

1. Description

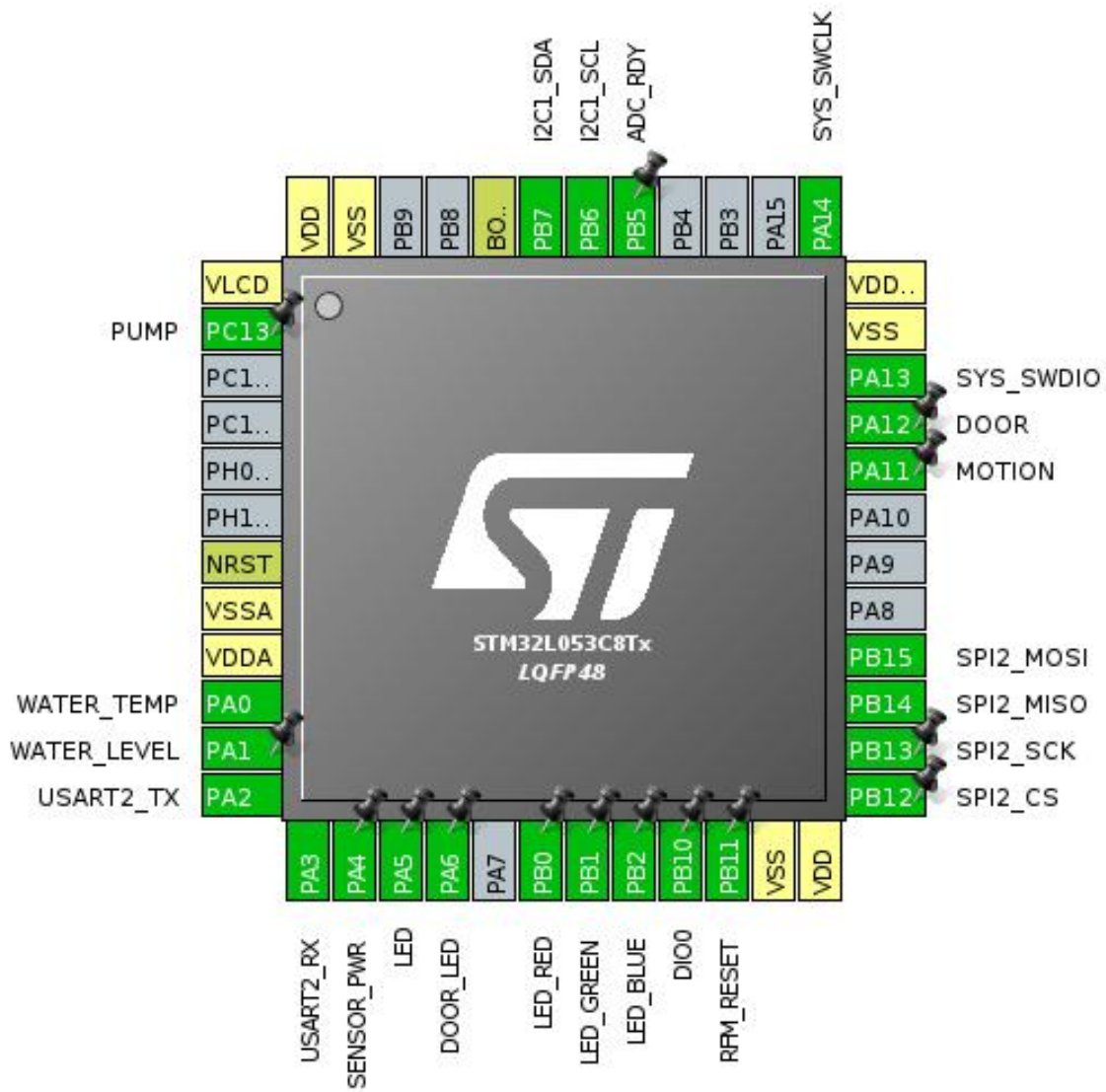
1.1. Project

Project Name	pump_controller
Board Name	lora_sensor
Generated with:	STM32CubeMX 5.0.0
Date	12/26/2018

1.2. MCU

MCU Series	STM32L0
MCU Line	STM32L0x3
MCU name	STM32L053C8Tx
MCU Package	LQFP48
MCU Pin number	48

2. Pinout Configuration

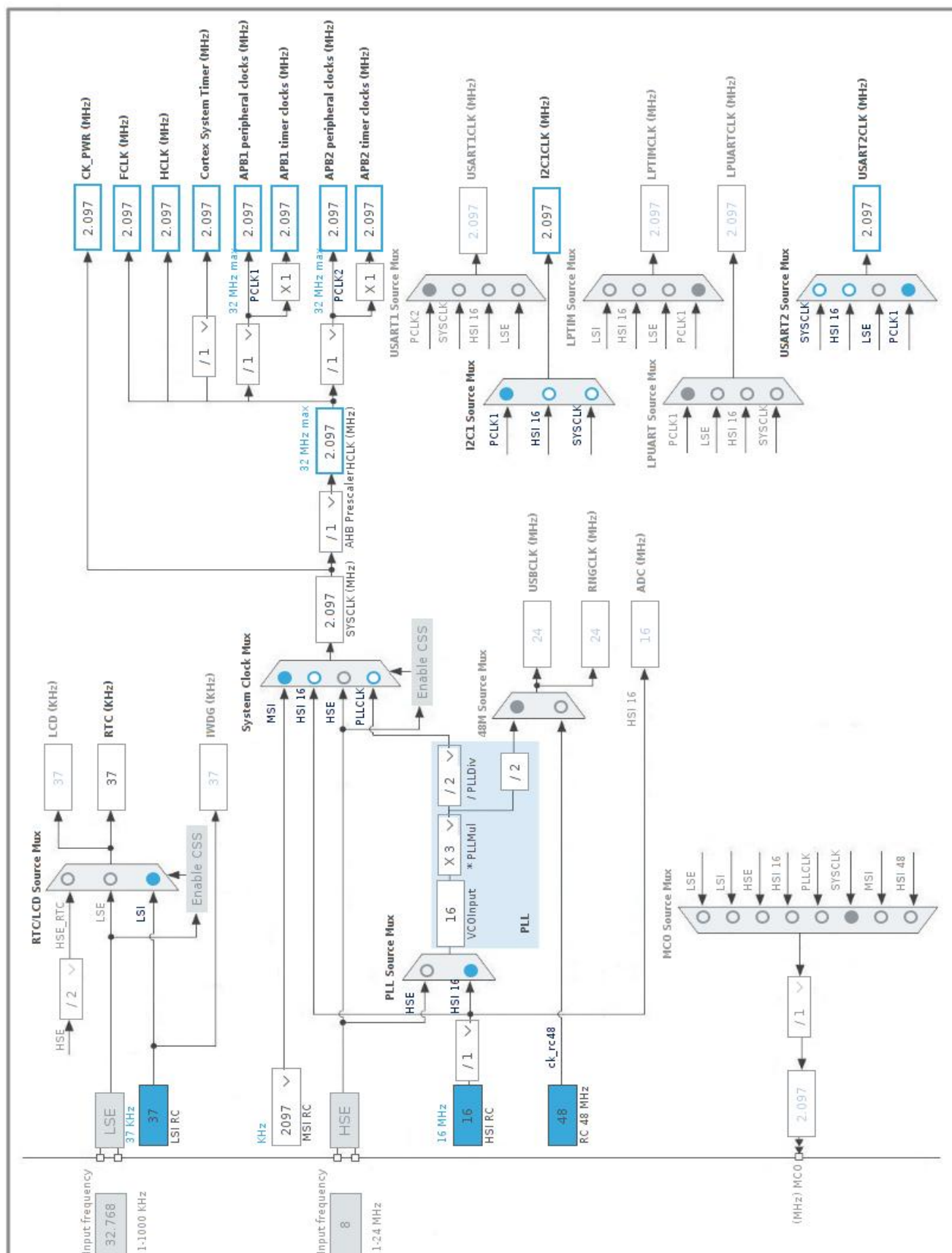


3. Pins Configuration

Pin Number LQFP48	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
1	VLCD	Power		
2	PC13 *	I/O	GPIO_Output	PUMP
7	NRST	Reset		
8	VSSA	Power		
9	VDDA	Power		
10	PA0	I/O	ADC_IN0	WATER_TEMP
11	PA1 *	I/O	GPIO_Input	WATER_LEVEL
12	PA2	I/O	USART2_TX	
13	PA3	I/O	USART2_RX	
14	PA4 *	I/O	GPIO_Output	SENSOR_PWR
15	PA5 *	I/O	GPIO_Output	LED
16	PA6 *	I/O	GPIO_Output	DOOR_LED
18	PB0 *	I/O	GPIO_Output	LED_RED
19	PB1 *	I/O	GPIO_Output	LED_GREEN
20	PB2 *	I/O	GPIO_Output	LED_BLUE
21	PB10	I/O	GPIO_EXTI10	DIO0
22	PB11 *	I/O	GPIO_Output	RFM_RESET
23	VSS	Power		
24	VDD	Power		
25	PB12 *	I/O	GPIO_Output	SPI2_CS
26	PB13	I/O	SPI2_SCK	
27	PB14	I/O	SPI2_MISO	
28	PB15	I/O	SPI2_MOSI	
32	PA11 *	I/O	GPIO_Input	MOTION
33	PA12	I/O	GPIO_EXTI12	DOOR
34	PA13	I/O	SYS_SWDIO	
35	VSS	Power		
36	VDD_USB	Power		
37	PA14	I/O	SYS_SWCLK	
41	PB5	I/O	GPIO_EXTI5	ADC_RDY
42	PB6	I/O	I2C1_SCL	
43	PB7	I/O	I2C1_SDA	
44	BOOT0	Boot		
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	pump_controller
Project Folder	/home/peter/repos/gard_hw/stm32/pump_controller
Toolchain / IDE	SW4STM32
Firmware Package Name and Version	STM32Cube FW_L0 V1.11.0

5.2. 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 consumption)	Yes

6. Power Consumption Calculator report

6.1. Microcontroller Selection

Series	STM32L0
Line	STM32L0x3
MCU	STM32L053C8Tx
Datasheet	025844_Rev7

6.2. Parameter Selection

Temperature	25
Vdd	3.0

6.3. Sequence

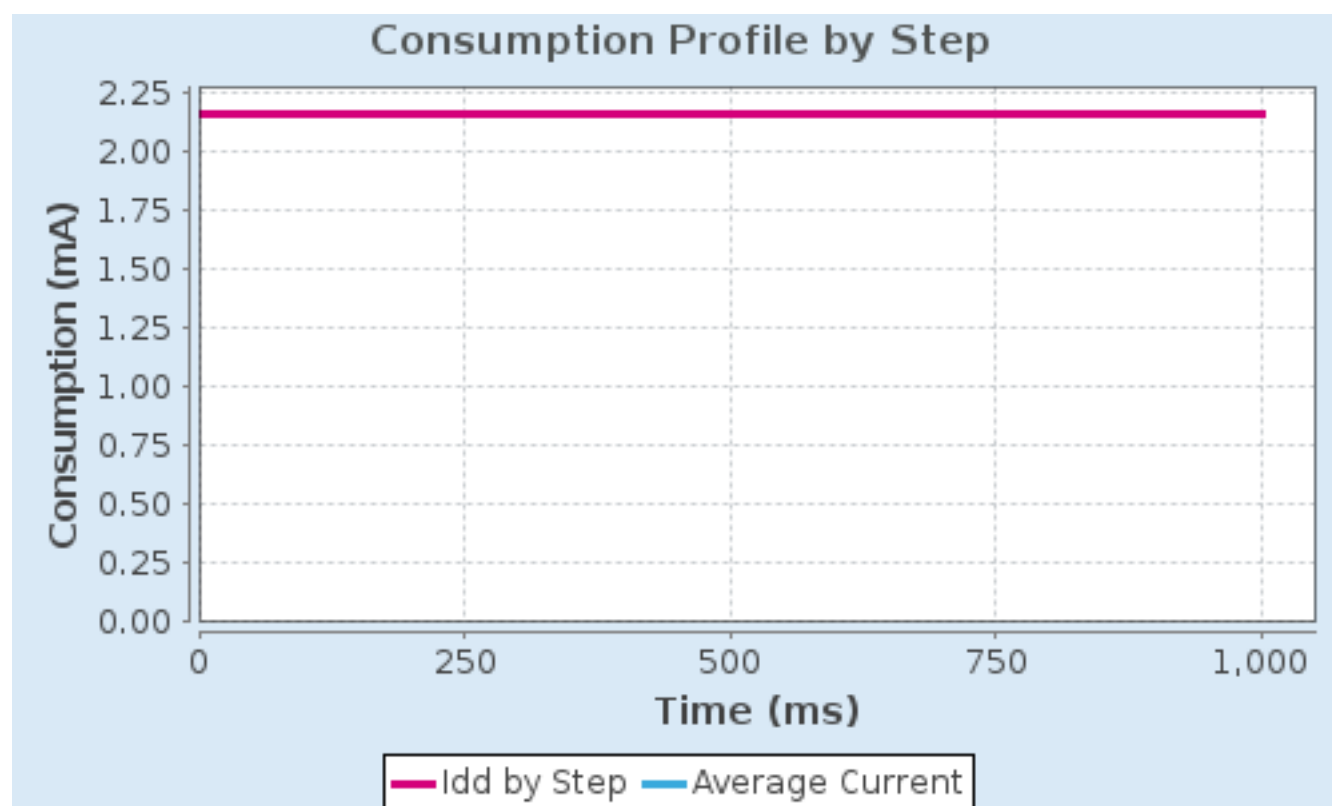
Step	Step1
Mode	RUN
Vdd	3.0
Voltage Source	Battery
Range	Range1-High
Fetch Type	FLASH
Clock Configuration	HSEBYP
Clock Source Frequency	8 MHz
CPU Frequency	8 MHz
Peripherals	ADC:10KSPS FLASH GPIOA GPIOB GPIOC I2C1 RTC SPI2 SYS USART1 USART2
Additional Cons.	0 mA
Average Current	2.17 mA
Duration	1 s
DMIPS	7.6
Ta Max	104.64
Category	In DS Table

6.4. RESULTS

Sequence Time	1 s	Average Current	2.17 mA
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Battery Life	0	Average DMIPS	7.6 DMIPS
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6.5. Chart



7. IPs and Middleware Configuration

7.1. ADC

mode: IN0

mode: Temperature Sensor Channel

7.1.1. Parameter Settings:

ADC_Settings:

Clock Prescaler	Synchronous clock mode divided by 2 *
Resolution	ADC 12-bit resolution
Data Alignment	Right alignment
Scan Direction	Forward
Continuous Conversion Mode	Enabled *
Discontinuous Conversion Mode	Disabled
DMA Continuous Requests	Disabled
End Of Conversion Selection	End of single conversion
Overrun behaviour	Overrun data preserved
Low Power Auto Wait	Enabled *
Low Frequency Mode	Disabled
Auto Off	Disabled
Oversampling Mode	Disabled

ADC_Regular_ConversionMode:

Sampling Time	160.5 Cycles *
External Trigger Conversion Source	Regular Conversion launched by software
External Trigger Conversion Edge	None

WatchDog:

Enable Analog WatchDog Mode	false
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7.2. I2C1

I2C: I2C

7.2.1. Parameter Settings:

Timing configuration:

I2C Speed Mode	Standard Mode
I2C Speed Frequency (KHz)	100
Rise Time (ns)	0
Fall Time (ns)	0
Coefficient of Digital Filter	0

Analog Filter	Enabled
Timing	0x00000708

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

7.3. RTC

mode: Activate Clock Source

mode: Activate Calendar

WakeUp: Internal WakeUp

7.3.1. Parameter Settings:

General:

Hour Format	Hourformat 24
Asynchronous Predivider value	127
Synchronous Predivider value	255

Calendar Time:

Data Format	BCD 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	January
Date	1
Year	0

Wake UP:

Wake Up Clock	1 Hz *
Wake Up Counter	0

7.4. SPI2

Mode: Full-Duplex 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)	8 *
Baud Rate	262.125 KBits/s *
Clock Polarity (CPOL)	Low
Clock Phase (CPHA)	1 Edge

Advanced Parameters:

CRC Calculation	Disabled
NSS Signal Type	Software

7.5. SYS

mode: Debug Serial Wire

Timebase Source: SysTick

7.6. USART2

Mode: Asynchronous

7.6.1. Parameter Settings:

Basic Parameters:

Baud Rate	9600 *
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:

Auto Baudrate	Disable
TX Pin Active Level Inversion	Disable
RX Pin Active Level Inversion	Disable

Data Inversion	Disable
TX and RX Pins Swapping	Disable
Overrun	Enable
DMA on RX Error	Enable
MSB First	Disable

*** User modified value**

8. System Configuration

8.1. GPIO configuration

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
ADC	PA0	ADC_IN0	Analog mode	No pull-up and no pull-down	n/a	WATER_TEMP
I2C1	PB6	I2C1_SCL	Alternate Function Open Drain	Pull-up	Very High *	
	PB7	I2C1_SDA	Alternate Function Open Drain	Pull-up	Very High *	
SPI2	PB13	SPI2_SCK	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PB14	SPI2_MISO	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 *	
SYS	PA13	SYS_SWDIO	n/a	n/a	n/a	
	PA14	SYS_SWCLK	n/a	n/a	n/a	
USART2	PA2	USART2_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PA3	USART2_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
GPIO	PC13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PUMP
	PA1	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	WATER_LEVEL
	PA4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SENSOR_PWR
	PA5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED
	PA6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	DOOR_LED
	PB0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_RED
	PB1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_GREEN
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	LED_BLUE
	PB10	GPIO_EXTI10	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	DIO0
	PB11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RFM_RESET
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SPI2_CS
	PA11	GPIO_Input	Input mode	No pull-up and no pull-down	n/a	MOTION
	PA12	GPIO_EXTI12	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	DOOR
	PB5	GPIO_EXTI5	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	ADC_RDY

8.2. DMA configuration

nothing configured in DMA service

8.3. NVIC configuration

Interrupt Table	Enable	Preenmption Priority	SubPriority
Non maskable interrupt	true	0	0
Hard fault interrupt	true	0	0
System service call via SWI instruction	true	0	0
Pendable request for system service	true	0	0
System tick timer	true	0	0
RTC global interrupt through EXTI lines 17, 19 and 20 and LSE CSS interrupt through EXTI line 19	true	0	0
EXTI line 4 to 15 interrupts	true	0	0
USART2 global interrupt / USART2 wake-up interrupt through EXTI line 26	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash and EEPROM global interrupt	unused		
RCC and CRS global interrupt	unused		
ADC, COMP1 and COMP2 interrupts (COMP interrupts through EXTI lines 21 and 22)	unused		
I2C1 event global interrupt / I2C1 wake-up interrupt through EXTI line 23	unused		
SPI2 global interrupt	unused		

* User modified value

9. Software Pack Report