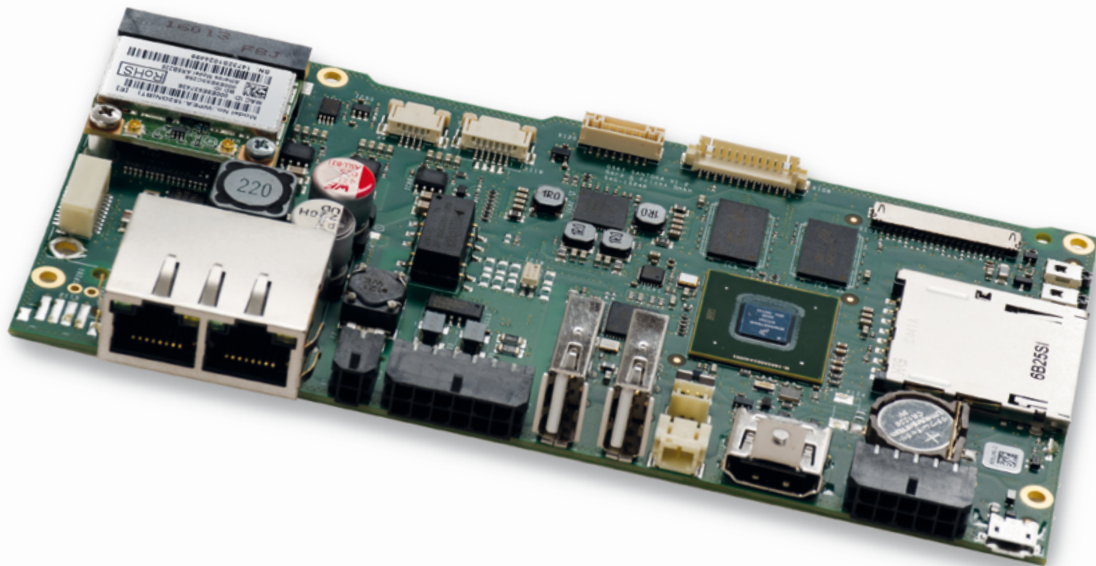# SANTOKA core

Arm® Cortex®-A9 Single Board Computer

Our IOT solution: PCIe interface for wireless connectivity and two Ethernet ports

Product Manual

Document Revision History

The information in this document is subject to change without prior notice in order to improve reliability, design and function and does not represent a commitment on the part of the manufacturer.

Revision	Date	Author	Description
V 1	09.03.2017	CG	Initial Release
V 2	12.10.2017	CG	additional footnote chapter 6.24
V 3	15.03.2018	CG	Page 17 New Picture RS485 Pin 6 to 11
V 4	26.08.2019	CG	Change address
V 5	05.07.2021	CG	Page 27 chapter 6.20 Pin 5 Levelchange in pulldown Page 29 chapter 6.22 Changes in Pin 37, 39, 41, 43, 52
V 6	17.12.2021	bmy	SECO CI Update 2022

Online support on edge.seco.com

Table of Contents

* alternative assembly upon request

1.   Introduction

Thank you very much for purchasing a SECO Northern Europe product. Our products are dedicated to professional use and therefore we suppose extended technical knowledge and practice in working with such products.

The information in this manual is subject to technical changes, particularly as a result of continuous product upgrades. Thus this manual only reflects the technical status of the products at the time of printing. Before design-in the device into your or your customer's product, please verify that this document and the therein described specification is the latest revision and matches to the PCB version. We highly recommend contacting our technical sales team prior to any activity of that kind.

The attached documentation does not entail any guarantee on the part of SECO Northern Europe GmbH with respect to technical processes described in the manual or any product characteristics set out in the manual. We do not accept any liability for any printing errors or other inaccuracies in the manual unless it can be proven that we are aware of such errors or inaccuracies or that we are unaware of these as a result of gross negligence and
SECO Northern Europe has failed to eliminate these errors or inaccuracies for this reason.
SECO Northern Europe GmbH expressly informs that this manual only contains a general description of technical processes and instructions which may not be applicable in every individual case. In cases of doubt, please contact our technical sales team.

In no event, SECO Northern Europe is liable for any direct, indirect, special, incidental or consequential damages arising out of use or resulting from non-compliancy of therein conditions and precautions, even if advised of the possibility of such damages.

Before using a device covered by this document, please carefully read

> ▶ **Annex „D-1 Warranty hints"**
> ▶ **Annex „D-2 Field of Application"**

Embedded systems are complex and sensitive electronic products. Please act carefully and ensure that only qualified personnel will handle and use the device at the stage of development. In the event of damage to the device caused by failure to observe the hints in this manual and on the device (especially the safety instructions), SECO Northern Europe shall not be required to honour the warranty even during the warranty period and shall be exempted from the statutory accident liability obligation. Attempting to repair or modify the product also voids all warranty claims.

2.   Safety Hints

Please read this section carefully and observe the instructions for your own safety and correct use of the device. Observe the warnings and instructions on the device and in the manual. SECO Northern Europe embedded systems have been built and tested by us and left the company in a perfectly safe condition.In order to maintain this condition and ensure safe operation, the user must observe the instructions and warnings contained in this manual.

I.   General Handling

► Don't drop or strike the unit: The PCB, display and/or other parts might be damaged.
► Keep away from water and other liquids, the unit is not protected against.
► Operate the unit under electrical and environmental conditions according to the technical specification.
► The electrical installations in the room must correspond to the requirements of the local (country-specific) regulations.
► Take care that there are no cables, particularly power cables, in areas where persons can trip over them.
► Do not place the device in direct sunlight, near heat sources or in a damp place.
► All plugs on the connection cables must be screwed or locked to the housing.
► Repairs may only be carried out by qualified specialist personnel authorized by SECO Northern Europe GmbH or their local distributors.
► Maintenance or repair on the open device may only be carried out by qualified personnel authorized by SECO Northern Europe GmbH which is aware of with the associated dangers.

II.   Electricity

► The embedded systems may only be opened in accordance with the description in this user's manual for
  - replacing of the (rechargeable, where applicable) lithium battery and/or
  - configuration of interfaces, where applicable
► These procedures have to be carried-out only by qualified specialist personnel.
► When accessing internal components the device must be switched off and disconnected from the power source.
► When purchased core or basic versions without protecting back cover, don't touch the PCB directly with your fingers. Especially these products need to be handled very carefully.
► Don't operate or handle the unit without typical ESD protection measures, such as ground earthing.
► Operate the unit according to the technical specification only.

III.   Damage or Permanent Malfunction

► It must be assumed that a safe operation is no longer possible, in case
  -the device has visible damage or
  -the display is dark or shows strange pattern for longer period
  -the device doesn't react after a reset
► In these cases the device must be shut down and secured against further use

IV. Approvals

► The SANTOKA may be equipped with a certified transmitting module.

► This device complies with Part 15 of the FCC Rules11. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.
Any changes or modifications not expressly approved by SECO Northern Europe GmbH could void the user's authority to operate the equipment.
The internal / external antenna(s) used for this module must provide a separation distance of at least 2 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
The outside of final products containing the SANTOKA module must display in a user accessible area a label referring to the enclosed transmitting module. This exterior label can use wording such as the following12: "Contains Transmitter Module FCC ID: *(insert the modules FCC ID)*" or "Contains FCC ID: *(insert the modules FCC ID)*".

► Approved antennas list: For the WLAN/Bluetooth module WPEA-152GN(BT) a dipole antenna with 2 dBi (peak) gain is approved

3. Product Introduction

This document is applicable for hardware revisions 1.0 or later of the SANTOKA series.

Please find the hardware version grid in **„Annex A: Hardware Revision Information"**:
SANTOKA is an Embedded System to be used as human machine interface (HMI) in various applications. Please refer to **Annex „D-2 Field of Application"** for further information. The system is equipped with a large number of industrial interfaces. A wide variety of options is available as well.

3.1 Type Plate and Device Information

For service and later identification of the device, the type plate contains important information.
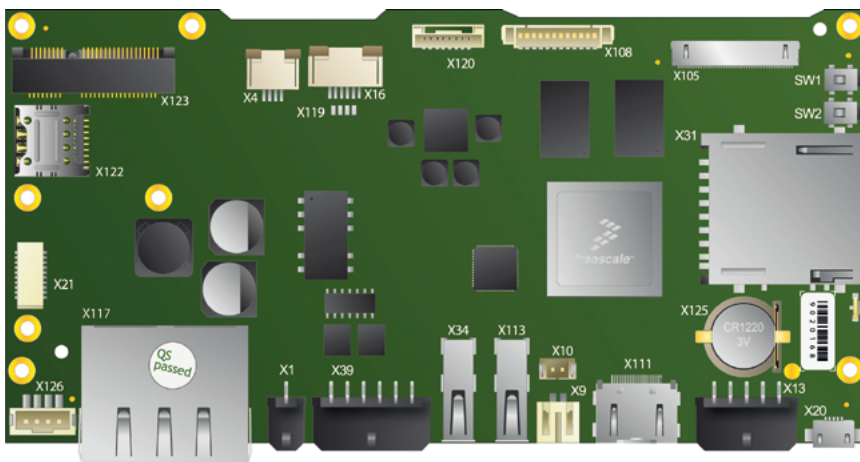
code defines the serial number

3.2 Related Documents and Online Support

This document contains operating system specific information. The following additional documentations are available:

OPERATING SYSTEMS

Linux Yocto Jethro	https://bit.ly/3lwp6an	Contains information about Linux BSP with development environment Linux Embedded System Yocto (Codename: Jethro, Version 3.0) includes first information about the bootloader Flash-N-Go
Linux Yocto Rocko	https://bit.ly/3puByZA	
Android 7.1	https://bit.ly/32XoCni	

UPDATE / BOOT / SYSTEM

Flash-N-Go	https://bit.ly/3xPzoHy	Contains information about the usage of the G&F Flash-N-Go solution which consists of three submodules: ▶ Flash-N-Go Boot (A tiny boot loader) ▶ Flash-N-Go System (A maintenance os) ▶ Flash-N-Go Update (A GUI based update solution for all os)

4.   Technical Data

| CPU	x1	x2	x4	x4P
CPU Type	i.MX6Solo	i.MX6DualLite	i.MX6Quad	i.MX6QuadPlus
Core Class	Arm®-Cortex®-A9			
Core Clock	1 GHz			
Features	NEON for SIMD media acceleration and VFP operations; Multi-format HD 1080p video decoder and HD 720p video encoder hardware engine; L1 cache, 32 KB for instruction, 32 KB for data			
	512 KB L2 cache	1 MB L2 cache		
HW Accelerators	OpenGL ES 2.0, OpenVG 1.1			
RTC	Accuracy: +/- 30 ppm at 25°C			
Memory				
eMMC Flash	4 GB MLC eMMC			8 GB MLC eMMC
RAM Standard	1 GB 32 bit DDR3L	1 GB 64 bit DDR3L		4 GB 64 bit DDR3L
SD Card Slot	4 bit MMC/SDIO/SD/SDHC			
Operating Systems				
Supported OS	Linux Yocto			
Communication Interfaces				
Network	2x 10/100 Mbit/s Ethernet (RJ-45)			
USB 2.0	2x 480 Mbit/s Host (Type A) 1x 480 Mbit/s OTG (Type Micro-AB) [1]			
CAN Fieldbus / RS-485	1x CAN (ISO/DIS 11898) + 1x RS-485	1x CAN (ISO/DIS 11898) + 1x RS-485 galvanic isolated		
RS-232	2x RS-232 (RX/TX/CTS/RTS)			
	MDB [2] /1x MDB (Master / Slave optional) [3] instead of 2nd external RS-232			
Synchronous Serial Interfaces	SPI up to 12 chip selects; I²C; Matrix keypad up to 8 x 8			
Wireless Communication				
Wireless	WLAN 802.11 b/g/n; Bluetooth 4.0 LE / available as optional mPCIe card			
Video				
Video output		Full HD HDMI		
Audio				
Speaker output	1x speaker (connector), 1.5 W RMS (8Ω)			
Audio Internal	1x speaker connector parallel to external output			
Display and Touch				
Display Interface	Dual Channel 24bpp LVDS			
Touch Interface	4-wire analog resistive; PCAP I²C			
Backlight Interface	+12 V, +5V, on/off, PWM			
Device Dimensions				
W x H x D	159.0 x 18.0 x 80.0 mm			
Weight	102g			
Power Supply				
Supply Voltage	Nom. 13 to 32 V DC			
Consumption	Typ. 2.2 W; max. 25.1 W			
Internal Backup Battery (RTC)	Type: 3 V Li-Ion Type CR1220: Lifetime (RTC only): Approximately 8 years, depending on application			
Typical Environmental Conditions				
Storage Temp.	-20 to +70 °C			
Operating Temp.	0 to +60 °C			
Humidity	5 to 90 % RH			
Max. Operating Altitude ty	3.000 m			
Max. Storage/Transit Altitude	10.000 m			
Noise Level [db(A)] @ 1m	<<40 (fanless design)			
Lifetime				
MTBF	≥ 400.000 h (without backlight)			
Expansion Slot				
PCIe	PCIe Mini connector (for half size card)			

[1] Mechanically the Micro-USB interface has not been designed for frequent contact operations. Please use an adapter cable with a strain relief.

[2] Option

[3] The selection of a variant eliminates the other.

4.1 Block Diagram SBC

Block Diagram SANTOKA
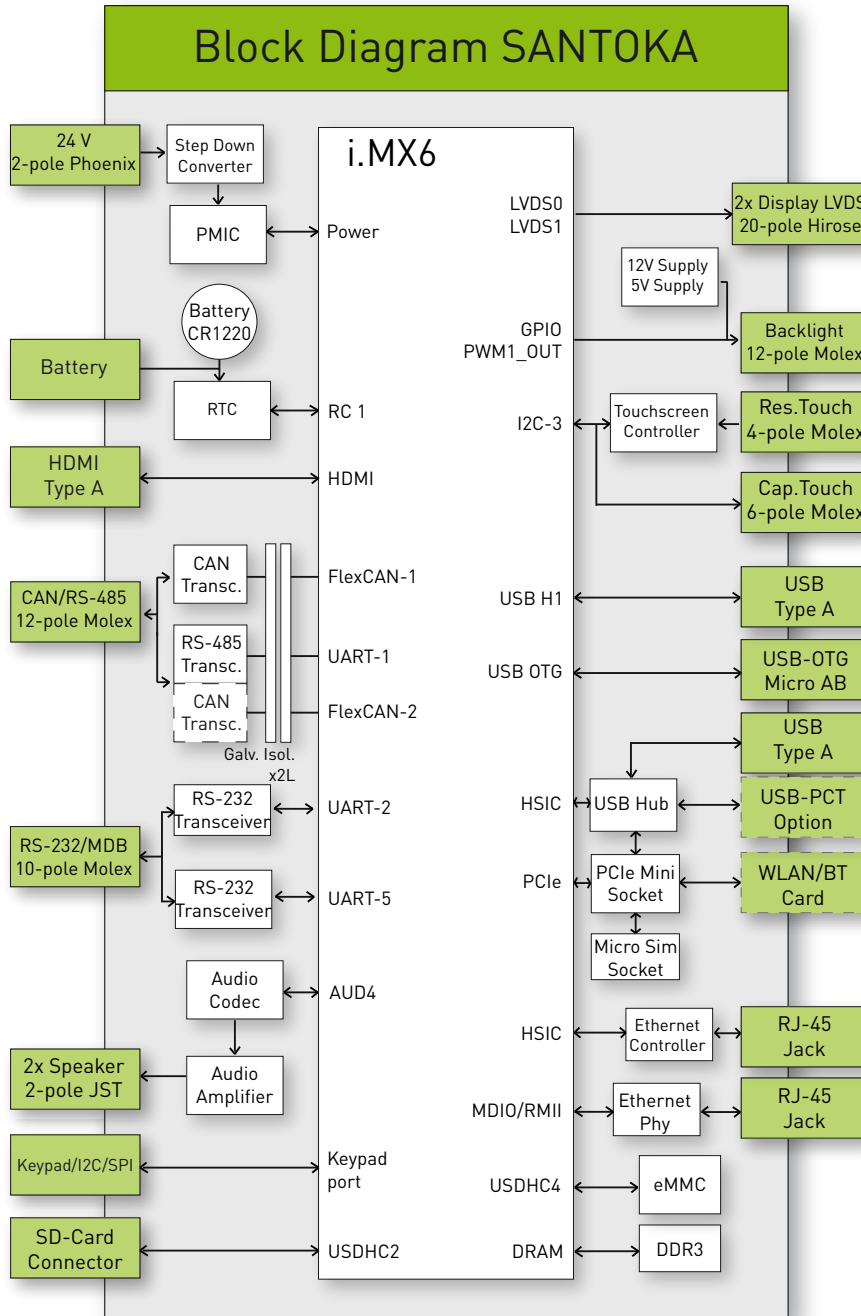
4.2   Technical Drawing
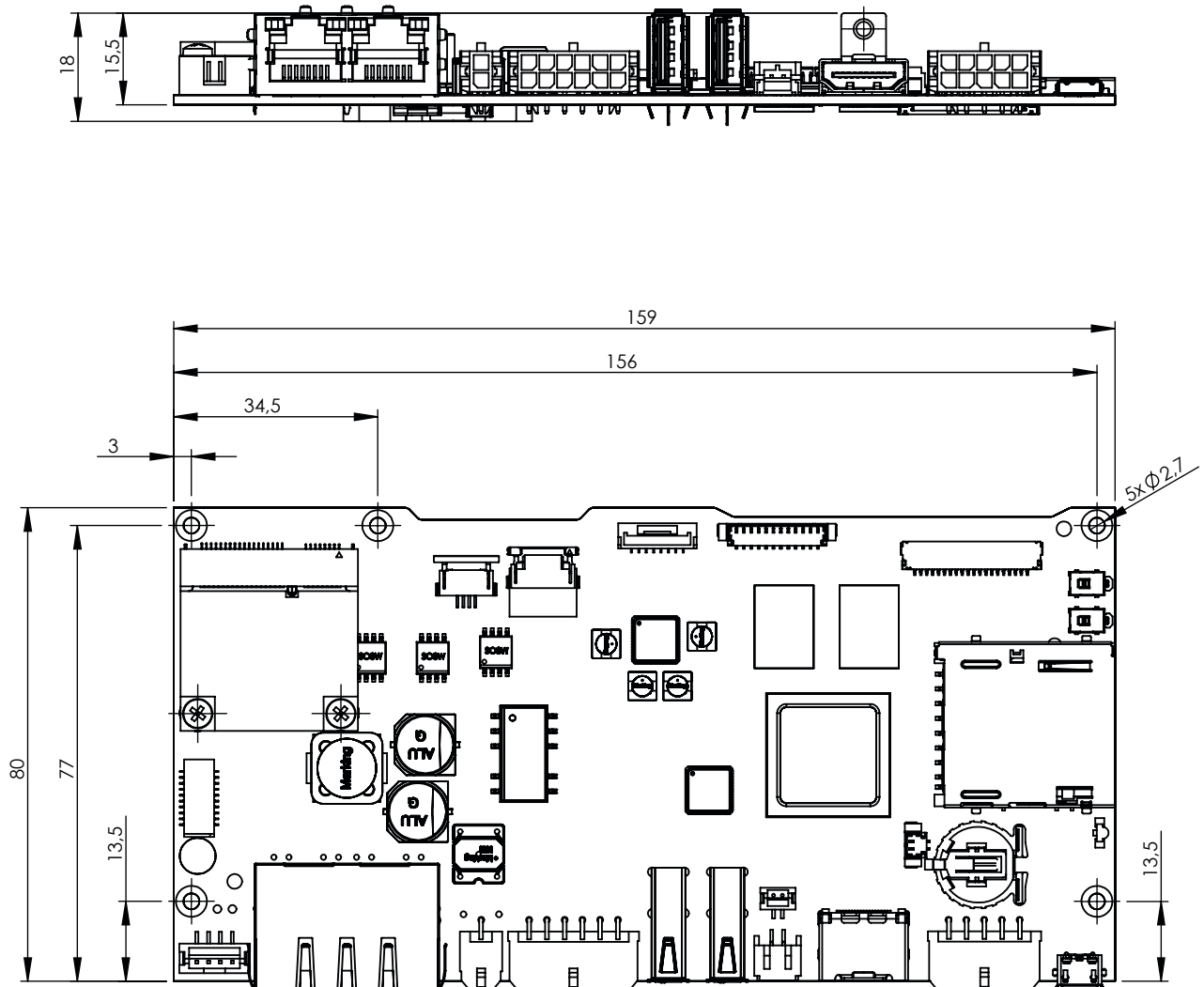
Missing dimensions according to 3D CAD files

4.3   Connectors

As this manual describes a core version, the internal and external interfaces will be mentioned in the following chapter.
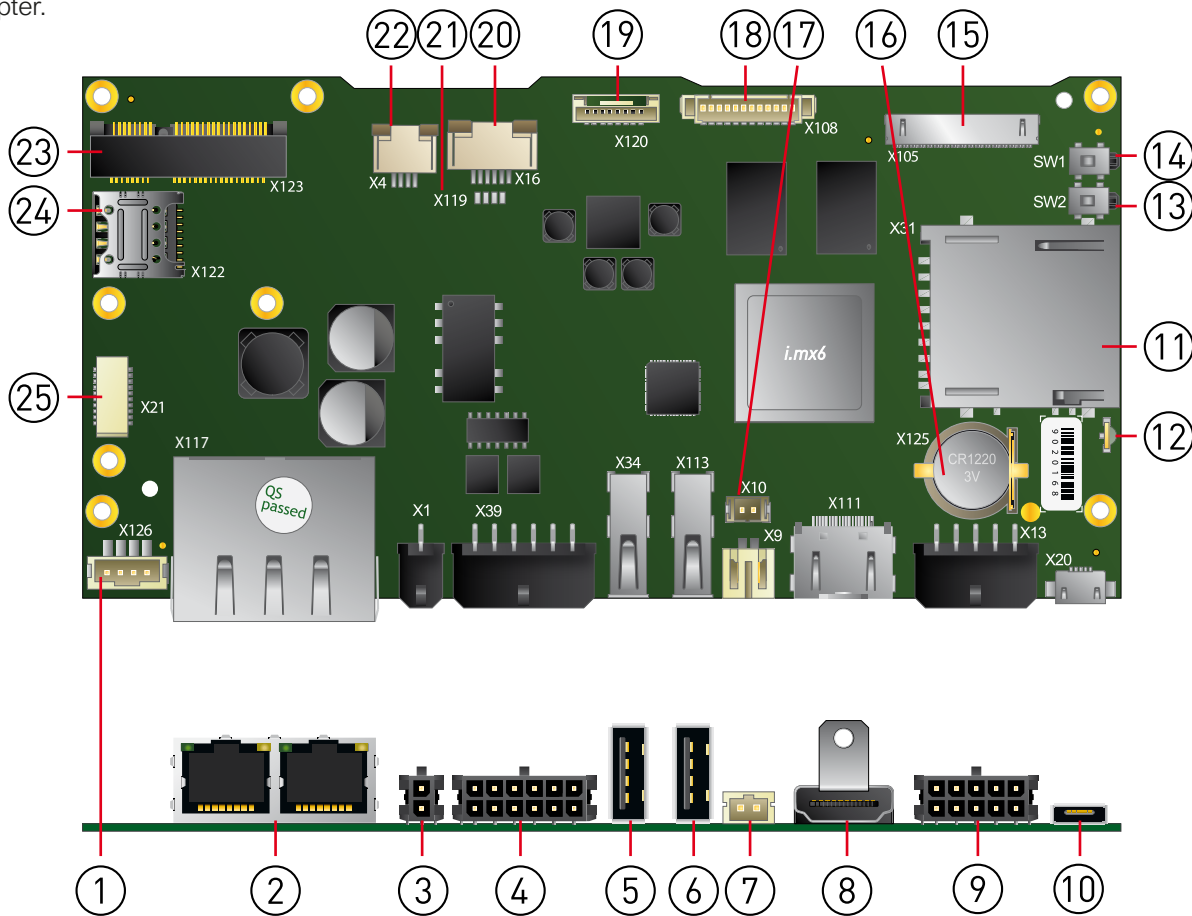
(Exemplary Illustration front side. The illustration shows the fully equipped Santoka Quadcore. It shows no heatsink to provide a better overview.)

Pos.	Description
1	Optional: 12 V DC Input (X126)
2	Ethernet (X117 1+2)
3	Power (X1)
4	CAN/RS-485 Interface (X39) Optional with galvanic isolation
5	USB Host (X34)
6	USB Host (X113)
7	Speaker (X9)
8	HDMI (X111)
9	RS-232/MDB (X13)
10	USB OTG (X20)
11	SD - card slot (X31)
12	Power LED (D30)
13	Boot - Select Swich (SW2)[1]

Pos.	Description
14	Reset Switch (SW1)
15	Display LVDS (X105/X109)
16	Battery (X125)
17	Speaker internal (X10)
18	Backlight (X108)
19	JTAG Debug Interface (X120)
20	Capacitive Touch (X16))
21	Capacitive Touch (X119)) Option
22	Resistive 4-wire Touch (X4)
23	PCIe Half Mini connector (X123)
24	SIM connector (X122)
25	Keypad/SPI (X21)

[1] For the function of this switch please refer in the future to the Flash N Go User Manual.

⑮

X109
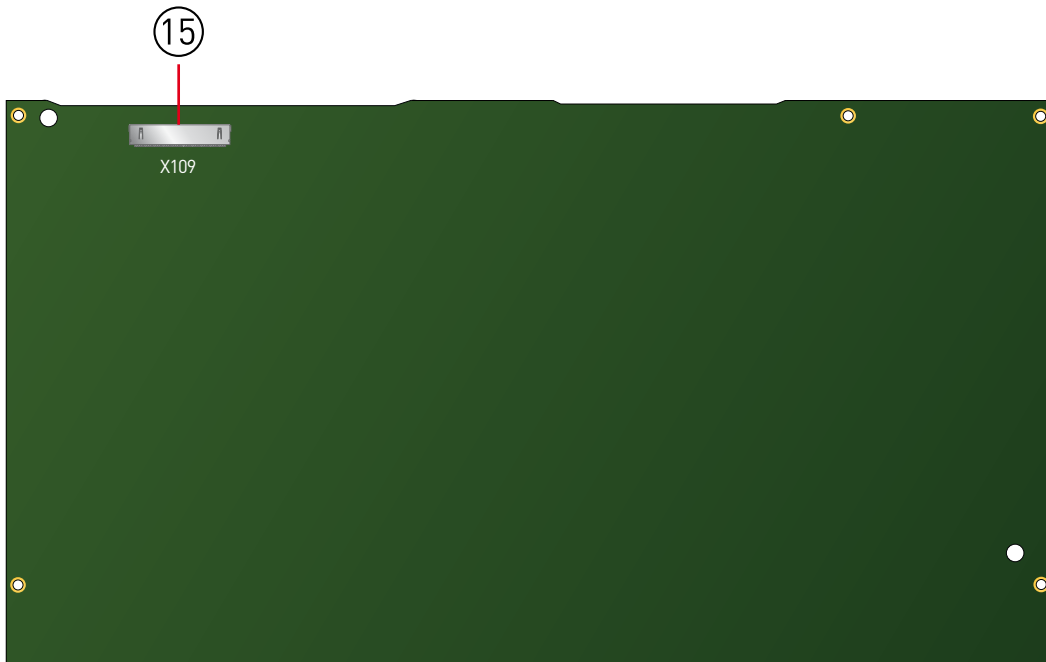
(Exemplary Illustration back side)

5. Installation and Start Up

The content of this document is limited to explain the device connectors and how to access SANOKA via FTP over your local area network (LAN) within a few seconds. For advanced hardware specifications and software support, please refer to chapter **„3.2 Related Documents and Online Support"**

5.1 Connection Scheme

USB Accessory
Memory stick,
mouse

RS-232 (Serial)
Debug-PC / Periphery

USB (Active Sync)
to PC / Development

Ethernet (TCP/IP) via
cross over cable or switch
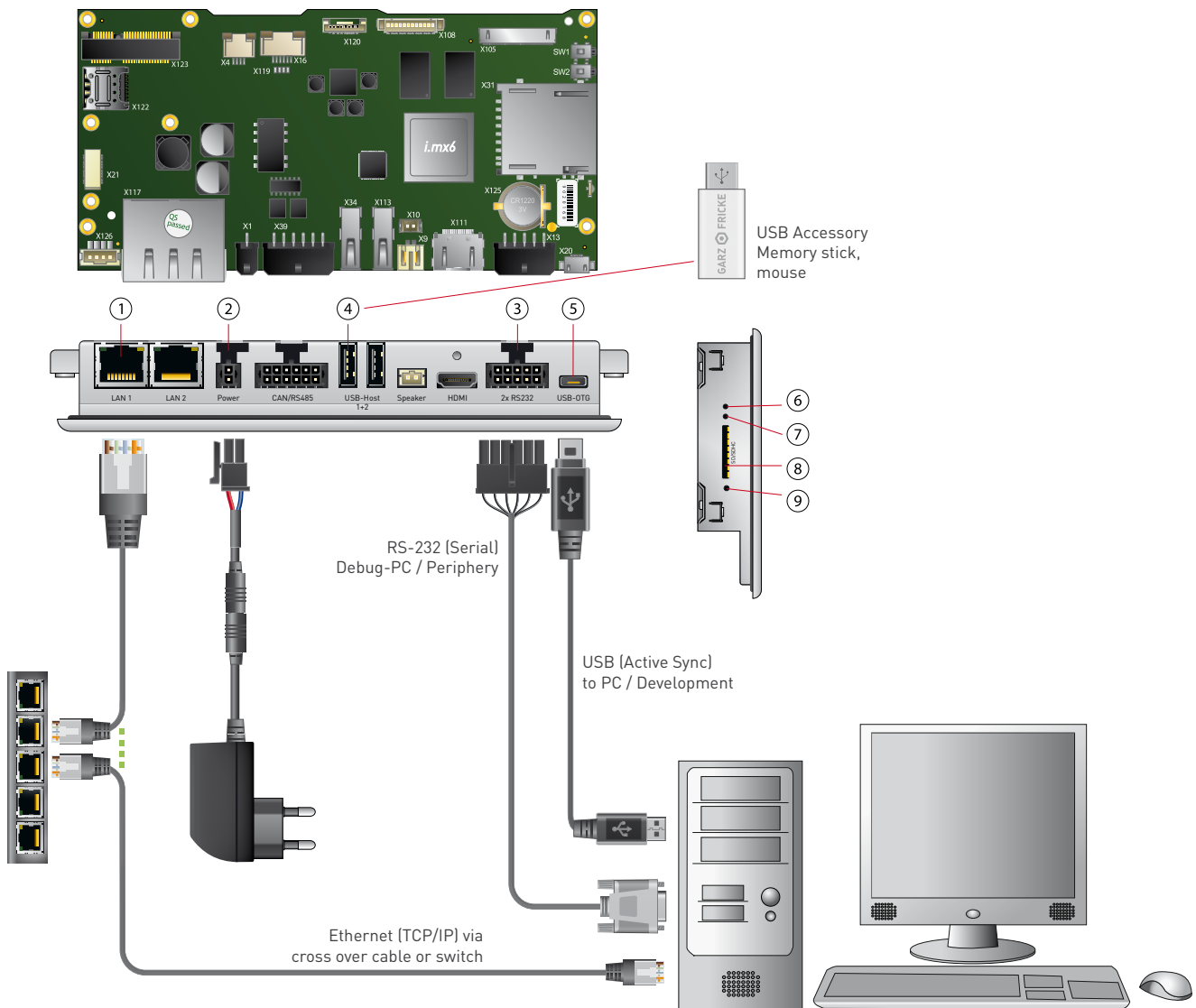
Exemplary Illustration

Pos.	Description
1	Ethernet
2	DC in
3	RS-232
4	USB-Device
5	USB HOST (OTG)

Pos.	Description
6	Reset sw
7	Bootselect sw
8	SD card slot
9	Power LED

http://support.garz-fricke.com/projects/Santoka/

6. Internal and External Interfaces

6.1 Optional 12 V DC Input (X126)

Pin	Name	Description	Information
1	VCC	DC Input Voltage	12 V DC
2	VCC	DC Input Voltage	12 V DC
3	GND	DC Ground	0 V DC
4	GND	DC Ground	0 V DC

Header: JST PH SM4
Plug: JST PHR-4
crimp contact JST SPH-002T-P0.5L

6.2 Ethernet (X117) (1+2)
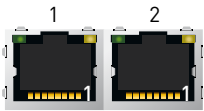
Pin	Name	Description	Information
1	Tx+		
2	TX-		
3	RX+		Rx/Tx might be swapped (Auto-MDIX) +/- might be swapped (Autom. polarity correction)
4	SPARE 1	Power Supply	
5			
6	RX-		
7	SPARE 2	Power Supply	
8			

Header: RJ45

Green LED (link) is default off and turns on when link is detected.

Yellow LED (act) flashes during sending/receiving packets.

6.3 Power (X1)

Pin	Name	Description	Level
1	GND	DC Ground	0 V
2	Vcc_In	DC Input voltage	Nom. 9 to 32 V DC

Header: Molex 43045-0200 Micro-Fit 2p
Plug: Molex 43025-0200 Micro-Fit 2p,
            crimp contact Molex 43030-0007
Shielding with 6,3 mm male spade terminal connector.

Caution:
Power supplies connected to this device must be compliant to the requirements of
"limited power sources" (LPS) to prevent the end-user from danger in case of a fault.

F2
1   2
TP446
4A_Nano_Slo-Blo_Typ-454
TP447
DC_IN

X1
3002-2*1AW
DC_IN

TP448 TP449

6.4   CAN/RS-485 Interface (X39)

Pin	Name	Description	Level	
1	GND_CAN_RS485	Ground for CAN and RS485 group		
2	CAN1_TERM	To enable CAN1-Termination, bridge with CAN1_H		
3	CAN1_H	CAN bus 1 high	-24	+24 V
4	CAN1_L	CAN bus 1 low	-24	+24 V
5	CAN1_TERM	To enable CAN1-Termination, bridge with CAN1_L		
6	RS485_TERM	To enable RS485-Termination: bridge with RS485_A		
7	GND_CAN_RS485	Ground for CAN and RS485 group		
8	n.a.			
9	RS485_Y	TX+	-7	+12 V
10	RS485_Z	TX-	-7	+12 V
11	RS485_A	RX+, to enable Half-Duplex: bridge with RS485_Y		
12	RS485_B	RX- ,to enable Half-Duplex: bridge with RS485_Z		

CAN1 Termination

RS485 Termination

RS485 Half-Duplex

Header: Molex 43045-1200 Micro-Fit 12p
Plug: Molex 43025-1200 Micro-Fit 12p, crimp contact Molex 43030-0007
Shielding with 6,3 mm male spade terminal connector

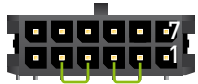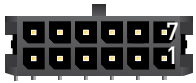## CAN1 / CAN2 *

Pin	Name	Description	Level	
1-5		Identical to standard		
6	n.a.			
7	GND_CAN_RS485	Ground for CAN group		
8	CAN2_TERM	To enable CAN2-Termination, bridge with CAN2_H		
9	CAN2_H	CAN bus 2 high	-24	+24 V
10	CAN2_L	CAN bus 2 low	-24	+24 V
11	CAN2_TERM	To enable CAN2-Termination, bridge with CAN2_L		
12	n.a.			
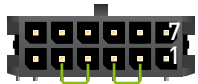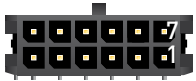
CAN1 Termination

CAN2 Termination

* alternative assembly upon request

6.5   USB Host (X34)

Pin	Name	Description	Level
1	USB_H1_VBUS	Power supply	+5 V DC max 500mA
2	USB_H1_DN	Data minus (D-)	
3	USB_H1_DP	Data plus (D+)	
4	GND	Ground	

Header: USB Type A

6.6   USB Host (X113)

Pin	Name	Description	Level
1	USB_H1_VBUS	Power supply	+5 V DC max 500mA
2	USB_H1_DN	Data minus (D-)	
3	USB_H1_DP	Data plus (D+)	
4	GND	Ground	

Header: USB Type A

6.7   Speaker (X9)

Pin	Name	Description	Level
1	Speaker +	Parallel to X10	1.5W RMS 8 Ohm
2	Speaker -		

Header: JST S2B-PH-SM3-TB
Plug: ST PHR-2 with crimp contacts SPH-002GW-P0.5L-ND

6.8   HDMI (X111)
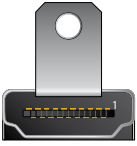
Pin	Name	Description	Level
1	D2 +	TMDS Data2+	
2	GND	TMDS Data2 shield	
3	D2 -	TMDS Data2-	
4	D1 +	TMDS Data1+	
5	GND	TMDS Data1 shield	
6	D1 -	TMDS Data1-	
7	D0 +	TMDS Data0+	
8	GND	TMDS Data0 shield	
9	D0-	TMDS Data0-	
10	CK +	TMDS Clock+	
11	GND	TMDS Clock schirm	
12	CK -	TMDS Clock-	
13	CEC	CEC	
14	Utility	NC	
15	I2C_CLK	SCL (I²C serial clock for DDC)	
16	I2C_Data	SDA (I²C serial data for DDC)	
17	DDC/CEC_GND	DDC/CEC/HEC - Masse	
18	+ 5 V	Supply	+ 5 V max. 55 mA
19	HOT_PLUG_DETECT	Hot - Plug - Detect	

Header: HDMI Type - A

6.9   RS-232/RS-232 (X13)

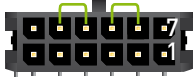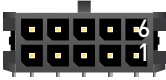| Pin	Name	Description	Level
1	GND	Ground	
2	RS232_TXD1	Port#1: Transmit data (Output)	
3	RS232_RXD1	Port#1: Receive data (Input)	
4	RS232_RTS1	Port#1: Request-to-send (Output)	
5	RS232_CTS1	Port#1: Clear-to-send (Input)	
6	GND	Ground	
7	RS232_TXD2	Port#2: Transmit data (Output)	
8	RS232_RXD2	Port#2: Receive data (Input)	
9	RS232_RTS2	Port#2: Request-to-send (Output)	
10	RS232_CTS2	Port#2: Clear-to-send (Input)	

Header: Molex 43045-1000 Micro-Fit 10p
Plug: Molex 43025-1000 Micro-Fit 10p,
                crimp contact Molex 43030-0007
Shielding with 6,3 mm male spade terminal connector

RS-232/MDB *

Pin	Name	Description	Level
1-6		Identical to standard	
7	MDB_TXD	MDB: Transmit data (Output)	
8	MDB_RXD2	MDB: Receive data (Input)	
9	MDB_WakeUp	MDB: WakeUp Signal (Output)	
10		MDB: WakeUp PullUp VCC	0.5 V

* alternative assembly upon request

6.10 USB OTG (X20)

Pin	Name	Description	Level
1	USB_OTG_VBUS	Power supply	+5 V DC max 500mA
2	USB_OTG_DN	Data minus (D-)	
3	USB_OTG_DP	Data plus (D+)	
4	USB_OTG_ID	Device ID	
5	GND	Ground	

Header: Micro-USB Type AB

6.11 SD Card Slot (X31)
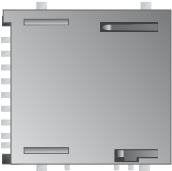
Pin	Name	Description	Level
1	DAT3		
2	CMD	Pullup	3.3 V
3	GND		
4	VDD		3.3 V
5	CLK		
6	GND		
7	DAT0		
8	DAT1		
9	DAT2		

6.12 Power LED (D30)

Should be green if the device is powered up.

6.13 Bootselect Switch (SW2)

Push during a power on sequence to boot into the secondary OS.

6.14 Reset Switch (SW1)

Push for a power on reset.

6.15   Display LVDS (X105, X109)

X105

Pin	Name	Description	Level
1	VCC	max. 1.500 mA	3.3 V +- 3%
2	VCC		3.3 V +- 3%
3	GND		
4	GND		
5	LVDS0_TX0_N	Differential Output	See table LVDS
6	LVDS0_TX0_P		
7	GND		
8	LVDS0_TX1_N	Differential Output	See table LVDS
9	LVDS0_TX1_P		
10	GND		
11	LVDS0_TX2_N	Differential Output	See table LVDS
12	LVDS0_TX2_P		
13	GND		
14	LVDS0_TXCLK_N	Differential Clock	See table LVDS
15	LVDS0_TXCLK_P		
16	GND		
17	LVDS0_TX3_N	Differential Output	See table LVDS
18	LVDS0_TX3_P		
19	GND		
20	GPO	Digital Output	3.3 V

Header: HIROSE DF19G-20P-1H
Plug: HIROSE DF19G-20S-1C

X109

Pin	Name	Description	Level
1	VCC	max. 1.500 mA	3.3 V +- 3%
2	VCC		3.3 V +- 3%
3	I2C3 SDA	Daten	3.3 V , Pullup 1kOhm
4	GND	Ground	
5	LVDS1_TX0_N	Differential Output	See table LVDS
6	LVDS1_TX0_P		
7	GND	Ground	
8	LVDS1_TX1_N	Differential Output	See table LVDS
9	LVDS1_TX1_P		
10	GND	Ground	
11	LVDS1_TX2_N	Differential Output	See table LVDS
12	LVDS1_TX2_P		
13	GND	Ground	
14	LVDS1_TXCLK_N	Differential Clock	See table LVDS
15	LVDS1_TXCLK_P		
16	GND	Ground	
17	LVDS0_TX3_N	Differential Output	See table LVDS
18	LVDS0_TX3_P		
19	GND	Ground	
20	I2C3 SCL	Clock	3.3 V , Pullup 1kOhm

Header: HIROSE DF19G-20P-1H
Plug: HIROSE DF19G-20S-1C

6.16 Battery-Holder (X125)

Pin	Name	Description	Level
1	VCC	Supply	3 V
2	GND	Ground	

Header: AUK BH19VWG-R5H-H
Battery: CR2032
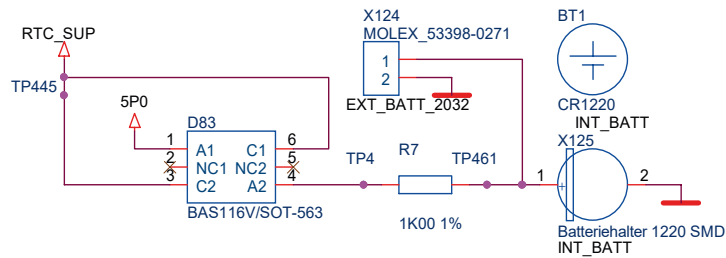
6.17   Speaker Internal (X10)

Pin	Name	Description	Level
1	Speaker +	Parallel to X9	1.5W RMS 8 Ohm
2	Speaker -		

Header: JST B2B-ZR-SM4-TF
Plug: ZHR-2 with crimp contacts SZH-003T-P0.5

6.18 Backlight (X108)
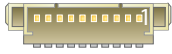
Pin	Name	Description	Level
1	12 V	Supply; only for X1 Supply >12.5V	12V +-2% max 3 A
2	12 V		
3	12 V		
4	5 V	Supply	5V +-3% max 3 A
5	5 V		
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	PWM	Typ. 250Hz 16 Bit	3.3 V
10	PWM 5 V	Driven by Signal of Pin 9	5 V
11	GPIO	Digital Output	3.3 V
12	GPIO 5 V	Driven by Signal of Pin 11	5 V

Header: Molex 53398-1271
Plug: Molex 51021-1200

6.19   JTAG - Debug Interface (X120)

Pin	Name	Description	Level
1	JTAG_TVK		
2	GND		
3	JTAG_TDO		
4	JTAG_MOD		
5	JTAG_TMS		
6	JTAG_TDI		
7	JTAG_TRST_B		
8	J_SRST_B		

6.20   Capacitive Touch (X16)

Pin	Name	Description	Level
1	5 V	Supply	5 V max 300mA
2	I²C SDA		3.3 V, 1kOhm Pullup intern
3	I²C SCL		3.3 V, 1kOhm Pullup intern
4	GND	Ground	
5	Reset#	Digital Output	3.3 V, 1kOhm Pulldown intern
6	Int#	Digital Input	3.3 V, 1kOhm Pullup intern

Header: Molex 52207_0660_FFC_6x1mm_TOP
Cable: FFC/FPC

Capacitive Touch (X119) *

Pin	Name	Description	Level
1	VDD	Supply	5 V max. 300 mA
2	USB_DN	Data minus	
3	USB_DP	Data plus	
4	GND	Ground	

Header: Molex

* alternative assembly upon request

6.21   Resistive 4 - wire Touch (X4)

Compatible with 4-wire resistive touch screens.
For further information see ST Microelectronic's datasheet STMPE610

Pin	Name	Description	Level
1	XP		
2	YN		
3	XN		
4	YP		

Header: Molex 52207-0433 or 52207-0485
Cable: FFC/FPC

6.22 PCIe Half Mini Connector (X123)

Pin	Name	Description	Level
1	WAKE#	PCIE Wake	
2	3.3V	Supply	3.3 V
3	Reserved	not connected	
4	GND	Ground	
5	Reserved	not connected	
6	1.5V	Supply	1.5 V
7	CLKREQ#	not connected	
8	UIM_PWR	SIM Card Interface	
9	GND	Ground	
10	UIM_DATA	SIM Card Interface	
11	REFCLK-	PCIE Clock	
12	UIM_CLK	SIM Card Interface	
13	REFCLK+	PCIE Clock	
14	UIM_RESET	SIM Card Interface	
15	GND	Ground	
16	UIM_VPP	SIM Card Interface	
17	Reserved	not connected	
18	GND	Ground	
19	Reserved	not connected	
20	W_Disable#	PCIE Disable	
21	GND	Ground	
22	PERST#	PCIE Perst	
23	PERn0	PCIE Data receive	
24	3.3Vaux	Supply	3.3 V
25	PERp0	PCIE Data receive	
26	GND	Ground	
27	GND	Ground	
28	1.5V	Supply	1.5 V
29	GND	Ground	
30	SMB_CLK	not connected	
31	PETn0	PCIE Data send	
32	SMB_DATA	not connected	
33	PETp0	PCIE Data send	
34	GND	Ground	
35	GND	Ground	
36	USB_D-	USB Data	
37	GND	Ground	
38	USB_D+	USB Data	
39	3.3Vaux	Supply	3.3 V
40	GND	Ground	
41	3.3Vaux	Supply	3.3 V
42	LED_WWAN#	LED red	
43	GND	Ground	
44	LED_WLAN#	LED green	
45	Reserved	not connected	
46	LED_WPAN#	LED yellow	
47	Reserved	not connected	
48	1.5V	Supply	1.5 V
49	Reserved	not connected	
50	GND	Ground	
51	Reserved	not connected	
52	3.3Vaux	Supply	3.3 V

Header: Mini PCIe socket

6.23 SIM connector (X122)
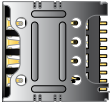
Pin	Name	Description	Level
1	PWR	Supply	
2	Reset	Reset	
3	Clk	Clock	
4	RFU2	not connected	
5	GND	Ground	
6	VPP	Supply	
7	I/O	Data	
8	RFU1	not connected	
9	Detect	not connected	

Header: Micro SIM socket

6.24 Keypad/SPI (X21) *

Keypad/SPI/I²C, multiplexed

Pin	Name	Description Default Mode	Description Mode 1	Level
1	GND	Ground	Ground	
2	GND	Ground	Ground	
3	KP_ROW0	Keypad row 0	Keypad row 0	
4	KP_COL0	Keypad column 0	Keypad column 0	
5	KP_ROW1	Keypad row 1	Keypad row 1	
6	KP_COL1	Keypad column 1	Keypad column 1	
7	KP_ROW2	Keypad row 2	Keypad row 2	
8	KP_COL2	Keypad column 2	Keypad column 2	
9	KP_ROW3	Keypad row 3	Keypad row 3	
10	KP_COL3	Keypad column 3	Keypad column 3	3.3 V
11 *1	KP_ROW4	I²C2 SDA (without internen pullups)	I²C2 SDA (without internal pullups)	
12 *1	KP_COL4	I²C2 SCL (without internen pullups)	I²C2 SCL (without internal pullups)	
13	KP_ROW5_DMA	Keypad row 5	SPI Interrupt Request	
14	KP_COL5_SS1	Keypad column 5	SPI Slave Select 1	
15	KP_ROW6_MISO	Keypad row 6	SPI Master in Slave out	
16	KP_COL6_MOSI	Keypad column 6	SPI Master out Slave in	
17	KP_ROW7_SLK	Keypad row 7	SPI Serial Clock	
18	KP_COL7_SS0	Keypad column 7	SPI Slave Select 0	
19	Aux_Out	500 mA (can be controlled by software)		5.0 V
20				

Header: JST SM20B-SRDS-G-TF, side entry, RM = 1.00
Plug: JST SHDR-20V-S-B, crimp contact: SSH-003GA-P0.2

*1 If Option HDMI is populated:
not usable as keypad row 4 and keypad column 4 (mode 2 / mode 3)
I²C2 is shared with I²C at HMDI
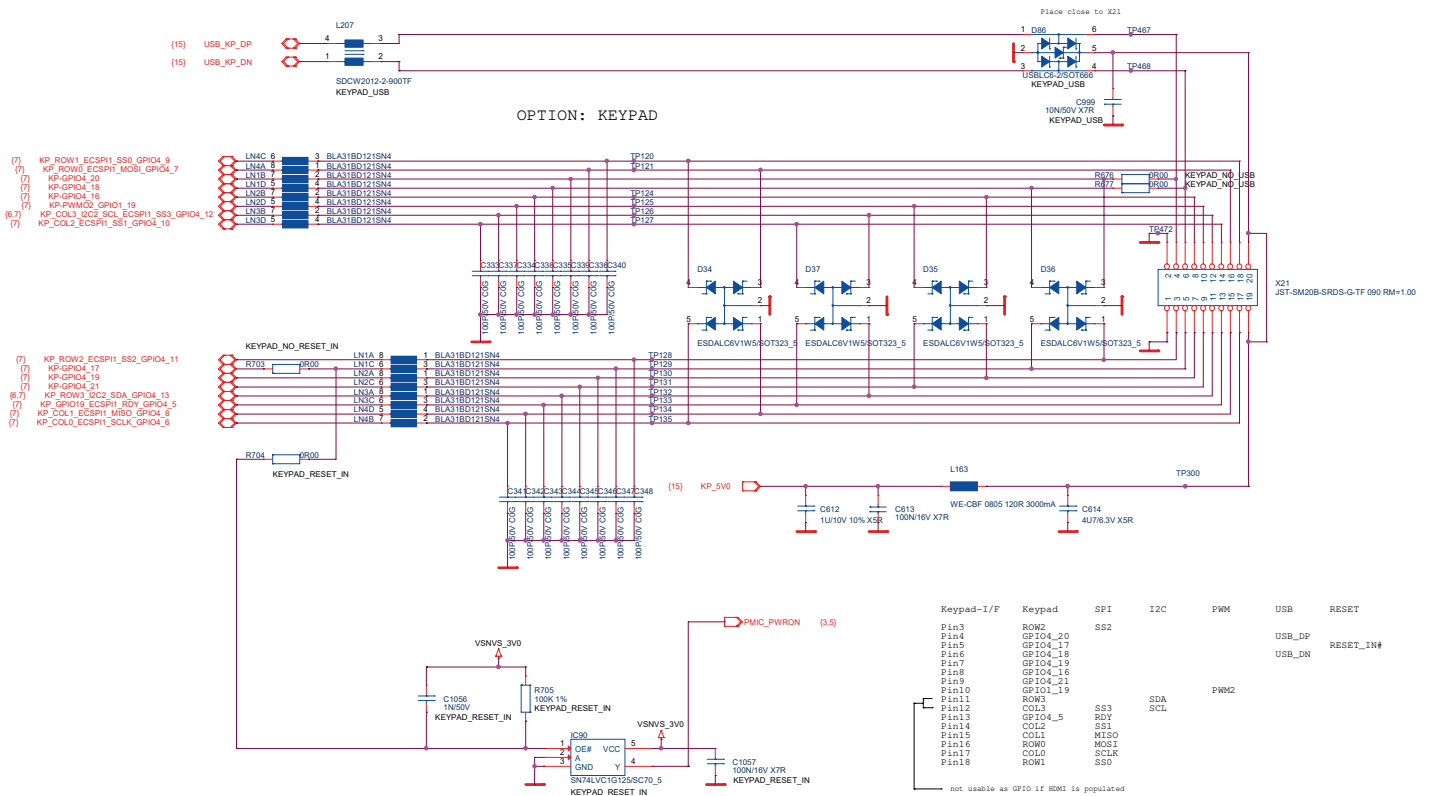Pull-Ups of about 2kOhm to 3.3V existing on I²C signals.

* alternative assembly upon request

Keypad/SPI/I²C, multiplexed 1*

Pin	Name	Description Mode 2	Description Mode 3	Level
1-10		Identical to standard	Identical to standard	
11 *1	KP_ROW4	Keypad row 4	Keypad row 4	
12 *1	KP_COL4	Keypad column 4	Keypad column 4	
13	KP_ROW5_DMA	Keypad row 5	SPI Interrupt Request	
14	KP_COL5_SS1	Keypad column 5	SPI Slave Select 1	3.3 V
15	KP_ROW6_MISO	Keypad row 6	SPI Master in Slave out	
16	KP_COL6_MOSI	Keypad column 6	SPI Master out Slave in	
17	KP_ROW7_SLK	Keypad row 7	SPI Serial Clock	
18	KP_COL7_SS0	Keypad column 7	SPI Slave Select 0	
19	Aux_Out	500 mA (can be controlled by software)		5.0 V
20				

*1 If Option HDMI is populated:
not usable as keypad row 4 and keypad column 4 (mode 2 / mode 3)
I²C2 is shared with I²C at HMDI
Pull-Ups of about 2kOhm to 3.3V existing on I²C signals.

* alternative assembly upon request

7. Battery

7.1 Battery Specifications

The internal baseboard is equipped with a Primary Lithium battery (type CR1220), which has a typical lifetime of 8 years.

Type	SECO Northern Europe Article Number
Battery type CR1220	010-0059R

Manufacturer	Model
Varta	CR1220
Alpha 3 Manufacturing Ltd.	YOBCR1220
Keystone	1220
Maxell	CR1220

One of these brands must be installed.

Danger of explosion when replaced with wrong type of battery.
Replace the battery only with a Lithium battery that has the same or equivalent type recommended by SECO Northern Europe GmbH.

Do not dispose of used CMOS batteries in domestic waste.
Dispose of the battery according to the local regulations dealing with the disposal of these special materials (e. g. to the collecting points for disposal of batteries).

7.2   Replacement of the Internal Battery

The internal battery is placed as per figure below.
The device shall be handled by authorized and skilled personnel only.

⚠️ Danger of electric hazard! First before removing battery, please make sure that the unit is completely disconnected from any power supply, direct or indirect.
Furthermore take care about the socket and connectors. Especially the micro USB connector might be damaged easily.

SANTOKA core

Position of the battery
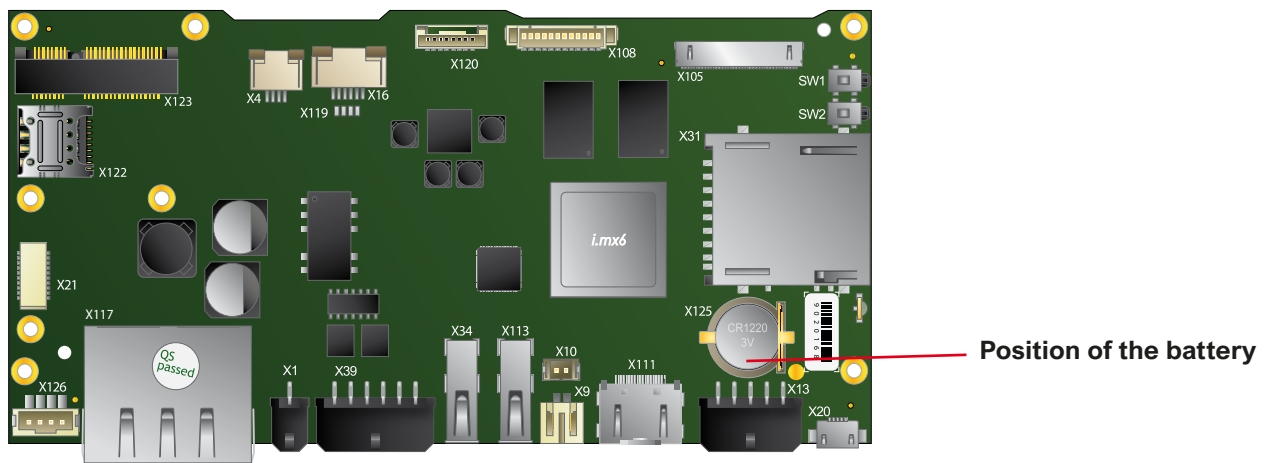
Annex A: Hardware Revision Information

This document is applicable for all products listed below. Please note that customized variants might possibly not support all features listed herein. Additional features are documented in specific attachments.

Platform	Article Number	Marking on PCB
SANTOKA core x1	900-3022R	0567 SANTOKA V1.3
SANTOKA core x2	900-3024R	0567 SANTOKA V1.3
SANTOKA core x4	900-3530R	0567 SANTOKA V1.3
SANTOKA core x4P	tbd.	0567 SANTOKA V1.3

Hardware Revision	Marking on PCB
V1.2	0567 SANTOKA V1.2

Annex B: Assembly Options

B-1   Wi-Fi / Bluetooth

Some appliances require a wireless network connection. To be more flexible with regard to future Wi-Fi standards and regulations, we decided not to assemble this functionality directly onto the single-board-computer. We recommend an external USB or miniPCIe solution. Drivers for both versions will be included in the related operating systems. Please contact the support for information about supported modules.

Annex C: Guidelines and Standards

C-1   RoHS Declaration

Devices comply with the requirements of Directive 2011/65/EU of the European Parliament and of the Council of 8th June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

C-2   Supplier Declaration – Directive EG 1907/2006 REACH

SECO Northern Europe is manufacturer of electronic products, thus - in the sense of REACH - we are so called „downstream users". The products we supply to you are solely non-chemical products (goods). Moreover and under normal and reasonably foreseeable circumstances of application, the goods supplied to you shall not release any substance. For that, SECO Northern Europe is neither obligatory for registration nor for the creation of material safety data sheet (MSDS).
From state of knowledge today our products contain no substances of very high concern from the current SVHC candidate list of the European Chemicals Agency in percentage >0,1.
We will immediately inform you in correspondence to REACH-Article 33 if any substance of content >0,1 percentage in our goods will be classified alarming by the ECHA. Based on the current status, however, we do not expect such an incidence.

C-3   UL Certification

Customers of SECO Northern Europe are attending on different markets. These markets are subjected to different UL certifications. Therefore SECO Northern Europe have no UL certification for their products.
To obtain UL certifications the product is designed to respect the following constraints:

- ▶ All electronic printed circuit boards are conform to UL standard
- ▶ Battery schematics meets the requirements of UL standard (please refer to chapter **„6.16 Battery-Holder (X125)"**)
- ▶ All wirings are designed with UL components
- ▶ The selected components on the markets are UL (List of UL relevant components is available at SECO Northern Europe (on request))

SECO Northern Europe do not guarantee to obtain UL certifications.

C-4   SECO Northern Europe Conformity Statement

SECO Northern Europe GmbH develops and distributes reliable, Arm®-based embedded solutions.
We offer various solutions from computer-on-modules (COM) to single-board computers (SBC) and fully-assembled human machine interface (HMI) with pre-installed operating system, display and housing.

These solutions are offered exclusively as OEM products. They do not include any application software that is intended for the end user. Therefore, we do not make any EU declarations of conformity in the name of SECO Northern Europe GmbH and do not provide the products with the CE mark.

Our customers provide the products with application software and build them into an end-user device as part of an industrial production process. They identify themselves as a manufacturer by affixing a license plate with their company or brand name.

We are happy to assist our customers when they compile the necessary technical documentation for the EU Declaration of Conformity of the complete device. We provide e.g. Supplier declarations or RoHS certifications, issue EMC testing results and carry out safety / radio / SAR tests, etc.

C-5   Approvals

The SANTOKA may be quipped with the transmitter module Sparklan WPEA 152-GN/BT

European Union regulatory compliance

The SANTOKA series modules comply with the regulatory standards EN 300 328 and
EN 301 489-1/-17. We declare that the human exposure of these modules is below the SAR limits specified in the
EU recommendations 1999/519/EC.

IMPORTANT: The 'CE' marking must be affixed to a visible location on the OEM product, where this module is installed in, and has to be labeled in accordance to R&TTE Directive 1999/5/EC.

FCC compliance

This device complies with Part 15 of the FCC Rules11. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.
Any changes or modifications not expressly approved bySECO Northern Europe GmbH could void the user's authority to operate the equipment.
The internal / external antenna(s) used for this module must provide a separation distance of at least 2 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
The outside of final products containing the SANTOKA module must display in a user accessible area alabel referring to the enclosed module. This exterior label can use wording such as the following12:
"Contains Transmitter Module FCC ID: PPD-AR5B225" or "Contains FCC ID: PPD-AR5B225".

Approved Antenna:

Dipole antenna with 2dBi (peak) gain for WLAN and Bluetooth

Annex D: Common Documentation

D-1   Warranty hints

SECO Northern Europe embedded systems are subject to manufacturer's warranty as long as the products are handled with adequate care and caution and in accordance to this manual.
The period of guarantee starts from the date of shipment
The products are warranted against defects in material, quality and functionality within the warranty period.
During this period, the repair of the products is free of charge.
SECO Northern Europe will decide for repair or replacement at their own discretion.
If the product has been returned with or without prior notice and no failure or malfunction can be detected or the failure or malfunction is caused by inappropriate handling or the device has been returned after expiry of warranty period, SECO Northern Europe reserve the right to charge the user for repair or replacement.

The warranty does not cover defects caused by improper or inadequate installation, maintenance or handling by the user, unauthorized modification or misuse, operation outside the specification a non-compliance of this manual. In case of doubt, please contact the technical sales team prior to intended activity.
The warranty does also not cover any defects or damages of other equipment connected to the SECO Northern Europe product, faulty or not.
For warranty or repair service, please contact the technical sales team.

support.north@seco.com
rma.north@seco.com

D-2 Field of Application

The products covered by this document are designed and manufactured for the following applications (I).
If you intend to use these products in applications as quoted in (II) we highly recommend a personal contact
with our consultants and/or technical sales team.

(I) Recommended application areas for SECO Northern Europe embedded systems

Even for these applications, we recommend to get in contact with our technical sales team. We offer
a wide range of support, even at an early stage of evaluation and/or design-in phase.

- ▶ Vending machines and gastronomy devices
- ▶ Industrial controllers and HMI systems
- ▶ Home automation and facility management
- ▶ Audiovisual equipment
- ▶ Instrumentation and measuring equipment

**(II) Restricted application areas, prior consultation is mandatory to identify and meet the individual
regulatory requirements**

- ▶ Gas leak detectors
- ▶ Rescue and security equipment
- ▶ Safety devices
- ▶ Control and safety devices for airplanes, trains, automobiles and other transportation equipment
- ▶ Traffic control systems
- ▶ Control equipment for nuclear power industry
- ▶ Medical equipment related to life support etc.
- ▶ Gasoline stations and oil raffineries

Annex E: Technical Support

Before contacting the SECO Northern Europe support team, please try to help yourself by the means of this manual or any other documentation provided by SECO Northern Europe or the related websites.
If this does not help at all, please feel free to contact us.
Our technicans and engineers will be glad to support you. Please note that beyond the support hours included the Starter Kit, various support packages are available. To keep the pure product cost at a reasonable level, we have to charge support and consulting services per effort.

Shipping Address:

SECO Northern Europe GmbH
Schlachthofstrasse 20
21079 Hamburg
Germany

Support Contact:

Phone: +49 (0) 40 / 791 899-200
Fax: +49 (0) 40 / 791 899-39
E-Mail: support.north@seco.com
URL: north.seco.com

Annex F: General Information

Trademarks and service marks

Names and logos in this document may be trademarks of their respective companies.

In some cases descriptions for copyrighted products are not explicitly indicated as such. The absence of the trademark (™) and copyright (©) symbols does not imply that a product is not protected. Additionally, registered patents and trademarks are similarly not expressly indicated.

Drawings

All drawings, which are shown in this manual are schematic drawings.

For exact technical drawings please refer to our sales team or product manager

All other product or service names are the property of their respective owners.