1. Description

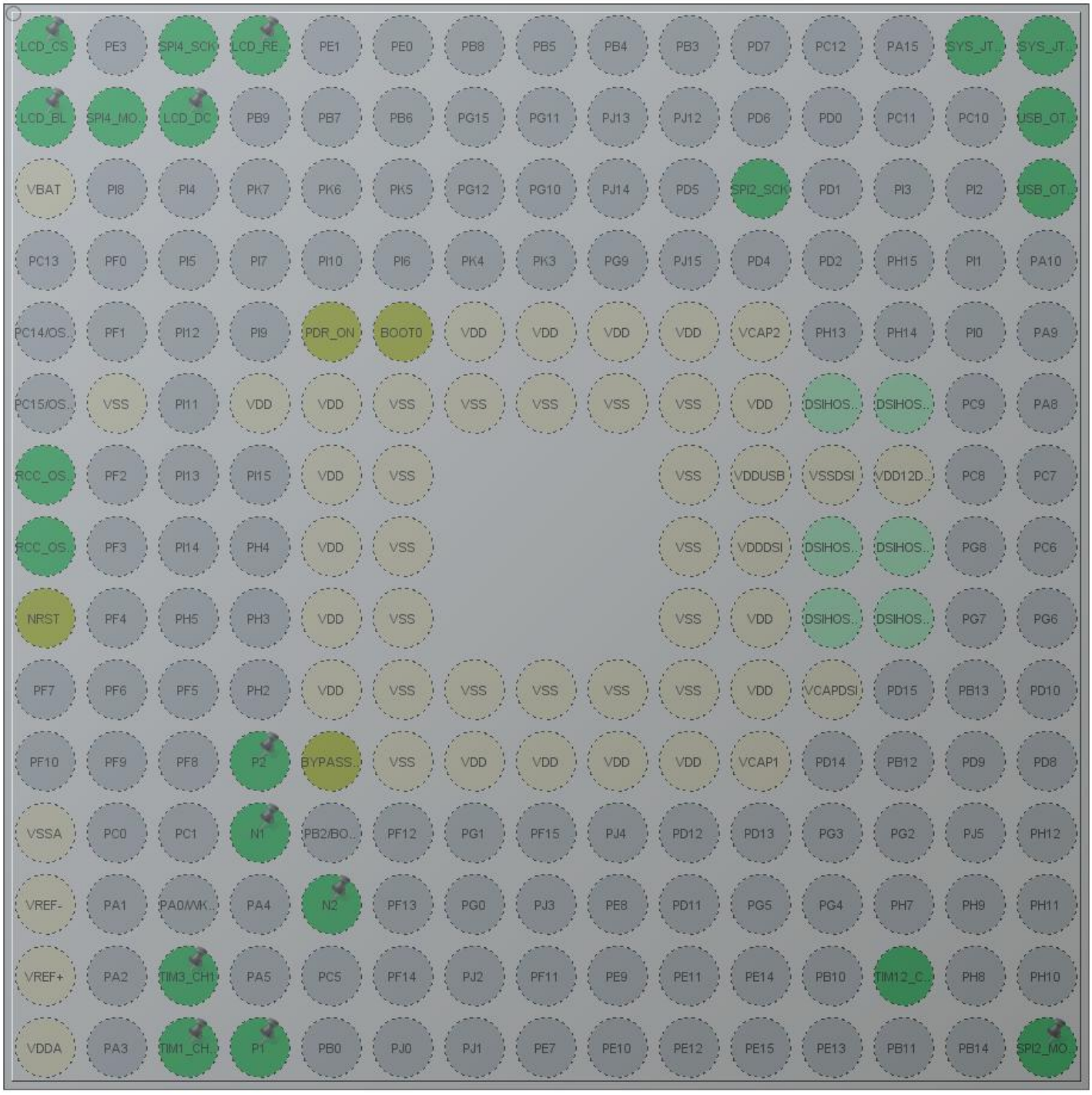
1.1. Project

Project Name	VOxmeter_STM32F469NI
Board Name	custom
Generated with:	STM32CubeMX 5.6.0
Date	11/18/2020

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F469/479
MCU name	STM32F469NIHx
MCU Package	TFBGA216
MCU Pin number	216

2. Pinout Configuration



TFBGA216 (Top view)

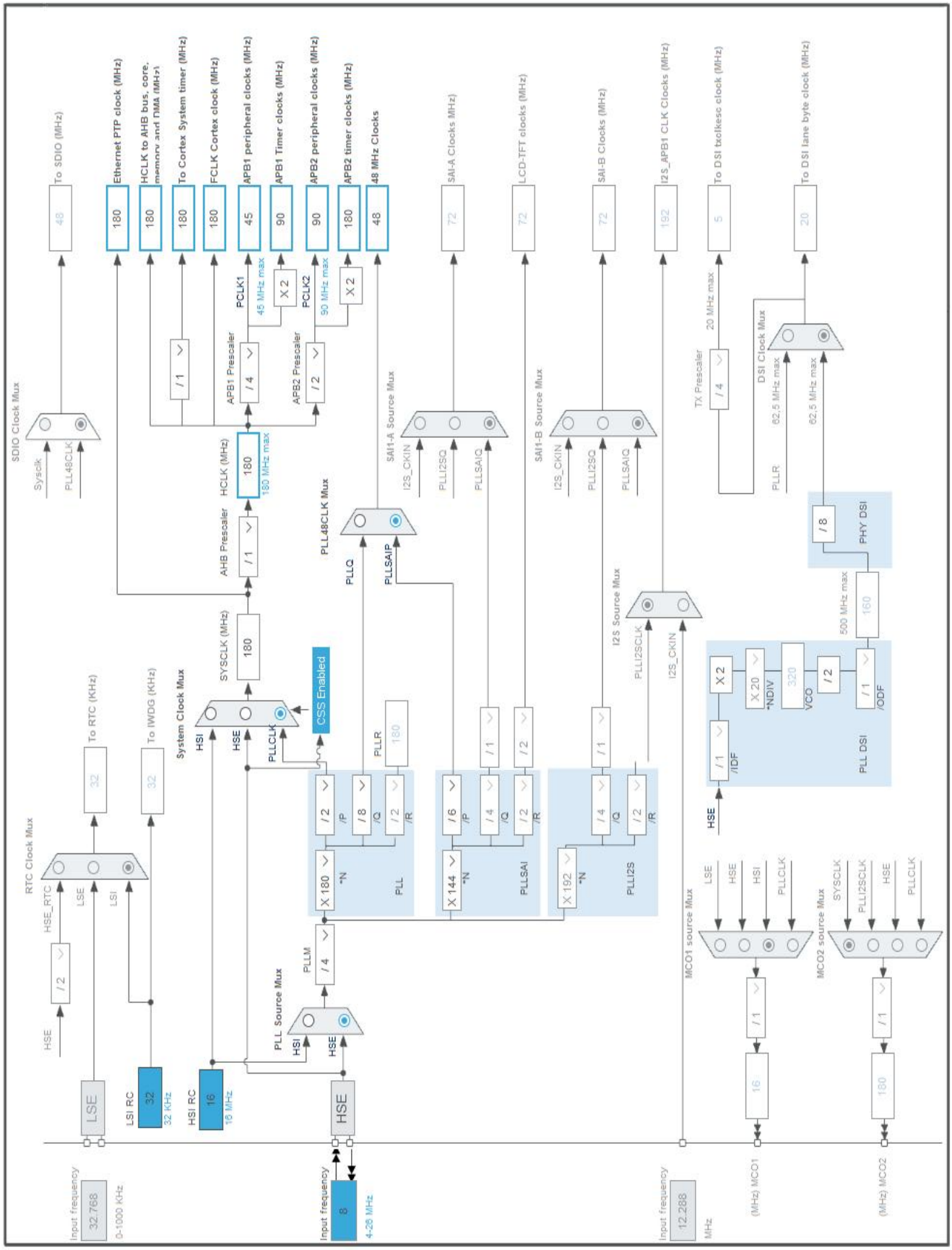
3. Pins Configuration

Pin Number TFBGA216	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
A1	PE4 *	I/O	GPIO_Output	LCD_CS
A3	PE2	I/O	SPI4_SCK	
A4	PG14 *	I/O	GPIO_Output	LCD_RESET
A14	PA14	I/O	SYS_JTCK-SWCLK	
A15	PA13	I/O	SYS_JTMS-SWDIO	
B1	PE5 *	I/O	GPIO_Output	LCD_BL
B2	PE6	I/O	SPI4_MOSI	
B3	PG13 *	I/O	GPIO_Output	LCD_DC
B15	PA12	I/O	USB_OTG_FS_DP	
C1	VBAT	Power		
C11	PD3	I/O	SPI2_SCK	
C15	PA11	I/O	USB_OTG_FS_DM	
E5	PDR_ON	Reset		
E6	BOOT0	Boot		
E7	VDD	Power		
E8	VDD	Power		
E9	VDD	Power		
E10	VDD	Power		
E11	VCAP2	Power		
F2	VSS	Power		
F4	VDD	Power		
F5	VDD	Power		
F6	VSS	Power		
F7	VSS	Power		
F8	VSS	Power		
F9	VSS	Power		
F10	VSS	Power		
F11	VDD	Power		
G1	PH0/OSC_IN	I/O	RCC_OSC_IN	
G5	VDD	Power		
G6	VSS	Power		
G10	VSS	Power		
G11	VDDUSB	Power		
G12	VSSDSI	Power		
G13	VDD12DSI	Power		
H1	PH1/OSC_OUT	I/O	RCC_OSC_OUT	

Pin Number TFBGA216	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
H5	VDD	Power		
H6	VSS	Power		
H10	VSS	Power		
H11	VDDDSI	Power		
J1	NRST	Reset		
J5	VDD	Power		
J6	VSS	Power		
J10	VSS	Power		
J11	VDD	Power		
K5	VDD	Power		
K6	VSS	Power		
K7	VSS	Power		
K8	VSS	Power		
K9	VSS	Power		
K10	VSS	Power		
K11	VDD	Power		
K12	VCAPDSI	Power		
L4	PC3 *	I/O	GPIO_Output	P2
L5	BYPASS_REG	Reset		
L6	VSS	Power		
L7	VDD	Power		
L8	VDD	Power		
L9	VDD	Power		
L10	VDD	Power		
L11	VCAP1	Power		
M1	VSSA	Power		
M4	PC2 *	I/O	GPIO_Output	N1
N1	VREF-	Power		
N5	PC4 *	I/O	GPIO_Output	N2
P1	VREF+	Power		
P3	PA6	I/O	TIM3_CH1	
P13	PH6	I/O	TIM12_CH1	
R1	VDDA	Power		
R3	PA7	I/O	TIM1_CH1N	
R4	PB1 *	I/O	GPIO_Output	P1
R15	PB15	I/O	SPI2_MOSI	

* The pin is affected with an I/O function

4. Clock Tree Configuration



5. Software Project

5.1. Project Settings

Name	Value
Project Name	VOxmeter_STM32F469NI
Project Folder	C:\Users\User\Desktop\VOxmeter_STM32F469NI
Toolchain / IDE	MDK-ARM V5.27
Firmware Package Name and Version	STM32Cube FW_F4 V1.25.1

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
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	STM32F4
Line	STM32F469/479
MCU	STM32F469NIHx
Datasheet	028196_Rev4

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

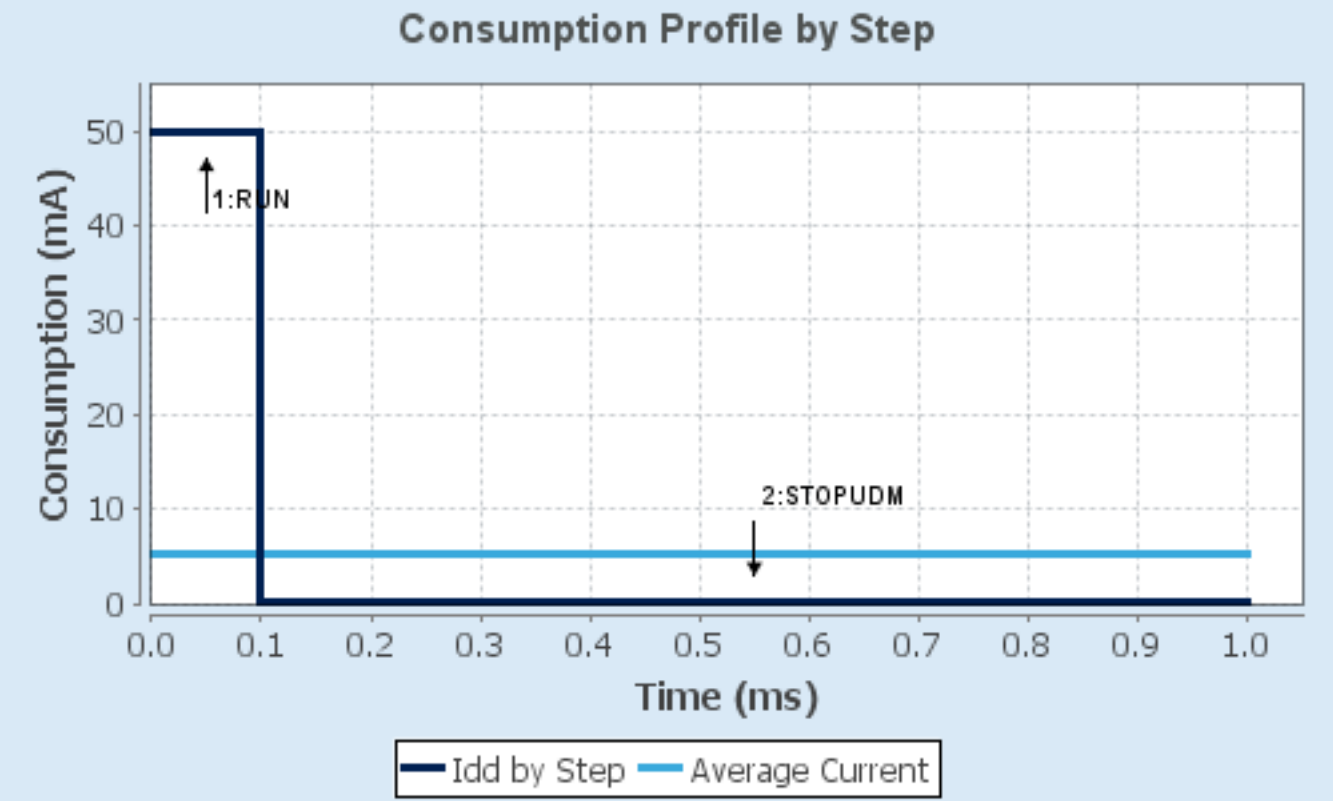
6.4. Sequence

Step	Step1	Step2
Mode	RUN	STOP_UDM (Under Drive)
Vdd	3.3	3.3
Voltage Source	Battery	Battery
Range	Scale1-High	No Scale
Fetch Type	RAM/FLASH/ART/REGON	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	50 mA	140 µA
Duration	0.1 ms	0.9 ms
DMIPS	225.0	0.0
Ta Max	100.21	104.99
Category	In DS Table	In DS Table

6.5. RESULTS

Sequence Time	1 ms	Average Current	5.13 mA
Battery Life	27 days, 14 hours	Average DMIPS	225.0 DMIPS

6.6. Chart


Consumption Profile by Step
Consumption (mA)
50
40
30
20
10
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

7. IPs and Middleware Configuration

7.1. GPIO

7.2. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

7.2.1. 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

7.3. SPI2

Mode: Receive Only Slave

7.3.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	**16 Bits ***
First Bit	MSB First

Clock Parameters:

Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.4. SPI4

Mode: Transmit Only 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	**45.0 MBits/s ***
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.5. SYS

Debug: Serial Wire

Timebase Source: TIM6

7.6. TIM1

Slave Mode: External Clock Mode 1

Trigger Source: ITR3

Channel1: PWM Generation CH1N

7.6.1. Parameter Settings:

Counter Settings:

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

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 1N:

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

7.7. TIM3

Slave Mode: External Clock Mode 1

Trigger Source: ITR3

Channel1: PWM Generation CH1

7.7.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**67 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable
Slave Mode Controller	ETR mode 1

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 1:

Mode	PWM mode 1
Pulse (16 bits value)	**36 ***

Output compare preload	Enable
Fast Mode	Disable
CH Polarity	High

7.8. TIM4

Clock Source : Internal Clock

7.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**1 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	**Enable ***

Trigger Output (TRGO) Parameters:

Master/Slave Mode (MSM bit)	Disable (Trigger input effect not delayed)
Trigger Event Selection	**Update Event ***

7.9. TIM12

Slave Mode: External Clock Mode 1

Trigger Source: ITR0

Channel1: PWM Generation CH1

7.9.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 16 bits value)	**67 ***
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable
Slave Mode Controller	ETR mode 1

PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	**36 ***
Output compare preload	Enable
Fast Mode	Disable

CH Polarity	**Low ***

7.10. USB_OTG_FS

Mode: Device_Only

7.10.1. Parameter Settings:

Speed	Full Speed 12MBit/s
Low power	Disabled
Link Power Management	Disabled
VBUS sensing	Disabled
Signal start of frame	Disabled

7.11. USB_DEVICE

Class For FS IP: Communication Device Class (Virtual Port Com)

7.11.1. Parameter Settings:

Basic Parameters:

USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	1
USBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration)	1
USBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)	512
USBD_SELF_POWERED (Enabled self power)	Enabled
USBD_DEBUG_LEVEL (USBD Debug Level)	0: No debug message
USBD_LPM_ENABLED (Link Power Management)	1: Link Power Management supported

Class Parameters:

USB CDC Rx Buffer Size	2048
USB CDC Tx Buffer Size	2048

7.11.2. Device Descriptor:

Device Descriptor:

VID (Vendor IDentifier)	1155
LANGID_STRING (Language Identifier)	English(United States)
MANUFACTURER_STRING (Manufacturer Identifier)	STMicroelectronics

Device Descriptor FS:

PID (Product IDentifier)	22336
PRODUCT_STRING (Product Identifier)	STM32 Virtual ComPort
CONFIGURATION_STRING (Configuration Identifier)	CDC Config

INTERFACE_STRING (Interface Identifier)	CDC Interface

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
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	
SPI2	PD3	SPI2_SCK	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 ***	
SPI4	PE2	SPI4_SCK	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PE6	SPI4_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
SYS	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
TIM1	PA7	TIM1_CH1N	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	
TIM12	PH6	TIM12_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
USB_OTG_FS	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	**Very High ***	
GPIO	PE4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_CS
	PG14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_RESET
	PE5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_BL
	PG13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LCD_DC
	PC3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	P2
	PC2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	N1
	PC4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	N2
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	P1

8.2. DMA configuration

DMA request	Stream	Direction	Priority
SPI2_RX	DMA1_Stream3	Peripheral To Memory	Low

SPI2_RX: DMA1_Stream3 DMA request Settings:

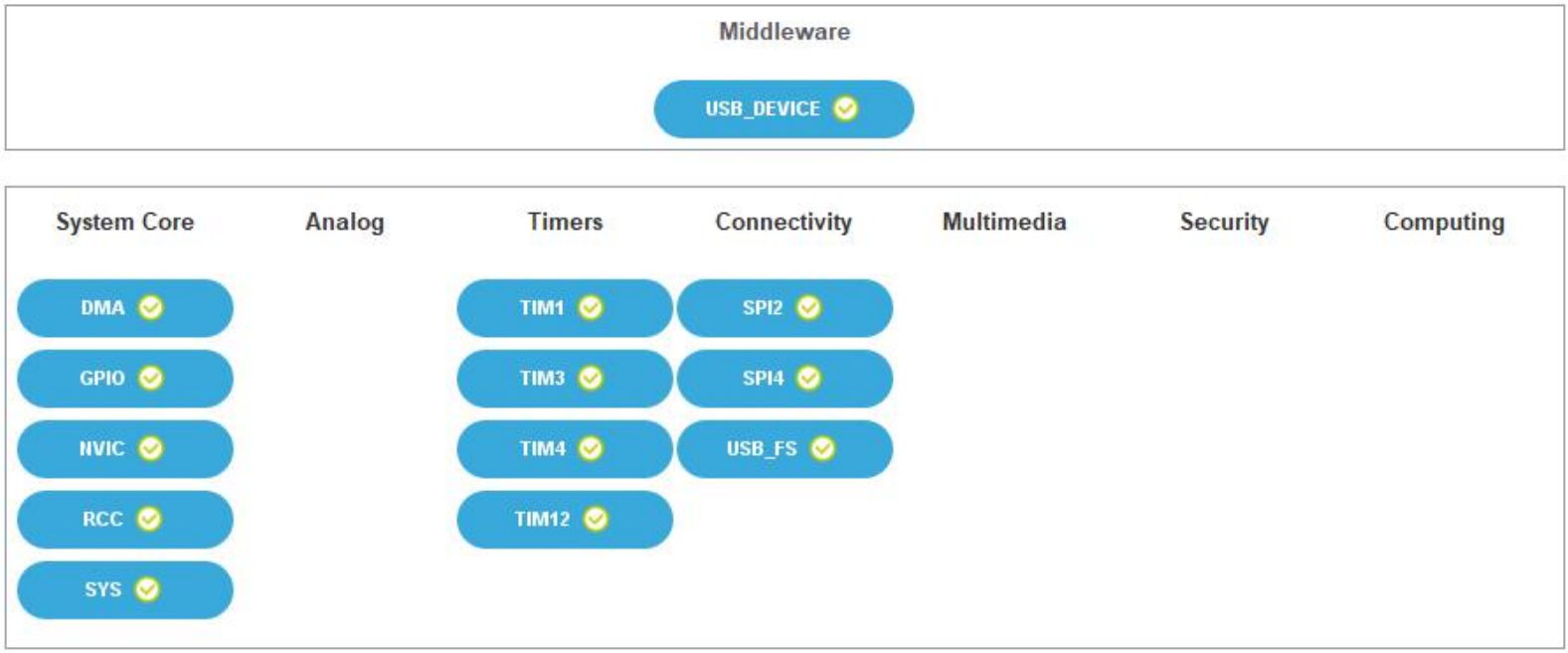
Mode:	**Circular ***
Use fifo:	Disable
Peripheral Increment:	Disable
Memory Increment:	**Enable ***
Peripheral Data Width:	Half Word
Memory Data Width:	Half Word

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
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 stream3 global interrupt	true	0	0
TIM6 global interrupt, DAC1 and DAC2 underrun error interrupts	true	0	0
USB On The Go FS 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 update interrupt and TIM10 global interrupt	unused		
TIM1 trigger and commutation interrupts and TIM11 global interrupt	unused		
TIM1 capture compare interrupt	unused		
TIM3 global interrupt	unused		
TIM4 global interrupt	unused		
SPI2 global interrupt	unused		
TIM8 break interrupt and TIM12 global interrupt	unused		
FPU global interrupt	unused		
SPI4 global interrupt	unused		

*** User modified value**

9. Predefined Views - Category view : Current



10. Software Pack Report