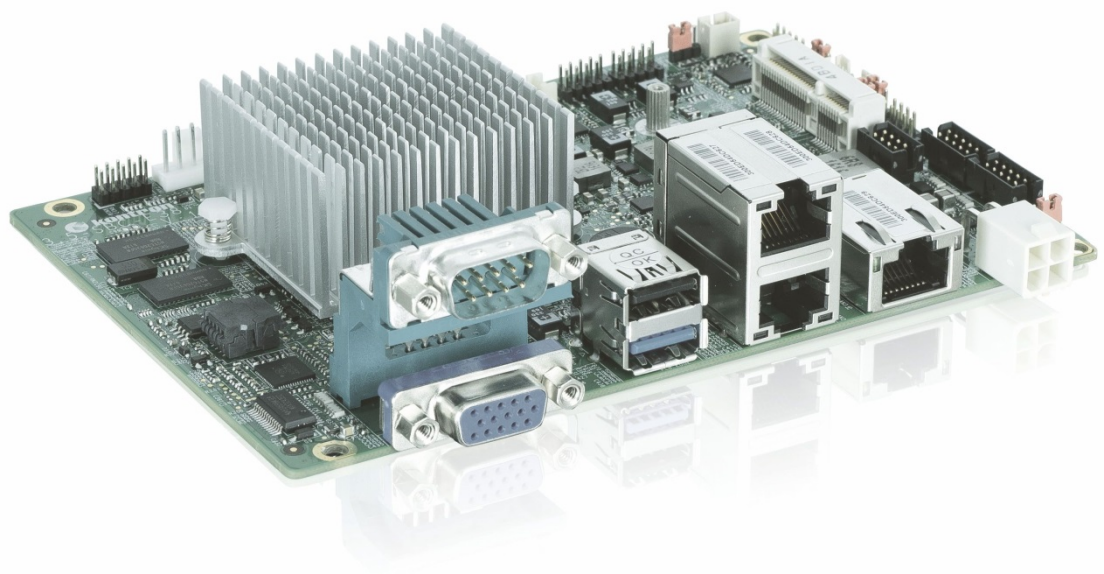
USER GUIDE



3.5-SBC-E38

Doc. User Guide, Rev. 1.2

Doc. ID: 1060-9661

POSSIBILITIES START HERE kontron

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3.5-SBC-E38 - USER GUIDE

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Kontron S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
www.kontron.com

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Revision History

Revision	Brief Description of Changes	Date of Issue
1.0	Initial Version	2017-July-06
1.1	Bundled cable Information	2017-Aug-17
1.2	Removed the 4GByte system memory option Updated Kontron AG to Kontron S&T AG	2017-Oct-13

Terms and Conditions

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As a trusted technology innovator and global solutions provider, Kontron extends its embedded market strengths into a services portfolio allowing companies to break the barriers of traditional product lifecycles. Proven product expertise coupled with collaborative and highly-experienced support enables Kontron to provide exceptional peace of mind to build and maintain successful products.

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If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact Kontron support. Detail any errors you find. We will correct the errors or problems as soon as possible and post the revised user guide on our website.

Symbols

The following symbols may be used in this user guide:

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.
	Electric Shock! This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	ESD Sensitive Device! This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	HOT Surface! Do NOT touch! Allow to cool before servicing.
	Laser! This symbol inform of the risk of exposure to laser beam from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠CAUTION

Warning

All operations on this product must be carried out by sufficiently skilled personnel only.

⚠CAUTION

Electric Shock!

Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE

ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version, that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present User Guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

Environmental protection is a high priority with Kontron.
Kontron follows the WEEE directive
You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- Reduce waste arising from electrical and electronic equipment (EEE)
- Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- Improve the environmental performance of all those involved during the lifecycle of EEE

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

⚠CAUTION

Danger of explosion if the lithium battery is incorrectly replaced.

- Replace only with the same or equivalent type recommended by the manufacturer
- Dispose of used batteries according to the manufacturer's instructions

Table of Contents

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1/ Introduction

This user guide describes the 3.5-SBC-E38 motherboard from Kontron named as 3.5 SBC-E38 within this user guide.

The 3.5-SBC-E38 is a 3.5" form factor, single board computer based on the Intel® Bay Trail SOC (System-on-Chip) processor and features:

- Intel® Atom™ processor E3815, (1 Core), TDP 5 W
- mPCIe half size, CFast Card and 3x RJ45 LAN port
- System memory 1 GByte soldered down DDR3L-1067
- LVDS 18-bit/24-bit dual channel, VGA/ HDMI co-layout
- Wide range 19 V – 36 V DC input

Use of this users guide implies a basic knowledge of PC-AT hardware and software. This user guide is focused on describing the 3.5-SBC-E38 motherboard's special features and is not intended to be a standard PC-AT textbook. The configuration and setup of the CPU board is either carried out automatically or manually by the user via the BIOS setup menus.

Before switching on the power, new users are recommended to study the short installation instructions in the following chapter Installation Procedures.

For the latest revision of this user guide and datasheet, visit http://www.kontron.com/.

2/ Installation Procedures

2.1. Installing the Board

ESD Sensitive Device

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry.

- Wear ESD-protective clothing and shoes
- Wear an ESD-preventive wrist strap attached to a good earth ground
- Check the resistance value of the wrist strap periodically (1 MΩ to 10 MΩ)
- Transport and store the board in an antistatic bag
- Only Handle the board at an approved ESD workstation
- Handle the board only by the edges

To get the board running follow the steps listed below. If the board shipped by KONTRON already has components such as a RAM and CPU cooler mounted then skip the relevant step(s).

1. **Turn off the PSU (Power Supply Unit)**

NOTICE

Turn off PSU (Power Supply Unit) completely (no mains power connected to the PSU) or leave the Power Connectors unconnected while configuring the board. Otherwise components (RAM, LAN cards etc.) might get damaged. Make sure to use a suitable PSU with an appropriate cable kit and PS_ON# active.

2. **Cooler Installation**
   The 3.5-SBC-E38 comes with a pre-installed passive heatsink.
3. **Connecting Interfaces**
   Insert all external cables for hard disk and keyboard etc. A monitor must be connected in order to change BIOS settings.
4. **Connect and turn on PSU**
   Connect PSU to the board by the ATX+19 V 4-pin connector.
5. **BIOS Setup**
   Enter the BIOS setup by pressing the <DEL> key during boot up.

   Enter "Exit Menu" and Load Setup Defaults.

To clear all BIOS settings, including Password protection, activate "Clear CMOS Jumper" for > 10 sec (without power connected).

6. **Mounting the board in chassis**

NOTICE

When mounting the board to chassis etc. please note that the board contains components on both sides of the PCB that can easily be damaged if board is handled without reasonable care. A damaged component can result in malfunction or no function at all.

When fixing the motherboard on a chassis, it is recommended to use screws with an integrated washer and a diameter of >7 mm. Do not use washers with teeth, as they can damage the PCB and cause short circuits.

2.2. Chassis Safety Standards

Before installing the 3.5-SBC-E38 in the chassis, users must evaluate the end product to ensure compliance with the requirements of the IEC60950-1 safety standard:

- The motherboard must be installed in a suitable mechanical, electrical and fire enclosure.
- The system, in its enclosure, must be evaluated for temperature and airflow considerations.
- The motherboard must be powered by a CSA or UL approved power supply that limits the maximum input current.
- For interfaces having a power pin such as external power or fan, ensure that the connectors and wires are suitably rated. All connections from and to the product shall be with SELV circuits only.
- Wires have suitable rating to withstand the maximum available power.
- The peripheral device enclosure fulfils the IEC60950-1 fire protecting requirements.

2.3. Lithium Battery Replacement

If replacing the lithium battery follow the replacement precautions stated in the notification below:

⚠CAUTION

Danger of explosion if the lithium battery is incorrectly replaced.

- Replace only with the same or equivalent type recommended by the manufacturer
- Dispose of used batteries according to the manufacturer's instructions

VORSICHT! Explosionsgefahr bei unsachgemäßem Austausch der Batterie.

- Ersatz nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ
- Entsorgung gebrauchter Batterien nach Angaben des Herstellers

ATTENTION! Risque d'explosion avec l'échange inadéquat de la batterie.

- Remplacement seulement par le même ou un type équivalent recommandé par le producteur
- L'évacuation des batteries usagées conformément à des indications du fabricant

PRECAUCION! Peligro de explosión si la batería se sustituye incorrectamente.

- Sustituya solamente por el mismo o tipo equivalente recomendado por el fabricante
- Disponga las baterías usadas según las instrucciones del fabricante

ADVARSEL! Lithiumbatteri – Eksplosionsfare ved fejlagtig håndtering.

- Udskiftning må kun ske med batteri af samme fabrikat og type
- Levér det brugte batteri tilbage til leverandøren.

ADVARSEL! Eksplosjonsfare ved feilaktig skifte av batteri.

- Benytt samme batteritype eller en tilsvarende type anbefalt av apparatfabrikanten.
- Brukte batterier kasseres i henhold til fabrikantens instruksjoner

VARNING! Explosionsfara vid felaktigt batteribyte.

- Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren.
- Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS! Paristo voi räjähtää, jos se on virheellisesti asennettu.

- Vaihda paristo ainoastaan lalteval- mistajan suosittelemaan tyyppiln
- Hävitä käytetty paristo valmistajan ohjeiden mukaisesti

3/ Product Variants

The 3.5-SBC-E38 supports the Intel® Atom™ E3815 processor that is part of the Bay Trail family of multicore SoC mobile processors, and is available in the following processor variant at standard operating temperature (0°C to +60°C).

Table 1: 3.5-SBC-E38 Product Variant (Standard Operating Temperature (0°C to +60°C))

Product Number	Product Name	Description
43010-1000-14-1	3.5-SBC-E38 E3815 1GB C	3.5-SBC-E38 E3815 1.46 GHz, 1 GByte Memory on-board, w.cooler

3.1. Accessories

Specific 3.5-SBC-E38 accessories are specified below. For more information, contact your local Kontron sales representative or Kontron Inside Sales.

Table 2: Memory Module Accessories

Part Number	Part Name
1060-2526	DDR3-1600 SODIMM 1 GByte E2
1060-2528	DDR3-1600 SODIMM 2 GByte E2
1060-2530	DDR3-1600 SODIMM 4 GByte E2

Cables are available separately or as a bundled option including the main cable requirements.

Table 3: Cable Accessories

Part Number	Part Name	Description
1061-6898	CAA_2 USB 2.0_2x5 CONN TERM_NO BRK_20cm	USB 2.0 cable, length 20 cm
1061-6899	CAA_RESET+POWER+2*LED_2x5 CONN TERM_18cm	LED switch cable, length 18 cm
1061-6900	CAA_SATA_POWER_50cm	SATA power cable, length 50 cm
1061-6952	CAA_2 MINI DIN 6P/F TO HSG_18cm	2x mini DIN 6P /F to HSG cable, length 18 cm
1061-6901	CAA_BACKLIGHT_70cm	Backlight cable, length 70 cm
1061-6955	CAA_POWER_4-PIN_EDAC_15cm	4-pin power input cable, length 15 cm
1061-6902	CAA_LVDS_20-pin_40-pin_70cm	LVDS cable, length 70 cm
1061-6954	CAA_AUDIO_15cm	Audio, length 15 cm
1061-6953	CAA_DSUB-9P TO PH2x5_20cm	D-sub, length 20 cm
1061-7108	CABLE Bundle-SBC E3815 BAYTRAIL	Including following cables: 1061-6898 1061-6899 1061-6900 1061-6952 1061-6901 1061-6955 1061-6902 1061-6954 1061-6953

4/ Product Specification

4.1. Component Data

Table 4: Component Data

Form Factor	102 mm x 146 mm (3.5“)
Processor	Intel ® Atom ™ E3815 SoC, 512 K cache, 1.46 GHz base frequency, TDP 5W
System Memory	Soldered down 1 GByte, DDR3L (1.35 V) 1067 MHz
Graphics	**Graphics Controller** Support for DirectX*11, compliant to Pixel Shader OGL 3.2
	DP to LVDS Controller eDP to LVDS transceiver PARADE PS8622QFN46GTR-A0
	Display Interface 2 x Independent displays: ▸ 1x VGA (1920 x 1200) ▸ 1x LVDS 18-bit / 24-bit LVDS (1440 x 900)
Ethernet	3 x RJ-45 ports with Realtek® RTL8119I-CG Gigabit Ethernet Controller IEEE 802.3 10BASE-T/100BASE-TX / 1000BASE-T compliant
I/O Controller	ITE8786 Embedded Controller
Internal I/O	**Power Mode** 1x AT or ATX
	SATA 1 x SATA Gen 2.0
	SATA Power 1x 5V or 12 V
	SATA DOM Power SATA pin 7 – 5 V jumper select (reserved)
	COM2, COM3 1x RS232 at COM3 1x RS422/RS485 at COM2 (BIOS select)
	USB 2-3 USB 4-5 4 x USB 2.0
	LVDS Single channel 18-bit / 24-bit LVDS (BIOS select) The following LVDS Panel has been verified for use - G150XGE-L05
	LVDS Power 1x 3.3 V or 5 V
	Backlight 1 x LVDS backlight connector
	SSD 1 x CFast™, speed 600 m/s (supports a push – push type socket)
	PS/2 Keyboard and mouse support (WEC7.0 does not support PS/2)

Internal I/O continued	**Fan Power** CPU fan w/PWM function (reserved)
	Front Panel Power button, Power LED and Storage LED
	Clear CMOS Recovers from incorrect BIOS settings by clearing the BIOS
	Touch Power 5 V or GND
	Power Input 4-pin ATX connector
	GPIO 1x 4 input ports / 4 output ports
	Audio Audio outputs, audio inputs and microphone signals
External I/O	**LAN** 3x RJ-45 LAN port (including transformer and two LED indicators)
	USB Dual stack 1x USB 2.0 + 1x USB 3.0
	VGA 1x VGA (co-layout with HDMI)
	COM1 1x RS-232 D-Sub 9-pin male connector
	Power 1x 4-pin ATX power connector (19 V – 36 V)
Expansion Capabilities	1x miniPCIe slot (half size)
Hardware Status Monitor	Monitors CPU, system temperature and voltage status: ▸ Four voltages (Vcore, +12 V, +3.3 V, +5 V) ▸ Two temperatures (CPU temp. and temp. at the center of the motherboard) ▸ One fan speed
Watchdog Timer	Enables setting the rest time: ▸ By step (range: minute or seconds.) ▸ Timer-out value (range:1 sec. to 255 min)
Wake On	▸ Wake On LAN ▸ PXE ▸ Wake On USB
Power Supply	Power Type - 19 V / 36 V DC input (tolerance ± 5 %)
Battery	CR2032 - exchangeable 3.0 V Lithium battery, (220 mAh, 20 mm diameter and 3.2 mm high)
Audio	Realtek® ALC269Q-VC3 High Definition Audio codec
Buzzer	One on-board buzzer
BIOS	AMI Aptio V UEFI BIOS with 8 MB SPI Flash ROM
Operating Systems	Windows Embedded Compact 7 (WEC7), Windows 7 and Linux

4.2. Standards and Certifications

The 3.5-SBC-E38 is compliant to the following standards and certifications. For more specific compliancy information, contact Kontron Support.

Table 5: Standards and Certifications

EMC	EN 55032 CISPR 32	Electromagnetic compatibility of multimedia equipment
Emission	EN 61000-3-2	EMC part 3-2 limits for harmonics current emission in public supply systems
	EN 61000-3-3	EMC part 3-3 limits of voltage changes, Voltage fluctuation and voltage flicker in public low voltage products
Immunity	EN 55024	Information technology equipment immunity characteristics limits and methods of measurement
	IEC 61000-4-2	Electrostatic discharge immunity
	IEC 61000-4-3	RF electromagnetic field immunity
	IEC 61000-4-4	Burst immunity
	IEC 61000-4-5	Surge immunity
	IEC 61000-4-6	Conducted interferences immunity
	IEC 61000-4-8	Power frequency magnetic field immunity
	IEC 61000-4-11	Voltage dips, short interruptions and variation immunity
Federal Communication Commission (FCC)	FCC Part 15 Class A	
Industrial Canadian (IC)	ICES-003	
Restriction of Hazardous Substances (RoHS)	RoHS compliant	
Waste Electrical and Electronic Equipment (WEEE)	Follows the WEEE directive	

4.3. Environmental Conditions

The 3.5-SBC-E38 is compliant to the following environmental conditions. It is the customer's responsibility to provide sufficient airflow around each of the components to keep them within the allowed temperature range.

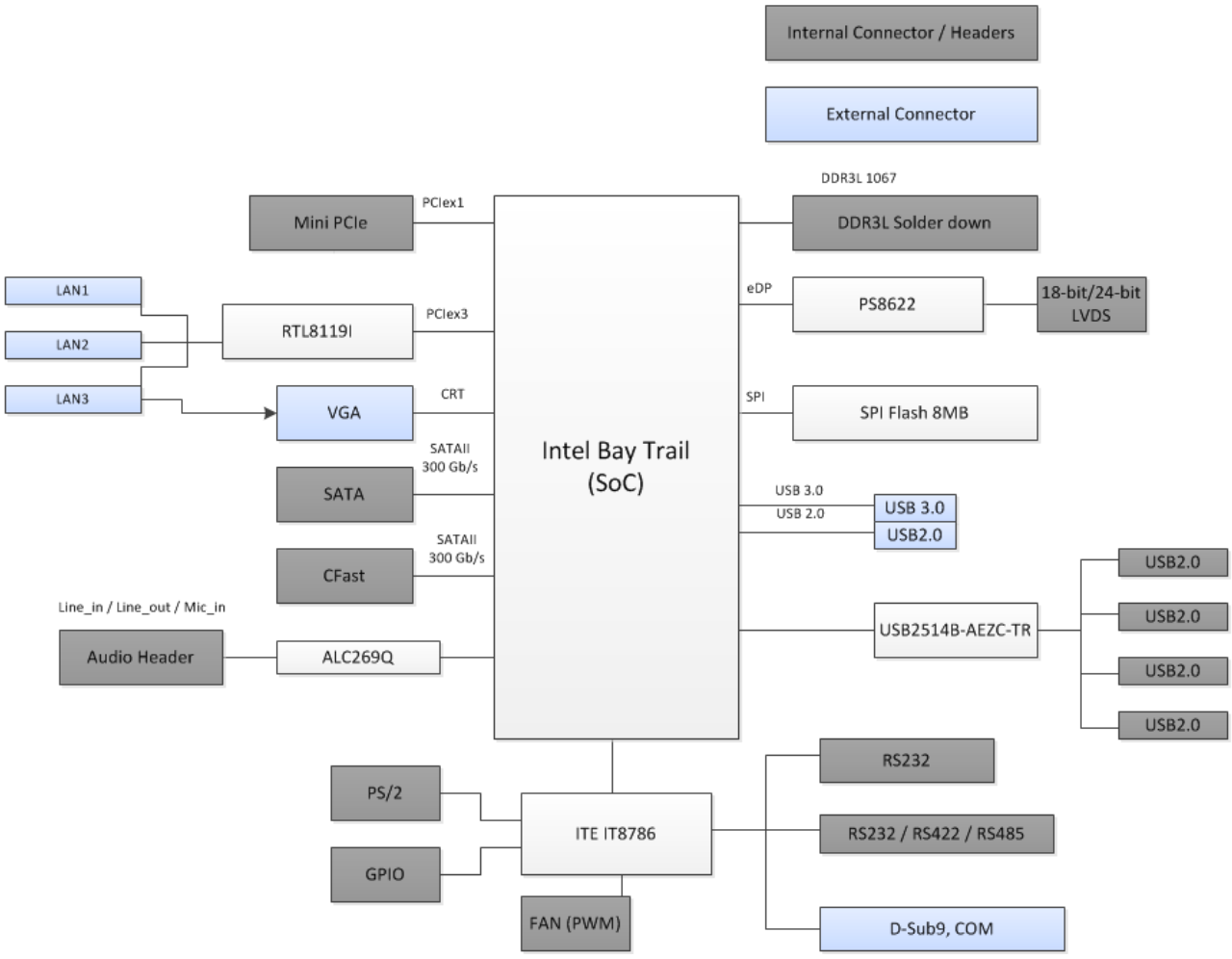
Table 6: Temperature Grade and Humidity Specifications

Temperature Grades	Temperature	Relative Humidity
Operating temperature	10°C to +60°C (32°F to 140°F) (forced cooling)	10% to 95% (non-condensing)
Storage temperature	20°C to +85°C (-4°F to 185°F) (lower temperature limit)	5% to 95% (non-condensing)

4.4. Block Diagram

The following block diagram displays the 3.5-SBC-E38's system architecture.

Figure 1: Block Diagram



4.5. Processor

The 3.5-SBC-E38 supports the Intel® Atom™ E3815 processor that is part of the Bay Trail family of multicore SoC mobile processors. The Intel® Atom™ E3815 uses the 22 nm process technology with 25 mm x 27 mm package size and FCBGA 1170 socket.

Processor characteristics are:

- 512 KB L2
- 1.46 GHz base frequency
- TDP 5 W

4.5.1. Processor Cooling

The 3.5-SBC-E38 comes with a pre-mounted cooler to provide sufficient cooling to the processor and to remove the effects of TDP (Thermal Design Power). The level of sufficient cooling depends on the worst-case maximum ambient operating temperature and the actual worst-case processor load.

4.6. System Memory

The 3.5-SBC-E38 comes with 1 GByte of soldered down system memory and supports DDR3L (1.35V) memory with memory controller speeds of 1067 MHz.

4.7. Graphics

The 3.5-SBS-E38 features on-board Intel® HD Graphics and supports two displays.

Table 7: On-Board Graphics Output

Processor	Graphics	Base Frequency	Graphics Output	Max. Resolution
Atom ™ E3815	Intel® HD Graphics	400 MHz	VGA	1920 x 1200
			LVDS (18-bit/24-bit)	1440 x 900

4.8. Power Consumption

In order to ensure safe operation of the board, the input power supply must monitor the supply voltage and shut down if the supply is out of range. For more information, refer to the actual power supply specification. In order to keep the power consumption to a minimal level, boards do not implement a guaranteed minimum load. In some cases, this can lead to compatibility problems with ATX power supplies that require a minimum load to stay in regulation.

An ATX 4-pin power connector powers the 3.5-SBC-E38 with a 19 V supply voltage supporting a voltage range of 19 V to 36 V depending on the power source or the adapter.

NOTICE

Hot plugging the power supply is not supported. Hot plugging may damage the board.

NOTICE

ATX+19 V Supply: ATX+19 V, 4-pin connector must be used in according to the ATX19V PSU standard.

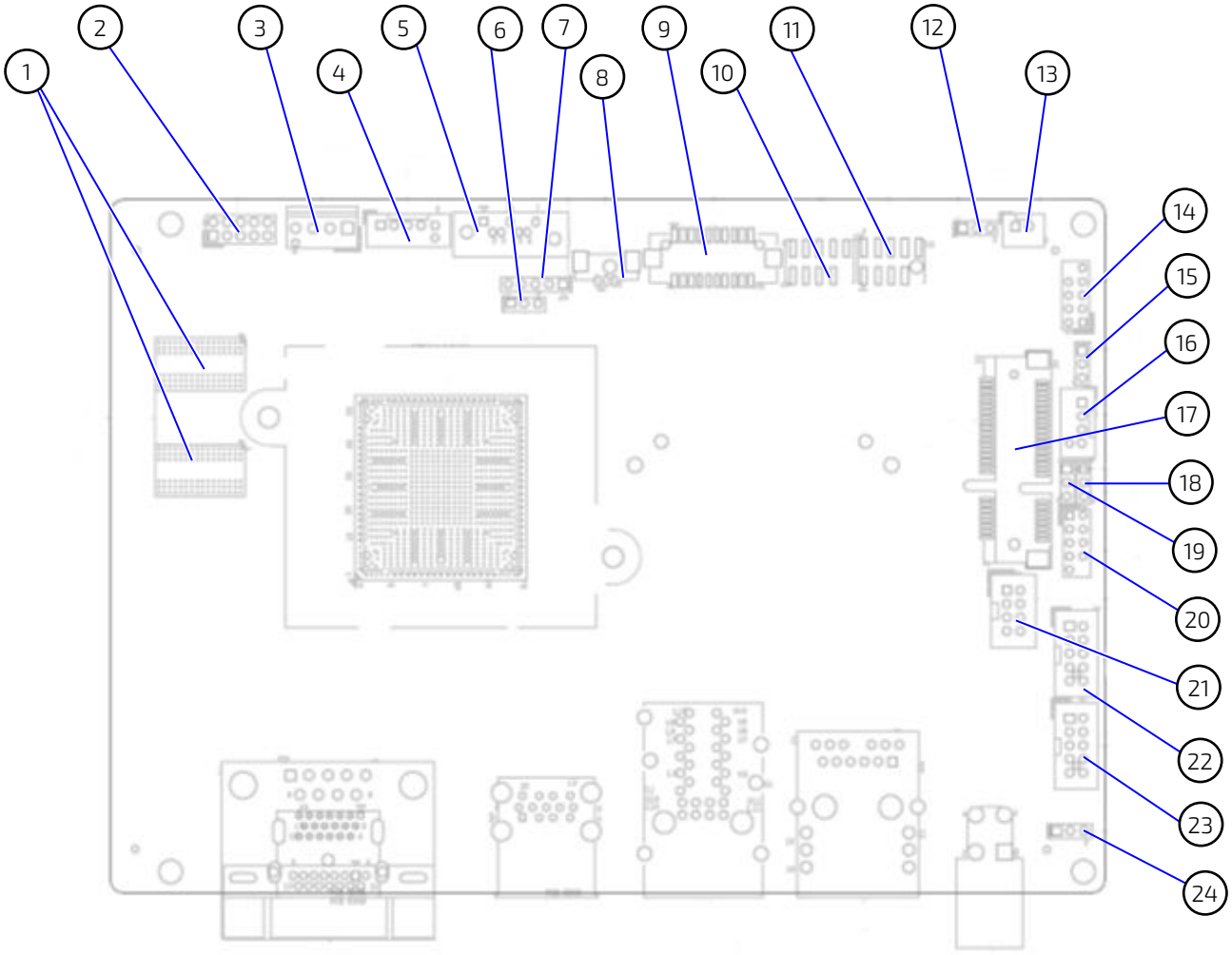
Table 8: Supply Voltage Requirements

Supply	Min.	Max.	Note
19 V	19 V	36 V	Supply voltage should be ±5% for compliance with the ATX specification
GND	0 V	0 V	Power Supply GND

5/ Board Views

5.1. Top Side

Figure 2: Top Side View

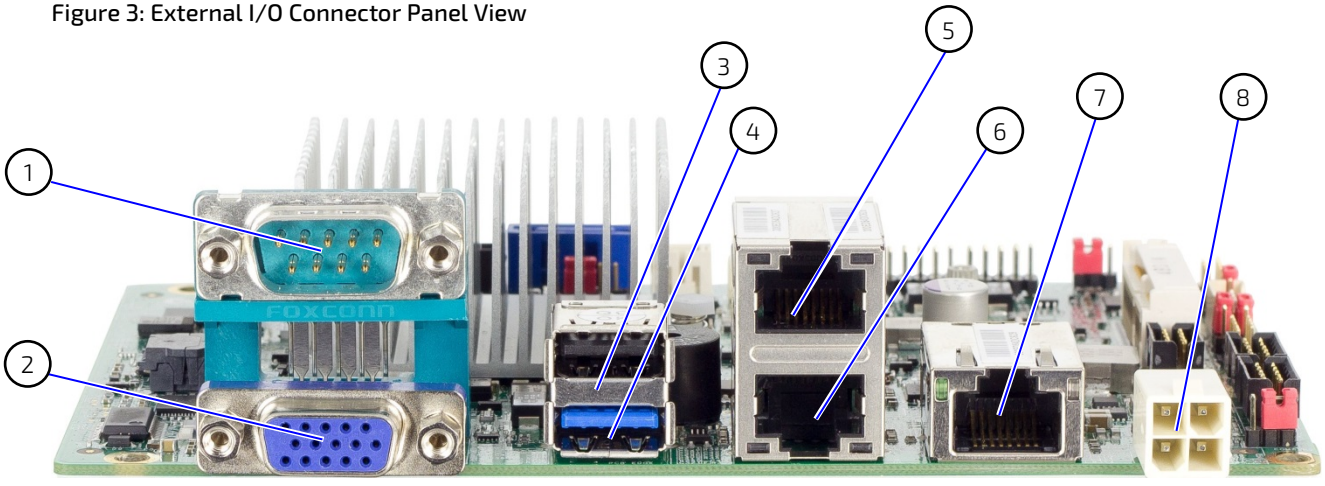


Item	Signal	Description	See Chapter
1	Memory down	Memory down	4.6
2	GPIO	General Purpose Input Output connector	7.9
3	CPU-Fan 1	CPU-Fan connector	7.11
4	LVDS_backlight	LVDS backlight connector	7.7
5	SATA	SATA connector	7.3
6	LVDS_PWR	LVDS power jumper	8.4
7	SIO_SPI	SPI interface connector from SoC	
8	BAT 1	Lithium Battery, 20 mm diameter and 3.2 mm height	
9	LVDS	LVDS connector	7.6
10	USB2_3	USB2_3	7.1

Item	Signal	Description	See Chapter
11	USB4_5	USB 4_5	7.1
12	SATA_DOM_PWR	SATA Disk on Module (DOM) Power jumper	8.6
13	Touch_PWR	Touch power connector	7.12
14	Audio	Audio connector	7.8
15	RLV-CFG	LVDS color depth selector jumper	8.5
16	SATA_PWR	SATA power connector	7.4
17	MINIPCIE	miniPCIe connector	7.14.1
18	AT_MOD	Power mode select jumper	8.2
19	CLR_COM	Clear CMOS jumper	8.1
20	FP1	Front panel connector	7.10
21	PS2	P/S 2 connector	7.5
22	COM3	Serial port COM3 connector	7.2
23	COM2	Serial port COM2 connector	7.2
24	COM2-P9	COM2 P9 jumper	8.3

5.2. External I/O Connector Panel

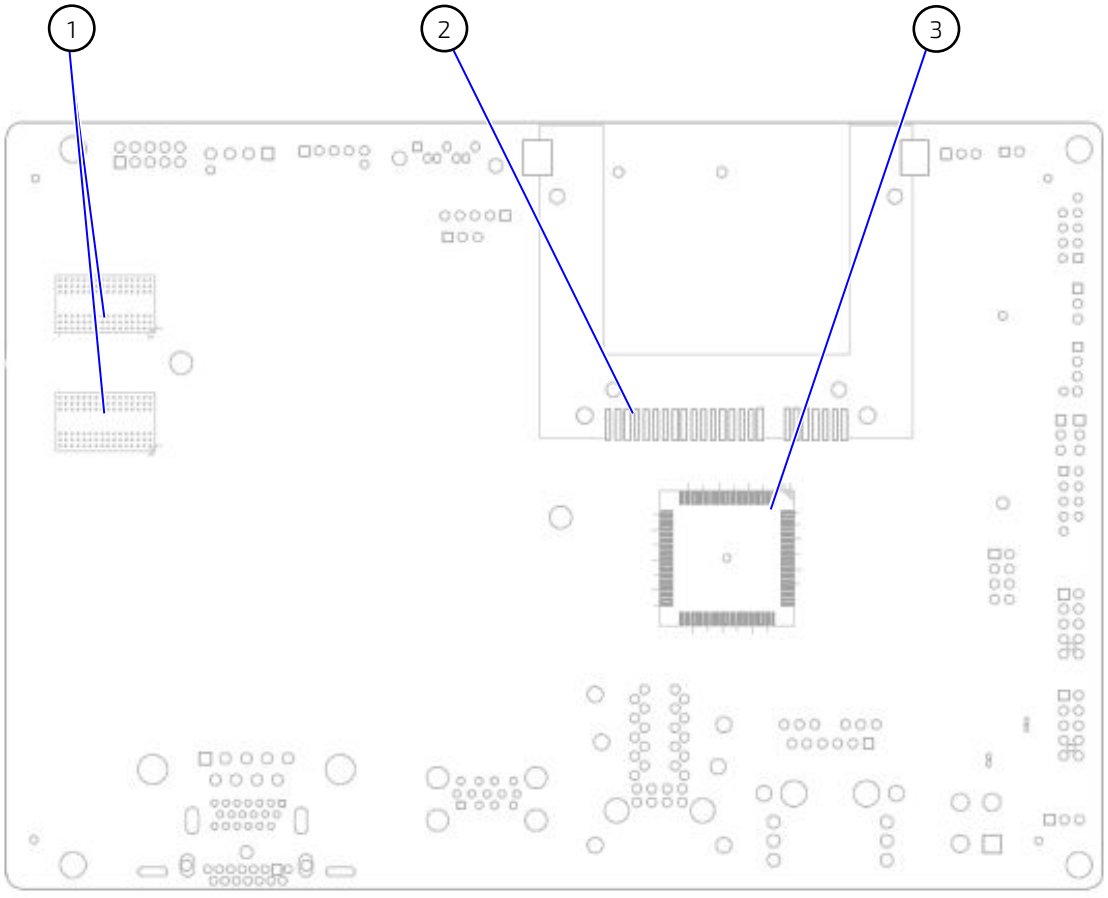
Figure 3: External I/O Connector Panel View



Item	Signal	Description	See Chapter
1	COM1	Serial Port COM1 connector	6.2
2	VGA	VGA connector	6.1
3	USB3_0	USB2.0 (top dual stack connector))	6.3
4	USB3_0	USB3.0 (bottom dual stack connector)	6.3
5	LAN_1	LAN 1, RJ54 Ethernet LAN connector	6.4
6	LAN_2	LAN2, RJ54 Ethernet LAN connector	6.4
7	LAN_3	LAN 3, RJ54 Ethernet LAN connector	6.4
8	PWR	4-pin Power connector	6.5

5.3. Rear Side

Figure 4: Rear Side View



Item	Signal	Description	See Chapter
1		Memory Down	4.6
2	C Fast	CFast™, speed 600 m/s socket support push-push	7.13
3	SIO	SIO	

6/ I/O Connectors

6.1. VGA Connector (VGA)

The external I/O connector panel supports one VGA (DE-15/HD-15) connector with a VGA/HDMI co-layout design.

Figure 5: VGA Connector (DE-15/HD-15)

Pin Assignment VGA Connector

Pin	Signal	Pin	Signal
1	Red video	2	Green video
3	Blue video	4	NC
5	GND	6	Red return
7	Green return	8	Blue return
9	Key/PWR	10	GND
11	NC	12	SDA
13	Horizontal Sync	14	Vertical sync
15	SCL		

6.2. Serial Port Connector (COM1)

The external I/O connector panel supports one serial port D-Sub, 9-pin male connector that is compliant with the RS232 standard.

Figure 6: Serial COM1 Connector (D-sub 9-pin male)

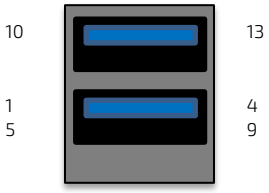
Pin Assignment Serial COM1 Connector

Pin	Signal	Pin	Signal
1	Data carrier detect	2	Receive data
3	Transmit data	4	Data terminal ready
5	Ground	6	Data set ready
7	Ready to send	8	Clear to send
9	Ring indicator		

6.3. USB Connectors (USB3_0)

The external I/O connector panel supports a dual USB connector that provides USB 2.0 on the top and USB 3.0 on the bottom. USB 3.0 ports are backwards compatible with USB 2.0.

Figure 7: Dual Stack USB Connector



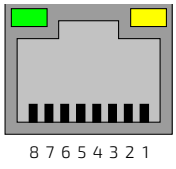
Pin Assignment USB 2.0 and USB 3.0 Connectors

Pin	Signal	Pin	Signal
USB 2.0 (Top)			
10	PWR	11	DN
12	DP	13	GND
USB 3.0 (Bottom)			
1	PWR	2	DN
3	DP	4	GND
5	RX-	6	RX+
7	GND	8	TX-
9	TX+		

6.4. Ethernet Connectors (LAN_1, LAN_2 and LAN_3)

The external I/O connector panel supports three separate external RJ54 Ethernet LAN connectors LAN_1, LAN_2 and LAN_3 for data transfer.

Figure 8: Ethernet LAN Connector (RJ45 Female)



Pin Assignment Ethernet LAN Connector (LAN_1, LAN_2, LAN_3)

Pin	Signal	Pin	Signal
1	Media Dependent Interface (MDI0+)	2	Media Dependent Interface (MDI0-)
3	Media Dependent Interface (MDI1+)	4	Media Dependent Interface (MDI2+)
5	Media Dependent Interface (MDI2-)	6	Media Dependent Interface (MDI1-)
7	Media Dependent Interface (MDI3+)	8	Media Dependent Interface (MDI3-)

Signal Description for the Ethernet Ports

Signal	Description
MDI0+ / MDI0-	In MDI mode, this is the first pair in 1000Base-T, i.e. BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX.
MDI1+ / MDI1-	In MDI mode, this is the second pair in 1000Base-T, i.e. the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX.
MDI2+ / MDI2-	In MDI mode, this is the third pair in 1000Base-T, i.e. the BI_DC+/- pair. In MDI crossover mode, this pair acts as the BI_DD+/- pair.
MDI3+ / MDI3-	In MDI mode, this is the fourth pair in 1000Base-T, i.e. the BI_DD+/- pair. In MDI crossover mode, this pair acts as the BI_DC+/- pair.

6.5. Power Connector (ATX+19 V 4-Pin)

The ATX 4-pin internal power supply connector is a standard motherboard power connector providing +19 V DC to the processor's voltage regulator.

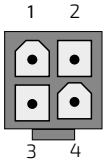
For more information on input tolerances at +19 V and +36 V, see Chapter4.8 Power Consumption or refer to the ATX Specification version 2.2.

NOTICE

Hot plugging of the power connectors is not allowed. Hot plugging might damage the board.

When connecting to the motherboard, turn off the mains supply to make sure that all the power lines are turned off.

Figure 9: Input Power (2x2, 4-pin ATX Connector)



Pin Assignment Power Connector

Pin	Signal
1	GND
2	GND
3	+19 V / 36 V
4	+19 V / 36 V

7/ Internal Connectors

7.1. USB Connectors (USB2_3 and USB4_5)

The USB connectors (USB2_3 and USB4_5) support four internal USB2.0 ports.

Figure 10: USB 2.0 Connector (2x 5-pin, 2 mm pin header)

Pin Assignment USB2_3 and USB4_5

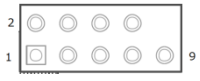
Pin	Signal	Pin	Signal
1	USB1_PWR	2	USB2_PWR
3	USB_1_FBJ (-)	4	USB_2_FBJ (-)
5	USB_1_FB (+)	6	USB_2_FB (+)
7	GND	8	GND
9	Reserved	10	NC

7.2. Serial Port Connectors (COM2, COM3)

The serial port connectors support the following serial interfaces:

- COM2 supports RS422 / RS485 (selected in the BIOS setup)
- COM3 supports RS232

Figure 11: Serial Port COM1 or COM2 Connector (2x 5-pin, 2 mm box header)



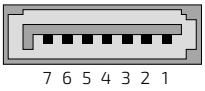
Pin Assignment Serial Ports (COM2, COM3)

Pin	Signal			Pin	Signal		
	RS232	RS422	RS485		RS232	RS422	RS485
1	DCD#	TX-	TX-	2	SIN		
3	SOUT	RX+		4	DTR	RX+	NC
5	GND	GND	GND	6	DSR	NC	NC
7	RTS	NC	NC	8	CTS	NC	NC
9	RI	NC /5 V	NC /5 V	10	NC	NC	NC

7.3. SATA Connector (SATA)

The SATA connector supplies the data connection for the SATA hard disk and is SATA 2.0 compatible. There are two different SATA configurations SATA mode or SATA DOM mode, chosen by setting the SAT-DOM-PWR jumper. For information on the required jumper setting, see Chapter 8.6, SATA DOM Power Jumper (SATA_DOM_PWR).

Figure 12: SATA Connector



Pin Assignment SATA mode (SATA)

Pin	Signal	Pin	Signal
1	GND	2	Transmit +
3	Transmit -	4	GND
5	Receive -	6	Receive+
7	GND		

Pin Assignment SATA DOM mode (SATA)

Pin	Signal	Pin	Signal
1	GND	2	Transmit +
3	Transmit -	4	GND
5	Receive -	6	Receive+
7	5 V		

7.4. SATA Power Connector (SATA_PWR)

The SATA power connector supplies the SATA hard disk with either 12 V or 5 V.

Figure 13: SATA Power Internal Connector (4-pin, 2mm pitch wafer)

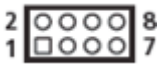
Pin Assignment SATA Power (SATA_PWR)

Pin	Signal
1	+V12S
2	GND
3	GND
4	+V5S

7.5. P/S 2 Connector (PS2)

The P/S 2 internal connector supports serial connections for the keyboard and mouse.

Figure 14: P/S 2 connector (2x 4-pin, 2 mm box header)



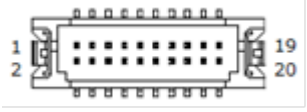
Pin Assignment P/S 2 (PS2)

Pin	Signal	Pin	Signal
1	+V5A	2	+V5A
3	O_MSDATA_R	4	O_KBDATA_R
5	O_MSCLK_R	6	O_KBCLK_R
7	GND	8	GND

7.6. LVDS Connector (LVDS)

The LVDS connector supports either single channel 18-bit / 24-bit LVDS. The LVDS setup is changed within the BIOS setup.

Figure 15: LVDS Connector (2x 10-pin, 1.25 mm pitch)



Pin Assignment LVDS Connector (LVDS)

Pin	Signal	Pin	Signal
1	M_LVDSDDCCLK_L	2	M_LVDSDDCDATA_L
3	VCC_LCD	4	LVDS_CH_TX0_P
5	LVDS_CH_TX3_P	6	LVDS_CH_TX0_N
7	LVDS_CH_TX3_N	8	VCC_LCD
9	GND	10	LVDS_CH_TX1_P
11	LVDS_CH_CLK_P	12	LVDS_CH_TX1_N
13	LVDS_CH_CLK_N	14	GND
15	GND	16	+V12S
17	LVDS_CH_TX2_P	18	+V12S
19	LVDS_CH_TX2_N	20	GND

7.7. LVDS Backlight Connector (LVDS_BACKLIGHT)

The LVDS backlight connector controls the display device's backlighting.

Figure 16: LVDS Backlight Connector (5-pin, 2 mm box header)

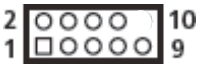
Pin Assignment LVDS Backlight Connector (LVDS_BACKLIGHT)

Pin	Signal	Pin	Signal
1	+V12S	2	GND
3	BL_EN(On/Off)	4	BL_CTL
5	+V5S		

7.8. Audio Connector (AUDIO)

The audio connector provides audio output, audio inputs and microphone signals.

Figure 17: Audio Connector (2x 5-pin, 2 mm box header)



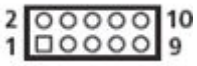
Pin Assignment Audio Connector (AUDIO)

Pin	Signal	Pin	Signal
1	A_LOUT_R	2	GND_AUDIO
3	A_LOUT_L	4	A_LINE1_R
5	GND_AUDIO	6	A_LINE1_L
7	A_MIC1_R	8	GND_AUDIO
9	A_MIC1_L		

7.9. GPIO Connector (GPIO)

General Purpose Inputs/Output connector supports four input and four output ports.

Figure 18: GPIO Connector (2x 5-pin, 2mm pin header)



Pin Assignment GPIO Connector (GPIO)

Pin	Signal	Pin	Signal
1	+V5S	2	GND
3	GPI_GP52	4	GPO_GP31
5	GPI_GP37	6	GPO_GP32
7	GPI_GP36	8	GPO_GP33
9	GPI_GP35	10	GPO_GP50

7.10. Front Panel Connector (FP1)

The front panel connector supplies signal for the power button, power LED and storage LED.

Figure 19: Front Panel Connector (2x 5-pin, 2 mm pin header)

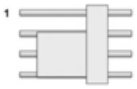
Pin Assignment Front Panel Connector (FP1)

Pin	Signal	Pin	Signal
1	GND	2	FP_RST#
3	PWRBTN#	4	GND
5	O_PLED#	6	+V5S
7	+V5A	8	SATA_LED#
9	GND	10	

7.11. CPU Fan Connector (CPU_FAN1)

The CPU fan connector is reserved for the CPU fan with PWM functions.

Figure 20: CPU Fan Connector (4-pin, 2.54 mm wafer)



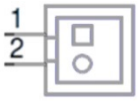
Pin Assignment CPU Fan Connector (CPU_FAN1)

Pin	Signal
1	GND
2	+12V
3	CPU_FAN_TACH
4	CPU_FAN_CTRL

7.12. Touch Power Connector (Touch_PWR)

The touch power connector provides 5 V power for touch power or any other device that needs a 5 V power supply.

Figure 21: Touch Power Connector ((1x2) JST 2 mm box header)



Pin Assignment Touch Power (TOUCH_PWR)

Pin	Signal
1	5 V
2	GND

7.13. Solid State Drive (C_Fast™)

The Solid State Drive (SSD) uses a CFast™ small card form factor with a speed of 600 m/s and push-push type socket for ejection and insertion of the card.

The card's 7+17-pin connector consists of a SATA-compatible 7-pin signal connector and a 17-pin power and control connector.

7.14. Slot Connectors

For enable expansion, the 3.5-SBC-E38 supports one miniPCIe half size slot connector.

7.14.1. miniPCIe Half Size Expansion Slot (MINIPCIE)

The miniPCIe half size expansion slot supports PCIEx1.

Pin Assignment miniPCIe Half Size Slot (MINIPCIe)

Pin	Signal	Pin	Signal
1	WAKE#	2	+3.3 V
3	NC	4	GND
5	NC	6	+1.5 V
7	CLKREQ#	8	NC
9	GND	10	NC
11	PCIE_REFCLK[x]-	12	NC
13	PCIE_REFCLK[x]+	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	W_Disable#
21	GND	22	RST#
23	PCIE_RX[x]-	24	+3.3 V
25	PCIE_RX[x]+	26	GND
27	GND	28	+1.5 V
29	GND	30	SMB_CLK
31	PCIE_TX[x]-	32	SMB_DATA
33	PCIE_TX[x]+	34	GND
35	GND	36	USB_[x]-
37	GND	38	USB_[x]+
39	+3.3 V	40	GND
41	+3.3 V	42	NC
43	GND	44	NC
45	NC	46	NC
47	NC	48	+1.5 V
49	NC	50	GND
51	NC	52	+3.3 V

8/ Internal Switchers and Jumpers

8.1. Clear CMOS Jumper (CLR_CMOS)

The Clear CMOS jumper recovers from incorrect BIOS settings by clearing the BIOS.

Clear CMOS Jumper (3-pin, 2 mm pitch)

Clear CMOS (CLR_CMOS) Jumper Settings

Pin	Description
1-2 On	Normal
2-3 On	Clear BIOS

Pin Assignment Clear CMOS Jumper (CLR_CMOS)

Pin	Signal
1	NC
2	SRTCRST_N / RTCRST#
3	GND

8.2. Power Mode Select Jumper (AT_MOD)

The power mode select jumper selects between AT and ATX power modes.

Power Modes Select Jumper (3-pin, 2 mm pitch)

Power Mode (AT_MOD) Jumper Settings

Pin	Description
1-2 On	AT
2-3 On	ATX

Pin Assignment Power Mode Select (AT_MOD)

Pin	Signal
1	GND
2	JP6
3	+V3P3A

8.3. Serial COM2_P9 Jumper (COM2_P9)

The serial COM2_P9 jumper selects between +5 V or normal power.

COM2_P9 Jumper (3-pin, 2 mm pitch)

COM2_P9 Jumper Settings (COM2_P9)

Pin	Description
1-2 On	COM2_Pin9 5V power
2-3 On	Normal power

Pin Assignment COM2-P9 Jumper (COM2_P9)

Pin	Signal
1	+V5S
2	COM2_P9
3	RI

8.4. LVDS Power Jumper (LVDS_PWR)

The LVDS power jumper selects between 3.3 V and 5 V LVDS power.

LVDS Power Jumper (3-pin, 2 mm pitch)

LVDS Power Jumper Settings (LVDS_PWR)

Pin	Description
1-2 On	3.3V Power
2-3 On	5V Power

Pin Assignment LVDS Power Jumper (LVDS_PWR)

Pin	Signal
1	+V3P3S
2	VCC_SEL
3	+V5S

8.5. LVDS Color Depth Select Jumper (RLV_CFG)

The LVDS color depth select jumper selects between 6-bit or 8-bit color depth.

LVDS Color Depth Select Jumper (3-pin, 2 mm pitch)

LVDS Color Depth Select Jumper Settings (RLV_CFG)

Pin	Description
1-2 On	6-bit LVDS,VESA & JEIDA mapping
2-3 On	8-bit LVDS,JEIDA mapping
NC	8-bit LVDS,VESA mapping

Pin Assignment LVDS Color Depth Select (RLV_CFG)

Pin	Signal
1	RLV_CFG_H
2	RLV_CFG
3	RLV_CFG_M

8.6. SATA DOM Power Jumper (SATA_DOM_PWR)

The SATA DOM power jumper selects between two different SATA configurations SATA mode, and SATA DOM mode.

SATA_DOM-Power Jumper (3-pin, 2 mm pitch)

SATA DOM Power Jumper Settings (SATA_DOM_PWR)

Pin	Description
1-2 On	SATA Mode
2-3 On	SATA DOM Mode

Pin Assignment SATA DOM Power (SATA_DOM_PWR)

Pin	Signal
1	GND
2	SATA PIN7
3	+V5S

9/ BIOS

9.1. Starting the BIOS

The 3.5-SBC-E38 uses a pre-installed and configured AMI UEFI BIOS with 8 MB SPI Flash.

The uEFI BIOS comes with a Setup program that provides quick and easy access to the individual function settings for control or modification of the uEFI BIOS configuration. The Setup program allows for access to various menus that provide functions or access to sub-menus with further specific functions of their own.

To start the BIOS Setup program, follow the steps below:

1. Power on the board.
2. Wait until the first characters appear on the screen (POST messages or splash screen).
3. Press the <DEL> key.
4. If the BIOS is password-protected, a request for password will appear. Enter either the user password or the supervisor password (see the security menu), press <RETURN>, and proceed with step 5.
5. A Setup menu will appear.

The BIOS Setup program uses a hot key-based navigation system. A hot key legend bar is located on the bottom of the Setup screens. The following table lists the navigation hot keys available in the legend bar.

Table 9: BIOS Navigation Hotkeys

Hotkeys	Description
<F1>	The <F1> key is used to invoke the General Help window.
<->	The <Minus> key is used to select the next lower value within a field.
<+>	The <Plus> key is used to select the next higher value within a field.
<F2>	The <F2> key is used to load the previous values.
<F3>	The <F3> key is used to load the standard default values.
<F4>	The <F4> key is used to save the current settings and exit the UEFI BIOS Setup.
<→> or <←>	The <Left/Right> arrows are used to select major Setup menus on the menu bar. For example: Main screen, Advanced screen, Security screen, etc.
<↑> or <↓>	The <Up/Down> arrows are used to select fields in the current menu. For example: A Setup function or a sub-screen.
<ESC>	The <ESC> key is used to exit a major Setup menu and enter the Exit Setup menu. Pressing the <ESC> key in a sub-menu causes the next higher menu level to be displayed.
<RETURN>	The <RETURN> key is used to execute a command or select a submenu.

9.2. Setup Menus

The Setup utility features menus listed in the selection bar at the top of the screen with the currently active menu and the currently active uEFI BIOS Setup item highlighted in white. Use the left and right arrow keys to select the Setup menus. Each Setup menu provides two main frames. The left frame displays all available functions with configurable functions displayed in blue. Functions displayed in grey provide information about the status or the operational configuration. The right frame displays a Help window explaining the respective function.

Within the BIOS Setup utility, it is possible to configure:

- 18-bit / 24-bit LVDS
- COM2 RS422 and RS485 (COM2 is jumper-less and must be configured within the BIOS)

APPENDIX A: LIST OF ACRONYMS

API	Application Programming Interface
BMC	Base Management Controller
CLI	Command-Line Interface
COM	Computer-on-Module
ECC	Error Checking and Correction
ESD	Electrostatic discharge
FAT	File Allocation Table
FCC	Federal Communication Commission
FRU	Field Replaceable Unit
GPIO	General Purpose Input Output
GPU	Graphics Processing Unit
HDAC	High Definition Audio Codec
HD/HDD	Hard Disk /Drive
HPM	PICMG Hardware Platform Management specification family
IOL	IPMI-Over-LAN
IOT	Internet of Things
IPMI	Intelligent Platform Management Interface
KCS	Keyboard Controller Style
KVM	Keyboard Video Mouse
LAN	Local Ara network
LVDS	Low Voltage Differential Signaling
MEI	Management Engine Interface
MTBF	Mean Time Before Failure
NCSI	Network Communications Services Interface
PCIe	PCI-Express
PECI	Platform Environment Control Interface
PICMG®	PCI Industrial Computer Manufacturers Group
PSU	Power Supply Unit
RTC	Real Time Clock
SATA	Serial Advanced Technology Attachment
SEL	System Event Log
ShMC	Shelf Management Controller
SMBus	System Management Bus
SMWI	System Monitor Web Interface
SoC	System-on-Chip
SOL	Serial Over LAN
SSD	Solid State Drive
SSH	Secure Shell
TDP	Thermal design Power
TPM	Trusted Platform Module
UEFI	Unified Extensible Firmware Interface
USB	Universal Serial Bus
VGA	Video Graphics Array
VLP	Very Low Profile
WEC	Windows Embedded Compact software

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Kontron, a global leader in embedded computing technology and trusted advisor in Internet of Things (IoT), works closely with its customers, allowing them to focus on their core competencies by offering a complete and integrated portfolio of hardware, software and services designed to help them make the most of their applications.

With a significant percentage of employees in research and development, Kontron creates many of the standards that drive the world's embedded computing platforms; bringing to life numerous technologies and applications that touch millions of lives. The result is an accelerated time-to-market, reduced total-cost-of-ownership, product longevity and the best possible overall application with leading-edge, highest reliability embedded technology.

Kontron is a listed company. Its shares are traded in the Prime Standard segment of the Frankfurt Stock Exchange and on other exchanges under the symbol "KBC". For more information, please visit: **http://www.kontron.com/**

CORPORATE OFFICES

EUROPE, MIDDLE EAST & AFRICA

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
Tel.: + 49 821 4086-0
Fax: + 49 821 4086-111
info@kontron.com

NORTH AMERICA

9477S Waples Street
San Diego, CA 92121
USA
Tel.: + 1 888 294 4558
Fax: + 1 858 677 0898
info@us.kontron.com

ASIA PACIFIC

1~2F, 10 Building, No. 8 Liangshuihe 2nd Street,
Economical & Technological Development Zone,
Beijing, 100176, P.R. China
Tel.: + 86 10 63751188
Fax: + 86 10 83682438
info@kontron.cn