1. Description

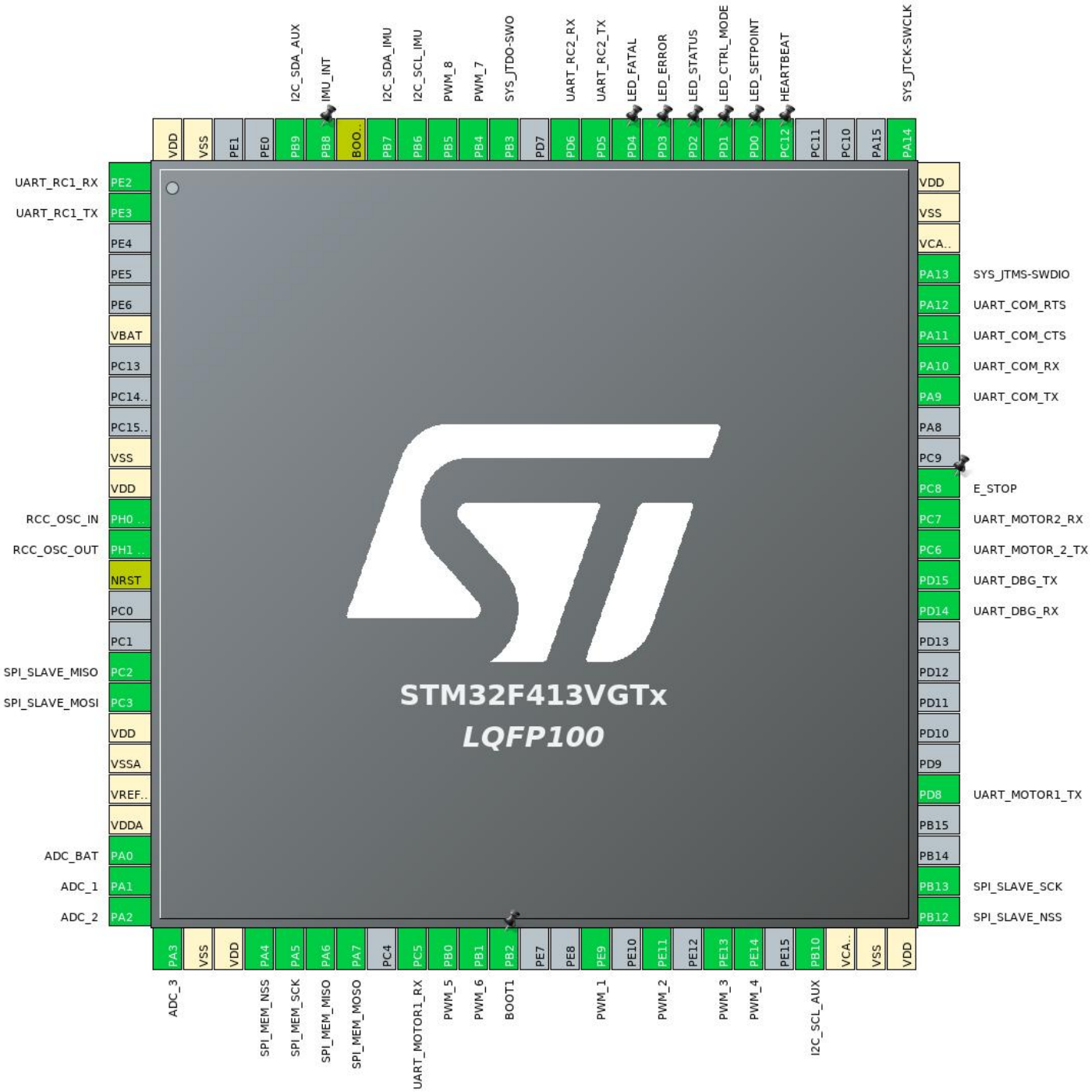
1.1. Project

Project Name	TitanMCU
Board Name	custom
Generated with:	STM32CubeMX 5.3.0
Date	01/30/2020

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F413/423
MCU name	STM32F413VGTx
MCU Package	LQFP100
MCU Pin number	100

2. Pinout Configuration



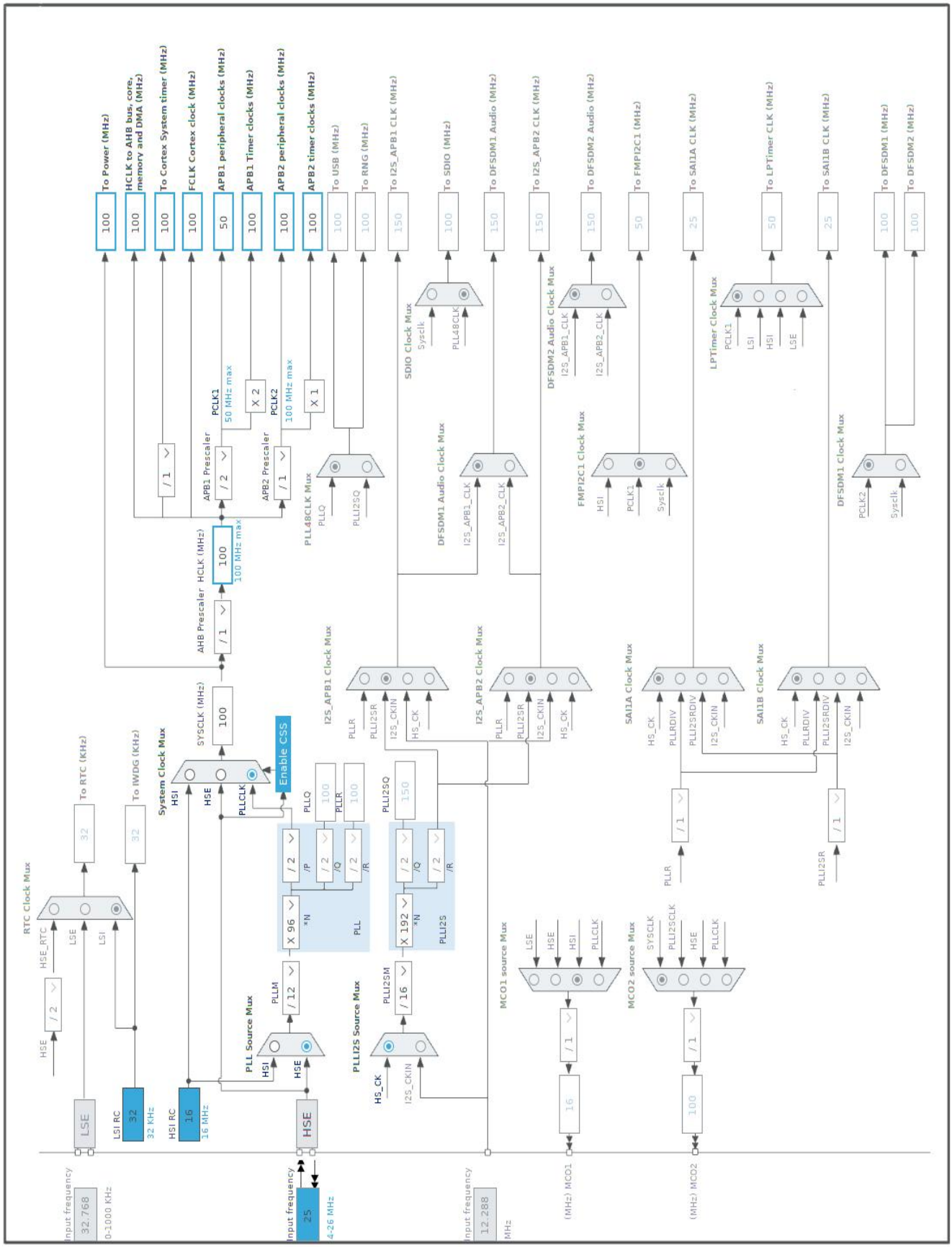
3. Pins Configuration

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2	I/O	UART10_RX	UART_RC1_RX
2	PE3	I/O	UART10_TX	UART_RC1_TX
6	VBAT	Power		
10	VSS	Power		
11	VDD	Power		
12	PH0 - OSC_IN	I/O	RCC_OSC_IN	
13	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
14	NRST	Reset		
17	PC2	I/O	SPI2_MISO	SPI_SLAVE_MISO
18	PC3	I/O	SPI2_MOSI	SPI_SLAVE_MOSI
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
23	PA0	I/O	ADC1_IN0	ADC_BAT
24	PA1	I/O	ADC1_IN1	ADC_1
25	PA2	I/O	ADC1_IN2	ADC_2
26	PA3	I/O	ADC1_IN3	ADC_3
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	SPI1_NSS	SPI_MEM_NSS
30	PA5	I/O	SPI1_SCK	SPI_MEM_SCK
31	PA6	I/O	SPI1_MISO	SPI_MEM_MISO
32	PA7	I/O	SPI1_MOSI	SPI_MEM_MOSO
34	PC5	I/O	USART3_RX	UART_MOTOR1_RX
35	PB0	I/O	TIM3_CH3	PWM_5
36	PB1	I/O	TIM3_CH4	PWM_6
37	PB2 *	I/O	GPIO_Input	BOOT1
40	PE9	I/O	TIM1_CH1	PWM_1
42	PE11	I/O	TIM1_CH2	PWM_2
44	PE13	I/O	TIM1_CH3	PWM_3
45	PE14	I/O	TIM1_CH4	PWM_4
47	PB10	I/O	I2C2_SCL	I2C_SCL_AUX
48	VCAP_1	Power		
49	VSS	Power		
50	VDD	Power		

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
51	PB12	I/O	SPI2_NSS	SPI_SLAVE_NSS
52	PB13	I/O	SPI2_SCK	SPI_SLAVE_SCK
55	PD8	I/O	USART3_TX	UART_MOTOR1_TX
61	PD14	I/O	UART9_RX	UART_DBG_RX
62	PD15	I/O	UART9_TX	UART_DBG_TX
63	PC6	I/O	USART6_TX	UART_MOTOR_2_TX
64	PC7	I/O	USART6_RX	UART_MOTOR2_RX
65	PC8 *	I/O	GPIO_Input	E_STOP
68	PA9	I/O	USART1_TX	UART_COM_TX
69	PA10	I/O	USART1_RX	UART_COM_RX
70	PA11	I/O	USART1_CTS	UART_COM_CTS
71	PA12	I/O	USART1_RTS	UART_COM_RTS
72	PA13	I/O	SYS_JTMS-SWDIO	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
80	PC12 *	I/O	GPIO_Output	HEARTBEAT
81	PD0 *	I/O	GPIO_Output	LED_SETPOINT
82	PD1 *	I/O	GPIO_Output	LED_CTRL_MODE
83	PD2 *	I/O	GPIO_Output	LED_STATUS
84	PD3 *	I/O	GPIO_Output	LED_ERROR
85	PD4 *	I/O	GPIO_Output	LED_FATAL
86	PD5	I/O	USART2_TX	UART_RC2_TX
87	PD6	I/O	USART2_RX	UART_RC2_RX
89	PB3	I/O	SYS_JTDO-SWO	
90	PB4	I/O	TIM3_CH1	PWM_7
91	PB5	I/O	TIM3_CH2	PWM_8
92	PB6	I/O	I2C1_SCL	I2C_SCL_IMU
93	PB7	I/O	I2C1_SDA	I2C_SDA_IMU
94	BOOT0	Boot		
95	PB8	I/O	GPIO_EXTI8	IMU_INT
96	PB9	I/O	I2C2_SDA	I2C_SDA_AUX
99	VSS	Power		
100	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	TitanMCU
Project Folder	/home/mlundh/CubeMX/TitanMCU
Toolchain / IDE	EWARM V8
Firmware Package Name and Version	STM32Cube FW_F4 V1.24.1

5.2. Code Generation Settings

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

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F413/423
MCU	STM32F413VGTx
Datasheet	029162_Rev5

6.2. Parameter Selection

Temperature	25
Vdd	null

7. IPs and Middleware Configuration

7.1. ADC1

mode: IN0

mode: IN1

mode: IN2

mode: IN3

7.1.1. Parameter Settings:

	PCLK2 divided by 4
	12 bits (15 ADC Clock cycles)
	Right alignment
ode	Disabled
ion Mode	Disabled
ersion Mode	Disabled
quests	Disabled
Selection	EOC flag at the end of single channel conversion

ConversionMode:

on	1
nversion Source	Regular Conversion launched by software
nversion Edge	None
	1
	Channel 0
	3 Cycles

ConversionMode:

ons	0
hDog Mode	false

7.2. CRC

mode: Activated

7.3. I2C1

I2C: I2C

7.3.1. Parameter Settings:

s:

	Standard Mode
z)	100000
de	Disabled
ngth selection	7-bit
wledged	Disabled
ss	0
s detection	Disabled

7.4. I2C2

I2C: I2C

7.4.1. Parameter Settings:

s:

	Standard Mode
z)	100000
de	Disabled
ngth selection	7-bit
wledged	Disabled
ss	0
s detection	Disabled

7.5. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

7.5.1. Parameter Settings:

eters:

	3.3
	Enabled
	Enabled
	Enabled
	3 WS (4 CPU cycle)

rs:

e	16

tion	Disabled
Value (ms)	100
Value (ms)	5000

ers:

ltage Scale	Power Regulator Voltage Scale 1

7.6. SPI1

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

7.6.1. Parameter Settings:

ers:

	Motorola
	8 Bits
	MSB First

ers:

Rate)	2
	50.0 MBits/s *
L)	Low
)	1 Edge

meters:

	Disabled
	Output Hardware

7.7. SPI2

Mode: Full-Duplex Slave

Hardware NSS Signal: Hardware NSS Input Signal

7.7.1. Parameter Settings:

ers:

	Motorola
	8 Bits
	MSB First

ers:

L)	Low
)	1 Edge

meters:

	Disabled
	Input Hardware

7.8. SYS

Debug: Trace Asynchronous Sw

Timebase Source: SysTick

7.9. TIM1

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: Output Compare CH4

7.9.1. Parameter Settings:

gs:

bits value)	0
	Up
oReload Register - 16 bits value)	0
on (CKD)	No Division
RCR - 8 bits value)	0
	Disable

(TRGO) Parameters:

(MSM bit)	Disable (Trigger input effect not delayed)
ion	Reset (UG bit from TIMx_EGR)

d Time management - BRK Configuration:

	Disable
	High

d Time management - Output Configuration:

ate	Disable
or Run Mode (OSSR)	Disable
or Idle Mode (OSSI)	Disable
	Off

on Channel 1:

	PWM mode 1
	0
	Disable

	High
	Reset

n Channel 2:

	PWM mode 1
	0
	Disable
	High
	Reset

n Channel 3:

	PWM mode 1
	0
	Disable
	High
	Reset

e Channel 4:

	Frozen (used for Timing base)
	0
	High
	Reset

7.10. TIM3

Clock Source : Internal Clock

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

7.10.1. Parameter Settings:

gs:

bits value)	0
	Up
oReload Register - 16 bits value)	0
on (CKD)	No Division
	Disable

(TRGO) Parameters:

(MSM bit)	Disable (Trigger input effect not delayed)
ion	Reset (UG bit from TIMx_EGR)

n Channel 1:

	PWM mode 1

0
Disable
High

n Channel 2:

PWM mode 1
0
Disable
High

n Channel 3:

PWM mode 1
0
Disable
High

n Channel 4:

PWM mode 1
0
Disable
High

7.11. UART9

Mode: Asynchronous

7.11.1. Parameter Settings:

rs:

115200
8 Bits (including Parity)
None
1

meters:

Receive and Transmit
16 Samples

7.12. UART10

Mode: Asynchronous

7.12.1. Parameter Settings:

rs:

115200
8 Bits (including Parity)
None
1

meters:

Receive and Transmit
16 Samples

7.13. USART1

Mode: Asynchronous

Hardware Flow Control (RS232): CTS/RTS

7.13.1. Parameter Settings:

ers:

115200
8 Bits (including Parity)
None
1

meters:

Receive and Transmit
16 Samples

7.14. USART2

Mode: Asynchronous

7.14.1. Parameter Settings:

ers:

115200
8 Bits (including Parity)
None
1

meters:

Receive and Transmit
16 Samples

7.15. USART3

Mode: Asynchronous

7.15.1. Parameter Settings:

rs:

115200

8 Bits (including Parity)

None

1

meters:

Receive and Transmit

16 Samples

7.16. USART6

Mode: Asynchronous

7.16.1. Parameter Settings:

rs:

115200

8 Bits (including Parity)

None

1

meters:

Receive and Transmit

16 Samples

7.17. FREERTOS

Interface: CMSIS_V2

7.17.1. Config parameters:

CMSIS v2

10.0.1

on 2.00

:

l	Enabled
	SystemCoreClock
	1000
	56
IZE	128
_LEN	16
S	Disabled
LD	Enabled
	Enabled
MUTEXES	Enabled
EMAPHORES	Enabled
_SIZE	8
_TASK_TAG	Disabled
RD_COMPATIBILITY	Enabled
ISED_TASK_SELECTION	Disabled
LE	Disabled
CATIONS	Enabled
HIGH_ADDRESS	Disabled

ement settings:

	Dynamic / Static
E	15360
nt scheme	heap_4

related definitions:

	Disabled
	Disabled
LED_HOOK	Disabled
SK_STARTUP_HOOK	Disabled
CK_OVERFLOW	Disabled

ask stats gathering related definitions:

TIME_STATS	Disabled
LITY	Enabled
MATTING_FUNCTIONS	Disabled

ted definitions:

ES	Disabled
E_PRIORITIES	2

definitions:

	Enabled
ORITY	2
NGTH	10
CK_DEPTH	256

g behaviour configuration:

_INTERRUPT_PRIORITY	15
SCALL_INTERRUPT_PRIORITY	5

7.17.2. Include parameters:

ons:

	Enabled
	Enabled
	Enabled
urces	Disabled
	Enabled
	Enabled
	Enabled
State	Enabled
SR	Enabled
lder	Enabled
exHolder	Disabled
e	Disabled
nWaterMark	Enabled
skHandle	Disabled
	Enabled
romISR	Disabled
Call	Enabled
	Disabled
	Disabled

*** User modified value**

8. System Configuration

8.1. GPIO configuration

in	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	
A0	ADC1_IN0	Analog mode	No pull-up and no pull-down	n/a	
A1	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	
A2	ADC1_IN2	Analog mode	No pull-up and no pull-down	n/a	
A3	ADC1_IN3	Analog mode	No pull-up and no pull-down	n/a	
B6	I2C1_SCL	Alternate Function Open Drain	Pull-up	**High ***	
B7	I2C1_SDA	Alternate Function Open Drain	Pull-up	**High ***	
310	I2C2_SCL	Alternate Function Open Drain	Pull-up	**High ***	
B9	I2C2_SDA	Alternate Function Open Drain	Pull-up	**High ***	
OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
SC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
A4	SPI1_NSS	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
A5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
A6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
A7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
C2	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
C3	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
312	SPI2_NSS	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
313	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
A13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
A14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
B3	SYS_JTDO-SWO	n/a	n/a	n/a	
E9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
E11	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
E13	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
E14	TIM1_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
B0	TIM3_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
B1	TIM3_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
B4	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
B5	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
D14	UART9_RX	Alternate Function Push Pull	Pull-up	**High ***	
D15	UART9_TX	Alternate Function Push Pull	Pull-up	**High ***	
E2	UART10_RX	Alternate Function Push Pull	Pull-up	**High ***	
E3	UART10_TX	Alternate Function Push Pull	Pull-up	**High ***	
A9	USART1_TX	Alternate Function Push Pull	Pull-up	**High ***	

in	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	
A10	USART1_RX	Alternate Function Push Pull	Pull-up	**High ***	
A11	USART1_CTS	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
A12	USART1_RTS	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
D5	USART2_TX	Alternate Function Push Pull	Pull-up	**High ***	
D6	USART2_RX	Alternate Function Push Pull	Pull-up	**High ***	
C5	USART3_RX	Alternate Function Push Pull	Pull-up	**High ***	U
D8	USART3_TX	Alternate Function Push Pull	Pull-up	**High ***	U
C6	USART6_TX	Alternate Function Push Pull	Pull-up	**High ***	U
C7	USART6_RX	Alternate Function Push Pull	Pull-up	**High ***	U
B2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	
C8	GPIO_Input	Input mode	**Pull-up ***	n/a	
C12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
D0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
D1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
D2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
D3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
D4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
B8	GPIO_EXTI8	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	

8.2. DMA configuration

nothing configured in DMA service

8.3. NVIC configuration

Interrupt Table	Enable	Preenmption Priority	SubPriori
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
re-fetch fault, memory access fault	true	0	0
ndefined instruction or illegal state	true	0	0
stem service call via SWI instruction	true	0	0
Debug monitor	true	0	0
endable request for system service	true	15	0
System tick timer	true	15	0
EXTI line[9:5] interrupts	true	5	0
I2C1 event interrupt	true	5	0
I2C1 error interrupt	true	5	0
I2C2 event interrupt	true	5	0
I2C2 error interrupt	true	5	0
SPI1 global interrupt	true	5	0
SPI2 global interrupt	true	5	0
USART1 global interrupt	true	5	0
USART2 global interrupt	true	5	0
USART3 global interrupt	true	5	0
USART6 global interrupt	true	5	0
UART9 global interrupt	true	5	0
UART10 global interrupt	true	5	0
VD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1 global interrupt	unused		
reak interrupt and TIM9 global interrupt	unused		
date interrupt and TIM10 global interrupt	unused		
commutation interrupts and TIM11 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM3 global interrupt	unused		
FPU global interrupt	unused		

*** User modified value**

9. Software Pack Report