

## 1. Description

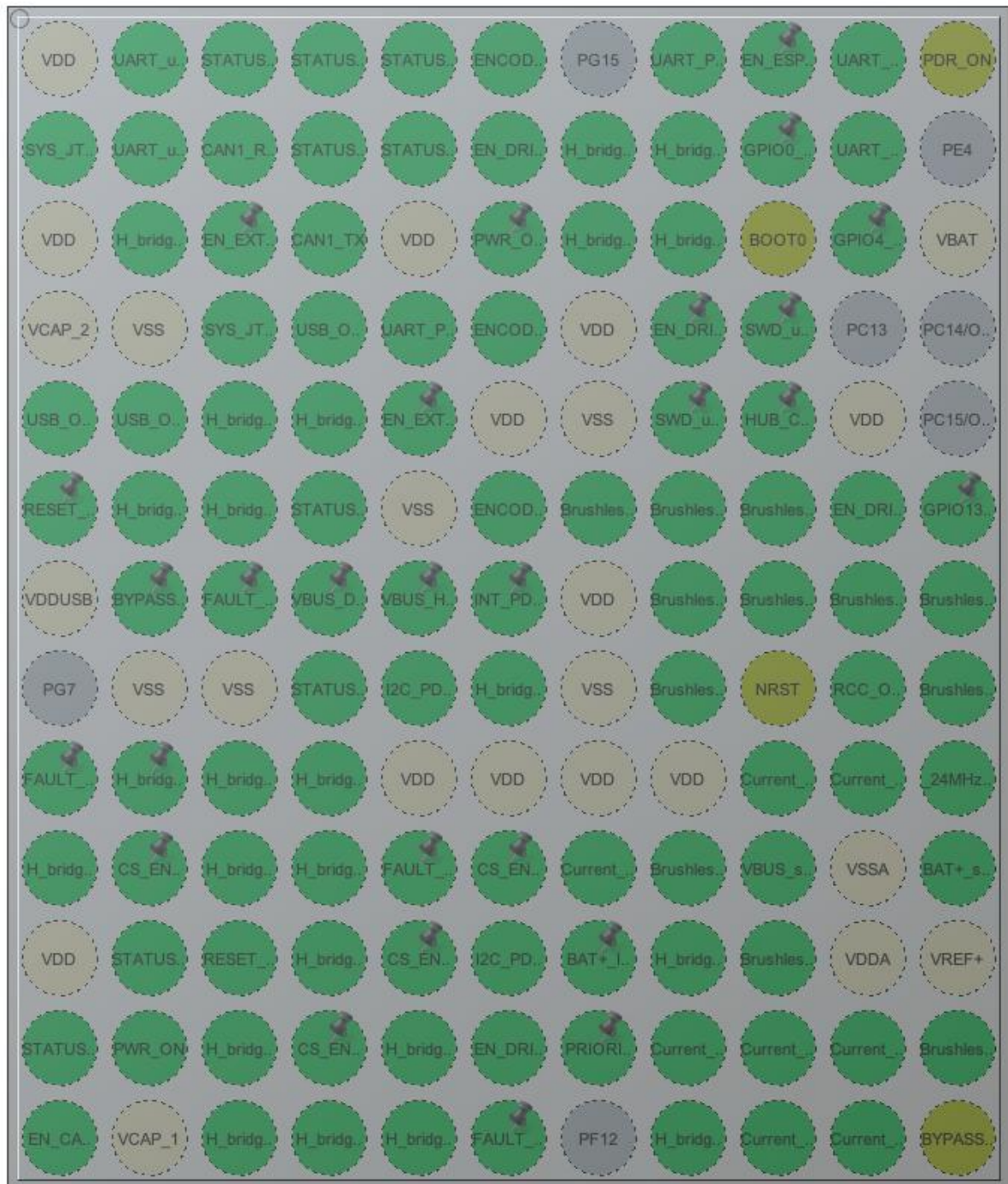
### 1.1. Project

Project Name	Programmer_pinout_rev1
Board Name	custom
Generated with:	STM32CubeMX 5.5.0
Date	06/03/2020

### 1.2. MCU

MCU Series	STM32F7
MCU Line	STM32F7x6
MCU name	STM32F746ZGYx
MCU Package	WLCSP143
MCU Pin number	143

## 2. Pinout Configuration



### 3. Pins Configuration

Pin Number WLCSP143	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
A1	VDD	Power		
A2	PC10	I/O	USART3_TX	UART_uC_ESP
A3	PD2 *	I/O	GPIO_Output	STATUS_LED1_R
A4	PD5 *	I/O	GPIO_Output	STATUS_LED2_R
A5	PD7 *	I/O	GPIO_Output	STATUS_LED2_B
A6	PG12	I/O	SPI6_MISO	ENCODERS_GATE_DRIVE RS
A8	PB6	I/O	USART1_TX	UART_PROG_ESP
A9	PB8 *	I/O	GPIO_Output	EN_ESP32
A10	PE1	I/O	UART8_TX	UART_CMD
A11	PDR_ON	Reset		
B1	PA14	I/O	SYS_JTCK-SWCLK	
B2	PC11	I/O	USART3_RX	UART_uC_ESP
B3	PD0	I/O	CAN1_RX	
B4	PD3 *	I/O	GPIO_Output	STATUS_LED1_G
B5	PD4 *	I/O	GPIO_Output	STATUS_LED1_B
B6	PG11 *	I/O	GPIO_Output	EN_DRIVER_3
B7	PB3	I/O	TIM2_CH2	H_bridge_mot2AN
B8	PB7	I/O	TIM4_CH2	H_bridge_mot3BN
B9	PB9 *	I/O	GPIO_Output	GPIO0_ESP32
B10	PE0	I/O	UART8_RX	UART_CMD
C1	VDD	Power		
C2	PA15	I/O	TIM2_CH1	H_bridge_mot2AP
C3	PC12 *	I/O	GPIO_Output	EN_EXTENSION_TOP
C4	PD1	I/O	CAN1_TX	
C5	VDD	Power		
C6	PG10	I/O	GPIO_EXTI10	PWR_ON_BTN_STATE_n
C7	PB4	I/O	TIM3_CH1	H_bridge_mot2CP
C8	PB5	I/O	TIM3_CH2	H_bridge_mot2CN
C9	BOOT0	Boot		
C10	PE3 *	I/O	GPIO_Output	GPIO4_ESP32
C11	VBAT	Power		
D1	VCAP_2	Power		
D2	VSS	Power		
D3	PA13	I/O	SYS_JTMS-SWDIO	
D4	PA11	I/O	USB_OTG_FS_DM	

Pin Number WLCSP143	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
D5	PA10	I/O	USART1_RX	UART_PROG_ESP
D6	PG13	I/O	SPI6_SCK	ENCODERS_GATE_DRIVE RS
D7	VDD	Power		
D8	PE2 *	I/O	GPIO_Output	EN_DRIVER_4
D9	PE5 *	I/O	GPIO_Output	SWD_uC_SWCLK
E1	PA12	I/O	USB_OTG_FS_DP	
E2	PA9	I/O	USB_OTG_FS_VBUS	
E3	PC9	I/O	TIM3_CH4	H_bridge_mot3AN
E4	PC8	I/O	TIM8_CH3	H_bridge_mot4CP
E5	PG9 *	I/O	GPIO_Output	EN_EXTENSION_BOTTOM
E6	VDD	Power		
E7	VSS	Power		
E8	PE6 *	I/O	GPIO_Output	SWD_uC_SWDIO
E9	PF1 *	I/O	GPIO_Output	HUB_CONNECT
E10	VDD	Power		
F1	PA8 *	I/O	GPIO_Output	RESET_HUB_n
F2	PC6	I/O	TIM8_CH1	H_bridge_mot4AP
F3	PC7	I/O	TIM8_CH2	H_bridge_mot4BP
F4	PD6 *	I/O	GPIO_Output	STATUS_LED2_G
F5	VSS	Power		
F6	PG14	I/O	SPI6_MOSI	ENCODERS_GATE_DRIVE RS
F7	PF7	I/O	ADC3_IN5	Brushless_sense_mot1A
F8	PF5	I/O	ADC3_IN15	Brushless_sense_mot1C
F9	PF4	I/O	ADC3_IN14	Brushless_sense_mot1B
F10	PF2 *	I/O	GPIO_Output	EN_DRIVER_2
F11	PF0 *	I/O	GPIO_Output	GPIO13_ESP32
G1	VDDUSB	Power		
G2	PG8 *	I/O	GPIO_Output	BYPASS_HUB_n
G3	PG3	I/O	GPIO_EXTI3	FAULT_DRIVER_3_n
G4	PG6 *	I/O	GPIO_Output	VBUS_DEVICES
G5	PG4	I/O	GPIO_EXTI4	VBUS_HOST
G6	PG5	I/O	GPIO_EXTI5	INT_PD_CTRL_n
G7	VDD	Power		
G8	PF9	I/O	ADC3_IN7	Brushless_sense_mot2A
G9	PF10	I/O	ADC3_IN8	Brushless_sense_mot2B
G10	PF6	I/O	ADC3_IN4	Brushless_sense_mot3A
G11	PF3	I/O	ADC3_IN9	Brushless_sense_mot3C
H2	VSS	Power		

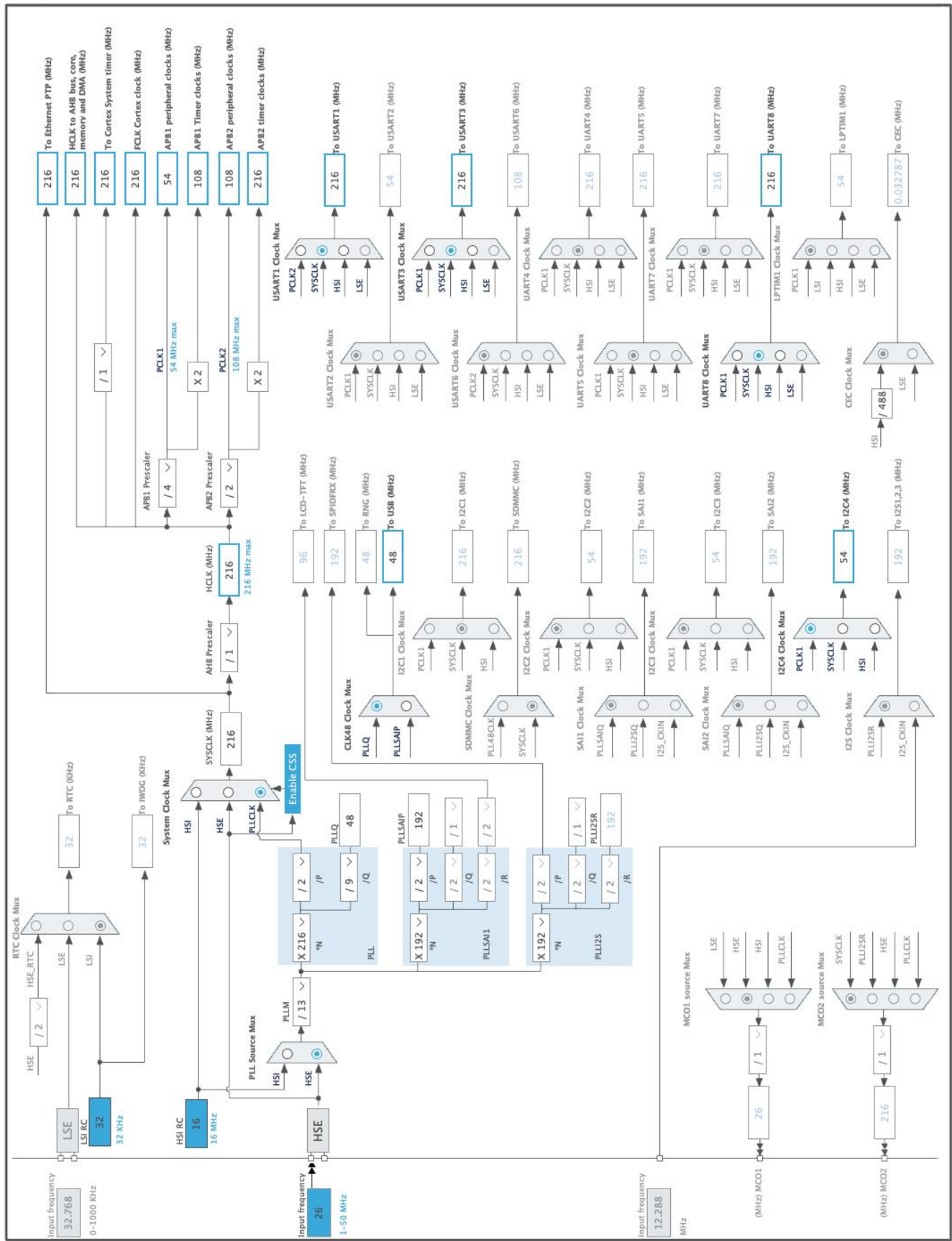
Pin Number WLCSP143	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
H3	VSS	Power		
H4	PD10 *	I/O	GPIO_Output	STATUS_LED3_B
H5	PD13	I/O	I2C4_SDA	I2C_PD_CONTROLLER
H6	PD12	I/O	TIM4_CH1	H_bridge_mot3BP
H7	VSS	Power		
H8	PC0	I/O	ADC3_IN10	Brushless_sense_mot2C
H9	NRST	Reset		
H10	PH1/OSC_OUT	I/O	RCC_OSC_OUT	
H11	PF8	I/O	ADC3_IN6	Brushless_sense_mot3B
J1	PG2	I/O	GPIO_EXTI2	FAULT_DRIVER_4_n
J2	PD14	I/O	TIM4_CH3	H_bridge_mot3CP
J3	PB15	I/O	TIM8_CH3N	H_bridge_mot4CN
J4	PE10	I/O	TIM1_CH2N	H_bridge_mot1BN
J5	VDD	Power		
J6	VDD	Power		
J7	VDD	Power		
J8	VDD	Power		
J9	PC3	I/O	ADC2_IN13	Current_sense_mot1B
J10	PC2	I/O	ADC2_IN12	Current_sense_mot1A
J11	PH0/OSC_IN	I/O	RCC_OSC_IN	_24MHz_IN
K1	PD15	I/O	TIM4_CH4	H_bridge_mot3CN
K2	PD11 *	I/O	GPIO_Output	CS_ENCODER1_n
K3	PB14	I/O	TIM8_CH2N	H_bridge_mot4BN
K4	PE11	I/O	TIM1_CH2	H_bridge_mot1BP
K5	PG1	I/O	GPIO_EXTI1	FAULT_DRIVER_2_n
K6	PF13 *	I/O	GPIO_Output	CS_ENCODER4_n
K7	PB1	I/O	ADC2_IN9	Current_sense_mot4A
K8	PA1	I/O	ADC3_IN1	Brushless_sense_mot4A
K9	PA0/WKUP	I/O	ADC1_IN0	VBUS_sense
K10	VSSA	Power		
K11	PC1	I/O	ADC1_IN11	BAT+_sense
L1	VDD	Power		
L2	PD8 *	I/O	GPIO_Output	STATUS_LED3_R
L3	PE15 *	I/O	GPIO_Output	RESET_uC
L4	PE12	I/O	TIM1_CH3N	H_bridge_mot1CN
L5	PE7 *	I/O	GPIO_Output	CS_ENCODER2_n
L6	PF14	I/O	I2C4_SCL	I2C_PD_CONTROLLER
L7	PB2 *	I/O	GPIO_Output	BAT+_INRUSH_LIMIT_n
L8	PA7	I/O	TIM8_CH1N	H_bridge_mot4AN

Pin Number WLCSP143	Pin Name (function after reset)	Pin Type	Alternate Function(s)	Label
L9	PA2	I/O	ADC3_IN2	Brushless_sense_mot4B
L10	VDDA	Power		
L11	VREF+	Power		
M1	PD9 *	I/O	GPIO_Output	STATUS_LED3_G
M2	PB12 *	I/O	GPIO_Output	PWR_ON
M3	PB10	I/O	TIM2_CH3	H_bridge_mot2BP
M4	PE14 *	I/O	GPIO_Output	CS_ENCODER3_n
M5	PE8	I/O	TIM1_CH1N	H_bridge_mot1AN
M6	PF15 *	I/O	GPIO_Output	EN_DRIVER_1
M7	PF11 *	I/O	GPIO_Output	PRIORITY_TO_VBUS
M8	PC4	I/O	ADC2_IN14	Current_sense_mot4B
M9	PA5	I/O	ADC2_IN5	Current_sense_mot2B
M10	PA4	I/O	ADC2_IN4	Current_sense_mot2A
M11	PA3	I/O	ADC3_IN3	Brushless_sense_mot4C
N1	PB13 *	I/O	GPIO_Output	EN_CAN_PROG_n
N2	VCAP_1	Power		
N3	PB11	I/O	TIM2_CH4	H_bridge_mot2BN
N4	PE13	I/O	TIM1_CH3	H_bridge_mot1CP
N5	PE9	I/O	TIM1_CH1	H_bridge_mot1AP
N6	PG0	I/O	GPIO_EXTI0	FAULT_DRIVER_1_n
N8	PB0	I/O	TIM3_CH3	H_bridge_mot3AP
N9	PC5	I/O	ADC2_IN15	Current_sense_mot3B
N10	PA6	I/O	ADC2_IN6	Current_sense_mot3A
N11	BYPASS_REG	Reset		

\* The pin is affected with an I/O function



## 4. Clock Tree Configuration



## 5. Software Project

### 5.1. Project Settings

Name	Value
Project Name	Programmer_pinout_rev1
Project Folder	/Users/eliot/Documents/SmartGit/e-puck3-coreboard
Toolchain / IDE	EWARM V8
Firmware Package Name and Version	STM32Cube FW_F7 V1.15.0

### 5.2. Code Generation Settings

Name	Value
STM32Cube MCU packages and embedded software	Copy all used libraries into the project folder
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	STM32F7
Line	STM32F7x6
MCU	STM32F746ZGYx
Datasheet	027590_Rev4

### 6.2. Parameter Selection

Temperature	25
Vdd	3.3

## 7. IPs and Middleware Configuration

### 7.1. ADC1

mode: IN0

mode: IN11

mode: Temperature Sensor Channel

mode: Vrefint Channel

#### 7.1.1. 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 0

Sampling Time 3 Cycles

##### ADC\_Injected\_ConversionMode:

Number Of Conversions 0

##### WatchDog:

Enable Analog WatchDog Mode false

### 7.2. ADC2

mode: IN4

mode: IN5

mode: IN6

mode: IN9

mode: IN12

mode: IN13

mode: IN14

mode: IN15

### 7.2.1. 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 4

Sampling Time 3 Cycles

#### ADC\_Injected\_ConversionMode:

Number Of Conversions 0

#### WatchDog:

Enable Analog WatchDog Mode false

### 7.3. ADC3

mode: IN1

mode: IN2

mode: IN3

mode: IN4

mode: IN5

mode: IN6

**mode: IN7**

**mode: IN8**

**mode: IN9**

**mode: IN10**

**mode: IN14**

**mode: IN15**

### 7.3.1. 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 4 \***

Sampling Time 3 Cycles

#### ADC\_Injected\_ConversionMode:

Number Of Conversions 0

#### WatchDog:

Enable Analog WatchDog Mode false

## 7.4. CAN1

**mode: Mode**

### 7.4.1. Parameter Settings:

#### Bit Timings Parameters:

Prescaler (for Time Quantum) 16

Time Quantum

**296.2962962962963 \***

Time Quanta in Bit Segment 1	<b>5 Times *</b>
Time Quanta in Bit Segment 2	<b>3 Times *</b>
ReSynchronization Jump Width	1 Time

**Basic Parameters:**

Time Triggered Communication Mode	Disable
Automatic Bus-Off Management	Disable
Automatic Wake-Up Mode	Disable
No-Automatic Retransmission	Disable
Receive Fifo Locked Mode	Disable
Transmit Fifo Priority	Disable

**Advanced Parameters:**

Operating Mode	Normal
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## 7.5. CORTEX\_M7

### 7.5.1. Parameter Settings:

**Cortex Interface Settings:**

Flash Interface	<b>TCM Interface *</b>
ART ACCELERATOR	Enabled
Instruction Prefetch	<b>Disabled *</b>
CPU ICache	Disabled
CPU DCache	Disabled

**Cortex Memory Protection Unit Control Settings:**

MPU Control Mode	MPU NOT USED
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## 7.6. GPIO

## 7.7. I2C4

### I2C: I2C

#### 7.7.1. Parameter Settings:

**Timing configuration:**

I2C Speed Mode	<b>Fast Mode Plus *</b>
I2C Speed Frequency (KHz)	1000
Rise Time (ns)	0

Fall Time (ns)	0
Coefficient of Digital Filter	0
Analog Filter	Enabled
Timing	<b>0x00200922 *</b>

**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

## 7.8. RCC

### High Speed Clock (HSE): BYPASS Clock Source

#### 7.8.1. Parameter Settings:

**System Parameters:**

VDD voltage (V)	3.3
Flash Latency(WS)	7 WS (8 CPU cycle)

**RCC Parameters:**

HSI Calibration Value	16
TIM Prescaler Selection	Disabled
HSE Startup Timeout Value (ms)	100
LSE Startup Timeout Value (ms)	5000

**Power Parameters:**

Power Over Drive	Enabled
Power Regulator Voltage Scale	Power Regulator Voltage Scale 1

## 7.9. SPI6

### Mode: Full-Duplex Master

#### 7.9.1. Parameter Settings:

**Basic Parameters:**

Frame Format	Motorola
Data Size	<b>16 Bits *</b>
First Bit	MSB First

**Clock Parameters:**

Prescaler (for Baud Rate)	2
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Baud Rate **54.0 MBits/s \***

Clock Polarity (CPOL) Low

Clock Phase (CPHA) 1 Edge

**Advanced Parameters:**

CRC Calculation Disabled

NSSP Mode Enabled

NSS Signal Type Software

## 7.10. SYS

**Debug: Serial Wire**

**Timebase Source: SysTick**

## 7.11. TIM1

**Trigger Source: ITR0**

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1 CH1N**

**Channel2: PWM Generation CH2 CH2N**

**Channel3: PWM Generation CH3 CH3N**

### 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

Repetition Counter (RCR - 16 bits value) 0

auto-reload preload Disable

Slave Mode Controller Slave mode disable

**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)

Trigger Event Selection TRGO2 Reset (UG bit from TIMx\_EGR)

**Break And Dead Time management - BRK Configuration:**

BRK State Disable

BRK Polarity High

BRK Filter (4 bits value) 0

**Break And Dead Time management - BRK2 Configuration:**

BRK2 State Disable



BRK2 Polarity	High
BRK2 Filter (4 bits value)	0

**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
Dead Time	0

**PWM Generation Channel 1 and 1N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

**PWM Generation Channel 2 and 2N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

**PWM Generation Channel 3 and 3N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

## 7.12. TIM2

**Slave Mode: Trigger Mode**

**Trigger Source: ITR0**

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

## Channel2: PWM Generation CH2

## Channel3: PWM Generation CH3

## Channel4: PWM Generation CH4

### 7.12.1. Parameter Settings:

#### Counter Settings:

Prescaler (PSC - 16 bits value)	0
Counter Mode	Up
Counter Period (AutoReload Register - 32 bits value )	0
Internal Clock Division (CKD)	No Division
auto-reload preload	Disable
Slave Mode Controller	Trigger Mode

#### 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)

#### PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (32 bits value)	0
Fast Mode	Disable
CH Polarity	High

## 7.13. TIM3

## Slave Mode: Trigger Mode

Trigger Source: ITR0

Channel1: PWM Generation CH1

Channel2: PWM Generation CH2

Channel3: PWM Generation CH3

Channel4: PWM Generation CH4

### 7.13.1. 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
Slave Mode Controller	Trigger Mode

#### 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)

#### PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

## 7.14. TIM4

**Slave Mode: Trigger Mode**

**Trigger Source: ITR0**

**Clock Source : Internal Clock**

**Channel1: PWM Generation CH1**

**Channel2: PWM Generation CH2**

**Channel3: PWM Generation CH3**

**Channel4: PWM Generation CH4**

### 7.14.1. 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
Slave Mode Controller	Trigger Mode

#### 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)

#### PWM Generation Channel 1:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 2:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 3:

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High

#### PWM Generation Channel 4:

Mode	PWM mode 1
Pulse (16 bits value)	0

Fast Mode	Disable
CH Polarity	High

## 7.15. TIM8

### Slave Mode: Trigger Mode

Trigger Source: ITR0

Clock Source : Internal Clock

Channel1: PWM Generation CH1 CH1N

Channel2: PWM Generation CH2 CH2N

Channel3: PWM Generation CH3 CH3N

#### 7.15.1. 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 - 16 bits value)	0
auto-reload preload	Disable
Slave Mode Controller	Trigger Mode

##### 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)
Trigger Event Selection TRGO2	Reset (UG bit from TIMx_EGR)

##### Break And Dead Time management - BRK Configuration:

BRK State	Disable
BRK Polarity	High
BRK Filter (4 bits value)	0

##### Break And Dead Time management - BRK2 Configuration:

BRK2 State	Disable
BRK2 Polarity	High
BRK2 Filter (4 bits value)	0

##### 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
Dead Time	0

#### **PWM Generation Channel 1 and 1N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

#### **PWM Generation Channel 2 and 2N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

#### **PWM Generation Channel 3 and 3N:**

Mode	PWM mode 1
Pulse (16 bits value)	0
Fast Mode	Disable
CH Polarity	High
CHN Polarity	High
CH Idle State	Reset
CHN Idle State	Reset

## **7.16. UART8**

### **Mode: Asynchronous**

#### **7.16.1. 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
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

## 7.17. USART1

**Mode: Asynchronous**

### 7.17.1. 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
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

## 7.18. USART3

**Mode: Asynchronous**

### 7.18.1. 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
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

## 7.19. USB\_OTG\_FS

**Mode: Device\_Only**

**mode: Activate\_VBUS**

### 7.19.1. Parameter Settings:

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

**\* 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	PA0/WKUP	ADC1_IN0	Analog mode	No pull-up and no pull-down	n/a	VBUS_sense
	PC1	ADC1_IN11	Analog mode	No pull-up and no pull-down	n/a	BAT+_sense
ADC2	PC3	ADC2_IN13	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot1B
	PC2	ADC2_IN12	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot1A
	PB1	ADC2_IN9	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot4A
	PC4	ADC2_IN14	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot4B
	PA5	ADC2_IN5	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot2B
	PA4	ADC2_IN4	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot2A
	PC5	ADC2_IN15	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot3B
	PA6	ADC2_IN6	Analog mode	No pull-up and no pull-down	n/a	Current_sense_mot3A
ADC3	PF7	ADC3_IN5	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot1A
	PF5	ADC3_IN15	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot1C
	PF4	ADC3_IN14	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot1B
	PF9	ADC3_IN7	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot2A
	PF10	ADC3_IN8	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot2B
	PF6	ADC3_IN4	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot3A
	PF3	ADC3_IN9	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot3C
	PC0	ADC3_IN10	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot2C
	PF8	ADC3_IN6	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot3B
	PA1	ADC3_IN1	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot4A
	PA2	ADC3_IN2	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot4B
	PA3	ADC3_IN3	Analog mode	No pull-up and no pull-down	n/a	Brushless_sense_mot4C
CAN1	PD0	CAN1_RX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
	PD1	CAN1_TX	Alternate Function Push Pull	No pull-up and no pull-down	Very High *	
I2C4	PD13	I2C4_SDA	Alternate Function Open Drain	Pull-up	Very High *	I2C_PD_CONTROLLER
	PF14	I2C4_SCL	Alternate Function Open Drain	Pull-up	Very High *	I2C_PD_CONTROLLER
RCC	PH1/OSC_OUT	RCC_OSC_OUT	n/a	n/a	n/a	
	PH0/OSC_IN	RCC_OSC_IN	n/a	n/a	n/a	_24MHz_IN
SPI6	PG12	SPI6_MISO	Alternate Function Push Pull	No pull-up and no pull-down	Very High	ENCODERS_GATE_DRIVERS

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IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					*	
	PG13	SPI6_SCK	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	ENCODERS_GATE_DRIVERS
	PG14	SPI6_MOSI	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	ENCODERS_GATE_DRIVERS
SYS	PA14	SYS_JTCK-SWCLK	n/a	n/a	n/a	
	PA13	SYS_JTMS-SWDIO	n/a	n/a	n/a	
TIM1	PE10	TIM1_CH2N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1BN
	PE11	TIM1_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1BP
	PE12	TIM1_CH3N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1CN
	PE8	TIM1_CH1N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1AN
	PE13	TIM1_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1CP
	PE9	TIM1_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot1AP
TIM2	PB3	TIM2_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2AN
	PA15	TIM2_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2AP
	PB10	TIM2_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2BP
	PB11	TIM2_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2BN
TIM3	PB4	TIM3_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2CP
	PB5	TIM3_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot2CN
	PC9	TIM3_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3AN
	PB0	TIM3_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3AP
TIM4	PB7	TIM4_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3BN
	PD12	TIM4_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3BP
	PD14	TIM4_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3CP
	PD15	TIM4_CH4	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot3CN
TIM8	PC8	TIM8_CH3	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4CP
	PC6	TIM8_CH1	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4AP
	PC7	TIM8_CH2	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4BP
	PB15	TIM8_CH3N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4CN
	PB14	TIM8_CH2N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4BN
	PA7	TIM8_CH1N	Alternate Function Push Pull	No pull-up and no pull-down	Low	H_bridge_mot4AN
UART8	PE1	UART8_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	UART_CMD
	PE0	UART8_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	UART_CMD
USART1	PB6	USART1_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	UART_PROG_ESP
	PA10	USART1_RX	Alternate Function Push Pull	No pull-up and no pull-down		UART_PROG_ESP

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IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
					<b>Very High</b> *	
USART3	PC10	USART3_TX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	UART_uC_ESP
	PC11	USART3_RX	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	UART_uC_ESP
USB_OTG_FS	PA11	USB_OTG_FS_DM	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PA12	USB_OTG_FS_DP	Alternate Function Push Pull	No pull-up and no pull-down	<b>Very High</b> *	
	PA9	USB_OTG_FS_VBUS	Input mode	No pull-up and no pull-down	<b>n/a</b>	
GPIO	PD2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED1_R
	PD5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED2_R
	PD7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED2_B
	PB8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_ESP32
	PD3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED1_G
	PD4	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED1_B
	PG11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_DRIVER_3
	PB9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GPIO0_ESP32
	PC12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_EXTENSION_TOP
	PG10	GPIO_EXTI10	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	PWR_ON_BTN_STATE_n
	PE3	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GPIO4_ESP32
	PE2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_DRIVER_4
	PE5	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SWD_uC_SWCLK
	PG9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_EXTENSION_BOTTOM
	PE6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	SWD_uC_SWDIO
	PF1	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	HUB_CONNECT
	PA8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RESET_HUB_n
	PD6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED2_G
	PF2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_DRIVER_2
	PF0	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	GPIO13_ESP32
	PG8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BYPASS_HUB_n
	PG3	GPIO_EXTI3	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	FAULT_DRIVER_3_n
	PG6	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	VBUS_DEVICES
	PG4	GPIO_EXTI4	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	VBUS_HOST

IP	Pin	Signal	GPIO mode	GPIO pull/up pull down	Max Speed	User Label
	PG5	GPIO_EXTI5	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	INT_PD_CTRL_n
	PD10	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED3_B
	PG2	GPIO_EXTI2	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	FAULT_DRIVER_4_n
	PD11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS_ENCODER1_n
	PG1	GPIO_EXTI1	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	FAULT_DRIVER_2_n
	PF13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS_ENCODER4_n
	PD8	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED3_R
	PE15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	RESET_uC
	PE7	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS_ENCODER2_n
	PB2	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	BAT+_INRUSH_LIMIT_n
	PD9	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	STATUS_LED3_G
	PB12	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PWR_ON
	PE14	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	CS_ENCODER3_n
	PF15	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_DRIVER_1
	PF11	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	PRIORITY_TO_VBUS
	PB13	GPIO_Output	Output Push Pull	No pull-up and no pull-down	Low	EN_CAN_PROG_n
	PG0	GPIO_EXTI0	External Interrupt Mode with Rising edge trigger detection	No pull-up and no pull-down	n/a	FAULT_DRIVER_1_n

## 8.2. DMA configuration

DMA request	Stream	Direction	Priority
ADC1	DMA2_Stream0	Peripheral To Memory	Low
ADC2	DMA2_Stream3	Peripheral To Memory	Low
ADC3	DMA2_Stream1	Peripheral To Memory	Low
SPI6_RX	DMA2_Stream6	Peripheral To Memory	Low
SPI6_TX	DMA2_Stream5	Memory To Peripheral	Low
UART8_RX	DMA1_Stream6	Peripheral To Memory	Low
UART8_TX	DMA1_Stream0	Memory To Peripheral	Low
USART3_RX	DMA1_Stream1	Peripheral To Memory	Low
USART3_TX	DMA1_Stream4	Memory To Peripheral	Low
I2C4_RX	DMA1_Stream2	Peripheral To Memory	Low
I2C4_TX	DMA1_Stream5	Memory To Peripheral	Low
USART1_RX	DMA2_Stream2	Peripheral To Memory	Low
USART1_TX	DMA2_Stream7	Memory To Peripheral	Low

### ADC1: DMA2\_Stream0 DMA request Settings:

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

### ADC2: DMA2\_Stream3 DMA request Settings:

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

### ADC3: DMA2\_Stream1 DMA request Settings:

Mode: Normal  
 Use fifo: Disable  
 Peripheral Increment: Disable

Memory Increment: **Enable \***  
Peripheral Data Width: Half Word  
Memory Data Width: Half Word

*SPI6\_RX: DMA2\_Stream6 DMA request Settings:*

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

*SPI6\_TX: DMA2\_Stream5 DMA request Settings:*

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

*UART8\_RX: DMA1\_Stream6 DMA request Settings:*

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

*UART8\_TX: DMA1\_Stream0 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

USART3\_TX: DMA1\_Stream4 DMA request Settings:

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

I2C4\_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

I2C4\_TX: DMA1\_Stream5 DMA request Settings:

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

USART1\_RX: DMA2\_Stream2 DMA request Settings:

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

USART1\_TX: DMA2\_Stream7 DMA request Settings:

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

### 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 stream0 global interrupt	true	0	0
DMA1 stream1 global interrupt	true	0	0
DMA1 stream2 global interrupt	true	0	0
DMA1 stream4 global interrupt	true	0	0
DMA1 stream5 global interrupt	true	0	0
DMA1 stream6 global interrupt	true	0	0
DMA2 stream0 global interrupt	true	0	0
DMA2 stream1 global interrupt	true	0	0
DMA2 stream2 global interrupt	true	0	0
DMA2 stream3 global interrupt	true	0	0
DMA2 stream5 global interrupt	true	0	0
DMA2 stream6 global interrupt	true	0	0
DMA2 stream7 global interrupt	true	0	0
PVD interrupt through EXTI line 16	unused		
Flash global interrupt	unused		
RCC global interrupt	unused		
EXTI line0 interrupt	unused		
EXTI line1 interrupt	unused		
EXTI line2 interrupt	unused		
EXTI line3 interrupt	unused		
EXTI line4 interrupt	unused		
ADC1, ADC2 and ADC3 global interrupts	unused		
CAN1 TX interrupts	unused		
CAN1 RX0 interrupts	unused		
CAN1 RX1 interrupt	unused		
CAN1 SCE interrupt	unused		
EXTI line[9:5] interrupts	unused		
TIM1 break interrupt and TIM9 global interrupt	unused		
TIM1 update interrupt and TIM10 global interrupt	unused		

Interrupt Table	Enable	Preenmption Priority	SubPriority
TIM1 trigger and commutation interrupts and TIM11 global interrupt		unused	
TIM1 capture compare interrupt		unused	
TIM2 global interrupt		unused	
TIM3 global interrupt		unused	
TIM4 global interrupt		unused	
USART1 global interrupt		unused	
USART3 global interrupt		unused	
EXTI line[15:10] interrupts		unused	
TIM8 break interrupt and TIM12 global interrupt		unused	
TIM8 update interrupt and TIM13 global interrupt		unused	
TIM8 trigger and commutation interrupts and TIM14 global interrupt		unused	
TIM8 capture compare interrupt		unused	
USB On The Go FS global interrupt		unused	
FPU global interrupt		unused	
UART8 global interrupt		unused	
SPI6 global interrupt		unused	
I2C4 event interrupt		unused	
I2C4 error interrupt		unused	

\* User modified value

## ***9. Software Pack Report***