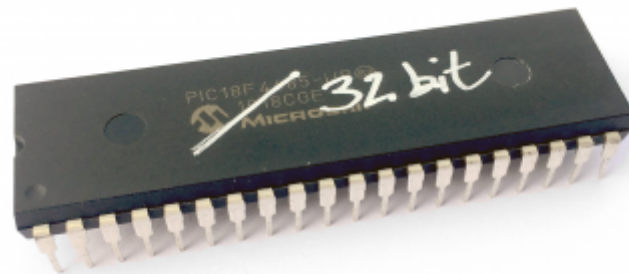
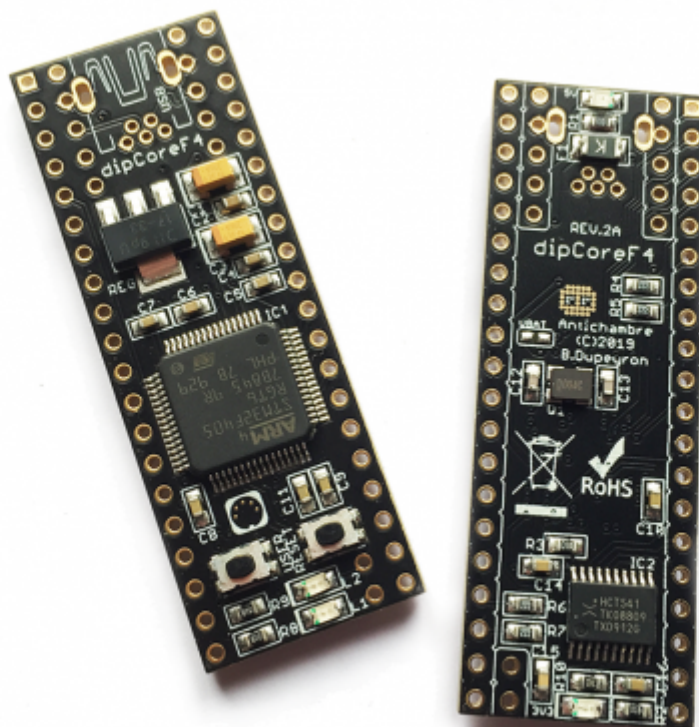


# dipCoreF4



**A reduced Core for your MIDibox App, an STM32F405RG in a DIP40 format.**



## Features

- MIOS32 uses same processor family and drivers(no deep change).
- Same internal hardware as Disco or wCore (speed, memory, peripherals, etc...) .
- Board pinout and package compatible with a MIOS8 PIC 
- USB connector onboard. 2 OTG are available, second(new) USB is Host only.
- 5V power input and led.
- 3.3V regulator and led on board.

- 74HCT541 on board for the 5V output ports.
- User and Reset buttons.
- 2 user leds.
- 12 extra pins for USB, buttons and leds.
- Your favorite Core is now a current component easy to integrate.

All commons MIOS32 ports are available except:

- General purpose J10x ports were removed.
- LCD port was reduced to a serial one, no more pins J15.D0-D7 , no back-light power supply.
- 2 UART only(2 MIDI In/2Out).
- 2 AIN channels only(e.g. pedal inputs).
- SPI slave only supported by J19(SPI3).

Check the [dipBoardF4](#) for more details 

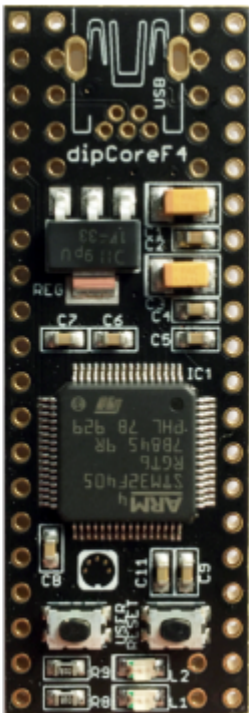
## Download

[dipCoreF4 eagle lib](#) for easy integration in your design.

dipcoref4\_v2a.zip

## Pinout

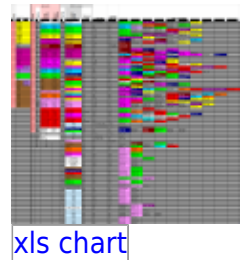
The dipCoreF4 and the legacy MIOS32 ports.

|    |             |    |        |                                                                                     |    |               |    |
|----|-------------|----|--------|-------------------------------------------------------------------------------------|----|---------------|----|
| 1  | RESET       | 41 | J1.ID1 |  | 46 | J16.SO        | 40 |
| 2  | USER-BUTTON | 42 | GND    |                                                                                     | 46 | J16.SI        | 39 |
| 3  | J4.SC1      | 43 | J1.DP1 |                                                                                     | 48 | J16.SC        | 38 |
| 4  | J4.SD1      | 44 | J1.DM2 |                                                                                     | 49 | J16.RC1       | 37 |
| 5  | J11.MI1     | 45 | J1.DP2 |                                                                                     | 50 | J18.RX        | 36 |
| 6  | J11.MO1     |    |        |                                                                                     |    | J18.TX        | 35 |
| 7  | J5.A0       |    |        |                                                                                     |    | J16.RC2       | 34 |
| 8  | J5.A1       |    |        |                                                                                     |    | J15.CS1       | 33 |
| 9  | J19.RC2     |    |        |                                                                                     |    | VBAT/3V3(OUT) | 32 |
| 10 | J8/9.RC2    |    |        |                                                                                     |    | GND           | 31 |
| 11 | 3V3(OUT)    |    |        |                                                                                     |    | J15.SCL       | 30 |
| 12 | GND         |    |        |                                                                                     |    | J15.SDA       | 29 |
| 13 | SWDIO       |    |        |                                                                                     |    | J15.DC        | 28 |
| 14 | SWCLK       |    |        |                                                                                     |    | J15.CS2       | 27 |
| 15 | J19.RC1     |    |        |                                                                                     |    | J11.MI2       | 26 |
| 16 | J19.SC      |    |        |                                                                                     |    | J11.MO2       | 25 |
| 17 | J19.SO      |    |        |                                                                                     |    | J4.SD2        | 24 |
| 18 | J19.SI      |    |        |                                                                                     |    | J4.SC2        | 23 |
| 19 | J8/9.SO     |    |        |                                                                                     |    | J8/9.SC       | 22 |
| 20 | J8/9.SI     |    |        |                                                                                     |    | J8/9.RC1      | 21 |
|    |             |    |        |                                                                                     | 51 | LED.2         |    |
|    |             |    |        |                                                                                     | 52 | LED.1         |    |

Check [dipBoardF4](#) for more details about the connectors.

### **First, was a chart.**

This chart gives you the equivalence between the different pinout and functions.



| PIC / MIO8 |               |        |   | STM32F4 / MIO32 |        |                |                |         |                    |                  |                      |
|------------|---------------|--------|---|-----------------|--------|----------------|----------------|---------|--------------------|------------------|----------------------|
|            |               |        |   | dipCoreF4       |        |                | DISCO / wCore  |         |                    |                  |                      |
| DIP40      | MIO8 Function |        |   | DIP40           | LQFP64 | STM32 F415RG   | MIO32 Function | LQFP100 | STM32F 407VG       | Discovery F4 Pin | Pin name             |
| ↓          | ↓             | ↓      | ↓ | ↓               | ↓      | ↓              | ↓              | ↓       | ↓                  | ↓                | ↓                    |
| 2          | J5 RA0        |        |   | 2               | 14     | GPIO           | USER BUTT      | 23      | USER BUTT          | P1.12            | PA0(s)-WKP(s)        |
| 3          | J5 RA1        |        |   | 3               | 58     | I2C1_SCL       | J4B.SC         | 92      | I2C1_SCL           | P2.23            | PB6                  |
| 4          | J5 RA2        |        |   | 4               | 59     | I2C1_SDA       | J4B.SD         | 93      | USART1_RX          | P2.24            | PB7                  |
| 5          | J5 RA3        |        |   | 5               | 17     | USART2_RX      | J11.MI1        | 26      | USART2_RX          | P1.13            | PA3(s)               |
| 6          | J5 RA4        |        |   | 6               | 16     | USART2_TX      | J11.MO1        | 25      | USART2_TX          | P1.14            | PA2(s)               |
| 7          | J5 RA5        |        |   | 7               | 15     | ADC123_IN1     | J5.A0          | 24      | ADC123_IN1         | P1.11            | PA1(s)               |
| 8          | J5 RE0        |        |   | 8               | 25     | ADC12_IN15     | J5.A1          | 34      | ADC12_IN15         | P1.19            | PC5(s)               |
| 9          | J5 RE1        |        |   | 9               | 40     | SP3_RC2(GPIO)  | J19.RC2        | 66      | LCD-SER/E2         | P2.46            | PC9                  |
| 10         | J5 RE2        |        |   | 10              | 26     | SPI2_RC2(GPIO) | J8/9.RC2       | 35      | ADC12_IN8          | P1.22            | PB0(s)               |
| 13         | OSC1          |        |   | 13              | 46     | JTMS-SWDIO     |                | 72      | JTMS-SWDIO         | P2.42            | PA13                 |
| 14         | OSC2          |        |   | 14              | 49     | JTCK-SWCLK     |                | 76      | JTCK-SWCLK         | P2.39            | PA14                 |
| 15         | J6/7_RC       |        |   | 15              | 50     | SPI3_RC1(NSS)  | J19.RC1        | 77      | SPI3_NSS.RC1       | P2.40            | PA15                 |
| 16         | J6/7_SC       |        |   | 16              | 55     | SPI3_SCK       | J19.SC         | 89      | SPI3_SCK           | P2.28            | PB3                  |
| 17         | J6/7_SO       |        |   | 17              | 57     | SPI3_MOSI      | J19.SO         | 91      | SPI3_MOSI          | P2.26            | PB5                  |
| 18         | J6/7_SI       |        |   | 18              | 56     | SPI3_MISO      | J19.SI         | 90      | SPI3_MISO          | P2.25            | PB4                  |
| 19         | J8/9 SO       |        |   | 19              | 11     | SPI2_MOSI      | J8/9.SO        | 18      | N.U.               | P1.9             | PC3(s)               |
| 20         | J8/9 SI       |        |   | 20              | 10     | SPI2_MISO      | J8/9.SI        | 17      | ADC123_IN12        | P1.10            | PC2(s)               |
| 21         | J8/9 RC       |        |   | 21              | 27     | SPI2_RC1(GPIO) | J8/9.RC1       | 36      | ADC12_IN9          | P1.21            | PB1(s)               |
| 22         | J8/9 SC       | J10 SC |   | 22              | 34     | SPI2_SCK       | J8/9.SC        | 52      | SPI2_SCK           | P1.37            | PB13                 |
| 23         | J10 RC        |        |   | 23              | 30     | I2C2_SDA       | J4A.SC         | 48      | I2C2_SDA           | P1.35            | PB11                 |
| 24         | J10 SO        |        |   | 24              | 29     | I2C2_SCL       | J4A.SD         | 47      | I2C2_SCL           | P1.34            | PB10                 |
| 25         | J11 TX        |        |   | 25              | 51     | UART4_TX       | J11.MO2        | 78      | DAC_CK(discovery)  | P2.37            | PC10                 |
| 26         | J11 RX        |        |   | 26              | 52     | UART4_RX       | J11.MI2        | 79      | LCD-SER/RW         | P2.38            | PC11                 |
| 27         | J14           |        |   | 27              | 8      | GPIO           | J15.CS2        | 15      | OTG_FS_EN          | P1.8             | PC0(s)               |
| 28         | J15 RS        | J10 MD |   | 28              | 54     | GPIO           | J15.DC         | 83      | UART5_RX           | P2.34            | PD2                  |
| 29         | J15 RW        | J10 MO |   | 29              | 53     | GPIO           | J15.SDA        | 80      | UART5_TX           | P2.35            | PC12                 |
| 30         | J15 E         |        |   | 30              | 9      | GPIO           | J15.SCL        | 16      | ADC123_IN11        | P1.7             | PC1(s)               |
| 33         | J15 D0        |        |   | 33              | 33     | GPIO           | J15.CS1        | 51      | SPI2_NSS.RC1       | P1.36            | PB12                 |
| 34         | J15 D1        |        |   | 34              | 24     | SPI1_RC2(GPIO) | J16.RC2        | 33      | ADC12_IN14         | P1.20            | PC4(s)               |
| 35         | J15 D2        |        |   | 35              | 62     | CAN1_TX        | J18.TX         | 96      | I2C1_SDA           | P2.20            | PB9                  |
| 36         | J15 D3        |        |   | 36              | 61     | CAN1_RX        | J18.RX         | 95      | SP3_RC2            | P2.19            | PB8                  |
| 37         | J15 D4        |        |   | 37              | 20     | SPI1_RC1(NSS)  | J16.RC1        | 29      | ADC12_IN4          | P1.16            | PA4(s)               |
| 38         | J15 D5        |        |   | 38              | 21     | SPI1_SCK       | J16.SC         | 30      | SPI1_SCK           | P1.15            | PA5(s)               |
| 39         | J15 D6        |        |   | 39              | 22     | SPI1_MISO      | J16.SI         | 32      | SPI1_MOSI          | P1.17            | PA7(s)               |
| 40         | J15 D7        |        |   | 40              | 23     | SPI1_MOSI      | J16.SO         | 31      | SPI1_MISO          | P1.18            | PA6(s)               |
|            |               |        |   | 41              | 43     | OTG_FS_ID      | J11.D1         | 69      | OTG_FS_ID          | P2.41            | PA10                 |
|            |               |        |   | 43              | 45     | OTG_FS_DP      | J1.DP1         | 71      | OTG_FS_DP          | CN5 (USB)        | PA12                 |
|            |               |        |   | 44              | 35     | OTG_HS_DM      | J1.DM2         | 53      | SPI2_MISO          | P1.38            | PB14                 |
|            |               |        |   | 45              | 36     | OTG_HS_DP      | J1.DP2         | 54      | SPI2_MOSI          | P1.39            | PB15                 |
|            |               |        |   | 46              | 42     | OTG_FS_VBUS    | J1.VBUS        | 68      | OTG_FS_VBUS        | P2.44            | PA9                  |
|            |               |        |   | 48              | 44     | OTG_FS_DM      | J1.DM1         | 70      | OTG_FS_DM          | CN5 (USB)        | PA11                 |
|            |               |        |   | 49              | 3      | OTG_HS_OC      | J1.OC2         | 8       | J10/D9             | P2.9             | PC14(s)-OSC32_IN(s)  |
|            |               |        |   | 50              | 4      | OTG_HS_EN      | J1.EN2         | 9       | J10/D10            | P2.10            | PC15(s)-OSC32_OUT(s) |
|            |               |        |   | 51              | 38     | LED BLUE       | LED.2          | 64      | DAC_MCK(discovery) | P2.48            | PC7                  |
|            |               |        |   | 52              | 37     | LED RED        | LED.1          | 63      | USART6_TX          | P2.47            | PC6                  |
|            |               |        |   | 2               |        | N.U.           |                | 7       | J10/D8             | P2.12            | PC13(s)              |
|            |               |        |   | 5               |        | OSC_IN         |                | 12      | N.U.               | P2.7             | PH0(s)-OSC_IN        |
|            |               |        |   | 6               |        | OSC_OUT        |                | 13      | N.U.               | P2.8             | PH1(s)-OSC_OUT       |
|            |               |        |   | 28              |        | N.U.           |                | 37      | SPI1_RC1           | P1.24            | PB2                  |
|            |               |        |   | 39              |        | N.U.           |                | 65      | LCD-SER/E1         | P2.45            | PC8                  |
|            |               |        |   | 41              |        | N.U.           |                | 67      | LCD-RS             | P2.43            | PA8                  |

## BOM

Due to the small SMD, which is sometime a difficulty to solder, the board is already assembled by

manufacturer, except the connectors.  
The mini-USB is optional.

| Qty              | Value    | Package | Parts | Mouser                               | Reichelt | Conrad | LCSC | Notes                                                                                   |
|------------------|----------|---------|-------|--------------------------------------|----------|--------|------|-----------------------------------------------------------------------------------------|
| <b>Headers</b>   |          |         |       |                                      |          |        |      |                                                                                         |
| 3                | 1*20     | male    |       | <a href="#">437-3501012000006101</a> |          |        | No!  | Adapted to sockets Mill-Max<br>0552-1-15-01-11-27-10-0<br>or<br>0553-1-15-15-11-27-10-0 |
| <b>Connector</b> |          |         |       |                                      |          |        |      |                                                                                         |
| 1                | mini-USB | THT     | USB   | <a href="#">571-1734510-1</a>        |          |        | no!  | for other ref take care about restricted area!                                          |

[External Link](#)

## Bootloader Flashing

All dedicated MIDIBox Cores, must have pre-programmed bootloader in order to communicate in MIDI with [MIOS-Studio](#)

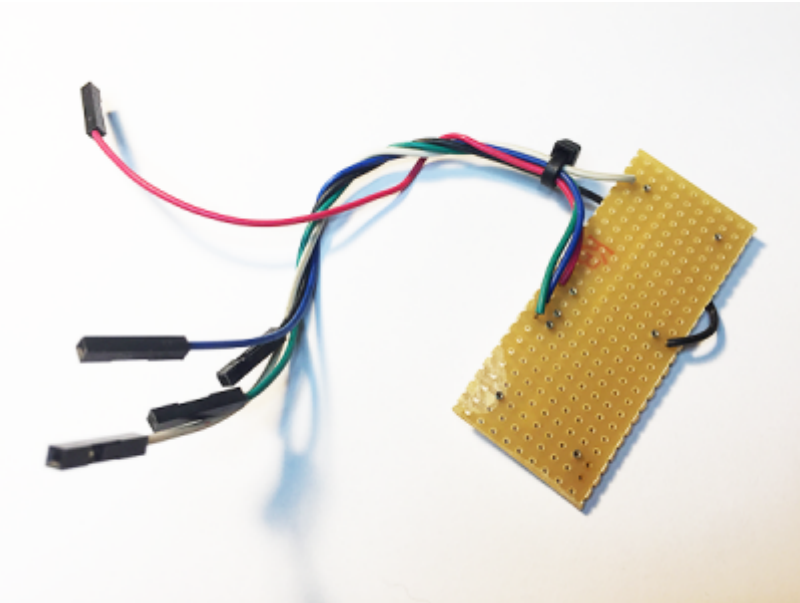
Like the Waveshare, the dipCoreF4 has no programmer onboard.

Even if the dipCoreF4 is now provided with it, should be necessary to explain connection and process.

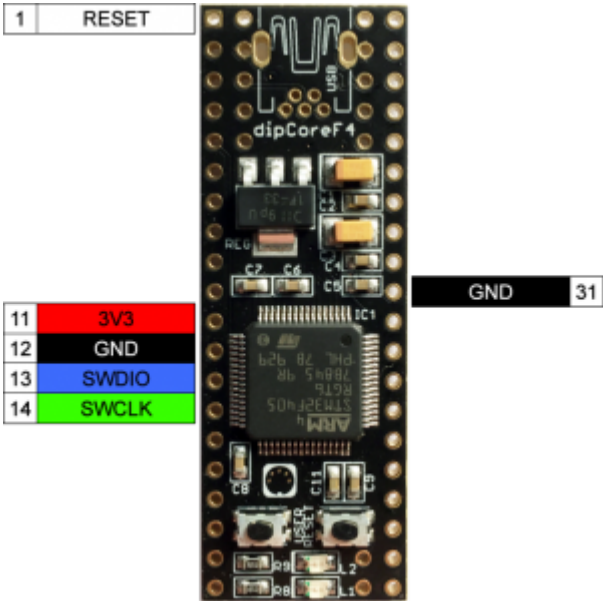
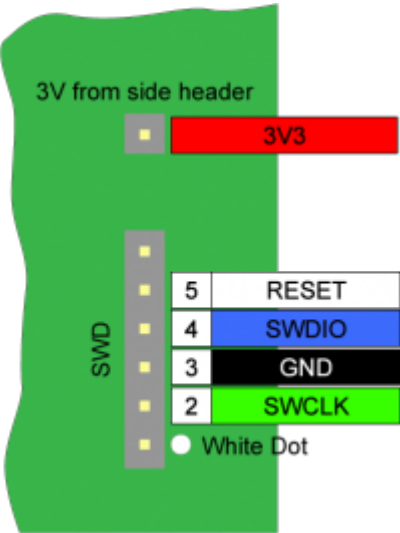
You will need:

- A ST-LINK/V2 SWD interface, [dedicated programmer/debugger](#) or any equipped Discovery/Nucleus board.
- The [ST-Link Software](#).
- [Bootloader hex file for dipCoreF4](#)
- 5 Grabber clips or an home-made adapter board.

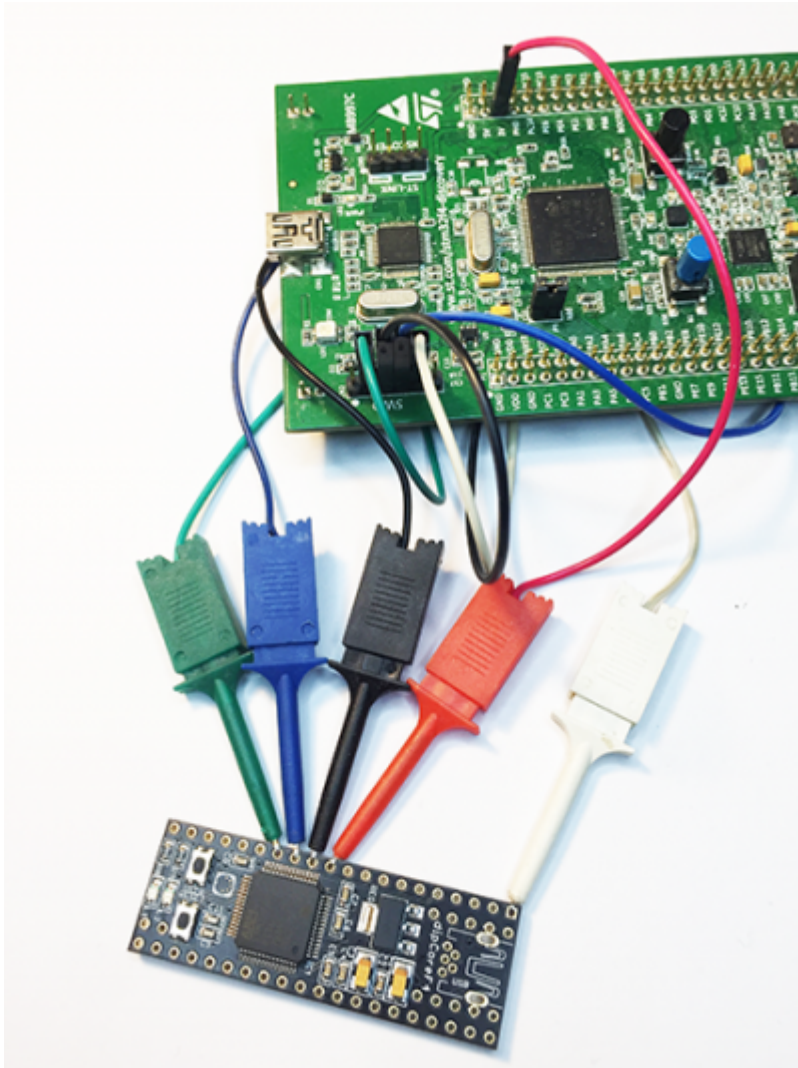




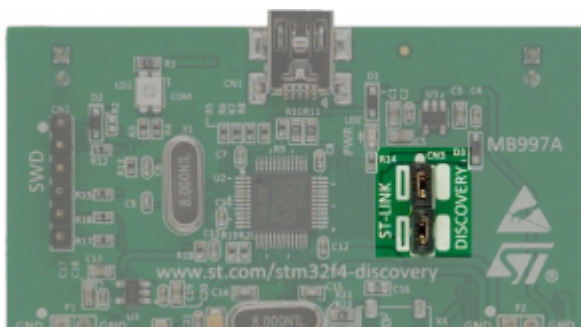
Disco/Nucleus and dipCoreF4 SWD Pinout and connection



Example:



## Flashing



be removed.

If you use a Disco or Nucleus board, those jumpers must

Once the dipCoreF4 is correctly connected refer to [uCaps STM32F4 Based Core page > Installing the MIOS32 Bootloader](#) where the flashing process is already well explained.

## 407VG vs 405RG

The 405RG is a TQFP64, a

## Legacy STM32F407 and 405 share the same characteristics.

10x10mm package and only 64 pins.

| Compare Attributes <span>✕</span>                    |                                                                                                                    |                                                                                                                                    |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Show Differences | STM32F405RG ✕                                                                                                      | STM32F407VG ✕                                                                                                                      |
| Description                                          | High-performance foundation line, ARM Cortex-M4 core with DSP and FPU, 1 Mbyte Flash, 168 MHz CPU, ART Accelerator | High-performance foundation line, ARM Cortex-M4 core with DSP and FPU, 1 Mbyte Flash, 168 MHz CPU, ART Accelerator, Ethernet, FSMC |
| Package                                              | LQFP 64 10x10x1.4                                                                                                  | LQFP 100 14x14x1.4                                                                                                                 |
| Core                                                 | Arm Cortex-M4                                                                                                      | Arm Cortex-M4                                                                                                                      |
| Operating Frequency (MHz) (Processor speed)          | 168                                                                                                                | 168                                                                                                                                |
| Co-Processor type                                    | -                                                                                                                  | -                                                                                                                                  |
| Co-Processor frequency (MHz) (max)                   | -                                                                                                                  | -                                                                                                                                  |
| FLASH Size (kB) (Prog)                               | 1024                                                                                                               | 1024                                                                                                                               |
| Data EEPROM (B) (nom)                                | -                                                                                                                  | -                                                                                                                                  |
| RAM Size (kB)                                        | 192                                                                                                                | 192                                                                                                                                |
| Timers (typ) (16 bit)                                | 12                                                                                                                 | 12                                                                                                                                 |
| Timers (typ) (32 bit)                                | 2                                                                                                                  | 2                                                                                                                                  |
| Other timer functions                                | 2 x WDG, 24-bit down counter, RTC                                                                                  | 2 x WDG, 24-bit down counter, RTC                                                                                                  |
| A/D Converters (12-bit channels)                     | 16                                                                                                                 | 16                                                                                                                                 |
| A/D Converters (16-bit channels)                     | -                                                                                                                  | -                                                                                                                                  |
| D/A Converters (typ) (12 bit)                        | 2                                                                                                                  | 2                                                                                                                                  |
| Comparator                                           | -                                                                                                                  | -                                                                                                                                  |
| I/Os (High Current)                                  | 51                                                                                                                 | 82                                                                                                                                 |
| Display controller                                   | -                                                                                                                  | -                                                                                                                                  |
| CAN (typ)                                            | 2                                                                                                                  | 2                                                                                                                                  |
| CAN FD (typ)                                         | -                                                                                                                  | -                                                                                                                                  |
| I2C (typ)                                            | 3                                                                                                                  | 3                                                                                                                                  |
| SPI (typ)                                            | 3                                                                                                                  | 3                                                                                                                                  |
| I2S (typ)                                            | 2                                                                                                                  | 2                                                                                                                                  |
| USB Type                                             | USB OTG FS + USB OTG FS/HS                                                                                         | USB OTG FS + USB OTG FS/HS                                                                                                         |
| USART (typ)                                          | 4                                                                                                                  | 4                                                                                                                                  |
| UART (typ)                                           | 2                                                                                                                  | 2                                                                                                                                  |
| Connectivity supported                               | -                                                                                                                  | -                                                                                                                                  |
| Integrated op-amps                                   | -                                                                                                                  | -                                                                                                                                  |
| Additional Serial Interfaces                         | -                                                                                                                  | Ethernet                                                                                                                           |
| Parallel Interfaces                                  | FSMC, SD/MMC                                                                                                       | FSMC, SD/MMC                                                                                                                       |
| Crypto-HASH                                          | -                                                                                                                  | -                                                                                                                                  |
| TRNG (typ)                                           | true                                                                                                               | true                                                                                                                               |
| SMPs                                                 | -                                                                                                                  | -                                                                                                                                  |
| Supply Voltage (V) (min)                             | 1.8                                                                                                                | 1.8                                                                                                                                |
| Supply Voltage (V) (max)                             | 3.6                                                                                                                | 3.6                                                                                                                                |
| Supply Current (µA) (typ) (Lowest power mode)        | 1.7                                                                                                                | 1.7                                                                                                                                |
| Supply Current (µA) (typ) (Run mode (per Mhz))       | 215                                                                                                                | 215                                                                                                                                |
| Operating Temperature (°C) (min)                     | -40                                                                                                                | -40                                                                                                                                |
| Operating Temperature (°C) (max)                     | 105                                                                                                                | 105                                                                                                                                |
| A/D Converters (typ)                                 | -                                                                                                                  | -                                                                                                                                  |
| Number of Channels (typ)                             | -                                                                                                                  | -                                                                                                                                  |
| A/D Converters (typ)                                 | -                                                                                                                  | -                                                                                                                                  |
| Number of Channels (typ)                             | -                                                                                                                  | -                                                                                                                                  |

No Ethernet MAC and camera interface.

## ST STM32F4xx series

## In MIO32

We use the same peripheral drivers same family, some compilation defined conditions were added for the specific pinout and type, number of ports. `ToDo`

For any questions, informations or observations do not hesitate to contact me (Forum).  
[Antichambre](#).

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Last update: **2020/05/22 11:22**

