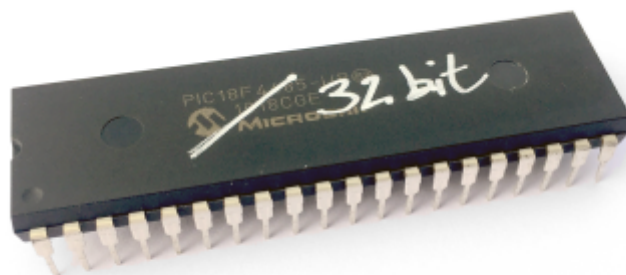
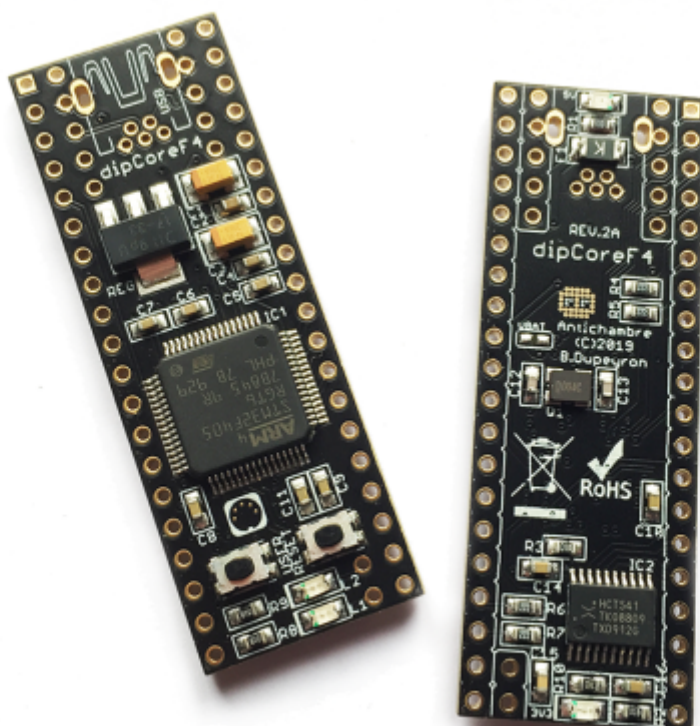


# dipCoreF4



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

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## Pinout

**The dipCoreF4 and the legacy MIOS32 ports.**

|    |             |    |        |   |             |    |               |    |
|----|-------------|----|--------|---|-------------|----|---------------|----|
| 1  | RESET       | 41 | J1.ID1 |  | VBUS/5V(IN) | 46 | J16.SO        | 40 |
| 2  | USER-BUTTON | 42 | GND    |   | GND         | 46 | J16.SI        | 39 |
| 3  | J4.SC1      | 43 | J1.DP1 |   | J1.DM1      | 48 | J16.SC        | 38 |
| 4  | J4.SD1      | 44 | J1.DM2 |   | J1.OV2      | 49 | J16.RC1       | 37 |
| 5  | J11.MI1     | 45 | J1.DP2 |   | J1.EN2      | 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 |
|    |             |    |        |   | LED.2       | 51 |               |    |
|    |             |    |        |   | LED.1       | 52 |               |    |

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

**First, was a chart.**

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



[xls chart](#)

| PIC / MIOS8 |                | STM32F4 / MIOS32 |        |                |                 |         |                    |                  |                      |      |
|-------------|----------------|------------------|--------|----------------|-----------------|---------|--------------------|------------------|----------------------|------|
|             |                | dipCoreF4        |        |                | DISCO / wCore   |         |                    |                  |                      |      |
| DIP-40      | MIOS8 Function | DIP-40           | LOFP04 | STM32 F415RG   | MIOS32 Function | LOFP100 | STM32F 407VG       | Discovery F4 Pin | Pin name             |      |
| 2           | J5 RA0         | 2                | 14     | GPIO           | USER BUTT       | 23      | USER BUTT          | P1.12            | PA0(5)-WKUP(5)       |      |
| 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(5)               |      |
| 6           | J5 RA4         | 6                | 16     | USART2_TX      | J11.MO1         | 25      | USART2_TX          | P1.14            | PA2(5)               |      |
| 7           | J5 RA5         | 7                | 15     | ADC123_IN1     | J5.A0           | 24      | ADC123_IN1         | P1.11            | PA1(5)               |      |
| 8           | J5 RE0         | 8                | 25     | ADC12_IN15     | J5.A1           | 34      | ADC12_IN15         | P1.19            | PC5(5)               |      |
| 9           | J5 RE1         | 9                | 40     | SPI3_RC2(GPIO) | J8/9.RC2        | 66      | LCD-SERVE2         | P2.46            | PC9                  |      |
| 10          | J5 RE2         | 10               | 26     | SPI2_RC2(GPIO) | J8/9.RC2        | 35      | ADC12_IN8          | P1.22            | PB0(5)               |      |
| 13          | OSC1           | 13               | 46     | JTMS-SWDIO     |                 | 72      | JTMS-SWDIO         | P2.42            | PA13                 |      |
| 14          | OSC2           | 14               | 49     | JTCK-SWCLK     |                 |         | JTCK-SWCLK         | P2.39            | PA14                 |      |
| 15          | J6/7_RC        | 15               | 50     | SPI3_RC1(NSS)  | J9.RC1          | 77      | SPI3_NSS:RC1       | P2.40            | PA15                 |      |
| 16          | J6/7_SC        | 16               | 55     | SPI3_SCK       | J9.SC           | 89      | SPI3_SCK           | P2.28            | PB3                  |      |
| 17          | J6/7_SO        | 17               | 57     | SPI3_MOSI      | J9.SO           | 91      | SPI3_MOSI          | P2.26            | PB5                  |      |
| 18          | J6/7_SI        | 18               | 56     | SPI3_MISO      | J9.SI           | 90      | SPI3_MISO          | P2.25            | PB4                  |      |
| 19          | J8/9 SO        | 19               | 11     | SPI2_MOSI      | J8/9.SO         | 18      | N.U.               | P1.9             | PC3(5)               |      |
| 20          | J8/9 SI        | 20               | 10     | SPI2_MISO      | J8/9.SI         | 17      | ADC123_IN12        | P1.10            | PC2(5)               |      |
| 21          | J8/9 RC        | 21               | 27     | SPI2_RC1(GPIO) | J8/9.RC1        | 36      | ADC12_IN9          | P1.21            | PB1(5)               |      |
| 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-SERVE/RV       | P2.38            | PC11                 |      |
| 27          | J14            | 27               | 8      | GPIO           | J15.CS2         | 15      | DTG_FS_EN          | P1.8             | PC0(5)               |      |
| 28          | J15 RS         | J10 MD           | 28     | 54             | GPIO            | J15.DC  | 83                 | UART5_RX         | P2.34                | PD2  |
| 29          | J15 RW         | J10 MD           | 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(5)               |      |
| 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(5)               |      |
| 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      | SPI3_RC2           | P2.19            | PB8                  |      |
| 37          | J15 D4         | 37               | 20     | SPI1_RC1(NSS)  | J16.RC1         | 29      | ADC12_IN4          | P1.16            | PA4(5)               |      |
| 38          | J15 D5         | 38               | 21     | SPI1_SCK       | J16.SC          | 30      | SPI1_SCK           | P1.15            | PA5(5)               |      |
| 39          | J15 D6         | 39               | 22     | SPI1_MISO      | J16.SI          | 32      | SPI1_MOSI          | P1.17            | PA7(5)               |      |
| 40          | J15 D7         | 40               | 23     | SPI1_MOSI      | J16.SO          | 31      | SPI1_MISO          | P1.18            | PA6(5)               |      |
|             |                | 41               | 43     | DTG_FS_ID      | J1.D1           | 69      | DTG_FS_ID          | P2.41            | PA10                 |      |
|             |                | 42               | 45     | DTG_FS_DP      | J1.DP1          | 71      | DTG_FS_DP          | CN5 (USB)        | PA12                 |      |
|             |                | 44               | 35     | DTG_HS_DM      | J1.DM2          | 53      | SPI2_MISO          | P1.38            | PB14                 |      |
|             |                | 45               | 36     | DTG_HS_DP      | J1.DP2          | 54      | SPI2_MOSI          | P1.39            | PB15                 |      |
|             |                | 46               | 42     | DTG_FS_VBUS    | J1.VBUS         | 68      | DTG_FS_VBUS        | P2.44            | PA9                  |      |
|             |                | 48               | 44     | DTG_FS_DM      | J1.DM1          | 70      | DTG_FS_DM          | CN5 (USB)        | PA11                 |      |
|             |                | 49               | 3      | DTG_HS_OC      | J1.OC2          | 8       | J10/D9             | P2.9             | PC14(3)-OSC32_IN(5)  |      |
|             |                | 50               | 4      | DTG_HS_EN      | J1.EN2          | 9       | J10/D10            | P2.10            | PC15(3)-OSC32_OUT(5) |      |
|             |                | 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(3)              |      |
|             |                |                  | 5      | OSC_IN         |                 | 12      | N.U.               | P2.7             | PH0(5)-OSC_IN        |      |
|             |                |                  | 6      | OSC_OUT        |                 | 13      | N.U.               | P2.8             | PH1(5)-OSC_OUT       |      |
|             |                |                  | 28     | N.U.           |                 | 37      | SPI1_RC1           | P1.24            | PB2                  |      |
|             |                |                  | 39     | N.U.           |                 | 65      | LCD-SERVE1         | 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!  |

## Installing the MIOS32 Bootloader

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

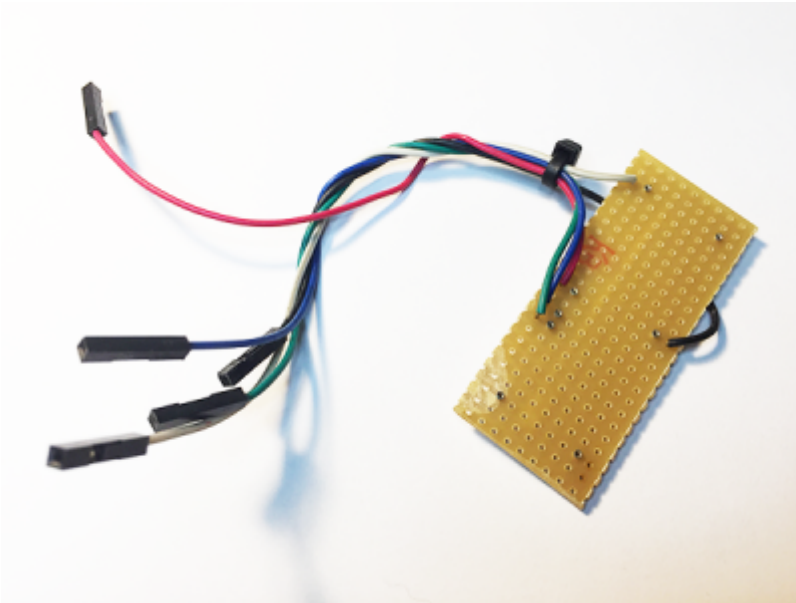
Like the Waveshare, the dipCoreF4 has no programmer onboard.

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

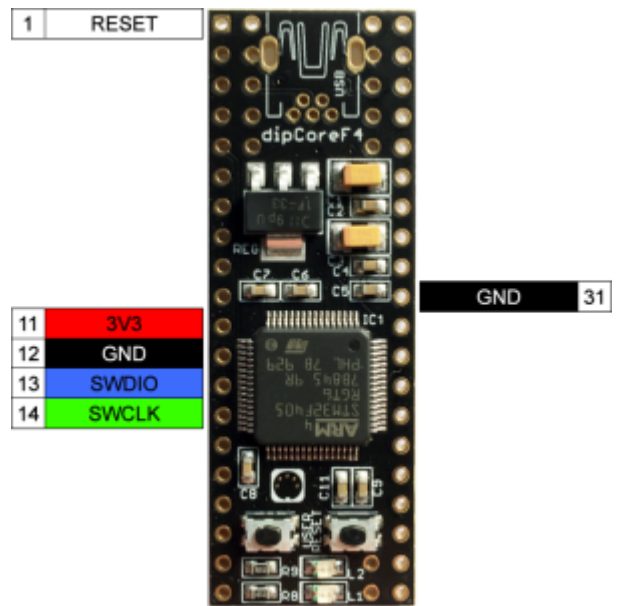
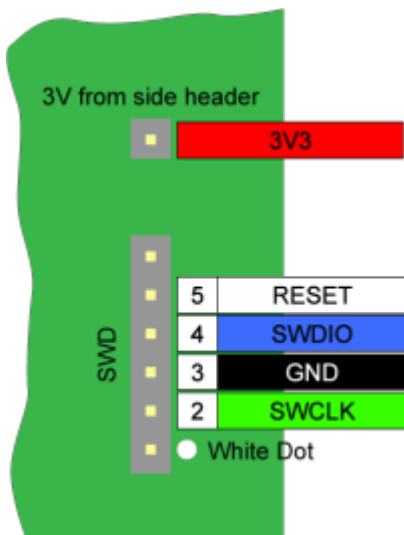
You will need:

- 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.

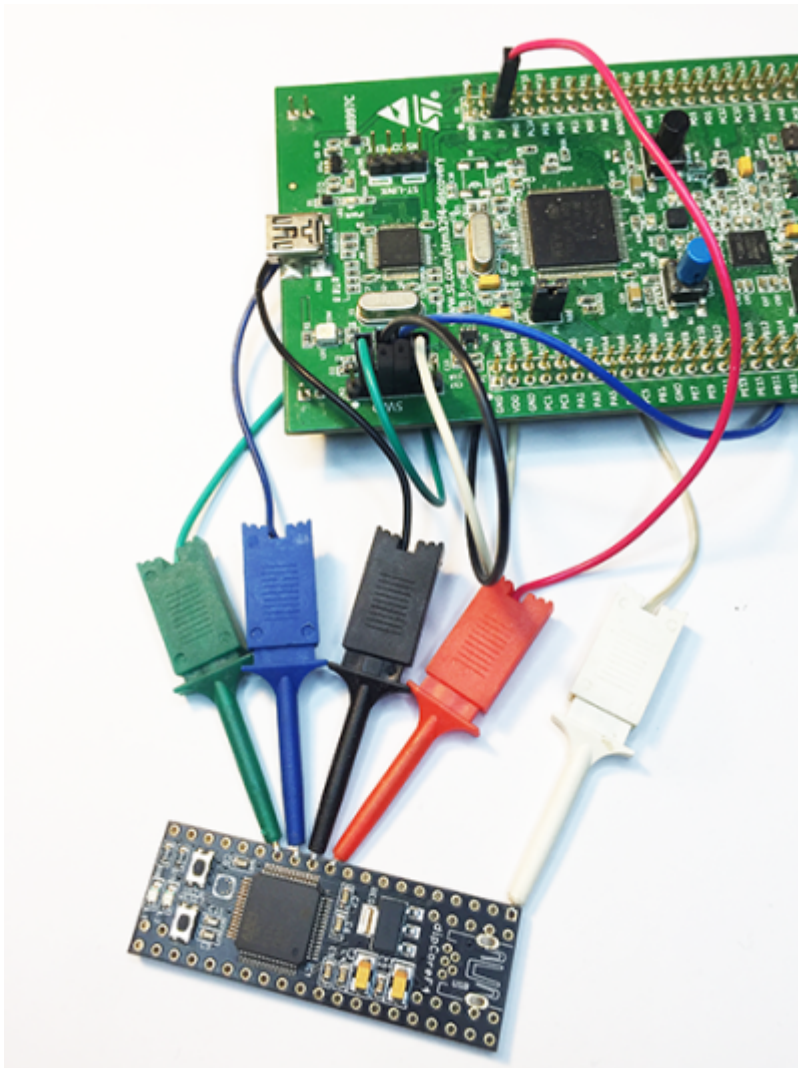




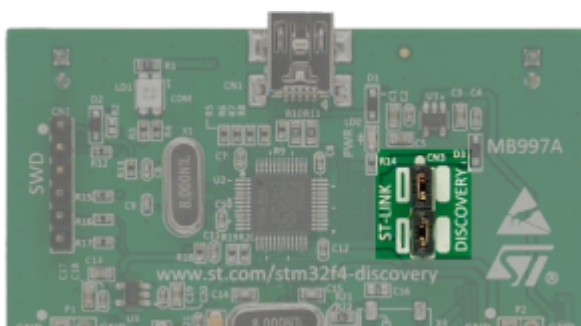
### Disco/Nucleus and dipCoreF4 SWD Pinout and connection



Example:



## Flashing



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

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. [please use dedicated bootloader hex file](#)

## 407VG vs 405RG

**Legacy STM32F407 and 405 share the same characteristics.**

The 405RG is a TQFP64, a 10x10mm package and only 64 pins.

No Ethernet MAC and camera interface.

| Compare Attributes <span style="float: right;">✕</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 E2PROM (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  | -  | -  |
| IOs (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)                                | -  | -  |

ST STM32F4xx series

## In MIOS32

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 10:29**

