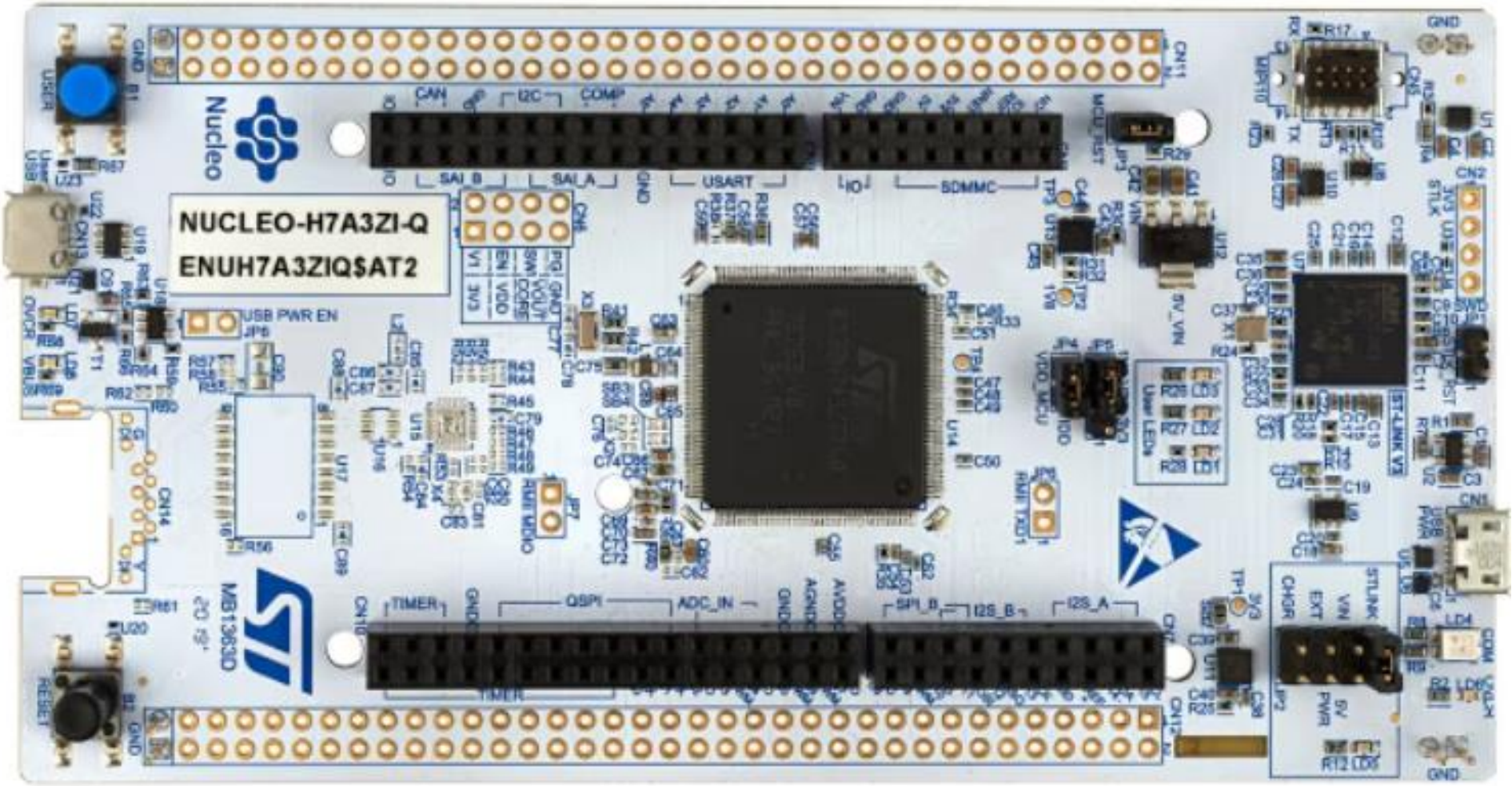
# The NUCLEO-H7A3ZI-Q

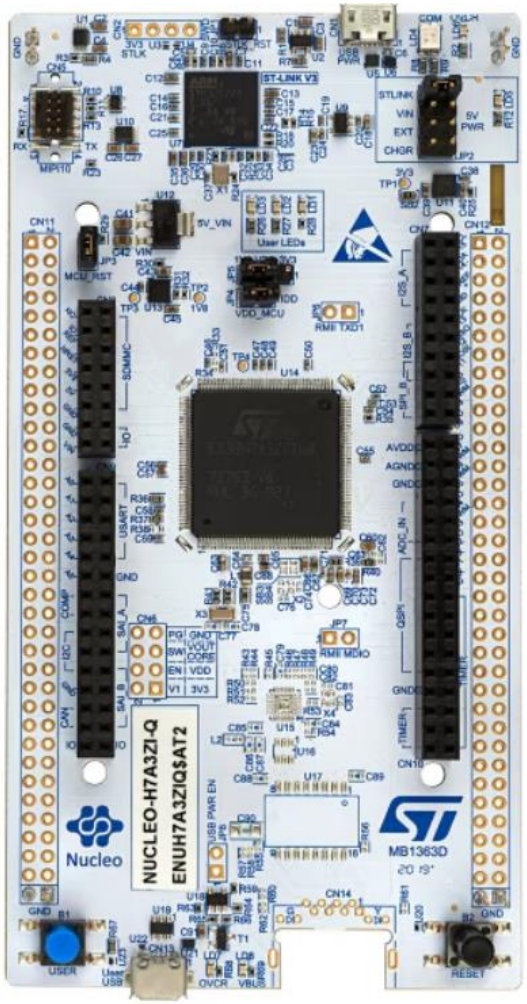
# Nucleo-H7A3ZI-Q

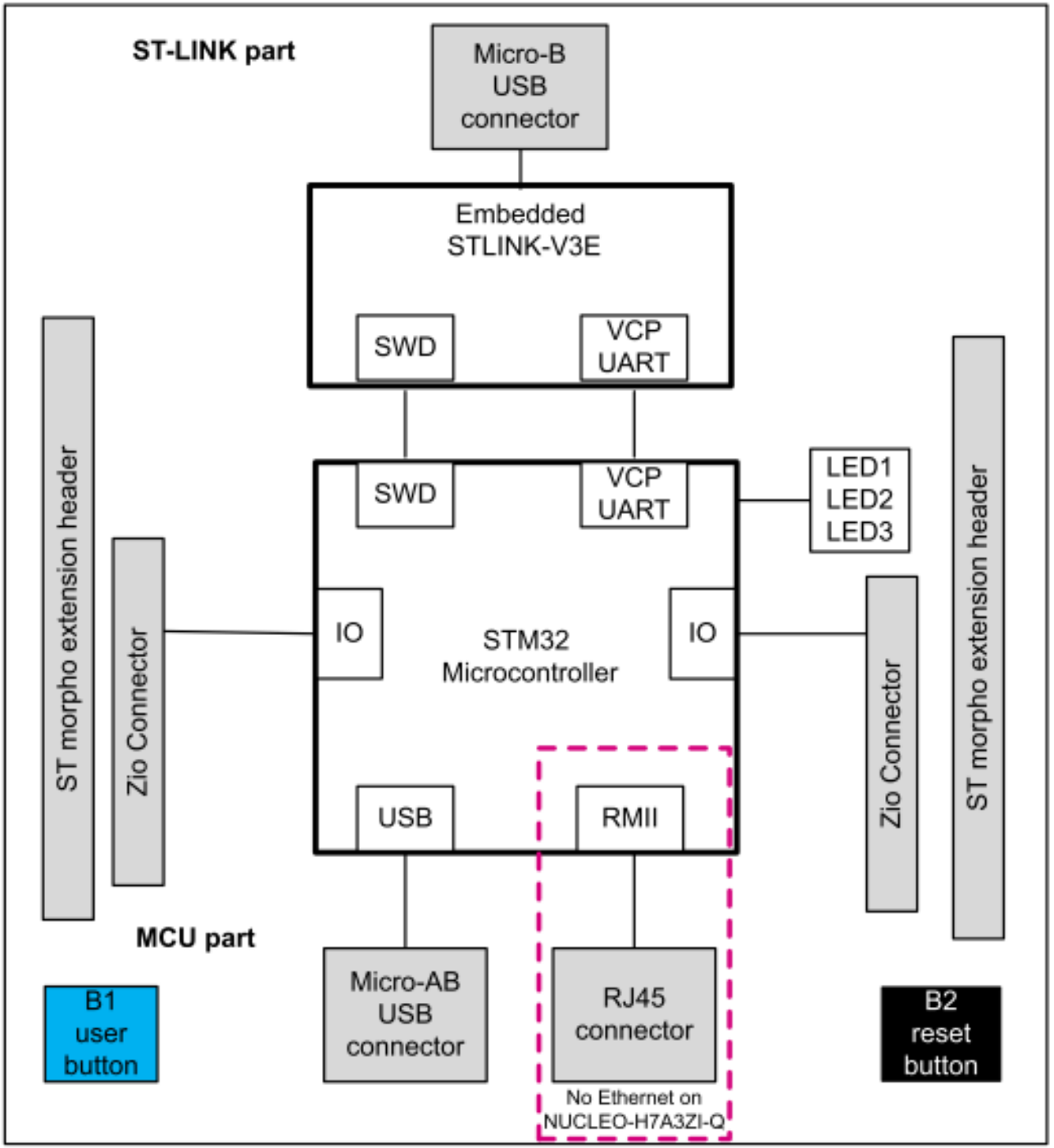


# Features

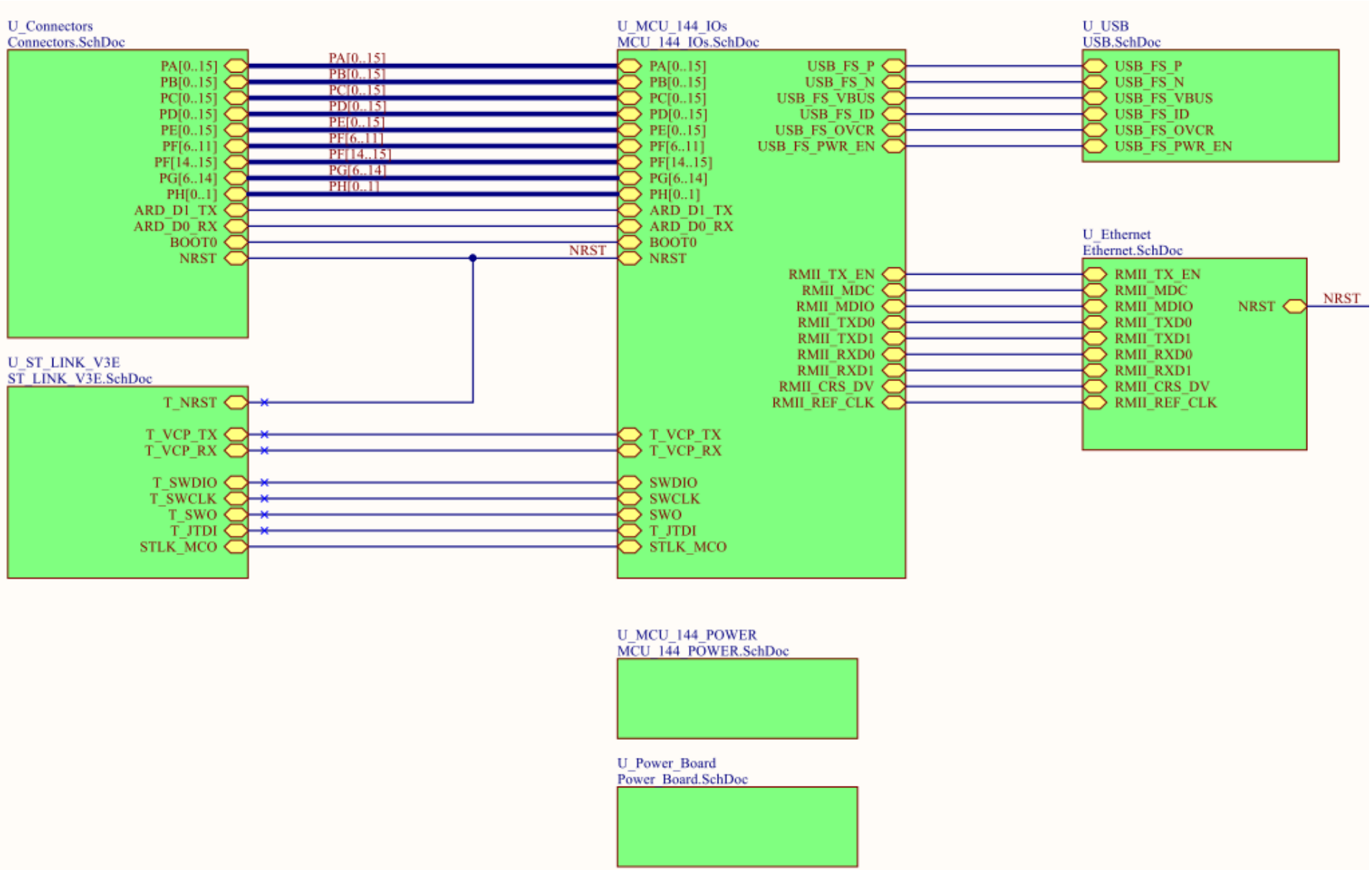
- STM32H7A3ZIT6QU microcontroller in an LQFP144 package
- 3 user LEDs
- 2 user and reset push-buttons
- 32.768 kHz crystal oscillator
- Board connectors:
  - SWD
  - ST Zio expansion connector
  - ST morpho expansion connector
- Flexible power-supply options: ST-LINK USB $V_{BUS}$, USB connector, or external sources
- Comprehensive free software libraries and examples available with the STM32Cube MCU Package
- Support of a wide choice of Integrated Development Environments (IDEs) including IAR Embedded Workbench® and STM32CubeIDE

# Block diagram

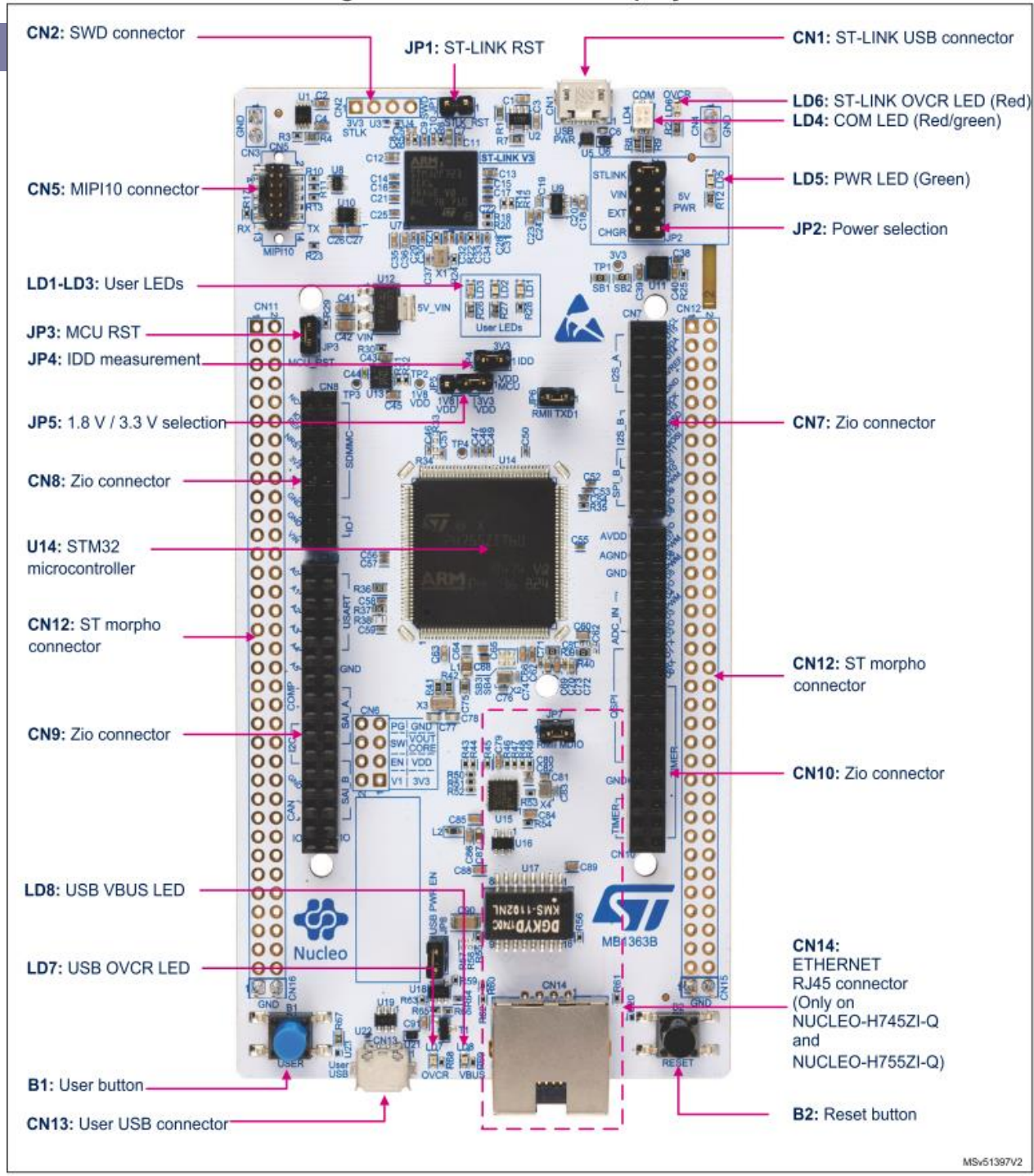


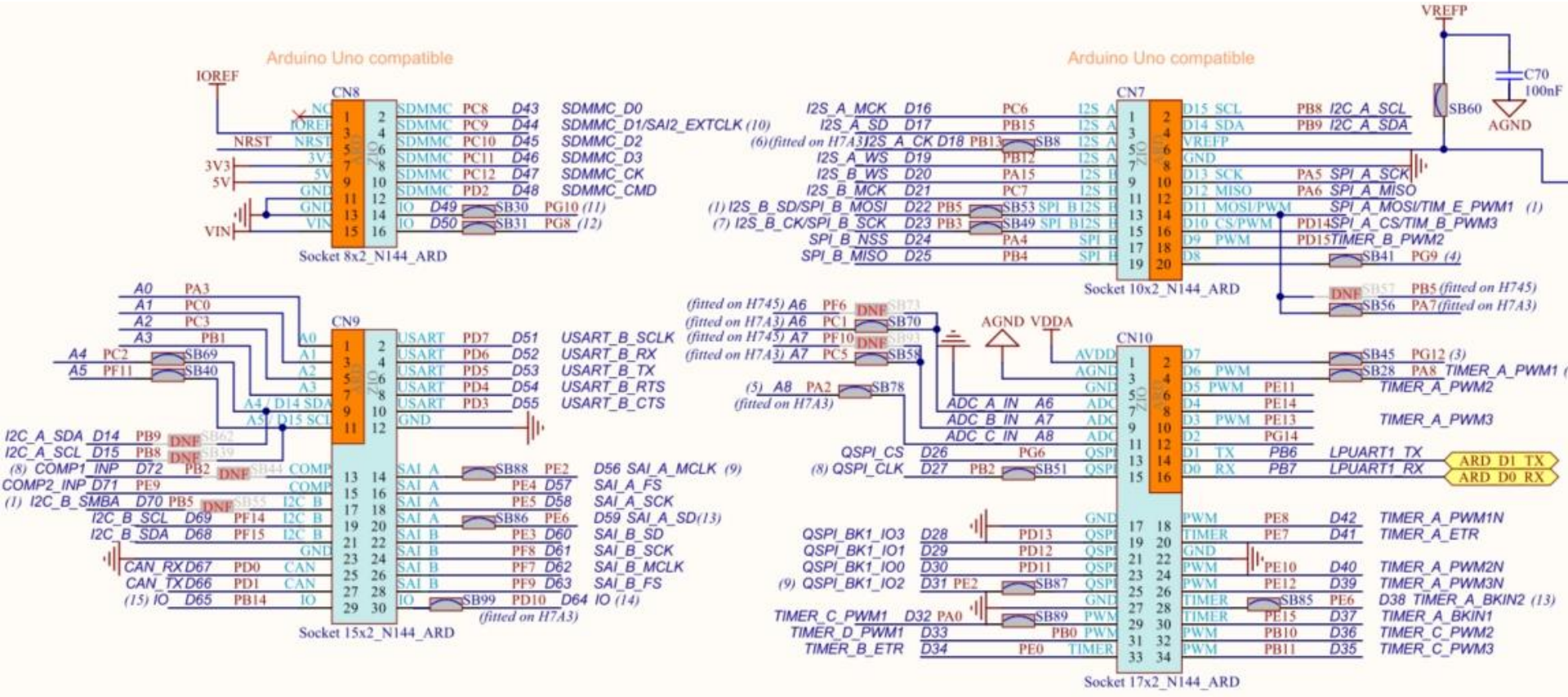
# Main board connections



# Board layout



# Zio connectors




There is also the ST morpho connector (CN11 and CN12, not soldered by default)

# Zio connectors

| Connector | Pin | Pin name | Signal name | STM32H7 pin | Function | Remark |
|---|---|---|---|---|---|---|
| CN8 | 1 | NC | NC | - | - | ARDUINO® support |
| | 3 | IOREF | IOREF | - | 3.3 V Ref | ARDUINO® support |
| | 5 | NRST | NRST | NRST | RESET | ARDUINO® support |
| | 7 | 3V3 | 3V3 | - | 3.3 V input/output | ARDUINO® support |
| | 9 | 5V | 5V | - | 5 V output | ARDUINO® support |
| | 11 | GND | GND | - | ground | ARDUINO® support |
| | 13 | GND | GND | - | ground | ARDUINO® support |
| | 15 | VIN | VIN | - | Power input | ARDUINO® support |
| | 2 | D43 | SDMMC_D0 | PC8 | SDMMC | - |
| | 4 | D44 | SDMMC_D1/ SAI2_EXTCLK | PC9(1) | SDMMC/I2S_A | - |
| | 6 | D45 | SDMMC_D2 | PC10 | SDMMC | - |
| | 8 | D46 | SDMMC_D3 | PC11 | SDMMC | - |
| | 10 | D47 | SDMMC_CK | PC12 | SDMMC | - |
| | 12 | D48 | SDMMC_CMD | PD2 | SDMMC | - |
| | 14 | D49 | I/O | PG10(2) | I/O | - |
| | 16 | D50 | I/O | PG8(3) | I/O | - |

# Zio connectors

| Connector | Pin | Pin name | Signal name | STM32H7 pin | Function | Remark |
|---|---|---|---|---|---|---|
| CN9 | 1 | A0 | ADC | PA3 | ADC_12_INP15 | ARDUINO® support |
| | 3 | A1 | ADC | PC0 | ADC_123_INP10 | ARDUINO® support |
| | 5 | A2 | ADC | PC3_C | ADC_3_INP1 | ARDUINO® support |
| | 7 | A3 | ADC | PB1 | ADC_12_INP5 | ARDUINO® support |
| | 9 | A4 | ADC | PC2_C or PB9 | ADC3_INP0 (PC2_C) or I2C1_SDA (PB9) | ARDUINO® support |
| | 11 | A5 | ADC | PF11 or PB8 | ADC1_INP2 (PF11) or I2C1_SCL (PB8) | ARDUINO® support |
| | 13 | D72 | COMP1_INP | PB2(4) | COMP | NC by default |
| | 15 | D71 | COMP2_INP | PE9 | COMP | - |
| | 17 | D70 | I2C_B_SMBA | PB5(5) | I2C_2 | NC by default |
| | 19 | D69 | I2C_B_SCL | PF14 | I2C_2 | - |
| | 21 | D68 | I2C_B_SDA | PF15 | I2C_2 | - |
| | 23 | GND | GND | - | ground | - |
| | 25 | D67 | CAN_RX | PD0 | CAN_1 | - |
| | 27 | D66 | CAN_TX | PD1 | CAN_1 | - |
| | 29 | D65 | I/O | PB14(6) | I/O | - |
| | 2 | D51 | USART_B_SCLK | PD7 | USART_2 | - |
| | 4 | D52 | USART_B_RX | PD6 | USART_2 | - |
| | 6 | D53 | USART_B_TX | PD5 | USART_2 | - |
| | 8 | D54 | USART_B_RTS | PD4 | USART_2 | - |
| | 10 | D55 | USART_B_CTS | PD3 | USART_2 | - |
| | 12 | GND | GND | - | ground | - |
| | 14 | D56 | SAI_A_MCLK | PE2(7) | SAI_1_A | - |
| | 16 | D57 | SAI_A_FS | PE4 | SAI_1_A | - |
| | 18 | D58 | SAI_A_SCK | PE5 | SAI_1_A | - |
| | 20 | D59 | SAI_A_SD | PE6(8) | SAI_1_A | - |
| | 22 | D60 | SAI_B_SD | PE3 | SAI_1_B | - |
| | 24 | D61 | SAI_B_SCK | PF8 | SAI_1_B | - |
| | 26 | D62 | SAI_B_MCLK | PF7 | SAI_1_B | - |
| | 28 | D63 | SAI_B_FS | PF9 | SAI_1_B | - |
| | 30 | D64 | I/O | PD10(9) | I/O | - |

# Zio connectors

| Connector | Pin | Pin name | Signal name | STM32H7 pin | Function | Remark |
|---|---|---|---|---|---|---|
| CN7 | 1 | D16 | I2S_A_MCK | PC6 | I2S_2 | - |
| | 3 | D17 | I2S_A_SD | PB15 | I2S_2 | - |
| | 5 | D18 | I2S_A_CK | PB13(10) | I2S_2 | - |
| | 7 | D19 | I2S_A_WS | PB12 | I2S_2 | - |
| | 9 | D20 | I2S_B_WS | PA15 | I2S_3 | - |
| | 11 | D21 | I2S_B_MCK | PC7 | I2S_3 | - |
| | 13 | D22 | I2S_B_SD/ SPI_B_MOSI | PB5(5) | I2S_3 / SPI3 | - |
| | 15 | D23 | I2S_B_CK/ SPI_B_SCK | PB3(11) | I2S_3 / SPI3 | - |
| | 17 | D24 | SPI_B_NSS | PA4 | SPI3 | - |
| | 19 | D25 | SPI_B_MISO | PB4 | SPI3 | - |
| | 2 | D15 | I2C_A_SCL | PB8 | I2C1_SCL | ARDUINO® support |
| | 4 | D14 | I2C_A_SDA | PB9 | I2C1_SDA | ARDUINO® support |
| | 6 | AREF | AREF | - | AVDD/VREF+ | ARDUINO® support |
| | 8 | GND | GND | | ground | ARDUINO® support |
| | 10 | D13 | SPI_A_SCK | PA5 | SPI1_SCK | ARDUINO® support |
| | 12 | D12 | SPI_A_MISO | PA6 | SPI1_MISO | ARDUINO® support |
| | 14 | D11 | SPI_A_MOSI/ TIM_E_PWM1 | PA7(5) | SPI1_MOSI/ TIM3_CH2 | ARDUINO® support |
| | 16 | D10 | SPI_A_CS/ TIM_B_PWM3 | PD14 | SPI1_CS/ TIM4_CH3 | ARDUINO® support |
| | 18 | D9 | TIMER_B_PWM2 | PD15 | TIM4_CH4 | ARDUINO® support |
| | 20 | D8 | I/O | PG9(12) | - | ARDUINO® support |

# Zio connectors

| Connector | Pin | Pin name | Signal name | STM32H7 pin | Function | Remark |
|---|---|---|---|---|---|---|
| CN10 | 1 | VDDA | VDDA | - | Analog VDD | - |
| | 3 | AGND | AGND | - | Analog ground | - |
| | 5 | GND | GND | - | ground | - |
| | 7 | A6 | ADC_A_IN | PC1 | ADC12_INP1 | - |
| | 9 | A7 | ADC_B_IN | PC5 | ADC12_INP8 | - |
| | 11 | A8 | ADC_C_IN | PA2(13) | ADC1_INP14 | - |
| | 13 | D26 | QSPI_CS | PG6 | QSPI_BK1 | - |
| | 15 | D27 | QSPI_CLK | PB2(4) | QSPI_CLK | - |
| | 17 | GND | GND | - | ground | - |
| | 19 | D28 | QSPI_BK1_IO3 | PD13 | QSPI_BK1 | - |
| | 21 | D29 | QSPI_BK1_IO1 | PD12 | QSPI_BK1 | - |
| | 23 | D30 | QSPI_BK1_IO0 | PD11 | QSPI_BK1 | - |
| | 25 | D31 | QSPI_BK1_IO2 | PE2(7) | QSPI_BK1 | - |
| | 27 | GND | GND | - | ground | - |
| | 29 | D32 | TIMER_C_PWM1 | PA0 | TIM2_CH1 | - |
| | 31 | D33 | TIMER_D_PWM1 | PB0 | TIM3_CH3 | - |
| | 33 | D34 | TIMER_B_ETR | PE0 | TIM4_ETR | - |
| | 2 | D7 | I/O | PG12(14) | - | ARDUINO® support |
| | 4 | D6 | TIMER_A_PWM1 | PA8(15) | TIM1_CH1 | ARDUINO® support |
| | 6 | D5 | TIMER_A_PWM2 | PE11 | TIM1_CH2 | ARDUINO® support |
| | 8 | D4 | I/O | PE14 | - | ARDUINO® support |
| | 10 | D3 | TIMER_A_PWM3 | PE13 | TIM1_CH3 | ARDUINO® support |
| | 12 | D2 | I/O | PG14 | - | ARDUINO® support |
| | 14 | D1 | USART_A_TX | PB6 | LPUART1 | ARDUINO® support |
| | 16 | D0 | USART_A_RX | PB7 | LPUART1 | ARDUINO® support |
| | 18 | D42 | TIMER_A_PWM1N | PE8 | TIM1_CH1N | - |
| | 20 | D41 | TIMER_A_ETR | PE7 | TIM1_ETR | - |
| | 22 | GND | GND | - | ground | - |
| | 24 | D40 | TIMER_A_PWM2N | PE10 | TIM1_CH2N | - |
| | 26 | D39 | TIMER_A_PWM3N | PE12 | TIM1_CH3N | - |
| | 28 | D38 | I/O | PE6(8) | I/O | - |
| | 30 | D37 | TIMER_A_BKIN1 | PE15 | TIM1_BKIN1 | - |
| | 32 | D36 | TIMER_C_PWM2 | PB10 | TIM2_CH3 | - |
| | 34 | D35 | TIMER_C_PWM3 | PB11 | TIM2_CH4 | |

# Power supply and power selection

Several possibilities:

- host PC connected to CN1 through a USB cable (default setting)
- external 7-11 V power supply connected to CN8 pin 15 or CN11 pin 24
- external 5 V power supply connected to CN11 pin 6
- external 5 V USB charger (5V_USB_CHGR) connected to CN1
- external 3.3 V power supply (3V3) connected to CN8 pin 7 or CN11 pin 16

# LEDs (1/3)

- User LD1: *green* user LED is connected to the STM32H7 I/O PB0
- User LD2: *yellow* user LED is connected to PE1
- User LD3: *red* user LED is connected to PB14
- These user LEDs are
  - on when the line is high, and
  - off when the line is low

# LEDs (2/3)

- LD4 COM: the tricolor LED LD4, green, orange, red, provides information about ST-LINK communication status
- *Slow blinking red or OFF*: at power-on before USB initialization
- *Fast blinking red or OFF*: after the first correct communication between PC and STLINK-V3E (Enumeration)
- *Red*: when the initialization between the PC and STLINK-V3E is complete
- *Green*: after a successful target communication initialization
- *Blinking red/green*: during communication with the target
- *Green*: communication finished and successful
- *Orange*: communication failure

# LEDs (3/3)

- LD5 PWR: *green* LED indicates that STM32H7 part is powered and +5 V power is available on CN8 pin 9 and CN11 pin 18
- LD6 USB power fault: board power consumption on USB exceeds 500 mA,
  - -> user must power the board using an external power supply
- LD7 and LD8 USB FS: for the USB OTG

# Push-buttons and JP4

- B1 user (*blue button*): user button is connected to I/O PC13 by default (or PA0)
  - line goes high when button is pressed
- B2 reset (*black button*): connected to NRST, used to reset STM32H7 microcontroller

- Jumper JP4, labeled IDD: used to measure STM32H7 microcontroller consumption by removing the jumper and by connecting an ammeter:
  - JP4 present: STM32H7 is powered (default position)
  - no JP4 : an ammeter must be connected to measure the STM32H7 current

# Programming and debugging

- Onboard STLINK-V3E debugger/programmer with SWD connector:
  - USB re-enumeration capability: virtual COM port, mass storage, debug port
  - STLINK-V3E standalone kit capability