

1. Description

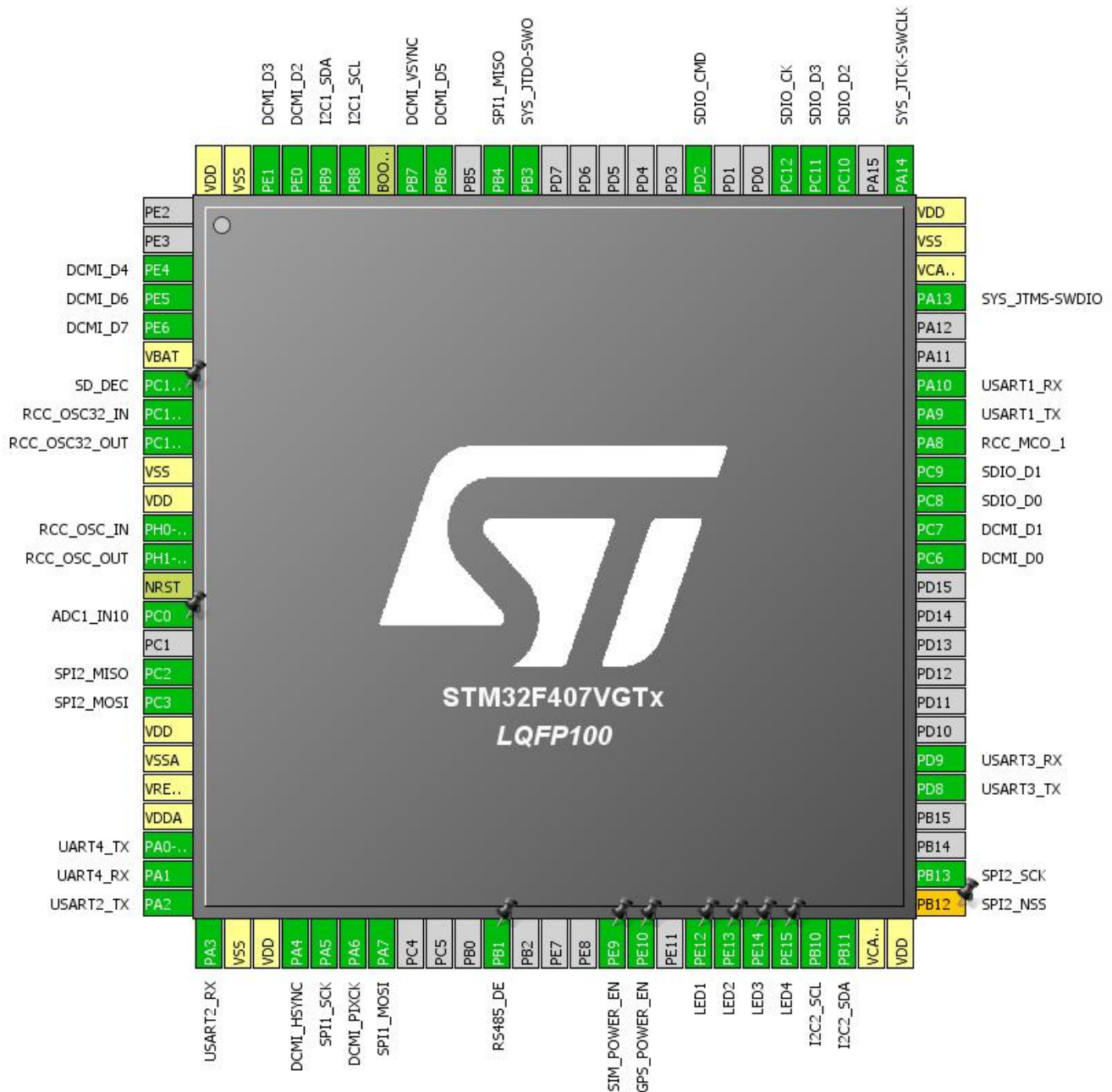
1.1. Project

Project Name	CarStatusMonitor
Board Name	custom
Generated with:	STM32CubeMX 4.27.0
Date	06/23/2019

1.2. MCU

MCU Series	STM32F4
MCU Line	STM32F407/417
MCU name	STM32F407VGTx
MCU Package	LQFP100
MCU Pin number	100

2. Pinout Configuration



3. Pins Configuration

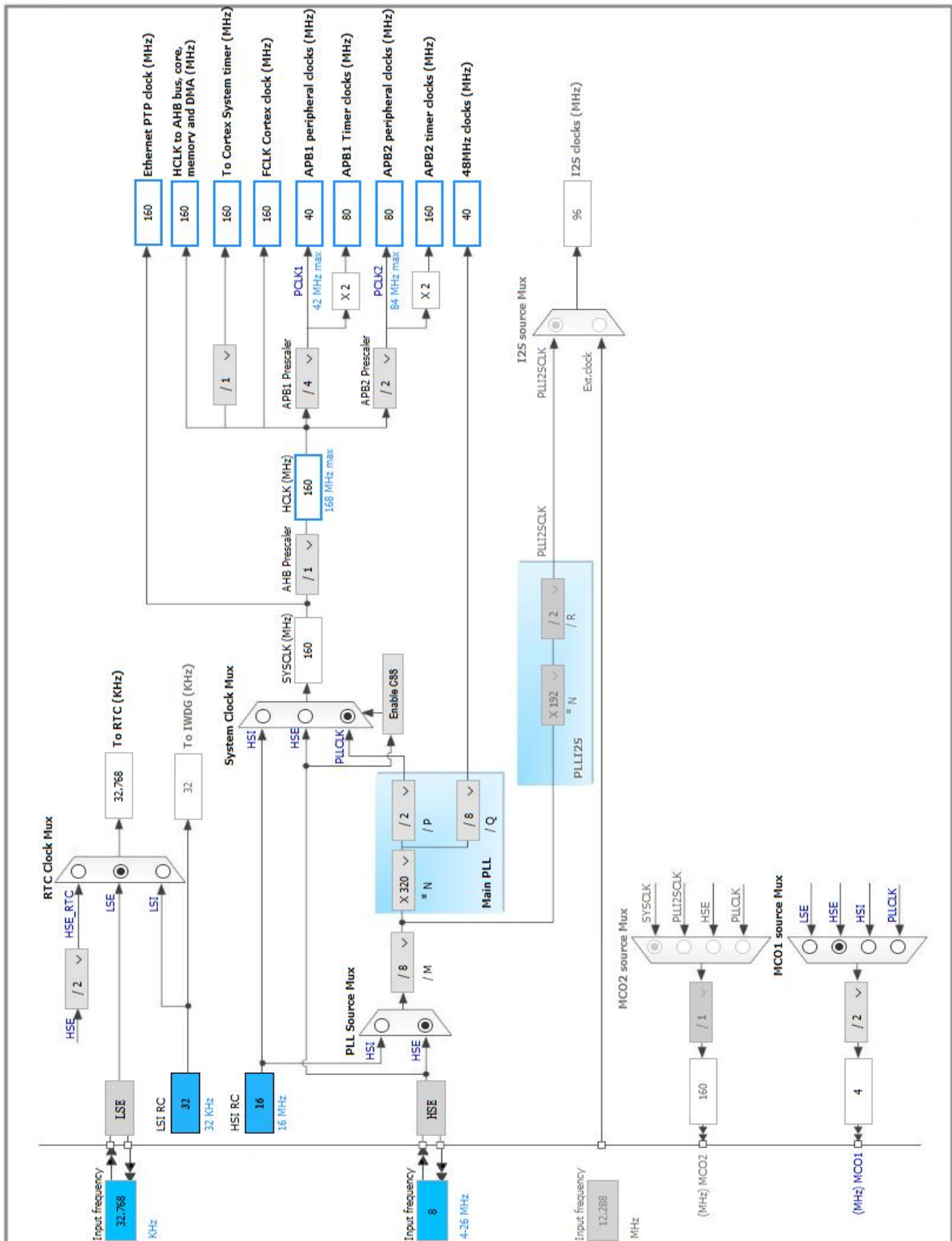
Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
3	PE4	I/O	DCMI_D4	
4	PE5	I/O	DCMI_D6	
5	PE6	I/O	DCMI_D7	
6	VBAT	Power		
7	PC13-ANTI_TAMP *	I/O	GPIO_Input	SD_DEC
8	PC14-OSC32_IN	I/O	RCC_OSC32_IN	
9	PC15-OSC32_OUT	I/O	RCC_OSC32_OUT	
10	VSS	Power		
11	VDD	Power		
12	PH0-OSC_IN	I/O	RCC_OSC_IN	
13	PH1-OSC_OUT	I/O	RCC_OSC_OUT	
14	NRST	Reset		
15	PC0	I/O	ADC1_IN10	
17	PC2	I/O	SPI2_MISO	
18	PC3	I/O	SPI2_MOSI	
19	VDD	Power		
20	VSSA	Power		
21	VREF+	Power		
22	VDDA	Power		
23	PA0-WKUP	I/O	UART4_TX	
24	PA1	I/O	UART4_RX	
25	PA2	I/O	USART2_TX	
26	PA3	I/O	USART2_RX	
27	VSS	Power		
28	VDD	Power		
29	PA4	I/O	DCMI_HSYNC	
30	PA5	I/O	SPI1_SCK	
31	PA6	I/O	DCMI_PIXCK	
32	PA7	I/O	SPI1_MOSI	
36	PB1 *	I/O	GPIO_Output	RS485_DE
40	PE9 *	I/O	GPIO_Output	SIM_POWER_EN
41	PE10 *	I/O	GPIO_Output	GPS_POWER_EN
43	PE12 *	I/O	GPIO_Output	LED1
44	PE13 *	I/O	GPIO_Output	LED2
45	PE14 *	I/O	GPIO_Output	LED3
46	PE15 *	I/O	GPIO_Output	LED4

Pin Number LQFP100	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
47	PB10	I/O	I2C2_SCL	
48	PB11	I/O	I2C2_SDA	
49	VCAP_1	Power		
50	VDD	Power		
51	PB12 **	I/O	SPI2_NSS	
52	PB13	I/O	SPI2_SCK	
55	PD8	I/O	USART3_TX	
56	PD9	I/O	USART3_RX	
63	PC6	I/O	DCMI_D0	
64	PC7	I/O	DCMI_D1	
65	PC8	I/O	SDIO_D0	
66	PC9	I/O	SDIO_D1	
67	PA8	I/O	RCC_MCO_1	
68	PA9	I/O	USART1_TX	
69	PA10	I/O	USART1_RX	
72	PA13	I/O	SYS_JTMS-SWDIO	
73	VCAP_2	Power		
74	VSS	Power		
75	VDD	Power		
76	PA14	I/O	SYS_JTCK-SWCLK	
78	PC10	I/O	SDIO_D2	
79	PC11	I/O	SDIO_D3	
80	PC12	I/O	SDIO_CK	
83	PD2	I/O	SDIO_CMD	
89	PB3	I/O	SYS_JTDO-SWO	
90	PB4	I/O	SPI1_MISO	
92	PB6	I/O	DCMI_D5	
93	PB7	I/O	DCMI_VSYNC	
94	BOOT0	Boot		
95	PB8	I/O	I2C1_SCL	
96	PB9	I/O	I2C1_SDA	
97	PE0	I/O	DCMI_D2	
98	PE1	I/O	DCMI_D3	
99	VSS	Power		
100	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. ADC1

mode: IN10

5.1.1. Parameter Settings:

ADCs_Common_Settings:

Mode Independent mode

ADC_Settings:

Clock Prescaler PCLK2 divided by 4

Resolution 12 bits (15 ADC Clock cycles)

Data Alignment Right alignment

Scan Conversion Mode Disabled

Continuous Conversion Mode Disabled

Discontinuous Conversion Mode Disabled

DMA Continuous Requests Disabled

End Of Conversion Selection EOC flag at the end of single channel conversion

ADC_Regular_ConversionMode:

Number Of Conversion 1

External Trigger Conversion Source Regular Conversion launched by software

External Trigger Conversion Edge None

Rank 1

Channel Channel 10

Sampling Time 3 Cycles

ADC_Injected_ConversionMode:

Number Of Conversions 0

WatchDog:

Enable Analog WatchDog Mode false

5.2. CRC

mode: Activated

5.3. DCMI

DCMI: Slave 8 bits External Synchro

5.3.1. Parameter Settings:

Mode Config:

Pixel clock polarity Active on Falling edge

Vertical synchronization polarity	Active Low
Horizontal synchronization polarity	Active Low
Frequency of frame capture	All frames are captured
JPEG mode	Disabled

5.4. I2C1

I2C: I2C

5.4.1. 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	Disabled
Primary slave address	0
General Call address detection	Disabled

5.5. I2C2

I2C: I2C

5.5.1. 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	Disabled
Primary slave address	0
General Call address detection	Disabled

5.6. RCC

High Speed Clock (HSE): Crystal/Ceramic Resonator

Low Speed Clock (LSE) : Crystal/Ceramic Resonator

mode: Master Clock Output 1

5.6.1. 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
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

Power Parameters:

Power Regulator Voltage Scale	Power Regulator Voltage Scale 1
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5.7. RTC

mode: Activate Clock Source

mode: Activate Calendar

5.7.1. 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 Day	Monday
Month	June *
Date	17 *
Year	0

5.8. SDIO

Mode: SD 4 bits Wide bus

5.8.1. Parameter Settings:

SDIO parameters:

Clock transition on which the bit capture is made	Rising transition
SDIO Clock divider bypass	Disable
SDIO Clock output enable when the bus is idle	Disable the power save for the clock
SDIO hardware flow control	The hardware control flow is disabled
SDIOCLK clock divide factor	0

5.9. SPI1

Mode: Full-Duplex Master

5.9.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	40.0 MBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

5.10. SPI2

Mode: Full-Duplex Master

5.10.1. Parameter Settings:

Basic Parameters:

Frame Format	Motorola
Data Size	8 Bits
First Bit	MSB First

Clock Parameters:

Prescaler (for Baud Rate)	2
Baud Rate	20.0 MBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

5.11. SYS

Debug: Trace Asynchronous Sw

Timebase Source: TIM2

5.12. UART4

Mode: Asynchronous

5.12.1. 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

5.13. USART1

Mode: Asynchronous

5.13.1. 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

5.14. USART2

Mode: Asynchronous

5.14.1. 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

5.15. USART3

Mode: Asynchronous

5.15.1. 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
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Over Sampling

16 Samples

5.16. FATFS

mode: SD Card

mode: User-defined

5.16.1. 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)	2
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
NORTC_YEAR (Year for timestamp)	2015

NORTC_MON (Month for timestamp)	6
NORTC_MDAY (Day for timestamp)	4
FS_REENTRANT (Re-Entrancy)	Enabled
FS_TIMEOUT (Timeout ticks)	1000
SYNC_t (O/S sync object)	osSemaphoreId
FS_LOCK (Number of files opened simultaneously)	2

5.16.2. IPs instances:

SDIO/SDMMC:

SDIO instance	SDIO
Use dma template	Enabled

5.17. FREERTOS

mode: Enabled

5.17.1. 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
USE_COUNTING_SEMAPHORES	Enabled *
QUEUE_REGISTRY_SIZE	8
USE_APPLICATION_TASK_TAG	Disabled
ENABLE_BACKWARD_COMPATIBILITY	Enabled
USE_PORT_OPTIMISED_TASK_SELECTION	Enabled
USE_TICKLESS_IDLE	Enabled *
USE_TASK_NOTIFICATIONS	Enabled

Memory management settings:

Memory Allocation	Dynamic
TOTAL_HEAP_SIZE	15360
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	Disabled
USE_STATS_FORMATTING_FUNCTIONS	Disabled

Co-routine related definitions:

USE_CO_ROUTINES	Disabled
MAX_CO_ROUTINE_PRIORITIES	2

Software timer definitions:

USE_TIMERS	Disabled
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Interrupt nesting behaviour configuration:

LIBRARY_LOWEST_INTERRUPT_PRIORITY	15
LIBRARY_MAX_SYSCALL_INTERRUPT_PRIORITY	5

5.17.2. Include parameters:

Include definitions:

vTaskPrioritySet	Enabled
uxTaskPriorityGet	Enabled
vTaskDelete	Enabled
vTaskCleanUpResources	Disabled
vTaskSuspend	Enabled
vTaskDelayUntil	Enabled *
vTaskDelay	Enabled
xTaskGetSchedulerState	Enabled
xTaskResumeFromISR	Enabled
xQueueGetMutexHolder	Disabled
xSemaphoreGetMutexHolder	Disabled
pcTaskGetTaskName	Disabled
uxTaskGetStackHighWaterMark	Disabled
xTaskGetCurrentTaskHandle	Disabled
eTaskGetState	Disabled
xEventGroupSetBitFromISR	Disabled

xTimerPendFunctionCall	Disabled
xTaskAbortDelay	Disabled
xTaskGetHandle	Disabled

5.18. *LIBJPEG*

mode: Enabled

5.18.1. Config parameters:

Version:

LIBJPEG version	8d
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MW configuration:

Data Stream management type	FatFS
FREERTOS	Enabled

General Settings:

Use FREERTOS Memory Allocator	Enabled
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* User modified value

6. System Configuration

6.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC1	PC0	ADC1_IN10	Analog mode	No pull-up and no pull-down	n/a	
DCMI	PE4	DCMI_D4	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE5	DCMI_D6	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE6	DCMI_D7	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA4	DCMI_HSYNC	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PA6	DCMI_PIXCK	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC6	DCMI_D0	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PC7	DCMI_D1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB6	DCMI_D5	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PB7	DCMI_VSYNC	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE0	DCMI_D2	Alternate Function Push Pull	No pull-up and no pull-down	Low	
	PE1	DCMI_D3	Alternate Function Push Pull	No pull-up and no pull-down	Low	
I2C1	PB8	I2C1_SCL	Alternate Function Open Drain	Pull-up	Very High *	
	PB9	I2C1_SDA	Alternate Function Open Drain	Pull-up	Very High *	
I2C2	PB10	I2C2_SCL	Alternate Function Open Drain	Pull-up	Very High *	
	PB11	I2C2_SDA	Alternate Function Open Drain	Pull-up	Very High *	
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	
	PH0-OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	
	PH1-OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
	PA8	RCC_MCO_1	Alternate Function Push Pull	No pull-up and no pull-down	Low	
SDIO	PC8	SDIO_D0	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC9	SDIO_D1	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC10	SDIO_D2	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC11	SDIO_D3	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PC12	SDIO_CK	Alternate Function Push Pull	No pull-up and no pull-down	Very High	
	PD2	SDIO_CMD	Alternate Function Push Pull	No pull-up and no pull-down	Very High	

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
SPI1	PA5	SPI1_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA7	SPI1_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PB4	SPI1_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
SPI2	PC2	SPI2_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PC3	SPI2_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PB13	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
SYS	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PB3	SYS_JTDO-SWO	n/a	n/a	n/a	
UART4	PA0-WKUP	UART4_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PA1	UART4_RX	Alternate Function Push Pull	Pull-up	Very High *	
USART1	PA9	USART1_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PA10	USART1_RX	Alternate Function Push Pull	Pull-up	Very High *	
USART2	PA2	USART2_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PA3	USART2_RX	Alternate Function Push Pull	Pull-up	Very High *	
USART3	PD8	USART3_TX	Alternate Function Push Pull	Pull-up	Very High *	
	PD9	USART3_RX	Alternate Function Push Pull	Pull-up	Very High *	
Single Mapped Signals	PB12	SPI2_NSS	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
GPIO	PC13-ANTI_TAMP	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	SD_DEC

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PB1	GPIO_Output	Output Push Pull	Pull-up *	Low	RS485_DE
	PE9	GPIO_Output	Output Push Pull	Pull-down *	Low	SIM_POWER_EN
	PE10	GPIO_Output	Output Push Pull	Pull-down *	Low	GPS_POWER_EN
	PE12	GPIO_Output	Output Push Pull	Pull-down *	Low	LED1
	PE13	GPIO_Output	Output Push Pull	Pull-down *	Low	LED2
	PE14	GPIO_Output	Output Push Pull	Pull-down *	Low	LED3
	PE15	GPIO_Output	Output Push Pull	Pull-down *	Low	LED4

6.2. DMA configuration

DMA request	Stream	Direction	Priority
USART2_RX	DMA1_Stream5	Peripheral To Memory	Low
UART4_RX	DMA1_Stream2	Peripheral To Memory	Low
USART3_RX	DMA1_Stream1	Peripheral To Memory	Low

USART2_RX: DMA1_Stream5 DMA request Settings:

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

UART4_RX: DMA1_Stream2 DMA request Settings:

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

USART3_RX: DMA1_Stream1 DMA request Settings:

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

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
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
DMA1 stream1 global interrupt	true	5	0
DMA1 stream2 global interrupt	true	5	0
DMA1 stream5 global interrupt	true	5	0
TIM2 global interrupt	true	0	0
USART1 global interrupt	true	5	0
USART2 global interrupt	true	5	0
USART3 global interrupt	true	5	0
UART4 global interrupt	true	5	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
I2C1 event interrupt	unused		
I2C1 error interrupt	unused		
I2C2 event interrupt	unused		
I2C2 error interrupt	unused		
SPI1 global interrupt	unused		
SPI2 global interrupt	unused		
SDIO global interrupt	unused		
DCMI global interrupt	unused		
FPU global interrupt	unused		

* User modified value

7. Power Consumption Calculator report

7.1. Microcontroller Selection

Series	STM32F4
Line	STM32F407/417
MCU	STM32F407VGTx
Datasheet	022152_Rev8

7.2. Parameter Selection

Temperature	25
Vdd	3.3

8. Software Project

8.1. Project Settings

Name	Value
Project Name	CarStatusMonitor
Project Folder	F:\co_pro_2019\4G-com\CODE\CarStatusMonitor
Toolchain / IDE	MDK-ARM V5
Firmware Package Name and Version	STM32Cube FW_F4 V1.21.0

8.2. Code Generation Settings

Name	Value
STM32Cube Firmware Library Package	Copy all used libraries into the project folder
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

9. Software Pack Report