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## EVAL-L9963-MCU Evaluation Board

### Introduction

The EVAL-L9963-MCU is a hardware tool for evaluation and development and is ideal for rapid prototyping of a 48 V battery management system (BMS) or as lower stage of a distributed BMS. This board can be used to evaluate the features of the L9963 device and L9963T.

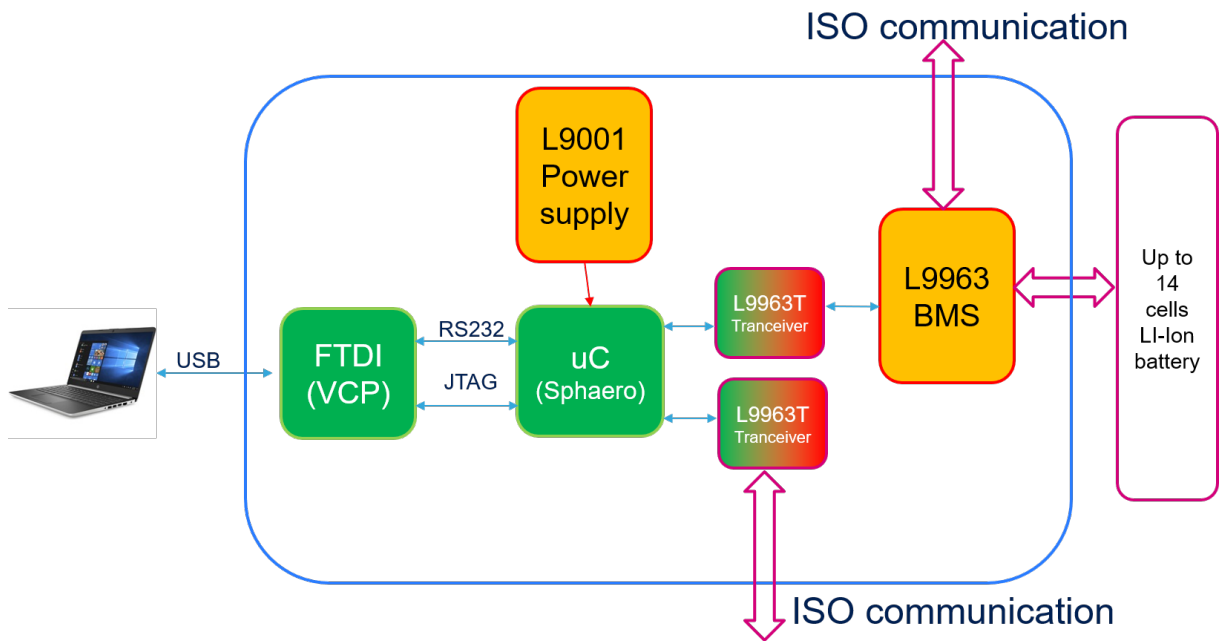
The EVAL-L9963 allows the user to connect up to 14 channels for cell voltage sensing, one channel for current sensing, and up to 4 channels for temperature sensing (plus an additional on-board NTC to sense PCB temperature). The board provides an onboard microcontroller with preloaded firmware intended to be used with STSW-L9963 Graphical User Interface.

# 1 Hardware description

The EVAL-L9963-MCU board provides maximum flexibility, giving access to all pins to simplify the evaluation and debug phase of the device.

## 1.1 Block Diagram

Figure 1. EVAL-L9963-MCU block diagram



## 1.2 Featured components

The EVAL-L9963-MCU can be considered a reference design for a 48 V BMS or as a first layer of a distributed BMS system. In the following table there is a short description of all the ST featured components.

Table 1. Featured components

Name	Description
L9963	Automotive chip for battery management applications
L9963T	Automotive SPI to isolated SPI transceiver
L9001	Automotive power supply IC with multiple voltage regulators
SPC574S64E3	32-bit Power Architecture MCU for Automotive Chassis and Safety Applications

### 1.3 Board description

Figure 2. Board Top view

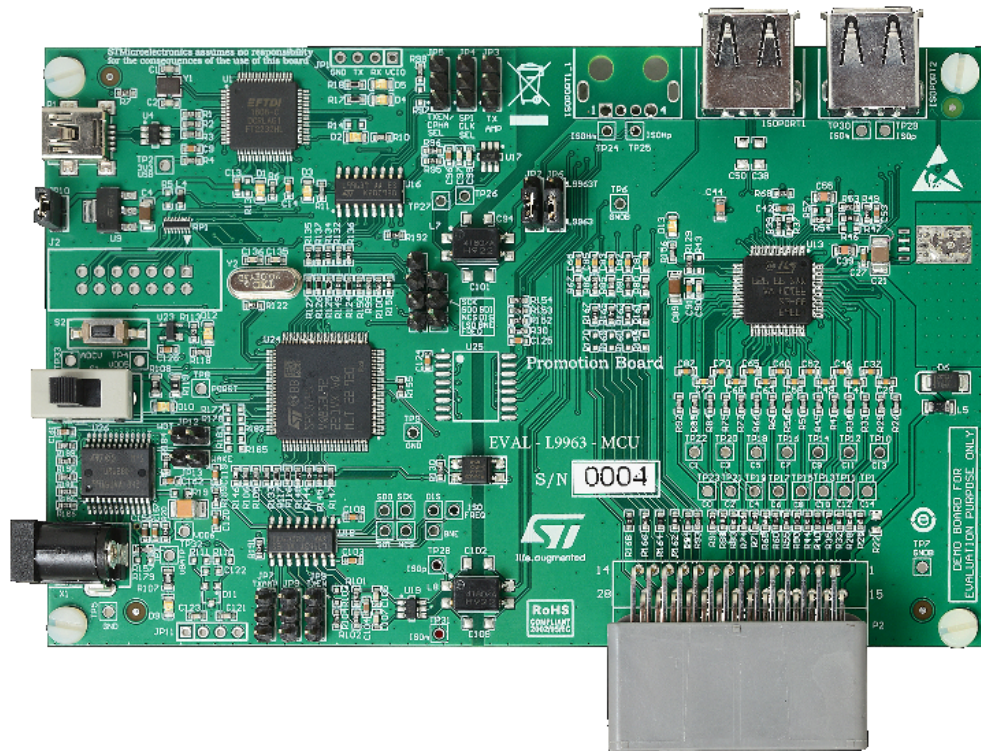
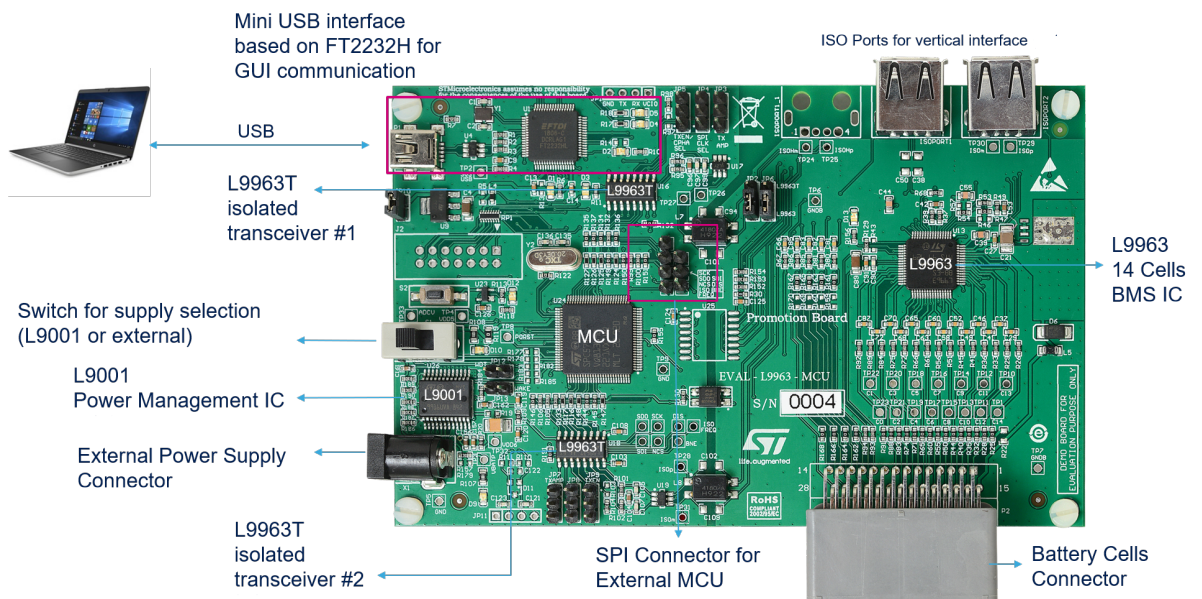


Figure 3. Main components and connectors



## 2 Jumpers and connectors

### 2.1 Mother board jumpers and connectors

Table 2. Motherboard jumpers and connectors

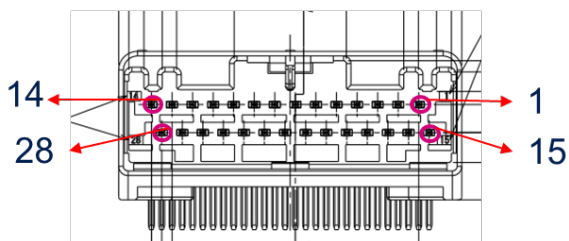
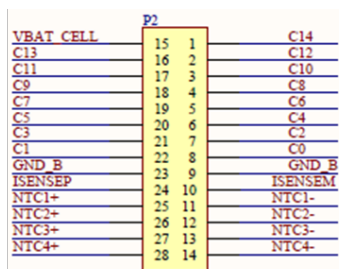
Name	Description	Type
X1	External power supply connector	Jack
P1	USB connector for PC communication	Mini USB connector
ISOPORT 1	Isolated serial communication port:	USB Type A connector
	1- VBAT	
	2- ISOH- (From L9963)	
	3- ISOH+ (From L9963)	
ISOPORT 2	Isolated serial communication port:	USB Type A connector
	1- N.C.	
	2- ISO- (from L9963T)	
	3- ISO+ (from L9963T)	
P2	Battery connector:	Multi pin connector
	1- Cell 14	
	2- Cell 12	
	3- Cell 10	
	4- Cell 8	
	5- Cell 6	
	6- Cell 4	
	7- Cell 2	
	8- Cell 0	
	9- Ground	
	10- Current sensor resistor negative pin	
	11- NTC 1-	
	12- NTC 2-	
	13- NTC3 -	
	14- NTC4 -	
	15- VBAT	
	16- Cell 13	
	17- Cell 11	
	18- Cell 9	
	19- Cell 7	
	20- Cell 5	
21- Cell 3		

Name	Description	Type
P2	22- Cell 1	Multi pin connector
	23- Ground	
	24- Current sensor resistor positive pin	
	25- NTC 1+	
	26- NTC 2+	
	27- NTC3 +	
	28- NTC4 +	
JP2	L9963T (U16) ISO- output selection	1-2 ISO- redirected to ISOPORT 1_1 2-3 ISO- redirected to L9963
JP3	L9963T (U16) TX amplitude selection	1-2 high amplitude/high threshold <sup>(1)</sup> 2-3 low amplitude/low threshold <sup>(1)</sup> Unconnected : highamplitude/high threshold
JP4	L9963T (U16) SPI Master Clock selection	1-2 minimum frequency <sup>(1)</sup> 2-3 Maximum frequency <sup>(1)</sup> Unconnected: minimum frequency
JP5	L9963T (U16) Transmitter enable signal	1-2 enable the TX activity <sup>(1)</sup> 2-3 disable the TX activity <sup>(1)</sup> Unconnected : controlled by $\mu$ c (PD9)
JP6	L9963T (U16) ISO+ output selection	1-2 ISO- redirected to ISOPORT 1_1 2-3 ISO- redirected to L9963
JP7	L9963T (U18) TX amplitude selection	1-2 high amplitude/high threshold <sup>(1)</sup> 2-3 low amplitude/low threshold <sup>(1)</sup> Unconnected: high amplitude/high threshold
JP8	L9963T (U18) SPI Master Clock selection	1-2 minimum frequency <sup>(1)</sup> 2-3 Maximum frequency <sup>(1)</sup> Unconnected: minimum frequency
JP9	L9963T (U18) Transmitter enable signal	1-2 enable the TX activity <sup>(1)</sup> 2-3 disable the TX activity <sup>(1)</sup> Unconnected: controlled by $\mu$ c (PD8)
JP10	USB +5 V selector	Connected: +5 V from PC USB Unconnected : +5 V from L9001
JP12	L9001 (U26) watchdog disable <sup>(2)</sup>	Connected: watchdog disabled Unconnected: watchdog enabled
JP13	L9001 (U26) wake signal	Connected: L9001 enabled Unconnected :L9001 disabled
S1	$\mu$ c +5 V deviator	1-2 +5 V from L9001 2-3 +5 V form USB (please check JP10)

1. See L9963T datasheet

2. See L9001 datasheet

Figure 4. P2 Battery connector



## 2.2 Default jumpers setting

Table 3. Jumpers configuration

Name	Description	Configuration
JP2	L9963T (U16) ISO- output selection	2-3 ISO- redirected to L9963
JP3	L9963T (U16) TX amplitude selection	1-2: high amplitude/high threshold
JP4	L9963T (U16) SPI Master Clock selection	Unconnected: minimum frequency
JP5	L9963T (U16) Transmitter enable signal	Unconnected: controlled by $\mu\text{c}$ (PD9)
JP6	L9963T (U16) ISO+ output selection	2-3 ISO- redirected to L9963
JP7	L9963T (U18) TX amplitude selection	1-2: high amplitude/high threshold
JP8	L9963T (U18) SPI Master Clock selection	Unconnected: minimum frequency
JP9	L9963T (U18) Transmitter enable signal	Unconnected: controlled by $\mu\text{c}$ (PD8)
JP10	USB +5 V selector	Connected: +5 V from PC USB
JP12	L9001 (U26) watchdog disable (2)	Connected: watchdog disabled
JP13	L9001 (U26) wake signal	Unconnected: L9001 disabled
S1	$\mu\text{c}$ +5 V deviator	2-3: +5 V form USB

### 3 Getting started

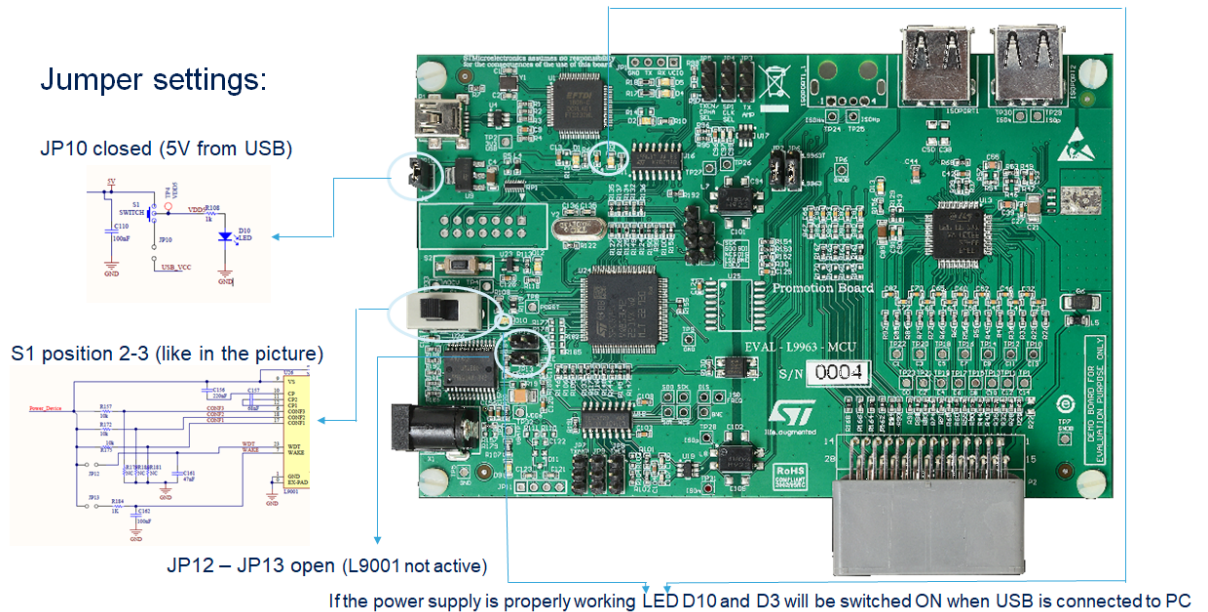
#### 3.1 System requirements

- EVAL-L9963-MCU
- Mini USB to USB type A cable
- Power supply (at least 3 output 0 – 30 V, if possible 60 V):
  - 1 output to power L9963 (0:60 V)
  - 1 output to simulate Cells common mode voltage (0:60 V)
  - 1 output to simulate Cell voltage (0:5 V)
- L9963 evaluation GUI ver 1.801 (please check STSW-L9963 user manual)

#### 3.2 EVAL-L9963-MCU board setup

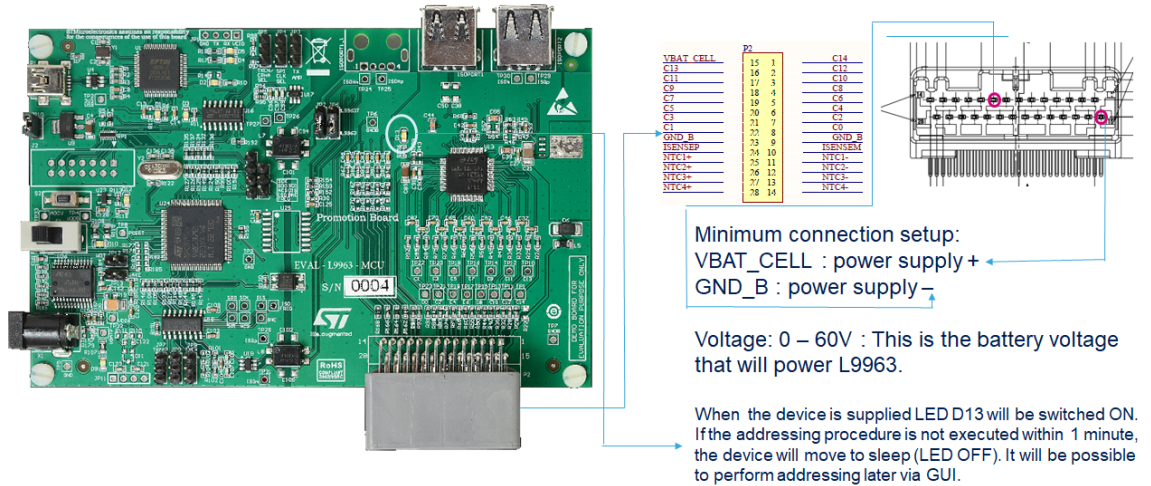
##### 3.2.1 Microcontroller Power supply

Figure 5. Microcontroller Power supply



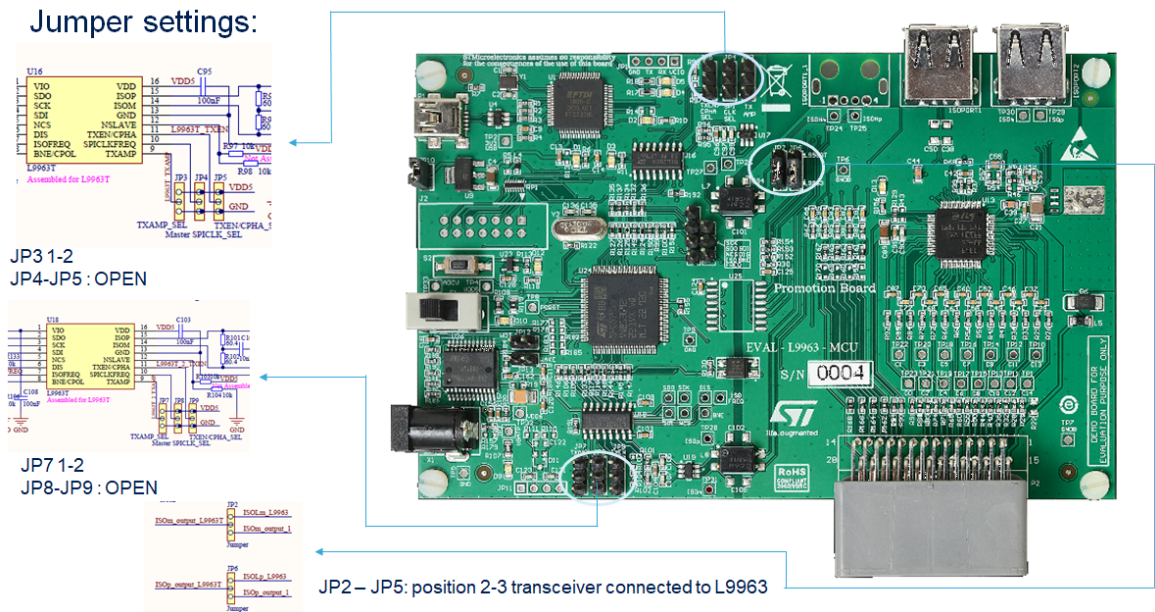
### 3.2.2 L9963 external connection and power supply

Figure 6. L9963 external connection and power supply



### 3.2.3 Transceiver settings

Figure 7. Transceiver settings

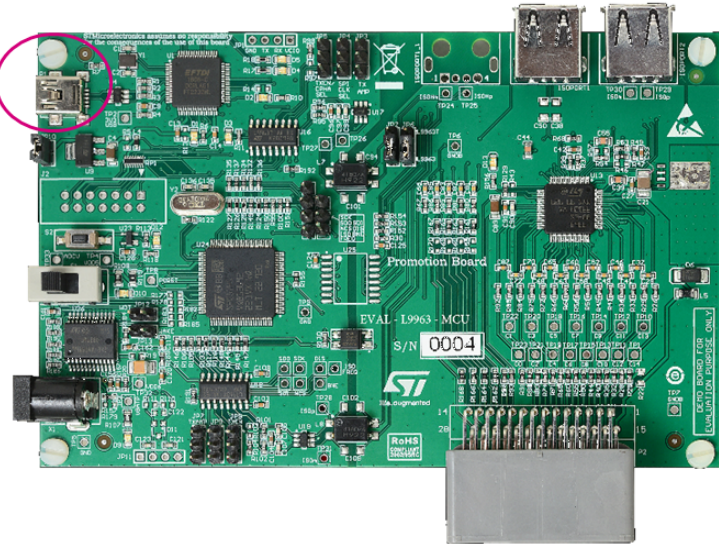




### 3.2.4 USB to PC connection

Figure 8. USB to PC connection

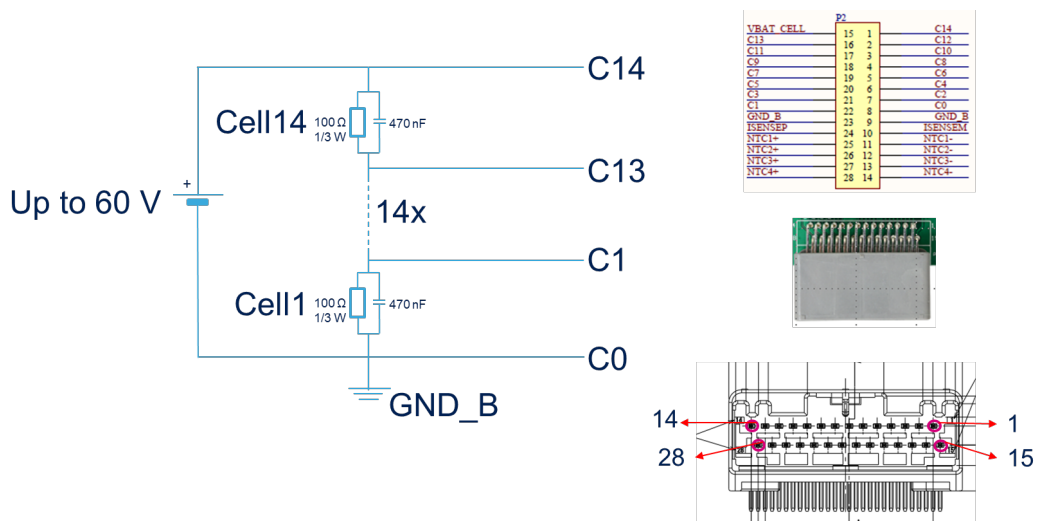
USB port to be connected to PC



### 3.2.5 Possible connection for battery simulation

In case a real battery is not available, it's possible to use the following circuit to simulate the battery pack.

Figure 9. Battery simulation



Minimum cells set: 1,2,13,14

# 4 Board schematic

Figure 10. Board schematic: page 1

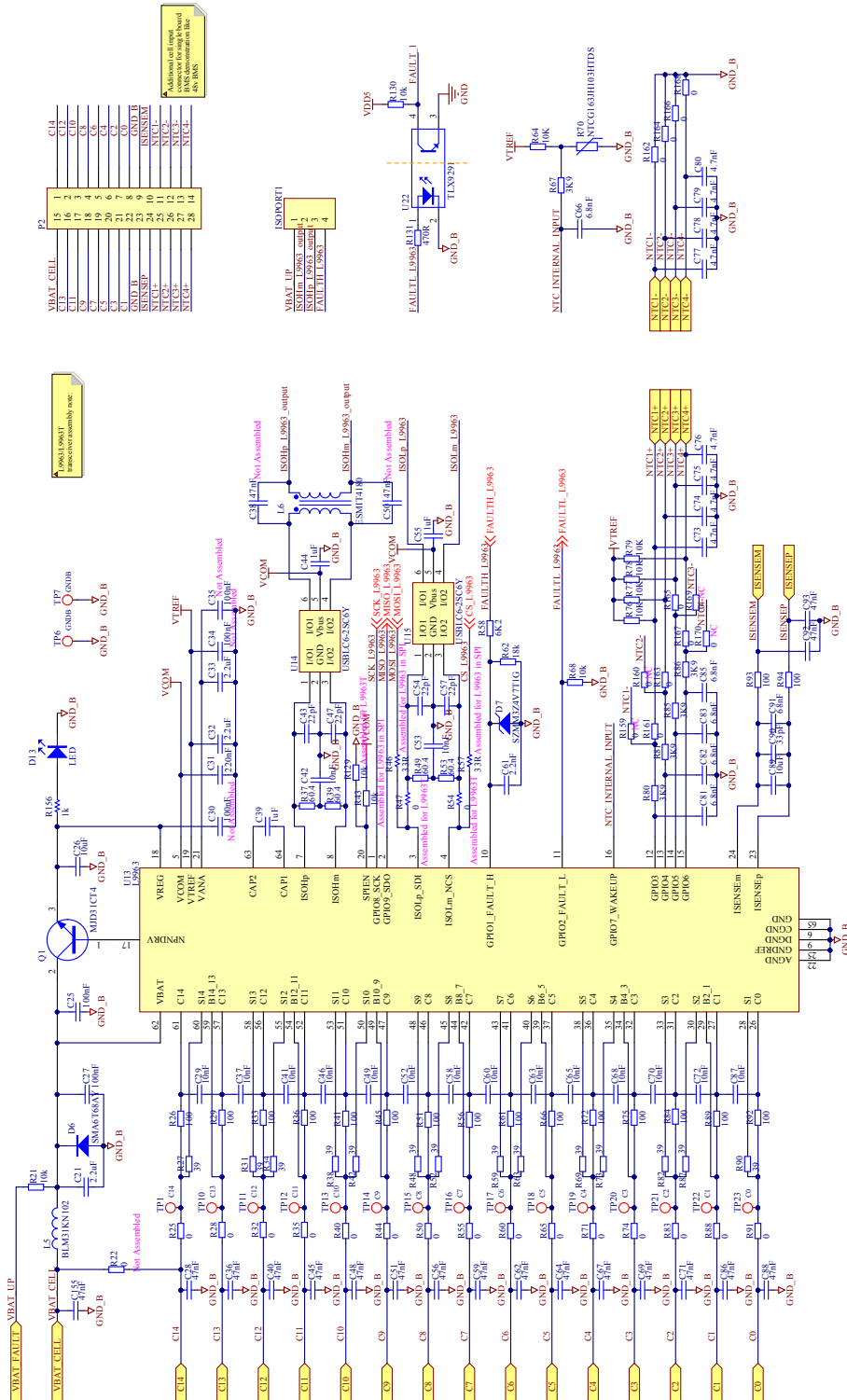




Figure 12. Board schematic: page 3

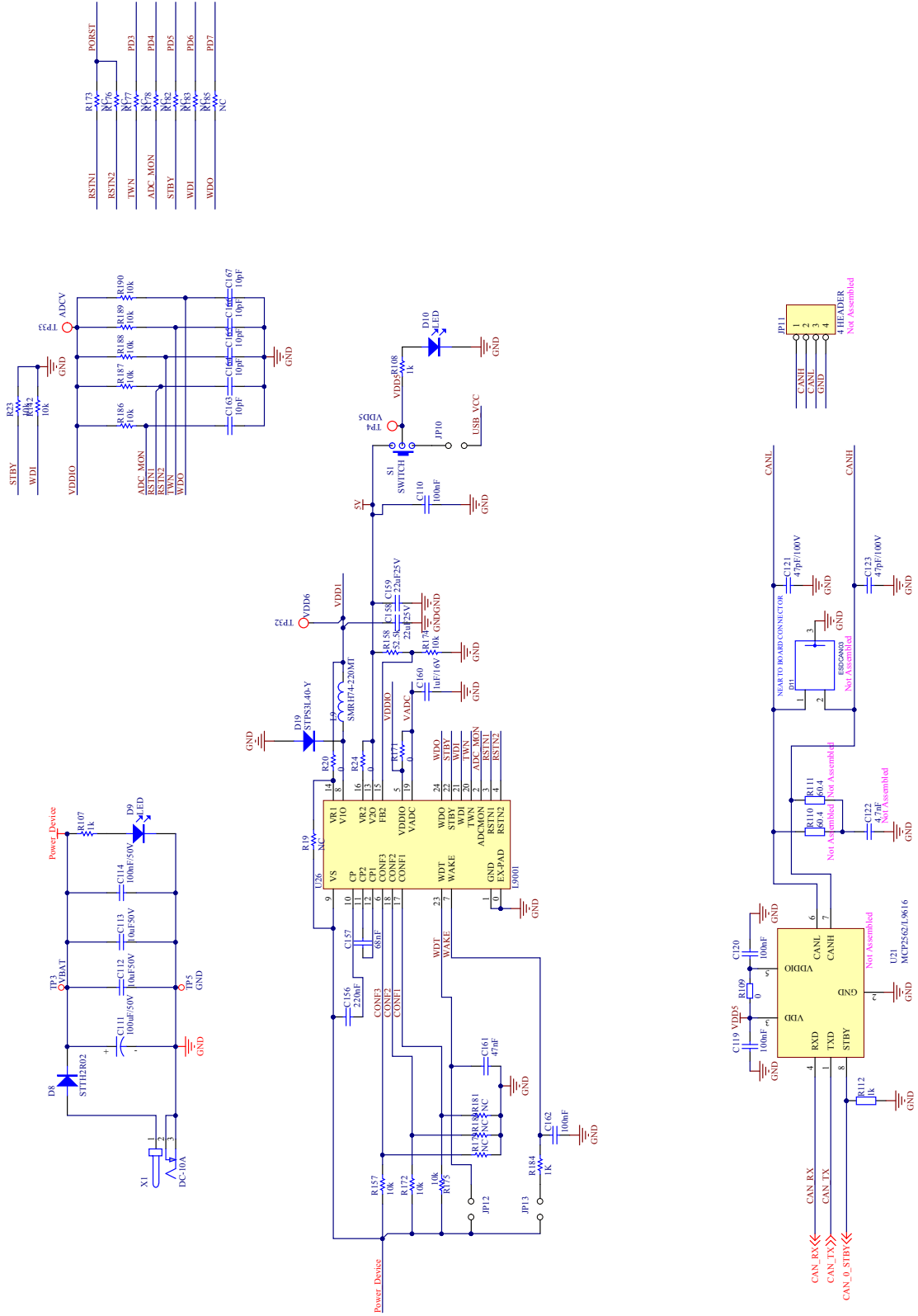
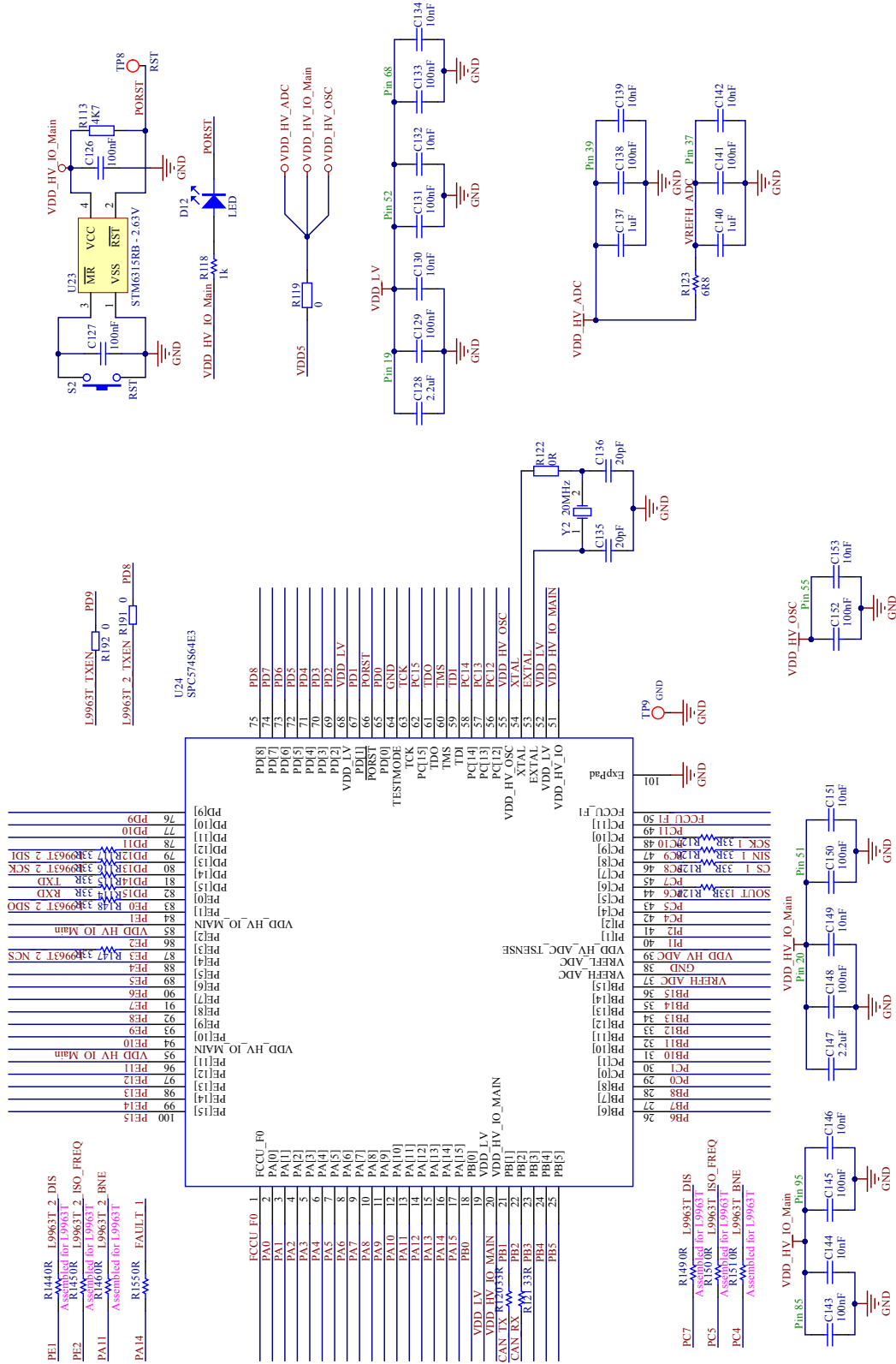


Figure 13. Board schematic: page 4





## 5 Board layout

Figure 15. Assembly TOP

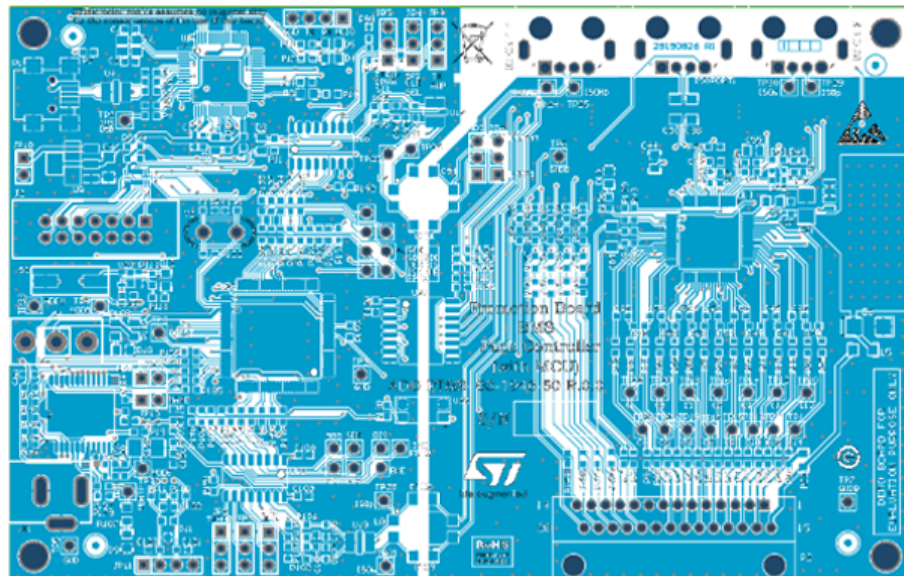


Figure 16. Inner 1

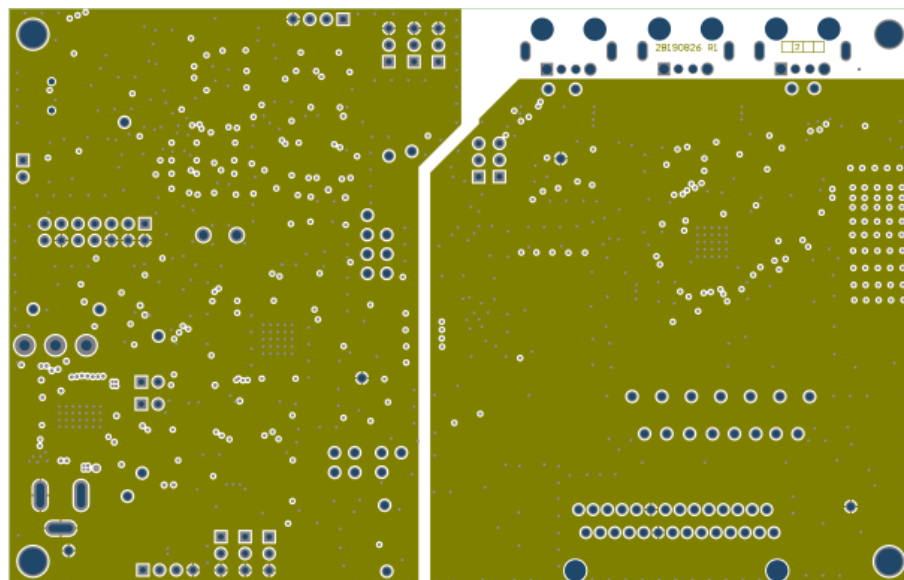


Figure 17. Inner 2

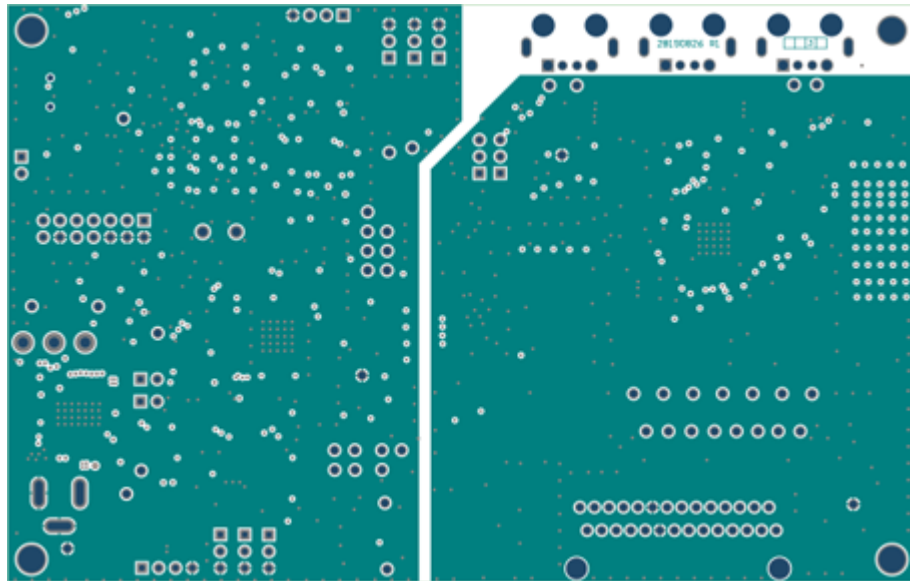
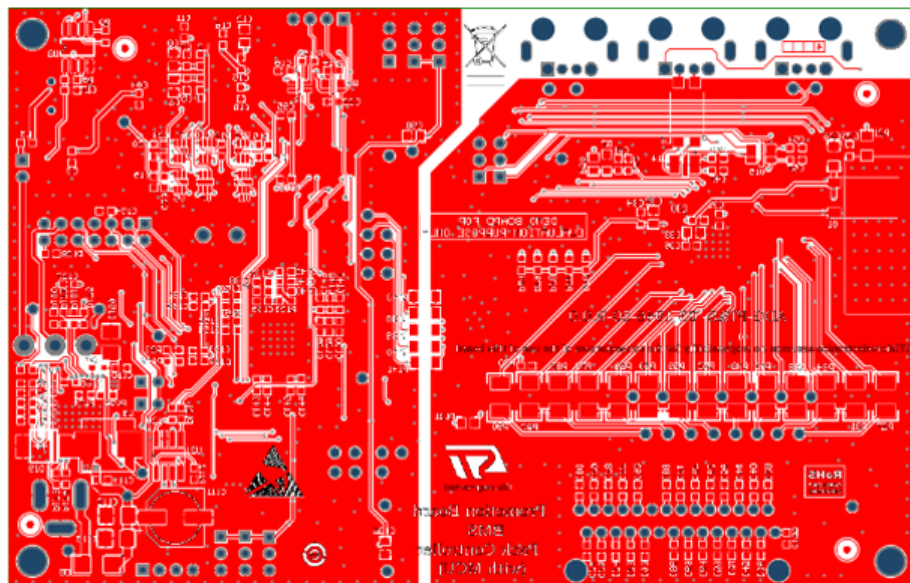
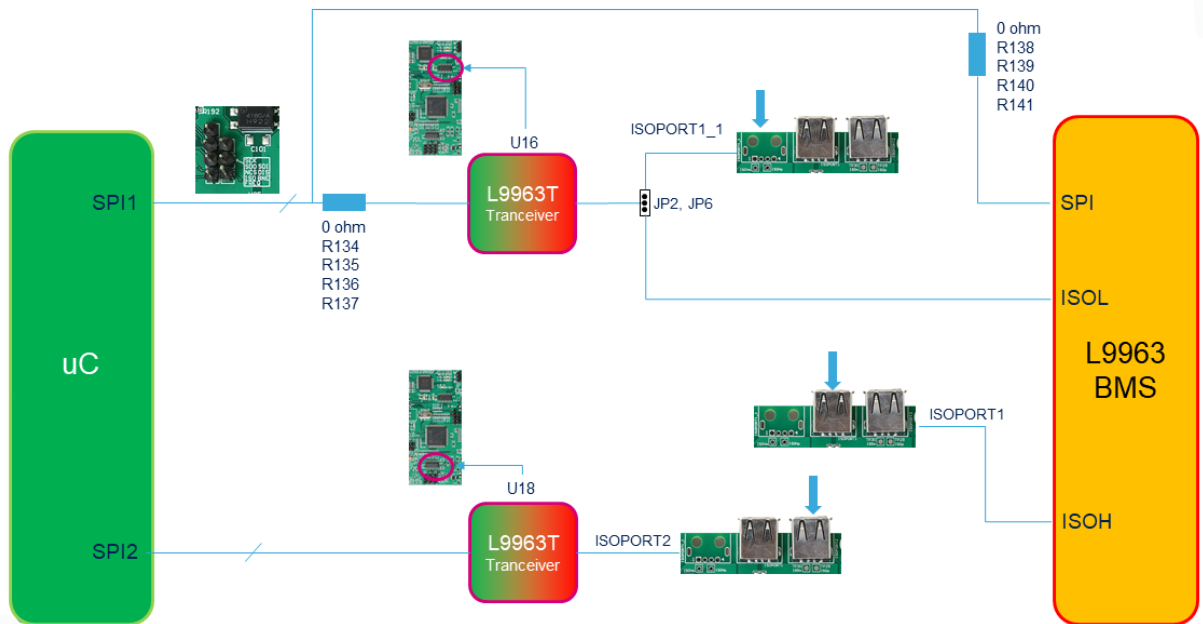


Figure 18. Assembly BOTTOM





## 6 Internal and external communication configuration

**Figure 19. Internal and external communication configuration**


## Revision history

**Table 4. Document revision history**

Date	Version	Changes
12-Mar-2020	1	Initial release.
10-Sep-2020	2	Updated Section 3.1 System requirements.

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