Design-Guide

XT-FEMTO-SXL

XT-PICO-SXL

XT-NANO-SXL

SXL - series

Contents

Contents

General description

RS232(TTL)
You can use up to two independently operating serial interfaces. Each interface can be individually set and allows data rates of up to 2.500.000 bauds. Furthermore, it is possible to additionally set emulations, such as modems, Auto-Connect, Connect-On-Data, TCP / UDP - Client with up to 10 parallel connections, TCP/UDP - Servers, tunnel mode with transfer of signal statuses such as settings, E-mail Client including sending and receiving of E-mails.

RS485(TTL)
You can use up to two independently operating RS485 interfaces. This mode also supports so-called 2-wire components such as e.g. the MAX3072E, since there is a suitable control line for it. Each interface can be individually set and allows data rates of up to 2.500.000 bauds. Furthermore, it is possible to additionally set emulations, such as modems, Auto-Connect, Connect-On-Data, TCP / UDP - Client with up to 10 parallel connections, TCP/UDP - Servers, tunnel mode with transfer of signal statuses such as settings, E-mail Client including sending and receiving of E-mails.

I2C
You can use up to two independently operating I2C interfaces. In addition, a data mode was implemented in order to achieve a maximum of flexibility. The interface can be individually set and allows data rates of up to 2.500.000 bits/sec. Furthermore, it is possible to additionally set emulations, such as a modem, Auto-Connect, Connect-On-Data, TCP / UDP - Client with up to 10 parallel connections, TCP/UDP - Servers, E-mail Client including sending and receiving of E-mails.

SPI
You can use up to two independently operating SPI interfaces in the master or slave mode. Each interface can be individually set and allows data rates of up to 25MBit (master) and 2.5MBit (slave). Furthermore, it is possible to additionally set emulations, such as Auto-Connect, Connect-On-Data, TCP / UDP - Client with up to 10 parallel connections, TCP/UDP - Servers, E-mail Client including sending and receiving of E-mails.
By means of settings in the setup, the SPI interface can directly operate SD cards, DF cards or Data-Flash components. An implemented Flash-File system with FAT12/16/32 structure supports the FTP server, in order to save data on it or to read data from it. It is only possible to save own websites or JAVA applets in order to present an own and individual appearance to the customers via the WEB server.

SD-Cards / DF-Cards:
- FAT12/16/32
- PC compatible

Serial-Flash components:

- AT45DB011B, AT45DB021B, AT45DB041B, AT45DB081B, AT45DB0161B, AT45DB0321B AT45DB0642, AT45DB1282
- SST25VF016B, SST25VF032B, SST25VF064C SST26VF016B, SST26VF032B, SST26VF064B, S25FL116K, S25FL132K, S25FL164K, SST25VF020

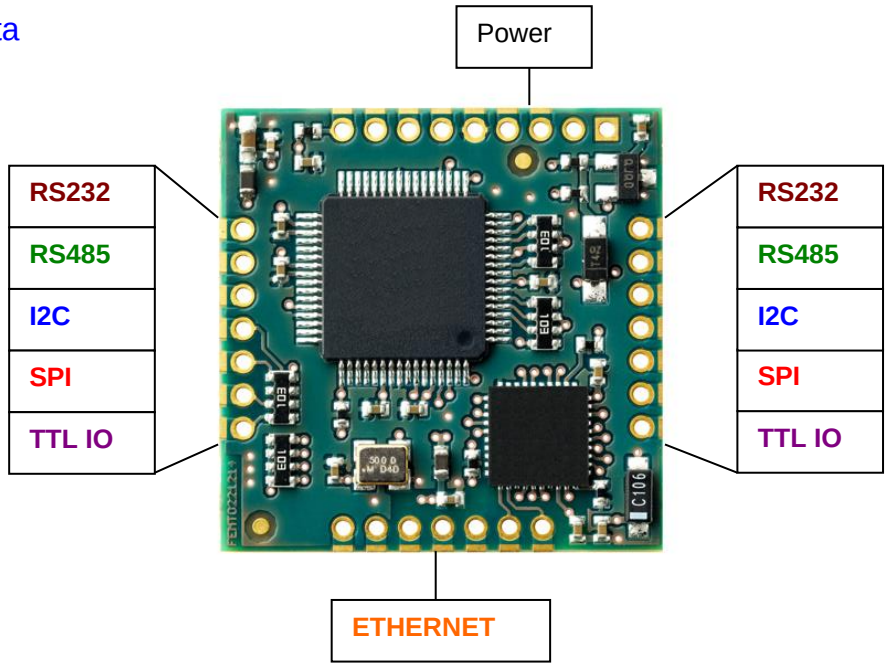
are directly recognised.

The SPI interface can directly control an SPI display e.g. the EA DOGM162B-A
which you can directly use via the TCP/IP.

TTL IO
Up to 14/15 pins can be directly controlled via two interfaces. To do so, there is an own control mode, which can read, switch the signals on or off. A tunnel mode allows the automatic transmittance of signalling states.

XT-FEMTO-SXL

Technical data



- **Temperature range:**
  -40°C .. + 85°C

- **Standards**
  CE / WEEE / RoHS
  EN 55022 Class B
  EN 55024 Class A

- **Power supply:**
  3.3 volts +-5%
  170 mA

- **Dimensions:**
  27 x 27 x 3 mm

- **Weight:**
  3 grams

- **Ethernet (MDIX)**
  10 Half Duplex
  10 Full Duplex
  100 Half Duplex
  100 Full Duplex
  AutoSensing

- **Interfaces – Features**
  - All data pins 3.3 volts TTL, 10K Pullup
  - All data interfaces are freely selectable

2 x RS232/RS485

Baud rate	: up to 2.5 MBauds
DataBits	: 7.8
Parity	: Odd,Even,None Mark,Space
Signals	: TXD, RXD, RTS, CTS, DSR, DTR, DCD
RS485	ReadWrite

2 x I2C

Mode	: Master
DataBits	: 8
Data rate	: 100KHz up to 2.5 MHz
Signals	: SDA, SCL

2 x SPI

Mode	: Master/Slave
DataBits	: 8
Data rate	: uo to 25 MBits (master) up to 2.5 MBits (Slave)
Signals	: MISO,MOSI,SCK,SS
SD-CARD	CardDetect,CardLock

2 x TTL-IO

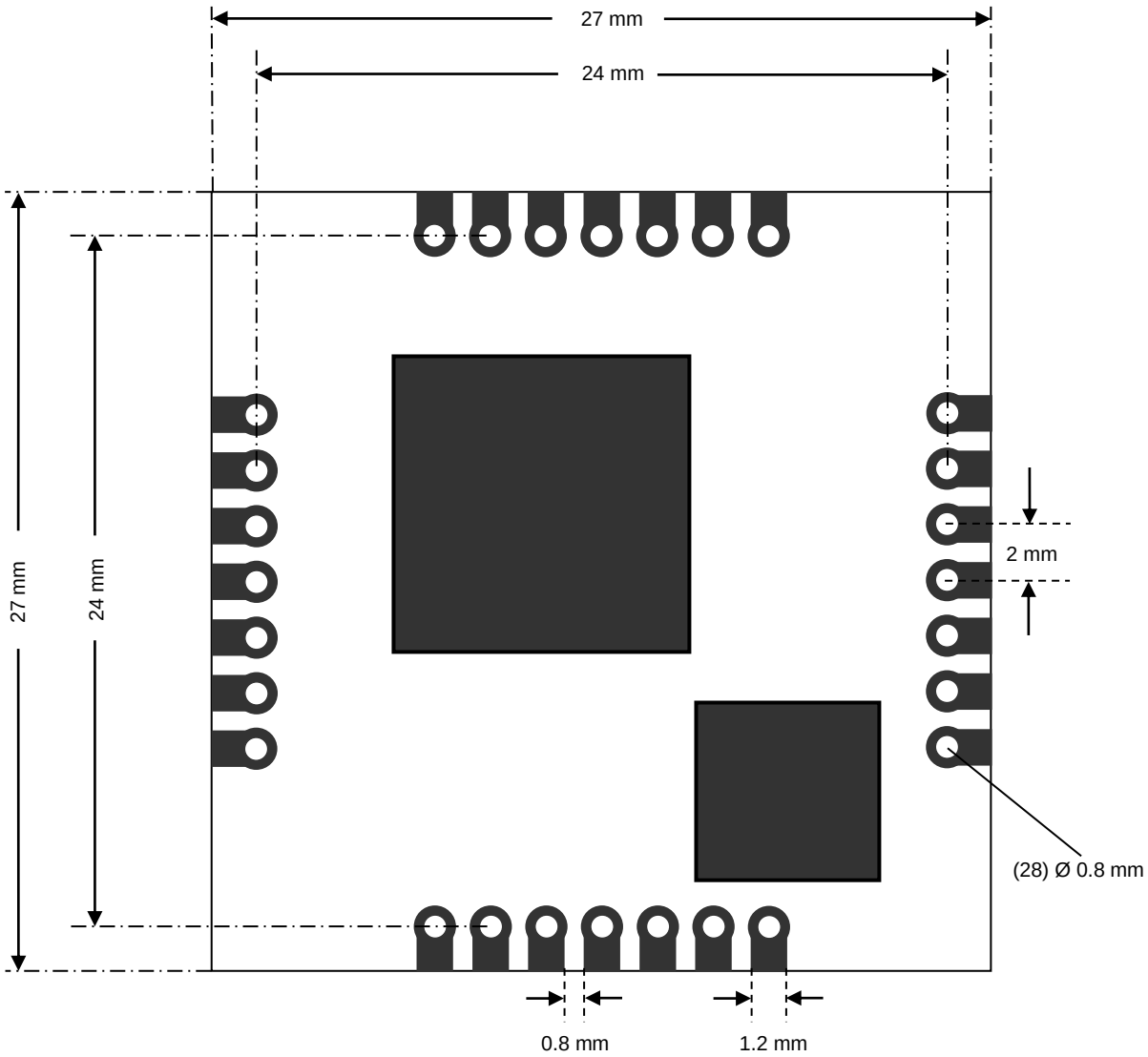
Mode	: digital Input/Output
Signals	: 7 Pins

1 x Ethernet

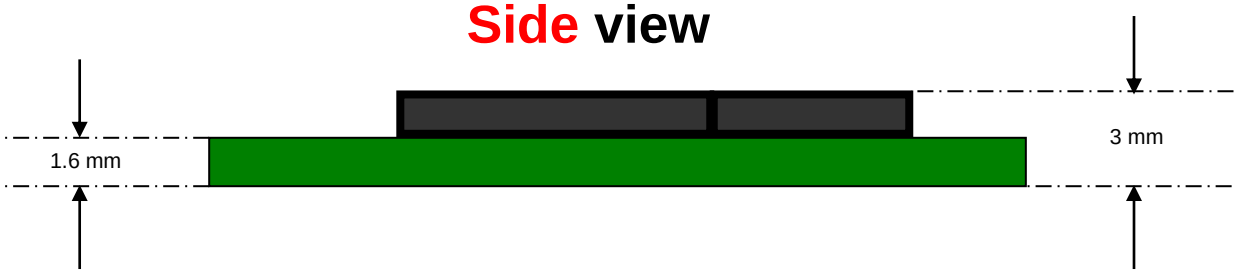
Signals	: RX+,RX-,TX+,TX-,AVDD, LED-ACT,LED-LINK

Dimensions

Top view



Side view



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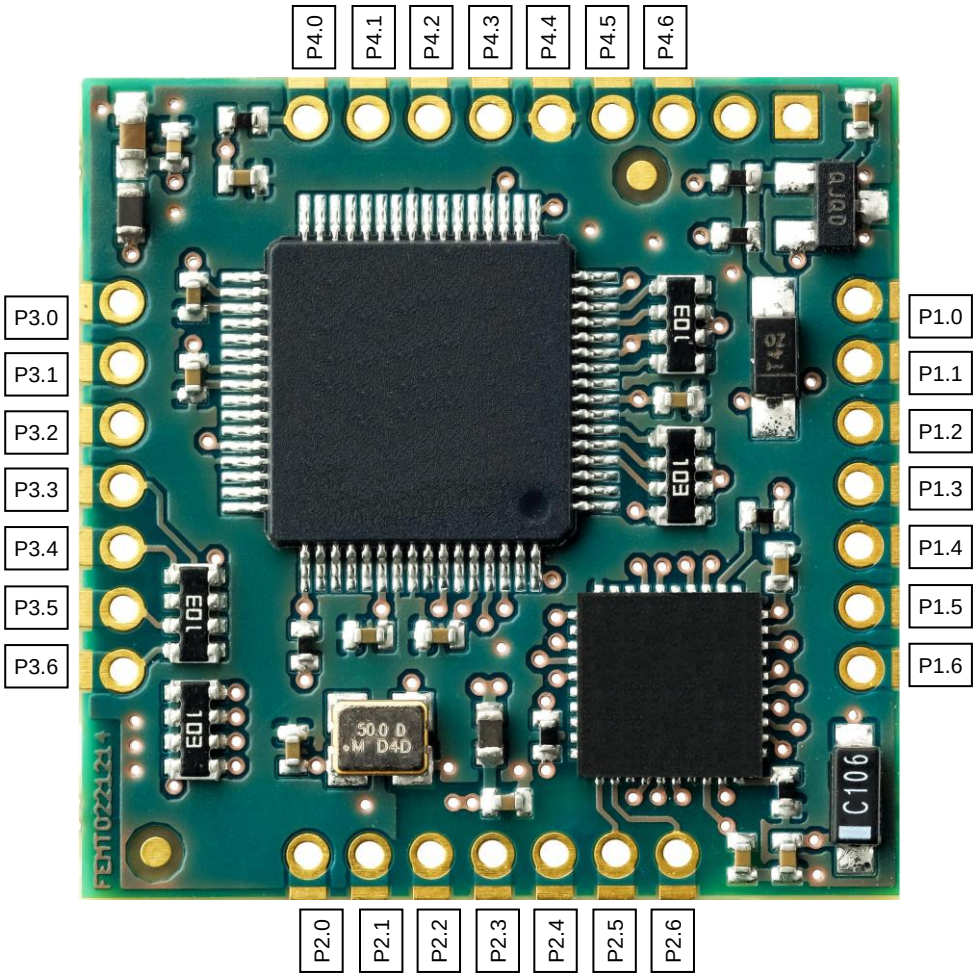
PIN - Description

Top view



Absolute Maximum Ratings

Ambient temperature under bias.....	-40°C to +85°C
Storage temperature.....	-65°C to +150°C
Voltage on VDD.....	-0.3V to +4.0V
Voltage on any 3.3 V pin.....	-0.3V to (VDD + 0.3V)
Voltage on any 5V tolerant pin	-0.3V to +5.5V

XT-FEMTO-SXL

PIN - Description

PORT1:

PIN	RS232	RS485	I2C	SPI	TTL-IO	PULLUP	Type	VDD max
P1.0	TXD0	TXD0		MISO0	PIN1	10K	I/O	+3.3 volts
P1.1	RXD0	RXD0		MOSI0	PIN2	10K	I/O	+3.3 volts
P1.2	RTS0		SCL0		PIN3	10K	I/O	+3.3 volts
P1.3	CTS0		SDA0		PIN4	10K	I/O	+3.3 volts
P1.4	DTR0	R/W0		SS0	PIN5	10K	I/O	+3.3 volts
P1.5	DSR0			SCK0	PIN6	10K	I/O	+3.3 volts
P1.6	DCD0				PIN7	10K	I/O	+5V tolerant

PORT2:

PIN	Ethernet	PULLUP	Type	VDD max
P2.0	LED LINK		O	+3.3 volts
P2.1	LED ACT		O	+3.3 volts
P2.2	AVDD 3.3		PWR	
P2.3	TD-		I/O	
P2.4	TD+		I/O	
P2.5	RD-		I/O	
P2.6	RD+		I/O	

PORT3:

PIN	RS232	RS485	I2C	SPI	TTL-IO	alternate	PULLUP	Type	VDD max
P3.0	TXD1	TXD1		MISO1	PIN1		10K	I/O	+3.3 volts
P3.1	RXD1	RXD1		MOSI1	PIN2		10K	I/O	+3.3 volts
P3.2	RTS1		SCL1		PIN3		10K	I/O	+5V tolerant
P3.3	CTS1		SDA1		PIN4		10K	I/O	+5V tolerant
P3.4	DTR1	R/W1		SS1	PIN5		10K	I/O	+3.3 volts
P3.5	DSR1			SCK1	PIN6		10K	I/O	+3.3 volts
P3.6	DCD1				PIN7	Factory	10K	I/O	+5V tolerant

PORT4:

PIN		POWER	RESET	Type	PULLUP	VDD max
P4.0		reserved	reserved	reserved	reserved	reserved
P4.1		reserved	reserved	reserved	reserved	reserved
P4.2		reserved	reserved	reserved	reserved	reserved
P4.3		reserved	reserved	reserved	reserved	reserved
P4.4		GND		PWR		0
P4.5		VDD		PWR		+3.3 volts +-5%
P4.6			RESET	I	10K	+5V tolerant

= ActivLow

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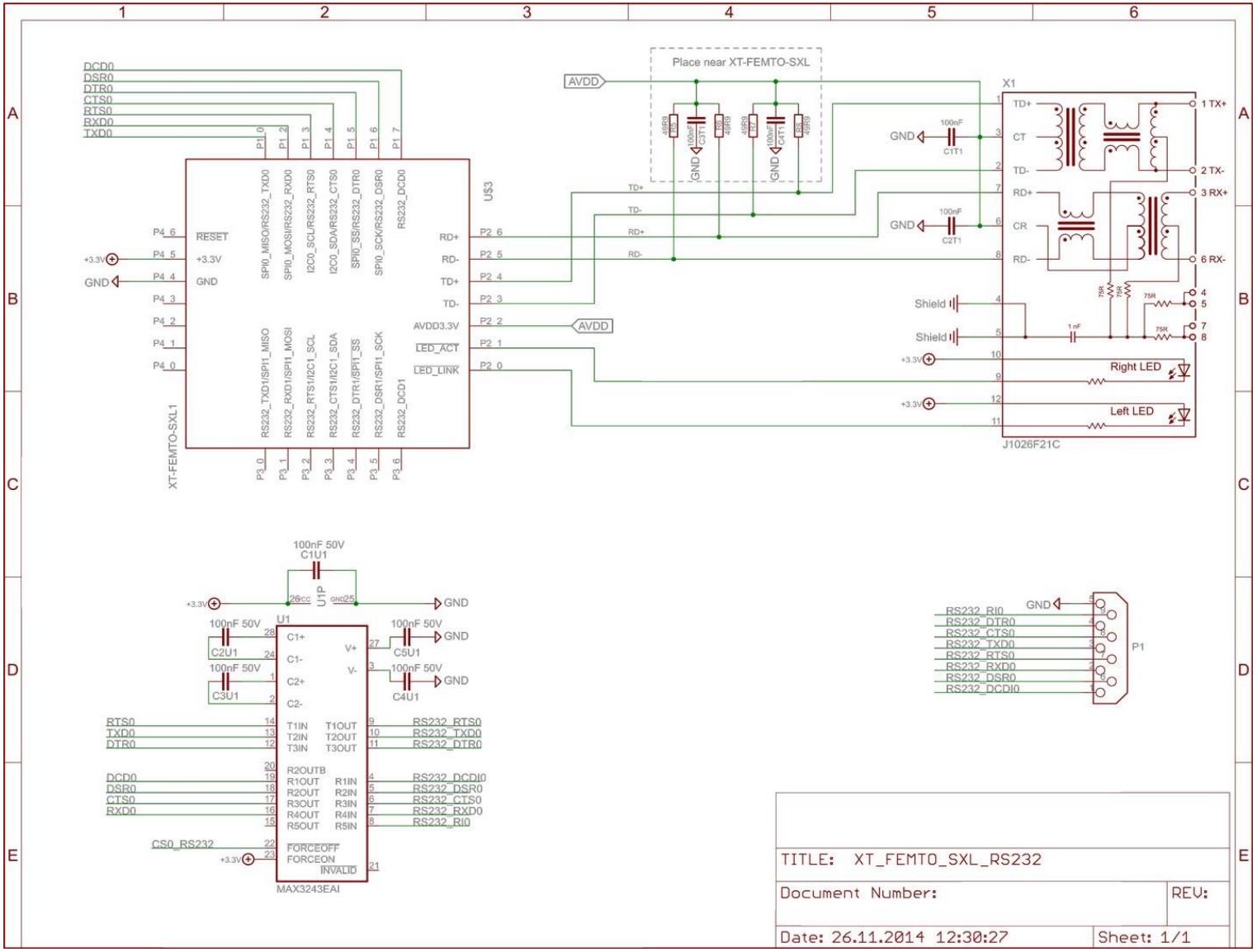
Schematic RS232



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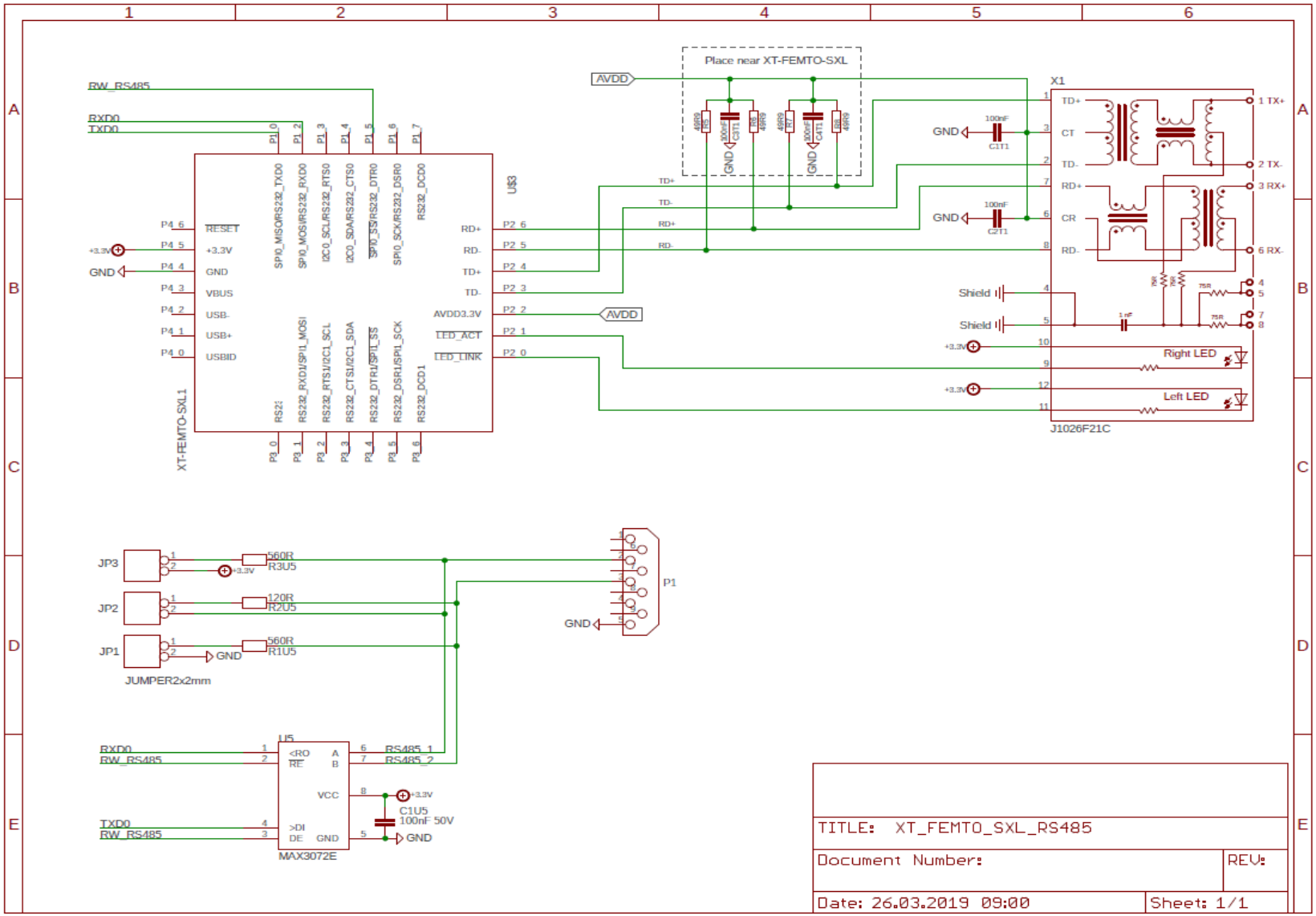
Schematic RS485



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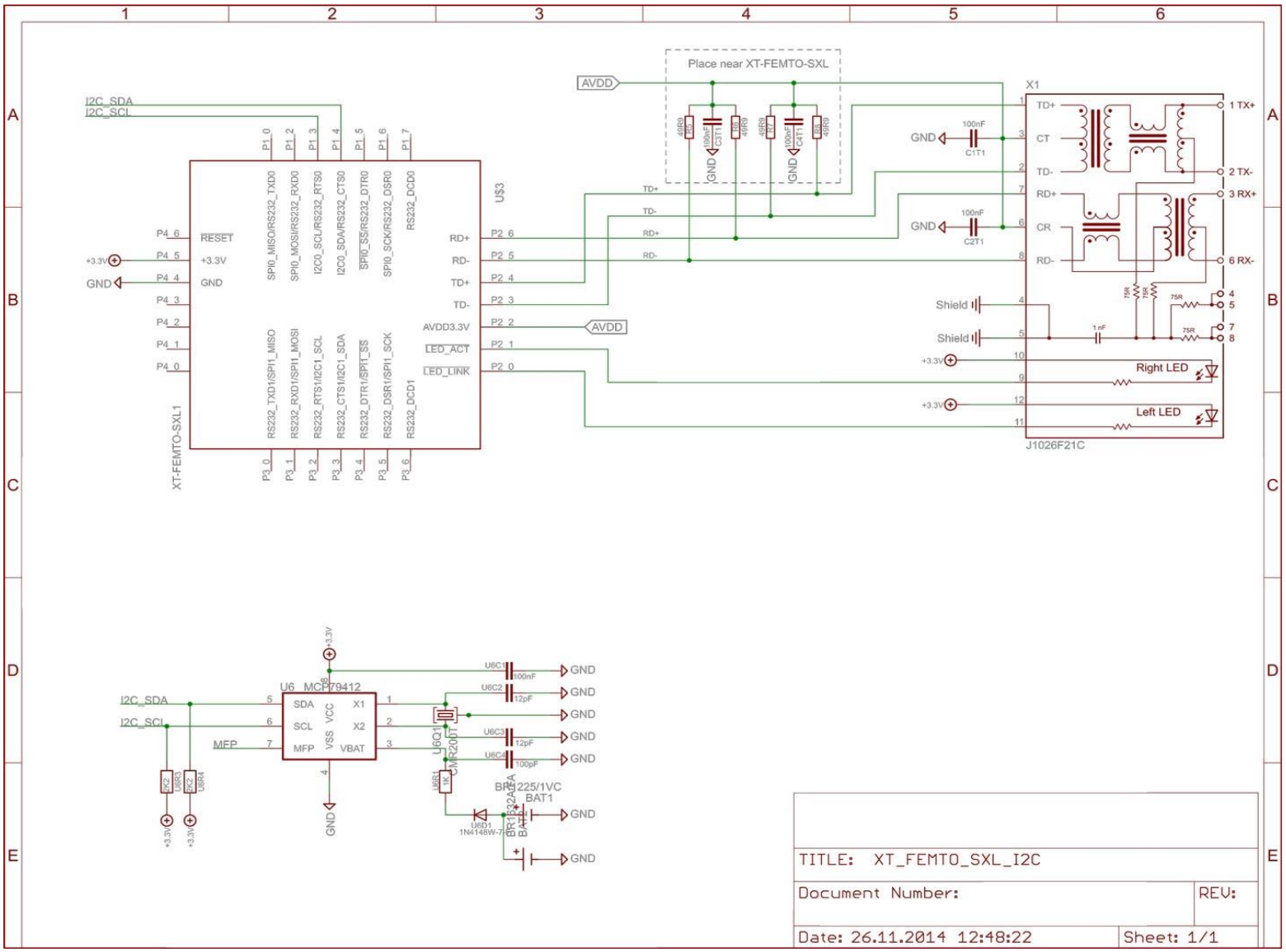
Schematic I2C



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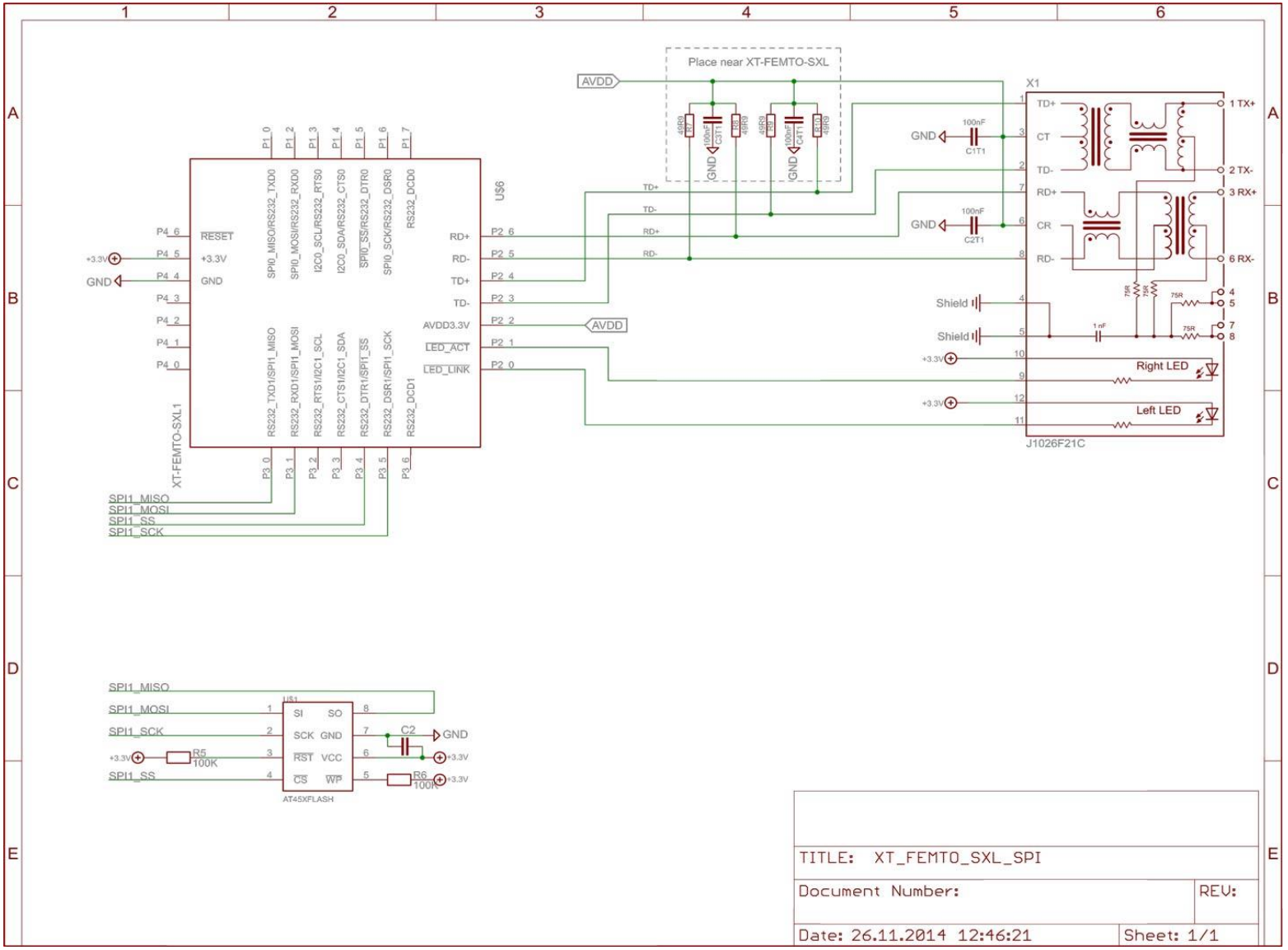
Schematic SPI



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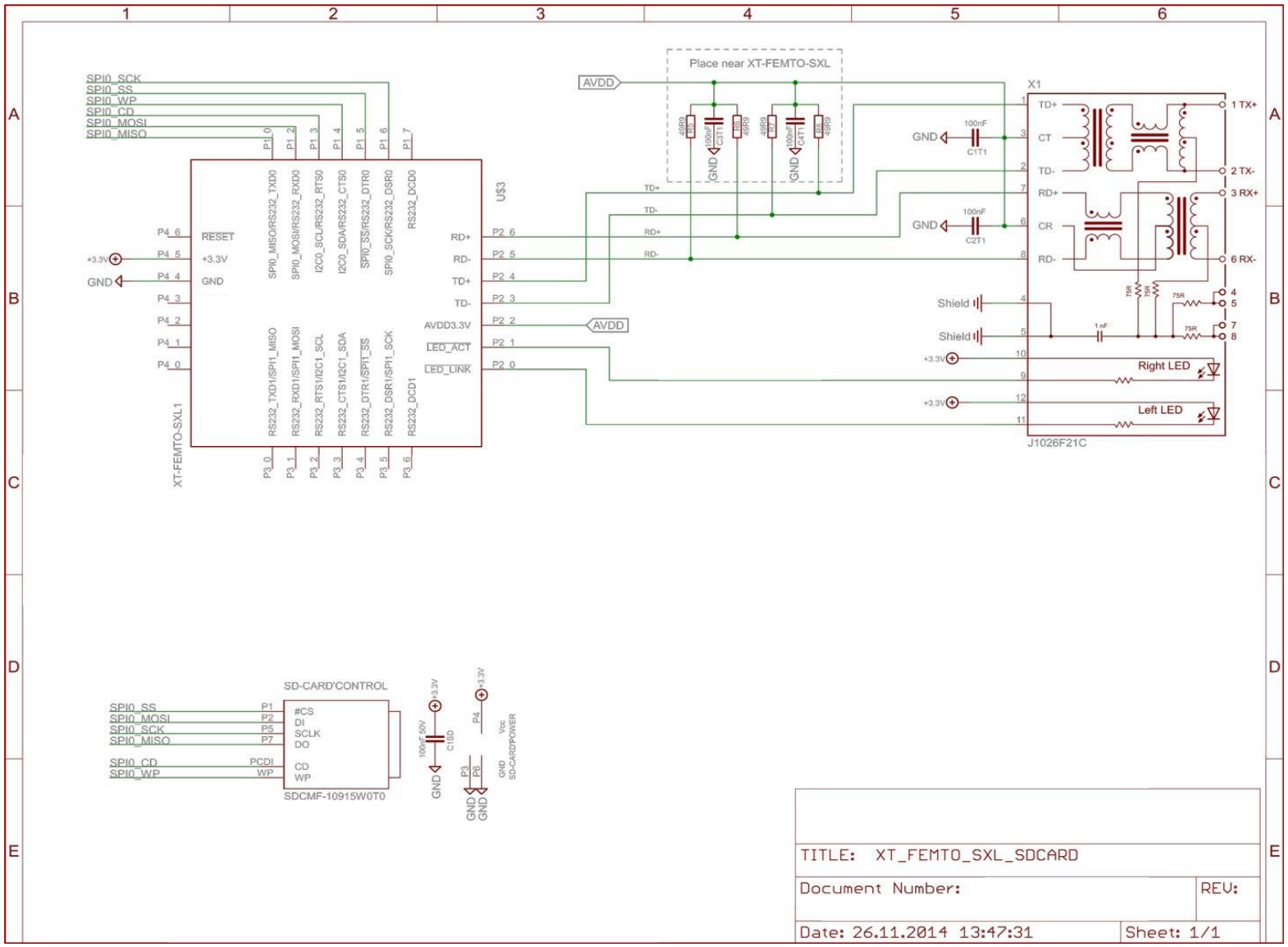
Schematic SD-CARD



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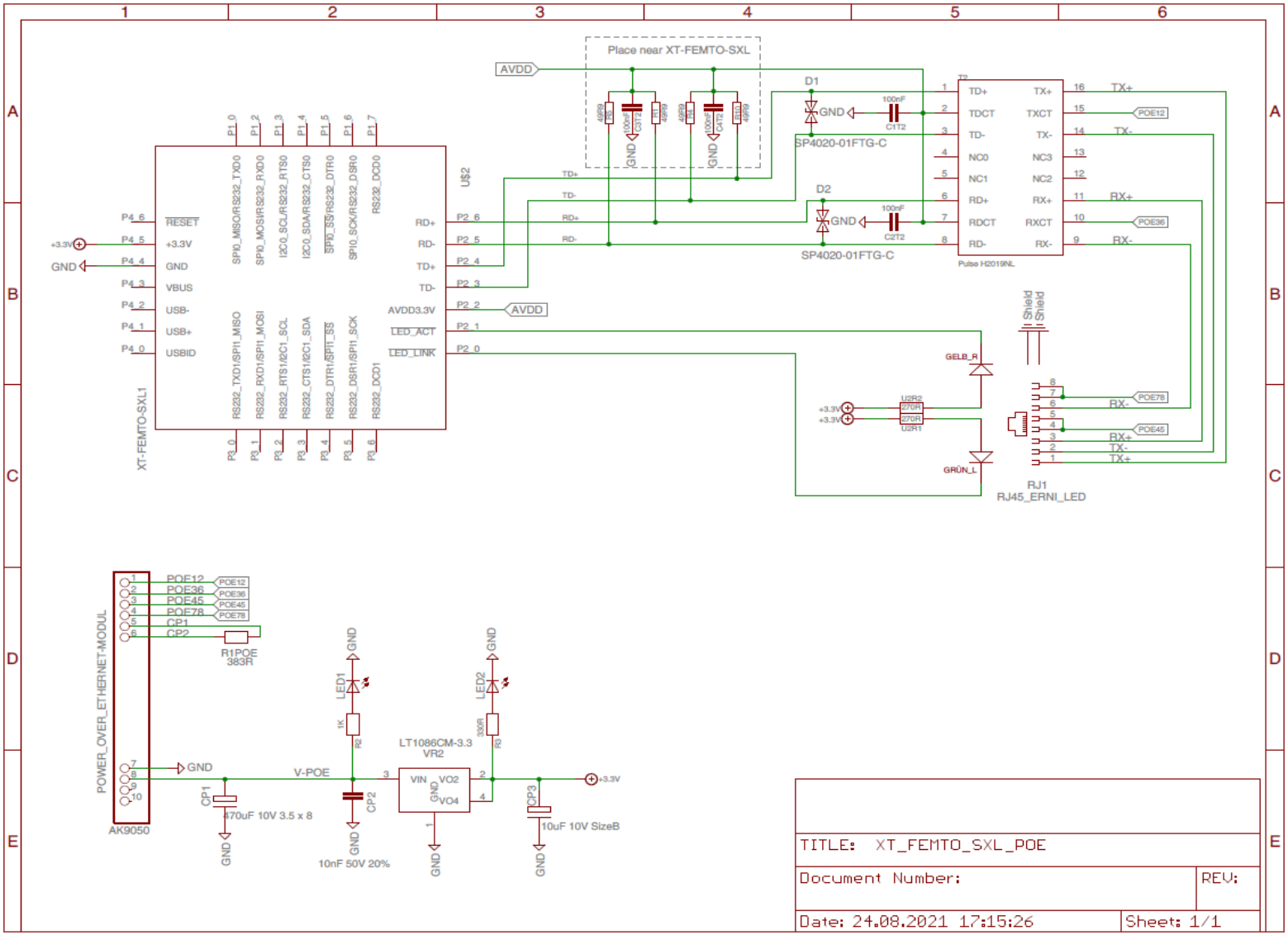
Schematic POE



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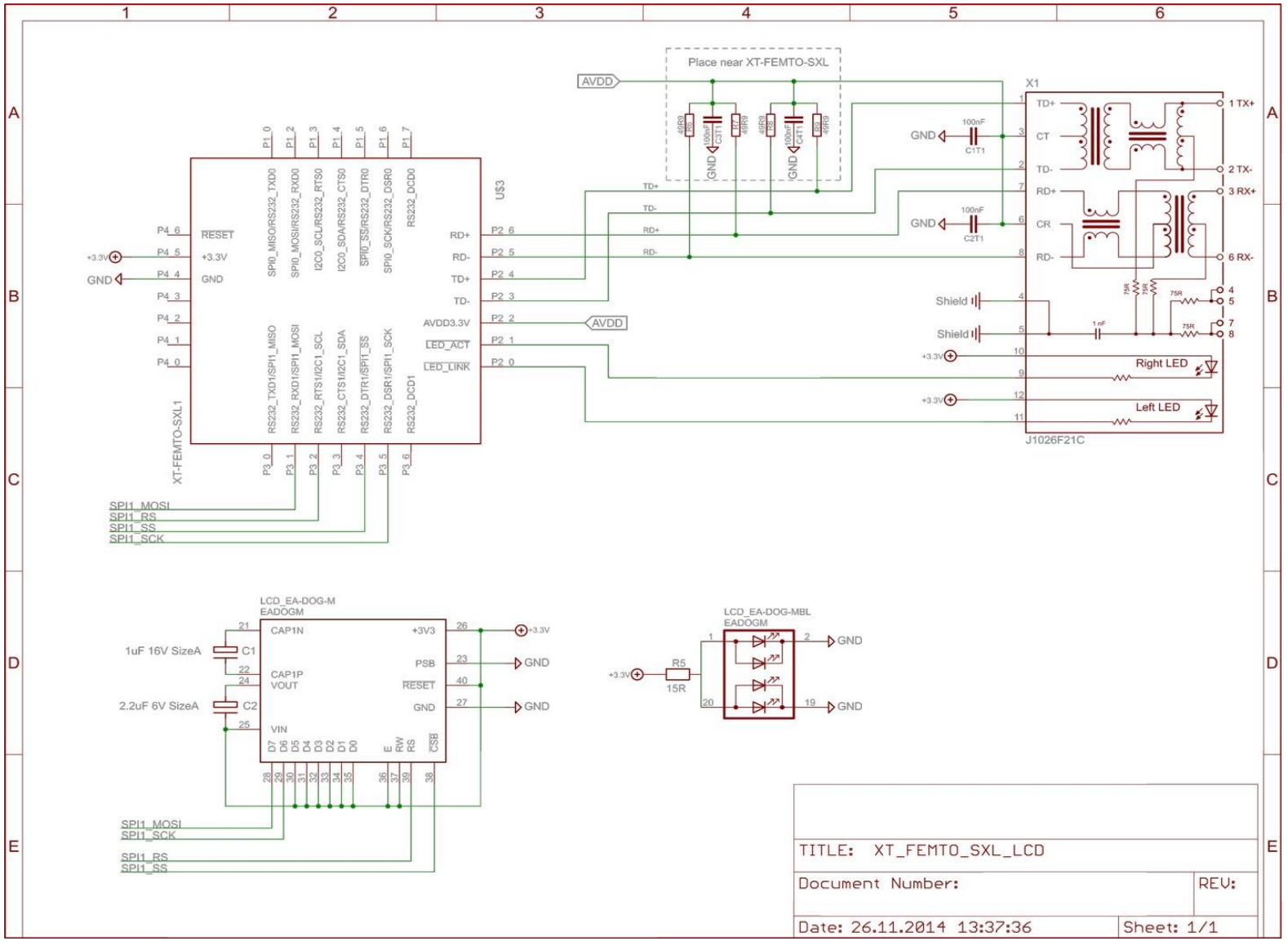
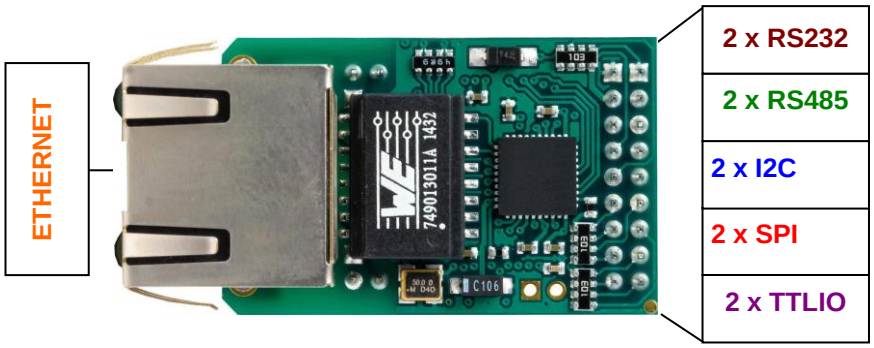
Schematic LCD



XT-NANO-SXL

Technical data

Top view



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- **Weight:**
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Baud rate	: up to 2.5 MBauds
DataBits	: 7,8
Parity	: Odd,Even,None Mark,Space
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RS485	ReadWrite

  2 x I2C

Mode	: Master
DataBits	: 8
Data rate	: 100KHz up to 2.5 MHz
Signals	: SDA, SCL

  2 x SPI

Mode	: Master/Slave
DataBits	: 8
Data rate	: uo to 25 MBits (master) up to 2.5 MBits (Slave)
Signals	: MISO,MOSI,SCK,SS
SD-CARD	CardDetect,CardLock

  2 x TTL-IO

Mode	: digital Input/Output
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XT-NANO-SXL

Dimensions

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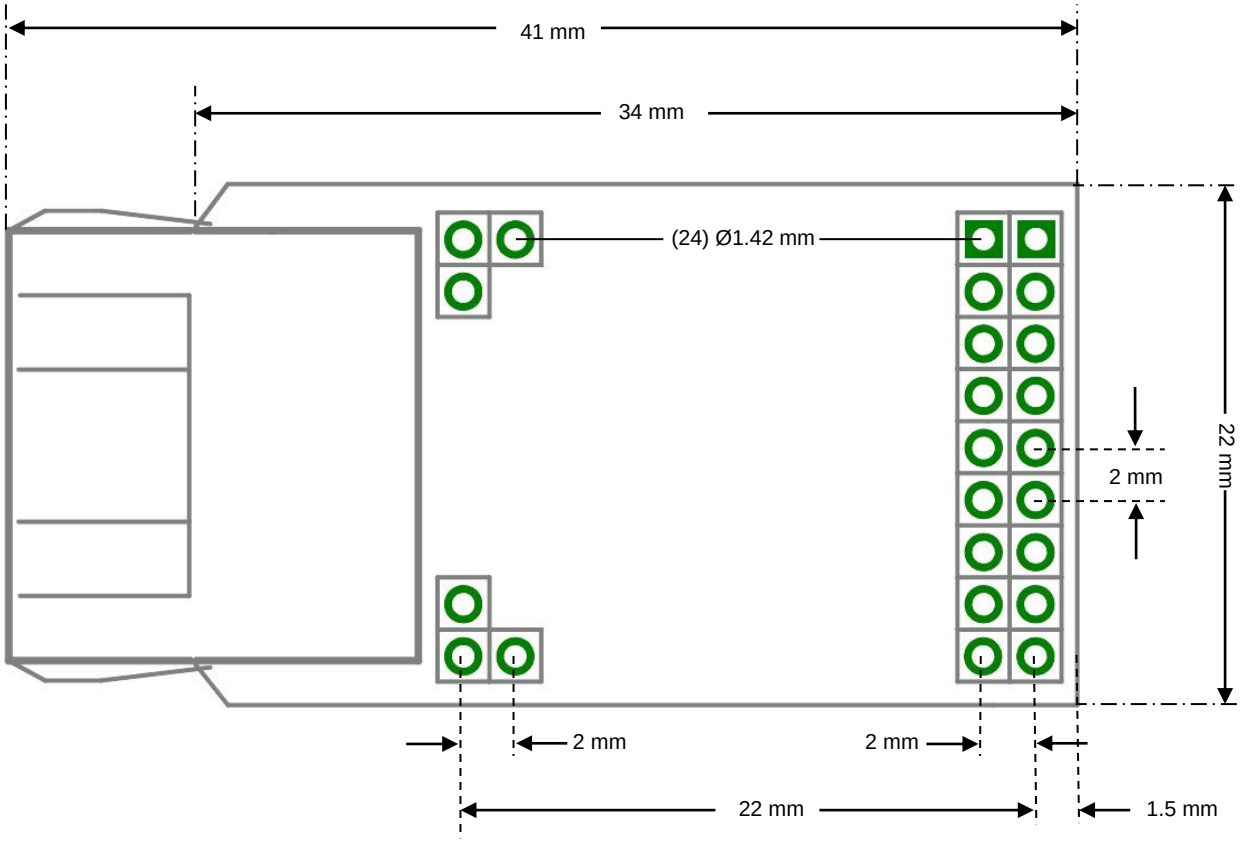
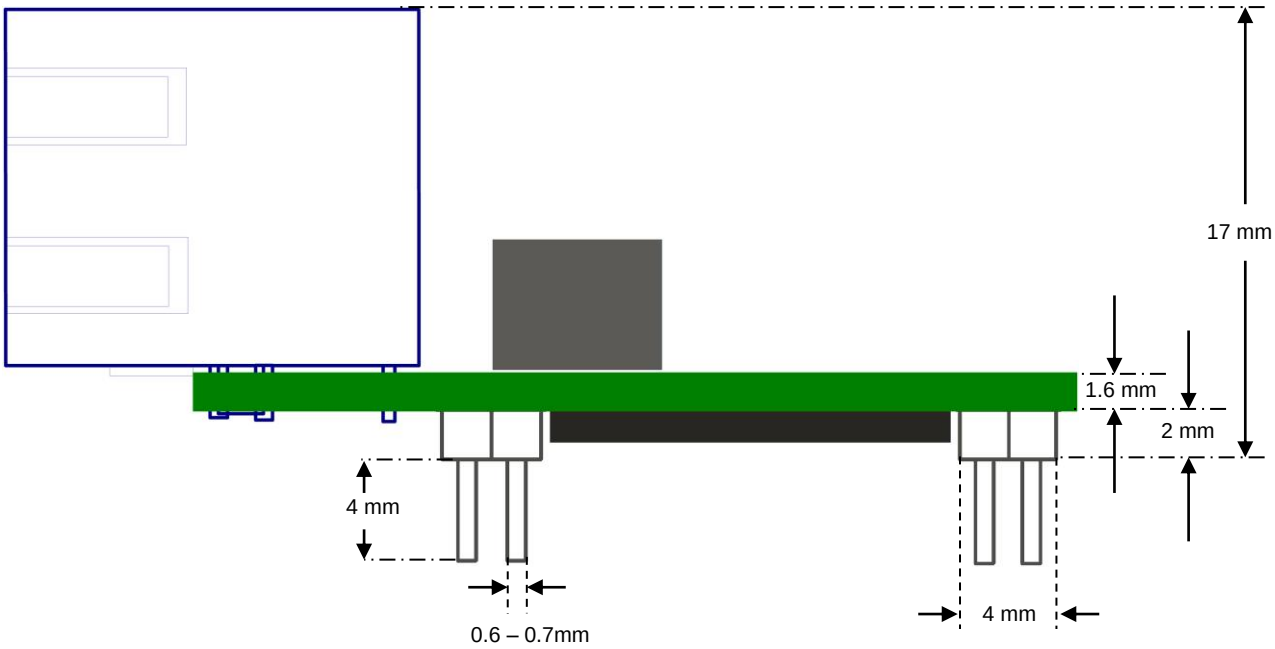


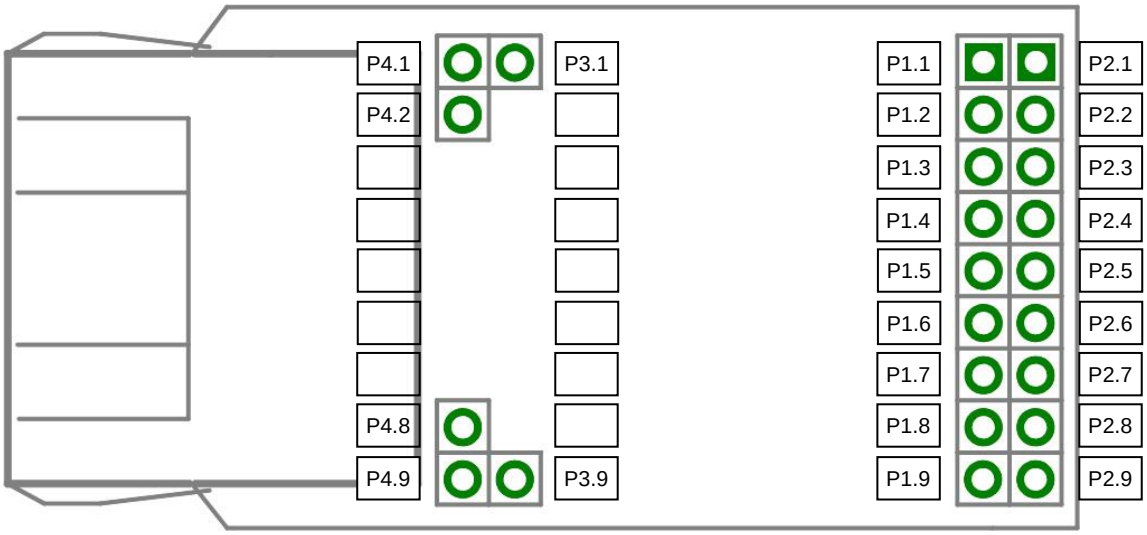
Side view



XT-NANO-SXL

PIN - Description

Top view



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Voltage on any 5V tolerant pin ……	-0.3V to +5.5V

XT-NANO-SXL

PIN – Description

PORT1:

PIN	Power	BUS	RS232	RS485	I2C	SPI	TTL-IO	alternate	Pullup	Type	VDD max
P1.1	GND									PWR	0
P1.2	VDD									PWR	+3.3 volts +-5%
P1.3	Reset								10K	I	+5V tolerant
P1.4		1	CTS0		SDA0		PIN4_0		10K	I/O	+3.3 volts
P1.5		1	RTS0		SCL0		PIN3_0		10K	I/O	+3.3 volts
P1.6		1	DTR0	R/W0		SS0	PIN5_0		10K	I/O	+3.3 volts
P1.7		1	DSR0			SCK0	PIN6_0		10K	I/O	+3.3 volts
P1.8		1	TXD0	TXD0		MISO0	PIN2_0		10K	I/O	+3.3 volts
P1.9		1	RXD0	RXD0		MOSI0	PIN1_0		10K	I/O	+3.3 volts

PORT2:

PIN	Power	BUS	RS232	RS485	I2C	SPI	TTL-IO	alternate	Pullup	Type	VDD max
P2.1		1	DCD0				PIN7_0		10K	I/O	+5V tolerant
P2.2		2	RI1				PIN8_1		10K	I/O	+3.3 volts
P2.3		2	DCD1				PIN7_1	Factory	10K	I/O	+5V tolerant
P2.4		2	CTS1		SDA1		PIN4_1		10K	I/O	+5V tolerant
P2.5		2	RTS1		SCL1		PIN3_1		10K	I/O	+5V tolerant
P2.6		2	DTR1	R/W1		SS1	PIN5_1		10K	I/O	+3.3 volts
P2.7		2	DSR1			SCK1	PIN6_1		10K	I/O	+3.3 volts
P2.8		2	TXD1	TXD1		MISO1	PIN2_1		10K	I/O	+3.3 volts
P2.9		2	RXD1	RXD1		MOSI1	PIN1_1		10K	I/O	+3.3 volts

PORT3:

PIN	Ethernet	Type	Beschreibung
P3.1	POE12	O	Connected to (TXCT) of the transformer
….			
P3.9	POE36	O	Connected to (RXCT) of the transformer

PORT4:

PIN	Ethernet	Type	Type
P4.1	Shield		Connected to Shield of the RJ45
P4.2	POE78	O	Connected to PIN7 and PIN8 of the RJ45
….			
P4.8	POE45	O	Connected to PIN4 and PIN5 of the RJ45
P4.9			

= ActivLow

XT-NANO-SXL

Connection Diagram

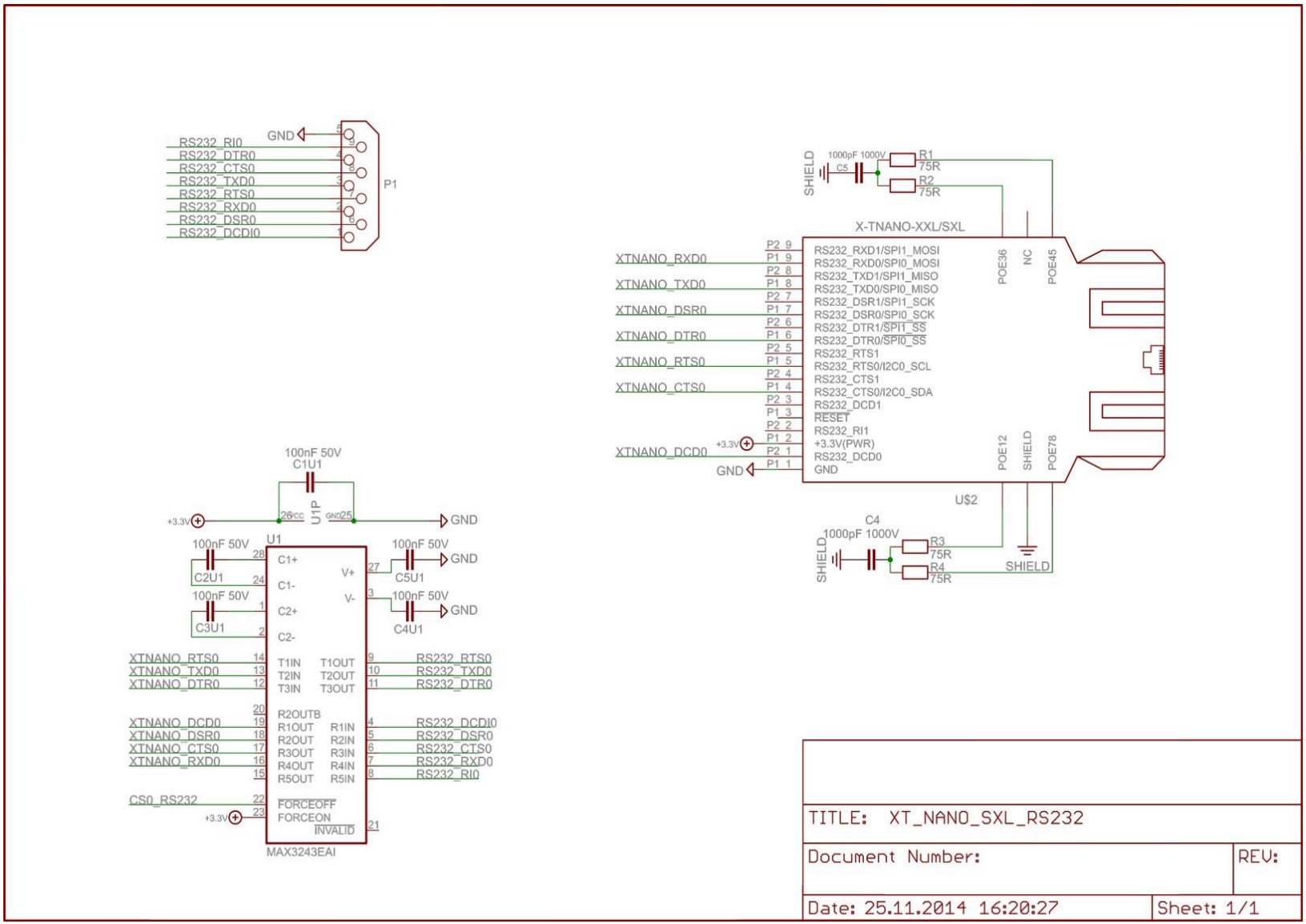
PIN	RS232	RS485 MAX3072	I2C	SPI	SD-CARD	DataFlash AT45xxx	LCD EADOGM	TTLIO	BUS
P1.4	CTS0		SDA0		WP			PIN4	
P1.5	RTS0		SCL0		CD		RS	PIN3	
P1.6	DTR0	RE/DE		SS0\	CS\	CS\	CS\	PIN5	
P1.7	DSR0			SCK0	SCLK	SCLK	SCLK	PIN6	
P1.8	TXD0	DI		MISO0	SO	SO		PIN2	
P1.9	RXD0	RO		MOSI0	SI	SI	MOSI	PIN1	
P2.1	DCD0							PIN7	
P2.2	RI1							PIN8	
P2.3	DCD1							PIN7	
P2.4	CTS1		SDA1		WP			PIN4	
P2.5	RTS1		SCL1		CD		RS	PIN3	
P2.6	DTR1	RE/DE		SS1\	CS\	CS\	CS\	PIN5	
P2.7	DSR1			SCK1	CLK	SCLK	SCLK	PIN6	
P2.8	TXD1	DI		MISO1	SO	SO		PIN2	
P2.9	RXD1	RO		MOSI1	SI	SI	MOSI1	PIN1	

BUS 1

BUS 2

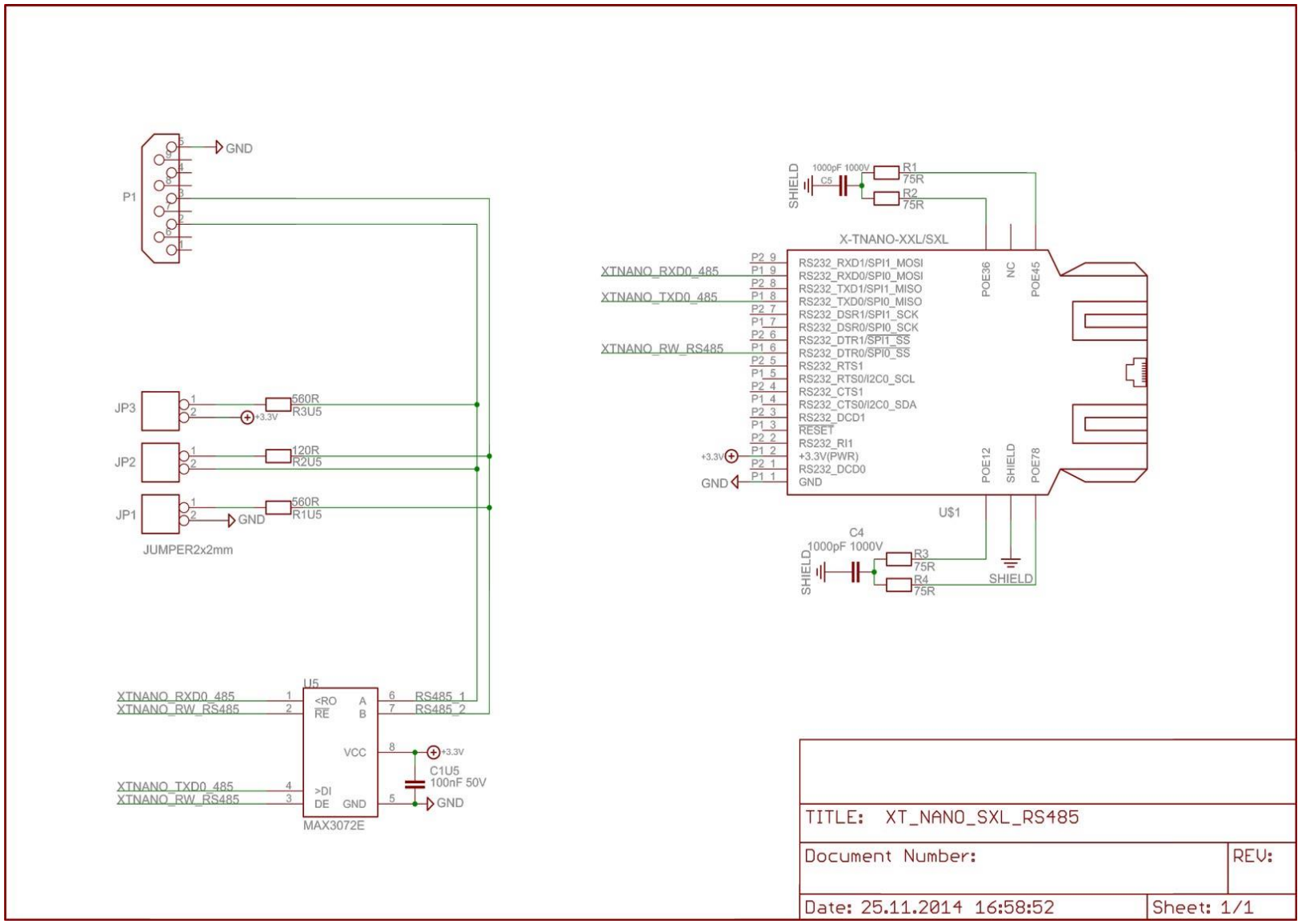
XT-NANO-SXL

Schematic RS232



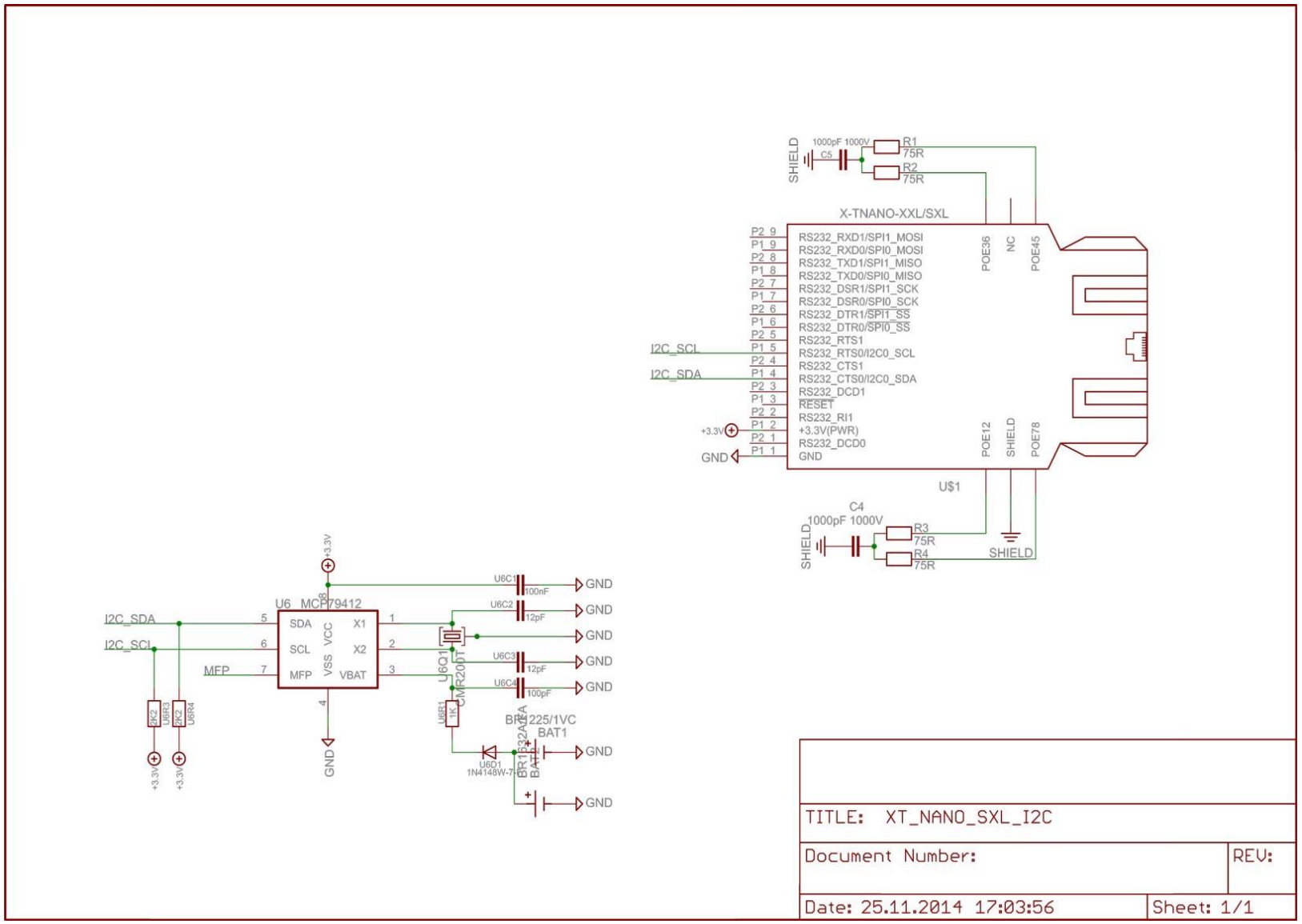
XT-NANO-SXL

Schematic RS485



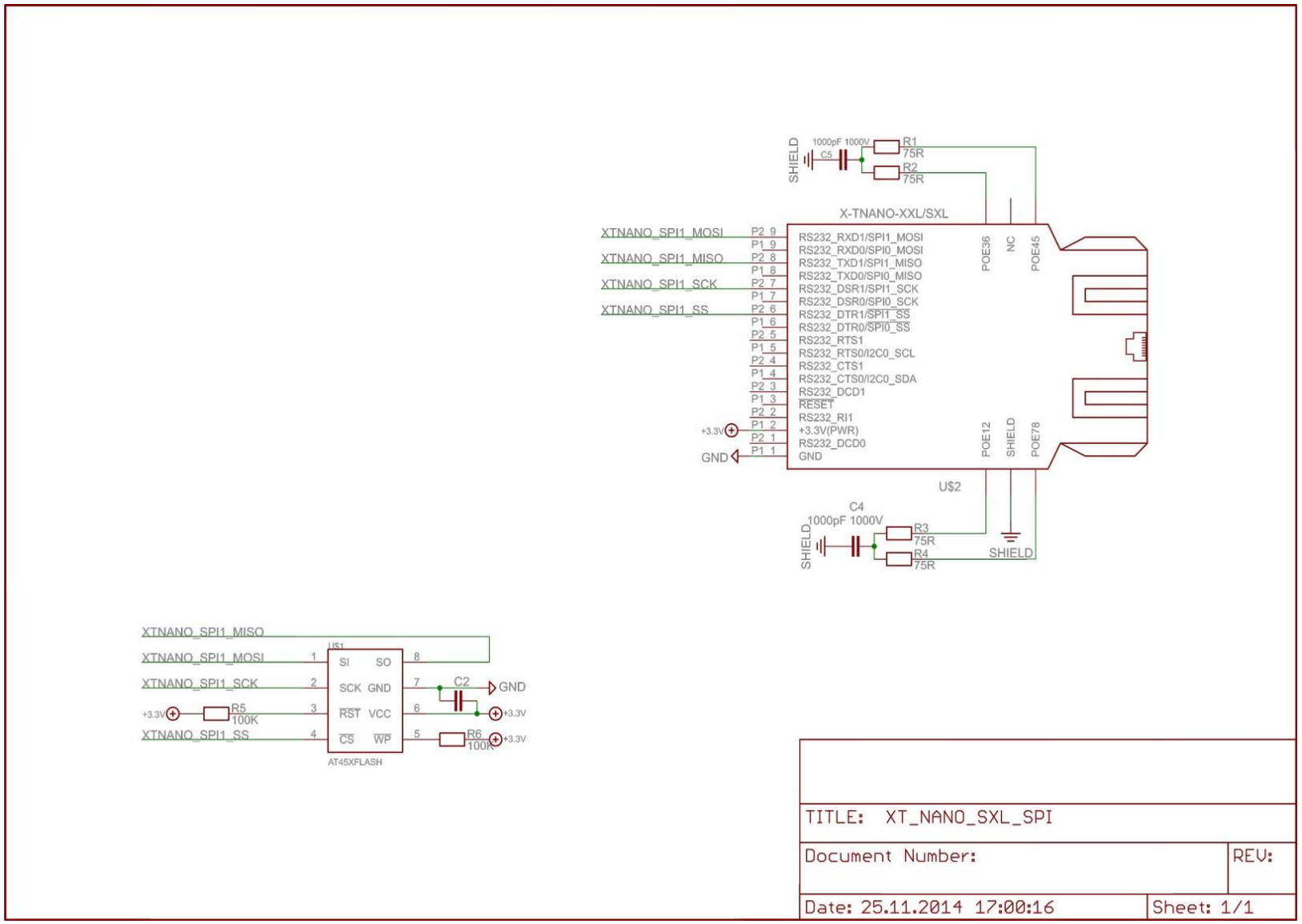
XT-NANO-SXL

Schematic I2C



XT-NANO-SXL

Schematic SPI



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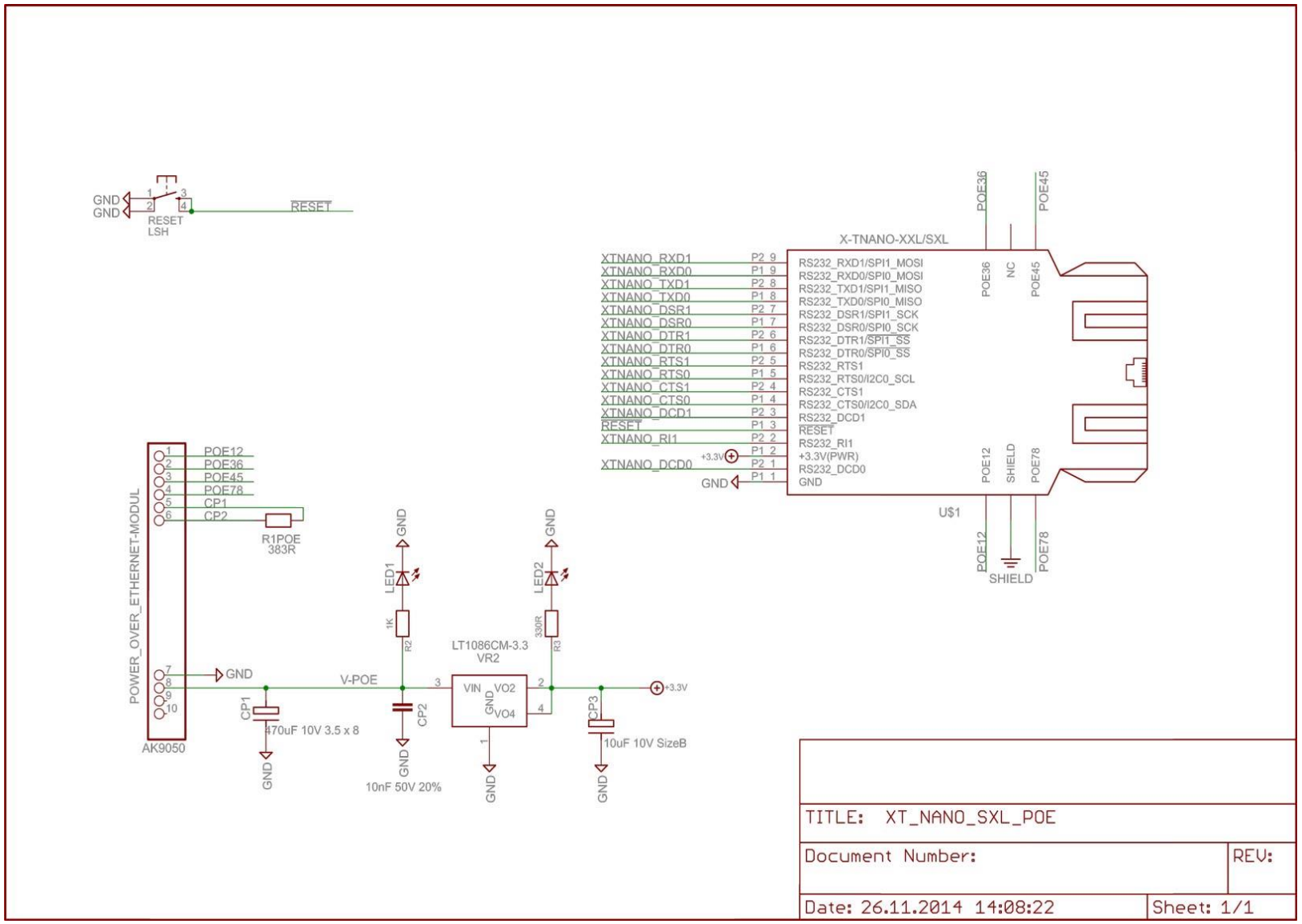
Schematic POE



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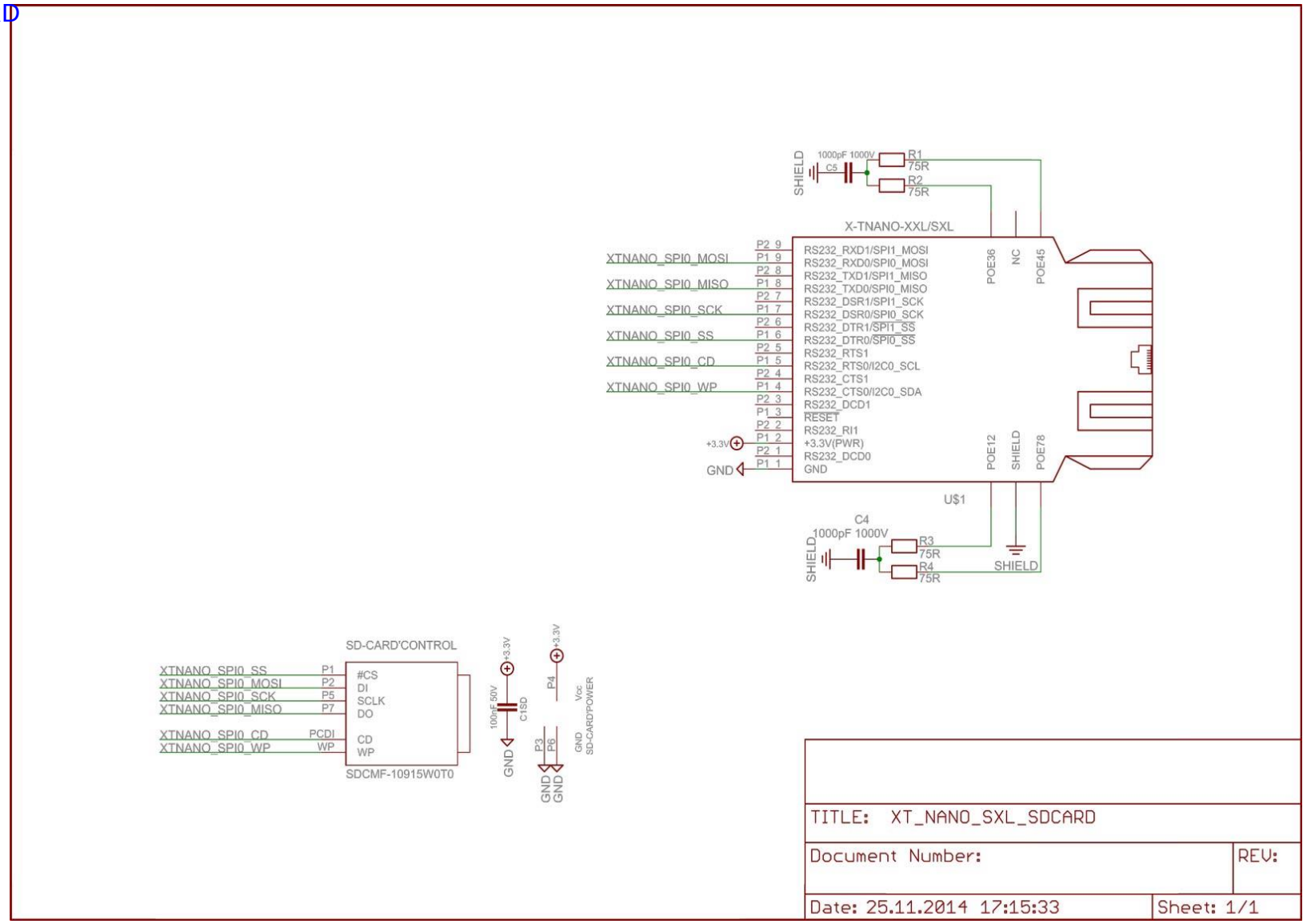
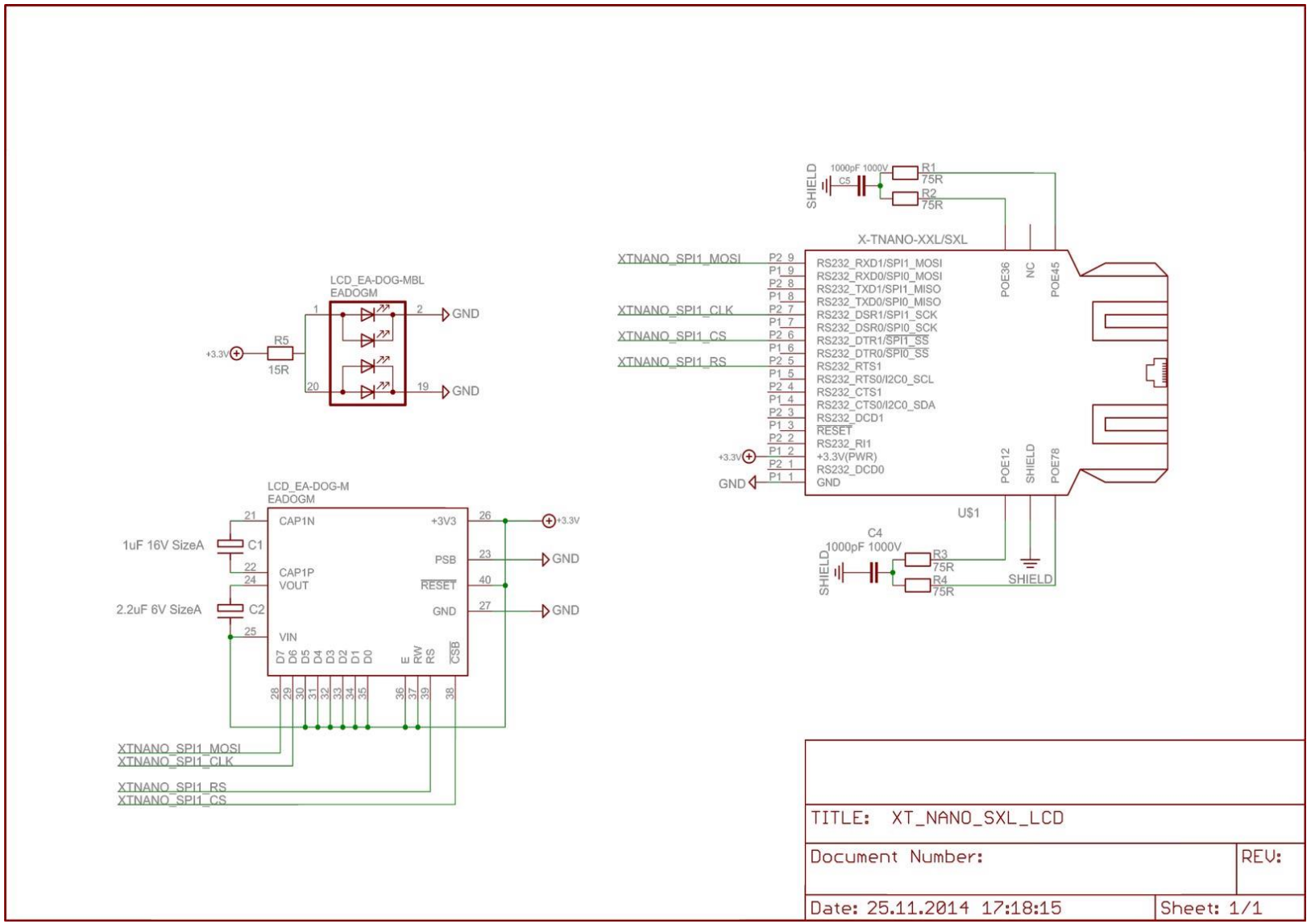
Schematic SD-CARD



XT-NANO-SXL

Schematic LCD



XT-PICO-SXL

Technical data

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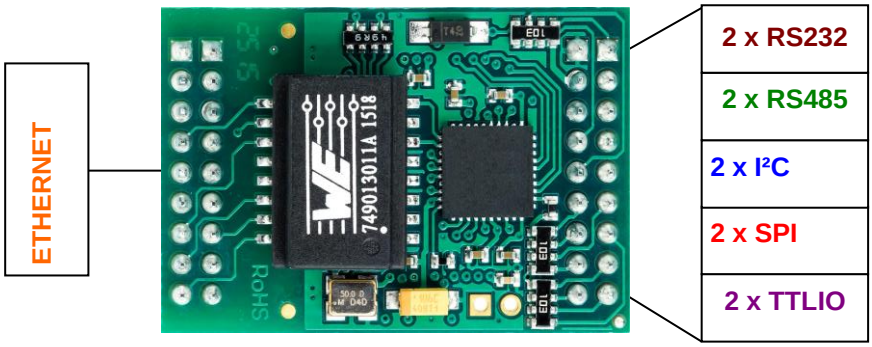

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Dimensions

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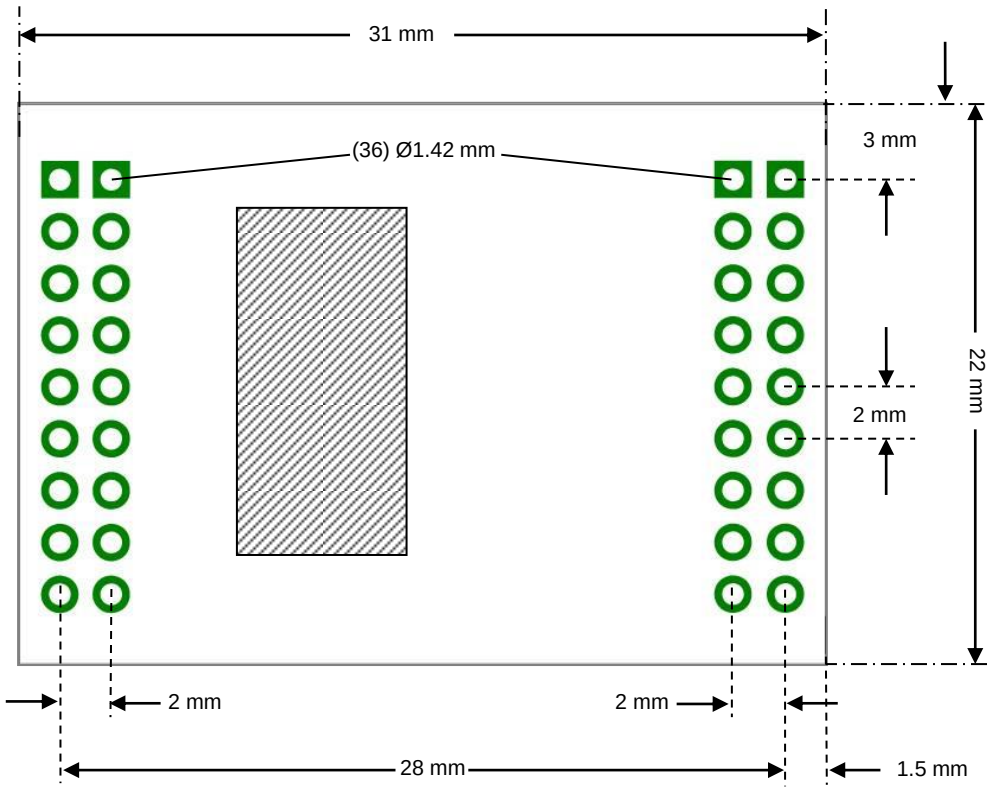
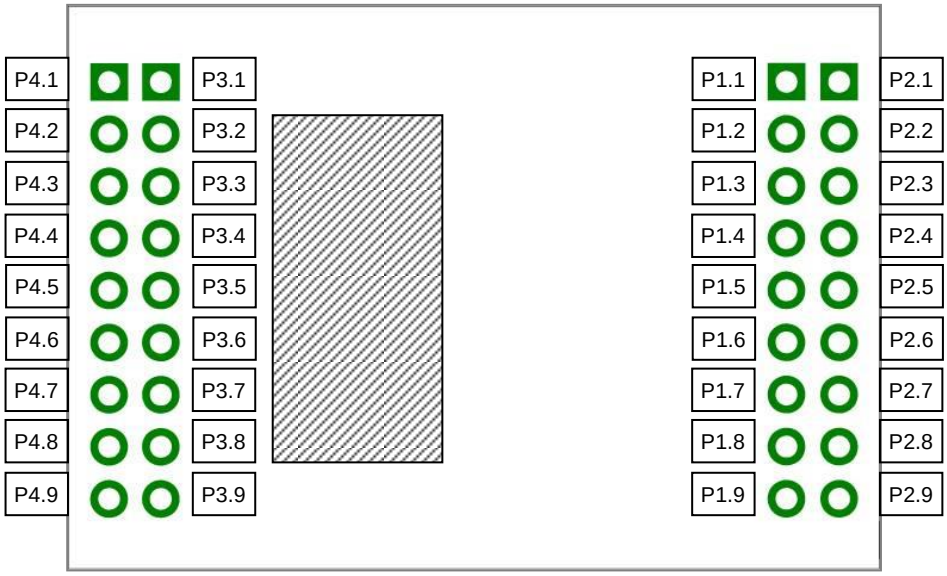


Side view

XT-PICO-SXL

PIN - Description

Top view



Absolute Maximum Ratings

Ambient temperature under bias.....	-40°C to +85°C
Storage temperature.....	-65°C to +150°C
Voltage on VDD…….....	-0.3V to +4.0V
Voltage on any 3.3 V pin……....	-0.3V to (VDD + 0.3V)
Voltage on any 5V tolerant pin ……	-0.3V to +5.5V

PIN – Description

PORT1:

PIN	Power	BUS	RS232	RS485	I2C	SPI	TTL-IO	alternate	Pullup	Type	VDD max
P1.1	GND									PWR	0
P1.2	VDD									PWR	+3.3 volts +5%
P1.3	RESET								10K	I	+5V tolerant
P1.4		1	CTS0		SDA0		PIN4_0		10K	I/O	+3.3 volts
P1.5		1	RTS0		SCL0		PIN3_0		10K	I/O	+3.3 volts
P1.6		1	DTR0	R/W0		SS0	PIN5_0		10K	I/O	+3.3 volts
P1.7		1	DSR0			SCK0	PIN6_0		10K	I/O	+3.3 volts
P1.8		1	TXD0	TXD0		MISO0	PIN2_0		10K	I/O	+3.3 volts
P1.9		1	RXD0	RXD0		MOSI0	PIN1_0		10K	I/O	+3.3 volts

PORT2:

PIN	Power	BUS	RS232	RS485	I2C	SPI	TTL-IO	alternate	Pullup	Type	VDD max
P2.1		1	DCD0				PIN7_0		10K	I/O	+5V tolerant
P2.2		2	RI1				PIN8_1		10K	I/O	+3.3 volts
P2.3		2	DCD1				PIN7_1	Factory	10K	I/O	+5V tolerant
P2.4		2	CTS1		SDA1		PIN4_1		10K	I/O	+5V tolerant
P2.5		2	RTS1		SCL1		PIN3_1		10K	I/O	+5V tolerant
P2.6		2	DTR1	R/W1		SS1	PIN5_1		10K	I/O	+3.3 volts
P2.7		2	DSR1			SCK1	PIN6_1		10K	I/O	+3.3 volts
P2.8		2	TXD1	TXD1		MISO1	PIN2_1		10K	I/O	+3.3 volts
P2.9		2	RXD1	RXD1		MOSI1	PIN1_1		10K	I/O	+3.3 volts

PORT3:

PIN	Ethernet	Type	Beschreibung
P3.1	LED_Link\	O	to LED's of the RJ45. No resistor necessary
P3.2	LED_ACT\	O	to LED's of the RJ45. No resistor necessary
P3.3	+3.3V	O	for LED's of the RJ45
P3.4	POE78	O	Connected to Pin7 and Pin8 of the RJ45
P3.5	POE45	O	Connected to Pin4 and Pin5 of the RJ45
P3.6	POE36	O	Connected to (RXCT) of the transformer
P3.7	POE12	O	Connected to (TXCT) of the transformer
P3.8	NC		
P3.9	NC		

PORT4:

PIN	RJ45	Type	Beschreibung
P4.1	NC		
P4.2	RJ45_8	I	direct from RJ45 Pin8
P4.3	RJ45_7	I	direct from RJ45 Pin7
P4.4	RJ45_6	I	direct from RJ45 Pin6
P4.5	RJ45_5	I	direct from RJ45 Pin5
P4.6	RJ45_4	I	direct from RJ45 Pin4
P4.7	RJ45_3	I	direct from RJ45 Pin3
P4.8	RJ45_2	I	direct from RJ45 Pin2
P4.9	RJ45_1	I	direct from RJ45 Pin1

= ActivLow

XT-PICO-SXL

Connection Diagram

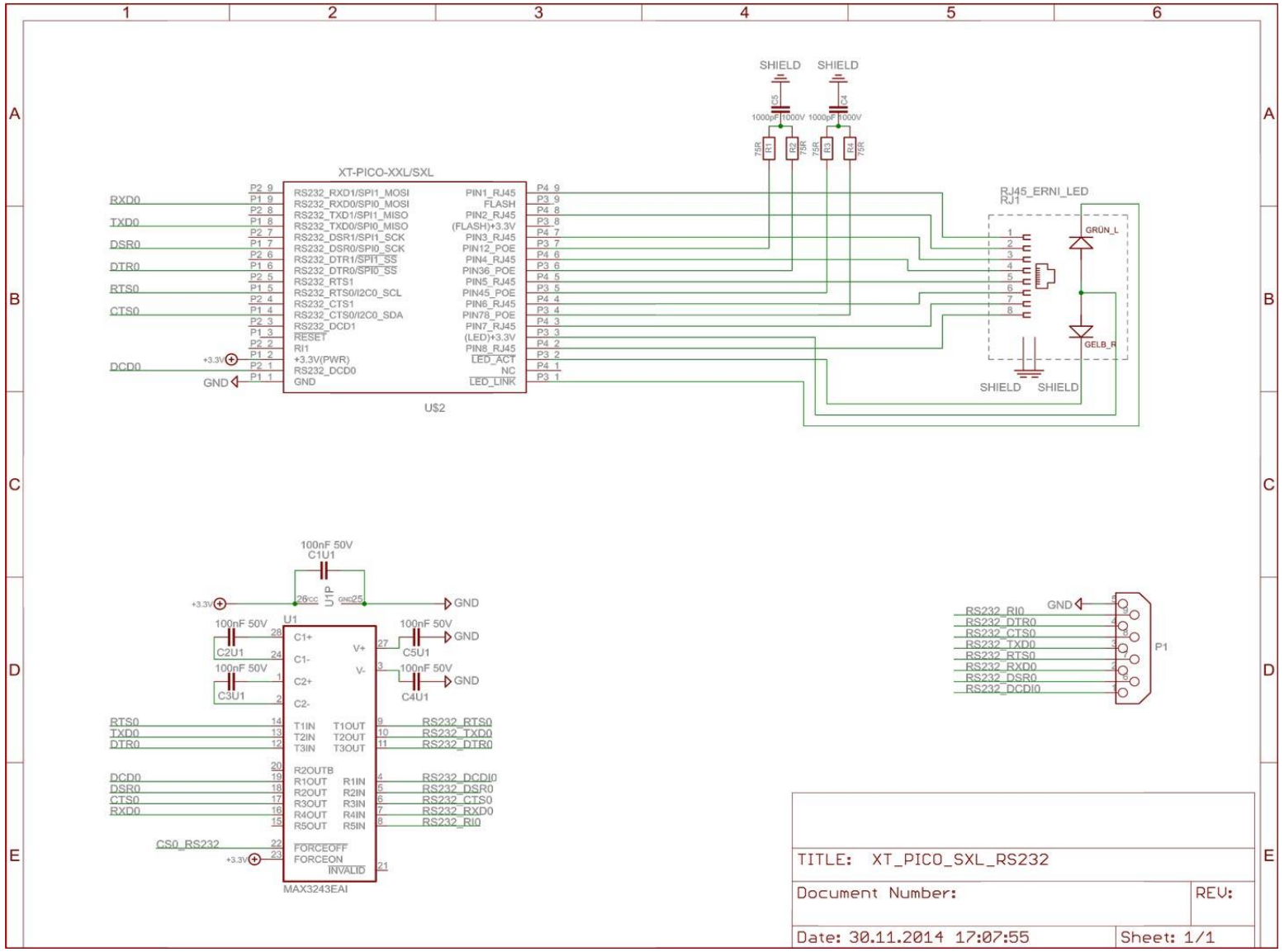
PIN	RS232	RS485 MAX3072	I2C	SPI	SD-CARD	DataFlash AT45xxx	LCD EADOGM	TTLIO	BUS
P1.4	CTS0		SDA0		WP			PIN4	
P1.5	RTS0		SCL0		CD		RS	PIN3	
P1.6	DTR0	RE/DE		SS0\	CS\	CS\	CS\	PIN5	
P1.7	DSR0			SCK0	SCLK	SCLK	SCLK	PIN6	
P1.8	TXD0	DI		MISO0	SO	SO		PIN2	
P1.9	RXD0	RO		MOSI0	SI	SI	MOSI	PIN1	
P2.1	DCD0							PIN7	
P2.2	RI1							PIN8	
P2.3	DCD1							PIN7	
P2.4	CTS1		SDA1		WP			PIN4	
P2.5	RTS1		SCL1		CD		RS	PIN3	
P2.6	DTR1	RE/DE		SS1\	CS\	CS\	CS\	PIN5	
P2.7	DSR1			SCK1	CLK	SCLK	SCLK	PIN6	
P2.8	TXD1	DI		MISO1	SO	SO		PIN2	
P2.9	RXD1	RO		MOSI1	SI	SI	MOSI1	PIN1	

BUS 1

BUS 2

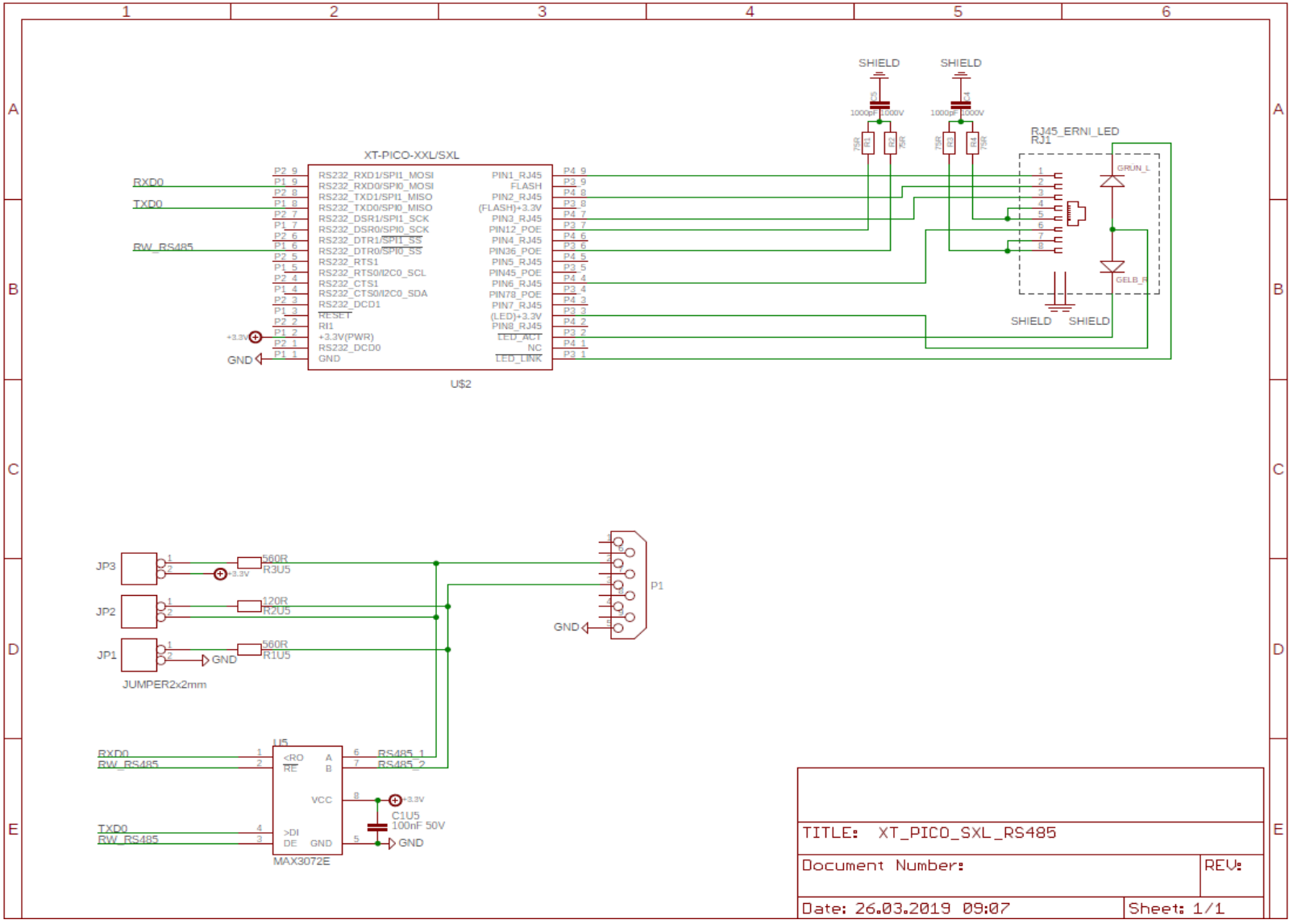
XT-PICO-SXL

Schematic RS232



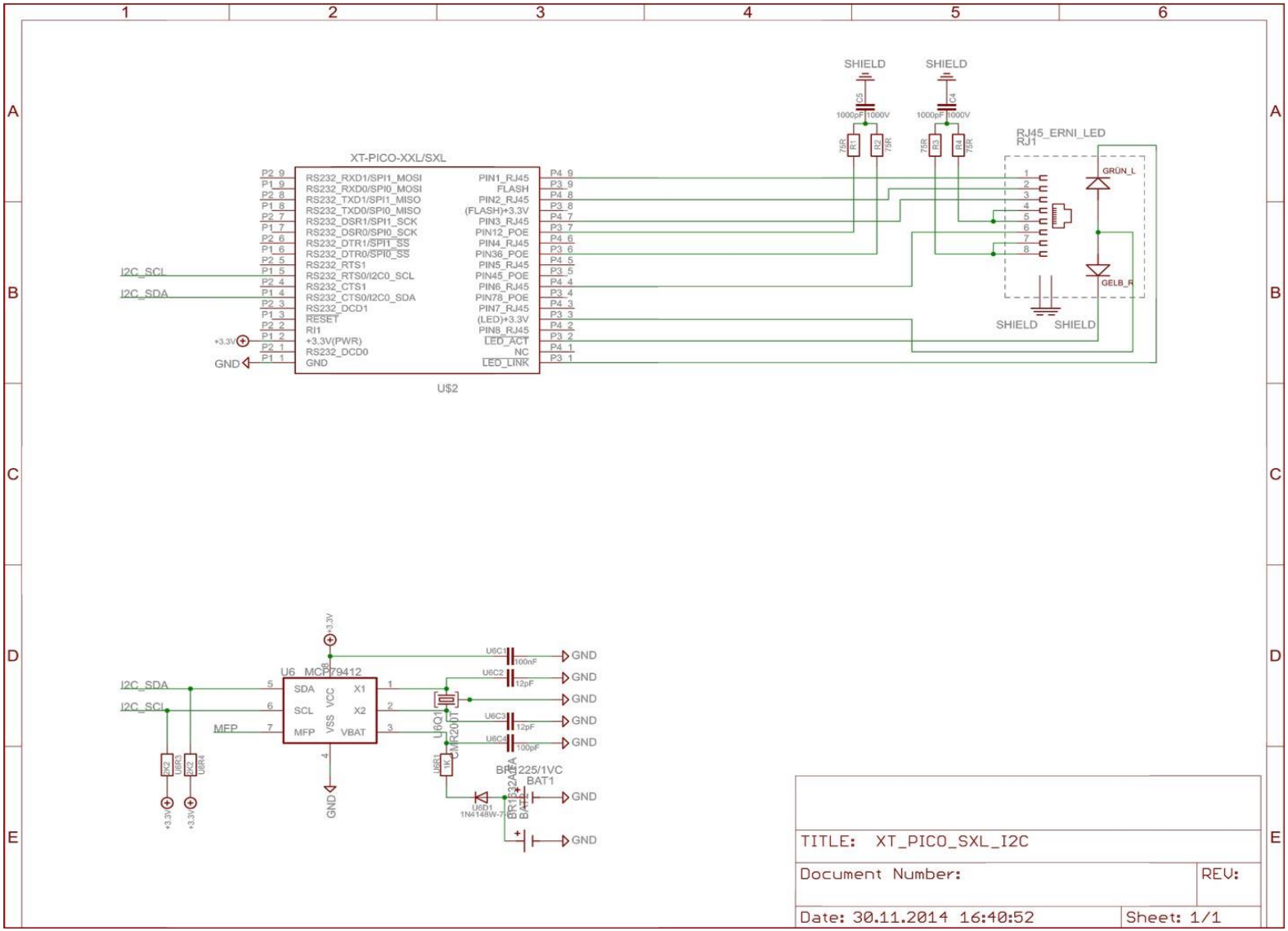
XT-PICO-SXL

Schematic RS485



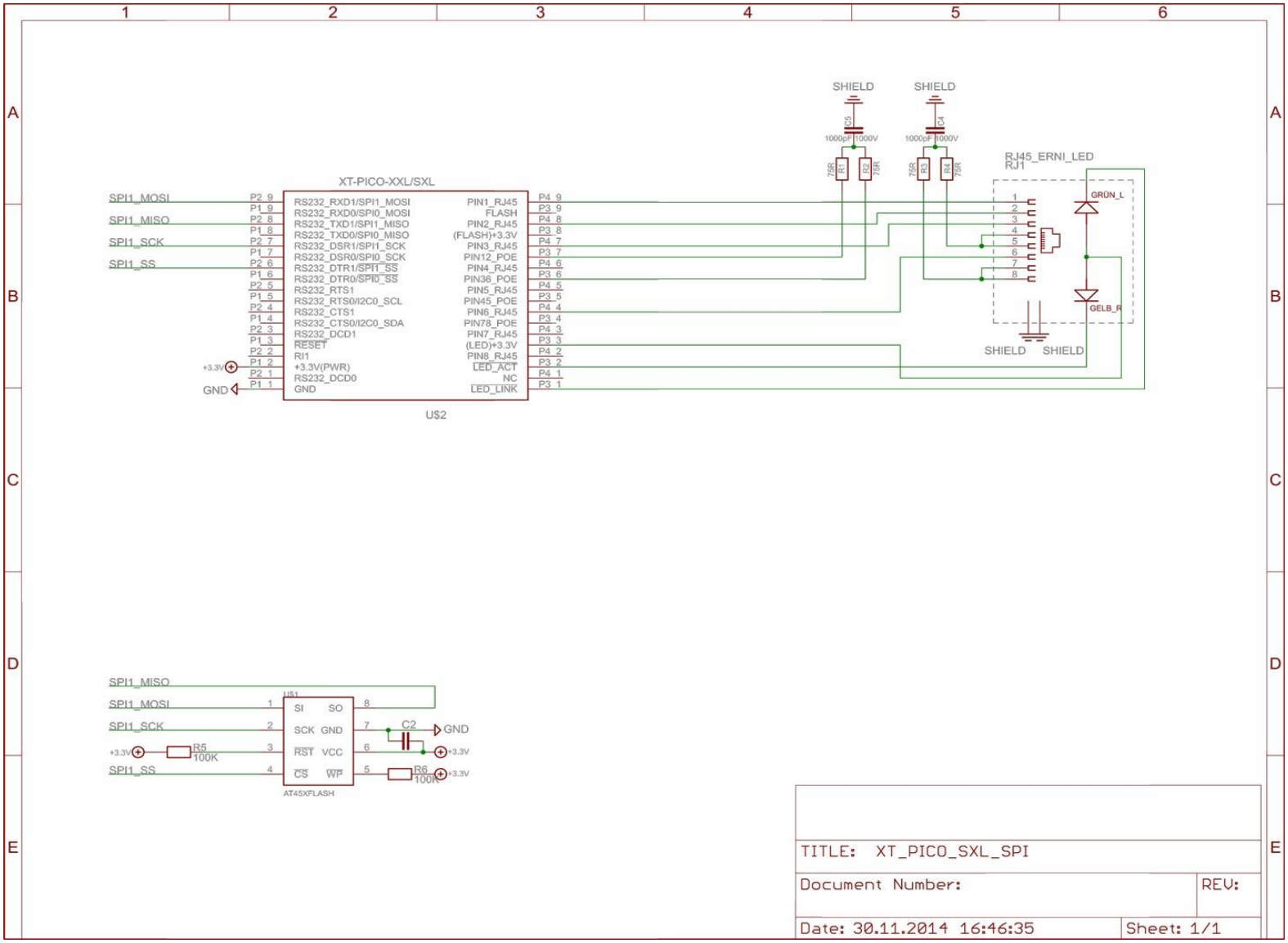
XT-PICO-SXL

Schematic I2C



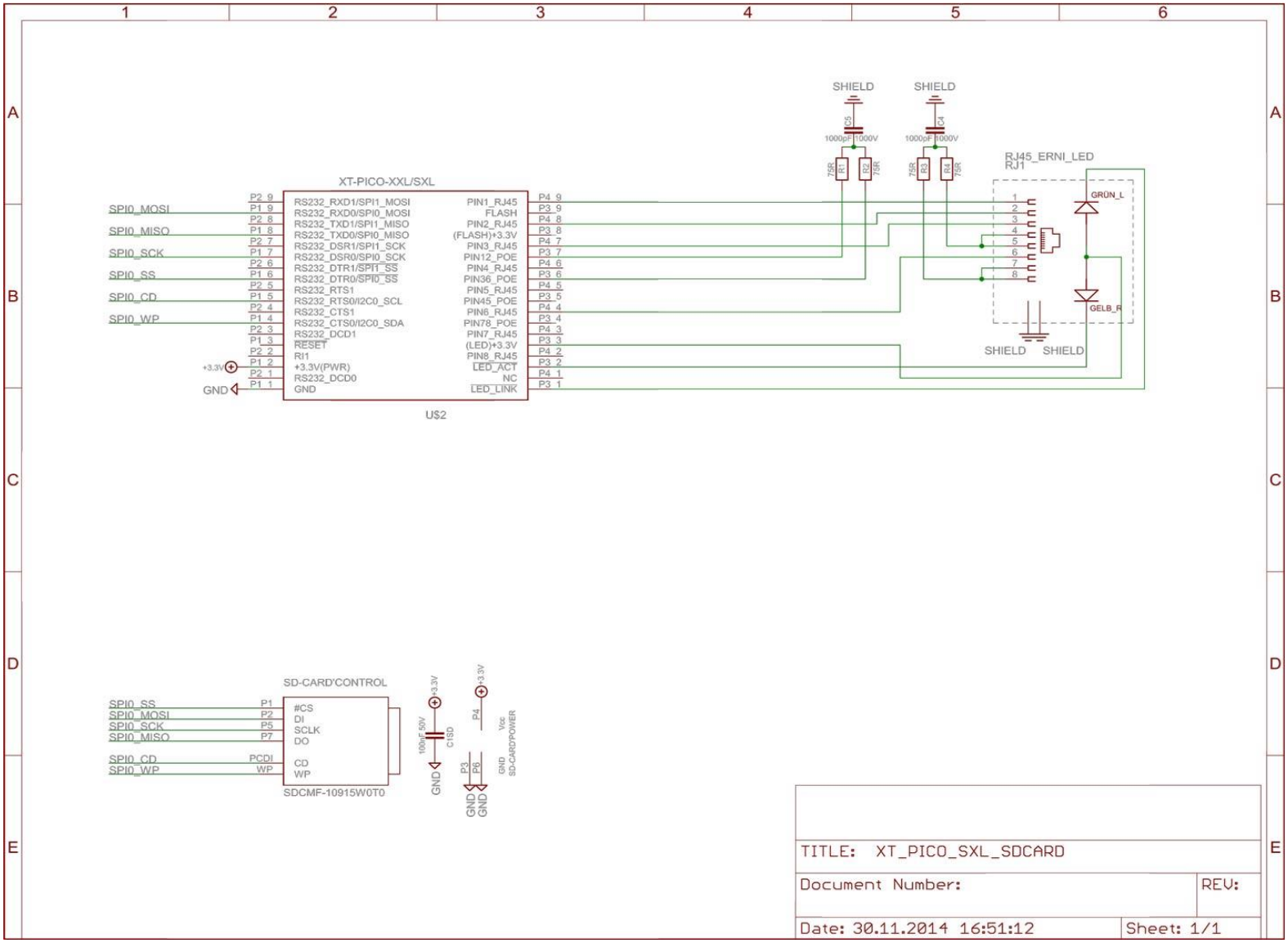
XT-PICO-SXL

Schematic SPI



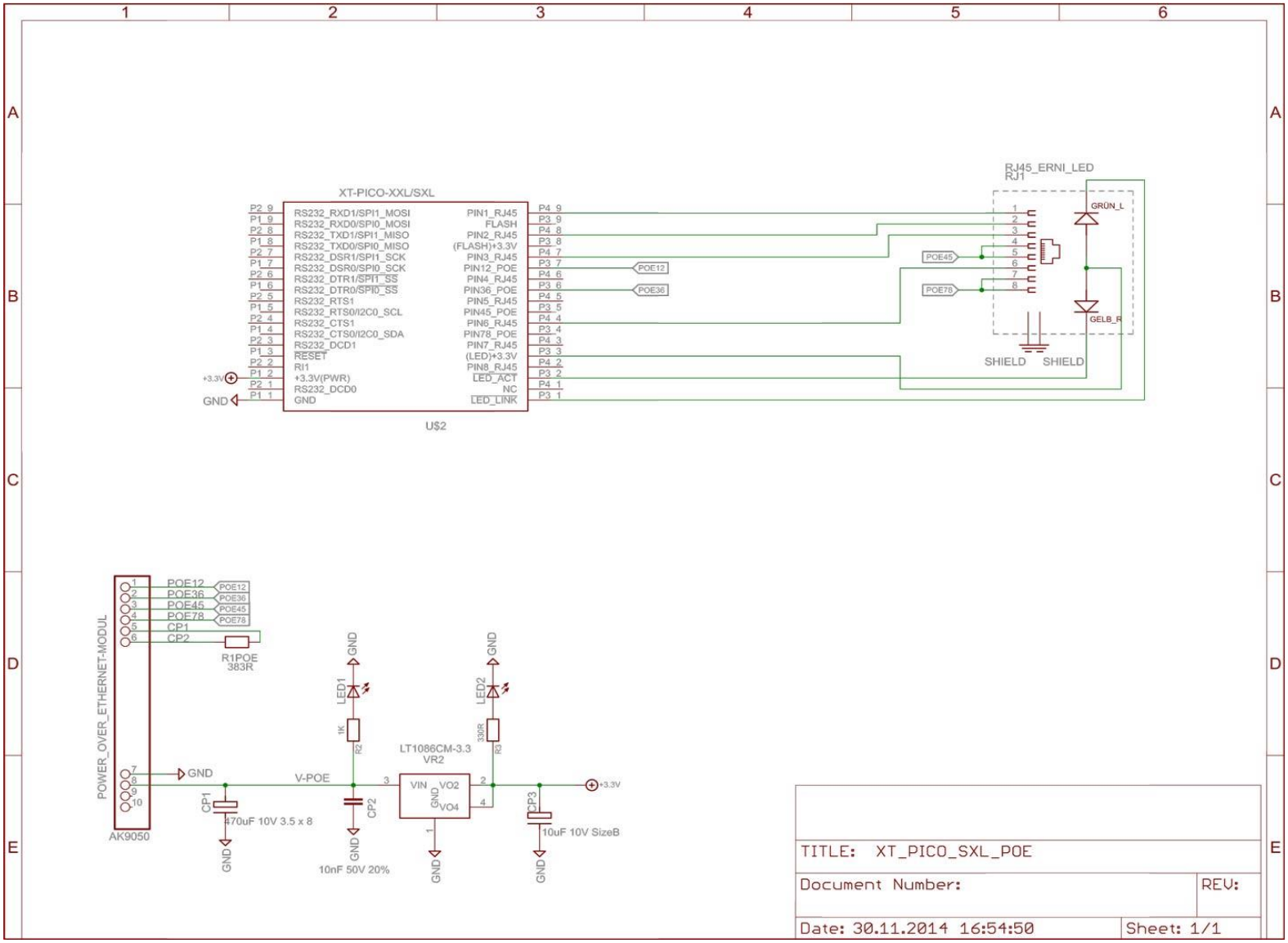
XT-PICO-SXL

Schematic SD-CARD



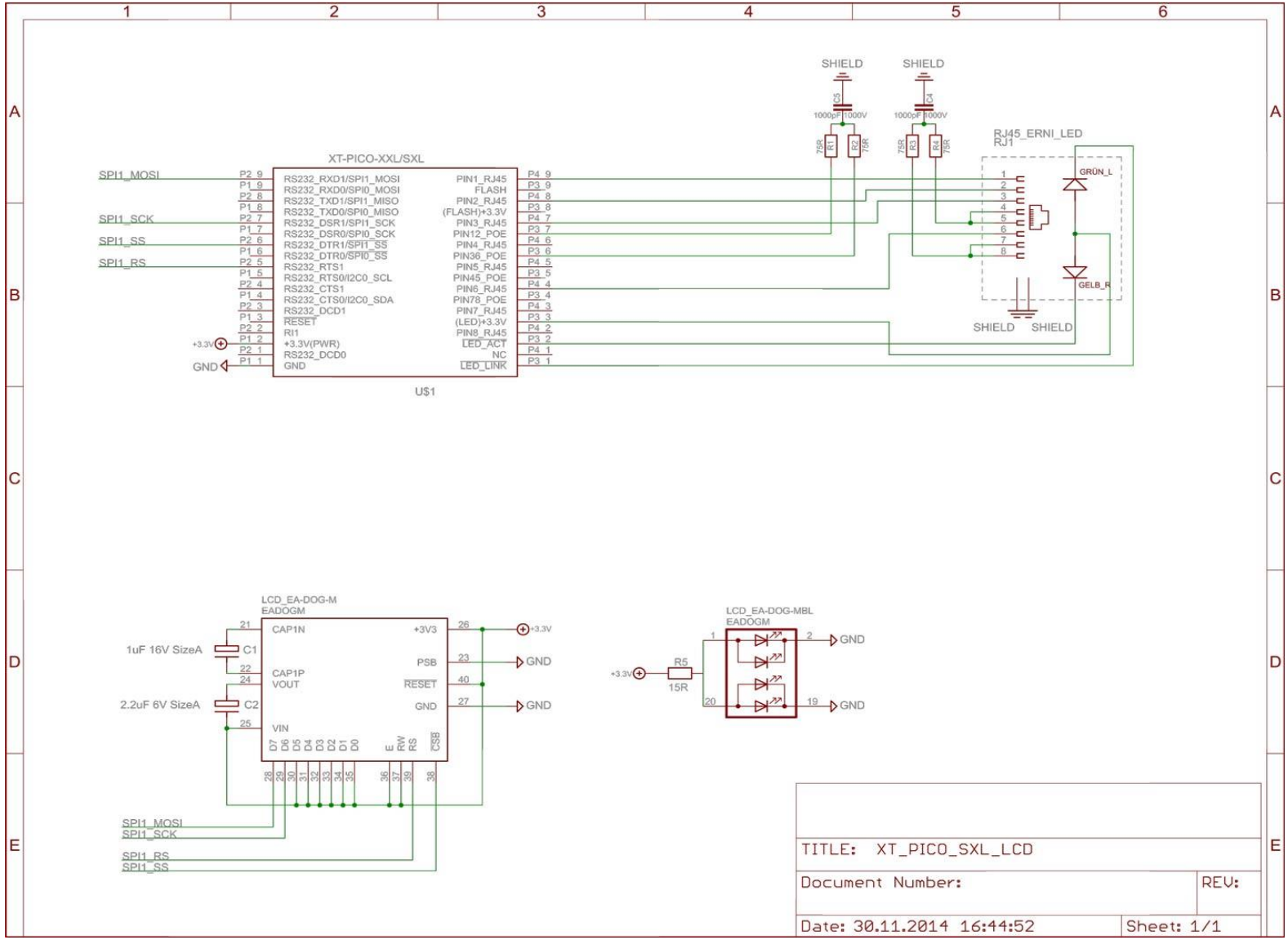
XT-PICO-SXL

Schematic POE



XT-PICO-SXL

Schematic LCD



Settings

General Information

In the Design Guide only the settings of the physical interface are described. Please find all other settings of the embedded module in the main manual of the AK-XXL/SXL products.

Changing over the physical interface

Generally, there are 2 physical interfaces available. In each menu **“Interface→xxx→Config Menu”** there is always the menu item **“BUS”**. You can reconfigure each bus by entering an admissible value, such as e.g.**RS232, RS485, I2C, SPI, LCD, SDCARD** or **DFCARD** into the menu item "Bus". However, only after having restarted the embedded module, the selected BUS is activated and can be configured.

If you would like to set an I2C interface, configure e.g. **“I2C”** in the menu item **“BUS”** of the just activated interface and restart the embedded module. Subsequently you can perform all other settings, such as e.g.“Baudrate” etc.

Changing the values

Please find either a number or a letter in front of each adjustable value. Followed by an equal sign and a short description. Then the set value is displayed.

Display: `1 = Baud rate = 9600`

In order to change this value, please enter the figure and the letters, then an equal sign followed by the new value and press the button “ENTER”. All entries without space characters.

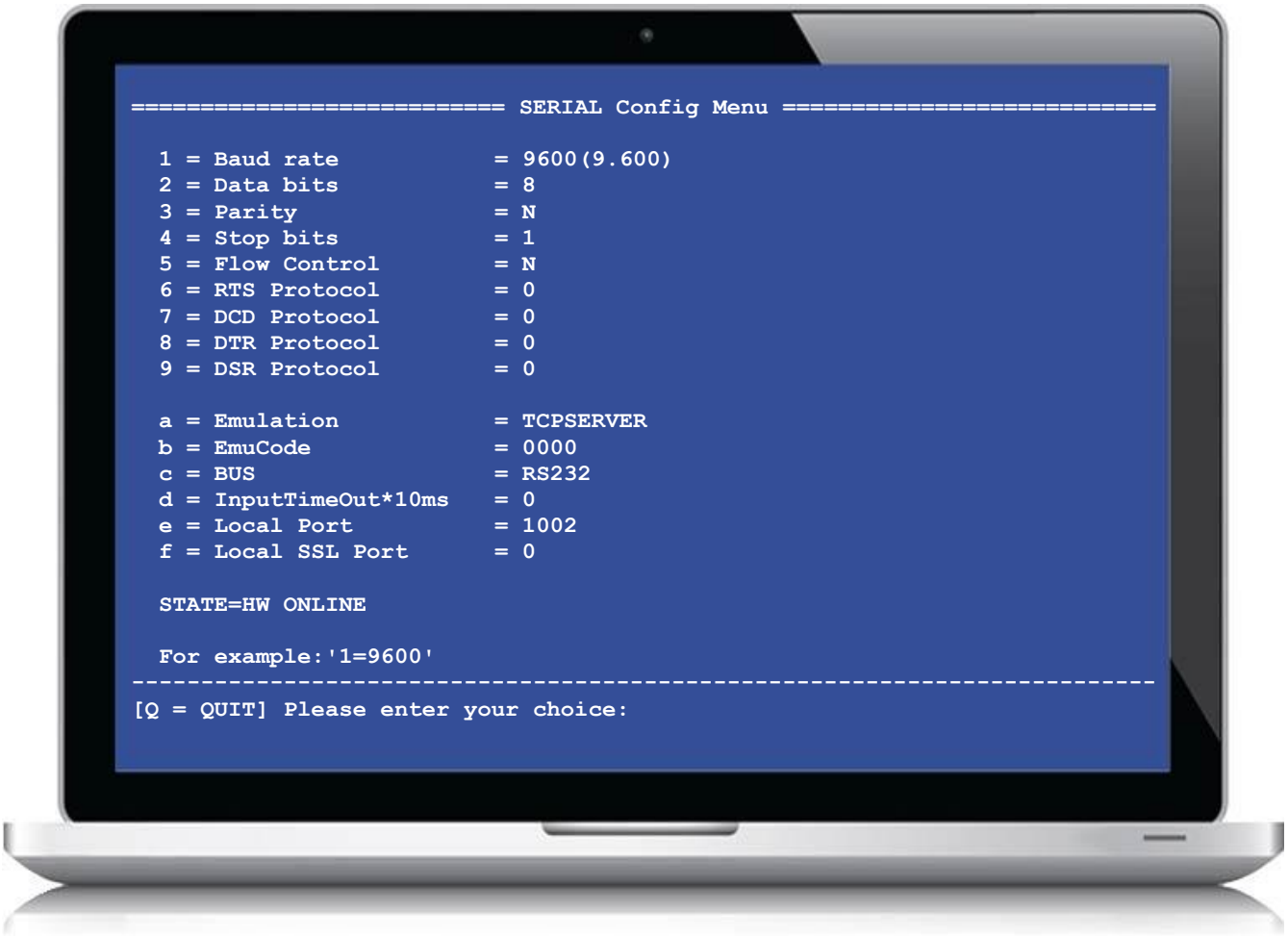
Entry: `1=19200 + "ENTER"`

Then the new value is displayed. If this is not the case, please either check your entry or if the value can be set at all.

Note:
For all speed settings, a value is additionally displayed in brackets. This value indicates the actual value. Due to the used quartz it is sometimes not possible to attain the desired speed.

RS232

RS232 Configuration



1 = Baud rate: Enter the baud rate of your terminal here.
The baud rate can be set variably up to 2.5 MBits.

2 = Data bits: Enter the number of you data bits here.
8
7

3 = Parity: Parity
N=NONE
O=ODD
E=EVEN
M=MARK
S=SPACE

4 = Stop bits: Number of stop bits,
1
2

5 = FlowControl Switches the flow control on or off.
N = None
H = Hardware = RST/CTS
S = Software = XON/XOFF

RS232

RS232 Configuration

6 = RTS Protocol Control fo the RTS line (outlet)

0	= RTS Always ON
1	= RTS Follows CTS
2	= RTS Follows DSR
3	= RTS Indicates Connection TTL = LOW
4	= RTS Indicates Connection TTL = HIGH
5	= RTS Always OFF

7 = DCD Protocol Control of the DCD line (outlet)

0	= DCD (inlet) no function
10	= DCD (outlet) Allways ON
11	= DCD (outlet) Indicates Connection TTL = LOW
12	= DCD (outlet) Follows DSR
13	= DCD (outlet) Indicates Connection TTL = HIGH
15	= DCD (outlet) Allways OFF

8 = DTR Protocol Control of the DTR line (outlet)

0	= DTR Always ON
1	= DTR Indicate Connection TTL = LOW
2	= DTR Follows DSR
3	= DTR Indicate Connection TTL = HIGH
5	= DTR Always OFF

9 = DSR Protocol Control of the DSR line (inlet)

0	= DSR No Control
1	= DSR Control Incoming
2	= DSR Clear Connection
3	= DSR Control Incoming and DSR Clear Connection

a = Emulation It is possible to use the following emulations:

TCPSERVER	= always active
MODEM	= Modem Emulation
EMAIL	= E-Mail Emulation
TCPCLIENT	=
UDPCLIENT	=
UDPSERVER	=

b = Emucode You can release customized functions in this menu item.

c = BUS **RS232**

d = InputTimeOut Determine how long the device server shall wait until the data are sent which are received by e.g. the serial interface. This value is important if the packages are not completely received at the target, since the data are more rapidly sent to the network by the device server than they will be received by the terminal. If you enter e.g. 2, then the interface will wait for 20 ms after having received the last byte on the serial interface and only sends the data in a package.

e = Local Port You can define the TCP/IP or UDP Port here which is admitted for the corresponding serial interface.

f = Local SSL Port Has the same function as the Local Port, but it is only used for the encrypted SSL communication

Note:
All other menus are described in the main manual of the AK-XXL/SXL products.

RS232

RS232 DataControl

Special ports

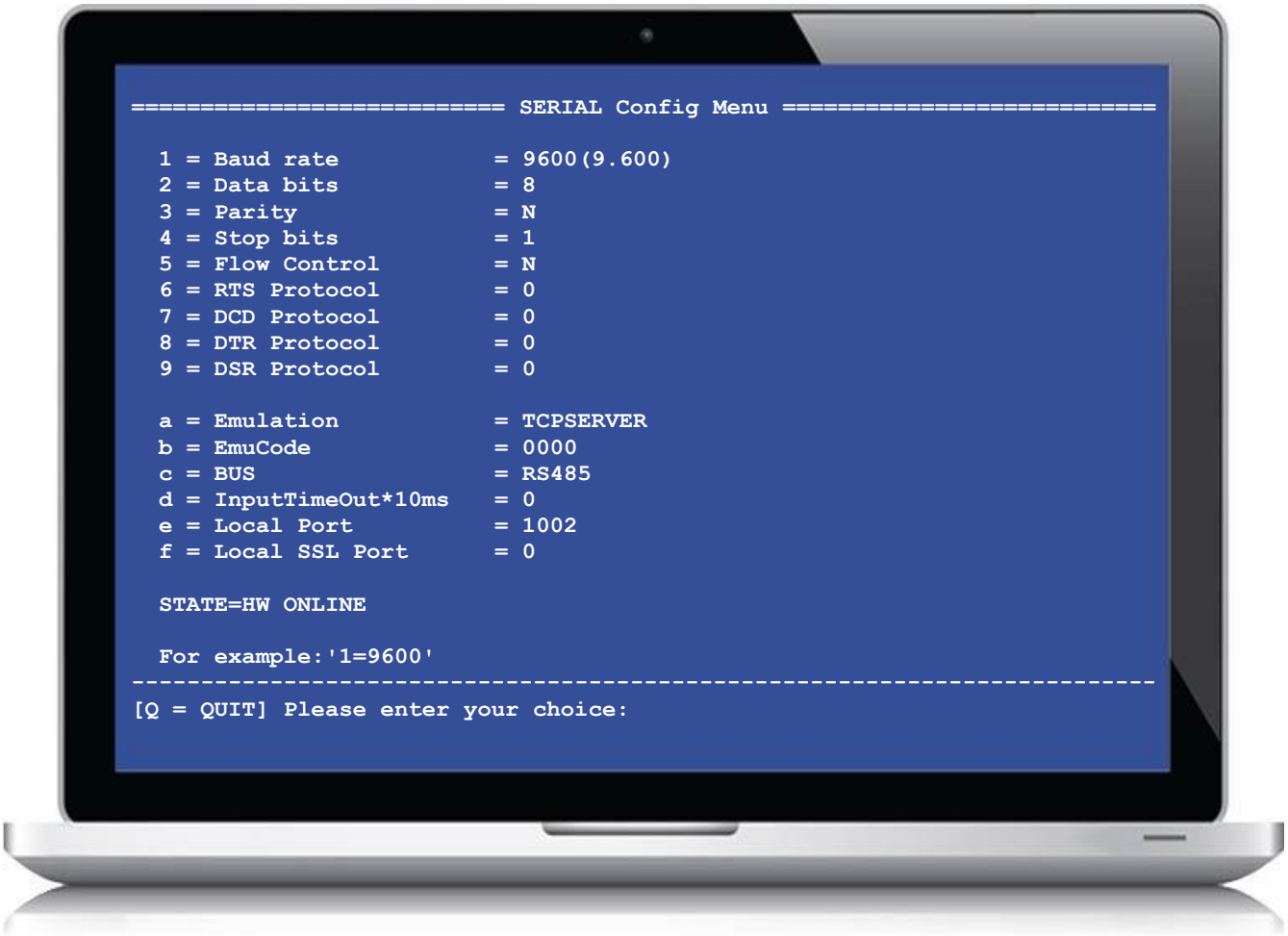
11011: Using this port it is possible to control all signals, baud rates, data bits and flow controls of the serial **Interface 1** by means of your software. There is an exact additional description for this port.

22022: Using this port it is possible to control all signals, baud rates, data bits and flow controls of the serial **Interface 2** by means of your software. There is an exact additional description for this port.

Note:
The exact description as well as the programming instructions can be obtained from AK-NORD.

RS485

RS485 Configuration



1 = Baud rate: Enter the baud rate of your terminal here.
The baud rate can be set variably up to **2.5 MBits**.

2 = Data bits: Enter the number of you data bits here.
8
7

3 = Parity: Parity

N	**=**	**NONE**
O	=	ODD
E	=	EVEN
M	=	MARK
S	=	SPACE

4 = Stop bits: Number of stop bits,
1
2

5 = FlowControl Switches the flow control on or off.
N = None
H = Hardware = RST/CTS
S = Software = XON/XOFF
No effect for a 2-wire transfer.

RS485

RS485 Configuration

6 = RTS Protocol

Control fo the RTS line (outlet)
0 = RTS Always ON
1 = RTS Follows CTS
2 = RTS Follows DSR
3 = RTS Indicates Connection TTL = LOW
4 = RTS Indicates Connection TTL = HIGH
5 = RTS Always OFF
No effect for a 2-wire transfer.

7 = DCD Protocol

Control of the DCD line
0 = DCD (inlet) no function
10 = DCD (outlet) Allways ON
11 = DCD (outlet) Indicates Connection TTL = LOW
12 = DCD (outlet) Follows DSR
13 = DCD (outlet) Indicates Connection TTL = HIGH
15 = DCD (outlet) Allways OFF
No effect for a 2-wire transfer.

8 = DTR Protocol

no function
DTR is used as control line for the RS485 ICs

9 = DSR Protocol

Control of the DSR line (inlet)
0 = DSR No Control
1 = DSR Control Incoming
2 = DSR Clear Connection
3 = DSR Control Incoming and DSR Clear Connection
No effect for a 2-wire transfer.

a = Emulation

It is possible to use the following emulations:
TCPSERVER = always active
MODEM = Modem Emulation
EMAIL = E-mail Emulation
TCPCLIENT =
UDPCLIENT =
UDPSERVER =

b = Emucode

You can release customized functions in this menu item.

c = BUS

RS485

d = InputTimeOut

Determine how long the device server shall wait until the data are sent which are received by e.g. the serial interface. This value is important if the packages are not completely received at the target, since the data are more rapidly sent to the network by the device server than they will be received by the terminal. If you enter e.g. 2, then the interface will wait for 20 ms after having received the last byte on the serial interface and only sends the data in a package.

e = Local Port

You can define the TCP/IP or UDP Port here which is admitted for the corresponding serial interface.

f = Local SSL Port

Has the same function as the Local Port, but it is only used for the encrypted SSL communication

Note:
All other menus are described in the main manual of the AK-XXL/SXL products.

Special ports

11011: Using this port it is possible to control all signals, baud rates, data bits and flow controls of the serial **Interface 1** by means of your software. There is an exact additional description for this port.

22022: Using this port it is possible to control all signals, baud rates, data bits and flow controls of the serial **Interface 2** by means of your software. There is an exact additional description for this port.

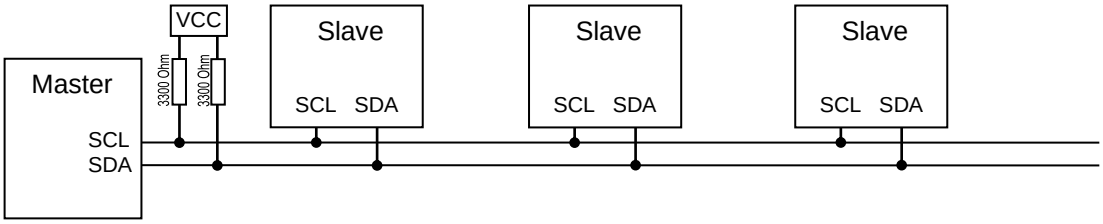
Note:
The exact description as well as the programming instructions can be obtained from AK-NORD.

I2C

I2C Functionality

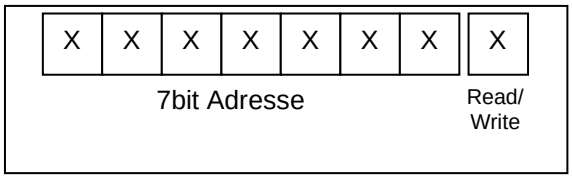
The I2C-BUS is a serial 2-wire bus to easily connect several ICs. The two necessary lines are the "Serial Clock Line SCL" and the "Serial Data Line SDA". A bidirectional connection is possible. It is possible to address several "Slaves" from one "Master".

Connection:



Note:
The size of the 3K3 pullup resistances indicated in this example are depending on the cable length and on the used I2C components. Please check in any case the signals using an oscilloscope and adapt these resistances, if required.

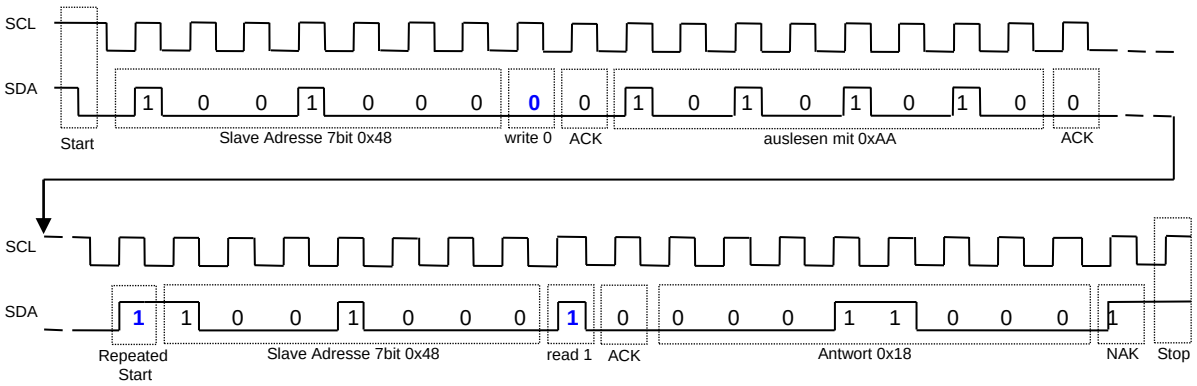
Adressierung:



The first byte which the "Master" sends, includes the address of the "Slave". It is a 7bit address. The 8th bit indicates if the Master would like to read or write. The data transmission is performed after the first byte.

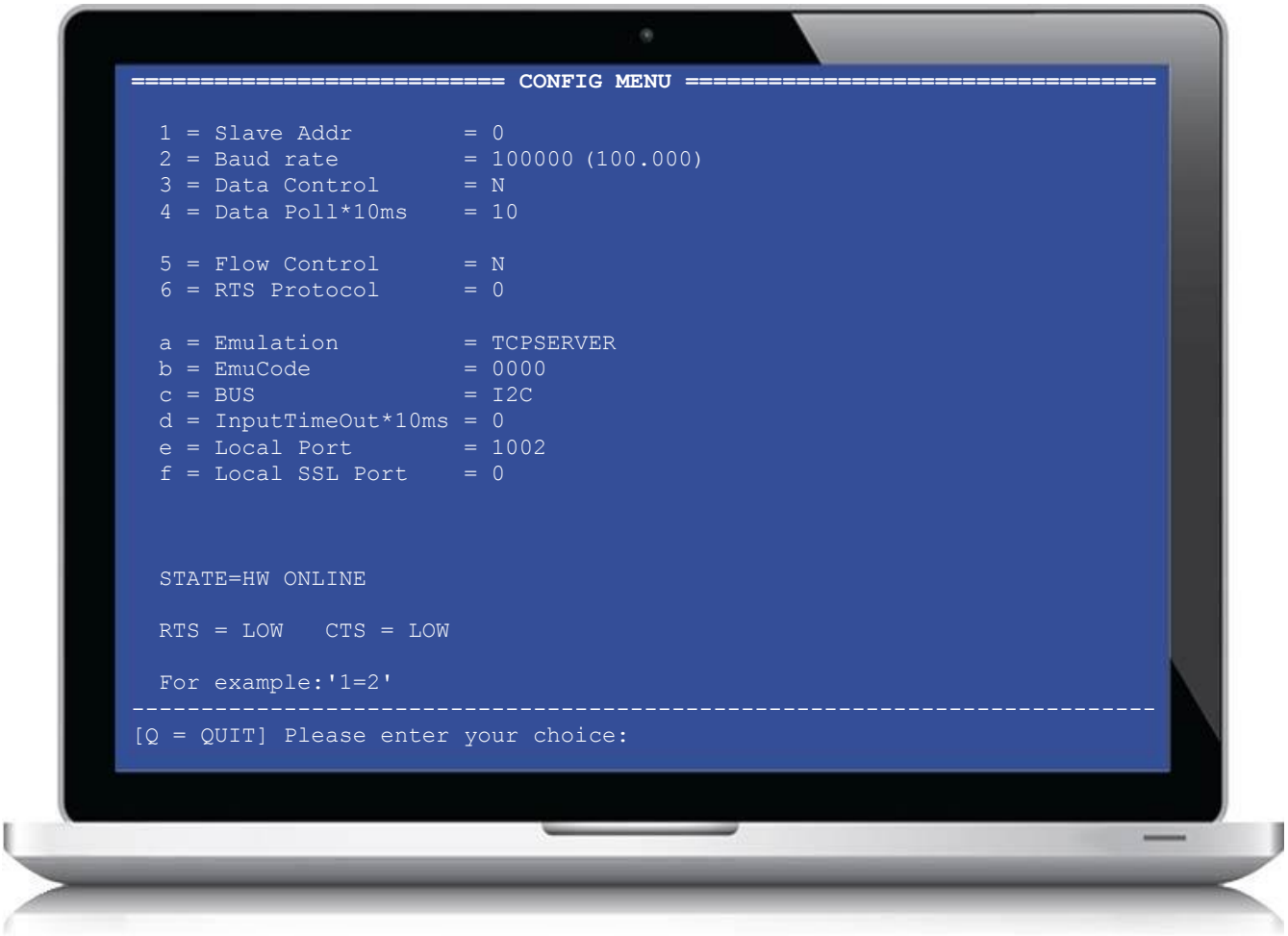
Example: Query of a thermometer (DS1621) with the address 0x48.

First,the write command is transmitted (7Bit=address and 1Bit(0)=Write). It is followed by an acknowledgement (ACK) of the thermometer. With the command byte 0xAA the current temperature of the DS1621 is prompted. After another "ACK" a "Repeated-Start" is initiated and the reading of the temperature value via a read command (7Bit=address and 1Bit=(1)Read) is initiated. After another "ACK" the temperature value 0x18 follows which is converted to 24° Celsius. If no other bytes are sent, a "NACK" is sent.



I2C

I2C Configuration



1 = Slave Addr	Address of the Slave. Possible value 0-127
2 = Baud rate	Clock frequency on the I2C bus. The clock frequency can be set variably up to 2.5 MBits.
3 = Data Control	N = No data control (refer to DataControl) D = DataControl (refer to DataControl)
4 = Data Poll*10ms	Only if the DataControl=N is activated. Here the slave will check every xxx ms, if data are available.
5 = Flow Control	No function
6 = RTS Protocol	No function

I2C

I2C Configuration

a = Emulation	It is possible to use e.g. the following emulations: TCPCLIENT UDPCLIENT UDPSERVER TCPSERVER
emulations	***Please find application examples and further explanations regarding the in the main manual of the AK-XXL/SXL products.***
b = Emucode	for customized functions
c = BUS	**I2C**
e = Local Port	You can define the TCP/IP or UDP Port here which is admitted for the corresponding serial interface.
f = Local SSL Port	Has the same function as the Local Port, but it is only used for the encrypted SSL communication

Note:
All other menus are described in the main manual of the AK-XXL/SXL products.

I2C

I2C DataControl

Normale Mode:

Settings:

```
1 = Slave Addr          = 0
2 = Baud rate           = 100000
3 = Data Control        = N
4 = Data Poll*10ms      = 10
5 = Flow Control        = N
```

In this setting, the XT-NANO module polls every **100ms** the I2C slave to the address **0** and tries to obtain data from it. Depending on other settings such as TCP-Client, modem etc. these data are being processed. As soon as there is a connection by TCP/IP and data are received, the system tries to send the data to the I2C slave on the address **0**.

I2C

I2C DataControl

Protocol Mode:

Settings:

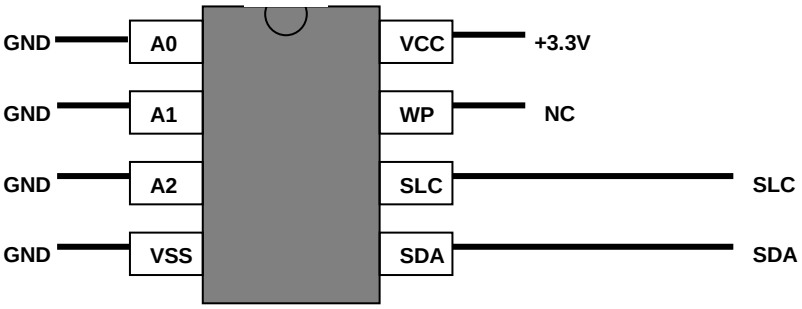
```
1 = Slave Addr          = 0
2 = Baud rate            = 400000
3 = Data Control        = P
4 = Data Poll*10ms      = 0
5 = Flow Control        = N
```

In this setting it is possible to directly address the I2C slave by TCP or UDP using the corresponding commands such as WRITE and READ. **All data have to be transferred binary.**

```
WRITE:      0x02,0x00,0x0A,0x03,0x50,0x02,0x00,0x00,0x57,0x00,0x01,0xnn,0x03
            0x02            STX
            0x00,0x0A       Len (10 Bytes) follows              always 2 bytes
            0x03            function code (with all messages)
            0x50            Slave Address
            0x02            Count Internal Address
            0x00,0x00       Internal Address 0x00,0x00          Count(0-4 Byte)
            0x57            W = WRITE
            0x00,0x01       write 1 byte                        always 2 bytes
            0xnn            Byte to write
            0x03            ETX

READ:       0x02,0x00,0x09,0x03,0x50,0x02,0x00,0x00,0x52,0x00,0x02,0x03
            0x02            STX
            0x00,0x09       Len (9 Bytes) follows               always 2 bytes
            0x03            function code (with all messages)
            0x50            Slave Address
            0x02            Count Internal Address
            0x00,0x00       Internal Address 0x00,0x00          Count(0-4 Byte)
            0x52            R = READ
            0x00,0x02       read 2 byte                         always 2 bytes
            0x03            ETX

Responses:

MSG:        no ACK/NAK  (function code = 0x00)
            NAK only    (function code = 0x01)
            ACK only    (function code = 0x02)
            ACK and NAK (function code = 0x03)


NAK         0x15,'S'        NAK STX
            0x15,'E'        NAK ETX
            0x15,'A'        NAK Slave Address
            0x15,'C'        NAK Command
            0x15,'L'        NAK Len
            0x15,'B'        NAK Buffer
            0x15,'R',..     NAK Read and Data we could read
            0x15,'W',nn,nn  NAK Write and nn,nn = Data we could write

ACK         0x06,'R'...     ACK Read and Data
            0x06,'W'        ACK Write
```

I2C

I2C Example: EEPROM 24LC16



Settings:

```
1 = Slave Addr          = 0
2 = Baud rate           = 400000
3 = Data Control        = P
4 = Data Poll*10ms      = 10
5 = Flow Control        = N
```

Write “HALLO”

```
WRITE:      0x02,0x00,0x0D,0x03,0x50,0x01,0x00,0x57,0x00,0x05,0x48,0x41,0x4C,
            0x4C,0x4F,0x03
REPLY:      0x06,0x57
```

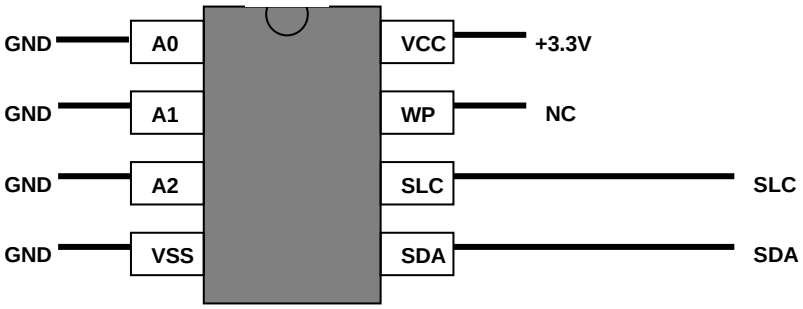
Read “HALLO”

```
WRITE:      0x02,0x00,0x08,0x03,0x50,0x01,0x00,0x52,0x00,0x05,0x03
REPLY:      0x06,0x52,0x48,0x41,0x4C,0x4C,0x4F
```

Note:
The characters displayed in hexadecimal value, such as **0xnn** must be transferred to the interface in the binary format by the interface.

I2C

I2C Example: EEPROM AT24C16



Settings:

```
1 = Slave Addr          = 0
2 = Baud rate            = 400000
3 = Data Control        = P
4 = Data Poll*10ms      = 10
5 = Flow Control        = N
```

Write “HALLO”

```
WRITE:      0x02,0x00,0x0E,0x03,0x50,0x02,0x00,0x00,0x57,0x00,0x05,0x48,0x41,
            0x4C,0x4C,0x4F,0x03
REPLY:      0x06,0x57
```

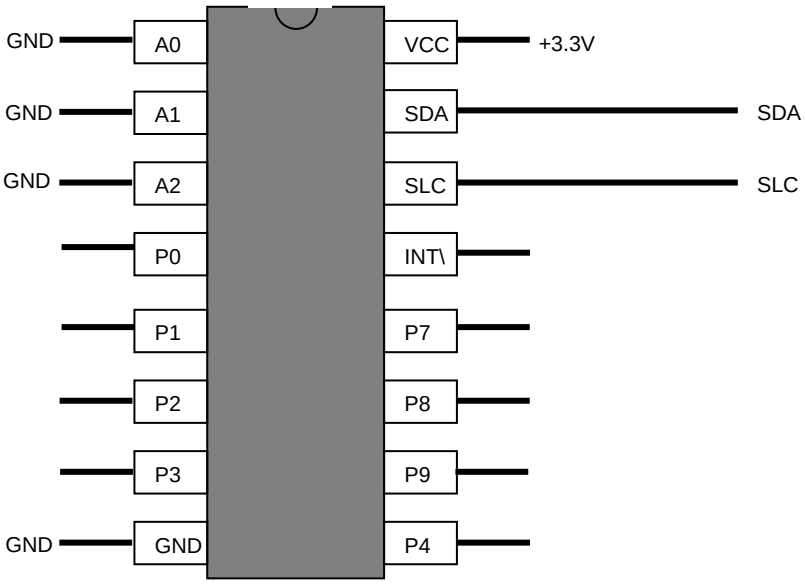
Read “HALLO”

```
WRITE:      0x02,0x00,0x09,0x03,0x50,0x02,0x00,0x00,0x52,0x00,0x05,0x03
REPLY:      0x06,0x52,0x48,0x41,0x4C,0x4C,0x4F
```

Note:
The characters displayed in hexadecimal value, such as **`0xnn`** must be transferred to the interface in the binary format by the interface.

I2C

I2C Example: I/O Expander PCF8574AP



Settings:

```
1 = Slave Addr          = 0
2 = Baud rate           = 100000
3 = Data Control        = P
4 = Data Poll*10ms      = 10
5 = Flow Control        = N
```

Set P0 = 0 (Low)

```
WRITE:      0x02,0x00,0x08,0x03,0x38,0x00,0x57,0x00,0x01,0xF7,0x03
REPLY:      0x06,0x57
```

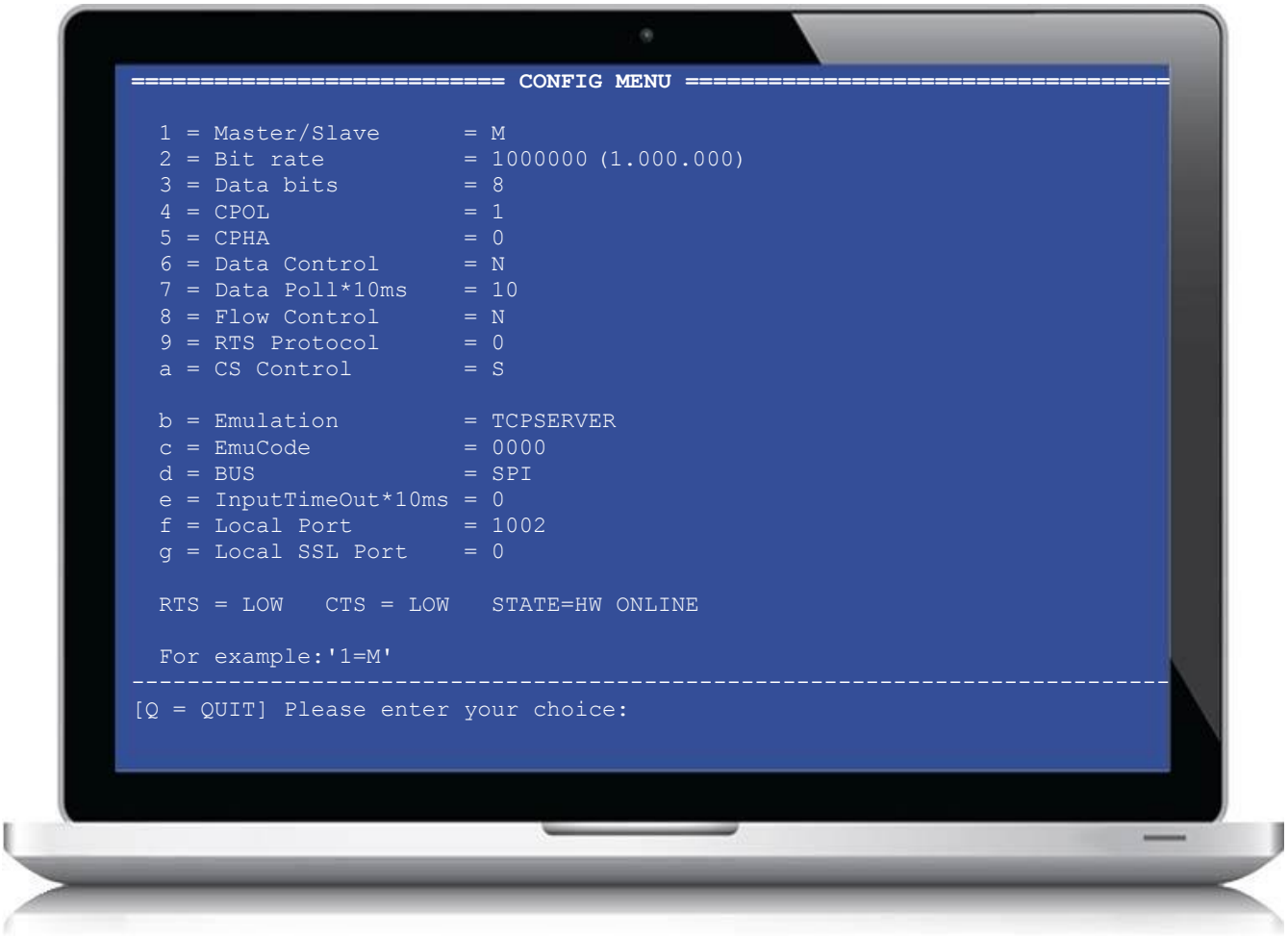
Read P0-P7

```
WRITE:      0x02,0x00,0x07,0x03,0x38,0x00,0x52,0x00,0x01,0x03
ANSWER:     0x06,0x52,0xFF
```

The characters displayed in hexadecimal value, such as **`0xnn`** must be transferred to the interface in the binary format by the interface.

SPI

SPI Configuration



1 = Master/Slave	Mode M = MASTER S = SLAVE
2 = Bit rate	Clock frequency on the SPI bus. (Master) up to 25.000.000 Bits/s (Slave) up to 2.500.000 Bits/s
3 = Data bits	8
4 = CPOL	Clock Polarity 0 1
5 = CPHA	Clock Phase 0 1
6 = Data Control	N = No data control (refer to DataControl) P = Protocol mode (refer to DataControl) D = Downstream. Data control mode without return data.

SPI

SPI Configuration

7 = Data Poll*10ms Then the slave is requested every xxx ms, if data are available.
(Only if DataControl=N activated)

8 = Flow Control Additional flow control via RTS/CTS hardware lines.
N = No flow control
H = Hardware flow control.

9 = RTS Protocol Signal statuses of RTS
0 = ALWAYS = RTS always low
1 = RTS_FOLLOWS_CTS = RTS follows CTS
3 = RTS_IND_CONNECTION_N = Shows an TCP/IP connection (LOW)
4 = RTS_IND_CONNECTION_I = Shows an TCP/IP connection (HIGH)

a = CS Control Functionality of the “Chip-Select” line in the master mode
S = Stream-Mode CS = Low at the beginning of the data transfer.
B = Byte-Mode CS = Low at each data byte

b = Emulation It is possible to use the following emulations:
TCPCLIENT
UDPCLIENT
UDPSERVER
TCPSERVER
Please find application examples and further explanations regarding the emulations in the main manual of the AK-XXL/SXL products.

c = Emucode for customized functions

d = BUS **SPI**

f = Local Port You can define the TCP/IP or UDP Port here which is admitted for the corresponding serial interface.

g = Local SSL Port Has the same function as the Local Port, but it is only used for the encrypted SSL communication

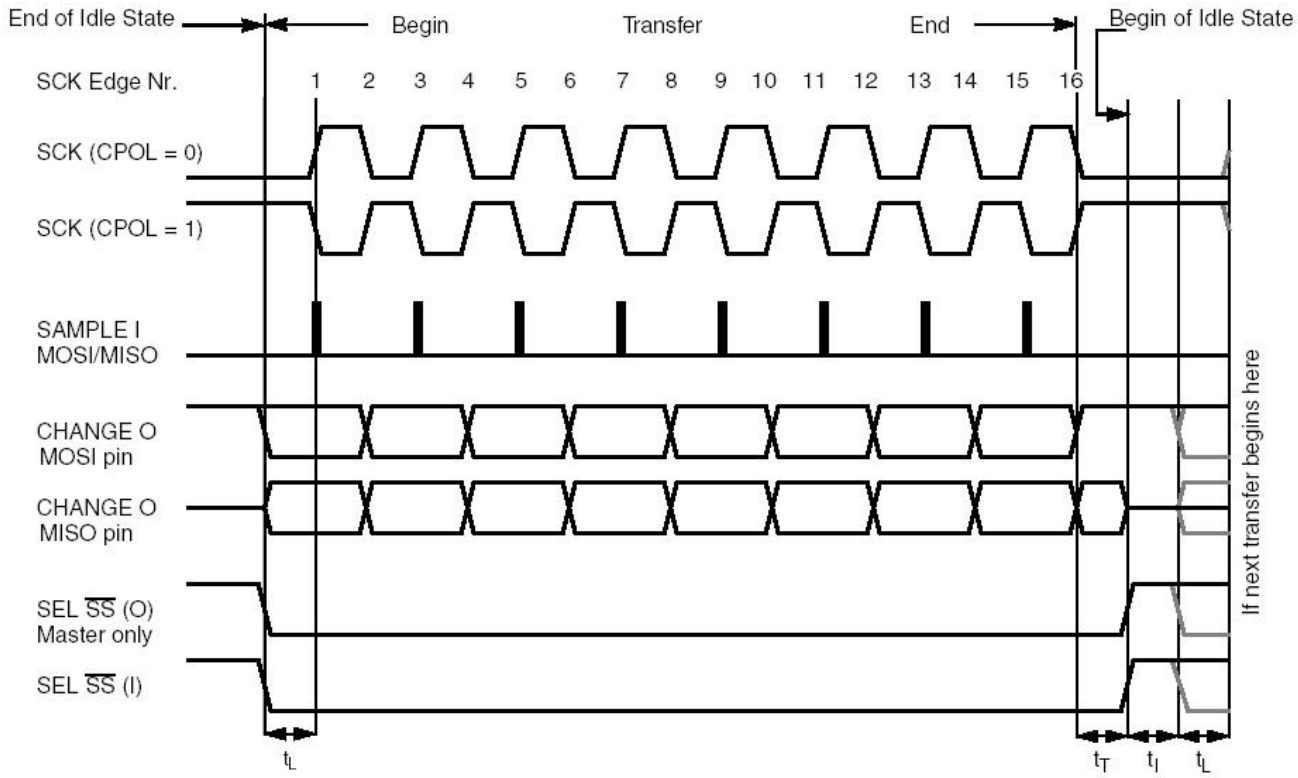
Note:
All other menus are described in the main manual of the AK-XXL/SXL products.

SPI

SPI Functionality

The SPI-bus is a 4-wire serial communications interface used by many microprocessor peripheral chips. The Serial Peripheral Interface (SPI) circuit is a synchronous serial data link that is standard across many microprocessors and other peripheral chips. It provides support for a bandwidth (**25MBit**) network connection amongst CPUs and other devices supporting the SPI.

SPI bus is basically a relatively simple synchronous serial interface for connecting low speed external devices using quite minimal number of wires. SPI (serial peripheral interface) is an interface standard defined by Motorola. A synchronous clock shifts serial data into and out of the microcontrollers in blocks of 8 bits.



SPI

SPI DataControl

Normal Mode:

Settings:

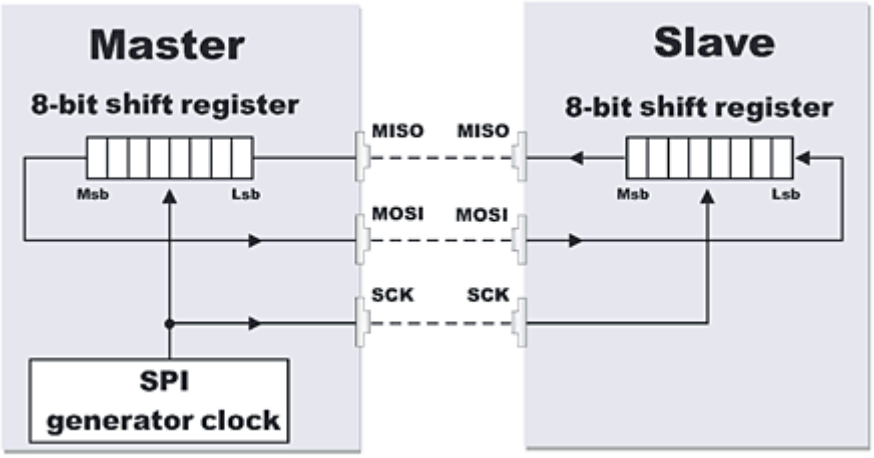
```
1 = Master/Slave      = M
2 = Bit rate          = 1000000(1.019.642)
3 = Data bits         = 8
4 = CPOL              = 1
5 = CPHA              = 0
6 = Data Control      = N
7 = Data Poll*10ms    = 10
8 = Flow Control      = N
9 = RTS Protocol      = 0
```

In this mode, the SPI interface is absolutely transparent. I.e., no data are sent to the SPI slave, as long as no data are received. The user has the option to control the data flow himself. I.e. in order to receive data of the SPI slave, it first has to be connected via the TCP/IP and data have to be sent from the Client (remote). Then they are directly sent to the SPI slave.

Example:
There is an TCP/IP connection and the SPI slave shall respond one byte “0x33” to a 3-byte long request e.g. “0x01, 0x00, 0x33”.

Remote	XT-NANO	SPI slave
0x01, 0x00, 0x33 ->	0x01, 0x00, 0x33 ->	->
0xnn, 0xnn, 0xnn <-	0xnn, 0xnn, 0xnn <-	<-
0xnn ->	0xnn ->	->
0x33 <-	0x33 <-	<-
	or (if the SPI slave is quick enough)	
0x01, 0x00, 0x33, 0xnn->	0x01, 0x00, 0x33, 0xnn ->	->
0xnn, 0xnn, 0xnn ,0x33 <-	0xnn, 0xnn, 0xnn, 0x33 <-	<-

The data marked with “nn” do not include any relevant information. However, it is necessary to consider that one bit is received when another bit is leaving the master. (refer to the illustration)



SPI

SPI DataControl

Protocol mode:

Settings:

```
1 = Master/Slave      = M
2 = Bit rate          = 1000000(1.019.642)
3 = Data bits         = 8
4 = CPOL              = 1
5 = CPHA              = 0
6 = Data Control      = P
7 = Data Poll*10ms    = 10
8 = Flow Control      = N
9 = RTS Protocol      = 0
```

In this setting, the XT-NANO module polls the SPI slave every **100ms** by sending an 0x00 and tries to receive data from it. In this case, the slave as well as the master have the option to separate the data from the non-relevant data “0xnn”. A 0x01 has to precede each data byte which is sent or received, in order to signalise that it is a correct data byte.

Example:

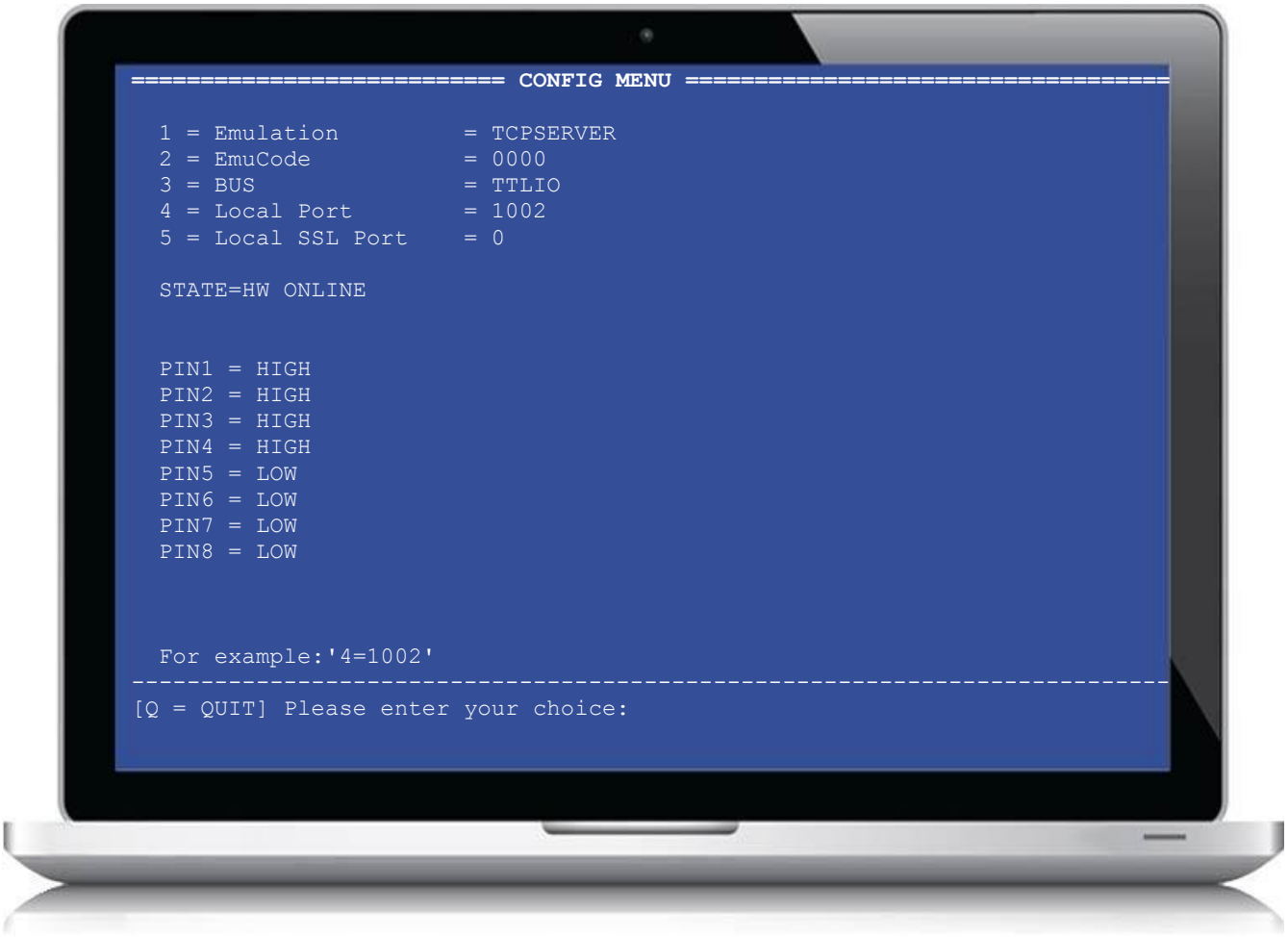
	Master	Slave	Data
Idle run	0x00 ->	<- 0x00	none
Master sends	0x01,0x33 ->	<- 0x00, 0x00	Slave includes 0x33
Slave sends	0x00,0x00 ->	<- 0x01, 0x44	Master includes 0x44
Master+Slave send	0x01,0x33,0x01,0x33 ->	<- 0x01, 0x44, 0x01, 0x44	

Note:
The Data-Poll-Timeout is only considered in the idle run. It is tried to send or receive data as rapidly as possible in the sending and receiving mode. Please consider to select the transmitting speed in a way that the slave also has the option to make the corresponding data available.

Note:
The characters displayed in hexadecimal value, such as **0xnn** must be transferred to the interface in the binary format by the interface.

TTL-IO

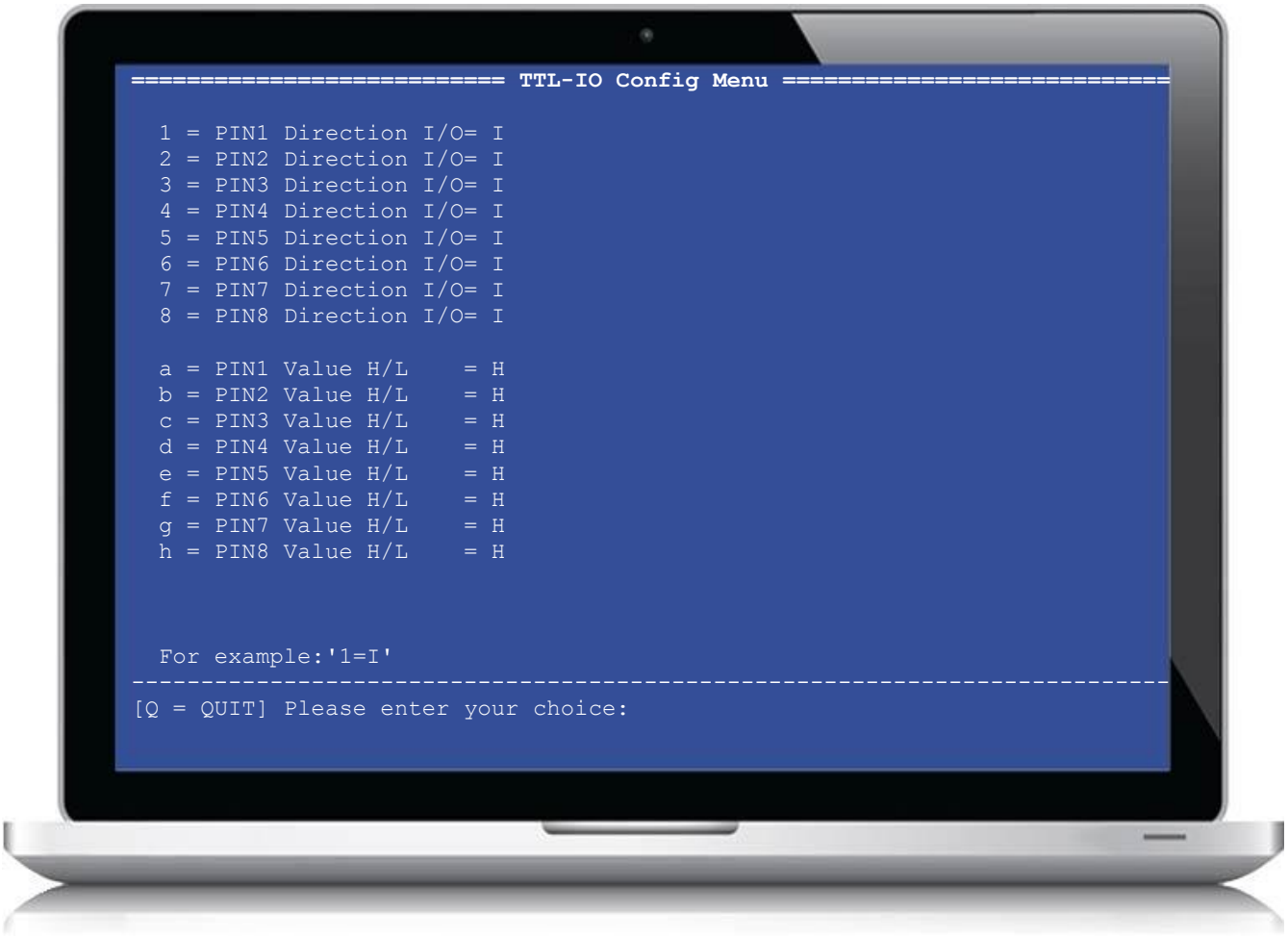
TTL-IO Configuration



1 = Emulation	It is possible to use the following emulations: TCPCLIENT UDPCLIENT UDPSERVER TCPSERVER ***Please find application examples and further explanations regarding the emulations in the main manual of the AK-XXL/SXL products.***
2 = Emucode	for customized functions
3 = BUS	**TTLIO**
4 = Local Port	You can define the TCP/IP or UDP port for the corresponding serial interface.
5 = Local SSL Port	Has the same function as the Local Port, only that it is used for the encrypted SSL communication
PIN1 – PIN8	The current condition of the TTL signal lines is displayed

TTL-IO

TTL-IO Configuration




```
1 = PIN1 Direction I/O= I
2 = PIN2 Direction I/O= I
3 = PIN3 Direction I/O= I
4 = PIN4 Direction I/O= I
5 = PIN5 Direction I/O= I
6 = PIN6 Direction I/O= I
7 = PIN7 Direction I/O= I
8 = PIN8 Direction I/O= I
```

It is possible to determine if the single PINs shall work when starting the interface as input or as output. It can also be set via the Data-Control during operation and is described on the following pages.

```
a = PIN1 Value H/L    = H
b = PIN2 Value H/L    = H
c = PIN3 Value H/L    = H
d = PIN4 Value H/L    = H
e = PIN5 Value H/L    = H
f = PIN6 Value H/L    = H
g = PIN7 Value H/L    = H
h = PIN8 Value H/L    = H
```

It is possible to determine if the single pins are HIGH or LOW when starting the interface. It can also be modified via the Data-Control during operation and is described on the following pages.

TTL-IO

TTL-IO DataControl

The TTL IO (Input/Output) mode makes more than two physical interfaces 14/15 digital signal lines available. They cab be configured either as output or as input and switched via the following log.

Protocol mode:

Log:
It is always necessary to have 2 bytes. The first byte is the function and the second byte includes the bit for the PIN.

Function:

0x00	= Read Pin
0x01	= Clear Pin
0x02	= Set Pin
0x03	= Configure Pin to Input
0x04	= Configure pin to Output
0x05	= Clear Pullup
0x06	= Set Pullup

Pin:

0x01	= PIN1
0x02	= PIN2
0x04	= PIN3
0x08	= PIN4
0x10	= PIN5
0x20	= PIN6
0x40	= PIN7
0x80	= PIN8 (not available)

The data bits can also be combined. E.g. 0x14 means PIN5 and PIN3

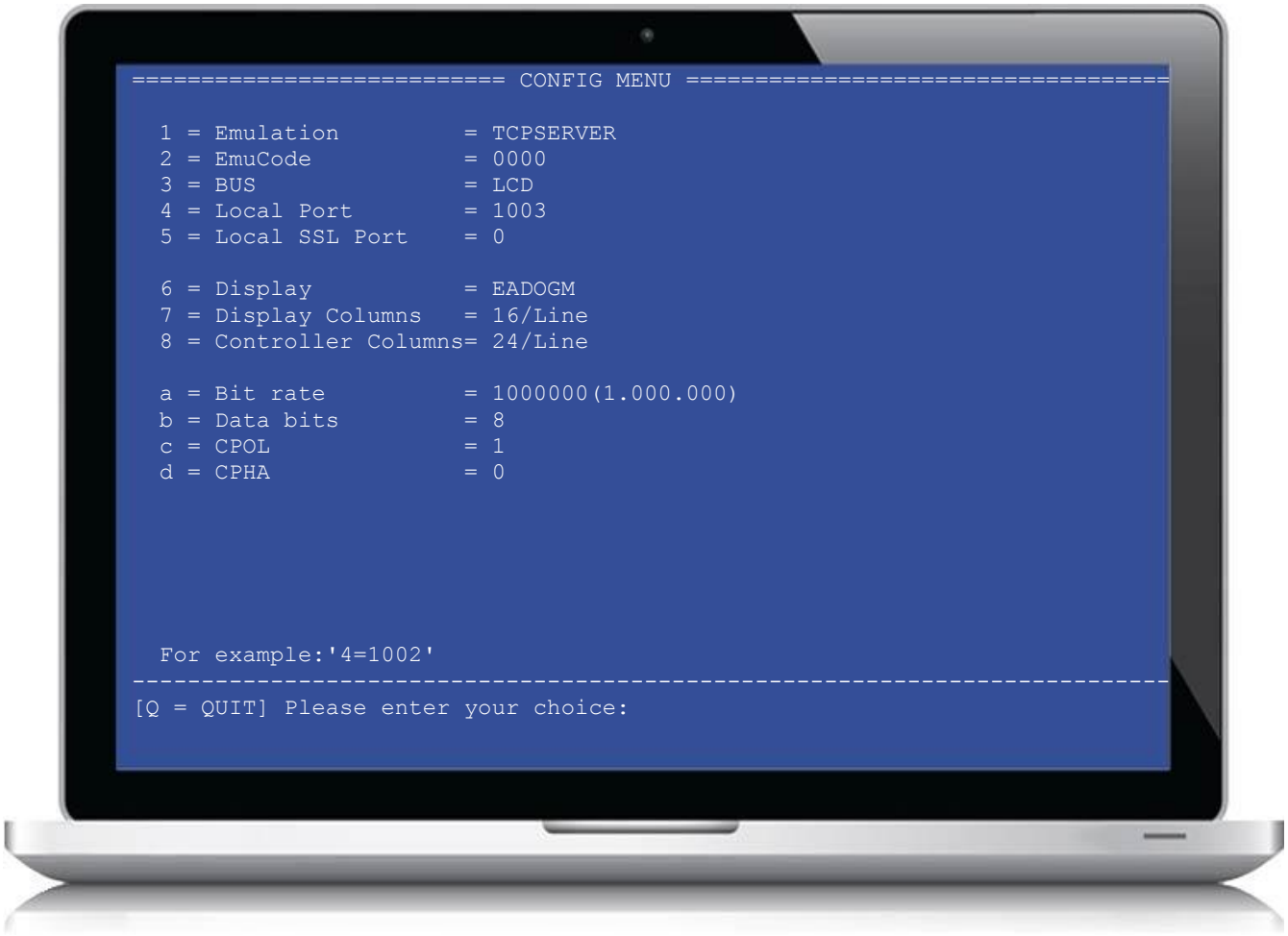
Examples:

0x04 0x01	= Configure PIN1 as output
0x02 0x01	= Set PIN1 to HIGH
0x01 0x01	= Set PIN1 to LOW

Note:
The characters displayed in hexadecimal value, such as **`0xnn`** must be transferred to the interface in the binary format by the interface.

LCD

LCD Configuration



1 = Emulation It is possible to use the following emulations:
TCPCLIENT
UDPCLIENT
UDPSERVER
TCPSERVER
Please find application examples and further explanations regarding the emulations in the main manual of the AK-XXL/SXL products.

2 = Emucode for customized functions

3 = BUS **LCD**

4 = Local Port You can define the TCP/IP or UDP port, which is admitted for the corresponding serial interface.

5 = Local SSL Port Has the same function as the Local Port, only that it is used for the encrypted SSL communication

LCD

LCD Configuration

6 = Display EADOGM or HD44780

7 = Display Columns You can indicate the display fields available per line here
.

8 **= Controller Columns** Using this option you can indicate the
display fields per line which are made available by the Display Controller.

The following values are all preset and compatible to the display. However, they are only relevant for the SPI display EADOGM.

a = Bit rate Clock frequency on the SPI bus.
(Master) up to 25.000.000 Bits/s

b = Data bits 8

c = CPOL Clock Polarity
0
1

d = CPHA Clock Phase
0
1

SD-CARD

SD-CARD Configuration

1 = Master/Slave Mode
M = MASTER
An SD card can only be operated in the master mode.

2 = Bit rate Clock frequency on the SPI bus.
(Master) up to 25.000.000 Bits/s

3 = Data bits 8

4 = CPOL Clock Polarity
0
1

5 = CPHA Clock Phase
0
1

a = BUS **SDCARD**

SD-CARD

SD-CARD Configuration

If no card is plugged in:

```
Card state          = not detected
Card info           = not identified
```

If a card is plugged in e.g.:

```
Card state          = detected
Manufacturer        = SD
Pages               = 1.987.584
PageSize            = 512
Size (MB)           = 970
```

DF-CARD

DF-CARD Configuration

1 = Master/Slave Mode
M = MASTER
An Data-Flash-Card can only be operated in the master mode.

2 = Bit rate Clock frequency on the SPI bus.
(Master) up to 25.000.000 Bits/s

3 = Data bits 8

4 = CPOL Clock Polarity
0
1

5 = CPHA Clock Phase
0
1

a = BUS **DFCARD**

DF-CARD

DF-CARD Configuration

If no card is plugged in:

```
Card state        = not detected
Card info         = not identified
```

If a card is plugged in e.g.:

```
Card state        = detected
Manufacturer      = AT45DB0321B
Pages             = 8192
PageSize          = 528
Size (MB)         = 4
```

Note:

DF cards / components:

- up to 4 GByte
- FAT12/16/32
- AT45DB011B,AT45DB021B
  AT45DB041B,AT45DB081B
  AT45DB0161B,AT45DB0321B,
  AT45DB0642, AT45DB1282

are directly recognised.

SSF(Serial Flash)

SSF Configuration

1 = Master/Slave Mode
M = MASTER
A serial flash chip can only be operated in the master mode.

2 = Bit rate Clock frequency on the SPI bus.
(Master) up to 25.000.000 Bits/s

3 = Data bits 8

4 = CPOL Clock Polarity
0
1

5 = CPHA Clock Phase
0
1

a = BUS **SSFLASH**

SSF(Serial Flash)

SSF Configuration

If no serial flash chip is connected:

```
Card state          = not detected
Card info           = not identified
```

If a serial flash chip is connected e.g.:

```
Card state          = detected
Manufacturer        = S25FL116K
Pages               = 512
PageSize            = 4.096
Size (MB)           = 2
```

Note:

Serial-Flash chips:

- SST25VF016B, SST25VF032B, SST25VF064C
  SST26VF016B, SST26VF032B, SST26VF064B,
  S25FL116K, S25FL132K, S25FL164K,
  SST25VF020

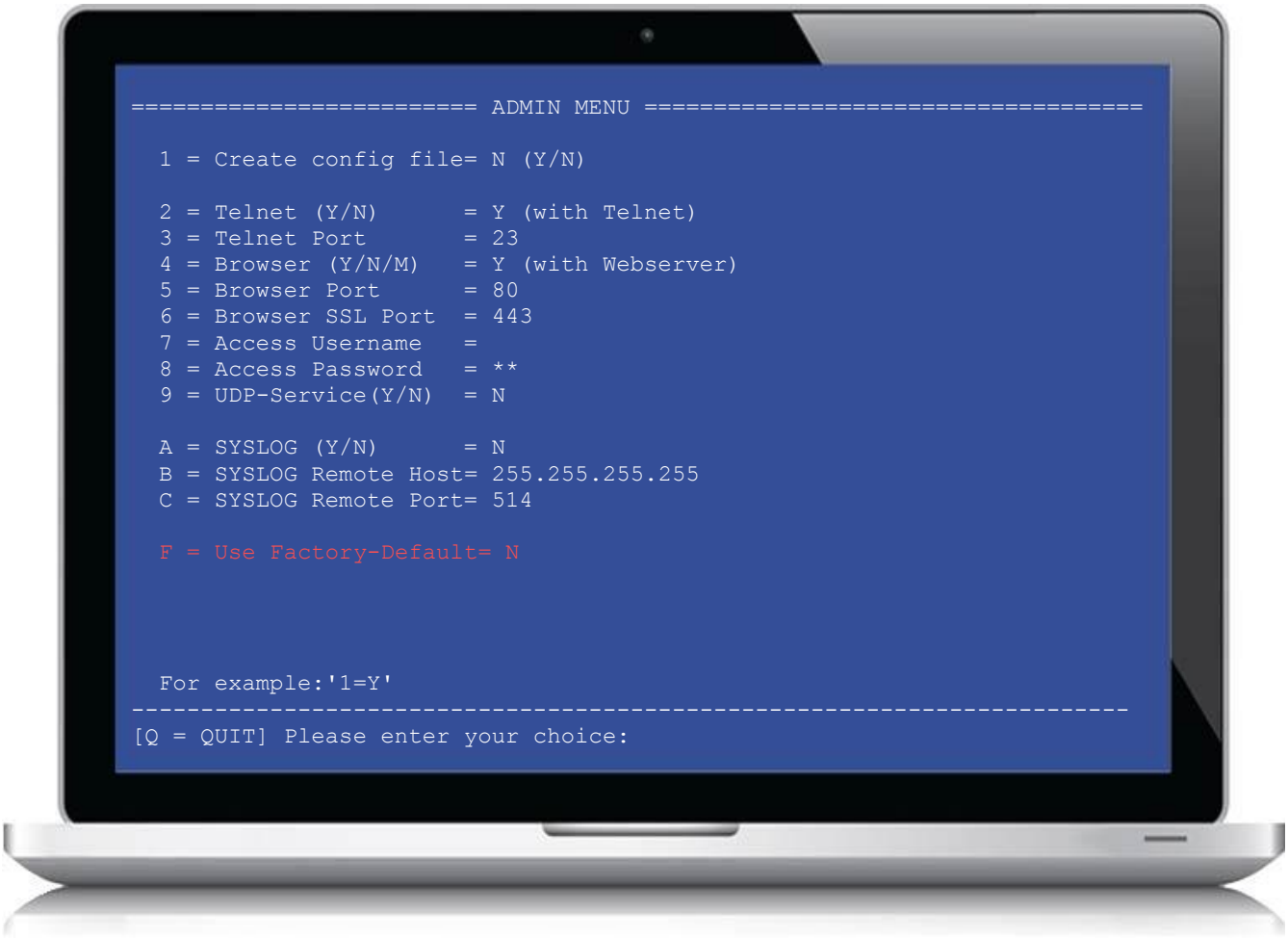
are directly recognised.

Factory-Default / Reset -Button

Factory-Default/Reset Configuration

From **Version 1.7.5** on**.**

If PIN DCD1/PIN7 on BUS1 is not in use, you can use this Pin as Factory-Default/ Reset.



The activation will done via the ADMIN menu.

Operation:

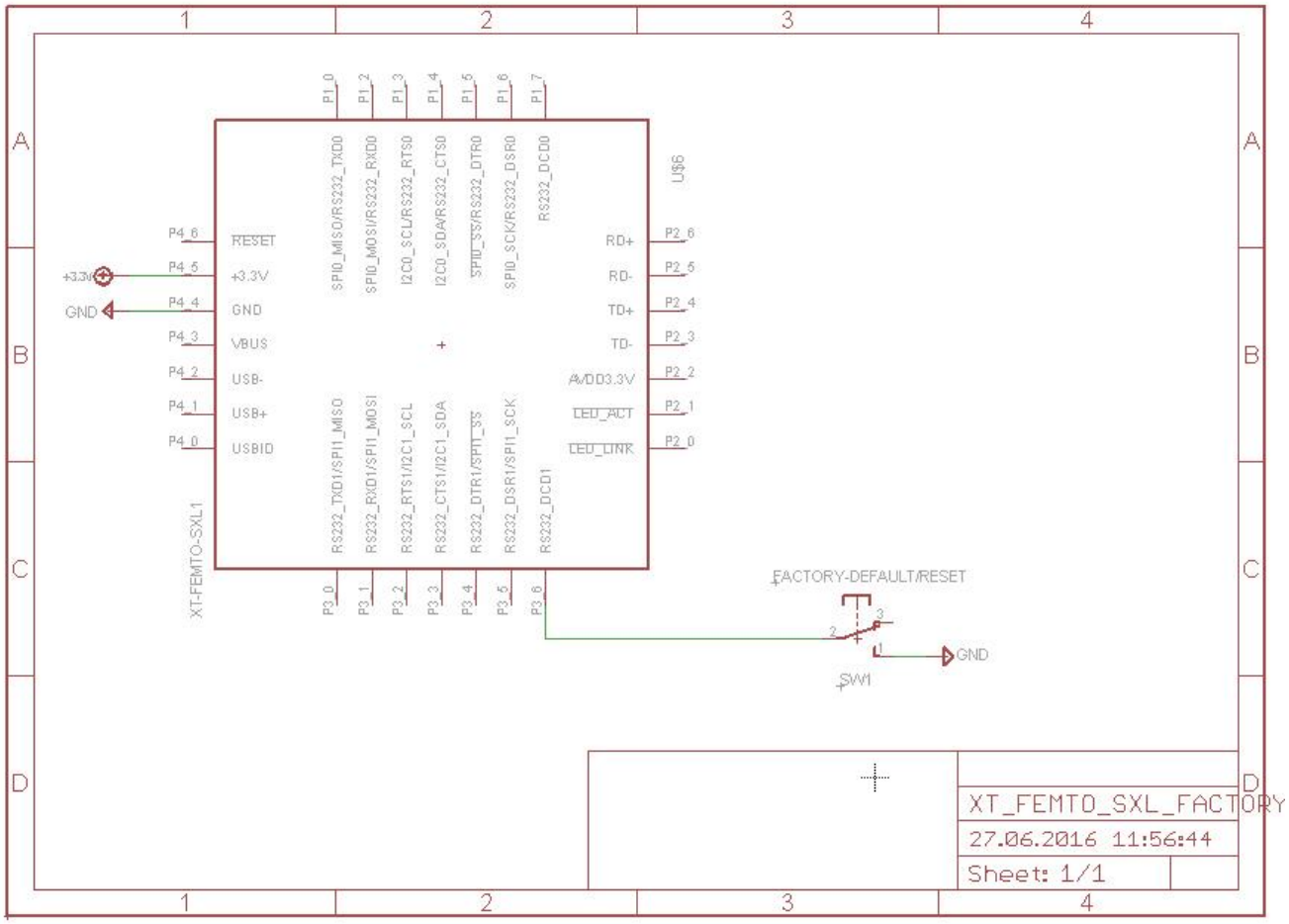
Factory-Default:
After powering on, press the button for 5 seconds. Then all parameters will reset and the interface restarts.

Reset (Software):
During operation, press the button for 1 seconds. Then a software reset will performed.

Factory-Default / Reset-Button

Schematic: Factory-Default/Reset

From **Version 1.7.5** on**.**



Creating a homepage

From **version 1.6.3** on you can create your own homepage on the AK-Nord interfaces.

SXL series:
The internal FlashFileSystem of the SXL series is equipped with a 512KB memory and can thus be used without any additional memory.

Request the prepared homepage project from AK-NORD. Please find a description of the way of proceeding in the project.

Warranty

Warranty

The information in this manual might change without prior notice. In spite of elaborateness this manual might include errors or be incomplete. We do not take any liability for errors or data losses as a result hereof.