Hardware documentation

for efus Startinterface

Version 1.0
(2014-03-10)

efus-SINTF

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

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

Table of Contents

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
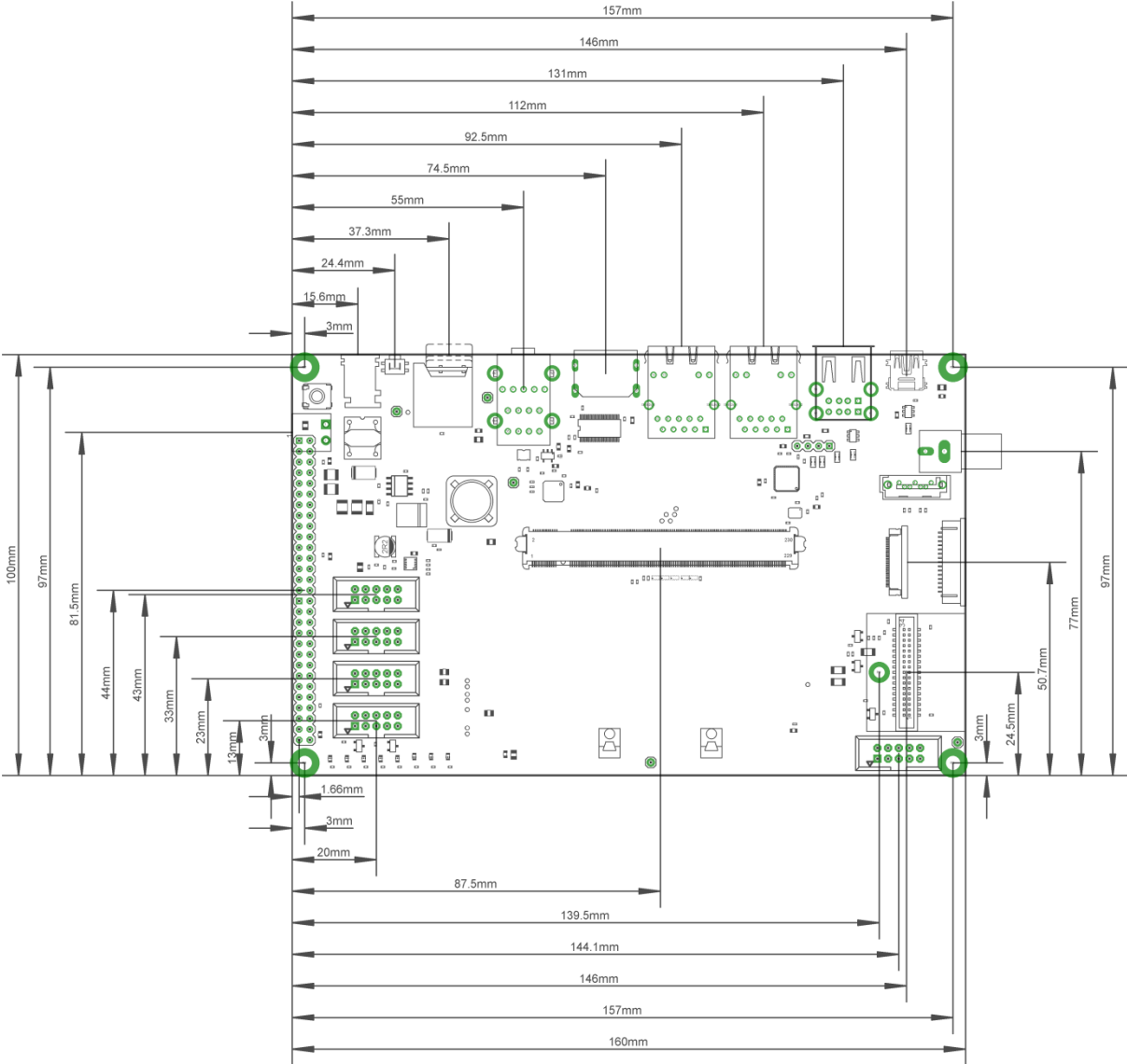
Figure 1: mechanical dimension

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: TBD

2.2 Modules

Size: 62.11mm x 47mm

PCB thickness: 1.2 ± 0.1mm

Height of the parts on the top side: TBD

Weight: TBD

3 Connector layout

Figure 2: Connector Layout Top

Figure 3: Connector Layout Bottom
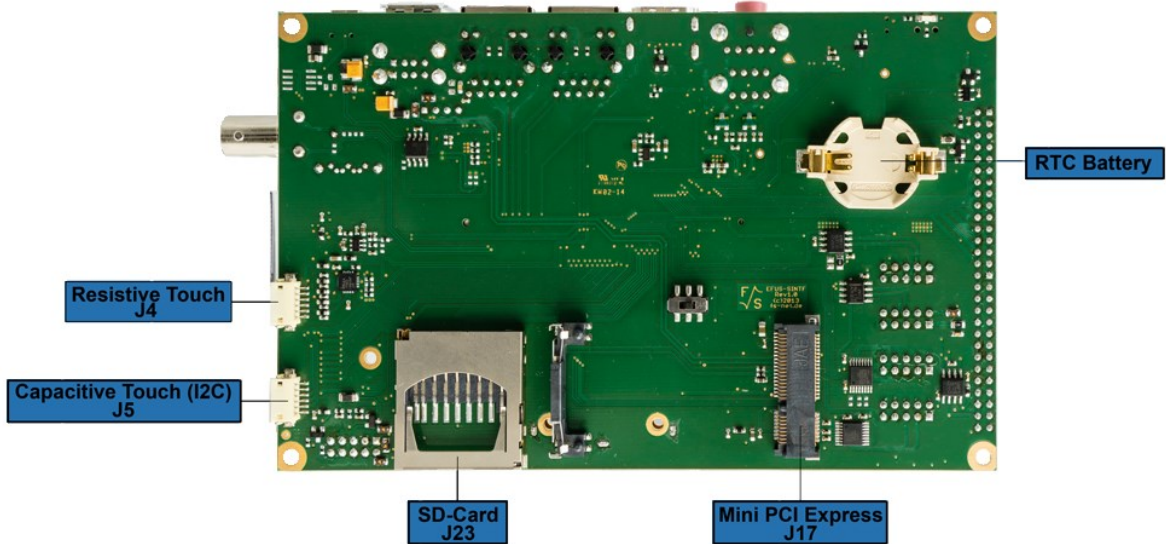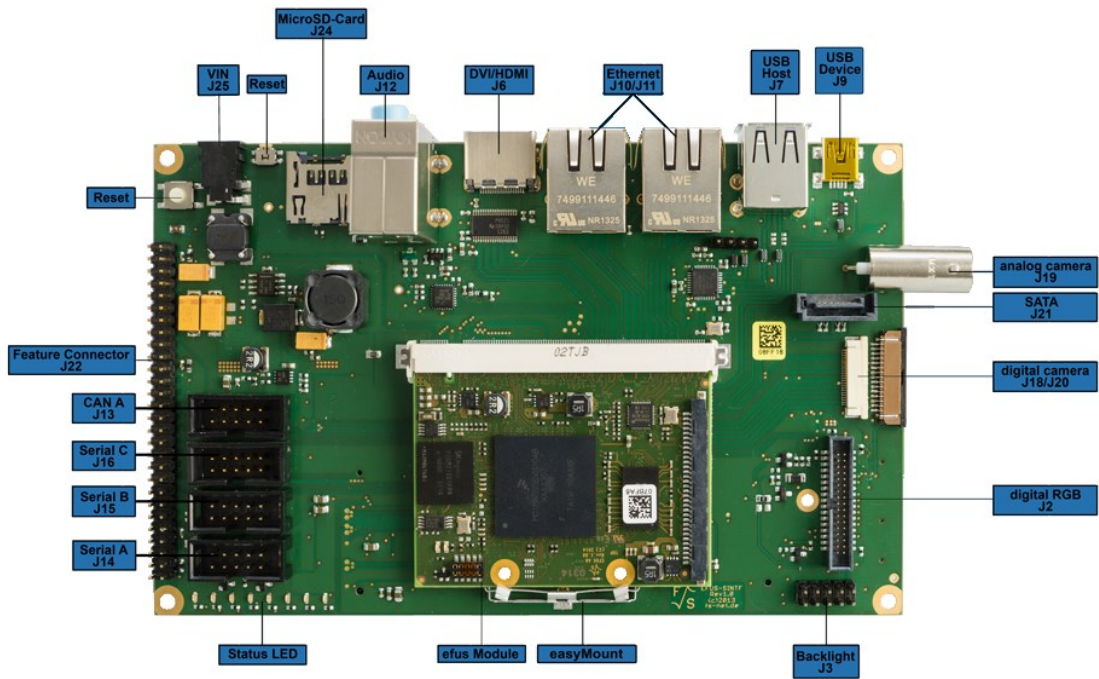
4   Interface and signal description

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.

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		J24
17	TXD_C_TTL	Converted to RS485	J16

J1			
Pin	Use on base board	Remarks	Connector
18	SD_A_CD		J24
19	RTS_C_TTL	Converted to RS485	J16
20	SD_A_DAT2		J24
21	CTS_C_TTL		
22	SD_A_DAT3		J24
23	PWM_B		J22
24	SD_A_CMD		J24
25	PWM_A		J22
26	SD_A_VCC		J24
27	GND		
28	SD_A_CLK		J24
29	CAN_A_TX		J13
30	GND		
31	CAN_A_RX		J13
32	SD_A_DAT0		J24
33	GND		
34	SD_A_DAT1		J24
35	CAN_B_TX		J22
36	RESERVED1		J22
37	CAN_B_RX		J22
38	RESERVED2		J22
39	GND		
40	RESERVED3		J22
41	MPCIE_CTX_P		J17
42	RESERVED4		J22
43	MPCIE_CTX_N		J17
44	RESERVED5		J22

Pin	Use on base board	Remarks	Connector
J1			
45	GND		
46	GND		
47	MPCIE_CRX_P		J17
48	EXT_PROG		J22
49	MPCIE_CRX_N		J17
50	SPI_B_MISO		J22
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

J1			
Pin	Use on base board	Remarks	Connector
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		
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

J1			
Pin	Use on base board	Remarks	Connector
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
108	CTS_B_TTL	Converted to RS232	J15
109	LCD_R3		J2
110	GND		
111	LCD_R4		J2
112	I2S_MCLK		J12
113	LCD_R5		J2
114	GND		
115	GND		
116	I2S_LRCLK		J12
117	LCD_G0		J2
118	GND		
119	LCD_G1		J2
120	I2S_SCLK		J12
121	LCD_G2		J2
122	GND		
123	LCD_G3		J2
124	I2S_DOUT		J12
125	LCD_G4		J2

J1			
Pin	Use on base board	Remarks	Connector
126	I2S_DIN		J12
127	LCD_G5		J2
128	GND		
129	GND		
130	I2C_C_DAT		
131	LCD_B0		J2
132	I2C_C_CLK		
133	LCD_B1		J2
134	DVI_DDC_VOUT	3.3V output for ESD protection	J6
135	LCD_B2		J2
136	GND		
137	LCD_B3		J2
138	DVI_DATA2_P		J6
139	LCD_B4		J2
140	DVI_DATA2_N		J6
141	LCD_B5		J2
142	DVI_DATA1_P		J6
143	GND		
144	DVI_DATA1_N		J6
145	LCD_DE		J2
146	DVI_DATA0_P		J6
147	GND		
148	DVI_DATA0_N		J6
149	VLCD_ON		J3
150	DVI_CLK_P		J6
151	I2C_A_DAT		J2/J5
152	DVI_CLK_N		J6

J1			
Pin	Use on base board	Remarks	Connector
153	I2C_A_IRQ		J2/J5
154	GND		
155	I2C_A_CLK		J2/J5
156	DVI_DDCCEC		J6
157	I2C_A_RST		J5
158	DVI_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
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

J1			
Pin	Use on base board	Remarks	Connector
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
201	SATA_RX_P		J21
202	ETH_A_D2_P		J11
203	SATA_RX_N		J21
204	ETH_A_LED_ACT		J11

J1			
Pin	Use on base board	Remarks	Connector
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	J19
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		

4.2   J12 Sound

The sound connector does provide Stereo Line In, Stereo Line Out and Microphone In.
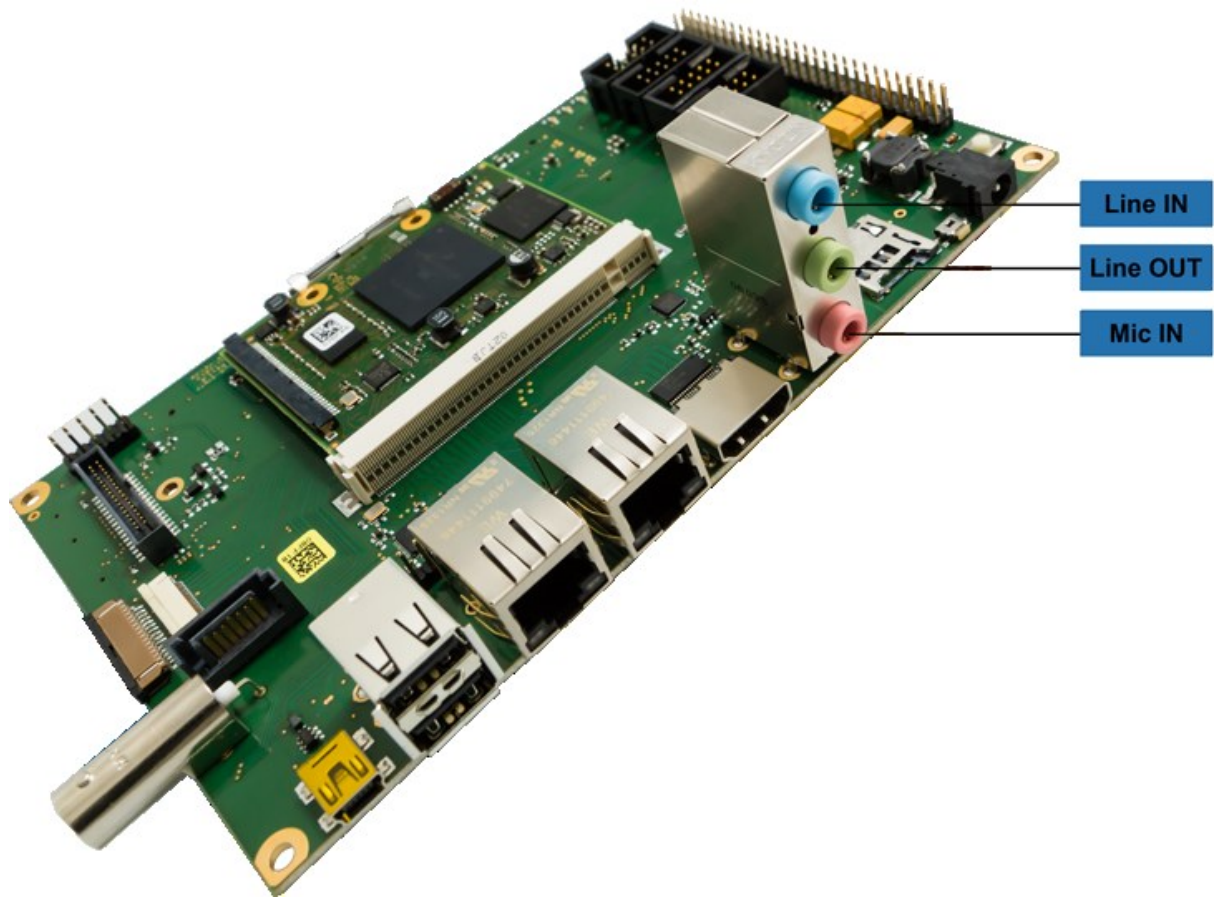
Figure 4: Audio connection

4.3 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.
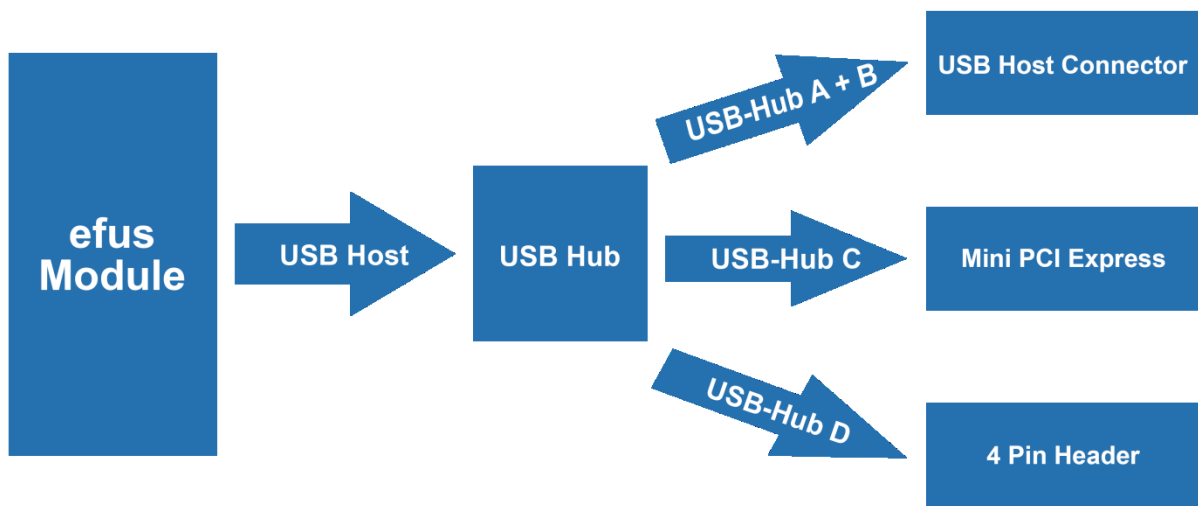
Figure 5: USB Host with USB Hub

4.4 J9 USB client

It's a standard USB mini connector to use the board as USB device.
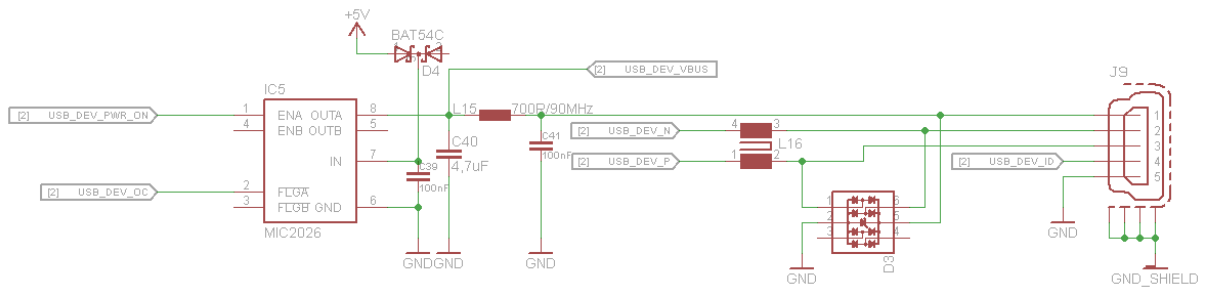
Figure 6: USB device

4.5   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 per default. The 120 Ohm terminations are set per default but can be separated by opening the solderjumper SJ1/SJ2. 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 on page **x**.
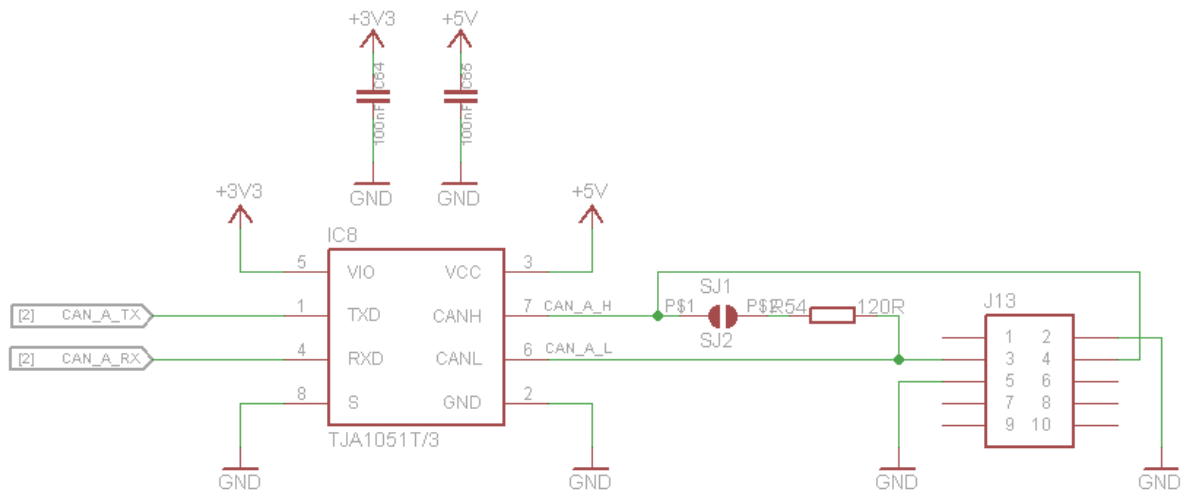
Figure 7: CAN transceiver

4.6   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.

1	+3V3
2	+5V
3	GND
4	LCD_CLK
5	LCD_HSYNC
6	LCD_VSYNC
7	
8	LCD_R0
9	LCD_R1
10	LCD_R2
11	LCD_R3
12	LCD_R4
13	LCD_R5
14	
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)

Pin 1 is marked on the connector with an arrow and also marked on PCB.

4.6.1   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 VCFL_IN and connect the VCFL_OUT to your Backlight. Now you can Switch your Backlight on/off with VCFL_ON or !VCFL_ON.

The connector also offers the 3.3V PWM-Output BL_CTRL to dim the Backlight.

+5V	1	2	+3V3
VIN	3	4	GND
VCFL_IN	5	6	GND
VCFL_OUT	7	8	!VCFL_ON
BL_CTRL	9	10	VCFL_ON

4.7 J23 SD Card Interface

The MMC/SD card interface does work with 3.3V level. The 3.3V SDcard power supply should be connected to the SD_B_VCC power out of the module.
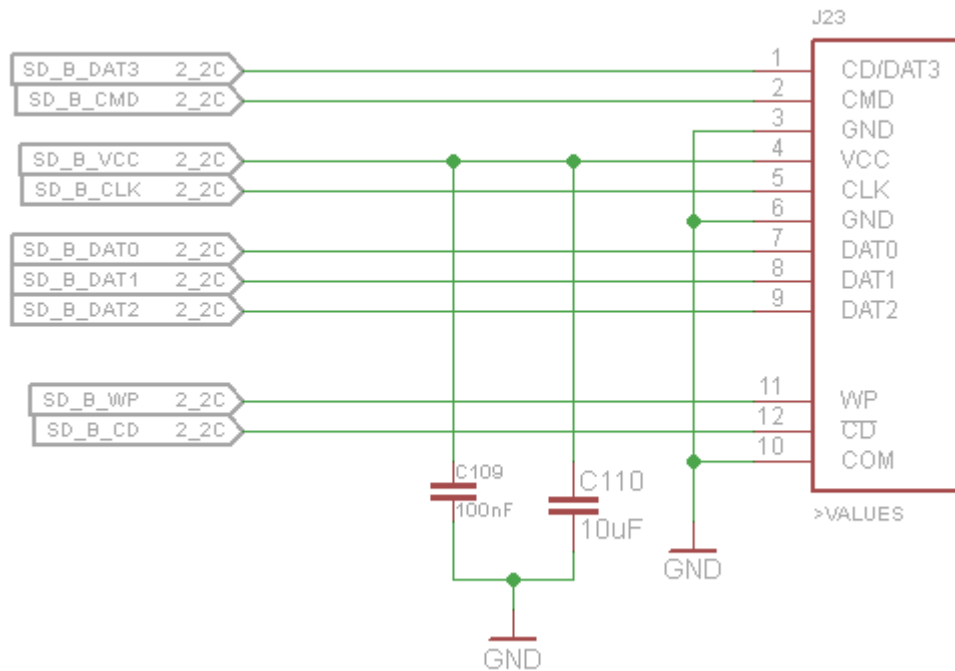
Figure 8: SD Card Interface

4.8   J24 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.

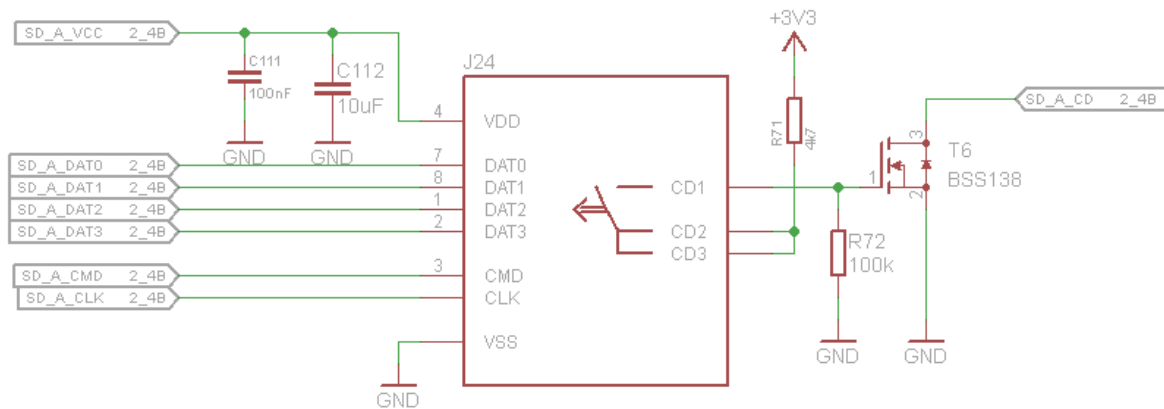The 3.3V SDcard power supply should be connected to the SD_A_VCC power out of the module.

Figure 9: microSD Card Interface

4.9 J6 DVI/HDMI

The display connector allows to connect a HDMI monitor or a DVI monitor by using an adapter. The connector is EMC protected by the CM2020.
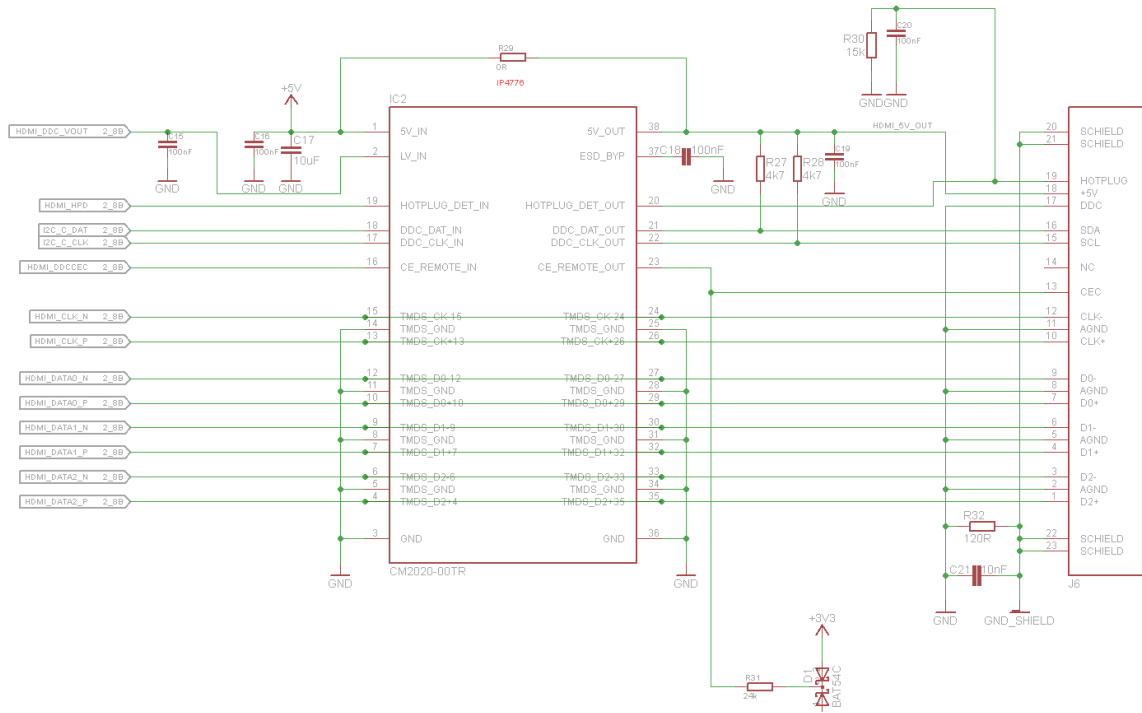

Figure 10: DVI / HDMI

4.10 J22 F&S Feature-Connector

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

VIN	1	2	VIN
GND_IN	3	4	GND_IN
+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

4.11 J10 / J11 Ethernet

The efus Startinterface provides two 10/100/1000 Mbit Ethernet channels.
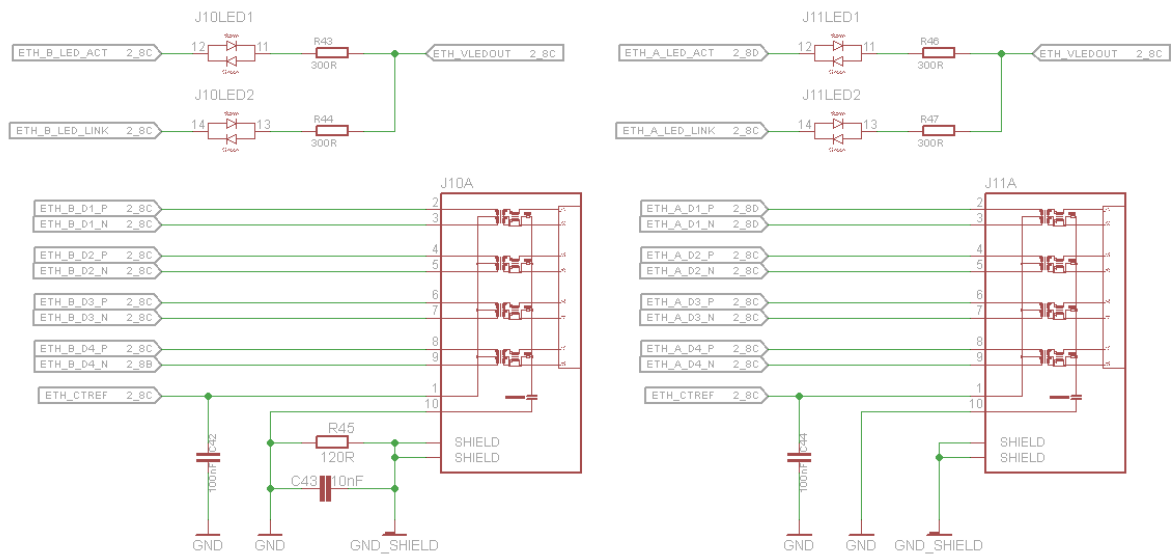
Figure 11: LAN 1 + 2

4.12 J21 SATA

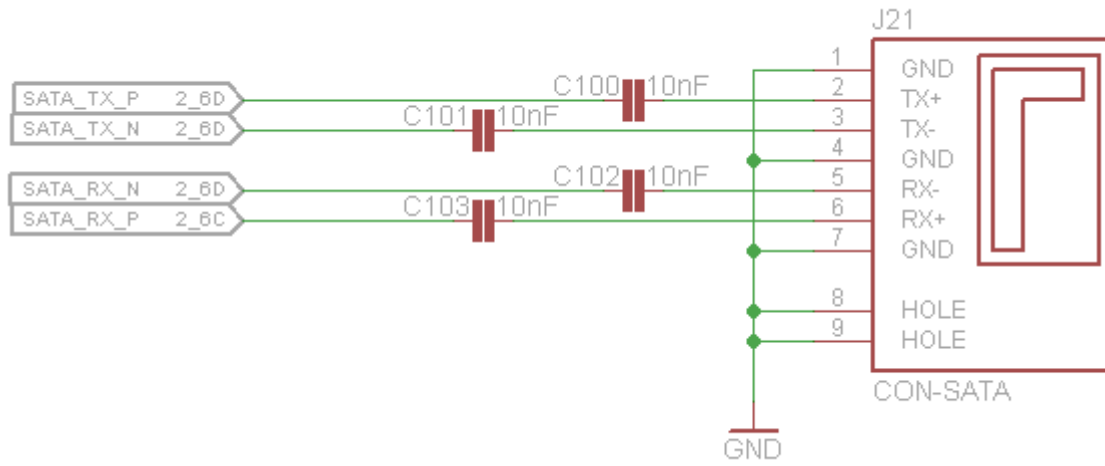The efus start interface provides a SATA connector to connect a SATA HD or SSD.

Figure 12: SATA

4.13 COM ports

On the Board are 4 COM ports (A-D)

4.13.1 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.

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

4.13.2 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.

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

4.13.3 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.

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.

4.13.4 COM D

The fourth port is a TTL port without RTS/CTS which is connected to the Feature-Connector.

Pin14: RXD

Pin16: TXD

4.14 J25 / J26 Power

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 page **X**.

For the CUI and Phoenix Contact:

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

5　Electrical characteristic

VCC: 5V +/- 5%

Power consumption onboard logic: TDB

Power consumption USB ports: max. 500 mA per port

Power consumption efus module: please refer module datasheet

6 Appendix

List of Figures

Important Notice

The information in this publication has been carefully checked and is believed to be entirely accurate at the time of publication. F&S Elektronik Systeme assumes no responsibility, however, for possible errors or omissions, or for any consequences resulting from the use of the information contained in this documentation.

F&S Elektronik Systeme reserves the right to make changes in its products or product specifications or product documentation with the intent to improve function or design at any time and without notice and is not required to update this documentation to reflect such changes.

F&S Elektronik Systeme makes no warranty or guarantee regarding the suitability of its products for any particular purpose, nor does F&S Elektronik Systeme assume any liability arising out of the documentation or use of any product and specifically disclaims any and all liability, including without limitation any consequential or incidental damages.

Specific testing of all parameters of each device is not necessarily performed unless required by law or regulation.

Products are not designed, intended, or authorised for use as components in systems intended for applications intended to support or sustain life, or for any other application in which the failure of the product from F&S Elektronik Systeme could create a situation where personal injury or death may occur. Should the Buyer purchase or use a F&S Elektronik Systeme product for any such unintended or unauthorised application, the Buyer shall indemnify and hold F&S Elektronik Systeme and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, expenses, and reasonable attorney fees arising out of, either directly or indirectly, any claim of personal injury or death that may be associated with such unintended or unauthorized use, even if such claim alleges that F&S Elektronik Systeme was negligent regarding the design or manufacture of said product.

Specifications are subject to change without notice.

Warranty Terms

Hardware Warranties

F&S guarantees hardware products against defects in workmanship and material for a period of one (1) year from the date of shipment. Your sole remedy and F&S's sole liability shall be for F&S, at its sole discretion, to either repair or replace the defective hardware product at no charge or to refund the purchase price. Shipment costs in both directions are the responsibility of the customer. This warranty is void if the hardware product has been altered or damaged by accident, misuse or abuse.

Software Warranties

Software is provided "AS IS". F&S makes no warranties, either express or implied, with regard to the software object code or software source code either or with respect to any third party materials or intellectual property obtained from third parties. F&S makes no warranty that the software is useable or fit for any particular purpose. This warranty replaces all other warranties written or unwritten. F&S expressly disclaims any such warranties. In no case shall F&S be liable for any consequential damages.

Disclaimer of Warranty

THIS WARRANTY IS MADE IN PLACE OF ANY OTHER WARRANTY, WHETHER EXPRESSED, OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A SPECIFIC PURPOSE, NON-INFRINGEMENT OR THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION, EXCEPT THE WARRANTY EXPRESSLY STATED HEREIN. THE REMEDIES SET FORTH HEREIN SHALL BE THE SOLE AND EXCLUSIVE REMEDIES OF ANY PURCHASER WITH RESPECT TO ANY DEFECTIVE PRODUCT.

Limitation on Liability

UNDER NO CIRCUMSTANCES SHALL F&S BE LIABLE FOR ANY LOSS, DAMAGE OR EXPENSE SUFFERED OR INCURRED WITH RESPECT TO ANY DEFECTIVE PRODUCT. IN NO EVENT SHALL F&S BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES THAT YOU MAY SUFFER DIRECTLY OR INDIRECTLY FROM USE OF ANY PRODUCT. BY ORDERING THE PRODUCT, THE CUSTOMER APPROVES THAT THE F&S PRODUCT, HARDWARE AND SOFTWARE, WAS THOROUGHLY TESTED AND HAS MET THE CUSTOMER'S REQUIREMETS AND SPECIFICATIONS