
STM32
CubeMX

1. Description

1.1. Project

Project Name	TFT_01_controller_TOUCH
Board Name	custom
Generated with:	STM32CubeMX 6.4.0
Date	01/12/2022

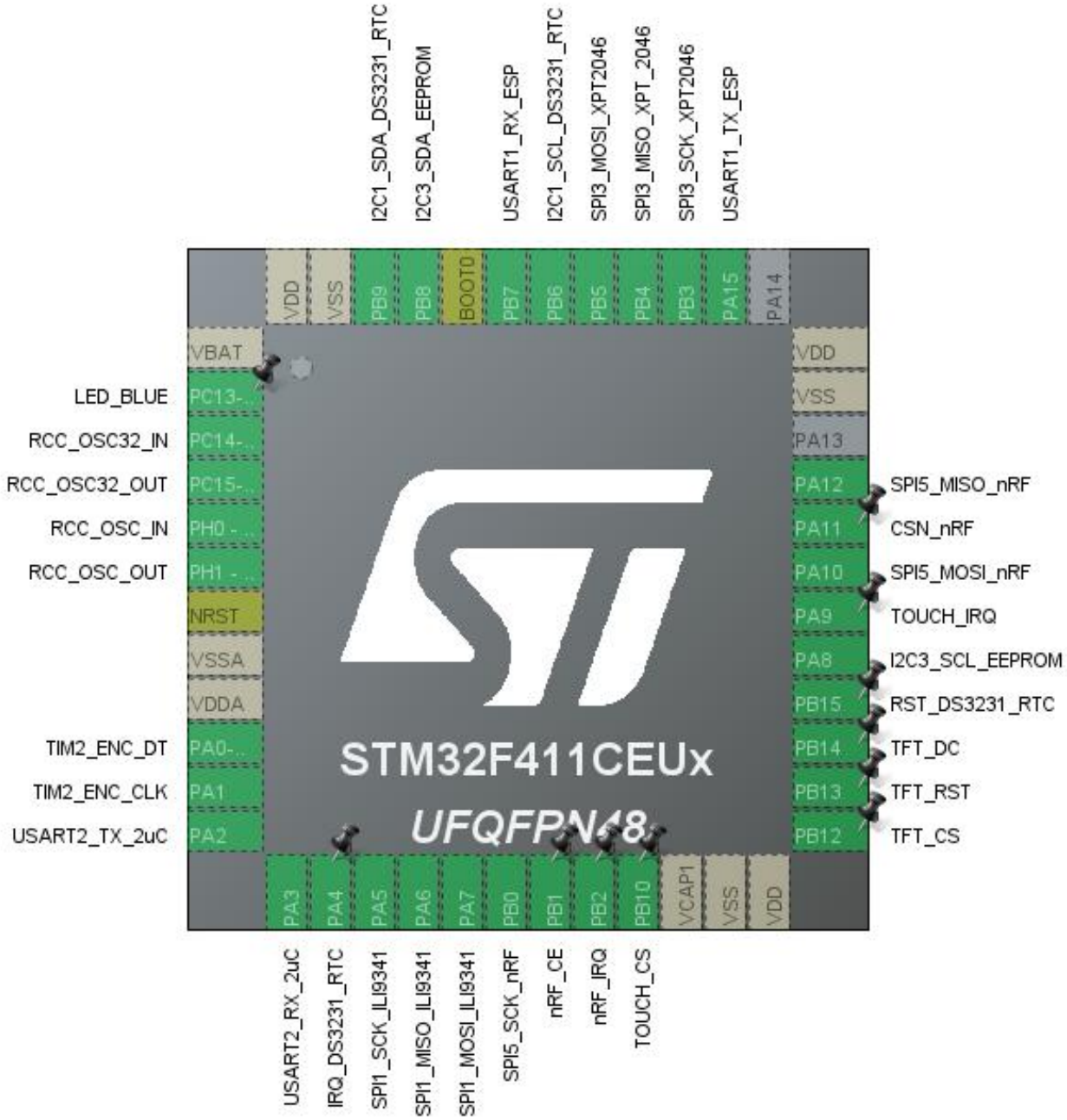
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F411
MCU name	STM32F411CEUx
MCU Package	UFQFPN48
MCU Pin number	48

1.3. Core(s) information

Core(s)	Arm Cortex-M4

2. Pinout Configuration



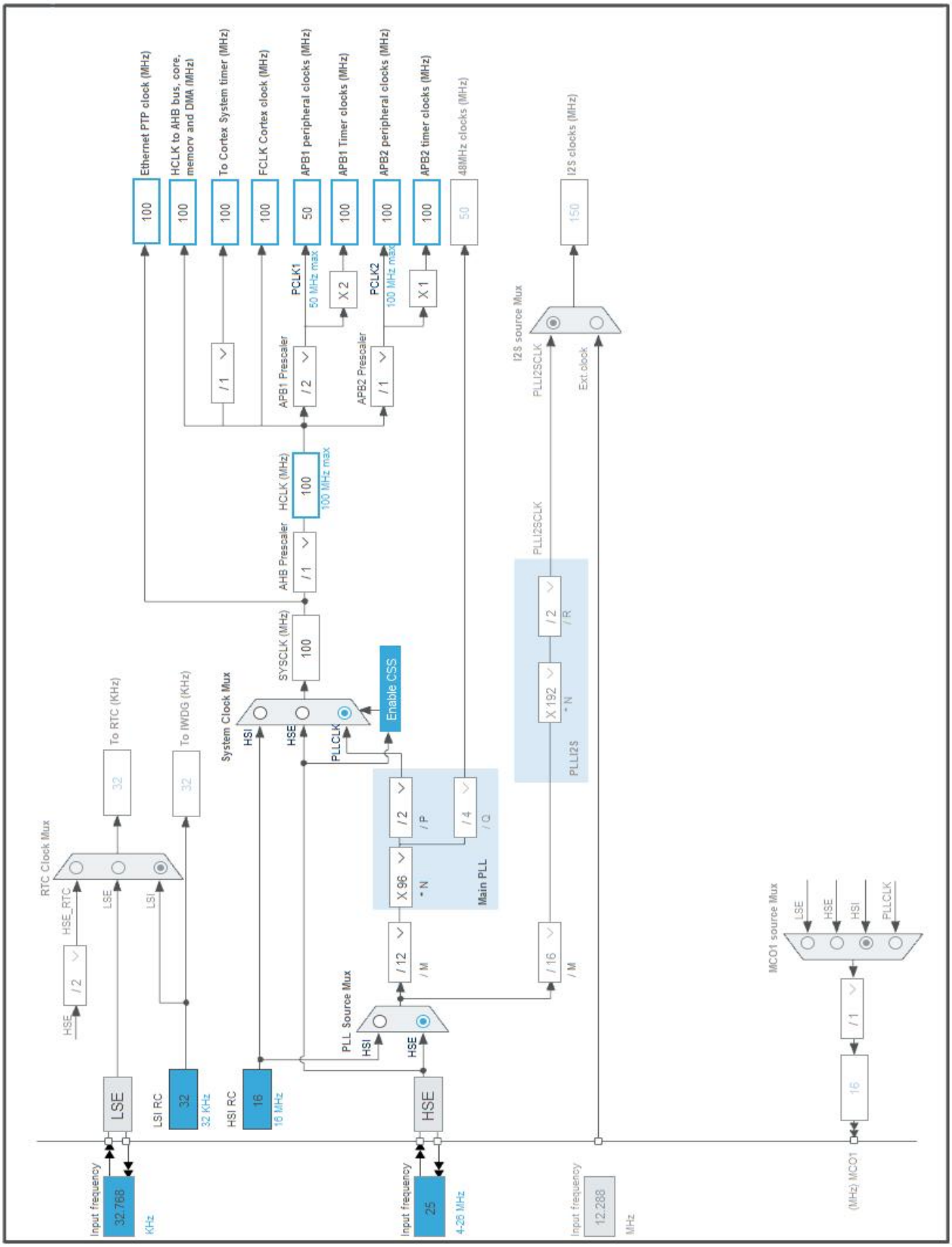
3. Pins Configuration

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-ANTI_TAMP *	I/O	GPIO_Output	LED_BLUE
3	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
5	PH0 - OSC_IN	I/O	RCC_OSC_IN	
6	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0-WKUP	I/O	TIM2_CH1	TIM2_ENC_DT
11	PA1	I/O	TIM2_CH2	TIM2_ENC_CLK
12	PA2	I/O	USART2_TX	USART2_TX_2uC
13	PA3	I/O	USART2_RX	USART2_RX_2uC
14	PA4	I/O	GPIO_EXTI4	IRQ_DS3231_RTC
15	PA5	I/O	SPI1_SCK	SPI1_SCK_ILI9341
16	PA6	I/O	SPI1_MISO	SPI1_MISO_ILI9341
17	PA7	I/O	SPI1_MOSI	SPI1_MOSI_ILI9341
18	PB0	I/O	SPI5_SCK	SPI5_SCK_nRF
19	PB1 *	I/O	GPIO_Output	nRF_CE
20	PB2	I/O	GPIO_EXTI2	nRF_IRQ
21	PB10 *	I/O	GPIO_Output	TOUCH_CS
22	VCAP1	Power		
23	VSS	Power		
24	VDD	Power		
25	PB12 *	I/O	GPIO_Output	TFT_CS
26	PB13 *	I/O	GPIO_Output	TFT_RST
27	PB14 *	I/O	GPIO_Output	TFT_DC
28	PB15 *	I/O	GPIO_Input	RST_DS3231_RTC
29	PA8	I/O	I2C3_SCL	I2C3_SCL_EEPROM
30	PA9	I/O	GPIO_EXTI9	TOUCH_IRQ
31	PA10	I/O	SPI5_MOSI	SPI5_MOSI_nRF
32	PA11 *	I/O	GPIO_Output	CSN_nRF
33	PA12	I/O	SPI5_MISO	SPI5_MISO_nRF
35	VSS	Power		
36	VDD	Power		
38	PA15	I/O	USART1_TX	USART1_TX_ESP

Pin Number UFQFPN48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
39	PB3	I/O	SPI3_SCK	SPI3_SCK_XPT2046
40	PB4	I/O	SPI3_MISO	SPI3_MISO_XPT_2046
41	PB5	I/O	SPI3_MOSI	SPI3_MOSI_XPT2046
42	PB6	I/O	I2C1_SCL	I2C1_SCL_DS3231_RTC
43	PB7	I/O	USART1_RX	USART1_RX_ESP
44	BOOT0	Boot		
45	PB8	I/O	I2C3_SDA	I2C3_SDA_EEPROM
46	PB9	I/O	I2C1_SDA	I2C1_SDA_DS3231_RTC
47	VSS	Power		
48	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	TFT_01_controller_TOUCH
Project Folder	D:\STM32\free_michelle\TFT_01_controller_TOUCH
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.26.2
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	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)	No
Enable Full Assert	No

5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_SPI1_Init	SPI1
4	MX_DMA_Init	DMA
5	MX_USART2_UART_Init	USART2
6	MX_SPI3_Init	SPI3
7	MX_I2C1_Init	I2C1
8	MX_TIM11_Init	TIM11
9	MX_TIM10_Init	TIM10
10	MX_I2C3_Init	I2C3
11	MX_SPI5_Init	SPI5

Rank	Function Name	Peripheral Instance Name
12	MX_USART1_UART_Init	USART1
13	MX_TIM2_Init	TIM2

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F411
MCU	STM32F411CEUx
Datasheet	DS10314_Rev6

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

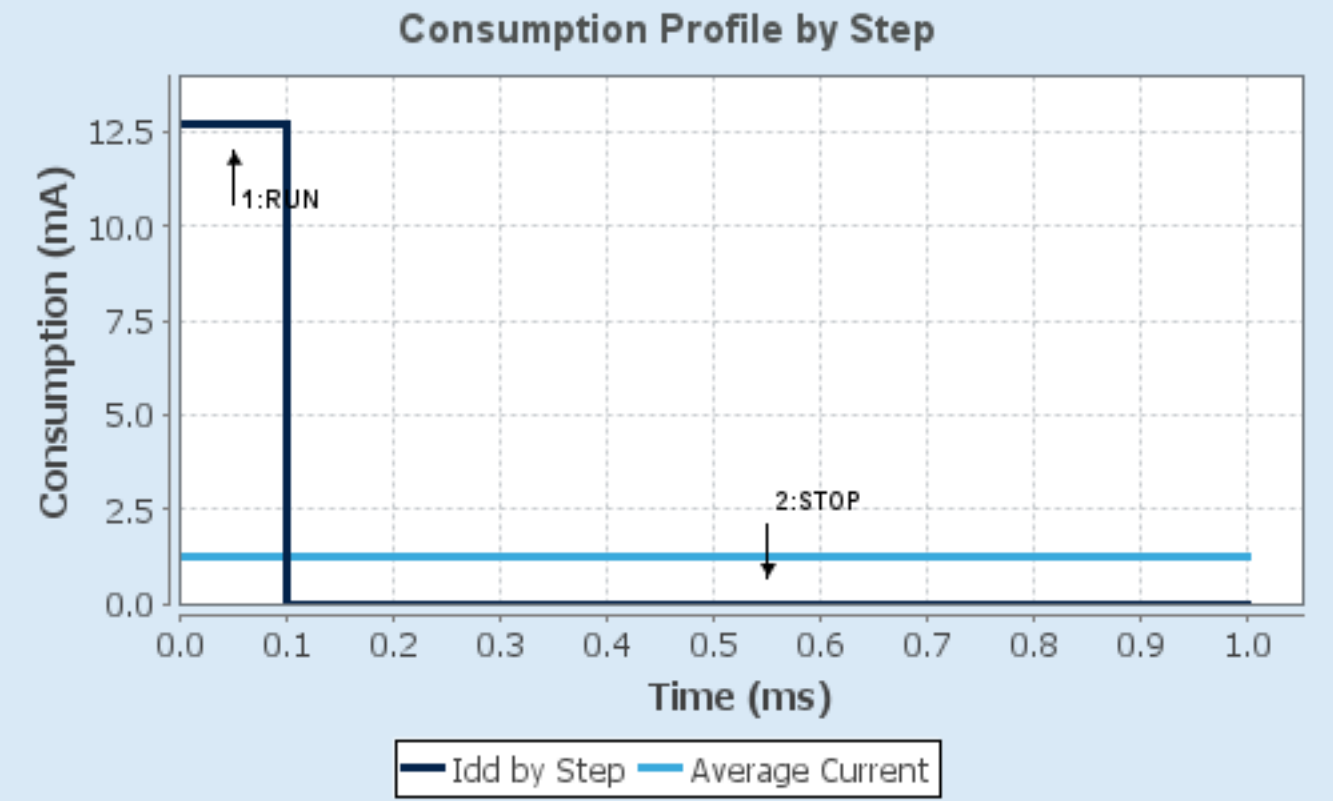
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	1.7	1.7
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	SRAM	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	12.7 mA	9 µA
Duration	0.1 ms	0.9 ms
DMIPS	125.0	0.0
Ta Max	104.31	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	1.28 mA
Battery Life	3 months, 19 days, 6 hours	Average DMIPS	125.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
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. I2C1

I2C: I2C

7.1.1. 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

7.2. I2C3

I2C: I2C

7.2.1. Parameter Settings:

Master Features:

I2C Speed Mode	Standard Mode
I2C Clock Speed (Hz)	100000

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

7.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.3.1. 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

7.4. SPI1

Mode: Full-Duplex Master

7.4.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**8 ***
Baud Rate	**12.5 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.5. SPI3

Mode: Full-Duplex Master

7.5.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits

First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**32 ***
Baud Rate	**1.5625 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.6. SPI5

Mode: Full-Duplex 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. SYS

Timebase Source: SysTick

7.8. TIM2

Combined Channels: Encoder Mode

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0

Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	4294967295
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

Trigger Output (TRGO) Parameters:

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

Encoder:

Encoder Mode	Encoder Mode TI1
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	0

7.9. TIM10

mode: Activated

7.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**9999 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**9999 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

7.10. TIM11

mode: Activated

7.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**14999 ***

Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**29999 ***
Internal Clock Division (CKD)	**Division by 4 ***
auto-reload preload	Disable

7.11. USART1

Mode: Asynchronous

7.11.1. 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

7.12. USART2

Mode: Asynchronous

7.12.1. 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

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	**Very High** *	I2C1_SCL_DS3231_RTC
	PB9	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	**Very High** *	I2C1_SDA_DS3231_RTC
I2C3	PA8	I2C3_SCL	Alternate Function Open Drain	No pull-up and no pull-down	**Very High** *	I2C3_SCL_EEPROM
	PB8	I2C3_SDA	Alternate Function Open Drain	No pull-up and no pull-down	**Very High** *	I2C3_SDA_EEPROM
RCC	PC14-OSC32_IN	RCC_OSC32_IN	n/a	n/a	n/a	
	PC15-OSC32_OUT	RCC_OSC32_OUT	n/a	n/a	n/a	
	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	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI1_SCK_ILI9341
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI1_MISO_ILI9341
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI1_MOSI_ILI9341
SPI3	PB3	SPI3_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI3_SCK_XPT2046
	PB4	SPI3_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI3_MISO_XPT_2046
	PB5	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI3_MOSI_XPT2046
SPI5	PB0	SPI5_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI5_SCK_nRF
	PA10	SPI5_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI5_MOSI_nRF
	PA12	SPI5_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High** *	SPI5_MISO_nRF

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
TIM2	PA0-WKUP	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	TIM2_ENC_DT
	PA1	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	TIM2_ENC_CLK
USART1	PA15	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	USART1_TX_ESP
	PB7	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	USART1_RX_ESP
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	USART2_TX_2uC
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	USART2_RX_2uC
GPIO	PC13-ANTI_TAMP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_BLUE
	PA4	GPIO_EXTI4	**External Interrupt Mode with Falling edge trigger detection**	**Pull-up ***	n/a	IRQ_DS3231_RTC
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	nRF_CE
	PB2	GPIO_EXTI2	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	nRF_IRQ
	PB10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TOUCH_CS
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TFT_CS
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TFT_RST
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TFT_DC
	PB15	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	RST_DS3231_RTC
	PA9	GPIO_EXTI9	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	TOUCH_IRQ
	PA11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CSN_nRF

8.2. DMA configuration

DMA request	Stream	Direction	Priority
USART2_RX	DMA1_Stream5	Peripheral To Memory	Low
USART2_TX	DMA1_Stream6	Memory To Peripheral	Low
I2C1_RX	DMA1_Stream0	Peripheral To Memory	Low
I2C1_TX	DMA1_Stream1	Memory To Peripheral	Low

USART2_RX: DMA1_Stream5 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_Stream6 DMA request Settings:

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

I2C1_RX: DMA1_Stream0 DMA request Settings:

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

I2C1_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

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	0	0
DMA1 stream0 global interrupt	true	0	0
DMA1 stream1 global interrupt	true	0	0
DMA1 stream5 global interrupt	true	0	0
DMA1 stream6 global interrupt	true	0	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
TIM1 trigger and commutation interrupts and TIM11 global interrupt	true	0	0
I2C1 event interrupt	true	0	0
I2C1 error interrupt	true	0	0
USART2 global interrupt	true	0	0
SPI3 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line2 interrupt	unused		
EXTI line[9:5] interrupts	unused		
TIM2 global interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt	unused		
I2C3 event interrupt	unused		
I2C3 error interrupt	unused		
FPU global interrupt	unused		
SPI5 global interrupt	unused		

8.3.2. NVIC Code generation

Enabled interrupt Table	Select for init	Generate IRQ	Call HAL handler

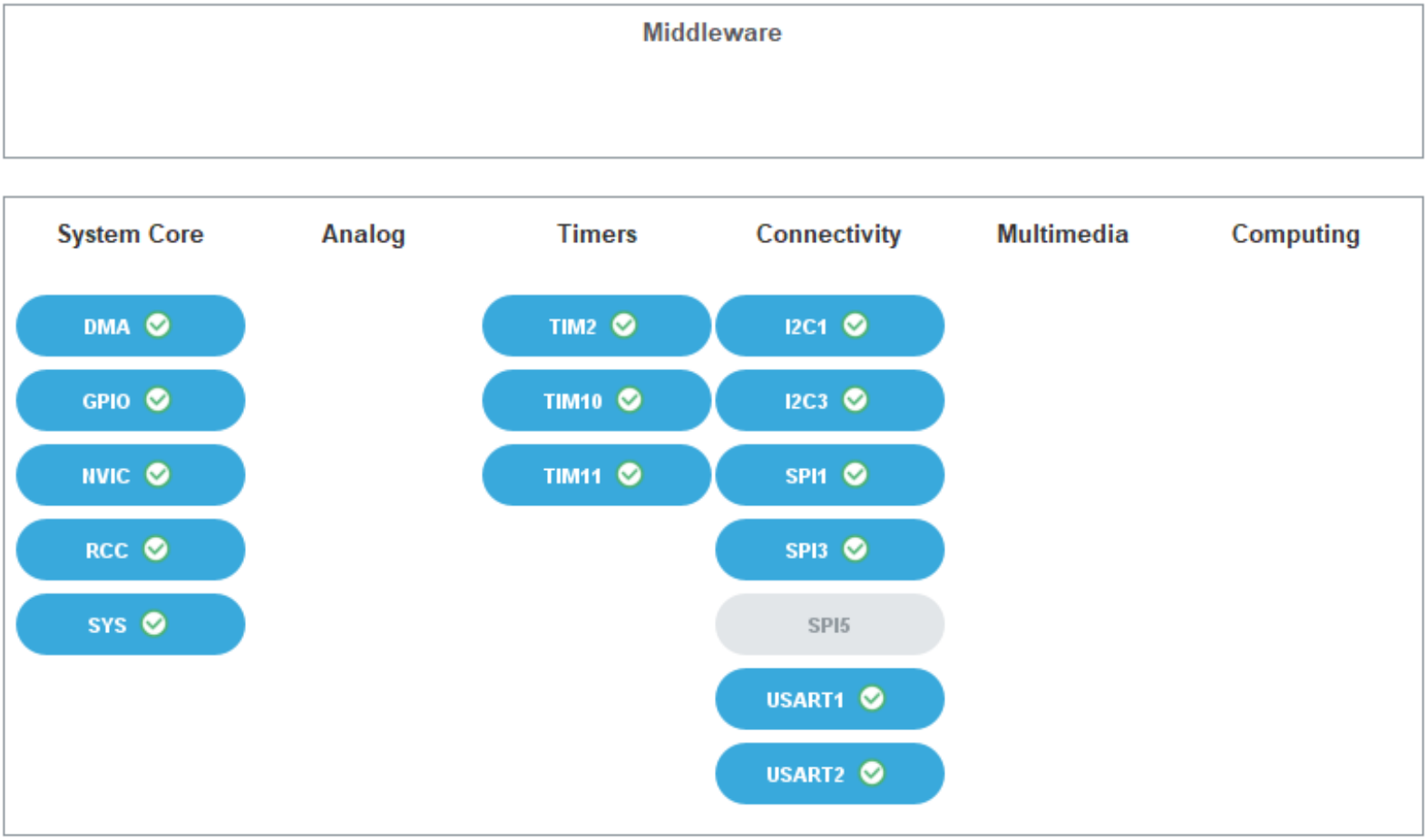
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal 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
EXTI line4 interrupt	true	true	true
DMA1 stream0 global interrupt	false	true	true
DMA1 stream1 global interrupt	false	true	true
DMA1 stream5 global interrupt	false	true	true
DMA1 stream6 global interrupt	false	true	true
TIM1 update interrupt and TIM10 global interrupt	false	true	true
TIM1 trigger and commutation interrupts and TIM11 global interrupt	false	true	true
I2C1 event interrupt	true	true	true
I2C1 error interrupt	false	true	true
USART2 global interrupt	true	true	true
SPI3 global interrupt	true	true	true

*** User modified value**

9. System Views

9.1. Category view

9.1.1. Current



10. Docs & Resources

Type	Link
Datasheet	http://www.st.com/resource/en/datasheet/DM00115249.pdf
Reference manual	http://www.st.com/resource/en/reference_manual/DM00119316.pdf
Programming manual	http://www.st.com/resource/en/programming_manual/DM00046982.pdf
Errata sheet	http://www.st.com/resource/en/errata_sheet/DM00137034.pdf
Application note	http://www.st.com/resource/en/application_note/CD00167594.pdf
Application note	http://www.st.com/resource/en/application_note/CD00211314.pdf
Application note	http://www.st.com/resource/en/application_note/CD00249778.pdf
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Application note	http://www.st.com/resource/en/application_note/DM00040802.pdf
Application note	http://www.st.com/resource/en/application_note/DM00040808.pdf
Application note	http://www.st.com/resource/en/application_note/DM00042534.pdf
Application note	http://www.st.com/resource/en/application_note/DM00046011.pdf
Application note	http://www.st.com/resource/en/application_note/DM00072315.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073742.pdf
Application note	http://www.st.com/resource/en/application_note/DM00073853.pdf
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Application note	http://www.st.com/resource/en/application_note/DM00296349.pdf
Application note	http://www.st.com/resource/en/application_note/DM00315319.pdf
Application note	http://www.st.com/resource/en/application_note/DM00325582.pdf
Application note	http://www.st.com/resource/en/application_note/DM00327191.pdf
Application note	http://www.st.com/resource/en/application_note/DM00354244.pdf
Application note	http://www.st.com/resource/en/application_note/DM00380469.pdf
Application note	http://www.st.com/resource/en/application_note/DM00395696.pdf
Application note	http://www.st.com/resource/en/application_note/DM00431633.pdf
Application note	http://www.st.com/resource/en/application_note/DM00493651.pdf
Application note	http://www.st.com/resource/en/application_note/DM00536349.pdf
Application note	http://www.st.com/resource/en/application_note/DM00725181.pdf