UM2259
User manual

SPC58EC-DISP Discovery Board

Introduction

The SPC58EC-DISP discovery+ board is a development board to evaluate and to develop applications with the microcontroller SPC58EC80E5 in eTQFP144 package.

The SPC58EC80E5 is a microcontroller targeting Body, Networking and Security applications.

This document describes the hardware architecture of the board and how it is possible to enable specific functions through the configuration of the jumpers.

Contents

1 SPC58EC-DISP discovery board 5

2 Hardware overview 6

2.1 Power supply section 6
2.2 Microcontroller power management 7
2.3 Integrated Programmer/Debugger 7
2.4 Crystal oscillator and Reset 8
2.5 FlexRay 9
2.6 LIN and RS232 9
2.7 CAN & ISO CAN-FD 10
2.8 Ethernet 10
2.9 User interface (pushbuttons, LEDs and trimmers) 10
2.10 Extended connectors (I/O Headers) 11

Appendix A Appendix. 14

A.1 PCB Layout 14

Revision history 15

List of tables

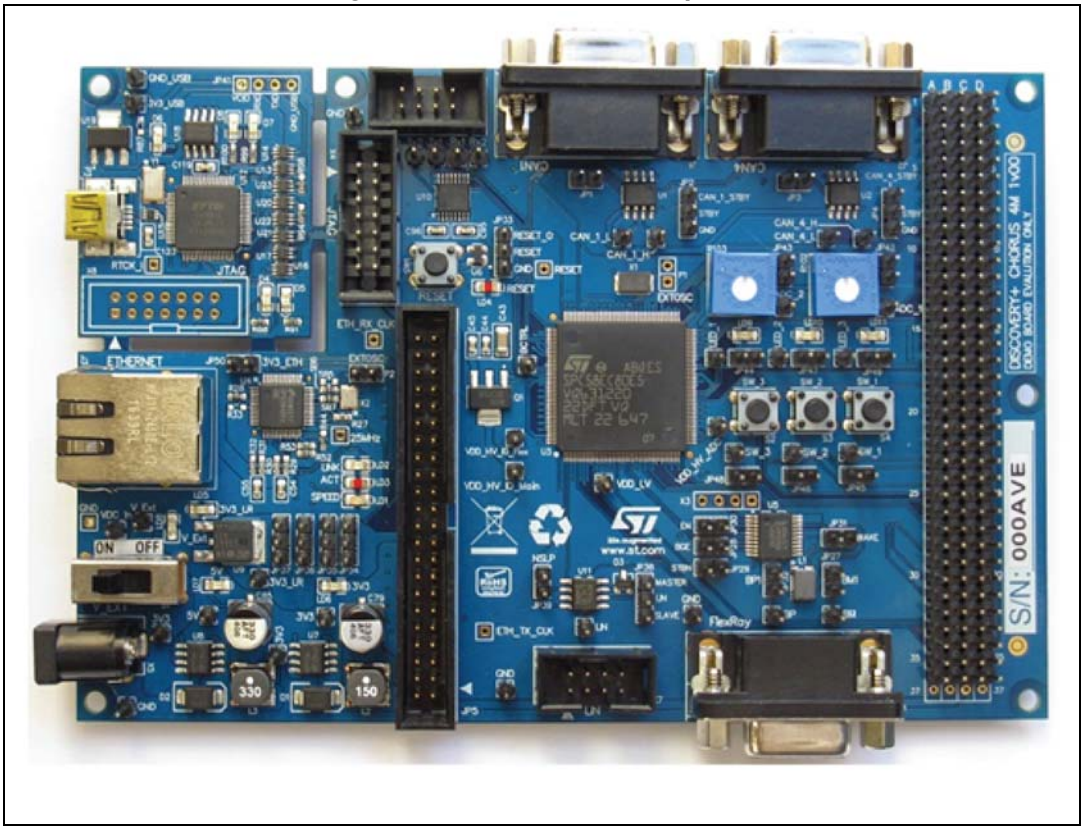
Table 1. X9 (part I) - Extended Connectors (I/O Headers) 11
Table 2. X9 (part II) - Extended Connectors (I/O Headers) 12
Table 3. Document revision history 15

List of figures

Figure 1. SPC58EC-DISP - top side . . . 5
Figure 2. 12 V - 5 V Buck converter . . . 6
Figure 3. 3.3 V Buck converter . . . 6
Figure 4. 3.3 V linear converter . . . 6
Figure 5. Power Supply Selector and LEDs . . . 7
Figure 6. Crystal oscillator . . . 8
Figure 7. Reset circuit . . . 9
Figure 8. FlexRay . . . 9
Figure 9. LIN section . . . 10
Figure 10. User Pushbutton and LEDs . . . 11
Figure 11. User LEDs . . . 11
Figure 12. SPC58EC-DISP - PCB Top side . . . 14

1 SPC58EC-DISP discovery board

Figure 1. SPC58EC-DISP - top side



The several interfaces including Ethernet controller, CAN-FD, FlexRay, LIN and UART, ADC, and JTAG port make the SPC58EC-DISP an excellent tool to evaluate the microcontroller as well as to develop and then debug applications.

An integrated programmer debugger (supported PLS) allows debugging and programming the microcontroller. The same section allows enabling a USB Virtual COM port.

Dedicated connectors allow plugging shields Arduino UNO R3-compatible. This feature makes it simple to expand the board functionality adding a shield or board available on the market. All GPIOs and main signals are accessible by a 4x37 0.1” pin array.

2 Hardware overview

2.1 Power supply section

The input voltage level is $12V_{DC}$, the output voltage is set to 5 V and 3.3 V.

Figure 2 and *Figure 3* show the buck converters used to generate 5 V and 3.3 V respectively.

Figure 4 shows a 3.3 V linear regulator; it is suitable to supply the ADC section.

Figure 2. 12 V - 5 V Buck converter

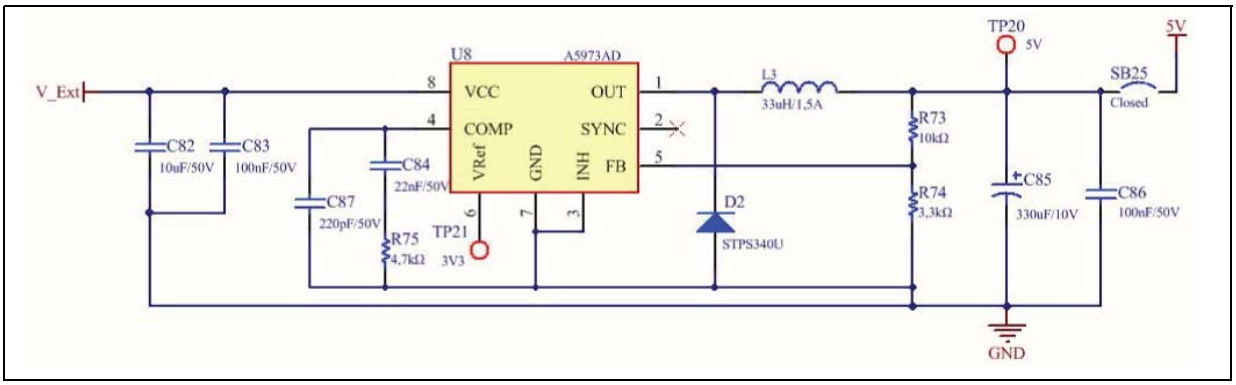


Figure 3. 3.3 V Buck converter

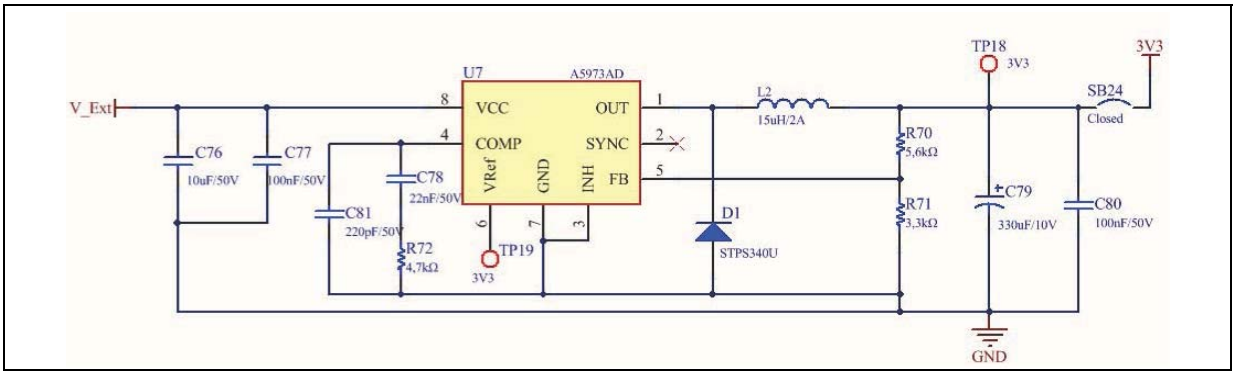
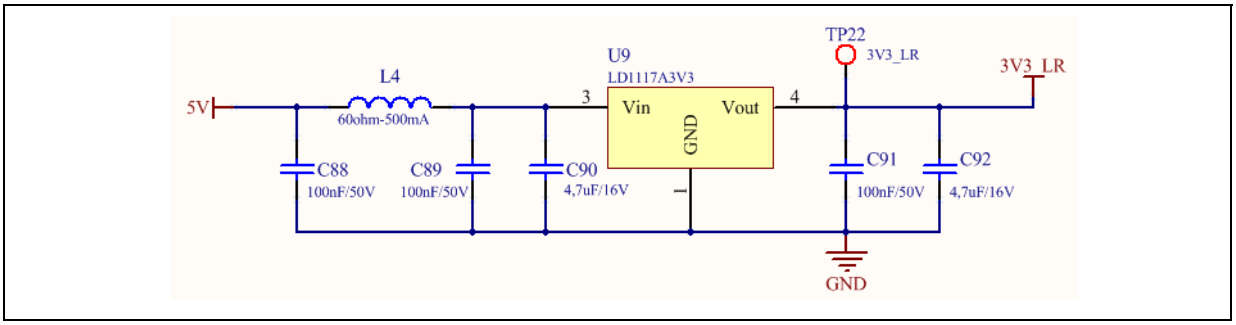


Figure 4. 3.3 V linear converter



2.2 Microcontroller power management

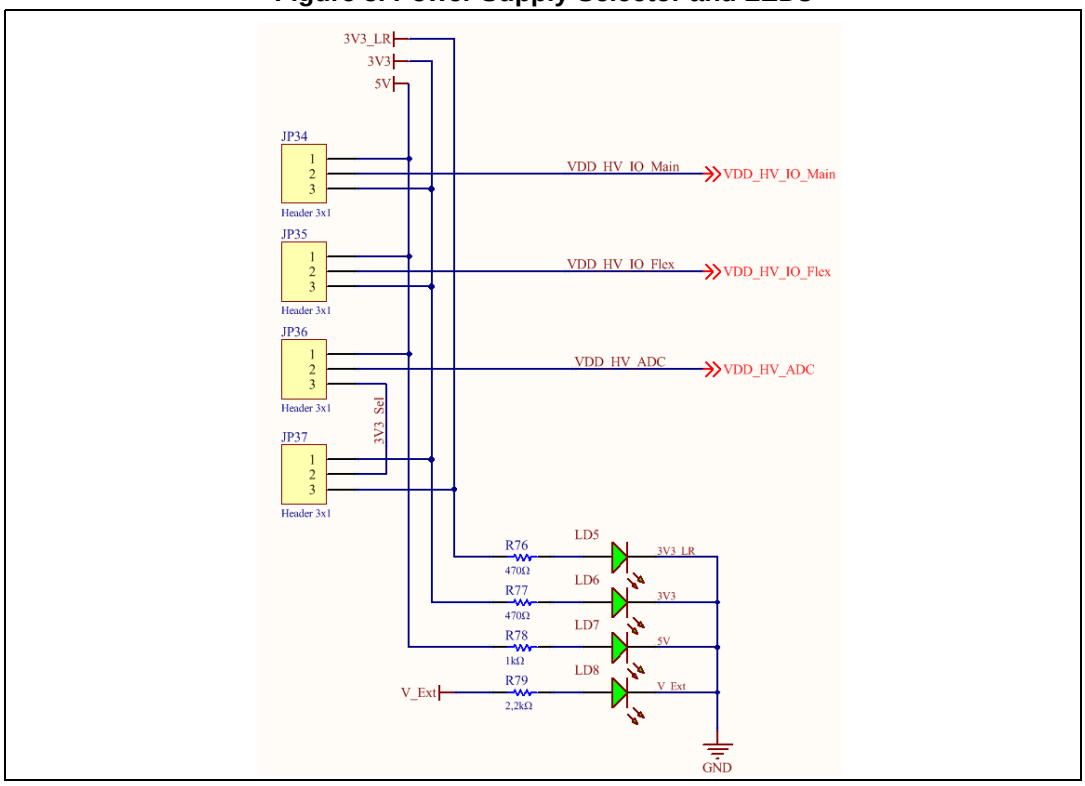
JP34 allows selecting the voltage level to supply VDD_HV_IO_main (5 V or 3.3 V); as well as JP35 sets the VDD_HV_IO_Flex level.

JP36 sets the VDD_HV_ADC supply level; JP37 sets the 3.3 V source (from linear or switching regulator).

These jumpers allow the evaluation of the current absorption.

The LEDs D5, D6, D7 and D8 provide a feedback about the status of the power supply section.

Figure 5. Power Supply Selector and LEDs



2.3 Integrated Programmer/Debugger

The integrated programmer/debugger allows the user to program the microcontroller, to build and to debug the software applications. The debugger works with the UDE PLS software.

The debugger serial number is a label applied on the PCB bottom side.

The integrated debugger SW is accessible via ST's free integrated development environment, SPC5Studio (www.st.com/spc5studio). To download the debugger software and to activate license refer to the PLS website.

The core of the debugger is a single chip USB to dual serial / parallel ports. A portion of the device manages the JTAG signals while the second part implements a UART

communication channel; the level shifters are necessary to balance the signals levels (3.3 V↔5 V).

The supply comes from PC through the USB cable and a dedicated 3.3 V linear regulator supplies this section.

The microcontroller can be the programmed and debugged also by using external tools connected to a JTAG port (2x7 pin). The solder jumper from SB8 to SB14 allows disconnecting the JTAG signal from the integrated debugger[(a)].

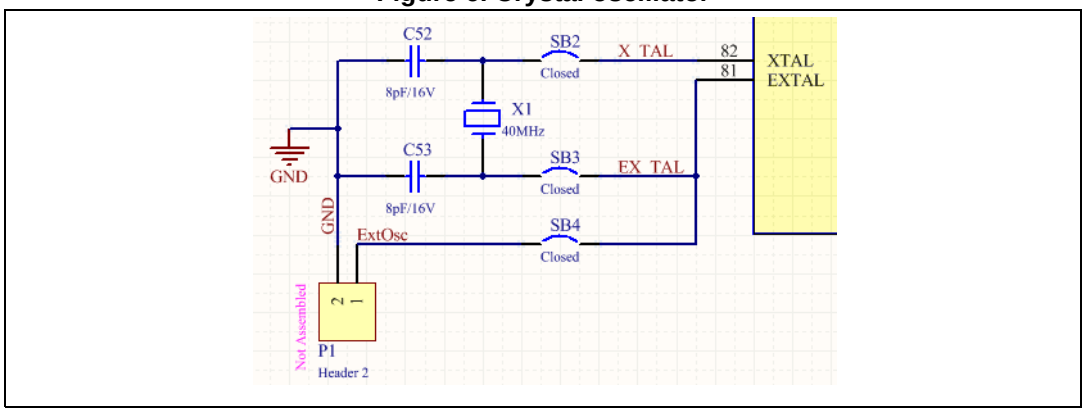
SPC58EC-DISP comes with the integrated programmer enabled (all solder jumpers from SB8 to SB14 are present).

2.4 Crystal oscillator and Reset

Figure 6 shows the external oscillator circuit; the frequency is 40MHz.

By setting SB2, SB3 (open) and SB3 (closed) it is possible to drive the EXTAL pin with an external clock.

Figure 6. Crystal oscillator

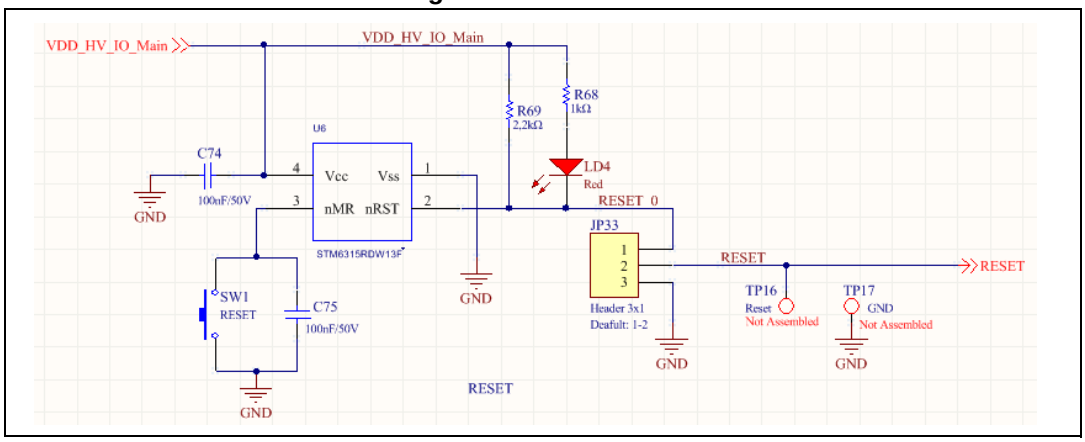


The reset circuit is the device STM6315.

The STM6315 (*Figure 7*) asserts a reset signal whenever the Vcc pin drops below 2.63 V and keep it asserted until the level of Vcc has risen above the threshold for a 210ms.

a. An external debugger must be used with the USB cable disconnected and under this working condition; the integrated debugger is not supplied. If the external programmer does not work properly, the jumpers SB8÷SB14 must be removed (open). It is suggested to perform some tests before removing the jumpers SB8÷SB14.

Figure 7. Reset circuit



The device generates a reset signal when the SW1 button is pressed.

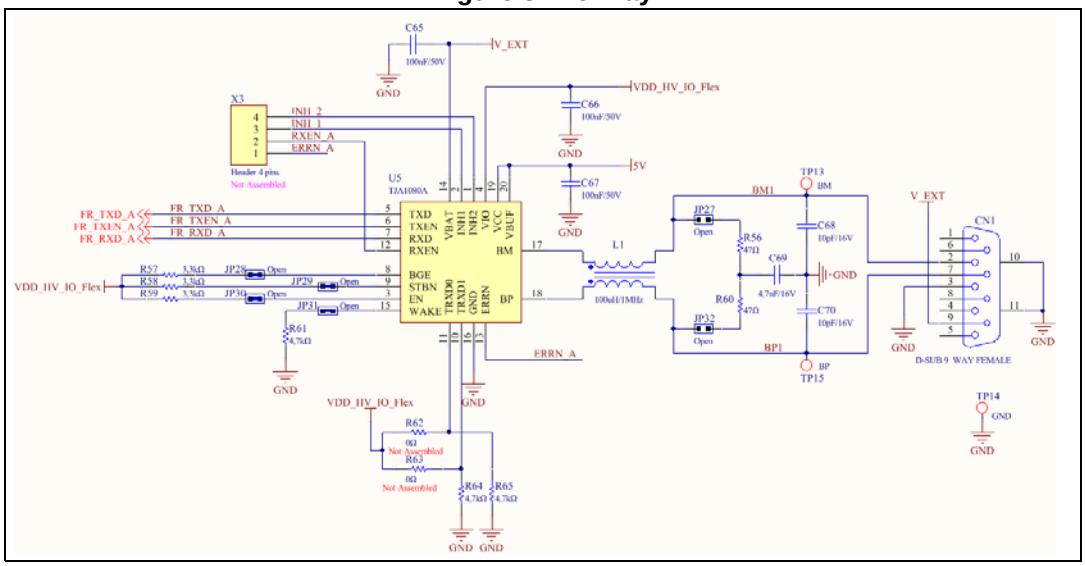
The reset output is an open drain pin and it must be pulled- up to VDD_CPU voltage level (R69). The LD4 provides a feedback when the reset pulse is generated.

2.5 FlexRay

Figure 8 shows the FlexRay section (transceiver + DB9 connector).

The jumpers JP27 and JP32 connect the load terminations (47Ω). The jumpers from JP28 to JP31 allow configuring the transceiver.

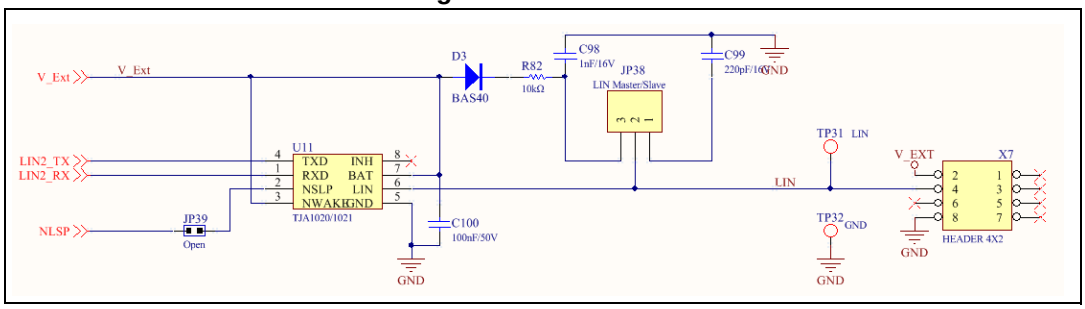
Figure 8. FlexRay



2.6 LIN and RS232

Figure 9 shows the LIN circuit; JP38 allows setting Master/Slave mode.

Figure 9. LIN section



Two serial communication channels are available; U10 is a dual RS232 driver and receiver.

2.7 CAN & ISO CAN-FD

Two CAN channels are available, both are based on a fast transceiver; the implemented solution is compatible with CAN-FD operation standard.

The jumper JP2 allows the selection in normal o standby mode:

- No jumper: normal operation[(b)]
- Jumper 2-3: device in standby mode (manual or fixed selection)
- Jumper 1-2: stand-by is driven by the microcontroller (dynamic configuration).
- Jumper JP1 enables the load termination.

2.8 Ethernet

Resistors R14, R15, R16 and R17 are the load termination.

The jumpers in P14 (2x10 male pins) enable the signals from the microcontroller to drive the transceiver (see *Table 2*).

Note: The transceiver supply voltage is 3.3 v; the microcontroller supply must be set consequently.

JP5 allows connecting the Ethernet transceiver to the microcontroller to implement RII or MII communication protocol.

JP5 allows the implementation of another feature: its pins allow plugging an addition board to evaluate the communication performance by using a different Ethernet physical layer.

R29 ÷ R32 are the load termination resistors.

Note: The level of the transceiver in/out pins is 3.3V then the microcontroller supply level must be set consequently.

2.9 User interface (pushbuttons, LEDs and trimmers)

In the board three LEDs and three push-buttons are present and they are suitable for user purposes (*Figure 11*).

b. In the transceiver an internal pull-up resistor is already present and R1 could be removed

Two trimmers allow the evaluation of the ADC performance (see *Figure 12*).

Figure 10. User Pushbutton and LEDs

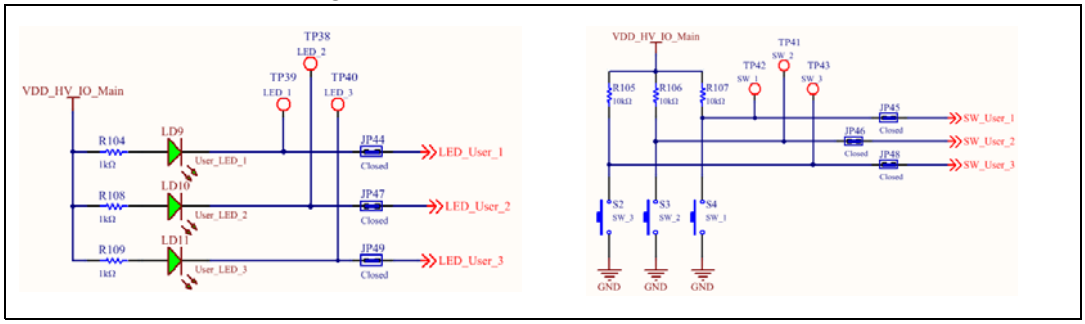
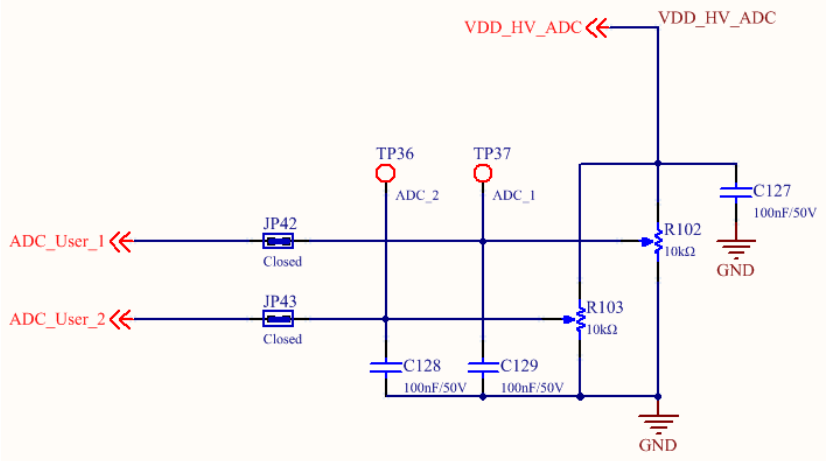


Figure 11. User LEDs



2.10 Extended connectors (I/O Headers)

Most of the GPIOs and signals are accessible by the connector X9, a 4x37 male pin array allowing connection of additional boards and with the user HW application. *Table 1* and *Table 2* summarize the function and signal of each pin.

Table 1. X9 (part I) - Extended Connectors (I/O Headers)

X9 pin	Function / Port		X9 pin	Function / Port
A1	GND		B1	5V
A2	PD10_eMIOS0-UC23		B2	PA13_eMIOS-UC13
A3	PD9_eMIOS1-UC3		B3	PH2_CAN_1_STBY
A4	PB2_eMIOS0-UC8		B4	PH4_CAN_4_STBY
A5			B5	
A6			B6	
A7	PA4_DSPI1-CS0		B7	PD6_DSPI1-SCK
A8			B8	

Table 1. X9 (part I) - Extended Connectors (I/O Headers) (continued)

X9 pin	Function / Port		X9 pin	Function / Port
A9	PC3_eMIOS0-UC7		B9	PA15_DSIP0-CS1
A10	PE10_LIN_0_RXD		B10	PD11_eMIOS0-UC21
A11	PE9_eMIOS0-UC9		B11	PK14_GPIO174
A12	RESET		B12	
A13			B13	
A14	PE1_eMIOS0-UC12		B14	
A15	PA12_DSPI2-CS0		B15	PH0_DSPI2-SCK
A16	PB9_DSPI2-SIN		B16	PB10_DSPI2-SOUT
A17	PF7_CAN4sys1-TX		B17	PF6_CAN4sys1-RX
A18	PG1_FR_RXD_A		B18	PI9_FR_TXD_A
A19	PD1_I2C-SDA		B19	PD2_I2C-SCL
A20	PA11_CAN1sys0_RX		B20	PA10_CAN1sys0_TX
A21	PI8_FR_TXEN_A		B21	
A22	PF11_SW_User_1		B22	PF0_eMIOS1-UC2
A23	PF12_SW_User_2		B23	
A24	PF13_SW_User_3		B24	PG14_eMIOS1-UC0
A25	PF1_eMIOS1-UC1		B25	PC14_eMIOS-UC27
A26			B26	PI3_ADC-AN39
A27	PI5_ADC-AN41		B27	PI6_ADC-AN49
A28	PG3_ADC-AN26		B28	PD13_ADC-AN16
A29	PG4_ADC-AN27		B29	PG5_ ADC-AN42
A30			B30	
A31	PE0_ADC-AN58		B31	PG12_ADC-AN58
A32	PE3_ADC-AN17		B32	PG10_ADC-AN55
A33			B33	
A34	PI2_eMIOS0-UC5		B34	PD5_DSPI0-SOUT
A35	PM14_GPIO206		B35	PE8_DSIP0-CS0
A36	PG15_LIN1-TXD		B36	5V
A37	V_EXT_P		B37	V_EXT_P

Table 2. X9 (part II) - Extended Connectors (I/O Headers)

X9 pin	Function / Port		X9 pin	Function / Port
C1	GND		D1	PE11_LIN_0_TXD
C2	PF3_eMIOS0-UC2		D2	PD15_LIN_2_RXD
C3	PF15_eMIOS1-UC28		D3	PB0_eMIOS1-UC28

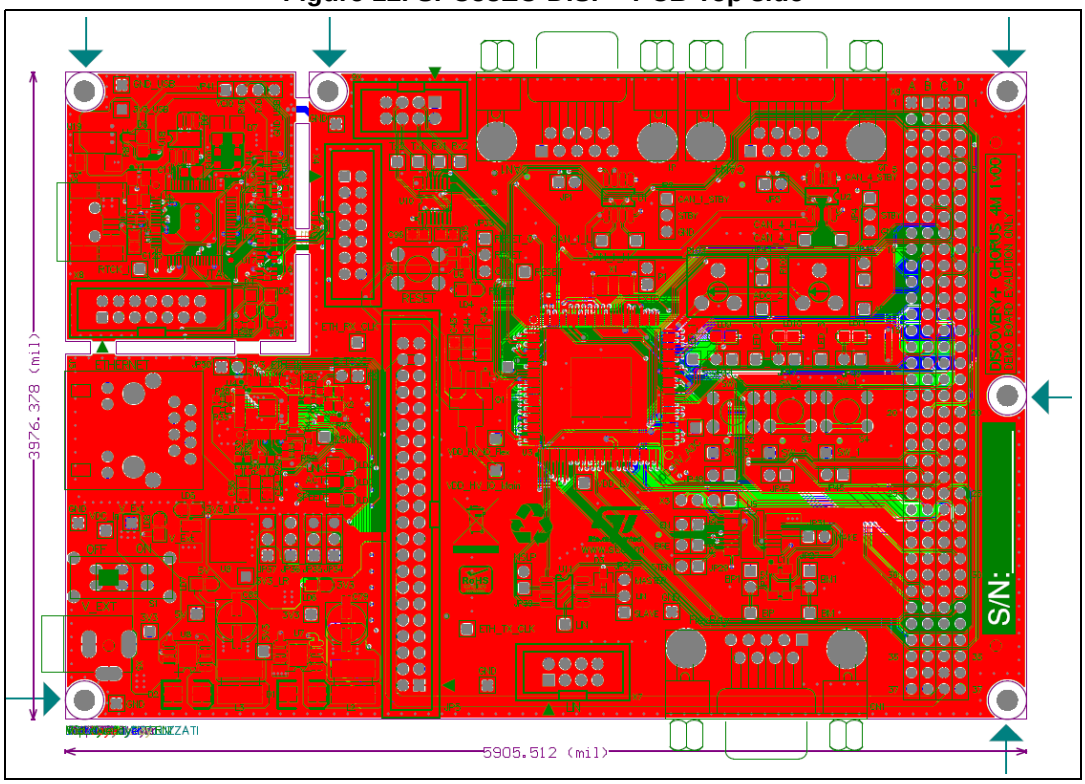
Table 2. X9 (part II) - Extended Connectors (I/O Headers) (continued)

X9 pin	Function / Port		X9 pin	Function / Port
C4	PE14_eMIOS1-UC26		D4	PG13_ETH_RX_CLK
C5			D5	PB11_eMIOS1-UC5
C6	PC12_DSPI1-SOUT		D6	PD7_DSPI1-SIN
C7			D7	
C8	PB8_eMIOS0-UC27		D8	
C9	PA14_GPIO14		D9	PB3_ADC_User_1
C10			D10	PB4_ADC_User_2
C11	PK0_GPIO160		D11	PD14_LIN_2_TXD
C12			D12	
C13			D13	
C14	PI1_eMIOS0-UC4		D14	PF8_LED_User_1
C15	PE13_eMIOS0-UC30		D15	PF9_LED_User_2
C16			D16	PF10_LED_User_3
C17	PA2_CAN2sys0_TX		D17	PA1_CAN2sys0_RX
C18	PE6_CAN0sys0_RX		D18	PE5_CAN0sys0_TX
C19	PE7_LIN_1_TXD		D19	
C20			D20	PF2_EIRQ6
C21			D21	PB1_FCCU-F0
C22			D22	PC2_FCCU-F1
C23	PF14_GPIO94		D23	PA3_eMIOS0-UC28
C24	PA3_eMIOS0-UC28		D24	
C25	PC7_eMIOS0-UC3		D25	PD12_eMIOS0-UC14
C26	PK1_GPIO161		D26	PH1_GPIO113
C27	PI7_ADC-AN50		D27	PG2_ADC-AN25
C28	PG11_ADC-AN57		D28	PI4_ADC-AN40
C29	PG6_ADC-AN44		D29	PG9_ADC-AN53
C30	PB6_ADC-AN48		D30	PB7_ADC-AN47
C31	PD8_ADC-AN92		D31	
C32			D32	PL8_ADC-AN5
C33			D33	
C34	PE15_DSIP0-SIN		D34	PE2__ADC-AN13
C35			D35	PD4_DSPI0-SCK
C36	GND		D36	PM2_GPIO194
C37	3V3		D37	V_Ext

Appendix A Appendix

A.1 PCB Layout

Figure 12. SPC58EC-DISP - PCB Top side



Revision history

Table 3. Document revision history

Date	Revision	Changes
25-Jul-2017	1	Initial release.

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