1. Description

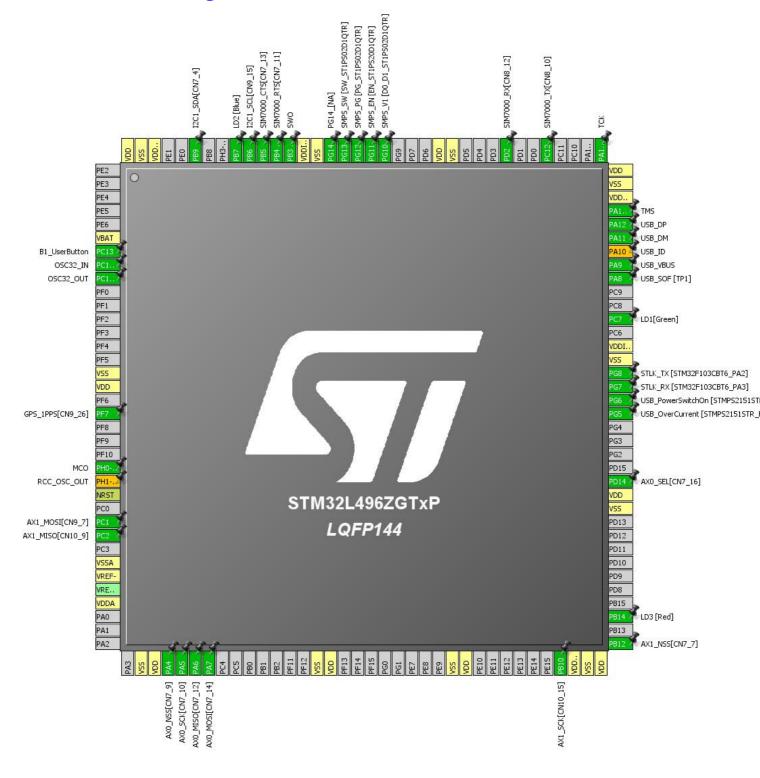
1.1. Project

Project Name	FindMeSAT_V2
Board Name	NUCLEO-L496ZG-P
Generated with:	STM32CubeMX 4.25.0
Date	04/29/2018

1.2. MCU

MCU Series	STM32L4
MCU Line	STM32L4x6
MCU name	STM32L496ZGTxP
MCU Package	LQFP144
MCU Pin number	144

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_EXTI13	B1_UserButton
8	PC14-OSC32_IN (PC14)	I/O	RCC_OSC32_IN	OSC32_IN
9	PC15-OSC32_OUT (PC15)	I/O	RCC_OSC32_OUT	OSC32_OUT
16	VSS	Power		_
17	VDD	Power		
19	PF7	I/O	TIM5_CH2	GPS_1PPS[CN9_26]
23	PH0-OSC_IN (PH0)	I/O	RCC_OSC_IN	MCO
24	PH1-OSC_OUT (PH1) *	I/O	RCC_OSC_OUT	
25	NRST	Reset		
27	PC1	I/O	SPI2_MOSI	AX1_MOSI[CN9_7]
28	PC2	I/O	SPI2_MISO	AX1_MISO[CN10_9]
30	VSSA	Power		
31	VREF-	Power		
33	VDDA	Power		
38	VSS	Power		
39	VDD	Power		
40	PA4	I/O	SPI1_NSS	AX0_NSS[CN7_9]
41	PA5	I/O	SPI1_SCK	AX0_SCK[CN7_10]
42	PA6	I/O	SPI1_MISO	AX0_MISO[CN7_12]
43	PA7	I/O	SPI1_MOSI	AX0_MOSI[CN7_14]
51	VSS	Power		
52	VDD	Power		
61	VSS	Power		
62	VDD	Power		
69	PB10	I/O	SPI2_SCK	AX1_SCK[CN10_15]
70	VDD12	Power		
71	VSS	Power		
72	VDD	Power		
73	PB12	I/O	SPI2_NSS	AX1_NSS[CN7_7]
75	PB14 **	I/O	GPIO_Output	LD3 [Red]
83	VSS	Power		
84	VDD	Power		
85	PD14 **	I/O	GPIO_Output	AX0_SEL[CN7_16]
90	PG5 **	I/O	GPIO_Input	USB_OverCurrent [STMPS2151STR_FAULT]

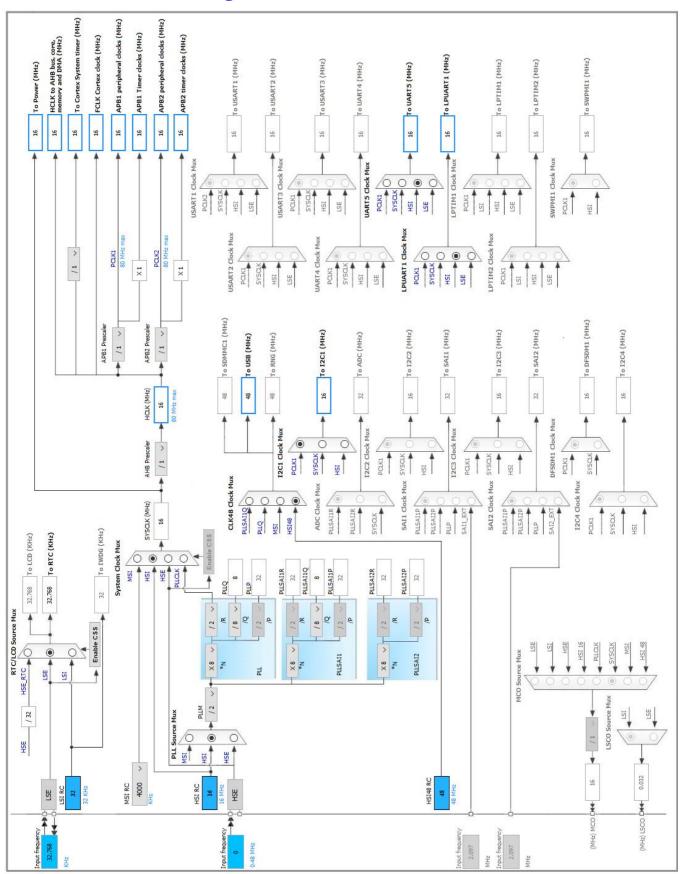
Pin Number	Pin Name	Pin Type	Alternate	Label
LQFP144	(function after		Function(s)	
	reset)			
91	PG6 **	I/O	GPIO_Output	USB_PowerSwitchOn [STMPS2151STR_EN]
92	PG7	I/O	LPUART1_TX	STLK_RX [STM32F103CBT6_PA3]
93	PG8	I/O	LPUART1_RX	STLK_TX [STM32F103CBT6_PA2]
94	VSS	Power		
95	VDDIO2	Power		
97	PC7 **	I/O	GPIO_Output	LD1[Green]
100	PA8	I/O	USB_OTG_FS_SOF	USB_SOF [TP1]
101	PA9	I/O	USB_OTG_FS_VBUS	USB_VBUS
102	PA10 *	I/O	USB_OTG_FS_ID	USB_ID
103	PA11	I/O	USB_OTG_FS_DM	USB_DM
104	PA12	I/O	USB_OTG_FS_DP	USB_DP
105	PA13 (JTMS/SWDIO)	I/O	SYS_JTMS-SWDIO	TMS
106	VDDUSB	Power		
107	VSS	Power		
108	VDD	Power		
109	PA14 (JTCK/SWCLK)	I/O	SYS_JTCK-SWCLK	TCK
113	PC12	I/O	UART5_TX	SIM7000_TX[CN8_10]
116	PD2	I/O	UART5_RX	SIM7000_RX[CN8_12]
120	VSS	Power		
121	VDD	Power		
125	PG10 **	I/O	GPIO_Output	SMPS_V1 [D0_D1_ST1PS02D1QTR]
126	PG11 **	I/O	GPIO_Output	SMPS_EN [EN_ST1PS20D1QTR]
127	PG12 **	I/O	GPIO_Input	SMPS_PG [PG_ST1PS02D1QTR]
128	PG13 **	I/O	GPIO_Output	SMPS_SW [SW_ST1PS02D1QTR]
129	PG14 **	I/O	GPIO_Analog	PG14_[NA]
130	VSS	Power	<u> </u>	
131	VDDIO2	Power		
132	PB3 (JTDO/TRACESWO)	I/O	SYS_JTDO-SWO	SWO
133	PB4 (NJTRST)	I/O	UART5_RTS	SIM7000_RTS[CN7_11]
134	PB5	I/O	UART5_CTS	SIM7000_CTS[CN7_13]
135	PB6	I/O	I2C1_SCL	I2C1_SCL[CN9_15]
136	PB7 **	I/O	GPIO_Output	LD2 [Blue]
139	PB9	I/O	I2C1_SDA	I2C1_SDA[CN7_4]
142	VDD12	Power		

Pin Number LQFP144	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
143	VSS	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



5. IPs and Middleware Configuration

5.1. I2C1

I2C: I2C

5.1.1. Parameter Settings:

Timing configuration:

I2C Speed Mode Fast Mode *

I2C Speed Frequency (KHz)400Rise Time (ns)0Fall Time (ns)0Coefficient of Digital Filter0Analog FilterEnabled

Timing 0x0010061A *

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

5.2. LPUART1

Mode: Asynchronous

5.2.1. Parameter Settings:

Basic Parameters:

Baud Rate 209700

Word Length 7 Bits (including Parity)

Parity None Stop Bits 1

Advanced Parameters:

Data Direction Receive and Transmit

Single Sample Disable

Advanced Features:

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

5.3. RCC

High Speed Clock (HSE): BYPASS Clock Source

Low Speed Clock (LSE): Crystal/Ceramic Resonator

5.3.1. Parameter Settings:

System Parameters:

VDD voltage (V)

Instruction Cache

Prefetch Buffer

Enabled *

Data Cache

Enabled *

Flash Latency(WS) 0 WS (1 CPU cycle)

RCC Parameters:

HSI Calibration Value 64
MSI Calibration Value 0

MSI Auto Calibration Enabled *

HSE Startup Timout Value (ms) 100
LSE Startup Timout Value (ms) 5000

LSE Drive Capability

LSE oscillator low drive capability

Power Parameters:

Power Regulator Voltage Scale Power Regulator Voltage Scale 1

5.4. RTC

mode: Activate Clock Source mode: Activate Calendar

Alarm A: Internal Alarm A

WakeUp: Internal WakeUp

5.4.1. Parameter Settings:

General:

Hour Format Hourformat 24

Asynchronous Predivider value 127
Synchronous Predivider value 255

Calendar Time:

Data Format Binary data format *

Hours 0
Minutes 0
Seconds 0

Day Light Saving: value of hour adjustment Daylightsaving None Store Operation Storeoperation Reset

Calendar Date:

Week DayMondayMonthJanuaryDate1

Year 18 *

Alarm A:

Hours0Minutes0Seconds0Sub Seconds0Alarm Mask Date Week dayDisableAlarm Mask HoursDisable

Alarm Mask Minutes

Alarm Mask Seconds

Disable

Disable

Alarm Sub Second Mask All Alarm SS fields are masked.

Alarm Date Week Day Sel Date
Alarm Date 1

Wake UP:

Wake Up Clock RTCCLK / 16

Wake Up Counter 0

5.5. SPI1

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

5.5.1. Parameter Settings:

Basic Parameters:

Frame Format TI *

Data Size 8 Bits *

Clock Parameters:

Prescaler (for Baud Rate) 2

Baud Rate 8.0 MBits/s *

Advanced Parameters:

CRC Calculation Disabled

NSS Signal Type Output Hardware

5.6. SPI2

Mode: Full-Duplex Master

Hardware NSS Signal: Hardware NSS Output Signal

5.6.1. Parameter Settings:

Basic Parameters:

Frame Format TI *

Data Size 8 Bits *

Clock Parameters:

Prescaler (for Baud Rate) 2

Baud Rate 8.0 MBits/s *

Advanced Parameters:

CRC Calculation Disabled

NSS Signal Type Output Hardware

5.7. SYS

Debug: Trace Asynchronous Sw

Timebase Source: TIM2

5.8. TIM5

Clock Source: Internal Clock

Channel2: Input Capture direct mode

5.8.1. Parameter Settings:

Counter Settings:

Prescaler (PSC - 16 bits value) 0

Counter Mode Up

Counter Period (AutoReload Register - 32 bits value) 1200000000 *

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 TRGO Reset (UG bit from TIMx_EGR)

Input Capture Channel 2:

Polarity Selection Rising Edge
IC Selection Direct
Prescaler Division Ratio No division

Input Filter (4 bits value) 0

5.9. UART5

Mode: Asynchronous

Hardware Flow Control (RS232): CTS/RTS

5.9.1. Parameter Settings:

Basic Parameters:

Baud Rate 19200 *

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

Advanced Features:

TX Pin Active Level Inversion

RX Pin Active Level Inversion

Disable

Data Inversion

Disable

TX and RX Pins Swapping

Overrun

Enable

DMA on RX Error

MSB First

Disable

5.10. USB_OTG_FS

Mode: Device_Only

Activate_VBUS: VBUS sensing

mode: Activate_SOF

5.10.1. Parameter Settings:

Speed Full Speed 12MBit/s

Endpoint 0 Max Packet size 64 Bytes Enable internal IP DMA Disabled Disabled Low power Battery charging Disabled * Link Power Management Enabled * Use dedicated end point 1 interrupt Disabled Enabled VBUS sensing Signal start of frame Enabled

5.11. FREERTOS

mode: Enabled

5.11.1. Config parameters:

Versions:

FreeRTOS version 9.0.0
CMSIS-RTOS version 1.02

Kernel settings:

USE_PREEMPTION Enabled

CPU_CLOCK_HZ SystemCoreClock

TICK_RATE_HZ 1000
MAX_PRIORITIES 7
MINIMAL_STACK_SIZE 128
MAX_TASK_NAME_LEN 16

USE_16_BIT_TICKS Disabled

IDLE_SHOULD_YIELD Enabled

USE_MUTEXES Enabled

USE_RECURSIVE_MUTEXES Disabled

QUEUE_REGISTRY_SIZE 8

Enabled *

USE_PORT_OPTIMISED_TASK_SELECTION Enabled
USE_TICKLESS_IDLE Disabled
USE_TASK_NOTIFICATIONS Enabled

Memory management settings:

USE_COUNTING_SEMAPHORES

Memory Allocation Dynamic
TOTAL_HEAP_SIZE 4500 *
Memory Management scheme heap_4

Hook function related definitions:

USE_IDLE_HOOK Disabled
USE_TICK_HOOK Disabled
USE_MALLOC_FAILED_HOOK Enabled *
USE_DAEMON_TASK_STARTUP_HOOK Disabled
CHECK_FOR_STACK_OVERFLOW Option1 *

Run time and task stats gathering related definitions:

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
 8 *

 TIMER_TASK_STACK_DEPTH
 256

Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY 15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY 5

5.11.2. Include parameters:

Include definitions:

Enabled vTaskPrioritySet Enabled uxTaskPriorityGet Enabled vTaskDelete vTaskCleanUpResources Enabled * Enabled vTaskSuspend vTaskDelayUntil Enabled * Enabled vTaskDelay Enabled xTaskGetSchedulerState Enabled xTaskResumeFromISR Disabled xQueueGetMutexHolder Disabled xSemaphoreGetMutexHolder pcTaskGetTaskName Enabled * uxTaskGetStackHighWaterMark Enabled * xTaskGetCurrentTaskHandle Enabled * eTaskGetState Enabled * xEventGroupSetBitFromISR Enabled * $x \\ Timer \\ Pend \\ Function \\ Call$ Enabled * xTaskAbortDelay Enabled * xTaskGetHandle Enabled *

5.12. USB DEVICE

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

5.12.1. Parameter Settings:

Basic Parameters:

USBD_SELF_POWERED (Enabled self power)	Disabled *
USBD_SUPPORT_USER_STRING (Enable user string descriptor)	Disabled
USBD_MAX_STR_DESC_SIZ (Maximum size for the string descriptors)	512
USBD_MAX_NUM_CONFIGURATION (Maximum number of supported configuration)	1
USBD_MAX_NUM_INTERFACES (Maximum number of supported interfaces)	1

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

5.12.2. Device Descriptor:

Device Descriptor:

VID (Vendor IDentifier) 1155

LANGID_STRING (Language Identifier) English(United States)

MANUFACTURER_STRING (Manufacturer Identifier)

DF4IAH Solutions *

Device Descriptor FS:

PID (Product IDentifier) 22336

PRODUCT_STRING (Product Identifier) FindMeSAT V2 *

SERIALNUMBER_STRING (Serial number) 0000000001A
CONFIGURATION_STRING (Configuration Identifier) CDC Config
INTERFACE_STRING (Interface Identifier) CDC Interface

^{*} User modified value

6. System Configuration

6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	Very High	I2C1_SCL[CN9_15]
	PB9	I2C1_SDA	Alternate Function Open Drain	Pull-up	Very High *	I2C1_SDA[CN7_4]
LPUART1	PG7	LPUART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High	STLK_RX [STM32F103CBT6_PA3]
	PG8	LPUART1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	STLK_TX [STM32F103CBT6_PA2]
RCC	PC14- OSC32_IN (PC14)	RCC_OSC32_IN	n/a	n/a	n/a	OSC32_IN
	PC15- OSC32_OU T (PC15)	RCC_OSC32_O UT	n/a	n/a	n/a	OSC32_OUT
	PH0- OSC_IN (PH0)	RCC_OSC_IN	n/a	n/a	n/a	MCO
SPI1	PA4	SPI1_NSS	Alternate Function Push Pull	No pull-up and no pull-down	Very High	AX0_NSS[CN7_9]
	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	AX0_SCK[CN7_10]
	PA6	SPI1_MISO	Alternate Function Push Pull	Pull-up *	Very High *	AX0_MISO[CN7_12]
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High	AX0_MOSI[CN7_14]
SPI2	PC1	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	AX1_MOSI[CN9_7]
	PC2	SPI2_MISO	Alternate Function Push Pull	Pull-up *	Very High *	AX1_MISO[CN10_9]
	PB10	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	AX1_SCK[CN10_15]
	PB12	SPI2_NSS	Alternate Function Push Pull	No pull-up and no pull-down	Very High	AX1_NSS[CN7_7]

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
SYS	PA13 (JTMS/SWDI O)	SYS_JTMS- SWDIO	n/a	n/a	n/a	TMS
	PA14 (JTCK/SWC LK)	SYS_JTCK- SWCLK	n/a	n/a	n/a	тск
	PB3 (JTDO/TRA CESWO)	SYS_JTDO- SWO	n/a	n/a	n/a	SWO
TIM5	PF7	TIM5_CH2	Alternate Function Push Pull	Pull-up *	Low	GPS_1PPS[CN9_26]
UART5	PC12	UART5_TX	Alternate Function Push Pull	No pull-up and no pull-down	Medium *	SIM7000_TX[CN8_10]
	PD2	UART5_RX	Alternate Function Push Pull	Pull-up *	Medium *	SIM7000_RX[CN8_12]
	PB4 (NJTRST)	UART5_RTS	Alternate Function Push Pull	No pull-up and no pull-down	Medium *	SIM7000_RTS[CN7_11]
	PB5	UART5_CTS	Alternate Function Push Pull	Pull-up *	Medium *	SIM7000_CTS[CN7_13]
USB_OTG_ FS	PA8	USB_OTG_FS_ SOF	Alternate Function Push Pull	No pull-up and no pull-down	Very High	USB_SOF [TP1]
	PA9	USB_OTG_FS_ VBUS	Input mode	No pull-up and no pull-down	n/a	USB_VBUS
	PA11	USB_OTG_FS_ DM	Alternate Function Push Pull	No pull-up and no pull-down	Very High	USB_DM
	PA12	USB_OTG_FS_ DP	Alternate Function Push Pull	No pull-up and no pull-down	Very High	USB_DP
Single Mapped Signals	PH1- OSC_OUT (PH1)	RCC_OSC_OUT	n/a	n/a	n/a	
	PA10	USB_OTG_FS_I D	Alternate Function Push Pull	No pull-up and no pull-down	Low	USB_ID
GPIO	PC13	GPIO_EXTI13	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	B1_UserButton
	PB14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD3 [Red]
	PD14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	High *	AX0_SEL[CN7_16]
	PG5	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	USB_OverCurrent [STMPS2151STR_FAULT]
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	USB_PowerSwitchOn [STMPS2151STR_EN]
	PC7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LD1[Green]
	PG10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SMPS_V1 [D0_D1_ST1PS02D1QTR]
	PG11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SMPS_EN [EN_ST1PS20D1QTR]
	PG12	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SMPS_PG

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PG13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	[PG_ST1PS02D1QTR] SMPS_SW [SW_ST1PS02D1QTR]
	PG14 PB7	GPIO_Analog GPIO_Output	Analog mode Output Push Pull	No pull-up and no pull-down	n/a Low	PG14_[NA] LD2 [Blue]

6.2. DMA configuration

nothing configured in DMA service

6.3. 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	15	0	
System tick timer	true	15	0	
RTC wake-up interrupt through EXTI line 20	true	0	0	
RCC global interrupt	true	5	0	
TIM2 global interrupt	true	0	0	
I2C1 event interrupt	true	5	0	
I2C1 error interrupt	true	5	0	
SPI1 global interrupt	true	5	0	
SPI2 global interrupt	true	5	0	
RTC alarm interrupt through EXTI line 18	true	0	0	
TIM5 global interrupt	true	5	0	
UART5 global interrupt	true	5	0	
USB OTG FS global interrupt	true	5	0	
PVD/PVM1/PVM2/PVM3/PVM4 interrupts through EXTI lines 16/35/36/37/38	unused			
Flash global interrupt		unused		
EXTI line[15:10] interrupts	unused			
LPUART1 global interrupt	unused			
FPU global interrupt	unused			

^{*} User modified value

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32L4
Line	STM32L4x6
MCU	STM32L496ZGTxP
Datasheet	029173_Rev2

7.2. Parameter Selection

Temperature	25
Vdd	3.0

7.3. SMPS Selection

SMPS	SMPS1_User
Vin	3.3 V
Vout	1.2 V
OffCurrent	250.0 nA
QCurrent	500.0 nA
Efficiency	85 %

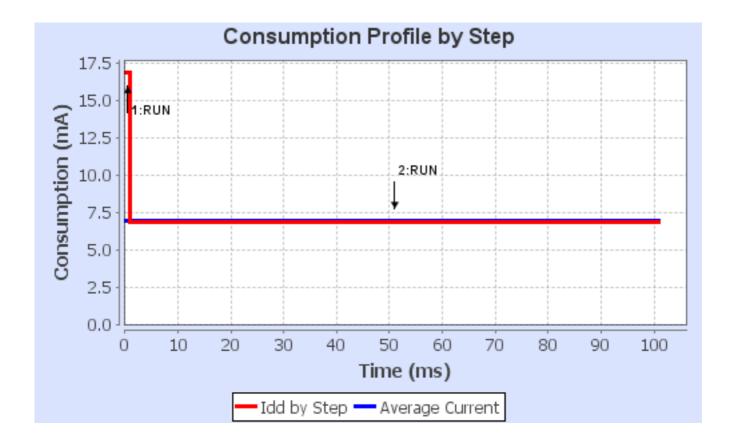
7.4. Sequence

	i	
Step	Step1	Step2
Mode	RUN	RUN
SMPS	DISCONNECTED	CONNECTED
Vdd	3.0	3.0
Voltage Source	Vbus	Vbus
Range	Range1-High	Range1-High
Fetch Type	FLASH	FLASH
Clock Configuration	HSE BYP PLL Flash-ON	HSE BYP PLL Flash-ON
Clock Source Frequency	4 MHz	4 MHz
CPU Frequency	80 MHz	80 MHz
Peripherals	GPIOA GPIOB GPIOC	GPIOA GPIOB GPIOC
	GPIOD GPIOE GPIOF	GPIOD GPIOE GPIOF
	GPIOG GPIOH I2C1 LPTIM1	GPIOG GPIOH I2C1
	LPUART1 PWR RTC SPI1	LPUART1 TIM2 TIM5
	SPI2 SPI3 TIM2 TIM5	UART5 USB_OTG_FS
	UART5 USB_OTG_FS	
Additional Cons.	0 mA	0 mA
Average Current	16.81 mA	6.85 mA
Duration	1 ms	100 ms
DMIPS	0.0	0.0
Ta Max	103.39	104.34
Category	In DS Table	In DS Table

7.5. RESULTS

Sequence Time	101 ms	Average Current	6.95 mA
Battery Life	0	Average DMIPS	100.0 DMIPS

7.6. Chart



8. Software Project

8.1. Project Settings

Name	Value	
Project Name	FindMeSAT_V2	
Project Folder	Z:\nfs_ds_nfs\git\FindMeSATSW\FindMeSAT_V2_SW\TrueSTUDIO\FindMeS	
Toolchain / IDE	TrueSTUDIO	
Firmware Package Name and Version	STM32Cube FW_L4 V1.11.0	

8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	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	Yes
consumption)	

9.	Software	Pack	Report
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