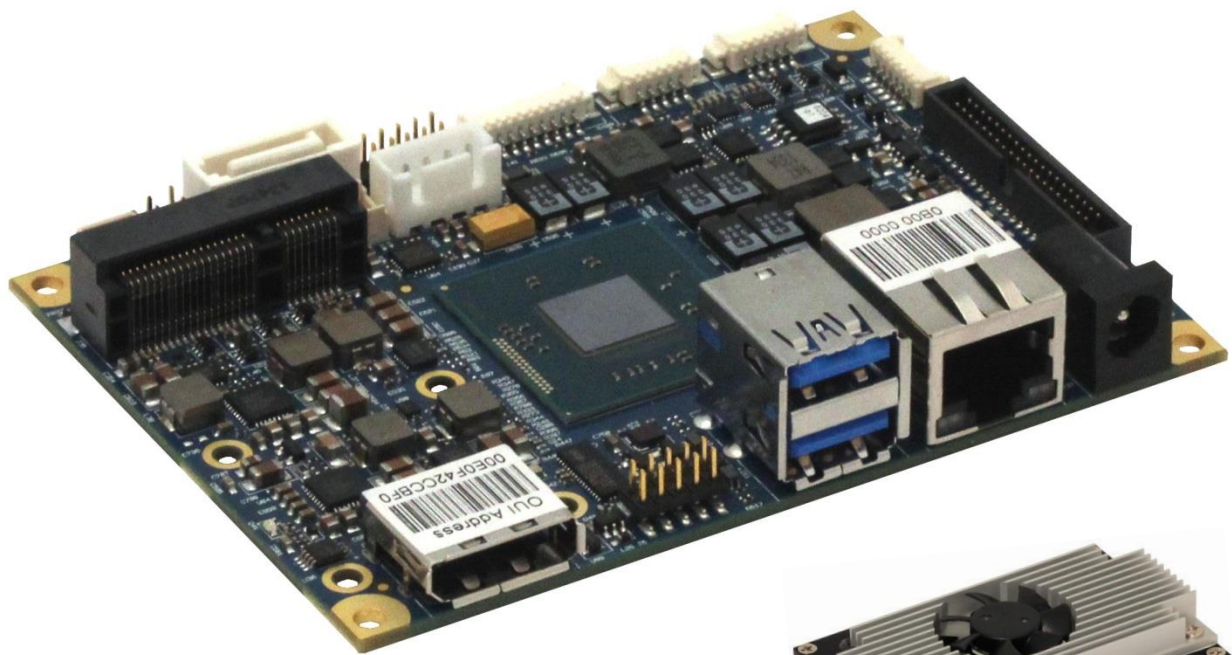


» Kontron User's Guide «



pITX-E38



KTD-N0904-H

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Document Revision History

Revision	Date	By	Comment
H	Sept. 23th 2016	HJS	Replaced corporate and legal information.
G	Aug. 12 th 2016	CW	Audio Connector- changed pinout table I/O type. Changed the pin 1 position of the Available Cable Kit figure in Serial COM1-COM2 port, Audio Connector, Front Panel Connector and Battery Module.
F	April 2016	GSZ	New memory SKU
E	January 26 th 2015	MLA	Battery Module Connector type added. TPM in BIOS section removed. Added note for mSATA selection in BIOS. Added warning when changing cooling system.
D	Nov. 6 th 2014	MLA	<F2> changed to - key to enter BIOS Menu. Added note on "OS Selection". SD changed to MicroSD. Added System Memory Support. Updated BIOS part. Added reference to COM port setup Application Note.
C	Sept. 25 th 2014	MLA	Lithium battery info corrected.
B	Sept. 23 rd 2014	MLA	Added info to DC Power Jack connector. Environmental Conditions update. Added note on mPCIe fixing tool.
A	July 15 th 2014	MLA	Added Frontpanel Pin 1 indication. Reference to "Flex" removed. Power Consumption Measurements added. Added Cooler, Battery Module and connector list. Added cable kits and BIOS part.
0	April 1 st 2014	MLA	Preliminary version

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

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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.

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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.



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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

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1 Introduction

This manual describes the pITX-E38 boards made by Kontron. In this manual the boards will also be denoted E38.

The E38 boards are based on Intel Atom E38xx SoC (System on Chip) "Intel Bay Trail" and will be available in three versions. The three types of boards are listed in this table:

Feature	pITX-E3815	pITX-E3826	pITX-E3845
Bay Trail SoC	E3815 (1 core)	E3826 (2cores)	E3845 (4 cores)
Kontron PN	810602-4500	810601-4500	810600-4500
Core speed	1,46GHz	1,46GHz	1,91GHz
Cooling (integrated)	Passive	Passive	Active
Battery module	Included	Included	Included
Total Design Power	5W	7W	10W



Warning: If changing the premounted cooling system, then the system might get overheated resulting in instable system or defects if the cooling system is sufficient.

Use of this Users Guide implies a basic knowledge of PC-AT hard- and software. This manual is focused on describing the E38 board's special features and is not intended to be a standard PC-AT textbook.

New users are recommended to study the short installation procedure stated in the following chapter before switching-on the power.

All configuration and setup of the CPU board is either done automatically or manually by the user via the BIOS setup menus. Only exceptions are the "Clear CMOS" Jumper and the "Always On" jumper.

Latest revision of this manual, datasheet, BIOS, drivers, BSP's (Board Support Packages), Mechanical drawings (2D and 3D) can be downloaded from here:

<http://www.kontron.com/products/boards-and-standard-form-factors/motherboards/pico-itx/pitx-e38.html>

Battery Module:
PN 1055-7645



Active cooler:



2 Installation Procedure

2.1 Installing the Board

To get the board running follow these steps. If the board shipped from KONTRON has already components like RAM and CPU cooler mounted, then relevant steps below can be skipped.

1. Turn off the PSU (Power Supply Unit)



Warning: 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 +5V single supply only. Alternatively use a standard ATX PSU with suitable cable kit and PS_ON# active.

2. Insert the DDR3L SODIMM module

For a list of approved DDR3L SODIMMs contact your Distributor or FAE. See also chapter "System Memory Support".

3. Cooler Installation

Normally the cooler is premounted, but in case not, then make sure the heat paste etc. on the cooler is intact and cover the full area of the SoC. Connect Cooler Fan electrically to the FAN_CPU connector.

4. Connecting Interfaces

Insert all external cables for hard disk, keyboard etc. A monitor must be connected in order to change BIOS settings.

5. Connect and turn on PSU

Connect PSU to the board by the +5Vin-Internal connector or the +5Vin-External connector. Please note that current limitations apply, see relevant connector description.

6. Power Button

If the board does not start by itself when switching on the ATX PSU AC mains, then follow these instructions to start the board. Install the Always On Jumper in the Always On position or toggle the PWRBTN_IN# signal (available in the FRONTPNL connector), by momentary shorting pins 2 (PWRBTN_IN#) and pin 4 (GND). A "normally open" switch is recommended.

7. BIOS Setup

Enter the BIOS setup by pressing the <F2> key during boot up.

Enter "Exit Menu" and Load Setup Defaults.

Refer to the "BIOS Configuration / Setup" section of this manual for details on BIOS setup. Please note that BIOS may boot in UEFI shell, if so then type exit to activate BIOS menu and select Set-up.

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

8. Mounting the board in chassis



Warning: When mounting the board to chassis etc. please notice that the board contains components on both sides of the PCB which 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 using screws with 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 Requirements IEC60950

Take care when designing chassis interface connectors in order to fulfil the IEC60950 standard.

When an interface or connector has a VCC (or other power) pin which is directly connected to a power plane like the VCC plane:

To protect the external power lines of the peripheral devices the customer has to ensure:

- Wires have suitable rating to withstand the maximum available power.
- That the enclosure of the peripheral device fulfils the fire protecting requirements of IEC60950.

Lithium battery precautions

CAUTION! Danger of explosion if battery is incorrectly re- placed. Replace only with same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instruc- tions.	VORSICHT! Explosionsgefahr bei unsachgemäßem Austausch der Batterie. Ersatz nur durch den selben oder einen vom Hersteller empfohlenen gleichwertigen Typ. Entsorgung gebrauchter Batterien nach Anga- ben 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! Ekspløsjonsfare 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 latteval- mistajan suosittelemaan tyyppiln. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

3 System Specifications

3.1 Component main data

Form factor	pITX (picoITX) 100 mm by 72 mm
Processor	Intel Bay Trail FCBGA1170 Type 3 27x25mm 0.593 Ball Pitch. Three versions available: E3815 (1 core), 1,46GHz, 5W E3826 (2 core), 1,46GHz, 7W E3845 (4 core), 1,91GHz, 10W
Memory	1x DDR3L SODIMM socket supporting single-channel unbuffered DDR3L 1066/1333MHz (PC3-8500/PC3-10600). pITX-E3815/E3826 supports only DDR3-1066MHz. Up to 4GB (Intel specification) however Kontron has qualified 8GB. (ECC not supported).
Lan	1x Gbe LAN Intel I210 "Springville"
DP	DP (DisplayPort) v1.1a Intel® Gen7 Graphics, OpenGL 3.0, OpenCL 1.2, DX11, H.264, MPEG2, MCV, VC-1, VP8
LVDS	LVDS panels up to 2 pixels per clock, 24 bit colors (VESA/JEIDA). Based on DP to LVDS converter type PTN3460BS.
USB	1x USB3.0/2.0 (IO area, lower port) 1x USB2.0 (IO area, upper port) 2x USB2.0 (internal)
Serial	2x Serial ports (RS232) (TTL only) on internal 5-pin connector
Sata	1x SATA2.0
GPIO	10 x GPIOs (General Purpose I/Os), (via GPIO connector)
MicroSD Card	1x MicroSD Card Slot
mPCIe or mSATA	1x mPCIe (miniPCI Express) or 1x mSATA (miniSATA). Full- or halfsize formfactor. (No USB included)
Hardware Monitor Subsystem	- Fan control system support Thermal cruise (fixed temperature limit, no BIOS setup). - Thermal inputs: PCB near SoC temperature (precision +/- 3°C). - System temperature sensor (precision +/- 0.5°C)
Power Supply Unit	+5V single supply via either Vin-Int. (4-pin connector) or Vin-Ext. connector (DC Connector RA 2mm locking type)
Audio	HDA Codec IDT 92HD73C1T5PRGIC1X8: 1x Stereo Line in 1x Stereo Line out 1x Mic in

Environmental Conditions	Operating: -25°C to 75°C operating temperature. It is the customer's responsibility to provide sufficient airflow around each of the components to keep them within allowed temperature range. 10% to 90% relative humidity (non-condensing) Storage: -20°C to 70°C; lower limit of storage temperature is defined by specification restriction of on-board BR2032 battery. Board with battery has been verified for storage temperature down to -40°C by Kontron. 5% to 95% relative humidity (non-condensing) Electro Static Discharge (ESD) / Radiated Emissions (EMI): All Peripheral interfaces intended for connection to external equipment are ESD/ EMI protected. EN 61000-4-2:2000 ESD Immunity EN55022:2006+A1:2007 class B Generic Emission Standard. Safety: IEC 60950-1: 2005, 2nd Edition UL 60950-1 CSA C22.2 No. 60950-1 Product Category: Information Technology Equipment Including Electrical Business Equipment Product Category CCN: NWGQ2, NWGQ8 File number: E194252 Shock: IAW IEC 60068-2-27, Test Ea, shock, 18 shocks 3 per axis, 6 directions. Shock pulse 50g, 11ms halfsine. Bump: IAW IEC 60068-2-29, Test Eb, Bump, 3000 bumps, 500 per axis, 6 directions. Half Sine Waveform Acceleration 2g; Pulse Duration 11ms. Vibration: IAW IEC 60068-2-64, Test Fh, Random Vibration. 90 min per axis, 3 axes, at 1.9 grms, with PSD: 10-20 Hz: 0.05 g²/Hz and 20-500 Hz: -3dB/octave. Theoretical MTBF: 414.670 / 183.190 hours @ 40°C / 75°C. Note that these values are without the active cooler used on the pITX-E3845 (see next page). Restriction of Hazardous Substances (RoHS): All boards in the pITX-E38 family are RoHS compliant. Capacitor utilization: Solid Capacitors with Conductive Polymer rated for 105 °C used on board.
---------------------------------	---

Battery

Battery Module PN 1055-7645. Contains exchangeable 3.0V Lithium battery for on-board Real Time Clock and CMOS RAM.

(via Battery Module)

Manufacturer Panasonic / Part-number BR-2032BN.

Approximate 7.2 years retention.

Current draw is typical less than 3 μ A when PSU is disconnected and 0 μ A in S0 – S5.

Note that if BR-2032BN is replaceable by CR2032 type Panasonic CR-2032L/BN, CR2032N/BN or CR-2032L/BE, then operating temperature range is -25°C to 60°C and storage temperature range is -20°C to 60°C and approximate 8.8 years retention.

Note that Intel specifies that battery must be connected, however it is unspecified what is the risk of not using battery. When battery is not connected, Kontron has not been able to find any problems except for RTC not running.

CAUTION: Danger of explosion if the 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.

Cooler

The Cooler heatspreader is passive on the pITX-E3815 and pITX-E3826, so no fan is included.

The Cooler heatspreader is active on the pITX-E3845, so the cooler has integrated fan (UL-approved) with the following specifications:

Supply Voltage: 4.5V – 5.5V

Startup Voltage: 4.0V

Rotation Speed, rated: 5000 RPM

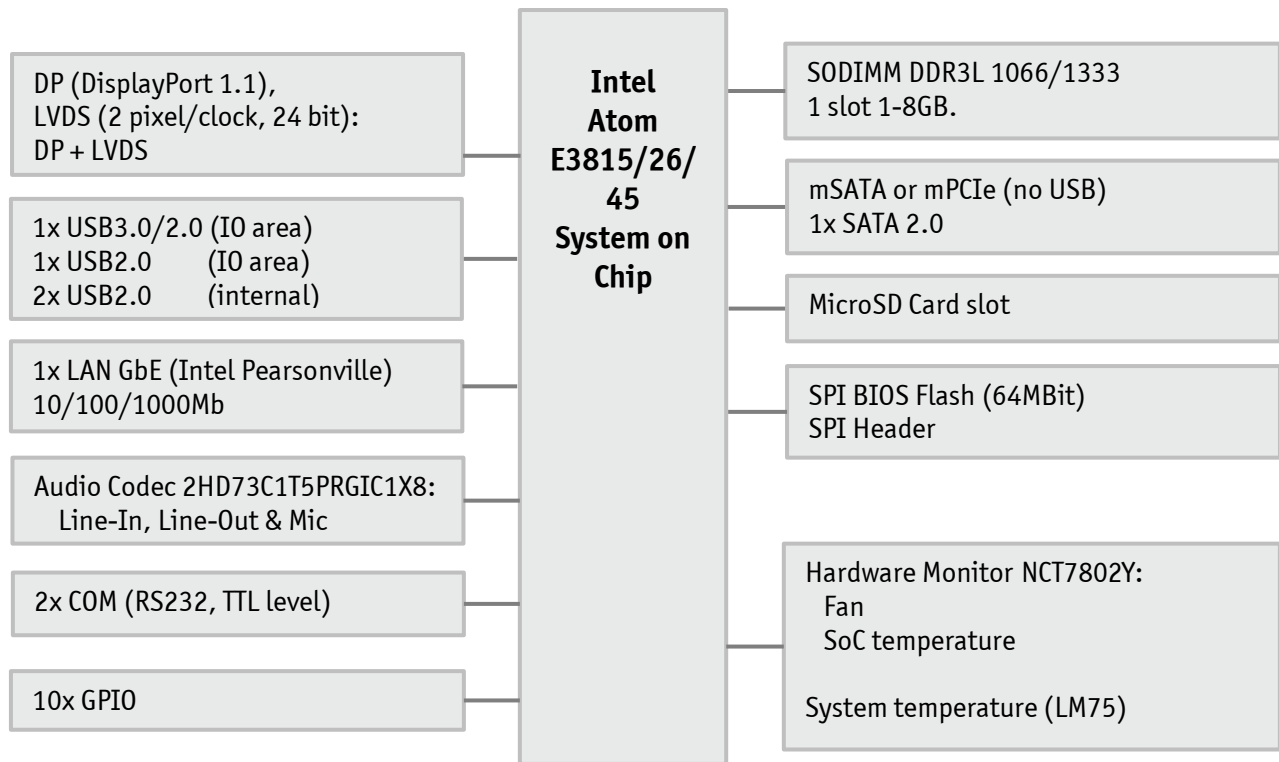
Noise level, maximum: 27.0 dB(A)

MTBF: 70000 Hours @ 40°C

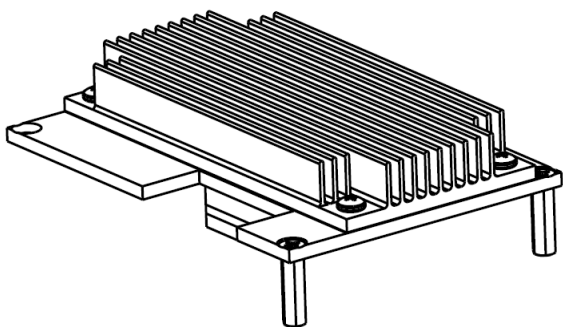
Operating Temperature: -25°C to +90°C

3.1 System overview

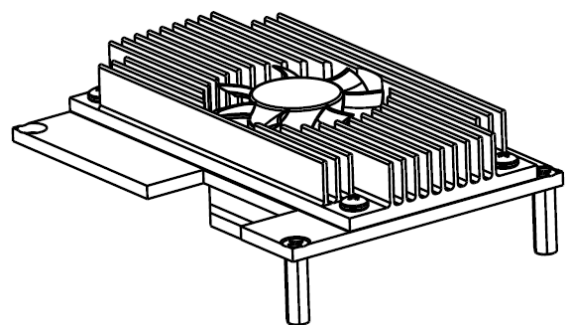
The block diagram below shows the architecture and main components of the pITX-E38. The key component on the board is the Intel® Atom E38xx SoC (Bay Trail).



3.2 Integrated premounted cooler



Passive cooler on the pITX-E3815 and pITX-E3826



Active cooler on the pITX-E3845

3.1 System Memory Support

The pITX-E38 has 1x DDR3L SODIMM 204 pin socket supporting single-channel unbuffered DDR3L 1066/1333MHz (PC3L-8500/PC3L-10600). pITX-E3815/E3826 supports only DDR3-1066MHz. Up to 4GB (Intel specification) however Kontron has qualified 8GB. (ECC not supported).



Note: If using 32bit OS then less than 4GB is displayed in System Properties (Shared Video Memory/PCI resources is subtracted, Windows 32b report 2.88GB free)

Kontron offers the following memory modules for support of the temperature range -25°C to 75°C:

NEW SKU 04/2016*	SKU Name**	OLD SKU before 04/2016
1060-2526	DDR3-1600 SODIMM 1GB E2	1055-9445
1060-2528	DDR3-1600 SODIMM 2GB E2	1055-9446
1060-2530	DDR3-1600 SODIMM 4GB E2	1055-9447
1060-2532	DDR3-1600 SODIMM 8GB E2	1055-9448

*SKU changes were caused by administrative issues only, no hardware changes.

**Named are always the min. requirements, the shipped memory can fulfill a higher performance level

Kontron offers the following memory modules for support of the temperature range 0°C to 60°C:

NEW SKU 04/2016*	SKU Name**	OLD SKU before 04/2016
1060-2520	DDR3L-1600 SODIMM 2GB	1055-9939
1060-2522	DDR3L-1600 SODIMM 4GB	1055-9941
1060-2524	DDR3L-1600 SODIMM 8GB	1055-9942

*SKU changes were caused by administrative issues only, no hardware changes.

**Named are always the min. requirements, the shipped memory can fulfill a higher performance level

Memory modules have in general a much lower longevity than embedded motherboards, and therefore EOL of modules can be expected several times during lifetime of the motherboard. Kontron guarantees that the above P/N will be maintained so that EOL module will be replaced by other similar type of qualified module.

As a minimum it is recommend using Kontron memory modules for prototype system(s) in order to prove stability of the system and as for reference.

For volume production you might request to test and qualify other types of RAM. In order to qualify RAM it is recommend configuring 3 systems running RAM Stress Test program in heat chamber at 60°C or 75°C (depending on the requested maximum temperature) for a minimum of 24 hours.

3.2 Power Consumption

The following items were used in the test setup:

1. Low Power Setup (E3815):

Standard system configuration equipped with Internal graphics, 1x 500GB SATA disk, mSATA 40GB, 1x SODIMM (2GB Modules), DP Monitor, USB Keyboard & Mouse. 1x 8GB USB2.0 Stick, 1x LAN Gigabit.

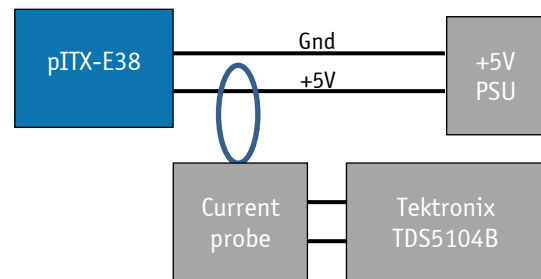
Mid Power Setup (E3826):

Standard system configuration equipped with Internal graphics, 1x 500GB SATA disk, mSATA 40GB, 1x SODIMM (4GB Modules), DP Monitor, USB Keyboard & Mouse. 2x 8GB USB2.0 Stick, 1x LAN Gigabit.

High Power Setup (E3845):

Standard system configuration equipped with Internal graphics, 1x 500GB SATA disk, mSATA 40GB, 1x SODIMM (8GB Modules), DP Monitor, LVDS, USB Keyboard & Mouse. 2x 8GB USB2.0 Stick, 1x 16GB USB3.0 Stick, 1x LAN Gigabit.

2. Active cooler (High & Mid), Passive cooler (Low)
3. USB Keyboard/Mouse
4. 2.5" SATA HDD external power.
5. Agilent E3634A @ 5V, 4A
6. Lecroy SDA820Zi-A Oscilloscope
7. Lecroy AP015 Current Probe
8. USB Flash 1x 8GB USB 2.0
9. USB Flash 1x 16GB USB 3.0
10. DP Monitor 1200x1600
11. LVDS Display 1200x1600
12. mSATA: 40GB
13. Memory: 8/4/2 GB SODIMM 1333 PC3-10600



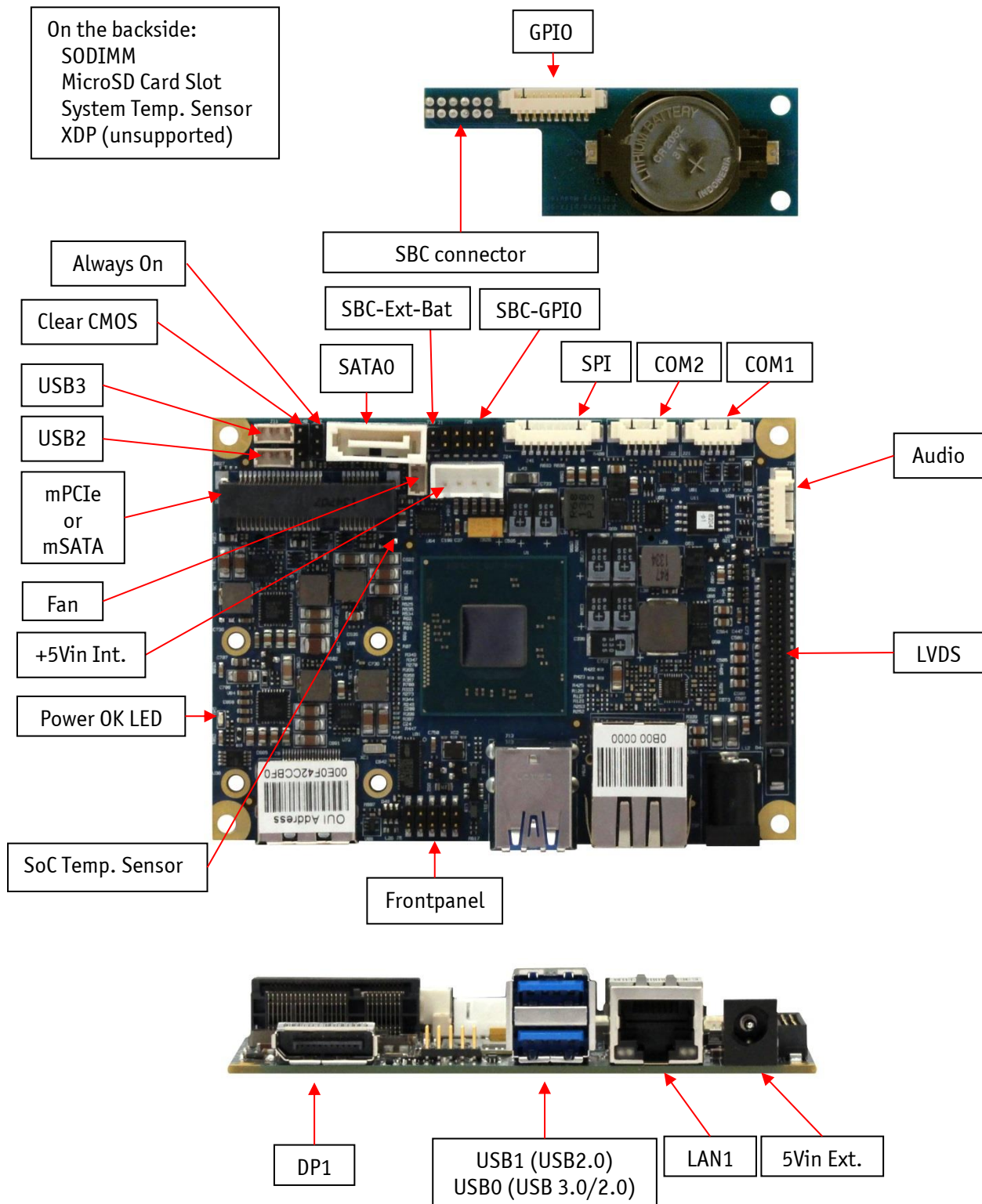
Note that power consumption of the Display and HDD are not included.

Power measurements:

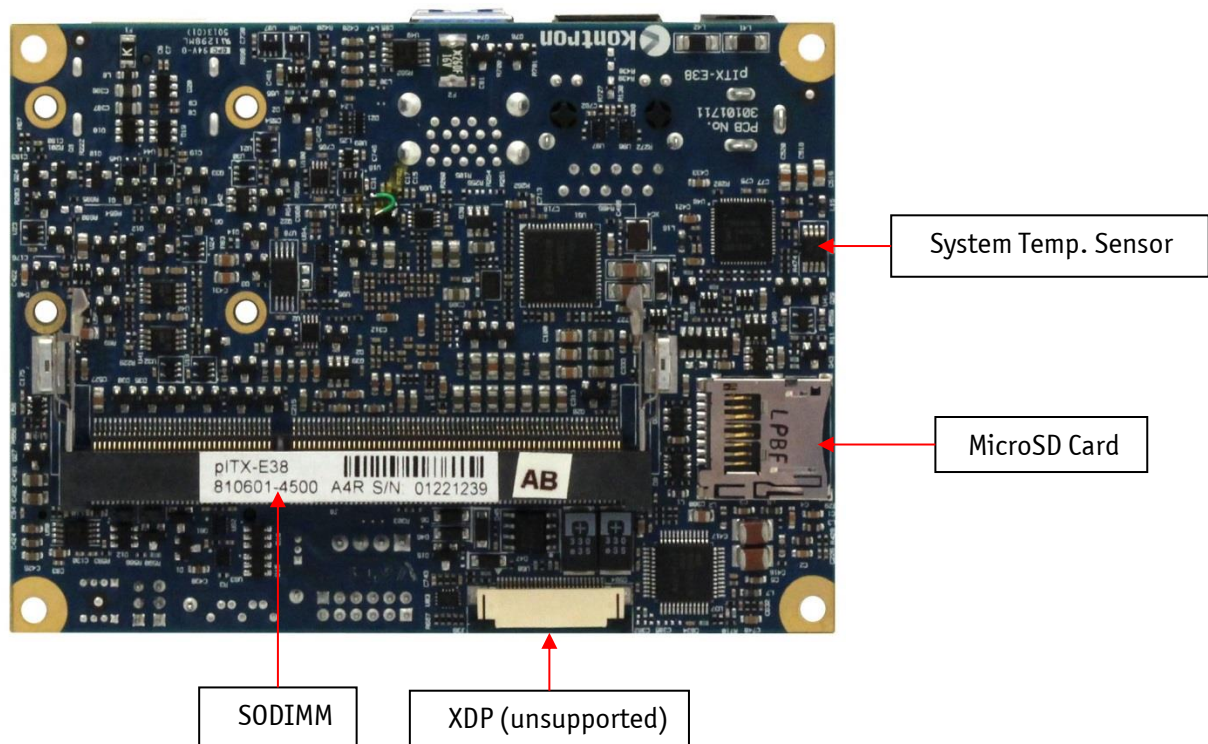
Low Power Setup (E3815)	Mid Power Setup (E3826)	High Power Setup (E3845)
DOS Idle		
760mA - 3.8W	935mA - 4.675W	1150mA - 5.75W
Windows 7, 3DMARK AE (first scene) +Burn in test 7.1		
1320mA - 6.6W	1810mA - 9.05W	2270mA - 11.35W
Windows 7, idle, desktop, no applications running		
848mA - 4.24W	1130mA - 5.65W	1250mA - 6.25W
S3 Mode		
247mA - 1.235W	255mA - 1.275W	266mA - 1.33W
S4 Mode		
239mA - 1.195W	238mA - 1.19W	236mA - 1.18W
S5 Mode		
214mA - 1.070W	219mA - 1.095W	228mA - 1.14

4 Connector Locations

4.1 pITX-E38 - frontside



4.2 pITX-E38 - backside



5 Connector Definitions

The following sections provide pin definitions and detailed description of all on-board connectors.

The connector definitions follow the following notation:

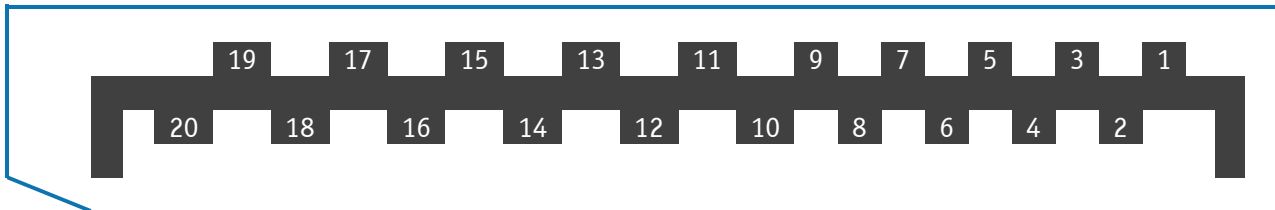
Column name	Description
Pin	Shows the pin-numbers in the connector. The graphical layout of the connector definition tables is made similar to the physical connectors.
Signal	The mnemonic name of the signal at the current pin. The notation "XX#" states that the signal "XX" is active low.
Type	AI: Analogue Input. AO: Analogue Output. I: Input, TTL compatible if nothing else stated. IO: Input / Output. TTL compatible if nothing else stated. IOT: Bi-directional tristate IO pin. IS: Schmitt-trigger input, TTL compatible. IOC: Input / open-collector Output, TTL compatible. IOD: Input / Output, CMOS level Schmitt-triggered. (Open drain output) NC: Pin not connected. O: Output, TTL compatible. OC: Output, open-collector or open-drain, TTL compatible. OT: Output with tri-state capability, TTL compatible. LVDS: Low Voltage Differential Signal. PWR: Power supply or ground reference pins.
	Ioh: Typical current in mA flowing out of an output pin through a grounded load, while the output voltage is > 2.4 V DC (if nothing else stated). Iol: Typical current in mA flowing into an output pin from a VCC connected load, while the output voltage is < 0.4 V DC (if nothing else stated).
Pull U/D	On-board pull-up or pull-down resistors on input pins or open-collector output pins.
Note	Special remarks concerning the signal.

The abbreviation *TBD* is used for specifications which are not available yet or which are not sufficiently specified by the component vendors.

6 IO-Area Connectors

6.1 DP Connectors (DP1)

The DP (DisplayPort) connector is based on standard DP type Foxconn 3VD51203-H7JJ-7H or similar.



Pin	Signal	Description	Type	Note
1	Lane 0 (p)		LVDS	
2	GND		PWR	
3	Lane 0 (n)		LVDS	
4	Lane 1 (p)		LVDS	
5	GND		PWR	
6	Lane 1 (n)		LVDS	
7	Lane 2 (p)		LVDS	
8	GND		PWR	
9	Lane 2 (n)		LVDS	
10	Lane 3 (p)		LVDS	
11	GND		PWR	
12	Lane 3 (n)		LVDS	
13	Config1	Aux or DDC selection	I	Internally pull down (1Mohm). Aux channel on pin 15/17 selected as default (when NC) DDC channel on pin 15/17, If HDMI adapter used (3.3V)
14	Config2	(Not used)	0	Internally connected to GND
15	Aux Ch (p)	Aux Channel (+) or DDC Clk		AUX (+) channel used by DP DDC Clk used by HDMI
16	GND		PWR	
17	Aux Ch (n)	Aux Channel (-) or DDC Data		AUX (-) channel used by DP DDC Data used by HDMI
18	Hot Plug		I	Internally pull down (100Kohm).
19	Return		PWR	Same as GND
20	3.3V		PWR	Fused by 1.5A resetable PTC fuse.

6.2 Ethernet Connector

The pITX-E38 support single channels of 10/100/1000Mb Ethernet based on Intel® Springville i210.

In order to achieve the specified performance of the Ethernet port, Category 5 twisted pair cables must be used with 10/100MB and Category 5E, 6 or 6E with 1Gb LAN networks.

The signals for the Ethernet ports are as follows:

Signal	Description
MDI[0]+ / MDI[0]-	In MDI mode, this is the first pair in 1000Base-T, i.e. the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX.
MDI[1]+ / MDI[1]-	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.
MDI[2]+ / MDI[2]-	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.
MDI[3]+ / MDI[3]-	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.

Note: MDI = Media Dependent Interface.

The pinout of the RJ45 connectors is as follows:

Signal	PIN	Type	Ioh/Iol	Note
MDI0+				
MDI0-				
MDI1+				
MDI2+				
MDI2-				
MDI1-				
MDI3+				
MDI3-				
Flashing => communication	 8 7 6 5 4 3 2 1	On => 1GB link		

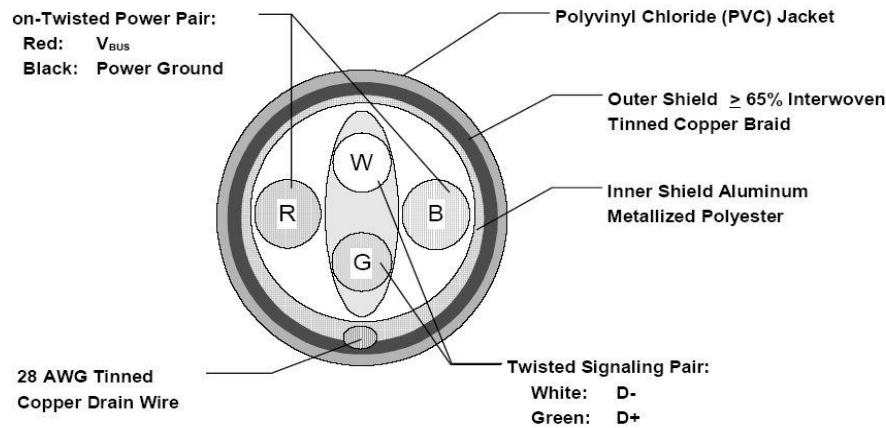
6.1 USB Connectors (IO Area)

The pITX-E38 board contains support for 1 USB3.0/2.0 port (Lower USB port, USB0) and one USB2.0 port (higher USB port, USB1) in the IO area.

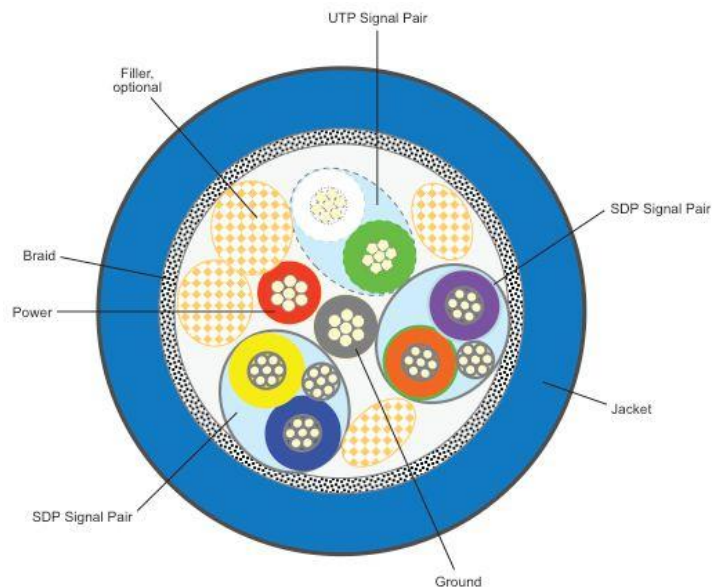
USB 2.0 ports allowing data transfers up to 480Mb/s. The USB 3.0 port allowing data transfers up to 5Gb/s.

(Two internal USB ports are available via internal 4-pin connectors)

For USB2.0 cabling it is required to use only HiSpeed USB cable, specified in USB2.0 standard:



For USB3.0 cabling it is required to use only HiSpeed USB cable, specified in USB3.0 standard:



USB Ports 0 and 1 are mounted together, USB1 (USB2.0) on top of the USB0 (USB3.0/USB2.0).

Note	Type	Signal	PIN				Signal	Type	Note
	IO	USB1-				USB1+			IO
1	PWR	5V/SB5V	1	2	3	4	GND	PWR	
	-	nc	5	6	7	8	9	nc	-
	-	nc				nc			-
	PWR	GND							
	IO	USB0-				USB0+			IO
1	PWR	5V/SB5V	1	2	3	4	GND	PWR	
	IO	RX0-	5	6	7	8	9	TX0+	IO
	IO	RX0+				TX0-			IO
	PWR	GND							

Note 1: In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

Signal	Description
USBn+ USBn- RXn+ RXn- TXn+ TXn- (n= 0,1)	Differential pair works as serial differential receive/transmit data lines.
5V/SB5V	5V supply for external devices. SB5V is supplied during power-down to allow wakeup on USB device activity. Protected by 1.0A current limiting circuit for each USB port.

6.2 DC Power Jack Connector (5Vin Ext.)

Either the DC Power Jack Connector (5Vin Ext.) or the “5Vin Int.” connector must be used to supply the board with +5V +/-5%.

The 5Vin Ext. power connector has Vin to the center pin and mates with Ø 6.3 mm DC Power jack with Ø 2.0 mm pin hole. (DC Connector RA 2mm locking type). Maximum allowed current is 5A.

Warning: Hot Plugging power supply is not supported. Hot plugging might damage the board.

Notes: **To protect the external power lines of peripheral devices make sure that**

- the wires have the right diameter to withstand the maximum available current.
- to enclosure of the peripheral device fulfills the fire-protecting conditions of IEC/EN 60950.

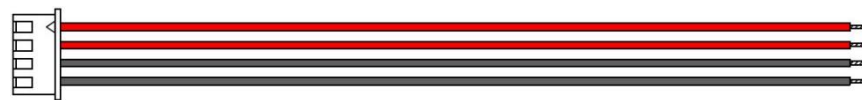
7 Internal Connectors

7.1 Internal Power Connector (Vin Int.)

Header	Pin	Signal	Description	Type
	1	+5V	+5V power input	PWR
	2	+5V	+5V power input	PWR
	3	GND	Power Ground	PWR
	4	GND	Power Ground	PWR

Maximum allowed current on each pin is 3A.

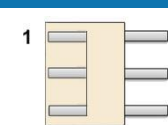
Available cable kit:



1055-8061 Cable Power 4p 30cm OE pITX-E38

7.2 Fan Connector (Fan)

The Fan can be used to actively cool the heatsink mounted on the board. The fan rotation speed can be monitored and the fan speed controlled by the temperature of the PCB (near SoC).

Header	Pin	Signal	Description	Type
	1	TACHO	Rotation speed	I
	2	PWM	PWM output	0-5V
	3	GND	Ground	PWR

Signal	Description
PWM	PWM output signal for FAN speed control.
TACHO	Tacho input signal from the fan, for rotation speed supervision RPM (Rotation Per Minute). The signal shall be generated by an open collector transistor or similar. Onboard is a pull-up resistor 2K2 to +3.3V. The signal has to be pulsed and onboard circuit is prepared for two pulses per rotation.
GND	Power Supply GND signal

7.1 LVDS Flat Panel Connector (LVDS)

The LVDS connector is based on 40 pole connector type Samtec SHF-120-01-F-D-SM-K-TR or similar.

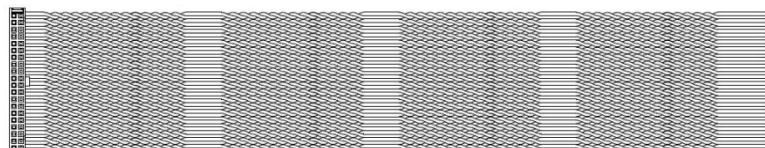
Note	Type	Signal	PIN	Signal	Type	Note
Max. 0.5A	PWR	+5V	1 2	+5V	PWR	Max. 0.5A
Max. 0.5A	PWR	+5V	3 4	+5V	PWR	Max. 0.5A
Max. 0.5A	PWR	+5V	5 6	GND	PWR	Max. 0.5A
Max. 0.5A	PWR	+5V	7 8	GND	PWR	Max. 0.5A
Max. 0.5A	PWR	LCDVCC	9 10	LCDVCC	PWR	Max. 0.5A
2K2Ω, 3.3V	OT	DDC CLK	11 12	DDC DATA	OT	2K2Ω, 3.3V
3.3V level	OT	BKLTCTL	13 14	VDD ENABLE	OT	3.3V level
3.3V level	OT	BKLTEN#	15 16	GND	PWR	Max. 0.5A
	LVDS	LVDS A0-	17 18	LVDS A0+	LVDS	
	LVDS	LVDS A1-	19 20	LVDS A1+	LVDS	
	LVDS	LVDS A2-	21 22	LVDS A2+	LVDS	
	LVDS	LVDS ACLK-	23 24	LVDS ACLK+	LVDS	
	LVDS	LVDS A3-	25 26	LVDS A3+	LVDS	
Max. 0.5A	PWR	GND	27 28	GND	PWR	Max. 0.5A
	LVDS	LVDS B0-	29 30	LVDS B0+	LVDS	
	LVDS	LVDS B1-	31 32	LVDS B1+	LVDS	
	LVDS	LVDS B2-	33 34	LVDS B2+	LVDS	
	LVDS	LVDS BCLK-	35 36	LVDS BCLK+	LVDS	
	LVDS	LVDS B3-	37 38	LVDS B3+	LVDS	
Max. 0.5A	PWR	GND	39 40	GND	PWR	Max. 0.5A

Note: The LVDS connector supports single and dual channel, 18/24bit SPWG panels up to a resolution of 1600x1200 or 1920x1080 and with limited frame rate up to 1920x1200.

Signal	Description
LVDS A0..A3	LVDS A Channel data
LVDS ACLK	LVDS A Channel clock
LVDS B0..B3	LVDS B Channel data
LVDS BCLK	LVDS B Channel clock
BKLTCTL	Backlight control (1), PWM signal to implement voltage in the range 0-3.3V
BKLTEN#	Backlight Enable signal (active low) (2)
VDD ENABLE	Output Display Enable.
LCDVCC	VCC supply to the display. 5V or 3.3V (1A Max.) selected in BIOS setup menu. Power sequencing depends on LVDS panel selection. (Shared with eDP connector)
DDC CLK	DDC Channel Clock

Notes: Windows API will be available to operate the BKLTCTL signal. Some Inverters have a limited voltage range 0- 2.5V for this signal: If voltage is > 2.5V the Inverter might latch up. Some Inverters generates noise on the BKLTCTL signal, causing the LVDS transmission to fail (corrupted picture on the display). By adding a 1Kohm resistor in series with this signal, mounted at the Inverter end of the cable kit, the noise is limited and the picture is stable.
If the Backlight Enable is required to be active high then, check the following BIOS Chipset setting: Backlight Signal Inversion = Enabled.

Available cable kit:



821515 Open End LVDS Cable 572mm

7.2 SATA (Serial ATA) Disk interface (SATA0)

Sata0 connector pinning:

PIN	Signal	Type	Ioh/Iol	Note
1	GND	PWR	-	
2	SATA* TX+			
3	SATA* TX-			
4	GND	PWR	-	
5	SATA* RX-			
6	SATA* RX+			
7	GND	PWR	-	

Signal	Description
SATA0 RX+ / RX-	Host transmitter differential signal pair
SATA0 TX+ / TX-	Host receiver differential signal pair

Available cable kit:



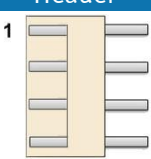
PN 96079-0000-00-1 Cable SATA 500mm

7.3 USB Connectors (USB2 and USB3)

The pITX-E38 support two internal USB 2.0 ports (USB2 and USB3) allowing data transfers up to 480Mb/s.

Legacy Keyboard/Mouse and wakeup from sleep states are supported. Over-current detection on all fourteen USB ports is supported.

See chapter “USB Connectors (IO Area)” for more information on USB0 – USB1.

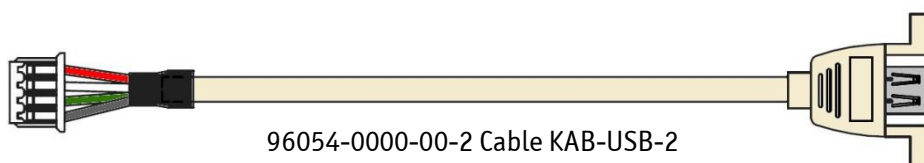
Header	Pin	Signal	Description	Type
	1	GND	Ground	PWR
	2	USBx+		IO
	3	USBx-		IO
	4	5V/SB5V	5V power	PWR

Note1:

Signal	Description
USBx+ USBx-	Differential pair works as Data/Address/Command Bus.
5V/SB5V	5V supply for external devices. SB5V is supplied during powerdown to allow wakeup on USB device activity. Protected by 1.0A current limiting circuit for each USB port.

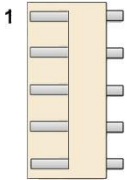
In order to meet the requirements of USB standard, the 5V input supply must be at least 5.00V.

Available cable kit:



7.4 Serial COM1 – COM2 Ports (COM1, COM2)

Two RS232 serial ports (TTL signals only) are available on the pITX-E38.

Header	Pin	Signal	Description	Type
	1	TxD	TTL signal	O
	2	RxD	TTL signal	I
	3	RTS	TTL signal	O
	4	CTS	TTL signal	I
	5	GND	Ground	PWR

The typical definition of the signals in the COM ports is as follows:

Signal	Description
TxD	Transmitted Data, sends data to the communications link. The signal is set to the marking state (0V) on hardware reset when the transmitter is empty or when loop mode operation is initiated.
RxD	Received Data, receives data from the communications link.
RTS	Request To Send, indicates to the modem etc. that the on-board UART is ready to exchange data.
CTS	Clear To Send, indicates that the modem or data set is ready to exchange data.

Available cable kit:

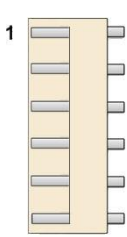


1055-8059 Cable Serial 5p 20cm OE pITX-E38

For more detailed information how to set up the COM ports please find KTD-N0914 “pITX-E38 COM port Application Note” on EMD Customer Section http://emdcustomersection.kontron.com/wp-login.php?redirect_to=/

7.5 Audio Connector

The on-board Audio circuit implements High Definition Audio with UAA (Universal Audio Architecture), featuring 24-bit stereo DAC and 20-bit stereo ADCs.

Header	Pin	Signal	Color	Type
	1	Line-in left	Brown	I
	2	Mic	Blue	I
	3	Line-in right	Green	O
	4	Line-out left	Red	O
	5	GND	Black	PWR
	6	Line-out right	Yellow	O

Available cable kit:

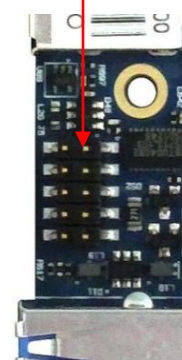


96063-0000-00-1 Cable KAB-SOUND-CMP-2

7.6 Front Panel Connector (FRONTPNL)

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
	-	-	I	PWRBTN_IN#	2 1	RSTIN#	I	-	-	
	-	-	PWR	Gnd	4 3	GND	PWR	-	-	
	-	-	PWR	5V	6 5	Beep	O	-	-	2
	220R	-	O	3.3V	8 7	3.3V	O	-	220R	
1	-	-	O	SuspendLED	10 9	SataLED#	O	-	-	1

Pin 1

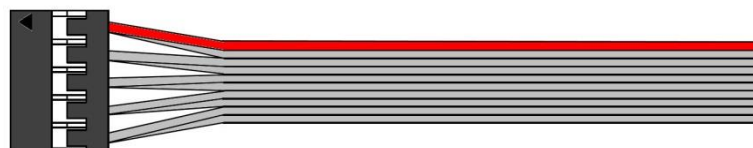


Note1, LED output has integrated 220 ohm.

Note 2: Beep buzzer input / open collector output. The buzzer's positive wire connects to 5 V and the buzzer's negative wire connects to Beep.

Signal	Description
RSTIN#	Reset Input active low.
PWRBTN_IN#	Power Button In. Toggle this signal low to boot the board or to shut down.
Beep	Beep buzzer input / open collector output
+5V	5V maximum load is 500mA.
3.3V	3.3V signal via 220 ohm resistor pullup to 3.3V.
SATA_LED#	SATA Activity LED (active low signal). 3V3 output when passive.
SUS_LED	Suspend Mode LED (active high signal). Output 3.3V via 220Ω.

Available cable kit:



1055-8065 Cable Frontpanel 10p 20cm OE pITX-E38

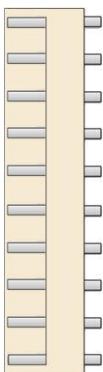
7.7 Battery Module

The battery module PN 1055-7645 contains Lithium battery BR2032/BN in a socket, GPIO connector and SBC-Connector. The SBC Connector is used to interface the SBC-GPIO and SBC-Ext-Bat connectors.

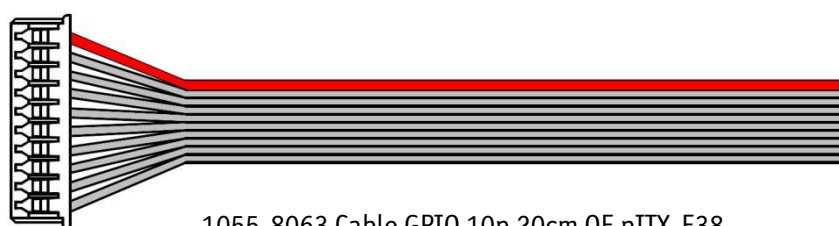


GPIO Connector (GPIO)

The GPIO connector is present on the Battery Module, type Molex 53261-1071 (or similar).

Header	Pin	Signal	Description	Type
	1	3.3V	3.3V Power Out	PWR
	2	GPIO0		IOT
	3	GPIO1		IOT
	4	GPIO2		IOT
	5	GPIO3		IOT
	6	GPIO4		IOT
	7	GPIO5		IOT
	8	GPIO6		IOT
	9	GPIO7		IOT
	10	GND	Ground	PWR

Available cable kit:



1055-8063 Cable GPIO 10p 20cm OE pITX-E38

SBC Connector (SBC-Connector)

The SBC connector is present on the Battery Module and used to interface the Battery Module to the SBC.

Note	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Note
	-	-		Bat-	2 1	Bat+			-	
	-	TBD	IOT	GPIO7	4 3	GND	PWR		-	
	-	TBD	IOT	GPIO5	6 5	GPIO6	IOT	TBD	-	
	-	TBD	IOT	GPIO3	8 7	GPIO4	IOT	TBD	-	
	-	TBD	IOT	GPIO1	10 9	GPIO2	IOT	TBD	-	
	-		PWR	3.3V	12 11	GPIO0	IOT	TBD	-	

7.8 SBC-GPIO Connector (SBC-GPIO)

The SBC-GPIO connector is present on the SBC and used to interface the Battery Module. The two connectors SBC-GPIO and SBC-Ext-Bat is positioned so that they fit a single 2x6 pin header connector on the Battery Module.

Battery Module	Pull U/D	Ioh/Iol	Type	Signal	PIN	Signal	Type	Ioh/Iol	Pull U/D	Battery Module
SBC-12	-	-	PWR	3.3V	1 2	GPIO0	IOT	TBD		SBC-11
SBC-10	-	TBD	IOT	GPIO1	3 4	GPIO2	IOT	TBD		SBC-9
SBC-8	-	TBD	IOT	GPIO3	5 6	GPIO4	IOT	TBD		SBC-7
SBC-6	-	TBD	IOT	GPIO5	7 8	GPIO6	IOT	TBD		SBC-5
SBC-4	-	TBD	IOT	GPIO7	9 10	GND	PWR	-	-	SBC-3

Signal	Description
3.3V	
GPIO0..7	General Purpose Inputs / Output. These Signals may be controlled or monitored through the use of the KT-API-V2 (Application Programming Interface).

7.9 SBC-External battery (SBC-Ext-Bat)

The two connectors SBC-GPIO and SBC-Ext-Bat is positioned so that they fit a single 2x6 pin header connector on the Battery Module.

Pin 1 is Bat+, (same as pin 1 on the SBC connector on the Battery Module)

Pin 2 is Bat-, (same as pin 2 on the SBC connector on the Battery Module)

Note that Intel specifies that battery must be connected, however it is unspecified what is the risk of not using battery. When battery is not connected, Kontron has not been able to find any problems except for RTC not running.

7.10 Clear CMOS (CLR-CMOS)

Connect jumper to clear CMOS settings. Don't leave the jumper installed.

CMOS1		Description
pin1-2	pin2-3	
-	X	Default position
X	-	Load Default BIOS Settings exclusive erasing Password
-	-	No function.

7.11 “Always On” (Always On)

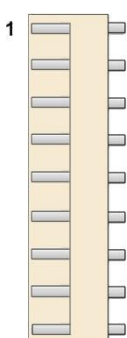
The “Always On” can be used to implement hardware controlled Always ON by jumper. When “Always On” is selected, then the board will power up automatically when power is connected. It doesn't matter if “Always On” is not selected in BIOS.

The board can still be shut down by PWRBTN_IN# (power button in) activation (via Front Panel connector).

Always On		Description
pin1-2	pin2-3	
X	-	Always On selection
-	X	Default position
-	-	No function. Note: may load default BIOS settings after several minutes

7.12 SPI Connector (SPI)

The SPI (Serial Peripheral Interface) Bus connector provides synchronous full duplex in a 9 pin header.

Header	Pin	Signal	Description	Type
	1	GND	Ground	PWR
	2	SPI_MISO	SPI master input, Slave Output	IO-3.3
	3	SPI_MOSI	SPI master output, Slave Input	IO-3.3
	4	SPI_CS#	SPI slave select, active low	O-3.3
	5	SPI_CLK	SPI clock	O-3.3
	6	NC	Not connected	NC
	7	3.3V	3.3V Power	PWR
	8	ADDIN	Disable onboard SPI flash	I-3.3
	9	ISOLATE#	Disable the SPI interface	I-3.3

Signal	Description
SPI_CLK	Serial Clock
3.3V	3.3V Standby Voltage power line. Normally output power, but when Motherboard is turned off then the on-board SPI Flash can be 3.3V power sourced via this pin.
SPI_CS#	CS# Chip Select, active low.
ADDIN	ADDIN input signal must be NC.
SPI_MOSI	Master Output, Slave Input.
ISOLATE#	The ISOLATE# input, active low, is normally NC, but must be connected to GND when programming the SPI flash. Power Supply to the Motherboard must be turned off when loading SPI flash. The pull up resistor is connected via diode to 5VSB.
SPI_MISO	Master Input, Slave Output
SPI_IO2_#WP	SPI Data I/O: A bidirectional signal used to support Dual IO Fast Read, Quad IO Fast Read and Quad Output Fast Read modes. The signal is not used in Dual Output Fast Read mode.
SPI_IO3_#HOLD	SPI Data I/O: A bidirectional signal used to support Dual IO Fast Read, Quad IO Fast Read and Quad Output Fast Read modes. The signal is not used in Dual Output Fast Read mode.

7.13 XDP (XDP)

The XDP-CPU (Intel Debug Port for CPU) connector is not mounted and not supported. XDP connector layout (pads) is located on the backside of PCB and is prepared for the Molex 52435-2671 (or 52435-2672).

Pin	Signal	Description	Type	Pull Up/Down	Note
1	OBSFN_A0			220R to 1,8V	
2	OBSFN_A1				
3	GND		PWR	-	
4	NC		NC	-	
5	NC		NC	-	
6	GND		PWR	-	
7	NC		NC	-	
8	NC		NC	-	
9	GND		PWR	-	
10	HOOK0	PMC_RSMRST#			
11	HOOK1	PWRBTN#			
12	HOOK2	PMC_CORE_PWROK			
13	HOOK3	XDP_RTEST#			
14	HOOK4		NC		
15	HOOK5		NC		
16	+1,8V		PWR	-	
17	HOOK6	PLTRST#			
18	HOOK7	1,8V_SYS_RESET#			
19	GND		PWR	-	
20	TDO			50R to 1,8V	
21	TRST#			/50R	
22	TDI			50R to 1,8V	
23	TMS			50R to 1,8V	
24	NC		NC	-	
25	GND		PWR	-	
26	TCKO			/50R	

8 Slot Connectors (mPCIe, mSATA, MicroSD card)

8.1 mPCIe or mSATA slot

The miniPCIe port support mPCIe, mSATA and LPC POST module.
(No USB is included).



Note	Type	Signal	PIN		Signal	Type	Note
		WAKE#	1	2	+3V3	PWR	
	NC	NC	3	4	GND	PWR	
	NC	NC	5	6	+1.5V	PWR	
1		CLKREQ#	7	8	LPC_Frame#	O	
	PWR	GND	9	10	LPC_AD3	IO	
		PCIE_mini CLK#	11	12	LPC_AD2	IO	
		PCIE_mini CLK	13	14	LPC_AD1	IO	
	PWR	GND	15	16	LPC_ADO	IO	
3	O	RST#_LPC	17	18	GND	PWR	
	O	CLK_Debug	19	20	W_Disable#		2
	PWR	GND	21	22	RST#		
		PCIE_RXN	23	24	+3V3 Dual	PWR	
		PCIE_RXP	25	26	GND	PWR	
	PWR	GND	27	28	+1.5V	PWR	
	PWR	GND	29	30	SMB_CLK		
		PCIE_TXN	31	32	SMB_DATA		
		PCIE_TXP	33	34	GND	PWR	
	PWR	GND	35	36	NC	NC	
	PWR	GND	37	38	NC	NC	
	PWR	+3V3 Dual	39	40	GND	PWR	
	PWR	+3V3 Dual	41	42	NC	NC	
	PWR	GND	43	44	NC	NC	
		CLK_MPCIE	45	46	NC	NC	
		DATA_MPCIE	47	48	+1.5V	PWR	
		RST_MPCIE#	49	50	GND	PWR	
		SEL_MSATA	51	52	+3V3 Dual	PWR	

Note 1: 10K ohm pull-up to 3V3.

Note 2: 2K2 ohm pull-up to 3V3 Dual.

Note 2: 10K ohm pull-down to GND.

Recommended fixing tool is "Richco MDLSP1-08M-01"

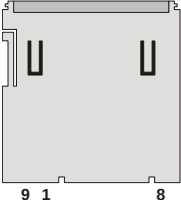
<http://portal.richco-inc.com/login>



8.2 MicroSD card slot

SD Card 3.0 interface.

- Up to 832Mbits per second data rate using up to 4 parallel data lines.
- Transfers the data in following UHS-I modes: HS and DDR50.
- Cyclic Redundancy Check CRC7 for command and CRC16 for data integrity.
- Designed to work with I/O cards, Read-only cards and Read/Write cards.
- Supports Read wait Control. SDIO only validated with WIFI devices.

Header	Pin	Signal	Description	Type
	1	CD / DATA3	Card detect / Data bit 3	IO-3.3
	2	CMD	Command line	IO-3.3
	3	GND	Ground	PWR
	4	VCC3	Power +3.3V	PWR
	5	CLK	Clock	0-3.3
	6	GND	Ground	PWR
	7	DATA0	Data bit 0	IO-3.3
	8	DATA1	Data bit 1	IO-3.3
	9	DATA2	Data bit 2	IO-3.3
	10	CD#	Card Detection on low	I
	11	WP	Write Protect	I

9 On-board - & mating connector types

The Mating connector(s) / Cable Kits(s) which are fitting the On-board connectors are listed in below table. The highlighted cable kits are included in the “pITX-E38 Cable & Driver Kit” PN 1056-2142 / 1000000021 (Different quantity of each cable kit included, depending on the quantity of onboard connectors).

Connector	On-board Connectors		Mating Connectors / Cables	
	Manufacturer	Type no.	Manufacturer	Type no.
FAN (J25)	MOLEX	53047-0310		
XDP (J39)	MOLEX	52435-2671		
SATA0 (J30)	LOTES	ABA-SAT-055-K03	Kontron	96079-0000-00-1 (cable)
+5Vin Int. (J24)	JST	B4B-XH-A(LF)(SN)	Kontron	1055-8061 (cable)
USB2 (J12)	MOLEX	53047-0410	Kontron	96054-0000-00-2 (cable)
USB3 (J11)	EFCO	1250S-04TW		
LVDS (J10)	DON CONNEX	C44-40BSBC1-G	Don Connex	A32-40-C-G-B-1
	WIESON TECHNOLOGIES	G2124-03200101-00	Kontron	910000005
	Hon Kon Technology	HB12-220-VFS-20R	Kontron	821515 (cable)
	SAMTEC	SHF-120-01-F-D-SM-K-TR	Kontron	821155 (cable)
COM1 (J21)	MOLEX	53261-0571	Kontron	1055-8059 (cable)
COM2 (J22)				
Audio (J28)	MOLEX	53261-0671	Kontron	96063-0000-00-1 (cable)
Ext. Battery (J1)	Wuerth Elektronik	62000211121	Kontron	Battery Module
	W+P	314-010-002-XX		
Always On (J42) Clear CMOS (J40)	YIMTEX	3291*03SAGR(6T)	TE Connectivity	382575-3 (jumper)
			TE Connectivity	382575-2 (jumper)
			W+P	351-201-10-00/BF*2 (jumper)
SPI (J41)	MOLEX	53261-0971		
FRONTPNL (J5)	MOLEX	87759-1014	Kontron	1055-8065 (cable)
GPIO (J2) (2x6 pin to Battery Module)	PLASTRON	LTZ-10S2-B-C/D-F		
	PLASTRON	LTZ-10S2-B-040/028-F		
	FCI	57102-F06-05ULF		
	MOLEX	0877581016		
	W+P	314-200-010-00		
GPIO 10-pole (from Battery Module)	Molex	53261-1071	Kontron	1055-8063 (cable)
	ACES ELECTRONIC	85204-10001		
	ACES ELECTRONIC	85204-10301		

Note: In above table, more than one connector can be listed for each type of on-board connector, if they all have same fit, form and function and are approved by Kontron as an alternative. Please notice that standard connectors like DP, miniPCIE, Ethernet and USB are not included in the list.

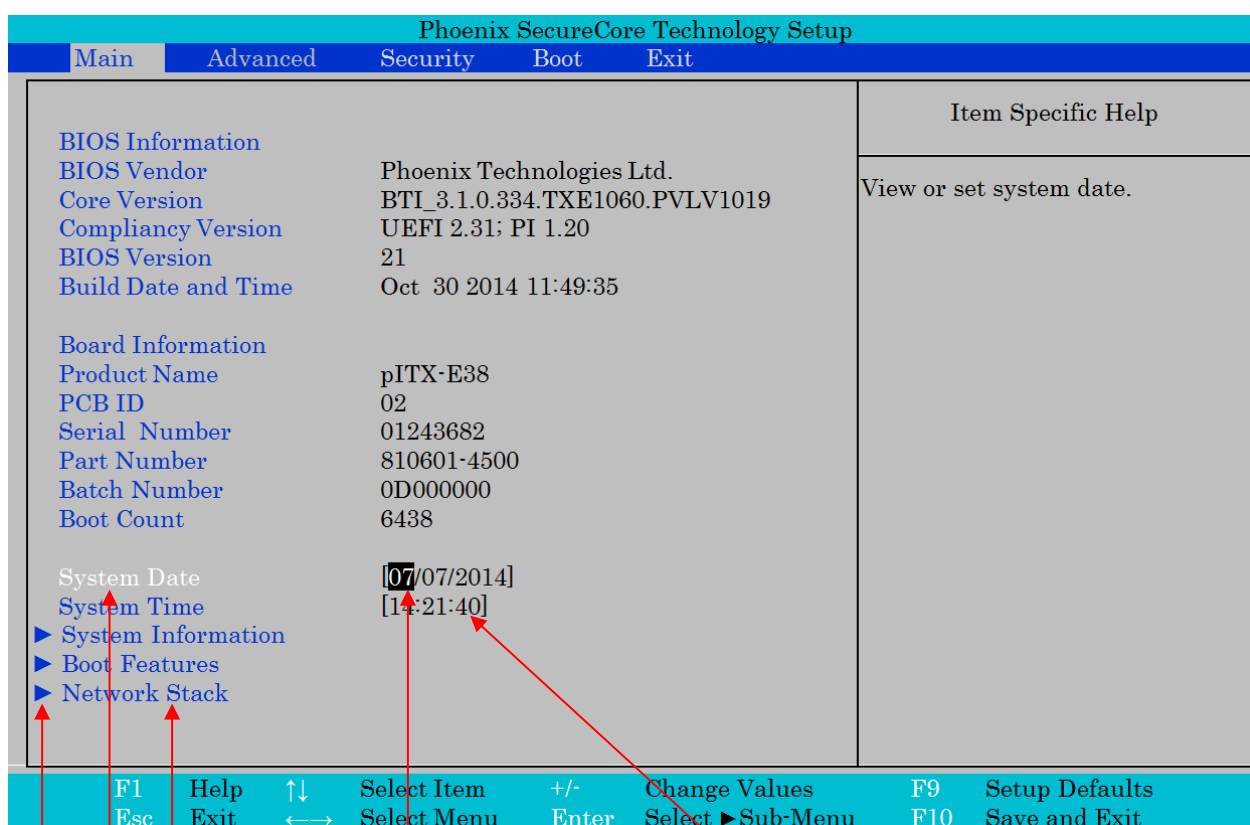
10 BIOS

The BIOS Setup is used to view and configure BIOS settings for the board. The BIOS Setup is accessed by pressing the -key (<F2>-key on BIOS version v.16 or below) after the Power-On Self-Test (POST) memory test begins and before the operating system boot begins.

From the EFI Shell write "Exit" followed by <TAB> and <Return> in order to enter BIOS Menu menu.

The BIOS settings will be loaded automatically when loading "Restore Default" see "Save & Exit" menu. In this Users Guide the default settings are indicated by **bold**. Please notice that "Restore User Defaults" might have different set of default values.

10.1 Main



Sub Menu available.

White text for actual selected function which can be modified.

Blue text for functions (not all can be modified).

Black background for actual selection. Black text actual settings.

The following table describes the changeable settings:

Feature	Options	Description
System Date	MM/DD/YYYY	Set the system date.
System Time	HH:MM:SS	Set the system time.

System Information

Phoenix SecureCore Technology Setup			
Main			
System Information			
BIOS Version	pITXE38.334.TXE1060.PVLV1019.B21 X64		
Build Time	10/30/2014		
Processor Type	Intel ® Atom™ CPU E3845 @ 1.91GHz		
Processor Speed	1.926 GHz		
System Memory Speed	1333 MHz		
L2 Cache RAM	2048 KB		
Total Memory	4096 MB		

F1	Help	↑↓	Select Item	+/-	Change Values	F9	Setup Defaults
Esc	Exit	←→	Select Menu	Enter	Select ► Sub-Menu	F10	Save and Exit

Boot Features

Phoenix SecureCore Technology Setup									
Main									
Boot Features						Item Specific Help			
NumLock: [On] Timeout [0] CSM Support [Yes] Quick Boot [Disabled] Diagnostic Splash Screen [Disabled] Diagnostic Summary Screen [Disabled] BIOS Level USB [Enabled] Console Redirection [Disabled] Allow Hotkey in S4 resume [Enabled] UEFI Boot [Enabled] Legacy Boot [Enabled] Boot in Legacy Video Mode [Disabled] Load OPROM [All]						Select Power-on state for NumLock.			
F1	Help	↑↓	Select Item	+/-	Change Values	F9	Setup Defaults		
Esc	Exit	←→	Select Menu	Enter	Select ► Sub-Menu	F10	Save and Exit		

Function	Selection	Description
NumLock:	On Off	Select Power-on state for NumLock.
Timeout	0 Note 1	Number of seconds that P.O.S.T will wait for the user input before booting.
CSM Support	No Yes	Compatibility Support Module that provides backward compatibility services for legacy BIOS services, like int10/int13, dependent OS.
Quick Boot	Disabled Enabled	Enable/Disable quick boot.
Diagnostic Splash Screen	Disabled Enabled	If you select 'Enabled' the diagnostic splash screen always displays during boot. If you select 'Disabled' the diagnostic splash screen does not display unless you press HOTKEY during boot.
Diagnostic Summary Screen	Disabled Enabled	Display the diagnostic summary screen during boot.
BIOS Level USB	Disabled Enabled	Enable/Disable all BIOS support for USB in order to reduce boot time. Note that this will prevent using a USB biometric scanner such as a finger print reader to control access to setup, but does not prevent the operating system from supporting such hardware.
Console Redirection	Disabled Enabled	Enable/Disable Universal Console Redirection.
Allow Hotkey in S4 resume	Disabled Enabled	Enable hotkey detection when system resuming from Hibernation state.
UEFI Boot	Disabled Enabled	Enable the UEFI boot.
Legacy Boot	Disabled Enabled	Enable the Legacy boot.
Boot in Legacy Video Mode	Disabled Enabled	Enable to force the display adapter to switch the video mode to Text Mode 3 at the end of BIOS POST for non-UEFI boot mode (Legacy Boot). Some legacy software, such as DUET, requires that the BIOS explicitly enter text video mode prior to boot.
Load OPROM	All On Demand	Load all OPROMs or on demand according to the boot device.

Note 1: Use either digit keys to enter value (0 – 99) or +/- keys to increase/decrease value.

Boot Features

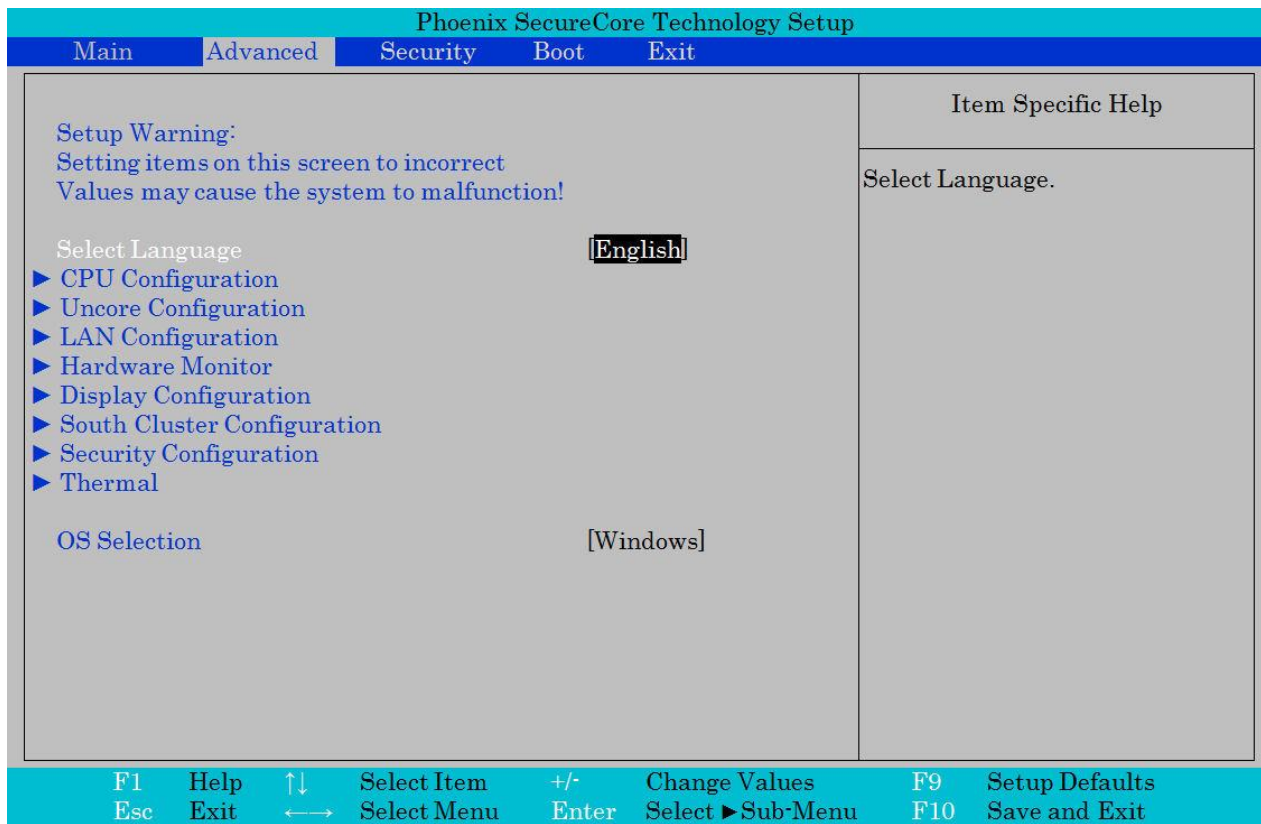
Phoenix SecureCore Technology Setup							
Main							
Network Stack		Item Specific Help					
Network Stack	[Enabled]	Enable/Disable UEFI Network Stack.					
IPv4	[Enabled]						
IPv6	[Enabled]						
UEFI PXE Boot Priority	[IPv4 First]						
F1	Help	↑↓	Select Item	+/-	Change Values	F9	Setup Defaults
Esc	Exit	←→	Select Menu	Enter	Select ► Sub-Menu	F10	Save and Exit

Function		Selection	Description
Network Stack		Disabled Enabled	Enable/Disable UEFI Network Stack.
IPv4	Note1	Disabled Enabled	Enable/Disable IPv4.
IPv6	Note1	Disabled Enabled	Enable/Disable IPv6.
UEFI PXE Boot Priority	Note2	IPv6 First IPv4 First	Set the priority of UEFI PXE Boot.

Note1: Only shown if Network Stack is enabled.

Note2: Only shown if Network Stack is enabled and greyed if not both IPv4 and IPv6 are enabled.

10.2 Advanced



The Advanced (main) menu contains only submenu selections which will be described in more details on the following pages.

In order to make a selection of a submenu activated the ↑↓ keys until the requested submenu becomes white color, then activate the <Enter>.

Function	Selection	Description
Select Language	English Francais Etc.	Select Language.
OS Selection	Windows Linux	OS Selection

Note: OS Selection must be set in according to the requested OS to boot. If incorrect OS Selection then system will not boot correctly.

CPU Configuration

Phoenix SecureCore Technology Setup		
Advanced		
CPU Configuration		Item Specific Help
CPU Configuration Execute Disable Bit [Enable] AESNI [Enable] Limit CPUID Maximum [Disable] DTS [Enable] ► CPU Power Management		Execute Disable Bit prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS.
F1	Help	↑↓
Esc	Exit	←→
Select Item		+/-
Select Menu		Enter
Change Values		F9
Select ► Sub-Menu		Setup Defaults
		F10
		Save and Exit

Function	Selection	Description
Execute Disable Bit	Disable Enable	Execute Disable Bit prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS.
AESNI	Disable Enable	AESNI.
Limit CPUID Maximum	Disable Enable	Disabled for Windows XP.
DTS	Disabled Enabled	Enabled/Disable Digital Thermal Sensor.

CPU Power Management

Phoenix SecureCore Technology Setup	
Advanced	
CPU Power Management	Item Specific Help
System Power Options Intel® SpeedStep™ [Enable] Boot performance mode [Max Performance] Intel® Turbo Boost Technology [Enable] C-States [Enable] Enhanced C-states [Enable] Max C State [C7]	Enable processor performance states (P-States).
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

Function	Selection	Description
Intel® SpeedStep™	Disable Enable	Enable processor performance states (P-States).
Boot performance mode	Max Performance Max Battery	Select the performance state that the BIOS will set before OS handoff.
Intel® Turbo Boost Technology	Disable Enable	Enable to automatically allow processor cores to run faster than the base operating frequency if it's operating below power, current, and temperature specification limits.
C-States	Disabled Enabled	Enable/Disable C States.
Enhanced C-states	Disabled Enabled	Enable/Disable C1E, C2E and C4E. When enabled, CPU will switch to minimum speed when all cores enter C-State.
Max C State	C7 C6 C4 C1	This option controls the Max C State that the processor will support.

Uncore Configuration

Phoenix SecureCore Technology Setup			
Advanced			
Uncore Configuration		Item Specific Help	
GOP Configuration GOP Driver		[Enable]	Enable GOP Driver will unload VBIOS; Disable it will load VBOIS.
IGD Configuration Integrated Graphics Driver		[Enable]	
Primary Display		[Auto]	
PAVC		[LITE Mode]	
DVMT Pre-Allocated		[64M]	
Spread Spectrum clock		[Disable]	
IGD – LCD Control			
LCD Panel Type		[Auto]	
IGD Boot Type		[Auto]	
Panel Scaling		[Auto]	
F1	Help	↑↓	Select Item
Esc	Exit	↔	Select Menu
+/-	Change Values		
Enter	Select ► Sub-Menu		
F9	Setup Defaults		
F10	Save and Exit		

Function	Selection	Description
GOP Driver	Disabled Enabled	Enable GOP Driver will unload VBIOS; Disable it will load VBOIS.
Integrated Graphics Driver	Disabled Enabled	Enable: Enable Integrated Graphics Device (IGD) when selected as the Primary Video Adaptor. Disable: Always disabled IGD.
Primary Display	AUTO IGD PCIe SG	Select which of IGD/PCI Graphics device should be Primary Display Or select SG for Switchable/Hybrid Gfx.
PAVC	Disable LITE Mode SERPENT Mode	Enable/Disable Protected Audio Video Control.
DVMT Pre-Allocated	64M , 96M, ..., 512M	Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
Spread Spectrum clock	Disabled Enable	Enable clock chip Spread Spectrum feature.
LCD Panel Type	Auto Panel1 640 x 480 Panel2 800 x 600 Panel3 1024 x 768 Panel4 1280 x 1024 Panel5 1400 x 1050 Panel6 1400 x 1050 Panel7 1600 x 1200 Panel8 1360 x 768 Panel9 1680 x 1050 Panel10 1820 x 1200 Panel11 1440 x 900 Panel12 1280 x 1024 Panel13 1600 x 900 Panel14 1024 x 768 Panel15 1920 x 1080 Panel16 2048 x 1536	
IGD Boot Type	Auto VGA Port HDMI Port B DP Port B DP Port C eDP DSI Port A DSI Port C	Selects preference for Integrated Graphics Device (IGD) display interface used when system boots. If CSM Enable: HDMI PortB=EFP1 DP PortB=EFP1 DP PortC=EFP2 eDP=LFP1 DSI PortA=LFP2 DSI PortC=LFP2
Panel Scaling	Auto Centering Stretching	Select the LCD panel scaling option used by Internal Graphics Device.

LAN Configuration

Phoenix SecureCore Technology Setup	
Advanced	
LAN Configuration System UUID {A7409B5D-A70F-1350-3D4D-6ADB329A768B} ETH1 Configuration MAC Address & Link status : Enabled [00E0F42CF929-]	Item Specific Help Control the Ethernet Devices and PXE boot.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

Note: The "+" and "-" (to the right of the MAC address) indicates respectively if link is established or not.

Function	Selection	Description
ETH1 Configuration	Disabled Enabled With PXE boot	Control the Ethernet Devices and PXE boot.

Hardware Monitor

Phoenix SecureCore Technology Setup	
Advanced	
Hardware Monitor	Item Specific Help
Hardware Monitor Board Temp [°C]: [32] CPU Control Temp [°C]: [33] Internal CPU Temp [°C]: [24] Fan Speed [RPM]: [4810] Fan Trip Point [°C]: [30] Trip Point Speed [%]: [50] Fan Poles : [4]	Temperature where fan accelerates. Range 20 – 80 C.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

Function	Selection	Description
Fan Trip Point	20, 21, ..., 30 , ..., 80	Temperature where fan accelerates. Range 20 – 80 C.
Trip Point Speed	30, 31, ..., 50 , ..., 100	Fan speed at trip point in %. Minimum value is 30.
Fan Poles	2 4 6	The number of pole pairs inside the fan. Ex: Fan poles=4 generates 2 pulses every one rotation.

Display Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Display Configuration		Item Specific Help
Display Configuration Onboard LVDS Enabled Resolution [640 x 480] Manufacture [(Standard)] Panel name [640x480 18] Panel VCC [3,3V] Backlight Enable Active [Low]		Enable/Disable onboard LVDS.
F1	Help	↑↓
Esc	Exit	←→
Select Item		+/-
Select Menu		Enter
Change Values		F9
Select ► Sub-Menu		F10
		Setup Defaults
		Save and Exit

Function	Selection	Description
Onboard LVDS	Disabled Enabled	Enable/Disable onboard LVDS.
Resolution	640 x 480 800 x 480 800 x 600 1024 x 600 1024 x 768 1280 x 800 1280 x 1024 1366 x 768 1600 x 1200 1920 x 1080 Custom	Resolution of panel to select.
Manufacture	(Standard) AUO Philips Primeview Samsung	Manufacture of panel to select.
Panel name	Note1 640x480 18 640x480 24 N/A	Name of panel to select.
Panel VCC	3,3V 5V	VCC of panel selected panel.
Backlight Enable Active	Low High	Inversion of backlight signal.

Note1: Depend on Resolution and Manufacture combination. If combination doesn't exist then Panel name is N/A (Not Available).

South Cluster Configuration

Phoenix SecureCore Technology Setup

Advanced

South Cluster Configuration	Item Specific Help
▶ PCI Express Configuration ▶ USB Configuration ▶ Audio Configuration ▶ SATA Drives ▶ LPSS & SCC Configuration ▶ Miscellaneous Configuration	PCI Express Configuration Settings.

F1Help↑↓Select Item+/-Change ValuesF9Setup Defaults

EscExit←→Select MenuEnterSelect ▶ Sub-MenuF10Save and Exit

PCI Express Configuration

Phoenix SecureCore Technology Setup			
Advanced			
PCI Express Configuration		Item Specific Help	
PCIe 1 Speed	[Auto]	Configure PCIe Speed.	
PCIe 2 Speed	[Auto]		
PCI Express Root Port 2	[Enable]		
PCI Express Root Port 3	[Enable]		

Function	Selection	Description
PCIe 1 Speed	Auto Gen1 Gen2	Configure PCIe Speed.
PCIe 2 Speed	Auto Gen1 Gen2	Configure PCIe Speed.
PCI Express Root Port 2	Enable Disable	Control the PCI Express Root Port.
PCI Express Root Port 2	Enable Disable	Control the PCI Express Root Port.

USB Configuration

Phoenix SecureCore Technology Setup			
Advanced			
USB Configuration		Item Specific Help	
xHCI Mode	[Disable]	Mode of operation of xHCI controller. To use DOS, enable EHCI and disable XHCI.	
XHCI Link Power Management	[Enable]		
USB OTG Support	[Disable]		
EHCI Controller	[Enable]		
USB Per-Port Control	[Enable]		
USB Port #0	[Enable]		
USB Port #1	[Enable]		
USB Port #2	[Enable]		
USB Port #3	[Enable]		
F1 Help	↑↓ Select Item	+/- Change Values	F9 Setup Defaults
Esc Exit	↔ Select Menu	Enter Select ► Sub-Menu	F10 Save and Exit

Function	Selection	Description
xHCI Mode	Disable Smart Auto	Mode of operation of xHCI controller. To use DOS, enable EHCI and disable XHCI.
XHCI Link Power Management	Disable Enable	Enable/Disable XHCI Link Power Management.
USB OTG Support	Disable PCI Mode ACPI Mode	Enable/Disable USB OTG Support
EHCI Controller	Enable Disable	Control the USB EHCI (USB 2.0) functions. One EHCI controller must always be enabled. To use DOS, enable EHCI and disable XHCI.
USB Per-Port Control	Disable Enable	Control each of the USB ports (0~3) disabling.
USB Port #0	Disable Enable	Disable USB port.
USB Port #1	Disable Enable	Disable USB port.
USB Port #2	Disable Enable	Disable USB port.
USB Port #3	Disable Enable	Disable USB port.

Audio Configuration

Phoenix SecureCore Technology Setup	
Advanced	
Audio Configuration	Item Specific Help
Audio Controller [Enable] Azalia HDMI Codec [Enable]	Control Detection of the Azalia device. Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally Enabled.
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

Function	Selection	Description
Audio Controller	Disable Enable	Control Detection of the Azalia device. Disabled = Azalia will be unconditionally disabled. Enabled = Azalia will be unconditionally Enabled.
Azalia HDMI Codec	Disable Enable	Enable/Disable internal HDMI codec for Azalia.

SATA Drives

Phoenix SecureCore Technology Setup	
Advanced	
SATA Drives	Item Specific Help
SATA Drives Chipset-SATA Controller Configuration Chipset SATA [Enabled] Chipset SATA Mode [ACHI] SATA Port 0 Hot Plug Capability [Disabled] SATA Port 1 Hot Plug Capability [Disabled]	Enables or Disables the Chipset SATA Controller. The Chipset SATA Controller supports the internal SATA ports (up to 3Gb/s supported per port).
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit	

Function	Selection	Description
Chipset SATA	Disabled Enabled	Enables or Disables the Chipset SATA Controller. The Chipset SATA Controller supports the internal SATA ports (up to 3Gb/s supported per port).
Chipset SATA Mode	IDE AHCI	IDE: Compatibility mode disables AHCI support. AHCI: Supports advanced SATA features such as Native Command Queuing. Warning: OS may not boot if this setting is changed after OS install.
SATA Port 0 Hot Plug Capability	Disabled Enabled	If enabled, SATA port will be reported as Hot Plug capable. Note: Requires hardware support.
SATA Port 1 Hot Plug Capability	Disabled Enabled	If enabled, SATA port will be reported as Hot Plug capable. Note: Requires hardware support.

LPSS & SCC Configuration

Phoenix SecureCore Technology Setup		
Advanced		
LPSS & SCC Configuration		Item Specific Help
LPSS & SCC Devices Mode	[PCI Mode]	LPSS & SCC Devices Mode Settings.
SCC Configuration SCC SD Card Support [Enable] SD SDR 25 Support [Enable] SD SDR 50 Support [Enable] LPSS HSUART#1 Support [Enable] LPSS HSUART#2 Support [Enable]		

F1	Help	↑↓	Select Item	+/-	Change Values	F9	Setup Defaults
Esc	Exit	←→	Select Menu	Enter	Select ► Sub-Menu	F10	Save and Exit

Function	Selection	Description
LPSS & SCC Device Mode	ACPI Mode PCI Mode	LPSS & SCC Devices Mode Settings.
SCC SD Card Support	Disable Enable	SCC SD Card Support Enable\Disable.
SD SDR 25 Support	Disable Enable	
SD SDR 50 Support	Disable Enable	
LPSS HSUART #1 Support	Disable Enable	LPSS HSUART #1 Support Enable\Disable.
LPSS HSUART #2 Support	Disable Enable	LPSS HSUART #2 Support Enable\Disable.

Miscellaneous Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Miscellaneous Configuration		Item Specific Help
Miscellaneous Configuration AC Power Loss [Power On] PCI Mmio Size [1GB] mSATA/mPCIE Selection [mPCIE]		Specify what state to go to when power is re-applied after a power failure (G3 state).
F1 Help ↑↓ Select Item +/- Change Values F9 Setup Defaults Esc Exit ←→ Select Menu Enter Select ► Sub-Menu F10 Save and Exit		

Function	Selection	Description
AC Power Loss	Power On Power Off	Specify what state to go to when power is re-applied after a power failure (G3 state).
PCI Mmio Size	2GB 1.5GB 1.25GB 1GB	PCI Mmio Size.
mSATA/mPCIE Selection	mPCIE mSATA (Note 1)	Select mSATA or PCIE.

Note 1: The mSATA setting works only on released board versions. (Batch no. 01.00 or above).

Example of mSATA modules working with the setting mPCIE:

SanDisk X110 mSATA SSD - 128GB (SD6SF1M-128G-1022)

Examples of mSATA modules working with the setting mSATA:

Transcend MSA370 (TS64GMSA370)

Apacer APSDM016GM5PN-PCM (0 °C to 70 °C)

Apacer APSDM016GM5PN-PCMw (-40 °C to 85 °C)

Security Configuration

Phoenix SecureCore Technology Setup		
Advanced		
Security Configuration		Item Specific Help
TXE Configuration TXE FW Version 1.0.2.1060 TXE FW Capabilities A0001040 TXE FW Features A0001040 TXE FW OEM Tag 00000000 TXE Firmware Mode Normal TXE File System Integrity Value 0 TXE [Enable] TXE HMRFP0 [Disable] TXE Firmware Update [Enable] TXE EOP Message [Enable] TXE Unconfiguration Perform		
F1	Help	↑↓
Esc	Exit	←→
Select Item		+/-
Select Menu		Enter
Change Values		F9
Select ► Sub-Menu		F10
Setup Defaults		
Save and Exit		

Function	Selection	Description
TXE	Disabled Enabled	
TXE HMRFP0	Disabled Enabled	
TXE Firmware Update	Disabled Enabled	
TXE EOP Message	Disabled Enabled	Send EOP Message Before Enter OS
TXE Unconfiguration Perform		

Thermal

Phoenix SecureCore Technology Setup							
Advanced							
Thermal		Item Specific Help					
Thermal Configuration Parameters		This value controls the temperature of the ACPI Critical Trip Point – the point in which the OS will shut the system off.					
Critical Trip Point	[90 C]						
Passive Trip Point	[85 C]						
Dynamic Platform & Thermal Framework		NOTE: 100C is the Plan Of Record (POR) for all Intel mobile processors.					
DPFT				[Disable]			
CPU Sensor Participants							
Critical	[70 C]						
Passive	[60 C]						
Ambient Sensor Participants							
Critical	[70 C]						
Passive	[52 C]						
DDR Sensor Participants							
Critical	[85 C]						
Passive	[61 C]						
Start P-State				[P0]			
Step Size				[25%]			
Power Control Setting				[Core Offlining]			
Performance Control Setting				[Core Offlining]			
Charger Participant				[Enable]			
Display Participant				[Enable]			
Power Participant				[Enable]			
F1	Help			↑↓	Select Item	+/-	Change Values
Esc	Exit	↔	Select Menu	Enter	Select ► Sub-Menu	F10	Save and Exit

Function	Selection	Description
Critical Trip Point	15 C, 23C, 31 C, 39C, 47 C, 55 C, 63 C, 71 C, 79 C, 85 C, 87 C, 90 C	This value controls the temperature of the ACPI Critical Trip Point – the point in which the OS will shut the system off. NOTE: 100C is the Plan Of Record (POR) for all Intel mobile processors.
Passive Trip Point	15 C, 23C, 31 C, 39C, 47 C, 55 C, 63 C, 71 C, 79 C, 85 C , 87 C, 90 C	This value controls the temperature of the ACPI Passive Trip Point – the point in which the OS will begin to throttling the processor.
DPFT	Disable Enable	Enable/Disable DPTF.
Charger Participant	Disable Enable	Enable/Disable Charger Participant Device.
Display Participant	Disable Enable	Enable/Disable Display Participant Device.
Power Participant	Disable Enable	Enable/Disable Power Participant Device.

10.3 Security

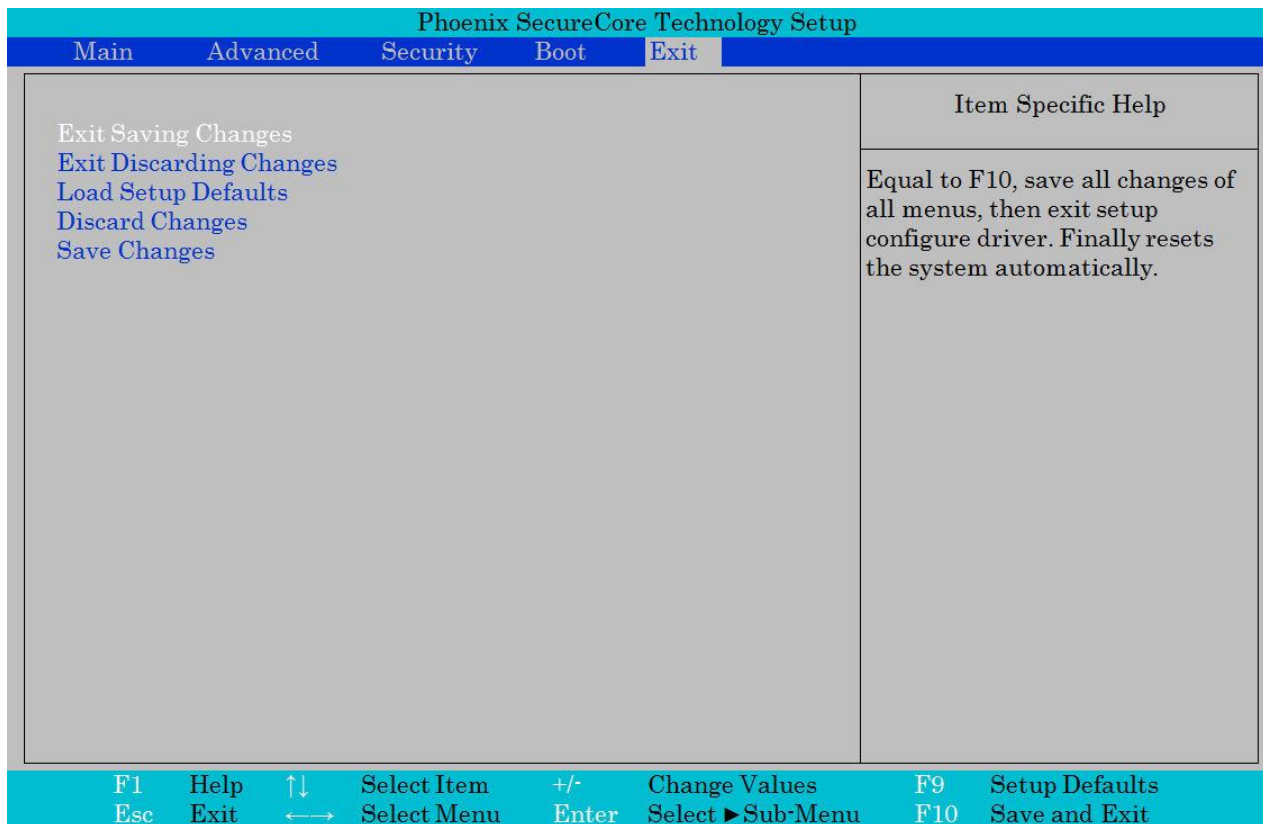
Phoenix SecureCore Technology Setup							
Main		Advanced		Security	Boot	Exit	
Secure Boot Activation [Disabled] ► Secure Boot Configuration Supervisor Password is: Cleared User Password is: Cleared Set Supervisor Password [Enter] Supervisor Hint String [] Set User Password [Enter] User Hint String [] Min. password length [1] Authenticate User on Boot [Disabled] HDD Security Status No HDD detected						Item Specific Help	
						Set or clear the Supervisor account's password.	
F1 Esc	Help Exit	↑↓ ↔	Select Item Select Menu	+/- Enter	Change Values Select ► Sub-Menu	F9 F10	Setup Defaults Save and Exit

Function	Selection	Description
Set Supervisor Password	(up to 20 characters)	Set or clear the Supervisor account's password.
Supervisor Hint String	(up to 20 characters)	Press Enter to type Supervisor Hint String.
Min. password length	1, 2, ..., 20	Set the minimum number of characters for password (1-20).

10.4 Boot

Phoenix SecureCore Technology Setup									
Main		Advanced		Security		Boot	Exit		
Boot Priority Order 1. ATAPI CD: 2. PCI LAN: 3. ATA HDD0: 4. ATA HDD1: 5. USB HDD: 6. USB CD: 7. USB FDD: 8. SD Card1: 9. Internal Shell:							Item Specific Help		
							Keys used to view or configure devices: ↑ and ↓ arrows Select a device. ‘+’ and ‘-’ move the device up or down. ‘Shift + 1’ enables or disables a device. ‘Del’ deletes an unprotected device.		
F1	Help	↑↓	Select Item	+/-	Change Values	F9	Setup Defaults		
Esc	Exit	←→	Select Menu	Enter	Select ►Sub-Menu	F10	Save and Exit		

10.5 Exit



Function	Description
Exit Saving Changes	Equal to F10, save all changes of all menus, then exit setup configure driver. Finally resets the system automatically.
Exit Discarding Changes	Equal to ESC, never save changes, then exit setup configure driver.
Load Setup Defaults	Equal to F9. Load standard defaults values.
Discard Changes	Load the original value of this boot time. Not the default Setup value.
Save Changes	Save all changes of all menus, but do not reset system.

About Kontron

Kontron, a global leader in embedded computing technology and trusted advisor in 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/>



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