EmCORE-i2802

Intel® Elkhart Lake Celeron® N6210 / Atom® x6413E Processor 3.5” Compact Board

User’s Manual

Version 1.2

2025.04

Revision History

Version	Release Time	Description
1.0	2024.06	Initial release
1.1	2025.03	Added JRS1 jumper location and descriptions. Revised sections include: 2.2.1 Jumpers 2.3. Jumpers & Connectors Location 2.3.1. Jumpers
1.2	2025.04	Added/revised information relate to JINV1/ JINV2 and AUDIO1 to the following section: P.15 P.27

Contents

Preface

Copyright Notice

The information in this document is subject to change without prior notice in order to improve the reliability, design and function. It does not represent a commitment on the part of the manufacturer.

Under no circumstances will the manufacturer be liable for any direct, indirect, special, incidental, or consequential damages arising from the use or inability to use the product or documentation, even if advised of the possibility of such damages.

Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and

(2)This device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

RoHS

ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction

of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

About This User's Manual

This user's manual provides general information and installation instructions about the product. This User's Manual is intended for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about any description in this booklet. Please consult your vendor before further handling.

Warning

Single Board Computers and their components contain very delicate Integrated Circuits (IC). To protect the Single Board Computer and its components against damage from static electricity, you should always follow the following precautions when handling it :

1. Disconnect your Single Board Computer from the power source when you want to work on the inside.
2. Hold the board by the edges and try not to touch the IC chips, leads or circuitry.
3. Use a grounded wrist strap when handling computer components.
4. Place components on a grounded antistatic pad or on the bag that comes with the Single Board Computer, whenever components are separated from the system.

Replacing the Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.

The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.

Do not throw lithium batteries into the trash-can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have any technical difficulties, please do not hesitate to call or e-mail our customer service.

https://www.arbor-technology.com
E-mail:info@arbor.com.tw

Warranty

This product is warranted to be in good working order for a period of two years from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

Chapter 1

Introduction

1.1. Packing List

Before starting with the installation, make sure the following items are shipped. If any item appears damaged or is missing, contact your vendor immediately:

1 x EmCORE-i2802 3.5”
Intel® Elkhart Lake Celeron® N6210 Compact Board /
Intel® Elkhart Lake Atom® x6413E Compact Board

1 x Quick Installation Guide

If any of the above items is damaged or missing, contact your vendor immediately.

1.2. Ordering Information

EmCORE-i2802-N6210	Intel Elkhart Lake Celeron N6210, 3.5” compact board
EmCORE-i2802-x6413E	Intel Elkhart Lake Atom x6413E, 3.5” compact board
CBK-10-2802-00	Cable kit 2 x USB 2.0 cables (2 ports / cable) 3 x COM ports cables 1 x AUDIO cable 2 x SATA cable 2 x SATA power cables

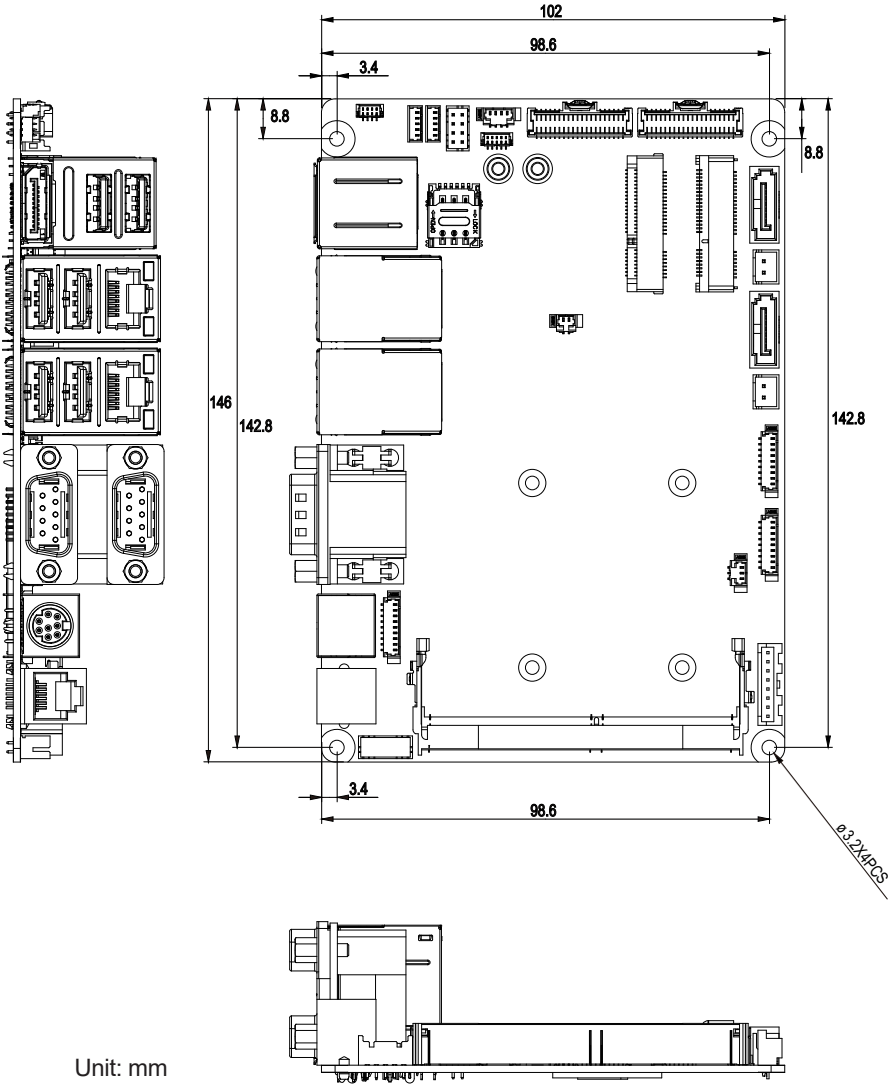
1.3. Driver Installation

To install the drivers, please visit our website at **www.arbor-technology.com** and download the driver pack from the product page.

1.4. Specifications

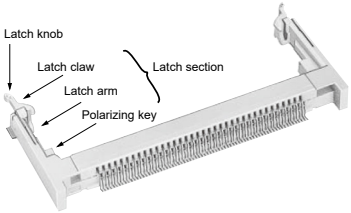
Form Factor	3.5" Compact Board
CPU	Soldered onboard for Intel® Elkhart Lake / Celeron® N6210 1.2GHz/ Atom® x6413E 1.5GHz Processor
Memory	1 x DDR4 SO-DIMM socket, up to 16GB DDR4 3200 MT/s SDRAM
BIOS	AMI BIOS
Watchdog Timer	1~255 levels reset
Serial Port	6 x Serial Ports
USB Port	4 x USB 2.0 ports 2 x USB 3.0 / 2.0 ports
Expansion	2 x Mini-card sockets
	1 x Micro SIM socket (for full size Mini-card)
Storage	2 x Serial ATA ports with 600MB/s HDD transfer rate
Ethernet Chipset	2 x Realtek RTL8111 PCIe GbE controllers
Digital I/O	8-bit Programmable
Audio	MIC-in/ Line-in/ Line-out
Graphic Chipset	Integrated Vega Core Graphics controller
Graphic Interface	1 x Display Port
	2 x Dual Channel 24-bit LVDS ports
Power Input	DC 8V ~ 13.2V
Power Consumption	TBD
Operating Temp.	-20 ~ 70°C (-4 ~ 158ºF)
Operating Humidity	10 ~ 95% @ 60°C (non-condensing)
Dimensions (L x W)	146 x 102 mm (5.7" x 4.0")

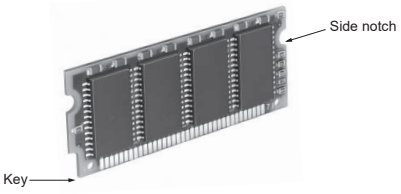
1.5. Board Dimensions



Unit: mm

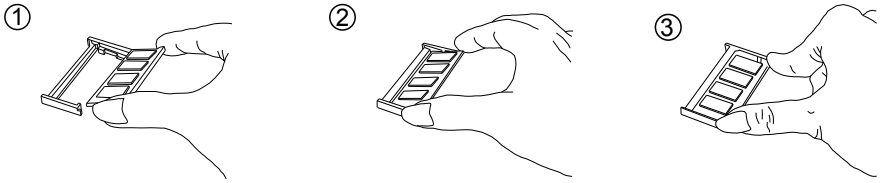
1.6 Installing the Memory





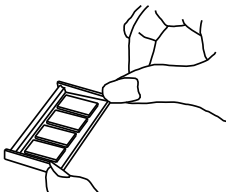
To install the Memory module, locate the Memory SO-DIMM slot on the board and perform as below:

1. Adjust the socket polarizing key and the board key to the same direction.
2. Insert the board obliquely. Moreover, lay the board in parallel to the opening at angle of 20^{o} to 30^{o}, and softly insert the board so as to hit the socket bottom. Stopping insertion halfway will result in improper insertion.
3. Applying the board side notch in parallel to the socket bottom so that the board position cannot be displaced, press the board side notch up, and fix it to the latch portion at both socket edges. Press the board side notch, and release the notch with a snap “click” tone, if the printed board exceeds the latch claw head.



Procedures for board extraction

Apply the thumb nail to the latch knob at both socket edges. Forcibly widen the latch knobs to right and left ways, and release the latch. Then draw the board out along an angle where the board is raised.

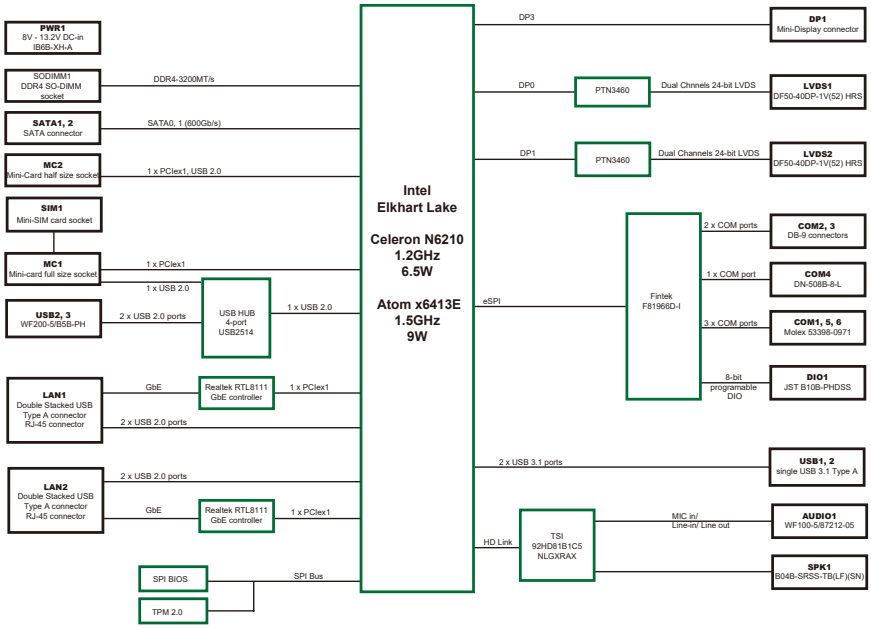


This page is intentionally left blank.

Chapter 2

Installation

2.1. Block Diagram



2.2. Jumpers & Connectors Quick Reference

2.2.1 Jumpers

Jumper	Description
❶JPWR1	AT/ATX Power Mode Selection
❷❸JVLCD1, 2	LVDS1, 2 LCD Voltage Selection
❹JBAT1	CMOS Setting
❺❻JINV1, 2	LVDS1, 2 LCD Inverter Voltage Selection
❼JRS1	COM1 Power Source Special Support

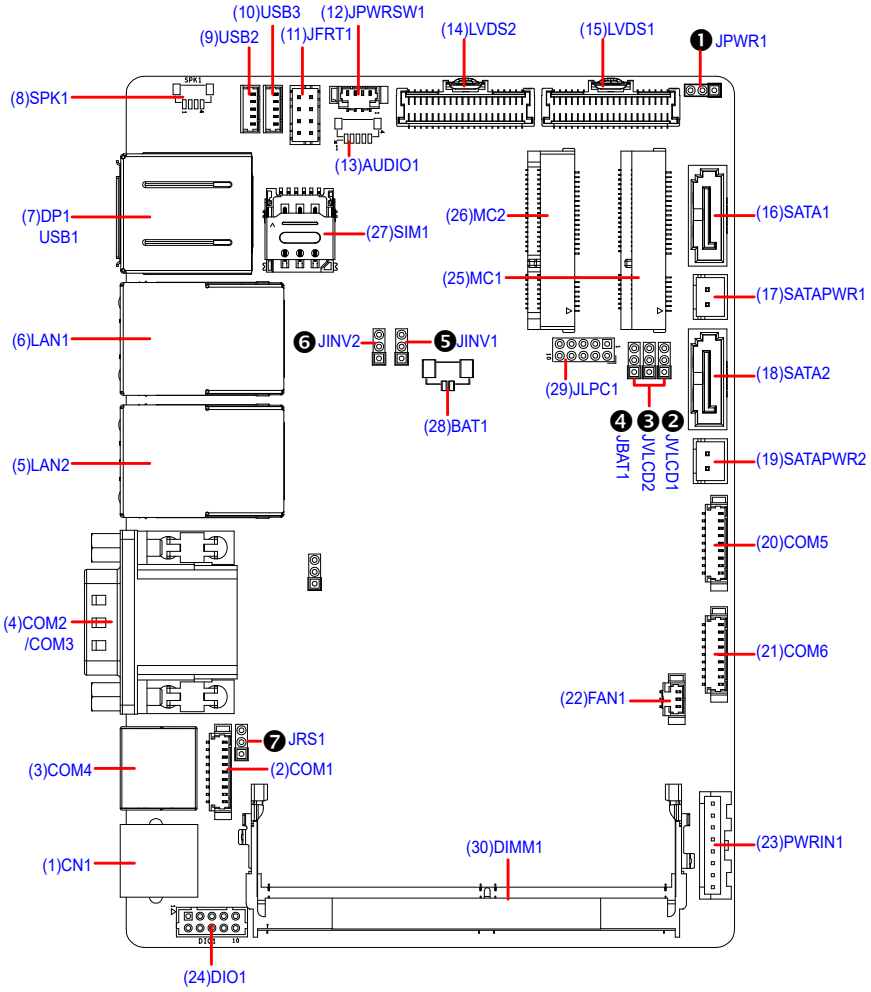
2.2.2 Connectors

Connector	Description
(1)CN1	DREWR Connector
(2)COM1	RS-232 Serial Port Connector
(3)COM4	Serial Port Connector
(4)COM2,COM3	RS-232 Serial Port Connectors
(5)(6)LAN2, 1	RJ-45 LAN and USB 2.0 Stack Connectors
(7)DP1 & USB1	USB 3.0 Stack Connectors and DisplayPort
(8)SPK1	2Watt (rms)/4Ω per Channel Speaker Output Connector
(9)(10)USB2, 3	USB Hub
(11)JFRT1	Switches and Indicators
(12)JPWRSW1	Power Switches and LED
(13)AUDIO1	MIC,LINE Audio Connector
(14)(15) LVDS2, 1	LVDS Connector
(16)(18)SATA1, 2	SATA Connector Channel 0, 1
(17)(19) SATAPWR1, 2	SATA Power Connector
(20)(21)COM5,6	RS-232 Serial Port Connector
(22)FAN1	Smart Fan Connector
(23)PWRIN1	DC +12V Power Input Connector
(24)DIO1	Digital I/O Connector
(25)MC1	Full size Mini-Card Socket
(26)MC2	Half size Mini-Card

(27)SIM1	MC1 NANO SIM Socket
(28)BAT1	Battery Connector
(29)JLPC1	LPC to 80 Port Debug Card Connector
(30)DIMM1	DDR4 SO-DIMM Socket

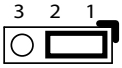
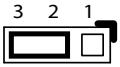
2.3. Jumpers & Connectors Location

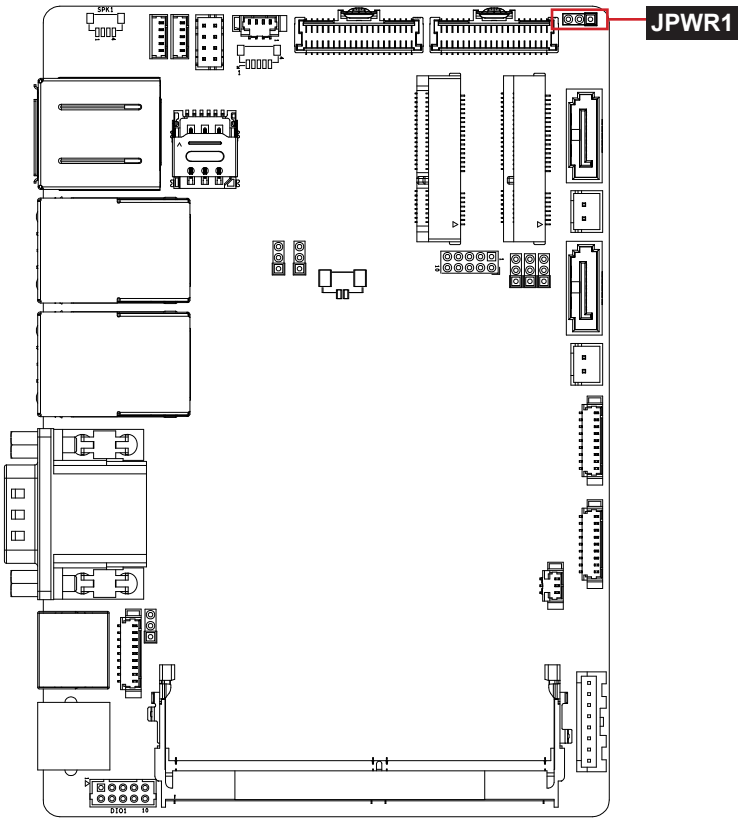
Board Top



2.3.1. Jumpers

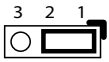
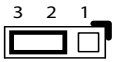
❶ JPWR1: AT/ATX Power Mode Selection
Connector type: 2.0mm pitch 1x3 pin header

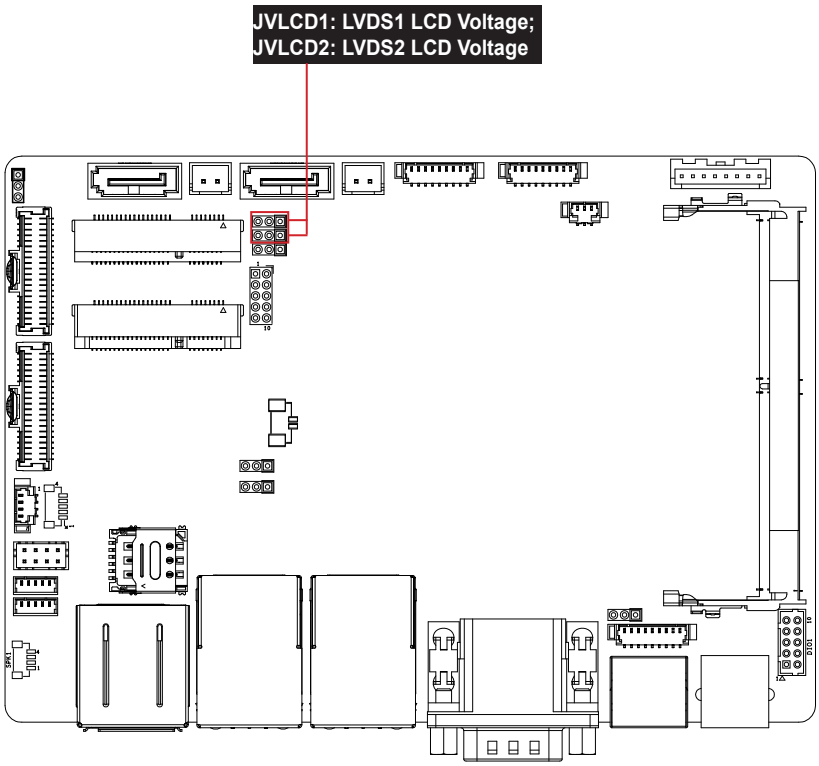
Pin	Power Mode Selection	
1-2	ATX Mode (Default)	
2-3	AT Mode	



❷ JVLCD1: LVDS1 LCD Voltage
❸ JVLCD2: LVDS2 LCD Voltage

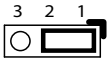
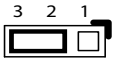
The voltage of LVDS1 and LVDS2 LCD panel could be selected by JVLCD1 and JVLCD1 in +5V or +3.3V.
Connector type: 2.0mm pitch 1x3 pin header

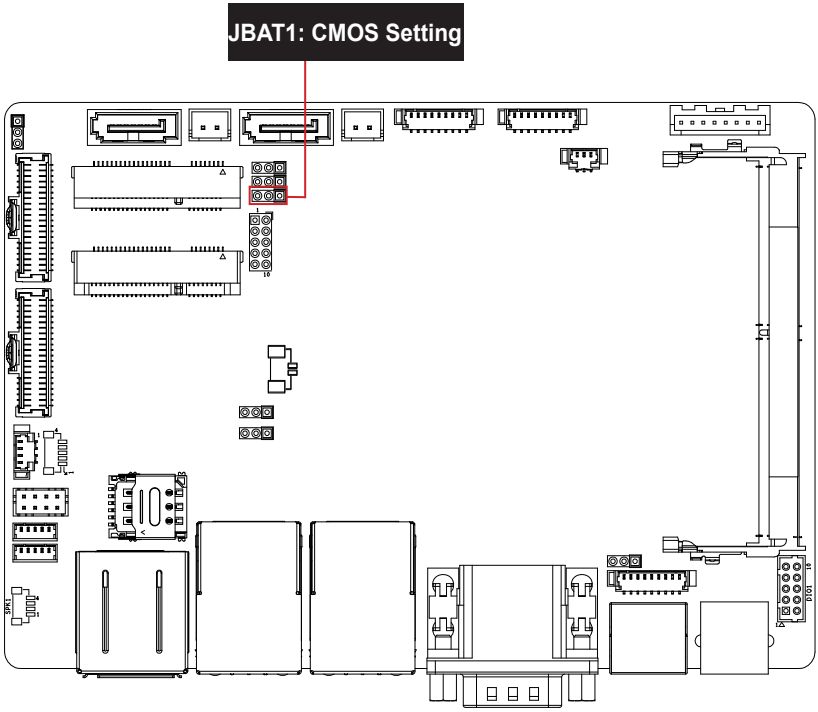
Pin	Voltage	
1-2	+5V	
2-3	+3.3V (Default)	



❹ JBAT1: CMOS Setting

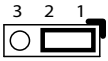
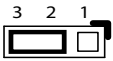
Connector type: 2.0mm pitch 1x3-pin header

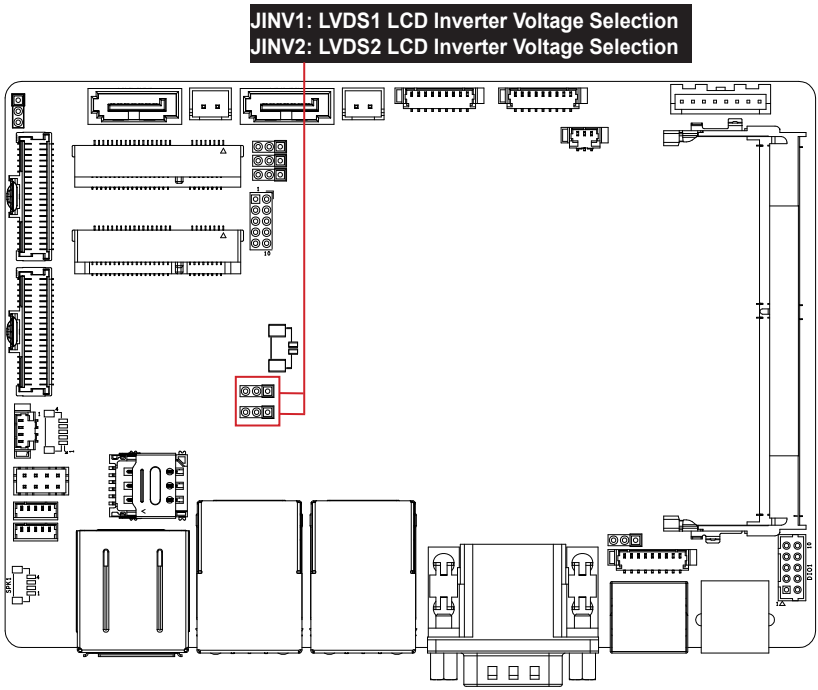
Pin	Mode	
1-2	Keep CMOS (Default)	
2-3	Clear CMOS	



❺ JINV1: LVDS1 LCD Inverter Voltage Selection
❻ JINV2: LVDS2 LCD Inverter Voltage Selection

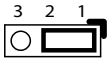
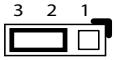
The voltage of LVDS1 and LVDS2 LCD panel inverter could be selected by JINV1 and JINV2 in 12V or +5V.
Connector type: 2.0mm pitch 1×3 pin header

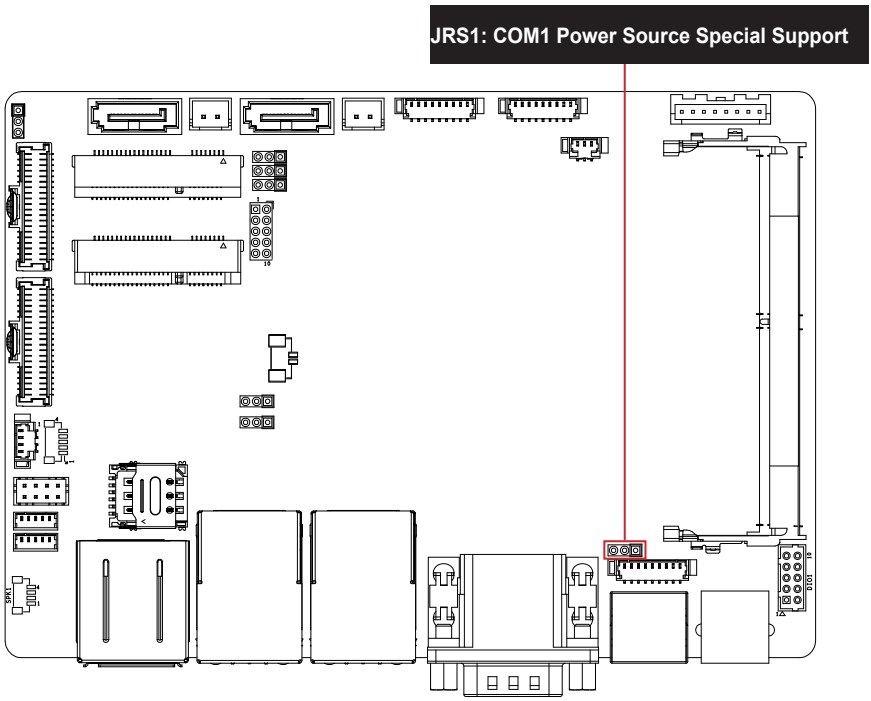
Pin	Mode	
1-2	+12V (default)	
2-3	+5V	



❼ JRS1: COM1 Power Source Special Support

Connector type: onboard 1×3 pin 2.0mm header

Pin	Mode	
1-2	POS: +5V on Pin9 (default)	
2-3	RI	

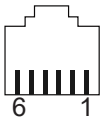


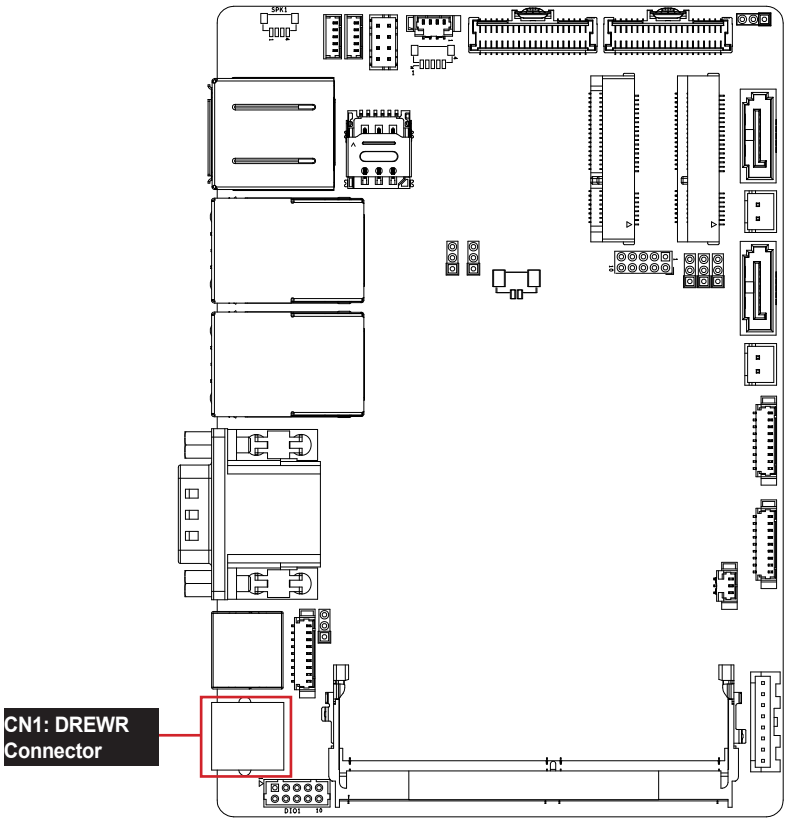
2.3.2. Connectors

(1)CN1: DREWR Connector

Connector type: RJ-11 Connector

Pin	Description
1	FRAME GND
2	DRWER1
3	SW_IN
4	24V
5	DRWER2
6	GND

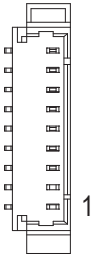


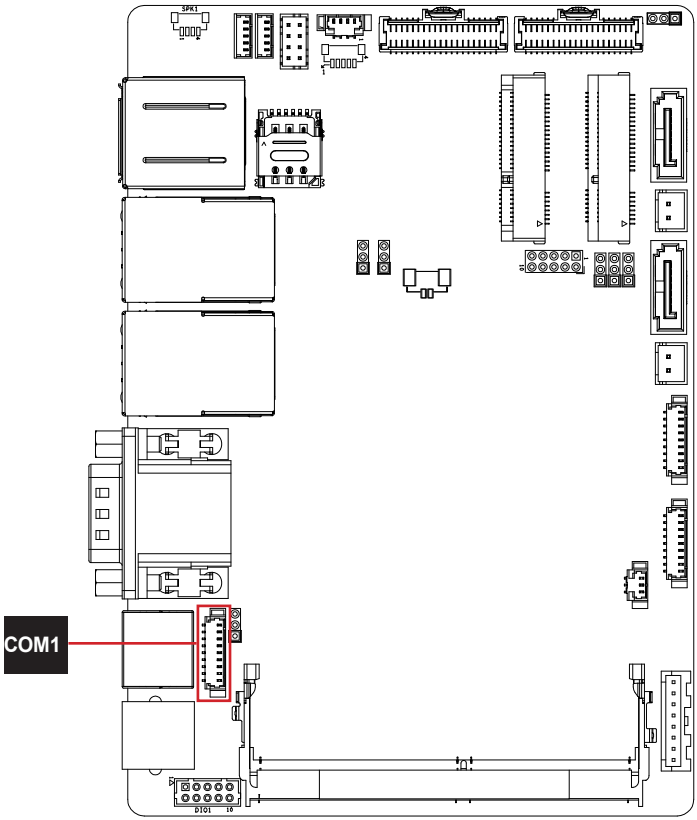


(2)COM1: RS-232 Serial Port Connector

Connector type: 1.25mm pitch 1x9-pin wafer connector

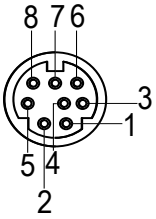
Pin	Description
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	no connection
7	RTS
8	CTS
9	+5V/RI (JRS1 Switchable)

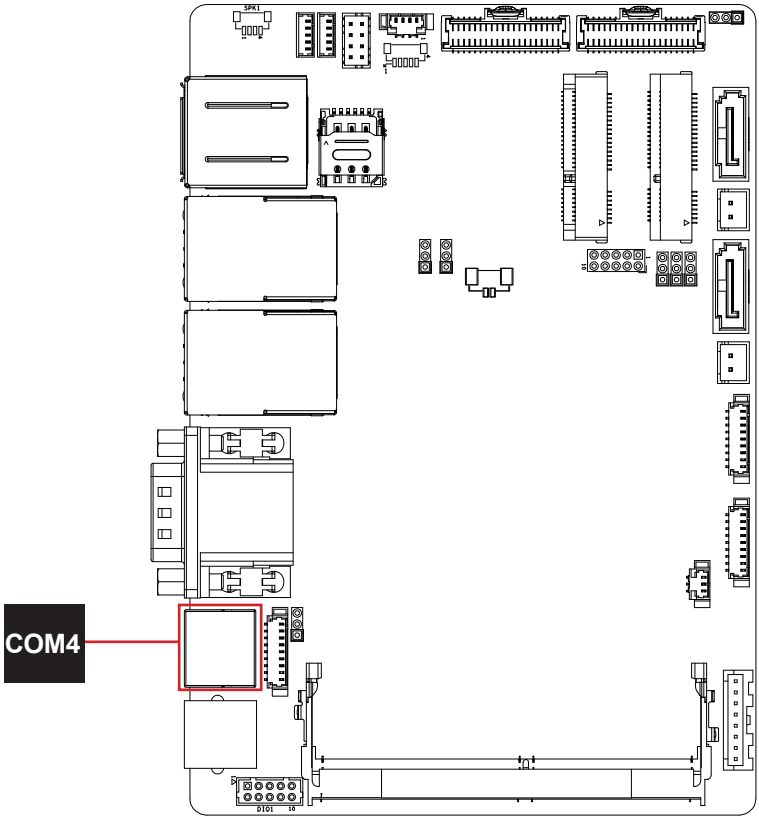




(3)COM4: Serial Port Connector
Connector type: 8-Pin mini DIN connector

Pin	Description
1	CTS
2	RTS
3	RXD
4	GND
5	TXD
6	DSR
7	DTR
8	+V5S

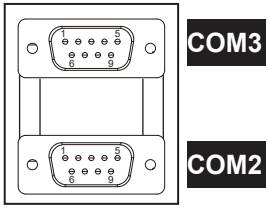


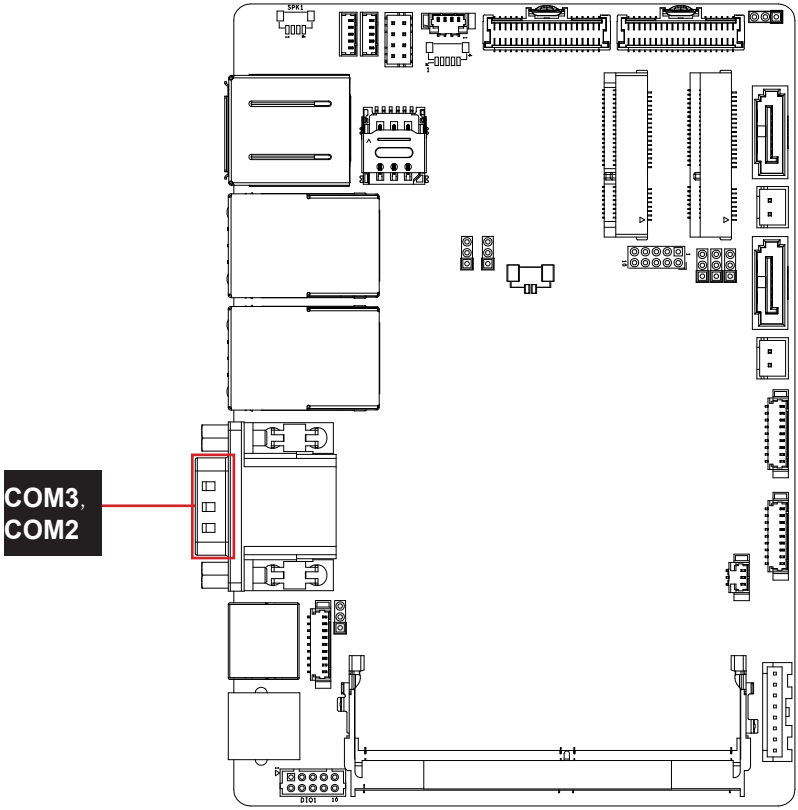


(4)COM2/COM3: RS-232 Serial Port Connector

Connector type: External 9-pin D-sub male connector.

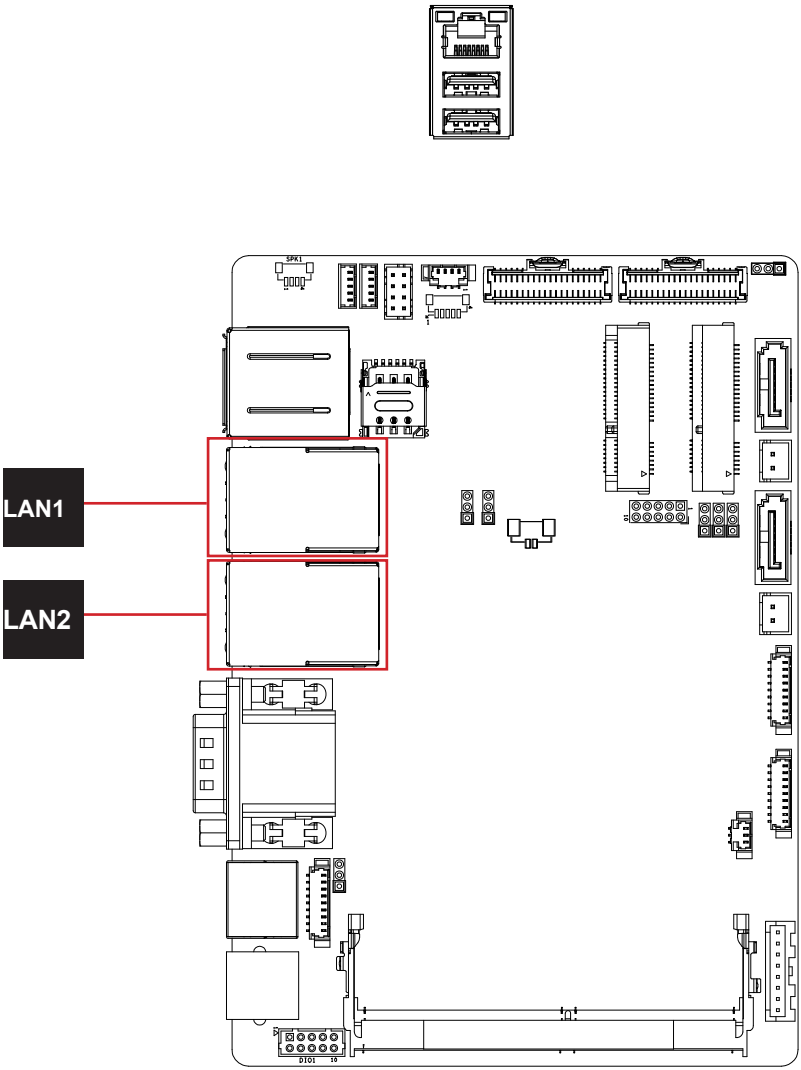
Pin	Description
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	+5V





(5)LAN2: RJ-45 LAN and USB 2.0 Stack Connectors
(6)LAN1: RJ-45 LAN and USB 2.0 Stack Connectors

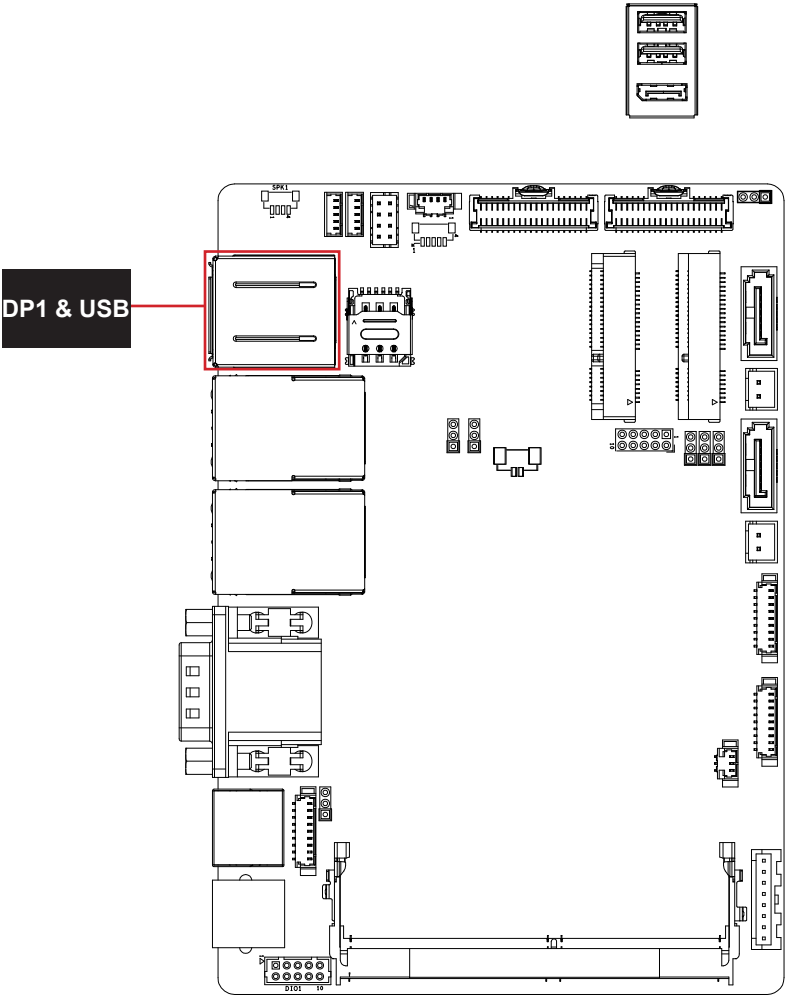
Connector type: RJ-45 LAN and double-stacked USB connectors
The pin assignments conform to the industry standard.



(7)DP1 & USB1: USB 3.0 Stack Connectors and DisplayPort

Connector type: Double-stacked USB connectors and DisplayPort

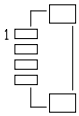
The pin assignments conform to the industry standard.

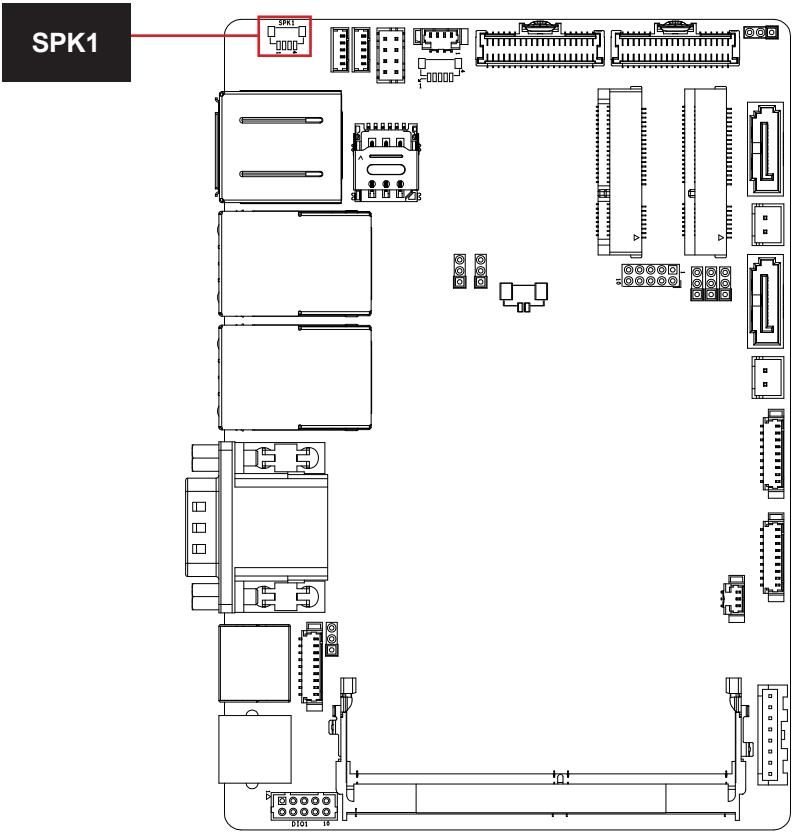


(8)SPK1: 2Watt (rms)/4Ω per Channel Speaker Output Connector

Connector type: 1.25mm pitch 1x4 pin header

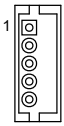
Pin	Description
1	SP_R-
2	SP_R+
3	SP_L-
4	SP_L+

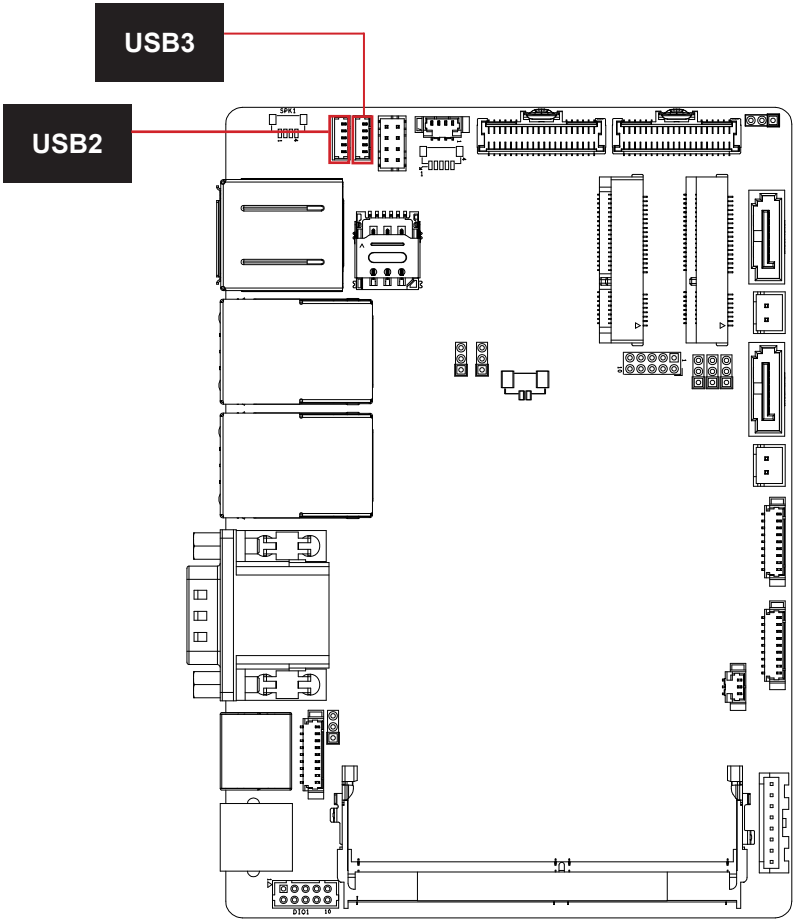




(9)USB2: USB Hub Connector
(10)USB3: USB Hub Connector
Connector type: 1.25mm pitch 1x5 pin header

Pin	Description
1	USB_+5V
2	USB-
3	USB+
4	GND
5	GND

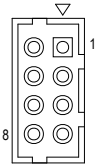


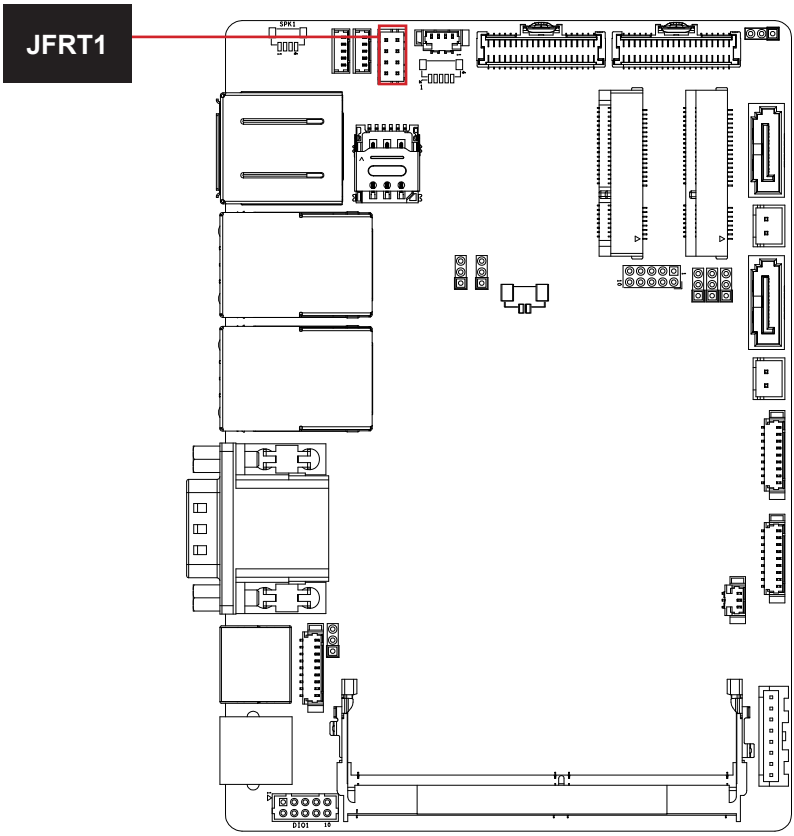


(11)JFRT1: Switches and Indicators

Connector type: 2.0mm pitch 2x4 pin wafer connector

Pin	Description	Pin	Description
2	POWER_LED-	1	POWER_LED+
4	HDD_LED-	3	HDD_LED+
6	12V_-	5	12V_+
8	RESET-	7	RESET+

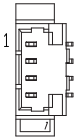


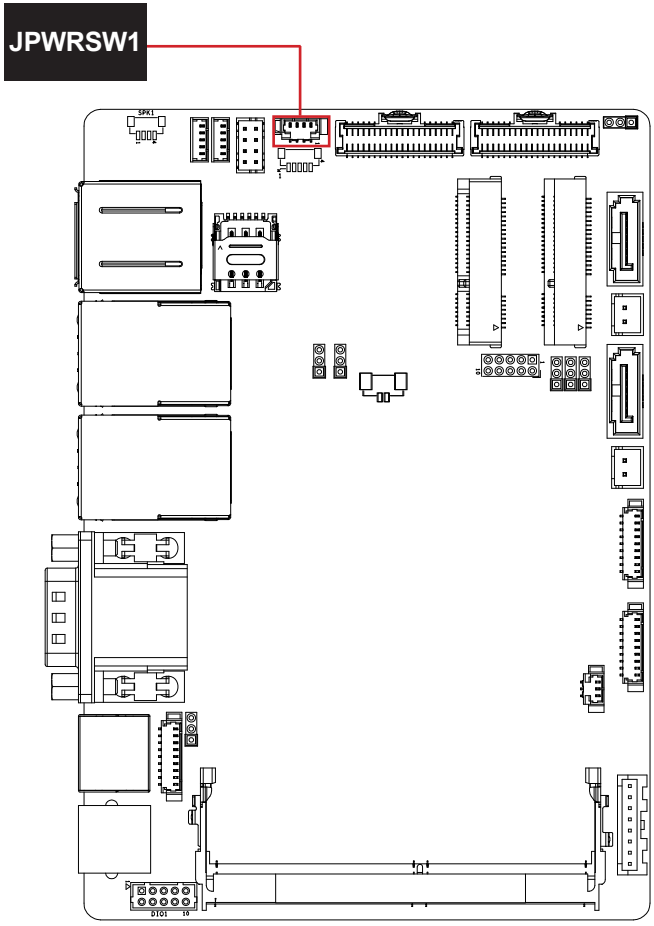


(12)JPWRSW1: Power Switches and LED

Connector type: 1.25mm pitch 1x4 pin wafer connector

Pin	Description
1	PSON+
2	PSON-
3	POWER_LED2+
4	POWER_LED2-

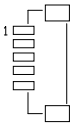




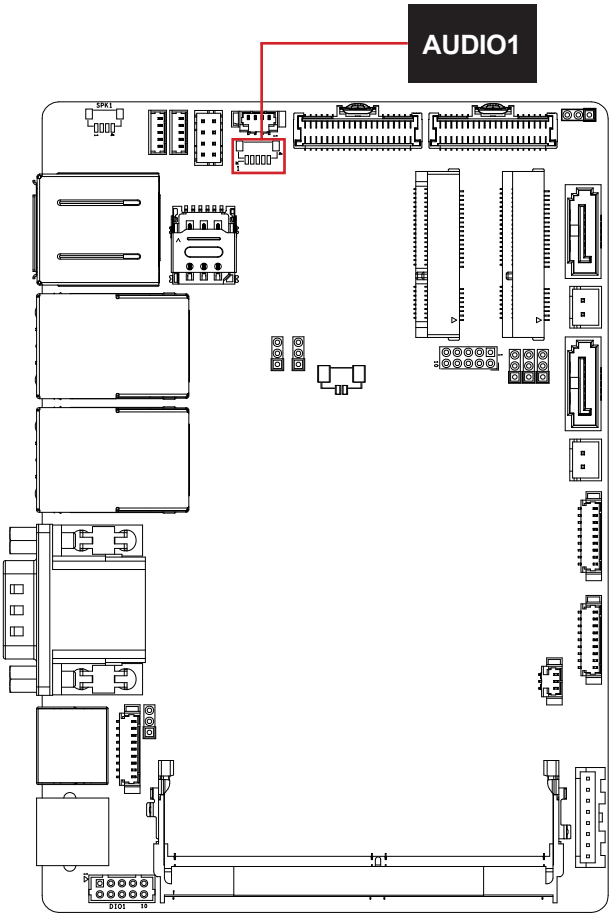
(13)AUDIO1: MIC, LINE Audio connector

Connector type: 1.25mm pitch 1x5 pin connector

Pin	Description
1	MIC
2	GND
3	LINE IN L **(Default)**
4	LINE IN R **(Default)**
5	GND



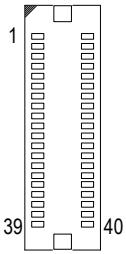
Note: LINE IN can be switched to LINE OUT by OEM BIOS.

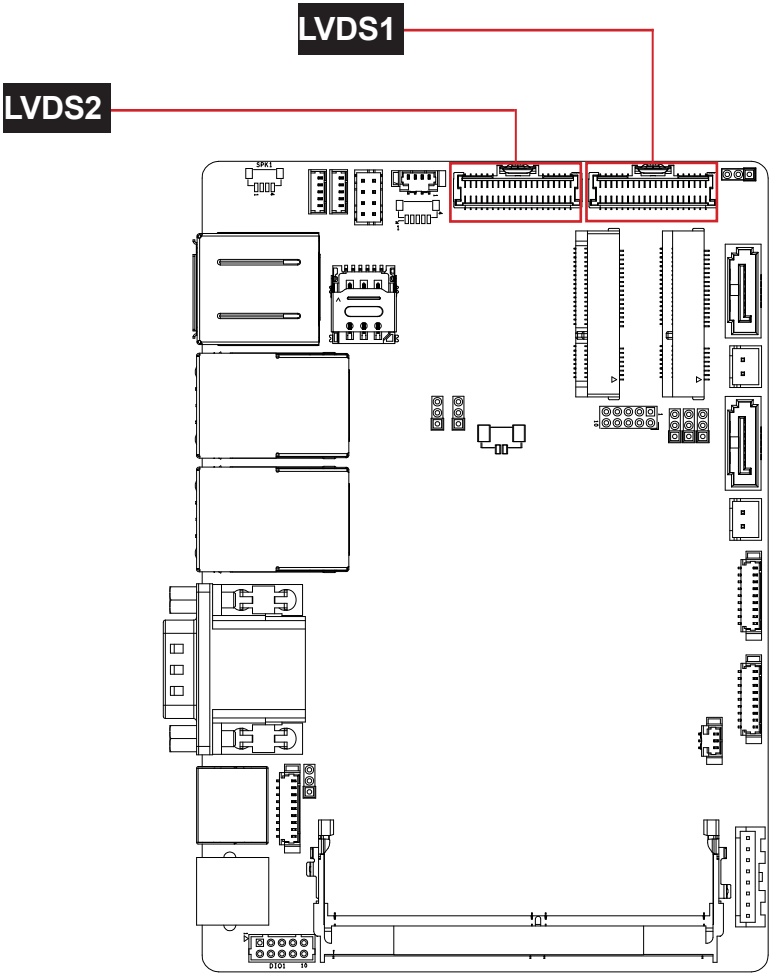


(14) LVDS2: LVDS Connector
(15) LVDS1: LVDS Connector

Connector type: 1.25mm pitch 2x20 pin connector, supporting 18/24 bit single/ dual channels

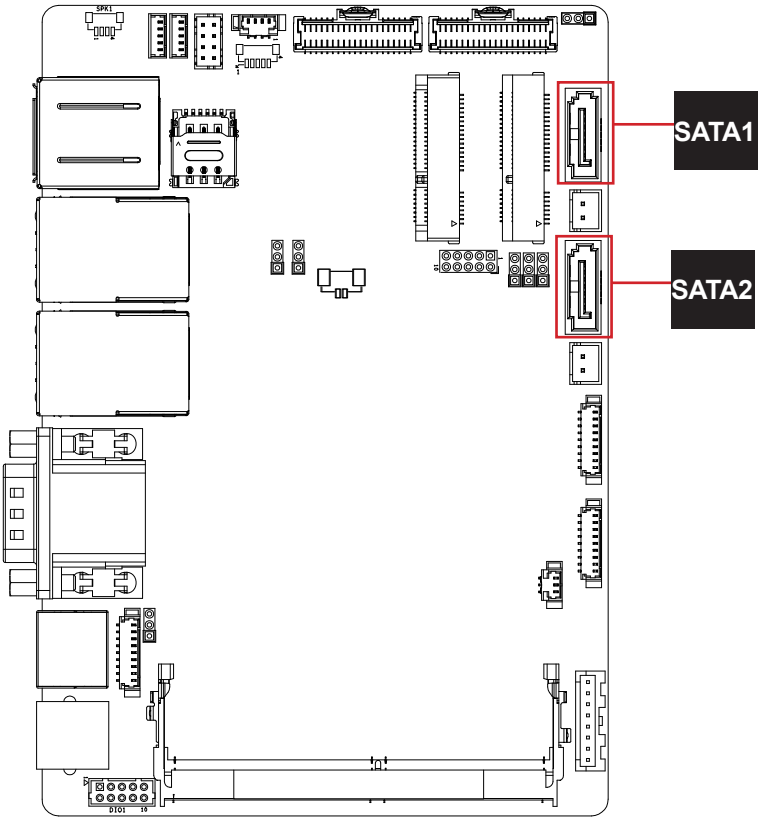
Pin	Description	Pin	Description
1	LCD VDD(+3.3V/+5V)	2	LCD VDD(+3.3V/+5V)
3	GND	4	LCD VDD(+3.3V/+5V)
5	LVDS_DA0-	6	LVDS_DB0-
7	LVDS_DA0+	8	LVDS_DB0+
9	GND	10	GND
11	LVDS_DA1-	12	LVDS_DB1-
13	LVDS_DA1+	14	LVDS_DB1+
15	GND	16	GND
17	LVDS_DA2-	18	LVDS_DB2-
19	LVDS_DA2+	20	LVDS_DB2+
21	GND	22	GND
23	LVDS_A_CLK-	24	LVDS_B_CLK-
25	LVDS_A_CLK+	26	LVDS_B_CLK+
27	GND	28	GND
29	LVDS_DA3-	30	LVDS_DB3-
31	LVDS_DA3+	32	LVDS_DB3+
33	GND	34	BKL_CONTROL
35	USB+ (USB2.0 PORT4)	36	BKL_ENABLE
37	USB-(USB2.0 PORT4)	38	GND
39	USB_+5V	40	BKL_ PWR(+5V/+12V)




LVDS1
LVDS2

(16)SATA1: SATA Connector Channel 0
(18)SATA2: SATA Connector Channel 1

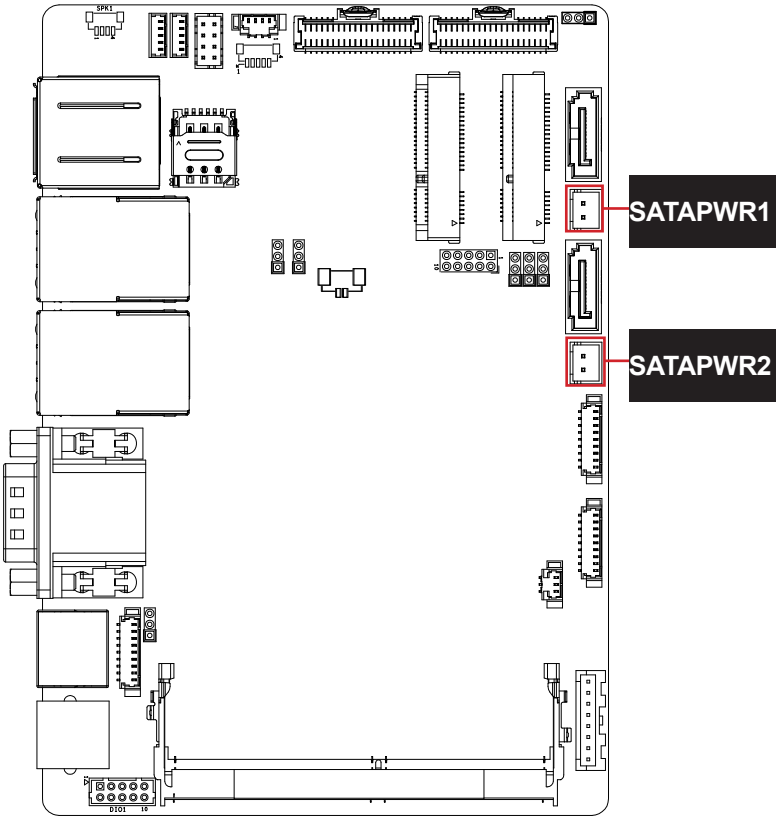
Connector type: SATA Connector
The pin assignments conform to the industry standard.



(17)SATAPWR1: SATA Power Connector
(19)SATAPWR2: SATA Power Connector

Connector type: 2.0mm pitch 1x2-pin wafer connector

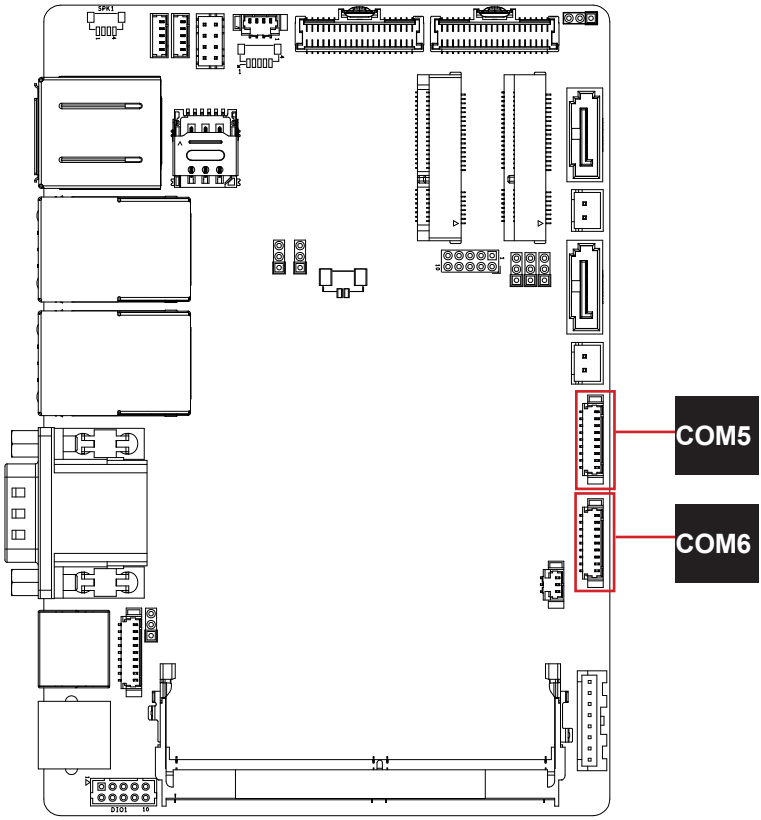
Pin	Description
1	+5VS
2	GND



(20)COM5: RS-232 Serial Port Connector
(21)COM6: RS-232 Serial Port Connector

Connector type: 1.25mm pitch 1x9-pin wafer connector

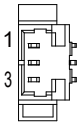
Pin	Description
1	DCD
2	RX
3	TX
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	COM5: RI / COM6: +V5S

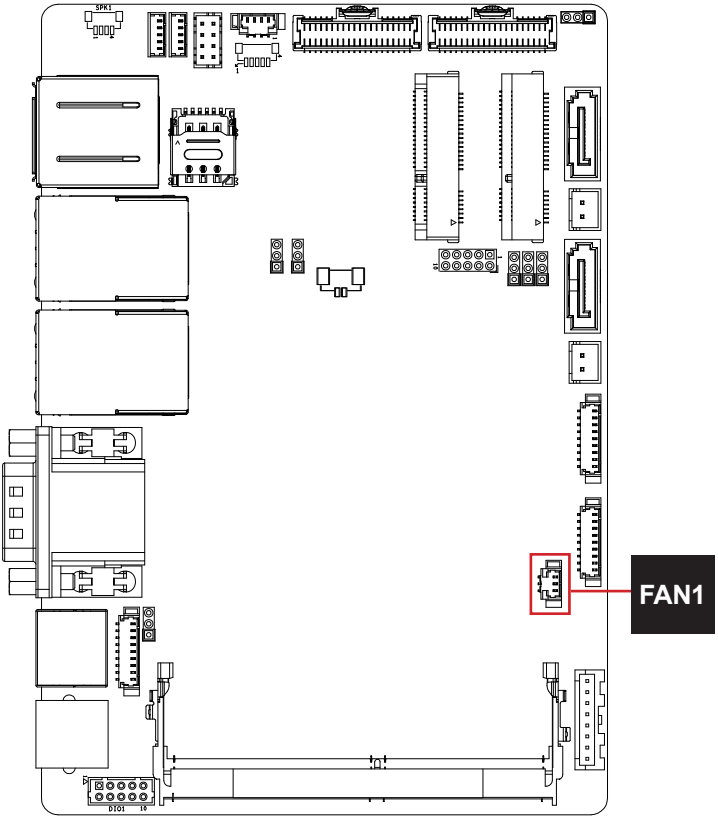


(22)FAN1: Smart Fan Connector

Connector type: 1.25mm pitch 1x3-pin wafer connector

Pin	Description
1	+5V~3V
2	GND
3	FANIN1

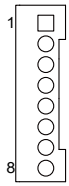


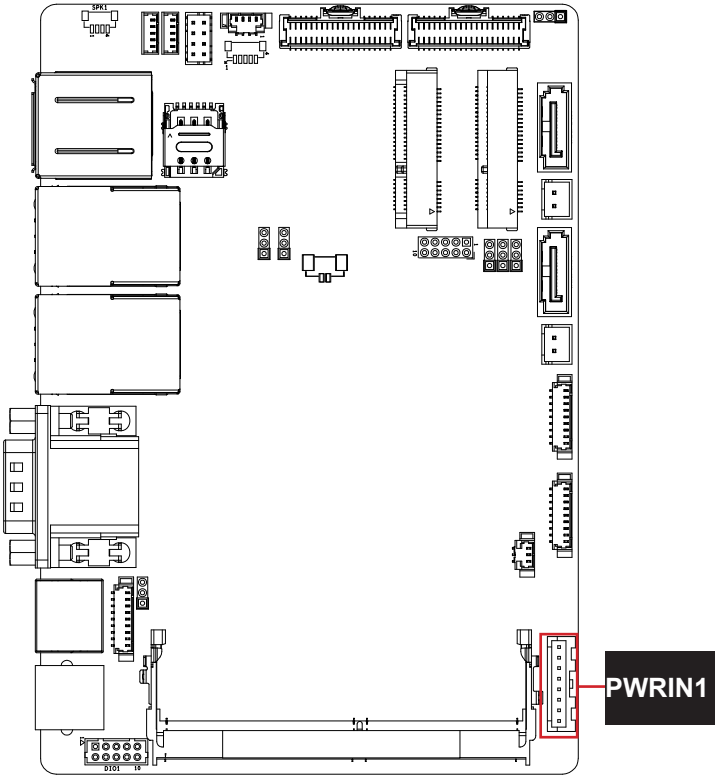


(23)PWRIN1: DC +12V Power Input Connector

Connector type: 2.5mm pitch 1x8 pin header

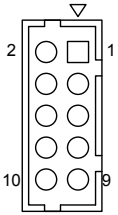
Pin	Description
1	VIN: 8V~13.2V
2	VIN: 8V~13.2V
3	GND
4	GND
5	+5V LED
6	COM1 DSR
7	GND
8	VIN:+24V

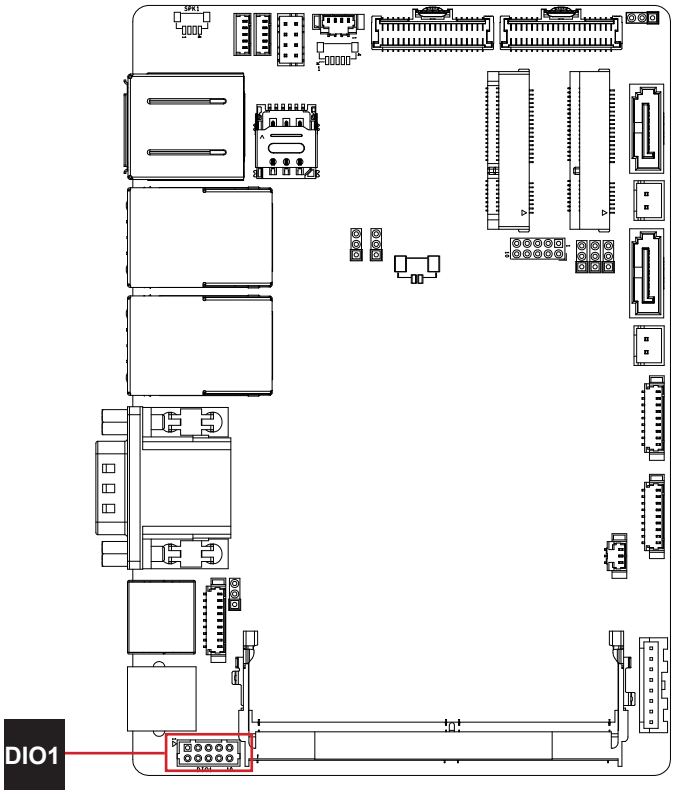




(24)DIO1: **Digital I/O Connector**
Connector type: 2.0mm pitch 2x5 pin wafer connector

Pin	Desc.	Pin	Desc.
2	DIO1	1	DIO0
4	DIO3	3	DIO2
6	DIO5	5	DIO4
8	DIO7	7	DIO6
10	GND	9	V5S+

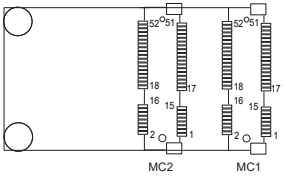


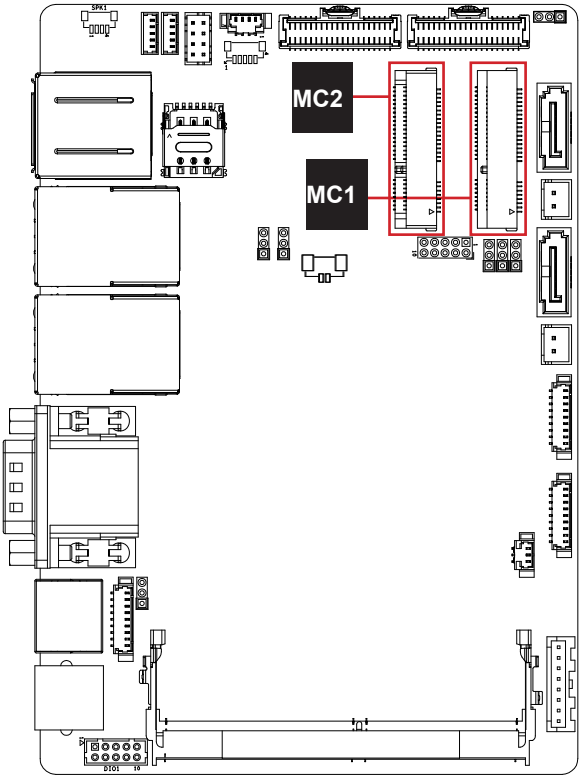


(25)MC1: Full size Mini-Card Socket
(26)MC2: Half size Mini-Card Socket

Connector type: Onboard 0.8mm-pitch 52-pin edge card connector

The pin assignments conform to the industry standard.

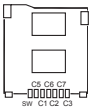


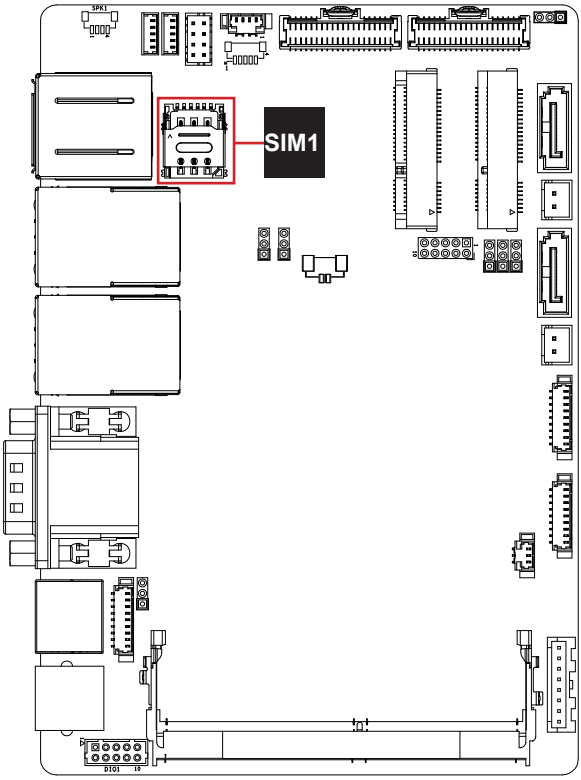


(27)SIM1: MC1 NANO SIM Socket

Connector type: SMD,6P,1.27mm, H1.5 socket

Pin	Desc.	Pin	Desc.
C1	VCC	C2	RST
C3	CLK	C5	GND
C6	VPP	C7	I/O

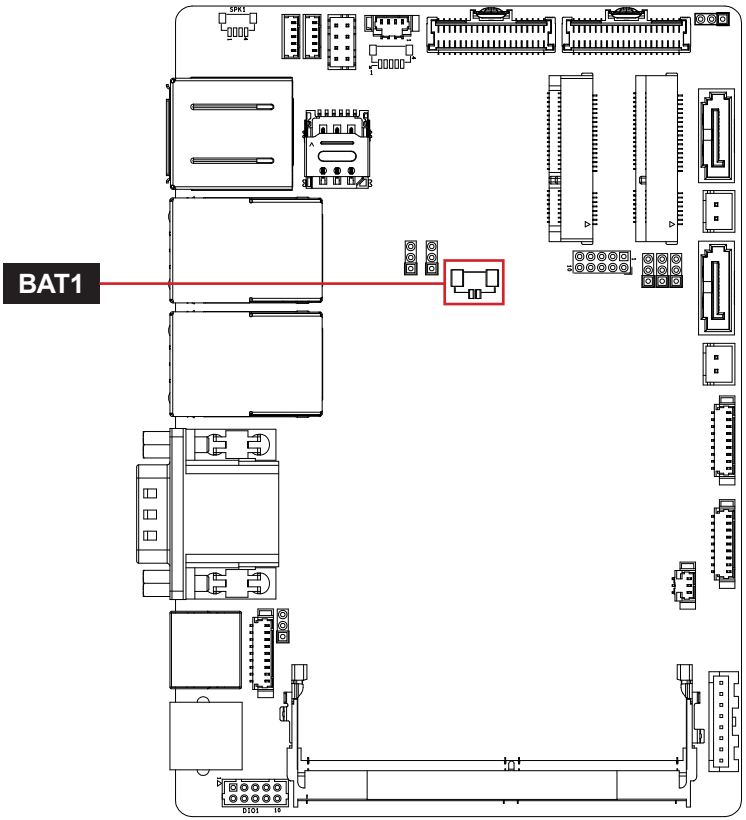




(28)BAT1: Battery Connector

Connector type: 1.25mm pitch 1x2-pin connector.

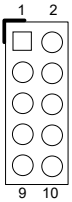
Pin	Description
1	GND
2	Battery Power

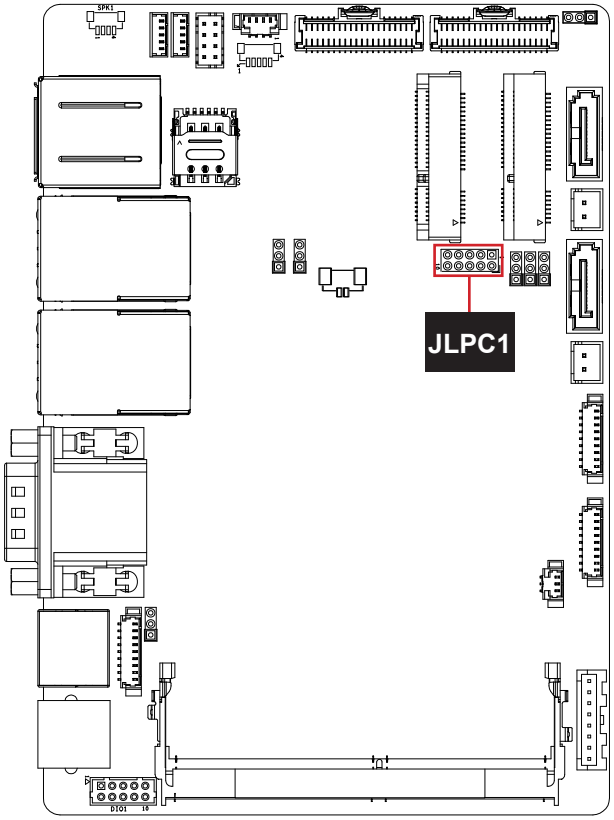


(29)JLPC1: LPC to 80 Port Debug Card Connector

Connector type: 1.25mm pitch 2x5 pin header

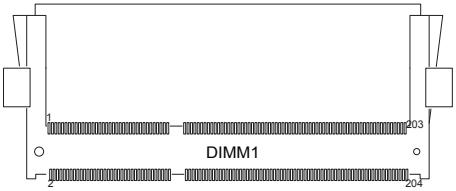
Pin	Description	Pin	Description
1	LPC_CLK0	2	GND
3	LPC_ LFRAME	4	3.3V_LPC_ LAD0
5	PLTRST	6	N/C
7	LPC_LAD3	8	LPC_LAD2
9	+3.3VS	10	LPC_LAD1

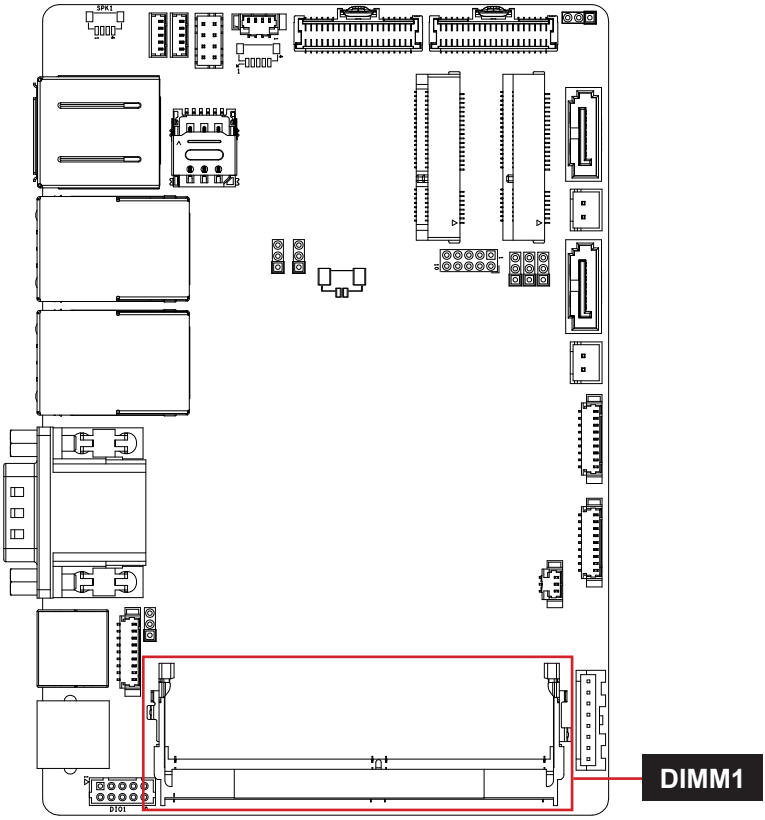




(30)DIMM1: DDR4 SO-DIMM Socket

Connector type: DDR4 SO-DIMM socket supporting 3200MHz SDRAM up to 16GB





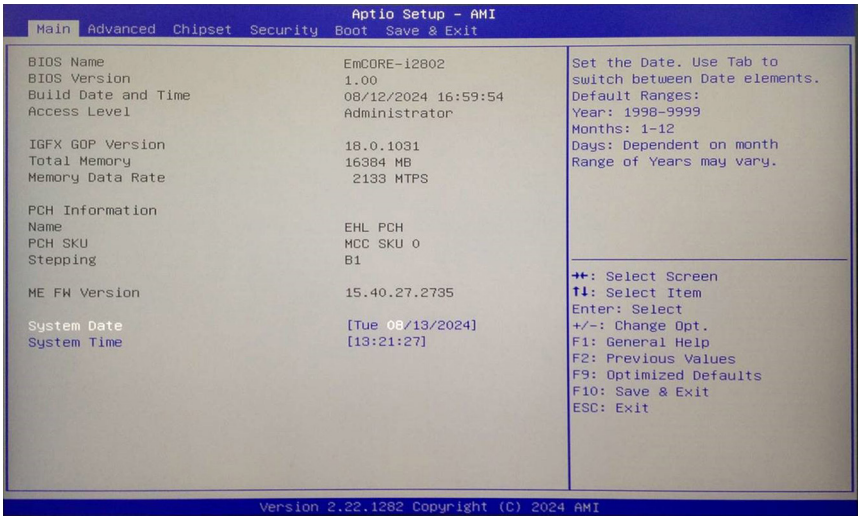
Chapter 3

BIOS

3.1 Main

The AMI BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS RAM of the system stores the Setup utility and configurations. When you turn on the computer, the AMI BIOS is immediately activated. To enter the BIOS SETUP UTILITY, press **"Delete"** once the power is turned on.

The **Main Setup** screen lists the following information:



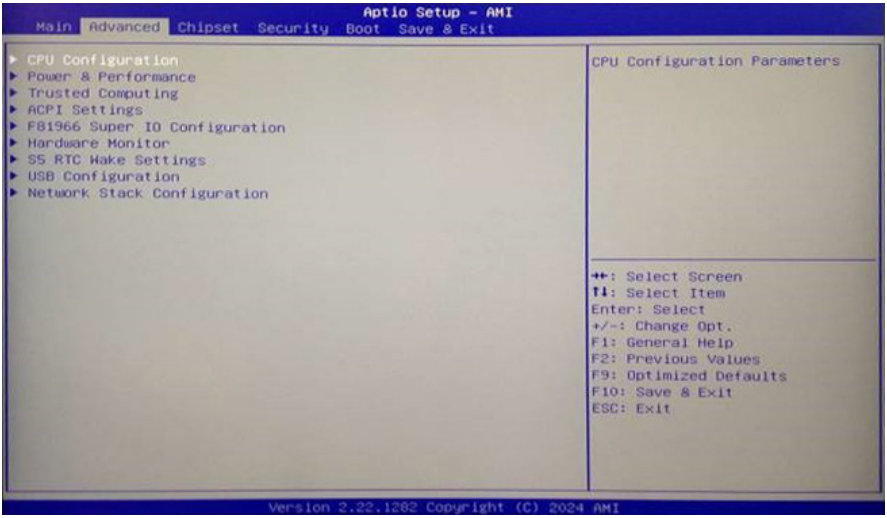
Setting	Description
BIOS Name	Display the model name of the computer.
BIOS Version	Display current BIOS version information.
Build Date and Time	The date that the BIOS version was made/updated.
Access Level	Delivers the level that the BIOS is being accessed at the moment.
System Date	Set the system date. Use Tab to switch between Date elements.
System Time	Set the system time. Use Tab to switch between Time elements.

Key Commands

BIOS Setup Utility is mainly a key-based navigation interface. Please refer to the following key command instructions for navigation process.

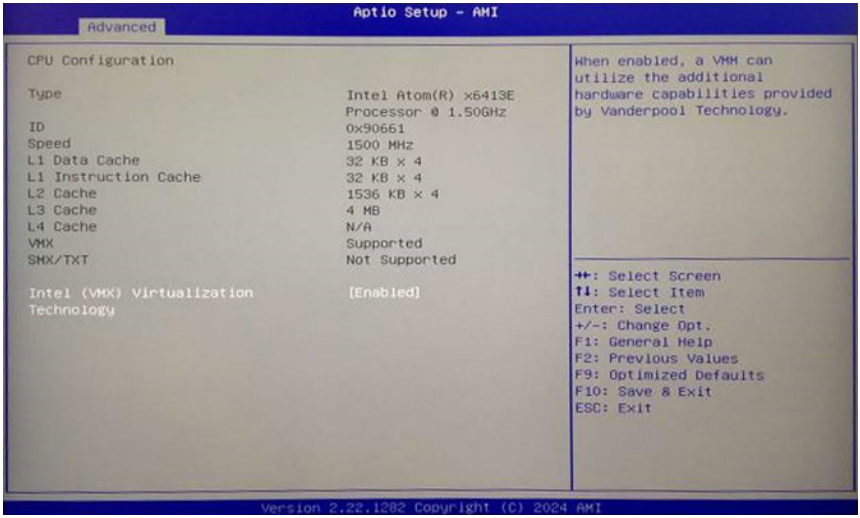
Keystroke	Function
← →	Move to highlight a particular configuration screen from the top menu bar / Move to highlight items on the screen
↓ ↑	Move to highlight previous/next item
Enter	Select and access a setup item/field
Esc	On the Main Menu – Quit the setup and not save changes into CMOS (a message screen will display and ask you to select “Yes” or “No” for exiting and discarding changes. Use “←” and “→” to select and press “Enter” to confirm) On the Sub Menu – Exit current page and return to main menu
Page Up / +	Increase the numeric value on a selected setup item / make change
Page Down / -	Decrease the numeric value on a selected setup item / make change
F1	Activate “General Help” screen
F2	Previous Values
F9	Optimized defaults
F10	Save the changes that have been made in the setup and exit. (a message screen will display and ask you to select “Yes” or “No” for exiting and saving changes. Use “←” and “→” to select and press “Enter” to confirm)

3.2 Advanced



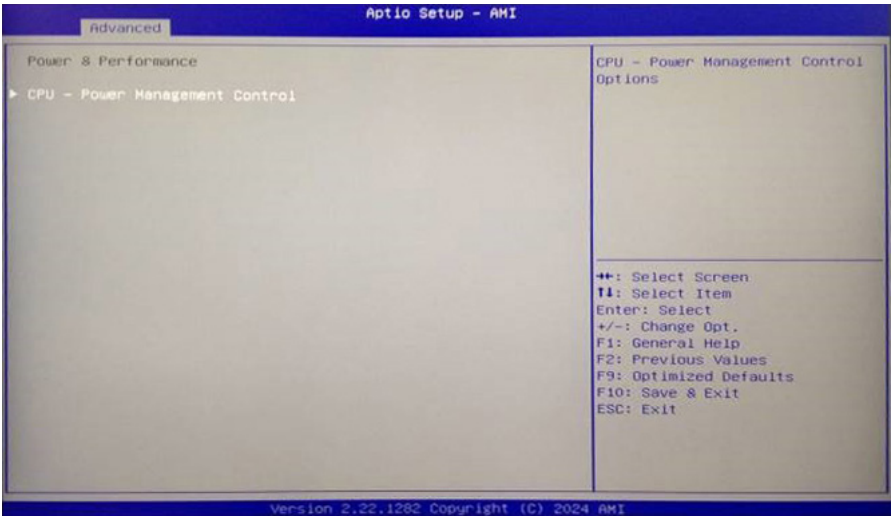
Setting	Description
CPU Configuration	See section 3.2.1 CPU Configuration on page 45
Power & Performance	See section 3.2.2 Power & Performance on page 46
Trusted Computing	See section 3.2.3 Trusted computing on page 47
ACPI Settings	See section 3.2.4 ACPI Settings on page 48
F81966 Super IO Configuration	See section 3.2.5 F81966 Super IO Configuration on page 49
Hardware Monitor	See section 3.2.6 Hardware Monitor on page 50
S5 RTC Wake Settings	See section 3.2.7 S5 RTC Wake Settings on page 51
USB Configuration	See section 3.2.8 USB Configuration on page 52
Netwotk Stack Configuration	See section 3.2.9 Network Stack Configuration on page 54

3.2.1 CPU Configuration



Setting	Description
Intel (VMX) Virtualization Technology	Enable or disable Intel virtualization technology. When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology. ► Options: **Enabled** (default) or **Disabled**.

3.2.2 Power & Performance



Setting	Description
CPU- Power Management Control	CPU-Power management control options.
Intel(R) SpeedStep(tm)	Enable or disable Intel SpeedStep. ► Options: **Enabled** (default) / **Disabled**.
Turbo Mode	Enable or disable the turbo mode. ► Options: **Enabled** (default) / **Disabled**.

3.2.3 Trusted computing

Setting	Description
Security Device Support	**Enable** (default) or **Disable** the BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.
SHA256 PCR Bank	**Enable** (default) or **Disable** SHA256 PCR Bank.
Pending Operation	Schedule an Operation for the security Device. Your computer will reboot during restart in order to change State of Security Device. ► Options: **None** (default) and **TPM Clear**
Platform Hierarchy	**Enable** (default) or **Disable** Platform Hierarchy.
Storage Hierarchy	**Enable** (default) or **Disable** Storage Hierarchy.
Endorsement Hierarchy	**Enable** (default) or **Disable** Endorsement Hierarchy.
Physical Presence Spec Version	Select to tell O.S. to support PPI Spec Version. Options: **1.2** or **1.3**
Device Select	Select TPM devices options: **TPM1.2**, **TPM2.0** and **Auto** (default)

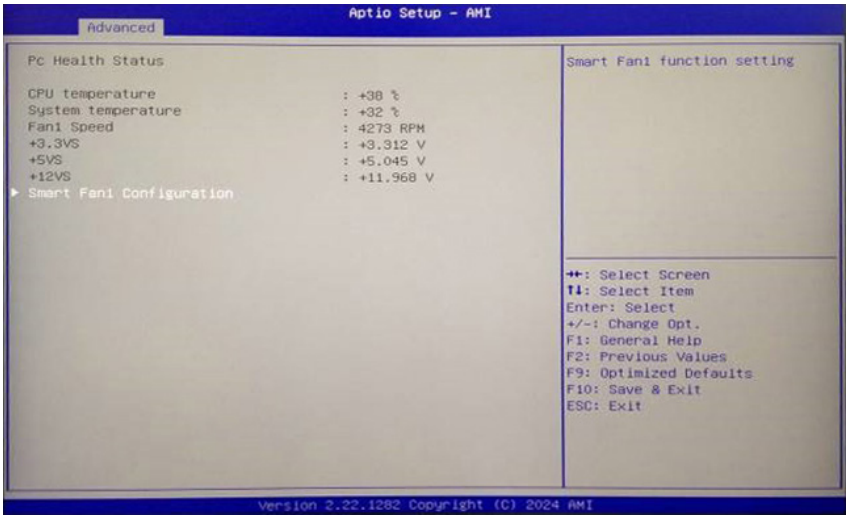
3.2.4 ACPI Settings

Setting	Description
Enable Hibernation	**Enable** (default) or **Disable** System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some Operating Systems.
ACPI Sleep State	Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed. ► Options: **Suspend Disabled** and **S3 (Suspend to RAM)** (default).

3.2.5 F81966 Super IO Configuration

Setting	Description
Serial Port 1~6 Configuration	Set Parameters of Serial Port 1~6.

3.2.6 Hardware Monitor



Access this submenu to monitor the hardware status.

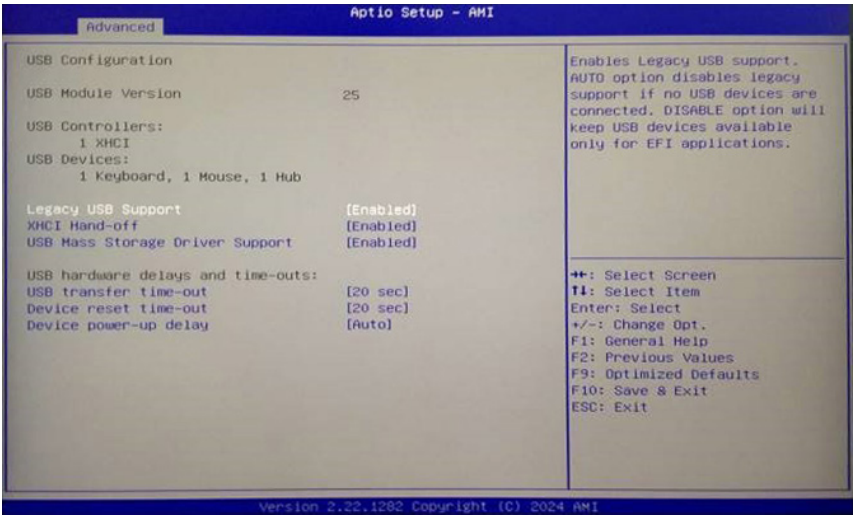
Setting	Description	
Smart Fan1 configuration	Smart fan1 setting.	
	FAN TYPE	Allows more than two frequency ranges to be supported. ► Options: **DAC Linear** (default) / **Disabled**.
	FAN MODE	CPU Smart Fan function settings. Fan mode selection: ► Options: **Auto - Dupty Cycle**(default) or **Manial - Dupty Cycle**

3.2.7 S5 RTC Wake Settings

The featured submenus are:

Setting	Description
Wake system from S5	Select System wake on alarm event. ► Options: **Disabled**(default)/**Fixed Time**/**Dynamic Time**.
Wake System with Fixed Time	Sets if to awake the system at a defined moment.
↳ Wake up hour	Defines the (hour) time to wake the system. ► 0 to 23 configurable.
↳ Wake up Minute	Defines the (minute) time to wake the system. ► 0 to 59 configurable.
↳ Wake up second	Defines the (second) time to wake the system. ► 0 to 59 configurable.
Wake System with Dynamic Time	Sets if to awake the system some time in the future.
↳ Wake up minute increase	Defines how long from now to wake the system. ► 1 to 5 minutes configurable.

3.2.8 USB Configuration



Setting	Description
Legacy USB Support	Sets legacy USB support. ► Options: **Enabled** (default), **Disabled** and **Auto**. **AUTO** option disables legacy support if no USB devices are connected. **Disable** option will keep USB devices available only for EFI applications.
XHCI Hand-off	**Enable** (default) or **Disable** XHCI Hand-off This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.
USB Mass Storage Driver Support	**Enable** (default) or **Disable** USB Mass Storage Driver Support.
USB hardware delays and time-outs	
USB Transfer time-out	Use this item to set the time-out value for control, bulk, and interrupt transfers. ► Options available are: **1 sec, 5 sec, 10 sec, 20 sec** (default)

Device reset time-out	Use this item to set USB mass storage device start unit command time-out. ► Options available are: **10 sec, 20 sec** (default)**, 30 sec, 40 sec**
Device power-up delay	Use this item to set maximum time the device will take before it properly reports itself to the host controller. ► Options available are: **Auto** (Default): 'Auto' uses default value: for a root port it is 100 ms, for a hub port the delay is taken from hub descriptor. **Manual**: Select **Manual** you can set value for the following sub-item: '**Device Power-up delay in seconds**', the delay range in from 1 to 40 seconds, in one second increments.

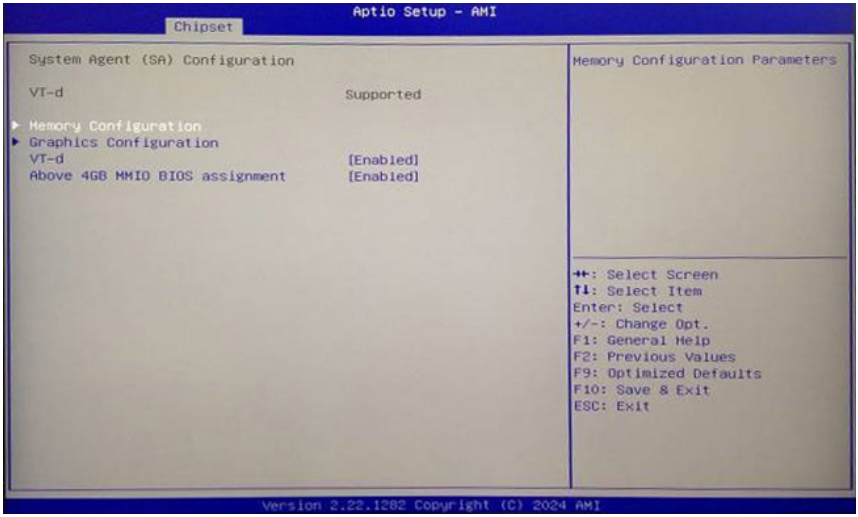
3.2.9 Network Stack Configuration

Setting	Description
Network Stack	Enables/Disables UEFI Network Stack. ► **Disabled** is the default.

3.3 Chipset

Setting	Description
System Agent (SA) Configuration	See section 3.3.1 System Agent (SA) Configuration on page 56
PCH-IO Configuration	See section 3.3.2 PCH-IO Configuration on page 58

3.3.1 System Agent (SA) Configuration



3.3.1.1 Memory Configuration

Setting	Description
Memory Configuration	Access to view the memory configuration.

3.3.1.2 Graphics Configuration

Setting	Description
DVMT Pre-Allocated	Select DVMT 5.0 Pre-Allocated(Fixed) Graphics Memory size from 4M to 160MB used by the Internal Graphics Device. (60MB is the default)
DVMT Total Gfx Mem	Select DVMT 5.0 Total Graphic Memory size from 128MB to MAX used by the Internal Graphics Device . (256MB is the default)

<table>
<tr><td>LCD Control</td><td><table>
<tr><td>Primary IGFX Boot Display</td><td>Select the Video Device which will be activated during POST. This has no effect if external graphics present. Secondary boot display selection will appear based on your selection. VGA modes will be supported only on primary display.</td></tr>
<tr><td>LCD Panel Type</td><td>Select LCD Panel Type.</td></tr>
<tr><td>Active LFP</td><td>Select the Active LFP Configuration.</td></tr>
<tr><td>LVDS Channel Type</td><td>Select LVDS Channel Type.</td></tr>
<tr><td>LVDS Panel Color Format</td><td>Select the LVDS panel color format.</td></tr>
</table></td></tr>
<tr><td>LCD2 Control</td><td><table>
<tr><td>LCD2 Panel Type</td><td>Select LCD2 Panel used by Internal Graphics Device by selecting the appropriate setup item.</td></tr>
<tr><td>LCD2 Backlight Brightness</td><td>Adjust the brightness percentage of the output.</td></tr>
<tr><td>LVDS Channel Type</td><td>Select LVDS Channel Type.</td></tr>
<tr><td>LVDS Panel Color Format</td><td>Select the LVDS panel color format.</td></tr>
</table></td></tr>
</table>

VT-d	Enables/disables the VT-d capability. (**Enabled** is the default)
Above 4GB MMIO BIOS assignment	Enables(default)/disables above 4GB Memory Mapped IO BIOS assignment. This is enabled automatically when Aperture Size is set to 2048MB.

3.3.2 PCH-IO Configuration

3.3.2.1 PCI Express Configuration:

Setting	Description
RealTek LAN-1/2	► **RealTek LAN-1/2:** Enables or Disables LAN-1/2 ► **ASPM**: Set the ASPM level ► **L1 Substates:** PCI Express L1 substates settings ► **PCIe Speed:** Configure PCIe speed
Mini Card-1/2	► **Mini Card-1/2:** Enables or Disables Mini Card-1/2 ► **ASPM:** Set the ASPM level ► **L1 Substates:** PCI Express L1 substates settings ► **PCIe Speed:** Configure PCIe speed

3.3.2.2 SATA Configuration:

Setting	Description
SATA Controller(s)	Enables (default) / Disables SATA device(s).
Aggressive LPM Support	Enables (default) / Disables aggressive LPM support.
Port 0/1	SATA device information. Enables (default) or Disables the SATA port. *Available SATA ports depend on your model.

3.3.2.3 USB Configuration:

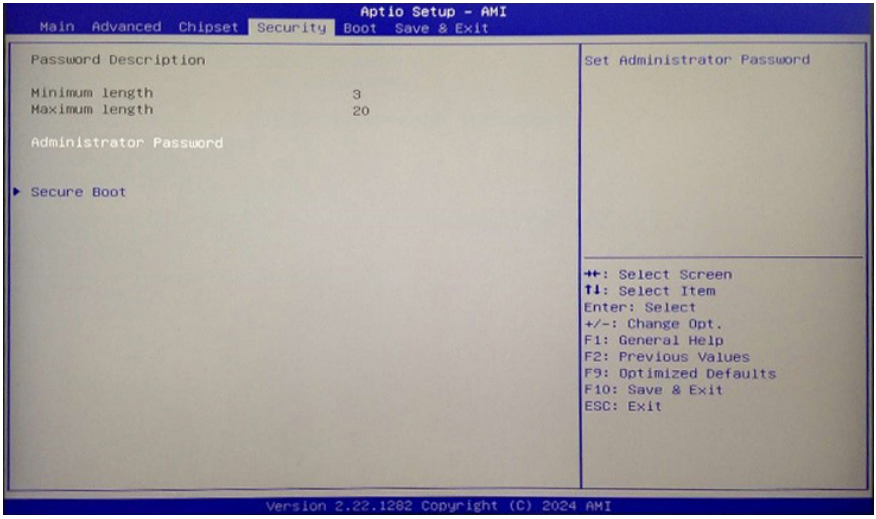
Setting	Description
XHCI Compliance Mode	Option to enable Compliance Mode. Default is to disable Compliance Mode. Change to enabled for Compliance Mode testing.
xDCI Support	Enable/Disable xDCI (USB OTG Device).
USB2 PHY Sus Well Power Gating	Select “Enabled” to enable SUS Well PG for USB2 PHY. This option has no effect on PCH-H.
USB3 Link Speed Selection	Select USB3 Link Speed GEN1 or GEN2.
USB PDO Programming	Select “Enabled” if Port Disable Override functionality is used.
USB Overcurrent	Select “Disabled” for pin-based debug. If pin-based debug is enabled but USB overcurrent is not disabled, USB DbC does not work.
USB Internal Pullup resistor	Control (Enable/Disable) internal Pull-up resistor for the Pin ball A12.
USB Overcurrent Lock	Select “Enabled” if Overcurrent functionality is used. Enabling this will make xHCI controller consume the Overcurrent mapping data.
USB Port Disable Override	Selectively Enable/Disable the corresponding USB port from reporting a Device Connection to the controller.
USB Device/ HOST Mode Override	Selectively Enable/Disable the corresponding USB 2.0 and USB 3.0 port device mode.
USB UCSI ACPI device	Enables/Disable USB UCSI ACPI device.

State After G3:

Setting	Description
State After G3	Specify what state to go to when power is re-applied after a power failure (G3 state). ► Options: **S0 State** (default)**, S5 State**

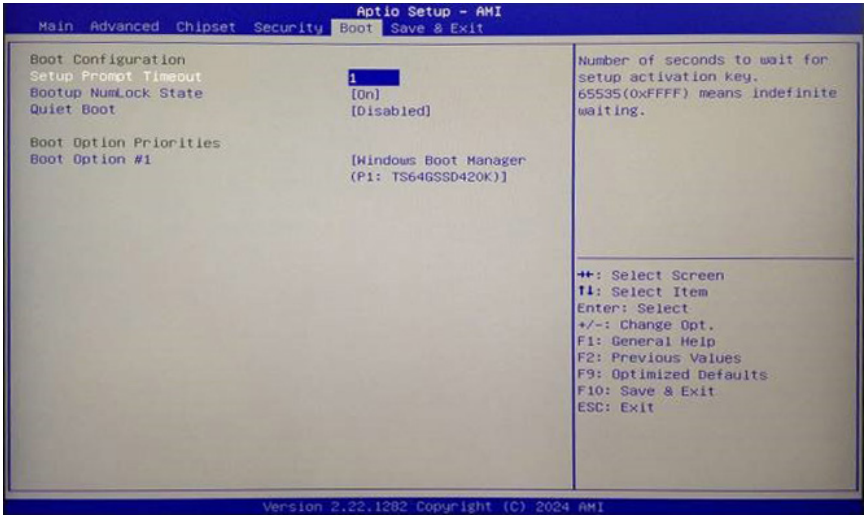
3.4 Security

The **Security** menu sets up the administrator password.



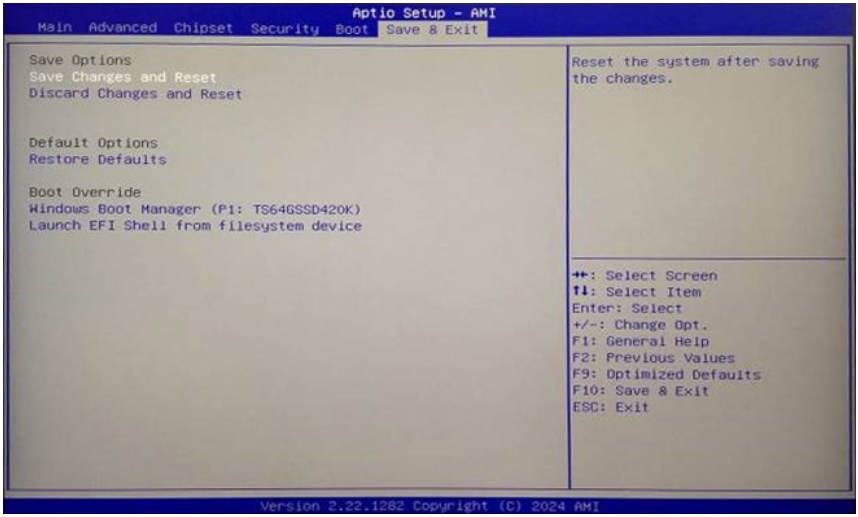
Setting	Description
Administrator Password	To set up an administrator password: 1. Select **Administrator Password**. The screen then pops up an **Create New Password** dialog. 2. Enter your desired password that is no less than 3 characters and no more than 20 characters. 3. Hit [Enter] key to submit.
Secure Boot	Secure Boot feature is Active if Secure Boot is Enabled, Platform Key (PK) is enrolled and the System is in User mode. The mode change requires platform reset. ► Options: **Disabled** (default)**, Enabled**
Secure Boot Mode	Secure Boot Mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.
Restore Factory Keys	Force System to User Mode. Install factory default Secure Boot key databases.
Key Management	Enables expert users to modify Secure Boot Policy variables without full authentication.

3.5 Boot



Setting	Description
Setup Prompt Timeout	Use this item to set number of seconds to wait for setup activation key. 65535 (0xFFFF) means indefinite waiting.
Bootup NumLock State	Select the keyboard NumLock state. ► Options: **On** (default) and **Off**.
Quiet Boot	**Enable** (default) or **Disable** Quiet Boot option.

3.6 Save & Exit



Setting	Description
Save Changes and Reset	Exit system setup after saving the changes. ► Enter the item and then a dialog box pops up: **Save configuration and reset? (Yes/ No)**
Discard Changes and Reset	Exit system setup without saving the changes. ► Enter the item and then a dialog box pops up: **Reset without saving? (Yes/ No)**
Restore Defaults	Restore/Load Default values for all the setup options. ► Enter the item and then a dialog box pops up: **Load Optimized Defaults? (Yes/ No)**
Launch EFI Shell from filesystem device	Attempts to launch EFI shell application (Shell.efi) from one of the available filesystem devices.

Appendix

Appendix A. Watchdog Timer (WDT) Setting

WDT is widely used for industrial application to monitor CPU activities. The application software depends on its requirement to trigger WDT with adequate timer setting. Before WDT timeout, the functional normal system will reload the WDT. The WDT never time-out for a normal system. The WDT will not be reloaded by an abnormal system, then WDT will time-out and auto-reset the system to avoid abnormal operation.

This computer supports 255 levels watchdog timer by software programming I/O ports.

Below is an program example to disable and load WDT.

Sample Codes:

```
/*---------------------------------------------------------------------------*/
#include <math.h>
#include <stdio.h>
#include <dos.h>

int WDTCount;

int main(void)
{
          unsigned char       iCount;

          printf("WDT Times ( 1 ~ 255 ) : ");
          scanf("%d",&iCount);
          printf("\n");

          WDT_Start(iCount);

          return 0;
}

void WDT_Start(int iCount)
{
          outportb(0x66,0xBA);                    /* Enable Watch Dog */
          delay(1000);

          WDTCount = iCount;
          outportb(0x62, WDTCount);               /* Number is Watch Dog Down count number */
          delay(1000);

          outportb(0x62, 0x00);                   /* Minute is 1 count unit by minute */
                                                  /* Minute is 0 count unit by second */
}

void WDT_Stop(void)
{
          outportb(0x66,0xBB);                    /* Disable Watch Dog */
}

void WDT_Clear(void)
{
          outportb(0x66,0xBA);                    /* Enable Watch Dog */
          delay(1000);

          outportb(0x62, WDTCount);               /* Number is Watch Dog Down count number */
          delay(1000);
```

```
        outportb(0x62, 0x00);                          /* Minute is 1 count unit by minute
*/
                                                                                    /   *
Minute is 0 count unit by second */
}
```

Appendix B. Digital I/O Setting

Digital I/O can read from or write to a line or an entire digital port, which is a collection of lines. This mechanism helps users achieve various applications such as industrial automation, customized circuit, and laboratory testing. Take the source code below that is written in C for the digital I/O application example.

Sample Codes:

```
/*-----   Include Header Area -----*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

#define    sioIndex  0x2E
#define    sioData   0x2F

/*-----   routing, sub-routing -----*/
void main()
{
    int iData;

    SioGPIOMode(0x0F);
    delay(2000);

    SioGPIOData(0x05);
    delay(2000);

    iData = SioGPIOStatus();
    printf(" Input : %2x \n",iData);
    delay(2000);

    SioGPIOData(0x0A);
    delay(2000);

    iData = SioGPIOStatus();
    printf(" Input : %2x \n",iData);
    delay(2000);
}

void SioGPIOMode(int iMode)
{
    outportb(sioIndex,0x87);                          /* Enable Super I/O */
    outportb(sioIndex,0x87);

    outportb(sioIndex,0x07);                          /* Select logic device - GPIO */
    outportb(sioData, 0x06);

    outportb(sioIndex,0x30);                          /* Enable GPIO */
    outportb(sioData, 0x01);

    outportb(sioIndex,0x88);                          /* GPIO 80~87 - Output Enable */
    outportb(sioData,iMode);

    outportb(sioIndex,0xAA);                          /* Disable Super I/O */
}

void SioGPIOData(int iData)
{
    outportb(sioIndex,0x87);                          /* Enable Super I/O */
```

```
    outportb(sioIndex,0x87);

    outportb(sioIndex,0x07);                          /* Select logic device - GPIO */
    outportb(sioData, 0x06);

    outportb(sioIndex,0x89);                          /* GPIO 80~87 - Output Data */
    outportb(sioData,iData);

    outportb(sioIndex,0xAA);                          /* Disable Super I/O */
}

int SioGPIOStatus()
{
    int iStatus = 0x00;

    outportb(sioIndex,0x87);                          /* Enable Super I/O */
    outportb(sioIndex,0x87);

    outportb(sioIndex,0x07);                          /* Select logic device - GPIO */
    outportb(sioData, 0x06);


    outportb(sioIndex,0x8A);                          /* GPIO 80~87 - Status */
    iStatus  = inportb(sioData);

    outportb(sioIndex,0xAA);                          /* Disable Super I/O */

    return iStatus;
}
```