



## 1. Description

### 1.1. Project

|                 |                   |
|-----------------|-------------------|
| Project Name    | H7L3ABaseProject  |
| Board Name      | custom            |
| Generated with: | STM32CubeMX 6.2.1 |
| Date            | 04/20/2021        |

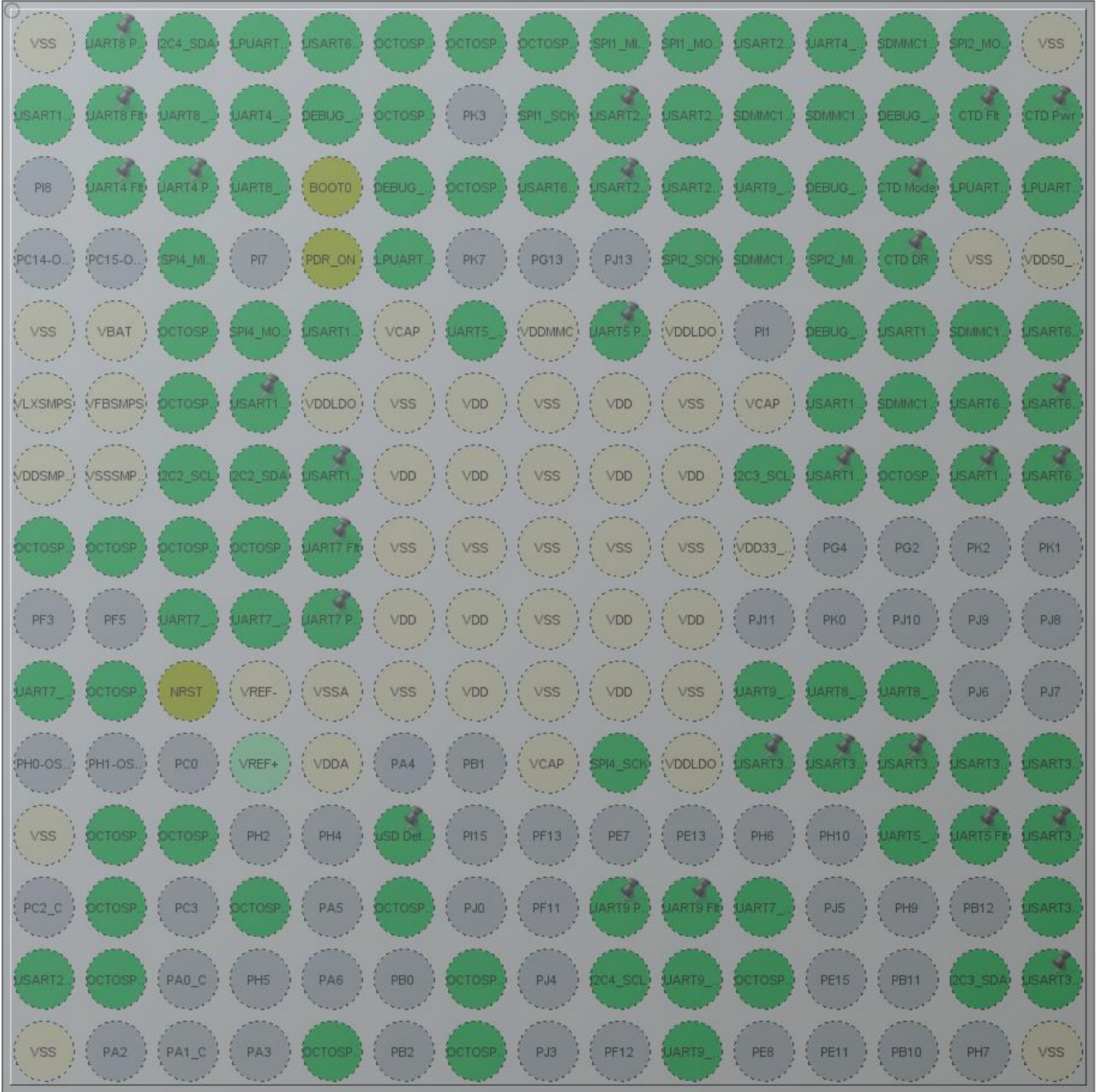
### 1.2. MCU

|                |                |
|----------------|----------------|
| MCU Series     | STM32H7        |
| MCU Line       | STM32H7A3/7B3  |
| MCU name       | STM32H7A3LIHxQ |
| MCU Package    | TFBGA225       |
| MCU Pin number | 225            |

### 1.3. Core(s) information

|         |               |
|---------|---------------|
| Core(s) | Arm Cortex-M7 |
|---------|---------------|

## 2. Pinout Configuration



TFBGA225 (Top view)

### 3. Pins Configuration

| Pin Number<br>TFBGA225 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label      |
|------------------------|---------------------------------------|----------|--------------------------|------------|
| A1                     | VSS                                   | Power    |                          |            |
| A2                     | PI4 *                                 | I/O      | GPIO_Output              | UART8 Pwr  |
| A3                     | PB9                                   | I/O      | I2C4_SDA                 |            |
| A4                     | PB6                                   | I/O      | LPUART1_TX               |            |
| A5                     | PG15                                  | I/O      | USART6_CTS               |            |
| A6                     | PK5                                   | I/O      | OCTOSPIM_P2_NCS          |            |
| A7                     | PG14                                  | I/O      | OCTOSPIM_P1_IO7          |            |
| A8                     | PG10                                  | I/O      | OCTOSPIM_P2_IO6          |            |
| A9                     | PG9                                   | I/O      | SPI1_MISO                |            |
| A10                    | PD7                                   | I/O      | SPI1_MOSI                |            |
| A11                    | PD4                                   | I/O      | USART2_RTS               |            |
| A12                    | PD1                                   | I/O      | UART4_TX                 |            |
| A13                    | PC10                                  | I/O      | SDMMC1_D2                |            |
| A14                    | PI3                                   | I/O      | SPI2_MOSI                |            |
| A15                    | VSS                                   | Power    |                          |            |
| B1                     | PE3                                   | I/O      | USART10_TX               |            |
| B2                     | PI5 *                                 | I/O      | GPIO_Input               | UART8 Flt  |
| B3                     | PE0                                   | I/O      | UART8_RX                 |            |
| B4                     | PB8                                   | I/O      | UART4_RX                 |            |
| B5                     | PB4                                   | I/O      | DEBUG_JTRST              |            |
| B6                     | PK6                                   | I/O      | OCTOSPIM_P2_DQS          |            |
| B8                     | PG11                                  | I/O      | SPI1_SCK                 |            |
| B9                     | PJ15 *                                | I/O      | GPIO_Output              | USART2 Pwr |
| B10                    | PD6                                   | I/O      | USART2_RX                |            |
| B11                    | PD2                                   | I/O      | SDMMC1_CMD               |            |
| B12                    | PC12                                  | I/O      | SDMMC1_CK                |            |
| B13                    | PA14                                  | I/O      | DEBUG_JTCK-SWCLK         |            |
| B14                    | PH15 *                                | I/O      | GPIO_Input               | CTD Flt    |
| B15                    | PH14 *                                | I/O      | GPIO_Output              | CTD Pwr    |
| C2                     | PE4 *                                 | I/O      | GPIO_Input               | UART4 Flt  |
| C3                     | PI6 *                                 | I/O      | GPIO_Output              | UART4 Pwr  |
| C4                     | PE1                                   | I/O      | UART8_TX                 |            |
| C5                     | BOOT0                                 | Boot     |                          |            |
| C6                     | PB3                                   | I/O      | DEBUG_JTDO-SWO           |            |
| C7                     | PK4                                   | I/O      | OCTOSPIM_P2_IO7          |            |
| C8                     | PG12                                  | I/O      | USART6_RTS               |            |

| Pin Number<br>TFBGA225 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label       |
|------------------------|---------------------------------------|----------|--------------------------|-------------|
| C9                     | PJ14 *                                | I/O      | GPIO_Input               | USART2 Flt  |
| C10                    | PD5                                   | I/O      | USART2_TX                |             |
| C11                    | PD0                                   | I/O      | UART9_CTS                |             |
| C12                    | PA15                                  | I/O      | DEBUG_JTDI               |             |
| C13                    | PI0 *                                 | I/O      | GPIO_Output              | CTD Mode    |
| C14                    | PA12                                  | I/O      | LPUART1_RTS              |             |
| C15                    | PA11                                  | I/O      | LPUART1_CTS              |             |
| D3                     | PE5                                   | I/O      | SPI4_MISO                |             |
| D5                     | PDR_ON                                | Reset    |                          |             |
| D6                     | PB7                                   | I/O      | LPUART1_RX               |             |
| D10                    | PD3                                   | I/O      | SPI2_SCK                 |             |
| D11                    | PC11                                  | I/O      | SDMMC1_D3                |             |
| D12                    | PI2                                   | I/O      | SPI2_MISO                |             |
| D13                    | PH13 *                                | I/O      | GPIO_Output              | CTD DR      |
| D14                    | VSS                                   | Power    |                          |             |
| D15                    | VDD50_USB                             | Power    |                          |             |
| E1                     | VSS                                   | Power    |                          |             |
| E2                     | VBAT                                  | Power    |                          |             |
| E3                     | PI9                                   | I/O      | OCTOSPIM_P2_IO0          |             |
| E4                     | PE6                                   | I/O      | SPI4_MOSI                |             |
| E5                     | PE2                                   | I/O      | USART10_RX               |             |
| E6                     | VCAP                                  | Power    |                          |             |
| E7                     | PB5                                   | I/O      | UART5_RX                 |             |
| E8                     | VDDMMC                                | Power    |                          |             |
| E9                     | PJ12 *                                | I/O      | GPIO_Output              | UART5 Pwr   |
| E10                    | VDDLDO                                | Power    |                          |             |
| E12                    | PA13                                  | I/O      | DEBUG_JTMS-SWDIO         |             |
| E13                    | PA10                                  | I/O      | USART1_RX                |             |
| E14                    | PC9                                   | I/O      | SDMMC1_D1                |             |
| E15                    | PC7                                   | I/O      | USART6_RX                |             |
| F1                     | VLXSMPS                               | Power    |                          |             |
| F2                     | VFBSMPS                               | Power    |                          |             |
| F3                     | PI10                                  | I/O      | OCTOSPIM_P2_IO1          |             |
| F4                     | PC13 *                                | I/O      | GPIO_Input               | USART10 Flt |
| F5                     | VDDLDO                                | Power    |                          |             |
| F6                     | VSS                                   | Power    |                          |             |
| F7                     | VDD                                   | Power    |                          |             |
| F8                     | VSS                                   | Power    |                          |             |
| F9                     | VDD                                   | Power    |                          |             |

| Pin Number<br>TFBGA225 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label       |
|------------------------|---------------------------------------|----------|--------------------------|-------------|
| F10                    | VSS                                   | Power    |                          |             |
| F11                    | VCAP                                  | Power    |                          |             |
| F12                    | PA9                                   | I/O      | USART1_TX                |             |
| F13                    | PC8                                   | I/O      | SDMMC1_D0                |             |
| F14                    | PC6                                   | I/O      | USART6_TX                |             |
| F15                    | PG8 *                                 | I/O      | GPIO_Output              | USART6 Pwr  |
| G1                     | VDDSMPS                               | Power    |                          |             |
| G2                     | VSSSMPS                               | Power    |                          |             |
| G3                     | PF1                                   | I/O      | I2C2_SCL                 |             |
| G4                     | PF0                                   | I/O      | I2C2_SDA                 |             |
| G5                     | PI11 *                                | I/O      | GPIO_Output              | USART10 Pwr |
| G6                     | VDD                                   | Power    |                          |             |
| G7                     | VDD                                   | Power    |                          |             |
| G8                     | VSS                                   | Power    |                          |             |
| G9                     | VDD                                   | Power    |                          |             |
| G10                    | VDD                                   | Power    |                          |             |
| G11                    | PA8                                   | I/O      | I2C3_SCL                 |             |
| G12                    | PG7 *                                 | I/O      | GPIO_Output              | USART1 Pwr  |
| G13                    | PG6                                   | I/O      | OCTOSPIM_P1_NCS          |             |
| G14                    | PG5 *                                 | I/O      | GPIO_Input               | USART1 Flt  |
| G15                    | PG3 *                                 | I/O      | GPIO_Input               | USART6 Flt  |
| H1                     | PF2                                   | I/O      | OCTOSPIM_P2_IO2          |             |
| H2                     | PI12                                  | I/O      | OCTOSPIM_P2_IO3          |             |
| H3                     | PF4                                   | I/O      | OCTOSPIM_P2_CLK          |             |
| H4                     | PI14                                  | I/O      | OCTOSPIM_P2_NCLK         |             |
| H5                     | PI13 *                                | I/O      | GPIO_Input               | UART7 Flt   |
| H6                     | VSS                                   | Power    |                          |             |
| H7                     | VSS                                   | Power    |                          |             |
| H8                     | VSS                                   | Power    |                          |             |
| H9                     | VSS                                   | Power    |                          |             |
| H10                    | VSS                                   | Power    |                          |             |
| H11                    | VDD33_USB                             | Power    |                          |             |
| J3                     | PF6                                   | I/O      | UART7_RX                 |             |
| J4                     | PF7                                   | I/O      | UART7_TX                 |             |
| J5                     | PC2 *                                 | I/O      | GPIO_Output              | UART7 Pwr   |
| J6                     | VDD                                   | Power    |                          |             |
| J7                     | VDD                                   | Power    |                          |             |
| J8                     | VSS                                   | Power    |                          |             |
| J9                     | VDD                                   | Power    |                          |             |

| Pin Number<br>TFBGA225 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label       |
|------------------------|---------------------------------------|----------|--------------------------|-------------|
| J10                    | VDD                                   | Power    |                          |             |
| K1                     | PF8                                   | I/O      | UART7_RTS                |             |
| K2                     | PF9                                   | I/O      | OCTOSPIM_P1_IO1          |             |
| K3                     | NRST                                  | Reset    |                          |             |
| K4                     | VREF-                                 | Power    |                          |             |
| K5                     | VSSA                                  | Power    |                          |             |
| K6                     | VSS                                   | Power    |                          |             |
| K7                     | VDD                                   | Power    |                          |             |
| K8                     | VSS                                   | Power    |                          |             |
| K9                     | VDD                                   | Power    |                          |             |
| K10                    | VSS                                   | Power    |                          |             |
| K11                    | PD13                                  | I/O      | UART9_RTS                |             |
| K12                    | PD14                                  | I/O      | UART8_CTS                |             |
| K13                    | PD15                                  | I/O      | UART8_RTS                |             |
| L5                     | VDDA                                  | Power    |                          |             |
| L8                     | VCAP                                  | Power    |                          |             |
| L9                     | PE12                                  | I/O      | SPI4_SCK                 |             |
| L10                    | VDDLDO                                | Power    |                          |             |
| L11                    | PH12 *                                | I/O      | GPIO_Output              | USART3 Pwr  |
| L12                    | PD8                                   | I/O      | USART3_TX                |             |
| L13                    | PD10 *                                | I/O      | GPIO_Input               | USART3 Flt  |
| L14                    | PD11                                  | I/O      | USART3_CTS               |             |
| L15                    | PD12                                  | I/O      | USART3_RTS               |             |
| M1                     | VSS                                   | Power    |                          |             |
| M2                     | PC1                                   | I/O      | OCTOSPIM_P1_IO4          |             |
| M3                     | PF10                                  | I/O      | OCTOSPIM_P1_CLK          |             |
| M6                     | PC4 *                                 | I/O      | GPIO_Input               | uSD Detec   |
| M13                    | PB13                                  | I/O      | UART5_TX                 |             |
| M14                    | PB14 *                                | I/O      | GPIO_Input               | UART5 Flt   |
| M15                    | PB15 *                                | I/O      | GPIO_Output              | USART3 Pwer |
| N2                     | PC3_C                                 | I/O      | OCTOSPIM_P1_IO0          |             |
| N4                     | PH3                                   | I/O      | OCTOSPIM_P1_IO5          |             |
| N6                     | PC5                                   | I/O      | OCTOSPIM_P1_DQS          |             |
| N9                     | PF15 *                                | I/O      | GPIO_Output              | UART9 Pwr   |
| N10                    | PE14 *                                | I/O      | GPIO_Input               | UART9 Flt   |
| N11                    | PE10                                  | I/O      | UART7_CTS                |             |
| N15                    | PD9                                   | I/O      | USART3_RX                |             |
| P1                     | PA0                                   | I/O      | USART2_CTS               |             |
| P2                     | PA1                                   | I/O      | OCTOSPIM_P1_IO3          |             |

| Pin Number<br>TFBGA225 | Pin Name<br>(function after<br>reset) | Pin Type | Alternate<br>Function(s) | Label      |
|------------------------|---------------------------------------|----------|--------------------------|------------|
| P7                     | PJ1                                   | I/O      | OCTOSPIM_P2_IO4          |            |
| P9                     | PF14                                  | I/O      | I2C4_SCL                 |            |
| P10                    | PG1                                   | I/O      | UART9_TX                 |            |
| P11                    | PE9                                   | I/O      | OCTOSPIM_P1_IO6          |            |
| P14                    | PH8                                   | I/O      | I2C3_SDA                 |            |
| P15                    | PH11 *                                | I/O      | GPIO_Input               | USART3 Flt |
| R1                     | VSS                                   | Power    |                          |            |
| R5                     | PA7                                   | I/O      | OCTOSPIM_P1_IO2          |            |
| R7                     | PJ2                                   | I/O      | OCTOSPIM_P2_IO5          |            |
| R10                    | PG0                                   | I/O      | UART9_RX                 |            |
| R15                    | VSS                                   | Power    |                          |            |

\* The pin is affected with an I/O function



## 5. Software Project

### 5.1. Project Settings

| Name                              | Value                                                               |
|-----------------------------------|---------------------------------------------------------------------|
| Project Name                      | H7L3ABaseProject                                                    |
| Project Folder                    | C:\Users\gene\Documents\CPF\ElecEngr\STM32H7A3_SOM\H7L3ABaseProject |
| Toolchain / IDE                   | STM32CubeIDE                                                        |
| Firmware Package Name and Version | STM32Cube FW_H7 V1.9.0                                              |
| Application Structure             | Advanced                                                            |
| Generate Under Root               | Yes                                                                 |
| Do not generate the main()        | No                                                                  |
| Minimum Heap Size                 | 0x200                                                               |
| Minimum Stack Size                | 0x400                                                               |

### 5.2. Code Generation Settings

| Name                                                            | Value                                 |
|-----------------------------------------------------------------|---------------------------------------|
| STM32Cube MCU packages and embedded software                    | Copy only the necessary library files |
| Generate peripheral initialization as a pair of '.c/.h' files   | No                                    |
| Backup previously generated files when re-generating            | Yes                                   |
| Keep User Code when re-generating                               | Yes                                   |
| Delete previously generated files when not re-generated         | Yes                                   |
| Set all free pins as analog (to optimize the power consumption) | No                                    |
| Enable Full Assert                                              | No                                    |

### 5.3. Advanced Settings - Generated Function Calls

| Rank | Function Name       | Peripheral Instance Name |
|------|---------------------|--------------------------|
| 1    | MX_GPIO_Init        | GPIO                     |
| 2    | MX_DMA_Init         | DMA                      |
| 3    | SystemClock_Config  | RCC                      |
| 4    | MX_USART1_UART_Init | USART1                   |
| 5    | MX_USART2_UART_Init | USART2                   |
| 6    | MX_I2C2_Init        | I2C2                     |
| 7    | MX_I2C3_Init        | I2C3                     |
| 8    | MX_I2C4_Init        | I2C4                     |
| 9    | MX_IWDG1_Init       | IWDG1                    |
| 10   | MX_LPTIM1_Init      | LPTIM1                   |
| 11   | MX_LPTIM3_Init      | LPTIM3                   |

| Rank | Function Name        | Peripheral Instance Name |
|------|----------------------|--------------------------|
| 12   | MX_LPUART1_UART_Init | LPUART1                  |
| 13   | MX_UART4_Init        | UART4                    |
| 14   | MX_UART7_Init        | UART7                    |
| 15   | MX_UART8_Init        | UART8                    |
| 16   | MX_UART9_Init        | UART9                    |
| 17   | MX_USART6_UART_Init  | USART6                   |
| 18   | MX_USART10_UART_Init | USART10                  |
| 19   | MX_OCTOSPI1_Init     | OCTOSPI1                 |
| 20   | MX_OCTOSPI2_Init     | OCTOSPI2                 |
| 21   | MX_RTC_Init          | RTC                      |
| 22   | MX_SPI1_Init         | SPI1                     |
| 23   | MX_SPI2_Init         | SPI2                     |
| 24   | MX_WWDG1_Init        | WWDG1                    |
| 25   | MX_FATFS_Init        | FATFS                    |
| 26   | MX_SDMMC1_SD_Init    | SDMMC1                   |
| 27   | MX_SPI4_Init         | SPI4                     |
| 28   | MX_UART5_Init        | UART5                    |
| 29   | MX_USART3_UART_Init  | USART3                   |

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

|           |                |
|-----------|----------------|
| Series    | STM32H7        |
| Line      | STM32H7A3/7B3  |
| MCU       | STM32H7A3LIHxQ |
| Datasheet | DS13139 Rev0   |

### 6.2. Parameter Selection

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

### 6.3. Battery Selection

|                   |                 |
|-------------------|-----------------|
| Battery           | Li-SOCL2(A3400) |
| Capacity          | 3400.0 mAh      |
| Self Discharge    | 0.08 %/month    |
| Nominal Voltage   | 3.6 V           |
| Max Cont Current  | 100.0 mA        |
| Max Pulse Current | 200.0 mA        |
| Cells in series   | 1               |
| Cells in parallel | 1               |

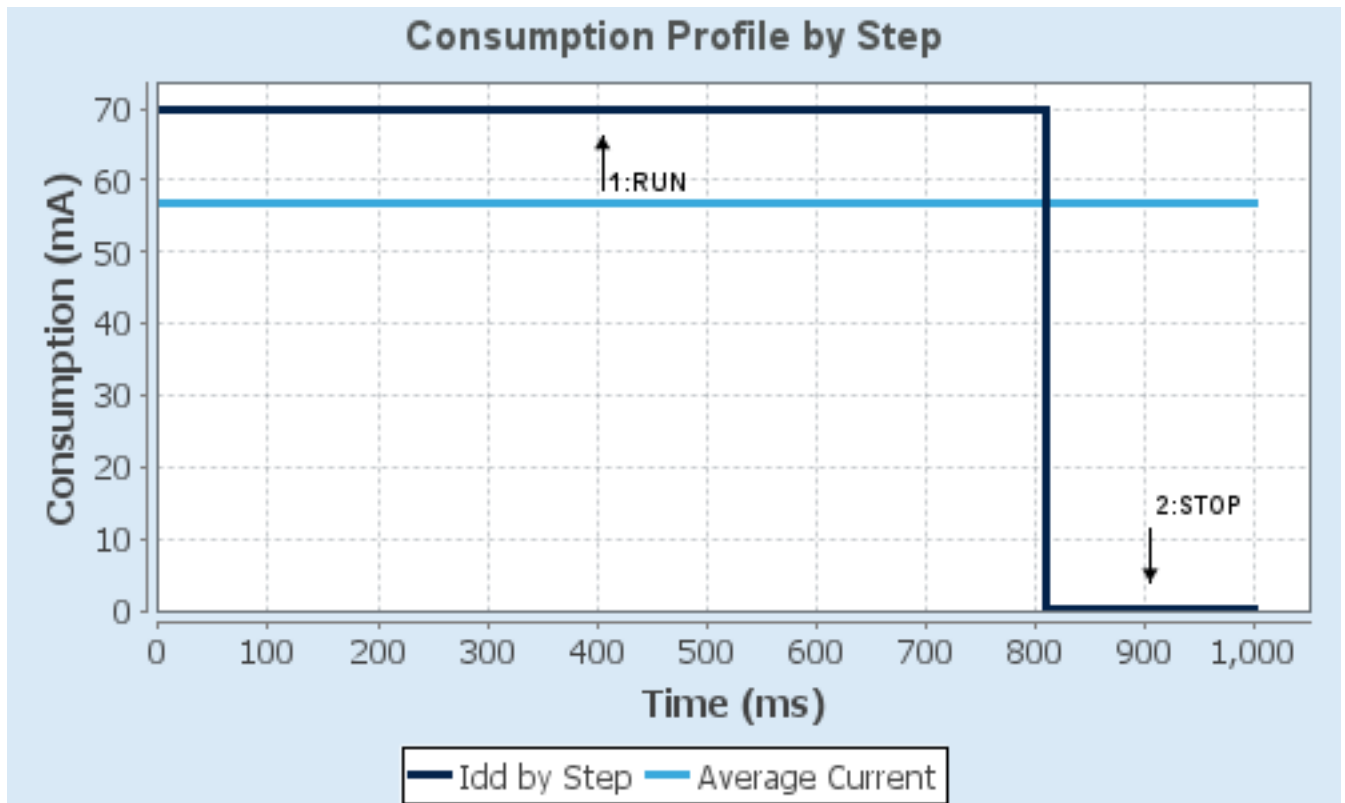
#### 6.4. Sequence

|                               |                 |                |
|-------------------------------|-----------------|----------------|
| <b>Step</b>                   | Step1           | Step2          |
| <b>Mode</b>                   | RUN             | STOP           |
| <b>Vdd</b>                    | 3.0             | 3.0            |
| <b>Voltage Source</b>         | Battery         | Battery        |
| <b>Range</b>                  | VOS0            | SVOS5          |
| <b>SRDomain</b>               | DRUN            | DSTOP          |
| <b>n/a</b>                    | SRDRUN          | SRDSTOP        |
| <b>Fetch Type</b>             | ITCM/DTCM/Cache | NA             |
| <b>CPU Frequency</b>          | 280 MHz         | 64 MHz         |
| <b>Clock Configuration</b>    | HSE PLL         | HSI Flash-ON   |
| <b>Clock Source Frequency</b> | 16 MHz          | 64 MHz         |
| <b>Peripherals</b>            |                 |                |
| <b>Additional Cons.</b>       | 0 mA            | 0 mA           |
| <b>Average Current</b>        | 69.92 mA        | 263.82 $\mu$ A |
| <b>Duration</b>               | 810 ms          | 190 ms         |
| <b>DMIPS</b>                  | 599.0           | 0.0            |
| <b>Ta Max</b>                 | 115.56          | 124.96         |
| <b>Category</b>               | In DS Table     | In DS Table    |

#### 6.5. Results

|               |                  |                 |             |
|---------------|------------------|-----------------|-------------|
| Sequence Time | 1 s              | Average Current | 56.69 mA    |
| Battery Life  | 2 days, 11 hours | Average DMIPS   | 599.2 DMIPS |

#### 6.6. Chart



## 7. Peripherals and Middlewares Configuration

### 7.1. DEBUG

Debug: JTAG (5 pins)

### 7.2. I2C2

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                        | <b>0x00707CBB *</b> |

##### 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. I2C3

I2C: I2C

#### 7.3.1. 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                        | <b>0x00707CBB *</b> |

**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        |

## 7.4. I2C4

### I2C: I2C

#### 7.4.1. 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                        | <b>0x00707CBB *</b> |

**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        |

## 7.5. IWDG1

### mode: Activated

#### 7.5.1. Parameter Settings:

**Watchdog Clocking:**

|                                |      |
|--------------------------------|------|
| IWDG counter clock prescaler   | 4    |
| IWDG window value              | 4095 |
| IWDG down-counter reload value | 4095 |

## 7.6. LPTIM1

### Mode: Counts internal clock events

#### 7.6.1. Parameter Settings:

**Clock:**

Clock Prescaler Prescaler Div1

**Preload:**

Update Mode Update Immediate

**Trigger:**

Trigger Source Software Trigger

## 7.7. LPTIM3

### mode: Mode

#### 7.7.1. Parameter Settings:

**Clock:**

Clock Prescaler Prescaler Div1

**Preload:**

Update Mode Update Immediate

**Trigger:**

Trigger Source Software Trigger

## 7.8. LPUART1

### Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.8.1. Parameter Settings:

**Basic Parameters:**

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 209700                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

**Advanced Parameters:**

|                |                      |
|----------------|----------------------|
| Data Direction | Receive and Transmit |
| Single Sample  | Disable              |

|                  |                             |
|------------------|-----------------------------|
| ClockPrescaler   | 1                           |
| Fifo Mode        | 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 |

## 7.9. OCTOSPI1

**Mode: Octo SPI**

**Clock: Port1 CLK**

**Chip Select: Port1 NCS**

**Data Strobe: Port1 DQS (RWDS)**

**Data [3:0]: Port1 IO[3:0]**

**Data [7:4]: Port1 IO[7:4]**

7.9.1. Parameter Settings:

#### Generic:

|                             |               |
|-----------------------------|---------------|
| Fifo Threshold              | 1             |
| Dual Quad mode              | Disable       |
| Memory Type                 | Micron        |
| Device Size                 | 32            |
| Chip Select High Time       | 1             |
| Free Running Clock          | Disable       |
| Clock Mode                  | Low           |
| Wrap Size                   | Not Supported |
| Clock Prescaler             | 1             |
| Sample Shifting             | None          |
| Delay Hold Quarter Cycle    | Disable       |
| Chip Select Boundary        | 1             |
| Clock Chip Select High Time | 0             |
| Delay Block                 | Disable       |
| Maximum Transfer            | 0             |
| Refresh Rate                | 0             |

## 7.10. OCTOSPI2

**Mode: HyperBus(TM)**

**Clock: Port2 CLK**

**HyperBus(TM) 1.8V Inverted Clock: Port2 NCLK**

**Chip Select: Port2 NCS**

**Data Strobe: Port2 DQS (RWDS)**

**Data [3:0]: Port2 IO[3:0]**

**Data [7:4]: Port2 IO[7:4]**

### 7.10.1. Parameter Settings:

#### **Generic:**

|                             |               |
|-----------------------------|---------------|
| Fifo Threshold              | 1             |
| Dual Quad mode              | Disable       |
| Memory Type                 | HyperBus(TM)  |
| Device Size                 | 32            |
| Chip Select High Time       | 1             |
| Free Running Clock          | Disable       |
| Clock Mode                  | Low           |
| Wrap Size                   | Not Supported |
| Clock Prescaler             | 1             |
| Sample Shifting             | None          |
| Delay Hold Quarter Cycle    | Disable       |
| Chip Select Boundary        | 1             |
| Clock Chip Select High Time | 0             |
| Delay Block                 | Disable       |
| Maximum Transfer            | 0             |
| Refresh Rate                | 0             |

#### **HyperBus(TM):**

|                      |          |
|----------------------|----------|
| RW Recovery Time     | 0        |
| Access Time          | 0        |
| Write Access Latency | Disable  |
| Latency Mode         | Variable |

## 7.11. RCC

### 7.11.1. Parameter Settings:

**Power Parameters:**

|                               |                                 |
|-------------------------------|---------------------------------|
| SupplySource                  | PWR_DIRECT_SMPS_SUPPLY          |
| Power Regulator Voltage Scale | Power Regulator Voltage Scale 3 |

**RCC Parameters:**

|                                |          |
|--------------------------------|----------|
| TIM Prescaler Selection        | Disabled |
| HSE Startup Timeout Value (ms) | 100      |
| LSE Startup Timeout Value (ms) | 5000     |
| CSI Calibration Value          | 16       |
| HSI Calibration Value          | 32       |

**System Parameters:**

|                   |                    |
|-------------------|--------------------|
| VDD voltage (V)   | 3.3                |
| Flash Latency(WS) | 2 WS (3 CPU cycle) |

**PLL range Parameters:**

|                            |                     |
|----------------------------|---------------------|
| PLL1 input frequency range | Between 2 and 4 MHz |
| PLL1 clock Output range    | Wide VCO range      |

## 7.12. RTC

**mode: Activate Clock Source**

**mode: Activate Calendar**

### 7.12.1. Parameter Settings:

**General:**

|                               |               |
|-------------------------------|---------------|
| Hour Format                   | Hourformat 24 |
| Asynchronous Predivider value | 127           |
| Synchronous Predivider value  | 255           |

**Calendar Time:**

|                                            |                      |
|--------------------------------------------|----------------------|
| Data Format                                | BCD data format      |
| Hours                                      | 0                    |
| Minutes                                    | 0                    |
| Seconds                                    | 0                    |
| Day Light Saving: value of hour adjustment | Daylightsaving None  |
| Store Operation                            | Storeoperation Reset |

**Calendar Date:**

|          |         |
|----------|---------|
| Week Day | Monday  |
| Month    | January |
| Date     | 1       |
| Year     | 0       |

## 7.13. SDMMC1

**Mode: SD 4 bits Wide bus**

### 7.13.1. Parameter Settings:

#### **SDMMC parameters:**

|                                                   |                                       |
|---------------------------------------------------|---------------------------------------|
| Clock transition on which the bit capture is made | Rising transition                     |
| SDMMC Clock output enable when the bus is idle    | Disable the power save for the clock  |
| SDMMC hardware flow control                       | The hardware control flow is disabled |
| SDMMC clock divide factor                         | 0                                     |
| Is external transceiver present ?                 | no                                    |

## 7.14. SPI1

**Mode: Full-Duplex Master**

### 7.14.1. Parameter Settings:

#### **Basic Parameters:**

|              |           |
|--------------|-----------|
| Frame Format | Motorola  |
| Data Size    | 4 Bits    |
| First Bit    | MSB First |

#### **Clock Parameters:**

|                           |                       |
|---------------------------|-----------------------|
| Prescaler (for Baud Rate) | 2                     |
| Baud Rate                 | <b>64.5 MBits/s *</b> |
| Clock Polarity (CPOL)     | Low                   |
| Clock Phase (CPHA)        | 1 Edge                |

#### **Advanced Parameters:**

|                               |                              |
|-------------------------------|------------------------------|
| CRC Calculation               | Disabled                     |
| NSSP Mode                     | Enabled                      |
| NSS Signal Type               | Software                     |
| Fifo Threshold                | Fifo Threshold 01 Data       |
| Tx Crc Initialization Pattern | All Zero Pattern             |
| Rx Crc Initialization Pattern | All Zero Pattern             |
| Nss Polarity                  | Nss Polarity Low             |
| Master Ss Idleness            | 00 Cycle                     |
| Master Inter Data Idleness    | 00 Cycle                     |
| Master Receiver Auto Susp     | Disable                      |
| Master Keep Io State          | Master Keep Io State Disable |
| IO Swap                       | Disabled                     |

## 7.15. SPI2

### Mode: Full-Duplex Master

#### 7.15.1. Parameter Settings:

##### Basic Parameters:

|              |           |
|--------------|-----------|
| Frame Format | Motorola  |
| Data Size    | 4 Bits    |
| First Bit    | MSB First |

##### Clock Parameters:

|                           |                       |
|---------------------------|-----------------------|
| Prescaler (for Baud Rate) | 2                     |
| Baud Rate                 | <b>64.5 MBits/s *</b> |
| Clock Polarity (CPOL)     | Low                   |
| Clock Phase (CPHA)        | 1 Edge                |

##### Advanced Parameters:

|                               |                              |
|-------------------------------|------------------------------|
| CRC Calculation               | Disabled                     |
| NSSP Mode                     | Enabled                      |
| NSS Signal Type               | Software                     |
| Fifo Threshold                | Fifo Threshold 01 Data       |
| Tx Crc Initialization Pattern | All Zero Pattern             |
| Rx Crc Initialization Pattern | All Zero Pattern             |
| Nss Polarity                  | Nss Polarity Low             |
| Master Ss Idleness            | 00 Cycle                     |
| Master Inter Data Idleness    | 00 Cycle                     |
| Master Receiver Auto Susp     | Disable                      |
| Master Keep Io State          | Master Keep Io State Disable |
| IO Swap                       | Disabled                     |

## 7.16. SPI4

### Mode: Full-Duplex Master

#### 7.16.1. Parameter Settings:

##### Basic Parameters:

|              |           |
|--------------|-----------|
| Frame Format | Motorola  |
| Data Size    | 4 Bits    |
| First Bit    | MSB First |

##### Clock Parameters:

|                               |                              |
|-------------------------------|------------------------------|
| Prescaler (for Baud Rate)     | 2                            |
| Baud Rate                     | <b>16.0 MBits/s *</b>        |
| Clock Polarity (CPOL)         | Low                          |
| Clock Phase (CPHA)            | 1 Edge                       |
| <b>Advanced Parameters:</b>   |                              |
| CRC Calculation               | Disabled                     |
| NSSP Mode                     | Enabled                      |
| NSS Signal Type               | Software                     |
| Fifo Threshold                | Fifo Threshold 01 Data       |
| Tx Crc Initialization Pattern | All Zero Pattern             |
| Rx Crc Initialization Pattern | All Zero Pattern             |
| Nss Polarity                  | Nss Polarity Low             |
| Master Ss Idleness            | 00 Cycle                     |
| Master Inter Data Idleness    | 00 Cycle                     |
| Master Receiver Auto Susp     | Disable                      |
| Master Keep Io State          | Master Keep Io State Disable |
| IO Swap                       | Disabled                     |

## 7.17. SYS

**Timebase Source: SysTick**

## 7.18. UART4

**Mode: Asynchronous**

### 7.18.1. Parameter Settings:

|                             |                             |
|-----------------------------|-----------------------------|
| <b>Basic Parameters:</b>    |                             |
| Baud Rate                   | 115200                      |
| Word Length                 | 8 Bits (including Parity)   |
| Parity                      | None                        |
| Stop Bits                   | 1                           |
| <b>Advanced Parameters:</b> |                             |
| Data Direction              | Receive and Transmit        |
| Over Sampling               | 16 Samples                  |
| Single Sample               | Disable                     |
| ClockPrescaler              | 1                           |
| Fifo Mode                   | FIFO mode disable           |
| Txfifo Threshold            | 1 eighth full configuration |
| Rxfifo Threshold            | 1 eighth full configuration |
| <b>Advanced Features:</b>   |                             |

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.19. UART5

### Mode: Asynchronous

#### 7.19.1. Parameter Settings:

##### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

##### Advanced Parameters:

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | FIFO mode disable           |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

##### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.20. UART7

## Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.20.1. Parameter Settings:

##### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

##### Advanced Parameters:

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | FIFO mode disable           |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

##### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.21. UART8

### Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.21.1. Parameter Settings:

##### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

##### Advanced Parameters:

|                |                      |
|----------------|----------------------|
| Data Direction | Receive and Transmit |
|----------------|----------------------|

|                  |                             |
|------------------|-----------------------------|
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | FIFO mode disable           |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

#### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.22. UART9

### Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.22.1. Parameter Settings:

#### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

#### Advanced Parameters:

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | FIFO mode disable           |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

#### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.23. USART1

### Mode: Asynchronous

#### 7.23.1. Parameter Settings:

##### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

##### Advanced Parameters:

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | Disable                     |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

##### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.24. USART2

### Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.24.1. Parameter Settings:

##### Basic Parameters:

|           |        |
|-----------|--------|
| Baud Rate | 115200 |
|-----------|--------|

|             |                           |
|-------------|---------------------------|
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

**Advanced Parameters:**

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | Disable                     |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

**Advanced Features:**

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.25. USART3

### Mode: Asynchronous

### Hardware Flow Control (RS232): CTS/RTS

#### 7.25.1. Parameter Settings:

**Basic Parameters:**

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

**Advanced Parameters:**

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | Disable                     |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

**Advanced Features:**

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.26. USART6

**Mode: Asynchronous**

**Hardware Flow Control (RS232): CTS/RTS**

### 7.26.1. Parameter Settings:

#### **Basic Parameters:**

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

#### **Advanced Parameters:**

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | Disable                     |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

#### **Advanced Features:**

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.27. USART10

### Mode: Asynchronous

#### 7.27.1. Parameter Settings:

##### Basic Parameters:

|             |                           |
|-------------|---------------------------|
| Baud Rate   | 115200                    |
| Word Length | 8 Bits (including Parity) |
| Parity      | None                      |
| Stop Bits   | 1                         |

##### Advanced Parameters:

|                  |                             |
|------------------|-----------------------------|
| Data Direction   | Receive and Transmit        |
| Over Sampling    | 16 Samples                  |
| Single Sample    | Disable                     |
| ClockPrescaler   | 1                           |
| Fifo Mode        | Disable                     |
| Txfifo Threshold | 1 eighth full configuration |
| Rxfifo Threshold | 1 eighth full configuration |

##### Advanced Features:

|                               |         |
|-------------------------------|---------|
| Auto Baudrate                 | Disable |
| 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 |

## 7.28. WWDG1

### mode: Activated

#### 7.28.1. Parameter Settings:

##### Watchdog Clocking:

|                                     |    |
|-------------------------------------|----|
| WWDG counter clock prescaler        | 1  |
| WWDG window value                   | 64 |
| WWDG free-running downcounter value | 64 |

##### Watchdog Interrupt:

|                        |         |
|------------------------|---------|
| Early wakeup interrupt | Disable |
|------------------------|---------|

## 7.29. FATFS

### mode: SD Card

#### 7.29.1. Set Defines:

##### Version:

FATFS version R0.12c

##### Function Parameters:

|                                        |                                    |
|----------------------------------------|------------------------------------|
| FS_READONLY (Read-only mode)           | Disabled                           |
| FS_MINIMIZE (Minimization level)       | Disabled                           |
| USE_STRFUNC (String functions)         | Enabled with LF -> CRLF conversion |
| USE_FIND (Find functions)              | Disabled                           |
| USE_MKFS (Make filesystem function)    | Enabled                            |
| USE_FASTSEEK (Fast seek function)      | Enabled                            |
| USE_EXPAND (Use f_expand function)     | Disabled                           |
| USE_CHMOD (Change attributes function) | Disabled                           |
| USE_LABEL (Volume label functions)     | Disabled                           |
| USE_FORWARD (Forward function)         | Disabled                           |

##### Locale and Namespace Parameters:

|                                  |          |
|----------------------------------|----------|
| CODE_PAGE (Code page on target)  | Latin 1  |
| USE_LFN (Use Long Filename)      | Disabled |
| MAX_LFN (Max Long Filename)      | 255      |
| LFN_UNICODE (Enable Unicode)     | ANSI/OEM |
| STRF_ENCODE (Character encoding) | UTF-8    |
| FS_RPATH (Relative Path)         | Disabled |

##### Physical Drive Parameters:

|                                             |          |
|---------------------------------------------|----------|
| VOLUMES (Logical drives)                    | 1        |
| MAX_SS (Maximum Sector Size)                | 512      |
| MIN_SS (Minimum Sector Size)                | 512      |
| MULTI_PARTITION (Volume partitions feature) | Disabled |
| USE_TRIM (Erase feature)                    | Disabled |
| FS_NOFSINFO (Force full FAT scan)           | 0        |

##### System Parameters:

|                                                 |                   |
|-------------------------------------------------|-------------------|
| FS_TINY (Tiny mode)                             | Disabled          |
| FS_EXFAT (Support of exFAT file system)         | Disabled          |
| FS_NORTC (Timestamp feature)                    | Dynamic timestamp |
| FS_REENTRANT (Re-Entrancy)                      | Disabled          |
| FS_TIMEOUT (Timeout ticks)                      | 1000              |
| FS_LOCK (Number of files opened simultaneously) | 2                 |

### 7.29.2. Advanced Settings:

#### **SDIO/SDMMC:**

|                  |          |
|------------------|----------|
| SDMMC instance   | SDMMC1   |
| Use dma template | Disabled |
| BSP code for SD  | Generic  |

### 7.29.3. Platform Settings:

|             |     |
|-------------|-----|
| Detect_SDIO | PC4 |
|-------------|-----|

**\* User modified value**

## 8. System Configuration

### 8.1. GPIO configuration

| IP       | Pin   | Signal           | GPIO mode                     | GPIO pull/up pull down      | Max Speed | User Label |
|----------|-------|------------------|-------------------------------|-----------------------------|-----------|------------|
| DEBUG    | PB4   | DEBUG_JTRST      | n/a                           | n/a                         | n/a       |            |
|          | PA14  | DEBUG_JTCK-SWCLK | n/a                           | n/a                         | n/a       |            |
|          | PB3   | DEBUG_JTDO-SWO   | n/a                           | n/a                         | n/a       |            |
|          | PA15  | DEBUG_JTDI       | n/a                           | n/a                         | n/a       |            |
|          | PA13  | DEBUG_JTMS-SWDIO | n/a                           | n/a                         | n/a       |            |
| I2C2     | PF1   | I2C2_SCL         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
|          | PF0   | I2C2_SDA         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
| I2C3     | PA8   | I2C3_SCL         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
|          | PH8   | I2C3_SDA         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
| I2C4     | PB9   | I2C4_SDA         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
|          | PF14  | I2C4_SCL         | Alternate Function Open Drain | No pull-up and no pull-down | Low       |            |
| LPUART1  | PB6   | LPUART1_TX       | Alternate Function Push Pull  | No pull-up and no pull-down | Low       |            |
|          | PA12  | LPUART1_RTS      | Alternate Function Push Pull  | No pull-up and no pull-down | Low       |            |
|          | PA11  | LPUART1_CTS      | Alternate Function Push Pull  | No pull-up and no pull-down | Low       |            |
|          | PB7   | LPUART1_RX       | Alternate Function Push Pull  | No pull-up and no pull-down | Low       |            |
| OCTOSPI1 | PG14  | OCTOSPI1_P1_IO7  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PG6   | OCTOSPI1_P1_NCS  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PF9   | OCTOSPI1_P1_IO1  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PC1   | OCTOSPI1_P1_IO4  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PF10  | OCTOSPI1_P1_CLK  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PC3_C | OCTOSPI1_P1_IO0  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PH3   | OCTOSPI1_P1_IO5  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |
|          | PC5   | OCTOSPI1_P1_DQS  | Alternate Function Push Pull  | No pull-up and no pull-down | Very High |            |

| IP       | Pin  | Signal           | GPIO mode                    | GPIO pull/up pull down      | Max Speed | User Label |
|----------|------|------------------|------------------------------|-----------------------------|-----------|------------|
|          | PA1  | OCTOSPIM_P1_IO3  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PE9  | OCTOSPIM_P1_IO6  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PA7  | OCTOSPIM_P1_IO2  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
| OCTOSPI2 | PK5  | OCTOSPIM_P2_NCS  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PG10 | OCTOSPIM_P2_IO6  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PK6  | OCTOSPIM_P2_DQS  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PK4  | OCTOSPIM_P2_IO7  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PI9  | OCTOSPIM_P2_IO0  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PI10 | OCTOSPIM_P2_IO1  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PF2  | OCTOSPIM_P2_IO2  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PI12 | OCTOSPIM_P2_IO3  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PF4  | OCTOSPIM_P2_CLK  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PI14 | OCTOSPIM_P2_NCLK | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PJ1  | OCTOSPIM_P2_IO4  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PJ2  | OCTOSPIM_P2_IO5  | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
| SDMMC1   | PC10 | SDMMC1_D2        | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PD2  | SDMMC1_CMD       | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PC12 | SDMMC1_CK        | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PC11 | SDMMC1_D3        | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PC9  | SDMMC1_D1        | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
|          | PC8  | SDMMC1_D0        | Alternate Function Push Pull | No pull-up and no pull-down | Very High |            |
| SPI1     | PG9  | SPI1_MISO        | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|          | PD7  | SPI1_MOSI        | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|          | PG11 | SPI1_SCK         | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| SPI2     | PI3  | SPI2_MOSI        | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|          | PD3  | SPI2_SCK         | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|          | PI2  | SPI2_MISO        | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| SPI4     | PE5  | SPI4_MISO        | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|          |      |                  |                              |                             |           |            |

| IP      | Pin  | Signal      | GPIO mode                    | GPIO pull/up pull down      | Max Speed | User Label |
|---------|------|-------------|------------------------------|-----------------------------|-----------|------------|
|         | PE6  | SPI4_MOSI   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PE12 | SPI4_SCK    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| UART4   | PD1  | UART4_TX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PB8  | UART4_RX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| UART5   | PB5  | UART5_RX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PB13 | UART5_TX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| UART7   | PF6  | UART7_RX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PF7  | UART7_TX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PF8  | UART7_RTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PE10 | UART7_CTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| UART8   | PE0  | UART8_RX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PE1  | UART8_TX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD14 | UART8_CTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD15 | UART8_RTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| UART9   | PD0  | UART9_CTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD13 | UART9_RTS   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PG1  | UART9_TX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PG0  | UART9_RX    | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| USART1  | PA10 | USART1_RX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PA9  | USART1_TX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| USART2  | PD4  | USART2_RTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD6  | USART2_RX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD5  | USART2_TX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PA0  | USART2_CTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| USART3  | PD8  | USART3_TX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD11 | USART3_CTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD12 | USART3_RTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PD9  | USART3_RX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| USART6  | PG15 | USART6_CTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PG12 | USART6_RTS  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PC7  | USART6_RX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PC6  | USART6_TX   | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| USART10 | PE3  | USART10_TX  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
|         | PE2  | USART10_RX  | Alternate Function Push Pull | No pull-up and no pull-down | Low       |            |
| GPIO    | PI4  | GPIO_Output | Output Push Pull             | No pull-up and no pull-down | Low       | UART8 Pwr  |
|         | PI5  | GPIO_Input  | Input mode                   | No pull-up and no pull-down | n/a       | UART8 Flt  |
|         | PJ15 | GPIO_Output | Output Push Pull             | No pull-up and no pull-down | Low       | USART2 Pwr |
|         | PH15 | GPIO_Input  | Input mode                   | No pull-up and no pull-down | n/a       | CTD Flt    |
|         | PH14 | GPIO_Output | Output Push Pull             | No pull-up and no pull-down | Low       | CTD Pwr    |
|         | PE4  | GPIO_Input  | Input mode                   | No pull-up and no pull-down | n/a       | UART4 Flt  |

| IP | Pin  | Signal      | GPIO mode        | GPIO pull/up pull down      | Max Speed | User Label  |
|----|------|-------------|------------------|-----------------------------|-----------|-------------|
|    | PI6  | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | UART4 Pwr   |
|    | PJ14 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART2 Flt  |
|    | PI0  | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | CTD Mode    |
|    | PH13 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | CTD DR      |
|    | PJ12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | UART5 Pwr   |
|    | PC13 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART10 Flt |
|    | PG8  | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | USART6 Pwr  |
|    | PI11 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | USART10 Pwr |
|    | PG7  | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | USART1 Pwr  |
|    | PG5  | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART1 Flt  |
|    | PG3  | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART6 Flt  |
|    | PI13 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | UART7 Flt   |
|    | PC2  | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | UART7 Pwr   |
|    | PH12 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | USART3 Pwr  |
|    | PD10 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART3 Flt  |
|    | PC4  | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | uSD Detec   |
|    | PB14 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | UART5 Flt   |
|    | PB15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | USART3 Pwr  |
|    | PF15 | GPIO_Output | Output Push Pull | No pull-up and no pull-down | Low       | UART9 Pwr   |
|    | PE14 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | UART9 Flt   |
|    | PH11 | GPIO_Input  | Input mode       | No pull-up and no pull-down | n/a       | USART3 Flt  |

## 8.2. DMA configuration

| DMA request | Stream       | Direction            | Priority |
|-------------|--------------|----------------------|----------|
| USART1_RX   | DMA1_Stream0 | Peripheral To Memory | Low      |
| USART1_TX   | DMA1_Stream1 | Memory To Peripheral | Low      |
| USART2_RX   | DMA1_Stream2 | Peripheral To Memory | Low      |
| USART2_TX   | DMA1_Stream3 | Memory To Peripheral | Low      |

### USART1\_RX: DMA1\_Stream0 DMA request Settings:

Mode: **Circular \***  
 Use fifo: **Enable \***  
 FIFO Threshold: **Half Full \***  
 Peripheral Increment: Disable  
 Memory Increment: **Enable \***  
 Peripheral Data Width: Byte  
 Memory Data Width: Byte  
 Peripheral Burst Size: Single  
 Memory Burst Size: Single

### USART1\_TX: DMA1\_Stream1 DMA request Settings:

Mode: Normal  
 Use fifo: Disable  
 Peripheral Increment: Disable  
 Memory Increment: **Enable \***  
 Peripheral Data Width: Byte  
 Memory Data Width: Byte

### USART2\_RX: DMA1\_Stream2 DMA request Settings:

Mode: Normal  
 Use fifo: Disable  
 Peripheral Increment: Disable  
 Memory Increment: **Enable \***  
 Peripheral Data Width: Byte  
 Memory Data Width: Byte

USART2\_TX: DMA1\_Stream3 DMA request Settings:

|                        |                 |
|------------------------|-----------------|
| Mode:                  | Normal          |
| Use fifo:              | Disable         |
| Peripheral Increment:  | Disable         |
| Memory Increment:      | <b>Enable *</b> |
| Peripheral Data Width: | Byte            |
| Memory Data Width:     | Byte            |

**8.3. BDMA1 configuration**

nothing configured in DMA service

**8.4. BDMA2 configuration**

nothing configured in DMA service

**8.5. MDMA configuration**

nothing configured in DMA service

## 8.6. NVIC configuration

### 8.6.1. NVIC

| Interrupt Table                          | Enable | Preenmption Priority | SubPriority |
|------------------------------------------|--------|----------------------|-------------|
| Non maskable interrupt                   | true   | 0                    | 0           |
| Hard fault interrupt                     | true   | 0                    | 0           |
| Memory management fault                  | true   | 0                    | 0           |
| Pre-fetch fault, memory access fault     | true   | 0                    | 0           |
| Undefined instruction or illegal state   | true   | 0                    | 0           |
| System service call via SWI instruction  | true   | 0                    | 0           |
| Debug monitor                            | true   | 0                    | 0           |
| Pendable request for system service      | true   | 0                    | 0           |
| System tick timer                        | true   | 0                    | 0           |
| DMA1 stream0 global interrupt            | true   | 0                    | 0           |
| DMA1 stream1 global interrupt            | true   | 0                    | 0           |
| DMA1 stream2 global interrupt            | true   | 0                    | 0           |
| DMA1 stream3 global interrupt            | true   | 0                    | 0           |
| Window watchdog interrupt                | unused |                      |             |
| PVD and PVM interrupts through EXTI line | unused |                      |             |
| Flash global interrupt                   | unused |                      |             |
| RCC global interrupt                     | unused |                      |             |
| I2C2 event interrupt                     | unused |                      |             |
| I2C2 error interrupt                     | unused |                      |             |
| SPI1 global interrupt                    | unused |                      |             |
| SPI2 global interrupt                    | unused |                      |             |
| USART1 global interrupt                  | unused |                      |             |
| USART2 global interrupt                  | unused |                      |             |
| USART3 global interrupt                  | unused |                      |             |
| SDMMC1 global interrupt                  | unused |                      |             |
| UART4 global interrupt                   | unused |                      |             |
| UART5 global interrupt                   | unused |                      |             |
| USART6 global interrupt                  | unused |                      |             |
| I2C3 event interrupt                     | unused |                      |             |
| I2C3 error interrupt                     | unused |                      |             |
| FPU global interrupt                     | unused |                      |             |
| UART7 global interrupt                   | unused |                      |             |
| UART8 global interrupt                   | unused |                      |             |
| SPI4 global interrupt                    | unused |                      |             |
| OCTOSPI1 global interrupt                | unused |                      |             |
| LPTIM1 global interrupt                  | unused |                      |             |
| I2C4 event interrupt                     | unused |                      |             |
| I2C4 error interrupt                     | unused |                      |             |

| Interrupt Table                 | Enable | Preenmption Priority | SubPriority |
|---------------------------------|--------|----------------------|-------------|
| HSEM1 global interrupt          |        | unused               |             |
| LPTIM3 global interrupt         |        | unused               |             |
| UART9 global interrupt          |        | unused               |             |
| USART10 global interrupt        |        | unused               |             |
| LPUART1 global interrupt        |        | unused               |             |
| Window watchdog reset interrupt |        | unused               |             |
| ECC diagnostic Global Interrupt |        | unused               |             |
| OCTOSPI2 global interrupt       |        | unused               |             |

### 8.6.2. NVIC Code generation

| Enabled interrupt Table                 | Select for init sequence ordering | Generate IRQ handler | Call HAL handler |
|-----------------------------------------|-----------------------------------|----------------------|------------------|
| Non maskable interrupt                  | false                             | true                 | false            |
| Hard fault interrupt                    | false                             | true                 | false            |
| Memory management fault                 | false                             | true                 | false            |
| Pre-fetch fault, memory access fault    | false                             | true                 | false            |
| Undefined instruction or illegal state  | false                             | true                 | false            |
| System service call via SWI instruction | false                             | true                 | false            |
| Debug monitor                           | false                             | true                 | false            |
| Pendable request for system service     | false                             | true                 | false            |
| System tick timer                       | false                             | true                 | true             |
| DMA1 stream0 global interrupt           | false                             | true                 | true             |
| DMA1 stream1 global interrupt           | false                             | true                 | true             |
| DMA1 stream2 global interrupt           | false                             | true                 | true             |
| DMA1 stream3 global interrupt           | false                             | true                 | true             |

\* User modified value

## 9. System Views

### 9.1. Category view

#### 9.1.1. Current

| Middleware  |        |          |              |            |            |          |           |                 |                   |
|-------------|--------|----------|--------------|------------|------------|----------|-----------|-----------------|-------------------|
| FATFS ✓     |        |          |              |            |            |          |           |                 |                   |
| System Core | Analog | Timers   | Connectivity |            | Multimedia | Security | Computing | Trace and Debug | Power and Thermal |
| BDMA1       |        | LPTIM1 ✓ | I2C2 ✓       | I2C3 ✓     |            |          |           | DEBUG ✓         |                   |
| BDMA2       |        | LPTIM3 ✓ | I2C4 ✓       | LPUART1 ✓  |            |          |           |                 |                   |
| CORTEX_M7 ✓ |        | RTC ✓    | OCTOSPI1 ✓   | OCTOSPI2 ✓ |            |          |           |                 |                   |
| DMA ✓       |        |          | SDMMC1 ✓     | SP1 ✓      |            |          |           |                 |                   |
| GPIO ✓      |        |          | SPI2 ✓       | SPI4 ✓     |            |          |           |                 |                   |
| IWDG1 ✓     |        |          | UART4 ✓      | UART5 ✓    |            |          |           |                 |                   |
| MDMA        |        |          | UART7 ✓      | UART8 ✓    |            |          |           |                 |                   |
| IVIC ✓      |        |          | UART9 ✓      | USART1 ✓   |            |          |           |                 |                   |
| RCC ✓       |        |          | USART2 ✓     | USART3 ✓   |            |          |           |                 |                   |
| SYS ✓       |        |          | USART6 ✓     | USART10 ✓  |            |          |           |                 |                   |
| WWDG1 ✓     |        |          |              |            |            |          |           |                 |                   |

## 10. Docs & Resources

| Type               | Link                                                                                                                                          |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Datasheet          | <a href="http://www.st.com/resource/en/datasheet/DM00674683.pdf">http://www.st.com/resource/en/datasheet/DM00674683.pdf</a>                   |
| Reference manual   | <a href="http://www.st.com/resource/en/reference_manual/DM00463927.pdf">http://www.st.com/resource/en/reference_manual/DM00463927.pdf</a>     |
| Programming manual | <a href="http://www.st.com/resource/en/programming_manual/DM00237416.pdf">http://www.st.com/resource/en/programming_manual/DM00237416.pdf</a> |
| Errata sheet       | <a href="http://www.st.com/resource/en/errata_sheet/DM00598144.pdf">http://www.st.com/resource/en/errata_sheet/DM00598144.pdf</a>             |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00167594.pdf">http://www.st.com/resource/en/application_note/CD00167594.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00211314.pdf">http://www.st.com/resource/en/application_note/CD00211314.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00259245.pdf">http://www.st.com/resource/en/application_note/CD00259245.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00264342.pdf">http://www.st.com/resource/en/application_note/CD00264342.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/CD00264379.pdf">http://www.st.com/resource/en/application_note/CD00264379.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00042534.pdf">http://www.st.com/resource/en/application_note/DM00042534.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00072315.pdf">http://www.st.com/resource/en/application_note/DM00072315.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00073742.pdf">http://www.st.com/resource/en/application_note/DM00073742.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00073853.pdf">http://www.st.com/resource/en/application_note/DM00073853.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00081379.pdf">http://www.st.com/resource/en/application_note/DM00081379.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00129215.pdf">http://www.st.com/resource/en/application_note/DM00129215.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00151811.pdf">http://www.st.com/resource/en/application_note/DM00151811.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00160482.pdf">http://www.st.com/resource/en/application_note/DM00160482.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00220769.pdf">http://www.st.com/resource/en/application_note/DM00220769.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00257177.pdf">http://www.st.com/resource/en/application_note/DM00257177.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00272912.pdf">http://www.st.com/resource/en/application_note/DM00272912.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00272913.pdf">http://www.st.com/resource/en/application_note/DM00272913.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00226326.pdf">http://www.st.com/resource/en/application_note/DM00226326.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00236305.pdf">http://www.st.com/resource/en/application_note/DM00236305.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00327191.pdf">http://www.st.com/resource/en/application_note/DM00327191.pdf</a>     |
| Application note   | <a href="http://www.st.com/resource/en/application_note/DM00287603.pdf">http://www.st.com/resource/en/application_note/DM00287603.pdf</a>     |

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Application note [http://www.st.com/resource/en/application\\_note/DM00606249.pdf](http://www.st.com/resource/en/application_note/DM00606249.pdf)

Application note [http://www.st.com/resource/en/application\\_note/DM00725181.pdf](http://www.st.com/resource/en/application_note/DM00725181.pdf)