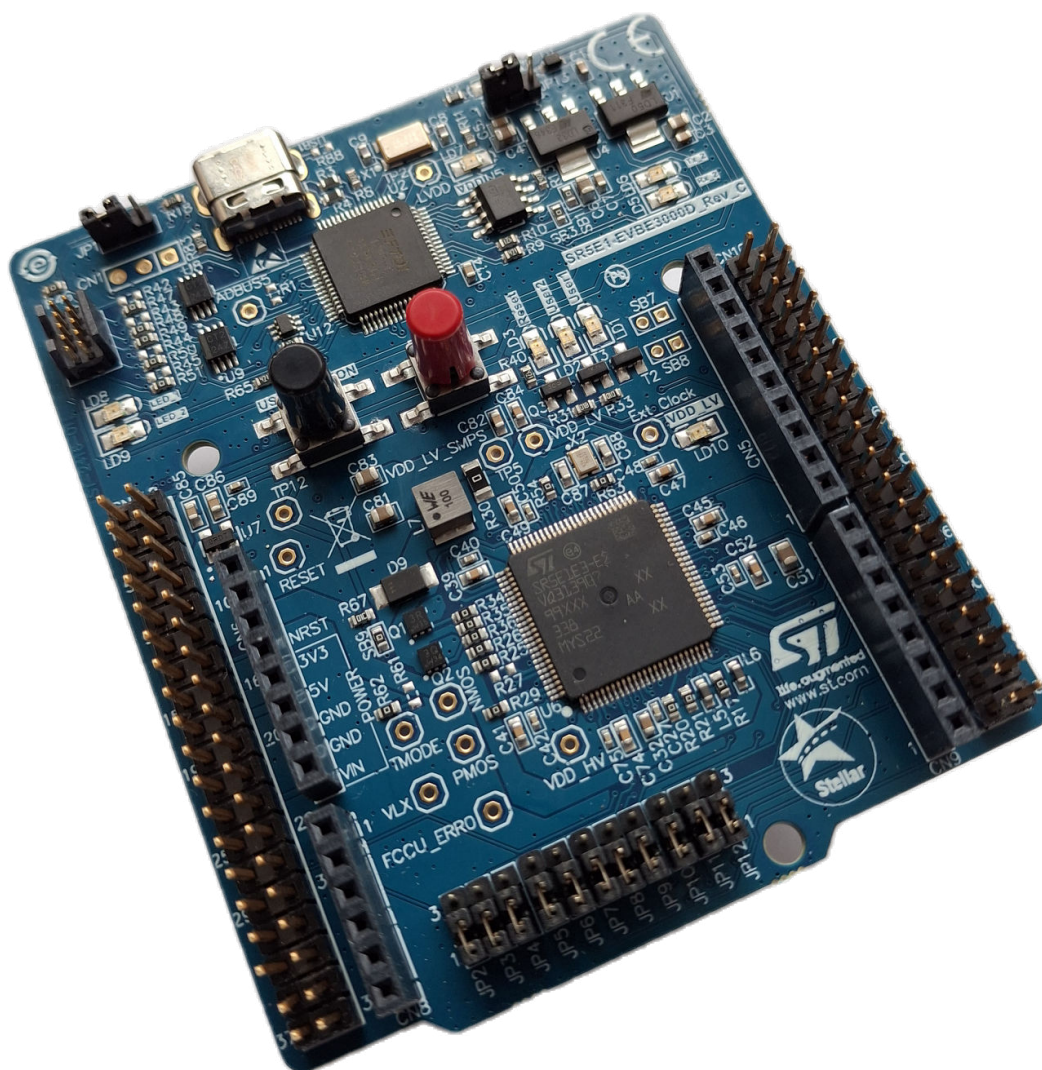


## SR5E1-EVBE3000D discovery board

### Introduction

The SR5E1-EVBE3000D is a low-cost development board to evaluate and develop applications with the microcontroller SR5E1E3 in the TQFP 100-pin package.

**Figure 1. SR5E1-EVBE3000D**



*Note: picture not contractual.*



## 1 Overview

The SR5E1-EVBE3000D discovery board is an evaluation tool supporting STMicroelectronics SR5E1E3, a high performance 32-bit Arm® Cortex®-M7 and Cortex®-M0+ cores, 2 MB Flash, rich analog, high-resolution timer, HSM, ASIL-D in an eTQFP100 package.

For information on the Arm® Cortex®-M7 and Cortex®-M0+ cores, refer to the technical reference manuals, available from the [www.arm.com](http://www.arm.com) website.



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The board integrates a programmer/debugger that allows debugging and programming the microcontroller via USB cable. In addition, it allows enabling a UART communication channel (USB virtual COM port).

Dedicated connectors allow plugging shields Arduino UNO-compatible; this feature makes it easy to expand the functionality of the SR5E1-EVBE3000D.

All CPUs pins are connected to two-pin arrays. This solution simplifies the debug activity as well as reducing the effort to connect the SR5E1-EVBE3000D to the final user application board.

A mipi-10 JTAG connector is available to program and debug the microcontroller by using an external tool.

Figure 2. SR5E1-EVBE3000D–Top overview

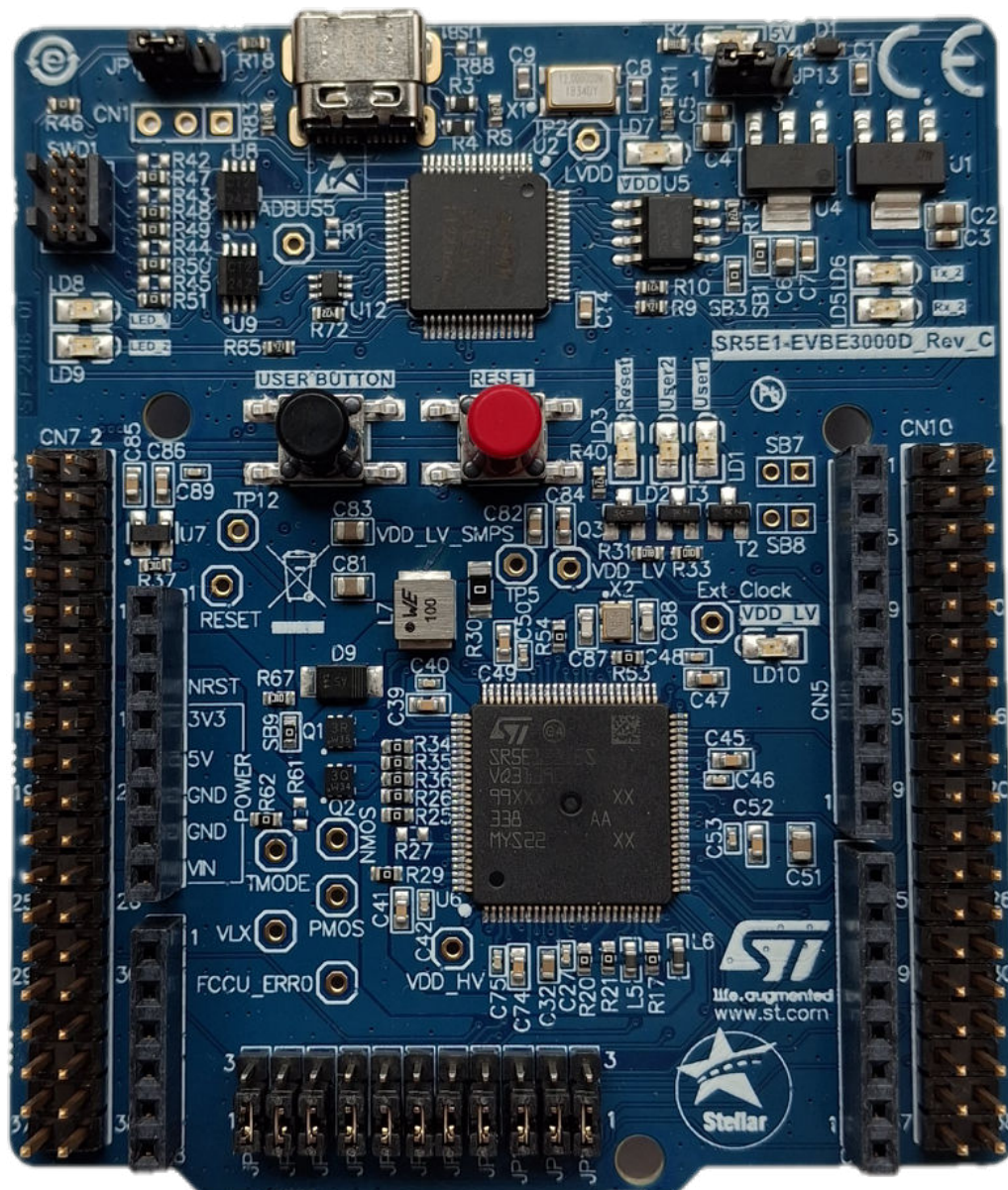
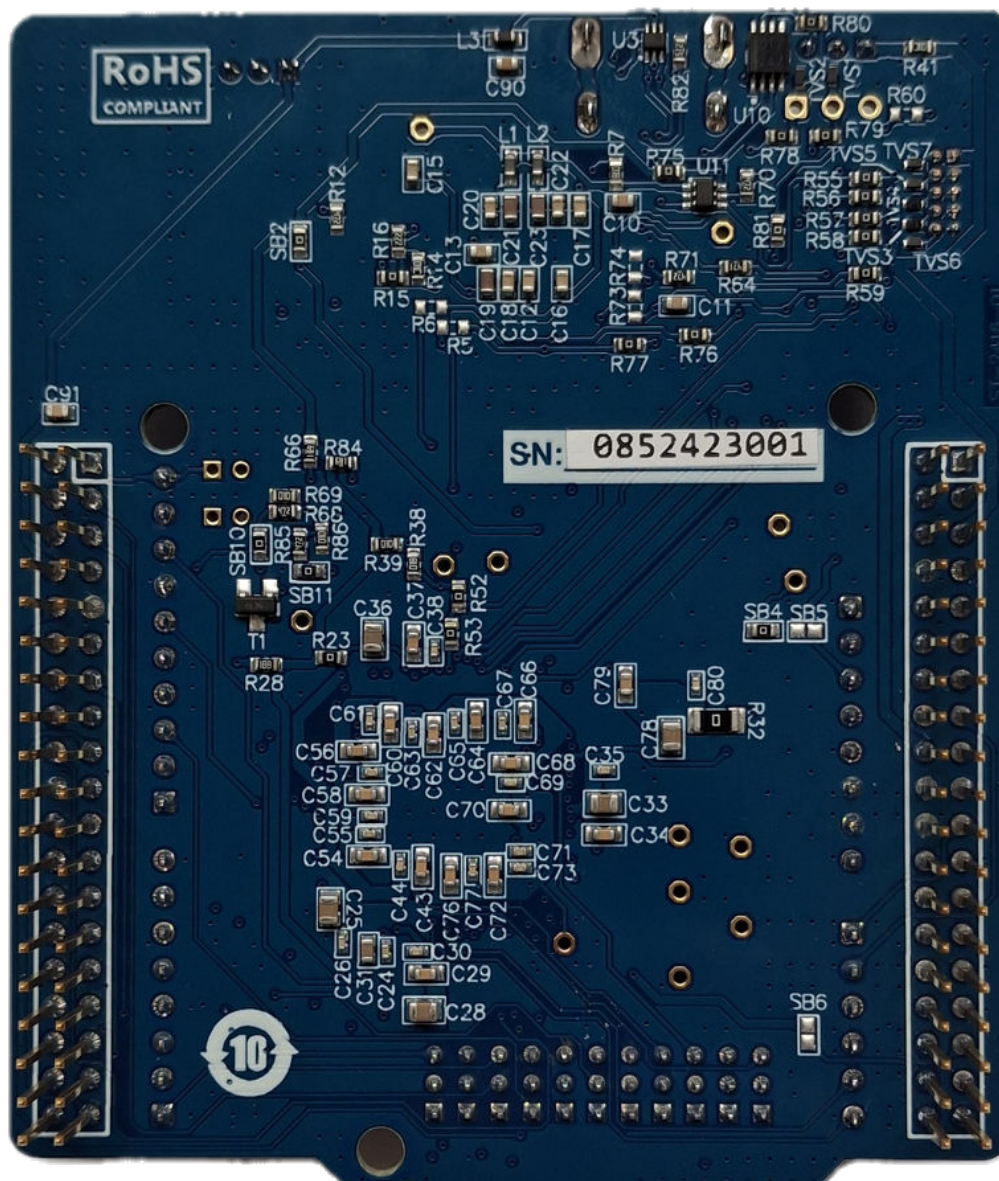


Figure 3. SR5E1-EVBE3000D–Bottom overview



## 1.1 Hardware dimensions

The discovery board has the following dimensions:

- PCB area: 82.50 mm x 70 mm
- Top components height: 8.5 mm
- Bottom components height: 8.5 mm
- PCB thickness 1.546 mm

## 2 License agreement

---

The packaging of this evaluation board was sealed with a seal stating, by breaking this seal, you agree to the terms and conditions of the evaluation board license agreement, the terms and conditions of which are available at [https://www.st.com/resource/en/evaluation\\_board\\_terms\\_of\\_use/evaluationproductlicenseagreement.pdf](https://www.st.com/resource/en/evaluation_board_terms_of_use/evaluationproductlicenseagreement.pdf).

Upon breaking the seal, you and STMicroelectronics entered into the evaluation board license agreement, a copy of which is also enclosed with the evaluation board for convenience.

**Attention:** *This evaluation board only offers limited features for evaluating ST products. It has not been tested for use with other products and is not suitable for any safety or other commercial or consumer application. This evaluation board is otherwise provided "AS IS" and STMicroelectronics disclaims all warranties, express or implied, including the implied warranties of merchantability and fitness for a particular purpose.*

## 3 Safety recommendations

---

### 3.1 Targeted audience

This product targets users with at least basic electronics or embedded software development knowledge like engineers, technicians, or students.

This board is not a toy and is not suited for use by children.

### 3.2 Handling the board

This product contains a bare printed circuit board. As for all products of this type, the user must be careful about the following points:

- The connection pins on the board might be sharp. Handle the board carefully to avoid getting hurt.
- This board contains static-sensitive devices. To avoid damaging it, handle the board in an ESD-proof environment.
- While powered, do not touch the electric connections on the board with fingers or anything conductive. The board operates at voltage levels that are not dangerous, but some components might be damaged when shorted.
- Do not put any liquid on the board; avoid operating it close to water or at a high humidity level.
- Do not operate the board if it is dirty or dusty.

### 3.3 Delivery recommendations

Before the first use, check the board for any damage that might have occurred during shipment, and check that all socketed components are firmly fixed in their sockets and none is lost in the plastic bag.

## 4 Hardware description

### 4.1 Power supply section

The SR5E1-EVBE3000D can be supplied by using some DC sources, setting some jumpers properly:

- By the host PC through the USB cable (5 V; this is the default configuration).
- By an external source connected to the VIN pin (CN6 pin 8, CN7 pin 24) (7÷12 V). The maximum input voltage level is limited by the thermal dissipation of the linear regulators. The input voltage level must be selected and limited according to the microcontroller current absorption.
- By an external source connected to 5 V (CN6 pin 5, CN7 pin 18) and to U5V (CN10 pin 8).
- By an external source connected both to 3V3 (CN6 pin 4 and CN7 pin 16).
- The external source can be a PSU, or the user application. The external sources or the PSUs connected to the board must be SELV (safety extralow voltage) compliant, self-protected and with limited current capability.

When power is applied to the board, the power LEDs show the presence of the supply voltages as follows:

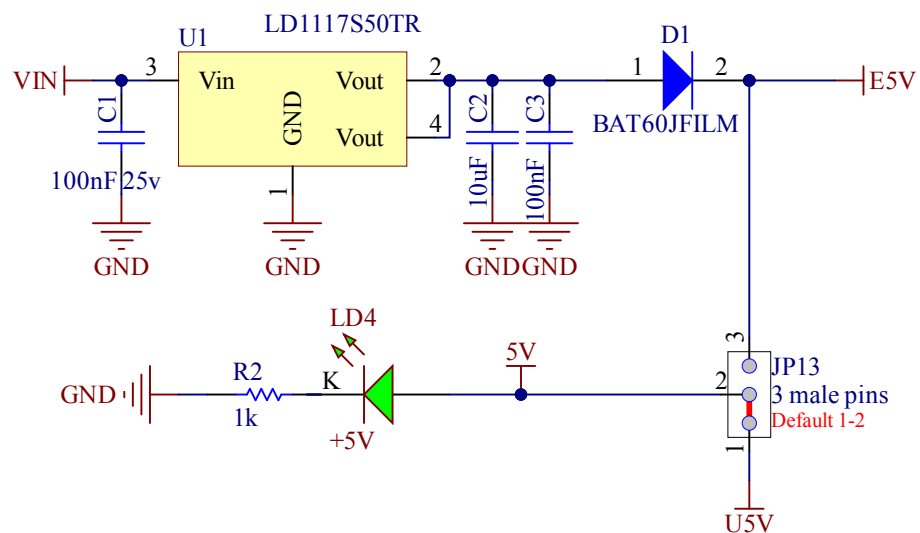
- The LED LD4 monitors the +5 V.
- The LED LD7 monitors the VDD.
- The LED LD10 monitors the VDD\_LV.

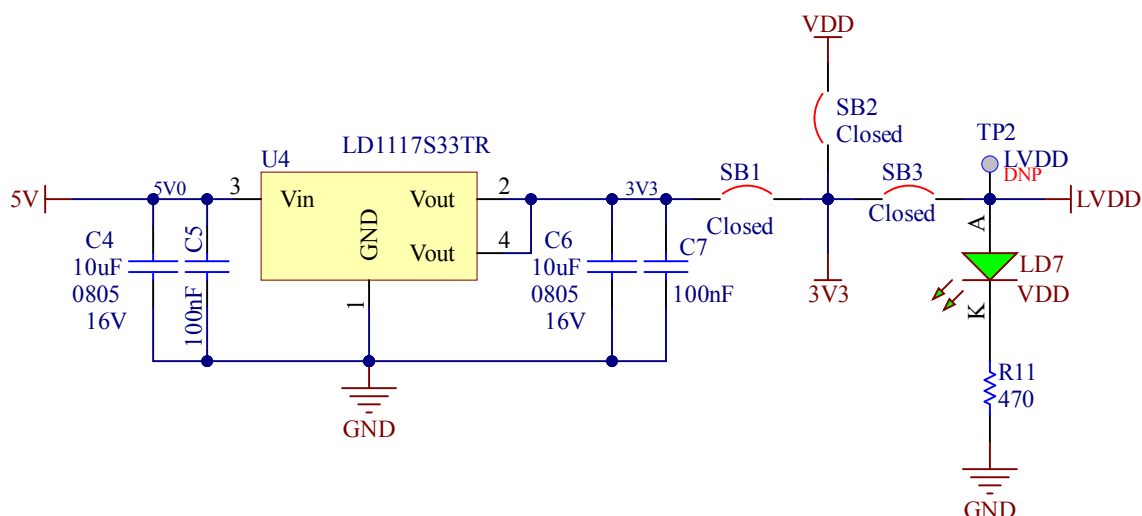
### 4.2 Voltage regulators

This paragraph describes the voltage regulators present on the board. There are two linear regulators, U1 (P/N: LD1117S50TR by STMicroelectronics) and U4 (P/N: LD1117S33TR by STMicroelectronics) supplying the 5 V and 3.3 V respectively.

The following figures show the schematic section of the two linear regulators.

**Figure 4. E5V voltage regulator**



**Figure 5. 3V3 voltage regulator**


The following table lists all power domains configuration jumpers.

**Table 1. Power source and jumpers' configuration**

| Jumpers | Description                                                                                                                                                                                                            | Default value | Position             |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------|
| JP13    | +5 V configuration jumper <ul style="list-style-type: none"> <li>1-2: +5 V connected to U5V</li> <li>2-3: +5 V connected to E5V</li> </ul>                                                                             | 1-2           | C1/D1 <sup>(1)</sup> |
| SB1     | 3V3 domain configuration jumper <ul style="list-style-type: none"> <li>Open: 3V3 domain not connected to U4 regulator V<sub>out</sub></li> <li>Closed: 3V3 domain connected to U4 regulator V<sub>out</sub></li> </ul> | Closed        | D1 <sup>(1)</sup>    |
| SB2     | VDD configuration jumper <ul style="list-style-type: none"> <li>Open: VDD not connected to 3V3</li> <li>Closed: VDD connected to 3V3</li> </ul>                                                                        | Closed        | B1 <sup>(2)</sup>    |
| SB3     | LVDD configuration jumper <ul style="list-style-type: none"> <li>Open: VDD not connected to 3V3</li> <li>Closed: VDD connected to 3V3</li> </ul>                                                                       | Closed        | C1 <sup>(1)</sup>    |

1. Refer to [Figure 12. SR5E1-EVBE3000D–Top layer.](#)

2. Refer to [Figure 13. SR5E1-EVBE3000D–Bottom layer.](#)

## 4.3 Microcontroller power management

The following table lists all power domains configuration jumpers.

**Table 2. Power source and jumpers' configuration**

| Jumpers | Description                                                                                                                                                        | Default value | Position          |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| R17     | HV_REFH_DAC jumper resistor configuration <ul style="list-style-type: none"> <li>Populated: connect to AVDD domain</li> <li>Not populated: disconnected</li> </ul> | Populated     | C4 <sup>(1)</sup> |
| R20     | HV_REFH_SAR jumper resistor configuration <ul style="list-style-type: none"> <li>Populated: connect to VDD domain</li> <li>Not populated: disconnected</li> </ul>  | Populated     | C4 <sup>(2)</sup> |

1. Refer to Figure 12. SR5E1-EVBE3000D–Top layer.
2. Refer to Figure 13. SR5E1-EVBE3000D–Bottom layer.

### Figure 6. Microcontroller power domains configuration jumper resistors



## 4.4 Integrated programmer/debugger

The integrated StellarLink is a programmer/debugger allowing the user to program the microcontroller and debug the software applications.

The Microsoft Windows driver of the integrated StellarLink is available at the following link: <https://www.st.com/en/development-tools/stellarlink-driv.html>

There is also available a software tool, StellarStudio providing a completely new look and feel comprehensive framework to design, build and deploy embedded applications. At the following link you can find more details and the download is also available: <https://www.st.com/en/development-tools/stellarstudio.html#overview>.

The connector used by the integrated StellarLink is a USB Type-C®.

## 4.5 JTAG connector

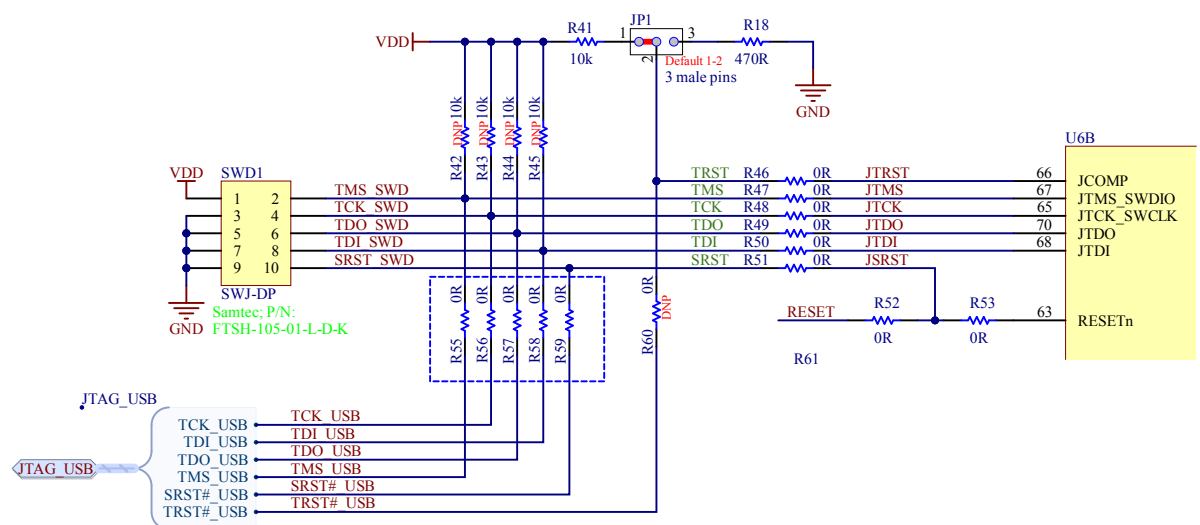
The following table shows the pinout of the JTAG connector (SWD1).

Table 3. JTAG connector pinout

| CN1 pin | Function/signal |
|---------|-----------------|
| 1       | VDD             |
| 2       | TMS             |
| 3       | GND             |
| 4       | TCK             |
| 5       | GND             |
| 6       | TDO             |
| 7       | GND             |
| 8       | TDI             |
| 9       | GND             |
| 10      | SRST            |

The following figure shows the JTAG schema.

Figure 7. JTAG schema



The following table shows the jumper resistors used to configure the microcontroller JTAG signals.

**Table 4. JTAG signals configuration jumpers**

| Signal | Jumper resistors | Assembly option                                                                              |
|--------|------------------|----------------------------------------------------------------------------------------------|
| JTRST  | R46              | Populated                                                                                    |
|        | JP1              | 1-2: connected to 10 kΩ pull up to VDD (default)<br>2-3: connected to 470 Ω pull down to GND |
| JTMS   | R47              | Populated                                                                                    |
| JTCK   | R48              | Populated                                                                                    |
| JTDO   | R49              | Populated                                                                                    |
| JTDI   | R50              | Populated                                                                                    |
| JSRST  | R51              | Populated                                                                                    |

The following table shows the jumper resistors used to configure the USB JTAG signals.

**Table 5. JTAG signals configuration jumpers**

| Signal    | Jumper resistors | Assembly option |
|-----------|------------------|-----------------|
| TCK_USB   | R56              | Populated       |
| TDI_USB   | R58              | Populated       |
| TDO_USB   | R57              | Populated       |
| TMS_USB   | R55              | Populated       |
| SRST#_USB | R59              | Populated       |
| TRST#_USB | R60              | Not populated   |

The following table shows the LEDs used by the USB section.

**Table 6. USB LEDs**

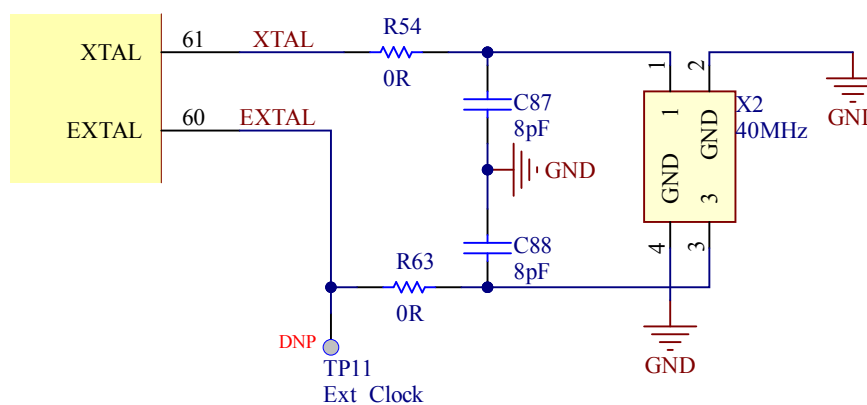
| LED         | Description  | Position          |
|-------------|--------------|-------------------|
| LD5 / Rx_2  | USB Rx LED   | D1 <sup>(1)</sup> |
| LD6 / Tx_2  | USB Tx LED   | D1 <sup>(1)</sup> |
| LD8 / LED_1 | USB JTAG LED | A1 <sup>(1)</sup> |
| LD9 / LED_2 | USB JTAG LED | A2 <sup>(1)</sup> |

1. Refer to Figure 12. SR5E1-EVBE3000D—Top layer.

## 4.6 Crystal oscillator

In the default hardware configuration, the microcontroller has a 40 MHz crystal oscillator (X1) connected. The following figure shows the crystal oscillator circuitry.

**Figure 8. Crystal oscillator circuitry**



The following table shows the jumper resistors used to configure the crystal oscillator.

**Table 7. Crystal oscillator configuration**

| Jumper | Description                                                                                                                                                                            | Default value | Position          |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| R54    | XTAL jumper configuration: <ul style="list-style-type: none"> <li>Not populated: XTAL not connected</li> <li>Populated: XTAL connected to 40 MHz crystal oscillator (X2)</li> </ul>    | Populated     | C3 <sup>(1)</sup> |
| R63    | EXTAL jumper configuration: <ul style="list-style-type: none"> <li>Not populated: EXTAL not connected</li> <li>Populated: EXTAL connected to 40 MHz crystal oscillator (X2)</li> </ul> | Populated     | C3 <sup>(1)</sup> |

1. Refer to [Figure 12. SR5E1-EVBE3000D–Top layer](#).

## 4.7 Reset circuitry

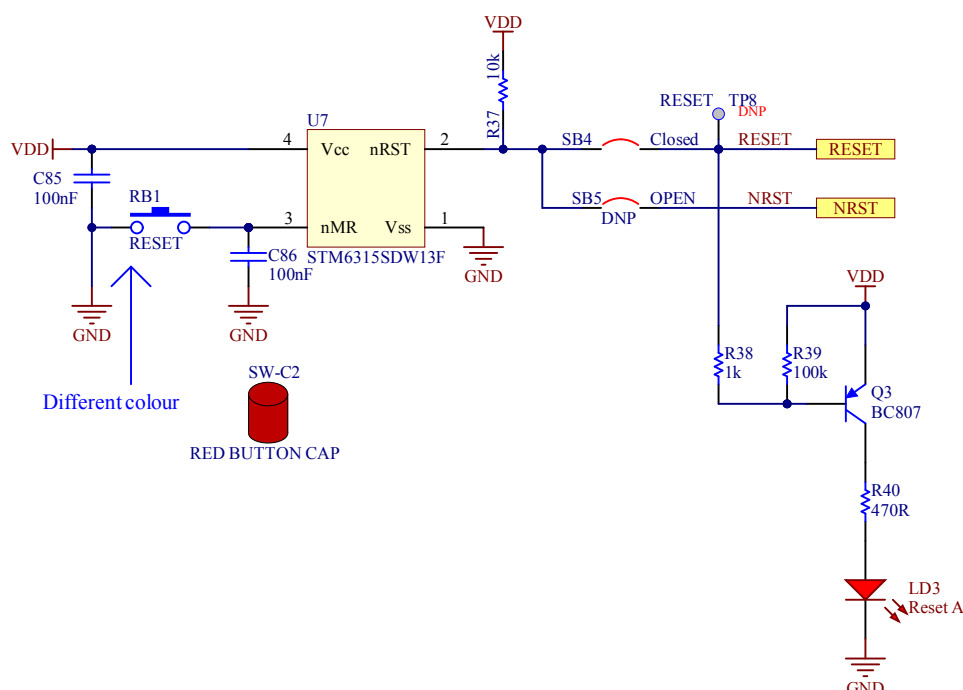
The reset circuit is designed using an open drain microprocessor reset; it generates a sharp signal to reset the microcontroller when the push button RW1 is pushed. The device user is the STM6315SDW13F by STMicroelectronics (U7).

RW1 triggers the reset, and it generates reset pulse (active low signal); LD1 is turned on when the reset pulse is generated. The solder jumper SB4 allows to disconnect RESET signal while the solder jumper SB5 allows to disconnect the NRST signal. In the default configuration SB4 is closed while SB5 is open.

The internal reset generator can be disabled, and the reset signal can be provided by an external source connected to CN6 pin3; to implement this configuration SB4 should be removed.

The following figure shows the reset circuitry schema.

### Figure 9. Reset circuitry



The following table shows the jumpers used to configure the reset.

### Table 8. Reset jumpers' configuration

| Jumper | Description                                                                                                                                                      | Default value | Position             |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------|
| SB4    | RESET jumper configuration: <ul style="list-style-type: none"><li>Open: RESET not connected</li><li>Closed: RESET connected to the device</li></ul>              | Closed        | C3/D3 <sup>(1)</sup> |
| SB5    | NRST jumper configuration: <ul style="list-style-type: none"><li>Open: NRST not connected</li><li>Closed: NRST connected to the pin 3 of CN6 connector</li></ul> | Open          | D3 <sup>(1)</sup>    |

1. Refer to Figure 13. SR5E1-EVBE3000D—Bottom layer.

## 4.8 User LEDs, user button

Two LEDs are available in the board for user purposes.

The following table shows the user LEDs available.

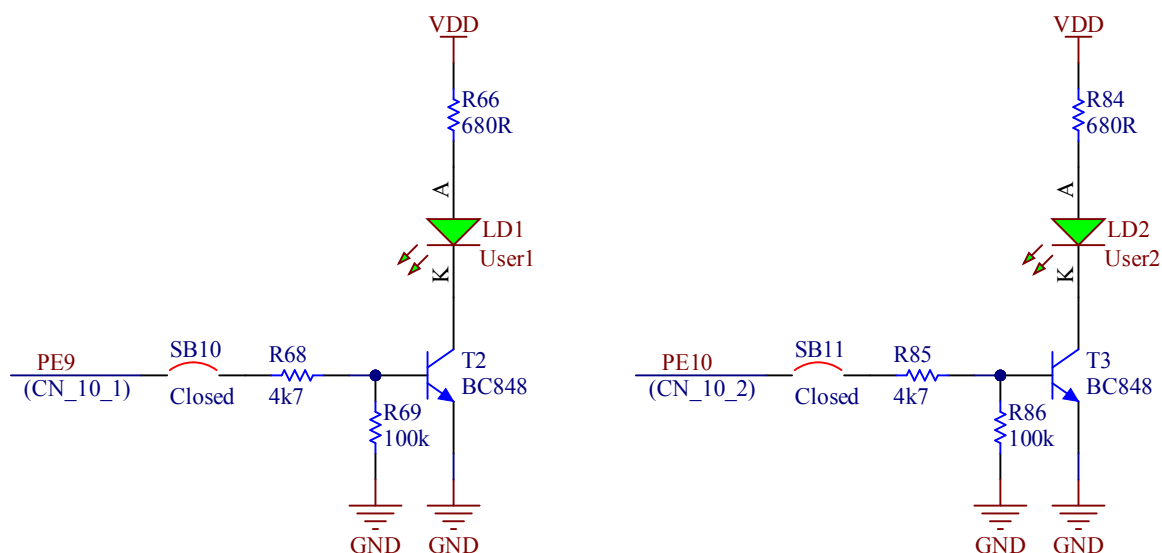
**Table 9. User LEDs setting**

| LED | Description | Signal                      | Solder bridge | Position          |
|-----|-------------|-----------------------------|---------------|-------------------|
| LD1 | User LED 1  | PE9 (connector CN10 pin 1)  | SB10          | C2 <sup>(1)</sup> |
| LD2 | User LED 2  | PE10 (connector CN10 pin 2) | SB11          | C2 <sup>(1)</sup> |

1. Refer to [Figure 12. SR5E1-EVBE3000D–Top layer](#).

The following figure shows the user LED schema.

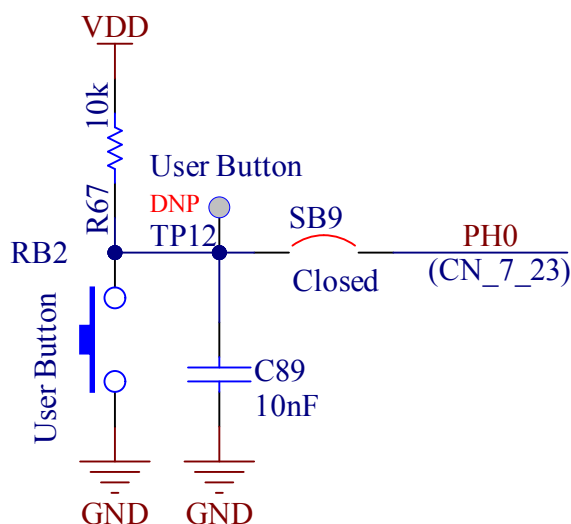
**Figure 10. User LEDs**



In the board it is available a pushbutton for user purpose. The solder jumper SB9 allows disconnecting the pushbutton and lets the user reserve the PH0 pin for a different purpose.

The following figure shows the user pushbutton schema.

**Figure 11. User pushbutton**



The following table shows the pin used to configure the user pushbutton.

**Table 10. User pushbutton**

| Push button | Description | Signal                     | Solder bridge | Position          |
|-------------|-------------|----------------------------|---------------|-------------------|
| RB2         | User button | PH0 (Connector CN7 pin 23) | SB9           | B2 <sup>(1)</sup> |

1. Refer to [Figure 12. SR5E1-EVBE3000D–Top layer](#).

## 4.9 Arduino connectors

The following table lists all Arduino connectors available.

**Table 11. Arduino connectors**

| Connector | Description                         | Position             |
|-----------|-------------------------------------|----------------------|
| CN5       | Arduino UNO-R3 digital PWM (D15÷D8) | D2/D3 <sup>(1)</sup> |
| CN6       | Arduino UNO-R3 Power connector      | A3 <sup>(1)</sup>    |
| CN8       | Arduino UNO-R3 analog input         | A4 <sup>(1)</sup>    |
| CN9       | Arduino UNO-R3 digital PWM (D7÷D0)  | D3/D4 <sup>(1)</sup> |

1. Refer to [Figure 12. SR5E1-EVBE3000D–Top layer](#).

The following table shows the pinout of the Arduino UNO-R3 digital PWM (D15÷D8) (CN5) connector.

**Table 12. Arduino UNO-R3 digital PWM (D15÷D8) (CN5) pinout**

| CN5 pin | Description                | Signal                   |
|---------|----------------------------|--------------------------|
| 1       | D8                         | CN7 pin 4                |
| 2       | D9 (PWM)                   | PE1                      |
| 3       | D10 (PWM/DSPI 3 NSS)       | PD13                     |
| 4       | D11 (PWM/DSPI 3 SOUT-MOSI) | PD12                     |
| 5       | D12 (PWM/DSPI 3 SIN-MISO)  | PD11                     |
| 6       | D13 (DSPI 3 CLK)           | PD10                     |
| 7       | GND                        | GND                      |
| 8       | AVDD                       | AVDD                     |
| 9       | D14                        | CN 10 pin 4 / SB7 pin 1  |
| 10      | D15                        | CN 10 pin 10 / SB8 pin 1 |

The following table shows the pinout of the Arduino UNO-R3 (CN6) connector.

**Table 13. Arduino UNO-R3 Power connector pinout**

| CN6 pin | Description   | Signal        |
|---------|---------------|---------------|
| 1       | Not connected | Not connected |
| 2       | IOREF         | VDD           |
| 3       | NRST          | NRST          |
| 4       | +3.3 V        | 3V3           |
| 5       | +5 V          | 5V            |
| 6       | GND           | GND           |

| CN6 pin | Description | Signal |
|---------|-------------|--------|
| 7       | GND         | GND    |
| 8       | VIN         | VIN    |

The following table shows the pinout of the Arduino UNO-R3 analog input (CN8) pinout connector.

**Table 14. Arduino UNO-R3 analog input (CN8) pinout**

| CN8 pin | Description | Function/signal   |
|---------|-------------|-------------------|
| 1       | A0          | PD[9]             |
| 2       | A1          | CN7 pin 15        |
| 3       | A2          | CN7 pin 32        |
| 4       | A3          | CN7 pin 34        |
| 5       | A4 (SDA)    | PB7 / CN7 pin 36  |
| 6       | A5 (SCL)    | PB12 / CN7 pin 38 |

The following table shows the pinout of the Arduino UNO-R3 digital PWM (D7÷D0) (CN9) connector.

**Table 15. Arduino UNO-R3 digital PWM (D7÷D0) (CN9) pinout**

| CN9 pin | Description | Function/signal |
|---------|-------------|-----------------|
| 1       | D0 (RDX)    | PD7             |
| 2       | D1 (TDX)    | PD8             |
| 3       | D2          | PI4             |
| 4       | D3 (PWM)    | PD10            |
| 5       | D4          | CN10 pin 29     |
| 6       | D5 (PWM)    | CN10 pin 27     |
| 7       | D6 (PWM)    | CN10 pin 25     |
| 8       | D7          | PD9             |

## 4.10 Extended connectors (I/O headers)

The following table lists all extended connectors available.

**Table 16. Extended connectors**

| Connector | Description                      | Position                |
|-----------|----------------------------------|-------------------------|
| CN7       | Extended connector (I/O headers) | A2/A3/A4 <sup>(1)</sup> |
| CN10      | Extended connector (I/O headers) | D2/D3/D4 <sup>(1)</sup> |

1. Refer to [Figure 12. SR5E1-EVBE3000D—Top layer](#).

The following table shows the pinout of the extended connector (CN7).

**Table 17. Extended connector (CN7) pinout**

| Extended connector (CN7) | μC port |
|--------------------------|---------|
| 1                        | PG11    |
| 2                        | PF2     |

| Extended connector (CN7) | μC port       |
|--------------------------|---------------|
| 3                        | PF3           |
| 4                        | PG12 / PG8    |
| 5                        | VDD           |
| 6                        | E5V           |
| 7                        | Not connected |
| 8                        | GND           |
| 9                        | PD10          |
| 10                       | PD11          |
| 11                       | PD12          |
| 12                       | VDD           |
| 13                       | PD13          |
| 14                       | T NRS         |
| 15                       | JP9 pin 2     |
| 16                       | 3V3           |
| 17                       | PG5           |
| 18                       | 5V            |
| 19                       | GND           |
| 20                       | GND           |
| 21                       | PD9           |
| 22                       | GND           |
| 23                       | PH0           |
| 24                       | VIN           |
| 25                       | PE1           |
| 26                       | PE2           |
| 27                       | PC1 / PA9     |
| 28                       | PB2           |
| 29                       | PE4           |
| 30                       | JP5 pin 2     |
| 31                       | PE3           |
| 32                       | PB1 / PB5     |
| 33                       | VDD           |
| 34                       | JP2 pin 2     |
| 35                       | PC10          |
| 36                       | PB7           |
| 37                       | PC8           |
| 38                       | PB12          |

The following table shows the pinout of the extended connector (CN10).

**Table 18. Extended connector (CN10) pinout**

| Extended connector (CN10) | µC Port    |
|---------------------------|------------|
| 1                         | PE9        |
| 2                         | PE10       |
| 3                         | JP10 pin 2 |
| 4                         | JP8 pin 2  |
| 5                         | JP7 pin 2  |
| 6                         | PC7        |
| 7                         | AVDD       |
| 8                         | U5V        |
| 9                         | GND        |
| 10                        | JP6 pin 2  |
| 11                        | PC5        |
| 12                        | PB9        |
| 13                        | PG15       |
| 14                        | PG14       |
| 15                        | JP4 pin 2  |
| 16                        | PD15       |
| 17                        | PD14       |
| 18                        | PB4        |
| 19                        | PH12       |
| 20                        | GND        |
| 21                        | PI2        |
| 22                        | PH13       |
| 23                        | PI0        |
| 24                        | JP3 pin 2  |
| 25                        | PG7 / PC2  |
| 26                        | PI1        |
| 27                        | JP11 pin 2 |
| 28                        | PI3        |
| 29                        | JP12 pin 2 |
| 30                        | PI1        |
| 31                        | PG6        |
| 32                        | GND        |
| 33                        | PI4        |
| 34                        | PC9        |
| 35                        | PD8        |
| 36                        | PD7        |
| 37                        | PD14       |
| 38                        | PD10       |

## 4.11 UART connector

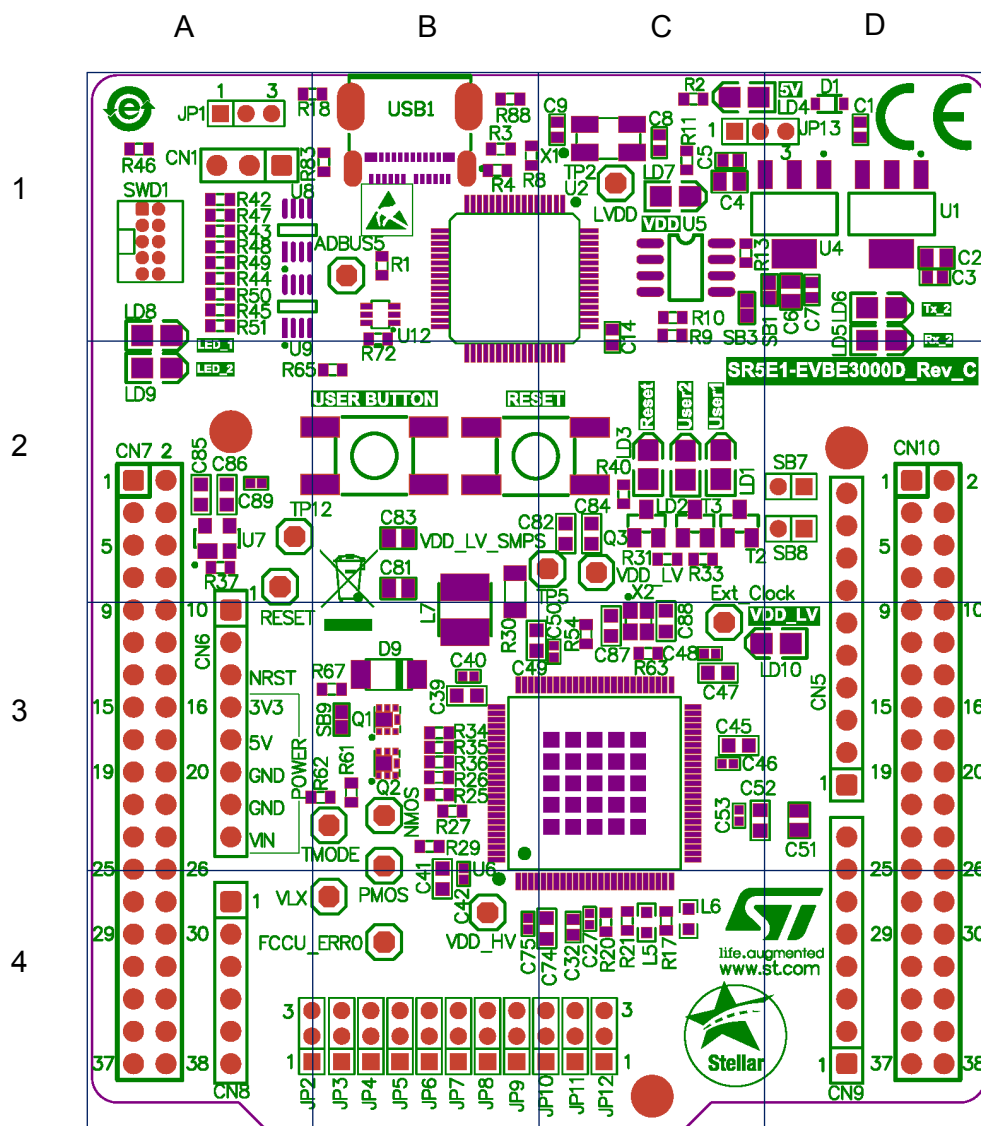
The following table shows the pinout of the UART connector (CN1).

**Table 19. UART connector (CN1) pinout**

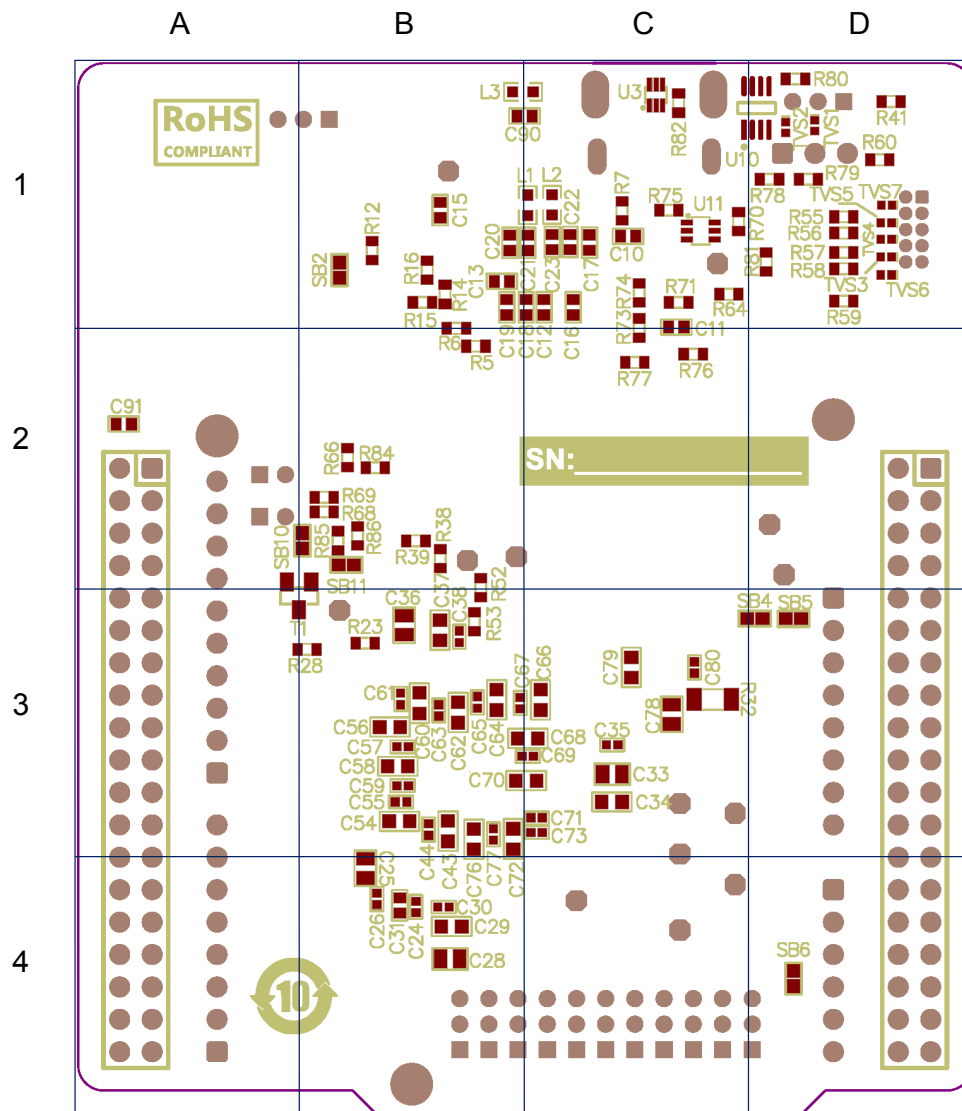
| CN1 pin | Jumper resistor                                                                  | Function/signal |
|---------|----------------------------------------------------------------------------------|-----------------|
| 1       | <ul style="list-style-type: none"> <li>PF3: R78</li> <li>UART_RX: R80</li> </ul> | PF3 / UART_RX   |
| 2       | <ul style="list-style-type: none"> <li>PF2: R79</li> <li>UART_RX: R81</li> </ul> | PF2 / UART_TX   |
| 3       | -                                                                                | GND             |

## 5 Layout overview

Figure 12. SR5E1-EVBE3000D–Top layer



**Figure 13. SR5E1-EVBE3000D–Bottom layer**



## 6 BOM

**Table 20. Bill of material**

| # | Item                                                                                                                         | Qty | Value       | Description                                                                                                                                 | Footprint | Ass. Opt. | Reference    |
|---|------------------------------------------------------------------------------------------------------------------------------|-----|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|--------------|
| 1 | C1                                                                                                                           | 1   | 100 nF 25v  | Capacitor X7R - 0603                                                                                                                        | C0603-C   | -         | Capacitor_ST |
| 2 | C2, C4, C6, C25, C28, C33, C36, C51, C78, C81, C83                                                                           | 11  | 10 $\mu$ F  | Multilayer ceramic capacitor, 10 $\mu$ F, 16 V, $\pm$ 10%, X7R, 0805 [2012 metric]                                                          | C0805-C   | -         | CAP_SMD_X7R  |
| 3 | C3, C5, C7, C10, C11, C12, C13, C14, C15, C16, C17, C18, C20, C22, C90, C91                                                  | 16  | 100 nF      | Capacitor X7R - 0603, multilayer ceramic capacitor, 0.1 $\mu$ F, 50 V, $\pm$ 10%, X7R, 0603 [1608 metric]                                   | C0603-C   | -         | Capacitor_ST |
| 4 | C8, C9                                                                                                                       | 2   | 12 pF       | Cap ceramic 12 pF 50 V C0G 5% pad SMD 0603 125°C extreme low ESR bag                                                                        | C0603-C   | -         | Capacitor    |
| 5 | C19, C21, C23                                                                                                                | 3   | 4.7 $\mu$ F | Capacitor X7R - 0603                                                                                                                        | C0603-C   | -         | Capacitor_ST |
| 6 | C24, C26, C27, C30, C35, C38, C40, C42, C44, C46, C48, C50, C53, C55, C57, C59, C61, C63, C65, C67, C69, C71, C73, C75, C77, | 27  | 10 nF       | WCAP-CSGP 0402 (1005 metric) ceramic capacitor 0.039Lx0.020W 1.00 mmx0.50 mm X7R $\pm$ 10% 10000 pF, SMD multilayer ceramic cap. Automotive | C0402-B   | -         | CAP_SMD_X7R  |

| #  | Item                                                                                                                                                                        | Qty | Value              | Description                                                                             | Footprint       | Ass. Opt.   | Reference            |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------|-----------------------------------------------------------------------------------------|-----------------|-------------|----------------------|
|    | C80,<br>C89                                                                                                                                                                 |     |                    |                                                                                         |                 |             |                      |
| 7  | C29,<br>C34,<br>C37,<br>C39,<br>C41,<br>C43,<br>C45,<br>C47,<br>C49,<br>C52,<br>C54,<br>C56,<br>C58,<br>C60,<br>C62,<br>C64,<br>C66,<br>C68,<br>C70,<br>C72,<br>C74,<br>C76 | 22  | 47 nF              | SMD multilayer ceramic cap. automotive                                                  | C0603-B         | -           | CAP_SMD_X7R          |
| 8  | C31,<br>C32                                                                                                                                                                 | 2   | 1 $\mu$ F          | Multilayer ceramic capacitor, 1 $\mu$ F, 16 V, $\pm$ 10%, X7R, 0603 [1608 metric]       | C0603-C         | -           | CAP_SMD_X7R          |
| 9  | C79,<br>C82,<br>C85,<br>C86                                                                                                                                                 | 4   | 100 nF             | SMD multilayer ceramic cap. automotive                                                  | C0603-B         | -           | CAP_SMD_X7R          |
| 10 | C84                                                                                                                                                                         | 1   | 1 nF               | SMD multilayer ceramic Cap. automotive                                                  | C0603-B         | -           | CAP_SMD_X7R          |
| 11 | C87,<br>C88                                                                                                                                                                 | 2   | 8 pF               | SMD multilayer ceramic Cap.                                                             | C0603-B         | -           | CAP_SMD_X7R          |
| 12 | CN1                                                                                                                                                                         | 1   | UART               | Header connector, PCB Mount, recept, 3 contacts, pin, 0.1 pitch, pc tail terminal       | SIP3            | DNP         | Header 3             |
| 13 | CN5                                                                                                                                                                         | 1   | Header 10X1_Female | Header, 10-Pin, single row, female                                                      | SIP10 - FEMALE  | -           | Header 10X1_Female   |
| 14 | CN6,<br>CN9                                                                                                                                                                 | 2   | Header 8X1_Female  | Header, 8-Pin, single row, female                                                       | SIP8 - FEMALE   | -           | Header 8X1_Female    |
| 15 | CN7,<br>CN10                                                                                                                                                                | 2   | Header 19X2        | Header, 19-Pin, dual row (6+2.5+10 mm)                                                  | HTSW-119-09-F-D | -           | Header 19X2          |
| 16 | CN8                                                                                                                                                                         | 1   | Header 6X1_Female  | Header, 6-Pin, single row, female                                                       | SIP6 - FEMALE   | -           | Header 6X1_Female    |
| 17 | D1                                                                                                                                                                          | 1   | BAT60JFILM         | DIODE Schottky 10 V 3A SOD323<br>mouser 511-BAT60JFILM                                  | SOD-323         | -           | Diode                |
| 18 | D9                                                                                                                                                                          | 1   | PMEG3030EP         | SMD 3 A low Vf MEGA Schottky barrier rectifier                                          | SOD-128         | -           | Diode 10TQ035        |
| 19 | JP1,<br>JP13                                                                                                                                                                | 2   | 3 male pins        | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm     | Default 1-2 | Jumper 3x2.54_Closed |

| #  | Item           | Qty | Value        | Description                                                                             | Footprint      | Ass. Opt. | Reference                     |
|----|----------------|-----|--------------|-----------------------------------------------------------------------------------------|----------------|-----------|-------------------------------|
| 20 | JP2            | 1   | CN_7_34      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 21 | JP3            | 1   | CN_10_24     | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 22 | JP4            | 1   | CN_10_15     | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 23 | JP5            | 1   | CN_7_30      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 24 | JP6            | 1   | CN_10_10     | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 25 | JP7            | 1   | CN_10_5      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 26 | JP8            | 1   | CN_10_4      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 27 | JP9            | 1   | CN_7_15      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 28 | JP10           | 1   | CN_10_3      | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 29 | JP11           | 1   | CN_10_27     | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 30 | JP12           | 1   | CN_10_29     | Male, 3 C, straight, .050" CC; 3.00 mm Head/2.30 mm tail, no mt; nylon 9T, brass, 105 C | SIP3 - 2 mm    | -         | Jumper<br>3x2.54_Closed_V_1_2 |
| 31 | L1, L2, L5, L6 | 4   | 60Ω@100MHz   | Ferrite bead 0603 60 Ω 500 mA, SMD multilayer ferrite                                   | F0603          | -         | Inductor                      |
| 32 | L3             | 1   | Ferrite bead | WE-CBF ferrite bead 0603 60 Ω 500 mA                                                    | F0603          | -         | Bead 60 Ω 500 mA              |
| 33 | L7             | 1   | 10 uH 2 A    | General purpose inductor, 10 uH, 20%, 1 element, iron alloy-core, SMD, 1616             | WE-MAPI SERIES | -         | 74438357100                   |
| 34 | LD1            | 1   | User1        | LED green                                                                               | 0805 LED       | -         | LED2                          |
| 35 | LD2            | 1   | User2        | LED green                                                                               | 0805 LED       | -         | LED2                          |

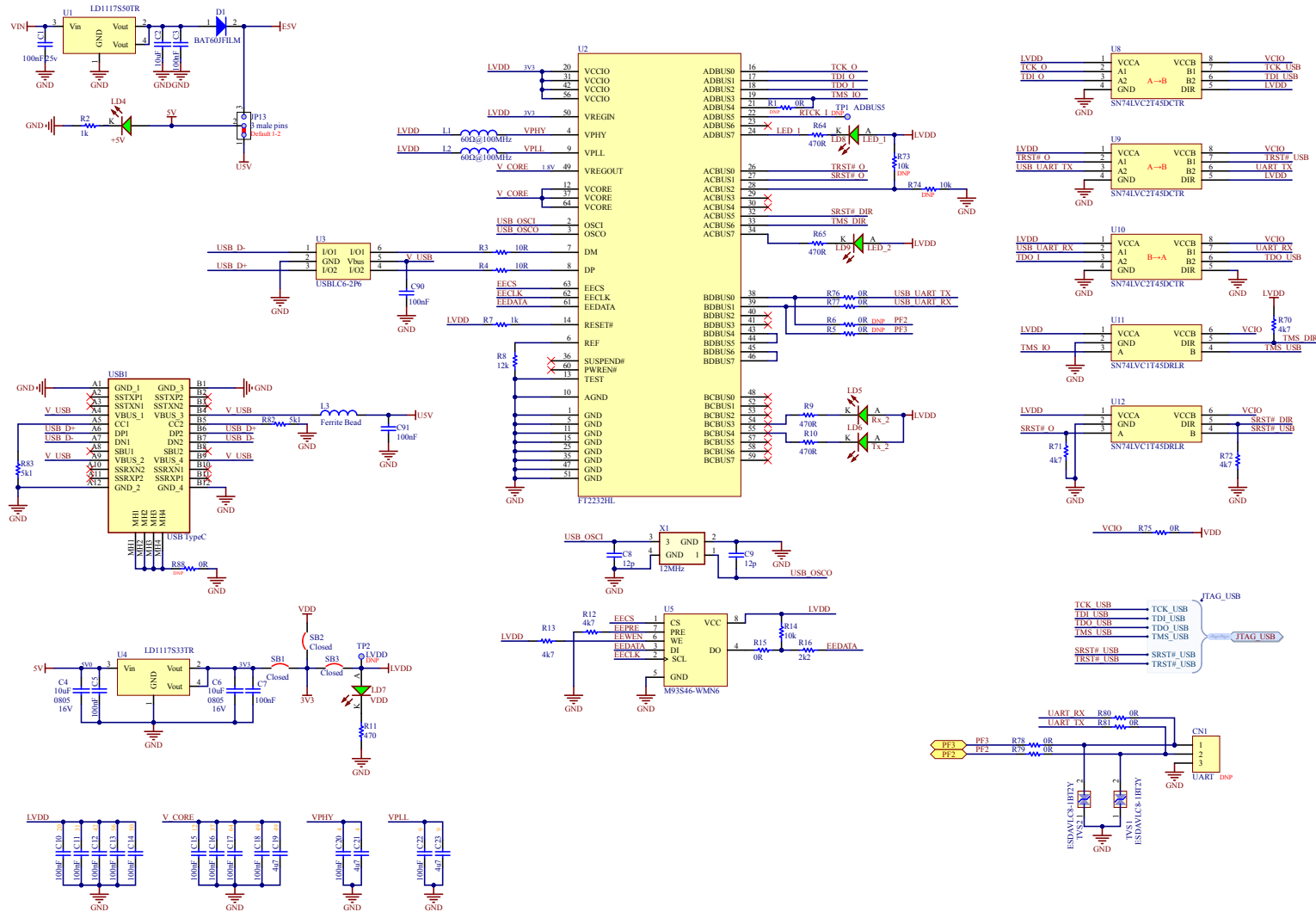
| #  | Item                                                                                                                                                                                                | Qty | Value        | Description                                                                                                      | Footprint           | Ass. Opt. | Reference          |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------|------------------------------------------------------------------------------------------------------------------|---------------------|-----------|--------------------|
| 36 | LD3                                                                                                                                                                                                 | 1   | Reset A      | SMD led diode red - standard bright                                                                              | 0805 LED            | -         | LED2               |
| 37 | LD4                                                                                                                                                                                                 | 1   | +5 V         | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 38 | LD5                                                                                                                                                                                                 | 1   | Rx_2         | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 39 | LD6                                                                                                                                                                                                 | 1   | Tx_2         | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 40 | LD7                                                                                                                                                                                                 | 1   | VDD          | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 41 | LD8                                                                                                                                                                                                 | 1   | LED_1        | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 42 | LD9                                                                                                                                                                                                 | 1   | LED_2        | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 43 | LD10                                                                                                                                                                                                | 1   | VDD_LV       | LED green                                                                                                        | 0805 LED            | -         | LED2               |
| 44 | Q1                                                                                                                                                                                                  | 1   | PMPB100XPEAX | -                                                                                                                | DFN2020MD (SOT1220) | -         | PMPB100XPEAX       |
| 45 | Q2                                                                                                                                                                                                  | 1   | PMPB55XNEAX  | -                                                                                                                | DFN2020MD (SOT1220) | -         | PMPB55XNEAX        |
| 46 | Q3                                                                                                                                                                                                  | 1   | BC807        | ON SEMICONDUCTOR - BC807-25LT1G - bipolar (BJT) single transistor, PNP, -45 V, 100 MHz, 225 mW, -500 mA, 160 hFE | SOT-23-RS           | -         | PNP                |
| 47 | R1, R5, R6, R15, R17, R20, R21, R23, R25, R26, R27, R29, R34, R35, R36, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R62, R63, R75, R76, R77, R78, R79, R80, R81, R88 | 40  | 0 Ω          | SMD resistor, resistor 0603                                                                                      | R0603-RS            | DNP       | Resistor_SMD, Res1 |

| #  | Item                                                  | Qty | Value          | Description                                                                                                | Footprint  | Ass. Opt. | Reference              |
|----|-------------------------------------------------------|-----|----------------|------------------------------------------------------------------------------------------------------------|------------|-----------|------------------------|
| 48 | R2, R7, R31, R38                                      | 4   | 1 k $\Omega$   | Resistor 0603, SMD resistor, RES SMD 1 K $\Omega$ 1% 1/10W 0603                                            | R0603-RS   | -         | Res1, Resistor_SMD     |
| 49 | R3, R4                                                | 2   | 10 $\Omega$    | Resistor 0603                                                                                              | R0603-RS   | -         | Res1                   |
| 50 | R8                                                    | 1   | 12 k $\Omega$  | Resistor 0603                                                                                              | R0603-RS   | -         | Res1                   |
| 51 | R9, R10, R18, R40, R64, R65                           | 6   | 470 $\Omega$   | Res thick film 0603 470 $\Omega$ 1% 1/4W $\pm$ 100ppm/ $^{\circ}$ C molded SMD SMD paper T/R, SMD resistor | R0603-RS   | -         | Resistor_SMD           |
| 52 | R11                                                   | 1   | 470 $\Omega$   | Resistor 0603                                                                                              | R0603-RS   | -         | Res1                   |
| 53 | R12, R13, R68, R70, R71, R72, R85                     | 7   | 4.7 k $\Omega$ | Resistor 0603, RES SMD 4.7 k $\Omega$ 1% 1/10W 0603                                                        | R0603-RS   | -         | Res1, Resistor_SMD     |
| 54 | R14, R37, R41, R42, R43, R44, R45, R61, R67, R73, R74 | 11  | 10 k $\Omega$  | SMD resistor                                                                                               | R0603-RS   | DNP       | Resistor_SMD           |
| 55 | R16                                                   | 1   | 2.2 k $\Omega$ | SMD chip resistor, 2.2 k $\Omega$ , $\pm$ 1%, 100 mW, 0603 [1608 metric], thick film, general purpose      | r0603-Rs   | -         | Resistor_SMD           |
| 56 | R28                                                   | 1   | 1.5 k $\Omega$ | SMD resistor                                                                                               | R0603-RS   | -         | Resistor_SMD           |
| 57 | R30, R32                                              | 2   | 0 $\Omega$     | SMD resistor automotive                                                                                    | R1206-RS   | -         | Resistor_SMD           |
| 58 | R33, R39, R69, R86                                    | 4   | 100 k $\Omega$ | Res thick film 1.6 x 0.8 mm 100 k $\Omega$ 1% 0.1 W(1/10W) 100ppm/ C molded SMD paper T/R                  | R0603-RS   | -         | Resistor_SMD           |
| 59 | R66, R84                                              | 2   | 680 $\Omega$   | SMD resistor                                                                                               | R0603-RS   | -         | Resistor_SMD           |
| 60 | R82, R83                                              | 2   | 5.1 k $\Omega$ | SMD chip resistor, 5.1 k $\Omega$ , $\pm$ 1%, 100 mW, 0603 [1608 metric], thick film, anti-sulfur          | r0603-Rs   | -         | 5.1K $\Omega$ 1% 1/10W |
| 61 | RB1                                                   | 1   | RESET          | SWITCH, TACTILE, SMD, h=5 mm                                                                               | KTH55150KA | RED       | KTH55150KA             |
| 62 | RB2                                                   | 1   | User button    | SWITCH, TACTILE, SMD, h=5 mm                                                                               | KTH55150KA | BLACK     | KTH55150KA             |

| #  | Item                                                       | Qty | Value         | Description                                                                   | Footprint            | Ass. Opt. | Reference       |
|----|------------------------------------------------------------|-----|---------------|-------------------------------------------------------------------------------|----------------------|-----------|-----------------|
| 63 | SB1,<br>SB2,<br>SB3,<br>SB4,<br>SB9,<br>SB10,<br>SB11      | 7   | Closed        | Circuit breaker                                                               | 0603                 | Closed    | Circuit breaker |
| 64 | SB5,<br>SB6                                                | 2   | OPEN          | Circuit breaker 0603                                                          | 0603                 | DNP       | Circuit breaker |
| 65 | SB7,<br>SB8                                                | 2   | JUMP2         | JUMP 2 POLI                                                                   | SIP2 - 2 mm          | DNP       | JUMP2           |
| 66 | SWD1                                                       | 1   | SWJ-DP        | Debug connector 5x2<br>1.27 mm                                                | FTSH-105-01-L-D-K    | -         | Header 5X2      |
| 67 | T1, T2,<br>T3                                              | 3   | BC848         | NPN bipolar transistor                                                        | SOT-23-RS            | -         | NPN             |
| 68 | TP1                                                        | 1   | ADBUS5        | Headers and wire<br>housings C-Grid SR Vt pn<br>6.75 .75/2.90 mm Au-F<br>1Ckt | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 69 | TP2                                                        | 1   | LVDD          | Headers and wire<br>housings C-Grid SR Vt pn<br>6.75 .75/2.90 mm Au-F<br>1Ckt | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 70 | TP3                                                        | 1   | VDD_HV        | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 71 | TP4                                                        | 1   | PMOS          | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 72 | TP5                                                        | 1   | VDD_LV_SMPS   | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 73 | TP6                                                        | 1   | VLX           | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 74 | TP7                                                        | 1   | NMOS          | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 75 | TP8                                                        | 1   | RESET         | PCB ring test point -<br>White (drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 76 | TP9                                                        | 1   | FCCU_ERR0     | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 77 | TP10                                                       | 1   | TMODE         | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 78 | TP11                                                       | 1   | Ext<br>Clock  | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 79 | TP12                                                       | 1   | User button   | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 80 | TP13                                                       | 1   | VDD_LV        | PCB ring test point - white<br>(drill 1.32 mm)                                | TEST POINT -<br>SIP1 | DNP       | Test point      |
| 81 | TVS1,<br>TVS2,<br>TVS3,<br>TVS4,<br>TVS5,<br>TVS6,<br>TVS7 | 7   | ESDALC8-1BT2Y | ESD suppressor diode<br>TVS Bi-Dir 3 V<br>automotive 2-pin<br>SOD-882T T/R    | SOD-882              | -         | ESDAVLC8-1BT2Y  |
| 82 | U1                                                         | 1   | LD1117S50TR   | IC REG LDO 5 V 0.8A<br>SOT223                                                 | SOT223               | -         | LD1117S33TR     |

| #  | Item        | Qty | Value           | Description                                                                                 | Footprint                              | Ass. Opt. | Reference      |
|----|-------------|-----|-----------------|---------------------------------------------------------------------------------------------|----------------------------------------|-----------|----------------|
| 83 | U2          | 1   | FT2232HL        | FT2232HL                                                                                    | QFP64 - SMALL PADS                     | -         | FT2232HL       |
| 84 | U3          | 1   | USBLC6-2P6      | VERY LOW CAPACITANCE ESD PROTECTION                                                         | SOT-666                                | -         | USBLC6-2P6     |
| 85 | U4          | 1   | LD1117S33TR     | Low drop positive voltage regulator                                                         | SOT223                                 | -         | LD1117S33TR    |
| 86 | U5          | 1   | M93S46-WMN6     | 1 K (x16) serial microwire bus EEPROM with block protection                                 | SO-8                                   | -         | M93S46RMN6     |
| 87 | U6          | 1   | SR5E1E3         | -                                                                                           | TQFP-100<br>14X14MM - EX-PAD 8.5X8.5MM | -         | -              |
| 88 | U7          | 1   | STM6315SDW13F   | Reset circuit, active-low, open-drain, 1 V to 5.5 V, 2.93 V threshold, 1 monitor, SOT-143-4 | SOT-143                                | -         | STM6315RDW13F  |
| 89 | U8, U9, U10 | 3   | SN74LVC2T45DCTR | Dual-bit dual-supply bus transceiver                                                        | ssop8                                  | -         | SN74LVC2T45DC  |
| 90 | U11, U12    | 2   | SN74LVC1T45DRLR | Single-bit dual-supply bus transceiver                                                      | SC-70                                  | -         | SN74LVC1T45DCK |
| 91 | USB1        | 1   | USB Type-C®     | Conn USB 3.1 type C F 24 POS 0.5 mm solder RA SMD 24 terminal 1 port T/R                    | 2012670005                             | -         | USB Type-C®    |
| 92 | X1          | 1   | 12 MHz          | Crystal 12.00 MHz 12PF SMD<br>ECS-120-12-36-AGN-TR3                                         | 7B-12.000MAAJ-T                        | -         | Crystal 4-pin  |
| 93 | X2          | 1   | 40 MHz          | SMD quartz ECS                                                                              | ECX-2236Q                              | -         | Crystal 4-pin  |

Figure 14. USB and FTDI section



### Figure 15. $\mu$ C Power supply

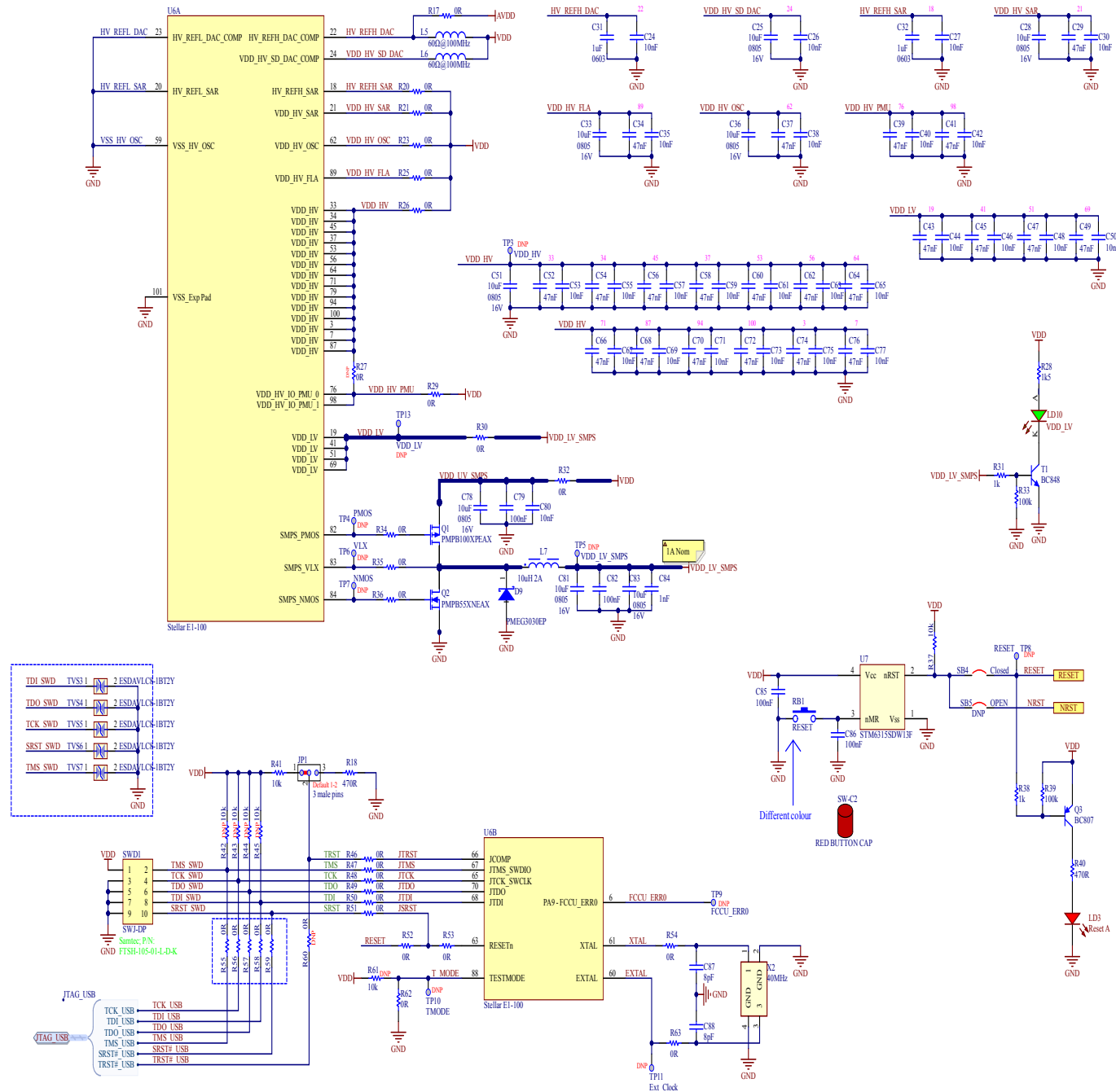
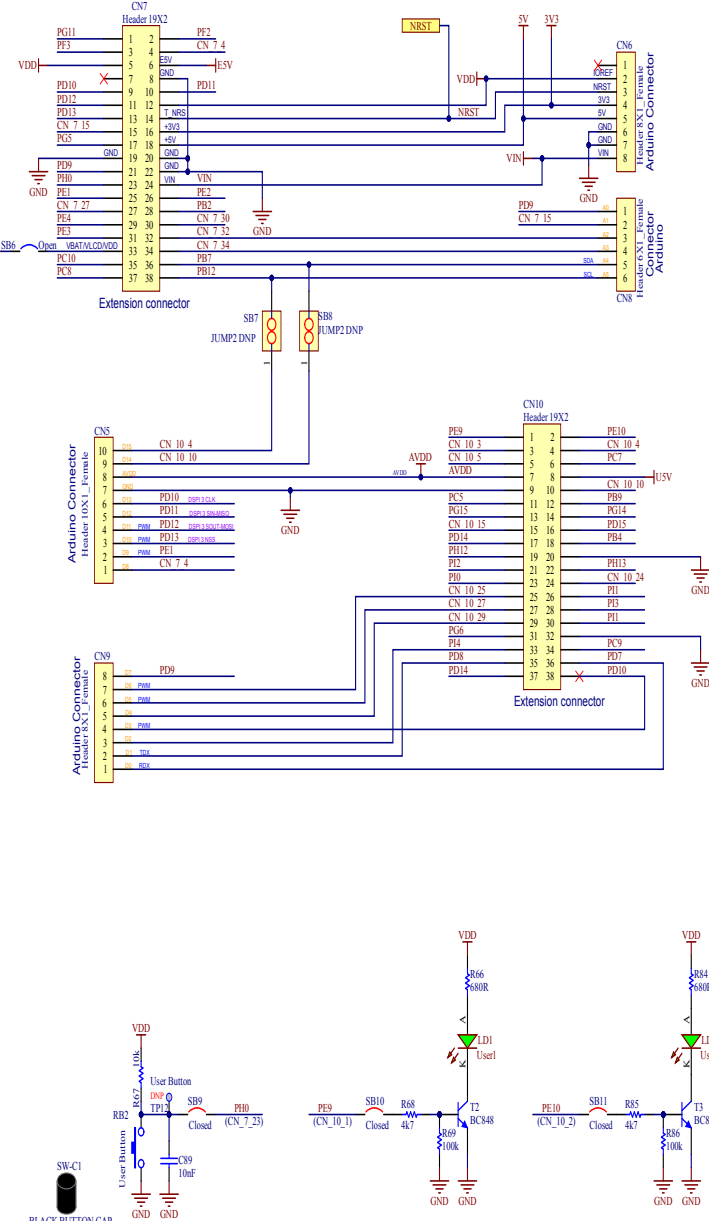
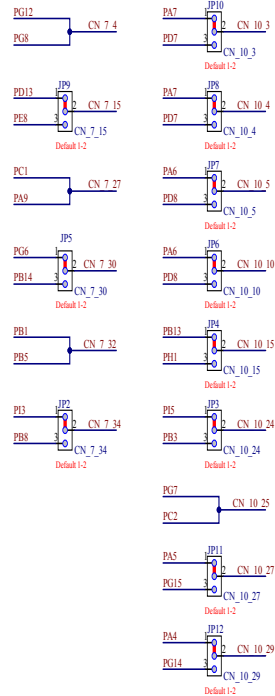
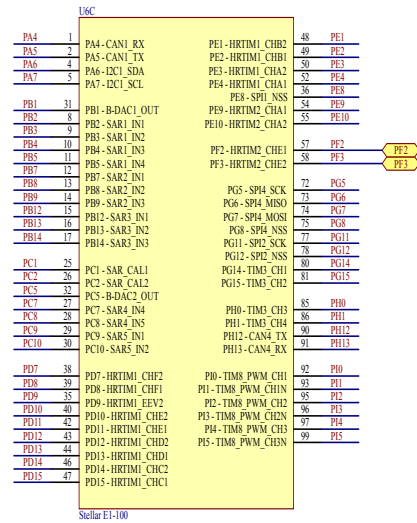
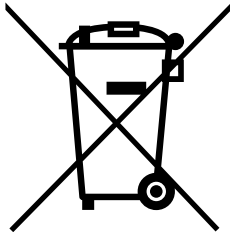


Figure 16.  $\mu$ C GPIO and connectors

## 8 Product disposal

### Disposal of this product: WEEE (Waste Electrical and Electronic Equipment)

(Applicable in Europe)



This symbol on the product, accessories, or accompanying documents indicates that the product and its electronic accessories must not be disposed of with household waste at the end of their working life.

To prevent possible harm to the environment and human health from uncontrolled waste disposal, separate these items from other types of waste and recycle them responsibly at a designated collection point to promote the sustainable reuse of material resources.

#### Household users:

Contact the retailer that you purchased the product from or your local authority for details of your nearest designated collection point.

#### Business users:

Contact your dealer or supplier for further information.

## Revision history

**Table 21. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                              |
|-------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 26-Aug-2024 | 1        | Initial release.                                                                                                                                                                                                                                                                                                                                     |
| 22-Jul-2026 | 2        | <p>Updated confidentiality level from "ST restricted" to "Public".</p> <p>Updated <a href="#">Section 1: Overview</a>.</p> <p>Replaced "<i>Section 3: Handling precautions</i>" with <a href="#">Section 3: Safety recommendations</a> and its subsections.</p> <p>Added <a href="#">Section 8: Product disposal</a>.</p> <p>Minor text changes.</p> |

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