
STM32
CubeMX

1. Description

1.1. Project

Project Name	SSLMainBoard
Board Name	STM32F411E-DISCO
Generated with:	STM32CubeMX 6.6.1
Date	06/25/2023

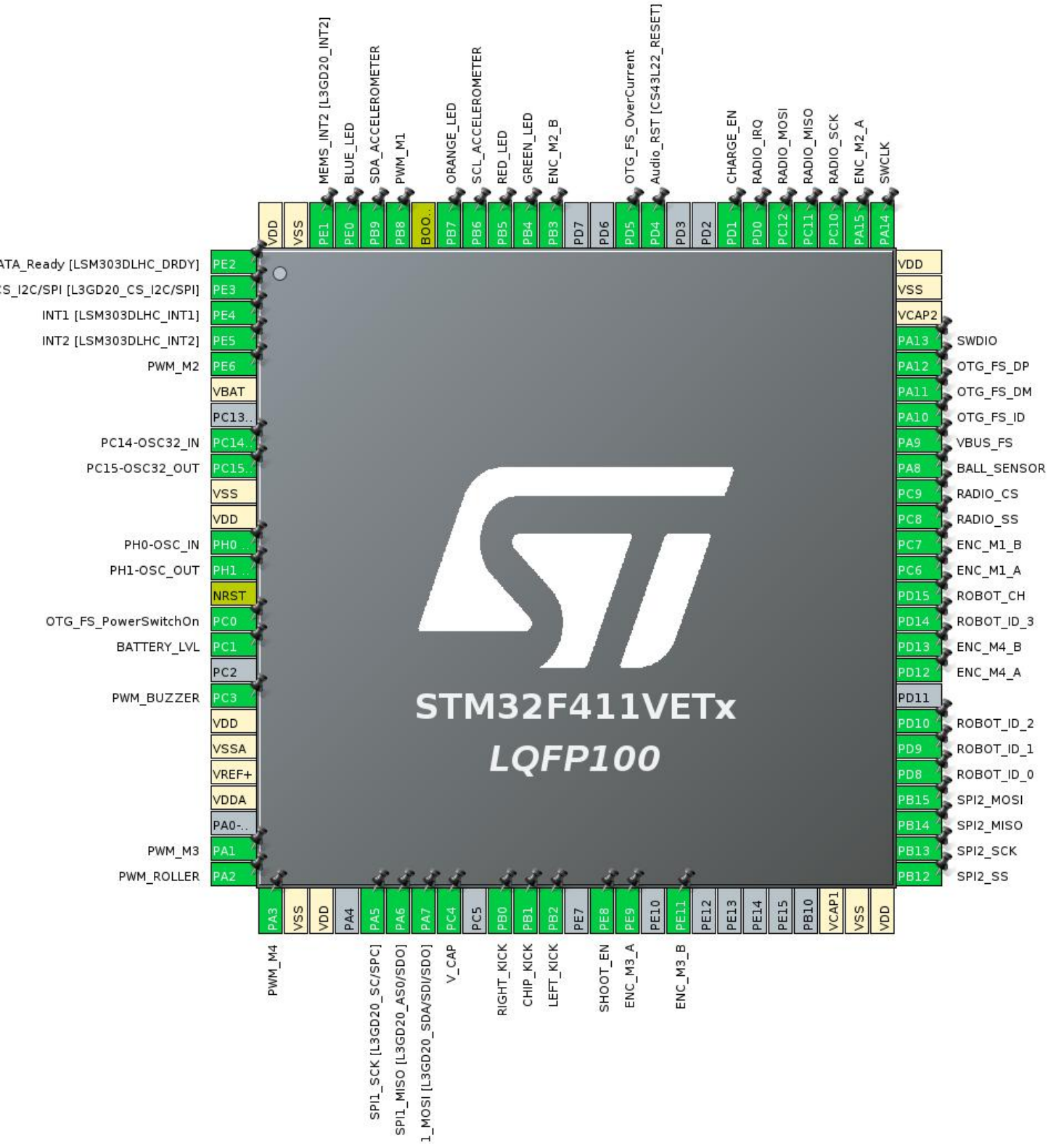
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F411
MCU name	STM32F411VETx
MCU Package	LQFP100
MCU Pin number	100

1.3. Core(s) information

Core(s)	Arm Cortex-M4

2. Pinout Configuration



3. Pins Configuration

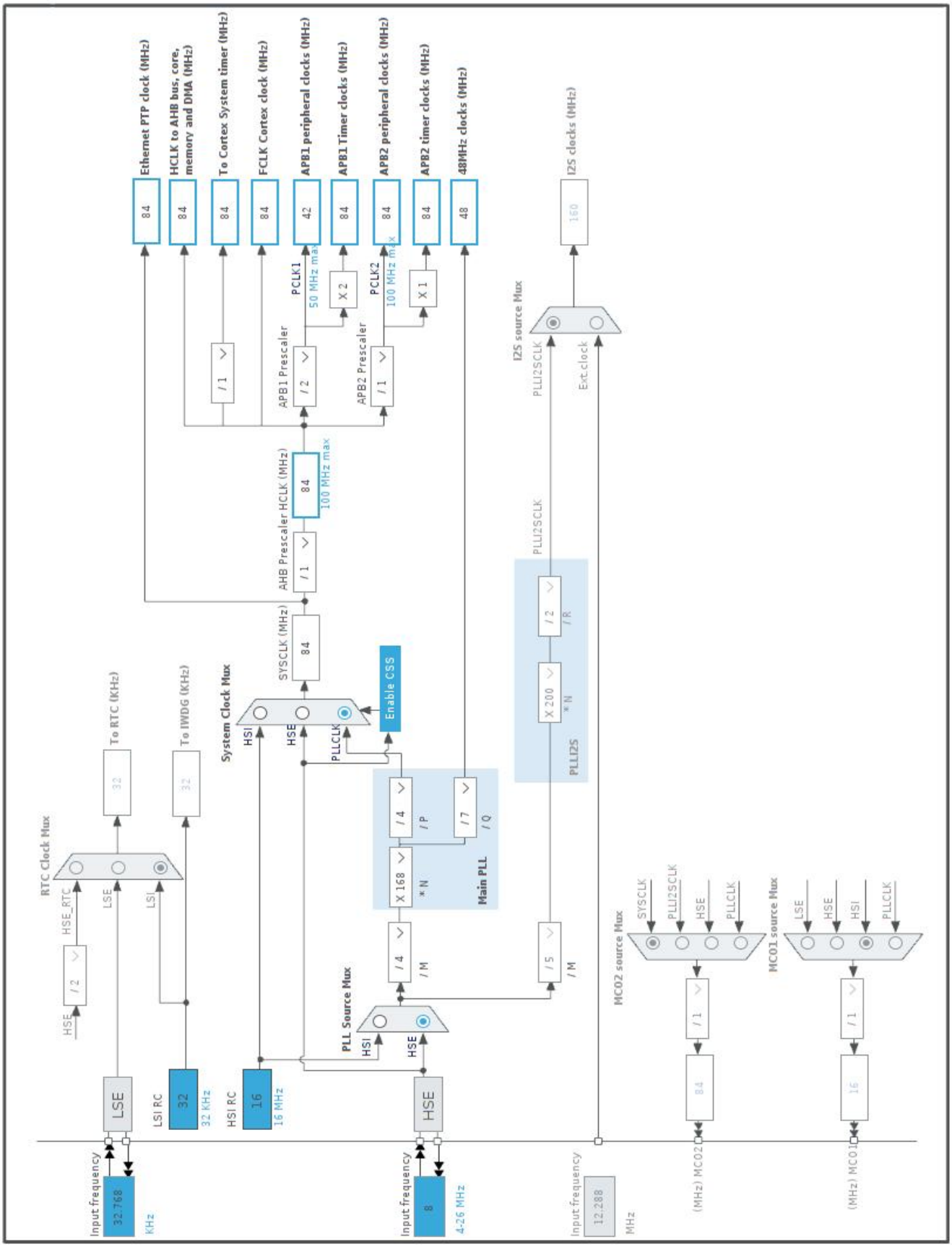
Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	PE2 *	I/O	GPIO_Input	DATA_Ready [LSM303DLHC_DRDY]
2	PE3 *	I/O	GPIO_Output	CS_I2C/SPI [L3GD20_CS_I2C/SPI]
3	PE4	I/O	GPIO_EXTI4	INT1 [LSM303DLHC_INT1]
4	PE5	I/O	GPIO_EXTI5	INT2 [LSM303DLHC_INT2]
5	PE6	I/O	TIM9_CH2	PWM_M2
6	VBAT	Power		
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	PC14-OSC32_IN
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	PC15-OSC32_OUT
10	VSS	Power		
11	VDD	Power		
12	PH0 - OSC_IN	I/O	RCC_OSC_IN	PH0-OSC_IN
13	PH1 - OSC_OUT	I/O	RCC_OSC_OUT	PH1-OSC_OUT
14	NRST	Reset		
15	PC0 *	I/O	GPIO_Output	OTG_FS_PowerSwitchOn
16	PC1	I/O	ADC1_IN11	BATTERY_LVL
18	PC3 *	I/O	GPIO_Output	PWM_BUZZER
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
24	PA1	I/O	TIM5_CH2	PWM_M3
25	PA2	I/O	TIM5_CH3	PWM_ROLLER
26	PA3	I/O	TIM5_CH4	PWM_M4
27	VSS	Power		
28	VDD	Power		
30	PA5	I/O	SPI1_SCK	SPI1_SCK [L3GD20_SC/SPC]
31	PA6	I/O	SPI1_MISO	SPI1_MISO [L3GD20_AS0/SDO]
32	PA7	I/O	SPI1_MOSI	SPI1_MOSI [L3GD20_SDA/SDI/SDO]
33	PC4	I/O	ADC1_IN14	V_CAP
35	PB0 *	I/O	GPIO_Output	RIGHT_KICK
36	PB1 *	I/O	GPIO_Output	CHIP_KICK
37	PB2 *	I/O	GPIO_Output	LEFT_KICK

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
39	PE8 *	I/O	GPIO_Output	SHOOT_EN
40	PE9	I/O	TIM1_CH1	ENC_M3_A
42	PE11	I/O	TIM1_CH2	ENC_M3_B
48	VCAP1	Power		
49	VSS	Power		
50	VDD	Power		
51	PB12 *	I/O	GPIO_Output	SPI2_SS
52	PB13	I/O	SPI2_SCK	
53	PB14	I/O	SPI2_MISO	
54	PB15	I/O	SPI2_MOSI	
55	PD8 *	I/O	GPIO_Input	ROBOT_ID_0
56	PD9 *	I/O	GPIO_Input	ROBOT_ID_1
57	PD10 *	I/O	GPIO_Input	ROBOT_ID_2
59	PD12	I/O	TIM4_CH1	ENC_M4_A
60	PD13	I/O	TIM4_CH2	ENC_M4_B
61	PD14 *	I/O	GPIO_Input	ROBOT_ID_3
62	PD15 *	I/O	GPIO_Input	ROBOT_CH
63	PC6	I/O	TIM3_CH1	ENC_M1_A
64	PC7	I/O	TIM3_CH2	ENC_M1_B
65	PC8 *	I/O	GPIO_Output	RADIO_SS
66	PC9 *	I/O	GPIO_Output	RADIO_CS
67	PA8 *	I/O	GPIO_Input	BALL_SENSOR
68	PA9	I/O	USB_OTG_FS_VBUS	VBUS_FS
69	PA10	I/O	USB_OTG_FS_ID	OTG_FS_ID
70	PA11	I/O	USB_OTG_FS_DM	OTG_FS_DM
71	PA12	I/O	USB_OTG_FS_DP	OTG_FS_DP
72	PA13	I/O	SYS_JTMS-SWDIO	SWDIO
73	VCAP2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	SWCLK
77	PA15	I/O	TIM2_CH1	ENC_M2_A
78	PC10	I/O	SPI3_SCK	RADIO_SCK
79	PC11	I/O	SPI3_MISO	RADIO_MISO
80	PC12	I/O	SPI3_MOSI	RADIO_MOSI
81	PD0	I/O	GPIO_EXTI0	RADIO_IRQ
82	PD1 *	I/O	GPIO_Output	CHARGE_EN
85	PD4 *	I/O	GPIO_Output	Audio_RST [CS43L22_RESET]

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
86	PD5 *	I/O	GPIO_Input	OTG_FS_OverCurrent
89	PB3	I/O	TIM2_CH2	ENC_M2_B
90	PB4 *	I/O	GPIO_Output	GREEN_LED
91	PB5 *	I/O	GPIO_Output	RED_LED
92	PB6	I/O	I2C1_SCL	SCL_ACCELEROMETER
93	PB7 *	I/O	GPIO_Output	ORANGE_LED
94	BOOT0	Boot		
95	PB8	I/O	TIM10_CH1	PWM_M1
96	PB9	I/O	I2C1_SDA	SDA_ACCELEROMETER
97	PE0 *	I/O	GPIO_Output	BLUE_LED
98	PE1	I/O	GPIO_EXTI1	MEMS_INT2 [L3GD20_INT2]
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	SSLMainBoard
Project Folder	/home/leonardo/Eletronica_SSL/PlacaMain_2022/Firmware
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.27.1
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	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	MX_GPIO_Init	GPIO
2	SystemClock_Config	RCC
3	MX_I2C1_Init	I2C1
4	MX_SPI1_Init	SPI1
5	MX_TIM1_Init	TIM1
6	MX_TIM2_Init	TIM2
7	MX_TIM10_Init	TIM10
8	MX_ADC1_Init	ADC1
9	MX_USB_OTG_FS_USB_Init	USB_OTG_FS
10	MX_TIM4_Init	TIM4
11	MX_TIM11_Init	TIM11

Rank	Function Name	Peripheral Instance Name
12	MX_SPI3_Init	SPI3
13	MX_TIM3_Init	TIM3
14	MX_SPI2_Init	SPI2
15	MX_TIM5_Init	TIM5
16	MX_TIM9_Init	TIM9

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F4
Line	STM32F411
MCU	STM32F411VETx
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

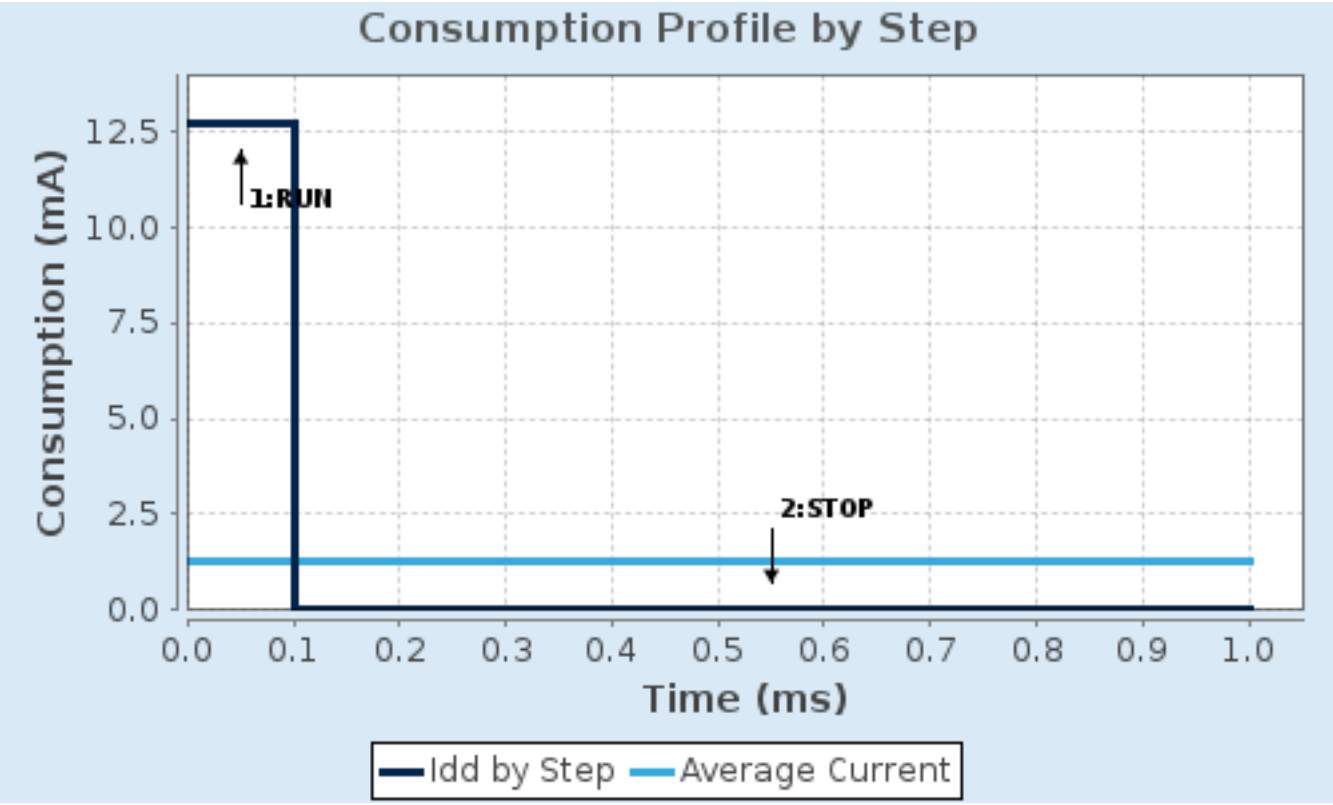
6.4. Sequence

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	104.07	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. ADC1

mode: IN11

mode: IN14

7.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	PCLK2 divided by 4
Resolution	12 bits (15 ADC Clock cycles)
Data Alignment	Right alignment
Scan Conversion Mode	Disabled
Continuous Conversion Mode	Disabled
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion	1
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
Rank	1
Channel	Channel 11
Sampling Time	3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions	0

WatchDog:

Enable Analog WatchDog Mode	false

7.2. I2C1

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)	2 WS (3 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)	2
Baud Rate	**42.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.5. SPI2

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)	2
Baud Rate	**21.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.6. SPI3

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)	**8 ***
Baud Rate	**5.25 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.7. SYS

Debug: Serial Wire

Timebase Source: SysTick

7.8. TIM1

Combined Channels: Encoder Mode

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
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. TIM2

Combined Channels: Encoder Mode

7.9.1. 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

7.10. TIM3

Combined Channels: Encoder Mode

7.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
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

7.11. TIM4

Combined Channels: Encoder Mode

7.11.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
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

7.12. TIM5

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

7.12.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**171423 ***
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)

PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (32 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (32 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (32 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.13. TIM9

Channel2: PWM Generation CH2

7.13.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**2 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**57143 ***
Internal Clock Division (CKD)	No Division

auto-reload preload	Disable

PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.14. TIM10

mode: Activated

Channel1: PWM Generation CH1

7.14.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**2 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**57143 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.15. TIM11

mode: Activated

7.15.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**84 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	65535
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

7.16. USB_OTG_FS

Mode: OTG/Dual_Role_Device

mode: Activate_VBUS

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PC1	ADC1_IN11	Analog mode	No pull-up and no pull-down	n/a	BATTERY_LVL
	PC4	ADC1_IN14	Analog mode	No pull-up and no pull-down	n/a	V_CAP
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	**Pull-up ***	Low	SCL_ACCELEROMETER
	PB9	I2C1_SDA	Alternate Function Open Drain	**Pull-up ***	Low	SDA_ACCELEROMETER
RCC	PC14-OSC32_IN	RCC_OSC32_IN	n/a	n/a	n/a	PC14-OSC32_IN
	PC15-OSC32_OUT	RCC_OSC32_OUT	n/a	n/a	n/a	PC15-OSC32_OUT
	PH0 - OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	PH0-OSC_IN
	PH1 - OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	PH1-OSC_OUT
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	SPI1_SCK [L3GD20_SC/SPC]
	PA6	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	SPI1_MISO [L3GD20_AS0/SDO]
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	SPI1_MOSI [L3GD20_SDA/SDI/SDO]
SPI2	PB13	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PB14	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PB15	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
SPI3	PC10	SPI3_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RADIO_SCK
	PC11	SPI3_MISO	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RADIO_MISO
	PC12	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	RADIO_MOSI
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	SWDIO
	PA14	SYS_JTCK-	n/a	n/a	n/a	SWCLK

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
		SWCLK				
TIM1	PE9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M3_A
	PE11	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M3_B
TIM2	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M2_A
	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M2_B
TIM3	PC6	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M1_A
	PC7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M1_B
TIM4	PD12	TIM4_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M4_A
	PD13	TIM4_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_M4_B
TIM5	PA1	TIM5_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM_M3
	PA2	TIM5_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM_ROLLER
	PA3	TIM5_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM_M4
TIM9	PE6	TIM9_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM_M2
TIM10	PB8	TIM10_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	PWM_M1
USB_OTG_FS	PA9	USB_OTG_FS_VBUS	Input mode	No pull-up and no pull-down	n/a	VBUS_FS
	PA10	USB_OTG_FS_ID	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	OTG_FS_ID
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	OTG_FS_DM
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	OTG_FS_DP
GPIO	PE2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	DATA_Ready [LSM303DLHC_DRDY]
	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS_I2C/SPI [L3GD20_CS_I2C/SPI]
	PE4	GPIO_EXTI4	**External Event Mode with Rising edge trigger detection ***	No pull-up and no pull-down	n/a	INT1 [LSM303DLHC_INT1]
	PE5	GPIO_EXTI5	**External Event Mode with Rising edge trigger detection ***	No pull-up and no pull-down	n/a	INT2 [LSM303DLHC_INT2]
	PC0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	OTG_FS_PowerSwitchOn
	PC3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWM_BUZZER
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RIGHT_KICK
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHIP_KICK
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LEFT_KICK
	PE8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SHOOT_EN
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SPI2_SS
	PD8	GPIO_Input	Input mode	**Pull-down ***	n/a	ROBOT_ID_0

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PD9	GPIO_Input	Input mode	**Pull-down ***	n/a	ROBOT_ID_1
	PD10	GPIO_Input	Input mode	**Pull-down ***	n/a	ROBOT_ID_2
	PD14	GPIO_Input	Input mode	**Pull-down ***	n/a	ROBOT_ID_3
	PD15	GPIO_Input	Input mode	**Pull-down ***	n/a	ROBOT_CH
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RADIO_SS
	PC9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RADIO_CS
	PA8	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	BALL_SENSOR
	PD0	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	RADIO_IRQ
	PD1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CHARGE_EN
	PD4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Audio_RST [CS43L22_RESET]
	PD5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	OTG_FS_OverCurrent
	PB4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GREEN_LED
	PB5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RED_LED
	PB7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	ORANGE_LED
	PE0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BLUE_LED
	PE1	GPIO_EXTI1	**External Event Mode with Rising edge trigger detection ***	No pull-up and no pull-down	n/a	MEMS_INT2 [L3GD20_INT2]

8.2. DMA configuration

nothing configured in DMA service

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 line0 interrupt	true	0	0
ADC1 global interrupt	true	0	0
TIM1 update interrupt and TIM10 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM11 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
TIM4 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
SPI1 global interrupt	unused		
SPI2 global interrupt	unused		
TIM5 global interrupt	unused		
SPI3 global interrupt	unused		
FPU global 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
Hard fault interrupt	false	true	false
Memory management fault	false	true	false

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
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 line0 interrupt	false	true	true
ADC1 global interrupt	false	true	true
TIM1 update interrupt and TIM10 global interrupt	false	true	true

*** User modified value**

9. System Views

9.1. Category view

9.1.1. Current

10. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f411_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f411_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/stm32f411_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f411_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
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Application Notes	https://www.st.com/resource/en/application_note/an4031-using-the-

	stm32f2-stm32f4-and-stm32f7-series-dma-controller-stmicroelectronics.pdf
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Application Notes	https://www.st.com/resource/en/application_note/an4229-how-to-implement-a-vocoder-solution-using-stm32-microcontrollers-stmicroelectronics.pdf
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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/an4616-migrating-from-stm32f401-and-stm32f411-lines-to-stm32l4-series-and-stm32l4-series-microcontrollers-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4646-peripheral-interconnections-on-stm32f401-and-stm32f411-lines-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
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	hardware-realtime-clock-rtc-and-the-tamper-management-unit-tamp-with-stm32-microcontrollers-stmicroelectronics.pdf
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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	https://www.st.com/resource/en/application_note/an4701-proprietary-code-readout-protection-on-microcontrollers-of-the-stm32f4-series-

& Software	stmicroelectronics.pdf
Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4739-stm32cube-firmware-examples-for-stm32f4-series-stmicroelectronics.pdf
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
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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
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