Hardware Documentation

PicoCoreBBDSI
PicoCore™ Base Board
for HW Revision 1.50

Version 002/06.2025

Elektronik Systeme

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About This Document

This document describes how to use the PicoCore™ Base Board (further named base board) with mechanical and electrical information. The latest version of this document can be found at: www.fsembedded.com.

ESD Requirements

All F&S hardware products are electrostatic discharge (ESD) sensitive. All products are handled and packaged according to ESD guidelines. Please do not handle or store ESD sensitive material in ESD unsafe environments. Negligent handling will harm the product and warranty claims become void.

Review Service

F&S provide a schematic review service for your baseboard implementation. Please send your schematic as searchable PDF to support@fs-net.de.

History

Date	Platform	Added (A) Removed (R) Modified (M)	Chapter	Description	Author
19.05.202524.06.2025	All	M	All	Initial version for PCB revision 1.50	TM/SM
24.06.2025	All	A	1.3, 2.1	Add pin 1 marking to J19, add note	SM

Table of Content

Tables

Figures

1 Overview

This base board is an evaluation board that supports our PicoCore™ module product family (further named module).

1.1 Additional Documentation

Please see the documentation of the respective module. The latest versions of the documents can be found on www.fsem-bedded.com/en/picocore.

1.2 General Parameter

Parameter	Description
Dimension	100.0 mm x 72.0 mm
Height parts on top	16.5 mm
Height parts on bottom	6.6 mm
Weight	≈ 65.0 g
Mounting Holes	4x Ø 3.2 mm

Table 1: General parameter

1.3 Technical Drawing

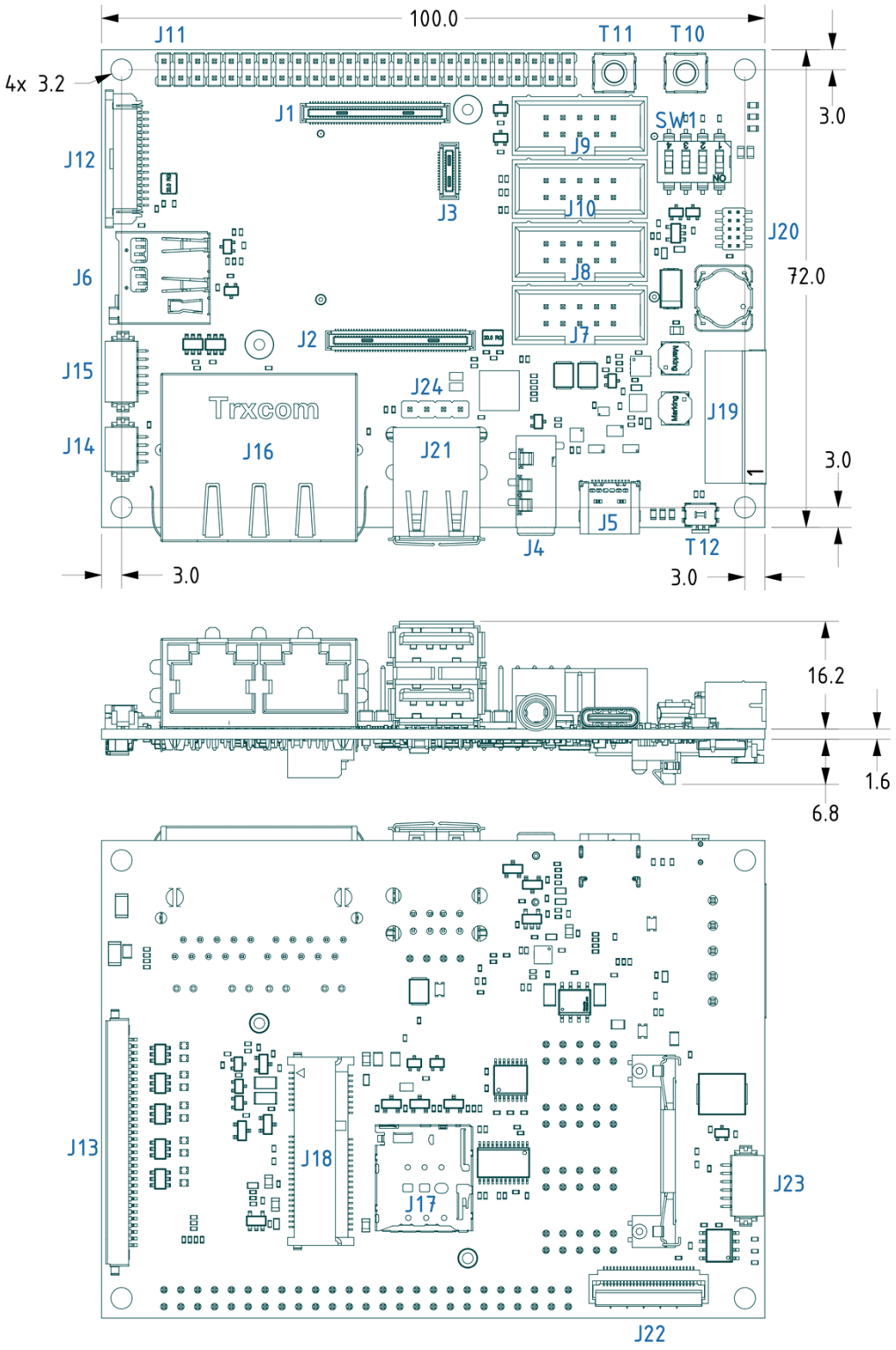

Figure 1: Technical Drawing

Note: All dimensions are in mm.

1.4 Connectors

Ref.	Description	Connector Type	Counter Part
J1	PicoCore Board to Board Connector	Hirose, DF40C-100DS-0.4V[1]	
J2			
J3	PicoCore Board to Board Connector	Hirose, DF40C-30DS-0.4V[1]	
J4	USB 2.0	2x Type A	
J4	Audio	3.5 mm Audio Jack	
J5	USB OTG	USB2.0 / 3.0, Type C	
J6	SD Card	Micro SD	
J7	CAN	2x5 pos RM: 2.54 mm, shrouded	
J8	RS232	2x5 pos RM: 2.54 mm, shrouded	
J9	Feature Connector	2x32 pos RM. 2.54 mm	
J10	RS232 / RS485	2x5 pos RM: 2.54 mm, shrouded	
J11	Feature Connector	2x25 pos RM. 2.54 mm	
J12	Camera	Amphenol, SFW15R-1	FPC cable, 15pos, Pitch: 1.00 mm[1]
J13	Display	Hirose, MDF76GW-30S-1H	JAE, FI-X30H[1]
J14	Backlight Connector	Hirose, DF13-04	Hirose, DF13-4S-1.25C[1]
J15	General Purpose Connector	Hirose, DF13-06	Hirose, DF13-6S-1.25C[1]
J16	Ethernet	2x RJ45	
J17	SIM	Micro SIM	
J18	Mini PCI express	Full size	
J19	Power Input	Phoenix Contact, MC 1,5/5-G-3,81	Phoenix Contact, MC 1,5/ 5-ST-3,81
J20	JTAG	2x5 pos RM: 1.27 mm	
J21	USB	2x USB 2.0, Type A	
J22	Camera	FH41-28S-0.5SH(05)	FPC cable, 28pos, Pitch: 0.50 mm[1]
J23	SPI	Hirose, DF13-06	Hirose, DF13-6S-1.25C[1]
J24	USB	1x4 pos RM: 2.54 mm	
T10	Button Reset		
T11	Button Boot select		
T12	Button Reset (optional On/Off)		
SW1	DIP - Switch		

[1]Connectors and preassembled cables are available for purchase at www.fsembedded.com.

Table 2: Connector description

2 Detailed Description

2.1 Power Supply, J19

The base board and its peripherals are supplied by J19.

Pin	Signal Name	Voltage	Description
1	GND		
2	VBAT_IN	3.0 V	Supply for real time clock, leave open if not used
3	POWERIN	5.0 V[1]	
4	GND		
5	VBL		Input for backlight voltage at J14

Table 3: J19 (pin description)

[1] For higher input voltage, you can use the ADP-NT24V4 power supply unit (www.fsembedded.com/en/accessories/power-adapter-v4), which is directly connected to J19. Please note that the pin numbers on the ADP-NT24V4 are mirrored because of the connector pin 1 definition, according to the datasheet.

2.2 Button & Switches

2.2.1 DIP Switch, SW1

SW1	SW2	SW3	SW4	Description
OFF	OFF	-	OFF	RS232
ON	OFF	-	ON	RS485 Half Duplex
ON	ON	-	ON	RS485 Full Duplex
-	-	OFF	-	mPCIe wirless functions enabled
-	-	ON	-	mPCIe wirless functions disabled

Table 4: SW1 (truth table)

2.2.2 Reset Button, T10

This button resets the module.

2.2.3 Boot Select Button, T11

This button sets the module into service state.

2.2.4 ON/OFF Button, T12

This button is connected to the ON/OFF pin of the CPU.

2.3 USB

The baseboard contains a USB hub to generate three host ports. Additionally a USB OTG port is integrated.

2.3.1 USB Host Ports , J21

Two USB 2.0 Type A connectors.

2.3.2 USB Host Ports J24

One USB 2.0 port on a pin header.

Pin	Signal Name	Voltage	Description
1	+5VS	5.0 V	
2	USB Data +		
3	USB Data -		
4	GND		

Table 5: J24 (pin description)

2.3.3 USB 2.0/3.0 OTG Port, J5

USB 2.0 / 3.O Type C OTG port.

2.4 Audio

The base board provides a 3.5mm audio jack with headphone and mic.

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	AUDIO_A_MIC		I	J2-10	
2	AUDIO_A_HP_L		O	J2-18	
3	AUDIO_A_HP_R		O	J2-20	
4	AUDIO_A_GND				

Table 6: J4 (pin description)

2.5 SD Card, J6

The base board provides a Micro-SD card slot.

2.6 CAN, J7

The base board has a CAN transceiver applied.

Pin	Signal Name	Voltage	Description
1	VCC_COM	5.0 V	max. 0.8 A, fused
2	GND		
3	CAN1L	max. ± 58.0 V	CAN Low
4	CAN1H	max. ± 58.0 V	CAN High
5	GND		
8	VCC_COM	5.0 V	max. 0.8 A, fused

Table 7: J7 (pin description)

Note: Not listed pin numbers are not connected.

2.7 Serial Interfaces

The base board offers three serial ports.

2.7.1 J8, J9 (RS232)

Two of the serial ports (Serial A[1] & C) are RS232 interfaces, without flow control (RTS / CTS).

[1] Serial A is the intended console port

Pin	Signal Name	Voltage	Description
3	RXD		
5	TXD		
9	GND		
10	VCC_COM	5.0 V	max. 0.8 A, fused

Table 8: J8 & J9 (pin description)

Note: Not listed pin numbers are not connected.

2.7.2 J10 (RS232/RS485)

Serial B can be used as RS232 with flow control or as RS485 in full or half duplex mode. SW1 is used to configure these options (see 2.2.1 DIP Switch, SW1).

Pin	Signal Name	Voltage	Description
3	RXD_B / RS484_P		
4	RTS_B		
5	TXD_B / RS484_N		
6	CTS_B		
9	GND		
10	VCC_COM	5.0 V	max. 0.8 A, fused

Table 9: J10 (pin description)

Note: Not listed pin numbers are not connected.

2.8 Feature Connector, J11

J11 is used mainly to provide all module signals that are not used otherwise on the base board. By default, the base board comes without a mounted pin header.

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	+3VS	3.3 V	PWR		max. 1.2 A
2	+5VS	5.0 V	PWR		max. 0.8 A
3	SPI_B_SCLK	3.3 V	O	J1-62	
4	SPI_B_SS0	3.3 V	O	J1-56	
5	SPI_B_MISO	3.3 V	I	J1-58	
6	SPI_B_MOSI	3.3 V	O	J1-60	
7	I2S_B_TXD0	3.3 V	O	J2-73	
8	GPIO_J1_54	3.3 V	I/O	J1-54	
9	I2S_B_RXD0	3.3 V	I	J2-75	
10	I2S_B_MCLK	3.3 V	O	J2-65	
11	GND				
12	I2S_B_TXFS	3.3 V	O	J2-67	
13	UART_D_TXD	3.3 V	O	J1-36	
14	I2S_B_TXC	3.3 V	O	J2-69	
15	UART_D_RXD	3.3 V	I	J1-34	
16	I2C_A_SCL	3.3 V	O	J1-4	
17	I2C_A_SDA	3.3 V	I/O	J1-6	
18	GPIO_J1_2	3.3 V	I/O	J1-2	
19	SD_A_DATA4	1.8/3.3 V	I/O	J2-74	
20	SD_A_DATA5	1.8/3.3 V	I/O	J2-76	
21	SD_A_DATA6	1.8/3.3 V	I/O	J2-78	
22	SD_A_DATA7	1.8/3.3 V	I/O	J2-80	
23	SD_A_DATA7	1.8/3.3 V	I/O	J2-100	
24	CAN_A_RX	3.3 V	I	J1-10	
25	SD_B_DATA2	1.8/3.3 V	I/O	J2-98	
26	CAN_A_TX	3.3 V	O	J1-12	
27	GND				
28	SD_B_DATA1	1.8/3.3 V	I/O	J2-96	
29	SD_B_DATA0	1.8/3.3 V	I/O	J2-94	
30	SD_B_CLK	1.8/3.3 V	O	J2-92	
31	SD_B_CMD	1.8/3.3 V	I/O	J2-90	
32	SD_B_CD	1.8/3.3 V	I		

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
33	SD_WP	1.8/3.3 V	I		
34	PWM	3.3 V	O		
35	SD_RST	1.8/3.3 V	O		
36	UART_A_RTS[1]	3.3 V	O		
37	GND				
38	UART_A_CTS[1]	3.3 V	I	J1-16	
39	+3VS	3.3 V	PWR		max. 1.2 A
40	+5VS	5.0 V	PWR		max. 0.8 A
41	AUDIO_A_MIC		I	J2-10	
42	GND				
43	n.c.				
44	AUDIO_A_LIN_R		I	J2-14	Audio Line In right
45	AUDIO_A_LOUT_R		O	J2-8	Audio Line Out right
46	GND				
47	GND				
48	AUDIO_A_LIN_L		I	J2-12	Audio Line In left
49	AUDIO_A_LOUT_L		O	J2-6	Audio Line Out left
50	GND				

Table 10: J11 (pin description)

2.9 Camera (MIPI-CSI)

The base board has two different camera interfaces. One for 2 lane and one for 4 lane MIPI CSI cameras.

2.9.1 2 Lane CSI Connector, J12

This connector follows the Raspberry Pi hardware specifications for camera modules (https://www.raspberrypi.com/documentation/accessories/camera.html#hardware-specification).

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	GND				
2	CSI_DATA0_N		I	J1_76	
3	CSI_DATA0_P		I	J1_74	
4	GND				
5	CSI_DATA1_N		I	J1_82	
6	CSI_DATA1_P		I	J1_80	
7	GND				
8	CSI_CLK_N		I	J1_88	
9	CSI_CLK_P		I	J1_86	
10	GND				
11	GPIO_J1_44	3.3V	I/O	J1_44	commonly used as camera enable signal
12	CAM_CLK_24M	3.3 V	O		camera master clock, 24 MHz
13	I2C_D_SCL	3.3 V	O	J1_48	
14	I2C_D_SDA	3.3 V	I/O	J1_50	
15	+3V3	3.3 V	PWR		max. 1.2 A

Table 11: Camera 15 Pol Connector (pin description)

2.9.2 4 Lane CSI Connector, J24

This connector follows the Basler BCON for MIPI interface (https://docs.baslerweb.com/bcon-for-mipi-interface-description) specification.

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	GND				
2	CSI_A_DATA3_P		I	J1-98 / J3_28	
3	CSI_A _DATA3_N		I	J1-100 / J3_30	
4	GND				
5	CSI_A _DATA2_P		I	J1-92 / J3_22	
6	CSI_A _DATA2_N		I	J1-94 / J3_24	
7	GND				
8	CSI_A _CLK_P			J1-74 / J3_4	
9	CSI_A _CLK_N			J1-76 / J3_6	
10	GND				
11	CSI_A _DATA1_P		I	J1-86 / J3_16	
12	CSI_A _DATA1_N		I	J1-88 / J3_18	
13	GND				
14	CSI_A _DATA0_P		I	J1-80 / J3_10	
15	CSI_A _DATA0_N		I	J1-82 / J3_12	
16	GND				
17	n.c.				
18	n.c.				
19	GND				
20	I2C_B_SCL	1.8 V	O	J1-3	
21	I2C_B_SDA	1.8 V	I/O	J1-5	
22	GND				
23	n.c.				
24	n.c.				
25	VIN	5.0 V	PWR		Directly connected to power input (J19)
26					
27					
28	GND				

Table 12: Camera 28 Pol Connector (pin description)

2.10 Display

2.10.1 MIPI-DSI / LVDS / HDMI, J13

The base board has one display port that supports different interfaces (DSI / LVDS / HDMI), depending on the module.

Pin	Signals DSI/LVDS	Signals HDMI	Voltage	I/O	Pico Core Pin	Description
1	DISP_A_DATA0_N	n.c.		O	J1-25	
2	DISP_A_DATA0_P	n.c.		O	J1-23	
3	DISP_A_DATA1_N	n.c.		O	J1-31	
4	DISP_A_DATA1_P	n.c.		O	J1-29	
5	DISP_A_DATA2_N	n.c.		O	J1-37	
6	DISP_A_DATA2_P	n.c.		O	J1-35	
7	GND					
8	DISP_A_CLK_N	n.c.		O	J1-19	
9	DISP_A_CLK_P	n.c.		O	J1-17	
10	DISP_A_DATA3_N	n.c.		O	J1-43	
11	DISP_A_DATA3_P	n.c.		O	J1-41	
12	DISP_B_DATA0_N	HDMI_TXD0_N		O	J1-55	
13	DISP_B_DATA0_P	HDMI_TXD0_P		O	J1-53	
14	GND					
15	DISP_B_DATA1_N	HDMI_TXD1_N		O	J1-61	
16	DISP_B_DATA1_P	HDMI_TXD1_P		O	J1-59	
17	GND					
18	DISP_B_DATA2_N	HDMI_TXD2_N		O	J1-67	
19	DISP_B_DATA2_P	HDMI_TXD2_P		O	J1-65	
20	DISP_B_CLK_N	HDMI_TXC_N		O	J1-49	
21	DISP_B_CLK_P	HDMI_TXC_P		O	J1-47	
22	DISP_B_DATA3_N	EARC_N_HPD		O	J1-73	
23	DISP_B_DATA3_P	EARC_P_UTIL		O	J1-71	
24	GND					
25	I2C_B_SDA		1.8 / 3.3 V[1]	I/O	J1-5	Shared with I²C Touch Connector (J15)
26	I2C_B_IRQ#		1.8 / 3.3 V[1]	I	J1-1	
27	I2C_B_SCL		1.8 / 3.3 V[1]	O	J1-3	
28	RESET#		1.8 / 3.3 V[1]	O	J1-7	
29	VLCD		3.3 V	PWR		max. 1.2 A
30						

Table 13: J13 (pin description)

[1] Depends on the module.

2.10.2 Backlight Connector, J14

J14 is the supply output connector for a backlight[1].

[1] Dicrectly routed from J19

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	VBL		PWR		Backlight voltage connected to power input VBL or VIN
2	BL_ON (opt. VBL)	3.3 V	O	J1-9	Signal to turn on Backlight
3	BL_PWM (opt. GND)	3.3 V	O	J1-11	Signal to control backlight brightness
4	GND				

Table 14: J14 (pin description)

2.10.3 I²C Touch Sensor Connector, J15

J5 can be used for an external I²C device like a touch sensor.

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	+3V3	3.3 V	PWR		max. 1.2 A
2	I2C_B_SDA	3.3 V	I/O	J1-5	shared with the display connector J13
3	I2C_B_SCL	3.3 V	O	J1-3	shared with the display connector J13
4	RESET#	3.3 V	O	J1-2	
5	I2C_B_IRQ	3.3 V	O	J1-1	
6	GND				

Table 15: J15 (pin description)

2.11 SPI Connector, J23

Pin	Signal	Voltage	I/O	Pico Core Pin	Description
1	+3V3	3.3 V	PWR		max. 1.2 A
2	SPI_A_SCLK	3.3 V	O	J1_70	
3	SPI_A_MOSI	3.3 V	O	J1_68	
4	SPI_A_MISO	3.3 V	I	J1_66	
5	SPI_A_SS0	3.3 V	O	J1_64	
6	GND				

Table 16: J23 (pin description)

2.12 Ethernet, J16

The base board supports two ethernet ports on RJ45 connectors with up to 1 Gbit, depending on the module.

2.13 Mini PCI Express, J18

The base board provides a Mini PCI Express slot for full size modules.

Pin	Signals	Voltage	I/O	Pico Core Pin	Description
1	MPCIE_WAKE#		I	J1-97	
2	+3V3	3.3 V	PWR		max. 1.2 A
4	GND				
6	+1V5	1.5 V	PWR		max. 0.2 A
8	UIM_PWR		PWR		Directly connected to SIM socket J17
9	GND				
10	UIM_DATA		I/O		Directly connected to SIM socket J17
11	MPCIE_CLK_N		I	J1-91	
12	UIM_CLK		O		Directly connected to SIM socket J17
13	MPCIE_CLK_P		I	J1-89	
14	UIM_RESET		O		Directly connected to SIM socket J17
15	GND				
16	UIM_VPP		PWR		Directly connected to SIM socket J17
18	GND				
20	W_DISABLE#		I		wireless com. enable signal, connected to SW1
21	GND				
22	MPCIE_PERST#		I	J1-95	
23	MPCIE_CRX_N		I	J1-85	

Pin	Signals	Voltage	I/O	Pico Core Pin	Description
24	+3V3	3.3 V	PWR		max. 1.2 A
25	MPCIE_CRX_P		I	J1-83	
26	GND				
27	GND				
28	+1V5	1.5 V	PWR		max. 0.2 A
29	GND				
30	I2C_C_SCL		I	J1-40	
31	MPCIE_CTX_N		O	J1-79	
32	I2C_C_SDA		I/O	J1-42	
33	MPCIE_CTX_P		O	J1-77	
34	GND				
35	GND				
36	USB_D_N		I/O		Connected to the USB Hub
37	GND				
38	USB_D_N		I/O		Connected to the USB Hub
39	+3V3	3.3 V	PWR		max. 1.2 A
40	GND				
41	+3V3	3.3 V	PWR		max. 1.2 A
42	LED_WWAN#		O		Connected to LED1
43	GND				
44	LED_WLAN#		O		Connected to LED2
46	LED_WPAN#		O		Connected to LED3
48	+1V5	1.5 V	PWR		max. 0.2 A
50	GND				
52	+3V3	3.3 V	PWR		max. 1.2 A

Table 17: J18 (pin description)

Note: Not listed pin numbers are not connected.

3 Characteristics

The following parameters refer only to the base board. For information about the module please see the specific documentation.

3.1 Absolute Maximum Ratings

Description	Min	Max	Unit
Power Input			
Supply voltage	-0.30	6.00	V
Signal Input			
Serial A, C (RS232)	-25.00	25.00	V
Serial B (RS232 / RS485)	-15.00	15.00	V
CAN A	-58.00	58.00	V
USB CC	-0.30	5.50	V
USB VBUS	-0.30	5.50	V

Table 18: Absolute maximum ratings

3.2 Recommended Operating Conditions

Parameter	Description	Condition	Min	Typ	Max	Unit
General						
POWERIN	Base board main voltage		4.75	5.00	5.25	V
VBAT_IN	Real time clock voltage		2.20	3.00	3.45	V
I_{+5VS}	Output current +5VS				0.80	A
I_{+3V3}	Output current at +3V3				1.20	A
I_{+1V5}	Output current at +1V5				0.20	A
I_{VLCD}	Output current display supply				1.20	A
I_{VCC_COM}	Output current at UART/CAN connectors				0.80	A

Table 19: Recommended operating conditions

4 Packaging & Labels

4.1 ESD

All F&S electrostatic discharge sensitive (ESDS) products are marked and will be shipped in ESD protective packaging.

4.2 Serial Number

All shipped F&S products are labeled with a matrix code sticker that includes the serial number. For product information visit www.fsembedded.com/en/support/serial-number-info-and-rma/.

5 Appendix

5.1 Second source rules

The qualifications of products from a second source are done autonomously by F&S. This is necessary to guarantee delivery times and product life. A setup of release samples with released second sources is not possible. F&S does not use broker components without the consent of the customer.

5.2 RoHS and REACH statement

Please see the following webpage: www.fsembedded.com/en/support/certifications/

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