
STM32
CubeMX

1. Description

1.1. Project

Project Name	STM32F334R8_BatteryLVControl_1
Board Name	custom
Generated with:	STM32CubeMX 6.6.1
Date	01/05/2023

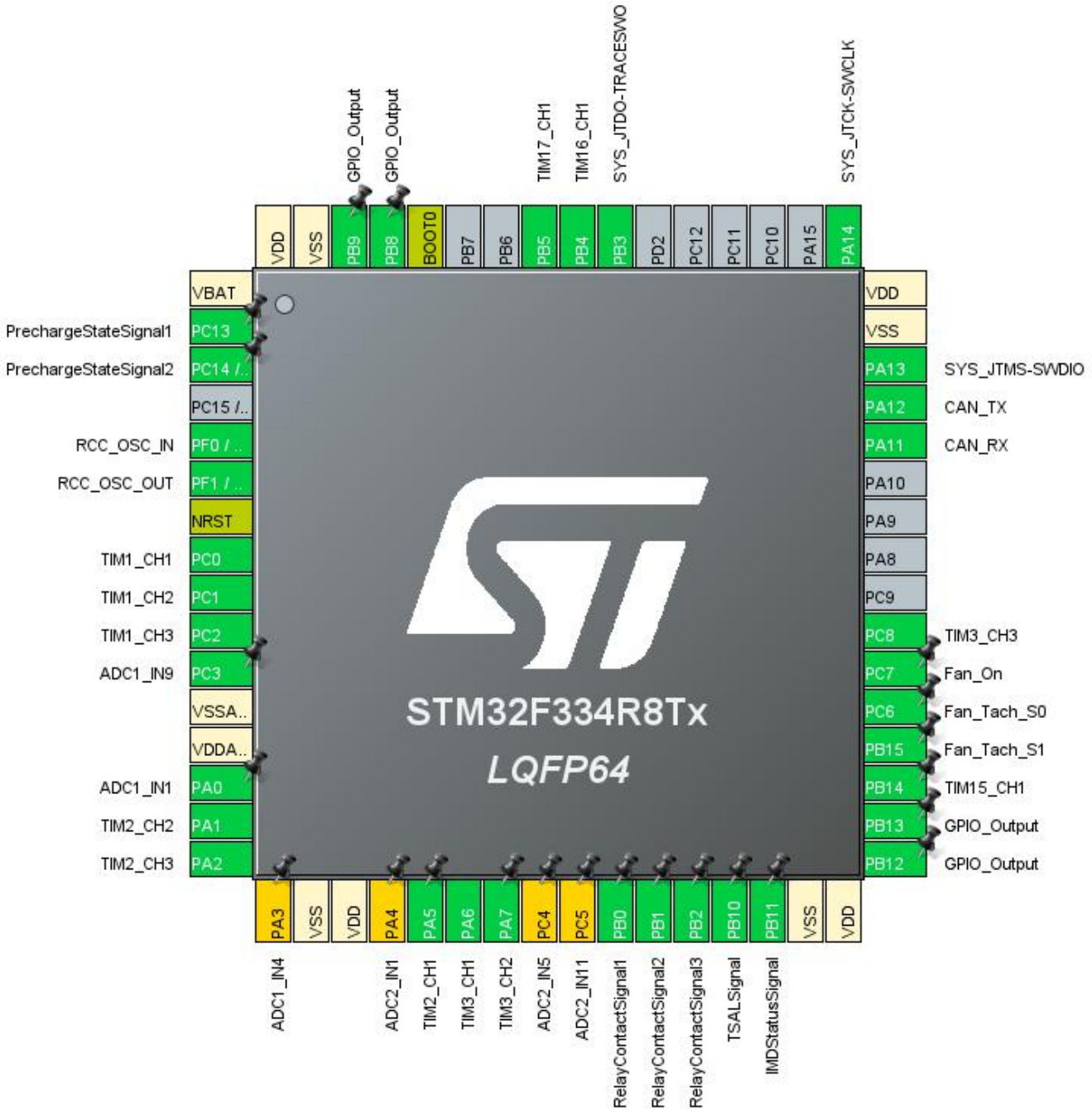
1.2. MCU

MCU Series	STM32F3
MCU Line	STM32F334
MCU name	STM32F334R8Tx
MCU Package	LQFP64
MCU Pin number	64

1.3. Core(s) information

Core(s)	Arm Cortex-M4

2. Pinout Configuration



3. Pins Configuration

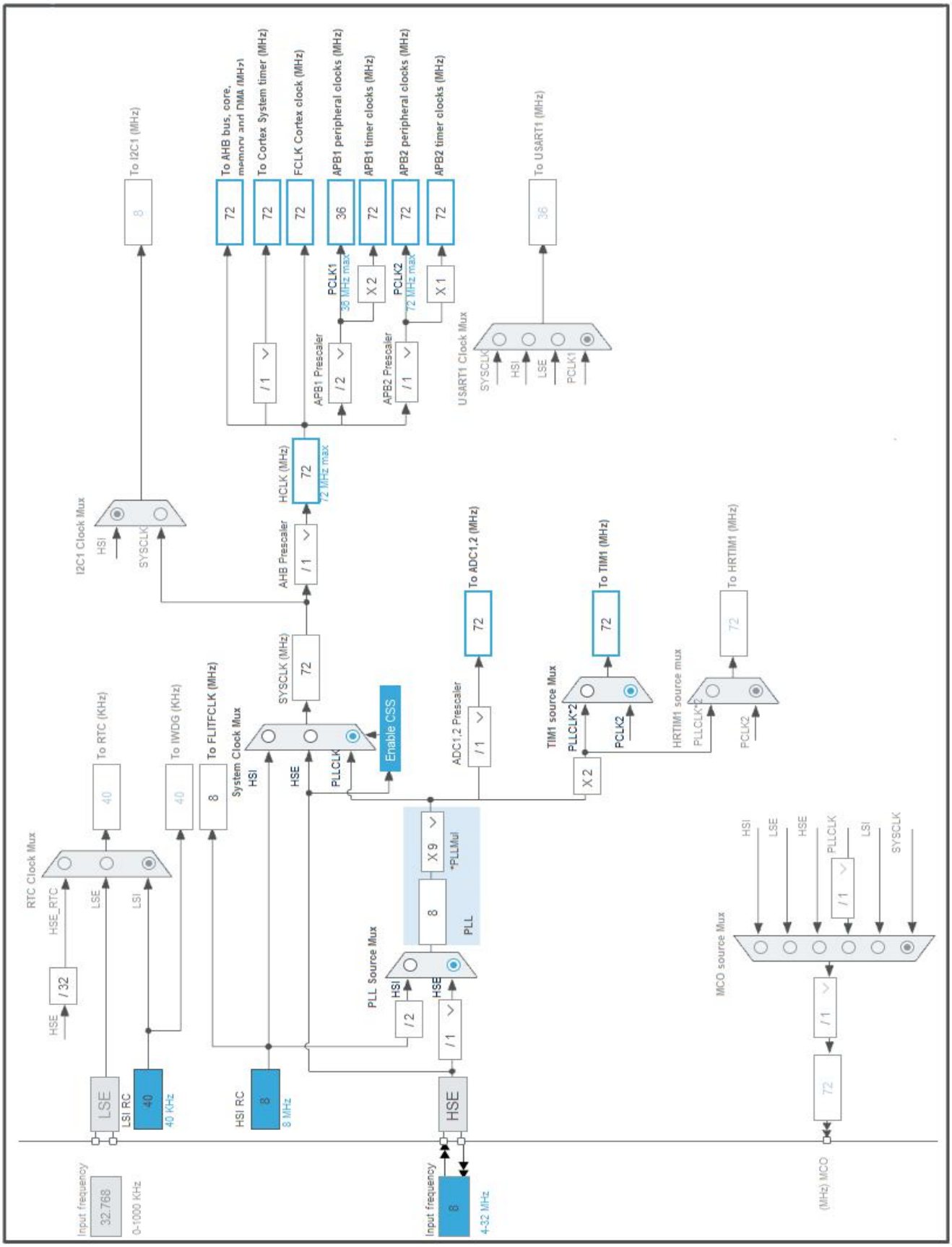
Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13 *	I/O	GPIO_Input	PrechargeStateSignal1
3	PC14 / OSC32_IN *	I/O	GPIO_Input	PrechargeStateSignal2
5	PF0 / OSC_IN	I/O	RCC_OSC_IN	
6	PF1 / OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	PC0	I/O	TIM1_CH1	
9	PC1	I/O	TIM1_CH2	
10	PC2	I/O	TIM1_CH3	
11	PC3	I/O	ADC1_IN9	
12	VSSA/VREF-	Power		
13	VDDA/VREF+	Power		
14	PA0	I/O	ADC1_IN1	
15	PA1	I/O	TIM2_CH2	
16	PA2	I/O	TIM2_CH3	
17	PA3 **	I/O	ADC1_IN4	
18	VSS	Power		
19	VDD	Power		
20	PA4 **	I/O	ADC2_IN1	
21	PA5	I/O	TIM2_CH1	
22	PA6	I/O	TIM3_CH1	
23	PA7	I/O	TIM3_CH2	
24	PC4 **	I/O	ADC2_IN5	
25	PC5 **	I/O	ADC2_IN11	
26	PB0 *	I/O	GPIO_Input	RelayContactSignal1
27	PB1 *	I/O	GPIO_Input	RelayContactSignal2
28	PB2 *	I/O	GPIO_Input	RelayContactSignal3
29	PB10 *	I/O	GPIO_Input	TSALSignal
30	PB11 *	I/O	GPIO_Input	IMDStatusSignal
31	VSS	Power		
32	VDD	Power		
33	PB12 *	I/O	GPIO_Output	
34	PB13 *	I/O	GPIO_Output	
35	PB14	I/O	TIM15_CH1	
36	PB15 *	I/O	GPIO_Output	Fan_Tach_S1
37	PC6 *	I/O	GPIO_Output	Fan_Tach_S0

Pin Number LQFP64	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
38	PC7 *	I/O	GPIO_Output	Fan_On
39	PC8	I/O	TIM3_CH3	
44	PA11	I/O	CAN_RX	
45	PA12	I/O	CAN_TX	
46	PA13	I/O	SYS_JTMS-SWDIO	
47	VSS	Power		
48	VDD	Power		
49	PA14	I/O	SYS_JTCK-SWCLK	
55	PB3	I/O	SYS_JTDO-TRACESWO	
56	PB4	I/O	TIM16_CH1	
57	PB5	I/O	TIM17_CH1	
60	BOOT0	Boot		
61	PB8 *	I/O	GPIO_Output	
62	PB9 *	I/O	GPIO_Output	
63	VSS	Power		
64	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



5. Software Project

5.1. Project Settings

Name	Value
Project Name	STM32F334R8_BatteryLVControl_1
Project Folder	D:\RACE\08_HAN_Code\STM32F334R8_BatteryLVControl_1\STM32F334R8_B
Toolchain / IDE	STM32CubeIDE
Firmware Package Name and Version	STM32Cube FW_F3 V1.11.3
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_CAN_Init	CAN
4	MX_TIM1_Init	TIM1
5	MX_TIM2_Init	TIM2
6	MX_TIM3_Init	TIM3
7	MX_TIM15_Init	TIM15
8	MX_ADC1_Init	ADC1
9	MX_TIM16_Init	TIM16
10	MX_DMA_Init	DMA
11	MX_TIM17_Init	TIM17

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F3
Line	STM32F334
MCU	STM32F334R8Tx
Datasheet	DS9994 Rev6

6.2. Parameter Selection

Temperature	25
Vdd	3.6

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

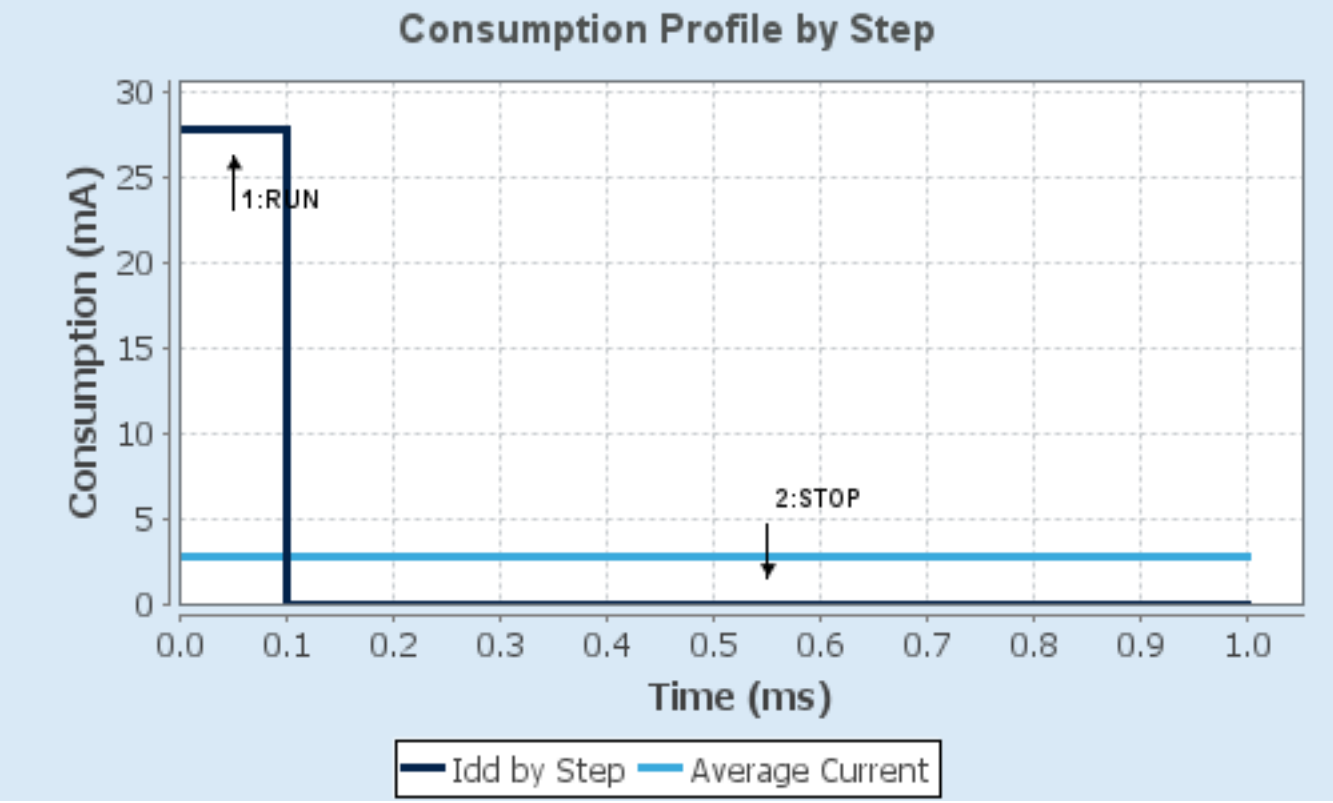
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.6	3.6
Voltage Source	Battery	Battery
Range	No Scale	No Scale
Fetch Type	RAM	n/a
CPU Frequency	72 MHz	0 Hz
Clock Configuration	HSEBYP PLL	Regulator_LP
Clock Source Frequency	8 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	27.84 mA	9.55 µA
Duration	0.1 ms	0.9 ms
DMIPS	90.0	0.0
Ta Max	100.49	105
Category	In DS Table	In DS Table

6.5. Results

Sequence Time	1 ms	Average Current	2.79 mA
Battery Life	1 month, 20 days, 5 hours	Average DMIPS	90.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
30
25
20
15
10
5
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

IN1: IN1 Single-ended

mode: IN9

7.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode	Independent mode

ADC_Settings:

Clock Prescaler	ADC Asynchronous clock mode
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Conversion Mode	Enabled
Continuous Conversion Mode	**Enabled ***
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	**Enabled ***
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data overwritten
Low Power Auto Wait	Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions	Enable
Number Of Conversion	**2 ***
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None
SequencerNbRanks	1
Rank	1
Channel	Channel 1
Sampling Time	1.5 Cycles
Offset Number	No offset
Offset	0
Rank	**2 ***
Channel	**Channel 9 ***
Sampling Time	1.5 Cycles
Offset Number	No offset
Offset	0

ADC_Injected_ConversionMode:

Enable Injected Conversions	Enable
Number Of Conversions	0

Analog Watchdog 1:

Enable Analog WatchDog1 Mode	false

Analog Watchdog 2:

Enable Analog WatchDog2 Mode	false

Analog Watchdog 3:

Enable Analog WatchDog3 Mode	false

7.2. CAN

mode: Activated

7.2.1. Parameter Settings:

Bit Timings Parameters:

Prescaler (for Time Quantum)	**9 ***
Time Quantum	**250.0 ***
Time Quanta in Bit Segment 1	**16 Times ***
Time Quanta in Bit Segment 2	**8 Times ***
Time for one Bit	**6250 ***
Baud Rate	**160000 ***
ReSynchronization Jump Width	1 Time

Basic Parameters:

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

Advanced Parameters:

Operating Mode	Normal

7.3. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

7.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)	3.3
Prefetch Buffer	Enabled
Flash Latency(WS)	2 WS (3 CPU cycle)

RCC Parameters:

HSI Calibration Value	16
HSE Startup Timout Value (ms)	100
LSE Startup Timout Value (ms)	5000

7.4. SYS

Debug: Trace Asynchronous Sw

Timebase Source: SysTick

7.5. TIM1

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

7.5.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**20-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**288-1 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 16 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 TRGO	Reset (UG bit from TIMx_EGR)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High
BRK Filter (4 bits value)	0

Break And Dead Time management - BRK2 Configuration:

BRK2 State	Disable
BRK2 Polarity	High
BRK2 Filter (4 bits value)	0

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

Clear Input:

Clear Input Source	Disable

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

PWM Generation Channel 2:

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

PWM Generation Channel 3:

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

7.6. TIM2

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

7.6.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**10-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value)	**288-1 ***
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 TRGO	Reset (UG bit from TIMx_EGR)

Clear Input:

Clear Input Source	Disable

PWM Generation Channel 1:

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

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

7.7. TIM3

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

7.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**10-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**288-1 ***
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 TRGO	Reset (UG bit from TIMx_EGR)

Clear Input:

Clear Input Source	Disable

PWM Generation Channel 1:

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

PWM Generation Channel 2:

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

PWM Generation Channel 3:

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

7.8. TIM15

Channel1: Input Capture direct mode

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**72-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**99 ***
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)

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

7.9. TIM16

mode: Activated

Channel1: Input Capture direct mode

7.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**72-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**99 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

7.10. TIM17

mode: Activated

Channel1: Input Capture direct mode

7.10.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	**72-1 ***
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**99 ***
Internal Clock Division (CKD)	No Division
Repetition Counter (RCR - 8 bits value)	0
auto-reload preload	Disable

Input Capture Channel 1:

Polarity Selection	Rising Edge
IC Selection	Direct
Prescaler Division Ratio	No division
Input Filter (4 bits value)	0

*** 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	PC3	ADC1_IN9	Analog mode	No pull-up and no pull-down	n/a	
	PA0	ADC1_IN1	Analog mode	No pull-up and no pull-down	n/a	
CAN	PA11	CAN_RX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
	PA12	CAN_TX	Alternate Function Push Pull	No pull-up and no pull-down	**High ***	
RCC	PF0 / OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PF1 / OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PB3	SYS_JTDO-TRACESWO	n/a	n/a	n/a	
TIM1	PC0	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC1	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC2	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM2	PA1	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA2	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA5	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM3	PA6	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA7	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC8	TIM3_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM15	PB14	TIM15_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM16	PB4	TIM16_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
TIM17	PB5	TIM17_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
Single Mapped Signals	PA3	ADC1_IN4	Analog mode	No pull-up and no pull-down	n/a	
	PA4	ADC2_IN1	Analog mode	No pull-up and no pull-down	n/a	
	PC4	ADC2_IN5	Analog mode	No pull-up and no pull-down	n/a	
	PC5	ADC2_IN11	Analog mode	No pull-up and no pull-down	n/a	
GPIO	PC13	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	PrechargeStateSignal1
	PC14 / OSC32_IN	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	PrechargeStateSignal2
	PB0	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	RelayContactSignal1
	PB1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	RelayContactSignal2
	PB2	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	RelayContactSignal3
	PB10	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	TSALSignal

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	IMDStatusSignal
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Fan_Tach_S1
	PC6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Fan_Tach_S0
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	Fan_On
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	

8.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA1_Channel1	Peripheral To Memory	Low

ADC1: DMA1_Channel1 DMA request Settings:

Mode:	**Circular ***
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	**Word ***
Memory Data Width:	**Word ***

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
DMA1 channel1 global interrupt	true	0	0
CAN RX0 interrupt	true	0	0
CAN RX1 interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1 and ADC2 interrupts	unused		
CAN TX interrupt	unused		
CAN SCE interrupt	unused		
TIM1 break and TIM15 interrupts	unused		
TIM1 update and TIM16 interrupts	unused		
TIM1 trigger and commutation and TIM17 interrupts	unused		
TIM1 capture compare interrupt	unused		
TIM2 global interrupt	unused		
TIM3 global interrupt	unused		
Floating point unit 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
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

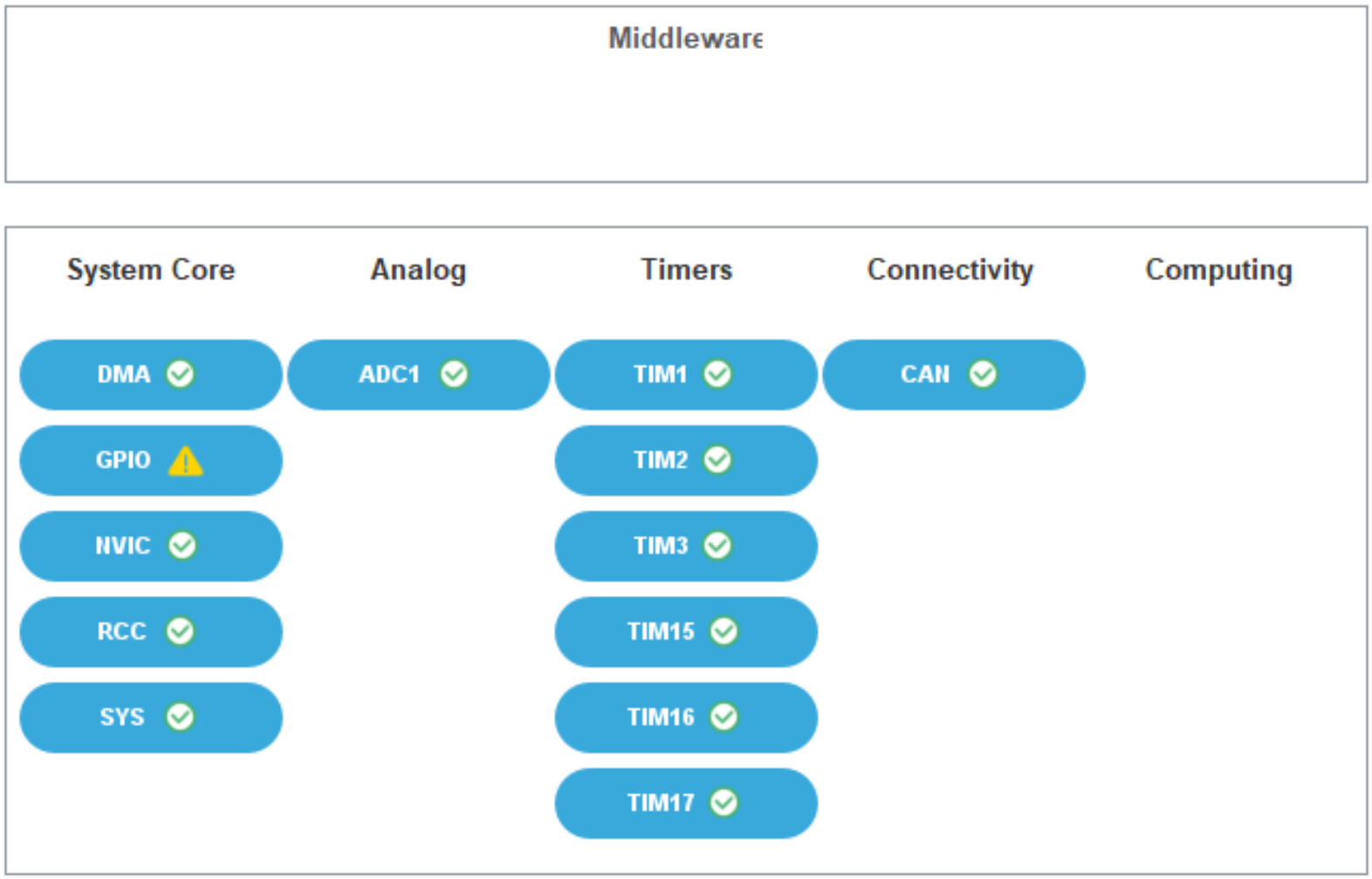
Enabled interrupt Table	Select for init sequence ordering	Generate IRQ handler	Call HAL handler
Pendable request for system service	false	true	false
System tick timer	false	true	true
DMA1 channel1 global interrupt	false	true	true
CAN RX0 interrupt	false	true	true
CAN RX1 interrupt	false	true	true

*** User modified value**

9. System Views

9.1. Category view

9.1.1. Current



10. Docs & Resources

Type	Link
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_sc2155.pdf
Brochures	https://www.st.com/resource/en/brochure/breveco0518.pdf
Brochures	https://www.st.com/resource/en/brochure/brstm32f3.pdf
Flyers	https://www.st.com/resource/en/flyer/flnucleolrwan.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/flpowerstbd.pdf
Flyers	https://www.st.com/resource/en/flyer/fldpstpfc11120.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/an2548-using-the-stm32f0f1f3gxlx-series-dma-controller-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/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/an3236-increase-the-number-of-touchkeys-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an3960-esd-considerations-for-touch-sensing-applications-on-mcus-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4013-stm32-crossseries-timer-overview-stmicroelectronics.pdf
Application Notes	https://www.st.com/resource/en/application_note/an4045-stm32f3-series-inapplication-programming-iap-using-the-usart-stmicroelectronics.pdf
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