

1. Description

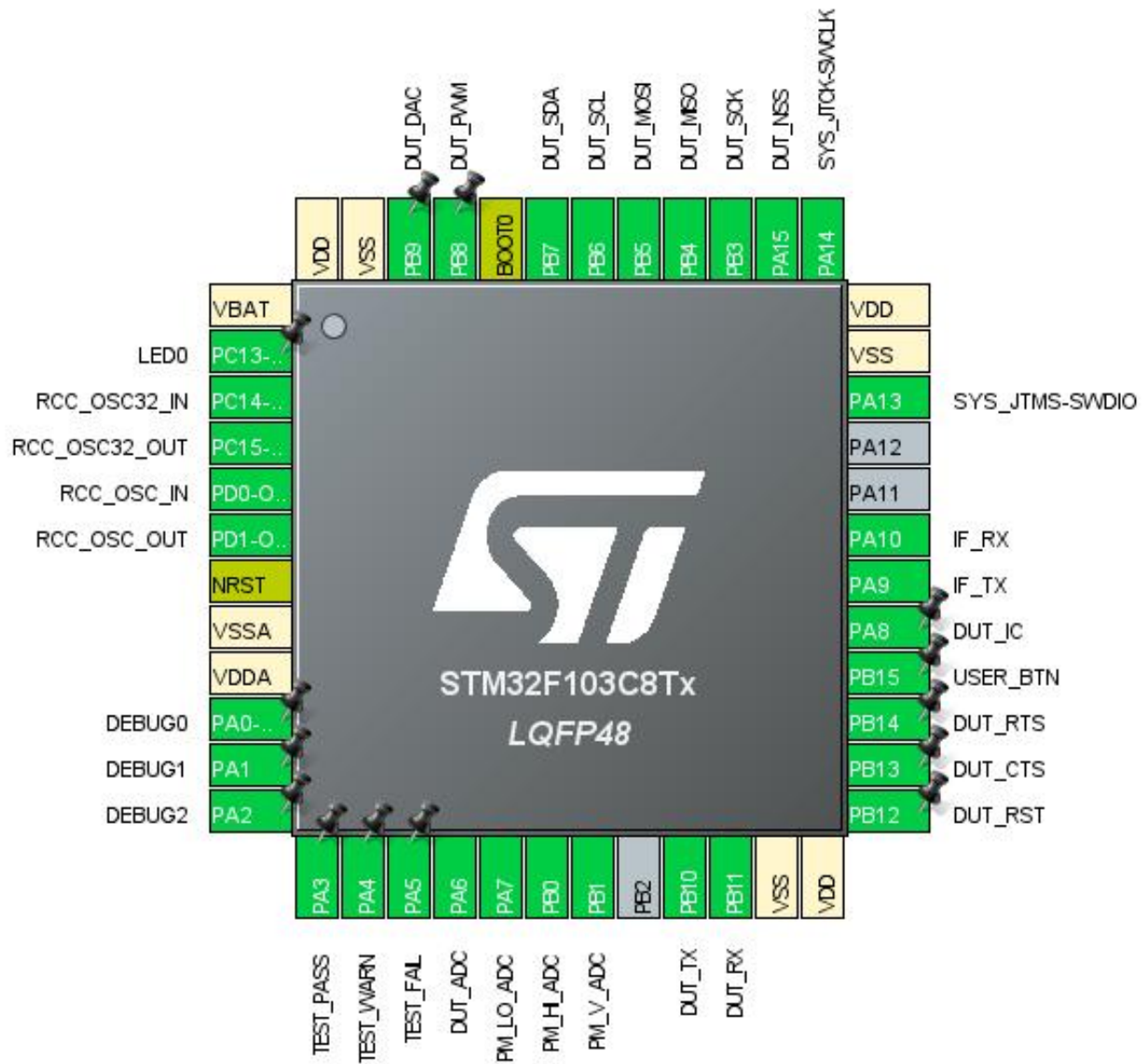
1.1. Project

Project Name	PHiLiP-BLUEPILL
Board Name	bluepill_tester
Generated with:	STM32CubeMX 5.6.0
Date	02/25/2020

1.2. MCU

MCU Series	STM32F1
MCU Line	STM32F103
MCU name	STM32F103C8Tx
MCU Package	LQFP48
MCU Pin number	48

2. Pinout Configuration



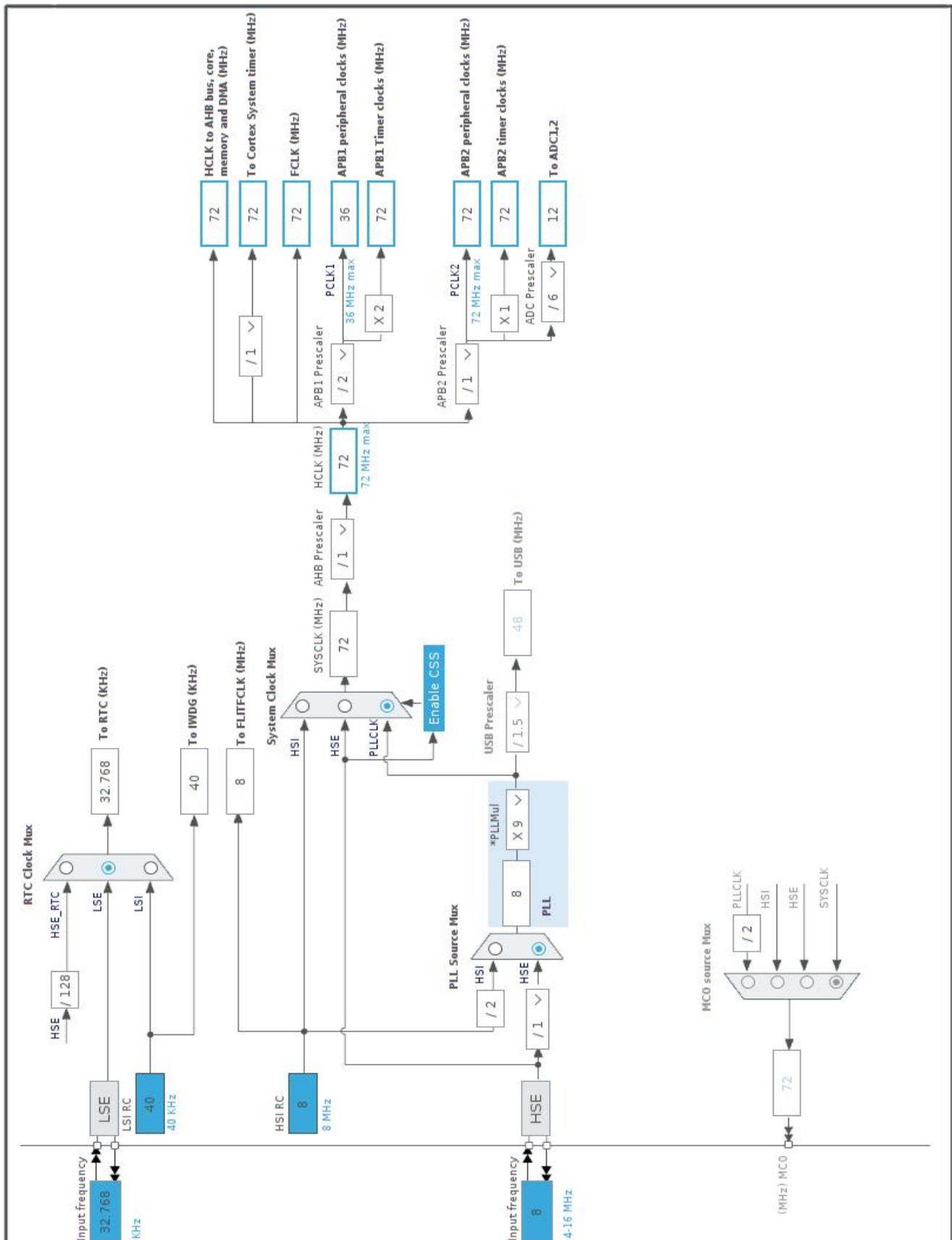
3. Pins Configuration

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VBAT	Power		
2	PC13-TAMPER-RTC *	I/O	GPIO_Output	LED0
3	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
4	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
5	PD0-OSC_IN	I/O	RCC_OSC_IN	
6	PD1-OSC_OUT	I/O	RCC_OSC_OUT	
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0-WKUP *	I/O	GPIO_Output	DEBUG0
11	PA1 *	I/O	GPIO_Output	DEBUG1
12	PA2 *	I/O	GPIO_Output	DEBUG2
13	PA3 *	I/O	GPIO_Output	TEST_PASS
14	PA4 *	I/O	GPIO_Output	TEST_WARN
15	PA5 *	I/O	GPIO_Output	TEST_FAIL
16	PA6	I/O	ADC2_IN6	DUT_ADC
17	PA7	I/O	ADC1_IN7	PM_LO_ADC
18	PB0	I/O	ADC1_IN8	PM_HI_ADC
19	PB1	I/O	ADC1_IN9	PM_V_ADC
21	PB10	I/O	USART3_TX	DUT_TX
22	PB11	I/O	USART3_RX	DUT_RX
23	VSS	Power		
24	VDD	Power		
25	PB12 *	I/O	GPIO_Output	DUT_RST
26	PB13	I/O	GPIO_EXTI13	DUT_CTS
27	PB14 *	I/O	GPIO_Output	DUT_RTS
28	PB15 *	I/O	GPIO_Input	USER_BTN
29	PA8	I/O	TIM1_CH1	DUT_IC
30	PA9	I/O	USART1_TX	IF_TX
31	PA10	I/O	USART1_RX	IF_RX
34	PA13	I/O	SYS_JTMS-SWDIO	
35	VSS	Power		
36	VDD	Power		
37	PA14	I/O	SYS_JTCK-SWCLK	
38	PA15	I/O	SPI1_NSS	DUT_NSS
39	PB3	I/O	SPI1_SCK	DUT_SCK

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
40	PB4	I/O	SPI1_MISO	DUT_MISO
41	PB5	I/O	SPI1_MOSI	DUT_MOSI
42	PB6	I/O	I2C1_SCL	DUT_SCL
43	PB7	I/O	I2C1_SDA	DUT_SDA
44	BOOT0	Boot		
45	PB8	I/O	TIM4_CH3	DUT_PWM
46	PB9	I/O	TIM4_CH4	DUT_DAC
47	VSS	Power		
48	VDD	Power		

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	PHiLiP-BLUEPiLL
Project Folder	/home/kevinweiss/WorkingDirectory/PHiLiP/STMCUBE_GENERATION/PHiLiP-
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_F1 V1.8.0

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
Delete previously generated files when not re-generated	Yes
Set all free pins as analog (to optimize the power consumption)	No

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32F1
Line	STM32F103
MCU	STM32F103C8Tx
Datasheet	13587_Rev17

6.2. Parameter Selection

Temperature	25
Vdd	3.3

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

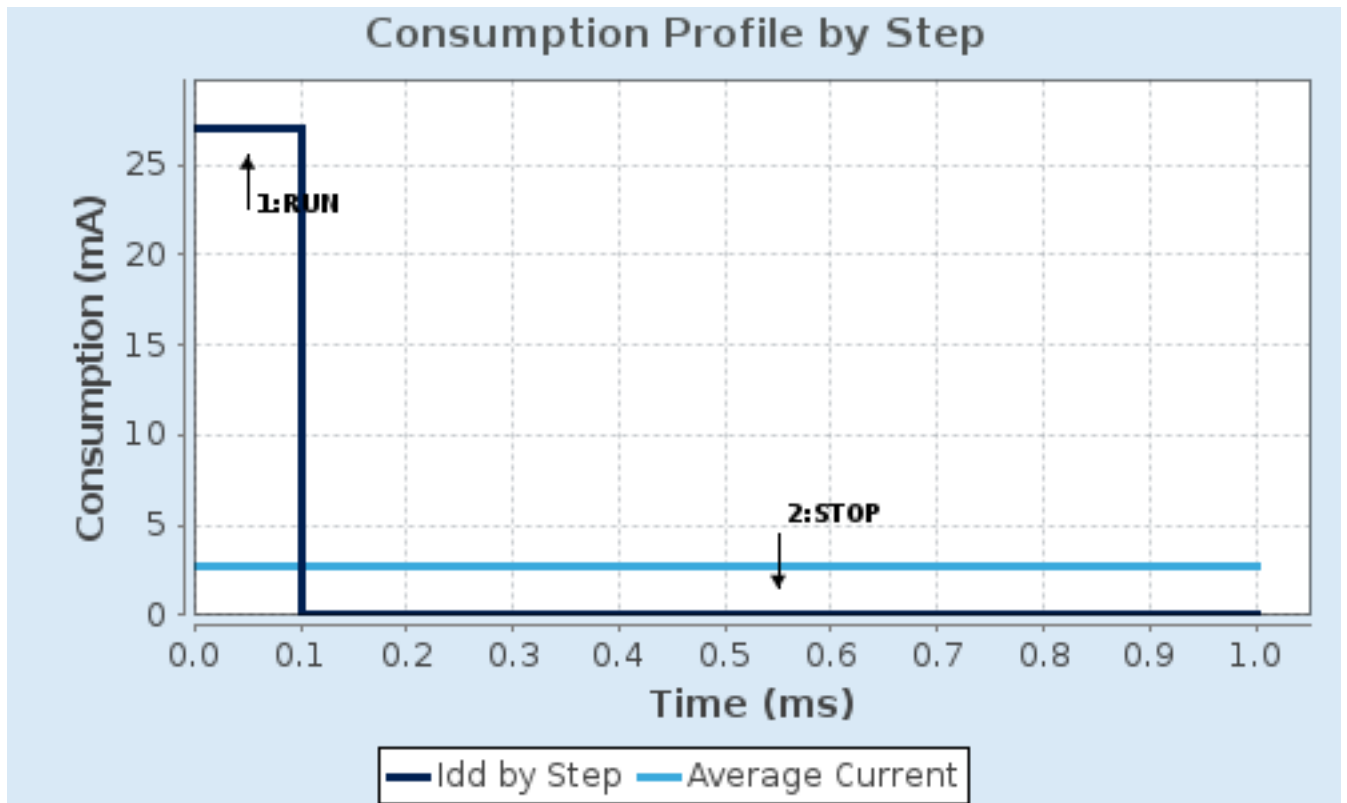
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	No Scale	No Scale
Fetch Type	FLASH	n/a
CPU Frequency	72 MHz	0 Hz
Clock Configuration	HSE PLL	Regulator LP
Clock Source Frequency	8 MHz	0 Hz
Peripherals		
Additional Cons.	0 mA	0 mA
Average Current	27 mA	14 μ A
Duration	0.1 ms	0.9 ms
DMIPS	90.0	0.0
Ta Max	100.1	105
Category	In DS Table	In DS Table

6.5. RESULTS

Sequence Time	1 ms	Average Current	2.71 mA
Battery Life	1 month, 21 days, 17 hours	Average DMIPS	61.0 DMIPS

6.6. Chart



7. IPs and Middleware Configuration

7.1. ADC1

mode: IN7

mode: IN8

mode: IN9

7.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Data Alignment Right alignment

Scan Conversion Mode Enabled

Continuous Conversion Mode **Enabled ***

Discontinuous Conversion Mode Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions Enable

Number Of Conversion **3 ***

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel **Channel 9 ***

Sampling Time 1.5 Cycles

Rank **2 ***

Channel **Channel 8 ***

Sampling Time 1.5 Cycles

Rank **3 ***

Channel Channel 7

Sampling Time 1.5 Cycles

ADC_Injected_ConversionMode:

Enable Injected Conversions Disable

WatchDog:

Enable Analog WatchDog Mode false

7.2. ADC2

mode: IN6

7.2.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

ADC_Regular_ConversionMode:

Enable Regular Conversions Enable

Number Of Conversion 1

External Trigger Conversion Source Regular Conversion launched by software

Rank 1

Channel Channel 6

Sampling Time 1.5 Cycles

ADC_Injected_ConversionMode:

Enable Injected Conversions Disable

WatchDog:

Enable Analog WatchDog Mode false

7.3. GPIO

7.4. I2C1

I2C: I2C

7.4.1. Parameter Settings:

Master Features:

I2C Speed Mode **Fast Mode ***

I2C Clock Speed (Hz) 400000

Fast Mode Duty Cycle Duty cycle Tlow/Thigh = 2

Slave Features:

Clock No Stretch Mode Disabled

Primary Address Length selection 7-bit

Dual Address Acknowledged **Enabled ***

Primary slave address **85 ***

Secondary slave address **64 ***

General Call address detection **Enabled ***

Secondary Address Mask

No mask

7.5. IWDG

mode: Activated

7.5.1. Parameter Settings:

Clocking:

IWDG counter clock prescaler	32 *
IWDG down-counter reload value	4095

7.6. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

7.6.1. 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 Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

7.7. RTC

mode: Activate Clock Source

mode: Activate Calendar

RTC OUT: No RTC Output

7.7.1. Parameter Settings:

Calendar Time:

Data Format	Binary data format *
Hours	0
Minutes	0

Seconds 0

General:

Auto Predivider Calculation	Enabled
Asynchronous Predivider value	Automatic Predivider Calculation Enabled
Output	No output on the TAMPER pin

Calendar Date:

Week Day	Monday
Month	January
Date	1
Year	18 *

7.8. SPI1

Mode: Full-Duplex Slave

Hardware NSS Signal: Hardware NSS Input Signal

7.8.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	4 *
Baud Rate	18.0 MBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Input Hardware

7.9. SYS

Debug: Serial Wire

Timebase Source: SysTick

7.10. TIM1

Channel1: Input Capture direct mode

7.10.1. Parameter Settings:

Counter Settings:

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

7.11. TIM4

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

7.11.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	0
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)	1 *
Output compare preload	Enable
Fast Mode	Disable

CH Polarity	High
PWM Generation Channel 4:	
Mode	PWM mode 1
Pulse (16 bits value)	32768 *
Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.12. USART1

Mode: Asynchronous

7.12.1. Parameter Settings:

Basic Parameters:

Baud Rate	115200
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

7.13. USART3

Mode: Asynchronous

7.13.1. Parameter Settings:

Basic Parameters:

Baud Rate	115200
Word Length	8 Bits (including Parity)
Parity	None
Stop Bits	1

Advanced Parameters:

Data Direction	Receive and Transmit
Over Sampling	16 Samples

* User modified value

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PA7	ADC1_IN7	Analog mode	n/a	n/a	PM_LO_ADC
	PB0	ADC1_IN8	Analog mode	n/a	n/a	PM_HI_ADC
	PB1	ADC1_IN9	Analog mode	n/a	n/a	PM_V_ADC
ADC2	PA6	ADC2_IN6	Analog mode	n/a	n/a	DUT_ADC
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	n/a	High *	DUT_SCL
	PB7	I2C1_SDA	Alternate Function Open Drain	n/a	High *	DUT_SDA
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	
	PD0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PD1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
SPI1	PA15	SPI1_NSS	Input mode	No pull-up and no pull-down	n/a	DUT_NSS
	PB3	SPI1_SCK	Input mode	No pull-up and no pull-down	n/a	DUT_SCK
	PB4	SPI1_MISO	Alternate Function Push Pull	n/a	High *	DUT_MISO
	PB5	SPI1_MOSI	Input mode	No pull-up and no pull-down	n/a	DUT_MOSI
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
TIM1	PA8	TIM1_CH1	Input mode	Pull-up *	n/a	DUT_IC
TIM4	PB8	TIM4_CH3	Alternate Function Push Pull	n/a	Low	DUT_PWM
	PB9	TIM4_CH4	Alternate Function Push Pull	n/a	Low	DUT_DAC
USART1	PA9	USART1_TX	Alternate Function Push Pull	n/a	High *	IF_TX
	PA10	USART1_RX	Input mode	No pull-up and no pull-down	n/a	IF_RX
USART3	PB10	USART3_TX	Alternate Function Push Pull	n/a	High *	DUT_TX
	PB11	USART3_RX	Input mode	No pull-up and no pull-down	n/a	DUT_RX
GPIO	PC13-TAMPER-RTC	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED0
	PA0-WKUP	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG0
	PA1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG1

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PA2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DEBUG2
	PA3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TEST_PASS
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TEST_WARN
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	TEST_FAIL
	PB12	GPIO_Output	Output Open Drain *	No pull-up and no pull-down	Low	DUT_RST
	PB13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	DUT_CTS
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DUT_RTS
	PB15	GPIO_Input	Input mode	Pull-up *	n/a	USER_BTN

8.2. DMA configuration

DMA request	Stream	Direction	Priority
USART1_RX	DMA1_Channel5	Peripheral To Memory	Low
USART1_TX	DMA1_Channel4	Memory To Peripheral	Low
USART3_RX	DMA1_Channel3	Peripheral To Memory	Low
USART3_TX	DMA1_Channel2	Memory To Peripheral	Low
ADC1	DMA1_Channel1	Peripheral To Memory	Low

USART1_RX: DMA1_Channel5 DMA request Settings:

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

USART1_TX: DMA1_Channel4 DMA request Settings:

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

USART3_RX: DMA1_Channel3 DMA request Settings:

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

USART3_TX: DMA1_Channel2 DMA request Settings:

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

Memory Data Width: Byte

ADC1: DMA1_Channel1 DMA request Settings:

Mode: Normal
Peripheral Increment: Disable
Memory Increment: **Enable ***
Peripheral Data Width: Half Word
Memory Data Width: Half Word

8.3. NVIC configuration

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
Memory management fault	true	0	0
Prefetch 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
DMA1 channel2 global interrupt	true	0	0
DMA1 channel3 global interrupt	true	0	0
DMA1 channel4 global interrupt	true	0	0
DMA1 channel5 global interrupt	true	0	0
ADC1 and ADC2 global interrupts	true	0	0
TIM1 update interrupt	true	0	0
I2C1 event interrupt	true	0	0
I2C1 error interrupt	true	0	0
SPI1 global interrupt	true	0	0
USART3 global interrupt	true	0	0
EXTI line[15:10] interrupts	true	0	0
PVD interrupt through EXTI line 16	unused		
RTC global interrupt	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
TIM1 break interrupt	unused		
TIM1 trigger and commutation interrupts	unused		
TIM1 capture compare interrupt	unused		
TIM4 global interrupt	unused		
USART1 global interrupt	unused		
RTC alarm interrupt through EXTI line 17	unused		

* User modified value

9. Predefined Views - Category view : Current

Middleware				
System Core	Analog	Timers	Connectivity	Computing
DMA ✓	ADC1 ✓	RTC ✓	I2C1 ✓	
GPIO ✓	ADC2 ✓	TIM1 ✓	SPI1 ✓	
IWDG ✓		TIM4 ✓	USART1 ✓	
NVIC ✓			USART3 ✓	
RCC ✓				
SYS ✓				

10. Software Pack Report