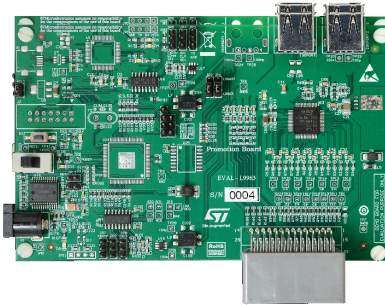


L9963 BMS IC Board



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

Order code	EVAL-L9963
Reference	EVAL-L9963 Evaluation board

1 Featured components

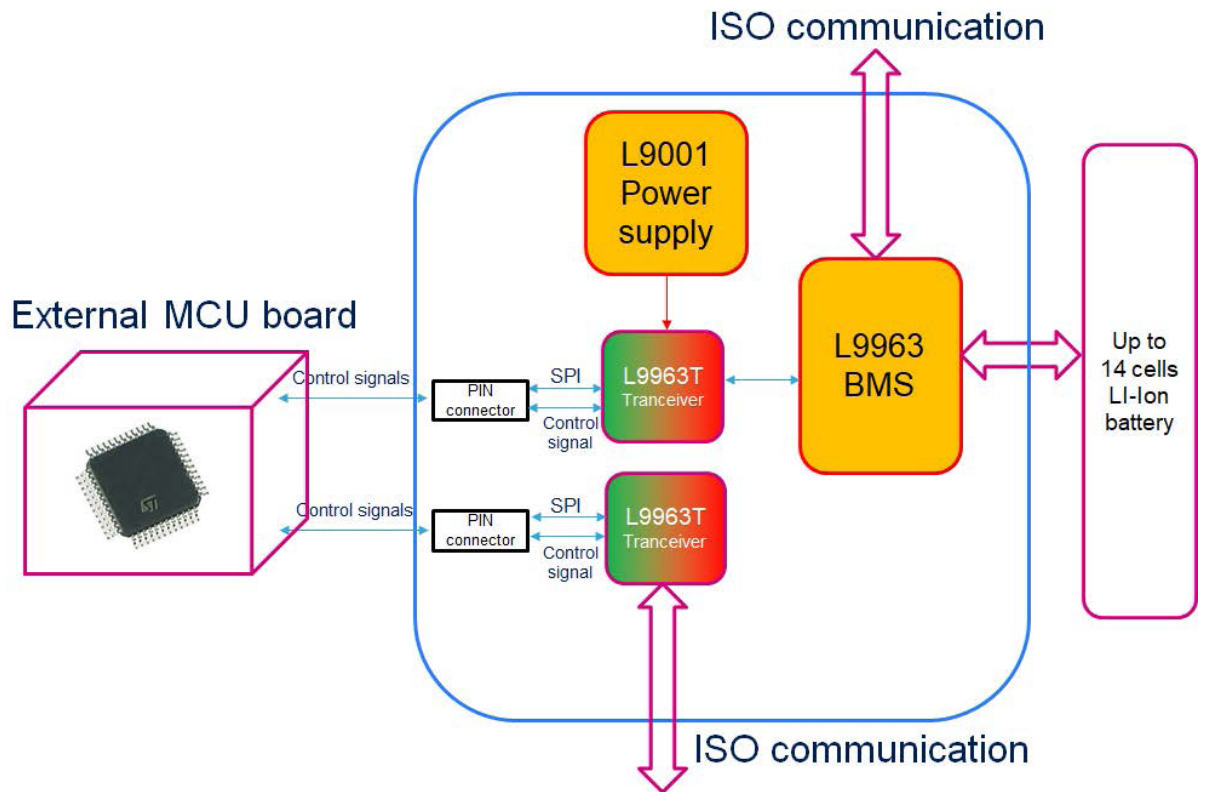
The EVAL-L9963 can be considered a reference design for a 48 V BMS or as a first layer of a distributed BMS system. In the following table there is a short description of all the ST featured components.

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

- 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	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	
	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 ⁽¹⁾ 2-3 low amplitude/low threshold ⁽¹⁾ Unconnected : highamplitude/high threshold
JP4	L9963T (U16) SPI Master Clock selection	1-2 minimum frequency ⁽¹⁾ 2-3 Maximum frequency ⁽¹⁾ Unconnected: minimum frequency
JP5	L9963T (U16) Transmitter enable signal	1-2 enable the TX activity ⁽¹⁾ 2-3 disable the TX activity ⁽¹⁾ 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 ⁽¹⁾ 2-3 low amplitude/low threshold ⁽¹⁾ Unconnected: high amplitude/high threshold
JP8	L9963T (U18) SPI Master Clock selection	1-2 minimum frequency ⁽¹⁾ 2-3 Maximum frequency ⁽¹⁾ Unconnected: minimum frequency
JP9	L9963T (U18) Transmitter enable signal	1-2 enable the TX activity ⁽¹⁾ 2-3 disable the TX activity ⁽¹⁾ Unconnected : controlled by MCU
JP10	USB +5 V selector	Unconnected : +5V from L9001 Connected : not allowed
JP12	L9001 (U26) watchdog disable ⁽²⁾	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

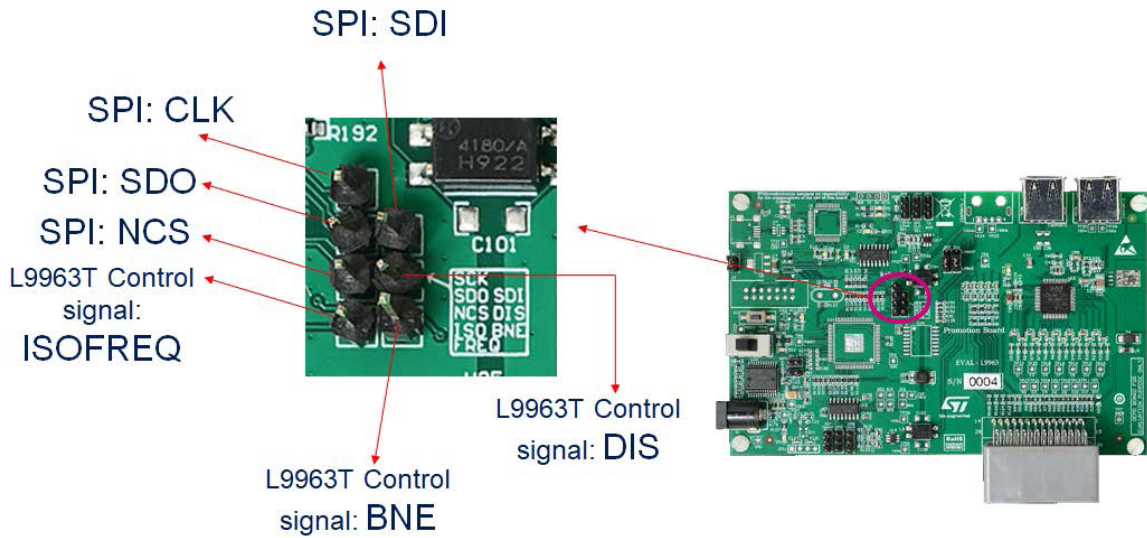
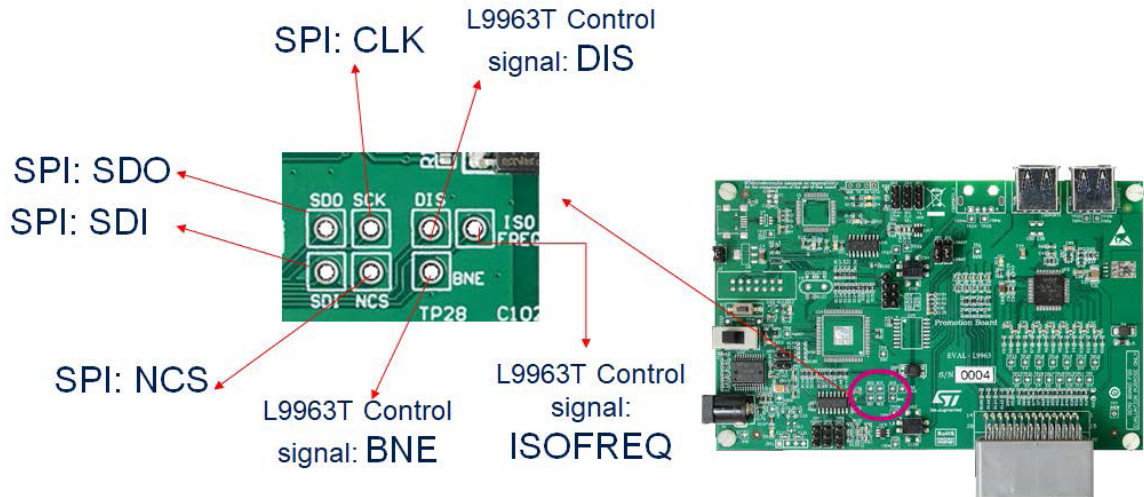


Figure 3. External Pin connectors for ISO communication control



7 EVAL-L9963-MCU Evaluation board schematic

Figure 4. Board schematic: page 1

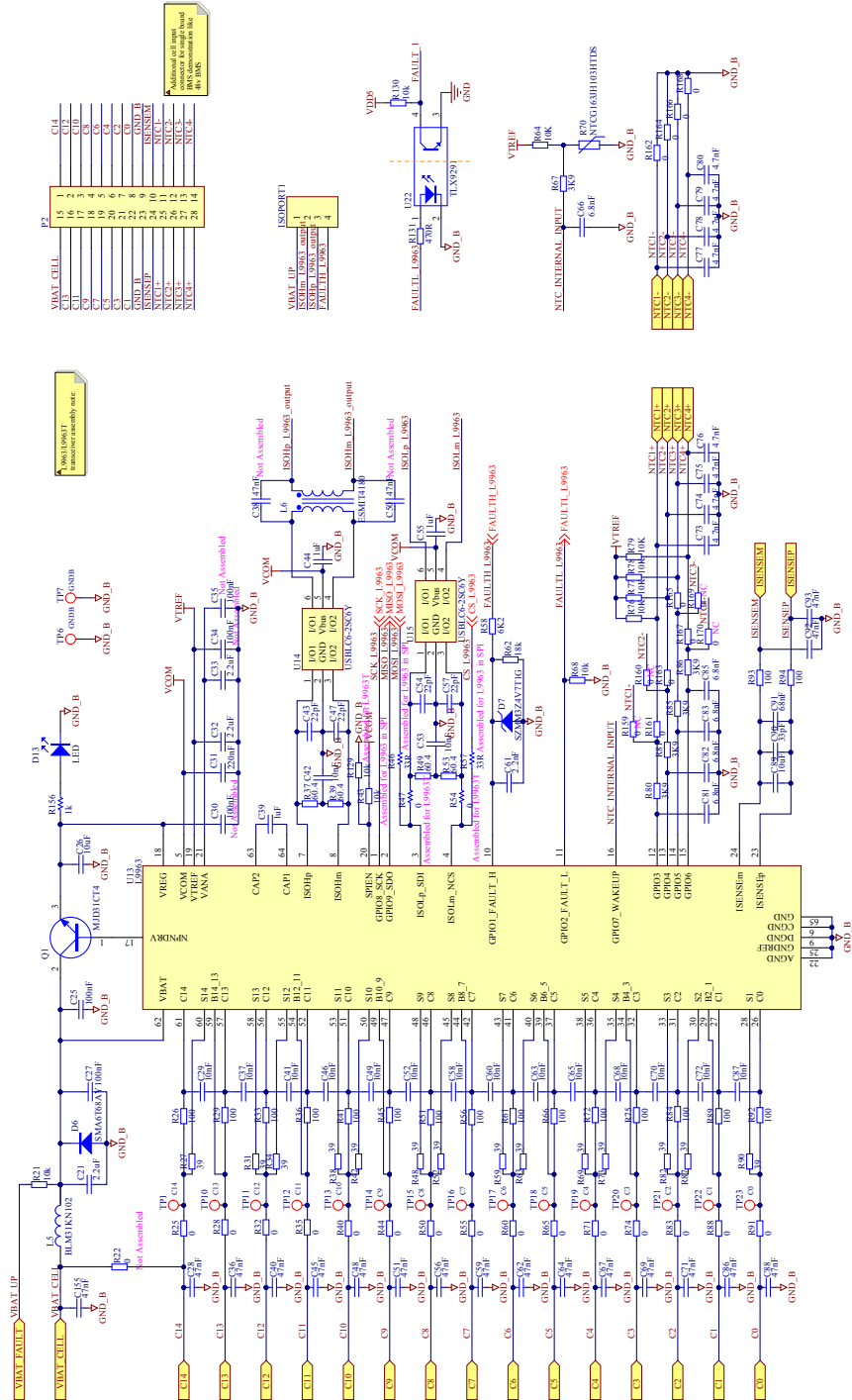


Figure 5. Board schematic: page 2

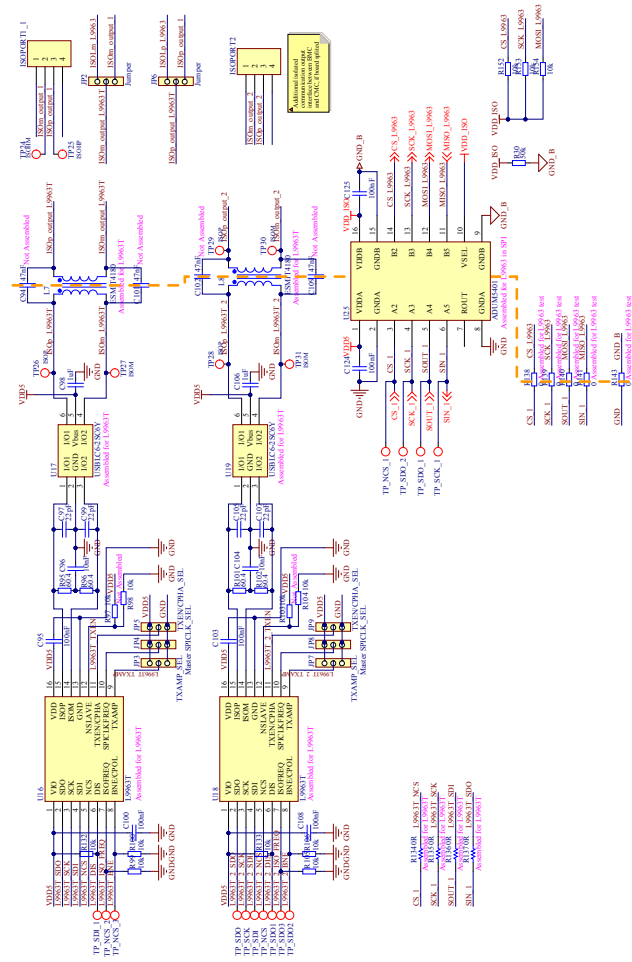


Figure 6. Board schematic: page 3

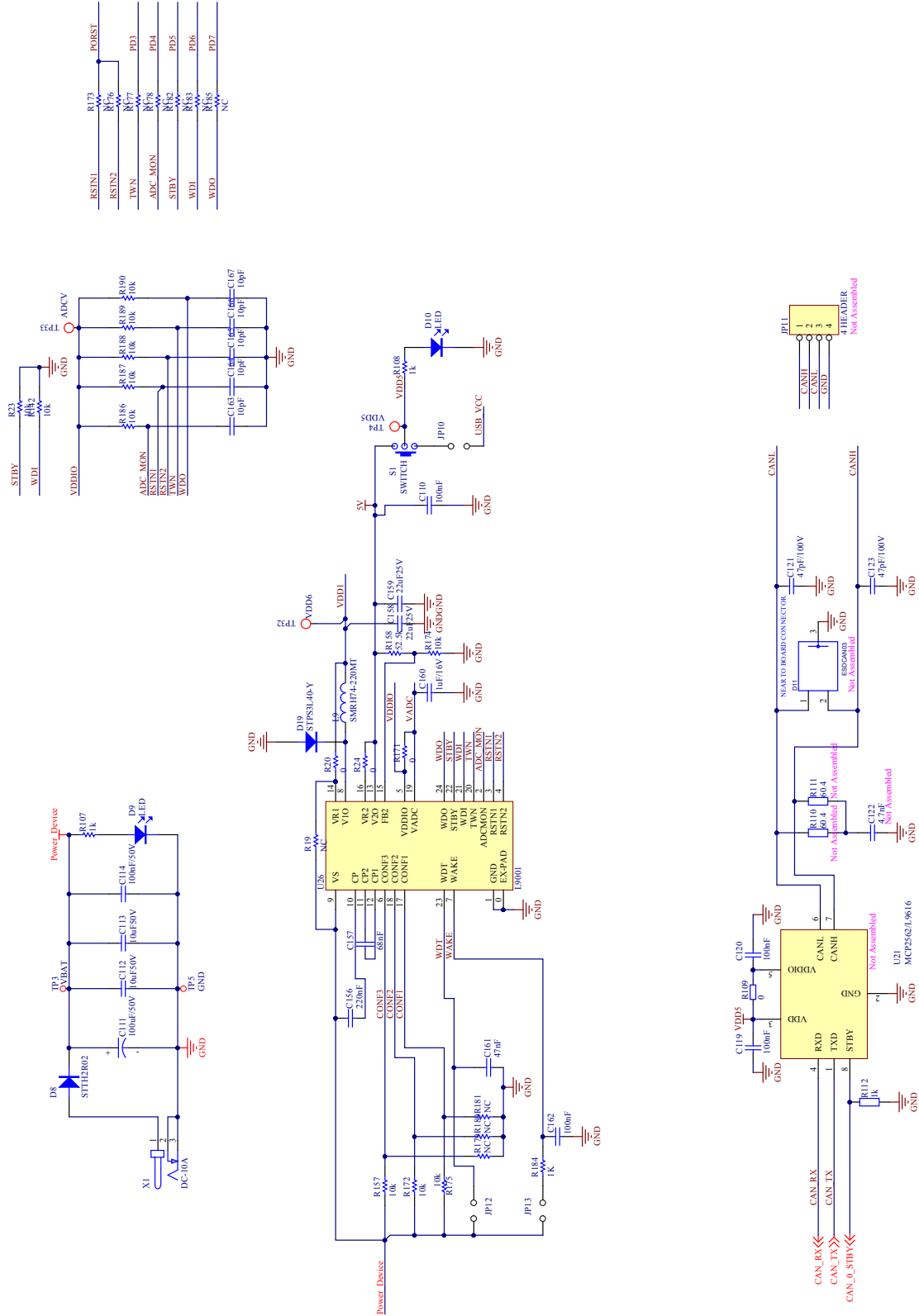


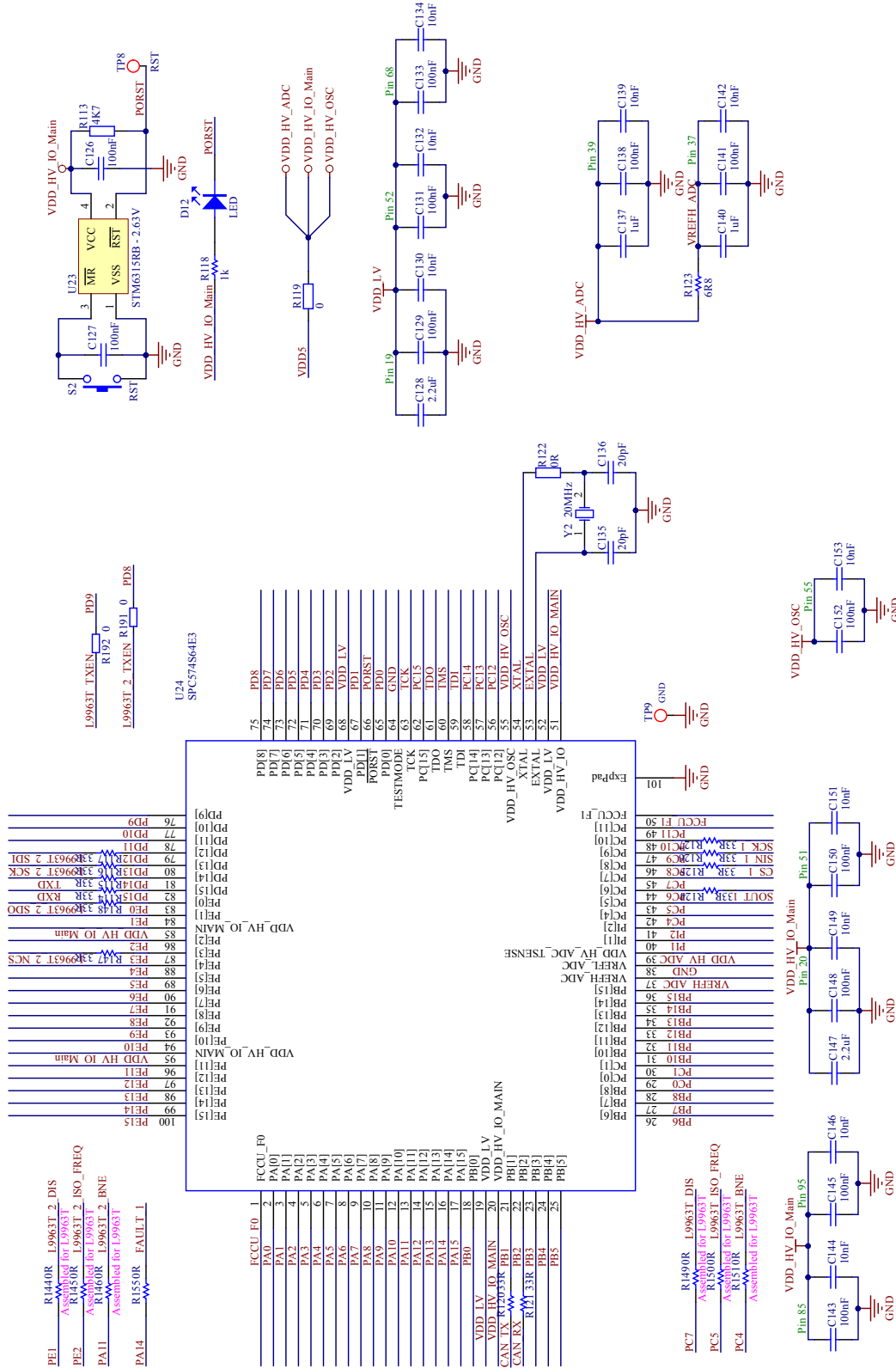
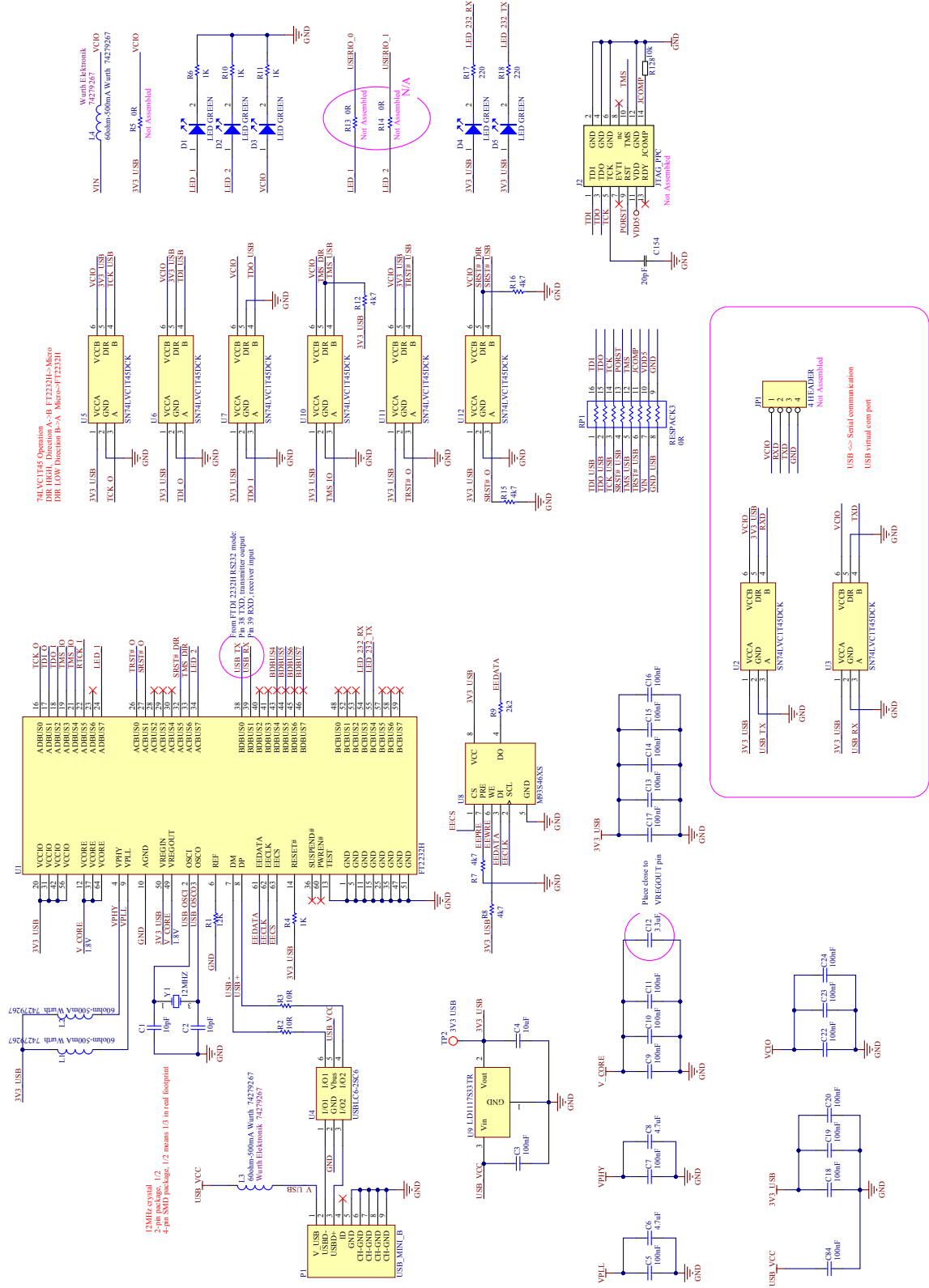
Figure 7. Board schematic: page 4


Figure 8. Board schematic: page 5



8 Board layout

Figure 9. Assembly TOP

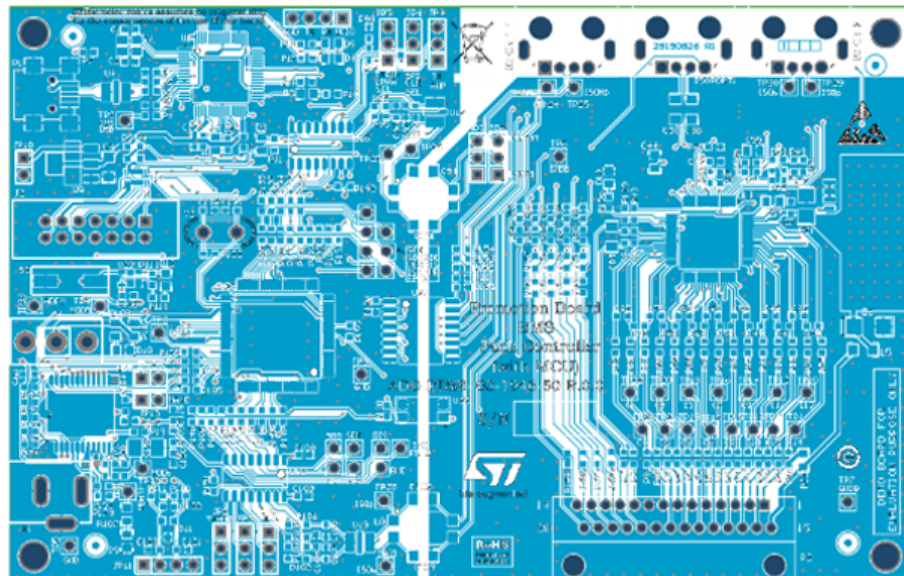


Figure 10. Inner 1

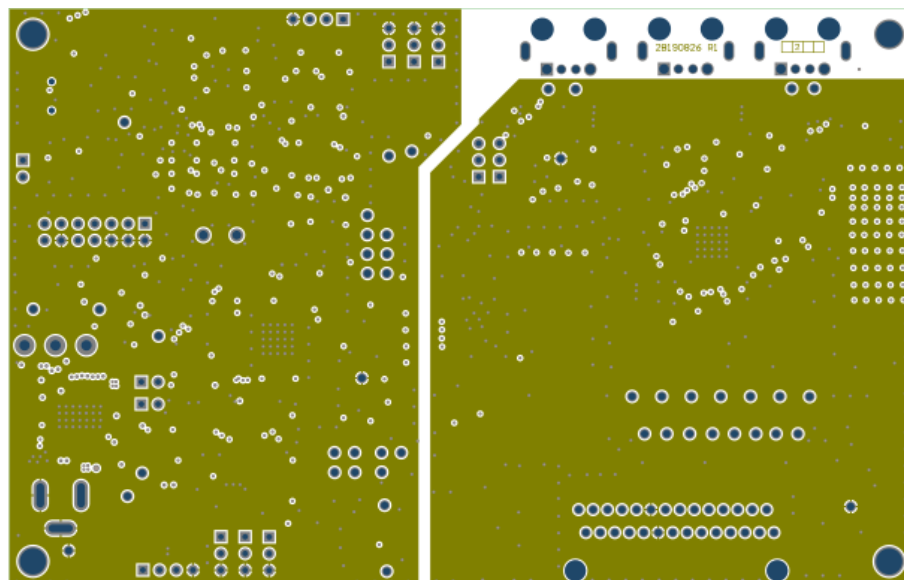


Figure 11. Inner 2

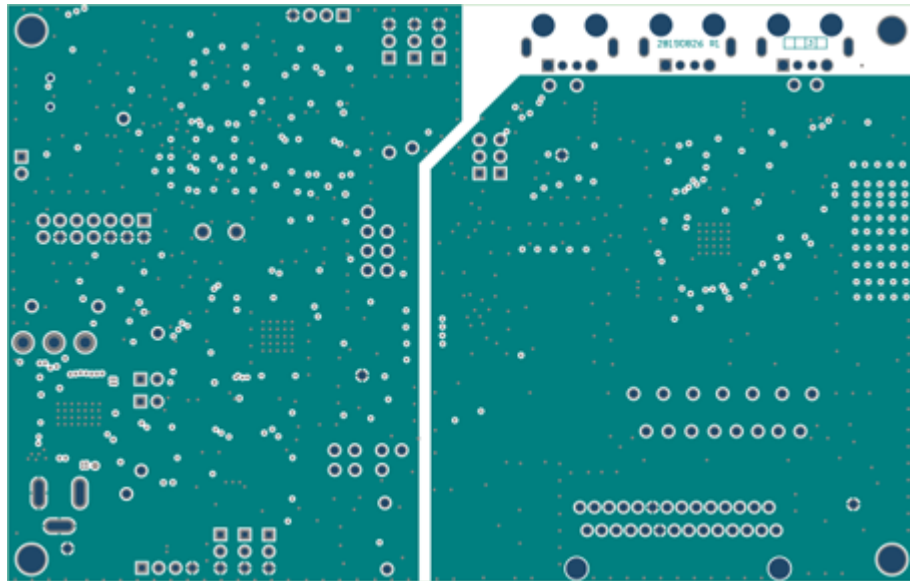
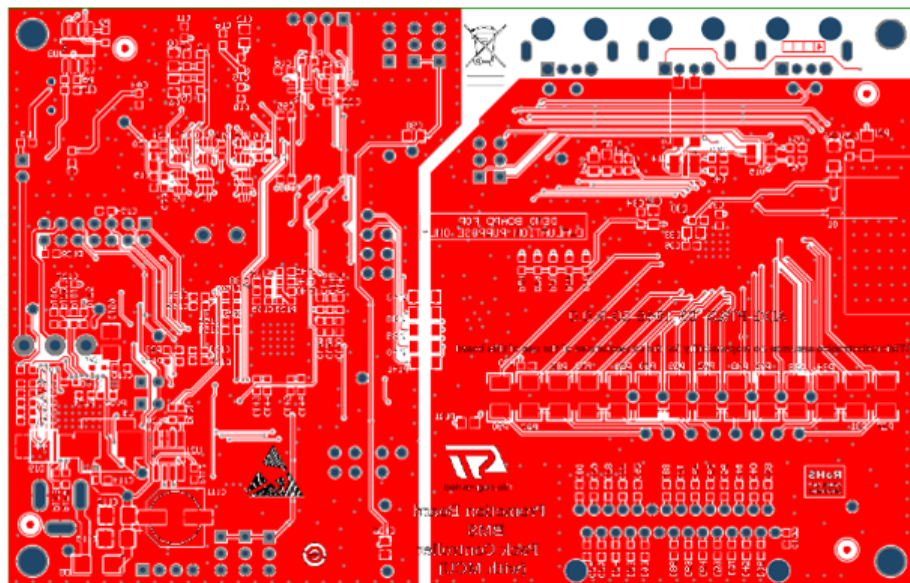


Figure 12. Assembly BOTTOM



Revision history

Table 4. Document revision history

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

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