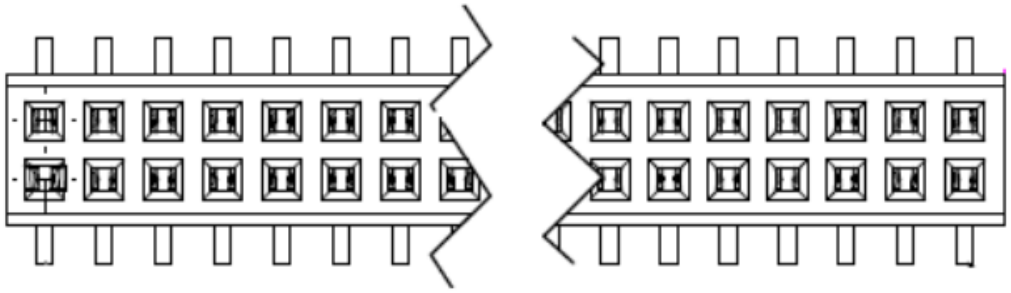


Table 4. MB1379 camera module connector CN2

Pin number	Description	Pin number	Description
1	1V8 (RSU)	2	1V8 (RSU)
3	GND	4	GND
5	-	6	-
7	GND	8	GND
9	-	10	-
11	GND	12	GND
13	I2C_SCL	14	I2C_SDA
15	PULLDOWN / LED2	16	GND
17	RESET#	18	-
19	PWR_EN / LED1	20	Camera_CLK
21	GND	22	GND
23	DCMI_D0	24	DCMI_D1
25	DCMI_D2	26	DCMI_D3
27	DCMI_D4	28	DCMI_D5
29	DCMI_D6	30	DCMI_D7
31	DCMI_HSYNC	32	DCMI_VSYNC
33	DCMI_PIXCLK	34	-
35	SHUTTER	36	FLASH
37	GND	38	GND
39	2V8	40	2V8

4.3 GPIO connector CN3

GPIO connector CN3 provides access to signals available on the CN1 or CN2 camera connectors. These signals are also available on connector CN5 but, depending on the STM32 board used, they are not always populated to an STM32 pin with the corresponding feature (for instance SPI). In this case, connector CN3 can be used to connect in a different way the camera module pins to STM32 pins, for instance using the ARDUINO® connector. SPI pins (pin 1 to 4) and pin 6 (shutter) are connected to the CN1 connector. Pin 5 (flash) and pin 6 (shutter) are connected to the CN2 connector. The GPIO connector CN3 is a standard 8 × 1 pin header connector with 2.54 mm pitch.

Table 5. GPIO connector CN3

Pin number	Description
1	SPI_CLK
2	SPI_MOSI
3	SPI_CS
4	SPI_MISO
5	FLASH
6	SHUTTER
7	PWR_EN / LED1
8	GND

4.4 Waveshare camera board connector CN4

The Waveshare camera board connector CN4 is based on the connector of the OV5640 Camera Board (C). Users can mount the OV5640 Camera Board (C) or any other compatible Waveshare camera module on the connector CN4 of the camera module bundle for their application. The Waveshare connector CN4 is a standard 9 × 2 pin socket connector with 2.54 mm pitch.

Figure 7. Waveshare camera module connector CN4

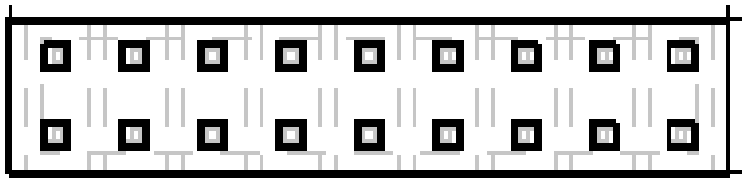


Table 6. Waveshare camera module connector CN4

Pin number	Description	Pin number	Description
1	GND	2	VCAM
3	I2C_SDA	4	I2C_SCL
5	DCMI_HSYNC	6	DCMI_VSYNC
7	Camera_CLK	8	DCMI_PIXCLK
9	DCMI_D6	10	DCMI_D7
11	DCMI_D4	12	DCMI_D5
13	DCMI_D2	14	DCMI_D3
15	DCMI_D0	16	DCMI_D1
17	PWR_EN / LED1	18	RESET#

4.5 ZIF connector CN5

The dedicated 30-pin ZIF connector defines DCMI, I^{2}C, GPIO and power as the bridge between the Discovery kit or Evaluation board and the camera module connected to the camera module adapter board.

The non-shielded 50 mm flexible flat cable referenced 687630050002 from Würth Elektronik is part of the B-CAMS-OMV camera module bundle It is the preferred cable reference for a functional setup that minimizes radiated emission. Users can select a longer FFC for their applications at the expense of possible effects on radiated emission.

Figure 8. 30-pin ZIF connector CN5 (front view)

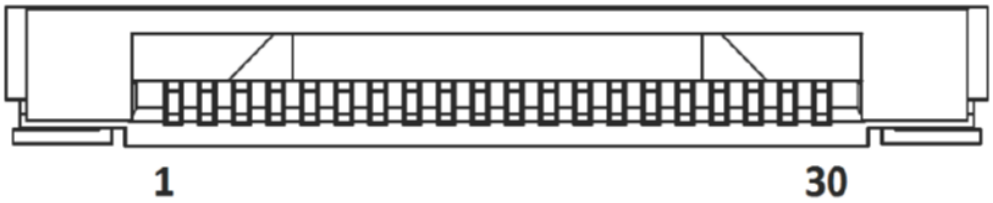


Table 7. 30-pin ZIF connector CN5

Pin number	Description	Pin number	Description
1	3V3	16	DCMI_PIXCK
2	GND	17	GND
3	I2C_SCL	18	SPI_MISO
4	I2C_SDA	19	SPI_CS
5	RESET#	20	DCMI_D7
6	PWR_EN / LED1	21	DCMI_D6
7	SHUTTER	22	DCMI_D5
8	GND	23	DCMI_D4
9	PULLDOWN / LED2	24	DCMI_D3
10	Camera_CLK	25	DCMI_D2
11	3V3	26	DCMI_D1
12	DCMI_VSYNC	27	DCMI_D0
13	5V (RSU)	28	SPI_MOSI
14	DCMI_HSYNC	29	SPI_CLK
15	GND	30	GND

Caution: Check the proper connection of ZIF connector CN5 before powering the STM32 board to avoid hot plugs that may cause sensor damage.

5 Product information

5.1 Product marking

The sticker located on the top or bottom side of the PCB shows the information about product identification such as board reference, revision, and serial number.

The first identification line has the following format: “MBxxxx-Variant-yzz”, where “MBxxxx” is the board reference, “Variant” (optional) identifies the mounting variant when several exist, "y" is the PCB revision and "zz" is the assembly revision, for example B01.

The second identification line is the board serial number used for traceability.

Evaluation tools marked as “ES” or “E” are not yet qualified and therefore not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference designs or in production.

“E” or “ES” 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 evaluation tool ordering part number that is stuck or silk-screen printed on the board.

5.2 Product revision history

Revision A-02

MB1683 revision A-02 is the initial release.

5.3 Known limitation

Revision A-02

None.

6 Federal Communications Commission (FCC) and ISED Canada Compliance Statements

6.1 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 his own expense.

Responsible party (in the USA)

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6.2 ISED Compliance Statement

ISED Canada ICES-003 Compliance Label: *CAN ICES-3 (A) / NMB-3 (A)*.

Étiquette de conformité à la NMB-003 d'ISDE Canada: *CAN ICES-3 (A) / NMB-3 (A)*.

Revision history

Table 8. **Document revision history**

Date	Version	Changes
15-Dec-2020	1	Initial release.

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