# UM3571

User manual

# Discovery kit with STM32MP215F MPU

## Introduction

The STM32MP215F-DK Discovery kit is designed as a complete demonstration and development platform for the STMicroelectronics STM32MP215F microprocessor, based on Arm® Cortex®-A35 up to 1.5 GHz and Cortex®-M33 at 300 MHz, and the STPMIC2L companion chip.

It leverages the capabilities of the STM32MP215F microprocessor for easy application development using STM32 MPU OpenSTLinux Distribution (such as STM32MP2Starter).

The STM32MP215F-DK Discovery kit, shown in Figure 1 and Figure 2, is used as a reference design for user application development. It cannot be considered as the hardware design of a final application. The hardware features of the Discovery kit are available for custom application development: 100-Mbit/s Ethernet, USB 2.0 Bus Powered, MIPI10 and STDC14 connectors, LCD LTDC display, CSI camera module, microSD™ card holder, and M.2 E-Key connector. Extension headers allow the easy connection of a third-party board for a specific application.

**Figure 1. STM32MP215F-DK top view**

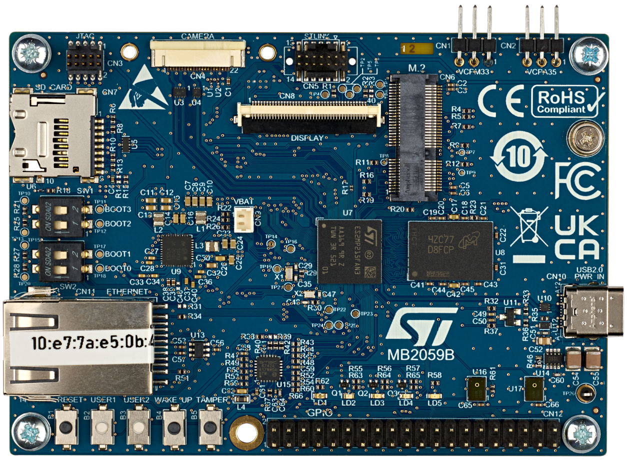
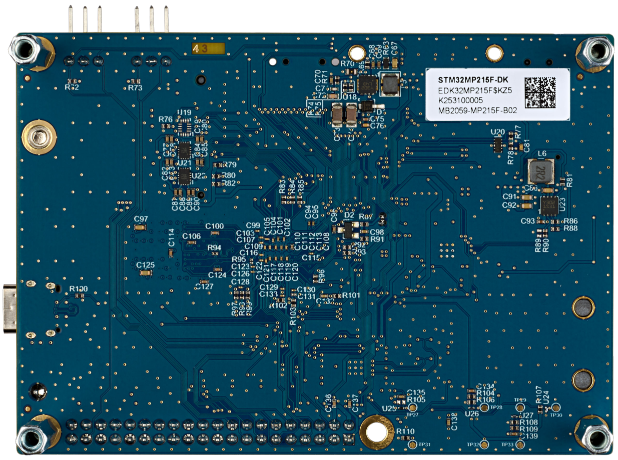


**Figure 2. STM32MP215F-DK bottom view**



*Pictures are not contractual.*

# 1 Features

- STM32MP215FAN3 microprocessor based on the Arm® Cortex®-A35 up to 1.5 GHz and Cortex®-M33 at 300 MHz in a VFBGA273 package
- STMicroelectronics power management STPMIC2L
- 16-Gbit LPDDR4 DRAM
- 100-Mbit/s Ethernet (RMII)
- USB 2.0 Bus Powered
- Four user LEDs
- Two user, one tamper, and one reset push-buttons
- Wake-up button
- Four boot pin switches
- Board connectors:
  - Ethernet RJ45
  - USB 2.0 USB Type-C®
  - microSD™ card holder
  - Dual-lane MIPI CSI-2® camera module expansion connector
  - LTDC display connector
  - M.2 E-Key connector to support Wi-Fi® and Bluetooth® SDIO modules
  - GPIO expansion connector
  - VBAT for power backup
  - MIPI10 JTAG connector
  - STDC14 connector for debug
- Mainlined open-source Linux® STM32 MPU OpenSTLinux Distribution and STM32CubeMP2 software with examples
- Linux® Yocto Project®, Buildroot, and STM32CubeIDE as development environments

*Note: Arm and Cortex are registered trademarks of Arm Limited (or its subsidiaries) in the US and/or elsewhere.*

# 2 Ordering information

To order the STM32MP215F-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 |
|---|---|---|
| STM32MP215F-DK | MB2059(1) | STM32MP215FAN3 |

*1. Subsequently called main board in the rest of the documentation.*

## 2.1 Codification

The meaning of the codification is explained in Table 2.

**Table 2. Codification explanation**

| STM32MP2XXY-DK | Description | Example: STM32MP215F-DK |
|---|---|---|
| STM32MP2 | MPU series in STM32 Arm Cortex MPUs | STM32MP2 series |
| XX | MPU product line in the series | STM32MP215 product line |
| Y | Option:<br>• F: Secure boot, cryptography hardware, maximal frequency | Secure boot, cryptography hardware, 1.5 GHz |
| DK | Toolkit type:<br>• DK: Discovery kit | Discovery kit |

# 3 Development environment

## 3.1 System requirements

- Multi-OS support: Windows® 10 or 11, Linux® 64-bit, or macOS®
- USB Type-A or USB Type-C® to USB Type-C® cable

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

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

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

## 3.2 Development tools

- Linux® Yocto Project®
- Buildroot
- STMicroelectronics - STM32CubeIDE

## 3.3 Demonstration software

The STM32 MPU OpenSTLinux Distribution and STM32CubeMP2 base demonstration software demonstrates 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 EDA resources

All board design resources, including schematics, EDA databases, manufacturing files, and the bill of materials, are available from the STM32MP215F-DK product page at *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 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 |
| Capacitor Cx ON | Capacitor soldered |
| Capacitor Cx OFF | Capacitor not soldered |

# 5 Safety recommendations

## 5.1 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.

## 5.2 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 injury.
- 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 it close to water or at a high humidity level.
- Do not operate the board if it is dirty or dusty.
- The pins of the board are exposed and must not come into contact with a metal surface, as this can produce a short circuit and damage the board.

## 5.3 Delivery recommendations

Before the first use, inspect the board for any damage that may have occurred during shipment. Ensure that all socketed components are securely fixed in their sockets and that nothing is loose in the plastic bag.

## 5.4 Power supply

A power supply unit or auxiliary equipment complying with the EN 62368-1:2014+A11:2017 standard (or the one replacing it) and safety extralow voltage (SELV/ES1) with limited power capability (LPS/PS2) must power this equipment.

# 6 Quick start

Before installing and using the product, accept the evaluation product license agreement from the *www.st.com/epla* webpage.

## 6.1 Getting started

Follow the sequence below to configure the STM32MP215F-DK Discovery kit and launch the demonstration application (refer to Figure 4 and Section 7.2 for component location).

To start using this board, follow the steps below:

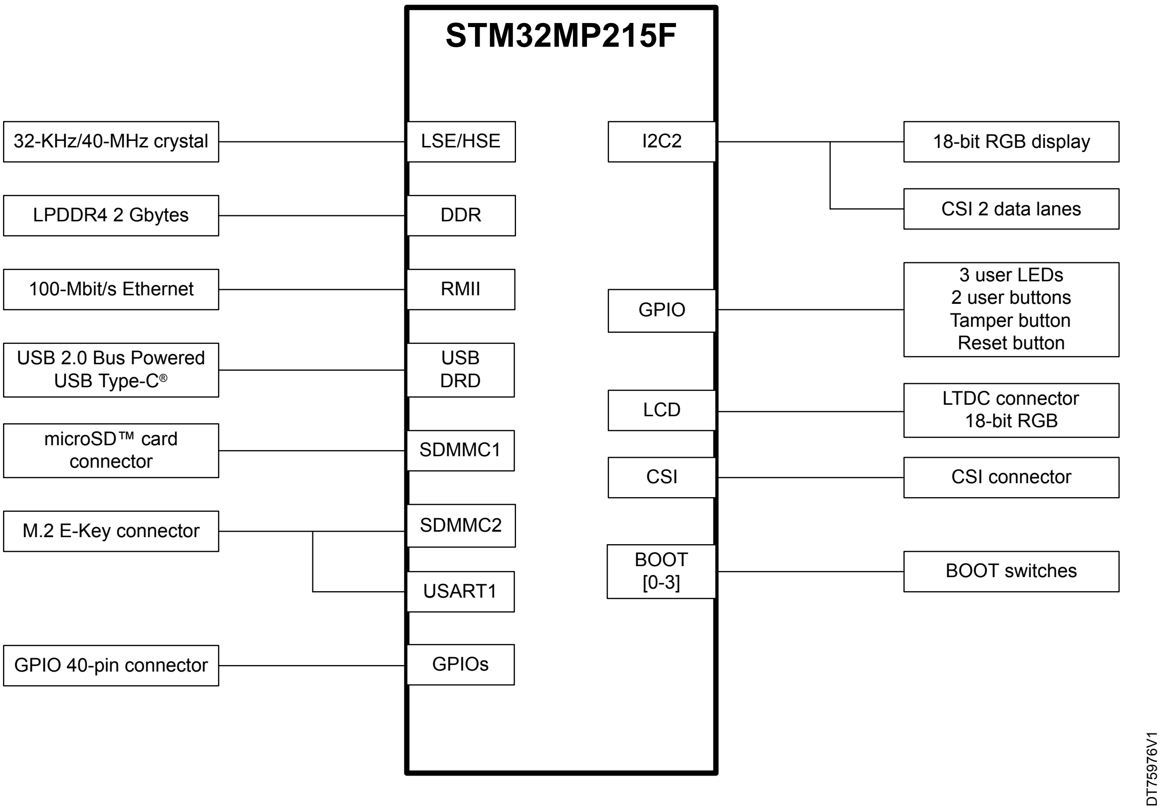
- To identify all device interfaces from the host PC, install the evaluation USB driver available from *www.st.com* before connecting the board.
- Install the software Starter Package, which allows the use of the evaluation features and is available from the STM32MP2 series webpage.
- Program an SD card (not provided) using the STM32MP215F-DK Discovery kit and STM32CubeProgrammer.
- Use the SD card to boot the image.
- Follow the detailed instructions on the Let's start wiki page.

# 7 Hardware layout and configuration

## 7.1 Hardware block diagram

STM32MP215F-DK is designed around the STM32MP215FAN3 microprocessor in the VFBGA273 package. The hardware block diagram (refer to Figure 3) illustrates the connection between the microprocessor and its peripherals, such as 100-Mbit/s Ethernet, CSI camera connector, USB Type-C® Bus Powered connector, GPIO expansion, and M.2 E-Key connector.

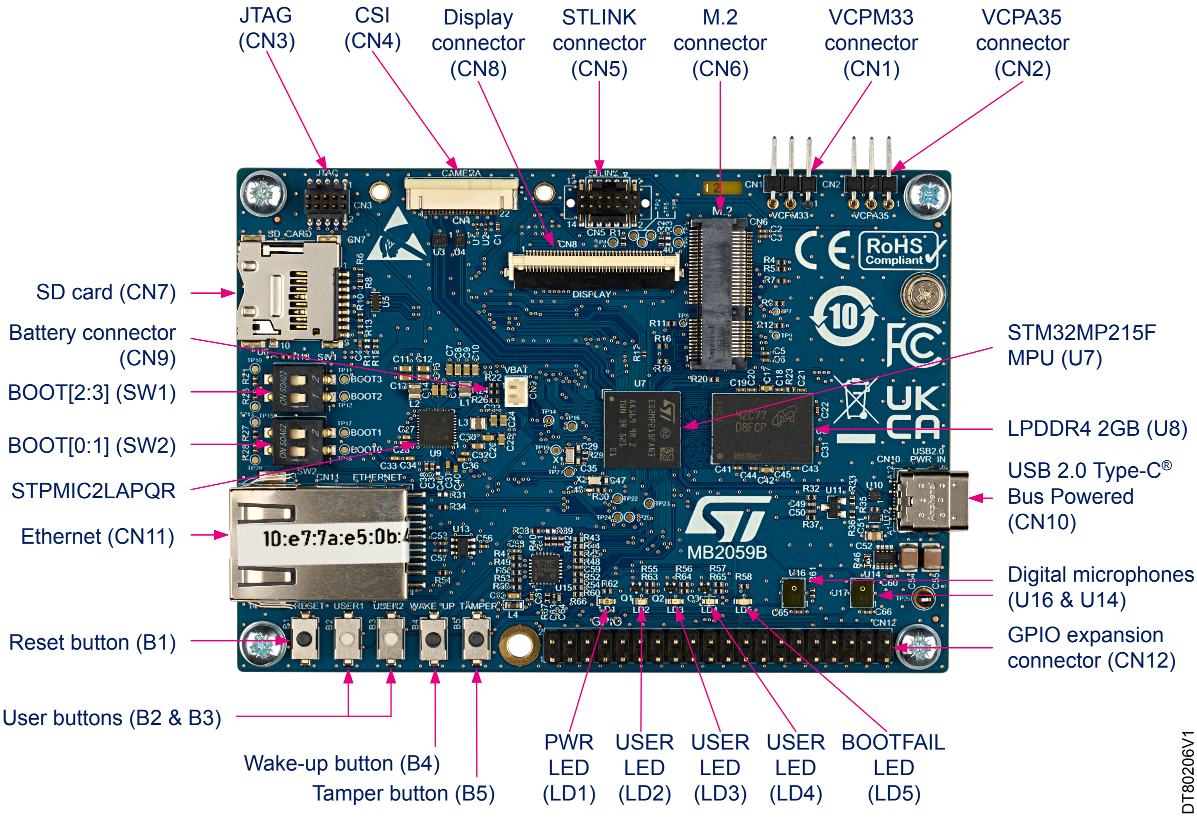
Figure 3. **STM32MP215F-DK hardware block diagram**



## 7.2 Hardware board layout

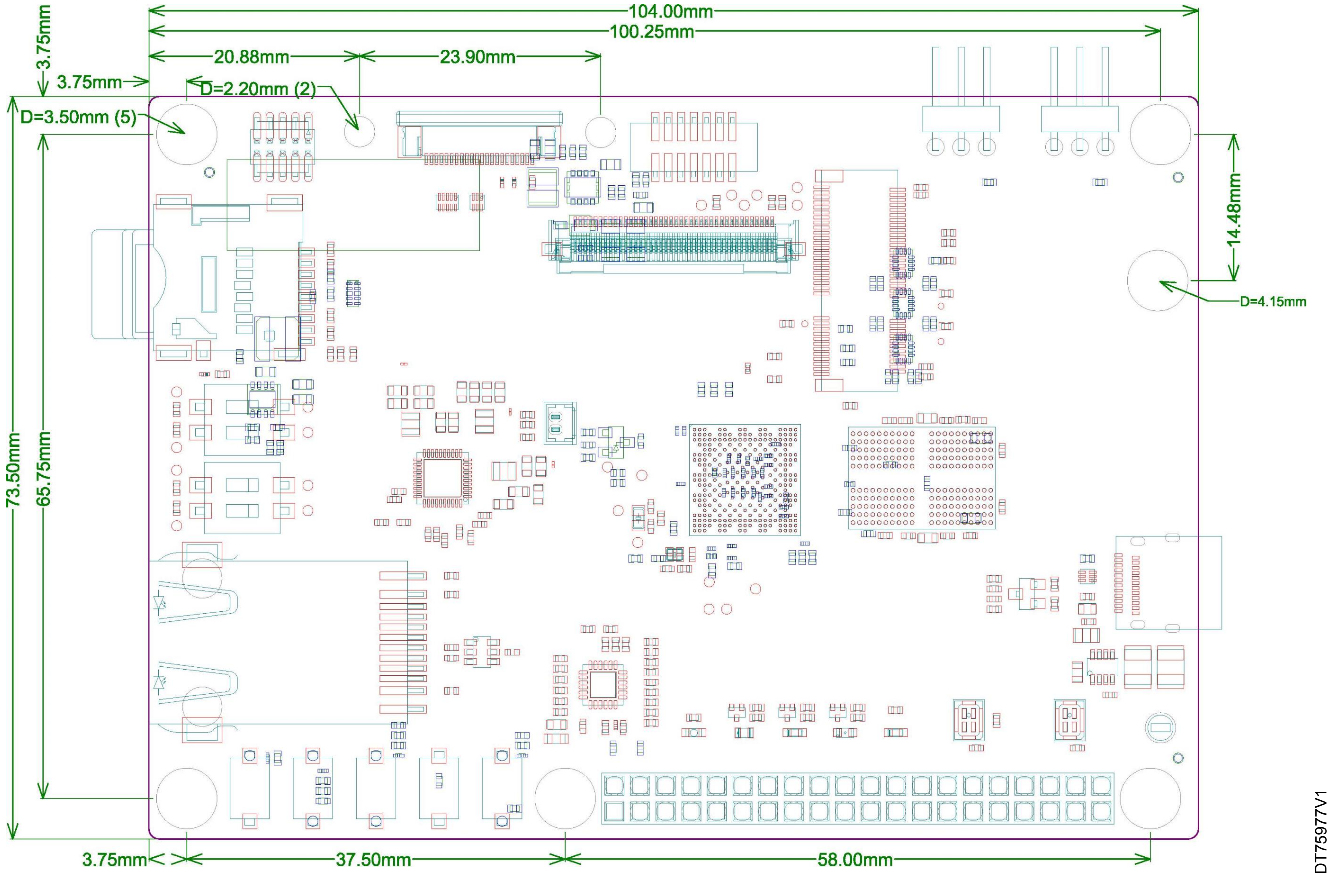
Figure 4 shows where the different features are located on the STM32MP215F-DK board.

Figure 4. STM32MP215F-DK PCB layout (top side)



## 7.3 Mechanical drawing

Figure 5. **STM32MP215F-DK Discovery kit mechanical dimensions (in millimeters)**

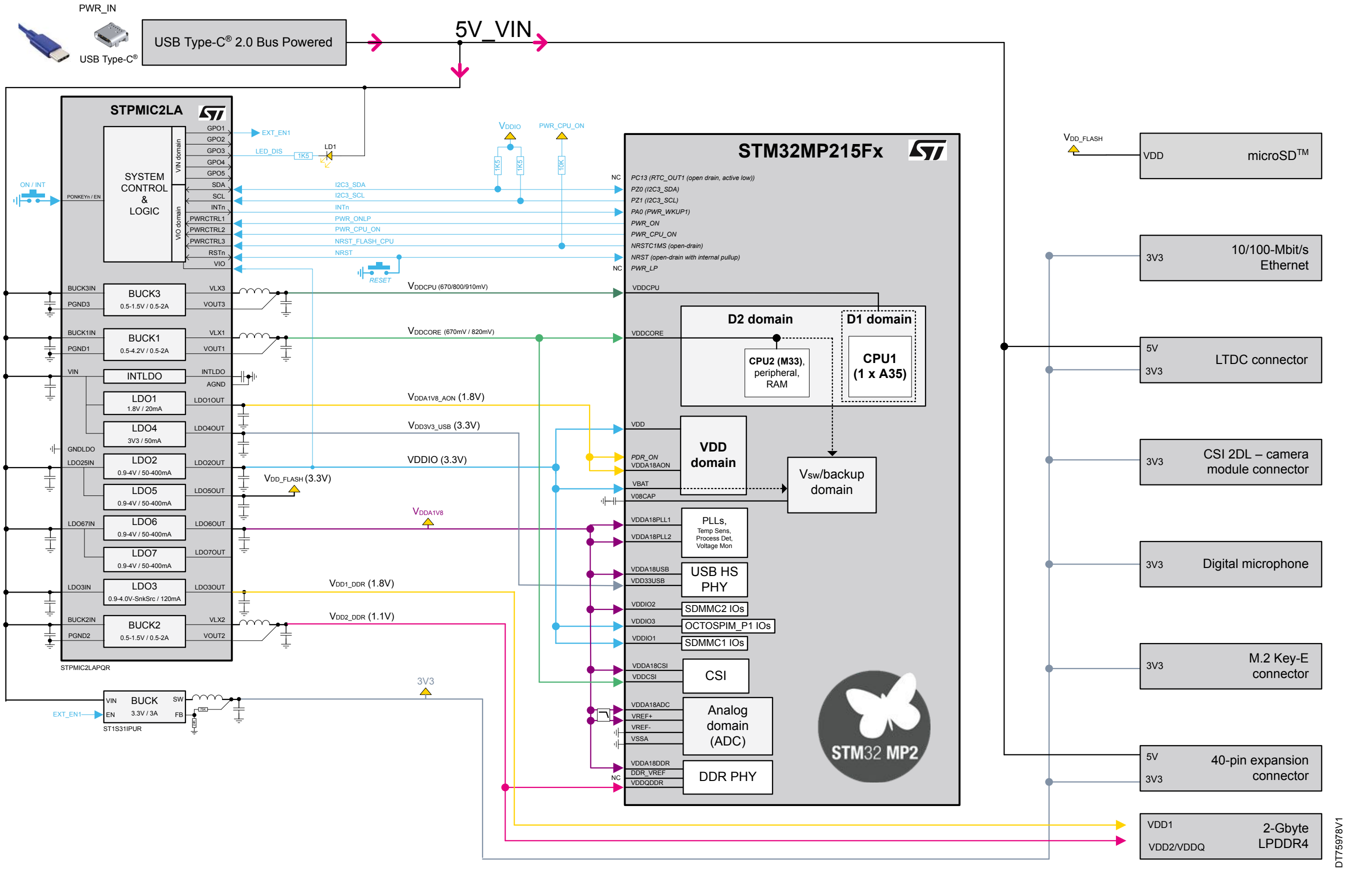


## 7.4 Power supply

### 7.4.1 Power diagram

Figure 6 describes the power architecture, under which functions can be safely used on the STM32MP215F-DK board. In any case, ensure the total power budget of the application always conforms to the 5 V power source; if not, a malfunction can occur. For configuration details, refer to the relevant function description and technical application notes.

**Figure 6. Power diagram**



### 7.4.2 USB power supply

The STM32MP215F-DK Discovery kit was designed to be powered by a 5-V USB Type-C® power source. It is recommended to use a power supply capable of providing 15 W, typically to a host PC USB Type-C® receptacle.

The CC1 and CC2 lines from CN10 are connected to ANA0 and ANA1 of STM32MP215FAN3 to detect the power capability advertised by the power supply source. The latter can be any of the following:

- 5 V/500 mA (vRd-USB): USB Type-A to USB Type-C® connected to a 2.5-W legacy Type-A receptacle (host PC or charger).
- 5 V/1.5 A(vRd-1.5): USB Type-C® to USB Type-C® connected to a 7.5-W USB Type-C® receptacle power source (host PC or charger).
- 5 V/3 A (vRd-3): USB Type-C® to USB Type-C® connected to a 15-W USB Type-C® receptacle power source (host PC or charger)

*Note:* *Legacy USB battery charging 1.2 detection (host with Type-A) is not supported: CDPs (charging downstream port: 5 V/1.5 A with USB data) and DCPs (dedicated charging port: 5 V/1.5 A without USB data) are detected as SDPs (standard downstream port: 5 V/500 mA with or without USB data).*

Depending on the power source connected to the STM32MP215F-DK Discovery kit USB Type-C® port and the active STM32MP215F-DK functionalities, power limitations can prevent the system from operating as expected.

Always make sure that the STM32MP215F-DK Discovery kit is supplied by the correct power source depending on the required current. It is recommended to use a USB Type-C® to USB Type-C® cable (5 V/1.5 A minimum supply), especially when using peripherals like a display, camera module, or M.2 daughter board.

### 7.4.3 STPMIC2LAPQR power management

For general information concerning STPMIC2LAPQR, refer to the datasheet on *www.st.com*.

For information about the STPMIC2LAPQR nonvolatile memory (NVM), refer to the *How to use STPMIC2L for a wall adapter powered application on STM32MP21x MPUs* application note (AN6303).

**STPMIC2LAPQR supply**

- VDDCORE (BUCK1), used to supply the digital logic of the STM32MP215 device
  - Value: 670 mV LPLV-STOP
  - Value: 820 mV RUN
- VDD2_DDR (BUCK2), used to supply the LPDDR4
  - Value: 1.2 mV
- VDDCPU (BUCK3), used to supply the CPU of the STM32MP215 device
  - Value: 670 mV LPLV-STOP1
  - Value: 800 mV RUN at 1.2 GHz
  - Value: 910 mV RUN at 1.5 GHz
- VDDA1V8_AON (LDO1), used to supply the 1.8-V, always-ON domain of the STM32MP215 device
  - Value: 1.8 V
- VDDIO (LDO2), used to supply the $V_{DD}$ domains of the STM32MP215 device
  - Value: 3.3 V
- VDD1_DDR (LDO3), used to supply the LPDDR4
  - Value: 1.8 V
- VDD3V3_USB (LDO4), used to supply the USB PHY of the STM32MP215 device
  - Value: 3.3 V
- VDD_FLASH (LDO5), used to supply the microSD™ card
  - Value: 3.3 V
- VDDA1V8 (LDO6), used to supply the 1.8-V analog domain of the STM32MP215 device
  - Value: 1.8 V
- GPO1, used to enable the external buck to supply the 3.3-V domain of the STM32MP215F-DK peripherals
  - Value: 3.3 V

## 7.5 Clock sources

### 7.5.1 LSE clock reference

The LSE clock reference on the STM32MP215FAN3 microprocessor is provided by the external crystal X1:

- 32.768 kHz crystal

### 7.5.2 HSE clock reference

The HSE clock reference on the STM32MP215FAN3 microprocessor is provided by the external crystal X2:

- 40 MHz crystal

## 7.6 Reset sources

The reset signal of STM32MP215F-DK is active LOW. The internal pull-up of the STM32MP2 forces the NRST signal to a high level.

The reset sources are:

- The B1 reset button (black button)
- STPMIC2LAPQR
- STM32MP215FAN3

## 7.7 Boot options

On startup, the boot pins select the boot source used by the internal bootROM. Table 4 describes the configurations of the boot pins.

Table 4. **Boot mode pin simplified table**

| Boot 3 | Boot 2 | Boot 1 | Boot 0 | Boot mode Cortex®-A35 | Boot mode Cortex®-M33 |
|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | UART/USB boot for flash programming | UART/USB boot for flash programming |
| 0 | 0 | 0 | 1 | SD card | - |
| 0 | 0 | 1 | 1 | Development boot | |
| 0 | 1 | 1 | 1 | - | SD card |

*Note: For the complete table, refer to the STM32MP215 datasheet.*

Table 5 shows the configurations of the boot-related SW1 and SW2 switches.

Table 5. **Boot mode SW1 and SW2 switches example of Cortex®-A35**

| BOOT0 BOOT1 BOOT2 BOOT3 | Boot pin selection | Boot mode |
|---|---|---|
|  | BOOT0: 0<br>BOOT1: 0<br>BOOT2: 0<br>BOOT3: 0 | Forced USB boot for flash programming |
|  | BOOT0: 1<br>BOOT1: 0<br>BOOT2: 0<br>BOOT3: 0 | SD card on SDMMC1 |

## 7.8 LEDs

### 7.8.1 Description

The STM32MP215F-DK board contains several LEDs:

- The LD1 LED turns yellow when the power cable is inserted into the CN10 connector.
- Two general-purpose color LEDs (LD2 and LD3) are available as light indicators:
  - The blue LED (LD2) is used as the Linux® Heartbeat LED, which blinks as long as Linux® is running on the Cortex®-A processor.
  - The orange LED (LD3) is used as an STM32Cube example verdict LED.
- The green LED (LD4) is connected to the STM32MP215 MPU.
- The red LED (LD5) is used as a BOOTFAIL indicator and to signal engineering boot mode.

### 7.8.2 Operating voltage

The yellow LED (LD1) is driven by the 5-V USB power supply.

All other LEDs are driven by the I/O level. They operate in the 3.3-V voltage range.

### 7.8.3 LED interface

Table 6 describes the I/O configuration of the LED interfaces.

Table 6. **I/O configuration of the LED interfaces**

| I/O | Configuration |
|---|---|
| PZ3 | PZ3 is connected to the blue LED (LD2). Active high. |
| PH12 | PH12 is connected to the orange LED (LD3). Active high. |
| PF10 | PF10 is connected to the green LED (LD4). Active high. |
| PH4 | PH4 is connected to the red LED (LD5). Active low. |

## 7.9 Buttons

### 7.9.1 Description

The STM32MP215F-DK Discovery kit provides five buttons:

- Reset button (B1):
  Used to reset the Discovery kit
- USER1 button (B2):
  - Used at boot time by U-Boot to enter the USB programming mode with STM32CubeProgrammer
  - Can be used at runtime for Linux® on STM32MP21
  - Can be used at runtime for Linux® examples or STM32Cube examples
- USER2 button (B3):
  - Used at boot time by U-Boot to enter the Android™ Fastboot mode
  - Can be used at runtime for STM32Cube examples on STM32MP21
- Wake-up button (B4):
  - Allows the platform to wake up from any low-power mode
  - Is connected to STPMIC2LAPQR PONKEYn, which generates a wake-up signal on the STM32MP215FAN3PA0 pin
- Tamper button (B5):
  Allows the detection of case opening as a security event

### 7.9.2 I/O interface

Table 7 describes the I/O configuration of the buttons on STM32MP215F-DK.

Table 7. **I/O configuration of the physical user interface**

| I/O | Configuration |
|---|---|
| NRST | Reset button (B1), active low |
| PC4 | USER1 user button (B2) |
| PF7 | USER2 user button (B3) |
| - | Wake-up button (B4). Connected to the PONKEYn pin of STPMIC2LAPQR |
| PF6 | TAMPER button (B3) |

# 8 Board connectors

## 8.1 USB 2.0 Bus Powered USB Type-C®

### 8.1.1 Description

The STM32MP215F-DK Discovery kit supports USB 2.0 Bus Powered communication. The USB connector is a USB Type-C® connector (CN10).

The STM32MP215F-DK Discovery kit supports USB Type-C® Source mode.

### 8.1.2 Operating voltage

The STM32MP215F-DK Discovery kit supports a 5-V USB voltage from 4.75 to 5.25 V.

### 8.1.3 USB HS Source

When a USB Device connection to the USB Type-C® connector (CN10) of STM32MP215F-DK is detected, the Discovery kit starts behaving as a USB Host.

### 8.1.4 USB Type-C® connector

Table 8 shows the pinout of the USB Type-C® connector (CN10).

**Table 8. USB Type-C® connector (CN10) pinout**

| A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GND | - | - | $V_{BUS}$ | CC1 | D+ | D- | - | $V_{BUS}$ | - | - | GND |
| | | | | | | | | | | | |
| GND | - | - | $V_{BUS}$ | - | D- | D+ | CC2 | $V_{BUS}$ | - | - | GND |
| B12 | B11 | B10 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |

Table 9 describes the pinout of the USB Type-C® connector (CN10).

**Table 9. USB Type-C® connector (CN10) pinout**

| Function | I/O | Signal name | Pin name | Pin | Pin | Pin name | Signal name | I/O | Function |
|---|---|---|---|---|---|---|---|---|---|
| GND | - | GND | GND | A1 | B12 | GND | GND | - | GND |
| TX1+ | - | - | TX1+ | A2 | B11 | RX1+ | - | - | RX1+ |
| TX1- | - | - | TX1- | A3 | B10 | RX1- | - | - | RX1- |
| VBUS | - | VBUS | VBUS | A4 | B9 | VBUS | VBUS | - | VBUS |
| CC1 | USBC_CC1_ADC | USBC_CC1 | CC1 | A5 | B8 | SBU2 | - | - | SBU2 |
| D+ | USBDR_P | USB_P | D+ | A6 | B7 | D- | USB_N | USBDR_N | D- |
| D- | USBDR_N | USB_N | D- | A7 | B6 | D+ | USB_P | USBDR_P | D+ |
| SBU1 | - | - | SBU1 | A8 | B5 | CC2 | USBC_CC2 | USBC_CC2_ADC | CC2 |
| VBUS | - | VBUS | VBUS | A9 | B4 | VBUS | VBUS | - | VBUS |
| RX2- | - | - | RX2- | A10 | B3 | TX2- | - | - | TX2- |
| RX2+ | - | - | RX2+ | A11 | B2 | TX2+ | - | - | TX2+ |
| GND | - | GND | GND | A12 | B1 | GND | GND | - | GND |

## 8.2 microSD™ card

### 8.2.1 Description

The CN7 slot for the microSD™ card is routed to the STM32MP215FAN3 SDIO port (SDMMC). This interface is fully compliant with version 6.0 of the SD memory card specifications.

### 8.2.2 Operating voltage

STM32MP215F-DK supports all microSD™ card types.

This Discovery kit does not support the UHS-I mode.

### 8.2.3 microSD™ card interface

The microSD™ card interface is used in the four data lines D[0:3] with one clock (CLK), one command line (CMD), and one card detection signal (uSD_DETECT). SDMMC1 is a bootable interface. Table 10 describes the I/O configuration for the SDIO interface.

**Table 10. I/O configuration for the SDIO interface**

| I/O | Configuration |
|---|---|
| PD3 | PD3 is connected to SD.uSD_DETECT |
| PE4 | PE4 is connected to SD.SDMMC1_D0 |
| PE5 | PE5 is connected to SD.SDMMC1_D1 |
| PE0 | PE0 is connected to SD.SDMMC1_D2 |
| PE1 | PE1 is connected to SD.SDMMC1_D3 |
| PE3 | PE3 is connected to SD.SDMMC1_CK |
| PE2 | PE2 is connected to SD.SDMMC1_CMD |

Figure 7 shows the pinout of the CN7 microSD™ connector.

**Figure 7. microSD™ card connector (CN7)**

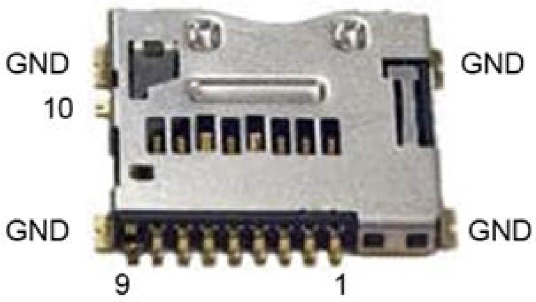


Table 11 describes the pinout of the microSD™ connector (CN7).

**Table 11. microSD™ connector (CN7) pinout**

| Pin | Pin name | Signal name | I/O | Function |
|---|---|---|---|---|
| 1 | DAT2 | SD.SDMMC1_D2 | PE0 | SDIO.D2 |
| 2 | DAT3_CD | SD.SDMMC1_D3 | PE1 | SDIO.D3 |
| 3 | CMD | SD.SDMMC1_CMD | PE2 | SDIO.CMD |
| 4 | VDD | VDD_SD | - | VDD_SDCARD |
| 5 | CLK | SD.SDMMC1_CK | PE3 | SDIO.CLK |
| 6 | VSS | GND | - | GND |
| 7 | DAT0 | SD.SDMMC1_D0 | PE4 | SDIO.D0 |
| 8 | DAT1 | SD.SDMMC_D1 | PE5 | SDIO.D1 |
| 9 | GND | GND | - | GND |
| 10 | CARD_DETECT | SD.uSD_DETECT | PD3 | uSD_DETECT active low |

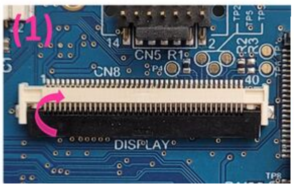
## 8.3 LTDC

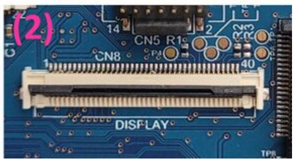
The STM32MP215F-DK Discovery kit provides a display connector for the Rocktech RK043FN78H-CT661C LTDC display.

### 8.3.1 How to connect the Rocktech RK043FN78H-CT661C LTDC display

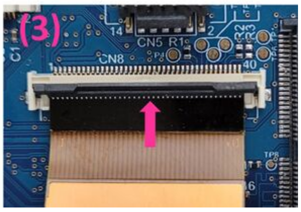
Follow these steps to connect a Rocktech RK043FN78H-CT661C LTDC display to the STM32MP215F-DK Discovery kit:

1. Locate the DISPLAY connector (CN8) on the top side of the MB2059 main board.
2. Flip the connector latch up.

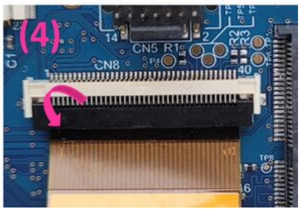




3. Insert the LCD cable with the exposed contacts facing down.



4. Flip the connector latch down to secure the cable.



## 8.4 Camera serial interface (CSI)

### 8.4.1 Description

The STM32MP215F-DK Discovery kit provides a camera module connector (CN4). It can be used to connect the B-CAMS-IMX camera module (not included in the package) to the board.

- The B-CAMS-IMX camera module provides a 5-Mpx image sensor, an inertial motion unit (IMU), a Time-of-Flight (ToF) sensor (limitation: STM32MP215F-DK does not support IMU and ToF), and a 22 to 22-pin FFC cable.
- This camera module can be purchased at *www.st.com* with the B-CAMS-IMX order code.
- Complete documentation can be found at *www.st.com*.

### 8.4.2 How to connect the B-CAMS-IMX camera module

Figure 8 shows a B-CAMS-IMX camera module connected to the STM32MP215F-DK Discovery kit.

**Figure 8. B-CAMS-IMX camera module connected to the STM32MP215F-DK Discovery kit**

*Note:*

1. *CSI camera module connector on the STM32 board.*
2. *Camera module connector on the B-CAMS-IMX camera module.*

*The FFC cable:*

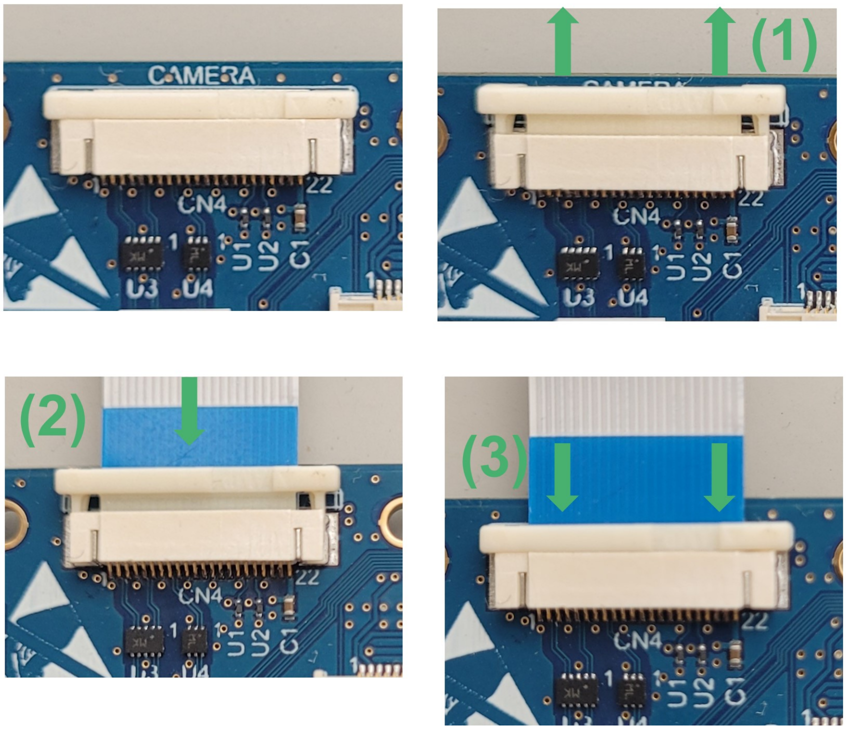
- *22 to 22-pin FFC: bottom side (blue)*
- *22 to 22-pin FCC: top side (contact)*

Follow these steps to connect the B-CAMS-IMX camera module to the STM32MP215F-DK Discovery kit.

For both boards (MB2059 and B-CAMS-IMX):

1. Lightly pull the white plastic (#1 in Figure 9) to insert the contact side of the FFC into the board connector (#2 in Figure 9).
2. Carefully push the white plastic back to secure the FFC cable (#3 in Figure 9).

Figure 9. Connecting B-CAMS-IMX to the target STM32 board



### 8.4.3 CSI interface

Table 12 describes the interface and pinout of the CSI connector (CN4) on STM32MP215F-DK.

**Table 12. I/O configuration for the CSI interface**

| Pin | I/O | Signal name | Function |
|---|---|---|---|
| 1 | - | GND | GND |
| 2 | CSI_D0N | CSI.D0_N | MIPI-CSI receiver 1 data lane 1 negative |
| 3 | CSI_D0P | CSI.D0_P | MIPI-CSI receiver 1 data lane 1 positive |
| 4 | - | GND | GND |
| 5 | CSI_D1N | CSI.D1_N | MIPI-CSI receiver 1 data lane 2 negative |
| 6 | CSI_D1P | CSI.D1_P | MIPI-CSI receiver 1 data lane 2 positive |
| 7 | - | GND | GND |
| 8 | CSI_CKN | CSI.CK_N | Clock lane negative |
| 9 | CSI_CKP | CSI.CK_P | Clock lane positive |
| 10 | - | GND | GND |
| 11 | - | - | - |
| 12 | - | - | - |
| 13 | - | GND | GND |
| 14 | - | - | - |
| 15 | - | - | - |
| 16 | - | GND | GND |
| 17 | PD5 | CAM.RESET | Camera reset |
| 18 | PD0 | CAM_ENABLE | Camera enable |
| 19 | - | GND | GND |
| 20 | PB5 | I2C2.SCL | I2C2.SCL shared with LTDC touch panel |
| 21 | PD15 | I2C2.SDA | I2C2.SDA shared with LTDC touch panel |
| 22 | - | 3V3 | 3V3 |

## 8.5 100-Mbit/s Ethernet

### 8.5.1 Description

The STM32MP215F-DK Discovery kit offers a 100-Mbit/s Ethernet feature using an external physical interface device (PHY). This PHY is connected to the STM32MP215 reduced media-independent interface (RMII), and uses the 25-MHz clock from STM32MP215. It is supplied by 3V3.

### 8.5.2 RMII interface

Table 13 describes the I/O configuration for the Ethernet1 interface.

Table 13. **I/O configuration Ethernet1 interface**

| I/O | Configuration |
|---|---|
| PH11 | PH11 is used as ETH1.NRST active Low. |
| PF2 | PF2 is used as ETH1.MDIO. |
| PA12 | PA12 is used as ETH1.MDINT. |
| PF0 | PF0 is used as ETH1.MDC. |
| PA11 | PA11 is used as ETH1.CRS_DV. |
| PF1 | PF1 is used as ETH1.RXD0. |
| PC2 | PC2 is used as ETH1.RXD1. |
| PA13 | PA13 is used as ETH1.TX_EN. |
| PA15 | PA15 is used as ETH1.TXD0. |
| PC1 | PC1 is used as ETH1.TXD1. |
| PF8 | PF8 is used as ETH1.CLK is not used by default. |

Figure 10 shows the pinout of the Ethernet connector (CN11).

Figure 10. **Ethernet connector (CN11) pinout**

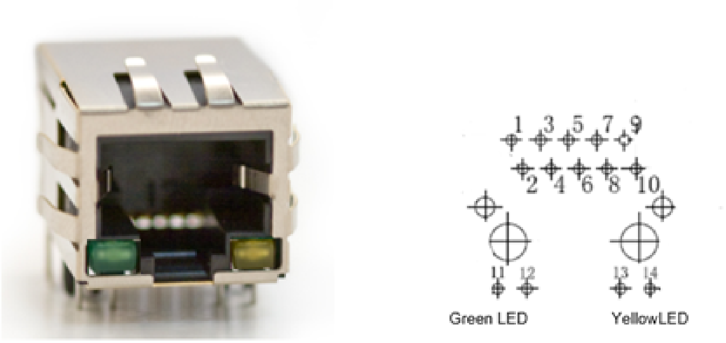


Table 14 describes the Ethernet interface and pinout of the CN11 connector.

Table 14. **Ethernet connector (CN11) pinout**

| Pin number | Pin name | Function |
|---|---|---|
| 1 | LED(Yellow)_A | Yellow LED anode |
| 2 | LED(Yellow)_K | Yellow LED cathode |
| 3 | TD+ | Differential pair to transmit data |
| 4 | TD- | |
| 5 | TCT | 3.3V |
| 6 | RCT | 3.3V |
| 7 | RD+ | Differential pair to receive data |
| 8 | RD- | |
| 9 | NC | - |
| 10 | CHS_GND | GND |
| 11 | LED(Green)_K | Green LED cathode |
| 12 | LED(Green)_A | Green LED anode |
| 13 | Shield_1 | GND |
| 14 | Shield_2 | GND |

## 8.6 M.2 E-Key connector for Wi-Fi® and Bluetooth® LE

The STM32MP215F-DK Discovery kit comes with an M.2 socket and mechanical E-Key to support Wi-Fi® and Bluetooth® LE connectivity modules.

It is based on the SDIO interface for Wi-Fi®. For Bluetooth® LE, it uses the UART interface for control and the PCM interface for audio. This is designed to support the modules 2BC/2BZ from Embedded Artists, with a limitation on the wake-up activity as described below.

### 8.6.1 Wi-Fi® I/O interface

Table 15 describes the I/O configuration for the Wi-Fi® interface.

Table 15. **I/O configuration for the Wi-Fi® interface**

| I/O | Configuration |
|---|---|
| PE12 | PE12 is connected to SDMMC2_D3 |
| PE8 | PE8 is connected to SDMMC2_D2 |
| PE11 | PE11 is connected to SDMMC2_D1 |
| PE13 | PE13 is connected to SDMMC2_D0 |
| PE15 | PE15 is connected to SDMMC2_CMD |
| PE14 | PE14 is connected to SDMMC2_CK |
| PB2 | PB2 is connected to WL_REG_ON |

*Note: The WL_HOST_WAKE signal is pulled up externally on the board. It cannot be controlled by an I/O on the STM32MP215F-DK Discovery kit due to an incorrect connection of the U19 level shifter (which is DNF).*

### 8.6.2 Bluetooth® LE I/O interface

Table 16 describes the I/O configuration for the Bluetooth® LE interface.

**Table 16. I/O configuration for the Bluetooth® LE interface**

| I/O | Configuration |
|---|---|
| PG14 | PG14 is connected to M2_USART1_TX |
| PB10 | PB10 is connected to M2_USART1_RX |
| PB9 | PB9 is connected to M2_USART1_RTS |
| PB11 | PB11 is connected to M2_USART1_CTS |
| PD8 | PD8 is connected to M2_I2S_WS |
| PD4 | PD4 is connected to M2_I2S _SDO |
| PD9 | PD9 is connected to M2_I2S _SDI |
| PD10 | PG6 is connected to M2_I2S _CLK |
| PB7 | PB7 is connected to BT_REG_ON |
| PC13 | LP0_32 |

*Note: The WL_HOST_WAKE signal is pulled up externally on the board. It cannot be controlled by an I/O on the STM32MP215F-DK Discovery kit due to an incorrect connection of the U19 level shifter (which is DNF).*

## 8.7 GPIO expansion connector

### 8.7.1 Description

The GPIO pins can be used as GPIOs or alternate functions. The available alternate functions are listed in Table 17.

Other functions can be mapped on the GPIO connectors, for instance using the STM32CubeMX tool.

The GPIO expansion connector (CN12) offers shield capability.

### 8.7.2 GPIO expansion connector interface

Figure 11 shows the pinout of the GPIO connectors.

**Figure 11. GPIO connectors**

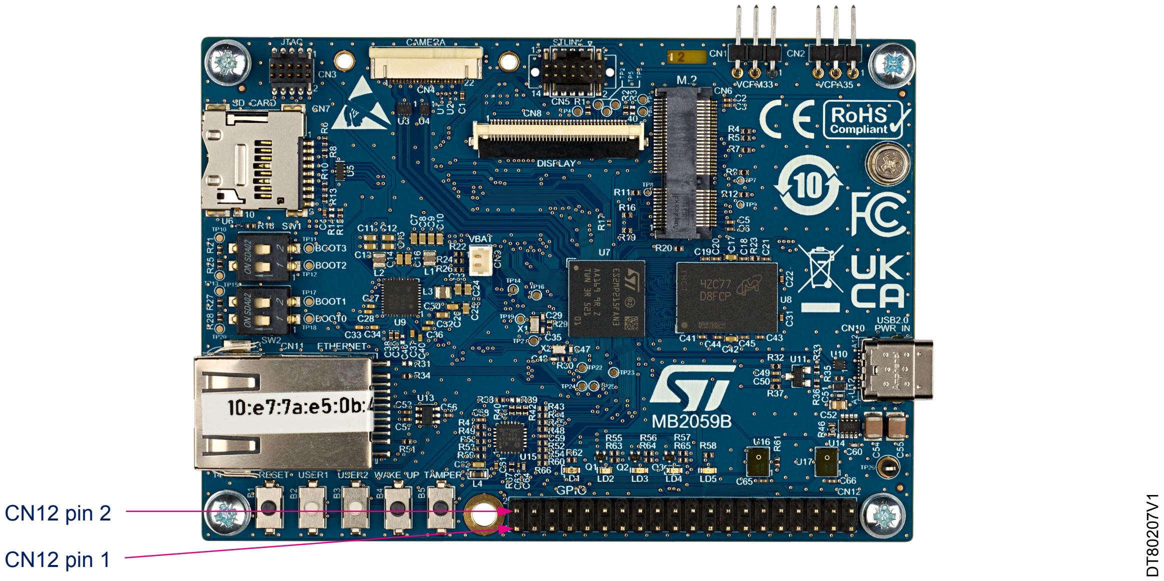


Table 17 describes the pinout of the GPIO connector.

Table 17. **GPIO connector pinout**

| Function | I/O | Pin | Pin | I/O | Function |
|---|---|---|---|---|---|
| 3V3 | - | 1 | 2 | - | 5V |
| GPIO2 / I3C1.SDA | PA2 | 3 | 4 | - | 5V |
| GPIO3 / I3C1.SCL | PG13 | 5 | 6 | - | GND |
| GPIO4 / MCO1 | PF11 | 7 | 8 | PF13 | GPIO14 / USART6.TX |
| GND | - | 9 | 10 | PH9 | GPIO15 / USART6.RX |
| GPIO17 / USART6.RTS | PC3 | 11 | 12 | PA9 | GPIO18 / SAI2.SCKB |
| GPIO27 / SDMMC3.D3 | PD14 | 13 | 14 | - | GND |
| GPIO22 / SDMMC3.CK | PB13 | 15 | 16 | PH8 | GPIO23 / SDMMC3.CMD |
| 3V3 | - | 17 | 18 | PB14 | GPIO24 / SDMMC3.D0 |
| GPIO10 / SPI1.MOSI | PI5 | 19 | 20 | - | GND |
| GPIO9 / SPI1.MISO | PD1 | 21 | 22 | PD13 | GPIO25 / SDMMC3.D1 |
| GPIO11 / SPI1.SCK | PD11 | 23 | 24 | PD2 | GPIO8 / SPI1.NSS |
| GND | - | 25 | 26 | PC7 | GPIO7 |
| I3C2.SDA | PG0 | 27 | 28 | PC12 | I3C2.SCL |
| GPIO5 / TIM11.CH1 | PH13 | 29 | 30 | - | GND |
| GPIO6 / TIM13.CH1 | PC9 | 31 | 32 | PC8 | GPIO12 / TIM8.CH2 |
| GPIO13 / TIM8.CH4 | PC10 | 33 | 34 | - | GND |
| GPIO19 / SAI2.FSB | PA6 | 35 | 36 | PF15 | GPIO16 / USART6.CTS |
| GPIO26 / SDMMC3.D2 | PB12 | 37 | 38 | PA5 | GPIO20 / SAI2.SDB |
| GND | - | 39 | 40 | PG1 | GPIO21 / SAI2.SDA |

## 8.8 VBAT connector

### 8.8.1 Description

The VBAT connector allows a power mode that maintains critical operations when a power loss occurs on VDDIO.

The VBAT power domain contains the RTC, the backup registers, the retention RAM, and the backup SRAM. To enable VBAT mode, a backup power source must be connected to the VBAT connector.

### 8.8.2 Operating voltage

The VBAT connector enables external power supply from 2.3 to 3.6 V.

### 8.8.3 VBAT interface

Table 18 describes the I/O configuration of the VBAT interface.

Table 18. **I/O configuration of the VBAT interface (CN9)**

| I/O | Configuration |
|---|---|
| 1 | VBAT |
| 2 | GND |

Figure 12 shows the pinout of the VBAT connector (CN9).

Figure 12. **VBAT connector (CN9) pinout**

# 9 STM32MP215F-DK I/O assignment

Table 19. **STM32MP215F-DK Discovery kit I/O assignment**

| Ball | Pin | Signal Assignment |
|---|---|---|
| Y6 | PA0 | MP215_INT (WKUP1) |
| N5 | PA1 | LCD_R3 |
| W17 | PA2 | I3C1_SDA (GPIO_EXP) |
| Y18 | PA3 | - |
| Y16 | PA4 | USART2_TX (STLINK VCP A35) |
| K1 | PA5 | SAI2_SD_B (GPIO_EXP) |
| W16 | PA6 | SAI2_FS_B (GPIO_EXP) |
| F2 | PA7 | LCD_B5 |
| V16 | PA8 | USART2_RX (STLINK VCP A35) |
| T16 | PA9 | SAI2_SCK_B (GPIO_EXP) |
| M2 | PA10 | LCD_R6 |
| W15 | PA11 | ETH1_CRS_DV (RMII) |
| Y14 | PA12 | ETH1_PHY_INTN [PA12] (RMII) |
| V12 | PA13 | ETH1_TX_EN (RMII) |
| AA10 | PA14 | - |
| U11 | PA15 | ETH1_TXD0 (RMII) |
| A10 | PB1 | - |
| E9 | PB2 | WL_REG_ON (M.2) |
| B10 | PB3 | MDF1_SDI3 |
| E7 | PB5 | I2C2_SCL (LCD & peripheral) |
| D6 | PB6 | - |
| C5 | PB7 | BT_REG_ON (M.2) |
| B8 | PB9 | USART1_RTS (M.2_BT) |
| C8 | PB10 | USART1_RX (M.2_BT) |
| C6 | PB11 | USART1_CTS (M.2_BT) |
| A18 | PB12 | SDMMC3_D2 (GPIO_EXP) |
| C16 | PB13 | SDMMC3_CK (GPIO_EXP) |
| B16 | PB14 | SDMMC3_D0 (GPIO_EXP) |
| N3 | PB15 | LCD_R4 |
| J5 | PC0 | LCD_G7 |
| V10 | PC1 | ETH1_TXD1 (RMII) |
| Y12 | PC2 | ETH1_RXD1 (RMII) |
| T12 | PC3 | USART6_RTS (GPIO_EXP) |
| R5 | PC4 | BUTTON_USER1 [PC4] |
| E4 | PC5 | LCD_DE |
| W12 | PC6 | - |
| T10 | PC7 | GPIO7 (GPIO_EXP) |
| Y10 | PC8 | TIM8_CH2 (GPIO_EXP) |

| Ball | Pin | Signal Assignment |
|---|---|---|
| W10 | PC9 | TIM13_CH1 (GPIO EXP.) |
| U9 | PC10 | TIM8_CH4 (GPIO EXP.) |
| P3 | PC11 | LCD_R2 |
| Y7 | PC12 | I3C2_SCL (GPIO_EXP) |
| T4 | PC13 | RTC_OUT1 (M.2) LPO_32 |
| D8 | PD0 | CAM_ENABLE |
| C7 | PD1 | SPI1_MISO (GPIO EXP.) |
| C4 | PD2 | SPI1_NSS (GPIO EXP.) |
| A6 | PD3 | SDMMC1_DETECT [PD3] |
| B6 | PD4 | SAI1_SD_B (BT AUDIO M.2) |
| C10 | PD5 | CAM_RESET |
| B11 | PD6 | - |
| E15 | PD7 | - |
| B7 | PD8 | SAI1_FS_A (BT AUDIO M.2) |
| C9 | PD9 | SAI1_SD_A (BT AUDIO M.2) |
| B4 | PD10 | SAI1_SCK_A (BT AUDIO M.2) |
| D4 | PD11 | SPI1_SCK (GPIO EXP.) |
| B18 | PD12 | SDMMC3_CMD (GPIO EXP.) |
| A19 | PD13 | SDMMC3_D1 (GPIO EXP.) |
| C17 | PD14 | SDMMC3_D3 (GPIO EXP.) |
| A7 | PD15 | I2C2_SDA (LCD & peripheral) |
| A11 | PE0 | SDMMC1_D2 (uSD) |
| C11 | PE1 | SDMMC1_D3 (uSD) |
| B12 | PE2 | SDMMC1_CMD (uSD) |
| C12 | PE3 | SDMMC1_CK (uSD) |
| D12 | PE4 | SDMMC1_D0 (uSD) |
| D10 | PE5 | SDMMC1_D1 (uSD) |
| E13 | PE6 | - |
| C14 | PE7 | - |
| C13 | PE8 | SDMMC2_D2 (M.2 WLAN) |
| B15 | PE9 | - |
| C15 | PE10 | - |
| B14 | PE11 | SDMMC2_D1 (M.2 WLAN) |
| A15 | PE12 | SDMMC2_D3 (M.2 WLAN) |
| A14 | PE13 | SDMMC2_D0 (M.2 WLAN) |
| D14 | PE14 | SDMMC2_CK (M.2 WLAN) |
| E11 | PE15 | SDMMC2_CMD (M.2 WLAN) |
| Y11 | PF0 | ETH1_MDC (RMII) |
| W11 | PF1 | ETH1_RXD0 (RMII) |
| AA11 | PF2 | ETH1_MDIO (RMII) |
| U13 | PF3 | MDF1_CCK0 |

| Ball | Pin | Signal Assignment |
|---|---|---|
| M3 | PF4 | LCD_INT [PF4] |
| F3 | PF5 | LCD_B6 |
| G3 | PF6 | TAMPER_BUTTON (TAMP_IN5) |
| P4 | PF7 | BUTTON_USER2 [PF7] |
| T14 | PF8 | ETH1_CLK (RMII) |
| AA7 | PF9 | LCD_BL (TIM2_CH2) |
| AA6 | PF10 | LED2 (LED GREEN) |
| W7 | PF11 | MCO1 (GPIO_EXP) |
| U3 | PF12 | LCD_CLK |
| P1 | PF13 | USART6_TX (GPIO_EXP) |
| P2 | PF15 | USART6_CTS (GPIO_EXP) |
| T8 | PG0 | I3C2_SDA (GPIO_EXP) |
| U7 | PG1 | SAI2_SD_A (GPIO_EXP) |
| E3 | PG2 | LCD_HSYNC |
| V6 | PG3 | - |
| P6 | PG4 | LCD_DISP |
| M4 | PG5 | LCD_R5 |
| L3 | PG7 | LCD_R7 |
| K3 | PG8 | LCD_G2 |
| J3 | PG9 | LCD_G3 |
| H4 | PG10 | LCD_G4 |
| H3 | PG11 | LCD_G5 |
| H2 | PG12 | LCD_G6 |
| T3 | PG13 | I3C1_SCL (GPIO_EXP) |
| G1 | PG14 | USART1_TX (M.2_BT) |
| G2 | PG15 | LCD_B2 |
| AA18 | PH4 | LED1 (LED RED - BOOTFAILN) |
| K2 | PH5 | WL_DEV_WAKE (M.2) |
| AA15 | PH7 | UART4_TX (STLINK VCP M33) |
| Y15 | PH8 | UART4_RX (STLINK VCP M33) |
| U15 | PH9 | USART6_RX (GPIO_EXP) |
| V14 | PH10 | - |
| W14 | PH11 | ETH1_NRST |
| AA14 | PH12 | LED3 (LED ORANGE) |
| W13 | PH13 | TIM11_CH1 (GPIO EXP.) |
| F4 | PI0 | LCD_B3 |
| F1 | PI1 | LCD_B4 |
| G5 | PI4 | LCD_B7 |
| E5 | PI5 | SPI1_MOSI (GPIO EXP.) |
| D3 | PI6 | LCD_VSYNC |
| U5 | PI8 | LCD_RST |

| Ball | Pin | Signal Assignment |
|---|---|---|
| K4 | PZ0 | I2C3_SDA (PMIC) |
| L5 | PZ1 | I2C3_SCL (PMIC) |
| K6 | PZ3 | LED4 (LED BLUE) |

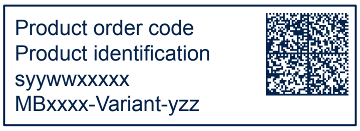
# 10 STM32MP215F-DK product information

## 10.1 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 ordering part number of the evaluation tool 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.

## 10.2 STM32MP215F-DK product history

Table 20. **Product history**

| Order code | Product identification | Product details | Product change description | Product limitations |
|---|---|---|---|---|
| STM32MP215F-DK | DK32MP215F$AR1 | MPU:<br>STM32MP215FAN3 silicon revision "Y" | Initial revision | No limitation |
| | | MPU errata sheet: *STM32MP21xA/C/D/F device errata* (ES0628) | | |
| | | Board:<br>- MB2059-MP215F-B02 (main board) | | |

## 10.3 Board revision history

Table 21. **Board revision history**

| Board reference | Board variant and revision | Board change description | Board limitations |
|---|---|---|---|
| MB2059<br>(main board) | MP215F-B02 | Initial revision | M.2 E-Key WAKE signals cannot be controlled by an I/O due to an incorrect connection of the U19 (DNF) level shifter. |

# 11 Compliance statements and conformity declarations

## 11.1 Federal Communications Commission (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 their own expense.

*Note: Use only shielded cables.*

**Responsible Party - U.S. Contact Information:**

Francesco Doddo
STMicroelectronics, Inc.
200 Summit Drive | Suite 405 | Burlington, MA 01803
USA
Telephone: +1 781-472-9634

## 11.2 Innovation, Science and Economic Development Canada (ISED) compliance statement

**This product complies with the ICES-003 standard class A of the ISED regulation.**

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

*Note: Use only shielded cables.*

**Ce produit est conforme à la norme NMB-003 classe A de la ISDE.**

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

*Note: Utiliser uniquement des câbles blindés.*

## 11.3 UKCA conformity

**Simplified UK declaration of conformity**

Hereby, the manufacturer STMicroelectronics, declares that the equipment type STM32MP215F-DK is in compliance with the UK Electromagnetic Compatibility Regulations 2016 (UK SI 2016 No. 1091) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK SI 2012 No. 3032).

*Note: Use only shielded cables.*

## 11.4 CE conformity

### 11.4.1 Simplified EU declaration of conformity

Hereby, STMicroelectronics declares that the equipment type STM32MP215F-DK is in compliance with directives 2011/53/EU and 2015/863/EU (RoHS), and 2014/30/EU (EMC).

*Note:*
- *RoHS: Restriction of hazardous substances*
- *EMC: Electromagnetic compatibility*

**Warning**

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

*Note:* *Use only shielded cables.*

### 11.4.2 Déclaration de conformité UE simplifiée

STMicroelectronics déclare que l'équipement électrique du type STM32MP215F-DK est conforme aux directives 2011/53/UE et 2015/863/UE (LdSD), et à la directive 2014/30/UE (CEM).

*Note:*
- *LdSD : directive sur la limitation de l'utilisation des substances dangereuses*
- *CEM : compatibilité électromagnétique*

**Avertissement**

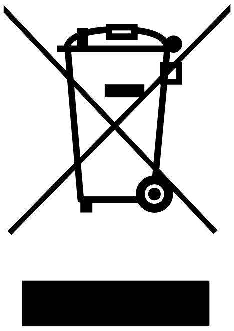
Cet équipement est conforme à la Classe A de la EN55032 / CISPR 32. Dans un environnement résidentiel, cet équipement peut créer des interférences radio.

*Note:* *Utiliser uniquement des câbles blindés.*

# 12 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 must 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, separate these items from other types of waste and recycle them responsibly at a designated collection point to promote the sustainable reuse of material resources.

Household users:

Contact the retailer that you purchased the product from or your local authority for details of your nearest designated collection point.

Business users:

Contact your dealer or supplier for further information.

# Revision history

Table 22. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 17-Nov-2025 | 1 | Initial release. |

# Contents

# List of tables

# List of figures

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