
STM32
CubeMX

1. Description

1.1. Project

Project Name	printalyzer-timer
Board Name	custom
Generated with:	STM32CubeMX 6.10.0
Date	02/05/2024

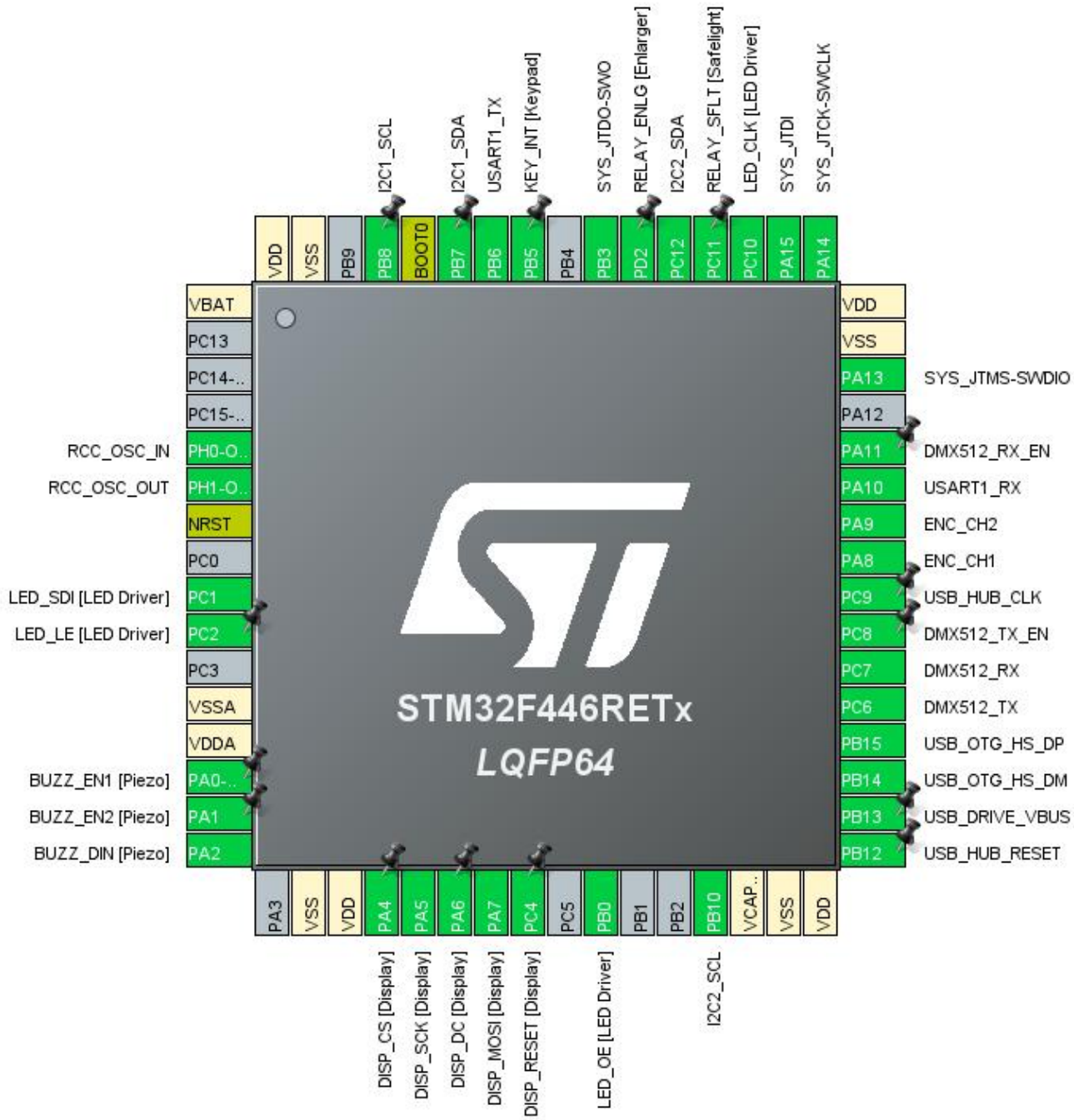
1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F446
MCU name	STM32F446RETx
MCU Package	LQFP64
MCU Pin number	64

1.3. Core(s) information

Core(s)	Arm Cortex-M4

2. Pinout Configuration



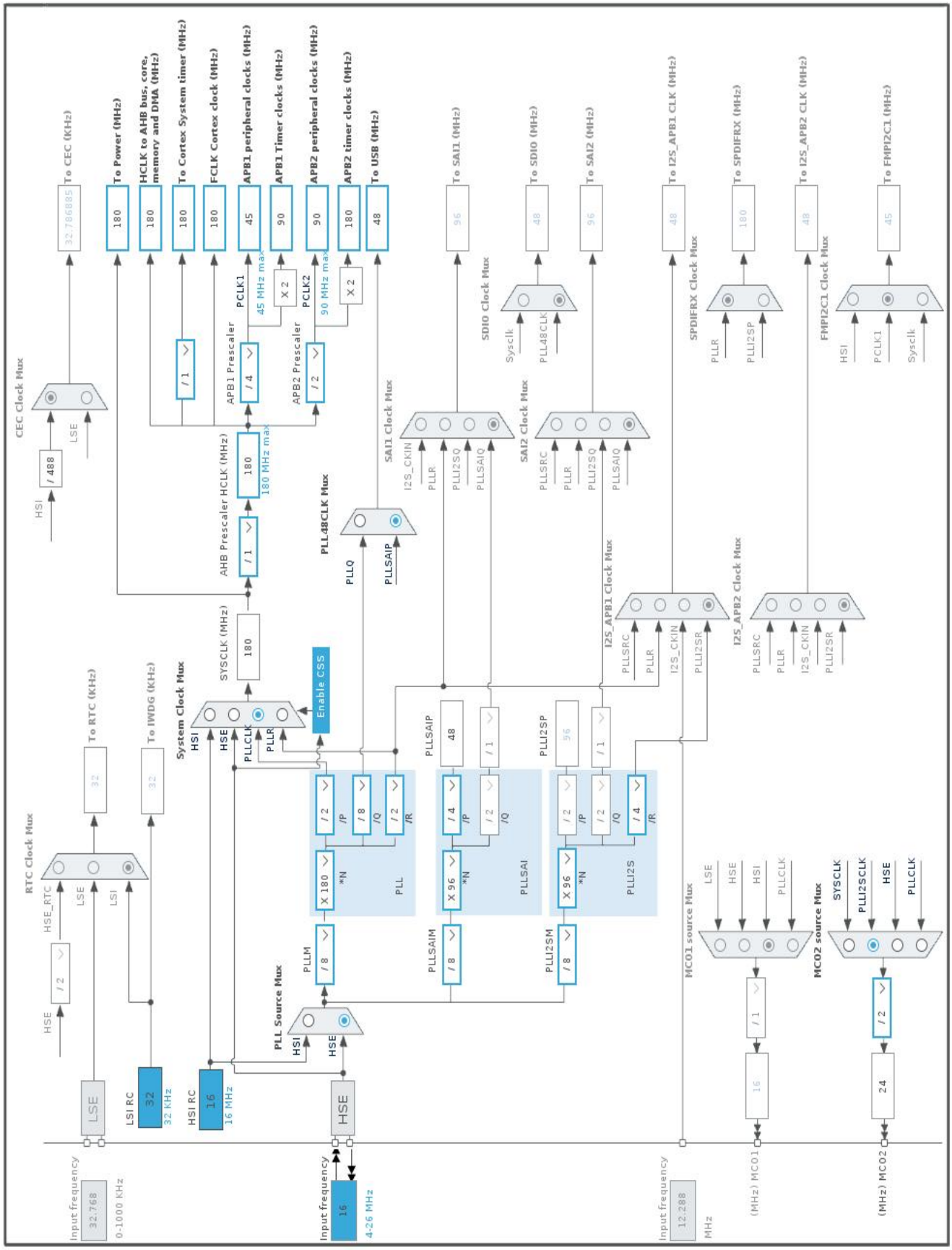
3. Pins Configuration

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
5	PH0-OSC_IN	I/O	RCC_OSC_IN	
6	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
9	PC1	I/O	SPI3_MOSI	LED_SDI [LED Driver]
10	PC2 *	I/O	GPIO_Output	LED_LE [LED Driver]
12	VSSA	Power		
13	VDDA	Power		
14	PA0-WKUP *	I/O	GPIO_Output	BUZZ_EN1 [Piezo]
15	PA1 *	I/O	GPIO_Output	BUZZ_EN2 [Piezo]
16	PA2	I/O	TIM9_CH1	BUZZ_DIN [Piezo]
18	VSS	Power		
19	VDD	Power		
20	PA4 *	I/O	GPIO_Output	DISP_CS [Display]
21	PA5	I/O	SPI1_SCK	DISP_SCK [Display]
22	PA6 *	I/O	GPIO_Output	DISP_DC [Display]
23	PA7	I/O	SPI1_MOSI	DISP_MOSI [Display]
24	PC4 *	I/O	GPIO_Output	DISP_RESET [Display]
26	PB0	I/O	TIM3_CH3	LED_OE [LED Driver]
29	PB10	I/O	I2C2_SCL	
30	VCAP_1	Power		
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	USB_HUB_RESET
34	PB13 *	I/O	GPIO_Output	USB_DRIVE_VBUS
35	PB14	I/O	USB_OTG_HS_DM	
36	PB15	I/O	USB_OTG_HS_DP	
37	PC6	I/O	USART6_TX	DMX512_TX
38	PC7	I/O	USART6_RX	DMX512_RX
39	PC8 *	I/O	GPIO_Output	DMX512_TX_EN
40	PC9	I/O	RCC_MCO_2	USB_HUB_CLK
41	PA8	I/O	TIM1_CH1	ENC_CH1
42	PA9	I/O	TIM1_CH2	ENC_CH2
43	PA10	I/O	USART1_RX	
44	PA11 *	I/O	GPIO_Output	DMX512_RX_EN
46	PA13	I/O	SYS_JTMS-SWDIO	

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
47	VSS	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
50	PA15	I/O	SYS_JTDI	
51	PC10	I/O	SPI3_SCK	LED_CLK [LED Driver]
52	PC11 *	I/O	GPIO_Output	RELAY_SFLT [Safelight]
53	PC12	I/O	I2C2_SDA	
54	PD2 *	I/O	GPIO_Output	RELAY_ENLG [Enlarger]
55	PB3	I/O	SYS_JTDO-SWO	
57	PB5	I/O	GPIO_EXTI5	KEY_INT [Keypad]
58	PB6	I/O	USART1_TX	
59	PB7	I/O	I2C1_SDA	
60	BOOT0	Boot		
61	PB8	I/O	I2C1_SCL	
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	printalyzer-timer
Project Folder	/home/octo/devel/printalyzer-cube/firmware_d
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F4 V1.28.0
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)	No
Enable Full Assert	No

5.3. Advanced Settings - Generated Function Calls

Rank	Function Name	Peripheral Instance Name
1	SystemClock_Config	RCC
2	MX_GPIO_Init	GPIO
3	MX_DMA_Init	DMA
4	MX_CRC_Init	CRC
5	MX_I2C1_Init	I2C1
6	MX_I2C2_SMBUS_Init	I2C2
7	MX_SPI1_Init	SPI1
8	MX_SPI3_Init	SPI3
9	MX_TIM1_Init	TIM1
10	MX_TIM3_Init	TIM3
11	MX_TIM4_Init	TIM4

Rank	Function Name	Peripheral Instance Name
12	MX_TIM8_Init	TIM8
13	MX_TIM9_Init	TIM9
14	MX_TIM10_Init	TIM10
15	MX_USART1_UART_Init	USART1
16	MX_USART6_UART_Init	USART6
17	MX_FATFS_Init	FATFS
18	MX_USB_HOST_Init	USB_HOST

1. Power Consumption Calculator report

1.1. Microcontroller Selection

Series	STM32F4
Line	STM32F446
MCU	STM32F446RETx
Datasheet	DS10693_Rev6

1.2. Parameter Selection

Temperature	25
Vdd	3.3

1.3. 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

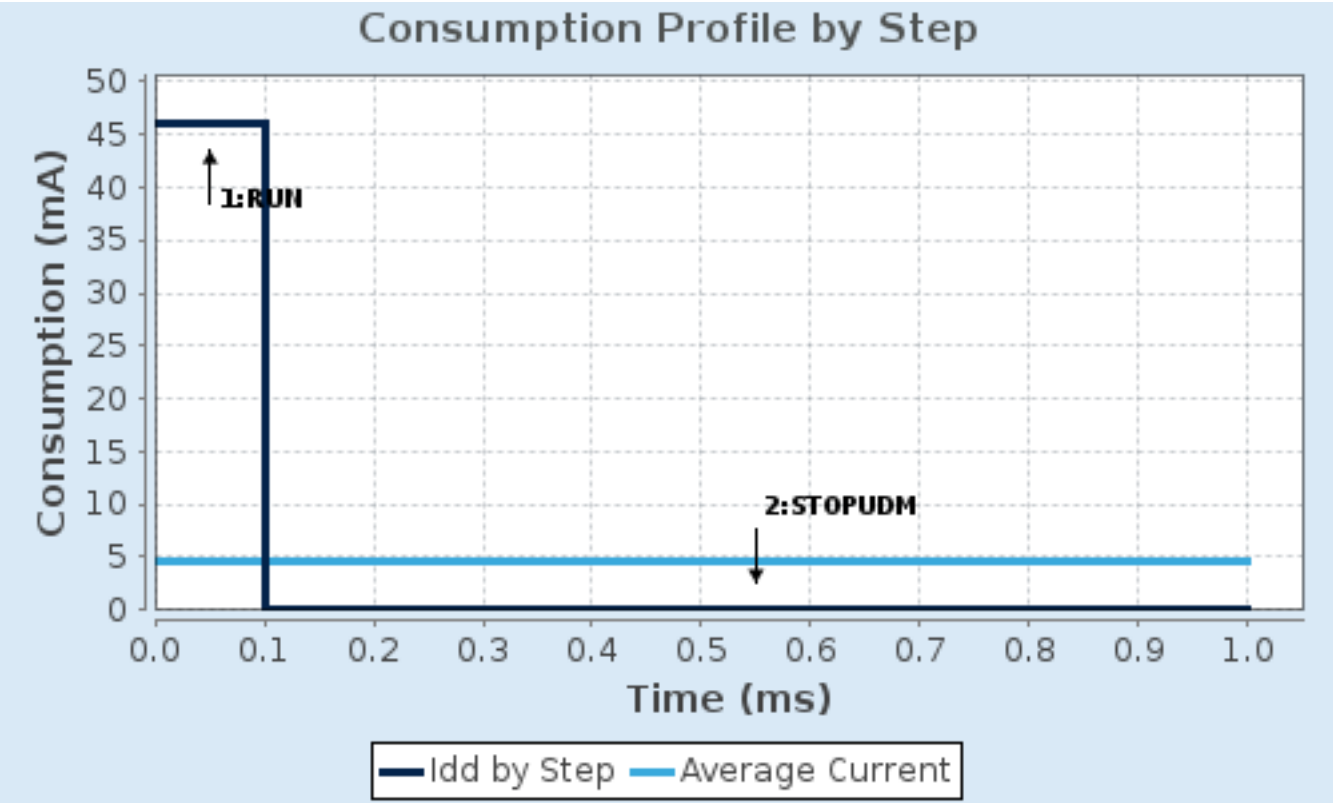
1.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP_UDM (Under Drive)
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	RAM/FLASH/REGON/ART/PREFETCH	n/a
CPU Frequency	180 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator_LP Flash-PwrDwn
Clock Source Frequency	4 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	46 mA	55 µA
Duration	0.1 ms	0.9 ms
DMIPS	225.0	0.0
Ta Max	98.02	104.99
Category	In DS Table	In DS Table

1.5. Results

Sequence Time	1 ms	Average Current	4.65 mA
Battery Life	1 month	Average DMIPS	225.0 DMIPS

1.6. Chart


Consumption Profile by Step
Consumption (mA)
50
45
40
35
30
25
20
15
10
5
0
1:RUN
2:STOPUDM
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

2. Peripherals and Middlewares Configuration

2.1. CRC

mode: Activated

2.2. I2C1

I2C: I2C

2.2.1. 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

2.3. I2C2

I2C: SMBus-two-wire-Interface

2.3.1. Parameter Settings:

Timing configuration:

Clock Speed (Hz)	100000

SMBus Slave Features:

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

SMBus Features:

Packet Error Check Mode	PEC Disabled
Peripheral Mode	**Peripheral Mode Smbus Master ***

Timeout configuration:

Timeout	0x00008019

2.4. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

mode: Master Clock Output 2

2.4.1. 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
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
Power Over Drive	Enabled

2.5. SPI1

Mode: Transmit Only Master

2.5.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**8 ***
Baud Rate	**11.25 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

2.6. SPI3

Mode: Transmit Only Master

2.6.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	**8 ***
Baud Rate	**5.625 MBits/s ***
Clock Polarity (CPOL)	**High ***
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

2.7. SYS

Debug: JTAG (4 pins)

Timebase Source: TIM11

2.8. TIM1

Combined Channels: Encoder Mode

2.8.1. 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 and TI2 ***
____ Parameters for Channel 1 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	**0x0F ***
____ Parameters for Channel 2 ____	
Polarity	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter	**0x0F ***

2.9. TIM3

Channel3: PWM Generation CH3

2.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**8 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**999 ***
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 3:

Mode	PWM mode 1
Pulse (16 bits value)	**500 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

2.10. TIM4

Channel1: Output Compare No Output

2.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**89 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**99 ***
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)

Output Compare No Output Channel 1:

Mode	Frozen (used for Timing base)
Pulse (16 bits value)	0
Output compare preload	Disable
CH Polarity	High

2.11. TIM8

Channel1: PWM Generation No Output

2.11.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**95 ***
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)

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High

Break And Dead Time management - Output Configuration:

Automatic Output State	Disable
Off State Selection for Run Mode (OSSR)	Disable
Off State Selection for Idle Mode (OSSI)	Disable
Lock Configuration	Off

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0

Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High
CH Idle State	Reset

2.12. TIM9

Channel1: PWM Generation CH1

2.12.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**179 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**999 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	**500 ***
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

2.13. TIM10

mode: Activated

Channel1: PWM Generation No Output

2.13.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**179 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**9999 ***
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

2.14. USART1

Mode: Asynchronous

2.14.1. 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

2.15. USART6

Mode: Asynchronous

2.15.1. Parameter Settings:

Basic Parameters:

Baud Rate	**250000 ***
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	**2 ***

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

2.16. USB_OTG_HS

Internal FS Phy: Host_Only

2.16.1. Parameter Settings:

Speed	Host Full Speed 12MBit/s
Enable internal IP DMA	Disabled

Physical interface	Internal Phy
Signal start of frame	Disabled

2.17. FATFS
mode: USB Disk
2.17.1. Set Defines:

Version:

FATFS version	R0.12c

Function Parameters:

FS_READONLY (Read-only mode)	Disabled
FS_MINIMIZE (Minimization level)	Disabled
USE_STRFUNC (String functions)	Enabled with LF -> CRLF conversion
USE_FIND (Find functions)	Disabled
USE_MKFS (Make filesystem function)	Enabled
USE_FASTSEEK (Fast seek function)	Enabled
USE_EXPAND (Use f_expand function)	Disabled
USE_CHMOD (Change attributes function)	Disabled
USE_LABEL (Volume label functions)	Disabled
USE_FORWARD (Forward function)	Disabled

Locale and Namespace Parameters:

CODE_PAGE (Code page on target)	Latin 1
USE_LFN (Use Long Filename)	Disabled
MAX_LFN (Max Long Filename)	255
LFN_UNICODE (Enable Unicode)	ANSI/OEM
STRF_ENCODE (Character encoding)	UTF-8
FS_RPATH (Relative Path)	Disabled

Physical Drive Parameters:

VOLUMES (Logical drives)	1
MAX_SS (Maximum Sector Size)	512
MIN_SS (Minimum Sector Size)	512
MULTI_PARTITION (Volume partitions feature)	Disabled
USE_TRIM (Erase feature)	Disabled
FS_NOFSINFO (Force full FAT scan)	0

System Parameters:

FS_TINY (Tiny mode)	Disabled
FS_EXFAT (Support of exFAT file system)	Disabled
FS_NORTC (Timestamp feature)	Dynamic timestamp
FS_REENTRANT (Re-Entrancy)	Enabled
FS_TIMEOUT (Timeout ticks)	1000

USE_MUTEX	Disabled
SYNC_t (O/S sync object)	osSemaphoreId_t
FS_LOCK (Number of files opened simultaneously)	2

2.17.2. Advanced Settings:

USBH:

USBH instance	USB Host MSC HS
Use dma template	Disabled

2.18. FREERTOS

Interface: CMSIS_V2

2.18.1. Config parameters:

API:

FreeRTOS API	CMSIS v2

Versions:

FreeRTOS version	10.3.1
CMSIS-RTOS version	2.00

MPU/FPU:

ENABLE_MPU	Disabled
ENABLE_FPU	**Enabled ***

Kernel settings:

USE_PREEMPTION	Enabled
CPU_CLOCK_HZ	SystemCoreClock
TICK_RATE_HZ	1000
MAX_PRIORITIES	56
MINIMAL_STACK_SIZE	128
MAX_TASK_NAME_LEN	16
USE_16_BIT_TICKS	Disabled
IDLE_SHOULD_YIELD	Enabled
USE_MUTEXES	Enabled
USE_RECURSIVE_MUTEXES	Enabled
USE_COUNTING_SEMAPHORES	Enabled
QUEUE_REGISTRY_SIZE	8
USE_APPLICATION_TASK_TAG	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Disabled
USE_TICKLESS_IDLE	Disabled

USE_TASK_NOTIFICATIONS	Enabled
RECORD_STACK_HIGH_ADDRESS	Disabled

Memory management settings:

Memory Allocation	Dynamic / Static
TOTAL_HEAP_SIZE	**32768 ***
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	Enabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

Software timer definitions:

USE_TIMERS	Enabled
TIMER_TASK_PRIORITY	2
TIMER_QUEUE_LENGTH	10
TIMER_TASK_STACK_DEPTH	256

Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

Added with 10.2.1 support:

MESSAGE_BUFFER_LENGTH_TYPE	size_t
USE_POSIX_ERRNO	Disabled

CMSIS-RTOS V2 flags:

USE_OS2_THREAD_SUSPEND_RESUME	Enabled
USE_OS2_THREAD_ENUMERATE	Enabled
USE_OS2_EVENTFLAGS_FROM_ISR	Enabled
USE_OS2_THREAD_FLAGS	Enabled
USE_OS2_TIMER	Enabled
USE_OS2_MUTEX	Enabled

2.18.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Enabled
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Enabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Enabled
xTaskGetCurrentTaskHandle	Enabled
eTaskGetState	Enabled
xEventGroupSetBitFromISR	Disabled
xTimerPendFunctionCall	Enabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled
uxTaskGetStackHighWaterMark2	Disabled

2.18.3. Advanced settings:

Newlib settings (see parameter description first):

USE_NEWLIB_REENTRANT	**Enabled ***

Project settings (see parameter description first):

Use FW pack heap file	Enabled

2.19. USB_HOST

Class For HS IP: Host Supporting ALL Classes

2.19.1. Parameter Settings:

NO_SW_VBUS_DRIVE_HS	false

Host Configuration:

USBH_MAX_NUM_ENDPOINTS (Maximum number of endpoints)	5
USBH_MAX_NUM_INTERFACES (Maximun number of interfaces)	10
USBH_MAX_NUM_SUPPORTED_CLASS (Maximun number of supported class)	5

USBH_MAX_NUM_CONFIGURATION (Maximun number of supported configuration)	1
USBH_KEEP_CFG_DESCRIPTOR (Keep the configuration into RAM)	Enabled
USBH_MAX_SIZE_CONFIGURATION (Maximun size in bytes for the Configuration Descriptor)	256
USBH_MAX_DATA_BUFFER (Maximun size of temporary data)	512
USBH_DEBUG_LEVEL (USBH Debug Level)	**2: User + Error messages ***

CMSIS_RTOS:

USBH_USE_OS (Enable the support of an RTOS)	Enabled
USBH_PROCESS_PRIO (The CMSIS-RTOS osPriority value specifies the priority for the USB Host thread)	priority: normal (default)
USBH_PROCESS_STACK_SIZE (The CMSIS-RTOS stack size requirements in words)	**2048 ***

2.19.2. Platform Settings:

Drive_VBUS_HS	PB13

*** User modified value**

3. System Configuration

3.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB7	I2C1_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PB8	I2C1_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
I2C2	PB10	I2C2_SCL	Alternate Function Open Drain	No pull-up and no pull-down	Low	
	PC12	I2C2_SDA	Alternate Function Open Drain	No pull-up and no pull-down	Low	
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	
	PC9	RCC_MCO_2	Alternate Function Push Pull	No pull-up and no pull-down	Low	USB_HUB_CLK
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	DISP_SCK [Display]
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Low	DISP_MOSI [Display]
SPI3	PC1	SPI3_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Low	LED_SDI [LED Driver]
	PC10	SPI3_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	LED_CLK [LED Driver]
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA15	SYS_JTDI	n/a	n/a	n/a	
	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	
TIM1	PA8	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_CH1
	PA9	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	ENC_CH2
TIM3	PB0	TIM3_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	LED_OE [LED Driver]
TIM9	PA2	TIM9_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	BUZZ_DIN [Piezo]
USART1	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB6	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USART6	PC6	USART6_TX	Alternate Function Push Pull	No pull-up and no pull-down	Low	DMX512_TX
	PC7	USART6_RX	Alternate Function Push Pull	No pull-up and no pull-down	Low	DMX512_RX
USB_OTG_HS	PB14	USB_OTG_HS_DM	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PB15	USB_OTG_HS_DP	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
GPIO	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_LE [LED Driver]
	PA0-WKUP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BUZZ_EN1 [Piezo]

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BUZZ_EN2 [Piezo]
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_CS [Display]
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_DC [Display]
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DISP_RESET [Display]
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_HUB_RESET
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_DRIVE_VBUS
	PC8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DMX512_TX_EN
	PA11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DMX512_RX_EN
	PC11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_SFLT [Safelight]
	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RELAY_ENLG [Enlarger]
	PB5	GPIO_EXTI5	**External Interrupt Mode with Falling edge trigger detection**	No pull-up and no pull-down	n/a	KEY_INT [Keypad]

3.2. DMA configuration

DMA request	Stream	Direction	Priority
USART6_TX	DMA2_Stream6	Memory To Peripheral	Low

USART6_TX: DMA2_Stream6 DMA request Settings:

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

3.3. NVIC configuration

3.3.1. 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	15	0
System tick timer	true	15	0
EXTI line[9:5] interrupts	true	5	0
TIM1 update interrupt and TIM10 global interrupt	true	5	0
TIM1 trigger and commutation interrupts and TIM11 global interrupt	true	15	0
TIM1 capture compare interrupt	true	5	0
TIM4 global interrupt	true	5	0
TIM8 break interrupt and TIM12 global interrupt	true	15	0
TIM8 capture compare interrupt	true	5	0
DMA2 stream6 global interrupt	true	5	0
USART6 global interrupt	true	5	0
USB On The Go HS global interrupt	true	5	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM3 global interrupt	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
SPI1 global interrupt	unused		
USART1 global interrupt	unused		
TIM8 update interrupt and TIM13 global interrupt	unused		
TIM8 trigger and commutation interrupts and TIM14 global interrupt	unused		
SPI3 global interrupt	unused		
USB On The Go HS End Point 1 Out global interrupt	unused		

Interrupt Table	Enable	Preenmption Priority	SubPriority
USB On The Go HS End Point 1 In global interrupt	unused		
FPU global interrupt	unused		

3.3.2. NVIC Code generation

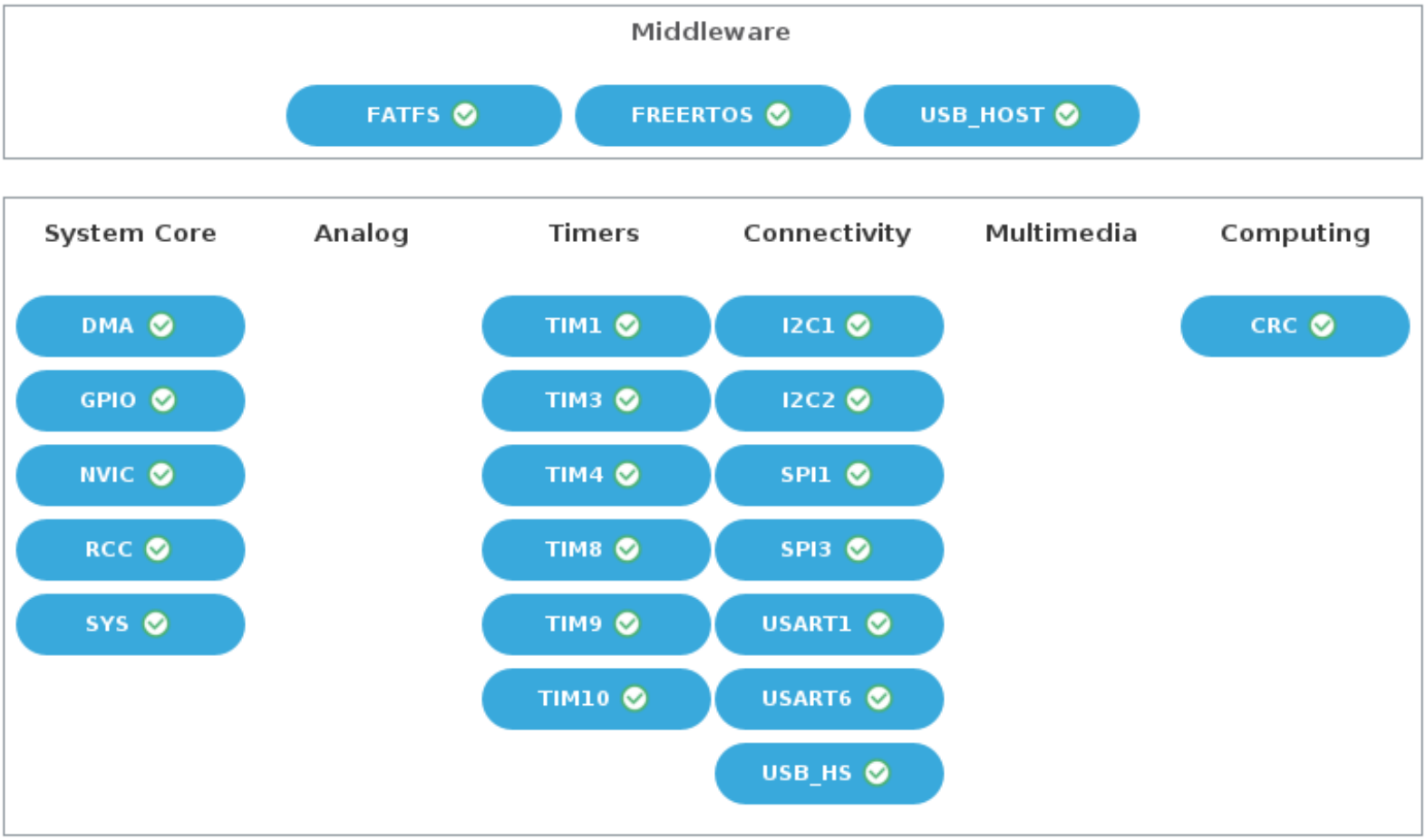
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Non maskable interrupt	false	true	false
Hard fault interrupt	false	true	false
Memory management fault	false	true	false
Pre-fetch fault, memory access fault	false	true	false
Undefined instruction or illegal state	false	true	false
System service call via SWI instruction	false	false	false
Debug monitor	false	true	false
Pendable request for system service	false	false	false
System tick timer	false	false	true
EXTI line[9:5] interrupts	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
TIM1 capture compare interrupt	false	true	true
TIM4 global interrupt	false	true	true
TIM8 break interrupt and TIM12 global interrupt	false	true	true
TIM8 capture compare interrupt	false	true	true
DMA2 stream6 global interrupt	false	true	true
USART6 global interrupt	false	true	true
USB On The Go HS global interrupt	false	true	true

*** User modified value**

4. System Views

4.1. Category view

4.1.1. Current



5. Docs & Resources

Type	Link
BSDL files	https://www.st.com/resource/en/bsdl_model/stm32f446_bsdl.zip
IBIS models	https://www.st.com/resource/en/ibis_model/stm32f446_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
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Flyers	https://www.st.com/resource/en/flyer/flstm32trust.pdf
Product Certifications	https://www.st.com/resource/en/certification_document/stm32_authentication_can.pdf
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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/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
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Application Notes for related Tools & Software	https://www.st.com/resource/en/application_note/an4499-stm32--nrf51822-bluetooth-low-energy-system-solution-stmicroelectronics.pdf
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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
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