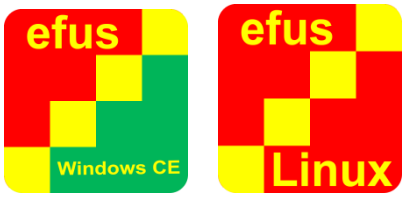
Hardware Documentation

efus™ Startinterface

Version 1.20
(2020-09-18)



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About This Document

This document describes how to use the efus Startinterface board with mechanical and electrical information. The latest version of this document can be found at:
http://www.fs-net.de.

History

Date	V	Platform	A,M,R	Chapter	Description	Au
21.02.14	0.1	All	A	-	Build the document	MW
11.07.14	1.0	All	M	*	Changed to new company CI	JG
03.08.15	1.11	All	M	*	USB-Device modification added	MW
11.08.15	1.12	All	M	*	USB-Device modification added	MW
27.08.15	1.13	All	M	*	Information's about J4 added	MW
17.03.16	1.14	All	M	*	New Layout; Information's about new HW Revision added	MW
05.04.16	1.15	All	M		Correct Schematic for MicroSD Card Interface	MW
24.05.16	1.16	All	M		Added information's for efus fixing holes	MW
10.10.16	1.17	All	M	*	Added information's and pictures	MW
04.07.16	1.18	All	M	*	Modified information's Resistive Touch	MW
09.02.18	1.19	All	M		Modified Figure 7 & 9	MW
18.09.20	1.20	All	M		Updates of HW Revision 1.40	MD

V Version
A,M,R Added, Modified, Removed
Au Author

Table of Content

1 Introduction

The efus start interface is a base board for the efus family. It can be used with efusA9 or other boards of the efus family. For connecting it to a display, it has either DVI/HDMI, or the F&S display connector for digital RGB, to be able to connect the same adapter like other F&S boards.
For designing your own base board you can use our example Layout created with CadSoft EAGLE® which you can get on our homepage http://www.fs-net.de.

2 Mechanical dimension

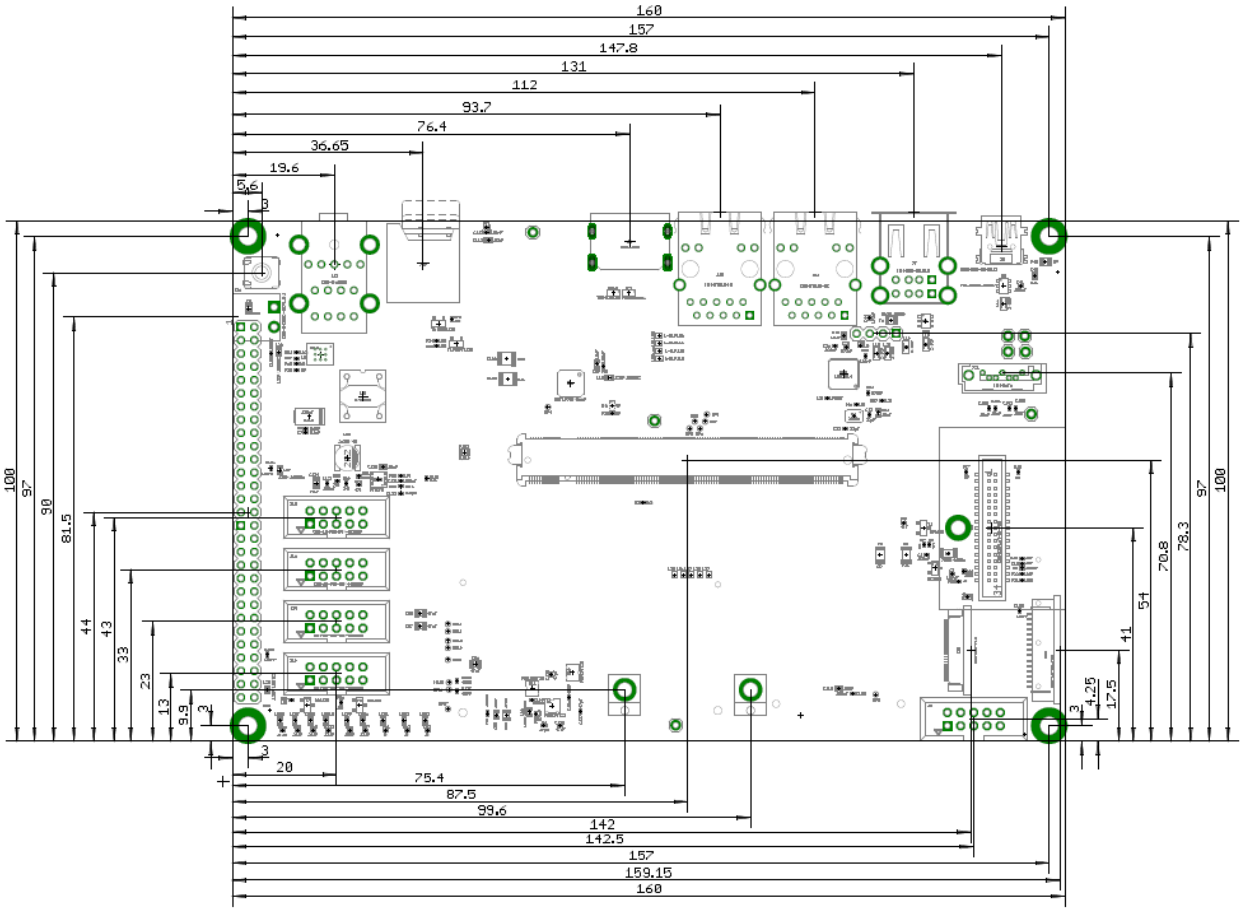

Figure 1: Mechanical dimension

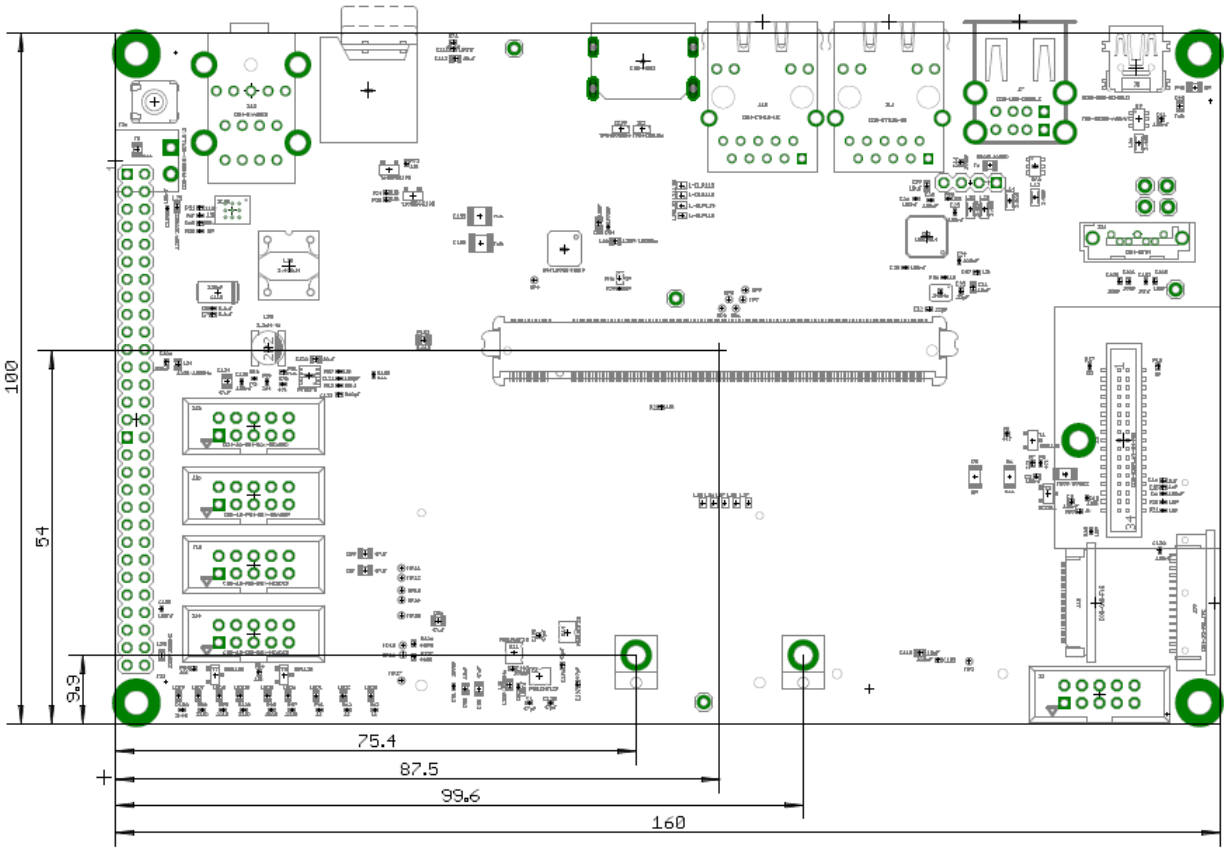

Figure 2: Fixing holes of the efus module

2.1 Baseboard

PCB size:	160mm x 100mm
PCB thickness:	1.6 ± 0.1mm
High of parts on the top side:	38mm
High of parts on the bottom side:	7.8mm
Weight:	135 gram

2.2 Modules

Size:	62.11mm x 47mm
PCB thickness:	1.2 ± 0.1mm

3 Connector layout

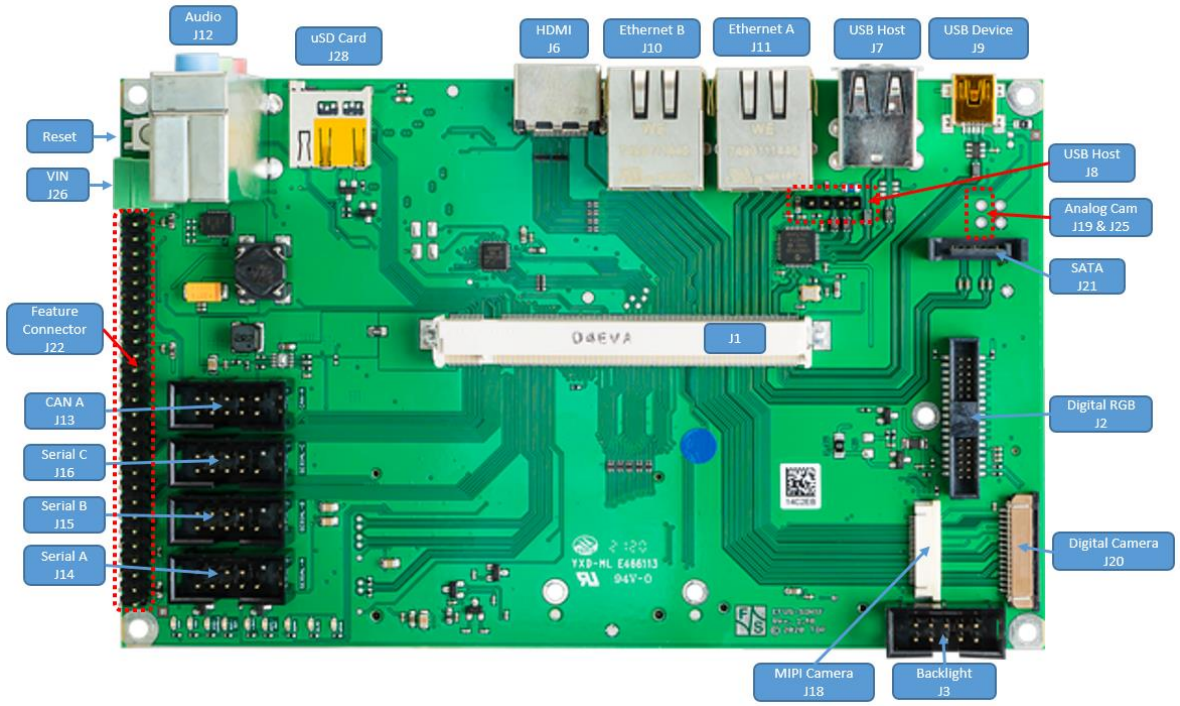

Figure 3: Connector Layout Top

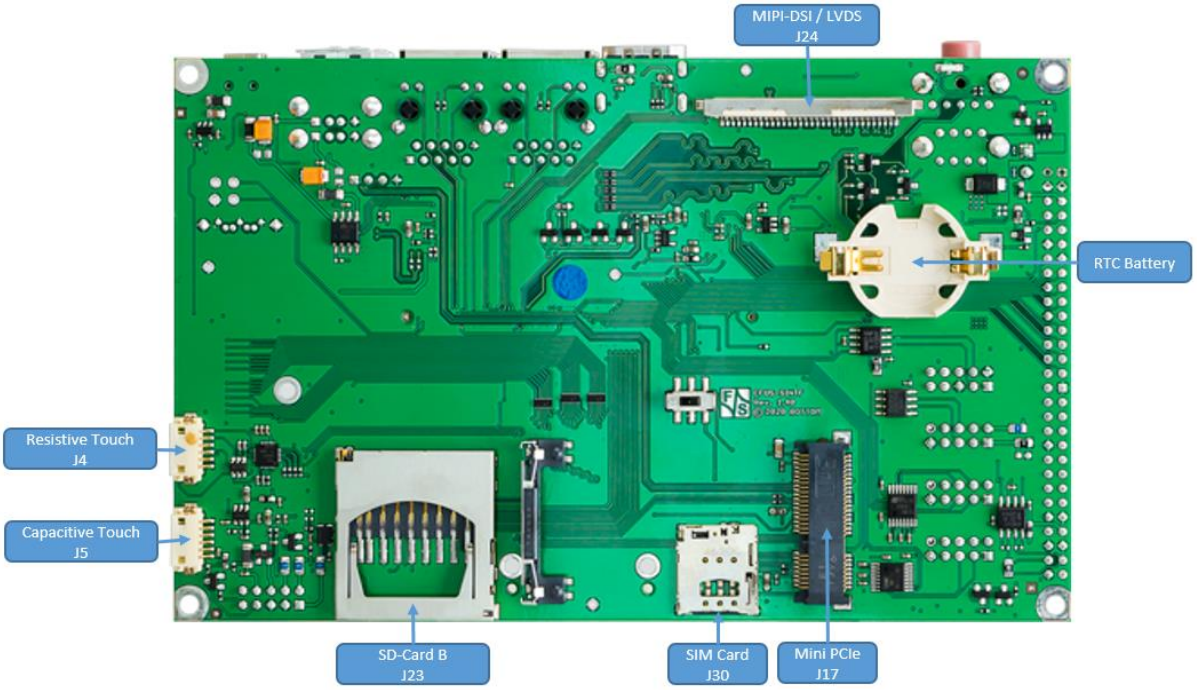

Figure 4: Connector Layout Bottom

4 Interface and Signal Description

4.1 J1 efus MXM-Connector

The efus module is plugged on this connector.
The connector is a Foxconn 0.5mm MXMII connector part-no AS0B326-S78N-7F for 5mm stacking height.
The efus module is fixed on the connector with the F&S EASYMOUNT technique.
See efus documentation for more information.

4.1.1 Pinlist:

J1			
Pin	Use on base board	Remarks	Connector
1	+5V Power In		
2	+5V Power In		
3	+5V Power In		
4	+5V Power In		
5	+5V Power In		
6	+5V Power In		
7	GND		
8	GND		
9	VBAT In	RTC battery input	J22/Battery
10	V33-Enable	EN for baseboard switcher. 3.3V VOUT with limited current. Please refer module datasheet.	
11	ACOK		J22
12	!RESET_IN	Drive with OC/OD, 3.3V PU on module	J22
13	IOOUT_ADC_IN		J22
14	!RESET_OUT	Low active reset for baseboard logic	J22
15	RXD_C_TTL	Converted to RS485	J16
16	SD_A_WP		J28
17	TXD_C_TTL	Converted to RS485	J16
18	SD_A_CD		J28
19	RTS_C_TTL	Converted to RS485	J16
20	SD_A_DAT2		J28

J1			
Pin	Use on base board	Remarks	Connector
21	CTS_C_TTL		
22	SD_A_DAT3		J28
23	PWM_B		J22
24	SD_A_CMD		J28
25	PWM_A		J22
26	SD_A_VCC		J28
27	GND		
28	SD_A_CLK		J28
29	CAN_A_TX		J13
30	GND		
31	CAN_A_RX		J13
32	SD_A_DAT0		J28
33	GND		
34	SD_A_DAT1		J28
35	CAN_B_TX		J22
36	RESERVED1	ADC_IN0	J22
37	CAN_B_RX		J22
38	RESERVED2	ADC_IN1	J22
39	GND		
40	RESERVED3	ADC_IN2	J22
41	MPCIE_CTX_P		J17
42	RESERVED4	ADC_IN3	J22
43	MPCIE_CTX_N		J17
44	RESERVED5	ADC_IN4	J22
45	GND		
46	GND		
47	MPCIE_CRX_P		J17
48	EXT_PROG		J22
49	MPCIE_CRX_N		J17
50	SPI_B_MISO		J22

J1			
Pin	Use on base board	Remarks	Connector
51	GND		
52	SPI_B_MOSI		J22
53	MPCIE_CLK_P		J17
54	SPI_B_SPCK		J22
55	MPCIE_CLK_N		J17
56	SPI_B_CS1		J22
57	GND		
58	SPI_B_CS2		J22
59	MPCIE_PERST		J17
60	SPI_B_IRQ1		J22
61	MPCIE_WAKE		J17
62	SPI_B_IRQ2		J22
63	GND		
64	GND		
65	SD_B_DAT2		J23
66	SPI_A_MISO		J22
67	SD_B_DAT3		J23
68	SPI_A_MOSI		J22
69	SD_B_CMD		J23
70	SPI_A_SPCK		J22
71	SD_B_VCC		J23
72	SPI_A_CS1		J22
73	SD_B_CLK		J23
74	SPI_A_CS2		J22
75	GND		
76	SPI_A_IRQ1		J22
77	SD_B_DAT0		J23
78	SPI_A_IRQ2		J22
79	SD_B_DAT1		J23
80	GND		

J1			
Pin	Use on base board	Remarks	Connector
81	SD_B_WP		J23
82	I2C_B_DAT	PU on module	J22
83	SD_B_CD		J23
84	I2C_B_CLK	PU on module	J22
85	GND		
86	I2C_B_IRQ	PU on module	J22
87	BL_CTRL	PWM Backlight dimming	J3
88	I2C_B_RST		J22
89	VCFL_ON	Backlight on	J3
90	GND		
91	GND		
92	RXD_A_TTL	Debug; Converted to RS232	J14
93	LCD_CLK		J2
94	TXD_A_TTL	Debug; Converted to RS232	J14
95	GND		
96	RXD_D_TTL		J22
97	LCD_HSYNC		J2
98	TXD_D_TTL		J22
99	LCD_VSYNC		J2
100	GND		
101	GND		
102	RXD_B_TTL	Converted to RS232	J15
103	LCD_R0		J2
104	TXD_B_TTL	Converted to RS232	J15
105	LCD_R1		J2
106	RTS_B_TTL	Converted to RS232	J15
107	LCD_R2		J2/J24
108	CTS_B_TTL	Converted to RS232	J15
109	LCD_R3		J2/J24
110	GND		

J1			
Pin	Use on base board	Remarks	Connector
111	LCD_R4		J2/J24
112	I2S_MCLK		J12
113	LCD_R5		J2/J24
114	GND		
115	GND		
116	I2S_LRCLK		J12
117	LCD_G0		J2/J24
118	GND		
119	LCD_G1		J2/J24
120	I2S_SCLK		J12
121	LCD_G2		J2/J24
122	GND		
123	LCD_G3		J2/J24
124	I2S_DOUT		J12
125	LCD_G4		J2/J24
126	I2S_DIN		J12
127	LCD_G5		J2/J24
128	GND		
129	GND		
130	I2C_C_DAT		
131	LCD_B0		J2
132	I2C_C_CLK		
133	LCD_B1		J2
134	HDMI_DDC_VOUT	3.3V output for ESD protection	J6
135	LCD_B2		J2
136	GND		
137	LCD_B3		J2
138	HDMI_DATA2_P		J6/J24
139	LCD_B4		J2
140	HDMI_DATA2_N		J6/J24

J1			
Pin	Use on base board	Remarks	Connector
141	LCD_B5		J2
142	HDMI_DATA1_P		J6/J24
143	GND		
144	HDMI_DATA1_N		J6/J24
145	LCD_DE		J2
146	HDMI_DATA0_P		J6/J24
147	GND		
148	HDMI_DATA0_N		J6/J24
149	VLCD_ON		J3
150	HDMI_CLK_P		J6/J24
151	I2C_A_DAT		J2/J5/J24
152	HDMI_CLK_N		J6/J24
153	I2C_A_IRQ		J2/J5/J24
154	HDMI_DDCCEC/AUX_P		J6/J24
155	I2C_A_CLK		J2/J5/J24
156	HDMI_DDCCEC/AUX_N		J6/J24
157	I2C_A_RST		J5/J24
158	HDMI_HPD		J6
159	GND		
160	GND		
161	CAM_YDATA9/D0_N		J18/J20
162	ETH_B_D4_N		J10
163	CAM_YDATA8/D0_P		J18/J20
164	ETH_B_D4_P		J10
165	CAM_YDATA2/D1_N		J18/J20
166	ETH_B_LED_LINK		J10
167	CAM_YDATA1/D1_P		J18/J20
168	ETH_B_D3_N		J10
169	CAM_YDATA3/D2_N		J18/J20
170	ETH_B_D3_P		J10

J1			
Pin	Use on base board	Remarks	Connector
171	CAM_YDATA0/D2_P		J18/J20
172	GND		
173	CAM_YDATA4/D3_N		J18/J20
174	ETH_B_D2_N		J10
175	CAM_PCLK/D3_P		J18/J20
176	ETH_B_D2_P		J10
177	CAM_YDATA5/CLK_N		J18/J20
178	ETH_B_LED_ACT		J10
179	CAM_YDATA6/CLK_P		J18/J20
180	ETH_B_D1_N		J10
181	GND		
182	ETH_B_D1_P		J10
183	CAM_MCLK		J18/J20
184	GND		
185	GND		
186	ETH_CTREF		J10/J11
187	CAM_YDATA7		J18
188	ETH_A_D4_N		J11
189	CAM_VCAM		J18
190	ETH_A_D4_P		J11
191	CAM_HREF		J18
192	ETH_A_LED_LINK		J11
193	CAM_PWDN		J18/J20
194	ETH_A_D3_N		J11
195	CAM_VSYNC		J18
196	ETH_A_D3_P		J11
197	I2C_C_CAMRST		J18
198	ETH_A_VLEDOUT	VOUT for LAN LEDs	J11
199	GND		
200	ETH_A_D2_N		J11

J1			
Pin	Use on base board	Remarks	Connector
201	SATA_RX_P		J21
202	ETH_A_D2_P		J11
203	SATA_RX_N		J21
204	ETH_A_LED_ACT		J11
205	SATA_TX_N		J21
206	ETH_A_D1_N		J11
207	SATA_TX_P		J21
208	ETH_A_D1_P		J11
209	GND		
210	GND		
211	CAM_A_IN	Analog Camera IN	J19
212	USB_A_PWRON		J7/J8/J17
213	CAM_A_GND	Analog Camera Ground	J25
214	USB_A_N		J7/J8/J17
215	GND		
216	USB_A_P		J7/J8/J17
217	USB_DEV_VBUS		J9
218	GND		
219	USB_DEV_PWR_ON		J9
220	USB_A_SSRX_N		/
221	USB_DEV_OC		J9
222	USB_A_SSRX_P		/
223	USB_DEV_ID		J9
224	GND		
225	USB_DEV_N		J9
226	USB_A_SSTX_N		/
227	USB_DEV_P		J9
228	USB_A_SSTX_P		/
229	GND		
230	GND		

4.1.2 Schematic:

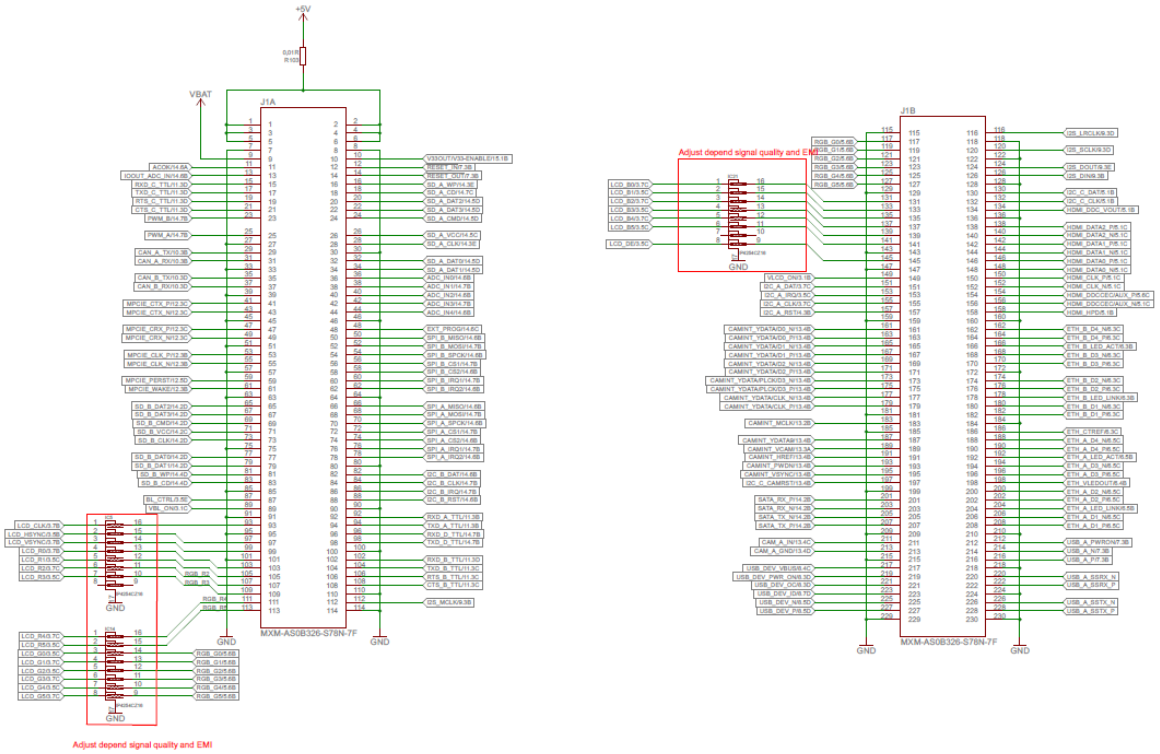

Figure 5: MXM connector schematic

4.1.3 Picture of the connector:

Figure 6: MXM connector

4.2 J2 Digital RGB

The connector is a 1.27mm pitch shrouded header for a 1.27mm pitch IDC connector. The pinout follows the ESDCI specification. All signals have 3.3V level.

4.2.1 Pinlist:

J2:

1	+3V3
2	+5V
3	GND
4	LCD_CLK
5	LCD_HSYNC
6	LCD_VSYNC
7	GND
8	LCD_R0
9	LCD_R1
10	LCD_R2
11	LCD_R3
12	LCD_R4
13	LCD_R5
14	GND
15	LCD_G0
16	LCD_G1
17	LCD_G2
18	LCD_G3
19	LCD_G4
20	LCD_G5
21	GND
22	LCD_B0
23	LCD_B1
24	LCD_B2
25	LCD_B3
26	LCD_B4
27	LCD_B5
28	GND
29	LCD_DE
30	VLCD (3.3V switched)
31	VLCD (3.3V switched)
32	I2C_DATA (shared with touch & MPCI-Express)
33	I2C_IRQ (shared with touch & MPCI-Express)
34	I2C_CLK (shared with touch & MPCI-Express)

4.2.2 Schematic:

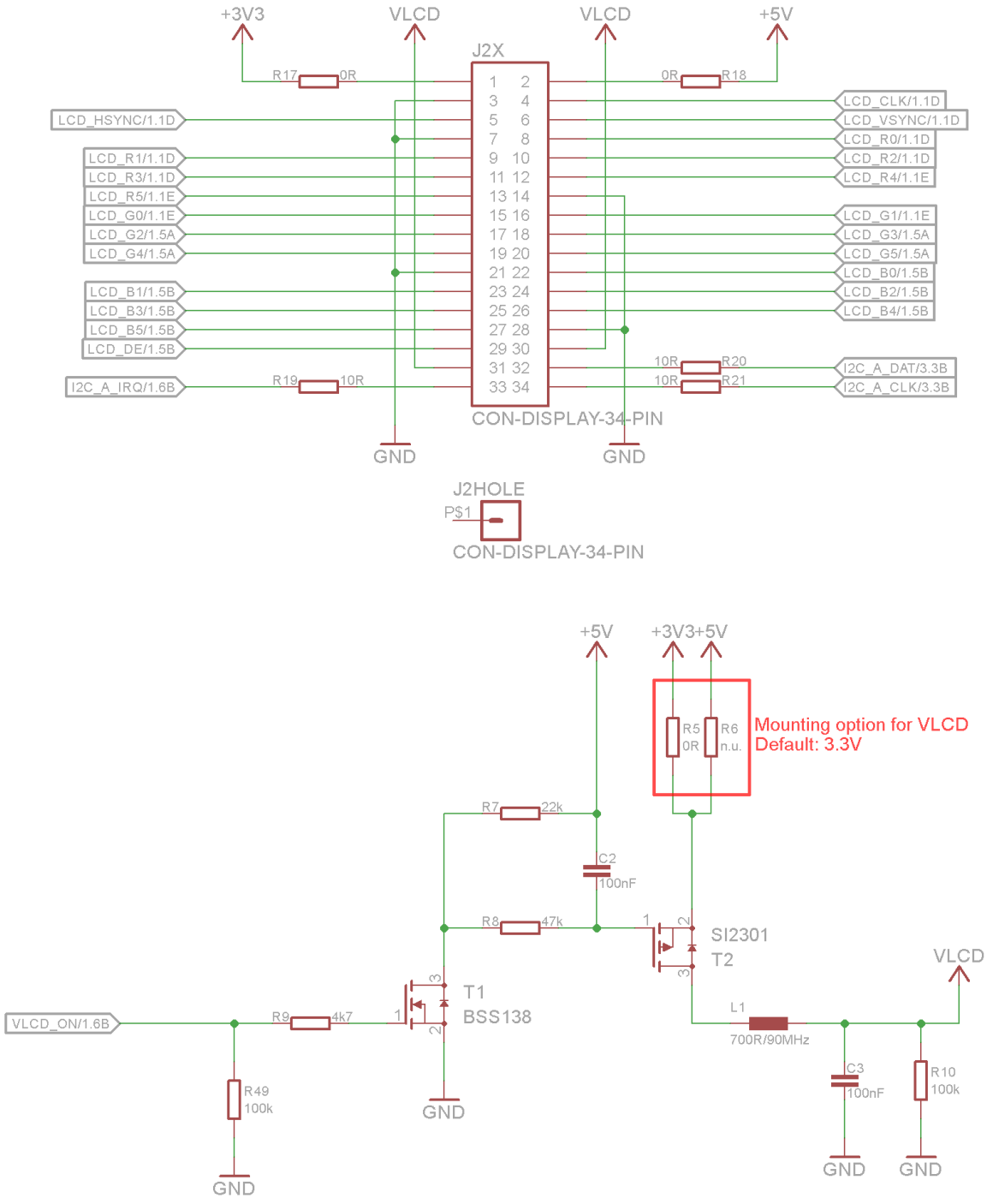

Figure 7: Digital RGB schematic

4.2.3 Picture of the connector:

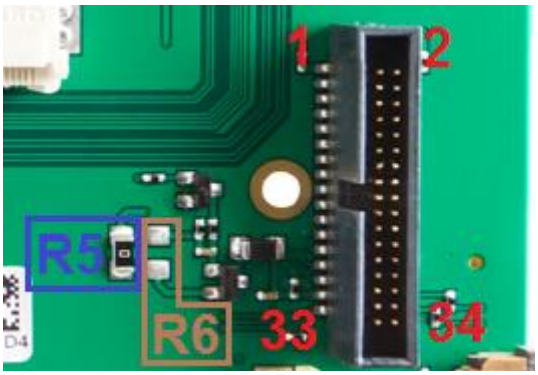

Figure 8: Digital RGB connector

4.3 J3 Display Power

To connect the Backlight of a Display, the board got a standard 2.54 mm 10 pin header. You have to connect VIN (baseboard power supply), +5V, +3V3 or another voltage to VBL_IN and connect the VBL_OUT to your Backlight. You can Switch your Backlight on/off with VBL_ON (high active) or !VBL_ON (low active). Both signals are 3.3V TTL level and not tolerant for higher voltage.
The connector also offers the 3.3V PWM-Output BL_CTRL to dim the Backlight.

4.3.1 Pinlist:

J3:

+3V3	1	2	+5V
GND	3	4	VIN
GND	5	6	VBL_IN
!VBL_ON	7	8	VBL_OUT
VBL_ON	9	10	BL_CTRL

4.3.2 Schematic:

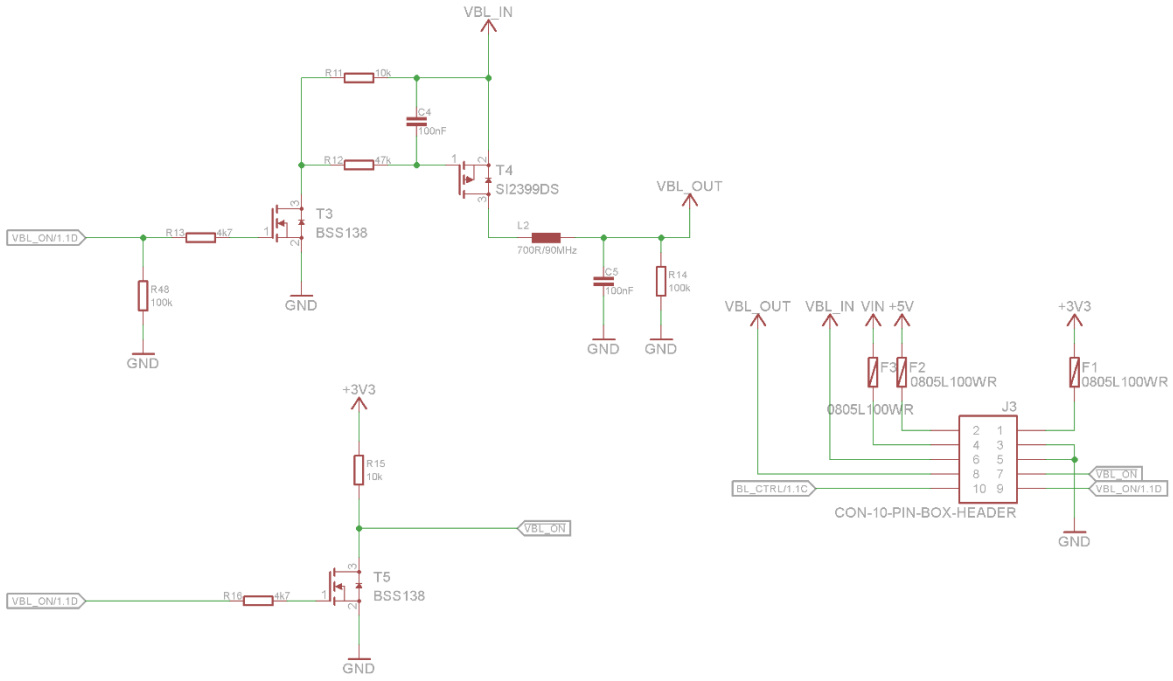

Figure 9: Display Power schematic

4.3.3 Picture of the connector:

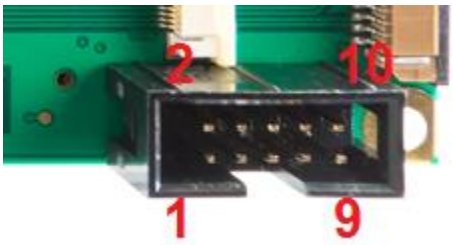

Figure 10: Display Power connector

4.4 J4 Resistive Touch

To connect a resistive touch panel of a display, the board got a crimpable 1.25 mm 6 pin header. The Connector is an Hirose DF13-6P-1.25H(20).
We use a Texas Instruments TSC2004 resistive Touch controller.

4.4.1 Pinlist:

J4:

1	Ground
2	N.C.
3	Y-
4	X-
5	Y+
6	X+

4.4.2 Schematic:

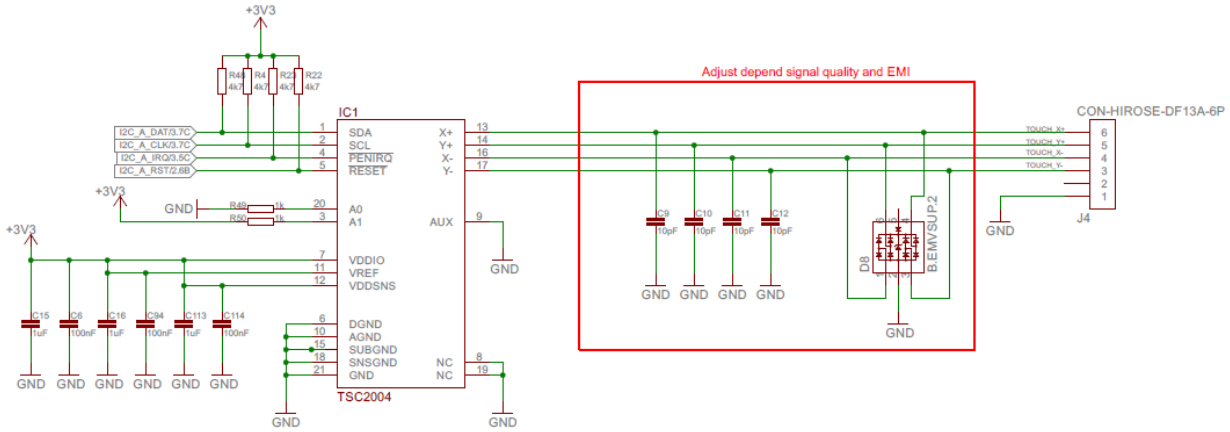

Figure 11: Resistive Touch schematic

4.4.3 Picture of the connector:

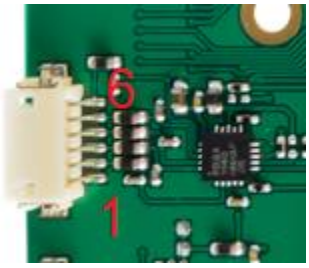

Figure 12: Resistive Touch connector

4.5 J5 I2C for Capacitive Touch

To connect a capacitive touch panel of a Display, the board got a crimpable 1.25 mm 6 pin header. The Connector is an Hirose DF13-6P-1.25H(20).

4.5.1 Pinlist:

J5:

1	+3V3
2	I2C_Data
3	I2C_Clock
4	I2C_Reser
5	I2C_Interrupt
6	Ground

4.5.2 Schematic:

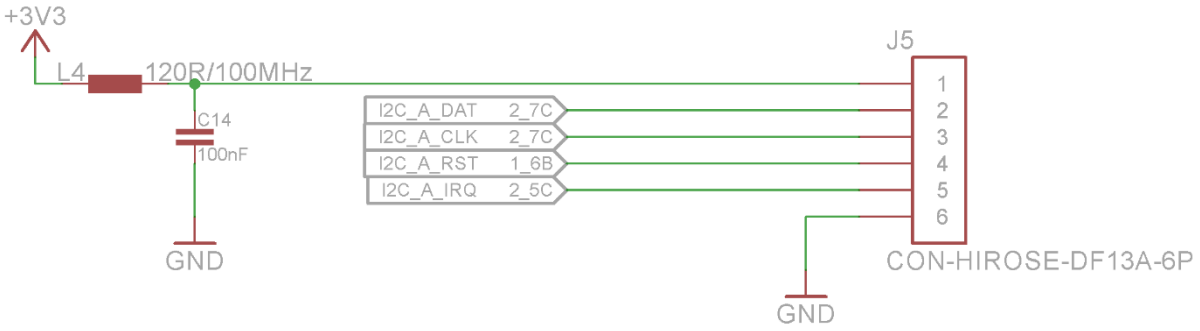

Figure 13: Resistive Touch schematic

4.5.3 Picture of the connector:

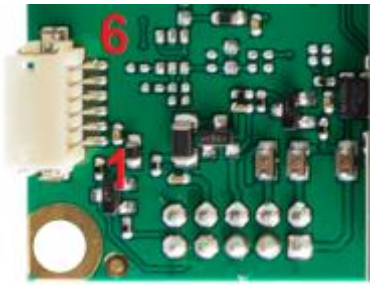

Figure 14: Resistive Touch connector

4.6 J6 DVI/HDMI

The display connector allows connecting a HDMI monitor or a DVI monitor by using an adapter. The connector is EMC protected.

4.6.1 Pinlist:

J6:

1	HDMI_DATA2_P
2	Ground
3	HDMI_DATA2_N
4	HDMI_DATA1_P
5	Ground
6	HDMI_DATA1_N
7	HDMI_DATA0_P
8	Ground
9	HDMI_DATA0_N
10	HDMI_CLK_P
11	Ground
12	HDMI_CLK_N
13	HDMI_DDCCEC/AUX_N
14	Not connected
15	I2C_C_CLK
16	I2C_C_DAT
17	Ground
18	+5V
19	HDMI_HPD

4.6.2 Schematic:

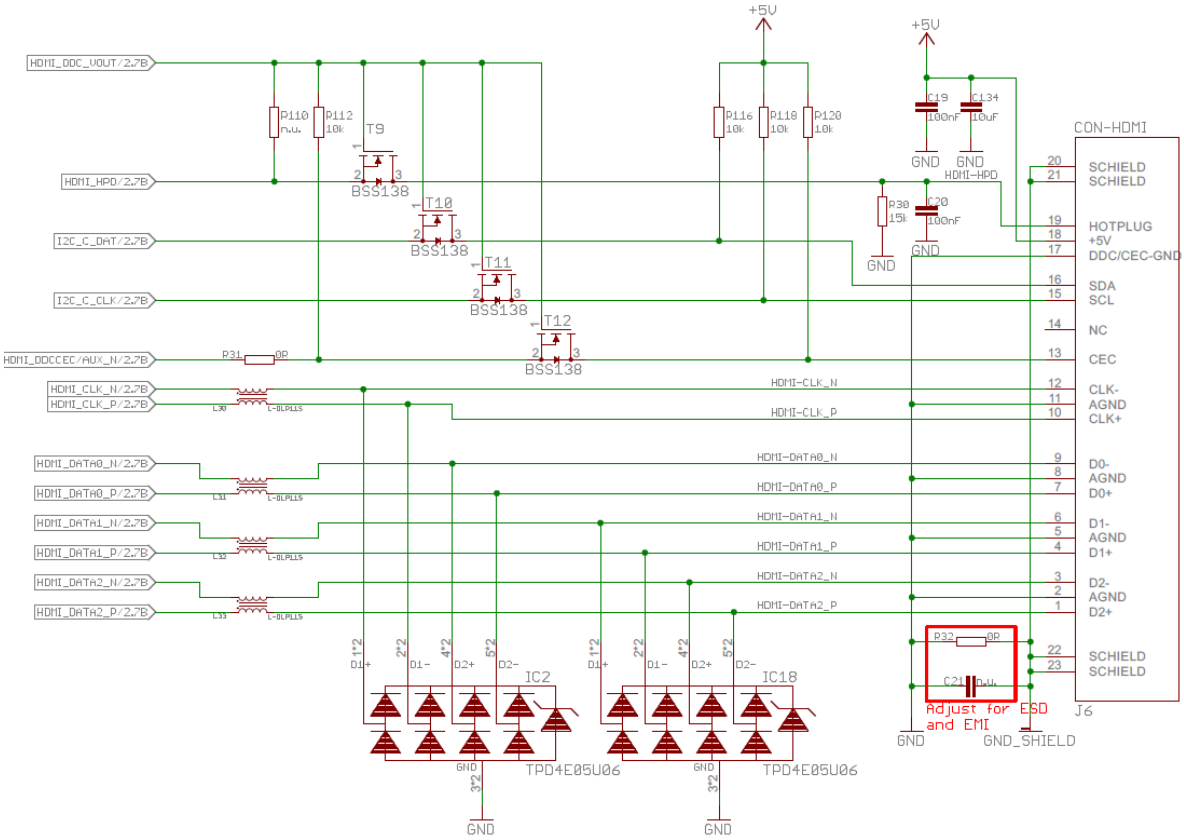

Figure 15: DVI / HDMI schematic

4.6.3 Picture of the connector:

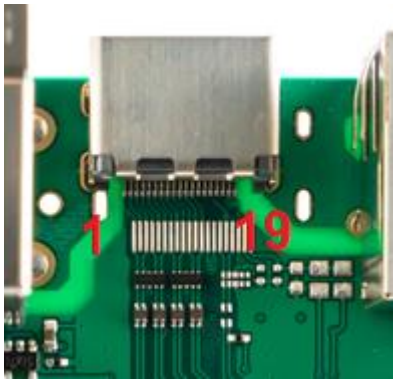

Figure 16: DVI / HDMI connector

4.7 J7 / J8 USB host

All USB ports follow the USB 2.0 specification.
With a Hub, the single USB-Port of the efus module is expanded to four USB Ports (A - D).
Port A & B are connected to the USB Host front connector. USB Port C is connected to a 4 pin header. USB Port D is connected to the mPCIE connector.
The 90 Ohm differential pair of USB signals doesn't need any termination. For external ports, EMV protection is required nearby the USB connector.
The usb.org webpage provides "High Speed USB Platform Design Guidelines" with highly recommended information for a proper working USB design.
If a USB port is not used, please leave it open.

4.7.1 Pinlist:

J7:

T1	+5V*
T2	USB-Hub-A-
T3	USB-Hub-A+
T4	Ground
B1	+5V*
B2	USB-Hub-B-
B3	USB-Hub-B+
B4	Ground

*Switched with IC4

J8:

1	+5V
2	USB_Hub-D-
3	USB-Hub-D+
4	Ground

4.7.2 Schematic:

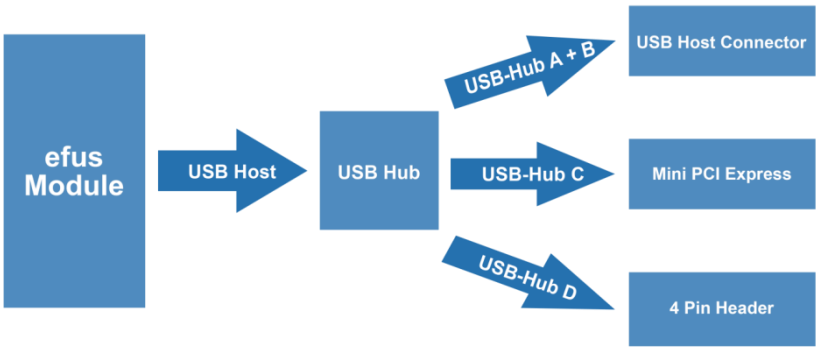

Figure 17: USB Host with USB Hub

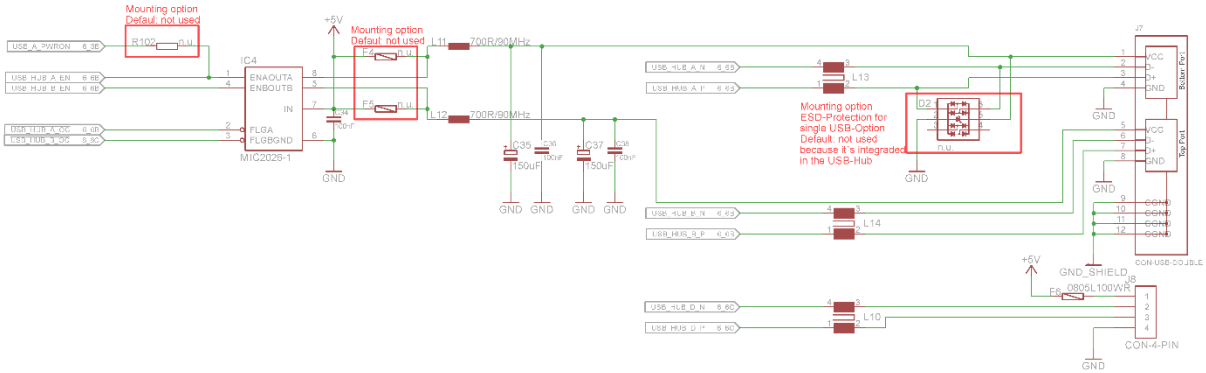

Figure 18: USB Host schematic

4.7.3 Picture of the connector:

Figure 19: USB Host connector Top

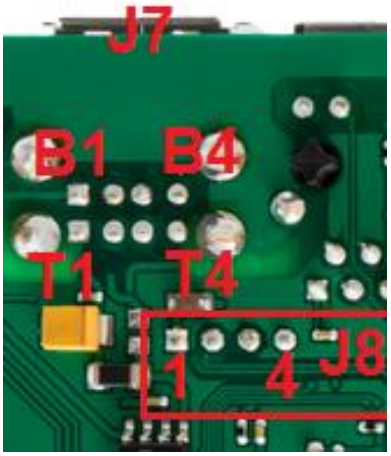

Figure 20: USB Host connector Bottom

*T1 → Top Port Pin 1
*B1 → Bottom Port Pin 1

4.8 J9 USB client

It’s a standard USB mini connector to use the board as USB device.

4.8.1 Pinlist:

J9:

1	USB-Dev-VBUS
2	USB-Dev-
3	USB-Dev+
4	USB-Dev-ID
5	Ground

4.8.2 Schematic:

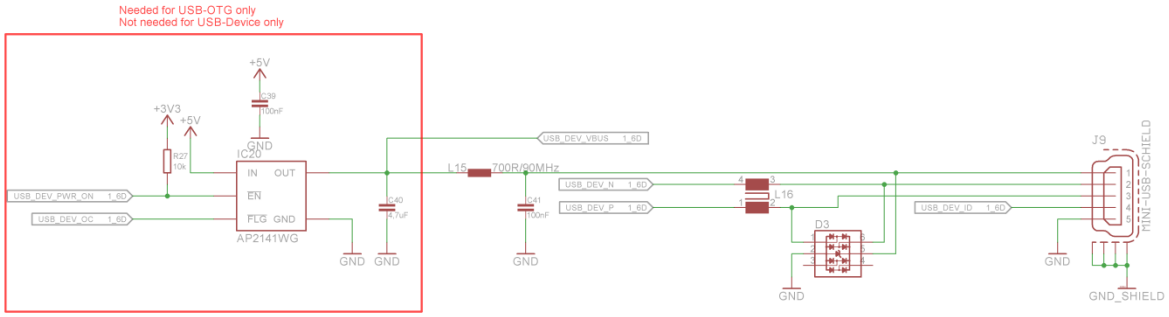

Figure 21: USB device schematic

4.8.3 Picture of the connector:

Figure 22: USB device connector

4.9 J10 / J11 Ethernet

The efus Startinterface provides two 10/100/1000 Mbit Ethernet channels.

4.9.1 Pinlist:

J10:

1	ETH-CTREF
2	ETHB-D1+
3	ETHB-D1-
4	ETHB-D2+
5	ETHB-D2-
6	ETHB-D3+
7	ETHB-D3-
8	ETHB-D4+
9	ETHB-D4-
10	Ground
11	ETH-VLEDOUT
12	ETHB-LED-LINK
13	ETH-VLEDOUT
14	ETHB-LED-ACT

J11:

1	ETH-CTREF
2	ETHA-D1+
3	ETHA-D1-
4	ETHA-D2+
5	ETHA-D2-
6	ETHA-D3+
7	ETHA-D3-
8	ETHA-D4+
9	ETHA-D4-
10	Ground
11	ETH-VLEDOUT
12	ETHA-LED-LINK
13	ETH-VLEDOUT
14	ETHA-LED-ACT

4.9.2 Schematic:

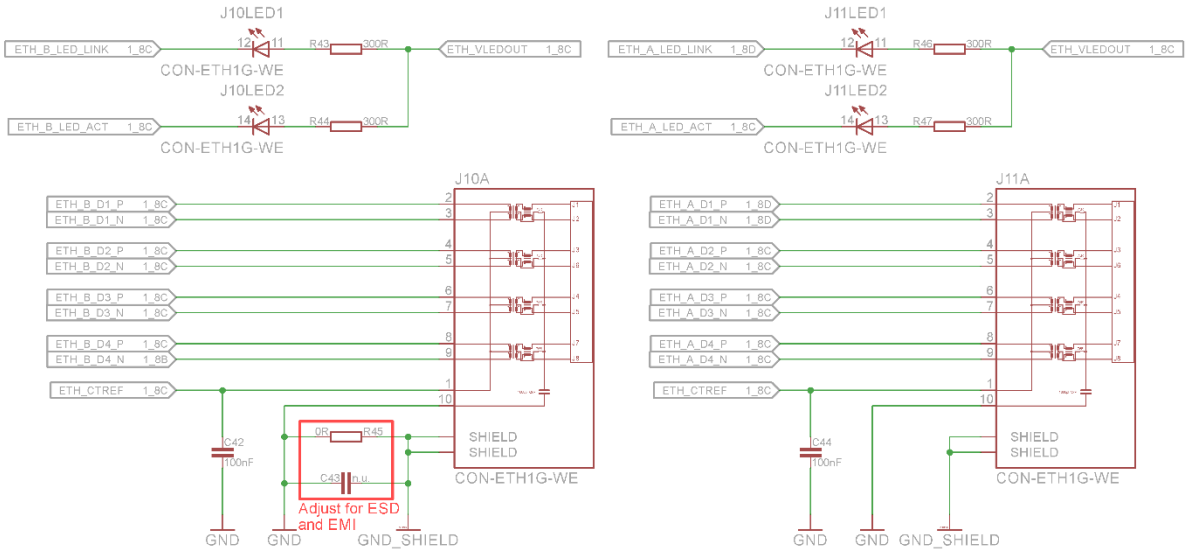

Figure 23: LAN 1 + 2 schematic

4.9.3 Picture of the connector:

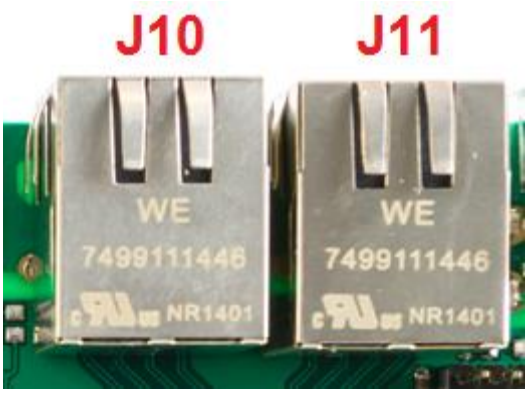

Figure 24: LAN 1+2 connector Top

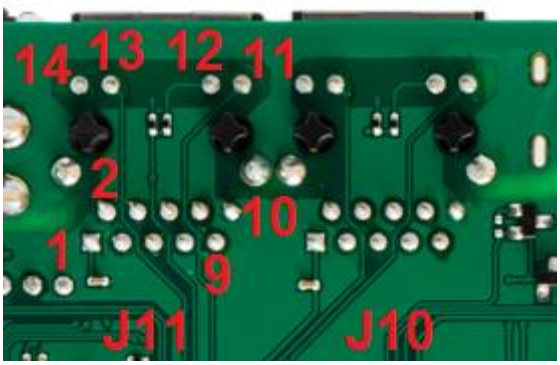

Figure 25: LAN 1+2 connector Bottom

4.10 J12 Sound

The sound connector does provide Stereo Line In, Stereo Line Out and Microphone In.

4.10.1 Pinlist:

J6:

1	Analog Ground
2	Not connected
3	Not connected
4	Not connected
5	MICIN
22	LineOut-R / HeadphoneOut-R*
23	Not connected
24	Not connected
25	LineOut-L / HeadphoneOut-L*
32	LineIn-R
33	Not connected
34	Not connected
35	LineIn-L

*Mountingoption

4.10.2 Schematic:

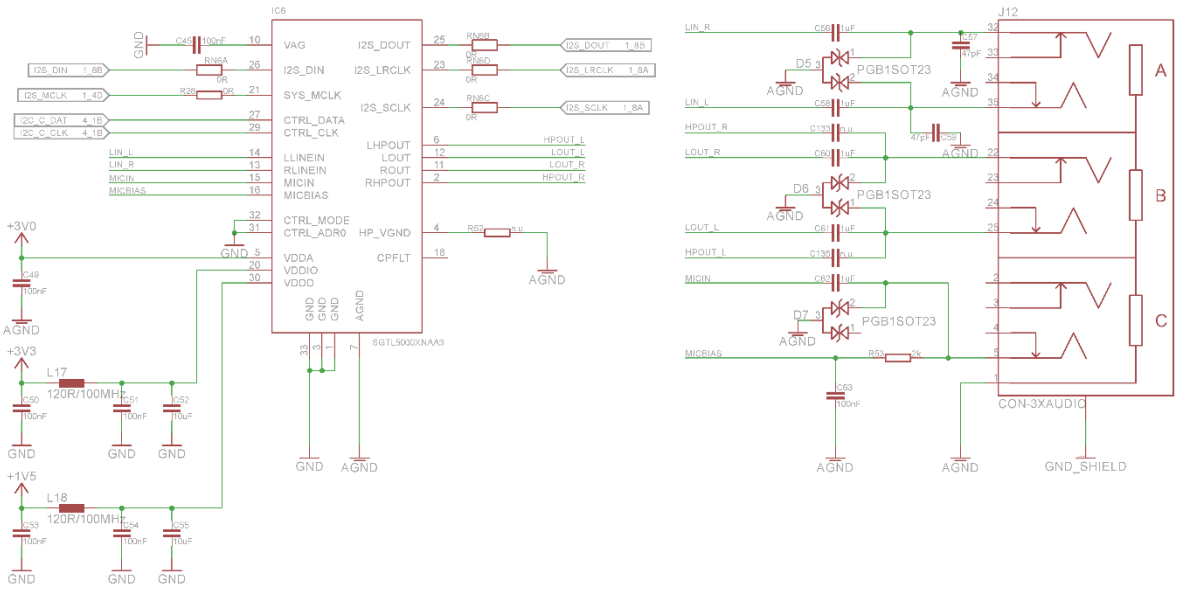

Figure 26: Audio schematic

4.10.3 Picture of the connector:

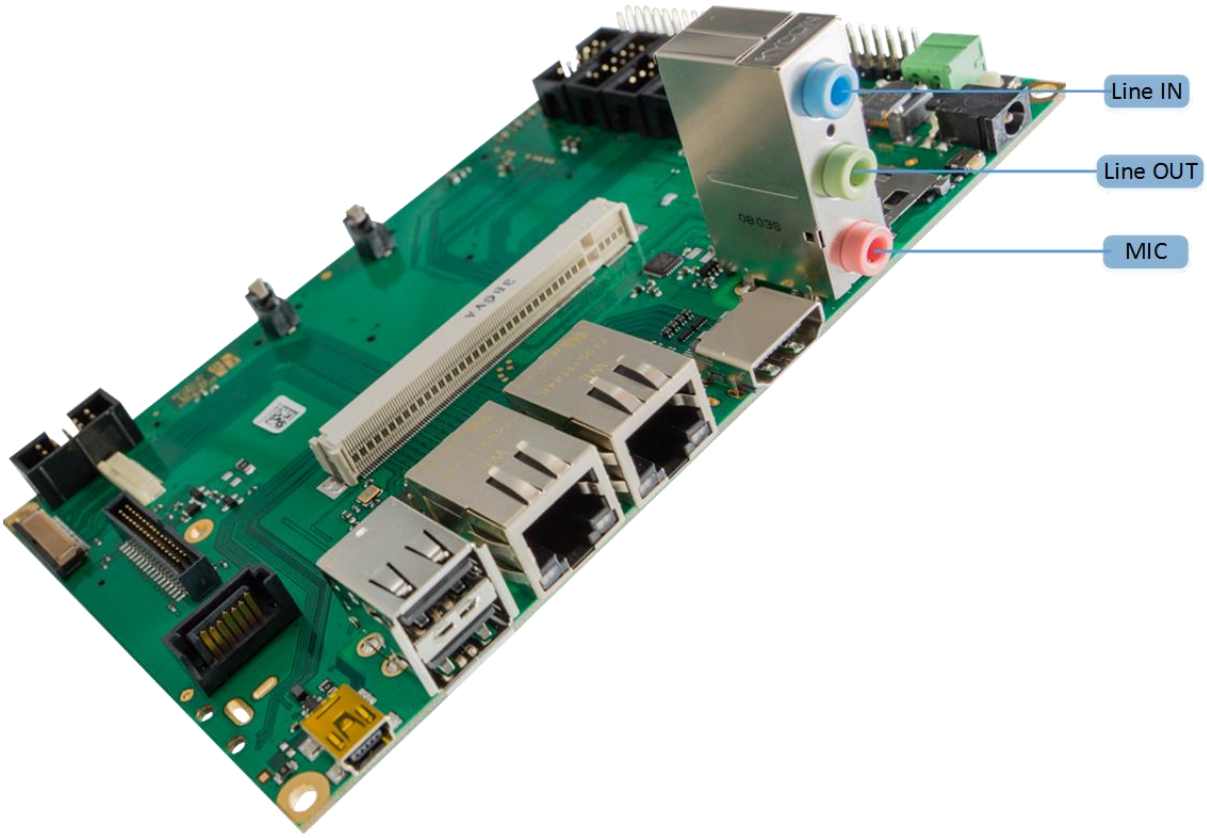

Figure 27: Audio connector Side

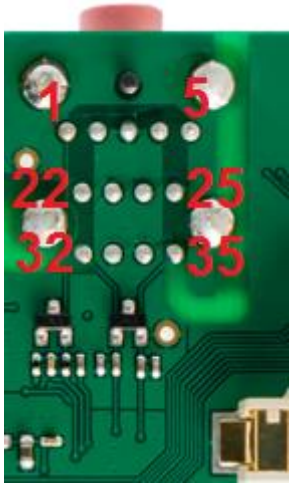

Figure 28: Audio connector Bottom

4.11 J13 CAN

The board offers 2 CAN ports. Both CAN_TX and CAN_RX signals are with 3.3V voltage level and are not 5V compliant.. The first CAN port (CAN_A) is connected to a standard 10 pin header (J13), to connect a free hanging IDC DSUB-9 connector. Pin 1 is marked on the connector with an arrow. The second CAN port (CAN_B) is connected to the Feature-Connector (J22).

4.11.1 Pinlist:

J13:

N.C.	1	2	GND
CAN_A_L	3	4	CAN_A_H
GND	5	6	N.C.
N.C.	7	8	N.C.
N.C.	9	10	N.C.

4.11.2 Schematic:

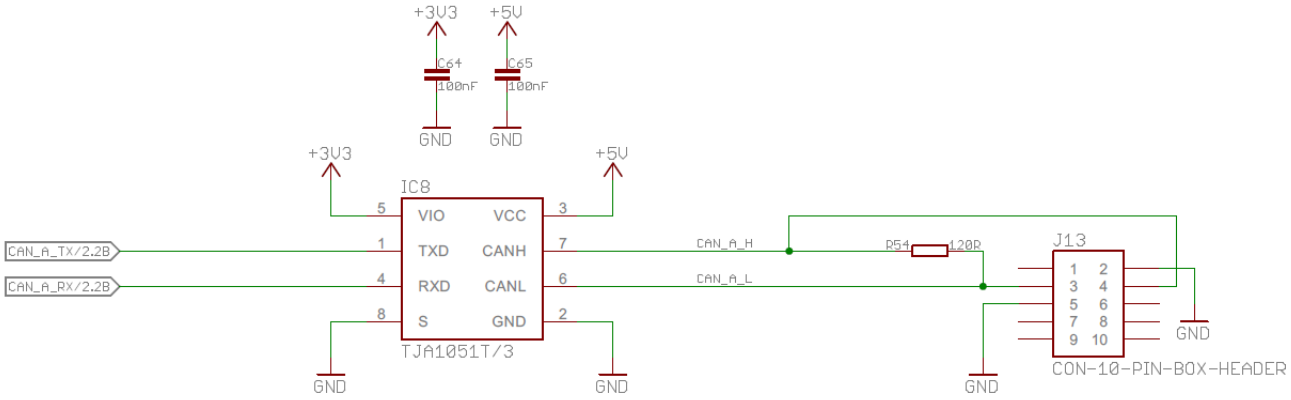

Figure 29: CAN transceiver schematic

4.11.3 Picture of the connector:

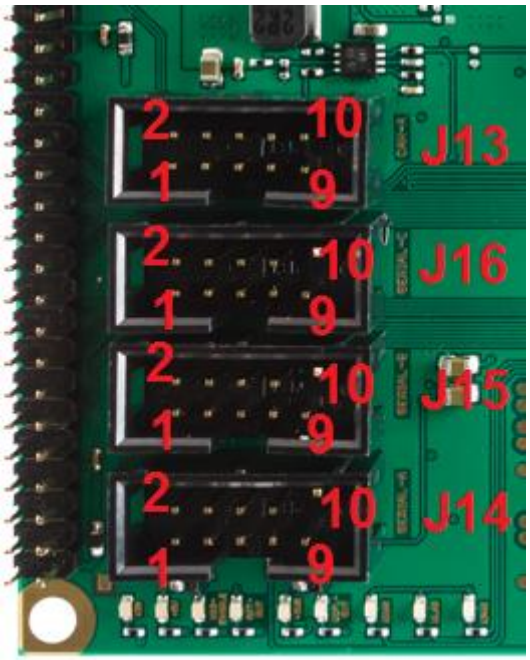

Figure 30: CAN connector

4.12 COM ports

On the Board are 4 COM ports (A-D).
Signals from efus board are 3.3V CMOS level and only 3.3V tolerant.
This port will supply the debug messages from F&S bootloader and kernel.

4.12.1 J14 COM A

The first port is a RS232 port without RTS/CTS which is used as Debug-port. The COM connector is a standard 2.54 mm 10 pin header to connect a free hanging IDC DSUB-9 connector. Pin 1 is marked on the connector with an arrow.

Pinlist:

N.C.	1	2	N.C.
RXD	3	4	N.C.
TXD	5	6	N.C.
N.C.	7	8	N.C.
GND	9	10	V5OUT

Schematic:

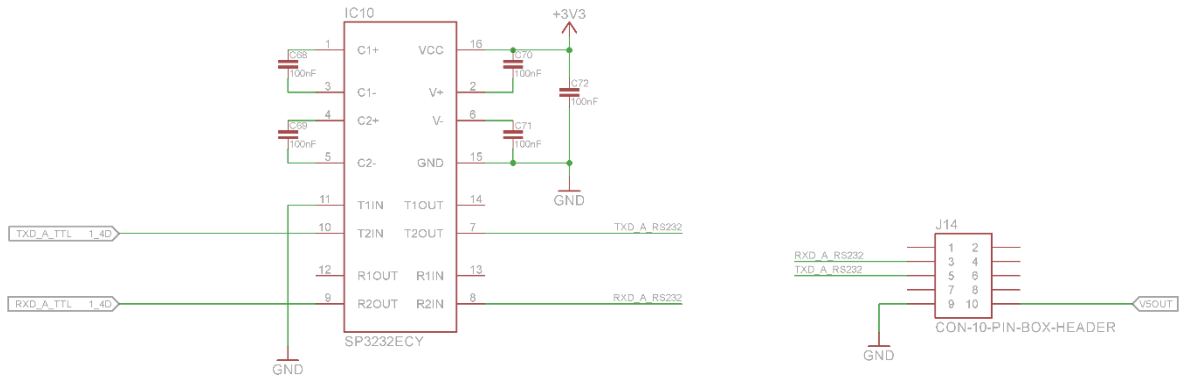

Figure 31: COM A schematic

Picture of the connector:

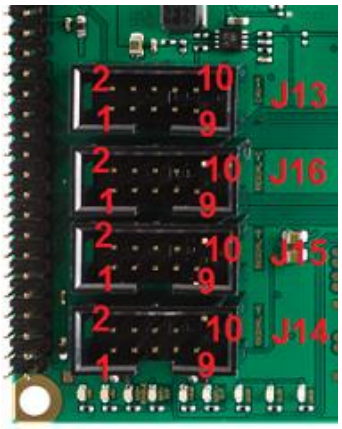

Figure 32: COM A connector

4.12.2 J15 COM B

The second port is a RS232 port within RTS/CTS. The COM connector is a 2.54 mm standard 10 pin header to connect a free hanging IDC DSUB-9 connector. Pin 1 is marked on the connector with an arrow.

Pinlist:

N.C.	1	2	N.C.
RXD	3	4	RTS
TXD	5	6	CTS
N.C.	7	8	N.C.
GND	9	10	V5OUT

Schematic:

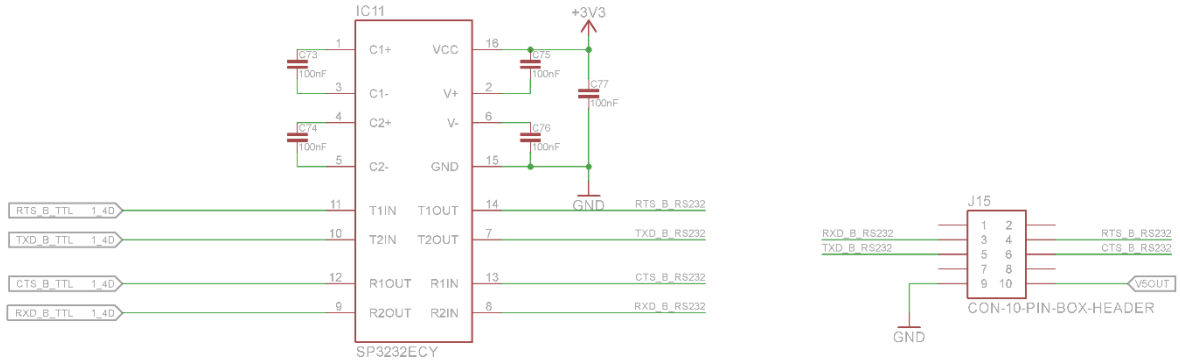

Figure 33: COM B schematic

Picture of the connector:

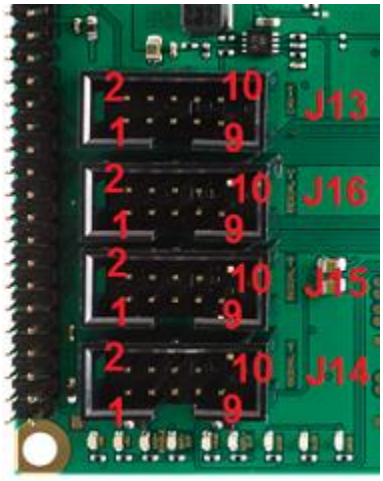

Figure 34: COM B connector

4.12.3 J16 COM C

The third port is a RS485 port. The COM connector is a 2.54 mm standard 10 pin header to connect a free hanging IDC DSUB-9 connector. Pin 1 is marked on the connector with an arrow.

Pinlist:

SHIELD	1	2	V5OUT
N.C.	3	4	N.C.
RS485+	5	6	RS485-
N.C.	7	8	N.C.
GND	9	10	N.C.

Schematic:

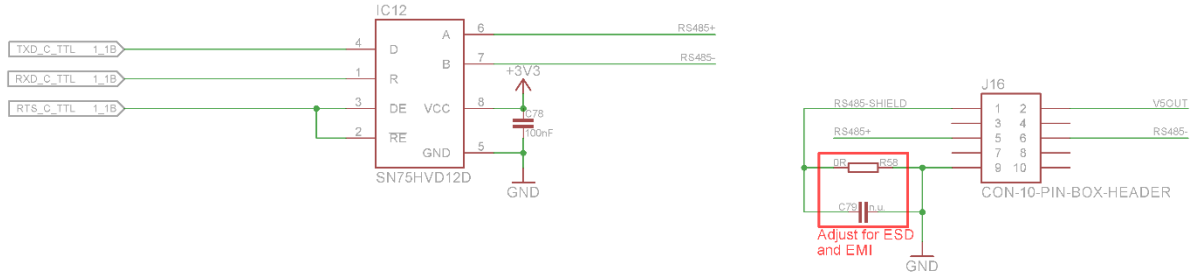

Figure 35: COM C schematic

Picture of the connector:

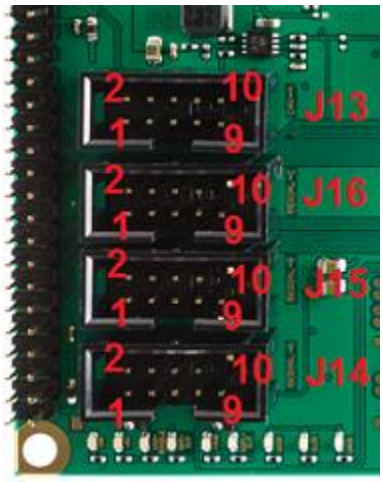

Figure 36: COM C connector

4.12.4 COM D

The fourth port is a TTL port without RTS/CTS which is connected to the Feature-Connector (J22).
Pin14: RXD
Pin16: TXD

4.13 J17 Mini PCI-Express

4.13.1 Pinlist:

J17:

WAKE	1	2	+3V3
not connected	3	4	Ground
not connected	5	6	+1V5
not connected	7	8	→ VCC (J30_C1)
Ground	9	10	→ I/O (J30_C7)
Clock -	11	12	→ CLK (J30_C3)
Clock +	13	14	→ RST (J30_C2)
Ground	15	16	→ VPP (J30_C6)
not connected	17	18	Ground
not connected	19	20	connected to “SW3”
Ground	21	22	PERST
CRX -	23	24	+3V3
CRX +	25	26	Ground
Ground	27	28	+1V5
Ground	29	30	I2C-Clock
CTX -	31	32	I2C-Data
CTX +	33	34	Ground
Ground	35	36	USB-D-Data -
Ground	37	38	USB-D-Data +
+3V3	39	40	Ground
+3V3	41	42	connected to *LED1*
Ground	43	44	connected to *LED2*
not connected	45	46	connected to *LED3*
not connected	47	48	+1V5
not connected	49	50	Ground
not connected	51	52	+3V3

4.13.2 Schematic:

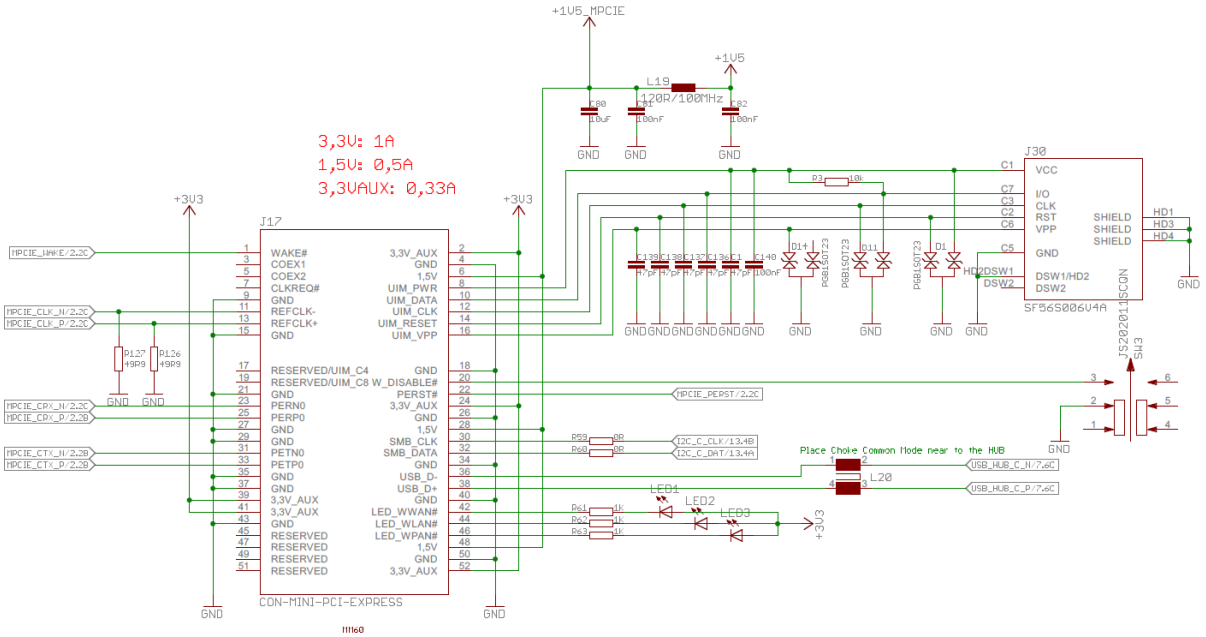

Figure 37: Mini PCI-Express schematic

4.13.3 Picture of the connector:

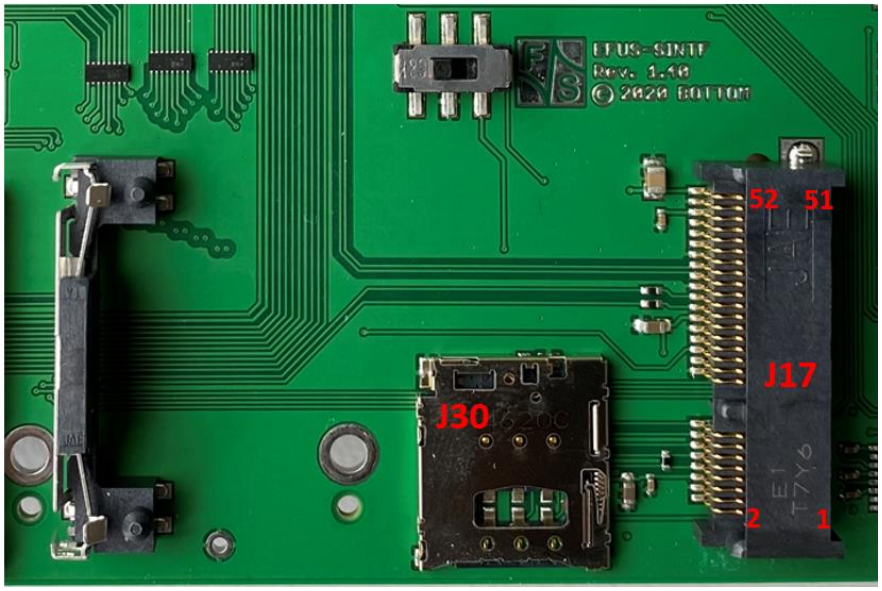

Figure 38: Mini PCI-Express connector

4.14 J18 Digital Camera

This 0.5mm pitch FPC connector with 24 pins makes it possible to connect digital camera modules.
Depend on the efus board whether this connector or the MIPI CSI (J20) connector is supported from the module.

4.14.1 Pinlist:

J18:

1	+3V3
2	Ground
3	I2C_C_DAT
4	VCAM
5	I2C_C_CLK
6	I2C_C_CAMRST
7	CAMINT_VSYNC
8	CAMINT_PWDN
9	CAMINT_HREF
10	+1V5*
11	CAMINT_VCAM
12	CAMINT_YDATA9
13	CAMINT-MCLK
14	CAMINT_YDATA/CLK_P
15	Ground
16	CAMINT_YDATA/CLK_N
17	CAMINT_YDATA/PLCK/D3_P
18	CAMINT_YDATA/PLCK/D3_N
19	CAMINT_YDATA/D2_P
20	CAMINT_YDATA/D2_N
21	CAMINT_YDATA/D1_P
22	CAMINT_YDATA/D1_N
23	CAMINT_YDATA/D0_P
24	CAMINT_YDATA/D0_N

*Default: not connected

4.14.2 Schematic:

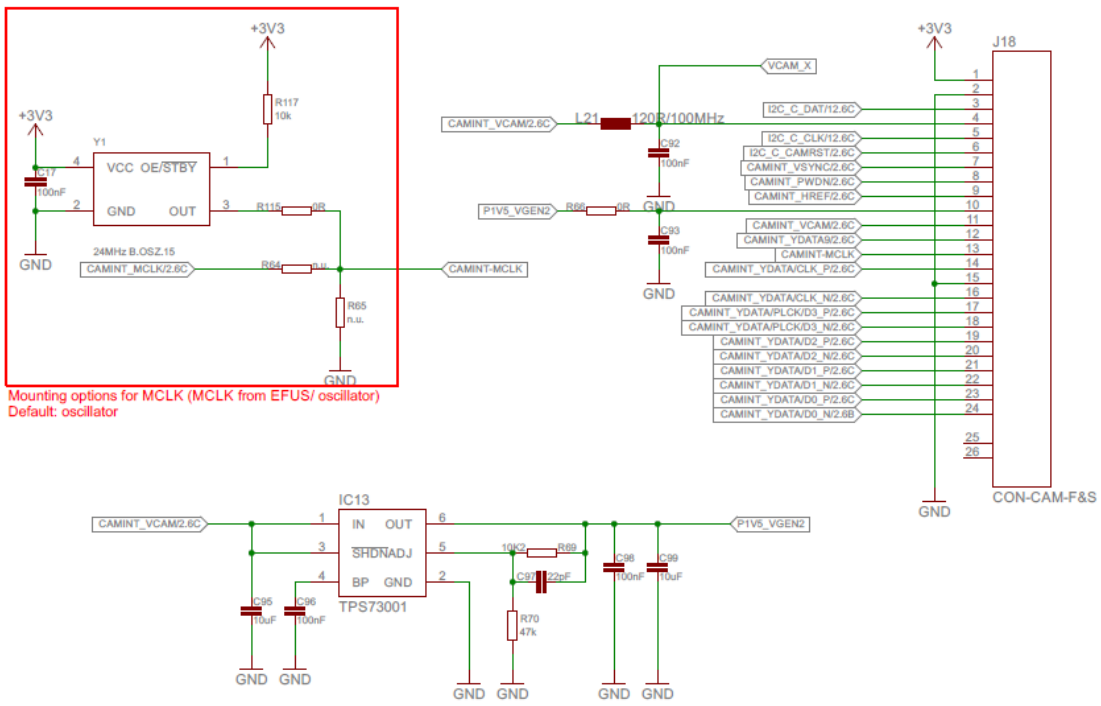

Figure 39: Digital Camera schematic

4.14.3 Picture of the connector:

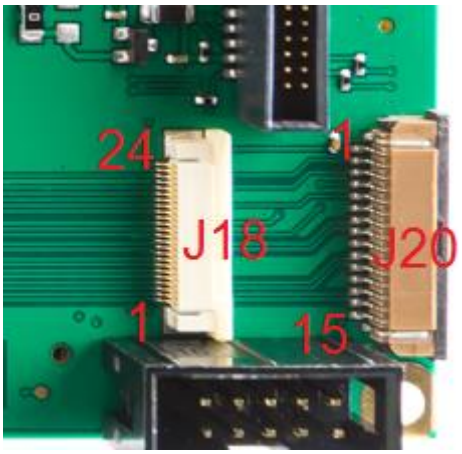

Figure 40: Digital Camera connector

4.15 J20 MIPI-CSI

This 1.0mm pitch FPC connector with 24 pins makes it possible to connect a MIPI-CSI camera module.
Depends on the used efus board whether this connector is supported instead J18.

4.15.1 Pinlist:

J20:

1	Ground
2	CAMINT_YDATA/D0_N
3	CAMINT_YDATA/D0_P
4	Ground
5	CAMINT_YDATA/D1_N
6	CAMINT_YDATA/D1_P
7	Ground
8	CAMINT_YDATA/D2_N
9	CAMINT_YDATA/D2_P
10	Ground
11	CAMINT_PWDN
12	CAMINT-MCLK
13	I2C_C_CLK
14	I2C_C_DAT
15	VCAM_X

4.15.2 Schematic:

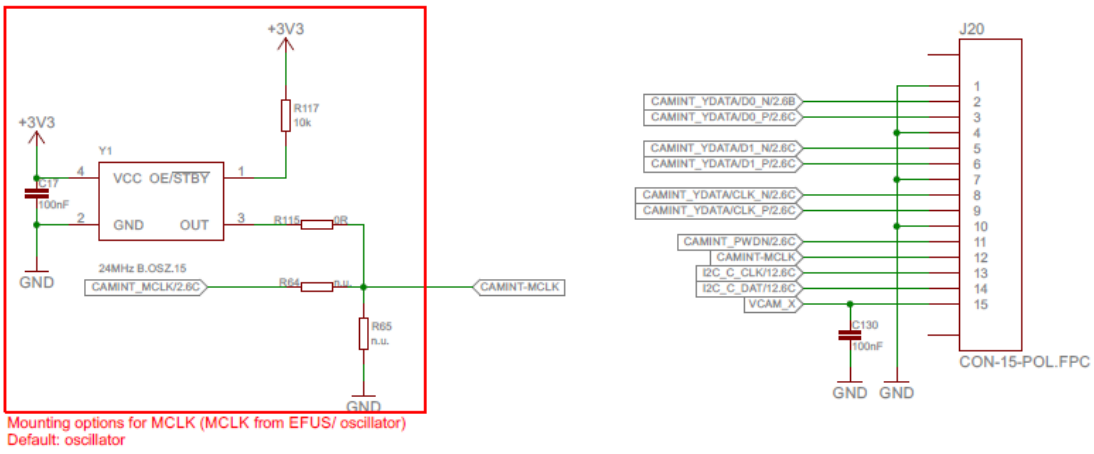

Figure 41: MIPI-CSI schematic

4.15.3 Picture of the connector:

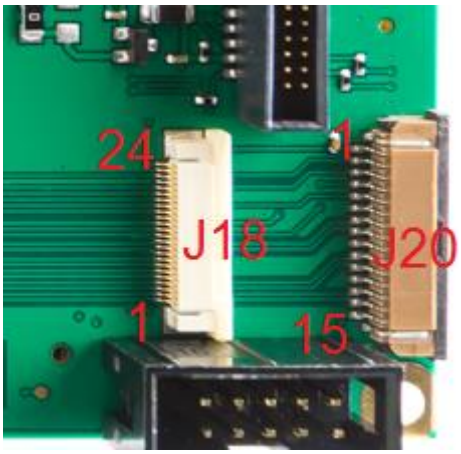

Figure 42: MIPI-CSI connector

4.16 J19 & J25 Analog Camera

To connect an analog camera to the efus-SINTF there are 2 pin headers/test points.

4.16.1 Pinlist:

J19	CAM_A_IN
J25	CAM_A_GND

4.16.2 Schematic:

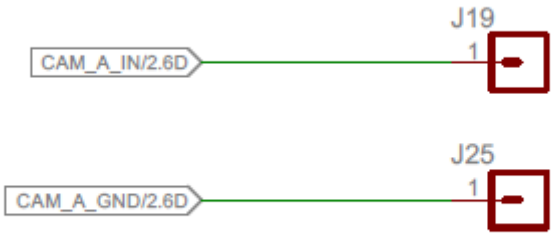

Figure 43: Analog Camera schematic

4.16.1 Picture of the connector:

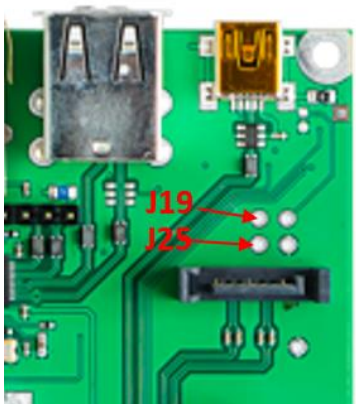

Figure 44: Analog Camera schematic

4.17 J21 SATA

The efus start interface provides a SATA connector to connect a SATA HD or SSD.

4.17.1 Pinlist:

J21:

1	Ground
2	SATA_TX_P
3	SATA_TX_N
4	Ground
5	SATA_RX_N
6	SATA_RX_P
7	Ground

4.17.2 Schematic:

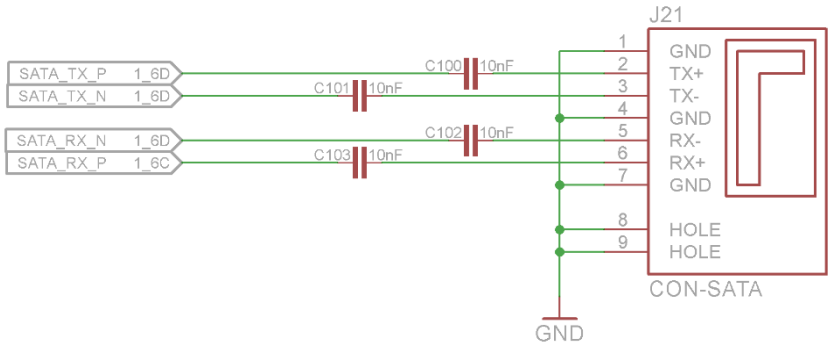

Figure 45: SATA schematic

4.17.3 Picture of the connector:

Figure 46: SATA connector Top

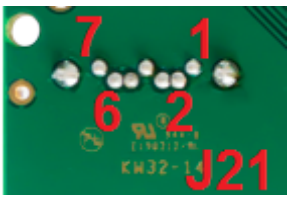

Figure 47: SATA connector Bottom

4.18 J22 F&S Feature-Connector

This 2.54mm connector with 58 pins makes it possible to connect various add-on modules.

4.18.1 Pinlist:

J22:

VIN	*(hidden)*	*1*	*2*	*VIN*	*(hidden)*
GND_IN	*(hidden)*	*3*	*4*	*GND_IN*	*(hidden)*
+3V3		5	6	+5V	
VBAT_IN		7	8	!RESET_OUT	
ACOK		9	10	!RESETBTN	
IOOUT_ADC_IN		11	12	GND	
GND		13	14	RXD_D_TTL	
Reserved1		15	16	TXD_D_TTL	
Reserved3		17	18	Reserved2	
Reserved5		19	20	Reserved3	
+3V3		21	22	GND	
SPI_B_MISO		23	24	SPI_B_MOSI	
SPI_B_SPCK		25	26	SPI_B_CS1	
SPI_B_CS2		27	28	SPI_B_IRQ1	
SPI_B_IRQ2		29	30	PWM_B	
GND		31	32	PWM_A	
SPI_A_MISO		33	34	SPI_A_MOSI	
SPI_A_SPCK		35	36	SPI_A_CS1	
SPI_A_CS2		37	38	SPI_A_IRQ1	
SPI_A_IRQ2		39	40	GND	
I2C_A_DAT		41	42	I2C_A_CLK	
I2C_A_RST		43	44	I2C_A_IRQ	
I2C_B_DAT		45	46	I2C_B_CLK	
I2C_B_RST		47	48	I2C_B_IRQ	
GND		49	50	GND	
+3V3		51	52	+5V	
GND		53	54	GND	
CAN_B_H		55	56	CAN_B_L	
EXT_PROG		57	58	GND	

4.18.2 Schematic:

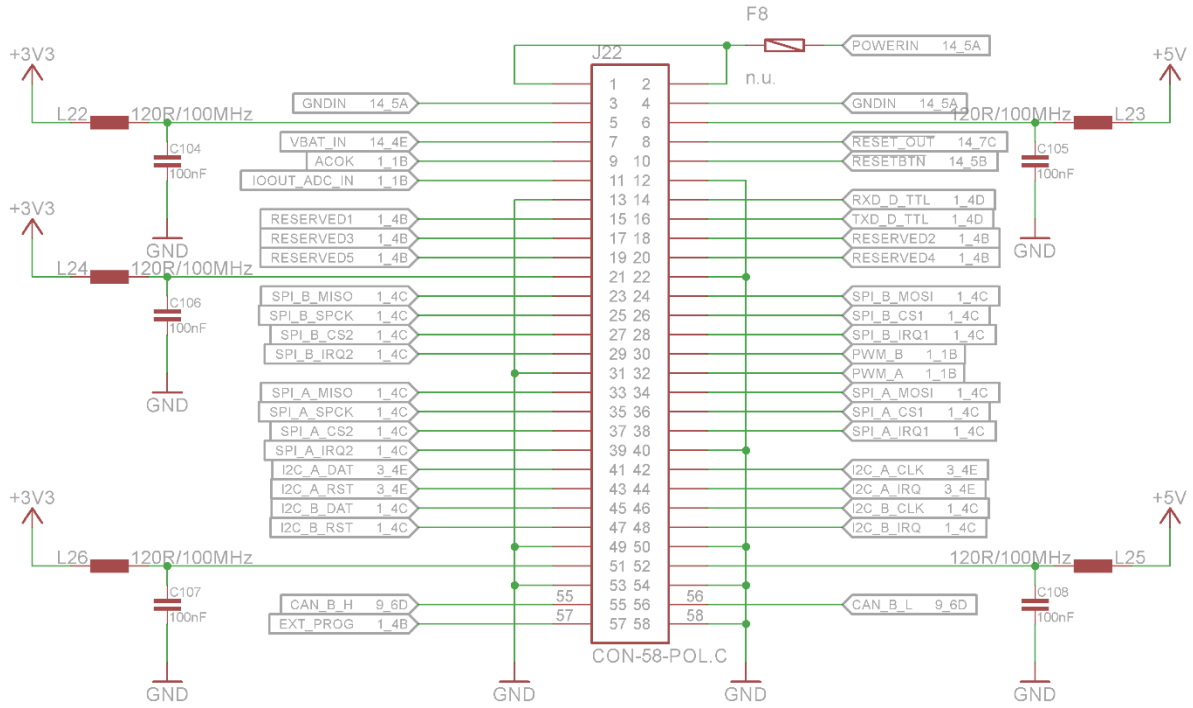

Figure 48: F&S Feature-Connector schematic

4.18.3 Picture of the connector:

Figure 49: F&S Feature-Connector

Pin 1-4 are hidden, if the green power connector J26 is mounted.

4.19 J23 SD Card Interface

The MMC/SD card interface does work with 3.3V level. The 3.3V SD card power supply should be connected to the SD_B_VCC power out of the module.

4.19.1 Pinlist:

J23:

1	SD_B_DAT3
2	SD_B_CMD
3	Ground
4	SD_B_VCC
5	SD_B_CLK
6	Ground
7	SD_B_DAT0
8	SD_B_DAT1
9	SD_B_DAT2
10	Ground
11	SD_B_WP
12	SD_B_CD

4.19.2 Schematic:

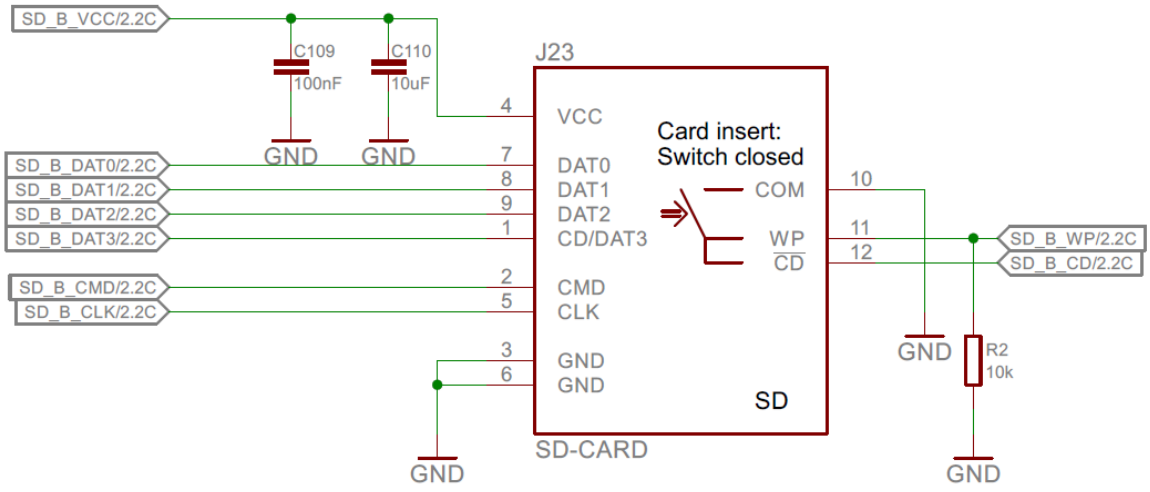

Figure 50: SD Card Interface schematic

4.19.3 Picture of the connector:

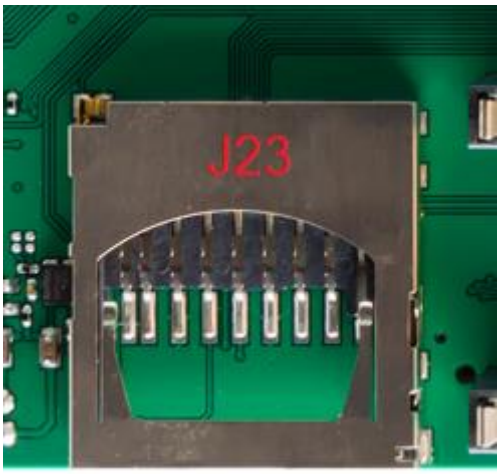

Figure 51: SD Card Interface connector

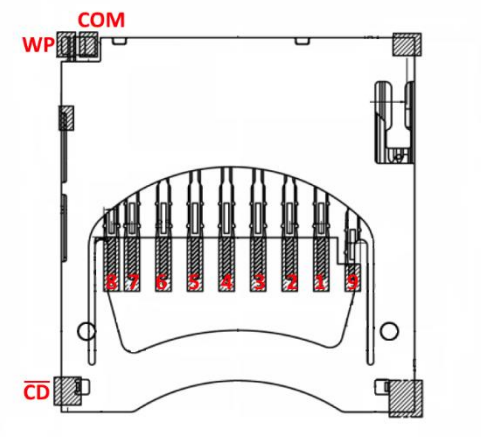

Figure 52: SD Card Interface pin counting

4.20 J28 MicroSD Card Interface

The MMC/SD card interface does work with 3.3V level. The efus module also provides a writing protected Signal for this SD-Port.
The 3.3V SD card power supply should be connected to the SD_A_VCC power out of the module.

4.20.1 Pinlist:

J24:

1	SD_A_DAT3
2	SD_A_CMD
3	Ground
4	SD_A_VCC
5	SD_A_CLK
6	Ground
7	SD_A_DAT0
8	SD_A_DAT1
9	SD_A_DAT2
10	Ground
11	SD_A_WP
12	SD_A_CD

4.20.2 Schematic:

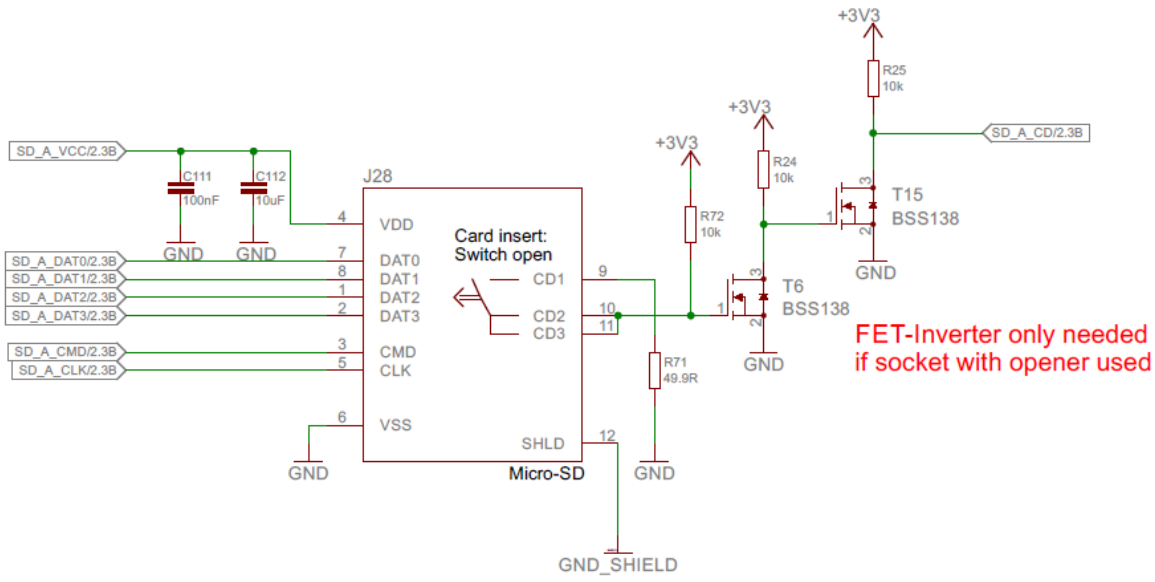

Figure 53: microSD Card Interface schematic

4.20.3 Picture of the connector:

Figure 54: microSD Card Interface connector

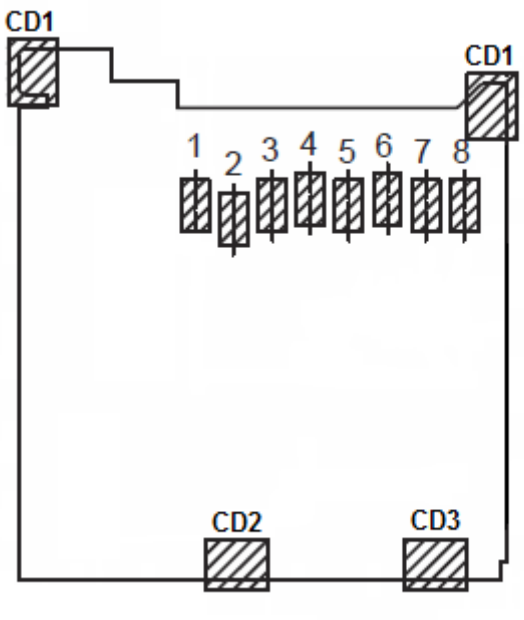

Figure 55: microSD Card Interface pin counting

4.21 J24 MIPI-DSI/LVDS

The efus startinterface board provides a 30 pol. Connector (FI-X30SSLA-HF-R2500) for a MIPI-DSI display interface (2 channels with 4 lanes) or a LVDS display interface (2 channels with 4 lanes). MIPI-DSI or LVDS depends on the used efus module. Please refer the hardware documentation of the related efus module for further information.

4.21.1 Pinlist:

J24

1	LADATA0_N	MIPI/LVDS_A Data0+
2	LADATA0_P	MIPI/LVDS_A Data0-
3	LADATA1_N	MIPI/LVDS_A Data1+
4	LADATA1_P	MIPI/LVDS_A Data1-
5	LADATA2_N	MIPI/LVDS_A Data2+
6	LADATA2_P	MIPI/LVDS_A Data2-
7	Ground	
8	LACLK_N	MIPI/LVDS_A Clock+
9	LACLK_P	MIPI/LVDS_A Clock-
10	LADATA3_N	MIPI/LVDS_A Data3+
11	LADATA3_P	MIPI/LVDS_A Data3-
12	LBDATA0_N	MIPI/LVDS_B Data0+
13	LBDATA0_P	MIPI/LVDS_B Data0-
14	Ground	
15	LBDATA1_N	MIPI/LVDS_B Data1+
16	LBDATA1_P	MIPI/LVDS_B Data1-
17	Ground	
18	LBDATA2_N	MIPI/LVDS_B Data2+
19	LBDATA2_P	MIPI/LVDS_B Data2-
20	LBCLK_N	MIPI/LVDS_B Clock+
21	LBCLK_P	MIPI/LVDS_B Clock-
22	LBDATA3_N	MIPI/LVDS_B Data3+
23	LBDATA3_P	MIPI/LVDS_B Data3-
24	Ground	
25	I2C_A_DAT	
26	I2C_A_IRQ	
27	I2C_A_CLK	
28	I2C_A_RST	
29	VLCD	3.3V
30	VLCD	3.3V

4.21.1 Schematic:

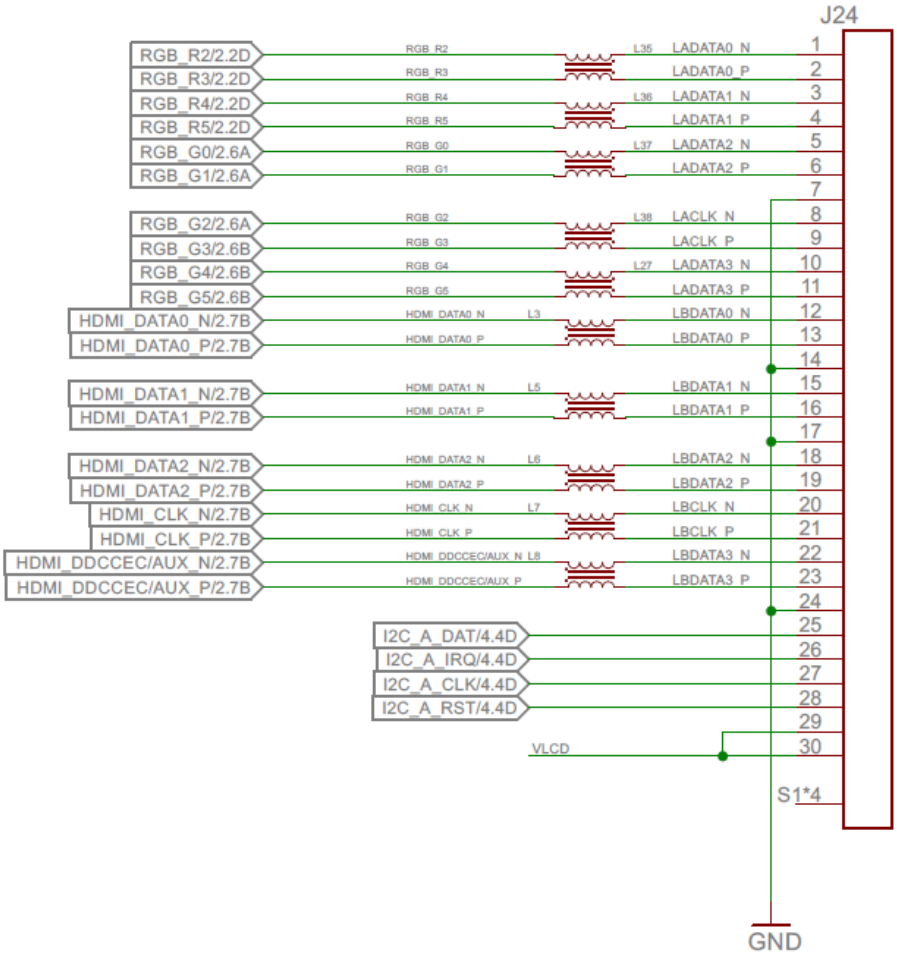

Figure 56: MIPI/LVDS interface schematic

4.21.2 Picture of the connector:

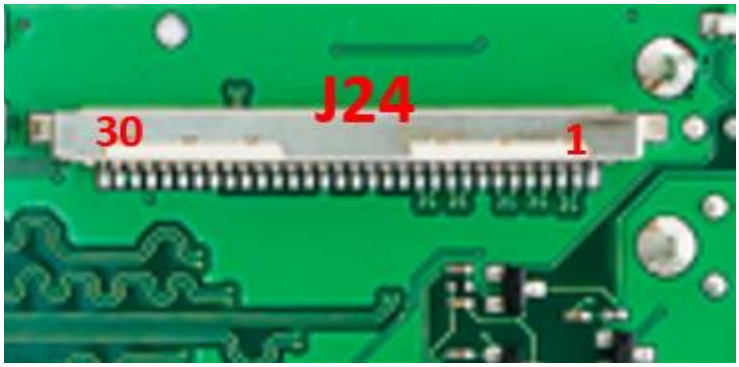

Figure 57: MIPI/LVDS connector pin counting

4.22 J26 Power In

Either a Phoenix Contact MC 1,5/2-GF-3.81 connector, a CUI PJ1-021-SMT connector or the Feature-Connector is used for power supply.
For the Pin assignment of the Feature-Connector please use this page.
For the CUI and Phoenix Contact:

4.22.1 Pinlist:

J26:

1	VIN	5V DC power supply +/- 5%
2	GND	Ground

4.22.2 Picture of the connector:

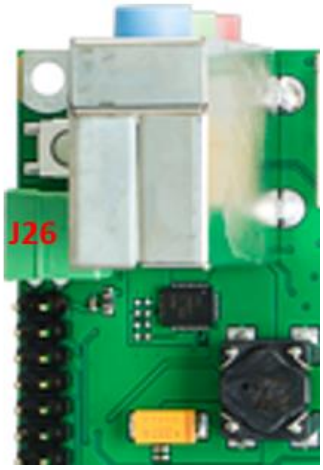

Figure 58: Power-Connector Top

Figure 59: Power-Connector Bottom

4.23 RTC-Power

On the efus-SINTF there are three Options to power the RTC of the efus module. Per default the board comes with a socket for a 3 Volt CR2032 battery.

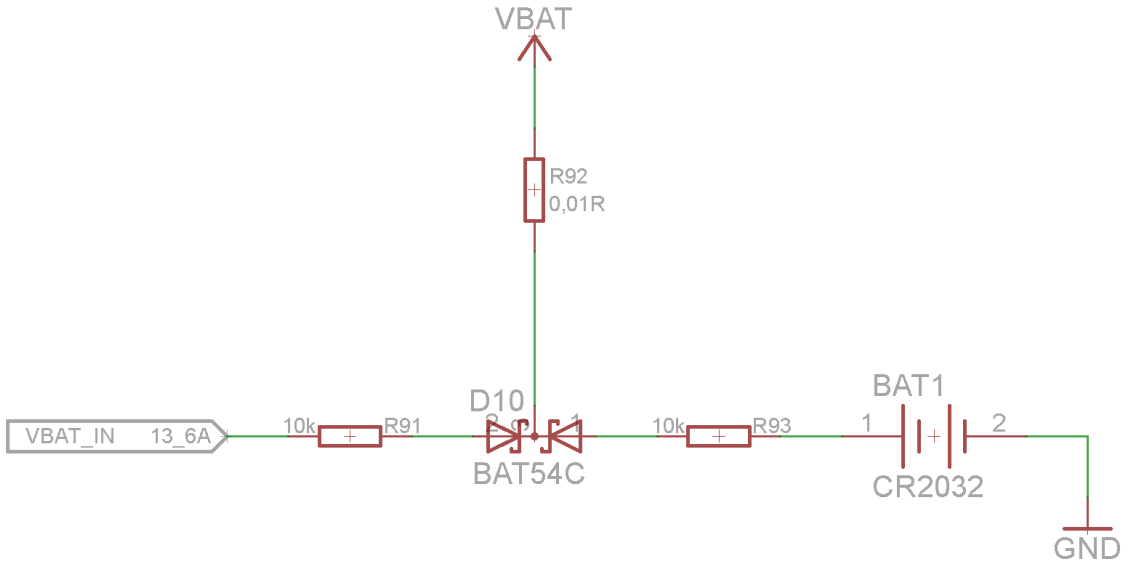

Figure 60: VBAT CR2032

Optionally the RTC also can be power by a Super CAP. For this purpose the SINTF need a charging circuit.

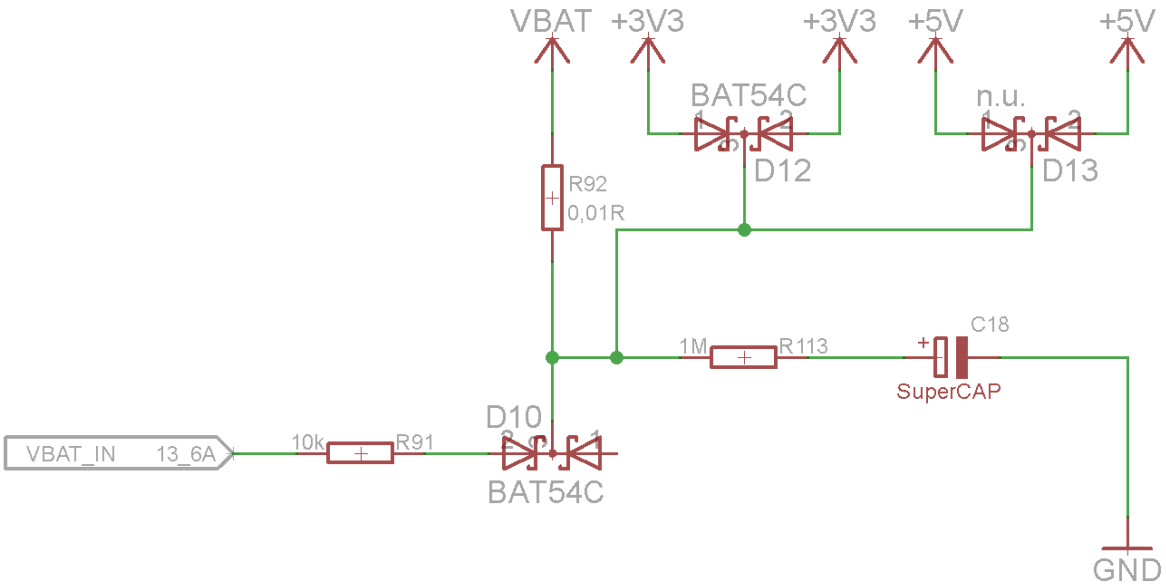

Figure 61: VBAT Super CAP

If you want to power the RTC external you can connect the VBAT on the Feature-Connector J22.

4.23.1 Picture of the connector:

Figure 62: VBAT CR2032 socket

5 Electrical characteristic

VCC:	5V +/- 5%
Power consumption onboard logic:	TBD
Power consumption USB ports:	max. 500 mA per port
Power consumption efus module:	please refer module datasheet

6 Measure Current and Voltage of the efus-Module

Needed test equipment:

1. Voltmeter for A
2. Ampere-meter for B

Test setup:

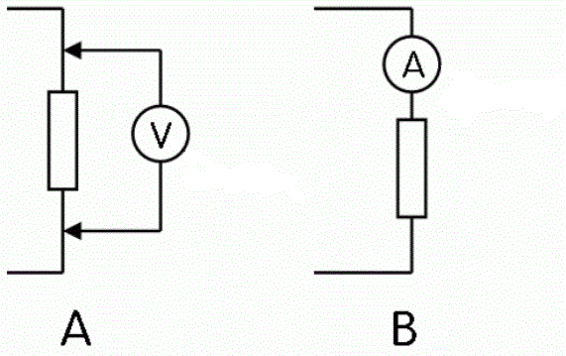

Figure 63: method of measurement

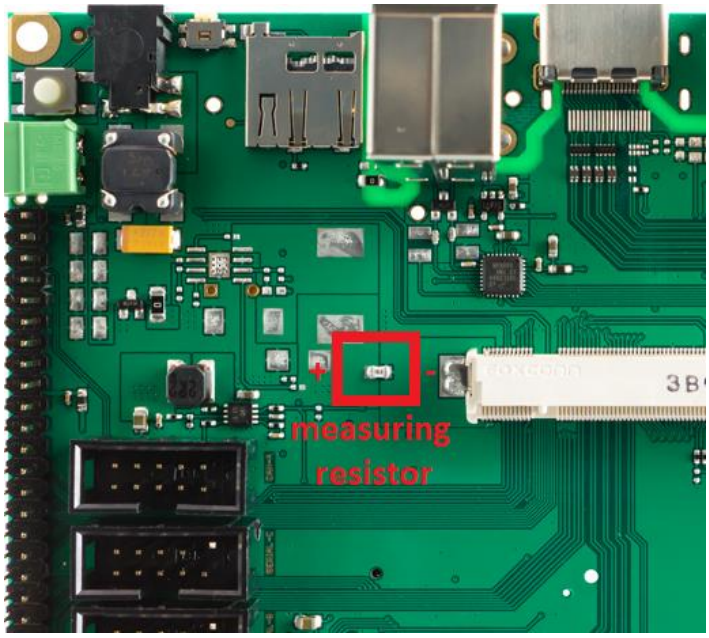

Figure 64: measuring resistor

For A:

1. Connect the positive pole of the voltmeter to the “+”-pin of the measuring resistor of the efus-SINTF
2. Connect the negative pole to the “-“-pin of the measuring resistor
3. Now you can measure the voltage, which is drop at the resistor (0,01Ω)
4. Now you can calculate the current:
5. $current = \frac{messured\ voltage}{measuring\ resistor\ (0{,}01\Omega)}$

For B:

1. Remove the measuring resistor
2. Connect the positive pole of the Ampere-meter to the “+”-pad of the measuring resistor of the efus-SINTF
3. Connect the negative pole to the “-“-pad of the measuring resistor
4. Now you can measure the current.

Note, if you use option B:

After you have measure the current you have to solder a 0,01R resistor on the free pads, otherwise the efus won’t get supplied.
Please observe the inner resistance of your ampere meter could induce a instable supply voltage for the module.

7 Programming NBoot

Needed test equipment:

1. Tweezers, 2.54mm Jumper or another tool to short the Bootselect-Pins

Test setup:

1. Connect USB-Device cable from Windows PC to the board
2. Connect the serial debug interface on COM A
3. Connect the switched off power supply
4. Short the Bootselect-Pins J22 Pin57+58 (the both last pins on connector):

Figure 65: Bootselect Pin

Test software:

1. MFG-Tool (Download)
2. Latest NBoot
3. DCU-Term (Download)

Procedure:

1. Rename the latest NBoot from our Homepage to “nboot.bin”
2. Place the “nboot.bin” into the same folder as the MFG-Tool
3. Start the MFG Tool
4. Start the DCU-Term and connect your COM-Port
5. Power the board. Now the MFG-Tool shows the message “HID-conform device”:

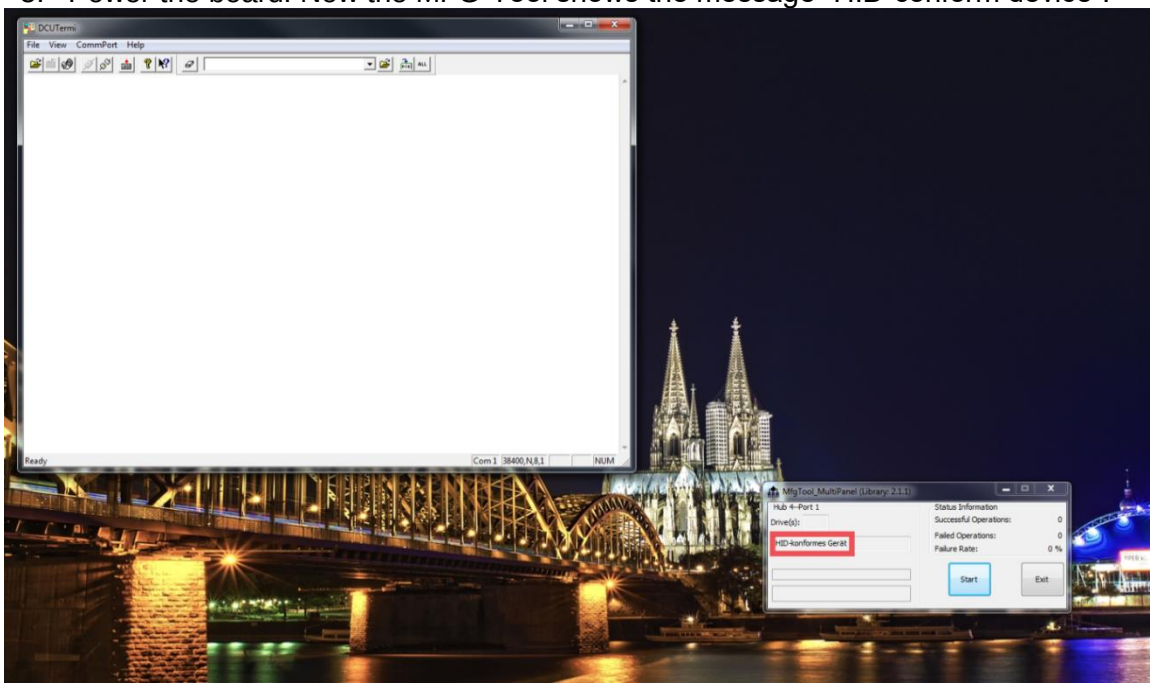

Figure 66: HID-conform device

6. Press “Start” at the MFG-Tool.
7. Now the download of the NBoot starts. The NBoot will be saved on your board.
8. You can see the debug-messages of the NBoot in the DCU-Termi window:

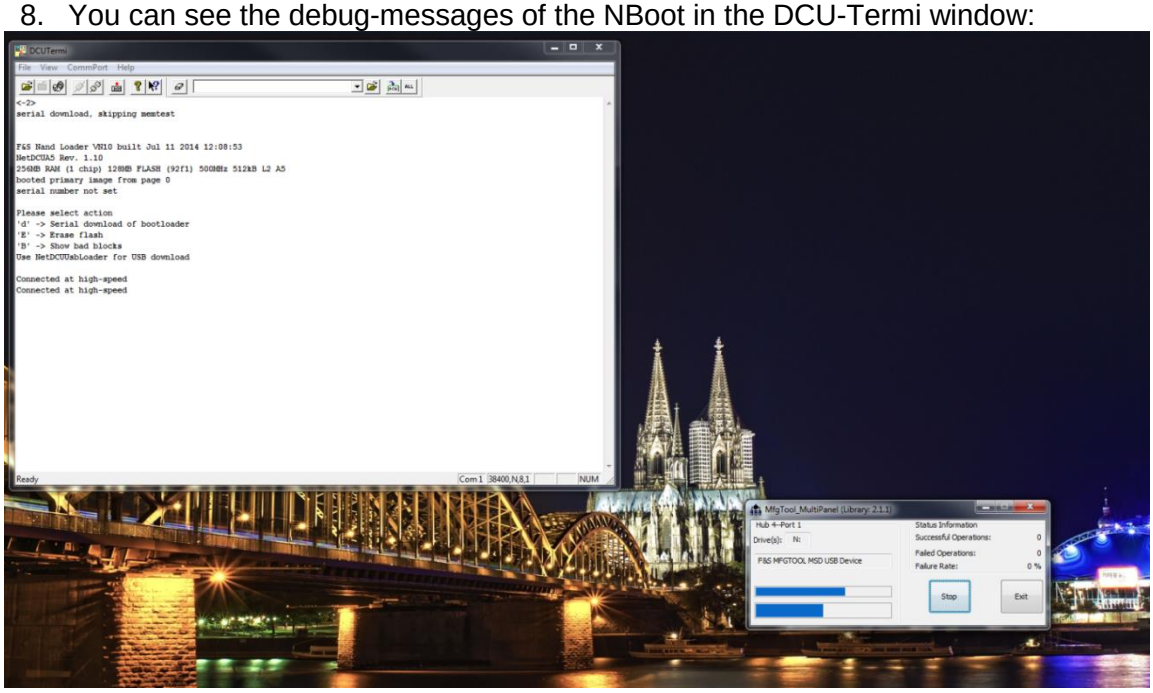

Figure 67: Debug messages on DCU-Termi

9. Now you can remove the short of the Bootselect-Pins and restart the board.

If the NBoot of the board starts normally, the programming was successful.

8 Appendix

List of Figures

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