

NetDCU11/NetDCU11.2

Hardware Documentation

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About This Document

This document describes how to use the NetDCU11 or NetDCU11.2 board with mechanical and electrical information. The latest version of this document can be found at:

<http://www.fs-net.de>.

Within this document NetDCU11 is used as a placeholder for NetDCU11 and NetDCU11.2.

ESD Requirements



All F&S hardware products are ESD (electrostatic sensitive devices). 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.

History

Date	V	Platform	A,M,R	Chapter	Description	Au
28.01.2008	1.00	All	M	all-	First version	DB
01.12.2012	1.01	All	M	all-	Extended to NetDCU11.2	DB
29.09.2014	1.02	All	M	all-	Updated to new CI	JG

V Version

A,M,R Added, Modified, Removed

Au Author

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1 Arrangement of Connectors

Figure 1.1: Top View
J10

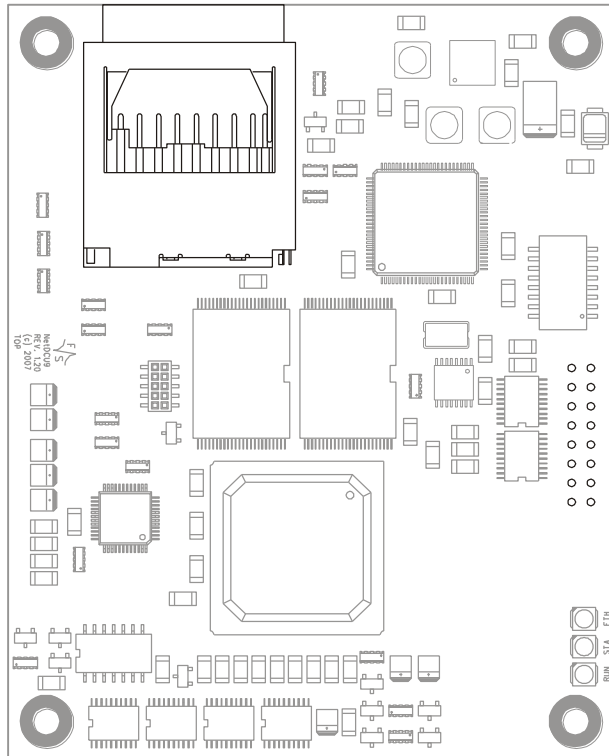
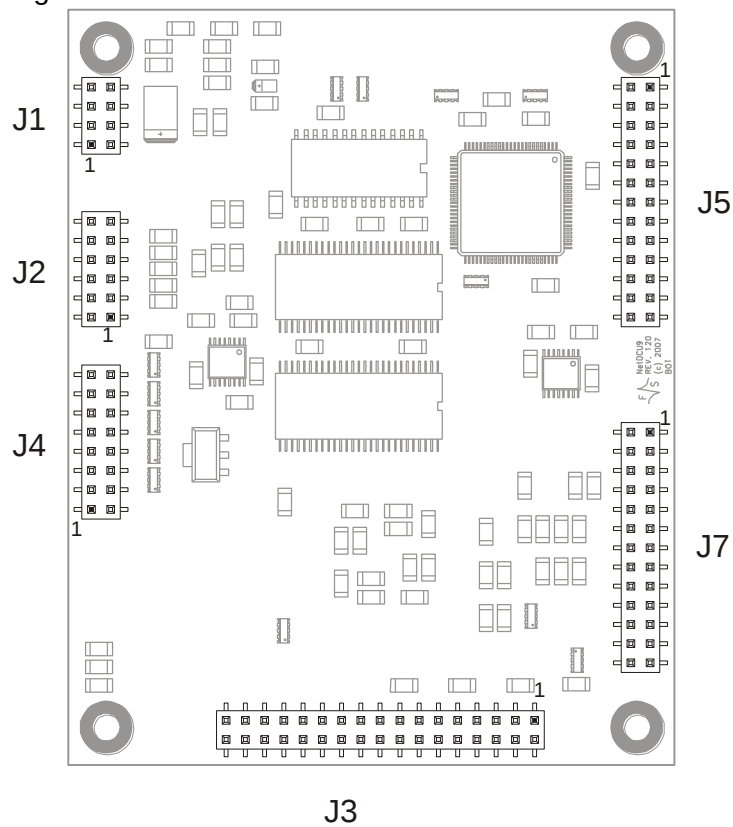


Figure 1.2: Bottom View



2 Connectors

2.1 Counting of the connector pins

All connections prepared for two-row connectors on the NetDCU11 are treated as follow. The row with pin 1 contains all odd-numbered pins (1, 3, 5, 7, etc.), and, corresponding to this, the row without pin 1 contains all even-numbered pins (2, 4, 6, 8, etc.).

2.2 J1 Power Supply

J1 Power Supply	
Pin	Function
1	+3V ... +15V / max. 2A DC (CFL- Converter)
2	-
3	+5V $\pm$ 5% DC at max. 0,6A (*)
4	+5V $\pm$ 5% DC at max. 0,6A (*)
5	+3V...+3,6V DC (Battery buffering RTC) (**)
6	-
7	GND (Ground Power Supply)
8	GND (Ground Power Supply)

(*) $\Rightarrow$ No Display connected.

(**) $\Rightarrow$ Can be left out depending on application.

2.3 J2 Ethernet Interface

J2 Ethernet Interface		
Pin	Signal	Function
1	RxD	Pin 6 of RJ45 connector
2	RxD	Pin 3 of RJ45 connector
3	- - -	
4	- - -	
5	- - -	
6	- - -	
7	TxD	Pin 2 of RJ45 connector
8	TxD	Pin 1 of RJ45 connector
9	GND	Signal Ground
10	V _{CC}	+5V DC
11	- - -	
12	- - -	

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.4 J2 Serial RS232 Port A

J2 serial RS232 port 1			
Pin	Signal	Function	I/O
1	- - -		
2	- - -		
3	RxD1	Received Data	I
4	RTS1	Request To Send	O
5	TxD1	Transmitted Data	O
6	CTS1	Clear To Send	I
7	- - -		
8	- - -		
9	GND	Signal Ground	Power
10	V _{CC}	+5V DC	Power
11	- - -		
12	- - -		

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.5 J2 CAN Interface

J2 CAN Interface			
Pin	Signal	Function	I/O
1	- - -		
2	- - -		
3	- - -		
4	- - -		
5	- - -		
6	- - -		
7	- - -		
8	- - -		
9	GND	Signal Ground	Power
10	V _{CC}	+5V DC	Power
11	CAN-RxD	Receive signal	I
12	CAN-TxD	Transmit signal	O

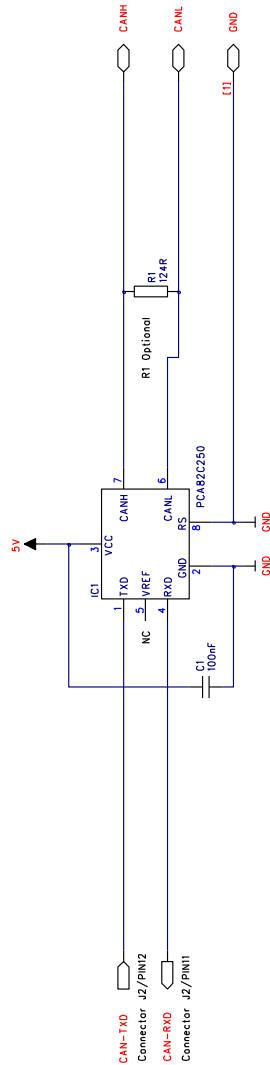
(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

Note:

The two CAN signals can NOT be connected directly to the CAN bus. You need a special interface logic to doing this. Take a look at the following to examples to get an idea how to connect the CAN bus.

2.5.1 Example CAN-Interface type 1

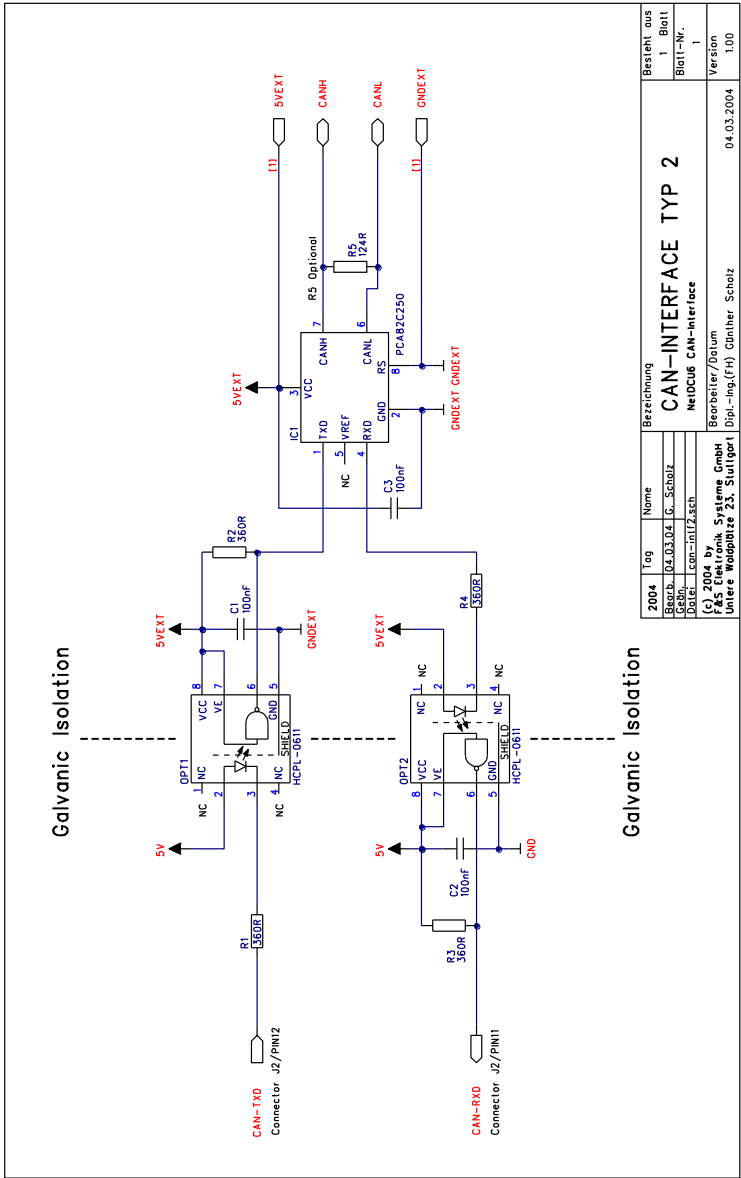
The following schematic shows the needed interface between NetDCU11 and CAN bus. It has no galvanic isolation.



2004	Tag	Name	Bezeichnung	Bestell. aus
Bezd.	03.03.04	G. Scholz	CAN-INTERFACE TYP 1	1 Blatt
Gez.			NeIDC06 CAN-Interface	Blatt-Nr.
Datei	can-int1.sch			1
(c) 2004 by FSV Systems GmbH				Version
Unternehmensplatz 23, Stuttgart				03.03.2004
Dipl.-Ing.(FH) Günther Scholz				1.00

2.5.2 Example CAN-Interface type 2

The following schematic shows the needed interface between NetDCU8 and CAN bus. It has galvanic isolation.



2.6 J3 Display Interface

J3 Display Interface		
Pin	Signal	Function
1	GND	Signal Ground
2	R1	Red Bit 1
3	R0	Red Bit 0 (LSB)
4	G5	Green Bit 5 (MSB)
5	G4	Green Bit 4
6	G3	Green Bit 3
7	G2	Green Bit 2
8	GND	Signal Ground
9	B3	Blue Bit 3
10	B2	Blue Bit 2
11	B1	Blue Bit 1
12	B0	Blue Bit 0 (LSB)
13	G1	Green Bit 1
14	G0	Green Bit 0 (LSB)
15	B5	Blue Bit 5 (MSB)
16	B4	Blue Bit 4
17	GND	Signal Ground
18	V _{EEK}	(*)
19	CLP	Data clock pulse
20	FRP	Frame Impulse
21	M	Display data valid signal
22	LIP	Line Impulse
23	DEN	Display ON
24	GND	Signal Ground
25	V _{LCD}	Power supply LCD +5V (+3,3V)
26	--	NC
27	--	NC
28	GND	Signal Ground
29	--	NC
30	V _{CFL}	Max. +12V for CFL converter
31	R2	Red Bit 2

J3 Display Interface		
Pin	Signal	Function
32	R3	Red Bit 3
33	R4	Red Bit 4
34	R5	Red Bit 5 (MSB)

(*) ⇒ software adjustable output voltage 0V...+3,3V.

2.7 J4 FS-Bus (8 bit Extension interface)

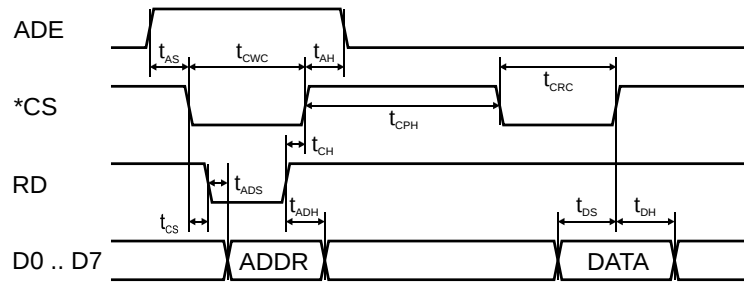
J4 parallel extension interface		
Pin	Signal	Function
1	D0	Data Bit D0, I/O (*)
2	D1	Data Bit D1, I/O (*)
3	D2	Data Bit D2, I/O (*)
4	D3	Data Bit D3, I/O (*)
5	D4	Data Bit D4, I/O (*)
6	D5	Data Bit D5, I/O (*)
7	D6	Data Bit D6, I/O (*)
8	D7	Data Bit D7, I/O (*)
9	V _{IO}	IO Voltage, +3,3V or +5V (***)
10	RD	Read, output, active High (*)
11	NCS	Chip Select, output, active Low (*)
12	ADE	Address Enable, output, active High (*)
13	NIRQ	Interrupt, input, active Low (*)
14	NRES	Reset, input, active Low (**)
15	V _{EXT}	External +V _{EEK} voltage for LCD
16	GND	Signal Ground

(*) ⇒ Input/output with Pull Up resistor 4,7kΩ at +3,3V or +5V (-> configuration parallel port).

(**) ⇒ Input with Pull Up resistor 3kΩ at +3,3V.

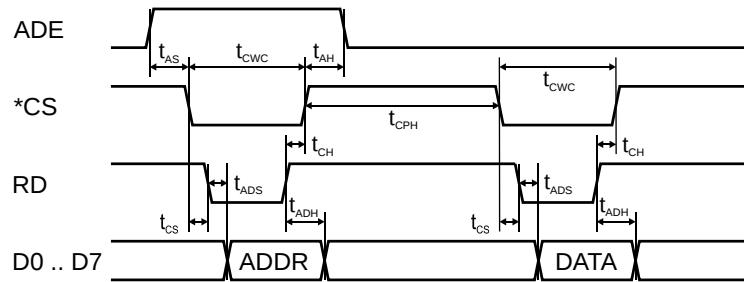
(***) ⇒ See also configuration of the parallel port.

2.7.1 FS-Bus Timing Read Cycle



Item	Symbol	Min.	Typ.	Max.	Unit
ADE set up time	t_{AS}	20	-	-	ns
ADE hold time	t_{AH}	20	-	-	ns
CS cycle write time	t_{CWC}	180	-	-	ns
CS set up time	t_{CS}	0	-	-	ns
CS hold time	t_{CH}	0	-	-	ns
ADDR set up time	t_{ADS}	2	-	-2	ns
ADDR hold time	t_{ADH}	0	-	-	ns
CS pulse high width	t_{CPH}	100	-	-	ns
CS cycle read time	t_{CRC}	180	-	-	ns
DATA set up time	t_{DS}	25	-	-	ns
DATA hold time	t_{DH}	0	-	-	ns

2.7.2 FS-Bus Timing Write Cycle



Item	Symbol	Min.	Typ.	Max.	Unit
ADE set up time	t_{AS}	20	-	-	ns
ADE hold time	t_{AH}	20	-	-	ns
CS cycle write time	t_{CWC}	180	-	-	ns
CS set up time	t_{CS}	0	-	-	ns
CS hold time	t_{CH}	0	-	-	ns
ADDR set up time	t_{ADS}	2	-	-2	ns
ADDR hold time	t_{ADH}	0	-	-	ns
CS pulse high width	t_{CPH}	100	-	-	ns

2.8 J5 Matrix Keyboard

J5 Matrix Keyboard			
Pin	Signal	Function	I/O
1	- - -		
2	GPIO7	Row 7 – Matrix key	O
3	GPIO6	Row 6 - Matrix key	O
4	GPIO5	Row 5 - Matrix key	O
5	GPIO4	Row 4 - Matrix key	O
6	GPIO3	Row 3 - Matrix key	O
7	GPIO2	Row 2 - Matrix key	O
8	GPIO1	Row 1 - Matrix key	O
9	GPIO0	Row 0 - Matrix key	O
10	GPIO9	Column 8 - Matrix key	I (*)
11	GPIO10	Column 9 - Matrix key	I (*)
12	- - -		
13	GPIO11	Column 10 - Matrix key	I (*)
14	- - -		
15	GPIO12	Column 11 - Matrix key	I (*)
16	GND	Signal Ground	Power
17	KBIN0	Column 0 .- Matrix key	I (*)
18	KBIN1	Column 1 - Matrix key	I (*)
19	KBIN2	Column 2 - Matrix key	I (*)
20	KBIN3	Column 3 - Matrix key	I (*)
21	KBIN4	Column 4 - Matrix key	I (*)
22	KBIN5	Column 5 - Matrix key	I (*)
23	KBIN6	Column 6 – Matrix key	I (*)
24	KBIN7	Column 7 – Matrix key	I (*)
25	V _{CC}	+5V DC	Power
26	V _{DD}	+3,3V (0,1A max.) DC	Power

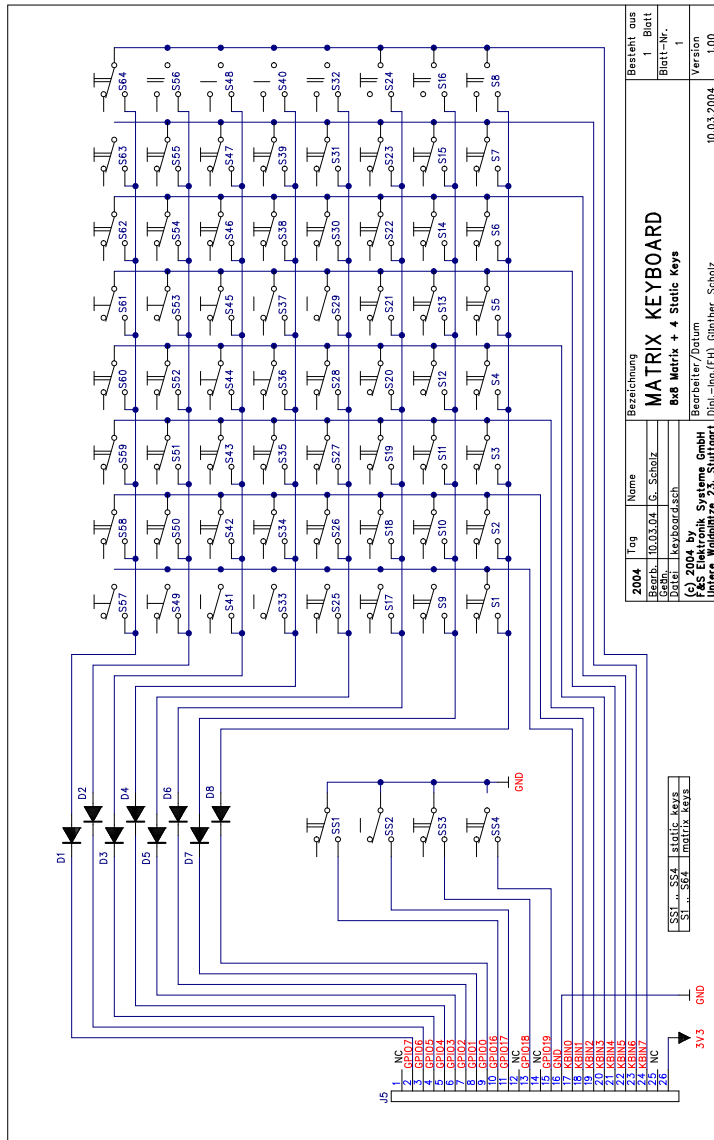
(*) ⇒ Note: I/O pins have pull-up resistor 4,7kΩ to +3,3V.

(- - -) ⇒ Please note: These pins carry active signals. *Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!*

All voltage levels of the input and output signals must be compatible to the LVC (3,3V) specification !

2.8.1 Matrix Keyboard example connection

The following schematic show the connection of a keyboard with a 8x8 matrix and four static keys.



2.9 J5 I/O interface

J5 I/O Interface			
Pin	Signal	Function	I/O
1	GPIO8	Interrupt	I/O (*)
2	GPIO7	IO-Port 7	I/O
3	GPIO6	IO-Port 6	I/O
4	GPIO5	IO-Port 5	I/O
5	GPIO4	IO-Port 4	I/O
6	GPIO3	IO-Port 3	I/O
7	GPIO2	IO-Port 2	I/O
8	GPIO1	IO-Port 1	I/O
9	GPIO0	IO-Port 0	I/O
10	GPIO9	IO-Port 9	I/O (*)
11	GPIO10	IO-Port 10	I/O (*)
12	- - -		
13	GPIO11	IO-Port 11	I/O (*)
14	- - -		
15	GPIO12	IO-Port 12	I/O (*)
16	GND	Signal Ground	Power
17	KBIN7	Input-Port 7	I (*)
18	KBIN6	Input-Port 6	I (*)
19	KBIN5	Input-Port 5	I (*)
20	KBIN4	Input-Port 4	I (*)
21	KBIN3	Input-Port 3	I (*)
22	KBIN2	Input-Port 2	I (*)
23	KBIN1	Input-Port 1	I (*)
24	KBIN0	Input-Port 0	I (*)
25	V _{CC}	+5V DC	Power
26	V _{DD}	+3,3V (0,1A max.) DC	Power

(*) ⇒ Note: I/O pins have pull-up resistor 4,7kΩ at +3,3V.

(- - -) ⇒ Please note: These pins carry active signals. *Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!*

All voltage levels of the input and output signals must be compatible to the LVC (3,3V) specification !

2.10 J5 serial RS232 port B

J5 serial RS232 Interface			
Pin	Signal	Function	I/O
1	- - -		
.	- - -	.	.
.	.	.	.
.	.	.	.
12	RxD2	Received Data	I
13	- - -		
14	TxD2	Transmitted Data	O
15	- - -		
16	GND	Signal Ground	Power
.	- - -	.	.
.	.	.	.
.	.	.	.
25	V _{CC}	+5V DC	Power
26	V _{DD}	+3,3V (0,1A max.) DC	Power

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.11 J7 serial RS232 port C

J7 serial RS232 Interface			
Pin	Signal	Function	I/O
1	- - -		
.	- - -	.	.
.	.	.	.
.	.	.	.
9	RxD3	Received Data	I
10	TxD3	Transmitted Data	O
.	- - -	.	.
.	.	.	.
.	.	.	.
13	V _{CC}	+5V DC	Power
14	GND	Signal Ground	Power
.	- - -	.	.
.	.	.	.
.	.	.	.
19	V _{DD}	+3,3V (0,1A max.) DC	Power
.	- - -	.	.
.	.	.	.
.	.	.	.

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.12 J7 Touchpanel Interface

J7 Touchpanel Interface		
Pin	Signal	Function
1	- - -	
.	- - -	.
.	.	.
.	.	.
13	V _{CC}	+5V DC
14	GND	Signal Ground
15	TOUCH X+	X- Voltage Measurement
16	TOUCH Y+	Y- Voltage Measurement
17	TOUCH X-	X- Set Active Measurement
18	TOUCH Y-	Y- Set Active Measurement
19	V _{DD}	+3,3V DC
20	GND	Signal Ground
.	- - -	.
.	.	.
.	.	.
26	- - -	

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.13 J7 USB Interface 1

J7 USB Interface 1		
Pin	Signal	Function
1	- - -	
.	- - -	.
.	.	.
13	V _{CC}	+5V DC
14	GND	Signal Ground
.	- - -	.
.	.	.
19	V _{DD}	+3,3V DC
20	GND	Signal Ground
21	- - -	
22	- - -	
23	M2	USB negative (Host)
24	P2	USB positive (Host)
25	- - -	
26	W2	USB power supply

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

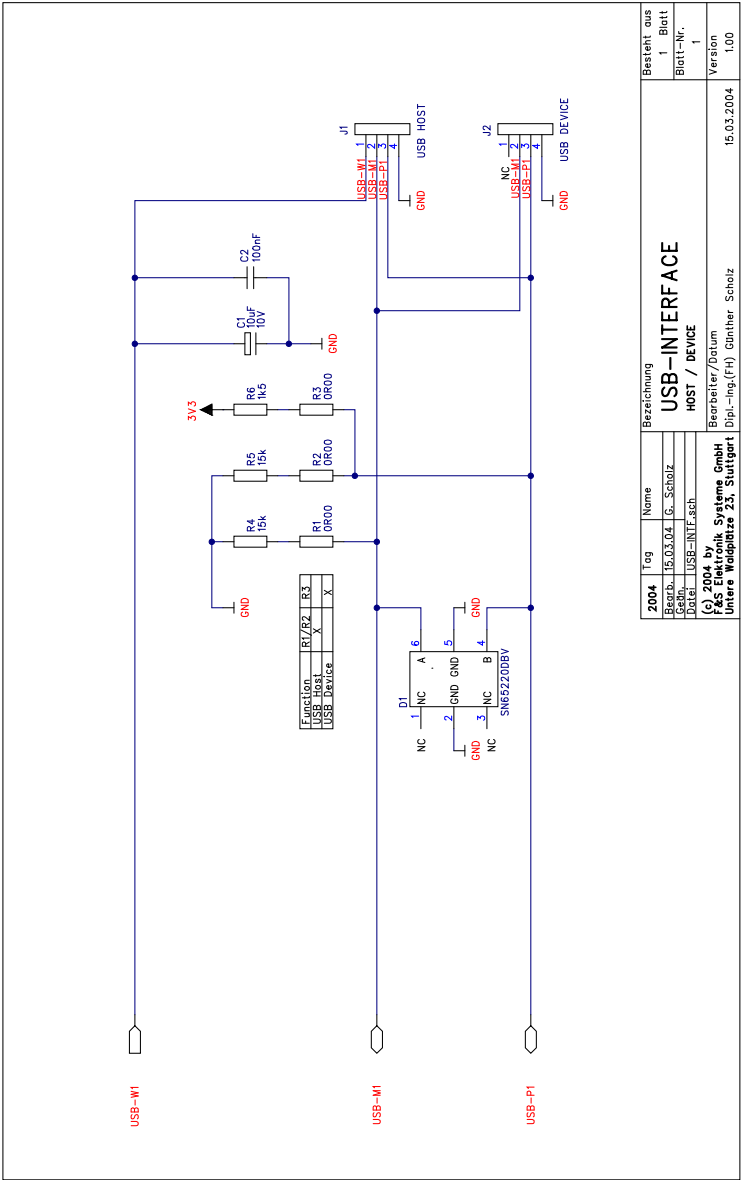
2.14 J7 USB Interface 2

J7 USB Interface 2		
Pin	Signal	Function
1	- - -	
.	- - -	
.	.	
13	V _{CC}	+5V DC
14	GND	Signal Ground
.	- - -	.
.	.	.
19	V _{DD}	+3,3V DC
20	GND	Signal Ground
21	M1	USB negative (Device)
22	P1	USB positive (Device)
23	- - -	
24	- - -	
25	W1	USB power in (Device)
26	- - -	

(- - -) ⇒ Please note: These pins carry active signals. Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!

2.15 Example USB Interface (Host/Device)

The following schematic shows the usage of the USB host or device interface.



2.16 J7 Audio Interface

J7 Audio Interface		
Pin	Signal	Function
1	LINEOUT-L	Line out left channel
2	LINEOUT-R	Line out right channel
3	GND	Signal Ground
4	LINEIN-L	Line in left channel
5	LINEIN-R	Line in right channel
6	GND	Signal Ground
7	MIC	Microphone input
8	MICGND	Signal Ground (Microphone)
.	---	.
.	.	.
13	V _{CC}	+5V DC
14	GND	Signal Ground
.	---	.
.	.	.
19	V _{DD}	+3.3V DC
20	GND	Signal Ground
.	---	.
.	.	.
26	---	

(- - -) ⇒ Please note: These pins carry active signals. *Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!*

2.17 J7 Analog Input

J7 analog Input		
Pin	Signal	Function
1	- - -	
.	- - -	.
.	.	.
9	AD2	Analog Input 2 (*) / altern. RxD3
10	AD3	Analog Input 3 (*) / altern. TxD3
11	AD0	Analog Input 0 (*)
12	AD1	Analog Input 1 (*)
13	V _{CC}	+5V DC
14	GND	Signal Ground
.	- - -	.
.	.	.
19	V _{DD}	+3,3V DC
20	GND	Signal Ground
.	- - -	.
.	.	.
26	- - -	

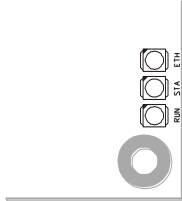
(*) ⇒ Input Voltage: 0V to 3,3V
 AD-Converter Resolution: 10 Bit, Error ±1 LSB
 47kΩ Pull Down resistor to GND.

(- - -) ⇒ Please note: These pins carry active signals. *Any invalid connection of these signals may result in unexpected behavior or even destruction of the component!*

3 Status Indicators

The NetDCU11 comprises three LED status indicators. They are located on the top side of the board in the bottom right corner

Figure 3.1: Status LED



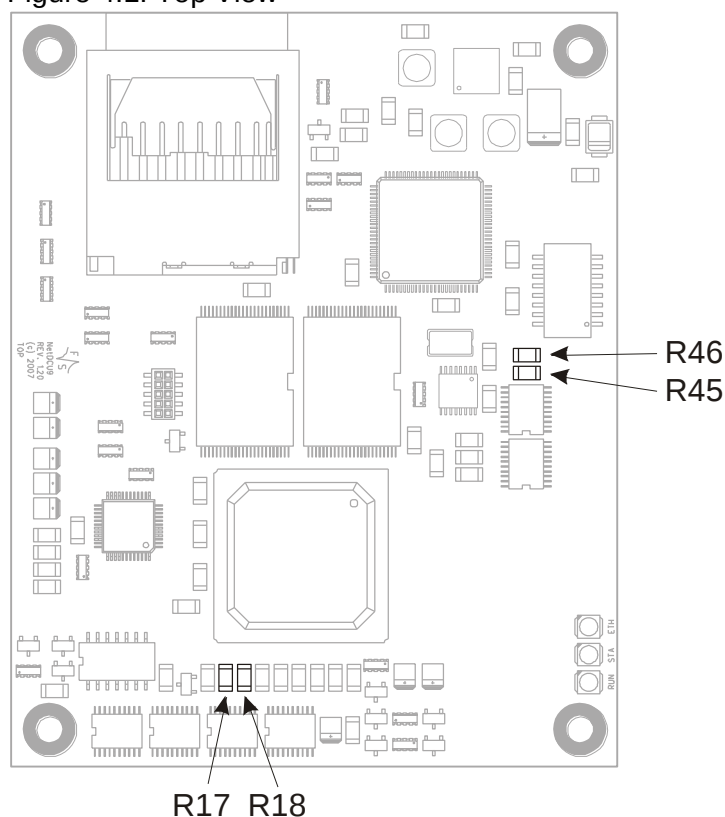
The following status information is displayed:

Status LED		
LED	Signal	Description
1	RUN	CPU in Run-Mode
2	STA	Status indicator(see SW documentation)
3	ETH	Ethernet: connection online

4 Configuration NetDCU11

By hardware-configuration of NetDCU11 some settings for peripheral devices can be done.

Figure 4.1: Top View



4.1 Configuration Display Interface

Power supply for the display and display type are configured with jumpers

Configuration	Rxx
LCD Power Supply +5V	R17
LCD Power Supply +3,3V (*)	R18

(*) Default Setting

Rxx Jumper, 0Ω Resistor Type 1206

4.2 Configuration parallel System Interface

The voltage level of the parallel port (J4) can set by jumpers.

Configuration	Rxx
5V I/O Parallel Interface (*)	R45
3.3V I/O Parallel Interface	R46

(*) Default Setting

Rxx Jumper, 0Ω Resistor, Type 1206

5 Dimensions NetDCU11

Board thickness:	1.6 mm
Height of parts on top side:	5.0 mm
Height on parts on bottom side:	2.5 mm
Pin grid of connectors	2.54 mm
Mounting hole diameter	3.4 mm

Figure 5.1 Top View

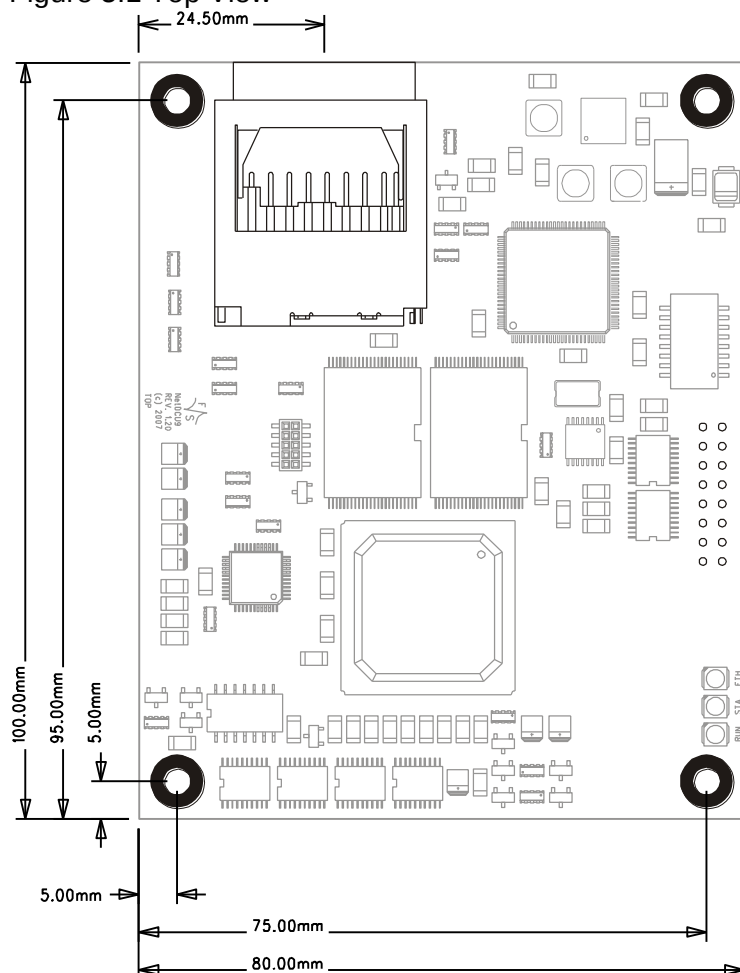
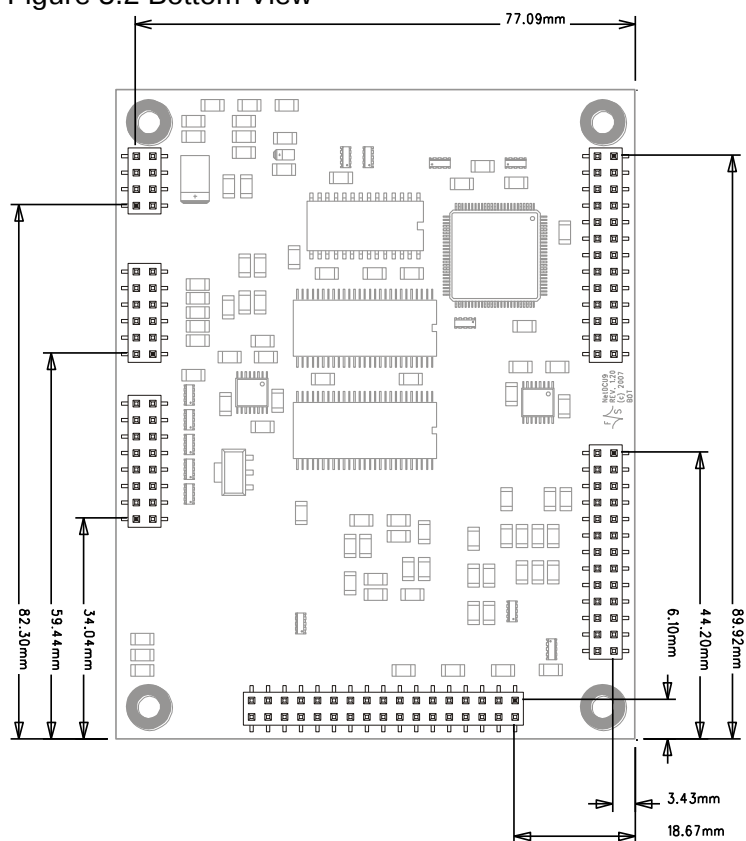


Figure 5.2 Bottom View



All values can have tolerances of $\pm 0.5\text{mm}$.

6 Technical Data NetDCU11

Power Supply:	+5V _{DC} / ±5%
Current Consumption:	<800mA (excluding Display)
Touch-Screen:	4 wire, analog resistive
Keyboard:	8 x 12 matrix keyboard alternative Digital-I/O
Inputs/Outputs:	max. 21 I/O ports alternative matrix keyboard 8 bit FS-Bus (hw extension bus) 1x SD-Card-Slot
Interfaces:	2x (4x)(*) analog input, 10 bit 3x RS232 (1x with RTS/CTS) 2x USB1.1 (1x Host, 1x Device) 1x Ethernet 10/100 Mbit 1x CAN2.0
LCD Interface:	TFT: up to 800x600 Pixel 256 / 65536 colors
RAM:	64 MByte SDRAM Optional: 128 MByte
Flash:	64 MByte Flash Optional: 128 MByte
CPU:	PXA270 520Mhz
Temperature:	0°C - +70°C
Dimensions:	100 x 80 x 11 mm (l x w x d)
Weight:	60 gr.

(*) ⇒ Note: If you want to use 4 analog inputs then serial line 3 cannot be used.

7 NetDCU11 vs NetDCU11.2

7.1 Design Goals

- NetDCU11.2 is a pin-compatible replacement part for NetDCU11
- Difference: New Audio-Codec WM9715L
- Function Audio-Codec: Audio, touch and A/D conversion
- CPU Interface: AC97 (ND9 and ND9.2)
- Frequency: 24,576 MHz (ND9 and ND9.2)
- A/D converter max input voltage: 7.5V (ND9 and ND9.2)*
- One system software which supports ND9 and ND9.2.
- No requirement for changes in customer application
- Availability NetDCU11.2: 02/2013

* Because differences on the A/D converters the return values could be up to 10% different between NetDCU11 and NetDCU11.2.

8 Appendix

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.

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