Discovery kit with STM32L562QE MCU

Introduction

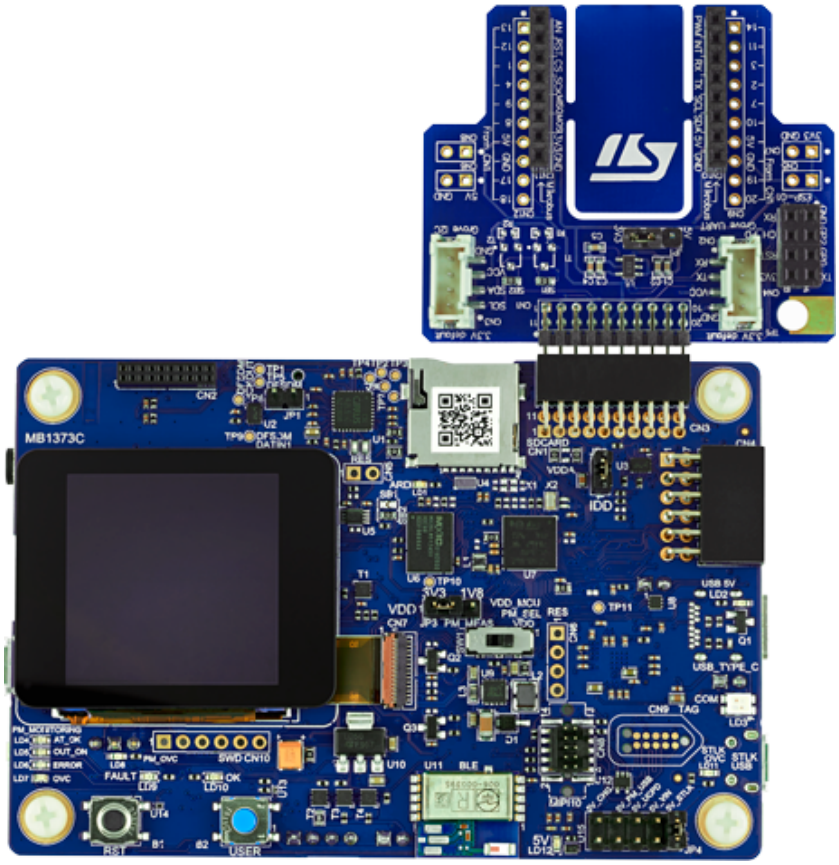
The STM32L562E-DK Discovery kit is designed as a complete demonstration and development platform for STMicroelectronics Arm® Cortex®-M33 core-based STM32L562QEI6QU microcontroller with TrustZone®. It features 256 Kbytes of internal SRAM and 512 Kbytes of internal Flash memory, one flexible memory controller (FMC) interface, one Octo-SPI memory interface, one LCD-TFT controller, one RTC, up to 16 timers, one USB Type-C™ device FS port with UCPD controller, two SAI ports, four I²C buses, six USART ports, three SPI, one CAN-FD port, one SDMMC interface, 2x 12-bit ADC, 2x 12-bit DAC, 2 low-power comparators, 4 digital filters for sigma-delta modulation, touch-sensing capability, an embedded step down converter, and JTAG and ETM debugging support.

STM32L562E-DK, shown in Figure 1, associated with the fan-out expansion board, is used as a reference design for user application development, although it is not considered as the final application.

The full range of hardware features on the board helps the user to evaluate all the peripherals (USB, USART, digital microphones, ADC and DAC, TFT LCD, Octo-SPI Flash memory device, microSD™ card, audio codec, joystick, user button, Bluetooth® Low Energy, accelerometer and gyroscope) and to develop applications. Extension headers allow easy connection of a daughterboard or wrapping board for a specific application.

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

Figure 1. STM32L562E-DK Discovery kit (top view)



Picture is not contractual.

1 Features

- STM32L562QEI6QU microcontroller featuring 512 Kbytes of Flash memory and 256 Kbytes of SRAM in BGA132 package
- 1.54" 240 × 240 pixel-262K color TFT LCD module with parallel interface and touch-control panel
- USB Type-C™ Sink device FS
- On-board energy meter: 300 nA to 150 mA measurement range with a dedicated USB interface
- SAI Audio CODEC
- MEMS digital microphones
- 512-Mbit Octal-SPI Flash memory
- Bluetooth® V4.1 Low Energy module
- iNEMO 3D accelerometer and 3D gyroscope
- 2 user LEDs
- User and reset push-buttons
- Board connectors:
  - USB Type-C™
  - microSD™ card
  - Stereo headset jack including analog microphone input
  - JTAG debugger
  - DPM dynamic-power measurement interface for external device
  - STMod+ expansion connector with fan-out expansion board for Wi-Fi®, Grove and mikroBUS™ compatible connectors
  - Pmod™ expansion connector
  - Audio MEMS daughterboard expansion connector
  - ARDUINO® Uno V3 expansion connector
- Flexible power-supply options: ST-LINK, USB V_{BUS} or external sources
- On-board STLINK-V3E debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
- Comprehensive free software libraries and examples available with the STM32CubeL5 MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR™, Keil®, and STM32CubeIDE

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

2 Ordering information

To order the STM32L562E-DK Discovery kit, refer to Table 1. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. Ordering information

Order code	Board references	Target STM32
STM32L562E-DK	• MB1373 • MB1280(1)	STM32L562QEI6QU

1. *Fan-out board.*

2.1 Product marking

Evaluation tools marked as “ES” or “E” are not yet qualified and therefore not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference designs or in production.

“E” or “ES” marking examples of location:

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

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

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

2.2 Codification

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

Table 2. Codification explanation

STM32TTXXY-DK	Description	Example: STM32L562E-DK
STM32TT	MCU series in STM32 32-bit Arm Cortex MCUs	STM32L5 Series
XX	MCU product line in the series	STM32L562
Y	STM32 Flash memory size: • E for 512 Kbytes	512 Kbytes

3 Development environment

3.1 System requirements

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

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

3.2 Development toolchains

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

Note: On Windows® only.

3.3 Demonstration software

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

4 Conventions

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

Table 3. ON/OFF convention

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

5 Delivery recommendations

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

6 Hardware layout and configuration

The STM32L562E-DK Discovery kit is designed around the STM32L562QEI6QU target microcontroller. Figure 2 illustrates STM32L562QEI6QU connections with peripheral components. Figure 3 shows the location of the main components on the top side of the Discovery board and Figure 4 shows the location of the main components on the bottom side of the Discovery board.

Figure 2. Hardware block diagram

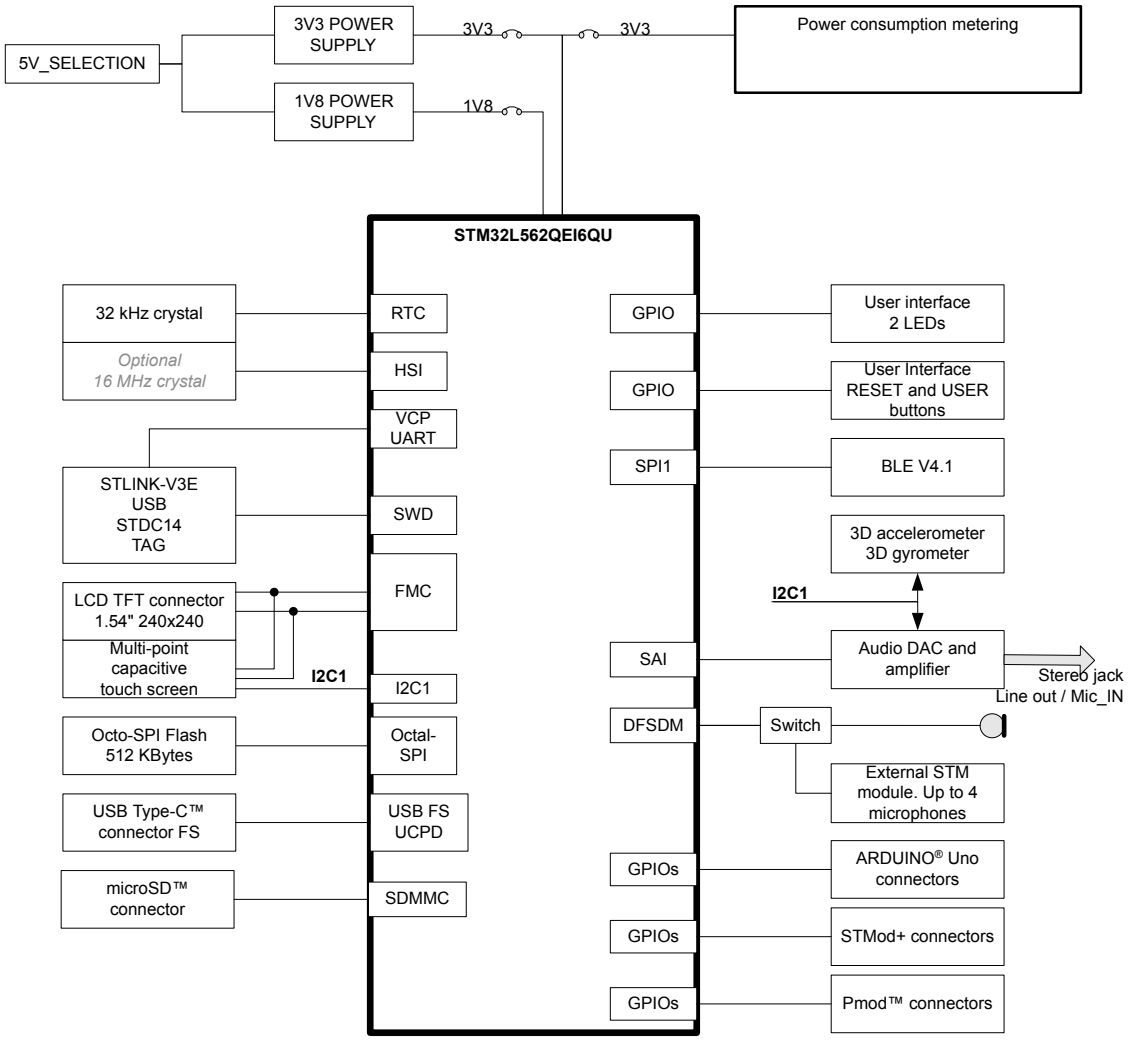


Figure 3. **STM32L562E-DK PCB layout (top view)**

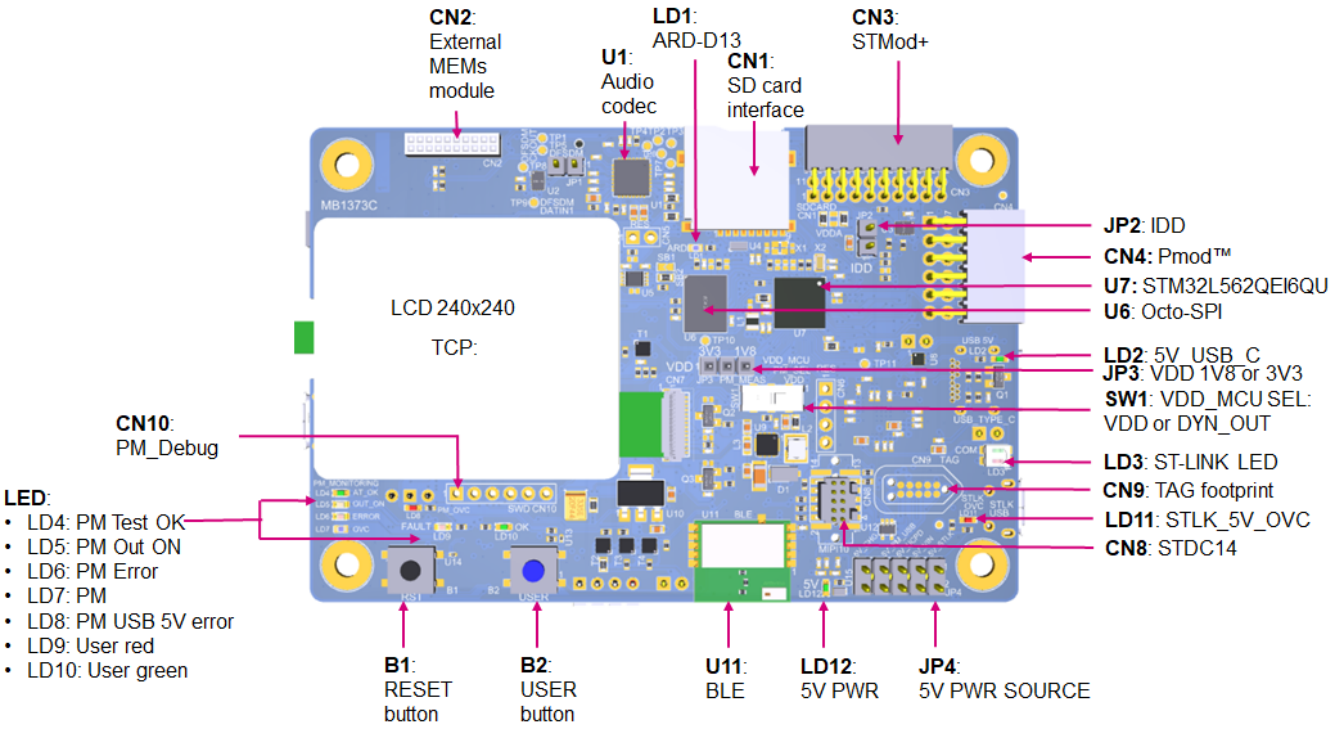
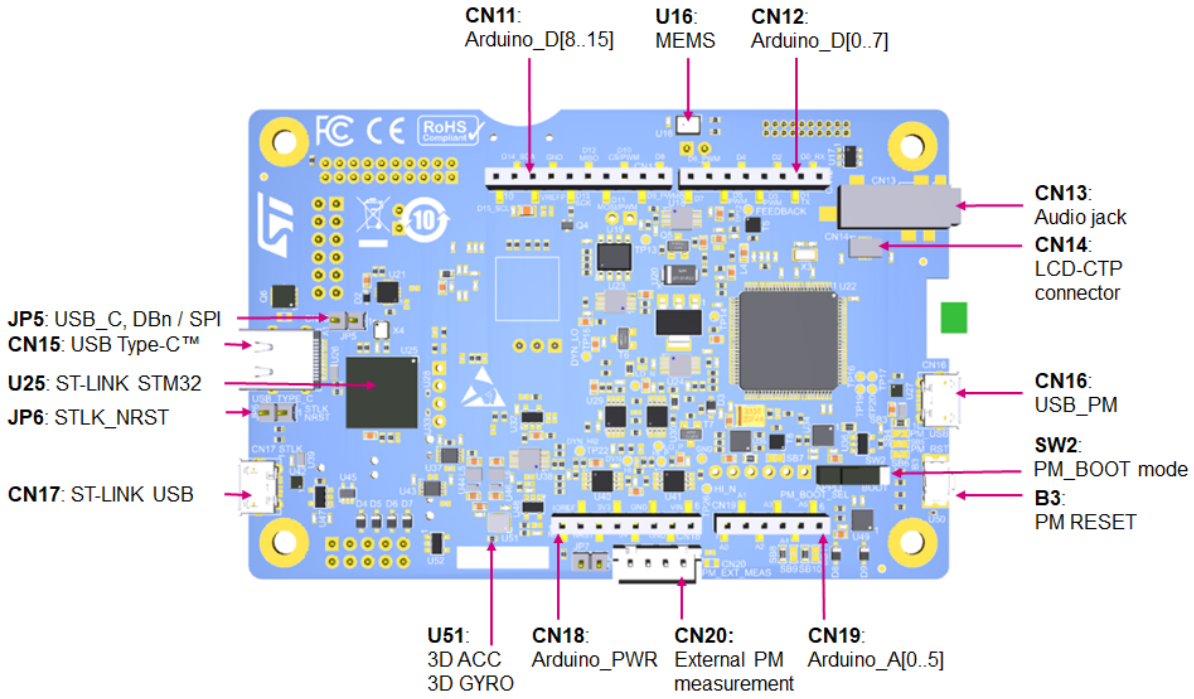


Figure 4. **STM32L562E-DK PCB layout (bottom view)**



6.1 Embedded STLINK-V3E

6.1.1 Description

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

- Using the embedded STLINK-V3E
- Using an external debug tool connected to CN8 STDC14/MIPI-10 connector

The STLINK-V3E facility for debugging and flashing is integrated into the STM32L562E-DK Discovery kit.

The STLINK-V3E makes the STM32L562E-DK Discovery kitArm® Mbed Enabled™.

The embedded STLINK-V3E supports only SWD and VCP for STM32 devices.

Features supported in STLINK-V3E:

- 5 V power supplied by the CN17 USB connector
- USB 2.0 high-speed-compatible interface
- JTAG and serial wire debugging (SWD) specific features:
  - 3 to 3.6 V application voltage on the JTAG/SWD interface and 5V tolerant inputs
  - JTAG
  - SWD and serial viewer (SWV) communication
- Direct firmware update feature (DFU) (CN6)
- STDC14 (MIPI10) compatible connector (CN8)
- LD3 status LED (COM) which blinks during communication with the PC
- LD11 fault red LED (OC) alerting on USB overcurrent request
- 5 V / 500 mA output power supply capability (U47) with current limitation and LD11 LED
- 5 V power green LD12 LED (5V)

Table 4 describes the CN17 USB Micro-B connector pinout.

Table 4. CN17 USB Micro-B connector pinout

Pin	Pin name	Signal name	STLINK-V3E STM32 pin	Function
1	VBUS	5V_USB_CHGR	-	VBUS Power
2	DM	USB_DEV_HS_CN_N	PB14	DM
3	DP	USB_DEV_HS_CN_P	PB15	DP
4	ID	-	GND	ID
5	GND	GND	GND	GND

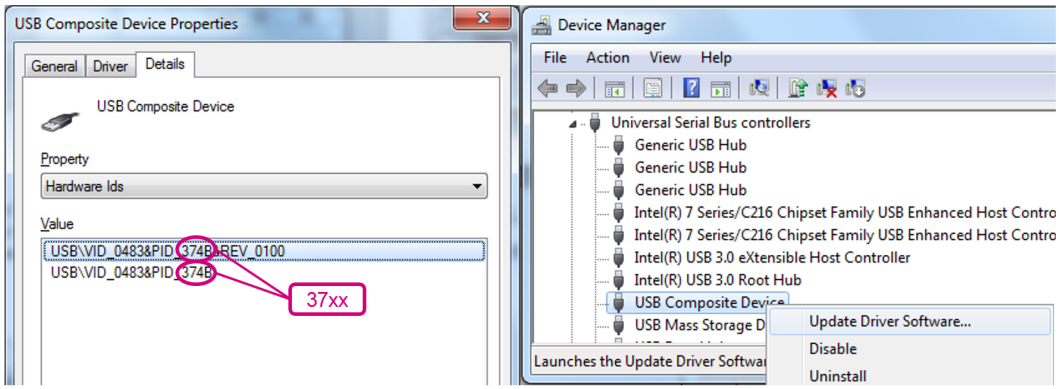
6.1.2 Drivers

Before connecting the STM32L562E-DK board to a Windows PC via USB, the user must install a driver for the STLINK-V3E (not required for Windows 10). It is available on the *www.st.com* website.

In case the STM32L562E-DK board is connected to the PC before the driver is installed, some STM32L562E-DK interfaces may be declared as “Unknown” in the PC device manager. In this case, the user must install the dedicated driver files, and update the driver of the connected device from the device manager as shown in Figure 5.

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

Figure 5. USB composite device



Note: 37xx:

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

6.1.3 STLINK-V3E firmware upgrade

The STLINK-V3E embeds a firmware upgrade mechanism for in-situ upgrades through the USB port. As the firmware may evolve during the lifetime of the STLINK-V3E product (for example new functionalities, bug fixes, support for new microcontroller families), it is recommended to visit the *www.st.com* website before starting to use the STM32L562E-DK Discovery kit and periodically, to stay up-to-date with the latest firmware version.

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

There are 2 basic ways to support an external debug tool:

1. Keep the embedded STLINK-V3E running. Power on the STLINK-V3E at first until the COM LED lights RED. Then connect the external debug tool through CN8 STDC14/MIPI-10 debug connector.
2. Set the embedded STLINK-V3E in a high impedance state. When setting the jumper JP6 (STLK_RST) ON, the embedded STLINK-V3E is in RESET state and all GPIOs are in high impedance. Then the user can connect his external debug tool on the debug connector CN8.

Figure 6. Connecting an external debug tool to program the on-board STM32L5

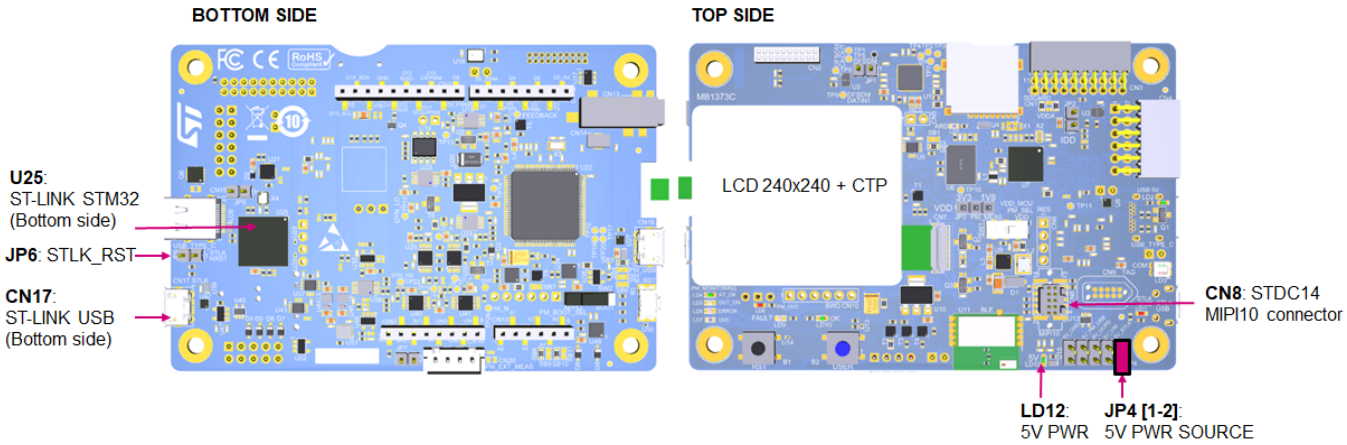


Figure 7 shows the CN8 STDC14 connector pinout.

Figure 7. CN8 STDC14 connector pinout

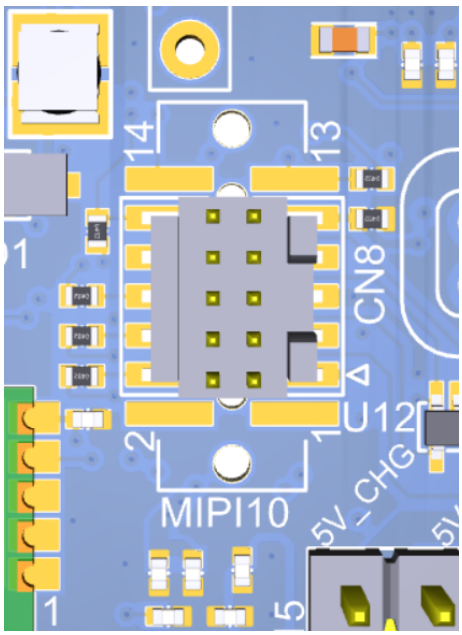


Table 5 describes the CN8 STDC14/MIPI10 debug connector pinout.

Table 5. STDC14 connector pinout

STM32 pin	Board function	Pin	Pin	Board function	STM32 pin
-	-	1	2	-	-
VDD	Power	3	4	T.SWDIO: Target SWDIO using SWD protocol or Target JTMS (T.JTMS) using JTAG protocol	PA13
GND	Power	5	6	T.SWCLK: Target SWCLK using SWD protocol or Target JCLK (T.JCLK) using JTAG protocol	PA14
GND	Power	7	8	T.SWO: Target SWO using SWD protocol or Target JTDO (T_JTMS) using JTAG protocol	PB3
-	KEY	9	10	T.JTDI(1): Not used by SWD protocol, Target JTDI (T.JTDI) using JTAG protocol, only for external tools	PA15(1)
-	GNDDetect: Pull-down	11	12	NRST: Target NRST using SWD protocol or Target JTMS (T.JTMS) using JTAG protocol	NRST
PA10	T.VCP_RX: Target RX used for VCP (can be a UART supported bootloader)	13	14	T.VCP_TX: Target TX used for VCP (can be a UART supported bootloader)	PA9

1. *PA15 is used by default for the UCPD_CC1 feature. To use PA15 for JTDI, add R42 resistor. In this case, the UCPD_CC1 feature cannot be used.*

6.2 TAG footprint

The CN9 TAG footprint can also output a debug interface compatible with the TAG probe TC2050-IDC-NL. Figure 8 shows the TAG connector pinout.

Figure 8. CN9 TAG connector pinout

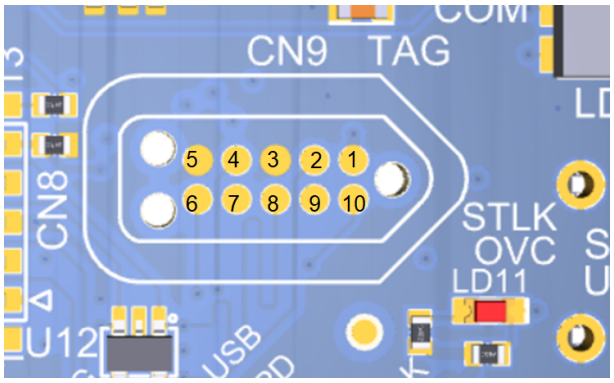


Table 6 describes the CN9 TAG connector pinout.

Table 6. CN9 TAG connector pinout

STM32 pin	Board function	Pin	Pin	Board function	STM32 pin
VDD	Power	1	10	NRST: Target NRST using SWD protocol or Target JTMS (T.JTMS) using JTAG protocol	NRST
PA13	T.SWDIO: Target SWDIO using SWD protocol or Target JTMS (T.JTMS) using JTAG protocol	2	9	NC	-
GND	Power	3	8	T.JTDI(1): Not used by SWD protocol, Target JTDI (T.JTDI) using JTAG protocol, only for external tools	PA15(1)
PA14	T.SWCLK: Target SWCLK using SWD protocol or Target JCLK (T.JCLK) using JTAG protocol	4	7	NC	-
GND	Power	5	6	T.SWO: Target SWO using SWD protocol or Target JTDO (T_JTMS) using JTAG protocol	PB3

1. *PA15 is used by default for the UCPD_CC1 feature. To use PA15 for JTDI, add R42 resistor. In this case, the UCPD_CC1 feature cannot be used.*

6.3 Power supply

6.3.1 5 V power supply general view

The STM32L562E-DK Discovery kit is designed to be powered from 5 V DC power source.

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

- **5V_STLK provided by a host PC connected to CN17 through a Micro-B USB cable (default configuration)**
- 5V_VIN provided by an external 7-12V power supply connected to **CN18** pin 8 (ARDUINO®)
- 5V_UCPD provided by a host PC connected to **CN15** through a USB Type-C™ cable.
- 5V_PM provided by a host PC connected to **CN16** through a Micro-B USB cable (This one is used for the energy meter function).
- 5V_CHG provided by a 5 V USB charger connected to **CN17** through a Micro-B USB cable
- 5V_DC provided by an external 5V_DC source on ARDUINO® CN18 pin 5, or directly after the JP4 connector for 5 V selection

When 5V_VIN, 5V_CHG, 5V_DC or 3V3 is used to power the STM32L562E-DK board, this power source must comply with the standard EN-60950-1: 2006+A11/2009 and must be Safety Extra Low Voltage (SELV) with limited power capability

LD12 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 STM32L562E-DK are derived from that 5 V line.

When the power supply is external 3V3 or 5V_CHG on CN17, the STLINK-V3E can not be used.

Table 7 describes the 5 V power supply capabilities.

Table 7. Power supply capabilities

Input power name	Connector pins	Input voltage range	Max. current	Limitation
5V_STLK	CN17 pin 1 JP4 [1-2]	4.75 to 5.25 V	500 mA	The maximum current depends on the USB enumeration: • 100 mA without enumeration • 500 mA with correct enumeration
5V_VIN	CN18 pin 8 JP4 [3-4]	7 to 12 V	-	From 7 V to 12 V only and input current capability is linked to input voltage: • 800 mA input current when VIN=7 V • 450 mA input current when 7V<VIN<9 V • 250 mA input current when 9 V<VIN<12 V
5V_UCPB	CN15 JP4 [5-6]	4.75 to 5.25 V	1 A	The maximum current depends on the USB host used to power the board.
5V_PM	CN16 pin 1 JP4 [7-8]	4.75 to 5.25 V	500 mA	The maximum current depends on the USB enumeration: • 100 mA without enumeration. • 500 mA with correct enumeration
5V_CHG	CN17 pin 1 JP4 [9-10]	4.75 to 5.25 V	-	The maximum current depends on the USB charger used to power the board.
5V_DC	CN18 pin 5 JP4 pin 2/4/6/8/10 JUMPER OFF	4.75 to 5.25 V	-	The maximum current depends on the 5V_DC used to power the board.

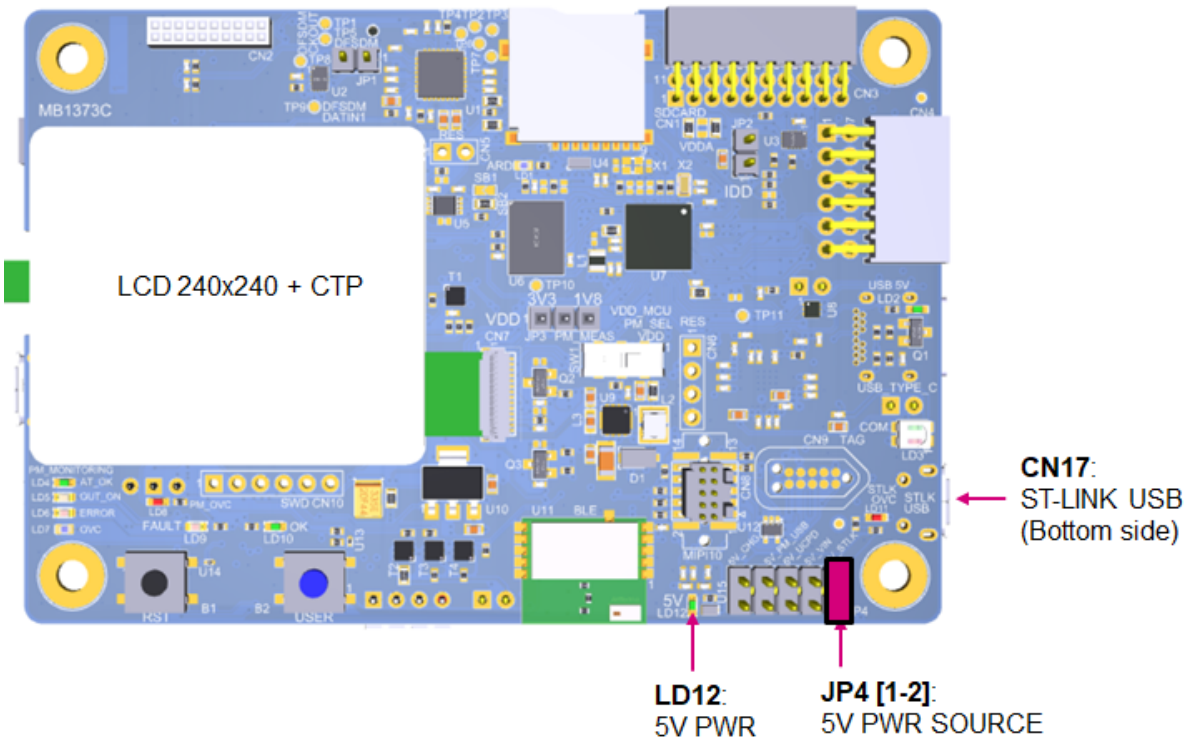
6.3.2 Power supply input from STLINK-V3E USB connector (default setting): 5V/500mA

5V_STLK is a DC power with limitation from CN17 STLINK-V3E USB connector, the USB type Micro-B connector of STLINK-V3E. In this case, the JP4 jumper must be on pin [1-2] to select 5V_STLK power source on JP4 silkscreen. This is the default setting. If the USB enumeration succeeds, the 5V_STLK power is enabled, by asserting the PWR_ENn signal (from the STLINK-V3E MCU). This pin is connected to a power switch STMPS2151STR, which powers the board. This power switch features also a 500 mA current limitation to protect the PC in case of an onboard short-circuit.

The Discovery board and its shield on it can be powered from the CN17 STLINK-V3E USB connector, but only STLINK-V3E circuit has the power before USB enumeration because the host PC only provides 100 mA to the board at that time. During the USB enumeration, the Discovery board asks for 500 mA current to the host PC. If the host is able to provide the required power, the enumeration finishes by a *SetConfiguration* command and then, the power switch is switched ON, the green LED LD12 turned ON, thus the Discovery board and its shield on it can consume 500 mA current, but no more. If the host is not able to provide the requested current, the enumeration fails. Therefore the power switch remains OFF and the MCU part including the expansion board is not powered. As a consequence, the green LED LD12 remains turned OFF. In this case, it is mandatory to use another power supply.

5V_STLK power source configuration for jumper JP4 [1-2] is described in Figure 9.

Figure 9. JP4 [1-2]: 5V_STLK PWR SOURCE



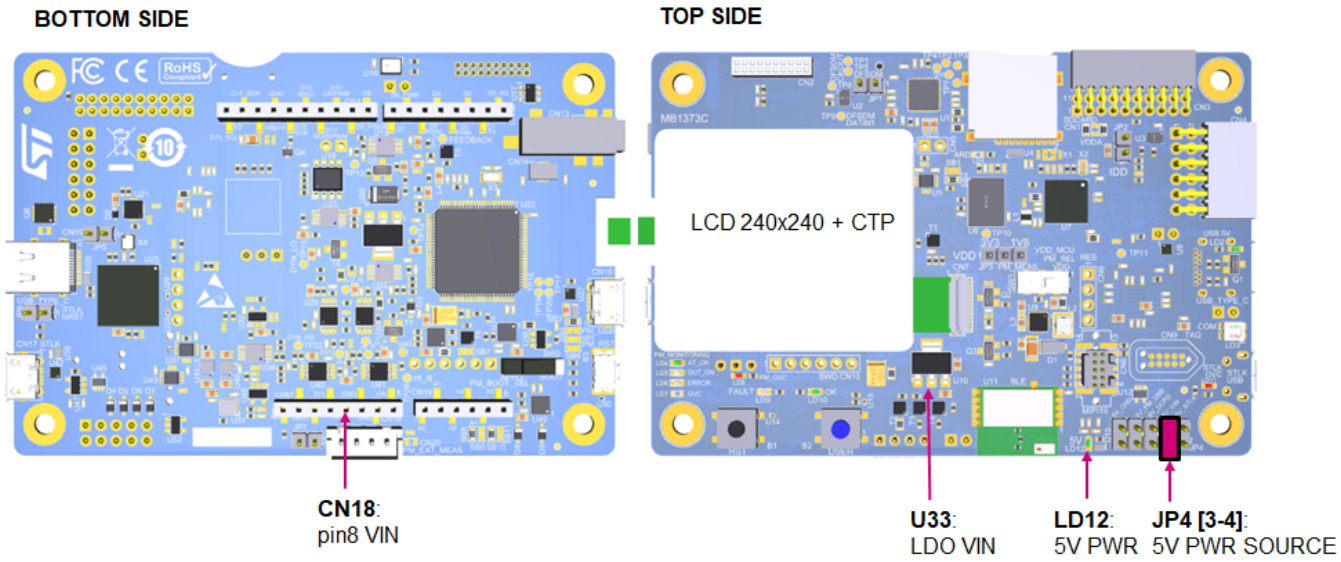
6.3.3 5V_VIN power source: 7 to 12 V, 800 mA maximum

5V_VIN is the DC power coming from the CN18 ARDUINO® connector. In this case, the JP4 jumper must be on pin [3-4] to select the 5V_VIN power source on JP4 silkscreen.

A dedicated LDO (U10) is used to generate the 5V_VIN from the 7 to 12 V VIN input.

5V_VIN power source configuration for jumper JP4 [3-4] is described in Figure 10.

Figure 10. **JP4 [3-4]: 5V_VIN PWR SOURCE**

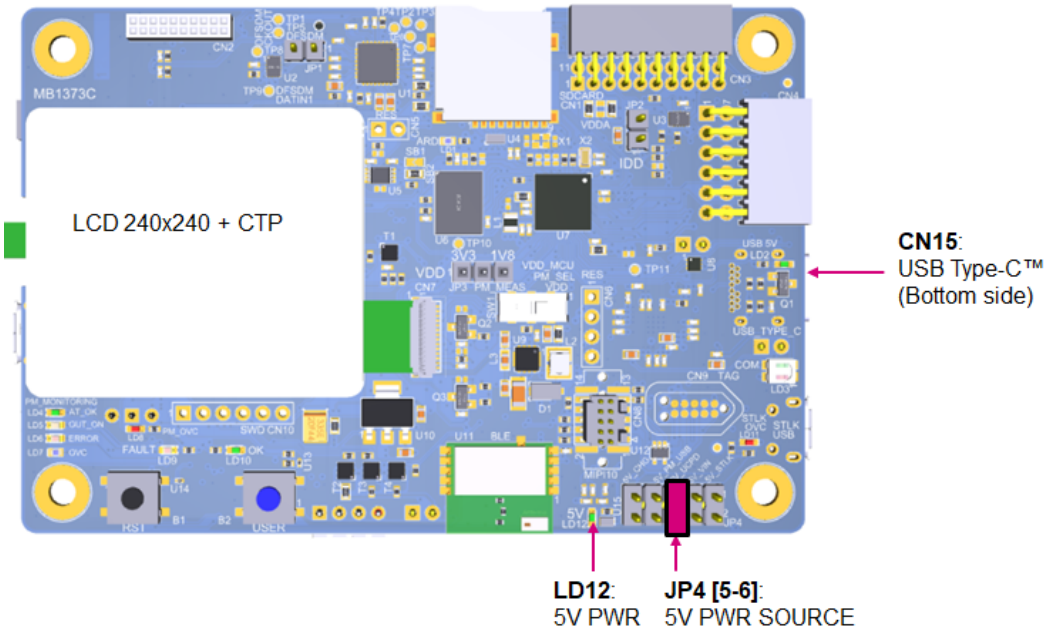


6.3.4 5V_UCPD power source: 5 V, 1 A maximum

5V_UCPD is the DC power supply connected to the CN15 user USB Type-C™ connector for Power Delivery. To select the 5V_UCPD power source on the JP4 silkscreen, the JP4 jumper must be on pins [5-6].

5V_UCPD power source configuration for jumper JP4 [5-6] is described in Figure 11

Figure 11. **JP4 [5-6]: CN15 5V_USB_TYPE_C PWR SOURCE**



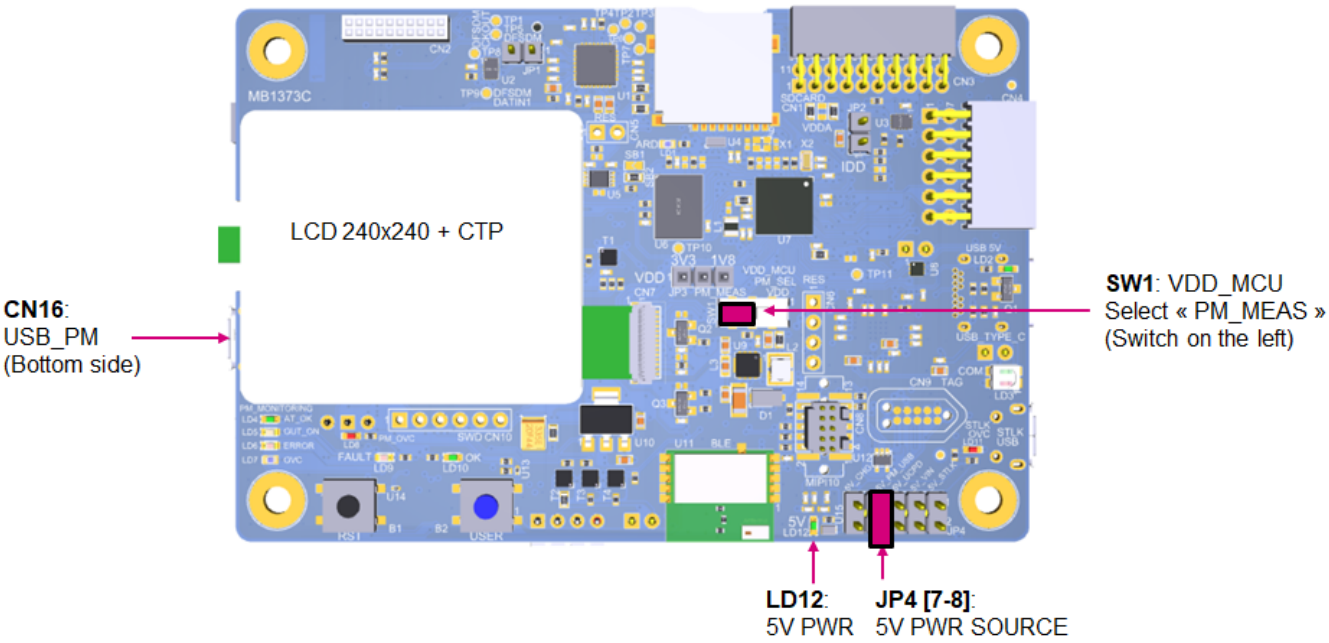
6.3.5 5V_PM power source: 5 V, 500 mA

5V_PM is the DC power coming from the energy metering part on the CN16 USB connector. In this case, the JP4 jumper must be on pin [7-8] to select the 5V_PM power source on JP4 silkscreen.

When the 5V_PM is selected, the SW1 switch must be set in position “PM_MEAS” to be able to provide and measure VDD.

5V_PM power source configuration for jumper JP4 [7-8] is described in Figure 12.

Figure 12. JP4 [7-8]: CN16 5V_PM PWR SOURCE

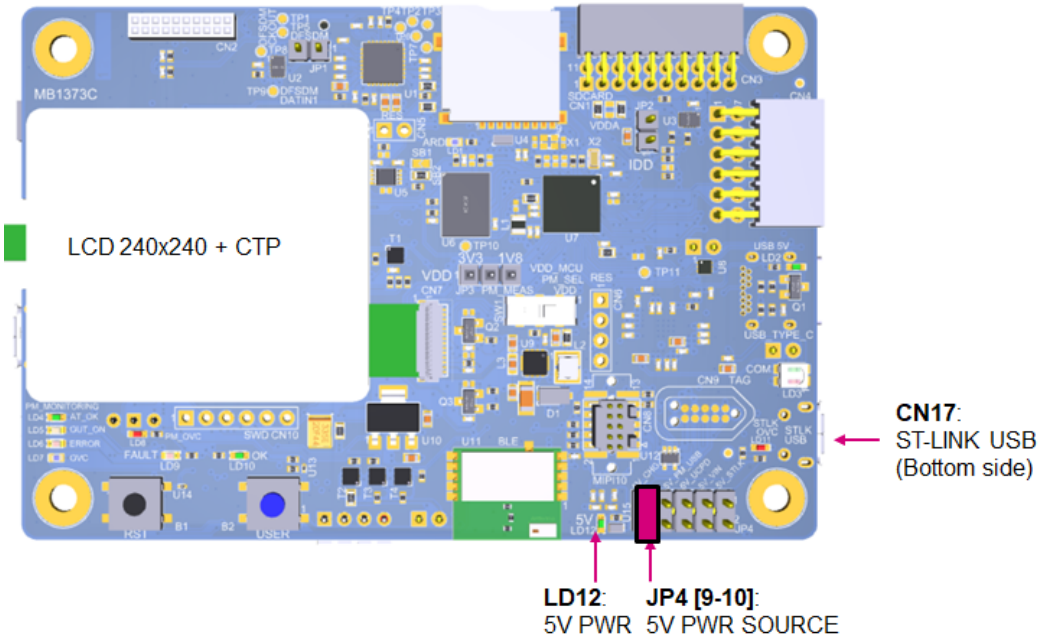


6.3.6 5V_CHG power source: 5 V

5V_CHG is the DC power charger connected to CN17 USB STLINK-V3E. To select the 5V_CHG power source on JP4 silkscreen, the JP4 jumper must be on pins [9-10]. In this case, if the STM32L562E-DK board is powered by an external USB charger, then the debug on the STLINK-V3E USB connector is not available.

5V_CHG power source configuration for jumper JP4 [9-10] is described in Figure 13.

Figure 13. **JP4 [9-10]: CN17 5V_CHG PWR SOURCE**



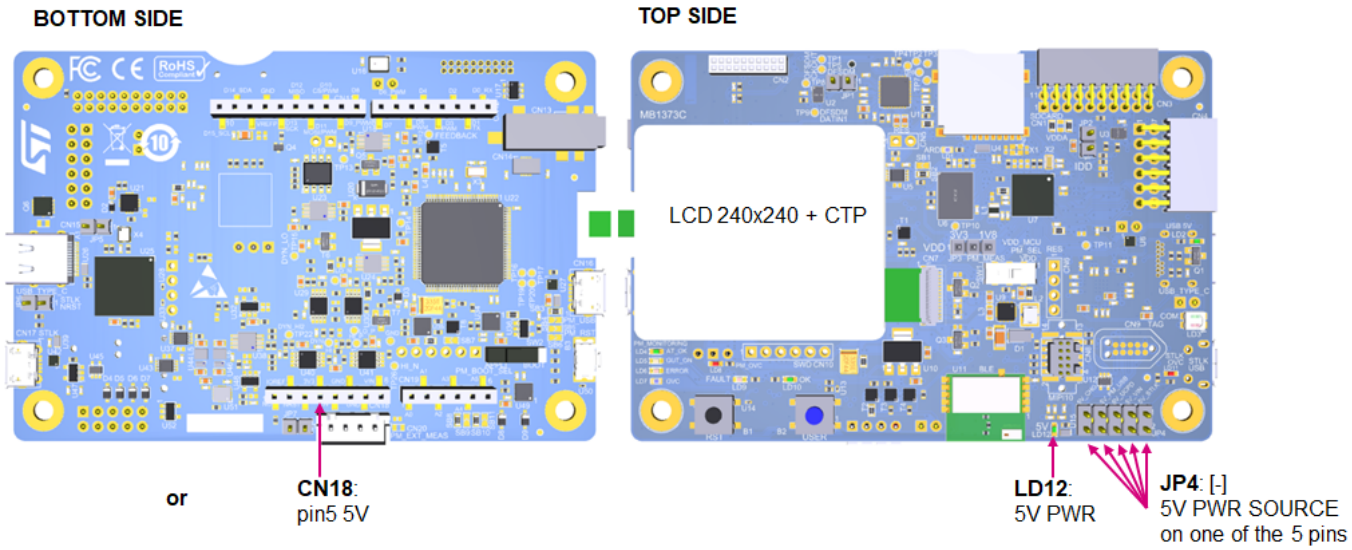
Note: With this JP4 configuration: 5V_CHG, the USB_PWR protection is bypassed. Never use this configuration with a computer connected instead of the charger, because as the USB_PWR_protection is bypassed, and if the board consumption is more than 500mA, this can damage the computer. If a 500 mA current is enough, it is recommended to prefer the 5V_STLK source instead of the 5V_CHG source.

6.3.7 5V_DC power source

5V_DC is the DC power coming from external (5V DC power from CN5 pin5 ARDUINO® or from JP4 pin 2, 4, 6, 8, or 10 jumper connectors. In this case, the JP4 jumper must be OFF.

5V_DC power source configuration for jumper JP4 [-] is described in Figure 14.

Figure 14. **JP4 [-]: 5V_DC PWR SOURCE**



6.3.8 Programing/debugging when the power supply is not from STLINK-V3E (5V_STLK)

5V_VIN, 5V_PM, 5V_DC or 5V_UCPD can be used as an external power supply, in case the current consumption of the STM32L562E-DK Discovery kit, with expansion boards, exceeds the allowed current on USB. In such a condition, it is still possible to use USB for communication for programming or debugging only.

In this case, it is mandatory to power the board first using 5V_VIN, 5V_PM, 5V_DC or 5V_UCPD then connect a USB cable to the PC. Proceeding this way, the enumeration succeeds thanks to the external power source.

The following power sequence procedure must be respected:

1. Connect the JP4 jumper according to the external 5V power source selected.
2. Connect the external power source according to JP4.
3. Power ON the external power supply.
4. Check 5V GREEN LED LD12 is turned ON.
5. Connect the PC to the CN17 USB connector.

If this sequence is not respected, the board may be powered by V_{BUS} first from STLINK-V3E, and the following risk may be encountered:

- If more than 500 mA current is needed by the board, the PC may be damaged or current can be limited by PC, As a consequence the board is not powered correctly.
- 500mA is requested at enumeration, so there is a risk that request is rejected and enumeration does not succeed if the PC does not provide such current. Consequently, the board is not powered (LED LD12 remains OFF).

6.3.9 External power supply output

5V: When the STM32L562E-DK board is powered by 5V_STLK, 5V_VIN, 5V_PM, 5V_UCPD or 5V_CHG, the 5V on ARDUINO® CN18 pin 5 can be used as an output power supply for an expansion board plugged on CN18. In this case, the maximum current of the power source specified in Table 7. Power supply capabilities must be respected.

3V3: ARDUINO® CN18 pin 4 can also be used as a power supply output. The current is limited by the maximum 300 mA current capability of the U46 DC-DC converter (TPS62743), concerning the STM32L562E-DK board and its shield consumption.

6.3.10 Internal power supply

For all general information concerning Design recommendations for STM32L562QEI6QU with INTERNAL SMPS, and design guide for ultra-low-power applications with performance, refer to the application note *Getting started with STM32L5 Series hardware development* (AN5211) at the *www.st.com* website.

3V3

Regardless of the 5V power source, a U46 DC-DC converter is used to deliver a fixed 3.3 V power supply, with a current capability of 300 mA. This power source of 3.3 V is shared between the STM32L562E-DK and its expansion board.

1V8

Regardless of the 5V power source, a U44 DC-DC converter is used to deliver a fixed 1.8 V voltage, with a current capability of 300 mA. This power source of 3.3 V is shared between the STM32L562E-DK and its expansion board.

When VDD_MCU is connected to 1V8, the MCU switch in LDO mode instead of SMPS mode.

Warning:

The power sequence is not respected when using 1V8 VDD. Refer to the application note Getting started with STM32L5 Series hardware development (AN5211), and STM32L5xx product datasheets for power sequencing.

DYN_OUT

The STM32L562E-DK Discovery kit offers the possibility to make dynamic current consumption measurements with a range of 300nA to 150mA. This function is done according to an energy meter embedded part. Refer to Section 6.19 MCU energy meter tools.

VDD_MCU selection

VDD_MCU used to supply the STM32 can be powered by the U46 DC-DC converter (3V3) by setting JP3 [1-2], or by the U44 DC-DC converter (1V8) by setting JP3 [2-3]. For both configurations, the SW1 must be in the VDD position.

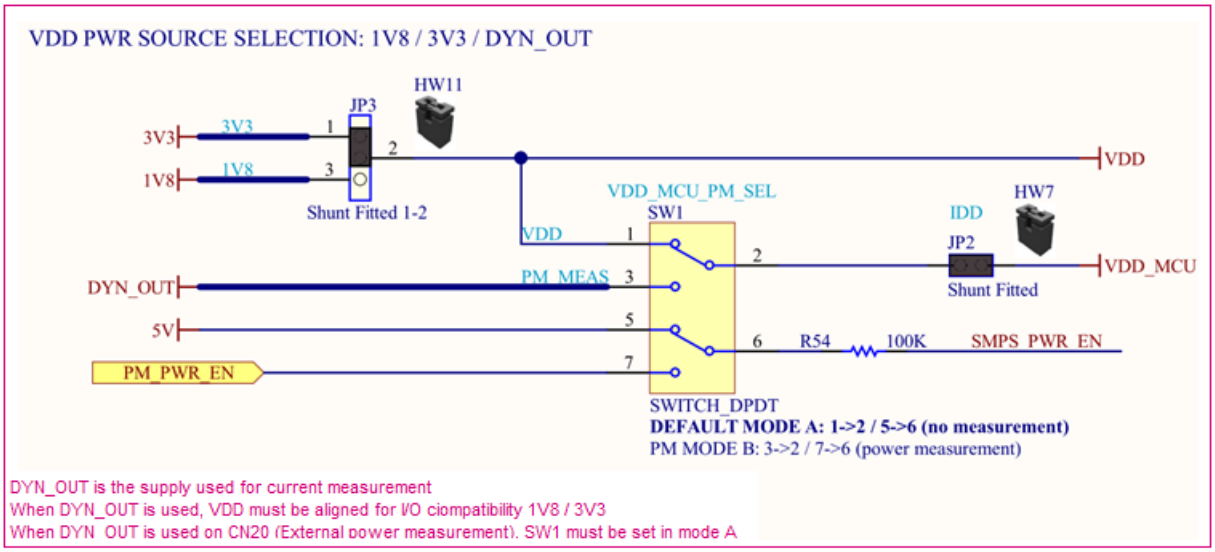
VDD_MCU can be also powered by energy meter tools. To use the energy meter tools, follow the configuration below:

- Set the SW1 switch to the position PM_MEAS.
- Power the board through the 5V_PM with the CN16 USB connector.
- JP4 jumper must be on pin [7-8] to select the 5V_PM power source on JP4 silkscreen.

With this configuration, it is recommended to set JP3 to the correct position, 3V3 or 1V8, to respect the I/O level compatibility between MCU and onboard I/Os.

VDD_MCU power selection schematic is described in Figure 15.

Figure 15. VDD_MCU power selection schematics



details the VDD_MCU power selection.

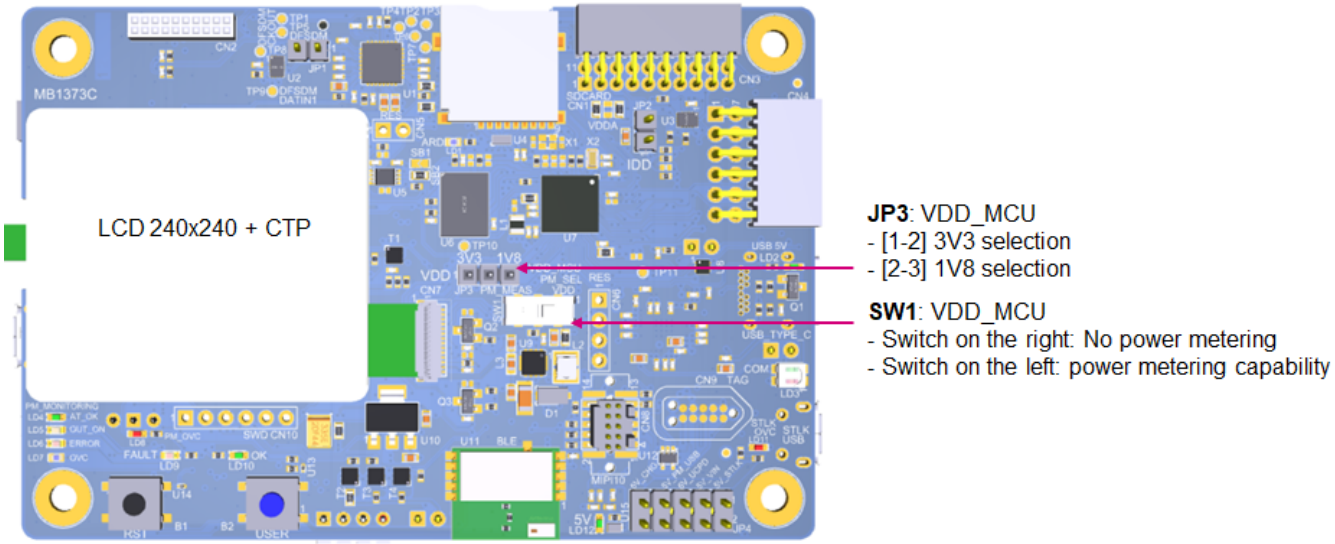
Table 8. VDD_MCU power selection

JP6	SW1	Definition[1]	Comment
JP3 [1-2]	**SW1 [1-2] [5-6]**	**DCDC U46 3V3**	**U46 is used to provide 3V3 VDD_MCU.**
	SW1 [2-3] [6-7]	NA	U46 is used to provide 3V3 only for the onboard device, not the MCU.
JP3 [2-3]	SW1 [1-2] [5-6]	U44 DC-DC 1V8	U44 is used to provide 1V8 VDD_MCU.
	SW1 [2-3] [6-7]	NA	U44 is used to provide 3V3 only for the onboard device, not the MCU.
JP3 [x-x]	SW1 [2-3] [6-7]	Current measurement selection	Energy metering part is used to supply VDD_MCU and to perform current consumption measurement.

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

Figure 16 describes the VDD_MCU power selection on the STM32L562E-DK board.

Figure 16. **VDD_MCU power selection**



6.4 RSS/bootloader

The bootloader is located in the system memory, programmed by ST during production. It is used to reprogram the Flash memory by using USART, I^{2}C, SPI, CAN FD or USB FS in device mode through the DFU (device firmware upgrade). The bootloader is available on all devices. Refer to the application note *STM32 microcontroller system memory boot mode* (AN2606) for more details.

The Root Secure Services (RSS) are embedded in a flash area named Secure information block, programmed during ST production. For example, it enables Secure Firmware Installation (SFI) thanks to the RSS extension firmware (RSSe SFI). This feature allows customers to protect the confidentiality of the FW to be provisioned into the STM32 when production is sub-contracted to an untrusted 3rd party. The RSS is available on all devices, after enabling the TrustZone® through TZEN option bit.

The bootloader version can be identified by reading the bootloader ID at the address `0x0BF97FFE`.

6.4.1 RSS limitation

The STM32L5 part soldered on STM32L562E-DK with the finished good (FG) DK32L562E$AT1 (sticker available on the top side of the board) embeds bootloader V9.0 affected by the limitations to be worked around, as described hereunder. The bootloader ID of the bootloader V9.0 is `0x90`.

The following limitations exist in the bootloader V9.0:

Issue observed:

Option Byte programming in RDP level 0.5: The user can not program non-secure option bytes in RDP level 0.5 through the bootloader.

Proposed workaround:

The user can program option bytes thanks to STM32CubeProgrammer GUI or command-line interfaces through JTAG. To know how to program option bytes through STM32CubeProgrammer, refer to the user manual *STM32CubeProgrammer software description* (UM2237).

Issue observed:

Impossible to set TZEN option bit: The user can not set the TZEN option bit through Bootloader interfaces.

Proposed workaround:

Instead of the bootloader interface, the user can use JTAG to set the TZEN option bit.

Issue observed:

Go command on USB-DFU interface: The user can not use Go command through bootloader on the USB-DFU interface.

Proposed workaround:

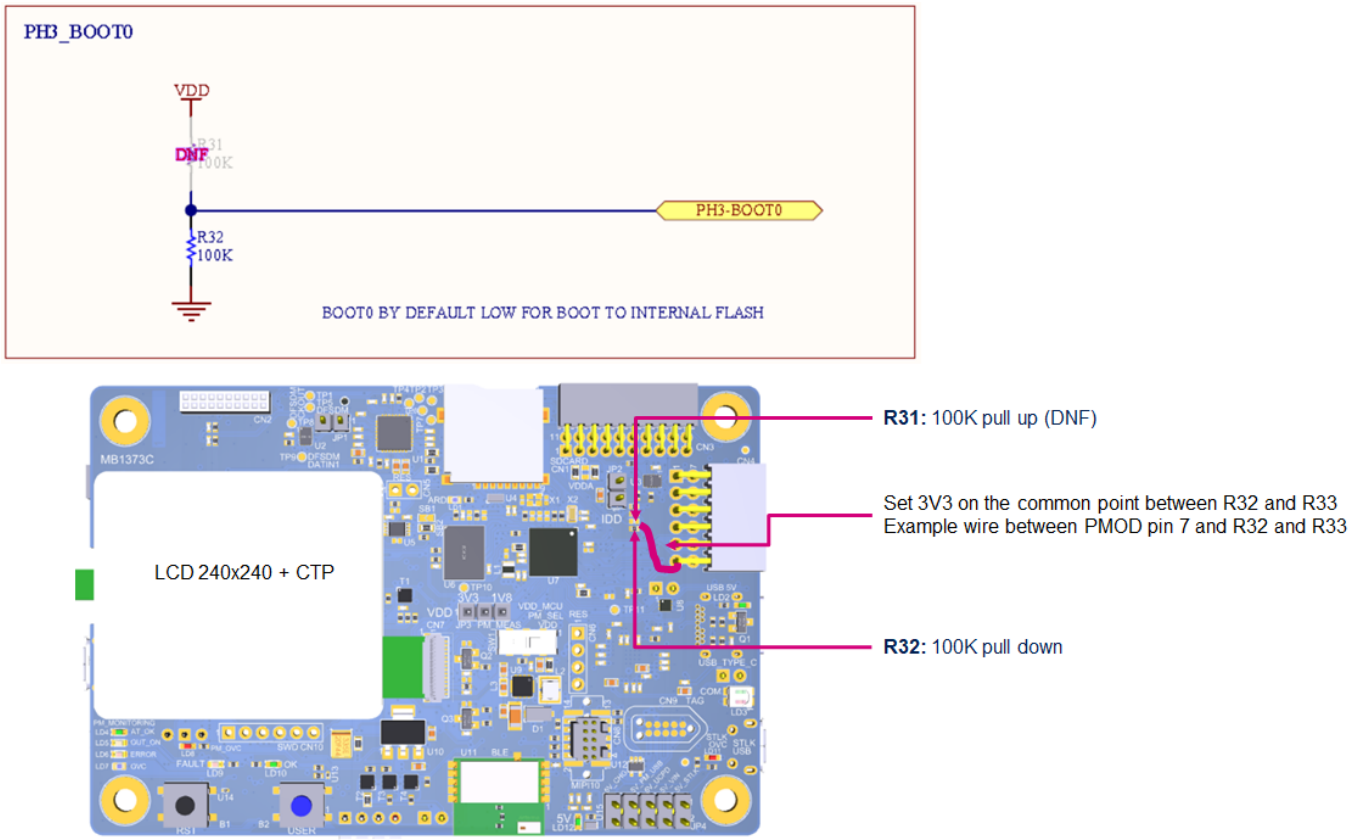
Instead of the USB-DFU interface, the user can use JTAG or any other communication ports supported by the bootloader to run Go command, like USART, I^2C, SPI or CAN FD.

6.4.2 Boot from RSS

On STM32L562E-DK, the PH3-BOOT0 is fixed to a LOW level allowing the boot from the memory address defined by SECBOOTADD0 option byte. In order to change the boot from RSS, it is needed to set the PH3-BOOT0 to the HIGH level by removing R32 and soldering R31, or just by applying 3V3 on PH3-BOOT0 signal between R32 and R31. In this second case, it is not necessary to remove R32 or to add R31.

Figure 17 explains how to easily connect 3V3 to BOOT0.

Figure 17. BOOT0 modification to set the HIGH level



6.5 Clock source

6.5.1 LSE clock reference

The LSE clock reference on the STM32L562QEI6QU microcontroller is done by an external crystal X2.

- 32.768 kHz crystal from NDK referenced NX2012SA

6.5.2 HSE clock reference

The HSE clock references on the STM32L562QEI6QU microcontroller can be done by:

- Internal RC for MSI clock reference (Default configuration)
- STLK_MCO from STLINK-V3E: 8MHz optional clock not connected by default
- 16 MHz crystal X1, for HSE clock generator. This one is optional and not mounted by default.

Table 9 describes the I/O configuration for the optional HSE.

Table 9. I/O configuration for the optional HSE

I/O	Resistor	Setting	Configuration
PH0	R28	**OFF**	**PH0 OSC_IN terminal is not connected to STLK_MCO** **MSI is used** **PH0 is used as GPIO LCD_PWR-ON (R29 connected)**
		ON	PH0 OSC_IN is connected to STLK_MCO 8 MHz MSI not used PH0 not used as GPIO
	R27	**OFF**	**PH0 OSC_IN terminal is not connected to HSE crystal** **MSI is used** **PH0 is used as GPIO LCD_PWR-ON (R29 connected)**
		ON	PH0 OSC_IN is connected to HSE crystal 16MHz MSI not used PH0 not used as GPIO
PH1	R26	**OFF**	**PH1 OSC_OUT terminal is not connected to HSE crystal** **MSI is used** **PH1 is used as GPIO MEMS LED (R25 connected)**
		ON	PH1 OSC_OUT is connected to HSE crystal 16MHz MSI not used PH1 not used as GPIO

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

6.6 Reset source

The reset signal of the STM32L562E-DK Discovery kit is active low. Internal PU force the RST signal to a high level.

Sources of reset are:

- B1 RESET button (black button)
- Embedded STLINK-V3E
- CN8 JTAG/SWD STDC connector and CN9 TAG connector (reset from debug tools)
- CN18 pin 3 ARDUINO® connector (reset from daughterboard)
- PD12 from energy meter part included in the STM32L562E-DK Discovery kit

6.7 Audio

6.7.1 Description

A codec CS42L51-CNZ (U1) is connected to the SAI interface of STM32L562QEI6QU which supports the TDM feature of the SAI port. The TDM feature offers STM32L562QEI6QU the capability to stream stereo audio channels.

There is one low-power digital microphone on-board of the STM32L562E-DK. The Discovery kit offers the possibility to connect a MEMS expansion module.

6.7.2 Operating voltage

The microphone is supplied by VDD and is compatible with the VDD_MCU voltage range from 1.8 to 3.3 V. The audio codec has two supplies:

- VL connected to VDD compatible with VDD_MCU voltage selection 1V8 or 3V3 according to audio codec datasheet
- 1V8_CODEC source provided by U44

6.7.3 Audio codec interface

The audio codec interface is the MCU SAI1 and an I^2C interface.

Table 10 describes the I/O configuration for the audio codec interface.

Table 10. I/O configuration for the audio interface

I/O	Configuration
PG1	PG1 used as Audio RESET (active LOW)
PE2	PE2 used as SAI.MCLK_A
PE3	PE3 used as SAI.SD_B
PE4	PE4 used as SAI.FS_A
PE5	PE5 used as SAI.SCK_A
PE6	PE6 used as SAI.SD_A
PB6	PB6 used as I2C1_SCL shared between ARDUINO®, CTP, STMod+, 3D accelerometer, and 3D gyrometer
PB7	PB7 used as I2C1_SDA shared between ARDUINO®, CTP, STMod+, 3D accelerometer, and 3D gyrometer

6.7.4 Headphones outputs

The STM32L562E-DK Discovery kit can drive stereo headphones. The STM32L562QEI6QU sends up the stereo audio channels, via its SAI1 TDM port, to the codec device. The codec device converts the digital audio stream to stereo analog signals. It then boosts them for direct drive of headphones connecting to CN13 3.5 mm stereo jack receptacles on the board.

The audio codec is set by an I²C-bus. The address is a 7-bit address, with an additional bit to read or write (High to read, low to write). The AD0 pin connected to GND gives the least significant bit of the address. The address of the audio codec is 0b1001010x. The hexadecimal code is `0x94` to write, and `0x95` to read.

6.7.5 Audio jack connector

Figure 18 shows the CN13 audio jack connector.

Figure 18. CN13 audio jack connector

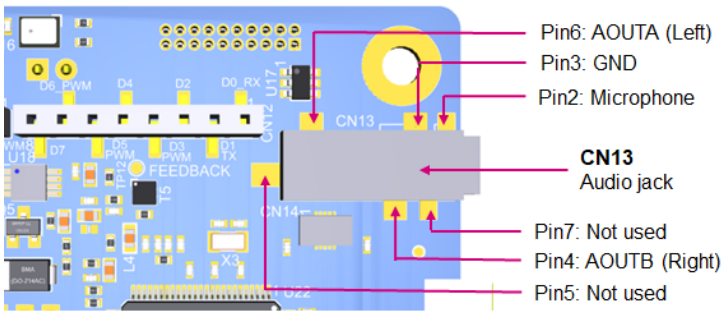


Table 11 describes the CN13 audio jack connector pinout.

Table 11. CN13 audio jack connector pinout

Pin	Signal name	Codec pin	Function
2	MIC_IN	MICIN1	Microphone IN
3	GND	GND	GND
4	AOUTB	AOUTB	OUT_SPEAKER_LEFT
5	-	NA	-
6	AOUTA	AOUTA	OUT_SPEAKER_RIGHT
7	-	NA	NA

6.7.6 Digital microphone interface

A low power digital microphone U16 is available on STM32L562E-DK.

The interface used for this microphone is the DFSDM1 with DFSDM1_CKOUT and DFSDM1_DATIN1. The microphone is supplied with a programmable clock directly generated by STM32L562QEI6QU.

The STM32L562QEI6QU DFSDM interface is shared and exclusive between the embedded microphone U13, the MEMs expansion module on connector CN2 and with the CN3 STMod+ connector.

A quad SPDT switch U2 driven by a jumper JP1 routs the DFSDM interface to the selected application.

Table 12 describes the I/O configuration for the Audio DFSDM interface.

Table 12. I/O configuration for the U13 AUDIO MEMS

I/O	Configuration
PG7	PG7 used as DFSDM_CKOUT
PB12	PB12 used as DFSDM_DATIN1

Table 13 describes the I/O configuration for the Audio DFSDM interface.

Table 13. CN13 audio jack connector pinout

Function	STM32 pin	Signal name	Pin	Pin	Signal name	STM32 pin	Function
GND	-	GND	1	2	3V3	-	3V3
-	-	-	3	4	DFSDM_CKOUT_EXT	PG7	DFSDM CLK
DFSDM DATA3	PC7	DFSDM_DATIN3	5	6	DFSDM_DATIN1_EXT	PB12	DFSDM DATA1
-	-	-	7	8	-	-	-
-	-	-	9	10	DETECTn	-	Module detection
-	-	-	1	12	MEMS_LED	PH1	Module LED
-	-	-	13	14	-	-	-
-	-	-	15	16	-	-	-
-	-	-	17	18	-	-	-
3V3	-	3V3	19	20	GND	-	GND

Table 14 describes the I/O configuration for the Audio DFSDM interface.

Table 14. I/O configuration for the Audio DFSDM interface

JP1 jumper	MEMS module on CN2	STMod+ shield on CN3	Configuration(1)
OFF	**NOT CONNECTED**	**NOT CONNECTED**	**The U2 switch connects directly the DFSDM interface to the U16 onboard MEMS (signal DETECTn low).**
OFF	CONNECTED	NOT CONNECTED	The U2 switch disconnects DFSDM of the U16 onboard MEMS, and connects the DFSDM to the CN2 connector (signal DETECTn switched HIGH by the module on CN2 pin10).
ON	NOT CONNECTED	CONNECTED	The U2 switch disconnects DFSDM of the U16 onboard MEMS, and connects the DFSDM to the CN2 connector (signal DETECTn switched HIGH by the jumper JP1).

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

6.7.7 I/O restriction to other features

Caution: Due to the sharing of some I/Os of STM32L562QEI6QU by multiple peripherals, and because STM32L562QEI6QU only supports one DFSDM interface, the following limitations apply in using the Audio DFSDM features:

The U16 onboard MEMS, the MEMS module on CN2 and the STMod+ DFSDM interface cannot be operated simultaneously.

6.8 USB Type-C™ FS port

6.8.1 Description

The STM32L562E-DK Discovery kit supports USB full-speed (FS) communication. The CN15 USB connector is a USB Type-C™ connector.

The STM32L562E-DK Discovery kit supports USB Type-C™ sink mode only.

A green LED LD2 lits up when V_{BUS} is powered by a USB host when the STM32L562E-DK Discovery kit works as a USB device.

6.8.2 Operating voltage

The STM32L562E-DK Discovery kit supports USB voltage, from 4.75 to 5.25 V.

MCU VDD_USB only supports the 3.3 V voltage.

6.8.3 USB FS device

When a *USB host* connection to the CN15 USB Type-C™ connector of STM32L562E-DK is detected, the STM32L562E-DK Discovery kit 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 CN15. In the board schematic diagrams, the corresponding power voltage line is called 5V_UCPD.

Section 6.3 Power supply provides information on how to use the powering option.

Table 15 describes the HW configuration for the USB interface.

Table 15. I/O configuration for the USB interface

I/O	Configuration
PA11	PA11 used as USB_FS_N diff pair interface
PA12	PA12 used as USB_FS_P diff pair interface

6.8.4 UCPD

USB Type-C™ introduces the USB Power Delivery feature. The STM32L562E-DK Discovery kit supports the dead battery and the SINK mode.

In addition to the DP/DM I/Os directly connected to the USB Type-C™ connector, 5 I/Os are also used for UCPD configuration: Configuration Channel (CCx), VBUS-SENSE, UCPD Dead Battery (DBn) and UCPD_FAULT (FLT) feature.

To protect STM32L562E-DK from USB over-voltage, a USB Type-C™ PPS-compliant port protection is used, TCPP01-M12, IC compliant with IEC6100-4-2 level 4.

- Configuration Channel I/O: UCPD_CCx: These signals are connected to the associated CCx line of the USB Type-C™ connector through the STM USB port Protection TCPP01-M12. These lines are used for the configuration channel lines (CCx) to select the USB Type-C™ current mode. STM32L562E-DK only supports SINK current mode.
- Dead Battery I/O: UCPD_DBn: This signal is connected to the associated DBn line of the TCPP01-M12. The STM USB port Protection TCPP01-M12 manages internally the Dead Battery resistors.
- V_{BUS} fault detection: UCPD_FLT: This signal is provided by the STM Type-C port Protection. It is used as fault reporting to MCU after a bad V_{BUS} level detection. By design, R45 set to 2.7 kΩ, the STM32L562E-DK V_{BUS} protection is set to 6 V maximum.

Table 16 describes the I/O configuration for the UCPD feature.

Table 16. I/O configuration for the UCPD feature

I/O	HW	Setting(1)	Configuration
PA15	R42	**OFF**	**PA15 used as USB_C.CC1**
		ON	PA15 shared between USB_C.CC1 and JTAG JTDI
PB15	-	**-**	PB15 used as USB_C.CC2 (No other muxing)
PA4	R33	OFF	PA4 not used as VBUS_SENSE
		ON	**PA4 shared between VBUS_SENSE and ARD_ADC.A2**
PB5	JP5	**ON**	**PB5 shared between USB-C.DB1 (Dead battery mode supported), ARD.D11 and STMod+**
PB14	-	**-**	**PB14 used as USB-C.FLT (over-voltage fault reporting to MCU)**

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

6.8.5 USB Type-C™ connector

Figure 19 shows the pinout of the CN15 USB Type-C™ connector.

Figure 19. CN15 USB Type-C™ connector pinout

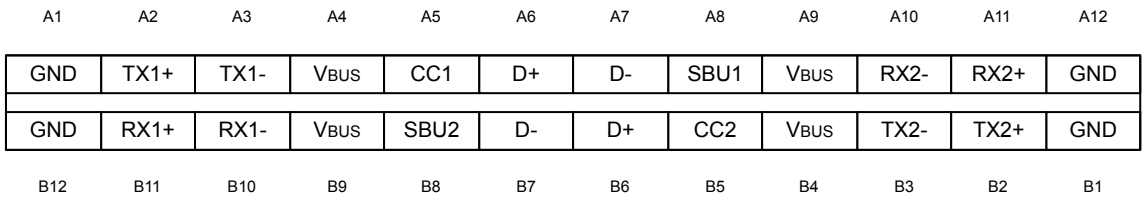


Table 17 describes the pinout of the CN15 USB Type-C™ connector.

Table 17. CN15 USB Type-C™ connector pinout

STM32 pin	Signal name	Pin	Pin	Signal name	STM32 pin
-	GND	A1	B12	GND	-
-	TX1+	A2	B11	RX1+	-
-	TX1-	A3	B10	RX1-	-

STM32 pin	Signal name	Pin	Pin	Signal name	STM32 pin
-	VBUSc	A4	B9	VBUSc	-
PA15	CC1	A5	B8	SBU2	-
PA12	D+	A6	B7	D-	PA11
PA11	D-	A7	B6	D+	PA12
-	SBU1	A8	B5	CC2	PB15
-	VBUSc	A9	B4	VBUSc	-
-	RX2-	A10	B3	TX2-	-
-	RX2+	A11	B2	TX2+	-
-	GND	A12	B1	GND	-

6.8.6 I/O restriction to other features

Caution: Due to the sharing of some I/Os of STM32L562QEI6QU by multiple peripherals, the following limitations apply in using the USB features:

The USB UCPD cannot be operated simultaneously with full JTAG (JTDI).

- If PA15 is used as USB_CC1 (USB peripheral), JTDI cannot be used for JTAG peripheral.

The USB UCPD imposes some restrictions to the ARDUINO® and the STMod+.

- If PB5 is used as USB_DBn (USB peripheral) and JP5 is OFF, ARDUINO® D11 (SPI_MOSI or timer) cannot be used, and STMod+ SPI3_MOSIP cannot be used.

6.9 microSD™ card

6.9.1 Description

The CN1 slot for the microSD™ card is routed to the STM32L562QEI6QU SDIO port. This interface is compliant with SD Memory Card Specification Version 4.1: SDR104 SDMMC_CK speed limited to the maximum allowed I/O speed. UHS-II mode is not supported.

6.9.2 Operating voltage

The SD card interface is only compatible with the 3.3 V voltage range, from 2.7 to 3.6 V.

The SD card interface does not support the MCU low voltage 1.8 V range.

6.9.3 SD card interface

The SD card interface is used in 4 data lines D [0:3], one CLK, one CDM, and a card detection signal.

Table 18 describes the HW configuration for the SDIO interface.

Table 18. I/O configuration for the SDIO interface

I/O	Configuration
PF2	PF2 is connected to SDCARD DETECT.
PC8	PC8 is connected to SDCARD SDIO_D0. PC8 is shared with STMod+ pin 14 (Timer function).
PC9	PC9 is connected to SDCARD SDIO_D1. PC9 is shared with Pmod™ pin 8 / STMod+ pin 12 (RST function).
PC10	PC10 is connected to SDCARD SDIO_D2. PC10 is shared with Pmod™ pin 2 / STMod+ pin 2 (UART_TX function).

I/O	Configuration
PC11	PC11 is connected to SDCARD SDIO_D3. PC11 is shared with Pmod™ pin3 / STMod+ pin 3 (UART_RX function).
PC12	PC12 is connected to SDCARD SDIO_CLK.
PD2	PD2 is connected to SDCARD SDIO_CMD. PD2 is shared with Pmod™ pin 4 / STMod+ pin 3 (UART_RTS function).

Figure 20 shows the CN1 SD card connector.

Figure 20. CN1 SD card connector

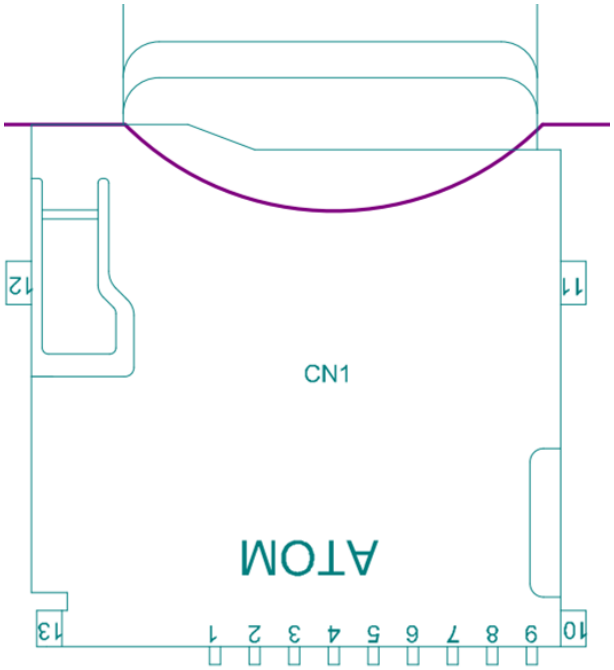


Table 19 describes the CN1 SD card connector pinout.

Table 19. CN1 SD card connector pinout

Pin	Pin names	Signal name	STM32 pin	Function
1	DAT2	SDIO.D2	PC10	SDIO.D2
2	DAT3_CD	SDIO.D3	PC11	SDIO.D3
3	CMD	SDIO.CMD	PD2	SDIO.CMD
4	VDD	VDD	-	VDD_SDCARD
5	CLK	SDIO.CLK	PC12	SDIO.CLK
6	VSS	GND	-	GND
7	DAT0	SDIO.D0	PC8	SDIO.D0
8	DAT1	SDIO.D1	PC9	SDIO.D1
9	CARD_DETECT	SDIO.DETECT	PF2	SDCARD_DETECT active LOW

Pin	Pin names	Signal name	STM32 pin	Function
10/11/12/13	GND	GND	-	GND pin

6.9.4 I/O restriction to other features

Caution: Due to the sharing of some I/Os of STM32L562QEI6QU by multiple peripherals, the following limitations apply in using the SDIO features:

The microSD™ card cannot be operated simultaneously with Pmod™.

The microSD™ card cannot be operated simultaneously with STMod+.

6.10 User LEDs

6.10.1 Description

Two general-purpose color LEDs (LD9 and LD10) are available as light indicators. Each LED is in light-emitting state when a low level is applied to the corresponding ports.

The green LD10 and the red LD9 user LEDs are directly connected to STM32L562QEI6QU.

6.10.2 Operating voltage

As LEDs are driven by the I/O LOW level, they are compatible with VDD_MCU 3.3 V and 1.8 V.

Caution: With this configuration, consumption is not optimized because of the I/Os at 1.8 V and LEDs VDD at 3.3 V. A small leakage current can appear.

6.10.3 LED interface

Table 20 describes the I/O configuration for the LED interface.

Table 20. HW configuration for the LED interface

I/O	Configuration
PG12	PG12 is connected to the green LED LD10 and active low.
PD3	PD3 is connected to the red LED LD9 and active low.

6.11 Physical input devices: buttons

6.11.1 Description

The STM32L562E-DK Discovery kit provides two push buttons for physical human control.

- The USER button (B2),
- The RST reset button (B1).

6.11.2 Operating voltage

Input devices for physical human control are connected to VDD or are referenced to GND. So input devices are compatible with VDD_MCU voltage range from 1.8 to 3.3 V.

6.11.3 Physical input I/O interface

Table 21 describes the I/O configuration for the physical user interface.

Table 21. I/O configuration for the physical user interface

I/O	Configuration
NRST	RST reset button (active LOW)
PC13	USER button (active HIGH, connected as MCU WKUP2 function) (shared with PM_WAKE-UP)

6.12 Octo-SPI memory devices

6.12.1 Description

MX25LM51245GXDI00, a 512-Mbit Octal-SPI Flash memory device, is fitted on STM32L562E-DK, in the U6 position. It is used when evaluating the STM32L562QEI6QU Octo-SPI interface.

MX25LM51245GXDI00 can operate in both single (STR) and double (DTR) transfer-rate modes.

6.12.2 Operating voltage

The voltage of the MX25LM51245GXDI00 Octo-SPI Flash memory device is in the range of 2.7 to 3.6 V.

The OCTO-SPI memory does not support the low voltage MCU 1.8 V.

6.12.3 Octo-SPI I/O interface

Table 22 describes the HW configuration for the Octo-SPI interface.

Table 22. I/O configuration for the Octo-SPI interface

I/O	Configuration
PA2	PA2 is connected to Octo-SPI FLASH as NCS.
PA3	PA3 is connected to Octo-SPI FLASH as CLK.
PA6	PA6 is connected to Octo-SPI FLASH as IO3.
PA7	PA7 is connected to Octo-SPI FLASH as IO2.
PB0	PB0 is connected to Octo-SPI FLASH as IO1.
PB1	PB1 is connected to Octo-SPI FLASH as IO0.
PB2	PB2 is connected to Octo-SPI FLASH as DQS.
PC0	PC0 is connected to Octo-SPI FLASH as IO7.
PC1	PC1 is connected to Octo-SPI FLASH as IO4.
PC2	PC2 is connected to Octo-SPI FLASH as IO5.
PC3	PC3 is connected to Octo-SPI FLASH as IO6.
NRST	NRST is connected to Octo-SPI FLASH as RESET.

6.13 Bluetooth® Low Energy (BLE)

6.13.1 Description

The STM32L562E-DK Discovery kit supports a Bluetooth® Low Energy module (BLE) V4.1. This function is supported by the STM module SPBTLE-RFTR. This module is driven by an SPI interface.

The Bluetooth antenna is integrated into the SPBTLE-RFTR module.

6.13.2 Operating voltage

The SPBTLE module supports the voltage range from 1.8 to 3.3 V.

6.13.3 BLE I/O interface

Table 23 describes the I/O configuration for the BLE interface.

Table 23. I/O configuration for the BLE I/O interface

I/O	Configuration
PG8	PG8 is connected to BLE_RSTN.
PG6	PG6 is connected to BLE_INT.

I/O	Configuration
PG5	PG5 is connected to SPI1.BLE_CS.
PG4	PG4 is connected to SPI1.MOSI.
PG3	PG3 is connected to SPI1.MISO.
PG2	PB0 is connected to SPI1.SCK.

6.14 3D-accelerometer and 3D-gyroscope

6.14.1 Description

The STM32L562E-DK Discovery kit supports a 3d accelerometer and a 3d gyroscope. These functions are supported by the STM module LSM6DSO. This module is driven by an I^2C interface.

6.14.2 Operating voltage

The LSM6DSO module supports the voltage range from 1.8 to 3.3 V.

6.14.3 3D accelerator and gyrometer interface

The 3D ACC/GYRO is set by an I^2C-bus. The address is a 7-bit address with an additional R/W bit (HIGH for reading, LOW for writing). The SD0/SA0 pin connected to GND gives the least-significant bit address. The 3D ACC/GYRO address is `0b1101010x`: `0xD4` to write, and `0xD5` to read.

Table 24 describes the I/O configuration for the 3D ACC/GYRO interface.

Table 24. I/O configuration for the 3D ACC/GYRO interface

I/O	Configuration
PF3	PF3 is connected to GYRO_ACC_INT.
PB6	PB6 used as I2C1_SCL shared between ARDUINO®, Audio, STMod+ and CTP.
PB7	PB7 used as I2C1_SDA shared between ARDUINO®, Audio, STMod+ and CTP.

6.15 TFT LCD

6.15.1 Description

The CN7 29-pin FCP connector is used to connect a TFT LCD module supporting the FMC interface. It is associated with the CN14 10-pin connector used for the Touch panel.

The LCD module is composed of the TFT LCD module FRQ154BP2902 with an LCD driver ST7789H2. The LCD supports a resolution of 240 (RGB) x 240 dots 262K-color, 1.54”. and a touch-sensitive panel driven by a self capacitive controller FT6236.

6.15.2 Operating voltage

The LCD module supports several power supplies: core power supply connected to 3V3, and I/O power supply connected to VDD and compatible with 1V8 and 3V3 voltage.

The touch panel supports several power supplies: core power supply connected to 3V3, and I/O power supply connected to VDD and compatible with 1V8 and 3V3 voltage.

The backlight of the LCD is driven by an external IC U7 STLD40DPUR connected directly to 5V.

6.15.3 LCD interface

Table 25 describes the I/O configuration for the LCD and CTP interface.

Table 25. I/O configuration for the LCD and CTP interface

I/O	Configuration
PD7	PD7 is used as LCD.FMC_NE1_CS.

I/O	Configuration
PD5	PD5 is used as LCD.FMC_NWE.
PD4	PD4 is used as LCD.FMC_NOE.
PF0	PF0 is used as LCD.FMC_A0_RS.
PD14	PD14 is used as LCD.FMC_D0.
PD15	PD15 is used as LCD.FMC_D1.
PD0	PD0 is used as LCD.FMC_D2.
PD1	PD1 is used as LCD.FMC_D3.
PE7	PE7 is used as LCD.FMC_D4.
PE8	PE8 is used as LCD.FMC_D5.
PE9	PE9 is used as LCD.FMC_D6.
PE10	PE10 is used as LCD.FMC_D7.
PE11	PE11 is used as LCD.FMC_D8.
PE12	PE12 is used as LCD.FMC_D9.
PE13	PE13 is used as LCD.FMC_D10.
PE14	PE14 is used as LCD.FMC_D11.
PE15	PE15 is used as LCD.FMC_D12.
PD8	PD8 is used as LCD.FMC_D13.
PD9	PD9 is used as LCD.FMC_D14.
PD10	PD10 is used as LCD.FMC_D15.
PE1	PE1 is used as LCD_BL_CTRL.
PF1	PF1 is used as LCD.CTP_INT for the touch panel.
PA8	PA8 is used as LCD.TE.
PF14	PF14 is used as LCD.RST.
PF15	PF15 is used as CTP.RST.
PH0	PH0 is used to switch OFF the LCD power supplies.
PB6	PB6 is used as I2C1_SCL shared between ARDUINO®, Audio, STMod+, 3D ACC & 3D GYRO.
PB7	PB7 is used as I2C1_SDA shared between ARDUINO®, Audio, STMod+, 3D ACC & 3D GYRO.

Figure 21 shows the CN7 LCD connector pinout.

Figure 21. **CN7 LCD connector pinout**

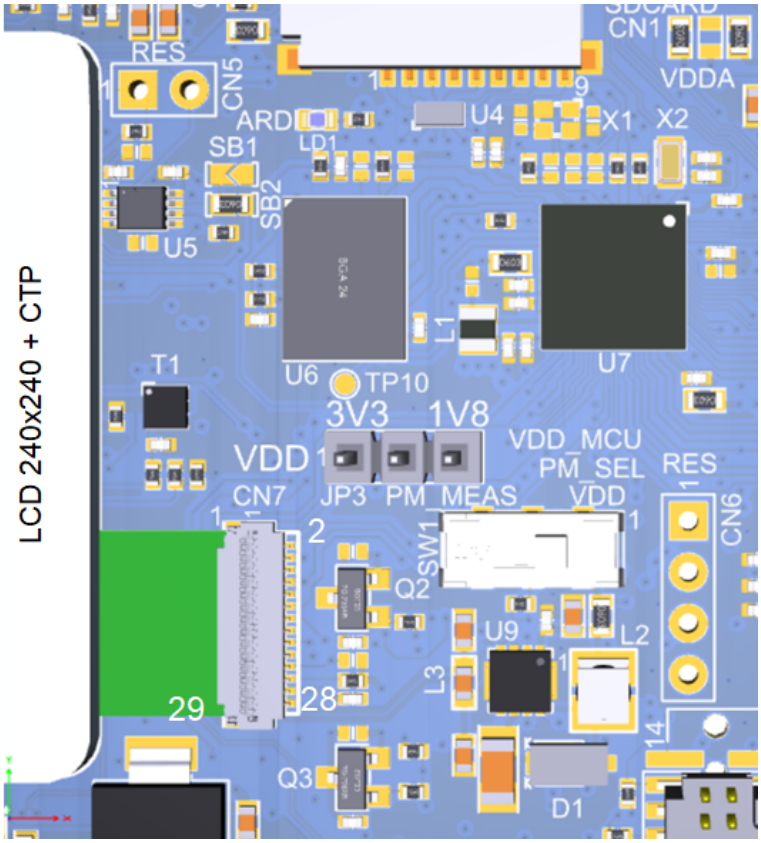


Table 26 describes the CN7 LCD interface and connector pinout.

Table 26. **CN7 LCD connector pinout**

Function	STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin	Function
GND	-	GND	GND	1	2	FMARK	LCD.TE	PA8	LCD.TE
D15	PD10	LCD.FMC_D15	DB15	3	4	DB14	LCD.FMC_D14	PD9	D14
D13	PD8	LCD.FMC_D13	DB13	5	6	DB12	LCD.FMC_D12	PE15	D12
D11	PE14	LCD.FMC_D11	DB11	7	8	DB10	LCD.FMC_D10	PE13	D10
D9	PE12	LCD.FMC_D9	DB9	9	10	DB8	LCD.FMC_D8	PE11	D8
D7	PE10	LCD.FMC_D7	DB7	11	12	DB6	LCD.FMC_D6	PE9	D6
D5	PE8	LCD.FMC_D5	DB5	13	14	DB4	LCD.FMC_D4	PE7	D4
D3	PD1	LCD.FMC_D3	DB3	15	16	DB2	LCD.FMC_D2	PD0	D2
D1	PD15	LCD.FMC_D1	DB1	17	18	DB0	LCD.FMC_D0	PD14	D0
NOE	PD4	LCD.FMC_NOE	RDn	19	20	WRn	LCD.FMC_NWE	PD5	NWE
RS	PF0	LCD.FMC_A0_RS	RS	21	22	CS	LCD.FMC_CS	PD7	CS
LCD_RST	PF14	LCD.RST	RESET	23	24	IM	IM	-	IM
IOVCC	-	VDD_LCD	IOVCC	25	26	VCI	3V3_LCD	-	VCI
GND	-	GND	GND	27	28	LEDA	LEDA	-	LEDA
LEDK	-	LEDK	LEDK	29	-	-	-	-	-

Figure 22 shows the CN14 touch panel connector pinout.

Figure 22. CN14 LCD touch panel connector pinout

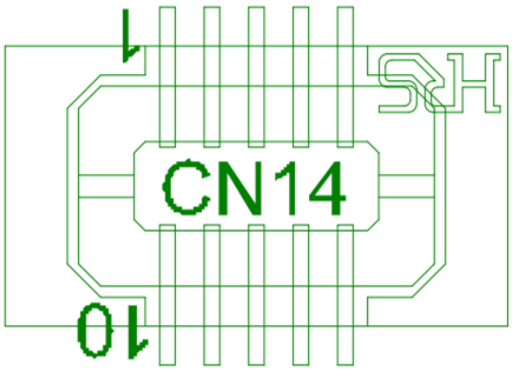


Table 27 describes the CN14 touch panel interface and connector pinout.

Table 27. CN14 touch panel connector pinout

Function	STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin	Function
GND	-	GND	GND	1	10	GND	GND	-	GND
CTP_INT	PF1	LCD.CTP_INT	INT	2	9	VDD	VDD_LCD	-	VDD
GND	-	GND	GND	3	8	IOVCC	VDD_LCD	-	IOVCC
I2C1_SDA	PB7	I2C1_SDA	SDA	4	7	RESET	LCD.CTP_RST	PF15	LCD.RST
I2C1_SCL	PB6	I2C1_SCL	SCL	5	6	GND	GND	-	GND

6.16 Pmod™ connector

6.16.1 Description

The CN4 Pmod™ standard connector is in the STM32L562E-DK board to support flexibility in small form factor application. The Pmod™ connector implements the Pmod™ type 2A and 4A on the STM32L562E-DK board.

6.16.2 Operating voltage

The Pmod™ module is directly supplied by 3.3 V. VDD and VDD_MCU must be set to 3.3 V to be I/O compatible with the Pmod™ module.

6.16.3 Pmod™ interface

A quad SPDT switch driven by two I/Os is used to connect three different interfaces: SPI, UART, and mikroBUS™ interfaces to the Pmod™ connector.

Table 28 describes the I/O configuration to select the SPI, the UART or the mikroBUS™ interface on PMO connector.

Table 28. I/O configuration for the Pmod™ interface

I/O PF12 STMod+ SEL_34	I/O PF11 STMod+ SEL_12	Configuration(1)
0	0	SPI interface PB13/PB5/PB4/PG9 used for SPI mode
0	**1**	**mikroBUS™ interface PC10/PC11 for UART mode and PB13/PG9 for SPI mode**
1	0	Not used
1	1	UART interface PB13/PC10/PC11/PD2 used for UART mode

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

Figure 23 shows the Pmod™ connector pinout.

Figure 23. CN4 Pmod™ connector pinout

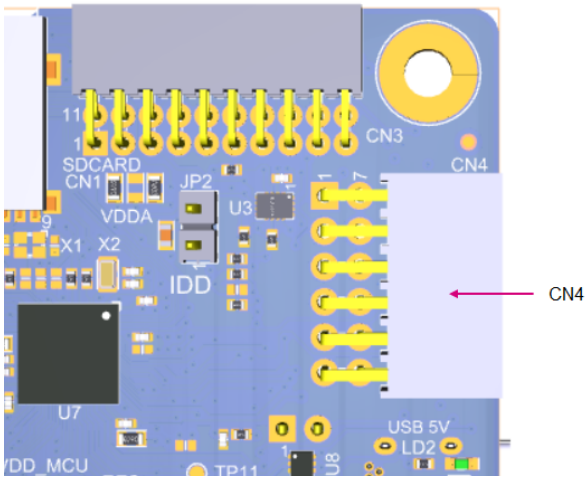


Table 29 describes the Pmod™ interface and connector pinout.

Table 29. CN4 Pmod™ connector pinout

Function	STM32 pin	Signal name	Pin name	Pin	Pin	Pin name	Signal name	STM32 pin	Function
SPI3 USART3	PB13 PB13	SPI_NSS UART_CTS	1	1	7	7	PMOD_INT	PF5	INT5
SPI3 USART3	PB5 PC10	SPI_MOSI UART_TX	2	2	8	8	PMOD_RST	PC9	Reset
SPI3 USART3	PB4 PC11	SPI_MISO UART_RX	3	3	9	9	NC	NC	NC
SPI3 USART3	PG9 PD2	SPI_SCK UART_RTS	4	4	10	10	NC	NC	NC
GND	-	GND	5	5	11	11	GND	-	GND
Power	-	VDD	6	6	12	12	VDD	-	Power

6.16.4 I/O restriction to other features

Caution: Due to the sharing of some I/Os of STM32L562QEI6QU by multiple peripherals, the following limitations apply in using the Pmod™ features:

- The Pmod™ cannot be operated simultaneously with the UCPD function.
- The Pmod™ cannot be operated simultaneously with the STMod+ function.
- The Pmod™ cannot be operated simultaneously with the SD card function.

6.17 STMod+ connector

6.17.1 Description

The CN3 STMod+ standard connector is on the STM32L562E-DK board to support flexibility in small form factor application. The STMod+ expansion connector supports the fan-out expansion board (MB1280) for Wi-Fi®, Grove and mikroBUS™ compatible connectors

6.17.2 Operating voltage

The STMod+ module is directly supplied by 5V. STM32L562E-DK I/O level can be set according to STMod+ module 3.3 V. The fan-out board also embeds a 3.3 V regulator and I^2C level shifters. For more detailed information, refer to ST fan-out board user manual and to relevant datasheets of associated modules.

6.17.3 STMod+ interface

A quad SPDT switch driven by two I/Os is used to connect three different interfaces: SPI, UART, and mikroBUS™ interface to the STMod+ connector.

Table 30 describes the I/O configuration to select the SPI, UART or mikroBUS™ interface to the STMod+ connector.

For more detailed information about the MB1280 fan-out board, refer to Section 6.20 Fan-out board (MB1280).

Table 30. I/O configuration for the STMod+ interface

IO PF12 STMod+ SEL_34	IO PF11 STMod + SEL_12	Configuration(1)
0	0	SPI interface PB13/PB5/PB4/PG9 used for SPI mode
0	**1**	**mikroBUS™ interface PC10/PC11 for UART mode and PB13/PG9 for SPI mode**
1	0	Not used
1	1	UART interface PB13/PC10/PC11/PD2 used for UART mode

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

Figure 24 shows the STMod+ connector pinout.

Figure 24. **CN3 STMod+ connector pinout**

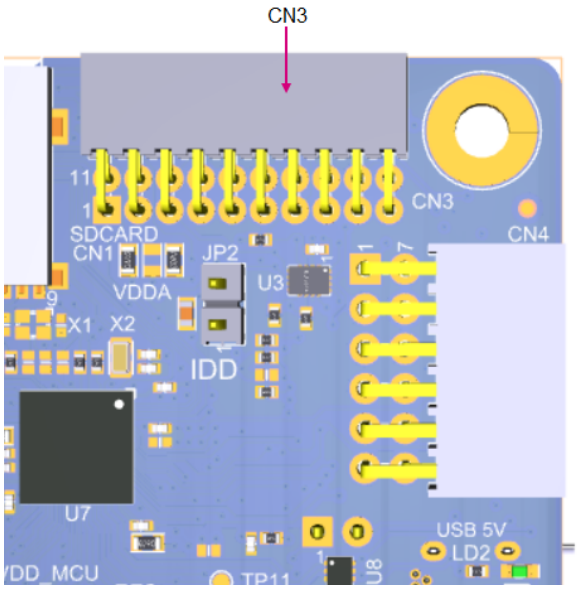


Table 31 describes the CN3 STMod+ interface and connector pinout.

Table 31. **CN3 STMod+ interface and connector pinout**

MCU Function	STM32 pin	Function	Pin	Pin	Function	STM32 pin	MCU Function
SPI3 USART3	PB13 PB13	SPI_NSS UART_CTS	1	11	PMOD_INT	PF5	INT5
SPI3 USART3	PB5 (1) PC10	SPI_MOSIp UART_TX	2	12	PMOD_RST	PC9	Reset
SPI3 USART3	PB4 PC11	SPI_MISOp UART_RX	3	13	STMod+ ADC	PA0	ADC1_IN5
SPI3 USART3	PG9 PD2	SPI_SCK UART_RTS	4	14	STMod+ _TIM	PC8	TIM8_CH3
GND	-	GND	5	15	5V	-	Power
Power	-	5V	6	16	GND	-	GND
I2C1	PB6	I2C1_SCL	7	17	DFSDM1_DATIN1	PB12	DFSDM
SPI3	PD6	SPI3_MOSIs	8	18	DFSDM1_CKOUT	PG7	DFSDM
SPI3	PG10	SPI3_MISOs	9	19	DFSDM1_DATIN3	PC7	DFSDM
I2C1	PB7	I2C1_SDA	10	20	DFSDM1_CKOUT	PG7	DFSDM

1. *To use PB5 as SPI_MOSI, it is recommended to remove JP5 to disconnect the USB_DBn function.*

6.17.4 I/O restriction to other features

Caution: Due to the sharing of some I/Os of STM32L562QEI6QU by multiple peripherals, the following limitations apply in using the STMod+ features:

- The STMod+ cannot be operated simultaneously with the UCPD function.
- The STMod+ cannot be operated simultaneously with the Pmod™ function.
- The STMod+ cannot be operated simultaneously with the SDCARD function.

- The STMod+ cannot be operated simultaneously with the ARDUINO® function.
- The STMod+ cannot be operated simultaneously with onboard MEMS and module CN2 MEMS.

6.18 ARDUINO® connectors

6.18.1 Description

The ARDUINO® Uno V3 connectors (CN11, CN12, CN18, and CN19) are available on the STM32L562E-DK board. Most shields designed for ARDUINO® can fit with the STM32L562E-DK Discovery kit to offer flexibility in small form factor application

6.18.2 Operating voltage

The ARDUINO® Uno V3 connector supports 5 V, 3.3 V and VDD for I/O compatibility. VIN, voltage range from 7 to 12 V is also available to supply the STM32L562E-DK Discovery kit from an ARDUINO® shield. Section 6.3 Power supply provides information on how to use the powering option.

6.18.3 ARDUINO® interface

Figure 25 shows the ARDUINO® connector pinouts.

Figure 25. ARDUINO® connector pinouts

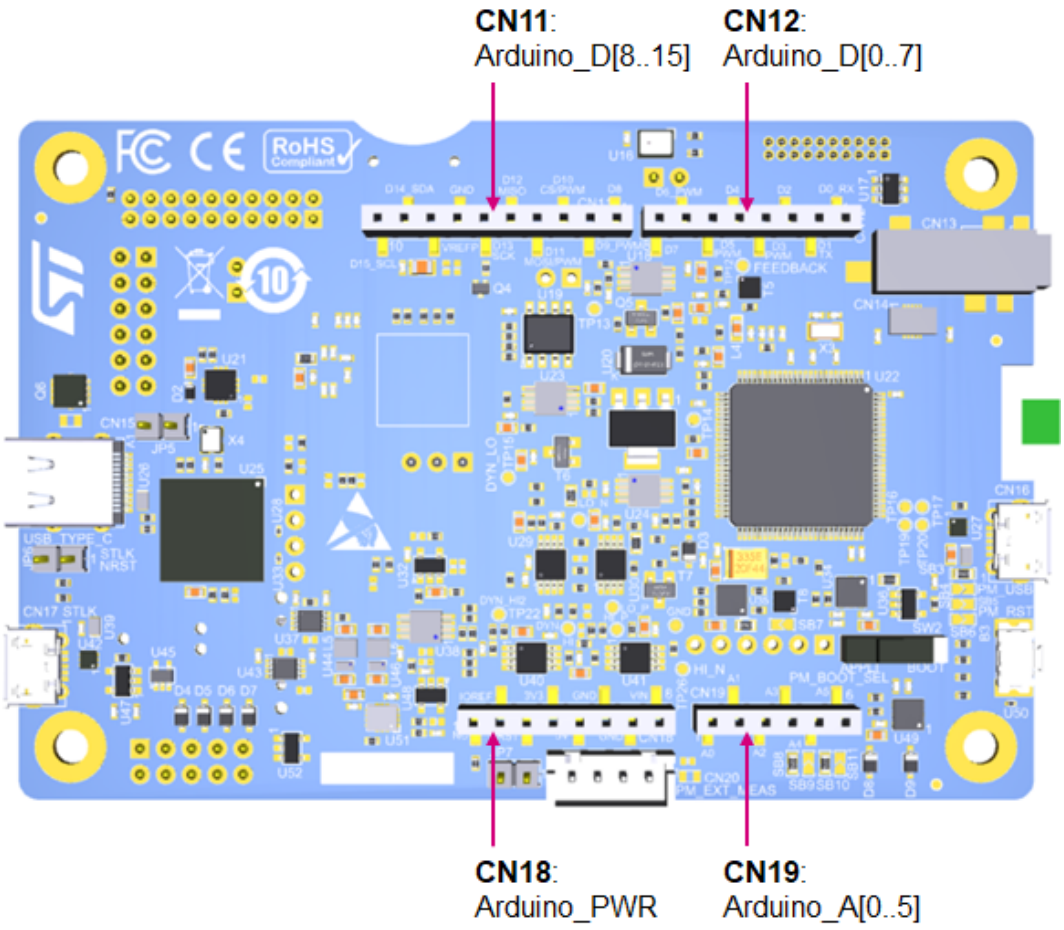


Table 32 describes the I/O configuration for the ARDUINO® interface.

Table 32. I/O configuration for the ARDUINO® interface

I/O	HW	Configuration[1]
PA0	-	PA0 is used as ARD.A0: ADC1_IN5. shared with STMod+.
PA1	-	PA1 is used as ARD.A1: ADC1_IN6.
PA4	R33 OFF	PA4 is used as ARD.A2: ADC1_IN9 only.
	R33 ON	**PA4 is used as ARD.A2: ADC1_IN9.** **Shared with USB_C.VBUS_SENSE**
PA5	-	PA5 is used as ARD.A3: ADC1_IN10.
PC4	-	PC4 is used as ARD.A4: ADC1_IN13.
PC5	-	PC5 is used as ARD.A5: ADC1_IN14.
PB10	R125 OFF	PB10 is not used as ARD.D0: PB10 can be used for VCP UART.
	R125 ON	**PB10 is used as ARD.D0: LPUART1_RX.**
PA10	**R124 OFF**	**PA10 is not used as ARD.D0:** **PA10 is used for VCP UART.**
	R124 ON	PA10 can be used as ARD.D0: USART1_RX
PB11	R133 OFF	PB11 is not used as ARD.D1: LPUART1_TX. PB11 can be used for VCP UART.
	R133 ON	**PB11 is used as ARD.D1: LPUART1_TX.**
PA9	**R131 OFF**	**PA9 is not used as ARD.D1: USART1_TX.** **PA9 is used for VCP UART.**
	R131 ON	PA9 can be used as ARD.D1: USART1_TX.
PD11	-	PD11 is used as ARD.D2: I/O.
PD12	-	PD12 is used as ARD.D3: TIM4_CH1.
PF4	-	PF4 is used as ARD.D4: INT.
PD13	-	PD13 is used as ARD.D5: TIM4_CH2.
PB8	-	PB8 is used as ARD.D6: TIM4_CH3.
PC6	-	PC6 is used as ARD.D7: I/O.
PG0	-	PG0 is used as ARD.D8: I/O.
PB9	-	PB9 is used as ARD.D9: TIM4_CH4.
PE0	-	PE0 is used as ARD.D10: SPI_CSn and TIM16_CH1.
PB5	-	PB5 is used as ARD.D11: SPI3_MOSI and TIM3_CH2 shared with UCPD, Pmod™ and STMod+.
PB4	-	PB4 is used as ARD.D12: SPI3_MISO shared with Pmod™ and STMod+.
PG9	-	PG9 is used as ARD.D13: SPI3_SCK shared with Pmod™ and STMod+.
PB7	-	PB7 is used as ARD.D14: I2C1_SDA shared between STMod+, Audio, LCD, and 3D accelerometer and 3D gyrometer.
PB6	-	PB6 is used as ARD.D15: I2C1_SCL shared between STMod+, Audio, LCD, and 3D accelerator and 3D gyrometer.

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

Table 33 describes the ARDUINO connector pinout.

Table 33. **ARDUINO® connector pinout**

Connector	Pin names	Function	STM32 pin	MCU Function
CN18	1	NC	-	NC (reserved for the test)
	2	VDD	-	IOREF (VDD 1V8 or 3V3)
	3	NRST	NRST	NRST
	4	3V3	-	3V3
	5	5V	-	5V
	6	GND	-	GND
	7	GND	-	GND
	8	VIN	-	VIN 7V-12V
CN19	1	ARD_ADC.A0	PA0	ADC1_IN5
	2	ARD_ADC.A1	PA1	ADC1_IN6
	3	ARD_ADC.A2	PA4	ADC1_IN9
	4	ARD_ADC.A3	PA5	ADC1_IN10
	5	ARD_ADC.A4	PC4	ADC1_IN13
	6	ARD_ADC.A5	PC5	ADC1_IN14
CN12	1	ARD_D0	**PB10**/PA10	**LPUART1_RX** / USART1_RX
	2	ARD_D1	**PB11**/PA9	**LPUART1_TX** / USART1_TX
	3	ARD_D2	PD11	I/O
	4	ARD_D3	PD12	TIM4_CH1
	5	ARD_D4	PF4	INT4
	6	ARD_D5	PD13	TIM4_CH2
	7	ARD_D6	PB8	TIM4_CH3
	8	ARD_D7	PC6	I/O
CN11	1	ARD_D8	PG0	I/O
	2	ARD_D9	PB9	TIM4_CH4
	3	ARD_D10	PE0	SPI_CSn and TIM16_CH1
	4	ARD_D11	PB5	SPI3_MOSI and TIM3_CH2
	5	ARD_D12	PB4	SPI3_MISO
	6	ARD_D13	PG9	SPI3_SCK / ARD LED(1)
	7	GND	-	GND
	8	VREFP	-	VREFP (AVDD)
	9	ARD_D14	PB7	I2C1_SDA
	10	ARD_D15	PB6	I2C1_SCL

1. *A blue LED is connected to ARD-D13. This LED can be disconnected by removing the resistor R87 to help to increase SPI frequency communication.*

6.19 MCU energy meter tools

6.19.1 Description

The STM32L562E-DK Discovery kit embeds energy meter tools.

This function is performed with the support of the U22 STM32L496VGT6 MCU. The energy meter tools included on the STM32L562E-DK are a part of the standalone board X-NUCLEO-LPM01A, also called PowerShield.

The X-NUCLEO-LPM01A expansion board is a programmable power supply source, from 1.8 to 3.3 V, with advanced power consumption measurement capability.

6.19.2 Operating voltage

The power metering part is independent and has its own power supplies, 3V3_PM, and 3V3_MCU_PM for the STM32L562QEI6QU.

6.19.3 IDD measurement

The STM32L562E-DK Discovery kit has a circuit to measure the STM32L562QEI6QU current consumption (IDD) within a range of 300 nA to 150 mA.

In order to measure MCU current lower than 300 nA, a JP2 jumper can be configured to use an external ammeter.

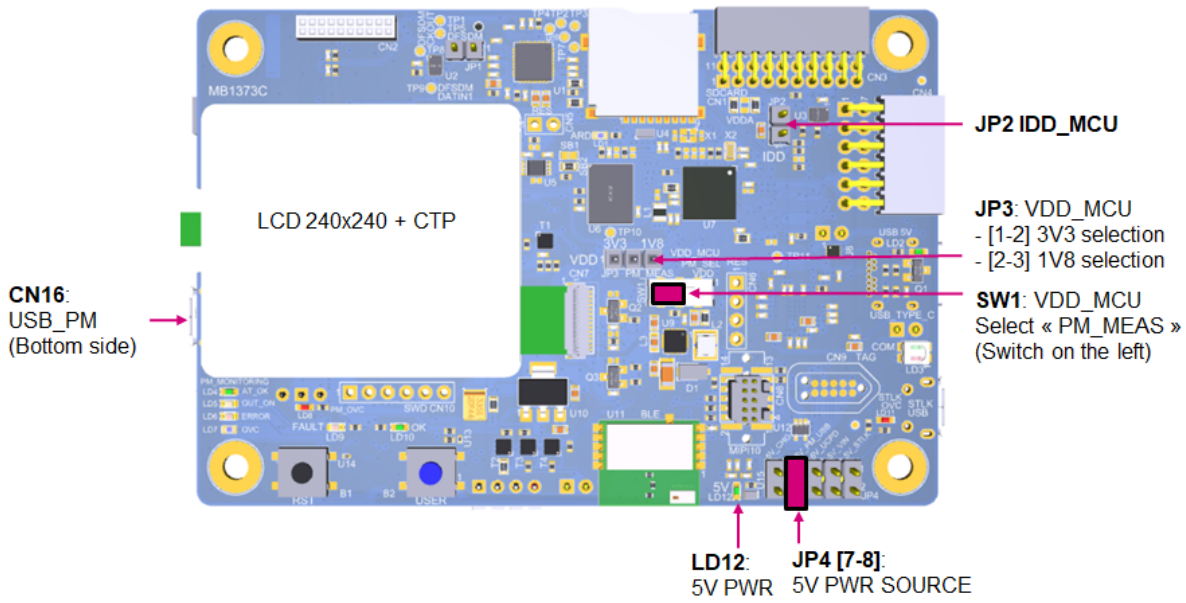
The recommendations for the power metering measurement are the following ones:

- Supply the STM32L562E-DK Discovery kit with USB_PM through the CN16 USB connector.
- Set JP4 jumper [7-8] to select 5V_PM power.
- Keep JP3 to correct voltage, to be aligned with energy metering setting: 1.8 or 3.3 V for the device I/O compatibility. By default, the energy meter tools start at 3.3 V.
- Keep the jumper on JP2 header (to measure a current below 300nA, remove it and add an external ammeter connected on JP2).
- Set the SW1 switch to PM_MEAS position, to perform the current consumption measurement.

Section 6.3 Power supply provides information on how to use the powering option.

Figure 26 shows the energy metering hardware configuration.

Figure 26. Energy metering hardware configuration



6.19.4 Energy meter firmware update

The Energy meter firmware can be upgraded with the following procedure:

1. Get the PowerShield firmware binary file on www.st.com: firmware binary file has the extension “.dfu” standing for Device Firmware Upgrade (DFU).
2. Download and install USB-DFU driver and utility: software reference: STSW-STM320803.
3. Set board in bootloader mode: Set switch SW2 to “BOOT” mode.
4. Download file “.dfu” with USB-DFU utility software. Connect energy meter part with a USB cable on CN16, launch USB-DFU utility software. Only two buttons to use:
   – “Choose”: Load the “.dfu” file
   – “Upgrade”: Upgrade into STM32L496VGT6 Flash memory
5. Set board in application mode (SW2 on the left to “APPLI”). Reset board by pressing button “RESET” or unplug and plug the USB cable.

Figure 27. Energy metering firmware update hardware

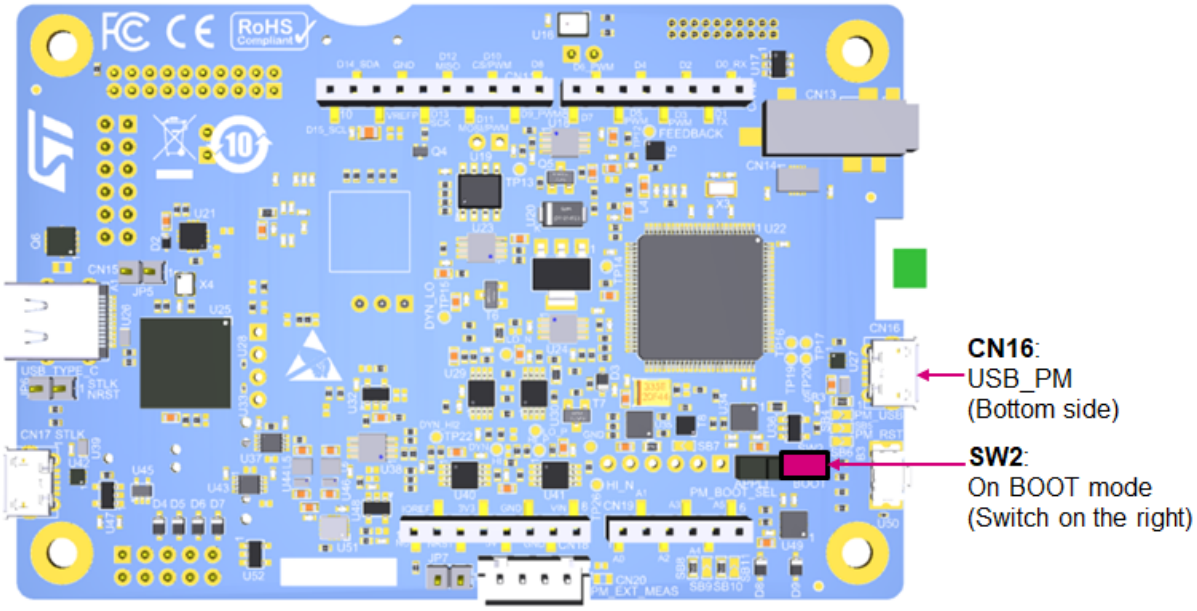
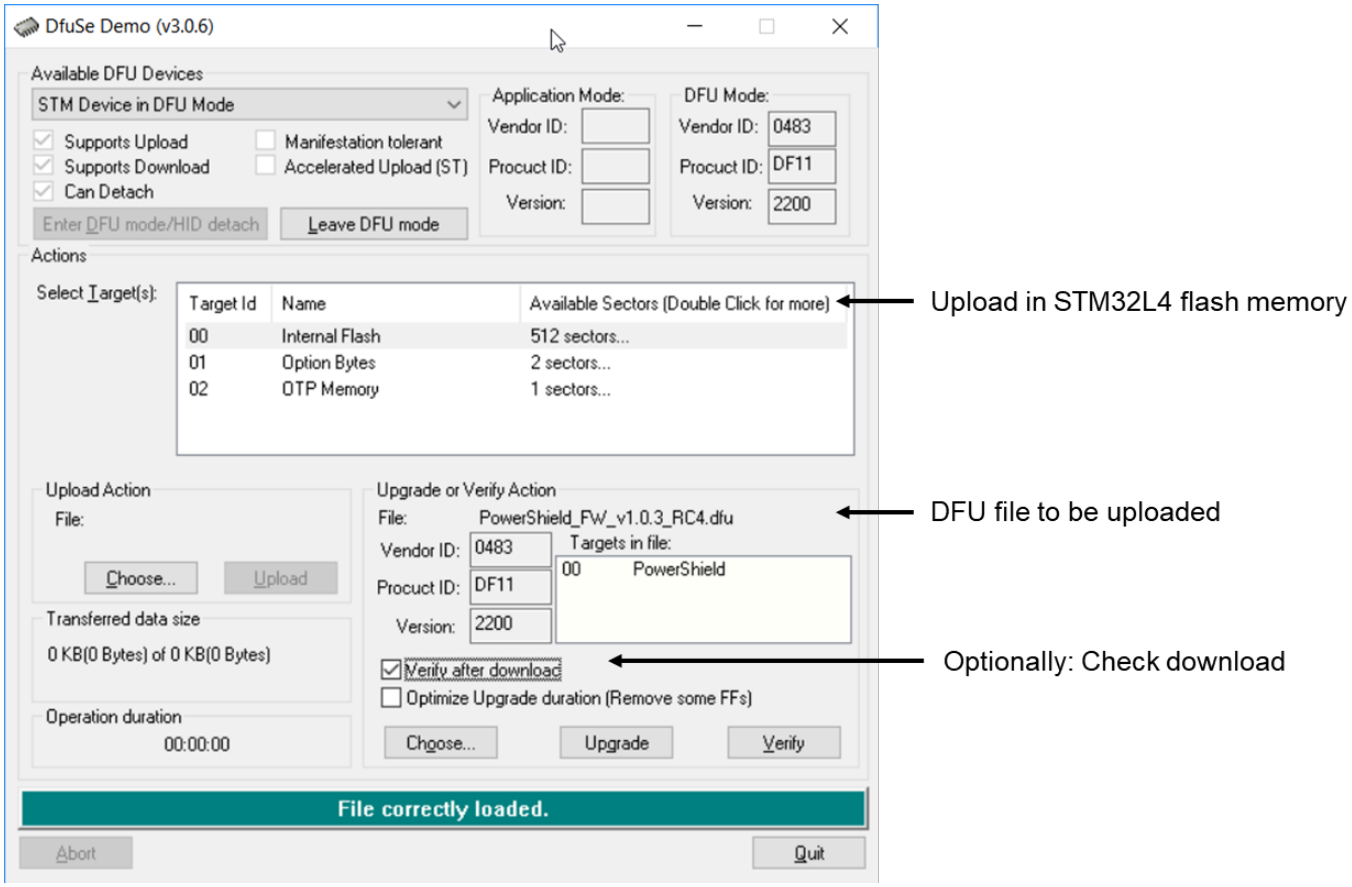


Figure 28. **Energy metering firmware upgrade software**



For more information about energy meter measurement firmware update, refer to the user manual *Getting started with PowerShield firmware* UM2269.

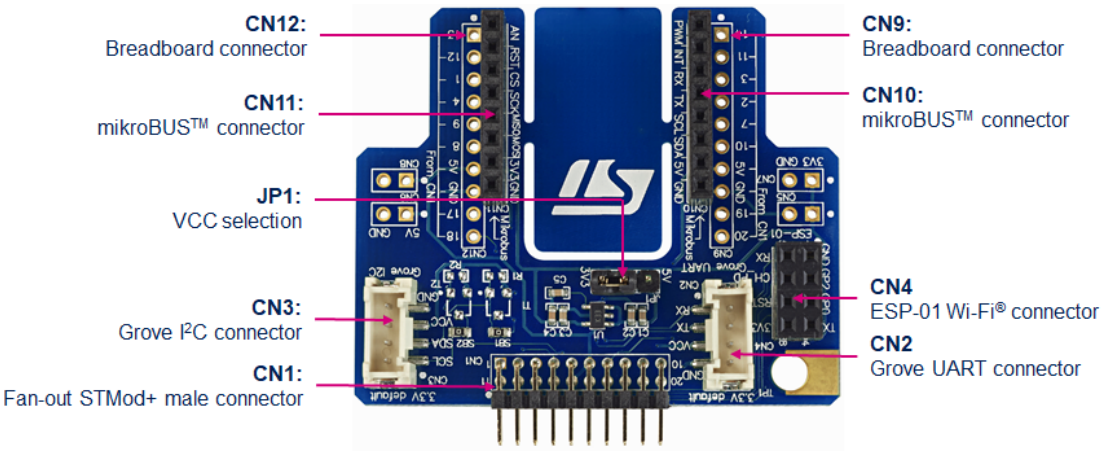
6.20 Fan-out board (MB1280)

The fan-out board, shown in Figure 29, is included in the STM32L562E-DK Discovery kit. It can be connected to STMod+ connector (CN3) and it provides access to:

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

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

Figure 29. **STMod+ fan-out board plugged into CN1 connector**



6.20.1 MikroElektronika mikroBUS™ compatible connector (Fan-out CN10 / CN11)

The mikroBUS™ compatible connector is 2.54" pitch with a pair of 1x8-pin female connectors. Table 34 shows the assignment of CN10 and CN11 mikroBUS™ connectors.

Table 34. **Description of the mikroBUS™ connector pins**

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

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

6.20.2 ESP-01 Wi-Fi® board compatible connector

The ESP-01 Wi-Fi® board connector is 2.54"-pitch with 2x4-pin female connectors. Table 35 shows the definition of the pins.

Table 35. **Description of the ESP-01 Wi-Fi® connector pins**

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

6.20.3 Compatible connectors for the Grove boards

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

Warning:

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

6.20.3.1 *Compatible connectors for I²C Grove boards (Fan-out CN3)*

The CN3 connector is compatible with the Grove barometer sensor (BMP180) and the Grove LCD RGB backlight boards using a cable for connection. Table 36 shows the definition of the pins.

Table 36. Description of the I²C Grove board CN3 connector pins

STMod+ connector number	CN3 Grove function	Pin number
STMod+#7-SCL (*)	SCL	1
STMod+#10-SDA (*)	SDA	2
STMod+#6#15 +5 V	VCC	3
STMod+#5#16 GND	GND	4

6.20.3.2 *Compatible connector for UART Grove boards (Fan-out CN2)*

The CN2 connector is compatible with Grove NFC boards using a cable for connection. Table 37 shows the definition of the pins.

Table 37. Description of the UART Grove board CN2 connector pins

STMod+ connector number	CN2 Grove function	Pin number
STMod+#3-RX	RX (Grove TX)	1
STMod+#2-TX	TX (Grove RX)	2
STMod+#6#15 +5 V	VCC	3
STMod+#5#16 GND	GND	4

7 Limitation

7.1 RSS and bootloader limitation

Issue observed:

The STM32L5 part soldered on STM32L562E-DK that embeds the bootloader V9.0 is affected by the limitations described in Section 6.4.1 RSS limitation.

Proposed workaround:

Refer to Section 6.4.1 RSS limitation to detail workaround.

Parts impacted:

This applies only to the STM32L562E-DK with the finished good (FG) DK32L562E$AT1 (sticker available on the top side of the board).

7.2 SMPS limitation

Issue observed:

The STM32L5 part soldered on STM32L562E-DK embeds an internal SMPS. The sample revision rev B embeds two SMPS limitations: SMPS regulation loss upon transiting into SMPS LP mode, and unpredictable SMPS state at power-on. Refer to errata sheet *STM32L552xx/562xx device errata* (ES0448) for more details.

Proposed workaround:

Refer to errata sheet *STM32L552xx/562xx device errata* (ES0448).

Parts impacted:

This applies only on the STM32L562E-DK with the finished good (FG) DK32L562E$AT1 (Sticker available on the top side of the board).

Appendix A STM32L562E-DK jumper summary

Figure 30 and Figure 31 summarize the default setting of the STM32L562E-DK jumpers and switches.

Figure 30. Default jumper and switch setting of the STM32L562E-DK (top view)

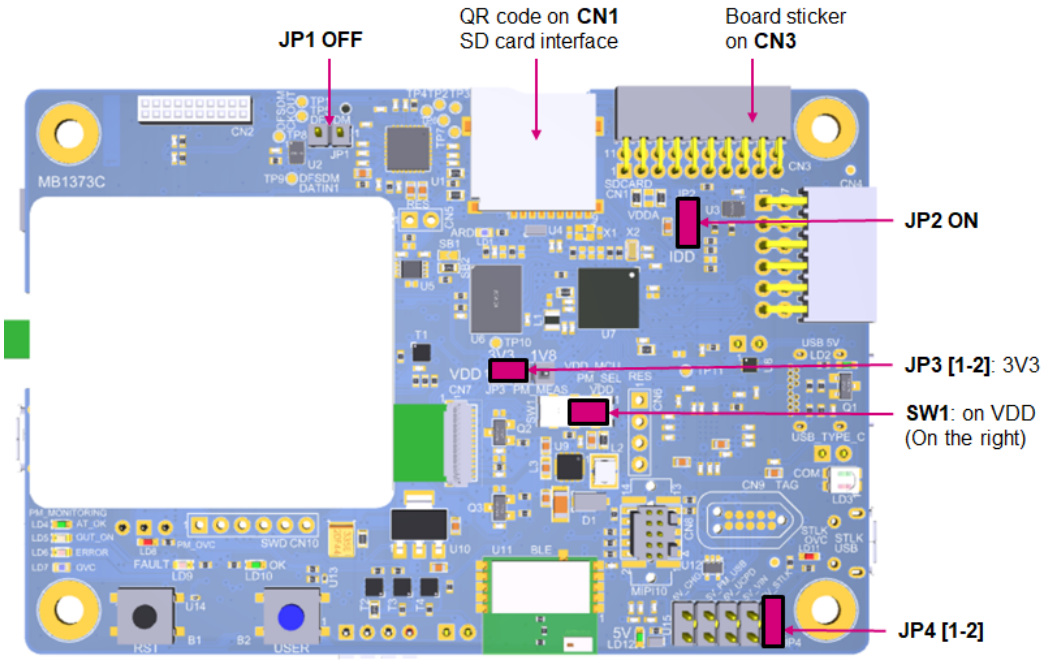
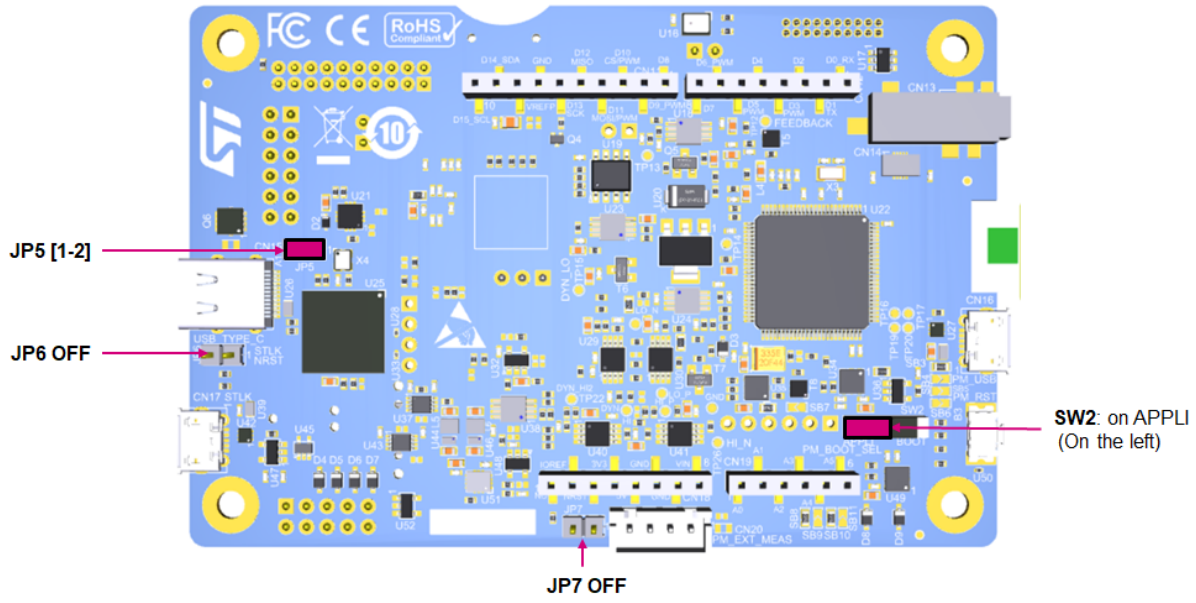


Figure 31. Default jumper and switch setting of the STM32L562E-DK (bottom view)



Appendix B STM32L562E-DK I/O assignment

Table 38. **STM32L562E-DK I/O assignment**

BGA pinout	Pin name	Main function pinout assignment	Optional function pinout assignment
A1	PE5	SAI.SCK_A	-
A2	PE3	SAI.SD_B	-
A3	PE1	LCD.BL_CTRL	-
A4	PB9	ARD.D9_TIM	-
A5	PB6	I2C1_SCL	-
A6	PG12	LED_GREEN	-
A7	PD6	-	STMod+ 8_SPI_MOSIs
A8	PD5	LCD.FMC_NWE	-
A9	PD2	SDIO.CMD	STMod+ 4_UART_RTS
A10	PC11	SDIO.D3	STMod+ 3_UART_RX
A11	PA15	USB_C.CC1	T.JTDI
A12	VDDUSB	POWER / VDD_USB	-
B1	VBAT	POWER / VBAT	-
B2	PE4	SAI.FS_A	-
B3	PE2	SAI.MCLK_A	-
B4	V15	POWER / V15SMPS	-
B5	PH3	PH3_BOOT0	-
B6	PB4	ARD.D12_SPI_MISO	STMod+ 3_SPI_MISOp
B7	PG9	ARD.D13_SPI_SCK	STMod+ 4_SPI_SCK
B8	PD4	LCD.FMC_NOE	-
B9	PD1	LCD.FMC_D3	-
B10	PC12	SDIO.CLK	-
B11	PC10	SDIO.D2	STMod+ 2_UART_TX
B12	PA12	USB_C.FS_P	-
C1	PC14	PC14-OSC32_IN	-
C2	PE6	SAI.SD_A	-
C3	PC13	USER BUTTON (WKUP2)	PM_WAKE-UP
C4	PE0	ARD.D10_TIM_SPI_CSN	-
C5	PB8	ARD.D6_TIM	-
C6	PB3	T.SWO	-
C7	PG10	-	STMod+ 9_SPI_MISOs
C8	PD3	LED_RED	-
C9	PD0	LCD.FMC_D2	-
C10	PA13	T.SWDIO	-
C11	PA14	T.SWCLK	-
C12	PA11	USB_C.FS_N	-

BGA pinout	Pin name	Main function pinout assignment	Optional function pinout assignment
D1	PC15	OSC32_OUT	-
D2	PF0	LCD.FMC_A0_RS	-
D3	PF3	GYRO_ACC_INT	-
D4	VDD	POWER / VDD_MCU	-
D5	PB7	I2C1_SDA	-
D6	PB5	USB_C.DBn ARD.D11_TIM_SPI_MOSI	STMod+ 2_SPI_MOSIp
D7	PD7	LCD.FMC_NE1_CS	-
D8	VDDIO	POWER / VDDIO2	-
D9	VDD	POWER / VDD_MCU	-
D10	PA9	T.VCP_TX	ARD.D1_TX
D11	PA10	T.VCP_RX	ARD.D0_RX
D12	PA8	LCD.TE	-
E1	PF2	SDIO.DETECT	-
E2	PF1	LCD.CTP_INT	-
E3	PF4	ARD.D4_INT	-
E4	VSS	POWER / GND	-
E9	VSS	POWER / GND	-
E10	PC7	DFSMD_DATIN3	-
E11	PC9	SDIO.D1	STMod+ 12_RST
E12	PC8	SDIO.D0	STMod+ 14_TIM
F1	PH0	LCD_PWR_ON	OSC_IN
F2	PF5	-	STMod+ 11_INT
F3	PC2	OCTOSPI.IO5	-
F4	PC3	OCTOSPI.IO6	-
F6	VSS	POWER / GND	-
F7	VDD	POWER / VDD_MCU	-
F9	PG6	BLE_INT	-
F10	PG7	DFSMD_CKOUT	-
F11	PC6	ARD.D7_IO	-
F12	PG8	BLE_RSTN	-
G1	PH1	MEMS_LED	OSC_OUT
G2	NRST	NRST	-
G3	PC1	OCTOSPI.IO4	-
G4	PA1	ARD.ADC_A1	-
G6	VDD	POWER / VDD_MCU	-
G7	VSS	POWER / GND	-
G9	PG4	SPI1.MOSI	-
G10	PG2	SPI1.SCK	-
G11	PG3	SPI1.MISO	-

BGA pinout	Pin name	Main function pinout assignment	Optional function pinout assignment
G12	PG5	SPI1.BLE_CS	-
H1	VSSA	POWER / GND	-
H2	PC0	OCTOSPI.IO7	-
H3	OPAM1_VINM	-	-
H4	VSS	POWER / GND	-
H9	VSS	POWER / GND	-
H10	PD14	LCD.FMC_D0	-
H11	PD13	ARD.D5_TIM	-
H12	PD15	LCD.FMC_D1	-
J1	VREFP	POWER / VREFP	-
J2	PA0	ARD_ADC.A0	STMod+ 13_ADC
J3	PC5	ARD_ADC.A5	-
J4	VDD	POWER / VDD_MCU	-
J5	PF14	LCD.RST	-
J6	PE8	LCD.FMC_D5	-
J7	PE10	LCD.FMC_D7	-
J8	PE12	LCD.FMC_D9	-
J9	VDD	POWER / VDD_MCU	-
J10	PD9	LCD.FMC_D14	-
J11	PD11	ARD.D2_IO	-
J12	PD12	ARD.D3_TIM	-
K1	VDDA	POWER / VDDA	-
K2	PA2	OCTOSPI.NCS	-
K3	PA7	OCTOSPI.IO2	-
K4	PB2	OCTOSPI.DQS	-
K5	PF11	-	STMod+ SEL_12
K6	PG1	AUDIO_RESETN	-
K7	PE7	LCD.FMC_D4	-
K8	PE14	LCD.FMC_D11	-
K9	PB10	ARD.D0_RX	T.VCP_RX
K10	PB13	-	STMod+ 1_UART_CTS / STMod+ 1_SPI_CSN
K11	PB14	USB_C.FLT	-
K12	PB15	USB_C.CC2	-
L1	PA3	OCTOSPI.CLK	-
L2	PA6	OCTOSPI.IO3	-
L3	PA4	ARD_ADC.A2	USB_C.VBUS_VSENSE
L4	PB1	OCTOSPI.IO0	-
L5	PF12	-	STMod+ SEL_34
L6	PF15	LCD.CTP_RST	-

BGA pinout	Pin name	Main function pinout assignment	Optional function pinout assignment
L7	PE11	LCD.FMC_D8	-
L8	PE15	LCD.FMC_D12	-
L9	PB11	ARC.D1_TX	T.VCP_TX
L10	VSS_SMPS	POWER / GND	-
L11	PB12	DFSDM_DATIN1	-
L12	PD8	LCD.FMC_D13	-
M1	PA5	ARD_ADC.A3	-
M2	OPAM2_VINM	-	-
M3	PC4	ARD_ADC.A4	-
M4	PB0	OCTOSPI.IO1	-
M5	PF13	-	-
M6	PG0	ARD.D8_IO	-
M7	PE9	LCD.FMC_D6	-
M8	PE13	LCD.FMC_D10	-
M9	VDD_SMPS	POWER / VDDSMPS	-
M10	VLX	POWER / VLX	-
M11	V15	POWER / V15SMPS	-
M12	PD10	LCD.FMC_D15	-

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

C.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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Americas Region Legal | Group Vice President and Regional Legal Counsel, The Americas
STMicroelectronics, Inc.
750 Canyon Drive | Suite 300 | Coppell, Texas 75019
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C.2 IC Compliance Statement

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

Compliance Statement

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

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

Déclaration de conformité

Avis: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

C.3 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.

Revision history

Table 39. **Document revision history**

Date	Revision	Changes
29-Nov-2019	1	Initial release.
28-Jan-2020	2	Added: • Section 7 Limitation Updated: • Section 6.4 RSS/bootloader

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