Discovery kit with STM32H7B3LI MCU

Introduction

The STM32H7B3I-DK Discovery kit is a complete demonstration and development platform for STMicroelectronics Arm® Cortex®-M7 core-based STM32H7B3LIH6QU microcontroller. This microcontroller features four I²C interfaces, six SPIs with four multiplexed full-duplex I²S interfaces, two SDMMC controllers, five USARTs, five UARTs, one ULPUART, one TTFD-CAN, one FD-CAN, two 16-bit ADCs, two 12-bit DACs, two SAIs, two Octo-SPI interfaces, two analog comparators, one SPDIF-RX, DFSDM (8 channels / 8 filters), one USB HS OTG and one USB FS OTG, DCMI interface, FMC interface, TFT LCD controller interface, JTAG, and SWD debugging support.

This STM32H7B3I-DK Discovery kit offers everything required for users to get started quickly and develop applications easily.

The hardware features on the board help to evaluate the following peripherals: USB HS OTG, microSD™ card, 8-bit camera interface, audio DAC stereo with audio jack input and output, 128-Mbit SDRAM memory, 512-Mbit Octo-SPI Flash memory, Wi-Fi® module (802.11 b/g/n compliant), I²C extension connector, FD-CAN, 20-pin microphone MEMS connector with DFSDM interface, 4.3-inch TFT-LCD (480*272) using an RGB interface with a capacitive touch panel. The ARDUINO® Uno V3 compatible connectors and STMod+ connector allow easy connection of extension shields or daughterboards for specific applications.

The integrated STLINK-V3E provides an embedded in-circuit debugger and programmer for the STM32 MCU.

Figure 1. STM32H7B3I-DK top view

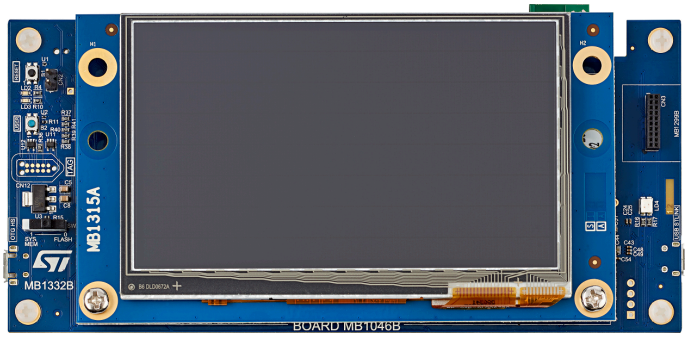
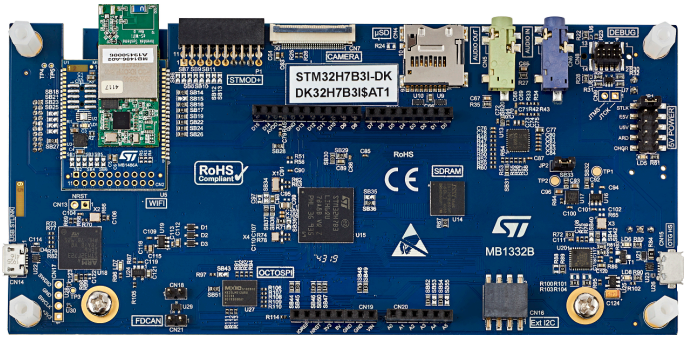


Figure 2. STM32H7B3I-DK bottom view



Pictures are not contractual.

1 Features

- STM32H7B3LIH6QU Arm®-based microcontroller featuring 2 Mbytes of Flash memory and 1.4 Mbyte of RAM in BGA225 package
- 4.3" (480x272 pixels) TFT color LCD module including a capacitive touch panel with RGB interface
- Wi-Fi® module compliant with 802.11 b/g/n
- USB OTG HS
- Audio codec
- 512-Mbit Octo-SPI NOR Flash memory
- 128-Mbit SDRAM
- 2 user LEDs
- User and Reset push-buttons
- Fanout daughterboard
- 1x FDCAN
- Board connectors:
  - Camera (8 bit)
  - USB with Micro-AB
  - Stereo headset jack including analog microphone input
  - Audio jack for external speakers
  - microSD™ card
  - TAG-Connect 10-pin footprint
  - Arm® Cortex® 10-pin 1.27mm-pitch debug connector over STDC14 footprint
  - ARDUINO® Uno V3 expansion connector
  - STMod+ expansion connector
  - Audio daughterboard expansion connector
  - External I^2C expansion connector
- Flexible power-supply options:
  - ST-LINK USB V_{BUS}, USB OTG HS connector, or external sources
- On-board STLINK-V3E debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32Cube MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR™, Keil®, and GCC-based IDEs

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

2 Ordering information

To order the STM32H7B3I-DK Discovery kit, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Board references	Target STM32
STM32H7B3I-DK	• MB1332 • MB1315(1) • MB1280(2) • MB1486(3)	STM32H7B3LIH6QU

1. *LCD board.*
2. *Fanout board.*
3. *Wi-Fi® module.*

2.1 Product marking

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.

This board features 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.

In order to use the same commercial stack in his application, a developer may need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

2.2 Codification

The meaning of the codification is explained in Table 2. The order code is mentioned on a sticker placed on the top side of the board.

Table 2. Codification explanation

STM32TTXXY-DK	Description	Example: STM32H7B3I-DK
STM32TT	MCU series in STM32 Arm Cortex MCUs	STM32H7 Series
XX	MCU product line in the series	STM32H7B3
Y	STM32 Flash memory size: • I for 2 Mbytes	2 Mbytes

3 Development environment

3.1 System requirements

- Windows® OS (7, 8 and 10), Linux® 64-bit, or macOS®
- USB Type-A to Micro-B cable

Note: macOS® is a trademark of Apple Inc. registered in the U.S. and other countries.
All other trademarks are the property of their respective owners.

3.2 Development toolchains

- Keil® MDK-ARM (see note)
- IAR™ EWARM (see note)
- GCC-based IDEs

Note: On Windows® only.

3.3 Demonstration software

The demonstration software, included in the STM32Cube MCU Package corresponding to the onboard microcontroller, is preloaded in the STM32 Flash memory for easy demonstration of the device peripherals in standalone mode. The latest versions of the demonstration source code and associated documentation can be downloaded from *www.st.com*.

4 Conventions

Table 3 provides the conventions used for the ON and OFF settings in the present document.

Table 3. ON/OFF convention

Convention	Definition
Jumper JPx ON	Jumper fitted
Jumper JPx OFF	Jumper not fitted
Jumper JPx [1-2]	Jumper should be fitted between Pin 1 and Pin 2
Solder bridge SBx ON	SBx connections closed by 0 Ω resistor
Solder bridge SBx OFF	SBx connections left open
Resistor Rx ON	Resistor soldered
Resistor Rx OFF	Resistor not soldered

5 Delivery recommendations

Before the first use, make sure that no damage occurred to the board during shipment and no socketed components are not firmly fixed in their sockets or loose in the plastic bag.

In particular, pay attention to the following component:

- MB1315 TFT display daughterboard in the CN1 connector

6 Getting started

1. Ensure that the JP1 jumper is set to STLK.
2. Connect a Type-A to Micro-B USB cable from the STM32H7B3I-DK board (Connect USB STLINK CN14) to a PC to power the board. Then LD5 (+5V) and LD4 (STLINK COM) light up.
3. Take advantage of three graphical stacks running on the same board with many featured applications for each selected Sub-Demo:
   - Menu launcher
   - Audio player TGFX application (MP3 support)
   - Clock and Weather with Alarm feature
   - Video player TGFX application (enabled)
   - TGFX Graphic demonstration
   - STemWin Graphic demonstration
   - EWZ Graphic demonstration
4. The demonstration application software as well as other software examples and applications for exploring STM32H7 features are available from STM32H7B3I-DK.

Note: The audio and video player applications play audio and video files from the microSD™ card.

7 Technology partners

MACRONIX:

512-Mbit Octo-SPI NOR Flash memory device, part number MX25LM51245GXDI00

8 Hardware layout and configuration

The STM32H7B3I-DK Discovery kit is designed around the STM32H7B3LIH6QU target microcontroller packaged in TFBGA225. The hardware block diagram, shown in Figure 3, illustrates the STM32H7B3LIH6QU connections with the peripheral components. Figure 4 shows the location of the main components on the top side of the Discovery board and Figure 5 shows the location of the main components on the bottom side of the Discovery board.

Figure 3. STM32H7B3I-DK hardware block diagram

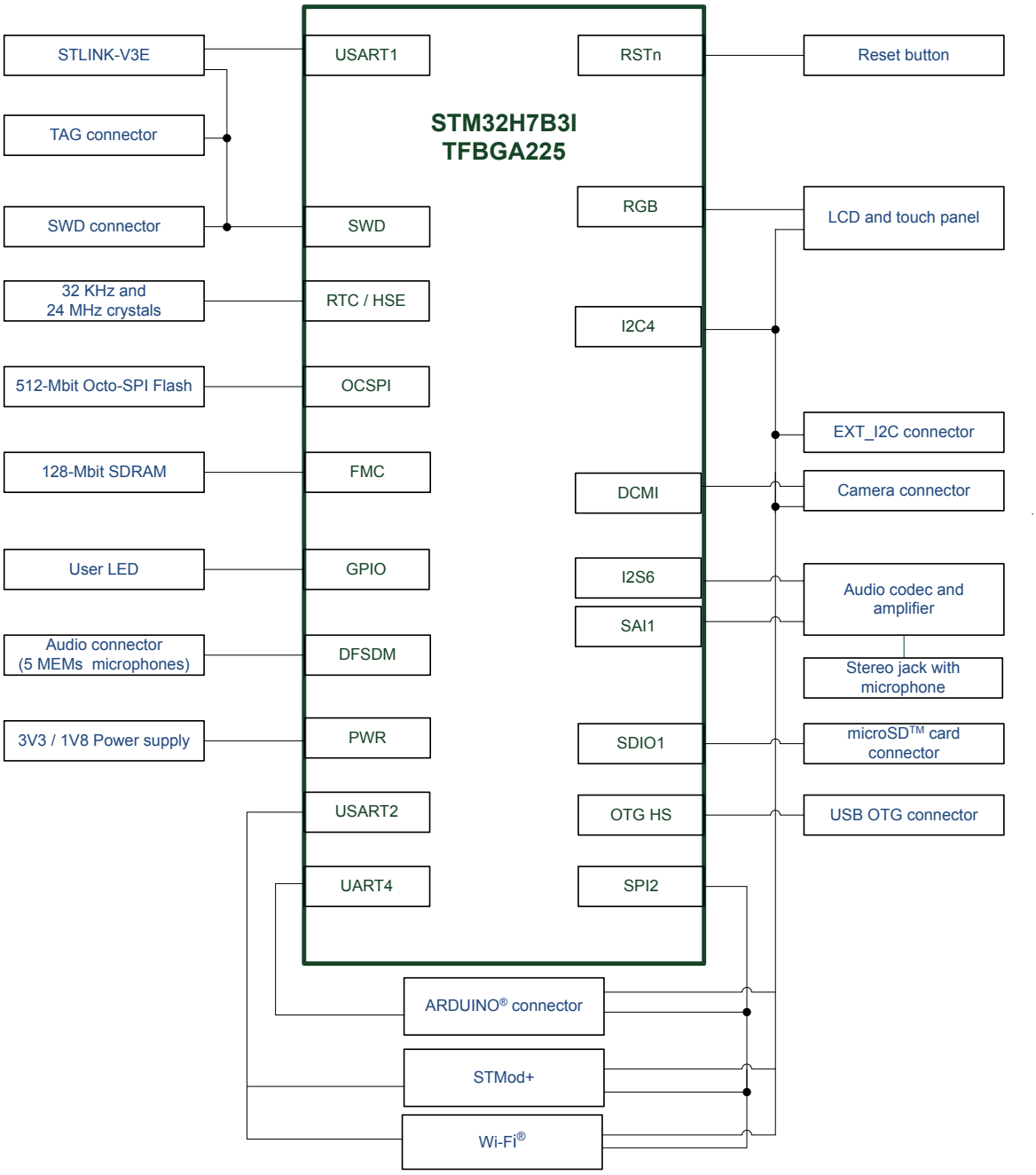


Figure 4. **STM32H7B3I-DK PCB layout (top view)**

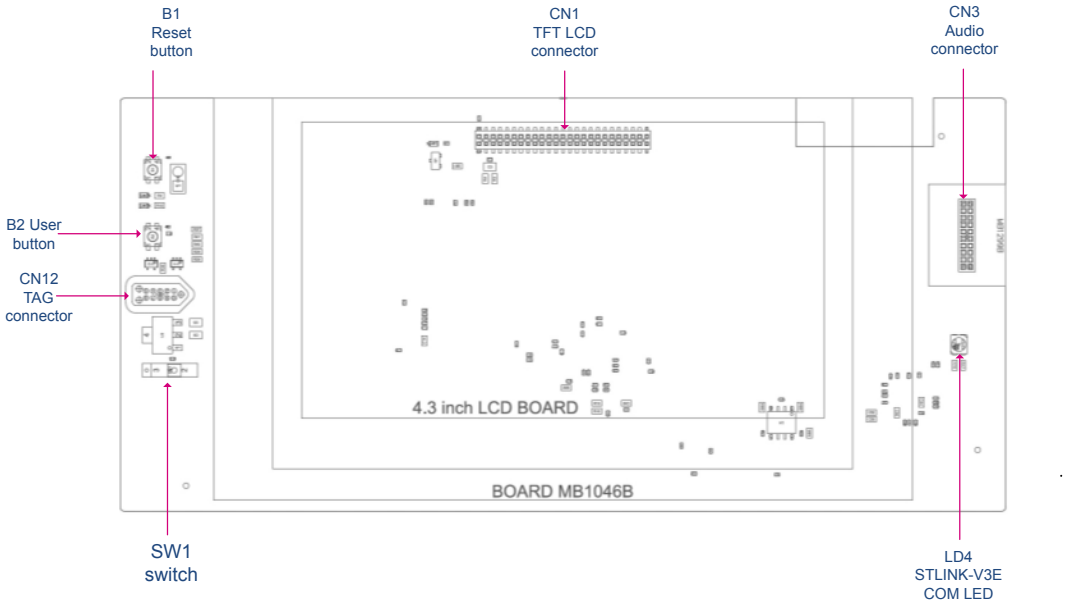


Figure 5. **STM32H7B3I-DK PCB layout (bottom view)**

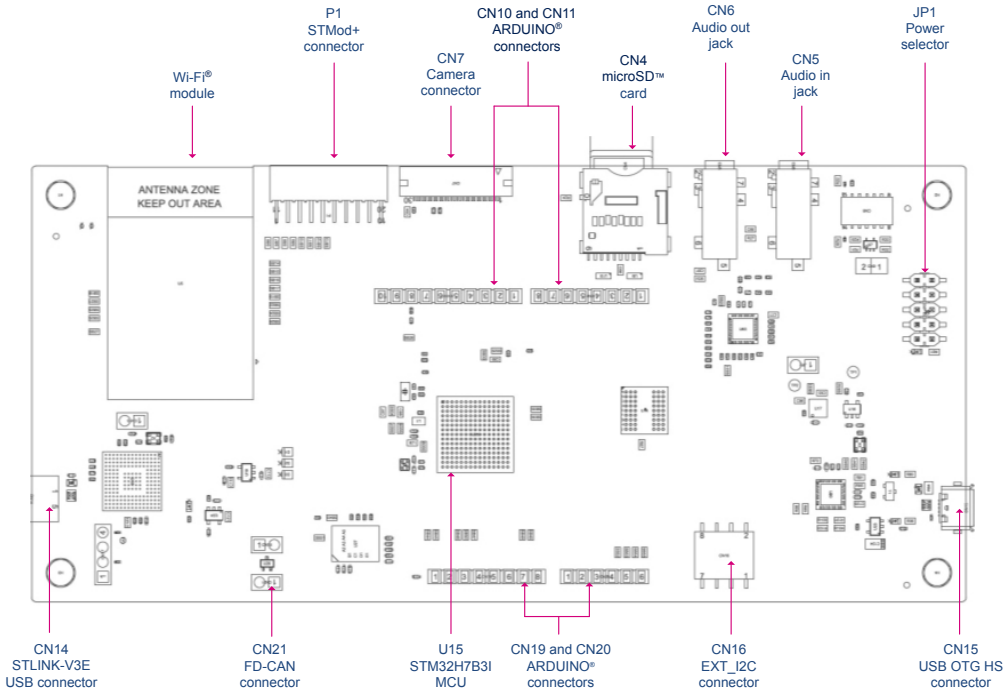


Figure 6 and Figure 7 provide the mechanical dimensions of the STM32H7B3I-DK board.

Figure 6. STM32H7B3I-DK board mechanical dimensions (top view, in millimeters)

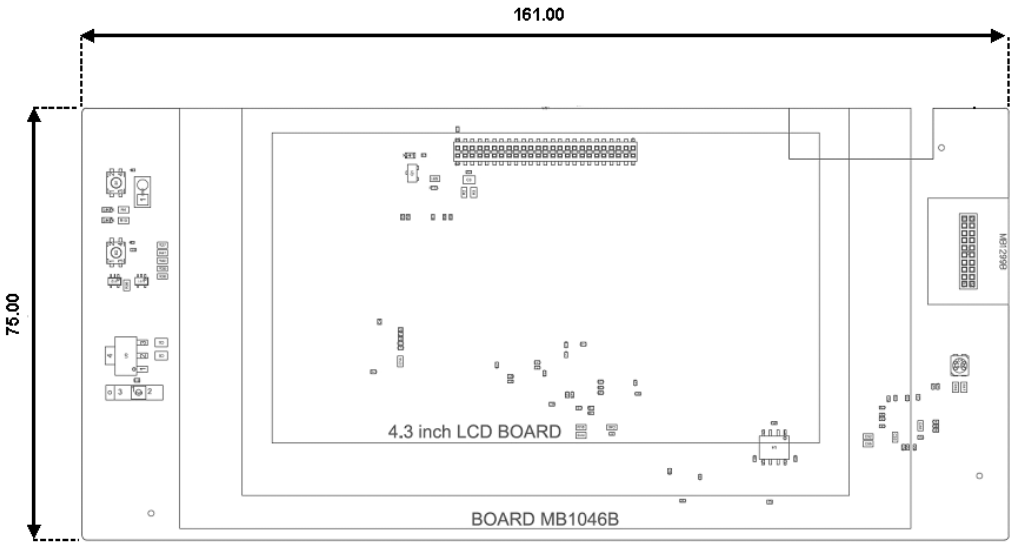
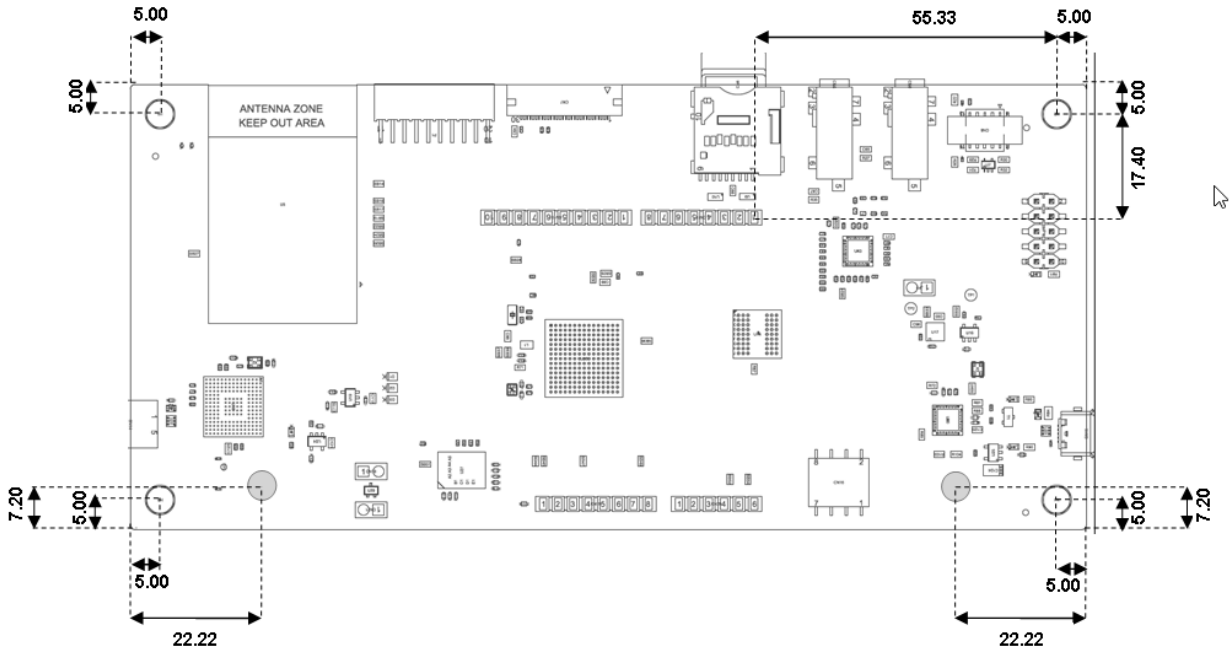


Figure 7. STM32H7B3I-DK board mechanical dimensions (bottom view, in millimeters)



8.1 Embedded STLINK-V3E

8.1.1 Description

There are two different ways to program or debug the onboard STM32 MCU:

- Using the embedded STLINK-V3E
- Using an external debug tool connected to CN8 MIPI-10 connector

The facility for programming and debugging the STM32H7B3LIH6QU is integrated into the STM32H7B3I-DK board.

The STLINK-V3E makes the STM32H7B3I-DK board Mbed Enabled™.

The embedded STLINK-V3E supports only SWD and VCP for STM32 devices. For information about debugging and programming features, refer to the technical note *Overview of ST-LINK derivatives* TN1235, which describes in detail all the STLINK-V3E features.

Features supported on STLINK-V3E:

- 5V power supplied by USB connector (CN14)
- USB 2.0 high-speed-compatible interface
- JTAG/serial wire debugging (SWD) specific features:
  - 3 to 3.6V application voltage on the JTAG/SWD interface and 5V tolerant inputs
  - JTAG
  - SWD and serial viewer (SWV) communication
- Direct firmware update feature (DFU) (CN17)
- STDC14 (MIPI10) compatible connector (CN8)
- Status COM LED (LD4) which blinks during communication with the PC
- Fault red LED (LD7) alerting on USB overcurrent request
- 5V/500mA output power supply capability (U24) with current limitation and LED
- Green LED ON: 5V enabled (LD5)

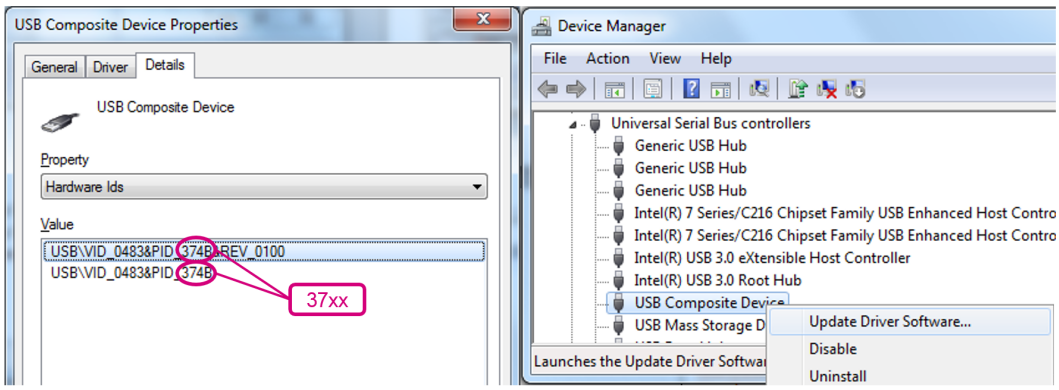
8.1.2 Drivers

Before connecting the STM32H7B3I-DK board to a Windows PC via USB, the user must install a driver for the STLINK-V3E (not required for Windows 10). It is available on the *www.st.com* website.

In case the STM32H7B3I-DK board is connected to the PC before the driver is installed, some STM32H7B3I-DK interfaces may be declared as *Unknown* in the PC device manager. In this case, the user must manually install the dedicated driver files, and update the driver of the connected device from the device manager as shown in Figure 8.

Note: Prefer using the USB Composite Device handle for a full recovery.

Figure 8. USB composite device



Note: 37xx:

- *374E for STLINK-V3E without bridges functions*
- *374F for STLINK-V3E with bridges functions*

8.1.3 STLINK-V3E firmware upgrade

The STLINK-V3E embeds a firmware upgrade mechanism for in-situ upgrades through the USB port. As the firmware may evolve during the lifetime of the STLINK-V3E product (for example new functionalities, bug fixes, support for new microcontroller families), it is recommended to visit the *www.st.com* website before starting to use the STM32H7B3I-DK Discovery kit and periodically, to stay up-to-date with the latest firmware version.

8.1.4 Using an external debug tool to program and debug the onboard STM32

There are two basic ways to support an external debug tool:

1. Keep the embedded STLINK-V3E running. Power on the STLINK-V3E at first until the COM LED lights RED. Then connect the external debug tool through CN8 STDC14/MIPI-10 debug connector.
2. Set the embedded STLINK-V3E in a high impedance state. When setting the jumper CN13 (STLK_RST) ON, the embedded STLINK-V3E is in RESET state and all GPIOs are in high impedance. Then the user can connect his external debug tool on the debug connector CN8.

Figure 9. Connecting an external debug tool to program the onboard STM32H7B3

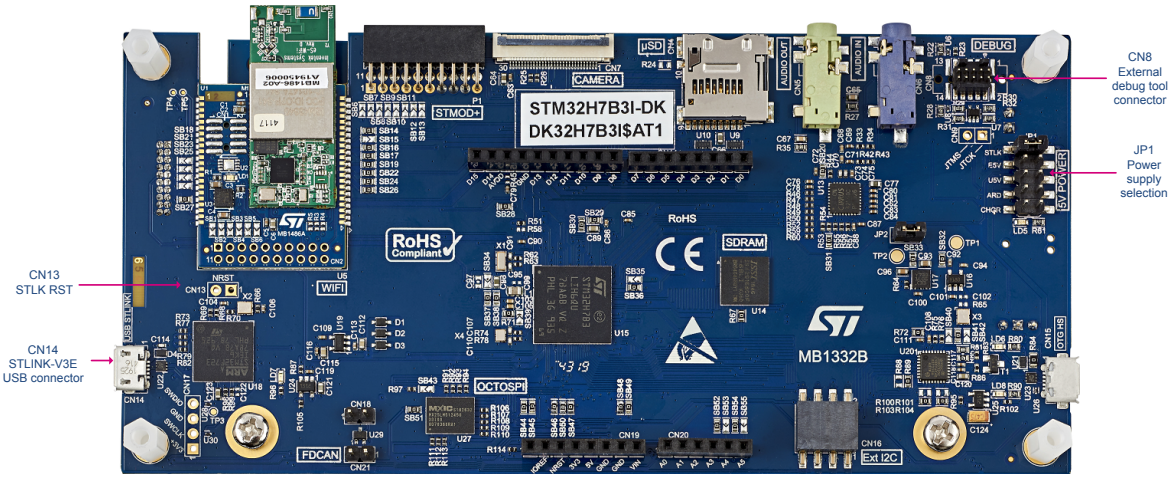


Table 4. CN8 MIPI-10 debug connector

MIPI-10 pin	STDC14 pin	CN8	Designation
-	1	NC	Reserved
-	2	NC	Reserved
1	3	T_VCC	Target VCC
2	4	T_SWDIO	Target SWDIO using SWD protocol or Target JTMS (T_JTMS) using JTAG protocol
3	5	GND	Ground
4	6	T_SWCLK	Target SWCLK using SWD protocol or Target JCLK (T_JCLK) using JTAG protocol
5	7	GND	Ground
6	8	T_SWO	Target SWO using SWD protocol or Target JTDO (T_JTMS) using JTAG protocol

MIPI-10 pin	STDC14 pin	CN8	Designation
7	9	T_JRCLK	Not used by SWD protocol, Target JRCLK (T_JRCLK) using JTAG protocol, only for specific use
8	10	T_JTDI	Not used by SWD protocol, Target JTDI (T_JTDI) using JTAG protocol, only for external tools
9	11	GNDDetect	GND detect for plug indicator, used on SWD and JTAG neither
10	12	T_NRST	Target NRST using SWD protocol or Target JTMS (T_JTMS) using JTAG protocol
-	13	T_VCP_RX	Target RX used for VCP (must be UART dedicated to bootloader)
-	14	T_VCP_TX	Target TX used for VCP (must be UART dedicated to bootloader)

8.2 Power supply

The STM32H7B3I-DK Discovery kit is designed to be powered from 5 V DC power source.

One of the following 5 V DC power inputs can be used, upon an appropriate board configuration:

- **A host PC connected to CN14 through a USB Micro-B cable with enumeration (default setting)**
- An external charger connected to CN14 through a USB Micro-B cable (without enumeration)
- An external 7-12V power supply connected to CN19 pin 8 (ARDUINO®)
- A host PC connected to CN15 through a USB Micro-AB cable (5V_USB_HS)
- An external 5V power supply connected to CN2 (E5V)

The LD5 green LED turns ON when the voltage on the power line marked 5V is present. All supply lines required for the operation of the components on the STM32H7B3I-DK are derived from that 5V line.

Note: The Discovery board must be powered by a power supply unit, or by auxiliary equipment complying with the standard EN-60950-1: 2006+A11/2009, and must be Safety Extra Low Voltage (SELV) with limited power capability.

8.2.1 Supplying the board through STLINK-V3E USB connector 5 V / 500 mA

The STM32H7B3I-DK Discovery kit can be powered from the STLINK-V3E connector CN14, by placing a jumper between the pins 1-2 of JP1 “STLK”. This is the default setting.

If the USB enumeration succeeds, the 5V_ST_LINK power is enabled, by asserting the PWR_ENn signal from STM32F723IEK6 “STLINK V3” (U18). This pin is connected to a power switch STMPS2151STR (U24), which powers the board. The power switch STMPS2151STR (U24) features also a current limitation to protect the PC in case of short-circuit on the board. If an overcurrent (more than 500mA) occurs onboard, the RED LED LD7 is lit.

The STM32H7B3I-DK board with its shield can be powered from the STLINK-V3E USB connector CN14, but only ST-LINK circuit gets power before USB enumeration because the host PC only provides 100mA to the board at that time.

During the USB enumeration, the STM32H7B3I-DK board asks for 500mA power to the host PC.

- If the host is able to provide the required power, the enumeration finishes by a *SetConfiguration* command and then, the power switch STMPS2151STR is switched ON, the Green LED LD5 is turned ON, thus the STM32H7B3I-DK board and its shield on it can consume 500mA current, but no more.
- If the host is not able to provide the requested current, the enumeration fails. Therefore, the STMPS2151STR power switch (U24) remains OFF and the MCU part including the extension board is not powered. As a consequence, the green LED LD5 remains turned OFF. In this case, it is mandatory to use an external power supply.

8.2.2 Supplying the STM32H7B3I-DK using the external power supply input from VIN (7 to 12 V, 800mA max)

It can happen that the STM32H7B3I-DK board requires more than 500 mA of supply current. In such a case, the board can be supplied through pin8 (marked VIN on the board) of the CN19 ARDUINO® connector.

Note that using STLINK-V3E for debugging when powering the board with an external power supply, it is important to power the board before connecting the host PC to CN14, which requires the following sequence to be respected:

1. Set the jumper between the pins 7-8 of JP1 “ARD”.
2. Connect the external power source to pin8 of CN19.
3. Check that the green LED LD5 is turned ON.
4. Connect the host PC to USB connector CN14.

If this order is not respected, the board may be powered by VBUS first from STLINK, and the following risks may be encountered:

1. If more than 500 mA current is needed by the board, the PC may be damaged or the current can be limited by PC. As a consequence, the board is not powered correctly.
2. 500 mA is requested at the enumeration step, so there is a risk that the request is rejected and enumeration does not succeed if PC cannot provide such current.

Table 5. External power sources: VIN (7 to 12 V)

Input power name	Connector pins	Voltage range	Maximum current	Limitation
VIN	CN19 pin 8	7 to 12 V	800 mA	From 7 V to 12 V only and input current capability is linked to input voltage: • 800 mA input current when VIN = 7 V • 450 mA input current when 7 V < VIN < 9 V • 250 mA input current when 9 V < VIN < 12 V

8.2.3 Supplying the STM32H7B3I-DK using USB charger (5 V)

When the STM32H7B3I-DK board is power supplied by a USB charger through CN14 (see Table 6), the jumper must be placed on pin 9-10 of JP1 “CHGR”.

Table 6. External power source: CHGR (5 V)

Input power name	Connector pins	Voltage range	Maximum current
CHGR	CN14	5 V	-

8.2.4 Supplying the STM32H7B3I-DK using USB OTG HS connector (5 V / 500 mA)

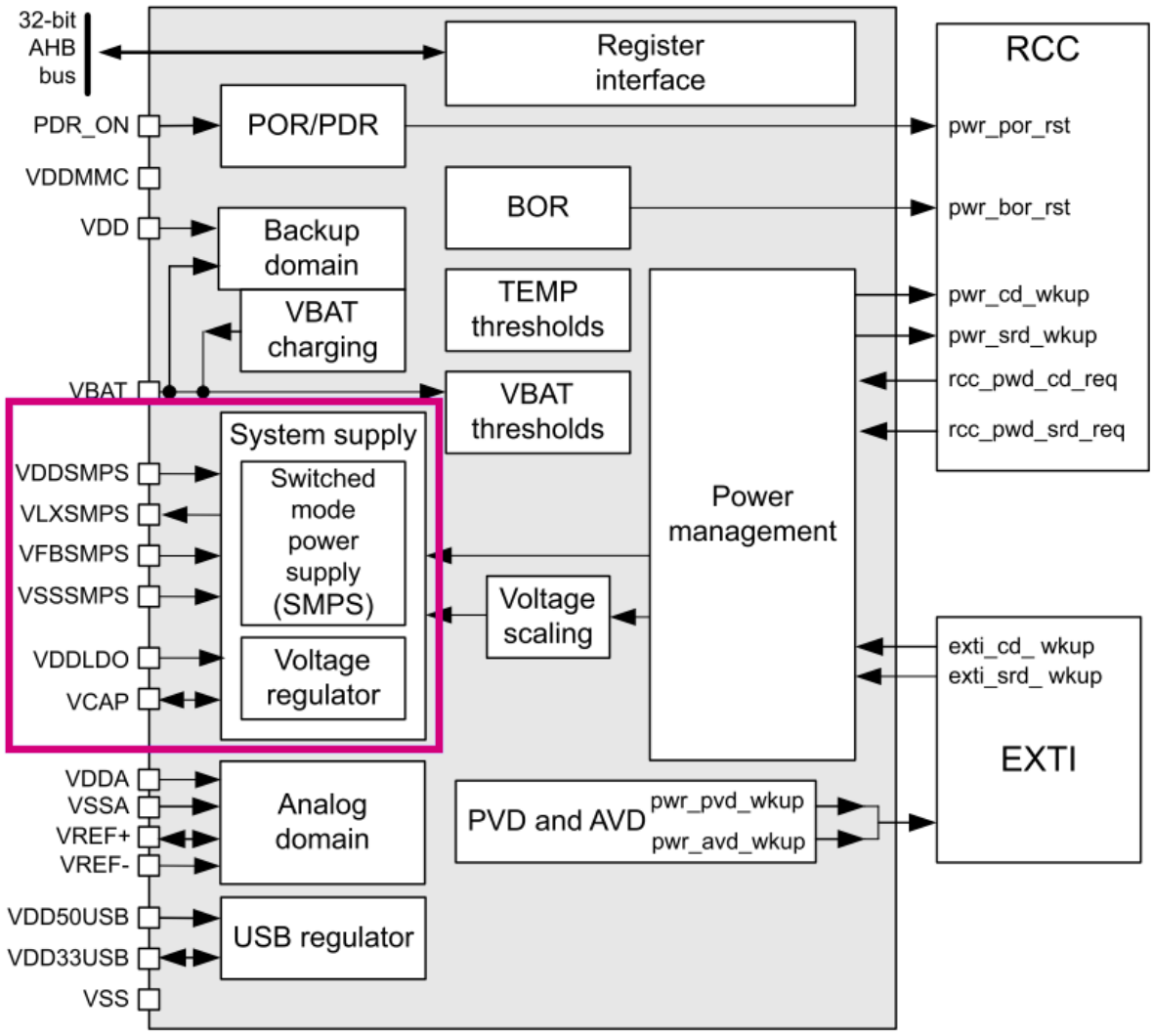
When the STM32H7B3I-DK board is power supplied by the host PC through the CN15 USB OTG HS connector (see Table 7), the jumper must be placed on pin 5-6 of JP1 “U5V”.

Table 7. External power source: U5V (5 V)

Input power name	Connector pins	Voltage range	Maximum current
U5V	CN15	5 V	-

8.2.5 MCU power supply – SMPS/LDO configuration

Figure 10. **MCU power: SMPS/LDO**



The STM32H7B3I-DK board supports four “SMPS/LDO” configurations of STM32H7B3LIH6QU microcontroller, given in the figures below.

Figure 11. Config1 - LDO only

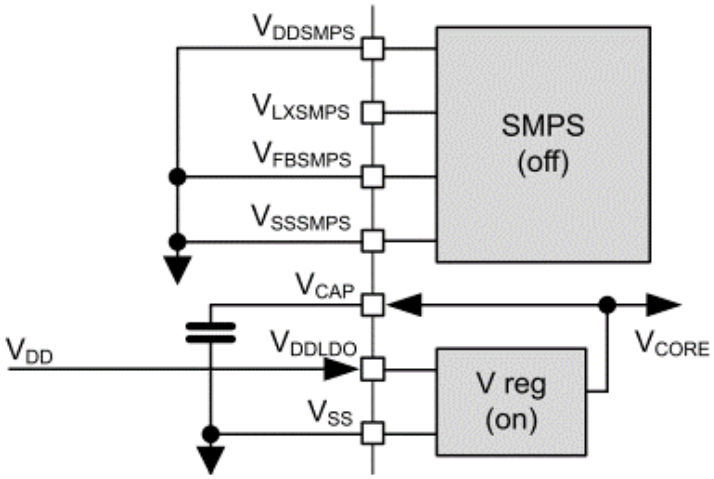


Figure 12. Config2 - SMPS only (default)

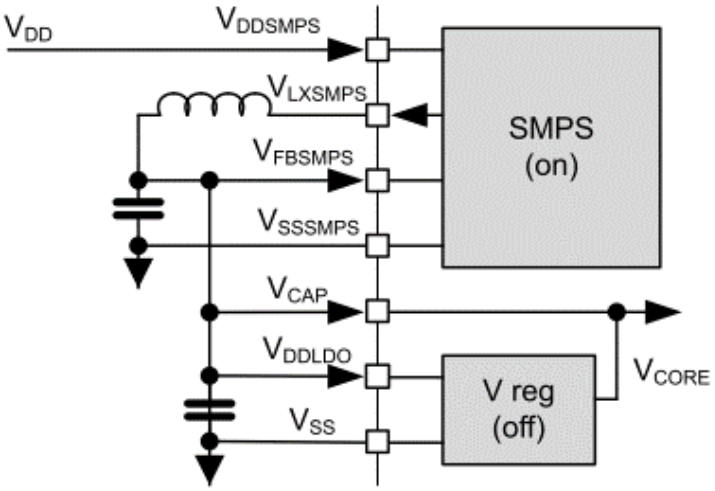


Figure 13. **Config3 - SMPS and LDO cascaded**

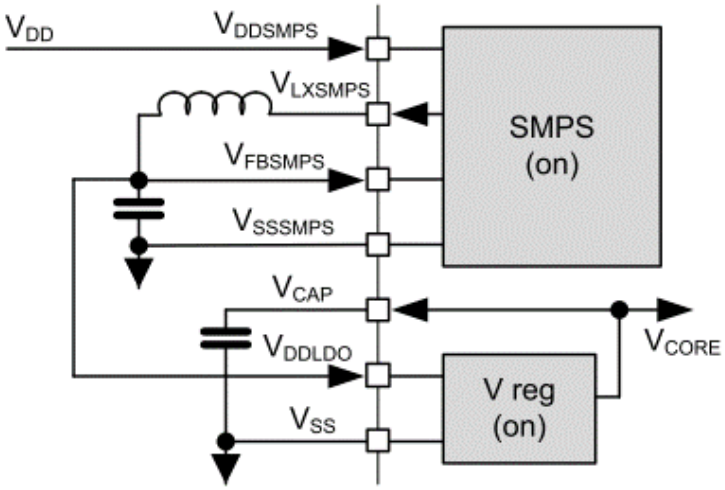
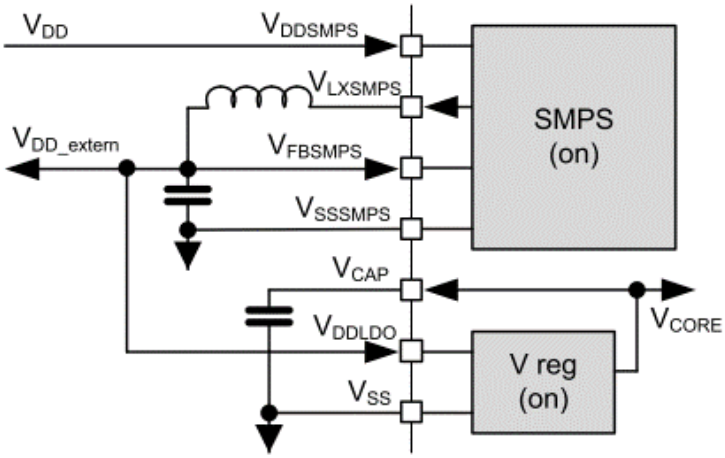


Figure 14. **Config4 - External SMPS**



To change the power supply configuration, some reworks are needed on the STM32H7B3I-DK board as detailed in the table below.

Table 8. **Internal SMPS / LDO and board configuration**

	Config1 SMPS OFF LDO ON	Config2 SMPS ON LDO OFF (Default config)	Config3 (SMPS and LDO cascaded) SMPS ON LDO ON	Config4 (External SMPS) SMPS ON LDO ON
SB2	ON	-	-	-
R14	ON	-	-	-
SB39	ON	-	-	-

	Config1 SMPS OFF LDO ON	Config2 SMPS ON LDO OFF (Default config)	Config3 (SMPS and LDO cascaded) SMPS ON LDO ON	Config4 (External SMPS) SMPS ON LDO ON
R71	ON	ON	ON	ON
SB37	-	ON	ON	ON
SB38	-	ON	-	-
C15	2.2 uF	100 nF	2.2 uF	2.2 uF
C27	2.2 uF	100 nF	2.2 uF	2.2 uF
R13	-	ON	-	-
R12	-	-	ON	ON
SB34	-	-	-	ON
C97	-	-	-	ON

Warning:

Board SMPS/LDO firmware PWR configuration must match with the hardware configuration.

If not, you face a deadlock: after the reset, STLINK cannot connect the target anymore.

The firmware PWR configuration corresponds with the following in the main.c:

In the function SystemClock_Config:

- *In the case of "Direct SMPS" hardware configuration (default):*

```
HAL_PWREx_ConfigSupply(PWR_DIRECT_SMPS_SUPPLY);
```

- *In the case of "LDO" hardware configuration:*

```
HAL_PWREx_ConfigSupply(PWR_LDO_SUPPLY);
```

If a deadlock is faced due to a mismatch between the hardware board setting and the firmware setting (LDO/SMPS), the user can recover the board by doing the following:

- *Power off the board.*
- *Change the SW1 switch position to "1".*
- *This changes the BOOT0 pin to 1 instead of 0 and thus the device boot address is changed to boot address 1 making the bootloader starting in System memory, instead of starting the firmware in the user Flash (Firmware that is setting a wrong LDO/SMPS configuration).*
- *Power on the board, and connect using STM32CubeProgrammer.*
- *Erase the user Flash.*
- *Power off the board and put back the switch SW1 to position "0".*
- *The board is now recovered and can proceed normally.*

8.3 Measurement of MCU current consumption

The Jumper JP2 allows the current consumption of STM32H7B3LIH6QU to be measured directly by removing the jumper and replace it with an external ammeter. If there is no ammeter, the STM32H7B3LIH6QU is not powered.

8.4 Clock source

Three clock sources are available on the STM32H7B3I-DK board:

- 32.768 kHz crystal X1, for the STM32H7B3LIH6QU embedded RTC
- 24 MHz crystal X4, for the STM32H7B3LIH6QU system clock
- 25 MHz oscillator X2 for the STLINK-V3E

Note: By default, 24MHz clock of Camera and USB PHY is provided by the MCO1 clock signal.

8.5 Reset sources

The general reset of the STM32H7B3I-DK Discovery kit is active LOW. Sources of reset are:

- RESET button B1
- Embedded STLINK-V3E
- ARDUINO® Uno shield board through CN19 connector, pin 3
- MIPI10 and TAG connectors (Reset from debug tool)

The general reset is connected to the following peripheral reset functions:

- STM32H7B3LIH6QU MCU reset
- Octo-SPI Flash reset
- Camera reset
- LCD reset
- Wi-Fi® module reset (optional)

8.6 Board functions

8.6.1 TFT color LCD 480x272 pixels

The STM32H7B3I-DK board includes a 4.3-inch LCD touchscreen board which is connected to the RGB interface of the STM32H7B3LIH6QU through the CN1 50-pin connector. The MB1315 LCD board uses the RK043FN48H-CT672B TFT LCD from Rocktech with a driving system, a white LED backlight, and a capacitive touch panel. The touchscreen controller interfaces with the STM32H7B3LIH6QU via the bidirectional I2C4 bus, since the reset of the TFT LCD is controlled by the NRST general reset. A U14 external SDRAM is also used to store display data.

8.6.2 USB OTG HS

The STM32H7B3I-DK board supports USB OTG high-speed communication via a CN15 USB Micro-AB connector and a U20 Hi-Speed USB 2.0 external PHY. A U25 USB power switch is also connected on V_{BUS} and provides power to CN15. The green LED LD6 is lit in one of these cases:

- The power switch is ON and the STM32H7B3I-DK board works as a USB host
- V_{BUS} is powered by another USB host when the STM32H7B3I-DK board works as a USB device.

The red LED LD8 is lit when an overcurrent occurs (Higher than 500 mA).

Note: The STM32H7B3I-DK board can be powered by the CN15 USB connector at 5 V DC with 500 mA current limitation.

8.6.3 EXT_I2C

An EXT_I2C connector socket is available on the STM32H7B3I-DK board and offers the possibility to connect external modules via the I2C4 bus. The EXT_RESET is managed by an I/O signal from the STM32H7B3LIH6QU MCU.

8.6.4 microSD™ card

A CN4 slot for microSD™ card (SD 2.0 compliant) is available on STM32H7B3I-DK board and is connected to SDOI1 interface of the STM32H7B3LIH6QU. The microSD™ card detection is managed by the uSD_Detect signal. When a microSD™ card is inserted in the slot, the uSD_Detect signal level is LOW, otherwise, it is HIGH.

Limitations:

On the STM32H7B3I-DK board, some SDIO1 signals are shared with some digital camera interface DCMI signals. As a consequence, the user must pay attention that there is no camera connected to CN7 when using the microSD™ card.

8.6.5 Audio

An audio codec CS42L51-CNZ is connected to either I2S6 or SAI1 interface of STM32H7B3LIH6QU to support the TDM feature. **I2S6 interface is used by default.**

This feature is able to implement audio recording on analog Microphone and audio playback of different audio stream on headphones and lineout at the same time.

The audio codec communicates with STM32H7B3LIH6QU via the I2C4 bus, which is shared with the camera module, the TFT-LCD, the ARDUINO® Uno connectors, the STMod+ connector, and the Wi-Fi® module. The I²C-bus addresses of the CS42L51- CNZ codec are *0x95* and *0x94*.

Several audio connections are available on the STM32H7B3I-DK board:

- An analog microphone input which is connected to ADC of CS42L51- CNZ through the blue audio jack CN6
- An external speaker which can be connected to CS42L51-CNZ via green audio jack CN5
- A CN3 connector offers the possibility to connect a microphone module with up to five ST-MEMS microphones. They are connected to the digital input microphones of STM32H7B3LIH6QU and are managed by the DFSDM interface.

Note: When using the I2S6 interface, make sure that SB46 (I2S6_MCK) and SB31 (I2S6_WS) are ON.

8.6.6 FD-CAN

The STM32H7B3I-DK board supports one channel of FD-CAN (Flexible Data Rate CAN) compliant bus based on 3V3 CAN transceiver.

Standby signal on the FD-CAN transceiver is controlled by PH8 GPIO of STM32H7B3LIH6QU.

Limitations:

FD-CAN signals are shared with STMod+ signals. As a consequence, the user must take care that nothing is connected to STMod+ connector (1, 4 pins), or SB7 and SB12 must be OFF when the FD-CAN1 bus is activated.

Table 9. FD-CAN1 – Solder bridge configuration

Solder bridge	Setting(1)	Configuration
SB3, SB4, SB5	SB3, SB4, SB5 ON	TXD, RXD, and STBY of MCD2562FD are connected to PA11 (FDCAN1_RX), PA12 (FDCAN1_TX) and PH8 (GPIO) of STM32H7B3LIH6QU MCU.
	SB3, SB4, SB5 OFF	**FDCAN1 bus not connected: TXD, RXD, and STBY of MCD2562FD are not connected to PA11 (FDCAN1_RX), PA12 (FDCAN1_TX) and PH8 (GPIO) of STM32H7B3LIH6QU MCU.**

1. *The default configuration is shown in bold.*

8.6.7 Octo-SPI NOR Flash memory

The STM32H7B3I-DK board includes a 512-Mbit Octo-SPI NOR Flash memory device (MX25LM51245GXDI00 from MACRONIX), which is connected to the OCTOSPI1 interface of the STM32H7B3LIH6QU microcontroller. MX25LM51245GXDI00 operates in a single transfer rate (STR) or a double transfer rate (DTR) mode. The RESETn of the Flash memory is connected to the general reset (NRST) of the STM32H7B3I-DK Discovery kit.

8.6.8 SDRAM memory

The STM32H7B3I-DK board adds an external 128-Mbit SDRAM (IS42S16800F- 6BLI), which is connected to STM32H7B3LIH6QU flexible memory controller FMC interface.

8.6.9 Virtual COM port

The serial interface USART1 (PA9/PA10), which supports the bootloader, is directly available as a Virtual COM port of a PC connected to the CN14 STLINK-V3E USB connector. The VCP configuration is the following:

- 115200 bit/s
- 8-bit data
- No parity
- 1 stop bit
- No flow control

8.6.10 TAG

A CN12 TAG interface footprint is reserved on the STM32H7B3I-DK board, which can be used to debug and program the board.

8.6.11 Buttons and LEDs

The black button B1 located on the top side is the reset of the STM32H7B3LIH6QU microcontroller.

The blue button B2 located on the top side can be used as a digital input or as a wakeup-alternate function.

When the button is depressed the logic state is LOW, otherwise, the logic state is HIGH.

Two LEDs located on the top side, blue LD2 and red LD3, are available for the user. To light a LED, a logic state HIGH must be written in the corresponding GPIO register. Table 10 shows the assignment of the control ports to the LED indicators.

Table 10. Button and LED control port

Reference	Color	Name	Comment
B1	Black	Reset	-
B2	Blue	Wake-up	Wake-up alternate function
LD1	Green	LED1	PA12 alternate with ARD D13
LD2	Blue	LED2	PG2 user LED2
LD3	Red	LED3	PG11 user LED1
LD4	Bicolor red and green	ST-LINK COM	Green during communication
LD5	Green	5 V power	5 V available
LD6	Green	VBUSOK	USB 5 V available
LD7	Red	Power fault	Current higher than 550 mA
LD8	Red	VBUS OCRCR	PH12

8.6.12 Wi-Fi® RF module

A Wi-Fi® module Inventek ISM43340-M4G-L44-10CF (802.11 b/g/n compliant) is supported on the STM32H7B3I-DK board. This module is an embedded (eS-WiFi) wireless Internet Connectivity device and consists of an Arm® Cortex®-M4 STM32 host processor, an integrated antenna (or optional external antenna) and a Cypress Wi-Fi® device. The module uses SPI interface, as the corresponding firmware (for SPI capability only) is downloaded on the ISM43340-M4GL44-10CF Wi-Fi® module. The Wi-Fi® module requires no operating system and has a completely integrated TCP/IP stack that only requires AT commands to establish connectivity for a wireless product. The main features of the Inventek ISM43340- M4G-L44-10CF module are:

- Based on CYW43340 Cypress Leading Edge Radio Device
- Includes STM32F405 ST Cortex M4 Microcontroller
- Hardware supported by Cypress WICED SDK 3.5.2 or later
- IEEE 802.11b (DSSS 11 Mbit/s)
- IEEE 802.11g (OFDM 54 Mbit/s)
- IEEE 802.11n (OFDM 72.2 Mbit/s - single stream w/20 MHz, Short GI)
- IEEE 802.11i (Security)
  - WPA (Wi-Fi Protected Access) – PSK/TKIP
  - WPA2 (Wi-Fi Protected Access 2) – PSK
- 5 GPIOs for SPI or ADC (SPI uses ADC pins)
- Low power operation with built-in power modes
- EMI/EMC Metal Shield for best RF performance in noisy environments and to accommodate for lower RF emissions/signature for easier FCC compliance
- FCC/IC/CE compliance certification

Figure 15. Wi-Fi® module (Top view)

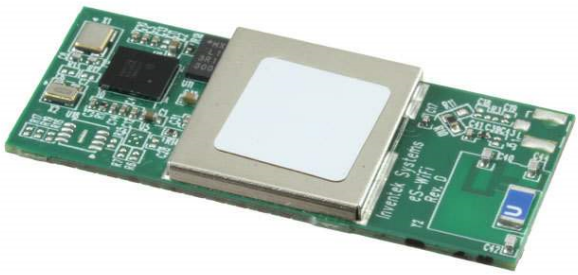


Table 11. Wi-Fi® - Solder bridge configuration

Solder bridge	Setting[1]	Description
SB18, SB21, SB23, SB25 SB19, SB22, SB24, SB26	ON	UART2 connected to Wi-Fi module
	OFF	SPI2 disconnected to Wi-Fi module
	OFF	**UART2 disconnected to W-iFi module**
	ON	**SPI2 connected to Wi-Fi module**
SB14	**ON**	**WIFI_WKUP signal connected to PI2 of STM32H7B3LIH6QU**
	OFF	WIFI_WKUP signal not connected to PI2 of STM32H7B3LIH6QU
SB17	**ON**	**WIFI_GPIO signal connected to PI4 of STM32H7B3LIH6QU**
	OFF	WIFI_GPIO signal not connected to PI4 of STM32H7B3LIH6QU
SB15, SB16	**OFF, ON**	**WIFI reset controlled by WIFI_RST (GPIO) – PI1 of STM32H7B3LIH6QU**
	ON, OFF	WIFI reset controlled by system NRST
SB27	**ON**	**WIFI_DATRDY signal connected to PI5 of STM32H7B3LIH6QU**
	OFF	WIFI_DATRDY signal not connected to PI5 of STM32H7B3LIH6QU

1. *The default configuration is shown in bold.*

Note: In STM32H7B3I-DK boards labeled A1945xxxx, the ISM43340-M4G-L44-10CF is loaded with the C3.5.2.6.STM.BETA4 version which allows a network scan only once.

A new version of the ISM43340-M4G-L44-10CF firmware named C3.5.2.6.STM that fixes this limitation is available on the www.st.com website.

To upgrade the ISM43340-M4G-L44-10CF firmware version, proceed as follows:

1. *Remove R30 and R32, connect a wire between the R30 right side (SWDIO) and TP4 (JTMS / SWDIO).*
2. *Connect a wire between the R32 right side (SWCLK) and TP5 (JTCK / SWCLK).*
3. *Then use the embedded STLINK-V3E to flash the Inventek module.*

9 Board connectors

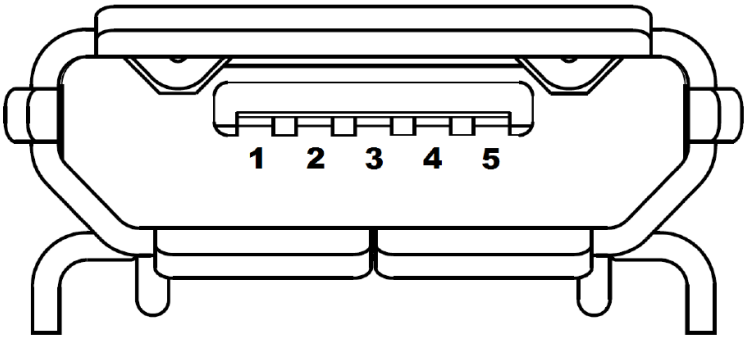
16 connectors are implemented on the STM32H7B3I-DK board.

- CN14: STLINK-V3E USB Micro-B
- CN15: USB OTG HS Micro-AB
- CN4: microSD™
- P1: STMod+
- CN7: Camera
- CN12: TAG
- CN16: External I^2C
- CN3: Audio extension board (DFSDM)
- CN8: STDC14/MIPI10
- CN10, CN11, CN19, and CN20: ARDUINO® Uno Revision 3
- CN1: LCD
- CN5 and CN6: Audio jack

9.1 CN14 STLINK-V3E USB Micro-B connector

The CN14 USB connector is used to connect the embedded STLINK-V3E to the PC for programming and debugging purposes.

Figure 16. CN14 Micro-B connector (Front view)



The related pinout for the USB ST-LINK connector is listed in Table 12.

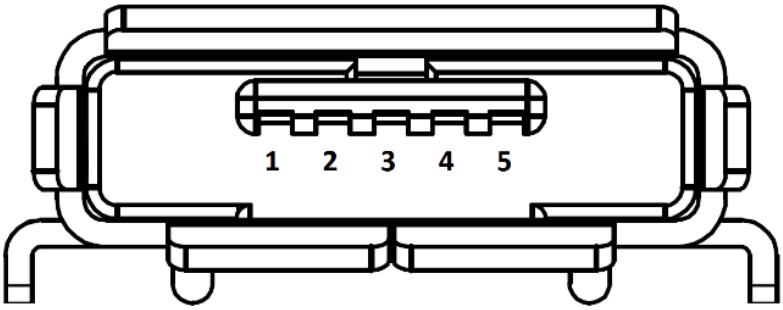
Table 12. CN14 USB Micro-B connector pinout

Connector	Pin number	Pin name	Signal name	ST-LINK MCU pin	Function
CN14	1	VBUS	5V_USB_CHARGER	-	5 V power
	2	DM	USB_DEV_HS_CN_N	PB14	USB differential pair M
	3	DP	USB_DEV_HS_CN_P	PB15	USB differential pair P
	4	ID	-	-	-
	5	GND	-	-	GND

9.2 CN15 USB OTG HS Micro-AB connector

A USB OTG high-speed communication link is available at CN15 USB Micro-AB receptacle connector. Micro-AB receptacle enables USB Host and USB Device features.

Figure 17. CN15 USB OTG HS Micro-AB connector (Front view)



The related pinout for the USB OTG HS connector is listed in Table 13.

Table 13. CN15 USB OTG HS Micro-AB connector pinout

Connector	Pin number	Pin name	Signal name	USB3320C-EZK pin	Function
CN15	1	VBUS	5V_USB_HS	22	5 V power
	2	DM	USB_HS_N	19	Data-
	3	DP	USB_HS_P	18	Data+
	4	ID	-	23	ID
	5	GND	-	-	GND

9.3 CN4 microSD™ card connector

microSD™ cards with 4 GB or more capacity can be inserted in the receptacle CN4. Four data bits of the SDIO1 interface, CLK and CMD signals of the STM32H7B3LIH6QU are used to communicate with the microSD™ card. The card insertion is detected by the µSD_Detect signal. When a microSD™ card is inserted, the µSD_Detect level is LOW, otherwise, it is HIGH.

Figure 18. CN4 microSD™ card connector

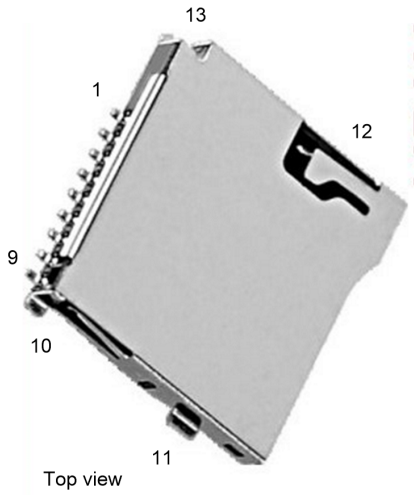


Table 14. CN4 microSD™ connector pinout

Pin number	Description	Pin number	Description
1	SDIO1_D2 (PC10)	6-9	GND
2	SDIO1_D3 (PC11)	7	SDIO1_D0 (PC8)
3	SDIO1_CMD (PD2)	8	SDIO1_D1 (PC9)
4	VDD (3V3)	10	µSD_Detect (PI8)
5	SDIO1_CK (PC12)	11-12-13-14	GND (casing)

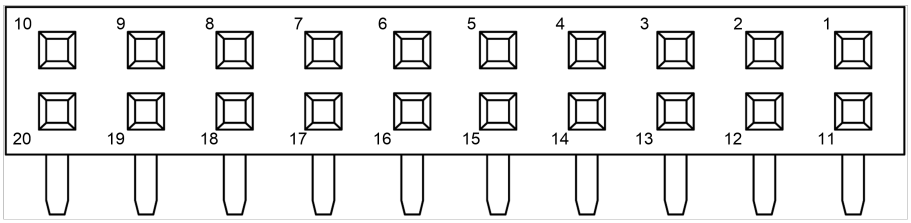
9.4 P1 STMod+ connector

The standard 20-pin STMod+ connector is available on the STM32H7B3I-DK board to increase compatibility with external boards and modules from the Ecosystem of microcontrollers. By default, it is designed to support an ST-dedicated fanout board to connect different modules or board extensions from different manufacturers.

For more detailed information, refer to Section Appendix B .

For details about STMod+ interface, refer to the technical note *STMod+ interface specification* (TN1238).

Figure 19. P1 STMod+ connector



Front view

Table 15. P1 STMod+ connector pinout

Pin number	Description	Pin number	Description
1	SPI2_NSS / USART2_CTS (PA11/PA0)	11	INT (PC6)
2	SPI2_MOSI / USART2_TX (PC3/PD5)	12	RESET (PH8)
3	SPI2_MISO / USART2_RX (PC2/PD6)	13	ADC (PA4)
4	SPI2_SCK / USART2_RTS (PA12/PD4)	14	PWM (PF8)
5	GND	15	5V
6	5V	16	GND
7	I2C4_SCL (PD12)	17	DFSDM-DATA3 (PC7)
8	SPI2_MOSIs (PB15)	18	DFSDM-CKOUT (PD3)
9	SPI2_MISOs (PB14)	19	DFSDM-DATA7 (PB9)
10	I2C4_SDA (PD13)	20	DFSDM-CK7 (PB8)

Note: Note that this connector shares many GPIOs with other functions on the boards. For more detailed information, refer to Section Appendix A STM32H7B3I-DK I/O assignment. In addition, to have a quick look at STMod+ GPIO sharing and multiplexing, and to get a quick view on other alternate functions available on its pins, refer to Section Appendix C STMod+ GPIO sharing and multiplexing.

9.5 CN7 camera module connector

On the STM32H7B3I-DK board, a 30-pin CN7 connector with Digital Camera Interface DCMI signals is available to connect an 8-bit camera module such as the STM32F4DIS-CAM module. This module must be connected with caution before powering the STM32H7B3I-DK board.

Note: The camera clock is the MCO clock by default. I^2C address for the STM32F4DIS-CAM module is `60h` and `61h`.

Limitations:

Care must be taken of GPIO sharing and multiplexing with other functions, in order to program the good configuration. GPIO assignment and sharing are precise below:

- DCMI_SDA and DCMI_SCL I^2C peripheral share with STMod+ connector, ARDUINO® connector, audio codec, and TFT LCD.
- Camera signals PA4, PB8, PB9, PC6, PC7, and PD3 are shared with STMod+ connector.
- Camera signals PC9 and PC11 share with SDIO1_D1 and SDIO1_D3 signals
- DCMI_HSYNC camera signal (PA4) shares with ARDUINO® ARD_A0 signal.

As a consequence, when using the camera, the user must pay attention that there is nothing connected to STMod + connector. And SB44 must be OFF. Same, when using the camera, the microSD™ cannot be used.

At least, the user must take care that the SB45 is OFF (ARD_A0 signal disconnected to PA4).

Figure 20. CN7 camera module connector

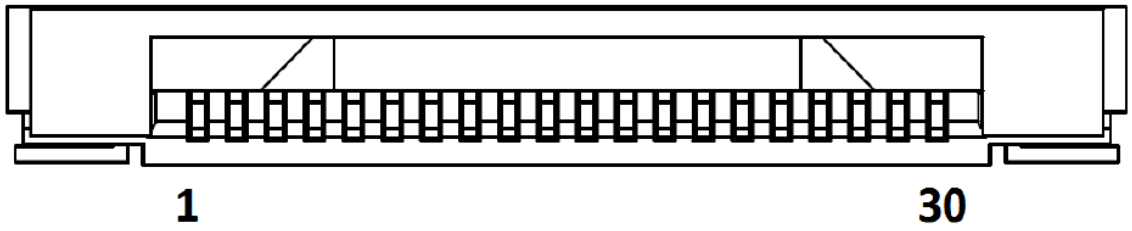


Table 16. CN7 camera module connector pinout

Pin number	Description	Pin number	Description
1	GND	16	GND
2	NC	17	DCMI_HSYNC (PA4)
3	NC	18	NC
4	DCMI_D0 (PC6)	19	DCMI_VSYNC (PB7)
5	DCMI_D1 (PC7)	20	VDD (3V3)
6	DCMI_D2 (PG10)	21	CAMERA_CLK (MCO1) (PA8)
7	DCMI_D3 (PC9)	22	NC
8	DCMI_D4 (PC11)	23	GND
9	DCMI_D5 (PD3)	24	NC
10	DCMI_D6 (PB8)	25	DCMI_PWR_EN (PA7)
11	DCMI_D7 (PB9)	26	DCMI_NRST (NRST from MCU)
12	NC	27	I2C4_SDA (PD13)

Pin number	Description	Pin number	Description
13	NC	28	I2C4_SCL (PD12)
14	GND	29	GND
15	DCMI_PIXCLK (PA6)	30	VDD (3V3)

9.6 CN12 TAG connector

The CN12 TAG connector footprint is used to connect STM32H7B3LIH6QU microcontroller for programming or debugging the board.

Figure 21. CN12 TAG connector

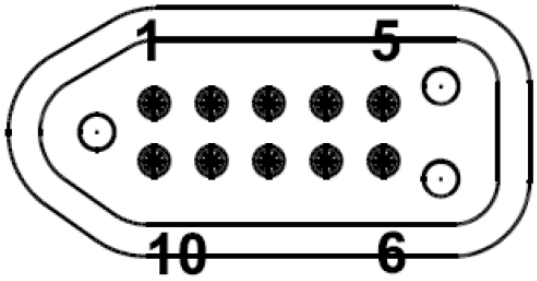


Table 17. CN12 TAG connector pinout

Pin number	Description	Pin number	Description
1	VDD (3V3)	10	NRST (PH3)
2	SWDIO / JTMS (PA13)	9	NJTRST (PB4)
3	GND	8	JTDI (PA15)
4	SWCLK / JTCK (PA14)	7	NC
5	GND	6	SWO / JTDO (PB3)

9.7 CN16 EXT_I2C connector

The EXT_I2C connector socket (SSM-104-L-DH from SAMTEC) is used to connect external modules to I2C4 interface or to monitor the I2C4 interface.

Figure 22. CN16 EXT_I2C connector

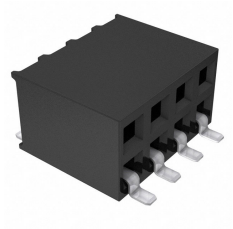


Table 18. **CN16 EXT_I2C connector pinout**

Pin number	Description	Pin number	Description
1	NC	5	EXT_RESET (PB6)
2	GND	6	I2C4_SCL (PD12)
3	NC	7	NC
4	VDD (3V3)	8	I2C4_SDA (PD13)

As I2C4 is available for external use, it is important to note those following I2C4 addresses are already used on board:

Table 19. **I2C4 onboard addresses**

Application	W/R I^2C address	I^2C maximum speed	Comment
TFT LCD touch panel	*0x71* and *0x70*	400 kHz	Default I^2C address
Audio codec	*0x95* and *0x94*	100 kHz	-
Camera	*0x61* and *0x60*	400 kHz	For STM32F4DIS-CAM module

9.8 CN3 audio connector

The 2x10-male-pin 1.27 mm-pitch audio connector, 20021311-00020T4LF from AMPHENOL FCI, is used for audio MEMS daughter extension using the DFSDM interface. The reference to be used is the MB1299 MEMS microphones daughterboard. The MB1299 embeds five digital MEMS microphones MP34DT01TR-M from STMicroelectronics.

Limitations:

On the STM32H7B3I-DK board, some DFSDM signals are shared with STMod+ signals. As a consequence, the user must make sure that nothing is connected to the P1 STMod+ connector (Pins 17 and 19).

Table 20. **DFSDM – Solder bridge configuration**

Solder bridge	Setting(1)	Configuration
SB48, SB50	**SB48, SB50 ON**	**DFSDM1_2_DATIN1 and DFSDM1_2_CKOUT are connected to PB12 and PB0 of STM32H7B3LIH6QU MCU.**
	SB48, SB50 OFF	DFSDM interface not connected: DFSDM1_2_DATIN1 and DFSDM1_2_CKOUT are not connected to PB12 and PB0 of STM32H7B3LIH6QU MCU.

1. *The default configuration is shown in bold.*

Figure 23. **CN3 audio connector**

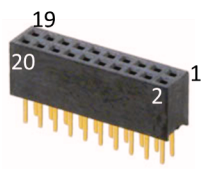


Table 21. **CN3 audio connector pinout**

Pin number	Function / MCU port	Pin number	Function / MCU port
1	GND	2	3V3
3	DFSDM1_2_CKOUT (PB0)	4	DFSDM1_2_CKOUT (PB0)
5	DFSDM1_DATIN7 (PB9)	6	DFSDM1_2_DATIN1 (PB12)
7	DFSDM1_DATIN3 (PC7)	8	NC
9	NC	10	DETECTn (PI6)
11	NC	12	MEMS_LED (PH15)
13	NC	14	NC
15	NC	16	NC
17	NC	18	NC
19	3V3	20	GND

9.9 CN1 TFT LCD display connector

The CN1 connector is designed to connect the 4.3-inch TFT LCD touchscreen board. Table 22 shows the assignment of CN1 and STM32H7B3LIH6QU terminals.

Figure 24. CN1 TFT LCD display connector

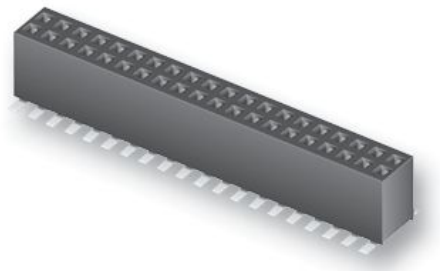


Table 22. CN1 TFT LCD display connector

MCU port	Signal name	CN1 pin number		Signal name	MCU port
-	GND	1	2	GND	-
PI15	LCD_R0	3	4	LCD_G0	PJ7
PJ0	LCD_R1	5	6	LCD_G1	PJ8
PJ1	LCD_R2	7	8	LCD_G2	PJ9
PJ2	LCD_R3	9	10	LCD_G3	PJ10
PJ3	LCD_R4	11	12	LCD_G4	PJ11
PJ4	LCD_R5	13	14	LCD_G5	PK0
PJ5	LCD_R6	15	16	LCD_G6	PK1
PJ6	LCD_R7	17	18	LCD_G7	PK2
-	GND	19	20	GND	-
PJ12	LCD_B0	21	22	LCD_DE	PK7
PJ13	LCD_B1	23	24	LCD_ON/OFF	PA2
PJ14	LCD_B2	25	26	LCD_HSYNC	PI12
PJ15	LCD_B3	27	28	LCD_VSYNC	PI13
PK3	LCD_B4	29	30	GND	-
PK4	LCD_B5	31	32	LCD_CLK	PI14
PK5	LCD_B6	33	34	GND	-
PK6	LCD_B7	35	36	NRST	NRST
-	GND	37	38	I2C4_SDA	PD13
PH2	LCD_INT	39	40	I2C1_SCL	PD12
-	NC	41	42	NC	-
PA1	LCD_BL_CTRL	43	44	NC	PB6
-	5V	45	46	NC	-
-	GND	47	48	NC	-
-	GND	49	50	3V3	-

9.10 CN10, CN11, CN19, and CN20 ARDUINO® Uno V3 connectors

CN10, CN11, CN19, and CN20 ARDUINO® Uno V3 connectors are female connectors compatible with ARDUINO® Uno Revision 3 standard. Most of the shields designed for ARDUINO® Uno V3 fit STM32H7B3I-DK board.

Table 23. ARDUINO® Uno V3 compatible connectors pinout

Left connectors					Right connectors				
CN number	Pin number	Pin name	MCU pin	Function	Function	MCU pin	Pin name	Pin number	CN number
-					I2C4_SCL	PD12	D15	10	CN10 digital
					I2C4_SDA	PD13	D14	9	
					AVDD	-	AVDD	8	
					Ground	-	GND	7	
CN19 power	1	-	-	5V_IN test	SPI2_SCK	PA12	D13	6	
	2	IOREF	-	3.3 V Ref.	SPI2 _MISO	PB14	D12	5	
	3	NRST	NRST	Reset	TIM1_CH2N || SPI2_MOSI	PB15	D11	4	
	4	3V3	-	3.3V output(1)	TIM5_CH4 || SPI2_NSS	PI0	D10	3	
	5	+5V	-	5 V output	TIM8_CH4	PI2	D9	2	
	6	GND	-	Ground		PD1	D8	1	
	7	GND	-	Ground	-				
	8	VIN	-	Power input(2)	-	PI10	D7	8	CN11 digital
-					TIM5_CH1	PH10	D6	7	
CN20 analog	1	A0	PA7	ADC1_IN8	TIM5_CH2	PH11	D5	6	
	2	A1	PC4	ADC12_INP4	-	PE2	D4	5	
	3	A2	PC3	ADC1_INP0	TIM12_CH2	PH9	D3	4	
	4	A3	PB0	ADC1_INP1	-	PI9	D2	3	
	5	A4	PC2_C || PD13(3)	ADC2_INP0 || I2C4_SDA(3)	USART4_TX	PH13	D1	2	
	6	A5	PC3_C || PD12(3)	ADC2_INP1 || I2C4_SCL(3)	USART3_RX	PB11	D0	1	

1. *The 3V3 on ARD connector pin 4 of CN19 is not a power input for the STM32H7B3I-DK board, to simplify power architecture.*
2. *The external voltage applied to pin VIN on pin 8 of CN19 must be in the range 6 to 9V at 25°C ambient temperature. If a higher voltage is applied on the regulator U15, it may overheat and could be damaged.*
3. *By default, pin 5 and pin 6 of CN20 connector are connected to ADC MCU input ports PC2_C and PC3_C respectively, thanks to the configuration of solder bridges: SB52 and SB54 closed, SB53 and SB55 opened. In case it is necessary to connect I^2C interface signals on pins 5 and 6 of CN20 instead of ADC inputs, open SB52 and SB54, close SB53 and SB55.*

Before using any ARDUINO® Uno V3 shield, it is important to refer to Section 8.2 for a correct configuration of JPx.

Caution: The STM32 MCU I/Os are 3.3 V compatible instead of 5 V for ARDUINO® Uno V3.

9.11 CN5 audio green jack - line out

A 3.5 mm stereo audio green jack output CN5 is available on the STM32H7B3I-DK board to support headphones.

Figure 25. CN5 stereo headset with a microphone jack

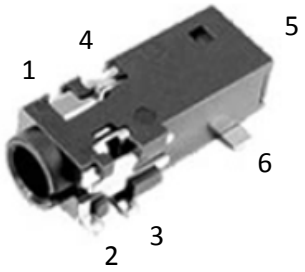


Table 24. CN5 audio jack connector pinout (Onboard)

Pin number	Description	Stereo headset with microphone pinning	
1	NC	NA	
2	NC	NA	
3	GND	GND	
4	OUT_Right	SPK_R (33 Ω typical)	
5	NC	NA	
6	OUT_Left	SPK_L (33 Ω typical)	

9.12 CN6 audio blue jack - line in

A 3.5 mm stereo audio blue jack output CN6 is available on the STM32H7B3I-DK board for audio line input.

Figure 26. CN6 stereo headset with a microphone jack

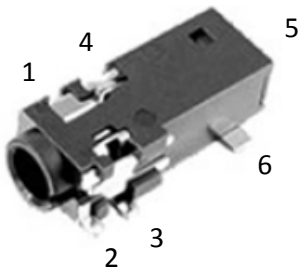


Table 25. **CN5 audio jack connector pinout (Onboard)**

Pin number	Description	Stereo headset with microphone pinning	
1	NC	NA	
2	NC	NA	
3	GND	GND	
4	OUT_Right	SPK_R (33 Ω typical)	
5	NC	NA	
6	OUT_Left	SPK_L (33 Ω typical)	

Appendix A STM32H7B3I-DK I/O assignment

Table 26. **STM32H7B3I-DK I/O assignment**

Pin number	GPIO port	Signal or label	Comment
P1	PA0	I2S6_WS PMOD1-CTS	USART2_CTS
P2	PA1	LCD_BL_CTRL	-
R2	PA2	LCD_ON/OFF	-
R4	PA3	ULPI_D0 I2S6_MCK	-
L6	PA4	DCMI_HSYNC PMOD13-ADC ARD_A0	ADC1_INP18
N5	PA5	ULPI_CK	-
P5	PA6	DCMI_PIXCLK	-
R5	PA7	DCMI_PWR_EN	-
G11	PA8	MCO1	-
F12	PA9	USART1_TX	-
E13	PA10	USART1_RX	-
C15	PA11	PMOD1-NSS FDCAN_RX	SPI2_NSS
C14	PA12	PMOD4-SCK / ARD_D13 FDCAN_TX	SPI2_SCK
E12	PA13	JTMS	-
B13	PA14	JTCK	-
C12	PA15	JTDI	-
P6	PB0	ULPI_D1 DFSDM1_2_CKOUT	-
L7	PB1	ULPI_D2	-
R6	PB2	OCSPI1_CLK	-
C6	PB3	JTDO/TRACESWO	-
B5	PB4	NJTRST	-
E7	PB5	ULPI_D7	-
A4	PB6	EXT_RESET	-
D6	PB7	DCMI_VSYNC	-
B4	PB8	DCMI_D6 PMOD20-DF-CK7	-
A3	PB9	DCMI_D7 PMOD19-DF-D7	IO, DFSDM1_DATIN7
R13	PB10	ULPI_D3	-
P13	PB11	ULPI_D4	-
N14	PB12	ULPI_D5	-

Pin number	GPIO port	Signal or label	Comment
		DFSDM1_2_DATIN1	
M13	PB13	ULPI_D6	-
M14	PB14	PMOD9-MISOs ARD_D12	SPI2_MISO
M15	PB15	PMOD8-MOSIs ARD_D11	SPI2_MOSI TIM1_CH3N
L3	PC0	ULPI_STP	-
M2	PC1	OCSPI1_IO4	-
J5	PC2	PMOD3-MISOp	SPI2_MISO
N3	PC3	PMOD2-MOSIp	SPI2_MOSI
M6	PC4	ARD_A1	ADC12_INP4
N6	PC5	OCSPI1_DQS	-
F14	PC6	PMOD11-INT	-
E15	PC7	PMOD17-DF-D3	DFSDM1_DATIN3
F13	PC8	SDIO1_D0	-
E14	PC9	SDIO1_D1 DCMI_D3	-
A13	PC10	SDIO1_D2	-
D11	PC11	SDIO1_D3 DCMI_D4	-
B12	PC12	SDIO1_CK	-
F4	PC13	WAKEUP	-
D1	PC14-OSC32_IN	-	-
D2	PC15-OSC32_OUT	-	-
C11	PD0	FMC_D2	-
A12	PD1	FMC_D3	-
B11	PD2	SDIO1_CMD	-
D10	PD3	DCMI_D5 PMOD18-DF-CKOUT	-
A11	PD4	PMOD4-RTS	USART2_RTS
C10	PD5	PMOD2-TX	USART2_TX
B10	PD6	PMOD3-RX	USART2_RX
A10	PD7	OSCPI1_IO7	-
L12	PD8	FMC_D13	-
N15	PD9	FMC_D14	-
L13	PD10	FMC_D15	-
L14	PD11	OSCPI1_IO0	-
L15	PD12	I2C4_SCL	-
K11	PD13	I2C4_SDA	-
K12	PD14	FMC_D0	-
K13	PD15	FMC_D1	-

Pin number	GPIO port	Signal or label	Comment
B3	PE0	FMC_NBL0	-
C4	PE1	FMC_NBL1	-
E5	PE2	ARD_D4	-
B1	PE3	SAI1_SD_B	-
C2	PE4	SAI1_FS_A	-
D3	PE5	SAI1_SCK_A	-
E4	PE6	SAI1_SD_A	-
M9	PE7	FMC_D4	-
R11	PE8	FMC_D5	-
P11	PE9	FMC_D6	-
N11	PE10	FMC_D7	-
R12	PE11	FMC_D8	-
L9	PE12	FMC_D9	-
M10	PE13	FMC_D10	-
N10	PE14	FMC_D11	-
P12	PE15	FMC_D12	-
G4	PF0	FMC_A0	-
G3	PF1	FMC_A1	-
H1	PF2	FMC_A2	-
J1	PF3	FMC_A3	-
H3	PF4	FMC_A4	-
J2	PF5	FMC_A5	-
J3	PF6	OSCPI1_IO3	-
J4	PF7	OCSPI1_IO2	-
K1	PF8	PMOD14-PWM	-
K2	PF9	OCSPI1_IO1	-
M3	PF10	ARD_D8	-
N8	PF11	FMC_SDNRAS	-
R9	PF12	FMC_A6	-
M8	PF13	FMC_A7	-
P9	PF14	FMC_A8	-
N9	PF15	FMC_A9	-
R10	PG0	FMC_A10	-
P10	PG1	FMC_A11	-
H13	PG2	USER_LED2	-
G15	PG3	AUDIO_NRST	-
H12	PG4	FMC_A14	-
G14	PG5	FMC_A15	-
G13	PG6	OCSPI1_NCS	-
G12	PG7	SAI1_MCLK_A	-

Pin number	GPIO port	Signal or label	Comment
F15	PG8	FMC_SDCLK	-
A9	PG9	OCSPI1_IO6	-
A8	PG10	DCMI_D2	-
B8	PG11	USER_LED1	-
C8	PG12	I2S6_SDI	-
D8	PG13	I2S6_CK	-
A7	PG14	I2S6_SDO	-
A5	PG15	FMC_SDNCAS	-
L1	PH0	OSC_IN	-
L2	PH1	OSC_OUT	-
M4	PH2	LCD_INT	-
N4	PH3	OCSPI1_IO5	-
M5	PH4	ULPI_NXT	-
P4	PH5	FMC_SDNWE	-
M11	PH6	FMC_SDNE1	-
R14	PH7	FMC_SDCKE1	-
P14	PH8	PMOD12-RST II FDCAN_STBY	-
N13	PH9	ARD_D3	TIM12_CH2
M12	PH10	ARD_D6	TIM5_CH1
P15	PH11	ARD_D5	TIM5_CH2
L11	PH12	USB_OTG_HS_OVCR	-
D13	PH13	ARD_D1	UART4_TX
B15	PH14	ARD_D0	UART4_RX
B14	PH15	MEMS_LED	-
C13	PI0	ARD_D10	SPI2_NSS/TIM5_CH4
E11	PI1	WIFI_RST	-
D12	PI2	WIFI_WKUP	-
A14	PI3	WIFI_BOOT	-
A2	PI4	WIFI_GPIO	-
B2	PI5	WIFI_DATRDY	-
C3	PI6	-	-
D4	PI7	ARD_D9	TIM8_CH3
C1	PI8	uSD_Detect	-
E3	PI9	ARD_D2	-
F3	PI10	ARD_D7	-
G5	PI11	ULPI_DIR	-
H2	PI12	LCD_HSYNC	-
H5	PI13	LCS_VSYNC	-
H4	PI14	LCD_CLK	-

Pin number	GPIO port	Signal or label	Comment
M7	PI15	LCD_R0	-
N7	PJ0	LCD_R1	-
P7	PJ1	LCD_R2	-
R7	PJ2	LCD_R3	-
R8	PJ3	LCD_R4	-
P8	PJ4	LCD_R5	-
N12	PJ5	LCD_R6	-
K14	PJ6	LCD_R7	-
K15	PJ7	LCD_G0	-
J15	PJ8	LCD_G1	-
J14	PJ9	LCD_G2	-
J13	PJ10	LCD_G3	-
J11	PJ11	LCD_G4	-
E9	PJ12	LCD_B0	-
D9	PJ13	LCD_B1	-
C9	PJ14	LCD_B2	-
B9	PJ15	LCD_B3	-
J12	PK0	LCD_G5	-
H15	PK1	LCD_G6	-
H14	PK2	LCD_G7	-
B7	PK3	LCD_B4	-
C7	PK4	LCD_B5	-
A6	PK5	LCD_B6	-
B6	PK6	LCD_B7	-
D7	PK7	LCD_DE	-
P3	PA0_C	ARD_A2	ADC1_INP0
R3	PA1_C	ARD_A3	ADC1_INP1
N1	PC2_C	ARD_A4	ADC2_INP0
N2	PC3_C	ARD_A5	ADC2_INP1
K3	NRST	-	-
C5	BOOT0	-	-
D5	PDR_ON	-	-

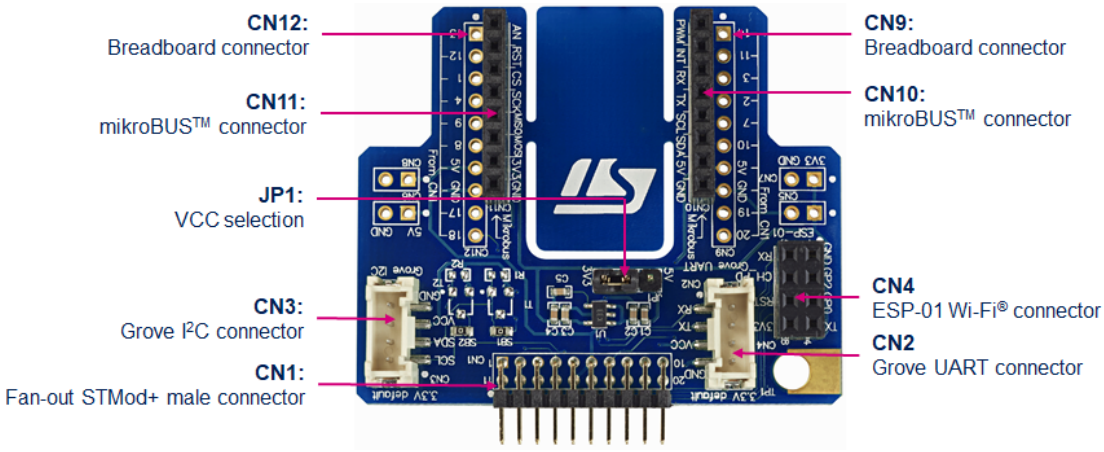
Appendix B Fanout board (MB1280)

The fanout board, shown in Figure 29, is included in the STM32H7B3I-DK Discovery kit. It can be connected to P1 STMod+ connector and it provides access to:

- MikroElektronika Click board compatible connectors (MB1280 CN10 and CN11: two 1x8-pin female connectors)
- ESP-01 compatible connector (MB1280 CN4: 2x4-pin female connector)
- Seeed Studio™ Grove compatible connectors (MB1280 CN3 and CN2: two 1x4-pin male connectors)
- Reserved standard 2.54 mm pitch of STMod+ pin header for breadboard

The main active component for this fanout board is the 3.3 V regulator MB1280-U1 (200 mA).

Figure 27. STMod+ fanout board plugged into CN1 connector



B.1 MikroElektronika mikroBUS™ compatible connector (Fanout CN10 / CN11)

The mikroBUS™ compatible connector is 2.54" pitch with a pair of 1x8-pin female connectors. Table 27 shows the assignment of CN10 and CN11 mikroBUS™ connectors.

Table 27. Description of the mikroBUS™ connector pins

CN11 STMod+ connector number	CN11 mikroBUS™ function	CN11 pin number	CN10 pin number	CN10 mikroBUS™ function	CN10 STMod+ connector number
STMod+#13-ADC	AN	1	1	PWM	STMod+#14-PWM
STMod+#12-RST	RST	2	2	INT	STMod+#11-INT
STMod+#1-CS	CS	3	3	RX	STMod+#3-RX
STMod+#4-SCK	SCK	4	4	TX	STMod+#2-TX
STMod+#9-MISOs	MISO	5	5	SCL	STMod+#7-SCL
STMod+#8-MOSIs	MOSI	6	6	SDA	STMod+#10-SDA
-	+3.3V	7	7	+5V	STMod+#6#15 +5 V
STMod+#5#16 GND	GND	8	8	GND	STMod+#5#16 GND

The mikroBUS™ pinout assignment is available at the www.mikroe.com website

B.2 ESP-01 Wi-Fi® board compatible connector

The ESP-01 Wi-Fi® board connector is 2.54"-pitch with 2x4-pin female connectors. Table 28 shows the definition of the pins.

Table 28. Description of the ESP-01 Wi-Fi® connector pins

STMod+ connector number	ESP-01 function	Pin number	Pin number	ESP-01 function	STMod+ connector number
STMod+#5#16 GND	GND	1	8	TXD	STMod+#3-RX
STMod+#14	GPIO2	2	7	CH_PD	STMod+#13
STMod+#11	GPIO0	3	6	RST	STMod+#12-RST
STMod+#2-TX	RXD	4	5	VCC	-

B.3 Compatible connectors for the Grove boards

The two connectors of the Grove board are 2.54"-pitch with 1x4-pin male connectors. The part number is 1125S-SMT-4P.

Warning:

On MB1280 revision A and B PCBs, the I²C interface is only 3.3 V tolerant. For the 5 V Grove module, a fanout MB1280 revision C PCB is mandatory.

B.3.1 Compatible connectors for I²C Grove boards (Fanout CN3)

The CN3 connector is compatible with the Grove barometer sensor (BMP180) and the Grove LCD RGB backlight boards using a cable for connection. Table 29 shows the definition of the pins.

Table 29. Description of the I²C Grove board CN3 connector pins

STMod+ connector pin	CN3 Grove function	Pin number
STMod+#7-SCL (*)	SCL	1
STMod+#10-SDA (*)	SDA	2
+5 V	VCC	3
-	GND	4

B.3.2 Compatible connector for UART Grove boards (Fanout CN2)

The CN2 connector is compatible with Grove NFC boards using a cable for connection. Table 30 shows the definition of the pins.

Table 30. Description of the UART Grove board CN2 connector pins

STMod+ connector number	CN2 Grove function	Pin number
STMod+#3-RX	RX (Grove TX)	1
STMod+#2-TX	TX (Grove RX)	2
+5 V	VCC	3
-	GND	4

Appendix C STMod+ GPIO sharing and multiplexing

Table 31 gives the description of the signals available on the STMod+ connector. It also shows which signal is shared with other board connectors (such as camera, ARDUINO® Uno V3, DFSDM or Wi-Fi®). Solder bridges (SB) are present to manually select which function is wired by default.

Analog signals are in brackets [xxx].

The I^2C bus is shared with the ARDUINO® Uno V3 connectors. It is recommended to check the device slave address when adding it to the bus.

Table 31. STMod+ GPIO sharing and multiplexing

Shared or exclusive functions			STMod+								Shared or exclusive functions			
Wi-Fi®	ARD	Some other alternate functions	Basic	SB	Port	Pins		Port	SB	Basic	Some other alternate functions	ARD	DFSDM	DCMI
CTS2 NSS2	-	TIM2_CH1, TIM2_ETR, TIM5_CH1, TIM8_ETR, SPI6_NSS, USART2_NSS, UART4_TX, [ADC1_INP16] TIM1_CH4, LPUART1_CTS, SPI2_NSS, UART4_RX, USART1_CTS, FDCAN1_RX	CTS2 NSS2	6 7	PA0 PA11	1	11	PC6	-	INT	TIM3_CH1, TIM8_CH1, USART6_TX	-	-	D0
MOSI2 TX2	-	FDCAN_TXFD	MOSI2 TX2	8 9	PC3 PD5	2	12	PH8	-	RST	TIM5_ETR, I2C3_SDA	-	-	-
MOSI2 RX2	-	SPI3_MOSI, FDCAN2_RXFD	MISO2 RX2	10 11	PC2 PD6	3	13	PA4	-	ADC	TIM5_ETR, SPI1_NSS, SPI3_NSS, SPI6_NSS	A0	-	HSYNC
SCK2 RTS2	D13	TIM1_ETR, LPUART1_RTS, UART4_TX, UART1_RTS, FDCAN1_TX FDCAN1_RXFD	SCK2 RTS2	12 13	PA12 PD4	4	14	PF8	-	PWM	TIM16_CH1N, SPI5_MISO, UART7_TRS, TIM13_CH1	-	-	-
-	-	-	GND	-	GND	5	15	+5V	-	+5V	-	-	-	-
-	-	-	+5V	-	+5V	6	16	GND	-	GND	-	-	-	-
SCL4	SCL4	TIM4_CH1, USART3_RTS	SCL4	-	PD12	7	17	PC7	-	GPIO	TIM8_CH2, USART6_RX	-	DATA3	D1
-	D11	TIM1_CH3N, TIM12_CH2,TIM8_CH3N, USART1_RX, USART4_CTS	MOSI2	-	PB15	8	18	PD3	-	GPIO	SPI2_SCK, USART2_CTS, USART2_NSS	-	CKOUT	-
-	D12	TIM1_CH2N, TIM12_CH1, TIM8_CH2N, USART1_TX, USART3_RTS, USART4_RTS	MISO2	-	PB14	9	19	PB9	-	GPIO	TIM17_CH1, TIM4_CH4, I2C1_SDA, SPI2_NSS, I2C4_SDA, UART4_TX, FDCAN1_TX	-	DATA7	D7
SDA4	SDA4	TIM4_CH2, UART9_RTS	SDA4	-	PD13	10	20	PB8	-	GPIO	TIM16_CH1, TIM4_CH3, I2C1_SCL, I2C4_SCL, UART4_TX, FDCAN1_RX	-	CK7	D6

Appendix D Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements

Applicable for STM32H7B3I-DK Discovery kit products with order code STM32H7B3I-DK (containing ISM43340-M4G-L44-10CF module).

D.1 FCC Compliance Statement

FCC Compliance Statement

Contains FCC ID: O7P-341

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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D.2 IC Compliance Statement

IC Compliance Statement

Contains/Contient IC: 10147A-341

Compliance Statement

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

Licence-Exempt Radio Apparatus (ISED) This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Déclaration de conformité

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

Appareils radio exempts de licence (ISDE) L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF exposure statement

To satisfy FCC and ISED Exposure requirements for mobile devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operation at closer than this distance is not recommended. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Pour satisfaire aux exigences FCC et ISED concernant l'exposition aux champs RF pour les appareils mobiles, une distance de séparation de 20 cm ou plus doit être maintenu entre l'antenne de ce dispositif et les personnes pendant le fonctionnement. Pour assurer la conformité, il est déconseillé d'utiliser cet équipement à une distance inférieure. Cet émetteur ne doit pas être co-situé ou fonctionner conjointement avec une autre antenne ou un autre émetteur.

Revision history

Table 32. **Document revision history**

Date	Revision	Changes
19-Dec-2019	1	Initial release

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