STM32
CubeMX

# 1. Description

## 1.1. Project

| | |
|---|---|
| Project Name | Main_Control-V5 |
| Board Name | custom |
| Generated with: | STM32CubeMX 6.8.0 |
| Date | 04/29/2023 |

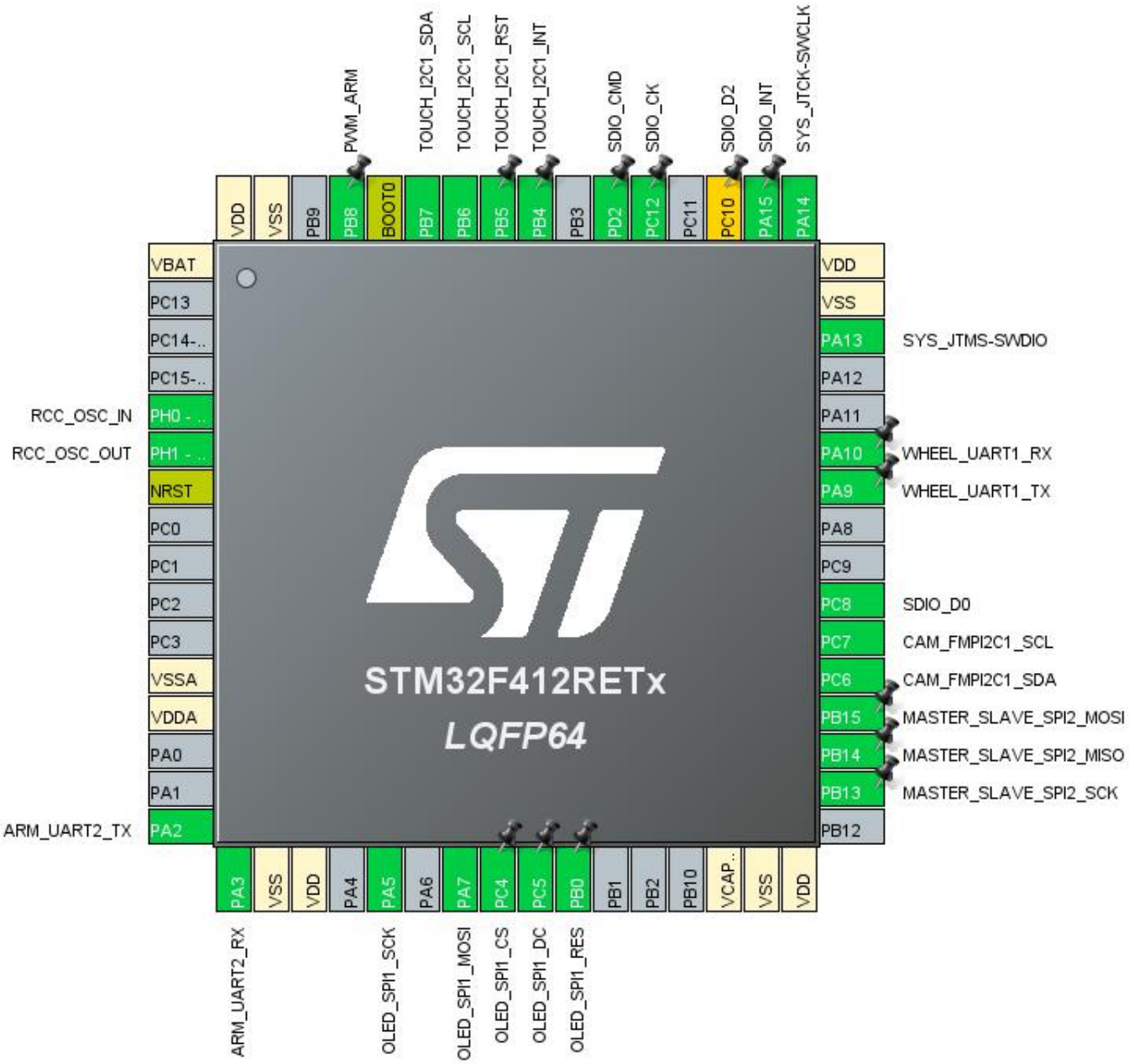
## 1.2. MCU

| | |
|---|---|
| MCU Series | STM32F4 |
| MCU Line | STM32F412 |
| MCU name | STM32F412RETx |
| MCU Package | LQFP64 |
| MCU Pin number | 64 |

## 1.3. Core(s) information

| | |
|---|---|
| Core(s) | Arm Cortex-M4 |

## 2. Pinout Configuration



# 3. Pins Configuration

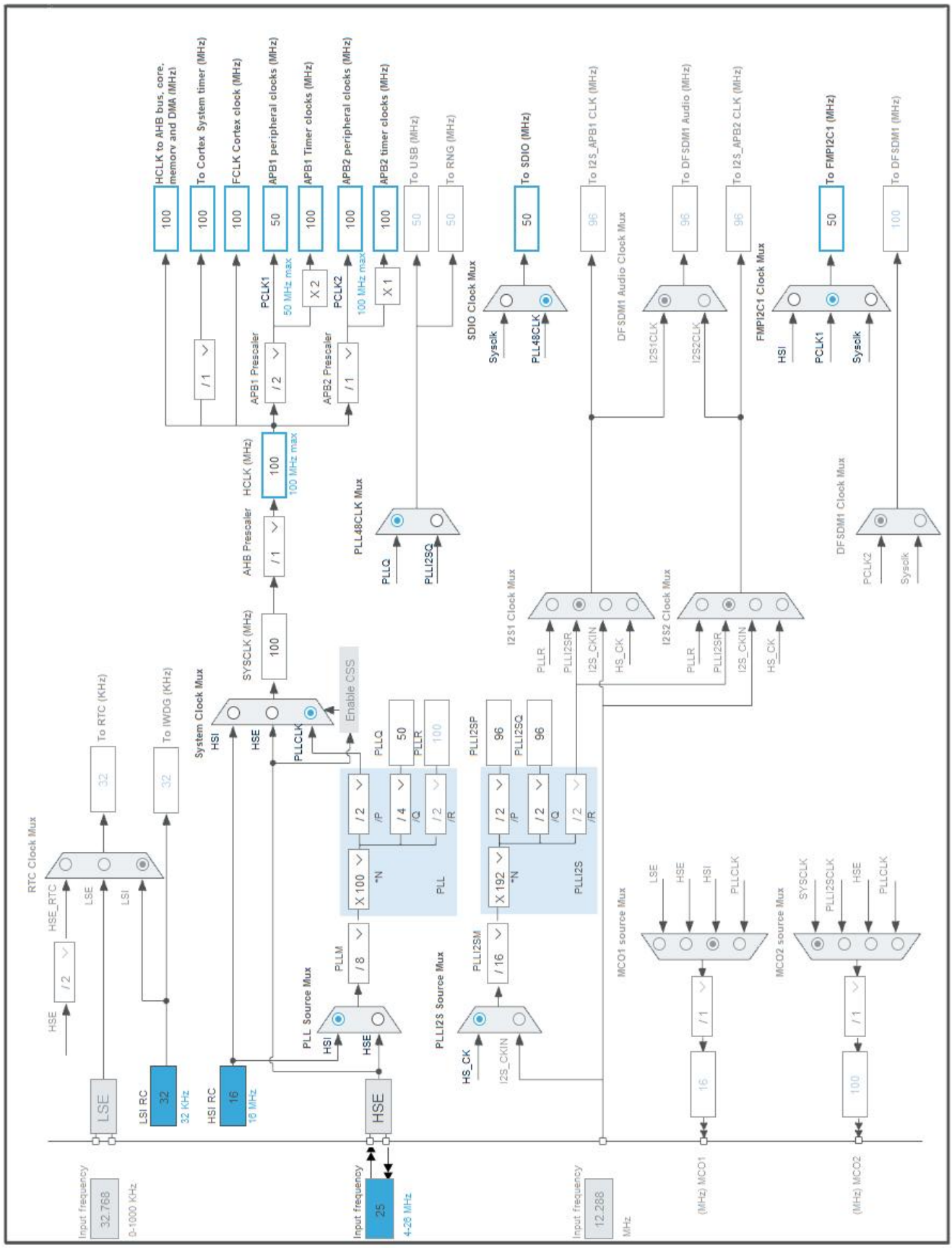
| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 1 | VBAT | Power | | |
| 5 | PH0 - OSC_IN | I/O | RCC_OSC_IN | |
| 6 | PH1 - OSC_OUT | I/O | RCC_OSC_OUT | |
| 7 | NRST | Reset | | |
| 12 | VSSA | Power | | |
| 13 | VDDA | Power | | |
| 16 | PA2 | I/O | USART2_TX | ARM_UART2_TX |
| 17 | PA3 | I/O | USART2_RX | ARM_UART2_RX |
| 18 | VSS | Power | | |
| 19 | VDD | Power | | |
| 21 | PA5 | I/O | SPI1_SCK | OLED_SPI1_SCK |
| 23 | PA7 | I/O | SPI1_MOSI | OLED_SPI1_MOSI |
| 24 | PC4 * | I/O | GPIO_Output | OLED_SPI1_CS |
| 25 | PC5 * | I/O | GPIO_Output | OLED_SPI1_DC |
| 26 | PB0 * | I/O | GPIO_Output | OLED_SPI1_RES |
| 30 | VCAP_1 | Power | | |
| 31 | VSS | Power | | |
| 32 | VDD | Power | | |
| 34 | PB13 | I/O | SPI2_SCK | MASTER_SLAVE_SPI2_SCK |
| 35 | PB14 | I/O | SPI2_MISO | MASTER_SLAVE_SPI2_MISO |
| 36 | PB15 | I/O | SPI2_MOSI | MASTER_SLAVE_SPI2_MOSI |
| 37 | PC6 | I/O | FMPI2C1_SCL | CAM_FMPI2C1_SDA |
| 38 | PC7 | I/O | FMPI2C1_SDA | CAM_FMPI2C1_SCL |
| 39 | PC8 | I/O | SDIO_D0 | |
| 42 | PA9 | I/O | USART1_TX | WHEEL_UART1_TX |
| 43 | PA10 | I/O | USART1_RX | WHEEL_UART1_RX |
| 46 | PA13 | I/O | SYS_JTMS-SWDIO | |
| 47 | VSS | Power | | |
| 48 | VDD | Power | | |
| 49 | PA14 | I/O | SYS_JTCK-SWCLK | |
| 50 | PA15 * | I/O | GPIO_Input | SDIO_INT |
| 51 | PC10 ** | I/O | SDIO_D2 | |
| 53 | PC12 | I/O | SDIO_CK | |

| Pin Number LQFP64 | Pin Name (function after reset) | Pin Type | Alternate Function(s) | Label |
|---|---|---|---|---|
| 54 | PD2 | I/O | SDIO_CMD | |
| 56 | PB4 | I/O | GPIO_EXTI4 | TOUCH_I2C1_INT |
| 57 | PB5 * | I/O | GPIO_Output | TOUCH_I2C1_RST |
| 58 | PB6 | I/O | I2C1_SCL | TOUCH_I2C1_SCL |
| 59 | PB7 | I/O | I2C1_SDA | TOUCH_I2C1_SDA |
| 60 | BOOT0 | Boot | | |
| 61 | PB8 | I/O | TIM10_CH1 | PWM_ARM |
| 63 | VSS | Power | | |
| 64 | VDD | Power | | |

* The pin is affected with an I/O function

** The pin is affected with a peripheral function but no peripheral mode is activated

# 4. Clock Tree Configuration



# 5. Software Project

## 5.1. Project Settings

| Name | Value |
|---|---|
| Project Name | Main_Control-V5.0 |
| Project Folder | D:\PersonalDada\Project\WuliuCar\Program\STM32\Main_Control-V5.0 |
| Toolchain / IDE | MDK-ARM V5.32 |
| Firmware Package Name and Version | STM32Cube FW_F4 V1.27.1 |
| Application Structure | Advanced |
| Generate Under Root | No |
| Do not generate the main() | No |
| Minimum Heap Size | 0x4000 |
| Minimum Stack Size | 0x4000 |

## 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 | Yes |
| Backup previously generated files when re-generating | No |
| 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) | Yes |
| Enable Full Assert | No |

## 5.3. Advanced Settings - Generated Function Calls

| Rank | Function Name | Peripheral Instance Name |
|---|---|---|
| 1 | SystemClock_Config | RCC |
| 2 | MX_GPIO_Init | GPIO |
| 3 | MX_DMA_Init | DMA |
| 4 | MX_TIM10_Init | TIM10 |
| 5 | MX_USART1_UART_Init | USART1 |
| 6 | MX_USART2_UART_Init | USART2 |
| 7 | MX_I2C1_Init | I2C1 |
| 8 | MX_SDIO_SD_Init | SDIO |
| 9 | MX_SPI1_Init | SPI1 |
| 10 | MX_SPI2_Init | SPI2 |
| 11 | MX_FMPI2C1_Init | FMPI2C1 |

| Rank | Function Name | Peripheral Instance Name |
|---|---|---|
| 12 | MX_FATFS_Init | FATFS |
| 13 | MX_TIM3_Init | TIM3 |
| 14 | MX_CRC_Init | CRC |
| 15 | MX_TIM13_Init | TIM13 |
| 16 | MX_TIM6_Init | TIM6 |

# 6. Power Consumption Calculator report

## 6.1. Microcontroller Selection

| | |
|---|---|
| Series | STM32F4 |
| Line | STM32F412 |
| MCU | STM32F412RETx |
| Datasheet | DS11139_Rev5 |

## 6.2. Parameter Selection

| | |
|---|---|
| Temperature | 25 |
| Vdd | 1.7 |

## 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 |

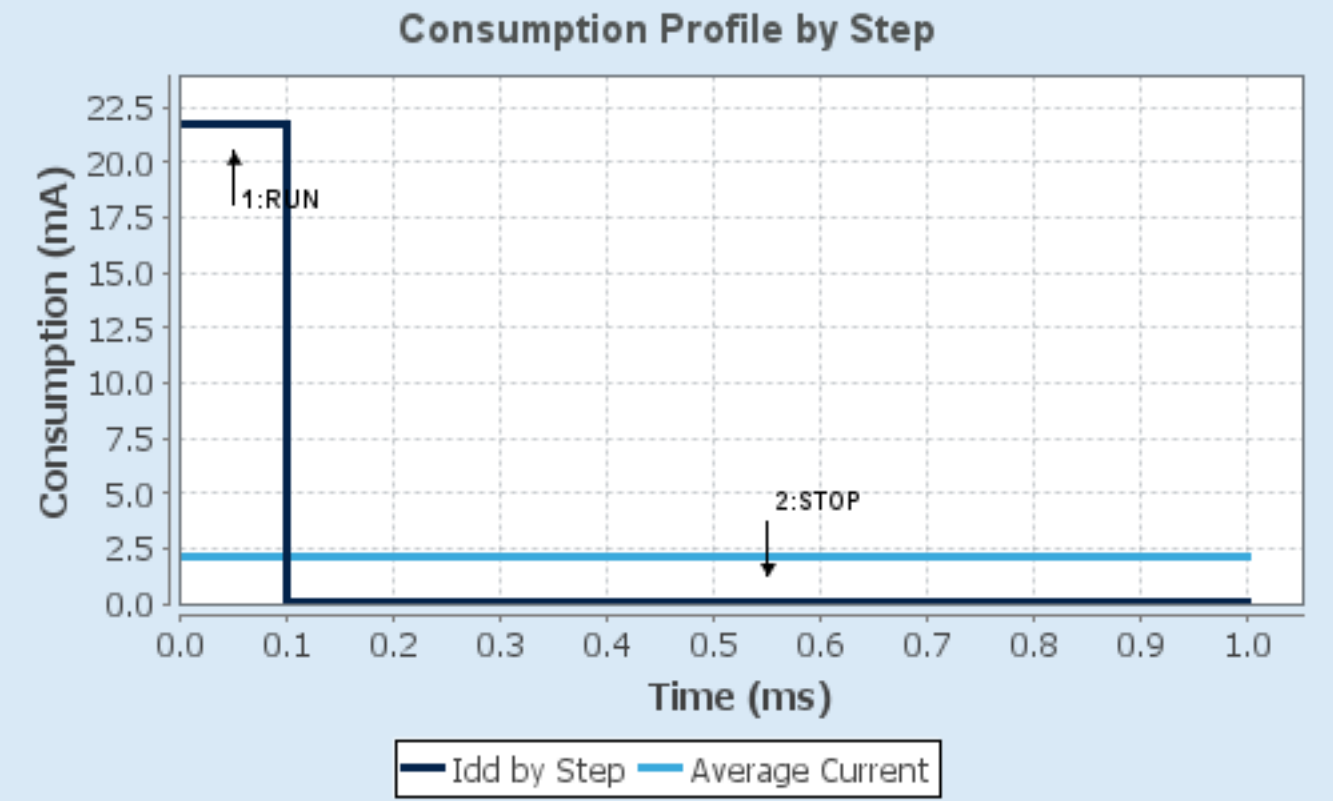
## 6.4. Sequence

| ***Step*** | Step1 | Step2 |
|---|---|---|
| ***Mode*** | RUN | STOP |
| ***Vdd*** | 1.7 | 1.7 |
| ***Voltage Source*** | Battery | Battery |
| ***Range*** | Scale1-High | No Scale |
| ***Fetch Type*** | FLASH | n/a |
| ***CPU Frequency*** | 100 MHz | 0 Hz |
| ***Clock Configuration*** | HSE PLL | Regulator_LPLV Flash-PwrDwn |
| ***Clock Source Frequency*** | 4 MHz | 0 Hz |
| ***Peripherals*** | | |
| ***Additional Cons.*** | 0 mA | 0 mA |
| ***Average Current*** | 21.7 mA | 18.5 µA |
| ***Duration*** | 0.1 ms | 0.9 ms |
| ***DMIPS*** | 125.0 | 0.0 |
| ***Ta Max*** | 103.27 | 105 |
| ***Category*** | In DS Table | In DS Table |

## 6.5. Results

| Sequence Time | 1 ms | Average Current | 2.19 mA |
|---|---|---|---|
| Battery Life | 2 months, 3 days, 20 hours | Average DMIPS | 125.0 DMIPS |

## 6.6. Chart


Consumption Profile by Step
Consumption (mA)
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
1:RUN
2:STOP
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Time (ms)
Idd by Step
Average Current

# 7. Peripherals and Middlewares Configuration

## 7.1. CRC

**mode: Activated**

## 7.2. FMPI2C1

**I2C: I2C**

### 7.2.1. Parameter Settings:

**Timing configuration:**

| | |
|---|---|
| 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 | **0x00C0EAFF *** |

**Slave Features:**

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

## 7.3. I2C1

**I2C: I2C**

### 7.3.1. Parameter Settings:

**Master Features:**

| | |
|---|---|
| I2C Speed Mode | **Fast Mode *** |
| I2C Clock Speed (Hz) | 400000 |
| Fast Mode Duty Cycle | Duty cycle Tlow/Thigh = 2 |

**Slave Features:**

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

## 7.4. RCC

## High Speed Clock (HSE): Crystal/Ceramic Resonator

### 7.4.1. Parameter Settings:

**System Parameters:**

| | |
|---|---|
| VDD voltage (V) | 3.3 |
| Instruction Cache | Enabled |
| Prefetch Buffer | Enabled |
| Data Cache | Enabled |
| Flash Latency(WS) | 3 WS (4 CPU cycle) |

**RCC Parameters:**

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

**Power Parameters:**

| | |
|---|---|
| Power Regulator Voltage Scale | Power Regulator Voltage Scale 1 |

## 7.5. SDIO

## Mode: SD 1 bit

### 7.5.1. Parameter Settings:

**SDIO parameters:**

| | |
|---|---|
| Clock transition on which the bit capture is made | Rising transition |
| SDIO Clock divider bypass | Disable |
| SDIO Clock output enable when the bus is idle | Disable the power save for the clock |
| SDIO hardware flow control | The hardware control flow is disabled |
| SDIOCLK clock divide factor | 0 |

## 7.6. SPI1

## Mode: Transmit Only Master

### 7.6.1. Parameter Settings:

**Basic Parameters:**

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

**Clock Parameters:**

| | |
|---|---|
| Prescaler (for Baud Rate) | 2 |
| Baud Rate | **50.0 MBits/s *** |
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

| | |
|---|---|
| CRC Calculation | Disabled |
| NSS Signal Type | Software |

## 7.7. SPI2

## Mode: Full-Duplex Slave

### 7.7.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Frame Format | Motorola |
| Data Size | **16 Bits *** |
| First Bit | MSB First |

**Clock Parameters:**

| | |
|---|---|
| Clock Polarity (CPOL) | Low |
| Clock Phase (CPHA) | 1 Edge |

**Advanced Parameters:**

| | |
|---|---|
| CRC Calculation | Disabled |
| NSS Signal Type | Software |

## 7.8. SYS

## Debug: Serial Wire

## Timebase Source: SysTick

## 7.9. TIM3

## Clock Source : Internal Clock

### 7.9.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | **100-1 *** |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | **1000-1 *** |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | **Enable *** |

**Trigger Output (TRGO) Parameters:**

| | |
|---|---|
| Master/Slave Mode (MSM bit) | Disable (Trigger input effect not delayed) |
| Trigger Event Selection | Reset (UG bit from TIMx_EGR) |

## 7.10. TIM6

## mode: Activated

### 7.10.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | **1000-1 *** |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | **5000-1 *** |
| auto-reload preload | Disable |

**Trigger Output (TRGO) Parameters:**

| | |
|---|---|
| Trigger Event Selection | Reset (UG bit from TIMx_EGR) |

## 7.11. TIM10

## mode: Activated

## Channel1: PWM Generation CH1

### 7.11.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | **1000-1 *** |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | **2000-1 *** |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | Disable |

**PWM Generation Channel 1:**

| | |
|---|---|
| Mode | PWM mode 1 |
| Pulse (16 bits value) | **250-1 *** |
| Output compare preload | Enable |

| | |
|---|---|
| Fast Mode | Disable |
| CH Polarity | High |

## 7.12. TIM13

## mode: Activated

### 7.12.1. Parameter Settings:

**Counter Settings:**

| | |
|---|---|
| Prescaler (PSC - 16 bits value) | **10000-1 *** |
| Counter Mode | Up |
| Counter Period (AutoReload Register - 16 bits value ) | 65535 |
| Internal Clock Division (CKD) | No Division |
| auto-reload preload | **Enable *** |

## 7.13. USART1

## Mode: Asynchronous

### 7.13.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Baud Rate | **9600 *** |
| Word Length | 8 Bits (including Parity) |
| Parity | None |
| Stop Bits | 1 |

**Advanced Parameters:**

| | |
|---|---|
| Data Direction | Receive and Transmit |
| Over Sampling | 16 Samples |

## 7.14. USART2

## Mode: Asynchronous

### 7.14.1. Parameter Settings:

**Basic Parameters:**

| | |
|---|---|
| Baud Rate | **9600 *** |
| Word Length | 8 Bits (including Parity) |
| Parity | None |

| | |
|---|---|
| Stop Bits | 1 |

**Advanced Parameters:**

| | |
|---|---|
| Data Direction | Receive and Transmit |
| Over Sampling | 16 Samples |

## 7.15. FATFS

## mode: SD Card

### 7.15.1. 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) | **Simplified Chinese (DBCS) *** |
| USE_LFN (Use Long Filename) | **Enabled with dynamic working buffer on the STACK *** |
| 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 |

### 7.15.2. Advanced Settings:

**SDIO/SDMMC:**

| | |
|---|---|
| SDIO instance | SDIO |
| Use dma template | **Enabled *** |
| BSP code for SD | Generic |

### 7.15.3. Platform Settings:

| | |
|---|---|
| Detect_SDIO | PA15 |

## 7.16. STMicroelectronics.X-CUBE-ALGOBUILD.1.3.0 mode: DSPOoLibraryJjLibrary

*** User modified value**

# 8. System Configuration

## 8.1. GPIO configuration

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| FMPI2C1 | PC6 | FMPI2C1_SCL | Alternate Function Open Drain | Pull-up | **Very High *** | CAM_FMPI2C1_SDA |
| | PC7 | FMPI2C1_SDA | Alternate Function Open Drain | Pull-up | **Very High *** | CAM_FMPI2C1_SCL |
| I2C1 | PB6 | I2C1_SCL | Alternate Function Open Drain | No pull-up and no pull-down | **Very High *** | TOUCH_I2C1_SCL |
| | PB7 | I2C1_SDA | Alternate Function Open Drain | No pull-up and no pull-down | **Very High *** | TOUCH_I2C1_SDA |
| RCC | PH0 - OSC_IN | RCC_OSC_IN | n/a | n/a | n/a | |
| | PH1 - OSC_OUT | RCC_OSC_OUT | n/a | n/a | n/a | |
| SDIO | PC8 | SDIO_D0 | Alternate Function Push Pull | No pull-up and no pull-down | Very High | |
| | PC12 | SDIO_CK | Alternate Function Push Pull | No pull-up and no pull-down | Very High | |
| | PD2 | SDIO_CMD | Alternate Function Push Pull | No pull-up and no pull-down | Very High | |
| SPI1 | PA5 | SPI1_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | OLED_SPI1_SCK |
| | PA7 | SPI1_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | OLED_SPI1_MOSI |
| SPI2 | PB13 | SPI2_SCK | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | MASTER_SLAVE_SPI2_SCK |
| | PB14 | SPI2_MISO | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | MASTER_SLAVE_SPI2_MISO |
| | PB15 | SPI2_MOSI | Alternate Function Push Pull | No pull-up and no pull-down | **Very High *** | MASTER_SLAVE_SPI2_MOSI |
| SYS | PA13 | SYS_JTMS-SWDIO | n/a | n/a | n/a | |
| | PA14 | SYS_JTCK-SWCLK | n/a | n/a | n/a | |
| TIM10 | PB8 | TIM10_CH1 | Alternate Function Push Pull | No pull-up and no pull-down | Low | PWM_ARM |
| USART1 | PA9 | USART1_TX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | WHEEL_UART1_TX |
| | PA10 | USART1_RX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | WHEEL_UART1_RX |
| USART2 | PA2 | USART2_TX | Alternate Function Push Pull | **Pull-up *** | **Very High** | ARM_UART2_TX |

| IP | Pin | Signal | GPIO mode | GPIO pull/up pull down | Max Speed | User Label |
|---|---|---|---|---|---|---|
| | | | | | * | |
| | PA3 | USART2_RX | Alternate Function Push Pull | **Pull-up *** | **Very High *** | ARM_UART2_RX |
| Single Mapped Signals | PC10 | SDIO_D2 | Alternate Function Push Pull | **Pull-up *** | Very High | |
| GPIO | PC4 | GPIO_Output | Output Push Pull | **Pull-up *** | **Very High *** | OLED_SPI1_CS |
| | PC5 | GPIO_Output | Output Push Pull | **Pull-up *** | **Very High *** | OLED_SPI1_DC |
| | PB0 | GPIO_Output | Output Push Pull | **Pull-up *** | Low | OLED_SPI1_RES |
| | PA15 | GPIO_Input | Input mode | **Pull-up *** | n/a | SDIO_INT |
| | PB4 | GPIO_EXTI4 | **External Interrupt Mode with Falling edge trigger detection** | No pull-up and no pull-down | n/a | TOUCH_I2C1_INT |
| | PB5 | GPIO_Output | Output Push Pull | **Pull-up *** | Low | TOUCH_I2C1_RST |

## 8.2. DMA configuration

| DMA request | Stream | Direction | Priority |
|---|---|---|---|
| SPI2_RX | DMA1_Stream3 | Peripheral To Memory | Low |
| SPI1_TX | DMA2_Stream5 | Memory To Peripheral | Low |
| SDIO | DMA2_Stream3 | Peripheral To Memory | Low |

*SPI2_RX: DMA1_Stream3 DMA request Settings:*

| | |
|---|---|
| Mode: | **Circular *** |
| Use fifo: | Disable |
| Peripheral Increment: | Disable |
| Memory Increment: | **Enable *** |
| Peripheral Data Width: | Half Word |
| Memory Data Width: | Half Word |

*SPI1_TX: DMA2_Stream5 DMA request Settings:*

| | |
|---|---|
| Mode: | Normal |
| Use fifo: | Disable |
| Peripheral Increment: | Disable |
| Memory Increment: | **Enable *** |
| Peripheral Data Width: | **Half Word *** |
| Memory Data Width: | **Half Word *** |

*SDIO: DMA2_Stream3 DMA request Settings:*

| | |
|---|---|
| Mode: | **Peripheral Flow Control *** |
| Use fifo: | **Enable *** |
| FIFO Threshold: | Full |
| Peripheral Increment: | Disable |
| Memory Increment: | **Enable *** |
| Peripheral Data Width: | **Word *** |
| Memory Data Width: | Word |
| Peripheral Burst Size: | **4 Increment *** |
| Memory Burst Size: | 4 Increment |

## 8.3. NVIC configuration

### 8.3.1. 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 |
| EXTI line4 interrupt | true | 14 | 0 |
| DMA1 stream3 global interrupt | true | 1 | 0 |
| TIM3 global interrupt | true | 14 | 0 |
| SDIO global interrupt | true | 14 | 0 |
| TIM6 global interrupt | true | 2 | 0 |
| DMA2 stream3 global interrupt | true | 14 | 0 |
| DMA2 stream5 global interrupt | true | 14 | 0 |
| PVD interrupt through EXTI line 16 | unused | | |
| Flash global interrupt | unused | | |
| RCC global interrupt | unused | | |
| TIM1 update interrupt and TIM10 global interrupt | unused | | |
| I2C1 event interrupt | unused | | |
| I2C1 error interrupt | unused | | |
| SPI1 global interrupt | unused | | |
| SPI2 global interrupt | unused | | |
| USART1 global interrupt | unused | | |
| USART2 global interrupt | unused | | |
| TIM8 update interrupt and TIM13 global interrupt | unused | | |
| FPU global interrupt | unused | | |
| FMPI2C1 event interrupt | unused | | |
| FMPI2C1 error interrupt | unused | | |

### 8.3.2. NVIC Code generation

| Enabled interrupt Table | Select for init sequence ordering | Generate IRQ handler | Call HAL handler |
|---|---|---|---|
| Non maskable interrupt | false | true | false |
| | | | |

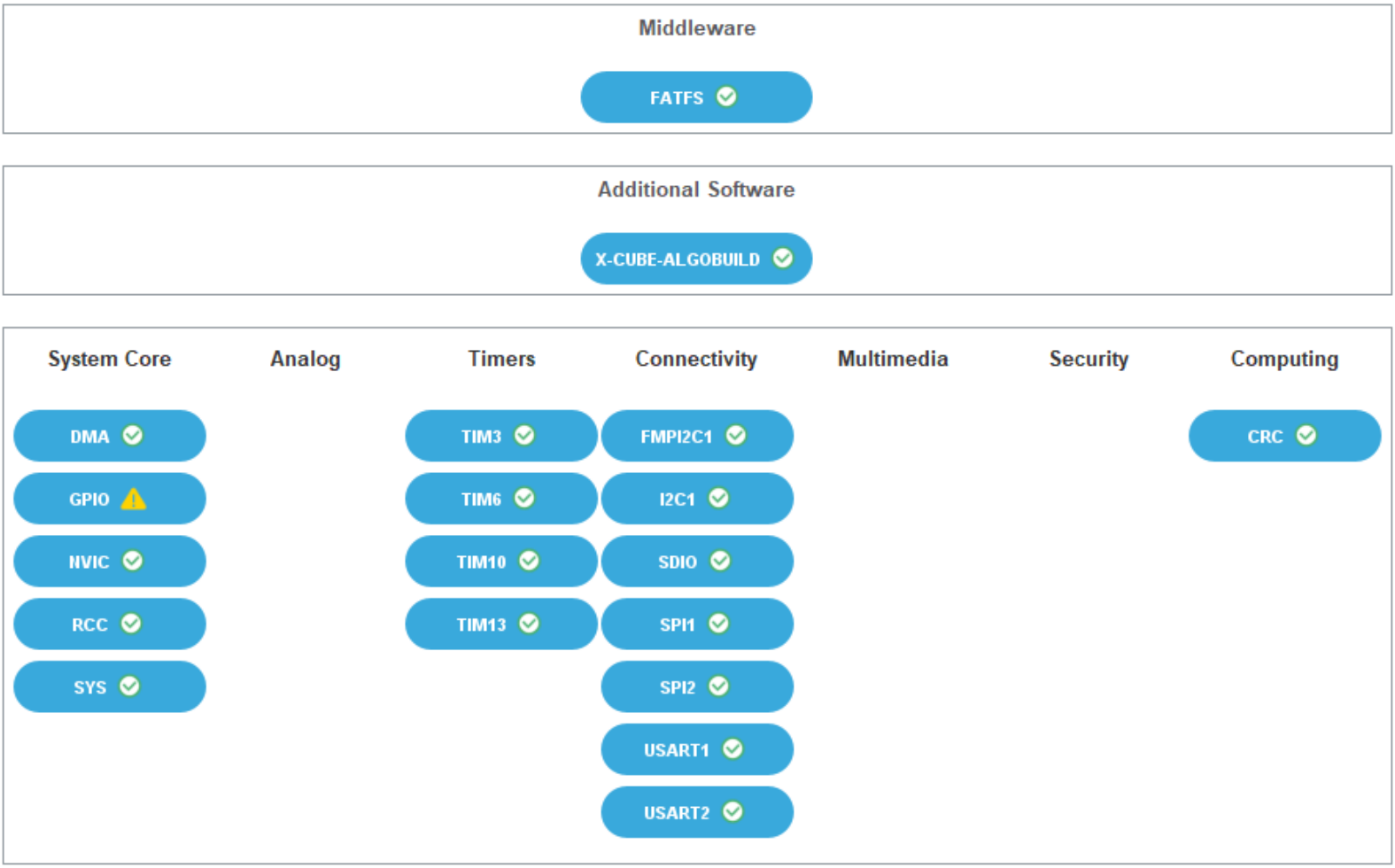
| Enabled interrupt Table | Select for init sequence ordering | Generate IRQ handler | Call HAL handler |
|---|---|---|---|
| Hard fault interrupt | false | true | false |
| Memory management fault | false | true | false |
| Pre-fetch fault, memory access fault | false | true | false |
| Undefined instruction 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 |
| EXTI line4 interrupt | false | true | true |
| DMA1 stream3 global interrupt | false | true | true |
| TIM3 global interrupt | false | true | true |
| SDIO global interrupt | false | true | true |
| TIM6 global interrupt | false | true | true |
| DMA2 stream3 global interrupt | false | true | true |
| DMA2 stream5 global interrupt | false | true | true |

*** User modified value**

# 9. System Views

9.1. Category view

*9.1.1. Current*



# 10. Software Pack Report

## 10.1. Software Pack selected

| Vendor | Name | Version | Component |
|---|---|---|---|
| STMicroelectronics | X-CUBE-ALGOBUILD | 1.3.0 | Class : DSP Library<br>Group : DSP Library<br>Version : 1.3.0 |

## 11. Docs & Resources

| Type | Link |
|---|---|
| BSDL files | https://www.st.com/resource/en/bsdl_model/stm32f412_bsdl.zip |
| IBIS models | https://www.st.com/resource/en/ibis_model/stm32f412_ibis.zip |
| System View Description | https://www.st.com/resource/en/svd/stm32f4_svd.zip |
| BSDL files | https://www.st.com/resource/en/bsdl_model/stm32f412_bsdl.zip |
| IBIS models | https://www.st.com/resource/en/ibis_model/stm32f412_ibis.zip |
| System View Description | https://www.st.com/resource/en/svd/stm32f4_svd.zip |
| Presentations | https://www.st.com/resource/en/product_presentation/stm32-stm8_embedded_software_solutions.pdf |
| Presentations | https://www.st.com/resource/en/product_presentation/stm32_eval-tools_portfolio.pdf |
| Presentations | https://www.st.com/resource/en/product_presentation/stm32_stm8_functional-safety-packages.pdf |
| Presentations | https://www.st.com/resource/en/product_presentation/stm32-stm8_software_development_tools.pdf |
| Training Material | https://www.st.com/resource/en/sales_guide/sg_sc2154.pdf |
| Flyers | https://www.st.com/resource/en/flyer/flstm32f4x1.pdf |
| Flyers | https://www.st.com/resource/en/flyer/flstm32nucleo.pdf |
| Flyers | https://www.st.com/resource/en/flyer/flstmcsuite.pdf |
| Flyers | https://www.st.com/resource/en/flyer/flstm32trust.pdf |
| Product Certifications | https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an1181-electrostatic-discharge-sensitivity-measurement-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an1709-emc-design-guide-for-stm8-stm32-and-legacy-mcus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2606-stm32- |

| | |
|---|---|
| | microcontroller-system-memory-boot-mode-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2639-soldering-recommendations-and-package-information-for-leadfree-ecopack-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2834-how-to-get-the-best-adc-accuracy-in-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2867-oscillator-design-guide-for-stm8afals-stm32-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an2945-stm8s-and-stm32-mcus-a-consistent-832bit-product-line-for-painless-migration-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3070-managing-the-driver-enable-signal-for-rs485-and-iolink-communications-with-the-stm32s-usart-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3154-can-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3155-usart-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3156-usb-dfu-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3997-audio-playback-and-recording-using-the-stm32f4discovery-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3998-pdm-audio-software-decoding-on-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4031-using-the- |

| | |
|---|---|
| | stm32f2-stm32f4-and-stm32f7-series-dma-controller-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4221-i2c-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4230-stm32-microcontroller-random-number-generation-validation-using-the-nist-statistical-test-suite-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4277-using-stm32-device-pwm-shutdown-features-for-motor-control-and-digital-power-conversion-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4286-spi-protocol-used-in-the-stm32-bootloader-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4488-getting-started-with-stm32f4xxxx-mcu-hardware-development-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4566-extending-the-dac-performance-of-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4655-virtually-increasing-the-number-of-serial-communication-peripherals-in-stm32-applications-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4750-handling-of-soft-errors-in-stm32-applications-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4759-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4776-generalpurpose-timer-cookbook-for-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4803-highspeed-si-simulations-using-ibis-and-boardlevel-simulations-using-hyperlynx-si-on- |

| | |
|---|---|
| | stm32-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4838-managing-memory-protection-unit-in-stm32-mcus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4850-stm32-mcus-spreadspectrum-clock-generation-principles-properties-and-implementation-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4879-usb-hardware-and-pcb-guidelines-using-stm32-mcus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4904-migration-of-microcontroller-applications-from-stm32f1-series-to-stm32f4-access-lines-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4908-stm32-usart-automatic-baud-rate-detection-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4989-stm32-microcontroller-debug-toolbox-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4990-getting-started-with-sigmadelta-digital-interface-on-applicable-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4995-using-an-electromyogram-technique-to-detect-muscle-activity-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5027-interfacing-pdm-digital-microphones-using-stm32-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5036-thermal-management-guidelines-for-stm32-applications-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5073-receiving-spdif-audio-stream-with-the-stm32f4f7h7-series-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5225-usb-typec-power-delivery-using-stm32-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5543-enhanced-methods-to-handle-spi-communication-on-stm32-devices-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4760-quadspi- |

| | |
|---|---|
| | interface-on-stm32-microcontrollers-and-microprocessors--stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an4899-stm32-microcontroller-gpio-hardware-settings-and-lowpower-consumption-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5612-esd-protection-of-stm32-mcus-and-mpus-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an5156-introduction-to-stm32-microcontrollers-security-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an1202_freertos_guide-freertos-guide-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an1602_semihosting_in_truestudio-how-to-do-semihosting-in-truestudio-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an1801_stm32cubeprogrammer_in_truestudio-installing-stm32cubeprogrammer-in-truestudio-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/atollic_editing_keyboard_shortcuts-atollic-editing-keyboard-shortcuts-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/iar_to_atollic_truestudio_migration_guide-truestudio-for-arm-migration-guide-iar-embedded-workbench-to-truestudio-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/stm32cubemx_installation_in_truestudio-stm32cubemx-installation-in-truestudio-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an2656-stm32f10xxx-lcd-glass-driver-firmware-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an2790-tft-lcd-interfacing-with-the-highdensity-stm32f10xxx-fsmc-stmicroelectronics.pdf |
| Application Notes | https://www.st.com/resource/en/application_note/an3078-stm32- |

| | |
|---|---|
| for related Tools & Software | inapplication-programming-over-the-ic-bus-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3116-stm32s-adc-modes-and-their-applications-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3174-implementing-receivers-for-infrared-remote-control-protocols-using-stm32f10xxx-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3241-qvga-tftlcd-direct-drive-using-the-stm32f10xx-fsmc-peripheral-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3307-guidelines-for-obtaining-iec-60335-class-b-certification-for-any-stm32-application-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3364-migration-and-compatibility-guidelines-for-stm32-microcontroller-applications-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3965-stm32f40xstm32f41x-inapplication-programming-using-the-usart-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3969-eeprom-emulation-in-stm32f40xstm32f41x-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3990-upgrading-stm32f4discovery-board-firmware-using-a-usb-key-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3997-audio-playback-and-recording-using-the-stm32f4discovery-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an3998-pdm-audio-software-decoding-on-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools | https://www.st.com/resource/en/application_note/an4044-floating-point-unit-demonstration-on-stm32-microcontrollers-stmicroelectronics.pdf |

| | |
|---|---|
| & Software | |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4323-getting-started-with-stemwin-library-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4435-guidelines-for-obtaining-ulcsaiec-607301603351-class-b-certification-in-any-stm32-application-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4457-implementing-an-emulated-uart-on-stm32f4-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4499-stm32--nrf51822-bluetooth-low-energy-system-solution-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4502-stm32-smbuspmbus-embedded-software-expansion-for-stm32cube-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4515-using-batch-acquisition-mode-bam-to-maximize-power-efficiency-on-stm32f410-stm32f411-stm32f412-stm32f413-microcontroller-lines-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4657-stm32-inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4666-parallel-synchronous-transmission-using-gpio-and-dma-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4678-full-duplex-spi-emulation-for-stm32f4-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4701-proprietary-code-readout-protection-on-microcontrollers-of-the-stm32f4-series-stmicroelectronics.pdf |
| Application Notes for related Tools | https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf |

| | |
|---|---|
| & Software | |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4758-proprietary-code-readout-protection-on-stm32l4-stm32l4-stm32g4-and-stm32wb-series-mcus-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4759-using-the-hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4841-digital-signal-processing-for-stm32-microcontrollers-using-cmsis-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an4968-proprietary-code-read-out-protection-pcrop-on-stm32f72xxx-and-stm32f73xxx-microcontrollers-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5054-secure-programming-using-stm32cubeprogrammer-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5056-integration-guide-for-the-xcubesbsfu-stm32cube-expansion-package-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5360-getting-started-with-projects-based-on-the-stm32mp1-series-in-stm32cubeide-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5361-getting-started-with-projects-based-on-dualcore-stm32h7-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5394-getting-started-with-projects-based-on-the-stm32l5-series-in-stm32cubeide-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5418-how-to-build-a-simple-usbpd-sink-application-with-stm32cubemx-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5426-migrating-graphics-middleware-projects-from-stm32cubemx-540-to-stm32cubemx-550-stmicroelectronics.pdf |

| | |
|---|---|
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5464-position-control-of-a-threephase-permanent-magnet-motor-using-xcubemcsdk-or-xcubemcsdkful-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5564-getting-started-with-projects-based-on-dualcore-stm32wl-microcontrollers-in-stm32cubeide-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5698-adapting-the-xcubestl-functional-safety-package-for-stm32-iec-61508-compliant-to-other-safety-standards-stmicroelectronics.pdf |
| Application Notes for related Tools & Software | https://www.st.com/resource/en/application_note/an5731-stm32cubemx-and-stm32cubeide-threadsafe-solution-stmicroelectronics.pdf |
| Design Notes & Tips | https://www.st.com/resource/en/design_tip/dt0117-microphone-array-beamforming-in-the-pcm-and-pdm-domain-stmicroelectronics.pdf |
| Device Option Lists | https://www.st.com/resource/en/device_option_list/opl_stm32f412_1m.zip |
| Errata Sheets | https://www.st.com/resource/en/errata_sheet/es0305-stm32f412xexg-device-limitations-stmicroelectronics.pdf |
| Datasheet | https://www.st.com/resource/en/datasheet/dm00213872.pdf |
| Data brief | https://www.st.com/resource/en/data_brief/dm00166585.pdf |
| Programming Manuals | https://www.st.com/resource/en/programming_manual/pm0214-stm32-cortexm4-mcus-and-mpus-programming-manual-stmicroelectronics.pdf |
| Reference Manuals | https://www.st.com/resource/en/reference_manual/rm0402-stm32f412-advanced-armbased-32bit-mcus-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn0516-overview-of-the-stm32f0xf100xxf103xx-and-stm32f2xxf30xf4xx-mcus-pmsm-singledual-foc-sdk-v40-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1163-description-of-wlcsp-for-microcontrollers-and-recommendations-for-its-use-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1204-tape-and-reel-shipping-media-for-stm32-microcontrollers-in-bga-packages-stmicroelectronics.pdf |

| | |
|---|---|
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1205-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-fpn-packages-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1206-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-qfp-packages-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1207-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-so-packages-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1208-tape-and-reel-shipping-media-for-stm8-and-stm32-microcontrollers-in-tssop-and-ssop-packages-stmicroelectronics.pdf |
| Technical Notes & Articles | https://www.st.com/resource/en/technical_note/tn1433-reference-device-marking-schematics-for-stm32-microcontrollers-and-microprocessors-stmicroelectronics.pdf |