08/11/2024

1. Description

1.1. Project

Project Name	robosoccer-stm32
Board Name	NUCLEO-H723ZG
Generated with:	STM32CubeMX 6.12.1
Date	11/08/2024

1.2. MCU

MCU Series	STM32H7
MCU Line	STM32H723/733
MCU name	STM32H723ZGTx
MCU Package	LQFP144
MCU Pin number	144

1.3. Core(s) information

Core(s)	Arm Cortex-M7

2. Pinout Configuration
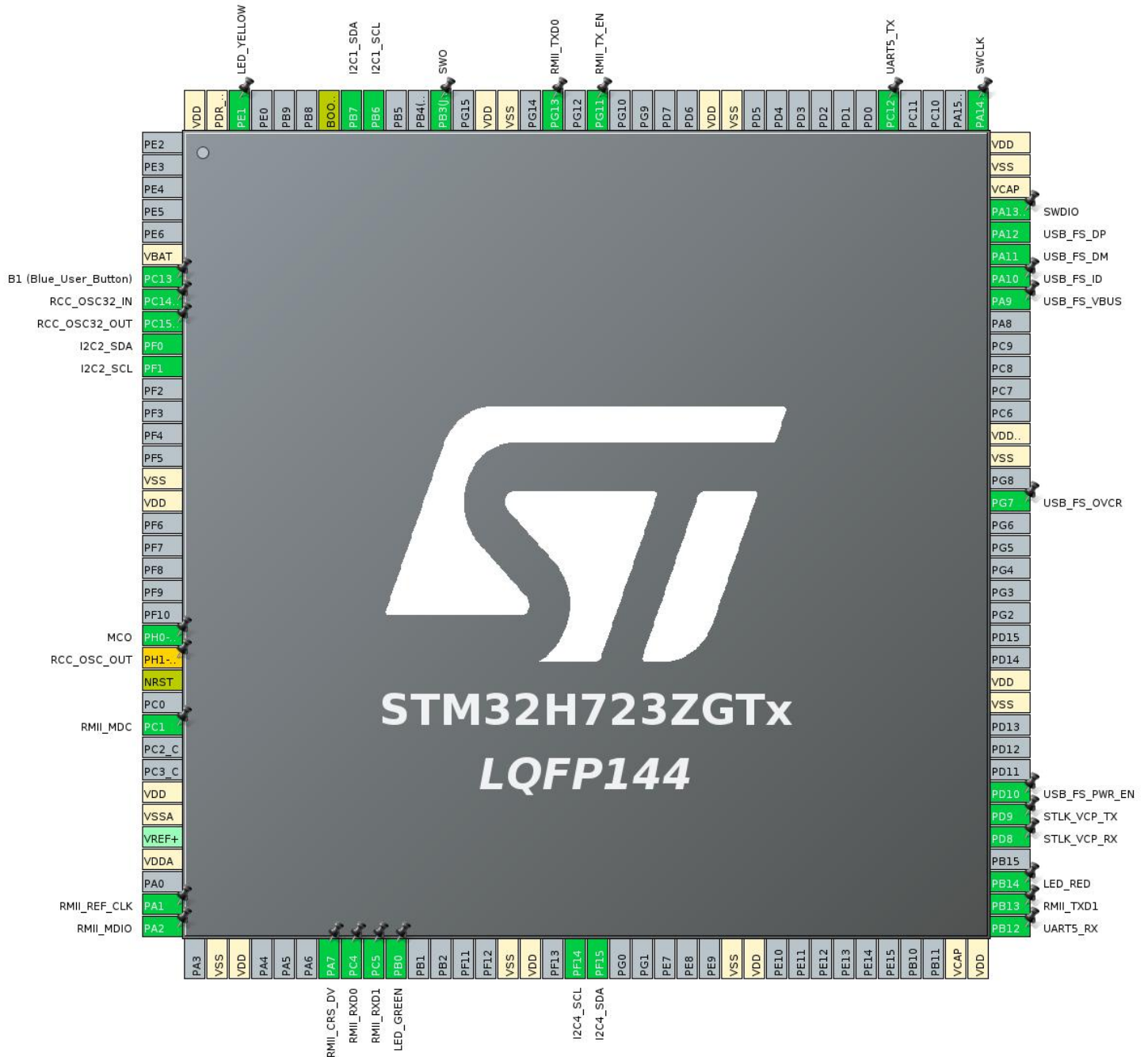
3. Pins Configuration

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
6	VBAT	Power		
7	PC13 *	I/O	GPIO_Input	B1 (Blue_User_Button)
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
10	PF0	I/O	I2C2_SDA	
11	PF1	I/O	I2C2_SCL	
16	VSS	Power		
17	VDD	Power		
23	PH0-OSC_IN	I/O	RCC_OSC_IN	MCO
24	PH1-OSC_OUT **	I/O	RCC_OSC_OUT	
25	NRST	Reset		
27	PC1	I/O	ETH_MDC	RMII_MDC
30	VDD	Power		
31	VSSA	Power		
33	VDDA	Power		
35	PA1	I/O	ETH_REF_CLK	RMII_REF_CLK
36	PA2	I/O	ETH_MDIO	RMII_MDIO
38	VSS	Power		
39	VDD	Power		
43	PA7	I/O	ETH_CRS_DV	RMII_CRS_DV
44	PC4	I/O	ETH_RXD0	RMII_RXD0
45	PC5	I/O	ETH_RXD1	RMII_RXD1
46	PB0 *	I/O	GPIO_Output	LED_GREEN
51	VSS	Power		
52	VDD	Power		
54	PF14	I/O	I2C4_SCL	
55	PF15	I/O	I2C4_SDA	
61	VSS	Power		
62	VDD	Power		
71	VCAP	Power		
72	VDD	Power		
73	PB12	I/O	UART5_RX	
74	PB13	I/O	ETH_TXD1	RMII_TXD1
75	PB14 *	I/O	GPIO_Output	LED_RED
77	PD8	I/O	USART3_TX	STLK_VCP_RX
78	PD9	I/O	USART3_RX	STLK_VCP_TX

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
79	PD10 *	I/O	GPIO_Output	USB_FS_PWR_EN
83	VSS	Power		
84	VDD	Power		
92	PG7	I/O	GPIO_EXTI7	USB_FS_OVCR
94	VSS	Power		
95	VDD33USB	Power		
101	PA9	I/O	USB_OTG_HS_VBUS	USB_FS_VBUS
102	PA10	I/O	USB_OTG_HS_ID	USB_FS_ID
103	PA11	I/O	USB_OTG_HS_DM	USB_FS_DM
104	PA12	I/O	USB_OTG_HS_DP	USB_FS_DP
105	PA13(JTMS/SWDIO)	I/O	DEBUG_JTMS-SWDIO	SWDIO
106	VCAP	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14(JTCK/SWCLK)	I/O	DEBUG_JTCK-SWCLK	SWCLK
113	PC12	I/O	UART5_TX	
120	VSS	Power		
121	VDD	Power		
126	PG11	I/O	ETH_TX_EN	RMII_TX_EN
128	PG13	I/O	ETH_TXD0	RMII_TXD0
130	VSS	Power		
131	VDD	Power		
133	PB3(JTDO/TRACESWO)	I/O	DEBUG_JTDO-SWO	SWO
136	PB6	I/O	I2C1_SCL	
137	PB7	I/O	I2C1_SDA	
138	BOOT0	Boot		
142	PE1 *	I/O	GPIO_Output	LED_YELLOW
143	PDR_ON	Power		
144	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
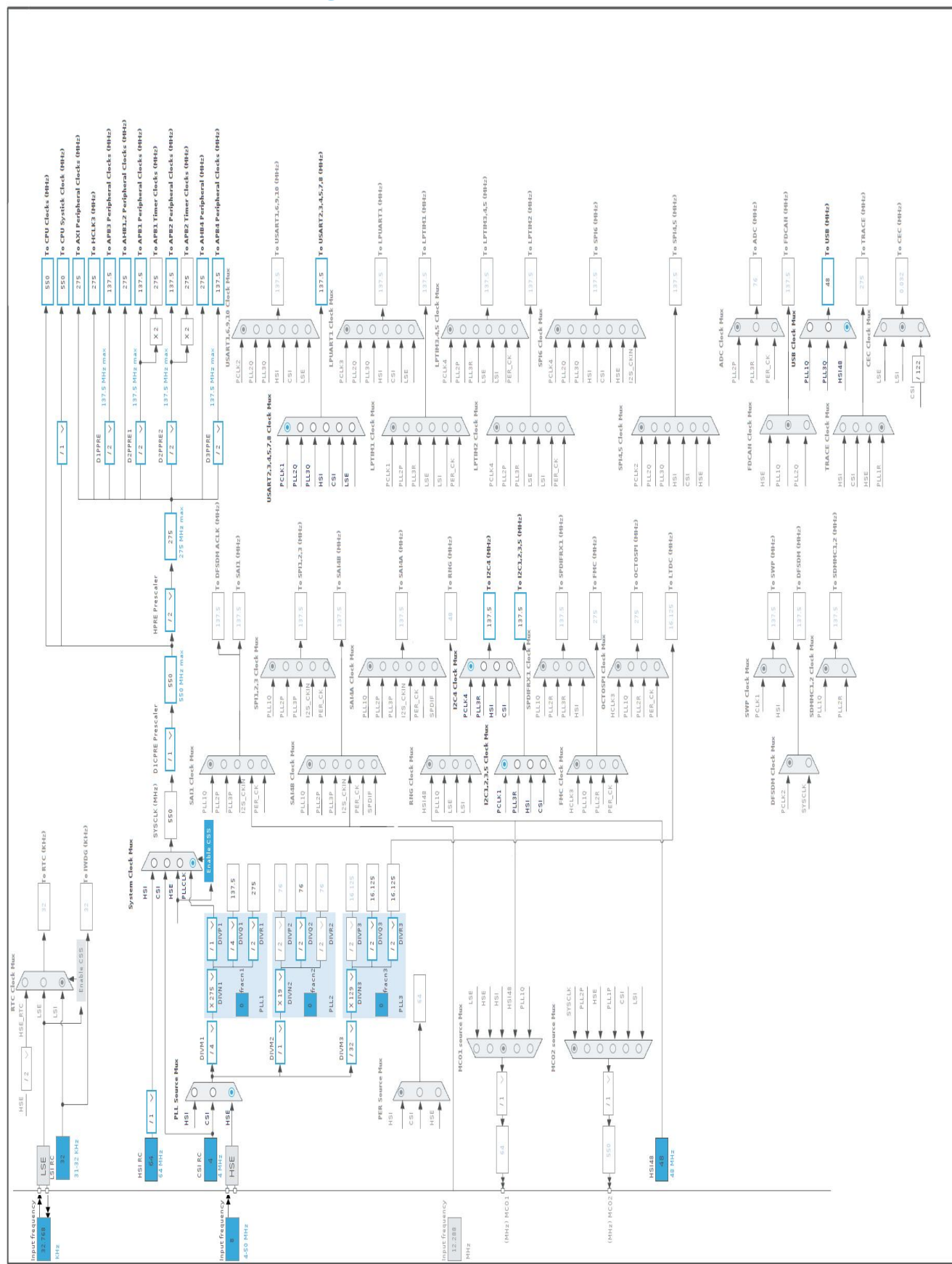
1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32H7
Line	STM32H723/733
MCU	STM32H723ZGTx
Datasheet	DS13313_Rev1

1.2. Parameter Selection

Temperature	25
Vdd	3.0

1.3. Battery Selection

Battery	Alkaline(9V)
Capacity	625.0 mAh
Self Discharge	0.3 %/month
Nominal Voltage	9.0 V
Max Cont Current	200.0 mA
Max Pulse Current	0.0 mA
Cells in series	1
Cells in parallel	1

1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.0	3.0
Voltage Source	Battery	Battery
Range	VOS0: Scale0/Boost	SVOS5: System-Scale5
D1 Mode	DRUN	DSTANDBY
D2 Mode	DRUN	DSTANDBY
D3 Mode	DRUN	DSTOP
Fetch Type	SRAM1/FlashMode-ON/Cache	NA
CPU Frequency	550 MHz	0 Hz
Clock Configuration	HSE BYP PLL	ALL_CLOCKS_OFF
Clock Source Frequency	8 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	150 mA	94.5 µA
Duration	0.1 ms	0.9 ms
DMIPS	1177.0	0.0
Ta Max	105.2	124.99
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	15.09 mA
Battery Life	1 day, 17 hours	Average DMIPS	1177.0 DMIPS

1.6. Chart
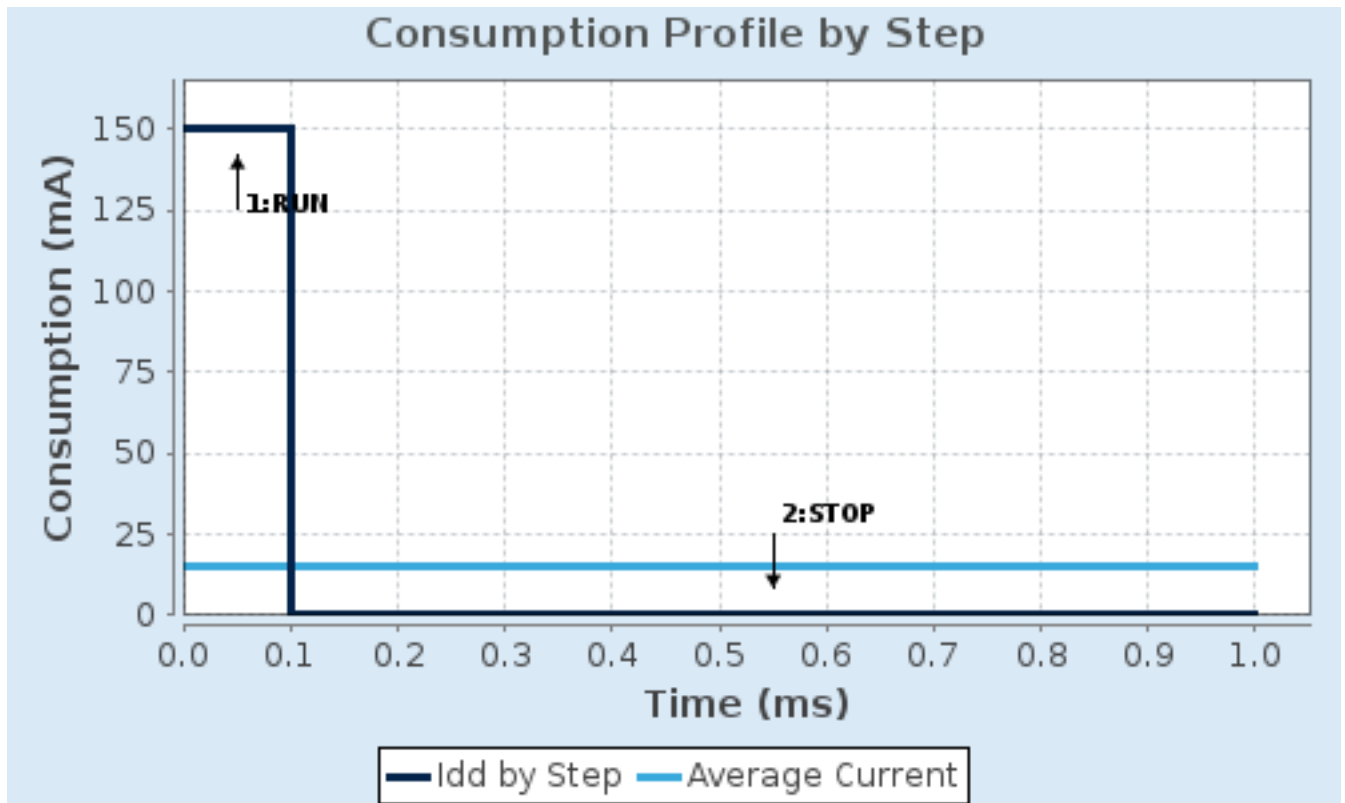
2. Software Project

2.1. Project Settings

Name	Value
Project Name	robosoccer-stm32
Project Folder	/home/aaiza/Desktop/projectrepo/robot-controller-interface/src/hardware-
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_H7 V1.11.2
Application Structure	Advanced
Generate Under Root	Yes
Do not generate the main()	No
Minimum Heap Size	0x200
Minimum Stack Size	0x400

2.2. 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

2.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_ETH_Init	ETH
4	MX_USART3_UART_Init	USART3
5	MX_USB_OTG_HS_USB_Init	USB_OTG_HS
6	MX_I2C1_Init	I2C1
7	MX_I2C2_Init	I2C2
8	MX_I2C4_Init	I2C4
9	MX_UART5_Init	UART5

3. Peripherals and Middlewares Configuration

3.1. DEBUG

Debug: Trace Asynchronous Sw

3.2. ETH

Mode: RMII

3.2.1. Parameter Settings:

General : Ethernet Configuration:

Warning	The ETH can work only when RAM is pointing at 0x24000000
Ethernet MAC Address	00:80:E1:00:00:00
Tx Descriptor Length	4
First Tx Descriptor Address	**0x30000080 ***
Rx Descriptor Length	4
First Rx Descriptor Address	**0x30000000 ***
Rx Buffers Address	**0x30000100 ***
Rx Buffers Length	1524

3.3. I2C1

I2C: I2C

3.3.1. Parameter Settings:

Timing configuration:

Custom Timing	Disabled
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	**0x60404E72 ***

Slave Features:

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

3.4. I2C2
I2C: I2C
3.4.1. Parameter Settings:

Timing configuration:

Custom Timing	Disabled
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	**0x60404E72 ***

Slave Features:

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

3.5. I2C4
I2C: I2C
3.5.1. Parameter Settings:

Timing configuration:

Custom Timing	Disabled
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	**0x60404E72 ***

Slave Features:

Clock No Stretch Mode	Disabled
General Call Address Detection	Disabled

Primary Address Length selection	7-bit
Dual Address Acknowledged	Disabled
Primary slave address	0

3.6. MEMORYMAP
mode: Activated

3.7. RCC
High Speed Clock (HSE): BYPASS Clock Source
Low Speed Clock (LSE) : Crystal/Ceramic Resonator
3.7.1. Parameter Settings:

Power Parameters:

SupplySource	PWR_LDO_SUPPLY
Power Regulator Voltage Scale	Power Regulator Voltage Scale 0

RCC Parameters:

TIM Prescaler Selection	Disabled
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000
CSI Calibration Value	16
HSI Calibration Value	64

System Parameters:

VDD voltage (V)	3.3
Flash Latency(WS)	3 WS (4 CPU cycle)

PLL range Parameters:

PLL1 input frequency range	Between 2 and 4 MHz
PLL1 clock Output range	Wide VCO range

3.8. SYS
Timebase Source: SysTick

3.9. UART5
Mode: Asynchronous
3.9.1. 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
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	FIFO mode disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

3.10. USART3
Mode: Asynchronous
3.10.1. 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
Single Sample	Disable
ClockPrescaler	1
Fifo Mode	Disable
Txfifo Threshold	1 eighth full configuration
Rxfifo Threshold	1 eighth full configuration

Advanced Features:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable
Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

3.11. USB_OTG_HS
Internal FS Phy: OTG/Dual_Role_Device
Activate_VBUS: Activate-VBUS

* User modified value

4. System Configuration

4.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
DEBUG	PA13(JTMS/SWDIO)	DEBUG_JTMS-SWDIO	n/a	n/a	n/a	SWDIO
	PA14(JTCK/SWCLK)	DEBUG_JTCK-SWCLK	n/a	n/a	n/a	SWCLK
	PB3(JTDO/TRACESWO)	DEBUG_JTDO-SWO	n/a	n/a	n/a	SWO
ETH	PC1	ETH_MDC	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_MDC
	PA1	ETH_REF_CLK	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_REF_CLK
	PA2	ETH_MDIO	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_MDIO
	PA7	ETH_CRS_DV	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_CRS_DV
	PC4	ETH_RXD0	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_RXD0
	PC5	ETH_RXD1	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_RXD1
	PB13	ETH_TXD1	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_TXD1
	PG11	ETH_TX_EN	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_TX_EN
	PG13	ETH_TXD0	Alternate Function Push Pull	No pull-up and no pull-down	Low	RMII_TXD0
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
I2C2	PF0	I2C2_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PF1	I2C2_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
I2C4	PF14	I2C4_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PF15	I2C4_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
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	MCO
UART5	PB12	UART5_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC12	UART5_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART3	PD8	USART3_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	STLK_VCP_RX
	PD9	USART3_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	STLK_VCP_TX
USB_OTG_	PA9	USB_OTG_HS_	Input mode	No pull-up and no pull-down	n/a	USB_FS_VBUS

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
HS		VBUS				
	PA10	USB_OTG_HS_ID	Alternate Function Push Pull	No pull-up and no pull-down	Low	USB_FS_ID
	PA11	USB_OTG_HS_DM	n/a	n/a	n/a	USB_FS_DM
	PA12	USB_OTG_HS_DP	n/a	n/a	n/a	USB_FS_DP
Single Mapped Signals	PH1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
GPIO	PC13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	B1 (Blue_User_Button)
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_GREEN
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_RED
	PD10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_FS_PWR_EN
	PG7	GPIO_EXTI7	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	USB_FS_OVCR
	PE1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_YELLOW

4.2. DMA configuration

nothing configured in DMA service

4.3. BDMA configuration

nothing configured in DMA service

4.4. MDMA configuration

nothing configured in DMA service

4.5. NVIC configuration

4.5.1. 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
PVD/AVD through EXTI Line detection Interrupt	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line[9:5] interrupts	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
USART3 global interrupt	unused		
UART5 global interrupt	unused		
Ethernet global interrupt	unused		
Ethernet wake-up interrupt through EXTI line 86	unused		
FPU global interrupt	unused		
I2C4 event interrupt	unused		
I2C4 error interrupt	unused		
HSEM1 global interrupt	unused		

4.5.2. 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
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

Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
System tick timer	false	true	true

* User modified value

5. System Views

5.1. Category view

5.1.1. Current

Middleware

System Core	Analog	Timers	Connectivity	Multimedia	Security	Computing	Trace and Debug	Power and Therma	Other
BDMA			ETH ✓				DEBUG ✓		
CORTEX_M7 ✓			I2C1 ✓						
DMA			I2C2 ✓						
GPIO ⚠			I2C4 ✓						
MDMA			UART5 ✓						
NVIC ✓			USART3 ✓						
RCC ✓			USB_HS ✓						
SYS ✓									

6. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32h7_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32h7_ibis.zip
System View Description	https://www.st.com/resource/en/svd/stm32h7-svd.zip
System View Description	https://www.st.com/resource/en/svd/stm32h7rs-svd.zip
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers_stm32h7_series_product_overview.pdf
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
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers_stm32h72x-3x_line_product-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf
Presentations	https://www.st.com/resource/en/product_presentation/microcontrollers-stm32h7rs-lines-overview.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32h7.pdf
Brochures	https://www.st.com/resource/en/brochure/products-and-solutions-for-plcs-and-smart-i-os.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32nucleo.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Flyers	https://www.st.com/resource/en/flyer/flstm32h7rs.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/an3126-audio-and-waveform-generation-using-the-dac-in-stm32-products-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/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/an4286-spi-protocol-used-in-the-stm32-bootloader-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/an4750-handling-of-soft-errors-in-stm32-applications-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/an4839-level-1-cache-

on-stm32f7-series-and-stm32h7-series-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4891-stm32h72x-stm32h73x-and-singlecore-stm32h74x75x-system-architecture-and-performance-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/an5020-digital-camera-interface-dcmi-on-stm32-mcus-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/an5033-stm32cube-mcu-package-examples-for-stm32h7-series-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/an5337-stm32h7-series-lifetime-estimates-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5419-getting-started-with-stm32h723733-stm32h725735-and-stm32h730-value-line-hardware-development-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/an5293-migration-guide-from-stm32f7-series-to-stmh74x75x-stm32h72x73x-and-stmh7a37bx-devices-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an4838-introduction-to-memory-protection-unit-management-on-stm32-mcus-stmicroelectronics.pdf

Application Notes https://www.st.com/resource/en/application_note/an5325-how-to-use-the-cordic-to-perform-mathematical-functions-on-stm32-mcus-stmicroelectronics.pdf

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