UM1903
User manual

Evaluation board with STM32F756NG MCU

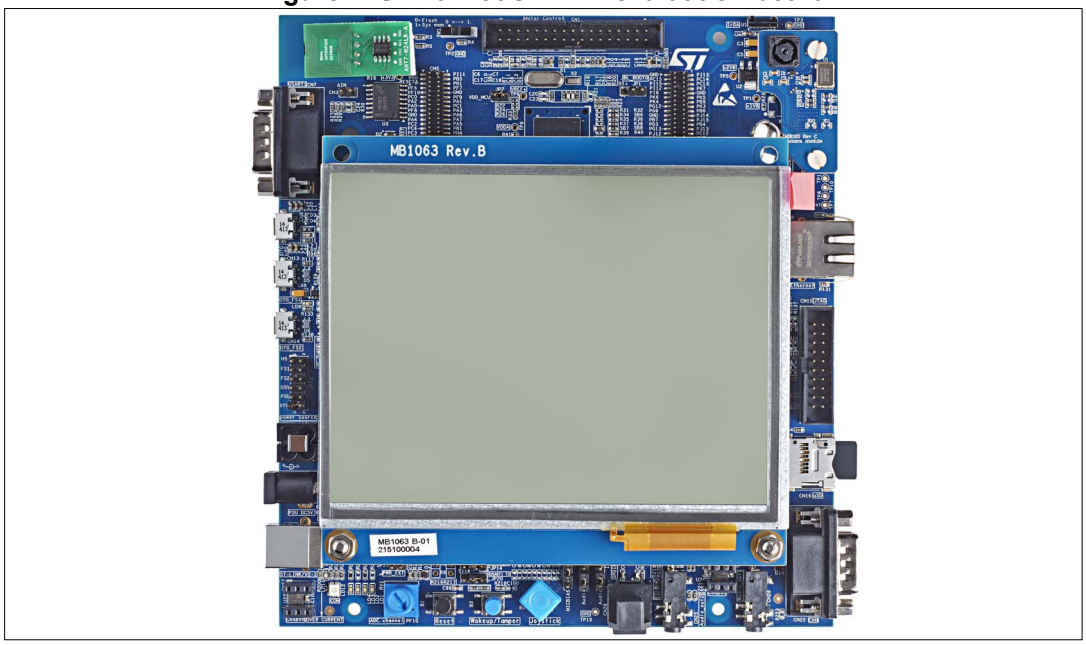
Introduction

The STM32756G-EVAL evaluation board is a complete demonstration and development platform for STMicroelectronics ARM® Cortex® -M7 core-based STM32F756NGH6 microcontroller. It features four I^2C interfaces, six SPIs with three multiplexed simplex I^2S interfaces, SDMMC, four USARTs, four UARTs, two CANs, three 12-bit ADCs, two 12-bit DACs, two SAIs, 8 to 14-bit digital camera module interface, internal 320+4-Kbyte SRAM and 1-Mbyte Flash memory, USB HS OTG and USB FS OTG, Ethernet MAC, FMC interface, Quad-SPI interface, cryptographic hardware accelerator, JTAG debugging support. This evaluation board can be used as a reference design for user application development but it is not considered as a final application.

The full range of hardware features on the board helps the user to evaluate all peripherals (USB OTG HS, USB OTG FS, Ethernet, Motor control, CAN, microSD card, USART, Audio DAC and ADC, digital microphone, IrDA, RF-EEPROM, SRAM, Nor Flash memory, SDRAM, Quad-SPI Flash memory, 5.7" TFT LCD with a capacitive touch panel and others) and to develop his applications. Extension headers make it possible to easily connect a daughterboard for a specific application.

The integrated ST-LINK/V2-1 provides an embedded in-circuit debugger and programmer for the STM32.

Figure 1. STM32756G-EVAL evaluation board



1. Picture not contractual.

Contents

List of tables

List of figures

1 Features

- STM32F756NGH6 microcontroller with 1-Mbyte Flash memory and 320+4-Kbyte RAM
- Six 5 V power supply options:
  - Power jack
  - ST-LINK/V2-1 USB connector
  - User USB HS connector
  - User USB FS1 connector
  - User USB FS2 connector
  - Daughterboard
- SAI Audio DAC, stereo audio jack which supports headset with microphone
- Stereo digital microphone, audio jack connector used to connect external speakers
- 2-Gbyte (or more) SDMMC interface microSD card
- RF-EEPROM on I^2C compatible serial interface
- RS232 communication
- IrDA transceiver
- JTAG/SWD and ETM trace debug support
- Embedded ST-LINK/V2-1
- IEEE-802.3-2002 compliant Ethernet connector
- Camera module
- 8Mx32-bit SDRAM, 1Mx16-bit SRAM and 8Mx16-bit Nor Flash memory
- 512-Mbit Quad-SPI Nor Flash memory
- 5.7-inch 640x480-pixel TFT color LCD with touch panel
- Joystick with 4-direction control and selector
- Reset, WakeUp/Tamper or key button
- 4-color user LEDs
- Extension connectors and memory connectors for daughterboard or wrapping board
- USB OTG HS and FS with Micro-AB connectors
- RTC with backup battery
- CAN2.0 A/B compliant connection
- Potentiometer
- Motor control connector

2 Demonstration software

Demonstration software is preloaded in the Flash memory of the STM32F756NGH6 MCU for easy demonstration of the device peripherals in stand-alone mode. For more information and to download the latest version available, refer to the STM32756G-EVAL demonstration software available on *www.st.com*.

3 Ordering information

To order the evaluation board for STM32F756NGH6 MCU, use the order code: STM32756G-EVAL2.

4 Delivery recommendations

Some verifications are needed before using the evaluation board for the first time, to make sure that nothing was damaged 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 components to verify are:

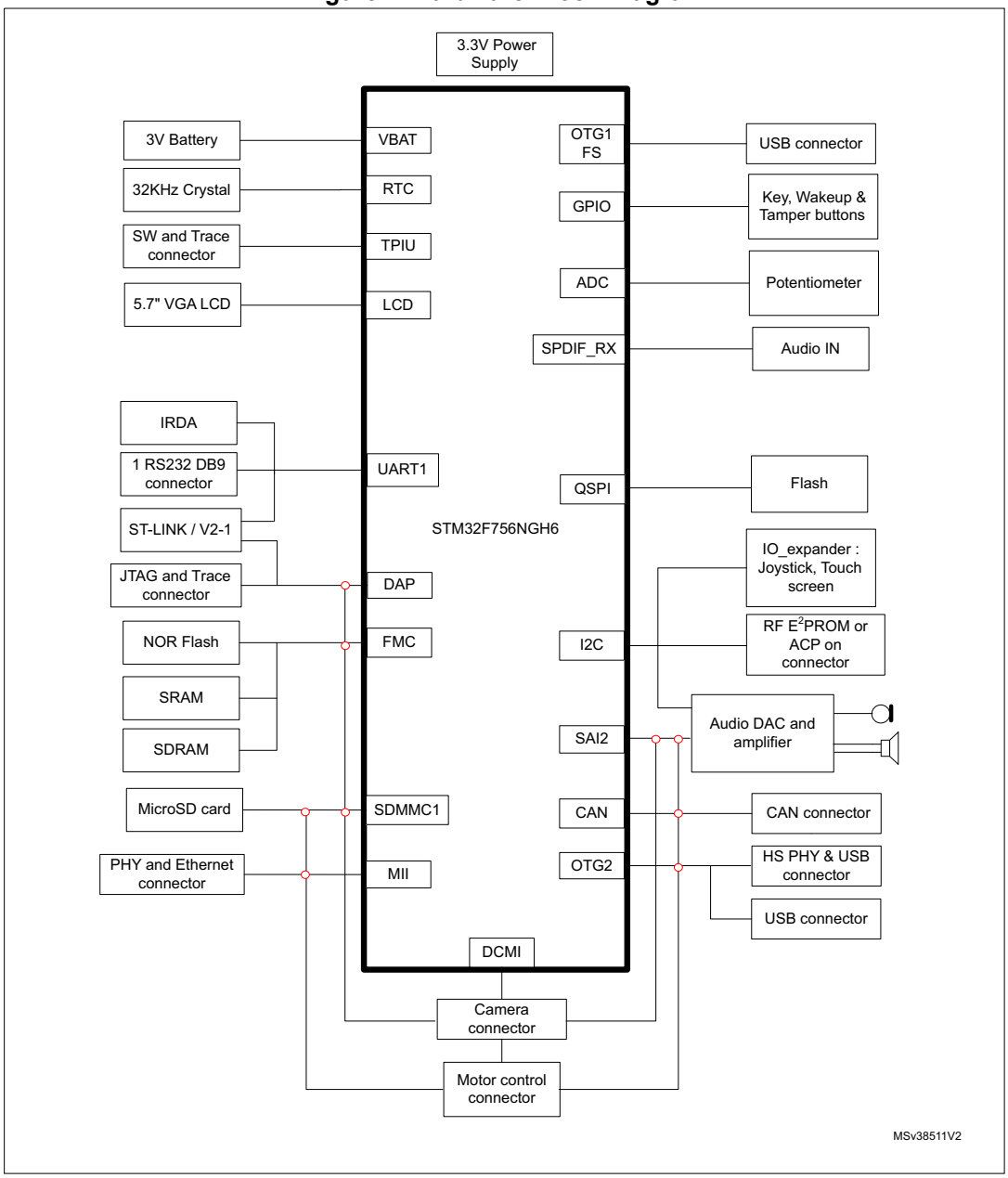
- The 25MHz crystal (X1) and 25MHz crystal (X4), which may have been removed from its socket by a shock
- The microSD card, which may have been ejected from the connector CN16 (right side of the board)
- The dual-interface EEPROM board (ANT7-M24LR-A), which may have been unplugged from the connector CN2 (top left corner of the board)

Caution: There is an explosion risk, if the battery is replaced by an incorrect one.

5 Hardware layout and configuration

STM32756G-EVAL evaluation board is designed around the STM32F756NGH6 (216-pin TFBGA package) MCU. The hardware block diagram *Figure 2: Hardware Block Diagram* illustrates the connection between STM32F756NGH6 MCU and peripherals (SDRAM, SRAM, Nor Flash memory, QSPI Flash memory, Camera module, Color LCD, USB OTG connectors, Motor control connector, USART, IrDA, Ethernet, Audio, CAN, RF-EEPROM, microSD card and embedded ST-LINK/V2-1).

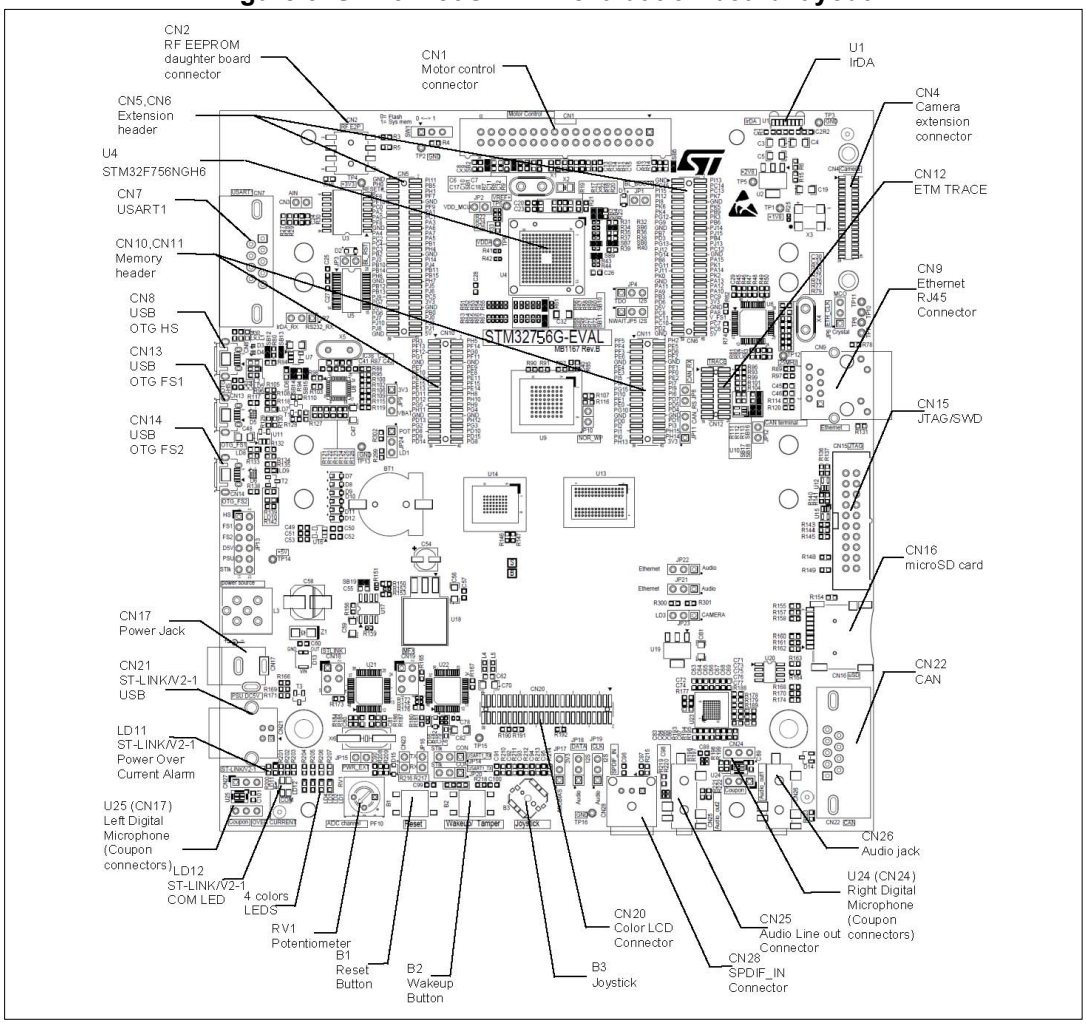
Figure 2. Hardware Block Diagram



1. The red circles show the I/O shared among the default functions and the camera or the motor control connectors.

Figure 3 will help the user to locate all these features on the actual evaluation board.

Figure 3. STM32756G-EVAL evaluation board layout



5.1 Embedded ST-LINK/V2-1

The ST-LINK/V2-1 programming and debugging tool is embedded on the STM32756G-EVAL evaluation board. Compared to ST-LINK/V2 the changes are listed below.

The new features supported on ST-LINK/V2-1 are:

- USB software re-enumeration
- Virtual Com Port interface on USB
- Mass storage interface on USB
- USB power management request for more than 100 mA power on USB

This feature is no more supported on ST-LINK/V2-1:

- SWIM interface

For all general information concerning debugging and programming features common between ST-LINK/V2 and ST-LINK/V2-1 refer to ST-LINK/V2 User Manual UM1075.

Note: ETM can only work at 50 MHz clock by default, because ETM signals are shared with other peripherals. If a better performance of ETM is required (84 MHz/98 MHz), R31, R34, R35, R37, R39, R247, SB4, SB16, SB18 must be removed, to reduce the stub on ETM signals. In this configuration SAI, Ethernet and Camera are not functional and Nor Flash memory and SRAM addresses are limited on A18.

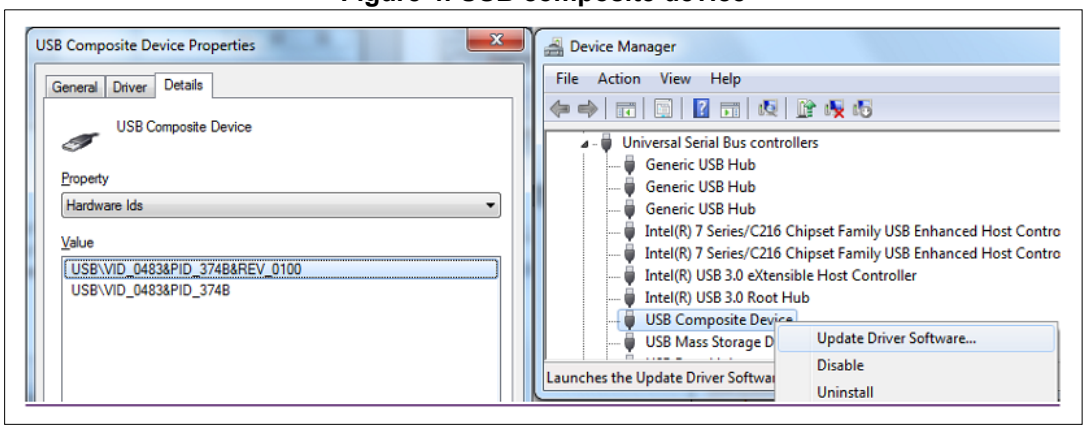
5.1.1 Drivers

The ST-LINK/V2-1 requires a dedicated USB driver, which can be found on *www.st.com* for Windows 7 and 8. On Windows XP the ST-LINK/V2-1 driver requires WinUsb to be installed before using the ST-LINK/V2-1 (either available from Microsoft website or included in the USB driver for ST-LINK/V2 for XP).

In case the STM32756G-EVAL evaluation board is connected to the PC, before the driver is installed, some STM32756G-EVAL interfaces may be declared as “Unknown” in the PC device manager. In this case the user must install the driver files, and update the driver of the connected device from the device manager.

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

Figure 4. USB composite device



5.1.2 ST-LINK/V2-1 firmware upgrade

The ST-LINK/V2-1 embeds a firmware upgrade mechanism for in-situ upgrade through the USB port. As the firmware may evolve during the life time of the ST-LINK/V2-1 product (for example new functionalities, bug fixes, support for new microcontroller families), it is recommended to visit *www.st.com* before starting to use the STM32756G-EVAL board and periodically, in order to stay up-to-date with the latest firmware version.

5.2 Power supply

STM32756G-EVAL evaluation board is designed to be powered by 5 V DC power supply and it is protected by PolyZen from wrong power plug-in event. 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 on the board to the power jack CN17, the power jack on the board (Power Supply Unit on silk screen of JP13 (PSU)). This is default setting of power supply source selection on STM32756G-EVAL evaluation board.
- 5 V DC power with 300 mA limitation from CN21, the USB type B connector of ST-LINK/V2-1 (USB 5 V power source on silkscreen of JP13 (STlk)). If the USB enumeration succeeds (as explained below), the ST-LINK/V2-1 U5V power is enabled, by asserting the PWR_EN pin. This pin is connected to a power switch (ST890), which powers the board. This power switch features also a current limitation to protect the PC in case of short-circuit on board. If an overcurrent (more than 600 mA) happens on the board, the LED LD11 is lit. This setting cannot be used as default power source selection, because the whole board power consumption will be larger than the current limitation of DC power from CN21.
- 5V DC power with 500 mA limitation from CN8, the USB OTG HS Micro-AB connector (USB 5V power source on silkscreen of JP13 (HS)).
- 5V DC power with 500 mA limitation from CN13, the USB OTG FS1 Micro-AB connector (USB 5V power source on silkscreen of JP13 (FS1)).
- 5V DC power with 500 mA limitation from CN14, the USB OTG FS2 Micro-AB connector (USB 5V power source on silkscreen of JP13 (FS2)).
- 5V DC power from CN5 and CN6, the extension connectors for daughterboard (daughterboard power source on silkscreen of JP13 (D5V)).

STM32756G-EVAL evaluation board can be powered from ST-LINK/V2-1 USB connector CN21 (U5V), only when the 5.7" LCD is disconnected, otherwise power consumption exceeds 300mA. When the board is connected to USB port only the ST-LINK/V2-1 is powered for the USB enumeration, because host PC only provides 100 mA max to the board at that time. During the USB enumeration, STM32756G-EVAL board requires 300 mA power from the host PC. If the host PC is able to provide the required power, the enumeration succeeds and the power transistor U17 (ST890) is switched ON, the red LED LD10 is turned ON, thus STM32756G-EVAL evaluation board can consume no more than 300 mA of current. If the host PC is not able to provide the requested current, the enumeration fails. Therefore the ST890 (U17) remains OFF so consequently 3.3 V domain of the board and STM32 will not be powered. As a consequence, the red LED LD10 remains turned OFF. In this case it is mandatory to use an external power supply as extra power supply.

E5V (from PSU) or D5V must be used as external power supply, in case current consumption of STM32756G-EVAL evaluation board exceeds the allowed current on USB. In this condition it is still possible to use USB for communication, for programming or debugging only, but it is mandatory to power the board, first using E5V or D5V, 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:

- Connect jumper JP13 for PSU or D5V side
- Check that JP15 is removed
- Connect the external power source to PSU or D5V (daughterboard mounted)
- Check red LED LD10 is turned ON
- Connect the PC to USB connector CN21

If this order is not respected, the board may be powered by VBUS first then 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 will be requested at enumeration (since JP15 must be OFF), so there is risk that request is rejected and enumeration does not succeed if the PC cannot provide such current. Consequently the board is not powered (the led LD10 remains OFF).

Note: In case the board is powered by an USB charger, there is no USB enumeration, so the led LD10 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 but in any cases the current will be limited to 600 mA by U17 (ST890).

The power supply is configured by setting the related jumpers JP2, JP9 and JP13 as described in *Table 1*.

Table 1. Power related jumpers

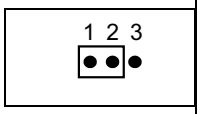
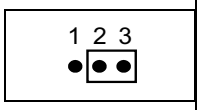
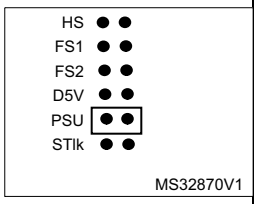
Jumper	Description
JP2	JP2 is used to measure STM32 current consumption manually by multimeter. Default setting: Fitted
JP9	V_{bat} is connected to +3.3 V when JP9 is set as shown to the right (Default setting): 
	V_{bat} is connected to battery when JP9 is set as shown to the right: 
JP13	JP13 is used to select one of the six possible power supply resources. For power supply jack (CN17) to the STM32756G-EVAL only, JP13 is set as shown to the right (Default setting): 

Table 1. Power related jumpers (continued)

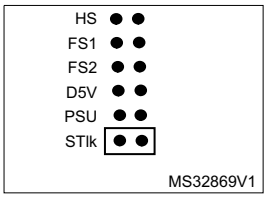
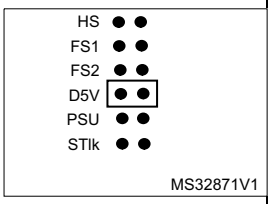
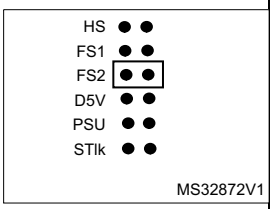
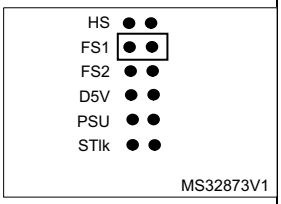
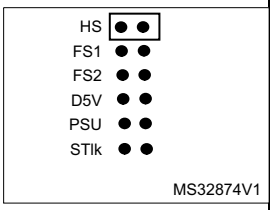
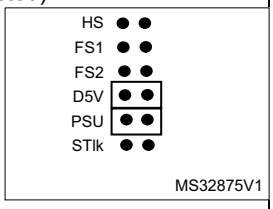
Jumper	Description
JP13	For power supply from USB connector of ST-LINK/V2-1 (CN21) to STM32756G-EVAL only, JP13 is set as shown to the right: 
	For power supply from the daughterboard connectors (CN5 and CN6) to STM32756G-EVAL only, JP13 is set as shown to the right: 
	For power supply from USB OTG FS2 (CN14) to STM32756G-EVAL only, JP13 is set as shown to the right: 
	For power supply from USB OTG FS1 (CN13) to STM32756G-EVAL only, JP13 is set as shown to the right: 

Table 1. Power related jumpers (continued)

Jumper	Description
JP13	For power supply from USB OTG HS (CN8) to STM32756G-EVAL only, JP13 is set as shown to the right: 
	For power supply from power supply jack(CN17) to both STM32756G-EVAL and daughterboard connected on CN5 and CN6, JP13 is set as shown to the right (daughterboard must not have its own power supply connected): 

The led LD10 is lit when the STM32756G-EVAL evaluation board is correctly powered by the 5 V .

Note: In order to avoid the impact of USB PHY and Ethernet PHY and get precise results of current consumption on JP2, the following cautions need to be taken into account:

1) Configure Ethernet PHY into Power Down Mode by setting low level of IO_Expander (EXP_IO1)

2) Configure USB HS PHY into Low Power Mode (Register Address=04,bit 6 in USB PHY).

5.3 Clock source

Two clock sources are available on STM32756G-EVAL evaluation board for STM32F756NGH6 MCU and RTC embedded. Three clock resources for camera, Ethernet PHY and USB OTG PHY:

- X1, 25 MHz Crystal with socket for STM32F756NGH6 Microcontroller, it can be removed from socket when internal RC clock is used
- X2, 32 KHz Crystal for embedded RTC
- X3, 24 MHz oscillator for camera module (Default on camera daughterboard)
- X4, 25 MHz Crystal with socket for Ethernet PHY
- X5, 24 MHz Crystal for USB OTG HS PHY

Table 2. 25 MHz Crystal X1 related solder bridges

Jumper	Description
SB27	PH0 is connected to 25 MHz crystal when SB27 is open. (Default setting)
	PH0 is connected to extension connector CN5 when SB27 is closed. In such case R19 must be removed to avoid disturbance due to the 25 MHz quartz.
SB28	PH1 is connected to 25MHz crystal when SB28 is open. (Default setting)
	PH1 is connected to extension connector CN5 when SB28 is closed. In such case C23 and X1 must be removed to avoid disturbance due to the 25 MHz quartz.

Table 3. 32KHz Crystal X2 related solder bridges

Solder Bridge	Description
SB25	PC14 is connected to 32 KHz crystal when SB25 is open. (Default setting)
	PC14 is connected to extension connector CN6 when SB25 is closed. In such case R18 must be removed to avoid disturbance due to the 32 Khz quartz.
SB26	PC15 is connected to 32 KHz crystal when SB26 is open. (Default setting)
	PC15 is connected to extension connector CN6 when SB26 is closed. In such case R17 must be removed to avoid disturbance due to the 32 Khz quartz.

Note: About the jumper JP6 for Ethernet clock, refer to Section 5.13: Ethernet.

5.4 Reset source

The reset signal of STM32756G-EVAL evaluation board is low active and the reset sources include:

- Reset button B1
- Debugging Tools from JTAG/SWD connector CN15 and ETM trace connector CN12
- Daughterboard from CN5
- Embedded ST-LINK/V2-1
- RS232 connector CN7 for ISP

Note: The jumper JP3 has to be closed for RESET handled by the pin 8 of the RS232 connector CN7 (CTS signal).

5.5 Boot option

STM32756G-EVAL evaluation board can boot from:

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

The boot option is configured by setting switch SW1 (BOOT) and the boot base address is programmed in the BOOT_ADD0 and BOOT_ADD1 option bytes. The BOOT can be configured also via RS232 connector CN7.

Table 4. Boot related switch

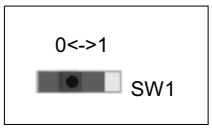
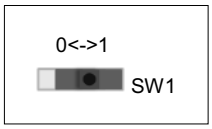
Switch configuration	Boot address option bytes	Boot space
	BOOT_ADD0 [15:0]	STM32756G-EVAL boot from BOOT_ADD0[15:0] ST programmed value: Flash memory on ITCM at 0x0020 0000 (Default setting).
	BOOT_ADD1 [15:0]	STM32756G-EVAL boot from BOOT_ADD1[15:0] ST programmed value: System bootloader at 0x0010 0000

Table 5. Boot related jumpers

Jumper	Description
JP1	The Bootloader_BOOT is managed by pin 6 of connector CN7 (RS232 DSR signal) when JP1 is closed. This configuration is used for boot loader application only. Default setting: Not fitted

5.6 Audio

An audio codec WM8994ECS/R, with 4 DACs and 2 ADCs inside, is connected to SAI interface of the STM32F756NGH6 microcontroller to support TDM feature on SAI port. This feature is able to implement audio recording on digital microphone and analog microphone and audio playback of different audio stream on headphone and lineout at the same time.

It communicates with STM32F756NGH6 microcontroller via I2C1 bus which is shared with LCD, camera module, RF-EEPROM and MFX (Multi-Function eXpander).

The analog microphone on the headset is connected to ADC of WM8994ECS/R through the audio jack connector CN26. External speakers can be connected to WM8994ECS/R via audio jack connector CN25.

Two digital microphones (MEMs microphone) MP34DT01TR are on STM32756G-EVAL evaluation board. They are able to be connected to either audio codec or I2S port of the STM32F756NGH6 microcontroller, by setting the jumpers shown in *Table 6*. The coupon

connectors CN24 and CN27 can be used to support MEMS microphone evaluation board STEVAL-MKI129V1 after removing SB20 and SB21.

An optical connector CN28, compatible with SPDIF spec, is implemented on STM32756G-EVAL, to receive external audio data.

Table 6. Audio related jumpers

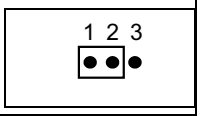
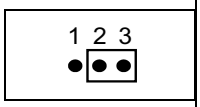
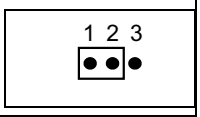
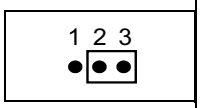
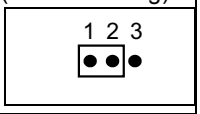
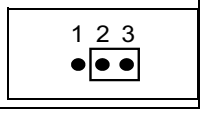
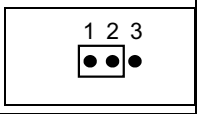
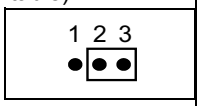
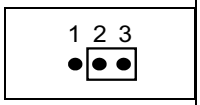
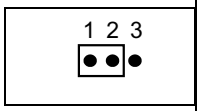
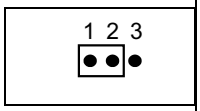
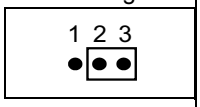
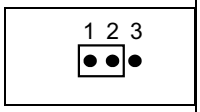
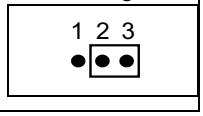
Jumper	Description
JP18	Data signal on digital microphone is connected to audio codec when JP18 is set as shown to the right (Default setting): 
	Data signal on digital microphone is connected to I2S port of the STM32F756NGH6 when JP18 is set as shown to the right (it is also needed to set JP5, according to this table): 
JP19	Clock signal on digital microphone is connected to audio codec when JP19 is set as shown to the right (Default setting): 
	Clock signal on digital microphone is connected to timer output (PC7) of the STM32F756NGH6, used to divide by two I2S clock, when JP19 is set as shown to the right (it is also needed to set JP4 according to this table): 
JP4	PB3 is as TDO/SWO signal when JP4 is set as shown to the right (Default setting): 
	PB3 (I2S Clock) is connected to Timer input (PC6) of the STM32F756NGH6, used as microphone clock divider, when JP4 is set as shown to the right (it is also needed to set JP19 according to this table): 

Table 6. Audio related jumpers (continued)

Jumper	Description
JP5	PD6 is as FMC_NWAIT signal when JP5 is set as shown to the right (Default setting): 
	PD6 is connected to digital microphone as I2S data signal when JP5 is set as shown to the right (it is also needed to set JP18 together according to this table): 
JP17	Digital microphone power source is connected to +3.3 V power when JP17 is set as shown to the right (Default setting): 
	Digital microphone power source is connected to MICBIAS1 from WM8994ECS/R when JP17 is set as shown to the right: 
JP21	PA2 is connected to SAI2_SCKB when JP21 is set as shown to the right (Default setting): 
	PA2 is connected to MII_MDIO (Ethernet) when JP21 is set as shown to the right: 
JP22	PC1 is connected to SAI1_SDA when JP22 is set as shown to the right (Default setting): 
	PC1 is connected to MII_MDC (Ethernet) when JP22 is set as shown to the right: 

Note: The I^2C address of WM8994ECS/R is 0b0011010.

5.7 USB OTG FS1

STM32756G-EVAL evaluation board supports USB OTG full speed communication via a USB Micro-AB connector (CN13) and USB power switch (U11) connected to VBUS. The evaluation board can be powered by this USB connection at 5 V DC with 500 mA current limitation.

A green led LD7 will be lit in one of these cases:

- Power switch (U11) is ON and STM32756G-EVAL works as a USB host
- VBUS is powered by another USB host when STM32756G-EVAL works as a USB device

The red led LD8 will be lit when overcurrent occurs.

Note 1 *STM32756G-EVAL evaluation board should be powered by external power supply when using OTG function.*

Note 2 *JP8 must be removed when using USB OTG FS as mentioned in Table 9.*

5.8 USB OTG HS and USB OTG FS2

STM32756G-EVAL evaluation board supports USB OTG FS2:

- High speed communication via a USB Micro-AB connector (CN8), USB High speed PHY (U8) for high speed function.
- Full speed communication via another USB Micro-AB connector (CN14)

The evaluation board can be powered by these USB connectors (CN8 or CN14) at 5 V DC with 500 mA current limitation.

As several OTG FS2 signals are shared with OTG HS ULPI bus, some PCB reworks are needed, when using OTG FS2 (CN14), as shown in *Table 7*.

Table 7. USB OTG FS2 function configuration

Function	Mount	Remove
OTG HS-CN8 (Default)	R109,R115,SB12,SB15	R259,SB13,SB14,SB51
OTG FS2-CN14	R259,SB13,SB14,SB51	R109,R115,SB12,SB15

An USB power switch (U7) is also connected on VBUS and provides power to either CN8 (with SB12 and SB15 closed and SB13 and SB14 open), or CN14 (with SB13 and SB14 closed and SB12 and SB15 open).

Green led LD5 (for CN8) or LD9 (for CN14) will be lit when either power switch (U7) is ON and STM32756G-EVAL works as a USB host, or VBUS is powered by another USB host when STM32756G-EVAL works as a USB device.

The red led LD6 will be lit when over-current occurs.

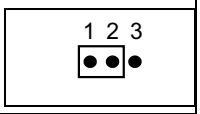
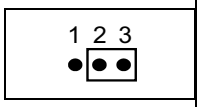
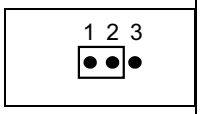
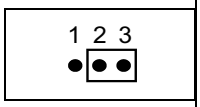
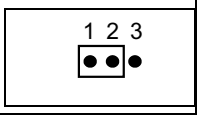
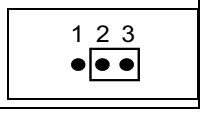
Note: *STM32756G-EVAL evaluation board should be powered, by an external power supply when using OTG function.*

5.9 RS232 and IrDA

RS232 and IrDA communication is supported by D-type 9-pins RS232 connector CN7, and IrDA transceiver U1, which is connected to USART1 of the STM32F756NGH6 microcontroller on STM32756G-EVAL evaluation board. The signal Bootloader_RESET and Bootloader_BOOT are added on RS232 connector CN7 for ISP support.

USART1 of the STM32F756NGH6 microcontroller is shared with RS232/IrDA and ST-LINK/V2-1 controller. Its communication can be changed by setting JP14 and JP20.

Table 8. USART1 related jumpers

Jumper	Description
JP14	USART1_RX is connected to RS232/IrDA when JP14 is set as shown to the right (Default setting): 
	USART1_RX is connected to ST-LINK/V2-1 controller's USART_TX when JP14 is set as shown to the right: 
JP20	USART1_TX is connected to RS232/IrDA when JP20 is set as shown to the right (Default setting): 
	USART1_TX is connected to ST-LINK/V2-1 controller's USART_RX when JP20 is set as shown to the right: 
JP7	USART1_RX is connected to RS232 transceiver and RS232 communication is enabled when JP14 is set to pin1-2 and JP7 is set as shown to the right (Default setting): 
	USART1_RX is connected to IrDA transceiver and IrDA communication is enabled when JP14 is set to pin1-2 and JP7 is set as shown to the right: 

5.10 MicroSD card

The 2-Gbyte (or more) microSD card connected to SDMMC1 port of the STM32F756NGH6 microcontroller, is available on the board. Detection of the microSD card is managed by MFX GPIO15.

5.11 RF-EEPROM

RF-EEPROM daughterboard ANT7-M24LR-A is mounted on CN2 of the STM32F756NGH6 microcontroller via I2C1 bus. The RF-EEPROM can be accessed by the microcontroller via the I2C1 bus or by Radio Frequency (RF), using a 13.56 MHz reader (for example, CR95HF).

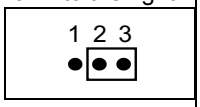
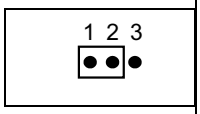
Note: The I^2C address of RF-EEPROM is 0b1010000.

5.12 CAN

STM32756G-EVAL evaluation board supports one channel of CAN2.0 A/B compliant CAN bus communication based on 3.3 V CAN transceiver.

High-speed mode, standby mode and slope control mode are available and can be selected by setting JP11.

Table 9. CAN related jumpers

Jumper	Description
JP11	CAN transceiver is working in standby mode when JP11 is set as shown to the right: 
	CAN transceiver is working in high-speed mode when JP11 is set as shown to the right (Default setting): 
	CAN transceiver is working in slope control mode when JP11 is open.
JP12	CAN terminal resistor is enabled when JP12 is fitted. Default setting: Not fitted
JP8	PA11 is connected with CAN RX signal when JP8 is fitted. Default setting: Not fitted

5.13 Ethernet

STM32756G-EVAL evaluation board supports 10 M/100 M Ethernet communication by a PHY DP83848CVV (U6) and integrated RJ45 connector (CN9). Ethernet PHY is connected to STM32F756NGH6 microcontroller via MII interface. A 25 M clock can be generated by PHY or provided by MCO from STM32F756NGH6 microcontroller by setting the jumper JP6 as shown in *Table 10: Ethernet related jumpers*.

MII Serial Management signals (MDIO and MDC) are simulated by GPIOs (PG6 and PG7) on STM32756G-EVAL evaluation board by default. The original MII serial management signals of the Ethernet IP in STM32F756NGH6 microcontroller, can be also used by setting JP21 and JP22.

Refer to *Table 6: Audio related jumpers* for all the details.

Table 10. Ethernet related jumpers

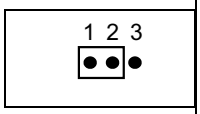
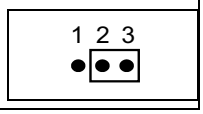
Jumper	Description
JP6	25 MHz clock is provided by external crystal X4 when JP6 is set as shown to the right (Default setting): 
	25 MHz clock for MII is provided by MCO at PA8 when JP6 is set as shown to the right: 

Table 11. Ethernet related solder bridges

Solder Bridges	Description
SB36	MII CRS on DP83848CVV is connected to PA0 when SB36 is closed and SB32,SB34 are open Default setting: Open
SB47	MII COL on DP83848CVV is connected to PH3 when SB47 is closed and R251 is unmounted Default setting: Open
SB9	MII_RX_ER on DP83848CVV is connected to PI10 when SB9 is closed and R248 is unmounted Default setting: Open

5.14 Memories

8 Mx32-bit SDRAM is connected to SDRAM Bank1 of FMC interface of the STM32F756NGH6 microcontroller.

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

A 128-Mbit Nor Flash memory is connected to the bank1 NOR/PSRAM1 of the FMC interface. The 16-bit operation mode is selected by pull-up resistor, connected to the BYTE pin of the NOR Flash memory. The write protection can be enabled or disabled, depending on how the jumper JP10 is set, as showed inside *Table 12*.

Table 12. NOR Flash memory related jumpers

Jumper	Description
JP10	Write protection is enabled when JP10 is fitted while write protection is disabled when JP10 is not fitted. Default setting: Not fitted
JP5	Description of JP5 is in *Section 5.6: Audio*

All signals for memory are also connected on memory connectors CN10 and CN11 for memory daughterboards.

Some limitation can happen when using other peripherals:

1. FMC addressing limitation depending number of Trace data bus used (A18 max for 4 bit ETM to A21 max for 1 bit ETM)
2. FMC addresses limited to A21 when SAI used
3. FMC addresses limited to A20 when Camera is used
4. FMC addresses limited to A22 when Ethernet is used

In such cases, memory addresses A19 to A22 not connected to FMC, are pulled down, so that memories can be addressed within a limited address range. If A21 or A22 is required, the camera board should be removed on the board.

5.15 Quad-SPI Nor Flash memory

512-Mbit Quad-SPI Nor Flash memory is connected to Quad-SPI interface of the STM32F756NGH6 microcontroller on STM32756G-EVAL evaluation board.

5.16 Analog input

The two-pin header CN3 and 10K ohm potentiometer RV1 are connected to PF10 of the STM32F756NGH6 microcontroller as analog input. A low pass filter can be implemented by replacing of R29 and C24 with right value of resistor and capacitor, as requested by the end user application.

PF10 is shared with LED1 and can be set by jumper JP24. Refer to *Section 5.18: Display and input devices* for details.

5.17 Camera module

A connector CN4 for DCMI signals is on STM32756G-EVAL evaluation board and camera module daughterboard MB1183.

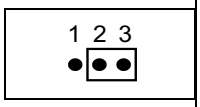
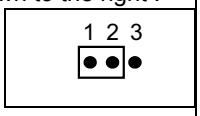
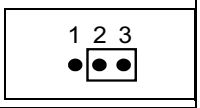
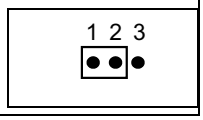
DCMI signals are duplicated with other peripherals (SAI, I2S, Nor Flash memory, microSD card, TRACE, MEMS Microphone and LED3).

These peripherals may not function correctly if camera module is being used. VSYNC signal is shared with LED3 and can be set by jumper JP23. Refer to *Section 5.18: Display and input devices* for details.

5.18 Display and input devices

4-general-purpose-color leds (LD 1,2,3,4) are available for the display device and they are connected on MFX.

Table 13. LED related jumpers

Jumper	Description
JP23	PB7 is connected to LED3(red) when JP23 is set as shown to the right (Default setting): 
	PB7 is used as VSYNC signal of camera when JP23 is set as shown to the right : 
JP24	PF10 is connected to LED1(green) when JP24 is set as shown to the right (Default setting): 
	PF10 is used as analog input from potentiometer when JP24 is set as shown to the right : 

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

5.7-inch 640x480-pixel TFT color LCD with capacitive touch panel are connected to RGB LCD interface of the STM32F756NGH6 microcontroller.

Table 14. LCD modules connector (CN20)

Pin No.	Description	Pin connection	Pin No.	Description	Pin connection
1	GND	-	2	GND	-
3	R0	PI15	4	G0	PJ7
5	R1	PJ0	6	G1	PJ8
7	R2	PJ1	8	G2	PJ9
9	R3	PJ2	10	G3	PJ10
11	R4	PJ3	12	G4	PJ11
13	R5	PJ4	14	G5	PK0
15	R6	PJ5	16	G6	PK1
17	R7	PJ6	18	G7	PK2
19	GND	-	20	GND	-

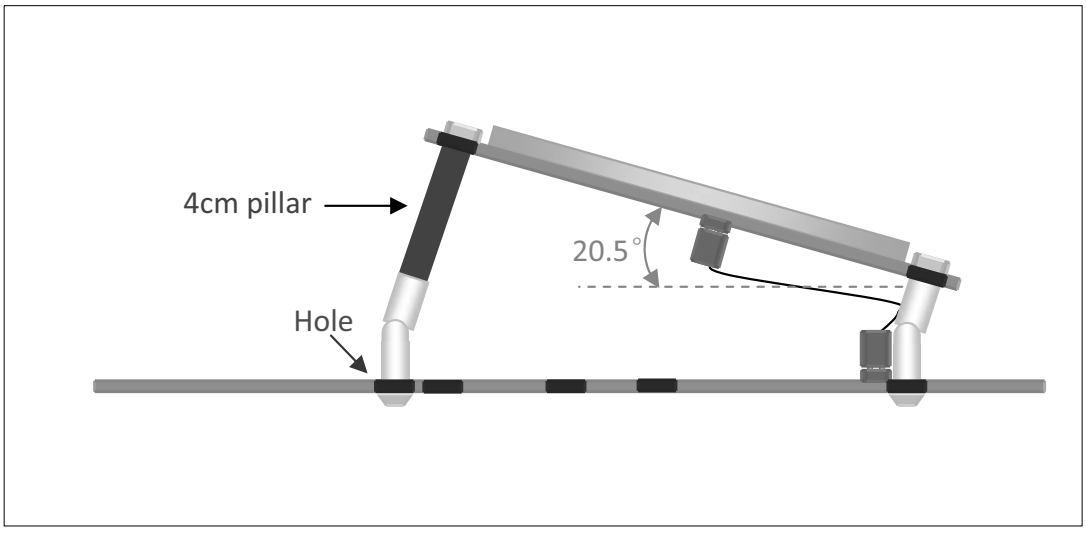
Table 14. LCD modules connector (CN20) (continued)

Pin No.	Description	Pin connection	Pin No.	Description	Pin connection
21	B0	PJ12	22	ENB	PK7
23	B1	PJ13	24	-	-
25	B2	PJ14	26	HSYNC	PI12
27	B3	PJ15	28	VSYNC	PI13
29	B4	PK3	30	GND	-
31	B5	PK4	32	CLK	PI14
33	B6	PK5	34	GND	-
35	B7	PK6	36	RESET#	-
37	GND	-	38	I2C1_SDA	PB9
39	INT	MFX GPIO14	40	I2C1_SCL	PB6
41	-	-	42	-	-
43	BL_CTRL	PA8	44	-	-
45	5V	-	46	-	-
47	BLGND	-	48	-	-
49	BLGND	-	50	3.3V	-

Note: On a 5.7-inch LCD daughterboard, BL_CTRL(PA8) signal adjusts brightness of backlight by mean of a pulse signal. Since BL_CTRL is shared with MII_MCO, which is in default setting, SB57 must be removed and SB60 must be closed.

The orientation of the 5.7-inch LCD daughterboard can be changed by hinged standoffs and pillars. Refer to *Figure 5* for details.

Figure 5. Orientation setting of the 5.7-inch LCD daughterboard



5.19 Motor control

STM32756G-EVAL evaluation board supports both asynchronous and synchronous three-phase brushless motor control via a 34-pin connector CN1, which provides all required control and feedback signals to and from motor power-driving board.

The available signals on this connector are emergency stop, motor speed, 3 phases motor current, bus voltage, heatsink temperature, coming from the motor driving board and 6 channels of PWM control signal, going to the motor driving circuit.

Some PCB reworks are needed for motor control application, to disconnect those peripherals, which share I/Os with motor control connector and connect these I/Os to motor control connector:

- Open SB5, SB29, SB32, SB36, SB37, SB41, SB43, SB45, SB49, SB52, SB55, SB57, SB60, SB61, Remove R95, R100, R241, R252, keep no jumper on JP4 (Pin2-3), keep no jumper on JP8/JP21/JP22, keep no jumper on JP19 (Pin 2-3), keep CN4 and CN13 unconnected.
- Close SB23, SB30, SB31, SB34, SB35, SB38, SB39, SB40, SB42, SB44, SB46, SB48, SB50, SB53, SB56, SB58, SB59, SB62. Mount R14 with 0 ohm resistor.

PA4 and PA5 are DAC output; when using them for debugging purposes, keep CN4 unconnected and remove R126.

Figure 6 and *Figure 7* show that all the solder bridges and resistors to be removed, are marked in orange, while the solder bridges to be closed, are marked in green.

Figure 6. STM32756G-EVAL evaluation board motor control PCB reworks (Bottom side)

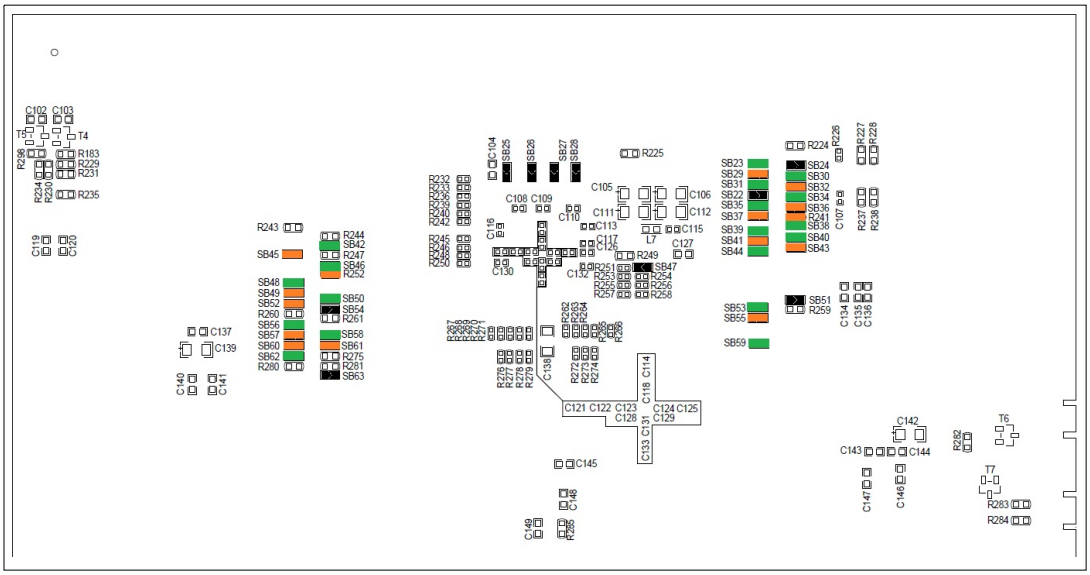
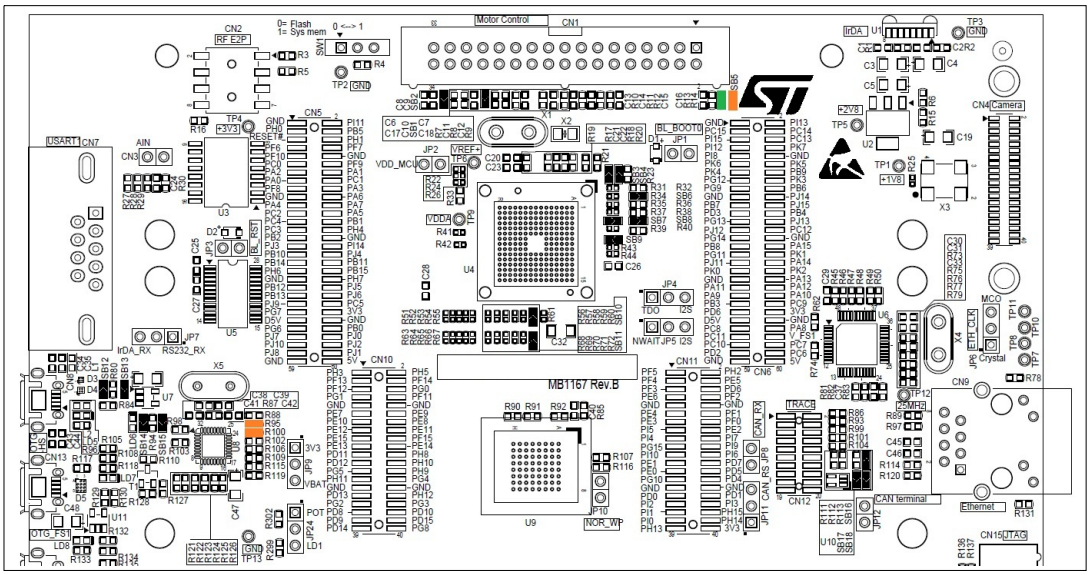


Figure 7. STM32756G-EVAL evaluation board motor control PCB reworks (Top side)



1. To remove R95 and R100, open SB5 and mount R14

Table 15. Motor control related solder bridges

Solder Bridges	Description
SB1	The special motor current sampling operation is enabled when SB1 is closed (PA12 connected to PA8). The I/O pins PA12 and PA8 are disconnected and can be used by daughterboard when SB1 is not fitted. Default setting: Open
SB2	SB2 should be kept open when encoder signal is from pin 31 of motor control connector CN1, while it should be kept closed when analog signal is from pin 31 of CN1 for special motor. Default setting: Open

5.20 MFX (Multi-Function eXpander)

There is a MFX circuit on STM32756G-EVAL evaluation board as IO-expander and driver for 2 LEDs.The communication interface between MFX and STM32F756NGH6 is I2C1 bus.

The signals connected to MFX are listed in *Table 16*.

Table 16. MFX signals

Pin number of MFX	Pin name of MFX	MFX functions	Functions of STM32756G-EVAL	Direction (For MFX)	Terminal device
11	PA1	MFX_GPO1	LED2	Output	LED
13	PA3	MFX_GPO3	LED4	Output	LED

Table 16. MFX signals (continued)

Pin number of MFX	Pin name of MFX	MFX functions	Functions of STM32756G-EVAL	Direction (For MFX)	Terminal device
15	PA5	MFX_GPIO5	Audio_INT	Input	Codec
16	PA6	MFX_GPIO6	OTG_FS1_ OverCurrent	Input	USB_FS1
17	PA7	MFX_GPIO7	OTG_FS1_ PowerSwitchOn	Output	USB_FS1
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	MII_INT	Input	Ethernet PHY
27	PB14	MFX_GPIO14	LCD_INT	Input	LCD
28	PB15	MFX_GPIO15	microSDcard Detect	Input	microSD
29	PA8	MFX_GPIO8	OTG_FS2_ OverCurrent	Input	USB_FS2
30	PA9	MFX_GPIO9	OTG_FS2_ PowerSwitchOn	Output	USB_FS2
31	PA10	MFX_GPIO10	XSDN	Output	Camera
32	PA11	MFX_GPIO11	RSTI	Output	Camera
33	PA12	MFX_GPIO12	Camera_PLUG	Input	Camera
39	PB3	MFX_GPIO3	JOY_RIGHT	Input	Joystick
40	PB4	MFX_GPIO4	JOY_UP	Input	Joystick

6 Connector

6.1 Motor control connector CN1

Figure 8. Motor control connector CN1 (Top view)

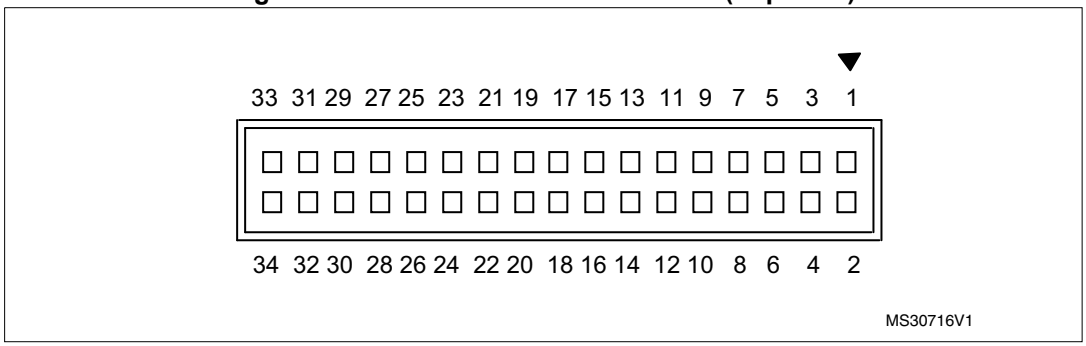


Table 17. Motor control connector CN1

Description	Pins of the STM32F756NGH6	Pin number of CN1	Pin number of CN1	Pins of the STM32F756NGH6	Description
Emergency STOP	PA6	1	2	-	GND
MC_UH	PC6	3	4	-	GND
MC_UL	PA7	5	6	-	GND
MC_VH	PC7	7	8	-	GND
MC_VL	PB0	9	10	-	GND
MC_WH	PC8	11	12	-	GND
MC_WL	PB1	13	14	PC4	BUS VOLTAGE
CURRENT A	PC1	15	16	-	GND
CURRENT B	PC2	17	18	-	GND
CURRENT C	PC3	19	20	-	GND
NTC BYPASS RELAY	PG11	21	22	-	GND
DISSIPATIVE BRAKE PWM	PH6	23	24	-	GND
+5V power	-	25	26	PC5	Heatsink temperature
PFC SYNC	PA12 and PA8 See *Table 15* for details	27	28	-	3.3 V power
PFC PWM	PA11	29	30	-	GND
Encoder A	PA0	31	32	-	GND
Encoder B	PA1	33	34	PA2	Encoder Index

6.2 RF-EEPROM daughterboard connector CN2

Figure 9. RF-EEPROM daughterboard connector CN2 (Front view)

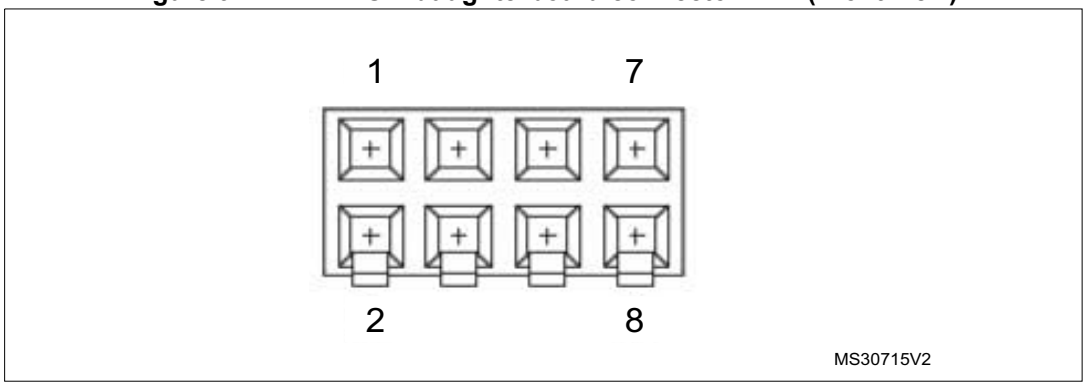


Table 18. RF-EEPROM daughterboard connector CN2

Pin number	Description	Pin number	Description
1	I2C1_SDA (PB9)	5	+3V3
2	NC	6	NC
3	I2C1_SCL (PB8)	7	GND
4	RESET(PC10)	8	NC

6.3 Analog input connector CN3

Figure 10. Analog input-output connector CN3 (Top view)

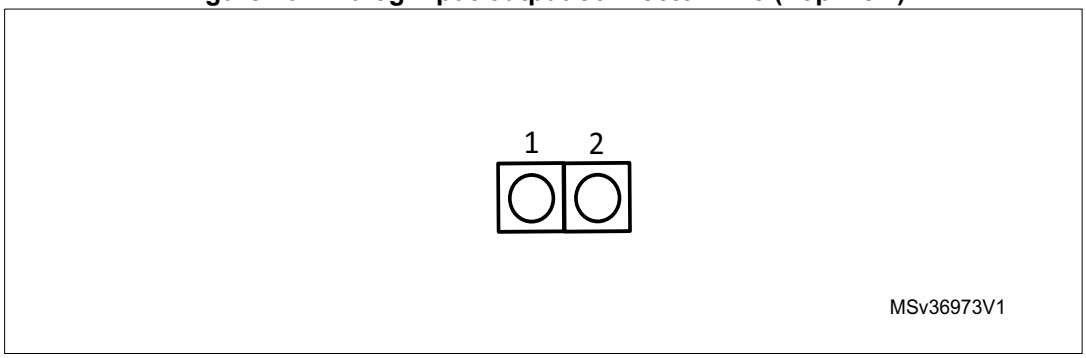


Table 19. Analog input-output connector CN3

Pin number	Description	Pin number	Description
1	analog input-output (PF10)	2	GND

6.4 Camera module connector CN4

Figure 11. Camera module connector CN4 (Top view)

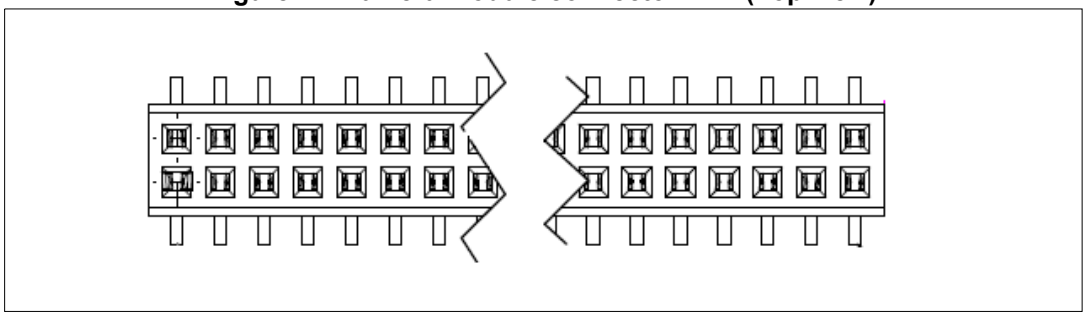


Table 20. Camera module connector CN4

Pin number	Description	Pin number	Description
1	+1.8V	21	GND
2	+1.8V	22	GND
3	GND	23	D0(PC6)
4	GND	24	D1(PC7)
5	D10(PD6)	25	D2(PC8)
6	D11(PD2)	26	D3(PC9)
7	GND	27	D4(PC11)
8	GND	28	D5(PD3)
9	D8(PC10)	29	D6(PE5)
10	D9(PC12)	30	D7(PE6)
11	GND	31	HSYNC(PA4)
12	GND	32	VSYNC(PB7)
13	I2C1_SCL(PB8)	33	PCLK(PA6)
14	I2C1_SDA(PB9)	34	Test point8
15	Camera_PLUG (MFX GPIO12)	35	Test point11
16	GND	36	Test point10
17	RST IN (MFX GPIO11)	37	GND
18	Test point 7	38	GND
19	XSDN (MFX GPIO10)	39	+2.8V
20	Camera clock	40	+2.8V

6.5 Daughterboard extension connector CN5 and CN6

Two 60-pin male headers CN5 and CN6 can be used to connect with daughterboard or standard wrapping board to STM32756G-EVAL evaluation board. All GPIOs are dispatched on memory connectors (CN10 and CN11), and on connectors CN5 and CN6.

The space between CN5 and CN6 connectors is defined as a standard, this allows developing common daughterboards for several ST evaluation boards. The standard width between CN5 pin1 and CN6 pin1 is 2700 mils (68.58 mm).

Each pin on CN5 and on CN6 can be used by a daughterboard, after disconnecting it from the corresponding function block on STM32756G-EVAL evaluation board. Refer to *Table 21* and *Table 22* for details.

Table 21. Daughterboard extension connector CN5

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL board
1	GND	-	-
3	PH0	OSC_IN	Remove R19, Close SB27
5	RESET#	-	-
7	PF6	QSPI_BK1_IO3	Remove R237
9	PF10	LED1/Potentiometer	Keep JP24 on open
11	PC0	ULPI_STP	Remove R125
13	PA2	SAI2_SCKB/MII_MDIO/MC_EnIndex	Open SB30, Keep JP21 on open
15	PA0	SAI2_SDB/ MII_CRS/MC_ENA	Open SB32,SB34,SB36
17	PF8	QSPI_BK1_IO0	Remove R238
19	GND	-	-
21	PA4	PAR_HSYNC	Disconnect CN4
23	PC2	MII_TXD2/MC_CurrentB	Open SB38, Remove R241
25	PC4	MII_RXD0/ MC_BUSVOLTAGE	Open SB40,SB43
27	PC3	MII_TX_CLK/ MC_CurrentC	Open SB41,SB44
29	PB2	QSPI_CLK	-
31	PJ3	LCD_R4	-
33	PB10	ULPI_D3	Remove R102
35	PB14	USB_FS2_DM	Remove R288, Disconnect CN14
37	PH6	MII_RXD2/MC_DissipativeBrake	Open SB42,SB45
39	GND	-	-
41	PB12	ULPI_D5/ USB_FS2_ID	Open SB51, Remove R109
43	PB13	ULPI_D6/ USB_FS2_VBUS	Remove R115,R259
45	PJ9	LCD_G2	-
47	PG7	MII_MDC_GPIO	Open SB10

Table 21. Daughterboard extension connector CN5 (continued)

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL board
49	D5V	-	-
51	PG6	MII_MDIO_GPIO	Open SB11
53	PJ7	LCD_G0	-
55	PJ10	LCD_G3	-
57	PJ8	LCD_G1	-
59	GND	-	-
2	PI11	ULPI_DIR	Remove R124
4	PB5	ULPI_D7	Remove R119
6	PH1	OSC_OUT	Remove C23,X1, Close SB28
8	PF7	QSPI_BK1_IO2	Remove R228
10	GND	-	-
12	PF9	QSPI_BK1_IO1	Remove R227
14	PA1	MII_RX_CLK/MC_ENB	Open SB23,SB29
16	PC1	SAI1_SDA/MII_MDC/ MC_CurrentA	Open SB31, Keep JP22 on open
18	PA3	ULPI_D0	Remove R88
20	PA6	MC_EmergencySTOP/PAR_PCLK	Remove SB5,R14
22	PA7	MII_RX_DV/MC_UL	Open SB35,SB37
24	PA5	ULPI_CK	Remove R126
26	PB1	ULPI_D2/MC_WL	Open SB39, Remove R100
28	PH4	ULPI_NXT	Remove R123
30	GND	-	-
32	PI14	LCD_CLK	-
34	PJ4	LCD_R5	-
36	PB11	ULPI_D4	Remove R106
38	PB15	USB_FS2_DP	Remove R286, Disconnect CN14
40	PH7	MII_RXD3	Remove R45
42	PJ5	LCD_R6	-
44	PJ6	LCD_R7	-
46	PC5	MII_RXD1/MC_HEATSINK	Open SB53,SB55
48	+3V3	-	-
50	GND	-	-
52	PB0	ULPI_D1/MC_VL	Open SB59,Remove R95
54	PJ0	LCD_R1	-
56	PJ2	LCD_R3	-

Table 21. Daughterboard extension connector CN5 (continued)

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL board
58	PJ1	LCD_R2	-
60	+5V	-	-

Table 22. Daughterboard extension connector CN6

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL board
1	GND	-	-
3	PC15	OSC32_OUT	Remove R17, Close SB26
5	PI15	LCD_R0	-
7	PI12	LCD_HSYNC	-
9	PI8	EXPANDER_INT	Remove R295
11	PK6	LCD_B7	-
13	PK4	LCD_B5	-
15	PG12	SPDIF_RX1	Remove R215
17	PG9	SAI2_FSB	Remove R193
19	GND	-	-
21	PB7	LED3/PAR_ VSYNC	Keep JP23 on open
23	PD3	PAR_D5	Disconnect CN4
25	PG13	MII_TXD0	Remove R243
27	PJ12	LCD_B0	-
29	PG14	MII_TXD1	Remove R244
31	PB8	I2C1_SCL	Remove R5,R195,R290, Disconnect CN4
33	PG11	MII_TX_EN/MC_NTC	Open SB46, Remove R252
35	PJ11	LCD_G4	-
37	PK0	LCD_G5	-
39	GND	-	-
41	PA11	CAN1_RX/USB_FS1_DM /MC_PFCpwm	Open SB50,Remove R284, Keep JP8 on open, Disconnect CN13
43	PA9	RS232_IRDA_TX/USB_FS1_ VBUS	Open SB54,Remove R261
45	PB3	JTDO- SWO/I2S3_CK	Keep JP4 on open
47	PD6	NWAIT/I2S3_SD/PAR_D10	Keep JP5 on open, Disconnect CN4
49	D5V	-	-
51	PC8	SDCARD_D0/MC_WH/PAR_ D2	Open SB58,SB61, Disconnect CN4

Table 22. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL board
53	PC11	SDCARD_D3 /PAR_D4	Remove R275, Disconnect CN4
55	PC10	SDCARD_D2/EXT_RESET/PAR_D8	Remove R16,R281, Disconnect CN4
57	PD2	SDCARD_CMD/PAR_D11	Open SB63, Disconnect CN4
59	GND	-	-
2	PI13	LCD_VSYNC	-
4	PC14	OSC32_IN	Remove R18, Close SB25
6	PC13	TAMPER_WAKEUP_KEY	Remove R216
8	PK7	LCD_ENB	Remove R192
10	GND	-	-
12	PK5	LCD_B6	-
14	PB9	I2C1_SDA	Remove R3, R189,R291, Disconnect CN4
16	PK3	LCD_B4	-
18	PB6	QSPI_BK1_NCS	Remove R226
20	PJ14	LCD_B2	-
22	PJ15	LCD_B3	-
24	PB4	JTRST	Remove R112
26	PJ13	LCD_B1	-
28	PC12	SDCARD_CK/ PAR_D9	Disconnect CN4,CN16
30	GND	-	-
32	PA15	JTDI	Remove R101
34	PK1	LCD_G6	-
36	PA14	JTCK-SWCLK	Remove R93
38	PK2	LCD_G7	-
40	PA13	JTMS-SWDIO	Remove R86
42	PA12	CAN1_TX/USB_FS1_DP/MC_PFCsync2	Open SB48,SB49,SB52
44	PA10	RS232_IRDA_RX/USB_FS1_ID	Remove R117, Keep JP14 on open
46	PC9	SDCARD_D1/PAR_D3	Remove R260, Disconnect CN4
48	+3.3V	-	-
50	GND	-	-
52	PA8	LCD_BL_CTRL/MII_MCO/MC_PFCsync1	Open SB56,SB57,SB60
54	VBUS_FS1	-	-

Table 22. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative Function	How to disconnect with function block on STM32756G-EVAL **board**
56	PC7	MC_VH/PAR_D1/MIC_CK	Disconnect CN1,CN4, Keep JP19 on open
58	PC6	MC_UH/PAR_D0/I2S3_CK	Open SB62, Disconnect CN4, Keep JP4 on open
60	+5V	-	-

6.6 RS232 connector CN7

Figure 12. RS232 connector CN7 (Front view)

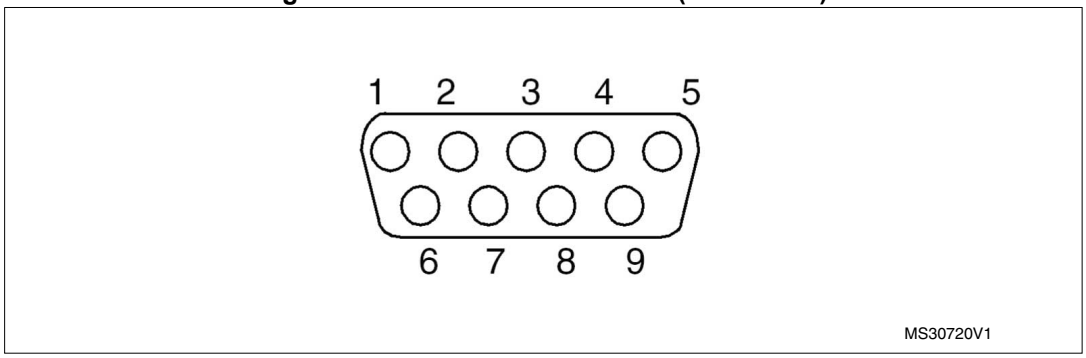


Table 23. RS232 connector CN7 with ISP support

Pin number	Description	Pin number	Description
1	NC	6	Bootloader_BOOT
2	RS232_RX (PA10)	7	NC
3	RS232_TX (PA9)	8	Bootloader_RESET
4	NC	9	NC
5	GND	-	-

6.7 USB OTG HS Micro-AB connector CN8

Figure 13. USB OTG HS Micro-AB connector CN8 (Front view)

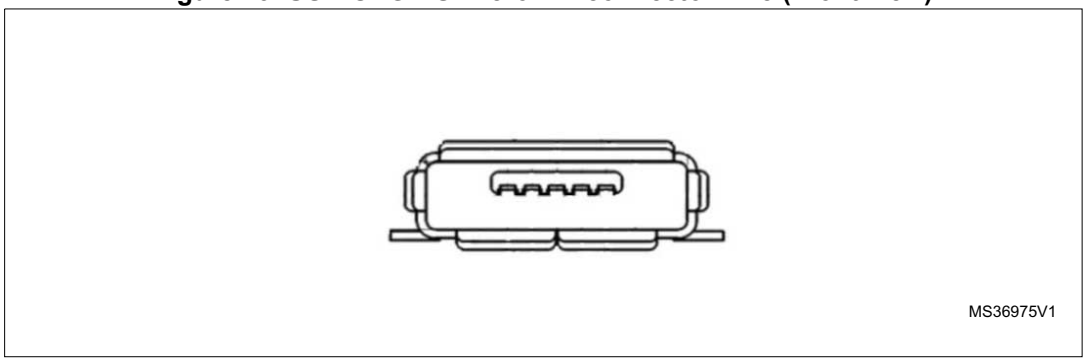


Table 24. USB OTG HS Micro-AB connector CN8

Pin number	Description	Pin number	Description
1	VBUS	4	ID
2	D-	5	GND
3	D+	-	-

6.8 Ethernet RJ45 connector CN9

Figure 14. Ethernet RJ45 connector CN9 (Front view)

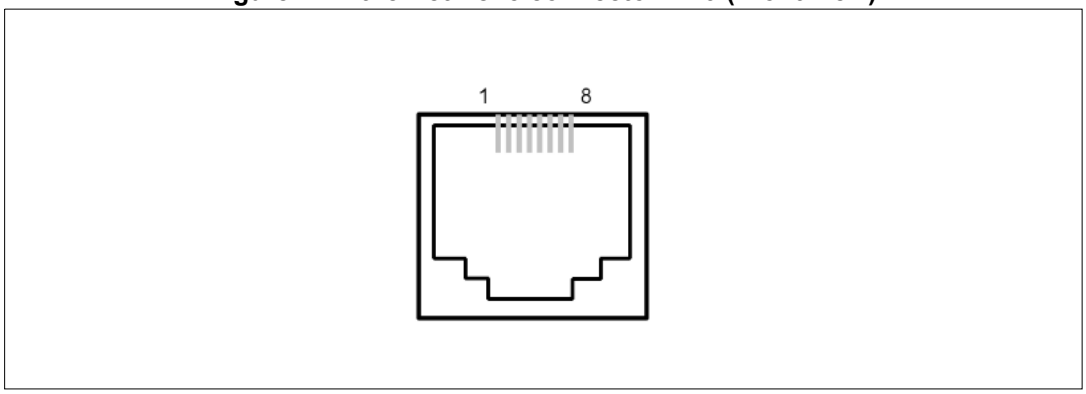


Table 25. RJ45 connector CN9

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

6.9 Memory connector CN10 and CN11

Two 40-pin male headers CN10 and CN11 are used to connect with memory daughterboard. GPIOs (which work as FMC memory signals) that are not present on CN5 and CN6, are available on these two connectors.

The space between these two connectors is defined as a standard, which allows to develop common daughterboards. The standard width between CN10 pin 1 and CN11 pin 1 is 1914 mils (48.62 mm). For details on the signals assignment refer to *Table 26* and *Table 27*.

Table 26. Memory connector CN10

Pin	Description	Alternative function	How to disconnect with function block on STM32756G-EVAL board
1	PH3	SDNE0/MII_COL	Open SB47
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	-
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	-

Table 26. Memory connector CN10 (continued)

Pin	Description	Alternative function	How to disconnect with function block on STM32756G-EVAL **board**
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/ MII_PPS_OUT	-

Table 27. Memory connector CN11

Pin	Description	Alternative function	How to disconnect with function block on STM32756G-EVAL **board**
1	PF5	A5	-
3	PF4	A4	-
5	PF3	A3	-
7	PE6	A22/SAI2_MCLK_B/TRACED 3/PAR_D7	Open SB16,SB17,SB18
9	GND	-	-
11	PE4	A20/TRACED1	Open SB6
13	PE3	A19/TRACED0	Open SB8
15	PI5	NBL3	-
17	PI4	NBL2	-
19	PG15	SDNCAS	-
21	PI10	D31/MII_RX_ER	Open SB9
23	PE1	NBL1	-
25	PE0	NBL0	-
27	PG10	NE3	-
29	GND	-	-
31	PD0	D2	-
33	PI2	D26	-

Table 27. Memory connector CN11 (continued)

Pin	Description	Alternative function	How to disconnect with function block on STM32756G-EVAL board
35	PI1	D25	-
37	PI0	D24	-
39	PH13	D21	-
2	PH2	SDCKE0	-
4	PE5	A21/TRACED2/PAR_D6	Open SB3,SB4
6	PD6	NWAIT /I2S3_SD/PAR_D10	Set JP5 on pin1-2, Disconnect CN4
8	PF2	A2	-
10	GND	-	-
12	PF1	A1	-
14	PF0	A0	-
16	PE2	A23/TRACECLK/ MII_TXD3	Open SB7, Remove R247
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	-	-

6.10 ETM Trace debugging connector CN12

Figure 15. ETM Trace debugging connector CN12 (Top view)

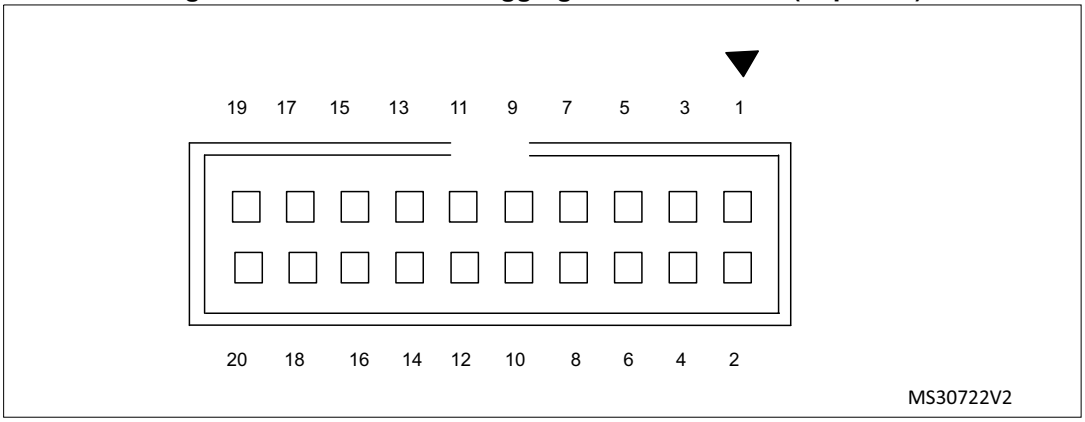


Table 28. ETM Trace debugging connector CN12

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

6.11 USB OTG FS1 Micro-AB connector CN13

Figure 16. USB OTG FS1 Micro-AB connector CN13 (Front view)

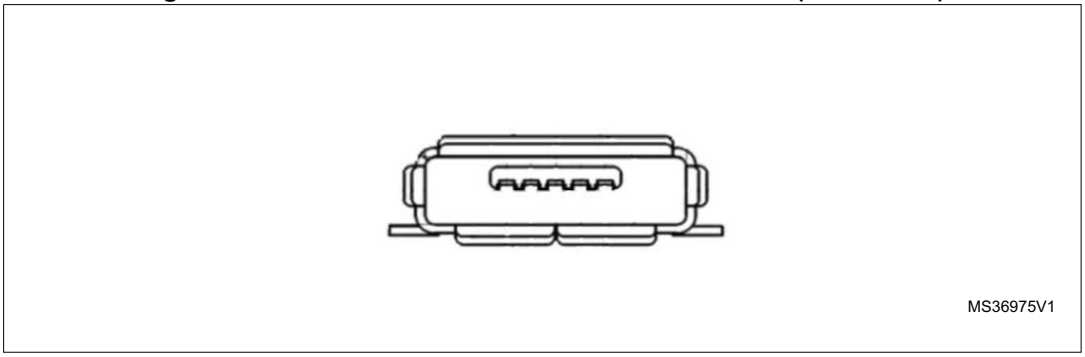


Table 29. USB OTG FS1 Micro-AB connector CN13

Pin number	Description	Pin number	Description
1	VBUS (PA9)	4	ID (PA10)
2	D- (PA11)	5	GND
3	D+ (PA12)	-	-

6.12 USB OTG FS2 Micro-AB connector CN14

Figure 17. USB OTG FS2 Micro-AB connector CN14 (Front view)

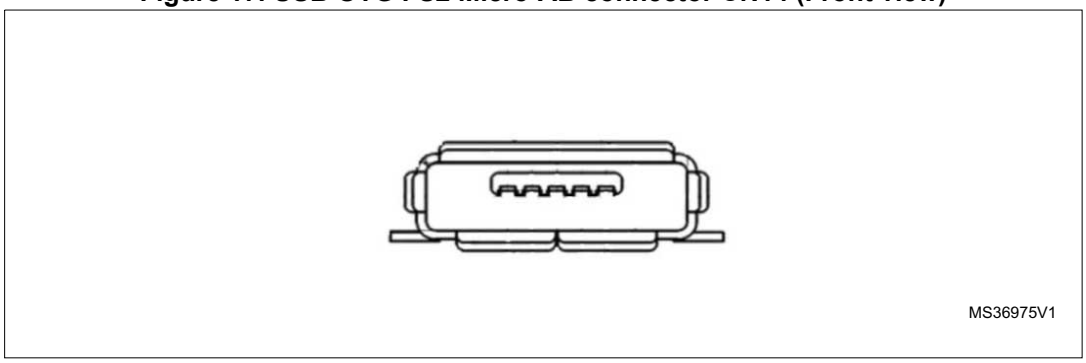


Table 30. USB OTG FS2 Micro-AB connector CN14

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

6.13 JTAG/SWD connector CN15

Figure 18. JTAG/SWD debugging connector CN15 (Top view)

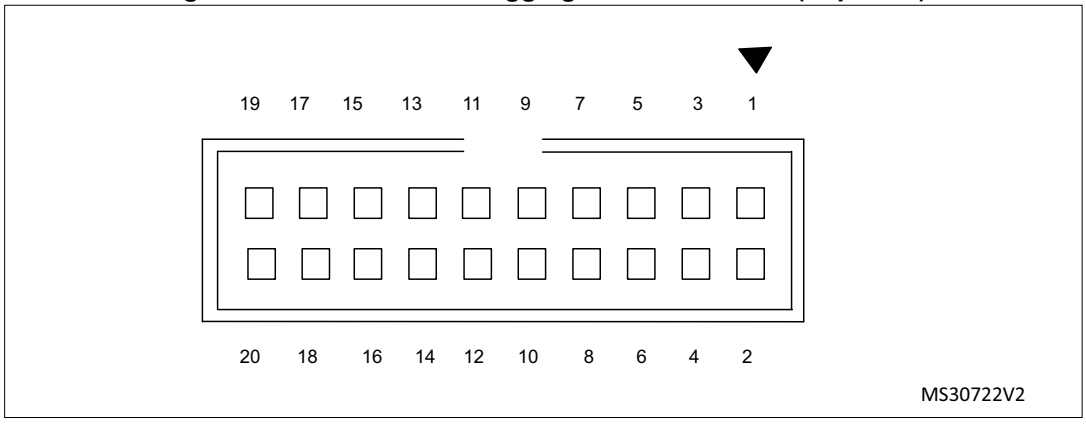


Table 31. JTAG/SWD debugging connector CN15

Pin number	Description	Pin number	Description
1	+3.3V	2	+3.3V
3	PB4	4	GND
5	PA15	6	GND
7	PA13	8	GND
9	PA14	10	GND
11	RTCK	12	GND
13	PB3	14	GND
15	RESET#	16	GND
17	DBGRQ	18	GND
19	DBGACK	20	GND

6.14 MicroSD connector CN16

Figure 19. MicroSD connector CN16 (Top view)

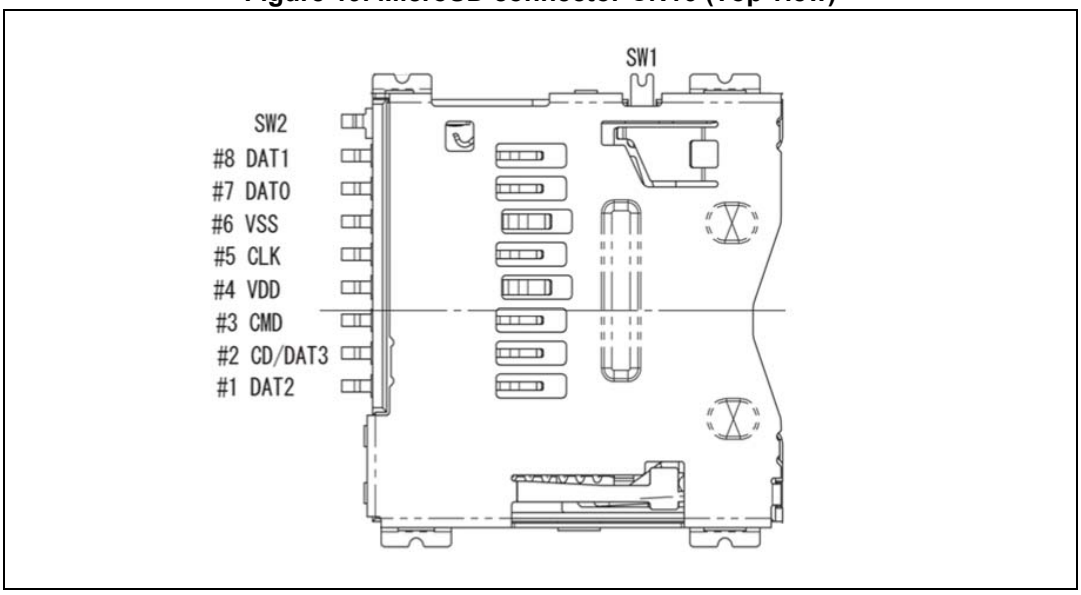


Table 32. MicroSD connector CN16

Pin number	Description	Pin number	Description
1	SDMMC_D2(PC10)	6	VSS/GND
2	SDMMC_D3(PC11)	7	SDMMC_D0(PC8)
3	SDMMC_CMD(PD2)	8	SDMMC_D1(PC9)

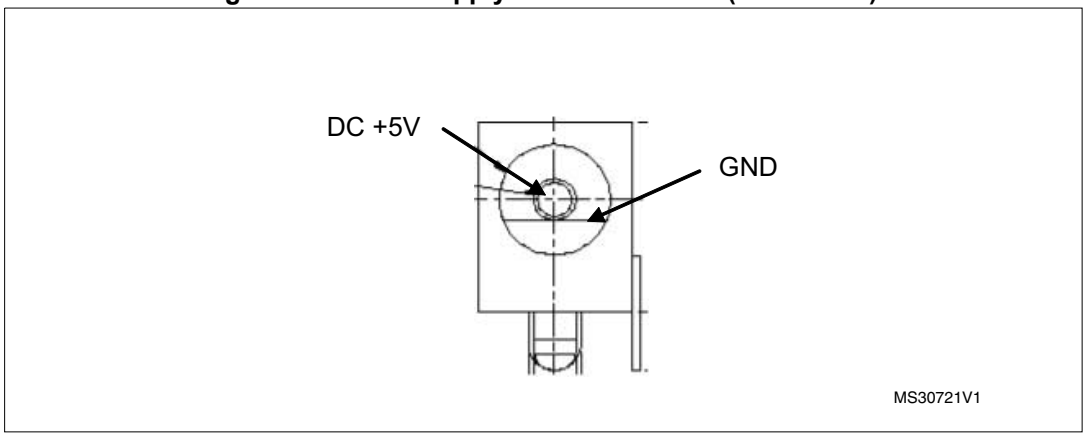
Table 32. MicroSD connector CN16 (continued)

Pin number	Description	Pin number	Description
4	+3.3V	9	GND
5	SDMMC_CLK(PC12)	10	microSDcard_detect (MFX GPIO15)

6.15 Power connector CN17

STM32756G-EVAL evaluation board can be powered from a DC 5 V power supply via the external power supply jack (CN17), shown in *Figure 20*. The central pin of CN17 must be positive.

Figure 20. Power supply connector CN17 (Front view)



6.16 ST-LINK/V2-1 programming connector CN18

The connector CN18 is used only for embedded ST-LINK/V2-1 programming during board manufacturing. It is not populated by default and not for end user.

6.17 MFX programming connector CN19

The connector CN19 is used only for MFX (Multi-Function eXpander) programming during board manufacturing. It is not populated by default and not for end user.

6.18 TFT LCD connector CN20

A TFT color LCD board is mounted on CN20. Refer to *Section 5.18: Display and input devices* for details.

6.19 ST-LINK/V2-1 USB Type B connector CN21

The USB connector CN21 is used to connect the embedded ST-LINK/V2-1 to PC to debug the board.

Figure 21. USB type B connector CN21 (Front view)

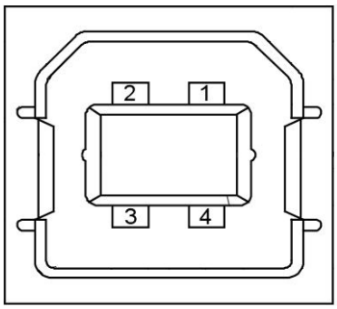


Table 33. USB type B connector CN21

Pin number	Description	Pin number	Description
1	VBUS(power)	4	GND
2	DM	5,6	Shield
3	DP	-	-

6.20 CAN D-type 9-pin male connector CN22

Figure 22. CAN D-type 9-pin male connector CN22 (Front view)

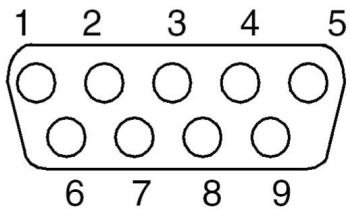


Table 34. CAN D-type 9-pin male connector CN22

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

6.21 MEMS microphone coupon connectors CN24 and CN27

Figure 23. MEMS microphone coupon connectors CN24 and CN27 (Top view)

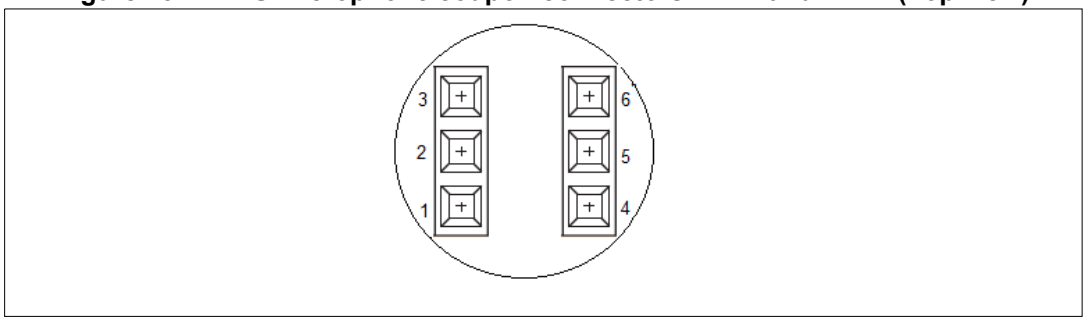


Table 35. MEMS microphone coupon connectors CN24 and CN27

Pin number	Description	Pin number	Description
1	DATA	4	VDD
2	GND	5	L/R
3	CLK	6	NC

6.22 Audio jack (speaker) CN25

A 3.5 mm stereo audio jack CN25 for speaker out is available on STM32756G-EVAL evaluation board to support external speaker.

6.23 Audio jack CN26

A 3.5 mm stereo audio jack CN26 is available on STM32756G-EVAL evaluation board to support headset (headphone and microphone integrated).

6.24 SPDIF IN connector CN28

Figure 24. SPDIF IN connector CN28 (Front view)

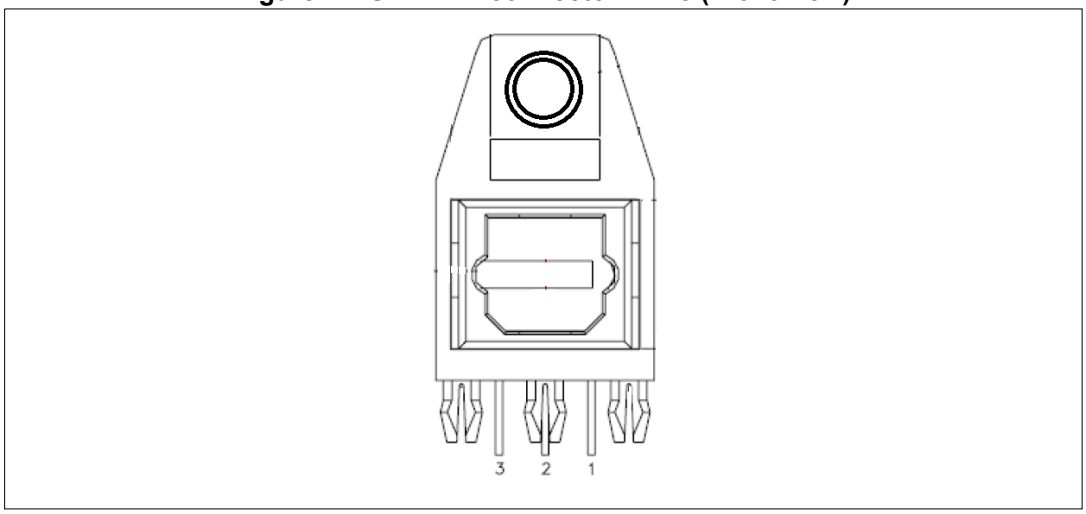


Table 36. SPDIF IN connector CN28

Pin number	Description	Pin number	Description
1	SPDIF_RX1(PG12)	3	VCC
2	GND	-	-

Appendix A Electrical schematics

Figure 25. STM32756G-EVAL evaluation board

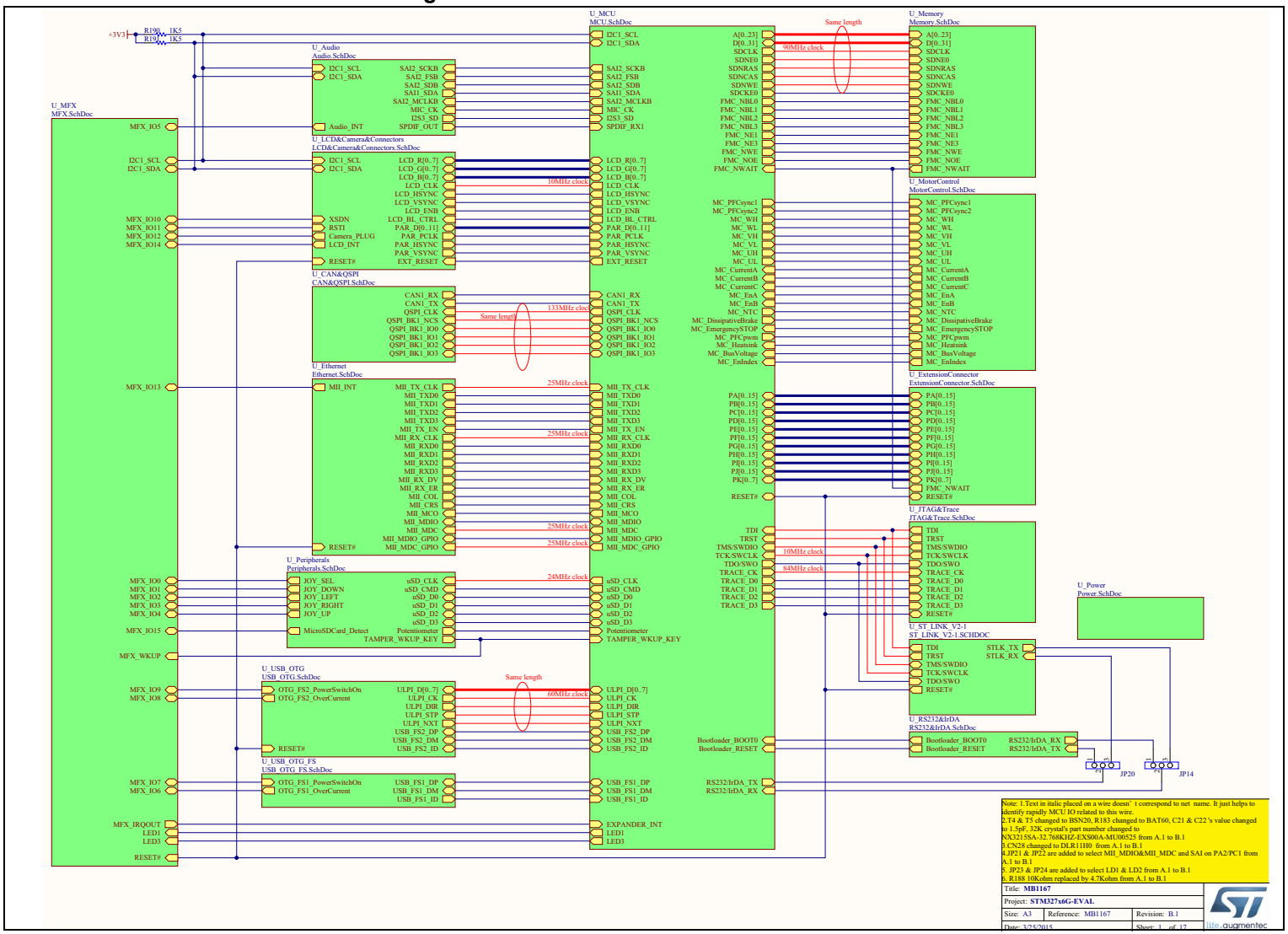


Figure 26. STM32756G-EVAL MCU

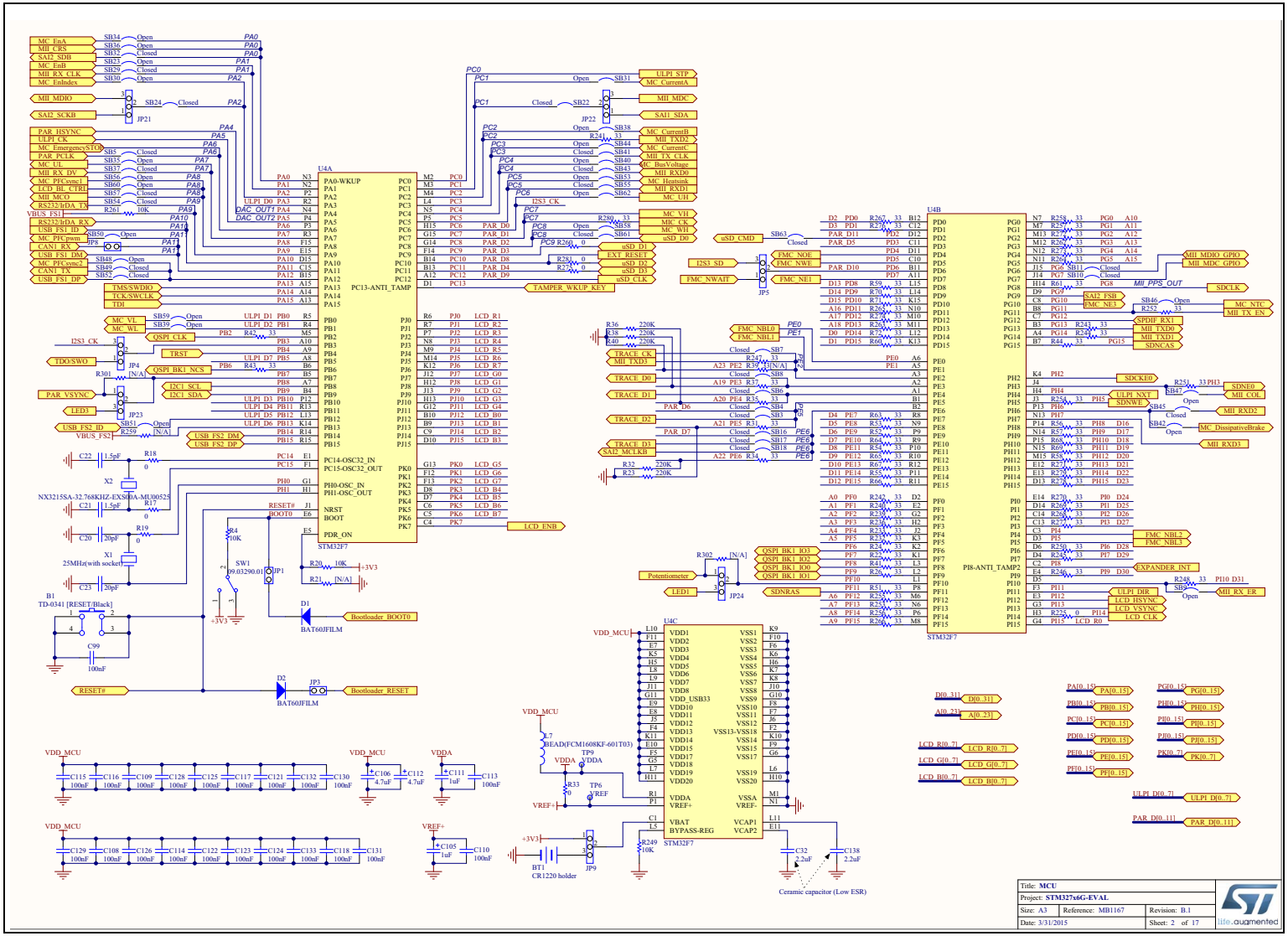


Figure 27. STM32756G-EVAL Power

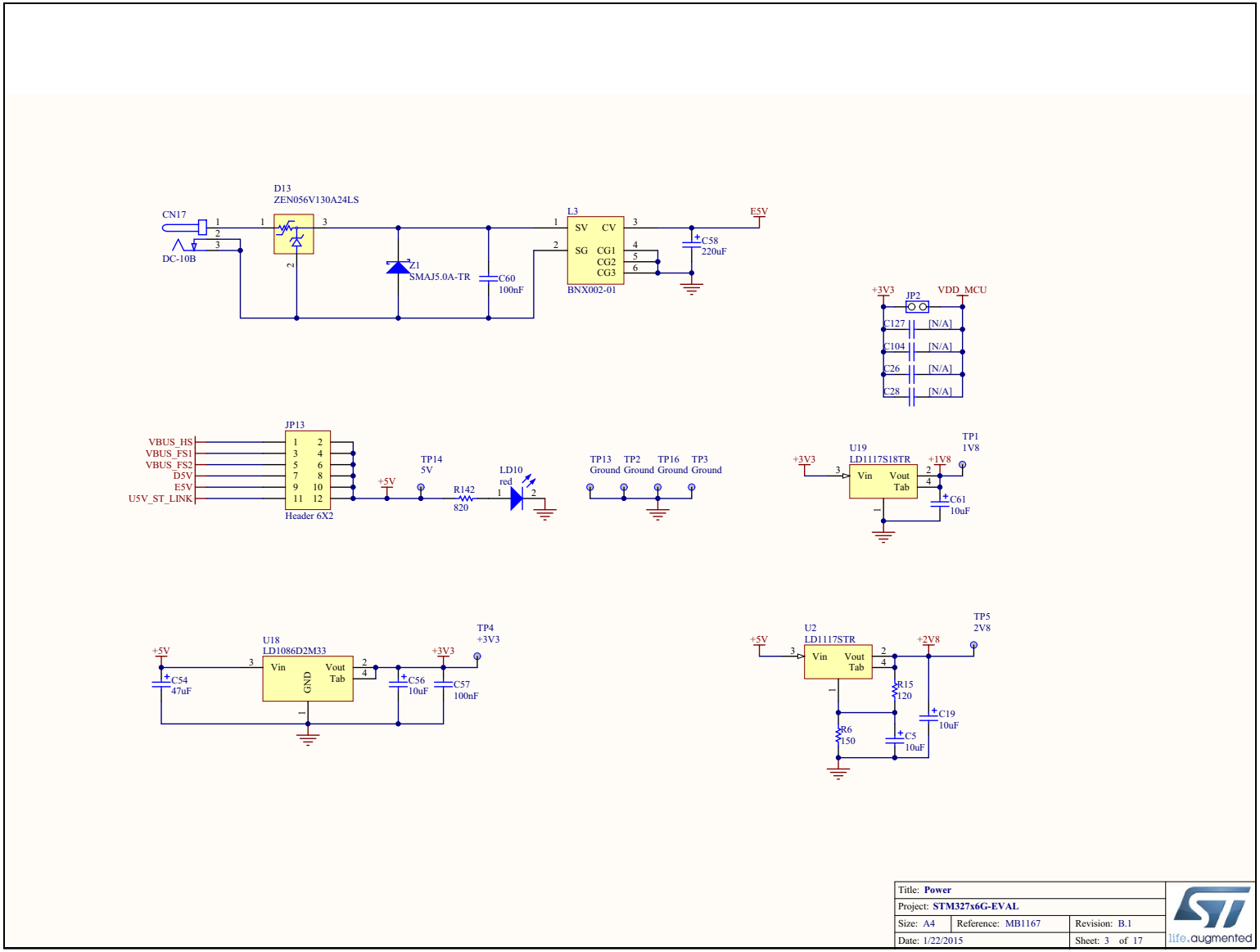


Figure 28. STM32756G-EVAL SRAM, Flash memory and DRAM

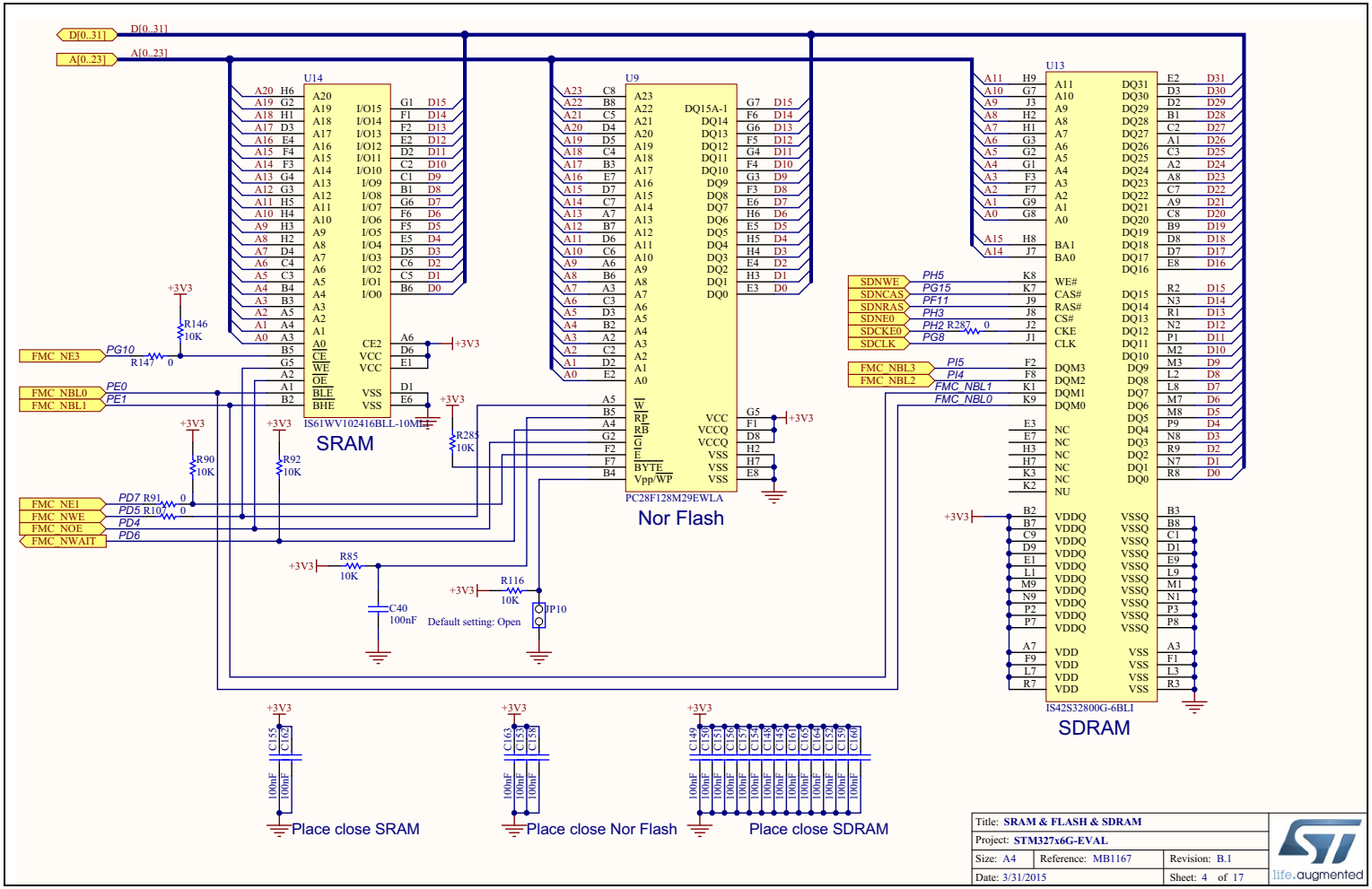


Figure 29. STM32756G-EVAL Audio

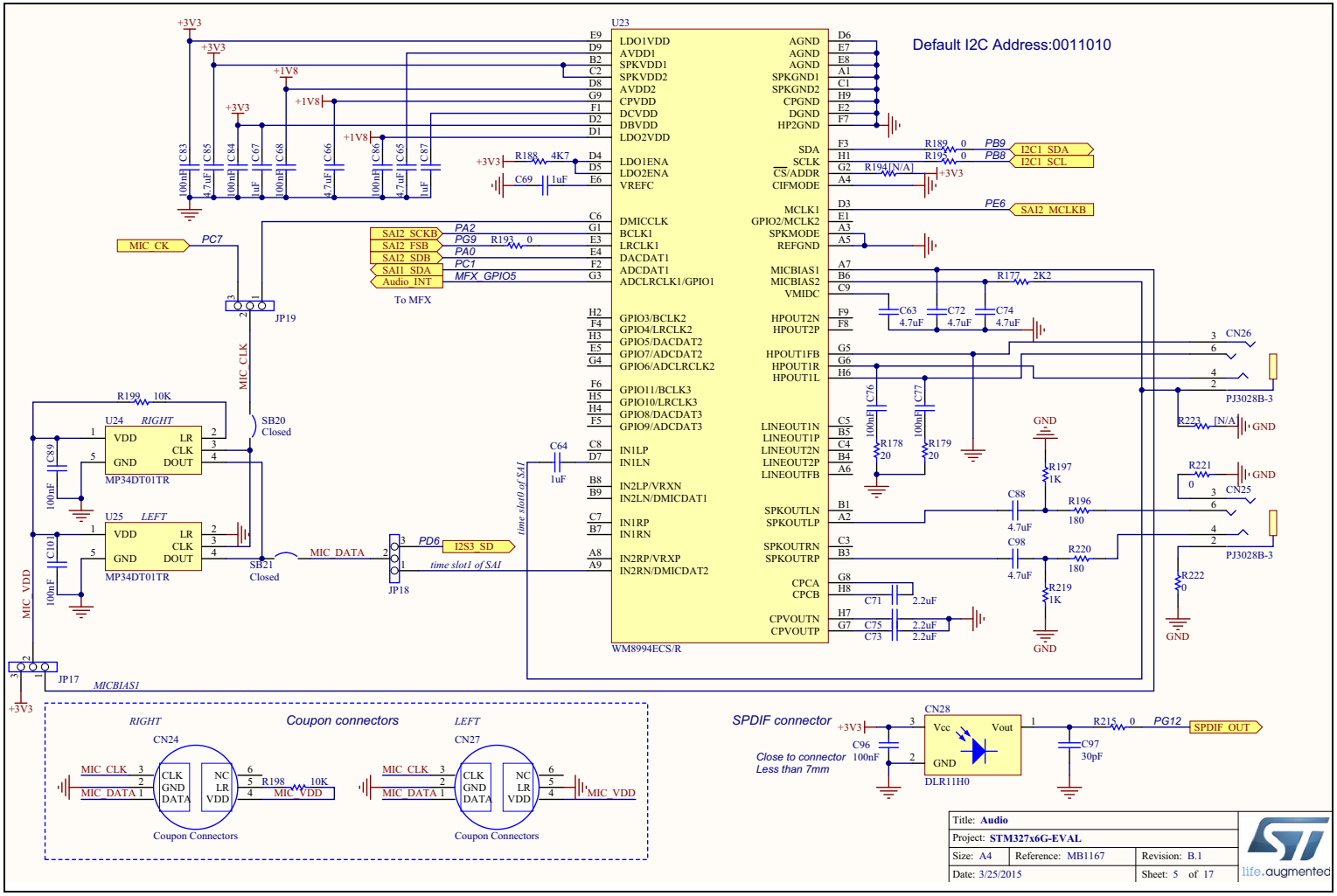


Figure 30. STM32756G-EVAL LCD, Camera and RF connector

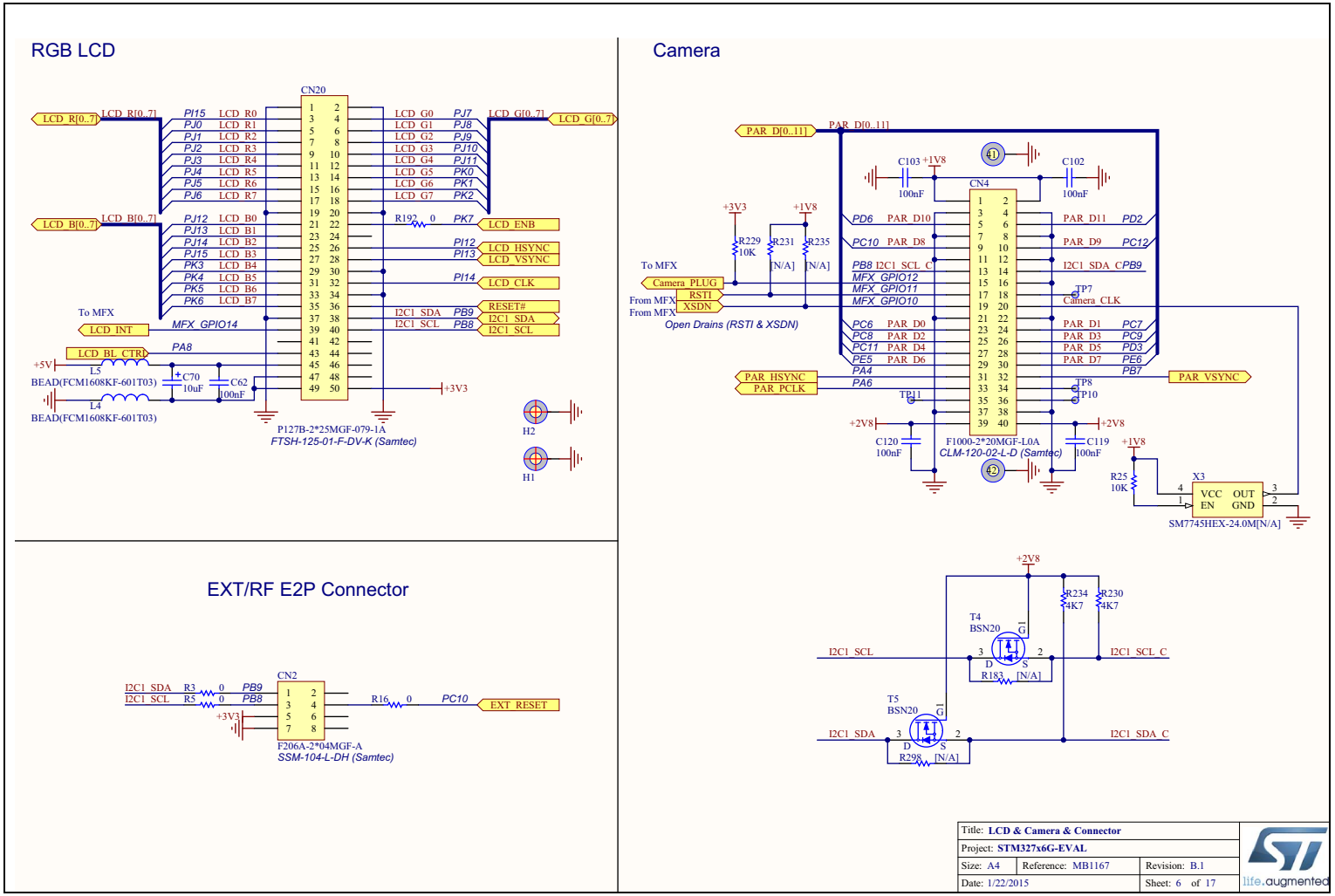


Figure 31. STM32756G-EVAL Ethernet

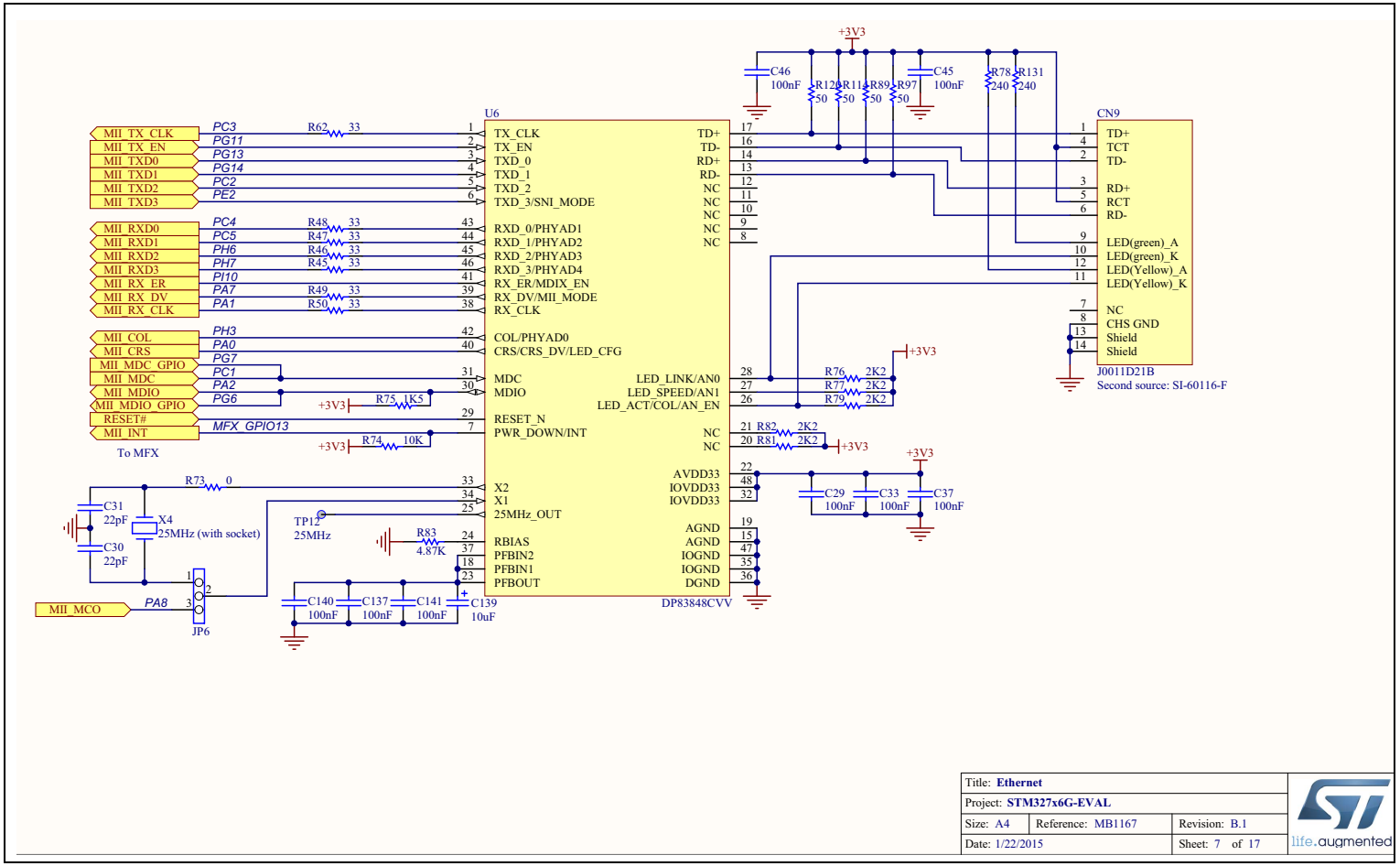


Figure 32. STM32756G-EVAL USB OTG HS and OTG FS2

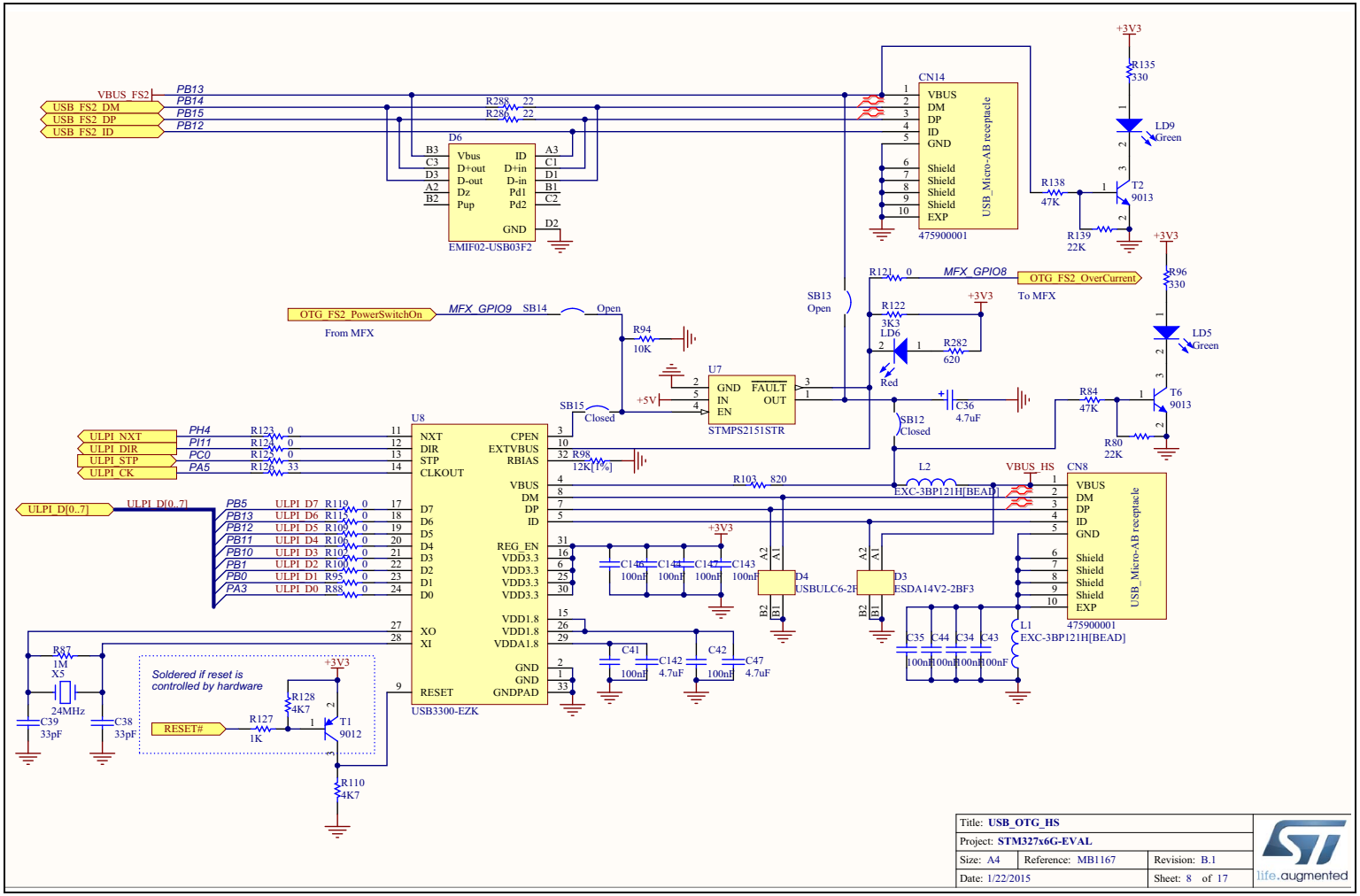


Figure 33. STM32756G-EVAL USB OTG FS1

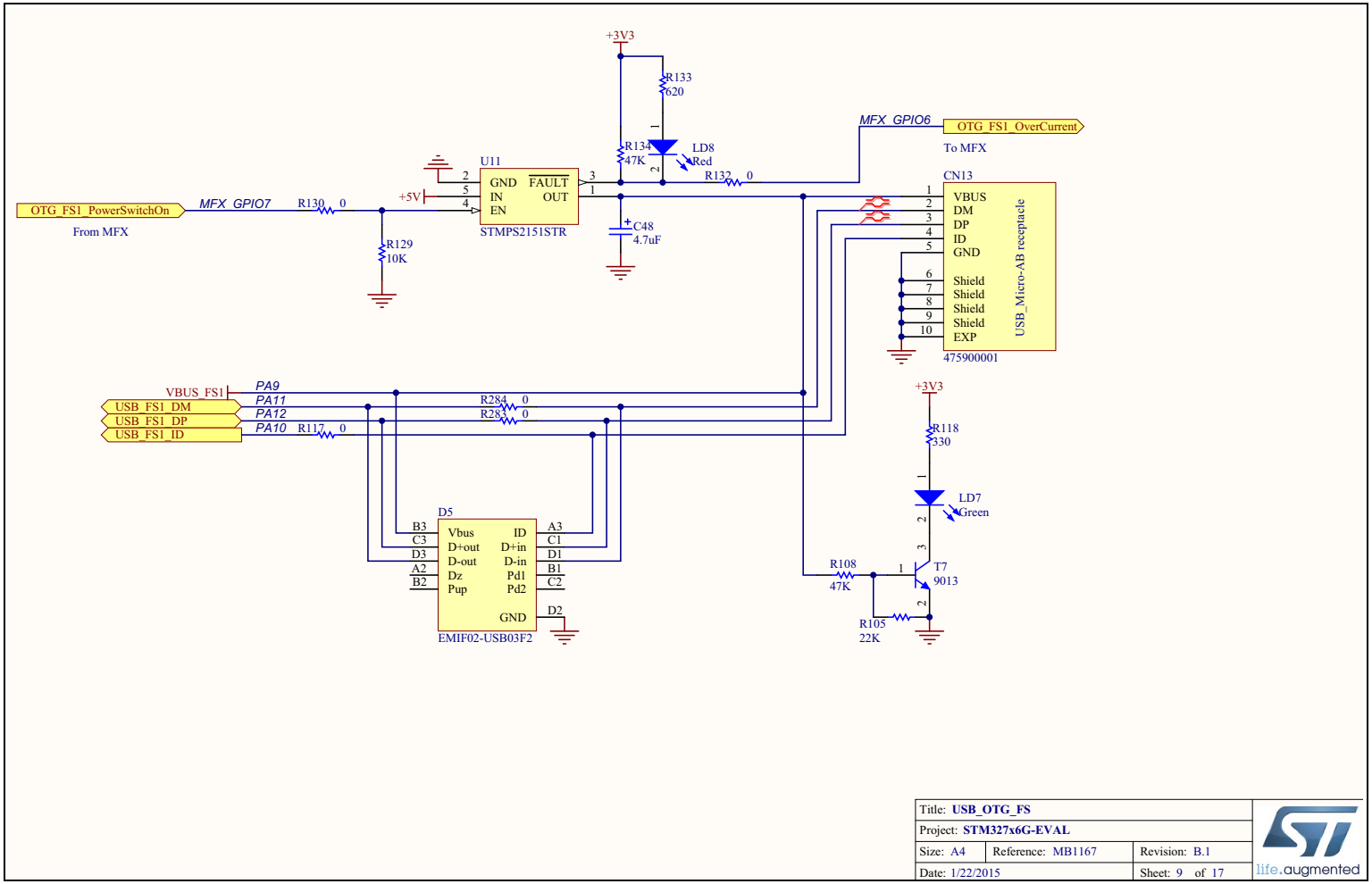


Figure 34. STM32756G-EVAL RS232 and IrDA

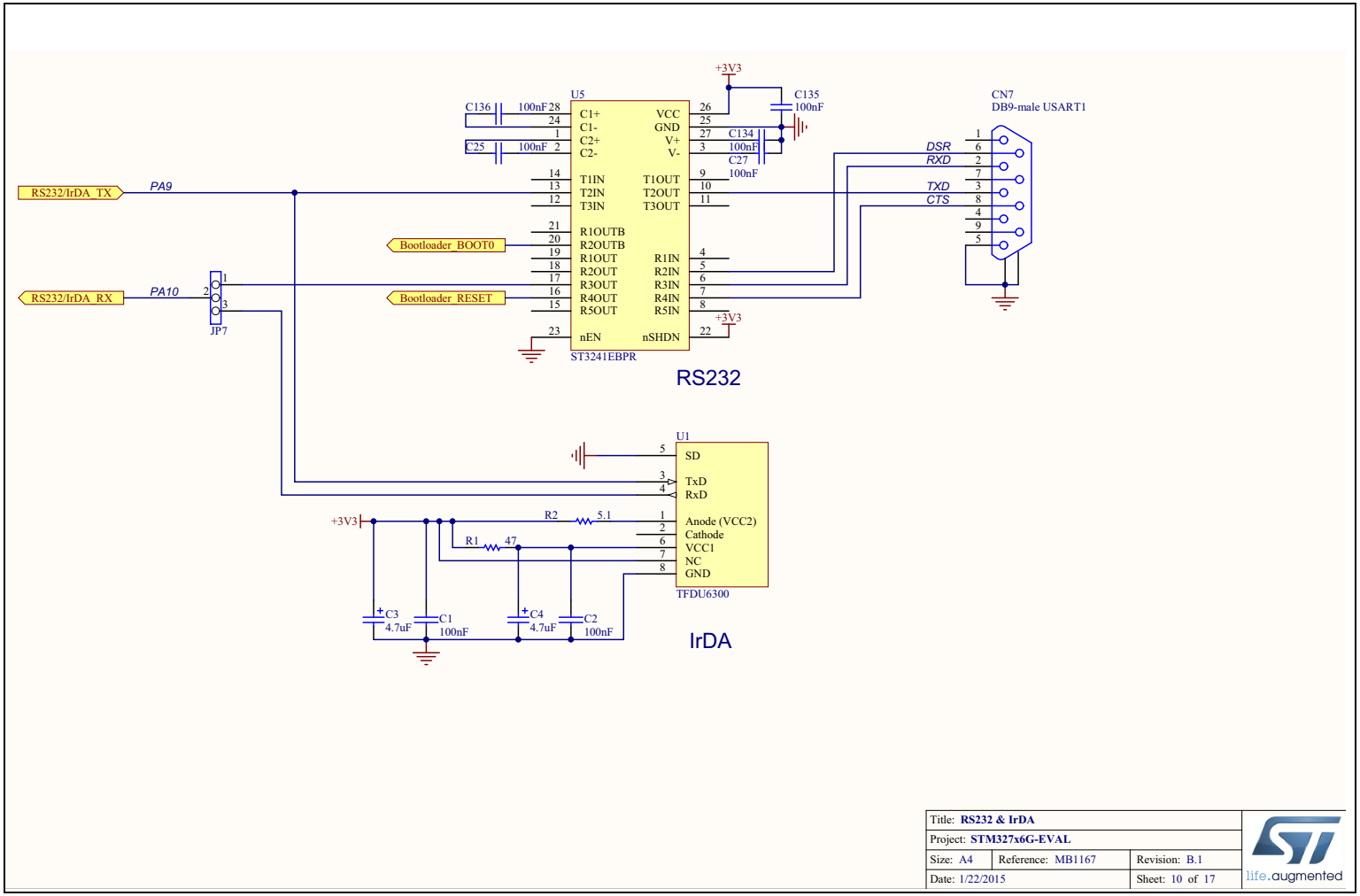


Figure 35. STM32756G-EVAL CAN and QSPI

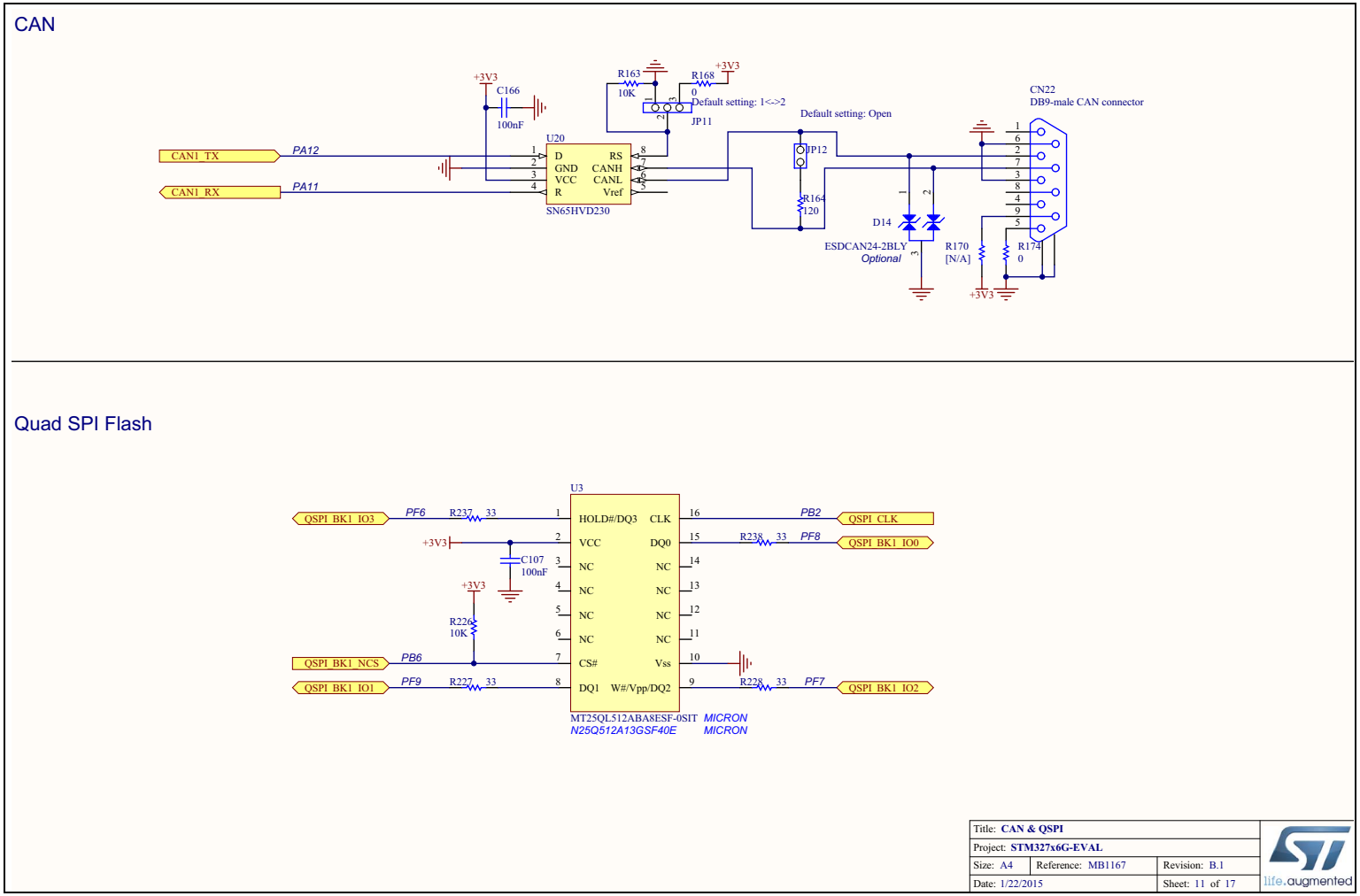


Figure 36. STM32756G-EVAL Peripherals

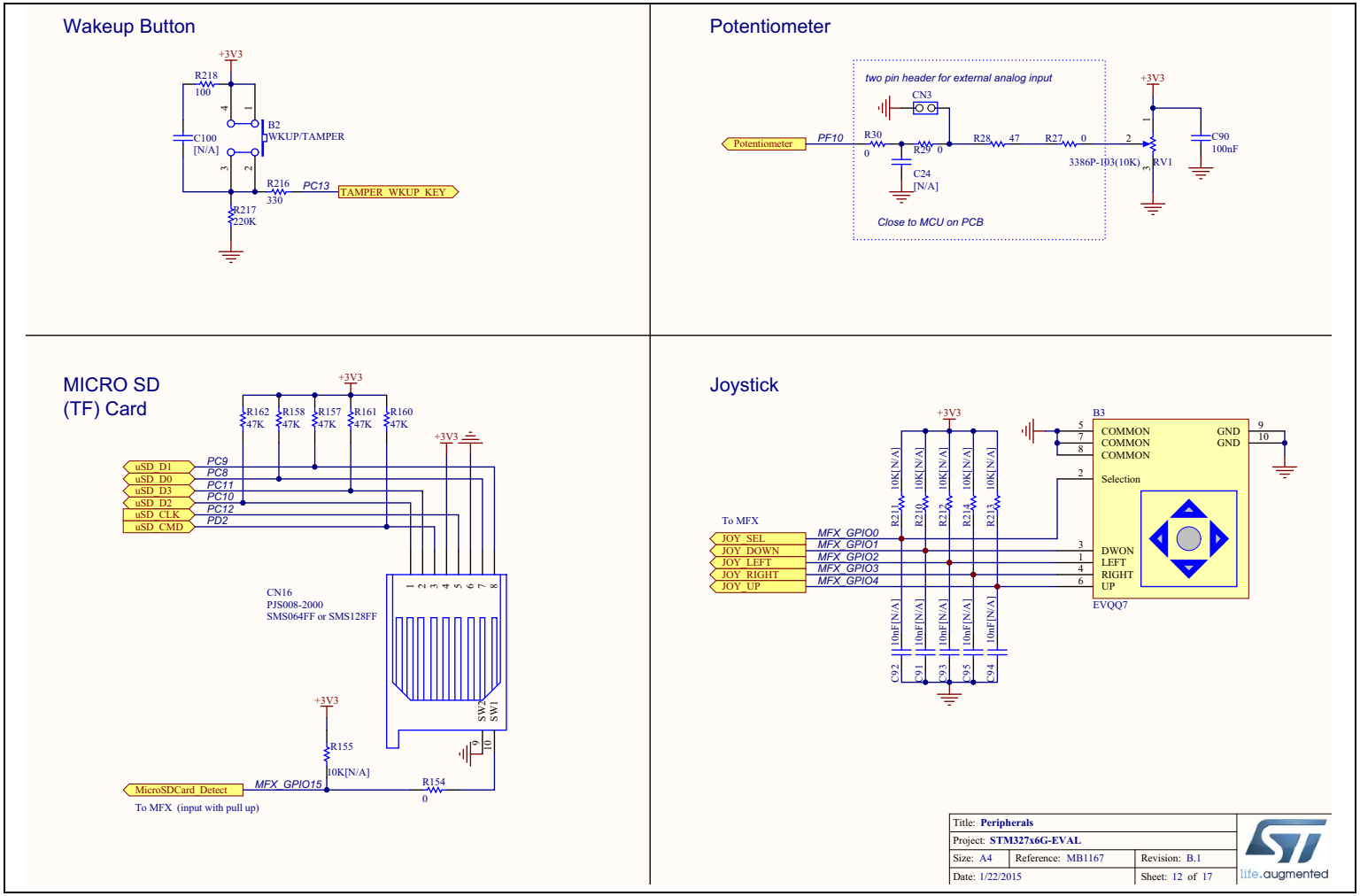


Figure 37. STM32756G-EVAL Motor control

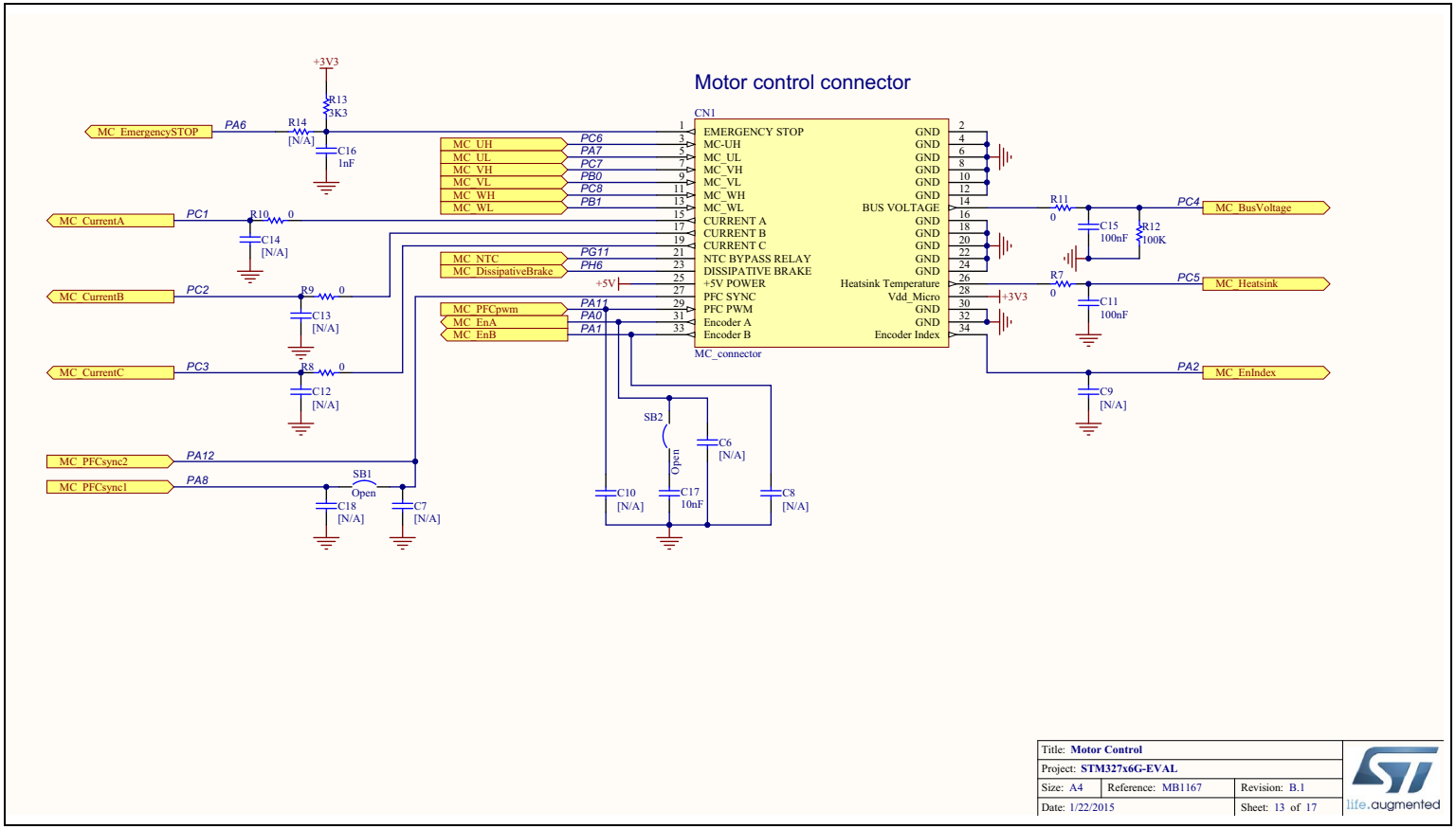


Figure 38. STM32756G-EVAL Extension connector

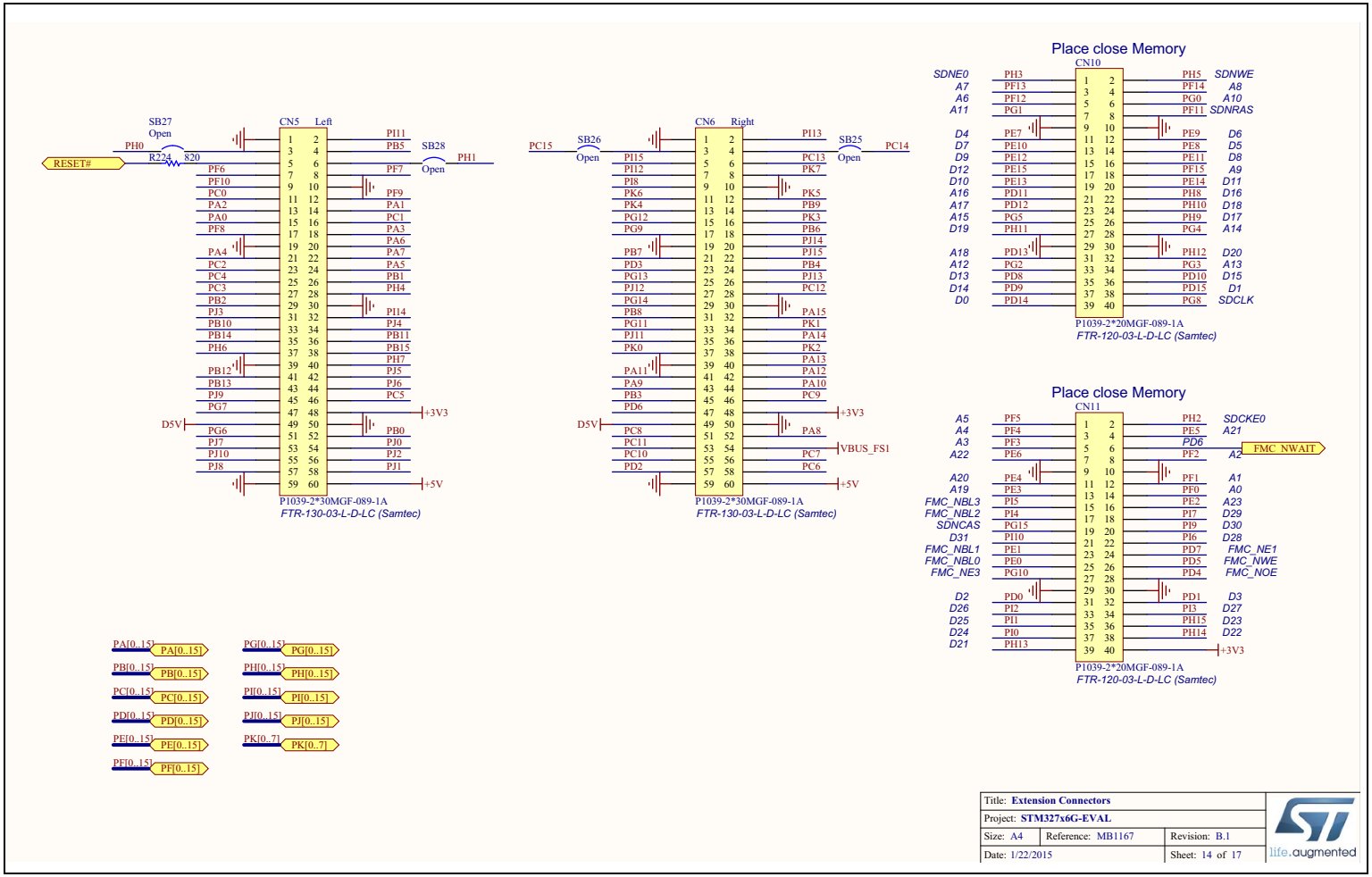


Figure 39. STM32756G-EVAL ST-LINK/V2-1

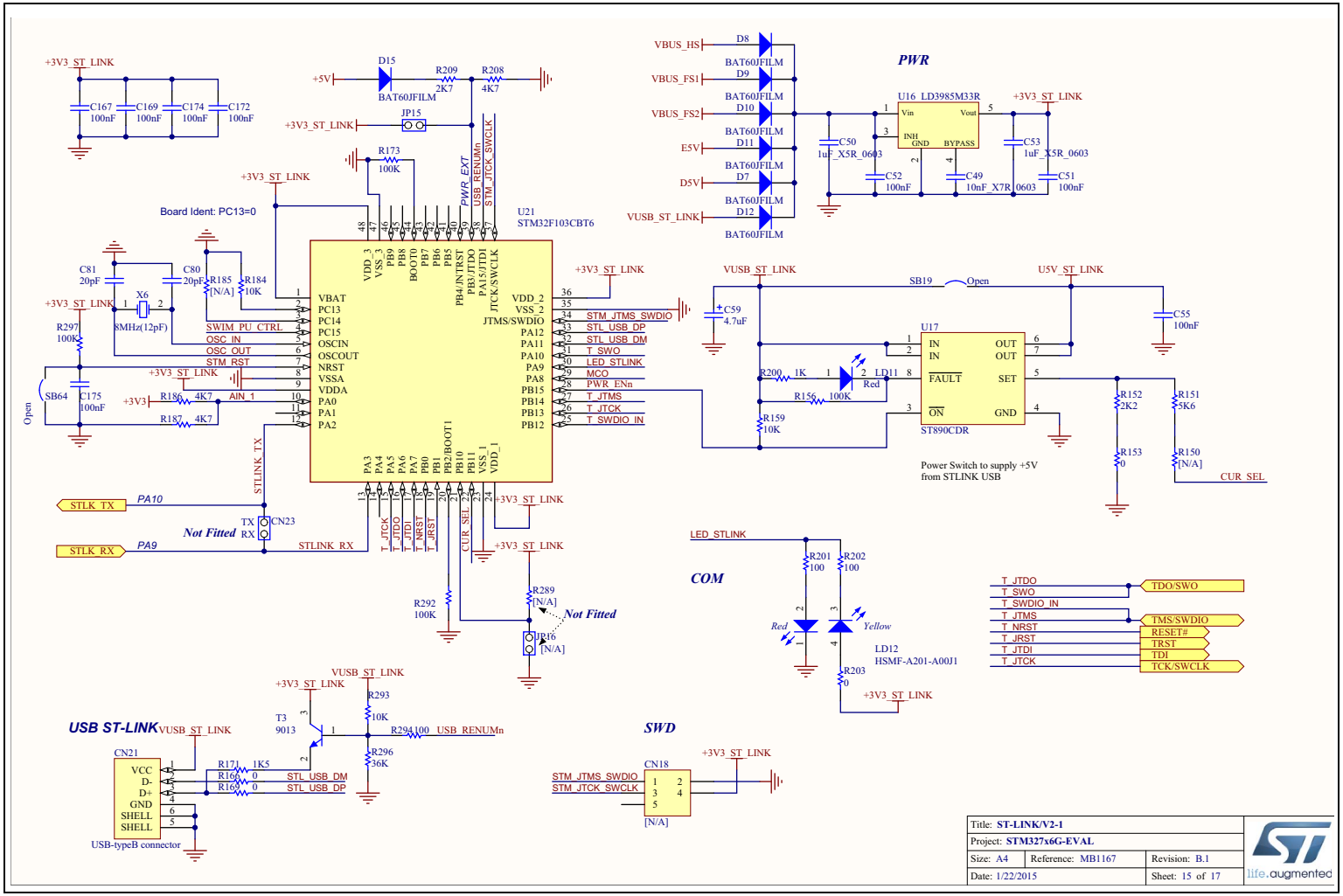


Figure 40. STM32756G-EVAL MFX

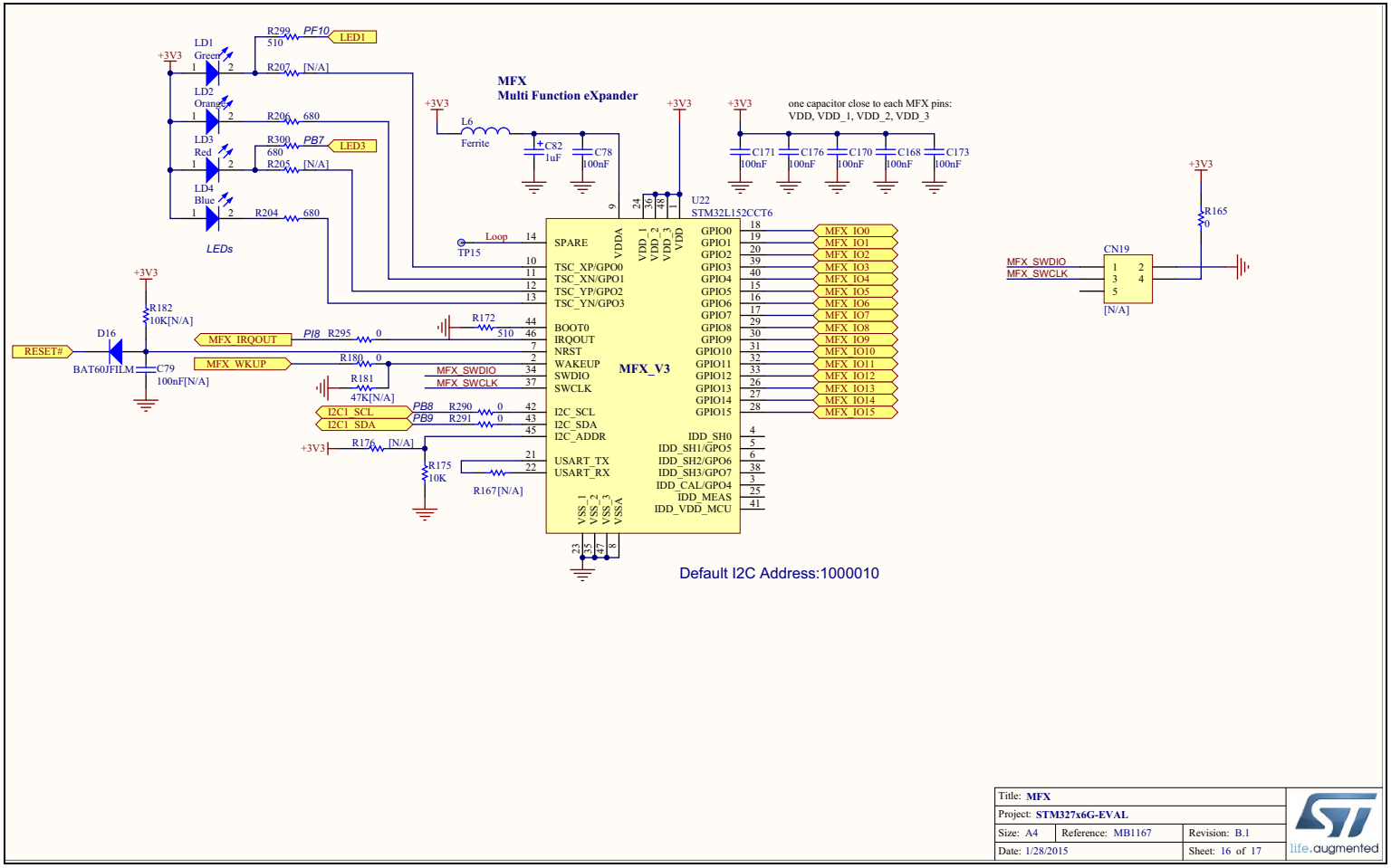


Figure 41. STM32756G-EVAL JTAG and Trace

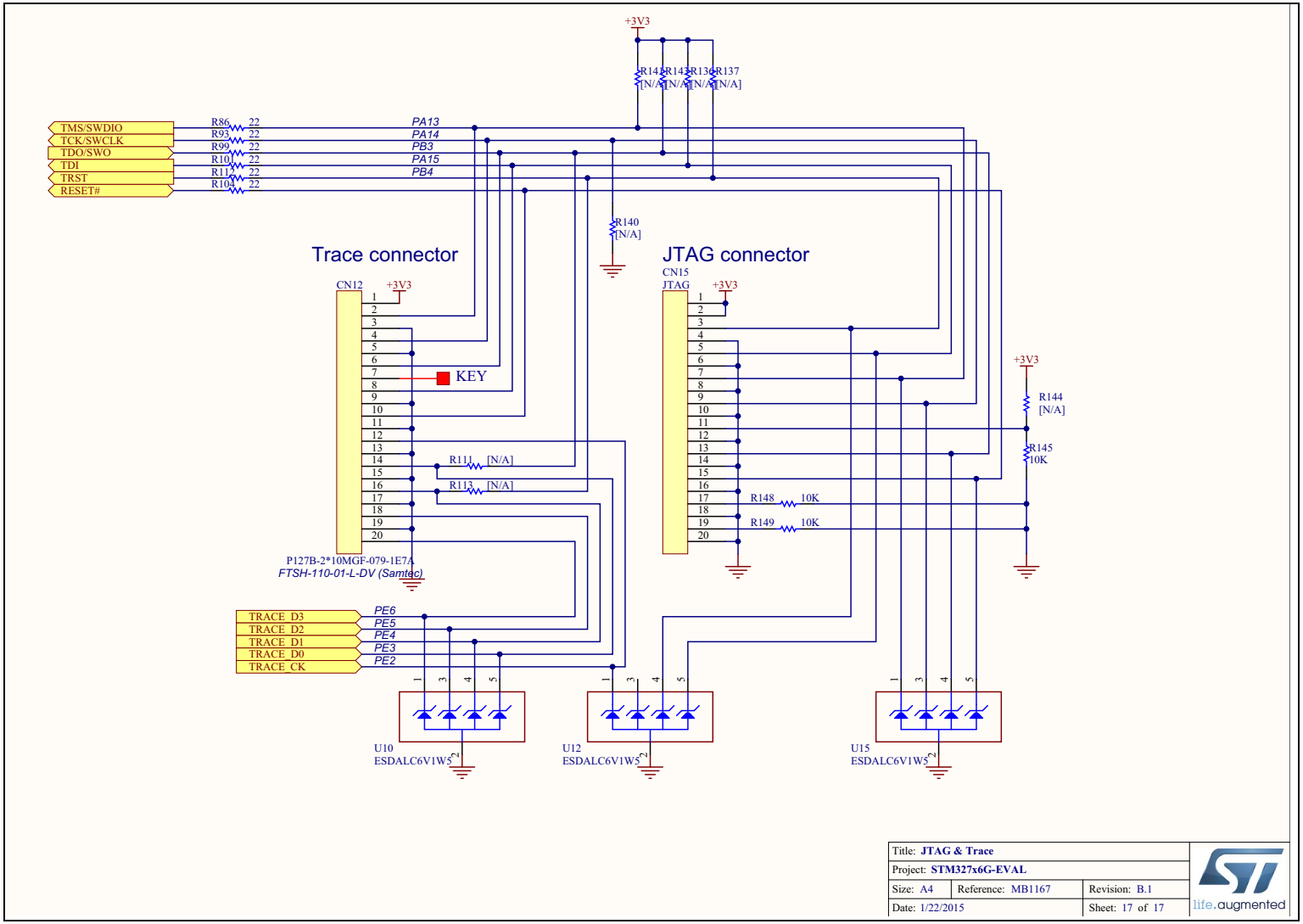


Figure 42. STM32756G-EVAL Camera daughterboard

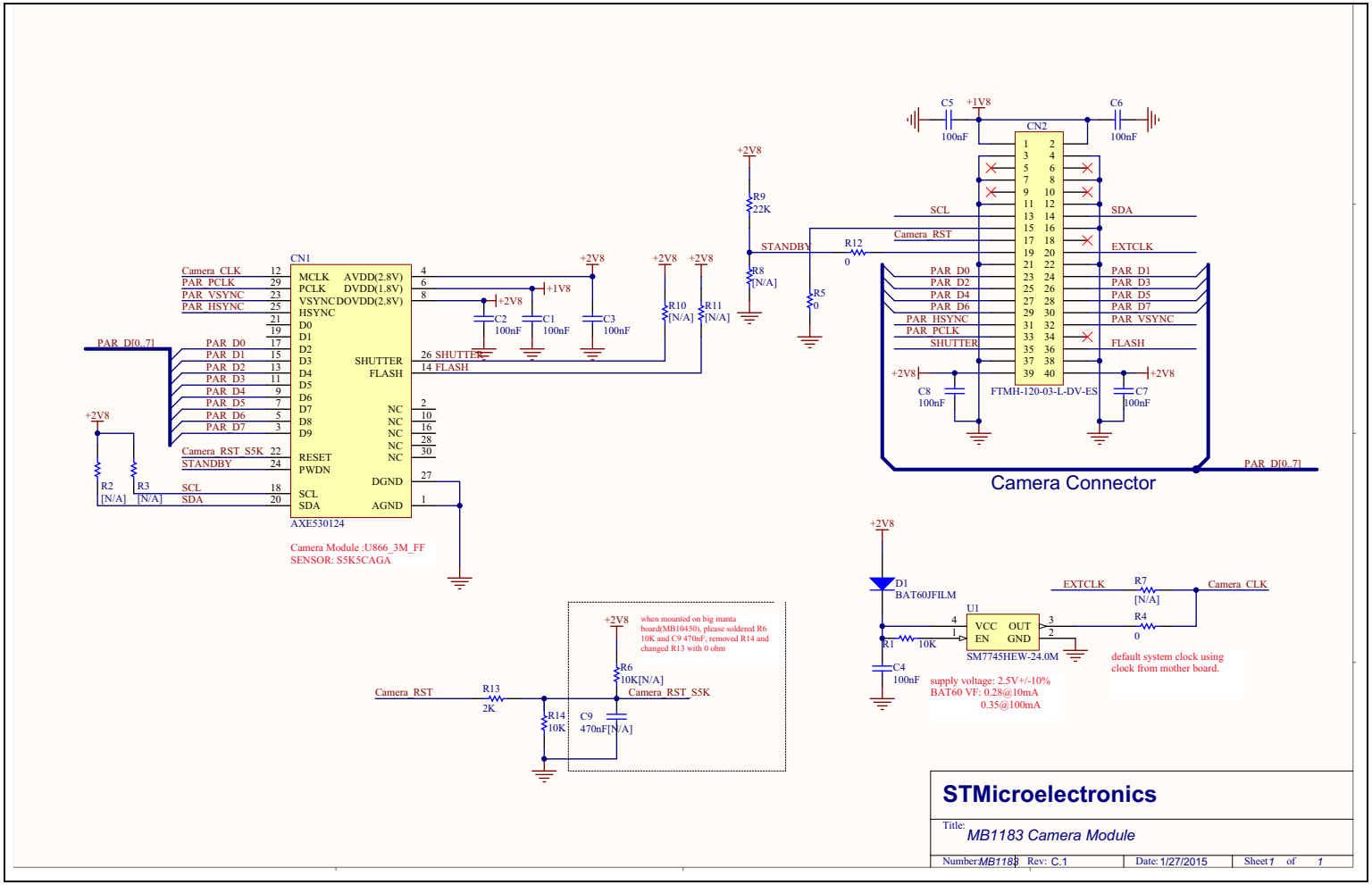
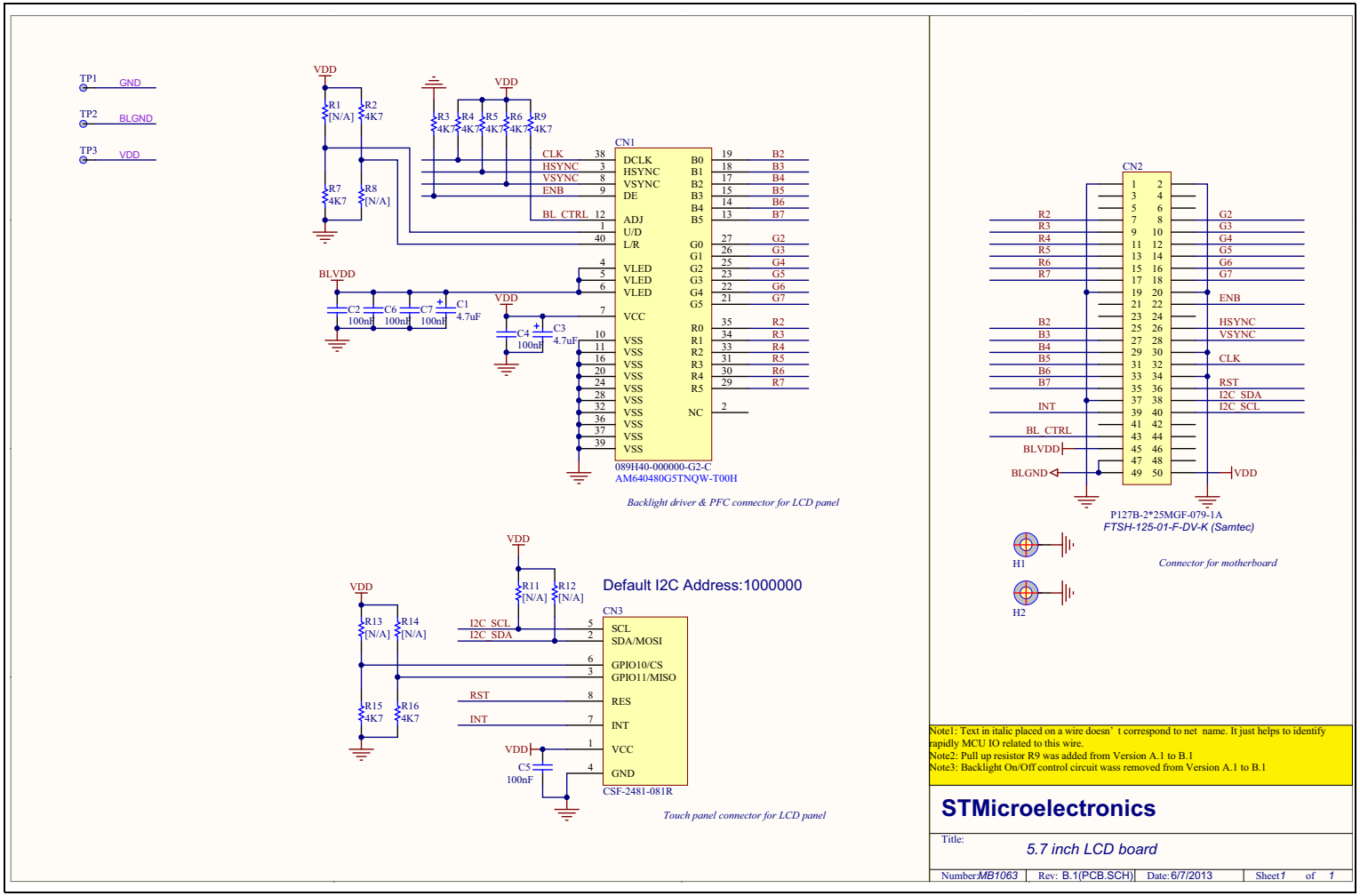


Figure 43. STM32756G-EVAL 5.7 TFT LCD daughterboard



Appendix B STM32756G-EVAL I/O assignment

Table 37. I/O assignment

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
A1	PE4	A20/TRACED1	-	-
A2	PE3	A19/TRACED0	-	-
A3	PE2	A23/TRACECLK/MII_TXD3	-	-
A4	PG14	MII_TXD1	-	-
A5	PE1	NBL1	-	-
A6	PE0	NBL0	-	-
A7	PB8	Audio and EXPANDER and ACP and RF_I2C1_SCL	-	-
A8	PB5	ULPI_D7	-	-
A9	PB4	NJTRST	-	-
A10	PB3	JTDO/TRACESWO/ MICROPHONE2_I2S3_CK	-	-
A11	PD7	NE1	-	-
A12	PC12	SDCARD_CK	-	D9
A13	PA15	JTDI	-	-
A14	PA14	JTCK-SWCLK	-	-
A15	PA13	JTMS-SWDIO	-	-
B1	PE5	A21/TRACED2	-	D6
B2	PE6	A22/SAI2_MCLK_B/TRACED3	-	D7
B3	PG13	MII_TXD0	-	-
B4	PB9	Audio and EXPANDER and ACP and RF_I2C1_SDA	-	-
B5	PB7	LED3	-	VSYNC
B6	PB6	QSPI_BK1_NCS	-	-
B7	PG15	SDNCAS	-	-
B8	PG11	MII_TX_EN	NTC_BYPASS_IO	-
B9	PJ13	LCD_B1	-	-
B10	PJ12	LCD_B0	-	-
B11	PD6	NWAIT/MICROPHONE2_I2S3_SD	-	D10
B12	PD0	D2	-	-
B13	PC11	SDCARD_D3	-	D4
B14	PC10	SDCARD_D2/EXT_RESET	-	D8

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
B15	PA12	CAN1_TX/USB_FS1_DP	PFC_SYNC2_TIM1_ETR	-
C1	V_{bat}	V_{bat}	-	-
C2	PI8-ANTI TAMP2	EXPANDER_INT	-	-
C3	PI4	NBL2	-	-
C4	PK7	LCD_DE	-	-
C5	PK6	LCD_B7	-	-
C6	PK5	LCD_B6	-	-
C7	PG12	SPDIF_RX1	-	-
C8	PG10	NE3	-	-
C9	PJ14	LCD_B2	-	-
C10	PD5	NWE	-	-
C11	PD3	-	-	D5
C12	PD1	D3	-	-
C13	PI3	D27	-	-
C14	PI2	D26	-	-
C15	PA11	CAN1_RX/USB_FS1_DM	PFC_PWM_TIM1_1_CH4	-
D1	PC13-ANTI_TAMP	KEY_ TAMP1_WKUP2	-	-
D2	PF0	A0	-	-
D3	PI5	NBL3	-	-
D4	PI7	D29	-	-
D5	PI10	D31/MII_RX_ER	-	-
D6	PI6	D28	-	-
D7	PK4	LCD_B5	-	-
D8	PK3	LCD_B4	-	-
D9	PG9	SAI2_FS_B	-	-
D10	PJ15	LCD_B3	-	-
D11	PD4	NOE	-	-
D12	PD2	SDCARD_CMD	-	D11
D13	PH15	D23	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
D14	PI1	D25	-	-
D15	PA10	RS232_IRDA_USART1_RX/USB_FS1_ID	-	-
E1	PC14-OSC32_IN	OSC32_IN	-	-
E2	PF1	A1	-	-
E3	PI12	LCD_HSYNC	-	-
E4	PI9	D30	-	-
E5	PDR_ON	-	-	-
E6	BOOT	BOOT	-	-
E7	VDD_3	-	-	-
E8	VDD_11	-	-	-
E9	VDD_10	-	-	-
E10	VDD_15	-	-	-
E11	VCAP2	-	-	-
E12	PH13	D21	-	-
E13	PH14	D22	-	-
E14	PI0	D24	-	-
E15	PA9	RS232_IRDA_USART1_TX/ USB_FS1_VBUS	-	-
F1	PC15-OSC32_OUT	OSC32_OUT	-	-
F2	VSS_18	-	-	-
F2	VSS_13	-	-	-
F3	PI11	ULPI_DIR	-	-
F4	VDD_13	-	-	-
F5	VDD_17	-	-	-
F6	VSS_3	-	-	-
F7	VSS_11	-	-	-
F8	VSS_10	-	-	-
F9	VSS_15	-	-	-
F10	VSS 2	-	-	-
F11	VDD_2	-	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
F12	PK1	LCD_G6	-	-
F13	PK2	LCD_G7	-	-
F14	PC9	SDCARD_D1	-	D3
F15	PA8	Backlight_PWM_TIM1_CH1 /MII_MCO	PFC_SYNC1_TIM1_1_CH1	-
G1	PH0 - OSC_IN	OSC_IN	-	-
G2	PF2	A2	-	-
G3	PI13	LCD_VSYNC	-	-
G4	PI15	LCD_R0	-	-
G5	VDD_18	-	-	-
G6	VSS_17	-	-	-
G10	VSS_9	-	-	-
G11	VDDUSB	-	-	-
G12	PJ11	LCD_G4	-	-
G13	PK0	LCD_G5	-	-
G14	PC8	SDCARD_D0	WH_TIM8_CH3	D2
G15	PC7	MIC_CK_OUT_TIM8_CH2	VH_TIM8_CH2	D1
H1	PH1 - OSC_OUT	OSC_OUT	-	-
H2	PF3	A3	-	-
H3	PI14	LCD_CLK	-	-
H4	PH4	ULPI_NXT	-	-
H5	VDD_5	-	-	-
H6	VSS_5	-	-	-
H10	VSS_20	-	-	-
H11	VDD_20	-	-	-
H12	PJ8	LCD_G1	-	-
H13	PJ10	LCD_G3	-	-
H14	PG8	SDCLK/MII_PPS_OUT	-	-
H15	PC6	MIC_CK_IN_TIM8_CH1	UH_TIM8_CH1	D0
J1	NRST	NRST	-	-
J2	PF4	A4	-	-
J3	PH5	SDNWE	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
J4	PH3	SDNE0/MII_COL	-	-
J5	VDD_12	-	-	-
J6	VSS_12	-	-	-
J10	VSS_8	-	-	-
J11	VDD_8	-	-	-
J12	PJ7	LCD_G0	-	-
J13	PJ9	LCD_G2	-	-
J14	PG7	MII_MDC(GPIO)	-	-
J15	PG6	MII_MDIO(GPIO)	-	-
K1	PF7	QSPI_BK1_IO2	-	-
K2	PF6	QSPI_BK1_IO3	-	-
K3	PF5	A5	-	-
K4	PH2	SDCKE0	-	-
K5	VDD_4	-	-	-
K6	VSS_4	-	-	-
K7	VSS_6	-	-	-
K8	VSS_7	-	-	-
K9	VSS_1	-	-	-
K10	VSS_14	-	-	-
K11	VDD_14	-	-	-
K12	PJ6	LCD_R7	-	-
K13	PD15	D1	-	-
K14	PB13	ULPI_D6/USB_FS2_VBUS	-	-
K15	PD10	D15	-	-
L1	PF10	LED1/POT_ADC3_IN8	-	-
L2	PF9	QSPI_BK1_IO1	-	-
L3	PF8	QSPI_BK1_IO0	-	-
L4	PC3	MII_TX_CLK	CURRENT_C_ADC3_123_IN13	-
L5	BYPASS_REG	-	-	-
L6	VSS_19	-	-	-
L7	VDD_19	-	-	-
L8	VDD_6	-	-	-
L9	VDD_7	-	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
L10	VDD_1	-	-	-
L11	VCAP1	-	-	-
L12	PD14	D0	-	-
L13	PB12	ULPI_D5/USB_FS2_ID	-	-
L14	PD9	D14	-	-
L15	PD8	D13	-	-
M1	VSSA	-	-	-
M2	PC0	ULPI_STP	-	-
M3	PC1	SAI1_SD_A/MII_MDC	CURRENT_A_ADC1_123_IN11	-
M4	PC2	MII_TXD2	CURRENT_B_ADC2_123_IN12	-
M5	PB2	QSPI_CLK	-	-
M6	PF12	A6	-	-
M7	PG1	A11	-	-
M8	PF15	A9	-	-
M9	PJ4	LCD_R5	-	-
M10	PD12	A17	-	-
M11	PD13	A18	-	-
M12	PG3	A13	-	-
M13	PG2	A12	-	-
M14	PJ5	LCD_R6	-	-
M15	PH12	D20	-	-
N1	VREF-	-	-	-
N2	PA1	MII_RX_CLK	ENCODER_B_TIM5_5_CH2	-
N3	PA0-WKUP	SAI2_SD_B/MII_CRS	ENCODER_A_TIM5_5_CH1	-
N4	PA4	-	DAC_OUT1	HSYNC
N5	PC4	MII_RXD0	BUSVOLTAGE_ADC12_IN14	-
N6	PF13	A7	-	-
N7	PG0	A10	-	-
N8	PJ3	LCD_R4	-	-
N9	PE8	D5	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
N10	PD11	A16	-	-
N11	PG5	A15(BA1)	-	-
N12	PG4	A14(BA0)	-	-
N13	PH7	MII_RXD3	-	-
N14	PH9	D17	-	-
N15	PH11	D19	-	-
P1	VREF+	-	-	-
P2	PA2	SAI2_SCK_B/MII_MDIO	INDEX_TIM5_5_CH3	-
P3	PA6	-	STOP_TIM8_BKIN	PIXCLK
P4	PA5	ULPI_CK	DAC_OUT2	-
P5	PC5	MII_RXD1	HEATSINK_ADC12_IN15	-
P6	PF14	A8	-	-
P7	PJ2	LCD_R3	-	-
P8	PF11	SDNRAS	-	-
P9	PE9	D6	-	-
P10	PE11	D8	-	-
P11	PE14	D11	-	-
P12	PB10	ULPI_D3	-	-
P13	PH6	MII_RXD2	DISSIPATIVE_BRAKE_TIM2_12_CH1	-
P14	PH8	D16	-	-
P15	PH10	D18	-	-
R1	VDDA	-	-	-
R2	PA3	ULPI_D0	-	-
R3	PA7	MII_RX_DV	UL_TIM8_CH1N	-
R4	PB1	ULPI_D2	WL_TIM8_CH3N	-
R5	PB0	ULPI_D1	VL_TIM8_CH2N	-
R6	PJ0	LCD_R1	-	-
R7	PJ1	LCD_R2	-	-
R8	PE7	D4	-	-
R9	PE10	D7	-	-
R10	PE12	D9	-	-
R11	PE15	D12	-	-
R12	PE13	D10	-	-

Table 37. I/O assignment (continued)

Pin No.	Pin name	STM32756G-EVAL standard	Motor control variant	Camera variant
R13	PB11	ULPI_D4	-	-
R14	PB14	USB_FS2_DM	-	-
R15	PB15	USB_FS2_DP	-	-

Appendix C Mechanical dimensions

Figure 44. Mechanical dimensions

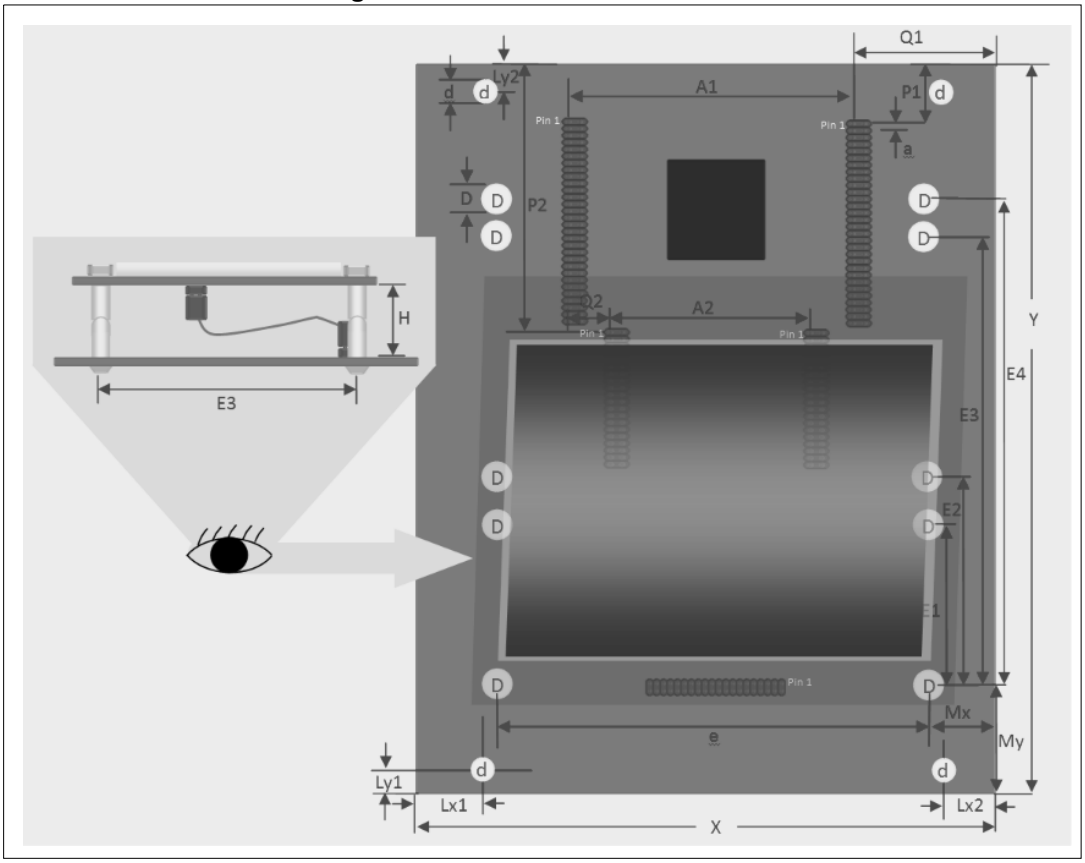


Table 38. Mechanical dimensions

Symbol	Size (mm)	Symbol	Size (mm)	Symbol	Size (mm)
A1	68.58	E4	114.18	My	24.43
A2	48.62	e	116.5	P1	16.94
a	1.27	H	25	P2	55.37
D	4.5	Lx1	21.36	Q1	46.77
d	3.5	Lx2	32.64	Q2	9.98
E1	55	Ly1	5	X	157
E2	68	Ly2	6.4	Y	172.72
E3	107	Mx	20.1	-	-

Appendix D Compliance statement

D.1 Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements

D.1.1 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 15.105

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.

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.

D.2 IC Compliance Statement

D.2.1 Compliance Statement

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

D.2.2 Déclaration de conformité

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

7 Revision History

Table 39. Document Revision History

Date	Version	Revision Details
10-Jun-2015	1	Initial release.
16-Mar-2016	2	Added *Section Appendix D: Compliance statement*.

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