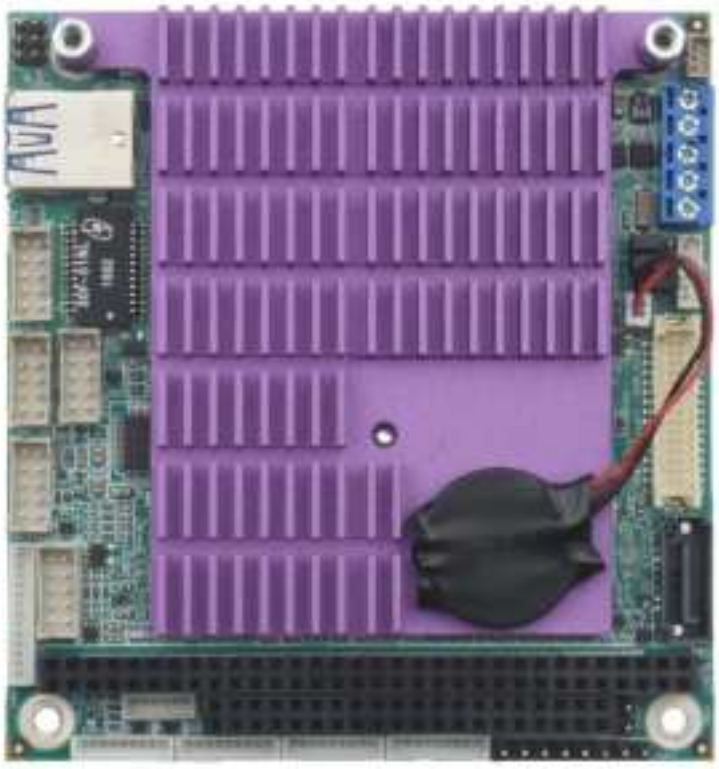
SAMSON

PC/104 Single-Board Computer
With E3825/E3845 Processor

User Manual

Rev 1.0



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Contents

1 IMPORTANT SAFE HANDLING INFORMATION

WARNING!

ESD-Sensitive Electronic Equipment

Observe ESD-safe handling procedures when working with this product.

Always use this product in a properly grounded work area and wear appropriate ESD-preventive clothing and/or accessories.

Always store this product in ESD-protective packaging when not in use.

Safe Handling Precautions

Diamond Systems boards are designed with complex circuitry and electronic components that are ESD-sensitive. This increases the likelihood of the boards incurring accidental damage during handling, installation, and connection to other equipment.

It is highly recommended that the following precautionary measures and best practices be observed in sequential order:

Wear an anti-static Wristband/Strap or/and an antistatic Lab Coat or/and Rubber-soled shoes.

Spread anti-static mats over the table or work surface or/and anti-static mats on the floor.

Unpack components and remove them from their anti-static bags only when they are ready to be used.

Avoid ungrounded surfaces such as plastic, carpets, floors, or tables, in the work area.

Handle boards by the edges and their metal mounting brackets. Avoid touching components on the boards and the edge connectors that connect to expansion slots.

The following information describes common causes of failure found on boards and components returned to Diamond Systems for repair. It is provided as a guideline to avoid accidental damage.

ESD Damage: This type of damage is typically impossible to detect because there is no visual sign of failure or damage. In this type of damage, the board eventually stops functioning because of some defective components. Usually, the failure can be identified, and the chip can be replaced.

To prevent ESD damage, always follow proper ESD-prevention practices when handling computer boards.

Damage During Handling or Storage: Physical damage on boards also occur due to mishandling. A common observation is that of a screwdriver slipping on the board during installation, causing a gouge on the PCB surface, cutting signal traces or damaging components.

Another common observation is damaged board corners, indicating the board was dropped. This may or may not cause damage to the circuitry, depending on components located near the edges. Most Diamond System boards are designed with a minimum 25 mils clearance between the board edge and component pad. The ground/power planes are located a minimum of 20 mils from the edge to avoid possible shorting from this type of damage. However, these design rules do not prevent damage in all situations.

Sometimes boards are stored in racks with slots that grip the edge of the board. This is a common practice for board manufacturers. Though Diamond Systems boards are resilient to damages, the components located close to the board edges can be damaged or even knocked off the board if the board lies tilted in the rack.

Diamond Systems recommends that all its boards be stored only in individual ESD-safe packaging units. If multiple boards are stored together, they should be contained in bins with dividers placed between the boards. Do not pile boards on top of each other or cram too many boards within a small location. This can cause damage to connector pins or fragile components.

Bent Connector Pins: This type of problem can be resolved by re-bending the pins to their original shape using needle-nose pliers.

The most common cause of a bent connector pin is when the board is pulled off a stack by tugging it at angles from one end of the connector to the other, in an effort to release it off the stack. Tugging the board off the stack in this manner can bend the pin(s) significantly.

A similar situation can occur when pulling a ribbon cable off a pin header. If the pins are bent too severely, bending them back can cause them to weaken or break. In this case, the connector must be replaced.

Power Damages: There are various causes of power-specific damages that can occur while handling the board. Some common causes such as –a metal screwdriver tip slipping, or a screw dropping onto the board while it is powered-up, causes a short between a power pin and a signal pin on a component.

These faults can cause over-voltage/power supply problems besides other causes described below.

To avoid such damages, assembly operations must be performed when the system is powered off.

Power Supply Wired Backwards: Diamond Systems power supplies and boards are not designed to withstand a reverse power supply connection. This will destroy almost all ICs connected to the power supply. In this case, the board will likely be irreparable and must be replaced. A chip destroyed by reverse or excessive power will often have a visible hole or show some deformation on the surface due to vaporization inside the package.

Overvoltage on Analog Input: If a voltage applied to an analog input exceeds the power specification of the board, the input multiplexer and/or parts behind it can be damaged. Most Diamond Systems boards will withstand an erroneous connection of up to 36V on the analog inputs, even when the board is powered off, but not on all boards, and not under all conditions.

Overvoltage on Analog Output: If an Analog output is accidentally connected to another output signal or a power supply voltage, the output can be damaged. On most Diamond boards, a short circuit to ground on an analog output will deter any damage to the board.

Overvoltage on Digital I/O Line: If a Digital I/O signal is connected to a voltage above the maximum specified voltage, the digital circuitry can be damaged. The acceptable voltage range, on most Diamond Systems boards connected to digital I/O signals is 0-5V, with overvoltage protection up to 5.5V (-0.5 to 5.5V). Overvoltage beyond this limit can damage the circuitry.

Other considerations are Logic Signals, which are typically generated between 12V to 24V.

If a Digital I/O Line of 12V to 24V is connected to a 5V logic chip, the chip will be damaged, and the damage could extend to other chips in the circuit.

IMPORTANT! Always check twice before Powering Up!

2 INTRODUCTION

2.1 Samson Product Overview

Samson features a fanless design, ensuring efficient operation without the need for active cooling. It supports the Intel® Atom™ E3800 family of processors, offering powerful performance for embedded applications. Dual Gigabit Ethernet ports provide high-speed network connectivity, while the board also includes LVDS and Analog RGB ports, enabling versatile display options. It supports dual independent displays for enhanced visual performance. Additionally, the wide operating temperature range of -40°C to 85°C ensures reliable operation in extreme and demanding environments.

2.2 Feature List

Feature	
CPU	Soldered onboard Intel® Atom™ processor E3825 dual-core 1.33GHz / E3845 quad-core 1.91GHz
Memory	1 x DDR3L SO-DIMM socket populated with 4GB 1333 MT/s SDRAM
BIOS	Insyde BIOS
Watchdog Timer	1 ~ 255 levels reset
I/O Chipset	Fintek F81866
USB 3.0	1
USB 2.0	2
Serial	2x RS-232 2 x RS-232/422/485 selectable
KB/MS	6-pin wafer connector for PS/2 keyboard and mouse via Y-cable
Expansion Bus	PC/104 interface & Mini-card socket
Storage	1 x Serial ATA port with 300MB/s HDD transfer rate
	1 x mSATA socket (Socket shared and BIOS selectable with Mini PCIe card)
Ethernet Chipset	2 x RTL8111H PCIe GbE controllers
Digital I/O	8-bit programmable
Audio	Realtek ALC888S HD Audio CODEC, Mic-in/ Line-in/Line-out
Display	
Graphics Chipset	Integrated Intel® HD Graphics
Graphics Interface	Analog RGB supports resolution up to 2048 x 1536
	LCD: Dual Channel 24-bit LVDS
Mechanical & Environmental	
Power Requirement	+5V (Additional +12V might be required for LCD panel)
Power Consumption	1.81A@5V with E3825 (Typical) 2.24A@5V with E3845 (Typical)
Operating Temp.	-40 ~ 85ºC (-40 ~ 185ºF)
Operating Humidity	10%~95% @ 85C (non-condensing)
Dimension (L x W)	90 x 96 mm (3.55” x 3.775”)

2.3 Samson Ordering Guide

The table below lists the available standard configurations for the carrier board. As the board can work with multiple COMs, new COMs are tested and added regularly, so check the Diamond website for currently available SBC processor options. In general, when a new COM is added, OS support will also be available for the current versions of Windows and Ubuntu Linux.

SAM-E3825-4G-XT	Samson PC/104 SBC, E3825 processor, 4GB, -40 to +85C
SAM-E3845-4G-XT	Samson PC/104 SBC, E3825 processor, 4GB, -40 to +85C
CK-SAM-01	Cable Kit, includes the following: 1 x SATA cable 1 x Audio cable 4 x COM port cables 1 x KB & MS cable 1 x USB cable 1 x VGA cable 2 x LAN cables 1x GPIO cable

3 BLOCK DIAGRAM

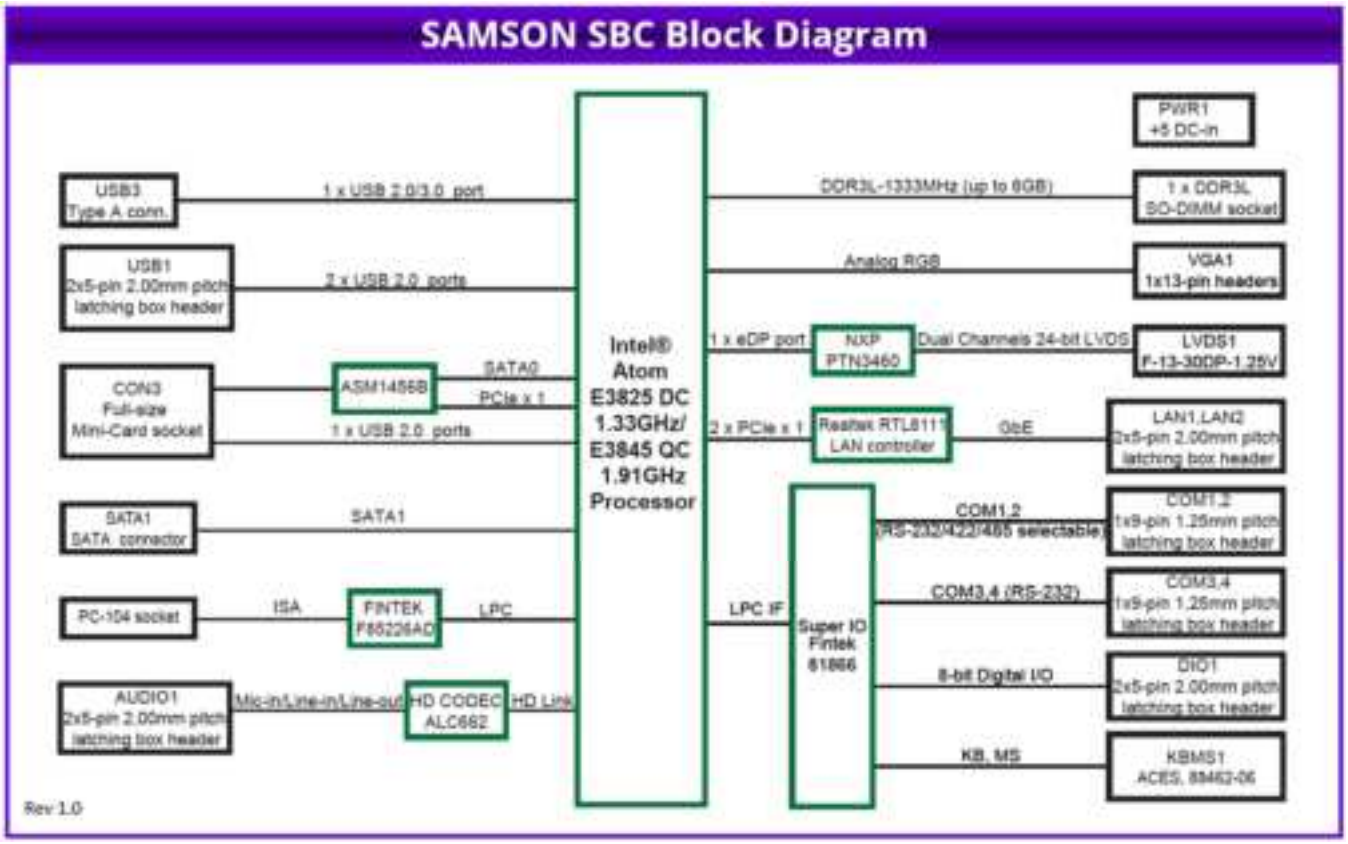
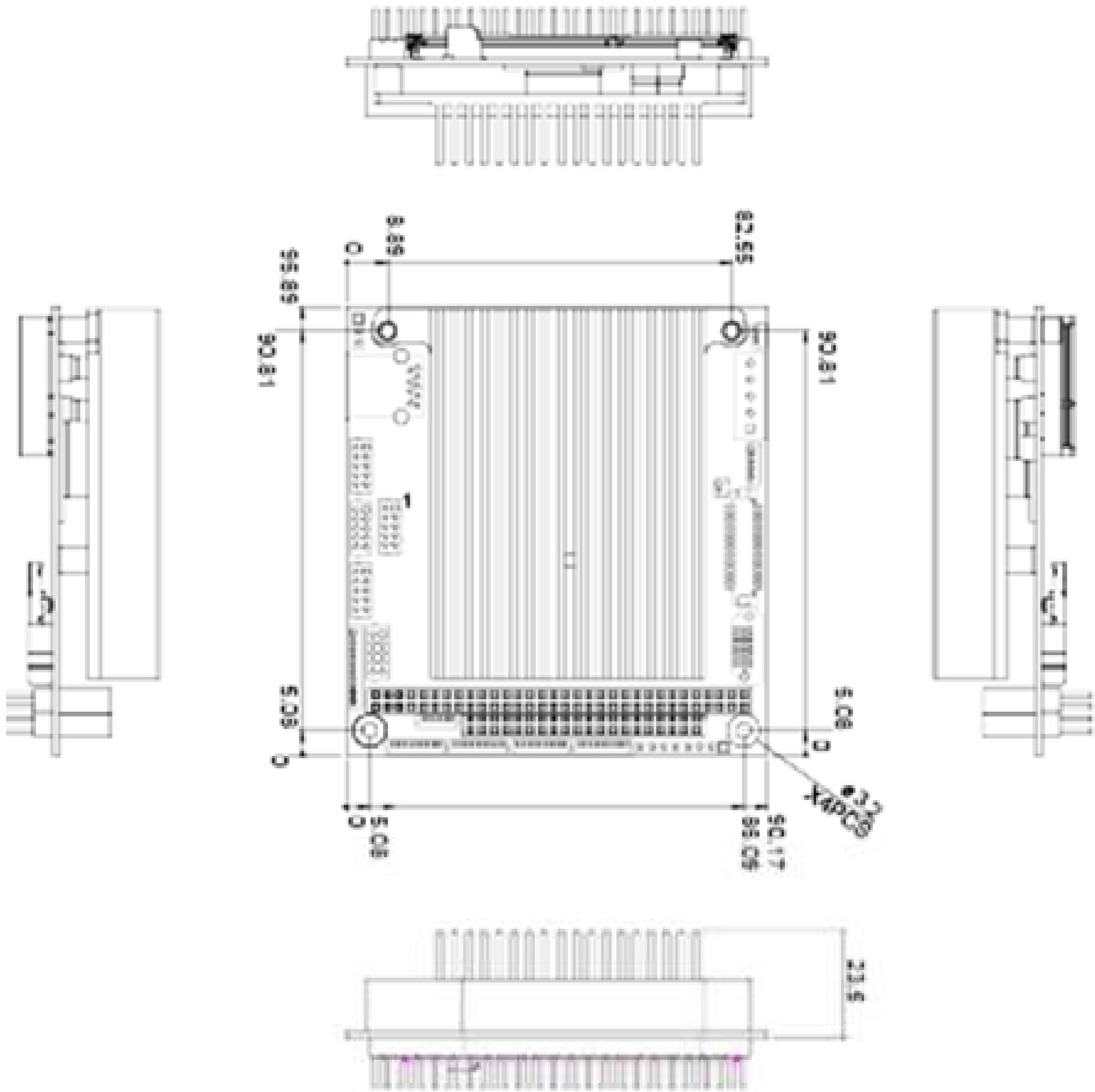


Figure 1: SAMSON PC/104 CPU Module Block Diagram

4 BOARD DIMENSIONS

The illustrations below provide dimensions of the key connectors and features of Samson.



5 CONNECTOR AND JUMPER LOCATIONS

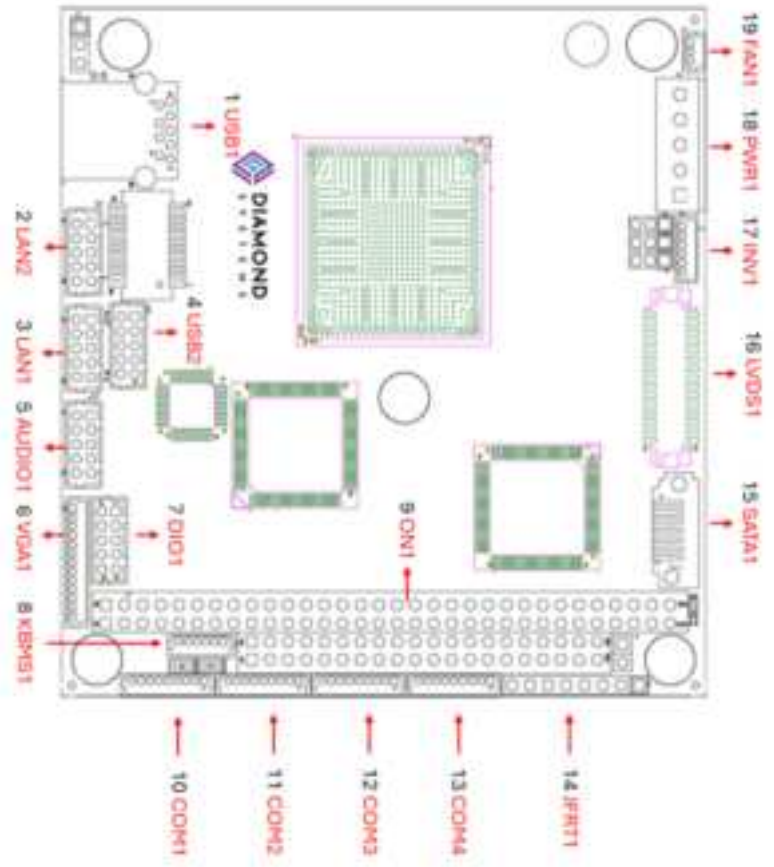


Figure 2: Top view (heat sink omitted)

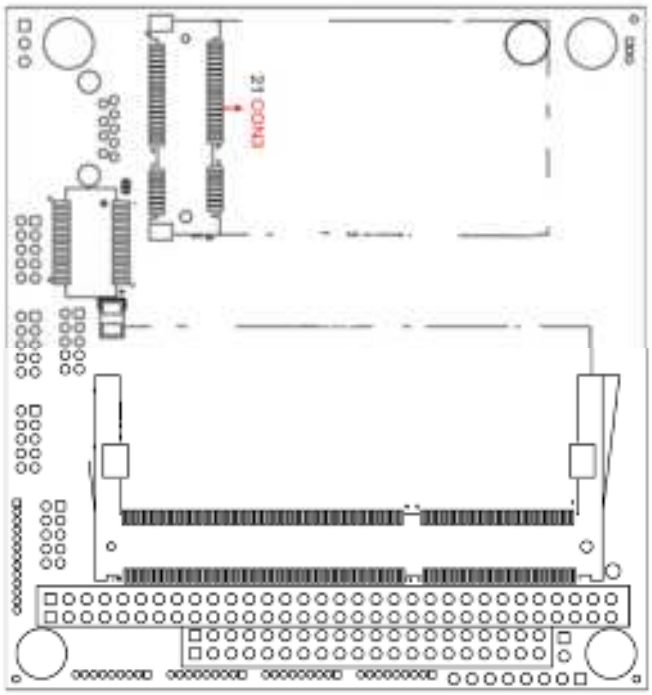


Figure 3: Bottom view showing Minicard and SODIMM sockets

5.1 Jumper Selection

The board comes with some jumpers to alter the hardware configuration.

The following table describes the Jumper Blocks on the baseboard.

Jumper	Description
JP1	Sets LCD inverter voltage
JP2	Sets LCD panel voltage
JP3	The voltage selection of LCD panel
JP4	

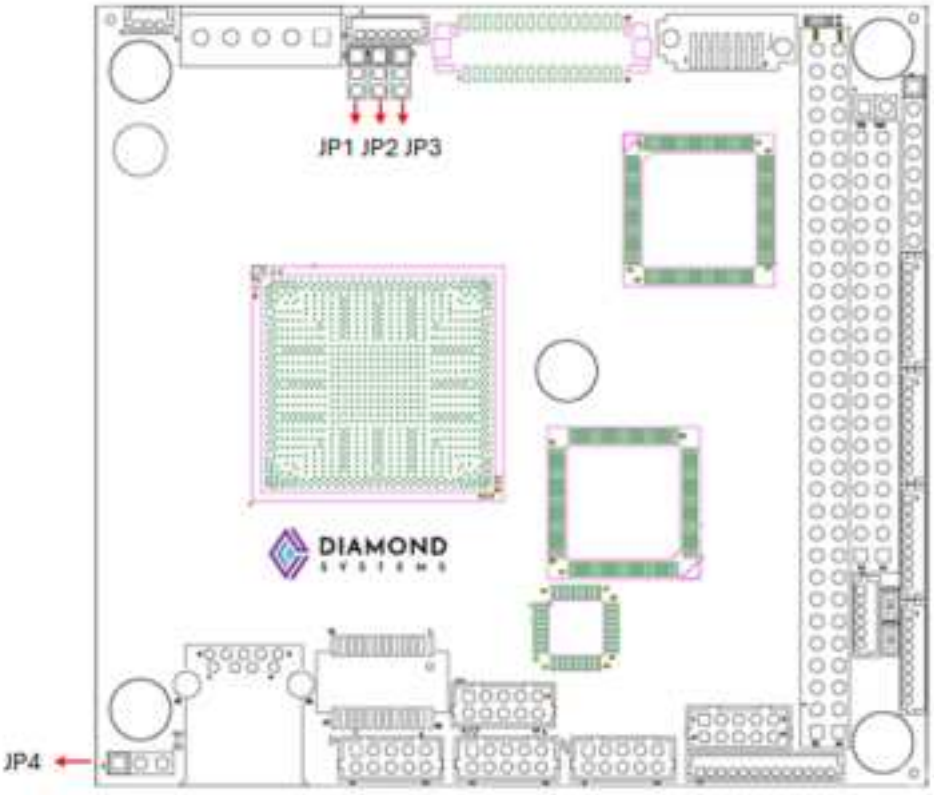


Figure 4: Default Jumper Locations

5.1.1 JINV1

The JP1 jumper allows you to set the LCD inverter voltage for the LCD connector INV1. This jumper determines the voltage for pin 1 of the INV1 connector. It features a 2.00mm pitch, 1x3-pin header jumper type. The voltage can be configured as follows:

- Pins 1-2: +12V
- Pins 2-3: +5V (default setting)

This configuration lets you easily switch between different voltage levels based on your specific LCD requirements.

5.1.2 JLVCD1

The jumper for setting the LCD panel voltage allows you to configure the voltage output for your LCD panel. It utilizes a 2.00mm pitch, 1x3-pin header. The available voltage settings are:

- Pins 1-2: +5V
- Pins 2-3: +3.3V (default setting)

This jumper configuration lets you adjust the voltage to match the requirements of your specific LCD panel.

5.1.3 JBAT1

The JBAT1 jumper is used for selecting the voltage of the LCD panel and managing the CMOS memory. It is a 2.00mm pitch, 1x3-pin header. The jumper has two configuration options:

- Pins 1-2: Keeps CMOS (default setting)
- Pins 2-3: Clears CMOS

This feature allows you to either retain or reset the CMOS settings based on your system requirements.

5.1.4 JPIC1

This jumper is for internal testing only.

6 CONNECTOR PINOUTS

6.1 PWR1

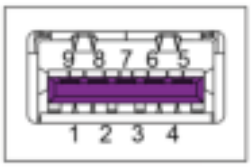
The input power is provided by a 6 position screw terminal block.

1	VCC 12V	Backlight power input, not required for SBC operation
2	GND	Common connection for all input voltages
3	GND	Common connection for all input voltages
4	BKLT_CTRL	Backlight enable signal
5	VCC 5V	Main power input for SBC operation
6	VCC 5V	Main power input for SBC operation

Although two terminals are provided for both 5V input and Ground, the individual terminal rating exceeds the power requirements for Samson, so just a single +5V connection and a single Ground wire is sufficient.

6.2 USB1

The USB1 connector is a USB 3.0/2.0 Type A connector, designed to support both USB 3.0 and 2.0 devices. The pin assignments follow the industry-standard specifications, ensuring compatibility with a wide range of USB peripherals.



Description: USB 3.0/2.0 Connector

Connector Type: Type A connector

Setting: The pin assignments confirm to the industry standard.

6.3 Ethernet

The Ethernet connectors use a 2.00mm pitch 2x5-pin wafer connector. Below are the pin assignments.

TX_MDI0-	2	1	TX_MDI0+
MDI2+	4	3	RX_MDI1+
RX_MDI1-	6	5	MDI2-
MDI3-	8	7	MDI3+
N/C	10	9	N/C

Connector PN:

Connector Type: 2.00mm pitch 2x5-pin wafer connector.

Mating Cable PN: DSC no. 6989032

6.4 USB 2.0 Ports

The Carrier board supports 2 USB2.0 ports on a 2x5 connector. The pinout for the connector is as shown below:

+5V-	2	1	+5V
USBP1-	4	3	USBP0-
USBP1+	6	5	USBP0+
GND	8	7	GND
N/C	10	9	GND

Connector PN:

Connector Type: 2.00mm pitch 2x5-pin headers

Mating Cable PN: DSC no. 6989033

6.5 Audio (J3)

The AUDIO1 connector is an AUDIO connector with a 2.00mm pitch 2x5-pin wafer connector. The pin assignments are as follows:

Line In R	2	1	Line In L
Gnd	4	3	Gnd
N/C	6	5	Mic
Gnd	8	7	Gnd
Line Out R	10	9	Line Out L

Connector PN:

Connector Type: 2.00mm pitch 2x5-pin wafer connector.

Mating Cable PN: DSC no. 6989030

6.6 VGA (J2)

VGA availability is dependent on the installed COM.

1	VSync
2	HSync
3	GND
4	SCL
5	SDA
6	GND
7	BLUE
8	GND
9	GREEN
10	GND
11	RED
12	GND
13	VCC

Connector PN: ACES 1.25mm 86801-13

Connector Type: 1x13-pin 1.25mm 4-wall connector

Mating Cable PN: DSC no. 6989035

6.7 Digital I/O (J13)

The digital I/O lines operate with 5V logic levels and are individually configurable for input or output. These DIO lines are controlled with a C language programming library available for free download. The library provides functions for direction configuration, input, and output operations.

DIO 0	1	2	DIO 1
DIO 2	3	4	DIO 3
DIO 4	5	6	DIO 5
DIO 6	7	8	DIO 7
5V	9	10	GND

Connector PN:
Connector Type: 2.00mm pitch 2x5-pin wafer connector

Mating Cable PN: DSC no. 6989036

6.8 KBMS1

The connector for keyboard and mouse uses a 1x6-pin CVILUX 1.25mm CI4406P1V00-LF 4-wall connector. The pin assignments are as follows.

1	KB_DATA
2	KB_CLK
3	GND
4	PS2_VCC
5	MS_DATA
6	MS_CLK

Connector PN:
Connector Type: 1x6-pin 1.25mm 4-wall connector

Mating Cable PN: DSC no. 6989034

6.9 COM 1~4

Serial ports 1 and 2 support RS-232, RS-422, and RS-485 protocols. The connector pinout for each protocol is shown below.

Serial ports 3 and 4 support RS-232 only. The pinout for these connectors matches the RS-232 column in the below diagram.

PIN	RS-232	RS-422	RS-485
1	DCD#	TX-	D-
2	DSR#		
3	RX	TX+	D+
4	RTS#		
5	TX	RX+	
6	CTS#		
7	DTR#	RX-	
8	RI#		
9	GND	GND	GND

Connector PN: ACES 86801-09

Connector Type: 1x9-pin1.25mm 4-wall connector

Mating Cable PN: DSC no. 6989031

6.10 JFRT1

The connector for reset, power LED, HDD LED, and speaker uses a 2.54mm pitch 1x8-pin header. The pin assignments are as follows:

1	Reset
2	Gnd
3	Power LED+
4	Gnd
5	HD LED+
6	HDD LED-
7	Speaker+
8	Speaker-

Connector PN:
Connector Type: 2.54mm pitch 1x8-pin header
Mating Cable PN: N/A

6.11 SATA 1

The Serial ATA (SATA) connector supports high-speed data transfer rates of up to 300MB/s. This connector type is designed for fast and reliable data transfer, ideal for hard drives and SSDs, conforming to the SATA interface standard for modern storage solutions.

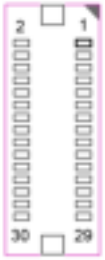
1	Ground
2	Transmit +
3	Transmit -
4	Ground
5	Receive -
6	Receive +
7	Ground

Connector Type: Industry-standard SATA 7-pin connector
Mating Cable PN: Generic

6.12 LVDS

The LCD panel connector is a DF-13-30DP-1.25V type connector. This connector is specifically designed for LCD panel connections, providing a reliable interface with a 1.25mm pitch to support the required signal and power connections for the display.

VDD 5V/3.3V	**1**	**2**	VDD 5V/3.3V
TX1CLK+	**3**	**4**	TX2CLK+
TX1CLK-	**5**	**6**	TX2CLK-
GND	**7**	**8**	GND
TX1_D0+	**9**	**10**	TX2_D0+
TX1_D0-	**11**	**12**	TX2_D0-
GND	**13**	**14**	GND
TX1D1+	**15**	**16**	TX2_D1+
TX1D1-	**17**	**18**	TX2_D1-
GND	**19**	**20**	GND
TX1D2+	**21**	**22**	TX2D2+
TX1D2-	**23**	**24**	TX2D2-
GND	**25**	**26**	GND
TX1D3+	**27**	**28**	TX2D3+
TX1D3-	**29**	**30**	TX2D3-



Connector PN:

Connector Type: DF-13-30DP-1.25V connector

6.13 INV1

The LCD Inverter Connector uses a 1x6-pin CVILUX 1.25mm CI4406P1V00-LF 4-wall connector. The pin assignments are as follows:

1	INV_VCC
2	INV_VCC
3	BKLT_EN
4	BKLT_CTRL
5	GND
6	GND

Connector PN:
Connector Type: 1x6-pin CVILUX 1.25mm CI4406P1V00- LF 4-wall connector