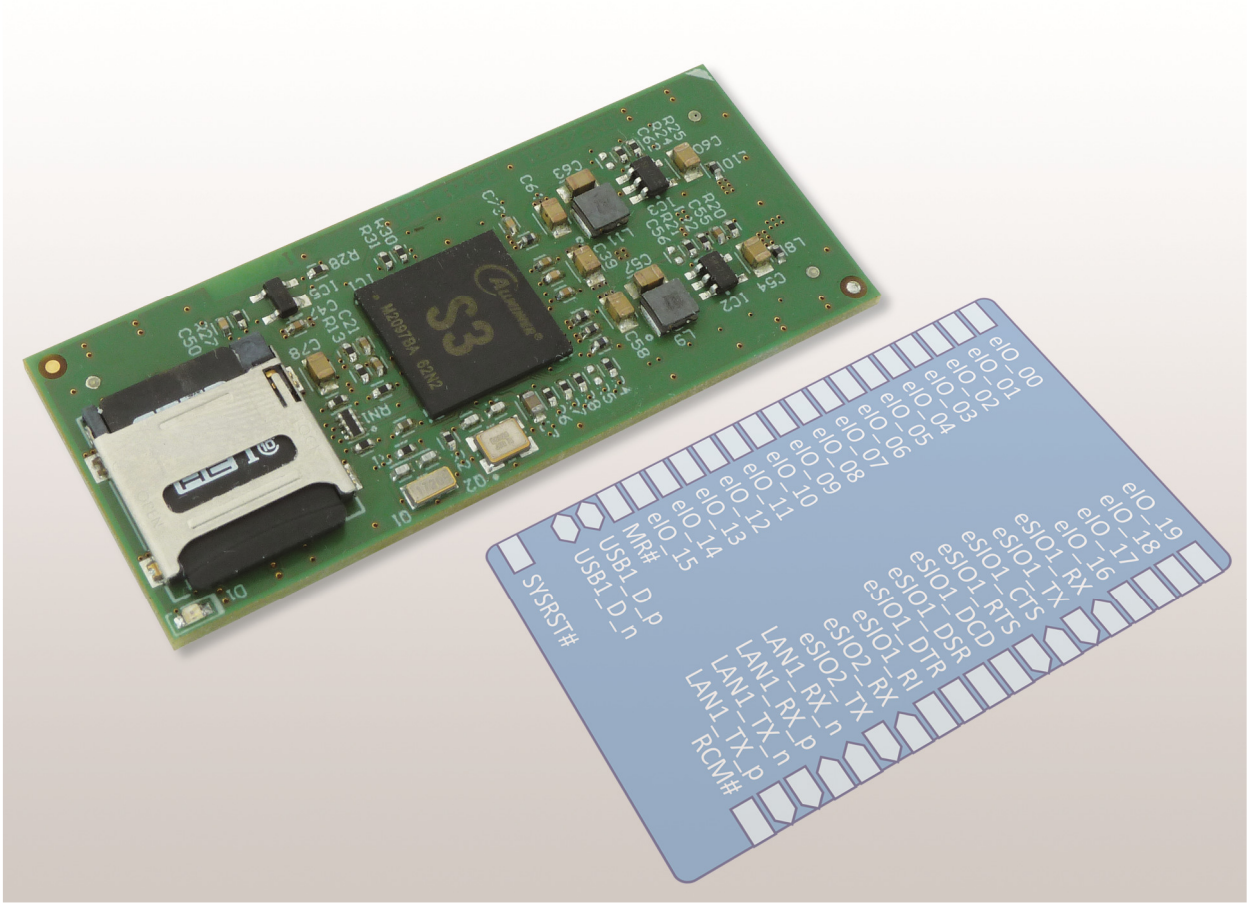
DIL/NetPC (e)DNP/8331
Board Revision 1.0

Hardware Reference



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CONTENT

1 INTRODUCTION

This document describes the basic hardware components of the DIL/NetPC (e)DNP/8331 resp. of its “virtual” version eDNP/8331.

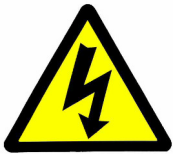
The eDNP/8331 is the circuit of the DNP/8331 and is provided as a schematic and PCB snippet for the widely used electronic design automation (EDA) tool **Altium Designer**. The eDNP/8331 can be fully integrated in own PCB designs.

More information about the eDNP/8331 can be found here:

`https://www.ssv-embedded.de/en/products/ednp8331`

1.1 Safety Guidelines

Please read the following safety guidelines carefully! In case of property or personal damage by not paying attention to this document and/or by incorrect handling, we do not assume liability. In such cases any warranty claim expires.



ATTENTION!
Observe precautions for handling – electrostatic sensitive device!

- The installation of the device should be done only by qualified personnel.
- Discharge yourself before you work with the device, e.g. by touching a heater of metal, to avoid damages.
- Stay grounded while working with the device to avoid damage through electrostatic discharge.

1.2 Conventions

Convention	Usage
bold	Important terms
`monospace`	Pathnames, filenames, command lines and program code

Table 1: Conventions used in this Document

1.3 Block Diagram

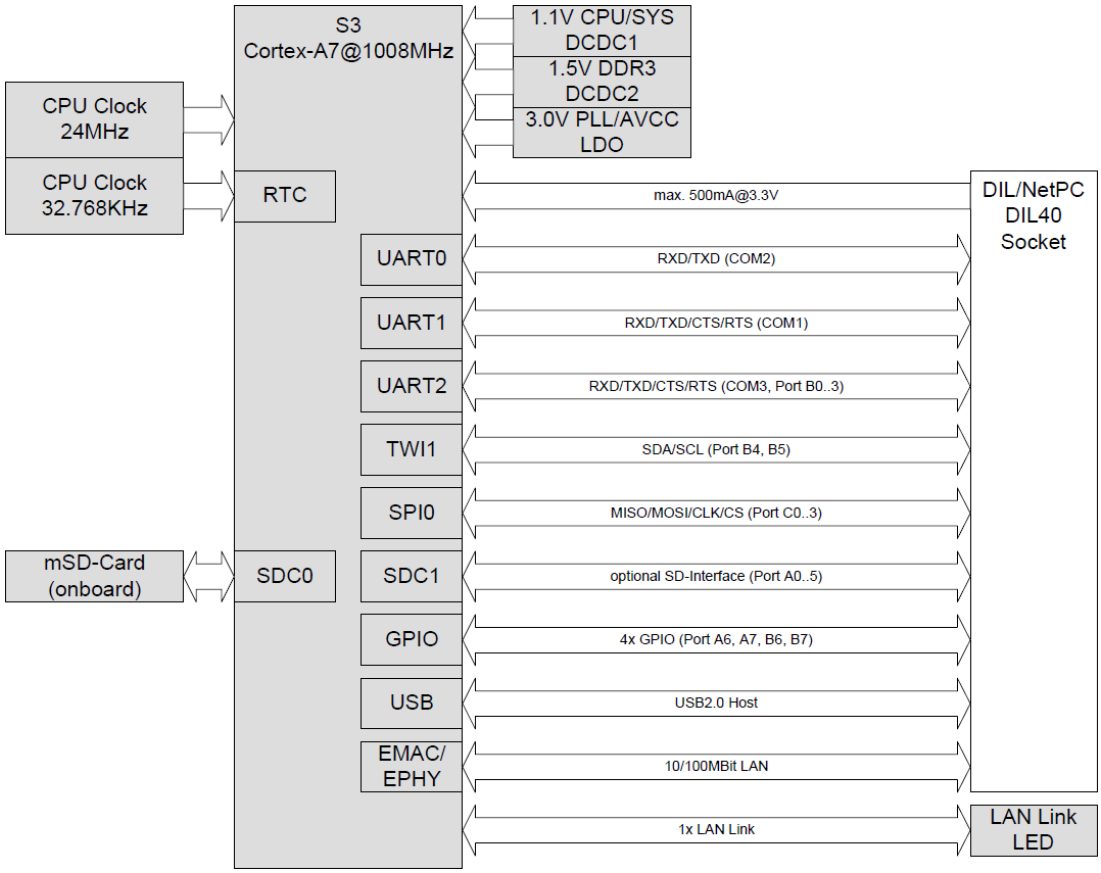


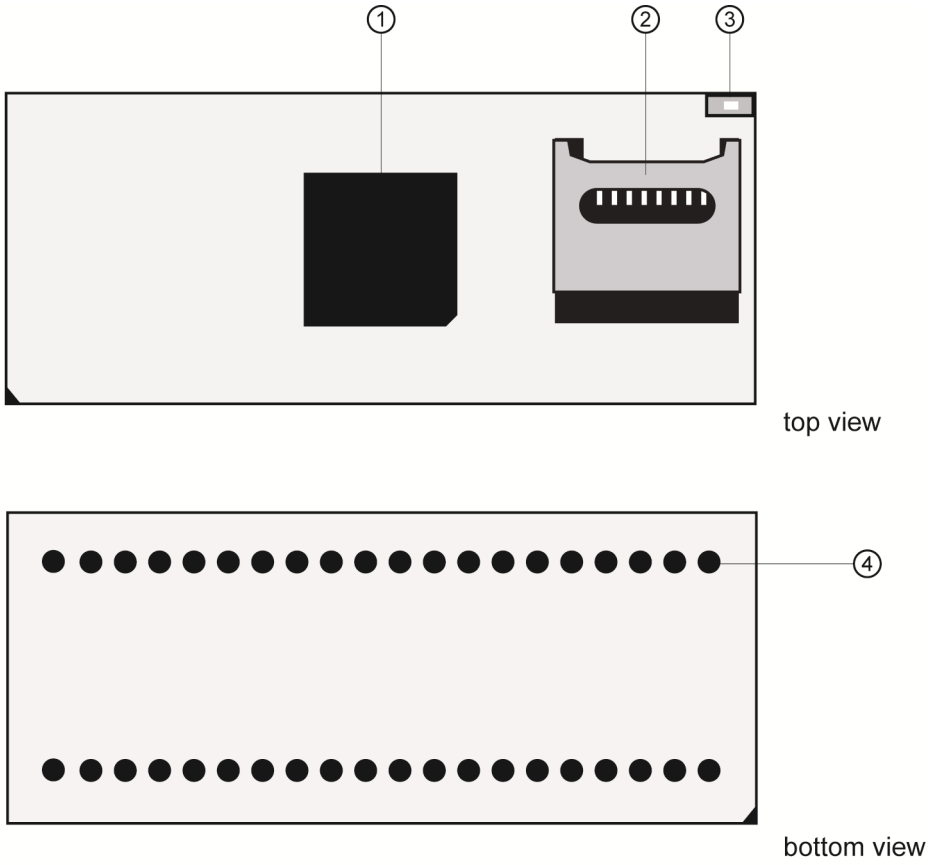
Figure 1: Block diagram of DIL/NetPC (e)DNP/8331

1.4 Features and Technical Data

Processor	
Manufacturer / Type	Sochip S3 with ARM Cortex-A7 CPU
Clock speed	1008 MHz
Memory	
RAM	128 MB DDR3 SDRAM
Storage media	1x internal microSD card holder (with pre-installed microSD) or 8 GB eMMC
Interfaces	
Ethernet	1x 10/100 Mbps
USB	1x USB 2.0 host port with max. 480 Mbps
UART	3x UART (COM1 with all hardware handshake signals, COM2 TX/RX only, COM3 TX/RX/RTS/CTS - functional OR with 4 GPIO signals)
SPI	1x SPI master controller, functional OR with 4 GPIO signals
I2C	1x I2C master controller, functional OR with 2 GPIO signals
GPIO	20-bit GPIO (General Purpose Input Output)
Special Functions	
Watchdog	1x Timer watchdog (hardware-based, software-configurable) 1x Power supervisor (hardware-based)
Displays / Control Elements	
LEDs	1x LAN link LED
Software	
Boot loader	Preinstalled U Boot boot loader
Operating system	Preinstalled Linux operating system
Electrical Characteristics	
Supply voltage	3.3 VDC ±5%
Supply current	300 mA typical / 500 mA max.
Mechanical Characteristics (DNP/8331 only)	
Socket	40 pin JEDEC DIL 40 connector, 2.54 mm centers (Pin-compatible to other SSV DIL-40 devices)
Mass	< 150 g
Dimensions	55 mm x 23 mm
Operating temperature	0 .. 70 °C
Standards and Certifications	
EMC	CE
Environmental standards	RoHS, WEEE

Table 2: Features and technical data

1.5 Board Layout of DNP/8331



① IC1: Sochip S3 with ARM Cortex-A7 CPU
② J2: microSD card hinge
③ D1: LAN LED
④ J1: DIL-40 connector

Figure 2: Board layout of DIL/NetPC (e)DNP/8331

2 PINOUTS

2.1 DIL-40 Connector – J1

Please note:
The arrangement of the signals in groups has compatibility reasons. Other products of SSV with DIL-40 pinout are fully or conditionally pin compatible to the DIL/NetPC DNP/8331 by observance of the corresponding application note.

Pin	Name	Group	Function	eDNP/8331 Signal Name
1	PA0	PIO	Parallel I/O, Port A, Bit 0	eIO_00
2	PA1	PIO	Parallel I/O, Port A, Bit 1	eIO_01
3	PA2	PIO	Parallel I/O, Port A, Bit 2	eIO_02
4	PA3	PIO	Parallel I/O, Port A, Bit 3	eIO_03
5	PA4	PIO	Parallel I/O, Port A, Bit 4	eIO_04
6	PA5	PIO	Parallel I/O, Port A, Bit 5	eIO_05
7	PA6	PIO	Parallel I/O, Port A, Bit 6	eIO_06
8	PA7	PIO	Parallel I/O, Port A, Bit 7	eIO_07
9	PB0	PIO	Parallel I/O, Port B, Bit 0	eIO_08
10	PB1	PIO	Parallel I/O, Port B, Bit 1	eIO_09
11	PB2	PIO	Parallel I/O, Port B, Bit 2	eIO_10
12	PB3	PIO	Parallel I/O, Port B, Bit 3	eIO_11
13	PB4	PIO	Parallel I/O, Port B, Bit 4	eIO_12
14	PB5	PIO	Parallel I/O, Port B, Bit 5	eIO_13
15	PB6	PIO	Parallel I/O, Port B, Bit 6	eIO_14
16	PB7	PIO	Parallel I/O, Port B, Bit 7	eIO_15
17	RESIN	RESET	Reset Input (Low Active)	MR#
18	HDMA	USB	USB Host Port -	USB1_D_n
19	HDPA	USB	USB Host Port +	USB1_D_p
20	GND	---	Ground	---
21	RCM	---	RCM (Remote Console Mode) Input	RCM#
22	TX+	LAN	10/100 Mbps LAN, TX+ Pin	LAN1_TX_p
23	TX-	LAN	10/100 Mbps LAN, TX- Pin	LAN1_TX_n
24	RX+	LAN	10/100 Mbps LAN, RX+ Pin	LAN1_RX_p
25	RX-	LAN	10/100 Mbps LAN, RX- Pin	LAN1_RX_n
26	TXD2	SIO	COM2 Serial Port, TXD Pin	eSIO2_TX
27	RXD2	SIO	COM2 Serial Port, RXD Pin	eSIO2_RX
28	RI1	SIO	COM1 Serial Port, RI Pin	eSIO1_RI
29	DTR1	SIO	COM1 Serial Port, DTR Pin	eSIO1_DTR
30	DSR1	SIO	COM1 Serial Port, DSR Pin	eSIO1_DSR

Table 3: Pinout DIL-40 connector part 1

Please note:
Refer to **chapter 3** for more details about the eDNP/8331 pinout and signal names.

Pin	Name	Group	Function	eDNP/8331 Signal Name
31	DCD1	SIO	COM1 Serial Port, DCD Pin	eSIO1_DCD
32	RTS1	SIO	COM1 Serial Port, RTS Pin	eSIO1_RTS
33	CTS1	SIO	COM1 Serial Port, CTS Pin	eSIO1_CTS
34	TXD1	SIO	COM1 Serial Port, TXD Pin	eSIO1_TX
35	RXD1	SIO	COM1 Serial Port, RXD Pin	eSIO1_RX
36	PC0	PIO	Parallel I/O, Port C, Bit 0	eIO_16
37	PC1	PIO	Parallel I/O, Port C, Bit 1	eIO_17
38	PC2	PIO	Parallel I/O, Port C, Bit 2	eIO_18
39	PC3	PIO	Parallel I/O, Port C, Bit 3	eIO_19
40	VCC	---	3.3 Volt Power Input	---

Table 4: Pinout DIL-40 connector part 2

2.2 DIL-40 Connector Function Multiplexing

Some pins of the DIL-40 connector of the DNP/8331 have multiple meanings. The pins have a main and an alternate function (function multiplexing).

The main functions correspond with the standard pinout of the DIL-40 connector as shown in **table 4**. The alternate functions are shown in **table 5**.

Pin	Name	Main Function	SoC Signal Name	Alternate SoC Function
1	PA0	Parallel I/O, Port A, Bit 0	PG0 (SDC1_CLK)	SD Card Clock
2	PA1	Parallel I/O, Port A, Bit 1	PG1 (SDC1_CMD)	SD Card Command
3	PA2	Parallel I/O, Port A, Bit 2	PG2 (SDC1_D0)	SD Card Data Bit 0
4	PA3	Parallel I/O, Port A, Bit 3	PG3 (SDC1_D1)	SD Card Data Bit 1
5	PA4	Parallel I/O, Port A, Bit 4	PG4 (SDC1_D2)	SD Card Data Bit 2
6	PA5	Parallel I/O, Port A, Bit 5	PG5 (SDC1_D3	SD Card Data Bit 3
7	PA6	Parallel I/O, Port A, Bit 6	PE23	---
8	PA7	Parallel I/O, Port A, Bit 7	PE24	---
9	PB0	Parallel I/O, Port B, Bit 0	PB0 (UART2_TX)	COM3 Serial Port, TXD
10	PB1	Parallel I/O, Port B, Bit 1	PB1 (UART2_RX)	COM3 Serial Port, RXD
11	PB2	Parallel I/O, Port B, Bit 2	PB2 (UART2_RTS)	COM3 Serial Port, RTS
12	PB3	Parallel I/O, Port B, Bit 3	PB3 (UART2_CTS)	COM3 Serial Port, CTS
13	PB4	Parallel I/O, Port B, Bit 4	PE21 (TWI1_CLK)	I2C Clock
14	PB5	Parallel I/O, Port B, Bit 5	PE22 (TWI1_SDA)	I2C Data
15	PB6	Parallel I/O, Port B, Bit 6	PB4	---
16	PB7	Parallel I/O, Port B, Bit 7	PB5	---
36	PC0	Parallel I/O, Port C, Bit 0	PC3 (SPI0_MOSI)	SPI MOSI
37	PC1	Parallel I/O, Port C, Bit 1	PC0 (SPI0_MISO)	SPI MISO
38	PC2	Parallel I/O, Port C, Bit 2	PC1 (SPI0_CLK)	SPI Clock
39	PC3	Parallel I/O, Port C, Bit 3	PC2 (SPI0_CS0)	SPI Chip Select 0

Table 5: (e)DNP/8331 function multiplexing

3 SIGNAL DESCRIPTION OF EDNP/8331

Figure 3 shows the "virtual" System-on-Module eDNP/8331, which can be integrated in own schematic and PCB layouts

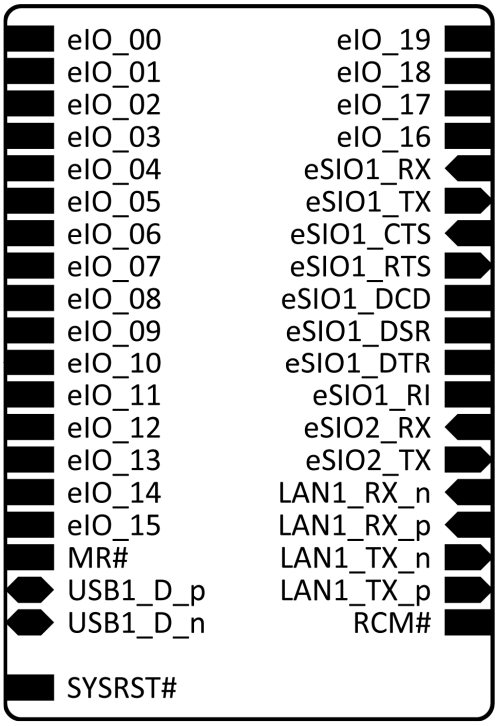


Figure 3: Pinout with signal names of DIL/NetPC (e)DNP/8331

Signal	Description	See Note(s)
eIO_xx	20x GPIO signals	1
eSIO1_xx	7x UART I/O signals	1
eSIO2_xx	3x UART I/O signals	1
LAN1_xx	4x LAN interface I/O signals	1, 2
USB1D_x	2x USB bidirectional host interface signals	1
RCM#	1x Remote console mode signal input	1
SYSRST#	1x System reset signal output	1

Table 6: Signal description of eDNP/8331

Note 1: Please refer to **table 7** for more details about the DC electrical characteristics.

Note 2: These signals can be connected directly to the 10/100BASE-T LAN transformer **Wuerth WE7499010211A**.

4 DC ELECTRICAL CHARACTERISTICS

Table 7 summarizes the DC electrical characteristics of the Sochip S3 processor.

Symbol	Parameter	Min.	Typ.	Max.	Unit
VIH	High-Level Input Voltage	0.7 * VCC_IO	---	VCC_IO + 0.3	V
VIL	Low-Level Input Voltage	-0.3	---	0.3 * VCC-IO	V
RPU	Input Pull-Up Resistance	50	100	150	kΩ
RPD	Input Pull-Down Resistance	50	---	150	kΩ
IIH	High-Level Input Current	---	---	10	µA
IIL	Low-Level Input Current	---	---	10	µA
VOH	High-Level Output Voltage	VCC_IO - 0.2	---	VCC_IO	V
VOL	Low-Level Output Voltage	0	---	0.2	V
IOZ	Tri-State Output Leakage Current	-10	---	10	µA
CIN	Input Capacitance	---	---	5	pF
COUT	Output Capacitance	---	---	5	pF

Table 7: DC electrical characteristics of S3 processor

Please note:
VCC_IO = 3.3 VDC.

5 SUPPLY VOLTAGE OF EDNP/8331

The eDNP/8331 snippet offers all the necessary voltage regulators for the S3 core and I/O voltage, including the necessary power sequencing for a safe system start.

Only an external 3.3 VDC voltage is required to supply the eDNP/8331.

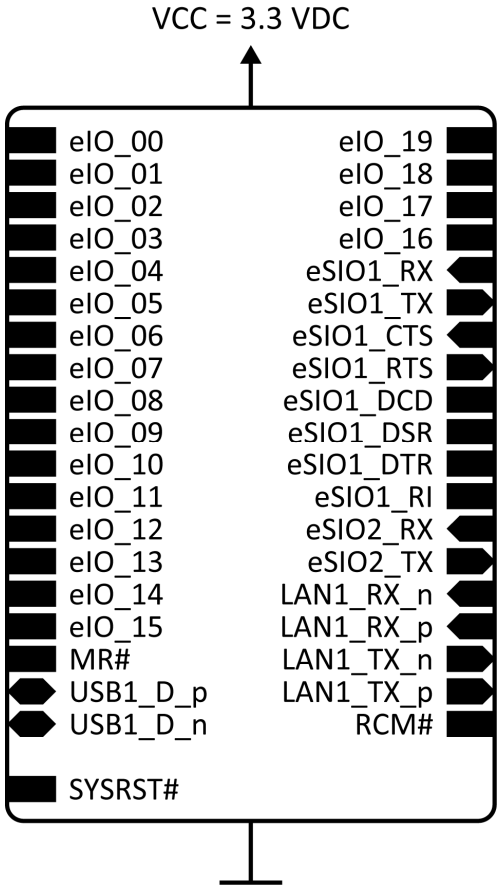


Figure 4: Supply voltage of eDNP/8331

6 ARCHITECTURE OF SOCHIP S3 CPU

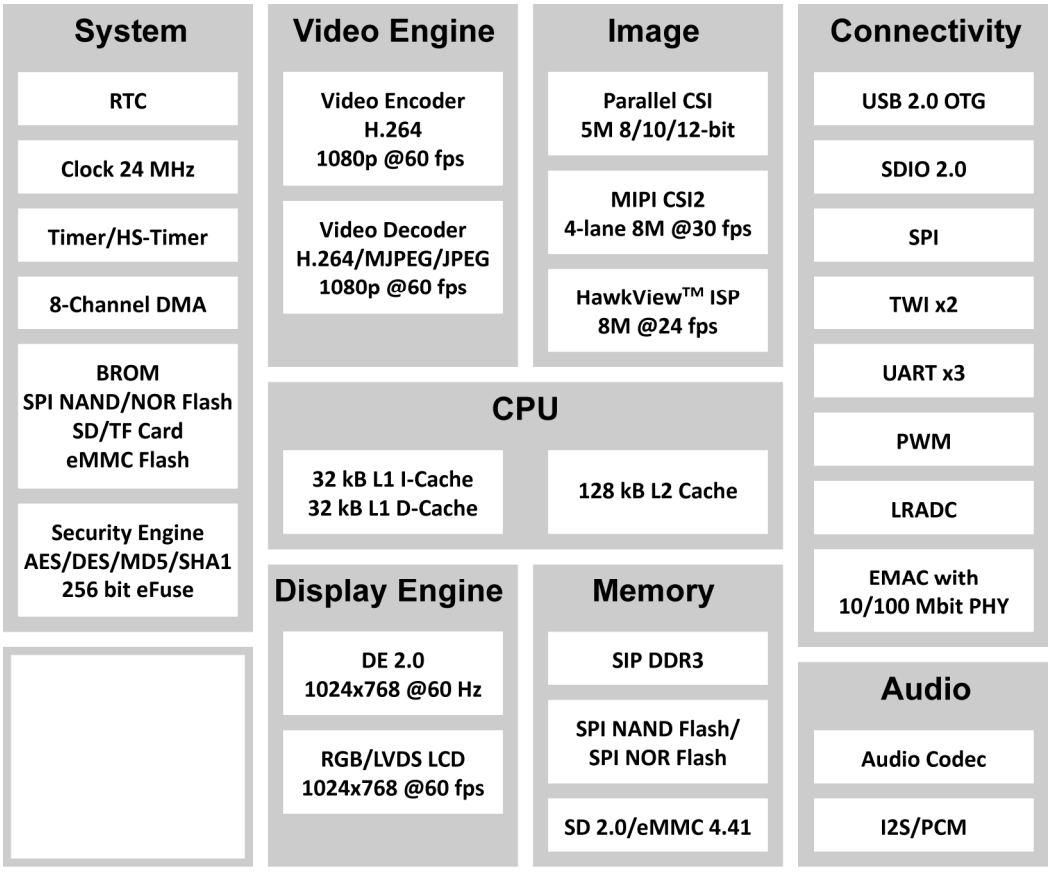


Figure 5: Sochip S3 CPU architecture

7 MECHANICAL DIMENSIONS OF DNP/8331

All length dimensions have a tolerance of 0.5 mm.

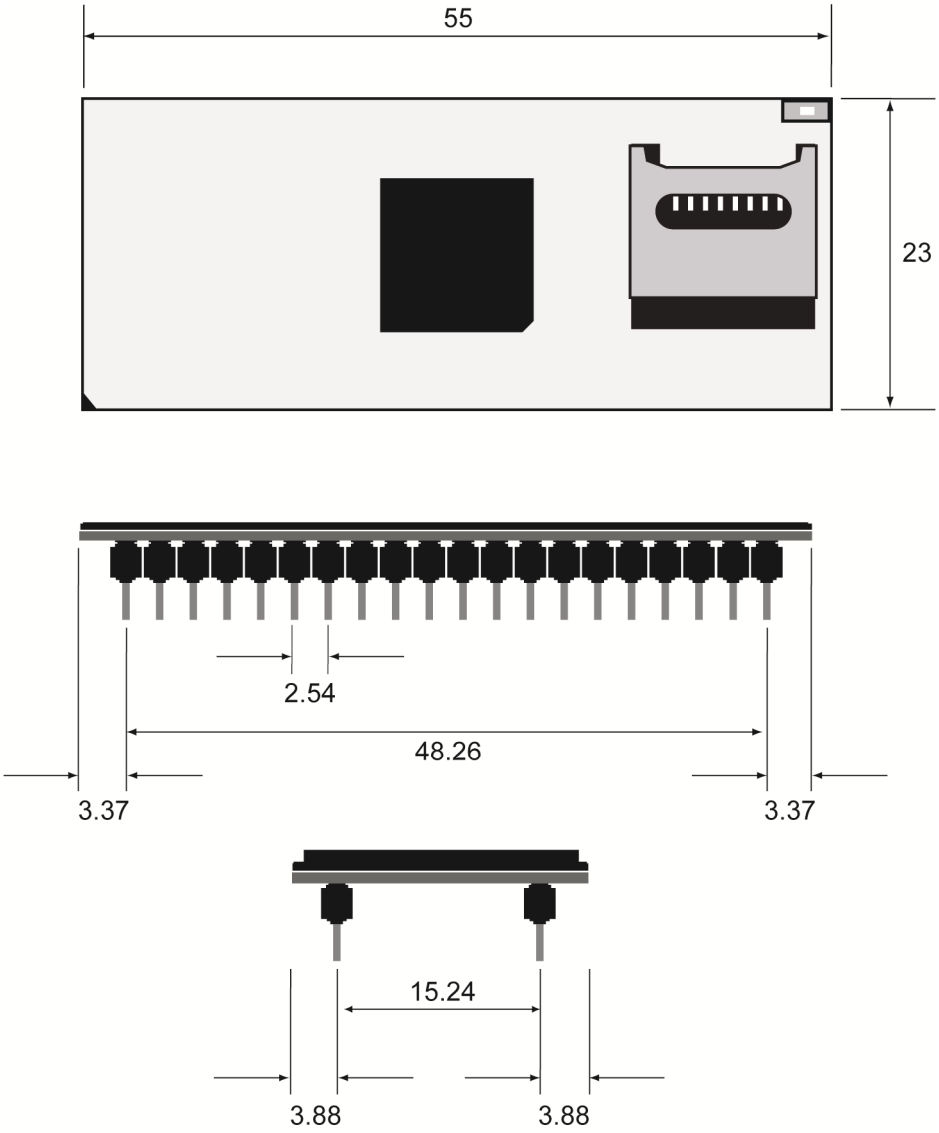


Figure 6: Mechanical dimensions of DIL/NetPC (e)DNP/8331

8 HELPFUL LITERATURE

- Sochip S3 datasheet: http://www.sochip.com.cn/s3
- eDNP/8331 datasheet:
  https://www.ssv-embedded.de/doks/daten/datasheet_ednp8331.pdf

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DOCUMENT HISTORY

Revision	Date	Remarks	Name	Review
1.0	2022-04-04	first version	WBU	SSC
2.0	2023-02-10	added signal names of eDNP/8331 in table 3, added chapters 3, 4, 5, 6	WBU	KDW
2.1	2024-02-09	added 8 GB eMMC in table 2	WBU	KDW