# 1. Description

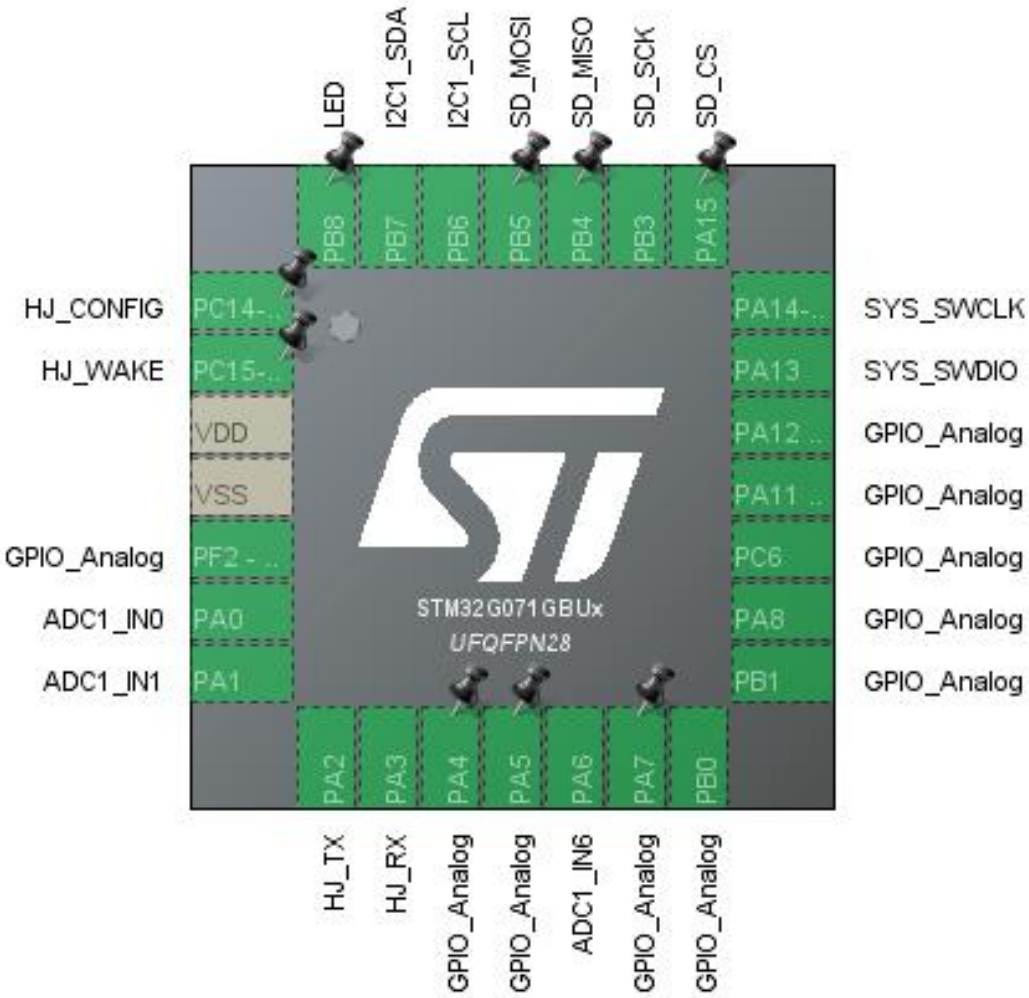
## 1.1. Project

| | |
|---|---|
| Project Name | LP_ECG |
| Board Name | custom |
| Generated with: | STM32CubeMX 5.3.0 |
| Date | 08/20/2019 |

## 1.2. MCU

| | |
|---|---|
| MCU Series | STM32G0 |
| MCU Line | STM32G0x1 |
| MCU name | STM32G071GBUx |
| MCU Package | UFQFPN28 |
| MCU Pin number | 28 |

## 2. Pinout Configuration

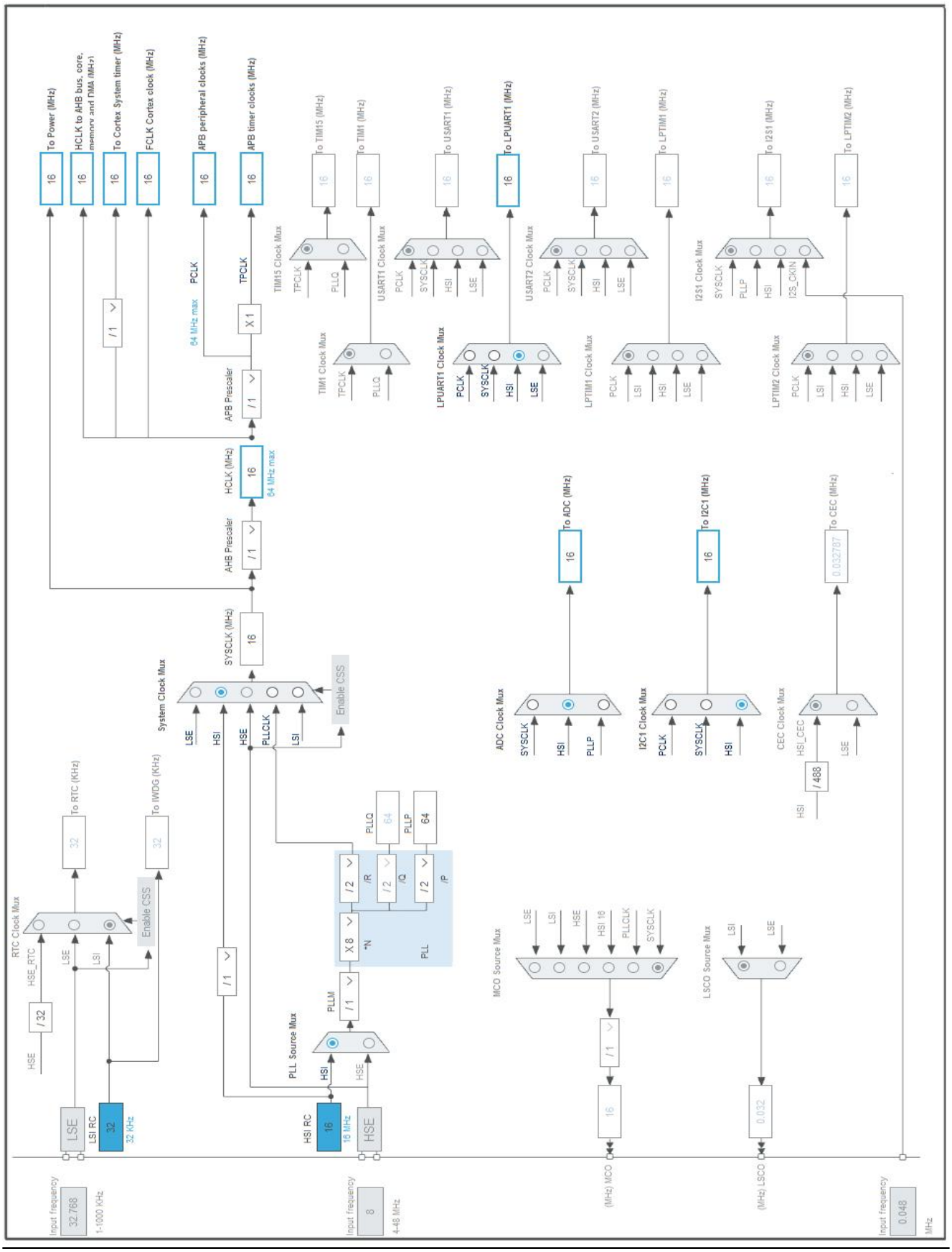


# 3. Pins Configuration

| Pin Number UFQFPN28 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | PC14-OSC32_IN (PC14) * | I/O | GPIO_Output | HJ_CONFIG |
| 2 | PC15-OSC32_OUT (PC15) * | I/O | GPIO_Output | HJ_WAKE |
| 3 | VDD | Power | | |
| 4 | VSS | Power | | |
| 5 | PF2 - NRST * | I/O | GPIO_Analog | |
| 6 | PA0 | I/O | ADC1_IN0 | |
| 7 | PA1 | I/O | ADC1_IN1 | |
| 8 | PA2 | I/O | LPUART1_TX | HJ_TX |
| 9 | PA3 | I/O | LPUART1_RX | HJ_RX |
| 10 | PA4 * | I/O | GPIO_Analog | |
| 11 | PA5 * | I/O | GPIO_Analog | |
| 12 | PA6 | I/O | ADC1_IN6 | |
| 13 | PA7 * | I/O | GPIO_Analog | |
| 14 | PB0 * | I/O | GPIO_Analog | |
| 15 | PB1 * | I/O | GPIO_Analog | |
| 16 | PA8 * | I/O | GPIO_Analog | |
| 17 | PC6 * | I/O | GPIO_Analog | |
| 18 | PA11 [PA9] * | I/O | GPIO_Analog | |
| 19 | PA12 [PA10] * | I/O | GPIO_Analog | |
| 20 | PA13 | I/O | SYS_SWDIO | |
| 21 | PA14-BOOT0 | I/O | SYS_SWCLK | |
| 22 | PA15 * | I/O | GPIO_Output | SD_CS |
| 23 | PB3 | I/O | SPI1_SCK | SD_SCK |
| 24 | PB4 | I/O | SPI1_MISO | SD_MISO |
| 25 | PB5 | I/O | SPI1_MOSI | SD_MOSI |
| 26 | PB6 | I/O | I2C1_SCL | |
| 27 | PB7 | I/O | I2C1_SDA | |
| 28 | PB8 | I/O | GPIO_EXTI8 | LED |

* The pin is affected with an I/O function

# 4. Clock Tree Configuration



# 5. Software Project

## 5.1. Project Settings

| Name | Value |
|---|---|
| Project Name | LP_ECG |
| Project Folder | D:\code\uC\LP_ECG |
| Toolchain / IDE | MDK-ARM V5 |
| Firmware Package Name and Version | STM32Cube FW_G0 V1.3.0 |

## 5.2. Code Generation Settings

| Name | Value |
|---|---|
| STM32Cube MCU packages and embedded software | Copy all used libraries into the project folder |
| Generate peripheral initialization as a pair of '.c/.h' files | No |
| Backup previously generated files when re-generating | No |
| Delete previously generated files when not re-generated | Yes |
| Set all free pins as analog (to optimize the power consumption) | No |

# 6. Power Consumption Calculator report

6.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32G0 |
| Line | STM32G0x1 |
| MCU | STM32G071GBUx |
| Datasheet | DS12232_Rev0 |

6.2. Parameter Selection

| | |
|---|---|
| Temperature | 25 |
| Vdd | 3.0 |

6.3. Battery Selection

| | |
|---|---|
| Battery | Li-MnO2(CR2477) |
| Capacity | 850.0 mAh |
| Self Discharge | 0.12 %/month |
| Nominal Voltage | 3.0 V |
| Max Cont Current | 2.0 mA |
| Max Pulse Current | 10.0 mA |
| Cells in series | 1 |
| Cells in parallel | 1 |

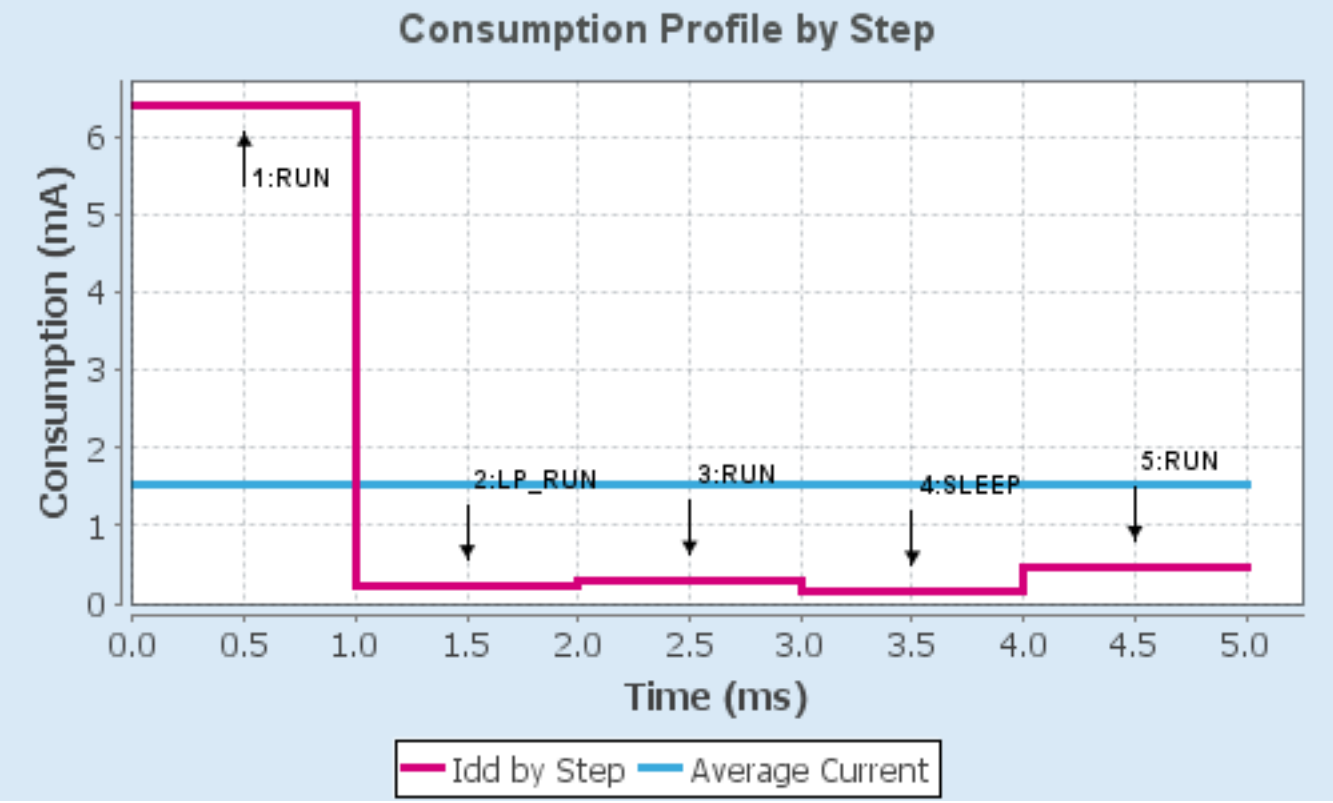
6.4. Sequence

| ***Step*** | Step1 | Step2 | Step3 | Step4 | Step5 |
|---|---|---|---|---|---|
| ***Mode*** | RUN | LOWPOWER_RUN | RUN | SLEEP | RUN |
| ***Vdd*** | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| ***Voltage Source*** | Battery | Battery | Battery | Battery | Battery |
| ***Range*** | Range1-High | NoRange | Range2-Medium | Range2-Medium | Range2-Medium |
| ***Fetch Type*** | FLASH | FLASH | FLASH | FLASH | FLASH |
| ***Clock Configuration*** | HSE BYP PLL | HSE BYP Regulator_LP | HSE BYP | HSE BYP | HSI |
| ***Clock Source Frequency*** | 16 MHz | 2 MHz | 2 MHz | 2 MHz | 2 MHz |
| ***CPU Frequency*** | 64 MHz | 2 MHz | 2 MHz | 2 MHz | 2 MHz |
| ***Peripherals*** | ADC1:fs_10_ksps | ADC1:fs_10_ksps | ADC1:fs_10_ksps | ADC1:fs_10_ksps | ADC1:fs_10_ksps LPUART1 TIM14 |
| ***Additional Cons.*** | 0 mA | 0 mA | 0 mA | 0 mA | 0 mA |
| ***Average Current*** | 6.39 mA | 239.26 µA | 293.56 µA | 163.56 µA | 482.96 µA |
| ***Duration*** | 1 ms | 1 ms | 1 ms | 1 ms | 1 ms |
| ***DMIPS*** | 80.0 | 2.5 | 2.5 | 2.5 | 2.5 |
| ***Ta Max*** | 129.16 | 129.97 | 129.96 | 129.98 | 129.94 |
| ***Category*** | In DS Table | In DS Table | In DS Table | In DS Table | In DS Table |

## 6.5. RESULTS

| | | | |
|---|---|---|---|
| Sequence Time | 5 ms | Average Current | 1.51 mA |
| Battery Life | 23 days, 8 hours | Average DMIPS | 18.0 DMIPS |

## 6.6. Chart


Consumption Profile by Step
Consumption (mA)
0
1
2
3
4
5
6
1:RUN
2:LP_RUN
3:RUN
4:SLEEP
5:RUN
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Time (ms)
Idd by Step
Average Current

# 7. IPs and Middleware Configuration

## 7.1. ADC1

**mode: IN0**

**mode: IN1**

**mode: IN6**

### 7.1.1. Parameter Settings:

**ADC_Settings:**

| | |
|---|---|
| Clock Prescaler | Synchronous clock mode divided by 2 |
| Resolution | ADC 12-bit resolution |
| Data Alignment | Right alignment |
| Sequencer | Sequencer set to fully configurable |
| Scan Conversion Mode | Disabled |
| Continuous Conversion Mode | Disabled |
| Discontinuous Conversion Mode | Disabled |
| DMA Continuous Requests | Disabled |
| End Of Conversion Selection | End of single conversion |
| Overrun behaviour | Overrun data preserved |
| Low Power Auto Wait | **Enabled *** |
| Auto Off | **Enabled *** |
| Oversampling Mode | **Enabled *** |
| Right Bit Shift | No bit shift |
| Ratio | **Oversampling ratio 4x *** |
| Triggered Mode | Single trigger |

**ADC_Regular_ConversionMode:**

| | |
|---|---|
| SamplingTime Common 1 | 1.5 Cycles |
| SamplingTime Common 2 | 1.5 Cycles |
| Number Of Conversion | 1 |
| External Trigger Conversion Source | Regular Conversion launched by software |
| External Trigger Conversion Edge | None |
| Trigger Frequency | **Low frequency *** |
| Rank | 1 |
| Channel | Channel 0 |
| Sampling Time | Sampling time common 1 |

**Analog Watchdog 1:**

| | |
|---|---|
| Enable Analog WatchDog1 Mode | false |

**Analog Watchdog 2:**

| | |
|---|---|
| Enable Analog WatchDog2 Mode | false |

**Analog Watchdog 3:**

| | |
|---|---|
| Enable Analog WatchDog3 Mode | false |

## 7.2. I2C1

### I2C: I2C

### 7.2.1. Parameter Settings:

**Timing configuration:**

| | |
|---|---|
| Custom Timing | Disabled |
| I2C Speed Mode | Standard Mode |
| I2C Speed Frequency (KHz) | 100 |
| Rise Time (ns) | 0 |
| Fall Time (ns) | 0 |
| Coefficient of Digital Filter | 0 |
| Analog Filter | Enabled |
| Timing | 0x00303D5B |

**Slave Features:**

| | |
|---|---|
| Clock No Stretch Mode | Disabled |
| General Call Address Detection | Disabled |
| Primary Address Length selection | 7-bit |
| Dual Address Acknowledged | Disabled |
| Primary slave address | 0 |

## 7.3. LPUART1

### Mode: Asynchronous

### 7.3.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Baud Rate | **19200 *** |
| Word Length | **8 Bits (including Parity) *** |
| Parity | None |
| Stop Bits | 1 |

**Advanced Parameters:**

| | |
|---|---|
| Data Direction | Receive and Transmit |
| Single Sample | Disable |
| Prescaler | clock /1 |
| Fifo Mode | Disable |
| Txfifo Threshold | 1 eighth full configuration |

| | |
|---|---|
| Rxfifo Threshold | 1 eighth full configuration |

**Advanced Features:**

| | |
|---|---|
| TX Pin Active Level Inversion | Disable |
| RX Pin Active Level Inversion | Disable |
| Data Inversion | Disable |
| TX and RX pins Swapping | Disable |
| Overrun | Enable |
| DMA on RX Error | Enable |
| MSB First | Disable |

## 7.4. SPI1

**Mode: Full-Duplex Master**

### 7.4.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Frame Format | Motorola |
| Data Size | **8 Bits *** |
| First Bit | MSB First |

**Clock Parameters:**

| | |
|---|---|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | **8.0 MBits/s *** |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

| | |
|---|---|
| CRC Calculation | Disabled |
| NSSP Mode | Enabled |
| NSS Signal Type | Software |

## 7.5. SYS

**mode: Debug**

**Timebase Source: SysTick**

**mode: save power of non-active UCPD - deactive Dead Battery pull-up**

## 7.6. TIM14

**mode: Activated**

### 7.6.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | **1599 *** |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | **99 *** |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | **Enable *** |

*** User modified value**

# 8. System Configuration

## 8.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| ADC1 | PA0 | ADC1_IN0 | Analog mode | No pull-up and no pull-down | n/a | |
| | PA1 | ADC1_IN1 | Analog mode | No pull-up and no pull-down | n/a | |
| | PA6 | ADC1_IN6 | Analog mode | No pull-up and no pull-down | n/a | |
| I2C1 | PB6 | I2C1_SCL | Alternate Function Open Drain | Pull-up | Low | |
| | PB7 | I2C1_SDA | Alternate Function Open Drain | Pull-up | Low | |
| LPUART1 | PA2 | LPUART1_TX | Alternate Function Push Pull | No pull-up and no pull-down | Low | HJ_TX |
| | PA3 | LPUART1_RX | Alternate Function Push Pull | No pull-up and no pull-down | Low | HJ_RX |
| SPI1 | PB3 | SPI1_SCK | Alternate Function Push Pull | No pull-up and no pull-down | Low | SD_SCK |
| | PB4 | SPI1_MISO | Alternate Function Push Pull | No pull-up and no pull-down | Low | SD_MISO |
| | PB5 | SPI1_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | Low | SD_MOSI |
| SYS | PA13 | SYS_SWDIO | n/a | n/a | n/a | |
| | PA14-BOOT0 | SYS_SWCLK | n/a | n/a | n/a | |
| GPIO | PC14-OSC32_IN (PC14) | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | HJ_CONFIG |
| | PC15-OSC32_OUT (PC15) | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | HJ_WAKE |
| | PF2 - NRST | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA4 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA5 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA7 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PB0 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PB1 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA8 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PC6 | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA11 [PA9] | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA12 [PA10] | GPIO_Analog | Analog mode | No pull-up and no pull-down | n/a | |
| | PA15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low | SD_CS |
| | PB8 | GPIO_EXTI8 | External Interrupt Mode with Rising edge trigger detection | No pull-up and no pull-down | n/a | LED |

## 8.2. DMA configuration

| DMA request | Stream | Direction | Priority |
|---|---|---|---|
| LPUART1_TX | DMA1_Channel1 | Memory To Peripheral | Low |

*LPUART1_TX: DMA1_Channel1 DMA request Settings:*

| | |
|---|---|
| Mode: | Normal |
| Peripheral Increment: | Disable |
| Memory Increment: | **Enable *** |
| Peripheral Data Width: | Byte |
| Memory Data Width: | Byte |

## 8.3. NVIC configuration

| Interrupt Table | Enable | Preenmption Priority | SubPriority |
|---|---|---|---|
| Non maskable interrupt | true | 0 | 0 |
| Hard fault interrupt | true | 0 | 0 |
| System service call via SWI instruction | true | 0 | 0 |
| Pendable request for system service | true | 0 | 0 |
| System tick timer | true | 0 | 0 |
| DMA1 channel 1 interrupt | true | 0 | 0 |
| TIM14 global interrupt | true | 1 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| EXTI line 4 to 15 interrupts | unused | | |
| ADC1, COMP1 and COMP2 interrupts (COMP interrupts through EXTI lines 17 and 18) | unused | | |
| I2C1 event global interrupt / I2C1 wake-up interrupt through EXTI line 23 | unused | | |
| SPI1 global interrupt | unused | | |
| USART3, USART4 and LPUART1 interrupts / LPUART1 wake-up interrupt through EXTI line 28 | unused | | |

*** User modified value**

# 9. Software Pack Report