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 STM32G474QET6 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, 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 STM32G484QET6 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 an easy connection to a 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, and STM32G474E-EVAL1) are described in this user manual, together with STM32G474E-EVAL figures.

Figure 1. STM32G474E-EVAL top view

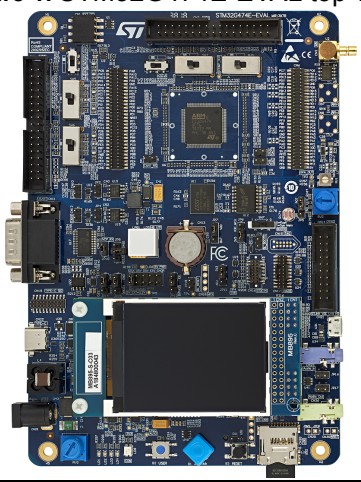
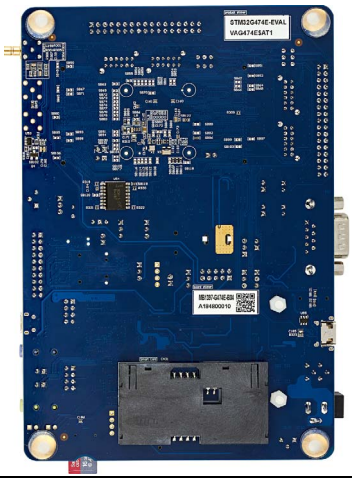


Figure 2. STM32G474E-EVAL bottom view



Pictures are not contractual.

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1 Features

- STM32G474QET6 (STM32G474E-EVAL and STM32G474E-EVAL1) or STM32G484QET6 (STM32G484E-EVAL) Arm® Cortex®-M4 core-based microcontroller with 512 Kbytes of flash memory and 96 Kbytes of RAM in an LQFP128 package
- 240x320 TFT color LCD 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 a 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
  - Two sets of motor control expansion connectors
  - Board expansion extension connectors

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

- Flexible power supply options: ST-LINK USB V_{BUS}, USB connector, or external sources
- Microcontroller supply voltage: fixed 3.3 V or adjustable range from 1.62 to 3.6 V
- On-board STLINK-V3E debugger/programmer with USB reenumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32CubeG4 MCU Package
- Support of a wide choice of integrated development environments (IDEs) including IAR Embedded Workbench®, MDK-ARM, and STM32CubeIDE

arm

2 Ordering information

To order the STM32G474E-EVAL, STM32G474E-EVAL1, or STM32G484E-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(1) MB895(2)	STM32G474QET6	Basic security
STM32G474E-EVAL1			Motor-control configuration board
STM32G484E-EVAL		STM32G484QET6	Cryptography

1. Main board
2. LCD daughterboard

2.1 Codification

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

Table 2. Codification explanation

STM32TTXXY-EVAL(Z)	Description	Example: STM32G484E-EVAL
STM32TT	MCU series in STM32 Arm Cortex MCUs	STM32G4 series
XX	MCU product line in the series – G474: basic security – G484: cryptography	STM32G484
Y	STM32 flash memory size, E for 512 Kbytes	512 Kbytes
-EVAL(Z)	Evaluation board configuration: – EVAL: basic – EVAL1: with motor-control configuration board	Basic

3 Development environment

3.1 System requirements

- Multi-OS support: Windows® 10, Linux®(a) 64-bit, or macOS®(b) (c)
- USB Type-A or USB Type-C® to Micro-B cable

3.2 Development toolchains

- IAR Systems - IAR Embedded Workbench®(d)
- Keil® - MDK-ARM(d)
- STMicroelectronics - STM32CubeIDE

3.3 Demonstration software

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

3.4 CAD resources

All board design resources, including schematics, CAD databases, manufacturing files, and the bill of materials, are available from the STM32G474E-EVAL, STM32G474E-EVAL1, and STM32G484E-EVAL product pages at *www.st.com*.

a. Linux® is a registered trademark of Linus Torvalds.

b. macOS® is a trademark of Apple Inc., registered in the U.S. and other countries and regions.

c. Windows is a trademark of the Microsoft group of companies.

d. on Windows® only.

4 Safety recommendations

4.1 Targeted audience

This product targets users with at least basic electronics or embedded software development knowledge such as engineers, technicians, or students. This board is not a toy and is not suited for use by children.

4.2 Handling the board

This product contains a bare printed circuit board and like all products of this type, the user must be careful about the following points:

- The connection pins on the board might be sharp. Be careful when handling the board to avoid hurting yourself.
- This board contains static-sensitive devices. To avoid damaging it, handle the board in an ESD.proof environment.
- While powered, do not touch the electric connections on the board with your fingers or anything conductive. The board operates at a voltage level that is not dangerous, but components might be damaged when shorted.
- Do not put any liquid on the board and avoid operating the board close to water or at a high humidity level.
- Do not operate the board if dirty or dusty.

4.3 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 that might be ejected from the CN28 connector (right side of the board),
2. TFT LCD MB895 daughterboard that must be in its CN20 and CN24 connectors

For product information related to the STM32G4xxQET6 microcontroller, visit the *www.st.com* website.

5 Hardware layout and configuration

The STM32G474E-EVAL board is designed around the STM32G474QET6 target microcontroller in the 128-pin TQFP package. *Figure 3* illustrates the connections of the STM32G474QET6 with the peripheral components. *Figure 4* and *Figure 5* show the locations of the main components on the Evaluation board.

Figure 3. Hardware block diagram

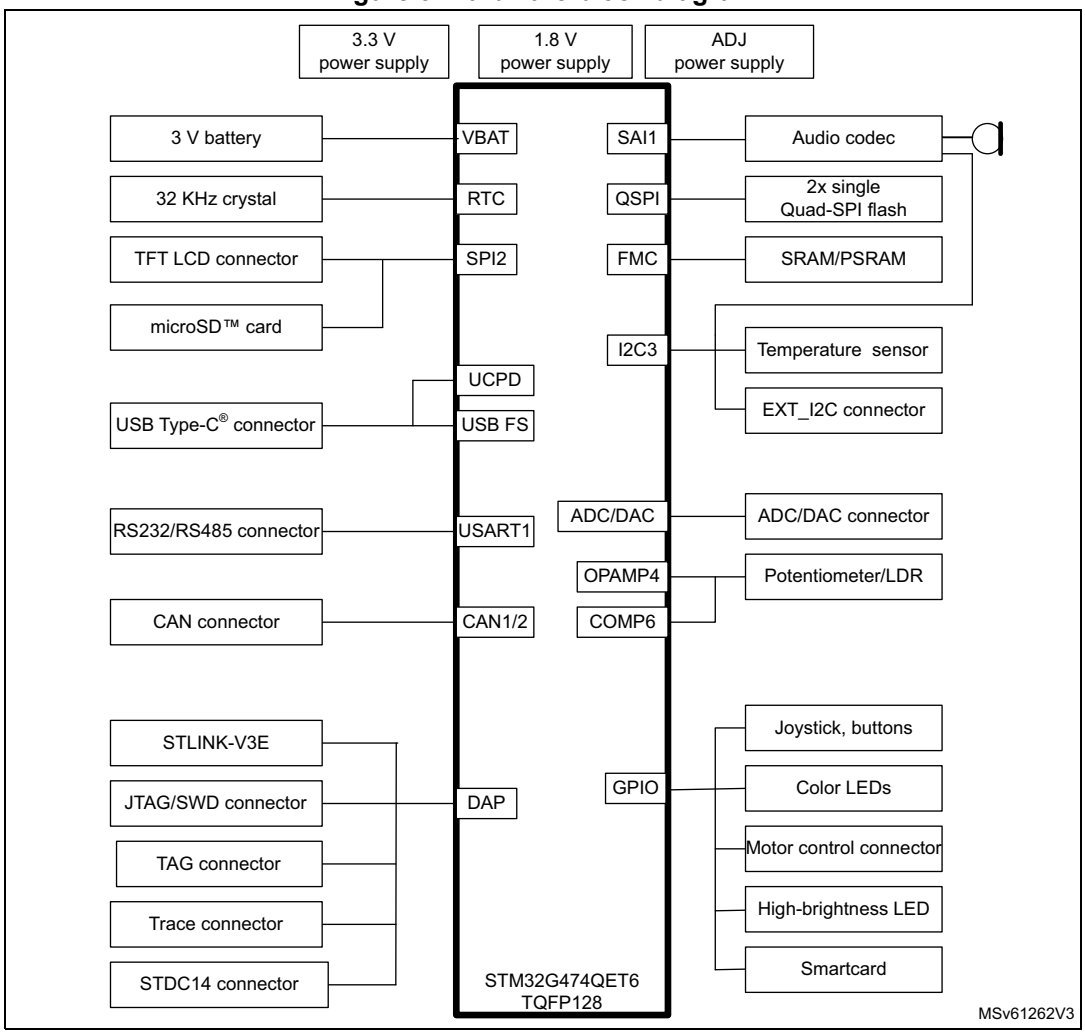


Figure 4. STM32G474E-EVAL Evaluation board layout (top view)

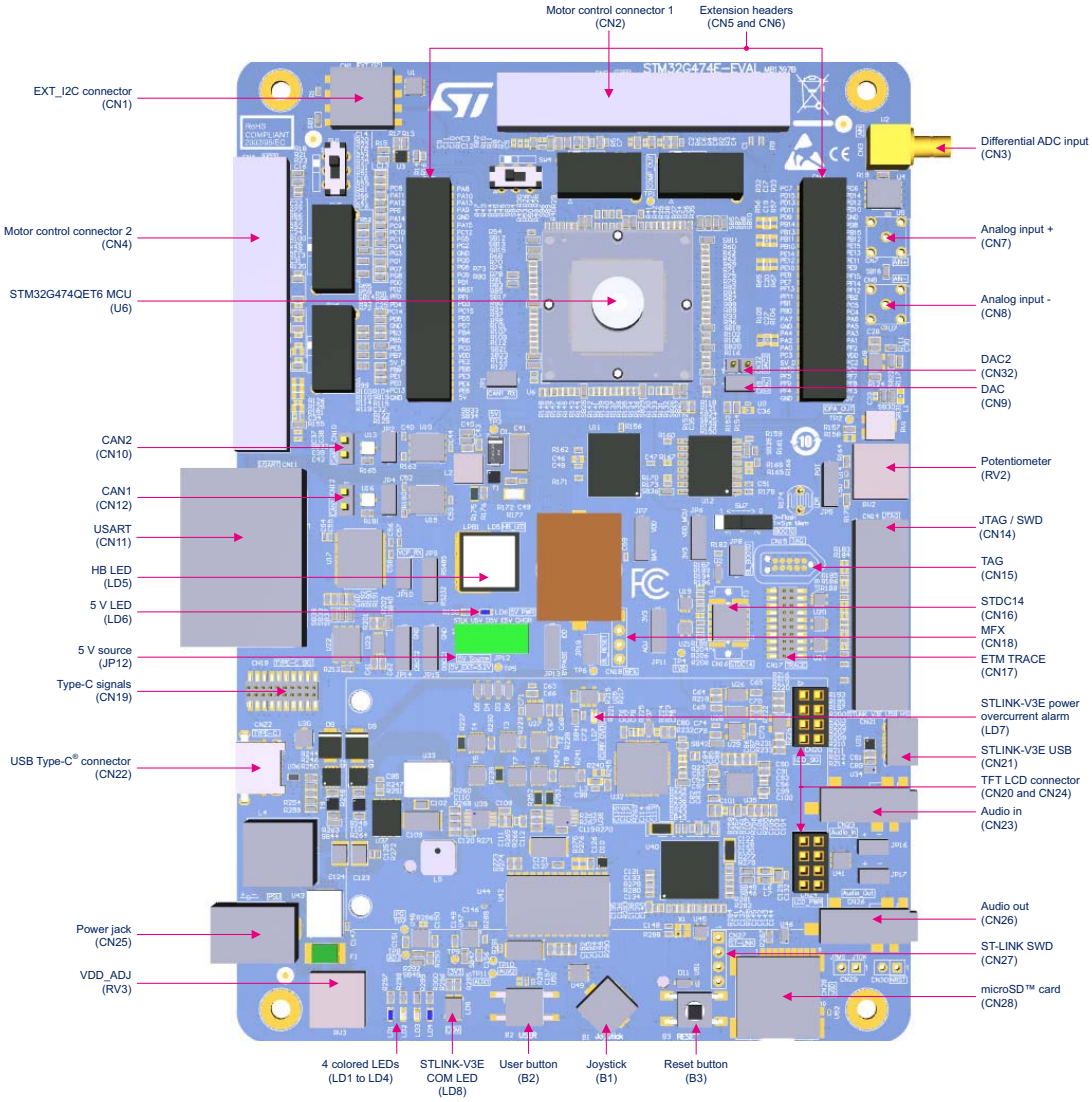


Figure 5. STM32G474E-EVAL Evaluation board layout (bottom view)

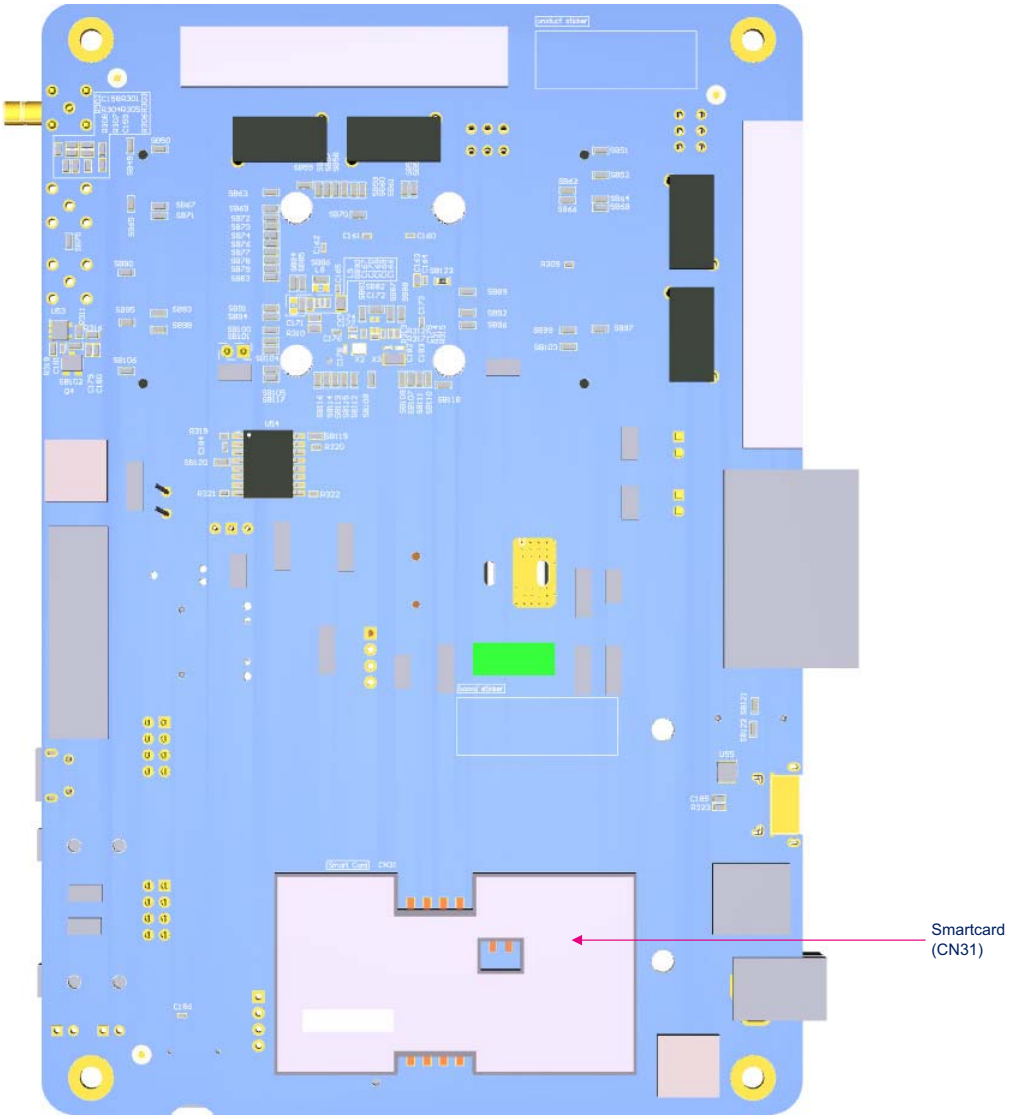
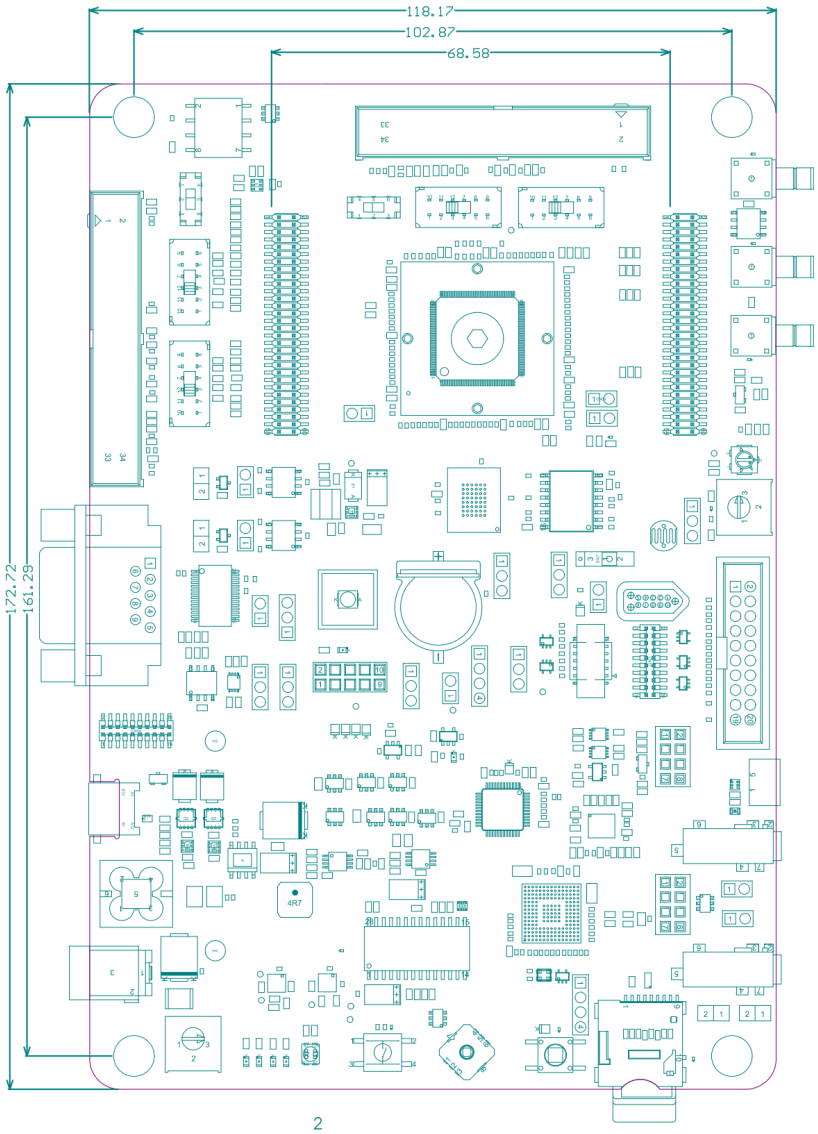


Figure 6 provides the mechanical dimensions of the STM32G474E-EVAL board.

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



5.1 STLINK-V3E

STLINK-V3E facility for debugging and flashing STM32G474QET6 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 LEDs: communication, power

The USB connector (CN21) can power the STM32G474E-EVAL regardless of the STLINK-V3E facility for debugging or programming STM32G474QET6. This also holds when the STLINK standalone tool is connected to the CN14, CN15, CN16, or CN17 connector and used for debugging or programming the STM32G474QET6. *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 firmware that needs to be updated from time to time to benefit from new functionality or corrections. Refer to the technical note *Overview of ST-LINK derivatives* (TN1235) for details.

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

5.2 ETM trace

The CN17 connector is available to output trace signals used for debugging. By default, the Evaluation board is configured such that, STM32G474QET6 signals PE2, PE3, and PE4 are connected to trace outputs TRACECLK, TRACED0, and TRACED1 of CN17, but these signals are shared with the audio codec, motor control connectors, and FMC.

Table 3 shows the setting of configuration elements to shunt PE3 and PE4 MCU ports to the 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	OFF	**Default setting.** CN17 pin 14 connects to TRACED0.
	ON	CN17 pin 14 connects to JTAG_TDO.
R207	OFF	**Default setting.** CN17 pin 16 connects to TRACED1.
	ON	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 OFF SB103 OFF	**Default setting.** PE2 connects to TRACECLK.
	R147 out SB111 ON SB103 OFF	**Default setting.** PE2 connects to SAI_MCLK_A.
	R147 out SB111 OFF SB103 ON	PE2 connects to MC1|MC2_PFC_Sync.
R145 SB110 SB118 R146	R145 in SB110 OFF SB118 OFF R146 out	**Default setting.** PE3 connects to TRACED0.
	R145 out SB110 ON SB118 OFF R146 out	**Default setting.** PE3 connects to SAI_SD_B.
	R145 out SB110 OFF SB118 ON R146 out	PE3 connects to MC1|MC2_PFC_pwm.
	R145 out SB110 OFF SB118 OFF R146 in	**Default setting.** PE3 connects to memory address line A19.
R144 SB107 SB109 R143	R144 in SB107 OFF SB109 OFF R143 out	**Default setting.** PE4 connects to TRACED1.
	R144 out SB107 ON SB109 OFF R143 out	**Default setting.** PE4 connects to SAI_FS_A.
	R144 out SB107 OFF SB109 ON R143 out	PE4 connects to MC1_ICL_SHUTOUT.
	R144 out SB107 OFF SB109 OFF 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 ON SB97 OFF	**Default setting.** PE5 connects to TRACED2
	SB28 OFF SB97 ON	PE5 connects to MC1_DissipativeBrake

Warning: Generally, we have one default setting for the 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 might be powered by a 5 V DC power source. It incorporates a precise PTC and TRANSIL to protect the board from damage due to a 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 the silkscreen). The positive pole is on the center pin as illustrated in *Figure 22*.
  The external power supply from the power jack (CN25) is from 5 to 18 V input voltage. A dedicated DC-DC regulator is used for about 5.2 V output voltage and provides up to 3 A current.
- USB Micro-B receptacle (CN21) of STLINK-V3E with enumeration:
  Up to 500 mA can be supplied to the board (JP12 jumper setting on STLK on the silkscreen).
  It offers the enumeration feature described in *Section 5.3.1*.
- USB Micro-B 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 the silkscreen).
- USB Type-C® receptacle (CN22) of USB PD interface:
  Marked TYPE-C on the board (JP12 jumper setting on U5V on the 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 the silkscreen).

The green LED (LD6) 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 describes the settings of all jumpers related to powering the STM32G474E-EVAL and extension board. VDD_MCU is an STM32G474QET6 digital supply voltage line. It can be connected to a fixed 3.3 V or with an adjustable voltage regulator controlled by the RV3 potentiometer producing a range of voltages between 1.62 and 3.60 V.

Note: The STM32G474E-EVAL Evaluation board must be powered by a power supply unit, or by auxiliary equipment complying with the standard EN 62368-1:2014+A11:2017. It must be a safety extralow voltage (SELV) with limited power capability.

5.3.1 Supplying the board through the STLINK-V3E USB port

To power the STM32G474E-EVAL board, 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 current supply capability of the USB port on the host is limited to 100 mA. It is enough because only the STLINK-V3E part of the STM32G474E-EVAL draws power at that time: the power switch (U25) 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 power switch (U25) to the 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 power jack (CN25) is available to supply the board.

If a short circuit occurs on the board, the power switch (U25) protects the USB port of the host PC against a current demand exceeding 500 mA. In such an event, the LED (LD7) 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 ON with a jumper hat as shown in *Table 5*. STLINK-V3E bypasses the power switch (U25) regardless of the enumeration procedure result and passes the power unconditionally to the board.

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

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

When the board requires a current higher than 300 mA, the host PC, connected to the STLINK-V3E USB port for debugging or programming, cannot supply the STM32G474QET6 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 the E5V position.
2. Connect the external power source to CN25.
3. Check that the green LED (LD6) is turned on.
4. Connect the host PC to the 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 can supply 300 mA (the enumeration succeeds) but it features no overcurrent protection on its USB port. It is damaged due to over-current.
2. The host PC can supply 300 mA (the enumeration succeeds) and it has 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 cannot supply 300 mA (the enumeration fails). The STLINK-V3E does not supply the rest of the STM32G474E-EVAL from its USB port V_{BUS} line.

Table 5 details the 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

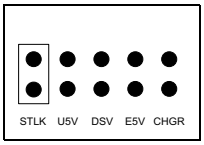
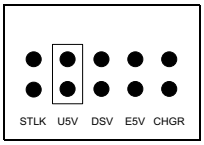
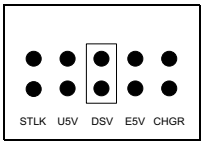
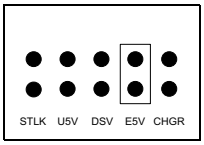
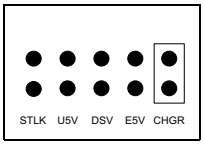
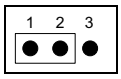
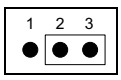
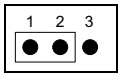
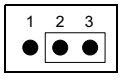
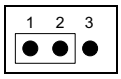
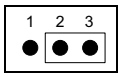
Jumper/ solder bridge	Setting	Configuration
JP12 Power source selector		**Default setting.** STM32G474E-EVAL is supplied through the Micro-B USB receptacle (CN21). It depends on the host PC USB port powering capability declared in the enumeration.
		STM32G474E-EVAL is supplied through the USB Type-C® receptacle (CN22).
		STM32G474E-EVAL is supplied through pin 49 of CN5 and pin 49 of CN6 extension connectors.
		**Default setting.** STM32G474E-EVAL is supplied through the power jack (CN25).
		STM32G474E-EVAL is supplied through the Micro-B USB receptacle (CN21). Set to power the board through the CN21 using a USB charger.
JP7 Vbat connection		**Default setting.** Vbat is connected to VDD.
		Vbat is connected to the battery.
JP6 VDDA connection		VDDA terminal of STM32G474QET6 is connected with VDD_MCU.
		**Default setting.** VDDA terminal of STM32G474QET6 is connected to 3.3 V.

Table 5. Power-supply-related jumper and solder bridge settings (continued)

Jumper/ solder bridge	Setting	Configuration
JP11 VDD_MCU connection		**Default setting.** VDD_MCU (VDD terminals of STM32G474QET6) is connected to the fixed 3.3 V.
		VDD_MCU is connected to voltage in the range from 1.62 to 3.61 V adjustable with the RV3 potentiometer.

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 non-enumerating USB Host).

5.4 Clock references

Two clock references are available on the STM32G474E-EVAL Evaluation board for the STM32G474QET6 target microcontroller.

- 32.768 kHz crystal X3, for embedded RTC
- 24 MHz crystal X2, for the 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 the internal RC clock is used.

Table 6. X3 crystal-related solder bridge settings

Solder bridge	Setting	Configuration
SB88	OFF	**Default setting.** PC14 OSC32_IN terminal is not routed to the extension connector (CN5). X3 is used as the clock reference.
	ON	PC14 OSC32_IN is routed to the extension connector (CN5). Resistor R315 must be removed, for the X3 quartz circuit not to disturb the clock reference or source on the daughterboard.
SB87	OFF	**Default setting.** PC15 OSC32_OUT terminal is not routed to the extension connector (CN5). X3 is used as a clock reference.
	ON	PC15 OSC32_OUT is routed to the extension connector (CN5). Resistor R314 must be removed, for the X3 quartz circuit not to disturb the clock reference on the daughterboard.

Table 7. X2 crystal-related solder bridge settings

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

5.5 Reset source

The controller reset of the STM32G474E-EVAL board is active at a low level. The reset sources are:

- Reset button (B3)
- JTAG/SWD (CN14), ETM trace (CN17), STDC14 (CN16), and TAG (CN15) connectors (reset from debugging tools)
- Through pin 30 of the CN5 extension connector (reset from daughterboard)
- Embedded STLINK-V3E

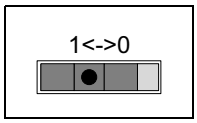
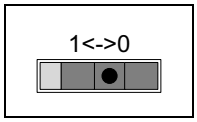
5.6 Boot option

After reset, the STM32G474QET6 MCU can boot from the following embedded memory locations:

- Main (user, nonprotected) 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		The BOOT0 line is tied high. STM32G474QET6 boots from the system flash memory (nBOOT1 bit of FLASH_OPTR register is set high) or from RAM (nBOOT1 is set low).
		**Default setting**. The BOOT0 line is tied low. STM32G474QET6 boots from the main flash memory.

5.6.1 Limitations

BOOT0 PB8 is exclusive to FDCAN1 and JP1 must be OFF to disconnect the FDCAN1_RX signal.

5.7 Audio

A WM8894 codec is connected to the SAI interface of the STM32G474QET6. It supports the TDM feature of the SAI port. The TDM feature enables the STM32G474QET6 simultaneously to stream two independent stereo audio channels to two separate stereo analog audio outputs. The codec communicates with the STM32G474QET6 via the I2C3 bus, which is shared with the MFX, temperature sensor, and EXT_I2C connector.

The audio connections are:

- The analog line input is connected to the ADC of WM8994ECS/R through the blue audio jack (CN23).
- The analog line output is connected to the DAC of WM8994ECS/R via the green audio jack (CN26).
- Two external speakers can be connected to WM8994ECS/R via JP17 for the right speaker and JP16 for the left speaker, OFF as default.

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

5.7.1 Limitations in using audio features

Due to the sharing of PE2, PE3, PE4, and PF6 terminals of STM32G474QET6 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 the SAI port, they cannot be used as TRACE and FMC peripherals.
- If the SAI port of STM32G474QET6 is used for streaming audio to the WM8994 codec IC, STM32G474QET6 cannot control the motor.

5.8 USB FS port

The STM32G474E-EVAL board supports USB full-speed (FS) as a USB Device communication via the 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 the V_{BUS} 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 STM32G474QET6 (VDD_USB line) must be within the range from 3.0 V to 3.6 V.

5.9 RS-232 and RS-485 port

The STM32G474E-EVAL board offers one RS-232 communication or RS-485 communication port. They use the same DB9 male connector (CN1). Rx and Tx signals of the USART1 port of STM32G474QET6 are shared with USB PD and VCP. *Table 9* shows the configuration PA10 of STM32G474QET6 terminals.

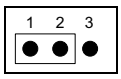
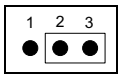
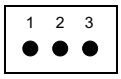
5.9.1 Limitations

Due to the sharing of the PA9 and PA10 terminals of STM32G474QET6 by multiple peripherals, if the RS-232 or RS-485 port is used as part of the USART1 port, it cannot be used as a USB PD and VCP peripheral.

5.9.2 Operating voltage

The RS-232 or RS-485 operating supply voltage of STM32G474QET6 (VDD line) must be within the range of 1.62 to 3.6 V.

Table 9. Configuration PA10 of STM32G474QET6 terminals

JP9 USART1_RX connection		USART1_RX is connected to the RS-232 RXD of the transceiver.
		USART1_RX is connected to the RS-485 RO of the transceiver.
		**Default setting.** USART1_RX is not connected to the RS-232 or RS-485 of the 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™ cards is routed to the STM32G474QET6 SPI port, accepting 8-Gbyte (or more) microSD™ cards. One 16-Gbyte microSD™ card is delivered as part of

STM32G474E-EVAL. The card insertion switch is routed to the MFX_GPIO5 of the MFX MCU port and it must be set with an internal pull-up.

5.10.1 Limitations

Due to the sharing of I/O ports, the following limitations apply:

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

5.10.2 Operating voltage

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

5.11 Motor control

The MC1 (CN2) and MC2 (CN4) 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 six 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 peripheral sharing I/Os with motor-control connectors and connect these I/Os to motor-control connectors. *Table 10* and *Table 11* show the assignment of CN2 and CN4 of the STM32G474QET6 terminals.

Table 10 and *Table 11* also list the modifications to perform on the board from its default configuration. See *Section 5.11.1* for further details.

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

CN22 motor-control connector		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
1	Emergency Stop	PE15	TIM1_BKIN	-	SB69 ON and R60 OFF
2	GND	-	GND	-	-
3	PWM_1H	PE9	TIM1_CH1	-	SB78 ON and R79 OFF
4	GND	-	GND	-	-
5	PWM_1L	PE8	TIM1_CH1N	-	SB79 ON and R82 OFF
6	GND	-	GND	-	-
7	PWM_2H	PE11	TIM1_CH2	-	SB76 ON and R71 OFF
8	GND	-	GND	-	-
9	PWM_2L	PE10	TIM1_CH2N	-	SB77 ON and R75 OFF
10	GND	-	GND	-	-
11	PWM_3H	PE13	TIM1_CH3	-	SB73 ON and R63 OFF
12	GND	-	GND	-	-
13	PWM_3L	PE12	TIM1_CH3N	-	SB74 ON and R69 OFF
14	Bus Voltage	PC1	ADC12_IN7	-	SB115 ON and R130 OFF
15	PhaseA current+	PC2	ADC12_IN8	-	SB113 ON and R133 OFF
16	PhaseA current-	-	GND	-	-
17	PhaseB current+	PC3	ADC12_IN9	-	SB114 ON and R131 OFF

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

CN22 motor-control connector		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
18	PhaseB current-	-	GND	-	-
19	PhaseC current+	PC0	ADC12_IN6	-	SB99 ON and SB29 OFF
20	PhaseC current-	-	GND	-	-
21	ICL Shutout	PE4	GPIO	-	SB109 ON and SB107 OFF(1)
22	GND	-	GND	-	-
23	Dissipative Brake	PE5	GPIO	-	SB97 ON and SB28 OFF(1)
24	PFC ind. current	PD8	ADC45_IN12	-	SB55 ON, R34 OFF, R5 ON, and R113 OFF
25	+5 V	-	+5 V	-	-
26	Heatsink Temp.	PC4	ADC2_IN5	-	SB100 ON and R116 OFF
27	PFC Sync	PE2	TIM3_CH1	-	SB103 ON, SB111 OFF, R8 ON, and R126 OFF(1)
28	+3.3 V	-	+3.3 V	-	-
29	PFC PWM	PE3	TIM3_CH2	-	SB118 ON, SB110 OFF, R11 ON, and R151 OFF
30	PFC Shutdown	PD2	TIM3_ETR	-	SB17 ON and SB123 OFF
31	Encoder A	PA0	TIM2_CH1	-	SB98 ON and SB26 OFF
32	PFC Vac	PD9	ADC45_IN13	-	SB56 ON, R37 OFF, R12 ON, and R155 OFF
33	Encoder B	PD4	TIM2_CH2	-	SB89 ON and R94 OFF
34	Encoder Index	PD7 or PA15	TIM2_CH3 or TIM2_ETR	-	SB92 ON, R101 OFF or SB62 ON, and R54 OFF

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

CN4 motor-control connector		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	-	SB49 ON and SB9 OFF(1)
4	GND	-	GND	-	-
5	PWM_1L	PC10	TIM8_CH1N	-	SB64 ON and SB12 OFF(1)
6	GND	-	GND	-	-
7	PWM_2H	PC7	TIM8_CH2	-	SB50 ON and SB6 OFF(1)
8	GND	-	GND	-	-
9	PWM_2L	PC11	TIM8_CH2N	-	SB68 ON and SB13 OFF(1)
10	GND	-	GND	-	-
11	PWM_3H	PC8	TIM8_CH3	-	SB51 ON and R26 OFF(1)
12	GND	-	GND	-	-
13	PWM_3L	PC12	TIM8_CH3N	-	SB66 ON and SB15 OFF(1)
14	Bus Voltage	PE14	ADC4_IN1	-	SB72 ON and R62 OFF
15	PhaseA current+	PD13	ADC345_IN10	-	SB60 ON and R41 OFF
16	PhaseA current-	-	GND	-	-
17	PhaseB current+	PD12	ADC345_IN9	-	SB59 ON and R42 OFF
18	PhaseB current-	-	GND	-	-
19	PhaseC current+	PD10	ADC345_IN7	-	SB57 ON and R38 OFF
20	PhaseC current-	-	GND	-	-
21	ICL Shutout	PD15	GPIO	-	SB61 ON and R40 OFF
22	GND	-	GND	-	-
23	Dissipative Brake	PF10	GPIO	-	SB112 ON and R136 OFF(1)
24	PFC ind. current	PD8	ADC45_IN12	-	SB55 ON, R34 OFF, R113 ON, and R5 OFF
25	+5 V	-	+5 V	-	-

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

CN4 motor-control connector		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
26	Heatsink Temp.	PE7	ADC3_IN4	-	SB83 ON and R84 OFF
27	PFC Sync	PE2	TIM3_CH1	-	SB103 ON, SB111 OFF, R126 ON, and R8 OFF(1)
28	+3.3 V	-	+3.3 V	-	-
29	PFC PWM	PE3	TIM3_CH2	-	SB118 ON, SB110 OFF, R151 ON, and R11 OFF
30	PFC Shutdown	PD2	TIM3_ETR	-	R128 ON and R10 OFF
31	Encoder A	PF6	TIM5_CH1	-	SB52 ON and R43 OFF
32	PFC Vac	PD9	ADC45_IN13	-	SB56 ON, R37 OFF, R155 ON, and R12 OFF
33	Encoder B	PF7	TIM5_CH2	-	SB108 ON, and R138 OFF
34	Encoder Index	PF8 or PD11	TIM5_CH3 or TIM5_ETR	-	SB106 ON, R135 OFF or SB58 ON, and R39 OFF

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

Table 12 shows the OpAmp and DAC of the STM32G474QET6 terminals.

Table 12. Motor control OpAmp and DAC function assignment

CN22 motor-control connector		STM32G474QET6 microcontroller			
Terminal	**Terminal name**	**Port name**	**Function**	**Alternate function**	**Board modifications for enabling motor control**
1	OPAMP1_INP	PA1	OPAMP1_VINP	-	SB95 ON and SB27 OFF
2	OPAMP1_INN	PA3	OPAMP1_VINM	-	SB105 ON and R129 OFF
3	OPAMP1_OUT	PA2	OPAMP1_VOUT	-	SB117 ON and R150 OFF
4	OPAMP2_IN1P	PA7	OPAMP2_VINP	-	SB101 ON and R118 OFF
5	OPAMP2_IN2P	PD14	OPAMP2_VINP	-	SB70 ON and R29 OFF
6	OPAMP2_INN	PC5	OPAMP2_VINM	-	-
7	OPAMP2_OUT	PA6	OPAMP2_VOUT	-	SB104 ON and R121 OFF
8	OPAMP4_IN1P	PB11	OPAMP4_VINP	-	SB67 ON and SB8 OFF
9	OPAMP4_IN2P	PB13	OPAMP4_VINP	-	SB63 ON and SB5 OFF
10	OPAMP4_INN	PB10	OPAMP4_VINM	-	SB71 ON and SB11 OFF
11	OPAMP4_OUT	PB12	OPAMP4_VOUT	-	SB65 ON and SB7 OFF
12	OPAMP3_INP	PB0	OPAMP3_VINP	-	SB94 ON and R108 OFF
13	OPAMP3_INN	PB2	OPAMP3_VINM	-	SB80 ON and SB18 OFF
14	OPAMP3_OUT	PB1	OPAMP3_VOUT	-	SB91 ON and R102 OFF
15	DAC_OUT1	PA4	DAC1_OUT1	-	SB93 ON and SB25 OFF
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

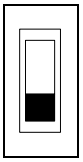
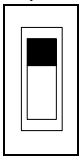
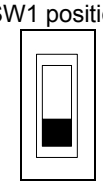
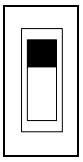
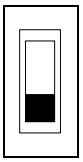
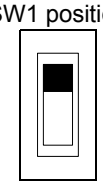
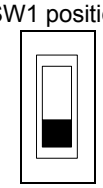
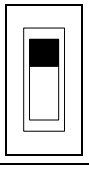
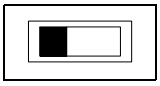
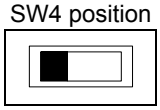
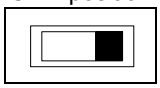
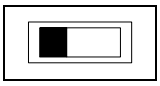
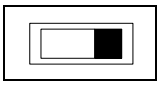
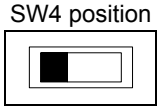
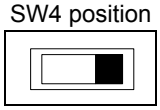
OAM position	Other conditions	Description
SW5 	R72, R58 ON SB14 OFF	MC1_CurrentA+ connect to OPAMP1_INP(PA1) MC1_CurrentB+ connect to OPAMP2_IN1P(PA7)
	R72, R58 OFF SB14 ON	MC1_CurrentB+ connect to OPAMP1_INP(PA1)
	SW1 position 	MC1_CurrentC+ connect to OPAMP2_IN2P(PD14)
	SW1 position 	MC1_CurrentC+ 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 ON SB19 OFF	MC2_CurrentA+ connect to OPAMP3_INP(PB0) MC2_CurrentB+ connect to OPAMP4_IN2P(PB13)
	R110, R114 OFF SB19 ON	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, and OPAMP2_IN2P pull-up sources connected to 3.3 V power
SW2 	SW4 position 	OPAMP1_INP, OPAMP2_IN1P, and OPAMP2_IN2P pull-up sources connected to DAC_OUT1(PA4)
	SW4 position 	OPAMP1_INP and OPAMP2_IN1P pull-up sources connected to DAC_OUT1(PA4) OPAMP2_IN2P pull-up source connected to DAC_OUT2(PA5)
SW3 	-	OPAMP4_INP, OPAMP4_IN1P, and OPAMP4_IN2P pull-up sources connected to 3.3 V power
SW3 	SW4 position 	OPAMP3_INP, OPAMP4_IN1P, and OPAMP4_IN2P pull-up sources connected to DAC_OUT2(PA5)
	SW4 position 	OPAMP3_INP and OPAMP4_IN2P pull-up sources connected to DAC_OUT2(PA5) OPAMP2_IN1P pull-up source connected 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. The blue color denotes a component to remove. The red color denotes a component to use.

5.11.2 Limitations

Motor control operation is exclusive to Octo-SPIP1 flash memory, audio codec, potentiometer, LDR, microSD™ 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, OPAMP2, and OPAMP4 limitations.

Figure 7. PCB top side rework for motor control

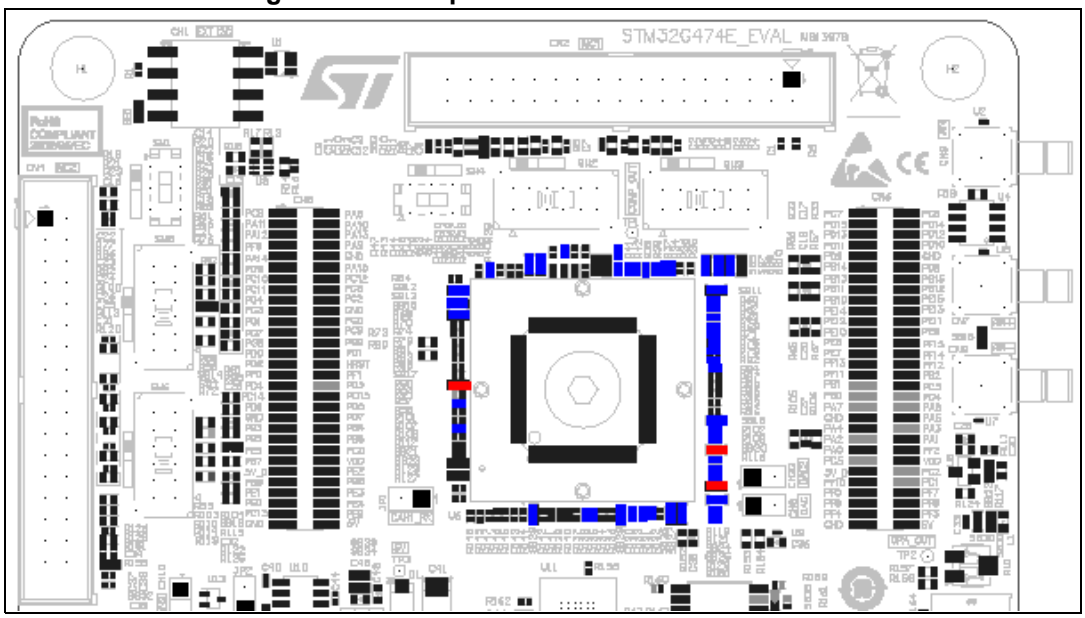
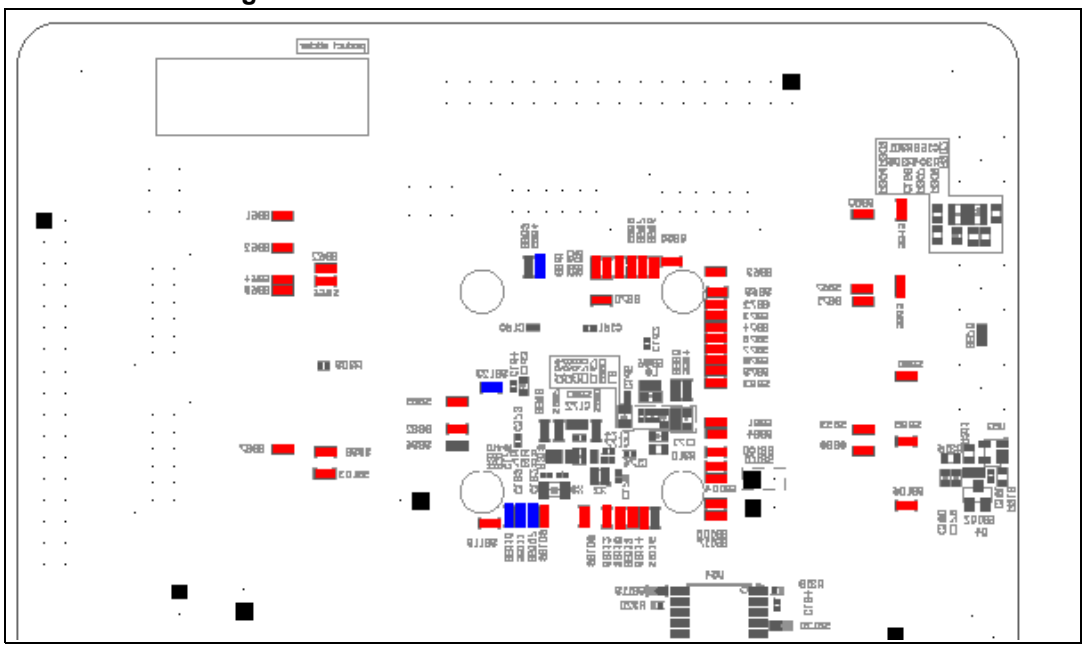


Figure 8. PCB bottom side rework for motor control



5.12 FDCAN

The STM32G474E-EVAL board supports two CAN2.0A/B channels compliant with FDCAN specifications. CN10 and CN12 are available as CAN interfaces.

Two CAN transceivers are used between the CN10 and CN12 connectors and the CAN controller port of STM32G474QET6.

5.12.1 Limitations

CAN operation is exclusive to 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, CN6)

The CN5 and CN6 headers complement to give access to all GPIOs of the STM32G474QET6 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, and LD4) are available as light indicators. Each LED emits light with a low level of the corresponding ports of the STM32G474QET6 MCU.

The LD1 and LD3 LEDs are exclusive to MC operation. MFX_GPIO6 and MFX_GPIO7 control LD2 and LD4.

5.15 Physical input devices

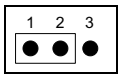
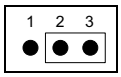
The STM32G474E-EVAL board provides several input devices for physical human control.

- 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 are mutually exclusive and can be routed to the PB11 port of the STM32G474QET6. *Table 15* depicts the setting of associated configuration jumpers.

As illustrated in the schematic diagrams, the PB11 port is routed, in the STM32G474QET6, to the noninverting input of the Comp6 comparator or OpAmp4 operational amplifier.

Table 15. Port assignment for control of physical input devices

Jumper	setting	Routing
JP5		**Default setting.** The potentiometer is routed to pin PB11 of STM32G474QET6.
		LDR is routed to pin PB11 of STM32G474QET6.

5.15.1 Limitations

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

5.16 Operational amplifier and comparator

5.16.1 Operational amplifier

STM32G474QET6 provides an on-board operational amplifier, OpAmp4, which is made accessible on STM32G474E-EVAL. OpAmp4 has its inputs and 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 diagrams.

The ratio of the variable resistor RV1 and the resistor R157 determines the gain of OpAmp4, 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 to OpAmp4

Element	Setting	Configuration
SB11 SB71	SB11 ON SB71 OFF	**Default setting.** Pin PB10 of STM32G474QET6 is routed to OpAmp4_VINM.
	SB11 OFF SB71 ON	Pin PB10 of STM32G474QET6 is routed to OpAmp4_INN of MC.

Table 16. Configuration elements related to OpAmp4 (continued)

Element	Setting	Configuration
SB8 SB67 SB10	SB8 ON SB67 OFF SB10 OFF	Pin PB11 of STM32G474QET6 is routed to OpAmp4_VINP or COMP6_INP.
	SB8 OFF SB67 ON SB10 OFF	PB11 of STM32G474QET6 is routed to OpAmp4_IN1P of MC.
	SB8 OFF SB67 OFF SB10 ON	**Default setting.** Pin PB11 of STM32G474QET6 is routed to BK_Sense for high-brightness LED.
SB7 SB65	SB7 ON SB65 OFF	**Default setting.** Pin PB12 of STM32G474QET6 is routed to OpAmp4_VOUT.
	SB7 OFF SB65 ON	Pin PB12 of STM32G474QET6 is routed to OpAmp4_IN2P of MC.

5.16.2 Comparator

STM32G474QET6 provides an on-board comparator, Comp4, which is made accessible on STM32G474E-EVAL. Comp4 has its noninverting 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 diagrams.

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 to Comp4

Element	Setting	Configuration
SB9 SB49	SB9 ON SB49 OFF	**Default setting.** Pin PC6 of STM32G474QET6 is routed to Comp6_OUT.
	SB9 ON SB49 OFF	Pin PC6 of STM32G474QET6 is routed to MC2_PWM_1H.

5.16.3 Limitations

Issue observed

The OpAmp offset value is minimized using 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

Software must calibrate the offset values of OPAMP1, OPAMP2, and OPAMP4, applying the calibration procedure described in the reference manual *STM32G4 series advanced Arm®-*

based 32-bit MCUs (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 to high-brightness LED and MC operation.

The Comp6 is exclusive to high-brightness LED and MC operation.

5.17 Analog input, output, VREF

5.17.1 Analog input

STM32G474QET6 provides an on-board differential analog-to-digital converter, differential ADC. The PA0 and PA1 ports can be configured to operate as a differential ADC input, which is routed to the SMB connectors (CN7, CN8) or the SMB connector (CN3) via a single-ended differential circuit. The default setting is the analog input signal from the SMB connector (CN3).

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

STM32G474QET6 provides an on-board digital-to-analog converter, DAC. The port PA4 can be configured to operate as a 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 STM32G474QET6 is used as the reference voltage for both ADC and DAC. It is routed to VDDA or VREF_EXT through the solder bridge configuration shown in *Table 18*.

VREF_EXT is a high-resolution voltage reference from U53.

Table 18. Configuration elements related to VREF+

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

5.17.4 Limitations

The differential ADC is exclusive to MFX_IRQ_OUT and MC operation.

The DAC is exclusive to the MC operation.

5.18 SRAM

An 8-Mbit static RAM (SRAM), 512K x16-bit, is used on the STM32G474E-EVAL main board, in the U11 position. The STM32G474E-EVAL main board as well as the addressing capabilities of FMC allow hosting SRAMs up to 64 Mbytes. This is the reason why the schematic diagrams mention several SRAMs.

The SRAM 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 is selected with the FMC_NE1 chip select signal. 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 A20 FMC address lines are shunted to the CN17 connector for debug trace purposes. In such a case, the resistors pull down the disconnected addressing inputs of the SRAM. *Section 5.2* provides information on the associated configuration elements.

The SRAM is exclusive to the MC operation.

5.18.2 Operating voltage

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

5.19 EXT_I2C connector

EXT_I2C connector (CN1) can be connected to the daughterboard I²C bus. MFX_GPIO15 of MFX MCU provides the EXT_RSET signal. The SB1 solder bridge is used to connect the 5 V power supply to the daughterboard.

5.20 Quad-SPI flash memory

Two 512-Mbit Quad-SPI flash memories are used on the STM32G474E-EVAL main board, in U12 and U54 positions. It allows the evaluation of the STM32G474QET6 Quad-SPI interface.

5.20.1 Limitations

Quad-SPI flash memory operation is exclusive to motor control.

5.20.2 Operating voltage

The voltage of the Quad-SPI flash memory is in the range of 2.7 to 3.6 V.

5.21 MFX MCU

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

5.21.1 MFX

The MFX circuit on the STM32G474E-EVAL board acts as an IO-expander. The communication interface between MFX and STM32G474QET6 is the 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	microSD™
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	microSD™ 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

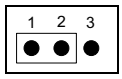
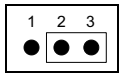
5.21.2 IDD measurement

STM32G474QET6 has a built-in circuit to measure its current consumption (IDD) in Run and Low-power modes, except for Shutdown mode. It is strongly recommended that the MCU supply voltage (VDD_MCU line) does not 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 might inject current into 3.3 V-supplied peripheral I/Os and false the MCU current consumption measurement.

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

Table 20. IDD measurement-related jumper settings

Jumper	setting	Configuration
JP13		**Default setting.** STM32G474QET6 has a built-in circuit to measure its own current consumption.
		IDD measurement is not available, bypass mode only for STM32G474QET6 VDD_MCU power supply.

5.21.3 Limitations

1. The MFX is exclusive to differential ADC and MC operations.
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 a bypass mode for normal MCU working. Refer to *Table 20* for the JP13 configuration.

5.22 TFT LCD panel

The STM32G474E-EVAL is delivered with MB895, a daughterboard plugged into the CN20 and CN24 connectors. It bears a TFT 2.4-inch color TFT LCD panel with a resistive touchscreen and an on-board controller. The TFT LCD is connected to the SPI2 port of the STM32G474QET6.

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 connectors (CN20, 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

Table 21. TFT LCD connectors (CN20, CN24) (continued)

CN20 terminal		Terminal name	MCU port	CN24 terminal	Terminal name	Power port
7	-	SDO	PB14	7	BL_GND	GND
8	-	RESET	RESET#	8	BL_GND	GND

Note: The bidirectional voltage translator is implemented on the SPI MOSI signal between the STM32G474QET6 and LCD. It supports the 3-wire serial interface of the LCD panel that only handles a 3-wire SPI port. MFX_GPIO13 controls the direction of this voltage translator (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 a 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 the case of Consumer configuration.

The STM32G474E-EVAL board also supports USB 2.0-compliant full-speed communication via the USB Type-C® receptacle (CN22).

5.23.2 Power delivery and local power management

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

5.23.3 V_{BUS} management and discharge mechanism

The USB Type-C® receptacle (CN22) can be used as a DRP (dual-role port). Its V_{BUS} can be managed for supplying other platforms as a Provider or to be supplied as a Consumer. Two MOSFETs Q2 and Q3 are set in the back-to-back configuration to protect and isolate the V_{BUS} supplying path in both directions.

If the CN22 acts as Provider, the V_{BUS} is on the supply path through the discrete load switch (Q2 and Q3) driven by the STM32G474QET6 (GPIO, PC11). For the Consumer case, the same V_{BUS} path is managed by PC11 of the STM32G474QET6 enabling the discrete load switch.

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

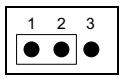
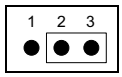
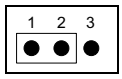
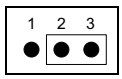
5.23.4 V_{BUS} voltage-sensing

The USB Type-C® receptacle (CN22) is equipped with a voltage-sensing stage that matches the voltage-sensing carried by the STM32G474QET6 ADC port PC0. It can be able to monitor the right power level applied on the V_{BUS} port.

5.23.5 CC management

An embedded feature of the STM32G474QET6 supports the dead battery function. It can be enabled or disabled by enabling signals by setting CC1 (JP15) or CC2 (JP14). Refer to *Table 22* for details.

Table 22. Dead-battery related jumpers

Jumper	Setting	Configuration
JP15		**Default setting.** The embed dead battery function is enabled.
		The embed dead battery function is disabled.
JP14		**Default setting.** The embed dead battery function is enabled.
		The embed dead battery function is disabled.

5.23.6 Limitations

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

Due to the share of PA9 and PA10 terminals of the STM32G474QET6 by multiple peripherals, if USB PD is used as part of the USART1 port, it cannot be used as an RS-232 or RS-485 port and VCP peripheral.

Only SWD might 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 using 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 is connected to the I2C3 bus of the STM32G474QET6. It shares the same I2C3 bus with MFX, audio, and EXT_I2C connector.

The I^2C address of the temperature sensor is 0x90 or 0x91.

Note: The temperature result measured from the temperature sensor might 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 of 2.25 to 3.60 V.

5.25 Smartcard

STMicroelectronics smartcard interface chip is used on the STM32G474E-EVAL Evaluation board for asynchronous 1.8, 3.0, and 5.0 V smartcards. It performs all supply protection and control functions based on the connections with STM32G474QET6 listed in *Table 23*.

Table 23. Connection between ST8024L and STM32F091VCT6

Signals of ST8024L	Description	Connect to STM32G474E-EVAL
5 V/3 V	Smartcard power-supply selection pin	MFX_GPIO9
I/OUC	MCU data I/O line	PC10
XTAL1	Crystal or external clock input	PC12
OFF	Detect the presence of a card, with an interrupt to the 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. The 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 smartcard operating voltage is in the range of 2.7 to 3.6 V.

5.26 High-brightness LED

A high-brightness LED 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 STM32G474QET6 through PC8. The current on the LED can be monitored by the STM32G474QET6, thanks to the voltage measured on PB11, which corresponds to the current through R177 (1 Ω). Refer to *Table 16* for the PB11 configuration.

5.26.1 Limitations

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

6 Connectors

6.1 External I²C connector (CN1)

Figure 9. I²C EXT connector (CN1) front view

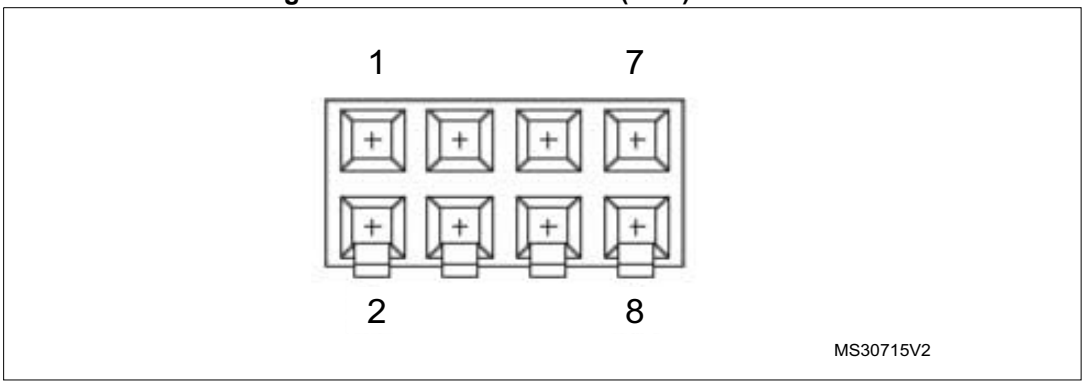


Table 24. EXT_I2C connector (CN1)

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 connectors (CN2, CN4)

Figure 10. Motor-control connectors (CN2, CN4) front view

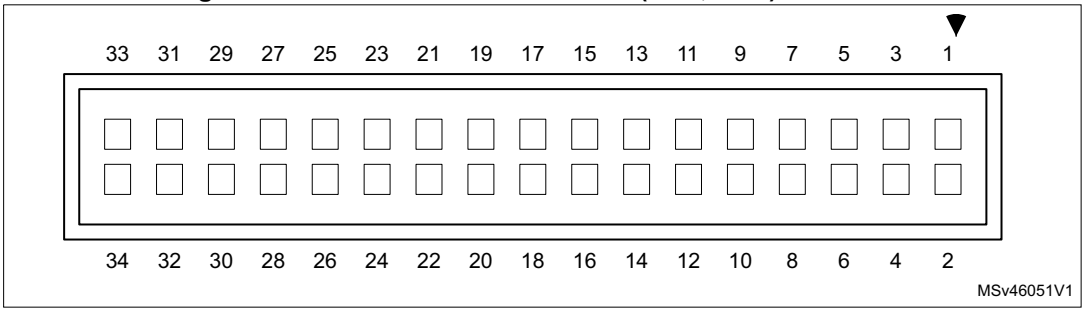


Table 25. Motor-control connector (CN2)

Description	STM32G474QET6 pin	CN2 pin number	CN2 pin number	STM32G474QET6 pin	Description
Emergency STOP	PE15	1	2	-	GND
PWM_1H	PE9	3	4	-	GND
PWM_1L	PE8	5	6	-	GND

Table 25. Motor-control connector (CN2) (continued)

Description	STM32G474QET6 pin	CN2 pin number	CN2 pin number	STM32G474QET6 pin	Description
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 shutdown
Encoder A	PA0	31	32	PD9	PFC Vac
Encoder B	PD4	33	34	PD7 or PA15	Encoder Index

Table 26. Motor-control connector (CN4)

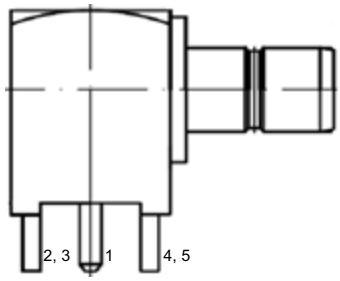
Description	STM32G474QET6 pin	CN4 pin number	CN4 pin number	STM32G474QET6 pin	Description
Emergency STOP	PB7	1	2	-	GND
PWM_1H	PC6	3	4	-	GND
PWM_1L	PC10	5	6	-	GND
PWM_2H	PC7	7	8	-	GND
PWM_2L	PC11	9	10	-	GND
PWM_3H	PC8	11	12	-	GND
PWM_3L	PC12	13	14	PE14	BUS VOLTAGE
CURRENT A	PD10	15	16	-	GND
CURRENT B	PD12	17	18	-	GND
CURRENT C	PD13	19	20	-	GND
ICL Shutout	PD15	21	22	-	GND
DISSIPATIVE BRAKE	PF10	23	24	PD8	PCD Ind. Current
+5 V power	-	25	26	PE7	Heatsink temperature

Table 26. Motor-control connector (CN4) (continued)

Description	STM32G474QET6 pin	CN4 pin number	CN4 pin number	STM32G474QET6 pin	Description
PFC SYNC	PE2	27	28	-	3.3 V power
PFC PWM	PE3	29	30	PD2	PFC shutdown
Encoder A	PF6	31	32	PD9	PFC Vac
Encoder B	PF7	33	34	PF8 or PD11	Encoder Index

6.3 SMB connectors (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, CN6)

All GPIO signals from the STM32G474QET6 are connected to extension connectors (CN5, 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 connectors (CN12, CN10)

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

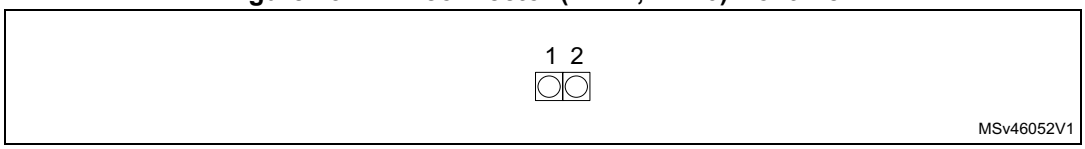


Table 29. CAN connector (CN12, CN10)

Pin number	Description	Pin number	Description
1	CANL	2	CANH

6.7 RS-232 and RS-485 connector (CN11)

Figure 14. RS-232 and RS-485 connector (CN11) front view

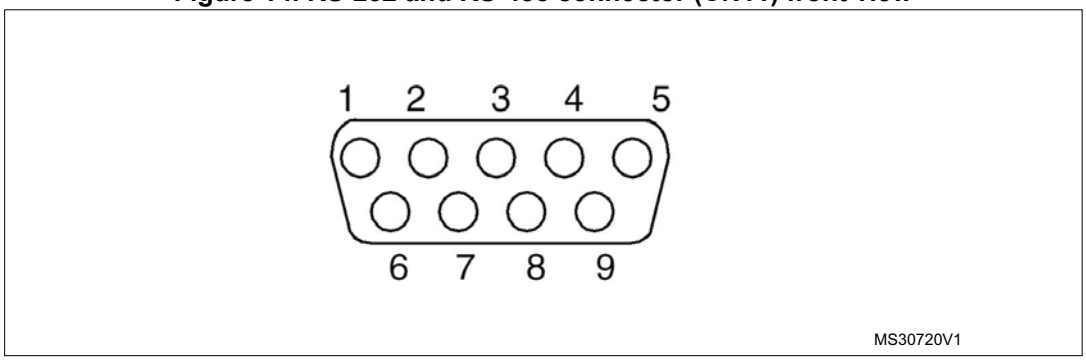


Table 30. RS-232/RS-485 D-sub connector (CN11)

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)

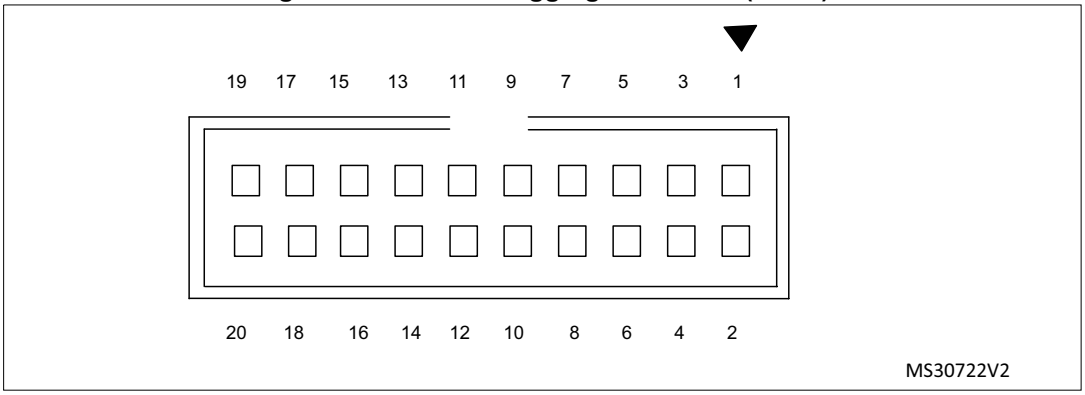


Table 31. JTAG debugging connector (CN14)

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

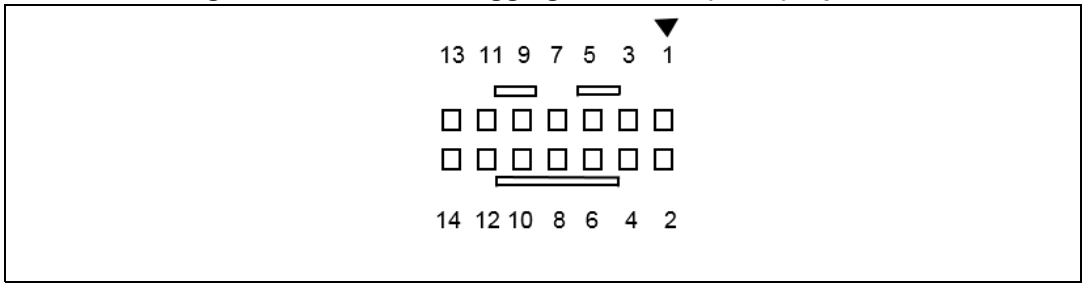


Table 33. STDC14 debugging connector (CN16)

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

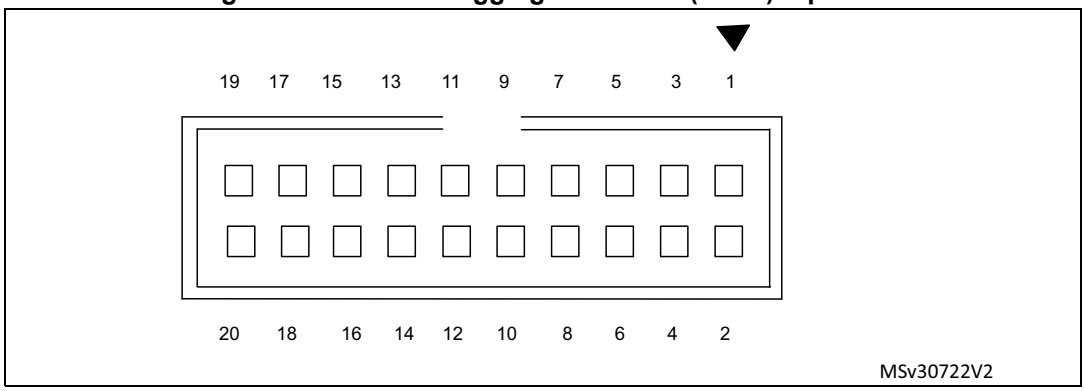


Table 34. Trace-debugging connector (CN17)

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 CN18 connector is used only for embedded MFX (multifunction expander) programming during board manufacturing. It is not populated by default or end-user-oriented.

6.13 Type-C signals connector (CN19)

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

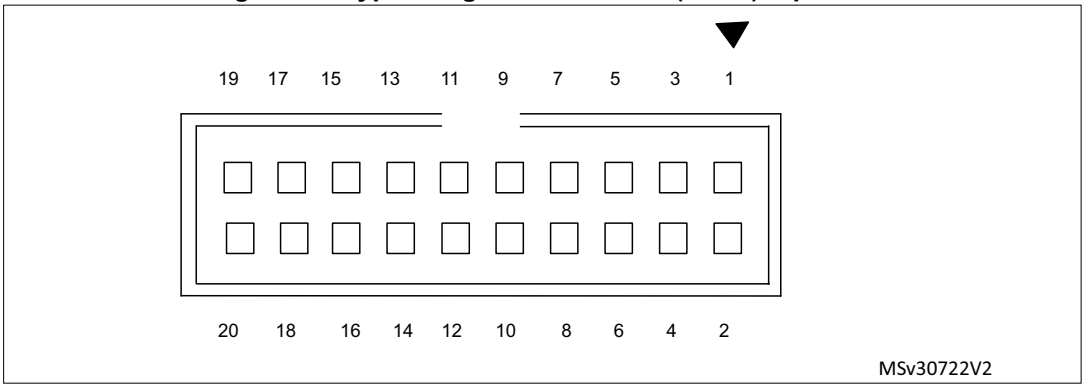


Table 35. Type-C signals connector (CN19)

Terminal	Function/MCU port	Terminal	Function/MCU port
1	GND	2	GND
3	TX1+	4	RX1+
5	TX1-	6	RX1-
7	V_{BUS}	8	V_{BUS}
9	CC1	10	CC2
11	SUB1	12	SUB2
13	V_{BUS}	14	V_{BUS}
15	RX2-	16	TX2-

Table 35. Type-C signals connector (CN19) (continued)

Terminal	Function/MCU port	Terminal	Function/MCU port
17	RX2+	18	TX2+
19	GND	20	GND

6.14 LCD connectors (CN20, CN24)

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

6.15 STLINK-V3E USB Micro-B connector (CN21)

The USB connector (CN21) is used to connect the on-board STLINK-V3E facility to the PC for flashing and debugging software.

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

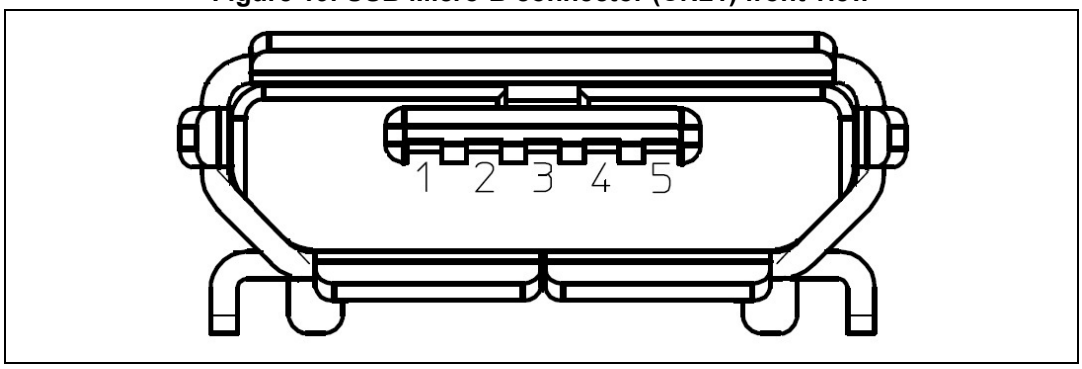


Table 36. USB Micro-B connector (CN21)

Terminal	Description	Terminal	Description
1	V_{BUS} (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

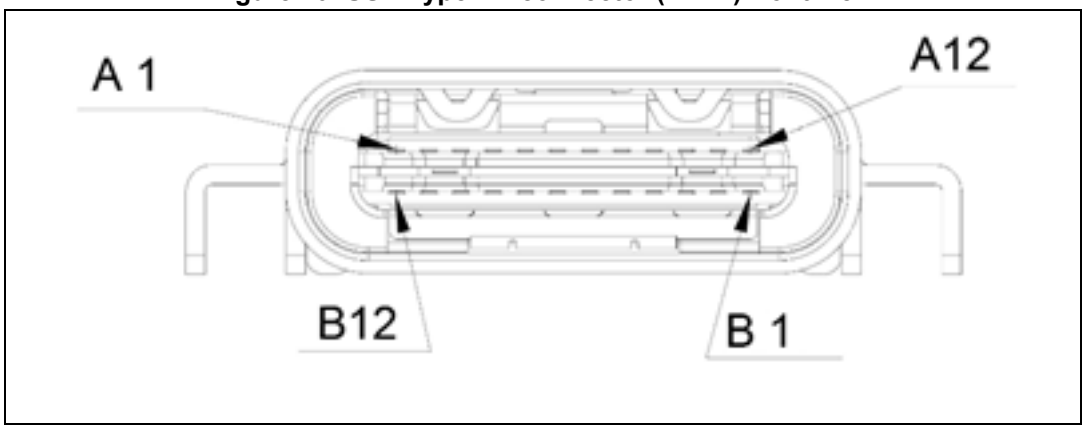


Table 37. USB Type-C® connector (CN22)

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

6.17 Blue line-in audio jack (CN23)

A blue 3.5 mm stereo input audio jack (CN23) is available on the STM32G474E-EVAL board to support audio line input.

6.18 Green line-out audio jack (CN26)

A green 3.5 mm stereo output audio jack (CN26) is available on the STM32G474E-EVAL board to support a headphone.

Figure 21. Stereo headset with a microphone jack (CN26)

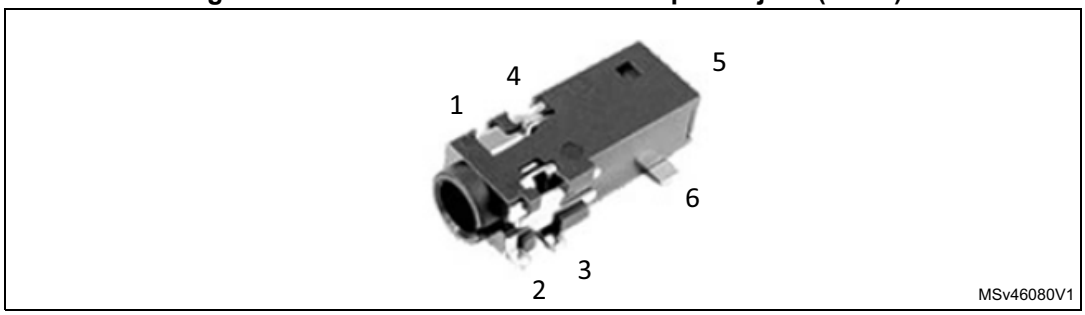


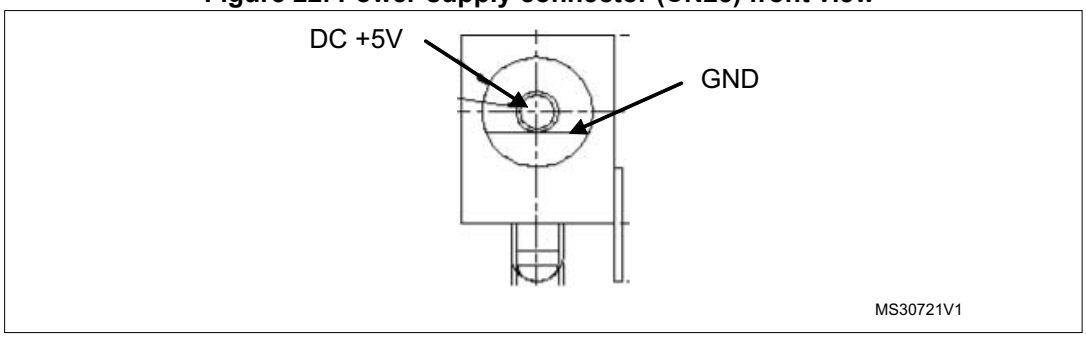
Table 38. On-board audio jack connector (CN26)

Pin number	Description	Stereo headset with microphone pinning	
3	GND	GND	
4	OUT_Right	SPK_R (33 Ω typical)	
6	OUT_Left	SPK_L (33 Ω typical)	
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 STLINK-V3E programming connector (CN27)

The CN27 connector is only used for embedded STLINK-V3E programming during board manufacturing. It is not populated by default or end-user-oriented.

6.21 microSD™ connector (CN28)

Figure 23. microSD™ connector (CN28) front view

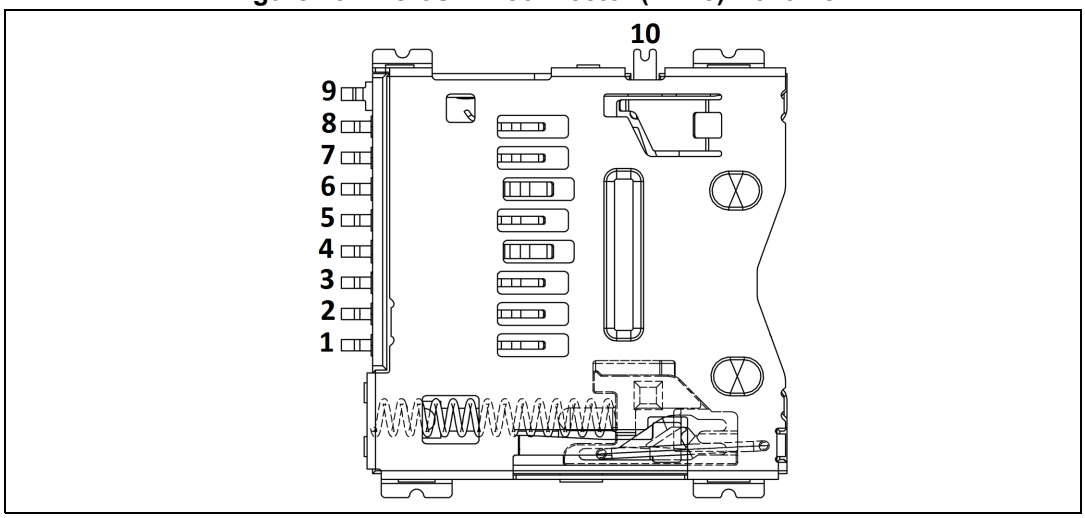


Table 39. microSD™ connector (CN28)

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

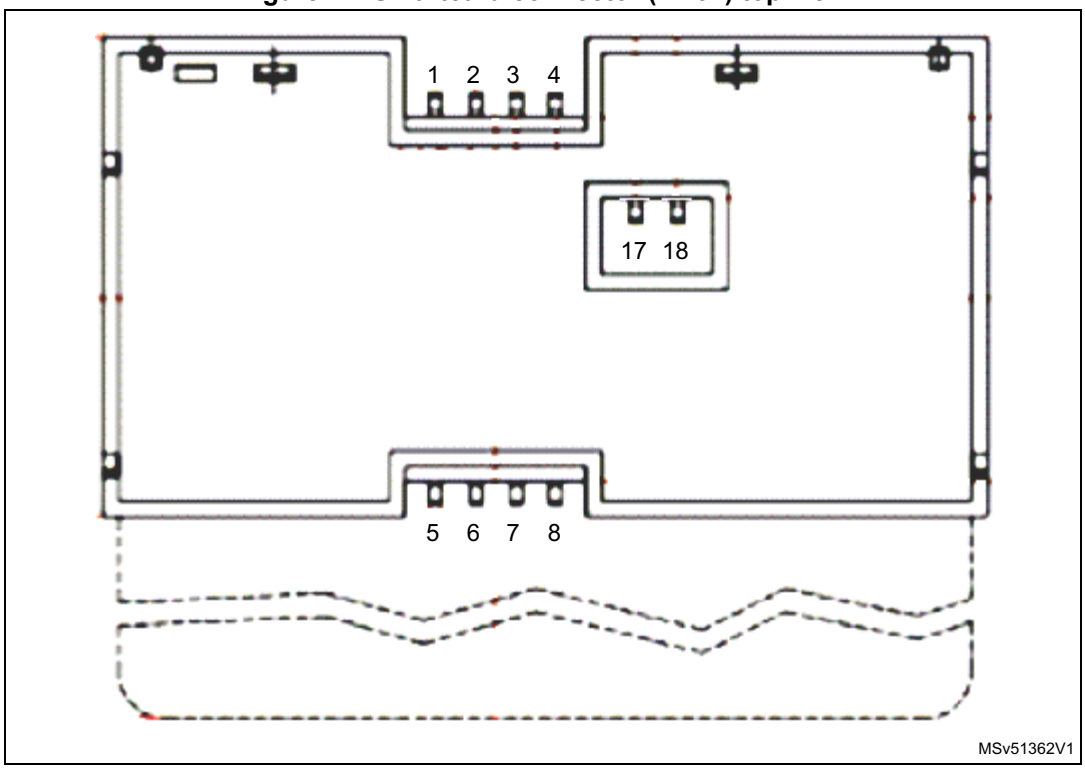


Table 40. Smartcard connector (CN31)

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 STM32G474E-EVAL I/O assignment

Table 41. STM32G474E-EVAL I/O assignment

Pin name	LQFP128	Double motor control STM32G474E-EVAL	General-purpose features STM32G474E-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

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

Pin name	LQFP128	Double motor control STM32G474E-EVAL	General-purpose features STM32G474E-EVAL
PC2	24	MC1_Ain+_ADC12_IN8	QSPI_BK2_IO1
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

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

Pin name	LQFP128	Double motor control STM32G474E-EVAL	General-purpose features STM32G474E-EVAL
PF15	52	-	FMC_A9
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	-	-

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

Pin name	LQFP128	Double motor control STM32G474E-EVAL	General-purpose features STM32G474E-EVAL
PC6	80	MC2_PWM_TIM8_CH1	COMP6_OUT
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

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

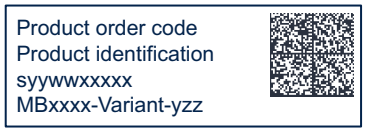
Pin name	LQFP128	Double motor control STM32G474E-EVAL	General-purpose features STM32G474E-EVAL
PD1	109	-	FMC_D3
VSS_7	110	-	-
VDD_7	111	-	-
PD2	112	MC1|MC2_PFC_Shunt-Down_TIM3_ETR	RS485_DIR
PD3	113	-	QSPI_BK2_NCS
PD4	114	MC1_Encoder_B_TIM2_CH2	FMC_NOE
PD5	115	-	FMC_NWE
PD6	116	-	Audio_SAI_SD_A
PD7	117	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	-	-

8 STM32G484E-EVAL product information

8.1 Product marking

The product and each board composing the product are identified with one or several stickers. The stickers, located on the top or bottom side of each PCB, provide product information:

- Main board featuring the target device: product order code, product identification, serial number, and board reference with revision.
  Single-sticker example:



  Dual-sticker example:

- Other boards if any: board reference with revision and serial number.
  Examples:

On the main board sticker, the first line provides the product order code, and the second line the product identification.
On all board stickers, the line formatted as *"MBxxxx-Variant-yzz"* shows the board reference *"MBxxxx"*, the mounting variant *"Variant"* when several exist (optional), the PCB revision *"y"*, and the assembly revision *"zz"*, for example B01. The other line shows the board serial number used for traceability.
Products and parts labeled as *"ES"* or *"E"* are not yet qualified or feature devices that are not yet qualified. STMicroelectronics disclaims any responsibility for consequences arising from their use. Under no circumstances will STMicroelectronics be liable for the customer's use of these engineering samples. Before deciding to use these engineering samples for qualification activities, contact STMicroelectronics' quality department.

"ES" or *"E"* marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet *Package information* paragraph at the *www.st.com* website).
- Next to the evaluation tool ordering part number that is stuck or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a *"U"* marking option at the end of the standard part number and is not available for sales.
To use the same commercial stack in their applications, the developers might need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

8.2 STM32G474E-EVAL, STM32G474E-EVAL1, and STM32G484E-EVAL product history

Table 42. Product history

Order code	Product identification	Product details	Product change description	Product limitations
STM32G474E-EVAL	VAG474E$AT1	MCU: – STM32G474QET6 silicon revision ‘Z’	Initial revision	No limitation
		MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)*		
		Boards: – MB1397-G474E-B04 (Main board) – MB895/S-C03 (LCD daughterboard)		
	VA32G474E$AT2	MCU: – STM32G474QET6 silicon revision ‘Y’	– Main board revision changed – MCU silicon revision changed	No limitation
		MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)*		
		Boards: – MB1397-G474E-B05 (Main board) – MB895/S-C03 (LCD daughterboard)		

Table 42. Product history (continued)

Order code	Product identification	Product details	Product change description	Product limitations
STM32G474E-EVAL1	VAG474E1$AT1	MCU: – STM32G474QET6 silicon revision ‘Z’ MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)* Boards: – MB1397-G474EMC-B04 (Main board) – MB895/S-C03 (LCD daughterboard)	Initial revision	No limitation
	VA32G474E1$AT2	MCU: – STM32G474QET6 silicon revision ‘Y’ MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)* Boards: – MB1397-G474EMC-B05 (Main board) – MB895/S-C03 (LCD daughterboard)	– Main board revision changed – MCU silicon revision changed	No limitation
	VA32G474E1$AT3	MCU: – STM32G474QET6 silicon revision ‘X’ MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)* Boards: – MB1397-G474EMC-B05 (Main board) – MB895/S-C03 (LCD daughterboard)	– Packaging: plastic blister replaced by a carton box – MCU silicon revision changed	No demonstration software provided in this product identification
	VA32G474E1$AT4	MCU: – STM32G474QET6 silicon revision ‘X’ MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)* Boards: – MB1397-G474EMC-B06 (Main board) – MB895/S-C04 (LCD daughterboard)	– Main board revision changed – LCD daughterboard revision changed – Board stickers format changed	No demonstration software provided in this product identification

Table 42. Product history (continued)

Order code	Product identification	Product details	Product change description	Product limitations
STM32G484E-EVAL	VAG484E$AT1	MCU: – STM32G484QET6 silicon revision ‘Z’	Initial revision	No limitation
		MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)*		
		Boards: – MB1397-G484E-B04 (Main board) – MB895/S-C03 (LCD daughterboard)		
	VA32G484E$AT2	MCU: – STM32G484QET6 silicon revision ‘Y’	– Main board revision changed – MCU silicon revision changed	No limitation
		MCU errata sheet: – *STM32G471xx/473xx/474xx/483xx/484xx device errata (ES0430)*		
		Boards: – MB1397-G484E-B05 (Main board) – MB895/S-C03 (LCD daughterboard)		

8.3 Board revision history

Table 43. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1397 (Main board)	G474E-B04 G474EMC-B04 G484E-B04	Initial revision	No limitation
	G474E-B05 G474EMC-B05 G484E-B05	Revision B05 of the MB1397 board has an updated listing: – STT4P3LLH6 (EOL STTPUH7) T2-T8 replaced by PMN30XP – SB86 and SB90 ON, L8 and L9 OFF – C166 modified to 1 µF	No limitation
	G474EMC-B06	Several part references updated due to obsolescence, including passive components and DB9 connector, without functional impact. Refer to the bill of materials for further details.	No limitation
MB895 (LCD daughterboard)	MB895/S-C03	Initial revision	No limitation
	MB895/S-C04	Several parts references updated due to obsolescence, including passive components and connector, without functional impact. Refer to the bill of materials for further details.	No limitation

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

9.1 FCC Compliance Statement

Part 15.19

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment.

Part 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Responsible party (in the USA)

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9.2 ISED Compliance Statement

Compliance Statement

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

Déclaration de conformité

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

10 CE conformity

10.1 Warning

EN 55032 / CISPR32 (2012) Class A product

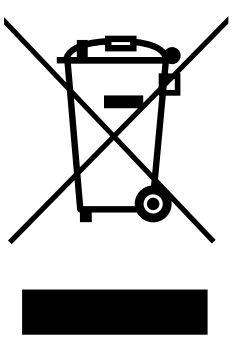
Warning: This device is compliant with Class A of EN55032 / CISPR32. In a residential environment, this equipment may cause radio interference.

Avertissement : cet équipement est conforme à la Classe A de la EN55032 / CISPR 32. Dans un environnement résidentiel, cet équipement peut créer des interférences radio.

11 Product disposal

Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)



This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories should not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, please separate these items from other type of waste and recycle them responsibly to the designated collection point to promote the sustainable reuse of material resources.

Household users:

You should contact either the retailer where you buy the product or your local authority for further details of your nearest designated collection point.

Business users:

You should contact your dealer or supplier for further information.

Revision history

Table 44. Document revision history

Date	Revision	Changes
08-Feb-2019	1	Initial version
18-Apr-2019	2	Updated *Section 5.16.3* with OPAMP1, 2, and 4 limitations
03-Jun-2019	3	Updated *Section 5.21.3* with MFX limitations
10-Sep-2019	4	Updated *Section 5.20* with external flash memory reference
05-Jan-2023	5	Added: – STM32G474E-EVAL1 product – *Section 8: STM32G474E-EVAL, STM32G474E-EVAL1, and STM32G484E-EVAL board information* – *Section 9*: FCC and ISED certifications Updated: – *Table 1* with board references – *Figure 4* and *Figure 5* top and bottom views Removed: – *Schematic diagrams* section
12-Sep-2023	6	Added VA32G474E1$AT3 product identification with G474EMC-B06 main board and MB895-C04 LCD daughterboard in *Section 8*
07-May-2025	7	Added: – *Safety recommendations* and *Product disposal* Updated: – *Power supply*, *STM32G484E-EVAL product information* including *Product marking*, and *Product history* and *Board revision history* tables