

## 1. Description

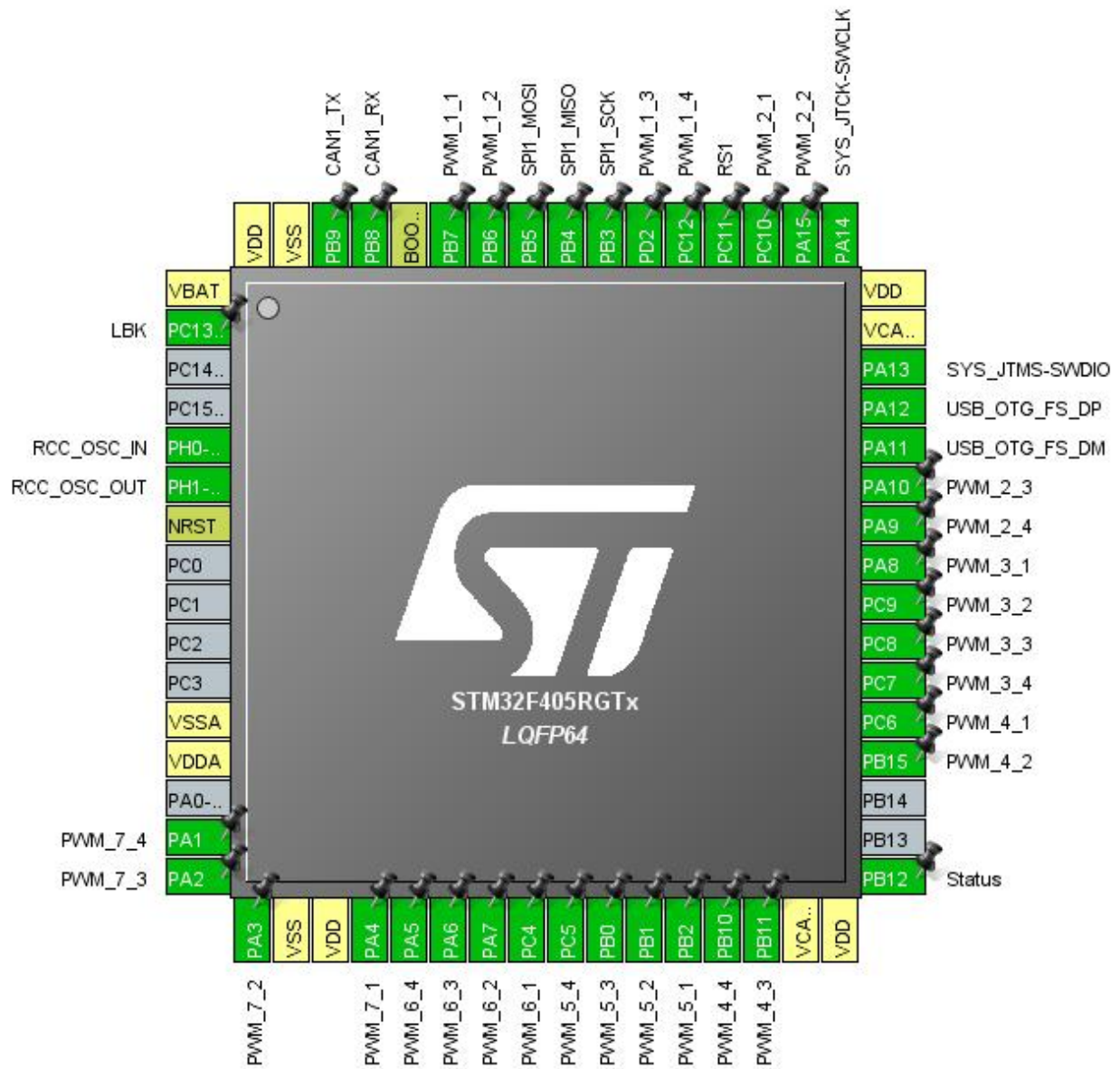
### 1.1. Project

Project Name	7x5WStepper
Board Name	custom
Generated with:	STM32CubeMX 5.0.1
Date	02/16/2019

### 1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F405/415
MCU name	STM32F405RGTx
MCU Package	LQFP64
MCU Pin number	64

## 2. Pinout Configuration



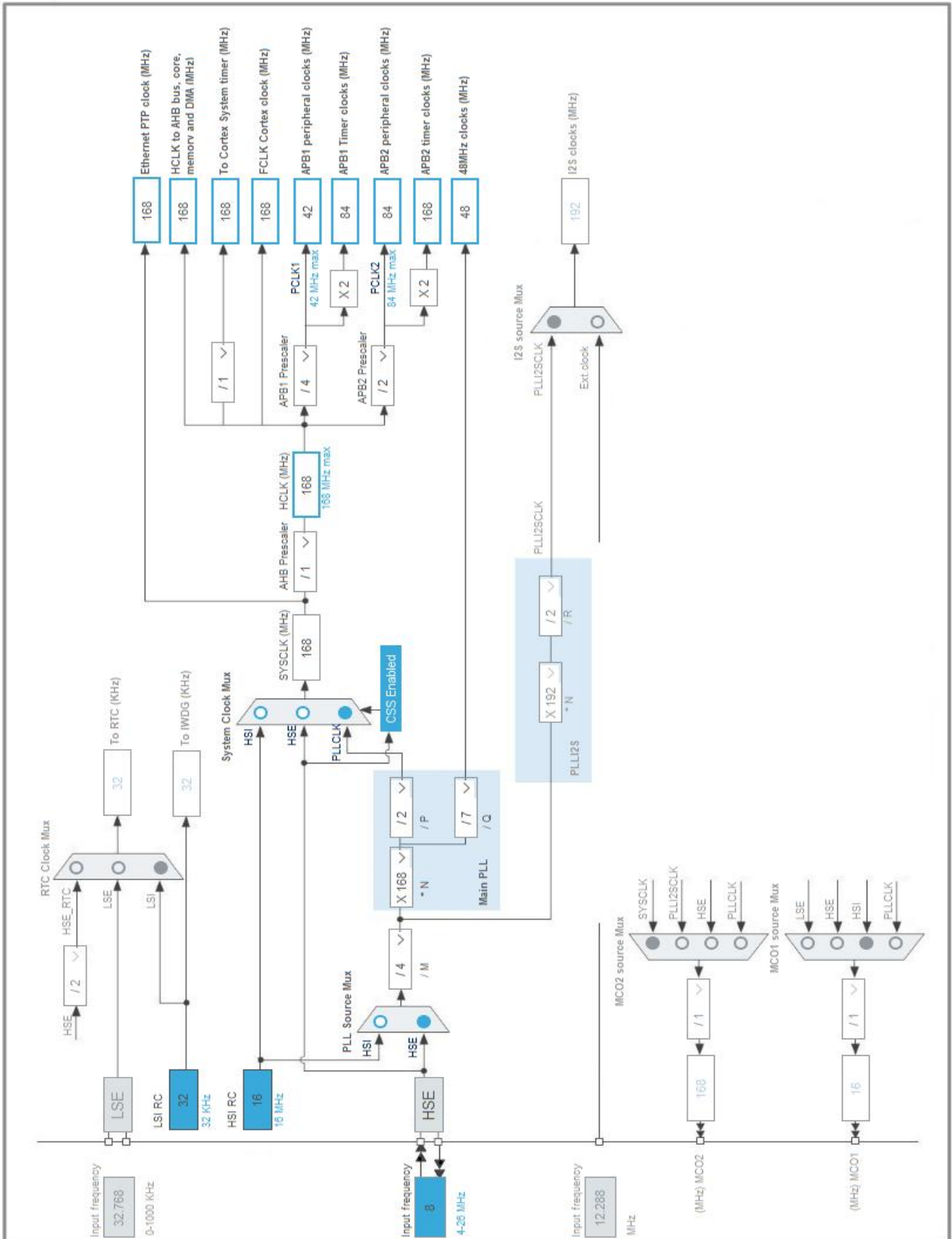
### 3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP *	I/O	GPIO_Output	LBK
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		
15	PA1 *	I/O	GPIO_Output	PWM_7_4
16	PA2 *	I/O	GPIO_Output	PWM_7_3
17	PA3 *	I/O	GPIO_Output	PWM_7_2
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	PWM_7_1
21	PA5 *	I/O	GPIO_Output	PWM_6_4
22	PA6 *	I/O	GPIO_Output	PWM_6_3
23	PA7 *	I/O	GPIO_Output	PWM_6_2
24	PC4 *	I/O	GPIO_Output	PWM_6_1
25	PC5 *	I/O	GPIO_Output	PWM_5_4
26	PB0 *	I/O	GPIO_Output	PWM_5_3
27	PB1 *	I/O	GPIO_Output	PWM_5_2
28	PB2 *	I/O	GPIO_Output	PWM_5_1
29	PB10 *	I/O	GPIO_Output	PWM_4_4
30	PB11 *	I/O	GPIO_Output	PWM_4_3
31	VCAP_1	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	Status
36	PB15 *	I/O	GPIO_Output	PWM_4_2
37	PC6 *	I/O	GPIO_Output	PWM_4_1
38	PC7 *	I/O	GPIO_Output	PWM_3_4
39	PC8 *	I/O	GPIO_Output	PWM_3_3
40	PC9 *	I/O	GPIO_Output	PWM_3_2
41	PA8 *	I/O	GPIO_Output	PWM_3_1
42	PA9 *	I/O	GPIO_Output	PWM_2_4
43	PA10 *	I/O	GPIO_Output	PWM_2_3
44	PA11	I/O	USB_OTG_FS_DM	
45	PA12	I/O	USB_OTG_FS_DP	

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VCAP_2	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
50	PA15 *	I/O	GPIO_Output	PWM_2_2
51	PC10 *	I/O	GPIO_Output	PWM_2_1
52	PC11 *	I/O	GPIO_Output	RS1
53	PC12 *	I/O	GPIO_Output	PWM_1_4
54	PD2 *	I/O	GPIO_Output	PWM_1_3
55	PB3	I/O	SPI1_SCK	
56	PB4	I/O	SPI1_MISO	
57	PB5	I/O	SPI1_MOSI	
58	PB6 *	I/O	GPIO_Output	PWM_1_2
59	PB7 *	I/O	GPIO_Output	PWM_1_1
60	BOOT0	Boot		
61	PB8	I/O	CAN1_RX	
62	PB9	I/O	CAN1_TX	
63	VSS	Power		
64	VDD	Power		

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

## 4. Clock Tree Configuration



## 5. Software Project

### 5.1. Project Settings

Name	Value
Project Name	7x5WStepper
Project Folder	D:\Data\Elektronikk\Projects\RPI3\7x5WStepper
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F4 V1.23.0

### 5.2. Code Generation Settings

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

## 6. Power Consumption Calculator report

### 6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F405/415
MCU	STM32F405RGTx
Datasheet	022152_Rev8

### 6.2. Parameter Selection

Temperature	25
Vdd	3.3

## 7. IPs and Middleware Configuration

### 7.1. CAN1

**mode: Mode**

#### 7.1.1. Parameter Settings:

##### Bit Timings Parameters:

Prescaler (for Time Quantum)	16
Time Quantum	<b>380.95238095238096 *</b>
Time Quanta in Bit Segment 1	1 Time
Time Quanta in Bit Segment 2	1 Time
ReSynchronization Jump Width	1 Time

##### Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

##### Advanced Parameters:

Operating Mode	Normal
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### 7.2. RCC

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

##### 7.2.1. Parameter Settings:

##### System Parameters:

VDD voltage (V)	3.3
Instruction Cache	Enabled
Prefetch Buffer	Enabled
Data Cache	Enabled
Flash Latency(WS)	5 WS (6 CPU cycle)

##### RCC Parameters:

HSI Calibration Value	16
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

##### Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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## 7.3. SPI1

**Mode: Full-Duplex Master**

### 7.3.1. Parameter Settings:

#### Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

#### Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	<b>42.0 MBits/s *</b>
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

#### Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

## 7.4. SYS

**Debug: Serial Wire**

**Timebase Source: TIM1**

## 7.5. USB\_OTG\_FS

**Mode: Device\_Only**

### 7.5.1. Parameter Settings:

Speed	Device Full Speed 12MBit/s
Endpoint 0 Max Packet size	64 Bytes
Enable internal IP DMA	Disabled
Low power	Disabled
Link Power Management	Disabled
VBUS sensing	Disabled
Signal start of frame	Disabled

## 7.6. FREERTOS

mode: Enabled

### 7.6.1. Config parameters:

#### Versions:

FreeRTOS version	9.0.0
CMSIS-RTOS version	1.02

#### Kernel settings:

USE_PREEMPTION	Enabled
CPU_CLOCK_HZ	SystemCoreClock
TICK_RATE_HZ	1000
MAX_PRIORITIES	7
MINIMAL_STACK_SIZE	128
MAX_TASK_NAME_LEN	16
USE_16_BIT_TICKS	Disabled
IDLE_SHOULD_YIELD	Enabled
USE_MUTEXES	Enabled
USE_RECURSIVE_MUTEXES	Disabled
USE_COUNTING_SEMAPHORES	Disabled
QUEUE_REGISTRY_SIZE	8
USE_APPLICATION_TASK_TAG	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Enabled
USE_TICKLESS_IDLE	Disabled
USE_TASK_NOTIFICATIONS	Enabled

#### Memory management settings:

Memory Allocation	Dynamic
TOTAL_HEAP_SIZE	15360
Memory Management scheme	heap_4

#### Hook function related definitions:

USE_IDLE_HOOK	Disabled
USE_TICK_HOOK	Disabled
USE_MALLOC_FAILED_HOOK	Disabled
USE_DAEMON_TASK_STARTUP_HOOK	Disabled
CHECK_FOR_STACK_OVERFLOW	Disabled

#### Run time and task stats gathering related definitions:

GENERATE_RUN_TIME_STATS	Disabled
USE_TRACE_FACILITY	Disabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

#### Co-routine related definitions:

USE_CO_ROUTINES	Disabled
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MAX\_CO\_ROUTINE\_PRIORITIES 2

**Software timer definitions:**

USE\_TIMERS Disabled

**Interrupt nesting behaviour configuration:**

LIBRARY\_LOWEST\_INTERRUPT\_PRIORITY 15

LIBRARY\_MAX\_SYSCALL\_INTERRUPT\_PRIORITY 5

**7.6.2. Include parameters:**

**Include definitions:**

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Disabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Disabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Disabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Disabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	Disabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled

**7.7. USB\_DEVICE**

**Class For FS IP: Communication Device Class (Virtual Port Com)**

**7.7.1. Parameter Settings:**

**Basic Parameters:**

USBBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	1
USBBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration)	1
USBBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)	512
USBBD_SUPPORT_USER_STRING (Enable user string descriptor)	Disabled

USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message
<b>Class Parameters:</b>	
USB CDC Rx Buffer Size	2048
USB CDC Tx Buffer Size	2048

### 7.7.2. Device Descriptor:

#### Device Descriptor:

VID (Vendor Identifier)	1155
LANGID_STRING (Language Identifier)	English(United States)
MANUFACTURER_STRING (Manufacturer Identifier)	STMicroelectronics

#### Device Descriptor FS:

PID (Product Identifier)	22336
PRODUCT_STRING (Product Identifier)	STM32 Virtual ComPort
SERIALNUMBER_STRING (Serial number)	00000000001A
CONFIGURATION_STRING (Configuration Identifier)	CDC Config
INTERFACE_STRING (Interface Identifier)	CDC Interface

\* User modified value

## 8. System Configuration

### 8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
CAN1	PB8	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PB9	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
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	
SPI1	PB3	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PB4	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PB5	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
USB_OTG_FS	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
GPIO	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LBK
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_7_4
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_7_3
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_7_2
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_7_1
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_6_4
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_6_3
	PA7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_6_2
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_6_1
	PC5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_5_4
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_5_3
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_5_2

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_5_1
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_4_4
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_4_3
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Status
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_4_2
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_4_1
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_3_4
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_3_3
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_3_2
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_3_1
	PA9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_2_4
	PA10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_2_3
	PA15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_2_2
	PC10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_2_1
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RS1
	PC12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_1_4
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_1_3
	PB6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_1_2
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_1_1

## 8.2. DMA configuration

nothing configured in DMA service

### 8.3. NVIC configuration

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	15	0
System tick timer	true	15	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
USB On The Go FS global interrupt	true	5	0
PVD interrupt through EXTI line 16		unused	
Flash global interrupt		unused	
RCC global interrupt		unused	
CAN1 TX interrupts		unused	
CAN1 RX0 interrupts		unused	
CAN1 RX1 interrupt		unused	
CAN1 SCE interrupt		unused	
SPI1 global interrupt		unused	
FPU global interrupt		unused	

\* User modified value

## **9. Software Pack Report**