UM2514
User manual

Evaluation board with STM32G4xxQE MCU

Introduction

The STM32G474E-EVAL board is a complete demonstration and development platform for the STMicroelectronics Arm® Cortex®-M4 core-based STM32G474QET6U microcontroller. It features three FDCAN controllers, four I²C Fast mode plus, five USART/UARTs and one LPUART, four SPIs, one SAI port, USB FS and IRTIM communication interfaces, UCPD, five 12-bit ADCs, seven 12-bit DAC channels, seven comparators and six operational amplifiers, 17 timers, 96 Kbytes of internal SRAM, 32 Kbytes of CCM SRAM, 512 Kbytes of Flash memory, and JTAG/SWD debugging support.

The STM32G474E-EVAL, shown in *Figure 1* and *Figure 2*, is used as a reference design for user application development before porting to the final product. The STM32G484E-EVAL is populated with an STM32G484QET6U MCU with Cryptography. The STM32G474E-EVAL1 is configured as a dedicated motor-control board.

The full range of hardware features available on the board helps users to optimize the application development by the evaluation of all the peripherals (USB FS, UCPD, USART, audio, ADC and DAC, differential ADC, TFT LCD, potentiometer/LDR, SRAM, Quad-SPI Flash memory device, microSD™ card, Smartcard, FDCAN transceiver, high brightness LED, motor control connectors, temperature sensor, and others). Extension headers provide easy connection to daughterboard for specific applications.

STLINK-V3E is integrated into the board, as the embedded in-circuit debugger and programmer for the STM32 MCU and the USB virtual COM port bridge.

The three products (STM32G474E-EVAL, STM32G484E-EVAL, STM32G474E-EVAL1) are described in this user manual, together with STM32G474E-EVAL figures.

Figure 1. STM32G474E-EVAL top view

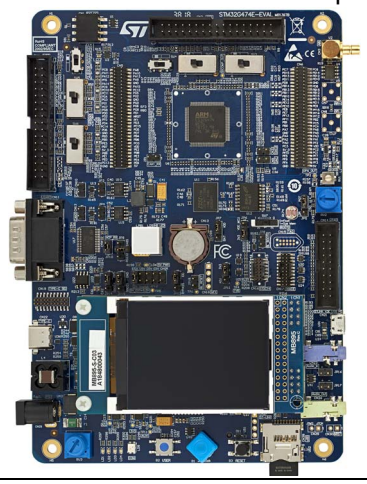

Figure 2. STM32G474E-EVAL bottom view

Pictures are not contractual.

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1 Features

- Common features
  - 240x320 TFT color LCD display module with SPI interface
  - 16-Gbyte microSD™ card bundled
  - On-board current measurement
  - SAI audio codec
  - Temperature sensor
  - 8-Mbit (512 K x 16-bit) SRAM
  - Two 512-Mbit Quad-SPI NOR Flash memories
  - Four color user LEDs
  - One high brightness LED
  - Reset and wake-up / tamper buttons
  - 4-direction joystick with selection button
  - Light-dependent resistor (LDR)
  - Potentiometer
  - Access to comparator and operational amplifier
  - Board connectors:

    -Analog line input jack

    -Stereo headset jack

    -Two connectors for external speakers

    -microSD™ card

    -EXT_I2C connector supporting I^2C bus

    -RS-232 port configurable for communication or MCU flashing

    -RS-485 port

    -USB Type-C™ port supporting USB FS Device

    -Two CAN 2.0A/B-compliant ports

    -Connector for DAC output

    -JTAG/SWD connector

    -ETM trace debug connector

    -User interface through USB virtual COM port

    -Embedded STLINK-V3E debug and flashing facility

    -TAG connector 10-pin footprint

-Arm®(a) Cortex® 10-pin 1.27 mm-pitch debug connector over STDC14 footprint

-Coin cell battery holder

– Board expansion connectors:

-Two sets of motor control expansion connectors

-Board expansion extension connectors

– Flexible power-supply options:

-ST-LINK USB VBUS, external sources, USB Type-C™ connector, or daughterboard

– On-board STLINK-V3E debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
– Microcontroller supply voltage: fixed 3.3 V or adjustable range from 1.62 V to 3.6 V
– Comprehensive free software libraries and examples available with the STM32CubeG4 MCU Package
– Support of a wide choice of integrated development environments (IDEs) including IAR™, Keil®, GCC-based IDEs

- Board-specific features

-STM32G474QET6U microcontroller with 512 Kbytes of Flash memory and 96 Kbytes of RAM in LQFP128 package (STM32G474E-EVAL and STM32G474E-EVAL1)

-STM32G474E-EVAL1 is the board to use for motor control application with solder bridge and resistor configuration

-STM32G484QET6U with cryptography (STM32G484E-EVAL)

- Fully compatible with all microcontrollers of the STM32G4x1 and STM32G4x3 lines with “QET6” part number suffix

arm

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2 Ordering information

To order the STM32G4x4E-EVAL Evaluation board, refer to *Table 1*. Additional information is available in the datasheet and reference manual of the targeted STM32.

Table 1. List of available products

Order code	Board reference	Target STM32	Differentiating feature
STM32G474E-EVAL	MB1397	STM32G474QET6U	-
STM32G474E-EVAL1			Motor-control configuration board
STM32G484E-EVAL		STM32G484QET6U	Cryptography

2.1 Product marking

Evaluation tools marked as “ES” or “E” are not yet qualified and are therefore not ready to be used as reference design or in production. Any consequences arising from such usage will not be at STMicroelectronics’ charge. In no event will STMicroelectronics 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 illustration of STM32 marking, refer to the section *Package information* in the STM32 datasheet at *www.st.com*).
- next to the evaluation tool ordering part number, that is stuck or silkscreen printed on the board.

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

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

2.2 Codification

The meaning of the codification is explained in *Table 2*.

Table 2. Codification explanation

STM32XXYYYZ-EVAL(T)	Description	Example: STM32G484E-EVAL
XX	MCU series in STM32 Arm Cortex MCUs	STM32G4 Series
YY	MCU product line in the series – G474: basic security – G484: cryptography	STM32G484
Z	STM32 Flash memory size, E for 512 Kbytes	512 Kbytes
T	Evaluation board configuration: – EVAL: basic – EVAL1: with motor-control configuration board	Basic

The order code is mentioned on a sticker placed on the top side of the board.

3 Development environment

3.1 System requirements

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

3.2 Development toolchains

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

3.3 Demonstration software

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

Some verifications are needed before using the 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 components to verify are:

1. microSD card which may have been ejected from the connector CN28 (right side of the board),
2. TFT LCD display MB895 daughterboard which must be in its CN20 and CN24 connectors

For product information related to STM32G4xxQET6U microcontroller, visit the *www.st.com* website.

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b. on Windows® only

5 Hardware layout and configuration

The STM32G474E-EVAL board is designed around STM32G474QET6U target microcontroller in TQFP 128-pin package. *Figure 3* illustrates the connections of the STM32G474QET6U with the peripheral components. *Figure 4* and *Figure 5* show the locations of main components on the evaluation board.

Figure 3. Hardware block diagram

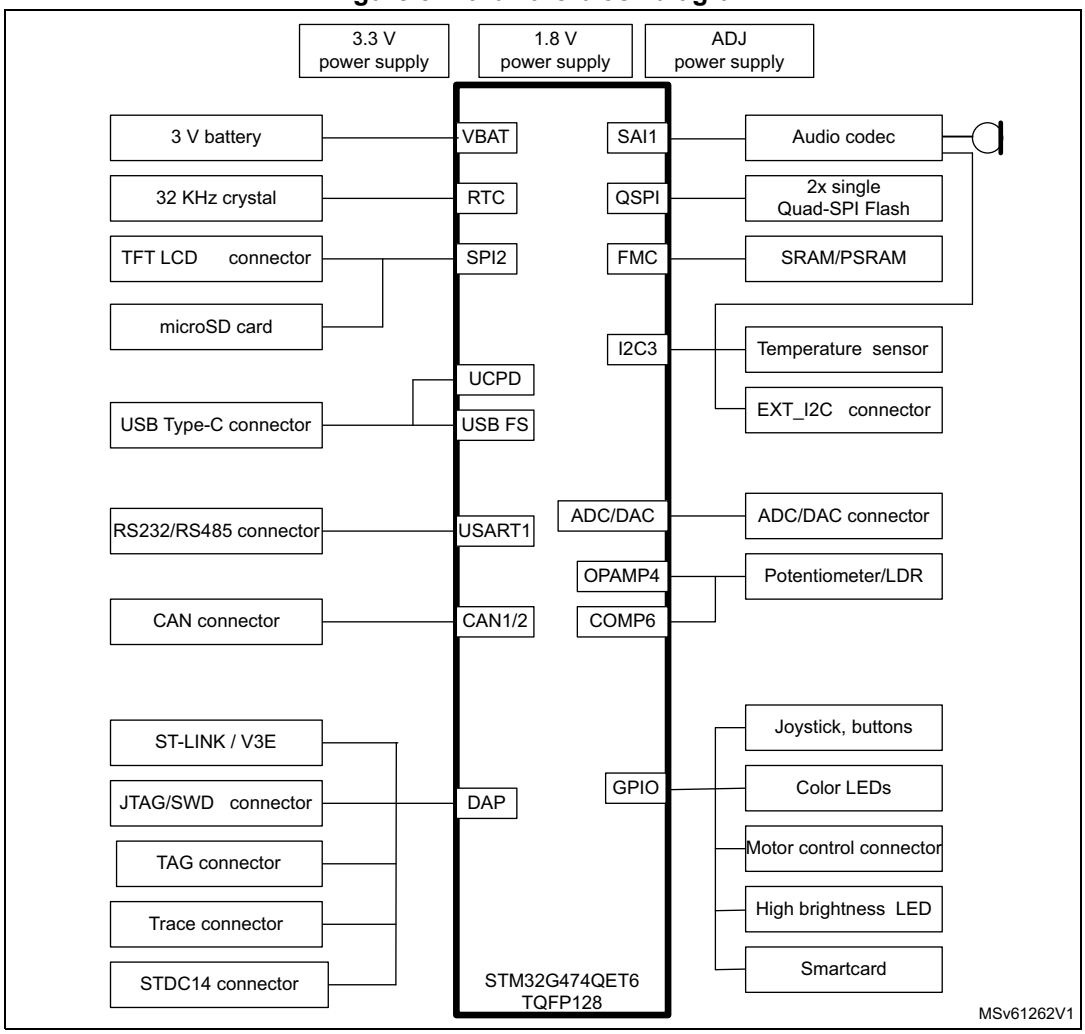


Figure 4. STM32G474E-EVAL Evaluation board layout (top view)

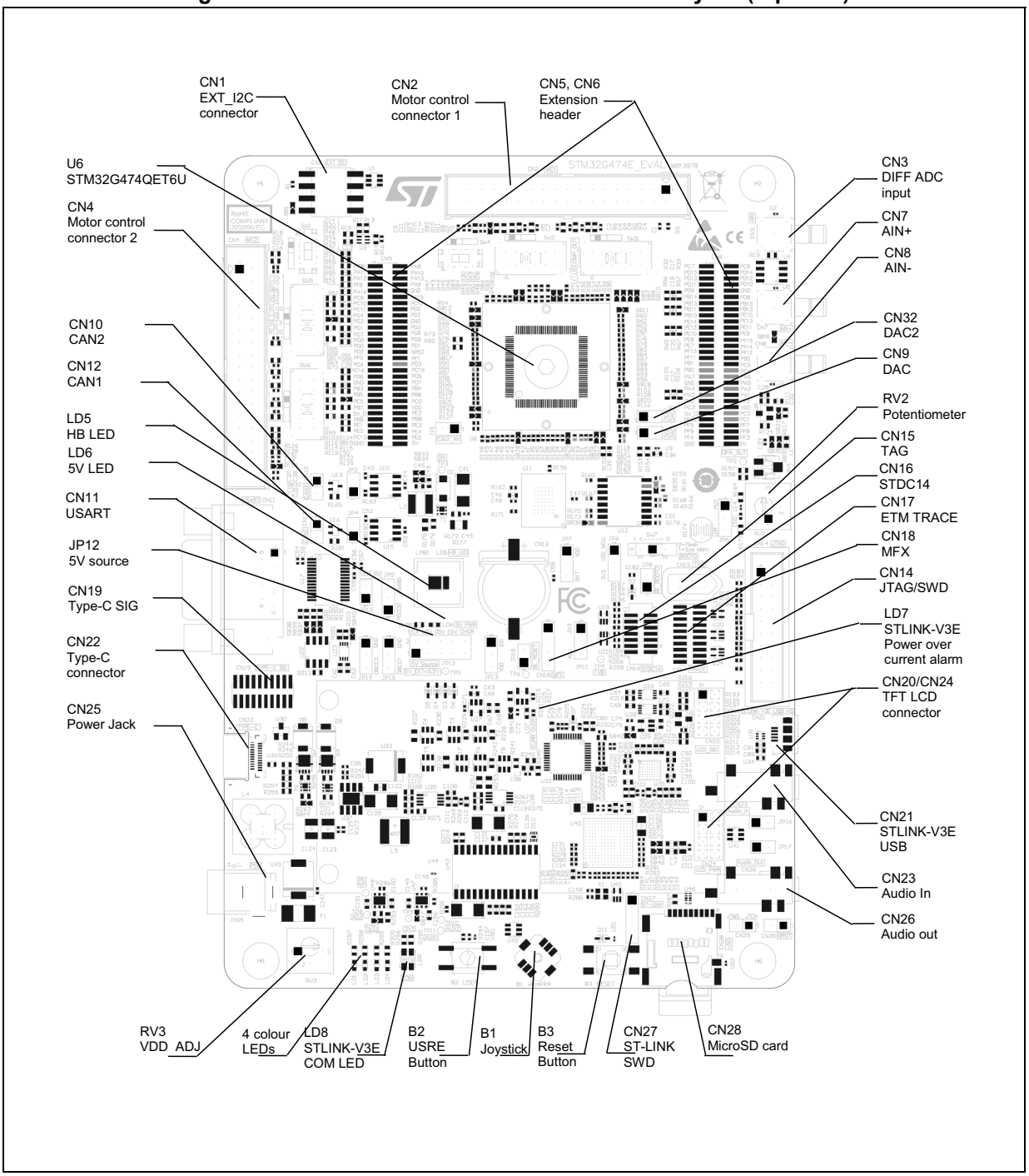


Figure 5. STM32G474E-EVAL Evaluation board layout (bottom view)

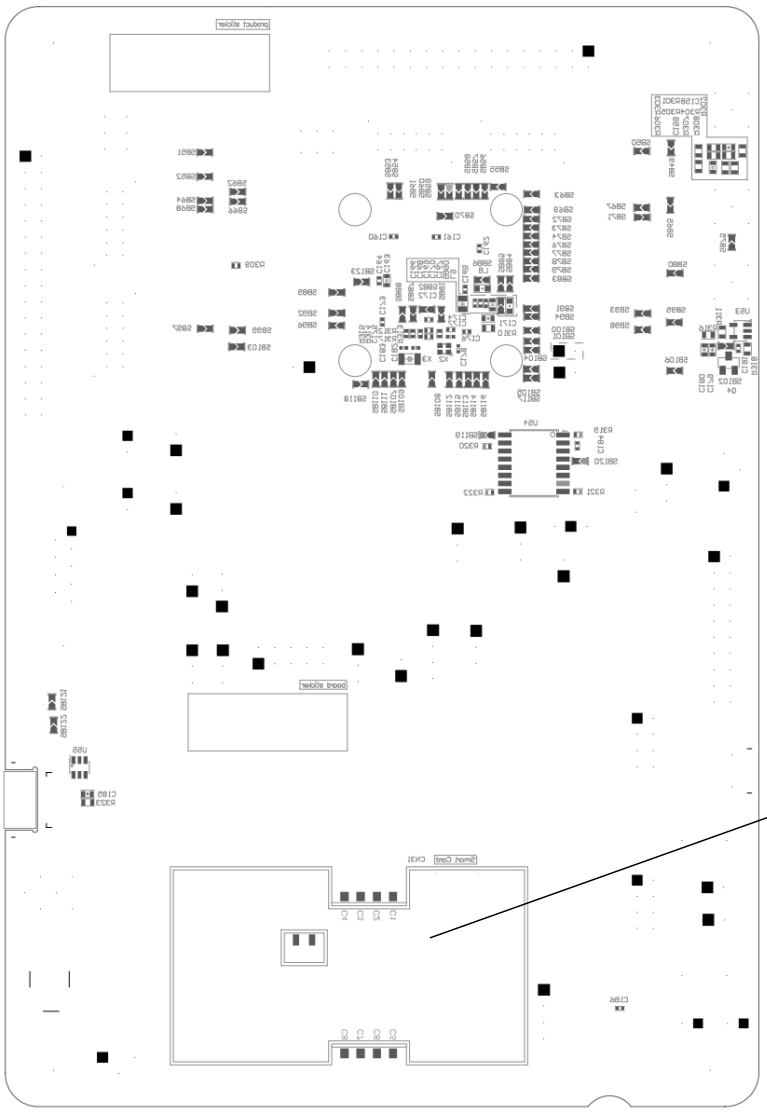
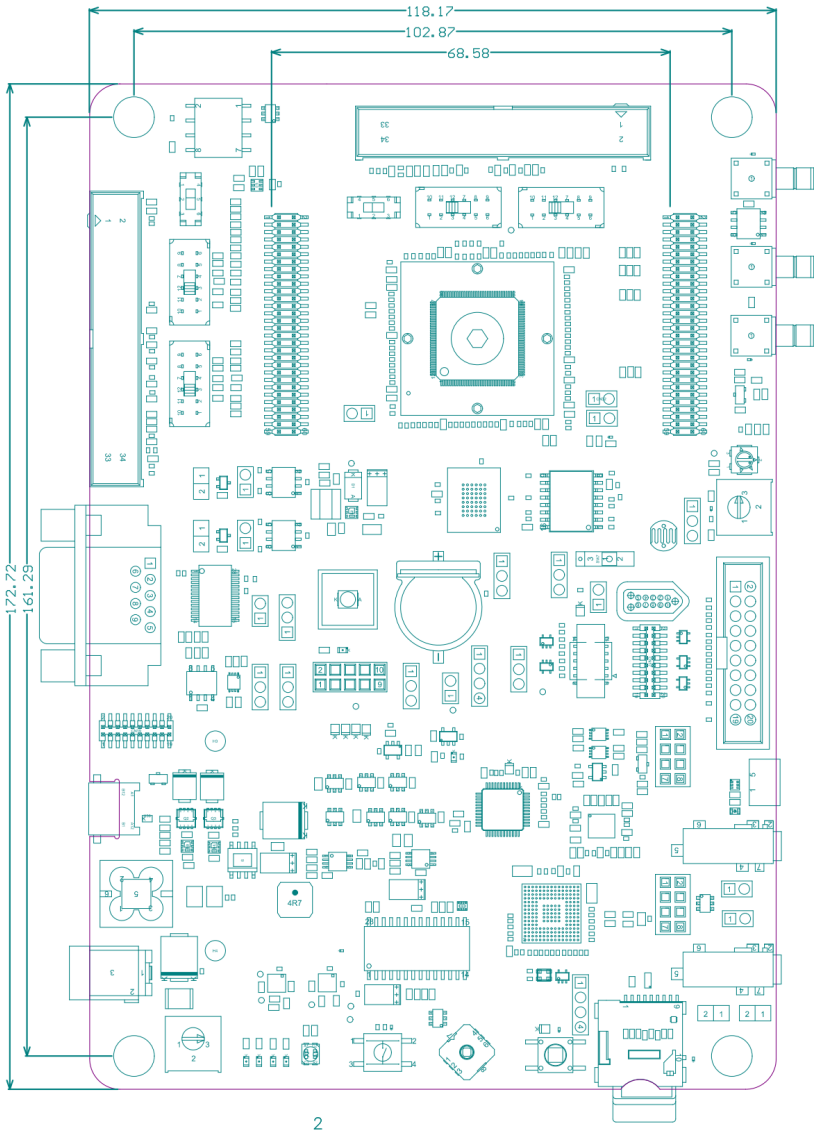


Figure 6 provides the mechanical dimensions of the STM32G474E-EVAL board.

Figure 6. STM32G474E-EVAL Evaluation board mechanical dimensions (top view)



5.1 STLINK-V3E

STLINK-V3E facility for debug and flashing of STM32G474QET6U is integrated on the STM32G474E-EVAL board. It features:

- Self-powered through a USB connector (Micro-B)
- USB 2.0 high-speed compatible interface
- Direct firmware update support (DFU)
- SWD and serial wire viewer (SWV) communication support
- Drag-and-drop Flash programming
- Two color LEDs: communication, power

The USB connector CN21 can be used to power the STM32G474E-EVAL regardless of the STLINK-V3E facility used for debugging or programming STM32G474QET6U. This holds also when the STLINK stand-alone tool is connected to connector CN14 or CN15 or CN16 or CN17 and used for debugging or programming the STM32G474QET6U. *Section 5.3: Power supply* provides more detail about powering the STM32G474E-EVAL.

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

5.1.1 Drivers and firmware upgrade

The STLINK-V3E requires drivers to be installed on Windows, and embeds a firmware which needs to be updated from time to time in order to benefit from new functionality or corrections. Refer to the Overview of ST-LINK derivatives technical note (TN1235) for details.

Before connecting the STM32G474E-EVAL to a Windows (7, 8 10) PC via USB, a driver for STLINK-V3E must be installed. It is available from *www.st.com*.

5.2 ETM trace

The connector CN17 is available to output trace signals used for debug. By default, the evaluation board is configured such that, STM32G474QET6U signals PE2, PE3 and PE4 are connected to trace outputs TRACECLK, TRACED0, and TRACED1 of CN17, but these signals shared with Audio codec, motor control connectors and FMC.

Table 3 shows the setting of configuration elements to shunt PE3 and PE4 MCU ports to CN17 connector, to use them as debug trace signals.

Table 4 shows the setting of configuration I/Os to shunt PE2, PE3, PE4 and PE5 MCU ports to use them as the right functions.

Table 3. Setting of configuration elements for trace connector CN17

Element	Setting	Configuration
R210	open	**Default setting.** CN17 pin 14 connects to TRACED0.
	closed	CN17 pin 14 connects to JTAG_TDO.
R207	open	**Default setting.** CN17 pin 16 connects to TRACED1.
	closed	CN17 pin 16 connects to JTAG_TRST.

Table 4. Setting of configuration I/Os for PE2, PE3, PE4 and PE5

Element	Setting	Configuration
R147 SB111 SB103	R147 in SB111 open SB103 open	**Default setting.** PE2 connects to TRACECLK.
	R147 out SB111 closed SB103 open	**Default setting.** PE2 connects to SAI_MCLK_A.
	R147 out SB111 open SB103 closed	PE2 connects to MC1|MC2_PFC_Sync.
R145 SB110 SB118 R146	R145 in SB110 open SB118 open R146 out	**Default setting.** PE3 connects to TRACED0.
	R145 out SB110 closed SB118 open R146 out	**Default setting.** PE3 connects to SAI_SD_B.
	R145 out SB110 open SB118 closed R146 out	PE3 connects to MC1|MC2_PFC_pwm.
	R145 out SB110 open SB118 open R146 in	**Default setting.** PE3 connects to memory address line A19.
R144 SB107 SB109 R143	R144 in SB107 open SB109 open R143 out	**Default setting.** PE4 connects to TRACED1.
	R144 out SB107 closed SB109 open R143 out	**Default setting.** PE4 connects to SAI_FS_A.
	R144 out SB107 open SB109 closed R143 out	PE4 connects to MC1_ICL_SHUTOUT.
	R144 out SB107 open SB109 open R143 in	**Default setting.** PE4 connects to memory address line A20.

Table 4. Setting of configuration I/Os for PE2, PE3, PE4 and PE5 (continued)

Element	Setting	Configuration
SB28 SB97	SB28 closed SB97 open	**Default setting.** PE5 connects to TRACED2
	SB28 open SB97 closed	PE5 connects to MC1_DissipativeBrake

Warning: Generally we have one default setting for best performance of many shared features, but it is easy for users to configure features as we have many default settings for MCU ports (solder bridge or resistor is soldered).

5.3 Power supply

The STM32G474E-EVAL board is designed to be powered from a 5 V DC power source. It incorporates a precise PTC and transil to protect the board from damage due to wrong power supply. One of the following five 5 V DC power inputs can be used, upon appropriate board configuration:

- Power jack CN25:
  Marked PSU on the board (JP12 jumper setting on E5V on silkscreen). The positive pole is on the center pin as illustrated in *Figure 22*.
  The External power supply from Power jack CN25 is from 5 V to 18 V input voltage. The dedicated DC/DC regulator ST1S41PHR is used for about 5.2 V output voltage and provided up to 3 A current.
- Micro-B USB receptacle CN21 of STLINK-V3E with enumeration:
  Up to 500 mA can be supplied to the board (JP12 jumper setting on STLK on silkscreen).
  Offers the enumeration feature described in *Section 5.3.1*.
- Micro-B USB receptacle CN21 of STLINK-V3E without enumeration:
  Up to 1000 mA can be supplied to the board directly without enumeration (JP12 jumper setting on CHGR on silkscreen).
- USB Type-C receptacle CN22 of USB PD interface:
  Marked TYPE-C on the board (JP12 jumper setting on U5V on silkscreen). Up to 500 mA can be supplied to the board in this way.
- Pin 49 of CN5 and Pin 49 of CN6 extension connectors for custom daughterboard:
  Marked 5V_D on the board (JP12 jumper setting on D5V on silkscreen).

The LD6 green LED turns on when the voltage on the power line marked as 5 V is present. All supply lines required for the operation of the components on the STM32G474E-EVAL are derived from that 5 V line.

Table 5: Power supply related jumper and solder bridge settings describes the settings of all jumpers related to powering the STM32G474E-EVAL and extension board. VDD_MCU is STM32G474QET6U digital supply voltage line. It can be connected to a fixed 3.3 V or with

an adjustable voltage regulator controlled by RV3 potentiometer and producing a range of voltages between 1.62 V and 3.6 V.

5.3.1 Supplying the board through STLINK-V3E USB port

To power the STM32G474E-EVAL this way, the USB host (a PC) gets connected to the Micro-B USB receptacle of the STM32G474E-EVAL board via a USB cable. The connection event starts the USB enumeration procedure. In its initial phase, the host USB port current supply capability is limited to 100 mA. It is enough because only STLINK-V3E part of the STM32G474E-EVAL draws power at that time: the U25 STMPS2151 power switch is set to the OFF position, which isolates the rest of the STM32G474E-EVAL from the power source. In the next phase of the enumeration procedure, the host PC informs the STLINK-V3E facility of its capability to supply current up to 300 mA. If the answer is positive, the STLINK-V3E sets the U25 STMPS2151 switch to ON position to supply power to the rest of the STM32G474E-EVAL board. If the PC USB port is not capable of supplying current up to 300 mA, the CN25 power jack is available to supply the board.

If a short-circuit occurs on the board, the STMPS2151 power switch protects the USB port of the host PC against a current demand exceeding 500 mA. In such an event, the LD7 LED lights up.

The STM32G474E-EVAL board can also be supplied from a USB power source not supporting enumeration, such as a USB charger. In this particular case, jumper JP12 must be fitted with a jumper hat as shown in *Table 5: Power supply related jumper and solder bridge settings*. STLINK-V3E bypasses STMPS2151 power regardless of enumeration procedure result and passes the power unconditionally to the board.

The LD6 green LED turns on whenever the whole board is powered.

5.3.2 Using STLINK-V3E along with powering through CN25 power jack

When the board requires a current higher than 300 mA, the host PC, connected to STLINK-V3E USB port for debugging or programming, cannot supply the STM32G474QET6U MCU. In such a case, the board can be powered through CN25 (marked PSU on the board).

To do this, it is important to power the board before connecting it with the host PC, which requires the following sequence to be respected:

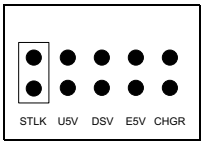
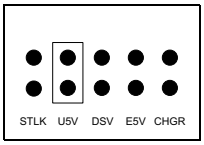
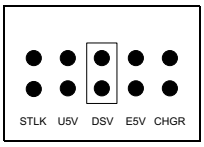
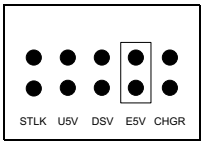
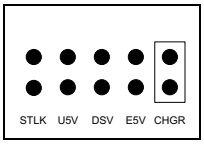
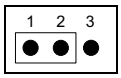
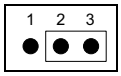
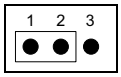
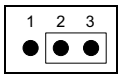
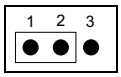
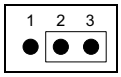
1. Set the jumper JP12 in E5V position
2. Connect the external power source to CN25
3. Check that the green LED LD6 is turned on
4. Connect host PC to USB connector CN21

Caution: In case the board requires more than 300 mA and the host PC is connected via USB before the board is powered from CN25, the following risk events are possible (listed in reverse severity order):

1. The host PC is capable of supplying 300 mA (the enumeration succeeds) but it features no over-current protection on its USB port. It is damaged due to over- current.
2. The host PC is capable of supplying 300 mA (the enumeration succeeds) and it has a built-in over-current protection on its USB port, limiting or shutting down the power out of its USB port when the excessive current demand from the STM32G474E-EVAL is detected. This causes an operating failure of the STM32G474E-EVAL.
3. The host PC is not capable of supplying 300 mA (the enumeration fails). The STLINK-V3E does not supply the rest of the STM32G474E-EVAL from its USB port VBUS line.

Table 5 details jumper and solder bridge settings used for the configuration of the power supply of the STM32G474E-EVAL.

Table 5. Power supply related jumper and solder bridge settings

Jumper / solder bridge	setting	Configuration
JP12 Power source selector		**Default setting.** STM32G474E-EVAL is supplied through CN21 Micro-B USB receptacle. Depend on host PC USB port's powering capability declared in the enumeration.
		STM32G474E-EVAL is supplied through CN22 USB Type-C receptacle.
		STM32G474E-EVAL is supplied through pin 49 of CN5 and pin 49 of CN6 extension connectors.
		**Default setting.** STM32G474E-EVAL is supplied through CN25 power jack.
		STM32G474E-EVAL is supplied through CN21 Micro-B USB receptacle. Setting for powering the board through CN21 using USB charger.
JP7 Vbat connection		**Default setting.** Vbat is connected to VDD.
		Vbat is connected to battery.
JP6 VDDA connection		VDDA terminal of STM32G474QET6U is connected with VDD_MCU.
		**Default setting.** VDDA terminal of STM32G474QET6U is connected to 3.3 V.
JP11 VDD_MCU connection		**Default setting.** VDD_MCU (VDD terminals of STM32G474QET6U) is connected to fixed 3.3 V.
		VDD_MCU is connected to voltage in the range from +1.62 V to +3.61 V, adjustable with potentiometer RV3.

Note: On all STLINK-V3E boards, the target application is now able to run even if the STLINK-V3E is either not connected to a USB host, or is powered through a USB charger (or through a not-enumerating USB host).

5.4 Clock references

Two clock references are available on the STM32G474E-EVAL Evaluation board for the STM32G474QET6U target microcontroller.

- 32.768 kHz crystal X3, for embedded RTC
- 24 MHz crystal X2, for main clock generator

The main clock generation is possible via an internal RC oscillator or from STLK_MCO, disconnected by removing resistors R312, R313 and R317 when internal RC clock is used.

Table 6. X3 crystal related solder bridge settings

Solder bridge	Setting	Configuration
SB88	Open	**Default setting.** PC14 OSC32_IN terminal is not routed to extension connector CN5. X3 is used as clock reference.
	Closed	PC14 OSC32_IN is routed to extension connector CN5. Resistor R315 must be removed, for X3 quartz circuit not to disturb clock reference or source on daughter board.
SB87	Open	**Default setting.** PC15 OSC32_OUT terminal is not routed to extension connector CN5. X3 is used as clock reference.
	Closed	PC15 OSC32_OUT is routed to extension connector CN5. Resistor R314 must be removed, for X3 quartz circuit not to disturb clock reference on daughter board.

Table 7. X2 crystal related solder bridge settings

Solder bridge	Setting	Configuration
SB82	open	**Default setting.** PF0 OSC_IN terminal is not routed to extension connector CN5. X2 is used as clock reference.
	closed	PF0 OSC_IN is routed to extension connector CN5. Resistor R317 and R312 must be removed, in order not to disturb clock reference or source on daughterboard.
SB81	open	**Default setting.** PF1 OSC_OUT terminal is not routed to extension connector CN5. X2 is used as clock reference.
	closed	PF1 OSC_OUT is routed to extension connector CN5. Resistor R313 must be removed, in order not to disturb clock reference or source on daughter board.

5.5 Reset source

The general reset of the STM32G474E-EVAL board is active low. The reset sources are:

- reset button B3
- JTAG/SWD connector CN14, ETM trace connector CN17, STDC14 connector CN16 and TAG connector CN15 (reset from debug tools)
- Through extension connector CN5 pin 30 (reset from daughter board)
- Embedded STLINK-V3E

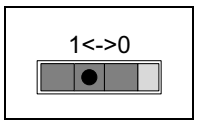
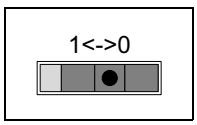
5.6 Boot Option

After reset, the STM32G474QET6U MCU can boot from the following embedded memory locations:

- Main (user, non-protected) Flash memory
- System (protected) Flash memory
- RAM, for debugging

The boot option is configured by setting switch SW7 (BOOT0) and the boot base address programmed in the nBOOT1, nBOOT0 and nSWBOOT0 of FLASH_OPTR option bytes.

Table 8. Boot selection switch

Switch	Setting	Description
SW7		BOOT0 line is tied high. STM32G474QET6U boots from system Flash memory (nBOOT1 bit of FLASH_OPTR register is set high) or from RAM (nBOOT1 is set low).
		**Default setting**. BOOT0 line is tied low. STM32G474QET6U boots from Main Flash memory.

5.6.1 Limitations

BOOT0 PB8 is exclusive with FDCAN1, JP1 must be opened to disconnect FDCAN1_RX signal.

5.7 Audio

A WM8894 codec is connected to SAI interface of the STM32G474QET6U. It supports the TDM feature of the SAI port. The TDM feature enables the STM32G474QET6U to simultaneously stream two independent stereo audio channels to two separate stereo analog audio outputs. The codec communicates with the STM32G474QET6U via the I2C3 bus, which is shared with MFX, Temperature Sensor, EXT_I2C connector.

The audio connections are:

- The analog line input is connected to ADC of WM8994ECS/R through blue audio jack CN23.
- The analog line output is connected to DAC of WM8994ECS/R via green audio jack CN26.
- Two external speakers can be connected to WM8994ECS/R via JP17 for right speaker and JP16 for left speaker, not fitted as default.

The I^2C-bus address of WM8994 codec are 0x34 or 0x35.

5.7.1 Limitations in using audio features

Due to the share of PE2, PE3, PE4 and PF6 terminals of STM32G474QET6U by multiple peripherals, refer to *Table 4*. The following limitations apply in using the audio features:

- If the SAI_MCLKA, SAI_SDB and SAI_FSA are used as part of SAI port, it cannot be used as TRACE and FMC peripheral.
- If the SAI port of STM32G474QET6U is used for streaming audio to the WM8994 codec IC, STM32G474QET6U cannot control the motor.

5.8 USB FS port

The STM32G474E-EVAL board supports USB full-speed (FS) as a USB device communication via USB Type-C receptacle CN22.

When a USB host connection to the USB Type-C receptacle CN22 of STM32G474E-EVAL is detected, the STM32G474E-EVAL board starts behaving as a USB device. Depending on the powering capability of the USB host, the board can take power from VBUS terminal of CN22. In the board schematic diagrams, the corresponding power voltage line is called U5V.

5.8.1 Operating voltage

The USB-related operating supply voltage of STM32G474QET6U (VDD_USB line) must be within the range from 3.0 V to 3.6 V.

5.9 RS232 and RS485 port

The STM32G474E-EVAL board offers one RS-232 communication or RS-485 communication port. They use the same DB9 male connector CN11. RX and TX signals of USART1 port of STM32G474QET6U are shared with USBPD and VCP. *Table 9* shows the configuration PA10 of STM32G474QET6U terminals.

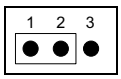
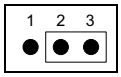
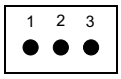
5.9.1 Limitations

Due to the sharing of PA9 and PA10 terminals of STM32G474QET6U by multiple peripherals, if RS-232 or RS485 port use as part of USART1 port, it cannot be used as USBPD and VCP peripheral.

5.9.2 Operating voltage

The RS-232 or RS-485 operating supply voltage of STM32G474QET6U (VDD line) must be within the range from 1.62 V to 3.6 V.

Table 9. Configuration PA10 of STM32G474QET6U terminals

JP9 USART1_RX connection		USART1_RX is connected to RS-232 RXD of transceiver.
		USART1_RX is connected to RS-485 RO of transceiver.
		**Default setting.** USART1_RX is not connected to RS-232 or RS-485 of transceiver.
JP10 VCP_RX connection		**Default setting.** VCP_RX is connected to STLINK-V3E STLK_VCP_TX.
		VCP_RX is not connected to STLINK-V3E STLK_VCP_TX.

5.10 microSD card

The CN28 slot for microSD card is routed to STM32G474QET6U SPI port, accepting 8GB (or more) Micro SD card. One 16-Gbyte microSD card is delivered as part of STM32G474E-EVAL. The card insertion switch is routed to the MFX_GPIO5 of MFX MCU port and it must be set with internal pull-up.

5.10.1 Limitations

Due to the share of I/O port, the following limitations apply:

- The microSD card cannot be operated simultaneously with motor control connector 2.

5.10.2 Operating voltage

The supply voltage for STM32G474E-EVAL microSD card operation must be within the range from 1.62 V to 3.6 V.

5.11 Motor control

The CN2 (MC1) and CN4 (MC2) connectors are designed to receive a motor control module. Available signals on these connectors include emergency stop, motor speed, 3-phase 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.

The dedicated motor control STM32G474E-EVAL1 board is supported for motor control module application only.

If the STM32G474E-EVAL board is used, some PCB reworks are needed for motor control applications: the goal is to disconnect peripherals sharing I/Os with motor control connectors, and to connect these I/Os to motor control connectors. *Table 10* and *Table 11* show the assignment of CN2 and CN4 of the STM32G474QET6U terminals.

Table 10 and *Table 11* also list the modifications to be made on the board versus its by-default configuration. See *Section 5.11.1* for further details.

Table 10. Motor control CN2 terminal and function assignment

Motor control connector CN2		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
1	Emergency Stop	PE15	TIM1_BKIN	-	Close SB69, and remove R60
2	GND	-	GND	-	-
3	PWM_1H	PE9	TIM1_CH1	-	Close SB78, and remove R79
4	GND	-	GND	-	-
5	PWM_1L	PE8	TIM1_CH1N	-	Close SB79, and remove R82
6	GND	-	GND	-	-
7	PWM_2H	PE11	TIM1_CH2	-	Close SB76, and remove R71
8	GND	-	GND	-	-
9	PWM_2L	PE10	TIM1_CH2N	-	Close SB77, and remove R75
10	GND	-	GND	-	-
11	PWM_3H	PE13	TIM1_CH3	-	Close SB73, and remove R63
12	GND	-	GND	-	-
13	PWM_3L	PE12	TIM1_CH3N	-	Close SB74, and remove R69
14	Bus Voltage	PC1	ADC12_IN7	-	Close SB115, and remove R130
15	PhaseA current+	PC2	ADC12_IN8	-	Close SB113, and remove R133
16	PhaseA current-	-	GND	-	-
17	PhaseB current+	PC3	ADC12_IN9	-	Close SB114, and remove R131
18	PhaseB current-	-	GND	-	-
19	PhaseC current+	PC0	ADC12_IN6	-	Close SB99, and open SB29
20	PhaseC current-	-	GND	-	-
21	ICL Shutout	PE4	GPIO	-	Close SB109, and open SB107(1)

Table 10. Motor control CN2 terminal and function assignment (continued)

Motor control connector CN2		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
22	GND	-	GND	-	-
23	Dissipative Brake	PE5	GPIO	-	Close SB97, and open SB28(1)
24	PFC ind. current	PD8	ADC45_IN12	-	Close SB55, remove R34, solder R5, and remove R113
25	+5 V	-	+5 V	-	-
26	Heatsink Temp.	PC4	ADC2_IN5	-	Close SB100, and remove R116
27	PFC Sync	PE2	TIM3_CH1	-	Close SB103, open SB111(1), solder R8, and remove R126
28	+3.3 V	-	+3.3 V	-	-
29	PFC PWM	PE3	TIM3_CH2	-	Close SB118, open SB110, solder R11, and remove R151
30	PFC Shutdown	PD2	TIM3_ETR	-	Solder SB17, and remove SB123
31	Encoder A	PA0	TIM2_CH1	-	Close SB98, and open SB26
32	PFC Vac	PD9	ADC45_IN13	-	Close SB56, remove R37, solder R12, and remove R155
33	Encoder B	PD4	TIM2_CH2	-	Close SB89, and remove R94
34	Encoder Index	PD7 or PA15	TIM2_CH3 or TIM2_ETR	-	Close SB92, remove R101 or close SB62, and remove R54

Table 11. Motor control CN4 terminal and function assignment

Motor control connector CN4		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
1	Emergency Stop	PB7	TIM8_BKIN	-	-
2	GND	-	GND	-	-
3	PWM_1H	PC6	TIM8_CH1	-	Close SB49, and open SB9(1)
4	GND	-	GND	-	-
5	PWM_1L	PC10	TIM8_CH1N	-	Close SB64, and open SB12(1)
6	GND	-	GND	-	-
7	PWM_2H	PC7	TIM8_CH2	-	Close SB50, and open SB6(1)

Table 11. Motor control CN4 terminal and function assignment (continued)

Motor control connector CN4		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
8	GND	-	GND	-	-
9	PWM_2L	PC11	TIM8_CH2N	-	Close SB68, and open SB13(1)
10	GND	-	GND	-	-
11	PWM_3H	PC8	TIM8_CH3	-	Close SB51, and remove R26(1)
12	GND	-	GND	-	-
13	PWM_3L	PC12	TIM8_CH3N	-	Close SB66, and open SB15(1)
14	Bus Voltage	PE14	ADC4_IN1	-	Close SB72, and remove R62
15	PhaseA current+	PD13	ADC345_IN10	-	Close SB60, and remove R41
16	PhaseA current-	-	GND	-	-
17	PhaseB current+	PD12	ADC345_IN9	-	Close SB59, and remove R42
18	PhaseB current-	-	GND	-	-
19	PhaseC current+	PD10	ADC345_IN7	-	Close SB57, and remove R38
20	PhaseC current-	-	GND	-	-
21	ICL Shutout	PD15	GPIO	-	Close SB61, and remove R40
22	GND	-	GND	-	-
23	Dissipative Brake	PF10	GPIO	-	Close SB112, and remove R136(1)
24	PFC ind. current	PD8	ADC45_IN12	-	Close SB55, remove R34, solder R113, and remove R5
25	+5 V	-	+5 V	-	-
26	Heatsink Temp.	PE7	ADC3_IN4	-	Close SB83, and remove R84
27	PFC Sync	PE2	TIM3_CH1	-	Close SB103, open SB111(1), solder R126, and remove R8
28	+3.3 V	-	+3.3 V	-	-
29	PFC PWM	PE3	TIM3_CH2	-	Close SB118, open SB110, solder R151, and remove R11
30	PFC Shutdown	PD2	TIM3_ETR	-	Solder R128, and remove R10
31	Encoder A	PF6	TIM5_CH1	-	Close SB52, and remove R43

Table 11. Motor control CN4 terminal and function assignment (continued)

Motor control connector CN4		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
32	PFC Vac	PD9	ADC45_IN13	-	Close SB56, remove R37, solder R155, and remove R12
33	Encoder B	PF7	TIM5_CH2	-	Close SB108, and remove R138
34	Encoder Index	PF8 or PD11	TIM5_CH3 or TIM5_ETR	-	Close SB106, remove R135 or close SB58, and remove R39

1. For quality purpose, remove the unused components located on the board.

Table 12 shows OpAmp and DAC of the STM32G474QET6U terminals.

Table 12. Motor control OpAmp and DAC function assignment

Motor control connector CN2		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
1	OPAMP1_INP	PA1	OPAMP1_VINP	-	Close SB95, and open SB27
2	OPAMP1_INN	PA3	OPAMP1_VINM	-	Close SB105, and remove R129
3	OPAMP1_OUT	PA2	OPAMP1_VOUT	-	Close SB117, and remove R150
4	OPAMP2_IN1P	PA7	OPAMP2_VINP	-	Close SB101, and remove R118
5	OPAMP2_IN2P	PD14	OPAMP2_VINP	-	Close SB70, and remove R29
6	OPAMP2_INN	PC5	OPAMP2_VINM	-	-
7	OPAMP2_OUT	PA6	OPAMP2_VOUT	-	Close SB104, and remove R121
8	OPAMP4_IN1P	PB11	OPAMP4_VINP	-	Close SB67, and open SB8
9	OPAMP4_IN2P	PB13	OPAMP4_VINP	-	Close SB63, and open SB5
10	OPAMP4_INN	PB10	OPAMP4_VINM	-	Close SB71, and open SB11
11	OPAMP4_OUT	PB12	OPAMP4_VOUT	-	Close SB65 and open SB7
12	OPAMP3_INP	PB0	OPAMP3_VINP	-	Close SB94, and remove R108
13	OPAMP3_INN	PB2	OPAMP3_VINM	-	Close SB80, and open SB18
14	OPAMP3_OUT	PB1	OPAMP3_VOUT	-	Close SB91, and remove R102
15	DAC_OUT1	PA4	DAC1_OUT1	-	Close SB93, and open SB25
16	DAC_OUT2	PA5	DAC1_OUT2	-	-

Table 13 and *Table 14* show motor control related switches and solder bridges.

Table 13. Motor control related switches and solder bridges

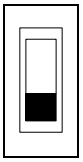
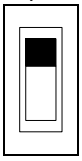
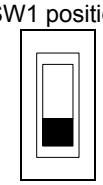
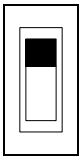
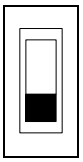
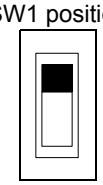
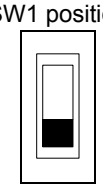
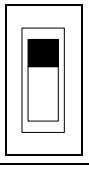
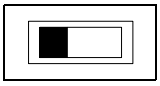
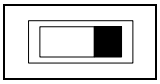
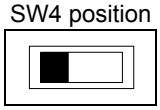
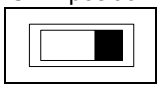
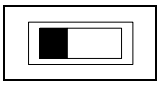
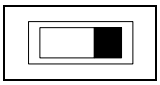
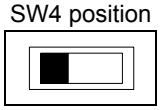
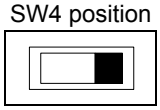
OAM Position	Other conditions	Description
SW5 	R72,R58 mounted SB14 open	MC1_CurrentA+ connect to OPAMP1_INP(PA1) MC1_CurrentB+ connect to OPAMP2_IN1P(PA7)
	72,R58 un-mounted SB14 closed	MC1_CurrentB+ connect to OPAMP1_INP(PA1)
	SW1 position 	MC1_CurrentC+ connect to OPAMP2_IN2P(PD14)
	SW1 position 	MC1_CurrentC+ connect to OPAMP4_IN1P(PB11)
SW5 	-	MC1_CurrentA+ connect to ADC12(PC2) MC1_CurrentB+ connect to ADC12(PC3) MC1_CurrentC+ connect to ADC12(PC0)
SW6 	R110,R114 mounted SB19 open	MC2_CurrentA+ connect to OPAMP3_INP(PB0) MC2_CurrentB+ connect to OPAMP4_IN2P(PB13)
	R110,R114 un-mounted SB19 closed	MC2_CurrentB+ connect to OPAMP3_INP(PB0)
	SW1 position 	MC2_CurrentC+ connect to OPAMP4_IN1P(PB11)
	SW1 position 	MC2_CurrentC+ connect to OPAMP2_IN2P(PD14)
SW6 	-	MC2_CurrentA+ connect to ADC345(PD10) MC2_CurrentB+ connect to ADC345(PD12) MC2_CurrentC+ connect to ADC345(PD13)

Table 14. Motor control related switches and solder bridges

PGM Position	Other conditions	Description
SW2 	-	OPAMP1_INP,OPAMP2_IN1P,OPAMP2_IN2P pull up source connect to 3.3 V power
SW2 	SW4 position 	OPAMP1_INP, OPAMP2_IN1P,OPAMP2_IN2P pull up source connect to DAC_OUT1(PA4)
	SW4 position 	OPAMP1_INP, OPAMP2_IN1P pull up source connect to DAC_OUT1(PA4) OPAMP2_IN2P pull up source connect to DAC_OUT2(PA5)
SW3 	-	OPAMP4_INP,OPAMP4_IN1P,OPAMP4_IN2P pull up source connect to 3.3 V power
SW3 	SW4 position 	OPAMP3_INP, OPAMP4_IN1P,OPAMP4_IN2P pull up source connect to DAC_OUT2(PA5)
	SW4 position 	OPAMP3_INP, OPAMP4_IN2P pull up source connect to DAC_OUT2(PA5) OPAMP2_IN1P pull up source connect to DAC_OUT1(PA4)

5.11.1 Board modifications to enable motor control

Figure 7 (top side) and *Figure 8* (bottom side) illustrate the board modifications listed in *Table 10* and *Table 11*, required for the operation of motor control. Blue color denotes a component to be removed. Red color denotes a component to be fitted.

5.11.2 Limitations

Motor control operation is exclusive with Octo-SPIP1 Flash memory device, audio codec, potentiometer, LDR, Micro SD card, LED1 to LED4 drive, MEMs, MFX, PMOD, USB OTG_FS, TFT LCD connector, DSI LCD connector and touch sensing.

Refer to *Section 5.16.3* for OPAMP1, 2 and 4 limitations.

Figure 7. PCB top side rework for motor control

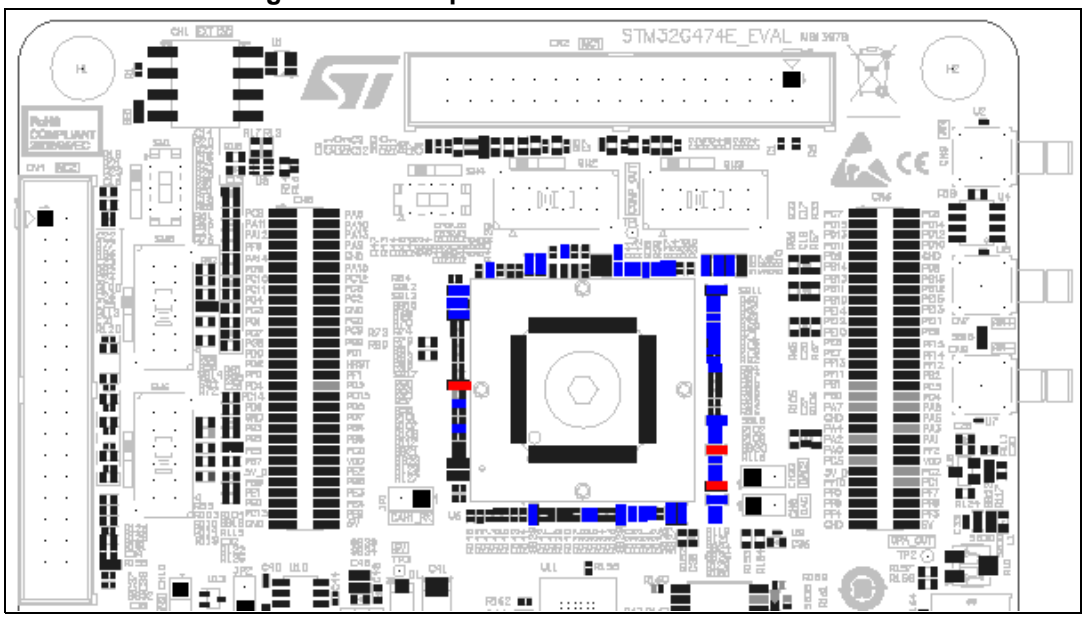
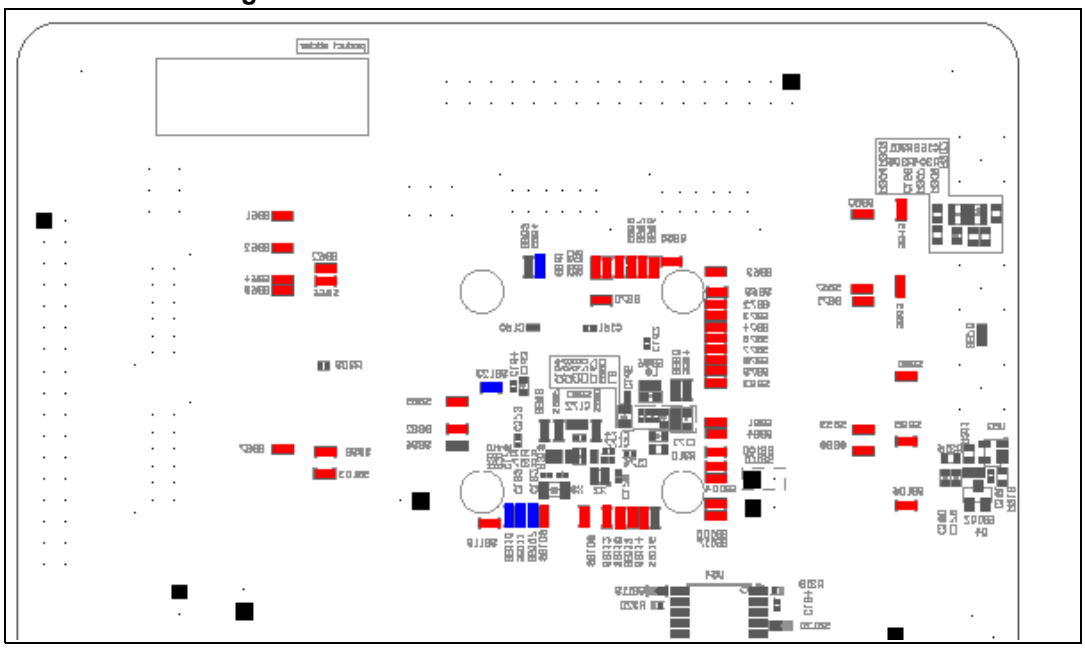


Figure 8. PCB bottom side rework for motor control



5.12 FDCAN

The STM32G474E-EVAL board supports two CAN2.0A/B channel compliant with FDCAN specification. The CN10 and CN12 are available as CAN interface.

Two CAN transceiver are fitted between the CN10 and CN12 connectors and the CAN controller port of STM32G474QET6U.

5.12.1 Limitations

CAN operation is exclusive with BOOT0 and motor control connector 2.

5.12.2 Operating voltage

The supply voltage for STM32G474E-EVAL CAN operation must be more than 1.8 V.

5.13 Extension connectors CN5 and CN6

The CN5 and CN6 headers complement to give access to all GPIOs of the STM32G474QET6U microcontroller. In addition to GPIOs, the following signals and power supply lines are also routed on CN5 or CN6:

- GND
- 5V
- 5V_D
- VDD
- RESET#
- Clock terminals PC14-OSC32_IN, PC15-OSC32_OUT, PF0-OSC_IN, PF1-OSC_OUT

Each header has two rows of 30 pins, with 1.27 mm pitch and 2.54 mm row spacing. For extension modules, SAMTEC RSM-130-02-L-D-xxx and SMS-130-x-x-D can be recommended as SMD and through-hole receptacles, respectively (x is a wild card).

5.14 User LEDs

Four general-purpose color LEDs (LD1, LD2, LD3, LD4) are available as light indicators. Each LED is in light-emitting state with low level of the corresponding ports of the STM32G474QET6U MCU.

And the LD1 and LD3 LEDs are exclusive with MC operation, LD2 and LD4 are controlled by MFX_GPIO6 and MFX_GPIO7.

5.15 Physical input devices

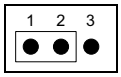
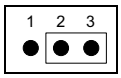
The STM32G474E-EVAL board provides a number of input devices for physical human control.

- four-way joystick controller with select key (B1)
- wake-up/ tamper button (B2)
- reset button (B3)
- 10 kΩ potentiometer (RV2)
- light-dependent resistor, LDR (R174)

The potentiometer and the light-dependent resistor can be routed, mutually exclusively, to PB11 port of the STM32G474QET6U. *Table 15* depicts the setting of associated configuration jumpers.

As illustrated in the schematic diagram in *Figure 36*, the PB11 port is routed, in the STM32G474QET6U, to the non-inverting input of comparator Comp6 or non-inverting input of operational amplifier OpAmp4.

Table 15. Port assignment for control of physical input devices

Jumper	setting	Routing
JP5		**Default setting.** Potentiometer is routed to pin PB11 of STM32G474QET6U.
		LDR is routed to pin PB11 of STM32G474QET6U.

5.15.1 Limitations

The potentiometer and the light-dependent resistor are exclusive with high brightness LED and MC operation. And they are mutually exclusive.

5.16 Operational amplifier and comparator

5.16.1 Operational amplifier

STM32G474QET6U provides on-board operational amplifier, OpAmp4, is made accessible on STM32G474E-EVAL. OpAmp4 has its inputs and its output routed to I/O ports PB11, PB10 and PB12, respectively.

The PB12 output of the operational amplifier can be accessed on test point TP2. Refer to the schematic diagram in *Figure 36*.

The gain of OpAmp4 is determined by the ratio of the variable resistor RV1 and the resistor R157, as shown in the following equation:

$$\text{Gain} = 1 + \text{RV1}/\text{R157}$$

With the RV1 ranging from 0 to 10 kΩ and R157 being 1 kΩ, the gain can vary from 1 to 11.

The R158 resistor in series with PB12 is beneficial for reducing the output offset.

Table 16 shows the configuration elements and their settings to access the OpAmp4 function.

Table 16. Configuration elements related with OpAmp4

Element	Setting	Configuration
SB11 SB71	SB11 closed SB71 open	**Default setting.** Pin PB10 of STM32G474QET6U is routed to OpAmp4_VINM.
	SB11 open SB71 closed	Pin PB10 of STM32G474QET6U is routed to OpAmp4_INN of MC.

Table 16. Configuration elements related with OpAmp4 (continued)

Element	Setting	Configuration
SB8 SB67 SB10	SB8 closed SB67 open SB10 open	Pin PB11 of STM32G474QET6U is routed to OpAmp4_VINP or COMP6_INP.
	SB8 open SB67 closed SB10 open	PB11 of STM32G474QET6U is routed to OpAmp4_IN1P of MC.
	SB8 open SB67 open SB10 closed	**Default setting.** Pin PB11 of STM32G474QET6U is routed to BK_Sense for high brightness LED.
SB7 SB65	SB7 closed SB65 open	**Default setting.** Pin PB12 of STM32G474QET6U is routed to OpAmp4_VOUT.
	SB7 open SB65 closed	Pin PB12 of STM32G474QET6U is routed to OpAmp4_IN2P of MC.

5.16.2 Comparator

STM32G474QET6U provides on-board comparator, Comp4, is made accessible on STM32G474E-EVAL. Comp4 has its non-inverting input and its output routed to I/O ports PB11 and PC6, respectively.

The PC6 output of the comparator can be accessed on test point TP1. Refer to the schematic diagram in *Figure 36*.

Table 17 shows the configuration elements and their settings to access the Comp4 function (pin PB11 for Comp6_INP refer to *Table 16*).

Table 17. Configuration elements related with Comp4

Element	Setting	Configuration
SB9 SB49	SB9 closed SB49 open	**Default setting.** Pin PC6 of STM32G474QET6U is routed to Comp6_OUT.
	SB9 closed SB49 open	Pin PC6 of STM32G474QET6U is routed to MC2_PWM_1H.

5.16.3 Limitations

Issue observed

The OPAMP offset value is minimized using a trimming circuitry. At startup, the trimming values are initialized with the preset factory trimming values. The trimming values of OPAMP1, OPAMP2 and OPAMP4 are not programmed correctly, resulting in a large offset compared to the one specified.

Proposed workaround

The offset values of OPAMP1, OPAMP2 and OPAMP4 must be calibrated by software, applying the calibration procedure described in the *STM32G4 Series advanced Arm®-*

based 32-bit MCUs reference manual (RM0440), in the *Calibration* section of the *Operational amplifiers (OPAMP)* chapter. Such a procedure is already implemented in the STM32CubeG4 MCU Package.

Parts impacted

This applies only to the MB1397-based boards within the following range of serial numbers:

MB1397-G474E: A191000001-A191000170
MB1397-G474EMC: A191000001- A191000100
MB1397-G484E: A191000001-A191000030

Other issues

The OpAmp4 is exclusive with high brightness LED and MC operation.

The Comp6 is exclusive with high brightness LED and MC operation.

5.17 Analog input, output, VREF

5.17.1 Analog input

STM32G474QET6U provides on-board Differential analog-to-digital converter, Differential ADC. The port PA0 and PA1 can be configured to operate as Differential ADC input which is routed to the CN7 and CN8 SMB connectors or CN3 SMB connector via a Single-Ended to Differential circuit. The default setting is Analog input signal from CN3 SMB connector.

Parameters of the ADC input low-pass filter formed with R310/C171 and R152/C35 can be modified by replacing these components according to application requirements.

5.17.2 Analog output

STM32G474QET6U provides on-board digital-to-analog converter, DAC. The port PA4 can be configured to operate as DAC output. PA4 is routed to the two-way header CN9 to fetch signals from PA4 to ground it by fitting a jumper into CN9.

Parameters of the DAC output low-pass filter formed with R153 and C36 can be modified by replacing these components according to application requirements.

5.17.3 VREF+ terminal

The VREF+ terminal of STM32G474QET6U is used as reference voltage for both ADC and DAC. It is routed to VDDA or VREF_EXT through solder bridges configuration shown as *Table 18*.

VREF_EXT is high resolution of voltage reference from U53 TL1431ACL5T.

Table 18. Configuration elements related with VREF+

Element	Setting	Configuration
SB84 SB85	SB84 closed SB85 open	**Default setting.** VREF_EXT is routed to VREF+.
	SB84 closed SB85 open	VDDA is routed to VREF+.

5.17.4 Limitations

The Differential ADC is exclusive with MFX_IRQ_OUT and MC operation.

The DAC is exclusive with MC operation.

5.18 SRAM device

IS61WV51216BLL, an 8-Mbit static RAM (SRAM), 512K x16-bit, is fitted on the STM32G474E-EVAL main board, in U11 position. The STM32G474E-EVAL main board as well as the addressing capabilities of FMC allow hosting SRAM devices up to 64 Mbytes. This is the reason why the schematic diagram in *Figure 30* mentions several SRAM devices.

The SRAM device is attached to the 16-bit data bus and accessed with FMC. The base address is 0x6000 0000, corresponding to NOR/SRAM1 bank1. The SRAM device is selected with FMC_NE1 chip select. FMC_NBL0 and FMC_NBL1 signals allow selecting 8-bit and 16-bit data word operating modes.

5.18.1 Limitations

The SRAM addressable space is limited if some or all of A20 FMC address lines is shunted to the CN17 connector for debug trace purposes. In such a case, the disconnected addressing inputs of the SRAM device are pulled down by resistors. *Section 5.2* provides information on the associated configuration elements.

The SRAM is exclusive with MC operation.

5.18.2 Operating voltage

The SRAM device operating voltage is in the range from 2.4 V to 3.6 V.

5.19 EXT_I2C connector

EXT_I2C connector CN1 can be connected to I²C bus daughter board. MFX_GPIO15 of MFX MCU provide EXT_RSET signal. And solder bridge SB1 is used to connector 5 V power supply for daughter board.

5.20 Quad-SPI Flash memory device

Two 512-Mbit Quad-SPI Flash memory device MX25QL512ABB8ESF-0SIT are fitted on the STM32G474E-EVAL main board, in U12 and U54 position. It allows evaluating STM32G474QET6U Quad-SPI interface.

5.20.1 Limitations

Quad-SPI Flash memory device operation is exclusive with motor control.

5.20.2 Operating voltage

Voltage of Quad-SPI Flash memory device MX25QL512ABB8ESF-0SIT is in the range of 2.7 V to 3.6 V.

5.21 MFX MCU

The MFX MCU is used as MFX (Multi function expander) and IDD measurement.

5.21.1 MFX

MFX circuit on the STM32G474E-EVAL board acts as IO-expander. The communication interface between MFX and STM32G474QET6U is I2C3 bus. The signals connected to MFX are listed in *Table 19*.

Table 19. MFX signals

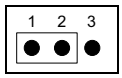
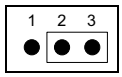
Pin number of MFX	Pin name of MFX	MFX functions	Function of STM32H7XXI-EVAL	Direction (For MFX)	Terminal device
15	PA5	MFX_GPIO5	uS_Detect	Input	Micro SD
16	PA6	MFX_GPIO6	LED2	Output	LEDs
17	PA7	MFX_GPIO7	LED4	Output	LEDs
18	PB0	MFX_GPIO0	JOY_SEL	Input	Joystick
19	PB1	MFX_GPIO1	JOY_DOWN	Input	Joystick
20	PB2	MFX_GPIO2	JOY_LEFT	Input	Joystick
26	PB13	MFX_GPIO13	uSD_LCD_SPI2_DIR	Output	Micro SD or LCD
27	PB14	MFX_GPIO14	-	-	-
28	PB15	MFX_GPIO15	EXT_RESET	Output	EXT_I2C
29	PA8	MFX_GPIO8	SmartCard_1V8	Output	Smartcard
30	PA9	MFX_GPIO9	SmartCard_3/5V	Output	Smartcard
31	PA10	MFX_GPIO10	SmartCard_OFF	Output	Smartcard
32	PA11	MFX_GPIO11	SmartCard_CMDVCC	Output	Smartcard
33	PA12	MFX_GPIO12	SmartCard_RST	Output	Smartcard
39	PB3	MFX_GPIO3	JOY_RIGHT	Input	Joystick
40	PB4	MFX_GPIO4	JOY_UP	Input	Joystick

5.21.2 IDD measurement

STM32G474QET6U has a built-in circuit to measure its own current consumption (IDD) in Run and Low-power modes, except for Shutdown mode. It is strongly recommended for the MCU supply voltage (VDD_MCU line) not to exceed 3.3 V. The reason is that there are components on the STM32G474E-EVAL supplied from 3.3 V, and they communicate with the MCU through I/O ports. Voltage exceeding 3.3 V on the MCU output port may inject current into 3.3 V-supplied peripheral I/Os and false the MCU current consumption measurement.

Table 20 shows settings of jumper associated with the IDD measurement on the board.

Table 20. IDD measurement related jumper settings

Jumper	setting	Configuration
JP13		**Default setting.** STM32G474QET6U has a built-in circuit to measure its own current consumption.
		IDD measurement is not available, bypass mode only for STM32G474QET6U VDD_MCU power supply.

5.21.3 Limitations

1. The MFX is exclusive with Differential ADC and MC operation.
2. The IDD measurement operating voltage is in the range of 2.05 V to 3.6 V. This applies only to the MB1397-based boards within the following range of serial numbers:
   – MB1397-G474E: A191000001 -A191000170
   – MB1397-G474EMC: A191000001- A191000100
   – MB1397-G484E: A191000001-A191000030

It can be used as bypass mode for normal MCU working. Refer to *Table 20* for JP13 configuration.

5.22 TFT LCD panel

The STM32G474E-EVAL is delivered with MB895C, a daughterboard plugged into the CN20 and CN24 connectors. It bears a TFT 2.4-inch color TFT LCD panel with resistive touchscreen and an on-board controller. The TFT LCD connected to SPI2 port of the STM32G474QET6U.

Thanks to level shifters on all signal lines, the TFT LCD panel works with the entire operating voltage range of the STM32G474E-EVAL.

Table 21. TFT LCD connector CN20 and CN24

CN20 terminal		Terminal name	MCU Port	CN24 terminal	Terminal name	Power Port
1	-	CS	PC9	1	VDD	3.3 V
2	-	SCL	PF9	2	VCI	3.3 V
3	-	SDI	PB15	3	GND	GND
4	-	RS	-	4	GND	GND
5	-	WR	-	5	BL_VDD	5 V or 3.3 V
6	-	RD	-	6	BL_Control	5 V or 3.3 V
7	-	SDO	PB14	7	BL_GND	GND
8	-	RESET	RESET#	8	BL_GND	GND

Note: The bi-directional voltage translator is implemented on SPI MOSI signal between the STM32G474QET6U and LCD to support 3-wires serial interface of LCD panel only supports

3-wire SPI port. The direction of this voltage translator is controlled by MFX_GPIO13 (the I/O PB15 is working as MOSI when MFX_GPIO13 is high or as MISO when MFX_GPIO13 is LOW).

5.23 UCPD

5.23.1 USB Type-C receptacles

The USB Type-C certified receptacle CN22 is present on the STM32G474E-EVAL board. It can be used as DRP (Dual-Role Port), which is eligible to supply another platform plugged by a USB Type-C cable when they are configured as Provider or, otherwise, to be supplied in case of Consumer configuration.

The STM32G474E-EVAL board also supports USB2.0 compliant full speed communication via USB Type-C receptacle CN22.

5.23.2 Power Delivery & Local power management

The STM32G474E-EVAL board has its own external power jack (CN25, 5 V to 18 V input) with internal DC/DC regulator to support power delivery function and to provide up to 5.2 V / 3 A on Type-C receptacles (CN22). Please refer to *Table 5* for JP12 setting selection.

5.23.3 VBUS management and discharge mechanism

Type-C receptacle (CN22) can be used as DRP (Dual-Role Port) Its VBUS can be managed for supplying other platforms as Provider, or to be supplied as Consumer. Two MOSFETs Q2 and Q3 are set in back-to-back configuration to protect and isolate the VBUS supplying path on both directions.

If the CN22 acts as Provider, the VBUS is on the supply path by mean of the discrete load switch (Q2 and Q3) driven by the STM32G474QET6U (GPIO, PC11). For the Consumer case, the same VBUS path is managed by PC11 of the STM32G474QET6U enabling the discrete load switch.

Moreover, the VBUS path on receptacle presents a discharge mechanism implemented by the MOSFET T9 and an RC filter and controlled by PB2.

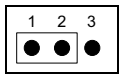
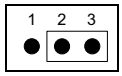
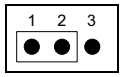
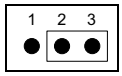
5.23.4 VBUS voltage-sensing

Type-C receptacle (CN22) is equipped by a voltage-sensing stage which are matched with the voltage sensing carried by the STM32G474QET6U ADC port PC0. It can be able to monitor the right power level applied on the port VBUS.

5.23.5 CC management

Dead battery function is supported by embedded in the STM32G474QET6U, it can be enable or disable through enable signals by set JP15 (CC1) or JP14 (CC2). Refer to *Table 22* for details.

Table 22. Dead battery related jumpers

Jumper	Setting	Configuration
JP15		**Default setting.** Embed dead battery function is enable.
		Embed dead battery function is disable.
JP14		**Default setting.** Embed dead battery function is enable.
		Embed dead battery function is disable.

5.23.6 Limitations

UCPD operation is exclusive with motor control and JTAG JTRST signal PB4.

Due to the share of PA9 and PA10 terminals of the STM32G474QET6U by multiple peripherals, if USBPD use as part of USART1 port, it cannot be used as RS-232 or RS485 port and VCP peripheral.

Only SWD may be used for dead battery applications. It is impossible to use the JTAG due to the pull down on the PB4.

For no dead battery applications, the alternative to use the JTAG is:

- Either pulling low the DBCC2 pin (PA10)
- Or putting an external pull up on the PB4 (R183)

5.24 Temperature Sensor

A Temperature Sensor STTS751 is connected to I2C3 bus of the STM32G474QET6U, and shares same I2C3 bus with MFX, Audio and EXT_I2C connector.

I2C address of temperature sensor is 0x90 or 0x91.

Note: The temperature result measured from STTS751 may be a little higher than the ambient temperature due to the power dissipation of components on the board.

5.24.1 Operating voltage

The temperature Sensor operating voltage is in the range from 2.25 V to 3.6 V.

5.25 Smartcard

STMicroelectronics smartcard interface chip ST8024L is used on the STM32G474E-EVAL evaluation board for asynchronous 1.8 V, 3 V and 5 V smartcards. It performs all supply protection and control functions based on the connections with STM32G474QET6U listed in *Table 23*.

Table 23. Connection between ST8024L and STM32F091VCT6

Signals of ST8024L	Description	Connect to STM32G474E-EVAL
5 V / 3 V	Smart card power supply selection pin	MFX_GPIO9
I/OUC	MCU data I/O line	PC10
XTAL1	Crystal or external clock input	PC12
OFF	Detect presence of a card, Interrupt to MCU	MFX_GPIO10
RSTIN	Card Reset Input from MCU	MFX_GPIO12
CMDVCC	Start activation sequence input (Active Low)	MFX_GPIO11
1.8V	1.8 V Vcc operation selection. Logic high selects 1.8 V operation and overrides any setting on the 5 V / 3 V pin.	MFX_GPIO8

5.25.1 Operating voltage

The Smart card operating voltage is in the range from 2.7 V to 3.6 V.

5.26 High brightness LED

An Everluck company high brightness LED LE-CWC12100 and its power control circuits with the inverted buck topology are on the STM32G474E-EVAL board. The brightness can be adjusted by the PWM signal from STM32G474QET6U through PC8. The current on the LED can be monitored by the STM32G474QET6U thanks to the voltage measured on PB11, which corresponds to current through R177 (1 ohm). Please refer *Table 16* for PB11 configuration.

5.26.1 Limitations

The high brightness LED is exclusive with OpAmp4/ Comp6 and MC operation.

6 Connectors

6.1 External I2C connector CN1

Figure 9. I2C EXT connector CN2 (front view)

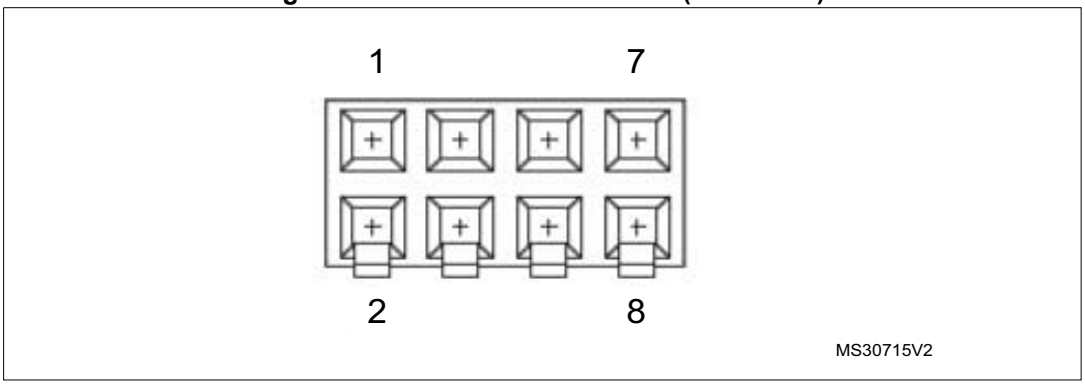


Table 24. EXT_I2C connector CN1

Pin number	Description	Pin number	Description
1	I2C_SDA (PG8)	5	VDD
2	NC	6	NC
3	I2C_SCL (PG7)	7	GND
4	EXT_RESET(MFX_GPIO15)	8	5 V

6.2 Motor control connector CN2 and CN4

Figure 10. Motor control connector CN2 and CN4 (top view)

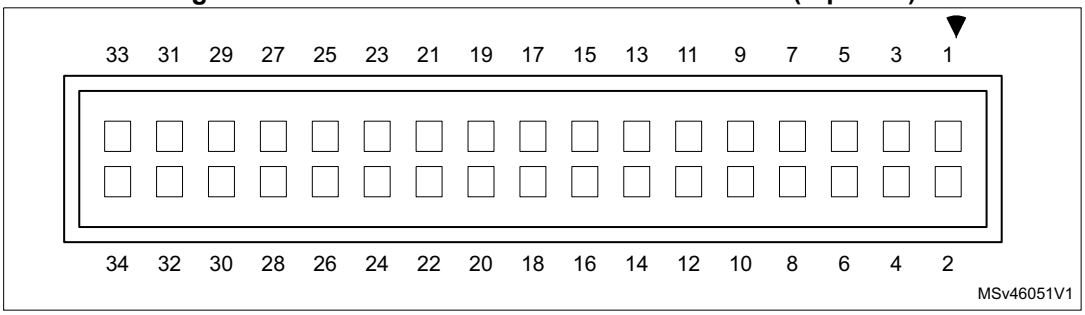


Table 25. Motor control connector CN2

Description	Pin of STM32G474QET6U	Pin number of CN2	Pin number of CN2	Pin of STM32G474QET6U	Description
Emergency STOP	PE15	1	2	-	GND
PWM_1H	PE9	3	4	-	GND

Table 25. Motor control connector CN2 (continued)

Description	Pin of STM32G474QET6U	Pin number of CN2	Pin number of CN2	Pin of STM32G474QET6U	Description
PWM_1L	PE8	5	6	-	GND
PWM_2H	PE11	7	8	-	GND
PWM_2L	PE10	9	10	-	GND
PWM_3H	PE13	11	12	-	GND
PWM_3L	PE12	13	14	PC1	BUS VOLTAGE
CURRENT A	PC2	15	16	-	GND
CURRENT B	PC3	17	18	-	GND
CURRENT C	PC0	19	20	-	GND
ICL Shutout	PE4	21	22	-	GND
DISSIPATIVE BRAKE	PE5	23	24	PD8	PCD Ind. Current
+5 V power	-	25	26	PC4	Heatsink temperature
PFC SYNC	PE2	27	28	-	3.3 V power
PFC PWM	PE3	29	30	PD2	PFC Shut Down
Encoder A	PA0	31	32	PD9	PFC Vac
Encoder B	PD4	33	34	PD7 or PA15	Encoder Index

Table 26. Motor control connector CN4

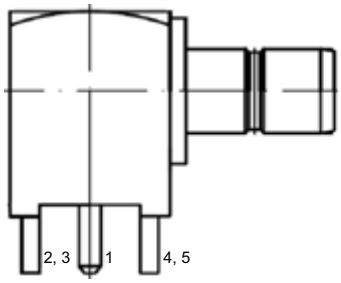
Description	Pin of STM32G474QET6U	Pin number of CN4	Pin number of CN4	Pin of STM32G474QET6U	Description
Emergency STOP	PB7	1	2	-	GND
PWM_1H	PC6	3	4	-	GND
PWM_1L	PC10	5	6	-	GND
PWM_2H	PC7	7	8	-	GND
PWM_2L	PC11	9	10	-	GND
PWM_3H	PC8	11	12	-	GND
PWM_3L	PC12	13	14	PE14	BUS VOLTAGE
CURRENT A	PD10	15	16	-	GND
CURRENT B	PD12	17	18	-	GND
CURRENT C	PD13	19	20	-	GND
ICL Shutout	PD15	21	22	-	GND

Table 26. Motor control connector CN4 (continued)

Description	Pin of STM32G474QET6U	Pin number of CN4	Pin number of CN4	Pin of STM32G474QET6U	Description
DISSIPATIVE BRAKE	PF10	23	24	PD8	PCD Ind. Current
+5 V power	-	25	26	PE7	Heatsink temperature
PFC SYNC	PE2	27	28	-	3.3 V power
PFC PWM	PE3	29	30	PD2	PFC Shut Down
Encoder A	PF6	31	32	PD9	PFC Vac
Encoder B	PF7	33	34	PF8 or PD11	Encoder Index

6.3 SMB connector CN3, CN7 and CN8

Figure 11. SMB connector (front view)



MSv61277V1

Table 27. SMB connector

Pin number	Description	Pin number	Description
1	analog input	2,3,4,5	GND

6.4 Extension connectors CN5 and CN6

All GPIO signals from the STM32G474QET6U are connected to extension connectors CN5 and CN6.

6.5 DAC connector CN9

Figure 12. Analog input-output connector CN9 (top view)

MSv46052V1

Table 28. Analog input-output connector CN9

Pin number	Description	Pin number	Description
1	analog output PA4	2	GND

6.6 CAN1 and CAN2 connector CN12 and CN10

Figure 13. CAN connector CN10 or CN12 (front view)

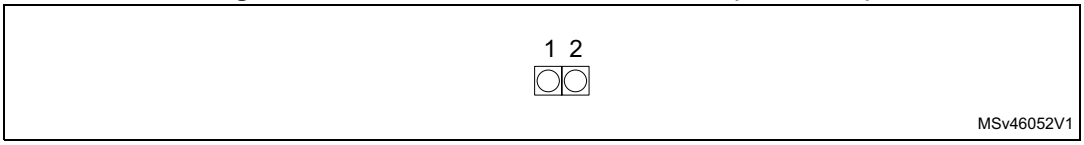


Table 29. CAN connector CN10 or CN12

Pin number	Description	Pin number	Description
1	CANL	2	CANH

6.7 RS232 and RS485 connector CN11

Figure 14. RS232 and RS485 connector CN11 (front view)

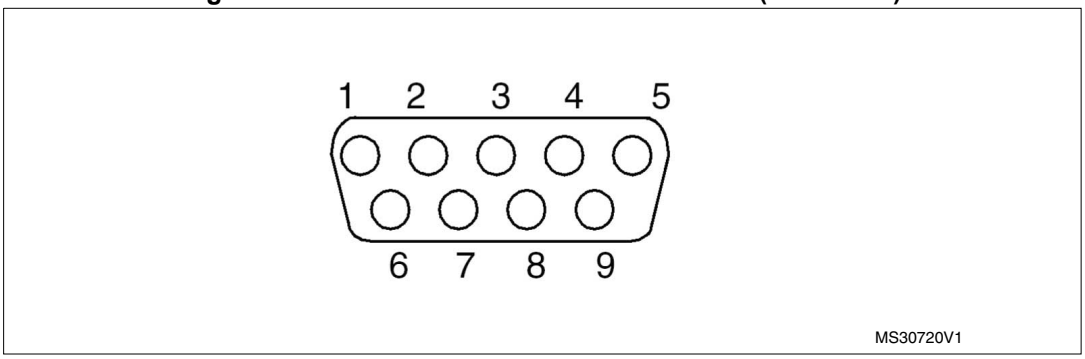


Table 30. RS-232/RS-485 D-sub connector CN11

Terminal	Terminal name	Terminal	Terminal name
1	NC	6	RS-232_DSR (BOOT0)
2	RS-232_RX (PA10)	7	NC
3	RS-232_TX (PA9)	8	RS-232_CTS (NRST)
4	RS-485_A	9	RS-485_B
5	GND	-	-

6.8 JTAG connector CN14

Figure 15. JTAG debugging connector CN14

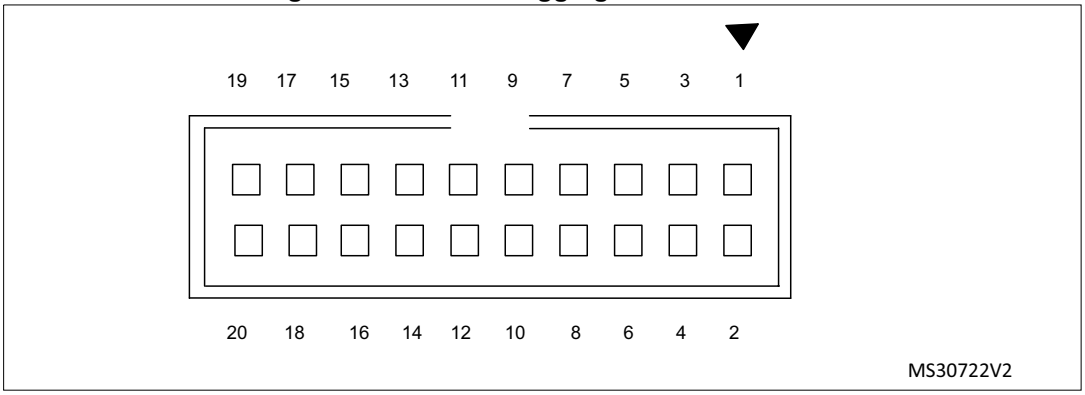


Table 31. JTAG debugging connector CN14

Terminal	Function / MCU port	Terminal	Function / MCU port
1	VDD power	2	VDD power
3	PB4	4	GND
5	PA15	6	GND
7	PA13	8	GND
9	PA14	10	GND
11	NC	12	GND
13	PB3	14	GND
15	RESET#	16	GND
17	-	18	GND
19	-	20	GND

6.9 TAG connector CN15

Table 32. TAG debugging connector CN15

Terminal	Function / MCU port	Terminal	Function / MCU port
1	VDD	2	SWDIO/TMS (PA13)
3	GND	4	SWDCLK/TCK (PA14)
5	GND	6	SWO/TDO (PB3)
7	NC	8	TDI (PA15)
9	TRST (PB4)	10	RESET#

6.10 STDC14 connector CN16

Figure 16. STDC14 debugging connector CN16 (top view)

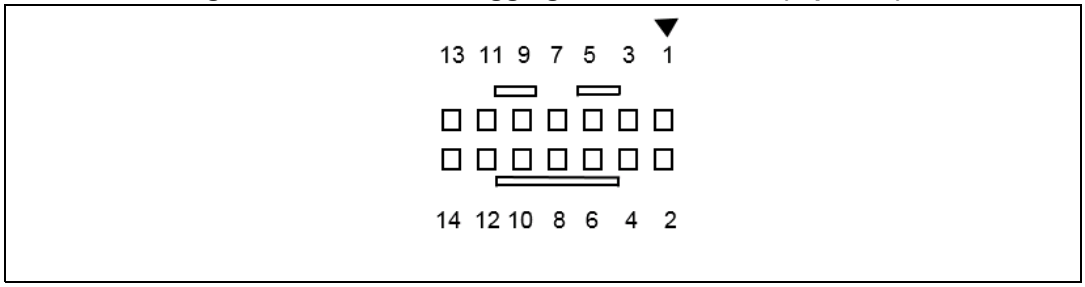


Table 33. STDC14 debugging connector CN16

Terminal	Function / MCU port	Terminal	Function / MCU port
1	-	2	-
3	VDD	4	SWDIO/TMS (PA13)
5	GND	6	SWDCLK/TCK (PA14)
7	GND	8	SWO/TDO (PB3)
9	KEY	10	TDI (PA15)
11	GND	12	RESET#
13	VCP_RX_STDC (PA10)	14	VCP_TX_STDC (PA9)

6.11 Trace debugging connector CN17

Figure 17. Trace debugging connector CN17 (top view)

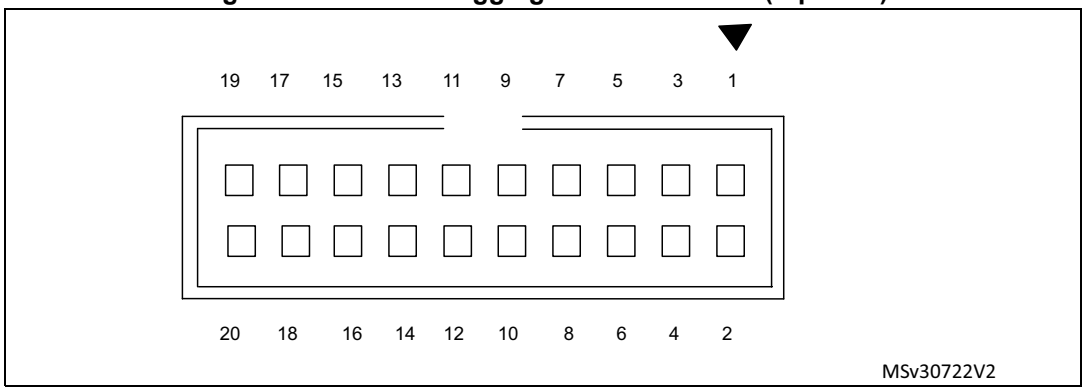


Table 34. Trace debugging connector CN17

Terminal	Function / MCU port	Terminal	Function / MCU port
1	VDD power	2	TMS/PA13
3	GND	4	TCK/PA14
5	GND	6	TDO/PB3
7	KEY	8	TDI/PA15

Table 34. Trace debugging connector CN17 (continued)

Terminal	Function / MCU port	Terminal	Function / MCU port
9	GND	10	RESET#
11	GND	12	Trace_CLK/PE2
13	GND	14	Trace_D0/PE3 or SWO/PB3
15	GND	16	Trace_D1/PE4 or nTRST/PB4
17	GND	18	Trace_D2/PE5
19	GND	20	Trace_D3/PE6

6.12 MFX programming connector CN18

The connector CN18 is used only for embedded MFX (Multi function expander) programming during board manufacture. It is not populated by default and not for end user.

6.13 Type-C signals connector CN19

Figure 18. Type-C signals connector CN19 (top view)

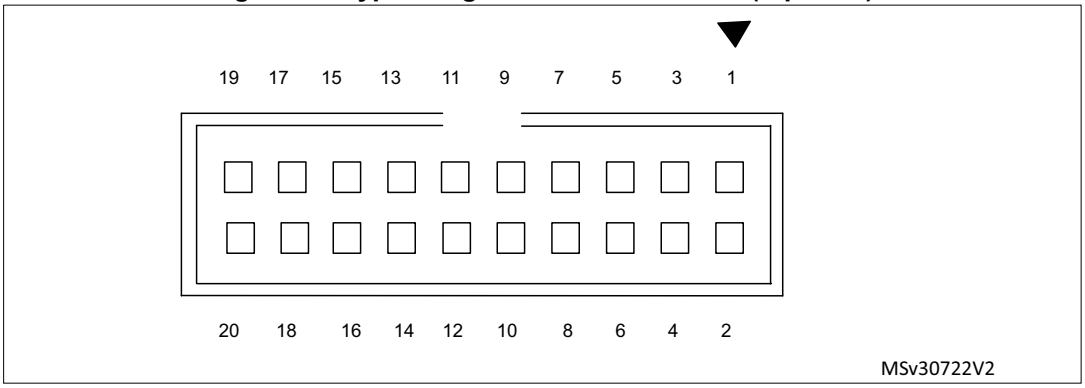


Table 35. Type-C signals connector CN19

Terminal	Function / MCU port	Terminal	Function / MCU port
1	GND	2	GND
3	TX1+	4	RX1+
5	TX1-	6	RX1-
7	VBUS	8	VBUS
9	CC1	10	CC2
11	SUB1	12	SUB2
13	VBUS	14	VBUS
15	RX2-	16	TX2-
17	RX2+	18	TX2+
19	GND	20	GND

6.14 LCD connector CN20 and CN24

A TFT color LCD with SPI interface board is mounted on CN20 and CN24.

6.15 ST-LINK-V3E USB Micro-B connector CN21

The USB connector CN21 is used to connect on-board ST-LINK-V3E facility to PC for flashing and debugging software.

Figure 19. USB Micro-B connector CN21 (front view)

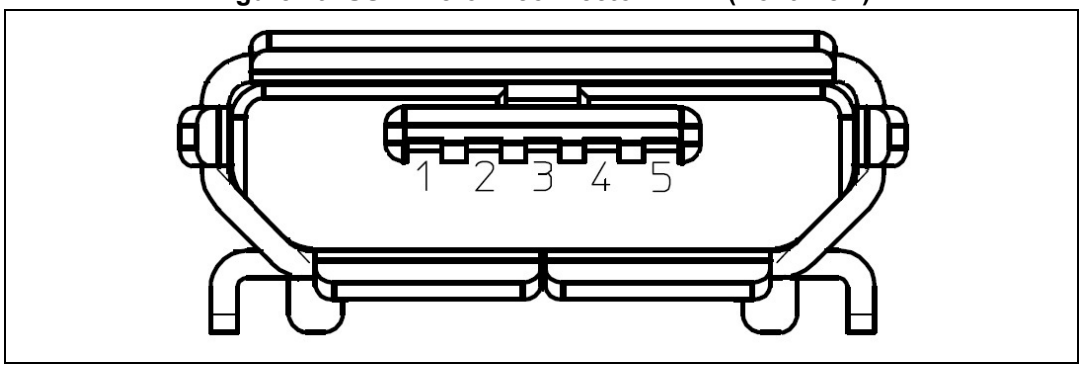


Table 36. USB Micro-B connector CN21

Terminal	Description	Terminal	Description
1	VBUS (power)	4	ID
2	DM	5	GND
3	DP	6 - 11	Shield

6.16 USB Type-C connector CN22

Figure 20. USB Type C connector CN22 (front view)

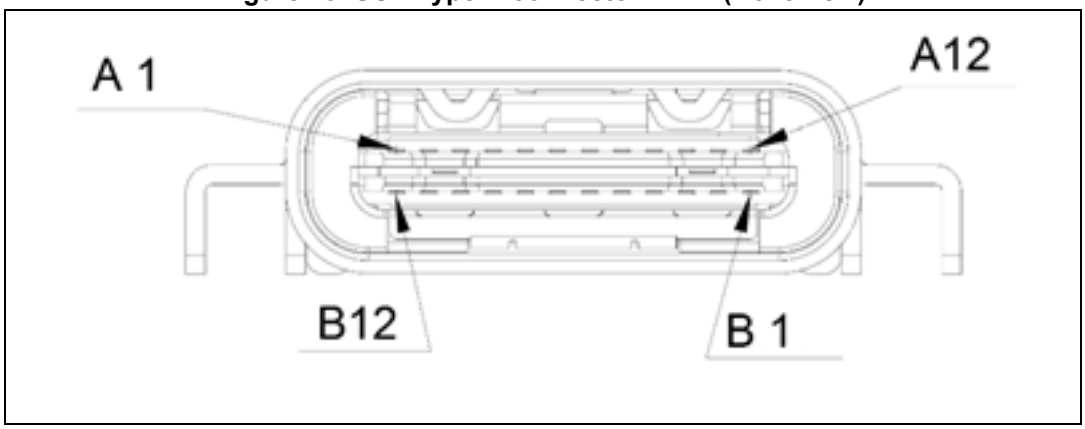


Table 37. USB Type C connector CN22

Pin number	Description	Pin number	Description
A1	GND	B1	GND
A2	TX1+	B2	TX2+
A3	TX1-	B3	TX2-
A4	VBUS	B4	VBUS
A5	CC1 (PB6)	B5	CC2 (PB4)
A6	D+	B6	D+
A7	D-	B7	D-
A8	SBU1	B8	SBU2
A9	VBUS	B9	VBUS
A10	RX2-	B10	RX1-
A11	RX2+	B11	RX1+
A12	GND	B12	GND

6.17 Audio blue jack (Line In) CN23

A 3.5 mm Stereo audio blue jack input CN23 is available on STM32G474E-EVAL board to support audio Line input.

6.18 Audio green jack (Line Out) CN26

A 3.5 mm Stereo audio green jack output CN26 is available on STM32G474E-EVAL board to support headphone.

Figure 21. Stereo headset with microphone jack CN26

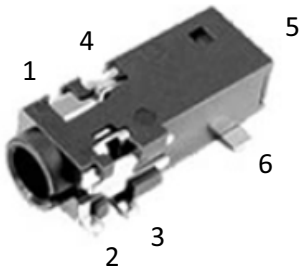


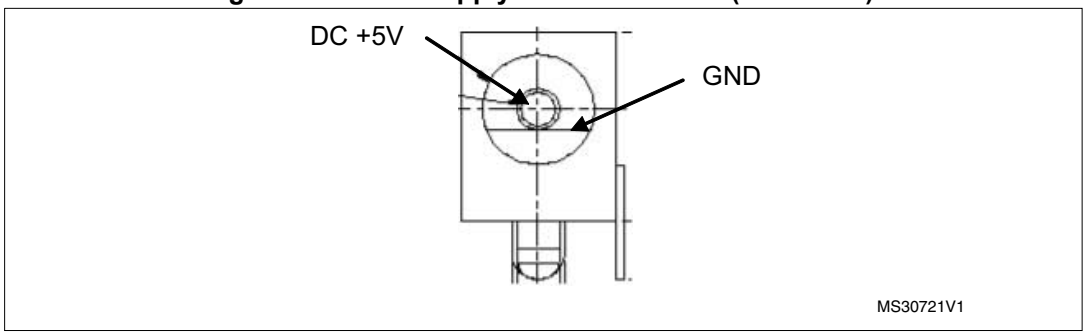
Table 38. Audio Jack Connector CN26 (on board)

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

6.19 Power connector CN25

The STM32G474E-EVAL board can be powered from a DC 5 V to 18 V power supply via the external power supply jack (CN25) shown in *Figure 22*. The central pin of CN25 must be positive.

Figure 22. Power supply connector CN25 (front view)



6.20 ST-LINK-V3E programming connector CN27

The connector CN27 is used only for embedded ST-LINK-V3E programming during board manufacturing. It is not populated by default and not for end user.

6.21 microSD connector CN28

Figure 23. microSD connector CN28 (front view)

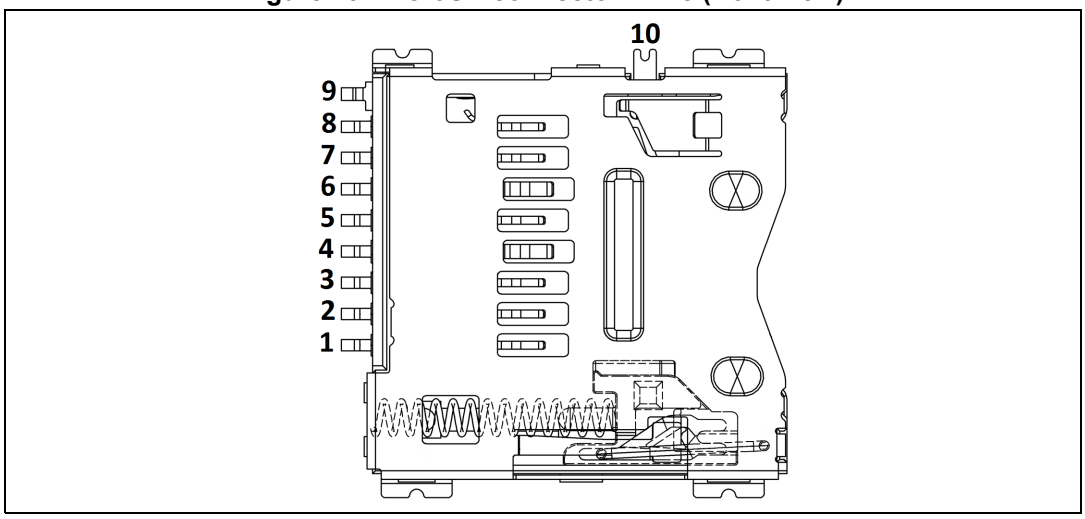


Table 39. MicroSD connector CN28

Pin number	Description	Pin number	Description
1	NC	6	GND
2	uSD_CS (PF8)	7	SPI2_MISO (PV14)
3	SPI2_MOSI (PB15)	8	NC
4	VDD	9	GND
5	SPI2_SCK (PF9)	10	uSD_Detect (MFX_GPIO5)

6.22 Smartcard connector CN31

Figure 24. Smartcard connector CN31 (top view)

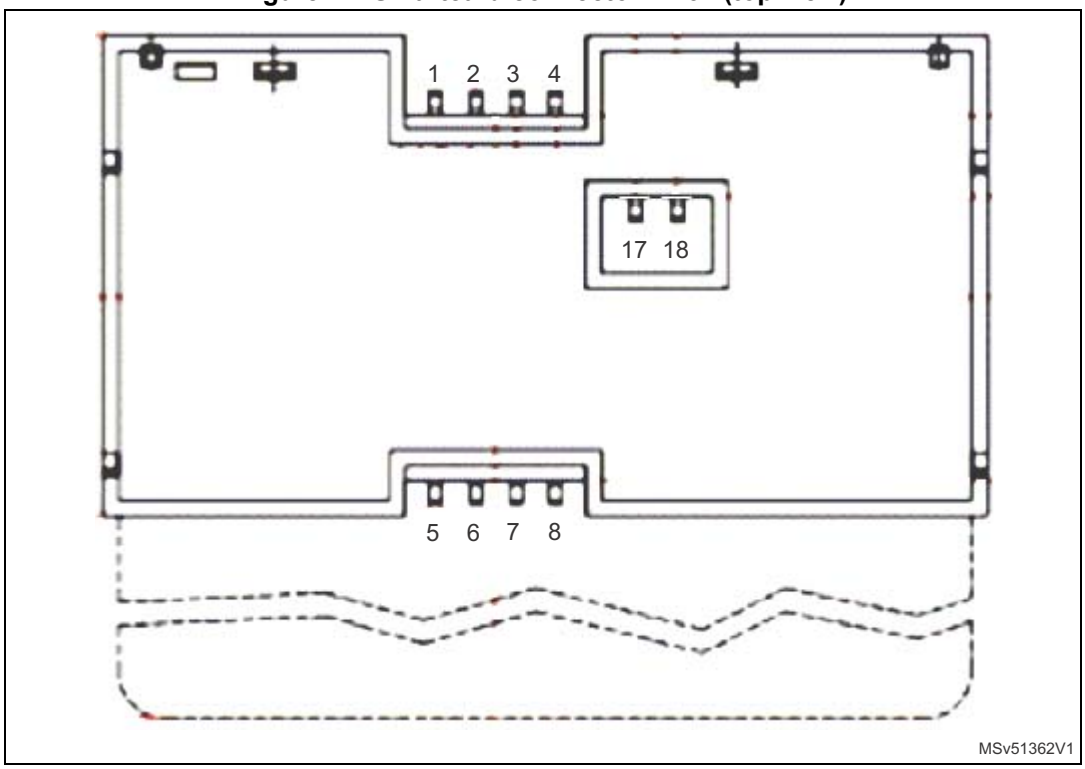


Table 40. Smartcard connector CN31

Pin number	Description	Pin number	Description
1	VCC	5	GND
2	RST	6	NC
3	CLK	7	I/O
4	NC	8	NC
17	Card presence detection pin	18	Card presence detection pin

7 Schematic diagrams

This chapter provides design schematics for the STM32G474E-EVAL key features to help users to implement these features in application designs.

This section includes:

Figure 25. MB1397_TOP

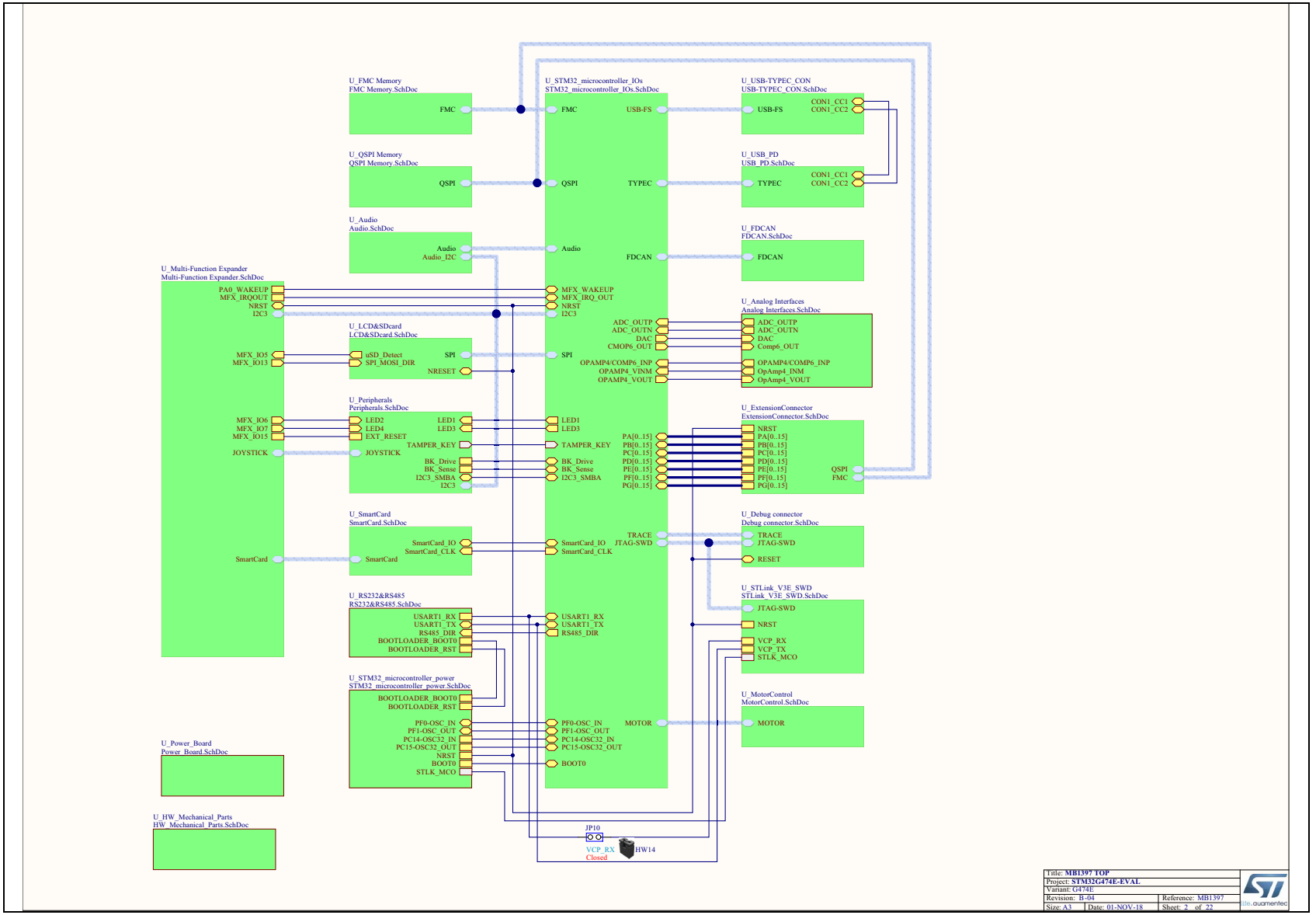


Figure 26. STM32 microcontroller I/Os

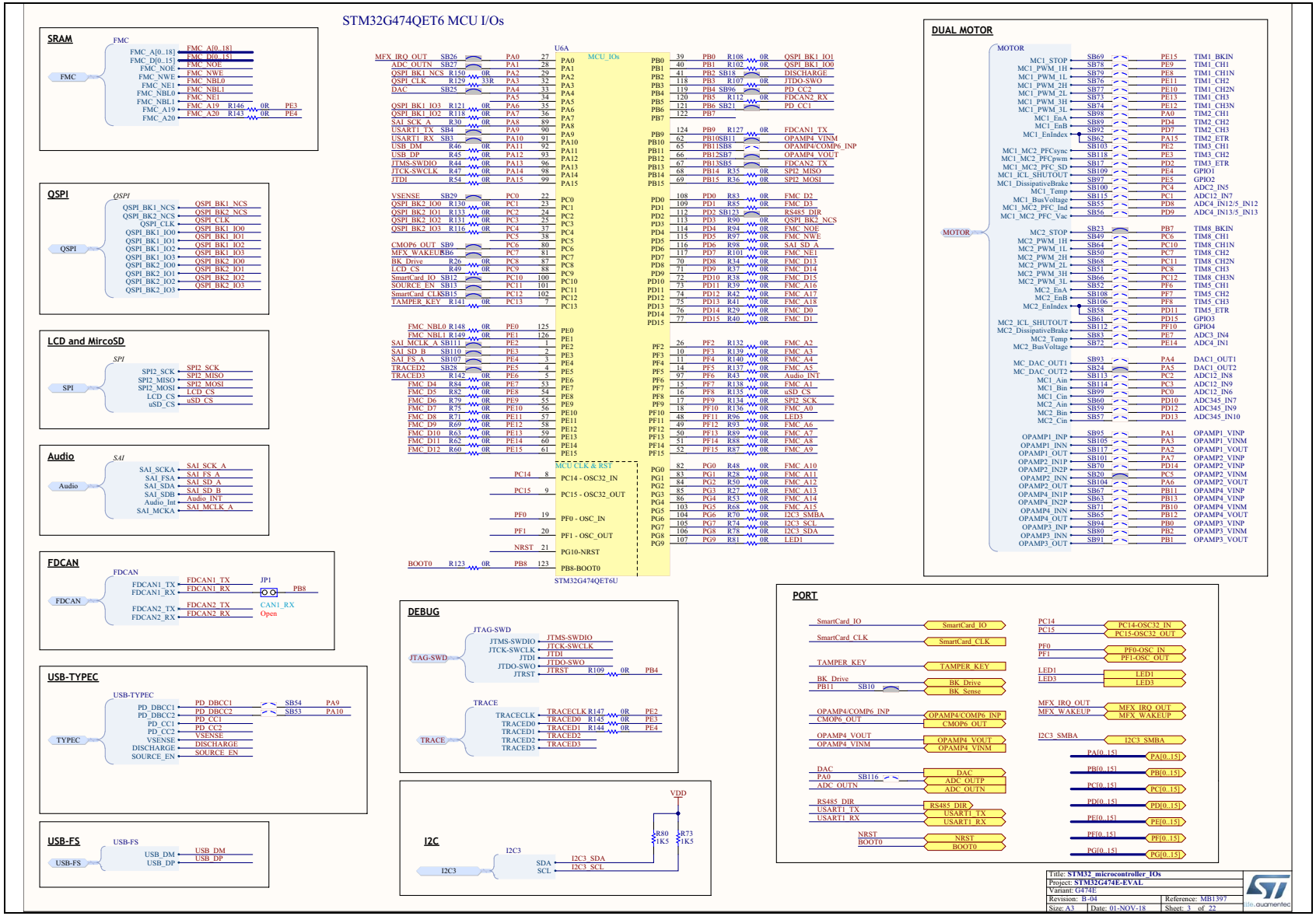


Figure 27. STM32 microcontroller power

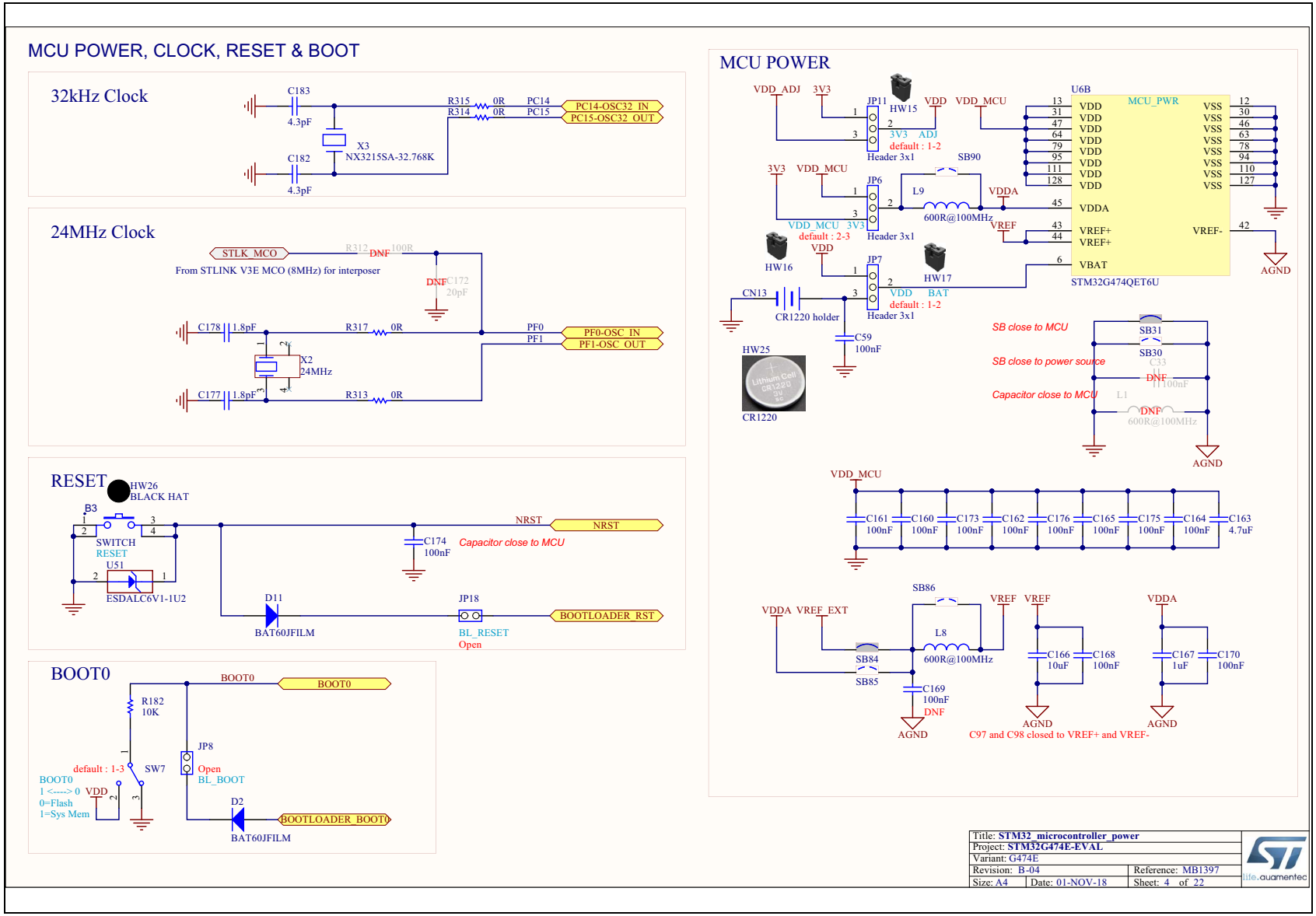


Figure 28. USB_PD

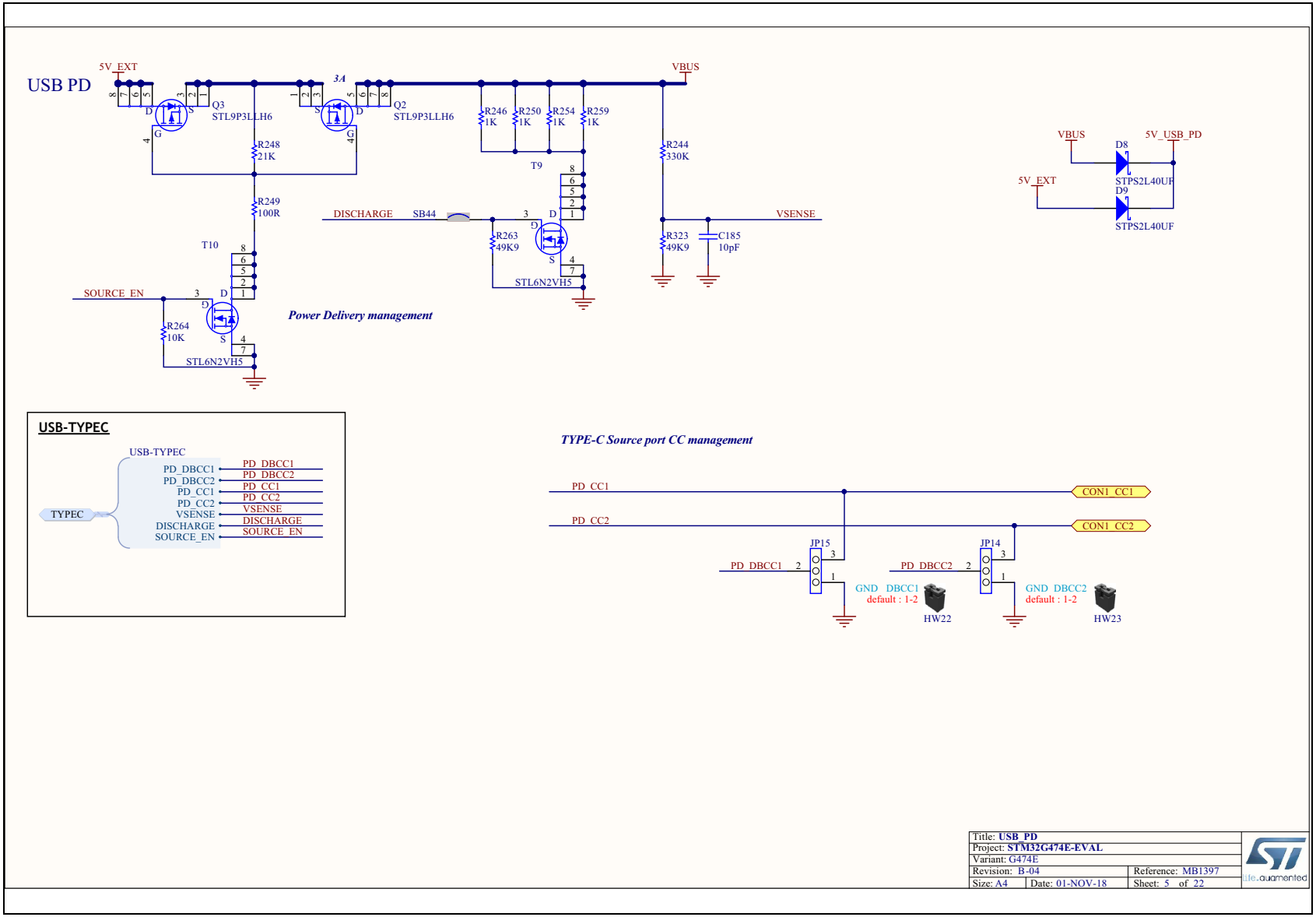


Figure 29. USB-TYPEC_CON

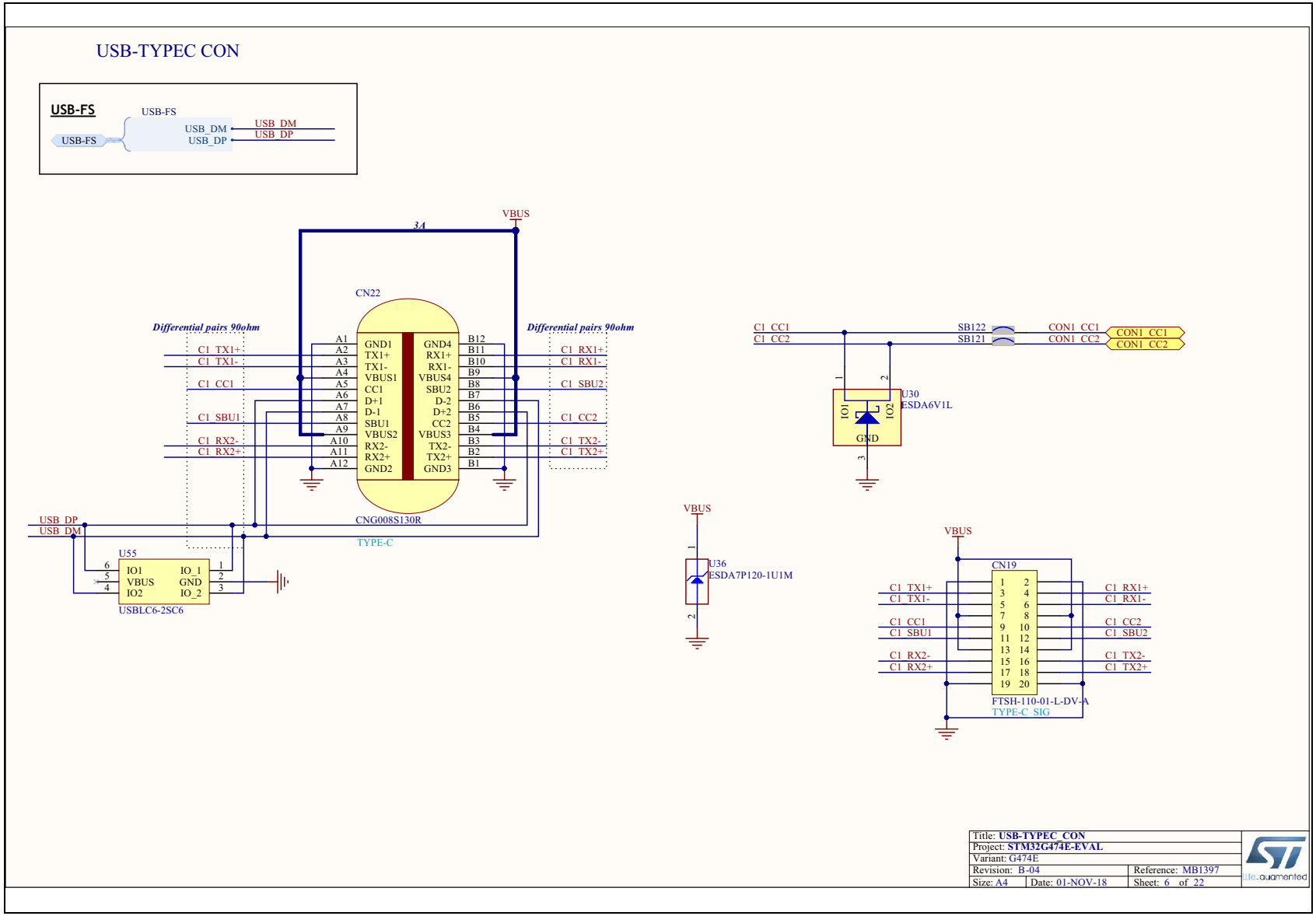


Figure 30. FMC memory

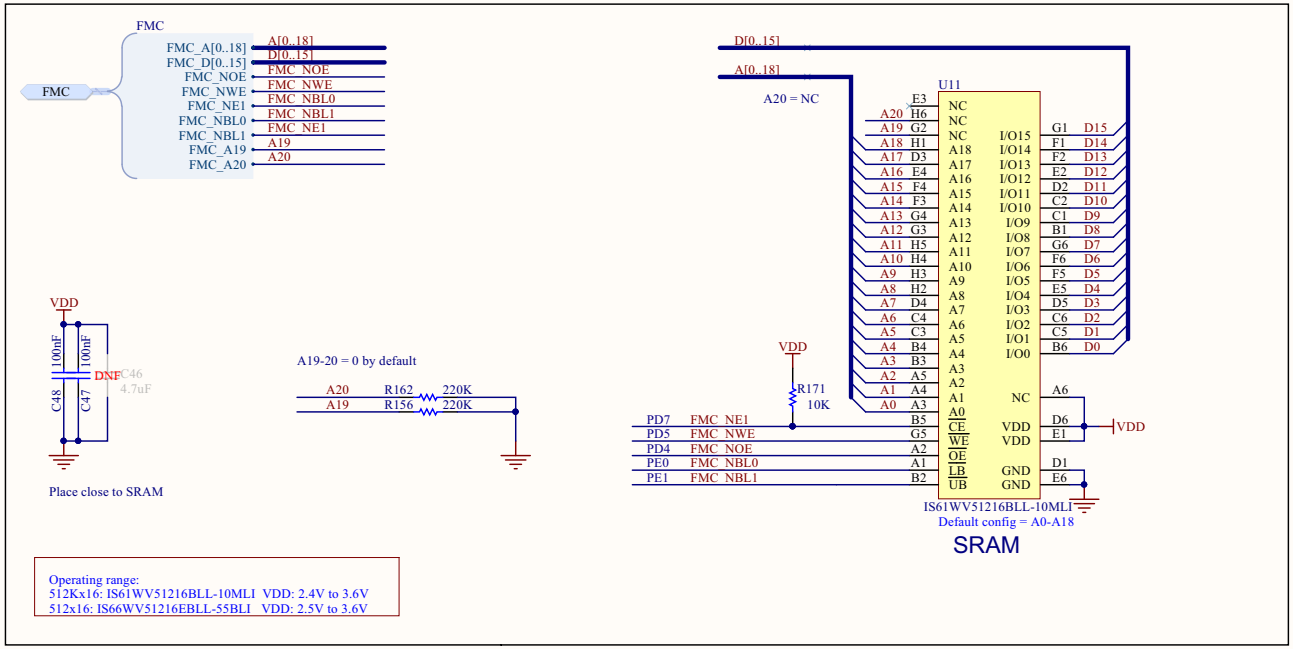


Figure 31. QSPI memory

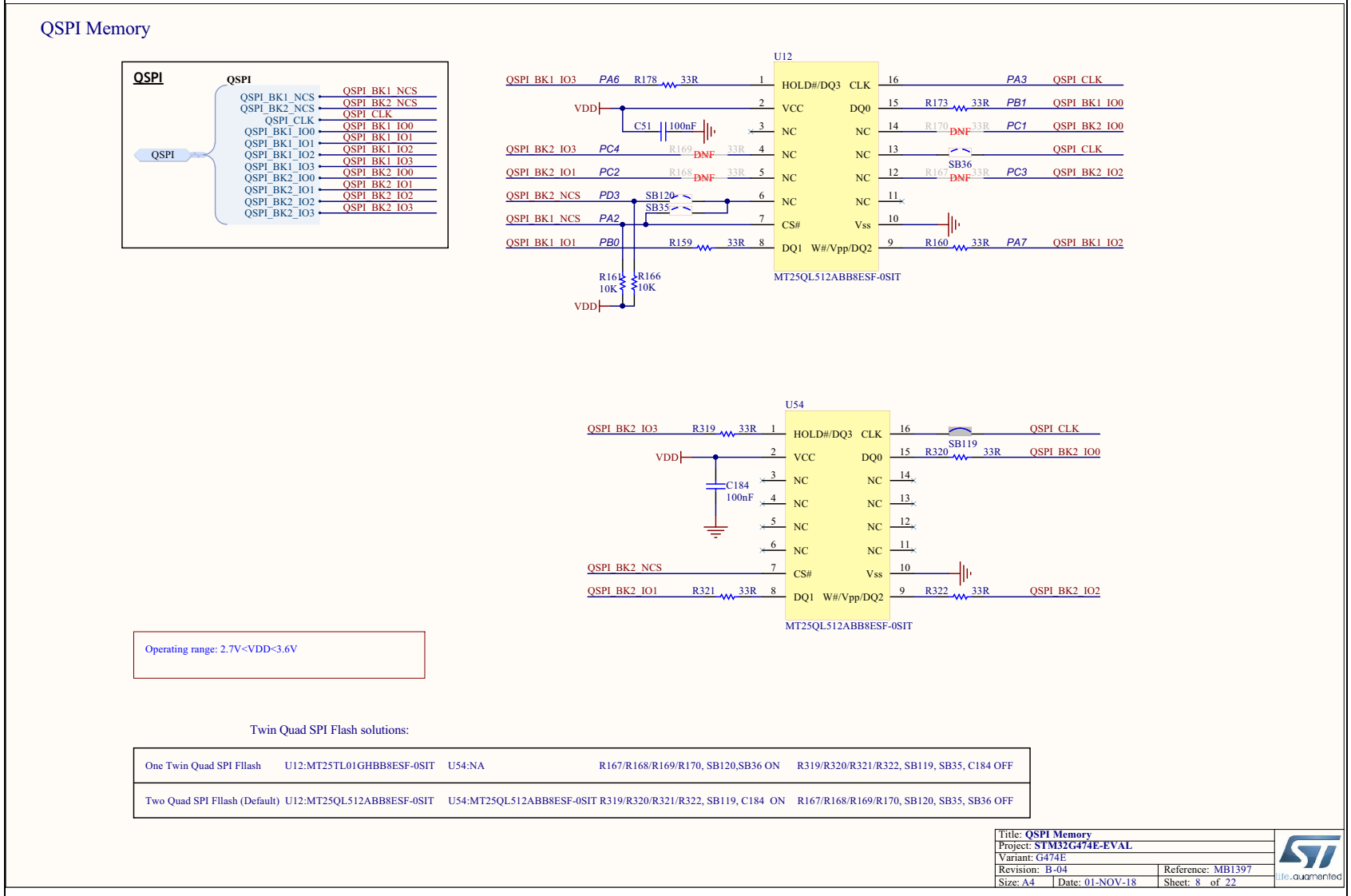


Figure 32. Audio

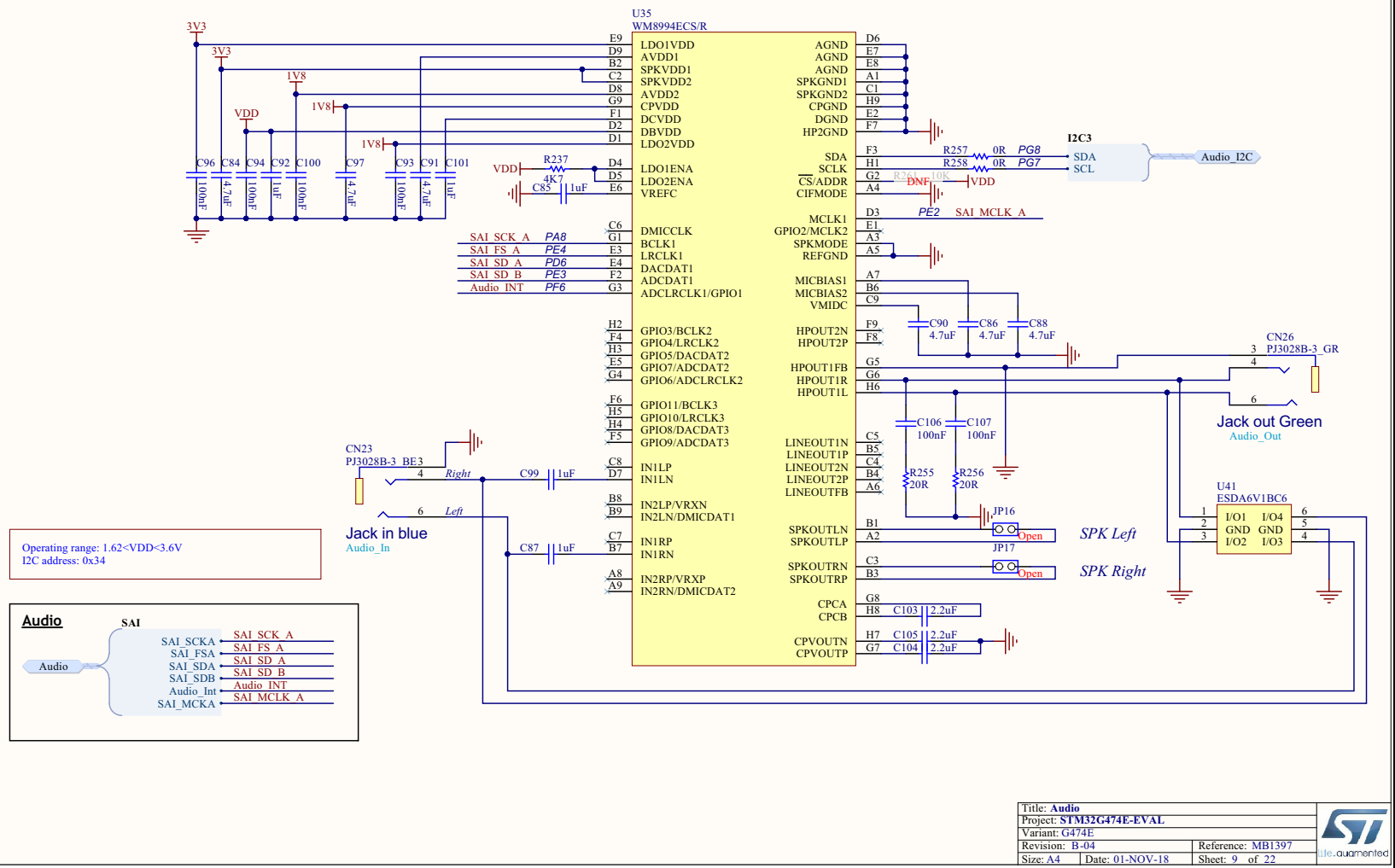


Figure 33. LCD and SD card

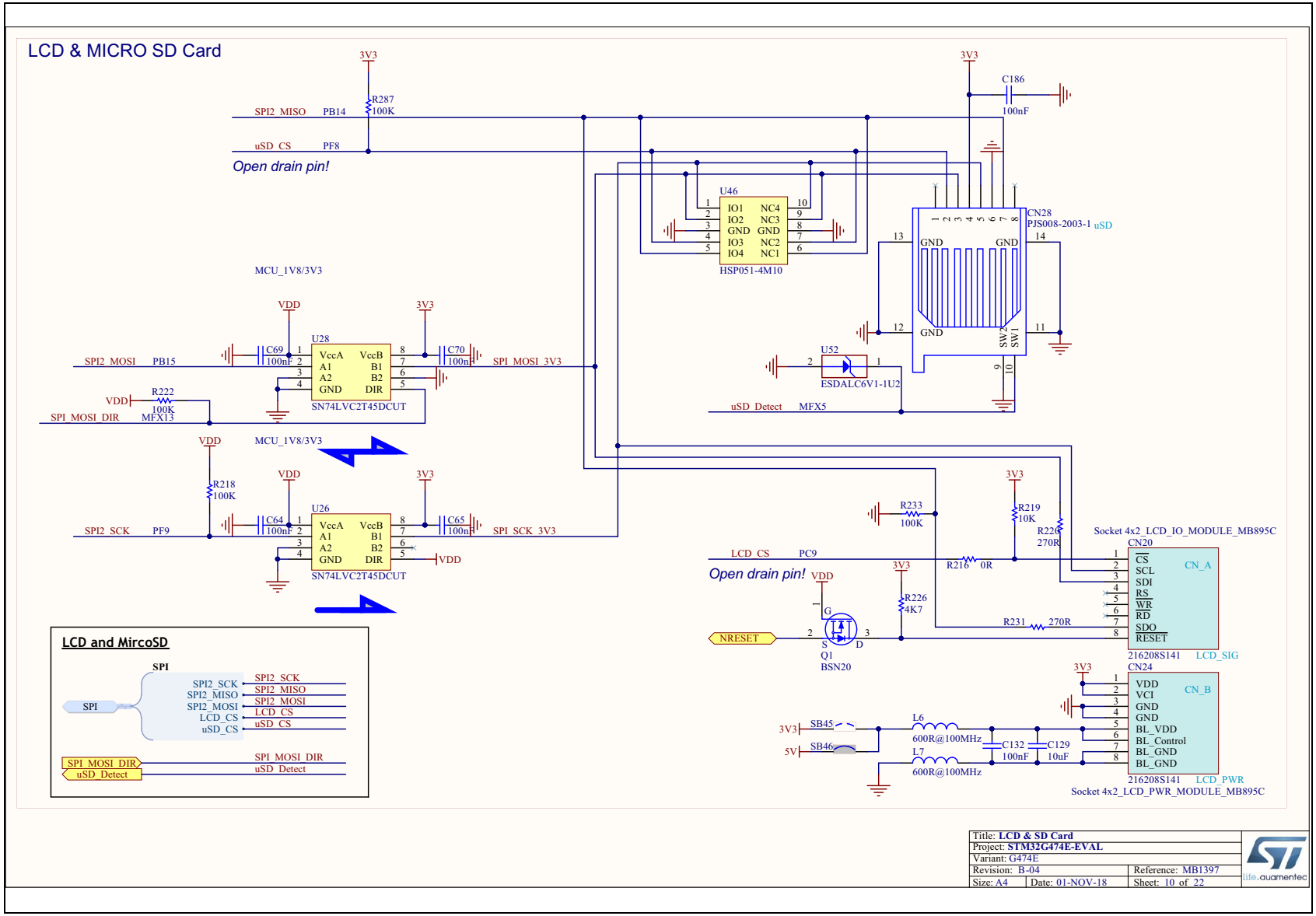


Figure 34. RS232 and RS485

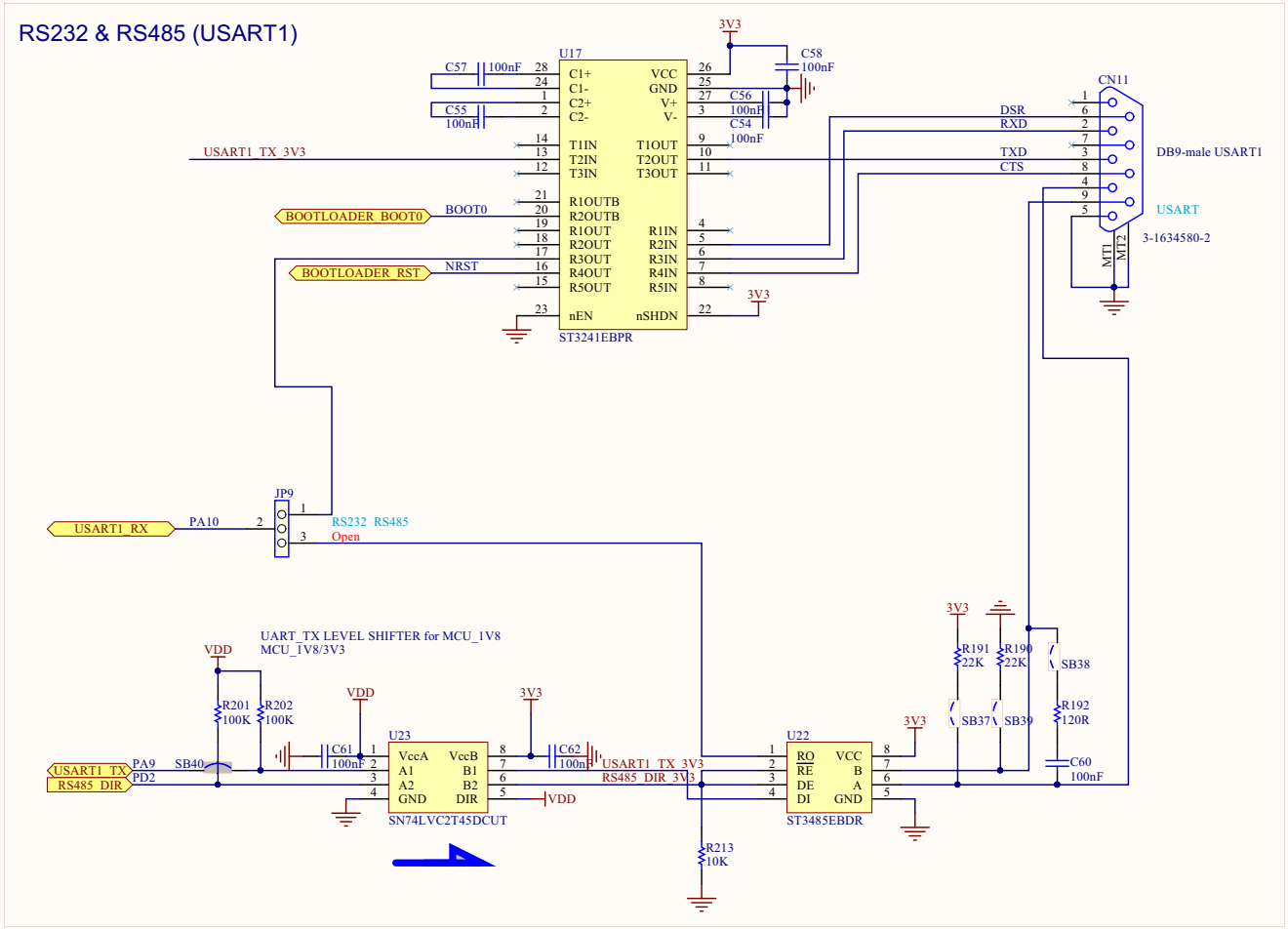


Figure 35. FDCAN

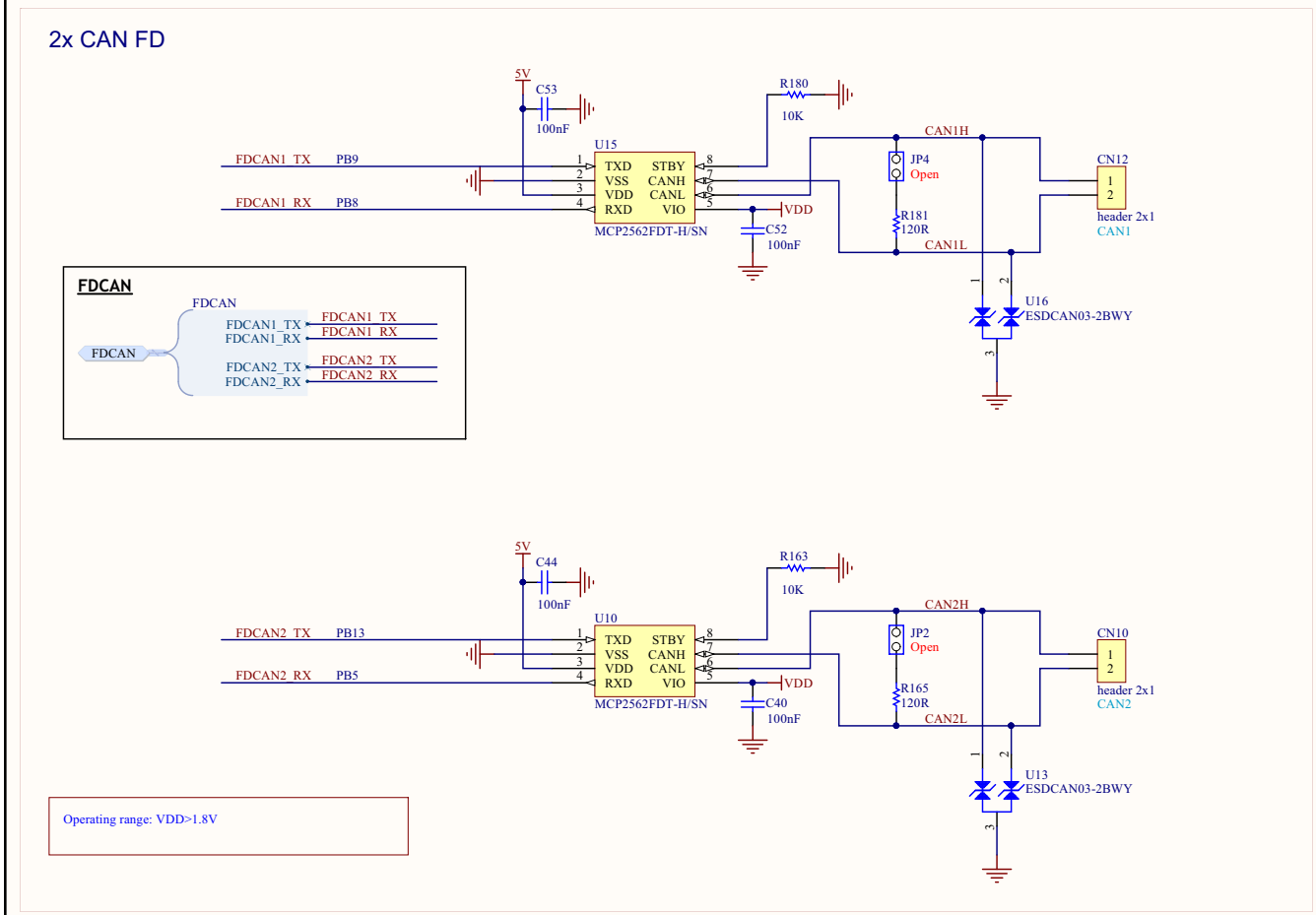


Figure 36. Analog interfaces

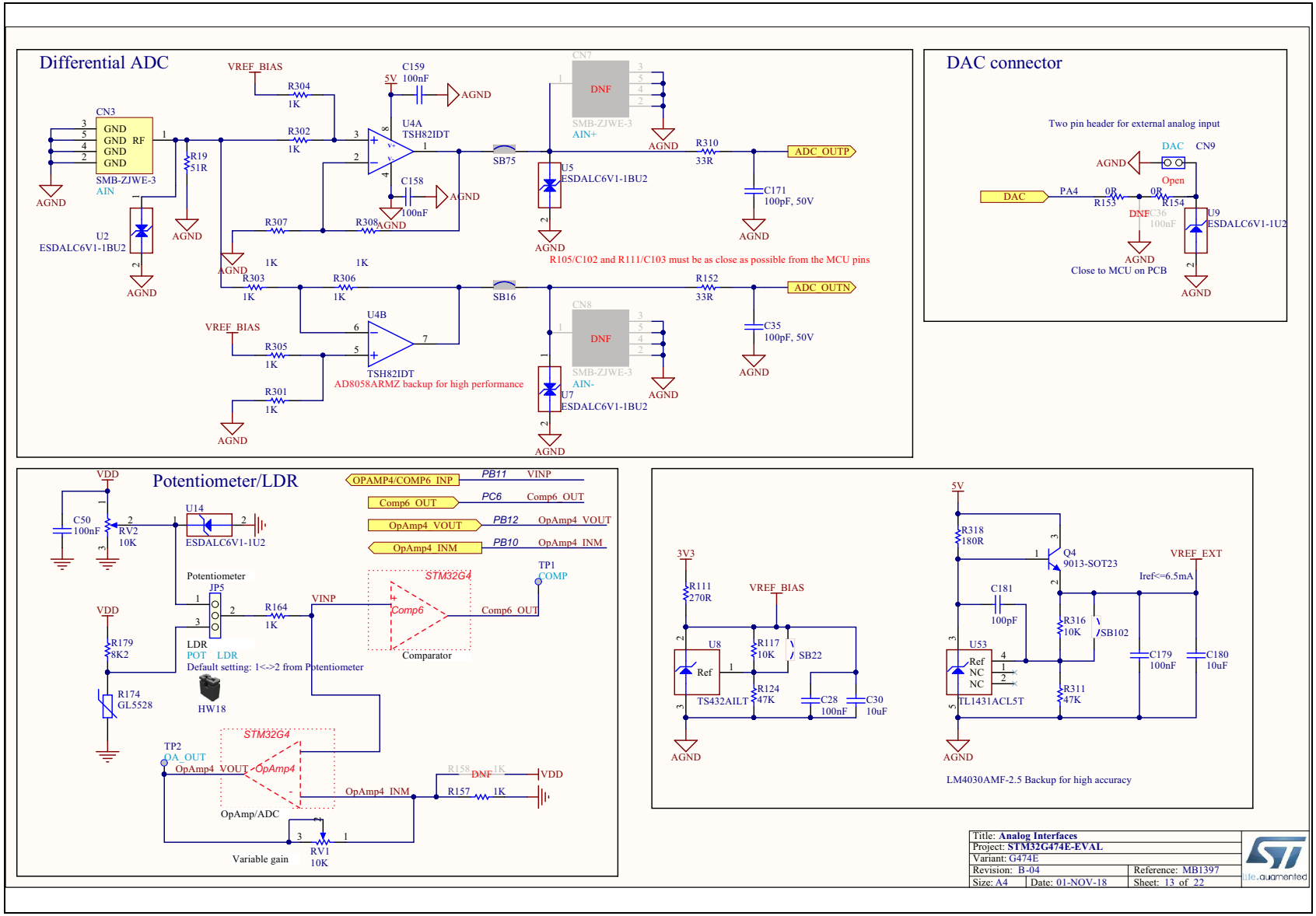


Figure 37. Peripherals

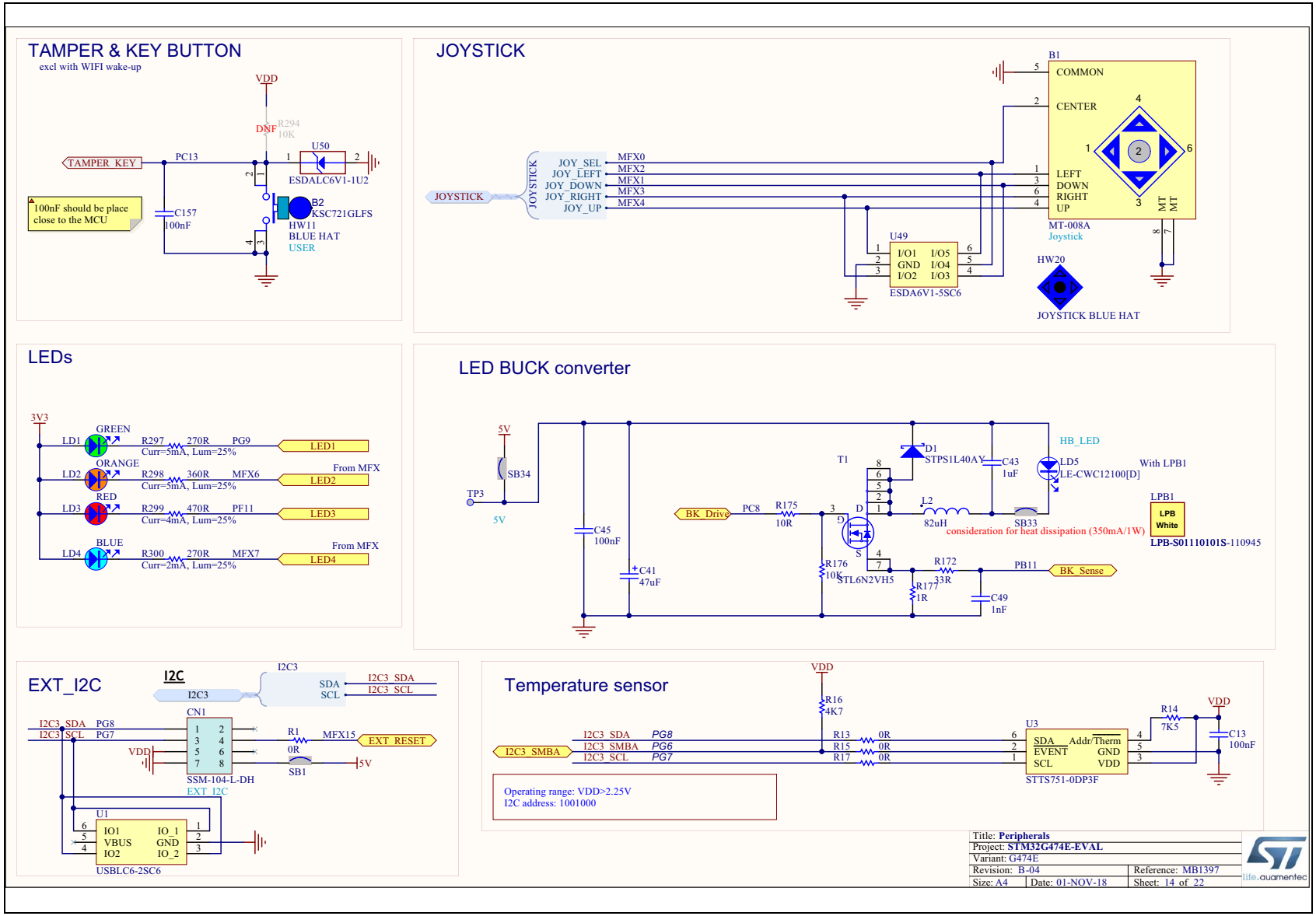


Figure 38. Smartcard

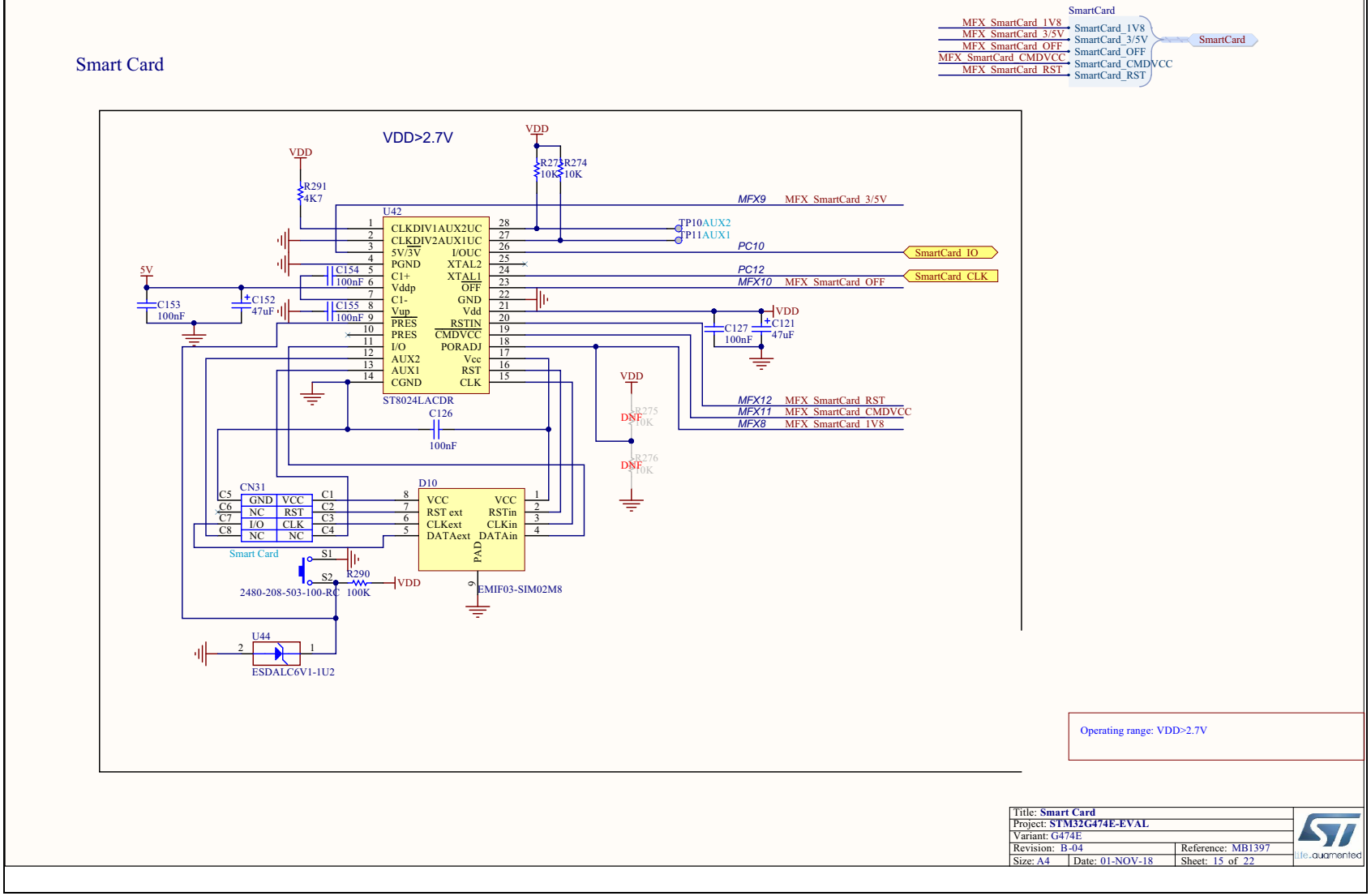


Figure 39. Motor control

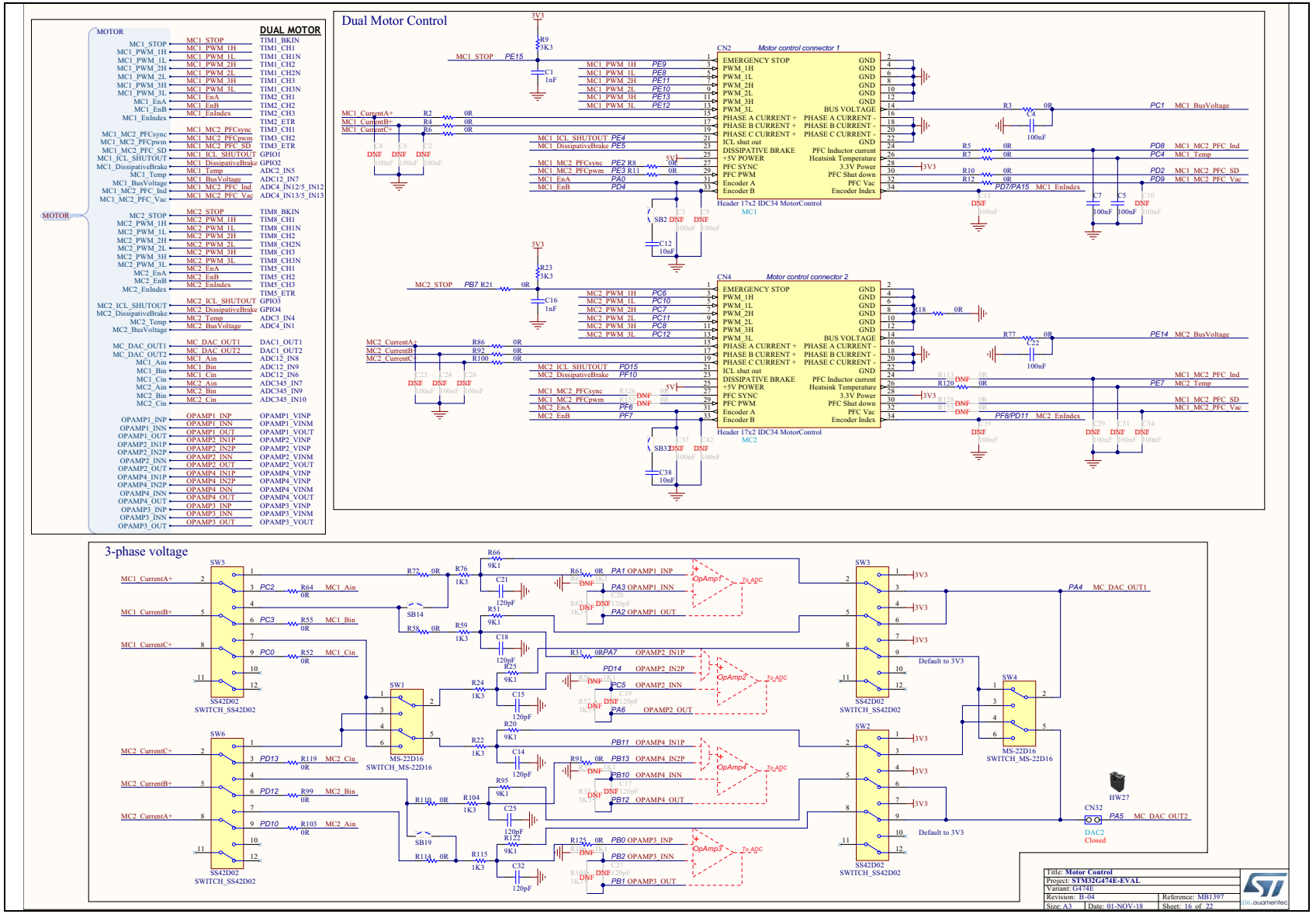


Figure 40. Extension connector

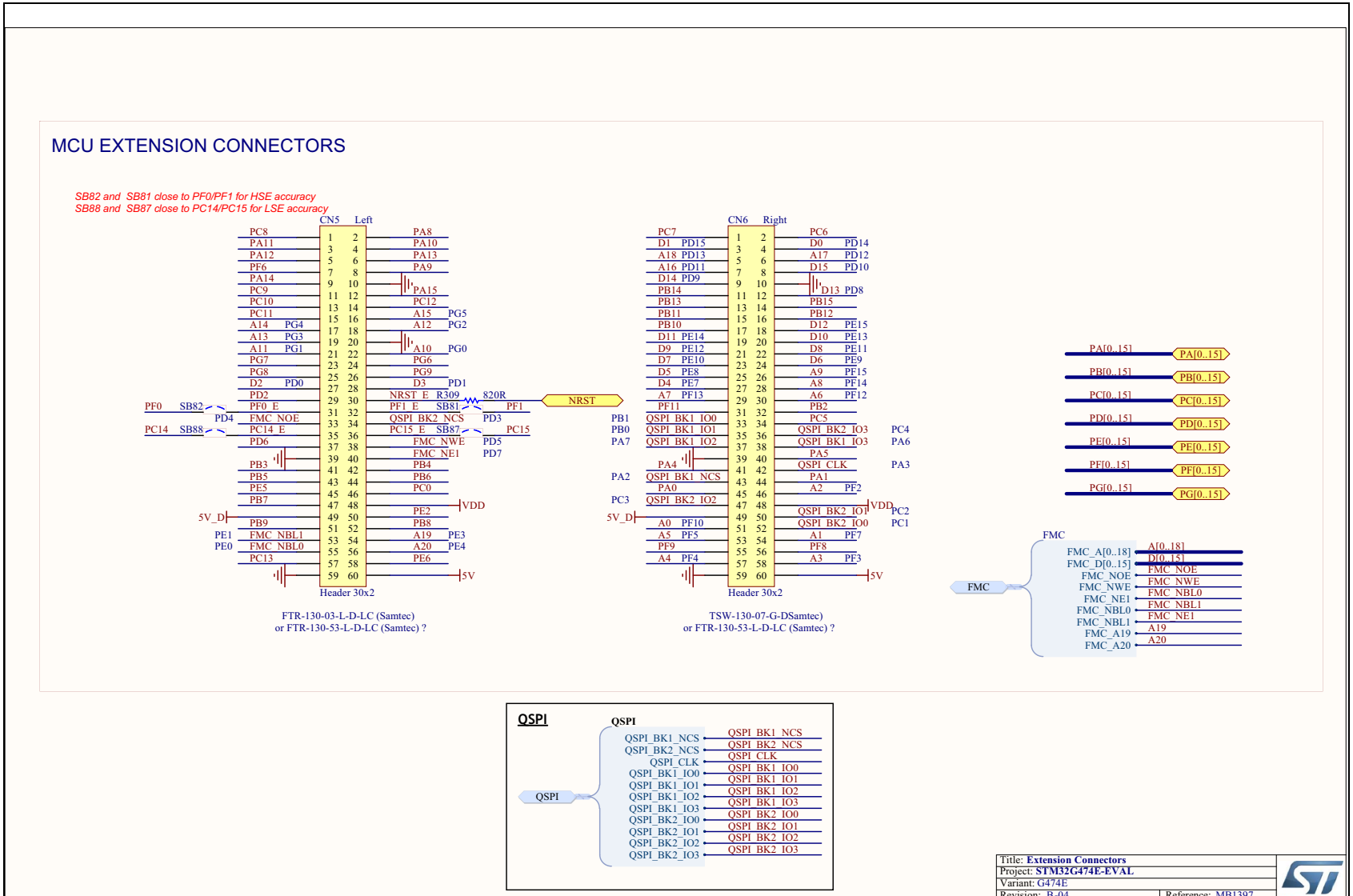


Figure 41. Debug connectors

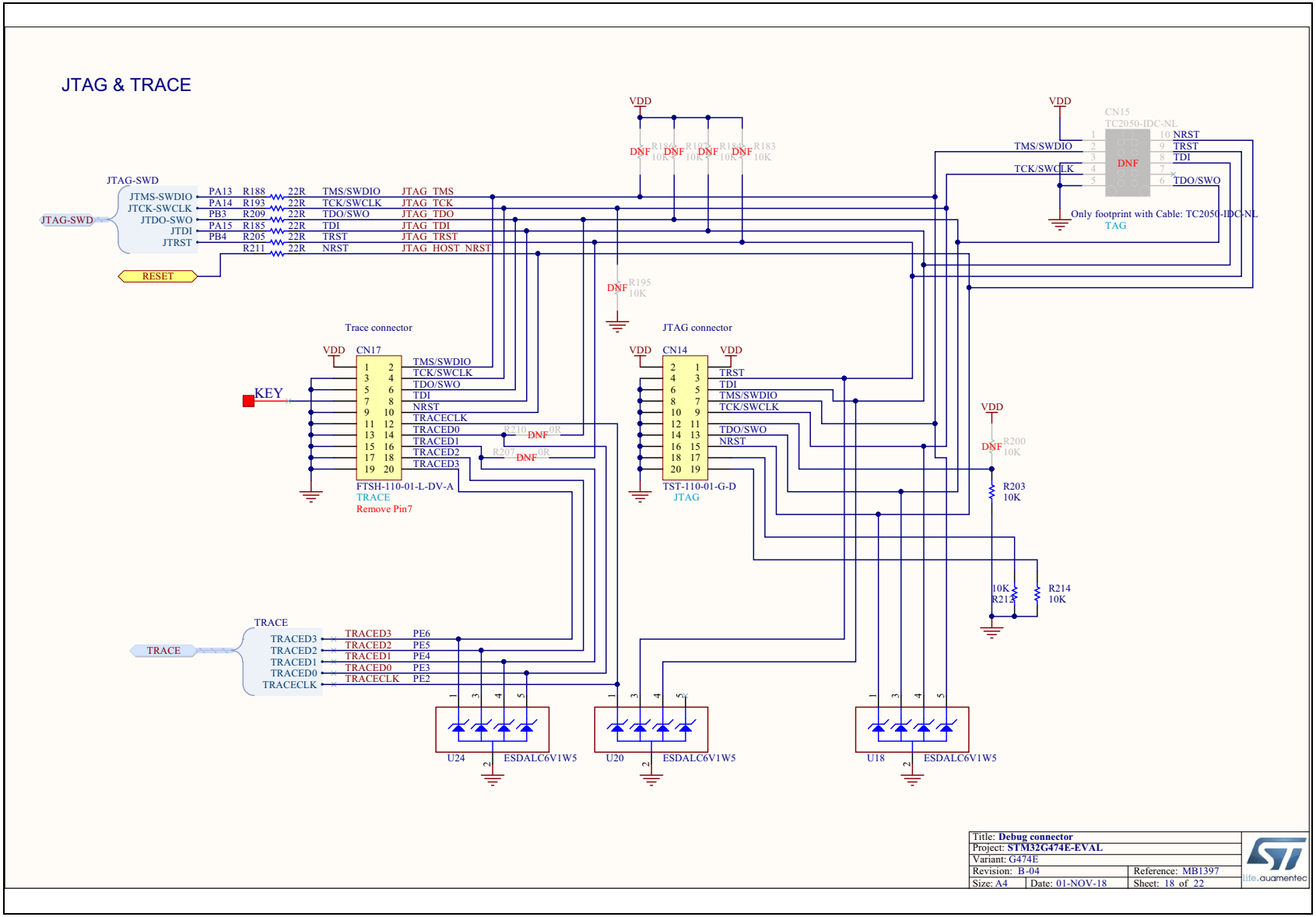


Figure 42. Multi function expander

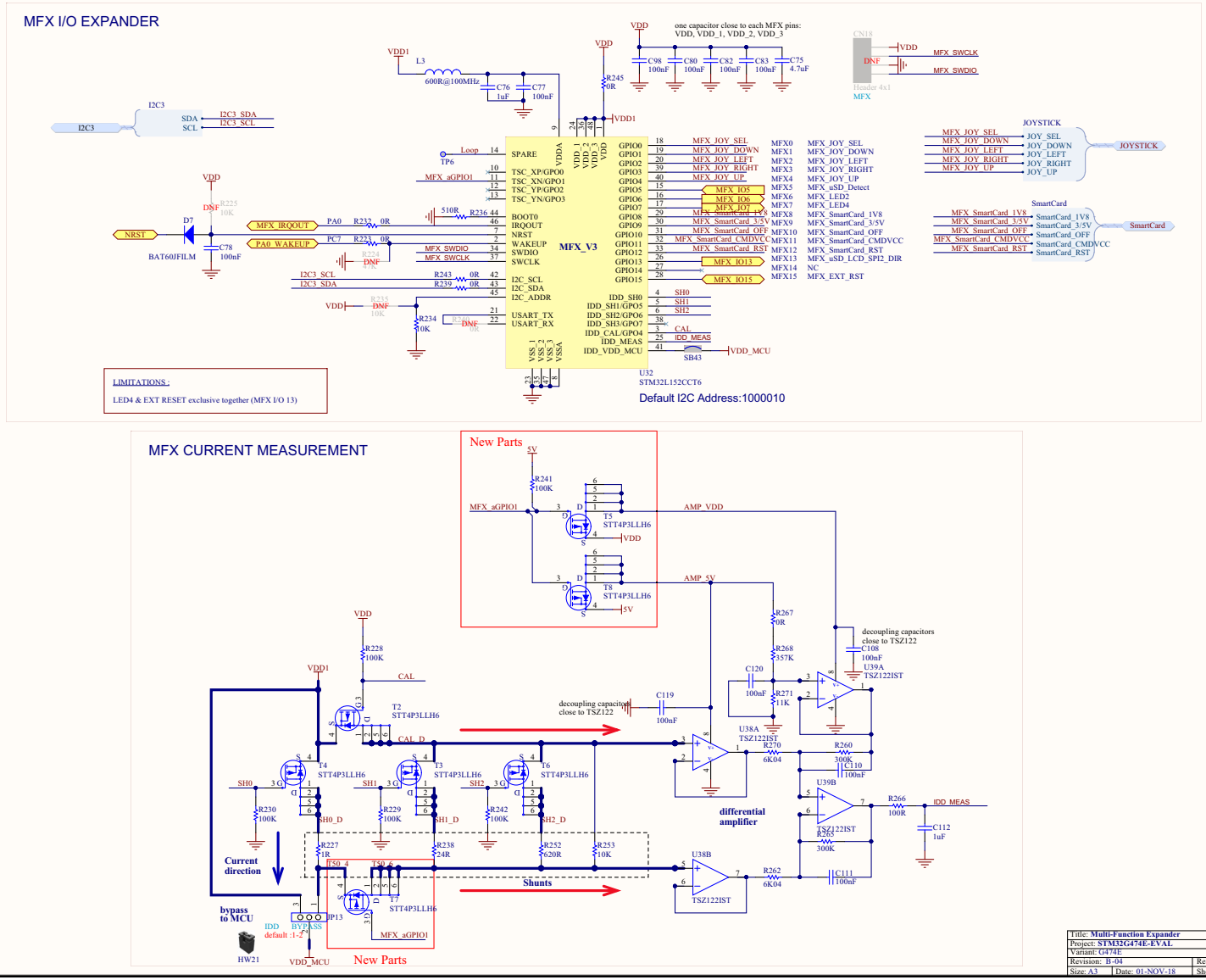


Figure 43. Power board

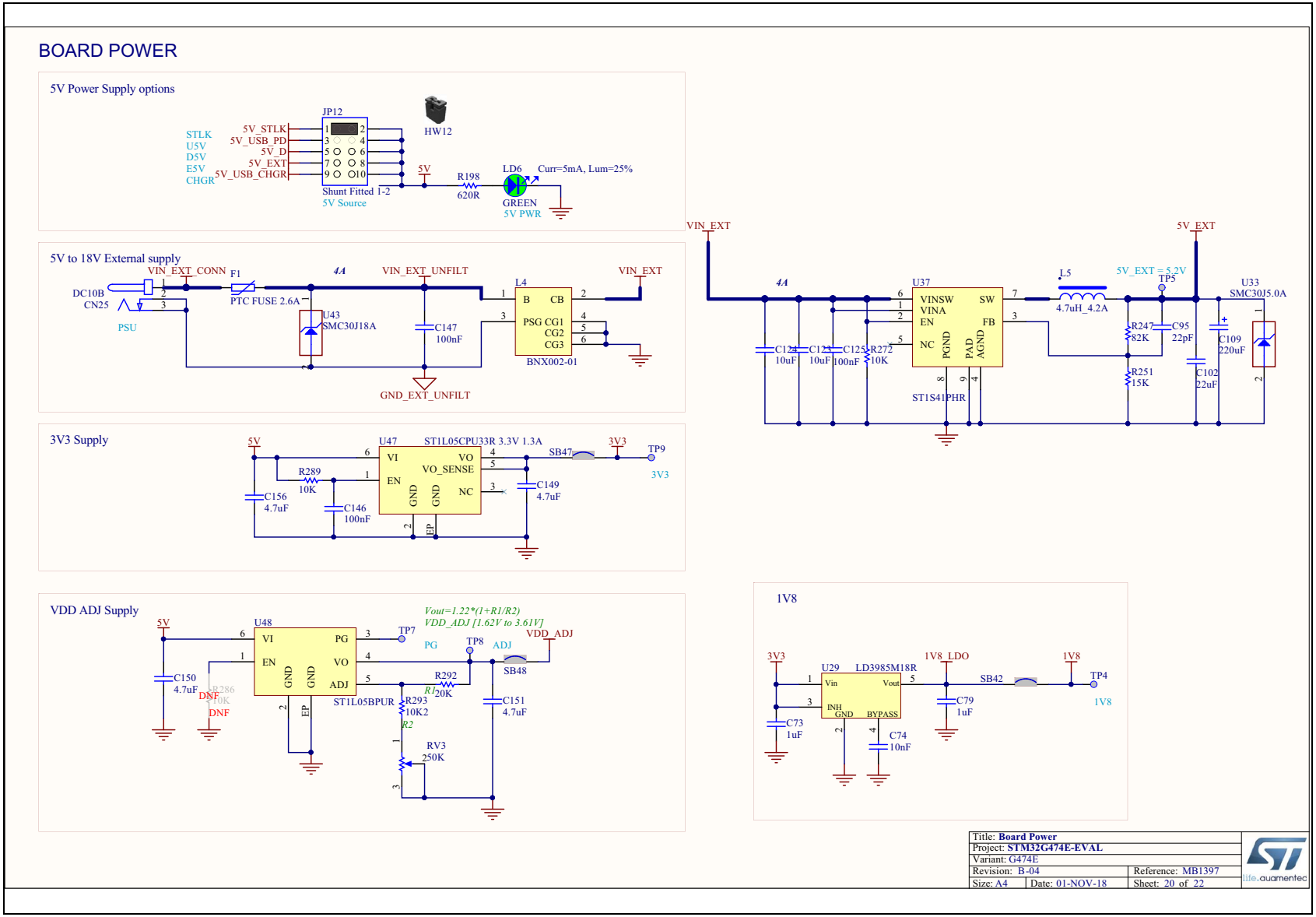
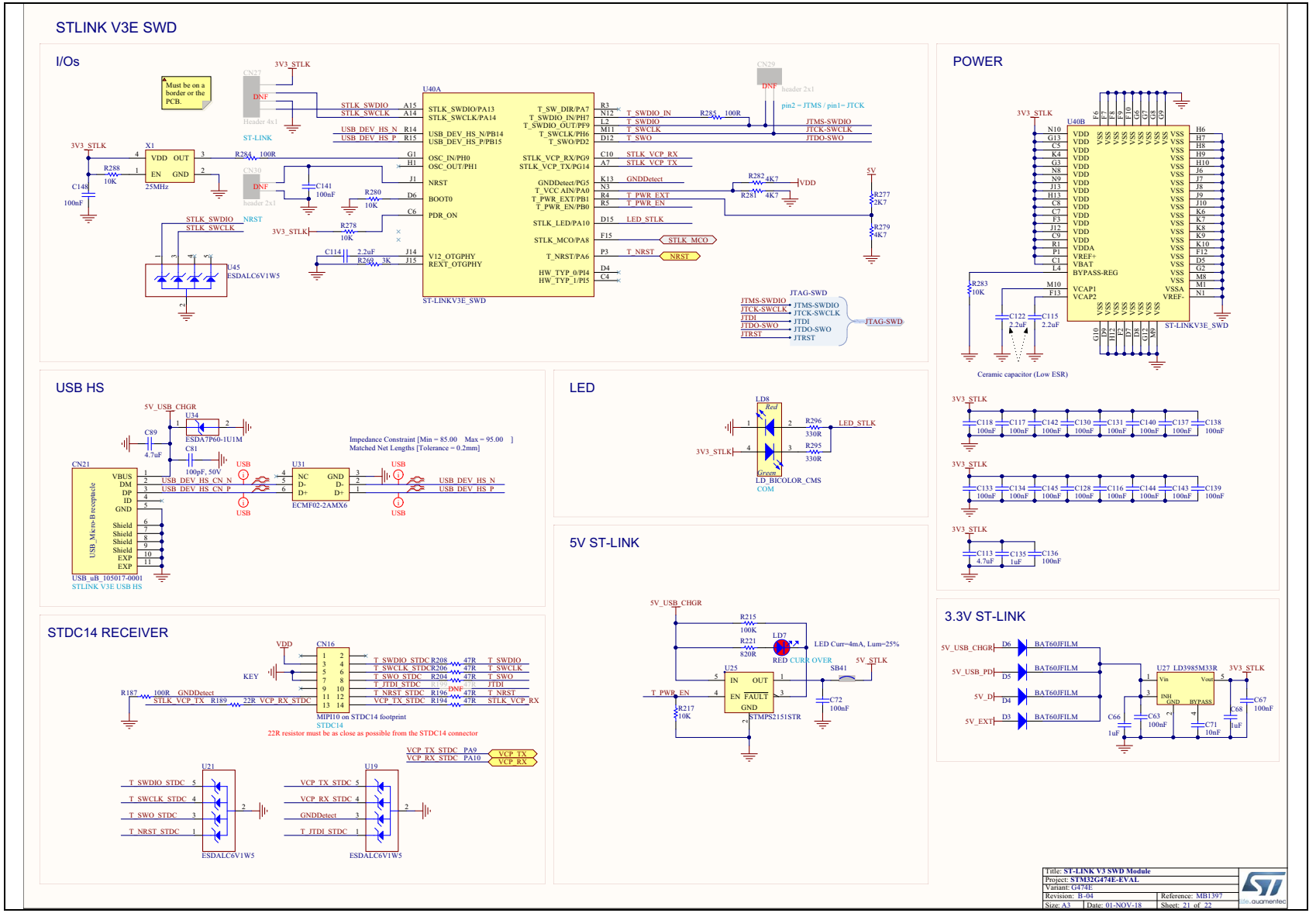


Figure 44. STLINK-V3E -SWD Module



Appendix A STM32G474E-EVAL I/O Assignment

Table 41. STM32G474E-EVAL I/O Assignment

Pin Name	LQFP128	Double motor control RockFish-EVAL	General purpose features RockFish-EVAL
PE2	1	MC1|MC2_PFC_Sync_TIM3_CH1	Audio_SAI_MCLK_A || TRACECK
PE3	2	MC1|MC2_PFC_Pwm_TIM3_CH2	Audio_SAI_SD_B || FMC_A19 || TRACED0
PE4	3	MC1_ICL-shut-out_GPIO	Audio_SAI_FS_A || FMC_A20 || TRACED1
PE5	4	MC1_Dissipative_brake_GPIO	TRACED2
PE6	5	-	TRACED3
VBAT	6	-	-
PC13	7	-	WKUP2, RTC_TAMP1, RTC_TS, RTC_OUT1
PC14-OSC32_IN	8	-	OSC32_IN
PC15-OSC32_OUT	9	-	OSC32_OUT
PF3	10	-	FMC_A3
PF4	11	-	FMC_A4
VSS_1	12	-	-
VDD_1	13	-	-
PF5	14	-	FMC_A5
PF7	15	MC2_Encoder_B_TIM5_CH2	FMC_A1
PF8	16	MC2_Encoder Index_TIM5_CH3	uSD_CS
PF9	17	-	uSD-LCD_SPI2_SCK
PF10	18	MC2_Dissipative_brake_GPIO	FMC_A0
PF0-OSC_IN	19	-	OSC_IN
PF1-OSC_OUT	20	-	OSC_OUT
PG10-NRST	21	-	NRST
PC0	22	MC1_Cin+_ADC12_IN6	USBPD_Vsense_ADC12_IN6
PC1	23	MC2_BUS_VOLTAGE_ADC12_IN7	QSPI_BK2_IO0
PC2	24	MC1_Ain+_ADC12_IN8	QSPI_BK2_IO1

Table 41. STM32G474E-EVAL I/O Assignment (continued)

Pin Name	LQFP128	Double motor control RockFish-EVAL	General purpose features RockFish-EVAL
PC3	25	MC1_Bin+_ADC12_IN9	QSPI_BK2_IO2
PF2	26	-	FMC_A2
PA0	27	MC1_Encoder_A_TIM2_CH1	DIFF_ADC12_IN1 || MFX_IRQ_OUT
PA1	28	MC1_OPAMP1_VINP	DIFF_ADC12_IN2
PA2	29	MC1_OPAMP1_VOUT	QSPI_BK1_NCS
VSS_2	30	-	-
VDD_2	31	-	-
PA3	32	MC1_OPAMP1_VINM/ 1_VINP	QSPI_CLK
PA4	33	MC_DAC1_OUT1	DAC
PA5	34	MC_DAC1_OUT2	USBPD_FRSTX
PA6	35	MC1|MC2_OPAMP2_VOUT	QSPI_BK1_IO3
PA7	36	MC1_OPAMP2_VINP	QSPI_BK1_IO2
PC4	37	MC1_heatsink_temp_ADC2_IN5	QSPI_BK2_IO3
PC5	38	MC1|MC2_OPAMP2_VINM	USBPD_Isense_ADC2_IN11
PB0	39	MC2_OPAMP3_VINP	QSPI_BK1_IO1
PB1	40	MC2_OPAMP3_VOUT	QSPI_BK1_IO0
PB2	41	MC2_OPAMP3_VINM	USBPD_Discharge
VSSA	42	-	-
VREF-	[42]	-	-
VREF+	43	-	-
VREF+	44	-	-
VDDA	45	-	-
VSS_3	46	-	-
VDD_3	47	-	-
PF11	48	-	LED3
PF12	49	-	FMC_A6
PF13	50	-	FMC_A7
PF14	51	-	FMC_A8
PF15	52	-	FMC_A9

Table 41. STM32G474E-EVAL I/O Assignment (continued)

Pin Name	LQFP128	Double motor control RockFish-EVAL	General purpose features RockFish-EVAL
PE7	53	MC2_heatsink_temp_ADC3_IN4	FMC_D4
PE8	54	MC1_PWM_TIM1_CH1N	FMC_D5
PE9	55	MC1_PWM_TIM1_CH1	FMC_D6
PE10	56	MC1_PWM_TIM1_CH2N	FMC_D7
PE11	57	MC1_PWM_TIM1_CH2	FMC_D8
PE12	58	MC1_PWM_TIM1_CH3N	FMC_D9
PE13	59	MC1_PWM_TIM1_CH3	FMC_D10
PE14	60	MC1_BUS_VOLTAGE_ADC4_IN1	FMC_D11
PE15	61	MC1_PWM_TIM1_BKIN	FMC_D12
PB10	62	MC1|MC2_OPAMP4_VINM	OPAMP4_VINM
VSS_4	63	-	-
VDD_4	64	-	-
PB11	65	MC1|MC2_OPAMP4_VINP	OPAMP4_VINP || COMP6_INP || BK_sense
PB12	66	MC1|MC2_OPAMP4_VOUT	OPAMP4_VOUT
PB13	67	MC2_OPAM4_VINP	CAN2_TX
PB14	68	-	uSD-LCD_SPI2_MISO
PB15	69	-	uSD-LCD_SPI2_MOSI
PD8	70	MC1|MC2_PFC-inductor-current_ADC4_IN12/5_IN12	FMC_D13
PD9	71	MC1|MC2_PFC_VAC_ADC4_IN13/5_IN13	FMC_D14
PD10	72	MC2_Cin+_ADC345_IN7	FMC_D15
PD11	73	MC2_Encoder Index_TIM5_ETR	FMC_A16
PD12	74	MC2_Bin+_ADC345_IN9	FMC_A17
PD13	75	MC2_Ain+_ADC345_IN10	FMC_A18
PD14	76	MC1|MC2_OPAMP2_VINP	FMC_D0
PD15	77	MC2_ICL-shut-out_GPIO	FMC_D1
VSS_5	78	-	-
VDD_5	79	-	-
PC6	80	MC2_PWM_TIM8_CH1	COMP6_OUT

Table 41. STM32G474E-EVAL I/O Assignment (continued)

Pin Name	LQFP128	Double motor control RockFish-EVAL	General purpose features RockFish-EVAL
PC7	81	MC2_PWM_TIM8_CH2	MFX_WAKEUP
PG0	82	-	FMC_A10
PG1	83	-	FMC_A11
PG2	84	-	FMC_A12
PG3	85	-	FMC_A13
PG4	86	-	FMC_A14
PC8	87	MC2_PWM_TIM8_CH3	BK_Driver_TIM3_CH3
PC9	88	-	LCD_CS
PA8	89	-	Audio_SAI_SCK_A
PA9	90	-	USBPD_DBCC1 || USART1_TX
PA10	91	-	USBPD_DBCC2 || USART1_RX
PA11	92	-	USB_DM
PA12	93	-	USB_DP
VSS_6	94	-	-
VDD_6	95	-	-
PA13	96	-	SWDIO-JTMS
PF6	97	MC2_Encoder A_TIM5_CH1	Audio_INT
PA14	98	-	SWCLK-JTCK
PA15	99	MC1_Encoder_Index_TIM2_ETR	JTDI
PC10	100	MC2_PWM_TIM8_CH1N	SmartCard_IO_USART3_TX
PC11	101	MC2_PWM_TIM8_CH2N	USBPD_Source_EN
PC12	102	MC2_PWM_TIM8_CH3N	SmartCard_CLK_USART3_CK || USBPD_FRSTX
PG5	103	-	FMC_A15
PG6	104	-	I2C3_SMBA
PG7	105	-	I2C3_SCL
PG8	106	-	I2C3_SDA
PG9	107	-	LED1
PD0	108	-	FMC_D2
PD1	109	-	FMC_D3

Table 41. STM32G474E-EVAL I/O Assignment (continued)

Pin Name	LQFP128	Double motor control RockFish-EVAL	General purpose features RockFish-EVAL
VSS_7	110	-	-
VDD_7	111	-	-
PD2	112	MC1|MC2_PFC_Shunt-Down_TIM3_ETR	RS485_DIR
PD3	113	-	QSPI_BK2_NCS
PD4	114	MC1_Encoder_B_TIM2_CH2	FMC_NOE
PD5	115	-	FMC_NWE
PD6	116	-	Audio_SAI_SD_A
PD7	117	MC1_Encoder_Index_TIM2_CH3	FMC_NE1
PB3	118	-	JTDO-TRACESWO
PB4	119	-	USBPD_CC2 || JTRST
PB5	120	-	CAN2_RX
PB6	121	-	USBPD_CC1
PB7	122	MC2_STOP_TIM8_BKIN	USBPD_VCONN_EN2
PB8-BOOT0	123	-	CAN1_RX || BOOT0
PB9	124	-	CAN1_TX
PE0	125	-	FMC_NBL0
PE1	126	-	FMC_NBL1
VSS_8	127	-	-
VDD_8	128	-	-

Revision history

Table 42. Document revision history

Date	Revision	Changes
8-Feb-2019	1	Initial version
18-Apr-2019	2	Updated: *Section 5.16.3* with OPAMP1, 2 and 4 limitations
3-Jun-2019	3	Updated: *Section 5.21.3* with MFX limitations