Evaluation boards with STM32H747XI and STM32H757XI MCUs

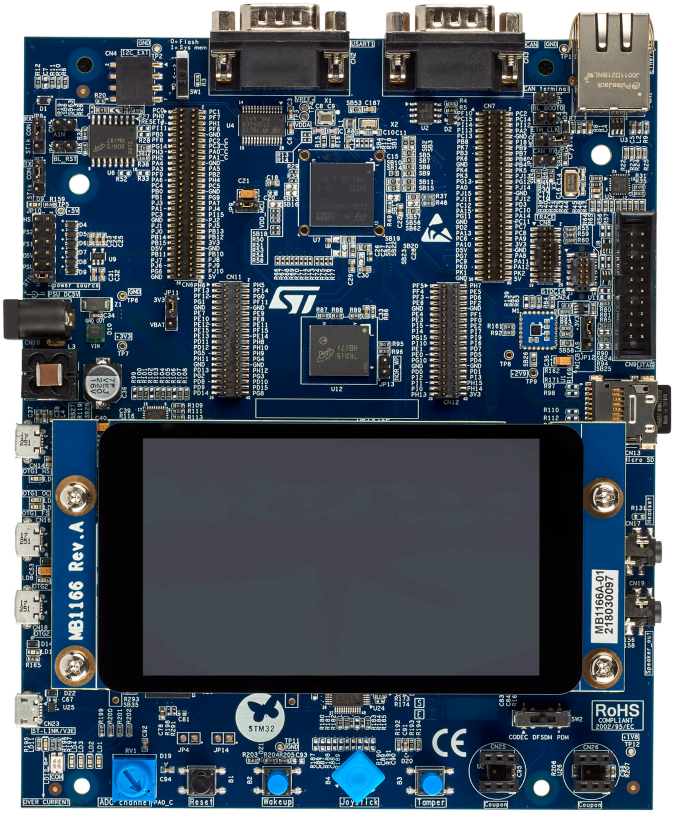
Introduction

The STM32H747I-EVAL and STM32H757I-EVAL Evaluation boards (STM32H7x7I-EVAL) are high-end development platforms for the Arm® Cortex®-M7-based STM32H747XI and STM32H757XI microcontrollers (STM32H7x7XI), respectively. The STM32H7x7I-EVAL Evaluation boards provide access to all the STM32 peripherals for user applications, and include an embedded STLINK-V3E debugger/programmer.

The full range of the STM32H7x7I-EVAL hardware features helps develop applications and evaluate all peripherals: USB OTG_HS and FS, Ethernet, CAN FD, USART, Audio DAC and ADC, digital microphone, SRAM, SDRAM, NOR Flash memory, Twin Quad-SPI Flash memory, microSD™ 3.0 card, 4” 480×800 TFT color LCD with MIPI DSI℠ interface and capacitive touchpanel, and cryptographic hardware accelerator (available only on STM32H757XI devices) .

The expansion connectors provide an easy way to add specialized features, while ETM trace is supported through external probes.

Figure 1. STM32H7x7I-EVAL board (top view)



Picture is not contractual.

1 Features

- STM32H747XIH6 and STM32H757XIH6 microcontrollers with 2 Mbytes of Flash memory and 1 Mbyte of RAM in TFBGA240+25 package
- 4” 480×800 TFT color LCD with MIPI DSI℠ interface and capacitive touchpanel
- Ethernet compliant with IEEE-802.3-2002
- USB OTG_HS and OTG_FS
- I^2C compatible serial interface
- RTC with rechargeable backup battery
- SAI audio DAC
- ST-MEMS digital microphones
- 8-Gbyte (or more) SDIO3.0 interface microSD™ card
- 8 M×32bit SDRAM, 1 M×16bit SRAM and 8 M×16bit NOR Flash memory
- 1-Gbit Twin Quad-SPI NOR Flash memory or two 512-Mbit Quad-SPI NOR Flash memories
- Potentiometer
- 4 color user LEDs
- Reset, wakeup, tamper or key buttons
- Joystick with 4-direction control and selector
- Board connectors
  - Power jack
  - 3 USB interfaces with Micro-AB connector
  - RS-232 communications
  - Ethernet RJ45
  - CAN FD compliant connection
  - Stereo headset jack including analog microphone input
  - 2 audio jacks for external speakers
  - microSD™ card
  - JTAG/SWD and ETM trace
  - Extension connectors and memory connectors for daughterboard or wire-wrap board
- Flexible power-supply options: ST-LINK, USB V_{BUS} 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 STM32CubeIDE

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

2 Ordering information

To order STM32H747I-EVAL and STM32H757I-EVAL refer to Table 1. Ordering information. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Board reference	Target STM32	Differentiating features
STM32H747I-EVAL	• MB1246 • MB1166(1)	STM32H747XIH6U	-
STM32H757I-EVAL		STM32H757XIH6U	Cryptography

1. *LCD board.*

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.

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.

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 or bottom side of the board.

Table 2. Codification explanation

STM32H7X7I-EVAL	Description	Example: STM32H757I-EVAL
H7	MCU series in STM32 32-bit Arm Cortex MCUs	STM32H7 Series
X7	MCU product line in the series	STM32H757
I	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

- IAR™ - EWARM (see note)
- Keil® - MDK-ARM (see note)
- STMicroelectronics - STM32CubeIDE

Note: On Windows® only.

3.3 Demonstration software

The demonstration software, included in the STM32Cube MCU Package corresponding to the on-board 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

Some verifications are needed before using the Evaluation board for the first time, to make sure that no damage occurred during shipment and that no components are unplugged or lost.

When the board is extracted from its plastic bag, check that no component remains in the bag. The main component to verify is the microSD card that may have been ejected from the connector CN13 (right side of the board).

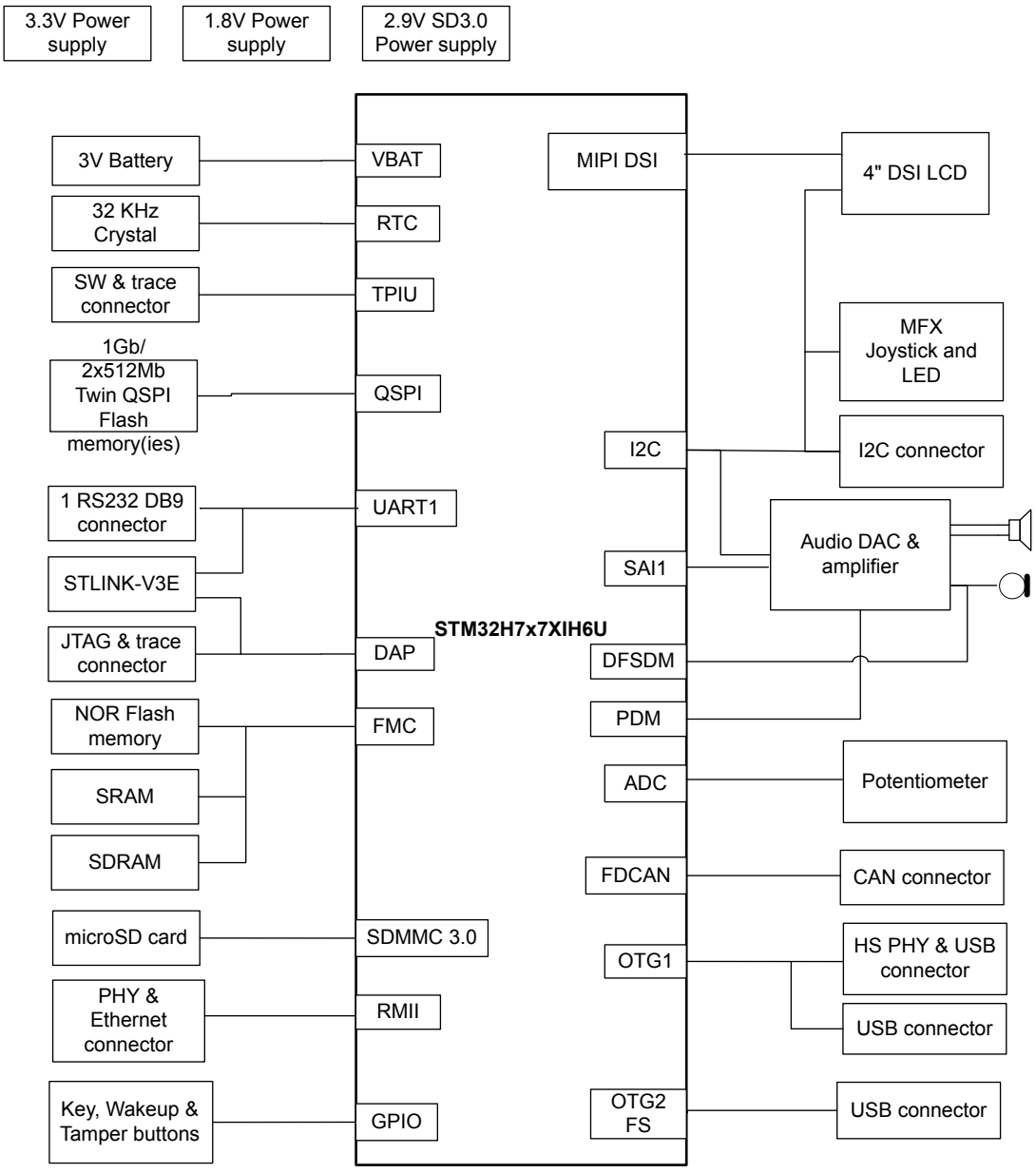
Warning:

There is an explosion risk if the battery is replaced by an incorrect one. Make sure to dispose of used batteries according to the instructions.

6 STM32H7x7I-EVAL hardware layout and configuration

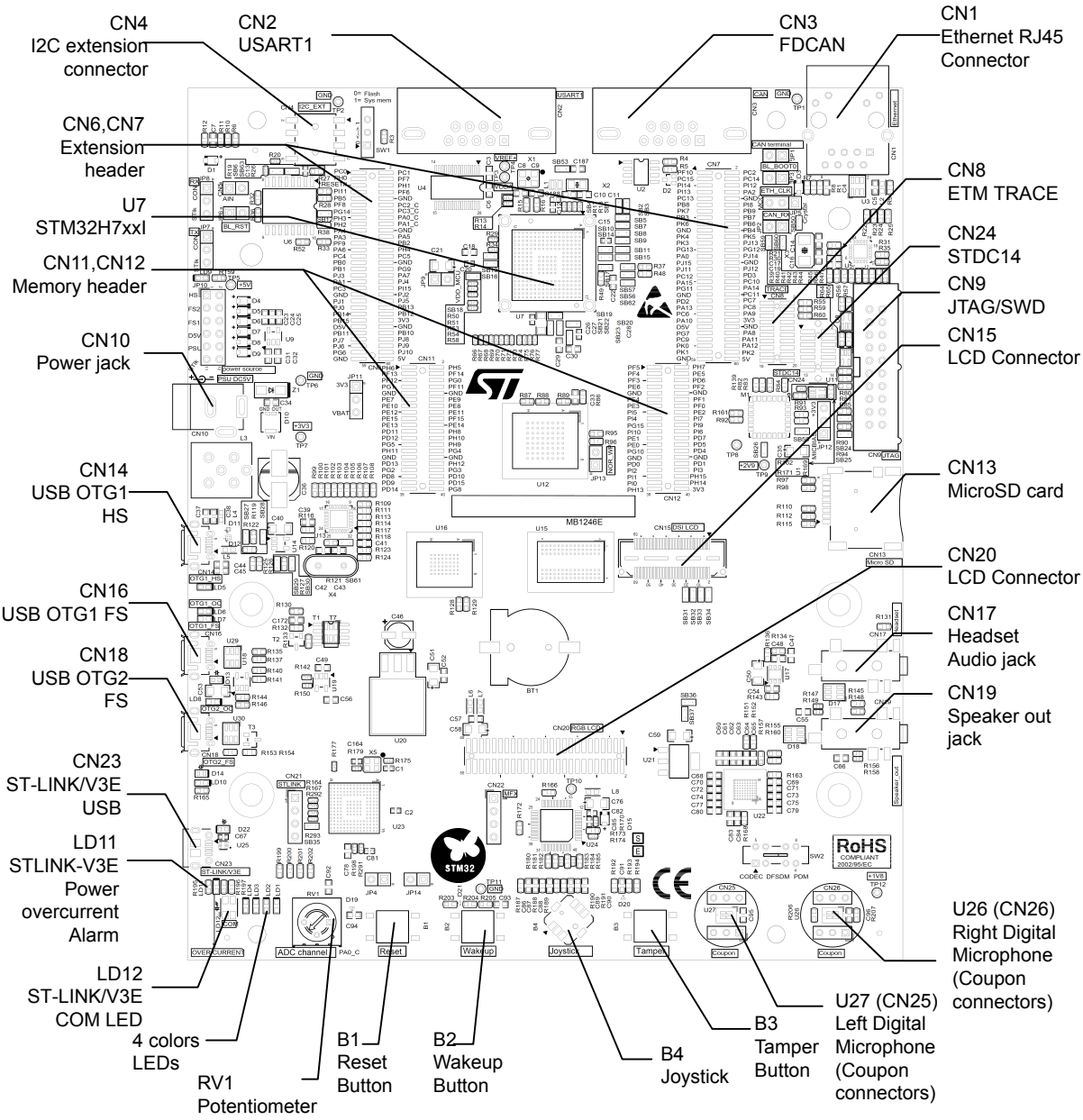
The STM32H7x7I-EVAL Evaluation boards are designed around the STM32H7x7XIH6U (240+25-pin TFBGA package) microcontroller. Figure 2 shows the hardware block diagram for STM32H7x7XIH6U and illustrates the connection between the microcontroller and the peripherals (SDRAM, SRAM, NOR Flash, Twin Quad-SPI Flash, color LCD, USB OTG connectors, USART, Ethernet, Audio, CAN FD (FDCAN), microSD™ 3.0 card and embedded ST-LINK). Figure 3. STM32H7x7I-EVAL Evaluation board (top side) helps users to locate these features on the Evaluation board. The mechanical dimensions of the board are showed in Figure 4. STM32H7x7I-EVAL Evaluation board mechanical drawing.

Figure 2. Hardware block diagram



6.1 STM32H7x7I-EVAL Evaluation board layout

Figure 3. STM32H7x7I-EVAL Evaluation board (top side)



6.2 STM32H7x7I-EVAL Evaluation board mechanical drawing

Figure 4 and Table 4 show the mechanical dimensions for the MB1246 board with the 5.7” LCD daughterboard.

Figure 4. STM32H7x7I-EVAL Evaluation board mechanical drawing

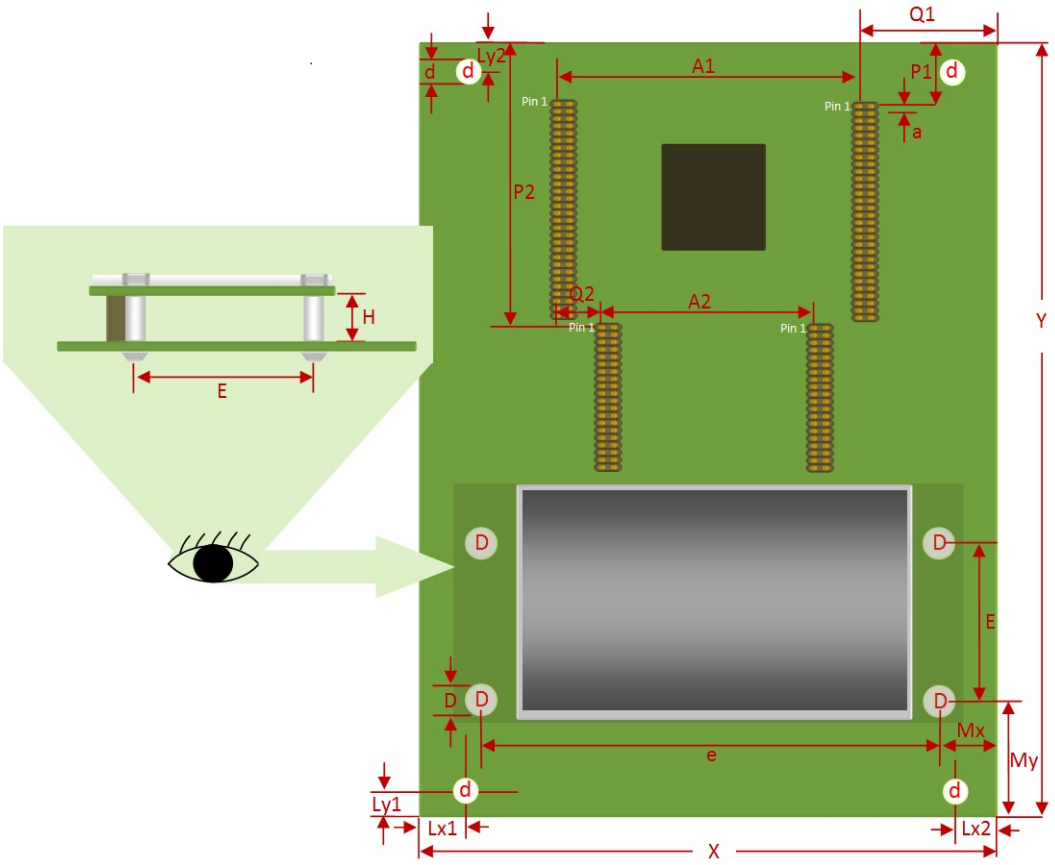


Table 4. Mechanical dimensions

Symbol	Size(mm)	Symbol	Size(mm)	Symbol	Size(mm)
A1	68.58	H	8	P1	16.76
A2	48.62	Lx1	13.7	P2	55.32
a	1.27	Lx2	25	Q1	39.23
D	4.5	Ly1	5	Q2	9.98
d	3.5	Ly2	6.4	X	141.60
E	37.7	Mx	12.5	Y	172.72
e	116.5	My	32.7		

6.3 Embedded STLINK-V3E

The STLINK-V3E programming and debugging tool is integrated on the STM32H7x7I-EVAL Evaluation board.

The key STLINK-V3E features are the following:

- Standalone probe with modular extensions
- Self-powered through a USB connector (Micro-B)
- USB 2.0 high-speed compatible interface
- Direct firmware update support (DFU)
- JTAG/serial wire debugging (SWD) specific features:
  - 3 to 3.6 V application voltage support and 5 V tolerant inputs
  - Flat cables STDC14 to MIPI10 / STDC14 / MIPI20 (connectors with 1.27 mm pitch)
  - JTAG communication support
  - SWD and serial wire viewer (SWV) communication support
- Virtual COM port (VCP) specific features:
  - 3 to 3.6 V application voltage support on the UART interface and 5 V tolerant inputs
  - VCP frequency up to 15 MHz
  - Available on STDC14 debug connector (not available on MIPI10)
- Multipath bridge USB to SPI/UART/I2C/CAN/GPIOs specific features:
  - 3 to 3.6 V application voltage support and 5 V tolerant inputs
  - Signals available on adapter board only (MB1440)
- Drag-and-drop Flash programming
- Two color LEDs: communication, power

Refer to *www.st.com* for details about STLINK-V3E.

Note: It is possible to power the Evaluation board through CN23 (Embedded STLINK-V3E USB connector) even if an external tool is connected to CN8 (ETM Trace connector) or CN9 (External JTAG and SWD connector).

ETM can only work at 50 MHz clock by default because ETM signals are shared with other peripherals. If better performance of ETM is required (84 MHz/98 MHz), R217, R230, R231, R234, R236, SB2, SB5, SB8, SB11, SB42, SB57 must be removed to reduce the stub on ETM signals. In this configuration SAI and PDM are not functional and NOR Flash and the address of SRAM are limited on A18.

ETM trace function would be abnormal as SAI_SDB share the same pins with TRACE_D0, and TRACE_D0 would be forced high by SAI_SDB. When using ETM trace it is necessary to set ADCDAT1 pin (SAI_SDB signal of the STM32) of audio codec WM8994ECS/R (U22) by software to be tri-state.

6.3.1 Drivers and firmware upgrade

The STLINK-V3E requires drivers to be installed on Windows®. It embeds a firmware which needs to be updated from time to time to benefit from new functionalities and bug corrections. Refer to technical note *"Overview of ST-LINK derivated*" (TN1235) for details.

6.4 Power supply

The STM32H7x7I-EVAL Evaluation board is designed to be powered by 5 V DC power supply and is protected by PolyZen from wrong power plug-in events. It is possible to configure the Evaluation board to use any of the following six sources for the power supply:

- 5 V DC power adapter connected to CN10, the power jack on the board (Power Supply Unit on silk screen of JP10 (PSU)).
- 5 V DC power with 500 mA limitation from CN23, the USB Micro-B connector of STLINK-V3E (USB 5 V power source on silkscreen of JP10 (STlk)). If the USB enumeration succeeds (as explained below), the ST-LINK U5V power is enabled, by asserting the PWR_EN pin. This pin is connected to a power switch (ST890) that powers the board. This power switch features also a current limitation to protect the PC in case of short-circuit on the board. If overcurrent (more than 600 mA) happens on the board, the LED LD11 lights up.
- 5 V DC power with 500 mA limitation from CN14, the USB OTG1_HS Micro-AB connector (USB 5 V power source on silkscreen of JP10 (HS)).

- 5 V DC power with 500 mA limitation from CN18, the USB OTG2_FS Micro-AB connector (USB 5 V power source on silkscreen of JP10 (FS2)).
- 5 V DC power with 500 mA limitation from CN16, the USB OTG1_FS Micro-AB connector (USB 5 V power source on silkscreen of JP10 (FS1)).
- 5 V DC power from CN6 and CN7, the extension connectors for daughterboard (daughterboard power source on silkscreen of JP10 (D5V)).

The STM32H7x7I-EVAL Evaluation board can be powered from the STLINK-V3E USB connector CN23 (U5V), but only the STLINK-V3E circuit has the power before USB enumeration, because the host PC only provides 100 mA to the board at that time. During the USB enumeration phase the STM32H7x7I-EVAL board requires 300 mA power from the host PC. If the host is able to provide the required power, the enumeration succeeds, the power transistor U19 is switched ON, the green LED LD9 is turned ON, and thus the STM32H7x7I-EVAL board is powered and can consume maximum 300 mA current. If the host PC is not able to provide the requested current, the enumeration fails. Therefore the STM32 part including the extension board is not powered. As a consequence the green LED LD9 remains turned OFF. In this case it is mandatory to use an external power supply to supply extra power.

E5V (from PSU) or D5V can be used as an external power supply in case the current consumption of the STM32H7x7I-EVAL board exceeds the allowed current on USB. In this condition it is still possible to use USB for communication, programming or debugging only, but it is mandatory to power the board first using E5V or D5V, and then connecting the USB cable to the PC. Proceeding this way ensures that the enumeration succeeds thanks to the external power source.

The following power sequence procedure must be respected:

1. Connect jumper JP10 for PSU or D5V side
2. Check that SB35 is removed
3. Connect the external power source to PSU or D5V (daughterboard mounted)
4. Check green LED LD9 is turned ON
5. Connect the PC to USB connector CN23

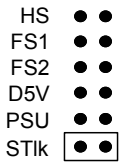
If this order is not respected, the board may be powered by V_{BUS} first then by E5V or D5V, and the following risks may be encountered:

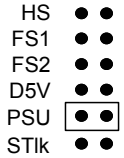
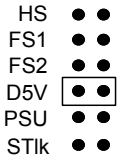
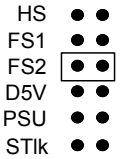
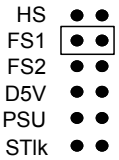
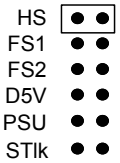
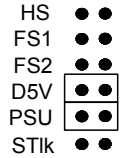
1. If more than 300 mA current is needed by the board, the PC may be damaged or current can be limited by PC. As a consequence the board is not powered correctly.
2. 300 mA is requested at the enumeration phase (since JP15 must be OFF), so there is risk that the request is rejected and the enumeration does not succeed if PC cannot provide such current. Consequently the board is not powered (LED LD9 remains OFF).

Note: In case the STM32H7x7I-EVAL board is powered by a USB charger, there is no USB enumeration, so the led LD9 remains set to OFF permanently and the board is not powered. Only in this specific case the jumper JP15 needs to be set to ON, to allow the board to be powered anyway.

The power supply is configured by setting the related jumpers **JP9, JP10 and JP11** as described in Table 5.

Table 5. Power related jumpers

Jumper	Description
JP9	JP9 is used to measure STM32 current consumption manually by a multimeter. Default setting: ON
JP10	JP10 is used to select one of the six possible power supply resources. To supply the STM32H7x7I-EVAL board through the USB connector of the STLINK-V3E (CN23) set JP10 as shown below: (default setting) 
	To supply the STM32H7x7I-EVAL board through **the jack** (CN10), set JP10 as shown below:

Jumper	Description
JP10	
	To supply the STM32H7x7I-EVAL board through the **daughterboard connectors** (CN6 and CN7), set JP10 as shown below: 
	To supply the STM32H7x7I-EVAL board through the USB OTG1_FS (CN16), set JP10 as shown below: 
	To supply the STM32H7x7I-EVAL board through the USB OTG2_FS (CN18), set JP10 as shown below: 
JP10	To supply the STM32H7x7I-EVAL board through the USB OTG1_HS (CN14), set JP10 as shown below: 
	To supply the STM32H7x7I-EVAL board and the daughterboard connected on CN6 and CN7 through the **power supply jack** (CN10), set JP10 as shown below (**daughterboard must not have its power supply connected**) 
JP11	V_{BAT} is connected to +3.3 V when JP11 is set as shown below: (Default setting) 
	V_{BAT} is connected to the battery when JP11 is set as shown below: 

The LED LD9 lights up when the STM32H7x7I-EVAL Evaluation board is powered by the 5 V correctly.

Note: To avoid the impact of USB PHY, Ethernet PHY and get precise results about current consumption on JP9, take into account the following cautions:

1. *Remove JP5 to avoid Ethernet PHY influence.*
2. *Configure USB HS PHY into low-power mode (Register Address=04, bit 6 in USB PHY)*

6.4.1 SMPS/LDO power supply

There are three solutions to provide power to the microcontroller V_{CORE} logic supply: SMPS, LDO, and SMPS+ LDO. Power consumption in Run mode is significantly improved by generating V_{CORE} from the internal DC/DC converter (SMPS) and the default connection must be set to SMPS. Some modifications are required to supply the microcontroller from the LDO. Below the board configuration for each case:

- SMPS mode (default):
  - SB14, SB20, SB10, SB53 and L1 mounted
  - SB13, SB17, SB23, SB16, SB18 removed
- LDO mode:
  - SB13, SB23, SB18 mounted
  - SB14, SB16, SB20, SB10, SB17, SB53 and L1 removed
- SMPS+ LDO mode:
  - SB13, SB23, SB10, SB53 and L1 mounted
  - SB14, SB16, SB17, SB18 and SB20 removed

Caution: A deadlock occurs if the board SMPS/LDO firmware PWR configuration does not match its hardware configuration: after the reset, the ST-LINK cannot connect the target anymore.

The firmware PWR configuration must be set as follows in function `SystemClock_Config` in file `main.c`:

- If the hardware configuration is *Direct SMPS* (default configuration):

```
HAL_PWREx_ConfigSupply(PWR_DIRECT_SMPS_SUPPLY);
```

- If the hardware configuration is *LDO*:

```
HAL_PWREx_ConfigSupply(PWR_LDO_SUPPLY);
```

If a deadlock occurs because of a mismatch between hardware and firmware PWR settings (SMPS/LDO), the user can recover the board by applying the following procedure:

1. Power off the board.
2. Set SW1 (BOOT0) to 1 (system memory).

   This changes the BOOT0 pin to 1 instead of 0, thus changing the device boot address to boot address 1 and making the bootloader start in System memory. This avoids starting firmware in the user Flash with a wrong SMPS/LDO configuration versus the hardware board configuration.
3. Power on the board and connect using STM32CubeProgrammer (STM32CubeProg).
4. Erase the user Flash.
5. Power off the board and and set SW1 to 0.
6. The board is recovered and can be used normally with matching firmware PWR.

6.5 Clock source

Two clock sources (X1 and X2) are available on the STM32H7x7I-EVAL Evaluation board for the STM32H7x7XI, and embedded RTC. Other clock sources (X3 and X4) are used for their peripherals:

- X1, 25 MHz crystal for the STM32H7x7XI, it can be disconnected by removing R15 and R16 when internal RC clock is used
- X2, 32 kHz crystal for embedded RTC
- X3, 25 MHz crystal for Ethernet PHY
- X4, 24 MHz crystal for USB OTG2_HS PHY

Table 6. 25 MHz crystal X1 related solder bridges

Solder bridge	Description
SB39	PH0 is connected to 25 MHz crystal when SB39 is OFF (Default setting).
	PH0 is connected to extension connector CN6 when SB39 is ON. In such case R15 must be removed to avoid disturbance due to the 25 MHz quartz.
SB40	PH1 is connected to 25 MHz crystal when SB40 is OFF (Default setting).
	PH1 is connected to extension connector CN6 when SB40 is ON. In such case R16 must be removed to avoid disturbance due to the 25 MHz quartz.

Table 7. 32 kHz crystal X2 related solder bridges

Solder bridge	Description
SB1	PC14 is connected to 32 kHz crystal when SB1 is OFF (Default setting).
	PC14 is connected to extension connector CN7 when SB1 is ON. In such case R18 must be removed to avoid disturbance due to the 32 kHz quartz.
SB4	PC15 is connected to 32 kHz crystal when SB4 is OFF (Default setting).
	PC15 is connected to extension connector CN7 when SB4 is ON. In such case R17 must be removed to avoid disturbance due to the 32 kHz quartz.

Note: For Ethernet clock and jumper JP5 configuration refer to Section Ethernet.

6.6 Reset sources

The reset signal of STM32H7x7I-EVAL Evaluation board is low active and the reset sources include:

- Reset button B1
- Debugging tools from JTAG/SWD connector CN9 and ETM trace connector CN8
- Daughterboard from CN6
- Embedded STLINK-V3E
- RS232 connector CN2 for ISP.

Note: The jumper JP6 has to be ON for RESET handled by pin 8 of RS232 connector CN2 (CTS signal).

6.7 Boot option

The STM32H7x7I-EVAL Evaluation board can boot from:

- Embedded user Flash
- System memory with boot loader for ISP
- Embedded SRAM for debugging

The boot option is configured by setting the switch SW1 (BOOT) and the boot base address programmed in the BOOT_ADD0 and BOOT_ADD1 option bytes. The BOOT can be also configured through the RS232 connector CN2.

Table 8. Boot selection switch

Switch configuration	Boot address option bytes	Boot space
(Default setting) 0<->1  SW1	BOOT_ADD0 [15:0]	CPU boot address defined by user option byte BOOT_ADD0[15:0] ST programmed value: Flash at 0x0800 0000.

Switch configuration	Boot address option bytes	Boot space
0<->1  SW1	BOOT_ADD1 [15:0]	CPU boot address defined by user option byte BOOT_ADD1[15:0] ST programmed value: System boot loader at 0x0000 0000.

Table 9. Boot related jumpers

Jumper	Description
JP3	The Bootloader_BOOT0 is managed by pin 6 of connector CN2 (RS232 DSR signal) when JP3 is ON. This configuration is used for boot-loader application only. Default Setting: OFF

6.8 Audio

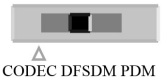
An audio codec WM8994ECS/R with 4 DACs and 2 ADCs inside is connected to the SAI interface of the STM32H7x7XI microcontroller to support the TDM feature on SAI port. This feature is able to implement audio recording on digital and analog microphones and audio playback of various audio streams on headphone and lineout at the same time.

It communicates with the STM32H7x7XI through I2C1 bus which is shared with LCD and MFX (Multi Function eXpander).

The analog microphone on the headset is connected to the ADC of the WM8994ECS/R through the audio jack CN17. External speakers can be connected to WM8994ECS/R through the audio jack CN19.

Two digital microphones (ST-MEMS microphones) MP34DT01TR are on the STM32H7x7I-EVAL Evaluation board. They can be connected to either an audio codec DFSDM or to the PDM port of the STM32H7x7XI, by setting the switch SW2 shown in Table 10. Audio related switch and jumper. The coupon connectors CN25 and CN26 can be used to support ST-MEMS microphone STEVAL-MKI129V1 after removing SB54 and SB55 solder bridges.

Table 10. Audio related switch and jumper

Switch/ Jumper	Description
SW2	Digital microphone is connected to the audio codec when SW2 is set as shown below (Default setting):  CODEC DFSDM PDM
	Digital microphone is connected to the DFSDM port of STM32H7x7XI when SW2 is set as shown below:  CODEC DFSDM PDM
	Digital microphone is connected to the PDM port of STM32H7x7XI when SW2 is set as shown below:  CODEC DFSDM PDM
JP12	Digital microphone power source is connected to +3.3 V power when JP12 is set as shown below (Default setting):  1 2 3
	Digital microphone power source is connected to MICBIAS1 from WM8994ECS/R when JP12 is set as shown below:  1 2 3

Note: I²C address of WM8994ECS/R is 0b0011010.

PDM clock is on PE2 and it conflicts with SAI_CLK on PE2 by default. When PDM and SAI functions are used at the same time, SB57 must be OFF and SB56 must be ON to move SAI_CLK to PG7.

6.9 USB OTG1_HS and FS

The STM32H7x7I-EVAL Evaluation board supports USB OTG1:

- High-speed communication through a USB Micro-AB connector (CN14), USB high-speed PHY (U13) for high-speed function
- Full-speed communication through another USB Micro-AB connector (CN16)

The Evaluation board can be powered by these USB connectors (CN14 or CN16) at 5 V DC with 500 mA current limitation.

As several OTG1_FS signals are shared with the OTG1_HS ULPI bus and USART1, some PCB reworks are needed when using OTG1_FS (CN16) as shown in Table 11.

Table 11. USB OTG1 and USART1 function configuration

Function	Mount	Remove
OTG1_HS-CN14 (Default)	R104,R105,SB27,SB30	R254,SB48,SB28,SB29
OTG1_FS-CN16	R254,SB48,SB28,SB29 SB47,SB49	R104,R105,SB27,SB30, SB46,SB51
USART1 (Default)	SB46,SB51	SB47,SB49

A USB power switch (U14) is also connected on V_{BUS} and provides power to either CN14 (with SB27 and SB30 ON and SB28 and SB29 OFF) or CN16 (with SB28 and SB29 ON and SB27 and SB30 OFF).

Green LED LD5 (for CN14) or LD7 (for CN16) lights up in one of these cases:

- Power switch (U14) is ON and the STM32H7x7I-EVAL board works as a USB host.
- V_{BUS} is powered by another USB host when the STM32H7x7I-EVAL board works as a USB device.

The red LED LD6 lights up when an overcurrent occurs (I_{VBUS} > 500 mA).

Note: The STM32H7x7I-EVAL board should be powered by an external power supply when using OTG function.

6.10 USB OTG2_FS

The STM32H7x7I-EVAL Evaluation board supports USB OTG2 full-speed communication through a USB Micro-AB connector (CN18) and USB power switch (U18) connected to V_{BUS}. The Evaluation board can be powered by this USB connection at 5 V DC at a current up to 500 mA.

A green LED (LD10) lights up if either one of the following events occurs:

- Power switch (U18) is ON and the STM32H7x7I-EVAL board works as a USB host.
- V_{BUS} is powered by another USB host when the STM32H7x7I-EVAL board works as a USB device.

The red LED (LD8) lights up when an overcurrent occurs (I_{VBUS} > 500 mA).

Note: The STM32H7x7I-EVAL board must be powered by an external power supply when using the OTG function.

Note: JP2 and SB50 must be removed when using USB OTG_FS as mentioned in Table 13. CAN related jumpers and solder bridges.

6.11 RS232

Communication through RS232 is supported by the D-type, 9-pins connector CN2, which is connected to the USART1 of the STM32H7x7XI on the STM32H7x7I-EVAL Evaluation board. The signals Bootloader_RESET and Bootloader_BOOT0 are added on the RS232 connector CN2 for ISP support.

The USART1 of the STM32H7x7XI is shared with the RS232 of the STLINK-V3E controller. Connection is switched by setting JP7 and JP8.

Table 12. **USART1 related jumpers**

Jumper	Description
JP7	USART1_TX is connected to RS232 when JP7 is set as shown below (Default setting): 
	USART1_TX is connected to the USART_RX of the STLINK-V3E controller when JP7 is set as shown below: 
JP8	USART1_RX is connected to RS232 when JP8 is set as shown below (Default setting): 
	USART1_RX is connected to the USART_TX of the STLINK-V3E controller when JP8 is set as shown below: 

6.12 microSD™ card

The 8-Gbyte (or more) microSD™ card connected to the SDIO 3.0 port of the STM32H7x7XI microcontroller is available on the Evaluation board. Detection of the microSD card is managed by MFX GPIO15.

IP4856CX25/C (M1) is an SD 3.0-compliant, 6-bit-bidirectional, dual-voltage-level translator. It is implemented on the STM32H7x7I-EVAL board and it supports SD 3.0, SDR104, SDR50, DDR50, SDR25, SDR12 and SD 2.0 in high-speed (50 MHz) and default-speed (25 MHz) modes.

6.13 External I²C connector

The I2C1 bus of the STM32H7x7XI is connected to CN4 on the STM32H7x7I-EVAL. The I²C functional daughterboard can be mounted on the CN4 connector and accessed by the microcontroller through the I2C1 bus.

6.14 FDCAN

The STM32H7x7I-EVAL Evaluation board supports one channel of the Flexible Data Rate CAN (FDCAN) communication bus, based on the 3.3 V CAN transceiver.

The standby signal on the FDCAN transceiver is controlled by PD3 of the STM32H7x7XI. Other FDCAN signals are shared with USB OTG1_FS signals.

Table 13. **CAN related jumpers and solder bridges**

Jumper	Description
JP1	CAN terminal resistor is enabled when JP1 is ON. Default setting: OFF
JP2	PA11 is connected with FDCAN RX signal when JP2 is ON. Default setting: OFF

6.15 Ethernet

The STM32H7x7I-EVAL Evaluation board supports 10M/100M Ethernet communication by a PHY LAN8742A (U5) and integrated RJ45 connector (CN1). Ethernet PHY is connected to STM32H7x7XI through the RMII interface.

A 50 M reference clock can be generated by PHY with 25 MHz crystal or with 25 M MCO from STM32H7x7XI. These two resources can be selected by setting jumper JP5 as shown in Table 14. Ethernet related jumpers.

Table 14. Ethernet related jumpers

Jumper	Description
JP5	50 M RMII reference clock is generated by an external crystal X3 when JP5 is set as shown below: (Default setting) 
	50 M RMII reference clock is generated by MCO at PA8 when JP5 is set as shown below: 

6.16 Memories

An 8M x 32-bit SDRAM is connected to the SDRAM bank1 of the FMC interface of the STM32H7x7XI microcontroller.

A 1Mx16-bit SRAM is connected to the NOR/PSRAM2 bank1 of the FMC interface and both 8-bit and 16-bit accesses are allowed by BLN0 and BLN1, connected to BLE and BHE of SRAM respectively.

A 128-Mbit NOR Flash is connected to the NOR/PSRAM1 bank1 of the FMC interface. The 16-bit operation mode is selected by pull-up resistor connected to the BYTE pin of NOR Flash memory. The write protection can be enabled or disabled, depending on how the jumper JP13 is set, as showed in Table 15. NOR Flash related jumpers.

Table 15. NOR Flash related jumpers

Jumper	Description
JP13	Write protection is enabled when JP13 is ON while write protection is disabled when JP13 is OFF. Default Setting: OFF

All signals for memory are also connected on memory connectors CN11 and CN12 for memory daughterboards.

Limitations can happen when using other peripherals:

1. FMC addressing limitation depending on number of trace data bus used (A18 max for 4 bit ETM to A21 max for 1 bit ETM)
2. FMC addresses limited to A18 when SAI used
3. FMC addresses limited to A22 when PDM is used

In such cases, serial resistors R236 (A19), R231 (A20), R217 (A21) and R230 (A22) should be removed. Thus memory addresses A19 to A22 are not connected to FMC and they are pulled down on the board. Memories can be addressed within a limited address range.

By default, all these serial resistors are soldered on the board. If A19 is required, it is necessary to configure (SAI_SDB) ADCDAT1 pin of audio codec WM8994ECS/R (U22) by software to be tri-state.

6.17 Twin Quad-SPI NOR Flash memory

The Quad-SPI Flash memory is implemented on the STM32H7x7XI microcontroller of the Evaluation board either as 1 Twin Quad-SPI NOR Flash memory (1-Gbit (2×512 Mb)) memory or as two Quad-SPI NOR Flash (512 Mb) memories.

The two dies in the Twin Quad-SPI Flash memory share the same clock and chip select signals of the STM32H7x7XI microcontroller.

6.18 Analog input

The two-pin header CN5 and 10 KΩ potentiometer RV1 is connected to PA0_C of STM32H7x7XI as analog input. A low-pass filter can be implemented by replacing R11 and C7 with the right value of resistor and capacitor as requested by the end-user application.

6.19 Display and input devices

Four general-purpose-color LEDs (LD 1, 2, 3 and 4) are available as display device.

The 4-direction joystick (B4) with selection, Wakeup (B2) and Tamper/key button (B3) are available as input devices.

A 4” 800x480 TFT color LCD with capacitive touch panel is connected to the MIPI DSI interface of the STM32H7x7XI microcontroller.

Table 16. LCD module connector (CN15)

Pin number	Description	Pin connection	Pin number	Description	Pin connection
1	GND	-	2	-	-
3	DSI_CK_P	-	4	TOUCH_INT	MFX GPIO14
5	DSI_CK_N	-	6	GND	-
7	GND	-	8	RFU	GND
9	DSI_D0_P	-	10	RFU	GND
11	DSI_D0_N	-	12	GND	-
13	GND	-	14	RFU	GND
15	DSI_D1_P	-	16	RFU	GND
17	DSI_D1_N	-	18	GND	-
19	GND	-	20	-	-
21	BLVDD(5V)	-	22	-	-
23	BLVDD(5V)	-	24	-	-
25	-	-	26	-	-
27	BLGND	-	28	-	-
29	BLGND	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	SCLK/MCLK	PE5	36	3.3V	-
37	LRCLK	PE4	38	-	-
39	I2S_DATA	PE6	40	I2C1_SDA	PB7
41	-	-	42	-	
43	-	-	44	I2C1_SCL	PB6
45	CEC_CLK	PA8	46	-	-
47	CEC	PA15	48	-	-
49	DSI_TE	PJ2	50	-	-
51	-	-	52	-	-
53	BL_CTRL	PA6	54	-	-
55	-		56	-	-
57	DSI_RESET	PF10	58	-	-

Pin number	Description	Pin connection	Pin number	Description	Pin connection
59	-		60	1.8V	-

6.20 MFX (multifunction eXpander)

MFX circuit on STM32H7x7I-EVAL Evaluation board acts as IO-expander. The communication interface between MFX and STM32H7x7XI is I2C1 bus.

The signals connected to MFX are listed in Table 17. MFX signals.

Table 17. MFX signals

Pin number of MFX	Pin name of MFX	MFX functions	Function of STM32H7x7I-EVAL	Direction (for MFX)	Terminal device
15	PA5	MFX_GPIO5	Audio_INT	Input	Codec
16	PA6	MFX_GPIO6	OTG_FS2_ OverCurrent	Input	USB_FS2
17	PA7	MFX_GPIO7	OTG_FS2_ PowerSwitchOn	Output	USB_FS2
18	PB0	MFX_GPIO0	JOY_SEL	Input	Joystick
19	PB1	MFX_GPIO1	JOY_DOWN	Input	Joystick
20	PB2	MFX_GPIO2	JOY_LEFT	Input	Joystick
26	PB13	MFX_GPIO13	SD_LDO_SEL	Output	microSD
27	PB14	MFX_GPIO14	TOUCH_INT	Input	LCD
28	PB15	MFX_GPIO15	MicroSDcard Detect	Input	microSD
29	PA8	MFX_GPIO8	OTG_FS1_ OverCurrent	Input	USB_FS1
30	PA9	MFX_GPIO9	OTG_FS1_ PowerSwitchOn	Output	USB_FS1
31	PA10	MFX_GPIO10	-	-	-
32	PA11	MFX_GPIO11	-	-	-
33	PA12	MFX_GPIO12	-	-	-
39	PB3	MFX_GPIO3	JOY_RIGHT	Input	Joystick
40	PB4	MFX_GPIO4	JOY_UP	Input	Joystick

7 STM32H7x7I-EVAL connectors

7.1 Ethernet RJ45 connector CN1

Figure 5. **Ethernet RJ45 connector CN1 (front view)**

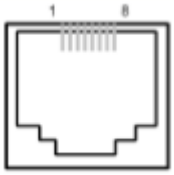


Table 18. **RJ45 connector CN1**

Pin number	Description	Pin number	Description
1	TxData+	2	TxData-
3	RxData+	4	Shield
5	Shield	6	RxData-
7	Shield	8	Shield

7.2 RS232 connector CN2

Figure 6. **RS232 connector CN2 (front view)**

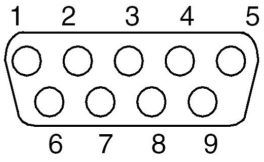


Table 19. **RS232 connector CN2 with ISP support**

Pin number	Description	Pin number	Description
1	NC	6	Bootloader_BOOT0
2	RS232_RX (PB15)	7	NC
3	RS232_TX (PB14)	8	Bootloader_RESET
4	NC	9	NC
5	GND	-	-

7.3 CAN D-type, 9-pin male connector CN3

Figure 7. CAN D-type, 9-pin connector CN3 (front view)

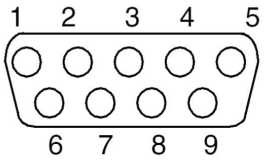


Table 20. CAN D-type 9-pin male connector CN3

Pin number	Description	Pin number	Description
1,4,8,9	NC	7	CANH
2	CANL	3,5,6	GND

7.4 External I²C connector CN4

Figure 8. I²C EXT connector CN4 (front view)

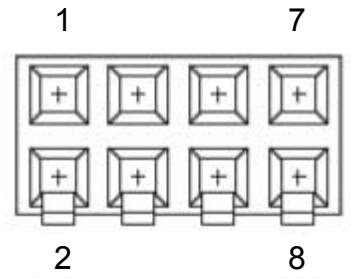


Table 21. I²C EXT connector CN4

Pin number	Description	Pin number	Description
1	I2C1_SDA (PB7)	5	+3.3 V
2	NC	6	NC
3	I2C1_SCL (PB6)	7	GND
4	RESET (PA4)	8	NC

7.5 Analog input-output connector CN5

Figure 9. Analog input-output connector CN5 (top view)

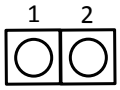


Table 22. Analog input-output connector CN5

Pin number	Description	Pin number	Description
1	analog input-output (PA0_C)	2	GND

7.6 Daughterboard extension connector CN6 and CN7

Two 60-pin male headers CN6 and CN7 can be used to connect a daughterboard or a standard wrapping board to the STM32H7x7I-EVAL Evaluation board. All GPI/Os are available on CN6 and CN7 and memory connectors on CN11 and CN12.

The space between these two connectors is defined as a standard that allows developing common daughterboards for several ST evaluation boards. The standard width between CN6 pin1 and CN7 pin1 is 2700 mils (68.58 mm).

Each pin on CN6 and CN7 can be used by a daughterboard after disconnecting it from the corresponding function block on STM32H7x7I-EVAL Evaluation board. For details refer to Table 23. Daughterboard extension connector CN6 and Table 24. Daughterboard extension connector CN7.

Table 23. Daughterboard extension connector CN6

Pin	Description	Alternate function	How to disconnect with function block on STM32H7x7I-EVAL board
1	PC0	ULPI_STP	Remove R124
3	PH0	OSC_IN	Remove R15, Close SB39
5	RESET#	-	-
7	PI11	ULPI_DIR	Remove R123
9	PB5	ULPI_D7	Remove R101
11	PF8	QSPI_BK1_IO0	Remove R38
13	PG14	QSPI_BK2_IO3	Remove R27
15	PH3	QSPI_BK2_IO1	Remove R28
17	PH2	QSPI_BK2_IO0	Remove R52
19	PA4	EXT_RESET	Disconnect CN4
21	PA3	ULPI_D0	Remove R114
23	PF9	QSPI_BK1_IO1	Remove R32
25	PA6	GPIO_LCD_BL_CTRL	Disconnect CN15
27	PC4	RMII_RXD0	Remove R41
29	PB0	ULPI_D1	Remove R113
31	PB1	ULPI_D2	Remove R111
33	PJ3	-	-
35	PA1	RMII_RX_CLK	Remove R31
37	PC3	DFSDM_DATA1	Not to dial SW2 to the middle

Pin	Description	Alternate function	How to disconnect with function block on STM32H7x7I-EVAL board
39	GND	-	-
41	PJ1	-	-
43	PJ0	-	-
45	PB14	USART1_TX/USB_FS1_DM	Open SB46, SB47
47	PB15	USART1_RX/USB_FS1_DP	Open SB49, SB51
49	D5V	-	-
51	PB11	ULPI_D4	Remove R108
53	PJ7	TRGIN	Remove SB24
55	PJ6	-	-
57	PG6	QSPI_BK1_NCS	Open SB6, Remove R19
59	GND	-	-
2	PC1	RMII_MDC/ PDM1_D1	Open SB38, Not to dial SW2 to the right
4	PF7	QSPI_BK1_IO2	Remove R36
6	PH1	OSC_OUT	Remove R16
8	PF6	QSPI_BK1_IO3	Remove R26
10	GND	-	-
12	PC2_C	-	-
14	PC3_C	-	-
16	PA0_C	Potentiometer	Open SB43
18	PA1_C	-	-
20	GND	-	-
22	PA5	ULPI_CK	Remove R118
24	PB2	QSPI_CLK	-
26	PH4	ULPI_NXT	Remove R117
28	PC5	RMII_RXD1	Remove R39
30	GND	-	-
32	PG9	QSPI_BK2_IO2	Remove R33
34	PA7	RMII_CRS_DV	Remove R44
36	PJ4	-	-
38	PI15	-	-
40	PJ2	DSI_TE	Disconnect CN15
42	PJ5	-	-
44	PB13	ULPI_D6/USB_FS1_VBUS	Remove R104, R254
46	PB12	ULPI_D5/USB_FS1_ID	Remove R105, Open SB48
48	+3V3	-	-
50	GND	-	-
52	PB10	ULPI_D3	Remove R109
54	PJ8	-	-
56	PJ9	-	-
58	PJ10	-	-

Pin	Description	Alternate function	How to disconnect with function block on STM32H7x7I-EVAL board
60	+5V	-	-

Table 24. Daughterboard extension connector CN7

Pin	Description	Alternate function	How to disconnect with function block on STM32H7x7I-EVAL board
1	PF10	GPIO_DSI_RST	Remove R286, Disconnect CN15
3	PC15	OSC32_OUT	Remove R17, Close SB4
5	PI14	-	-
7	PI13	-	-
9	PC13	KEY_TAMP_1/WKUP2	Remove R193
11	PB8	SDIO_1_CKIN	Remove R161
13	PK7	-	-
15	PB3	JTDO/TRACESWO	Remove R60
17	PK6	LED4	Remove R199
19	GND	-	-
21	PK4	LED2	Remove R201
23	PK3	LED1	Remove R202
25	PG13	RMII_TXD0	-
27	PA0	KEY_WKUP0	Remove R173, R203
29	PJ15	-	-
31	PJ11	-	-
33	PC12	SDIO_1_CK	Add R139 10Kohm, Remove R83
35	PA15	JTDI/CEC	Remove R61, Disconnect CN15
37	PG11	RMII_TX_EN	-
39	GND	-	-
41	PD2	SDIO_1_CMD	Add R139 10Kohm
43	PA13	JTMS-SWDIO	Remove R55
45	PC6	SDIO_1_D0DIR	Add R139 10Kohm, Remove SB58
47	PA10	USB_FS2_ID	Disconnect CN18
49	D5V	-	-
51	PG7	SAI_1_MCLK_A/ETH_nINT	Remove SB56, SB62
53	PC9	SDIO_1_D1	Add R139 10Kohm
55	PK0	-	-
57	PK1	-	-
59	GND	-	-
2	PC2	DFSDM_CKOUT	Not to dial SW2 to the middle
4	PC14	OSC32_IN	Remove R18, Close SB1
6	PI12	-	-
8	PA2	RMII_MDIO	Remove R47
10	GND	-	-

Pin	Description	Alternate function	How to disconnect with function block on STM32H7x7I-EVAL board
12	PI8	GPIO_EXPANDER_INT	Remove R185
14	PB9	SDIO_1_CDIR	Add R139 10Kohm, Remove R91
16	PB7	I2C_1_SDA	Remove R160, R181, R209, Disconnect CN4, CN15
18	PB6	I2C_1_SCL	Remove R155, R180, R212, Disconnect CN4, CN15
20	PB4	NJTRST	Remove R79
22	PK5	LED3	Remove R200
24	PJ13	-	-
26	PG12	RMII_TXD1	-
28	PJ14	-	-
30	GND	-	-
32	PJ12	TRGOUT	Remove SB25
34	PD3	GPIO_CAN_STBY	Remove R4
36	PC10	SDIO_1_D2	Add R139 10Kohm
38	PA14	JTCK-SWCLK	Remove R59
40	PC11	SDIO_1_D3	Add R139 10Kohm, Open SB45
42	PC7	SDIO_1_D123DIR	Add R139 10Kohm, Remove R92
44	PC8	SDIO_1_D0	Add R139 10Kohm
46	PA9	USB_FS2_VBUS	Remove R255
48	+3.3V	-	-
50	GND	-	-
52	PA8	MCO1	Disconnect CN15, Keep JP5 on open
54	PA11	USB_FS2_DM/ FDCAN_1_RXFD	Keep JP2 on open, Open SB59
56	PA12	USB_FS2_DP/ FDCAN_1_TXFD	Open SB50, SB60
58	PK2	-	-
60	+5V	-	-

7.7 ETM trace debugging connector CN8

Figure 10. ETM trace debugging connector CN8 (top view)

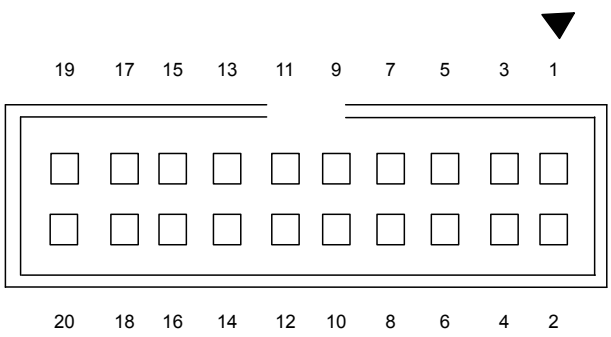


Table 25. **ETM trace debugging connector CN8**

Pin number	Description	Pin number	Description
1	+3.3V	2	TMS/PA13
3	GND	4	TCK/PA14
5	GND	6	TDO/PB3
7	KEY	8	TDI/PA15
9	GND	10	RESET#
11	GND	12	TraceCLK/PE2
13	GND	14	TraceD0/PE3 or SWO/PB3
15	GND	16	TraceD1/PE4 or nTRST/PB4
17	GND	18	TraceD2/PE5
19	GND	20	TraceD3/PE6

7.8 JTAG/SWD connector CN9

Figure 11. **JTAG/SWD debugging connector CN9 (top view)**

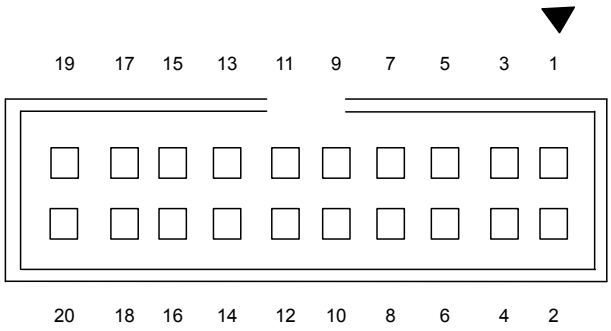


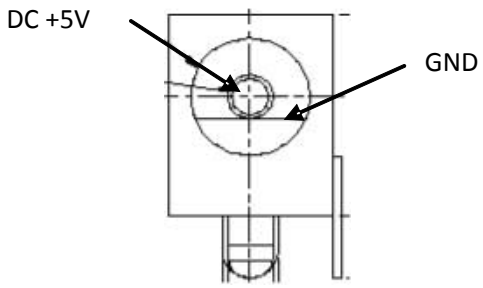
Table 26. **JTAG/SWD debugging connector CN9**

Pin number	Description	Pin number	Description
1	+3.3V	2	+3.3V
3	TRST(PB4)	4	GND
5	TDI(PA15)	6	GND
7	TMS/SWDIO(PA13)	8	GND
9	TCK/SWCLK(PA14)	10	GND
11	RTCK	12	GND
13	TDO/SWO(PB3)	14	GND
15	RESET#	16	GND
17	DBGRQ(PJ7)	18	GND
19	DBGACK(PJ12)	20	GND

7.9 Power connector CN10

The STM32H7x7I-EVAL Evaluation board can be powered from a DC 5 V power supply through the external power supply jack (CN10) shown in Figure 13. Power supply connector CN10 (front view). The central pin of CN10 must be positive.

Figure 12. Power supply connector CN10 (front view)



7.10 Memory connector CN11 and CN12

Two 40-pin male headers CN11 and CN12 are used to connect with memory daughterboard.

All GPIOs are connected on the extension connectors CN6 and CN7, but the GPIOs which are used for FMC memory signals, are connected on CN11 and CN12.

The space between these two connectors is defined as a standard that allows to develop common daughterboard. The standard width between CN11 pin1 and CN12 pin1 is 1914 mils (48.62 mm). For details on signals assignment refer to Table 27. Memory connector CN11 and Table 28. Memory connector CN12.

Table 27. Memory connector CN11

Pin	Description	Alternative function	How to disconnect with function block on STM32H7x7I-EVAL board
1	PH6	SDNE1	-
3	PF13	A7	-
5	PF12	A6	-
7	PG1	A11	-
9	GND	-	-
11	PE7	D4	-
13	PE10	D7	-
15	PE12	D9	-
17	PE15	D12	-
19	PE13	D10	-
21	PD11	A16	-
23	PD12	A17	-
25	PG5	A15/BA1	-
27	PH11	D19	-
29	GND	-	-
31	PD13	A18	-

Pin	Description	Alternative function	How to disconnect with function block on STM32H7x7I-EVAL board
33	PG2	A12	-
35	PD8	D13	-
37	PD9	D14	-
39	PD14	D0	-
2	PH5	SDNWE	-
4	PF14	A8	-
6	PG0	A10	-
8	PF11	SDNRAS	-
10	GND	-	-
12	PE9	D6	-
14	PE8	D5	-
16	PE11	D8	-
18	PF15	A9	-
20	PE14	D11	-
22	PH8	D16	-
24	PH10	D18	-
26	PH9	D17	-
28	PG4	A14/BA0	-
30	GND	-	-
32	PH12	D20	-
34	PG3	A13	-
36	PD10	D15	-
38	PD15	D1	-
40	PG8	SDCLK	-

Table 28. Memory connector CN12

Pin	Description	Alternative function	How to disconnect with function block on STM32H7x7I-EVAL board
1	PF5	A5	-
3	PF4	A4	-
5	PF3	A3	-
7	PE6	A22/SAI1_SD_A/TRACED3	Open SB2, SB3
9	GND	-	-
11	PE4	A20/SAI1_FS_A/TRACED1	Open SB5, SB7
13	PE3	A19/SAI1_SD_B/TRACED0	Open SB8, SB9
15	PI5	NBL3	-
17	PI4	NBL2	-
19	PG15	SDNCAS	-
21	PI10	D31	-
23	PE1	NBL1	-

Pin	Description	Alternative function	How to disconnect with function block on STM32H7x7I-EVAL board
25	PE0	NBL0	-
27	PG10	NE3	-
29	GND	-	-
31	PD0	D2	-
33	PI2	D26	-
35	PI1	D25	-
37	PI0	D24	-
39	PH13	D21	-
2	PH7	SDCKE1	-
4	PE5	A21/SAI1_SCK_A/TRACED2	Open SB41, SB42
6	PD6	NWAIT	-
8	PF2	A2	-
10	GND	-	-
12	PF1	A1	-
14	PF0	A0	-
16	PE2	A23/PDM1_CK1/ SAI1_MCLK_A /TRACECLK	Open SB11, SB15, SB57
18	PI7	D29	-
20	PI9	D30	-
22	PI6	D28	-
24	PD7	NE1	-
26	PD5	NWE	-
28	PD4	NOE	-
30	GND	-	-
32	PD1	D3	-
34	PI3	D27	-
36	PH15	D23	-
38	PH14	D22	-
40	+3.3V	-	-

7.11 microSD™ connector CN13

Figure 13. microSD™ connector (top view)

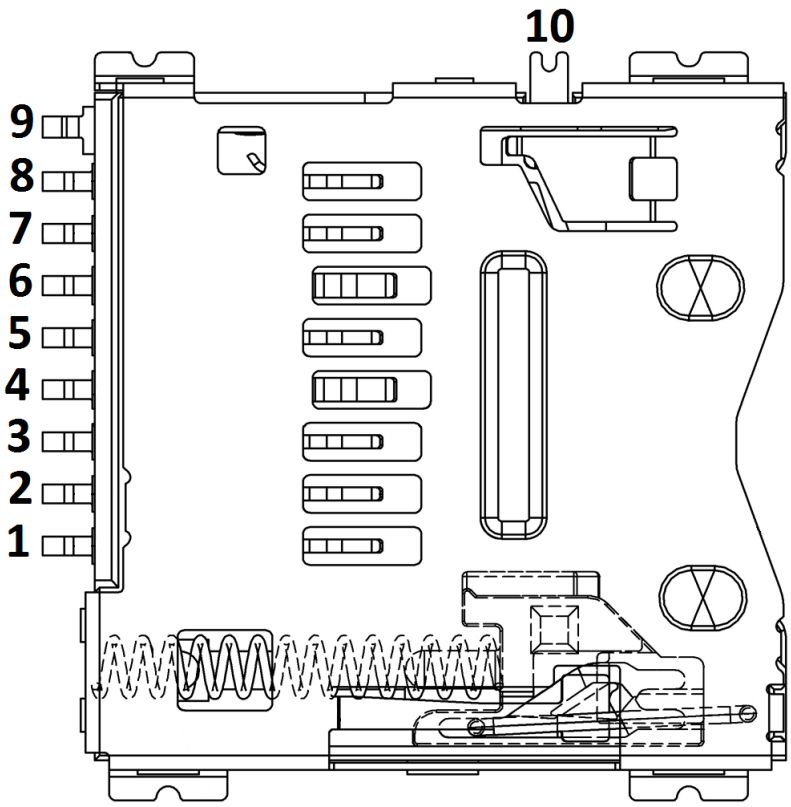


Table 29. microSD™ connector CN13

Pin number	Description	Pin number	Description
1	SD_DATA2	6	Vss/GND
2	SD_DATA3	7	SD_DATA0
3	SD_CMD	8	SD_DATA1
4	+2.9V_SD	9	GND
5	SD_CLK	10	MicroSDcard_detect (MFX GPIO15)

7.12 USB OTG1_HS Micro-AB connector CN14

Figure 14. USB OTG1_HS Micro-AB connector CN14 (front view)

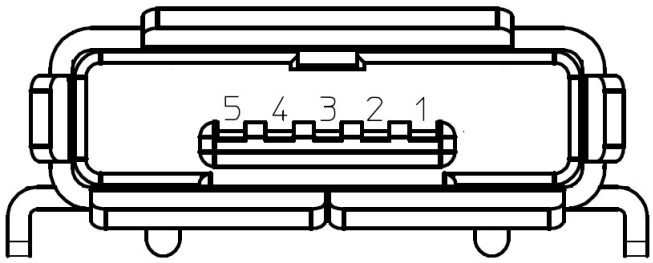


Table 30. **USB OTG1_HS Micro-AB connector CN14**

Pin number	Description	Pin number	Description
1	V_{BUS}	4	ID
2	D-	5	GND
3	D+	-	-

7.13 TFT LCD connector CN15

A TFT-color LCD with MIPI DSI interface board is mounted on CN15. Refer to Section 6.19 Display and input devices for details.

7.14 USB OTG1_FS Micro-AB connector CN16

Figure 15. **USB OTG1_FS Micro-AB connector CN16 (front view)**

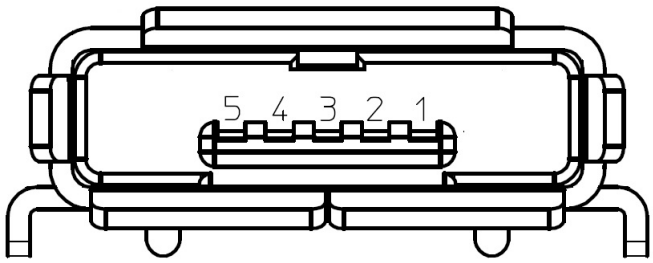


Table 31. **USB OTG1_FS Micro-AB connector CN16**

Pin number	Description	Pin number	Description
1	VBUS (PB13)	4	ID (PB12)
2	D- (PB14)	5	GND
3	D+ (PB15)	-	-

7.15 Audio jack CN17

A 3.5 mm stereo audio jack CN17 is available on the STM32H7x7I-EVAL Evaluation board to support headset (headphone and microphone integrated).

7.16 USB OTG2_FS Micro-AB connector CN18

Figure 16. **USB OTG2_FS Micro-AB connector CN18 (front view)**

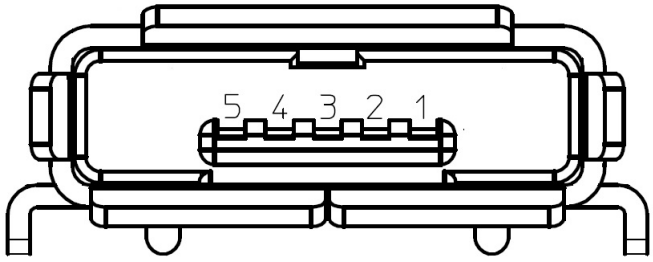


Table 32. **USB OTG2_FS Micro-AB connector CN18**

Pin number	Description	Pin number	Description
1	V_{BUS} (PA9)	4	ID (PA10)
2	D- (PA11)	5	GND
3	D+ (PA12)	-	-

7.17 Audio jack (speaker) CN19

A 3.5mm stereo audio jack CN19 for speaker out is available on STM32H7x7I-EVAL Evaluation board to support an external speaker.

7.18 STLINK-V3E programming connector CN21

The connector CN21 is used only for embedded STLINK-V3E programming during board manufacturing. It is not populated by default and not for end users.

7.19 MFX programming connector CN22

The connector CN22 is used only for MFX (Multifunction eXpander) programming during board manufacturing. It is not populated by default and not for end users.

7.20 STLINK-V3E USB Micro-B connector CN23

The USB Micro-B connector CN23 is used to connect the embedded STLINK-V3E to a PC for programming and debugging purposes.

Figure 17. **USB Micro-B connector CN23 (front view)**

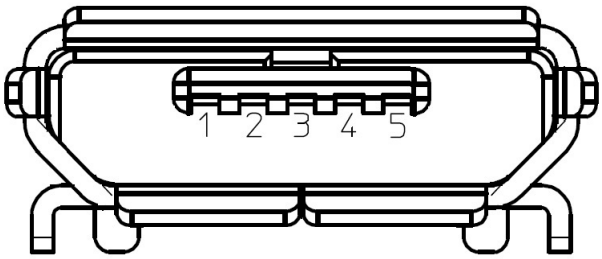


Table 33. **USB Micro-B connector CN23 (front view)**

Pin number	Description	Pin number	Description
1	V_{BUS} (power)	4	ID
2	DM	5	GND
3	DP	-	-

7.21 STDC14 debugging connector CN24

Figure 18. **STDC14 debugging connector CN24 (top view)**

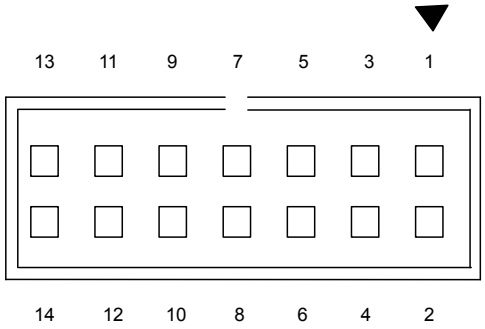


Table 34. **STDC14 debugging connector CN24**

Pin number	Description	Pin number	Description
1	NC	2	NC
3	+3.3V	4	SWDIO-TMS /PA13
5	GND	6	SWCLK-TCK /PA14
7	GND	8	SWO-TDO/PB3
9	KEY	10	TDI/PA15
11	GNDDetect	12	RESET#
13	VCP_USART_RX /PB14	14	VCP_USART_TX /PB15

7.22 MEMS microphone coupon connectors CN25 and CN26

Figure 19. **MEMS microphone coupon connectors CN25 and CN26 (top view)**

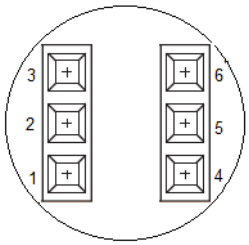


Table 35. **MEMS microphone coupon connectors CN25 and CN26**

Pin number	Description	Pin number	Description
1	DATA	4	V_{DD}
2	GND	5	L/R

Pin number	Description	Pin number	Description
3	CLK	6	NC

8 STM32H7x7I-EVAL I/O assignment

Table 36. **STM32H7x7I-EVAL I/O assignment**

Pin number	Pin name	Default function	Alternate function
N5	PA0-WKUP	KEY_WKUP0	-
N4	PA1	RMII_REF_CLK	-
N3	PA2	RMII_MDIO	-
U2	PA3	ULPI_D0	-
U3	PA4	EXT_RESET	-
T3	PA5	ULPI_CK	-
R3	PA6	GPIO_LCD_BACKLIGHT_CTRL	-
R5	PA7	RMII_CRS_DV	-
E15	PA8	MCO1	-
D15	PA9	USB_FS2_VBUS	-
D14	PA10	USB_FS2_ID	-
E17	PA11	USB_FS2_DM	FDCAN_1_RXFD
E16	PA12	USB_FS2_DP	FDCAN_1_TXFD
C15	PA13	JTMS-SWDIO	-
B14	PA14	JTCK-SWCLK	-
A14	PA15	JTDI	CEC
U5	PB0	ULPI_D1	-
T5	PB1	ULPI_D2	-
R6	PB2	QSPI_CLK	-
C6	PB3	JTDO/TRACESWO	-
B7	PB4	NJTRST	-
A5	PB5	ULPI_D7	-
B5	PB6	I2C_1_SCL	-
C5	PB7	I2C_1_SDA	-
D5	PB8	SDIO_1_CKIN	-
D4	PB9	SDIO_1_CDIR	-
P11	PB10	ULPI_D3	-
P12	PB11	ULPI_D4	-
T14	PB12	ULPI_D5	USB_FS1_ID
U14	PB13	ULPI_D6	USB_FS1_VBUS
U15	PB14	USART1_TX	USB_FS1_DM
T15	PB15	USART1_RX	USB_FS1_DP
L2	PC0	ULPI_STP	-
M2	PC1	RMII_MDC	PDM1_D1
M3	PC2	DFSDM_CKOUT	-
M4	PC3	DFSDM_DATA1	-
T4	PC4	RMII_RXD0	-

Pin number	Pin name	Default function	Alternate function
U4	PC5	RMII_RXD1	-
F14	PC6	SDIO_1_D0DIR	-
F13	PC7	SDIO_1_D123DIR	-
E13	PC8	SDIO_1_D0	-
E14	PC9	SDIO_1_D1	-
A13	PC10	SDIO_1_D2	-
B13	PC11	SDIO_1_D3	-
C12	PC12	SDIO_1_CK	-
E3	PC13-ANTI_TAMP	KEY_TAMP_1/WKUP2	-
C2	PC14-OSC32_IN	OSC32_IN	-
C1	PC15-OSC32_OUT	OSC32_OUT	-
D13	PD0	FMC_D2	-
E12	PD1	FMC_D3	-
D12	PD2	SDIO_1_CMD	-
B12	PD3	GPIO_CAN_STANDBY	-
A12	PD4	FMC_NOE	-
A11	PD5	FMC_NWE	-
B11	PD6	FMC_NWAIT	-
C11	PD7	FMC_NE1	-
U16	PD8	FMC_D13	-
T17	PD9	FMC_D14	-
T16	PD10	FMC_D15	-
R15	PD11	FMC_A16	-
R16	PD12	FMC_A17	-
R17	PD13	FMC_A18	-
P16	PD14	FMC_D0	-
P15	PD15	FMC_D1	-
C4	PE0	FMC_NBL0	-
B4	PE1	FMC_NBL1	-
C3	PE2	PDM1_CK1	FMC_A23/TRACECLK/ SAI_1_MCLK_A
D3	PE3	SAI1_SD_B	FMC_A19/TRACED0
D2	PE4	SAI1_FS_A	FMC_A20/TRACED1
D1	PE5	SAI1_SCK_A	FMC_A21/TRACED2
E5	PE6	SAI1_SD_A	FMC_A22/TRACED3
U9	PE7	FMC_D4	-
T9	PE8	FMC_D5	-
P9	PE9	FMC_D6	-
N9	PE10	FMC_D7	-
P10	PE11	FMC_D8	-
R10	PE12	FMC_D9	-

Pin number	Pin name	Default function	Alternate function
T10	PE13	FMC_D10	-
U10	PE14	FMC_D11	-
R11	PE15	FMC_D12	-
G4	PF0	FMC_A0	-
G3	PF1	FMC_A1	-
G1	PF2	FMC_A2	-
H4	PF3	FMC_A3	-
J5	PF4	FMC_A4	-
J4	PF5	FMC_A5	-
K2	PF6	QSPI_BK1_IO3	-
K3	PF7	QSPI_BK1_IO2	-
K4	PF8	QSPI_BK1_IO0	-
L4	PF9	QSPI_BK1_IO1	-
L3	PF10	GPIO_DSI_RST	-
T7	PF11	SDR_SDNRAS	-
R7	PF12	FMC_A6	-
P7	PF13	FMC_A7	-
P8	PF14	FMC_A8	-
R9	PF15	FMC_A9	-
T8	PG0	FMC_A10	-
U8	PG1	FMC_A11	-
H16	PG2	FMC_A12	-
H15	PG3	FMC_A13	-
H14	PG4	FMC_A14 / SDR_BA0	-
G14	PG5	FMC_A15 / SDR_BA1	-
G15	PG6	QSPI_BK1_NCS	-
F16	PG7	SAI_1_MCLK_A	-
F15	PG8	SDR_SDCLK	-
A10	PG9	QSPI_BK2_IO2	-
A9	PG10	FMC_NE3	-
B9	PG11	RMII_TX_EN	-
C9	PG12	RMII_TXD1	-
D9	PG13	RMII_TXD0	-
D8	PG14	QSPI_BK2_IO3	-
D6	PG15	SDR_SDNCAS	-
J2	PH0 - OSC_IN	OSC_IN	-
J1	PH1 - OSC_OUT	OSC_OUT	-
N2	PH2	QSPI_BK2_IO0	-
P2	PH3	QSPI_BK2_IO1	-
P3	PH4	ULPI_NXT	-

Pin number	Pin name	Default function	Alternate function
P4	PH5	SDR_SDNWE	-
T11	PH6	SDR_SDNE1	-
U13	PH7	SDR_SDCKE1	-
T13	PH8	FMC_D16	-
R13	PH9	FMC_D17	-
P13	PH10	FMC_D18	-
P14	PH11	FMC_D19	-
R14	PH12	FMC_D20	-
D16	PH13	FMC_D21	-
B17	PH14	FMC_D22	-
B16	PH15	FMC_D23	-
A16	PI0	FMC_D24	-
A15	PI1	FMC_D25	-
B15	PI2	FMC_D26	-
C14	PI3	FMC_D27	-
A4	PI4	FMC_NBL2	-
A3	PI5	FMC_NBL3	-
A2	PI6	FMC_D28	-
B3	PI7	FMC_D29	-
E4	PI8- ANTI TAMP2	GPIO_EXPANDER_INT	-
E2	PI9	FMC_D30	-
F3	PI10	FMC_D31	-
F4	PI11	ULPI_DIR	-
H1	PI12	-	-
H2	PI13	-	-
H3	PI14	-	-
P5	PI15	-	-
N6	PJ0	-	-
P6	PJ1	-	-
T6	PJ2	DSI_TE	-
U6	PJ3	-	-
U7	PJ4	-	-
R12	PJ5	-	-
N15	PJ6	-	-
N14	PJ7	TRGIN	-
N13	PJ8	-	-
M14	PJ9	-	-
L14	PJ10	-	-
K14	PJ11	-	-
D11	PJ12	TRGOUT	-

Pin number	Pin name	Default function	Alternate function
E10	PJ13	-	-
D10	PJ14	-	-
B10	PJ15	-	-
J14	PK0	-	-
J15	PK1	-	-
H17	PK2	-	-
C8	PK3	LED1	-
B8	PK4	LED2	-
A8	PK5	LED3	-
C7	PK6	LED4	-
D7	PK7	-	-
T1	PA0_C	Potentiometer	-
T2	PA1_C	-	-
R1	PC2_C	-	-
R2	PC3_C	-	-

9 STM32H7x7I-EVAL electrical schematics

This section provides the design schematics for the STM32H7x7I-EVAL Evaluation board:

- Overall schematic for the STM32H7x7I-EVAL (see Figure 21)
- STM32H7x7I-EVAL MCU (see Figure 22)
- Power (see Figure 23)
- SRAM, Flash memory and SDRAM (see Figure 24)
- Audio (see Figure 25)
- LCD (see Figure 26)
- Ethernet (see Figure 27)
- USB OTG_HS (see Figure 28)
- USB OTG_FS (see Figure 29)
- RS232 (see Figure 30)
- FDCAN and Quad-SPI (see Figure 31)
- microSD (see Figure 32)
- Peripherals (see Figure 33)
- Extension connectors (see Figure 34)
- STLINK-V3E (see Figure 35)
- MFX (see Figure 36)
- JTAG and trace (see Figure 37)
- 4” DSI LCD board (see Figure 38)

Figure 20. STM32H7x7I-EVAL Evaluation board

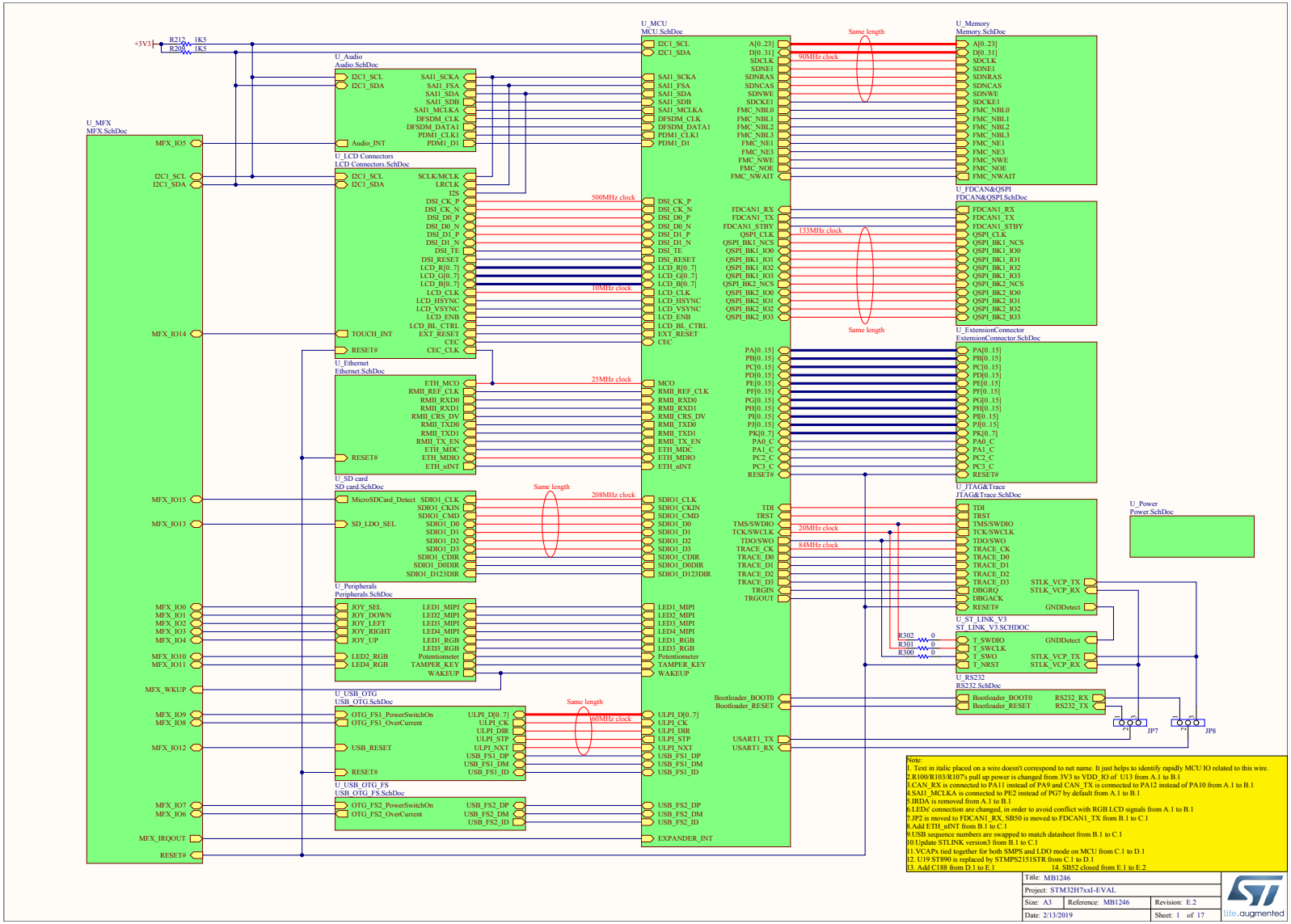


Figure 21. STM32H7x7I-EVAL MCU

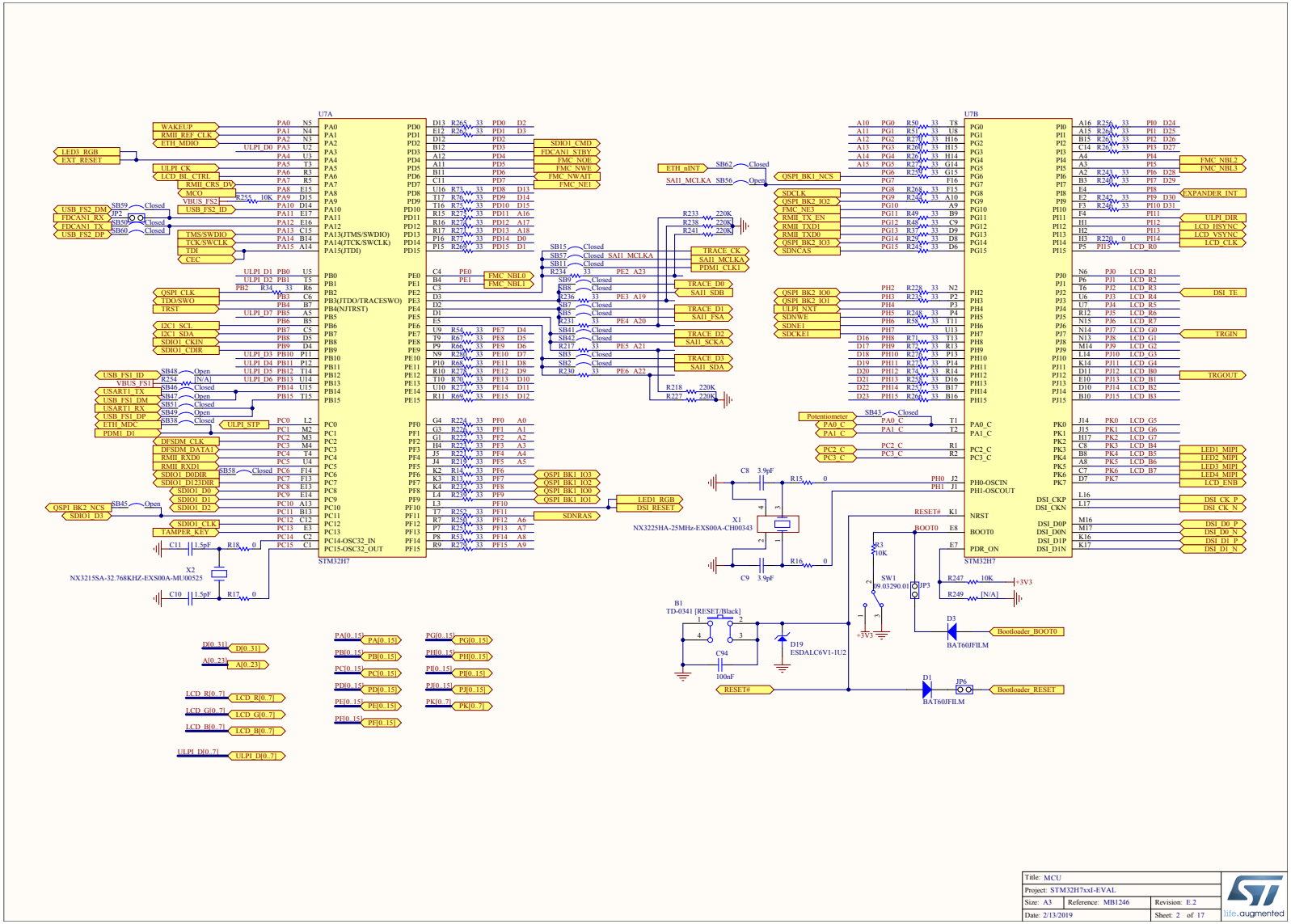


Figure 22. **STM32H7x7I-EVAL power**

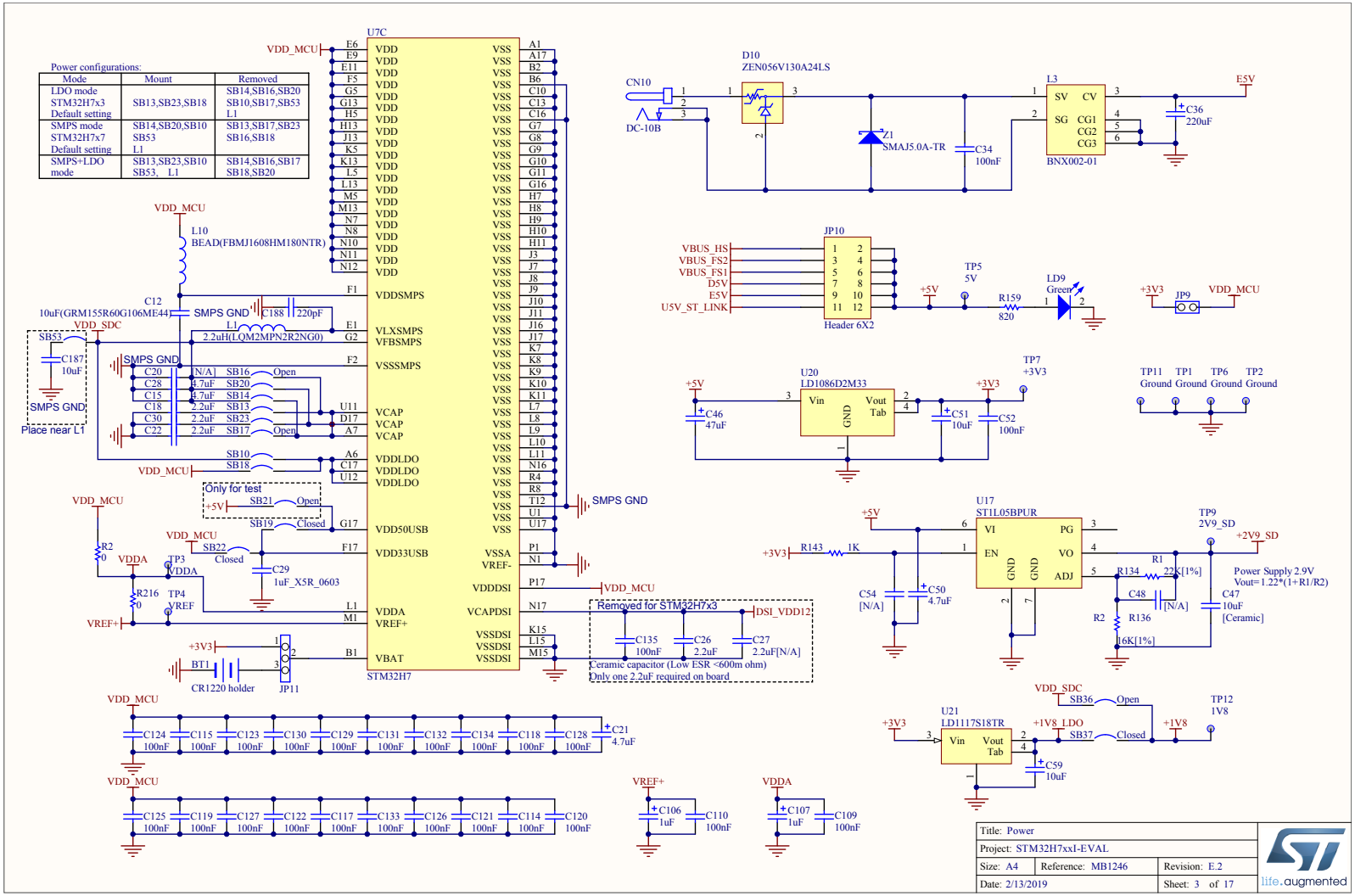


Figure 23. STM32H7x7I-EVAL SRAM, FLASH and SDRAM

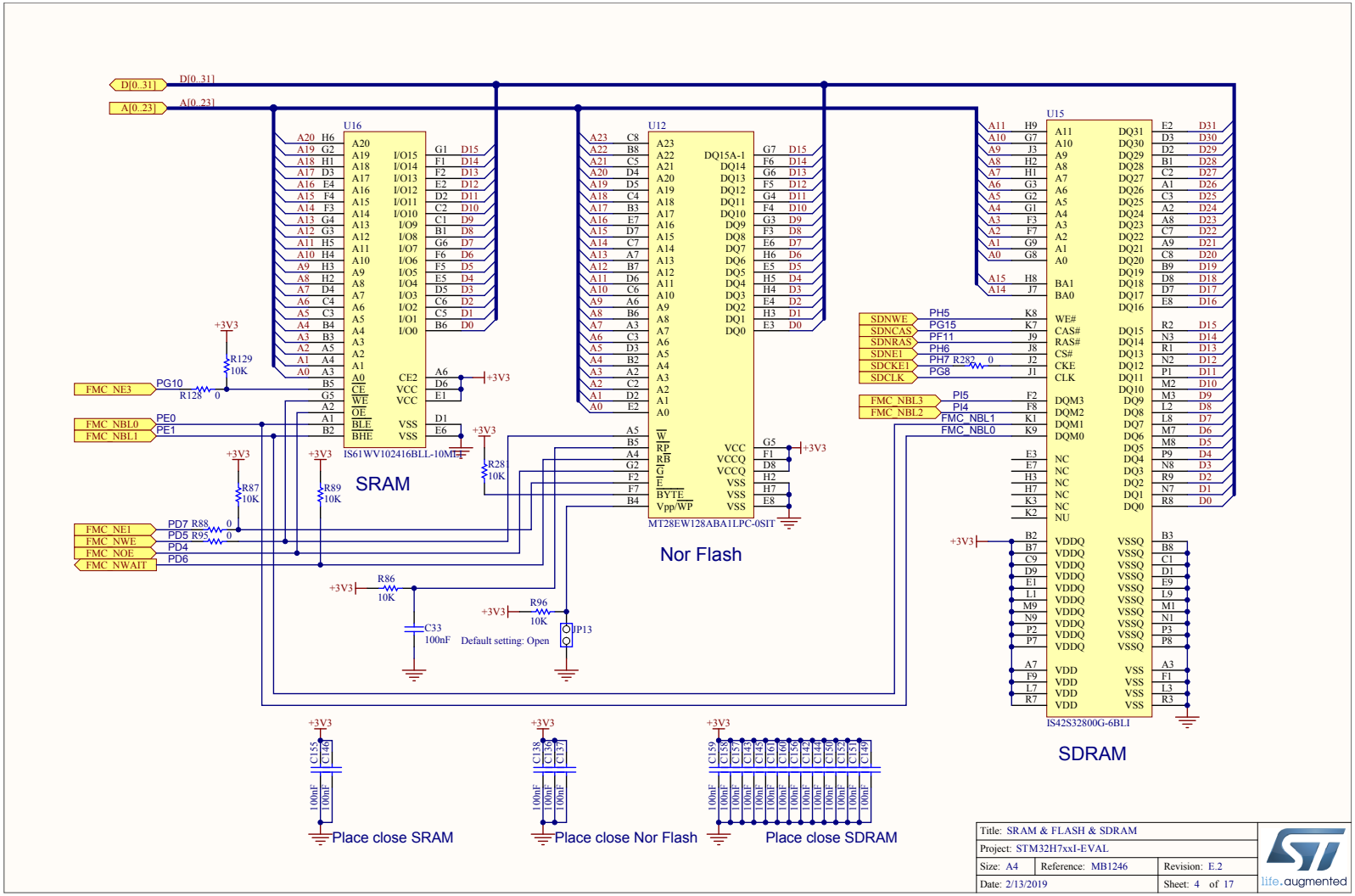


Figure 24. STM32H7x7I-EVAL audio

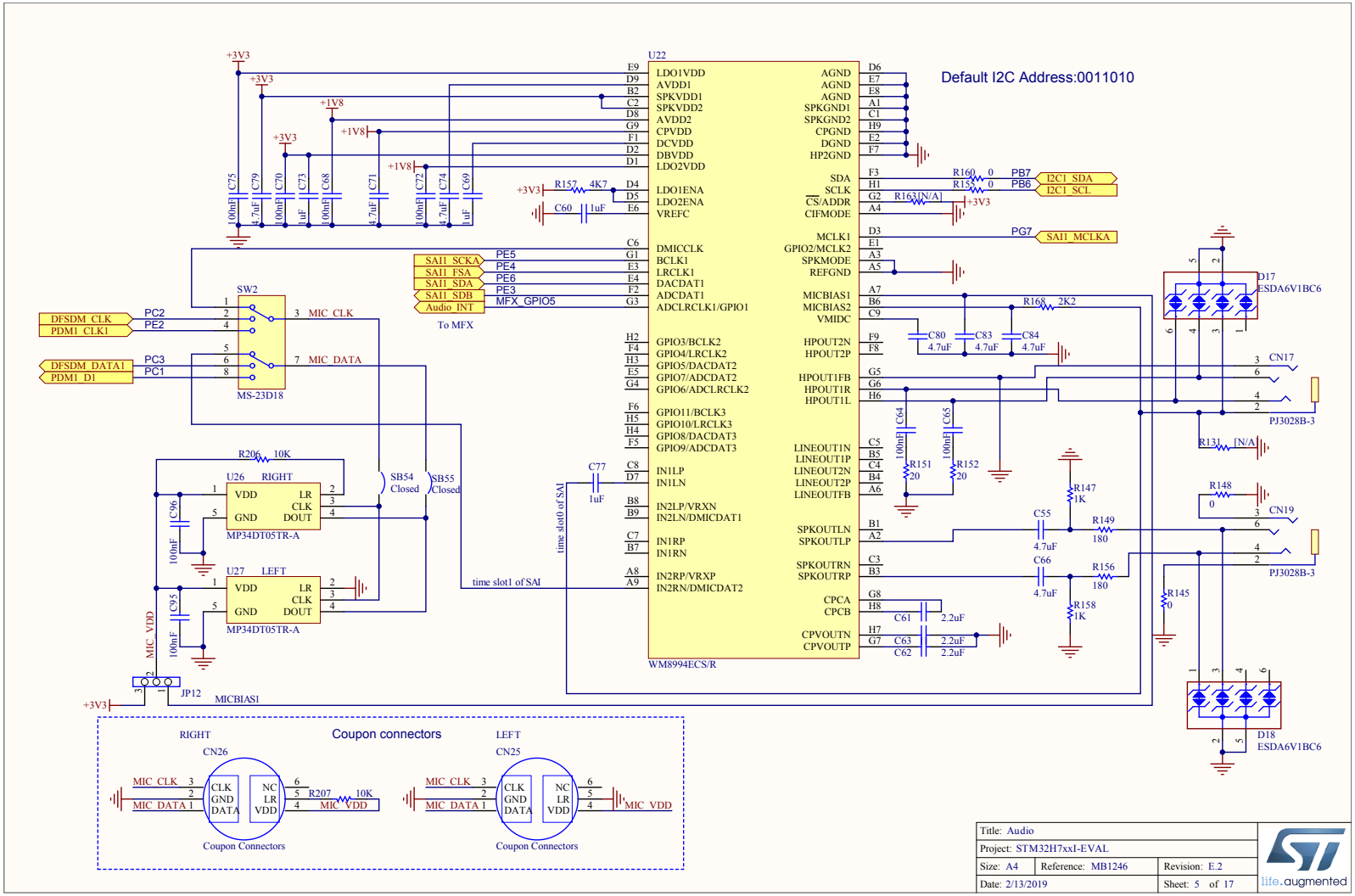


Figure 25. STM32H7x7I-EVAL LCD connectors

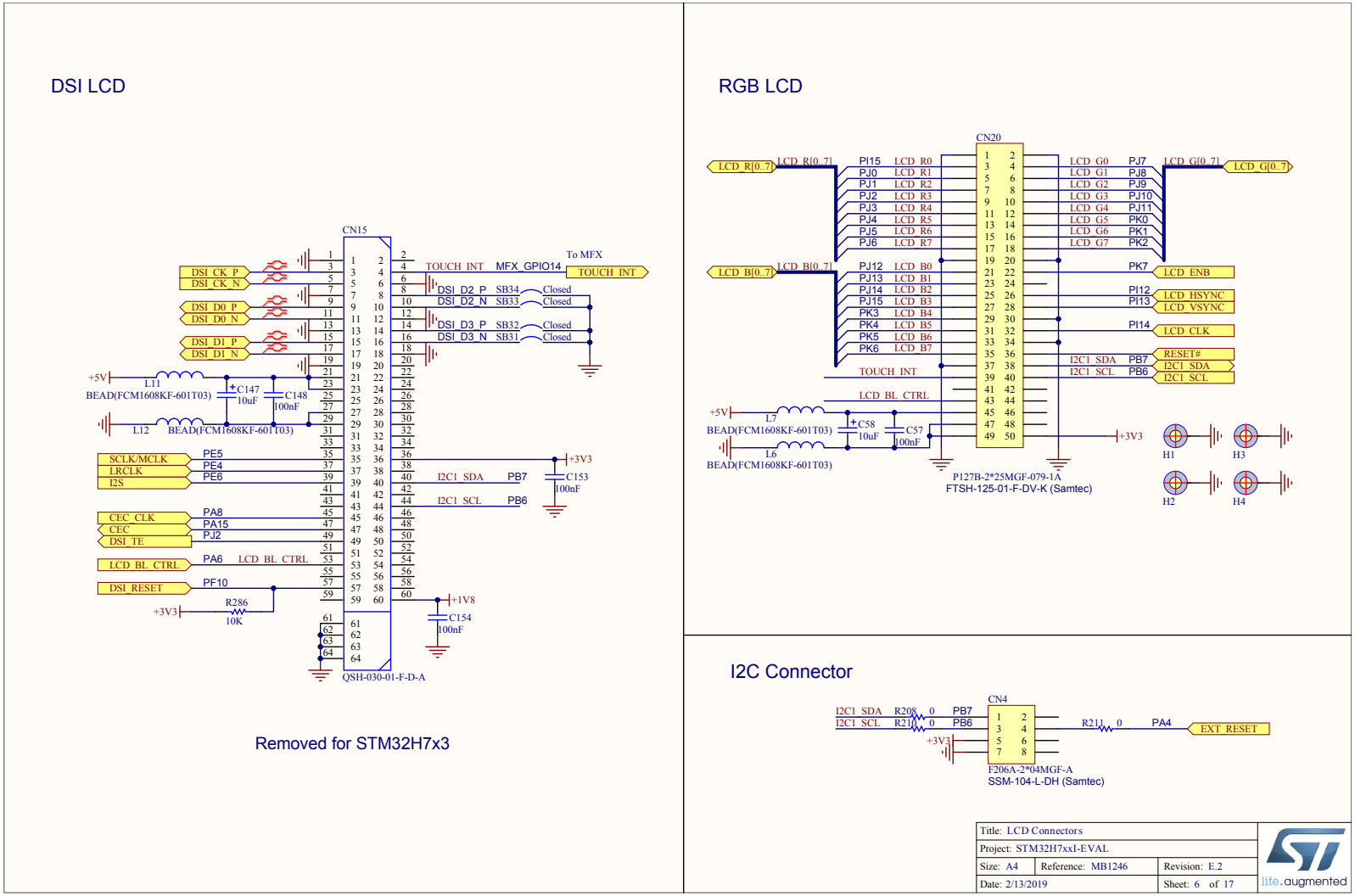


Figure 26. STM32H7x7I-EVAL Ethernet

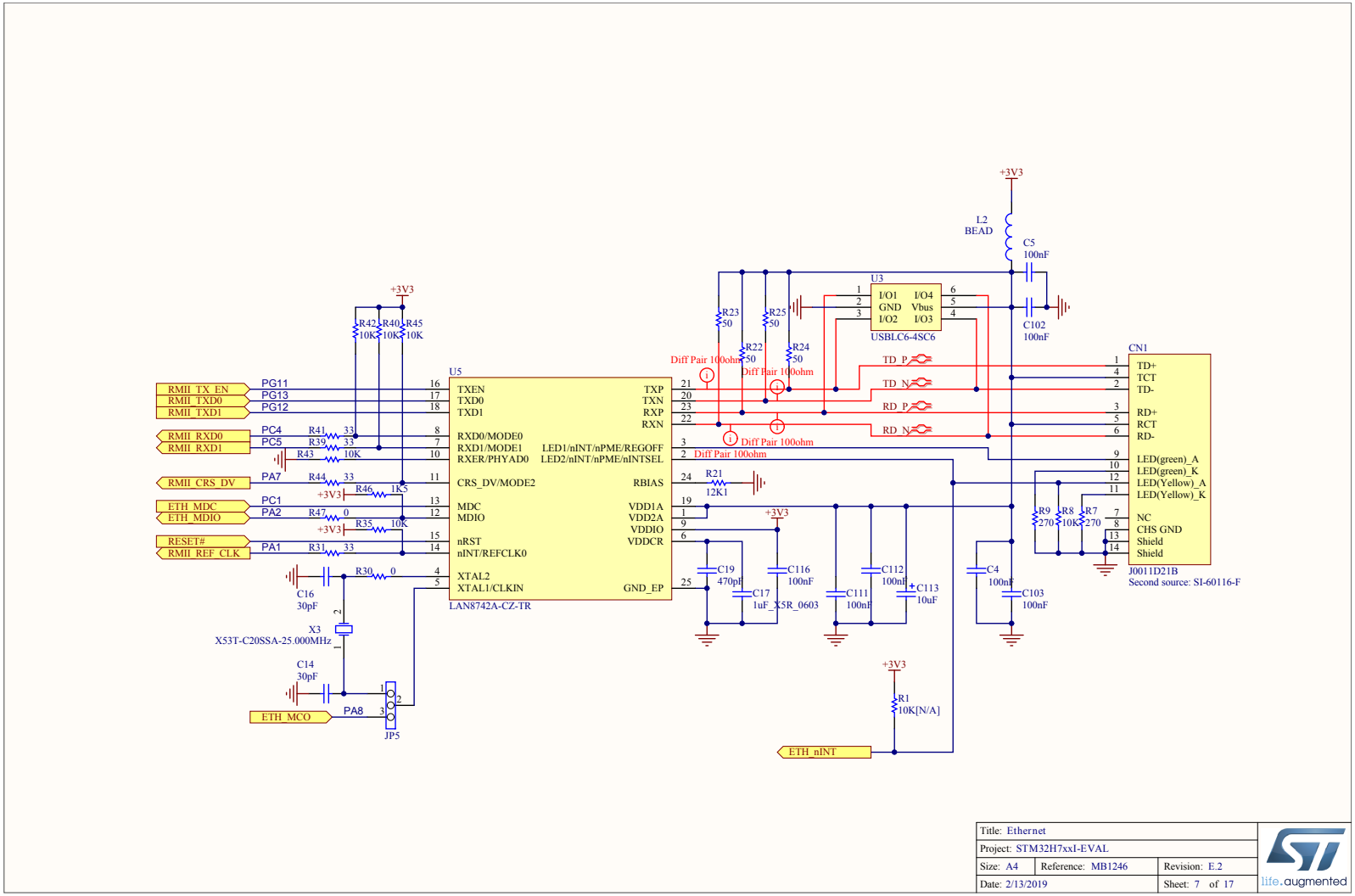


Figure 27. STM32H7x7I-EVAL USB OTG_HS

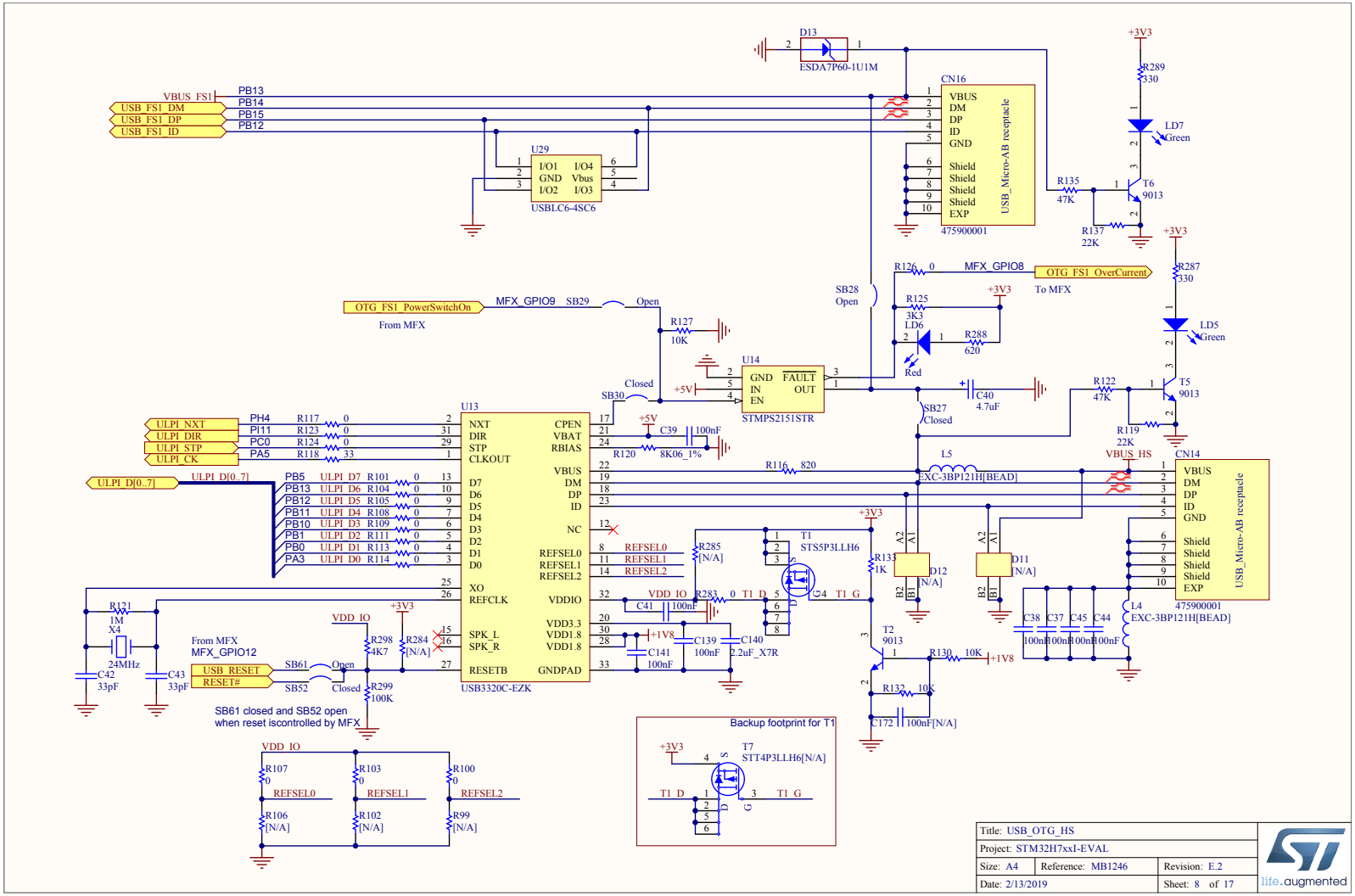


Figure 28. STM32H7x7I-EVAL USB OTG_FS

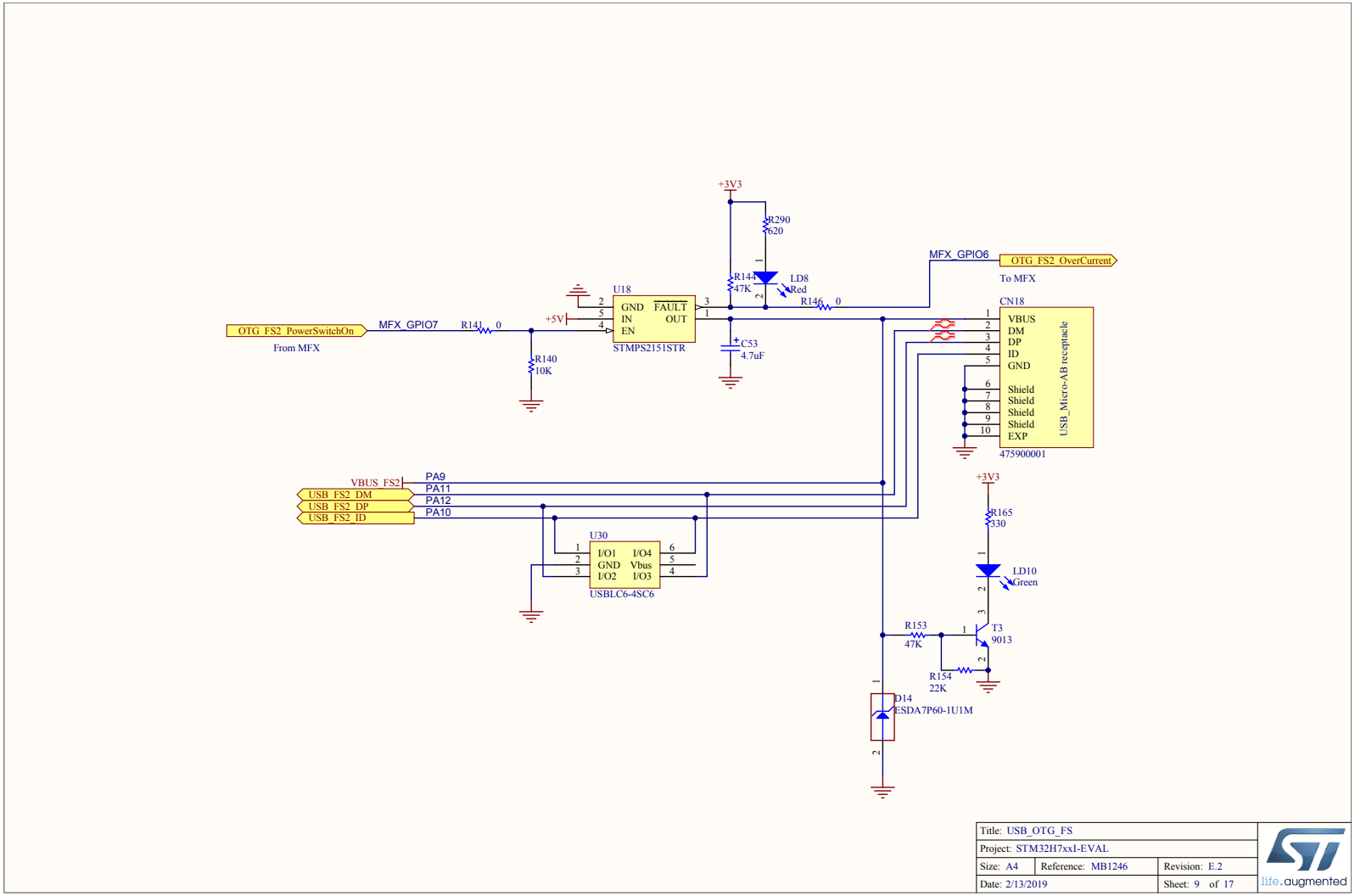
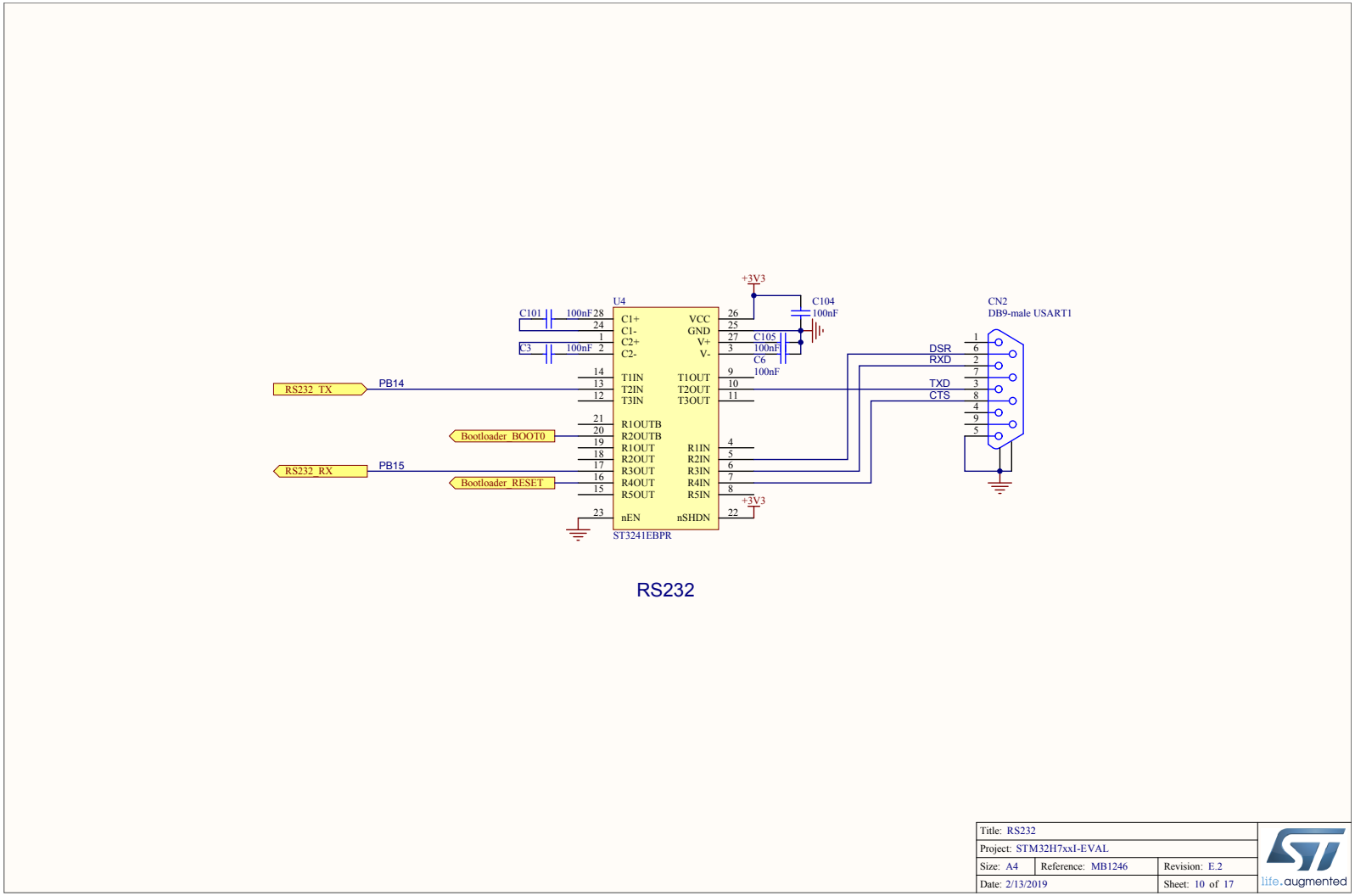


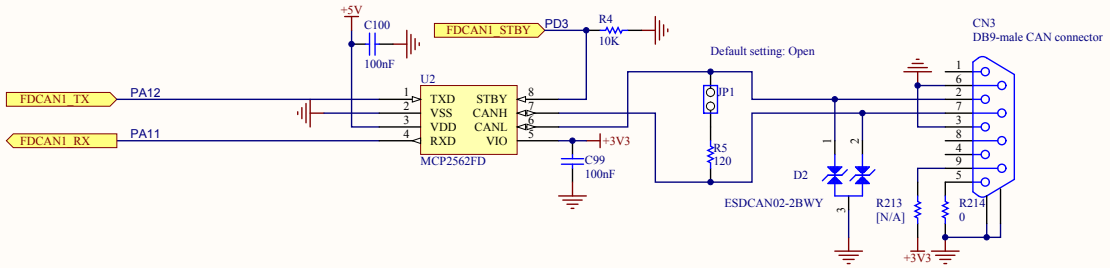
Figure 29. STM32H7x7I-EVAL RS232



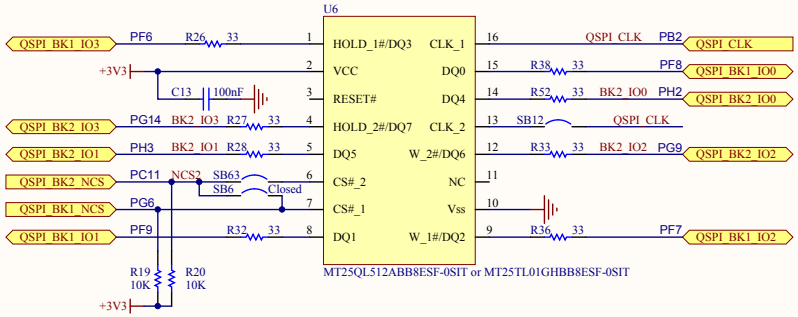
RS232

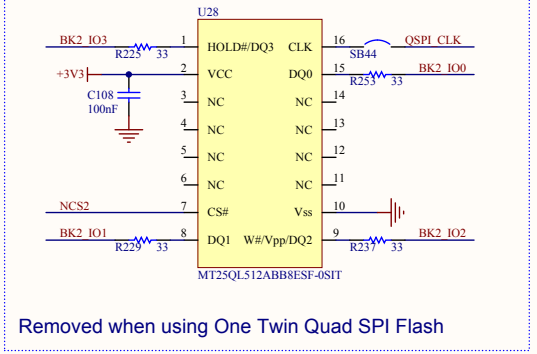
Figure 30. STM32H7x7I-EVAL FDCAN and QSPI

FDCAN



Twin Quad SPI Flash





Removed when using One Twin Quad SPI Flash

Twin Quad SPI Flash configurations:

Two Quad SPI Flash	U6:MT25QL512ABB8ESF-0SIT	U28:MT25QL512ABB8ESF-0SIT	R225/R229/R237/R253, SB44, C108 ON R27/R28/R33/R52, SB12/SB63 OFF
One Twin Quad SPI Flash	U6:MT25TL01GHBB8ESF-0SIT	U28:NA	R27/R28/R33/R52, SB12/SB63 ON R225/R229/R237/R253, SB44, C108 OFF

Title: FDCAN & QSPI		
Project: STM32H7xxI-EVAL		
Size: A4	Reference: MB1246	Revision: E.2
Date: 2/13/2019		Sheet: 11 of 17

life.augmented

Figure 31. STM32H7x7I-EVAL microSD 3.0 card

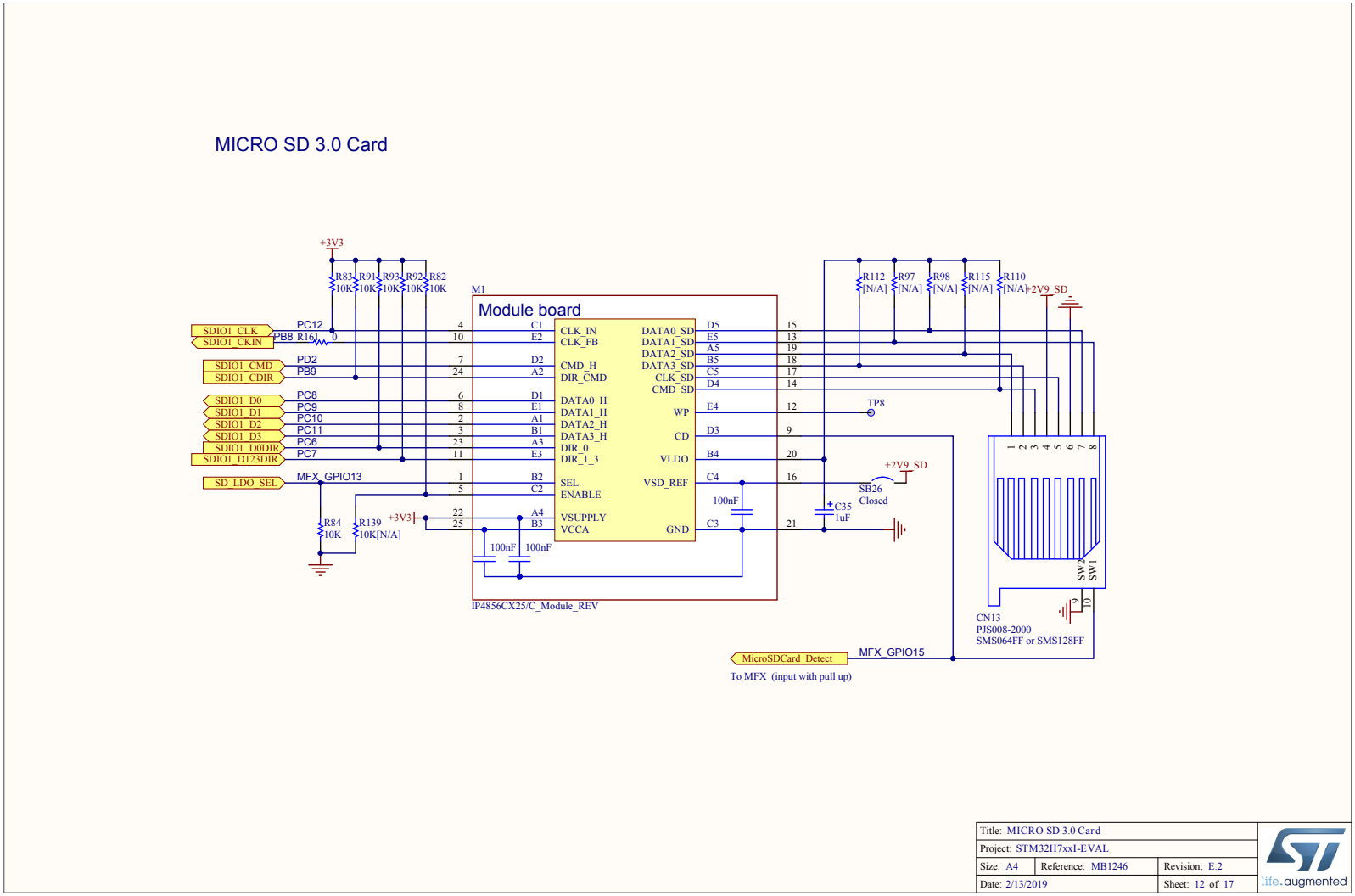


Figure 32. STM32H7x7I-EVAL peripherals

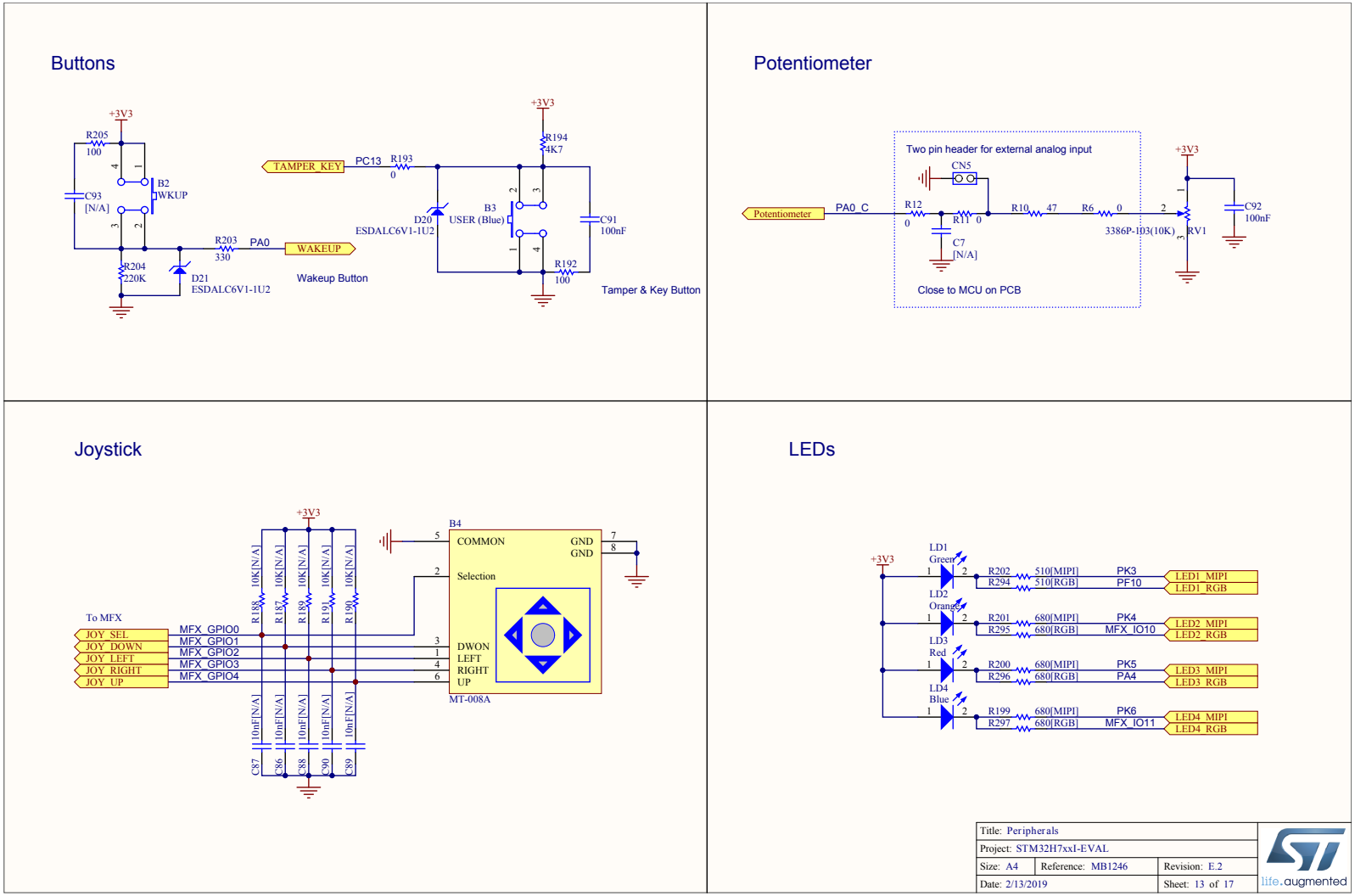


Figure 33. STM32H7x7I-EVAL extension connectors

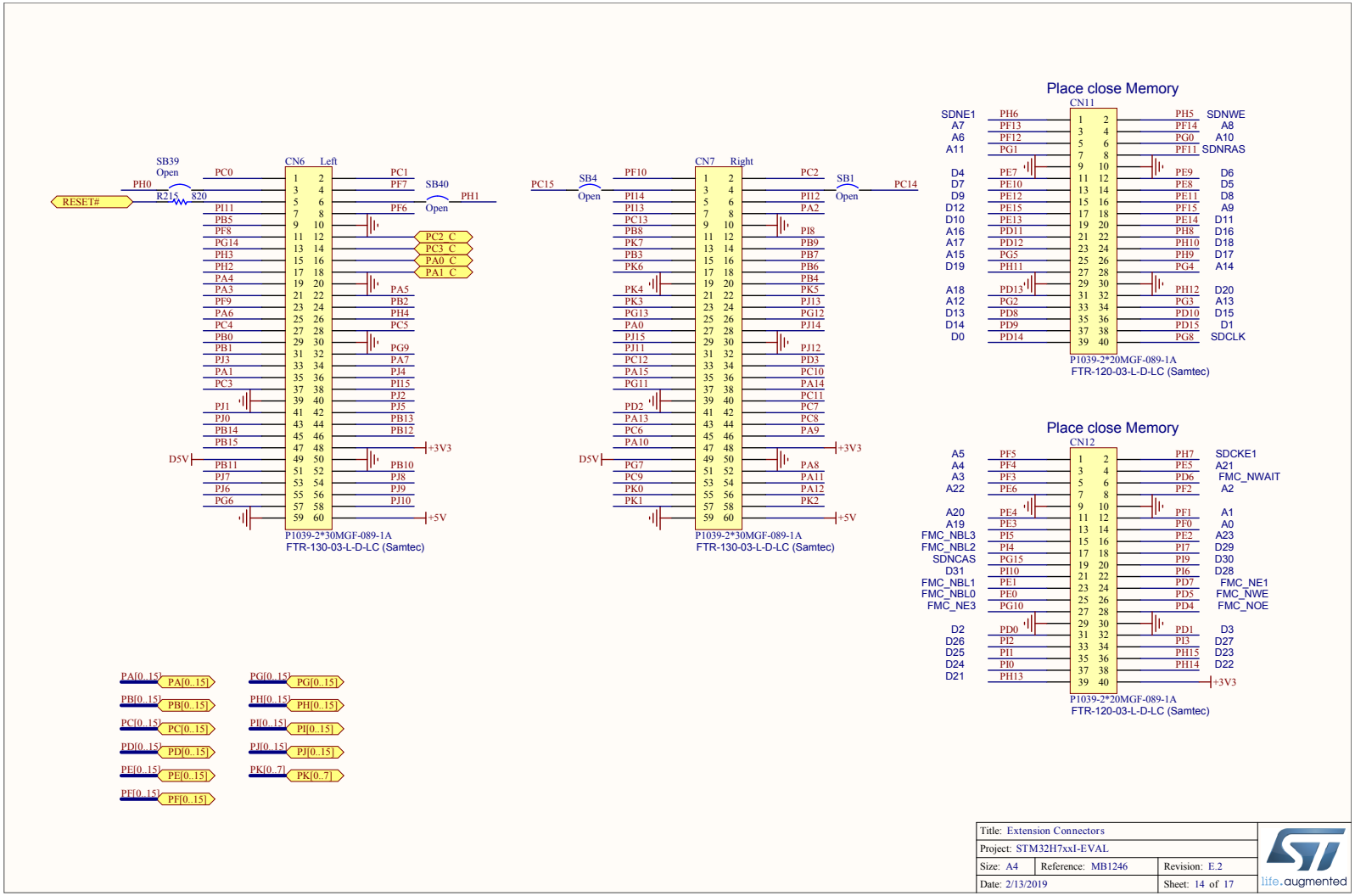


Figure 34. STM32H7x7I-EVAL STLINK-V3E

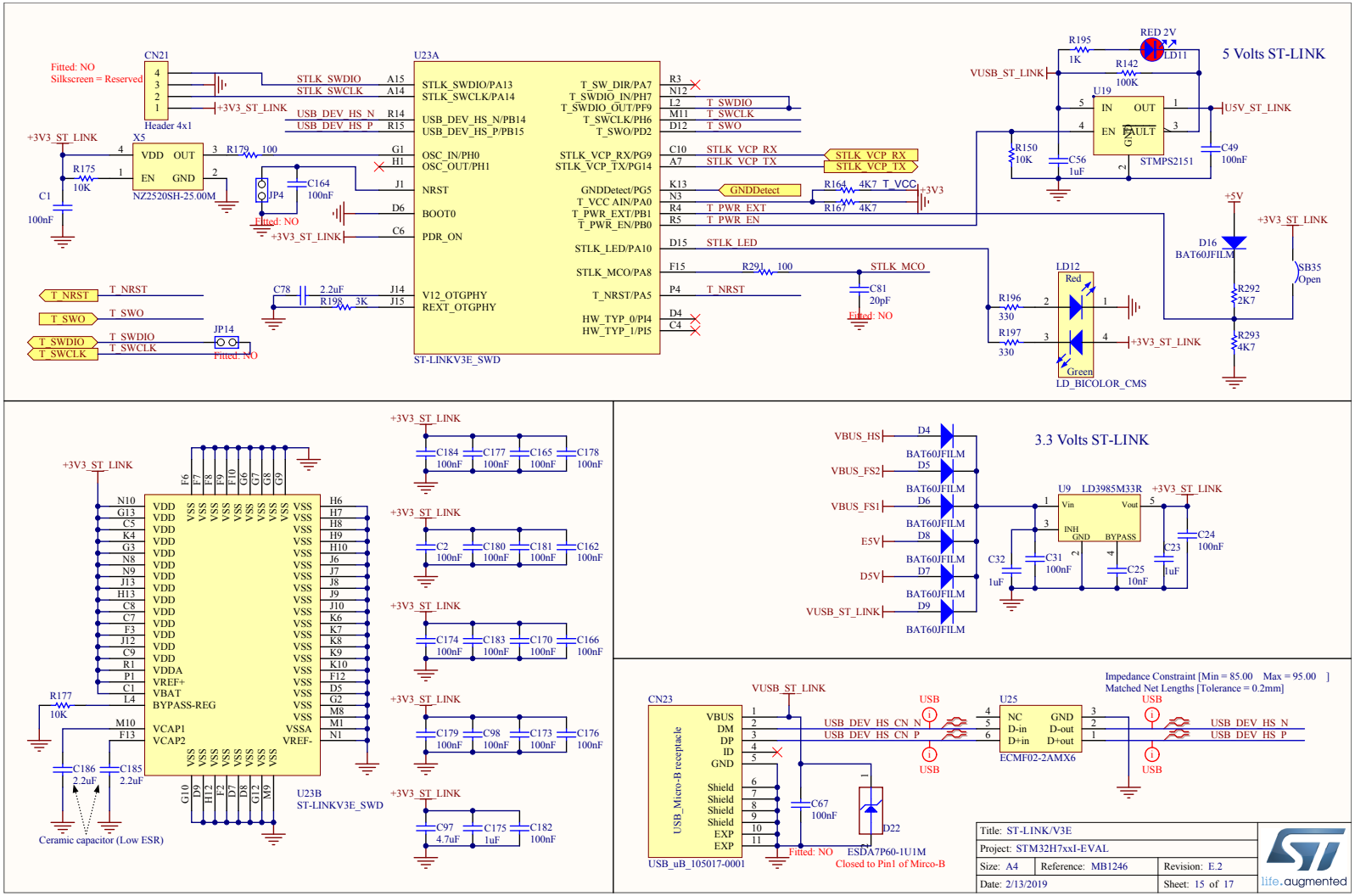


Figure 35. STM32H7x7I-EVAL MFX

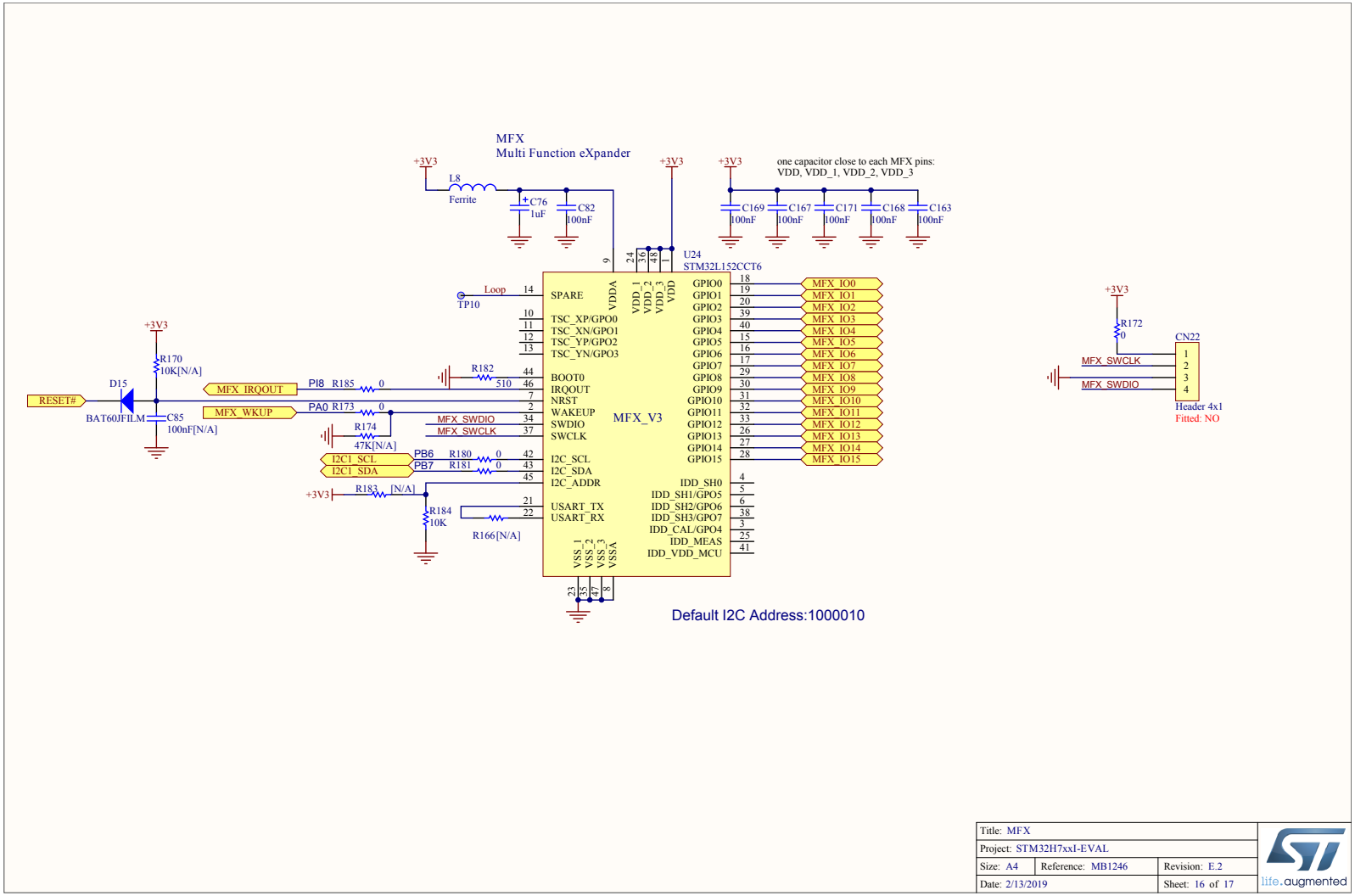


Figure 36. STM32H7x7I-EVAL JTAG and trace

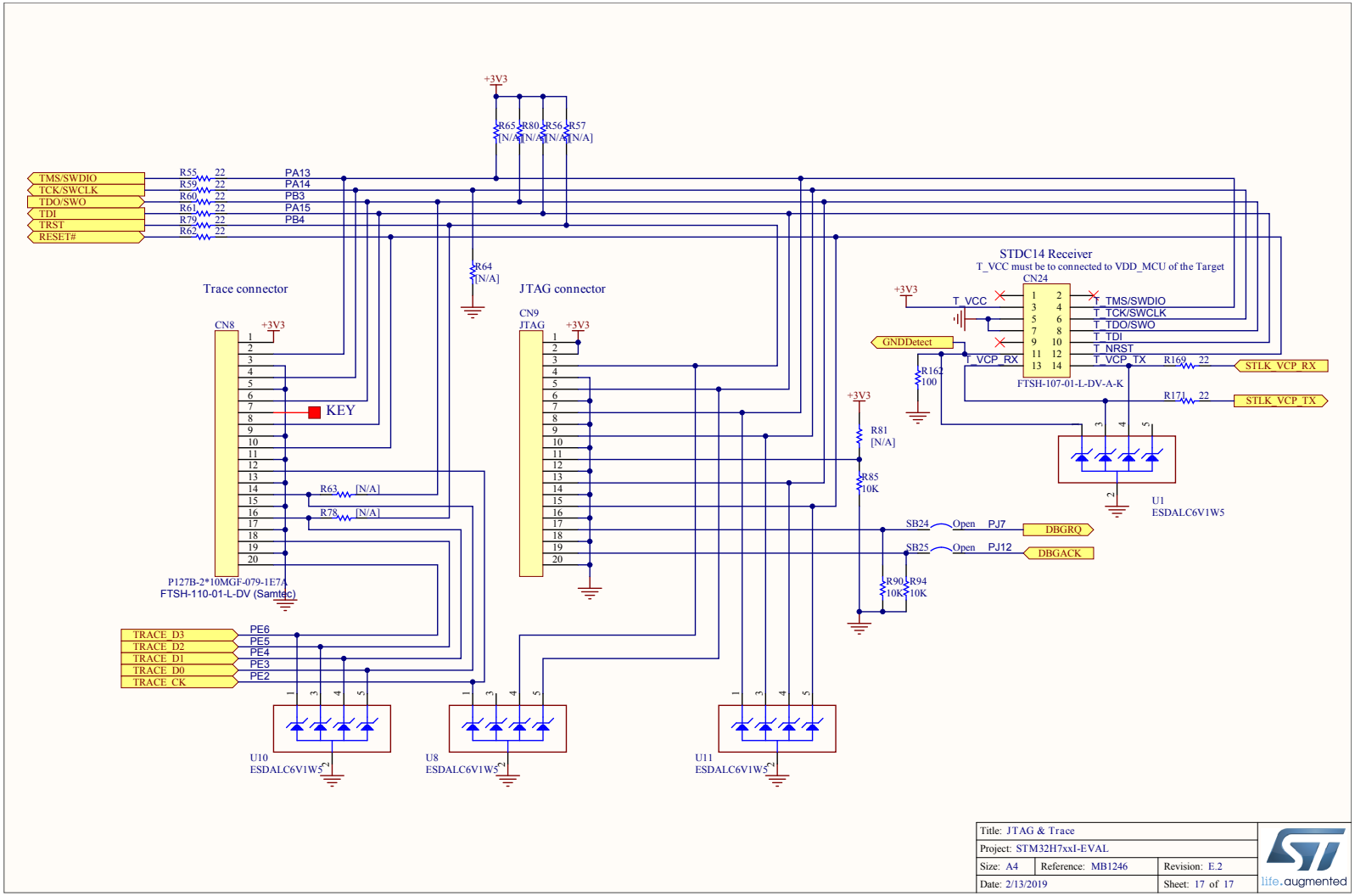
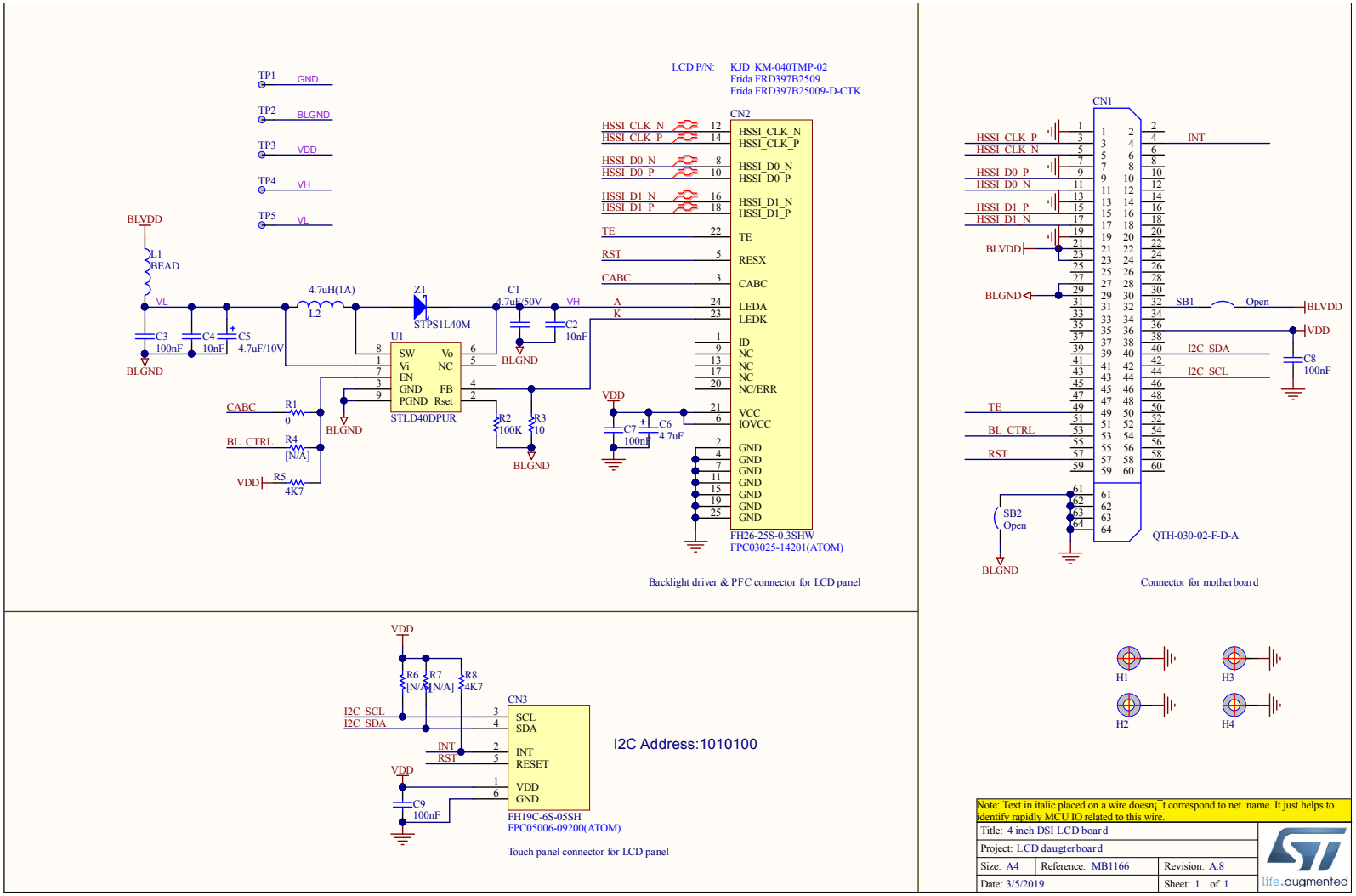


Figure 37. STM32H7x7I-EVAL 4” DSI LCD board



10 STM32H7x7I-EVAL board revision history and limitations

Table 37. **STM32H7x7I-EVAL board revision history and limitations**

Board	Version	Revision details	Known limitations
MB1246 (Main board)	E-02	Initial version of STM32H7x7I-EVAL	-
MB1166 (LCD board)	A-08	Initial version	-

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

A.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)

Terry Blanchard
Americas Region Legal | Group Vice President and Regional Legal Counsel, The Americas
STMicroelectronics, Inc.
750 Canyon Drive | Suite 300 | Coppell, Texas 75019
USA
Telephone: +1 972-466-7845

A.2 IC Compliance Statement

This device complies with FCC and Industry Canada RF radiation exposure limits set forth for general population for mobile application (uncontrolled exposure). This device must not be collocated or operating in conjunction with any other antenna or transmitter.

Compliance Statement

Notice: This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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

Déclaration de conformité

Avis: Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

Revision history

Table 38. **Document revision history**

Date	Revision	Changes
20-Dec-2018	1	Initial release.
28-Mar-2019	2	Reorganized the beginning of the document: updated *Features* and *Ordering information*; added *Codification*. Updated the schematics in *Section 9 STM32H7x7I-EVAL electrical schematics*. Updated the corresponding entries in *Section 10 STM32H7x7I-EVAL board revision history and limitations*.
21-May-2019	3	Changed document classification to public.
3-Dec-2019	4	Updated the configurations of the LDO and SMPS modes in *Section 6.4.1 SMPS/LDO power supply* in accordance with their description in *Figure 23. STM32H7x7I-EVAL power*.
3-Feb-2020	5	Updated SMPS/LDO caution in Section 6.4.1 SMPS/LDO power supply for hardware/firmware mismatch deadlock recovery.

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