UM1018
User Manual

STM32L152-EVAL evaluation board

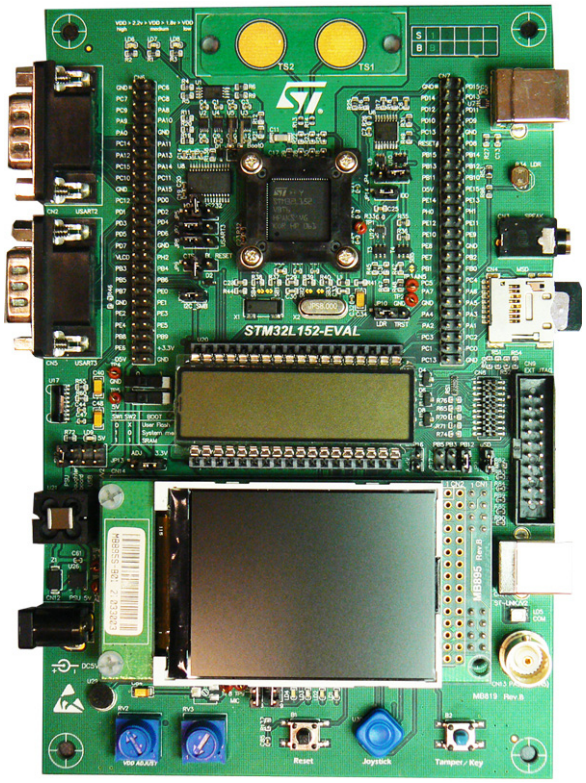
Introduction

The STM32L152-EVAL evaluation board is a complete demonstration and development platform for STMicroelectronics' ARM cortex-M3 core-based STM32L152VBT6 microcontroller supporting two I2C, two SPI and three USART channels, 12-bit ADC, 12-bit DAC, 16 KB internal SRAM and 128 KB Flash, USB FS, LCD controller, touch sensing and JTAG debugging support.

The full range of hardware features on the board helps you evaluate all peripherals (USB FS, USART, Audio DAC, microphone ADC, dot-matrix LCD, LCD glass, IrDA, light dependant resistor (LDR), MicroSD Card™ and temperature sensor amongst others) and develop your own applications. Extension headers make it possible to easily connect a daughter board or wrapping board for your specific application.

An ST-LINK/V2 is integrated on the board as embedded in-circuit debugger and programmer for the STM32 MCU.

Figure 1. STM32L152-EVAL evaluation board



Contents

1 **Features** 4

1.1 Demonstration software 4

1.2 Order code 4

2 **Hardware and layout** 5

2.1 Development and debug support 7

2.2 Power supply 7

2.3 Clock source 9

2.4 Reset source 9

2.5 Boot option 10

2.6 LCD glass module 10

2.7 Audio 11

2.8 USB 11

2.9 RS-232 and IrDA 11

2.10 Touch sensing buttons 12

2.11 MicroSD Card 12

2.12 Analog input 12

2.13 Comparator 13

2.14 Temperature sensor 14

2.15 Display and input devices 14

2.16 IDD measurement 15

2.16.1 Run mode 15

2.16.2 Low power mode 15

2.16.3 Ibias current measurement procedure 17

3 **Connectors** 18

3.1 RS-232 connectors (CN2, CN5) 18

3.2 TFT LCD connector (CN14) 18

3.3 Power connector (CN12) 19

3.4 Daughterboard extension connectors (CN6 and CN7) 19

3.5 ST-LINK/V2 programming connector CN10 22

3.6 ST-LINK/V2 USB type B connector CN11 23

3.7 User USB Type B connector CN1 23
3.8 Audio jack CN3 23
3.9 JTAG connector CN9 24
3.10 Trace debugging connector CN8 24
3.11 MicroSD Card connector CN4 25
3.12 BNC connector CN13 25

4 Schematics 26

5 Revision history 41

1 Features

- Four 5 V power supply options:
  - Power jack
  - ST-LINK/V2 USB connector
  - User USB connector
  - Daughterboard
- Audio speaker and microphone connected to DAC and ADC of STM32L152VBT6
- 2 GByte or more SPI interface MicroSD Card™
- I2C compatible serial interface temperature sensor
- RS-232 communication
- IrDA transceiver
- JTAG and trace debug support, ST-LINK/V2 embedded.
- 240x320 TFT color LCD connected to SPI interface of STM32L152VBT6
- Joystick with 4-direction control and selector
- Reset button
- Tamper or Key button
- 4 color user LEDs and 3 LEDs as MCU power range indicator
- MCU consumption measurement circuit
- LCD glass 32 x 4 segments connected to LCD controller in STM32L152VBT6
- Extension connector for daughterboard or wrapping board
- MCU voltage choice of 3.3 V or adjustable from 1.65 V to 3.6 V
- USB FS connector
- Two touch sensing buttons
- Light dependent resistor (LDR)
- Potentiometer

1.1 Demonstration software

Demonstration software is preloaded in the board's Flash memory for easy demonstration of the device peripherals in stand-alone mode. For more information and to download the latest version available, please refer to the STM32L152-EVAL demonstration software available on www.st.com.

1.2 Order code

To order the STM32L152VBT6 evaluation board, use the order code STM32L152-EVAL.

2 Hardware and layout

The STM32L152-EVAL evaluation board is designed around the STM32L152VBT6 microcontroller in a 100-pin TQFP package.

Figure 1 illustrates the connections between the STM32L152VBT6 and its peripherals (color LCD, touch sensing button, USB FS connector, temperature sensor, USART, IrDA, audio, MicroSD Card and embedded ST-LINK/V2).

Figure 2 helps you to locate these features on the evaluation board.

Figure 1. Hardware block diagram

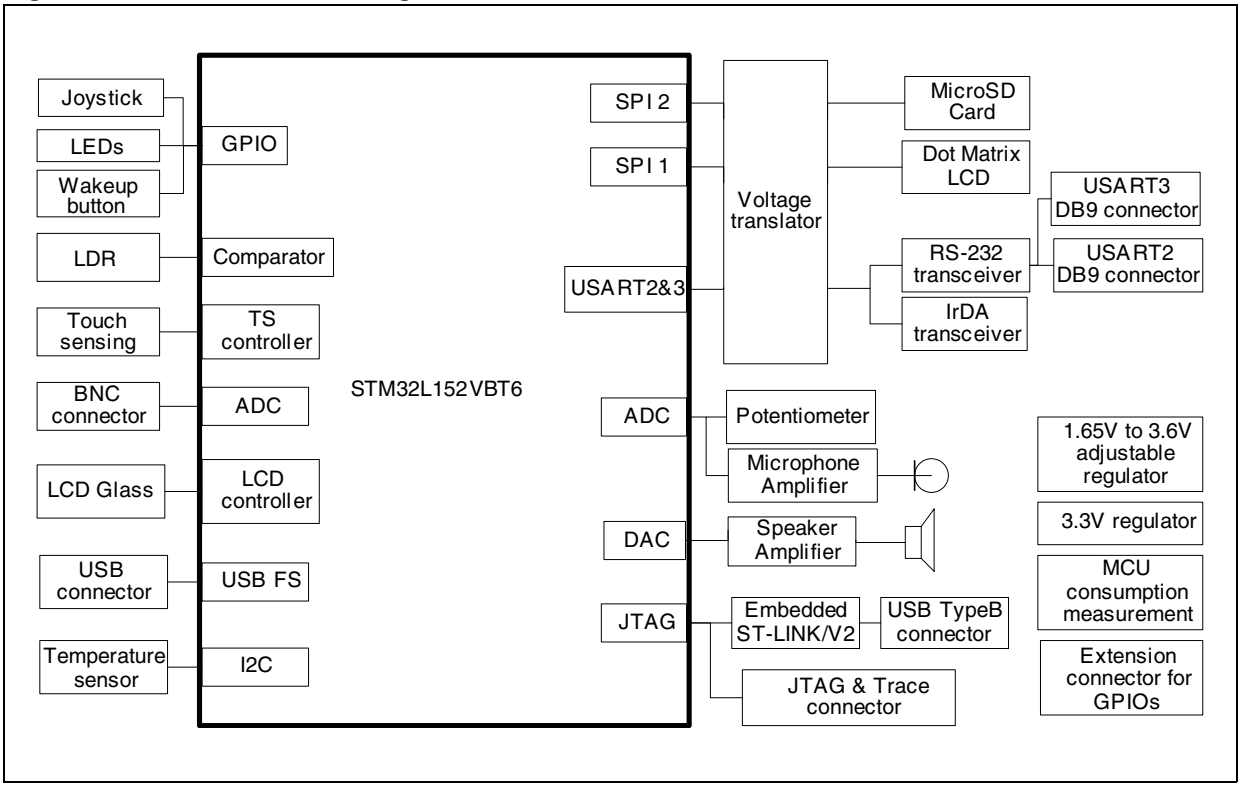
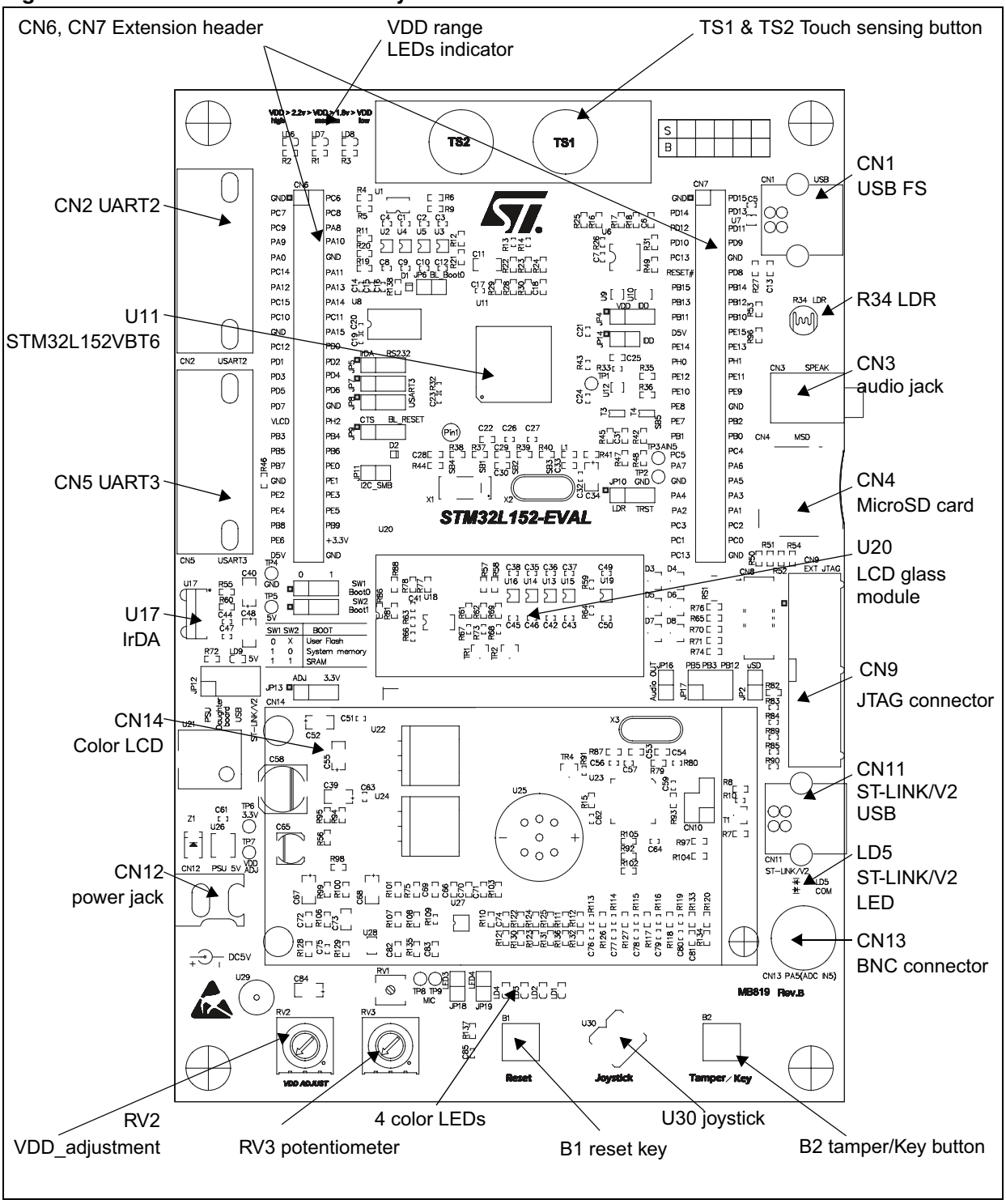


Figure 2. STM32L152-EVAL board layout



2.1 Development and debug support

Version 2 of the ST-LINK, called ST-LINK/V2, is embedded on the board. This tool allows on-board program loading and debugging of the STM32L using the JTAG or SWD interface. Third-party debug tools are also supported by the JTAG (CN9) or Trace (CN8) connectors.

To communicate with the embedded ST-LINK/V2, a specific driver needs to be installed on your PC. To download and install this driver, refer to the Software and development tools page for the ultra low power STM32L family available on www.st.com (the install shield is called *ST-LINK_V2_USBdriver.exe*).

The embedded ST-LINK/V2 connects to the PC via a standard USB cable from connector CN11. The bicolor LED LD5 (COM) advises on the status of the communication as follows:

1. Slow blinking Red, then Off: At power-on before USB initialization.
2. Fast blinking Red, then Off: After the first correct communication between PC and ST-Link/V2 (enumeration).
3. Red On: When initialization between PC and ST-LINK/V2 is successfully finished.
4. Green On: After successful target communication initialization.
5. Blinking Red/Green: During communication with target.
6. Green On: Communication finished and OK.
7. Orange On: Communication failure.

Note: It is possible to power the board via CN11 (embedded ST/LINK/V2 USB connector) even if an external tool is connected to CN8 (trace) or CN9 (external JTAG and SWD).

2.2 Power supply

The STM32L152-EVAL is designed to be powered by a 5 V DC power supply and to be protected by PolyZen from a wrong power plug-in event. It is possible to configure the evaluation board to use any of the following four power supply sources by setting jumpers JP12, JP13 and JP4 (see *Table 1*).

- 5 V DC power adapter connected to CN12, the power jack on the board (power supply unit (*PSU* on silk screen)). The external power supply is not provided with the board but can be ordered separately.

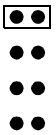
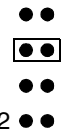
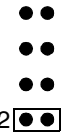
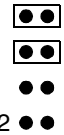
Note: The AC220V to DC5V power adapter PSU-5V2A (recommended, can be ordered from ST order code PSU-5V2A) or equivalent (polarity compatible with CN12) can be used to power the STM32L152-EVAL board via its power jack CN12.

- 5 V DC power with 500 mA limitation from CN11, the USB type B connector of ST-LINK/V2 (USB 5 V power source (*ST-LINK/V2* on silkscreen)).
- 5 V DC power with 500 mA limitation from CN1, the USB type B connector (5 V power source (*USB* on silkscreen)).
- 5 V DC power from CN6, the extension connector for daughterboard (daughterboard power source (*Daughter board* on JP12 silkscreen).

Various LEDs indicate the power status:

- Red LED LD9 is lit when the STM32L152-EVAL board is powered correctly by 5 V.
- Red LED LD8 is lit when MCU is powered by low voltage (VDD < 1.8 V).
- Yellow LED LD7 is lit when MCU is powered by voltage (1.8 V<VDD<2.2 V).
- Green LED LD6 is lit when MCU is powered by voltage (2.2 V<VDD).

Table 1. Power related jumpers

Jumper	Description	Jumper setting
JP12 (selects one of the four possible power supply resources)	For power supply from jack (CN12) to the STM32L152-EVAL only, JP12 is set as shown.	
	For power supply from daughterboard connector (CN6) to STM32L152-EVAL only, JP12 is set as shown.	
	For power supply from USB (CN1) to STM32L152-EVAL only, JP12 is set as shown.	
	For power supply from USB connector of ST-LINK/V2 (CN11) to STM32L152-EVAL only, JP12 is set as shown (**default setting**).	
	For power supply from power supply jack (CN12) to both STM32L152-EVAL and daughterboard connected on CN6 and CN7, JP12 is set as shown (daughterboard must not have its own power supply connected).	
JP13	VDD is connected to fixed +3.3V DC power when JP13 is set as shown (**default setting**).	
	VDD is connected to adjustable DC power from 1.65 V to 3.6 V when JP13 is set as shown.	
JP4	VDD power is directly connected to MCU VDD when JP4 is set as shown (**default setting**). *Note: For manual IDD measurement the jumper on JP4 must be removed and replaced by an ammeter connected between pin 1 and 2 of JP4.*	
	Connect VDD power to MCU with current-sampling resistor, 1 Ohm or 1 KOhm, in series for IDD current measurement when JP4 is set as shown.	

2.3 Clock source

Two clock sources are available on the STM32L152-EVAL evaluation board for the STM32L152VBT6 and embedded RTC.

- X1, 32 KHz crystal for embedded RTC
- X2, 8 MHz crystal with socket for the STM32L152VBT6 microcontroller, it can be removed from the socket when an internal RC clock is used.

Table 2. 32 KHz crystal X1 related solder bridges

Solder bridge	Description
SB1	PC14 is connected to 32 KHz crystal when SB1 is open (**default setting**).
	PC14 is connected to extension connector CN6 when SB1 is closed. In such case R37 must be removed to avoid disturbance due to the 32 KHz quartz.
SB4	PC15 is connected to 32 KHz crystal when SB4 is open (**default setting**).
	PC15 is connected to extension connector CN6 when SB4 is closed. In such case R38 must be removed to avoid disturbance due to the 32 KHz quartz.

Table 3. 8 MHz crystal X2 related solder bridges

Solder bridge	Description
SB2	PH1 is connected to 8 MHz crystal when SB2 is open (**default setting**).
	PH1 is connected to extension connector CN7 when SB2 is closed. In such case R39 must be removed to avoid disturbance due to the 8 MHz quartz.
SB3	PH0 is connected to 8 MHz crystal when SB3 is open (**default setting**).
	PH1 is connected to extension connector CN7 when SB3 is closed. In such case C30 and X2 must be removed.

2.4 Reset source

The reset signal of the STM32L152-EVAL evaluation board is low active and the reset sources include:

- Reset button B1
- Debugging Tools from JTAG connector CN9 and trace connector CN8
- Daughterboard from CN7
- Embedded ST-LINK/V2
- RS-232 connector CN2 for ISP

Note: Jumper JP9 must be changed for RESET. This is handled by pin8 of the RS-232 connector CN2 (CTS signal), refer to Section 2.9 for details.

2.5 Boot option

The STM32L152-EVAL evaluation board is able to boot from:

- Embedded user Flash
- System memory with boot loader for ISP
- Embedded SRAM for debugging

The boot option is configured by setting switch SW1 (BOOT0) and SW2 (BOOT1). BOOT0 can also be configured via RS-232 connector CN2.

Table 4. Boot related switches

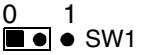
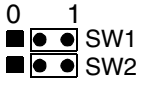
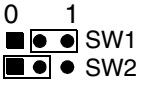
Switch	Boot from	Setting
SW1 and SW2	STM32L152-EVAL boot from embedded user Flash when SW1 is set as shown. SW2 is not relevant in this configuration (**default setting**).	
	STM32L152-EVAL boot from embedded SRAM when SW1 and SW2 are set as shown.	
	STM32L152-EVAL boot from system memory when SW1 and SW2 are set as shown.	

Table 5. Boot0 related jumper JP6

Jumper	Description
JP6	Bootloader_BOOT0 is managed by pin 6 of CN2 (RS-232 DSR signal) when JP6 is closed. This configuration is used for boot loader application only. **Default setting**: **Not fitted**.

2.6 LCD glass module

An LCD glass module, U20, with 8-digit liquid crystal display is mounted on the STM32L152-EVAL evaluation board and is connected to the LCD controller of the STM32L152VBT6.

Table 6. LCD glass related jumpers

Jumper	Description	Setting
JP7	PC10 is connected to LCD glass as SEG40 when JP7 is set as shown (**default setting**).	
	PC10 is connected to USART3_TX when JP7 is set as shown.	
JP8	PC11 is connected to LCD glass as SEG41 when JP8 is set as shown (**default setting**).	
	PC11 is connected to USART3_RX when JP8 is set as shown.	

2.7 Audio

The STM32L152-EVAL evaluation board supports both:

- The speaker which is connected to the DAC output of the STM32L152VBT6 through an audio amplifier.
- The microphone which is connected to the ADC input of the STM32L152VBT6 through a microphone amplifier.

The speaker can be enabled or disabled by setting JP16, refer to *Table 7* for details.

Table 7. Audio related jumpers

Jumper	Description
JP16	Speaker amplifier U27 is enabled when JP16 is open (**default setting**).
	Speaker amplifier U27 is disabled when JP16 is closed.

2.8 USB

The STM32L152-EVAL evaluation board supports USB 2.0 compliant full speed communication via a USB type B connector (CN1). The evaluation board can be powered by this USB connection at 5 V DC with 500 mA current limitation.

USB disconnection simulation can be implemented by controlling the internal 1.5 K pull-up resistor on the USB D+ line to detect 5 V power on the USB connector, CN1 (using the resistor bridge that is connected to PE5).

2.9 RS-232 and IrDA

Both IrDA and RS-232 (with hardware flow control CTS and RTS) communication is supported by:

- IrDA transceiver, U17 (connected to USART2 of the STM32L152VBT6 on the STM32L152-EVAL evaluation board).
- RS-232 connector, CN2 (D-type 9-pin).
  For ISP support, two signals are added on the RS-232 connector CN2:
  - Bootloader_RESET (shared with CTS signal).
  - Bootloader_BOOT0 (shared with DSR signal).

Another RS-232 (without hardware flow control) connector, CN5, is connected to USART3 of the STM32L152VBT6.

Table 8. RS-232 and IrDA related jumpers

Jumper	Description	Setting
JP5	USART2_RX is connected to RS-232 transceiver and RS-232 communication is enabled when JP5 is set as shown (**default setting**).	
	USART2_RX is connected to IrDA transceiver and IrDA communication is enabled when JP5 is set as shown.	

Table 8. RS-232 and IrDA related jumpers (continued)

Jumper	Description	Setting
JP9	USART2_CTS is connected to RS-232 transceiver when JP9 is set as shown (**default setting**).	1 2 3
	Bootloader_RESET is connected to RS-232 transceiver when JP9 is set as shown.	1 2 3
JP7,JP8	Refer to *Table 6* for USART3 settings.	
JP6	See *Table 5* for Bootloader_BOOT0 settings.	

2.10 Touch sensing buttons

The STM32L152-EVAL evaluation board supports two touch sensing buttons based on either charge transfer technology (**default**) or RC charging.

RC charging technology can be enabled by modifying the board:

1. Remove R29.
2. Mount resistors R22 (1 MOhm), R23 (1 MOhm), R24 (10 KOhm) and C18(1 nF).

2.11 MicroSD Card

The 2 GB (or more) MicroSD Card connected to SPI2 port of the STM32L152VBT6 is available on the board. MicroSD Card detection is managed by standard I/O port PE6.

Note: JP2 must be kept on open for trace purposes (connected to CN8).

Table 9. MicroSD Card related jumpers

Jumper	Description
JP2	PE6 is connected to MicroSD Card detection when JP2 is closed (**default setting**).
	PE6 is disconnected from MicroSD Card detection but remains connected to trace connector CN8 when JP2 is open.

2.12 Analog input

A BNC connector, CN13, is connected to PA5 of the STM32L152VBT6 as external analog input or DAC output. The 50 ohm terminal resistor can be enabled by closing the solder bridge SB5. A low pass filter can be implemented for the BNC connector by replacing R47 and C31 for ADC input or replacing R45 and C31 for DAC output with the values requested by end user's application.

There are also 3 analog signals available on the board:

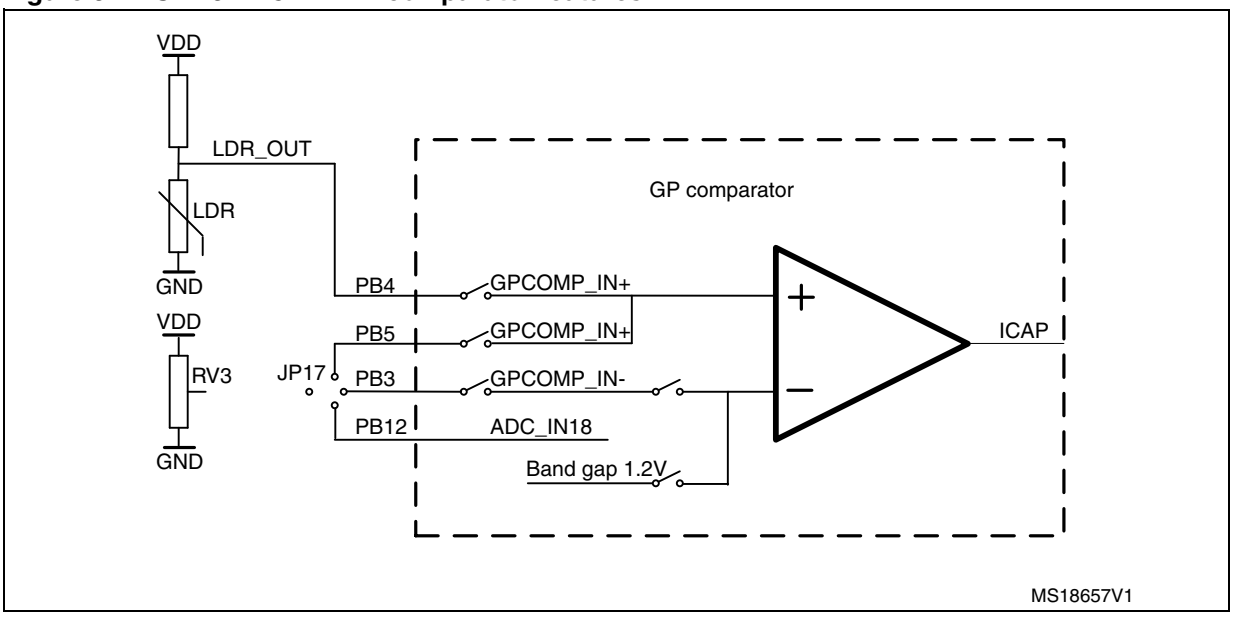
1. 10 KOhm potentiometer RV3 connected to PB12.
2. IDD measurement output signal connected to PA5 for MCU power consumption test.
3. External ADC input which can be connected to TP3 (AIN+) and TP2 (AIN-), R48 should be removed to reduce the noise on this analog input.

2.13 Comparator

Three I/Os are used to implement a comparator feature as shown in *Figure 3*.

- Comparator non-inverting input PB4 connected to LDR (R34).
- Comparator inverting input PB3 connected to potentiometer (RV3) used as variable threshold input for comparison to luminosity measured on LDR.
- Comparator non-inverting input PB5 connected to potentiometer (RV3) used as analogue voltage input for comparison with internal voltage reference (for instance Band gap) in order to test analogue Wakeup feature of the MCU.

Figure 3. STM32L152-EVAL comparator features



Jumper JP17 allows 3 different usages of the potentiometer as shown in *Table 10*.

Table 10. Comparator and potentiometer related jumpers

Jumper	Description	Setting
JP17	Potentiometer RV3 is connected to ADC input PB12. Used as ADC input when JP17 is set as shown (**default setting**).	PB12 ●● PB3 ●● PB5 ●●
	Potentiometer RV3 used as LDR variable threshold. Input is connected to comparator inverting input GPCOMP_IN- (PB3) when JP17 is set as shown.	PB12 ●● PB3 ●● PB5 ●●
	Potentiometer RV3 is connected to non-inverting input GPCOMP_IN+(PB5). The comparator inverting input can be connected to ¼ band gap, ½ band gap, band gap or DAC internally to test MCU wakeup possibility when an external voltage reaches a programmable threshold when JP17 is set as shown.	PB12 ●● PB3 ●● PB5 ●●
JP10	PB4 is connected to JTAG connector CN9 (TRST) when JP10 is set as shown (**default setting**).	1 2 3 ● ●●
	PB4 is connected to LDR when JP10 is set as shown.	1 2 3 ●● ●

Table 10. Comparator and potentiometer related jumpers (continued)

Jumper	Description	Setting
JP11	PB5 is connected to I2C_SMB, the interrupt output of temperature sensor U18 when JP11 is closed (**default setting**).	
	PB5 is disconnected from I2C_SMB but remains connected to COM_IN+ when JP11 is open for comparator application.	

2.14 Temperature sensor

A temperature sensor STLM75M2E is connected to the I2C bus of the STM32L152VBT6 through two transistors to support a wide voltage range, from 1.65 V to 3.6 V.

2.15 Display and input devices

The display devices are:

- 2.4" color TFT LCD, connected to the SPI1 port of the STM32L152VBT6.
- 4 general purpose color LED's (LD 1,2,3,4).
  LD3 and LD4 are disabled by default; JP18 and JP19 must be closed to enable these two LEDs.

The input devices are:

- 4-direction joystick (U30) with selection key
- Wakeup button (B2)

Table 11. 2.4" TFT LCD module CN14

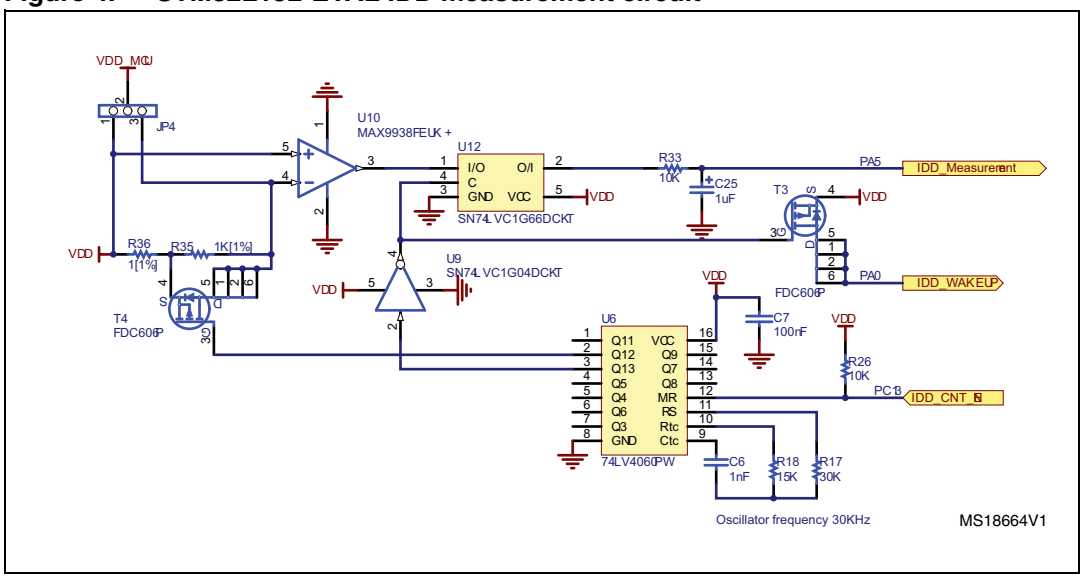
Pin on CN3	Description	Pin connection
1	CS	PH2
2	SCL	PE13
3	SDI	PE15
4	RS	-
5	WR	-
6	RD	-
7	SDO	PE14
8	RESET	RESET#
9	VDD	3.3V
10	VCI	3.3V
11	GND	GND
12	GND	GND
13	BL_VDD	5V
14	BL_Control	5V
15	BL_GND	GND
16	BL_GND	GND

2.16 IDD measurement

The built-in IDD measurement circuit implemented allows the consumption measurement of the STM32L152C6T6 while the MCU is in Run or Low power saving modes.

For IDD measurement the circuit below is implemented on STM32L152-EVAL.

Figure 4. STM32L152-EVAL IDD measurement circuit



2.16.1 Run mode

In Run mode, IDD current is measured using the operational amplifier MAX9938FEUK+ (U10) connected to the 1 Ohm shunt resistor (R36).

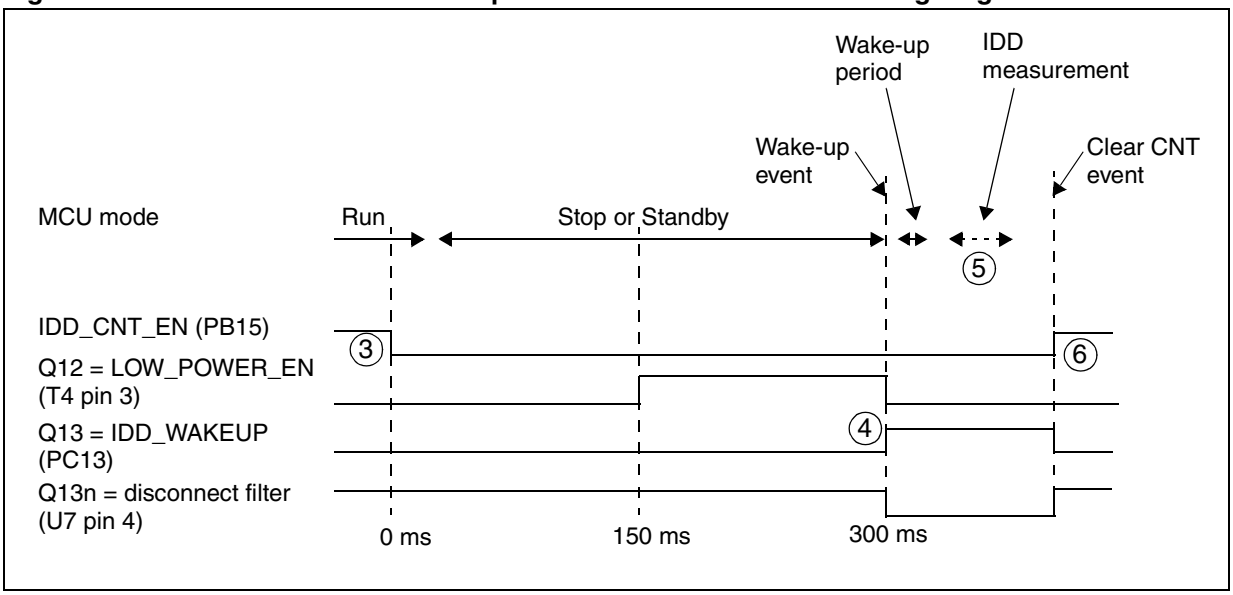
In this case IDD_CNT_EN remains high during measurement, so R35 remains in short-circuit during the measurement because of transistor T4 which remains ON permanently. Jumper JP4 must be connected between pins 2 and 3.

2.16.2 Low power mode

In Low power modes (Stop or Standby), the operational amplifier MAX9938FEUK+ (U10) is connected to the 1 KOhm shunt resistor (R35), controlled by the analogue switch T4.

In this case the counter 74HC4060 (U6) enabled by IDD_CNT_EN manages the measurement timing according to *Figure 5*.

Figure 5. STM32L152-EVAL IDD low power modes measurement timing diagram



The principle used to measure a current when the STM32L is in Low power mode is:

1. Configure ADC to measure voltage on the IDD_Measurement pin (PA5).
2. Configure PA0 to serve as wakeup pin.
3. Enter Low power mode after setting IDD_CNT_EN signal low.
4. IDD_WAKEUP rising edge wakes up the MCU after around 300 ms.
5. Start ADC conversion as soon as possible after wakeup in order to measure the voltage corresponding to Low power mode on capacitor C25.
6. Reset the counter by programming IDD_CNT_EN high (in less than 70 ms after the wakeup) to avoid the R35 (1 KOhm) resistor being connected later in Run mode.

In Low power modes, the 1 KOhm resistor is connected when T4 goes off after entering Low power mode. Q12 output of the counter allows connection of the 1 K resistor when the current IDD becomes very low.
Figure 5 shows how the counter and T4 ensure that, 150 ms after IDD_CNT_EN falling edge, the shunt resistor R35 is connected between VDD_MCU and the power supply in order to reduce the measurement range to 30 uA full scale when VDD = 1.8 V.
Then after another 150 ms for current stabilization, R35 is shorted, the IDD measurement is stored in C25, and the MCU is woken up.
After wakeup the MCU can measure the IDD current corresponding to the Low power mode stored in C25.

Note: It is recommended to maintain VDD on the STM32L at a value lower than 3.5 V during low power current measurement to avoid extra current consumption on the NRST pin (U11 pin 14).
The reason for this is that the NRST pin of the STM32L is connected to the ST-LINK MCU T_NRST signal (U23 pin 18), and as the ST-LINK is powered at 3.3 V a leakage current is injected into the STM32L NRST pin when MCU VDD becomes equal to or greater than 3.5 V.

2.16.3 Ibias current measurement procedure

In Low power mode the bias current of operational amplifier input (U10 pin 4) is not negligible compared to IDD current (typical Ibias is ~240 nA). To obtain a reliable MCU IDD measurement it is possible to subtract the bias current from the IDD low power measurement since this current is not sinked by the MCU.

The procedure for accurate IDD measurement is:

1. Set jumper on JP4 pins 1 and 2.
2. Follow the Low power mode procedure to measure I1 = I bias.
3. Remove jumper on JP4 pins 1 and 2 and place it on JP4 pins 2 and 3.
4. Follow the low power mode procedure to measure I2 = IDD + I bias.
5. Calculate actual IDD: IDD = I2 - I1.

Table 12. IDD measurement related jumpers

Jumper	Description	Setting
JP14	PA5 is connected to IDD_measurement, the output of IDD measurement circuit when JP14 is closed (**default**).	
	PA5 is disconnected from IDD_measurement but remains connected to BNC connector CN13 when JP14 is open.	
JP4	STM32L is powered through IDD measurement circuit (**default**)	
	STM32L is powered directly by +3V3, IDD measurement circuit is bypassed. Please refer to *Section 2.2: Power supply* for details.	

Note: When jumper JP4 is removed the current consumption of the STM32L can be measured by connecting an ammeter between jumper JP4 pin 1 and pin 2.

Note: RDS (on) typical value of analog switch T4 = 50 micro Ohm, so to improve measurement accuracy it is recommended to take into account the RDS in series with R36 (1 Ohm) in the Idd Run mode current calculation.

3 Connectors

3.1 RS-232 connectors (CN2, CN5)

Figure 6. RS-232 connector (viewed from front)

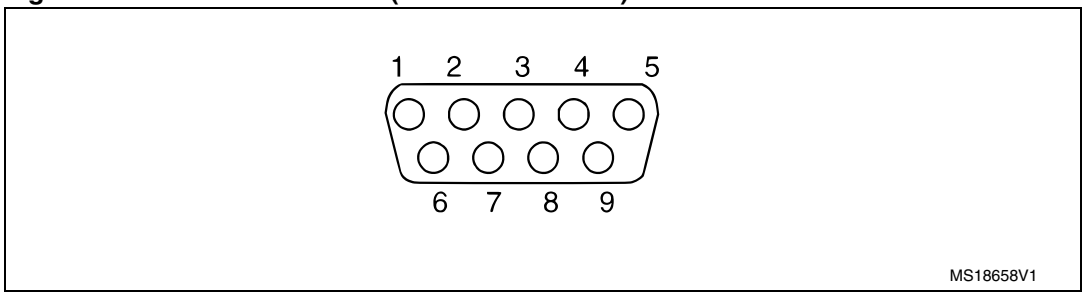


Table 13. RS-232 connector CN2 with HW flow control and ISP support

Pin number	Description	Pin number	Description
1		6	Bootloader_BOOT0
2	RS-232_RX (PD6)	7	RS-232_RTS(PD4)
3	RS-232_TX (PD5)	8	RS-232_CTS(PD3)/Bootloader_RESET
4	NC	9	NC
5	GND		

Table 14. RS-232 connector CN5

Pin number	Description	Pin number	Description
1	NC	6	Connected to pin4
2	RS-232_RX (PC11)	7	Connected to pin8
3	RS-232_TX (PC10)	8	Connected to pin7
4	Connected to pin6	9	NC
5	GND		

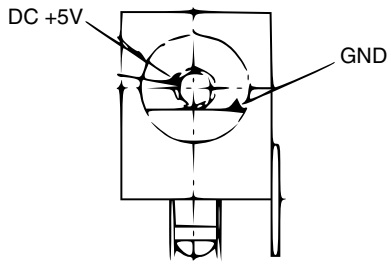
3.2 TFT LCD connector (CN14)

A TFT color LCD board (MB895) is mounted on CN14.

3.3 Power connector (CN12)

Your STM32L152-EVAL evaluation board can be powered from a DC 5 V power supply via the external power supply jack (CN12) shown in *Figure 7*. The central pin of CN12 must be positive.

Figure 7. Power supply connector CN12 (viewed from front)



3.4 Daughterboard extension connectors (CN6 and CN7)

Two 50-pin male headers CN6 and CN7 can connect a daughterboard or standard wrapping board to the STM32L152-EVAL evaluation board. All GPIOs are available on it. The space between these two connectors and position of power, GND and RESET pins are defined as a standard which allows common daughterboards to be developed for several evaluation boards. The standard width between CN6 pin1 and CN7 pin1 is 2700 mils (68.58 mm). This standard is implemented on the majority of evaluation boards.

Each pin on CN6 and CN7 can be used by a daughterboard after disconnecting it from the corresponding function block on the STM32L152-EVAL evaluation board. Please refer to *Table 15* and *Table 16* for details.

Table 15. Daughterboard extension connector CN6

Pin	Description	Alternative function	How to disconnect with function block on STM32L152-EVAL board
1	GND	-	-
3	PC7	TS_KEY2	Remove R13
5	PC9	TS_CT	Remove R29
7	PA9	COM1	Remove LCD glass U20
9	PA0	Tamper/Key	-
11	PC14	32K OSC	Remove R37
13	PA12	USB DP	Remove R25
15	PC15	32K OSC	Remove R38
17	PC10	LCD glass_SEG40 / USART3_TX	JP7 open
19	GND	-	-
21	PC12	LCD glass_SEG42	Remove LCD glass U20
23	PD1	LED2	Remove R125

Table 15. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative function	How to disconnect with function block on STM32L152-EVAL board
25	PD3	USART2_CTS	JP9 open
27	PD5	USART2_TX / LED4	JP19 open
29	PD7	CS_uSD	Remove SD card from CN4
31	VLCD	-	-
33	PB3	JTDO / COMP_POT-	JP17 open
35	PB5	TEMP_SMBAI / COMP_POT+	JP17 and JP11 open
37	PB7	I2C_TEMP_SDA	Remove R62
39	GND	-	-
41	PE2	LCD glass_SEG38 / TRACE_CLK	Remove LCD glass U20
43	PE4	TRACE_D1	-
45	PB8	LCD glass_SEG16	Remove LCD glass U20
47	PE6	TRACE_D3 / SD Card detection	JP2 open
49	D5V	-	-
2	PC6	TS_KEY1	Remove R14
4	PC8	TS_SHIELD	-
6	PA8	LCD glass_COM0	Remove LCD glass U20
8	PA10	LCD glass_COM2	Remove LCD glass U20
10	GND	-	-
12	PA11	USB DM	Remove R16
14	PA13	JTMS	-
16	PA14	JTCK	-
18	PC11	LCD glass_SEG41 / USART3_RX	JP8 open
20	PA15	JTDI	-
22	PD0	LED1	Remove R111
24	PD2	LCD glass_SEG43	Remove LCD glass U20
26	PD4	USART2_RTS/ LED3	JP18 open
28	PD6	USART2_RX	Remove R19
30	GND	-	-
32	PH2	CS_LCD	-
34	PB4	JTRST / LDR	JP10 open
36	PB6	I2C_TEMP_SCL	Remove R69
38	PE0	LCD glass_SEG36	Remove LCD glass U20
40	PE1	LCD glass_SEG37	Remove LCD glass U20
42	PE3	LCD glass_SEG39 / TRACE_D0	Remove LCD glass U20

Table 15. Daughterboard extension connector CN6 (continued)

Pin	Description	Alternative function	How to disconnect with function block on STM32L152-EVAL board
44	PE5	TRACE_D2	-
46	PB9	LCD glass_COM3	Remove LCD glass U20
48	+3V3	-	-
50	GND	-	-

Table 16. Daughterboard extension connector CN7

Pin	Description	Alternative function	How to disconnect with function block on STM32L152-EVAL board
1	GND	-	-
3	PD14	LCD glass_SEG34	Remove LCD glass U20
5	PD12	LCD glass_SEG32	Remove LCD glass U20
7	PD10	LCD glass_SEG30	Remove LCD glass U20
9	PC13	IDD_CNT_EN	-
11	RESET#	-	-
13	PB15	uSD_SPI2_MOSI	-
15	PB13	uSD_SPI2_SCK	-
17	PB11	LCD glass_SEG11	Remove LCD glass U20
19	D5V		-
21	PE14	LCD_SPI1_MISO	Remove R57
23	PH0	OSC_IN	Remove X2 from socket and close SB3
25	PE12	JOYSTICK_LEFT	Remove R118
27	PE10	JOYSTICK_DOWN	Remove R127
29	PE8	JOYSTICK_SEL	Remove R112
31	PE7	Audio_IN	Remove R75
33	PB1	LCD glass_SEG6	Remove LCD glass U20
35	PC5	LCD glass_SEG23	Remove LCD glass U20
37	PA7	LCD glass_SEG4	Remove LCD glass U20
39	GND	-	-
41	PA4	Audio_DAC1_out	Remove R103
43	PA2	LCD glass_SEG1	Remove LCD glass U20
45	PC3	LCD glass_SEG21	Remove LCD glass U20
47	PC1	LCD glass_SEG19	Remove LCD glass U20
49	PC13	IDD_CNT_EN	-
2	PD15	LCD glass_SEG35	Remove LCD glass U20

Table 16. Daughterboard extension connector CN7 (continued)

Pin	Description	Alternative function	How to disconnect with function block on STM32L152-EVAL board
4	PD13	LCD glass_SEG33	Remove LCD glass U20
6	PD11	LCD glass_SEG31	Remove LCD glass U20
8	PD9	LCD glass_SEG29	Remove LCD glass U20
10	GND	-	-
12	PD8	LCD glass_SEG28	Remove LCD glass U20
14	PB14	uSD_SPI2_	-
16	PB12	POT_ADC18	JP17 open
18	PB10	LCD glass_SEG10	Remove LCD glass U20
20	PE15	LCD_SPI1_MOSI	-
22	PE13	LCD_SPI1_SCK	-
24	PH1	OSC_OUT	Remove X2 from socket and close SB2
26	PE11	JOYSTICK_RIGHT	Remove R117
28	PE9	JOYSTICK_UP	Remove R126
30	GND	-	-
32	PB2	BOOT1 / TS_LOAD	-
34	PB0	LCD glass_SEG5	Remove LCD glass U20
36	PC4	LCD glass_SEG22	Remove LCD glass U20
38	PA6	LCD glass_SEG3	Remove LCD glass U20
40	PA5	BNC	JP14 open
42	PA3	LCD glass_SEG2	Remove LCD glass U20
44	PA1	LCD glass_SEG0	Remove LCD glass U20
46	PC2	LCD glass_SEG20	Remove LCD glass U20
48	PC0	LCD glass_SEG18	Remove LCD glass U20
50	GND	-	-

3.5 ST-LINK/V2 programming connector CN10

Connector CN10 is used only for embedded ST-LINK/V2 programming during board manufacture. It is not populated by default and is not for end user usage.

3.6 ST-LINK/V2 USB type B connector CN11

The USB connector, CN11, is used to connect the embedded ST-LINK/V2 to the PC for board debugging.

Figure 8. USB type B connector CN11 (viewed from front)

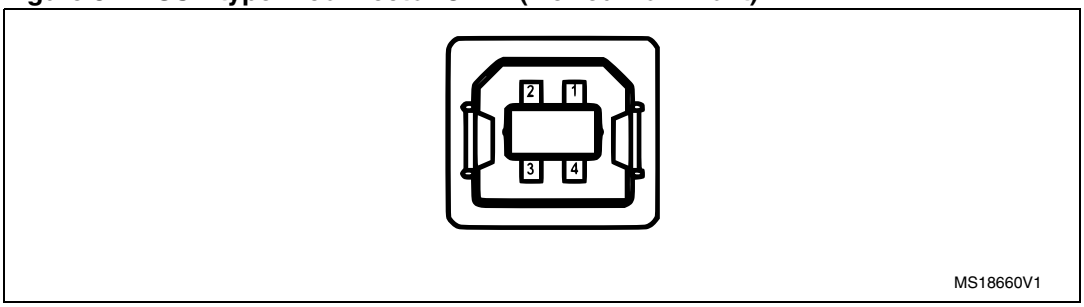


Table 17. USB type B connector CN11

Pin number	Description	Pin number	Description
1	VBUS (power)	4	GND
2	DM	5,6	Shield
3	DP		

3.7 User USB Type B connector CN1

Figure 9. USB type B connector CN1 (viewed from front)

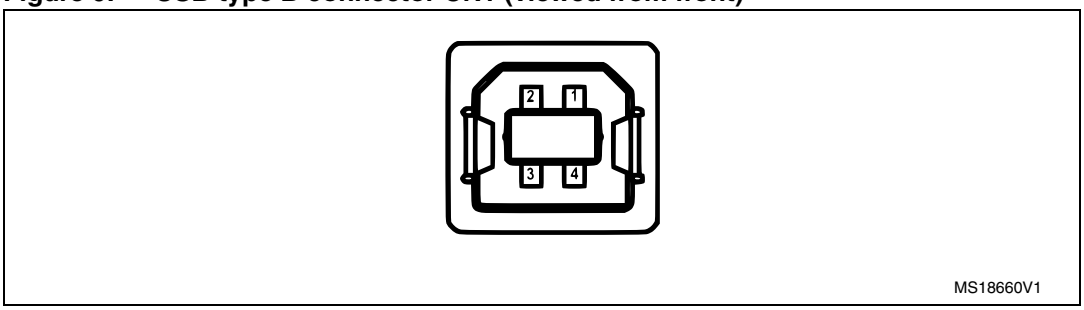


Table 18. USB type B connector CN1

Pin number	Description	Pin number	Description
1	VBUS (power)	4	GND
2	DM	5	Shield
3	DP	6	Shield

3.8 Audio jack CN3

A 3.5 mm stereo audio jack, CN3, connected to audio DAC is available.

3.9 JTAG connector CN9

Figure 10. JTAG debugging connector CN9 (viewed from above PCB)

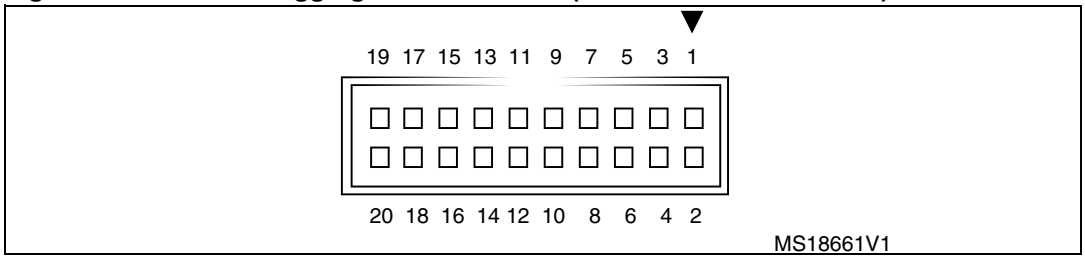


Table 19. JTAG debugging connector CN9

Pin number	Description	Pin number	Description
1	3.3 V power	2	3.3 V power
3	PB4	4	GND
5	PA15	6	GND
7	PA13	8	GND
9	PA14	10	GND
11	RTCK	12	GND
13	PB3	14	GND
15	RESET#	16	GND
17	DBGRQ	18	GND
19	DBGACK	20	GND

3.10 Trace debugging connector CN8

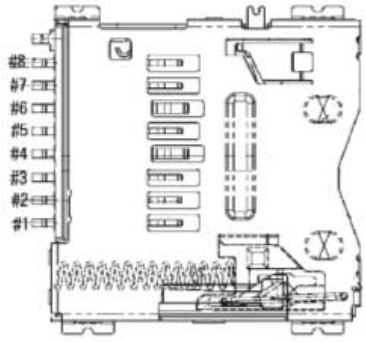
This is the same connector type as CN9 (see *Figure 10*).

Table 20. Trace debugging connector CN8

Pin number	Description	Pin number	Description
1	3.3V power	2	TMS/PA13
3	GND	4	TCK/PA14
5	GND	6	TDO/PB3
7	KEY	8	TDI/PA15
9	GND	10	RESET#
11	GND	12	TraceCLK/PE2
13	GND	14	TraceD0/PE3 or SWO/PB3
15	GND	16	TraceD1/PE4 or nTRST/PB4
17	GND	18	TraceD2/PE5
19	GND	20	TraceD3/PE6

3.11 MicroSD Card connector CN4

Figure 11. MicroSD Card connector CN4 (viewed from front)



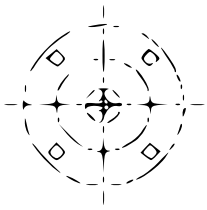
MS18662V1

Table 21. MicroSD Card connector CN4

Pin number	Description	Pin number	Description
1		5	MicroSDcard_CLK (PB13)
2	MicroSDcard_CS (PD7)	6	Vss/GND
3	MicroSDcard_DIN(PB15)	7	MicroSDcard_DOUT(PB14)
4	+3V3	8	
		9	MicroSDcard_detect (PE6)

3.12 BNC connector CN13

Figure 12. Analog input connector CN13 (viewed from bottom)



MS18663V1

Table 22. Analog input connector CN13

Pin number	Description	Pin number	Description
1	GND	4	GND
2	GND	5	Analog input PA5
3	GND		

4 Schematics

The following schematics are listed.

- *Figure 13: STM32L152-EVAL on page 27*
- *Figure 14: MCU on page 28*
- *Figure 15: LCD glass on page 29*
- *Figure 16: Audio on page 30*
- *Figure 17: Peripherals on page 31*
- *Figure 18: Power on page 32*
- *Figure 19: Extension connector on page 33*
- *Figure 20: LCD and SD Card on page 34*
- *Figure 21: RS-232 and IrDA on page 35*
- *Figure 22: IDD_Measurement on page 36*
- *Figure 23: Temperature sensor on page 37*
- *Figure 24: ST-LINK on page 38*
- *Figure 23: Temperature sensor on page 37*
- *Figure 26: Touch sensing on page 40*

Figure 13. STM32L152-EVAL

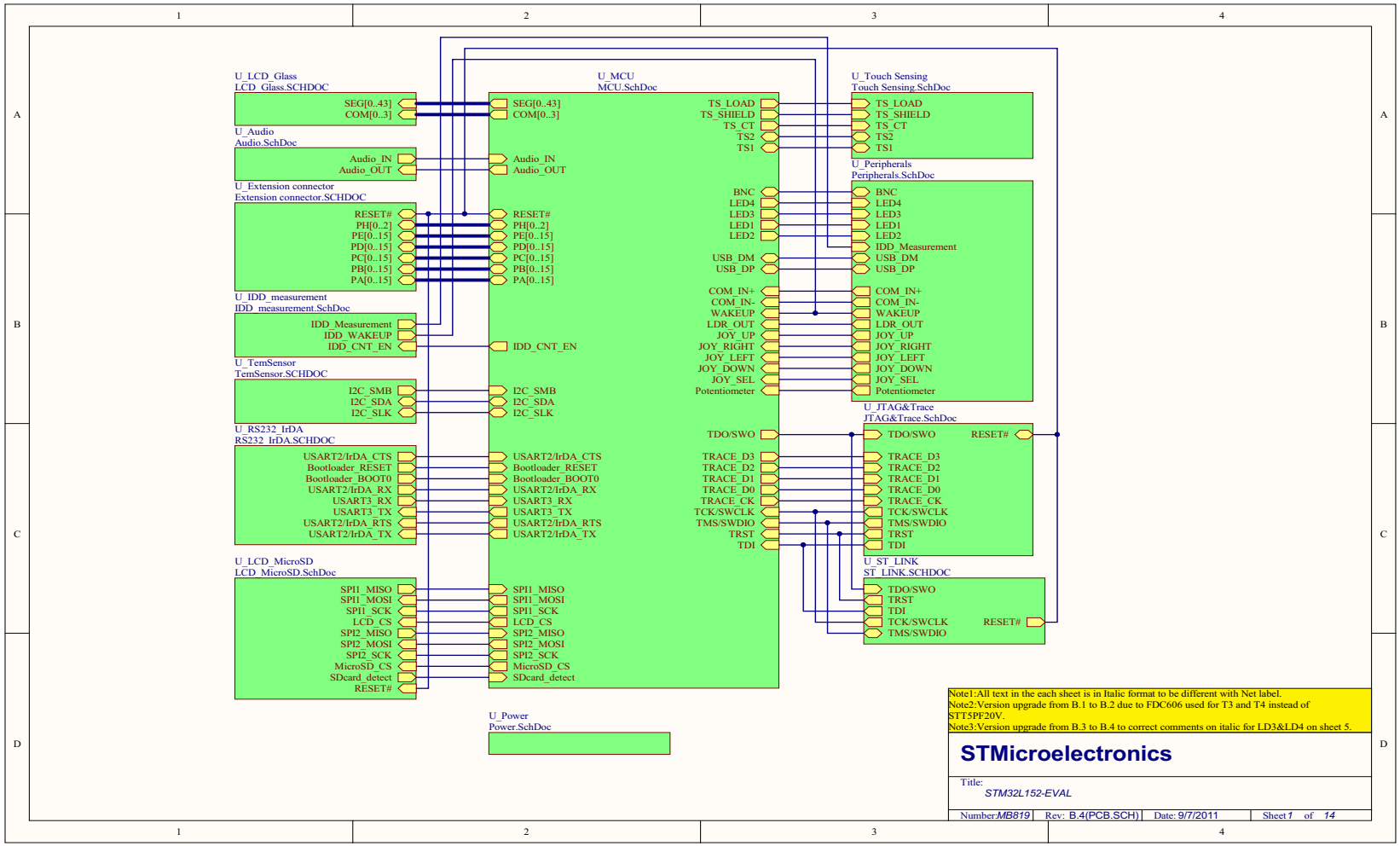


Figure 14. MCU

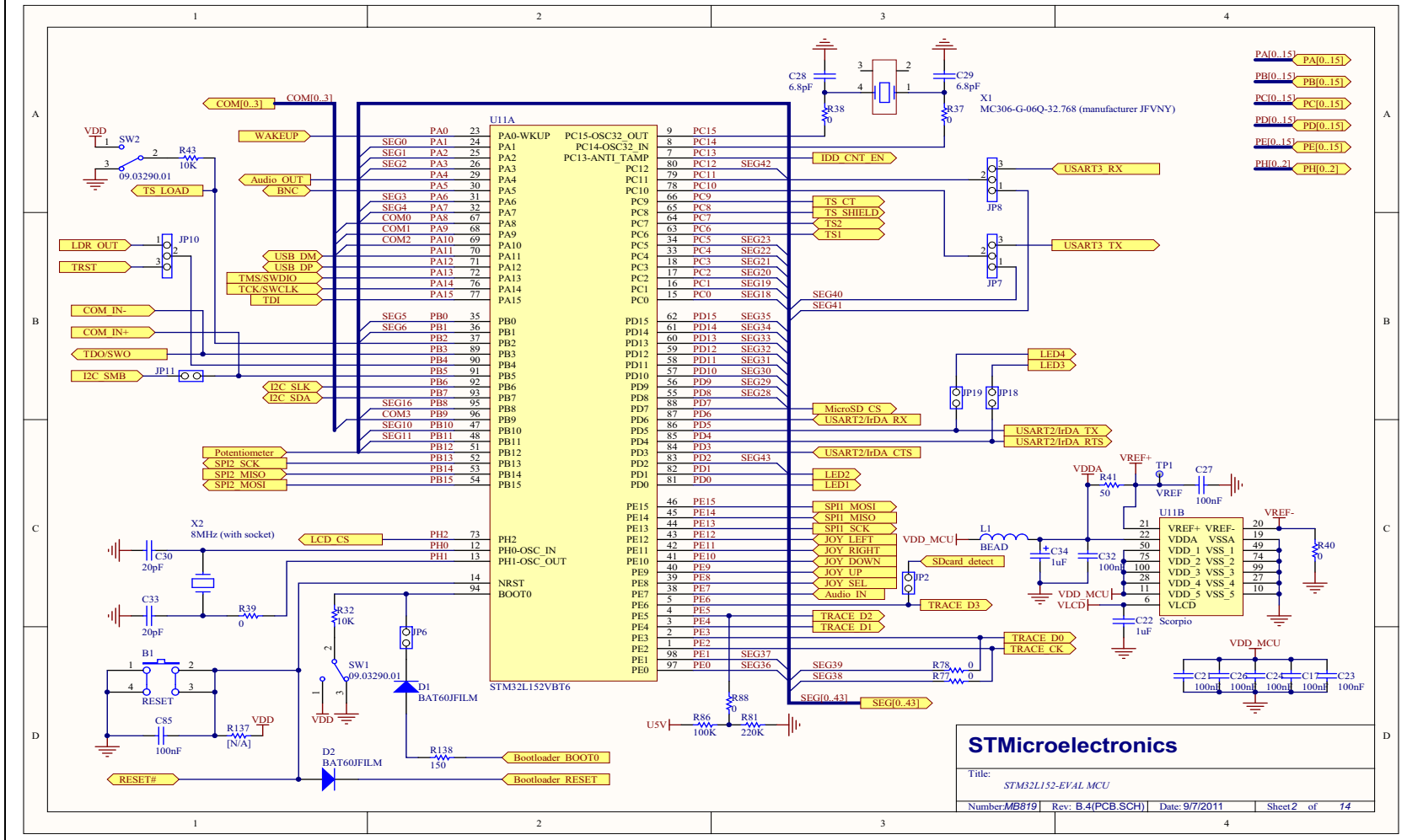


Figure 15. LCD glass

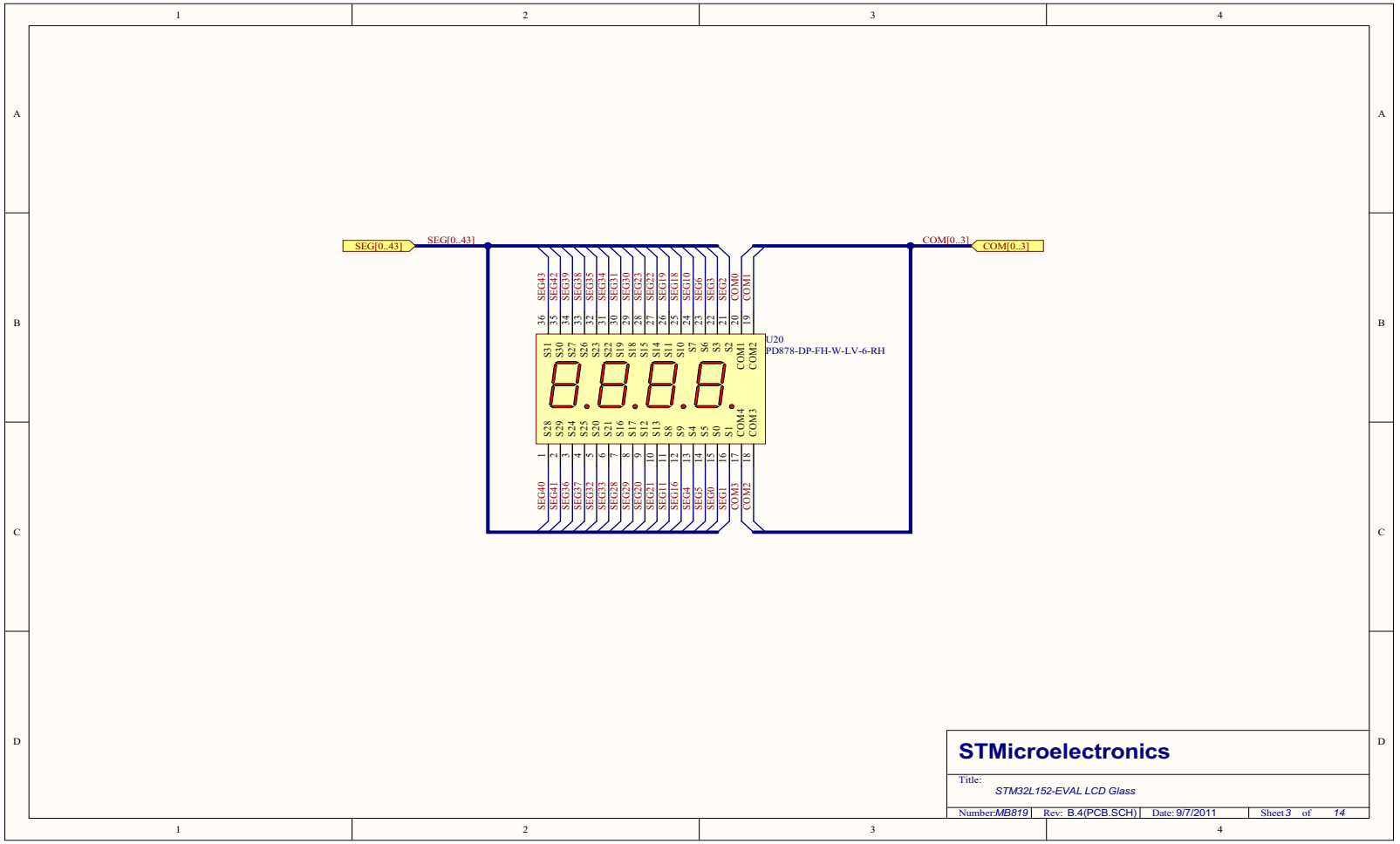


Figure 16. Audio

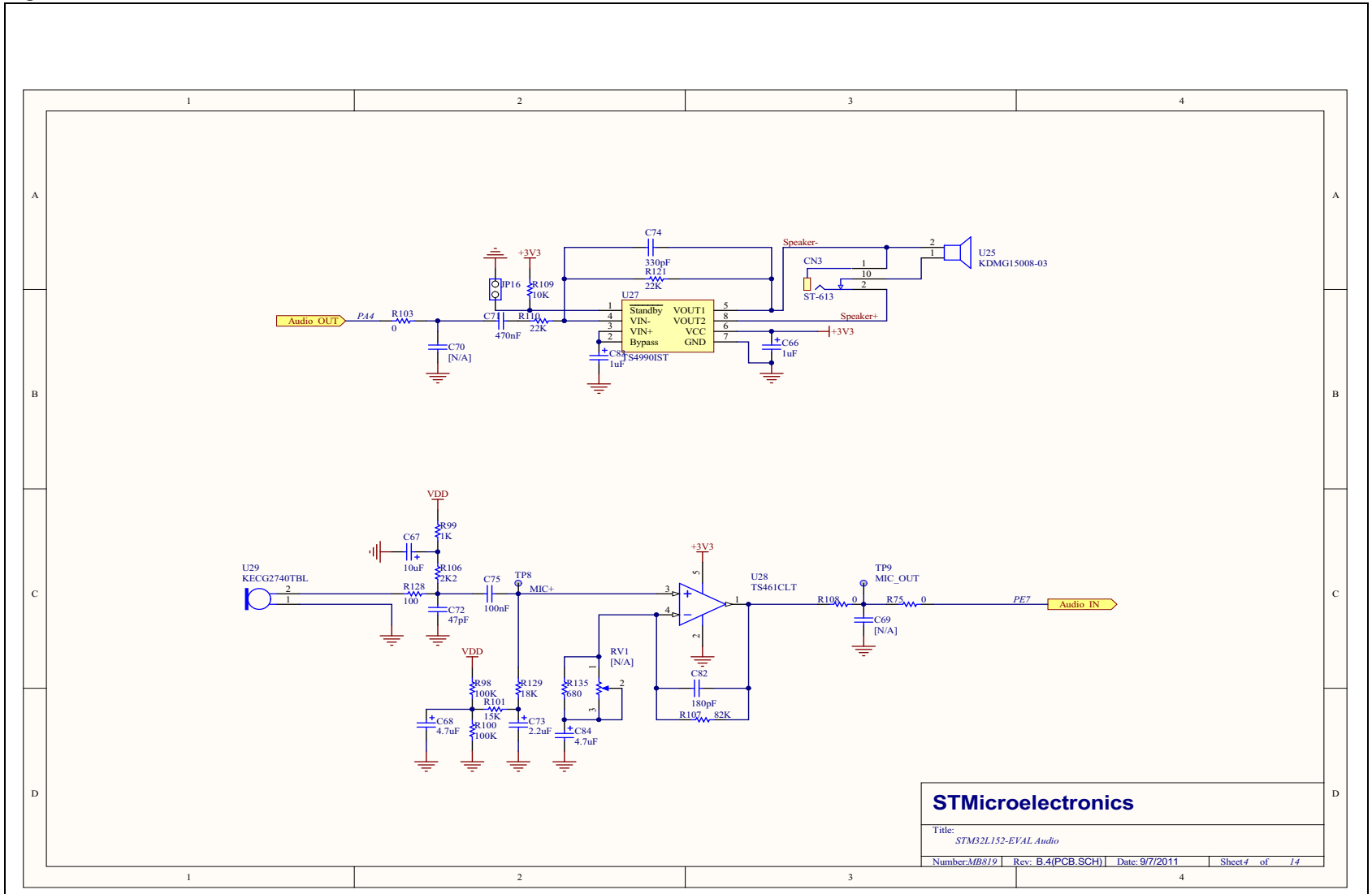


Figure 17. Peripherals

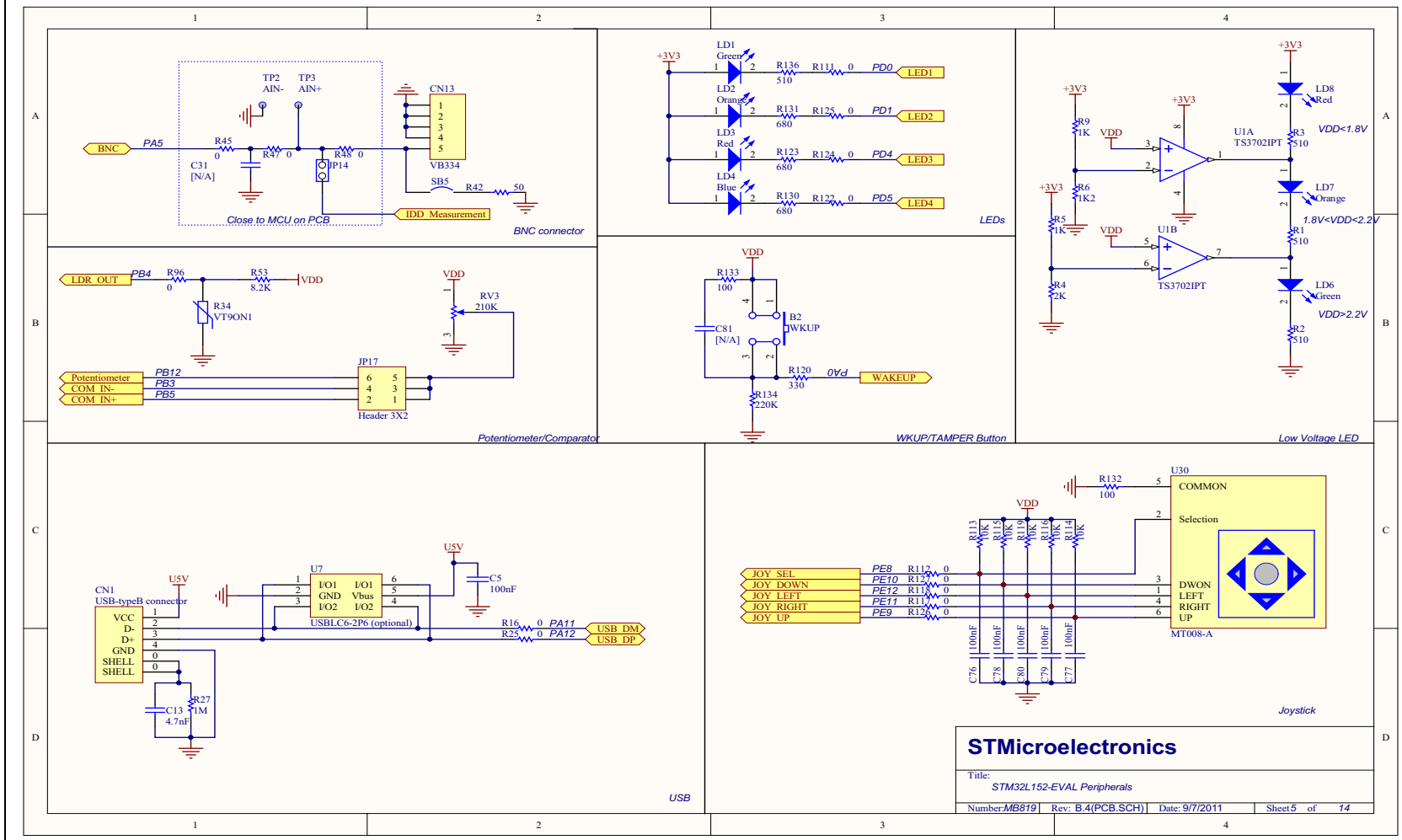


Figure 18. Power

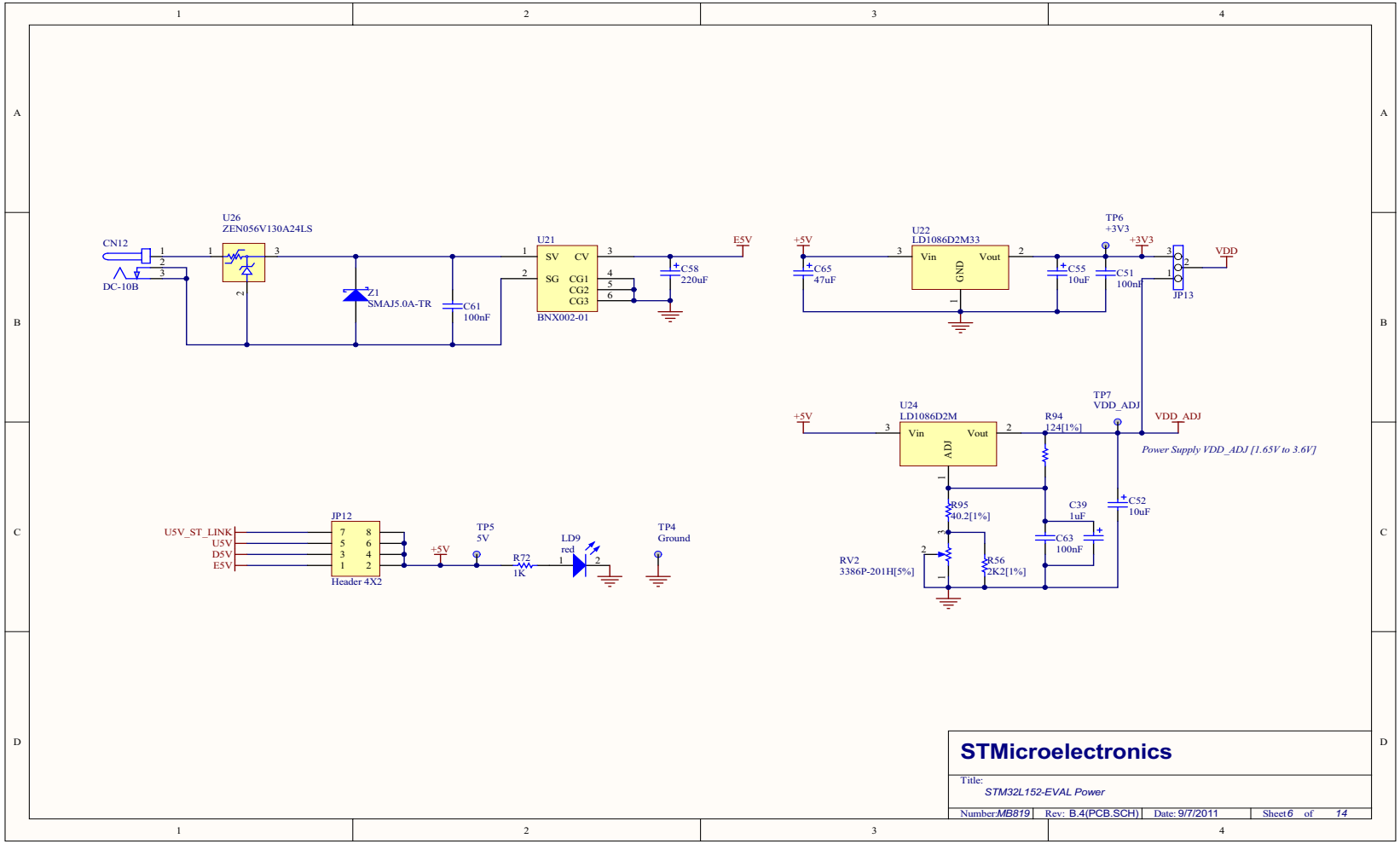


Figure 19. Extension connector

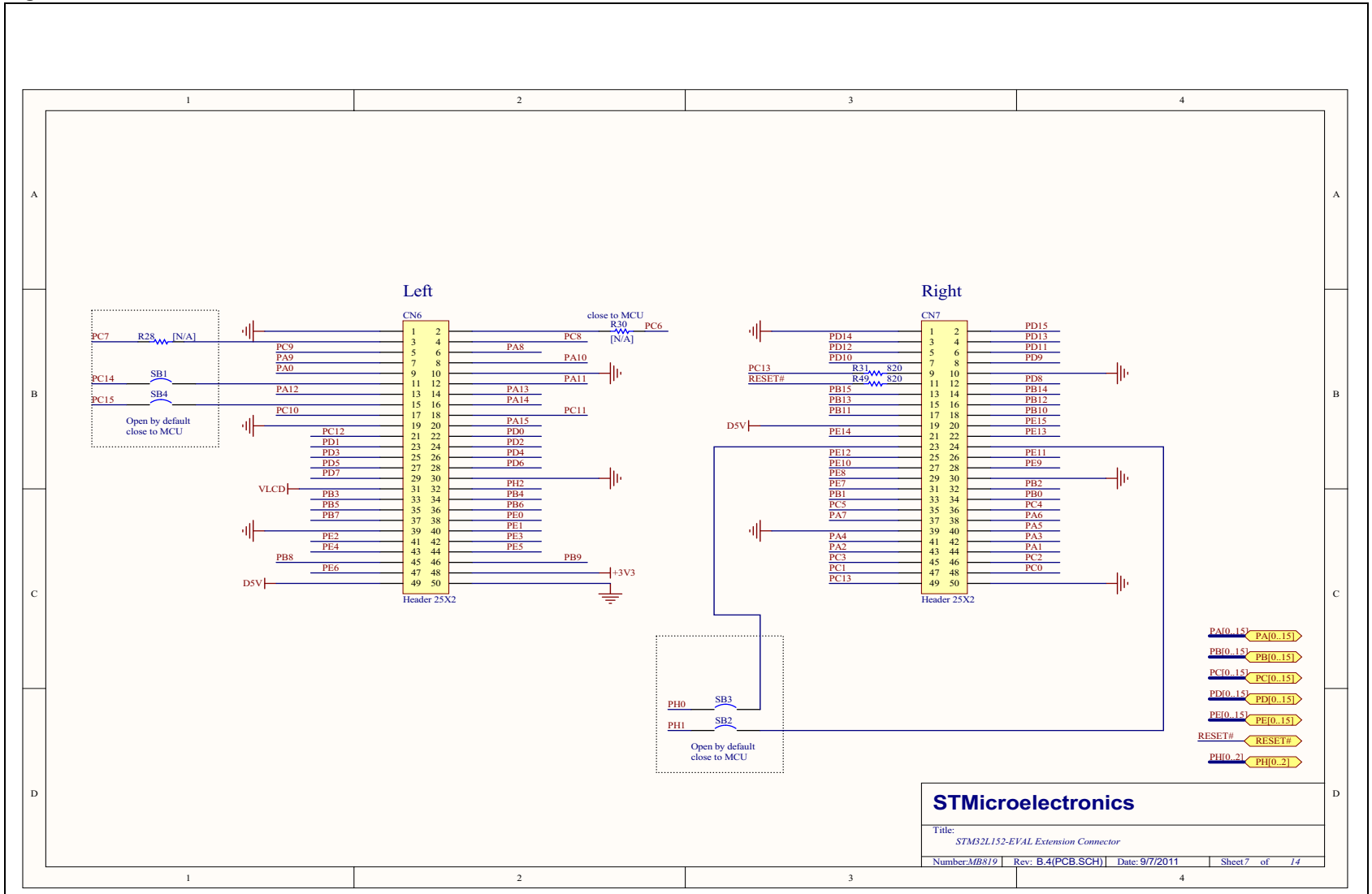


Figure 20. LCD and SD Card

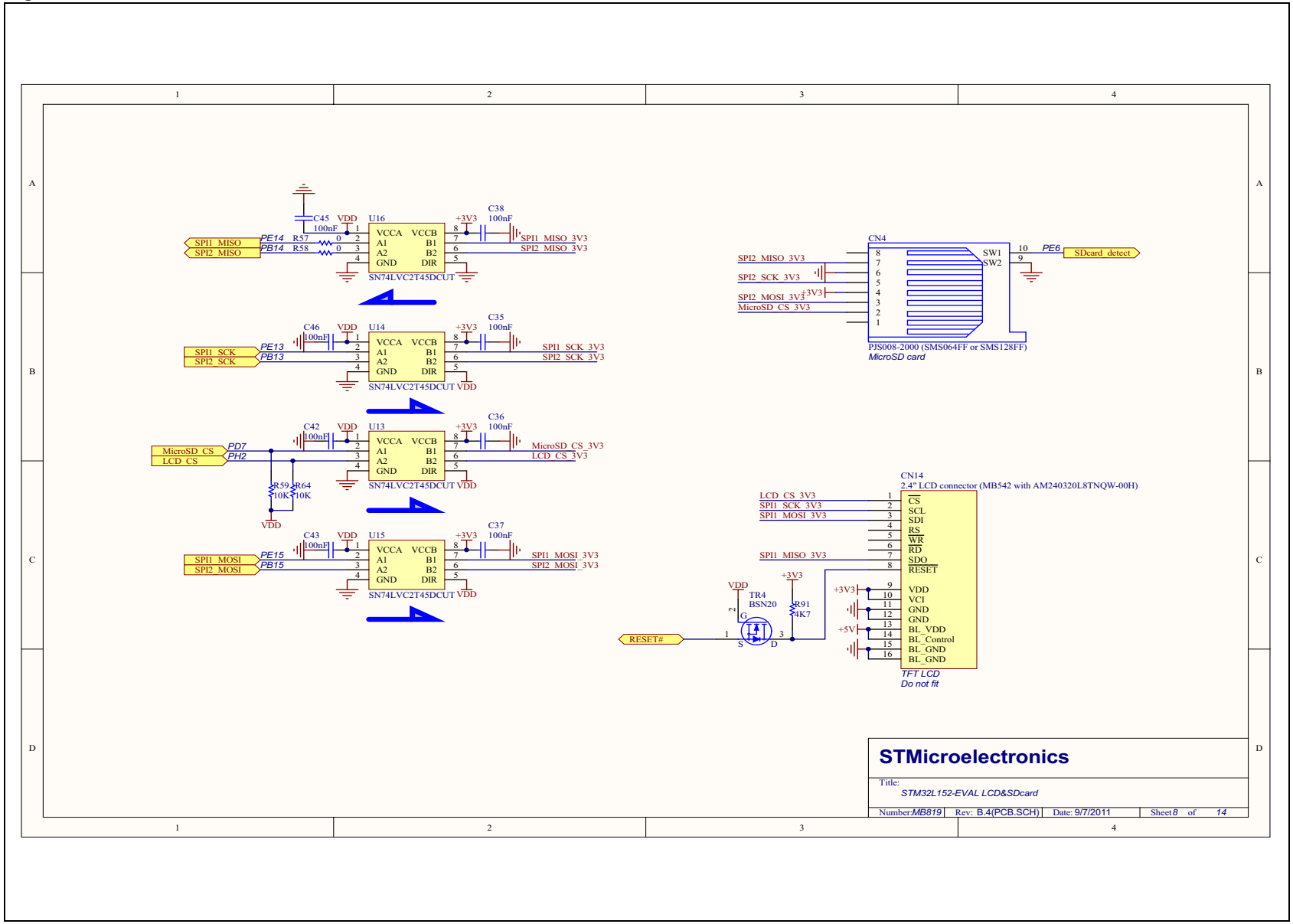


Figure 21. RS-232 and IrDA

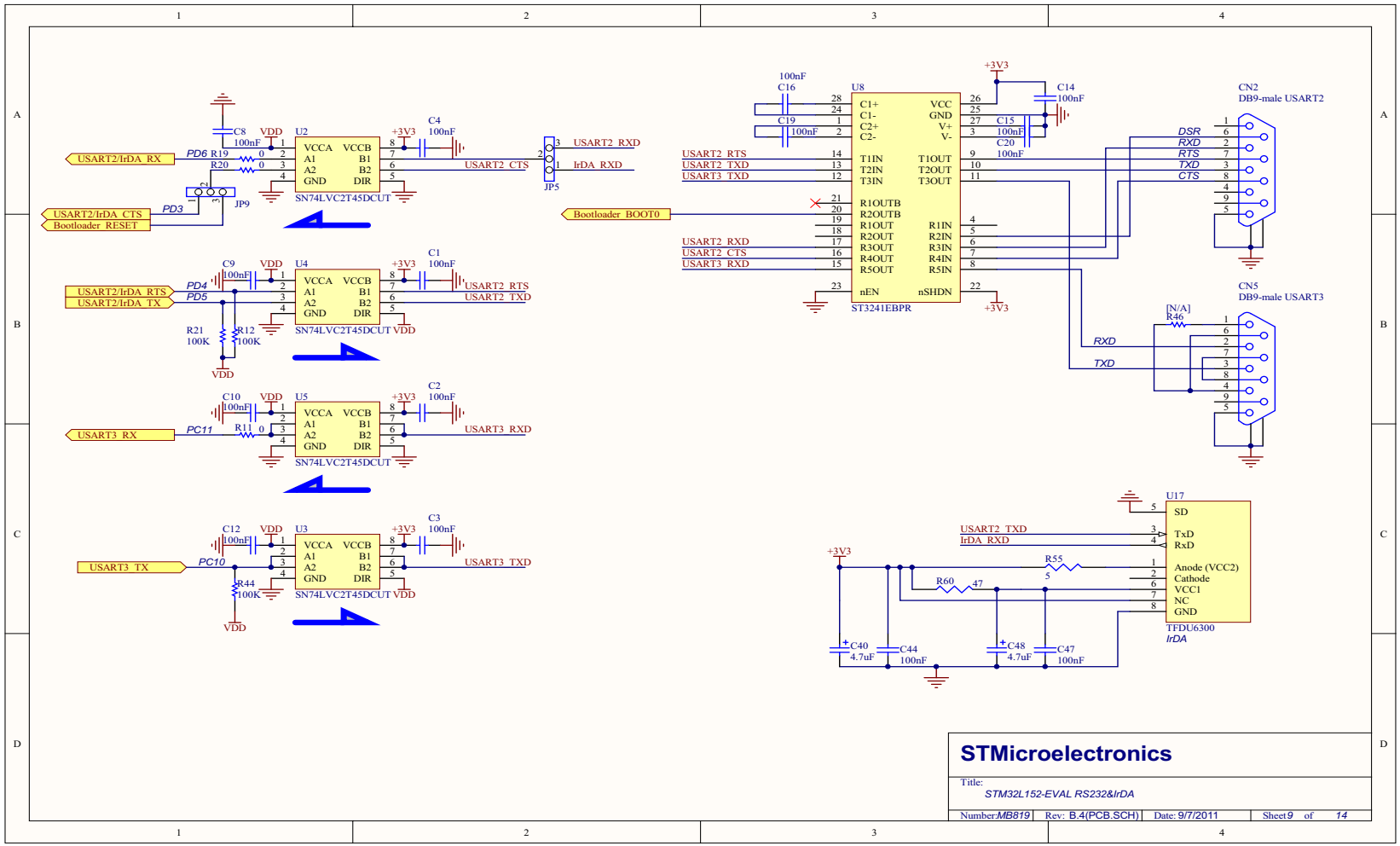


Figure 22. IDD_Measurement

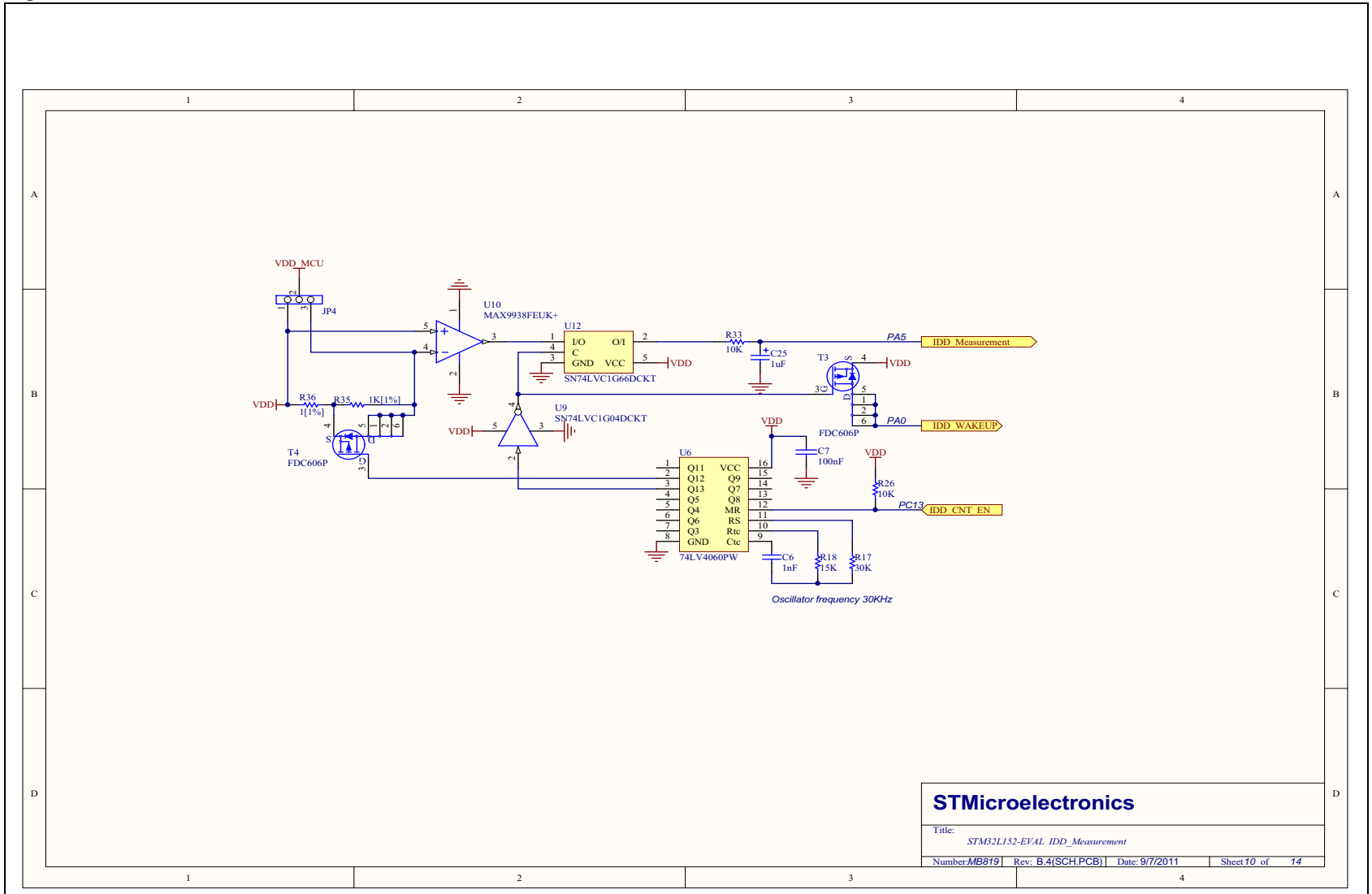


Figure 23. Temperature sensor

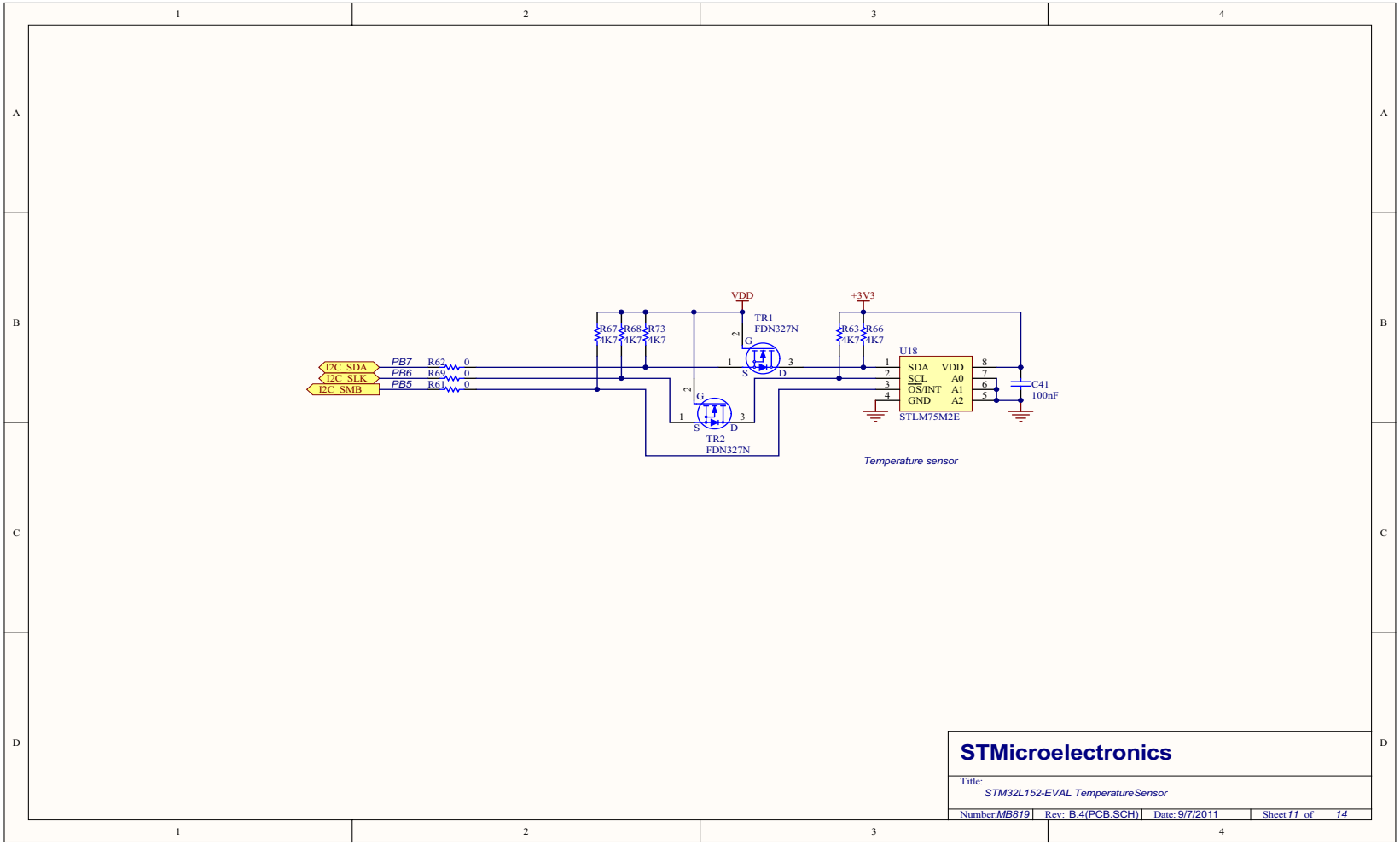


Figure 24. ST-LINK

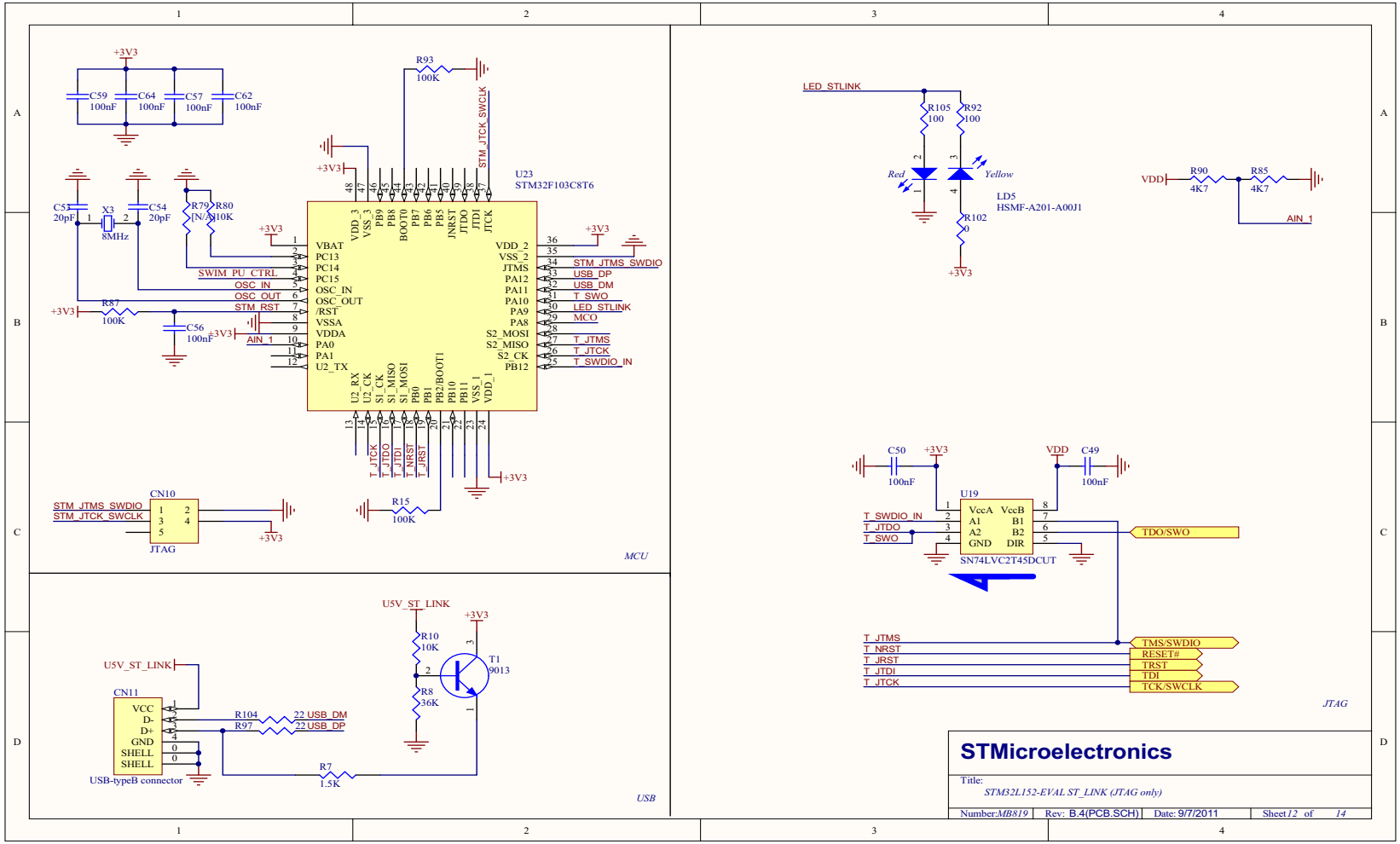


Figure 25. JTAG and Trace

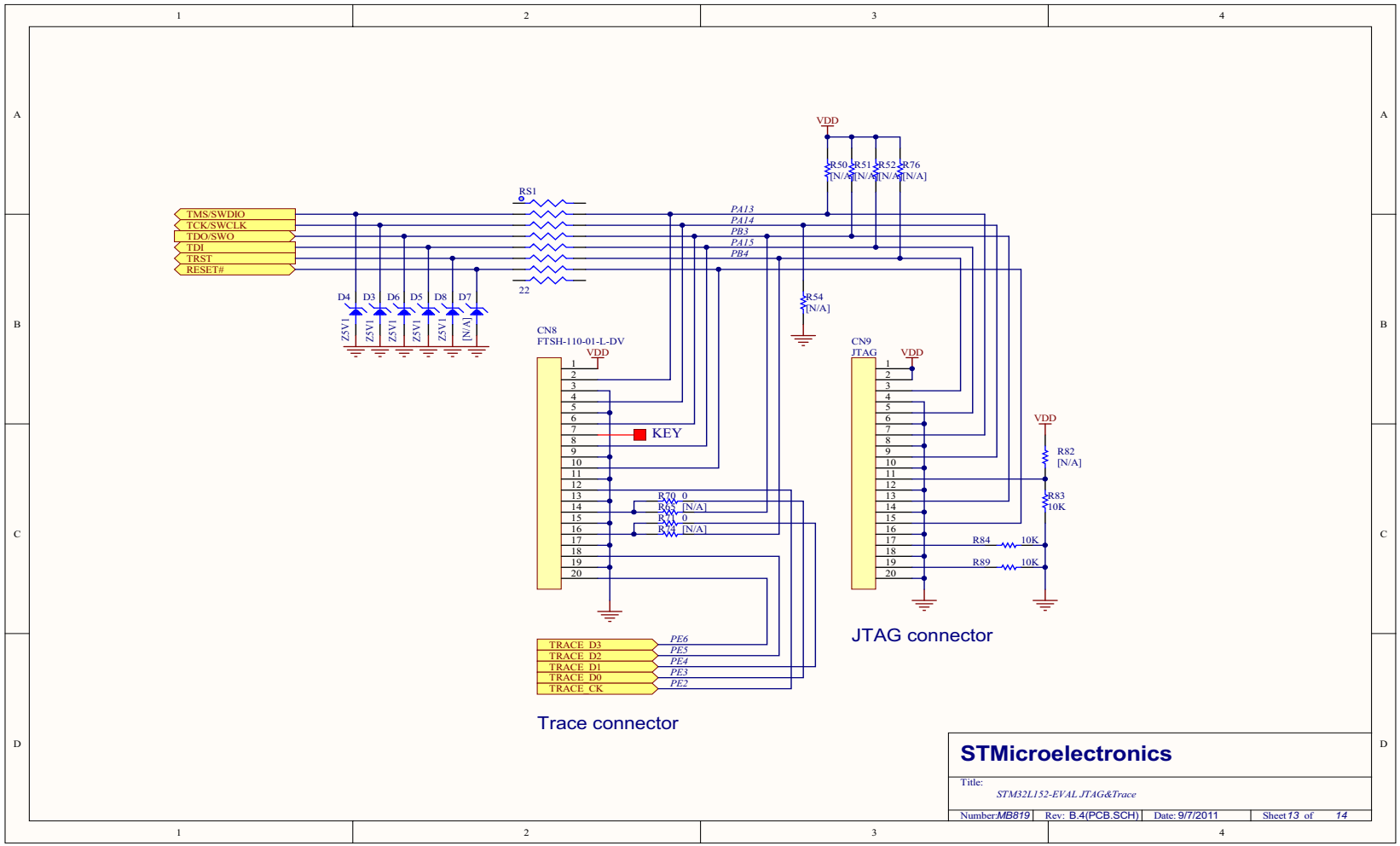
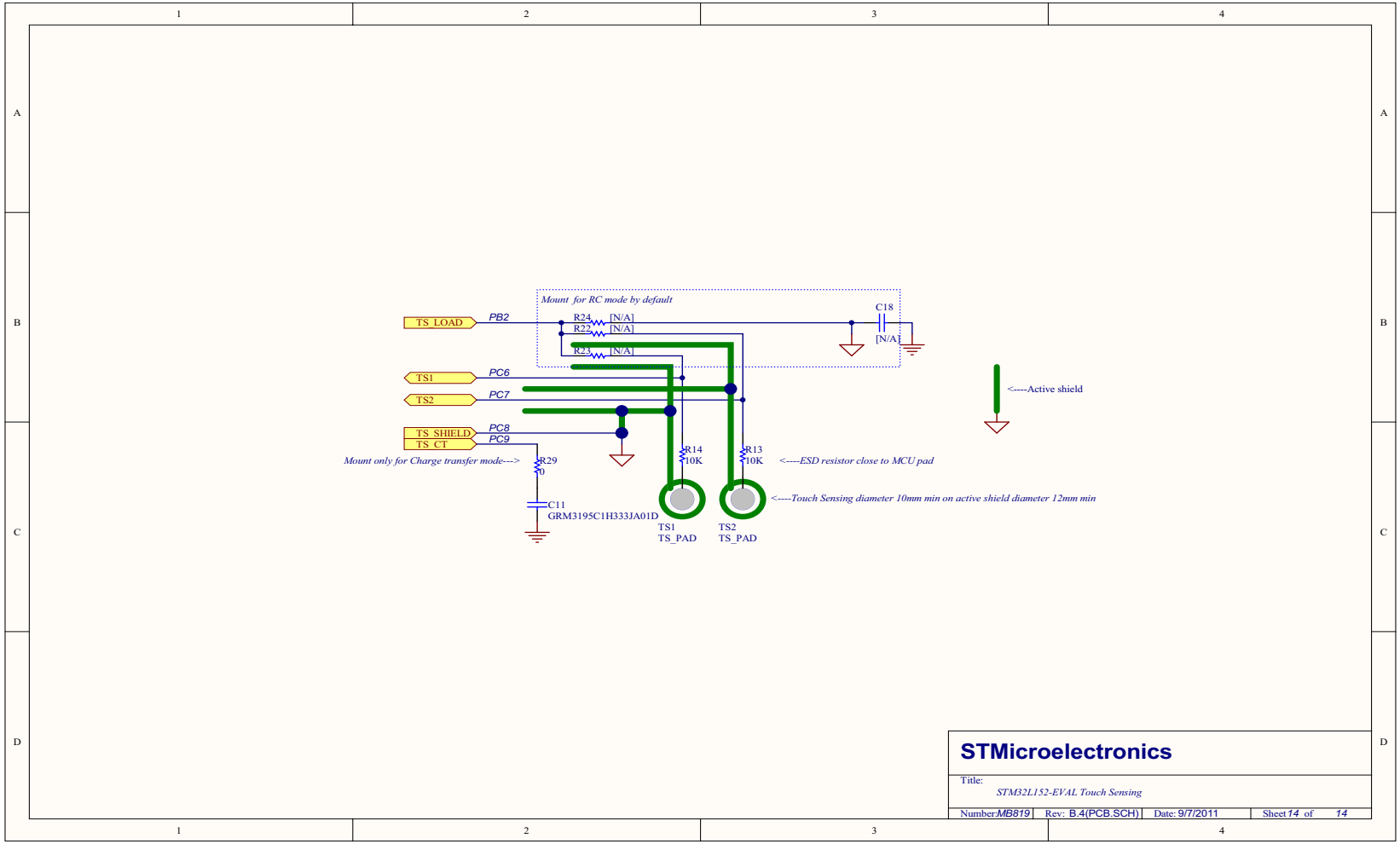


Figure 26. Touch sensing



5 Revision history

Table 23. Document revision history

Date	Revision	Changes
13-Dec-2010	1	Initial release.
14-Nov-2011	2	Modified LED in *Figure 17: Peripherals* and updated schematics.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER’S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com