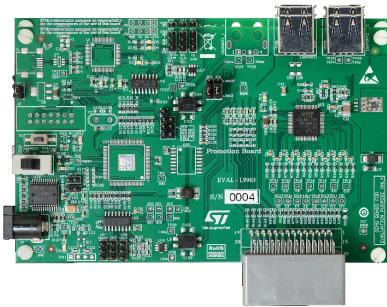


## L9963 BMS IC Board



### Features

- Pin connector for external MCU for FW development
- Measures from 4 to 14 cells in series, with 0 us desynchronization delay between samples. Supports also busbar connection without altering cell results
- Coulomb counter supporting pack overcurrent detection in both ignition on and off states
- Fully synchronized current and voltage samples
- 16-bit voltage measurement
- 2.66 Mbps isolated serial communication with regenerative buffer, supporting dual access ring
- Transformer based isolation
- Up to 4 analog inputs for NTC sensing, plus PCB temperature sensing
- Onboard L9001 regulator power supply.

### Description

The **EVAL-L9963** is a hardware tool for evaluation of L9963, automotive chip for battery management applications. It can be used for the development of a 48 V battery management system (BMS) or as lower stage of a distributed BMS (depending on total battery voltage. Additional stages can be added thanks to EVAL-L9963-NDS).

An external MCU is necessary for development purpose. For L9963 evaluation EVAL-L9963-MCU is recommended. EVAL-L9963 allows the user to connect up to 14 channels for cell voltage sensing, one channel for current sensing, and up to 4 analog input for temperature sensing (plus an additional on-board NTC to sense PCB temperature). The board provides pin connector with relevant control signal (i.e. SPI) in order to help prototyping of a BMS based on EVAL-L9963 and an external MCU.

#### Product summary

<b>Order code</b>	EVAL-L9963
<b>Reference</b>	EVAL-L9963 Evaluation board

## 1 Featured components

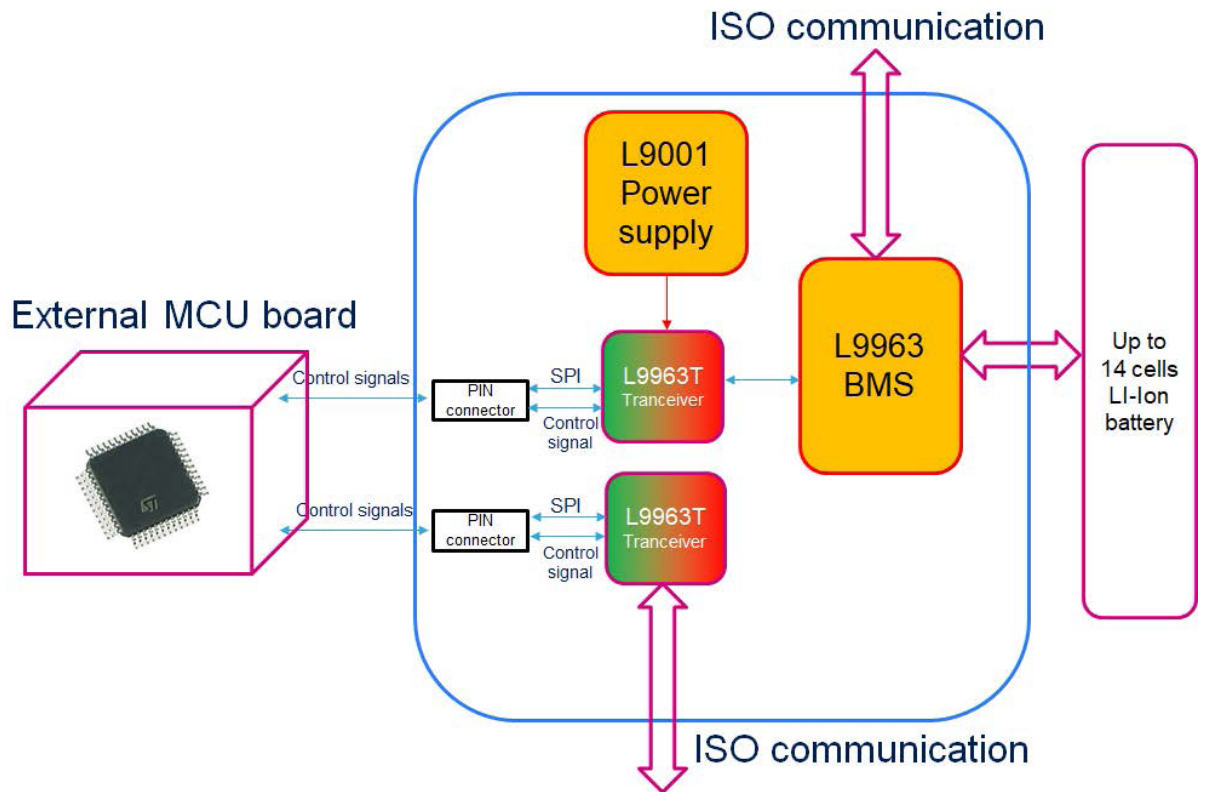
The EVAL-L9963 can be considered a reference design for a 48 V BMS or as a first layer of a distributed BMS system. In the following table there is a short description of all the ST featured components.

**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

## 2 Block Diagram

Figure 1. EVAL-L9963 block diagram



### **3 Minimum system requirements**

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- External MCU unit with:
  - 2 x SPI port
  - 8x GPIO (for L9963T control signals)
- Power supply:
- at least 3 output 0 – 30 V (if possible 60V):
  - 1 output to power L9963 (0:60 V)
  - 1 output to simulate Cells common mode voltage (0:60V)
  - 1 output to simulate Cell voltage (0:5V)

## 4 Jumpers and connectors

**Table 2. Motherboard jumpers and connectors**

Name	Description	Type
X1	External power supply connector	Jack
ISOPORT 1	Isolated serial communication port:	USB Type A connector
	1- VBAT	
	2- ISOH- (From L9963)	
	3- ISOH+ (From L9963)	
ISOPORT 2	4- FaultH	USB Type A connector
	Isolated serial communication port:	
	1- N.C.	
	2- ISO- (from L9963T)	
P2	3- ISO+ (from L9963T)	Multi pin connector
	4- N.C.	
	Battery 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	
	22- Cell 1	
23- Ground		
24- Current sensor resistor positive pin		
25- NTC 1+		

Name	Description	Type
P2	26- NTC 2+	Multi pin connector
	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 MCU
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 MCU
JP10	USB +5 V selector	Unconnected : +5V from L9001 Connected : not allowed
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	+5V power switch	1-2: +5V ON 2-3 : +5V OFF

1. See L9963T datasheet

2. See L9001 datasheet

## 5 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 MCU
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 MCU
JP10	USB +5 V selector	Unconnected
JP12	L9001 (U26) watchdog disable (2)	Connected: watchdog disabled
JP13	L9001 (U26) wake signal	Connected: L9001 enabled
S1	+5V power switch	1-2: +5V ON

## 6 PIN connectors for external MCU unit

Figure 2. External Pin connectors for L9963 control

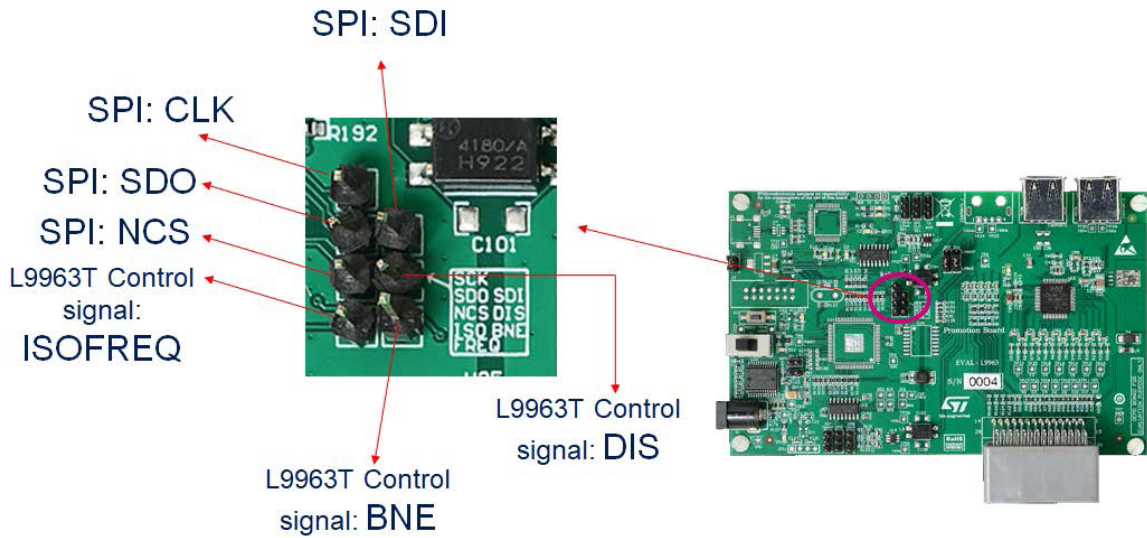
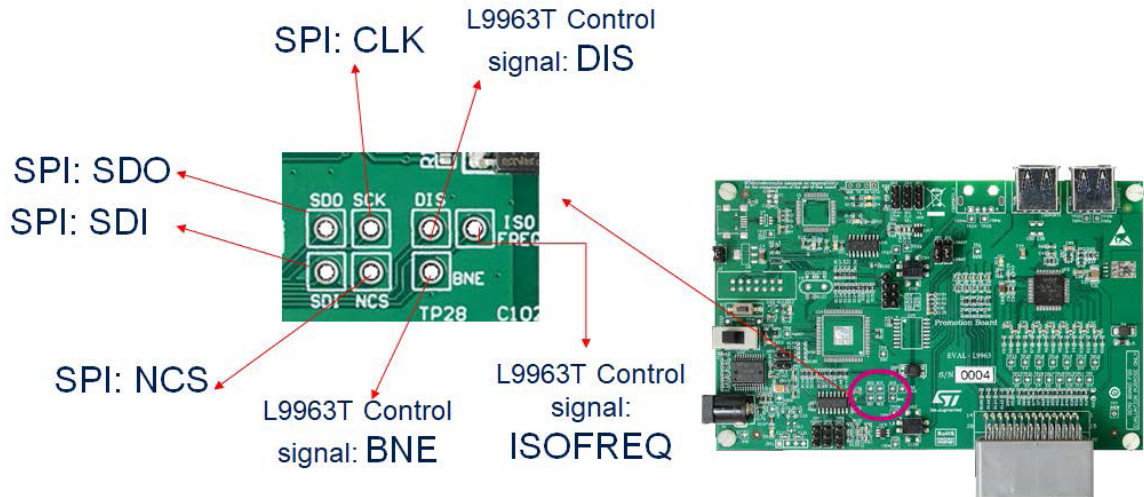


Figure 3. External Pin connectors for ISO communication control





# 7 EVAL-L9963-MCU Evaluation board schematic

Figure 4. Board schematic: page 1

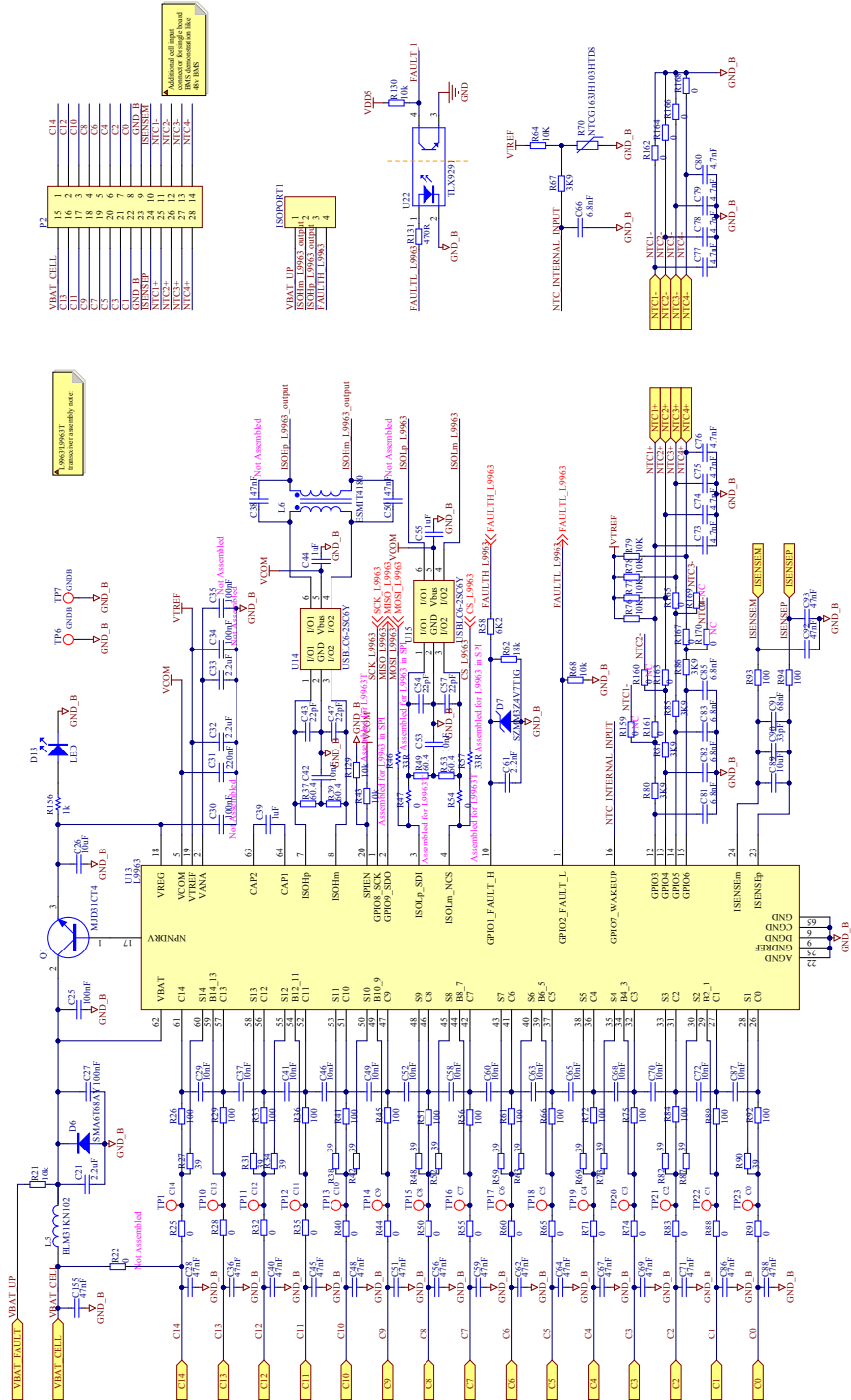


Figure 5. Board schematic: page 2

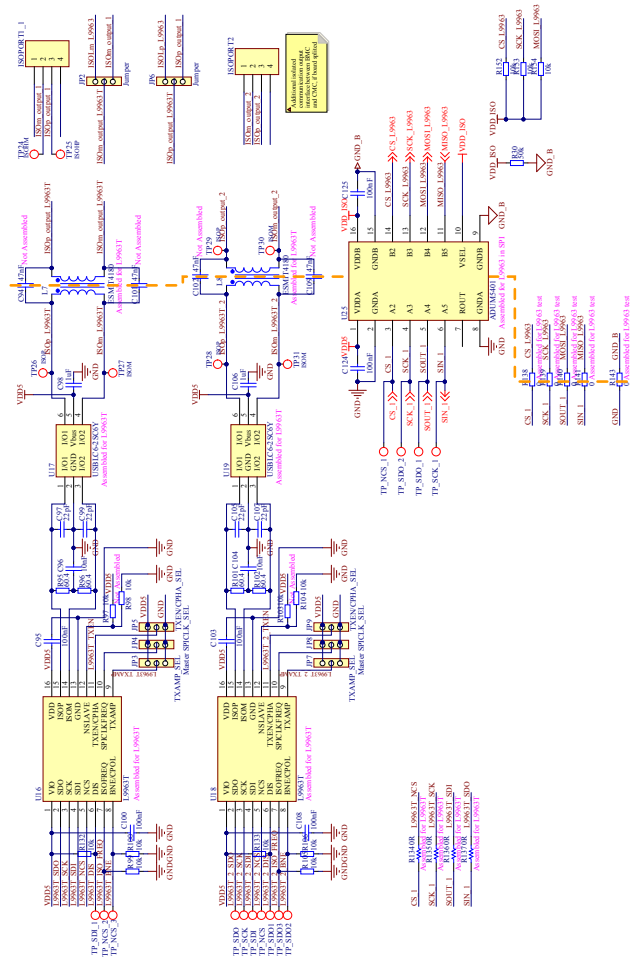


Figure 6. Board schematic: page 3

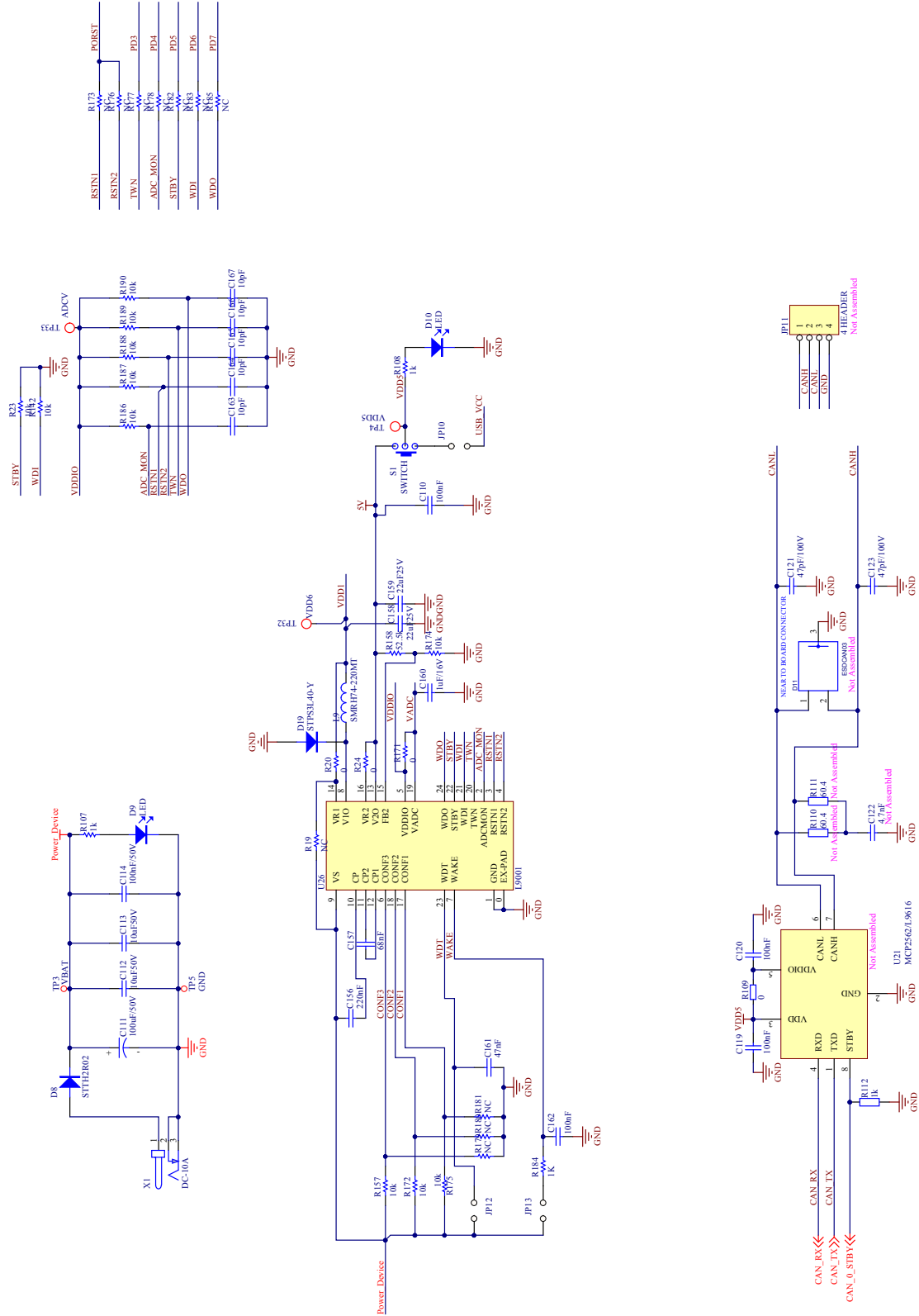
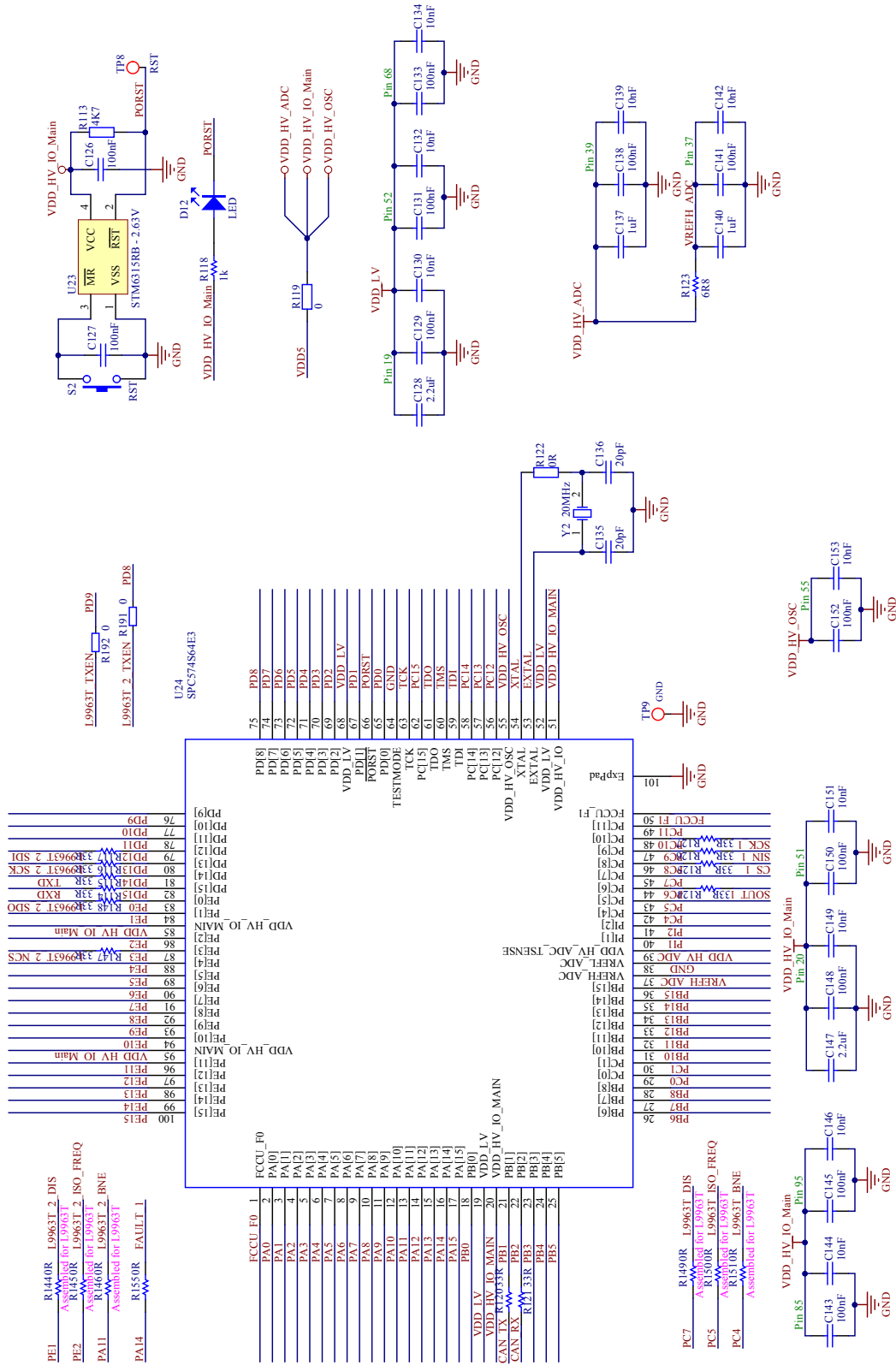


Figure 7. Board schematic: page 4





## 8 Board layout

Figure 9. Assembly TOP

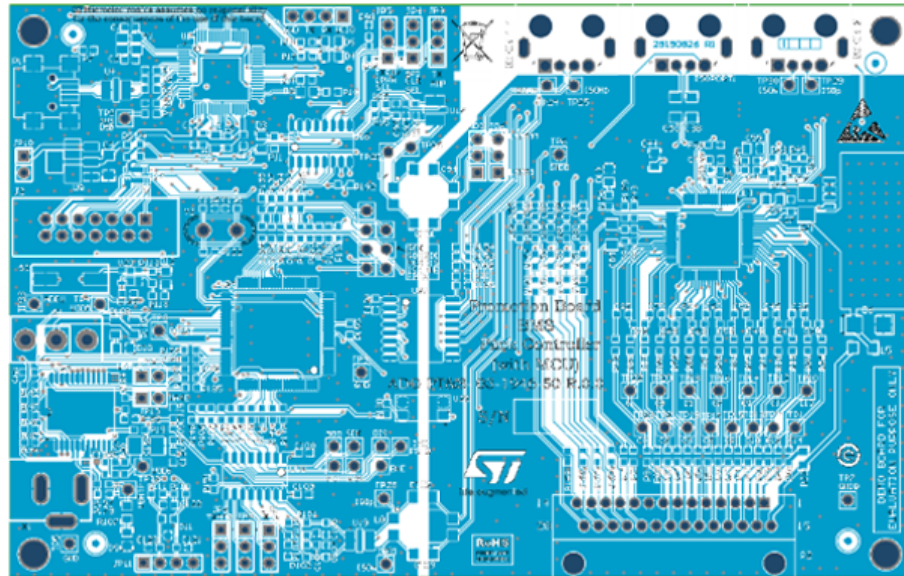


Figure 10. Inner 1

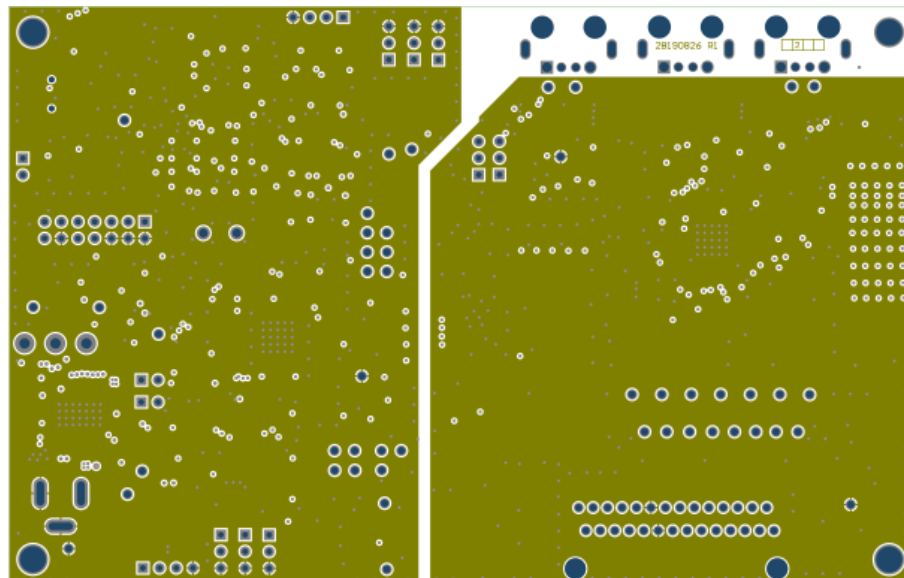


Figure 11. Inner 2

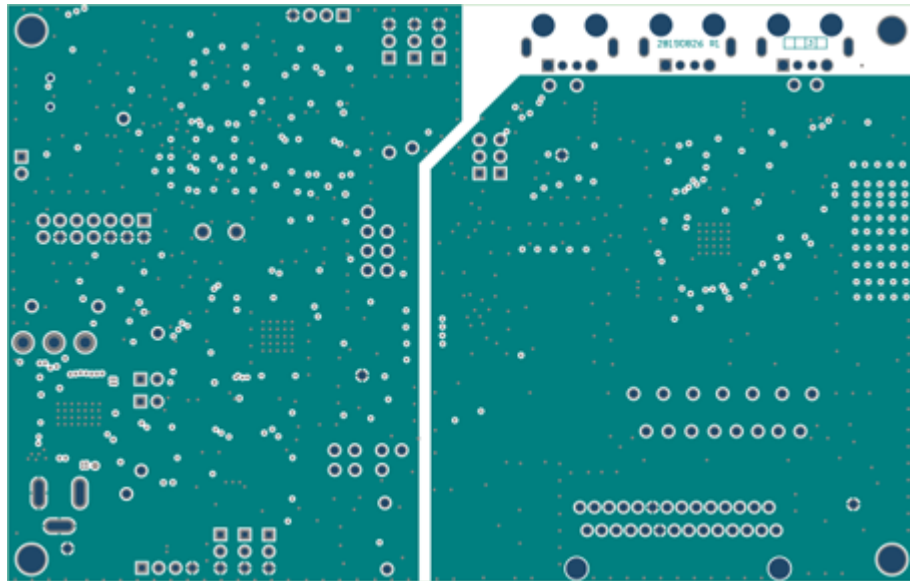
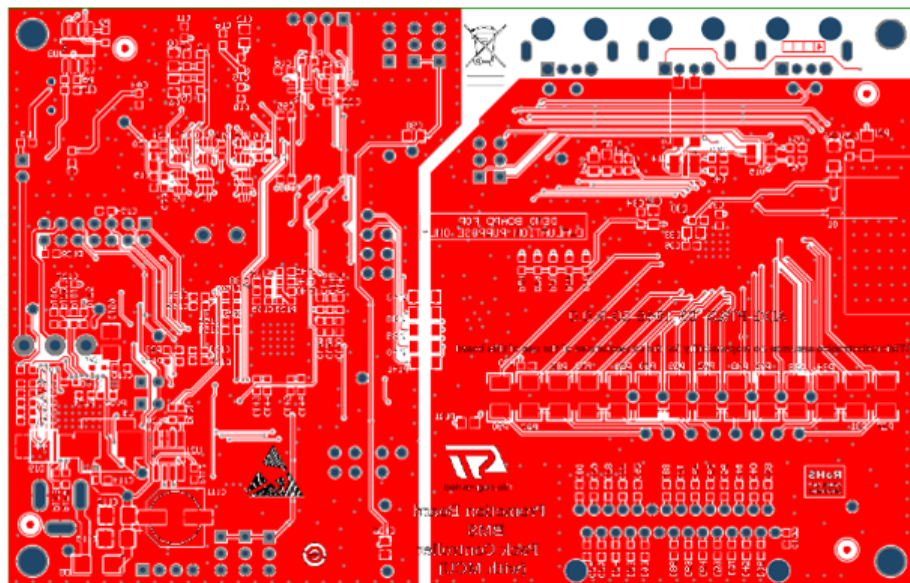


Figure 12. Assembly BOTTOM



## Revision history

**Table 4. Document revision history**

Date	Version	Changes
30-Mar-2020	1	Initial release.



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